REPUBLIC OF LEBANON
MINISTRY OF TRANSPORT
DIRECTORATE GENERAL OF CIVIL AVIATION

LARs

LEBANESE AVIATION REGULATIONS

Part VI

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Special Flight Operations
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***** Revision No. 1 *****
International Civil Aviation Organization
Richard B. Fauquier

Directorate General of Civil Aviation

Lebanese Aviation Regulations
Part VI

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4	# 1	Dec 1, 2000	13	# 1	Dec 1, 2000
5	# 1	Dec 1, 2000	14	# 1	Dec 1, 2000
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3	# 1	Dec 1, 2000	38	# 1	Dec 1, 2000
4	# 1	Dec 1, 2000	39	# 1	Dec 1, 2000
5	# 1	Dec 1, 2000	40	# 1	Dec 1, 2000
6	# 1	Dec 1, 2000	41	# 1	Dec 1, 2000
7	# 1	Dec 1, 2000	42	# 1	Dec 1, 2000
8	# 1	Dec 1, 2000	43	# 1	Dec 1, 2000
9	# 1	Dec 1, 2000	44	# 1	Dec 1, 2000
10	# 1	Dec 1, 2000	45	# 1	Dec 1, 2000
11	# 1	Dec 1, 2000	46	# 1	Dec 1, 2000
12	# 1	Dec 1, 2000	47	# 1	Dec 1, 2000
13	# 1	Dec 1, 2000	48	# 1	Dec 1, 2000
14	# 1	Dec 1, 2000	49	# 1	Dec 1, 2000
15	# 1	Dec 1, 2000	50	# 1	Dec 1, 2000
16	# 1	Dec 1, 2000	51	# 1	Dec 1, 2000
17	# 1	Dec 1, 2000	52	# 1	Dec 1, 2000
18	# 1	Dec 1, 2000	53	# 1	Dec 1, 2000
19	# 1	Dec 1, 2000	54	# 1	Dec 1, 2000
20	# 1	Dec 1, 2000	55	# 1	Dec 1, 2000
21	# 1	Dec 1, 2000	56	# 1	Dec 1, 2000
22	# 1	Dec 1, 2000	57	# 1	Dec 1, 2000
23	# 1	Dec 1, 2000	58	# 1	Dec 1, 2000
24	# 1	Dec 1, 2000	59	# 1	Dec 1, 2000
25	# 1	Dec 1, 2000	60	# 1	Dec 1, 2000
26	# 1	Dec 1, 2000	61	# 1	Dec 1, 2000
27	# 1	Dec 1, 2000	62	# 1	Dec 1, 2000
28	# 1	Dec 1, 2000	63	# 1	Dec 1, 2000
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2	# 1	Dec 1, 2000	16	# 1	Dec 1, 2000
3	# 1	Dec 1, 2000	17	# 1	Dec 1, 2000
4	# 1	Dec 1, 2000	18	# 1	Dec 1, 2000
5	# 1	Dec 1, 2000	19	# 1	Dec 1, 2000
6	# 1	Dec 1, 2000	20	# 1	Dec 1, 2000
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i	# 1	Dec 1, 2000	24	# 1	Dec 1, 2000
ii	# 1	Dec 1, 2000	25	# 1	Dec 1, 2000
iii	# 1	Dec 1, 2000	26	# 1	Dec 1, 2000
iv	# 1	Dec 1, 2000	27	# 1	Dec 1, 2000
1	# 1	Dec 1, 2000	28	# 1	Dec 1, 2000
2	# 1	Dec 1, 2000	29	# 1	Dec 1, 2000
3	# 1	Dec 1, 2000	30	# 1	Dec 1, 2000
4	# 1	Dec 1, 2000	31	# 1	Dec 1, 2000
5	# 1	Dec 1, 2000	32	# 1	Dec 1, 2000
6	# 1	Dec 1, 2000	33	# 1	Dec 1, 2000
7	# 1	Dec 1, 2000	34	# 1	Dec 1, 2000
8	# 1	Dec 1, 2000	35	# 1	Dec 1, 2000
9	# 1	Dec 1, 2000	36	# 1	Dec 1, 2000
10	# 1	Dec 1, 2000	37	# 1	Dec 1, 2000
11	# 1	Dec 1, 2000	38	# 1	Dec 1, 2000
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2	# 1	Dec 1, 2000	17	# 1	Dec 1, 2000
3	# 1	Dec 1, 2000	18	# 1	Dec 1, 2000
4	# 1	Dec 1, 2000	19	# 1	Dec 1, 2000
5	# 1	Dec 1, 2000	20	# 1	Dec 1, 2000
6	# 1	Dec 1, 2000	21	# 1	Dec 1, 2000
7	# 1	Dec 1, 2000	22	# 1	Dec 1, 2000
8	# 1	Dec 1, 2000	23	# 1	Dec 1, 2000
9	# 1	Dec 1, 2000	24	# 1	Dec 1, 2000
10	# 1	Dec 1, 2000	25	# 1	Dec 1, 2000
11	# 1	Dec 1, 2000	26	# 1	Dec 1, 2000
12	# 1	Dec 1, 2000	27	# 1	Dec 1, 2000
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i	# 1	Dec 1, 2000	9	# 1	Dec 1, 2000
ii	# 1	Dec 1, 2000	10	# 1	Dec 1, 2000
iii	# 1	Dec 1, 2000	11	# 1	Dec 1, 2000
iv	# 1	Dec 1, 2000	12	# 1	Dec 1, 2000
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1	# 1	Dec 1, 2000			
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3	# 1	Dec 1, 2000			
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1	# 1	Dec 1, 2000
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1	# 1	Dec 1, 2000	7	# 1	Dec 1, 2000
2	# 1	Dec 1, 2000	8	# 1	Dec 1, 2000
3	# 1	Dec 1, 2000	9	# 1	Dec 1, 2000
4	# 1	Dec 1, 2000	10	# 1	Dec 1, 2000
5	# 1	Dec 1, 2000			
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1	# 1	Dec 1, 2000	6	# 1	Dec 1, 2000
2	# 1	Dec 1, 2000			
3	# 1	Dec 1, 2000			
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1	# 1	Dec 1, 2000	6	# 1	Dec 1, 2000
2	# 1	Dec 1, 2000			
3	# 1	Dec 1, 2000			
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5	# 1	Dec 1, 2000			

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1	# 1	Dec 1, 2000	9	# 1	Dec 1, 2000
2	# 1	Dec 1, 2000	10	# 1	Dec 1, 2000
3	# 1	Dec 1, 2000	11	# 1	Dec 1, 2000
4	# 1	Dec 1, 2000	12	# 1	Dec 1, 2000
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6	# 1	Dec 1, 2000			
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1	# 1	Dec 1, 2000	5	# 1	Dec 1, 2000
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5	# 1	Dec 1, 2000			
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7	# 1	Dec 1, 2000			
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Appendix J
Unserviceable and Removed Equipment – Aircraft with Minimum Equipment List

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3	# 1	Dec 1, 2000	17	# 1	Dec 1, 2000
4	# 1	Dec 1, 2000	18	# 1	Dec 1, 2000
5	# 1	Dec 1, 2000	19	# 1	Dec 1, 2000
6	# 1	Dec 1, 2000	20	# 1	Dec 1, 2000
7	# 1	Dec 1, 2000	21	# 1	Dec 1, 2000
8	# 1	Dec 1, 2000	22	# 1	Dec 1, 2000
9	# 1	Dec 1, 2000	23	# 1	Dec 1, 2000
10	# 1	Dec 1, 2000	24	# 1	Dec 1, 2000
11	# 1	Dec 1, 2000	25	# 1	Dec 1, 2000
12	# 1	Dec 1, 2000	26	# 1	Dec 1, 2000
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ii	# 1	Dec 1, 2000	4	# 1	Dec 1, 2000
1	# 1	Dec 1, 2000			
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Approved by
Director General of Civil Aviation, Lebanon

Inspector Full Name: Richard Beresford Fauquier

Inspector Signature: ____________________

Date: 01/12/00

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Lebanese Aviation Regulations

Part VI

General Operating and Flight Rules

Revision No. 1
(Effective 01 December 2000)

Revision Instructions

Remove:		***Insert:***	
Part VI /	Subpart 0	Part VI /	Subpart 0
	Subpart 1		Subpart 1
	Subpart 2		Subpart 2
	Subpart 3		Subpart 3
	Subpart 4		Subpart 4
	Subpart 5		Subpart 5
	Subpart 6		Subpart 6

Summary of Revisions:

This is Revision 1 to the original.

Republic of Lebanon

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NOTE

All revisions to the Lebanese Aviation Regulations will be indicated by a side bar to the left of the revised text and a revision number at the bottom of the page.

RECORD OF REVISIONS

Date of Revision	***Revision #***	***Date Entered***	***Entered By***
01/07/00	Original	01/07/00	RBF
01/12/00	# 1	01/12/00	RBF

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Subpart 0
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***** Revision No. 1 *****
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Richard B. Fauquier

LEBANESE AVIATION REGULATIONS (LARs)

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Subpart 0 – Applicability and Interpretation

600.01 Applicability

(1) This part prescribes general operating and flight rules governing the operation of aircraft within Lebanon and Lebanese registered aircraft operated outside of Lebanon.
(2) This part does not apply in respect of:
- (a) military aircraft of Lebanon when they are being maneuvered under the authority of the Minister of Defense.
- (b) model aircraft, rockets, hovercraft or wing-in-ground-effect machines, unless otherwise indicated in the LARs.
- (c) State aircraft of Lebanon

600.02 Interpretation

In addition to interpretations located in Part 1, Subpart 1 of the LARs, in this Part,

"aerial application" - means the seeding from an aircraft or the spraying or dusting of chemicals from an aircraft, or any other operation of a similar nature;

"aerial inspection" - means the inspection from an aircraft of crops, forests, livestock or wildlife, the patrolling of pipelines or power lines, a flight inspection or any other operation of a similar nature;

"AX class" - means a classification of balloons by category, in accordance with their size, as established by the Fédération aéronautique internationale (FAI);

"large aircraft" - means an airplane having a maximum permissible take-off weight in excess of 5,700 kg (12,566 pounds) or a rotorcraft having a maximum permissible take-off weight in excess of 2,730 kg (6,018 pounds);

"police authority" - means any municipal or regional police force established pursuant to Lebanese legislation.

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Subpart 1 - Airspace

Division I - Airspace Structure, Classification and Use

601.01 Airspace Structure

(1) Controlled airspace consists of the following types of airspace:
- (a) control area extensions;
- (b) control zones;
- (c) high level airways;
- (d) high level airspace;
- (e) low level airways;
- (f) terminal control areas;
- (g) transition areas;
- (h) restricted airspace;
- (i) advisory airspace;
- (j) military operations areas; and
- (k) danger areas.

(2) Uncontrolled airspace consists of the following types of airspace:
- (a) high level air routes;
- (b) low level air routes;
- (c) restricted airspace;
- (d) advisory airspace;
- (e) military operations areas; and
- (f) danger areas.

(3) The horizontal and vertical limits of any airspace of a type referred to in subsection (1) or (2) shall be as specified in the Aeronautical Information Publication (AIP).

(4) The geographical locations of and the horizontal and vertical limits of the following areas, zones, regions and points are as specified in the Aeronautical Information Publication (AIP):
- (a) altimeter setting regions;
- (b) standard pressure regions;
- (c) mountainous regions;
- (d) holding points;
- (e) reporting points;
- (f) intersections;
- (g) control towers;
- (h) military terminal control areas;
- (i) flight information regions; and
- (j) any other areas, zones, regions and points that are specified in the Aeronautical Information Publication (AIP).

601.02 Airspace Classification

(1) The class of any controlled airspace of a type referred to in Subsection 601.01(1) of the Lebanese Aviation Regulations (LARs) is one of the following, as specified in the Aeronautical Information Publication (AIP):
- (a) Class A;
- (b) Class B;
- (c) Class C;
- (d) Class D;
- (e) Class E;

(f) Class F Special Use Restricted; or
(g) Class F Special Use Advisory.

(2) The class of any uncontrolled airspace of a type referred to in Subsection 601.01(2) is one of the following, as specified in the Aeronautical Information Publication (AIP):
(a) Class G;
(b) Class F Special Use Restricted; or
(c) Class F Special Use Advisory.

601.03 Transponder Airspace

Transponder airspace consists of:
(a) all Class A, B and C airspace; and
(b) any Class D or E airspace specified as transponder airspace in the Aeronautical Information Publication (AIP).

601.04 IFR or VFR Flight in Class F Special Use Restricted Airspace or Class F Special Use Advisory Airspace

(1) The procedures for the operation of aircraft in Class F Special Use Restricted airspace and Class F Special Use Advisory airspace are those specified in the Aeronautical Information Publication (AIP).
(2) No person shall operate an aircraft in Class F Special Use Restricted airspace unless authorized to do so by the person specified for that purpose in the Aeronautical Information Publication (AIP).
3) For the purposes of subsection (2), a person specified in the Aeronautical Information Publication (AIP) may authorize the operation of an aircraft where activities on the ground or in the airspace are not hazardous to aircraft operating in that airspace and access by aircraft to that airspace does not jeopardize national security interests.

601.05 IFR Flight in Class A, B, C, D or E Airspace or Class F Special Use Restricted or Class F Special Use Advisory Controlled Airspace

(1) No person shall operate an IFR aircraft in Class A, B, C, D or E airspace or in Class F Special Use Restricted or Class F Special Use Advisory controlled airspace unless the aircraft is operated in accordance with an air traffic control clearance or an authorization issued by the Minister.
(2) The Minister may issue an authorization referred to in subsection (1) where the operation of the aircraft is in the public interest and is not likely to affect aviation safety.

601.06 VFR Flight in Class A Airspace

(1) No person shall operate a VFR aircraft in Class A airspace unless the aircraft is operated in accordance with an authorization issued by the Minister.
(2) The Minister may issue an authorization referred to in subsection (1) where the operation of the aircraft is in the public interest and is not likely to affect aviation safety.

601.07 VFR Flight in Class B Airspace

(1) No person shall operate a VFR aircraft in Class B airspace unless the aircraft is operated in accordance with an air traffic control clearance or an authorization issued by the Minister.
(2) The Minister may issue an authorization referred to in subsection (1) where the operation of the aircraft is in the public interest and is not likely to affect aviation safety.

(3) The pilot-in-command of a VFR aircraft operating in Class B airspace in accordance with an air traffic control clearance shall, when it becomes evident that it will not be possible to operate the aircraft in VMC at the altitude or along the route specified in the air traffic control clearance,

(a) where the airspace is a control zone, request authorization to operate the aircraft in special VFR flight; and

(b) in any other case,

(i) request an amended air traffic control clearance that will enable the aircraft to be operated in VMC to the destination specified in the flight plan or to an alternate aerodrome, or

(ii) request an air traffic control clearance to operate the aircraft in IFR flight.

601.08 VFR Flight in Class C Airspace

(1) Subject to subsection (2), no person operating a VFR aircraft shall enter Class C airspace unless the person receives a clearance to enter from the appropriate air traffic control unit before entering the airspace.
(2) The pilot-in-command of a VFR aircraft that is not equipped with radio communication equipment capable of two-way communication with the appropriate air traffic control unit may, during daylight in VMC, enter Class C airspace if the pilot-in-command receives authorization to enter from the appropriate air traffic control unit before entering the airspace.
(3) Class C airspace becomes Class E airspace when the appropriate air traffic control unit is not in operation.

601.09 VFR Flight in Class D Airspace

(1) Subject to subsection (2), no person operating a VFR aircraft shall enter Class D airspace unless the person establishes two-way radio contact with the appropriate air traffic control unit before entering the airspace.
(2) The pilot-in-command of a VFR aircraft that is not equipped with radio communication equipment capable of two-way communication with the appropriate air traffic control unit may, during daylight in VMC, enter Class D airspace if the pilot-in-command receives authorization to enter from the appropriate air traffic control unit before entering the airspace.
(3) Class D airspace becomes Class E airspace when the appropriate air traffic control unit is not in operation.

601.10 to 601.13 Reserved

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Division II - Aircraft Operating Restrictions and Hazards to Aviation Safety

601.14 Interpretation

In this Division,

"fire control authority" - means an official of a government forestry service or other fire control agency that is responsible for the protection of persons and property against fire;

"forest fire area" - means an area on the surface of the earth on which standing timber, grass or any other vegetation or buildings are burning.

601.15 Forest Fire Aircraft Operating Restrictions

No person shall operate an aircraft:

(a) over a forest fire area, or over any area that is located within five nautical miles of a forest fire area, at an altitude of less than 3,000 feet AGL; or
(b) in any airspace that is described in a NOTAM issued pursuant to Section 601.16 of the LARs.

601.16 Issuance of NOTAM for Forest Fire Aircraft Operating Restrictions

The Minister may issue a NOTAM that relates to restrictions on the operation of aircraft in the case of a forest fire and that describes:

(a) the location and dimensions of the forest fire area; and
(b) the airspace in which forest fire control operations are being conducted.

601.17 Exceptions

Section 601.15 of the LARs does not apply to:

(a) persons who are operating an aircraft at the request of an appropriate fire control authority; and
(b) Directorate General Civil Aviation personnel who are operating an aircraft in the performance of duties related to surveillance and the enforcement of aviation legislation.

601.18 Orders Prohibiting or Restricting Aircraft Operation

The Minister may make orders prohibiting or restricting the operation of aircraft over such areas as are specified by the Minister, either absolutely or subject to such exceptions or conditions as may be specified by the Minister.

601.19 Orders Regarding the Marking and Lighting of Hazards to Aviation Safety

Where it is likely that a building, structure or object, including an object of natural growth, is hazardous to aviation safety because of its height and location, the Minister may, by order, direct the owner, or other person in possession or control of the building, structure or object, to mark it and light it in accordance with the standards specified in the Lebanese Laws and Regulations regarding the safety of aerodromes..

601.20 to 601.25 Reserved

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Division I - General

602.01 Reckless or Negligent Operation of Aircraft

No person shall operate an aircraft in such a reckless or negligent manner as to endanger or be likely to endanger the life or property of any person.

602.02 Fitness of Flight Crew Members

No operator of an aircraft shall require any person to act as a flight crew member and no person shall act as a flight crew member, if either the person or the operator has any reason to believe, having regard to the circumstances of the particular flight to be undertaken, that the person:

(a) is suffering or is likely to suffer from fatigue; or
(b) is otherwise unfit to perform properly the person's duties as a flight crew member.

602.03 Alcohol or Drugs - Crew Members

No person shall act as a crew member of an aircraft:

(a) within twelve hours after consuming an alcoholic beverage;
(b) while under the influence of alcohol; or
(c) while using any drug that impairs the person's faculties to the extent that the safety of the aircraft or of persons on board the aircraft is endangered in any way.

602.04 Alcohol or Drugs - Passengers

(1) In this Section, "intoxicating liquor" means a beverage that contains more than 2.5 per cent proof spirits.
(2) No person shall consume on board an aircraft an intoxicating liquor unless the intoxicating liquor:

(a) has been served to that person by the operator of the aircraft; or
(b) where no flight attendant is on board, has been provided by the operator of the aircraft.

(3) No operator of an aircraft shall provide or serve any intoxicating liquor to a person on board the aircraft, where there are reasonable grounds to believe that the person's faculties are impaired by alcohol or a drug to an extent that may present a hazard to the aircraft or to persons on board the aircraft.
(4) Subject to Subsection (5), no operator of an aircraft shall allow a person to board the aircraft, where there are reasonable grounds to believe that the person's faculties are impaired by alcohol or a drug to an extent that may present a hazard to the aircraft or to persons on board the aircraft.
(5) The operator of an aircraft may allow a person whose faculties are impaired by a drug to board an aircraft, where the drug was administered in accordance with a medical authorization and the person is under the supervision of an attendant.

602.05 Compliance with Instructions

(1) Every passenger on board an aircraft shall comply with instructions given by any crew member respecting the safety of the aircraft or of persons on board the aircraft.
(2) Every crew member on board an aircraft shall, during flight time, comply with the instructions of the pilot-in-command or of any person whom the pilot-in-command has authorized to act on behalf of the pilot-in-command.

602.06 Smoking

(1) No person shall smoke on board an aircraft during take-off or landing or when directed not to smoke by the pilot-in-command.
(2) No person shall smoke in an aircraft lavatory.
(3) No person shall tamper with or disable a smoke detector installed in an aircraft lavatory without permission from a crew member or the operator of the aircraft.

602.07 Aircraft Operating Limitations

No person shall operate an aircraft unless it is operated in accordance with the operating limitations:
- (a) set out in the aircraft flight manual, where an aircraft flight manual is required by the applicable standards of airworthiness;
- (b) set out in a document other than the aircraft flight manual, where use of that document is authorized pursuant to Part VII of the Lebanese Aviation regulations (LARs);
- (c) indicated by markings or placards required pursuant to Section 605.05 of the LARs; or
- (d) prescribed by the competent authority of the state of registry of the aircraft.

602.08 Portable Electronic Devices

(1) No operator of an aircraft shall permit the use of a portable electronic device on board an aircraft, where the device may impair the functioning of the aircraft's systems or equipment.
(2) No person shall use a portable electronic device on board an aircraft except with the permission of the operator of the aircraft.

602.09 Fuelling with Engines Running

No person operating an aircraft shall permit the fuelling of the aircraft while an engine used for the propulsion of the aircraft is running and passengers are on board the aircraft or are embarking or disembarking, unless Subsections 604.17(3), 704.33(4) or 705.40(3) of the LARs, as applicable, is complied with.

602.10 Starting and Ground Running of Aircraft Engines

(1) No person shall start an engine of an aircraft unless:
- (a) a pilot's seat is occupied by a person who is competent to control the aircraft;
- (b) precautions have been taken to prevent the aircraft from moving; or
- (c) in the case of a seaplane, the aircraft is in a location from which any movement of the aircraft will not endanger persons or property.

(2) No person shall leave an engine of an aircraft running unless:
- (a) a pilot's seat is occupied by a person who is competent to control the aircraft; or
- (b) where no persons are on board the aircraft,
  - (i) precautions have been taken to prevent the aircraft from moving, and
  - (ii) the aircraft is not left unattended.

602.11 Aircraft Icing

(1) In this Section, "critical surfaces" means the wings, control surfaces, rotors, propellers, horizontal stabilizers, vertical stabilizers or any other stabilizing surface of an aircraft and, in the case of an aircraft that has rear-mounted engines, includes the upper surface of its fuselage.
(2) No person shall conduct or attempt to conduct a take-off in an aircraft that has frost, ice or snow adhering to any of its critical surfaces.

(3) Notwithstanding Subsection (2), a person may conduct a take-off in an aircraft that has frost adhering to the underside of its wings that is caused by cold-soaked fuel, if the take-off is conducted in accordance with the aircraft manufacturer's instructions for take-off under those conditions.
(4) Where conditions are such that frost, ice or snow may reasonably be expected to adhere to the aircraft, no person shall conduct or attempt to conduct a take-off in an aircraft unless:
- (a) for aircraft that are not operated under Subpart 5 of Part VII of the LARs,
  - (i) the aircraft has been inspected immediately prior to take-off to determine whether any frost, ice or snow is adhering to any of its critical surfaces, or
  - (ii) the operator has established an aircraft inspection program in accordance with the General Operating and Flight Rules Standards, and the dispatch and take-off of the aircraft are in accordance with that program; and
- (b) for aircraft that are operated under Subpart 5 of Part VII of the LARs, the operator has established an aircraft inspection program in accordance with the General Operating and Flight Rules Standards, and the dispatch and take-off of the aircraft are in accordance with that program.

(5) The inspection referred to in Subsection (4)(a)(i) shall be performed by:
- (a) the pilot-in-command;
- (b) a flight crew member of the aircraft who is designated by the pilot-in-command; or
- (c) a person, other than a person referred to in Subsection (a) or (b), who
  - (i) is designated by the operator of the aircraft, and
  - (ii) has successfully completed an aircraft surface contamination training program pursuant to Part VI, Subpart 4 or Part VII of the LARs.

(6) Where, before commencing take-off, a crew member of an aircraft observes that there is frost, ice or snow adhering to the wings of the aircraft, the crew member shall immediately report that observation to the pilot-in-command, and the pilot-in-command or a flight crew member designated by the pilot-in-command shall inspect the wings of the aircraft before take-off.
(7) Before an aircraft is de-iced or anti-iced, the pilot-in-command of the aircraft shall ensure that the crew members and passengers are informed of the decision to do so.

602.12 Overflight of Built-up Areas or Open-air Assemblies of Persons during Take-offs, Approaches and Landings

Except if conducting a take-off, approach or landing at an airport or military aerodrome, no person shall conduct a take-off, approach or landing in an aircraft during which the aircraft will overfly a built-up area or an open-air assembly of persons, unless the aircraft is operated at an altitude from which, in the event of an engine failure or any other emergency necessitating an immediate landing, it would be possible to land the aircraft without creating a hazard to persons or property on the surface.

602.13 Take-offs, Approaches and Landings within Built-up Areas of Cities and Towns

(1) Except if otherwise permitted under this Section, Section 603.66 or Part VII of the LARs, no person shall conduct a take-off, approach or landing in an aircraft within a built-up area of a city or town, unless that take-off, approach or landing is conducted at an airport or a military aerodrome.
(2) A person may conduct a take-off or landing in an aircraft within a built-up area of a city or town at a place that is not located at an airport or a military aerodrome where:
- (a) the place is set apart for the operation of aircraft;
- (b) the flight is conducted without creating a hazard to persons or property on the surface; and
- (c) the aircraft is operated
  - (i) for the purpose of a police operation that is conducted in the service of a police authority, or
  - (ii) for the purpose of saving human life.

(3) A person may conduct a take-off in a balloon within a built-up area of a city or town from a place that is not located at an airport or a military aerodrome, where:

- (a) permission to use the place as a launch site has been obtained from the land owner;
- (b) a special aviation event is not being held at that place at the time of take-off;
- (c) no written objection in respect of the use of the place as a launch site has been received by the Minister from a competent land use authority;
- (d) the diameter of the launch site is no less than the greater of
  - (i) 100 feet [30 m], and
  - (ii) the greatest dimension of the balloon, be it the length, width or height, plus 25 per cent; and
- (e) the take-off point within the launch site is upwind of the highest obstacle in the take-off path by a horizontal distance equal to the height of that obstacle, and the take-off is conducted
  - (i) using a positive rate of climb to a minimum altitude of 500 feet [150 m] above the highest obstacle located within a horizontal distance of 500 feet [150 m] from the balloon, or
  - (ii) where the flight path of the balloon is directly over residential or commercial buildings or over an open-air assembly of persons, using the maximum rate of climb possible, considering operational and passenger safety.

(4) A person may conduct a landing in a balloon within a built-up area at a place that is not located at an airport or military aerodrome, where:

- (a) the landing is necessary to avoid endangering the safety of the persons on board; and
- (b) the pilot-in-command contacts the appropriate air traffic control unit or flight service station, either prior to landing or as soon as possible after landing, and provides
  - (i) the balloon's nationality mark and registration mark,
  - (ii) the estimated or actual, as applicable, time and location of the landing, and
  - (iii) the reasons why it is believed that the safety of the persons on board is or was endangered.

602.14 Minimum Altitudes and Distances

(1) For the purposes of this Section and Section 602.15 of the LARs, an aircraft shall be deemed to be operated over a built-up area or over an open-air assembly of persons where that built-up area or open-air assembly of persons is within a horizontal distance of:

- (a) 500 feet [150 m] from a helicopter or balloon; or
- (b) 2,000 feet [600 m] from an aircraft other than a helicopter or balloon.

(2) Except where conducting a take-off, approach or landing or where permitted under Section 602.15 0f the LARs, no person shall operate an aircraft:

- (a) over a built-up area or over an open-air assembly of persons unless the aircraft is operated at an altitude from which, in the event of an emergency necessitating an immediate landing, it would be possible to land the aircraft without creating a hazard to persons or property on the surface, and, in any case, at an altitude that is not lower than
  - (i) for airplanes, 1,000 feet [300 m] above the highest obstacle located within a horizontal distance of 2,000 feet [600 m] from the airplane,
  - (ii) for balloons, 500 feet [150 m] above the highest obstacle located within a horizontal distance of 500 feet [150 m] from the balloon, or
  - (iii) for an aircraft other than an airplane or a balloon, 1,000 feet [300 m] above the highest obstacle located within a horizontal distance of 500 feet [150 m] from the aircraft; and
- (b) in circumstances other than those referred to in Section (a), at a distance less than 500 feet [150 m] from any person, vessel, vehicle or structure.

602.15 Permissible Low Altitude Flight

(1) A person may operate an aircraft at altitudes and distances less than those specified in Subsection 602.14(2) of the LARs where the aircraft is operated at altitudes and distances that are no less than necessary for the purposes of the operation in which the aircraft is engaged, the aircraft is operated without creating a hazard to persons or property on the surface and the aircraft is operated:
- (a) for the purpose of a police operation that is conducted in the service of a police authority;
- (b) for the purpose of saving human life;
- (c) for fire-fighting or air ambulance operations;
- (d) for the purpose of flight inspection.

(2) A person may operate an aircraft, to the extent necessary for the purpose of the operation in which the aircraft is engaged, at altitudes and distances less than those set out in:
- (a) Subsection 602.14(2)(a) of the LARs, where operation of the aircraft is authorized under Subpart 3 or Section 702.22 of the LARs; or
- (b) Subsection 602.14(2)(b) of the LARs, where the aircraft is operated without creating a hazard to persons or property on the surface and the aircraft is operated for the purpose of
  - (i) aerial application or aerial inspection,
  - (ii) aerial photography conducted by the holder of an air operator certificate,
  - (iii) helicopter external load operations, or
  - (iv) flight training conducted by or under the supervision of a qualified flight instructor.

602.16 Flights over Open-air Assemblies of Persons or Built-up Areas - Helicopters with External Loads

(1) No person shall operate a helicopter that is carrying a Class B, C or D external load over an open-air assembly of persons.
(2) Except where authorized under Section 603.66 or 702.22 of the LARs, no person shall operate a helicopter that is carrying a Class B, C or D external load over a built-up area.

602.17 Carriage of Persons during Low Altitude Flight

No person operating an aircraft shall conduct helicopter Class B, C or D external load operations or engage in aerial application or aerial inspection at altitudes less than 500 feet [150 m] AGL while carrying on board any person other than a flight crew member, unless that person's presence on board is essential to the purposes of the flight.

602.18 Flights over Built-up Areas - Balloons

(1) No person shall operate a balloon over a built-up area without carrying on board sufficient fuel to permit the balloon to fly clear of the built-up area, taking into consideration the take-off weight of the balloon, the ambient temperature and actual and forecast winds, and possible variations of those factors.
(2) No person shall operate a balloon on a flight that is planned to enter Class C airspace while over a built-up area unless the clearance to enter that airspace that is required pursuant to Section 601.08 of the LARs has been obtained from the appropriate air traffic control unit prior to take-off.

602.19 Right of Way - General

(1) Notwithstanding any other provision of this Section:
- (a) the pilot-in-command of an aircraft that has the right of way shall, if there is any risk of collision, take such action as is necessary to avoid collision; and

(b) where the pilot-in-command of an aircraft is aware that another aircraft is in an emergency situation, the pilot-in-command shall give way to that other aircraft.

(2) When two aircraft are converging at approximately the same altitude, the pilot-in-command of the aircraft that has the other on its right shall give way, except as follows:

(a) a power-driven, heavier-than-air aircraft shall give way to airships, gliders and balloons;
(b) an airship shall give way to gliders and balloons;
(c) a glider shall give way to balloons; and
(d) a power-driven aircraft shall give way to aircraft that are seen to be towing gliders or other objects or carrying a slung load.

(3) When two balloons operating at different altitudes are converging, the pilot-in-command of the balloon at the higher altitude shall give way to the balloon at the lower altitude.

(4) Where an aircraft is required to give way to another aircraft, the pilot-in-command of the first-mentioned aircraft shall not pass over or under, or cross ahead of, the other aircraft unless passing or crossing at such a distance as will not create a risk of collision.

(5) Where two aircraft are approaching head-on or approximately so and there is a risk of collision, the pilot-in-command of each aircraft shall alter its heading to the right.

(6) An aircraft that is being overtaken has the right of way and the pilot-in-command of the overtaking aircraft, whether climbing, descending or in level flight, shall give way to the other aircraft by altering the heading of the overtaking aircraft to the right, and no subsequent change in the relative positions of the two aircraft shall absolve the pilot-in-command of the overtaking aircraft from this obligation until that aircraft has entirely passed and is clear of the other aircraft.

(7) Where an aircraft is in flight or maneuvering on the surface, the pilot-in-command of the aircraft shall give way to an aircraft that is landing or about to land.

(8) The pilot-in-command of an aircraft that is approaching an aerodrome for the purpose of landing shall give way to any aircraft at a lower altitude that is also approaching the aerodrome for the purpose of landing.

(9) The pilot-in-command of an aircraft at a lower altitude, as described in Subsection (8), shall not overtake or cut in front of an aircraft at a higher altitude that is in the final stages of an approach to land.

(10) No person shall conduct or attempt to conduct a take-off or landing in an aircraft until there is no apparent risk of collision with any aircraft, person, vessel, vehicle or structure in the take-off or landing path.

602.20 Right of Way - Aircraft Maneuvering on Water

(1) Where an aircraft on the water has another aircraft or a vessel on its right, the pilot-in-command of the first-mentioned aircraft shall give way.

(2) Where an aircraft on the water is approaching another aircraft or a vessel head-on, or approximately so, the pilot-in-command of the first-mentioned aircraft shall alter its heading to the right.

(3) The pilot-in-command of an aircraft that is overtaking another aircraft or a vessel on the water shall alter its heading to keep well clear of the other aircraft or the vessel.

602.21 Avoidance of Collision

No person shall operate an aircraft in such proximity to another aircraft as to create a risk of collision.

602.22 Towing

No person shall operate an airplane that is towing an object unless the airplane is equipped with a tow hook and release control system that meet the applicable standards of airworthiness.

602.23 Dropping of Objects

No person shall create a hazard to persons or property on the surface by dropping an object from an aircraft in flight.

602.24 Formation Flight

No person shall operate an aircraft in formation with other aircraft except by pre-arrangement between:

(a) the pilots-in-command of the aircraft; or
(b) where the flight is conducted within a control zone, the pilots-in-command and the appropriate air traffic control unit.

602.25 Entering or Leaving an Aircraft in Flight

(1) No person shall enter or leave an aircraft in flight except with the permission of the pilot-in-command of the aircraft.
(2) No pilot-in-command of an aircraft shall permit a person to enter or leave the aircraft during flight unless:

(a) the person leaves for the purpose of making a parachute descent; or
(b) the flight is authorized under Subpart 3 or the entering or leaving is permitted in accordance with Section 702.19 of the LARs.

602.26 Parachute Descents

Except where permitted in accordance with Section 603.37 of the LARs, no pilot-in-command of an aircraft shall permit, and no person shall conduct, a parachute descent from the aircraft:

(a) in or into controlled airspace or an air route; or
(b) over or into a built-up area or an open-air assembly of persons.

602.27 Aerobatic Maneuvers - Prohibited Areas and Flight Conditions

No person operating an aircraft shall conduct aerobatic maneuvers:

(a) over a built-up area or an open-air assembly of persons;
(b) in controlled airspace, except in accordance with a special flight operations certificate issued pursuant to Section 603.67 of the LARs;
(c) when flight visibility is less than three miles; or
(d) below 2,000 feet [600 m] AGL, except in accordance with a special flight operations certificate issued pursuant to Section 603.02 or 603.67 of the LARs.

602.28 Aerobatic Maneuvers with Passengers

No person operating an aircraft with a passenger on board shall conduct an aerobatic maneuver unless the pilot-in-command of the aircraft has engaged in:

(a) at least 10 hours dual flight instruction in the conducting of aerobatic maneuvers or 20 hours conducting aerobatic maneuvers; and
(b) at least one hour of conducting aerobatic maneuvers in the preceding six months.

602.29 Hang Glider and Ultra-light Airplane Operation

(1) No person shall operate a hang glider or an ultra-light airplane:

(a) at night;

- (b) in IFR flight;
- (c) subject to Subsections (2) and (3), in controlled airspace;
- (d) unless the aircraft is equipped with
  - (i) a suitable means of restraint that is attached to the primary structure of the aircraft,
  - (ii) a radio communication system adequate to permit two-way communication on the appropriate frequency when the aircraft is operated within
    - (A) Class D airspace,
    - (B) an MF area, and
  - (iii) where the aircraft is an ultra-light airplane, a placard that is affixed to a surface in plain view of any occupant seated at the flight controls and that states, "THIS AIRPLANE IS OPERATING WITHOUT A CERTIFICATE OF AIRWORTHINESS";
- (e) subject to Subsections (4) and (5), while carrying another person on board; or
- (f) unless each person on board
  - (i) is secured by a means of restraint referred to in Subsection (d)(i), and
  - (ii) where the aircraft is not an advanced ultra-light airplane, is wearing a protective helmet.

(2) A person may operate a hang glider or an ultra-light airplane in controlled airspace:
- (a) within five nautical miles from the center of an airport or within a control zone of an uncontrolled airport where the person has obtained permission from the airport operator;
- (b) within a control zone of a controlled airport where the person has obtained an air traffic control clearance by two-way radio voice communication from the air traffic control unit of the airport; or
- (c) where the aircraft is an advanced ultra-light airplane, if the airplane is equipped in accordance with Section 605.14 of the LARs.

(3) A person may operate a hang glider in Class E airspace where:
- (a) the pilot
  - (i) is at least 16 years of age,
  - (ii) is in possession of a medical certificate required by the Lebanese Aviation Regulations, and
  - (iii) has obtained a grade of not less than 60 per cent on a Directorate General of Civil Aviation written examination pertaining to the Lebanese Aviation Regulations, air traffic procedures, flight instruments, navigation, flight operations and human factors respecting hang glider operations in Class E airspace;
- (b) the hang glider is equipped with a magnetic compass and altimeter;
- (c) the flight is a cross-country flight; and
- (d) the pilot informs the nearest flight service station of the time of departure and estimated duration of the flight in Class E airspace.

(4) A person may operate a hang glider or an ultra-light airplane with another person on board where the flight is conducted for the purpose of providing dual flight instruction.

(5) A person may operate an advanced ultra-light airplane with another person on board where the pilot holds a permit or license issued pursuant to Subpart 1 of Part IV of the LARs that is appropriate to the functions or privileges being exercised.

602.30 Fuel Dumping

No person shall jettison fuel from an aircraft in flight unless:
- (a) it is necessary to do so in order to ensure aviation safety; and
- (b) all appropriate measures are taken to minimize danger to human life and damage to the environment, insofar as the circumstances permit.

602.31 Compliance with Air Traffic Control Instructions and Clearances

(1) Subject to Subsection (3), the pilot-in command of an aircraft shall:
- (a) comply with and acknowledge, to the appropriate air traffic control unit, all of the air traffic control instructions directed to and received by the pilot-in-command; and
- (b) comply with all of the air traffic control clearances received and accepted by the pilot-in-command and
  - (i) subject to Subsection (2), in the case of an IFR flight, read back to the appropriate air traffic control unit the text of any air traffic control clearance received, and
  - (ii) in the case of a VFR flight, read back to the appropriate air traffic control unit the text of any air traffic control clearance received, when so requested by the air traffic control unit.

(2) Except if requested to do so by an air traffic control unit, the pilot-in-command of an IFR aircraft is not required to read back the text of an air traffic control clearance pursuant to Subsection (1)(b)(i) where:
- (a) the air traffic control clearance is received on the ground by the pilot-in-command before departing from a controlled aerodrome in respect of which a standard instrument departure procedure is specified in the Jeppesen Aeronautical Publications ; or
- (b) the receipt of the air traffic control clearance is acknowledged by the pilot-in-command by electronic means.

(3) The pilot-in-command of an aircraft may deviate from an air traffic control clearance or an air traffic control instruction to the extent necessary to carry out a collision avoidance maneuver, where the maneuver is carried out:
- (a) in accordance with a resolution advisory generated by an Airborne Collision Avoidance System (ACAS) or a Traffic Alert and Collision Avoidance System (TCAS); or
- (b) in response to a warning from a Ground Proximity Warning System (GPWS) on board the aircraft.

(4) The pilot-in-command of an aircraft shall:
- (a) as soon as possible after initiating the collision avoidance maneuver referred to in Subsection (3), inform the appropriate air traffic control unit of the deviation; and
- (b) immediately after completing the collision avoidance maneuver referred to in Subsection (3), comply with the last air traffic control clearance received and accepted by, or the last air traffic control instruction received and acknowledged by, the pilot-in-command.

602.32 Airspeed Limitations

(1) Subject to Subsection (2), no person shall operate an aircraft below 10,000 feet ASL at an indicated airspeed of more than 250 knots.
(2) No person shall operate an aircraft below 3,000 feet AGL within 10 nautical miles of a controlled airport at an indicated airspeed of more than 200 knots unless authorized to do so in an air traffic control clearance.
(3) Notwithstanding Subsections (1) and (2), a person may operate an aircraft at an indicated airspeed greater than the airspeeds referred to in Subsections (1) and (2) where the aircraft is being operated on departure or in accordance with a special flight operations certificate - special aviation event issued pursuant to Section 603.02 of the LARs.
(4) Where the minimum safe speed for the flight configuration of an aircraft is greater than the speed referred to in Subsection (1) or (2), the aircraft shall be operated at the minimum safe speed.

602.33 Supersonic Flight

No person shall operate an aircraft at a true Mach number of 1 or greater.

602.34 Cruising Altitudes and Cruising Flight Levels

(1) The appropriate cruising altitude or cruising flight level for an aircraft in level cruising flight is determined in accordance with:

(a) the magnetic track.

(2) Subject to Subsection (3), the pilot-in-command of an aircraft shall ensure that the aircraft is operated at a cruising altitude or cruising flight level appropriate to the track, as set out in the table to this Section, unless the pilot-in-command is assigned another altitude or flight level by an air traffic control unit and the aircraft is operated in level cruising flight:

(a) at more than 3,000 feet AGL, in VFR flight; or
(b) in IFR flight.

(3) Subsection (2) does not apply where an aircraft is operated for the purpose of aerial survey or mapping and the following conditions are met:

(a) advance as possible of the proposed flight;
(b) the pilot-in-command of the aircraft provides, as far in advance as possible of the proposed take-off time of the aircraft, to any air traffic control unit that so requests, a topographical map at either a 1: 500 000 or a 1: 1 000 000 scale of the area to be surveyed or mapped, with proposed tracks and planned entry and exit points clearly delineated on the map;
(c) the pilot-in-command of the aircraft files a flight plan or flight itinerary with an air traffic control unit as far in advance as possible of the proposed take-off time of the aircraft;
(d) the flight plan or flight itinerary referred to in Section (c) specifies the area to be surveyed or mapped
    (i) by reference to the relevant maps of the National Topographic System,
    (ii) by reference to the geographic co-ordinates of the area, or
    (iii) where required by an air traffic control unit, by reference to the air photograph block reference grid map provided by the air traffic control unit; and
(e) where the aircraft is operated in controlled airspace, it is operated in accordance with an air traffic control clearance.

TABLE

Cruising Altitudes and Cruising Flight

Levels Appropriate to Aircraft Track

TRACK 000º - 179º			**TRACK 180º - 359º**	
Column I	**Column II**		**Column III**	**Column IV**
IFR	**VFR**		**IFR**	**VFR**
1,000	-	Cruising Altitudes or Cruising Flight Levels 14,000 feet and below	2,000	-
3,000	3,500		4,000	4,500
5,000	5,500		6,000	6,500
7,000	7,500		8,000	8,500
9,000	9,500		10,000	10,500
11,000	11,500		12,000	12,500
13,000	13,500			
ALL FLIGHTS		Cruising Flight Levels – 150 to 460	ALL FLIGHTS	
150			160	
170			180	
190			200	
210			220	
230			240	
250			260	
270			280	
290			310	
330			350	
370			390	
410			430	
450				

602.35 Altimeter-setting and Operating Procedures in the Altimeter-setting Region

When an aircraft is operated in the altimeter-setting region, each flight crew member who occupies a flight crew member position that is equipped with an altimeter shall:

(a) immediately before conducting a take-off from an aerodrome, set the altimeter to the altimeter setting of the aerodrome or, if that altimeter setting is not obtainable, to the elevation of the aerodrome;
(b) while in flight, set the altimeter to the altimeter setting of the nearest station along the route of flight or, where the nearest stations along the route of flight are separated by more than 150 nautical miles, to the altimeter setting of a station near the route of flight; and
(c) immediately before commencing a descent for the purpose of landing at an aerodrome, set the altimeter to the altimeter setting of the aerodrome, if that altimeter setting is obtainable.

602.36 Altimeter-setting and Operating Procedures in the Standard Pressure Region

(1) When an aircraft is operated in the standard pressure region, each flight crew member who occupies a flight crew member position that is equipped with an altimeter shall:

(a) immediately before conducting a take-off from an aerodrome, set the altimeter to the altimeter setting of the aerodrome or, if that altimeter setting is not obtainable, to the elevation of the aerodrome;
(b) before reaching the flight level at which the flight is to be conducted, set the altimeter to 29.92 inches of mercury or 1,013.2 millibars; and
(c) immediately before commencing a descent for the purpose of landing at an aerodrome, set the altimeter to the altimeter setting of the aerodrome, if that altimeter setting is obtainable.

(2) Notwithstanding Section (1)(c), when a holding procedure is being conducted before landing at an aerodrome located in the standard pressure region, each flight crew member who occupies a flight crew member position that is equipped with an altimeter shall set the altimeter to the altimeter setting of the aerodrome immediately before descending below the lowest flight level at which the holding procedure is conducted.

602.37 Altimeter-setting and Operating Procedures in Transition between Regions

Except where otherwise authorized by an air traffic control unit, each flight crew member who occupies a flight crew member position that is equipped with an altimeter shall:

(a) when flying from the altimeter-setting region into the standard pressure region, set the altimeter to 29.92 inches of mercury or 1,013.2 millibars immediately after the aircraft's entry into the standard pressure region; and
(b) when flying from the standard pressure region into the altimeter-setting region, set the altimeter to the altimeter setting of the nearest station along the route of flight or, where the nearest stations along the route of flight are separated by more than 150 nautical miles, the altimeter setting of a station near the route of flight immediately before the aircraft's entry into the altimeter-setting region.

602.38 Flight over the High Seas

The pilot-in-command of a Lebanese aircraft that is in flight over the high seas shall comply with the applicable Rules of the Air set out in Annex 2 to the Convention and the applicable Regional Supplementary Procedures set out in Document 7030/4 of the International Civil Aviation Organization (ICAO).

602.39 Transoceanic Flight

(1) Subject to Subsection (2), no pilot-in-command of a single-engined aircraft, or of a multi-engined aircraft that would be unable to maintain flight in the event of the failure of any engine, shall commence a flight that will leave Lebanese Domestic Airspace and enter airspace over the high seas unless:

- (a) the pilot-in-command holds a pilot license endorsed with an instrument rating;
- (b) the aircraft is equipped with
  - (i) the equipment referred to in Section 605.18 of the LARs,
  - (ii) a high frequency radio capable of transmitting and receiving on a minimum of two appropriate international air-ground general purpose frequencies, and
  - (iii) hypothermia protection for each person on board; and
- (c) the aircraft carries sufficient fuel to meet the requirements of Section 602.88 of the LARs and, in addition, carries contingency fuel equal to at least 10 per cent of the fuel required pursuant to Section 602.88 of the LARs to complete the flight to the aerodrome of destination.

(2) Subsections (a), (b) and (c) above do not apply to flights within 120 nautical miles of Lebanon and the aircraft weighs less than 5,700 kg (12,500 pounds).

602.40 Landing at or Take-off from an Aerodrome at Night

(1) Subject to Subsection (2), no person shall conduct a landing or a take-off in a heavier-than-air aircraft at night at an aerodrome unless the aerodrome is lighted in accordance with the aerodrome lighting requirements specified in the Lebanese Aviation Regulations.

(2) A person may conduct a landing or a take-off in a heavier-than-air aircraft at night at an aerodrome that is not lighted in accordance with the requirements referred to in Subsection (1) where:

- (a) the flight is conducted without creating a hazard to persons or property on the surface; and
- (b) the aircraft is operated
  - (i) for the purpose of a police operation that is conducted in the service of a police authority, or
  - (ii) for the purpose of saving human life.

602.41 Non-piloted Aircraft

No person shall operate a non-piloted aircraft in flight except in accordance with a special flight operations certificate or an air operator certificate.

602.42 Large Unoccupied Free Balloons

No person shall release an unoccupied free balloon having a gas-carrying capacity of more than 115 cubic feet (3.256 m3) except in accordance with an authorization issued by the Minister pursuant to Section 602.44 of the LARs.

602.43 Rockets

No person shall launch a rocket, other than a model rocket or a rocket of a type used in a fireworks display, except in accordance with an authorization issued by the Minister pursuant to Section 602.44 of the LARs.

602.44 Authorization by the Minister

The Minister may issue an authorization referred to in Section 602.42 or 602.43 of the LARs where the release of the balloon or the launch of the rocket is in the public interest and is not likely to affect aviation safety.

602.45 Model Aircraft, Kites and Model Rockets

No person shall fly a model aircraft or a kite or launch a model rocket or a rocket of a type used in a fireworks display into cloud or in a manner that is or is likely to be hazardous to aviation safety.

602.46 Foreign Aircraft Operations and Operations of Lebanese Civil Aircraft Operating Under the Provisions of the Lebanese Aviation Regulations (LARs) Outside of Lebanon

This section applies to the operations of civil aircraft operating under the provisions of the Lebanese Aviation Regulations (LARs) outside of Lebanon and the operations of foreign civil aircraft within Lebanon.

(1) Operations of Lebanese civil aircraft outside of Lebanon.
- (a) each person operating a Lebanese civil aircraft outside Lebanon shall:
  - (a) when over the high seas, comply with annex 2 (Rules of the Air) to the Convention on International Civil Aviation.;
  - (b) when within a foreign country, comply with the regulations relating to the flight and maneuver of aircraft there in force;
  - (c) comply with this part so far as it is not inconsistent with applicable regulations of the foreign country where the aircraft is operated or annex 2 of the Convention on International Civil Aviation; and
  - (d) when operating within airspace designated as Minimum Navigation Performance Specifications (MNPS) airspace, comply with Subsection (2) of this Section.
  - (e) when operating within airspace designated as Reduced Navigation Performance (RNP) airspace, comply with Subsection (3) of this Section.
  - (f) when operating within airspace designated as Reduced Vertical Separation Minimum Airspace (RVSM)
- (b) Annex 2 to the Convention on International Civil Aviation, Ninth Edition--July 1990, with Amendments through Amendment 35 effective July 19, 1999, to which reference is made in this part, is incorporated into this part and made a part hereof. Annex 2 (including a complete historic file of changes thereto) is available from the International Civil Aviation Organization (Attention: Distribution Officer), 999 University Street, Montreal, Quebec, Canada H3C 5H7.

(2) Operations within airspace designated as Minimum Navigation Performance Specification Airspace.
- (a) except as provided in Subsection (ii) of this Subsection, no person may operate a civil aircraft operating under the provisions of the Lebanese Aviation Regulations (LARs) in airspace designated as Minimum Navigation Performance Specifications airspace unless:
  - (i) the aircraft has approved navigation performance capability that complies with the requirements of Subsection 602.163(3) of this part; and
  - (ii) the operator is authorized by the Minister to perform such operations.
- (b) the Minister may authorize a deviation from the requirements of this section for a specific flight if, at the time of the flight plan filing for that flight, ATC determines that the aircraft may be provided appropriate separation.

(3) Operations within airspace designed as RNP Airspace.

(4) Operations within airspace designed as Reduced Vertical Separation Minimum Airspace (RVSM).

(a) except as provided in Subsection (b) of this section, no person may operate a civil aircraft operating under the provisions of the Lebanese Aviation Regulations (LARs) in airspace designated as Reduced Vertical Separation Minimum (RVSM) airspace unless:
   (i) the operator and the operator's aircraft comply with the requirements of Appendix IV Attachment 6 of this part; and
   (ii) the operator is authorized by the Minister to conduct such operations.

(b) the Minister may authorize a deviation from the requirements of this section for a specific flight if, at the time of the flight plan filing for that flight, ATC determines that the aircraft may be provided appropriate separation.

(5) Special rules for foreign civil aircraft.

(a) General. In addition to the other applicable regulations of this part, each person operating a foreign civil aircraft within Lebanon shall comply with this section.

(b) VFR. No person may conduct VFR operations which require two-way radio communications under this part unless at least one crewmember of that aircraft is able to conduct two-way radio communications in the English language and is on duty during that operation.

(c) IFR. No person may operate a foreign civil aircraft under IFR unless:
   (i) that aircraft is equipped with:
      A. radio equipment allowing two-way radio communication with ATC when it is operated in controlled airspace; and
      B. radio navigational equipment appropriate to the navigational facilities to be used;
   (ii) each person piloting the aircraft -
      A. holds a current Lebanese instrument rating or is authorized by his foreign airman certificate to pilot under IFR; and
      B. is thoroughly familiar with the Lebanese enroute, holding, and letdown procedures; and
   (iii) at least one crewmember of that aircraft is able to conduct two-way radio telephone communications in the English language and that crewmember is on duty while the aircraft is approaching, operating within, or leaving Lebanon.

Over Water. Each person operating a foreign civil aircraft over water off the shores of Lebanon shall give flight notification or file a flight plan in accordance with the Supplementary Procedures for the ICAO region concerned.

Flight at and Above FL 150. If VOR navigational equipment is required under Section (5)(c)(i)B. of this section, no person may operate a foreign civil aircraft within Lebanon at or above FL 150, unless the aircraft is equipped with distance measuring equipment (DME) capable of receiving and indicating distance information from the VORTAC facilities to be used. When DME required by this Subsection fails at and above FL 150, the pilot in command of the aircraft shall notify ATC immediately and may then continue operations at and above FL 150 to the next airport of intended landing at which repairs or replacement of the equipment can be made.

(6) Special flight authorizations for foreign civil aircraft.

(a) foreign civil aircraft may be operated without airworthiness certificates required under LARs Part V if a special flight authorization for that operation is issued under this section. Application for a special flight authorization must be made to the Director General of Civil Aviation, Lebanon.

(b) the Minister may issue a special flight authorization for a foreign civil aircraft subject to any conditions and limitations that the Minister considers necessary for safe operation in Lebanese airspace.

(c) no person may operate a foreign civil aircraft under a special flight authorization unless that operation also complies with LARs Part V.

602.47 to 602.56 Reserved

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Division II - Operational and Emergency Equipment Requirements

602.57 Application

This Division applies to persons operating:

(a) Lebanese aircraft; and
(b) foreign aircraft in Lebanon where those persons are Lebanese citizens, permanent residents or corporations incorporated by or under the laws of Lebanon.

602.58 Prohibition

No person shall operate an aircraft referred to in Section 602.57 of the LARs unless the operational and emergency equipment required by these Regulations is carried on board.

602.59 Equipment Standards

(1) Subject to Subsection (2), no person shall operate an aircraft unless the operational and emergency equipment carried on board the aircraft:

(a) meets the applicable standards specified in the LARs, Part V; and
(b) is functional.

(2) Section (1)(a) does not apply in respect of the following operational and emergency equipment:

(a) survival equipment;
(b) a personal flotation device;
(c) a hand-held fire extinguisher, except if carried on board an aircraft operated under Subpart 4 or Part VII of the LARs, where the extinguisher meets the applicable standards in the Lebanese Aviation Regulations.;
(d) a first aid kit, except if carried on board an aircraft operated under Subpart 4 or Part VII of the LARs;
(e) aeronautical charts and publications;
(f) a timepiece; and
(g) a flashlight.

602.60 Requirements for Power-driven Aircraft

(1) No person shall conduct a take-off in a power-driven aircraft, other than an ultra-light airplane, unless the following operational and emergency equipment is carried on board:

(a) a checklist or placards that enable the aircraft to be operated in accordance with the limitations specified in the aircraft flight manual, aircraft operating manual, pilot operating handbook or any equivalent document provided by the manufacturer;
(b) where the aircraft is operated in VFR OTT, night VFR flight or IFR flight, all of the necessary current aeronautical charts and publications covering the route of the proposed flight and any probable diversionary route;
(c) a hand-held fire extinguisher in the cockpit that is
(d) of a type suitable for extinguishing the fires that are likely to occur,
  (i) designed to minimize the hazard of toxic gas concentrations, and
  (ii) readily available in flight to each flight crew member;
(e) a timepiece that is readily available to each flight crew member;
(f) where the aircraft is operated at night, a flashlight that is readily available to each crew member; and
(g) a first aid kit.

(2) A checklist or placards referred to in Subsection (1)(a) shall enable the aircraft to be operated in normal, abnormal and emergency conditions and shall include:
- (a) a pre-start check;
- (b) a pre-take-off check;
- (c) a post-take-off check;
- (d) a pre-landing check; and
- (e) emergency procedures.

(3) Emergency procedures referred to in Subsection (2)(e) shall include:
- (a) emergency operation of fuel, hydraulic, electrical and mechanical systems, where applicable;
- (b) emergency operation of instruments and controls, where applicable;
- (c) engine inoperative procedures; and
- (d) any other procedure that is necessary for aviation safety.

(4) Checks and emergency procedures referred to in Subsections (2) and (3) shall be performed and followed where they are applicable.

602.61 Survival Equipment - Flights over Land

(1) Subject to Subsection (2), no person shall operate an aircraft over land unless there is carried on board survival equipment, sufficient for the survival on the ground of each person on board, given the geographical area, the season of the year and anticipated seasonal climatic variations, that provides the means for:
- (a) starting a fire;
- (b) providing shelter;
- (c) providing or purifying water; and
- (d) visually signaling distress.

(2) Subsection (1) does not apply in respect of:
- (a) a balloon, a glider, a hang glider, a gyroplane or an ultra-light airplane;
- (b) an aircraft that is operated within 25 nautical miles of the aerodrome of departure and that has the capability of radio communication with a surface-based radio station for the duration of the flight;
- (c) a multi-engined aircraft that is operated
  - (i) in IFR flight within controlled airspace, or
  - (ii) along designated air routes;
- (d) an aircraft that is operated by an air operator, where the aircraft is equipped with equipment specified in the air operator's company operations manual, but not with the equipment required by Subsection (1); or
- (e) an aircraft that is operated in a geographical area where and at a time of year when the survival of the persons on board is not jeopardized.

602.62 Life Preservers and Flotation Devices

(1) No person shall conduct a take-off or a landing on water in an aircraft or operate an aircraft over water beyond a point where the aircraft could reach shore in the event of an engine failure, unless a life preserver, individual flotation device or personal flotation device is carried for each person on board.

(2) No person shall operate a land airplane, gyroplane, helicopter or airship at more than 50 nautical miles from shore unless a life preserver is carried for each person on board.

(3) No person shall operate a balloon at more than two nautical miles from shore unless a life preserver, individual flotation device or personal flotation device is carried for each person on board.

(4) For aircraft other than balloons, every life preserver, individual flotation device and personal flotation device referred to in this Section shall be stowed in a position that is easily accessible to the person for whose use it is provided, when that person is seated.

602.63 Life Rafts and Survival Equipment - Flights over Water

(1) No person shall operate over water a single-engined airplane, or a multi-engined airplane that is unable to maintain flight with any engine failed, at more than 100 nautical miles, or the distance that can be covered in 30 minutes of flight at the cruising speed filed in the flight plan or flight itinerary, whichever distance is the lesser, from a suitable emergency landing site unless life rafts are carried on board and are sufficient in total rated capacity to accommodate all of the persons on board.
(2) Subject to Subsection (3), no person shall operate over water a multi-engined airplane that is able to maintain flight with any engine failed at more than 200 nautical miles, or the distance that can be covered in 60 minutes of flight at the cruising speed filed in the flight plan or flight itinerary, whichever distance is the lesser, from a suitable emergency landing site unless life rafts are carried on board and are sufficient in total rated capacity to accommodate all of the persons on board.
(3) A person may operate over water a transport category aircraft that is an airplane, at up to 400 nautical miles, or the distance that can be covered in 120 minutes of flight at the cruising speed filed in the flight plan or flight itinerary, whichever distance is the lesser, from a suitable emergency landing site without the life rafts referred to in Subsection (2) being carried on board.
(4) No person shall operate over water a single-engined helicopter, or a multi-engined helicopter that is unable to maintain flight with any engine failed, at more than 25 nautical miles, or the distance that can be covered in 15 minutes of flight at the cruising speed filed in the flight plan or flight itinerary, whichever distance is the lesser, from a suitable emergency landing site unless life rafts are carried on board and are sufficient in total rated capacity to accommodate all of the persons on board.
(5) No person shall operate over water a multi-engined helicopter that is able to maintain flight with any engine failed at more than 50 nautical miles, or the distance that can be covered in 30 minutes of flight at the cruising speed filed in the flight plan or flight itinerary, whichever distance is the lesser, from a suitable emergency landing site unless life rafts are carried on board and are sufficient in total rated capacity to accommodate all of the persons on board.
(6) The life rafts referred to in this Section shall be:
- (a) stowed so that they are easily accessible for use in the event of a ditching;
- (b) installed in conspicuously marked locations near an exit; and
- (c) equipped with an attached survival kit, sufficient for the survival on water of each person on board the aircraft, given the geographical area, the season of the year and anticipated seasonal climatic variations, that provides a means for
  - (i) providing shelter,
  - (ii) providing or purifying water, and
  - (iii) visually signaling distress.

(7) Where a helicopter is required to carry life rafts pursuant to Subsection (4) or (5), no person shall operate the helicopter over water having a temperature of less than 10°C unless:
- (a) a helicopter passenger transportation suit system is provided for the use of each person on board; and
- (b) the pilot-in-command directs each person on board to wear the helicopter passenger transportation suit system.

(8) Every person who has been directed to wear a helicopter passenger transportation suit system pursuant to Subsection (7)(b) shall wear that suit system.

602.64 to 602.69 Reserved

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Division III - Flight Preparation, Flight Plans and Flight Itineraries

602.70 Interpretation

In addition to interpretations found in Part 1, Subpart 1 of the LARs, in this Division,

"overdue" - in respect of an aircraft, means an aircraft for which an arrival report has not been filed:

- (a) where a flight plan has been filed in respect of the aircraft,
  - (i) if a search and rescue notification time is specified in the flight plan, immediately after the last reported such time, or
  - (ii) in all other cases, within one hour after the last reported estimated time of arrival, or
- (b) where a flight itinerary has been filed in respect of the aircraft,
  - (i) if a search and rescue notification time is specified in the flight itinerary, immediately after the last reported such time, or
  - (ii) in all other cases, within 24 hours after the last reported estimated time of arrival; (en retard)

"responsible person" - means an individual who has agreed with the person who has filed a flight itinerary to ensure that the following are notified in the manner prescribed in this Division, if the aircraft is overdue, namely:

- (a) an air traffic control unit, a flight service station or a community aerodrome radio station, or
- (b) a Rescue Co-ordination Center.

602.71 Pre-flight Information

The pilot-in-command of an aircraft shall, before commencing a flight, be familiar with the available information that is appropriate to the intended flight.

602.72 Weather Information

The pilot-in-command of an aircraft shall, before commencing a flight, be familiar with the available weather information that is appropriate to the intended flight.

602.73 Requirement to File a Flight Plan or a Flight Itinerary

(1) Subject to Subsection (3), no pilot-in-command shall operate an aircraft in IFR flight unless an IFR flight plan has been filed.
(2) No pilot-in-command shall operate an aircraft in VFR flight unless a VFR flight plan or a VFR flight itinerary has been filed, except where the flight is conducted within 25 nautical miles of the departure aerodrome.
(3) A pilot-in-command may file an IFR flight itinerary instead of an IFR flight plan where:

- (a) the flight is conducted in part or in whole outside controlled airspace; or
- (b) facilities are inadequate to permit the communication of flight plan information to an air traffic control unit, a flight service station or a community aerodrome radio station.

(4) Notwithstanding anything in this Division, no pilot-in-command shall, unless a flight plan has been filed, operate an aircraft between Lebanon and a foreign state.

602.74 Contents of a Flight Plan or a Flight Itinerary

A flight plan or flight itinerary shall contain such information as is specified by the Minister in the Aeronautical Information Publication (AIP).

602.75 Filing of a Flight Plan or a Flight Itinerary

(1) A flight plan shall be filed with an air traffic control unit.
(2) A flight itinerary shall be filed with a responsible person, an air traffic control unit.
(3) A flight plan or flight itinerary shall be filed by:
- (a) sending, delivering or otherwise communicating the flight plan or flight itinerary or the information contained therein; and
- (b) receiving acknowledgement that the flight plan or flight itinerary or the information contained therein has been received.

602.76 Changes in the Flight Plan

(1) The pilot-in-command of an aircraft for which an IFR flight plan or an IFR flight itinerary has been filed shall follow the procedure set out in Subsection (2) where the pilot-in-command intends to make any change in the plan or itinerary in respect of:
- (a) the cruising altitude or cruising flight level;
- (b) the route of flight;
- (c) the destination aerodrome;
- (d) in the case of a flight plan, the true airspeed at the cruising altitude or cruising flight level, where the change intended is five per cent or more of the true airspeed specified in the IFR flight plan; or
- (e) the Mach number, where the change intended is .01 or more of the Mach number that has been included in the air traffic control clearance.

(2) A pilot-in-command of an aircraft who intends to make any of the changes in the IFR flight plan or the IFR flight itinerary that are referred to in Subsection (1) shall:
- (a) notify as soon as practicable an air traffic control unit or the responsible person, as the case may be, of the intended change; and
- (b) where the flight is being conducted in controlled airspace, receive an air traffic control clearance before making the intended change.

(3) The pilot-in-command of an aircraft for which a VFR flight plan or a VFR flight itinerary has been filed shall follow the procedure set out in Subsection (4) where the pilot-in-command intends to make a change in the plan or itinerary in respect of:
- (a) the route of flight;
- (b) the duration of the flight; or
- (c) the destination aerodrome.

(4) A pilot-in-command of an aircraft who intends to make any of the changes in the VFR flight plan or the VFR flight itinerary that are referred to in Subsection (3) shall notify as soon as practicable an air traffic control unit, a flight service station, a community aerodrome radio station or the responsible person, of the intended change.

602.77 Requirement to File an Arrival Report

(1) Subject to Subsection (3), a pilot-in-command of an aircraft who terminates a flight in respect of which a flight plan has been filed pursuant to Subsection 602.75(1) of the LARs shall ensure that an arrival report is filed with an air traffic control unit as soon as practicable after landing but not later than:
- (a) the search and rescue action initiation time specified in the flight plan; or
- (b) where no search and rescue action initiation time is specified in the flight plan, one hour after the last reported estimated time of arrival.

(2) A pilot-in-command of an aircraft who terminates a flight in respect of which a flight itinerary has been filed pursuant to Subsection 602.75(2) of the LARs shall ensure that an arrival report is filed with an air traffic control unit, a flight service station, a community aerodrome radio station or, where

the flight itinerary was filed with a responsible person, the responsible person as soon as practicable after landing but not later than:

(a) the search and rescue action initiation time specified in the flight itinerary; or
(b) where no search and rescue action initiation time is specified in the flight itinerary, 24 hours after the last reported estimated time of arrival.

(3) A pilot-in-command who terminates an IFR flight at an aerodrome where there is an operating air traffic control unit or flight service station is not required to file an arrival report unless requested to do so by the appropriate air traffic control unit.

602.78 Contents of an Arrival Report

An arrival report shall contain such information as is specified by the Minister in the Aeronautical Information Publication (AIP).

602.79 Overdue Aircraft Report

Any person who assumes responsibilities with respect to an aircraft and who has reason to believe that the aircraft is overdue, or any other person who has been directed by that person to do so, shall immediately, by the quickest means available:

(a) notify an air traffic control unit, or a Rescue Co-ordination Center; and
(b) provide, to the best of the person's knowledge, all of the available information concerning the overdue aircraft that may be requested by the air traffic control unit, or the Rescue Co-ordination Center.

602.80 to 602.85 Reserved

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Division IV - Pre-flight and Fuel Requirements

602.86 Carry-on Baggage, Equipment and Cargo

(1) No person shall operate an aircraft with carry-on baggage, equipment or cargo on board, unless the carry-on baggage, equipment and cargo are:
- (a) stowed in a bin, compartment, rack or other location that is certified in accordance with the aircraft type certificate in respect of the stowage of carry-on baggage, equipment or cargo; or
- (b) restrained so as to prevent them from shifting during movement of the aircraft on the surface and during take-off, landing and in-flight turbulence.

(2) No person shall operate an aircraft with carry-on baggage, equipment or cargo on board unless:
- (a) the safety equipment, the normal and emergency exits that are accessible to passengers and the aisles between the flight deck and a passenger compartment are not wholly or partially blocked by carry-on baggage, equipment or cargo;
- (b) all of the equipment and cargo that are stowed in a passenger compartment are packaged or covered to avoid possible injury to persons on board;
- (c) where the aircraft is type-certificated to carry 10 or more passengers and passengers are carried on board,
  - (i) no passenger's view of any "seat belt" sign, "no smoking" sign or exit sign is obscured by carry-on baggage, equipment or cargo except if an auxiliary sign is visible to the passenger or another means of notification of the passenger is available,
  - (ii) all of the passenger service carts and trolleys are securely restrained during movement of the aircraft on the surface, take-off and landing, and during in-flight turbulence where the pilot-in-command or in-charge flight attendant has directed that the cabin be secured pursuant to Subsection 605.25(3) or (4) of the LARs, and
  - (iii) all of the video monitors that are suspended from the ceiling of the aircraft and extend into an aisle are stowed and securely restrained during take-off and landing; and
- (d) all of the cargo that is stowed in a compartment to which crew members have access is stowed in such a manner as to allow a crew member to effectively reach all parts of the compartment with a hand-held fire extinguisher.

602.87 Crew Member Instructions

The pilot-in-command of an aircraft shall ensure that each crew member, before acting as a crew member on board the aircraft, has been instructed with respect to:
- (a) the duties that the crew member is to perform; and
- (b) the location and use of all of the normal and emergency exits and of all of the emergency equipment that is carried on board the aircraft.

602.88 Fuel Requirements

(1) This Section does not apply in respect of any glider, balloon or ultra-light airplane.

(2) No pilot-in-command of an aircraft shall commence a flight or, during flight, change the destination aerodrome set out in the flight plan or flight itinerary, unless the aircraft carries sufficient fuel to ensure compliance with Subsections (3) to (5).

(3) An aircraft operated in VFR flight shall carry an amount of fuel that is sufficient to allow the aircraft:
- (a) in the case of an aircraft other than a helicopter,
  - (i) when operated during the day, to fly to the destination aerodrome and then to fly for a period of 30 minutes at normal cruising speed, or

(ii) when operated at night, to fly to the destination aerodrome and then to fly for a period of 45 minutes at normal cruising speed; or

(b) in the case of a helicopter, to fly to the destination aerodrome and then to fly for a period of 20 minutes at normal cruising speed.

(4) An aircraft operated in IFR flight shall carry an amount of fuel that is sufficient to allow the aircraft:

(a) in the case of a propeller-driven airplane,

(i) where an alternate aerodrome is specified in the flight plan or flight itinerary, to fly to and execute an approach and a missed approach at the destination aerodrome, to fly to and land at the alternate aerodrome and then to fly for a period of 45 minutes, or

(ii) where an alternate aerodrome is not specified in the flight plan or flight itinerary, to fly to and execute an approach and a missed approach at the destination aerodrome and then to fly for a period of 45 minutes; or

(b) in the case of a turbo-jet-powered airplane or a helicopter,

(i) where an alternate aerodrome is specified in the flight plan or flight itinerary, to fly to and execute an approach and a missed approach at the destination aerodrome, to fly to and land at the alternate aerodrome and then to fly for a period of 30 minutes, or

(ii) where an alternate aerodrome is not specified in the flight plan or flight itinerary, to fly to and execute an approach and a missed approach at the destination aerodrome and then to fly for a period of 30 minutes.

(5) Every aircraft shall carry an amount of fuel that is sufficient to provide for:

(a) taxiing and foreseeable delays prior to take-off;

(b) meteorological conditions;

(c) foreseeable air traffic routings and traffic delays;

(d) landing at a suitable aerodrome in the event of loss of cabin pressurization or, in the case of a multi-engined aircraft, failure of any engine, at the most critical point during the flight; and

(e) any other foreseeable conditions that could delay the landing of the aircraft.

602.89 Passenger Briefings

(1) The pilot-in-command of an aircraft shall ensure that all of the passengers on board the aircraft are briefed before take-off with respect to the following, where applicable:

(a) the location and means of operation of emergency and normal exits;

(b) the location and means of operation of safety belts, shoulder harnesses and restraint devices;

(c) the positioning of seats and the securing of seat backs and chair tables;

(d) the stowage of carry-on baggage;

(e) where the aircraft is unpressurized and it is possible that the flight will require the use of oxygen by the passengers, the location and means of operation of oxygen equipment; and

(f) any prohibition against smoking.

(2) The pilot-in-command of an aircraft shall ensure that all of the passengers on board the aircraft are briefed:

(a) in the case of an over-water flight where the carriage of life preservers, individual flotation devices or personal flotation devices is required pursuant to Section 602.62 of the LARs, before commencement of the over-water portion of the flight, with respect to the location and use of those items; and

(b) in the case of a pressurized aircraft that is to be operated at an altitude above FL 250, before the aircraft reaches FL 250, with respect to the location and means of operation of oxygen equipment.

(3) The pilot-in-command of an aircraft shall, before take-off, ensure that all of the passengers on board the aircraft are provided with information respecting the location and use of:

(a) first aid kits and survival equipment;

(b) where the aircraft is a helicopter or a small aircraft that is an airplane, any ELT that is required to be carried on board pursuant to Section 605.38 of the LARs; and
(c) any life raft that is required to be carried on board pursuant to Section 602.63 of the LARs.

602.90 to 602.95 Reserved

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Division V - Operations at or in the Vicinity of an Aerodrome

602.96 General

(1) This Section applies to persons operating VFR or IFR aircraft at or in the vicinity of an uncontrolled or controlled aerodrome.
(2) Before taking off from, landing at or otherwise operating an aircraft at an aerodrome, the pilot-in-command of the aircraft shall be satisfied that:
- (a) there is no likelihood of collision with another aircraft or a vehicle; and
- (b) the aerodrome is suitable for the intended operation.

(3) The pilot-in-command of an aircraft operating at or in the vicinity of an aerodrome shall:
- (a) observe aerodrome traffic for the purpose of avoiding a collision;
- (b) conform to or avoid the pattern of traffic formed by other aircraft in operation;
- (c) make all turns to the left when operating within the aerodrome traffic circuit, except where right turns are specified by the Minister in the Aeronautical Information Publication (AIP) or where otherwise authorized by the appropriate air traffic control unit;
- (d) where the aerodrome is an airport, comply with any airport operating restrictions specified by the Minister in the Aeronautical Information Publication (AIP);
- (e) where practicable, land and take off into the wind unless otherwise authorized by the appropriate air traffic control unit;
- (f) maintain a continuous listening watch on the appropriate frequency for aerodrome control communications or, if this is not possible and an air traffic control unit is in operation at the aerodrome, keep a watch for such instructions as may be issued by visual means by the air traffic control unit; and
- (g) where the aerodrome is a controlled aerodrome, obtain from the appropriate air traffic control unit, either by radio communication or by visual signal, clearance to taxi, take off from or land at the aerodrome.

(4) Unless otherwise authorized by the appropriate air traffic control unit, no pilot-in-command shall operate an aircraft at an altitude of less than 2,000 feet [600 m] over an aerodrome except for the purpose of landing or taking off or if the aircraft is operated pursuant to Subsection (5).

(5) Where it is necessary for the purposes of the operation in which the aircraft is engaged, a pilot-in-command may operate an aircraft at an altitude of less than 2,000 feet over an aerodrome, where it is being operated:
- (a) in the service of a police authority;
- (b) for the purpose of saving human life;
- (c) for fire-fighting or air ambulance operations;
- (d) for the purpose of the administration of the national parks;
- (e) for the purpose of flight inspection;
- (f) for the purpose of aerial application or aerial inspection;
- (g) for the purpose of highway or city traffic patrol;
- (h) for the purpose of aerial photography conducted by the holder of an air operator certificate;
- (i) for the purpose of helicopter external load operations; or
- (j) for the purpose of flight training conducted by the holder of a flight training unit operator certificate.

602.97 VFR and IFR Aircraft Operations at Uncontrolled Aerodromes within an MF Area

(1) Subject to Subsection (3), no pilot-in-command shall operate a VFR or IFR aircraft within an MF area unless the aircraft is equipped with radio communication equipment pursuant to Subpart 5 of this Part.

(2) The pilot-in-command of a VFR or IFR aircraft operating within an MF area shall maintain a listening watch on the mandatory frequency specified for use in the MF area.
(3) The pilot-in-command of a VFR aircraft that is not equipped with the radio communication equipment referred to in Subsection (1) may operate the aircraft to or from an uncontrolled aerodrome that lies within an MF area if:

- (a) a ground station is in operation at the aerodrome;
- (b) prior notice of the pilot-in-command's intention to operate the aircraft at the aerodrome has been given to the ground station;
- (c) when conducting a take-off, the pilot-in-command ascertains by visual observation that there is no likelihood of collision with another aircraft or a vehicle during take-off; and
- (d) when approaching for a landing, the aircraft enters the aerodrome traffic circuit from a position that will require it to complete two sides of a rectangular circuit before turning onto the final approach path.

602.98 General MF Reporting Requirements

(1) Every report made pursuant to this Division shall be made on the mandatory frequency that has been specified for use in the applicable MF area.
(2) Every report referred to in Subsection (1) shall be:

- (a) directed to the ground station associated with the MF area, if a ground station exists and is in operation; or
- (b) broadcast, if a ground station does not exist or is not in operation.

602.99 MF Reporting Procedures before Entering Maneuvering Area

The pilot-in-command of a VFR or IFR aircraft that is operated at an uncontrolled aerodrome that lies within an MF area shall report the pilot-in-command's intentions before entering the maneuvering area of the aerodrome.

602.100 MF Reporting Procedures on Departure

The pilot-in-command of a VFR or IFR aircraft that is departing from an uncontrolled aerodrome that lies within an MF area shall:

- (a) before moving onto the take-off surface, report the pilot-in-command's departure procedure intentions;
- (b) before take-off, ascertain by radio communication and by visual observation that there is no likelihood of collision with another aircraft or a vehicle during take-off; and
- (c) after take-off, report departing from the aerodrome traffic circuit.

602.101 MF Reporting Procedures on Arrival

The pilot-in-command of a VFR aircraft arriving at an uncontrolled aerodrome that lies within an MF area shall report:

- (a) before entering the MF area and, where circumstances permit, shall do so at least five minutes before entering the area, giving the aircraft's position, altitude and estimated time of landing and the pilot-in-command's arrival procedure intentions;
- (b) when joining the aerodrome traffic circuit, giving the aircraft's position in the circuit;
- (c) when on the downwind leg, if applicable;
- (d) when on final approach; and
- (e) when clear of the surface on which the aircraft has landed.

602.102 MF Reporting Procedures When Flying Continuous Circuits

The pilot-in-command of a VFR aircraft carrying out continuous circuits at an uncontrolled aerodrome that lies within an MF area shall report:

(a) when joining the downwind leg of the circuit;
(b) when on final approach, stating the pilot-in-command's intentions; and
(c) when clear of the surface on which the aircraft has landed.

602.103 Reporting Procedures When Flying through an MF Area

The pilot-in-command of an aircraft flying through an MF area shall report:

(a) before entering the MF area and, where circumstances permit, shall do so at least five minutes before entering the area, giving the aircraft's position and altitude and the pilot-in-command's intentions; and
(b) when clear of the MF area.

602.104 Reporting Procedures for IFR Aircraft When Approaching or Landing at an Uncontrolled Aerodrome

(1) This Section applies to persons operating IFR aircraft when approaching or landing at an uncontrolled aerodrome, whether or not the aerodrome lies within an MF area.
(2) The pilot-in-command of an IFR aircraft who intends to conduct an approach to or a landing at an uncontrolled aerodrome shall report:

(a) the pilot-in-command's intentions regarding the operation of the aircraft
  (i) five minutes before the estimated time of commencing the approach procedure, stating the estimated time of landing,
  (ii) when commencing a circling maneuver, and
  (iii) as soon as practicable after initiating a missed approach procedure; and
(b) the aircraft's position
  (i) when passing the fix outbound, where the pilot-in-command intends to conduct a procedure turn or, if no procedure turn is intended, when the aircraft first intercepts the final approach course,
  (ii) when passing the final approach fix or three minutes before the estimated time of landing where no final approach fix exists, and
  (iii) on final approach.

602.105 Noise Operating Criteria

No person shall operate an aircraft at or in the vicinity of an aerodrome except in accordance with the applicable noise abatement procedures and noise control requirements specified by the Minister in the Aeronautical Information Publication (AIP), including the procedures and requirements relating to:

(a) preferential runways;
(b) hours when aircraft operations are prohibited or restricted;
(c) arrival procedures;
(d) departure procedures;
(e) duration of flights;
(f) the prohibition or restriction of training flights;
(g) VFR or visual approaches;
(h) simulated approach procedures; and
(i) the minimum altitude for the operation of aircraft in the vicinity of the aerodrome.

602.106 to 602.113 Reserved

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Division VI - Visual Flight Rules

602.114 Minimum Visual Meteorological Conditions for VFR Flight in Controlled Airspace

No person shall operate an aircraft in VFR flight within controlled airspace unless:
- (a) the aircraft is operated with visual reference to the surface;
- (b) flight visibility is not less than three miles;
- (c) the distance of the aircraft from cloud is not less than 1,000 feet [300 m] vertically and one mile horizontally; and
- (d) where the aircraft is operated within a control zone,
  - (i) when reported, ground visibility is not less than three miles, and
  - (ii) except when taking off or landing, the distance of the aircraft from the surface is not less than 500 feet [150 m].

602.115 Minimum Visual Meteorological Conditions for VFR Flight in Uncontrolled Airspace

No person shall operate an aircraft in VFR flight within uncontrolled airspace unless:
- (a) the aircraft is operated with visual reference to the surface;
- (b) where the aircraft is operated at or above 1,000 feet AGL
  - (i) during the day, flight visibility is not less than one mile,
  - (ii) during the night, flight visibility is not less than three miles, and
  - (iii) in either case, the distance of the aircraft from cloud is not less than 500 feet [150 m] vertically and 2,000 feet [600 m] horizontally;
- (c) where the aircraft is not a helicopter and is operated at less than 1,000 feet AGL
  - (i) during the day, flight visibility is not less than two miles, except if otherwise authorized in an air operator certificate or a private operator certificate,
  - (ii) during the night, flight visibility is not less than three miles, and
  - (iii) in either case, the aircraft is operated clear of cloud; and
- (d) where the aircraft is a helicopter and is operated at less than 1,000 feet AGL
  - (i) during the day, flight visibility is not less than one mile, except if otherwise authorized in an air operator certificate or a flight training unit operator certificate - helicopter,
  - (ii) during the night, flight visibility is not less than three miles, and
  - (iii) in either case, the aircraft is operated clear of cloud.

602.116 VFR Over-the-Top

Notwithstanding Subsections 602.114(a) and 602.115(a) of the LARs, an aircraft may be operated in VFR OTT flight during the cruise portion of the flight during the day if:
- (a) the aircraft is operated at a vertical distance from cloud of at least 1,000 feet [300 m];
- (b) where the aircraft is operated between two cloud layers, the vertical distance between the layers is at least 5,000 feet [1600 m];
- (c) flight visibility at the cruising altitude of the aircraft is at least five miles; and
- (d) the weather at the aerodrome of destination is forecast to have a sky condition of scattered cloud or clear and a ground visibility of five miles or greater with no forecast of precipitation, fog, thunderstorms or blowing snow, and those conditions are forecast to exist
  - (i) where the forecast is an aerodrome forecast (TAF), for the period from one hour before to two hours after the estimated time of arrival; and
  - (ii) where an aerodrome forecast (TAF) is not available and the forecast is an area forecast (FA), for the period from one hour before to three hours after the estimated time of arrival.

602.117 Special VFR Flight

(1) Notwithstanding Subsection 602.114(b) of the LARs, an aircraft may be operated in special VFR flight within a control zone if:

- (a) weather conditions preclude compliance with Subsection 602.114(b) of the LARs;
- (b) flight visibility is not less than
  - (i) one mile, where the aircraft is not a helicopter, or
  - (ii) one-half mile, where the aircraft is a helicopter;
- (c) the aircraft is operated clear of cloud and with visual reference to the surface at all times; and
- (d) authorization to do so has been requested and obtained from the appropriate air traffic control unit.

(2) Where aerodrome traffic permits, an air traffic control unit shall authorize a pilot-in-command to operate an aircraft in special VFR flight within a control zone if:

- (a) the pilot-in-command requests authorization to operate the aircraft in special VFR flight;
- (b) when reported, ground visibility within the control zone is not less than
  - (i) one mile, where the aircraft is not a helicopter, or
  - (ii) one-half mile, where the aircraft is a helicopter;
- (c) the aircraft is equipped with radio communication equipment capable of maintaining communication with the appropriate air traffic control unit; and
- (d) when the aircraft is operated during the night, the authorization is for the purpose of allowing the aircraft to land at the destination aerodrome.

602.118 to 602.120 Reserved

Division VII - Instrument Flight Rules

602.121 General Requirements

(1) No pilot-in-command shall operate an aircraft in IMC in any class of airspace, except in accordance with IFR.
(2) No pilot-in-command of an aircraft shall conduct an IFR flight within controlled airspace unless the aircraft is operated in accordance with an air traffic control clearance pursuant to Section 602.31 of the LARs.

602.122 Alternate Aerodrome Requirements

Except as otherwise authorized by the Minister in an air operator certificate or in a private operator certificate, no pilot-in-command shall operate an aircraft in IFR flight unless the IFR flight plan or IFR flight itinerary that has been filed for the flight pursuant to Section 602.73 of the LARs includes an alternate aerodrome having a landing area suitable for use by that aircraft.

602.123 Alternate Aerodrome Weather Minima

No pilot-in-command of an aircraft shall include an alternate aerodrome in an IFR flight plan or IFR flight itinerary unless available weather information indicates that the ceiling and visibility at the alternate aerodrome will, at the expected time of arrival, be at or above the alternate aerodrome weather minima specified in the Jeppesen Aeronautical Publications.

602.124 Minimum Altitudes to Ensure Obstacle Clearance

(1) Subject to Subsections (2) and (3), the pilot-in-command of an IFR aircraft shall, except when taking off or landing, or when being radar-vectored by an air traffic control unit, ensure that the aircraft is operated at or above:
- (a) the MOCA, when the aircraft is on an airway or air route; and
- (b) the minimum altitude established by the Minister to ensure obstacle clearance and specified on an IFR chart, when the aircraft is within airspace in respect of which such a minimum altitude has been established.

(2) When an aircraft referred to in Subsection (1) is not being operated on an airway or air route or within airspace in respect of which a minimum altitude referred to in Subsection (1)(b) has been established, the pilot-in-command shall ensure that the aircraft is operated at or above:
- (a) an altitude of 1,000 feet [300 m] above the highest obstacle located within a horizontal distance of five nautical miles from the estimated position of the aircraft in flight;
- (b) in a region designated as a mountainous region in the Aeronautical Information Publication (AIP), an altitude of 2,000 feet [600 m] above the highest obstacle within a horizontal distance of five nautical miles from the estimated position of the aircraft in flight; and

(3) If aviation safety would be at risk as a result of the presence of obstacles to air navigation, the Minister may issue a NOTAM that establishes a higher minimum altitude requirement than that referred to in Subsection (1) or (2).

602.125 Enroute IFR Position Reports

(1) The pilot-in-command of an IFR aircraft shall transmit position reports over compulsory reporting points specified in the Aeronautical Information Publication (AIP), unless advised by the appropriate air traffic control unit that the aircraft is radar-identified.
(2) A position report transmitted pursuant to Subsection (1) shall contain the information specified by the Minister in the Aeronautical Information Publication (AIP).

602.126 Take-off Minima

(1) No pilot-in-command of an aircraft shall conduct a take-off if the take-off visibility, as determined in accordance with Subsection (2), is below the minimum take-off visibility specified in:
- (a) the air operator certificate and Operations Specifications (OpSpecs) where the aircraft is operated in accordance with Part VII;
- (b) the private operator certificate and Operations Specifications (OpSpecs) where the aircraft is operated in accordance with Subpart 4; or
- (c) the Jeppesen Aeronautical Publications in any case other than a case described in Section (a) or (b).

(2) For the purposes of Subsection (1), the take-off visibility is:
- (a) the RVR of the runway, if the RVR is reported to be at or above the minimum take-off visibility specified in a document or the manual referred to in Subsection (1);
- (b) the ground visibility of the aerodrome for the runway, if the RVR
  - (i) is reported to be less than the minimum take-off visibility specified in a document or the manual referred to in Subsection (1),
  - (ii) is reported to be fluctuating above and below the minimum take-off visibility specified in a document or the manual referred to in Subsection (1), or
  - (iii) is not reported; or
- (c) the visibility for the runway as observed by the pilot-in-command, if
  - (i) the RVR is not reported, and
  - (ii) the ground visibility of the aerodrome is not reported.

602.127 Instrument Approaches

(1) Unless otherwise authorized by the appropriate air traffic control unit, the pilot-in-command of an IFR aircraft shall, when conducting an approach to an aerodrome or a runway, ensure that the approach is made in accordance with the instrument approach procedure.
(2) No pilot-in-command of an IFR aircraft shall commence an instrument approach procedure unless the aircraft altimeter is set to an altimeter setting that is usable at the aerodrome where the approach is to be conducted.

602.128 Landing Minima

(1) No pilot-in-command of an IFR aircraft shall conduct an instrument approach procedure except in accordance with the minima specified in the Jeppesen Aeronautical Publications or the route and approach inventory.
(2) No pilot-in-command of an IFR aircraft shall, unless the required visual reference necessary to continue the approach to land has been established:
- (a) in the case of a CAT I or II precision approach, continue the final approach descent below the decision height; or
- (b) in the case of a non-precision approach, descend below the minimum descent altitude.

(3) Where the pilot-in-command of an IFR aircraft conducting an instrument approach does not establish the required visual reference referred to in Subsection (2), the pilot-in-command shall initiate a missed approach procedure:

(a) in the case of a CAT I or II precision approach, at decision height; and
(b) in the case of a non-precision approach, at the missed approach point.

(4) Notwithstanding anything in this Division, no pilot-in-command of an IFR aircraft shall conduct a precision approach to CAT II or CAT III minima unless:

(a) the flight crew has received the training specified in Part VI Standard s604.15 of the LARs, Instrument Approach Procedures; and
(b) the aircraft is operated in accordance with the procedures, the equipment requirements and the limitations specified in the standard referred to in Subsection (a).

602.129 Precision Approach Ban - General

(1) With respect to an airplane, for the purposes of Subsection (3), the RVR is below the minimum RVR if:

(a) where both RVR "A" and RVR "B" are measured, RVR "A" is less than 1,200 feet [350 m] and RVR "B" is less than 600 feet [175 m]; or
(b) where only one of RVR "A" or RVR "B" is measured, the RVR is less than 1,200 feet [350 m].

(2) With respect to a helicopter, for the purposes of Subsection (3), the RVR is below the minimum RVR if:

(a) where both RVR "A" and RVR "B" are measured, RVR "A" is less than 1,200 feet [350 m]; or
(b) where only one of RVR "A" or RVR "B" is measured, the RVR is less than 1,200 feet [350 m].

(3) Where the RVR is reported to be below the minimum RVR as described in Subsection (1) or (2), as applicable, the pilot-in-command of an IFR aircraft conducting an instrument approach shall discontinue the approach unless:

(a) when the RVR report is received, the aircraft
    (i) has passed the outer marker or the fix that serves as the outer marker, and
    (ii) is in descent to the runway;
(b) the aircraft is on a training flight where a landing is not intended, and the appropriate air traffic control unit is informed that a missed approach procedure will be initiated at or above the decision height or the minimum descent altitude, as appropriate;
(c) the RVR is fluctuating above and below the minimum RVR and the ground visibility of the aerodrome where the runway is located is reported to be at least one-quarter mile; or
(d) the pilot-in-command of the aircraft is conducting a precision approach to CAT III minima.

602.130 Approach Ban – CAT II and CAT III

No pilot-in-command of an IFR aircraft conducting a CAT II or CAT III precision approach shall continue the approach beyond the outer marker or the fix that serves as the outer marker unless the RVR is at or above the minimum approach RVR specified by the Minister or in the Directorate General of Civil Aviation Approved Jeppesen Aeronautical Publications, which ever is higher.

602.131 Category II and III Operations

(1) No person may operate a civil aircraft in a Category II or III operation unless:

(a) the flight crew of the aircraft consists of a pilot in command and a second in command who hold the appropriate authorizations and ratings prescribed in Subpart 401 of the LARs;

(b) each flight crewmember has adequate knowledge of, and familiarity with, the aircraft and the procedures to be used; and
(c) the instrument panel in front of the pilot who is controlling the aircraft has appropriate instrumentation for the type of flight control guidance system that is being used.

(2) Unless otherwise authorized by the Minister, no person may operate a civil aircraft in a Category II or Category III operation unless each ground component required for that operation and the related airborne equipment is installed and operating.

(3) Authorized DH - For the purpose of this Section, when the approach procedure being used provides for and requires the use of a DH, the authorized DH is the highest of the following:
(a) the DH prescribed by the approach procedure.
(b) the DH prescribed for the pilot in command.
(c) the DH for which the aircraft is equipped.

(4) Unless otherwise authorized by the Minister, no pilot operating an aircraft in a Category II or Category III approach that provides and requires use of a DH may continue the approach below the authorized decision height unless the following conditions are met:
(a) the aircraft is in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and where that descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing.
(b) at least one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:
    (i) the approach light system, except that the pilot may not descend below 100 feet [30 m] above the touchdown zone elevation using the approach lights as a reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.
    (ii) the threshold.
    (iii) the threshold markings.
    (iv) the threshold lights.
    (v) the touchdown zone or touchdown zone markings.
    (vi) the touchdown zone lights.

(5) Unless otherwise authorized by the Minister, each pilot operating an aircraft shall immediately execute an appropriate missed approach whenever, prior to touchdown, the requirements of Subsection (4) of this Section are not met.

(6) No person operating an aircraft using a Category III approach without decision height may land that aircraft except in accordance with the provisions of the letter of authorization issued by the Director General of Civil Aviation.

(7) Subsections (1) through (6) of this Section do not apply to operations conducted by the holders of certificates issued under Part VI, Subpart 4 or Part VII of the Lebanese Aviation Regulations. No person may operate a civil aircraft in a Category II or Category III operation conducted by the holder of a certificate issued under Part VI, Subpart 4 or Part VII of the Lebanese Aviation Regulations unless the operation is conducted in accordance with that certificate holder's Operations Specifications.

(8) No person may operate a civil aircraft in a Category II or Category III operation conducted by the holder of a certificate issued under Part VI, Subpart 4 or Part VII of the Lebanese Aviation Regulations unless the operation is conducted in accordance with the General Operating and Flight Rules Standards.

602.132 Category II and Category III Manual

(1) Except as provided in Subsection (3) of this Section, no person may operate a Lebanese registered civil aircraft in a Category II or a Category III operation unless:
(a) there is available in the aircraft a current and approved Category II or Category III manual, as appropriate, for that aircraft;

(b) the operation is conducted in accordance with the procedures, instructions, and limitations in the appropriate manual; and

(c) the instruments and equipment listed in the manual that are required for a particular Category II or Category III operation have been inspected and maintained in accordance with the maintenance program contained in the manual.

(2) Each operator must keep a current copy of each approved manual at its principal base of operations and must make each manual available for inspection upon request by the Minister.

(3) This Section does not apply to operations conducted by a holder of a certificate issued under Part VII of the Lebanese Aviation Regulations.

602.133 Certificate of Authorization for Certain Category II Operations.

The Minister may issue a certificate of authorization authorizing deviations from the requirements of Sections 602.131 and 602.132 of the LARs for the operation of small aircraft identified as aircraft approach category A in Category II operations if the Minister finds that the proposed operation can be safely conducted under the terms of the certificate. Such authorization does not permit operation of the aircraft carrying persons or property for compensation or hire.

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Division VIII – Radio Communications

602.134 Language Used in Aeronautical Radio Communications

English is the language of aeronautical radio communication in Lebanon.

602.135 Locations Where Services Are Available in English

All air traffic control units shall provide aeronautical radio communication services in English.

602.136 Continuous Listening Watch

Subject to Sections 602.137 and 602.138 of the LARs, where an aircraft is equipped with radio communication equipment, the pilot-in-command shall ensure that:

(a) a listening watch is maintained on the appropriate frequency; and

(b) where communications are required, communication is established with an air traffic control unit, flight service station or community aerodrome radio station, as applicable, on that appropriate frequency.

602.137 Two-way Radio Communication Failure in IFR Flight

(1) Where there is a two-way radio communication failure between the controlling air traffic control unit and an IFR aircraft that is in or has received a clearance to enter controlled airspace, the pilot-in-command shall:

(a) maintain a listening watch on the appropriate frequency for control messages or further clearance and acknowledge receipt of any such messages, if possible, by any means available;

(b) set the transponder to code 7600; and

(c) attempt to establish communications with any air traffic services facility or other aircraft, inform the facility or aircraft of the difficulty and request it to relay the information to the last air traffic control unit with which communications had been established.

(2) Where communications cannot be established with any air traffic services facility, either directly or by relay through an intermediary, the pilot-in-command shall, except where specific instructions to cover an anticipated communications failure have been received from an air traffic control unit, comply with the procedures specified by the Minister in the Aeronautical Information Publication (AIP).

602.138 Two-way Radio Communication Failure in VFR Flight

Where there is a two-way radio communication failure between the controlling air traffic control unit and a VFR aircraft while operating in Class B, Class C or Class D airspace, the pilot-in-command shall:

(a) leave the airspace

  (i) where the airspace is a control zone, by landing at the aerodrome for which the control zone is established, and

  (ii) in any other case, by the shortest route;

(b) where the aircraft is equipped with a transponder, set the transponder to code 7600; and

(c) inform an air traffic control unit as soon as possible of the actions taken pursuant to Section (a).

602.139 to 602.142 Reserved

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Division IX - Emergency Communications and Security

602.143 Emergency Radio Frequency Capability

No person shall operate an aircraft equipped with two-way VHF radio communication equipment unless the equipment is capable of providing communication on VHF frequency 121.5 MHz.

602.144 Interception Signals, Interception of Aircraft and Instructions to Land

(1) No person shall give an interception signal or an instruction to land except:
- (a) a peace officer, an officer of a police authority or an officer of the Lebanese Forces acting within the scope of their duties; or
- (b) a person authorized to do so by the Minister pursuant to Subsection (2).

(2) The Minister may authorize a person to give an interception signal or an instruction to land if such authorization is in the public interest and is not likely to affect aviation safety.
(3) The pilot-in-command of an aircraft who receives an instruction to land from a person referred to in Subsection (1) shall, subject to any direction received from an air traffic control unit, comply with the instruction.
(4) The pilot-in-command of an intercepting aircraft and the pilot-in-command of an intercepted aircraft shall comply with the rules of interception set out in the Aeronautical Information Publication (AIP).

602.145 to 602.149 Reserved

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Division X - Aircraft Noise Emission Levels - Transition to Chapter 3 Airplanes

602.150 Interpretation

In this Division,

"base level" - means the original base level of an operator and any subsequent changes to it made pursuant to Section 602.155 of the LARs ;

"Chapter 2 airplane" - means an airplane that does not conform to the noise emission standards set out in Chapter 3 of ICAO Annex 16, Volume I, second edition, 1988, or the Stage 3 noise limits set out in Section C36.5(a)(3) of Appendix C of Part 36 of the Federal Aviation Regulations, published by the Government of the United States, in effect on August 18, 1990;

"Chapter 3 airplane" - means a subsonic turbo-jet airplane with a MCTOW of 34 000 kg (74,956 pounds) or greater that conforms to the noise emission standards set out in Chapter 3 of ICAO Annex 16, Volume I, second edition, 1988, or the Stage 3 noise limits set out in Section C36.5(a)(3) of Appendix C of Part 36 of the Federal Aviation Regulations, published by the Government of the United States, in effect on August 18, 1990;

"fleet" - means the Chapter 2 and Chapter 3 airplanes owned, leased or leased out by an operator that are intended for operation in Lebanon;

"new entrant" - means an operator that had not begun operating an airplane to or from an aerodrome in Lebanon as of August 1, 1995, and includes a Lebanese operator that elected to operate an airplane in Lebanon as a new entrant pursuant to Section 602.154 of the LARs;

"original base level" - means the base level of an operator established pursuant to Section 602.157 of the LARs;

"wide-body airplane" - means an airplane that, in its passenger configuration, has more than one aisle.

602.151 Application

(1) Subject to Subsection (2), this Division applies to operators that operate, in Lebanon, Chapter 2 airplanes or Chapter 3 airplanes.
(2) This Division does not apply in respect of airplanes that use no aerodrome in Lebanon.
(3) Any reference in this Division to Chapter 3 of ICAO Annex 16, Volume I, second edition, 1988, or to Part 36 of the Federal Aviation Regulations is a reference only to that Chapter or Part and any documents that are referred to in that Chapter or Part are for informational purposes only.

602.152 Final Compliance Requirement

After April 1, 2002, no person shall operate an airplane to or from an aerodrome in Lebanon unless the airplane:

(a) is a Chapter 3 airplane;
(b) has a MCTOW of less than 34 000 kg (74,956 pounds); or
(c) is operated pursuant to an exemption issued under Section 602.159 or 602.160 of the LARs.

602.153 Importation of Chapter 2 Airplanes

(1) Subject to Subsection (2), no person shall operate a Chapter 2 airplane that was imported into Lebanon after August 1, 1995, unless the airplane:

(a) is operated as a replacement for an airplane that was included as part of the operator's original base level and that was removed from service and was not transferred to another operator; or

(b) was imported from the United States and the operator meets the applicable requirements respecting the phase-in of Chapter 3 airplanes set out in Part 91 of the Federal Aviation Regulations of the United States.

(2) Subsection (1) does not apply in respect of a Chapter 2 airplane that is owned by a Lebanese operator and that was leased to a foreign operator on August 1, 1995, where the airplane:

(a) was reported to the Minister in writing as part of the operator's original base level pursuant to Subsection 6(1) of the Order; and

(b) is returned to Lebanon not later than six months after the date of the expiration of the lease agreement or of any extensions thereof.

602.154 Reserved

602.155 Transfers of Chapter 2 Airplanes and Base Level

(1) An operator may transfer legal custody and control of a Chapter 2 airplane to another person with or without transferring the amount of base level that corresponds to that airplane.
(2) An operator may not transfer an amount of base level to another person unless the operator also transfers to that person legal custody and control of the number of Chapter 2 airplanes that corresponds to that amount of base level.

602.156 Report of Changes to Base Level

Every operator shall report to the Minister in writing any changes that are made to the operator's base level pursuant to Section 602.155 of the LARs within 60 days after the day on which the change is made.

602.157 Compliance Schedule

(1) Every operator that reported an original base level to the Minister in writing pursuant to Section 602.156 of the LARs shall ensure that:

(a) on the compliance date set out in column I of each item of Table 1 to this Section, the number of Chapter 2 airplanes in the operator's fleet, expressed as a percentage of base level, is equal to or less than the percentage set out in column II of that item; or

(b) on the compliance date set out in column I of each item of Table 2 to this Section, the number of Chapter 3 airplanes in the operator's fleet, expressed as a percentage of the fleet, is equal to or greater than the percentage set out in column II of that item.

(2) Every operator that did not report an original base level to the Minister in writing pursuant to Section 602.156 of the LARs and every new entrant shall, on the compliance date set out in column I of each item of Table 2 to this Section, ensure that the number of Chapter 3 airplanes in the operator's fleet, expressed as a percentage of the fleet, is equal to or greater than the percentage set out in column III of that item.
(3) An operator is not required to include wide-body airplanes in the operator's fleet for the purposes of this Section.

(4) No operator shall include a Chapter 3 airplane in the operator's fleet for the purpose of complying with this Division if the airplane has been included in the fleet of another operator for the same purpose.
(5) Where a calculation made for the purpose of determining a percentage referred to in Subsection (1) or (2) results in a number that is not a whole number, that number may, at the option of the operator, be rounded either up or down to the next whole number.

Table 1

Phase-out of Chapter 2 Airplanes

	COLUMN I	COLUMN II
Item	**Compliance Date**	**Maximum Number of Chapter 2 Airplanes in Fleet, Expressed as a Percentage of Base Level**
1.	Dec. 31, 1995	75
2.	Dec. 31, 1997	50
3.	Dec. 31, 1999	25

Table 2

Phase-in of Chapter 3 Airplanes

	COLUMN I	COLUMN II	COLUMN III
Item	**Compliance Date**	**Minimum Number of Chapter 3 Airplanes in Fleet, Expressed as a Percentage of Fleet**	**Minimum Number of Chapter 3 Airplanes in Fleet, Expressed as a Percentage of Fleet**
1.	Dec. 31, 1995	55	25
2.	Dec. 31, 1997	65	50
3.	Dec. 31, 1999	75	75

602.158 Credits

An operator that exceeds a requirement imposed by Subsection 602.157(1)(a) or (b) of the LARs or Subsection 602.157(2) of the LARs, in respect of a compliance date set out in column I of an item of Table 1 or 2 to Section 602.157 of the LARs is entitled to a credit equal to the amount by which the requirement is exceeded, which credit may be used by the operator to meet any further requirement imposed by that Section or Subsection in respect of a subsequent compliance date set out in that Table.

602.159 Temporary Exemption from Final Compliance

(1) A Lebanese operator of an airplane, or a foreign operator of an airplane registered in a foreign state that issues equivalent exemptions to Lebanese operators, may apply for a temporary exemption from the requirements of Subsection 602.152(a) of the LARs in respect of that airplane if the application is submitted in writing to the Minister by no later than April 1, 2001.
(2) The Minister shall approve an application made pursuant to Subsection (1) if the operator demonstrates that:
- (a) at least 85 per cent of the airplanes operated by the operator to or from an aerodrome in Lebanon will be Chapter 3 airplanes on or before October 1, 2001; and
- (b) each Chapter 2 airplane operated by the operator to or from an aerodrome in Lebanon will, as soon as practicable,
  - (i) be replaced by a Chapter 3 airplane, as demonstrated by proof of a firm order to lease or buy the Chapter 3 airplane, or
  - (ii) be converted to a Chapter 3 airplane, as demonstrated by proof of a signed contract for such a conversion.

(3) The duration of an exemption issued pursuant to this Section shall be determined by the Minister, based on the material provided by the operator in connection with the application and on the time needed by the operator to modify the composition of the operator's fleet, but no exemption shall be issued pursuant to this Section that would permit the operation of a Chapter 2 airplane after December 31, 2003.

602.160 to 602.161 Reserved

602.162 Annual Progress Report

Every operator shall, not later than 60 days after the end of each calendar year, submit an annual report to the Minister detailing the composition of the operator's fleet and the progress the operator has made towards complying with the requirements of this Division.

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Division XI – Air Navigation

602.163 Air Navigation Requirements

(1) No pilot-in-command shall operate an aircraft in airspace designated as Special Navigation Areas of Operation until the Operation is approved by the Directorate General of Civil Aviation in accordance with the General Operating and Flight Rules Standards. Special Navigation Areas of Operation include the following:

- (a) areas requiring high levels of long range navigation performance (high navigation precision) due to traffic density.
- (b) areas where navigation by magnetic reference is unreliable and/or inappropriate.
- (c) areas where metric altitudes / flight levels are used (altitudes in meters).
- (d) areas where communication difficulties are frequently encountered.
- (e) areas where air traffic control difficulties are frequently encountered.
- (f) areas where operations by Lebanese operators have political or international sensitivity.
- (g) areas where aircraft with unique performance characteristics require special criteria.
- (h) areas where redundant long range navigation systems are not normally required.
- (i) any area that the Minister designates.

(2) No pilot-in-command shall operate an aircraft in airspace designated as Required Navigational Performance (RNP) airspace until the RNP Flight Operation is approved by the Directorate General of Civil Aviation in accordance with the General Operating and Flight Rules Standards.

(3) No pilot-in-command shall operate an aircraft in airspace designated as Minimum Navigation Performance Specifications (MNPS) airspace until the MNPS Flight Operation is approved by the Directorate General of Civil Aviation in accordance with the General Operating and Flight Rules Standards.

(4) No pilot-in-command shall operate an aircraft in airspace designated as Reduced Vertical Separation Minimum (RVSM) airspace until the RVSM Flight Operation is approved by the Directorate General of Civil Aviation in accordance with the General Operating and Flight Rules Standards.

(5) No Part VI, Private Operator Passenger Transportation Operator shall operate in Special Navigation Areas of Operation Airspace unless approved in the carrier’s Operations Specifications (OpSpecs).

(5) No Part VII, Commercial Air Services Operator shall operate in Special Navigation Areas of Operation Airspace unless approved in the carrier’s Operations Specifications (OpSpecs).

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Division XII – Special Operations

602.164 Extended Twin Operations (ETOPS)

(1) No pilot-in-command shall operate a two-engine aircraft over a route that contains a point further than one hour's flying time from an adequate airport at the approved one-engine inoperative cruise speed (ETOPS) until the ETOPS Flight Operation is approved by the Directorate General of Civil Aviation in accordance with the General Operating and Flight Rules Standards.

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Division XIII – Validation Tests

602.165 Validation Test Requirements

(1) The following require the Directorate General of Civil Aviation to conduct Validation Tests under the provisions of the General Operating and Flight Rules Standards:

(a) operator initial certification;
(b) initial aircraft operations;
(c) Category II ILS Operations;
(d) Category III ILS Operations;
(e) Minimum Navigation Performance Specifications (MNPS) Operations;
(f) Reduced Vertical Separation Minimum (RVSM) Operations;
(g) Extended Twin Operations (ETOPS);
(h) Required Navigation Performance (RNP) Operations;
(i) Class II navigation using Doppler Radar;
(j) Class II navigation using Inertial Navigation System (INS);
(k) Class II navigation using Global Positioning System (GPS);
(l) route authorizations; and
(m) any Validation Test the Minister deems necessary.

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Division XIV – Directorate General of Civil Aviation Approvals

602.166 Regulatory Required Approvals

(1) The following require Directorate General of Civil Aviation Approval under the provisions of the General Operating and Flight Rules Standards:

(a) Operator Management Personnel;
(b) Operations Specifications (OpSpecs);
(c) Operator Operations Manual;
(d) Operator Aircraft Flight Manual;
(e) Operator Training Manual;
(f) Operator Maintenance Manual;
(g) Aircraft Checklists;
(h) Minimum Equipment List (MEL);
(i) Simulators;
(j) Training Devices;
(k) Category II ILS Program;
(l) Category II ILS Manual;
(m) Category III ILS Program;
(n) Category III ILS Manual;
(o) Required Navigation Performance (RNP) Operations;
(p) Minimum Navigation Performance Specifications (MNPS) Operations;
(q) Reduced Vertical Separation Minimum (RVSM) Operations;
(r) North Atlantic Track/Minimum Navigation Performance Specifications (NAT/MNPS);Operations
(s) Land and Hold Short Operations;
(t) Extended Twin Operations (ETOPS);
(u) Aircrew Designated Examiners (ADE) Program;
(v) Check Airman; and
(w) Any Approval the Minister deems necessary.

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Division XV – Operations Specifications (OpSpecs)

602.167 Required Operations Specifications (OpSpecs)

(1) No person may operate a civil aircraft operation conducted by the holder of a certificate issued under Part VI, Subpart 4 or Part VII of the Lebanese Aviation Regulations unless Operations Specifications (OpSpecs) are issued by the Minister in accordance with the General Operating and Flight Rules Standards
(2) The information contained in a certificate holder's Operations Specifications (OpSpecs), shall be made available to company personnel through its manual system.
(3) All LARs Part VI, Subpart 4, and Part VII operators will conduct their operations in accordance with their Operations Specifications.

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Division XVI – Aircrew Designated Examiner (ADE) Program

602.168 Aircrew Designated Examiner Requirements

(1) In the Lebanese Aviation Regulations (LARs), Aircrew Designated Examiners are airmen who conduct airman checking as representatives of the Directorate General of Civil Aviation for operators holding:

(a) Private Operator Certificates pursuant to Part VI, Subpart 4 of the LARs.
(b) Air Operator Certificates pursuant to Part VII of the LARs.

(2) Aircrew Designated Examiners shall be approved and designated by the Director General of Civil Aviation.
(3) Aircrew Designated Examiners shall meet the requirements and standards set forth in the General Operating and Flight Rules Standards.

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Division XVII – Proving Tests

602.169 Proving Test Requirements

(1) The following require the Directorate General of Civil Aviation to conduct Proving Tests under the provisions of the General Operating and Flight Rules Standards:

- (a) operator initial certification;
- (b) initial aircraft operations;
- (c) when an operator proposes to use an aircraft that has been materially altered in design; and
- (d) any Proving Test the Minister deems necessary.

602.170 Part VII, Subpart 5 Aircraft Proving Tests.

(1) Initial airplane proving tests. No person may operate an airplane not before proven for use in a kind of operation under LARs Part VII, Subpart 5 unless an airplane of that type has had, in addition to the airplane certification tests, at least 100 hours of proving tests acceptable to the Minister, including a representative number of flights into en route airports. The requirement for at least 100 hours of proving tests may be reduced by the Minister if the Minister determines that a satisfactory level of proficiency has been demonstrated to justify the reduction. At least 10 hours of proving flights must be flown at night; these tests are irreducible.
(2) Proving tests for kinds of operations. Unless otherwise authorized by the Minister, for each type of airplane, a certificate holder must conduct at least 50 hours of proving tests acceptable to the Minister for each kind of operation it intends to conduct, including a representative number of flights into en route airports.
(3) Proving tests for materially altered airplanes. Unless otherwise authorized by the Minister, for each type of airplane that is materially altered in design, a certificate holder must conduct at least 50 hours of proving tests acceptable to the Minister for each kind of operation it intends to conduct with that airplane, including a representative number of flights into en route airports.
(4) Definition of materially altered. For the purposes of Section (3) of this section, a type of airplane is considered to be materially altered in design if the alteration includes:

- (a) the installation of powerplants other than those of a type similar to those with which it is certificated; or
- (b) alterations to the aircraft or its components that materially affect flight characteristics.

(5) No certificate holder may carry passengers in an aircraft during proving tests, except for those needed to make the test and those designated by the Minister. However, it may carry mail, express, or other cargo, when approved.

602.171 Part VI, Subpart 4 Aircraft Proving Tests.

(1) Initial airplane proving tests. No person may operate an airplane not before proven for use in a kind of operation under LARs Part VI, Subpart 4 unless an airplane of that type has had, in addition to the airplane certification tests, at least 25 hours of proving tests acceptable to the Minister, including a representative number of flights into en route airports. The requirement for at least 25 hours of proving tests may be reduced by the Minister if the Minister determines that a satisfactory level of proficiency has been demonstrated to justify the reduction. At least 5 hours of proving flights must be flown at night; these tests are irreducible.
(2) Proving tests for kinds of operations. Unless otherwise authorized by the Minister, for each type of airplane, a certificate holder must conduct at least 25 hours of proving tests acceptable to the Minister for each kind of operation it intends to conduct, including a representative number of flights into en route airports.

(3) Proving tests for materially altered airplanes. Unless otherwise authorized by the Minister, for each type of airplane that is materially altered in design, a certificate holder must conduct at least 50 hours of proving tests acceptable to the Minister for each kind of operation it intends to conduct with that airplane, including a representative number of flights into en route airports.
(4) Definition of materially altered. For the purposes of Section (3) of this section, a type of airplane is considered to be materially altered in design if the alteration includes:
(a) the installation of powerplants other than those of a type similar to those with which it is certificated; or
(b) alterations to the aircraft or its components that materially affect flight characteristics.
(5) No certificate holder may carry passengers in an aircraft during proving tests, except for those needed to make the test and those designated by the Minister. However, it may carry mail, express, or other cargo, when approved.

602.172 Part VII, Subparts 3 and 4 Aircraft Proving Tests.

(1) Initial airplane proving tests. No person may operate an airplane not before proven for use in a kind of operation under LARs Part VII, Subpart 3 and 4 unless an airplane of that type has had, in addition to the airplane certification tests, at least 25 hours of proving tests acceptable to the Minister, including a representative number of flights into en route airports. The requirement for at least 25 hours of proving tests may be reduced by the Minister if the Minister determines that a satisfactory level of proficiency has been demonstrated to justify the reduction. At least 5 hours of proving flights must be flown at night; these tests are irreducible.
(2) Proving tests for kinds of operations. Unless otherwise authorized by the Minister, for each type of airplane, a certificate holder must conduct at least 25 hours of proving tests acceptable to the Minister for each kind of operation it intends to conduct, including a representative number of flights into en route airports.
(3) Proving tests for materially altered airplanes. Unless otherwise authorized by the Minister, for each type of airplane that is materially altered in design, a certificate holder must conduct at least 50 hours of proving tests acceptable to the Minister for each kind of operation it intends to conduct with that airplane, including a representative number of flights into en route airports.
(4) Definition of materially altered. For the purposes of Section (3) of this section, a type of airplane is considered to be materially altered in design if the alteration includes:
(a) the installation of powerplants other than those of a type similar to those with which it is certificated; or
(b) alterations to the aircraft or its components that materially affect flight characteristics.
(5) No certificate holder may carry passengers in an aircraft during proving tests, except for those needed to make the test and those designated by the Minister. However, it may carry mail, express, or other cargo, when approved.

602.173 Reserved

REPUBLIC OF LEBANON
MINISTRY OF TRANSPORT
DIRECTORATE GENERAL OF CIVIL AVIATION

LARs

LEBANESE AVIATION REGULATIONS

Part VI

General Operating and Flight Rules

Subpart 2
Operating and Flight Rules

Standards
s602.01 to s602.173

***** Revision No. 1 *****
International Civil Aviation Organization
Richard B. Fauquier

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LEBANESE AVIATION REGULATIONS (LARs)

Part VI – General Operating and Flight Rules
Standards

s602.01 to s602.173

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Appendix I
to
General Operating and Flight Rules Standards
Part VI, Subpart 2
s602.11 – Aircraft Icing

Division I - General

INTRODUCTION

(1) In order to operate an aircraft under icing conditions in accordance with the requirements of LAR Section 602.11, an operator must have a Ground Icing Operations Program as specified in these Standards and the dispatch and take-off of the aircraft shall comply with that program. These Aircraft Icing Standards specify the program elements, for both operations and training, that shall be addressed in an operator's Ground Icing Operations Program and described in the appropriate operator's Operations Specifications (OpSpecs) and manuals. As applied to Lebanese operators, these Standards outline a Program's minimum requirements, which may be adapted according to the needs of the individual operator. Foreign operators should use this Standard as a guideline for the development of their Ground Icing Operations Program in Lebanon.
(2) For ease of reference the standards are published in "normal print", and the Information Notes which are meant to offer guidance are published in *"italicized print"*.

APPLICABILITY

These criteria are applicable to flight operations pursuant to Part VI, Subpart 4 and Part VII of the Lebanese Aviation Regulations.

INTERPRETATIONS

The following are definitions of important terms used in these Standards.

"anti-icing" - means a precautionary procedure that provides protection against the formation of frost or ice and the accumulation of snow on treated surfaces of an aircraft for a period of time.

"contamination" - means any frost, ice or snow that adheres to the critical surfaces of an aircraft.

"critical surfaces" - means the wings, control surfaces, rotors, propellers, upper surface of the fuselage on aircraft that have rear-mounted engines, horizontal stabilizers, vertical stabilizers or any other stabilizing surface of an aircraft.

"critical surface inspection" - means a pre-flight external inspection of critical surfaces conducted by a qualified person as specified in Part VI, subsection 602.11(5), to determine if they are contaminated by frost, ice, or snow. Under ground icing conditions, this inspection is mandatory.

"de-icing" - means a procedure by which frost, ice, or snow is removed from the critical surfaces of an aircraft in order to render them free of contamination.

"ground icing conditions" - with due regard to aircraft skin temperature and weather conditions, means ground icing conditions exist when frost, ice, or snow is adhering or may adhere to the critical surfaces of an aircraft.

APPENDIX II
to
General Operating and Flight Rules Standards
Part VI, Subpart 2
s602.131 Category I and II Operations

CRITERIA FOR APPROVAL OF CATEGORY I AND CATEGORY II WEATHER MINIMA FOR APPROACH

1. INTRODUCTION

(1) These Commercial Air Services/Private Operator Passenger Transportation Standards and Procedures are the standards and procedures that must be met for the Director General of Civil Aviation (DGCA) to grant approval of turbojet landing minima of less than 300-3/4 [75-1200 m] or RVR 4000 [1200 m] (Category I) and Category II minima for all aircraft.
(2) For ease of reference the standards are published in "normal print", and the Information Notes which are meant to offer guidance are published in *"italicized print"*.

2. APPLICABILITY

These criteria are applicable to operators holding Private Operator Certificates issued pursuant to Part VI and Air Operator Certificates pursuant to Part VII of the Lebanese Aviation Regulations (LARs). The Director General of Civil Aviation grants approval of these minima by amending an operator's Operations Specifications (OpSpecs).

3. INTERPRETATIONS

Interpretations that are specific to this Appendix are located in Attachment 1 to this Appendix.

Within this Appendix, Runway Visual Range (RVR) values are specified in units of feet (ft.) and meters [m].

Where visibility minima are stated in both feet and meters (e.g., 300RVR [75 m]) using values other than those identified as "equivalent" in standard operations specifications, it is intended that the RVR value in feet apply to minima specified in feet, and the value in meters apply in states specifying their minima in meters.

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DIVISION I - BACKGROUND.

(1) This Appendix incorporates changes resulting from the first steps toward international all weather operations (AWO) criteria harmonization taken by the U.S. FAA, European JAA, and several other regulatory authorities. Subsequent revisions of this Appendix are planned as additional all weather operations harmonization items (AHI(s)) are agreed and completed by ICAO.
(2) Relationship of Operational Authorizations for Category I or Category II and Airborne System Demonstrations. Approach weather minima are approved through applicable operating rules, use of approved instrument procedures and issuance of OpSpecs. Airworthiness demonstration of aircraft equipment is usually accomplished in support of operational authorizations on a one time basis at the time of Type Certification (TC) or Supplemental Type Certification (STC). This demonstration is based upon the airworthiness criteria in place at that time. Since operating rules continuously apply over time and may change after airworthiness demonstrations are conducted, or may be updated consistent with safety experience, additional Category I or Category II credit or constraints may apply to operators or aircraft as necessary for safe operations. In general, criteria related to operational approval is contained in the main body of this Appendix and criteria related primarily to the airworthiness demonstration of systems or equipment is included in the Attachments to this Appendix.
(3) Applicable Criteria. Except as described below, new airworthiness demonstrations or operational authorizations should use the criteria of this Appendix. Airworthiness demonstrations may use equivalent FAA/JAA criteria where agreed by the Director General of Civil Aviation (DGCA) after a review of the FAA/JAA criteria harmonization process. Operators electing to comply with the criteria in this Appendix may receive additional credit. Aircraft modifiers may elect to demonstrate their aircraft using the criteria in this Appendix to seek credit for additional operations. Aircraft demonstrated using earlier criteria will be required to meet these Standards within a time period determined by the Minister.

Appendix III
to
General Operating and Flight Rules Standards
Part VI, Subpart 2
s602.131 Category III Operations

CRITERIA FOR APPROVAL OF CATEGORY III WEATHER MINIMA FOR TAKEOFF, LANDING, AND ROLLOUT

1. INTRODUCTION

(1) These Commercial Air Services/Private Operator Passenger Transportation Standards and Procedures are the standards and procedures that must be met for the Director General of Civil Aviation to grant approval of turbojet Category III minima for all aircraft.
(2) For ease of reference the standards are published in "normal print", and the Information Notes which are meant to offer guidance are published in *"italicized print"*.

2. APPLICABILITY

These criteria are applicable to operators holding Private Operator Certificates issued pursuant to Part VI and Air Operator Certificates pursuant to Part VII of the Lebanese Aviation Regulations (LARs). The Director General of Civil Aviation (DGCA) grants approval of these minima by amending an operator's Operations Specifications (OpSpecs).

3. PURPOSE

This Appendix provides the Standards for obtaining and maintaining approval of operations in Category III Landing Weather Minima and low visibility takeoff including the installation and approval of associated aircraft systems. It includes Category III criteria for use in conjunction with Head-up Displays, satellite navigation systems, low visibility takeoff guidance systems, Wide-body Fail Passive operations and use of Category III during certain engine inoperative operations.

This Appendix incorporates changes resulting from the first steps toward international all weather operations (AWO) criteria harmonization taken by the Federal Aviation Administration (FAA), European Joint Aviation Authorities (JAA), and several other regulatory authorities. Subsequent revisions of this Appendix are planned as additional all weather operations harmonization items (AHI) are agreed and completed by DGCA / JAA, and other regulatory authorities.

4. INTERPRETATIONS

A comprehensive set of definitions pertinent to Category III approach and low visibility takeoff is included in Attachment 1.

Within this Appendix, Runway Visual Range (RVR) values are specified in units of feet (ft.) and meters [m].

Where visibility minima are stated in both feet and meters (e.g., 300RVR [75 m]) using values other than those identified as "equivalent" in standard operations specifications, it is intended that the RVR value in feet apply to minima specified in feet, and the value in meters apply in states specifying their minima in meters.

DIVISION I - BACKGROUND

(1) Relationship of Operational Authorizations for Category III and Airborne System Demonstrations. Takeoff and landing weather minima are approved through applicable operating rules, use of approved instrument procedures and issuance of Operations Specifications. Airworthiness demonstration of airborne equipment and systems is usually accomplished in support of operational authorizations on a one time basis at the time of Type Certification (TC) or Supplemental Type Certification (STC). Since operating rules continuously apply over time and may change after airworthiness demonstrations are conducted, or may be updated consistent with safety experience, additional Category III credit or constraints may apply to operators or aircraft as necessary for safe operations. Airworthiness demonstrations are based on the particular operational and airworthiness criteria in effect at the time a type design certification basis is established for a particular TC or STC. Subsequent operational authorizations may constrain capabilities originally demonstrated based on current operational regulatory requirements and experience. The main body of this Appendix contains criteria related to operational approval and Attachment 2 and Attachment 3 are the primary source of airworthiness criteria. Nothing in this Appendix is intended to preclude an operator from proposing and demonstrating to the DGCA, its ability to operate to Category III minima with a different equipment configuration; or alternatively to an RVR minima lower than that presently described in this document.
(2) Applicable Criteria**.** Airworthiness demonstrations may use JAA criteria where agreed by Authority's through the DGCA/JAA criteria harmonization process.

In general, the provisions of the main body of this Appendix outline concepts, objectives, and provisions necessary for operators. The Attachments contain definitions, abbreviations, airworthiness demonstration provisions typically applied in conjunction with type certification, technical information necessary for airworthiness or operational assessments (e.g., atmospheric/wind models, obstacle clearance criteria) and examples of operational authorizations (e.g., sample Operations-Specifications (OpSpecs)). Certain criteria related to airworthiness assessment are included in the main body of the Appendix primarily to address the status and eligibility of previously certificated in-service aircraft for current authorizations (e.g., status of service bulletin compliance requirements for continued or new authorizations, demonstration provisions applicable to "in-service" aircraft).

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DIVISION II - OPERATIONAL CONCEPTS

(1) Classification and Applicability of Minima. Landing minima are generally classified by Category I, Category II and Category III (e.g., see ICAO Annex 6 references, and the associated ICAO Manual of All Weather Operations DOC 9360/AN910, 2nd Edition, 1991). Appendix I (as amended) addresses Category I and II. This Appendix addresses Category III.

Takeoff minima are usually classified by RVR or meteorological visibility, and other factors (e.g., aircraft characteristics).

Although a wide variety of normal and non-normal situations are considered in the design and approval of systems used for Category III, Category III minima are primarily intended to apply to normal operations.

For non-normal operations, flightcrews are expected to take the safest course of action appropriate for the situation, including consideration of normal landing weather minima. When aircraft systems have been demonstrated to account for certain non-normal configurations (e.g., an approach with an engine inoperative) flightcrew may take into account this information in assessing the safest course of action.

Takeoff

(2) Takeoff minimums are included in standard operations specifications. This Appendix addresses criteria for takeoff in low visibility conditions where additional aircraft equipment is provided to assist the pilot in a low visibility takeoff, or is required to assure safe operations when using minima below values acceptable for exclusive use of visual reference.

Standard OpSpecs list minima acceptable to the DGCA for manual control based exclusively on visual reference.

Authorization of takeoff minima below the level supported by use of visual reference alone requires use of a guidance system which has been demonstrated to provide an acceptable level of performance and satisfactory workload for the minima approved, with or without use of visual reference. The performance and workload assessment of such a system must have considered any compensation that may be introduced by the pilot for particular guidance system characteristics (e.g., coping with a slight localizer signal offset during initial runway alignment) or concurrent pilot use of the guidance system with limited or patchy visual references.

Systems intended to be used at or above the minima authorized for visual reference alone (e.g., as a supplement to manual control) may be used if demonstrated to be safe without increasing pilot workload. Authorized minima for such systems may be no lower than that specified for manual control using visual reference alone.

If low visibility takeoff operations are predicated on the use of RNP, then the provisions applicable to RNP apply only following liftoff, after passing 35 ft. [10.67 m]above the published elevation of the runway.

A proof of concept demonstration is necessary for initial authorization of takeoff minima less than 300 RVR ft. [75 m].

Criteria for demonstration of systems eligible for takeoff minima below the level supported by use of visual reference alone are found in Attachment 2.

Landing

(3) Concepts and Objectives. Category III landing minima are classified as Category IIIa, Category IIIb or Category IIIc. Definitions of these categories are provided in Attachment 1. Visual conditions encountered in Category III operations range from visual references being adequate for manual control during rollout (e.g., Category IIIa) to visual references being inadequate even for taxi operations without special visual reference enhancements or suitable synthetic references. For any Category III operation, the airplane and external system requirements established (e.g., position fixing) should be compatible with any visual reference requirements that are specified.

Category III operations may be conducted manually using Flight Guidance Displays, or automatically using approved autoland system or with Hybrid Systems which employ both automatic and flight guidance elements. If the particular Flight Guidance Display depicts flight director or other command guidance it may be approved in accordance with this Appendix, or equivalent. Situational Flight Guidance Displays may be used if the Proof of Concept (PoC) is satisfactorily demonstrated. When an automatic system is to be the primary means of control the use of that system should not require pilot intervention. The means for crew intervention must be provided, however, in the unlikely event the pilot detects or strongly suspects inadequate system performance (e.g., the pilot determines that an automatic landing cannot be accomplished within the touch down zone). If a Hybrid system is employed, then the primary mode of operation must be automatic to touch down, with manual control used only as an alternate means to complete the operation.

To be approved for Category III operations, the airplane and its associated systems should be shown to be capable of safely completing an approach, touch down, and rollout and permitting a safe go-around from any altitude to touch down following any failure condition not shown to be extremely improbable. Cockpit design, instrumentation, annunciations and warning systems, should be adequate in combination to assure that the pilot can verify that the aircraft should touch down within the touch down zone and safely rollout if the controlling visibility is reported at or above applicable minima. Systems based on automatic control to touch down, or touch down and rollout and manually flown flight guidance system (e.g., HUD), have been approved by DGCA. Other concepts may be acceptable if Proof of Concept [PoC] testing can demonstrate an equivalent or greater level of safety as presently required for approval of automatic systems (e.g., hybrid systems or vision enhancement systems).

To be approved for Category III operations, the airplane and its associated systems should be shown to be able to perform to the necessary level of accuracy, integrity, and availability. This is typically shown initially during airworthiness demonstration, is confirmed during the operational authorization process, and is monitored by the operator on a continuing basis.

Category III operations are predicated on meeting requirements for Category II, or equivalent, for that portion of the approach prior to 100' [30 m] HAT (See Appendix II to this Standard as amended).

If Category III operations are predicated on the use of RNP, then the provisions of Appendix I, as amended, for RNP apply to that phase of the operations down to 100 ft.[30 m] HAT. Below 100 ft.[30 m] HAT, the provisions of this Appendix apply to assure the necessary performance for landing and rollout. For a go-around and missed approach, RNP provisions may be applied from the initiation of the go-around to completion of this missed approach procedure in accordance with provisions of Appendix I or other RNP criteria acceptable to the DGCA, as applicable.

(4) Fail Operational Category III Operations. A Fail Operational System is a system which after failure of any single component, is capable of completing an approach, flare and touch down, or approach, flare, touch down and rollout by using the remaining operating elements of the Fail Operational system. The failure effects of single components of the system, airplane or equipment external to the airplane which could have an effect on touch down or rollout performance must be considered when evaluating Fail Operational systems. Fail Operational systems may be used to touch down for Category IIIa (e.g., without a rollout system) or Category IIIb through rollout to a full stop. Use of a fail-operational system to touch down in conjunction with a rollout system that is not fail-operational is acceptable as long as a minimum RVR is specified in the operations specifications, for rollout.

This Appendix contains criteria for approval of minima as low as 150RVR [50 m] using a fail-operational system for landing and rollout. Approval of minima less than 150RVR [50 m] would require a proof of concept demonstration.

Information Note: *A landing system includes each of the elements in the aircraft which are necessary to perform the landing and rollout function(e.g., flight control, hydraulics, electrics, sensors).*

The required redundancy may be provided by multiple automatic landing systems, by multiple automatic landing and rollout systems or by hybrid systems.

The reliability and performance of the required operational systems should be such that continued safe operation to landing for Category IIIa, or landing and rollout for Category IIIb, can be achieved following any failure condition occurring below the Alert Height that is not shown to be extremely improbable. Systems identified below**,** or equivalent, are considered to meet the intent of this provision.

Failure conditions which result in the loss or disconnect of all the redundant landing, or landing and rollout systems, occurring below the Alert Height, are permissible if the occurrence of these failure conditions is extremely remote and the loss or disconnect is accompanied by acceptable warning indications for the pilots. Airplanes which are demonstrated to meet the airworthiness requirements of Attachment 3 for fail operational systems are considered to meet these reliability and performance criteria.

The following are typical arrangements by which the requirements for Fail Operational Systems may be met:

(a) two or more monitored fail passive autopilots or integrated autopilot flight director systems each with dual channels making up an automatic fail operational system designed so that at least one autoflight system remains operative after the failure of one system, and the failed system is not used or cannot cause unacceptable autoflight system performance.

Information Note: *Following a failure with this configuration, it is not intended* *that a landing be continued with flight director alone, unless a successful Proof of Concept demonstration has been completed.*

(b) three autopilots or integrated autopilot flight director systems designed so that at least two remain operative after failure to permit comparison and provide necessary monitoring and protection while continuing to a landing.

(c) a monitored fail passive automatic flight control system with automatic landing capability to touch down and rollout, if applicable, plus an independent and adequately failure protected flight guidance system, suitable for landing and rollout with guidance provided for the flying pilot and monitoring displays for the non-flying pilot.

Information Note: *A proof of concept demonstration would be necessary for this arrangement.*

(d) two independent and adequately monitored flight guidance systems with independent displays for the pilot flying and the pilot not flying, each capable of supporting a landing and rollout.

Information Note: *A proof of concept demonstration would be necessary for this arrangement.*

Aircraft authorized for fail-operational Category III in accordance with this Appendix should meet requirements of Attachment 3, or equivalent.

(5) Alert Height. Fail-operational Category III is based on use of an Alert Height (see Attachment 1). An Alert Height is the height above a runway based on characteristics of the airplane and its Fail Operational System, above which a Category III approach must be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the flight control or related aircraft systems, or if a failure occurred in any one of the relevant ground systems. Use of an Alert Height is consistent with the design philosophy which requires that an aircraft be capable of safely completing a touch down and rollout (if applicable) following a failure occurring after passing the point at which the Alert Height is specified.

Operational Alert Heights must always be equal to or lower than that specified in the airworthiness demonstration, and may be specified at or below 200 ft. [60 m] HAT. The Alert Height is specified by an operator of an aircraft and approved by the DGCA. The operational Alert Height used must be consistent with the aircraft design, training, ground facilities, and other factors pertinent to the air carriers operation.

Airworthiness demonstration of an Alert Height is as specified in Attachment 3. In order to assure the necessary reliability of aircraft systems, airworthiness demonstrations of Alert Height are from an altitude at least 200 ft.[60 m] above the touch down zone elevation or higher.

(6) Fail Passive Category III Operations. A Fail Passive System is a system which in the event of a failure, causes no significant deviation of aircraft flight path or attitude. The capability to continue the operation may be lost and an alternate course of action (e.g., a missed approach) may be required. A fail-passive system is the minimum capability system required for Category III operation with a Decision Height not less than 50 ft. [15 m] HAT.

Fail Passive Approach Operations are conducted with a decision height not lower than 50 ft. [15 m], and are limited to RVR values which provide suitable visual reference to address normal operations as well as failure contingencies. Since a Fail Passive Category III system does not necessarily provide sufficient redundancy to successfully continue the approach and landing to touch down following any failure in the flight control system not shown to be extremely remote, a DH is specified. A DH is established to assure that prior to passing that point the pilot is able to determine that adequate visual reference exists to allow verification that the aircraft should touch down in the touch down zone. If this visual reference is not established prior to passing DH, a missed approach must be initiated. After passing DH, a missed approach will also be initiated if visual cues are lost, or a reduction in visual cues occurs which prevents the pilot from continuing to verify the aircraft is in a position which will permit a landing in the touch down zone. In the event of a failure of the airborne system at any point in the approach to touch down, a missed approach is required. However, this provision does not preclude a pilot's authority to continue an approach if continuation of an approach is considered by the pilot to be a safer course of action.

Such a failure however, does not preclude continuation to a Category I or Category II minima if the necessary remaining elements of the aircraft system are operational and if the crew qualification requirements necessary to continue such an approach are met. Any adjustments to approach minima or procedures made on final approach should be completed at a safe altitude (e.g., above 500 ft.[150 m] HAT).

The need to initiate a go-around below 100 ft. [30 m] AGL due to an airplane failure condition should be infrequent. In addition, an aircraft using a Fail Passive system for Category III should be shown to provide the capability to touch down in the touch down zone or to complete a safe manual or automatic go-around from any altitude to touch down following any failure condition not shown to be extremely improbable.

Typical arrangements which may be used to meet the requirements for Category III fail passive operations using a 50 ft. [15 m] Decision Height include the following:

(a) a single monitored automatic flight control system with automatic landing capability.

(b) a fail operational automatic flight control system with automatic landing which has reverted to a Fail Passive configuration or has been dispatched in a fail-passive configuration.

(c) a monitored flight guidance system (e.g., HUD) designed for manual control by the pilot flying, and for monitoring by the pilot not flying. Aircraft intended for Fail Passive Category III operations should have aircraft systems which meet the requirements specified in Appendix 3. Aircraft previously demonstrated to meet Fail Passive requirements using earlier criteria may continue to operate using Category III minima in accordance with approved operation specifications.

(7) Decision Altitude (Height). For Category II and certain Category III procedures (e.g., when using a Fail-Passive autoflight system) a Decision Height (or an equivalent IM position fix) is used as the controlling minima. The "Altitude" value specified is considered as advisory. The altitude value is available for cross reference.

A Decision Height is applied to all Fail Passive operations and is specified at certain locations where fail operational minima is authorized. For Category III, a Decision Height is usually based on a specified radio altitude above terrain on the final approach or touch down zone. The Decision Height is established to assure that prior to passing that point the pilot is able to determine that adequate visual reference exists to allow verification that the aircraft should touch down in the touch down zone.

For Category I, a DA(H) is specified as the minimum altitude in an approach by which a missed approach must be initiated if the required visual reference to continue the approach has not been established. The "Altitude" value is typically measured by a barometric altimeter or equivalent (e.g., Middle Marker) and is the determining factor for minima for Category I Instrument Approach Procedures. The "Height" value specified in parenthesis is typically a radio altitude equivalent height above the touch down zone (HAT) used only for advisory reference and does not necessarily reflect actual height above underlying terrain. The DA element of a DA(H) is applicable to Category III only in the event that an approach is considered to revert to Category I or Category II minima following airborne equipment failure, ground facility status, or other similar condition permitting an approach to be conducted to pertinent Category I or II minima.

(8) Go-Around Safety. An aircraft approved for Category III should be capable of safely executing a go-around from any point in an approach prior to touch down with the aircraft in a normal configuration, or specified non-normal configuration (e.g., engine out if applicable). It is necessary to provide for go-around due to Air Traffic Services contingencies, rejected landings, loss of visual reference, or missed approaches due to other reasons. The evaluation of this capability is based on normal, or specified non-normal, Category III operations at the lowest controlling RVR authorized and should account for factors related to geometric limitations during the transition to go around, limited visual cues, auto-pilot mode switching and other pertinent factors. For aircraft in which a go-around from a very low altitude may result in an inadvertent touch down, the safety of such a procedure should be established considering its effect on related systems, such as operation of auto spoilers, automatic braking systems, autopilot mode switching, autothrottle mode, reverse thrust initiation and other systems associated with, or affected by, a low altitude go-around.

Except for failure conditions shown to be extremely improbable, a safe go-around must be possible from any point on the approach to touch down.

If an automatic go-around capability is provided, it should be demonstrated that a go-around can be safely initiated and completed from any altitude to touch down. If the automatic go-around mode can be engaged at or after touch down, it should be shown to be safe. The ability to initiate an automatic go-around at or after touch down is not required.

(9) Category IIIa. In accordance with ICAO definitions of Category III, Category IIIa operations may be conducted with either Fail Operational or Fail Passive systems. The lowest approvable landing minima for Category IIIa is 700RVR [200 m] or a foreign equivalent of 200 meters.

Information Note: *For certain Category III operations using fail passive systems that were formerly limited to 700RVR [200 m], but now are eligible for authorization to 600RVR [175 m], (Most Cat III operations authorized for 700RVR [200 m] prior to issuance of this Appendix are now eligible for authorization to 600RVR [175 m], upon request of the operator for issuance of a revision to that operator's pertinent Operations-Specifications).*

Category IIIa operations with fail passive systems are conducted using a 50 ft. [15 m] Decision Height.

Category IIIa operations using a fail operational system with a rollout control system are generally conducted using an Alert Height, and not a Decision Height. Visual reference is not a specific requirement for continuation of the approach or touch down.

Category IIIa operations using a fail operational system without a rollout control system installed require establishment of suitable visual reference with the touch down zone prior to touch down.

For any of the above systems there should be a sufficient combination of information from flight instruments, annunciations, and alerting systems to assure that the pilot can verify that the aircraft should touch down within the touch down zone, and safely initiate rollout.

Unless otherwise specified by DGCA, aircraft having operation specifications authorizing 700RVR [200 m] as of the effective date of this Appendix, may continue to use those minima without additional demonstration.

Aircraft, including wide body aircraft such as the DC-10, L1011 and B 747, which are authorized for fail-operational Category III, but have not been demonstrated to meet the provisions for Fail Passive systems shown in Attachment 3, may be approved for Fail Passive operations with landing minima limited to 1000RVR [300 m] provided the following criteria are met:

(a) the aircraft must be shown to be in compliance with relevant service bulletins for the applicable flight control system and displays.
(b) an auto throttle system must be installed and operational.
(c) the system must be shown to provide reliable auto land performance in line operations.
(d) a demonstration using a simulator or aircraft must be completed for that operator and aircraft type, showing that the system and procedures applicable to Fail Passive operations can be practically applied for that air carrier’s operation.

Wide body aircraft types not previously authorized or currently authorized by DGCA to use minima less than 1000RVR [300 m] based on a fail passive system must meet the airworthiness requirements of Appendix 3 or equivalent for any new authorization of minima less than 1000RVR [300 m].

New aircraft types or derivative aircraft with new flight control system designs should be demonstrated in accordance with the requirements of Attachment 3 for Fail Passive systems, or equivalent requirements, if fail passive authorization is sought.

(10) Category IIIb. Category IIIb operations are usually conducted with fail operational systems. Fail passive landing systems may be used, but are limited to Cat IIIb minima not less than touchdown zone

600RVR [175 m]. Airborne systems used for Cat IIIb authorized for landing below touchdown zone 600RVR [175 m] must include either a manual flight guidance or automatic rollout or control system for lateral steering which provides the means to control the aircraft until the aircraft slows to a safe taxi speed. Category IIIb operations based on fail operational systems require the use of systems which after passing Alert Height, are capable of the safe completion of the approach, touch down, and rollout, following any failure conditions not shown to be extremely remote. When fail operational systems are used, they do not necessarily require that operating procedures specify that the approach must necessarily be continued after a failure.

Category IIIb operations based on fail passive landing systems meeting provisions of Attachment 3 of this Appendix, or equivalent, must use a decision height not less than 50 ft. [15 m] HAT.

For Category IIIb fail operational operations, the availability of visual reference is not a specific requirement for continuation of an approach to touch down. The design of flight instrument systems, annunciations, and alerting systems should be adequate to assure that the pilot can verify the aircraft should touch down within the touch down zone, and rollout.

Visual reference requirements for fail passive operations to minima not less than 600RVR [175 m] are the same as specified for Cat IIIa.

Category IIIb operations may be conducted to a touchdown zone RVR and relevant mid or rollout RVR not less than 600 ft. [175 m] with a fail operational or fail passive landing system without a rollout control system.

Category IIIb operations may be conducted to a touchdown RVR of not less than 600 ft. [175 m] and an relevant mid or rollout RVR not less than 400RVR [125 m] with a fail operational or fail passive landing system and with any DGCA approved rollout control system.

Category IIIb operations may be conducted to a touchdown zone, and relevant mid, and rollout RVR minima not lower than 400RVR [125 m] when using a fail operational landing system and a rollout control system shown to meet Fail Passive criteria of Attachment 3.

Category IIIb operations may be conducted to a touchdown zone RVR, and relevant mid, and rollout RVR minima not less than 150RVR [50 m] with a fail operational landing system and a rollout control systems shown to meet the Fail Operational criteria of Attachment 3.

(11) <u>Runway Field-Length Requirements</u>.

(a) the Runway Field-Length Requirement for Category III is as specified by the LARs for a wet runway, if each of the following conditions are met:

(i) anti-skid systems are operative (if installed for the aircraft type).

(ii) the runway surface braking action is expected to be at least "fair" or better (or equivalent Runway Condition Reading, James Brake Devise, or Tapley reading).

In the event that either of the above conditions are not met, the factor to be applied to the LARs required distance is 1.3, unless otherwise demonstrated to the DGCA that a factor less than 1.3 is acceptable (e.g., due to other factors, such as the required use of an auto brake system).

(b) once airborne, additional consideration of Category III landing field length requirements by the flightcrew is not required for normal operations. In the event of un-forecast adverse weather or if failures occur, the crew and aircraft dispatcher should consider any adverse consequences that may result from a decision to make a Category III landing (e.g., braking action reports). Category III operations should not normally be conducted with braking action less than "fair".

(c) when auto brake systems are used for Category III, information must be available to the flightcrew to assist in making the proper selection of a suitable auto brake setting consistent with the field length available for landing and the runway condition, including braking action.

(12) Landing System Sensors (NAVAIDs) and Aircraft Position Determination**.** Various landing system sensors (NAVAIDs) or combinations of sensors may be used to provide the necessary position fixing capability to support authorization of Category III landing weather minima. While certain navigation sensors (NAVAIDs) are installed and classified primarily based on landing operations, the sensors described in this Division may also be used for takeoff, missed approach, or other operations (e.g., RNAV position determination). Regardless of the sensors, NAVAIDs, or combination of NAVAIDs used, the NAVAIDs and sensors must provide coverage for the intended flight path and for anticipated displacements from that flight path for normal operations, rare normal operations (e.g., winds and wind gradients), and for specified non-normal operations where applicable (e.g., "engine-out go-around" flight path). In addition, Category III authorizations should be consistent with the provisions or characteristics for specific sensors listed below unless otherwise accepted or approved by DGCA.

(13) Instrument Landing System (ILS). The ILS provides a reference signal aligned with the runway centerline and deviation signals when the airplane is displaced left or right of the extended runway centerline. The linear coverage area for this signal is approximately 3 degrees either side of the extended runway centerline from a point emanating at the far end of the runway. The ILS also provides a vertical flight path (nominally 3 degree descent angle) to a point in the landing zone of the runway. The vertical coverage is approximately 0.7 degrees on either side of the vertical reference path. ILS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by DGCA.

(14) Microwave Landing System (MLS). The MLS provides a reference signal aligned with the runway centerline and deviation signals when the airplane is left or right of the extended centerline. The linear coverage area is approximately 40 degrees either side of the extended runway centerline emanating from a point at the far end of the runway. The MLS provides a vertical flight path to the runway similar to ILS. MLS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by DGCA.

(15) GNSS Landing System (GLS). GLS provides is a landing systems based upon the Global Navigation Satellite System (GNSS). For Category III operations the landing system typically includes a local area differential augmentation system in the vicinity of the runway for which a Category III procedure is specified. The local area system may serve one or more runways, or nearby airports, depending on its classification for each particular runway. The classification of a GLS service may be different for different runway ends (e.g., III/E/3 for Runways 14L and 14R, but I/D/1 for RW 22L). Desired path, centerline, and deviation signals as applicable, are computed by airborne avionics. The coverage area for GLS is typically within a 25 mile radius of a primary airport, but extended service volumes are permitted. GLS provides for both vertical and lateral flight path specification to the touch down zone of the runway(s) served, and a lateral path for rollout or takeoff guidance. GLS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by DGCA (e.g., DGCA accepted references to RTCA SC159 MASPS). US GLS systems are classified by "Type" for each runway end served, similar to ILS (e.g., GLS II/D/2). Authorization for use of GLS is for each specific air carrier, aircraft, and GLS system type until pertinent GLS international standards accepted by DGCA are promulgated.

(16) RNAV/Flight Management Systems (FMS). RNAV/Flight Management Systems (FMS) are typically used in conjunction with Category III Instrument Approach Procedures only for initial or intermediate approach segments, or for missed approach.

For departure, RNAV/Flight Management Systems (FMS) may be used for non-visual takeoff guidance after passing the height at which LNAV or VNAV may respectively be engaged or made active, or above 35' AGL, whichever is higher. Other applicable DGCA criteria must be addressed for takeoff. For development or authorization of departure procedures which follow completion of a low visibility takeoff, U.S FAA Orders 8260.40A, 7100.1, or other acceptable RNAV/RNP criteria should be consulted.

Procedures based on 3D or 2D RNAV may or may not include use of RNP. For RNP operations, see Division II, Section(17) below.

(17) Required Navigation Performance (RNP). A definition for Required Navigation Performance (RNP) is specified in Attachment 1. Standard Levels of RNP typically used for various initial, intermediate approach and missed approach segments for Category III procedures may be based on specific landing systems (e.g., ILS, MLS, or GLS), on multisensor RNAV (e.g., FMS with IRS, VOR, DME inputs), or on other aircraft navigation systems having FMS like capabilities (e.g., GPS Navigation Systems).

RNP applications used for a final approach segment supporting a Category III procedure must typically be based on use of a specific landing system sensor (e.g., ILS, MLS, or GLS), or on multisensor RNAV systems having suitable flight critical performance (e.g., multiple FMS with flight critical software and multiple IRS, ILS, and/or DGNSS inputs).

(18) Standard RNP Types. Standard values of RNP supporting initial, intermediate, or final approach segments, or missed approach segments applicable to Category III procedures are as specified in Table 1. below.

Table 1.
STANDARD RNP TYPES APPLICABLE TO Category III

RNP Type	Applicability/Operation (Approach segment)	Normal Performance (95%)	Containment Limit
RNP 1	Initial/Intermediate/ Missed approach	+/- 1 nm	+/- 2 nm
RNP 0.5	Initial/Intermediate/ Missed approach	+/- 0.5 nm	+/- 1 nm
RNP 0.3	Initial/Intermediate/ Missed approach	+/- 0.3 nm	+/- 0.6 nm
RNP levels as specified for lowest Category I	Final approach/ initial missed approach (but not below 200' [60 m] HAT)	(See Appendix II)	(See Appendix II)
RNP levels as specified for Category II	Final approach/ initial missed approach (but not below 100' [30 m] HAT)	(See Appendix II)	(See Appendix II)
RNP 0.03/15	Final approach/ initial missed approach (any altitude)	+/- 0.03 nm +/- 15 ft. (*)	+/- 0.06 nm +/- 30 ft. (*)

(*) Note: vertical accuracy does not apply below 100 ft. [30 m] HAT - below 100 ft. [30 m] HAT vertical performance is determined by applicable standards for touch down performance.

RNP is a required navigation performance level described by the specification of a numeric value indicating the required navigation accuracy for a specific operation, typically specified laterally in nautical miles - e.g., RNP 1 is a Required Navigation Performance of ± 1 nautical mile (95% Probability).

RNP containment is specified as RNP(X) x^2.

Standard RNP Levels are defined for lateral performance, or lateral and vertical performance, if applicable.

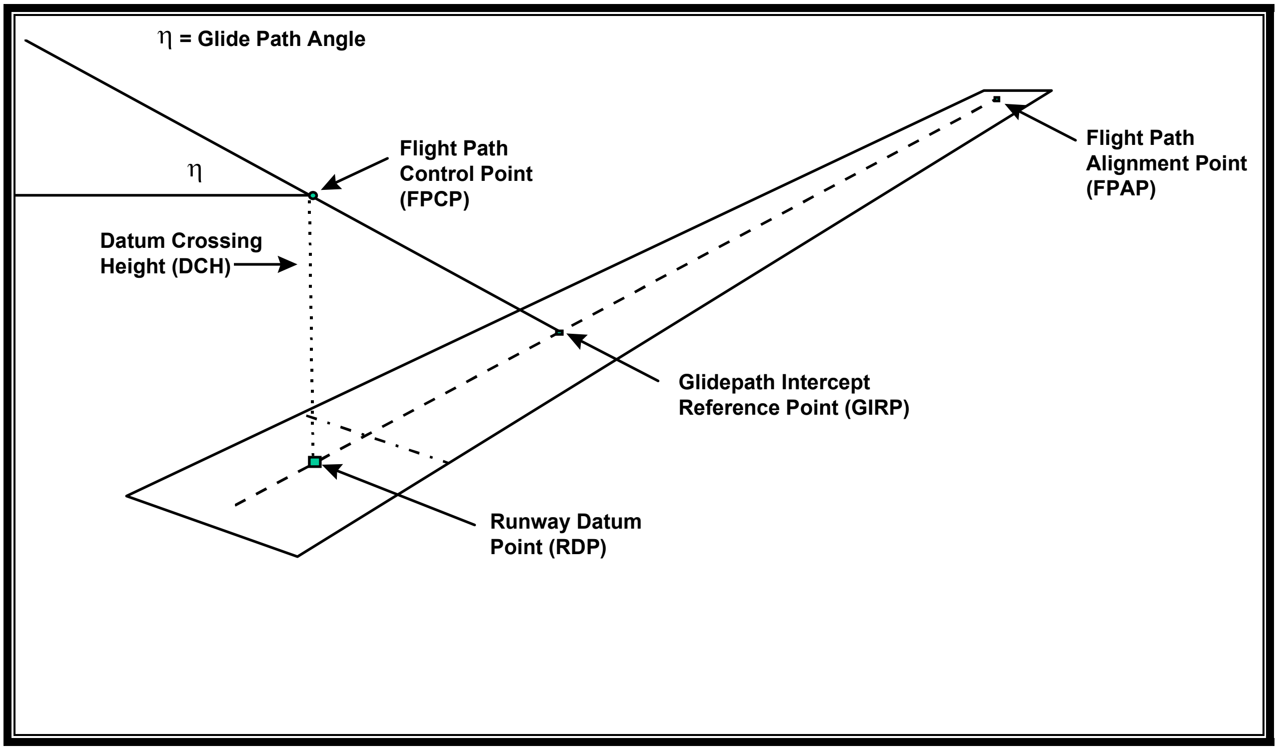
(19) Non-Standard RNP Types. Non-Standard RNP Types are those RNP values other than as specified in Division II, Section(18). Non-Standard RNP Types are authorized by the DGCA on a case by case basis where an applicant has a demonstrated need for such use.

Flight Path Definition.

(20) Landing and Rollout Flight Path. The following criteria specifies certain reference points and other criteria necessary to effectively implement landing and rollout operations using a landing system where the required flight path is not inherent in the signal structure of the navigation aid (e.g., satellite systems). The location of points used to describe the landing and rollout flight path are shown in Figure 4.6-1.

(21) Runway Datum Point (RDP). The RDP is used in conjunction with the FPAP and the geometric center of the WGS-84 ellipsoid to define the geodesic plane of a precision final approach flight path to touch down and rollout. It is a point at the designated lateral center of the landing runway defined by latitude, longitude, ellipsoidal height, and orthometric height. The RDP is typically a surveyed reference point used to connect the approach flight path with the runway. The RDP may not be coincident with the designated runway threshold.
(22) Flight Path Alignment Point (FPAP). The FPAP is used in conjunction with the RDP and the geometric center of the WGS-84 ellipsoid to define the geodesic plane of a precision final approach, landing and flight path. The FPAP may be the RDP for the reciprocal runway.
(23) Flight Path Control Point (FPCP). The FPCP is a calculated point located directly above the RDP. The FPCP is used to relate the vertical descent of the final approach flight path to the landing runway.
(24) Datum Crossing Height [DCH]. The height (feet) of the FPCP above the RDP.
(25) Glide Path Angle [GPA]. The glide path angle is an angle, defined at the FPCP, that establishes the intended descent gradient for the final approach flight path of a precision approach procedure. It is measured from a horizontal plane that is parallel to the WGS-84 ellipsoid at the FPCP.
(26) Glidepath Intercept Reference Point [GIRP]. The GIRP is the point at which the extension of the final approach path intercepts the runway.

Figure 4.6-1



The locations established for, and the values assigned to, the RDP, FPCP, DCH and GPA should be selected based upon the operational need to establish the required GIRP. Operational considerations include:

(a) path of wheels over threshold,
(b) need for coincidence with other aids and systems - visual and non-visual,
(c) runway characteristics (upslope and downslope, crown etc.),
(d) real, displaced and multiple thresholds,
(e) real clearways - stopways.

(27) Takeoff Flight Path. The flight path for low visibility takeoff (while on the runway) should be defined by the RDP and FPAP.

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DIVISION III - AIRBORNE SYSTEM REQUIREMENTS

General

(1) Airborne Systems. Airworthiness criteria for airborne systems intended to meet requirements of this Appendix are specified below or Attachment 2 for takeoff, and Attachment 3 for landing and rollout.

Aircraft shown to meet provisions of Attachment 2 or 3 respectively, are considered to meet provisions of this Division.

For aircraft approved using earlier versions of this Appendix, airworthiness criteria for airborne systems intended for Category III operations are as specified in criteria referenced by the approved AFM.

Airborne equipment listed in this Division needs to be operative for Category III, in accordance with OpSpecs. Airframe manufacturers and individual operators may also include other optional equipment as part of the Category III configuration, however, that equipment does not need to be operative to conduct a Category III approach unless required by that operator's OpSpecs.

(2) Non-Airborne Systems. Unless otherwise specified in the Attachments to this Appendix, navaid/landing system characteristics, including facility classification, should be considered as specified in Division II, Section(12) above and Appendix I for ILS, MLS or GLS (e.g., US use of ICAO Annex 10 Criteria, U.S. FAA Order 6750.24 as amended, and the applicable navaid facility classification for Category III). NAVAID facility use is predicated on applicable ILS, MLS, or GLS Type classifications (e.g., ILS III/E/2, GLSII/D/2) or equivalent classifications. Specific Navigation Services are addressed in Division III, Section(16) of this Appendix.

(3) Takeoff Guidance System Requirements. When takeoff minima are predicated on use of a takeoff guidance system, the takeoff guidance system should be demonstrated to meet provisions of this Division or provisions specified in Attachment 2 by an airworthiness demonstration. Takeoff guidance systems which have been shown to meet Attachment 2 by airworthiness demonstration and have a corresponding AFM reference are typically considered to meet requirements of this Division.

A takeoff guidance systems shall be demonstrated to show that the airplane will not deviate significantly from the runway centerline during takeoff while the system is being used within the limitations established for it. Compliance may be demonstrated by flight test, or by a combination of flight test and simulation. Flight testing must demonstrate repeatable performance, and cover those factors affecting the behavior of this airplane (e.g., wind conditions, ILS characteristics, weight, center of gravity). Compliance with the performance envelope should be demonstrated with pilots appropriately qualified to use the airborne system, and should not require extraordinary skill, training or proficiency.

Demonstrated winds should be 150% of the winds for which credit is sought, but not less than 15 knots of headwind or crosswind.

In the event that the airplane is displaced from the runway centerline at any point during the takeoff or rejected takeoff, the system must provide sufficient guidance to enable the "pilot flying", or the pilot in command who may assume control and become the "pilot flying", to control the airplane smoothly back to the runway centerline without significant overshoot or any sustained nuisance oscillation.

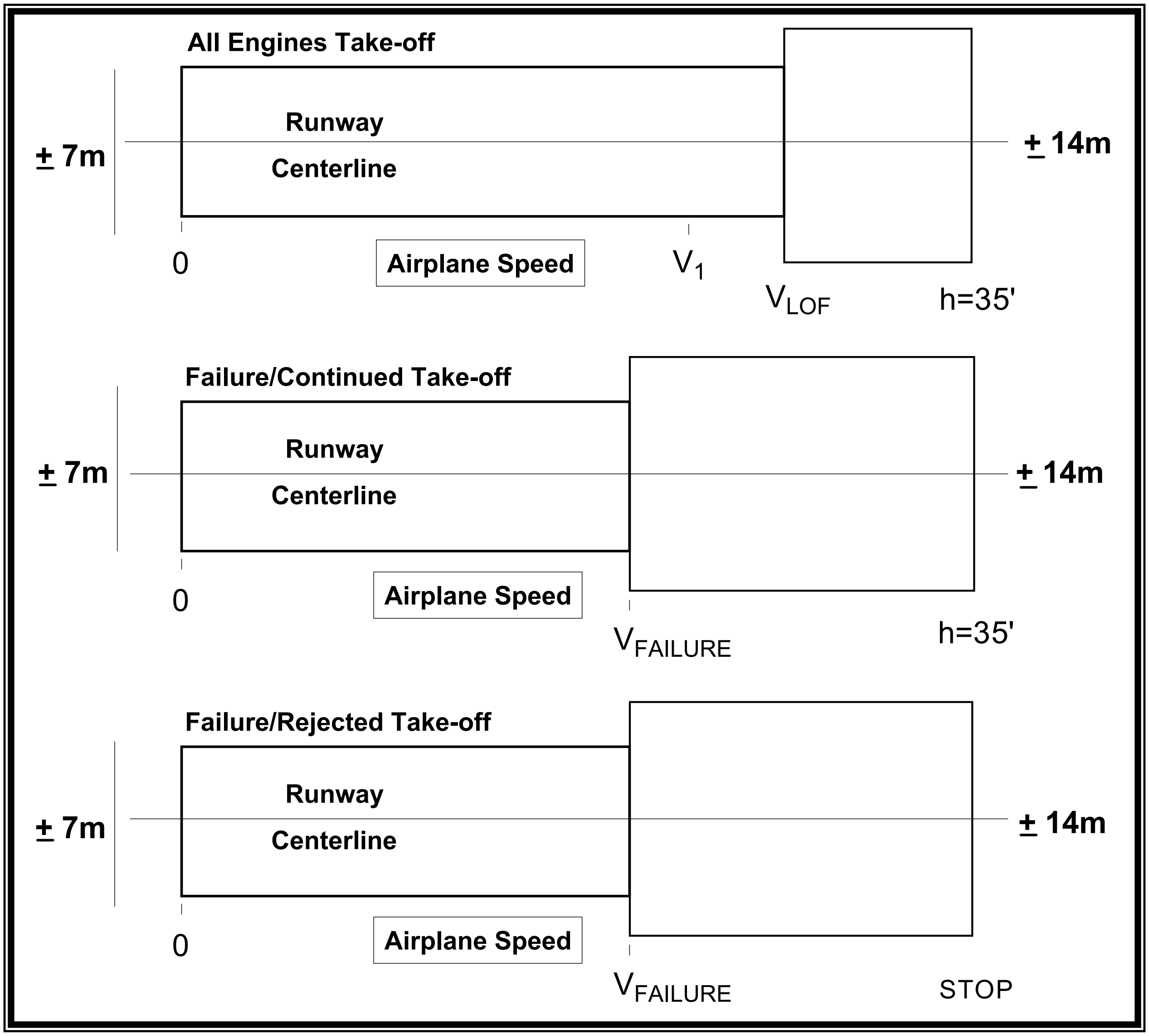
Figure 5.1.3-1 provides the performance envelope for evaluating takeoff command guidance systems for the following scenarios:

(a) takeoff with all engines operating
(b) engine Failure at V_{ef} - continued takeoff

(c) engine Failure just prior to V_1 - rejected takeoff
(d) engine Failure at a critical speed prior to V_{mcg} rejected takeoff: ($V_{ef} < V_{mcg}$)

Information Note: *For that portion of the flight path following liftoff, the demonstrated lateral path may be adjusted for any effect of wind drift when showing compliance with the performance envelope below.*

FIGURE 5.1.3-1.



(4) Airborne Systems for Category III Minima Not Less than 600RVR [175 m]. The following equipment in addition to the instrument and navigation equipment required by LARs for IFR flight is the minimum aircraft equipment considered necessary for Category III:

(a) a redundant flight control or guidance system, which meets the requirements of Attachment 3, or acceptable international criteria, such as the JAR AWO.

Acceptable flight guidance or control systems include the following:

(i) a Fail Operational or Fail Passive automatic landing system at least to touchdown, or
(ii) a Fail Operational or Fail Passive flight guidance system providing suitable head-up or head-down guidance, and suitable monitoring capability at least to touchdown, or
(iii) a hybrid system, using automatic landing capability as the primary means of landing at least to touchdown.
(iv) other system which can provide an equivalent level of performance and safety.

Information Note *For system concepts not currently approved by DGCA or system concepts not addressed by Attachment 3, a proof of concept demonstration is required prior to either airworthiness or operational consideration for approval*

(b) an automatic throttle or automatic thrust control system which meets the requirements of Attachment 3, or appropriate earlier criteria as specified in a DGCA-accepted approved AFM. However, for operations with a 50 foot [15 m] Decision Height, automatic throttles may not be required if it has been demonstrated that operations can safely be conducted, with an acceptable work load, without their use.
(c) at least two independent navigation receivers/sensors providing lateral and vertical position or displacement information, typically with the first pilot's station receiving information from one and the second pilot's station receiving information from the other. The navigation receivers/sensors must meet the criteria specified in Attachment 3 or equivalent, or must meet an earlier acceptable criteria as specified in a DGCA accepted approved AFM.
(d) at least two approved radio altimeter systems which meet the performance requirements outlined in Attachment 3, or acceptable earlier criteria, as specified in a DGCA accepted approved AFM, typically with the first pilot's station receiving information from one and the second pilot's station receiving information from the other.
(e) failure detection, annunciation, and warning capability, as described in Attachment 3, or as determined acceptable by earlier criteria and specified in a DGCA accepted approved AFM.
(f) missed approach guidance provided by one or more of the following means:
   (i) attitude displays which include suitable pitch attitude markings, or a pre-established computed pitch command display.
   (ii) an approved flight path angle display, or
   (iii) an automatic or flight guidance go-around capability.
(g) suitable forward and side flight deck visibility for each pilot, as specified in Division III, Section(17) of this Appendix.
(h) suitable windshield rain removal, ice protection, or defog capability as specified in Division III, Section(18) of this Appendix.

Airborne Systems for Category III Minima Less Than 600RVR.

(5) Airborne Systems for Category III Minima Not Less than 400RVR. The following equipment in addition to the instrument and navigation equipment required by Part VI of the LARs for IFR flight is the minimum aircraft equipment considered necessary for Category III operations to minima less than 600RVR
[175 m] but not less than 400RVR [125 m]:

(a) a redundant flight control or guidance system, which meets the requirements of Attachment 3, or acceptable international criteria, such as the JAR AWO.

Acceptable flight guidance or control systems include the following:

(i) a Fail Operational landing system with a Fail Operational or Fail Passive automatic rollout system, or
(ii) a Fail Passive landing system (limited to touchdown RVR of 600 [175 m]) with Fail Passive rollout provided automatically or by a flight guidance system providing suitable head-up or head-down guidance, and suitable monitoring capability, or
(iii) a Fail Operational hybrid automatic landing and rollout system with compatible manual flight guidance system, using automatic landing capability as the primary means of landing.
(iv) other system which can provide an equivalent level of performance and safety.

Information Note: *For system concepts not currently approved by DGCA or system concepts not addressed by Attachment 3, a proof of concept demonstration is required prior to either airworthiness or operational consideration for approval.*

(b) an automatic throttle or automatic thrust control system which meets the requirements of Attachment 3, or appropriate earlier criteria as specified in an DGCA-approved AFM. However, for operations with a 50 foot [15 m] Decision Height, automatic throttles may not be required if it has been demonstrated that operations can safely be conducted, with an acceptable work load, without their use.
(c) at least two independent navigation receivers/sensors providing lateral and vertical position or displacement information, typically with the first pilot's station receiving information from one and the second pilot's station receiving information from the other. The navigation receivers/sensors must meet the criteria specified in Attachment 3 or equivalent, or must meet an earlier acceptable criteria as specified in a DGCA accepted approved AFM.
(d) at least two approved radio altimeter systems which meet the performance requirements outlined in Attachment 3, or acceptable earlier criteria, as specified in a DGCA accepted approved AFM, typically with the first pilot's station receiving information from one and the second pilot's station receiving information from the other.
(e) failure detection, annunciation, and warning capability, as described in Attachment 3, or acceptable by earlier criteria, and specified in a DGCA accepted approved AFM.
(f) missed approach guidance provided by one or more of the following means:
(i) attitude displays which include calibrated pitch attitude markings, or a pre-established computed pitch command display.
(ii) an approved flight path angle display, or
(iii) an automatic or flight guidance go-around capability.

(g) suitable forward and side flight deck visibility for each pilot, as specified in Division III, Section(17) of this Appendix.
(h) suitable windshield rain removal, ice protection, or defog capability as specified in Division III, Section(18) of this Appendix.

(6) Airborne Systems for Category III Minima Not Less than 300RVR (75 m). Visibility minima of 300RVR is applicable to those facilities reporting RVR in feet and which have appropriate reporting increments in feet. Visibility minima of 75m is applicable to those facilities reporting RVR in meters and which have appropriate reporting increments in meters.

In addition to the aircraft equipment required in Subsection (5) above, the following equipment is required for Category III minima not less than 300RVR (75m):

(a) a Fail Operational Automatic Flight Control System, or manual flight guidance system designed to meet fail operational system criteria, or a hybrid system in which both the fail-passive automatic system and the monitored manual flight guidance components provide approach and flare guidance to touch down , and in combination provide full fail operational capability, and
(b) a fail operational rollout guidance or control system that can assure safe rollout to taxi speed consisting of either:
  (i) a fail operational automatic rollout control system or fail operational manual flight guidance rollout system, or
  (ii) a hybrid system consisting of at least a fail passive automatic rollout system and a compatible Fail Passive manual flight guidance rollout control system demonstrated in accordance with Attachment 3; (may be approved for operations not less than 300RVR [75 m]), or
(c) suitable flight instruments, annunciations, or crew procedures which can reliably detect and alert the flightcrew to abnormal lateral or vertical flight path performance during an approach to touch down, or abnormal lateral performance during rollout.

(7) Airborne Systems for Category III Minima Less than 300RVR [75 m]. In addition to the aircraft equipment required in Subsection (6) above, the following equipment is required for Category III minima less than 300RVR [75 m]:

(a) a Fail Operational Automatic Flight Control System, or manual flight guidance system designed to meet fail operational system criteria, or a hybrid system in which both the fail-passive automatic system and the monitored manual flight guidance components provide approach and flare guidance to touch down , and in combination provide full fail operational capability, and
(b) a fail operational automatic, manual, or hybrid rollout control system.

(8) Automatic Flight Control Systems and Automatic Landing Systems. Automatic Flight Control Systems or Autoland Systems considered acceptable for Category III, include those meeting pertinent criteria of Attachment 3, those meeting acceptable earlier DGCA criteria referenced by a DGCA accepted approved AFM or those meeting other equivalent criteria, such as JAR AWO, found acceptable to DGCA.

(9) Flight Director Systems. Characteristics of Flight Director Systems (head down or head up) used for aircraft authorized for Category III should be compatible with any characteristics of autopilot or autoland system used. Flight control systems which provide both autopilot control and flight director information may or may not display flight director commands as appropriate for the system design and operator requirements. Regardless of whether Flight Director commands are provided, situational information displays of navigation displacement must also be provided to both flightcrew members. To assure that

unacceptable deviations and failures can be detected, the displays must be appropriately scaled and readily understandable in the modes or configurations applicable.

"Flight director systems" may be considered as "fail passive" if after a failure, the flight path of the aircraft does not experience a significant immediate deviation due to the pilot following the failed guidance before the pilot detects the failure and discontinues using the guidance.

(10) Head-up Display Systems. Head-up Display systems used as the basis for a suitable Category III authorization must provide guidance for one or both pilots as appropriate for the system design. If information is provided to only the flying pilot, then appropriate monitoring capability must be established for the non flying pilot. Monitoring tasks must be identified, and the non flying pilot must be able to assume control of the aircraft in the event of system failure or incapacitation of the pilot using the Head-up Display (e.g., for a safe go-around or completion of rollout). Head-up Display Systems acceptable for Category III must meet provisions of Attachment 3, or acceptable earlier criteria specified by the DGCA and referenced in a DGCA accepted approved AFM.

"Head-up Display systems" may be considered as "fail passive" if:

(a) after a failure, the pilot using the system or pilot monitoring the system is made aware of the failure in a timely manner, and

(b) the flight path of the aircraft does not experience a significant immediate deviation from the intended path due to the pilot following the failed guidance before the pilot flying or pilot monitoring detects the failure, and the pilot flying discontinues using the guidance.

(11) Enhanced/Synthetic Vision Systems. Enhanced/Synthetic Vision Systems based on millimeter wave radar or other such sensors may be used to assure the integrity of other flight guidance or control systems in use during Category III operations. They must be demonstrated to be acceptable to DGCA in a proof of concept evaluation and they must otherwise meet the requirements of Attachment 3. Use of Enhanced/Synthetic Vision Systems for purposes other than establishing the accuracy or integrity of flight guidance system performance must be demonstrated to be acceptable through proof of concept testing prior to identification of specific airworthiness and operation criteria.

(12) Hybrid Systems. Hybrid systems (e.g., a fail passive autoland system used in combination with a monitored HUD flight guidance system) may be acceptable for Category III if each element of the system alone is shown to meet its respective requirements for Category III, and if taken together, the components provide the equivalent performance and safety to a non-hybrid system as specified for the minima sought (e.g., fail operational Category IIIb).

Hybrid systems with automatic landing capability should be based on the concept of use of the automatic landing system as the primary means of control, with the manual flight guidance system serving as a backup mode or reversionary mode.

Manual rollout flight guidance capability must be provided for hybrid systems which do not have automatic rollout capability. Such manual rollout capability must have been shown to have performance and reliability at least equivalent to that required of a fail passive automatic rollout system.

Any transition between hybrid system elements (e.g., control transition from autoland use to manual control HUD use, or for response to failures) must be acceptable for use by properly qualified flightcrews (e.g., qualified in accordance with Part VI or VII of the LARs or equivalent JAA criteria, as applicable, and standard industry practices). Transitions should not require extraordinary skill, training, or proficiency.

For any system which requires a pilot to initiate manual control near or shortly after touch down, the transition from automatic control prior to touch down to manual control using the remaining element of the hybrid system (e.g., HUD) after touch down must be shown to be safe and reliable.

For hybrid systems, operational procedures following failure of the automatic system or flight guidance system prior to touch down may require that the pilot initiate a go-around, even though the aircraft using a hybrid system must have been demonstrated as being capable of safely completing a landing and rollout following a failure of one of the hybrid system elements below alert height.

A hybrid system may be approved for Category III if it is shown to meet the criteria specified in Attachment 3 when approved through an airworthiness demonstration process. Alternately, a hybrid system may be acceptable for Category III if it is determined to meet applicable airworthiness criteria for each element of the system separately (e.g., separately meets Cat III criteria for autoland and HUD), and in addition, a successful operational suitability demonstration is completed using the individual system elements together as a hybrid system. If acceptability is determined through an operational demonstration process, the individual elements of the hybrid system must be shown to be compatible for both normal and non-normal operations, and the combined system must be shown to have the necessary performance, integrity, and availability appropriate for the operations intended.

An operator may receive approval to use an automatic landing system and a manual flight guidance system as a Hybrid System provided, (a) each system individually meets appropriate airworthiness requirements, and (b), that operator conducts a successful operational demonstration showing the hybrid system's capability to meet applicable provisions of this Division.

For hybrid systems used for Category III an Alert Height of 50' [15 m] or higher should be used unless otherwise approved by the DGCA.

(13) Instruments and Displays. Flight instrument and display presentations related to Category III, including attitude indicators, EADIs, primary flight displays, EHSIs, HSIs, or other such navigation displays must provide pertinent, reliable and readily understandable information for both normal and non-normal conditions related to Category III landing and missed approach.

Alert Height and/or Decision Height indications must be readily understandable, appropriately highlighted, and not be compromised by effects such as typical underlying terrain on the final approach path, and other annunciations or automatic audio call-outs. In addition, instruments and displays should provide appropriate indications considering terrain characteristics identified in Attachment 3. Controls for altitude or height alerts used for minima determination or alert heights should use standard indications such as RA for radio altitude and BARO for barometric altitude, rather than operational designations such as DH or MDA. Use of the designation RA or BARO for reference setting controls does not preclude use of color changes or use of flashing symbology as the aircraft descends below the referenced value.

Situational information displays of navigation displacement must be available to both flightcrew members, and must be appropriately scaled and readily understandable in presentations or mode of display used. Instrument and panel layouts must follow accepted principles of flight deck design.

(14) Annunciations. Annunciations must be clear, unambiguous, and appropriately related to the flight control mode in use. The mode annunciation labels should not be identified by landing minima classification. For example, LAND 2, LAND 3, Single Land, Dual Land, etc., are acceptable mode annunciation labels, whereas, Category II, Category III, etc., should not be used. Aircraft previously demonstrated for Category III which do not meet this criteria may require additional operational constraints to assure the correct use of minima suited to the aircraft configuration.

(15) Automatic Aural Alerts. Automatic Aural Alerts (e.g., automatic call-outs, voice callouts) of radio altitude, or call-outs approaching landing minimums, or call-outs denoting landing minimums must be consistent with the design philosophy of the aircraft in question. However, any automatic call-outs used should not be of a volume or frequency that interferes with necessary flightcrew communications or normal crew coordination procedures. Recommended automatic call-outs include a suitable alert or tone as follows:

(a) at 500 ft. (radio altitude), approaching minimums and at minimums, and

(b) altitude call-outs during flare, such as at "50" ft., "30" ft. and "10" ft., or altitudes appropriate to aircraft flare characteristics. Low altitude radio altitude call-outs, if used, should appropriately address the situation of higher than normal sink rate during flare, or an extended flare which may be progressing beyond the touch down zone.

(16) Navigation Sensors. Various navigation sensors may be acceptable to support Category III operations as specified in Division II, Section(12) of this Appendix. ILS localizer and glideslope signals are the primary means currently used for the determination of deviation from the desired path for Category III operations. Criteria for acceptable ILS and MLS localizer and glide-slope receivers are included in Attachment 3. Other navigation sensors, such as GNSS, or DGNSS, may be used individually or in combination to satisfy the necessary accuracy, integrity and availability for Category III if proof of concept demonstrations are successfully completed and operational experience at Category I and Category II minimums is acceptable. Navigation sensors other than ILS must meet equivalent ILS performance or appropriate RTCA or EUROCAE criteria, unless otherwise authorized.

Appropriate marker beacon information, or equivalent, must be displayed to each pilot for the outer, middle and inner markers. Appropriate substitutes for marker beacons may be authorized by the DGCA for Category III based upon the use of suitable GNSS/DGNSS capabilities, or DME.

Supporting Systems and Capabilities.

(17) Flight Deck Visibility. Suitable forward and side flight deck visibility for each pilot should be provided as follows:

(a) the aircraft should have a suitable visual reference cockpit cutoff angle over the nose for the intended operations, at the intended approach speeds, and for the intended aircraft configurations, as applicable (e.g., flap settings),

(b) the aircraft's flight deck forward and side windows should provide suitable visibility for taxi and ground operations in low visibility, and

(c) placement of any devices or structure in the pilots visual field which could significantly affect the pilot's view for low visibility operations must be acceptable (e.g., HUD drive electronics, sunvisor function or mountings).

(18) Rain and Ice Removal. Suitable windshield rain removal, ice protection, or defog capability should be provided as specified below:

(a) installation of rain removal capability is required (e.g., windshield wipers, windshield bleed air).

(b) installation of use of windshield hydrophobic coatings, or use of equivalent rain repellent systems which meet pertinent environmental standards are recommended.
(c) installation of windshield anti-ice or de-ice capability is required for aircraft intended to operate in known icing conditions during approach and landing.
(d) installation of at least forward windshield defog capability is recommended for aircraft subject to obscuration of the pilot's view during humid conditions.

Aircraft subject to obscuration of the windshield due to rain, ice, or fogging of the pilot's view which do not have protection, or which do not have adequate protection may require operational limitations on the conditions in which low visibility operations are conducted.

(19) Miscellaneous Systems. Other supporting systems including instruments, radar altimeters, air data computers, inertial reference units, instrument switching, or capabilities such as flight deck night lighting, landing lights and taxi lights, position, turnoff, and recognition lights, or other low visibility related aircraft systems must meet appropriate criteria as specified in Attachment 3, in basic airworthiness requirements applicable to JAA/US certificated aircraft or equivalent.
(20) Go-Around Capability. Regardless of the flight guidance system used an appropriate go-around mode/capability should be provided. A go-around mode/capability must be able to be selected at any time during the approach to touch down. The go-around mode/capability should provide information for a safe discontinuance of the approach at any point to touch down, if activated prior to touch down. If activated at a low altitude where the aircraft inadvertently touches the ground, the go-around mode should provide adequate information to accomplish a safe go around and not exhibit unsafe characteristics as a result of an inadvertent touch down. Inadvertent selection of go-around after touch down should have no adverse effect on the ability of the aircraft to safely rollout and stop.
(21) Excessive Deviation Alerting. An acceptable method should be provided to detect excessive deviation of the aircraft laterally and vertically during approach, and laterally during rollout, as applicable. The method used should not require excessive workload or undue attention. This provision does not require a specified deviation warning method or annunciation, but may be addressed by parameters displayed on the ADI, EADI, or PFD. When a dedicated deviation warning is provided, its use must not cause excessive nuisance alerts.

Rollout Deceleration Systems or Procedures for Category III.

(22) Stopping Means. A means to determine that an aircraft can be reliably stopped within the available length of the runway is necessary to conduct Category III operations. At least one of the following means to assess stopping performance should be used:
(a) an automatic braking system which includes information for the flightcrew about appropriate auto brake settings to be used for landing or which provides landing distance information suitable for use by the flightcrew to determine which auto brake setting may or may not be appropriate.
(b) a ground speed indicating system based on inertial information or other equivalent source such as GNSS, together with acceptable procedures for its use.
(c) a deceleration display or other indication which can advise the pilot of the adequacy of aircraft deceleration to stop within the available runway length.
(d) a runway remaining indicator display reliably showing the length of remaining runway after touch down.
(e) a procedural means to assure a safe stop acceptable to DGCA. However, a procedural means to ensure a safe stop is not appropriate for minima less than 300RVR [75 m].

(23) Antiskid Systems. Unless otherwise determined to be acceptable to the DGCA, aircraft authorized for Category III should have an operable anti-skid system installed and operative per the applicable MMEL and DGCA approved MEL.

The authorization for aircraft to operate using Category III minima without anti-skid is determined by the DGCA for each aircraft type, considering the following factors:

(a) extra field length margin of runways to be authorized, compared with field lengths required for the aircraft type, and

(b) the braking system characteristics of the aircraft regarding susceptibility to tire failure during heavy braking, and susceptibility to tire failure during operations with reduced or patchy runway surface friction.

(24) Engine Inoperative Category III Capability. The following criteria are applicable to aircraft systems intended to qualify for "engine inoperative Category III" authorizations. Aircraft demonstrated to meet "engine inoperative" provisions of Attachment 3 that have an appropriate reference to engine inoperative Category III capability in the DGCA accepted approved AFM are typically considered to meet the provisions listed below.

(a) the AFM must suitably describe demonstrated approach and missed approach performance for the engine inoperative configuration, and the aircraft must meet pertinent criteria otherwise required for all-engine Category III or equivalent criteria. This performance data should also be available in the automated flight planning, performance and weight and balance systems normally used by the air carrier so as to be readily available to the captain and the aircraft dispatcher. Exceptions to criteria may be authorized as follows:

(i) the effects of a second engine failure when conducting Category III operations with an engine inoperative need not be considered, except for a demonstration that the airplane remain controllable when the second engine fails,

(ii) crew intervention to retrim the aircraft to address thrust asymmetry following engine loss may be permitted,

(iii) alternate electrical and hydraulic system redundancy provisions may be acceptable, as suited to the type design (e.g., bus isolation and electrical generator remaining capability must be suitable for the engine out configuration),

(iv) requirements to show acceptable landing performance may be limited to demonstration of acceptable performance during engine out flight demonstrations (e.g., a safe landing on the runway), and

(v) landing system "status" should accurately reflect the aircraft configuration and capability.

(b) suitable information must be available to the flightcrew at any time in-flight, and particularly at the time of a "continuation to destination" or "diversion to alternate decision." This is to determine that the aircraft can have an appropriate Category III approach capability when the approach is initiated (e.g., Non-normal checklist specification of expected configuration during approach, autoland status annunciation of expected capability).

(c) performance should be demonstrated in appropriate weather conditions considering winds and any other relevant factors (e.g., Attachment 3).

(25) Airborne System Assessment for Irregular Pre-Threshold Terrain. Not withstanding that airworthiness demonstrations may consider irregular terrain in the pre-threshold area, special operational evaluations are nonetheless required for certain airports having difficult pre-threshold terrain conditions (see Division IV, Section(14) of this Appendix). Criteria for the operational evaluation of irregular pre-threshold terrain airports is contained in Attachment 8. This criteria may be both for operational authorizations.

(26) Airworthiness Demonstrations of Airborne System Capability for Category III. Airworthiness demonstrations of airborne systems not previously approved for Category III should be in accordance with the provisions of Attachments 2 through 6. Aircraft which have previously completed airworthiness demonstrations in accordance with earlier criteria may continue to reference the demonstrations against earlier criteria in their AFM. The criteria of this Appendix must be used when seeking credit not provided by the earlier criteria. Category III aircraft systems may be evaluated in accordance with the applicable criteria contained in the Attachments of this Appendix during airworthiness demonstrations, or they may be evaluated in conjunction with a DGCA approved program with an operator, for aircraft that are "in service" using the equivalent criteria and evaluation methods, to those specified in the Attachments to this Appendix. Operational demonstrations will not be conducted based on criteria prior to this Appendix.

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DIVISION IV - PROCEDURES.

(1) Operational Procedures. Appropriate operational procedures based on the approved operator program should be addressed. Operational procedures should consider the pilot qualification and training program, airplane flight manual, crew coordination, monitoring, appropriate takeoff and landing minima including specification of either a Decision Height or an Alert Height (as applicable) for landing, crew call-outs, and assurance of appropriate aircraft configurations. Suitable operational procedures must be used by the operator and be used by flightcrews prior to conducting low visibility takeoff or Category III landing operations.
(2) Application of AFM Provisions. The operator's procedures for low visibility takeoff or Category III landing should be consistent with any AFM provisions specified in the normal or non-normal procedures sections (e.g., Section 3 of the AFM) during airworthiness demonstrations. Adjustments of procedures consistent with operator requirements are permitted when approved by the DGCA. Operators should assure that no adjustments to procedures are made which invalidate the applicability of the original airworthiness demonstration.
(3) Crew Coordination. Appropriate procedures for crew coordination should be established so that each flightcrew member can carry out their assigned responsibilities. Briefings prior to the applicable takeoff or approach should be specified to assure appropriate and necessary crew communications. Responsibilities and assignment of tasks should be clearly understood by crew members.
(4) Monitoring. Operators should establish appropriate monitoring procedures for each low visibility takeoff, approach, landing, and missed approach. Procedures should assure that adequate crew attention can be devoted to control of aircraft flight path, displacements from intended path, mode annunciations, failure annunciations and warnings, and adherence to minima requirements associated with DH and AH. Where a "monitored approach" is used, (e.g., where the First Officer is responsible for control of the aircraft flight path by monitoring of the automatic flight system) appropriate procedures should be established for transfer of control to the captain who will be making the decision for continuation of the landing at or prior to Decision Height or Alert Height. Monitoring procedures should not require a transfer of responsibility or transfer of control at a time that could interfere with safe landing of the aircraft. Procedures for calling out failure conditions should be pre-established, and responsibility for alerting other crew members to a failure condition should be clearly identified.
(5) Use of the Decision Height or Alert Height. Decision heights are normally used for Fail Passive Category III operations and Alert Heights are used for Fail Operational Category III operations. Certain exceptions are noted elsewhere in this Appendix (e.g., use of a Decision Height (DH) due to specific fail operational aircraft characteristic at a runway with irregular pre-threshold terrain). When Decision Heights are specified, procedures for setting various reference bugs in the cockpit should be clearly identified, responsibilities for Decision Height call-outs should be clearly defined, and visual reference requirements necessary at Decision Height should be clearly specified so that flightcrews are aware of the necessary visual references that must be established by, and maintained after passing Decision Height.

When Alert Heights are specified, the operator may elect to use an Alert Height at or below 200 ft. [60 m] HAT as suitable for procedure or procedures identified for use by that operator.

Procedures should be specified for call-out of the Alert Height and if applicable for conversion of the Alert Height to a Decision Height in the event that the aircraft reverts from Fail Operational to Fail Passive flight control.

The operator should assure that at each runway intended for Category III operations, the radar altimeter systems used to define Alert Height or Decision Height provides consistent, reliable, and appropriate readings for determination of Decision Height or Alert Height in the event of irregular terrain underlying the approach path, or an alternate method should be used. Alert Height or DH may be based on other means (e.g., inner marker) only when specifically approved by DGCA. Any adjustments to approach minima or procedures made on final approach should be completed at a safe altitude (e.g., above 500 ft. [150 m] HAT).

(6) Call-outs. Altitude/Height call-outs should be used for Category III. Callouts may be accomplished by the flightcrew or may be automatic (e.g., using synthetic voice call-outs or a tone system). Typical call-outs acceptable for Category III include a combination of the following:

- "1000 ft." above the touch down zone,
- "500 ft." above the touch down zone,
- "approaching minimums"
- "at minimums"
- altitudes during flare, (e.g., 50, 30, 10) or AFGS mode transitions (e.g., flare, rollout) and
- as appropriate, auto spoiler, reverse thrust deployment and autobrake disconnect.

Calls made by the flightcrew should not conflict with the automatic systems or auto call-outs of the aircraft, and conversely the configuration selected for the aircraft should not conflict with expected call-outs to be made by the flightcrew. Compatibility between the automatic call-outs and the crew call-outs must be assured. The number of call-outs made, either automatically, by crew, or in combination, should not be so frequent as to interfere with necessary crew communication for abnormal events.

Also, call-outs should be specified to address any non-normal configurations, mode switches, failed modes, or other failures that could affect safe flight, continuation of the landing, or the accomplishment of a safe missed approach. Any use of crew initiated call-outs at altitudes below 100 ft. should assure that the callouts do not require undue concentration of the non-flying pilot on reading of the radar altimeter rather than monitoring the overall configuration of the aircraft, mode switching, and annunciations that might be related to a successful Category III landing. Automatic altitude call-outs or tones are recommended for altitude awareness, at least at and after passing Decision Height or Alert Height.

(7) Aircraft Configurations. Operational procedures should accommodate any authorized aircraft configurations that might be required for low visibility takeoff or Category III approaches or missed approaches. Examples of configurations that operational procedures may need to accommodate include:

(a) alternate flap settings approved for Category III,
(b) use of alternate AFGS modes or configurations (e.g., Single Land, LAND2),
(c) inoperative equipment provisions related to the minimum equipment list, such as a non-availability of certain electrical system components, inoperative radar altimeter, air data computers, hydraulic systems or instrument switching system components, and
(d) availability and use of alternate electrical power sources (e.g., APU) if required as a standby source.

Procedures required to accommodate various aircraft configurations should be readily available to the flightcrew and the aircraft dispatcher to preclude the inadvertent use of an incorrect procedure or configuration. Acceptable configurations for that operator and aircraft type should be clearly identified so that the crews can easily determine whether the aircraft is or is not in a configuration to initiate a low visibility takeoff or Category III approach. Configuration provisions must be consistent with, but are not limited to, those provided in the operations specifications for that operator.

(8) Compatibility with Category I and Category II Procedures. The operator should assure that to the greatest extent possible, procedures for Category III are consistent with the procedures for that operator for Category II and Category I to minimize confusion about which procedure should be used or to preclude procedural errors due to crews reverting to familiar procedures accomplished more frequently such as for Category I. The operator should to the extent practical, minimize the number of procedures that the crew needs to be familiar with for low visibility operations so that, regardless of the landing category necessary for an approach, the correct procedures can be used consistently and reliably.
(9) Flight Crew Response to Non-Normal Events. Takeoff and landing weather minimums are intended for normal operations. When non-normal events occur, flightcrews and aircraft dispatchers are expected to take the safest course of action to assure safe completion of the flight. Using emergency authority, crews can deviate from rules or polices, to the extent necessary, to minimize the risk of continued flight to a safe landing. In some instances, guidelines are established for particular failure situations, such as failure of required aircraft systems prior to reaching Alert Height.

When procedures or configurations have not been specified, crews and aircraft dispatchers are expected to use good judgment in making the determination of appropriate configurations or situations to conduct safe Category III operations. The decision to continue an approach or to discontinue an approach must be made considering all relevant factors of the status of the aircraft, fuel on board, seriousness of the emergency, distance away of other available airports, and the likelihood of changing weather conditions, among other factors. It is not the intent of this Appendix to attempt to define guidelines for circumstances such as in-flight fire, minimum fuel reserves, or other situations requiring complex judgments of skilled crew members.

However, in the case of certain well-defined situations that can be addressed before departure, such as contingency planning in the event of an engine failure, guidelines are provided to assist crews in making safe and consistent judgments about available alternative courses of action. Specific guidelines for initiation for a Category III approach with an inoperative engine are provided in Division III, Section(24) of this Appendix. Guidelines for other configuration situations may be provided by the normal or non-normal procedure section of the aircraft flight manual or by the operator. Crews and aircraft dispatchers are expected to be familiar with these guidelines and apply them to the extent practical but may deviate as necessary from those guidelines, to the extent that they consider necessary to assure safe flight and landing. If doubt exists as to the advisability of continuation of an approach or diversion, it is the flightcrews responsibility to exercise their emergency authority to the extent necessary to assure a safe flight.

Category III Instrument Approach Procedures and Low Visibility Takeoff.

(10) Takeoff Guidance System Procedures. When takeoff minima are predicated on use of a takeoff guidance system meeting the criteria of Division III, Section(3) of this Appendix or Attachment 2, procedures for use of the takeoff guidance system should be identified consistent with the approved AFM, or applicable operational authorization. Procedures should address at least the following items or factors:

- Setup, test, and initialization of the guidance system and NAVAIDs, as applicable
- Roles and responsibilities of the PF and PNF
- Suitable alignment with and tracking of the runway centerline
- Suitable transfer of control between pilots for failures or incapacitation, as applicable
- Suitable response to failures (e.g., engine failure before and after V_1, electrical failure, guidance system alerts, warnings, and failures as applicable)

(11) Acceptable Procedures for Category III Approach. Instrument Approach Procedures for Category III may be conducted in accordance with:
(a) published 14 CFR part 97 procedures, or
(b) approved operations specifications for special procedures, or
(c) published foreign or military procedures approved by the DGCA, or
(d) foreign or military procedures accepted by DGCA for specific foreign airports and runways.

(12) Standard Obstacle clearance for approach and missed approach. Appendix I as amended provides the standard Category II and III approach and missed approach criteria not otherwise specified in the LARs. The criteria in Appendix I should be applied except where acceptable criteria is provided for Category II and III operations using ILS, MLS, GLS or RNP facilities and equipment. Standard criteria used by several foreign authorities based on ICAO PANS OPS may be used where found to be acceptable to the DGCA (e.g., JAA approved procedures). Category II and III procedures developed using other than PANS OPS are normally issued through operations specifications as special procedures. (See Division IV, Section(13) of this Appendix)

(13) Special Obstacle Criteria. In certain instances standard obstacle criteria may not be appropriate for particular Category III procedures. In such instances alternate criteria acceptable to the DGCA may be used as specified in OpSpecs (e.g., RNP criteria).

(14) Irregular Terrain Airports. Irregular terrain airports identified by the DGCA, must be evaluated in accordance with DGCA approved procedures prior to incorporation in operations specifications for use by air carriers operating to Category III minima.

Irregular terrain airport special evaluations should consider each particular aircraft type, the particular flight control system, and may include consideration of particular system elements such as the type of radar altimeters installed or other equipment.

Procedures for evaluation of these airports are provided in Attachment 8.

(15) Airport Surface Depiction for Category III Operations. A suitable airport surface depiction (e.g., airport diagrams) should be available to flightcrews to assure appropriate identification of visual

landmarks or lighting to safely accomplish taxing in Category III conditions from the gate to the runway and from the runway to the gate. The Airport depiction should use an appropriate scale with suitable detailed information on gate locations, parking locations, holding locations, critical areas, obstacle free zones, taxi way identifications, runway identifications, and any applicable taxi way markings for designated holding spots or holding areas. Standard depictions provided by commercial charting services are typically acceptable if they provide sufficient detail to identify suitable routes of taxi to and from the runway and gate positions for departure or arrival.
(16) Continuing Cat III Approaches in Deteriorating Weather Conditions. The following procedures are considered acceptable in the event that weather conditions are reported to drop below the applicable Category III minima after an aircraft has passed the final approach point or final approach fix, as applicable.

- Operations based on a DA(H) may continue to the DA(H) and then land, if the specified visual reference is subsequently established by the pilot no later than the DA(H).

- Operations based on an Alert Height (AH) may continue to the AH, and then land if weather is reported to be at or above minima before passing the AH, or if suitable visual reference has been established by the pilot.

- Operations based on an AH may continue to land regardless of reported weather conditions if equipped with a fail operational rollout system which did not indicate a malfunction prior to passing alert height, and the pilot considers continuation a safe course of action.

Operators requesting amended operations specifications reflecting the procedures described above may have their current operations specifications amended by making application in accordance with Division VIII, Section(29) of this Appendix. New Category III operators should have operations specifications issued reflecting these provisions in accordance with revised standard operations specifications (see samples provided in Attachment 7).

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DIVISION V - TRAINING AND CREW QUALIFICATION

Training and crew qualification programs pertinent to Category III should include provisions for appropriate ground training, flight training, initial qualification, recurrent qualification, recency of experience, and re-qualification. The operators program should provide appropriate training and qualification for each pilot in command, second in command and any other crew member expected to have knowledge of or perform duties related to Category III landing or low visibility takeoff operations (e.g., Flight engineer).

Pilots in command are expected to have a comprehensive level of knowledge with respect to each of the ground training subjects and have performed each of the specified maneuvers and demonstrated skill in accomplishing each of the tasks specified for flight training. Second in command pilots should have a comprehensive knowledge of the subjects specified in the ground training program, and are expected to perform those relevant procedures or maneuvers applicable to the second in command is assigned duties during Category III landing operations or for low visibility takeoff. Other crew members are expected to have the knowledge required and the demonstrated skills to perform their assigned duties.

Ground Training.

(1) Ground System and NAVAIDs for Category III. Ground systems and NAVAIDs are considered to include characteristics of the airport, electronic navigation aids, lighting, marking and other systems (e.g., RVR) and any other relevant information necessary for safe Category III landing or low visibility takeoff operations.

The training and qualification program should appropriately address the operational characteristics, capabilities and limitations of at least each of the following:

(a) NAVAIDs. The navigation systems to be used, such as the instrument landing system with its associated critical area protection criteria, marker beacons, distance measuring equipment, compass locators or other relevant systems should be addressed to the extent necessary for safe operations. If non ground based systems (e.g., GNSS) are used, any characteristics or constraints regarding that method of navigation, must be addressed (e.g., waypoint use, integrity assurance).

(b) Visual aids. Visual aids include approach lighting system, touch down zone, centerline lighting, runway edge lighting, taxiway lighting, standby power for lighting and any other lighting systems that might be relevant to a Category III environment, such as the coding of the center line lighting for distance remaining, and lighting for displaced thresholds, stop ways, or other relevant configurations should be addressed.

(c) Runway and Taxiways. The runway and taxiway characteristics concerning width, safety areas, obstacle free zones, markings, hold lines, signs, holding spots, or taxi way position markings, runway distance remaining markings and runway distance remaining signs should be addressed.

(d) Weather Reporting. Weather reporting and transmissiometers systems, including RVR locations, readout increments, sensitivity to lighting levels set for the runway edge lights, variation in the significance of reported values during international operations, controlling and advisory status of readouts, and requirements when transmissiometers become inoperative.

(e) Facility Status. Facility status, proper interpretation of outage reports for lighting components, standby power, or other factors and proper application of NOTAMS regarding the initiation of Category III approaches or initiation of a low visibility takeoff.

(2) The Airborne System. The training and qualification program should address the characteristics, capabilities, limitations, and proper use of each appropriate airborne system element applicable to Category III landing or low visibility takeoff including the following:

(a) Flight Guidance. The flight control system, flight guidance system, instruments and displays and annunciation systems including any associated flight director, landing system and roll out system, or takeoff systems, if applicable. For automatic or manual systems which require crew input for parameters such as inbound course or automatic or manually tuned navigation frequencies, the crew should be aware of the importance of checking that proper selections have been made to assure appropriate system performance.

(b) Speed Management. The automatic throttle, FMC or other speed management system, if applicable.

(c) Instruments. Situation information displays, as applicable.

(d) Supporting Systems. Other associated instrumentation and displays, as applicable, including any monitoring displays, status displays, mode annunciation displays, failure or warning annunciations and associated system status displays that may be relevant.

(e) Aircraft Characteristics. Any aircraft characteristics that may be relevant to Category III, such as cockpit visibility cutoff angles and the effect on cockpit visibility of proper eye height, seat position or instrument lighting intensities related to transition through areas of varying brightness visual conditions change. Crews should be aware of the effects on flight visibility related to use of different flap settings, approach speeds, use of various landing or taxi lights and proper procedures for use of windshield wipers and rain repellent. If windshield defog, anti-ice, or de-icing systems affect forward visibility, crews should be aware of those effects and be familiar with proper settings for use of that equipment related to low visibility landing.

(3) Flight Procedures and Associated Information.

(a) Operations Specification. Crews and aircraft dispatchers should be familiar with, and properly able to apply, operations specifications applicable to Category III landing or low visibility takeoff.

(b) Normal and Non-normal Procedures. Crews should be familiar with appropriate normal and non-normal procedures including crew duties, monitoring assignments, transfer of control during normal operations using a "monitored approach," appropriate automatic or crew initiated call-outs to be used, proper use of standard instrument approach procedures, special instrument approach procedures, applicable minima for normal configurations or for alternate or failure configurations and reversion to higher minima in the event of failures.

(c) Weather and RVR. Crews and aircraft dispatchers should be familiar with weather associated with Category III and proper application of runway visual range, including its use and limitations, the determination of controlling RVR and advisory RVR, required transmissiometers, appropriate light settings for correct RVR readouts and proper determination of RVR values reported at foreign facilities.

(d) Use of DA(H) or Alert Height. Crews should be familiar with the proper application of Decision Height or Alert Height, as applicable, including proper use and setting of radar altimeter bugs, use of the inner marker where authorized or required due to irregular underlying terrain and appropriate altimeter setting procedures for the barometric altimeter consistent with the operators practice of using either QNH or QFE.

(e) Use of Visual Reference. Crews should be familiar with the availability and limitations of visual references encountered, both on approach before and after Decision Height, if a Decision Height is applicable, particularly those procedures listed in Division IV, Section(16) of this Appendix above. Crews should be familiar with the expected visual references likely to be encountered if an Alert Height is used even though a visual reference requirement is not established. Crews should be familiar with procedures for an unexpected deterioration of conditions to less than the minimum visibility specified for the procedure during an approach, flare or roll out including the proper response to a loss of visual reference or a reduction of visual reference below the specified values when using a Decision Height and prior to the time that the aircraft touches down. The operator should provide some means of demonstrating the expected visual references where the weather is at acceptable minimum conditions and the expected sequence of visual queues during an approach in which the visibility is at or above the specified landing minimums. This may be done using simulation, video presentation of simulated landings or actual landings, slides showing expected visual references, computer based reproductions of expected visual references or other means acceptable to the DGCA.

(f) When a synthetic reference system such as "synthetic vision" or enhanced vision systems or independent landing monitors are used, crews should be familiar and current with the interpretation of the displays to assure proper identification of the runway and proper positioning of the aircraft relative to continuation of the approach to a landing. Crews should be briefed on the limitations of these systems for use in various weather conditions and specific information may need to be provided on a site-specific basis to assure that mis-identification of runways, taxiways or other adjacent runways does not occur when using such systems.

(g) Transfer of Control. Procedures should be addressed for transfer of control and transition from non-visual to visual flight for both the pilot in command, second in command, as well as the pilot flying and pilot not flying during the approach. For systems which include electronic monitoring displays, as described in item 5 above, procedures for transition from those monitoring displays to external visual references should be addressed.

(h) Acceptable Flight Path Deviations. Pilots should be familiar with the recognition of the limits of acceptable aircraft position and flight path tracking during approach, flare and if applicable roll out. This should be addressed using appropriate displays or annunciations for either automatic landing systems or for manual landing systems or when using electronic monitoring systems such as an independent landing monitor.

(i) Wind Limitations. Environmental effects should be addressed. Environmental effects include appropriate constraints for head winds, tail winds, cross winds, and the effect of vertical and horizontal wind shear on automatic systems, flight directors, or other system (e.g., synthetic vision) performance. For systems such as head-up displays which have a limited field of view or synthetic reference systems crews should be familiar with the display limitations of these systems and expected crew actions in the event that the aircraft reaches or exceeds a display limit capability.

(j) Contaminated Runways. Crews and aircraft dispatchers should be familiar with the operator’s policies and procedures concerning constraints applicable to Category III landings or low visibility takeoffs, on contaminated or cluttered runways. Limits should be noted for use of slippery or icy runways as far as directional control or stopping performance is concerned, and crews should be familiar with appropriate constraints related to braking friction reports. Crews and aircraft dispatchers should be familiar with the method of providing braking friction reports applicable to each airport having Category III landing operations or low visibility takeoff operations.

(k) Airborne System Failures. Crews should be familiar with the recognition and proper reaction to significant airborne system failures experienced prior to and after reaching the final approach fix and experienced prior to and after reaching Alert Height or Decision Height, as applicable. Expected crew response to failure after touch down should be addressed, particularly for Category III operations.

(l) Go-around Provisions. Pilots are expected to appropriately recognize and react to ground or navigation system faults, failures or abnormalities at any point during the approach, before and after passing Alert Height or Decision Height and in the event an abnormality or failure which occurs after touch down. Crews should be familiar with appropriate go-around techniques, systems to be used either automatically or manually, consequences of failures on go-around systems which may be used, the expected height loss during a manual or automatic go around considering various initiation altitudes, and appropriate consideration for obstacle clearance in the event that a missed approach must be initiated below Alert Height or Decision Height.

(m) Reporting Anomalies. Pilots should be familiar with the need to report navigation system anomalies or discrepancies, or failures of approach lights, runway lights, touch down zone lights, center line lights or any other discrepancies which could be pertinent to subsequent Category III operations.

Flight Training

(4) Flight training should address the following maneuvers and procedures and may be done individually as Category III maneuvers, or they may be accomplished in appropriate combinations with Category I or Category II maneuvers. When flightcrews are authorized to use minima for Category I or Category II, as well as Category III, maneuvers may be appropriately combined and done in conjunction with other required approaches necessary for Category I or Category II training and qualification when such combinations are appropriate (e.g., engine-inoperative missed approach). During each of the specified maneuvers or procedures, crew members are expected to perform their respective assignments or duties as applicable. In situations where crew members are being qualified, other than as part of the complete flightcrew, such as when two pilots in command are being qualified, it may in some cases be necessary to assure that each candidate completes the required maneuvers or procedures involving manual control of the aircraft or other demonstration of proficiency when such demonstration is required for a PIC.

Flight training for Category III should address at least the following maneuvers:

(a) normal landings at the lowest applicable Category III minima.

(b) a missed approach from the Alert Height or Decision Height (may be combined with other maneuvers).

(c) a missed approach from a low altitude that could result in a touch down during go-around (rejected landing).

(d) appropriate aircraft and ground system failures (may be combined with other maneuvers).

(e) engine failure prior to or during approach (if specific flight characteristics of the aircraft or operational authorizations require this maneuver).

(f) except for aircraft using an automatic Fail Operational roll out system, manual roll out in low visibility at applicable minima (may be combined).

(g) landings at the limiting environmental conditions authorized for Category III for that operator with respect to wind, cross wind components, and runway surface friction characteristics (may be combined).

For low visibility takeoff (RVR less than 500 ft./150 m), where a flight guidance system is required, the following maneuvers and procedures should be addressed:

(a) normal takeoff,
(b) rejected takeoff from a point prior to V_1 (including an engine failure),
(c) continued takeoff following failures including engine failure, and any critical failures for the aircraft type which could lead to lateral asymmetry during the takeoff or
(d) rejected takeoff which involve transfer of control from the first officer to the captain, if first officers are authorized to make takeoffs under the specified low visibility conditions (if applicable).

The conditions under which these normal and rejected takeoffs should be demonstrated include appropriate limiting cross winds, winds, gusts and runway surface friction levels authorized. A demonstration should be done at weights or on runways that represent a critical field length. If the flight guidance devices used have not been shown to have failure characteristics which are extremely improbable, a takeoff and rejected takeoff should be demonstrated with failure of the flight guidance device at a critical point of the takeoff.

Initial Qualification.

(5) Ground Training. Initial ground training should cover the subjects specified in Division V for each pilot in command and second in command and appropriate subjects from Division V relevant to other crew members when they have assigned responsibilities for Category III landing or low visibility takeoff.
(6) Flight Training. Flight training should be conducted using an approved simulator capable of performing the appropriate maneuvers specified, and which can appropriately represent the limiting visual conditions related to the minima which are applicable. Where simulation is not available, an aircraft with suitable view limiting device may be used if authorized by the DGCA. While the number of simulator periods, training flights, or length of simulator periods is not specified, the operator is expected to provide sufficient training to assure that crew members can competently perform each of the maneuvers or procedures specified in Division V, Section(2) of this Appendix to an acceptable degree of proficiency. When Category III minima are based on manual operations using systems like head-up displays or flight directors, a number of repetitions of the maneuvers specified in Division V, Section(2) above may be necessary to assure that each of the required maneuvers can be properly and reliably performed. Guidance for acceptable programs can be found in FSB reports for specific aircraft types. Operators should adhere to FSB guidelines when published, unless otherwise authorized by the DGCA.

Recurrent Qualification.

(7) Recurrent Ground Training. Recurrent ground training should provide any necessary review of topics specified in Division V, Section(1) to assure continued familiarity with those topics. Emphasis should be place on any program modifications, changes to aircraft equipment or procedures, review of any occurrences or incidents that may be pertinent, and finally emphasis may be placed on re-familiarization with topics such as mode annunciations for failure conditions or other information which the crews may not routinely see during normal line operations. Topics to be addressed for each pilot in command, second in command other crew member or aircraft dispatchers are those topics necessary for the performance of the assigned duties for each respective crew member.
(8) Recurrent Flight Training. Recurrent flight training should be conducted using an approved simulator with an appropriate visual system. In the event that simulation is not available, recurrent flight training

may be accomplished in the aircraft using suitable view limiting devices, if approved by the DGCA. Recurrent flight training should include at least one Category III approach to a landing if the pilot has not had recent Category III or simulated Category III experience, and one approach requiring a go-around from a low altitude below Alert Height or Decision Height prior to touch down.

When takeoff minimums below 500RVR [150 m] are approved, recurrent flight training must include at least one rejected takeoff at the lowest approvable minima, with an engine failure near but prior to V_1. For both Category III landings and low visibility takeoffs, sufficient training should be provided to assure competency in each of the maneuvers or procedures listed in Division V, Section(2) of this Appendix.

Recurrent flight training maneuvers may be accomplished individually or may be integrated with other maneuvers required during proficiency training or during proficiency checking. If minima are authorized using several methods of flight control such as both automatic landing and head-up display, then the training program should assure an appropriate level of proficiency using each authorized mode or system. Where Category III minima are based on manual control using flight guidance such as provided by a head-up flight guidance system, appropriate emphasis should be placed on failure conditions which a pilot does not normally experience in line operations.

Recency of Experience

(9) Recency of experience requirements specified by the LARs normally provide an assurance of the necessary level of experience for Category III landing or low visibility takeoff operations. In the event that special circumstances exist where crew members may not have exposure to the automatic landing system or manual systems such as head-up flight guidance for long periods of time beyond that permitted by the LARs, then the operator should assure that the necessary recency of experience is addressed prior to crews conducting Category III landings, or low visibility takeoff operations below 500RVR [150 m].

For automatic landing systems, as a minimum, crews should be exposed to automatic landing system operation and procedures during training or checking at least annually, if the crew has not otherwise conducted line landings using an automatic system within the previous 12 months. For manual flight guidance landing or takeoff systems the pilot flying (PF) should be exposed to system operation, procedures, and use during training or checking at least once each 90 days, if the pilot has not otherwise conducted line landings using the manual flight guidance system within the previous 90 days.

Re-qualification

(10) Credit for previous Category III qualification in a different aircraft type or variant, or previous qualification in the same type or variant at an earlier time may be considered in determining the type of program, length of program, required maneuvers to be completed or the repetition of maneuvers for re-qualification for Category III operations. Any re-qualification program should assure that the crews have the necessary knowledge of the topics specified in Division V, Section(1) of this Appendix and are able to perform their assigned duties for Category III or low visibility takeoff considering the maneuvers or procedures identified in Division V, Section(2) of this Appendix.

For programs which credit previous Category III qualification in a different type aircraft, the transition program should assure that any subtle differences between aircraft types which could lead to pilot misunderstanding of appropriate characteristics or procedures in the new type must be suitably addressed.

(11) Cockpit or Aircraft System Differences. For Category III programs using aircraft which have several variants, training programs should assure that crews are aware of any differences which exist and appropriately understand the consequences of those differences. Guidelines for addressing differences can be found in FSB reports applicable to a particular type.

(12) Category III Operations with an Inoperative Engine. For air carriers authorized to initiate a Category III approach with an inoperative engine either through Category III dispatch or equivalent procedures or for engine failures which occur en route, appropriate training should be completed to assure that crews and aircraft dispatchers can properly apply the provisions of Division VIII, Section(13) of this Appendix. For airlines that do not authorize the initiation of a Category III approach with an engine inoperative as an approved procedure, crews should at least be familiar with the provisions of Division VIII, Section(17) and (18) of this Appendix regarding an engine failure after passing the final approach fix. Additionally, crews should be made aware of the engine inoperative capabilities of the aircraft by reference to the AFM.

(13) Credit for "High Limit Captains". When authorized by the DGCA, credit for high landing weather minimum limits and required turbojet experience may be authorized consistent with provisions of exemptions authorized for Category III qualification credit.

(14) Enhanced or Synthetic Vision Systems (Independent Landing Monitor). Training required for enhanced or synthetic vision systems may be as specified by DGCA based on successful completion of proof of concept testing.

(15) Checking or Evaluations. For both initial qualification and recurrent qualification, crew members should demonstrate proper use of aircraft systems and correct procedures as follows, unless otherwise specified by an applicable FSB report.

- (a) for automatic systems, for landing at least one automatic landing to a full stop, and one go-around from a low approach at, or after, decision or Alert Height. The automatic landing to a full stop may be waived for recurrent qualification if the crew member has accomplished an automatic landing within a period for autoland currency for that operation and aircraft type.
- (b) for manual systems one landing to a complete stop at the lowest applicable minima and one go-around from low altitude below Alert Height or Decision Height and at least one response to a failure condition during the approach to a landing or a missed approach should be demonstrated.
- (c) for takeoff at RVRs below 500 [150 m], crews should successfully demonstrate one takeoff in the event of an engine failure at, or after, V_1 and one rejected takeoff with an engine failure or other appropriate failure near but prior to, V_1.

(16) Experience with Line Landings. When a qualification program has been completed using only a simulator program, at least the following experience should be required before initiating Category III operations, unless otherwise specified by an applicable FSB report.

- (a) for automatic systems at least one line landing using the auto flight system approved for Category III minima should be accomplished in weather conditions at or better than Category II, unless a pilot's qualification has been completed in a Level C or D simulator found acceptable for that autoland system.
- (a) for manual systems such as head-up flight guidance system, the pilot in command must have completed at least ten line landings, using the approved flight guidance system in the configuration specified for Category III and at suitable facilities (e.g., facilities having appropriate ground facilities for the lowest minima authorized, or equivalent).

(17) Crew Records. The operator should assure that records suitably identify initial and continued eligibility of flightcrews for Category III operations. Records should note the appropriate completion of training for both ground qualification, flight qualification, and initial training, recurrent training, or re-qualification training, as applicable.
(18) Dual Qualification. In the event that crew members are dual qualified as either captain or first officer for checking and performing the duties of the second in command or for crew members dual qualified between several aircraft types or variants, appropriate training and qualification must be completed to assure that each crew member can perform the assigned duties for each seat position and each aircraft type or variant.

For programs involving dual qualification, the DGCA should approve the particular operators program considering the degree of differences involved in the Category III aircraft systems, the assigned duties for each crew position and the criteria related to differences. If a pilot serving as second in command is not expressly restricted from performing the duties of the pilot in command during Category III approaches or low visibility takeoffs below 500RVR [150 m], then that pilot must satisfactorily complete the requirements for a pilot in command regarding maneuvers specified in Division V, Section(4).

(19) Interchange. When aircraft interchange is involved between operators, flightcrew members and aircraft dispatchers must receive sufficient ground and flight training to assure familiarity and competency with respect to the particular aircraft system or systems of the interchange aircraft. Guidelines for differences should be consistent with those specified in the FSB reports.
(20) Training Regarding Use of Foreign Airports for Category III Operations or Low Visibility Takeoff. Operators authorized to conduct Category III operations or low visibility takeoffs below 600RVR [175 m] at foreign airports, which require procedures or limitations different than those applicable within Lebanon should assure that flightcrew members and aircraft dispatchers are familiar with any differences appropriate to operations at those foreign airports.
(21) Line Checks. Operators should include assessments of Category III procedures and practices as necessary during line checks when operations are conducted at facilities appropriate for Category III or at facilities appropriate for simulating Category III operations.

DIVISION VI
AIRPORTS, NAVIGATION FACILITIES AND METEOROLOGICAL CRITERIA

Airports and runways for Category III are those either having published DGCA approved SIAPS, or as otherwise specified on the DGCA "Category II/Category III status checklist". Requests for authorization to use other airports/runways should be coordinated with the DGCA.

(1) Use of Standard Navigation Facilities. Category III operations may be approved on standard ICAO navigation facilities as follows:

- Facilities meeting ICAO criteria (ICAO Annex 10, ICAO Manual of All Weather Operations DOC 9365/AN910, etc.) and which are promulgated for use for Category III by the "State of the Aerodrome."

(2) Use of Other Navigation Facilities or Methods. Category III operations may be approved using other types of navigation facilities than ILS or using other acceptable position fixing and integrity assurance methods, if proof of concept demonstrations acceptable to the DGCA are successfully completed:

(a) other facilities approvable for Category III (MLS, GLS, DGPS, or a Type I ILS used in conjunction with an acceptable aircraft integrity assurance system, etc.) are as determined acceptable by the DGCA, and

(b) ILS facilities meeting acceptable criteria other than ICAO (e.g., JAA), may be used as determined to be acceptable by the DGCA.

(3) Lighting Systems. Lighting used for Category III must include the following systems, or ICAO equivalent systems, unless approved by the DGCA:

(a) United States Standard ALSF1 or ALSF2 approach lights;
(b) United States Standard Touch down Zone Lights;
(c) United States Standard Runway Centerline Lights;
(d) United States Standard High Intensity Runway Lights;
(e) United States Standard taxiway centerline lights (for any areas of the airport determined to be critical in a DGCA accepted Surface Movement Guidance and Control (SMGC) plan), or equivalent;
(f) United States Standard taxiway edge lights (for taxiways not requiring centerline lights);
(g) Suitable ramp and gate area lighting for low visibility operations (for night operations); and
(h) Runway Hold line/Stop Bar lights (if applicable to a DGCA approved SMGC plan).

Exceptions to the above lighting criteria may be authorized only if equivalent safety can be demonstrated by an alternate means (e.g., substitution for required approach lighting components due to an approved aircraft system providing equivalent information or performance [such as radar based EVS], or redundant, high integrity, computed runway centerline information, displayed on a HUD).

(4) Marking and Signs. Airports approved for Category III operations must include the following runway and taxiway markings and airport surface signs, or ICAO equivalent, unless approved by the DGCA:

(a) United States Standard Precision Instrument Runway Markings.
(b) United States Standard Taxiway edge and centerline Markings.
(c) Runway signs, taxiway signs, hold line signs, taxiway reference point markings (if required by SMGC), and navaid (ILS) critical area signs and markings.

Markings and signs must be in serviceable condition, as determined by the operator or DGCA. Markings or signs found in an unacceptable condition by an operator should be reported to the appropriate airport authority and DGCA. Operators should discontinue Category III use of those areas of airport facilities or runways where unsafe conditions are known to exist due to markings or signs being inadequate, until remedial actions are taken by the airport authority (e.g., snow removal, rubber deposit removal on runway touch down zone markings or centerline markings, critical area hold line or runway centerline marking repainting, runway hold line sign snow removal).

(5) Low Visibility Surface Movement Guidance and Control (SMGC) Plans. Certain foreign airports conducting takeoff or landing operations below 1,200RVR [350 m] are required to develop a Surface Movement Guidance and Control System (SMGCS) plan. SMGCS operations facilitate low visibility takeoffs and landings and surface traffic movement by providing procedures and visual aids for taxiing aircraft between the runway(s) and apron(s). Specific low visibility taxi routes are provided on a separate SMGCS airport chart. SMGCS operations also facilitate the safety of vehicle movements that directly support aircraft operations, such as aircraft rescue and fire fighting (ARFF) and follow-me services, towing and marshaling.

U.S. Advisory Circular AC 120-57 as amended describes the standards and provides guidance in implementing SMGCS operations such as aircrew training, etc. An operator intending authorization for Category III operations should coordinate with the airport authority regarding their SMGCS plan.

Meteorological Services and RVR Availability and Use Requirements

(6) Meteorological Services. Appropriate meteorological service (e.g., RVR, Altitude Settings, METARs, TAFs, Braking Action, NOTAMs, reports) are necessary for each airport/ runway intended for use by an operator for Category III, unless otherwise approved by the DGCA. Facilities should meet criteria of ICAO Doc 9365/AN910, second edition, or later, as amended. This information must be readily available to both the crew and the aircraft dispatcher.

RVR Availability and Use Requirements

(7) RVR Availability. RVR availability requirements for touch down zone (TDZ), mid runway (MID), and ROLLOUT RVR (or a corresponding international equivalent location) are as follows. RVR should be provided for any runway over 8000 ft. [2438.4 m] in length. TDZ and ROLLOUT RVR should be provided for runways less than 8000 ft. [2438.4 m]. Factors considered due to local circumstances at airports may include such issues as minima requested, characteristics of prevailing local weather conditions, location of RVR sites or RVR calibration, availability of other supporting weather reports on nearby runways, etc.
(8) RVR Use. RVR use by operators and pilots is as specified in standard operations specifications Part C (see Attachment 7).

However, when approved as an exception in operations specifications, aircraft capable of certificated landing or takeoff distance of less than 4000 ft. [1200 m] may be approved to use a single TDZ, MID, or ROLLOUT transmissiometer as applicable to the part of the runway used (e.g., "Relevant" RVR). For such operations, transmissiometers not used are considered to be optional and advisory, unless the aircraft operation is planned to take place at a speed above safe taxi speed on the part of the runway where the MID or ROLLOUT transmissiometer is located.

RVR reports that are not instrumentally derived may be used if their basis is determined to be reliable and accurate by the operator and the DGCA.

(9) Pilot Assessment of Takeoff Visibility Equivalent to RVR. In special circumstances, provision may be made for pilot assessment of takeoff visibility equivalent to RVR to determine compliance with takeoff minima. Authorization for pilot assessment is provided through operations specifications SectionC056 (see Attachment 7). A pilot may assess visibility at the take off position in lieu of reported TDZ RVR (or equivalent) in accordance with the requirements detailed below:

(a) TDZ RVR is inoperative, or is not reported (e.g., ATS facility is closed), or
(b) local visibility conditions as determined by the pilot indicate that a significantly different visibility exists than the reported RVR (e.g., patchy fog, blowing snow, RVR believed to be inaccurate due to snow cover or ice), and
(c) pertinent markings, lighting, and electronic aids are clearly visible and in service (e.g., no obscuring clutter), and
(d) a pilot assessment is made using an accepted method regarding identification of an appropriate number of centerline lights, or markings, of known spacing visible to the pilot when viewed from the flight deck when the aircraft is at the take-off point, and
(e) pilot assessment of visibility as a substitute for TDZ (takeoff) RVR is approved for the operator, and observed visibility is determined to be greater than the equivalent of 300RVR [75 m], and
(f) a report of the pilot's determination of visibility (PIREP) is forwarded to suitable ATS and dispatch facilities prior to departure (if an ATS facility or dispatch facility is available and providing services). A report of pilot visibility is intended to provide information for other operations, and is not intended to restrict the aircraft making the report.

(10) Critical Area Protection. Airports and runways used for Category II or III must have suitable navaid (e.g., ILS) critical area protection, as applicable to the ground and aircraft systems used. Procedures equivalent or more stringent than those specified in the U.S. Air Traffic Control Handbook (FAA Order 7110.65) as amended, or equivalent are required. Procedures consistent with ICAO DOC 9365/AN910 are acceptable. Where uncertainty regarding acceptability of airport procedures is a factor, operators should contact the DGCA (e.g., for airports and runways listed on the DGCA Category II/Category III status checklist where doubt exists regarding adequacy of procedures encountered in routine operations) for follow up.

(11) Operational Facilities, Outages, Airport Construction, and NOTAMs. For operations to be initially authorized, operations to continue to be authorized, for an aircraft to be dispatched with the intention of using a facility described above, or for an aircraft to continue to its destination or an alternate with the intent of completing a Category III instrument approach procedure, each of the applicable necessary components or services identified in Sections (1) through (10) above must be operating, available, or normal as intended for Category III (e.g., NAVAIDs, standby power, lighting systems) except as specified below.

Outer, Middle, or Inner Marker beacons may be inoperative unless a Category III operation is predicated on their use (e.g., an AH is predicated on use of an Inner Marker due to irregular terrain, and the aircraft system requires use of a marker beacon for proper flight guidance function).

Lighting systems are in normal status except that isolated lights of an approach light, or runway light system may be inoperative; approach light components not necessary for the particular operation (such as REIL, VASI, RAIL, or SFL) may be inoperative; lights may not be completely obscured by snow or other such contaminants if necessary for the operation (e.g., night); Taxiway, ramp, and gate area lighting components may be inoperative if not essential for the operation to be conducted.

Ground facility standby power capability for the landing airport or alternate (if applicable) must be operative at the time of the aircraft's departure to a Category III destination or alternate.

Category III operations may be continued at airports at which construction projects affect runways, taxiways, signs, markings, lighting, or ramp areas only if the operator has determined that low visibility operations may be safely conducted with the altered or temporary facilities that are provided. In the event of uncertainty as to the suitability of facilities, the operator should consult with the DGCA.

Operators may make the determination as to the suitability of the above facilities regarding unusual weather or failure conditions unless otherwise specified by the airport authority, or the DGCA.

NOTAMs for NAVAIDs, facilities, lighting, marking, or other capabilities must be appropriately considered for both dispatch, and for continued flight operations intending to use a Category III procedure. Operators, aircraft dispatchers, and flightcrews must appropriately respond to NOTAMs potentially adversely affecting the aircraft system operation, or the availability or suitability of Category III procedures at the airport of landing, or any alternate airport intended for Category III.

An operator may make the determination that a NOTAM does not apply to the aircraft system and procedures being used for a particular flight if the safety of the operation can be ensured, considering the NOTAM and situation (e.g., a NOTAM specifying Category III Not Available due to the ALS inoperative, for an aircraft that had previously been dispatched based on a Category III ETOPS alternate airport flight plan, and no other suitable airport facility is available). In such instances, crews must be advised of any relevant information to the decision, and any precautions to be taken.

(12) Use of Military Facilities. Military facilities may be used for Category III if authorized by the Minister of Defense, and if equivalent criteria are met as applicable to Lebanese civil airports.

(13) Special Provisions for Facilities Used for ETOPS Alternates. In addition to criteria specified above, an airport used as an ETOPS Category III engine-inoperative alternate must meet the following criteria:

- (a) sufficient information about pre-threshold terrain, missed approach path terrain, and obstructions must be available so that an operator can assure that a safe Category III landing can be completed, and that an engine-inoperative missed approach can be completed from AH or DH as applicable, up to a point at the end of the landing touch down zone (TDZ).
- (b) sufficient meteorological and facility status information must be available so that a diverting flightcrew and the aircraft dispatcher can receive timely status updates on facility capability, weather/RVR, wind components, and braking action reports (if applicable), if conditions could or would adversely affect a planned Category III landing during the period of an ETOPS diversion.
- (c) for any alternate airports not routinely used by that operator (e.g., BIKF), sufficient information must be provided for aircraft dispatchers and flightcrews to be familiar with relevant low visibility and adverse weather characteristics of that airport that might have relevance to an engine-inoperative operation (e.g., unique lighting or markings, any nearby obstructions or frequently encountered local windshear or turbulence characteristics, meteorological report, braking report, and NOTAM interpretation, appropriate ground taxi route and gate location information, emergency services available).

(14) Alternate Minima. Use of alternate minima are specified in Standard OpSpecs Part C, paragraph C055. For applicability of "engine inoperative Category III" capability see Division VIII, Section(13) , and in particular, Division VIII, Section(15)(j) and (k).

SectionC055 is issued to all Part VI and Part VII operators who conduct IFR operations with airplanes. This Section provides a three-part table from which the operator, during the initial dispatch or flight release planning segment of a flight, determines applicable alternate airport IFR weather minimums for those cases where it has been determined that an alternate airport is required.

(a) Standard Provisions. Standard provisions of the Part C SectionC055 operation-specification are applicable to airports with at least one operational navigational facility, or for multiple navigation facilities providing straight-in instrument approach procedures other than precision, or a straight-in precision approach procedure, or a circling maneuver from an instrument approach procedure. The required ceiling and visibility is obtained by adding an increment to the landing minima (e.g., adding 400 ft. [125 m] to the Category I HAT or, as applicable, the authorized HAA, and by adding 1 statute mile to the authorized landing visibility.

(b) Special Engine Inoperative Provisions. Special provisions for Category II and Category III engine-out capability are listed in the third part of the table for airports with at least two operational navigational facilities, each providing a straight-in precision approach, including a precision approach procedure to Category II or Category III minima. The required ceiling and visibility for this operational credit is obtained by adding 300 ft. [75 m] or 200 ft. [60 m] to the respective lowest Category II or Category III touch down zone elevation of the two approaches considered, and by adding 1200 ft. [350 m] to the lowest authorized RVR minimum (see Attachment 7 Part C, paragraph C055).

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DIVISION VII - CONTINUING AIRWORTHINESS/MAINTENANCE

(1) Maintenance Program Provisions. Typically, each operator should already have an approved continuous airworthiness maintenance program (CAMP) in place. The approved continuous airworthiness maintenance program for lower landing minima (LLM) should include any additional maintenance and administrative procedures. The LLM program is an extension of the CAMP. Emphasis is focused on maintaining and ensuring total system integrity and accuracy while conducting lower landing and takeoff operation. The program should ensure that the airborne equipment is maintained at an acceptable level of performance, reliability, and availability consistent with the Maintenance Review Board (MRB) or equivalent requirements. Maintenance personnel should be knowledgeable regarding the information contained in this Appendix and the LARs related to LLM.
(2) Program Requirements. The maintenance criteria for LLM programs should be compatible with an operator's organization and existing maintenance program and the applicable regulations. The program should include Maintenance Review Board considerations and the airframe manufacturer's certification basis for conducting LLM operations. The LLM program should include:

(a) all maintenance procedures necessary to ensure continued airworthiness.
(b) a procedure to revise and update the program.
(c) a method which identifies and records those persons [including contractors] who are currently involved in maintaining the program.
(d) an initial and recurrent training program. The program should include all operator and contract personnel. These persons should include, as the program applies to the duties: quality and reliability groups, maintenance personnel and maintenance control, incoming inspection and stores. The training should be performed in the classroom and in the airplane. Areas of training should include: Minimum Equipment List (MEL) application, information related to the different categories of operational authority (what lower weather minima is), general information from an operational stand point, and all other maintenance program requirements.
(e) validation of each aircraft brought into the lower minimum program. Procedures should be established for ensuring certification and verification that each aircraft meets its type design lower minimum standards for systems and equipment (TC-STC) which include:
(f) titles and numbers of all modifications, additions and changes which were made to qualify aircraft systems for LLM if other than TC.
(g) identification of additional maintenance requirements which allows status change from one minimum to a lower/higher minimum.
(h) discrepancy reporting procedures unique to the LLM program. These procedures must be identically described in maintenance documents and operations documents.
(i) procedures which identify, monitor and report lower minimum system and component discrepancies for the purpose of quality control and analysis.
(j) procedures which define, monitor and report chronic and repetitive discrepancies.
(k) procedures which ensure aircraft remain out of lower minimum status until successful corrective action has been verified for chronic and repetitive discrepancies.
(l) procedures which ensure the aircraft LLM system status is placarded properly and clearly documented in the aircraft log book under the direction of maintenance control and flight operations dispatch.
(m) procedures to ensure the downgrade of an aircraft from LLM status when maintenance has been performed by persons not properly trained, qualified, or authorized.

(n) procedures for periodic maintenance LLM systems ground check and an LLM systems flight check. For example, performed following a heavy maintenance check and prior to return to service.
(o) should require, for an aircraft to remain in Category II status, at least one satisfactory LLM approach must have been accomplished within 6 months unless a satisfactory complete LLM systems ground check has not been accomplished. A recording procedure for both satisfactory and unsatisfactory results should be included. Fleet sampling is not acceptable.
(p) should require at least one satisfactory LLM Category III/ autoland or a satisfactory complete LLM systems ground check accomplished within 30 days, for an aircraft to remain in Category III/ autoland status. A recording procedure for both satisfactory and unsatisfactory results should be included. Fleet sampling is not acceptable

(3) Initial And Recurrent Maintenance Training. Operator and contract maintenance personnel which include mechanics and maintenance controllers should receive initial and recurrent training. The training curriculum should include specific aircraft systems and operator LLM policies and procedures. Recurrent training should be accomplished at least annually or when a person has not been involved in the maintenance of LLM systems within six months. Training should include classroom and hands-on aircraft training leading to a certification for LLM.

The training curriculum should include:

(a) procedures for the use of outside vendor parts that ensures compatibility to program requirements and for establishing measures to control and account for parts overall quality assurance.
(b) procedures to ensure tracking and control of components that are “swapped” between systems for trouble shooting when systems discrepancies can not be duplicated. These procedures should provide for total system testing and/or removal of aircraft from lower minimum status.
(c) procedures to assess, track and control the accomplishment of changes to components and/or systems, i.e., service bulletins, engineering orders, 14 CFR requirements and any other source to evaluate their effect on LLM systems and components.
(d) procedures to record and report lower minimum operation(s) that are discontinued/ interrupted because of LLM system malfunction.
(e) procedures to evaluate, control, and test system and component software changes.
(f) procedures within the minimum equipment list remarks section which identify LLM systems and components, specifying limitations and upgrading and downgrading.
(g) procedures for identifying LLM components and systems as required inspection items (RII) thereby ensuring quality assurance whether performed in-house or by contract vendors.

(4) Test Equipment/Calibration Standards. Test equipment may require re-evaluation to ensure it has the required accuracy and reliability to return systems and components to service following maintenance pursuant to aircraft status upgrade. A listing of all primary and secondary standards used to maintain test equipment which relate to LLM operations should be submitted to the DGCA for determination of adequacy. It is the operator’s responsibility to ensure these standards are adhered to by contract maintenance organizations. Traceability to a national standard or the manufacturer’s calibration standards should be maintained at all times.

(5) Return To Service Procedures. Procedures should be included to upgrade and downgrade systems status concerning LLM. The method for controlling operational status of the aircraft should ensure that

the flightcrew, maintenance and inspection departments, dispatch and administrative personnel are aware of aircraft system status.

The minimum level of system testing must be specified for each component and system. unless demonstrated and certified by the airframe manufacturer, built-in-test-equipment (bite)/return to service (rts) may not be appropriate as a return to service requirement pursuant to status upgrade. If not demonstrated and certified it may only be used for fault isolation and troubleshooting. The airframe manufacturer must certify that these tests will ensure the desired accuracy and integrity for LLM operations.

Contract facilities must follow the operator's DGCA approved LLM maintenance program before approving the aircraft for return to service. The operator is responsible for ensuring contract personnel are appropriately trained, qualified, and authorized.

(6) Periodic Aircraft System Evaluations. The operator must provide a method to continuously assess or periodically evaluate aircraft system performance to ensure satisfactory operation for those systems applicable to Category III. An acceptable method for assuring satisfactory performance of a low visibility flight guidance system (e.g., autoland or HUD) is to periodically use the system and note satisfactory performance. A reliable record such as a logbook entry or computer ACARS record showing satisfactory performance within the previous 30 days is typically an acceptable method for assuring satisfactory system operation.

Periodic flight guidance system/autoland system checks should be conducted in accordance with procedures recommended by the airframe or avionics manufacturer, or by an alternate procedure approved by the DGCA. For periodic assessment, a record should be established to show when and where the flight guidance/autoland system was satisfactorily used, and if performance was not satisfactory, to describe any remedial action taken.

Use of the flight guidance/automatic landing system should be encouraged to assist in maintaining its availability and reliability.

(7) Reliability Reporting And Quality Control. For a period of 1 year after an applicant has been authorized reduced minima, a monthly summary is to be submitted to the certificate holding office. The following information should be reported:

(a) the total number of satisfactory LLM approaches, actual and simulated to LLM minima by aircraft type.
(b) the total number of unsatisfactory approaches and the reasons by appropriate category; aircraft equipment; ground facilities; ATC or other.
(c) the total number of unscheduled removals of components of the LLM avionics systems.
(d) reporting there after should be in accordance with the operators established reliability and the LARs reporting requirements.

(8) Configuration Control/System Modifications. The operator must ensure that any modification to systems and components approved for LLM are not affected when incorporating software changes, service bulletins, additions, and changes to LLM related systems. Any change to system components requires DGCA approval.

(9) Records. The operator must keep suitable records (e.g., both the operator's own records and access to records of any applicable contract maintenance organization). This is to ensure that both the operator and

DGCA can determine the appropriate airworthiness configuration and status of each aircraft intended for Category III operation.

Contract maintenance organizations must have appropriate records and instructions for coordination of records with the operator.

Foreign Operator Maintenance Programs

(10) Maintenance of Part VII, Subpart 1 Foreign Registered Aircraft. For Part VII, Subpart 1 operators of Foreign registered aircraft, the cognizant CAA is the CAA of the operator. For those situations, the DGCA may implicitly accept that the maintenance program is considered to be acceptable if the cognizant CAA has approved it, and if the operator or CAA states that the program meets Lebanese criteria, or equivalent criteria (e.g., criteria such as JAA criteria), or ICAO criteria
(e.g., Annex 6 and Doc 9365/AN910 "Manual of All Weather Operations"), and the cognizant CAA has authorized Cat II or Cat III US operations. The DGCA then issues the pertinent Part VII, Subpart 1 category II/III OpSpecs based on the other CAAs approval for that operator. However, DGCA reserves the prerogative to use judgment to assure competence of both the operator and authorizing and supervising CAA, depending on whether the CAA or operator are from a Category I, II, or III country (safety classification not low visibility landing classification), and if there have been any reported problems with the operator or CAA. Evidence of the operator satisfying or being consistent with the manufacturer's recommended maintenance program should serve as evidence of an acceptable maintenance program, regardless of the capability of the CAA or the operator, unless the DGCA has specifically addressed maintenance requirements beyond those of the manufacturer for that aircraft type (e.g., required service bulletin compliance or Airworthiness Directive compliance related to the flight guidance system).
(11) Maintenance of Part VII, Subpart 1 Foreign Operated Lebanese “OD” Registered Aircraft. Foreign operators of Lebanese "OD" Registered Aircraft should have maintenance programs equivalent to that required for a Lebanese Part VI or Part VII operator. Use of the Part VI provisions for General Aviation are not applicable or appropriate. DGCA Approval of Category II/III OpSpecs for a Part VII, Subpart 1 operator may implicitly be considered to also accept the maintenance program adequacy. Accordingly, coordination between the DGCA Inspector specialties is necessary before Part VII, Subpart 1 OpSpec authorization is completed. The DGCA is ultimately the cognizant CAA for the maintenance program in this instance, if the aircraft is OD registered. The DGCA may however, accept the oversight of the operators CAA if that CAA is judged by DGCA to have equivalent processes, criteria and procedures for oversight of maintenance programs (e.g., JAA countries). The basis for any such maintenance program should be the recommended airframe manufacturer (or avionics vendor) program, considering any adjusted MRB requirements.

DIVISION VIII - APPROVAL OF LEBANESE OPERATORS

Approval for Category I, II and III is through issuance of, or amendments to, Operations-Specifications. The authorizations, limitations, and provisions applicable to Category I and II operations are specified in Part C of the OpSpecs. Sample OpSpecs are provided in Attachment 7 to Appendix I of this Standard.

Operations specifications authorizing reciprocating and turbopropeller-powered airplane Category I operations that use ICAO standard NAVAIDs and ASRs and PARs are normally approved by the certificate holding district office without further review and concurrence, following satisfactory completion of the pertinent items below. Category I turbojet, turbofan and propfan normally require regional flight standards review and concurrence before approval. All Category II operations and operations using NAVAIDs which are not ICAO-standard NAVAIDs (e.g., Loran C, ARA, OSAP and TLS) normally require both regional flight standards and AFS-400 review and concurrence before approval.

(1) Operations Manuals and Procedures.

(a) Manuals. Prior to Category approval, appropriate flightcrew operating manuals, flight manuals, airline policy manuals, maintenance manuals, training manuals, and related aircraft checklists, quick reference handbooks, or other equivalent operator information, must satisfactorily incorporate pertinent Category III provisions.

Information covered in ground training, and procedures addressed in flight training should be available to crews in an appropriate form for reference use.

(b) Procedures. Prior to Category approval, provisions of Division IV of this Appendix for procedures, duties, instructions, or any other necessary information to be used by flightcrews and aircraft dispatchers should be implemented by the operator.

Crew member duties during a the approach, flare, rollout, or missed approach should described. Duties should at least address responsibilities, tasks of the pilot flying the aircraft and the pilot not flying the aircraft during all stages of the approach, landing, rollout and missed approach. The duties of additional crew members, if required, should also be explicitly defined.

Specification of crew member duties should address any needed interaction with the aircraft dispatcher or maintenance (e.g., addressing resolution of aircraft discrepancies and return to service).

The applicant's qualification program should incorporate specific Category II/III procedural responsibilities for the pilot in command and second in command in each of the ground training subject areas listed in Division V, Section(1), and each of the flight training subject areas listed in Division V, Section(4).

(2) Training Programs and Crew Qualification. Training programs, crew qualification and checking provisions and standards, differences qualification, check airmen qualification, line check, route check, and IOE programs should each satisfactorily incorporate necessary Category III provisions, as applicable (see Sections (4) through (16). An acceptable method to track pertinent crew member Category III qualification and recency must be established (see Section(17).

For manually flown Category III systems (e.g., HUD FDs, Hybrid HUD/Autoland) ensure that provisions are made for each flightcrew member to receive the appropriate training, qualification, and line experience before that particular crew member is authorized to use the pertinent Category III minima.

(3) Dispatch Planning (e.g., MEL, Alternate Airports, ETOPS). MEL and CDL provisions should be addressed, as necessary, for Category III operations. The aircraft dispatcher should ensure appropriate consideration of reported and forecast weather, field conditions, facility status, NOTAM information, alternate airport designation, engine-inoperative missed approach performance, crew qualification, airborne system status, and fuel planning. For ETOPS operations, a satisfactory method to address Division VI, Section(13) above should be demonstrated.

(4) Formulation of Operations Specification Requirements (e.g., RVR limits, DH or AH, equipment requirements, field lengths). Proposed OpSpecs should list pertinent approved RVR limits, DH or AH use provisions, "Inner Marker based DH or AH" provisions (if applicable), required transmissiometers, airports/runways, aircraft equipment provisions for "normal" and, if applicable, "engine-inoperative" operations, landing field length provisions, and any other special requirements identified by the DGCA (e.g., ETOPS Category III). The operator's manuals, procedures, checklists, QRHs, MELs, dispatch procedures and other related flightcrew information must be shown to be consistent with the proposed OpSpecs.

(5) Operational/Airworthiness Demonstrations. Appropriate "airborne system suitability" and "operational use suitability" demonstrations must be completed as described in Division VIII, Section(6) and (7)., unless otherwise specified by the DGCA. The purpose of these operational demonstrations is to determine or validate the use and effectiveness of the applicable aircraft flight guidance systems, training, flightcrew procedures, maintenance program, and manuals applicable to the Category III program being approved.

(6) Airborne System Suitability Demonstration. Low visibility takeoff and landing requirements for Category I, Category II, and Category III are related to operating rules addressed by Standard OpSpecs and the LARs. These provisions apply continuously, as defined at the time of a particular Category I, II, or III operation. Airworthiness rules primarily apply at the time a "certification basis" is established for type certificate (TC) or supplemental type certificate (STC) and do not necessarily reflect "present" requirements, except through issuance of ADs updated with an amended type certificate (ATC) or new STC application. Accordingly, operationally acceptable demonstrations addressing suitability of airborne systems for Category III, as applicable, must be successfully completed initially, and acceptable system status must be maintained by an operator to reflect compliance with current operating rules and airworthiness requirements, to initially operate or continue to operate to Category III minima.

To minimize the need for repeating initial airborne system operational suitability demonstrations for each operator, airborne system suitability is usually demonstrated in conjunction with airworthiness approval (TC or STC) of airborne system components such as flight guidance systems, autoland, flight directors, HUDs, flight instrument and alerting systems, radio altimeters, inertial systems, and air data systems. This approach to determination of airborne system suitability is taken to optimize use of analysis and flight demonstration resources for operators, aircraft manufacturers, avionics manufacturers, and the DGCA. Accordingly, airborne system suitability is normally demonstrated through an initial airworthiness demonstration meeting applicable provisions of Attachments to this Appendix (or combined airworthiness/operational evaluation for new systems or concepts, or where otherwise necessary).

Acceptable results of such airworthiness evaluations are usually described in Division I (Normal and Non-Normal Procedures) of the DGCA accepted approved AFM or AFM Supplement. The DGCA should ensure that aircraft proposed for Category III have completed such an appropriate airborne system operational suitability demonstration, and that result should normally be reflected in the approved AFM or AFM Supplement, unless otherwise specified by the DGCA.

(7) "Operator Use Suitability" Demonstration. At least one-hundred (100) successful landings should be accomplished in line operations using the Category IIIa or Category IIIb system installed in each aircraft type. Demonstrations may be conducted in line operations, during training flights, or during aircraft type or route proving runs.

If an excessive number of failures (e.g., unsatisfactory landings, system disconnects) occur during the landing demonstration program, a determination should be made for the need for additional demonstration landings, or for consideration of other remedial action (e.g., procedures adjustment, wind constraints, or system modifications).

The system should demonstrate reliability and performance in line operations consistent with the operational concepts specified in Division II. In unique situations where the completion of 100 successful landings could take an unreasonably long period of time due to factors such as a small number of aircraft in the fleet, limited opportunity to use runways having Category II/III procedures, or inability to obtain ATS critical area protection during good weather conditions, and equivalent reliability assurance can be achieved, a reduction in the required number of landings may be considered on a case-by-case basis. Reduction of the number of landings to be demonstrated requires a justification for the reduction, and prior approval from the DGCA.

Landing demonstrations should be accomplished on international facilities acceptable to DGCA which have Category II or III procedures. However, at the operator's option, demonstrations may be made on other runways and facilities if sufficient information is collected to determine the cause of any unsatisfactory performance (e.g., critical area was not protected). No more than 50 percent of the demonstrations may be made on such facilities.

If an operator has different models of the same type of aircraft using the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft, the operator should show that the various models have satisfactory performance, but the operator need not conduct a full operational demonstration for each model or variant.

(8) Data Collection For Airborne System Demonstrations. Each applicant should develop a data collection method (e.g., form to be used by flightcrew) to record approach and landing performance. Data should be collected whenever an approach and landing is attempted using the Category III system, regardless of whether the approach is abandoned, unsatisfactory, or is concluded successfully. The resulting data and a summary of the demonstration data should be made available to the DGCA for evaluation. The data should, as a minimum, include the following information:

(a) inability to Initiate an Approach. Identify deficiencies related to airborne equipment which preclude initiation of a Category III approach.

(b) abandoned Approaches. Give the reasons and altitude above the runway at which approach was discontinued or the automatic landing system was disengaged.

(c) touch down or Touch down and Rollout Performance. Describe whether or not the aircraft landed satisfactorily (within the desired touch down area) with lateral velocity or crosstrack error which could be corrected by the pilot or automatic system so as to remain within the lateral confines of the runway without unusual pilot skill or technique. The approximate lateral and longitudinal position of the actual touch down point in relation to the runway centerline and the runway threshold, respectively, should be indicated in the report. This report should also include any Category III system abnormalities which required manual intervention by the pilot to ensure a safe touch down or touch down and rollout, as appropriate.

(9) Data Analysis. Unsatisfactory approaches using facilities approved for Category II or III where landing system signal protection was provided should be fully documented. The following factors should be considered:

- (a) ATS Factors. ATS factors which result in unsuccessful approaches should be reported. Examples include situations in which a flight is vectored too close to the final approach fix/point for adequate localizer and glide slope capture, lack of protection of ILS critical areas, or ATS requests the flight to discontinue the approach.
- (b) Faulty NAVAID Signals. NAVAID (e.g., ILS localizer) irregularities, such as those caused by other aircraft taxiing, over-flying the navaid (antenna), or where a pattern of such faulty performance can be established should be reported.
- (c) Other Factors. Any other specific factors affecting the success of Category III operations that are clearly discernible to the flightcrew should be reported. An evaluation of reports discussed in Division VIII, Section(8) will be made to determine system suitability for further Category III operations.

(10) Approval of Landing Minima. When the data from the operational demonstration has been analyzed and found acceptable, an applicant may be authorized the lowest requested minima consistent with this Appendix and applicable standard operations specifications. Several examples are provided below.

For Category III, fail passive operations where the operator was initially authorized 1000RVR [300 m] to begin a demonstration program, following successful demonstration that operator may be authorized to operate to minima of 600RVR [175 m].

For Category III fail operational operations, where the operator was initially authorized 1000RVR [300 m] to begin a demonstration program, following successful demonstration that operator may be authorized to operate to minima of 600RVR [175 m] or 300RVR [75 m] as applicable.

If the Category III rollout control system has been shown to meet the appropriate provisions of Attachment 3.

Additional approvals for operations below 300RVR [75 m] may be authorized in the future if the airplane is suitably equipped and operational experience indicates that the airborne and ground support equipment are compatible with the lower minima.

For additional examples of minima step down provisions acceptable to DGCA see Division VIII, Sections (19) and (20).

(11) Eligible Airports and Runways. An assessment of eligible airports, runways, and airborne systems must be made in order to list appropriate runways on OpSpecs. Runways authorized for particular aircraft in accordance with existing operations listed on the DGCA Category II/Category III status checklist may be directly incorporated in OpSpecs. Aircraft type/runway combinations not shown should be verified by airborne system use in line operations at Category II or better minima, prior to authorization for Category III. Airports/aircraft types restricted due to special conditions (e.g., irregular underlying terrain) must be evaluated in accordance with Attachment 8, prior to OpSpecs authorization.

If applicable, the operator should identify any necessary provisions for periodic demonstration of the airborne system on runways other than those having Category II or III procedures (e.g., periodic autoland performance verification, using runways served only by a Category I procedure).

To access this list, search the menu for Air Transportation and select All Weather Operations. The desired section can then be selected from the All Weather Operations home page menu.

(12) Irregular Pre-Threshold Terrain and Other Restricted Runways. Airports/runways with irregular pre-threshold terrain, or runways restricted due to navaid or facility characteristics (see DGCA Category II/Category III Status Checklist in Division VIII, Section(11) may require special evaluation, or limitations. The DGCA should identify pertinent criteria and evaluation requirements. Various procedures used by DGCA to assess irregular pre-threshold terrain are described in Attachment 8.

(13) Engine-Inoperative Operations and ETOPS Category III Alternates. Low visibility landing minima are typically based on normal operations. For non-normal operations, flightcrews and aircraft dispatchers are expected to take the safest course of action to resolve the non-normal condition. The low weather minima capability of the aircraft must be known and available to the flightcrew and aircraft dispatcher.

In certain instances, sufficient airborne system redundancy may be included in the aircraft design to permit use of an alternate configuration such as, permitting an engine inoperative capability for initiation of a Category III approach. Use of an engine inoperative configuration is based on the premise that the engine non-normal condition is an engine failure that has not adversely affected other airborne systems. Systems which should be considered include systems such as hydraulic systems, electrical systems or other relevant systems for Category III that are necessary to establish the appropriate flight guidance configuration.

An alternate engine inoperative configuration also is based on the premise that catastrophic engine failure has not occurred which may have caused uncertain, or unsafe collateral damage to the airframe, or aerodynamic configuration.

In instances when AFM or operational criteria is not met, and a Category III approach is necessary, because it is the safest course of action, (e.g., in flight fire), the flightcrew may use emergency authority. The flightcrew should determine to the extent necessary the state of the aircraft and other diversion options to ensure that an approach in weather conditions less than Category II is the safest course of action.

Four cases are useful in considering engine inoperative Category III capability, and engine inoperative approach authorization:

(a) dispatch planning is based on aircraft configuration, reliability, and capability for "engine inoperative Category III" (see Division VIII, Section(15).
(b) an engine fails en route, but prior to final approach (see Division VIII, Section(16).
(c) an engine fails during the approach after passing the final approach fix, but prior to reaching the Alert Height or Decision Height (see Division VIII, Section(17).
(d) an engine fails during approach after passing the Alert Height or Decision Height (see Division VIII, Section(18)).

Division III, Section(24) provides airworthiness criteria for demonstration of Category III engine out capability. Division VIII, Sections (14) through (18) below address criteria for use of aircraft with "engine inoperative Category III" capability.

(14) General Criteria for Engine-Inoperative Category III Authorization. Aircraft capability for "engine-inoperative Category III" should be approved in accordance with the provisions of Division III, Section(24) and Attachment 3 to Appendix I of this Standard.

Regardless of whether an operator is or is not operationally authorized for "engine inoperative Category III", it must be clear that having this aircraft capability should not be interpreted as requiring a Cat III landing at the "nearest suitable" airport in time.

The DGCA should ensure that the following conditions are met:

(a) operations must be in accordance with the "engine inoperative Cat III" AFM provisions (e.g., within demonstrated wind limits, using appropriate crew procedures).

(b) demonstrated/acceptable configurations must be used (e.g., AFDS modes, flap settings, electrical power sources, MEL provisions).

(c) WAT limits must be established, and Engine-inoperative Missed Approach obstacle clearance from the TDZ must be ensured. This data should be readily available to the aircraft dispatcher either by pre-determined certification listing or through appropriate engine-inoperative programming in automated flight planning and performance systems.

(d) appropriate training program provisions for engine inoperative approaches must be provided (see Division V, Section(12)).

(e) crews must be aware that they are expected to take the safest course of action, in their judgment, in the event that unforeseen circumstances or unusual conditions occur that are not addressed by the "engine-inoperative" Category III demonstrated configuration (e.g., uncertain aircraft damage, possible fire, weather deterioration).

(f) operations Specifications must identify the type of "engine-inoperative" Category III operations authorized. Types of operations are described in Division VIII, Sections (15) through (18) below.

(15) Engine Inoperative "Flight Planning." The aircraft dispatcher may consider "engine inoperative Category III" capability in planning flights for a takeoff alternate, en route (ETOPS) alternate, re-dispatch alternate, destination, or destination alternate only if each of the following conditions are met:

(a) the aircraft dispatcher has determined that the aircraft is capable of engine inoperative Category III.

(b) appropriate procedures, performance, and obstacle clearance information must be provided to the crew to be able to safely accomplish an engine inoperative missed approach at any point in the approach. The same information must also be readily available to the aircraft dispatcher.

(c) appropriate operational weather constraints must be considered and specified as necessary regarding cross wind, head wind, tail wind limits considering the demonstrated capability specified in the AFM.

(d) weather reports or forecast must indicate that specified alternate minimums or landing minimums will be available for the runway equipped with approved Category III systems and procedures. The operators use of engine inoperative capability credit should consider both the availability and reliability of meteorological reports and forecasts, the time factors involved in potential forecast accuracy, the potential for variability in the weather at each pertinent airport, and the ability for the crew and aircraft dispatcher to obtain timely weather reports and forecast updates during the time the flight is en route. Flight planning considerations must account for any expected ATS delays that might be experienced during arrival due to weather, snow removal, or other factors.

(e) notices to airmen or equivalent information for airport and facility status should be reviewed to ensure that they do not preclude the accomplishment of a safe engine inoperative approach on the designated runway using approved Category III procedures (e.g., temporary obstructions). Any change in NOTAM status of facilities related to use of landing minima or alternate minima must be provided to the crew in a timely manner while en route.

(f) if the engine inoperative configuration is different than a normal landing configuration, a means to determine the landing distance of the LARs distance must be available for the pertinent engine inoperative aircraft configuration (e.g., landing flap setting). This distance is to ensure sufficient runway to provide for any limitations on the use of reverse thrust or other factors that could pertain to an inoperative engine landing (e.g., reduced flap settings used for an engine inoperative approach). This data may be based on basic aircraft data otherwise available and need not be redemonstrated for "engine-out' cases.

(g) the expectation for runway surface condition based on pilot and aircraft dispatcher interpretation of the available weather reports, field conditions, and forecasts is that the applicable runway is likely to be free from standing water, snow, slush, ice, or other contaminants at the time of landing. The flightcrew must be advised of any adverse change in this expectation while en route.

(h) other requirements applicable to "all engine" Category III, such as training, crew qualification, procedures, and other items must also be addressed for the engine inoperative landing case.

(i) the operator is approved for operations based on engine inoperative Category III capability. In addition, operator responsibilities for engine inoperative credit should be equivalent to that of current normal operations when an en route landing system failure causes degraded landing capability. If an inflight failure causes further degradation of engine inoperative landing capability, the flightcrew in conjunction with the aircraft dispatcher should determine an acceptable alternative course of action (e.g., specification of different en route diversion options, revised fuel reserves plan, or revised flight plan routing).

(j) when engine inoperative provisions are applied to identification of any destination alternate, more than one qualifying destination alternate is required. This is to provide for the possibility of adverse area wide weather phenomena, or unexpected loss of landing capability at the first designated alternate airport.

(k) an appropriate ceiling and visibility increment is added to the lowest authorized minimums when credit for an alternate airport or airports is sought (e.g., 200 ft. [[75 m] DH additive and appropriate RVR additive; see Attachment 7 - Operations Specification Example).

(l) the airborne system should be shown through "in-service" performance that for fail-operational systems, landing system availability is at least 99% from takeoff to 500’ [150 m] HAT on approach, and for fail-passive systems, system availability is at least 95% from takeoff to 500’ [150 m] HAT on approach (see Attachment 3 to Appendix I of this Standard).

It should be noted that even if the aircraft, flightcrews, and operator are authorized for engine inoperative Category III, flightcrews are not required to use a Category III approach to satisfy requirements of the LARs. Not withstanding the LARs, crews may elect to take a safe course of action by landing at a more distant airport than one at which a Category III approach may be required. Conversely, crews may elect to conduct the Category III approach as the safest or a safe course of action.

(16) Engine Inoperative En Route. For engine failure en route, a pilot may initiate an "engine inoperative" Category III approach under the following conditions:

(a) the airplane flight manual normal or non-normal sections specify that engine inoperative approach capability has been demonstrated and procedures are available.

(b) the aircraft dispatcher and pilot have taken into account the landing runway length needed for the inoperative engine configuration and corresponding approach speeds, and obstacle clearance can be maintained in the event of a missed approach.
(c) the aircraft dispatcher and pilot have determined that the approach can be conducted within the wind, weather, configuration, or other relevant constraints demonstrated for the configuration.
(d) the aircraft dispatcher and pilot have determined from interpretation of the best available information that the runway is expected to be free from standing water, snow, slush, ice, or other contaminants.
(e) the pilot is confident that the aircraft has not experienced damage related to the engine failure that would make an engine inoperative Category III approach unsuccessful, or unsafe.
(f) the operator is approved and the pilot is qualified to conduct a Category III engine inoperative approach.
(g) the aircraft dispatcher and pilot consider that conducting a Category III approach is a safe and appropriate course of action.

(17) Engine Failure During Approach, Prior to Alert Height or Decision Height. If the aircraft, operator, and crew meet Division III, Section(24) for the aircraft and Division VIII, Sections (15) and (16) of this Appendix for operational use, a Category III approach may be continued if an engine failure is experienced after passing the final approach fix.

In the event that an aircraft has not been demonstrated for engine inoperative Category III approach capability, or the operator or crew have not been authorized for Category III engine inoperative approaches, then continuation of an approach in the event of an engine failure is permitted only in accordance with the emergency authority of the pilot to select the safest course of action.

Information Note: *For some aircraft configurations, it may be necessary to discontinue the approach after passing the final approach fix or final approach point; re-trim the aircraft for an inoperative engine, and then re-initiate the approach in order to be able to appropriately complete a satisfactory Category III landing.*

(18) Engine Failure After Passing Alert Height or Decision Height. If an engine fails after passing the Alert Height or Decision Height, the procedure specified in the airplane flight manual for normal or non-normal operations should be followed. All Category III approvals must consider the case of engine failure at, or after, DH or AH. Standard operations specifications are considered to address this case. "Engine inoperative Category III capability" is not specifically a factor in determining response to this situation.

(19) New Category III Operators. New operators should follow demonstration period provisions of Division VII, Section(7). Additionally, typical acceptable minima step down provisions approvable by the DGCA are as follows:

<u>Starting from Category I</u>

Fail - Passive Landing System	100 ft. DH/1000RVR [300 m] then 50 ft. [15 m] DH/600RVR [175 m[
Fail - Operational Landing System	100 ft. DH/1200RVR then 600RVR [175 m], then 300RVR [75 m]

<u>Starting from Category II</u>

Fail - Passive Landing System	50 ft. [15 m] DH/600RVR [175 m]
Fail - Operational Landing System	600RVR [175 m] then 300RVR [75 m]

Each runway/procedure not already being used by any operator of a similar type aircraft must be successfully demonstrated by a line service or an evaluation landing using the Category III system and procedures, in Category II or better conditions, for each aircraft/system type (e.g., B767, L1011). Once this capability has been successfully demonstrated by any operator for a particular runway and aircraft type, subsequent operators may take credit for that demonstration and need not re-demonstrate suitable performance. However, the operator must appropriately address special airports/runways as noted in Division VIII, Section(12) and the DGCA Category II/Category III Status Checklist.

(20) <u>Credit for Experienced Category III Operators for New Authorizations</u>. Experienced operators are considered to be those operators having successfully completed their initial 6 month/ 100 Category III landing demonstration period, and have current operations specifications authorizing use of lowest applicable or intended Category III minima. Division VIII, Sections (21) through (23) below address examples of Category III program changes where "experienced operator" credit may apply.

Operators authorized for Category III using one class of system (e.g., autoland) but who are introducing a significantly different class of system as the basis for a Category III authorization (e.g., manually flown Category III approaches using a HUD) are typically considered to be "New Category III operators" for the purposes of demonstration period provisions and acceptable minima "step down" provisions for that class of system (see Division VIII, Section(19).

(21) <u>New Airports/Runways</u>. New airports/runways may be added to an experienced Category III operators OpSpecs without further demonstration, if the same or equivalent aircraft/airborne system for the approach are shown on the Category II/III status checklist.

Otherwise, the operator needs to accomplish a line service landing at Category II or better weather conditions to ensure satisfactory performance. Special runways on the DGCA Category II/Category III Status Checklist (e.g., irregular terrain runways) may still require special evaluation.

Prior to approval of Category III minima for a particular aircraft type on any facility not formerly approved for Category III use for that type of aircraft, acceptable flight guidance (e.g., autoland, or autoland and rollout) performance if applicable, should be verified. This verification will be made by the DGCA through observation of automatic landings during line operations or training flights in weather conditions at or above Category II minima to determine adequacy of the facility for that type aircraft. In certain special cases, as designated by the DGCA, where the characteristics of the pre-threshold terrain may induce abnormal performance in certain automatic flight control systems, additional analysis or flight demonstrations in line service may be required for each aircraft type prior to approval of Category III minima.

(22) New or Upgraded Airborne System Capability. Unless otherwise specified by the DGCA, experienced Category III operators may initially use new or upgraded airborne system capabilities/ components to the lowest authorized minima established for those systems or components, consistent with the examples provided below. Operators may also request reduced length demonstration periods, consistent with the new airborne systems to be used, FSB requirements, and NAVAIDs, runways, and procedures to used. Examples of this provision include addition of a new capability such as "engine inoperative" autoland to a system currently approved for "all engine" Category III, or introduction of an updated flight guidance system software version on an aircraft previously authorized for Category III for that operator. In such cases, the lowest authorized minima may be used, or may continue to be used, without additional demonstration.

(23) Adding a New Category III Aircraft Type. Experienced Category III operators may operate new or upgraded aircraft types/systems, or derivative types, using reduced length demonstration periods (e.g., less than 6 months/100 landings) when authorized by the DGCA. Demonstration requirements are established considering any applicable FSB criteria, applicability of previous operator service experience, experience with that aircraft type by other operators, experience of crews of that operator for Category III and the type of system, and other such factors, on an individual basis. Appropriate minima reduction steps may also be established for an abbreviated demonstration period, consistent with prior operator experience, NAVAIDs and runways used, and procedures to be used, etc. (e.g., newly acquired B757s being added to Category III OpSpecs, in addition to an operator's currently approved Category III A300 and MD-80 fleets).

(24) Category III Program Status Following Operator Acquisitions/Mergers. Category III operators involved in acquisitions of other operators, or mergers, and the DGCA must ensure compatibility of programs. Procedures, airborne systems, runways served and any other relevant issues must be addressed before amending operations-specifications, or advising the surviving or controlling operator of the status of Category III OpSpecs of the acquired or merged operator.

(25) Initiating New Combined Category II and Category III Programs. Unless otherwise specified by the DGCA, Category II and Category III programs may initiated simultaneously for new operators, or for existing operators currently approved for Category I. Appropriate provisions of both Appendix I, as amended, and Appendix II are used. Operational Suitability Demonstration programs may be simultaneously conducted as long as procedures and systems applicable to both Category II and Category III minima are assessed (e.g., use of Category II DH vs. Category III AH). The lowest authorized minima established during the evaluation program should be as specified in Division VIII, Section(19).

(26) Lebanese Carrier Category III Operations at Foreign Airports. An applicant may be authorized to use Category III minima at foreign airports on the DGCA-approved list. Airports are approved and listed when the following conditions are met:

(a) the airport is approved for Category III operations by the appropriate foreign airport authority.
(b) the visual aids are equivalent to those used for Lebanese Category III approaches.
(c) electronic ground aids are at least equivalent to those designated for Lebanese Category III approaches.
(d) the DGCA has reviewed and verified the conditions in items (1), (2), and (3) above.

The major factors to be considered when approving such airports will be the equivalence with U.S. standards or equivalent of the approach light systems, high intensity runway lights, in-runway lights, quality and integrity of the approach and landing guidance systems, runway marking, procedures for reporting runway visibility, and airport surface traffic control. Although it is recognized that the systems at foreign airports may not be exactly in accordance with U.S. standards, it is important that any foreign facilities used for Category III provide the necessary information or functions consistent with the intent of the U.S. standards or the equivalent used. Carriers desiring Category III approvals at foreign airports or runways not on the DGCA-approved list should submit such requests to the DGCA.

Figure 1. provides a checklist for carriers use to facilitate approval of Category II/III operations at facilities listed in the controlling states Aeronautical Information Publication (AIP). It should be used to ensure suitability of the intended facility and to verify conformance or equivalence with U.S. standards. Completion of this checklist must reflect achieved or completed status -- not planned actions. For ICAO states that do not maintain an AIP, a copy of the Notice to Airmen (NOTAM), obstruction data, and/or a reliable and regular method of correspondence with the charting services used by Lebanese certificate holders must be attached.

Figure 10.13-1.
FACILITY CHECKLIST FOR CATEGORY II/III

AIRPORT (ICAO ID): ________ COUNTRY: ____________ DATE: ____________

Runway: ________ Length: _________ Width: _________ G/S Angle (deg.): ___________

Lowest Minima ________________________ (ft./m) Runway TCH _____________ (ft./m)

Special Limitations (if any):

LIGHTING:
Approach _____ TDZ _____ Centerline ____ HIRL ____ Stopbars _____

Other (e.g., PAPI):

MARKINGS:
Runway _______ Taxiway _______ Other (e.g., Taxiway Position) __________

Critical Area Protection Policy (ceiling/visibility or conditions):
LOC ____________________________ G/S ________________________________

METEOROLOGICAL DATA: METARs ________ TAFs ___________
TRANSMISSOMETERS:
(Locations/Lowest RVR reported/readout step increment)
Touch down _______________ Mid _________________ Rollout _______________

OBSTRUCTION CLEARANCE ASSESSMENT COMPLETION DATE: _________________
Verified by: certificate holder ________, "state of the aerodrome" __________, other _______
Irregular terrain a factor (Y/N): _______ Similar type aircraft currently operate (Y/N) ________

NOTAM SOURCE/CONTACT: ____
FIELD CONDITIONS SOURCE/CONTACT ____

Attached procedure has been developed in accordance with:

ICAO PANS-OPS Doc. 8168-OPS/611, Vol.-11 ____

Other Criteria Accepted by DGCA ____ (indicate criteria) ______________________________

Facility reviewed in accordance with ICAO Manual of All Weather Operations, as revised (DOC 9365/AN910) chapters 3, 5, and 6 DATE REVIEW COMPLETED: _________________

Name: ____________________________
Title: _____________________________
Signature: _________________________
Date: _____________________________

Attachments List:

(27) Category III Operations on Off-Route Charters. Unless otherwise specified by the DGCA, experienced Category III operators may receive authorization to use Category III minima at off-route charter airports and runways as follows:

(a) the runway must be on the DGCA Category II/Category III status checklist, and not be restricted or require special evaluation (e.g., irregular terrain).

(b) the aircraft used must be the same as or equivalent to an aircraft type already using the facility by another DGCA certificated operator (e.g., a charter flight could be considered acceptable using an MD-83 with a "-971 Flight Guidance Control System (FGCS)" at a runway which had current Category III operations authorized for an MD-81 of another operator, but with an earlier but similar FGCS version).

(c) crews must have sufficient information to safely conduct the low visibility operation regarding familiarity with the airport (e.g., SMGC procedures, taxi hold point or gate direction markings, gate location to be used).

(d) the OpSpecs must authorize off-route charter Category III procedures, and

(e) the DGCA must be advised of the specific airports, aircraft, crew qualifications and any special provisions to be used.

(28) Approval of Category III Minima and Issuance of Operations Specifications. Applicants should submit documentation requesting approval of Category III weather minima to the DGCA. The application should demonstrate compliance with the appropriate provisions of applicable sections of this Appendix, particularly Divisions V through X. Proposed operations specifications provisions should be included with the application.

The operators application documentation should be evaluated by the DGCA for approval of Category III minima.

Following DGCA approval, OpSpecs authorizing Category IIIa or Category IIIb minima may be issued (see Attachment 7 for sample Operations Specifications examples).

During the period following the issuance of new or revised operations specifications for Category III (typically 6 months), the operator must successfully complete a suitable operations demonstration and data collection program in "line service" for each type aircraft, as the final part of the approval process.

The approval process is considered to be completed following a successful demonstration period. This is to ensure appropriate performance and reliability of the Category III system with that operators aircraft, procedures, maintenance, airports, and NAVAIDs. This process must be completed before operations down to lowest requested minima are authorized. Division VIII, Section(5) addresses appropriate demonstration process criteria.

In situations involving newly manufactured airplanes or where otherwise authorized by DGCA, the operations demonstration and data collection process may be initiated prior to the issuance of Category III operations specifications. Division VIII, Sections (19) through (25) provide criteria that may be used to establish acceptable operations demonstration time periods, and demonstration program scope for different operator situations, aircraft variants, and low visibility operating experience history.

(29) Operations Specification Amendments. The operator is responsible for maintaining current OpSpecs reflecting current approvals authorized by DGCA. Once DGCA has authorized a change for airborne systems, new runways, or other authorizations, appropriate and timely amendments to affected OpSpecs should be issued. Issuance of amendments to guidance or procedures in other related material such as the Flight Operations Manual or Training Program may also be required. When updated standard operations

specification provisions are adopted by the DGCA, provisions of those updated operations specifications should normally be applied to each operator's program in a timely manner.

(30) Use of Special Obstacle Clearance Criteria (e.g., RNP criteria). This Section addresses use of special criteria such as "Required Navigation Performance" (RNP) criteria. Pending implementation of RNP criteria for public use Standard Instrument Approach Procedures (SIAPS), obstacle assessments using RNP criteria will be conducted on a case-by-case basis, and for Category III, only authorized as an element of special procedures for RNP qualified operators, using RNP qualified aircraft. Early application of RNP for special procedures is typically intended to apply to instrument procedure segments classified as a transition to a final approach segment, or to facilitate definition of suitable missed approach segments. Use of special obstacle clearance criteria or RNP criteria must be approved by the DGCA for any Category III procedures.

(31) Proof-of-Concept Requirements for New Systems/Methods. Proof-of-Concept [PoC] as used in this Appendix is defined as:

A generic demonstration in a full operational environment of facilities, weather, crew complement, airborne systems and any other relevant parameters necessary to show concept validity in terms of performance, system reliability, repeatability, and typical pilot response to failures as well as to demonstrate that an equivalent level of safety is provided.

Proof-of-Concept may be established by a combination of analysis, simulation and/or flight demonstrations in an operational environment. PoC is typically a combined effort of an Authority's CAA airworthiness and operational organizations with the applicant, with input from any associated or interested organizations.

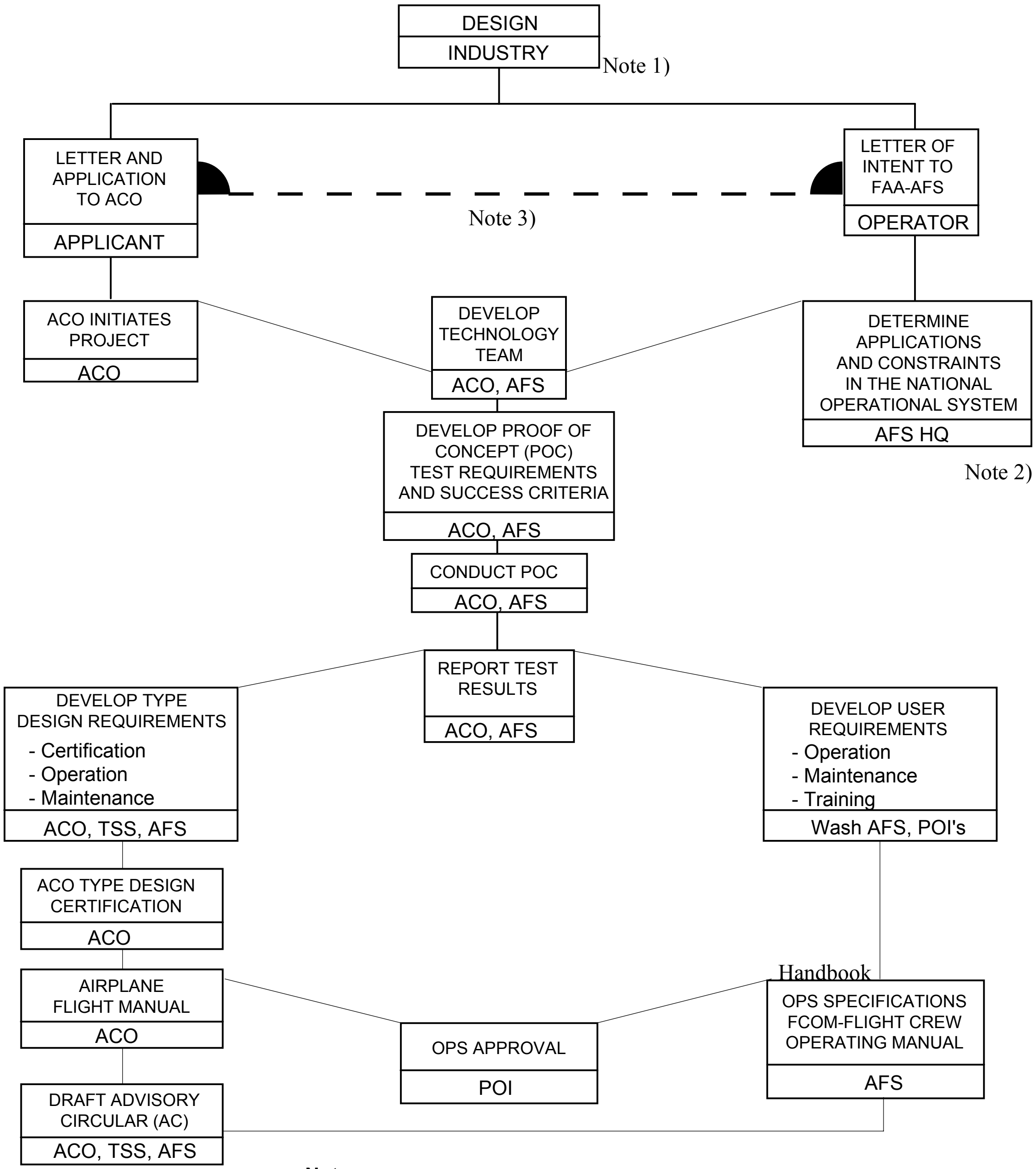
A typical PoC program consists of the following elements:

(a) applicant submits a request to either Aircraft Certification or Flight Standards.
(b) meetings are arranged to include all disciplines involved: Aircraft certification; Flight Standards; NRSs; the applicant, and supporting personnel as necessary (e.g., Air Traffic and representative flightcrews, as appropriate).
(c) a test plan is established which includes input from applicable CAA organizations, the applicant, and as applicable, industry user groups.
(d) the test plan should include as a minimum: system definition, operations procedures, qualification, training, weather and environment definition, normal, rare-normal, and non-normal conditions to be assessed, flightcrew, test subject, and test crew requirements, test procedures, test safety constraints as applicable, assessment criteria, and analysis, simulator and test aircraft requirements, and a clear understanding of what constitutes a successful test and proof of concept.
(e) PoC is conducted using agreed subject pilots, as appropriate.
(f) PoC data is collected in a real-time simulator environment and validated in a realistic airplane environment.
(g) The CAA is responsible for assessing the PoC data which is typically provided to DGCA as agreed by DGCA and the applicant. DGCA reports relevant findings to the applicant and if applicable, interested industry representatives.
(h) CAA operations and airworthiness organizations use the data to develop criteria for approval of type designs, certification processes and procedures, operating concepts, facilities, flightcrew/aircraft dispatcher and maintenance qualification, operations specification, operations procedures, manuals, AFMs, maintenance procedures, and any criteria necessary.

(i) CAA Appendix criteria for airworthiness and operational approval typically is a product of PoC assessment.

This process is presented pictorially in the following figure.

TECHNOLOGY DEVELOPMENT PROCESS



Note: 1) Futher modifications to the applicant's original Type Design may require additional technology revisions and/or follow on Proof of Concept testing.
2) The AFS group has the responsibility to coordinate with all Industry technology groups (ALPA, APA, ATA, ADF Industry, manufactures, vendors, DOD, NASA, etc.)
3) Both the FAA ACO and FAA AFS should be contacted to provide certification and operational data to the respective offices.

Index: ACO - Aircraft Certification Office (Including Aircraft Evaluation Group)
AFS - Washington Flight Standards Policy Office
TSS - Transport Standards Staff

RRD7/19/94

DIVISION IX
FOREIGN AIR CARRIER CATEGORY III AT LEBANESE AIRPORTS (PART VII OPERATIONS SPECIFICATIONS).

(1) Use of ICAO or DGCA Criteria. International operators requesting or authorized for Category III at Lebanese airports should meet criteria of Division IX, Sections (2) through (4) below.
(2) Acceptable Criteria. Criteria Acceptable for use for assessment of international operator's applications for Cat III at US airports includes this Appendix, equivalent JAA criteria, or the ICAO Manual of All Weather Operations DOC 9365/AN910, as amended.

International operators must meet criteria of this Appendix, or equivalent criteria acceptable to DGCA, for those applicable provisions.

(3) Foreign Operator AFM Provisions. Unless otherwise authorized by DGCA, aircraft used by international operators for Category III within Lebanon should have AFM provisions reflecting an appropriate level of Category III capability as demonstrated, or demonstrated to or authorized by an authority recognized by DGCA, as having acceptable equivalent Category III airworthiness criteria (e.g., European JAA, Canada MOT, UK CAA).
(4) Foreign Operator Category III Demonstrations. International (Foreign) Air Carriers meeting DGCA criteria, or criteria acceptable to DGCA (e.g., European JAA, ICAO Criteria including Doc 9365/AN910), and having more than six months experience in use of Category III operations with the applicable aircraft type may be approved for Category III in accordance with provisions of their own regulatory authority, or in accordance with standard provisions of the LARS Part VI1, Subpart 1 OpSpecs, which ever is the more restrictive. However, operators approved in accordance with this provision may nonetheless be subject to additional DGCA demonstration requirements for special situations, such as at airports with irregular underlying terrain.

International (Foreign) Air Carriers not meeting above provisions may be subject to the demonstration requirements equivalent to those necessary for Lebanese operators, as determined applicable by DGCA.

(5) Issuance of Part VII, Subpart 1 Operations Specifications. International (Foreign) Air Carriers operating to Lebanese airports which meet applicable provisions above are approved for Category III through issuance of Part VII, Subpart 1 OpSpecs.

Operators intending Category III operations at Lebanese designated irregular terrain airports, or airports otherwise requiring special assessments must successfully complete those assessments prior to use of those facilities.

Each foreign operator seeking Category III procedure authorization at a facility not published as a standard and unrestricted Category III SIAP, or at any other facilities identified as special or restricted on the DGCA Category II/III Status checklist, and that operator's controlling authority must:

(a) be aware of the restrictions applicable to the procedure (e.g., facility status),
(b) provide evidence to DGCA of the controlling authority's approval of the operator for each special procedure requested, and
(c) must have the applicable limitations and conditions included in that operator's Part VII, Subpart 1 OpSpecs for each procedure to be used.

Foreign operators shall not normally be authorized special Category III operations to minima lower than those specified in Category III SIAPS consistent with ICAO criteria.

DIVISION X
OPERATOR REPORTING, AND TAKING CORRECTIVE ACTIONS.

(1) Operator Reporting. The reporting of satisfactory and unsatisfactory Category III aircraft performance is a useful tool in establishing and maintaining effective maintenance and operating policy and procedures. Information obtained from reporting data and its analysis is useful in recommending and issuing appropriate corrective action(s).

Accordingly, for a period of at least 1 year after an applicant has been advised that its aircraft and program meet Category III requirements, and reduced minima are authorized, the operator is to provide a monthly summary to the DGCA of the following information:

(a) the total number of approaches where the equipment constituting the airborne portion of the Category III system was utilized to make satisfactory (actual or simulated) approaches to the applicable Category III minima (by aircraft type).

(b) the total number of unsatisfactory approaches by airport and aircraft registration number with explanations in the following categories - airborne equipment faults, ground facility difficulties, aborts of approaches because of ATC instructions, or other reasons.

(c) notify the certificate-holding office as soon as possible of any system failures or abnormalities which require flightcrew intervention after passing 100 ft.[30 m] during operations in weather conditions below Category I minima.

This 1 year recording and reporting requirement applies to the initial Category III airplane, however, when maintained over longer periods of time the report data substantiates a successful program and can identify trends, or recurring problems that may not be related to aircraft performance.

(2) Operator Corrective Actions. In addition to the corrective actions contained in the operations and maintenance manuals, operators are expected to take appropriate corrective actions when they determine that conditions exist which could adversely affect safe Category III operations. Examples of situations for which an operator may need to take action restricting, limiting, or discontinuing Category III operations include:

Repeated aircraft system difficulties, repeated maintenance write-ups, chronic pilot reports of unacceptable landing performance, applicable service bulletin issuance, ADs, navaid status or performance problems, applicable NOTAMs, airport facility status change, air traffic procedure adjustment, lighting, marking, or standby power system status outages, airport construction, obstacle construction, temporary obstacles, natural disasters, adverse weather, snow banks, snow removal, icy runways or taxiways, deep snow in glide slope critical areas, inability to confirm appropriate critical area protection at foreign airports, and other such conditions.

Examples of appropriate corrective action could be an adjustment of Category III programs, procedures, training, modification to aircraft, restriction of minima, limitations on winds, restriction of navaid facility use, adjustment of payload, service bulletin incorporation, or other such measures necessary to ensure safe operation.

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ATTACHMENT 1
DEFINITIONS AND ACRONYMS

This Attachment contains the definition of terms and acronyms used within this Standard, Attachment III. This Attachment also contains certain terms that are not used in this Standard but are used in related material and are included for convenient reference. Certain definition of terms and acronyms are also provided to facilitate common use of this Standard for other related Standards.

Definitions.

Actual Navigation Performance	A measure of the current estimated navigation performance, excluding Flight Technical Error (FTE). Actual Navigation Performance is measured in terms of accuracy, integrity, and availability of navigation signals and equipment. Note: Also see Estimated Position Uncertainty [EPU].
Aeronautical Chart Critical Data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a very low probability of significant error and very high probability of validity [e.g., P_{error} per unit data element <1 X 10^{-8}]
Aeronautical Chart Essential Data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a low probability of significant error and high probability of validity [e.g., P_{error} per unit data element <1 X 10^{-5}]
Aeronautical Chart Routine Data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a routine possibility of significant error and routine validity [e.g., P_{error} per unit data element <1 X 10^{-3}]
Approach Intercept Waypoint (APIWP)	Variable waypoint used only when intercepting the Final Approach Segment (FAS).
Automatic Dependent Surveillance (ADS)	A surveillance technique in which aircraft automatically provide, via data link, data derived from on-board navigation and position fixing systems, including aircraft identification, four dimensional position and additional data as appropriate (ICAO - IS&RP Annex 6).

Alert Height	A height above the runway based on the characteristics of the aircraft and its fail-operational landing system, above which a Category III approach would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the fail operational landing system, or in the relevant ground equipment. (ICAO - IS&RP Annex 6).
Airborne Navigation system	The airborne equipment that senses and computes the aircraft position relative to the defined path, and provides information to the displays and to the flight guidance system. It may include a number of receivers and/or system computers such as a Flight Management Computer and typically provides inputs to the Flight Guidance System.
Automatic Go-Around	A Go-Around which is accomplished by an autopilot following pilot selection and initiation of the "Go-Around" autopilot mode, when an autopilot is engaged in an "approach mode."
Availability	An expectation that systems or elements required for an operations will be available to perform their intended functions so that the operation will be accomplished as planned to an acceptable level of probability.
Balked Landing	A discontinued landing attempt. Term is often used in conjunction with aircraft configuration or performance assessment, as in "Balked landing climb gradient," Also see "Rejected Landing."
Catastrophic Failure Condition	Failure Condition which would result in multiple fatalities, usually with the loss of the airplane.
Category I	A precision instrument approach and landing with a decision height not lower than 60m (200 ft) and with either a visibility not less than 800m (2400 ft), or a runway visual range not less than 550m (1800 ft). (ICAO - IS&RP Annex 6).
Category II	A precision instrument approach and landing with a decision height lower than 60m (200 ft) but not lower than 30m (100 ft) and a runway visual range not less than 350m (1200 ft). (ICAO - IS&RP Annex 6).
Category IIIa	A precision instrument approach and landing with a decision height lower than 30m (100 ft), or no decision height and a runway visual range not less than 200m (700 ft). (ICAO - IS&RP Annex 6).

Category IIIb	A precision instrument approach and landing with a decision height lower than 15m (50 ft), or no decision height and a runway visual range less than 200m (700 ft) but not less than 50m (150 ft). (ICAO - IS&RP Annex 6). Note - the United States does not use Decision Heights for Category IIIb.
Category IIIc	A precision instrument approach and landing with no decision height and no runway visual range limitations. (ICAO - IS&RP Annex 6).
Class I Navigation	Navigation within the Service Volume of an ICAO Standard NAVAID.
Class II Navigation	A flight operation or portion of a flight operation (irrespective of the means of navigation) which takes place outside (beyond) the designated Operational Service Volume of an ICAO standard airway navigation facility or NAVAID (e.g., VOR, VOR/DME, NDB).
Combiner	The element of the head-up- display (HUD) in which the pilot simultaneously views the external visual scene along with synthetic information provided in symbolic form.
Command Information	Information that directs the pilot to follow a course of action in a specific situation (e.g., Flight Director).
Conformal Information	Information which correctly overlays the image of the real world, irrespective of the pilots viewing position.
Datum Crossing Height [DCH]	The height (in feet or meters) of the Flight Path Control Point above the Runway Datum Point.
Decision Altitude (DA)	A specified altitude in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established. (Adapted from ICAO – IS&RP Annex 6).

Decision Altitude (Height) DA(H)	For Category I, a specified minimum altitude in an approach by which a missed approach must be initiated if the required visual reference to continue the approach has not been established. The "Altitude" value is typically measured by a barometric altimeter or equivalent (e.g., Inner Marker) and is the determining factor for minima for Category I Instrument Approach Procedures. The "Height" value specified in parenthesis is typically a radio altitude equivalent height above the touchdown zone (HAT) used only for advisory reference and does not necessarily reflect actual height above underlying terrain. For Category II and certain Category III procedures (e.g., when using a Fail-Passive autoflight system) the Decision Height (or an equivalent IM position fix) is the controlling minima, and the altitude value specified is advisory. The altitude value is available for cross reference. Use of a barometrically referenced DA for Category II is not currently authorized for 14 CFR part 121, 129 or 135 operations at U.S. facilities (Adapted from ICAO - IS&RP Annex 6).
Decision Height (DH)	A specified height in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established (Adapted from ICAO - IS&RP Annex 6).
Design Eye Box	The three dimensional volume in space surrounding the Design Eye Position from which the HUD information can be viewed.
Design Eye Position	The position at each pilot's station from which a seated pilot achieves the optimum combination of outside visibility and instrument scan.
Defined Path	The path that is defined by the path definition function.
Desired Path	The path that the flightcrew and air traffic control can expect the aircraft to fly.
Enhanced Vision System	An electronic means to provide the flightcrew with a synthetic image of the external scene.
Estimate of Position Uncertainty [EPU], or Estimated Position Error [EPE]	A measure based on a scale which conveys the current position estimation performance - Also called Estimated Position Error (EPE)
Extended Final Approach Segment (EFAS)	That segment of an approach, co-linear with the Final Approach Segment, but which extends beyond the Glidepath Intercept

	Waypoint (GPIWP) or Approach Intercept Waypoint (APIWP).
External Visual Reference	Information the pilot derives from visual observation of real world cues outside the cockpit.
Extremely Improbable	A probability of occurrence on the order of 1×10^{-9} or less per hour of flight, or per event (e.g., takeoff, landing).
Extremely Remote	A probability of occurrence between the orders of 1×10^{-9} and 1×10^{-7} per hour of flight, or per event (e.g., takeoff, landing).
Fail Operational System	A system capable of completing the specified phases of an operation following the failure of any single system component after passing a point designated by the applicable safety analysis (e.g., Alert Height).
Fail Passive System	A system which, in the event of a failure, causes no significant deviation of aircraft flight path or attitude.
Field of View	As applied to a Head Up Display - the angular extent of the display that can be seen from within the design eye box.
Frequent	Occurring more often than 1 in 1000 events or 1000 flight hours.
Final Approach Course (FAC)	The final bearing/radial/track of an instrument approach leading to a runway, without regard to distance. For certain previously designed approach procedures that are not aligned with a runway, the FAC bearing/radial/track of an instrument approach may lead to the extended runway centerline, rather than to alignment with the runway.
Final Approach Fix (FAF)	The fix from which the final approach to an airport is executed. For standard procedures that do not involve multiple approaches segments intercepting the runway centerline near the runway, the FAF typically identifies the beginning of the straight-in final approach segment.
Final Approach Point (FAP)	The point applicable to instrument approaches other than ILS, MLS or GLS, with no depicted FAF (e.g., only applies to approaches such as an on-airport VOR or NDB), where the aircraft is established inbound on the final approach course from a procedure turn, and where descent to the next procedurally specified altitude, or to minimum altitude, may be commenced.
Final Approach Segment (FAS)	The segment of an approach extending from the Glidepath Intercept Waypoint (GPIWP) or Approach Intercept Waypoint (APIWP), whichever occurs later, to the Glidepath Intercept

	Reference Point (GIRP).
Flight Guidance System	The means available to the flightcrew to maneuver the aircraft in a specific manner either manually or automatically. It may include a number of components such as the autopilot, flight directors, relevant display and annunciation elements and it typically accepts inputs from the airborne navigation system.
Flight Path Alignment Point (FPAP)	The FPAP is a point, usually at or near the stop end of a runway, used in conjunction with the RDP and a vector normal to the WGS-84 ellipsoid at the RDP to define the geodesic plane of a final approach and landing flight path. The FPAP typically may be the RDP for the reciprocal runway.
Flight Path Control Point (FPCP)	The Flight Path Control Point (FPCP) is a calculated point located directly above the Runway Datum Point. The FPCP is used to relate the vertical descent of the final approach flight path to the landing runway.
Flight Technical Error (FTE)	The accuracy with which the aircraft is controlled as measured by the indicated aircraft position with respect to the indicated command or desired position. Note: FTE does not include human performance conceptual errors, typically which may be of large magnitude (e.g., entry of an incorrect way-point or waypoint position, selection of an incorrect procedure, selection of an incorrect NAVAID frequency, failure to select a proper flight guidance mode).
Glide Path Angle [GPA]	The glide path angle is an angle, defined at the FPCP, that establishes the descent gradient for the final approach flight path of an approach procedure. It is measured in the geodesic plane of the approach (defined by the RDP, FPAP, and WGS-84 ellipsoid's center). The vertical and horizontal references for the GPA are a vector normal to the WGS-84 ellipsoid at the RDP and a plane perpendicular to that vector at the FPCP, respectively.
Glide Path Intercept Waypoint (GPIWP)	The point at which the established glide slope intercept altitude (MSL) meets the Final Approach Segment (FAS), on a standard day, using a standard altimeter setting (1013.2 HPa or 29.92 in).
Glidepath Intercept Reference Point [GIRP]	The Glidepath Intercept Reference Point is the point at which the extension of the final approach path intercepts the runway.

GNSS Landing System (GLS)	A differential GNSS (e.g., GPS) based landing system providing both vertical and lateral position fixing capability. Note: Term may be applied to any GNSS based differentially corrected landing system providing lateral and vertical service for approach and landing equivalent to or better than that provided by a U.S. Type I ILS, or equivalent ILS specified by ICAO Annex 10.
Global Positioning System [GPS]	The NAVSTAR Global Positioning System operated by the United States Department of Defense. It is a satellite -based radio navigation system composed of space, control and user segments. The space segment is composed of satellites. The control segment is composed of monitor stations, ground antennas and a master control station. The user segment consists of antennas and receiver-processors that derive time and compute a position and velocity from the data transmitted from the satellites.
Global Navigation Satellite System [GNSS]	A world wide position, velocity and time determination system that uses one or more satellite constellations.
Guidance	Information used during manual control or monitoring of automatic control of the aircraft that is of sufficient quality to be used by itself for the intended purpose.
Go-around	A transition from an approach to a stabilized climb.
Hazardous Failure Condition	Failure Conditions which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be: (i) A large reduction in safety margins or functional capabilities; (ii) Physical distress or higher workload such that the flightcrew cannot be relied upon to perform their tasks accurately or completely; or (iii) Serious or fatal injury to a relatively small number of the occupants.
Head Up Display System	An aircraft system which provides head-up guidance to the pilot during flight. It includes the display element, sensors, computers and power supplies, indications and controls. It may receive inputs from an airborne navigation system or flight guidance system.

Hybrid System	A combination of two, or more, systems of dissimilar design used to perform a particular operation.
Improbable	A probability of occurrence greater than 1×10^{-9} but less than or equal to 1×10^{-5} per hour of flight, or per event (e.g., takeoff, landing).
Independent Systems	A system that is not adversely influenced by the operation, computation, or failure of some other identical, related, or separate system (e.g., two separate ILS receivers).
Infrequent	Occurring less often than 1 in 1000 events or 1000 flight hours.
Initial Missed Approach (IMAWP)	Waypoint used to define the Missed Approach Point (MAP).
Initial Missed Approach Segment	That segment of an approach from the Glide Path Intercept Waypoint (GPIWP) to the Initial Missed Approach Waypoint (IMAWP).
Instantaneous Field of View	The angular extent of a HUD display which can be seen from either eye from a fixed position of the head.
Integrity	A measure of the acceptability of a system, or system element, to contribute to the required safety of an operation.
Landing	For the purpose of this ATTACHMENT, landing will begin at 100 ft., the DH or the AH to the first contact of the wheels with the runway.
Landing rollout	For the purpose of this ATTACHMENT, rollout starts from the first contact of the wheels with the runway and finishes when the airplane has slowed to a safe taxi speed (in the order of 30 knots).
Major Failure Condition	Failure Condition which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be, for example, a significant reduction in safety margins or functional capabilities, a significant increase in crew workload or in conditions impairing crew efficiency, or discomfort to occupants, possibly including injuries.
Minimum Descent Altitude(Height) [MDA(H)]	See individual definitions below for MDA and MDH.

Minimum Descent Altitude (MDA)	A specified altitude in a non-precision approach or circling approach below which descent must not be made without the required visual reference. Minimum Descent Altitude (MDA) is referenced to mean sea level. (ICAO - IS&RP Annex 6).
Minimum Descent Height (MDH)	A specified height in a non-precision approach or circling approach below which descent must not be made without the required visual reference. Minimum Descent Height (MDH) is referenced to aerodrome elevation or to the threshold if that is more than 7 ft. (2m) below the aerodrome elevation. A MDH for a circling approach is referenced to the aerodrome elevation. (ICAO - IS&RP Annex 6). Note - The United States does not use Minimum Descent Heights.
Minimum Use Height (MUH)	A height specified during airworthiness demonstration or review above which, under standard or specified conditions, a probable failures of a system is not likely to cause a significant path displacement unacceptably reducing flight path clearance from specified reference surfaces (e.g., airport elevation) or specified obstacle clearance surfaces.
Minor Failure Condition	Failure Condition which would not significantly reduce airplane safety and which involve crew actions that are well within their capabilities. Minor Failure Conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some inconvenience to occupants.
Missed Approach	The flight path followed by an aircraft after discontinuation of an approach procedure and initiation of a go-around. Typically a “missed approach” follows a published missed approach segment of an instrument approach procedure, or follows radar vectors to a missed approach point, return to landing, or diversion to an alternate.
Monitored HUD	A HUD which has internal or external capability to reliably detect erroneous sensor inputs or guidance outputs, to assure that a pilot does not receive incorrect or misleading guidance, failure, or status information.
Non-Normal Means of Navigation	A means of navigation which does not satisfy one or more of the necessary levels of accuracy, integrity, and availability for a particular area, route, procedure or operation, and which may require use of a pilot's "emergency authority" to continue navigation.
NOTAM	Notice to Airmen - A notice distributed by means of telecommunication

	containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. (ICAO - IS&RP Annex 6).
Performance	A measure of the accuracy with which an aircraft, a system, or an element of a system operates compared against specified parameters. Performance demonstration(s) typically include the component of Flight Technical Error (FTE).
Primary Means of Navigation	A means of navigation which satisfies the necessary levels of accuracy and integrity for a particular area, route, procedure or operation. The failure of a "Primary Means" of navigation may result in, or require reversion to a "non-normal" means of navigation, or an alternate level of RNP. NOTE: Qualification as a "primary means" of navigation typically requires that ANP/EPU be less than RNP for 99.99% of the time.
Rejected Landing	A discontinued landing attempt. A rejected landing typically is initiated at low altitude, but prior to touchdown. If from or following an instrument approach it typically is considered to be initiated below DA(H) or MDA(H). A rejected landing may be initiated in either VMC or IMC. A rejected landing typically leads to or results in a "go around," and if following an instrument approach, a "Missed Approach." If related to consideration of aircraft configuration(s) or performance it is sometime referred to as a "Balked Landing." The term "rejected landing is used to be consistent with regulatory references.
Remote	A probability of occurrence greater than 1×10^{-7} but less than or equal to 1×10^{-5} per hour of flight, or per event (e.g., takeoff, landing).
Required Navigation Performance (RNP)	A statement of the navigation performance necessary for operation within a defined airspace (Adapted from ICAO - IS&RP Annex 6). NOTE: Required Navigation Performance is specified in terms of accuracy, integrity, and availability of navigation signals and equipment for a particular airspace, route, procedure or operation.

Required Navigation Performance Containment (RNP Containment)	RNP Containment represents a bound of the rare-normal performance and specified non-normal performance of a system, typically expressed as 2*RNP(X). When RNP represents Gaussian statistical performance at a level of two sigma (2 x standard deviation), then containment represents a nominal performance bound specified at the level of four sigma (4 x standard deviation). Note: RNP containment use may vary with intended operational applications.
Required Navigation Performance Level or Type (RNP Level or RNP Type)	A value typically expressed as a distance in nautical miles from the intended position within which an aircraft would be for at least 95 percent of the total flying time (Adapted from ICAO - IS&RP Annex 6). NOTE: Applications of RNP to terminal area and other operations may also include a vertical and/or longitudinal component. ICAO may use the term RNP Type, while certain other States, aircraft manuals, procedures, and operators may use the term RNP Level. Example - RNP 4 represents a navigation lateral accuracy of plus or minus 4 nm (7.4 km) on a 95% basis. RNP is typically defined in terms of its lateral accuracy, and has an associated lateral containment boundary.
Required Visual Reference	That section of the visual aids or of the approach area which should have been in view for sufficient time for the pilots to have made an assessment of the aircraft's position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height, the required visual reference is that specified for the particular procedure and operations (ICAO - IS&RP Annex 6 - Decision Height definition - Note 2).
Runway Datum Point (RDP)	The RDP is used in conjunction with the FPAP and a vector normal to the WGS-84 ellipsoid at the RDP to define the geodesic plane of a final approach flight path to the runway for touchdown and rollout. It is a point at the designated lateral center of the landing runway defined by latitude, longitude, and ellipsoidal height. The RDP is typically a surveyed reference point used to connect the approach flight path with the runway. The RDP may or may not necessarily be coincident with the designated runway threshold
Runway Segment (RWS)	That segment of an approach from the glidepath intercept reference point (GIRP) to Flight Path Alignment Point (FPAP).
Situation Information	Information that directly informs the pilot about the status of the aircraft system operation or specific flight parameters including flight path.

Standard Landing Aid (SLA)	In the context of this section of this ATTACHMENT, is a navigation service provided by a State which meets internationally accepted performance standards (e.g., ICAO Standards and Recommended Practices (SARP's) or equivalent State standards).
Supplementary Means of Navigation	A means of navigation which satisfies one or more of the necessary levels of accuracy, integrity, or availability for a particular area, route, procedure or operation. The failure of a "Supplementary Means" of navigation may result in, or require reversion to another alternate "normal" means of navigation for the intended route, procedure or operation. NOTE: Qualification as a "supplementary means" of navigation typically requires that ANP/EPU be less than RNP for 99% of the time.
Synthetic Reference	Information provided to the crew by instrumentation or electronic displays. May be either command or situation information.
Synthetic Vision System	A system used to create a synthetic image representing the environment external to the airplane.
Take off Guidance System	A system which provides directional command guidance to the pilot during a takeoff, or takeoff and aborted takeoff. It includes sensors, computers and power supplies, indications and controls.
Total Field of View	The maximum angular extent of the display that can be seen with either eye, allowing head motion within the design eye box.
Touch Down Zone (TDZ)	The first 3000 ft. [1000 m] of usable runway for landing, unless otherwise specified by the DGCA, or other applicable ICAO or State authority (e.g., for STOL aircraft, or in accordance with an SFAR).
Visual Guidance	Visual information the pilot derives from the observation of real world cues, outside the cockpit and uses as the primary reference for aircraft control or flight path assessment.

ACRONYMS.

ACRONYM	EXPANSION
ABAS	Aircraft Based Augmentation System
AC	Advisory Circular
ACI	Adjacent Channel Interface
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
ADS	Automatic Dependent Surveillance
AFCS	Autopilot Flight Control System
AFDS	Autopilot Flight Director System
AFGS	Automatic Flight Guidance System
AFM	Airplane Flight Manual
AH	Alert Height
AHI	All-Weather Harmonization Items
AIP	Aeronautical Information Publication
ALS	Approach Light System
ANP	Actual Navigation Performance
APIWP	Approach Intercept Waypoint
APM	Aircrew Program Manager
APU	Auxiliary Power Unit
AQP	Advanced Qualification Program
ARA	Airborne Radar Approach
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATOGW	Allowable Takeoff Gross Weight
ATPC	Airline Transport Pilot Certificate
ATS	Air Traffic Service
AWO	All Weather Operations
BARO	[Abbreviation for "Barometric"]
BC	Back Course (e.g., ILS Back Course)
BITE	Built-In Test Equipment
CAA	Civil Aviation Authority
CDL	Configuration Deviation List

CFR	U.S. Code of Federal Regulations
CFR	Crash Fire Rescue
CL	Centerline Lights
CNS	Communication, Navigation and Surveillance
CRM	Collision Risk Model
CRM	Cockpit Resource Management
CVR	Cockpit Voice Recorder
DA	Decision Altitude
DA(H)	Decision Altitude(Height)
DCH	Datum Crossing Height
DD	DME-DME updating
DDM	Difference of Depth Modulation
DEP	Design Eye Position
DGNSS	Differential Global Navigation Satellite System
DH	Decision Height
DME	Distance Measuring Equipment
DP	Departure Procedure
EADI	Electronic Attitude Director Indicator
ECEF	Earth Centered Earth Fixed
EFAS	Extended Final Approach Segment
EGPWS	Enhanced Ground Proximity Warning System
EHSI	Electronic Horizontal Situation Indicator
EPE	Estimated Position Error
EPU	Estimated Position Uncertainty
EROPS	Extended Range Operations (any number of engines)
ET	Elapsed Time
ET	Error Term [FMS use]
ETOPS	Extended Range Operations with Two-Engine Airplanes
EVS	Enhanced Vision System
FAF	Final Approach Fix
FAP	Final Approach Point
FAR	Federal Aviation Regulation
FAS	Final Approach Segment
FBS	Fixed Base Simulator

FBW	Fly-by-wire
FCOM	Flight Crew Operating Manual
FDR	Flight Data Recorder
FGS	Flight Guidance System
FHA	Functional Hazard Assessment
FLIR	Forward Looking Infrared Sensor
FM	Frequency Modulation
FM	Fan Marker
FMC	Flight Management Computer
FMS	Flight Management System
FPAP	Flight Path Alignment Point
FPA	Flight Path Angle
FPCP	Flight Path Control Point
FSB	Flight Standardization Board
FTE	Flight Technical Error
GA	Go-Around
GBAS	Ground Based Augmentation System
GCA	Ground Controlled Approach
GIRP	Glidepath Intercept Reference Point
GLS	GPS (or GNSS) Landing System
GNSS	Global Navigation Satellite System
GPA	Glide Path Angle
GPIWP	Glide Path Intercept Waypoint
GPWS	Ground Proximity Warning System
GPS	Global Positioning System
HAA	Height Above Airport
HAT	Height above Touchdown
HDG	Heading
HQRS	Handling Quality Rating System (see AC 25-7A, as amended)
HUD	Head Up Display
IAP	Instrument Approach Procedure
IAW	In Accordance With
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules

IM	Inner Marker
IMAS	Initial Missed Approach Segment
IMAWP	Initial Missed Approach Waypoint
IMC	Instrument Meteorological Conditions
ILS	Instrument Landing System
INAS	International Airspace System
IOE	Initial Operating Experience
IRS	Inertial Reference System
IRU	Inertial Reference Unit
JAA	Joint Aviation Authority
JAR AWO	Joint Aviation Regulations – All Weather Operations
KRM	[Type of Landing system used in certain foreign States]
LAAS	Local Area Augmentation System
LAD	Local Area Differential
LAHSO	Land And Hold Short Operation
LDA	Localizer Descent Aid [approach type]
LLM	Lower Landing Minima
LMM	Compass Locator Middle Marker
LLTV	Low Light Level TV
LNAV	Lateral Navigation
LOC	[ILS] Localizer
LOE	Line operational evaluation
LOFT	Line oriented flight training
LOM	Compass Locator Outer Marker
LOS	Line oriented simulation
MAP	Mode Annunciator Panel
MAP	Missed Approach Point
MASPS	Minimum Aviation System Performance Standards
MB	Marker Beacon
MCP	Mode Control Panel
MDA	Minimum Descent Altitude
MDA(H)	Minimum Descent Altitude(Height)
MDH	Minimum Descent Height - NOTE: MDH is not used for U.S. Operations
MEH	Minimum Engage Height

MEL	Minimum Equipment List
METAR	ICAO Routine Aviation Weather Report
MLS	Microwave Landing System
MM	Middle Marker
MMEL	Master Minimum Equipment List
MMR	Multi-mode Receiver
MOT	Ministry of Transport
MRB	Maintenance Review Board
MSL	Mean Sea Level [altitude reference datum]
MUH	Minimum Use Height
MVA	Minimum Vectoring Altitude
NA	Not Authorized or Not Applicable
NAS	National Airspace System
NAVAID	Navigational Aid
ND	Navigation Display
NDB	Navigation Data Base
NDB	Non-directional Beacon
NOTAM	Notice to Airman
NRS	National Resource Specialist
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OCL	Obstacle Clearance Limit
OIS	Obstacle Identification Surface
OM	Outer Marker
OSAP	Offshore Standard Approach Procedure
PAI	Principal Avionics Inspector
PAR	Precision Approach Radar
PC/PT	Proficiency Check/Proficiency Training
PF	Pilot Flying
PFC	Porous Friction Coarse [runway surface]
PIC	Pilot in Command
PIREP	Pilot Weather Report
PNF	Pilot Not Flying
POC	Proof of Concept

POI	Principal Operations Inspector
PMI	Principal Maintenance Inspector
PRD	Progressive Re-Dispatch
PRM	Precision Radar Monitor
PTS	Practical Test Standard
QFE	Altimeter Setting referenced to airport field elevation
QNE	Altimeter Setting referenced to standard pressure (1013.2HPa or 29.92")
QNH	Altimeter Setting referenced to airport ambient local pressure
QRH	Quick Reference Handbook
RA	Radio Altitude or Radar Altimeter
RAIL	Runway Alignment Indicator Light System
RCLM	Runway Center Line Markings
RDMI	Radio Direction Magnetic Indicator
RDP	Runway Datum Point
REIL	Runway End Identification Lights
RII	Required Inspection Item
RMI	Radio Magnetic Indicator
RMS	Root-mean-square
RNAV	Area Navigation
RNP	Required Navigation Performance
RNPx2	RNP Containment Limit (2 times RNP value)
RTCA	Radio Technical Commission for Aeronautics
RTS	Return to Service
RTO	Rejected Takeoff
RVR	Runway Visual Range
RVV	Runway Visibility Value
RWS	Runway Segment
RWY	Runway
SA	Selective Availability
SARPS	ICAO Standards and Recommended Practices
SBAS	Space Based Augmentation System
SDF	Simplified Directional Facility
SFL	Sequence Flasher Lights
SIAP	Standard Instrument Approach Procedure

SID	Standard Instrument Departure
SLA	Standard Landing Aid
SLF	Supervised Line Flying
SMGC	Surface Movement Guidance and Control
SMGCP	Surface Movement Guidance and Control Plan
SMGCS	Surface Movement Guidance and Control System
STAR	Standard Terminal Arrival Route
STC	Supplemental Type Certificate
STOL	Short Takeoff and Landing
SRE	[Type of Landing system used in certain foreign States]
SV	Space Vehicle
TACAN	Tactical Air Navigation system [NAVAID]
TAF	Terminal Aviation Forecast
TC	Type Certificate
TDZ	Touchdown Zone
TERPS	[U.S.] Standard for Terminal Instrument Procedures
TLS	Target Level of Safety
TOGA	Takeoff or Go-Around [FGS Mode]
TSE	Total system error
ua	micro amps
VASI	Visual Approach Slope Indicator
VDP	Visual Descent Point
VFR	Visual Flight Rules
VHF	Very High Frequency
VIS	Visibility
VOR	VHF Omni-directional Radio Range
VORTAC	Co-located VOR and TACAN
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
V_1	Takeoff Decision Speed
V_{ef}	Engine Failure Speed
$V_{failure}$	Speed at which a failure occurs
V_{lof}	Liftoff Speed
V_{mcg}	Ground Minimum Control Speed

WAAS	Wide area augmentation system
WAD	Wide Area Differential
WAT	Weight, Altitude and Temperature
WGS	World Geological Survey
WGS-84	World Geological Survey - 1984
WP	Waypoint
xLS	[Generic term used to denote any one or more of the following NAVAID's: ILS, MLS, or GLS]

ATTACHMENT 2
AIRWORTHINESS APPROVAL OF AIRBORNE SYSTEMS USED DURING A TAKEOFF IN LOW VISIBILITY WEATHER CONDITIONS

1. PURPOSE.

This Attachment contains criteria for the approval of aircraft equipment and installations used during Takeoff in low visibility conditions (See Division II, Section (2) Takeoff of this Attachment).

2. GENERAL.

The type certification approval for the equipment, system installations and test methods should be based upon a consideration of factors such as the intended function of the installed system, its accuracy, reliability, and fail-safe features, as well as the operational concepts contained in the body of this Attachment. The guidelines and procedures contained herein are the Standards for determining airworthiness for a transport category airplane intended to conduct a takeoff in low visibility weather conditions.

The overall performance and safety of an operation should be assessed considering principle elements of the system, including aircraft, crew and facilities.

3. INTRODUCTION.

This Attachment provides airworthiness criteria for airplane systems that are required by Division II (2), Takeoff of this Attachment. These systems are required when visibility conditions, alone, may be inadequate for safe takeoff operation. This Attachment does not address all possible combinations of systems that might be proposed. This Attachment provides criteria which represents an acceptable means of compliance with performance, integrity and availability requirements for takeoff in low visibility conditions. Equivalent alternative criteria may be proposed by an applicant.

Operations using non-ground based facilities, or evolving ground facilities (e.g., local or wide area augmented GNSS), and the use of some new aircraft equipment require Proof of Concept testing to establish appropriate Criteria for operational approval and system certification. The need for a Proof of Concept program is identified with this Attachment by a [PoC] designator.

The airworthiness criteria contained in this Attachment for the takeoff system provides the requirements to track and maintain the runway centerline during a takeoff from brake release on the runway to liftoff and climb to 35 ft.[10.67 m] AGL, and from brake release through deceleration to a stop for a rejected takeoff.

It is important to emphasize that the entire takeoff operation, through completion of the en route climb configuration,, is considered to be an intensive phase of flight from an airworthiness perspective. The use of the takeoff system must not require exceptional skill, workload or pilot compensation. The takeoff system must provide an appropriate transition from lateral takeoff guidance (i.e., at about 35 ft. [10.67 m] AGL) through transition to en route climb for a takeoff, and from brake release through deceleration to a stop for a rejected takeoff. Requirements for the airborne portion of the takeoff (i.e., above 35 ft. [10.67 m] AGL) are provided in Attachment 8.

The takeoff system shall be shown to be satisfactory with and without the use of any outside visual references, except that outside visual references will not be considered when assessing lateral tracking performance. The airworthiness evaluation will also determine whether the combination of takeoff guidance and outside visual references would unacceptably degrade task performance, or require exceptional workload and pilot compensation, during normal operations and non-normal operations with system and airplane failure conditions.

For the purpose of the airworthiness demonstration, the operational concept for coping with the loss of takeoff guidance is based upon availability of some other method for the flightcrew to safely continue or reject the takeoff, if necessary.

Additional proof of concept demonstration may be appropriate for any operational concept that is not based on the presence of adequate outside visual references to safely continue or reject the takeoff, following loss of takeoff guidance. [PoC]

The minimum visibility required for safe operations will be specified by the Directorate General of Civil Aviation (DGCA) in the operational authorization.

The intended takeoff path is along the axis of the runway centerline. This path must be established as a reference for takeoff in restricted visibility conditions. A means must be provided to track the reference path for the length of the runway in order to accommodate both a normal takeoff and a rejected takeoff.

The intended lateral path may be established in a number of ways. For systems addressed by this Attachment, the required lateral path may be established by a navigation aid (e.g., ILS, MLS). Other methods may be acceptable if shown to be feasible by a PoC. Methods requiring PoC include, but are not limited to:

(a) the use of ground surveyed waypoints, either stored in an on-board data base or provided by data link to the airplane, with path definition by the airborne system,
(b) the use of inertial information following initial alignment,
(c) sensing of the runway surface, lighting and/or markings with a vision enhancement system (Indications of the airplane position with respect to the intended lateral path can be provided to the pilot in a number of ways.),
(d) deviation displays with reference to navigation source (e.g., ILS receiver, MLS receiver),
(e) on-board navigation system computations with corresponding displays of position and reference path, or
(f) by a vision enhancement system.

In addition to indications of the airplane position, the takeoff system should also compute and display command information (i.e., flight director), as lateral guidance, to the pilot, accounting for a number of parameters including airplane position, deviation from the reference path, and deviation rate. Takeoff system designs which provide only situational information, in lieu of command information, might be found acceptable, but would require a Proof of Concept demonstration. [PoC]

On-board navigation systems used for takeoff may have a number of possible navigation aid sensor elements by which to determine the position of an airplane including ILS, MLS, Global Navigation

Satellite System (GNSS), Local Area Differential GNSS, Pseudolites, or inertial information, etc. Each of these elements has limitations with regard to accuracy, integrity and availability and should be used within their appropriate capability.

New Takeoff System designs may be developed which employ various combinations of aircraft systems, sensors and system architecture, and use ground and space based navigation sources. Such new systems may be approved if suitably demonstrated. [PoC]

4. TYPES OF TAKEOFF OPERATIONS.

The operational concept and intended function of a takeoff system are important factors for its airworthiness approval. Division II (2) Takeoff of the Attachment describes a variety of low visibility concepts and intended functions for takeoff systems which vary according to the degree of reliance on the system to accomplish the takeoff, climb, and as necessary, the aborted takeoff.

Takeoff under low visibility conditions may be conducted as follows:

(a) based on authorizations in standard OpSpecs to visibility values not requiring takeoff guidance, or

(b) based on authorizations requiring takeoff guidance.

The airworthiness criteria for takeoff systems are based on item b) above. These systems should provide the required performance of the intended function, with acceptable levels of workload and pilot compensation to achieve the required level of safety.

5. TYPES OF TAKEOFF SERVICES.

There are a number of navigation aids which may support aircraft systems in providing guidance to the flightcrew during takeoff in low visibility conditions. The required flight path is inherent in the design of some systems (e.g., ILS and MLS) but some systems require the flight path to be defined either in the airplane or provided to the airplane by data link.

The accuracy, integrity and continuity of service of these external facilities, when used to support the takeoff system, will affect the overall safety of the operation (See Division II (12)). Criteria for ILS and MLS navigation aids for takeoff systems are the same as for landing systems.

(1) ILS. The ILS is supported by established international standards for ground station operation (ICAO Annex 10, or State equivalent). Ground facility provisions are stated in Division VI (1) of this Attachment. These standards should be considered when demonstrating aircraft system operation.

(2) MLS**.** The MLS is supported by established international standards for ground station operation (ICAO Annex 10, or State equivalent). Ground facility provisions are stated in Division VI (2) of this Attachment. These Standards should be considered when demonstrating aircraft system operation.

(3) GLS/GNSS [PoC]. This Attachment section is not intended to provide a comprehensive acceptable means of compliance for airworthiness approval of GLS or GNSS based systems, but it does address key issues pertinent to any applicant who may seek early approval of a GLS (or GNSS based) system. Currently approved systems are ILS or MLS based. The application of new technologies and systems such as GLS requires an overall assessment of the integration of the airplane components with other navigation and related elements (e.g., new ground based elements, satellite elements) to ensure that the

overall safety of the use of the system is acceptable. This GNSS section is also included to show the inherent differences between conventional ILS/MLS based systems and GLS (or GNSS) based systems that affect criteria development.

The performance, integrity and availability of any ground station elements, any data links to the airplane, any satellite elements and any data base considerations, when combined with the performance, integrity and availability of the airplane system, should be at least equivalent to the overall performance, integrity and availability provided by ILS to support low visibility operations.

(a) GLS/GNSS Flight Path Definition**.** The required lateral path for the takeoff is key to the safety of the operation. The required path has to be established to ensure that the airplane stays within the confines of the runway.

In a GLS/GNSS based Takeoff System, the required lateral path is established by data, rather than the physical location of an RF signal in space. Earth referenced waypoints define the required path, which is coincident with the runway centerline. The airplane navigation and flight guidance system will require that the appropriate waypoints be provided either from an onboard database or via a data link.

Certain "special waypoint" definitions, and other criteria are necessary to effectively implement takeoff operations using satellite systems and other integrated multi-sensor navigation systems. See Division II (20) of this ATTACHMENT, *Flight Path Definition*, which shows the minimum set of "special waypoints" considered necessary to conduct takeoff operations in air carrier operations.

The required path may be stored in an airplane database for recall and use by the takeoff guidance and/or control system when required to conduct the operation.

The definition, resolution and maintenance of the waypoints which define the required path and flight segments is key to the integrity of this type of takeoff operation.

A mechanism should be established to ensure the continued integrity of the waypoints.

The integrity of any data base used to define flight critical path waypoints for a Takeoff System should be addressed as part of the certification process. The flightcrew should not be able to modify information in the data base which relates to the definition of the required flight path.

(b) GLS/GNSS Airplane Position Determination**.** The safety of a low visibility takeoff operation is, in part, predicated on knowing where the airplane is positioned relative to the required path. Navigation satellite systems exist which can provide position information to specified levels of accuracy, integrity and availability. The accuracy, integrity and availability can be enhanced by additional space and ground based elements. These systems provide certain levels of capability to support present low visibility operations and are planned to have additional future capability.

Satellite systems have the potential to provide positioning information necessary to guide the airplane during the takeoff operations. If operational credit is sought for these operations, the performance, integrity and availability must be established to support that operation. Ground based aids such as differential position receivers, pseudolites etc., and a data link to the airplane may be required to achieve the accuracy, integrity or availability for certain types of operation.

An equivalent level of safety to current ILS based low visibility takeoff operations should be established.

The role of the satellite based elements in the takeoff system should be addressed as part of the airplane system certification process until such time as an acceptable national, or international standards, for satellite based systems are established.

Basic GNSS (Un-augmented).

This is the basic navigation service provided by a satellite system. No additional elements are used to enhance accuracy or integrity of the operation.

Differential Augmentation.

If a ground based GNSS receiver is used to provide differential pseudo-range corrections, or other data to an airplane to support low visibility operations, the overall integrity of that operation will have to be established.

The role of the differential station in the takeoff system will have to be addressed as part of the airplane system certification process until such time as an acceptable national, or international standard, for the ground reference system is established.

Local Area Differential Augmentation.

Local Area Differential (LAD) augmentation consists of a set of ground based GNSS receivers that are used to derive pseudorange corrections and integrity data referenced to a point on or near the airport. This augmentation data is then provided to the airplane via a local, ground based data broadcast signal.

(4) Other.

(a) Data link**.** A data link may be used to provide data to the airplane to provide the accuracy necessary to support certain operations (e.g., navigation way points, differential corrections for GNSS). The integrity, availability and continuity of service of the data link should be commensurate with the operation.

The role of the data link in the takeoff system must be addressed as part of the airplane system certification process until such time as an acceptable national, or international standard, for the ground system is established.

6. AIRWORTHINESS.

(1) General Takeoff System**.** The following sections identify the performance and workload requirements for the takeoff roll, through liftoff and for the rejected takeoff. These requirements apply for takeoff systems that are intended for use in low visibility conditions below the floor for visual operations.

The airplane elements of the Takeoff System must be shown to meet the performance, integrity and reliability requirements identified for the type(s) of operation for which approval is sought. The relationship and interaction of the aircraft elements with non-aircraft elements must be established and understood.

The performance of the aircraft elements may be established with reference to an approved flight path (e.g., localizer) provided the overall performance is not compromised by budgeting between aircraft and non-aircraft elements.

When international standards exist for the performance and integrity aspects of any non-aircraft elements of the Takeoff System, the applicant can assume these standards will be applied by member States of ICAO.

When international standards do not exist for the performance and integrity aspects of any non-aircraft elements of the Takeoff System, the applicant must address these considerations as part of the airworthiness process. A means must be provided to inform the operator of the limitations and assumptions necessary to ensure a safe operation. It will be the responsibility of the operator and associated State regulatory authorities to ensure that appropriate criteria and standards are applied.

(a) Takeoff Performance Prior to 35 Ft. [10.67 m] AGL**.** The takeoff system is intended to provide a means for the pilot to track and maintain the runway centerline during a takeoff from brake release on the runway to liftoff to 35 ft. [10.67 m] AGL, and during a rejected takeoff. Systems should ensure that a takeoff, or a rejected takeoff, can be safely completed on the designated runway, runway with clearway or runway with stopway, as applicable.

The system performance must be satisfactory, even in "non-visual conditions," for normal operations, aircraft failure cases (e.g., engine failure) and recovery from displacements from non-normal events. The system should be easy to follow and not increase workload significantly compared to the basic airplane. Consideration should not be given for performance improvements resulting from available visual cues.

The system should not require unusual skill, effort or excessive workload by the pilot to acquire and maintain the desired takeoff path. The display should be easy to interpret in all situations. Cockpit integration issues should be evaluated to ensure consistent operations and pilot response in all situations.

The continued takeoff or rejected takeoff operation should consider the effects of all reasonable events which would lead a flightcrew to make a continued takeoff or a rejected takeoff decision.

The airplane must not deviate significantly from the runway centerline during takeoff while the takeoff system is being used within the limitations established for it. The reference path of the system is usually defined by the ILS localizer, or other approved approach navigation aid, which normally coincides with the runway centerline. The performance of the system must account for differences, if any, between the runway centerline and the intended lateral path. Compliance may be demonstrated by flight test, or by a combination of flight test and simulation. Flight testing must cover those factors affecting the behavior of the airplane (e.g., wind conditions, ILS characteristics, weight, center of gravity). Specific takeoff system demonstration requirements are found in Division V (1) of this Attachment.

In the event that the airplane is displaced from the runway centerline at any point during the takeoff or rejected takeoff, the system must provide sufficient lateral guidance to enable the "pilot flying" to control the airplane smoothly back to the intended path in a controlled and predictable manner without significant overshoot or any sustained nuisance or divergent oscillations. Minor overshoot or oscillations around the centerline are permissible when not leading to unacceptable crew workload.

The performance envelope and conditions for evaluating takeoff systems for the following scenarios are described in Division III (17) of this Appendix (Figure 5.1.3-1) for at least the following conditions:
(i) takeoff with all engines operating
(ii) engine Failure at V_{ef} - continued takeoff*
(iii) engine Failure just prior to V_1 - rejected takeoff *
(iv) engine Failure at a critical speed prior to V_{mcg} - rejected takeoff *

* Wind and runway conditions consistent with basic aircraft takeoff performance demonstrations.

Figure 5.1.3-1 should not be interpreted to mean that the airplane can begin the takeoff roll up to 7m from the centerline. The pilot is expected to position and align the airplane on, or near, the runway centerline. While the pilot is positioning and aligning the airplane on the runway, the takeoff guidance system should provide an indication such that the flightcrew can confirm its proper operation.

For the rejected takeoff, the actual performance should reflect the effects of a dynamic engine failure, a short term increase in lateral deviation, and then converge toward the centerline during the deceleration to a full stop.

(2) ILS. The aircraft system response to permanent loss of the localizer signal shall be established, and the loss of the localizer signal must be appropriately annunciated to the crew.

The aircraft system response during a switchover from an active localizer transmitter to a backup transmitter shall be established (Reference ICAO Annex 10).

(3) MLS. The aircraft system response to the loss of the MLS signal shall be established, and appropriately annunciated to the crew.

The aircraft system response during a switchover from an active azimuth transmitter to a backup transmitter shall be established (reference ICAO Annex 10).

(4) Workload Criteria. The workload associated with the use of the takeoff system shall be satisfactory in accordance with U.S. criteria of AC 25-7A, as amended, or equivalent. The takeoff system should provide required tracking performance with satisfactory workload and pilot compensation, under foreseeable normal conditions. It may be assumed that the operational authorizations process will address any visual cues needed for the required task performance with satisfactory workload and pilot compensation.

The system should not require unusual skill, effort or excessive workload by the pilot to acquire and maintain the desired takeoff path. The display should be easy to interpret in all situations. Cockpit integration issues should be evaluated to ensure consistent operations and pilot response in all situations.

(5) Takeoff System Integrity. The takeoff system shall provide command information, as lateral guidance, which, if followed by the pilot, will maintain the airplane on the runway during the takeoff roll through acceleration to liftoff or, if necessary, during a deceleration to a stop during a rejected takeoff.

The onboard components of the low visibility takeoff system and associated components, considered separately and in relation to other systems, should be designed to meet the requirements of U.S. Title 14 of the code of Federal Regulations (14 CFR) part 25, section 25.1309 or equivalent, in addition to any specific safety related criteria identified in this Attachment. The elements not on the airplane should not reduce the overall safety of the operation to unacceptable levels. The following criteria is provided for the application of section 25.1309 to Takeoff Systems:

The system design should not possess characteristics, in normal operation or when failed, which would degrade takeoff safety, or lead to a hazardous condition. Any single failure of the airplane which could disturb the take-off path (e.g., engine failure, single electrical generator or bus failure, single IRU failure) must not cause loss of guidance information or give incorrect guidance information.

To the maximum extent possible, failures that would result in the airplane violating the lateral confines of the runway while on the ground should be detected by the takeoff system and promptly annunciated to the pilot. If pitch and/or speed guidance is also provided, failures that would result in rotation at an unsafe speed, pitch rate or pitch angle should be detected by the takeoff system and promptly annunciated to the pilot.

However, there may be failures, which result in misleading guidance, but cannot be annunciated. For these failures, outside visual references or other available information, that the pilot is expected to monitor, would be used by the pilot to detect the failures and mitigate their effects. These failures must be identified, and the ability of the pilot to detect them and mitigate their effects must be verified by analysis, flight test or both.

Whenever the takeoff system does not provide valid guidance appropriate for the takeoff operation, it must be clearly annunciated to the crew, and the guidance must be removed. The removal of guidance, alone, is not adequate annunciation. The annunciation must be located to ensure rapid recognition, and must not distract the pilot making the takeoff or significantly degrade the forward view.

The probability of the takeoff system generating misleading information that could lead to an unsafe condition shall be Improbable when the flightcrew is alerted to the condition by suitable fault annunciation or by information from other independent sources available within the pilot's primary field of view. For airworthiness, the effectiveness of the fault annunciation or information from other independent sources must be demonstrated.

The probability of the takeoff system generating misleading information that would be unsafe to follow, must be Extremely Improbable, if:

(a) no means are available for the takeoff system to detect and annunciate the failure, and
(b) no information is provided to the pilot to immediately detect the malfunction and take corrective action.

In the event of a probable failure (e.g., engine failure, electrical source failure) if the pilot follows the takeoff display and disregards external visual reference, the airplane performance must meet the requirements illustrated in figure 5.1.3-1.

In showing compliance with the performance and failure requirements, the probabilities of performance or failure effects may not be factored by the proportion of takeoffs which are made in low visibility.

Loss of any single source of electrical power or transient condition on any single source of electrical power should not cause loss of guidance to the pilot flying (PF), or loss of information that is required to monitor the takeoff to the pilot not flying (PNF).

Takeoff systems that use navigation aids other than ILS and MLS require an overall assessment of the integration of the airplane components with other elements (e.g., ground based aids, satellite systems) to ensure that the overall safety of the use of these takeoff systems is acceptable [PoC].

(6) Takeoff System Availability. When the Takeoff operation is predicated on the use of the Takeoff system, the probability of a system loss should be Remote (10-5/flight hour).
(7) Flight Deck Information, Annunciation and Alerting. This section identifies information, annunciations, and alerting requirements for the takeoff system on the flight deck. The controls, indicators, and alerts must be designed to minimize crew errors which could cause a hazard. Mode and system malfunction indications must be presented in a manner compatible with the procedures and assigned tasks of the flightcrew. The indications must be grouped in a logical and consistent manner and be visible under all expected normal lighting conditions.
(8) Flight Deck Information. System design or use should not degrade the flightcrews ability to otherwise adequately monitor takeoff performance or stopping performance.

The system shall be demonstrated to have no display or failure characteristics that lead to degradation of the crews ability to adequately monitor takeoff performance (e.g., acceleration, engine performance, takeoff speed callouts, attitude, and airspeed), conduct the entire takeoff, and make an appropriate transition to en route climb speed and configuration, for all normal, abnormal and emergency situations.

(9) Annunciation. Prior to takeoff initiation and during takeoff, positive, continuous and unambiguous indications of the following information about the takeoff system must be provided and made readily evident to both pilots:
- (a) system status
- (b) modes of engagement and operation, as applicable
- (c) guidance source

(10) Alerting. The takeoff system must alert the flightcrew whenever the system suffers a failure or any condition which prevents the system from meeting the takeoff system performance requirements (See Division IV (2) of this Appendix).

Alerts shall be timely, unambiguous, readily evident to each crewmember, and compatible with the alerting philosophy of the airplane. Annunciations must be located to ensure rapid recognition, and must not distract the pilot making the takeoff or significantly degrade the forward view.

(11) Warnings**.** Warnings shall be provided for conditions that require immediate pilot awareness and action. Warnings are required for the following conditions:

(a) loss of takeoff guidance
(b) invalid takeoff guidance
(c) failures of the guidance system that require immediate pilot awareness and compensation

During takeoff, whenever the takeoff system does not provide valid guidance appropriate for the takeoff operation, it must be clearly annunciated to the crew, and the guidance must be removed. The removal of guidance, alone, is not adequate annunciation. The annunciation must be located to ensure rapid recognition, and must not distract the pilot making the takeoff or significantly degrade the forward view.

(12) Cautions. Cautions shall be provided for conditions that require immediate pilot awareness and possible subsequent pilot action. These alerts need not generate a Master Caution light, which would be contrary to the takeoff alert inhibit philosophy. Cautions should be carefully generated so as not to cause flightcrew distraction during takeoff roll.
(13) Advisories. Advisories shall be provided for conditions that require pilot awareness in a timely manner. Advisories should not be generated after takeoff has commenced.
(14) System Status. Status of takeoff guidance system shall be provided (e.g., status of BITE/self-test).

7. Takeoff System Evaluation.

An applicant shall provide a certification plan which provides a description of the airplane systems, the basis for certification, the certification methods and compliance documentation. The certification plan should also describe how any non-airplane elements of the Takeoff System relate to the operation of airplane systems from a performance, integrity and availability perspective.

The certification plan shall identify the assumptions and considerations for the non-airplane elements of the system, and describe how the performance, integrity and availability ‘requirements’ of these elements are met.

For ILS and MLS based system elements, satisfaction of these requirements can be predicated upon compliance with either the ICAO SARP’s, equivalent state standard, or by reference to an acceptable standard for performance of any navigation service.

For the use of systems other than ILS or MLS for ‘path in space’ guidance, the assumptions and considerations for the non-airplane elements of the system may be different than applicable to ILS or MLS. If different than ILS or MLS, the applicant shall address these differences and how they relate to the airplane system certification plan.

As applicable, the plan for certification shall describe any new or novel system concepts or operational philosophy to allow the regulatory authority to determine whether criteria and requirements in excess of that contained in this Attachment are necessary.

(1) Performance Evaluation. For new systems and any significant changes to an existing system, the performance of the airplane and its systems must typically be demonstrated by flight test. Flight testing must include a sufficient number of normal and non-normal operations conducted in conditions which are reasonably representative of actual expected conditions and must cover the range of parameters affecting the behavior of the airplane (e.g., wind speed, ILS characteristics, airplane configurations, weight, center of gravity, and non-normal events).

The performance evaluation must verify that the Takeoff System meets the centerline tracking performance requirements and limits of Division IV (2) of this Attachment.

The system performance must be demonstrated in "non-visual conditions" for:

(a) normal operations,
(b) engine failure cases and,
(c) recovery from displacements from non-normal events.

This performance shall be demonstrated to have a satisfactory level of workload and pilot compensation, such as defined by the U.S. FAA Handling Quality Rating System (HQRS) found in AC 25-7A, as amended, or equivalent.

The takeoff system shall be shown to be satisfactory with and without the use of any outside visual references, except that outside visual references will not be considered in assessing lateral tracking performance. The airworthiness evaluation will also determine whether the combination of takeoff guidance and outside visual references would unacceptably degrade task performance, require excessive pilot compensation or workload during normal and non-normal operations.

For the purpose of the airworthiness demonstration, the operational concept for coping with the loss of takeoff guidance is based upon availability of some other method for the flightcrew to safely continue or reject the takeoff. The airworthiness demonstration may include a loss of takeoff guidance.

The demonstration of system performance should comprise at least the following, (though more demonstrations may be needed, depending on the airplane characteristics and system design, and any difficulties encountered during testing):

(a) 20 normal, all-engine takeoffs.
(b) 10 completed takeoffs, with simulated engine failure at or after the appropriate V_{ef} for the minimum V_1 for the airplane. All critical cases must be considered.
(c) 10 rejected takeoffs, some with simulated engine failure just prior to V_1, and at least one run with simulated engine failure at a critical speed less than V_{mcg}.

For modified systems, credit may be permitted for earlier demonstration(s), but testing up to that necessary for a new system may be required if credit for similarity of design or performance is not appropriate.

Engine failures should be assessed with respect to workload and pilot compensation throughout the entire takeoff phase. In cases where the dynamics of retarding the throttle to idle do not adequately simulate the dynamics of an engine failure, the certifying authorities may require an actual engine shutdown for these demonstrations.

Demonstrated winds, during normal all engine takeoff, should be at least the headwinds for which credit is sought, and at least 150% of the cross winds and tailwinds for which credit is sought, but not less than 15 knots of headwind or crosswind.

The applicant shall demonstrate that operation of the takeoff system does not exhibit any guidance or control characteristics during the operation which would cause the flightcrew to react in an inappropriate manner.

The system shall be demonstrated to have no display or failure characteristics that lead to degradation of the crew's ability to adequately monitor takeoff performance (e.g., acceleration, engine performance, takeoff speed callouts), and conduct the entire takeoff, and make an appropriate transition to en route climb speed and configuration, for all normal, abnormal and emergency situations.

The system must be evaluated and demonstrated to meet the integrity and failure annunciation requirements of Division IV (10), and sub-sections of this Attachment, as well as the pilot's ability to immediately detect and mitigate non-annunciated failures, as described in Division IV, (10).

For takeoff systems that use an ILS localizer signal, the airplane system response to loss of the localizer signal shall be demonstrated, and appropriately annunciated to the crew. The airplane system response during a switchover from an active localizer transmitter to a backup transmitter shall be demonstrated (Reference ICAO Annex 10).

For takeoff systems that use MLS, the airplane system response to the loss of the MLS signal shall be demonstrated, and appropriately annunciated to the crew. The airplane system response during a switchover from an active azimuth transmitter to a backup transmitter shall be demonstrated (Reference ICAO Annex 10).

For the evaluation of takeoff systems, the set of subject pilots provided by the applicant should have relevant variability of experience (e.g., experience with or without head-up- display (HUD), Captain or First Officer (F/O) crew position experience as applicable, experience in type). Subject pilots must not typically have special experience that invalidates the test (e.g., pilot's should not have special recent training to cope with HUD failures, beyond what a line pilot would be expected to have for routine operation). The set of pilots provided by the certifying authorities may have experience as specified by the authority appropriate to the test(s) to be conducted. The experience noted above for authority subject pilots or evaluation pilots may or may not be applicable or appropriate for the tests to be conducted.

Failure cases should typically be spontaneous and unpredictable on the subject's or evaluation pilot's part.

(2) Safety Assessment. In addition to any specific safety related criteria identified in this Attachment, a safety assessment of all airplane components of the takeoff system and associated components, considered separately, shall be conducted in accordance with U.S. AC 25.1309 or equivalent to meet the requirements of Section 25.1309.

In showing compliance with airplane system performance and failure requirements, the probabilities of performance or failure effects may not be factored by the proportion of takeoffs which are made in low visibility conditions.

The responses of the takeoff system to failures of navigation facilities must be considered, taking into account ICAO and other pertinent State criteria for navigation facilities, (for more information see Division VI of this Attachment).

Documented conclusions of the safety analysis shall include:

(a) a functional hazard assessment (FHA) conducted in accordance with Section 25.1309 or equivalent and a summary of results from the fault tree analysis, demonstrated compliance, and probability requirements for significant functional hazards.
(b) information regarding "alleviating flightcrew actions" that were considered in the safety analysis. This information should list appropriate alleviating actions, if any, and should be consistent with

the validation conducted during testing. If alleviating actions are identified, the alleviating actions should be described in a form suitable to aid in developing, as applicable:
(i) pertinent provisions of the airplane flight manual procedures section(s), or
(ii) flight Crew Operating Manual (FCOM) provisions, or equivalent, or
(iii) pilot qualification criteria (e.g., training requirements, FSB provisions), or
(iv) any other reference material necessary for an operator or flightcrew to safely use the system.

(c) Information to support preparation of any maintenance procedures necessary for safety, such as:
(i) certification maintenance requirements (CMR),
(ii) periodic checks, or
(iii) other checks, as necessary (e.g., return to service).

(d) information applicable to limitations, as necessary.

(e) identification of applicable systems, modes or equipment necessary for use of the takeoff system, to aid in development of flight planning or dispatch criteria, or to aid in development of procedures or checklists for pilot selection of takeoff mode or assessment of system status, prior to initiation of takeoff.

(f) information necessary for development of Non-normal procedures.

8. AIRBORNE SYSTEM.

(1) General. All general takeoff system requirements are found in Division IV (1) of this Attachment.
(2) Peripheral Vision Guidance Systems [PoC]. Peripheral vision systems have not been shown to be suitable as primary means of takeoff guidance. Such systems may be used as a supplemental means of takeoff guidance only if a suitable minimum visual segment is available. A Proof of Concept evaluation program is necessary for Peripheral Vision Guidance systems intended for use as primary means of takeoff guidance or as supplemental means with visual segments less than the minimum required for un-aided operation.

(3) Head Up Display Takeoff System. The following criteria is applicable to head up display takeoff systems:

(a) the workload associated with use of the HUD must be considered in showing compliance with U.S. 14 CFR part 25, Section 25.1523 or equivalent.

(b) the HUD installation and display presentation must not significantly obscure the pilot's outside view.

(c) the entire takeoff operation, through completion of the en route climb configuration, (see Section 25.111), is considered to be an intensive phase of flight during which unnecessary pilot workload and compensation should be avoided. Appropriate transition from lateral takeoff guidance (i.e., at about 35 ft. [10.67 m] AGL) through transition to en route climb for a takeoff, and from brake release through deceleration to a stop for an aborted takeoff should be ensured. For the entire takeoff and for all normal, and non-normal situations, except loss of the HUD itself, it must not be necessary for the "pilot flying (PF)" to make any immediate change of primary display reference for continued safe flight.

(d) Control of Takeoff Flight Path. For the entire takeoff path and for all normal and non-normal conditions, except loss of the HUD itself, the HUD takeoff system must provide acceptable guidance and flight information to enable the PF to complete the takeoff, or abort the takeoff, if required. Use of the HUD takeoff system should not require excessive workload, exceptional skill, or excessive reference to other cockpit displays.

(e) the HUD shall provide information suitable for the PF to perform the intended operation. The current mode of the HUD system itself, as well as the flight guidance/automatic flight control system, shall be clearly annunciated in the HUD, unless they can be acceptably displayed elsewhere.

(f) systems which display only lateral deviation as a cue for centerline tracking have not been shown to provide adequate information for the PF to determine the magnitude of the required directional correction. Consequently, with such displays workload and pilot compensation are considered excessive. A proposed system which displays situation information, in lieu of command information, requires a successful proof of concept evaluation. [PoC]

(g) if the system is designed as a single HUD configuration, then the HUD shall be installed for the Captain's (pilot in command) crew station.

(h) associated cockpit information must be provided to the pilot not flying (PNF) to monitor the PF performance, and perform other assigned duties.

(4) Satellite Based Systems [PoC]. Currently approved systems are ILS or MLS based. The application of new technologies and systems such as GLS/GNSS requires an overall assessment of the integration of the airplane components with other elements to ensure that the overall safety of the use of these systems is acceptable.

The performance, integrity and availability of any ground station elements, any data links to the airplane, any satellite elements and any data base considerations, when combined with the performance, integrity and availability of the airplane system, should be at least equal to the overall performance, integrity and availability provided by ILS to support equivalent low visibility operations.

The role of the satellite based elements in the takeoff system should be addressed as part of the airplane system certification process until such time as an acceptable national, or international standard, for the satellite based system is established.

(5) Flight Path Definition. For Flight Path Definition considerations refer to Division II (20) of the Attachment.

(6) On Board Database. Unless there is a means to upload the path definition data via data link, the required lateral ground path should be stored in an on board database for recall and incorporation into the guidance/control system when required to conduct the takeoff.

The definition, resolution and maintenance of the waypoints which define the required takeoff path should be consistent with the takeoff operation. A mechanism should be established to ensure the continued integrity of the takeoff path designators.

Corruption of the information contained in the on board data base used to define the reference flight path is considered Hazardous. Failures which result in hazardous unannunciated changes to the on board data base must be Extremely Remote.

The flightcrew should not be able to intentionally or inadvertently modify information in the on board data base which relates to the definition of the required flight path.

The integrity of any on board data base used to define takeoff path waypoints for a Takeoff System should be addressed as part of the certification process.

(7) Data link. Data may be sent to the airplane, via data link, so that the takeoff flight path can be defined with the required accuracy. The required takeoff path may be stored in a ground station database

which is uplinked to an airplane, either on request or through continuous transmission. The airplane guidance and control system may incorporate such information to conduct the takeoff.

The integrity of the data link should be commensurate with the integrity required for the operation. The role of the data link in the takeoff system must be addressed as part of the airplane system certification process unless acceptable international standards, for the ground system are established. The following items shall be addressed as part of the Takeoff System assessment:

(a) satellite systems used during takeoff must support the required performance, integrity and availability. This should include the assessment of satellite vehicle failures and the effect of satellite vehicle geometry on the required performance, integrity and availability.
(b) the capability of the Takeoff System failure detection and annunciation mechanism to preclude an undetected failure, or combination of failures which are not Extremely Remote, from producing a hazardous condition. This assessment should include failure mode detection coverage and adequacy of monitors and associated alarm times.
(c) the effect of airplane maneuvers on the reception of signals necessary to maintain the necessary performance, integrity and availability. Loss and re-acquisition of signals should be considered.

(8) Enhanced Vision Systems [PoC]. Enhanced Vision Systems which penetrate visibility restrictions to provide the flightcrew with an enhanced view of the scene outside the airplane (e.g., radar) may be considered for airworthiness installation and demonstration. However, this Attachment does not comprehensively address a means of compliance for airworthiness installation approval of such Enhanced Vision Systems. Performance must be demonstrated to be acceptable to the DGCA through proof of concept testing, during which specific airworthiness and operational criteria may be developed.

Criteria for approval of the enhanced vision system must match its intended use. The fidelity, alignment and real time response of the enhanced view must be shown to be appropriate for the intended application. Enhanced Vision Systems also must not significantly degrade the pilot's normal view, when visual reference is available.

9. Airplane Flight Manual.

Upon satisfactory completion of an airworthiness assessment and test program, the Authority's-approved airplane flight manual or supplement, and any associated markings or placards, if appropriate, should be issued or amended to address the following:

(a) relevant conditions or constraints applicable to takeoff system use regarding the airport or runway conditions (e.g., elevation, ambient temperature, runway slope).
(b) the criteria used for the demonstration of the system, acceptable normal and non-normal procedures (including procedures for response to loss of guidance), the demonstrated configurations, and any constraints or limitations necessary for safe operation.
(c) the type of navigation aids used as a basis for demonstration. This should not be taken as a limitation on the use of other facilities. The AFM may contain a statement regarding the type of facilities or condition known to be unacceptable for use (e.g., For ILS or MLS) based systems, the AFM shall indicate that operation is predicated upon the use of an ILS (or MLS) facility with performance and integrity equivalent to, or better than, a United States Type II or Type III ILS, or equivalent ICAO Annex 10 Facility Performance Category III facility).
(d) applicable atmospheric conditions under which the system was demonstrated (e.g., demonstrated headwind, crosswind, tailwind),
(e) for a Takeoff system meeting provisions of Attachment 2, the AFM (Section 3, Normal Procedures) should also contain the following statements:

"The airborne system has been demonstrated to meet the airworthiness requirements of AC 120-28D Attachment 2 for Takeoff when the following equipment is installed and operative:

<list pertinent equipment>"

"This AFM provision does not constitute operational approval or credit for use of the takeoff system."

Examples of general AFM considerations and specific AFM provisions are provided in Attachment 6.

ATTACHMENT 3
AIRWORTHINESS APPROVAL FOR AIRBORNE SYSTEMS USED TO LAND AND ROLLOUT IN LOW VISIBILITY CONDITIONS

1. PURPOSE.

This Attachment contains criteria for the approval of aircraft equipment and installations used for Landing and Rollout in low visibility conditions.

2. GENERAL.

The type certification approval for the equipment, system installations and test methods should be based upon a consideration of factors such as the intended function of the installed system, its accuracy, reliability, and fail-safe features, as well as the operational concepts contained in the body of this Attachment. The guidelines and procedures contained herein are considered to be acceptable methods of determining airworthiness for a transport category airplane intended to conduct a landing and rollout in low visibility conditions.

In addition to the criteria found in this Attachment, equipment and installation must also meet the criteria contained in U.S. AC 120-29, as amended, an equivalent foreign standard acceptable to the Minister, or any other criteria acceptable to the Minister.

The overall assurance of performance and safety of an operation can only be assessed when all elements of the system are considered.

3. INTRODUCTION.

This Attachment addresses the final approach, landing and the rollout phase of flight. Landing and Rollout Systems may combine various combinations of airplane sensors and system architecture with various combinations of ground and space based elements. This Attachment provides criteria which represents an acceptable means of compliance with performance, integrity and availability requirements for low visibility approach, landing and rollout systems to accomplish a landing and rollout in low visibility conditions. Alternative criteria may be proposed by an applicant. With new emerging technologies, there is a potential for many ways of conducting low visibility landings. This Attachment does not attempt to provide criteria for each potential combination of airborne and non-airborne elements.

Operations utilizing current ILS or MLS ground based facilities and airborne elements are in use, and the certification criteria for approval of these airborne systems are established. Other operations, using non-ground based facilities or evolving ground facilities (e.g., local or wide area augmented GNSS), and the use of some new aircraft equipment require Proof of Concept testing to establish appropriate criteria for operational approval and system certification. The need for a Proof of Concept program is identified in this ATTACHMENT with a [PoC] designator. This Attachment provides some general guidelines, but not comprehensive criteria for airplane systems that require a Proof of Concept.

The low visibility landing system is intended to guide the airplane down the final approach segment to a touch down in the prescribed touch down zone, with an appropriate sink rate and attitude without exceeding prescribed load limits of the airplane. The rollout system is intended to guide the airplane to converge on and track the runway centerline, from the point of touch down to a safe taxi speed.

The low visibility landing system shall be shown to be satisfactory with and without the use of any outside visual references, except that outside visual references will not be considered when assessing lateral tracking performance. The airworthiness evaluation will also determine whether the combination of guidance and outside visual references would unacceptably degrade task performance, or require exceptional workload and pilot compensation, during normal operations and non-normal operations with system and airplane failure conditions.

For the purpose of the airworthiness demonstration, the operational concept for coping with the loss of guidance is based upon the availability of some other method to accomplish a go-around, landing, or rollout, if necessary. The airworthiness demonstration may include a loss of guidance.

The minimum visibility required for safe operations with such systems and backup means will be specified by the DGCA in the operational authorization.

The intended flight path may be established in a number of ways. For systems addressed by this Attachment, the reference path may be established by a navigation aid (e.g., ILS, MLS). Other methods may be acceptable if shown feasible by a Proof of Concept [PoC]. Methods requiring PoC include, but are not limited to:

- ❖ the use of ground surveyed waypoints, either stored in an on-board data base or provided by data link to the airplane, with path definition by the airborne system,
- ❖ sensing of the runway environment (e.g., surface, lighting and/or markings) with a vision enhancement system.

On-board navigation systems may have various sensor elements by which to determine airplane position. The sensor elements may include ILS, MLS, Inertial information, GLS, other Global Navigation Satellite System (GNSS) elements, Local Area Differential GNSS, or GNSS related Pseudolites. Each of these sensor elements should be used within appropriate limitations with regard to accuracy, integrity and availability.

Indications of the airplane position with respect to the intended lateral path can be provided to the pilot in a number of ways.

- ❖ deviation displays with reference to navigation source (e.g., ILS receiver, MLS receiver), or
- ❖ on-board navigation system computations with corresponding displays of position and reference path

4. TYPES OF LANDING AND ROLLOUT OPERATIONS.

(1) The following types of Category III operations typically may be considered:

- (a) fail-operational landing with fail-operational rollout
- (b) fail-operational landing with fail-passive rollout
- (c) fail-passive landing with fail-passive rollout
- (d) fail-passive landing without rollout system capability
- (e) the following engine inoperative capabilities may optionally* be demonstrated, for each or any of the cases listed above:
    - (i) landing with engine failure prior to initiation of the approach

(ii) landing and rollout with engine failure after initiation of the approach, but prior to DA(H) or AH, as applicable.

Information Note: *The case of engine failure after passing AH (or DA(H)) through touchdown, or through touchdown and rollout as applicable, is typically addressed as a basic consideration for any system demonstration intended for Category III.*

The following definitions may be used for the operations described above.

Landing - for the purpose of this Attachment, landing begins at 100 ft., the DH or the AH, to the first contact of the wheels with the runway.

Rollout - for the purpose of this Attachment, rollout starts from the first contact of a wheel(s) with the runway and finishes when the airplane has slowed to a safe taxi speed.

Safe Taxi Speed - is the speed at which the pilot can safely taxi off the runway using typical exits, or bring the airplane expeditiously to a safe stop. The safe taxi speed may vary with visibility conditions, airplane characteristics, and means of lateral control.

5. TYPES OF LANDING AND ROLLOUT SERVICES.

(1) ILS. The ILS is supported by established international standards for ground station operation. These standards should be used in demonstrating airplane system operation.

The airplane system response during a switchover from an active localizer transmitter to a backup transmitter shall be established. For procedures which do not use a localizer for missed approach, total failure (shutdown) of the ILS ground station may not significantly adversely effect go-around capability.

The Airplane Flight Manual shall indicate that operation is predicated upon the use of an ILS facility with performance and integrity equivalent to, or better than, an ICAO Annex 10 Facility Performance Category III ILS, a United States Type II or Type III ILS, or equivalent.

(2) ILS Flight Path Definition. The required lateral flight path is inherent in the design of the ILS. Acceptable performance and integrity standards have been established for ILS (See Division VI (1) of the Attachment).

(3) ILS Airplane Position Determination. The airplane lateral position relative to the desired flight path is accomplished by an airplane ILS receiver which provides deviation from the extended runway centerline path when in the coverage area.

(4) MLS. The MLS is supported by established ICAO Annex 10 international standards for ground station operation. These standards should be used in demonstrating airplane system operation.

The airplane system response during a switchover from an active azimuth transmitter to a backup transmitter shall be established. Total failure (shutdown) of the MLS ground station may not significantly adversely affect go-around capability.

The Airplane Flight Manual shall indicate that operation is predicated upon the use of an MLS facility with performance and integrity equivalent to, or better than, an ICAO Annex 10 Facility Performance Category III MLS, or equivalent.

(5) MLS Flight Path Definition. The lateral required flight path is inherent in the design of the MLS. Acceptable performance and integrity standards have been established for MLS (See Division VI (1) of the Attachment).

(6) MLS Airplane Position Determination. The airplane lateral position relative to the desired flight path is accomplished by an airplane MLS receiver which provides deviation from the extended runway centerline path when in the coverage area.

(7) GLS/GNSS [PoC]. This Attachment section is not intended to provide a comprehensive acceptable means of compliance for airworthiness approval of GLS or GNSS based systems, but it does address key issues pertinent to any applicant who may seek early approval of a GLS (or GNSS based) system. Currently approved systems are ILS or MLS based. The application of new technologies and systems requires an overall assessment of the integration of the airplane components with other elements (e.g., new ground based aids, satellite elements) to ensure that the overall safety of the use of these systems for Category III. This GLS/GNSS section is also included to identify important differences between conventional ILS/MLS based systems and GLS/GNSS based systems that may affect GNSS or GLS criteria development.

The performance, integrity and availability of any ground station elements, any data links to the airplane, any satellite elements and any data base considerations, when combined with the performance, integrity and availability of the airplane system, should be at least equivalent to the overall performance, integrity and availability provided by ILS to support Category III operations.

(8) GLS/GNSS Flight Path Definition. Appropriate identification of the required flight path for the landing and rollout is necessary to ensure safety of the operation. The required flight path should be established to provide adequate clearance between the airplane and fixed obstacles on the ground, between airplane on adjacent approaches, and to ensure that the airplane stays within the confines of the runway.

The effect of the navigation reference point on the airplane on flight path and wheel to threshold crossing height must be addressed.

In a GNSS based Landing and Rollout System, the required lateral path is established by data, rather than the physical location of an RF signal in space. Earth referenced waypoints define the required path, which is coincident with the runway centerline. The airplane navigation and flight guidance system will require that the appropriate waypoints be provided either from an onboard database or via a data link.

Certain "special waypoint" definitions, "leg types," and other criteria are necessary to safely implement landing and rollout operations using satellite systems and other integrated multi-sensor navigation systems. Figure 4.6-1 of the Attachment shows the minimum set of "special waypoints" and "special leg types" considered necessary to conduct landing and rollout operations in air carrier operations.

The required flight path may be stored in an airplane database for recall and use by the command guidance and/or control system when required to conduct the landing and rollout.

The definition, resolution and maintenance of the waypoints which define the required flight path and flight segments is key to the integrity of this type of landing and rollout operation.

A mechanism should be established to ensure the continued integrity of the flight path designators.

The integrity of any data base used to define flight critical path waypoints for a Landing and Rollout System should be addressed as part of the certification process. The flightcrew shall not be able to modify information in the data base which relates to the definition of the required flight path for the critical portion of final approach through rollout.

(9) GLS/GNSS Airplane Position Determination.

The safety of a low visibility landing and rollout operation is, in part, predicated on knowing where the airplane is positioned relative to the required flight path. Navigation satellite systems exist which can provide position information to specified levels of accuracy, integrity and availability. The accuracy, integrity and availability can be enhanced by additional space and ground based elements. These systems provide certain levels of capability to support present low visibility operations and are planned to have additional future capability.

Satellite systems have the potential to provide positioning information necessary to guide the airplane during landing and rollout. If operational credit is sought for these operations, the performance, integrity and availability must be established to support that operation. Ground based aids such as differential position receivers, pseudolites etc., and a data link to the airplane, may be required to achieve the accuracy, integrity or availability for certain types of operation.

An equivalent level of safety to current ILS based Category III operations should be established.

The role of the satellite based elements in the landing system should be addressed as part of the airplane system certification process until such time as an acceptable national, or international standards, for satellite based systems are established.

Basic GNSS (Unaugmented). This is the basic navigation service provided by a satellite system. No additional elements are used to enhance accuracy or integrity of the operation.

Differential Augmentation. The role of the differential station in the landing system should be addressed as part of the airplane system certification process, unless an acceptable national, or international standard, for the ground reference system is established.

Local Area Differential Augmentation. Local Area Differential (LAD) augmentation consists of a set of ground based GNSS receivers that are used to derive pseudo-range corrections and integrity data referenced to a point on or near the airport. This augmentation data is then provided to the airplane via a local, ground based data broadcast signal.

Wide Area Differential Augmentation. Wide Area Differential (WAD) augmentation is not applicable to Category III, except where used in conjunction with other sensors (e.g., to substitute for DME with ILS).

Typically only LAD systems provide a basis for establishing the necessary position fixing accuracy, integrity and availability for the final portion of a final approach segment or rollout. Unaugmented

GNSS or WAD are typically only suited for support of initial or intermediate segments of an approach, final approach to restricted DA(H)s, or missed approach. GNSS or WAD may however be used in conjunction with Category III procedures for applications such as equivalent DME distance, or marker beacon position determination, when authorized by the operating rules.

(10) Data link. A data link may be used to provide data to the airplane to provide the accuracy necessary to support certain operations (e.g., navigation way points, differential corrections for GNSS).

The integrity of the data link should be commensurate with the integrity required for the operation.

The role of the data link in the landing system will have to be addressed as part of the airplane system certification process until such time as an acceptable international standard for data link ground systems are established.

6. AIRWORTHINESS.

This section identifies airworthiness requirements including those for performance, integrity, and availability which apply to all types of airplane systems, independent of the type of landing/navigation system used. The definitions of Performance, Integrity and Availability are found in Attachment 1.

The basic airworthiness criteria are intended to be independent of the specific implementation in the airplane or the type of Landing and Rollout system being used. Requirements for touch down performance, landing sink rates and attitudes, etc. are the same for landing systems with automatic flight control, and systems for manual flight control with command information (i.e., flight director) as guidance.

Criteria may be expanded further in later sections of this Attachment as it applies to a particular airplane system or architecture.

The types of landing or landing and rollout systems which may be approved are listed in Attachment 3 Section 4.

(1) General. An applicant shall provide a certification plan which describes how any non-aircraft elements of the Landing and Rollout System relate to the aircraft system from a performance, integrity and availability perspective.

The plan for certification shall describe the system concepts and operational philosophy to allow the regulatory authority to determine whether criteria and requirements other than those contained in this Attachment are necessary.

The applicant shall apply criteria contained in U.S. AC 120-29, as amended, an equivalent foreign standard acceptable to the Administrator, or any other criteria acceptable to the Minister for the system during approach to at least 100 ft. [30 m] HAT.

The safety level for automatic landing and rollout, or manual landing and rollout using command information as guidance, may not be less than that achieved by a conventional unguided manual landing using visual reference. In showing compliance with the performance and failure requirements, the probabilities of performance or failure effects may not be factored by the proportion of landings made with the landing and rollout system.

The landing and rollout system performance should be established considering the environmental and deterministic effects which may reasonably be experienced for the type of operation for which certification and operational approval will be sought.

Command information provided as guidance during the landing and rollout should be consistent with a pilot's manual technique and not require excessive skill or crew workload to accomplish the operation.

For those segments of the flight path where credit is taken for non-automatic systems, acceptable performance of those systems for landing and rollout shall be shown by reference to instruments alone without requiring the use of external visual reference. This requirement is appropriate because the landing rollout may begin off centerline and at higher speed.

Where reliance is placed on the pilot to detect a failure of engagement of a mode when it is selected, and the pilot cannot reliably detect this failure by other means, an appropriate indication or warning must be given.

The transition from automatic control to manual control may not require exceptional piloting skill, alertness or strength.

In the absence of failure or extreme conditions, the behavior of the landing system, and the resulting airplane flight path, shall not be so unusual as to cause a pilot to inappropriately intervene and assume control.

The effect of the failures of the navigation facilities must be considered taking into account ICAO and other pertinent State criteria.

(2) Approach Systems. The applicant shall establish acceptable approach performance to the criteria contained in U.S. AC 120-29, as amended, an equivalent foreign standard acceptable to the Minister, or any other criteria acceptable to the Administrator.
(3) Landing and Rollout System Performance. The stable approach (i.e., "normal maneuvering" without excessive attitudes, sink rates, path deviations or speed deviations) should be conducted to the point where a smooth transition is made to the landing.

If the landing system is designed to perform an alignment function prior to touch down, to correct for crosswind effects, it should operate in a manner consistent with a pilot's manual technique for crosswind landings for the aircraft type, typically using the wing low side slip procedure. Non-availability of the alignment mode, or failure of the alignment mode to perform its intended function must be easily detectable, or be suitably annunciated, so that the flightcrew can take appropriate action.

The landing system "landing flare to touch down" maneuver should reduce the airplane sink rate to a value and in a manner that is compatible with a normal flightcrew landing maneuver.

The automatic flight control system should provide de-rotation, consistent with a pilot's manual technique. Systems which provide rollout guidance for manually controlled rollout are not required to provide de-rotation. Systems which provide de-rotation, automatically or with guidance for manual control, must avoid any objectionable oscillatory motion or nose wheel touch downs, pitch up or other adverse behavior as a result of ground spoiler deployment or reverse thrust operation.

Automatic control during the landing and rollout should not result in any airplane maneuvers which would cause the flightcrew to intervene unnecessarily.

Guidance provided during the landing and rollout should be consistent with a pilot's manual technique, and not require excessive skill or crew workload to accomplish the operation.

(4) Landing System Performance. All types of low visibility landings systems, including automatic flight control, guidance for manual control, and hybrid, shall be demonstrated to achieve the performance accuracy with the probabilities prescribed in this section. The performance values may vary where justified by the characteristics of the airplane.

The performance criteria and probabilities are as follows:

- (a) longitudinal touch down earlier than a point on the runway 200 ft. (60m) from the threshold to a probability of 1×10^{-6};
- (b) longitudinal touch down beyond 2700 ft.(823m) from threshold to a probability of 1×10^{-6};
- (c) lateral touch down with the outboard landing gear more than 70 ft. (21.3m) from runway centerline to a probability of 1×10^{-6}.
- (d) structural limit load, to a probability of 1×10^{-6}. An acceptable means of establishing that the structural limit load is not exceeded is to show separately and independently that:
  - (i) the limit load that results from a sink rate at touch down not greater than 10 f.p.s. or the limit rate of descent used for certification under U.S. 14 CFR part 25 subpart C (see section 25.473), whichever is the greater (or equivalent).
  - (ii) the lateral side load does not exceed the limit value determined for the lateral drift landing condition defined in part 25, Section 25.479(d)(2) or equivalent.
- (e) bank angle resulting in hazard to the airplane to a probability of 1×10^{-7}. A hazard to the airplane is interpreted to mean a bank angle resulting in any part of the wing, high lift device, or engine nacelle touching the ground.

(5) Speed Control Performance. Airspeed must be controllable to within +/- five knots of the approach speed*, except for momentary gusts, up to the point where the throttles are retarded to idle for landing. For operations flown with manual control of approach speed, the flightcrew must be able to control speed to within +/- five knots of the approach speed.

Information Note: *This criteria is not specific to low visibility systems, but must be met by low visibility systems.*

(6) Rollout System Performance.

The rollout system, if included, should control the airplane, in the case of an automatic flight control system, or provide command information as guidance to the pilot, for manual control, from the point of landing to a safe taxi speed. The loss of rudder effectiveness, as the airplane speed is reduced, could be a factor in the level of approval which is granted to a system. The applicant should describe the system concept for rollout control so that the absence of low speed control, such as a nose wheel steering system, can be assessed.

Safe Taxi Speed is the speed at which the pilot can safely leave the runway or bring the airplane to a safe stop. The safe taxi speed may vary with visibility conditions, airplane characteristics, and means of lateral control. The performance criteria in this section assume a 150 ft. [45.7 m] runway width. The rollout performance limit may be appropriately increased if operation is limited to wider runways.

The rollout system performance is referenced to the centerline of the runway. The intended path for the rollout system is usually defined by an ILS localizer, or other approved approach navigation system, which normally coincides with the runway centerline.

The rollout system should be demonstrated to:

(a) not cause the outboard tire(s) to deviate from the runway centerline by more than 70 ft. [21.3 m]*, starting from the point at which touch down occurs and continuing to a point at which a safe taxi speed is reached, to a probability of 1×10^{-6}.
(b) capture the intended path or converge on the intended path (e.g., localizer centerline) in a smooth, timely and predictable manner. While a critically damped response is desired, minor overshoots are considered acceptable. Sustained or divergent oscillations or unnecessarily aggressive responses are unsatisfactory.
(c) promptly correct any lateral movement away from the runway centerline in a positive manner.
(d) following touchdown, if not already on a converging path, cause the airplane to initially turn and track a path to intercept the runway centerline at a point far enough in front of the airplane that it is obvious to the flightcrew that the rollout system is performing properly. Also, the rollout system should intercept the centerline sufficiently before the stop end of the runway, and before the point at which taxi speed is reached.

Information Note: *70 ft.[21.3 m] deviation from centerline is equivalent to outboard tire(s) at 5 ft. [1.5 m] within the edge of a 150 ft. [45.7 m] wide runway.*

(7) Variables Affecting Performance. This section identifies the variables to be considered when establishing landing and rollout performance.

The performance assessment shall take into account at least the following variables with the variables being applied based upon their expected distribution:

(a) configurations of the airplane (e.g., flap/slat settings);
(b) center of gravity;
(c) landing gross weight;
(d) conditions of headwind, tailwind, crosswind, turbulence and wind shear (See Attachment 4 for acceptable wind models);
(e) characteristics of applicable navigation systems and aid, variations in flight path definitions (ILS, MLS, GLS - ground, airplane and space elements etc.)
(f) approach airspeed and variations in approach airspeed.
(g) airport conditions (elevation, runway slope, runway condition).
(h) individual pilot performance, for systems with manual control.
(i) any other parameter which may affect system performance.

(8) Irregular Approach Terrain. Approach terrain may affect the performance and pilot acceptance of the approach and landing system.

The information on the nominal characteristics of an airport is contained in ICAO Annex 14. This information can be used to characterize the airport environment for nominal performance assessment. However, the system shall be evaluated to determine the performance characteristics in the presence of significant approach terrain variations. At a minimum the following profiles should be examined:

(a) sloping runway - slopes of 0.8%.
(b) hilltop runway - 12.5% slope up to a point 60m prior to the threshold; or
(c) sea-wall - 6m (20 ft.) step up to threshold elevation at a point 60m prior to the threshold.

Information Note: *In addition to the profiles described above, examination of the profiles of known airports with significant irregular approach terrain, at which operations are intended, is recommended (See Division III (25) of this Appendix).*

(9) Approach and Automatic Landing with an Inoperative Engine. For demonstration of engine inoperative capabilities, where the approach is initiated, and the landing made, with an inoperative engine, the landing system must be shown to perform a safe landing and, where applicable, safe rollout in this non-normal aircraft condition taking account the factors described in Division III (24) of this Appendix and the following:

(a) failure of the critical engine, and for propeller, where applicable, accounting for feathering of the propeller following failure of the critical engine;
(b) appropriate landing flap configurations;
(c) loss of any systems associated with the inoperative engine, e.g., electrical and hydraulic power;
(d) crosswinds in each direction of at least 10 knots;
(e) weight of aircraft.

Whether or not engine out landing approval is sought, the go-around from any point on the approach to touch down must not require exceptional piloting skill, alertness or strength and must ensure that sufficient information is available to determine that the airplane can remain clear of obstacles (See Section 6. (10) below).

(10) Inoperative Engine Information. Information for an operator to assure a successful go-around with an inoperative engine should be provided. The information may be in a form as requested by the operator, or as determined appropriate by the manufacturer. The information may or may not be provided to the operator as part of the AFM. Examples of acceptable information would include the following:

(a) information on height loss as a function of go-around initiation altitude, and
(b) performance information allowing the operator to determine that safe obstacle clearance can be maintained during a go around with an engine failure, or
(c) a method to assess and extend applicability of engine inoperative takeoff performance obstacle clearance determinations for a balked landing or go-around event.

(11) Landing and Rollout System Integrity. The applicant shall provide the certification authority with an overall operational safety assessment plan for the use of systems other than ILS or MLS for "path in space" guidance. This plan shall identify the assumptions and considerations for the non-aircraft elements of the system and how these assumptions and considerations relate to the airplane system certification plan.

The effect of the navigation reference point on the airplane on flight path and wheel to threshold crossing height shall be assessed.

(12) Landing System Integrity. The onboard components of the landing system, considered separately and in relation to other associated onboard systems, should be designed to meet the requirements of U.S. FAR Section 25.1309 or equivalent, in addition to any specific safety related criteria identified in this Attachment.

The following criteria is provided for the application of U.S. FAR 25.1309 to Landing Systems:

Any single malfunction or any combination of malfunctions of the landing system that could prevent a safe landing or go around must be Extremely Improbable, unless it can be detected and annunciated, as a warning to allow pilot intervention to avoid catastrophic results, and shown to be Extremely Remote.

Failure to detect and annunciate malfunctions that could prevent a safe landing or go around must be Extremely Improbable.

The exposure time for assessing failure probabilities for Fail Passive landing systems is the average time required to descend from 100 feet [30 m] HAT or higher to touchdown, and for Fail Operational landing systems the average time to descend from 200 feet [60 m] HAT or higher to touchdown.

For a Fail Passive automatic landing system, a single malfunction or any combination of malfunctions must not cause a significant deviation of the flight path or attitude (e.g., hardover) following a system disengagement. The airplane must be safely trimmed, when the system disengages, to prevent these significant deviations.

A Fail Operational automatic landing system, following a single malfunction, must not lose the capability to perform lateral and vertical path tracking, alignment with runway heading (e.g., decrab), flare and touchdown within the safe landing requirements listed below.

Malfunction cases may be considered under nominal environmental conditions.

For the purpose of analysis, a safe landing may be assumed if the following requirements are achieved:

- (a) longitudinal touch down no earlier than a point on the runway 200 ft. [60 m] from the threshold,
- (b) longitudinal touch down no further than 3000 ft. [1000 m] from the threshold e.g., not beyond the end of the touch down zone lighting,
- (c) lateral touch down with the outboard landing gear within 70 ft. [21 m] from runway centerline. (These values assume a 150 ft. [45 m] runway. The lateral touch down performance limit may be appropriately increased if operation is limited to wider runways),
- (d) structural limit load. An acceptable means of establishing that the structural limit load is not exceeded is to show separately and independently that:
  - (i) the limit load that results from a sink rate at touch down not greater than 10 f.p.s. or the limit rate of descent used for certification under FAR Part 25 Subpart C (See Section 25.473), whichever is the greater.
  - (ii) the lateral side load does not exceed the limit value determined for the lateral drift landing condition defined in FAR Section 25.479(d)(2).

(e) bank angle resulting in hazard to the airplane such that any part of the wing or engine nacelle touches the ground.

(13) Rollout System Integrity. The rollout system, if provided shall provide automatic control, or guidance for manual control, to maintain the airplane on the runway to a safe taxi speed on the runway.

The onboard components of the rollout system, considered separately and in relation to other associated onboard systems, should be designed to meet the requirements of FAR Section 25.1309 or equivalent, in addition to any specific safety related criteria identified in this Attachment.

The following criteria is provided for the application of U.S. FAR Section 25.1309 to Rollout Systems:

(a) a Fail Operational rollout system must meet the safe rollout performance requirements of Attachment 3 Section 6. (6) (i.e., no lateral deviation greater than 70 ft. [21.3 m] from centerline) after any single malfunction, or after any combination of malfunctions not shown to be Extremely Remote. Malfunction cases may be considered under nominal environmental conditions.

(b) for any rollout system, below 200 ft. [60 m] HAT, unannunciated malfunctions that would prevent a safe rollout must be shown to be Extremely Improbable.

(c) for a fail passive rollout system, the loss of a fail passive automatic rollout function after touchdown shall cause the automatic flight control system to disconnect. The loss of a Fail Passive rollout system after touchdown shall be Improbable. Whenever a fail passive guidance system for manual rollout does not provide valid guidance, an annunciation should be provided to both pilots, and the guidance removed. The removal of guidance, alone, is not adequate annunciation, unless independent information available within the pilot's primary field of view positively indicates the failure. The annunciation must be located to ensure rapid recognition, and must not distract the pilot flying or significantly degrade the forward view.

(d) for any rollout system, for malfunctions that only affect low speed directional control (speeds below which rudder is ineffective for steering), rollout system performance should not cause the airplane wheels to exceed the lateral confines of the runway, from the point of touch down to the point at which a safe taxi speed is reached, more often than once in ten million landings. A safe taxi speed is considered to be a speed at which the pilot can resume manual control to safely exit the runway or expeditiously bring the airplane to a safe stop. A safe taxi speed may vary with airplane characteristics and available means of lateral control.

(14) On Board Database Integrity [PoC]. The definition, resolution and maintenance of the waypoints which define the required flight path and flight segments is key to the integrity of this type of landing and rollout operation.

When the required flight path is defined by an on-board database, a mechanism should be established to ensure the continued integrity of the flight path designators.

The integrity of any on board data base used to define flight critical path waypoints for an Landing and Rollout System should be addressed as part of the certification process.

(15) Landing and Rollout System Availability.

(a) Landing System Availability. Below 500 ft. [150 m] on approach, the probability of a successful landing should be at least 95% for approach demonstrations conducted in the airplane (i.e., no more than 5% of the approaches result in a go-around, due to the combination of failures in the landing system and the incidence of unsatisfactory performance). Compliance with this requirement typically should be established during flight test, with approximately 100 approaches.

For an airplane equipped with a Fail Passive landing system, the need to initiate a go-around below 100 ft. [30 m] HAT on approach due to an airplane failure condition should be infrequent (i.e., typically fewer than 1 per 1000 approaches).

For a Fail Operational system, below 200 ft. [60 m] HAT on approach, the probability of total loss of the landing system (even though appropriate annunciation of system loss is provided) must be Extremely Remote. For any annunciation that is provided, that annunciation must enable a pilot to intervene in a timely manner to avoid a catastrophic result. Total loss of the system without annunciation shall be Extremely Improbable.

(b) Rollout System Availability. For a Fail Passive rollout system, from 200 ft. [60 m] HAT through landing and rollout to a safe taxi speed, the probability of a successful rollout should be at least 95%, considering loss or failure of the rollout system.

For a Fail Operational rollout system, during the period in which the aircraft descends below 200 ft. HAT to a safe taxi speed, the probability of degradation from Fail Operational to Fail Passive should be infrequent (i.e., fewer than 1 degradation per 1000 approaches), and the probability of total loss of rollout capability should be Extremely Remote, considering loss or failure of the rollout system.

After touch down, complete loss of the Fail Operational automatic rollout function, or any other unsafe malfunction or condition, shall cause the automatic flight control system to disconnect. The loss of a Fail Operational rollout system after touch down shall be Extremely Remote.

(16) Go-Around. The aircraft must be capable of safely executing a go-around from any point on the approach to touch down in all configurations to be certificated. The maneuver may not require exceptional piloting skill, alertness or strength.

(b) a go-around from a low altitude may result in inadvertent runway contact, therefore the safety of the procedure should be established giving consideration to at least the following:
   (i) the automatic control and guidance produced by the go-around mode, if such a mode is provided, should be retained and be shown to have safe and acceptable characteristics throughout the maneuver,
   (ii) other systems (e.g., automatic throttle, brakes, spoilers and reverse thrust) should not operate in a way that would adversely affect the safety of the go-around maneuver.

(c) inadvertent selection of go-around mode after touch down should have no adverse effect on the ability of the aircraft to safely roll out and stop.

(d) height loss should be assessed to assure expeditious go-around from a range of altitudes during the approach and flare when under automatic control and when using the landing guidance system, as appropriate, and as follows:
   (i) height loss may be assessed by flight testing (typically 10 go-arounds) supported by simulation.

(ii) the simulation should evaluate the effects of variation in parameters, such as weight, center of gravity, configuration and wind, and show correlation with the flight test results.
(iii) normal procedures for a go-around for the applicable configuration should be followed. If engine-inoperative capability is sought, and use of the go-around mode is applicable to those operations, an assessment of the engine-inoperative go-around is necessary.

(17) Automatic Braking System. If automatic braking is used for credit under Division III (22) of this Appendix, then the following apply:
(a) the automatic braking system should allow anti-skid protection and have manual reversion capability. An automatic braking system should provide smooth and continuous deceleration from touch down until the airplane comes to a complete stop on the runway and provide:
(i) disconnect of the autobrake system must not create unacceptable additional crew workload or crew distraction from normal rollout braking.
(ii) normal operation of the automatic braking system should not interfere with the rollout control system. Manual override of the automatic braking system must be possible without excessive brake pedal forces or interference with the rollout control system. The system should not be susceptible to inadvertent disconnect.
(iii) a positive indication of system disengagement and a conspicuous indication of system failure should be provided.
(iv) no malfunction of the automatic braking system should interfere with either pilots use of the manual braking system.
(b) the demonstrated wet and dry runway braking distances, for each mode of the automatic braking system, should be determined in a manner consistent with the Authority's Regulations and presented in the airplane flight manual as performance information.

(18) Flight Deck Information, Annunciation and Alerting. This section identifies information, annunciations and alerting requirements for the flight deck.

The controls, indicators and warnings must be designed to minimize crew errors which could create a hazard. Mode and system malfunction indications must be presented in a manner compatible with the procedures and assigned tasks of the flightcrew. The indications must be grouped in a logical and consistent manner and be visible under all expected normal lighting conditions.

(19) Flight Deck Information. This section identifies requirements for basic situation and command information.

For manual control of approach, landing and rollout flight path, the primary flight display(s), whether head down or head up, must provide sufficient information to enable a suitably trained pilot to maintain the approach path, to make the alignment with the runway, flare and land the airplane within the prescribed limits or to make a go-around without excessive reference to other cockpit displays.

Sufficient information should be provided in the flight deck to allow the pilots to monitor the progress and safety of the landing and rollout operation, using the information identified above and any additional information necessary to the design of the system.

Required in flight performance monitoring capability includes at least the following:

(a) unambiguous identification of the intended path for the approach, landing and rollout, (e.g., ILS/MLS/GLS approach identifier/frequency, and selected navigation source)
(b) indication of the position of the aircraft with respect to the intended path (e.g., situation information localizer and glide path, or equivalent).

(20) Annunciation. A positive, continuous and unambiguous indication must be provided of the modes actually in operation, as well as those which are armed for engagement. In addition, where engagement of a mode is automatic (e.g., localizer and glide path acquisition), clear indication must be given when the mode has been armed by either action of a member of the flightcrew, or automatically by the system (e.g., a pre-land test - LAND 3).
(21) Alerting. Alerting requirements are intended to address the need for warning, caution and advisory information for the flightcrew.
(22) Warnings. FAR/JAR 25.1309 requires that information must be provided to alert the crew to unsafe system operating conditions to enable the crew to take appropriate corrective action. A warning indication must be provided if immediate corrective action is required. An analysis should be performed to consider crew alerting cues, corrective action required, and the capability of detecting faults.

Warnings must be given without delay, be distinct from all other cockpit warnings and provide unmistakable indication of the need for the flightcrew to take immediate corrective action. Aural warnings must be audible to both pilots under typically assumed worst case ambient noise conditions, but not so loud and intrusive as to interfere with the crew taking the required corrective action or readily accomplishing crew coordination. Visual warnings, such as lights or alphanumeric messages, must be distinct and conspicuously located in the primary field of view for both pilots.

After beginning final approach (e.g., typically prior to reaching 1000' [300 m] HAT), the loss of a Fail Passive or Fail Operational system, shall be annunciated. Whenever a Fail Passive system, for manual control, does not provide valid guidance, it shall be indicated by a positive and unmistakable warning to both pilots, and the guidance removed. The removal of guidance, alone, is not adequate annunciation. The annunciation must be located to ensure rapid recognition, and must not distract the pilot flying or significantly degrade the forward view.

(23) Cautions. A caution is required whenever immediate crew awareness is required and timely subsequent crew action may be required. A means shall be provided to advise the flightcrew of failed airplane system elements that affect the decision to continue or discontinue the approach.
(a) after initiation of final approach (which typically occurs at or above 1000' [300 m] HAT), a Fail Passive landing system, or landing and rollout system, shall alert the flightcrew to any malfunction or condition that would adversely affect the ability of the system to safely operate or continue the approach or landing.
(b) after initiation of final approach (which typically occurs at or above 1000' [300 m] HAT), a Fail Passive command guidance system (e.g., head-up- display (HUD) guidance), shall provide a clear, distinct and unmistakable indication to alert each pilot to any malfunction or condition that would adversely affect the ability of the system to safely operate or continue the approach or landing.
(c) after initiation of final approach (which typically occurs at or above 1000' [300 m] HAT), but above the airworthiness demonstrated Alert Height, a Fail Operational landing system or landing and rollout system (with either Fail Operational or Fail Passive rollout) shall alert the flightcrew to:

(i) any malfunction or condition that would adversely affect the ability of the system to safely operate or continue the approach or landing, and
(ii) any malfunction that degrades the landing system from a Fail Operational to a Fail Passive landing system.

(a) below the airworthiness demonstrated Alert Height and throughout rollout, a Fail Operational landing systems shall inhibit alerts for malfunctions that degrade landing system capability from Fail Operational to Fail Passive status.

(b) Deviation Alerting - The Authorities expect the flightcrew to monitor flight path deviations as indicated on the primary flight instruments, and does not require automatic alerting of excessive deviation. Nonetheless, the Authority may approve systems which meet alternate appropriate criteria for deviation alerting (e.g., JAR/AWO). If a method is provided to detect excessive deviation of the airplane, laterally and vertically during approach to touch down and laterally after touch down, then it should not require excessive workload or undue attention. This provision does not require a specified deviation alerting method or annunciation, but may be addressed by parameters displayed on the ADI, EADI, HUD, or PFD. When a dedicated deviation alerting method is provided, its use must not cause excessive nuisance alerts.

(c) for systems demonstrated to meet JAA criteria, compliance with the following criteria, from JAR-AWO 236, is an acceptable means of compliance, but is not a required means of compliance:
(i) for systems meeting the JAR-AWO 236 criteria, excess-deviation alerts should operate when the deviation from the ILS, MLS, or GLS glide path or localizer centerline exceeds a value from which a safe landing can be made from offset positions equivalent to the excess-deviation alert, without exceptional piloting skill and with the visual references assumed to be available in these conditions.
(ii) for systems meeting the JAR-AWO 236 criteria, excess-deviation alerts should be set to operate with a delay of not more than one (1) second from the time that the deviation thresholds are exceeded.
(iii) for systems meeting the JAR-AWO 236 criteria, excess-deviation alerts should typically be active at least from 300 ft. [90 m] HAT to 50 ft. HAT, but the glide path deviation alert may be discontinued below 100 ft. [30 m] HAT.

(24) Advisories. A means shall be provided to inform the flightcrew when the airplane has reached the operational Alert Height or Decision Height, as applicable.
(25) System Status. A means should be provided for the operator and flightcrew to determine prior to departure and the flightcrew to determine after departure, the capability of the airplane elements to accomplish the intended low visibility operations. While en route, the failure of each airplane component adversely affecting the capability to conduct the intended landing operation should be indicated to the flightcrew as an advisory.

A means should be provided to advise the flightcrew of failed airplane system elements relating to landing system capability which otherwise could adversely affect a flightcrew's decision to use particular landing minima (e.g., adversely affect a decision to continue to a destination or divert to an alternate).

If multiple landing system capability is installed (e.g., MMR), then during approach, an indication of a failure in each non-selected airplane landing system element (e.g., an MLS or GLS receiver failure during conduct of an ILS approach) should be made available to the flightcrew as an indication of system status. Such failures or non-availability, however, should not produce a caution or warning if they are not relevant to the system in use.

System Status indications should be typically identified by names that are different than operational authorization categories (e.g., annunciations such as "LAND 3," or "DUAL" may be used). System or configuration status annunciations which may change over time as operational criteria change, or could be confusing or ambiguous if the flightcrew, operator, operation, runway or aircraft are otherwise constrained or found eligible for a particular minima or operation, should typically not be used (e.g., system or configuration annunciations such as "CAT I", "CAT II", or "CAT III" should typically not be used for new designs).

(26) Multiple Landing Systems. International agreements have established a number of landing systems as being acceptable means to conduct instrument approach and landing. This section identifies requirements which relate to airplane systems which provide the capability to conduct approach and landing operations using these multiple landing systems (e.g., ILS, MLS, GLS).
(27) General. Where practicable, the flight deck approach procedure should be the same irrespective of the navigation source being used.

A means (for example the current ILS facility identification) should be provided to confirm that the intended approach aid(s) has been correctly selected;

(28) Indications. The following criteria apply to indications in the flight deck for the use of a multi-mode landing system:

The primary flight display shall indicate deviation data for the selected landing system.

The loss of deviation data shall be indicated on the display. It is acceptable to have a single failure indication for each axis common to all navigation sources.

(29) Annunciations. The following criteria applies to annunciations in the flight deck when using a multi-mode landing system.

The navigation source (e.g., ILS, MLS, GLS, FMS) selected for the approach shall be positively indicated in the primary field of view at each pilot station;

The data designating the approach (e.g., ILS frequency, MLS channel, GLS 'channel') shall be unambiguously indicated in a position readily accessible and visible to each pilot;

A common set of ARM and ACTIVE mode indications (e.g., LOC and GS) is preferred for ILS, MLS and GLS operations;

A means must be provided for the crew to determine a failure of the non-selected navigation receiver function, in addition to the selected navigation receiver function. When considering equipment failures, the failure indications must not mislead through incorrect association with navigation source. For example, it would not be acceptable for the annunciation "ILS FAIL" to be displayed when the selected navigation source is MLS and the failure actually affects the MLS receiver;

(30) Alerting. Flight operations may require planning to alternate destination runways or alternate airports for takeoff, en route diversion and landing. Various runways at these airports may have different landing systems. Thus, flight operations may be planned, released and conducted on the basis of using one or more landing systems.

Accordingly, the ability to determine the capability of each element of a multi-mode landing system should be available to the flightcrew to support flight planning.

A failure of a non-selected landing mode (i.e., ILS, MLS, GLS) shall be indicated to the flightcrew as an advisory if it has been determined that the mode is not available or will not be available for use during the next approach and landing.

A failure of the active element of a multi-mode landing system during an approach shall be accompanied by a warning, caution, or advisory, as appropriate.

An indication of a failure in each non-selected element a multi-mode landing system shall be available to the flightcrew as an advisory but should not produce a caution or warning. Such advisories may be inhibited during takeoff, below Alert Height, and at other times as determined necessary or appropriate for the alerting system and flight deck design philosophy of the aircraft type.

7. Landing and Rollout System Evaluation.

(1) An evaluation should be conducted to verify that the pertinent systems as installed in the airplane meet the airworthiness requirements of section 6 of this Attachment. The evaluation should include verification of landing and rollout system performance requirements and a safety assessment for verification of the integrity and availability requirements. Engine failure cases and other selected failure conditions identified by the safety assessment should be demonstrated by simulator and /or flight tests.

(2) An applicant shall provide a certification plan which describes:

- (a) the means proposed to show compliance with the requirements of Division VI of this Attachment, with particular attention to methods which differ significantly from those described in this Attachment.
- (b) how any non-airplane elements of the Landing and Rollout System relate to the airplane system from a performance, integrity and availability perspective.
- (c) the assumptions on how the performance, integrity and availability requirements of the non-airplane elements will be ensured.
- (d) the system concepts and operational philosophy to allow the regulatory authority to determine whether criteria and requirements in excess of that contained in this Attachment are necessary.

Early agreement between the applicant and the Authority should be reached on the proposed certification plan. Upon completion of an Authority's engineering design review and supporting simulation studies, a type inspection authorization (TIA) should be issued to determine if the complete installation of the equipment associated with Category III operations meets the criteria of this Attachment or equivalent.

(3) Performance Evaluation. The performance of the airplane and its systems must be demonstrated by either flight test or by analysis and simulator tests supported by flight test. Flight testing must include a sufficient number of normal and non-normal approaches conducted in conditions which are reasonably representative of actual expected conditions and must cover the range of parameters affecting the behavior of the airplane (e.g., wind speed, NAVAID (e.g., ILS) characteristics, airplane configurations, weight, center of gravity, non-normal events).

The performance evaluation must verify that the Landing and Rollout System meets the performance requirements of Division VI (1), (2) and (3) and Subsections of this Attachment. The tests must cover the range of parameters affecting the behavior of the airplane (e.g., airplane configurations, weight, center of gravity, non-normal events) when the airplane encounters the winds described by either of the models in Attachment 4, or other model found acceptable by the Administrator, and the variations in flight path determination associated with the sensors used by the Landing and Rollout system. Flight testing must include a sufficient number of normal and non-normal approaches conducted in conditions which are reasonably representative of actual expected conditions.

The reference speed used as the basis for certification should be identified. The applicant should demonstrate acceptable performance within a speed range of -5 to +10 knots with respect to the reference speed, unless otherwise agreed by the Authority and the applicant. The reference speed used as the basis for certification should be the same as the speed used for normal landing operations, including wind and other environmental conditions.

The applicant shall demonstrate that the landing and rollout system does not exhibit any guidance system or control characteristics during the transition to rollout which would cause the flightcrew to react in an inappropriate manner (e.g., during nose wheel touch down, spoiler extension, initiation of reverse thrust).

Landing systems for manual control with guidance must meet the same requirements for touch down footprints, sink rates and attitude as automatic landing systems.

The landing and rollout system shall be shown to be satisfactory with and without the use of any outside visual references, except that outside visual references will not be considered in assessing path tracking and touch down performance. The airworthiness evaluation will also determine whether the combination of guidance and outside visual references would unacceptably degrade task performance, require excessive pilot compensation or workload during normal and non-normal operations.

For the purpose of the airworthiness demonstration, the operational concept for coping with the loss of guidance may assume the presence of adequate outside visual references for the flightcrew to safely continue the operation. The airworthiness demonstration should include the loss of guidance to show there are otherwise no adverse system effects.

For rollout systems for manual rollout with guidance, it shall be demonstrated that a safe rollout can be achieved with a Satisfactory level of workload and pilot compensation following a failure. Workload and task compensation may be assessed using the U.S. FAA Handling Quality Rating System (HQRS) found in U.S. AC 25-7A, as amended, or equivalent, with and without external visual reference. Rollout guidance must be demonstrated without external visual reference to show that a pilot can satisfactorily perform the lateral tracking task with the guidance alone. Rollout guidance must also be demonstrated with external visual reference to show that the combination of guidance and visual reference is compatible and does not unacceptably degrade task performance, require excessive pilot compensation or workload during normal and non-normal operations.

For the evaluation of low visibility systems for manual control with guidance for landing or rollout, the set of subject pilots provided by the applicant should have relevant variability of experience (e.g., experience with or without HUD, Captain or First Officer (F/O) crew position experience as applicable, and experience in type). Subject pilots must not typically have special experience that invalidates the test (e.g., pilot's should not have special recent training to cope with HUD failures, beyond that which a line pilot would be expected to have for routine operation). The set of pilots provided by the certifying authorities may have experience as specified by the authority appropriate to the test(s) to be conducted. The experience noted above for authority subject pilots or evaluation pilots may or may not be applicable or appropriate for the tests to be conducted.

Failure cases should typically be spontaneous and unpredictable on the subject's or evaluation pilot's part.

For the initial certification of a landing and rollout system for manual control with guidance (e.g., HUD guidance system) in a new type airplane or new type HUD installation, at least 1,000 simulated landings and at least 100 actual aircraft landings is typically necessary. For evaluation of these systems, individual pilot performance should also be considered as a variable affecting performance, see section 6.3.4. As described in the paragraph above, subject pilots of varying background and experience level should be used in the flight and simulation programs. Subject pilots should have appropriate qualifications and, when applicable, be trained in the use of the landing system in a manner equivalent to that expected for pilots who will use the system in operational service.

For data collection tests, after a significant number of consecutive approaches (e.g., 10 approaches), subject pilots should be afforded the opportunity for an appropriate rest break.

(4) High Altitude Automatic Landing System Demonstration.

The following describes an acceptable means to demonstrate performance of automatic landing systems at high altitude with a combination of flight test results and validated simulation. The airport elevation at which satisfactory performance of an automatic landing system has been demonstrated by this method, may then be documented in the Airplane Flight Manual (AFM). The flight test demonstration is considered the primary source of data, which can then be supplemented with data from a validated simulation.

The minimum required altitude or elevation for the flight test which is used to demonstrate a desired AFM Elevation Value, by this method, is shown in Figure 7.1.1-1 and the accompanying table, below. For example, the applicant may document an AFM Elevation Value of 8,000 ft., by a successful flight demonstration at 8,000 ft., or by a flight demonstration at a minimum elevation of 5,000 ft. with a simulation to the desired 8,000 ft. Note, the lines in Figure 7.1.1-1 converge at 11,000 ft, which indicates that credit for simulation is not available at 11,000 ft or above.

The atmospheric temperature and pressure during the flight test, for either method, should not be more favorable than International Standard Atmosphere (ISA) conditions, to ensure that the density altitude is not less than the airport elevation. When the density altitude value of the flight test is less than the airport elevation, then the density altitude value should be used as the effective Flight Test Demonstrated Elevation, and this will decrease the maximum AFM Elevation Value.

Assuring acceptable autoland performance at high altitude by using a flight test validated simulation requires a sufficient quantity of flight test data. Flight test data should be obtained from approximately 10-15 landings at a Flight Test Demonstrated Elevation shown in Figure 7.1.1-1. For flight validation, the test airplane should be equipped with instrumentation to measure and record:

(a) the airplane's trajectory, using an acceptably accurate method, such as by a differential global positioning system (DGPS) receiver, a laser optical tracker, a calibrated camera, or other equivalent method.

(b) touchdown vertical velocity and runway touchdown point, expressed in suitable units and coordinates.
(c) glideslope and Localizer signal deviations.
(d) airplane state parameters as necessary, including relevant powerplant and flight control, information.
(e) relevant Autopilot, autothrottle, and/or HUD guidance system parameters and performance.
(f) atmospheric conditions at the airport at the time of each approach, including temperature, barometric pressure (QNH), mean wind velocity and direction.

The simulation should be validated through comparison of simulation data with quantitative flight test measurements. Time histories of the airplane and systems performance in the approach, flare, touchdown, rollout and go-around flight phases, for flight tests at the Flight Test Demonstration Elevation should be compared with corresponding simulation results. The comparison between the flight test data and the simulation data should show that the two are consistent at corresponding altitudes.

Acceptable autoland performance at the selected AFM Elevation may then be based on validated simulation results, within the acceptable extrapolation range for flight test data shown in Figure 7.1.1-1. To assure acceptable autoland performance in a range of altitudes and atmospheric conditions up to and including the selected AFM Elevation, the simulation should include variation in atmospheric conditions at least as listed below. A sensitivity analysis should be conducted to assure that performance is not unsafe near any limits.

Unless otherwise found acceptable to the Authority, simulation cases should typically include the following:
(a) temperatures ranging from International Standard Atmosphere (ISA) value to ISA +40C.
(b) barometric pressure ranging from ISA value for that elevation to ISA -50 hPa.
(c) mean wind variations, including:
- headwinds to at least 25 knots
- crosswinds to at least 15 knots
- tailwinds to at least 10 knots

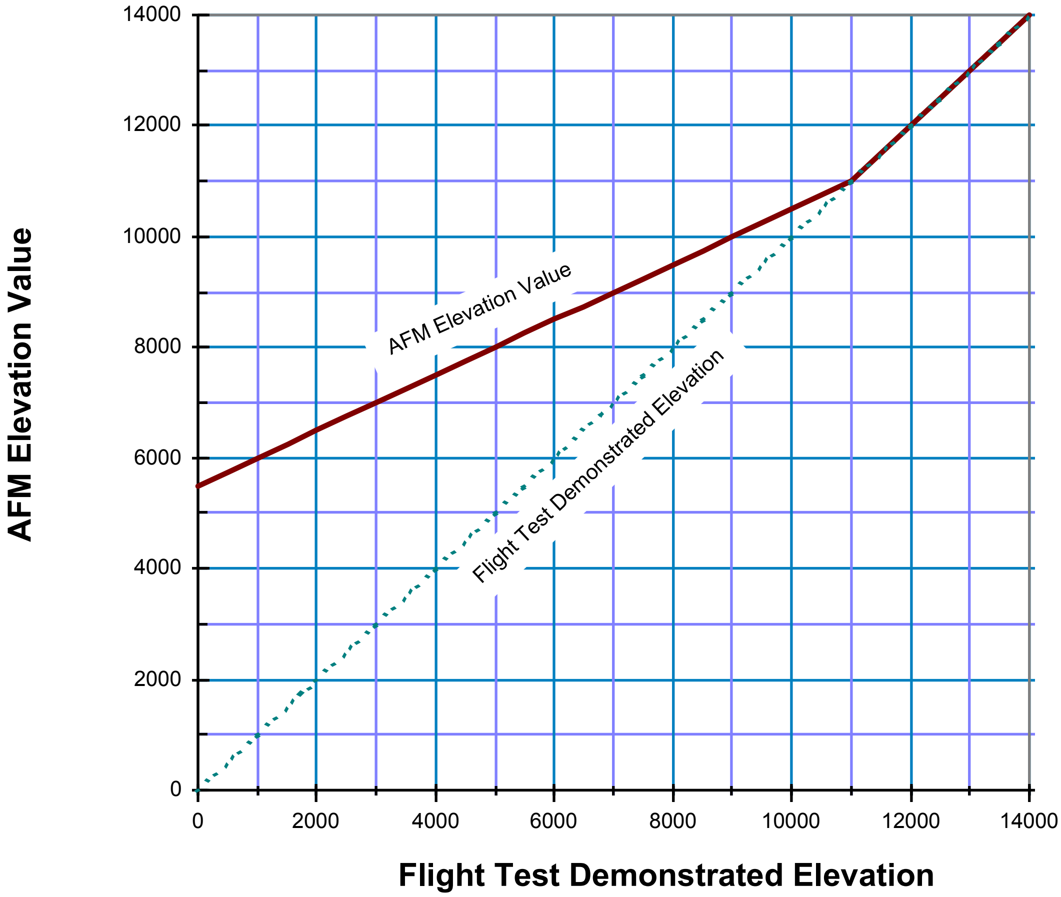

FIGURE 7.1.1-1: AFM ELEVATION VALUE FROM FLIGHT TEST AND VALIDATED SIMULATION

TABLE 7.1.1-1: EXAMPLE AFM ELEVATION VALUES

Flight Test Demonstration Airport Elevation (feet above mean sea level)	**Airport Elevation Value Which May Be Listed in the AFM (feet above mean sea level)**
1,000	6,000
2,000	6,500
3,000	7,000
5,000	8,000
7,000	9,000
9,000	10,000
11,000	11,000

(5) Validation of Simulators for Pilot-in-the-Loop Systems. The certification process for a "Pilot-in-the-Loop" system intended for Category III typically requires use of a high fidelity, engineering quality simulation.

U.S. Advisory Circular (AC) 120-40B (7/29/91) Airplane Simulator Qualification, as amended or equivalent, provides a means to qualify simulators for qualification of pilots. Meeting these requirements provides a known basis for acceptance of simulation capability, and is desirable, but may not necessarily be sufficient to meet the requirements of an engineering simulation to demonstrate landing system performance. Training simulators may not have suitable fidelity in each relevant area, and may not be acceptable for use without modification. For purposes of system airworthiness demonstration, meeting the requirements of U.S. AC 120-40B or equivalent is optional. Meeting the criteria of this Attachment provides an acceptable basis for establishing certification simulation capability.

When simulation is used for demonstration of manual "pilot-in-the-loop" systems with guidance, suitable simulation fidelity should be addressed for at least each critical characteristic affecting the validity of the simulation. An acceptable simulation should typically be capable of varying one parameter at a time, and be able to facilitate examination of the effects of specific wind, wind gradient, and turbulence conditions on approach and landing performance.

Factors of the simulation to be considered include the following:

- Guidance and control system interfaces
- motion base suitability
- "ground effect" aerodynamic characteristics
- wind/turbulence model suitability and adequacy of interface with the simulation
- suitability of landing gear and ground handling dynamics
- adequacy of stability derivative estimates used
- adequacy of any simplification assumptions used for the equations of motion;
- fidelity of flight controls and consequent simulated aircraft response to control inputs
- fidelity of the simulation of aircraft performance
- suitability of the simulation for alignment, flare, and rollout control tasks for any normal or non-normal configurations or disturbance conditions to be assessed
- adequacy of flight deck instruments and displays
- adequacy of simulator and display transient response to disturbances or failures (e.g., engine failure, autofeather, electrical bus switching)
- visual reference availability, fidelity, and delays
- suitability of visibility restriction models such as appropriate calibration of visual references for the tests to be performed for day, night, and dusk conditions as necessary
- ability to simulate flight deck visual cutoff angles
- ability to simulate fog, rain, snow or patchy or intermittent conditions or external visual runway, lighting, marking or nearby terrain scenes as necessary, or
- fidelity of any other significant factor or limitation relevant to the validity of the simulation.

For airworthiness certification credit, a review of the simulation, on a case by case basis, must address at least the following factors:

(a) simulation fidelity relevant to landing system assessment,
(b) stability derivatives, equation of motion assumptions, and relevant ground effect and air and ground dynamic models used,

(c) adequacy of the source of aerodynamic performance and handling quality data used,
(d) visual system fidelity and configuration,
(e) environmental models and methods of model input to the equations of motion, including suitable incorporation of altitude and atmospheric temperature effects,
(f) adequacy of adverse weather models (e.g., visual reference models, runway friction), and
(g) adequacy of irregular terrain models.

A suitably high degree of fidelity is required in each relevant component part of the simulation including: longitudinal, lateral and directional stability (static and dynamic), ground effect during takeoff or landing as applicable, rollout dynamic characteristics, propulsion system characteristics, (especially for turbo-propeller aircraft which have may have significant lift from thrust effects, and drag transient effects due to engine failure), flying qualities, display or visual system capability as it affects tracking tasks, force characteristics of flight controls (e.g., yoke/wheel, rudder, brakes), and performance of the airplane. The fidelity of the simulator may be demonstrated using matching time histories and ensemble touchdown footprint correlation obtained from flight test. The data provided to validate the simulation and the simulation data, itself, will be included as part of the type certification data package.

(6) Simulations for Automatic System Performance Demonstration.

The certification process for systems intended for assessment of automatic systems for Category III operations (e.g., automatic landing systems, automatic landing and rollout systems) typically require the use of a high fidelity "fast-time" simulation.

For airworthiness certification credit, a review of the simulation, on a case by case basis, must address at least the following factors:
(a) simulation fidelity relevant to landing system assessment,
(b) stability derivatives, equation of motion assumptions, and relevant ground effect and air and ground dynamic models used,
(c) adequacy of the source of aerodynamic performance and handling quality data used,
(d) disturbance input method(s) and fidelity,
(e) environmental models and methods of model input to the equations of motion, including suitable incorporation of altitude and atmospheric temperature effects,
(f) adverse weather models (e.g., turbulence, wind gradients, wind models), and
(g) adequacy of irregular terrain models.

Fidelity of the aerodynamic model is needed for at least ground effect, propulsion effects, touch down dynamics, de-rotation, and landing gear models if required for ground rollout characteristics. The fidelity of the simulator may be demonstrated using matching time histories obtained from flight test. The data provided to validate the simulation and the simulation data, itself, will be included as part of the type certification data package.

(7) Flight Test Performance Demonstration. A flight test performance demonstration should be conducted, in part, to confirm the results of simulation. A test airplane equipped with special instrumentation can be used to record the necessary flight test data, for subsequent correlation of flight test results with simulation results. Comparisons should address flight test data, "Monte Carlo simulation" results, and failure demonstration simulation results.

The principal performance parameters to be addressed include, as applicable: vertical and lateral flight path tracking with respect to the intended path (e.g., localizer error, glideslope error, lateral deviation from runway centerline during rollout); altitude and height above terrain during approach or the runway; air data vertical speed and radar altitude sink rate; airspeed and ground speed; and longitudinal and lateral runway touchdown point.

Instrumentation capable of appropriate sample rates and scaling should be used to record relevant parameters (as a function of time, when applicable) including: air data parameters (e.g., airspeed, angle of attack, temperature); aircraft position; attitude; heading; track; velocity and velocity errors (e.g., ground speed, speed error), relevant accelerations; pilot control inputs and resulting surface positions, command information (i.e., flight director), sink rate at touch down (for structural limit load); drift angle at touch down (for gear/tire load); applicable mode and mode transition information (e.g., flare, autothrottle retard, rollout engage); wind as measured at the airplane; a method to determine any unusual aircraft contact with the runway (e.g., wing, nacelle or tail skid ground contact); and reported surface winds and gusts near the runway, at the time of approach and landing.

Data taken during demonstration flight tests should be used to validate the simulation(s). Unless otherwise agreed by the Authority, the objective of a flight test program should be to demonstrate performance of the system to 100% of the steady state wind limit values (e.g., typically at least a 25 kt headwind, 15 kt crosswind, and 10 kt tailwind) that are used in the simulation statistical performance analysis. The simulation can be considered validated if at least four landings are accomplished during flight test at no less than 80% of the intended limit steady state wind value, and a best effort has been made to achieve the full steady state wind component values. It must be shown that the landing system is sufficiently robust near the desired AFM wind demonstrated values.

(8) Demonstration of Approach and Landing with an Inoperative Engine.

The applicant may optionally demonstrate the low visibility landing system with an inoperative engine, and, accordingly, the Airplane Flight Manual (AFM) may state what capability has been satisfactorily demonstrated. With the critical engine inoperative, the applicant may demonstrate the capability to “initiate” and complete the approach and landing. Alternatively, the applicant may demonstrate the capability to “continue” the approach and landing, following failure of the critical engine at any point above the Alert Height or Decision Height.

Provisions of Division III (24) of this Appendix apply to these demonstrations, as do provisions of this Attachment related to landing and rollout performance. The applicant should identify the critical engine, if any, considering any steady state or transient effects on performance, handling, loss of systems, and landing mode status (e.g., alignment, flare, rollout). Individual engines may be critical for different reasons.

If the airplane configuration, procedures or operation are the same as that used in the performance demonstration of Section 6. (4) of this Attachment for all-engine operation, compliance may be demonstrated by, typically, 10 to 15 landings. If there are differences in these airplane configurations, procedures or operations, the number of required landings will be determined by the Authority, on a case by case basis.

If the airplane configuration, procedures or operation is changed significantly from the all-engine operating case, compliance must typically be demonstrated by statistical analysis of Monte-Carlo simulation results supported by flight test. Any effect on configuration or landing distance must be considered.

To aid planning for landing with an inoperative engine, or engine failure during approach or go-around, appropriate procedures, performance, and obstacle clearance information should be available to permit an operator to provide for a safe go-around at any point in the approach to touchdown. For the purposes of this requirement, demonstration or data regarding landing and go-around performance in the event of a second engine failure need not be considered.

If compliance for the case of initiation or continuation of an approach with engine failure is intended, a statement shall be included in the Non-normal Procedures, or equivalent section of the Flight Manual. The flight manual should note that approach and landing with an engine inoperative has been satisfactorily demonstrated. The AFM should list the relevant configuration and conditions under which that demonstration was made (see Attachment 3 Section 9., and Attachment 6, regarding sample AFM provisions).

(9) Safety Assessment. In addition to any specific safety related criteria identified in this Attachment, a safety assessment of the Landing and Rollout system, considered separately and in conjunction with other systems, shall be conducted to meet the requirements of Section 25.1309.

The safety level for an automatic landing and rollout system, or manual landing and rollout system with command information as guidance, should not be less than that typically achieved during a conventional manual landing accomplished by a pilot using a combination of external visual reference and flight instruments. Hence, in showing compliance with the performance and failure requirements, the probabilities of performance or failure effects may not be factored by the proportion of landings made using the landing and roll out system.

In showing compliance with airplane system performance and failure requirements, the probabilities of performance or failure effects may also not be factored by the proportion of approaches which are made in low visibility conditions.

The effect of the failure of navigation facilities must be considered taking into account ICAO and other pertinent State criteria.

Documented conclusions of the safety analysis shall include:

(a) a summary of results from the fault tree analysis, demonstrated compliance, and probability requirements for significant functional hazards.
(b) information regarding "alleviating flightcrew actions" that were considered in the safety analysis. This information should list appropriate alleviating actions, if any, and should be consistent with the validation conducted during testing. If alleviating actions are identified, the alleviating actions should be described in a form suitable to aid in developing, as applicable:
    (i) pertinent provisions of the airplane flight manual procedures section(s), or
    (ii) Flight Crew Operating Manual (FCOM) provisions, or equivalent, or
    (iii) pilot qualification criteria (e.g., training requirements, FSB provisions), or
    (iv) any other reference material necessary for an operator or flightcrew to safely use the system.

(c) information to support preparation of any maintenance procedures necessary for safety, such as:
   (i) certification maintenance requirements (CMR),
   (ii) periodic checks, or
   (iii) other checks, as necessary (e.g., return to service).
(d) information applicable to limitations, as necessary.
(e) identification of applicable systems, modes or equipment necessary for use of the landing system, to aid in development of flight planning or dispatch criteria, or to aid in development of procedures or checklists for pilot selection of modes or assessment of system status, prior to initiation of approach or during approach.
(f) information necessary for development of Non-normal procedures.

8. AIRBORNE SYSTEMS.

The airborne system should be shown to meet the performance, integrity and availability requirements identified in this Attachment, as applicable to the type(s) of operation(s) intended. In addition, airborne systems intended for use for Category III approach and landing, or approach, landing and rollout shall comply with the pertinent sections of this Attachment and the specific requirements which follow.

(1) Automatic Flight Control Systems. When established on a final approach path below 1000 ft. HAT [300 m], it must not be possible to change the flight path of the airplane with the automatic pilot(s) engaged, except by initiating an automatic go-around.

It must be possible to disengage the automatic landing system at any time without the pilot being faced with significant out-of-trim forces that might lead to an unacceptable flight path disturbance.

It must be possible for each pilot to disengage the automatic landing system by applying a suitable force to the control column, wheel, or stick. This force should be high enough to preclude inadvertent disengagement, and low enough to be applied with one hand, but not as low as those described in FAR Section 25.143.

Following a failure or inadvertent disconnect of the automatic pilot, or loss of the automatic landing mode, when it is necessary for a pilot to immediately assume manual control, a visual alert and an aural warning must be given. This warning must be given without delay and be distinct from all other cockpit warnings. Even when the automatic pilot is disengaged by a pilot, a warning must sound for a period long enough to ensure that it is heard and recognized by that pilot and by other flightcrew members. The warning should continue until silenced by one of the pilots using an automatic pilot quick release control, or is silenced by another acceptable means. For purposes of this provision, an automatic pilot quick release control must be mounted on each control wheel or control stick.

(2) Autothrottle Systems. The following criteria apply to an autothrottle system when used with a low visibility landing system, if an autothrottle is provided.
(a) an automatic landing system must include automatic control of throttles to touch down unless it can be shown that:

   (i) airplane speed can be controlled manually without excessive workload, in representative conditions for which the system is intended and as demonstrated; and
   (ii) for manual control of throttles, the touch down performance limits must be achieved both for normal autopilot operations and applicable non-normal operations (e.g., engine failure, as

applicable; during pilot takeover to manual control using HUD guidance, if part of a hybrid system).

(b) an automatic throttle system must provide safe operation taking into account the factors listed in Attachment 3, Section 7.1 Landing and Rollout Criteria. Additionally, the system should:

(i) adjust throttles to maintain airplane speed* within acceptable limits;

Information Note: *The approach speed may be selected manually or automatically. If automatically selected, each pilot must be able to determine that the aircraft is flying an appropriate speed.*

(ii) provide throttle application at a rate consistent with the recommendations of the appropriate engine and airframe manufacturers,
(iii) modulate thrust or throttle application at a rate consistent with, and with activity consistent with typical pilot expectation, considering speed error to be corrected, and any particular conditions or circumstances (e.g., flare retard, go-around thrust application, response to wind gradients), and
(iv) respect maximum limits, minimum limits, and any limits necessary for specific conditions (e.g., anti-ice, approach idle).

(c) an indication of pertinent automatic throttle system engagement must be provided.
(d) an appropriate alert or warning of automatic throttle failure must be provided.
(e) it must be possible for each pilot to override the automatic throttle (when provided) without using excessive force.
(f) automatic throttle disengagement switches must be mounted on or adjacent to the throttle levers where they can be operated without removing the hand from the throttles.
(g) following a failure, failure disconnect, or inadvertent disconnect of the automatic throttle, or uncommanded loss of a selected automatic throttle mode, a suitably clear and compelling advisory or indication should be provided.

(3) Head Up Guidance.

(a) for a Head Up Guidance landing system, intended for manual "pilot-in-the-loop" control during a low visibility approach and landing, and if applicable, a low visibility rollout, the HUD must provide sufficient command information as guidance to enable the pilot to maintain the approach path, to make the alignment with the runway, flare and land the airplane within the prescribed limits. The HUD must also provide sufficient information to enable the pilot to initiate a go-around without reference to other cockpit displays.
(b) HUD manual guidance must not require exceptional piloting skill to achieve the required performance.
(c) the workload associated with use of the HUD must be considered in showing compliance with the minimum flightcrew requirements found in Section 25.1523.
(d) any HUD installation, or HUD display presentation, to comply with U.S. FAR 25.773 or equivalent, must not significantly obscure or degrade the pilot's outside view or field of view, or other flightcrew member's outside view or field of view, through the cockpit window(s). For compliance with this provision, consideration should be given to dynamic and/or extreme ambient lighting conditions which can affect the brightness of the display in a manner that adversely affect the suitability of outside view through the HUD and cockpit windows. The

outside view must also be adequate around the HUD combiner through cockpit windows (e.g., no significant HUD combiner or electronics unit blockage of pilot view).

(e) Head Up Guidance systems may be considered Fail Passive if, after a failure, the airplane's flight path does not experience a significant, immediate deviation due to the pilot following the failed guidance, before detecting the failure and discontinuing its use.

(f) the active mode of the HUD system itself, as well as the flight guidance/automatic flight control system, must be clearly annunciated in the HUD, unless there are compensating features for displaying them elsewhere.

(g) if a manual "pilot-in-the-loop" landing and rollout system is designed to be used as a single HUD configuration, the HUD should be installed at the captain's crew station.

(h) for a dual HUD configuration, unless otherwise approved by the Authority, procedures should be based on the concept that the Pilot Flying (PF) is the pilot using the HUD during an approach. The Pilot Not Flying (PNF) is expected to monitor other pertinent flight deck indications (e.g., head down PFD, ND, thrust or engine parameters, systems, annunciations other than those provided on the HUD, and alerts). While "head down" flight deck parameters may be assigned as a primary responsibility for a PNF, it is not necessary or expected that the PNF stow a PNF HUD. This provision does not preclude a PNF from referring to the HUD, or incorporating use of HUD information with outside visual reference, particularly when establishing or using outside visual reference. This provision also does not preclude other concepts for PF or PNF use of a dual HUD installation, if found acceptable by the Authority.

(i) if an automatic flight control system is used to control the flight path of the airplane prior to establishing manual "pilot-in-the-loop" HUD guidance on final approach (e.g., the autoflight system is used to intercept and establish tracking of the final approach path), the transition from automatic to manual flight shall be evaluated during either the HUD demonstration or automatic flight control system demonstration, or both demonstration(s).

(j) any transition from automatic flight control to manual control using HUD guidance must not require exceptional piloting skill, alertness, strength or excessive workload.

(k) if the HUD fails at any time during a go-around (GA), the pilot must be able to satisfactorily revert to use of head down displays or instruments. The transition must be completed without unacceptable flight path transients, or loss of climb performance that could adversely affect obstacle clearance.

(l) during demonstration of any HUD intended for use in Category III operations (e.g., to monitor autoland), and particularly for any HUD intended for manual "pilot-in-the-loop" flight guidance for Category III approach and landing, both landing cases and go-around (GA) cases should be demonstrated where:
   (i) external visual reference is available at or below 50 ft. [15 m] HAT to touchdown, and
   (ii) external visual reference is not available at any time below 50 ft. [15 m] HAT to touchdown, and, if applicable, is also not available for rollout, and
   (iii) external visual references and HUD and instrument references disagree (e.g., localizer centering errors).

(m) if rollout guidance is provided on the HUD, the HUD information must enable the pilot to safely control the airplane along the runway after touch down within the prescribed limits. Both normal tracking and any applicable non-normal capture or tracking conditions (e.g., recovery from displacements) should be assessed.

(n) after touch down, loss of a Fail Passive rollout system for manual control with guidance, shall be annunciated with an appropriate visual alert and removal of the command guidance.

(o) rollout systems which display only lateral deviation as a cue for centerline tracking have generally not been shown to provide adequate information to adequately control the aircraft or recover from displacements. Consequently, such displays are typically considered to have excessive workload and require excessive pilot task compensation. Also, systems which display only situation information in lieu of command information have not been shown to be effective. If proposed, either type of such system would require successful proof of concept evaluation. [PoC]

(4) Hybrid HUD/Autoland Systems [PoC]. Hybrid systems must be demonstrated to be acceptable to the Authority in a proof of concept evaluation during which specific airworthiness and operation criteria will be developed, and they must otherwise meet the requirements of Division III (12) and this Appendix.

(5) Hybrid HUD/Autoland System Fail Operational Equivalency Concept. Combining an automatic landing system which meets the Fail Passive criteria of this Attachment with a HUD which also meets that same criteria does not necessarily ensure that an acceptable Fail Operational system will result. These systems may be combined to establish a Fail Operational system for low visibility operations provided certain considerations are addressed:

(a) each element of the system alone is shown to meet its respective requirements for a Fail Passive system.
(b) the automatic landing system shall be the primary means of control, with the manual flight guidance system serving as a backup mode or reversionary mode.
(c) manual rollout flight guidance capability must be provided for hybrid systems which do not have automatic rollout capability. Such manual rollout capability must have been shown to have performance and reliability at least equivalent to that required of a Fail Passive automatic rollout system.
(d) the transition between automatic mode of operation and manual mode of operator should not require extraordinary skill, training, or proficiency.
(e) if the system requires a pilot to initiate manual control at or shortly after touch down, the transition from automatic control prior to touch down to manual control using the remaining element of the hybrid system (e.g., HUD) after touch down must be shown to be safe and reliable.
(f) the capability of the pilot to use a hybrid system to safely accomplish the landing and rollout, following a failure of one of the hybrid system elements below alert height, must be demonstrated, even if operational procedures require the pilot to initiate a go-around.
(g) appropriate annunciations must be provided to the flightcrew to ensure a safe operation.
(h) the combined elements of the system must be demonstrated to meet the required Fail Operational criteria necessary to support the operation (refer to Division II of this Appendix)
(i) the overall system must also be shown to meet necessary accuracy, availability, and integrity criteria suitable for Fail Operational systems. Individual components must each be individually reliable (e.g., a highly reliable automatic flight control system and an unreliable HUD would not be acceptable).

(6) Hybrid System Go Around Capability.

Demonstrations are necessary for each element of the hybrid system for low altitude go-around (GA), in the altitude range between 50 ft. [15 m] HAT and touchdown.

Hybrid system demonstrations must be conducted in the following conditions:

(a) without external visual reference,
(b) with visual reference, and

(c) with the presence of external visual reference that disagrees with instrument reference (e.g., localizer centering errors).

(7) Hybrid System Transition From Automatic to Manual Flight.

A safe manual takeover of airplane control to complete the landing within the established touchdown footprint must be demonstrated. Use of appropriate takeover response time delays for the transition should be considered during the demonstration.

These demonstrations must be conducted in the following conditions:

(a) without external visual reference,
(b) with visual reference, and
(c) with the presence of external visual reference that disagrees with instrument reference (e.g., localizer centering errors).

(8) Hybrid System Pilot Not Flying (PNF). The pilot not flying (PNF) must have suitable information provided to accomplish appropriate assigned duties, to be an integral part of the crew, and to safely deal with immediate or subtle incapacitation of the Pilot Flying (PF) regardless of visual reference availability.
(9) Satellite Based Landing Systems [PoC]. This Attachment is intended to provide criteria, but not a comprehensive acceptable means of compliance for airworthiness approval of GNSS based low visibility landing systems (e.g., GLS). Airworthiness approval of a GLS requires an overall assessment of the integration of the airplane landing system components with other related non-airplane landing system elements (e.g., GLS differential transmitters, pseudolites, satellite constellation(s) characteristics, waypoint data sources and use, reference datum used) to ensure that the overall safety is acceptable.

The performance, integrity and availability of any ground station elements, any data links to the airplane, any satellite elements and any data base considerations, when combined with the performance, integrity and availability of the airplane system, should be at least equivalent to the overall performance, integrity and availability achieved when ILS is used to support Category III operations.

The following requirements apply to approach and landing systems using GNSS (e.g., GLS):

(a) during the approach, the flightcrew must be advised if the GNSS service or landing system cannot support the required performance and integrity. This includes assessment of space vehicle (SV) degradation or failure, augmentation degradation or failure, including the effect of satellite vehicle geometry on the required performance, availability and integrity.
(b) the GNSS system assessment should address failure mode detection coverage and adequacy of monitors and associated alarm times. GLS landing and rollout system performance, failure detection and annunciation should be consistent with any established ICAO Standards and Recommended Practices, Authority's criteria, or other State criteria acceptable to Authority, unless otherwise approved by the Authority.

(c) The effect of airplane maneuvers on the reception of signals must be considered as necessary to maintain the required performance, availability and integrity. If applicable, loss and re-acquisition of signals should be considered. The effect of local terrain should also be considered.

(10) Flight Path Definition. For Flight Path Definition considerations refer to Division II (20) of this Appendix.

(11) Aircraft Database. The required flight path may be uplinked to the airplane or may be stored in an aircraft database for recall and incorporation into the flight guidance and/or control system when required to conduct an approach, landing and rollout.

Corruption of the information contained in the data base used to define the reference flight path is considered Hazardous. Failures which result in unannunciated changes to the data base must be Extremely Remote.

For a procedural specified flight path intended to support automatic landing or manual flight guidance below 100 ft [30 m] HAT, the flightcrew should not be able to modify information in the data base which relates to the critical definition of that required flight path, for any segment(s) of the procedure considered flight critical.

(12) Differential Augmentation. Differential augmentation uses a set of GNSS receivers at known locations to derive differential corrections for each of the satellite pseudo-ranges. This network of GNSS receivers typically also provides signal in space integrity monitoring. If such a ground based augmentation system is used to provide differential pseudo-range corrections, or other data to an airplane to support Category III operations, the overall integrity of that operation must be established.

The role of the ground based augmentation system in the landing system must be considered during the aircraft system certification process until such time as an acceptable national, or international standard, for the ground reference system is established.

(13) Data link. A data link may be used to provide data to the airplane to provide the accuracy necessary to support certain operations.

The integrity of the data link should be commensurate with the integrity required for the operation.

The role of the data link in the landing system must be addressed as part of the aircraft system certification process until such time as an acceptable national, or international standard, for the ground system is established.

(14) Enhanced Vision Systems or Synthetic Vision Systems [PoC]. Enhanced Vision System are typically considered to be those systems using airplane based sensors to penetrate visibility restrictions, and provide the flightcrew with a corresponding enhanced forward view of the scene outside the airplane (e.g., radar imagery presented in a perspective view, FLIR, LLTV). Synthetic Vision Systems (SVS) are typically those systems which create computer generated imagery or symbology representing how an outside forward vision scene would otherwise appear, or elements of that scene would appear, if a pilot could optically see through the visibility restriction or darkness.

This Attachment section is not intended to address acceptable means of compliance for airworthiness approval of either Enhanced Vision Systems or Synthetic Vision Systems. Criteria for approval of an enhanced vision system or synthetic vision systems must match the system's proposed intended use, and must follow and be based on successful completion of proof of concept testing acceptable to the Authority**.** Typically EVS or SVS systems would be expected to meet the same or equivalent performance accuracy, integrity, and availability criteria of other acceptable landing systems. Other limited uses, such as for assessing integrity alone (e.g., use as an independent landing monitor) may be assessed principally considering the proposed limited intended function. However, fidelity, alignment, penetration of weather, potential for misleading information, real time response, and any other relevant factor must be shown to be safe and appropriate for the intended application. If EVS or SVS information is to be presented on a head-up-display (HUD), such EVS or SVS information must additionally meet any pertinent HUD provisions (e.g., See Attachment 3, Section 8 (3) and (4), as applicable). For a HUD presentation of EVS or SVS, a significant issue to be considered, even for no credit or limited credit, is the issue of potential blockage of cockpit window forward view (See provisions of Attachment 3, Section 8.3 d.).

9. Airplane Flight Manual.

Upon satisfactory completion of an airworthiness assessment and test program, the Authority's-approved airplane flight manual or supplement, and any associated markings or placards, if appropriate, should be issued or amended to address the following:

(a) relevant conditions or constraints applicable to landing or landing and rollout system use regarding the airport or runway conditions (e.g., elevation, ambient temperature, runway slope).
(b) the criteria used for the demonstration of the system, acceptable normal and non-normal procedures (including procedures for response to loss of guidance), the demonstrated configurations, and any constraints or limitations necessary for safe operation.
(c) the type of navigation aids used as a basis for demonstration. This should not be taken as a limitation on the use of other facilities. The AFM may contain a statement regarding the type of facilities or condition known to be unacceptable for use (e.g., For ILS or MLS) based systems, the AFM should indicate that operation is predicated upon the use of an ILS (or MLS) facility with performance and integrity equivalent to, or better than, a United States Type II or Type III ILS, or equivalent ICAO Annex 10 Facility Performance Category III facility).
(d) applicable atmospheric conditions under which the system was demonstrated (e.g., demonstrated headwind, crosswind, tailwind) should be described as follows:

(i) in the Limitations Section, the wind component values* used as a basis for statistical analysis, as supported by flight evaluation and validation, which may apply to use of the landing system, such as if credit for use is sought for low visibility operations,

Information Note: *These are the wind values for which the applicable criteria of Attachment 3, (see Section 5) below), have been met.*

(ii) in the Normal Operations Section, or equivalent section, maximum** wind component values experienced during the flight demonstration, described as "Demonstrated Wind Component(s)",

Information Note: *These values are provided for information only.*

(iii) for use of the landing system other than for low visibility credit (e.g., in wind or other conditions where system performance may not necessarily be supported by the statistical analysis), any necessary description of considerations, if other than the maximum demonstrated wind component values for the basic airplane*** apply.

Information Note: *In the U.S. the FAA does not apply a "landing system" wind limitation unless unacceptable system characteristics dictate use of a limitation. This is consistent with specification of the demonstrated wind* *component value for the basic airplane, which is included in the AFM for information, and is not limiting.*

(e) for a landing or landing and rollout system meeting provisions of Attachment 3, the Normal Procedures, Normal Operations, or equivalent section, of the AFM should also contain the following statements:

"The airborne system has been demonstrated to meet the airworthiness requirements of AC 120-28D Attachment 3 for <specify the pertinent Landing or Landing and Rollout capability Section(s) criteria met> when the following equipment is installed and operative:

<list pertinent equipment>"

"This AFM provision does not constitute operational approval or credit for Category III use of this system."

(f) Airplane Flight Manual provisions should be consistent with the following:
(i) the AFM may list the alert height demonstrated,
(ii) the AFM should not specify a DA, DH or RVR constraint, and
(iii) the AFM should not include visual segment specifications.

Examples of general AFM considerations, specific AFM provisions, and location of those provisions for applicable landing or landing and rollout systems are provided in Attachment 6.

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ATTACHMENT 4
WIND MODEL FOR APPROACH AND LANDING SIMULATION

In carrying out the performance analysis, one of the following models of wind, turbulence and wind shear may be used:

Wind Model A

Mean Wind

The mean wind is the steady state wind measured at landing. This mean wind is composed of a downwind component (headwind and tailwind) and a crosswind component. The cumulative probability distributions for these components are provided in Figure A4-1 (downwind) and Figure A4-2 (crosswind). Alternatively, the mean wind can be defined with magnitude and direction. The cumulative probability for the mean wind magnitude is provided in Figure A4-3, and the histogram of the mean wind direction is provided in
Figure A4-4. The mean wind is measured at a reference altitude of 20 ft. [6.1 m] AGL. The models of the wind shear and turbulence given in following sections assume this reference altitude of 20 ft. [6.1 m] AGL is used.

Wind Shear

The wind shear component is that portion which affects the air mass moving along the ground (i.e., ground friction). The magnitude of the shear is defined by the following expression:

$$V_{wref} = 0.20407\ \overline{V}_{20}\ ln\left(\frac{h + 0.15}{0.15}\right)$$

where V_{wref} is the mean wind speed measured at h ft. and $\overline{V}_{20}$ is the mean wind speed at 20 ft. [6.1 m] AGL.

Turbulence

The turbulence spectra are of the Von Karman form.

Vertical Component of Turbulence.

The vertical component of turbulence has a spectrum of the form defined by the following equation:

$$\Phi_w(\Omega) = \frac{L_w \sigma_w^2\left(1 + 2.67\left(1.339\, L_w \Omega\right)^2\right)}{2\pi\left(1 + \left(1.339\, L_w \Omega\right)^2\right)^{11/6}}$$

where:

Φ_w = spectral density in $(\text{ft./sec})^2$

σ_w = root mean square (rms) turbulence magnitude in ft/sec = $0.1061\ \overline{V}_{20}$ (ft / sec)

where $\overline{V}_{20}$ is expressed in knots

L_w = scale length = h (for h < 1000 ft. [300 m])

Ω = spatial frequency in radians/ft. = ω/V_T

ω = temporal frequency in radians/sec, and

V_T = airplane speed in ft./sec.

Horizontal Component of Turbulence.

The horizontal component of turbulence consists of a longitudinal component (in the direction of the mean wind) and lateral component. The longitudinal and lateral components have spectra of the form defined by the following equations:

Longitudinal Component:

$$\Phi_u(\Omega) = \frac{L_u \sigma_u^2}{\pi\left(1 + (1.399\Omega L_u)^2\right)^{5/6}}$$

Lateral Component:

$$\Phi_v(\Omega) = \frac{L_v\ \sigma_v^2\left(1 + 2.67(1.339\,L_v\Omega)^2\right)}{2\pi\left(1 + (1.339\,L_v\Omega)^2\right)^{11/6}}$$

where the RMS Turbulence Scales are defined as below

$$\sigma_w = 0.1061\ \overline{V}_{20}\,(kts.)$$

a. When $h \geq 1{,}000\,ft.$ $\quad \sigma_u = \sigma_v = \sigma_w$

b. When $h < 1{,}000\,ft.$

$$\sigma_u = \sigma_v = \sigma_w\left[\frac{1}{0.177 + 0.000823h}\right]^{0.4}$$

c. When $h \leq 0$

$$\sigma_u = \sigma_v = \sigma_w\left[\frac{1}{0.177}\right]^{0.4}$$

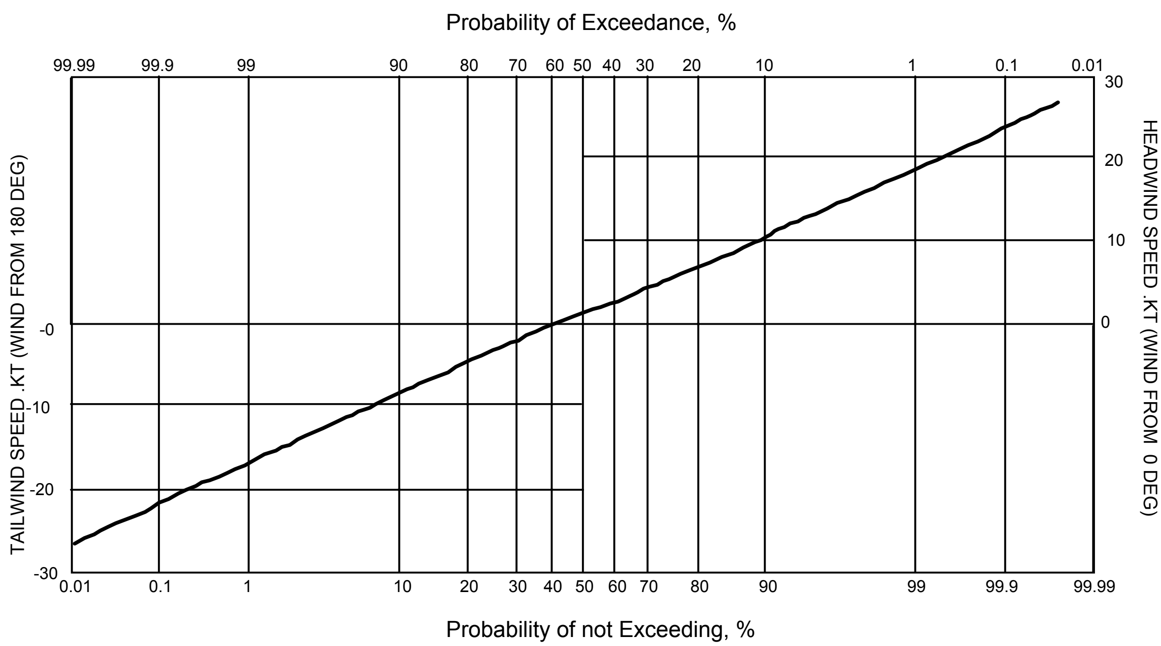
and where the Turbulence Scales are defined as below

a. When $h \geq 1{,}000\,ft.$ $\quad L_u = L_v = L_w = 1{,}000$

b. When $h < 1{,}000\,ft.$ $\quad L_w = h$

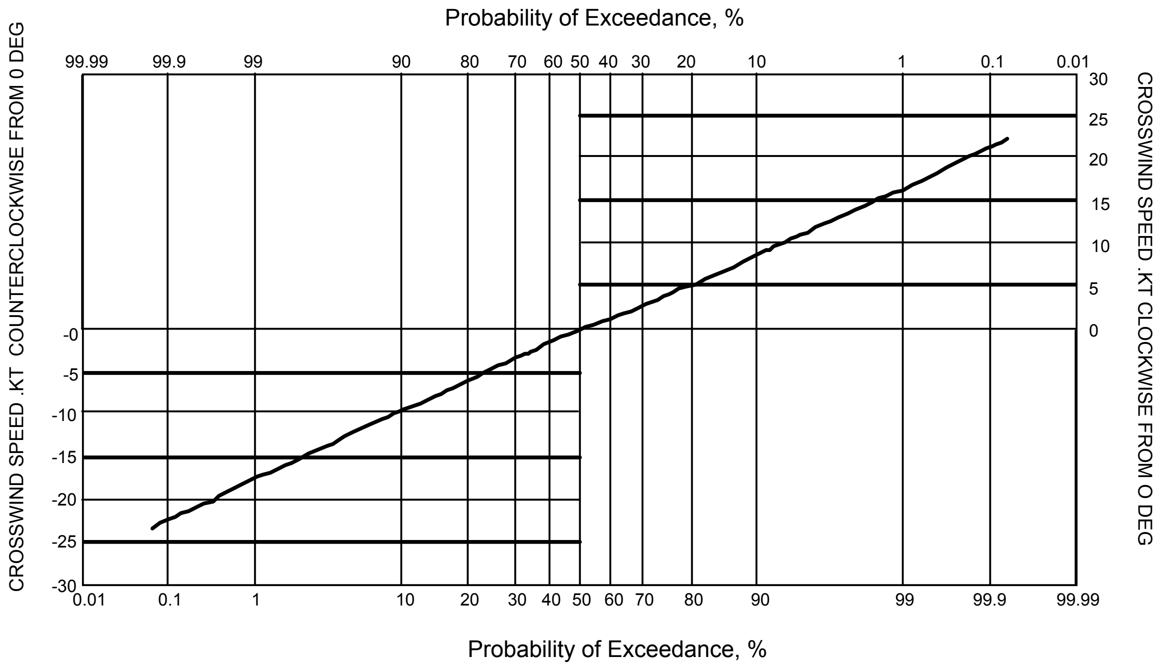
$$L_u = L_v = h\left[\frac{1}{(0.177 + 0.000823h)}\right]^{1.2}$$

c. When $h \leq 0\,ft$ $\quad L_u = L_v = L_w = 0$



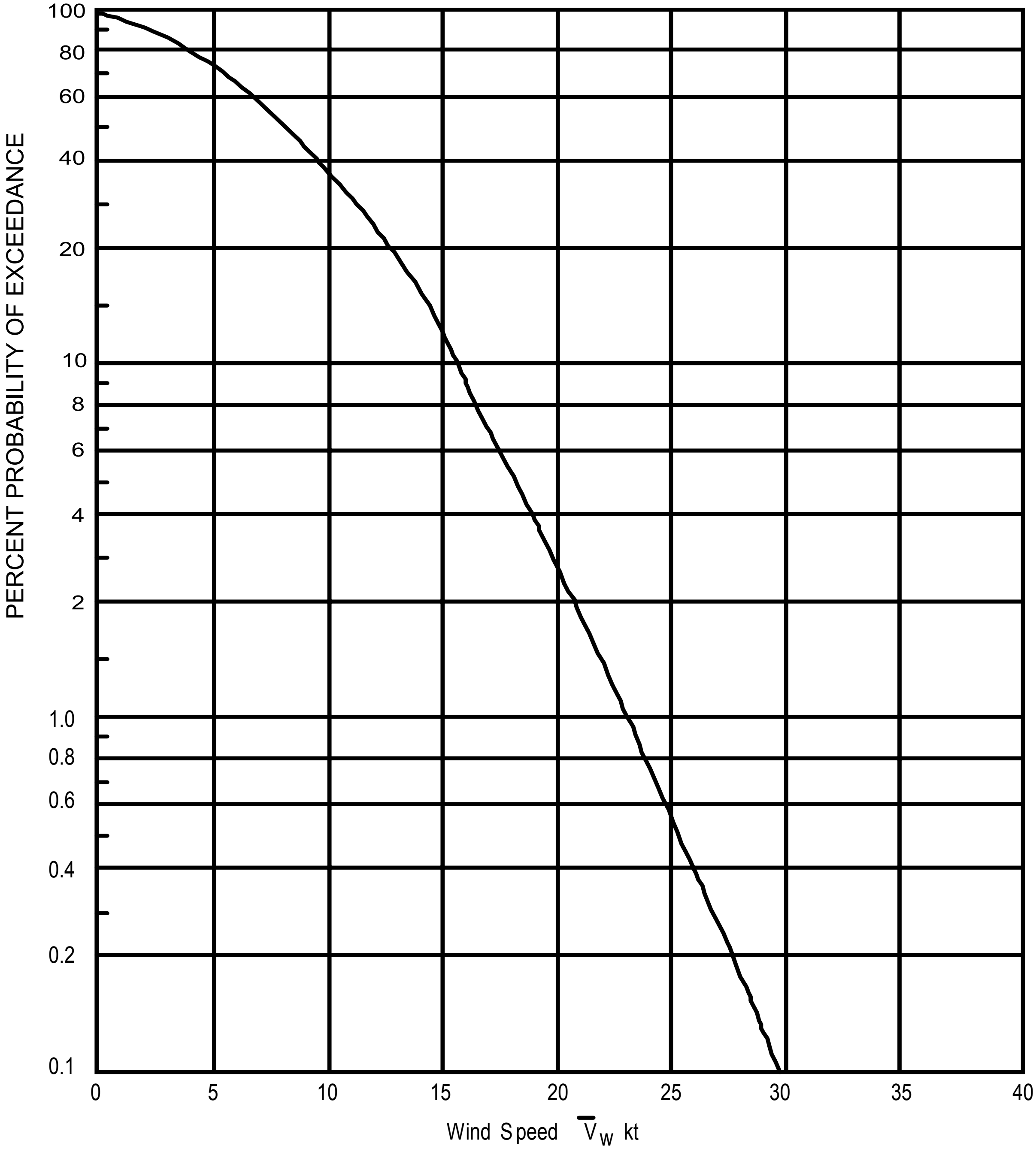
HEADWIND-TAILWIND DESCRIPTION

Figure A4-1



CROSSWIND DESCRIPTION

Figure A4-2



*ANNUAL PERCENT PROBABILITY OF MEAN WIND SPEED-
EQUALING OR EXCEEDING GIVEN VALUES*

Figure A4-3

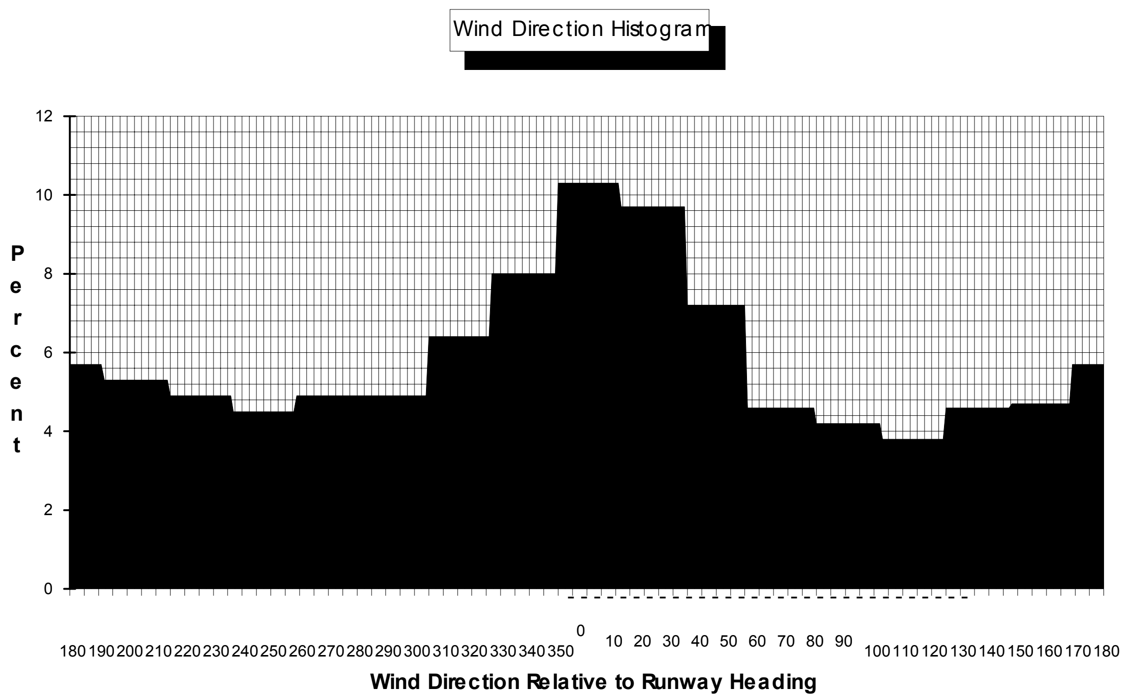
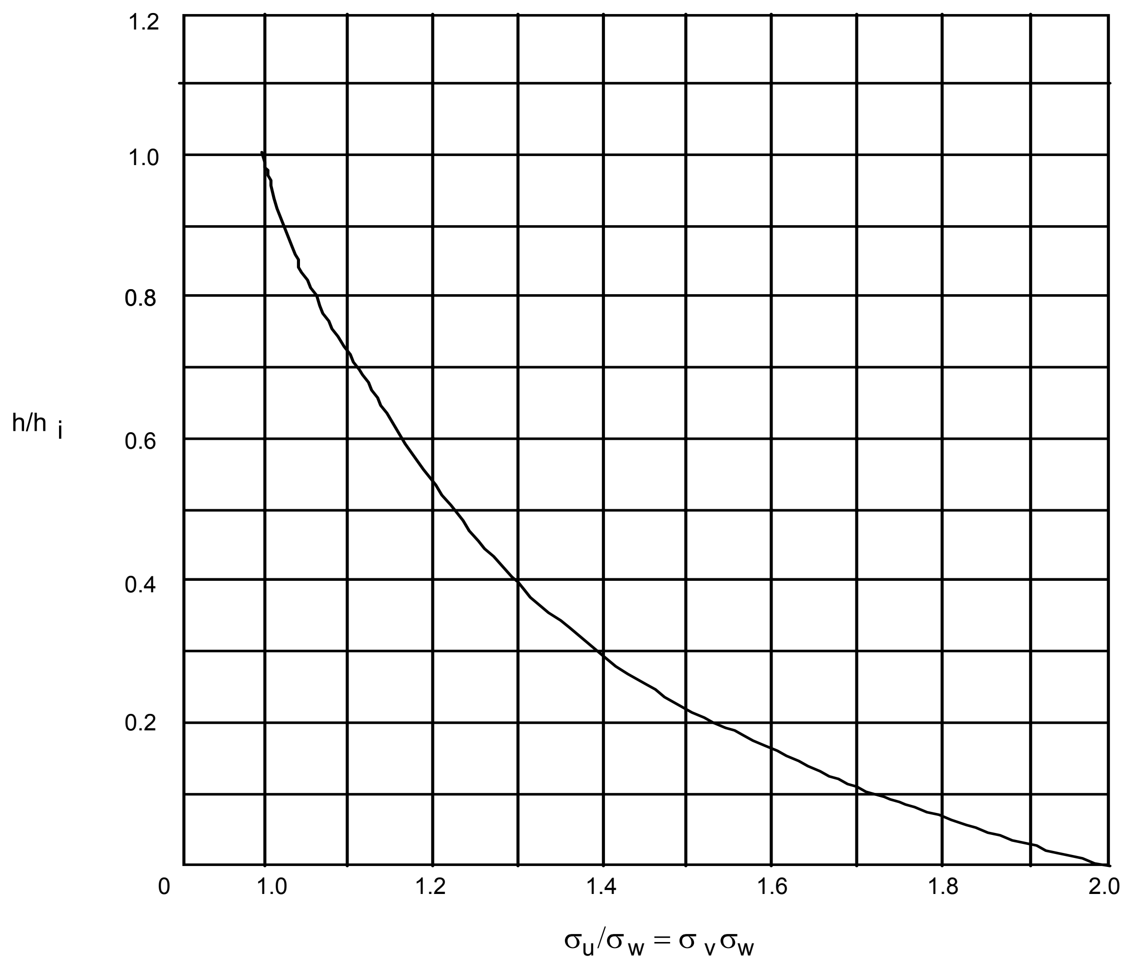

Wind Direction Histogram
Percent
0
2
4
6
8
10
12
180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Wind Direction Relative to Runway Heading

Figure A4-4

$$\frac{\sigma_u}{\sigma_w} = \frac{\sigma_v}{\sigma_w} = \begin{cases} \dfrac{1}{[0.177 + 0.823\, h/h_i]^{.4}} & h < h_i \\ 1.0 & h \geq h_i \end{cases}$$



SELECTED DESCRIPTION FOR VARIANCES OF HORIZONTAL TURBULENCE COMPONENTS

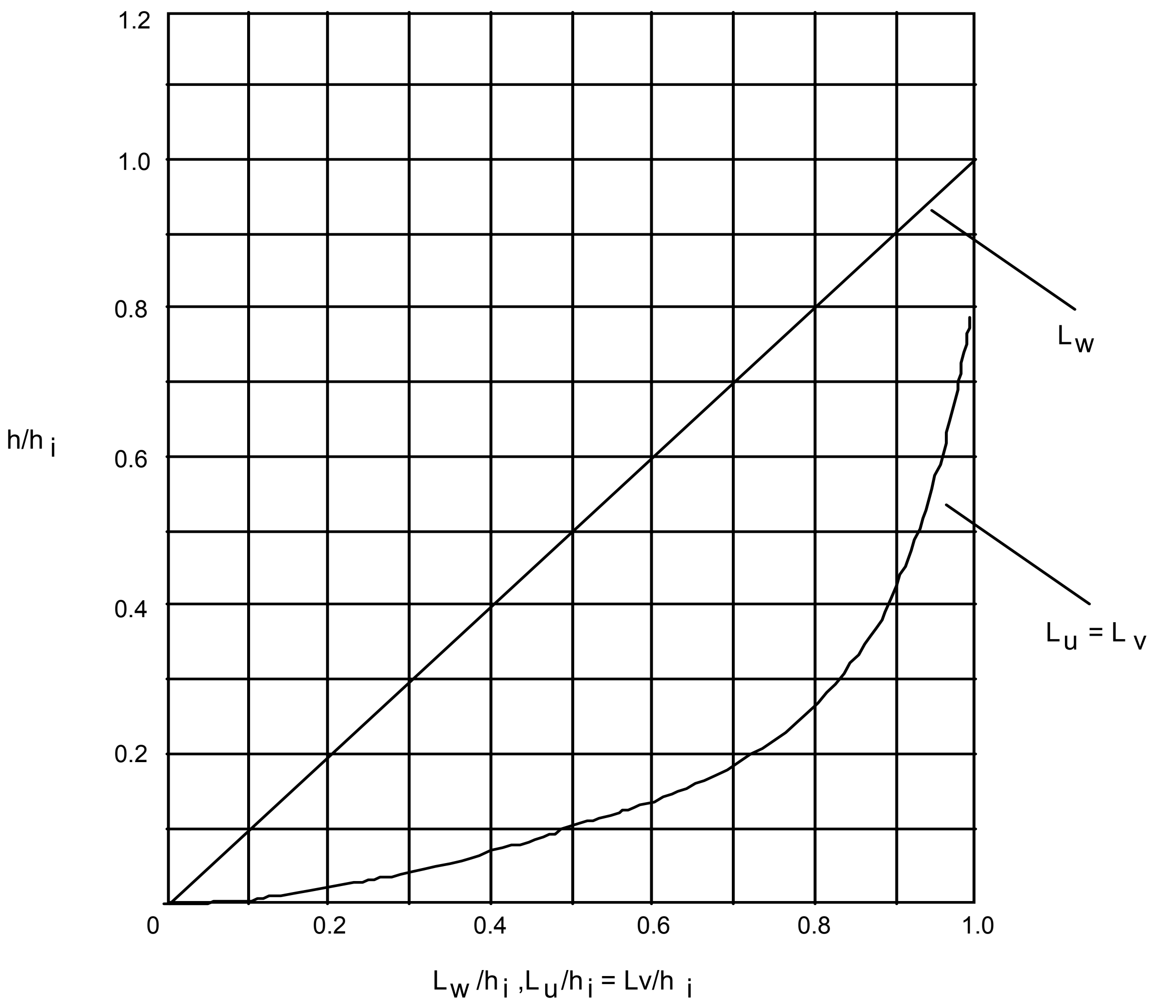
Figure A4-5

$$L_w = \begin{cases} h, h<h_i \\ d, h = h_i \end{cases}$$

$$L_u = \begin{cases} L_w \left(\dfrac{\sigma_u}{\sigma_w}\right)^3 = \dfrac{h}{[0.177 + 0.823\, h/h_i]^{1.2}} & h < h_i \\ d & h \geq h_i \end{cases}$$

$$L_v = L_u$$

h_i = Altitude above which turbulence is isotropic



SELECTED INTEGRAL SCALE DESCRIPTION

Figure A4-6

Wind Model B.

Mean Wind
It may be assumed that the cumulative probability of reported mean wind speed at landing, and the crosswind component of that wind are as shown in Figure A4-7. Normally, the mean wind which is reported to the pilot is measured at a height which may be between 6.1 m (20 ft.) and 10m (33 ft.) above the runway. The models of wind shear and turbulence given in the following paragraphs assume this reference height is used.

Wind Shear

Normal Wind Shear. Wind shear should be included in each simulated approach and landing, unless its effect can be accounted for separately. The magnitude of the shear should be defined by the expression:

$$u = 0.43\ U \log_{10}(z) + 0.57\ U, \text{ for } z \geq 0.05 \text{ m} \qquad (1)$$
$$u \cong 0, \text{ for } z < 0.05\text{m}$$

where z is the height in meters
u is the mean wind speed at height z (meters)
U is the mean wind speed at 10m (33 ft.).

Abnormal Wind Shear. The effect of wind shears exceeding those described above should be investigated using known severe wind shear data.

Turbulence.

Horizontal Component of Turbulence. It may be assumed that the longitudinal component (in the direction of mean wind) and lateral component of turbulence may each be represented by a Gaussian process having a spectrum of the form:

$$\Phi(\Omega) = \frac{2\sigma^2}{\pi} \bullet \frac{L}{1+\Omega^2 L^2} \qquad (2)$$

where $\Phi(\Omega)$ = a spectral density in (meters/sec)^2 per (radian/meter).

σ = root mean square (rms) turbulence intensity = 0.15 U
L = scale length = 183m (600 ft.)
Ω = frequency in radians/meter.

Vertical Component of Turbulence. It may be assumed that the vertical component of turbulence has a spectrum of the form defined by equation (2) above. The following values have been in use:

σ = 1.5 knots with L = 9.2m (30 ft.)

or alternatively

σ = 0.09 U with L = 4.6m (15 ft.) when $z < 9.2$m (30 ft.) and
L = 0.5 z when $9.2 < z < 305$m ($30 < z < 1000$ ft.)

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ATTACHMENT 5.
AIRWORTHINESS DEMONSTRATION OF DECELERATION AND BRAKING SYSTEMS OR DISPLAYS.

TBD

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ATTACHMENT 6
AFM PROVISIONS AND EXAMPLE AFM WORDING

6.1. Example Provision - AFM "Certificate Limitation" Section.

6.2. Example Provision - AFM “Normal Procedures” or “Normal Operation” Section [Typical Aircraft Type with Fail Operational and Fail Passive FGS Capability]

6.3. Example Provision - AFM “Normal Procedures” or “Normal Operation” Section [Typical Aircraft Type with Fail Passive FGS Capability]

6.1 Example Provision - AFM "Certificate Limitation" Section (With "Type Specific" Example Information and Notes)

(List Aircraft Type)
AIRPLANE FLIGHT MANUAL

Section 1 - CERTIFICATE LIMITATIONS

ELECTRONIC SYSTEMS

AUTOPILOT/FLIGHT DIRECTOR SYSTEM

Automatic Landing

Maximum wind component speeds when landing weather minima are predicated on autoland operations:

Headwind:	25 knots
Tailwind:	15 knots
Crosswind:	25 knots

The maximum and minimum glideslope angles are 3.25 degrees and 2.5 degrees respectively.

The autoland capability may be used with flaps 20 or 30, with both engines operative or with one engine inoperative. The Autopilot Flight Director System (AFDS) status annunciation must have LAND 2 or LAND 3 displayed and the SLATS DRIVE message must not be present.

Automatic Approach with Flaps 25

Autoland is not approved with flaps 25.

CAA APPROVED (Date) Section 3 Page ___

6.2 Example Provision - AFM "Normal Procedures" or "Normal Operation" Section
[Typical Aircraft Type with Fail Operational and Fail Passive FGS Capability]

(List Aircraft Type)
AIRPLANE FLIGHT MANUAL

Section 3 - NORMAL PROCEDURES

AUTOPILOT - FLIGHT DIRECTOR SYSTEM (AFDS)

LOW WEATHER MINIMA - AUTOMATIC LANDING - FAIL-OPERATIONAL
The autopilot system has been shown to meet the applicable airworthiness, performance, and integrity criteria applicable to Category III as specified in FAA Advisory Circular (AC) 120-28D Attachment 3 for a fail-operational automatic landing system, with the following functions operative and LAND 3 annunciated:

Autoland status annunciation on both PFD's
Autothrottle
Independent ILS and radio altitude sources on the PFD for each pilot, i.e., the following alerting messages are not displayed:

SGL SOURCE DISPLAYS
SGL SOURCE RAD ALT
SINGLE SOURCE ILS

LOW WEATHER MINTMA - AUTOMATIC LANDING - FAIL-PASSIVE

The autopilot system has been shown to meet the applicable airworthiness, performance, and integrity criteria applicable to Category III as specified in FAA AC 120-28D Attachment 3 for a fail-passive automatic landing system, with the following functions operative and LAND 2 annunciated:

Autoland status annunciation on both PFD's
Independent ILS and radio altitude sources on the PFD for each pilot, i.e., the following alerting messages are not displayed:

SGL SOURCE DISPLAYS
SGL SOURCE RAD ALT
SINGLE SOURCE ILS

The demonstration for fail-passive autoland operations with LAND 2 annunciated included a requirement for a go-around if a subsequent autopilot system failure were to be detected on approach, if operational credit for use of autoland is required.

CAUTION: **If the autopilot disconnects during an engine-out go-around, loss of autopilot rudder control can result in large yaw and roll excursions.**

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Section 3 - NORMAL PROCEDURES

AUTOPILOT - F LIGHT DIRECTOR SYSTEM (AFDS) (Continued)

LOW WEATHER MINIMA - AUTOPILOT APPROACH
The autopilot system has been shown to meet the applicable airworthiness, performance, and integrity criteria applicable to Category II as specified in FAA (AC) 120-29__ Attachment __ for automatic approach with the following functions operative and LAND 3 or LAND 2 annunciated:

Independent ILS and radio altitude sources on the PFD for each pilot, i.e., the following alerting messages are not displayed:

SGL SOURCE DISPLAYS
SGL SOURCE RAD ALT
SINGLE SOURCE ILS

LOW WEATHER MINIMA - FLIGHT DIRECTOR

The flight director system has been shown to meet the applicable airworthiness, performance, and integrity criteria applicable to Category II as specified in FAA (AC) 120-29__ Attachment __ for manual approach with the following functions operative:

Normal flight controls
Air Data Inertial Reference Unit
Independent ILS and radio altitude sources on the PFD for each pilot, i.e., the following alerting messages are not displayed:

SGL SOURCE DISPLAYS
SGL SOURCE RAD ALT
SINGLE SOURCE ILS
SINGLE SOURCE F/D

CAA APPROVED (Date) Section 3 Page ___

6.3 Example Provision - AFM "Normal Procedures" or "Normal Operation" Section [Typical Aircraft Type with Fail Passive FGS Capability]

(List Aircraft Type)
AIRPLANE FLIGHT MANUAL

Section 3 - NORMAL OPERATIONS

AUTOPILOT - FLIGHT DIRECTOR SYSTEM (AFDS)

The Autopilot-Flight Director System is used as either a single channel autopilot or flight director for en route and single channel approaches. Dual autopilot channels provide fail-passive operation for automatic landing and go-around. Dual flight directors provide for takeoff, approach and go-around guidance.

The following flight path control functions for automatic (autopilot) and/or manual (flight director) control of the airplane are provided:

Lateral navigation

Vertical navigation

VOR

Localizer (Front course only) Approach

Autoland (Dual autopilot only)

Go-around (Dual autopilot and/or flight director only)

The following pilot assist functions for automatic (autopilot) and/or manual (flight director) control of the airplane are provided:

Control Wheel Steering (Autopilot only)

Heading select and hold

Vertical speed select and hold

IAS/Mach select and hold (Elevator control of speed in level change)

Altitude Select/Acquire or Capture and Hold

Takeoff (Dual Flight director only)

Go-around, one engine inoperative (Dual Flight director only)

The Captain's and First Officer's instruments (Display Source, VHF NAV and IRS) must not be on the same source when credit for use of the AFDS is necessary to make lower weather minima approaches.

An interlock is provided with the electrical transfer bus sensing circuit to preclude dual-channel autopilot operation on a single source of power. However, the Auxiliary Power Unit generator may be used as an independent power source.

CAA APPROVED (Date) Section 3 Page ___

Section 3 - NORMAL OPERATIONS

AUTOPILOT - FLIGHT DIRECTOR SYSTEM (AFDS) (Continued)

DEMONSTRATED CONDITIONS

The system has been demonstrated both with and without yaw damper and autothrottle and with normal landing flaps 30 and 40.

The approach speed selected for automatic approaches using autothrottles Was VREF + 5 knots (no wind correction).

The approach speed selected for autothrottle inoperative was VREF for calm air conditions and VREF + 1/2 (Headwind) + Full Gust for wind conditions.

The automatic landing system has been demonstrated in VMC conditions with the following wind conditions:

Headwind - 25 knots

Tailwind - 30 knots

Crosswind - 24 knots

Satisfactory Automatic Landing System performance has been demonstrated on U.S. Type II and Type III ILS ground facilities.

An autopilot minimum engage height (MEH) of 400 feet after takeoff has been demonstrated to provide satisfactory performance.

Single Engine Approach: The AFDS has demonstrated adequate performance for low visibility approach using a single engine, with flaps 15.

MINIMUM MULTICHANNEL ENGAGE ALTITUDE FOR AUTOLAND

On approach for autoland, dual channel operation should be engaged prior to 800 feet AGL. Check FLARE arm annunciation at approximately 500 feet AGL.

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Section 3 - NORMAL OPERATIONS

AUTOPILOT - FLIGHT DIRECTOR SYSTEM (AFDS) (Continued)

AFDS SYSTEM CONFIGURATION

The AFDS equipment listings in this section do not necessarily denote all of the systems and equipment required for the types of operation specified. Applicable Regulation's and Guidance may prescribe an operational requirement for such additional systems such as autothrottle, or autobrakes. Operators should determine the total systems requirements for each type of operation prior to requesting OpSpecs authorization.

Demonstrated compliance with the airworthiness performance standards does not constitute approval to conduct operations in lower weather minimums.

DEMONSTRATED ALTITUDE LOSS

The demonstrated altitude loss due to a simulated hard-over autopilot malfunction is:

Level Flight:

Flaps up - 370 feet when recovery was initiated 3 seconds after the recognition point.

Approach:

(a) 23 feet with a 1 second time delay between recognition point and initiation of recovery.

(b) Negligible when recovery was initiated without delay after pilot recognition.

Go-Around:

The demonstrated altitude loss during an automatic go-around initiated below 100 feet AGL is listed below:

GA Altitude (ft AGL)	Altitude Loss (ft)
70 to 100	26
60	21
50	20
40	18
30	11
20	3
10	2.5

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Section 3 - NORMAL OPERATIONS

AUTOPILOT - FLIGHT DIRECTOR SYSTEM (AFDS) (Continued)

AUTOPILOT APPROACH/AUTOLAND (FAIL PASSIVE) (Applicable to Category III)

The Autopilot System has been shown to meet the applicable airworthiness and performance and reliability criteria of FAA AC120-28D for automatic approach and landing of the airplane to touchdown with the following additional equipment operative and FLARE arm annunciated.

Dual Channel Autopilot engaged

Low Range Radio Altimeter and display for each Pilot

Decision Height (DH) Display for each Pilot

Two Digital Air Data Computer Systems

Windshield Wipers for each Pilot

ILS Receiver and display for each Pilot

Flight Mode Annunciator for each Pilot

Two ADIRU's (associated with the engaged autopilots) in NAV mode

Dual Hydraulic Systems

Two sources of electrical power (The APU generator may be used as an independent power source)

Both Engines Operating

AUTOPILOT APPROACH (Applicable to Category II)

The Autopilot System has been shown to meet the airworthiness, performance, and reliability criteria of FAA AC 120-29 __, Attachment __ for Category II, for automatic approach with the following additional listed equipment operative:

Single or Dual channel Autopilot engaged

Low Range Radio Altimeter and display for each Pilot

Decision Height (DH) Display for each Pilot

Two Digital Air Data Computer Systems

Windshield Wipers for each Pilot

ILS Receiver and display for each Pilot

Flight Mode Annunciator for each Pilot

Two ADIRU's (associated with the engaged autopilot) in NAV mode

Two sources of electrical power (The APU generator may be used as an independent power source.)

Both Engines Operating

CAA APPROVED (Date) Section 3 Page ___

Section 3 - NORMAL OPERATIONS

AUTOPILOT - FLIGHT DIRECTOR SYSTEM (AFDS) (Continued)

FLIGHT DIRECTOR (F/D)

The flight director command may be used as supplemental guidance to the primary speed and attitude indications for takeoff, climb and descent to acquire and maintain desired altitudes.

All of the autopilot command modes, except "CWS," are also available on the flight directors. An additional takeoff mode exists for the F/D only. One or both F/Ds may be on for all modes, except during T/O or GA which requires dual F/D ON.

FLIGHT DIRECTOR APPROACH (Applicable to Category II)

The flight director system has been shown to meet the applicable airworthiness, performance and reliability requirements of FAA AC 120-29__, Attachment __, for manual approach with the following equipment operative:

Both flight directors must be selected

Low Range Radio Altimeter and display for each Pilot

Decision Height (DH) Display for each Pilot

Two Digital Air Data Computer Systems

Windshield Wipers for each Pilot

ILS Receiver and display for each Pilot

Flight Mode Annunciator for each Pilot

Two ADIRU's in NAV mode.

Two sources of electrical power. (The APU generator may be used as an independent power source.)

Both Engines Operating

GO - AR0UND

When go-around is initiated the autothrottle system (if engaged) advances the thrust levers automatically. Flaps and landing gear must be controlled manually.

An Autothrottle, Flight Director and/or Dual Autopilot go-around may be initiated below a radio altitude of 2000 feet by pressing the go-around switches.

When a decision is made to abort an approach, actuate the go-around switches and assure rotation to go-around attitude. Verify thrust lever movement to achieve a nominal rate of climb* and retract flaps to flaps 15.**

After a positive rate of climb has been established, retract landing gear. Climb to a safe altitude, accelerate and retract remaining flaps according to takeoff flap retraction speed schedule. Monitor rate of climb, attitude, and airspeed.

Full go-around thrust may be obtained, after engine spool up, by reactivating the go-around switch(es).

In windshear, the recommended procedure is to delay flap and gear retraction until windshear is no longer a factor.

CAA APPROVED (Date)

ATTACHMENT 7
IRREGULAR TERRAIN ASSESSMENT

The following information describes the operational evaluation process, procedures, and criteria applicable to approval of flight guidance systems (e.g., autoland or "pilot-in-the-loop" manual flight guidance systems) to support Category III procedures and minima at airports identified in the Authority's "Category II/III Status List" as having irregular underlying approach terrain.

Background. Authority's type design approval of flight guidance systems provides for generic performance evaluation of autoland capability or "pilot-in-the-loop" manual flight guidance capability through simulation with reference terrain conditions, and flight testing at a few particular locations. This is to verify suitability of the design analysis. When an aircraft is type certificated (or STC'd) for use of a flight guidance systems, it is not the intent, nor is it practical that each model of aircraft, flight guidance system, radar altimeter type, NAVAID receiver type, etc., be tested at each conceivable location that it could potentially be used in operation, domestic and foreign. Additionally, NAVAID performance itself (e.g., ILS system) may vary somewhat from location to location or time to time due to different ATS critical area protection procedures to assure NAVAID performance (e.g., to minimize reflective interference). While type design certification by an Authority, and frequent flight inspection by the Authority's, addresses generic system performance, specific operational review and approval of particular aircraft type/site autoland performance is necessary when minima are predicated on use of autoland or other manual flight guidance system (e.g., head-up- display (HUD)) use. This is especially important at airports with irregular pre-threshold terrain (e.g., cliffs, valleys, sea walls) in the area of final approach, within approximately 1500 ft. [457 m] of the landing threshold.

At typical airports/runways that are not considered to be "special terrain" (e.g., those not restricted by the Authority's regulations and the CAT II/III Status List) the review and approval process usually consists of verifying the operator's report of performance for a small number of "line landings" using the flight guidance system in weather conditions better than those requiring use of Cat II or lower minima. This is true whether the review and approval is for a new operator or aircraft type at a particular runway, or is for a "follow-on" operator or aircraft type starting service at a runway previously found suitable for a particular type aircraft and system. If the review and approval is for a "special terrain" runway, particularly for a first of an aircraft type or system to base Category II or Category III minima on using a particular flight guidance system at that runway, then a specific evaluation including an operational demonstration is generally necessary.

This Attachment describes the general evaluation process, procedures, and criteria to be applied for such cases. Since circumstances often are unique in assessing aircraft/ flight guidance system/site performance, this summary represents an acceptable method. It is not the only method that may be proposed by an Authority or an applicant. Credit may be applied for relevant testing by the manufacturer, for similar airborne systems, or for performance at similar locations (e.g., subsequent special terrain airport approvals). Certain aircraft/ flight guidance system combinations may require more extensive testing when an aircraft may exhibit unique characteristics at a particular runway (e.g., transient Radio Altimeter failure indication due to disagreement or unlock, inappropriate auto throttle response, inconsistent flare performance).

Accordingly, before establishing test requirements with a manufacturer or operator for special terrain airports or particular runways, the proposed evaluation plan should be coordinated with proper Authorities. This should be done prior to agreement by the DGCA or with the operator on the testing to be done and data to be collected.

Flight Guidance System Evaluation Process At Special Terrain Airports or Runways That Are Proposed For Category III Procedures Or Minima

A. Case I - First of a Type/Model at Any Special Terrain Airport/Runway.
Case I , First of a Type/Model, applies to the first Special Terrain airport/runway to be approved for a particular type (e.g., first L1011 autoland approval for irregular terrain at any airport – such as first L1011 use of KSEA Runway 16R, if not otherwise previously approved at KSEA, or any other "Special terrain airport" such as KCVG, KDEN, or KPIT).

(1). Evaluation objective. Assess and verify normal flight guidance system performance from an operational perspective, and identify miscellaneous factors needed for a safe Cat III operation (e.g., alert height or decision height identification).
(2). Procedure. Perform at least 4 to 6 successful evaluation landings in typical atmospheric conditions regarding wind and turbulence, using the applicable operational aircraft configuration, with a representative aircraft from the fleet, (e.g., a typical aircraft maintained using routine maintenance practices, not specially configured, not specially tested, or otherwise not specially selected from the operator's fleet). If the flight guidance system may be susceptible to an uncertain performance characteristic (e.g., long flare in a tailwind condition, pitch/throttle coupling oscillation during flare) the evaluation should take place when the system may be put to an appropriate test of the applicable crosswind, tailwind, headwind, wind gradient, or other critical condition applicable, consistent with the operator's proposed conditions or limits and the AFM's demonstrated conditions or limits.

Confirm the initial assessment of 4 to 6 data recorded evaluation landings, with subsequent successful initial operational landings (typically the first 25 or more) as reported by the operator (e.g., data recording or other special observation, other than by the regularly assigned flightcrew, is not required).

(3). Evaluator(s). A person qualified to assess flight guidance system function and performance should conduct these evaluations as the Authority's observer (e.g., typically an Category III qualified and experienced APM of a Category III authorized operator, and a qualified Authority's representative. The Authority may designate other suitably qualified representatives to assess flight guidance system function and performance as necessary (e.g., suitably qualified check airman, fleet manager, Authorized DER).
(4). FGS Performance/Data Recording. Generally, some form of quantitative data should be recorded and reviewed as verification of performance. Methods used in the past include, but are not limited to either method a, or method b, or method c below or any combination:

(a) Method A - Data Recording and Observation. Record pertinent flight guidance system performance data using a DFDR or a Quick reference recorder, or equivalent, which has ability to record the parameters shown below. The recording should be at a sufficiently high sample rate (e.g., at a rate ≥ 1 sample per second), for the part of the flight path of interest (typically from 300'HAT through de-rotation after touchdown).
   - barometric altitude
   - radio altitude
   - radio altitude rate (h dot)
   - glide slope error
   - vertical speed
   - elevator command
   - pitch attitude
   - throttle position

- airspeed
- Mode transition or engagement

Manual observations may be made for touchdown point (lateral, longitudinal), wind profile from 1000 ft. [300 m] to surface (e.g., from an INS or IRS that is capable of displaying winds at typical approach speeds).

(b) Method B - Review of Manufacturer's Data. A review of the manufacturer's data from flight guidance system development flight testing at the same special terrain runway, or equivalent, may be used to confirm items shown in 5) below.

(c) Method C - Photo recording. Photo recording of pertinent instruments or instruments and outside view, with a video camera or equivalent, allowing post flight replay and review of indications noted in Method A above.

(5) Data review and Analysis. The final approach, flare, and touchdown profile should be reviewed to ensure suitability of at least each of the following.

(a) suitability of the resulting flight path
(b) acceptability of any flight path displacement from the nominal path (e.g., Glide slope deviation, deviation from nominal flare profile),
(c) proper mode switching
(d) suitable touchdown point,
(e) suitable sink rate at touch down,
(f) proper flare initiation altitude
(g) suitable flare "quality" (e.g., no evidence of early or late flare, no overflare or underflare, no undue "pitchdown down" tendency at flare initiation or during flare, no flare oscillation, no abrupt flare, no inappropriate pitch response during flare, no unacceptable floating tendency, or other unacceptable characteristic that a pilot could interpret as failure or inappropriate response of the flight guidance system and disconnect, disregard, or contradict the FGS),
(h) no unusual flight control displacements (e.g., elevator control input spikes, or oscillations),
(i) appropriate throttle retard (e.g., no early or late throttle retard, no failure to retard, no undue reversal of the retard, no undue pitch/throttle coupling),
(j) appropriate speed decay in flare (e.g., no unusually low speed risking high pitch attitude and tail strike, no excessive float, appropriate speed decay even if well above V_{ref} at flare initiation due to planned wind or gust compensation),
(k) proper mode initiation or mode transition relating to altitude or radio altitude inputs, such as crosswind alignment initiation, if applicable (e.g., Appropriate radio altitude (RA) trigger of crosswind alignment, to be sure that an appropriate mode transition occurs, even though underlying approach terrain may be irregular).

(6) Miscellaneous Issues.

(a) determine acceptability of any variable radio altitude (RA) indications. Regarding Alert Height (AH) or Decision Height (DH) identification, determine the acceptability of any variable radio altitude (RA) indications or displays (e.g., considering variability due to underlying terrain variability in the last stage of the approach near Alert Height or Decision height). Assure that display indications are sufficiently stable and continuous to readily identify or define AH or DH. If an Inner Marker is to be used to establish Alert Height or Decision Height, determine if the inner marker function is adequate.

(b) address any anomalies occurring during the assessment (e.g., autopilot trip, firm landing, flare oscillation). Additional testing may be needed to clearly identify and resolve any particular problem identified.
(c) determine if special training, or other operational constraints are needed to accommodate peculiar approach or flare characteristics (e.g., require visual reference at flare initiation, apply a 50 ft. [15 m] DH).
(d) authorization for use should occur only after repeated successful landings have been demonstrated and any anomalies experienced have been resolved.

B. Case II - Subsequent Special Terrain Airport/Runway Authorization for a Particular Type.
Case II addresses the “First of a Model” at a particular runway, but at a subsequent “Special Terrain Airport” runway (e.g., After an aircraft type has already been successfully demonstrated at some special terrain airport runway – such as the first ever B767 type FGS use at KPIT Rwy 28L, after prior approval at KSEA).

(1) Evaluation objective. Same as Case I

(2) Procedure. Same as Case I.

(3) Evaluator(s). Same as Case I.

(4) FGS Performance/Data Recording - Data recording is not generally required. However, if the results of landings are marginal or unacceptable, the data recording and assessment procedures applicable to Case I may be needed to assess any remedial action required.

(5) Data review and Analysis. Same as Case I.

(6) Miscellaneous Issues. Same as Case I.

C. Case III - Subsequent Operator Use of a Particular Special Terrain Airport/Runway and Type Combination.

An Authority may review a request for an operator to use a particular Special Terrain Airport/runway and aircraft type, and with AFS concurrence, approve subsequent airline operation of a particular type at that special terrain airport/runway. Any authorization should be based on 25 or more successful "line" landings reported by the operator requesting authorization in weather conditions not requiring credit for FGS system use. The experience reported by operator should include no unsuccessful landing attempts or failures. If problems or failures are reported, then Case II or Case I procedures may be needed to resolve potential unique aircraft configuration effects, procedural effects, maintenance effects, or other effects.

D. Case IV – “Not-For-Credit” Use of Special Terrain Airport/Runway and Type Combinations.

“Not-For-Credit” use of “Special Terrain Airport/Runway and Type Combinations” applies to operators desiring to use an FGS (e.g., Autoland or Flight Guidance HUD) at a Special Terrain Airport/Runway, but not for any landing minima credit.

In this instance, a representative of the Authority may evaluate the use during first line operations or specify that an operator representative (e.g., technical pilot, qualified management pilot, or check airman who is experienced with flight guidance system operation and performance) assess and verify adequate flight guidance system performance. This assessment should be completed prior to initiating routine operational use of the flight guidance system to touchdown at each “Special Terrain” runway. It is desirable, but not necessary, that a qualified APM, or equivalent, witness each "special terrain airport" evaluation.

The Authority should request and review flight guidance system reports from line crews for at least the first 5 line landings to confirm appropriate performance. If problems occur, processes for cases I through IV may be needed to resolve problems depending on the severity and cause of problem (e.g., maintenance problem, unusual winds, lack of ATS critical area protection, problem with a modification to the FGS, use of a different associated component, such as substitution of a different and incompatible radar altimeter model).

A “Not-For-Credit” evaluation may be done in line operation as long as no previous reported problems have been noted with the same or similar aircraft type, and no NOTAM’s or other restrictions preclude such operations. If problems have been reported for the same or similar type, treatment as Case I through III, as applicable above, may be appropriate.

Information Note: *Unless otherwise restricted by an operator or CHDO, flight guidance system operations “Not-for-Minima-Credit” may generally be conducted on any ILS runway that does not have a restricting note on the approach plate (e.g., localizer unusable for rollout, glideslope unusable below xxx ft. AGL) and that has an adequate glide slope threshold clearance height (TCH) suitable for the aircraft type). If problems are noted in the operator’s evaluation, the operator should specify that flight guidance system use should not be accomplished at that site to touchdown. This may be done through a flightcrew bulletin or equivalent. Conversely, an operator may publish a list of runways approved for flight guidance system use to touchdown, or through rollout.*

ATTACHMENT 8
TAKEOFF SYSTEM PERFORMANCE AFTER LIFTOFF

Takeoff system operation should be continuous and smooth through transition from the runway portion of the takeoff to the airborne portion and reconfiguration for en route climb. The criteria found in this Attachment is not unique to low visibility takeoff systems, but such systems must meet these requirements in addition to those found in Section 6.(1)(a) of Attachment 2. The pilot must be able to continue the use of the same primary display(s) for the airborne portion as for the runway portion. Changes in guidance modes and display formats must be automatic.

(a) if the probability of the takeoff system presenting misleading guidance to the pilot is not Extremely Improbable, it must be shown that loss of the airplane will not occur if the takeoff system presents misleading guidance, whether caused by performance anomaly or malfunction. Compliance with this requirement can be demonstrated by showing that the display of misleading guidance information is Improbable when the flightcrew is alerted to the condition by:
- suitable annunciation means, or
- by information from other independent sources (e.g., primary flight references) available within the pilot's primary eye-scan area.

Information Note: *For takeoff systems using a Head Up Display (HUD) to present takeoff guidance, the head down instrument panel is typically not within the pilot's primary eye-scan area. Thus, annunciations displayed in locations near the HUD field of view, such as the glare shield, may be found suitable, if they are clear, conspicuous and unambiguous to the pilot while focused on using the HUD.*

(b) the display of misleading guidance for takeoff shall be Extremely Improbable if no alternate means are available to detect the malfunction or to assess alternate sources of the guidance information, or if the transition to an alternate means of guidance is impractical.

(c) the vertical axis guidance of the takeoff system during normal operation shall result in the appropriate pitch attitude, and climb speed for the airplane considering the following factors.

Normal rate rotation of the airplane to the commanded pitch attitude, at V_R-10 knots for all engines and V_R-5 knots for engine out, will not result in a tail-strike.

The system should provide commands that lead the airplane to smoothly acquire a pitch attitude that results in capture and tracking of the All-Engine Takeoff Climb Speed, $V_2 + X$. X is the All-Engine Speed Additive from the AFM (normally 10 knots or higher). If pitch limited conditions are encountered, a higher climb airspeed may be used to achieve the required takeoff path without exceeding the pitch limit.

(d) for engine-out operation, the system should provide commands that lead the airplane to smoothly acquire a pitch attitude that results in capture and tracking of the following reference speeds:

V_2, for engine failure at or below V_2. This speed should be attained by the time the airplane has reached 35 ft. altitude.

Airspeed at engine failure, for failures between V_2 and $V_2 + X$.

V_2 + X, for failures at or above V_2 + X. Alternatively, the airspeed at engine failure may be used, provided it has been shown that the minimum takeoff climb gradient can still be achieved at that speed.

(e) the loss of an electrical source (e.g., as a result of engine failure) shall not result in the guidance to either pilot being removed.

(f) the flightcrew should be clearly advised that takeoff guidance is unusable when the system does not provide guidance appropriate to the takeoff phase of flight. In the case of the split-cue flight director, the guidance command associated with the inappropriate information shall be removed from view. In the case of the single-cue flight director, the guidance cue shall be removed.

APPENDIX IV
to
General Operating and Flight Rules Standards
Part VI, Subpart 2
s602.163 Air Navigation Requirements

1. GENERAL.

Special navigation areas of operation are geographic areas having unique characteristics which require the use of special equipment, procedures, and/or techniques to safely conduct flight operations. These special areas also include operational situations when the application of standard criteria is unnecessarily restrictive and other than standard criteria are more appropriate and can be safely used. This Standard provides direction and guidance for the evaluation and approval or denial of an operator's request to conduct operations in these special navigation areas of operation. Special navigation areas of operation include the following:

(a) areas requiring high levels of long range navigation performance (high navigation precision) due to traffic density
(b) areas where navigation by magnetic reference is unreliable and/or inappropriate
(c) areas where metric altitudes / flight levels are used (altitudes in meters)
(d) areas where communication difficulties are frequently encountered
(e) areas where air traffic control difficulties are frequently encountered
(f) areas where operations by Lebanese operators have political or international sensitivity
(g) areas where aircraft with unique performance characteristics require special criteria
(h) areas where redundant long range navigation systems are not normally required

Information Note: *The geopolitical area formerly known as the Soviet Union is now comprised of the Commonwealth of Independent States (CIS) and other independent states. This group of aligned and independent states will be referred to as the CIS throughout this Standard.*

2. AREAS REQUIRING HIGH LEVELS OF LONG RANGE NAVIGATION PERFORMANCE.

(1) In certain special navigation areas of operation, the ATC system must be designed to operate more efficiently due to the density of the air traffic. This requires levels of navigation performance higher than the normal long range navigation standards. Significant increases in air traffic over certain busy routes, such as the North Atlantic, can be accommodated efficiently if the ATC separation minimums are reduced to permit more aircraft to fly along or as close as possible to the minimum cost routings. This reduction in separation minimums, however, can only be safely accomplished through significant improvements in ATC capabilities and the navigation performance of all aircraft operating within that route structure.

(a) the options currently available to permit reductions in ATC separation minimums include use of the following:
  (i) independent surveillance (ATC radar)
  (ii) dependant surveillance (data link of the aircraft's present position to the ATC system)
  (iii) reduced lateral separation minimums
  (iv) reduced vertical separation minimums
  (v) reduced longitudinal separation minimums
  (vi) a combination of reduced lateral and reduced vertical separation minimums (composite separation)

(b) with the exception of independent and/or dependent ATC surveillance, the safe implementation of any of these options requires improvements in navigational performance. It is important to remember that a navigation performance standard includes all causes of navigation error. The causes are not equipment accuracy standards alone. Navigation performance standard includes consideration for flight technical errors. Sections 3., 4., and 5. discuss three types of special navigation areas of operation which require high levels of long range navigation performance.

3. NORTH ATLANTIC MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS AIRSPACE (NAT/MNPS).

(1) The NAT/MNPS as implemented in the ICAO North Atlantic Region is an extremely demanding standard. Safety of flight in this airspace is critically dependent on each operator achieving and continuously maintaining these high levels of overall navigational performance. Figure 1. depicts the rectangular separation as it is currently applied in NAT/MNPS airspace. This standard requires each Lebanese operator to acquire Director General of Civil Aviation (DGCA) approval before conducting any operation in NAT/MNPS airspace. The operator must obtain this approval for each airplane and navigation/system combination used for operations in this airspace. To obtain NAT/MNPS approval, the operator must show compliance with the following conditions:

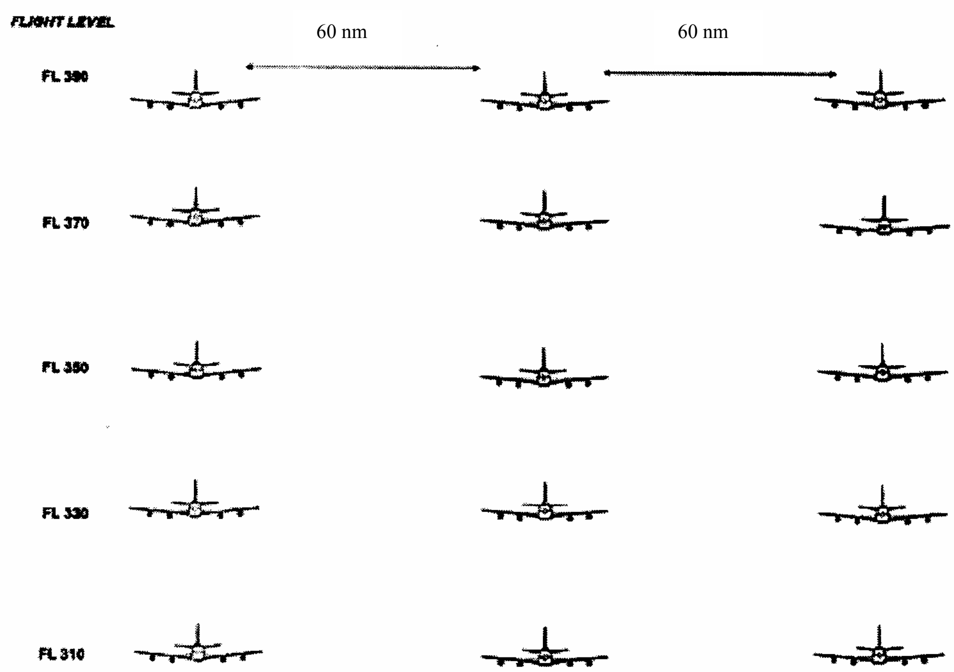
(a) each aircraft is suitably equipped and capable of meeting the MNPS standards;
(b) operating procedures are established which assure MNPS standards are met;
(c) the flightcrews are capable of operating with sufficient precision to consistently meet MNPS requirements;
(d) each aircraft type passes a validation test in accordance with Part VI, Subpart 2, Section 602.165; and
(e) the operator meets the requirements of attachment 1 of this Standard.

(2) The NAT/MNPS represents navigational performance (necessary to reduce the risk of collision) on a internationally established level. The MNPS establishes the following four demanding criteria:

(a) the average lateral deviation (for any cause) cannot be greater than 6.3 nm from the exact centerline of the assigned route over any portion of the route.
(b) ninety-five percent of all of the lateral displacements (for any cause) from the exact centerline of the assigned route cannot be greater than 12.6 nm for all flights over any portion of that route.
(c) each operator cannot have more than 1 lateral deviation (for any cause) of 30 nm or more in 1,887 flights in the NAT/MNPS airspace. When errors of these magnitudes occur the aircraft has failed to navigate to the degree of accuracy required for the control of air traffic.
(d) each operator cannot have more than 1 lateral deviation (for any cause) which is within ±10 nm of a multiple of the separation minimums applied in 7,693 flights in the NAT/MNPS airspace. NAT/MNPS airspace routes are separated by 60 nm. Multiples of 60 are 60, 120, 180, etc. Therefore, ±10 nm of these multiples are 50 - 70 nm, 110 - 130 nm, 170 - 190 nm, etc. For example, if an error of 50 - 70 nm occurs, the aircraft has blundered into the airspace of an adjacent route. Errors of these magnitudes are extremely serious. The potential for a collision is high because the resulting flight path can overlap the flight path assigned to another aircraft (possibly coming from the opposite direction).

FIGURE 1

ILLUSTRATION OF NORTH ATLANTIC (NAT/MNPS) RECTANGULAR SEPARATION



NORTH ATLANTIC MNPS SEPARATION STANDARDS. Aircraft are separated by one of the following methods:

A. *Lateral Separation.* Lateral separation between co-altitude aircraft (aircraft at the same flight level) is 60 nm.

B. *Vertical Separation.* Vertical separation between aircraft on the same track is 2,000 feet.

C. *Longitudinal Separation.* Basic longitudinal separation between aircraft on the same track is 10 minutes. If an aircraft is flying faster than the aircraft behind it (mach advantage), than this criteria may be reduced.

NOTE: Separation standards may be changed. Consult Regional Supplementary Procedures (ICAO Document 7030/3) for current standards applied in the NAT Region

Information Note: *Operational history in NAT/MNPS airspace clearly shows that most serious navigational errors are directly related to operator/pilot error. Equipment malfunction and equipment accuracy are usually not the primary cause for these errors. Most of these serious errors are caused by the flightcrew navigating precisely to the wrong place while believing they know the actual position of the aircraft.*

(3) Initial NAT/MNPS Approvals. Each operator and each aircraft and navigation system combination must be approved before operating in NAT/MNPS airspace. Each operator must demonstrate (validate) that it can meet MNPS standards before receiving approval. Sufficient accuracy data must be collected during this demonstration to show that navigation performance meets MNPS standards (see Validation Tests s602.165).

(a) all data collection flights necessary to validate navigational performance must be conducted outside (or above or below) NAT/MNPS airspace unless additional systems (currently meeting the MNPS) are installed and used as the primary means of navigation.

(b) inspectors must assure that requirements of Attachment 1 of this standard are fully met by the operator before approving any operation in this airspace. All NAT/MNPS approvals are granted by issuing OpSpecs paragraph B39 and by adding that area of enroute operation to paragraph B50 of the standard operations specifications.

(4) Maintaining NAT/MAPS Authorization.

(a) in addition to initially meeting MNPS criteria, each operator must continuously maintain the required level of navigational performance. Each gross navigational error (errors greater than 25 nm) has a significant impact on flight safety in this airspace and must be fully investigated in a timely manner. The cause of each error must be identified and meaningful action must be taken to prevent reoccurrence of similar errors.

(b) when a particular operator (for any cause) experiences a gross navigation error rate higher than the internationally established error rate permitted in MNPS airspace, the responsible inspector must immediately notify the operator that timely action must be taken to improve navigation performance. After this notification, inspectors must determine the effectiveness of the operator's actions as follows:

(i) if it is determined that an operator's actions will prevent the occurrence of similar errors, the operator should be permitted to continue NAT/MNPS operations with close surveillance of the operator's navigational performance. If similar errors occur (in subsequent operations) more frequently than permitted by the standard, stronger action must be taken.

(ii) if an operator fails to take action to improve navigation performance, action must be initiated to suspend NAT/MNPS authorization (operations specifications).

(iii) if it is determined that an operator's actions to improve navigational performance are inadequate or otherwise unsatisfactory, the operator must be notified that the corrective action is unacceptable. When an operator does not implement a satisfactory solution, the action must be initiated to suspend NAT/MNPS authorization.

4. CANADIAN MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS AIRSPACE.

Certain high altitude airspace in Northern Canada has been designated as Minimum Navigation Performance Specifications (MNPS) airspace (see Canadian AIP). The navigational performance criteria for operation in Canadian MNPS airspace is identical to the criteria for NAT/MNPS airspace.

(1) General Criteria. In general, any aircraft/navigation system combination approved for unrestricted operation in NAT/MNPS airspace for a particular operator also meets Canadian MNPS criteria. A particular operator can (under most circumstances) be authorized (without recertification under Attachment 1 to this Standard to conduct Canadian MNPS operations with those aircraft and navigation system combinations authorized for that operator in NAT/MNPS airspace. However, due to the unique nature of operations in high latitudes and in areas of magnetic unreliability, approval for Canadian MNPS operation is not automatic. Each proposed operation must be evaluated on its own merits.

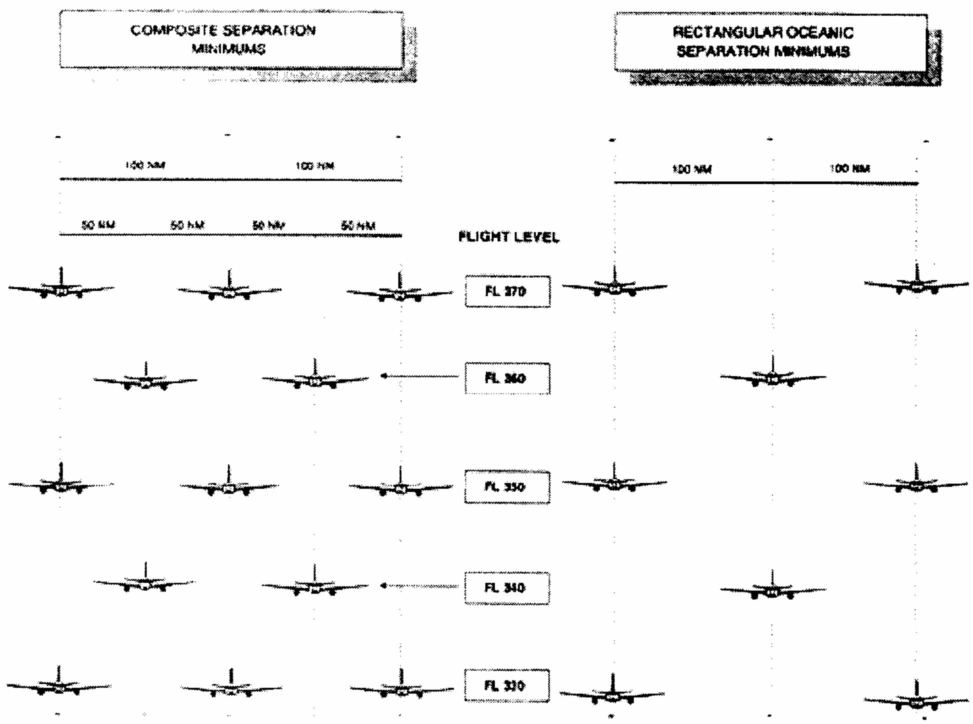
(2) Special Factors. The following special factors must be considered and carefully evaluated before granting air navigation approvals for operation in Canadian MNPS airspace.

- (a) for operators currently authorized to use an aircraft and an INS combination in NAT/MNPS airspace the following factors apply:
  - (i) INS systems meeting NAT/MNPS criteria automatically meet Canadian MNPS criteria.
  - (ii) operations at high latitude airports (greater than 67° N/S) must not be authorized unless INS platform alignment has been successfully demonstrated or approved for those latitudes.
  - (iii) training programs and crew procedures must provide techniques and methods for the following:
    - A. approaches and departures using appropriate heading references other than magnetic
    - B. use of ground based NAVAIDs oriented to appropriate directional references other than magnetic
- (b) for operators currently authorized to use an aircraft and an Omega navigation system combination in NAT/MNPS airspace the following factors apply:
  - (i) the operator must show that adequate signal coverage exists within Canadian MNPS airspace to reliably meet Attachment 1 of this Standard and U.S. Advisory Circular AC 120-37 criteria or equivalent.
  - (ii) Omega installations which provide, in Canadian MNPS airspace, signal coverage and signal figure of merit values equivalent to those approved for that aircraft and navigation system combination in NAT/MNPS airspace may be approved for Canadian MNPS operations, provided the system is certified as airworthy for this area using heading reference systems other than magnetic.
  - (iii) training programs and crew procedures must provide acceptable techniques and methods for the following:
    - A. accurate and reliable enroute navigation using heading references other than magnetic
    - B. approaches and departures using appropriate heading references other than magnetic
    - C. use of ground based NAVAIDs which are oriented to appropriate directional references other than magnetic
- (c) for operators who are not currently authorized to use an aircraft and a navigation system combination in NAT/MNPS airspace, but propose to operate in the Canadian MNPS airspace, the following direction applies:
  - (i) the operator must meet the criteria in Attachment 1 of this Standard (or equivalent) considering the conditions unique to Canadian MNPS airspace.
  - (ii) the operator must also meet the special factors specified in (2)(a) and/or (b), as appropriate.

(iii) all Canadian MNPS airspace approvals are granted by adding that area of enroute operations to paragraph B50 of the operations specifications.

FIGURE 2

ILLUSTRATION OF COMPARISON BETWEEN COMPOSITE SEPARATION MINIMUMS AND RECTANGULAR OCEANIC SEPARATION MINIMUMS



Separation standards establish separation between aircraft by either:

1. Vertical separation of 2000 ft. (above flight level 290) between aircraft on the same route.

2. A lateral separation of 100 nm between aircraft at the same altitude on adjacent routes.

3. A longitudinal separation of 15 minutes between aircraft on the same route at the same altitude.

4. A composite separation of 50 nm laterally and 1000 ft. vertically between aircraft or adjacent routes.

NOTE: Separation minimum vary between ICAO regions. Consult the Regional Supplementary Procedures (ICAO Document 7030/3) for current standards applied in each region.

5. OPERATIONS IN AIRSPACE WHERE COMPOSITE SEPARATION IS APPLIED BY ATC.

(1) Special long range navigation performance requirements are necessary in certain areas of the Eastern and Northern Pacific Ocean where composite separation has been applied (through international agreement) by ATC. There are two areas where composite separation is currently applied. They are the Central East Pacific (CEPAC) composite airspace and North Pacific (NOPAC) composite airspace. Operations in these areas must be conducted in accordance with paragraphs B37 and B38 of the standard operations specifications. The application of composite separation involves the use of a composite of lateral and vertical separation minimums to provide safe separation of aircraft and permit more flight tracks closer to the optimum minimum cost routing.
(2) Concept. The application of composite separation permits the use of flight levels not normally available for high altitude flight (FL 320, FL 340, FL 360, FL 380). A pictorial comparison between composite separation minimums and normal oceanic separation minimums is provided in Figure 2. When composite separation is used the following separation minimums currently apply:

- (a) co-altitude aircraft are still separated laterally by the standard minimums (100 nm).
- (b) aircraft assigned to the same flight track are still separated vertically by the standard minimums (2000 feet).
- (c) additional flight tracks, however, are sandwiched in between. These flight paths are separated from the adjacent flight paths by a composite of lateral separation (50 nm) and vertical separation (1000 feet).
- (d) aircraft assigned to the same flight track and altitude are separated longitudinally by 15 minutes.

Information Note: *Separation minimums may change with technological advances and/or enhanced ATC practices and procedures. See ICAO Document 7030 (Regional Supplementary Procedures) for current separation minimums applied in each ICAO region.*

(3) Navigational Performance. This unique route structure requires navigational performance better than the basic oceanic standard due to the closer proximity of aircraft on adjacent flight tracks. This higher level of required navigational performance is not compatible with operations based on the use of a flight navigator and aids such as celestial, pressure pattern, and dead reckoning. Pilot operated electronic long range navigation systems such as INS and Omega or Doppler updated by Omega are currently the primary means of providing the required performance. Operating procedures such as those specified in U.S. Advisory Circular AC 90-79 (or equivalent) are also necessary to consistently attain and maintain the necessary levels of navigational performance in composite airspace.
(4) Additional Requirements for Operations in the North Pacific. Certain North Pacific (NOPAC) routes bordering Soviet Airspace require additional navigational equipment and operational procedures. Operations on the NOPAC fixed routes require airborne radar suitable for ground mapping to monitor navigational performance, detect significant navigational errors, and avoid unauthorized overflight of Soviet territory. The airborne radar must be operational for all flights over these routes and must be continuously used by the flightcrew to monitor flight progress over these routes.
(5) Approvals. All CEPAC composite airspace approvals are granted by issuing paragraph B37 and by adding that area of enroute operation to paragraph B50 of the standard operations specifications. Approvals for any operations into the NOPAC airspace including the composite airspace of that area are granted by issuing paragraph B38 and by adding that area of enroute operation to paragraph B50 of the standard operations specifications.

6. OPERATIONS IN EUROPEAN AIRSPACE DESIGNATED FOR BASIC AREA NAVIGATION (BRNA/RNP-5)

In accordance with ICAO coordinated regional agreements, Lebanese operators shall obtain DGCA approval to the BRNA/RNP-5 criteria contained in Attachment 3 to this Appendix.

7. OPERATIONS IN AIRSPACE DESIGNATED FOR RNP-10 NAVIGATION

In accordance with ICAO coordinated regional agreements, Lebanese operators shall obtain DGCA approval to the RNP-10 criteria contained in Attachment 4 to this Appendix.

8. OPERATIONS IN ROUTE STRUCTURES DESIGNATED AS REDUCED VERTICAL SEPARATION MINIMUM (RVSM)

In accordance with ICAO coordinated regional agreements, Lebanese operators shall obtain DGCA approval to the Reduced Vertical Separation Minimum (RVSM) criteria contained in Attachment 5 to this Appendix.

9. OPERATIONS USING DOPPLER RADAR OR INERTIAL NAVIGATION SYSTEM (INS)

Operators using Doppler Radar or Inertial Navigation Systems (INS) for navigation will meet the Standards in Attachment 2 to this Appendix.

10. OPERATIONS USING GLOBAL POSITIONING SYSTEM (GPS)

Operators using Global Positioning System (GPS) for navigation will meet the Standards in Attachment 6 to this Appendix.

11 AREAS OF MAGNETIC UNRELIABILITY.

(1) Two large areas of enroute operation have unique features which significantly complicate air navigation. These two areas are centered around the earth's magnetic poles.
(2) Concept. Conventional magnetic compasses sense magnetic direction by detecting the horizontal component of the earth's magnetic field. Since this horizontal component vanishes near the magnetic poles, magnetic compasses are highly unreliable and unusable in an area approximately 1000 nm from each magnetic pole. Within these areas, air navigation tasks are further complicated by very rapid changes in magnetic variation over small distances. For example, when flying between the magnetic North Pole and the true North Pole, a heading of true North results in a magnetic heading of South (a magnetic variation of 180 degrees).
(3) Convergence of the Meridians. Since these two major areas of magnetic unreliability also occur near the earth's geographic poles, the convergence of the meridians also presents additional directional complications. When flying "great circle" courses at latitudes greater than 67 degrees, convergence of the meridians can create rapid changes in true headings and true courses with small changes in aircraft position. As a result, relatively small errors in determining the aircraft's actual position can produce very large errors in determining the proper heading to fly to maintain the assigned flight path. When even small errors occur, very large navigation errors can develop over extremely short distances. An extreme example of this phenomena occurs at the earth's geographic North Pole. Flight in any direction from the exact pole is initially due South (that is, the direction to the USSR or the U.S. is South).
(4) Special Equipment, Techniques, and/or Procedures. Special navigation equipment, techniques, and/or procedures are critical to operate safely in polar areas, including the two areas of magnetic

unreliability. Operations based solely on magnetic references within areas of magnetic unreliability are UNSAFE, UNACCEPTABLE, AND SHALL NOT BE APPROVED. Operations within these areas can only be conducted safely if the primary heading reference is derived from sources other than magnetic.

(a) all inertial navigation systems are capable of calculating true North independently from other aircraft systems. INS can be approved and safely used for operations in areas of magnetic unreliability and polar areas provided the following conditions are met:
  (i) the INS is certified as airworthy for the highest latitude authorized for these operations.
  (ii) ground alignment of the INS is restricted to those airports where satisfactory alignment has been demonstrated or otherwise approved.
  (iii) the operator's training programs and crew procedures provide acceptable techniques and methods for the following:

A. approaches and departures using appropriate heading references other than magnetic
B. the use of ground based NAVAIDs which are oriented to appropriate directional references other than magnetic

(b) all current Omega and Omega/VLF systems require reliable heading information to provide useful navigational guidance. As a result, all Omega systems must use an appropriate heading reference system, other than magnetic, when operating within these areas. The current means of providing the required heading reference is through the use of "free gyro" or "grid" equipment, procedures and techniques. The gyros (compasses) necessary for these operations require special calibration, special compensation techniques, and unusual operational procedures. The special skills required to operate these systems are critical to safety of flight.

Information Note: *The DGCA shall not approve operations in polar areas and/or areas of magnetic unreliability using navigation systems other than INS.*

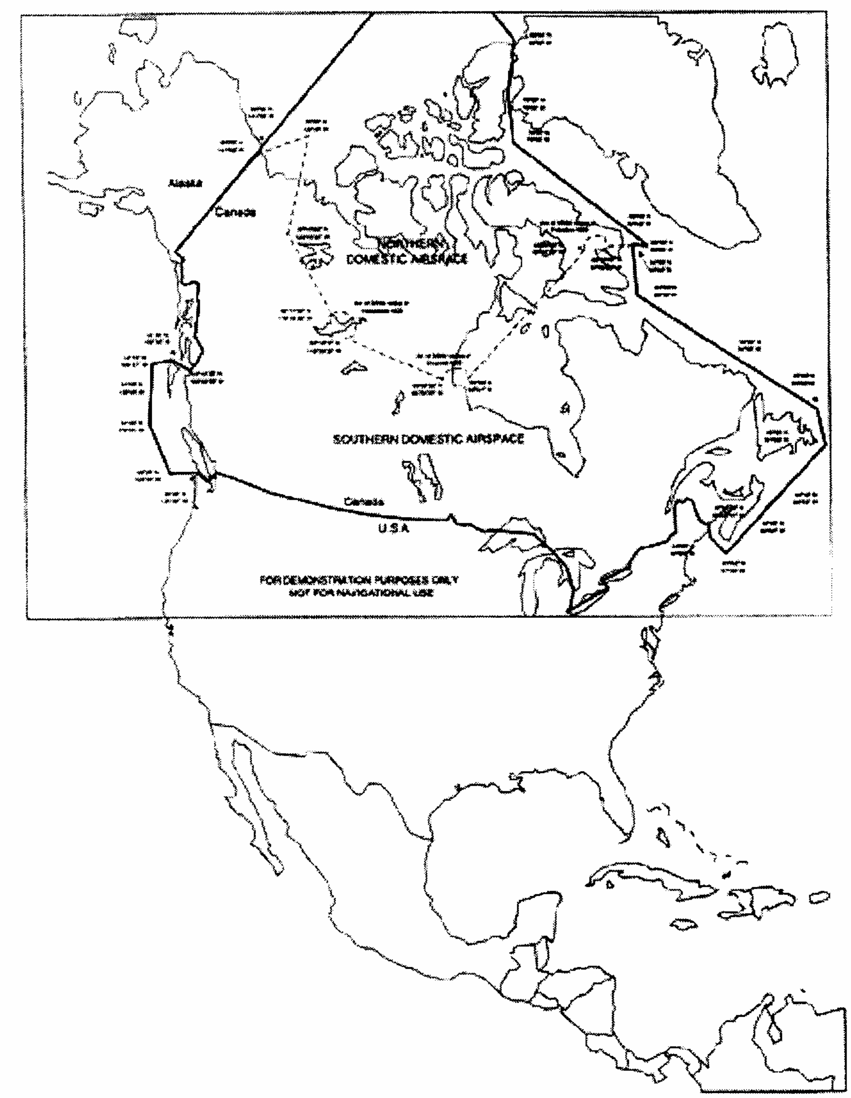
(c) there is a wide variety of other methods, systems, techniques, and procedures (including pilotage operations) which can be used for navigation in areas of magnetic unreliability and polar areas. However, due to the variety of means and the complexity of air navigation in these areas, specific direction and guidance for these other means of navigation are not provided in this handbook.

(4) Boundaries of the Area of Magnetic Unreliability.
(a) for the northern hemisphere, the Canadian Aeronautical Information Publication (AIP) establishes the basic boundaries for the area of magnetic unreliability. Canadian Air Navigation Order, Series V, No. 22 states in paragraph 4 that no person may operate an aircraft in IFR flight within Canadian northern domestic airspace unless it is equipped with a means of establishing direction which is not dependent on a magnetic source. The special equipment, training, and procedures discussed in this paragraph are required for all operations into the area of northern domestic airspace. The boundaries of this area are shown in Figure 3. This area is also outlined on Canadian enroute charts. For the purposes of this section, northern domestic airspace is considered to extend from ground level to infinity.
(b) for the southern hemisphere, any operation south of 65 degrees south latitude is considered to be within the area of magnetic unreliability. Any proposal to operate within the area of magnetic unreliability in the southern hemisphere must be reviewed and concurred with by the DGCA.

(5) Approvals. All approvals for operations into areas of magnetic unreliability are granted by issuing paragraph B40 and by adding that area of enroute operation to paragraph B50 of the standard operations specifications.

FIGURE 3

CANADIAN DOMESTIC AIRSPACE



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DIVISION II - OPERATIONAL CONCEPTS.

(1) Classification and Applicability of Minima. Landing minima are generally classified by Category I, Category II and Category III. Definitions for Category I, II, and III are specified by ICAO, and are included in Attachment I of this Appendix. This Appendix addresses criteria for Category I and Category II operations. Appendix II of this Standard (as amended) addresses takeoff in low visibility conditions and Category III Landing operations.

(2) Landing minima are generally addressed by Part VI and Part VII of the LARs and Standards or special OpSpecs Part C. Application of these definitions of Category I, II, and III to landing is discussed in Section (5) below.

(3) Although a wide variety of normal and non-normal situations are considered in the design and approval of systems and procedures for Category I and Category II, landing weather minima are primarily intended to apply to normal operations. For non-normal operations, flightcrews are expected to take the safest course of action appropriate for the situation, notwithstanding landing weather minima. When aircraft systems have been demonstrated to account for certain non-normal configurations and a procedure is specified (e.g., an approach with an engine inoperative non-normal procedure) flightcrew may take account of this information in assessing the safest course of action. In addition, when inoperative aircraft systems have been accounted for in the AFM as an alternate configuration using criteria of this Appendix (e.g., an approach with an engine inoperative is specified as a demonstrated configuration) operational credit for that configuration (alternate minima credit) may be authorized.

(4) Takeoff minimums are generally addressed by Part VI and Part VII of the LARs and standard or special OpSpecs. Application of takeoff minima is discussed below:

- (a) Takeoff Minima. Takeoff minima are addressed by Part VI and Part VII of the LARs, and standard or special OpSpecs Part C. The authority for lower than standard takeoff minimums is contained in OpSpecs. OpSpecs are applicable to Part VI and Part VII Operators. Where minima lower than that provided in standard OpSpecs are necessary, applicable criteria for use of those minima are specified in Appendix III of this Standard. When appropriate, the DGCA issues OpSpecs specifying the lower minima through paragraph C056 to Part VI and Part VII Operators. OpSpecs contain specific guidance regarding pilots, aircraft, and airports when lower than standard takeoff minimums are used.
- (b) Visibility Assessment and RVR Equivalence.
  - (i) reported RVR equivalent value for met visibility minima. For takeoff procedures where minima are expressed in terms of RVR, but visibility is reported as a meteorological visibility, the "visibility-RVR" equivalence table referenced in Standard OpSpecs may be used to establish equivalent RVR (see Part VI, Subpart 2, Division XV, OpSpec Paragraph C051).
  - (ii) reported meteorological visibility equivalent value for RVR minima. Conversely, for takeoff procedures where minima are expressed in terms of RVR, but reported visibility available to the flightcrew is specified as a meteorological visibility, the "Visibility-RVR Equivalence" table referenced in Standard OpSpecs may be used to establish equivalent RVR (See Part VI, Subpart 2, Division XV, OpSpecs Paragraph C051).
  - (iii) pilot assessment of equivalent RVR. For takeoff circumstances where Touchdown Zone RVR is inoperative or is determined by the pilot to be significantly in error (e.g., patchy fog obscuring a transmissometer but not the runway, snow on transmissometer causing erroneous readings) a pilot assessment may be made in lieu of RVR (see Part VI, Subpart 2, Division XV, OpSpec Paragraph C056).

A. to be eligible to use this provision the operator must assure that each pilot authorized to make this determination has completed approved training addressing pilot procedures to be used for visibility assessment in lieu of RVR, and the pilot can determine the necessary runway markings or runway lighting that must be available to provide an equivalent RVR to that specified to assure adequate visual reference for the takeoff.
B. when any pilot assessment of equivalent RVR is made, the pilot must be able to positively determine position on the airport and correct runway, and positively establish that the aircraft is at the correct position for initiation of takeoff. Typically this equivalent RVR assessment is applicable only at a runway threshold where runway identifying markings and number(s) are visible from the takeoff position (e.g., not applicable to intersection takeoffs).

(5) Approach and Landing Concepts and Objectives**.** Landing minima are classified as Category I, Category II, and Category III. Definitions of these categories are provided in Standard OpSpecs Part A paragraph A2, and in Attachment 1 of this Appendix. While generally consistent with ICAO definitions, the definitions used in Standard OpSpecs, where different from ICAO, apply and take precedence for Lebanese Operators, or for international operators conducting operations within Lebanon.

For Lebanese operators, any instrument approach with a DA (H) or MDA (H) and visibility above that specified in OpSpecs for Category I, (See Part VI, Subpart 2, Division XV) is considered to be a Category I operation (e.g., an approach with either a DA (H) or an MDA (H) which is greater than 200' [60 m] HAT and visibility greater than 1800 [550 m] RVR is considered to be Category I, even though it may be based on a NAVAID other than ILS).

Any instrument approach with a DA (H) or visibility less than that specified for Category I, but above that specified in for Category II, is considered to be a Category II operation.

Any instrument approach with a DA (H) less than that specified for Category II (or with no DA (H) or with an Alert Height), or with a visibility less than that specified for Category II, in accordance with applicable OpSpecs is considered to be a Category III operation.

Category I operations are typically conducted manually using raw data information, by reference to flight guidance displays (flight directors), or automatically using approved autopilot or autoland systems.

For Category I, basic airworthiness certification for IFR under provisions of Part V of the LARs typically is considered an acceptable means of demonstration of capability for operational acceptance of an aircraft and it's associated systems. Specific criteria for airworthiness demonstration of certain specific systems or capabilities for Category I are included in Attachment 2 (e.g., FMS or RNP).

For Category I minima, it is expected that for non-normal operations (e.g., engine(s) inoperative, hydraulic or electrical system(s) failure) the pilot or operator should consider any necessary adjustment of operating minima, wind limit constraints, or other factors to assure safe operation with the non-normal condition.

Category II operations may be conducted manually using flight guidance (e.g., flight director) displays. However, most Category II operations are conducted using an autopilot or autoland system, or with combinations of systems using both automatic and flight guidance (e.g., flight director) elements. Additional demonstration or operational assessment beyond that required for basic IFR flight under provisions of basic aircraft type certification typically is necessary for operational authorization of an aircraft for Category II (see Section 5 and Attachment 3). Specific criteria for airworthiness demonstration of systems or capabilities for Category II are included in Attachment 3 (e.g., for flight director(s), autopilot(s), or HUD) for cases where an applicant seeks prior credit for such an airworthiness demonstration in the airplane flight manual (AFM).

For Category II minima, certain non-normal conditions are typically considered in the assessment and authorization process. Response to those non-normal conditions may be explicitly defined in the Category II authorization (e.g., engine failure, electrical component failure, or engine inoperative Category II). For failures other than those addressed by the Category II authorization, the pilot or operator may need to adjust the operating minima used, introduce wind limit constraints, or address other factors to assure safe operation for the particular non-normal condition.

(6) Operational Safety Evaluation**.** For any instrument approach, using either Category I or Category II minima, the operator must adequately consider and provide for safe operations considering at least the following:

- (a) the possibility of a failure of any one of the pertinent navigation system, flight guidance system, flight instrument system, or annunciation system elements used for the approach or missed approach (e.g., ILS receiver failure, Autopilot disconnect, etc.),
- (b) the possibility of a "probable" failure of the aircraft or related supporting systems during the approach or missed approach (e.g., engine failure, electrical generator failure),
- (c) the possibility of a balked landing or rejected landing at or below DA (H), or MDA(H), as applicable,
- (d) the possibility of loss or significant reduction of visual reference, that may result in or require a go-around,
- (e) suitable obstacle clearance following a missed approach, considering applicable aircraft configuration during approach and any configuration changes associated with a go-around (e.g., engine failure, flap retraction).
- (f) for special airports identified in accordance with Part VII of the LARs**,** or other airports with critical obstacles that have not otherwise been accounted for, the ability to assure suitable obstacle clearance following a rejected landing; applicable aircraft configuration(s) during approach and any configuration changes associated with a go-around and missed approach should be considered.
- (g) unusual atmospheric or environmental conditions that could adversely affect the safety of the operation (e.g., extreme cold temperatures, known local atmospheric or weather phenomena that introduce undue risk, etc.).

When in conducting a safety assessment of issues listed above and uncertainty exists as to aircraft failure condition effects, procedural design intent or margins, aircraft characteristics or capabilities following failure, or other such issues, the operator should consult with the aircraft manufacturer, avionics manufacturer, procedure designer, air traffic authority, or regulatory authority as applicable and as necessary to assure use of comprehensive and accurate information.

(7) Primary and Supplementary Means of Navigation and Required Navigation Performance (RNP).

"Primary" and "Supplementary" means of navigation and Required Navigation Performance (RNP) are as defined in Attachment 1. Application of these terms to instrument approach or takeoff are as described below.

(a) Primary Means of Navigation. A "Primary Means" of navigation is a means of navigation that satisfies each of the necessary levels of accuracy, integrity, and availability for a particular area, route, procedure or operation. The failure of a "Primary Means" of navigation may result in, or require reversion to a "non-normal" means of navigation or alternate level of RNP.

As applicable to instrument approach operations for an air carrier, particularly for a final approach segment or a missed approach segment, the following may be considered to satisfy requirements for a primary means of navigation.

For sensor specific approaches (e.g., VOR, or NDB, or ILS) each particular airborne system using its respective associated NAVAID (e.g., ILS) may be considered as the "primary means of navigation" for completion of that respective specified approach procedure (e.g., ILS RWY 16R).

When multiple components are required (e.g., ILS, with use of an NDB for the missed approach), the collective set of specified navigation components are considered to be the primary means of navigation for that procedure. Failure of any one of the required components may preclude use of the procedure, or may require reversion to a non-normal means of navigation for completion of the procedure (e.g., failure of the NDB missed approach NAVAID associated with an ILS approach).

For RNAV based procedures where the only method of flying the procedure is by an RNAV or RNAV/RNP system (e.g., FMS), RNAV is considered to be the primary means of navigation for that approach procedure. Any associated NAVAID, or combinations of NAVAIDs, or airborne sensors necessary to achieve the necessary level of FMS performance may be considered as an input sensor(s) to the FMS, but the sensors or NAVAIDs taken alone are not necessarily considered to be the primary means of navigation.

Where RNAV systems are used to overfly other types of instrument approach procedures (e.g., FMS RNAV systems overflying flying VOR or NDB procedures), the RNAV system may be considered as a supplemental system if the aircraft can revert to use of the underlying procedure flown with "raw data", in the event of failure of the RNAV system (see b. below).

(b) Supplementary Means of Navigation. A "Supplementary Means" of navigation is a means of navigation which satisfies one or more, but not necessarily all of the necessary levels of accuracy, integrity, and availability for a particular area, route, procedure or operation. The failure of a "Supplementary Means" of navigation may result in, or require reversion to another alternate "normal" means of navigation for the intended route procedure or operation.

As applicable to instrument approach operations for an air carrier, particularly for a final approach segment or a missed approach segment, the following may be considered to satisfy requirements for a supplementary means of navigation.

When procedures have multiple methods to achieve compliance (e.g., a multi-sensor FMS overflying a VOR approach, or an ILS approach with the choice of either an NDB or a VOR based missed approach), those airborne systems which have another alternate normal means to accomplish the procedure, or a portion of the procedure, for one or more applicable segments, may be considered as supplementary for those applicable segments (e.g., if the FMS should fail, and the crew is monitoring the underlying VOR information, and the crew can transition to use of VOR based navigation) the FMS may be considered as supplementary.

Or, if after an ILS approach, FMS RNAV capability is used to overfly a VOR/DME based missed approach (with VOR/ DME NAVAID facilities operating), the FMS RNAV capability may be considered supplementary. Note however, that if the specified approach/missed approach VOR/DME NAVAIDs are not operative, and the FMS RNAV operation is based on use of multi-sensor NAVAID capability, then the FMS use for that approach/missed approach would typically considered a primary means of navigation.

(c) Required Navigation Performance (RNP). Required Navigation Performance is a statement of the navigation performance necessary for operation within a defined airspace (Adapted from ICAO - IS&RP Annex 6). Required Navigation Performance is specified in terms of accuracy, integrity, and availability of navigation signals and equipment for a particular airspace, route, procedure or operation.

(8) Use of ICAO Standard NAVAIDs. Lebanese Category I or Category II Operations are based on use of ICAO standard NAVAIDs, equivalent NAVAIDs, or other NAVAIDs acceptable to the DGCA and approved in OpSpecs. Authorization for use of NAVAIDs other than ICAO Standard NAVAIDs must be approved by the DGCA.

A Standard Landing Aid (SLA) in the context of this section of this Appendix, is considered to be a navigation service provided by a State which meets internationally accepted performance standards (e.g., ICAO Standards and Recommended Practices (SARP(s)), equivalent State standards found to be acceptable by Lebanon, or Lebanese standards

(9) Standard Instrument Approach Procedures (SIAPS).

(a) instrument approach procedures used by operators in accordance with this Appendix should be based on:
   (i) Lebanese Standard Instrument Approach Procedures,
   (ii) for non-Lebanese airports, foreign instrument approach procedures acceptable to the DGCA promulgated by the state of the airport of landing (i.e. ICAO - State of the Aerodrome),
   (iii) military instrument procedures acceptable to the DGCA for operations at military facilities,
   (iv) special instrument approach procedures developed by the DGCA,
   (v) special instrument approach procedures developed by the operator which are acceptable to the DGCA, or procedures developed by the operator using methods acceptable to the DGCA, or
   (vi) special instrument approach procedures acceptable to the DGCA developed by non-Lebanese operators, or by the State of the Aerodrome (for foreign airports).

(b) for procedures, the operator must assure consideration of at least the following factors related to use of those instrument procedures:
  (i) availability of suitable weather reporting and forecasts,
  (ii) identification of any necessary alternates airports or alternate minima,
  (iii) ability to discontinue an approach, if necessary, from any point to touchdown (extraction),
  (iv) suitability of the airborne equipment to use the procedure (e.g., compatibility of the airborne equipment with the type/characteristics of the ILS, VOR, DME, NDB ground facilities used),
  (v) suitability of Ground Systems/Equipment (e.g., lighting, transmissometers, pilot control of lighting),
  (vi) suitability of NAVAIDs (e.g., maintenance, monitoring),
  (vii) suitability of Airport/Runway (e.g., obstructions, clear zones, markings),
  (viii) availability of Aeronautical Information (e.g., timely NOTAM availability),
  (ix) identification of any special Training or qualification related to the procedure, and
  (x) resolution of any issues identified from adverse "service experience" with the procedure.

(c) special instrument approach procedures should address any provisions associated with Part VII of the LARs Sections for special airport qualification. Special procedures are approved by the DGCA after coordination with pertinent Directorate General of Civil Aviation organizations.

(10) "Steep Approaches" and Approach Path Descent Angle Constraints**.** Approach path angles between 2.75 degrees and 3.77 degrees are considered standard for air carrier operations. Approach angles above 3.77 degrees are considered "steep angle" and, if authorized, may require additional assessment. Air carrier use of approach angles over 3.77 degrees will require approval by the DGCA. Approach angles over 4.5 degrees should be predicated on associated aircraft type AFM provisions for steep angle approaches in accordance with Attachment 2, Division III, Section (52) of this Appendix.

(11). "Normal Maneuvering" Considerations**.** Part VI, and Part VII of the LARs require that approach procedures (including procedures for either Category I or II) should be predicated on use of "normal maneuvers" before and after passing DA (H) or MDA (H). Normal maneuvers typically do not involve use of bank angles greater than 30 degrees, pitch attitudes in excess of 25 degrees nose up or 10 degrees nose down, or sink rates in excess of 1100 feet per minute below 500 feet [150 m] HAT while maneuvering to land within the touchdown zone, during go-around, or during a rejected landing. During a missed approach, pitch attitudes are normally considered to be less than +30 degrees and bank angles are normally less than or equal to 30 degrees.

(12) Non-Normal Events or Configurations**.** Takeoff and landing weather minimums are intended for normal operations. When non-normal events occur, flightcrews are expected to take the safest course of action to assure safe completion of the flight. Using emergency authority, crews may deviate from rules or polices, to the extent necessary, to minimize the risk of continued flight to a safe landing.

Division IV, Section (9) addresses guidelines and procedures to be considered in conducting an instrument approach during a non-normal event.

(13) Go-Around Safety.

(a) an aircraft conducting an instrument approach (either Category I or Category II) should be capable of safely executing a go-around from any point in an approach prior to touchdown with the aircraft in a normal configuration, or specified non-normal configuration (e.g., engine out if applicable). It is necessary to provide for go-around due to aircraft related or Air Traffic Service contingencies, rejected landings, loss of visual reference, or missed approaches due to other reasons.

(b) an operator must have sufficient performance information to determine and assure, as necessary, obstacle clearance following a go-around or balked landing climb from both an approach and the runway environment.

(c) simplified methods accounting only for transition and reconfiguration and acceleration distance based on use of otherwise required allowable takeoff gross weight (ATOGW) data for takeoff on that same runway are acceptable. If a simplified method is used, such a method must account for:

- (i) actual go-around configuration transitions from approach to missed approach configuration including flap settings and flap retraction,
- (ii) speed changes,
- (iii) engine failure and shutdown (feathering if applicable) provisions,
- (iv) any lateral differences in flight path, and
- (v) balked landing obstacle clearance until reaching missed approach or enroute procedurally protected airspace.

(d) if data is developed or an obstacle clearance determination or demonstration is conducted by the operator, aircraft manufacturer, or a procedural consultant, for the purposes of this determination, the data may assume the following initial conditions:

- (i) a "balked landing" starts at the end of the TDZ.
- (ii) an engine failure occurs at the initiation of the balked landing, from an all-engine configuration.
- (iii) balked landing initiation speed $\geq$ Vref or Vga (as applicable).
- (iv) balked Landing initiation height is equal to the specified elevation of the TDZ.
- (v) balked landing initiation configuration is normal landing flaps, gear down.
- (vi) at the initiation of the maneuver, all engines are at least in a spooled configuration.

(e) the operator must be able to determine either the weight at which a given critical obstacle height may be cleared at a given longitudinal distance from the initiation of the balked landing (end of TDZ); or at a given weight, must be able to determine the height that may be cleared at a given distance from the initiation of the balked landing climb (end of TDZ), considering the airport elevation and temperature at the airport elevation, and appropriate configuration transitions.

(f) necessary data may be provided in a form similar to that provided for takeoff, or in a different form, as long as the operator can determine and assure the necessary obstacle clearance following the go-around and during the subsequent balked landing climb and missed approach. The operator should be able to account for:

- (i) any necessary reconfiguration of the aircraft from a landing configuration to a go-around configuration, including flap retraction if applicable, and landing gear retraction,
- (ii) longitudinal distance and obstacle clearance height achievable during acceleration, to Vga, and subsequently achieving a steady-state climb gradient, as necessary,
- (iii) any performance or gradient loss during turning flight, if necessary to follow a flight path that is not over the runway or is not aligned with the runway after the balked landing transition,
- (iv) transition between any flap settings intended to be used for approach and missed approach,

(v) any obstacle height or longitudinal distance of an obstacle or gross weight up to the maximum authorized for takeoff applicable to that operator, aircraft type, and runway.

(g) data may be based on or use methods otherwise used for takeoff such as "Overspeed V2", "engine-out maximum angle climb gradient" instead of "maximum rate" climb gradient, or other such techniques if they are determined to be safe by the operator, aircraft manufacturer, and the DGCA.

(h) performance data provided should be consistent with any applicable flight guidance system or operational procedures used. Any techniques required to achieve the specified performance should be provided to the flight crew.

(i) as necessary, the same lateral and vertical flight path obstacle clearance assumptions may be made as applied to corresponding takeoff flight paths in the determination of net vertical flight path clearance or lateral track definition or lateral track obstacle clearance within an airport boundary or beyond an airport boundary until the point at which cruise or other obstacle clearance requirements apply.

(j) compliance with PANS-OPS requirements alone, particularly for two-engine aircraft which achieve gradients with an engine inoperative that may be less than PANS-OPS gradients, does not ensure obstacle clearance or safety of a balked landing and subsequent missed approach. This is true whether a go-around is initiated from DA (H), MDA (H), on a circling approach, or from the end of the TDZ when below DA (H) or MDA (H).

(k) since the collision risk model (CRM) used with PANS-OPS is a statistical technique which does not assure obstacle impingement, use of collision risk models are not an acceptable means to assure compliance with Part VI, and Part VII of the LARs for takeoff, or for a similar analysis for missed approach with an engine inoperative.

(l) it is important to note that PANS-OPS are intended only to provide probabilistically determined protection for normal "operations" which are considered "standard" (e.g. standard procedures based on all-engine performance, not even "special" procedures based on all-engine, and no engine inoperative procedures whether standard or special). These references are not intended to address non-normal situations and events, such as engine failure for which deterministic compliance is required by the all weather operations and performance operating rules.

(m) RNP-based procedures and criteria intrinsically provide for appropriate balked landing and missed approach obstacle protection in their construction.

(n) as an alternate acceptable method, the operator may provide data for a longitudinal distance "D" from a worst case balked landing at the end of the touchdown zone to the point where a known acceptable stabilized climb rate is established. Air Carriers may add "D" distance to the 3000 feet [1000 m] point to identify the distance covered to establish an appropriate steady climb gradient, then use the climb gradient to confirm obstacle clearance.

(o) FGS Systems must be demonstrated to be compatible with obstacle analysis, transitions, and gradient determinations. This may be achieved by demonstrating a safe go-around from 100 feet [30 m] HAT operationally, or as part of an airworthiness demonstration conducted in accordance with Attachment 2 or 3 or Appendix II of this Standard. There is no requirement for height loss information to be provided by the operator or manufacturer in the FCOM or AFM.

(p) Attachment 3, Division VI of this Appendix addresses data availability from an aircraft manufacturer available to support climb gradient, maximum weight, or transition distance assessments for balked landing or missed approach obstacle clearance assurance. In the event such data is not available from the aircraft manufacturer, the operator may, as necessary, develop, compute, demonstrate or determine such information to the extent necessary to assure safe obstacle clearance during an engine-out missed approach or engine-failure following a rejected landing.

(q) Division III, Section (24) describes typical factors to be considered when assessing go-around capability for a particular aircraft and flight guidance system type. Division IV of this Appendix addresses procedures including those used for go-around or rejected landing, and Division V of this Appendix addresses flightcrew Training and Qualification including relevant aspects of missed approach, go-around, or rejected landing.

(14) ILS, GLS, or MLS (xLS) Instrument Approach Operations**.** ILS, GLS, or MLS (e.g., xLS) operations may be authorized to the lowest applicable DA (H) for the procedure used, and to the lowest visibility minima specified in the OpSpecs for the NAVAID, facilities, and lighting systems used (see Part VI, Subpart 2, Division XV, Standard OpSpecs Part C Paragraph C053 for Category I, and Standard OpSpecs Part C paragraph C059 for Category II).

ILS, GLS, or MLS (e.g., xLS) operations are typically authorized based on use of two or more navigation receivers or multi-mode receivers (MMRs) of a pertinent type, each providing independent information to the appropriate flight guidance system elements and pilot displays.

Precision Approach Radar (PAR) procedures are not considered xLS procedures. For PAR procedures, see Division II, Section (15) of this Appendix.

(15) Instrument Approaches other than ILS, GLS, or MLS**.** Instrument approach procedures other than ILS, GLS, or MLS that may be authorized include the following.

(a) Standard Landing Aid (SLA) Approaches**.** NAVAID specific procedures using a standard landing aid (SLA), without vertical guidance (e.g., non-precision approaches) as follows:
  (i) Localizer (LOC),
  (ii) Localizer Back Course (BC)
  (iii) Localizer Back Course with Glide Slope,
  (iv) VOR,
  (v) VOR/DME,
  (vi) NDB,
  (vii) Dual NDB,
  (viii) NDB/DME,
  (ix) TACAN, and
  (x) RNAV (Limited - 2D) based on a procedurally specified, particular standard landing aid/NAVAID (e.g., a particular VOR/DME to the procedure).

(b) Standard Landing Aid (SLA) Approaches with Vertical guidance (VNAV)**.** NAVAID specific procedures using a standard landing aid (SLA) with vertical guidance (e.g., procedures listed in a. above, but which are flown using a specified path for vertical guidance).

Information Note: *NAVAID specific procedures flown using an "open loop" vertical speed based descent profile, with a periodic altitude/distance crosscheck, are not considered to have vertical guidance.*

(c) RNAV Procedures (3D or 2D)**.** RNAV Procedures (3D or 2D), but not necessarily based on particular standard landing aids (SLAs) or NAVAIDs (e.g., may be based on applicable FMS determined DMD-DME position updating, VOR/DME updating, or GNSS, and which usually also considers 2 or more IRSs in the position determination).

(d) RNAV/RNP Procedures (3D or 2D). RNAV procedures (typically 3D) as noted in c. above, but which include RNP based minima, or which are exclusively flown using RNP, or have RNP in the procedure title (e.g., RNP.15 RW28L).

(e) Airport Surveillance Radar (ASR) Procedures.

(f) Precision Approach Radar (PAR) procedures.

(g) Other Limited Use Special Procedures. Other special instrument approach procedures (e.g., LORAN, Transponder Landing System (TLS), airborne radar approach, Eastern European KRM).

Special procedures include use of LORAN C, airborne radar, or any other landing system or non-ICAO NAVAID. Special procedures typically require unique approval of an operator's operational procedures, flightcrew qualification, and maintenance programs as well as proof of concept demonstration prior to operational authorization. Special Category I operations, by definition, require the use of airborne and/or ground based or spaced equipment over and above the minimum equipment necessary to operate in Lebanese national airspace. Special Category I operations usually also require special knowledge, skills, proficiency, and procedures. As a result, changes and amendments to the operator's overall Category I operations program are usually necessary to ensure safe conduct of these operations. There is additional criteria which must be incorporated into an operator's program for special Category I operations.

(16) Applicability of a DA (H) or MDA (H). Instrument approach and landing operations have limitations related to the minimum altitude (height) to which descent can be made without establishing visual reference. Minimum altitude or height to which descent can be made is typically related to assurance of clearance over terrain or obstacles, airborne instrumentation and equipment, NAVAIDs, and visual aids. Minimum height or altitude is usually specified as a DA (H) or MDA (H) and is used for various instrument approach procedures as described in Division II, Sections (17) through (19) of this Appendix.

Other expressions of minima may be used internationally. The Lebanese equivalent minima to be used is described below for various types of approaches:

(a) DA, DH, OCA, OCL. For xLS Approaches, the minimum height or altitude for instrument flight is specified as a DA (H) in the U.S. and many other countries. However, it may also be expressed as a decision altitude (DA), obstacle clearance altitude (OCA), decision height (DH), obstacle clearance height (OCH), or obstacle clearance limit (OCL). In Lebanon, the minimum instrument flight altitude for precision approaches is considered to be the DA value of the DA (H) if minima are based on a barometric altimeter, or the DH value if based on a radio (radar) altimeter. For a barometrically specified DA (H) minima, the associated height value in parenthesis is considered to be advisory. For a radio altitude based minima the DH height value of a DA (H) is considered controlling and the barometric altitude value is advisory. A DA is specified as a decision altitude referenced to mean sea level (MSL) for QNH altimeter settings. A DA is specified in terms of HAT for aircraft using a QFE barometric altimeter setting. OCH and OCL are used some countries in accordance with various revisions of ICAO PANS-OPS. OCA, where used, is referenced to a barometric altitude (MSL). OCH and OCL are referenced to a radio or radar height above either the elevation of the airport, the elevation of the touchdown zone, or the elevation of the landing threshold.

(b) MDA, MDH, HAT, HAA, OCA, OCH, OCL. For Approaches other than xLS (e.g., non-precision approaches), the minimum height or altitude may be specified as a decision altitude DA of a DA (H) if suitable vertical guidance is provided (e.g., VNAV path), or specified as a minimum descent altitude MDA of a MDA (H) if vertical guidance is not provided. Minima may also be specified height above touchdown (HAT), height above airport (HAA), minimum descent height (MDH), obstacle clearance altitude (OCA), obstacle clearance height (OCH), or obstacle clearance limit (OCL). MDA, HAT, and HAA are typically used by certain countries that use various earlier versions of U.S. TERPS criteria. OCA, OCH, and OCL are used in countries having procedures established in accordance with ICAO PANS-OPS. Although ICAO PANS-OPS now does not use OCL, some procedures still use OCL criteria from previous versions of PANS-OPS. Some countries, in addition to OCA and OCH, provide MDA and MDH. MDA and OCA are barometric flight altitudes referenced to mean sea level (MSL). HAT, HAA, MDH, OCH, and OCL are radio or radar altitudes referenced to either the elevation of the airport, the elevation of the touchdown zone, or the elevation of the landing threshold.

Accordingly, for international operations, the following equivalent minima formulations should be used by Lebanese Operators:

(i) use the altitude value of the MDA (H) where OCA may be specified for procedures other than xLS.

(ii) use the equivalent altitude value of the MDA (H) where HAT, OCH, or OCL are specified for "straight-in" approach procedures.

(iii) use the equivalent altitude value of the MDA (H) where HAA, OCH, or OCL may be specified circling approach maneuvers.

(c) Lowest Permissible DA (H) or MDA (H). The lowest permissible DA (H) or MDA (H) for instrument flight (IMC) for any approach should not be lower than the most restrictive of the following, as applicable:

(i) minimum height or altitude published or otherwise established for the instrument approach,

(ii) minimum height or altitude authorized in OpSpecs for the approach,

(iii) minimum height or altitude authorized for the flightcrew,

(iv) minimum height or altitude authorized for the operator, aircraft, and airborne equipment,

(v) minimum height or altitude permitted by operative airborne equipment and NAVAIDs,

(vi) minimum height or altitude for which required NAVAIDs can be relied upon*,

(vii) minimum height or altitude which provides adequate obstacle clearance*, and

(viii) minimum altitude which provides compensation for extremely cold temperatures, if applicable**.

Information Note: **Note: Item normally addressed by the published instrument approach procedure*

***Note: Applicable only when an operator has a procedure to correct altimeter errors for extremely cold temperatures (Typically T less than -22F/-30C).*

(17) Application of a Decision Altitude (Height) [DA (H)] for Category I. Procedures established based on use of NAVAID electronic vertical guidance (e.g., ILS, GLS or MLS glideslope) use the barometrically based DA (of the specified DA (H)) for minima determination. Radio altitude above the approach terrain or touchdown zone, if provided, is advisory.

Procedures established based on use of other electronic vertical guidance (e.g., Baro VNAV, GNSS VNAV) may use a barometrically based DA (of the specified DA (H)) for minima determination if an appropriate obstacle assessment has been completed for the region between the earliest point at which the DA may occur to the runway threshold. Radio altitude, if provided, is advisory.

For Category I a decision height (DH) is not used.

DA (H) and MDA (H) are applied to Category I instrument approach procedures as follows:

(a) Category I ILS, MLS, or GLS (xLS) Approaches**.** For Category I approaches based on ILS, MLS, or GLS (e.g., xLS, or precision approaches), a DA (H) is typically specified. The DA (H) represents the minimum altitude in an approach to which descent may continue, or by which a missed approach must be initiated, if the required visual reference to continue the approach has not been established. The DA (H) "altitude" value is typically measured by a barometric altimeter, and is the determining factor for descent minima for a xLS approach procedure. The "height" value specified in parenthesis is typically a radio or radar altitude equivalent height above the touchdown zone (HAT) used only for advisory reference, and does not necessarily reflect actual height above underlying terrain. Where a Middle Marker (MM) beacon is installed, it may be used as advisory information, confirming a barometrically determined DA (H) that is coincident with the glide slope altitude at that point.

For approaches which normally provide vertical guidance (e.g., xLS), but when vertical guidance capability cannot be used, such as due to an airborne system failure, see Division II, Section (18) of this Appendix.

(b) Category I Approaches with VNAV**.** For Category I approaches other than ILS, MLS, or GLS which use a published VNAV descent path to the runway threshold, a DA (H) may be specified instead of an MDA (H). See a) above for DA (H) applicability.

(c) Precision Approach Radar (PAR) procedures**.** For Category I minima, a DA (H) may be specified for PAR. See section a) above for DA (H) applicability. Category II is not applicable to civil aircraft use of PAR.

(18) Application of an MDA (H) for Category I**.** Procedures that are not based on use of vertical guidance (e.g., VOR, NDB, Back Course ILS) use the barometrically based MDA (of the specified MDA (H)) for minima determination. Radio altitude, if provided, is advisory.

(a) Category I approaches other than ILS, MLS, or GLS**.** For Category I approaches other than ILS, MLS, or GLS, (e.g., non-precision approaches) an MDA (H) is typically specified. The MDA (H) represents the minimum altitude in an approach to which descent may continue, until either the required visual reference is established and the aircraft is in a position to continue the descent to land using normal maneuvering, or until reaching the specified missed approach point. The MDA (H) "Altitude" value is typically measured by a barometric altimeter, and is the determining factor for descent minima for approaches other than ILS, MLS, or GLS (other than xLS) Category I instrument approach procedures. The "Height" value specified in parenthesis is typically a radio or radar altitude equivalent height above the touchdown zone (HAT), and is used only for advisory reference. This height value does not necessarily reflect actual height above underlying terrain. Where a VHF marker beacon (e.g., FM) is used, it may indicate a longitudinal position for a stepdown fix, if identified in the procedure.

(b) Circling Approaches**.** Many instrument procedures provide for circling approach minima. Sufficient visual references for manually maneuvering the aircraft to a landing must be maintained throughout a circling maneuver. The pilot must keep the aircraft's position within the established maneuvering area while performing the circling maneuver. The circling MDA (H) or equivalent must be maintained until an aircraft is in a position from which a normal descent can be made to touchdown within the touchdown zone, using normal maneuvers and a safe descent path.

(19) Application of a DA (H), or equivalent (i.e. IM), for Category II**.** Procedures using Category II minima typically use a radio altimeter and the associated DH (of the specified DA (H)) for minima determination. Barometric altitude is advisory.

Procedures that have "Radio Altitude Not Authorized (RA NA)", for example due to irregular underlying terrain, typically use the first indication of arrival at the "inner marker" as a means to define the DH of the specified DA (H) for minima determination. In this instance both radio altitude and barometric altitude are advisory.

While for Category II the use of barometric altitude (DA) is advisory, this does not preclude an operator or flightcrew from initiating a missed approach if the altitude equivalent to the barometric altitude minima (DA) is reached prior to arrival at the specified DH. This applies regardless whether radio altimeter or inner marker determines the DH.

When a procedure specifies "RA NA", a DA (H) of 150'[50 m] HAT is typically not used, since an equivalent marker beacon is not provided corresponding to that minima.

A barometrically specified "DA" is not currently used for air carrier Category II minima.

For Category II a Decision Height of a published DA (H) (or an equivalent Inner Marker [IM] for irregular pre-threshold terrain) is used as the applicable descent minima. Any "altitude" value specified is considered to be advisory. The altitude value is available for cross-reference and backup. Use of the barometrically referenced DA element of a published DA (H) is not authorized for Part VI and Part VII of the LARs operations. The DA element of a DA (H) is applicable to Category II in other than an advisory capacity only if an operator elects to base discontinuance of an approach on the DA, if the DA is reached prior to the applicable DH.

(20) Visibility and RVR Minima. Visibility minima are as specified in Standard or Special Instrument Approach Procedures approved for use by the operator, or as otherwise listed in Standard OpSpecs applicable to that operator for Category I or II landing. Operating minimums may be expressed as meteorological visibility (VIS), runway visual range (RVR), or runway visibility values (RVV).

(a) Meteorological Visibility (VIS). Meteorological visibility may be used as reported by a source approved by the DGCA.

Outside of Lebanon meteorological visibility determination may vary, and the operator should assure that the meaning, definition, and significance of any meteorological visibility reported for use in determining minima is understood by that operator's pilots.

(b) Runway Visual Range (RVR). RVR is considered to be an instrumentally derived value measured by transmissometers. RVR is calibrated by reference to runway lights and/or the contrast of objects.

Controlling RVR means the reported values of one or more RVR reporting locations (TDZ, Mid, Rollout, or equivalent international locations) used to determine whether operating minima are or are not met, for the purpose of approach initiation, or in some cases, continuation. All Lebanese Category I operating minimums below 1/2 statute mile (RVR2400 [750 m]) and all Category II and III operating minimums are based on RVR.

RVR use has practical limitations that should be familiar to both the operator and pilot. For example RVR is a value which typically only has meaning for the portions of the runway associated with the RVR report (TDZ, MID, or Rollout). RVR is a value that may vary with runway light step settings (1 through 5). Operators should assure that pilots are familiar with runway light setting effects on reported RVR. RVR may not be representative of actual visibility along portions of the runway due to the location of the transmissometer baseline and limited length of the baseline, or due to variable conditions in position or time (e.g., patchy fog). RVR is a value which could be up to six times greater than actual ground or tower visibility at night, and up to three times greater during daytime.

Some RVR reports may not be measured by transmissometers. Accordingly, operators should assure that the meaning, definition, and significance and variability of any non-instrumentally derived value of RVR reported to the pilot for use in determining minima is understood by that operator's pilots.

(c) Runway Visibility Values (RVV). RVV minima are now used infrequently, are being phased out, and should be used only where minima cannot otherwise be specified as a meteorological visibility (VIS) or runway visual range (RVR).

(21) Visibility Assessment and RVR Equivalence.

(a) for instrument procedures where minima are expressed in terms of meteorological visibility, but reported visibility available to the flightcrew is specified as an RVR, the "visibility-RVR" equivalence table referenced in Standard OpSpecs may be used to establish equivalent meteorological visibility minima (see Part VI, Subpart 2, Division XV, OpSpec paragraph C051).

(b) conversely, for instrument procedures where minima are expressed in terms of RVR, but reported visibility available to the flightcrew is specified as a meteorological visibility, the "Visibility-RVR Equivalence" table referenced in Standard OpSpecs may be used to establish equivalent meteorological visibility minima (see Part VI, Subpart 2, Division XV, OpSpec paragraph C051).

(22) General Requirements for Category I.

The following general requirements apply to the operational authorization of Category I instrument approach procedures:

(a) the airborne system should meet requirements of the applicable Division III, Section (8) of this Appendix for the type of Category I procedures to be flown,

(b) appropriate NAVAIDs and airport/lighting facilities for the procedures to be flown, consistent with Division VI of this Appendix, should be available,

(c) flightcrew qualification consistent with provisions of Division V of this Appendix for Category I has been completed,

(d) an acceptable airworthiness program for the airborne system is provided in accordance with Division VII of this Appendix**,** and

(e) an operational authorization has been completed in accordance with Division VIII for a Lebanese operator or Division IX of this Appendix for a Non-Lebanese operator.

(23) Category I minima not less than 200' [60 m] DA (H)

Instrument approach operations that may be authorized Category I minima not less than 200' [60 m] DA (H) include:

(a) ILS
(b) GLS
(c) MLS
(d) PAR

(24) Category I minima not less than 250' [75 m] DA (H)

Instrument approach operations that may be authorized Category I minima not less than 250' [75 m] DA (H) include:

(a) NAVAID specific procedures with vertical (e.g., using VNAV) guidance (e.g., VOR, VOR/DME, NDB, Back Course ILS flown with FMS VNAV),

(b) RNAV (3D - LNAV/VNAV) Procedures overlaying a NAVAID specific procedure (e.g., FMS/RNAV, used to fly an underlying VOR or NDB approach, but as a 3D RNAV procedure - no procedural tuning of the specified facility), and

(c) RNAV/RNP Procedures.

(25) Category I minima not less than 250' [75 m] MDA (H)

Instrument approach operations that may be authorized Category I minima not less than 250' [75 m] MDA (H) include:

(a) NAVAID specific procedures without vertical (e.g., no VNAV) guidance (e.g., VOR, VOR/DME, NDB, Back Course ILS),
(b) NAVAID specific procedures with vertical (e.g., using VNAV) guidance (e.g., VOR, VOR/DME, NDB, Back Course ILS flown with FMS VNAV), NOTE: Operators (e.g., for training reasons) or instrument procedures developers (for other instrument procedure criteria reasons) may specify use of an MDA (H), even though these procedures may otherwise normally be eligible for use of a DA(H).
(c) NAVAID specific procedures flown using an "open loop" vertical speed based descent profile,
(d) RNAV (2D - LNAV only) Procedures overlaying a NAVAID specific procedure (e.g., FMS/RNAV, used to fly an underlying VOR or NDB approach, but as a 2D RNAV procedure - no procedural tuning of the specified facility),
(e) radar surveillance procedures including ASR, and
(f) other approach procedures (e.g., Airborne radar approach).

(26) Reserved
(27) Use of Previous or New Criteria**.** Operators approved in accordance with earlier DGCA guidance will comply with these Standards within a time limit acceptable to the Minister.

Aircraft demonstrated to meet airworthiness provisions of earlier DGCA guidance will comply with these Standards within a time limit acceptable to the Minister.

New aircraft types or derivative aircraft with new flight control system designs should typically be demonstrated in accordance with the requirements of the appropriate Attachment of this Appendix.

(28) Requirements for Category II**.**
(a) General Category II Requirements**.**
The following requirements apply to the operational authorization of Category II instrument approach procedures:
(i) the airborne system should meet requirements of the applicable Division III, Section (8) of this Appendix for the type of Category II procedures to be flown,
(ii) appropriate NAVAIDs and airport/lighting facilities for the procedures to be flown, consistent with Division VI of this Appendix, should be available,
(iii) flightcrew qualification consistent with provisions of Division V of this Appendix for Category II has been completed,
(iv) an acceptable airworthiness program for the airborne system is provided in accordance with Division VII of this Appendix, and
(v) an operational authorization has been completed per Division VII of this Appendix for a Lebanese. operator.
(b) Category II minima not less than 100' [30 m] DA (H)**.**
Instrument approach operations that may be authorized Category II minima not less than 100' [30 m] DA (H) include:
(i) ILS,
(ii) GLS, and
(iii) MLS.

(c) Use of Inner Marker
Use of Inner Marker may be authorized in lieu of a DA (H) at runways so designated by the applicable procedure, and where RA NA is specified.

(d) Barometric altimeter DAs not currently used for LAR Part VI Category II**.**
Barometric altimeter specified DAs are not currently used as a basis for minima for air carrier Category II, except for those operators electing to discontinue an approach upon reaching either the DA or DH, which ever is reached first, when visual reference is not established, or upon reaching either the DA or IM, which ever is reached first, when using an IM as the basis for Category II minima.

(e) Reserved

(f) Category II using RVR 300 "meter" minima**.**
Category II using RVR300m minima (at designated international locations) may be authorized when meeting special provisions of Standard OpSpecs paragraph C059a. Note 1 (see Part VI, Subpart 2, Division XV). This provision permits an operator to be authorized use of Non-Lebanese State minima of RVR1000 [300 m] with a DA (H) of 100'[30 m] HAT at certain international runways qualifying for a minima less than that specified by ICAO for Category II. A flight guidance system meeting provisions of Part VI, Subpart 2, Division XV Paragraph C059 Note 1 is required. Corresponding flightcrew procedures must be used. Following successful operational experience using this provision, the DGCA may determine that the above authorization may be also acceptable using an autocoupled approach to 100' [30 m] HAT or other flight guidance system (e.g., HUD) without necessarily meeting other provisions for Category III. Following successful operational experience using this provision, the DGCA may determine that the above authorization may also be approved for use at certain facilities having appropriate Category II procedures with a minimum RVR of 1000 [300 m] and a DA (H) of 100' [30 m] HAT.

(g) Precision Approach radar (PAR)
PAR Minima may be authorized to minima of not less than 100' [30 m] HAT, or the published PAR minima, whichever is higher. PAR authorizations are limited to those operators and crews specifically qualified to use PAR.

(h) Previously Approved Category II Operations**.**
Operators approved in accordance with previous DGCA guidelines for Category II may continue to operate in accordance with their approved program. Credit for systems demonstrated prior to this Appendix will be as designated by the DGCA. After a reasonable time determined by the Minister operators will comply with this Appendix and issued appropriate OpSpecs.

(29) Runway Field Length Requirements and Runway Clutter**.** For Category I or II, landing distance requirements are as specified by Part VI and Part VII of the LARs**,** as applicable to the aircraft type, destination airport, or alternate airport.

The following typical means of complying with the above provisions of Part VI and Part VII of the LARs are considered to be acceptable. Examples are provided for turbine aircraft. Aircraft other than turbine powered aircraft, or aircraft operating under parts other than Part VI and Part VII of the LARs, may apply equivalent provisions in a similar manner.

Part VI and Part VII turbine aircraft operations, regardless whether Category I or Category II, must meet provisions of those Parts. Normally these landing distances (e.g., which already include the specified 60% factor) are factored into the AFM data provided for landing distance. They do not have to be added additionally or separately to the AFM data.

If during dispatch, in weather forecasts or reports, it is determined that the landing runway MAY be wet (e.g., includes "chance", "occasional", "temporary", or a probability equal to or greater than 10%, the effective runway length must be at least 115% of the distance determined in Part VI and Part VII of the LARs**.**

Unless otherwise authorized by the DGCA, wet is considered to be any condition "not clear and dry" on any part of the useable area of the runway (useable area does not include edges, sides, melting of ice or snow banks at edges or sides, area beyond the advertised plowed and sanded surface, overruns, etc.).

Information Note: *Note 1: For some operations, the DGCA may authorize a damp grooved runway with good braking friction characteristics, or equivalent, to be considered a dry runway for purposes of dispatch determination.*

Note 2: Specified distances are typically based on a dry runway, unless a special showing has been made on a wet runway, for compliance with applicable regulations. However, this is not typically done for most turbine aircraft types in current service..

If any useable part of the expected landing runway or runways are slippery (e.g., wet and not-grooved or porous friction coarse (PFC), snow, slush, ice, or standing water) provisions of the LARs apply. In addition, operators should consider the possible need for any additional landing distance factor, particularly if braking action is reported or expected to be worse than "good".

Guidance information on autobrake distance provided by the manufacturer may be used as the basis for Category I or Category II field length determinations, but are not required to be used.

If autobrake data (typically guidance information in the AFM) is used, the extra landing distance factor for wet runways (e.g., 115%) specified in Part VI and Part VII of the LARs, as applicable, should be applied to the pertinent "autobrake setting" distance on which the dispatch is based.

If autobrake data is not used, the 1.15 factor is applied directly to the distance (e.g., dry runway factored distance) assuming that the AFM specified braking method and configuration is used (e.g., maximum manual braking with all brakes and antiskid operative, and without credit for reverse thrust). However, the expected landing configuration, braking method, and speeds should be considered (e.g., engine out flap settings and speeds as applicable, or partial brakes, or partial antiskid, or reverse thrust inoperative) if the effect is significant, and the non-standard configuration is planned at the time of dispatch, or is expected to be used for landing, at the time dispatch determinations are made.

Use of alternate airport field length provisions typically apply only to those operations seeking dispatch credit for use of an alternate airport based on credit for having "Engine Inoperative Category II" capability.

The following field length factors and considerations are considered acceptable:

(a) Category I Field Lengths**.** For minima or conditions expected to be at or above RVR3000 [1000 m], the runway field-length requirement for Category I is as specified by Part VI and Part VII of the LARs for either a dry or wet runway. For minima or conditions expected to be below 3000 [1000 m] RVR the field length requirement should be based on conditions for a wet runway.

Requirements are as determined to be applicable for the operation based on applicable weather reports and forecasts considered at the time of dispatch. Once the aircraft is dispatched, it is recommended (but not specifically required) that field length requirements be reassessed if conditions significantly change from those assessed at the time of dispatch, particularly if the dispatch was based on a dry runway. This criteria presumes that dispatch is considered to take place and be completed within the period shortly before departure.

(b) Category II Field Lengths**.** The Runway Field-Length Requirement for Category II is as specified by Part VI and Part VII of the LARs for a wet runway.

When auto brake systems are used for Category II, information must be available to the flightcrew to assist in making the proper selection of a suitable auto brake setting consistent with the field length available for landing and the runway condition, including braking action.

Category II operations should not normally be conducted with braking action less than "fair" unless the operator has a method to assure that timely updates of field conditions are passed to the flightcrew, and that the flightcrew can determine that sufficient runway length is available for the landing in the conditions reported.

(c) Runway field length Airborne Considerations**.** Runway field length requirements are considered to be dispatch requirements. They are not normally in-flight requirements. For Part VI and Part VII of the LARs operations not based on a dispatch process, equivalent determinations may be made by the operator, or pilot, prior to departure. Once airborne, consideration of landing field length requirements by the flightcrew is a good operating practice, particularly if conditions change from those assumed at dispatch, but is not specifically required for normal operations. In the event of unforecast adverse weather or if failures occur, the crew should consider any adverse consequences that may result from a decision to make a landing on a particular runway (e.g., braking action reports, clutter).

Information Note: *For Category III, landing distance requirements are as described in Appendix II of this Standard, as amended.*

(30) NAVAIDs or Landing System Sensors and Aircraft Position Determination**.** Various landing system sensors (NAVAIDs) or combinations of sensors may be used to provide the necessary position fixing capability to support authorization of Category I or II landing weather minima. While certain navigation sensors (NAVAIDs) are installed and classified primarily based on landing operations, the

sensors described in this section may also be used for takeoff, missed approach, or other operations (e.g., RNAV position determination). Regardless of the sensors, NAVAIDs, or combination of NAVAIDs used, the NAVAIDs and sensors must provide coverage for the intended flight path and for anticipated displacements from that flight path for normal operations, rare normal operations (e.g., winds and wind gradients), and for specified non-normal operations where applicable (e.g., "VNAV out" flight path, "engine-out go-around" flight path). In addition, Category I or II authorizations should be consistent with the provisions or characteristics for specific sensors listed below in Division II, Section (30) of this Appendix unless otherwise accepted or approved by the DGCA.

For NAVAID specific procedures (e.g., ILS), use of ICAO recognized NAVAIDs are eligible for authorization as either a Standard Instrument Approach Procedure or as a Special Instrument Approach Procedure. NAVAID types that are not recognized by or in ICAO criteria (e.g., in Annex 6, Annex 10, ICAO Doc 9365/AN910 Manual of All Weather Operations) are eligible only for authorization as Special Instrument Approach Procedures.

(31) Instrument Landing System (ILS). The ILS provides a reference signal aligned with the runway centerline and deviation signals when the airplane is displaced left or right of the extended runway centerline. The linear coverage area for this signal is approximately 3 degrees either side of the extended runway centerline from a point emanating at the far end of the runway. The ILS also provides a vertical flight path (nominally 3 degree descent angle) to a point in the landing zone of the runway. The vertical coverage is approximately 0.7 degrees on either side of the vertical reference path. ILS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by the DGCA.

(32) Microwave Landing System (MLS). The MLS provides a reference signal aligned with the runway centerline and deviation signals when the airplane is left or right of the extended centerline. The linear coverage area is approximately 40 degrees either side of the extended runway centerline emanating from a point at the far end of the runway. The MLS provides a vertical flight path to the runway similar to ILS. MLS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by the DGCA.

(33) GNSS Landing System (GLS). GLS provides is a landing systems based upon the Global Navigation Satellite Navigation System (GNSS). For lowest Category I minima and Category II operations the landing system typically includes a local area differential augmentation system in the vicinity of the runway for which lowest Category I or Category II procedures are specified. The local area system may serve one or more runways, or nearby airports, depending on its classification for each particular runway. The classification of a GLS service may be different for different runway ends (e.g., III/E/3 for Runways 14L and 14R, but I/D/1 for RW 22L). Desired path, centerline, and deviation signals as applicable, are computed by airborne avionics. The coverage area for GLS is typically within a 25 mile [40 km] radius of a primary airport, but extended service volumes are permitted. GLS provides for both vertical and lateral flight path specification to the touchdown zone of the runway(s) served, and a lateral path for rollout or takeoff guidance. GLS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by the DGCA. Authorization for use of GLS is for each specific air carrier, aircraft, and GLS system type until pertinent GLS international standards accepted by the DGCA are promulgated.

(34) Satellite Systems. Satellite systems currently consist of the United States Global Positioning System (GPS) and the Russian Federation GLONASS. These systems may be considered part of a Global Navigation Satellite System (GNSS).

Various forms of augmentation exist or in development including Space Based Augmentation (SBAS), Ground Based Augmentation (GBAS), and Aircraft Based Augmentation (ABAS).

Ground based augmentation may include wide area (e.g., EGNOS, WAAS) or local area augmentation (e.g., DGPS, LAAS).

GNSS may be combined with certain GBAS systems (e.g., LAAS) to provide a GNSS based Landing System (GLS).

(35) GPS/GLONASS and Reference Datum Information**.** Satellite position fixing systems authorized for use by Lebanese operators include GPS and DGCA authorized augmentation systems for use with GPS (e.g., WAAS or LAAS). These systems may be used in States that authorize GPS use, or in international airspace.

When using GPS or navigation systems that base position fixing on GPS, it is the responsibility of the operator to assure that an appropriate Reference Datum (e.g., WGS-84 and NAVD-27) is used for definition of waypoint or critical path point coordinates. Information on states using WGS-84 or various other databases are typically available from commercial charting sources, and may be available on the worldwide web.

Information Note: *One worldwide web data source for "Datum" information that may be used is: http://www.jeppesen.com/qref.html*

GLONASS or other satellite position fixing systems may be used only as approved by the DGCA.

(36) Local Area Systems**.** Local area augmentation systems (LAAS) are considered to include U.S. FAA Local area augmentation system (GBAS) and other provided systems (e.g., SLS).

Credit for use of LAAS augmentation is currently limited to use of DA (H) not lower than 100' [30 m] HAT.

Procedures based on any form of LAAS augmentation equivalent to or better than a U.S. Type I ILS may be identified as "GLS" (GPS Landing System) procedures.

(37) Wide Area Systems**.** Wide area augmentation systems include U.S. FAA's wide area augmentation system (WAAS) and internationally accepted systems wide area augmentation system (e.g., EGNOS).

Credit for use of WAAS augmentation alone is currently limited to use of DA (H) not lower than 200' [60 m] HAT (e.g., when WAAS is not used as an input to a multi-sensor FMS system that also uses other sensors such as IRS).

Procedures based on any form of WAAS augmentation alone or WAAS augmentation in multi-sensor systems such as FMS should be identified as "RNAV" or "RNAV RNP" procedures, as applicable.

(38) LOC/LDA/SDF/Back Course**.** Localizer, Localizer Descent Aid (LDA), Simplified Directional Facility (SDF), or Back Course ILS (BC) procedures are authorized for air carrier use, and may be authorized to Category I minima not less than 250' [75 m] HAT.

(39) VOR.

Authorized Procedures**.** VOR based procedures, when based on VOR alone, when based on multiple VORs, or when specified in conjunction with use of DME are authorized for air carrier use, and may be authorized to Category I minima not less than 250' [75 m] HAT.

VOR or VOR/DME based procedures may be flown using an appropriate EHSI or ND Map Display, EHSI or ND Raw data display, Electromechanical HSI, RMI, RDMI, or using raw data cross pointer display for course guidance, as determined acceptable to the DGCA considering the crew qualification, training, and recency of experience applicable to that operator.

VOR procedures, when flown as a procedure without vertical guidance (e.g., without VNAV), use an MDA (H).

VOR procedures, when flown as a procedure with approved vertical guidance (e.g., with VNAV), may use a DA (H).

Use of a single VOR airborne system**.** Other than following an inflight failure, instrument procedures based on VOR may be flown using a single airborne VOR receiver only under the following conditions:

(a) procedures requiring simultaneous use of more than one VOR are not authorized, unless approved for that operator and specific procedure,

(b) in the event of failure of the airborne receiver, other essential element of the navigation or display system, or NAVAID, the approach can be safely discontinued at any point during the approach to touchdown, or during the missed approach,

(c) following initial climbout, a transition can be made to use of other NAVAIDs for resumption of a safe missed approach and flight to an alternate (a brief period of dead-reckoning may be permissible), and flight can be made to the alternate, including completion of a subsequent approach with different NAVAIDs, without loss of knowledge of position, loss of appropriate obstacle clearance, or loss of terrain clearance, and

(d) the operator is authorized to conduct procedures using a single airborne VOR (or TACAN) receiver.

Authorization for use of a single VOR may be for a specific procedure, a group of procedures, for an operator's particular fleet of aircraft (e.g., A-320 fleet), for all of an operator's aircraft, or for a geographic region (e.g., within the United Kingdom), as applicable to the operator's route structure, and fleet.

VOR, VORTAC, or DME Fix Substitution**.** When used in conjunction with ILS or MLS, VOR, NDB or DME cross track fixes may be authorized for use with Category I, II, or III procedures, as applicable to the specified procedure. RNAV fixes based on FMS may be substituted for radial or cross track fixes.

Except for procedures that are specifically identified by the DGCA as prohibiting RNAV (FMS) fix use, RNAV cross track or along track fixes may otherwise be substituted for any marker beacon, VOR, NDB, Compass Locator or other fix on any segment of a VOR, NDB, LOC, LOC BC, ILS or MLS procedure where the corresponding VOR azimuth (radial) is procedurally specified or can be determined by the FMS to the necessary degree of accuracy and reliability.

Inoperative or Unsuitable NAVAIDs**.** When VOR or VOR-DME updating is used in support of area navigation (FMS), operators and flightcrews should be aware of when and how to disable use of an unsuitable NAVAID within the navigation system. This is especially true for NAVAID failure conditions that are probable to cause a significant map shift (e.g., movement of a NAVAID to a new location without corresponding update of the NAVAID position in a database).

(40) DME.

DME based procedures, when used in conjunction with VOR, NDB, LOC, LDA, SDF, or BC are authorized for air carrier use, and may be authorized to Category I minima not less than 250' [75 m] HAT.

When used in conjunction with ILS or MLS, DME along track fixes may be authorized for use with Category I, II, or III procedures, as applicable to the specified procedure.

Except for Category II or Category III procedures that are specifically identified by the DGCA as requiring use of an Inner Marker, DME along track fixes may otherwise be substituted for any marker beacon, VOR, NDB, or Compass Locator on any segment of an ILS or MLS procedure where the corresponding DME value is procedurally specified or can be determined.

(41) NDB.

Authorized procedures**.** NDB based procedures, when based on NDB alone, when based on multiple NDBs, or when specified in conjunction with use of DME are authorized for air carrier use, and may be authorized to Category I minima not less than 250' [75 m] HAT.

NDB or NDB/DME based procedures may be flown using an appropriate EHSI or ND Map Display, EHSI or ND Raw data display, Electromechanical HSI, RMI, RDMI, or ADF display for course guidance, as determined acceptable to the DGCA considering the crew qualification, training, and recency of experience applicable to that operator.

NDB procedures, when flown as a procedure without vertical guidance (e.g., without VNAV), use an MDA (H).

NDB procedures, when flown as a procedure with approved vertical guidance (e.g., with VNAV), may use a DA (H).

Use of a single airborne ADF system. Other than following an inflight failure, instrument procedures based on NDB may be flown using a single airborne ADF receiver under the following conditions:

(a) procedures requiring simultaneous use of more than one NDB are not authorized,
(b) in the event of failure of the airborne receiver, other essential element of the navigation or display system, or NAVAID, the approach can be safely discontinued at any point during the approach to touchdown, or during the missed approach, and
(c) following initial climbout, a transition can be made to use of other NAVAIDs for resumption of a safe missed approach and flight to an alternate (a brief period of dead-reckoning may be permissible), and flight can be made to the alternate, including completion of a subsequent

approach with different NAVAIDs, without loss of knowledge of position, loss of appropriate obstacle clearance, or loss of terrain clearance.

(d) the operator is authorized to conduct procedures using a single airborne ADF receiver.

Authorization for use of a single ADF may be for a specific procedure, a group of procedures, for an operator's particular fleet of aircraft (e.g., A-320 fleet), for all of an operator's aircraft, or for a geographic region (e.g., within the United Kingdom), as applicable to the operator's route structure, and fleet.

NDB Fix Substitution**.** RNAV (FMS) fixes may be authorized for use as an NDB substitute with Category I, II, or III procedures, as applicable to the specified procedure. RNAV fixes based on FMS may also be substituted for bearing or cross track fixes as follows. Except for procedures that are specifically identified by the DGCA as prohibiting RNAV (FMS) fix use, RNAV cross track or along track fixes may otherwise be substituted for any NDB, Compass Locator or other NDB based fix on any segment of a VOR, NDB, LOC, LOC BC, ILS or MLS procedure where the corresponding NDB bearing is procedurally specified or can be determined by the FMS to the necessary degree of accuracy and reliability.

Inoperative or Unsuitable NAVAIDs**.** If NDB updating is used in support of area navigation (FMS), operators and flightcrews should be aware of when and how to disable use of an unsuitable NAVAID within the navigation system. This is especially true for NAVAID failure conditions that are probable to cause a significant map shift (e.g., movement of a NAVAID to a new location without corresponding update of the NAVAID position in a database).

(42) Radar Systems (e.g., PAR, ASR).

Various other systems are in limited use (e.g., PAR, ASR). These systems are considered for air carrier operations only as described below.

Air carrier approach operations using ASR or PAR may only be approved if OpSpecs contain authority for their use.

For use of ASR, dedicated training is not specifically required unless the DGCA determines that the operators general training and qualification program is not otherwise satisfactory for routine use of ASR procedures, and that specific ASR training is needed.

For use of PAR, dedicated PAR training is appropriate unless the DGCA determines that the operators training and qualification program is otherwise able to assure adequate crew preparation so that dedicated PAR/GCA training or demonstration is not needed.

(43) Other Systems, Procedures and Special Systems.

Marker Beacons**.** Marker beacons are used internationally as part of ILS, and for other limited or special applications (e.g., stepdown fixes, departure turn points for instrument departure heading assignments). Use of marker beacons does not require dedicated crew training or qualification beyond that for conduct of ILS approaches.

Airborne Radar Approach. Operational authorization of use of any "airborne radar approach" procedure (e.g., use of ground mapping radar or equivalent) for purposes of conducting an instrument approach requires approval by the DGCA, and may require Proof of Concept (PoC) demonstration acceptable to the DGCA. PoCs are explained in Attachment 7 to this Appendix.
KRM, RMS, SRE. KRM, RMS, SRE or other such systems or procedures (e.g., used in Europe) may only be approved for an air carrier if the aircraft is suitably equipped to receive and use the specified system and the system can meet the performance, integrity, and availability standards equivalent to those established for currently approved types of operations (ILS, FMS, etc.), to corresponding minima. Operational authorization of use of any of these systems requires coordination with the DGCA and may require demonstration (POC) acceptable to the DGCA.
Transponder Landing System. Transponder Landing System or other such "multi-lateration" systems may only be approved for an air carrier if the system can meet the performance, integrity, and availability standards equivalent to those established for currently approved types of operations (ILS, FMS, etc.), to corresponding minima. Operational authorization of use of any of these systems requires successful completion of a proof of concept demonstration (POC) acceptable to the DGCA.
Enhanced Vision Systems. Enhanced Vision Systems are intended to provide the flightcrew with a visual presentation of a view of the approach to a runway that may otherwise be obscured by weather or darkness. Air carrier approach operations using these systems may only be approved if the system can meet the performance, integrity, and availability standards equivalent to those established for currently approved types of operations (e.g., ILS, FMS, etc.), to corresponding minima. Operational authorization for use of enhanced vision systems requires successful completion of a proof of concept demonstration acceptable to the DGCA.

(44) Circling Approaches.

When instrument approach design criteria or operational factors do not permit a "straight-in" approach to the landing runway, circling procedures may be used. Circling criteria require SIAP publication of circling maneuver minima if the inbound course is offset more than 30 degrees from the runway centerline. This, however, does not preclude a pilot making a straight in landing if the requirements of the LARs can be continuously met below DA (H) or MDA (H), to touchdown, for adequate visual reference and for normal landing maneuvering.

The circling maneuver can be initiated from any instrument approach procedure where circling is authorized, and may be continued below DA (H) or MDA (H) or beyond the missed approach point (MAP) only when the specified visual reference exists, and when a position for a normal descent to landing. Electronic course or glidepath information, or FMS flight path presentations are only considered supplementary information to visually accomplishing the circling maneuver. The pilot must keep the aircraft's position within the established maneuvering area while performing the circling maneuver. An altitude at or above the circling MDA (H) must be maintained until an aircraft (using normal maneuvers) is in a position from which a normal descent can be made to touchdown within the touchdown zone. A missed approach must be executed when external visual references are lost or sufficient visual cues to manually maneuver the aircraft cannot be maintained.

It is important to note that the published missed approach procedure may not provide obstacle clearance when below DA (H) or MDA (H), or when past the published missed approach point (MAP). If it is necessary to conduct a missed approach from below the DA (H) or MDA (H) or from past the published MAP (e.g., as a result of a balked landing, rejected landing, loss of visual reference, not in a safe position to land, blocked runway, or other similar reason for a go-around), reference to the associated IFR departure procedure for the applicable runway(s) usually provide help to the pilot in determining a safe course of action to climb back to procedurally protected airspace (adequate obstacle clearance) as specified by the published missed approach procedure.

When a missed approach from a circling maneuver is executed below DA (H), MDA (H), or beyond the published MAP, the direction of the initial turn should typically be toward the airport to assure obstacle clearance, and to keep the aircraft within the maneuvering area, until climb above the DA (H) or MDA (H), and intercept of a published segment of the missed approach procedure.

Operators may elect either to be authorized to perform circling approaches as published, or elect to not train to and routinely perform circling approaches. If an operator elects not to train to and perform circling approaches, typically a 1000 ft [300 m] HAT DA (H) or MDA (H) and 2 mile visibility limit, or greater, is placed on OpSpecs minima for that operator or aircraft type. If the operator elects to train and check crews in performing circling approaches, OpSpecs typically permit use of published circling minima.

It is recommended that unless special circumstances exist, wide body (long wingspan) aircraft or aircraft needing to accomplish circling maneuvers at speeds in excess of 170 KTS ground speed should not typically be authorized circling minima below 1000' [300 m] HAT and 3 miles meteorological visibility.

(45) RNAV/Flight Management Systems (FMS). An FMS provides a means to navigate along a flight path based upon earth referenced waypoints. These waypoints can define a flight path that originates or terminates at a runway, or at other relevant fixes located in terminal or en route airspace. This type of system may be approved for low visibility approach and missed approach operations in accordance with criteria in pertinent appendices of this Appendix and standard OpSpecs. For departure, criteria is specified in Appendix II for RVRs requiring non-visual takeoff guidance on the runway, for departure procedures that do not require use of non-visual takeoff guidance on the runway.

FMS systems eligible to use criteria of this section must meet criteria of U.S. Advisory Circulars, AC 25-15, AC 20-129 and AC 20-130, or equivalent.

FMS operations may be based on 3D or 2D RNAV procedures, and may or may not include use of RNP. For RNP operations, additional information is provided below and in sections 4.5 and Attachment 5.

FMS may be used to conduct instrument approaches other than RNAV, ILS, MLS, or GLS (e.g., VOR, VOR/DME, NDB, LOC, LOC Back Course). For these approach types, unless otherwise approved by the DGCA, respective criteria of U.S. FAA Order 8260.3, as amended or equivalent, applicable to the type of NAVAIDs used is applicable. Vertical criteria of U.S. FAA Order 8260.40A, or other criteria acceptable to the DGCA, may optionally be used to specify vertical obstacle clearance criteria for use of VNAV.

FMS may be used as a 2D or 3D RNAV system, as applicable, to conduct RNAV instrument approaches. For these approach types, unless otherwise approved by the DGCA, respective criteria of U.S. FAA Order 8260.3 (U.S. TERPS), as amended or equivalent, applicable to RNAV approaches is applicable. Vertical criteria of U.S. FAA Order 8260.40A, or other criteria acceptable to DGCA, may optionally be used to specify vertical obstacle clearance criteria for use of VNAV. RNAV procedures may be authorized based on specific procedure identified NAVAIDs, or when approved for a particular operator and procedure, may alternately be authorized to use DME-DME based updating, VOR/DME updating, or GPS updating other than that for the procedurally identified NAVAID.

FMS may be used as a 2D or 3D RNAV RNP system, as applicable, to conduct RNAV instrument approaches based on RNP obstacle clearance criteria. For these approach types, unless otherwise approved by the DGCA, respective criteria of Attachment 5 applicable to RNP based RNAV approaches is applicable. RNP vertical criteria or vertical criteria of U.S.FAA Order 8260.40A, or other criteria acceptable to the DGCA, may optionally be used to specify vertical obstacle clearance criteria for use of VNAV.

FMSs which do not incorporate provisions for RNP as part of their type design approval, but nonetheless meet applicable provisions of RTCA DO-236 Appendix D for fleet qualification for one or more RNP levels, may use corresponding RNP procedures and criteria (e.g., Attachment 5). For these FMS systems, if specifically approved by the DGCA for applicable RNP levels, respective criteria of Attachment 5 applicable to RNP based RNAV approaches may be used. RNP vertical criteria or vertical criteria of U.S. FAA Order 8260.40A, or other criteria acceptable to the DGCA, may optionally be used to specify vertical obstacle clearance criteria for use of VNAV. Examples of aircraft and systems which may typically "fleet qualify" under this provision would be aircraft having dual FMSs incorporating GPS updating, or dual FMSs using DMD-DME updating that are operating in an area with multiply redundant DME facilities, with many facilities providing acceptable position update geometry and accuracy.

For international operations, equivalent criteria to the criteria specified above (e.g., ICAO PANS-OPS) may be used. In addition, operators may use criteria of this Appendix, and related US criteria referenced by this Appendix, internationally when approved by the DGCA and when found acceptable by the "State of the Aerodrome" for the procedure being used.

(46) Required Navigation Performance (RNP). RNP is a navigation performance standard for a particular area, airspace, route, procedure or operation. A definition of RNP is specified in Attachment 1. RNP addresses the aircraft and navigation service (non-aircraft) accuracy, integrity, continuity and availability requirements for normal and rare fault-free performance and for performance with failures. RNP specifies the nominal and limit lateral, and if applicable, vertical flight path displacements permissible for a particular procedure. RNP can be related to obstacle clearance or aircraft separation requirements to ensure a consistent set of operational procedures and design requirements.

A desired flight path through the airspace is identified by an airspace planner for each route or procedure. This flight path can be a complex path defined by waypoints or it can be a continuous curved or straight line.

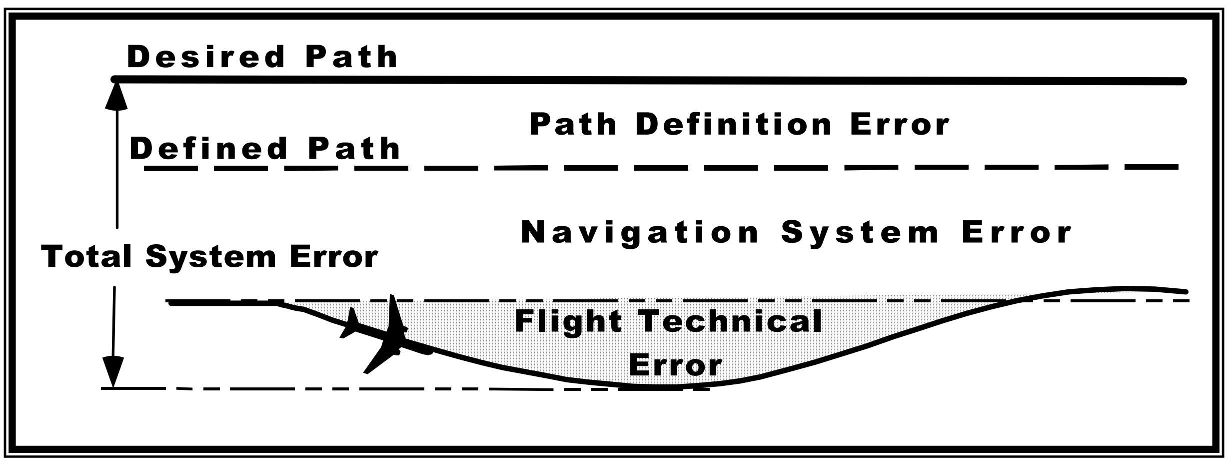
In order for an aircraft to follow the desired flight path it is necessary that the navigation system (airborne or on the ground) generate a defined flight path which is a close approximation (ideally equal) to the desired path. The difference between the desired path and the defined path is called the path definition error. This error may be due to survey errors, database resolution limitations, etc.

The aircraft elements of the navigation system estimate the aircraft's position and compares that position with the defined flight path. A deviation indication is produced which represents the perceived displacement of the airplane from the desired flight path. This deviation is typically displayed on a primary flight display, or navigation displays, for flightcrew awareness, and is provided as an input to an autopilot and/or flight director system for command guidance or automatic control.

Any error in the estimation of the aircraft's position is referred to as position estimation error, or navigation system error. Any error introduced in the display of the deviation signal on the primary flight display is a display error. Navigation system error can include display errors. The navigation system error will result in a displacement from the defined flight path.

The difference between the flight path as prescribed by maintaining the navigation deviation signal at zero and the path that the aircraft actually follows is called flight technical error (FTE). The FTE can be influenced by external environment conditions such as wind gradient, turbulence, etc. and flightcrew response to guidance (e.g., Flight Director).

The sum of the path definition error, Navigation system error (including display error if applicable) and the flight technical error is the total system error (TSE), which is the difference between the desired flight path and the actual flight path.



Standard Levels of RNP typically used for various approach and missed approach segments supporting Category I procedures may be based on use of specific landing systems (e.g., ILS, MLS, or GLS), on multi-sensor RNAV (e.g., FMS with IRS, VOR, DME inputs), or on other aircraft navigation systems having FMS like capabilities (e.g., GPS Navigation Systems).

Standard Levels of RNP typically used for various approach and missed approach segments supporting Category II procedures may be based on use of specific landing systems (e.g., ILS, MLS, or GLS), or on multi-sensor RNAV systems having suitable flight critical performance (e.g., FMS with IRS, ILS, and/or DGNSS inputs).

Particular levels of RNP can be satisfied using various NAVAIDs such as ILS and MLS, or by the use of a combination of navigation sensors (VOR/DME, IRU/IRS, GNSS, etc.) using a navigation computer (e.g., FMS). When a computed path (e.g., series of waypoints) is used as the basis for an approach operation, the desired flight path must typically be defined by a series of three dimensional earth based coordinates for the applicable waypoints or path definition points.

Approach or missed approach operations can be approved by demonstration of the capability to meet the required navigation performance (e.g., accuracy, integrity, availability) for a specific approach procedure, for a set of particular procedure types, or for a set of RNP levels.

The transition from typical en route or terminal RNP levels to an approach RNP level is accomplished by transitioning to the required RNP level for the approach in accordance with the approved instrument procedure or by a point no later than the final approach fix, if an aircraft is radar vectored to final.

Although RNP applications specify containment at a value of RNPx2, this does not preclude additional operational assessments beyond the value of RNPx2 for purposes of obstacle, terrain, or traffic identification. Such assessments beyond RNPx2 are intended only for the purpose of identifying potential obstacles, terrain, or traffic for procedure charting, crew awareness, air traffic separation buffers or other such operational reasons, and do not affect the selection or designation of a flight path or route. Obstacles, terrain, or traffic should not normally be within RNPx2 unless separation from the intended obstacle is not based on use of RNP containment.

(47) Standard RNP Types**.** Standard values of RNP supporting initial, intermediate, or final approach segments, or missed approach segments are as specified in Figure 1 below:

Figure 1.
STANDARD RNP TYPES FOR APPROACH

RNP Type	Applicability/Operation (Approach segment)	Normal Performance (95%)	Containment Limit
RNP 1	Initial/Intermediate approach	+/-1 nm	+/-2 nm
RNP 0.5	Initial/Intermediate/Final approach [Supports limited Category I minima)]	+/-0.5 nm	+/-1 nm
RNP 0.3	Initial/Intermediate/Final approach [Supports limited Category I minima]	+/-0.3 nm	+/-0.6 nm
RNP 0.3/125	Initial/Intermediate/Final approach with specified baro vertical guidance[Supports limited Category I minima]	+/-0.3 nm +/-125 ft/38.1m	+/-0.6 nm +/-250 ft/75m
RNP 0.03/45	Final approach with specified vertical guidance[Supports Category I minima]	+/-0.03 nm +/-45 ft/13.72m	+/-0.06 nm +/-90 ft/27.43m
RNP 0.01/15	Final approach with specified vertical guidance [Supports Category I/II minima]	+/-0.01 nm +/-15 ft/4.57m	+/-0.02nm +/-30 ft/9.14m
RNP 0.003/15	Final approach with specified vertical guidance [Supports Category I/II/III minima]	+/-0.003 nm +/-15 ft /4.57m(*)	+/-0.006 nm +/-30 ft /9.14m(*)

(*) Note: Vertical accuracy does not apply below 100 feet [30 m] HAT - below 100 feet [30 m] HAT vertical performance is determined by applicable standards for touchdown performance.

RNP is a required navigation performance level described by the specification of a numeric value indicating the required navigation accuracy for a specific operation, typically specified laterally in nautical miles - e.g., RNP 1 is a Required Navigation Performance of +/-1 nautical mile (95% Probability).

RNP containment is specified as RNP (X) x 2.

Standard RNP Levels are defined for lateral performance, or lateral and vertical performance, if applicable. Standard values for RNP for general use are specified in [RTCA SC181MASPS DO-xxx], U.S. FAA Advisory Circulars, AC120-CNS, and the ICAO RNP Manual. For Approach and missed approach standard RNP values are listed in Division II, Section (47) of this Appendix.

Longitudinal values for RNP are reserved for future operations.

(48) Non-Standard RNP Types**.** Non-Standard RNP Types may include RNP Types other than those specified in Division II, Section (47) of this Appendix.

Examples of Non-Standard RNP Types may be those types specified by a particular Authority for particular applications (e.g., RNP 5 within certain geographic areas; RNP 17 for a particular air carrier "Special approach Procedure").

(49) Flight Path Definition. Certain flight segments and waypoints are necessary to effectively implement approach and missed approach operations using landing systems where the required flight path is not inherent in the signal structure of the navigation aid (e.g., satellite systems and other integrated multi-sensor area navigation systems). The concepts and criteria described below may be applied to other types of navigation systems when using area navigation and RNP concepts.

The approach flight path terminates in the landing zone. The following criteria and considerations are necessary to specify the landing and rollout flight path. The approach segments connect with the landing and rollout segments.

Landing and Rollout Flight Path**.** The following criteria specifies certain reference points and other criteria necessary to effectively implement landing and rollout operations using a landing system where the required flight path is not inherent in the signal structure of the navigation aid (e.g., satellite systems).

Runway Datum Point (RDP)**.** The RDP is used in conjunction with the FPAP and the geometric center of the WGS-84 ellipsoid to define the geodesic plane of a precision final approach flight path to touchdown and rollout. It is a point at the designated center of the landing runway defined by latitude, longitude, ellipsoidal height, and orthometric height. The RDP is a surveyed reference point used to connect the approach flight path with the runway. The RDP may not be coincident with the designated runway threshold.

Flight Path Alignment Point (FPAP)**.** The FPAP is used in conjunction with the RDP and the geometric center of the WGS-84 ellipsoid to define the geodesic plane of a precision final approach, landing and flight path. The FPAP may be the RDP for the reciprocal runway.

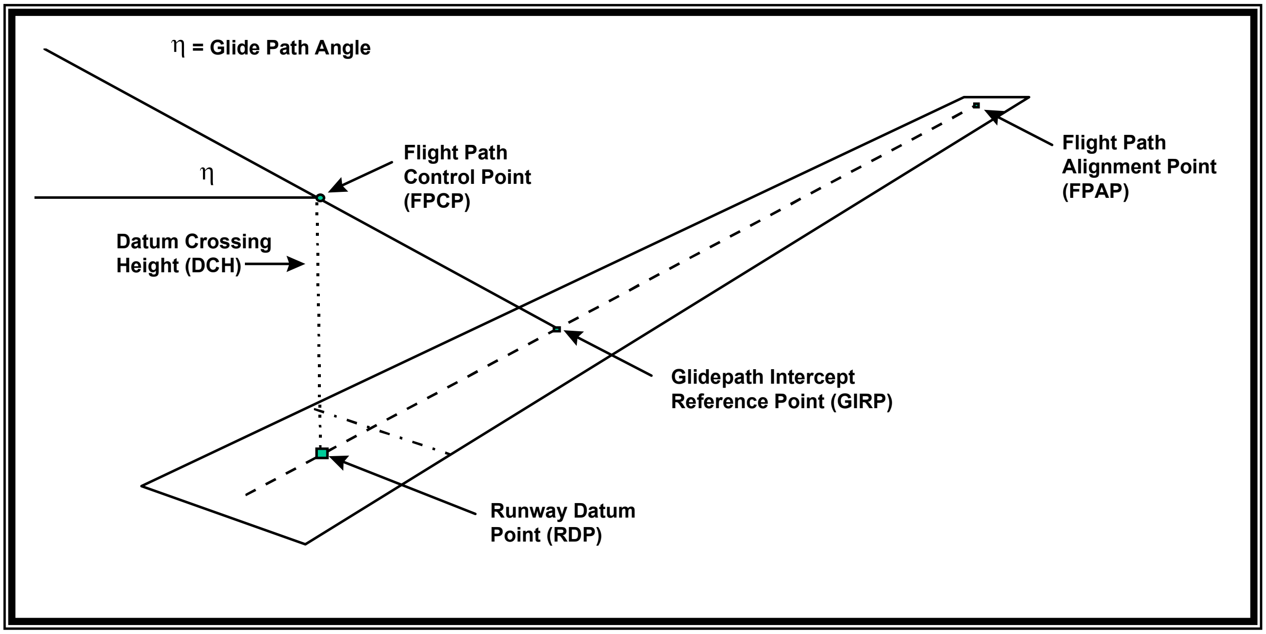
Flight Path Control Point (FPCP)**.** The FPCP is a calculated point located directly above the RDP. The FPCP is used to relate the vertical descent of the final approach flight path to the landing runway.

Datum Crossing Height [DCH]**.** The height (feet) of the FPCP above the RDP.

Glide Path Angle [GPA]**.** The glide path angle is an angle, defined at the FPCP, which establishes the intended descent gradient for the final approach flight path of a precision approach procedure. It is measured from a horizontal plane that is parallel to the WGS-84 ellipsoid at the FPCP.

Glidepath Intercept Reference Point [GIRP]. The GIRP is the point at which the extension of the final approach path intercepts the runway.

Figure 2.

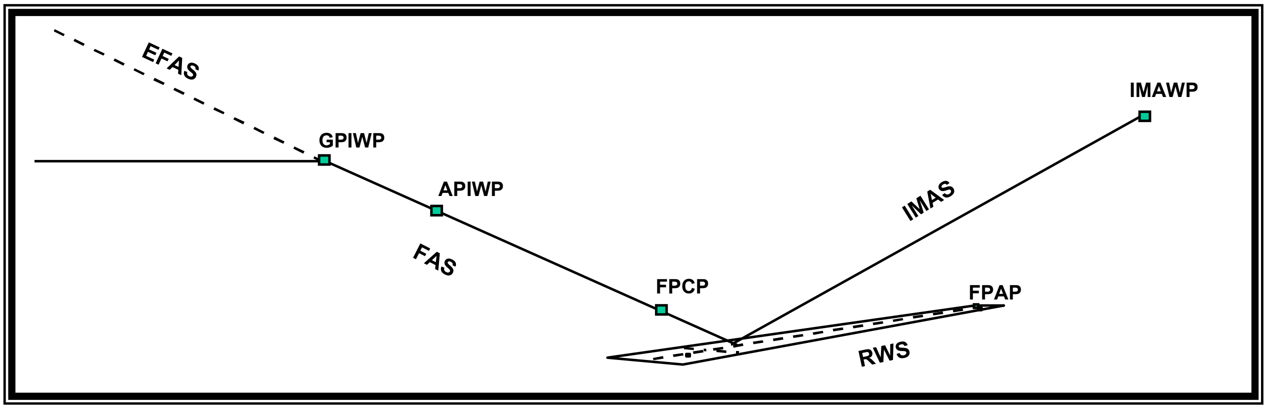


The locations established for, and the values assigned to, the RDP, FPCP, DCH and GPA will be selected based upon the operation need to establish the required GIRP. Operational considerations include:

(a) path of wheels over threshold,
(b) need for coincidence with other aids and systems - visual and non-visual,
(c) runway characteristics (upslope and downslope, crown etc.),
(d) real, displaced and multiple thresholds,
(e) real clearways - stopways

Approach and Missed Approach Segments**.** Figure 3. below shows the minimum set of reference points, path points, waypoints and leg types considered necessary to construct and use such instrument approach procedures in air carrier operations.

Figure 3.



Waypoints.

GPIWP Glide Path Intercept Waypoint - The point at which the FAS projects to intercept the runway surface

APIWP Approach Intercept Waypoint - variable Waypoint used only when intercepting the Final Approach Segment (FAS)

FPCP Flight Path Control Point

FPAP Flight Path Alignment Point

IMAWP Initial Missed Approach Waypoint (Used only for MAP)

Segments.

FAS Final Approach Segment. That segment of an approach extending from the GPIWP or APIWP, whichever occurs later, to GIRP.

EFAS Extended Final Approach Segment. That segment of an approach, co-linear with the FAS, but which extends beyond the GPIWP or APIWP.

RWS Runway Segment. That segment of an approach from the GPIWP to FPAP.

IMAS Initial Missed Approach Segment. That segment of an approach from the GPIWP to the IMAWP.

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DIVISION III - AIRBORNE SYSTEM REQUIREMENTS.

(1) General. The following accuracy, integrity and availability criteria are specified for aircraft systems intended for Category I or II. Aircraft related systems are addressed by Division III, Section (2) of this Appendix, Non-aircraft systems (e.g., NAVAIDs) are addressed in Division III, Section (3) of this Appendix, Specification of flight path is addressed in Division III, Section (3) of this Appendix, such as is applicable to defining an RNAV LNAV or VNAV path to be followed by an aircraft, and specific airborne equipment requirements for Category I or II authorizations are addressed in Division III, Section (8) and (9) of this Appendix.

(2) Airborne Systems. Airworthiness criteria for aircraft systems intended to meet requirements of this Appendix are specified in Division III, Section (3) through (30) of this Appendix below, or Attachment 2 or 3 for demonstration of airborne systems for eligibility for Category I or II minima respectively.

For aircraft which completed an airworthiness demonstration applicable to Category I or II using earlier DGCA procedures may be continued only as provided for in standard OpSpecs.

(3) Non-Airborne Systems. Unless otherwise specified in the Attachments to this Appendix, NAVAID/landing system characteristics, including facility classification, should be considered as specified in ICAO Annex 10 Criteria, and the applicable NAVAID facility classification for Category III. NAVAID facility use is predicated on applicable ILS, MLS, or GLS Type classifications (e.g., ILS III/E/2; GLS II/D/2) or equivalent classification.

For GLS, an appropriate alternate equivalent classification to ILS, as specified by ICAO, may also be used
(e.g., Performance Level/Coverage/Integrity as in "PL2/T/1").

Flight Path Specification

(4) Lateral.

(a) Category I. The following levels of lateral performance shown in Figure 4 are acceptable for Category I, and corresponding minima may be applied. Any one or more methods listed below may be demonstrated, but the method(s) used should be identified as the basis for the demonstration.

Figure 4.
CATEGORY I - LATERAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS, or any combination provided by MMR)	[Minima equivalent to ILS at 200' [60 m] HAT] [Lateral performance from 1500'HAT to 200' [60 m] HAT within ±35microamps deviation from the indicated course or path, or equivalent, (for 95% of samples taken), without undue oscillation]
2)	"ILS Equivalent" (e.g., SCAT I/ MASPS;WAAS/MOPS)	[Minima equivalent to ILS at 200' HAT]
3)	RNP RNP ≤ .03 .03 <RNP< .3 RNP ≥ .3	[Minima equivalent to ILS at 200' [60 m] HAT] [Minima typically not lower than a DA(H) of 250' [75 m] HAT] [Minima restricted to not lower than a DA(H) of 250' [75 m] HAT]
4)	FMS (LNAV/VNAV or LNAV)	[Minima restricted to not lower than a DA(H) of 250' [75 m] HAT]
5)	RNAV (Op-Specs Part C; Para C063)	[Minima as specified by Standard OpSpecs/SIAP]
6)	LOC, LOC BCRS,VOR, VOR/DME, NDB, ASR, PAR	[Minima as specified by Standard OpSpecs/SIAP]

(b) Category II. The following levels of lateral performance shown in Figure 5 are acceptable for Category II. Any one or more methods may be demonstrated, but the method used should be identified as the basis for the demonstration.

Figure 5.
CATEGORY II - LATERAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS, or any combination provided by MMR)	[Minima equivalent to ILS at 100' HAT] [[Lateral performance from 200'HAT to 100' HAT within ±25microamps deviation from the indicated course or path, or equivalent, (for 95% of samples taken), without undue oscillation]
2)	RNP RNP ≤ .01	[Minima equivalent to ILS at 100' HAT]

Lateral Performance below or beyond DA (H). For either Category I or II procedures with a DA (H) below 250'[75 m] HAT*, when guidance is provided (e.g., for autoland, or HUD flare/rollout), the lateral performance should at least be equivalent to that attainable using an ILS Type I/E/1 localizer (or RNP .03) from 200' [75 m] HAT, or 100' [30 m] HAT as applicable, to the end of rollout.

*Information Note: *This provision does not apply to systems intended for Category III - see Appendix II for Category III requirements.*

From 200' [60 m] HAT or 100' [30 m] HAT, as applicable, until returning to an established missed approach segment of the approach procedure, if guidance is provided, performance should be at least equivalent to that attainable using an ILS Type I/E/1 localizer front and back course, or RNP.3 as applicable.

(5) Vertical.

(a) Category I. The following levels of vertical performance are acceptable for Category I, and corresponding minima may be applied. Any one or more methods listed below may be demonstrated, but the method(s) used should be identified as the basis for the demonstration.

Figure 6.
CATEGORY I - VERTICAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS Glide Slope/Glide Path (any one xLS Glide Slope, or any combination provided by MMR)	[Minima equivalent to ILS at 200' [60 m] HAT] [Vertical performance from 700'[200 m] HAT to 200' [60 m] HAT within ±35microamps deviation from the indicated course or path, or equivalent, (for 95% of samples taken), without undue oscillation]
2)	"ILS Glide Slope Equivalent" (e.g., SCAT I/ MASPS; WAAS/MOPS)	[Minima equivalent to ILS at 200' [60 m] HAT]
3)	RNP RNP ≤ .03 and ECEF VNAV .03 <RNP< .3 and BARO VNAV RNP ≥ .3 with or without BARO VNAV	 [Minima equivalent to ILS at 200' [60 m] HAT] [Minima typically not lower than a DA(H) of 250' [75 m] HAT] [Minima restricted to not lower than a DA(H) of 250' [75 m] HAT]
4)	FMS BARO VNAV	[Minima restricted to not lower than a DA(H) of 250' [75 m] HAT]
5)	RNAV (Op-Specs Part C; Para C63)	[Vertical performance not applicable*]
6)	LOC, LOC BCRS,VOR, VOR/DME, NDB, ASR, PAR	[Vertical performance not applicable*; except PAR minima equivalent to ILS]

*Information Note: *A procedure addressing a stabilized approach from the Final Approach Fix to MDA (H) is recommended for these procedures (except this note does not apply to PAR).*

(b) Category II. The following levels of vertical performance are acceptable for Category II. Any one or more methods may be demonstrated, but the method used should be identified as the basis for the demonstration.

Figure 7.
CATEGORY II - VERTICAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS Glide Slope/Glide Path, or any combination provided by MMR)	[Minima equivalent to ILS at 100' [30 m] HAT] [Vertical performance from 200'[60 m] HAT to 100' [30 m] HAT within ±35microamps deviation from the indicated course or path, or ±12 ft, which ever is greater, or equivalent, (for 95% of samples taken), without undue oscillation]
2)	RNP RNP ≤ .01 with ECEF VNAV	{Minima equivalent to ILS at 100' [30 m] HAT}

(c) Category I or Category II.

Vertical (VNAV) performance at altitude constraints prior to a Final Approach Fix (FAF) or Final Approach Point (FAP), or at a FAF or FAP**.** For procedures with VNAV segment(s) prior to a FAF or FAP, at a FAF or FAP (e.g., intercepting a FAS from an en route segment, STAR, Profile Descent, initial approach or intermediate approach segment), vertical performance should normally be based on use of a vertical "Fly by" path rather than a "Fly over" path. The small vertical displacement which may occur (40' - 80' [12 – 24 m] typically) at a vertical constraint as a result of using a vertical "Fly by" waypoint rather than vertical "Fly over" waypoint is considered operationally acceptable, and desirable, to assure asymptotic capture of a new (next) vertical segment. This applies to both "level off" or "altitude acquire" segments following a climb or descent, or vertical climb or descent segment initiation, or joining of climb or descent paths with different gradients.

Vertical (VNAV) performance at waypoint altitude constraints near the point at which DA (H) or MDA (H) may occur**.** For procedures with waypoints at or near the point at which DA (H) may occur, vertical (VNAV) performance should not preclude continuous descent of the aircraft to the runway, following the established VNAV path to the runway (e.g., VNAV should not initiate inappropriate capture of a missed approach segment and automatic level off (at MDA (H)) or initiation of MAP climb, without pilot confirmation that a missed approach or go-around is intended (e.g., TOGA initiation).

Vertical (VNAV) performance below or beyond DA (H) or MDA (H)**.** For procedures with a DA (H) below 200' [60 m] HAT* (e.g., for autoland, or HUD flare/rollout), the glide path/glide slope vertical performance should at least be equivalent to that attainable using an ILS glide slope at a facility classified as Type I/E/1, between 200' [60 m] HAT and 50' [15 m] HAT.

*Information Note: *This provision does not apply to systems intended for Category III - see Appendix III for Category III requirements.*

(6) Logitudinal. Longitudinal (along track) requirements for Category I or II operations are as specified below.

(a) Category I. The following longitudinal (along track) requirements are acceptable for Category I. Any one or more methods listed below may be demonstrated, but the method(s) used should be identified as the basis for the demonstration.

Figure 8.
CATEGORY I - LONGITUDINAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS, or any combination provided by MMR)	
	Use of VHF OM/MM Marker Beacons	[Minima equivalent to ILS at 200' {60 m} HAT]
	Use of VOR/TACAN Fixes (other than for MM)	[Minima equivalent to ILS at 200' {60 m} HAT]
	Use of LOM/LMM NDBs	[Minima equivalent to ILS at 200' {60 m} HAT]
	Use of suitable DME Distance Information	[Minima equivalent to ILS at 200' {60 m} HAT]
	Use of FMS RNAV Fixes (other than for MM)	[Minima equivalent to ILS at 200' {60 m} HAT]
	Use of Distance to "Runway Threshold WP"	[Minima equivalent to ILS at 200' {60 m} HAT]
	Other methods (e.g., Radar fixes, Fan Markers)	[Restricted minima may apply - DA(H)$\geq$250' {75 m} HAT]
	No specific method of assuring along track position	[Restricted minima may apply - DA(H)$\geq$250' {75 m} HAT]
2)	"ILS Equivalent" (e.g., SCATI/MASPS;WAAS/MOPS)	[Same as for ILS/MLS/GLS described above
3)	RNP*	
	RNP $\leq$ .03	[Minima equivalent to ILS at 200' {60 m} HAT]
	.03 $<$RNP$<$ .3	[Minima typically not lower than a DA(H) of 250' {75 m} HAT]
	RNP $\geq$ .3	[Minima restricted to not lower than a DA(H) of 250' {75 m} HAT]
		*Note: RNP Systems/Procedures that do not provide for display of distance to a "Runway Threshold WP" may have minima additionally restricted.

4)	FMS (LNAV/VNAV or LNAV)	[Minima restricted to not lower than a DA(H) of 250' [75 m] HAT]
5)	RNAV (Op-Specs Part C; Para C63)	[Minima as specified by Standard Op-Specs/SIAP]
6)	LOC, LOC BCRS,VOR, VOR/DME, NDB, ASR, PAR	[Minima as specified by Standard Op-Specs/SIAP]

(b) Category II. The following levels of longitudinal (along track) performance are acceptable for Category II. Any one or more methods may be demonstrated, but the method used should be identified as the basis for the demonstration.

Figure 9.
CAT II - LONGITUDINAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS, or any combination provided by MMR)	Same as for Category I, except that an IM or suitable distance readout to a "Runway Threshold WP" is also required.
2)	RNP RNP $\leq$ .01	 [Same as for ILS/MLS/GLS above.]

(7) Typical Wind and Wind Gradient Disturbance Environment. The lateral and vertical performance described in Division III, Section (3) of this Appendix should typically be expected to be achievable in conditions at least as described below. Performance may be estimated, assessed analytically, demonstrated in simulation, or demonstrated in flight. Relevant associated information on demonstrated winds encountered or estimated wind gradient capability may be included in the AFM, as desired by the applicant.

Systems intended for use with procedures for either Category I or Category II should be capable of coping with at least the following wind, wind gradient, and turbulence conditions:

Surface Headwind Component - 25 kts
Surface Tailwind Component - 10 kts
Surface Crosswind Component - 15 kts

Wind Gradients/Shear - at least 4 kts per 100’ [30 m] from 500’ [150 m] HAT to the surface;

Recommended Capability - Ability to cope with 8 kts per 100’[30 m] for 500’[150 m], moderate turbulence, knife edge shears of at least 15kts over 100’[30 m], 20 kts lateral directional vector shears of 90 deg over 100’[30 m], and ability to cope with a 20 kt logarithmic shears between 200’ [60 m] and the surface.

(8) Airborne Equipment for Category I**.** The following equipment in addition to the instrument and navigation equipment required by the LARs for IFR flight is the minimum aircraft equipment considered necessary for a Category I authorization.

(a) for ILS, GLS, or MLS approach:
  (i) 2 navigation receivers (unless otherwise authorized by the DGCA for the facilities and route to be used. For GLS, at least one GBAS receiver for GNSS position fix correction data is considered to be acceptable)
  (ii) suitable navigation displays, attitude, vertical speed, and airspeed displays for each pilot
  (iii) suitable failure annunciation visible to each pilot
  (iv) 1 or more Marker Beacon systems (unless an approved RNAV substitute is available, or if not necessary for the route of flight, including alternates).
  (v) 1 or more DMEs (unless an approved RNAV substitute is available, or if not necessary for the route of flight, including alternates).
  (vi) 1 or more ADFs (unless an approved RNAV substitute system is available, or unless ADF is not required for the intended route of flight, including alternates). Note 2 ADFs may be required in accordance with the LARs for certain international operations, and for certain obstacle or terrain critical departure, approach, or missed approach procedures.
  (vii) it is recommended that the following capability be available: Radar Altimeter, standby power for at least one pilot's ILS/GLS nav receiver and displays, rain removal capability.

(b) for approaches other than ILS, GLS, or MLS (e.g., RNAV, VOR, VOR/DME, NDB).
  (i) 2 navigation receivers and associated displays of the type of the approach system to be used (unless otherwise authorized by the DGCA for the facilities and route to be used), or
  (ii) 2 FMS systems (unless use of 1 is authorized by the DGCA for the facilities and route to be used) which are capable of using the necessary NAVAIDs or equivalent (e.g., space vehicles (SVs)), or which can be monitored by using raw data NAVAID data (e.g., on an associated ND display or RDMI).
  (iii) suitable navigation displays, attitude, vertical speed, and airspeed displays for each pilot
  (iv) suitable failure annunciation visible to each pilot
  (v) for ASR or PAR, at least 2 com radios capable of receiving communications of ASR or PAR information.
  (vi) it is recommended that the following capability be available: Radar Altimeter, standby power for at least one pilot's VOR or RNAV nav receiver and displays, rain removal capability.

(9) Airborne Equipment for Category II**.** In addition to the aircraft equipment required for Category I, the following equipment is required for Category II:

a. an Automatic Flight Control System or manual flight guidance system (e.g., flight director) designed to meet criteria of Attachment 3, or for aircraft types and systems previously approved using earlier criteria the aircraft must meet the earlier criteria. At least 1 autopilot (AFGS) and at least dual flight director systems with an independent display for each pilot is recommended. Dual systems which provide the same information to both pilots, with the second system in "hot standby status" may be acceptable only if suitable comparison monitoring between the systems is available, and timely transfer to standby can be completed, and suitable annunciation to the flightcrew is provided.
b. a radar altimeter display for each pilot. (Note: At least 2 independent radar altimeters with a display for each pilot are recommended.)
c. rain removal equipment is required for each pilot (e.g., windshield wiper, bleed air). (Note: hydrophobic coating for windshield are recommended in lieu of rain repellent.)

d. flight instruments, annunciations which can reliably detect and alert the flightcrew in a timely manner to failures, abnormal lateral or vertical displacements during an approach, or excessive lateral deviation.
e. unless otherwise approved by the DGCA based on demonstration of acceptable pilot workload, an autothrottle system should be provided.

(10) Standard Category II Minima. Standard Category II minima are a DA (H) of 100' [30 m] HAT and RVR not less than 1200 feet [350 m].
(11) Special Category II Authorizations. Special Category II minima may be authorized for certain qualifying ILS/GLS facilities (e.g., Type I ILS). Minima at these facilities may be restricted as follows depending on NAVAID, airport facility, and obstacle assessments by the DGCA:
(a) DA (H) 150' [50 m] HAT RVR 1800 [550 m]
(b) DA (H) 150' [50 m] HAT RVR 1600 [500 m]
(c) DA (H) 100' [30 m] HAT RVR 1800 [550 m]
(d) DA (H) 100' [30 m] HAT RVR 1600 [500 m]
(e) DA (H) 100' [30 m] HAT RVR 1200 [350 m]

(12) Automatic Flight Control Systems and Automatic Landing Systems. Automatic Flight Control Systems, Autoland Systems, or Manual Flight Guidance systems (e.g., HUD) are considered acceptable for use and are recommended for Category I or II ILS, MLS, or GLS procedures which do not have NOTAM restrictions on localizer or glide slope or equivalent signals (e.g., Glide Slope unusable below 500'HAT, or Localizer unusable inside threshold).
(13) Flight Director Systems. Characteristics of Flight Director Systems (head down or head up) used for aircraft authorized for Category I or II should be compatible with any characteristics of autopilot or autoland system used. Flight control systems which provide both autopilot control and flight director information may display, or may not display, flight director commands as appropriate for the system design and operator requirements. Regardless of whether Flight Director commands are provided, situational information displays of navigation displacement must also be provided to both flight crewmembers. To assure that unacceptable deviations and failures can be detected, the displays must be appropriately scaled and readily understandable in the modes or configurations applicable.
(14) Head-up Display Systems. Head-up Display systems used as the basis for a suitable Category I or II authorizations must provide guidance for one or both pilots as appropriate for the system design. If information is provided to only the flying pilot, then appropriate monitoring capability must be established for the non-flying pilot. Monitoring tasks must be identified, and the non-flying pilot must be able to assume control of the aircraft in the event of system failure or incapacitation of the pilot using the HUD (e.g., for a safe go-around or completion of rollout). Head-up Display Systems acceptable for Category I or II must meet provisions of Attachment 2 or 3 respectively, and referenced in an AFM.
(15) Enhanced/Synthetic Vision Systems. Enhanced/Synthetic Vision Systems based on millimeter wave radar or other such sensors may be used to assure the integrity of other flight guidance or control systems in use during Category I or II operations. They must be demonstrated to be acceptable to the DGCA in a proof of concept evaluation and they must otherwise meet the requirements of Attachment 2 or 3 of this Appendix as applicable. Use of Enhanced/Synthetic Vision Systems for purposes other than establishing the accuracy or integrity of flight guidance system performance must be demonstrated to be acceptable through proof of concept testing prior to identification of specific airworthiness and operation criteria.
(16) Hybrid Systems. Hybrid systems (e.g., a fail passive autoland system used in combination with a monitored HUD flight guidance system) may be acceptable for Category I or II if the system provides the

equivalent performance and safety to a non-hybrid system as specified for the minima sought (e.g., Category I or II).

Hybrid systems with automatic landing capability should be based on the concept of use of the automatic landing system as the primary means of control, with the manual flight guidance system serving as a backup mode or reversionary mode.

Any transition between hybrid system elements (e.g., control transition from autoland use to manual control HUD use, or for response to failures) must be acceptable for use by properly qualified flightcrews (e.g., qualified in accordance with JAA criteria, as applicable, and standard industry practices). Transitions should not require extraordinary skill, training, or proficiency.

For any system which requires a pilot to initiate manual control at or shortly after touchdown, the transition from automatic control prior to touchdown to manual control using the remaining element of the hybrid system (e.g., HUD) after touchdown must be shown to be safe and reliable.

(17) Instruments, Systems, and Displays. The following identifies Flight Instrument, Systems, and Display presentations requirements for Category I and Category II operations:

Instruments, Systems, and Displays for Category I.

(a) attitude indicators, EADI's or primary flight displays must be provided for each required pilot (PF and PNF), or equivalent electro-mechanical instruments depicting attitude, barometric altitude, airspeed, and vertical speed.

(b) HSIs, EHSIs, NDs or other equivalent navigation displays, with pertinent, reliable and readily understandable lateral situation information for both normal and non-normal conditions related to Category I landing and missed approach procedures, must be provided for each required pilot.

(c) instrument and panel layouts must follow accepted principles of flight deck design (e.g., basic-T format, conventions for airspeed altitude scales).

(d) the location and placement of situation information/navigation displays must be appropriate for each required flight crewmember, and must be appropriately scaled and readily understandable in presentations or mode of display used.

(e) suitable redundant lateral, and where applicable, vertical path displacement information from the final approach course and specified glide path must be provided.

For any operation intended for use with a DA (H) below 250' [75 m] HAT, independent lateral and vertical displacement display information must be provided for each pilot on the PFD, EADI, ADI or equivalent.

For RNP operations with minima below 250' [75 m] HAT, the lateral and vertical displacement full-scale indication on the PFD, EADI, or attitude indicator should be as shown in Figure 10, unless otherwise approved by the DGCA. It is recommended that these displacement indications be provided for any RNP approach operations.

(f) decision Altitude (Height) or Minimum Descent Altitude (Height) advisory indications that are readily understandable and appropriately distinctive plus marker beacon indications (middle marker, and outer marker), or equivalent, should be provided at each required pilot station.

Information Note: *Unless otherwise approved by the the DGCA, advisory indications should be expressed as "RA" for radar/radio altitude and as "BARO" for barometric altitude. Flight deck depiction of radio and barometric altitude advisories should not typically use the operational designations of "DH" or "MDA".*

(g) appropriate system status and failure annunciations suited to the guidance systems used, navigation sensors used, and any related aircraft systems (e.g., autopilot, flight director, electrical system) should be provided.

(h) automatic audio call-outs which relate to minima and radio altitude during late stages of approach and landing are recommend, as suited for the instrument approach or missed approach operations intended. If provided, the following callouts are recommended:
  (i) "approaching minimums",
  (ii) "minimums",
  (iii) flare related callouts (e.g., "50"... "30"... "10"),

(i) a suitable rain removal method is recommended for each pilot for Category I operations. Suitable methods typically include windshield wipers, bleed air windshield rain removal, or hydrophobic coatings.

<u>Instruments, Systems, and Displays for Category II.</u>

(a) attitude indicators, EADI's or primary flight displays must be provided for each required pilot (PF and PNF), or equivalent electro-mechanical instruments depicting attitude, barometric altitude, airspeed, and vertical speed plus suitable standby attitude information available to each required pilot.

(b) HSIs, EHSIs, NDs or other equivalent navigation displays with pertinent, reliable and readily understandable lateral situation information for both normal and non-normal conditions related to Category II landing and missed approach procedures, must be provided for each required pilot.

(c) instrument and panel layouts must follow accepted principles of flight deck design (e.g., basic-T format, conventions for airspeed altitude scales).

(d) the location and placement of situation information/navigation displays must be appropriate for each required flight crewmember, and must be appropriately scaled and readily understandable in presentations or mode of display used.

(e) suitable redundant lateral and vertical path displacement information from the final approach course and specified glide path must be provided.

Independent lateral and vertical displacement display information must be provided each pilot on the PFD, EADI, ADI or equivalent.

Lateral displacement expanded scale information must be provided to confirm that the aircraft position with respect to intended flight path and the landing runway on each PFD, EADI, ADI or equivalent (e.g., for ILS, a full scale sensitivity of 1 Dot (0.0775 ddm)), or the following criteria applicable to RNP.

For RNP operations, the lateral and vertical displacement full-scale indication on the PFD, EADI, or attitude indicator should be as shown in Figure 10, unless otherwise approved by the DGCA. It is recommended that these displacement indications be provided for any RNP approach operations.

(f) an autopilot suitable for the minima to be authorized - Note: To achieve the lowest authorized minima a system with at least fail passive capability is recommended.
(g) unless otherwise approved by the DGCA for Category II operations based on autopilot use alone, flight director(s), or command guidance information, should be provided for each pilot, suitable for the minima to be authorized - at least dual independent system capability must be installed for Category II operations for aircraft which are certificated with more than one required pilot.

Information Note: *For HUD operations, availability of the information in items 1, 2 and 5 above on a HUD does not substitute for availability of this information on pertinent head-down displays.*

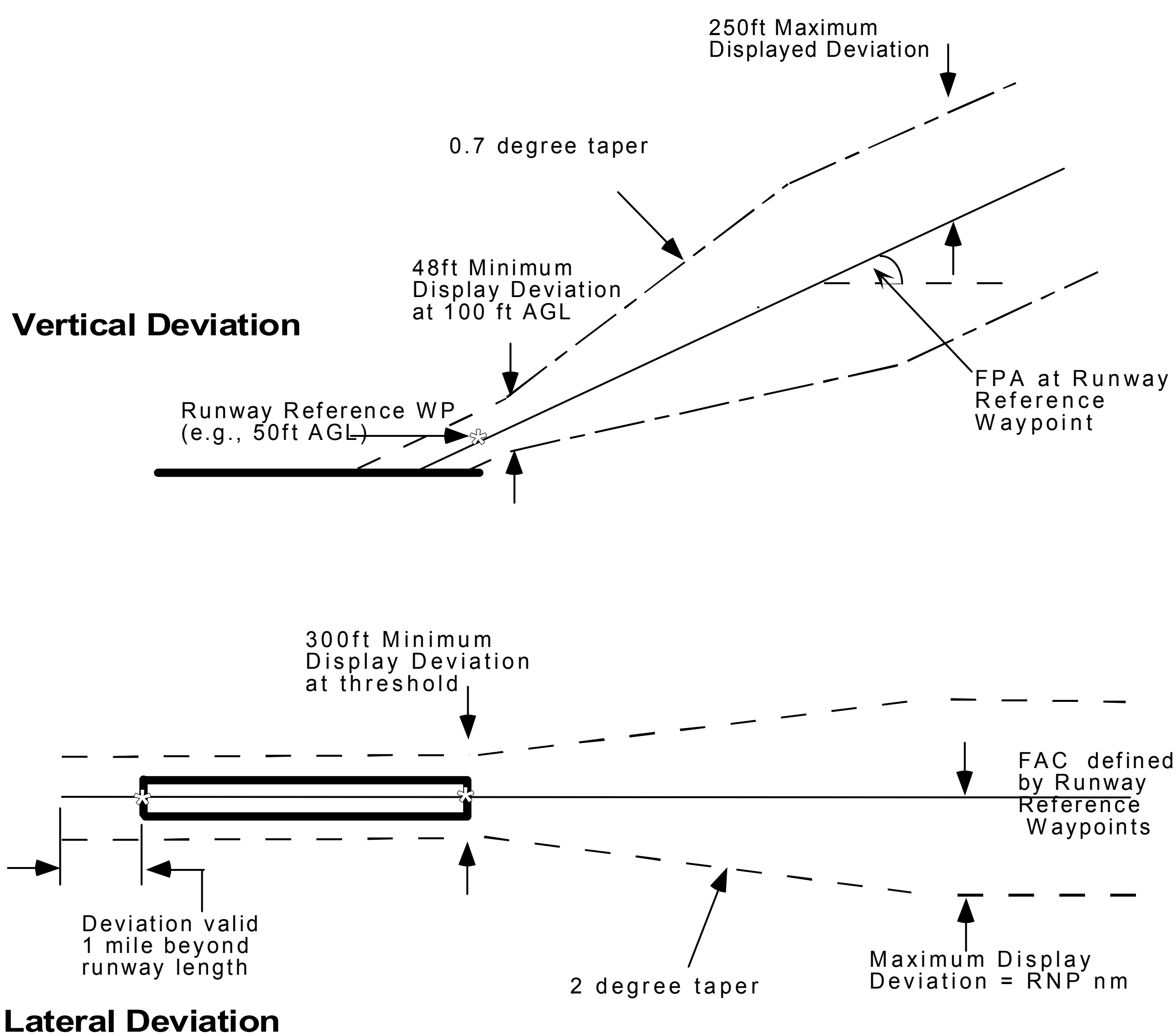
(h) unless otherwise approved by the DGCA based on demonstration of acceptable pilot workload, an autothrottle system should be provided.
(i) decision altitude (Height) advisory indications that are readily understandable and appropriately distinctive plus a display of radio altitude and marker beacon indications (inner marker, middle marker, and outer marker), or equivalent, should be provided at each required pilot station.

Information Note: *Unless otherwise approved by the DGCA, advisory indications should be expressed as "RA" for radar/radio altitude and as "BARO" for barometric altitude. Flight deck depiction of radio and barometric altitude advisories should not typically use the operational designations of "DH" or "MDA."*

(j) appropriate system status and failure annunciations suited to the guidance systems used, navigation sensors used, and any related aircraft systems (e.g., autopilot, flight director, electrical system) should be provided.
(k) automatic audio call-outs which relate to minima and radio altitude during late stages of approach and landing are recommend, as suited for the instrument approach or missed approach operations intended. If provided, the following callouts are recommended:
  (i) "approaching minimums"
  (ii) "minimums"
  (iii) flare related callouts (e.g., "50"... "30"... "10")
(l) a suitable rain removal method is required for each pilot for Category II operations.
(m) a demonstration of the suitability of any indications for non-normal configurations for which credit is sought (e.g., electrical configurations, hydraulic power).

Figure 10

LATERAL AND VERTICAL PATH DISPLACEMENT FULL SCALE INDICATIONS FOR RNP BASED SYSTEMS



(18) Annunciations. Annunciations must be clear, unambiguous, and appropriately related to the flight control mode in use. The mode annunciation labels should not be identified by landing minima classification. For example, APPROACH, LAND 2, LAND 3, Single Land, Dual Land, are acceptable mode annunciation labels, whereas, "Category II", "Category III", etc., should not be used. Aircraft previously demonstrated for Category I or II which do not meet this criteria may require additional operational constraints to assure the correct use of minima suited to the aircraft configuration.

(19) Auto Aural Alerts. Automatic Aural Alerts (automatic call-outs, voice callouts, etc.) of radar altitude, or call-outs approaching landing minimums, or call-outs denoting landing minimums are recommended and should be consistent with the design philosophy of the aircraft in question. However, any automatic call-outs used should not be of a volume or frequency that interferes with necessary flightcrew communications or normal crew coordination procedures. Recommended automatic call-outs include a suitable alert or tone as follows:

(a) at 500 feet [150 m] (radar altitude), approaching minimums and at minimums, and
(b) altitude call-outs during flare, such as at "50" feet, "30" feet and "10" feet, or altitudes appropriate to aircraft flare characteristics.

Low altitude radio altitude call-outs, if used, should appropriately address the situation of higher than normal sink rate during flare, or an extended flare which may be progressing beyond the touchdown zone. Other alerts may be used when approved by the DGCA, if those alerts are consistent with that operators approved procedures and minima, and do not impair crew communication.

(20) Navigation Sensors (xLS) - ILS, GLS, or MLS. For ILS, GLS, or MLS various navigation sensors individually may be acceptable to support Category I or II operations. ILS localizer and glideslope signals are the primary means currently used for the determination of deviation from the desired path for lowest Category I or II operations. Criteria for acceptable ILS and MLS localizer and glide-slope receivers are included in Attachment 2 or 3.

Other navigation sensors, such as GNSS, or DGNSS, may be used individually or in combination to satisfy the necessary accuracy, integrity and availability for Category I or II. Navigation sensors other than ILS must meet equivalent ILS performance or appropriate RTCA or EUROCAE criteria for lowest Category I minima credit, unless otherwise authorized.

Appropriate marker beacon information, or equivalent, must be displayed to each pilot for the outer, middle and inner markers. The DGCA may authorize appropriate substitutes for marker beacons for Category I or II based upon the use of suitable GNSS/DGNSS capabilities, or DME.

At least 1 ADF must be available for ILS procedures, unless an approved RNAV capability providing equivalent or better performance is available.

Information Note: *PAR may also be considered to be acceptable for Category I or II.*

Approaches other than ILS, GLS, or MLS**.** For approaches other than ILS, GLS, or MLS, the following sensors are considered to be acceptable for providing course guidance for Category I Operations (Note: Category II operations are not authorized exclusively using these sensors.):

(a) LOC
(b) LDA

(c) SDF
(d) BCRS
(e) RNAV (e.g., FMS)
(f) GPS
(g) VOR
(h) VOR/DME
(i) TACAN
(j) NDB
(k) NDB/DME
(l) Dual NDB
(m) ASR
(n) KRM (RMS)

Supporting Systems and Capabilities.

(21) Flight Deck Visibility. Suitable forward and side flight deck visibility for each pilot should be provided as follows:

(a) the aircraft should have a suitable visual reference cockpit cutoff angle over the nose for the intended operations, at the intended approach speeds, and for the intended aircraft configurations, as applicable (e.g., flap settings),
(b) the aircraft's flight deck forward and side windows should provide suitable visibility for taxi and ground operations in low visibility, and
(c) placement of any devices or structure in the pilot’s visual field which could significantly affect the pilot's view for low visibility operations must be acceptable (e.g., HUD drive electronics, sunvisor function or mountings).

(22) Rain and Ice Removal. Suitable windshield rain removal, ice protection, or defog capability should be provided as specified below:

(a) installation of rain removal capability is recommended for Category I and required for Category II (e.g., windshield wipers, windshield bleed air).
(b) installation of use of windshield hydrophobic coatings, or use of equivalent rain repellent systems which meet pertinent environmental standards are recommended.
(c) installation of windshield anti-ice or de-ice capability is recommended for Category I and required for Category II for aircraft intended to operate in known icing conditions during approach and landing.
(d) installation of at least forward windshield defog capability is recommended for aircraft subject to obscuration of the pilot's view during humid conditions.

Aircraft subject to obscuration of the windshield due to rain, ice, or fogging of the pilot's view which do not have protection, or which do not have adequate protection may require operational limitations on the conditions in which low visibility operations are conducted.

(23) Miscellaneous Systems. Other supporting systems including instruments, radar altimeters, air data computers, inertial reference units, instrument switching, or capabilities such as flight deck night lighting, landing lights and taxi lights, position, turnoff, and recognition lights, flight data recorders, cockpit voice recorders or other low visibility related aircraft systems must meet any appropriate criteria as specified in Attachment 2 or 3, in basic airworthiness requirements applicable to Lebanese certificated aircraft.

(24) Go-Around Capability. For aircraft authorized for instrument approaches, and particularly for aircraft intended for operation to Category II minima, evaluation of go-around capability should be based on both normal and any specified non-normal operations, down to the lowest minima expected. Assessment should account for factors related to aircraft geometric limitations (e.g., body attitude and potential for tail strike) during the transition to go around, limited visual cues, autoflight system mode switching and any other pertinent factors identified by the DGCA. For aircraft in which a go-around from a very low altitude may result in an inadvertent touchdown, the safety of such a procedure should be established considering its effect on related systems, such as operation of autospoilers, automatic braking systems, autopilot/flight director mode switching, autothrottle operation and mode switching, reverse thrust initiation and other systems associated with, or affected by, a low altitude go-around.

If an automatic go-around capability is provided, it should be demonstrated that a go-around can be safely initiated and completed from any altitude to touchdown. If the automatic go-around mode can be engaged at or after touchdown, it should be shown to be safe. The ability to initiate an automatic go-around at or after touchdown is not required.

Regardless of the flight guidance system used, availability of an appropriate go-around mode/capability is required. The go-around mode/capability must be able to be selected at any time during the approach to touchdown. The go-around mode/capability should provide information for a safe discontinuance of the approach at any point to touchdown, if activated prior to touchdown. If activated at a low altitude where the aircraft inadvertently touches the ground, the go-around mode should provide adequate information to accomplish a safe go around and not exhibit unsafe characteristics as a result of an inadvertent touchdown. Inadvertent selection of go-around after touchdown should have no adverse effect on the ability of the aircraft to safely rollout and stop.

The following factors should typically be considered when evaluating the safety of go-arounds from any point in the approach before touchdown:

(a) go-around capability should address normal operating conditions, and may include specified non-normal conditions (e.g., engine out) down to the lowest expected operating minimum.

(b) factors related to any geometric limitations (such as tail strike) or configuration changes (such as flap retraction, or allowing for any necessary acceleration segment) of the aircraft during the transition to a go-around should be considered.

(c) factors such as the autopilot, flight director, or autothrottle mode switching or automatic disconnect, minimizing altitude loss during transition to a go-around, and addressing any adverse consequences that might result from autopilot, flight director or autothrottle malfunction should be considered.

(d) if a go-around could result in an inadvertent touchdown, the safety of such an event should be considered. The aircraft design and/or procedures used should accommodate relevant factors. Examples of relevant factors to consider include operation and acceleration characteristics of engines, failure of an engine, the operation of autothrottle, autobrakes, autospoilers, autopilot/flight director mode switching, and other systems (e.g., ground sensing logic) which could be adversely affected by an inadvertent touchdown.

(e) if the occurrence of any failure condition in the aircraft or its associated equipment could preclude a safe go-around from low altitude, then such failure conditions should be identified. In such a case, a minimum height may be specified from which a safe go-around was demonstrated if the failure occurs. If the failure occurs below the specified height, pilots should be made aware of appropriate procedures to be used, and the effects or consequences of any attempt to go-around.

Information must be provided to the flightcrew concerning appropriate procedures for low altitude go-arounds and the height loss expected. If the conduct of certain approach and landing operations is authorized with an engine-out, height loss information for engine-out operations may also be provided to the flightcrew.

(25) Excessive Deviation Alerting. Some method is recommended for being able to detect excessive deviation of the aircraft laterally and vertically during approach, and laterally during rollout, as applicable. The method used should not require excessive workload or undue attention. This provision does not require a specified deviation warning method or annunciation, but may be addressed by parameters displayed on the ADI, EADI, or PFD. When a dedicated deviation warning is provided its use must not cause excessive nuisance alerts.

Rollout Deceleration Systems or Procedures for Category I or II.

(26) Stopping Means. A means to determine that an aircraft can be reliably stopped within the available length of the runway is recommended for any operation.
(27) Antiskid Systems. Unless otherwise determined to be acceptable to the DGCA, aircraft authorized for Category II should have an operable anti-skid system installed and operative per the applicable MMEL and MEL.

The authorization for aircraft to operate using Category II minima without anti-skid is determined by the DGCA for each aircraft type, considering the following factors:

(a) extra field length margin of runways to be authorized, compared with field lengths required for the aircraft type, and
(b) the braking system characteristics of the aircraft regarding susceptibility to tire failure during heavy braking, and susceptibility to tire failure during operations with reduced or patchy runway surface friction.

(28) Engine Inoperative Category II Capability. Low visibility landing minima are typically based on normal operations. For non-normal operations, flightcrews are expected to take the safest course of action to resolve the non-normal condition.

In certain instances, sufficient aircraft system redundancy may be included in the aircraft design to permit use of an alternate configuration such as, permitting an engine inoperative capability for initiation of a Category II approach.

Use of an alternate "engine inoperative" configuration presumes that the engine non-normal condition is an engine failure that has not adversely affected other aircraft systems, such as hydraulic systems, electrical systems or other relevant systems for Category II that are necessary to establish the appropriate flight guidance configuration.

An alternate engine inoperative configuration also assumes that catastrophic engine failure has not occurred which may have caused uncertain, or unsafe collateral damage to the airframe, or aerodynamic configuration. Approved alternate configurations as specified in AFM provisions may be used without exercising emergency authority.

In instances when AFM or operational criteria is not met, and a Category II approach is necessary, because it is the safest course of action, (e.g., in flight fire), crews may use their emergency authority to the extent necessary to conduct an approach in weather conditions less than Category I.

There are four general situations related to an engine inoperative Category II approach, and each are treated differently regarding approach authorization:

(a) the first situation involves planning for an engine inoperative Category II approach in conjunction with the dispatch of an aircraft. It involves designation of Category II capability at destination or alternate airports, and decisions about appropriate fuel reserves for planning purposes for landing at the destination, or for use at takeoff, en route or landing alternate airports. This includes the cases of planning for progressive re-dispatch (PRD) or en route alternate airports related to operations such as extended operations with twin engine aircraft (ETOPS). The result of this planning is usually to identify the weather conditions necessary to list an airport as a suitable alternate.

(b) the second situation is the case where a planned operation is conducted, without respect to engine inoperative Category II minima, but an engine fails en route (e.g., from the time that the aircraft has left the vicinity of the takeoff airport or takeoff alternate airport until the time that the aircraft has arrived at the final approach fix of the destination airport). This situation involves the crew's decision to consider demonstrated engine inoperative Category II capability in their decision to divert or continue to their destination.

(c) the third situation is where the engine fails during the approach after passing the final approach fix, but prior to reaching the Decision Height. This situation involves the crew's decision to continue the approach, abandon the approach to begin another approach after assessing the situation and perhaps re-trimming the aircraft, or diverting to an airport with better weather.

(d) the fourth situation is where the engine fails during the approach but after passing the Decision Height. This situation involves the crew's awareness of any precautions that must be taken to land or go-around following the engine failure.

Division II, Section (28) provides criteria for Category II operations addressing each of these situations.

The following criteria are applicable to aircraft systems intended to qualify for "engine inoperative Category II" authorizations:

(a) the non-normal or normal sections of the AFM must suitably describe demonstrated performance for the engine inoperative configuration, and the aircraft must meet pertinent criteria otherwise required for all-engine Category II or equivalent criteria. Exceptions to criteria may be authorized as follows:
   (i) the effects of a second engine failure when conducting Category II operations with an engine inoperative need not be considered, except for a demonstration that the airplane remain controllable when the second engine fails,
   (ii) crew intervention to re-trim the aircraft to address thrust asymmetry following engine loss may be permitted,
   (iii) alternate electrical and hydraulic system redundancy provisions may be acceptable, as suited to the type design (bus isolation and electrical generator remaining capability must be suitable for the engine out configuration etc.),

(iv) requirements to show acceptable approach or approach and landing performance may be limited to demonstration of acceptable performance during engine out flight demonstrations (e.g., a safe landing on the runway).

(v) approach system or approach and landing system "status" should accurately reflect the aircraft configuration and capability.

(b) suitable information must be available to the flightcrew at any time inflight, and particularly at the time of a "continuation to destination" or "diversion to alternate decision." This is to determine that the aircraft can have an appropriate Category II approach capability when the approach is initiated (e.g., Non-normal checklist specification of expected configuration during approach, approach system or autoland status annunciation of expected capability)

(c) performance should be demonstrated in appropriate weather conditions considering winds and any other relevant factors.

(29) Special Airports with Irregular Pre-Threshold Terrain. Not withstanding the fact that most aircraft systems that have completed airworthiness demonstrations consider irregular terrain in the pre-threshold area, special operational evaluations are nonetheless appropriate for certain airports having difficult pre-threshold terrain conditions. These special evaluations consider each particular aircraft type, the particular flight control system, and may include consideration of particular system elements such as the type of radar altimeters installed or other equipment. Acceptable criteria for the evaluation of irregular Pre-threshold terrain airports is contained in Appendix II of this Standard, Attachment 7.

(30) Airborne System Evaluation and Approval. Category I and Category II airborne systems may be evaluated in accordance with the applicable airworthiness criteria contained in Attachment 2 or 3 during type certification approval or they may be evaluated in conjunction with a DGCA-approved program with an air carrier. To be acceptable for Category II landing minima, the airborne equipment should meet the criteria in Attachment 3 of this Appendix and enable Category II operations in accordance with the operational concepts discussed in Section (9) above. However, if a determination of compliance with Attachment 3 has not been made, airborne equipment which is demonstrated to meet the operational demonstration criteria in Division III, Section (30) of this Appendix may also be acceptable for Category II landing minima if it is demonstrated that this equipment also enables Category II operations in accordance with the operational concepts discussed above.

Operator Use Suitability" Demonstration.

(31) Applicability. The following criteria apply to applicants desiring Category II airborne equipment approvals for those systems which do not have a statement in the approved airplane flight manual which indicates that the equipment meets the Category II performance standards of this Appendix, subsequent editions, or equivalent criteria.

(32) Airborne Equipment Operational Validation. The applicant should provide an acceptable test and evaluation plan which establishes satisfactory performance of the flight guidance system for Category II operations. To be acceptable, the applicant should conduct at least 300 approaches to 100 feet [30 m] in each aircraft type, except that if additional aircraft types are configured with the same basic flight guidance system, the additional approaches may be reduced by one-half. These approaches may be accomplished in line operations or during training and demonstration flights or any combination thereof. Eighty-five percent of the total demonstrations conducted during line operations should be successful and 90 percent conducted during training or demonstration flights should be successful. Approaches are to be accomplished in accordance with the following:

(a) a minimum of three facilities/runways should be used during the demonstrations and at least 10 percent of the total approaches should be conducted on each of at least three of the facilities selected. The number of approaches conducted on additional facilities can be at the applicant's discretion.
(b) the low approaches should be accomplished using facilities approved for Category II. However, at the applicant's option, demonstration may be made using facilities used only for Category I.
(c) no more than 15 approaches per day should be conducted on a single facility.
(d) no more than 60 percent of the approaches should be conducted in any single aircraft.
(e) where an applicant has different models of aircraft within a given type which utilize the same basic flight-control guidance system, the applicant should assure that the various models comply with the basic system performance criteria.
(f) a representative number of pilots assigned to an aircraft type are to be used in the conduct of these approaches. No single pilot in command should perform more than 15 percent of these approaches except when the total number of crews located at a small domicile requires a greater percentage.
(g) at least 30 percent of the approaches should be observed by DGCA Aviation Safety Inspectors who are type rated in the aircraft.

(33) Data Collection During Airborne System Evaluation. Each applicant is to develop a form to be used by the flightcrews to record data listed below. This form is completed whenever an approach is attempted using the airborne flight guidance system regardless of whether it is initiated, abandoned or concluded successfully. The completed forms should be provided to the DGCA for further evaluation. These forms should document at least the following situations:
(a) if unable to initiate approach due to a deficiency in the airborne equipment, state the deficiency.
(b) if approach is abandoned, give the reasons and altitude above runway at which approach is discontinued.
(c) adequacy of speed control at the 100 foot [30 m] point.
(d) was the airplane in trim at the 100 foot [30 m] point for continuation to flare and landing?
(e) evaluate the compatibility of flight director when coupled.
(f) flightcrew should indicate the position of the airplane at the 200 foot [60 m] point, the 100 foot [30 m] point and the estimated touchdown point using a diagram of cockpit display and diagram of runway extended to middle marker.
(g) evaluate the quality of overall system performance.

Information Note: *If the DGCA concurs, unsuccessful approaches attributed to ATS instructions may be excluded from the statistical data; for example, flights vectored too close in for adequate localizer and glide slope capture and ATS requests to abandon approach. Also, unsuccessful approaches may be excluded from consideration if it can be established that they are due to faulty ground station signals or where a pattern of such faulty performance can be established.*

(34) Definition of a Successful Approach. For the purpose for the airborne equipment operation validation, a successful approach is one in which, at the 100 foot [30 m] point:

(a) the airplane is in trim so as to allow for continuation of normal approach and landing.

(b) the indicated airspeed and heading are satisfactory for a normal flare and landing. Indicated air speed does not exceed ± 5 knots of planned approach airspeed but may not be less than computed threshold speed.

(c) the airplane is positioned so that the cockpit is within, and tracking so as to remain within, the lateral confines of the runway extended.

(d) deviation from glide slope does not exceed ± 75 microamps (1/2 scale) as displayed on the ILS indicator.

(e) no unusual maneuvers or excessive attitude changes occur after leaving the middle marker.

(35) GPWS or EGPWS Interface. Airborne equipment used for approach should have appropriate interfaces with or compatibility with GPWS and EGPWS. This is to assure nuisance free operation at routine airports. Special procedures may be used for non-normal procedures or at airports with unusually difficult underlying terrain, or other such factors.

(36) Flight Data Recorder (FDR) Interface. Airborne equipment used for approach should have appropriate interfaces with or compatibility with flight data recorders, and if applicable cockpit voice recorders (e.g., alerting audio audibility on CVR).

DIVISION IV - PROCEDURES.

(1) Operational Procedures. Appropriate operational procedures based on the approved operator program should be addressed. Operational procedures should consider the pilot qualification and training program, airplane flight manual, crew coordination, monitoring, appropriate takeoff and landing minima including specification of either a DA (H) or MDA (H), as applicable, for landing, crew call-outs, and assurance of appropriate aircraft configurations. Suitable operational procedures must be implemented by the operator and be used by flightcrews prior to conducting low visibility Category I or II landing operations.
(2) AFM Provisions. The operator's procedures for low visibility takeoff or Category I or II landing should be consistent with AFM provisions specified during airworthiness demonstrations. Adjustments of AFM procedures consistent with operator requirements are permitted when approved by the DGCA. Operators should assure that no adjustments to procedures are made which invalidate the applicability of the original airworthiness demonstration.
(3) Crew Coordination. Appropriate procedures for crew coordination should be established so that each flight crewmember can carry out their assigned responsibilities. Briefings prior to the applicable takeoff or approach should be specified to assure appropriate and necessary crew communications. Responsibilities and assignment of tasks should be clearly understood by crewmembers. Tasks should be accomplished consistent with the AFM provisions for the aircraft and each crewmember position unless otherwise approved by the DGCA (duties of each pilot, monitored approach, etc.).
(4) Monitoring. Operators should establish appropriate monitoring procedures for each type of low visibility approach, landing, and missed approach. Procedures should assure that adequate crew attention can be devoted to control of aircraft flight path, displacements from intended path, mode annunciations, failure annunciations and warnings, and adherence to minima requirements associated with DA (H) or MDA (H).

In the event that a "monitored approach" is used, (e.g., where the first officer is responsible for control of the aircraft flight path by monitoring of the automatic flight system) appropriate procedures should be established for transfer of control to the pilot who will be making the decision for continuation of the landing at or prior to DA (H) or MDA (H).

Monitoring procedures should not require a transfer of responsibility or transfer of control at a time that could interfere with safe landing of the aircraft. Procedures for calling out failure conditions should be pre-established, and responsibility for alerting other crewmembers to a failure condition should be clearly identified.

(5) Use of the DA (H) and MDA (H). Decision Altitude (Height) is used for Category I and II operations. Decision Altitude (Height) is used when vertical path guidance is available (e.g., ILS, GLS, MLS, VNAV). Decision Altitude (DA) is used for barometrically determined altitude minima (MSL), typically associated with Category I procedures where vertical guidance is available. If specifically authorized by the DGCA (rare uses) a DA may in some circumstances be used for Category II.

Decision Height (DH) is used for Category II operations, except where use of an Inner Marker is authorized in lieu of a DH, or where a DA is authorized (rare use).

When DAs or DHs are specified, procedures for setting various reference bugs in the cockpit should be clearly identified, responsibilities for DA or DH call-outs should be clearly defined, and visual reference requirements necessary at DA or DH should be clearly specified, so that flightcrews are aware of the necessary visual references that must be established by, and maintained after passing DA or DH.

MDA (H) is typically used for procedures that do not have vertical path guidance (e.g., VOR, NDB, 2D-RNAV, Circling). Lebanese Operators are authorized to use MDA. Lebanese operators are not typically authorized to use MDH. Any request for use of MDH must be approved by the DGCA.

Procedures should be specified for call-out of the DA, DH, or MDA (H).

Procedures should be specified for conversion of the DA or DH to an MDA (H) in the event that the aircraft reverts from or loses vertical path guidance. However, any adjustments to approach minima or procedures made on final approach should be completed at a safe altitude (e.g., above 1000 feet [300 m] HAT).

Any use of QFE procedures for DA or DH for operators that are not already so authorized (applicable to either Category I or II) must be specifically approved by the DGCA.

For Category II, the operator should assure that at each runway intended for Category II operations, the radar altimeter systems used to define Decision Height provides consistent, reliable, and appropriate readings for determination of Decision Height. In the event of irregular terrain underlying the approach path an alternate method should be used. DH may be based on other means (e.g., inner marker) when specifically approved by the DGCA.

(6) Callouts. Altitude/Height callouts should be developed, implemented, and used for Category I and Category II operations. When more than one Category of operation is used (e.g., Category I or II) callouts should be compatible, consistent, and preferably common to as many Categories of Operation as practicable.

Callouts may be accomplished by the flightcrew or may be automatic (e.g., using synthetic voice call-outs or a tone system). Typical call-outs acceptable for Category I or Category II include the following:

- (a) "1000 feet"[300 m] above the touchdown zone,
- (b) "500 feet"[150 m] above the touchdown zone,
- (c) "approaching minimums,"
- (d) "at minimums," as applicable,
- (e) [any pertinent visual reference(s) observed, and resulting crew action], as applicable (e.g., "runway in sight,... landing"),
- (f) key altitudes during flare, (e.g., 50, 30, 10) or AFGS mode transitions (e.g., flare, rollout), and
- (g) as appropriate, auto spoiler, reverse thrust deployment and autobrake disconnect.

Combinations of these calls may also be used as appropriate. In any event, the calls made by the flightcrew should not conflict with the automatic systems or auto call-outs of the aircraft, and conversely the configuration selected for the aircraft should not conflict with expected call-outs to be made by the flightcrew. Compatibility between the automatic call-outs and the crew call-outs must be assured. The number of call-outs made, either automatically, manually or in combination, should not be so frequent as to interfere with necessary crew communication for abnormal events.

Also, call-outs should be specified to address any non-normal configurations, mode switches, failed modes, or other failures that could affect safe flight, continuation of the landing, or the accomplishment of a safe missed approach. Any use of crew initiated call-outs at altitudes below 100 feet [30 m] during flare should assure that the callouts do not require undue concentration of the non-flying pilot on reading of the radar altimeter rather than monitoring the overall configuration of the aircraft, mode switching, and annunciations. Automatic altitude call-outs or tones are recommended for altitude awareness, at least at and after passing DA (H) or Minimum Descent Altitude (Height).

(7) Configurations. Operational procedures should accommodate any authorized aircraft configurations that might be required for Category I or Category II approaches or missed approaches. Examples of configurations that operational procedures that an operator may need to accommodate include:

- (a) alternate flap settings approved for Category I ILS or GLS approaches, or Category I procedures other than ILS or GLS, circling procedures, or Category II procedures,
- (b) use of alternate AFGS modes or configurations (e.g., with or without autopilot(s) or flight director(s), autoland, HUD),
- (c) inoperative equipment provisions related to engine(s) inoperative, or the minimum equipment list, such as a non-availability of certain, inoperative instruments (e.g., PFD, radar altimeter), air data computers, hydraulic systems or instrument switching system components, and
- (d) availability and use of various electrical system components (e.g., generator(s) inoperative), alternate electrical power sources (e.g., APU) if required as a standby source.
- (e) if applicable, describing the relationship of approach minima to any decision or commit points for critical aircraft configurations that are identified by the operator (e.g., two engines inoperative procedures for three or four engine aircraft, or abnormal flight control configuration procedures)

Procedures required to accommodate various aircraft configurations should be readily available to the flightcrew to preclude the inadvertent use of an incorrect procedure or configuration. Acceptable configurations for that operator and aircraft type should be clearly identified so that the crews can easily determine whether the aircraft is or is not in a configuration to initiate a low visibility approach using a pertinent Category I or Category II procedure.

Configuration provisions must be consistent with, but are not limited to, those provided in the OpSpecs for that operator.

(8) Compatibility between Category I, Category II and Category III Procedures. The operator should ensure that to the extent possible, flightcrew and operational procedures for Category I and Category II are consistent with the procedures for that operator for Category III, particularly to minimize confusion about which procedure should be used in variable weather.

The operator should to the extent practical, minimize the number of procedures that the crew needs to be familiar with for low visibility operations so that, regardless of the landing category necessary for an approach, the correct procedures can be used consistently and reliably.

(9) Procedure Considerations During Non-Normal Operations. When procedures or configurations have been specified for non-normal situations, flightcrews are expected to apply those procedures and use good judgment in making the determination of any appropriate adjustments to safely use an instrument approach procedure. This may include identifying any necessary adjustments to DA (H), MDA (H),

approach path, missed approach path, or required visibility believed to be necessary (e.g., assessing the climb gradient that can be achieved, identifying a safe engine out lateral and vertical flight path, requesting an appropriate length of final approach). Guidelines for non-normal configurations, situations, or procedures may be provided by the aircraft flight manual or by the operator. Crews are expected to be familiar with these guidelines and apply them to the extent practical.

Specific guidelines for initiation for a Category II approach with an inoperative engine are provided in Division III, Section (28).

When procedures or configurations have not been specified for a non-normal situation or configuration, flightcrews are expected to use good judgment and select the safest course of action in making the determination of appropriate configurations or margins for an approach. The decisions to initiate, continue, or to discontinue an approach, divert to an alternate, and any adjustments to minima should be made considering relevant factors such as:

(a) seriousness of the emergency,
(b) failure status of the aircraft,
(c) potential for unknown damage or further failures,
(d) navigation system status,
(e) runway, visual aid, and NAVAID status,
(f) procedure flight path and minima to be used
(g) proximity to high terrain, obstacles, or adjacent approaching aircraft
(h) potential altitude loss, flight path required, or cleanup altitude needed to change configuration and accelerate for a missed approach,
(i) obstacle clearance during transition to a missed approach (including the possible need to reject the landing from below DA (H) or MDA (H),
(j) fuel on board,
(k) distance and suitability of alternate airports, and
(l) likelihood of changing weather, NAVAID, or runway conditions,

It is not the intent of this circular to comprehensively define guidelines for each circumstance that might be possible
(e.g., serious in-flight fire, minimum fuel). It should be noted, however, that flightcrew have both the authority and responsibility to consider relevant factors, such as those identified above, when deciding the safest course of action. If doubt exists on a course of action (e.g., initiating or continuing an approach with conditions potentially below minima), it is the flightcrews responsibility to exercise any necessary emergency authority to assure safe flight.

Category I or Category II Instrument Approach Procedures.

(10) Acceptable Procedures for Category I. Procedures acceptable for a Category I authorization for a Lebanese Operator in Lebanon, or internationally, under provisions of Part VI and VII of the LARs are those listed in Division II, Sections (9), (14) and (15) of this Appendix, and any others found acceptable to the DGCA and listed in Standard OpSpecs, Part C.
(11) Acceptable Procedures for Category II. Procedures acceptable for a Category II authorization for a Lebanese Operator in Lebanon, or internationally, under provisions of Part VI and Part VII of the LARs, are those listed in Division II, Sections (9) and (14) of this Appendix, and any others found acceptable to the DGCA and listed in Standard OpSpecs, Part C.

(12) Standard Obstacle clearance for approach and missed approach. Standard approach and missed approach criteria for obstacle clearance for normal operations are as specified in ICAO PANS-OPS.

Standard VNAV criteria may be applied as specified in U.S. FAA order 8260.40, as amended or other equitable criteria acceptable to the Minister.

Standard RNP criteria may be applied as specified in Attachment 5 of this Appendix or pertinent sections of Appendix III of this Standard.

For non-normal operations (e.g., engine inoperative), criteria equivalent to that specified in Lebanese Aviation Regulations for takeoff may be applied for those portions of an approach or missed approach not otherwise addressed by procedure design for normal operations (e.g., engine out missed approach gradients, or engine inoperative flap retraction and acceleration segments, or a rejected landing climb back to procedurally protected airspace after loss of visual reference at an airport with significant nearby obstacles or mountainous terrain)

Regardless of criteria used, the operator should assure appropriate consistency between obstacle clearance criteria used for takeoff, en route operations, terminal procedures, instrument approach procedures, engine inoperative procedures, and driftdown procedures, as applicable.

Special Obstacle criteria is identified in Division IV, Section (12) of this Appendix.

(13) Irregular Terrain Airports. Pre-threshold runway irregular terrain airports must be evaluated in accordance with DGCA approved procedures prior to incorporation in OpSpecs for use by air carriers operating to Category II minima.

Acceptable procedures for evaluation of use of these airports may be found in Appendix II, Attachment 7. For aircraft not using autoland, this evaluation consists primarily of assuring an appropriate method for identification of DA (H).

(14) Airport Surface Depiction for Category I or II Operations. Unless otherwise authorized for a particular airport or series of airports, a suitable airport surface depiction should be available to flightcrews for each regular, provisional, alternate airport or any airport the operator could reasonably expect operations ETOPS diversion airports, designated emergency airports), to assure appropriate identification of visual landmarks or lighting to safely accomplish taxing from the gate to the runway and from the runway to the gate. Airport depiction should be on an appropriate scale with suitable detailed information on gate locations, parking locations, holding locations, critical areas, obstacle free zones, taxi way identifications, runway identifications, and any applicable taxiway markings for designated holding spots or holding areas. Standard depictions provided by commercial charting services may be acceptable if they provide sufficient detail to identify suitable routes of taxi to and from the runway and gate positions for departure or arrival.

Electronic presentations of airport diagrams are considered an acceptable substitute for paper (hard copy) depictions if acceptable operational provision is made for failure of the electronic device providing the airport depiction, if each necessary flight crewmember can have access to the depiction when needed, and if equivalent scaling, orientation, chart detail, and information content is provided.

(15) Continuing Category I or Category II Approaches in Deteriorating Weather Conditions. The following procedures are considered acceptable in the event that weather conditions are reported to drop below the applicable Category I or II minima after an aircraft has passed the final approach point or final approach fix, as applicable:

(a) operations based on a DA (H) may continue to the DA (H) and then land, if the specified visual reference is subsequently established by the pilot no later than the DA (H).

(b) operations based on an MDA (H) may continue to the MDA (H), and then to the point of intercept of the VNAV path to the runway, to the VDP, or equivalent, or to the MAP, as applicable, then land, if the specified visual reference is established by the pilot no later than point at which descent below the MDA (H) commences.

(16) "Approach Ban" Applicability. The LARs generally require that weather conditions be at or above takeoff minima prior to takeoff, and above landing minima prior to initiating the final segment of an instrument approach. However the applicability of these rules can be different for certain Lebanese and International Operations. This section explains and clarifies applicability of weather reporting for takeoff minima, and applicability of the "approach ban" provision related to Part VI and Part VII of the LARs at approved airports.

Differences in application of the approach ban between Lebanese airports and non-Lebanese airports stems from the recognition that there may be differences in methods to determine and report weather conditions. On a worldwide basis, differences exist in types and characteristics of meteorological devices used, measurement techniques and policies, or processes for categorizing, reporting or disseminating weather (e.g., different methods of determining and reporting RVR or meteorological visibility).

(17) Approach Operations When Weather is Reported "Below Minima". This section describes regulatory basis for executing an instrument approach procedure (IAP) at an airport when it is previously known that the weather at that airport may be, or is below the charted weather minima or approach ban weather criteria for that IAP.

When an aircraft approaches an airport a decision must typically be made whether or not to initiate the approach and whether it is permissible to proceed beyond the FAF or FAP on an IAP, based on specified "approach minima."

These criteria are not necessarily the same as the charted criteria at the bottom of the approach plate, since in ICAO compliant publications, some States set approach minimums for an IAP by specifying an "approach ban" at weather minima different than that specified on the approach plate or OpSpecs.

The approach initiation minimums for an IAP may or may not be the same as the landing minimums shown on the IAP.

The following criteria are considered to apply as noted below:

(a) Operations Specifications: Always apply, domestic and international.

(b) State of the Aerodrome Criteria if Promulgated as Rules or Regulations: Typically always apply in the national airspace of that state, as an agreed sovereign right.

(c) Lebanese Aviation Regulations: Always applies to domestic operations, and always applies internationally unless the State of the Aerodrome specifically prohibits use of a particular part or provision of the LARs or promulgates a rule contradicting a regulation and the DGCA agrees to apply the overriding provision of the State of the Aerodrome. Typically State of the Aerodrome provisions may be more restrictive than the LARs, but may not provide relief from a regulation.

The LARs require a weather report for an airport prior to commencing an IAP. This is required worldwide.

Section (c) of this part allows the crew to continue an IAP to DA (H)/MDA (H) if a below minimums weather report is received while already on the final segment of the approach.

(d) ICAO Standards: Apply over the high seas (international airspace), and in the airspace of a State which adheres to the ICAO Convention, subject to modification by that State, or ICAO filed "Differences."

ICAO Standards and Recommended Practices: ICAO Annex 2, Annex 6, and PANS-OPS do not address "approach minimums," or any particular weather criteria applying to the decision whether to initiate or continue an IAP. (Also see "ICAO Manual of All-Weather Operations" DOC 9365 AN/910.)

(e) Part VI of the LARs always applies unless superseded by Part VII of the LARs and always applies internationally when not otherwise superseded by Part VII of the LARs, ICAO or State of the Aerodrome Rules. The LARs do not specifically address minimums related to initiation of an approach, or any weather criteria for initiating an IAP. All references are to landing minimums and the required visual references to continue below DA (H)/MDA (H).

(18) IFR Approaches or Low Visibility Takeoffs in Class G Airspace. An operator may be authorized to conduct IFR approaches to Category I or Category II minima, or low visibility takeoffs, in Class G airspace, if the requirements of the applicable OpSpecs are met.

(a) Nonscheduled Operations. For nonscheduled operations, the DGCA must ensure that the operator's Category I or II operations program provides the policy, and direction and guidance necessary to safely conduct these operations. The DGCA must also ensure that the certificate holder's manuals cover the specific procedures which must be used, and the facilities and services which must be available and operational for the safe conduct of instrument approach operations in Class G airspace (e.g., weather reporting, advisory frequencies, and NAVAID critical area protection, as applicable).

(b) Scheduled Operations. In addition to meeting the requirements for nonscheduled operations, the DGCA must ensure that the facilities and services necessary for the safe conduct of instrument approach procedures in Class G airspace are available during the times of scheduled operations, and are specified in the OpSpecs.

(c) Method of Approval. The authorizations to conduct instrument approach procedures in Class G airspace are addressed by issuing paragraph C064 or H113 of the OpSpecs.

(19) Wind Constraint Applicability. When wind constraints apply to Category I or Category II procedures (e.g., an Operation-Specification 15 knot crosswind component limit for Category II) the limit is considered to apply to the point of touchdown. If a report of a crosswind component value greater than the limit is received while on approach, an aircraft may continue an approach, but a subsequent wind report indicating winds are within limits or a pilot determination that actual winds are within limits must be made prior to touchdown. Acceptable methods for such a determination may include pilot use of on board IRS or FMS wind readout capability, real time data link of TDZ winds, or pilot confirmation of an acceptable visual indication of winds on the surface by a wind sock, wind indicator or equivalent wind indicating device.

(20) Crosswind Component Determination at Airports with Significant Magnetic Variation (Polar Regions). Operators and flightcrews operating in Polar Regions or having ETOPS alternates in these regions should be familiar with appropriate methods to determine wind components and particularly tailwind and crosswind components at airports with significant magnetic variation, or with runways oriented to True North. Due to METAR, TAF, and ATS Tower reported winds and runways potentially having different magnetic or true North reference, caution must be exercised where significant magnetic variation values exist, to correctly determine applicable crosswind component limits.

(21) Extreme Temperatures or Pressures. Appropriate procedural adjustments for minimum approach procedure segment altitudes, or DA (H), or MDA (H) may need to be made by the operator for unusually cold surface temperatures (e.g. below -22F/-30C). Aircraft performance adjustments may need to be considered for unusually high temperatures (e.g. temperatures above available AFM data) or unusually low surface pressures.

(22) Metric Altitudes. The operator should address appropriate flight crew and dispatch procedures (if applicable) for identification of and appropriate setting and use of altimeters, altitude alert systems, and altitude reference bugs for metric altitude use (if applicable). This should include emphasis on distinguishing appropriate use of metric versus non-metric units for altimeter settings, change over points, and callouts as used by that operator, and as applicable to the metric altitude routes and procedures used.

(23) International "Approach Procedure Title" Requirements for or Limitations on Navaid Use. The operator should address appropriate flight crew and dispatch procedures (if applicable) for identification of and appropriate use of international approach procedures which may or may not have all necessary navaids listed in the "procedure title" (e.g., NDB ILS Rwy 16). For some of these procedures, navaids may be required which are not necessarily shown in the procedure title. For these procedures the operator should assure that appropriate airborne equipment is operating for dispatch (if applicable), and crews should verify that appropriate navigation equipment is operating to safely conduct the approach and missed approach. Where approved substitutions are approved for Lebanese operators (e.g., FMS based RNAV for NDB, VOR, or DME, or GPS for NDB) the operator should assure flight crews are familiar with substitutions allowable for that region, state or procedure.

(24) "ICAO PANS-OPS" Obstacle Clearance Procedural Protection Limitations. The operator should be aware that "ICAO PANS-OPS" based instrument procedures principally address normal operations, including flight above DA (H) or MDA (H), and above any specified or assumed climb gradients. Operations in non-normal configurations or at unusual speeds (e.g., operations with an engine inoperative, particularly for twin engine aircraft, or in unusual flap or flight control configurations) do not necessarily assure compliance with climb gradients assumed for PANS-OPS based standard procedures. Accordingly operators, flightcrews and dispatchers (if applicable) should consider any necessary aircraft type specific

or weight/altitude/temperature (WAT) specific procedures (e.g., similar to "T-Procedures" for takeoff) that may be necessary to assure safe obstacle clearance, for at least the following situations:

(a) engine failure prior to initiation of or during approach or missed approach,

(b) balked landing or go-around from below DA (H) or MDA (H) (e.g., as for inadvertent loss of visual reference)

(c) any special precautions that may be needed if a crew follows a published missed approach procedure or ATS instruction for a turn from below DA (H) or MDA (H), and before climbing to a safe altitude protected by the procedure or MVA,

(d) any necessary consideration of an associated "IFR departure procedure" as an aid to assure safe obstacle clearance, if initiating a go-around from below DA (H), MDA (H), or during a circling approach,

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DIVISION V - TRAINING AND CREW QUALIFICATION.

Training and crew qualification programs pertinent to Category I, Category II, or lower than standard takeoff minima should include appropriate ground training (e.g., knowledge assurance) and flight training (e.g., skill or maneuver experience in simulation or an aircraft) to assure safe aircraft operation for instrument procedures and low visibility operations in normal, rare normal (e.g., winds, turbulence, restricted visibility), and specified non-normal conditions (e.g., engine or various systems inoperative).

This is typically accomplished through appropriately addressing initial qualification, recurrent qualification, upgrade qualification, differences qualification, recency of experience, and re-qualification. The operators program should provide appropriate training and qualification for each pilot in command, second in command and any other pilot or flight crewmember expected to have knowledge of or perform duties related to Category I or Category II landing operations
(e.g., Flight engineer, augmented crewmember).

Pilots in command (PIC) are expected to have comprehensive knowledge of areas described in section (1) below and have successfully demonstrated necessary skills in accomplishing designated maneuvers or procedures for which they are expected to perform in normal or specified non-normal line operations (e.g., typically demonstrated through simulation training or evaluations).

Pilots other than the PIC should have comprehensive knowledge and similar maneuver/procedure skills as specified for the PIC, except that they may only be expected to perform those relevant duties, procedures or maneuvers applicable to their own crew position or assigned duties.

(1) General Knowledge (Ground) Training for All Weather Operations (AWO). Appropriate ground training should be conducted suitable for the "All weather Operations", instrument procedures, aircraft type(s) or variants, crew positions, airborne systems, NAVAIDs, and ground systems used.

Topics should be addressed to include at least those listed below, and be addressed or tailored to suit application to initial qualification, recurrent qualification, re-qualification, upgrade or differences qualification, as applicable.

Topics should be addressed for each PIC and any other pilots having assigned duties (e.g., SIC) as a PF or PNF during conduct of instrument approach procedures. When duties are specifically assigned to a PF or PNF (e.g., monitored approach, Category II), only those duties applicable to the assigned crew position need be addressed for that crew position. When instrument approach related duties are specifically assigned to other than the PIC or SIC, such as a flight engineer or relief pilot duties applicable to the assigned crew position should be addressed. When flight crewmembers other than a PIC or SIC are not assigned duties associated with an instrument approach procedure but are expected to be present on the flight deck during an instrument approach, it is recommended, but not required, that they also receive suitable academic training.

Acceptable methods to address ground training topics include classroom instruction, self guided slide/tape presentation, or computer based instruction, or self-instruction using appropriate reference materials.

If the method of satisfying ground training requirements is exclusively through self guided learning or review from appropriate reference materials (e.g., flightcrew operating manual, Aeronautical Information Manual, and commercially available instrument procedure charts), the operator should use some clearly identified method (e.g., periodic written examination) to verify that each pilot has acquired or has retained the necessary knowledge.

(2) <u>Ground Systems and NAVAIDs for Category I or Category II</u>. Ground systems and NAVAIDs are considered to include characteristics of the airport, electronic navigation aids, lighting, marking and other systems (e.g., RVR) and any other relevant information necessary for safe Category I or Category II landing or low visibility takeoff operations.

The training and qualification program should appropriately address the operational characteristics, capabilities and limitations of at least each of the following:

(a) <u>NAVAIDs</u>. The navigation systems or NAVAIDs to be used, such as the instrument landing system (ILS) with its associated critical area protection criteria, GPS Landing System (GLS), or Microwave Landing System (MLS) characteristics, as applicable, marker beacons, VOR, DME, NDB, DME, compass locators or other relevant systems should be addressed to the extent necessary for safe operations. If area navigation systems, or other non-ground based NAVAID systems (e.g., GNSS, LORAN) are used, any characteristics or constraints regarding that method of navigation or associated supporting elements (e.g., GBAS, WAAS), must be addressed.

(b) <u>Visual Aids</u>**.** Visual aids include approach lighting system, touch down zone, centerline lighting, runway edge lighting, taxiway lighting, standby power for lighting and any other lighting systems that might be relevant to a Category I or Category II environment, such as pilot control of lighting aids, or coding of the center line lighting for distance remaining, and lighting for displaced thresholds, land and hold short lighting, or other relevant configurations should be addressed.

(c) <u>Runways and Taxiways</u>. The runway and taxi way characteristics concerning width, safety areas, obstacle free zones, markings, hold lines, signs, holding spots, critical area protection areas, or taxi way position markings, runway distance remaining markings and runway distance remaining signs should be addressed.

(d) <u>Meteorological Information</u>**.** METARs, TAFs, visibility reporting, Transmissometers systems, including RVR locations, readout increments, sensitivity to lighting levels set for the runway edge lights, variation in the significance of reported values during international operations, controlling and advisory status of readouts, and requirements when transmissometers become inoperative. Appropriate use of Temperatures in C or F, conversion of temperatures between C and F. Appropriate use of pressure information including altimeter settings in units of HPa or inches, QNE, QNH, QFE (if applicable). Appropriate use of Transition Level and Transition Altitude. Appropriate interpretation and use of reported wind and gust information, in true or magnetic direction, as applicable to the source and circumstance.

(e) <u>NOTAMs and Other Aeronautical Information</u>**.** Facility status, proper interpretation of outage reports for lighting components, standby power, or other factors and proper application of NOTAMs regarding the initiation of Category I or Category II approaches or initiation of a low visibility takeoff.

(f) <u>Flight Planning and Flight Procedures Related to Inoperative or Unsuitable NAVAIDs</u>**.** When NAVAID position updating is used in support of area navigation position determination (e.g., VOR, VOR-DME, DME-DME, GNSS updating), operators and flightcrews should be aware of when and how to disable use of an unsuitable NAVAID or updating method within the airborne navigation system. This is especially true for NAVAID failure conditions that are probable to cause a significant map (position) shift (e.g., movement of a NAVAID to a new location without corresponding update of the NAVAID position in a database, significant numbers of space vehicle outages, or areas of interference).

(3) The Airborne System. The training and qualification program should address the characteristics, capabilities, and limitations of each appropriate airborne system element applicable to Category I or Category II landing including the following:

(a) Flight Guidance System**.** The flight guidance system, including appropriate modes to be used for different circumstances or procedures (e.g., APPROACH, HDG, V/S, LNAV/VNAV), and any associated landing system or landing and roll out system, or go-around capability, if applicable (e.g., autopilot, autoland),

(b) Flight Director System**.** The flight director system, including appropriate modes to be used for different circumstances or procedures (e.g., APPROACH, HDG, V/S, LNAV/VNAV), and including any associated landing or landing and roll out capability, or go-around capability, if applicable (e.g., HGS),

(c) Automatic Throttle. The automatic throttle control system, if applicable. Mixed mode autoflight/autothrottle operation should be addressed (e.g., manual flight, but with autothrottles on, or vice versa), if pertinent to the aircraft type,

(d) Displays. Situation information displays, as applicable, including any applicable limits for acceptable approach performance to continue an approach, flare, rollout, or go-around (e.g., typically 1/2 dot or less lateral or vertical displacement below 500 feet [150 m] HAT down to DA (H), and

(e) Status, Alerting and Warning Displays**.** Other associated instrumentation and displays, as applicable, including any monitoring displays, status displays, mode annunciation displays, failure or warning annunciations and associated system status displays that may be relevant.

(f) Means for Determining DA (H) or MDA (H).
The means for determining DA (H) or MDA (H) as follows:
(i) DA (H) as applicable to the particular Category I ILS, GLS, or MLS procedure (e.g., as an applicable DA, or Marker Beacon substitute for a DA when authorized),
(ii) DA (H) as applicable to the particular Category I RNAV or RNAV RNP procedure with VNAV (e.g., as an applicable DA),
(iii) MDA (H) as applicable to the particular Category I procedure other than ILS, GLS, or MLS (e.g., as an applicable MDA, and any associated missed approach point), and
(iv) DA (H) as applicable to the particular Category II ILS, GLS, or MLS procedure (e.g., as an applicable DH, or Marker Beacon substitute for a DH, when authorized).

(g) Other Flight Deck Systems. Other flight deck systems operations or use, as may be related to low visibility operations (e.g., autobrakes, autospoilers), and any associated limitations, characteristics, or constraints (e.g., touchdown pitchup or pitchdown tendency of certain autospoiler or autobrake settings or non-normal conditions, time delays, auto-deactivation features with go-around).

(h) Other Aircraft Characteristics**.** Any system or aircraft characteristics that may be relevant to Category I or Category II operations, such as cockpit visibility cutoff angles and the effect on cockpit visibility of proper eye height, seat position or instrument lighting intensities related to transition through areas of varying brightness visual conditions change. Crews should be aware of the effects on flight deck visibility related to use of different flap settings, approach speeds.

(i) Lighting. Proper use of various landing, taxi, turnoff, wing, logo, or strobe lights for approach visibility, taxi, or collision avoidance conspicuity.

(j) Rain Removal and De-fog. Proper procedures for use of rain removal/defog (e.g., windshield wipers). If windshield defog, anti-ice, or de-icing systems affect forward visibility, crews should be aware of those effects and be familiar with proper settings for use of that equipment related to low visibility landing.

(k) Course and Frequency Selection. For automatic or manual systems which require crew input for parameters such as inbound course or automatic or manually tuned navigation frequencies, the crew should be aware of the importance and significance of any incorrect selections or settings, if not obvious, to assure appropriate system performance.

(l) Environmental Limits. Description of the limits to which acceptable system performance has been demonstrated for headwind, tailwind, crosswind, and wind shear as applicable, and recognition of unacceptable performance in the case of adverse weather (e.g., windshear, turbulence).

(m) Non-Normal or Failure Conditions. Recognition and response to pertinent non-normal or failure conditions, and related non-normal procedure and checklist use for flight guidance, instrument, and supporting systems (electrical, hydraulic, and flight control systems).

(n) Go-Around. Proper airborne system use for go-around, including consideration of height loss during transition to a go-around, performance assurance for obstacle clearance, management of any necessary mode changes, and assurance of appropriate vertical and lateral flight path tracking.

As applicable, the operator may consult the DGCA to assure that information presented by the operator about any training or qualification items or issues referenced above, or any additional issues pertinent to the type aircraft or system used, are consistent with the pertinent Flight Standardization Board (FSB) Report for the applicable aircraft type.

Flight Procedures, Operations Specifications and Other Information.

(4) LARs and Op-Specs. Pilots should be familiar with the Lebanese Aviation Regulations pertinent to their operation and OpSpecs applicable to Category I or Category II landing, or lower than standard takeoff minima, as applicable.

(5) Crew Duties. Pilots should be familiar with appropriate crew duties, monitoring assignments, transfer of control during normal operations using a "monitored approach" appropriate automatic or crew initiated call-outs to be used, proper use of standard instrument approach procedures, special instrument approach procedures, applicable minima for normal configurations or for alternate or failure configurations and reversion to higher minima in the event of failures.

(6) Visibility and RVR. Pilots should be familiar with proper application of meteorological visibility, METARs or equivalent, TAFs or equivalent, runway visual range (RVR), RVV (if applicable), including their respective use and limitations, the determination of controlling RVR and advisory RVR, required transmissometers, appropriate light settings for correct RVR readouts and proper determination of RVR values reported at foreign facilities. Pilots should be familiar with any authorized methods for pilot assessment and reporting of visibility at non Lebanese facilities.

(7) Procedures and Charts. Pilots should be familiar with the proper use of instrument procedures and charts including application of DA (H) and MDA (H), and when to use DA, DH, or an equivalent (e.g., OCA (H)), or MDA as applicable, including proper use and setting of barometric or radar altimeter bugs, use of the inner marker where authorized or required due to irregular underlying terrain and appropriate altimeter setting procedures for the barometric altimeter consistent with the operators practice of using either QNH or QFE, and if applicable.

Pilots should be aware of when to make suitable cold weather temperature corrections for altimeter systems and procedures, if necessary.

(8) Visual References. Pilots should be familiar with the availability and limitations of visual references encountered, both on approach before and after DA (H), if a DA or DH is applicable. Pilots should be familiar with the expected visual references likely to be encountered. Pilots should be familiar with procedures for an unexpected deterioration of conditions to less than the minimum visibility specified for the procedure during an approach, flare or roll out including the proper response to a loss of visual reference or a reduction of visual reference below the specified values when using a DA (H) or MDA (H) and prior to the time that the aircraft touches down. The operator should provide some means of demonstrating the expected visual references where the weather is at acceptable minimum conditions and the expected sequence of visual queues during an approach in which the visibility is at or above the specified landing minimums. This may be done using simulation, video presentation of simulated landings or actual landings, slides showing expected visual references, computer based reproductions of expected visual references or other means acceptable to the DGCA.

When a synthetic reference system such as "synthetic vision" or enhanced vision systems or independent landing monitors are used, pilots should be familiar with the interpretation of the displays to assure proper identification of the runway and proper positioning of the aircraft relative to continuation of the approach to a landing. Pilots should be briefed on the limitations of these systems for use in various weather conditions and specific information may need to be provided on a site-specific basis to assure that misidentification of taxiways or other adjacent runways does not occur when using such systems.

(9) Visual Transition. Procedures should be addressed for transitioning from non-visual to visual flight for both the pilot in command, second in command, as well as the pilot flying and pilot not flying during the approach. For systems that include electronic monitoring displays, as described in item 5 above, procedures for transitioning from those monitoring displays to external visual references should be addressed.

(10) Unacceptable Displacements. Pilots should be familiar with the recognition of the limits of acceptable aircraft position and flight path tracking during approach, flare and if applicable roll out. This should be addressed using appropriate displays or annunciations for the aircraft type.

(11) Environmental Effects. Environmental effects should be addressed. Environmental effects include appropriate constraints for head winds, tail winds, cross winds, and the effect of vertical and horizontal wind shear on automatic systems, flight directors, or other system (e.g., HGS) performance. For systems such as head-up displays which have a limited field of view or synthetic reference systems pilots should be familiar with the display limitations of these systems and expected crew actions in the event that the aircraft reaches or exceeds a display limit capability.

Extreme temperature or pressure effects should be considered, if necessary.

(12) Operator Policies. Pilots should be familiar with the operators policies and procedures concerning any constraints applicable to Category I or Category II landings, or low visibility takeoff including constraints for operations on contaminated or cluttered runways. Procedures to be used when obscuring of appropriate lighting or markings occurs, and limits should be noted for operations on slippery or icy runways regarding both directional control and stopping performance. Pilots should be familiar with appropriate constraints related to use of braking friction reports. Pilots should be familiar with the method of providing braking friction reports applicable to each airport having instrument landing operations.
(13) Response to Aircraft or System Failures. Pilots should be familiar with the recognition and proper reaction to significant aircraft system failures experienced prior to and after reaching the final approach fix and experienced prior to and after reaching DA (H), as applicable. Expected crew response to failures prior to touchdown should be addressed, particularly for Category II operations.
(14) Ground or Navigation System Faults. Pilots are expected to appropriately recognize and react to ground or navigation system faults, failures or abnormalities at any point during the approach, before and after passing DA (H) and in the event an abnormality or failure which occurs after touchdown. Pilots should be familiar with appropriate go-around techniques, systems to be used either automatically or manually, consequences of failures on go-around systems which may be used, the expected height loss during a manual or automatic go around considering various initiation altitudes, and appropriate consideration for obstacle clearance in the event that a missed approach must be initiated below DA (H).
(15) Navigation Anomalies or Discrepancies. Pilots should be familiar with the need to report navigation system anomalies or discrepancies, or failures of approach lights, runway lights, touchdown zone lights, center line lights or any other discrepancies which could be pertinent to subsequent Category I or Category II operations.
(16) International Procedures. Pilots should be familiar with any applicable international procedures including application of OCA, OCH, the applicable State AIP, or regional supplements (if not otherwise addressed by the operator in the FCOM or equivalent), pertinent excerpts from ICAO references (e.g., Manual for All Weather Operations - ICAO DOC 9365AN/910). Regulatory requirements and responsibilities at non-Lebanese. international airports (e.g., approach ban).
(17) Performance and Obstacle Clearance. Pilots should be familiar with any applicable aircraft performance or weight limit information to assure safe obstacle clearance for "all engine", or "engine inoperative" missed approach, or rejected landing. Applicable performance information should consider applicable flap settings to be used, go-around procedures, acceleration segments if applicable, transition at any time following an engine failure between the specified "all-engine lateral flight path" (or radar vectors) and any specified "engine-inoperative lateral flight path", using acceptable flap retraction and cleanup height procedures.
(18) Flight Plans and Equipment Classification. Pilots should be familiar with use of appropriate flight plan equipment classifications [e.g., Required System Performance (RSP)] affecting eligibility for various takeoff or landing procedures (e.g., flight plan /F, /E designations), and proper alternate airport identification and use, including any takeoff, en route ETOPS, or destination alternates, as applicable.

Maneuver or Procedure (Flight) Training for All Weather Operations (AWO).

(19) Aircraft Or Flight Simulator Use. Maneuver/Procedure (Flight) training and evaluation should be provided, and should use appropriate simulation capability. If simulation capability is not available, training or evaluation may be accomplished partially with training devices, or partially or completely in an aircraft. However, when training or evaluation is done using training devices, or with simulators with

limited capability (not Level C or D), or with an aircraft, additional factors may need to be considered, or provisions or constraints applied by the DGCA, as described below.

(20) Addressing Applicable Regulations. Maneuver or procedure training should generally address applicable Lebanese Aviation Regulations as amended.

(21) Types Of Procedures And Conditions To Be Addressed. Maneuvers and procedures trained should be keyed to the types of instrument procedures used by the operator, the environment in which they are flown, and any special considerations that may apply to their safe application. Operating policies, procedures, and documentation representative of that applicable to the particular operator should be used. Maneuver and Procedure Training and any necessary evaluation should assure that instrument procedures can be safely flown considering at least the following factors, as applicable to the specific operator:

- (a) types of instrument procedures used (Standard and Special, if applicable),
- (b) that operator's manuals, charts, and checklists,
- (c) aircraft type(s) and variants flown,
- (d) flight guidance system(s) used,
- (e) NAVAID(s) and Visual aids used,
- (f) flightcrew procedures used (e.g., PF/PNF duties, monitored approach, callouts),
- (g) airport characteristics typically experienced (e.g., Visual aids, transition level, air traffic procedures, Met procedures, signs and markings, unusual airport features (elevations, slope) as applicable),
- (h) runway characteristics typically experienced (e.g., representative field lengths, grooving, marking),
- (i) nearby critical terrain or obstruction environment, if applicable,
- (j) relevant environmental conditions (e.g., wind, turbulence, shear, visibility and ceiling conditions, slippery runways, rain or snow effects on visibility),
- (k) lowest Category I or Category II straight-in, or Category I circling minima as applicable, and
- (l) other relevant AWO characteristics (e.g., special instrument procedures).

(22) Use of Part VI and Part VII Level C or D Simulators. When simulation is the primary method used for flight training or evaluation for takeoff, approach and landing procedures, appropriate normal, non-normal, and environmental conditions (relevant wind, turbulence, visibility and ceiling conditions) should be simulated. In this instance, training and evaluation need only be conducted using applicable landing minima and relevant and representative procedures and conditions (e.g., a representative mix of day, night, dusk, variable/patchy conditions, representative temperatures, landing runway altitudes, precipitation conditions, turbulence, and icing conditions). Multiple requirements for maneuvers may be combined at the discretion of the DGCA, subject to the constraints below (e.g., to preclude the need to repeat various Category I/II/III, approach scenarios for normal approaches, approaches with an engine(s) out, missed approach, landing, rejected landing, and various go-around events). The training benefit of realistic simulation is acknowledged, and credit for use of a representative sample of conditions to be flown, directly using pertinent minima, is considered to be acceptable. Accordingly, when level C or D simulation is used, only a sample of procedural types, environmental conditions, successful crew performance, and other factors listed in c. above need be assessed. However, when such credit for combining events is permitted, the operator and the DGCA should nonetheless ensure that the program used leads to flightcrews reliably performing the necessary low visibility procedures under both normal and anticipated non-normal conditions in line service. Acceptable numbers and types of training or demonstration instrument approach procedure events for various types of training or checking or qualification programs are listed below.

(23) Use of Simulators Other than Part VI and Part VII Level C or D, use of Training Devices, or use of an Aircraft. When advanced simulation (or equivalent) is not used for All Weather Operations (AWO) Qualification (e.g., when an aircraft is used, or a training device(s) level 2 through 7, or visual simulator, or non-visual simulator, or Level A or B simulator, or a simulator qualified for Level C or D but used as an FBS is used) certain restrictions and additional provisions may apply to training or qualification, as follows:

(a) the DGCA will require that during training or evaluations the flightcrew demonstrate satisfactory lateral and vertical flight path tracking performance to a tighter tolerance than otherwise operationally required (e.g., demonstrate less than 1/2 dot localizer or glideslope sustained tracking error, or demonstrating acceptable tracking to a lower altitude (e.g., 100' [30 m] below applicable DA (H)) to assure flight path stability after passing DA(H), and to compensate for the possible lack of visual reference or external environmental disturbances that exist in real operations but that are usually minimal or absent during training or testing (e.g., due to lack of turbulence or other disturbance).

(b) the DGCA will require that additional procedures or combinations of procedures be demonstrated, or that limitations apply to credits allowed by this Appendix in terms of credit for combining maneuvers or types of procedures trained, maneuvers demonstrated, or other events evaluated (e.g., for combinations of various Category I, II, III procedures for ILS, VOR, VOR/DME, NDB, Back Course Localizer, engine inoperative missed approach or landing procedures).

(c) the DGCA will require additional training or checking event items beyond those identified in this Appendix below, or those addressed only generically in Part VI of the LARs (e.g., providing for HUD or autoland qualification where Part VI only makes general reference to items like other special characteristics as necessary),

(d) when using an aircraft for training or testing, the DGCA may require that provision be made for use of a view limiting device for any necessary competency demonstrations. This is particularly applicable to any evaluation of a pilot that has not previously qualified to fly a similar class of aircraft (e.g., large turbojet aircraft), or for a pilot that does not have significant instrument experience beyond that necessary to satisfy minimums for issuance of a Lebanese commercial pilot's license with instrument rating.

(24) Flight Training Maneuvers for Category I or II Landings. Maneuvers may be addressed individually as a respective Category I or Category II maneuver, or an appropriate sample of Category I and Category II maneuvers may be trained and evaluated, if crews are to be both Category I and II qualified. When flightcrews are authorized to use minima for Category III, as well as Category II, samples of maneuvers selected to be performed for training and evaluation may be from appropriate combinations of Category I, II, and III procedures. When found acceptable to the DGCA, each maneuver need not be repeated for each Category of landing weather minima to be authorized.

Flight training for Category I or Category II landing should address at least the following maneuvers:

(a) Normal Landings. Normal landings at the lowest applicable Category I or Category II minima, using representative autoflight configurations or combinations of configurations authorized for use (e.g., flight director, autopilot, autothrottles),

(b) Missed Approach. A missed approach from the lowest applicable DA (H) and MDA (H), (may be combined with other maneuvers),

(c) Balked Landing. A balked landing or missed approach from a low altitude that could result in a touchdown during go-around (balked landing or rejected landing - may be combined with other maneuvers),

(d) System or Navaid Failures**.** Appropriate aircraft and ground system NAVAID failures (may be combined with other maneuvers),

(e) Engine Failures. Engine failure prior to or during approach (if specific flight characteristics of the aircraft or operational authorizations require this maneuver),

(f) Low Visibility Rollout. Manual roll out with low visibility at applicable minima (may be combined),

(g) Realistic Environmental Conditions. Landings (in simulation) with environmental conditions at a representative sample of limiting values authorized for applicable Category I or II minima for that operator (e.g., regarding wind magnitude, headwind and crosswind components, turbulence, and runway surface friction characteristics (wet, snow, slippery - may be combined), and

(h) Non-normal Configuration Approaches and Landings. Representative non-normal configuration approaches and landings in instrument conditions should be demonstrated. For these approaches, the simulated weather minima may be above, or well above, the lowest Category I or Category II minima authorized. Minima should be at levels that might typically be experienced in line operations, for a landing with the non-normal condition used. During these approaches, representative autoflight, instrument, and aircraft system configurations or combinations of configurations should be demonstrated (e.g., flight director, autopilot, autothrottles, raw data, inoperative electrical or hydraulic components).

(i) Basic Airmanship Skills**.** In accomplishing items 1. through 8. above, each pilot should demonstrate competence, or be judged to have the necessary competence in "basic airmanship skills" to adequately address:

  (i) Manual Control**.** Manual control, or reversion to manual control of the aircraft, if necessary, (for FBW aircraft, normal law or configuration is acceptable)

  (ii) Automation. Proper use of automation,

  (iii) Situation Awareness. Appropriate planning and situation awareness, including terrain awareness,

  (iv) Detection and Coping with Adverse Environmental Factors. Ability to detect and cope with adverse environmental conditions (e.g., applicable crosswinds, turbulence, windshear, convective weather, or adverse airport conditions (e.g., slippery runways)),

  (v) Detection and Coping with Adverse NAVAID Factors**.** Detection Ability to detect and cope with adverse ground system, space system, or NAVAID failures or anomalies), and

  (vi) Crew Coordination and CRM. Proper crew coordination, and crew resource management.

(25) Flight Training Maneuvers for Takeoffs. For low visibility takeoff (RVR less than 2400 [750 m] RVR), the following maneuvers and procedures should be addressed (may be combined):

(a) normal takeoff,

(b) rejected takeoff from a point prior to V1 (including an engine failure),

(c) continued takeoff following failures including engine failure, and any critical failures for the aircraft type which could lead to lateral asymmetry during the takeoff, or

(d) Limiting Conditions. The conditions under which these normal and rejected takeoffs should be demonstrated include appropriate limiting cross winds, winds, gusts and runway surface friction levels authorized. A demonstration should be done at weights or on runways that represent a critical field length.

(26) Demonstration Of Appropriate PF Or PNF Duties By Each Pilot. During each of the specified maneuvers or procedures, crewmembers are expected to perform their respective assignments or duties (e.g., Captain, First Officer, PIC, SIC, Pilot-Flying (PF), Pilot-Not-Flying (PNF)), as applicable. However, PICs and SICs should typically be able to perform either PF or PNF duties, unless otherwise limited by the operators policies or aircraft characteristics (e.g., if F/Os are precluded by operator policy or system installation (HUD) from serving as PF during certain adverse weather takeoffs or landings). In situations where crewmembers are being qualified other than as part of the complete flightcrew (e.g., when two pilots in command are being qualified) or when a pilot other than the PIC is also to be authorized to serve as the PF for low visibility operations, each crewmember should individually demonstrate the required maneuvers or procedures, or an acceptable sample of procedures. Relevant procedures are those involving manual control of the aircraft, rather than procedures such as autoland, which may not involve significant differences in PF or PNF skills.
(27) Initial Qualification. Prior to maneuver or flight training, Initial General Knowledge (Ground) Training for "All Weather Operations (AWO)" should be addressed. Coverage of those subjects specified in Division V, Section (1) of this Appendix should typically be completed for each pilot having assigned AWO responsibilities.

Maneuver or Procedure (Flight) Training addressing suitable for that operator's Initial Qualification for "All Weather Operations (AWO)" should be conducted. While the number of procedure types covered, number of simulator periods, number of training flights, if any, or other factors may vary, coverage should at least address the expected initial assignment of the crewmember receiving the initial training. AWO training may be combined with the initial aircraft type qualification training program or it may be done separately as AWO qualification. Regardless, the operator is expected to provide sufficient initial training to assess knowledge and skills of each new crewmember, address any individual area of weakness, assure each crewmember can perform to applicable Practical Test Standard (PTS), or other relevant standards, and assure that each crewmember can competently perform the maneuvers or procedures specified in Division V, Section (18) of this Appendix.

If weaknesses are identified, it is expected that the operator will provide sufficient remedial training to assure that any new crewmember can perform to applicable DGCA Commercial Pilot, Instrument, Multiengine, or ATPC standards, for the applicable aircraft type or variant, and can acceptably use that operator's policies, manuals and procedures, before releasing that crewmember to IOE or to serve in line operations.

When Category I or II minima are based on manual operations using systems like head-up displays or flight directors, a number of repetitions of the maneuvers specified Division V, Section (18) of this Appendix may be necessary to assure that each of the required maneuvers can be properly and reliably performed.

Operators should also assure that crewmembers receiving initial training have appropriate basic airmanship skills related to AWO (e.g., crosswind takeoff and landing skills, ability to fly to an adequate level using raw data, ability to assess and safely cope with adverse runway friction, make adverse weather avoidance judgments), or are provided relevant remedial training.

Guidance for acceptable programs related to a particular aircraft type can be found in U.S. FAA FSB reports or equivalent reports for specific aircraft types. Operators should adhere to FSB guidelines when published, unless otherwise authorized by the DGCA. Sufficient assessment should take place to assure that the operator has determined that above objectives have been met for each crewmember, and that the resulting evaluation or assessment can be documented.

Recurrent Qualification.

(28) Recurrent General Knowledge (Ground) Training for All Weather Operations (AWO). Recurrent General Knowledge (Ground) Training for All Weather Operations (AWO) should provide any remedial review of topics specified in Division V, Section (1) of this Appendix to assure continued familiarity with those topics. Emphasis should be place on any program modifications, changes to aircraft equipment or procedures, review of any occurrences or incidents that may be pertinent, and finally emphasis may be placed on re-familiarization with topics such as mode annunciations for failure conditions or other information which the pilots may not routinely see during normal line operations. Topics to be addressed for each pilot in command, second in command or other crewmember are those topics necessary for the performance of the assigned duties for each respective crewmember in the current assignment.
(29) Recurrent Maneuver or Procedure (Flight) Training for All Weather Operations (AWO). Recurrent Maneuver or Procedure (Flight) Training for Category I or II landings and low visibility takeoffs, as applicable, should be provided to assure competency in each of the maneuvers or procedures listed in Division V, Section (18) of this Appendix.
Recurrent Maneuver or Procedure (Flight) Training should be conducted using an approved simulator with an appropriate visual system. In the event that simulation is not available, recurrent flight training may be accomplished in the aircraft, as approved by the DGCA considering factors identified in Division V, Section (18) of this Appendix.

Recurrent flight training should include at least sample applicable Category I or Category II procedures to be used, emphasizing any rare or critical procedures used by that operator which have not otherwise been flown routinely or recently by the crewmember, but which may be needed. Emphasis may be placed on any critical non-normal procedures (e.g., engine inoperative, system failure cases), and any special emphasis procedures or items found to require attention due to in service feedback by the operator (e.g., excessively high descent rates near the surface, proper VNAV use). At least some procedures should be sampled at or near limiting adverse weather conditions (e.g., at minimum RVR or limiting wind components or with windshear, or to runways with minimum operationally used field lengths, or at critical terrain airports or at airports having operator unique special airport procedures). Repetition of maneuvers frequently accomplished successfully in line operations (e.g., normal ILS, normal autoland) may be de-emphasized by limited sampling, and limited assessments or those conditions and procedures.

Recurrent flight training maneuvers may be accomplished individually or may be integrated with other maneuvers required during proficiency training or during proficiency checking. If minima are authorized using several methods of flight guidance and control such as FMS, autopilot, flight director or head-up display, then the training program should assure an appropriate level of proficiency using each authorized mode or system. Where Category I or II minima are based on manual control using flight guidance such as provided by a headup flight guidance system, appropriate emphasis should be placed on failure conditions which a pilot does not normally experience in line operations.

When takeoff minimums below RVR2400 [750 m] are approved, recurrent flight training must include at least one rejected takeoff at the lowest approved takeoff minima used, with an engine failure near but prior to V1.

Numbers of maneuvers or procedures to be performed during recurrent training or checking should be sufficient to ensure appropriate crewmember performance, but not less than the following:

(a) an engine inoperative approach to a landing and a go around.
(b) appropriate aircraft or ground system NAVAID failures.
(c) approaches and landing(s) with environmental conditions at a representative sample of limiting values authorized for applicable Category I or II minima for that operator (e.g., wind components, turbulence, windshear or limiting runways or adverse runway surface friction).
(d) any special emphasis procedures or items identified by the operator or DGCA.
(e) a low visibility takeoff with critical performance or a suitable failure condition.

(30) Re-qualification. Credit for previous Category I or II qualification in a different aircraft type or variant, or previous qualification in the same type or variant at an earlier time may be considered in determining the type of program, length of program, required maneuvers to be completed or the repetition of maneuvers for re-qualification for Category I or II operations. Any re-qualification program should assure that the pilots have the necessary knowledge of the topics specified in Division V, Section (1) of this Appendix, and are able to perform their assigned duties for Category I or II or low visibility takeoff considering the maneuvers or procedures identified in Division V, Section (18) of this Appendix.

For programs which credit previous Category I or II qualification in a different type aircraft, the transition program should assure that any subtle differences between aircraft types which could lead to pilot misunderstanding of appropriate characteristics or procedures in the new type must be suitably addressed.

(31) Upgrade Qualification. Credit for previous Category I or II qualification in a different crew position in the same type or variant at an earlier time may be considered in determining the type of program, length of program, required maneuvers to be completed or the repetition of maneuvers for upgrade qualification for an aircraft type authorized for Category I or II operations. Any upgrade program should assure that the pilot has the necessary knowledge of the topics specified in Division V, Section (1) of this Appendix, and are able to perform the new or additional assigned duties for the new crew position for Category I or Category II or low visibility takeoff considering the maneuvers or procedures identified in Division V, Section (18) of this Appendix

(32) Differences Qualification - Addressing Cockpit or Aircraft System Differences. For Category I and II programs using aircraft which have several variants, training programs should assure that pilots are aware of any differences that exist and appropriately understand the consequences of those differences. Guidelines for addressing differences can be found in U.S. FAA Advisory Circular, AC 120-53 or equivalent and FSB reports applicable to a particular type.

(33) Recency of Experience. Recency of experience requirements specified by Part VI and Part VII of the LARs normally provide an assurance of the necessary level of experience for Category I or II landing or low visibility takeoff operations. In the event that special circumstances exist where crewmembers may not have exposure to particular aspects of the flight guidance system used for long periods of time, then the operator should assure that the necessary recency of experience is addressed prior to pilots conducting Category I or II landings, or low visibility takeoff operations below RVR2400 [750 m].

For FMS/RNAV or RNP approaches or automatic landing systems, pilots should specifically be exposed to use of these systems and procedures during training or checking if the crew has not otherwise conducted frequent relevant similar line operations with those systems since the previous training cycle or event.

For manual flight guidance landing or takeoff systems (e.g., HUD) a pilot flying should typically be afforded an opportunity to use such systems or procedures in the aircraft or in simulation once each 90 days. If the pilot has not otherwise had an opportunity to conduct line approaches or landings using the manual flight guidance system within the previous 90 days, a simulator refresher, recurrent training or checking event, line operational use in weather conditions better than basic VFR, flight with a check airman, or other similar method acceptable to the DGCA may be used to re-establish recency of experience with that system.

Checking or Evaluations.

(34) Checking For Category I Qualification. Testing, checking or evaluation for Category I is basic to qualification for IFR operations, and should be accomplished in conjunction with basic aircraft type or variant qualification for each crew position. Testing or evaluation, if necessary and as necessary, should be keyed to assuring that each pilot has the necessary knowledge and skill appropriate to the type of qualification being completed (e.g., Initial, transition, upgrade, differences, or re-qualification programs) in accordance with applicable regulations.

(35) Checking For Category II Qualification. Specific testing or evaluation should be completed for Category II qualification. Crewmembers should demonstrate proper use of Category II related aircraft systems and correct procedures including any provisions otherwise specified by an applicable FSB report. If not otherwise addressed by Category I or Category III qualification, pilots should demonstrate proficiency in performing duties related to conduct of Category II approaches including at least the following conditions individually or in combination:

(a) normal approaches to a landing and to a go-around at or near Category II minima,
(b) approaches with related aircraft system, navigation system, or flight guidance failures,
(c) engine inoperative approaches (if authorized Engine Inoperative Category II),
(d) for initial qualification for automatic systems for landing, at least one automatic landing to a full stop, and if applicable, one automatic go-around from a low approach at or after DA (H),
(e) for automatic systems, for landing at least one automatic landing to a full stop, and one go-around from a low approach at, or after, decision or Alert Height,
(f) for manual systems (e.g., HUD) one landing to a complete stop at the lowest applicable minima and one go-around from low altitude below DA (H) and at least one response to a failure condition during the approach to a landing or a missed approach, and
(g) recognition and proper response to representative non-normal or adverse weather situations (e.g., NOTAM, NAVAID failures, RVR decreasing below minima, ILS critical area unprotected).

(36) Combined Checking For Simultaneous Category I/II or I/II/III Qualification. When qualification programs simultaneously address Category I and Category II, or Category I, II and Category III, testing events may be appropriately combined, and the DGCA or operator need not repetitively test each type of approach at each landing Category.

(37) Checking For Low visibility Takeoff Qualification. For new low visibility takeoff authorizations, and unless otherwise qualified for low visibility takeoff in accordance with Appendix III of this Standard, before using any takeoff minima below RVR1200 [350 m], pilots should have successfully demonstrated in simulation at least one takeoff at the lowest applicable minima with an engine failure at or after V1, and one rejected takeoff with an engine failure or other appropriate failure prior to V1.

If an acceptable simulator is not available, the demonstration may be conducted in the type of aircraft to be authorized for use of takeoff minima below RVR1200 [350 m]. Representative failure speeds and conditions may be used that do not risk or adversely affect the aircraft or its systems (e.g., tires and brake energy). Use of a view limiting device for the pilot being evaluated is not necessary.

(38) Experience with Line Landings. For Category II, unless otherwise specified by an applicable FSB report for the aircraft type, when a qualification program has been completed using a simulator program other than Level C or D, at least the following experience should be required before initiating Category II operations:

- (a) for automatic systems at least one line landing using the auto flight system approved for Category II minima should be accomplished in weather conditions at or better than Category II.
- (b) for manual systems such as head-up flight guidance system for Category II, the pilot in command must have completed at least ten line landings using the approved flight guidance system and procedures, in the configuration specified for Category II, at suitable runways and using suitable landing NAVAIDs.

(39) Crew Records. The operator should assure that records suitably identify initial and continued eligibility of pilots for Category I or II operations. Records should note the appropriate completion of training and any necessary checking for both ground qualification, flight qualification, initial qualification, recurrent qualification, differences qualification, upgrade qualification, or re-qualification, or recency of experience for takeoffs or landings, or other tracked events (e.g., AQP), as applicable.

(40) Multiple Aircraft Type or Variant Qualification. In the event that crewmembers are multiply qualified as either captain or first officer, or for performing the duties of the PIC or SIC (e.g., International relief officers), or for crewmembers dual qualified between several aircraft types or variants, appropriate training and qualification must be completed to assure that each crewmember can perform the assigned duties for each crew position and each aircraft type or variant.

For programs involving dual qualification, the DGCA should approve the particular operators program considering the degree of differences involved in the Category I or II aircraft systems, the assigned duties for each crew position and criteria such as described in U.S. FAA AC 120-53 or equivalent, related to differences. If a pilot serving as second in command is not expressly restricted from performing the duties of the pilot in command during Category I or II approaches or low visibility takeoffs below 2400[750 m]R VR, then that pilot must satisfactorily complete the requirements for a pilot-in-command regarding those low visibility related maneuvers specified in Division V, Section (18) of this Appendix.

(41) Interchange. When aircraft interchange is involved between operators, flight crewmembers must receive sufficient ground and flight training or qualification assessment to assure familiarity and competency with respect to the particular aircraft system or systems of the interchange aircraft. Guidelines for differences should be consistent with those specified in U.S. FAA Advisory Circular AC 120-53 or equivalent and any applicable FSB reports.

(42) Training Regarding Use of Foreign Airports for Category I or Category II Operations. Operators authorized to conduct Category I or II operations or low visibility takeoffs below RVR1200 [350 m] at foreign airports, which require procedures or limitations different than those applicable within Lebanon , should assure that flight crewmembers are familiar with any meteorological reporting, airport, visual aid, NAVAID, or ATS clearance or procedure differences appropriate to operations at those foreign airports.

(43) Initial Operating Experience (IOE)/Supervised Line Flying (SLF). Any Initial Operating Experience (IOE) or Supervised Line Flying (SLF) conducted by the operator should be consistent with and assure compliance with applicable provisions of the AWO program of the operator.
(44) Line Checks, Route Checks, LOE, LOS, or LOFT. Any "Line Checks", "Route Checks", LOS, LOE, or LOFT (or other equivalent AQP events) conducted by the operator should be consistent with, and assure compliance with applicable provisions of the AWO program of the operator.
(45) Special Qualification Requirements for Particular Category I Operations. Certain authorizations may require additional Category I or II training or qualification such as specified in Division V, Section (45) of this Appendix through Division V, Section (50) of this Appendix.
(46) Use of Certain RVR 1800 [550 m] Authorizations based on HUD or Autoland. Use of lower than standard Category I minima based on use of HGS guidance or Autoland may be authorized. Such authorizations may be requested from the DGCA, and are approved on a case by case basis by the DGCA.
(47) Use Of Lowest Category I Minima At Certain Obstacle Limited Or Restricted ILS Facilities. Operators may receive an authorization to use the lowest Category I minima at runways otherwise restricted to use higher minima due to near-in obstacles (e.g., KDTW RW21R). Such authorizations may be requested from the DGCA, and are approved on a case by case basis by the DGCA.
(48) Simultaneous Operations using PRM Radar. For pilot procedures regarding Simultaneous Operations using PRM Radar, see the Aeronautical Information Manual. When these procedures are used by an operator, flightcrews should be suitably briefed on their appropriate use, and how and when to decline their use.
(49) Simultaneous Operations with Converging Approaches and Coordinated Missed Approaches. Simultaneous Operations with Converging Approaches should be addressed if used by the operator. Pilots should be familiar with how to determine if such operations are in effect, how to program the procedure in the FMS, if applicable, how to determine if their aircraft can comply with an applicable missed approach clearance for that particular landing, how to determine if there are any special SIAP or airport procedures to be used, what to do in a contingency, and circumstances in which it may be appropriate to decline such a clearance.
(50) Simultaneous Runway Operations (LAHSO). Simultaneous Operations with land and hold short ATS clearances (LAHSO) should be addressed if used by the operator. Pilots should be familiar with how to determine if such operations are in effect, if their aircraft can comply with a LAHSO clearance for that particular landing, how to determine if there are any special airport markings or lighting to be used, what to do in a contingency if the other aircraft does not respond as expected or cannot stop in the allocated distance, if a failure occurs on either aircraft, or if either or both aircraft must reject the landing, and circumstances in which it may be appropriate to decline such a clearance.
(51) Reserved
(52) Simultaneous Training and Qualification for Category I and II. Training and qualification may be completed individually for Category I and II or may be combined.

When combined Category I and Category II training is completed, pilots must clearly be aware of responsibilities for each Category of approach used, including differences in methods for determination of minima, controlling visibility or RVR, use of correct procedures and callouts for each Category, requirements for airborne equipment for initiation of approach with normal configurations, and response to typical failure cases appropriate for each Category of approach.
(53) Simultaneous Training and Qualification for Category I, II and III. See Appendix III of this Standard for provisions addressing Category III.

Training and qualification may be completed individually for Category I or II, or may be combined for Category I, II and III.

When combined Category I/II/III training is completed, pilots must clearly be aware of responsibilities for each Category of approach used, including differences in methods for determination of minima, controlling visibility or RVR, use of correct procedures and callouts for each Category, requirements for airborne equipment for initiation of approach with normal configurations, and response to typical failure cases appropriate for each Category of approach.

(54) Reserved

Particular Approach System/Procedure Qualification.

(55) Autoland Qualification. Unless otherwise specified by the DGCA in OpSpecs, autoland qualification for Category I or II may be completed through use of Level A, B, C or D simulation, or by observation of an autoland during IOE. When using simulation, at least one normal autoland and one autoland with a failure or non-normal condition requiring pilot intervention or takeover should be completed.

(56) Head Up Display Qualification.

(a) Category I or II, or Category I and II. An acceptable list of flight training events for Category I, or Category II, or Category I and II qualification is shown below.

For qualification, the PF (usually the Captain) and PNF (usually the F/O) should each accomplish their respective duties. It is desirable but not required that the PNF receive at least some exposure to use of the HUD as PF, in order to be familiar with its operation, its characteristics, and its limitations.

Takeoffs:

(i) two Takeoffs (RVR at lowest authorized minima - e.g., RVR300[75 m]),
(ii) one with an engine failure leading to continuation,
(iii) one with any failure leading to an RTO,
(iv) one windshear event during takeoff.
(v) landings:
(vi) five for the lowest Category I or Category II qualification as applicable (three with, two without failures),
(vii) five Missed Approaches/balked landings due to a failure,
(viii) one Circling approach (non ILS/GLS/MLS).

(b) Simultaneous Category I/II/III qualification (also see Appendix III of this Standard). An acceptable list of flight training events for Simultaneous Category I/II/III qualification is shown below.

The PF / PNF should each accomplish respective duties as in a. above. In addition, it is appropriate that the PNF receive at least limited exposure to use of the HUD as PF. The number of events for the PNF, however, may be determined by the operator considering the experience and familiarity of the PNF with HUD operations.

Landings:

(i) two Category I (one with, one without failure),
(ii) one Category II (with or without a failure),
(iii) five Category III (three with, two without failures),
(iv) five Missed Approaches/balked landings due to a failure,
(v) one Circling approach (non ILS/GLS/MLS).

(57) RNAV Approach Qualification. Requirements to conduct RNAV approaches (e.g., for /E or /F qualified airplanes, or RNP qualified aircraft) that already routinely use LNAV/VNAV autoflight modes, are as follows:

(a) the flightcrew must know how to properly use the applicable navigation system(s) for the particular types of approaches to be flown. This is typically addressed in training as a crewmember initially qualifies to fly a particular type or variant.
(b) the flightcrew should have, know, or be able to do each of the items below.
   (i) have access to the appropriate instrument chart(s) (e.g., SID, STAR, or approach plates) for the applicable procedures,
   (ii) know how to properly load the procedure(s) and any associated transitions, string related waypoints, address discontinuities, enter associated data (e.g., path constraints, altitude constraints, speed constraints, winds, anti-ice initiation altitudes), and
   (iii) know how to properly fly the procedure(s) (e.g., operate the aircraft to properly stay on the designated LNAV and VNAV path, and meet constraints, regardless of autoflight mode(s) selected for use, or unexpected mode changes or reversions).
(c) the flightcrew must know how to properly apply applicable flight information (e.g., NOTAMs), if any, for the navigation system and route of flight (e.g., to properly deselect relevant NAVAIDs that are out of service, or could otherwise cause a problem such as a map shift, if they could adversely and significantly degrade nav system performance),
(d) the flightcrew must know how to apply or accomplish any routine or special flight deck procedures specified by the operator for the approach type used or for the particular approach to be flown, including:
   (i) tuning or setting associated radios, altimeters, radar altimeters,
   (ii) setting reference bugs and MCP altitudes, speeds, or headings,
   (iii) selecting or arming appropriate AFDS modes,
   (iv) performing any necessary navigation performance/map validity verification checks, using some acceptable method to the operator, to assure suitable navigation performance. Examples of acceptable verification methods typically include:
      A. a crosscheck of FMS position with raw data prior to passing a FAF or FAP,
      B. a crew assuring that the FMS is using an acceptable updating mode during the descent check (e.g., DD IRS (3)), and no map shift is evident prior to passing the FAF or FAP,
      C. periodically monitoring raw data nav information for consistency with RNAV position information that is displayed on the PFD or ND, or
      D. comparison of RNAV position or other parameters (e.g., radio altitude at a known waypoint or position) with other independent sources of acceptable position information (e.g., Crosscheck an LNAV path with a path depicted by radar or EGPWS, if applicable) which assures the validity of the navigation system position estimate. Crosschecking VNAV with radio altitude, if applicable.
      E. know how to verify navigation data base loads for currency, verify waypoint and critical waypoint validity, if applicable. Know how to verify appropriate levels of

RNP, ANP, EPE, as applicable. Know how to verify suitable sensor performance if applicable (e.g., Acceptable IRS drift rate performance, DME-DME, VOR-DME or GPS updating)

(v) configuring the aircraft at appropriate times, or in conjunction with ATS clearances (speed intervention adjustments), and addressing or otherwise appropriately responding to related aircraft or system status annunciations, advisories, alerts, cautions or warnings.

(e) the flightcrew must be familiar with any unique issues particular to a specific approach or family of approach procedures (e.g., proper use of RNP [if applicable] for each particular approach or missed approach segment, or any special flight guidance procedures or actions necessary to accomplish the procedure(s) such as with the flight director, autopilot, autothrottle, or FMS).

(f) the operator must have the pertinent OpSpecs paragraph and the flightcrew must be aware of any operationally significant OpSpec provisions that relate to the procedures to be flown.

The above provisions may be addressed through initial or revised FCOM material, briefing bulletins, demonstrations, having crews accomplish typical procedures during scheduled PC/PT or, or as briefing emphasis items during IOE.

Each operator should assure that effective methods are used to implement applicable RNAV or RNAV/RNP procedures to assure that in line operations each pilot can perform assigned duties reliably, and expeditiously for each procedure to be flown, both in normal circumstances, and for probably non-normal circumstances (e.g., engine failure and other representative QRH, or equivalent, non-normals).

The best method or method(s) to be used by a particular operator to assure competency in flying RNAV or RNAV/RNP procedures may vary significantly from operator to operator. Methods, level and extent of training and checking, and recency may depending on the type of procedures used by the operator, the aircraft/FMS types and any autoflight systems used, level of familiarity or experience of crews with the FMS, autoflight, and the RNAV or RNAV/RNP procedures used, the complexity and criticality of procedures to be flown, and the environment in which the procedures are flown.

The DGCA may determine any credit allowed for an operator, or additional constraints determined necessary for that operator based on the above factors, and considering any provisions described in the applicable FSB report for the type.

(58) Category I or II Operations with an Engine Inoperative.

Category I**.** For a Category I approach with inoperative engine(s), appropriate training should be completed to assure that crews can properly identify and select the nearest adequate or suitable airport (2 engine aircraft), or a safe airport (3 or more engine aircraft) pertinent to OpSpecs and Lebanese Aviation Regulations, and safely conduct the engine(s) inoperative landing. The flightcrews should have and demonstrate knowledge of factors influencing selection of a suitable airport for landing and safe completion of the approach considering factors such as the following:

(a) engine(or engines) inoperative aircraft configuration (e.g., degree of thrust asymmetry, appropriate flap settings, adjusted reference speeds, remaining reverse thrust capability and use),

(b) other potentially affected aircraft systems (e.g., electrical, or hydraulic),
(c) Weather Conditions (winds, turbulence, ceiling and visibility, RVR, icing, windshear, crosswind or tailwind components, recency and accuracy of weather information),
(d) use of appropriate minima for the configuration and possible need for adjustment of approach and landing minima to suit the particular circumstances,
(e) special minima considerations that might be appropriate (e.g., engine-out missed approach obstacle or terrain assurance and balked landing obstacle avoidance considerations, consideration of subsequent engine failure (aircraft with more than 2 engines),
(f) selection of most favorable NAVAIDs, runway, or runway conditions (e.g., regarding braking friction, clutter),
(g) availability of emergency services,
(h) airport and procedure familiarity,
(i) nearby terrain or obstruction considerations,
(j) MEL status, and
(k) crew recency of experience.

Operators should at least be familiar with, and provide the necessary training to flightcrews, to address the above factors or issues considering that an engine failure may occur during or after takeoff, while en route, prior to approach, after passing the final approach fix, at or below MDA (H) or DA (H) leading to either a landing or go-around, or during missed approach.

<u>Category II</u>. For Category II the factors listed above for training and qualification for Category I should be considered, and in addition the following should be addressed. For crews authorized to initiate a Category II approach with an inoperative engine either through Category II dispatch procedures or for engine failures which occur en route, appropriate training should be completed to assure that crews can properly apply the provisions of Division III, Section (28) or (29) of this Appendix. For airlines that do not authorize the initiation of a Category II approach with an engine inoperative as an approved procedure, crews should at least be familiar with the provisions above for Category I and provisions regarding an engine failure after passing the final approach fix.

(59) <u>Enhanced or Synthetic Vision Systems (Independent Landing Monitor)</u>. Training required for enhanced or synthetic vision systems may be specified by the DGCA based on successful completion of proof of concept testing, as applicable. Pertinent requirements are as specified in the applicable FSB report.

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DIVISION VI
AIRPORTS, NAVIGATION FACILITIES AND METEROLOGICAL CRITERIA.

Lebanese and non-Lebanese airports and runways authorizable for Category I and II are those either having published Lebanese Aeronautical Information Publication (AIP), or as otherwise specified on the DGCA "Category II status checklist". Requests for authorization to use other airports/runways should be coordinated with the DGCA.

(1) Use of Standard Navigation Facilities. Lebanese Category I approaches may be approved as published in the AIP or as special procedures in OpSpecs

Category II operations may be approved on standard ICAO navigation facilities as follows:

(a) facilities meeting ICAO criteria (ICAO Annex 10, ICAO Manual of All Weather Operations DOC 9365/AN910, etc.) and which are promulgated for use for Category II by the "State of the Aerodrome", and

(b) Category II operations require facilities assessed and classified at least through point D (e.g., II/T/2).

(2) Use of Other Navigation Facilities or Methods. Category I or II operations may be approved using other types of navigation facilities or using other acceptable position fixing and integrity assurance methods, if proof of concept demonstrations acceptable to the DGCA are successfully completed:

ILS facilities meeting acceptable criteria such as ICAO (e.g., JAA), may be used as determined to be acceptable by the DGCA.

Operations may be approved using other types of navigation facilities or using other acceptable position fixing and integrity assurance methods, if proof of concept demonstrations acceptable to the DGCA are successfully completed:

ILS facilities meeting acceptable criteria other than ICAO (e.g., JAA), may be used as determined to be acceptable by the DGCA.

(3) Lighting Systems. Lighting for Category I is as specified by Standard OpSpecs, or any special provisions or procedures identified in OpSpecs.

Lighting used for Category II must include the following systems, or ICAO equivalent systems, unless approved by the DGCA or specific aircraft systems such as HUD or autoland:

(a) United States Standard ALSF 1 or ALSF 2 approach lights,

(b) United States Standard Touchdown Zone Lights,

(c) United States Standard Runway Centerline Lights, and

(d) United States Standard High Intensity Runway Lights.

Exceptions to the above lighting criteria may be authorized only if equivalent safety can be demonstrated by an alternate means (e.g., substitution for required approach lighting components due to use of an approved aircraft system providing equivalent information or performance, such as use of an autoland system, head up display (HUD) with inertially augmented flight path vector display), or availability of redundant, high integrity, computed or sensor based (e.g., high resolution radar) runway information, suitably displayed to a pilot.

(4) Marking and Signs. Marking and signs for Category I are as specified by the DGCA for precision approach runways.

Airports approved for Category II must include the following runway and taxiway markings and airport surface signs, or ICAO equivalent, unless approved by the DGCA.:

(a) United States Standard Precision Instrument Runway Markings,
(b) United States Standard Taxiway edge and centerline Markings, and
(c) runway signs, taxiway signs, hold line signs, taxiway reference point markings (if required by SMGC), and NAVAID (ILS) critical area signs and markings.

For Category II, markings and signs must be in serviceable condition, as determined by the operator or the DGCA. Markings or signs found in an unacceptable condition by an operator should be reported to the appropriate airport authority and the DGCA. Operators should discontinue Category II use of those areas of airport facilities or runways where unsafe conditions are known to exist due to markings or signs being inadequate, until remedial actions are taken by the airport authority (e.g., snow removal, rubber deposit removal on runway touchdown zone markings or centerline markings, critical area hold line or runway centerline marking repainting, runway hold line sign snow removal).

(5) Low Visibility Surface Movement Guidance and Control (SMGC) Plans. Surface movement guidance and control plans are recommended for operations below Category I. Where such plans are used, operators intending authorization for Category II should coordinate with the airport authority regarding the use of a SMGC plan prior to OpSpec authorization for that airport.

Some contracting states' airports conducting takeoff or landing operations below 1,200 feet [350 m] RVR are required to develop a Surface Movement Guidance and Control System (SMGCS) plan. SMGCS operations facilitate low visibility takeoffs and landings and surface traffic movement by providing procedures and visual aids for taxiing aircraft between the runway(s) and apron(s). Specific low visibility taxi routes are provided on a separate SMGCS airport chart. SMGCS operations also facilitate the safety of vehicle movements that directly support aircraft operations such as aircraft rescue and fire fighting (ARFF) and follow-me services, towing and marshaling.

U.S. Advisory Circular, AC 120-57 or equivalent describes the standards and provides guidance in implementing SMGCS operations such as aircrew training, etc. An operator intending authorization for Category III operations should coordinate with the airport authority regarding their SMGCS plan.

(6) Meteorological Services and RVR availability requirements. Standard meteorological reporting required by Lebanese Aviation Regulations is acceptable for Category I.

For Category II, appropriate meteorological service (e.g., SA, FT, RS, RVR, RVV, METAR, METAF, Braking Action, NOTAM, etc., reports, as applicable) are necessary for each airport/runway intended for use by an operator for Category II, unless otherwise approved by the DGCA. Airport meteorological facilities should meet criteria of ICAO Doc 9365/AN910, second edition, or later, as amended.

For Category II, TDZ, MID, and ROLLOUT RVR (or a corresponding international equivalent) should be provided for any runway over 8000 ft [2438 m] in length. TDZ and ROLLOUT RVR should be provided for runways less than 8000 ft.[2438 m] Exceptions to this requirement for international locations may be approved on a case by case basis, by the DGCA, if equivalent safety can be established. Factors considered due to local circumstances may include such issues as minima requested, landing field length requested, characteristics of prevailing local weather conditions, location of RVR sites or RVR calibration, availability of other supporting weather reports on nearby runways, etc.

Aircraft requiring a landing or takeoff distance in normal operation (using operational braking techniques) less that 4000 ft [1200 m] may be approved to use a single TDZ, MID, or ROLLOUT RVR report as applicable to the part of the runway used. For such operations, RVR values not used are optional and advisory, unless the aircraft operation is planned to take place on the part of the runway where a MID or ROLLOUT RVR is located.

In general the controlling RVR for Takeoff, Landing and Rollout are as follows:

(a) Take-off:
Where visibility minima are applicable, visibility must be reported sufficiently close to the takeoff runway to be considered valid or applicable. The determination of acceptability, if not otherwise addressed by the DGCA, may be determined by the operator. Where RVR minima are applicable, RVR must be reported, and the RVR minimum value is considered to be controlling at each relevant RVR reporting point. The RVR/Visibility representative of the initial part of the take-off may be replaced by pilot assessment. For take-off operations the relevant RVR refers to any portion of the runway that is needed for takeoff roll, including that part of the runway that may be needed for a rejected take-off.

(b) Landing:
(i) where visibility minima are applicable, visibility must be reported sufficiently close to the landing runway to be considered valid or applicable. The determination of acceptability, if not otherwise addressed by the DGCA, may be determined by the operator. Where RVR is used, the controlling RVR for all Category I operations is the touchdown RVR. All other readings, if any, are advisory.
(ii) the controlling RVR for Category II (for Category III see Appendix II of this Standard) is TDZ RVR or equivalent. Mid and rollout RVR are advisory, unless otherwise specified in OpSpecs.

An acceptable alternate set of OpSpecs may also provide for the following provisions, if determined appropriate by the DGCA, and agreed by the operator:
A. for airplanes without a rollout guidance or control system TDZ, MID, and ROLLOUT may be specified as controlling. If relevant, the minimum value for the MID may be 400-feet [125-m] or the value of the touchdown RVR minima, whichever is lower. The value for ROLLOUT RVR, if relevant, may not be less than 250-feet [75-m]. For landing operations the relevant RVR refers to the portion of the runway that is needed for landing down to a safe taxi speed (typically below 60-knots for a large turbojet aircraft).
B. the controlling RVR for Category II operations using airplanes with a rollout or guidance control system is the TDZ RVR, all other readings are advisory.

(iii) "Inoperative RVR" requirements for dispatch or continuation of a particular flight operations are as specified in standard operation specifications Part C, or any special operations specification provision unique to a particular operator. Unless otherwise approved, in special OpSpecs provisions, the controlling RVR must be operating for all operations based on RVR minima.

(7) Meteorological Services. Appropriate meteorological service (SA, FT, RS, RVR, RVV, METAR, METAF, Braking Action, NOTAM, etc., reports, as applicable) are necessary for each airport / runway intended for use. Facilities should meet criteria of ICAO Doc 9365/AN910, second edition, or later, as amended.

RVR Availability and Use Requirements.

(8) RVR Availability. RVR availability requirements for touchdown zone (TDZ), mid runway (MID), and ROLLOUT RVR (or a corresponding international equivalent location) are as follows. RVR should be provided for any runway over 8000 ft [2438 m] in length. TDZ and ROLLOUT RVR should be provided for runways less than 8000 ft [2438 m]. Exceptions to this requirement for international locations may be approved on a case by case basis, by the DGCA, if equivalent safety can be established. Factors considered due to local circumstances at foreign airports may include such issues as: minima requested, characteristics of prevailing local weather conditions, location of RVR sites or RVR calibration, availability of other supporting weather reports on nearby runways, etc.

(9) RVR Use. RVR use by operators and pilots is as specified in standard OpSpecs Part C (see Part VI, Subpart 2, Division XV). However, when approved as an exception in OpSpecs, aircraft capable of certificated landing or takeoff distance of less than 4000 ft may be approved to use a single TDZ, MID, or ROLLOUT transmissometer as applicable to the part of the runway used. For such operations, transmissometers not used are considered to be optional and advisory, unless the aircraft operation is planned to take place on the part of the runway where the MID or ROLLOUT transmissometer is located.
(10) Pilot Assessment of Takeoff Visibility Equivalent to RVR. In special circumstances, provisions may be made for pilot assessment of takeoff visibility equivalent to RVR to determine compliance with takeoff minima. Provisions to authorize pilot assessed RVR is provided through OpSpecs paragraph C056. A pilot may assess visibility at the take off position in lieu of reported TDZ RVR (or equivalent) in accordance with the requirements detailed below:

(a) TDZ RVR is inoperative, or is not reported (e.g., TDZ RVR inop, ATS facility is closed), or
(b) local visibility conditions as determined by the pilot indicate that a significantly different visibility exists than the reported RVR (e.g., patchy fog, blowing snow, RVR believed to be inoperative or inaccurate), and
(c) pertinent markings, lighting, and electronic aids are clearly visible and in service (e.g., no obscuring clutter), and
(d) the assessment is made using an accepted method regarding identification of an appropriate number of centerline lights, or markings, of known spacing visible to the pilot when viewed from the flight deck when the aircraft is at the take-off point, and
(e) pilot assessment of visibility as a substitute for TDZ (takeoff) RVR is approved for the operator, and observed visibility is determined to be greater than the equivalent of 300 [75 m] RVR, and
(f) a suitable report of the pilot's determination of visibility is forwarded to ATS prior to departure (if an ATS facility is available and providing ATS services).

Information Note: *This is intended to provide information for other operations, and is not intended to restrict the aircraft making the report.*

(11) Critical Area Protection. Airports and runways used for Category I and II must have suitable NAVAID (e.g., ILS) critical area protection, as applicable to the ground and aircraft systems used. Procedures equivalent or more stringent than those specified in the United States AIM (FAA Order 7110.65) as amended, are required. Procedures consistent with ICAO DOC 9365/AN910 are acceptable. Where uncertainty regarding acceptability of airport procedures is a factor, operators should contact the DGCA (e.g., for airports and runways listed on the DGCA Category II status checklist where doubt exists regarding adequacy of procedures encountered in routine operations) for follow up.
(12) Operational Facilities, Outages, Airport Construction, and NOTAMs. For operations to be initially authorized, operations to continue to be authorized, an aircraft to be dispatched with the intention of using a facility described above, or an aircraft to continue to its destination or an alternate with the intent of completing a Category I and II instrument approach procedure, operators must consider the status of components identified in Division VI, Section (1) through Section (I1) of this Appendix as necessary for Category I or II (NAVAIDs, standby power, lighting systems, etc.) and take appropriate action for inoperative components. The following guidelines are considered acceptable unless otherwise precluded in OpSpecs:

Outer, Middle, or Inner Marker beacons may be inoperative unless a Category I or II operation is predicated on their use (e.g., a DH is predicated on use of an Inner Marker due to irregular terrain, the aircraft system requires use of a marker beacon for proper function).

Lighting systems are in normal status except that isolated lights of an approach light, or runway light system may be inoperative; approach light components not necessary for the particular operation such as REIL, VASI, RAIL, etc. may be inoperative; lights may not be completely obscured by snow or other such contaminants if necessary for the operation (e.g., night).

Operations may be continued at airports at which construction projects affect runways, taxiways, signs, markings, lighting, or ramp areas only if the operator has determined that low visibility operations may be safely conducted with the altered or temporary facilities that are provided. In the event of uncertainty as to the suitability of facilities, the operator should consult with the DGCA.

NOTAMs for NAVAIDs, facilities, lighting, marking, or other capabilities must be appropriately considered for both dispatch, and for continued flight operations intending to use a Category I or II procedures. Operators and flightcrews must appropriately respond to NOTAMs potentially adversely affecting the aircraft system operation, or the availability or suitability of Category I or II procedures at the airport of landing, or any alternate airport intended for Category I and II.

An operator may make the determination that a NOTAM does not apply to the aircraft system and procedures being used for a particular flight if the safety of the operation can be assured, considering the NOTAM and situation.

(13) Use of Military Facilities. Military facilities may be used for Category I and II if authorized by the Minister of Defense and if equivalent criteria are met as applicable to the Lebanese Aviation Regulations.

(14) Special Provisions for Facilities Used for ETOPS Alternates (TBD). In addition to criteria specified above, an airport used as an ETOPS Category II engine-out alternate must meet the following criteria: Sufficient information about pre-threshold terrain, missed approach path terrain, and obstructions must be available so that an operator can assure that a safe Category II landing can be completed, and that an engine-out missed approach can be completed from the specified DH.

Sufficient meteorological and facility status information must be available so that a diverting flightcrew can receive timely status updates on facility capability, weather/RVR, wind components, and braking action reports (if applicable), if conditions could or would adversely affect a planned Category II landing during the period of an ETOPS diversion.

For any alternate airports not routinely used by that operator's flightcrews (e.g., BIKF), sufficient information must be provided for crews to be familiar with relevant low visibility and adverse weather characteristics of that airport that might have relevance to an engine-out operation (e.g., unique lighting or markings, any nearby obstructions or frequently encountered local windshear or turbulence characteristics, meteorological report, braking report, and NOTAM interpretation, appropriate ground taxi route and gate location information, emergency services available)

(15) Alternate Minima. Use of alternate minima are specified in Standard OpSpecs Part C paragraph C055. For applicability of "engine inoperative Category II" capability see Division VIII, Section (12) of this Appendix.

Paragraph C055 is issued to all Part VI and Part VII of the LARS operators who conduct IFR operations with airplanes. This paragraph provides a three-part table from which the operator, during the initial dispatch or flight release planning segment of a flight, derives alternate airport IFR weather minimums in those cases where it has been determined that an alternate airport is required.

(a) the first part of the table is for airports with at least one operational navigational facility providing a straight-in non precision approach procedure, or a straight-in precision approach procedure, or, when applicable, a circling maneuver from an instrument approach procedure. The required ceiling and visibility is obtained by adding 400 feet [125 m] to the Category I HAT or, when applicable, the authorized HAA and by adding 1 sm to the authorized Category I landing minimum, etc.

(b) special provisions for Category II and Category III engine-out capability are listed in the third part of the table for airports with at least two operational navigational facilities, each providing a straight-in precision approach, including a precision approach procedure to Category II DA (H) or Category III. The required ceiling and visibility is obtained by adding 200 feet [60 m] to the respective lowest Category II or Category III touchdown zone elevation of the two approaches used and by adding RVR1200 [350 m] to the lowest authorized minimum (see figure below).

(16) Dispatch to Airports That are Below Landing Minima. In certain instances an operator may dispatch an aircraft to a destination airport even though current weather is reported to be below, or may be forecast to be below landing minima. This is to permit aircraft to begin a flight if there is a reasonable expectation that at or near the expected time of arrival at the destination airport, weather conditions are expected to permit a landing at or above landing minima.

Dispatch to such airports typically is considered acceptable if the following conditions are met:

(a) all requirements are met to use the landing minima at the destination and at each alternate airport on which the dispatch is predicated (e.g., aircraft, crew, airport facilities, NAVAIDs).

(b) if Alternate minima credit is applied based on availability of Category III capability, or Engine inoperative Category III capability, then each of the airborne systems otherwise applicable to use of that capability must be available at the time of dispatch (e.g. flight guidance system, anti skid, thrust reverse capability, as applicable to the aircraft type and Category III authorization for that operator)

(c) ETA at the destination airport considers any necessary holding fuel that may be required while the aircraft waits for weather improvement.

(d) Air Traffic conditions are considered for potential delay due to other aircraft arrivals or departures at the destination and at each alternate airport.

(e) at least two qualifying alternates are available, the first of which considers the aircraft flying to the below minima intended destination, then holding for a time as determined by the operator awaiting approach or weather improvement, then flying to the closest alternate, then completing an approach and missed approach at that airport, and then flying to the second alternate and landing with appropriate reserve fuel.

(17) Temperatures and Temperature Extremes. The operator should address appropriate flight crew and dispatch (if applicable) use of temperature in degrees C, degrees F, and conversion between C and F, if necessary. The operator should address appropriate dispatch (if applicable) use of temperature in tenths of degrees C or F, and any appropriate rounding or identification of acceptable temperature ranges or bounds, as needed.

The operator should address appropriate flight crew and dispatch (if applicable) use of procedures to compensate for extremely cold temperatures, if necessary.

The operator should address appropriate flight crew and dispatch procedures (if applicable) for use of temperatures near or possibly beyond the AFM range, if operations are necessary or are reasonably expected to be conducted at or near AFM limits (e.g., runway temperatures near or above 120 degrees F [49 c] or near or below -54 degrees F [12 c]).

(18) Pressures and Unusually High or Low Pressures. The operator should address appropriate flight crew and dispatch procedures (if applicable) for identification of and appropriate setting and use of QNH, QNE, and QFE (if used). This should include emphasis on distinguishing appropriate use of metric versus non-metric units for altimeter settings as used by that operator (e.g., hectopascals (HPa), millibars (MB), or inches (in)). Emphasis should be placed on assuring use of proper settings for easily confused values for altimeter settings, particularly when abbreviated settings are used in ATS radiotelephony, ATIS messages, or checklists (e.g. "altimeter 993" being mistakenly confused for 29.93 inches instead of 0993 HPa when the appropriate units are metric).

The operator should address any appropriate flight crew and dispatch procedures (if applicable) for unusually Low pressures if necessary for safe operations (e.g., unusable altitudes or flight levels of instrument procedures).

The operator should address appropriate flight crew and dispatch procedures (if applicable) for use of transition Level and transition altitude.

If applicable, the operator should address appropriate flight crew and dispatch procedures or limitations, as necessary, for use of VNAV in states using QFE for approach.

DIVISION VII - CONTINUING AIRWORTHINESS / MAINTENANCE.

(1) Maintenance Program General Provisions. Unless otherwise approved by the DGCA, each operator should have an approved Maintenance Control System. The approved Maintenance Control System should typically include any necessary provisions to address lower landing minima (LLM) or low visibility takeoff in accordance with the operator's intended operation and the manufacturers recommended maintenance program, MRB requirements or equivalent requirements, or any subsequent DGCA designated requirements (e.g., ADs, mandatory service bulletins). Emphasis should be on maintaining and ensuring total system performance, accuracy, availability, reliability, and integrity for the intended operations.

(2) Maintenance Program Requirements. The maintenance program should be compatible with an operator's organization and ability to implement and supervise the program. Maintenance personnel should be familiar with the operators approved program, their individual responsibilities in accomplishing that program, and availability of any resources within or outside of the maintenance organization that may be necessary to assure program effectiveness
(e.g., getting applicable information related to the manufacturer's recommended maintenance program, getting information referenced in this Appendix such as service bulletin information).

Provision for low visibility operations may be addressed as a specific program or may be integrated with the general maintenance program.

Regardless whether the maintenance program is integrated or is designated as a specific program for Lower Landing Minima (LLM), the maintenance program should at least address the following:

- (a) maintenance procedures necessary to ensure continued airworthiness relative to low visibility operations.
- (b) a procedure to revise and update the maintenance program.
- (c) a method to identify, record or designate personnel currently assigned responsibility in managing the program, performing the program, maintaining the program, or performing quality assurance for the program. This includes identification of any contractor or sub-contractor organizations, or where applicable, their personnel.
- (d) verification should be made of the lower landing minima systems and configuration status for each aircraft brought into the maintenance or lower minimum program. Unless otherwise accepted by the DGCA, each aircraft should meet relevant criteria specified by the applicable aircraft manufacturer or avionics manufacturer for associated systems and equipment (e.g., Valid U.S. TC, appropriate STC records and compliance, assessment of status of any engineering orders, ADs, service bulletins or other compliance).
- (e) identification of modifications, additions, and changes which were made to qualify aircraft systems for the intended operation or minima, if other than as specified in the AFM, TC or STC.
- (f) identification of additional maintenance requirements and log entries necessary to change minima status.
- (g) any discrepancy reporting procedures that may be unique to the low visibility program. If applicable, such procedures should be compatibly described in maintenance documents and operations documents.
- (h) procedures that identify, monitor and report lower minimum system and component discrepancies for the purpose of quality control and analysis.
- (i) procedures that define, monitor and report chronic and repetitive discrepancies.

(j) procedures that ensure aircraft remain out of lower minimum status until successful corrective action has been verified for chronic and repetitive discrepancies.
(k) procedures that ensure the aircraft system status is placarded properly and clearly documented in the aircraft log book, in coordination with maintenance control, engineering, flight operations, and dispatch, or equivalent.
(l) procedures to ensure the downgrade of an aircraft low visibility capability status, if applicable, when maintenance has been performed by persons other than those trained, qualified, or authorized to use or approve procedures related to low visibility operations.
(m) procedures for periodic maintenance of systems ground check, and systems flight check, as applicable. For example, following a heavy maintenance, suitable checks may need to be performed prior to return to service.
(n) provisions for an aircraft to remain in a specific low visibility capability status (e.g., Category II, Fail-Operational, Fail Passive) or other designated operational status used by the operator.
(o) provision should be made for periodic operational sampling of suitable performance. Typically, at least one satisfactory approach should have been accomplished within a specified period approved for that operator, unless a satisfactory systems ground check has been accomplished. A recording procedure for both satisfactory and unsatisfactory results should be included. Fleet sampling is not acceptable in lieu of specific aircraft assessment. At least one satisfactory low visibility system operational use, or a satisfactory systems ground check, should be accomplished within 6 months, for an aircraft to remain in Category II status.

(3) <u>Initial And Recurrent Maintenance Training</u>. Operator and contract maintenance personnel including mechanics, maintenance controllers, avionics technicians, personnel performing maintenance inspection or quality assurance, or other engineering personnel if applicable, should receive initial and recurrent training as necessary for an effective program. The training curriculum should include specific aircraft systems and operator policies and procedures applicable to low visibility operations. Recurrent training should typically be accomplished at least annually, or when a person has not been involved in the maintenance of the specified aircraft or systems for an extended period (e.g., greater than 6 months). Training may lead to a certification or qualification (e.g., for lower landing minima "LLM") if the operator so designates such qualification in that operator's approved program.

The training should at least include, as applicable:
(a) an initial and recurrent training program for appropriate operator and contract personnel. Personnel considered to be included are maintenance personnel, quality and reliability groups, maintenance control, and incoming inspection and stores, or equivalent organizations. Training should include both classroom and at least some "hands-on" aircraft training for those personnel who are assigned aircraft maintenance duties. Otherwise, training may be performed in a classroom, by computer based training, in simulators, in an airplane or in any other effective combination of the above consistent with the approved program, and considered acceptable to the DGCA.
(b) subject areas for training should include: Operational concepts, aircraft types and systems affected, aircraft variants and differences where applicable, procedures to be used, manual or technical reference availability and use, processes, tools or test equipment to be used, quality control, methods for testing and return to service, signoffs required, proper Minimum Equipment List (MEL) application, general information about where to get technical assistance as necessary, necessary coordination with other parts of the operator's organization (e.g., flight

operations, dispatch), and any other maintenance program requirements unique to the operator or the aircraft types or variants flown (e.g., human factors considerations, problem reporting).

(c) procedures for the use of outside vendors or vendor's parts that ensures compatibility to program requirements and for establishing measures to control and account for parts overall quality assurance.

(d) procedures to ensure tracking and control of components that are "swapped" between systems for trouble shooting when systems discrepancies can not be duplicated. These procedures should provide for total system testing and/or removal of aircraft from lower minimum status.

(e) procedures to assess, track and control the accomplishment of changes to components or systems pertinent to low visibility operations (e.g., ADs, service bulletins, engineering orders, LARs requirements).

(f) procedures to record and report lower minimum operation(s) that are discontinued/ interrupted because of system(s) malfunction.

(g) procedures to install, evaluate, control, and test system and component software changes, updates, or periodic updates.

(h) procedures related to the minimum equipment list (MEL) remarks section use, which identify low visibility related systems and components, specifying limitations, upgrading and downgrading.

(i) procedures for identifying low visibility related components and systems as "required inspection items" (RII), to provide quality assurance whether performed in-house or by contract vendors.

(4) Test Equipment/Calibration Standards. Test equipment may require periodic re-evaluation to ensure it has the required accuracy and reliability to return systems and components to service following maintenance. A listing of primary and secondary standards used to maintain test equipment that relate to low visibility operations should be maintained. It is the operator's responsibility to ensure these standards are adhered to by contract maintenance organizations. Traceability to a national standard or the manufacturer's calibration standards should be maintained.

(5) Return To Service Procedures. Procedures should be included to upgrade or downgrade systems status concerning low visibility operations capability. The method for controlling operational status of the aircraft should ensure that flightcrews, maintenance and inspection departments, dispatch, and other administrative personnel as necessary are appropriately aware of aircraft and system status.

The appropriate level of testing should be specified for each component or system. The manufacturer's recommended maintenance program or maintenance instructions should be considered when determining the role built-in-test-equipment (BITE) should play for return to service (RTS) procedures, or for use as a method for low visibility status upgrade or downgrade.

Contract facilities or personnel should follow the operator's DGCA approved maintenance Control System prior to certification of a maintenance release returning the aircraft to service. The operator is responsible for ensuring that contract organizations and personnel are appropriately trained, qualified, and authorized.

(6) Periodic Aircraft System Evaluations. The operator should provide a method to continuously assess or periodically evaluate aircraft system performance to ensure satisfactory operation for those systems applicable to Category II. An acceptable method for assuring satisfactory performance of a low visibility flight guidance system (e.g., autoland or HUD) is to periodically use the system and note satisfactory

performance. A reliable record such as a logbook entry or computer ACARS record showing satisfactory performance within the previous 6 months for Category II is typically an acceptable method for assuring satisfactory system operation.

Periodic flight guidance system/autoland system checks should be conducted in accordance with procedures recommended by the airframe or avionics manufacturer, or by an alternate procedure approved by the DGCA. For periodic assessment, a record should be established to show when and where the flight guidance/autoland system was satisfactorily used, and if performance was not satisfactory, to describe any remedial action taken.

Use of the flight guidance/automatic landing system should be encouraged to assist in maintaining its availability and reliability.

Reliability Reporting And Quality Control.

(7) Reliability Reporting -Category I. No special "Reliability Reporting or Quality Control" requirements are applicable to Category I.

(8) Reliability Reporting -Category II. For a period of 1 year after an applicant has been authorized for Category II, a monthly summary should be submitted to the DGCA. The following information should be reported:

- (a) the total number of approaches tracked, the number of satisfactory approaches tracked, by aircraft/system type, and visibility (RVR), if known or recorded.
- (b) the total number of unsatisfactory approaches, and reasons for unsatisfactory performance, if known, listed by appropriate category(e.g., poor system performance, aircraft equipment problem/failure; ground facility problem, ATS handling, lack of critical area protection, or other).
- (c) the total number of unscheduled removals of components of the related avionics systems.
- (d) reporting after the initial period should be in accordance with the operators established reliability and reporting requirements.

(9) Configuration Control/System Modifications. The operator should ensure that any modification to systems and components approved for low visibility operations are not adversely affected when incorporating software changes, service bulletins, hardware additions or modifications. Any changes to system components should be consistent with the aircraft manufacturer's, avionics manufacturer's, industry or DGCA accepted criteria or processes.

(10) Records. The operator should keep suitable records (e.g., both the operator's own records and access to records of any applicable contract maintenance organization). This is to ensure that both the operator and DGCA can determine the appropriate airworthiness configuration and status of each aircraft intended for Category II operation.

Contract maintenance organizations should have appropriate records and instructions for coordination of records with the operator.

Foreign Operator Maintenance Programs.

(11) Maintenance of Foreign Registered Aircraft. For operators of Foreign registered aircraft, the cognizant Civil Aviation Authority is the CAA of the operator. For those situations, the DGCA may implicitly accept that the maintenance program is considered to be acceptable if the cognizant CAA has approved it, and if the operator or CAA indicates that the program meets Lebanese criteria, Lebanese equivalent criteria (e.g., criteria such as JAA criteria), or ICAO criteria (e.g., Annex 6 and Doc 9365/AN910 "Manual of All Weather Operations"), and the cognizant CAA has authorized Category II Lebanese operations. The DGCA then issues the pertinent Part VII, Subpart 1 of the LARs Category II OpSpec based on the other CAAs approval for that operator. However, the DGCA reserves the prerogative to assure competence of both the operator depending on whether the CAA or operator are considered to be from a U.S. category 1, 2, or 3 or equivalent, country (safety classification not a low visibility landing classification), and if there have been any reported problems with the operator or CAA. Evidence of the operator satisfying or being consistent with the manufacturer's recommended maintenance program should serve as evidence of an acceptable maintenance program, regardless of the capability of the CAA or the operator, unless the DGCA has specifically addressed maintenance requirements beyond those of the manufacturer for that aircraft type (e.g., required service bulletin compliance or Airworthiness Directive compliance related to the flight guidance system).

(12) Maintenance of Foreign Operated Lebanese “OD” Registered Aircraft. Foreign operators of Lebanese "OD" Registered Aircraft should have maintenance programs equivalent to that required for a Lebanese Part VI and VII of the LARs operator. DGCA Approval of Category II OpSpecs for a Part VI and VII, of the LARs operator may implicitly be considered to also accept the maintenance program adequacy. The DGCA is ultimately the cognizant CAA for the maintenance program in this instance, if the aircraft is OD registered. The DGCA may however, accept the oversight of the operators CAA if that CAA is judged by the DGCA to have equivalent processes, criteria and procedures for oversight of maintenance programs (e.g., JAA countries). The basis for any such maintenance program should be the recommended airframe manufacturer (or avionics vendor) program, considering any adjusted MRB requirements.

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DIVISION VIII - APPROVAL OF LEBANESE OPERATORS.

Approval for Category I and II is through issuance of, or amendments to, OpSpecs. The authorizations, limitations, and provisions applicable to Category I and II operations are specified in Part C of the OpSpecs. Sample OpSpecs are provided in Part VI, Subpart 2, Division XV.

Operations specifications authorizing turbojet, turbofan, propfan, reciprocating and turbopropeller-powered airplane Category I operations that use ICAO standard NAVAIDs and ASRs and PARs are approved by the DGCA following satisfactory completion of the pertinent items below. All Category II operations and operations using NAVAIDs which are not ICAO-standard NAVAIDs (e.g., Loran C, ARA, OSAP and TLS) DGCA review and concurrence before approval.

(1) Operations Manuals and Procedures. Appropriate Flightcrew Operating Manuals, Aircraft Flight Manuals, Policy Manuals, Aircraft Checklists, Quick Reference Checklists, Maintenance Manuals, Training Manuals or other equivalent operator documents (as necessary), must satisfactorily incorporate pertinent Category I and II provisions prior to Category I and II approval.

(a) Manuals**.** Prior to approval, appropriate flightcrew operating manuals, flight manuals, airline policy manuals, maintenance manuals, training manuals, and related aircraft checklists, quick reference handbooks, or other equivalent operator information, must satisfactorily incorporate provisions pertinent to each category of operation.

Information covered in ground training, and procedures addressed in flight training should be available to crews in an appropriate form for reference use.

(b) Procedures**.** Prior to approval of Category I or II operations, provisions of Division IV of this Appendix for procedures, duties, instructions, or any other necessary information to be used by flightcrews should be implemented by the operator.

Crewmember duties during the approach, flare, rollout, or missed approach should described. Duties should at least address responsibilities, tasks of the pilot flying the aircraft and the pilot not flying the aircraft during all stages of the approach, landing, rollout and missed approach. The duties of additional crewmembers, if required, should also be explicitly defined.

Specification of crewmember duties should address any needed interaction with dispatch or maintenance (e.g., addressing resolution of aircraft discrepancies and return to Category II/III service).

The applicant's qualification program should incorporate specific procedural responsibilities, appropriate to each category of landing minima being implemented, for the pilot in command and second in command in each of the ground training subject areas listed in Division V, Section (1) of this Appendix**,** and each of the flight training subject areas listed in Division V, Section (18) of this Appendix.

(2) Training Programs and Crew Qualification. Training programs, crew qualification and checking provisions and standards, differences qualification if applicable, check airmen qualification, line check, route check, and IOE programs should each satisfactorily incorporate necessary Category I and II

provisions, as applicable (see Division V, Section (1) through Division V, Section (43) of this Appendix). An acceptable method to track pertinent crewmember Category I and II qualification must be established.

For manually flown Category I and II systems (HUD FDs, etc.,) assure that provisions are made for each flight crewmember to receive the appropriate training, qualification, and line experience before that particular crewmember is authorized to use the pertinent Category I and II minima.

(3) Dispatch Planning (e.g., MEL, Alternate Airports, ETOPS). Appropriate provisions for MELs and CDLs should be made as necessary to address Category I and II operations. Dispatch procedures to ensure appropriate weather, field condition, facility status, NOTAM information, engine-out MAP performance, crew qualification, aircraft system status, and fuel planning pertinent to Category I and II should be implemented. For ETOPS operations, a satisfactory method to address Division VI, Section (1) of this Appendix should be demonstrated.

(4) Formulation of Operations Specification Requirements (e.g., RVR limits, DA (H) or MDA (H), equipment requirements, field lengths). Proposed OpSpecs should list pertinent approved airports/runways, RVR limits, required transmissometers, DA (H) use provisions, "Inner Marker based DH" provisions (if applicable), aircraft equipment provisions for "normal" and, if applicable, "engine-out" operations, landing field length provisions, and any other special requirements identified by the DGCA (ETOPS Category II, etc.). The operator's manuals, procedures, checklists, QRHs, MELs, dispatch procedures etc. must be shown to be consistent with the proposed OpSpecs.

(5) Operational/Airworthiness Demonstrations. Appropriate "aircraft system suitability" and "operational use suitability" demonstrations must be completed as described in Division VIII, Section (6) and (7) of this Appendix, unless otherwise specified by the DGCA. The purpose of these operational demonstrations is to determine or validate the use and effectiveness of the applicable aircraft flight guidance systems, training, flightcrew procedures, maintenance program, and manuals applicable to the program being approved. Operators of aircraft having an Authority's approved AFM referencing criteria acceptable to the Minister as the criteria used as the basis for Category I or II airworthiness demonstration already are considered to meet provisions Division VIII, Section (6) of this Appendix, and typically need only address provisions of Division VIII, Section (7) of this Appendix for verification of operational use suitability.

(6) Aircraft System Suitability Demonstration. Lebanese Aviation Regulations addressing low visibility takeoff and landing requirements and Category I and II are primarily operating rules addressed by Parts VI and VII. These provisions apply continuously, as defined at the time of a particular operation. Airworthiness rules primarily apply at the time a "certification basis" is established for TC or STC and do not necessarily reflect "present" requirements, except through issuance of AD's. Accordingly, operationally acceptable demonstrations addressing suitability of aircraft systems for Category I and II, as applicable, must be successfully completed initially, and acceptable system status must be maintained by an operator to reflect compliance with current operating rules, to initially operate or continue to operate to Category I and II minima.

To minimize the need for repeating initial aircraft system operational suitability demonstrations for each operator, aircraft system suitability is usually demonstrated in conjunction with airworthiness approval (TC or STC) of aircraft system components such as flight guidance systems, autoland, flight directors, HUDs, flight instrument and alerting systems, radio altimeters, inertial systems, and air data systems. This approach to determination of aircraft system suitability is taken to optimize use of analysis and flight demonstration resources for operators, aircraft manufacturers, avionics manufacturers, and DGCA. Accordingly, aircraft system suitability is normally demonstrated through an initial airworthiness demonstration meeting applicable provisions of Attachments to this Appendix (or combined airworthiness/operational evaluation for new systems or concepts, or where otherwise necessary).

Acceptable results of airworthiness evaluations are described in Section 3 (Normal and Non-Normal Procedures) of the approved AFM or AFM Supplement. For ILS precision approaches, basic type certification of an aircraft for "IFR" is considered to satisfactorily demonstrate Category I. For other systems or sensors, (HUD, GNSS etc.), other demonstrations per the Attachments of this Appendix may be requested for Category I. The DGCA should assure that aircraft proposed for Category I and II have completed such an appropriate aircraft system operational suitability demonstration, and that result should normally be reflected in the approved AFM or AFM Supplement, unless otherwise specified by the DGCA.

Certain foreign manufactured aircraft, AFM provisions applicable to Category I should be verified by AFM review. Provisions for Category II may vary. In certain instances, AFM provisions may not be consistent with Lebanese policy or rules applicable to Category I or II. In such instances, the DGCA will provide appropriate guidance to operators regarding applicability of various AFM provisions (e.g., DH and RVR limitations, acceptable NAVAID use, alerting system use, required versus recommended crew procedures). As a general guideline, AFMs meeting standards recognized by the U.S FAA (JAA, UK - CAA, France - DGAC, Canada - DOT etc.) may be accepted without further demonstration.

In the event of special circumstances such as DGCA Category I or II acceptance of an aircraft certificated by an airworthiness authority which has only foreign AFM IFR approval, or acceptance of additional credit for existing systems, operational assessments in accordance with criteria in this Appendix, or equivalent criteria, may be necessary. In such instances, the DGCA specifies applicable criteria.

(7) "Operator Use Suitability" Demonstration. At least one hundred (100) successful landings should be accomplished in line operations using the Category I, II or Category III system installed in each aircraft type. Demonstrations may be conducted in line operations, during training flights, or during aircraft type or route proving runs.

If an excessive number of failures (e.g., unsatisfactory landings, system disconnects) occur during the landing demonstration program, a determination should be made for the need for additional demonstration landings, or for consideration of other remedial action (e.g., procedures adjustment, wind constraints, system modifications).

The system should demonstrate reliability and performance in line operations consistent with the operational concepts specified in Division II of this Appendix. In unique situations where the completion of 100 successful landings could take an unreasonably long period of time due to factors such as a small number of aircraft in the fleet, limited opportunity to use runways having appropriate procedures, and equivalent reliability assurance can be achieved, a reduction in the required number of landings may be considered on a case-by-case basis. Reduction of the number of landings to be demonstrated requires a justification for the reduction, and approval by the DGCA.

Landing demonstrations should be accomplished on international facilities acceptable to the DGCA. However, at the operator's option, demonstrations may be made on other runways and facilities if sufficient information is collected to determine the cause of any unsatisfactory performance (e.g., critical area was not protected). No more than 50 percent of the demonstrations may be made on such facilities.

If an operator has different models of the same type of aircraft utilizing the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft, the operator should show that the various models have satisfactory performance, but the operator need not conduct a full operational demonstration for each model or variant.

(8) Data Collection For Airborne System Demonstrations**.** Each applicant should develop a data collection method (e.g., form to be used by flightcrew) to record approach and landing performance. The resulting data and a summary of the demonstration data should be made available to the DGCA for evaluation. The data should, as a minimum, include the following information:

(a) inability to initiate an approach or identify deficiencies related to airborne equipment.
(b) abandoned approaches. Give the reasons and altitude above the runway at which approach was discontinued or the automatic landing system was disengaged.
(c) this data should also include any system abnormalities which required manual intervention by the pilot to ensure a safe touchdown or touchdown and rollout, as appropriate.

(9) Data Analysis. Unsatisfactory approaches using facilities approved for Category II or Category III where landing system signal protection was provided should be fully documented. The following factors should be considered:

(a) ATS Factors. ATS factors that result in unsuccessful approaches should be reported. Examples include situations in which a flight is vectored too close to the final approach fix/point for adequate localizer and glide slope capture, lack of protection of ILS critical areas, or ATS requests the flight to discontinue the approach.
(b) Faulty NAVAID Signals. NAVAID (e.g., ILS localizer) irregularities, such as those caused by other aircraft taxiing, over-flying the NAVAID (antenna), or where a pattern of such faulty performance can be established should be reported.
(c) Other Factors. Any other specific factors affecting the success of Category III operations that are clearly discernible to the flightcrew should be reported. An evaluation of reports discussed in Division VIII, Section (7) of this Appendix will be made to determine system suitability for further Category III operations.

(10) Eligible Airports and Runways. For Category I, Airports and Runways are eligible as specified in ICAO accepted international procedures at foreign airports, or special procedures in OpSpecs. For Category II, an assessment of eligible airports, runways, and aircraft systems must be made in order to list appropriate runways on OpSpecs. For Category II, runways authorized for particular aircraft in accordance with existing operations listed on the DGCA (TBD) Category II status checklist may be directly incorporated in OpSpecs. Aircraft type/runway combinations not shown should be verified by aircraft system use in line operations at Category I or better minima, prior to authorization for Category II. Airports/aircraft types restricted due to special conditions (e.g., irregular underlying terrain) must be evaluated in accordance with Attachment 7, prior to OpSpec authorization.

If applicable, the operator should identify any necessary provisions for periodic demonstration of the aircraft system on runways other than those having Category II or III procedures (e.g., periodic autoland performance verification, using runways served only by a Category I procedure).

(11) Irregular Pre-Threshold Terrain and Other Restricted Runways**.** Airports/runways with irregular pre-threshold terrain, or runways restricted due to NAVAID or facility characteristics may require special

evaluation, or limitations. Operators desiring operations on these runways should contact the DGCA to identify pertinent criteria and evaluation requirements. Various procedures used by the DGCA to assess irregular pre-threshold terrain are described in Attachment 7.
(12) Engine-Out Operations and ETOPS Category II Alternates. Engine-out Category II operations may be approved in accordance with the provisions of Division III, Section (26) and (27) of this Appendix**.** The DGCA should ensure that approved AFM includes provisions indicating that an engine-out Category II capability has been demonstrated, and the following conditions are met:

Operations should be in accordance with the applicable AFM (e.g., within demonstrated wind limits, crew procedures such as "re-trim" requirements are incorporated).

Demonstrated/acceptable configurations must be used (e.g., AFDS modes, flap settings, electrical power sources, and MEL provisions).

Weight/Altitude/Temperature (WAT) limits should be established that conservatively assure obstacle clearance, or engine-out missed approach obstacle clearance should be assessed from at least the lowest applicable DA (H), considering aircraft performance and the intended missed approach flight path. Engine-out missed approach obstacle clearance should also be assessed from the end of the touchdown zone. This is to address the potential for a balked or rejected landing or go around (e.g., engine failure during a go-around that may have been due to an air traffic clearance, blocked runway, or loss of visual reference).

Appropriate training program provisions for engine inoperative approaches must be addressed (see Division V, Section (48) of this Appendix)**.**

Crews must be aware that they are expected to take the safest course of action, in their judgment, in the event that unforeseen circumstances, or unusual conditions occur that are not addressed by the "engine-out" Category II demonstrated configuration (uncertain aircraft damage, possible fire, weather deterioration, etc.). "Engine-out Category II authorization" for a twin engine turbine aircraft should not be interpreted as requiring a crew to land at the "nearest suitable" airport in time based on using engine out Category II capability.

OpSpecs must identify the type of "engine-out" Category II operations authorized (e.g., Dispatch for engine-out Category I and II as a takeoff, en route, or destination alternate; initiation of an "engine-out" Category II approach with a failure prior to a FAF; or continuation of an approach with an "engine-out" occurrence after passing a FAF - see Part VI, Subpart 2, Division XV)**.**

Four cases are useful in considering engine inoperative Category II capability, and engine inoperative approach authorization:

(a) when "dispatch planning" or preflight planning is based on aircraft configuration, system reliability, and capability of the aircraft, operator, and crew for "Engine inoperative Category II" a DGCA authorization for "Engine inoperative Category II" should specifically be addressed in OpSpecs.

(b) when an engine fails en route, but prior to final approach, either OpSpec authorization for Engine-inoperative Category II, or use of the Captain's "emergency authority," as the safest course of action, may be used as a basis for conduct of a Category II engine-inoperative approach.

(c) when an engine fails during an approach, after passing the final approach fix, but prior to reaching DA (H), continuation of an approach in expected conditions below Category I minima may only be based on use of OpSpec authorization for "Engine-inoperative Category II", or use of the Captain's "emergency authority", as the safest course of action.
(d) when an engine fails during approach, after passing the applicable DA (H), continuation of an approach and landing is at the discretion of the pilot, if the pilot determines that continuation of that approach is a safe course of action.

Division III, Section (28) of this Appendix provides airworthiness criteria for demonstration of Category II engine out capability. Division VIII, Section (13) through (17) of this Appendix address criteria for use of aircraft with "engine inoperative Category II" capability.

(13) General Criteria for Engine-Inoperative Category II Authorization. Aircraft capability for "engine-inoperative Category II" should be approved in accordance with the provisions of Division III, Section (28) of this Appendix, or Attachment 3.

Regardless of whether an operator is or is not operationally authorized for "engine inoperative Category II," it must be clear that having this aircraft capability should not be interpreted as requiring a Category II landing at the "nearest suitable" airport in time (e.g., Does not require landing at the nearest suitable Category II airport.

The DGCA should ensure that the following conditions are met:
(a) operations must be in accordance with the "engine inoperative Category II" AFM provisions (e.g., within demonstrated wind limits, using appropriate crew procedures).
(b) demonstrated/acceptable configurations must be used (e.g., AFDS modes, flap settings, electrical power sources, MEL provisions).
(c) WAT limits must be established, and Engine-inoperative Missed Approach obstacle clearance from the TDZ must be assured.
(d) appropriate training program provisions for engine inoperative approaches must be provided (see Division V, Section (58) of this Appendix).
(e) crews must be aware that they are expected to take the safest course of action, in their judgment, in the event that unforeseen circumstances, or unusual conditions occur that are not addressed by the "engine-inoperative" Category II demonstrated configuration (e.g., uncertain aircraft damage, possible fire, weather deterioration).
(f) operations Specifications must identify the type of "engine-inoperative" Category II operations authorized. Types of operations are described in Division VIII, Section (8) through (17) of this Appendix.

(14) Engine Inoperative "Dispatch Planning." Dispatch may consider "engine inoperative Category II" capability in planning flights for a takeoff alternate, en route (ETOPS) alternate, re-dispatch alternate, destination, or destination alternate only if each of the following conditions are met:
(a) dispatch has determined that the aircraft is capable of engine inoperative Category II.
(b) appropriate procedures, performance, and obstacle clearance information must be provided to the crew to be able to safely accomplish an engine inoperative missed approach at any point in the approach.

(c) appropriate operational weather constraints must be considered and specified as necessary regarding cross wind, head wind, tail wind limits considering the demonstrated capability specified in the AFM.

(d) weather reports or forecast must indicate that specified alternate minimums or landing minimums will be available for the runway equipped with approved Category II systems and procedures. The operators use of engine inoperative capability credit should consider both the availability and reliability of meteorological reports and forecasts, the time factors involved in potential forecast accuracy, the potential for variability in the weather at each pertinent airport, and the ability for the crew to receive timely weather reports and updates of forecasts en route. Dispatch considerations must account for any expected ATS delays that might be experienced during arrival due to weather, snow removal, or other factors.

(e) notices to airmen or equivalent information for airport and facility status should be reviewed to assure that they do not preclude the accomplishment of a safe engine inoperative approach on the designated runway using approved Category II procedures (e.g., temporary obstructions). Any change in NOTAM status of facilities related to use of landing minima or alternate minima must be provided to the crew in a timely manner while en route.

(f) if the engine inoperative configuration is different than a normal landing configuration, a means to determine the landing distance of the Part VI and Part VII of the LARs distance must be available for the pertinent engine inoperative aircraft configuration (e.g., landing flap setting). This distance is to assure sufficient runway to provide for any limitations on the use of reverse thrust or other factors that could pertain to an inoperative engine landing (e.g., reduced flap settings used for an engine inoperative approach). This data may be based on basic aircraft data otherwise available and need not be re-demonstrated for "engine-out' cases.

(g) the expectation for runway surface condition based on pilot and dispatch interpretation of available weather reports, field conditions, and forecasts is that the applicable runway is likely to be free from standing water, snow, slush, ice, or other contaminants at the time of landing. The flightcrew must be advised of any adverse change in this expectation while en route.

(h) other requirements applicable to "all engine" Category II, such as training, crew qualification, procedures, and other items must also be addressed for the engine inoperative landing case.

(i) the operator is approved for operations based on engine inoperative Category II capability. In addition, operator responsibilities for engine inoperative credit should be equivalent to that of current normal operations when an en route landing system failure causes degraded landing capability. If an inflight failure causes further degradation of engine inoperative landing capability, the flightcrew, or flightcrew in conjunction with airline operations control (e.g., Dispatch) should determine an acceptable alternative course of action (e.g., specification of different en route diversion options, revised fuel reserves plan, or revised flight plan routing).

(j) when engine inoperative Category II provisions are applied to identification of any destination or destination alternate more than one qualifying destination alternate is required. This is to provide for the possibility of adverse area wide weather phenomena, or unexpected loss of landing capability at the first designated alternate airport.

(k) an appropriate ceiling and visibility increment is added to the lowest authorized minimums when credit for an alternate airport or airports is sought (e.g., 200 feet [60 m] DH additive and appropriate RVR additive; see Part VI, Subpart 2, Division XV - Standard Operations Specifications).

It should be noted that even if the aircraft, flightcrews, and operator are authorized for engine inoperative Category II, during an engine out emergency flightcrews are not required to use a Category II approach to satisfy requirements of Part VI or Part VII of the LARs. Crews may elect to take a safe course of action by landing at a more distant airport than one at which a Category II approach may be required. Conversely, crews may elect to conduct the Category II approach as the safest, or a safe course of action.

(15) Engine Inoperative En route. For engine failure en route, a pilot may initiate an "engine inoperative" Category II approach under the following conditions:

(a) the airplane flight manual normal or non-normal sections specify that engine inoperative approach capability has been demonstrated and procedures are available.
(b) the operator or pilot has taken into account the landing runway length needed for the inoperative engine configuration and corresponding approach speeds, and obstacle clearance can be maintained in the event of a missed approach.
(c) the pilot determines that the approach can be conducted within the wind, weather, configuration, or other relevant constraints demonstrated for the configuration.
(d) the pilot has determined from interpretation of the best available information that the runway is expected to be free from standing water, snow, slush, ice, or other contaminants.
(e) the pilot is confident that the aircraft has not experienced damage related to the engine failure that would make an engine inoperative Category II approach unsuccessful, or unsafe.
(f) the operator is approved and the pilot is qualified to conduct a Category II engine inoperative approach.
(g) the pilot considers that conducting a Category II approach is a safe and appropriate course of action.

(16) Engine Failure During Approach, Prior to Reaching Decision Altitude (Height). If the aircraft, operator, and crew meet Division III, Section (28) for the aircraft and Division VIII, Section (14) or (15) of this Appendix for operational use, a Category II approach may be continued if an engine failure is experienced after passing the final approach fix or point.

In the event that an aircraft has not been demonstrated for engine inoperative Category II approach capability, or the operator or crew have not been authorized for Category II engine inoperative approaches, then continuation of an approach in the event of an engine failure is permitted only in accordance with the emergency authority of the pilot to select the safest course of action.

Information Note: *For some aircraft configurations, it may be necessary to discontinue the approach after passing the final approach fix or final approach point; re-trim the aircraft for an inoperative engine, and then re-initiate the approach in order to be able to appropriately complete a satisfactory Category II landing.*

(17) Engine Failure After Passing Decision Altitude (Height). If an engine fails after passing the DA (H), the procedure specified in the airplane flight manual for normal or non-normal operations should be followed. All Category II approvals must consider the case of engine failure at or after DA (H). Standard OpSpecs are considered to address this case. "Engine inoperative Category II capability" is not specifically a factor in determining response to this situation.
(18) New Category II Operators. New operators should follow demonstration period provisions of Division VIII, Section (7) of this Appendix. Additionally, typical acceptable minima step down provisions approvable by the DGCA are as follows:

(a) starting from "limited Category I" (e.g., 300 feet [75 m] DA (H) and one mile visibility) to lowest Category I minima (e.g., 200 feet [60 m] DA (H) and RVR 1800):

First 250 feet [75 m] DA (H) and RVR3000, and then DA (H) 200 feet [60 m] and RVR1800 [550 m].

(b) starting from Category I to Category II:
First DH 150 [30 m] /RVR1600 [500 m] , then DH 100 [30 m] and RVR1200 [350 m]

(c) starting from Category I for Category III:
See Appendix II.

Each runway/procedure not already being used by any operator of a similar type aircraft should be successfully demonstrated by a line service or an evaluation approach using the Category II system and procedures, in Category I or better conditions, for each applicable aircraft/system type (e.g., B767, L1011). In addition, the operator must address special airports/runways as noted in the DGCA Category II/Category III Status Checklist (TBD).

(19) Credit for Experienced Category II or Category III Operators for New Category II Authorizations. Experienced operators are considered to be those operators having successfully completed their initial 6 month/100 Category II or III approach or landing demonstration period, and have current OpSpecs authorizing use of lowest applicable or intended Category II minima.

Division VIII, Section (20) through (22) of this Appendix address examples of program changes where "experienced operator" credit may apply.

Operators authorized for Category II using one class of system (e.g., autopilot) but who are introducing a significantly different class of system as the basis for a Category II authorization (e.g., manually flown Category II approaches using a HUD) are typically considered to be "New operators" for the purposes of demonstration period provisions and acceptable minima "step down" provisions for that class of system Division VIII, Section (18) of this Appendix.

(20) New Airports/Runways. For ILS, Category I or II operations may be conducted at facilities with a published SIAP, or equivalent, without additional demonstration. For other systems, new airports/runways may be added to an experienced Category II operators OpSpecs without further demonstration, if the same or equivalent aircraft/aircraft system for the approach are shown on the Category II status checklist (HUD, GNSS etc.). Otherwise, the operator needs to accomplish a line service landing at Category I or better to assure satisfactory performance. Special runways on the Category II checklist (Irregular terrain runways, etc. may still require special evaluation**.** See Division VIII, Section (11) of this Appendix.

(21) New Aircraft Systems. Unless otherwise specified by the DGCA, experienced Category II operators may initially use new or upgraded aircraft system capabilities/components to the lowest authorized minima established for those systems or components, or use reduced length demonstration periods, consistent with the new aircraft systems to be used.

(22) Adding a New Category II Aircraft Type. Experienced Category II operators may operate new or upgraded aircraft types/systems, or derivative types, using reduced length demonstration periods (e.g., less than 6 months/100 landings) when authorized by the DGCA. Demonstration requirements are established considering any applicable Flight Standards Board criteria, applicability of previous operator service experience, experience with that aircraft type by other operators, experience of crews of that operator for Category II and the type of system, and other such factors, on an individual basis. Appropriate minima reduction steps may also be established for an abbreviated demonstration period, consistent with prior operator experience, NAVAIDs and runways used, and procedures to be used, etc.

(e.g., Newly acquired B757s being added to Category II OpSpecs, in addition to an operator's currently approved Category II A300 and MD-80 fleets).
(23) Category II Program Status Following Operator Acquisitions/Mergers**.** Category II operators involved in acquisitions of other operators, or mergers, and the DGCA must assure compatibility of programs, procedures, aircraft systems, runways served and any other relevant issues before amending OpSpecs, or advising the surviving or controlling operator of the status of Category II OpSpecs of the acquired or merged operator.
(24) Initiating Combined Category I and II, or Category I, II, and III Programs for New Equipment Types. When appropriate provisions of this Appendix, as amended, are used for Category I and II programs for a new equipment type (e.g., HUD) those programs may be initiated simultaneously for either a new Category II or Category II/III operator, or for an existing operator currently approved for Category II or III using other systems (e.g., ILS/FD).
(25) Lebanese Carrier Category I and II Operations at Foreign Airports. An applicant having Lebanese Category I and II approval may be authorized to use that minima at foreign airports in accordance with its OpSpecs.

Once approved, the operator must comply with both Lebanese Aviation Regulations and local requirements. The operator must also ensure current status information for NOTAMs are available and advise the DGCA of incompatible requirements.

Although it is recognized that the systems at foreign airports may not be exactly in accordance with Lebanese standards, it is important that any foreign facilities used for Category II provide the necessary information or functions consistent with the intent of the Lebanese standards. Carriers desiring Category II approvals at foreign airports or runways not on the DGCA approved list should submit such requests to the DGCA.

Figure 11. provides a checklist for carriers use to facilitate approval of Category II/III operations at facilities listed in the controlling states Aeronautical Information Publication (AIP). It should be used to ensure suitability of the intended facility and to verify conformance or equivalence with Lebanese standards at non-Lebanese airports. Completion of this checklist must reflect achieved or completed status - not planned actions. For ICAO states that do not maintain an AIP, a copy of the NOTAM, obstruction data, and/or a reliable and regular method of correspondence with the charting services used by Lebanese certificate holders must be attached.

Figure 11.

FACILITY CHECKLIST FOR CATEGORY II/III
(FOR NON-LEBANESE FACILITIES)

AIRPORT (ICAO ID): ________ COUNTRY: ______________ DATE: ______________

Runway: ________ Length: _________ Width: _________ G/S Angle (deg.): ___________

Lowest Minima ________________________ (ft/m) Runway TCH _______________ (ft/m)

Special Limitations (if any):
____.

LIGHTING:
Approach _____ TDZ _____ Centerline ____ HIRL ____ Stopbars _____

Other (e.g., PAPI):
________________________________.

MARKINGS:
Runway_______ Taxiway_______ Other (e.g., Taxiway Position) ______________

Critical Area Protection Policy (ceiling/visibility or conditions):
LOC ____________________________ G/S _______________________________________

METEROLOGICAL DATA: METARs ________ TAFs ___________
TRANSMISSOMETERS:

(Locations/Lowest RVR reported /readout step increment)

Touchdown _______________ Mid _________________ Rollout _________________________

OBSTRUCTION CLEARANCE ASSESSMENT COMPLETION DATE: ___________________
Verified by: certificate holder ________, "state of the aerodrome" __________, other __________
Irregular terrain a factor (Y/N): _______ Similar type aircraft currently operate (Y/N) __________

NOTAM SOURCE/CONTACT: ____
FIELD CONDITIONS SOURCE/CONTACT ____

Attached procedure has been developed in accordance with:
ICAO PANS-OPS Doc. 8168-OPS/611, Vol-11 ____
Other Criteria Accepted by DGCA ____ (indicate criteria) _________________________________

Facility reviewed in accordance with ICAO Manual of All Weather Operations, as revised
(DOC 9365/AN910) Chapters 3, 5, and 6 DATE REVIEW COMPLETED: ____________________

Name: ___________________
Title: ____________________
Signature: ________________
Date: ____________________

Attachments List:

(26) Category I and II Operations on Off-Route Charters. Unless otherwise specified by the DGCA, experienced Category I operations using non-traditional systems (HUD, GNSS etc.) and Category II operators may receive authorization to use Category I and II minima at off-route charter airports and runways as follows:

- (a) the runway has a published SIAP, or equivalent, or
- (b) the runway must be on the DGCA Category II status checklist, and not require special evaluation, or
- (c) the aircraft used must be the same as or equivalent to an aircraft already using the facility by other Lebanese operators (e.g., an off route charter with a B737/GNSS) could operate to runways having Category I and II Operations by an other operators B737-300 using same or equivalent system).

The OpSpec must authorize off-route charter Category I or II procedures, and

If applicable, the DGCA must be advised of the specific airports, aircraft, crew qualifications and any special provisions to be used, prior to the intended operation.

(27) Approval of Category I and II Minima. Applicants should submit documentation requesting approval to the Director General of Civil Aviation (DGCA). The application should demonstrate compliance with the appropriate provisions of applicable sections of this Appendix, particularly Divisions V through X of this Appendix. Proposed OpSpecs provisions should be included with the application.

Following DGCA concurrence, as described in Division VIII above, OpSpecs authorizing Category I or II minima may be issued (See Part VI, Subpart 2, Division XV for sample OpSpecs).

During the period following the issuance of new or revised OpSpecs for Category II (typically 6 months), the operator must successfully complete a suitable operations demonstration and data collection program in "line service" for each type aircraft, as the final part of the approval process.

The approval process is considered to be completed following a successful demonstration period. This is to ensure appropriate performance and reliability of the operator’s aircraft, procedures, maintenance, airports, and NAVAIDs. This process must be completed before operations down to lowest requested minima are authorized. Division VIII, Section (5) addresses appropriate demonstration process criteria.

When the data from the operational demonstration has been analyzed and found acceptable, an applicant may be authorized the lowest requested minima consistent with this Appendix and applicable standard OpSpecs. Examples of minima step down provisions acceptable to the DGCA are provided at Division VIII, Section (18) and (19).

(28) Operations Specification Amendments. The operator is responsible for maintaining current OpSpecs reflecting current approvals authorized by the DGCA. Once the DGCA has authorized a change for aircraft systems, new runways, or other authorizations, appropriate and timely amendments to affected OpSpecs should be issued. Issuance of amendments to guidance or procedures in other related material such as the Flight Operations Manual or Training Program may also be required. When updated standard OpSpecs provisions are adopted by the DGCA, provisions of those updated OpSpecs should normally be applied to each operator's program in a timely manner.

(29) Use of Special Obstacle Clearance Criteria (e.g. MASPS, or Non-standard RNP Criteria). This section addresses use of special criteria such as "Required Navigation Performance" (RNP) criteria. Pending implementation of RNP criteria for public use Standard Instrument Approach Procedures (SIAPS), obstacle assessments using RNP criteria will be conducted on a case-by-case basis, only authorized as an element of special procedures for RNP qualified operators, using RNP qualified aircraft. Early application of RNP for special procedures is typically intended to apply to instrument procedure segments classified as a transition to a final approach segment, or to facilitate definition of suitable missed approach segments. Use of special obstacle clearance criteria or non-standard RNP criteria must be approved by the DGCA.

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DIVISION IX - OPERATOR REPORTING, AND TAKING CORRECTIVE ACTIONS

(1) Operator Reporting. The reporting of satisfactory and unsatisfactory Category II aircraft performance is a useful tool in establishing and maintaining effective maintenance and operating policy and procedures. Additionally, when maintained over longer periods of time the report data substantiates a successful program and can identify trends, or recurring problems that may not be related to aircraft performance. Information obtained from reporting data and its analysis is useful in recommending and issuing appropriate corrective action(s).

Accordingly, for a period of at least 1 year after an applicant has been advised that its aircraft and program meet Category II requirements, and reduced minima are authorized, the operator is to provide a monthly summary to the DGCA of the following information:

(a) the total number of approaches where the equipment constituting the airborne portion of the Category II system was used to make satisfactory (actual or simulated) approaches to the applicable Category II minima (by aircraft type).

(b) the total number of unsatisfactory approaches by airport and aircraft registration number with explanations in the following categories - airborne equipment faults, ground facility difficulties, aborts of approaches because of ATS instructions, or other reasons.

(c) notify the DGCA immediately of any system failures or abnormalities that require flightcrew intervention after passing 100 feet [30 m] during operations in weather conditions below Category I minima.

(2) Operator Corrective Actions.

All Programs**.** Operators are expected to take appropriate corrective actions when they determine that aircraft, NAVAID, airport difficulties require program or minima adjustment.

At least the following factors should be considered: NAVAID status or performance problems, NOTAMs, airport facility status, air traffic procedure adjustments, lighting or marking system status, airport construction, adverse weather (snow banks, snow removal, icy runways or taxiways, deep snow in glide slope critical areas, etc.), appropriate limitations or restrictions to minima necessary to assure safe operations.

Category II**.** In addition to the corrective actions contained above, for Category II the operations and maintenance manuals should address any corrections needed. Operators are expected to take appropriate corrective actions when they determine that conditions exist which could adversely affect safe Category II operations. Examples of situations for which an operator may need to take action restricting, limiting, or discontinuing Category II operations include: Repeated aircraft system difficulties, repeated maintenance write-ups, chronic pilot reports of unacceptable landing performance, applicable service bulletin issuance, ADs, NAVAID status or performance problems, applicable NOTAMs, airport facility status change, air traffic procedure adjustment, lighting, marking, or standby power system status outages, airport construction, obstacle construction, temporary obstacles, natural disasters, adverse weather, snow banks, snow removal, icy runways or taxiways, deep snow in glide slope critical areas, inability to confirm appropriate critical area protection, and other such conditions.

Examples of appropriate corrective action could be an adjustment of Category II programs, procedures, training, modification to aircraft, restriction of minima, limitations on winds, restriction of NAVAID facility use, adjustment of payload, service bulletin incorporation, or other such measures necessary to assure safe operation.

ATTACHMENT 1

DEFINITIONS AND ACRONYMS

This Attachment contains the definition of terms and acronyms used within this Appendix.

Definitions

Actual Navigation Performance	A measure of the current estimated navigation performance, excluding Flight Technical Error (FTE). Actual Navigation Performance is measured in terms of accuracy, integrity, and availability of navigation signals and equipment. Note: *Also see Estimated Position Uncertainty [EPU]*.
Aeronautical Chart Critical Data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a very low probability of significant error and very high probability of validity [e.g. P_{error} per unit data element <1 X 10^{-8} □
Aeronautical Chart Essential Data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a low probability of significant error and high probability of validity [e.g. P_{error} per unit data element <1 X 10^{-5} □
Aeronautical Chart Routine Data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a routine possibility of significant error and routine validity [e.g. P_{error} per unit data element <1 X 10^{-3} □
Approach Intercept Waypoint (APIWP)	Variable waypoint used only when intercepting the Final Approach Segment (FAS).
Automatic Dependent Surveillance (ADS)	A surveillance technique in which aircraft automatically provide, via data link, data derived from on-board navigation and position fixing systems, including aircraft identification, four dimensional position and additional data as appropriate (ICAO - IS&RP Annex 6).
Alert Height	A height above the runway based on the characteristics of the aircraft and its fail-operational landing system, above which a Category III approach would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the fail operational landing system, or in the relevant ground equipment. (ICAO - IS&RP Annex 6).
Airborne Navigation system	The airborne equipment that senses and computes the aircraft position relative to the defined path, and provides information to the displays and to the flight guidance system. It may include a number of receivers and/or system computers such as a Flight Management Computer and typically provides inputs to the Flight Guidance System.
Automatic Go-Around	A Go-Around which is accomplished by an autopilot following pilot

	selection and initiation of the "Go-Around" autopilot mode, when an autopilot is engaged in an "approach mode".
Availability	An expectation that systems or elements required for an operations will be available to perform their intended functions so that the operation will be accomplished as planned to an acceptable level of probability.
Catastrophic Failure Condition	Failure Condition which would result in multiple fatalities, usually with the loss of the airplane.
Category I	A precision instrument approach and landing with a decision height not lower than 60m (200 ft) and with either a visibility not less than 800m (2400 ft), or a runway visual range not less than 550m (1800 ft). (ICAO - IS&RP Annex 6).
Category II	A precision instrument approach and landing with a decision height lower than 60m (200 ft) but not lower than 30m (100 ft) and a runway visual range not less than 350m (1200 ft). (ICAO - IS&RP Annex 6).
Category IIIa	A precision instrument approach and landing with a decision height lower than 30m (100 ft), or no decision height and a runway visual range not less than 200m (700 ft). (ICAO - IS&RP Annex 6).
Category IIIb	A precision instrument approach and landing with a decision height lower than 15m (50 ft), or no decision height and a runway visual range less than 200m (700 ft) but not less than 50m (150 ft). (ICAO - IS&RP Annex 6).
Category IIIc	A precision instrument approach and landing with no decision height and no runway visual range limitations. (ICAO - IS&RP Annex 6).
Class I Navigation	Navigation within the service volume of an ICAO Standard Navaid.
Class II Navigation	A flight operation or portion of a flight operation (irrespective of the means of navigation) which takes place outside (beyond) the designated Operational Service Volume of an ICAO standard airway navigation facility or Navaid (e.g. VOR, VOR/DME, NDB).
Combiner	The element of the HUD in which the pilot simultaneously views the external visual scene along with synthetic information provided in symbolic form.
Command Information	Information that directs the pilot to follow a course of action in a specific situation (e.g., Flight Director).
Conformal Information	Information which correctly overlays the image of the real world, irrespective of the pilots viewing position.
Datum Crossing Height [DCH]	The height (in feet or meters) of the Flight Path Control Point above the Runway Datum Point.
Decision Altitude (DA)	A specified altitude in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established. (Adapted from ICAO - IS&RP Annex 6).

Decision Altitude (Height) DA(H)	For Category I, a specified minimum altitude in an approach by which a missed approach must be initiated if the required visual reference to continue the approach has not been established. The "Altitude" value is typically measured by a barometric altimeter or equivalent (e.g., Inner Marker) and is the determining factor for minima for Category I Instrument Approach Procedures. The "Height" value specified in parenthesis is typically a radio altitude equivalent height above the touchdown zone (HAT) used only for advisory reference and does not necessarily reflect actual height above underlying terrain. For Category II and certain Category III procedures (e.g., when using a Fail-Passive autoflight system) the Decision Height (or an equivalent IM position fix) is the controlling minima, and the altitude value specified is advisory. The altitude value is available for cross reference. Use of a barometrically referenced DA for Category II is not currently authorized for Part VI and Part VII operations (Adapted from ICAO - IS&RP Annex 6).
Decision Height (DH)	A specified height in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established (Adapted from ICAO - IS&RP Annex 6).
Design Eye Box	The three dimensional volume in space surrounding the Design Eye Position from which the HUD information can be viewed.
Design Eye Position	The position at each pilot's station from which a seated pilot achieves the optimum combination of outside visibility and instrument scan.
Defined Path	The path that is defined by the path definition function.
Desired Path	The path that the flight crew and air traffic control can expect the aircraft to fly.
Enhanced Vision System	An electronic means to provide the flight crew with a synthetic image of the external scene.
Estimate of Position Uncertainty [EPU], or Estimated Position Error [EPE]	A measure based on a scale which conveys the current position estimation performance - Also called Estimated Position Error (EPE)
Extended Final Approach Segment (EFAS)	That segment of an approach, co-linear with the Final Approach Segment, but which extends beyond the Glidepath Intercept Waypoint (GPIWP) or Approach Intercept Waypoint (APIWP).
External Visual Reference	Information the pilot derives from visual observation of real world cues outside the cockpit.
Extremely Improbable	A probability of occurrence less than or equal to 1×10^{-9} per hour of flight, or per event (e.g., takeoff, landing).
Extremely Remote	A probability of occurrence greater than 1×10^{-9} but less than or equal to

	1 x 10^{-7} per hour of flight, or per event (e.g., takeoff, landing).
Fail Operational System	A system capable of completing the specified phases of an operation following the failure of any single system component after passing a point designated by the applicable safety analysis (e.g., Alert Height).
Fail Passive System	A system which, in the event of a failure, causes no significant deviation of aircraft flight path or attitude.
Field of View	As applied to a Head Up Display - the angular extent of the display that can be seen from within the design eye box.
Frequent	Occurring more often than 1 in 1000 events or 1000 flight hours.
Final Approach Course (FAC)	The final bearing/radial/track of an instrument approach leading to a runway, without regard to distance. For certain previously designed approach procedures that are not aligned with a runway, the FAC bearing/radial/track of an instrument approach may lead to the extended runway centerline, rather than to alignment with the runway.
Final Approach Fix (FAF)	The fix from which the final approach to an airport is executed. For standard procedures that do not involve multiple approaches segments intercepting the runway centerline near the runway, the FAF typically identifies the beginning of the straight-in final approach segment.
Final Approach Point (FAP)	The point applicable to instrument approaches other than ILS, MLS or GLS, with no depicted FAF (e.g. only applies to approaches such as an on-airport VOR or NDB), where the aircraft is established inbound on the final approach course from a procedure turn, and where descent to the next procedurally specified altitude, or to minimum altitude, may be commenced.
Final Approach Segment (FAS)	The segment of an approach extending from the Glidepath Intercept Waypoint (GPIWP) or Approach Intercept Waypoint (APIWP), whichever occurs later, to the Glidepath Intercept Reference Point (GIRP).

Flight Guidance System	The means available to the flight crew to maneuver the aircraft in a specific manner either manually or automatically. It may include a number of components such as the autopilot, flight directors, relevant display and annunciation elements and it typically accepts inputs from the airborne navigation system.
Flight Path Alignment Point (FPAP)	The FPAP is a point, usually at or near the stop end of a runway, used in conjunction with the RDP and a vector normal to the WGS-84 ellipsoid at the RDP to define the geodesic plane of a final approach and landing flight path. The FPAP typically may be the RDP for the reciprocal runway
Flight Path Control Point (FPCP)	The Flight Path Control Point (FPCP) is a calculated point located directly above the Runway Datum Point. The FPCP is used to relate the vertical descent of the final approach flight path to the landing runway.
Flight Technical Error (FTE)	The accuracy with which the aircraft is controlled as measured by the indicated aircraft position with respect to the indicated command or desired position. Note: *FTE does not include human performance conceptual errors, typically which may be of large magnitude (e.g. entry of an incorrect waypoint or waypoint position, selection of an incorrect procedure, selection of an incorrect NAVAID frequency, failure to select a proper flight guidance mode)*.
Glide Path Angle [GPA]	The glide path angle is an angle, defined at the FPCP, that establishes the descent gradient for the final approach flight path of an approach procedu is measured in the geodesic plane of the approach (defined by the RDP, F and WGS-84 ellipsoid's center). The vertical and horizontal references fo GPA are a vector normal to the WGS-84 ellipsoid at the RDP and a plane perpendicular to that vector at the FPCP, respectively.
Glide Path Intercept Waypoint (GPIWP)	The point at which the established glide slope intercept altitude (MSL) meets the Final Approach Segment (FAS), on a standard day, using a standard altimeter setting (1013.2 HPa or 29.92 in).
Glidepath Intercept Reference Point [GIRP]	The Glidepath Intercept Reference Point is the point at which the extension of the final approach path intercepts the runway.
GNSS Landing System (GLS)	A differential GNSS (e.g. GPS) based landing system providing both vertical and lateral position fixing capability. Note: *Term may be applied to any GNSS based differentially corrected landing system providing lateral and vertical service for approach and landing equivalent to or better than that provided by a U.S. Type I ILS, or equivalent ILS specified by ICAO Annex 10*.
Global Positioning System [GPS]	The NAVSTAR Global Positioning System operated by the United States Department of Defense. It is a satellite -based radio navigation system composed of space, control and user segments. The space segment is composed of satellites. The control segment is composed of monitor stations, ground antennas and a master control station. The user segment consists of antennas and receiver-processors that derive time and

	compute a position and velocity from the data transmitted from the satellites.
Global Navigation Satellite System [GNSS]	A world wide position, velocity and time determination system that uses one or more satellite constellations.
Guidance	Information used during manual control or monitoring of automatic control of the aircraft that is of sufficient quality to be used by itself for the intended purpose.
Go-around	A transition from an approach to a stabilized climb.
Hazardous Failure Condition	Failure Conditions which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be: (i) A large reduction in safety margins or functional capabilities; (ii) Physical distress or higher workload such that the flight crew cannot be relied upon to perform their tasks accurately or completely; or (iii) Serious or fatal injury to a relatively small number of the occupants.
Head Up Display System	An aircraft system which provides head-up guidance to the pilot during flight. It includes the display element, sensors, computers and power supplies, indications and controls. It may receive inputs from an airborne navigation system or flight guidance system.
Hybrid System	A combination of two, or more, systems of dissimilar design used to perform a particular operation.
Improbable	A probability of occurrence greater than 1×10^{-9} but less than or equal to 1×10^{-5} per hour of flight, or per event (e.g., takeoff, landing).
Independent Systems	A system that is not adversely influenced by the operation, computation, or failure of some other identical, related, or separate system (e.g., two separate ILS receivers).
Infrequent	Occurring less often than 1 in 1000 events or 1000 flight hours.
Initial Missed Approach (IMAWP)	Waypoint used to define the Missed Approach Point (MAP).
Initial Missed Approach Segment	That segment of an approach from the Glide Path Intercept Waypoint (GPIWP) to the Initial Missed Approach Waypoint (IMAWP).
Instantaneous Field of View	The angular extent of a HUD display which can be seen from either eye from a fixed position of the head.
Integrity	A measure of the acceptability of a system, or system element, to contribute to the required safety of an operation.

Landing	For the purpose of this Appendix, landing will begin at 100 ft.[30 m], the DH or the AH to the first contact of the wheels with the runway.
Landing rollout	For the purpose of this Appendix, rollout starts from the first contact of the wheels with the runway and finishes when the airplane has slowed to a safe taxi speed (in the order of 30 knots).
Major Failure Condition	Failure Condition which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be, for example, a significant reduction in safety margins or functional capabilities, a significant increase in crew workload or in conditions impairing crew efficiency, or discomfort to occupants, possibly including injuries.
Minimum Descent Altitude(Height) [MDA(H)]	See individual definitions below for MDA and MDH.
Minimum Descent Altitude (MDA)	A specified altitude in a non-precision approach or circling approach below which descent must not be made without the required visual reference. Minimum Descent Altitude (MDA) is referenced to mean sea level. (ICAO - IS&RP Annex 6).
Minimum Descent Height (MDH)	A specified height in a non-precision approach or circling approach below which descent must not be made without the required visual reference. Minimum Descent Height (MDH) is referenced to aerodrome elevation or to the threshold if that is more than 7 ft. (2m) below the aerodrome elevation. A MDH for a circling approach is referenced to the aerodrome elevation. (ICAO - IS&RP Annex 6).
Minimum Use Height (MUH)	A height specified during airworthiness demonstration or review above which, under standard or specified conditions, a probable failures of a system is not likely to cause a significant path displacement unacceptably reducing flight path clearance from specified reference surfaces (e.g. airport elevation) or specified obstacle clearance surfaces.
Minor Failure Condition	Failure Condition which would not significantly reduce airplane safety and which involve crew actions that are well within their capabilities. Minor Failure Conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some inconvenience to occupants.
Missed Approach	The flight path followed by an aircraft after discontinuation of an approach procedure and initiation of a go-around. Typically a “missed approach” follows a published missed approach segment of an instrument approach procedure, or follows radar vectors to a missed approach point, return to landing, or diversion to an alternate.
Monitored HUD	A HUD which has internal or external capability to reliably detect erroneous sensor inputs or guidance outputs, to assure that a pilot does

	not receive incorrect or misleading guidance, failure, or status information.
Non-Normal Means of Navigation	A means of navigation which does not satisfy one or more of the necessary levels of accuracy, integrity, and availability for a particular area, route, procedure or operation, and which may require use of a pilot's "emergency authority" to continue navigation.
NOTAM	Notice to Airmen - A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. (ICAO - IS&RP Annex 6).
Performance	A measure of the accuracy with which an aircraft, a system, or an element of a system operates compared against specified parameters. Performance demonstration(s) typically include the component of Flight Technical Error (FTE).
Primary Means of Navigation	A means of navigation which satisfies the necessary levels of accuracy and integrity for a particular area, route, procedure or operation. The failure of a "Primary Means" of navigation may result in, or require reversion to a "non-normal" means of navigation, or an alternate level of RNP. NOTE: *Qualification as a "primary means" of navigation typically requires that ANP/EPU be less than RNP for 99.99% of the time*.
Redundant	The presence of more than one independent means for accomplishing a given function or flight operation. Each means need not necessarily be identical.
Remote	A probability of occurrence greater than 1×10^{-7} but less than or equal to 1×10^{-5} per hour of flight, or per event (e.g., takeoff, landing).
Required Navigation Performance (RNP)	A statement of the navigation performance necessary for operation within a defined airspace (Adapted from ICAO - IS&RP Annex 6). NOTE: *Required Navigation Performance is specified in terms of accuracy, integrity, and availability of navigation signals and equipment for a particular airspace, route, procedure or operation*.
Required Navigation Performance Containment (RNP Containment)	RNP Containment represents a bound of the rare-normal performance and specified non-normal performance of a system, typically expressed as 2*RNP (X). When RNP represents Gaussian statistical performance at a level of two sigma (2 x standard deviation), then containment represents a nominal performance bound specified at the level of four sigma (4 x standard deviation). Note: RNP containment use may vary with intended operational applications.
Required Navigation Performance Level or Type	A value typically expressed as a distance in nautical miles from the intended position within which an aircraft would be for at least 95

(RNP Level or RNP Type)	percent of the total flying time (Adapted from ICAO - IS&RP Annex 6). NOTE: *Applications of RNP to terminal area and other operations may also include a vertical and/or longitudinal component. ICAO may use the term RNP Type, while certain other States, aircraft manuals, procedures, and operators may use the term RNP Level.* Example - RNP 4 represents a navigation lateral accuracy of plus or minus 4 nm (7.4 km) on a 95% basis. RNP is typically defined in terms of its lateral accuracy, and has an associated lateral containment boundary.
Required Visual Reference	That section of the visual aids or of the approach area which should have been in view for sufficient time for the pilots to have made an assessment of the aircraft's position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height, the required visual reference is that specified for the particular procedure and operations (ICAO - IS&RP Annex 6 - Decision Height definition - Note 2).
Runway Datum Point (RDP)	The RDP is used in conjunction with the FPAP and a vector normal to the WGS-84 ellipsoid at the RDP to define the geodesic plane of a final approach flight path to the runway for touchdown and rollout. It is a point at the designated lateral center of the landing runway defined by latitude, longitude, and ellipsoidal height. The RDP is typically a surveyed reference point used to connect the approach flight path with the runway. The RDP may or may not necessarily be coincident with the designated runway threshold
Runway Segment (RWS)	That segment of an approach from the glidepath intercept reference point (GIRP) to Flight Path Alignment Point (FPAP).
Situation Information	Information that directly informs the pilot about the status of the aircraft system operation or specific flight parameters including flight path.
Standard Landing Aid (SLA)	In the context of this section of this Appendix, is a navigation service provided by a State which meets internationally accepted performance standards (e.g., ICAO Standards and Recommended Practices (SARPs) or equivalent State standards).
Supplementary Means of Navigation	A means of navigation which satisfies one or more of the necessary levels of accuracy, integrity, or availability for a particular area, route, procedure or operation. The failure of a "Supplementary Means" of navigation may result in, or require reversion to another alternate "normal" means of navigation for the intended route, procedure or operation. NOTE: *Qualification as a "supplementary means" of navigation typically requires that ANP/EPU be less than RNP for 99% of the time.*
Synthetic Reference	Information provided to the crew by instrumentation or electronic displays. May be either command or situation information.

Synthetic Vision System	A system used to create a synthetic image representing the environment external to the airplane.
Take off Guidance System	A system which provides directional command guidance to the pilot during a takeoff, or takeoff and aborted takeoff. It includes sensors, computers and power supplies, indications and controls.
Total Field of View	The maximum angular extent of the display that can be seen with either eye, allowing head motion within the design eye box.
Touch Down Zone (TDZ)	The first 3000 ft.[1000 m] of usable runway for landing, unless otherwise specified by the DGCA, or other applicable ICAO or State authority (e.g for STOL aircraft).
Visual Guidance	Visual information the pilot derives from the observation of real world cues, outside the cockpit and uses as the primary reference for aircraft control or flight path assessment.

Acronyms

ACRONYM	EXPANSION
ABAS	Aircraft Based Augmentation System
ACI	Adjacent Channel Interface
ADS	Automatic Dependent Surveillance
AFCS	Autopilot Flight Control System
AFDS	Autopilot Flight Director System
AFGS	Automatic Flight Guidance System
AFM	Airplane Flight Manual
AH	Alert Height
AHI	All-Weather Harmonization Items
ALS	Approach Light System
ANP	Actual Navigation Performance
APIWP	Approach Intercept Waypoint
APM	Aircrew Program Manager
ARA	Airborne Radar Approach
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATS	Air Traffic Service
AWO	All Weather Operations
CAA	Civil Aviation Authority
CDL	Configuration Deviation List
CL	Centerline Lights
CNS	Communication, Navigation and Surveillance
CRM	Collision Risk Model
CRM	Cockpit Resource Management
DA	Decision Altitude
DA(H)	Decision Altitude(Height)
DCH	Datum Crossing Height
DDM	Difference of Depth Modulation

DEP	Design Eye Position
DGNSS	Differential Global Navigation Satellite System
DH	Decision Height
DME	Distance Measuring Equipment
ECEF	Earth Centered Earth Fixed
EFAS	Extended Final Approach Segment
EGPWS	Enhanced Ground Proximity Warning System
EPE	Estimated Position Error
EPU	Estimated Position Uncertainty
ETOPS	Extended Range Operations with Two-Engine Airplanes
EVS	Enhanced Vision System
FAF	Final Approach Fix
FAP	Final Approach Point
FAS	Final Approach Segment
FBS	Fixed Base Simulator
FHA	Functional Hazard Assessment
FMC	Flight Management Computer
FMS	Flight Management System
FPAP	Flight Path Alignment Point
FPA	Flight Path Angle
FPCP	Flight Path Control Point
FSB	Flight Standardization Board
FTE	Flight Technical Error
GBAS	Ground Based Augmentation System
GCA	Ground Controlled Approach
GIRP	Glidepath Intercept Reference Point
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
GPA	Glide Path Angle
GPIWP	Glide Path Intercept Waypoint
GPWS	Ground Proximity Warning System

GPS	Global Positioning System
HAT	Height above Touchdown
HUD	Head Up Display
IAW	In Accordance With
ICAO	International Civil Aviation Organization
IM	Inner Marker
IMAS	Initial Missed Approach Segment
IMAWP	Initial Missed Approach Waypoint
ILS	Instrument Landing System
INAS	International Airspace System
IRS	Inertial Reference System
IRU	Inertial Reference Unit
JAR AWO	Joint Aviation Regulations – All Weather Operations
LAAS	Local Area Augmentation System
LAD	Local Area Differential
LLM	Lower Landing Minima
MAP	Mode Annunciator Panel
MAP	Missed Approach Point
MASPS	Minimum Aviation System Performance Standards
MCP	Mode Control Panel
MDA	Minimum Descent Altitude
MDA(H)	Minimum Descent Altitude(Height)
MDH	Minimum Descent Height
MEL	Minimum Equipment List
METAR	ICAO Routine Aviation Weather Report
MLS	Microwave Landing System
MMEL	Master Minimum Equipment List
MMR	Multi-mode Receiver
MRB	Maintenance Review Board
MUH	Minimum Use Height
NAS	National Airspace System

NAVAID	Navigational Aid
NDB	Non-directional Beacon
NOTAM	Notice to Airman
NRS	National Resource Specialist
OIS	Obstacle Identification Surface
OSAP	Offshore Standard Approach Procedure
PAR	Precision Approach Radar
PF	Pilot Flying
PIC	Pilot in Command
PIREP	Pilot Weather Report
PNF	Pilot Not Flying
POC	Proof of Concept
QFE	Altimeter Setting referenced to airport field elevation
QNE	Altimeter Setting referenced to standard pressure (1013.2HPa or 29.92")
QNH	Altimeter Setting referenced to airport ambient local pressure
QRH	Quick Reference Handbook
RAIL	Runway Alignment Indicator Light System
RCLM	Runway Center Line Markings
RDMI	Radio Direction Magnetic Indicator
RDP	Runway Datum Point
REIL	Runway End Identification Lights
RII	Required Inspection Item
RMI	Radio Magnetic Indicator
RNP	Required Navigation Performance
RNPx2	RNP Containment Limit (2 times RNP value)
RTCA	Radio Technical Commission for Aeronautics
RTS	Return to Service
RVR	Runway Visual Range
RWS	Runway Segment
SARPS	ICAO Standards and Recommended Practices

SBAS	Space Based Augmentation System
SFL	Sequence Flasher Lights
SIAP	Standard Instrument Approach Procedure
SLA	Standard Landing Aid
SMGCP	Surface Movement and Guidance Plan
SMGCS	Surface Movement Guidance Control System
STC	Supplemental Type Certificate
SV	Space Vehicle
TAF	Terminal Aviation Forecast
TC	Type Certificate
TDZ	Touchdown Zone
TLS	Target Level of Safety
ua	micro amps
VASI	Visual Approach Slope Indicator
VOR	VHF Omni-directional Radio Range
VORTAC	Co-located VOR and TACAN
V_1	Takeoff Decision Speed
V_{ef}	Engine Failure Speed
$V_{failure}$	Speed at which a failure occurs
V_{lof}	Liftoff Speed
V_{mcg}	Ground Minimum Control Speed
WAAS	Wide area augmentation system
WAD	Wide Area Differential
WAT	Weight, Altitude and Temperature

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ATTACHMENT 2
AIRBORNE SYSTEMS FOR CATEGORY I

PURPOSE. This Attachment contains airworthiness criteria for the approval of aircraft equipment and installations required to conduct an approach in Category I weather minima.

GENERAL. The type certification approval for the equipment, system installations and test methods should be based on a consideration of factors such as the intended function of the installed system, its accuracy, reliability, and fail-safe features, as well as the operational concepts contained in the body of this Attachment. The guidelines and procedures contained herein are considered acceptable methods of determining transport category airplane airworthiness to conduct an approach in Category I weather conditions.

(a) the overall assurance of performance and safety of an operation can only be assessed when all elements of the system are considered. This Attachment includes a discussion of the non-aircraft elements of a system so that an overall assessment of the operation can be accomplished.

(b) references to JAA All Weather Operations Regulations are provided to facilitate the All Weather Operations Harmonization process. A reference to a JAR provision does not necessarily mean that the DGCA and JAA requirements are equivalent but they are related with similar intent.

INTRODUCTION. This Attachment addresses the approach phase flight. For the purpose of this Attachment, the approach phase of flight is defined as the flight segment from the Final Approach Fix (FAF) to the Category I decision altitude/height. This Attachment provides criteria which represents an acceptable means of compliance with performance, integrity and availability requirements for low visibility approach. Alternative criteria may be proposed by an applicant. With new emerging technologies, there is a potential for many ways of conducting low visibility approach operations. This Attachment does not attempt to provide criteria for each potential combination of airplane and non-airplane elements.

(a) operations using current ILS or MLS ground based facilities and airplane elements are in use, and the certification criteria for approval of these airplane systems are established. Other operations, using non-ground based facilities or evolving ground facilities (e.g., local or wide area augmented Global Navigation Satellite System (GNSS)), and the use of some new aircraft equipment require Proof of Concept testing to establish appropriate criteria for operational approval and system certification.

(b) the intended flight path may be established in a number of ways. For systems addressed by this Attachment, the reference path may be established by a navigation aid (e.g., ILS, MLS). Other methods may be acceptable if shown feasible by a Proof of Concept [PoC]. Methods requiring PoC include, but are not limited to:

 (i) the use of ground surveyed waypoints, either stored in an on-board data base or provided by data link to the airplane, with path definition by the airborne system,

 (ii) sensing of the runway environment (e.g., surface, lighting and/or markings) with a vision enhancement system.

On-board navigation systems may have various sensor elements by which to determine airplane position. The sensor elements may include ILS, MLS, GNSS, Inertial information, Local Area

Differential GNSS, or Pseudolites. Each of these sensor elements should be used within appropriate limitations with regard to accuracy, integrity and availability.

Indications of the airplane position with respect to the intended lateral path can be provided to the pilot in a number of ways:

(i) deviation displays with reference to navigation source (e.g., ILS receiver, MLS receiver), or

(ii) on-board navigation system computations with corresponding displays of position and reference path, or

(iii) by a vision enhancement system. [PoC]

(c) the minimum visibility required for safe operations with such systems and backup means will be specified by the DGCA in the operational authorization.

DIVISION I - TYPES OF APPROACH OPERATIONS.

The airworthiness criteria in this Attachment are intended to be consistent with the operational concepts of Division II, Section (5) of this Appendix.

(1) Operations based on a Standard Landing Aid. A Standard Landing Aid (SLA) in the context of this section of this Appendix, is a navigation service provided by a State which meets internationally accepted performance standards (e.g., ICAO Standards and Recommended Practices (SARPs) or equivalent State Standards).

The ILS and MLS have been characterized by appropriate international (ICAO) Standards. Landing Systems based on GNSS (GLS) may use agreed State criteria, or international standards developed for acceptable combination of space and ground based elements. Acceptable overall aircraft performance may be established based upon the assumption that these services are used and maintained to the specified standards identified, or as specified in the applicable airworthiness approval.

(2) Operations based on RNP. The airworthiness criteria in this Attachment support the operational concept for RNP as described in Section 4.5 in the main body of this Appendix.

(3) Standard RNP Types. Approach operations may be specified based upon standard RNP type designations. The type designation identifies the performance standard required to conduct the operation. The RNP Type will have a lateral performance component and may additionally have a vertical component. Refer to Division II, Section (47) in the main body of this Appendix for Standard RNP Types.

(4) Non-standard RNP Types. Some operations may be approved for Non-Standard RNP Types - Refer to Division II, Section (48) in the main body of this Appendix. It is envisioned that the airplane systems approval process for Non-Standard RNP Types will be equivalent to that used for Standard RNP Types unless otherwise agreed with the DGCA.

(5) Operations based on Area Navigation System(s). Division II, Section (15) through (49) in the main body of this Appendix provides the criteria for operational authorization of the use of area navigation systems for approach.

(a) instrument approach operations may be approved using aircraft area navigation with lateral and vertical or lateral only capability. The navigation system will typically use multi-sensor capability for position fixing (VOR, DME, GPS, IRS, INS, etc.,) to achieve the necessary performance for certain levels of Category I operations.

(b) required levels of accuracy, integrity and availability for various combinations of sensor dependent operations (e.g., ILS, GLS, VOR, NDB) or area navigation operations (e.g., LNAV/VNAV, LNAV only, or RNP), necessary to support either Category I or Category II instrument approach procedures, as applicable, are specified in Division III of the main body of this Appendix.

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DIVISION II - TYPES OF APPROACH NAVIGATION SERVICE.

(1) ILS. The ILS is supported by established international standards for ground station operation. These standards should be used in demonstrating airplane system operation.

The Airplane Flight Manual shall indicate that operation is predicated upon the use of an ILS facility with performance and integrity equivalent to, or better than, an ICAO Annex 10 Facility Performance Category I ILS, a U.S. Type I or equivalent.

(2) ILS Flight Path Definition. The required lateral and vertical flight path is inherent in the design of the ILS. Acceptable performance and integrity standards have been established for ILS.

(3) ILS Airplane Position Determination. The airplane lateral and vertical position relative to the desired flight path is accomplished by an airplane ILS receiver which provides deviation from the extended runway centerline path when in the coverage area.

(4) MLS. The MLS is supported by established ICAO Annex 10 international standards for ground station operation. These standards should be used in demonstrating airplane system operation.

The Airplane Flight Manual shall indicate that operation is predicated upon the use of an MLS facility with performance and integrity equivalent to, or better than, an ICAO Annex 10 Facility Performance Category I MLS, or equivalent.

(5) MLS Flight Path Definition. The lateral and vertical required flight path is inherent in the design of the MLS. Acceptable performance and integrity standards have been established for MLS.

(6) MLS Airplane Position Determination. The airplane lateral and vertical position relative to the desired flight path is accomplished by an airplane MLS receiver which provides deviation from the extended runway centerline path when in the coverage area.

(7) GNSS [PoC]. This Attachment section is not intended to provide a comprehensive means of compliance for airworthiness approval of GNSS based systems. Currently approved systems are ILS or MLS based. The application of new technologies and systems will require an overall assessment of the integration of the airplane components with other elements (e.g., new ground based aids, satellite systems, advanced radar mapping systems, enhanced vision sensor systems) to ensure that the overall safety of the use of these systems for Category I. This GNSS section is included to identify important differences between conventional ILS/MLS based systems and GNSS based systems that affect GNSS or GLS criteria development.

The performance, integrity and availability of any ground station elements, any data links to the airplane, any satellite elements and any data base considerations, when combined with the performance, integrity and availability of the airplane system, should be at least equivalent to the overall performance, integrity and availability provided by ILS to support Category I operations.

(8) GNSS Flight Path Definition [PoC]. Appropriate specification of the required flight path for approach, or approach, landing and rollout (as applicable), is necessary to assure safety of the operation to the relevant operational minima. The required flight path should be established to provide adequate clearance between the airplane and fixed obstacles on the ground, between airplane on adjacent approaches, and to ensure that the airplane stays within the confines of the runway.

- (a) the effect of the navigation reference point on the airplane flight path and wheel to threshold crossing height must be addressed.
- (b) the required flight path is not inherent in the design of a GNSS based approach, landing and rollout system, therefore an airplane navigation system must specify a sequence of earth referenced path points, or the airplane must receive information from a ground based system, to define the approach, landing and rollout required path points.
- (c) certain path points, waypoints, leg types and other criteria are necessary to safely implement the approach, or approach, landing and rollout operations based on satellite and other integrated multi-sensor navigation systems.
- (d) figure 2. in the main body of this Appendix shows the minimum set of path points, waypoints and leg types considered necessary to specify the flight path for approach, or approach, landing and rollout operations.
- (e) the required flight path may be stored in an airplane database for recall and use by the command guidance and/or control system when required to conduct the approach to relevant minima for landing and rollout.
- (f) the definition, resolution and maintenance of the waypoints which define the required flight path and flight segments is key to the integrity of this type of approach, landing and rollout operation.
- (g) a mechanism should be established to assure the continued integrity of the flight path designators.
- (h) the integrity of any data base used to define required path points for an approach should be addressed as part of the certification process. The flightcrew shall not be able to modify information in the data base which relates to the definition of the required flight path for the final approach, and if necessary, initial missed approach.

(9) GNSS Airplane Position Determination [PoC]. The safety of an approach operation is, in part, predicated on knowing where the airplane is positioned relative to the required flight path. Navigation satellite systems exist which can provide position information to specified levels of accuracy, integrity and availability. The accuracy, integrity and availability can be enhanced by additional space and ground based elements. These systems provide certain levels of capability to support present low visibility operations and are planned to have additional future capability.

- (a) satellite systems have the potential to provide positioning information necessary to guide the airplane during approach. If operational credit is sought for these operations, the performance, integrity and availability must be established to support that operation. Ground based aids such as differential position receivers, pseudolites etc. and a data link to the airplane may be required to achieve the accuracy, integrity or availability for certain types of operation.
- (b) a level of safety equivalent to current ILS based operations should be established.
- (c) the role of the satellite based elements in the landing system should be addressed as part of the airplane system certification process until such time as an acceptable national, or international standards, for satellite based systems are established.

(10) Basic GNSS (Un-augmented) [PoC]. This is the basic navigation service provided by a satellite system. No additional elements are used to enhance accuracy or integrity of the operation.
(11) Differential Augmentation [PoC]. Differential augmentation uses a GNSS ground station at a known (surveyed) point on the ground to provide corrections to the individual satellite pseudo-range data.

(a) if a GNSS ground station is used to provide differential pseudo-range corrections, or other data to an airplane to support approach, or approach and landing, operations, the equivalent overall integrity of that operation will have to be established.
(b) the role of the differential station in the landing system will have to be addressed as part of the airplane system certification process until such time as an acceptable national or international standard, for the ground reference system is established.

(12) Local Area Differential Augmentation [PoC]. Local Area Differential (LAD) augmentation consists of a ground based GNSS receiver located in the area of the airport, which provides differential coverage runways at that airport.
(13) Wide Area Differential Augmentation [PoC]. Wide Area Differential (WAD) augmentation may be used to provide approach capability supporting appropriate levels of Category I procedures.

Typically only LAD systems provide a basis for establishing the necessary position fixing accuracy, integrity and availability for the final portion of a final approach segment or rollout. Unaugmented GNSS or WAD are typically only suited for support of initial or intermediate segments of an approach, final approach to restricted DA (H)s, or missed approach. GNSS or WAD may however be used in conjunction with Category I procedures for applications such as equivalent DME distance, or marker beacon position determination, when authorized by the operating rules.

(14) Datalink [PoC]. A data link may be used to provide data to the airplane to provide the accuracy necessary to support certain operations (e.g., navigation waypoints, differential corrections for GNSS).
(a) the integrity of the data link should be commensurate with the integrity required for the operation.
(b) the role of the data link in the approach, or approach and landing system should be addressed as part of the airplane system certification process unless an identified acceptable international standard(s) for the data link ground system is applicable and is used.

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DIVISION III - BASIC AIRWORTHINESS REQUIREMENTS.

This section identifies airworthiness requirements including those for performance, integrity, and availability which apply to all types of airplane systems, independent of the type of approach and landing or navigation system used. The definitions of Performance, Integrity and Availability are found in Attachment 1. The basic airworthiness criteria are intended to be independent of the specific implementation in the airplane or the type of Approach system being used. Criteria may be expanded further in later sections of this Attachment as it applies to a particular airplane system or architecture.

Information Note: *Continuity of Approach Function may involve aircraft systems, ground systems and, in some cases, space based systems. This Attachment addresses the aircraft part of the system and aircraft criteria will be defined in terms of aircraft system availability to provide quantifiable criteria for airworthiness compliance.*

(1) General Requirements. An applicant shall provide a certification plan which describes how any non-aircraft elements of the Approach System relate to the aircraft system from a performance, integrity and availability perspective. Standard Landing Aids (SLA) can be addressed by reference to ICAO SARPS.

- (a) the plan for certification shall describe the system concepts and operational philosophy to allow the regulatory authority to determine whether criteria and requirements other than those contained in this Attachment are necessary.
- (b) the Approach system performance should be established considering the environmental and deterministic effects that may reasonably be experienced for the type of operation for which certification and operational approval will be sought.
- (c) where reliance is placed on the pilot to detect a failure of engagement of a mode when it is selected (e.g., Go-around); an appropriate indication or warning must be given.
- (d) the effect of the failures of the navigation facilities must be considered taking into account ICAO and other pertinent State criteria.
- (e) the effect of the aircraft navigation reference point on the airplane flight path and wheel to threshold crossing height shall be assessed.

(2) Approach System Accuracy Requirements. The following items are general criteria that apply to the various types of approach operation:

- (a) performance shall be demonstrated by flight test, or analysis validated by flight test, with a representative range of environmental and system variables which have an effect on overall performance.
- (b) the performance assessment shall take into taking into account at least the following variables with the variables being applied based upon their expected distribution:
  - (i) configurations of the airplane (e.g., flap settings);
  - (ii) center of gravity;
  - (iii) landing weight;
  - (iv) conditions of wind, turbulence and wind shear;
  - (v) characteristics of ground and space based systems and aids (ILS, MLS, DGPS, GNSS Satellites); and
  - (vi) any other parameter which may affect system performance (e.g., airport altitude, approach path slope, variations in approach speed).

(c) the criteria for acceptable approach performance is based upon acquiring and tracking the required flight path to the appropriate minimum altitude for the procedure, or through landing and rollout, if applicable. The acquisition should be accomplished in a manner compatible with instrument procedure requirements and flightcrew requirements for the type of approach being conducted.

(d) an approach guidance system shall not generate guidance (flight director, HUD etc.) which results in flight path control that is oscillatory or requires unusual effort by the pilot to satisfy the performance requirements.

(e) an approach control system shall not generate flight path control (e.g., autopilot) with sustained oscillations.

(f) the approach system must cause no sustained nuisance oscillations or undue attitude changes or control activity as a result of configuration or power changes or any other disturbance to be expected in normal operation.

(3) ILS. The performance standards for signal alignment and quality contained in ICAO Annex 10 or an equivalent State standard are acceptable standards for operations based on ILS. These standards shall be used in establishing the performance of the operation.

(a) the guidance or control system shall be demonstrated to track the localizer signal within ± 0.051 DDM (50ua) from 700 feet [200 m] to 200 feet [60 m] above the runway elevation or the Decision Altitude/Height (DA/H), whichever is greater.

(b) the guidance or control system shall be demonstrated to track the glideslope signal within ± 0.0875 DDM (75ua) from 700 feet [200 m] to 200 feet [60 m] above the runway elevation or the Decision Altitude/Height (DA/H), whichever is greater.

(4) MLS. The performance standards for signal alignment and quality contained in ICAO Annex 10 or an equivalent State standard are acceptable standards for operations based on MLS. These standards shall be used in establishing the performance of the operation.

(a) the guidance or control system shall be demonstrated to track the localizer signal within ± 0.051 DDM (50ua) from 700 feet [200 m] to 200 feet [60 m] above the runway elevation or the Decision Altitude/Height (DA/H), whichever is greater.

(b) the guidance or control system shall be demonstrated to track the glideslope signal within ± 0.0875 DDM (75ua) from 700 feet [200 m] to 200 feet [60 m] above the runway elevation or the Decision Altitude/Height (DA/H), whichever is greater.

(5) GLS [PoC]. Division III Section (9) in the main body of this Appendix provides background GLS considerations.

(a) the role of the satellite-based elements in the landing system should be addressed as part of the aircraft system certification process until such time as an acceptable national or international standard, for the satellite based system is established.

(b) the guidance or control system shall be demonstrated to track the lateral flight path within 180 feet [55 m] for 95% of the approach.

(c) the guidance or control system shall be demonstrated to track the vertical flight path within 45 feet [13.716 m] for 95% of the approach.

(6) RNP. The transition from en route RNP to approach RNP will be accomplished in a seamless manner (refer to U.S. FAA Advisory Circular AC 120-CNS or equivalent).

(a) the approach RNP is specified from the FAF to the DA (H).

(b) RNP operations are based upon the accuracy of the airplane flight path in absolute terms with respect to the required flight path over the ground. The Total System Error (TSE) will be characterized by the combined performance of airplane systems and any navigation aids. The certification plan should identify any navigation aid(s) on which the RNP performance will be established and how the airplane performance interacts with the navigation aid(s) to meet the TSE performance requirements. The certification plan should identify the assumed relationship between airplane performance and any navigation aid performance.

(c) the guidance or control system shall be demonstrated to maintain a flight path which tracks the required flight path to the RNP Type as specified in Division II, Section (46) of the body of this Appendix, as applicable.

(7) Flight Path Definition. Refer to Division II, Section (49) in the main body of this Appendix for consideration on Flight Path Definition when navigation aids are used which do not have the required flight path inherent in the structure of the signal in space.

(8) Area Navigation Systems. The accuracy requirements for area navigation systems are as specified in U.S. FAA Advisory Circulars AC 25-15, AC 20-129, and AC 20-130, or equivalent as amended. In addition, criteria described in the table below may alternately be met and referenced in the AFM.

The guidance or control system shall be demonstrated to track the lateral and vertical flight path or lateral flight path alone, if applicable, to one of the levels shown below.

Lateral Performance (ft) (2 sigma)	**Vertical Performance (ft) (2 sigma) ****
0.3 nm/1800'	N/A
0.2 nm/1200'	N/A
0.1 nm/600'	N/A
0.3 nm/1800'	+/- 50'[15.24 m]
0.2 nm/1200'	+/- 50' [15.24 m]
0.1 nm/600'	+/- 50' [15.24 m]

** Vertical performance excluding altimetry error.

The basis for demonstration, or the demonstrated values, should be referenced in the AFM

(9) Approach System Integrity Requirements. The applicant shall provide the certification authority with an overall operational safety assessment plan for the use of systems other than ILS or MLS for "path in space" guidance. This plan shall identify the assumptions and considerations for the non-aircraft elements of the system and how these assumptions and considerations relate to the airplane system certification plan.

(a) the onboard components of the landing system, considered separately and in relation to other associated onboard systems, should be designed to comply with U.S. 14 CFR/JAR, Section 25.1309 considering any specific safety related criteria identified in this Attachment, or as identified in accordance with the operating rules.

(b) the following criteria is provided as guidance for the application of U.S. 14 CFR/JAR, Section 25.1309 to Landing Systems:

(10) ILS. The aircraft system response to loss of ILS guidance signals (localizer and glideslope) shall be established.
(11) MLS. The aircraft system response to loss of MLS guidance signals (elevation and azimuth) shall be established.
(12) GLS. The aircraft system response to loss of GLS guidance signals shall be established.
(13) RNP. The aircraft system response to loss of the navigation service(s) used to conduct the RNP operation shall be established.

(a) the aircraft system response during any switch over to alternate navigation services shall be established.
(b) it shall be demonstrated that the airplane will maintain the required flight path within 2 times the RNP value when unannunciated failures not shown to be improbable (probability greater than 10^{-7} per approach) are experienced
(c) (i.e., Operation with Failures).

(14) Area Navigation Systems. The integrity requirements for area navigation systems are as specified in U.S. Advisory Circular AC 25-15, as amended, or equivalent.
(15) Approach System Availability Requirements. This section identifies the requirements for aircraft system reliability to conduct various approach operations.
(16) ILS. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure.
(17) MLS. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure.
(18) GLS. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure.
(19) RNP. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure.
(20) Area Navigation Systems. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure. In addition, system availability is as specified in accordance with the operating rules, Operations Specifications) for dual or single RNAV system installation.
(21) Go-around Requirements. A Go-around may be required following a failure in the Approach System, as required by the flightcrew or by Air Traffic Service at any time prior to touchdown.

(a) it should be possible to initiate a missed approach at any point during the approach until touchdown on the runway. It should be safe to initiate a missed approach that results in a momentary touchdown on the runway.
(b) a Go-around should not required unusual pilot skill, alertness, or strength.
(c) the proportion of approaches terminating in a go-around below 500 ft (150 m) due to inappropriate airplane system performance may not be greater than 5%.
(d) information should be available to the operator to assure that a safe go-around flight path can be determined.

(22) Flight Deck Information, Annunciation and Alerting Requirements. This section identifies information, annunciations and alerting requirements for the flight deck.

The controls, indicators and warnings must be designed to minimize crew errors that could create a hazard. Mode and system malfunction indications must be presented in a manner compatible with the procedures and assigned tasks of the flightcrew. The indications must be grouped in a logical and consistent manner and be visible under all expected normal lighting conditions.

(23) Flight Deck Information Requirements. This section identifies requirements for basic situational and guidance information.

- (a) for manual control of approach flight path, the appropriate flight display(s), whether head down or head up, must provide sufficient information, without excessive reference to other cockpit displays, to enable a suitably trained pilot to:
  - (i) maintain the approach path,
  - (ii) to make the alignment with the runway, flare and land the airplane within the prescribed limits (if applicable), or
  - (iii) go-around.
- (a) sufficient information should be provided in the flight deck to allow the pilots to monitor the progress and safety of the approach operation, using the information identified above and any additional information necessary to the design of the system.
- (b) required in flight performance monitoring capability includes at least the following:
  - (i) unambiguous identification of the intended path for the approach, landing and rollout (e.g., ILS/MLS approach identifier/frequency, and selected navigation source), and
  - (ii) indication of the position of the aircraft with respect to the intended path (e.g., raw data localizer and glide path, or equivalent).

(24) Annunciation Requirements. A positive, continuous and unambiguous indication must be provided of the modes actually in operation, as well as those that are armed for engagement. In addition, where engagement of a mode is automatic (e.g., localizer and glide path acquisition), clear indication must be given when the mode has been armed by either action of a member of the flightcrew, or automatically by the system (e.g., a pre-land test - LAND 3).

(25) Alerting. Alerting requirements are intended to address the need for warning, caution and advisory information for the flightcrew.

(26) Warnings. The standard will be equivalent to U.S. 14 CFR or JAR 25.1309 which requires that information must be provided to alert the crew to unsafe system operating conditions to enable the crew them to take appropriate corrective action. A warning indication must be provided if immediate corrective action is required. An analysis must be performed to consider crew alerting cues, corrective action required, and the capability of detecting faults.

(27) Cautions. A caution is required whenever immediate crew awareness is required and timely subsequent crew action will be required. A means shall be provided to advise the flightcrew of failed airplane system elements that affect the decision to continue or discontinue the approach.

(28) Advisories. A means shall be provided to inform the flightcrew when the airplane has reached the operational Decision Altitude/Height, as applicable.

(29) System Status. A means should be provided for the operator to determine prior to departure and the flightcrew to determine after departure, the capability of the airplane elements to accomplish the intended low visibility operations. While en route, the failure of each airplane component affecting the approach and landing capability should be indicated to the flightcrew as an advisory, without flightcrew action, unless otherwise required (e.g., autopilot disconnect warning).

- (a) a means shall be provided to advise the flightcrew of failed airplane system elements that affect the decision to continue to the destination or divert to an alternate.

(b) system Status indications should be identified by names that are different than operational authorization categories (e.g., use names such as "LAND 3", or "DUAL" - do not use CAT I, II, III).

(30) Multiple Landing Systems and Multi-mode Receivers (MMR). International agreements have established a number of landing systems as an acceptable means to provide guidance to support the conduct of an instrument approach. This section identifies unique requirements which relate to airplane systems which provide the capability to conduct approach and landing operations using these multiple landing systems (e.g., ILS, MLS, GNSS Landing System (GLS)). Typically these multiple landing systems are implemented through use of one or more multi-mode navigation receivers (MMR), capable of providing navigation information for ILS, MLS, and GLS or any one or more combinations of these landing sensor systems.

(a) ICAO has specified an ILS protection date of at least 2010 to support international approach and takeoff operations. In addition, MLS or GLS may be used on a regional basis, until GNSS (GLS) based approach, landing and departure system (GLS) are in worldwide use. Accordingly, an operator may elect to use ILS, ILS/MLS, ILS/GLS, or ILS/MLS and GLS. If a Multi-mode Receiver (MMR) is used, MMR characteristics should be consistent with applicable related ARINC characteristics for MMR.

(b) for systems which elect to use MLS, either U.S. FAA criteria or JAR-AWO as amended, (e.g., NPA AWO 9), may be used as a consideration in defining the airworthiness requirements for MLS certification.

(31) General Requirements. Where practicable, the flight deck approach procedure should be the same irrespective of the navigation source being used.

(a) a means (for example the current ILS audio idents) should be provided to confirm that the intended approach aid(s) has been correctly selected.

(b) during the approach, an indication of a failure in each non-selected airplane system element must be provided to the flightcrew as an indication of system status; it should not produce a caution or warning;

(32) Indications. The following criteria apply to indications in the flight deck for the use of a multi-mode landing system:

The loss of acceptable deviation data shall be indicated on the display. It is acceptable to have a single failure indication for each axis common to all navigation sources.

(33) Annunciations. The following criteria apply to annunciations in the flight deck when using a multi-mode approach system.

(a) the navigation source (e.g., ILS, MLS, GLS, FMS) selected for the approach shall be positively indicated in the primary field of view at each pilot station;

(b) the data designating the approach (e.g., ILS frequency, MLS channel, GNSS 'path identifier') shall be unambiguously indicated in a position readily accessible and visible to each pilot;

(c) a common set of mode ARM and ACTIVE indications (e.g., LOC and GS) is preferred for ILS, MLS and GNSS operations;

(d) a means should be provided for the crew to determine a failure of the non-selected navigation receiver function, in addition to the selected navigation receiver function. When considering equipment failures, the failure indications should not mislead through incorrect association with navigation source. For example, it would not be acceptable for the annunciation "ILS FAIL" to be displayed when the selected navigation source is MLS and the failure actually affects the MLS receiver;

(34) Alerting. Flight operations require alternate airports for takeoff, en route diversion and landing. These alternate airports may have different landing systems. Flight operations may be planned, released and conducted on the basis of using one or more landing systems.

(a) the capability of each element of a multi-mode approach and landing system shall be available to the flightcrew to support dispatch of the airplane.
(b) a failure of each element of a multi-mode approach and landing system must be indicated to the flightcrew as an advisory, without pilot action, during en route operation.
(c) a failure of the active element of a multi-mode approach and landing system during an approach shall be accompanied by a warning, caution, or advisory, as appropriate.
(d) an indication of a failure in each non-selected element of a multi-mode approach and landing system during an approach shall be available to the flightcrew as an advisory but should not produce a caution or warning.

(35) Multi-mode Receivers (MMR). For MMRs using more than one or more type(s) of landing system, the means of compliance required for certification can be simplified, provided the applicant provides appropriate justification. This section provides guidance for retrofit certifications, for "ILS Look alike" applications, and for certification of ILS installations with either new or modified receivers.

Typical receiver configurations for retrofit applications include:

(a) an ILS receiver from a new supplier,
(b) a modified ILS receiver from the same supplier (e.g. for purposes of providing improved FM Immunity),
(c) a re-packaged receiver from the same supplier (e.g. the ILS partition in an MMR, or the transition from ARINC 700 to 900 series equipment),
(d) a stand-alone MLS receiver (“ILS look alike”),
(e) an MLS partition in an MMR ("ILS look alike"),
(f) a stand-alone GLS receiver (“ILS look alike”), or
(g) a GLS partition in an MMR ("ILS look alike").

(36) "ILS Look alike" Definition applicable to MMR. "ILS Look alike" is defined as the ability of a non-ILS based navigation receiver function to provide operational characteristics and interface functionality to the rest of the aircraft equivalent to that provided by an ILS based receiver function. Specifically in the case of an MLS or GNSS (GLS) based receiver function, the output should be in DDM/microamps, with a sensitivity equivalent to an ILS receiver taking account of the effects of runway length.

General Certification Considerations.

(37) Certification Process. An “impact assessment” should address any new receiver functionality considering:

(a) differences between the current basis of certification and that requested (if applicable).
(b) the functionality being added.
(c) credit that can be taken for the existing approval.

(38) Equipment Approval. TSO/MOPS compliance should be demonstrated where appropriate, including software qualification and receiver environmental qualification to the appropriate levels.

(39) Aircraft Installation Approval. The following should be considered:

(a) impact on airplane system safety assessments.
(b) radio approval (e.g. antenna positions, range, polar diagrams, coverage, compatibility between receiver and antenna).
(c) EMI/EMC testing.
(d) functional integration aspects of the receiver with respect to other systems, controls, warnings, displays.
(e) electrical loading
(f) flight data recorder requirements
(g) suitable Aircraft Flight Manual (AFM) provisions.
(h) certification means of compliance for the receiver installation (e.g. specification of ground and/or flight testing, as necessary).

(40) Means of Compliance using JAR-AWO. JAR-AWO may be an acceptable means of compliance for ILS or MLS if the applicant establishes that the proposed new or modified navigation receiver configuration can be considered to have "ILS Look alike" characteristics. The following interpretative material to existing ACJ may be considered for that part of the certification affected by the revised installation.

(a) ACJ AWO 131 Performance Demonstration.
(b) 2.1 Flight Demonstrations - Program of Landings for Certification.
(c) ACJ AWO 161(b) Failure Conditions.
(d) ACJ AWO 231 Flight Demonstration.
(e) 1.1 Continuous Method (Analysis of Maximum Value).
(f) ACJ AWO 431 Performance (Interpretative Material).

(41) Recertification of an ILS function following the Introduction of a New or Modified ILS Navigation Receiver Installation. The certification program should consider the differences between the new configuration and the pre-existing ILS receiver system. An "impact assessment" may be used to establish a basis for certification.

(42) New or Modified ILS Impact Assessment. An impact assessment should consider the following aspects of the new or modified ILS receiver, or receiver function, for equivalence with the existing ILS receiver configuration:

(a) hardware design,
(b) software design,
(c) signal processing and functional performance,
(d) failure analysis,
(e) receiver function, installation and integration (e.g. with controls, indicators and warnings).

The impact assessment should also identify any additional considerations such as:

(a) future functionality provisions which have no impact on system operation.
(b) shared resources to support future functionality,

Based upon the assumption that the ILS receiver, or receiver function, can be shown to be equivalent to the current ILS configuration, the applicant may propose that the new installation be treated as a new ILS receiver for installation on a given airplane type.

(43) New or Modified ILS Failure Analysis. The failure characteristics of the new or modified installation should be reviewed, equivalent to systems using ILS data, to ensure that the failure characteristics are compatible with and do not invalidate any original or previous safety assessments.
(44) New or Modified ILS Autoland or HGS Landing Function Flight Testing (if necessary). For systems intended to provide Autoland or HGS Landing Function using a new ILS, MLS, GLS or combined MMR receiver, a flight test program of typically a minimum of eight approaches terminating in a successful (automatic or HGS) landing and rollout (if applicable) using the flight control/guidance system, including a minimum of two ILS facilities should be completed. Approaches should include captures from the both sides of the final approach course, at angles and distances representative of typical instrument approach procedures, and if applicable, from below and above the glideslope.

The approach and landing performance (flight path deviation, touchdown data etc.) as appropriate, should be shown to be equivalent to that achieved in the original ILS certification. Recorded flight test data may be required to support equivalency demonstration.

A demonstration of take off guidance performance should be included where applicable.

(45) New or Modified ILS Documentation. The following documentation should be provided for certification:

(a) an Impact Assessment including effects on System Safety Assessments
(b) a Flight test report, if applicable.
(c) revisions to the Flight Manual where appropriate.

(46) Recertification following the Introduction of an MLS or GLS Navigation Receiver Installation. The certification program should consider the differences between the new configuration and the pre-existing ILS receiver system. An "impact assessment" may be used to establish a basis for certification.
(47) MLS or GLS Introduction Impact Assessment. An MLS or GLS receiver or receiver function, can be certificated with an “impact assessment” similar to that required for the recertification of a new or modified ILS receiver, provided that the unit(s) has(have) been shown to have satisfactory "ILS Look alike" characteristics. The "impact assessment" should assess equivalent aspects of the MLS or GLS receiver or receiver function to those for the existing ILS receiver configuration.

Based upon the assumption that the MLS or GLS receiver or receiver function, can be shown to have "ILS look alike" characteristics, the applicant may propose that the new installation be treated as a new ILS receiver for approval on a particular airplane type.

(48) MLS or GLS Statistical Performance Assessment. If the flight control/guidance system control algorithms are unchanged or effects of any changes are fully accounted for (e.g. navigation reference point), the statistical performance assessment of a currently certificated automatic landing system or Head Up Display landing or takeoff system should typically not have to be re-assessed for the addition of MLS or GLS functionality. This equivalence is based on the assumption that the MLS or GLS receiver, or the MLS or GLS partition of an MMR, can be shown to have satisfactory "ILS Look alike" characteristics.
(49) MLS or GLS Antenna or Navigation Reference Point Location. The implication of differences in position of the MLS or GLS and ILS aircraft antennas or Navigation Reference Point should be assessed considering:

(a) wheel to threshold crossing height,

(b) lateral and vertical antenna position or navigation reference point position effects on flight guidance system performance (including any alignment, flare or rollout maneuvers).

(50) MLS or GLS Introduction Flight testing (as necessary). For an installation of MLS or GLS which can be treated as a new ILS receiver, a flight test program of typically a minimum of 10-15 approaches terminating in a landing and rollout (if applicable) using the flight control/guidance system, including a minimum of two MLS or GLS facilities for each system to be authorized should be completed. The approaches should include captures from the both sides of the final approach course using representative angles and distances, should include captures from below and above the glideslope if applicable, and should include representative wind conditions where antenna or navigation reference point positions may impact performance.

The approach and landing performance (flight path deviation, touchdown data etc.) as appropriate, should be shown to be equivalent to that achieved in the original ILS certification. Recorded flight test data may be required to support equivalency.

A demonstration of take off guidance performance should be included where applicable.

(51) MLS or GLS Introduction Documentation. The following documentation should be provided for certification of MLS or GLS:

(a) an Impact Assessment including effects on System Safety Assessments.
(b) a Flight test report, if applicable.
(c) revisions to the Flight Manual where appropriate.

(52) Steep Angle Approaches. The following considerations should be considered before AFM provisions are incorporated for steep angle approaches:

(a) the descent gradient range to be demonstrated
(b) suitable "touchdown zone" size considerations, if not standard
(c) adequate descent gradient abuse recovery
(d) adequate speed abuse recovery
(e) engine-failure continuation safety
(f) engine-failure balked or rejected landing safety
(g) adverse tailwind gradients on approach
(h) adverse tailwind component limits at touchdown
(i) de-ice and Anti-ice protection considerations
(j) suitability of cockpit visibility during approach and flare
(k) suitability of climb gradient achievable while in the steep angle approach configuration, as necessary
(l) suitability of descent, flare, and touchdown sink rates
(m) provision for drag device (e.g. spoiler or auto-feather) failure
(n) suitability of auto-feather response and time delays, as applicable
(o) flight guidance system compatibility with steep angle approach paths to be flown
(p) antenna function for navigation and communication performance are satisfactory
(q) flight guidance display systems are satisfactory
(r) suitable procedures are provided for approach, rejected landing, and missed approach for all-engine and engine-inoperative cases, and engine failure is addressed at any time until touchdown, during rollout, or after a go around.

(s) any adverse deck angle effects, or landing gear geometry effects are considered

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DIVISION IV - APPROACH SYSTEM EVALUATION

An evaluation should be conducted to verify that the pertinent systems as installed in the airplane meet the airworthiness requirements of Division III of this Attachment. The evaluation should include verification of approach system performance requirements and a safety assessment for verification of the integrity and availability requirements. Engine failure cases and other selected failure conditions identified by the safety assessment should be demonstrated by simulator and/or flight tests.

(1) An applicant shall provide a certification plan(s) that describes:

(a) the means proposed to show compliance with the requirements of Division III of this Attachment, with particular attention to methods that differ significantly from those described in this Attachment.

(b) how any non-airplane elements of the Approach System relate to the airplane system from a performance, integrity and availability perspective (e.g., appropriate reference to ICAO Annex or United States Standard).

(c) the assumptions on how the performance, integrity and availability requirements of the non-airplane elements of non-Standard Landing Aids will be assured.

(d) the system concepts and operational philosophy to allow the regulatory authority to determine whether criteria and requirements in excess of that contained in this Attachment are necessary.

(2) Performance Evaluation. The performance assessment can be accomplished "in flight", or credited from similar installations as follows:

(a) acceptable performance may be established as a by-product of, or in conjunction with, a more restrictive performance demonstration(s) (e.g., Basic type certification, or as a consequence of successfully meeting Category II/III criteria),

(b) as a dedicated qualitative "in flight" demonstration of acceptable performance, or

(c) by establishing similarity with other mature and acceptably performing system installations. For this provision, "in-flight" demonstration is not necessary, but a functional ground check, bench test, or other equipment check is typically appropriate (e.g., This provision is typically used in the instance of installation of a new model of ILS, VOR, ADF, or DME receiver).

(3) Safety Assessment. Except as required by any specific safety related criteria identified in this Attachment, or by the operating rules, a safety assessment of the Approach system, considered separately and in conjunction with other systems, shall be conducted to show compliance with U.S. 14 CFR/JAR Section 25.1309.

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DIVISION V - AIRBORNE SYSTEM REQUIREMENTS

This section identifies criteria applicable to specific aircraft system architecture selected to conduct the operation. This criteria is developed from Operational Considerations, Approach System Considerations, Aircraft System Considerations and the general operational philosophy contained in the body of this Appendix.

(1) General. Various airplane systems are expected to comply with the basic performance, integrity and availability requirements are identified in Division III of this Appendix.
(2) Autopilot. Criteria applicable to Autopilot systems is as specified by U.S. 14 CFR/JAR Section 25.1329.
(3) Head Down Guidance. Criteria applicable to Head Down Guidance systems are specified in the pertinent parts of Division I and II of this Attachment.
(4) Head Up Guidance. The following criteria is applicable to Head Up Guidance systems:
- (a) the workload associated with use of the HUD should be considered in showing compliance with U.S. 14 CFR/JAR Section 25.1523.
- (b) the HUD display medium must not significantly obscure the pilot's view through the cockpit window.
- (c) control of Approach Flight Path - the HUD must provide sufficient guidance information, without excessive reference to other cockpit displays, to enable a suitably trained pilot to:
  - (i) maintain the approach path,
  - (ii) to make the alignment with the runway, flare and land the airplane within the prescribed limits (if applicable), or
  - (iii) go-around.
- (d) if only one HUD is installed, it should be installed at the pilot-in-command crew station.
- (e) the HUD guidance must not require exceptional piloting skill to achieve the required performance.
- (f) the HUD system performance and alerting should be consistent with the intended operational use for duties and procedures of the pilot flying (PF) and pilot not flying (PNF) (see Division III, Sections (14) and (16) of the main body of this Appendix).
- (g) if the autopilot is used to control the flight path of the airplane to intercept and establish the approach path, the point during the approach at which the transition from automatic to manual flight takes place shall be identified and used for the performance demonstration.
- (h) any transition from autopilot to HUD guidance must not require exceptional piloting skill, alertness, strength or excessive workload.

(5) Hybrid. The following criteria is applicable to Hybrid systems:
- (a) if a HUD is used to monitor an autoflight system, it should be shown to be compatible with the autoflight system and permit a pilot to detect unsuitable autopilot performance.
- (b) other hybrid systems (e.g., including EVS) require a proof of concept [PoC] evaluation to establish suitable criteria.

(6) Satellite Based Approach System. The following criteria is applicable to satellite based approach systems:

(a) satellite based systems should be shown to provide equivalent or better capability than navigation systems based on VOR, DME, or ILS for comparable operations, or meet provisions applicable to RNP.
(b) satellite based systems should not exhibit undue sensitivity to masking of satellite vehicles, or interference from onboard or external sources.
(c) satellite based systems should not exhibit adverse characteristics during acquisition or loss of satellites.

(7) Area Navigation Systems. Area navigation systems should operate consistent with criteria specified in:
(a) U.S. FAA Advisory Circular AC 25-15, or equivalent, Approval of Flight Management Systems in Transport Category Airplanes,
(b) U.S. FAA Advisory Circular AC 20-129, or equivalent, Airworthiness Approval of Vertical Navigation (VNAV) Systems, and
(c) U.S. FAA Advisory Circular AC 20-130, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors, as amended, or equivalent criteria.

In addition, area navigation systems used for approach should have at least the following characteristics:
(a) if the operational software (ops program) is modifiable or loadable (e.g., by maintenance action) a "Version" identification must be provided and available for display to the pilot or maintenance personnel (e.g., PS4052520-161, or U7.4, or B767-300.3),
(b) a suitable database must be used which can be assured to be suited for the specific aircraft and navigation system type, and which can be assessed to have current data (e.g., Navigation DataBase "NW19810001"),
(c) pilot input/output functions, keys, and displays should have standard functions available, and operate consistent with industry standard conventions and practice,
(d) single systems must be accessible and usable by either pilot located at a pilot or copilot crew station (e.g., the PF or PNF) of a multi-crew aircraft. It is not necessary that such systems also be accessible, or easily accessible, to pilots other than the PF and PNF sitting in a jumpseat (e.g., do not need to be readily accessible to International Relief Officers (IRO's)), but it is recommended that such a system be at least visible to such other pilots (if they have assigned duties) for enhancement of crew coordination and monitoring,
(e) dual (or more) system installations must have a convenient and expedient way to "crossload" and be kept updated. Each system should have CDUs, displays, and annunciations, or equivalent that are at least visible and accessible to both the PF and PNF. This is to provide both for monitoring, and use in failure cases. It is not necessary that such systems also be accessible, or easily accessible, to pilots other than the PF and PNF sitting in a jumpseat (e.g., do not need to be readily accessible to International Relief Officers (IRO's)), but it is recommended that such a system be at least visible to such other pilots (if they have assigned duties) for enhancement of crew coordination and monitoring,
(f) system performance must be consistent with operational authorizations sought, or should be consistent with an identifiable performance standard such as for various levels of RNP.
(g) if credit is sought for operating on complex and closely spaced multiple Waypoint paths, an interface with a suitable "track up" or "heading up" navigation map display is necessary.
(h) a means to monitor lateral and vertical deviations should be provided (e.g., displacement display, progress page lateral and vertical deviation).

(i) a means must be provided to assure suitable operation or updating, and if RNP is included, to identify the level of RNP to be used, and ANP (or EPE).

(8) Autothrottle. If autothrottle capability is installed, the applicant should identify any necessary modes, conditions, procedures, or constraints that apply to its use. Use of the autothrottle should not cause unacceptable performance of any autopilot modes intended for use, and any autopilot mode intended for use with autothrottle should not cause unacceptable autothrottle performance. The autothrottle should expeditiously capture any commanded speed adjustments, acceptably maintain speed, and not cause any hazardous conditions with normal use, or for any probable failure modes, considering pilot intervention using normal piloting skills. The autothrottle should maintain stable short period and phugoid airplane modes for all intended flight situations during manual and automatic flight.

(9) Datalink. The following criteria is applicable to the use of datalink associated with a position fixing system:

(a) any necessary data link channel selection, tuning, status, or use should be clearly specified,
(b) data link performance, availability and integrity should be compatible with its intended use.
(c) appropriate status, advisories, cautions or warnings should be provided for failures or unsuitable performance.
(d) any recommended airborne system normal or non-normal procedures should be consistent with the assumptions made for the data link used (e.g., service volume, Classification of data link service available - II/D/2).

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DIVISION VI - Airplane Flight Manual

(1) The Airplane Flight Manual should contain the following information:

- (a) any conditions or constraints on Approach performance with regard to Airport conditions (e.g., elevation, ambient temperature, approach path slope, runway slope and ground profile under the approach path).
- (b) the criteria used for the demonstration of the system, acceptable normal and non-normal procedures, the demonstrated configurations, and types of facilities used, and any constraints or limitations necessary for safe operation.
- (c) the type of navigation facilities used as a basis for certification. This should not be taken as a limitation on the use of other facilities. The AFM may contain a statement regarding the type of facilities or condition known to be unacceptable for use.
- (d) information should be provided to the flightcrew regarding atmospheric conditions under which the system was demonstrated e.g., headwind, crosswind, tailwind etc. The AFM should contain a statement that "Credit may not be predicated on the use of <type of system> if conditions exceed … (those for which the system received airworthiness approval).
- (e) any necessary performance, procedure or configuration data to permit an operator to determine climb gradient and transition distances for safe obstacle clearance during a missed approach, balked landing or rejected landing. NOTE: This information need not be specifically included in the AFM if it is available to the operator using some other method acceptable to the operator and manufacturer (e.g. FCOM, supplementary performance information, separate AFM appendix).

(2) Data may be based on corresponding takeoff performance and obstacle assessment data if appropriate accommodation of configuration change and transition distance can be accounted for. Otherwise, additional information on data that may be useful to an operator for determination of engine-inoperative missed performance, maximum allowable weight, or obstacle assessments is discussed in the main body of this Appendix in Division II Section (13).

Information Note: *1: The AFM limitation section should not specify DA(H) or RVR limitations.*

2: U.S. Advisory Circular AC 25.1581-1 Section 2 discusses AFM contents. The approval status referenced in 2 b (9) (vii) for Category I, II, or III of that AC should be noted in the Normal Procedures Section of the AFM, in accordance with the above provisions.

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ATTACHMENT 3
AIRBORNE SYSTEMS FOR CATEGORY II

PURPOSE. This Attachment contains airworthiness criteria for the approval of aircraft equipment and installations required to conduct an approach in Category II weather minima.

GENERAL. The type certification approval for the equipment, system installations and test methods should be based on a consideration of factors such as the intended function of the installed system, its accuracy, reliability, and fail-safe features, as well as the operational concepts contained in the body of this Appendix. The guidelines and procedures contained herein are considered acceptable methods of determining transport category airplane airworthiness to conduct an approach in Category II weather conditions.

The overall assurance of performance and safety of an operation can only be assessed when all elements of the system are considered. This Attachment includes a discussion of the non-aircraft elements of a system so that an overall assessment of the operation can be accomplished.

References to JAA All Weather Operations Regulations (JAR) are provided to facilitate the All Weather Operations Harmonization process. A reference to a JAR provision does not necessarily mean that Lebanese and JAA requirements are equivalent but they are related with similar intent.

INTRODUCTION. This Attachment addresses the approach phase flight. For the purpose of this Attachment, the approach phase of flight is defined as the flight segment from the Final Approach Fix (FAF) to the Category II decision height. This Attachment provides criteria which represents an acceptable means of compliance with performance, integrity and availability requirements for low visibility approach. An applicant may propose alternative criteria. With new emerging technologies, there is a potential for many ways of conducting low visibility approach operations. This Attachment does not attempt to provide criteria for each potential combination of airplane and non-airplane elements.

Operations using current ILS or MLS ground based facilities and airplane elements are in use, and the certification criteria for approval of these airplane systems are established. Other operations, using non-ground based facilities or evolving ground facilities (e.g., local or wide area augmented GNSS), and the use of some new aircraft equipment require Proof of Concept testing to establish appropriate criteria for operational approval and system certification. The need for a Proof of Concept program is identified in this Attachment with a [PoC] designator. This Attachment provides some general guidelines, but not comprehensive criteria for airplane systems that require a Proof of Concept.

Definitive lateral and vertical flight paths are required to conduct an approach in low weather minima conditions. The flight paths should lead to a touchdown in the landing zone and airplane alignment with the axis that passes down the centerline of the runway. Means should be provided on-board the airplane to acquire and track the required flight paths.

The intended flight path may be established in a number of ways. For systems addressed by this Attachment, the reference path may be established by a navigation aid (e.g., ILS, MLS). Other methods may be acceptable if shown feasible by a Proof of Concept [PoC]. Methods requiring PoC include, but are not limited to:

(a) the use of ground surveyed waypoints, either stored in an on-board data base or provided by data link to the airplane, with path definition by the airborne system, and
(b) sensing of the runway environment (e.g., surface, lighting and/or markings) with a vision enhancement system.

On-board navigation systems may have various sensor elements by which to determine airplane position. The sensor elements may include ILS, MLS, Global Navigation Satellite System (GNSS), Inertial information, Local Area Differential GNSS, or Pseudolites. Each of these sensor elements should be used within appropriate limitations with regard to accuracy, integrity and availability.

Indications of the airplane position with respect to the intended lateral path can be provided to the pilot in a number of ways.
(a) deviation displays with reference to navigation source (e.g., ILS receiver, MLS receiver),
(b) on-board navigation system computations with corresponding displays of position and reference path, [PoC] or
(c) by a vision enhancement system. [PoC]

The minimum visibility required for safe operations with such systems and backup means will be specified by the DGCA in the operational authorization.

DIVISION I - TYPES OF APPROACH OPERATIONS

The airworthiness criteria in this Attachment are intended to be consistent with the operational concepts of Division II, Section (5) of the main body of this Appendix.

(1) Operations based on a Standard Landing Aid. A Standard Landing Aid (SLA) in the context of this section of this Attachment, is a navigation service provided by a State which meets internationally accepted performance standards (e.g., ICAO Standards and Recommended Practices (SARPs) or equivalent State standards).

The ILS and MLS have been characterized by appropriate international (ICAO) standards. Landing Systems based on GNSS (GLS) may use agreed State criteria, or international standards developed for acceptable combination of space and ground based elements. Acceptable overall aircraft performance may be established based upon the assumption that these services are used and maintained to the specified standards identified, or as specified in the applicable airworthiness approval.

(2) Operations based on RNP. The airworthiness criteria in this Attachment support the operational concept for RNP as described in Division II Section (5) in the main body of this Appendix.

(3) Standard RNP Types. Approach operations may be specified based upon standard RNP type designations. The type designation identifies the performance standard required to conduct the operation. The RNP Type will have a lateral performance component and may additionally have a vertical component. Refer to Division II Section (47) in the main body of this Appendix for Standard RNP Types.

(4) Non-standard RNP Types. Some operations may be approved for Non-Standard RNP Types - Refer to Division II, Section (48) in the main body of this Appendix. It is envisioned that the airplane systems approval process for Non-Standard RNP Types will be equivalent to that used for Standard RNP Types unless otherwise agreed with the DGCA.

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DIVISION II - TYPES OF APPROACH NAVIGATION SERVICE.

(1) ILS. The ILS is supported by established international standards for ground station operation. These standards should be used in demonstrating airplane system operation.

The Airplane Flight Manual shall indicate that operation is predicated upon the use of an ILS facility with performance and integrity equivalent to, or better than, an ICAO Annex 10 Facility Performance Category II ILS, an U.S. Type II or equivalent.

(2) ILS Flight Path Definition. The required lateral flight path is inherent in the design of the ILS. Acceptable performance and integrity standards have been established for ILS.

(3) ILS Airplane Position Determination. The airplane lateral position relative to the desired flight path is accomplished by an airplane ILS receiver that provides deviation from the extended runway centerline path when in the coverage area.

(4) MLS. The MLS is supported by established ICAO Annex 10 international standards for ground station operation. These standards should be used in demonstrating airplane system operation.

The airplane system response during a switchover from an active azimuth transmitter to a backup transmitter shall be established. Total failure (shutdown) of the MLS ground station may not significantly adversely affect go-around capability.

The Airplane Flight Manual shall indicate that operation is predicated upon the use of an MLS facility with performance and integrity equivalent to, or better than, an ICAO Annex 10 Facility Performance Category II MLS, or equivalent.

(5) MLS Flight Path Definition. The lateral required flight path is inherent in the design of the MLS. Acceptable performance and integrity standards have been established for MLS.

(6) MLS Airplane Position Determination. The airplane lateral position relative to the desired flight path is accomplished by an airplane MLS receiver that provides deviation from the extended runway centerline path when in the coverage area.

(7) GNSS [PoC]. This Attachment section is not intended to provide a comprehensive means of compliance for airworthiness approval of GNSS based systems. Currently approved systems are ILS or MLS based. The application of new technologies and systems will require an overall assessment of the integration of the airplane components with other elements (e.g., new ground based aids, satellite systems, advanced radar mapping systems, enhanced vision sensor systems) to ensure that the overall safety of the use of these systems for Category II. This GNSS section is included to identify important differences between conventional ILS/MLS based systems and GNSS based systems that affect GNSS or GLS criteria development.

The performance, integrity and availability of any ground station elements, any data links to the airplane, any satellite elements and any data base considerations, when combined with the performance, integrity and availability of the airplane system, should be at least equivalent to the overall performance, integrity and availability provided by ILS to support Category II operations.

(8) GNSS Flight Path Definition [PoC]. Appropriate specification of the required flight path for approach, or approach, landing and rollout (as applicable), is necessary to assure safety of the operation to

the relevant operational minima. The required flight path should be established to provide adequate clearance between the airplane and fixed obstacles on the ground, between airplane on adjacent approaches, and to ensure that the airplane stays within the confines of the runway.

The effect of the navigation reference point on the airplane flight path and wheel to threshold crossing height must be addressed.

The required flight path is not inherent in the design of a GNSS based approach, landing and rollout system, therefore an airplane navigation system must specify a sequence of earth referenced path points, or the airplane must receive information from a ground based system, to define the approach, landing and rollout required path points.

Certain path points, waypoints, leg types and other criteria are necessary to safely implement the approach, or approach, landing and rollout operations based on satellite and other integrated multi-sensor navigation systems.

Figure 2. in the main body of this Appendix shows the minimum set of path points, waypoints and leg types considered necessary to specify the flight path for approach, or approach, landing and rollout operations for air carrier operations.

The required flight path may be stored in an airplane database for recall and use by the command guidance and/or control system when required to conduct the approach to relevant minima for landing and rollout.

The definition, resolution and maintenance of the waypoints which define the required flight path and flight segments is key to the integrity of this type of approach, landing and rollout operation.

A mechanism should be established to assure the continued integrity of the flight path designators.

The integrity of any database used to define required path points for an approach should be addressed as part of the certification process. The flightcrew shall not be able to modify information in the database that relates to the definition of the required flight path for the final approach, and if necessary, initial missed approach.

(9) GNSS Airplane Position Determination [PoC]**.** The safety of a low visibility approach, and subsequent landing and rollout operation is, in part, predicated on knowing where the airplane is positioned relative to the required flight path. Navigation satellite systems exist which can provide position information to specified levels of accuracy, integrity and availability. The accuracy, integrity and availability can be enhanced by additional space and ground based elements. These systems provide certain levels of capability to support present low visibility operations and are planned to have additional future capability.

Satellite systems have the potential to provide positioning information necessary to guide the airplane during approach, landing and rollout. If operational credit is sought for these operations, the performance, integrity and availability must be established to support that operation. Ground based aids such as differential position receivers, pseudolites etc. and a data link to the airplane may be required to achieve the accuracy, integrity or availability for certain types of operation.

A level of safety equivalent to current ILS based operations should be established.

The role of the satellite based elements in the landing system should be addressed as part of the airplane system certification process until such time as an acceptable national, or international standards, for satellite based systems are established.

(10) Basic GNSS (Unaugmented) [PoC]. This is the basic navigation service provided by a satellite system. No additional elements are used to enhance accuracy or integrity of the operation.
(11) Differential Augmentation [PoC]. Differential augmentation uses a GNSS ground station at a known (surveyed) point on the ground to provide corrections to the individual satellite pseudo-range data.

If a GNSS ground station is used to provide differential pseudo-range corrections, or other data to an airplane to support approach, or approach and landing, operations, the equivalent overall integrity of that operation will have to be established.

The role of the differential station in the landing system will have to be addressed as part of the airplane system certification process until such time as an acceptable national, or international standard, for the ground reference system is established.

(12) Local Area Differential Augmentation [PoC]. Local Area Differential (LAD) augmentation consists of a ground based GNSS receiver located in the area of the airport that provides differential coverage runways at that airport.
(13) Wide Area Differential Augmentation [PoC]. Wide Area Differential (WAD) augmentation is not applicable to Category II, except where used in conjunction with other sensors (e.g., to substitute for DME with ILS).

Typically only LAD systems provide a basis for establishing the necessary position fixing accuracy, integrity and availability for the final portion of a final approach segment or rollout. Unaugmented GNSS or WAD are typically only suited for support of initial or intermediate segments of an approach, final approach to restricted DA(H)s, or missed approach. GNSS or WAD may however be used in conjunction with Category II procedures for applications such as equivalent DME distance, or marker beacon position determination, when authorized by the operating rules.

(14) Datalink [PoC]. A data link may be used to provide data to the airplane to provide the accuracy necessary to support certain operations (e.g., navigation waypoints, differential corrections for GNSS).

The integrity of the data link should be commensurate with the integrity required for the operation.

The role of the data link in the approach, or approach and landing system should be addressed as part of the airplane system certification process unless an identified acceptable U.S., or international standard(s) for the data link ground system is applicable and is used.

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DIVISION III - BASIC AIRWORTHINESS REQUIREMENTS

This section identifies airworthiness requirements including those for performance, integrity, and availability that apply to all types of airplane systems, independent of the type of approach and landing or navigation system used. The definitions of Performance, Integrity and Availability are found in Attachment 1.

The basic airworthiness criteria are intended to be independent of the specific implementation in the airplane or the type of Approach system being used.

Criteria may be expanded further in later sections of this Attachment as it applies to a particular airplane system or architecture.

The following definitions of Performance, Integrity and Availability will be used in this section of this Appendix:

Performance - A measure of the accuracy with which an aircraft, a system, or an element performs against specified parameters. Any performance demonstration will include components of Flight Technical Error.

Integrity - A measure of the acceptability of a system, or system element, to contribute to the required safety of an operation.

Availability - An expectation that systems or elements required for an operations will be available to perform their intended functions so that the operation will be accomplished as planned to an acceptable level of probability.

Information Note: *Continuity of Approach Function may involve aircraft systems, ground systems and, in some cases, space based systems. This Attachment addresses the aircraft part of the system and aircraft criteria will be defined in terms of aircraft system availability to provide quantifiable criteria for airworthiness compliance.*

(1) General Requirements. An applicant shall provide a certification plan which describes how any non-aircraft elements of the Approach System relate to the aircraft system from a performance, integrity and availability perspective. Standard Landing Aids (SLA) can be addressed by reference to ICAO SARPS.

The plan for certification shall describe the system concepts and operational philosophy to allow the regulatory authority to determine whether criteria and requirements other than those contained in this Attachment are necessary.

The Approach system performance should be established considering the environmental and deterministic effects that may reasonably be experienced for the type of operation for which certification and operational approval will be sought.

Where reliance is placed on the pilot to detect a failure of engagement of a mode when it is selected (e.g., Go-around), an appropriate indication or warning must be given.

The effect of the failures of the navigation facilities must be considered taking into account ICAO and other pertinent State criteria.

The effect of the aircraft navigation reference point on the airplane flight path and wheel to threshold crossing height shall be assessed.

The use of manual control or the transition from automatic control to manual control must not require exceptional piloting skill, alertness or strength.

(2) Approach System Accuracy Requirements. The following items are general criteria that apply to the various types of approach operation.

Performance shall be demonstrated by flight test, or analysis validated by flight test, with a representative range of environmental and system variables which have an effect on overall performance.

The performance assessment shall take into account at least the following variables with the variables being applied based upon their expected distribution:

- (a) configurations of the airplane (e.g., flap settings),
- (b) center of gravity,
- (c) landing weight,
- (d) conditions of wind, turbulence and wind shear,
- (e) characteristics of ground and space based systems and aids (ILS, MLS, DGPS, GNSS Satellites), and
- (f) any other parameter which may affect system performance (e.g., airport altitude, approach path slope, variations in approach speed).

The criteria for acceptable approach performance is based upon acquiring and tracking the required flight path to the appropriate minimum altitude for the procedure, or through landing and rollout, if applicable. The acquisition should be accomplished in a manner compatible with instrument procedure requirements and flightcrew requirements for the type of approach being conducted.

An approach guidance system shall not generate command guidance (e.g., flight director, HUD) which results in flight path control that is oscillatory, or requires unusual effort by the pilot to satisfy the performance requirements.

An approach control system shall not generate flight path control (e.g., autopilot) with sustained oscillations.

The approach system must cause no sustained nuisance oscillations or undue attitude changes or control activity as a result of configuration or power changes or any other disturbance to be expected in normal operation.

Between 500 feet [150 m] and the start of flare, the speed shall be maintained to +/- 5 knots of the approach reference speed (disregarding rapid airspeed fluctuations associated with turbulence).

(3) ILS. The performance standards for signal alignment and quality contained in ICAO Annex 10, or an equivalent State standard, are acceptable standards for operations based on ILS. These standards shall be used in establishing the performance of the operation.

At least three ILS beams should be used during the flight demonstration and the approach should be made in a representative aircraft configuration.

The guidance or control system shall be demonstrated to track the localizer signal within ± 0.0258 DDM (25ua) to a 95% probability from 500 feet [150 m] to 100 feet [30 m] above the runway elevation or the Decision Height, whichever is greater.

The guidance or control system shall be demonstrated to track the glideslope signal within ±0.0875 DDM (75ua) to a 95% probability from 500 feet [150 m] to 100 feet [30 m] above the runway elevation or the Decision Height, whichever is greater.

(4) MLS. The performance standards for signal alignment and quality contained in ICAO Annex 10 or an equivalent State standard are acceptable standards for operations based on 1 MLS. These standards shall be used in establishing the performance of the operation.

At least two MLS beams should be used during the flight demonstration and the approach should be made in a representative aircraft configuration.

Information Note: *If the MLS demonstration follows an ILS certification program, the number of MLS beams may be reduced to one.*

The guidance or control system shall be demonstrated to track the localizer signal within ± 0.0258 DDM (25ua) to a 95% probability from 500 feet [150 m] to 100 feet [30 m] above the runway elevation or the Decision Height, whichever is greater.

The guidance or control system shall be demonstrated to track the glideslope signal within ± 0.0875 DDM (75ua) to a 95% probability from 500 feet [150 m] to 100 feet [30 m] above the runway elevation or the Decision Height, whichever is greater.

(5) GLS [PoC]. Division II, Section (7) of this Attachment provides background GLS considerations.

The role of the satellite-based elements in the landing system should be addressed as part of the aircraft system certification process until such time as an acceptable national, or international standard, for the satellite based system is established.

The guidance or control system shall be demonstrated to track the lateral flight path within the lateral bounds equivalent to that achieved by use of an ILS (II/D/2) down to 100' [30 m] HAT, or for RNP based systems, the appropriate lateral RNP bounds, which ever is more restrictive.

The guidance or control system shall be demonstrated to track the vertical flight path within the vertical bounds equivalent to that achieved by use of an ILS (II/D/2) down to 100' [30 m] HAT, or for RNP based systems, the appropriate vertical RNP bounds, which ever is more restrictive.

(6) RNP. The transition from en route RNP to approach RNP will be accomplished in a seamless manner.

The approach RNP is specified from the FAF to the DA(H).

RNP operations are based upon the accuracy of the airplane flight path in absolute terms with respect to the required flight path over the ground. The Total System Error (TSE) will be characterized by the combined performance of airplane systems and any navigation aids. The certification plan should identify any navigation aid(s) on which the RNP performance will be established and how the airplane performance interacts with the navigation aid(s) to meet the TSE performance requirements. The certification plan should identify the assumed relationship between airplane performance and any navigation aid performance.

The guidance or control system shall be demonstrated to maintain a flight path which tracks the required flight path to the RNP Type as specified in Division II, Section (46) of the body of this Appendix, as applicable.

(7) Flight Path Definition. Refer to Division II, Section (49) in the main body of this Appendix for consideration on Flight Path Definition when navigation aids are used which do not have the required flight path inherent in the structure of the signal in space.

(8) Approach System Integrity Requirements. The applicant shall provide the certification authority with an overall operational safety assessment plan for the use of systems other than ILS or MLS for "path in space" guidance. This plan shall identify the assumptions and considerations for the non-aircraft elements of the system and how these assumptions and considerations relate to the airplane system certification plan.

The onboard components of the landing system, considered separately and in relation to other associated onboard systems, should be designed to comply with U.S. 14 CFR/JAR Section 25.1309, considering any specific safety related criteria identified in this Attachment, or as identified in accordance with the operating rules.

The following criteria is provided as guidance for the application of U.S. 14 CFR/JAR Section 25.1309 to Landing Systems:

(9) ILS. The aircraft system response to loss of ILS guidance signals (localizer and glideslope) shall be established.

The aircraft system response during a switchover from an active localizer or glideslope transmitter to a backup transmitter shall be established.

(10) MLS. The aircraft system response to loss of MLS guidance signals (elevation and azimuth) shall be established.

The aircraft system response during a switchover from an active elevation or azimuth transmitter to a backup transmitter shall be established.

(11) GLS. The aircraft system response to loss of GLS guidance signals shall be established.

(12) RNP. The aircraft system response to loss of the navigation service(s) used to conduct the RNP operation shall be established.

The aircraft system response during any switchover to alternate navigation services shall be established.

It shall be demonstrated that the airplane will maintain the required flight path within 2 times the RNP value when unannunciated failures not shown to be improbable (probability greater than 10^{-7} per approach) are experienced
(i.e., Operation with Failures).

(13) Approach System Availability Requirements. This section identifies the requirements for aircraft system reliability to conduct various approach operations.
(14) ILS. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure.
(15) MLS. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure.
(16) GLS. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure.
(17) RNP. The aircraft system shall demonstrate system reliability that would result in at least 95% of the approaches being conducted from 500 feet [150 m] without a system failure.
(18) Go-around Requirements. A Go-around may be required following a failure in the Approach System, as required by the flightcrew or by Air Traffic Service at any time prior to touchdown.

It should be possible to initiate a missed approach at any point during the approach until touchdown on the runway. It should be safe to initiate a missed approach that results in a momentary touchdown on the runway.

A Go-around should not required unusual pilot skill, alertness, or strength.

The proportion of approaches terminating in a go-around below 500 ft (150 m) due to inappropriate airplane system performance may not be greater than 5%.

Information should be available to the operator to assure that a safe go-around flight path can be determined.

(19) Flight Deck Information, Annunciation and Alerting Requirements. This section identifies information, annunciations and alerting requirements for the flight deck.

The controls, indicators and warnings must be designed to minimize crew errors that could create a hazard. Mode and system malfunction indications must be presented in a manner compatible with the procedures and assigned tasks of the flightcrew. The indications must be grouped in a logical and consistent manner and be visible under all expected normal lighting conditions.

(20) Flight Deck Information Requirements. This section identifies requirements for basic situational and guidance information.

For manual control of approach flight path, the appropriate flight display(s), whether head down or head up, must provide sufficient information, without excessive reference to other cockpit displays, to enable a suitably trained pilot to:

(a) maintain the approach path,
(b) to make the alignment with the runway, flare and land the airplane within the prescribed limits (if applicable), or
(c) go-around.

Sufficient information should be provided in the flight deck to allow the pilots to monitor the progress and safety of the approach operation, using the information identified above and any additional information necessary to the design of the system.

Required in flight performance monitoring capability includes at least the following:

(a) unambiguous identification of the intended path for the approach, landing and rollout, (e.g., ILS/MLS approach identifier/frequency, and selected navigation source).
(b) indication of the position of the aircraft with respect to the intended path (e.g., raw data localizer and glide path, or equivalent).

(21) Annunciation Requirements. A positive, continuous and unambiguous indication must be provided of the modes actually in operation, as well as those that are armed for engagement. In addition, where engagement of a mode is automatic (e.g., localizer and glide path acquisition), clear indication must be given when the mode has been armed by either action of a member of the flightcrew, or automatically by the system (e.g., a pre-land test - LAND 3).
(22) Alerting. Alerting requirements are intended to address the need for warning, caution and advisory information for the flightcrew.
(23) Warnings. The Standard will be as specified in U.S. 14 CFR/JAR 25.1309 which requires that information must be provided to alert the crew to unsafe system operating conditions to enable the crew them to take appropriate corrective action. A warning indication must be provided if immediate corrective action is required. An analysis must be performed to consider crew alerting cues, corrective action required, and the capability of detecting faults.
(24) Cautions. A caution is required whenever immediate crew awareness is required and timely subsequent crew action will be required. A means shall be provided to advise the flightcrew of failed airplane system elements that affect the decision to continue or discontinue the approach.

The guidance or control system shall indicate to the flightcrew when the Actual Navigation Performance (ANP) exceeds the RNP.

Deviation alerting. Authority's do not require excessive deviation alerting, but will approve systems that meet appropriate criteria. If a method is provided to detect excessive deviation of the airplane, laterally and vertically during approach to touchdown and laterally after touchdown, then it should not require excessive workload or undue attention. This provision does not require a specified deviation alerting method or annunciation, but may be addressed by parameters displayed on the ADI, EADI, HUD, or PFD. When a dedicated deviation alerting is provided its use must not cause excessive nuisance alerts.

For systems demonstrated to meet criteria for Category II, compliance with the following criteria, from JAA/AWO 236, is an acceptable means of compliance, but is not a required means of compliance:

(a) for systems meeting the AWO 236 criteria, excess-deviation alerts should operate when the deviation from the ILS or MLS glide path or localizer centerline exceeds a value from which a safe landing can be made from offset positions equivalent to the excess-deviation alert, without exceptional piloting skill and with the visual references available in these conditions.
(b) for systems meeting the AWO 236 criteria, excess-deviation alerts should be set to operate with a delay of nor more than one (1) second from the time that the deviation thresholds are exceeded.
(c) for systems meeting the AWO 236 criteria, excess-deviation alerts should be active at least from 300 feet [90 m] HAT to the decision height, but the glide path alert should not be active below 100 feet [30 m] HAT.

(25) Advisories. A means shall be provided to inform the flightcrew when the airplane has reached the operational Decision Altitude/Height, as applicable.
(26) System Status. A means should be provided for the operator to determine prior to departure and the flightcrew to determine after departure, the capability of the airplane elements to accomplish the intended low visibility operations. While en route, the failure of each airplane component affecting the approach and landing capability should be indicated to the flightcrew as an advisory, without flightcrew action, unless otherwise required (e.g., autopilot disconnect warning).

A means shall be provided to advise the flightcrew of failed airplane system elements that affect the decision to continue to the destination or divert to an alternate.

System Status indications should be identified by names that are different than operational authorization categories
(e.g., use names such as "LAND 3", or "DUAL", etc. - do not use Category I, II, III).

(27) Multiple Landing Systems and Multi-mode Receivers (MMR) for Category II. International agreements have established a number of landing systems as an acceptable means to provide guidance to support the conduct of an instrument approach. This section identifies unique requirements which relate to airplane systems which provide the capability to conduct approach and landing operations using these multiple landing systems (e.g., ILS, MLS, GNSS Landing System (GLS)). Provisions equivalent to those listed in Attachment 2, Section (44)**,** except as appropriate for systems applicable to Category II may be applied.
(28) General Requirements. Where practicable, the flight deck approach procedure should be the same irrespective of the navigation source being used.

A means (for example the current ILS audio idents) should be provided to confirm that the intended approach aid(s) has been correctly selected.

During the approach, an indication of a failure in each non-selected airplane system element must be provided to the flightcrew as an indication of system status; it should not produce a caution or warning.

(29) Indications. The following criteria apply to indications in the flight deck for the use of a multi-mode landing system:

The loss of acceptable deviation data shall be indicated on the display. It is acceptable to have a single failure indication for each axis common to all navigation sources.

(30) Annunciations. The following criteria applies to annunciations in the flight deck when using a multi-mode approach system:

The navigation source (e.g., ILS, MLS, GLS, FMS) selected for the approach shall be positively indicated in the primary field of view at each pilot station,

The data designating the approach (e.g., ILS frequency, MLS channel, GNSS 'path identifier') shall be unambiguously indicated in a position readily accessible and visible to each pilot,

A common set of mode ARM and ACTIVE indications (e.g., LOC and GS) is preferred for ILS, MLS and GNSS operations, and

A means should be provided for the crew to determine a failure of the non-selected navigation receiver function, in addition to the selected navigation receiver function. When considering equipment failures, the failure indications should not mislead through incorrect association with navigation source. For example, it would not be acceptable for the annunciation "ILS FAIL" to be displayed when the selected navigation source is MLS and the failure actually affects the MLS receiver.

(31) Alerting. Flight operations require alternate airports for takeoff, en route diversion and landing. These alternate airports may have different landing systems. Flight operations may be planned, released and conducted on the basis of using one or more landing systems.

The capability of each element of a multi-mode landing system shall be available to the flightcrew to support dispatch of the airplane.

A failure of each element of a multi-mode landing system must be indicated to the flightcrew as an advisory, without pilot action, during en route operation.

A failure of the active element of a multi-mode landing system during an approach shall be accompanied by a warning, caution, or advisory, as appropriate.

An indication of a failure in each non-selected element a multi-mode landing system during an approach shall be available to the flightcrew as an advisory but should not produce a caution or warning.

(32) Multi-mode Receivers (MMR) used for systems for Category II. For MMRs used for systems for Category II, using more than one or more type(s) of landing system, the means of compliance required for certification can be simplified, provided the applicant provides appropriate justification. This section provides guidance for retrofit certifications, for "ILS Look alike" applications, and for certification of ILS installations with either new or modified receivers. Equivalent provisions as to those described in Attachment 2, Section (49), except as applicable to criteria for Category II may be applied.

DIVISION IV - APPROACH SYSTEM EVALUATION

An evaluation should be conducted to verify that the pertinent systems as installed in the airplane meet the airworthiness requirements of Division III of this Attachment. The evaluation should include verification of approach system performance requirements and a safety assessment for verification of the integrity and availability requirements. Engine failure cases and other selected failure conditions identified by the safety assessment should be demonstrated by simulator and/or flight tests.

An applicant shall provide a certification plan(s) that describes:

(a) the means proposed to show compliance with the requirements of Division III this Attachment, with particular attention to methods that differ significantly from those described in this Attachment.

(b) how any non-airplane elements of the Approach System relate to the airplane system from a performance, integrity and availability perspective (e.g., appropriate reference to ICAO Annex or United States Standard).

(c) the assumptions on how the performance, integrity and availability requirements of the non-airplane elements of non-Standard Landing Aids will be assured.

(d) the system concepts and operational philosophy to allow the regulatory authority to determine whether criteria and requirements in excess of that contained in this Attachment are necessary.

Early agreement between the applicant and the Authority should be reached on the proposed certification plan. Upon completion of an Authority's engineering design review and supporting simulation studies, a type inspection authorization (TIA) should be issued to determine if the complete installation of the equipment associated with Category II operations meets the criteria of this Attachment.

(1) Performance Evaluation. Performance for an airborne system intended to meet provisions of this Appendix should be demonstrated by flight test.

The airborne system should be demonstrated in at least the following conditions taking into account manual/coupled autopilot, autothrottle configurations for Category II approaches:

(a) wind conditions:
  (i) 20 kts - Head wind component
  (ii) 10 kts - Crosswind component
  (iii) 10 kts - Tailwind component
  (iv) ATS reported surface winds, or equivalent, may be used.

(b) a minimum of 10 successful approaches should be completed.

If more than 1 approach in the series of approaches attempted are unsuccessful, an additional number of successful approaches may be required, as agreed by the applicant and the Authority.

(2) Safety Assessment. Except as required by any specific safety related criteria identified in this Attachment, or by the operating rules, a safety assessment of the Approach system, considered separately and in conjunction with other systems, shall be conducted to show compliance with U.S. 14 CFR/JAR Section 25.1309.

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DIVISION V - AIRBORNE SYSTEM REQUIREMENTS

This section identifies criteria applicable to specific aircraft system architecture selected to conduct the operation. This criteria is developed from Operational Considerations, Approach System Considerations, Aircraft System Considerations and the general operational philosophy contained in the body of this Appendix.

(1) General. Various airplane systems are expected to comply with the basic performance, integrity and availability requirements are identified in Division III of this Attachment.
(2) Autopilot. The following criteria is applicable to Autopilot systems:

The suitability of pertinent autopilot modes or features applicable to conducting or monitoring an approach, landing, rollout or go around, as applicable, should be considered in showing compliance with U.S. CFR 14/JAR Section 25.1523**.**

The autopilot must not have normal features or performance, or performance in typical adverse environmental conditions which would cause undue crew concern and lead to disconnect (e.g., inappropriate response to ILS beam disturbances or turbulence, unnecessarily abrupt flare or go-around attitude changes, unusual or inappropriate pitch or bank attitudes, or sideslip response).

Control of Approach Flight Path. - the autopilot must:
- (a) maintain the approach path,
- (b) if applicable, make the alignment with the runway, flare and land the airplane within the prescribed limits, or
- (c) promptly go-around, with minimum practical loss of altitude.

Autopilot performance must be compatible with either manual speed control, or if applicable, autothrottle speed control.

Mode definition and logic should be consistent with appropriate industry practice for mode identification and use (e.g., naming, mode arming and engagement). Definition of new modes or features, not otherwise in common use, should be consistent with their intended function, and consider potential for setting appropriate or adverse precedent.

The autopilot system performance and alerting should be consistent with the intended operational use for duties and procedures of the pilot flying (PF) and pilot not flying (PNF) (see Division III, Sections (14) and (16) of the main body of this Appendix).

If the autopilot is used to control the flight path of the airplane to intercept and establish the approach path, the pilot should be able to transition from automatic to manual flight at any time without undue effort, attention, or control forces, and with a minimum of disturbance of flight path.

If a HUD is installed, any transition from autopilot to HUD guidance or vice versa, must not require exceptional piloting skill, alertness, strength or excessive workload.

A flight director system, or alternative form of guidance, if used, must be compatible with the autopilot and vice versa.

A fault must cause an autopilot advisory, caution, or warning, as necessary. If a warning is necessary, the pilot must be able to detect the warning with a normal level of attention and alertness expected during an approach or go-around.

(3) Head Down Guidance. The following criteria is applicable to Head Down Guidance systems:

A flight director system, or alternative form of guidance, must be designed so that the probability of display of incorrect guidance commands is Remote.

Wherever practical, a fault must cause guidance information to be immediately removed from view. If a warning is given instead, it must be such that the pilot will observe the warning whilst using the information.

(4) Head Up Guidance. The following criteria is applicable to Head Up Guidance systems:

The workload associated with use of the HUD should be considered in showing compliance with U.S. 14 CFR/JAR Section 25.1523**.**

The HUD display medium must not significantly obscure the pilot's view through the cockpit window.

Control of Approach Flight Path. - the HUD must provide sufficient guidance information, without excessive reference to other cockpit displays, to enable a suitably trained pilot to:

- (a) maintain the approach path,
- (b) to make the alignment with the runway, flare and land the airplane within the prescribed limits (if applicable), or
- (c) go-around.

If only one HUD is installed, it should be installed at the pilot-in-command crew station.

The HUD guidance must not require exceptional piloting skill to achieve the required performance.

The HUD system performance and alerting should be consistent with the intended operational use for duties and procedures of the pilot flying (PF) and pilot not flying (PNF) (see sections 5.6 and 5.8 of the main body of this Appendix).

If the autopilot is used to control the flight path of the airplane to intercept and establish the approach path, the point during the approach at which the transition from automatic to manual flight takes place shall be identified and used for the performance demonstration.

Any transition from autopilot to HUD guidance must not require exceptional piloting skill, alertness, strength or excessive workload.

A flight director system, or alternative form of guidance, must be designed so that the probability of display of incorrect guidance commands is Remote.

Wherever practical, a fault must cause guidance information to be immediately removed from view. If a warning is given instead, it must be such that the pilot will observe the warning whilst using the information.

(5) Hybrid. The following criteria is applicable to Hybrid systems:

(a) if a HUD is used to monitor an autoflight system, it should be shown to be compatible with the autoflight system and permit a pilot to detect unsuitable autopilot performance.

(b) other hybrid systems (e.g., including EVS) require a proof of concept [PoC] evaluation to establish suitable criteria

(6) Satellite Based Approach System. The following criteria is applicable to Satellite Based Approach systems:

(a) satellite based systems should be shown to provide equivalent or better capability than navigation systems based on VOR, DME, or ILS for comparable operations, or meet provisions applicable to RNP.

(b) satellite based systems should not exhibit undue sensitivity to masking of satellite vehicles, or interference from onboard or external sources.

(c) satellite based systems should not exhibit adverse characteristics during acquisition or loss of satellites.

(7) Reserved.

(8) Autothrottle. For Category II, an autothrottle should meet the provisions of Attachment 2 Section (8) , and in addition:

(a) hold speed within a ± 5 kt tolerance of intended speed, in typical environmental conditions expected for use, and

(b) provide appropriate status, advisory, caution and warning information for failures, and

(c) provide timely application of "Go-around thrust" if a go-around mode is available, and

(d) not require undue crew attention or skill to recognize and respond to an engine failure during approach or go-around.

(9) Datalink. For Category II, a datalink should meet the provisions of Attachment 2 Section (9).

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DIVISION VI - Airplane Flight Manual

(1) The Airplane Flight Manual shall contain the following information:

- (a) any conditions or constraints on Approach performance with regard to Airport conditions (e.g., elevation, ambient temperature, approach path slope, runway slope and ground profile under the approach path).
- (b) the criteria used for the demonstration of the system, acceptable normal and non-normal procedures, the demonstrated configurations, and types of facilities used, and any constraints or limitations necessary for safe operation.
- (c) the type of navigation facilities used as a basis for certification. This should not be taken as a limitation on the use of other facilities. The AFM may contain a statement regarding the type of facilities or condition known to be unacceptable for use.
- (d) information should be provided to the flightcrew regarding atmospheric conditions under which the system was demonstrated (e.g., head wind, crosswind, tailwind). The AFM should contain a statement that "Credit may not be predicated on the use of <type of system> if conditions exceed ..." those for which the system received airworthiness approval.

Information Note: *1: The AFM limitation section should not specify DA(H) or RVR limitations.*

2 U.S. Advisory Circular AC 25.1581-1 Section 2 discusses AFM contents. The approval status referenced in 2 b (9) (vii) for Category I, II, or III of that AC should be noted in the Normal Procedures Section of the AFM, in accordance with the above provisions.

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ATTACHMENT 4.
WIND MODEL FOR APPROACH SIMULATION

Wind models need not be applied to system review and approval related to Attachment 2 or Attachment 3. However, if a wind model is used by the applicant, it is recommended that the model specified in Appendix III be used.

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ATTACHMENT 5
OBSTACLE ASSESSMENT FOR RNP FOR CATEGORY I OR CATEGORY II

DIVISION I
OBSTACLE ASSESSMENT FOR STANDARD RNP TYPES (E.G., USING LINEAR RNP)

(1) Obstacle Assessment for Required Navigation Performance Approaches and Missed Approaches. This Attachment provides a standard criteria that may be used in the development of RNP approaches by procedure designers and Designated Procedure Design Representatives. It also provides a standard criteria that may be used in lieu of the above criteria when it is desired to use ILS/or ILS equivalent criteria. This criteria may be used in conjunction with airworthiness demonstrations of airborne equipment, or in the assessment of other States criteria used in international operations for Lebanese Operators.

(2)The criteria presented in this Attachment applies to the Final Approach (FAS) and Missed Approach segments (MAS). The Final Approach segment is defined as beginning at the FAF and ending at the runway Datum Crossing Height (DCH) or missed approach point (DA(H)). No specific minimum or maximum length is assigned to the FAS, but the FAF must be located such that consideration is given to how the FMC VNAV operation may be constrained in certain ways at the point the FAS commences. In addition, consideration should be given in the placement of the FAF recognizing that a continuous VNAV descent may be intended to the FAF, instead of a level intermediate segment with a minimum VNAV intercept altitude. The Missed Approach segment is defined as beginning at the DA(H) and ending at the missed approach waypoint. No minimum or maximum length is assigned to the MAS, but consideration should be given to having the aircraft established on an en route transition.

(3) Three basic conditions are considered in the development of obstacle clearance criteria for RNP approaches and missed approaches:

(a) the aircraft arrives at the DA(H), continues with visual reference to a landing on the runway.
(b) the aircraft arrives at the DA(H), initiates a missed approach, and experiences an engine failure.
(c) the aircraft arrives at the DA(H), continues with visual reference to the runway, initiates a rejected landing at the end of the touchdown zone, and experiences an engine failure.

Each of these conditions have associated criteria for lateral and vertical obstacle clearance protection. In addition to these normal and non-normal conditions, rare-normal conditions must be assessed. Unless wind limitations are specified, these rare normal conditions should be considered as a wind from the most adverse direction at the certificated limit for landing, increasing to 50 knots at 1000 feet' AGL. This rare-normal wind condition shall increase at a gradient of 10 knots per 1000 feet up to a maximum of 100 knots from the most adverse direction (i.e., tailwind).

OBSTACLE CRITERIA.

(4) For condition 3(a), described above, an obstacle identification surface is defined for the visual segment between the DA(H) and the touchdown zone on the runway. This surface originates at the runway threshold and is inclined at an angle 1 degree less than the VNAV angle for the FAS. This surface is bounded laterally by two rays which originate from the center of the runway at a point 1000' [300 m] from the threshold, splay at an angle of 10 relative to the runway centerline to the DA(H), or the

point at which the lateral limit of 2* RNP is reached. Any obstacle which penetrates this obstacle identification surface must be identified and published for flightcrew reference (Figure A5-1).

In addition, this area should be free of fixed or movable obstacles (regardless of whether they are or are not present by their aeronautical purpose) at the time an instrument approach is conducted inside the FAF. A procedure should not be authorized with an obstacle in this areas unless the presence of the obstacle(s) is specifically reviewed and authorized by the DGCA, and the flightcrew of the landing aircraft is provided information on the location and nature of the obstacle.

(5) For the condition 3(b)**,** described above, a lateral containment surface is centered on the FAS and bounded on either side by two parallel lines located at a distance of 2* RNP (Figure A5-2**).** Within the lateral limits of this containment surface, a variable Required Obstacle Clearance (ROC) must be provided which is a function of altitude. This ROC is established by evaluating the Root-Sum-Square (RSS) of the variables which could be considered to contribute to errors in the vertical axis. Examples of these variables include, but are not limited to, horizontal along-track navigation system errors, temperature induced barometric altimetry errors, flight technical errors, static source errors, minimum waypoint resolution, minimum vertical path angle resolution, etc. The result of this analysis, when considered using 4 sigma variables, defines the ROC. By subtracting the ROC from the VNAV elevation at defined locations, a sloping Obstacle Identification Surface beneath the VNAV path is established. The DA(H) is defined as 50 feet above the point on the OIS where the aircraft must be established in a climb to clear all obstacles. The climb gradient used for this analysis is established for a particular aircraft by evaluating the worst case condition. This may include one-engine inoperative, maximum permissible tailwind, maximum permissible landing weight, icing/temp/altitude degradations, etc. A variable DA(H) may be employed if certain conditions are specifically excluded (e.g., no icing) **(**Figure A5-3 & A5-4).

Figure A5-5 shows the normal instrument approach case which has neither an approach or missed approach controlling obstacle.

Aircraft which have a wheel to nav reference point (e.g., altimeter reference) vertical height less than 19 feet [5.79 m] , or a longitudinal nav reference point (e.g., altimeter reference point) to lowest and most aft wheel distance of 125 feet [38.1 m] or less at the normal approach pitch attitude and speed need not account for altimeter vertical and longitudinal displacement from wheel height. Aircraft which have vertical or longitudinal distances which exceed these values should include suitable correction factors along with any RSS analysis of potential vertical path displacement errors.

(6) For the condition 3(c), described above, a lateral containment surface is centered on the MAS and bounded on either side by two rays which originate from a point 200 feet [60 m] either side of the runway centerline at the end of the TDZ (3000' from the approach end of the runway). These rays splay at an angle of 7.5^{o} out to a maximum distance from the MAS centerline of 2* RNP. Within the lateral limits of this containment surface, a minimum of 35 feet ROC must be provided below the one engine inoperative net flight path of the aircraft (Figure A5-6).

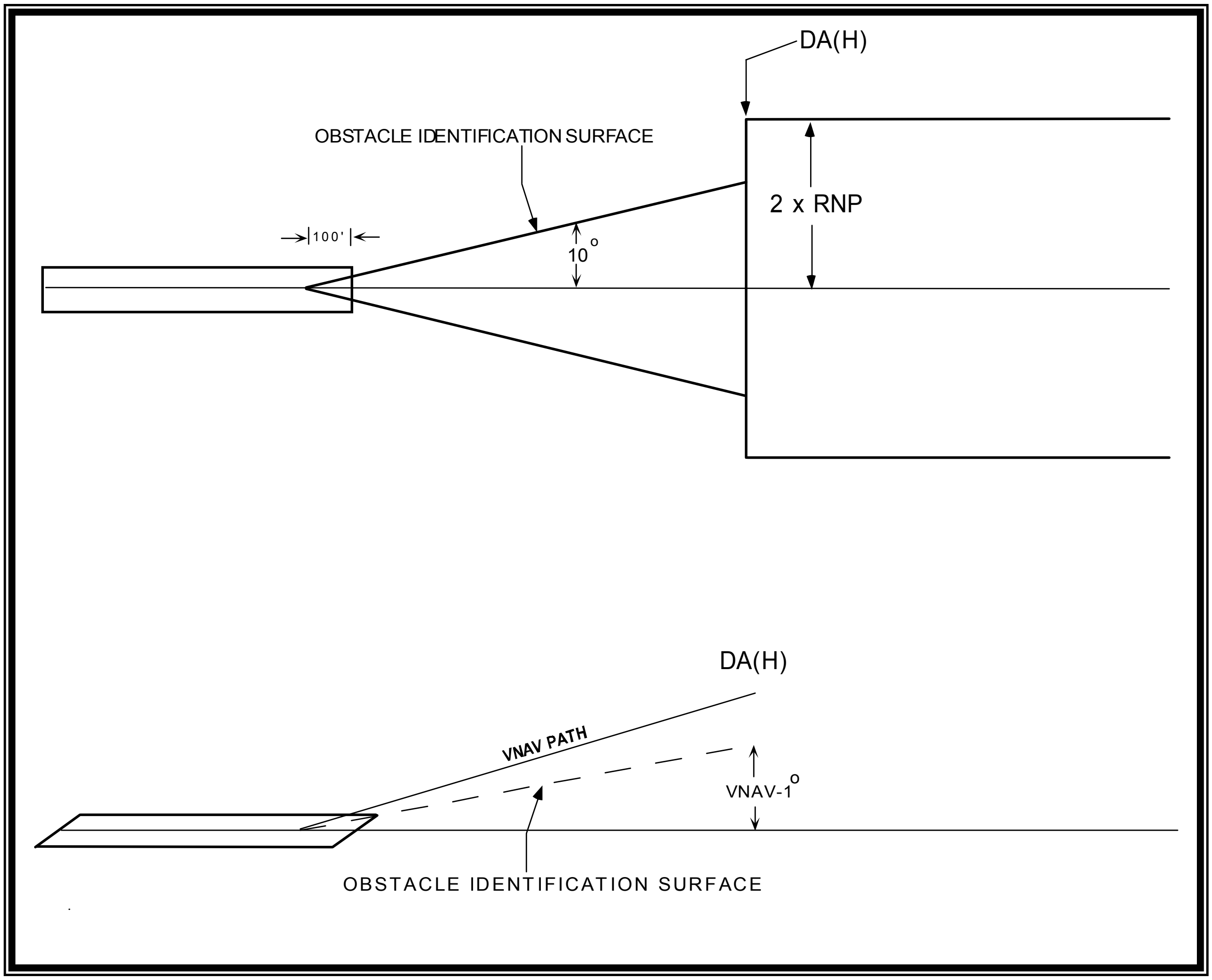
(7) FAS turns are constructed using specific lateral path guidance algorithms of the navigation system for which the procedure is designed, or by using generic algorithms which take numerous navigation system characteristics into consideration.

(8) Fly-by Waypoints: For turns on the FAS, the outside (of the turn) lateral containment surface is constructed via an arc of radius 2* RNP, which is centered on the turn waypoint. For the inside lateral containment surface, the ground speed condition which results in the greatest amount of turn anticipation

(earliest departure from and latest return to the FAS centerline) is used for construction. For this condition, the containment surface can be constructed in two ways. The first method uses a straight line which extends between the intersections of the two perpendiculars, located at the start and end points of the turn anticipation arc, and the 2* RNP containment surface which is parallel to the segments before and after the turn waypoint. The second method uses an arc of radius equal to the turn anticipation arc minus 2*RNP **(**Figure A5-7).
(9) Fly-over Waypoints: In the event that this type of turn is required, the ground speed which results in the greatest amount of overshoot and latest return to the FAS centerline should be determined. For this condition, the outside containment surface is constructed as an arc and straight segment combination parallel to and at a distance of 2* RNP from the computed flight path. The inside containment surface is constructed using the conservative assumption of no overshoot). Given this condition, the containment surface is simply defined as the intersection of the 2* RNP surfaces parallel to the Final Approach Segments (Figure A5-8).
(10) MAS turns are constructed in a manner identical to turns in the FAS, unless the turn occurs prior to the point at which the containment surfaces are fully expanded to the 2* RNP value. In this event, only fly-by waypoints should be used because of the complexity which results from constructing the outside containment surface for the fly-over waypoints.
(11) Fly-by Waypoints. For turns on the MAS, prior to the point at which the containment surfaces are fully expanded to the 2* RNP value, the containment surface should be constructed in the following manner: The outside lateral containment surface is constructed by transferring the width of the splay abeam the turn waypoint via an arc to the following segment. The arc is of radius equal to the attained half-width of the preceding segment and is centered at the turn waypoint. The arc is extended to a line perpendicular to the centerline of the following segment and passing through the turn waypoint. The splay is continued from that point by an angle of 7.5 to a distance of 2* RNP from the centerline. To simplify the containment surface construction for the inside of the turn, a straight line is drawn between the earliest point of departure and the latest point of return back to the following segment for the fly-by of the turn waypoint. The containment surface expands by a 7.5 splay angle using the simplified inside turn approximation as the reference centerline. This splay is continued until reaching the 2* RNP displacement from the reference centerline (Figure A5-9).
(12) RNP reductions on the FAS should be considered with much care. No transition area is required; however the RNP reduction should be located such that consideration is given to the maximum latency of RNP alerting messages, maximum ground speed, crew response time, height of any obstacles immediately beyond the change in RNP, and the one-engine inoperative climb gradient. This distance, "d", is shown in Figure A5-10. RNP increases do not require this special consideration, thus distance "b" in Figure A5-10 could be zero.
(13) Waypoint coordinates shall be defined in the WGS-84 or NAD-83 coordinate system. Waypoint resolution shall be provided to at least 0.01 arc minutes.
(14) General comments on the use of topographical charts:
(15) Use USGS 1:25,000 or 1:24,000 charts wherever possible.
(16) Authority's assign an accuracy code of "2C" to the 1:24,000 topographical charts. This does not meet the minimum accuracy standard for a precision final segment of an approach. For this reason, a 40' horizontal and 20 feet vertical adjustment is required to the obstacle values taken directly from the topographical chart. These adjustments are applied in the horizontal and vertical direction which most adversely affects the procedure; i.e., the range is reduced by 40 feet [12.19 m] and the height increased by 20 feet [6.1 m].
(17) Tree heights consistent with the maximum found in the area must be added to all contour elevations, unless specific survey heights are used in areas of interest.

(18) All assumptions on terrain elevations must be conservative; if an obstacle of interest falls between two gradient lines the obstacle is assigned a height equal to the next higher gradient line minus one unit of elevation. For terrain elevations which are critical (or perhaps controlling), the terrain is assumed to rise to a height equal to the next higher gradient line minus one unit of elevation at an incremental distance beyond the gradient line in question.
(19) Man-made obstacle data can be obtained from the U.S. Department of Commerce Quarterly Obstacle Memo Digital Obstacle File, or ICAO equivalent. Horizontal and vertical adjustments are applied as a function of the accuracy code assigned to each obstacle.
(20) Examples of completed RNP Forms. Reserved (Figures A5-11 and 12 reserved.)

OBSTACLE IDENTIFICATION - VISUAL SEGMENT
Figure A5-1



RNP LATERAL AREA TO CONSIDER - MISSED APPROACH FROM DA(H)
Figure A5-2

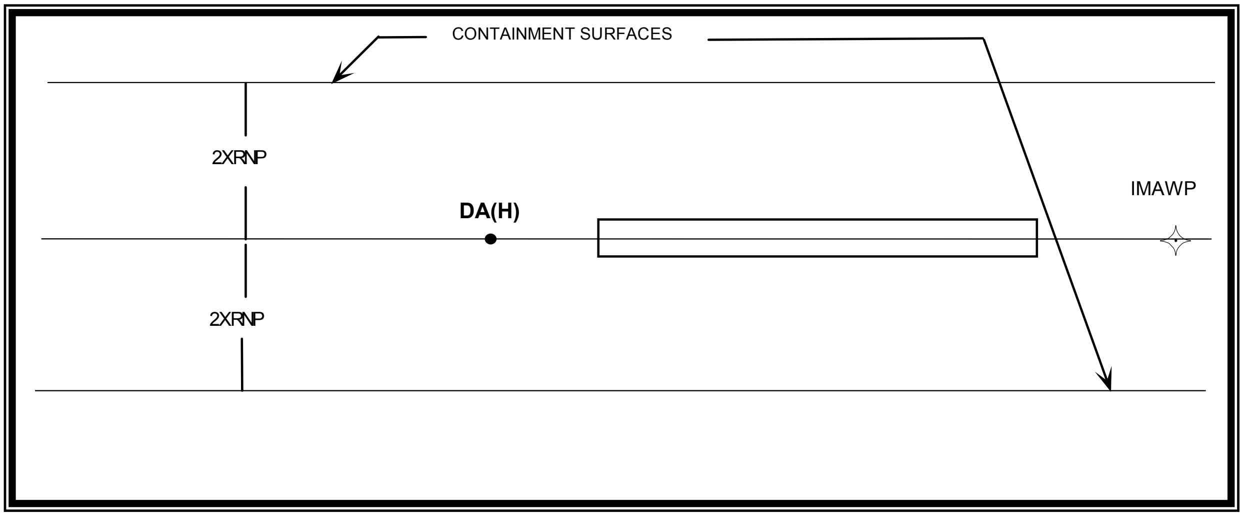


Figure A5-3

TBD

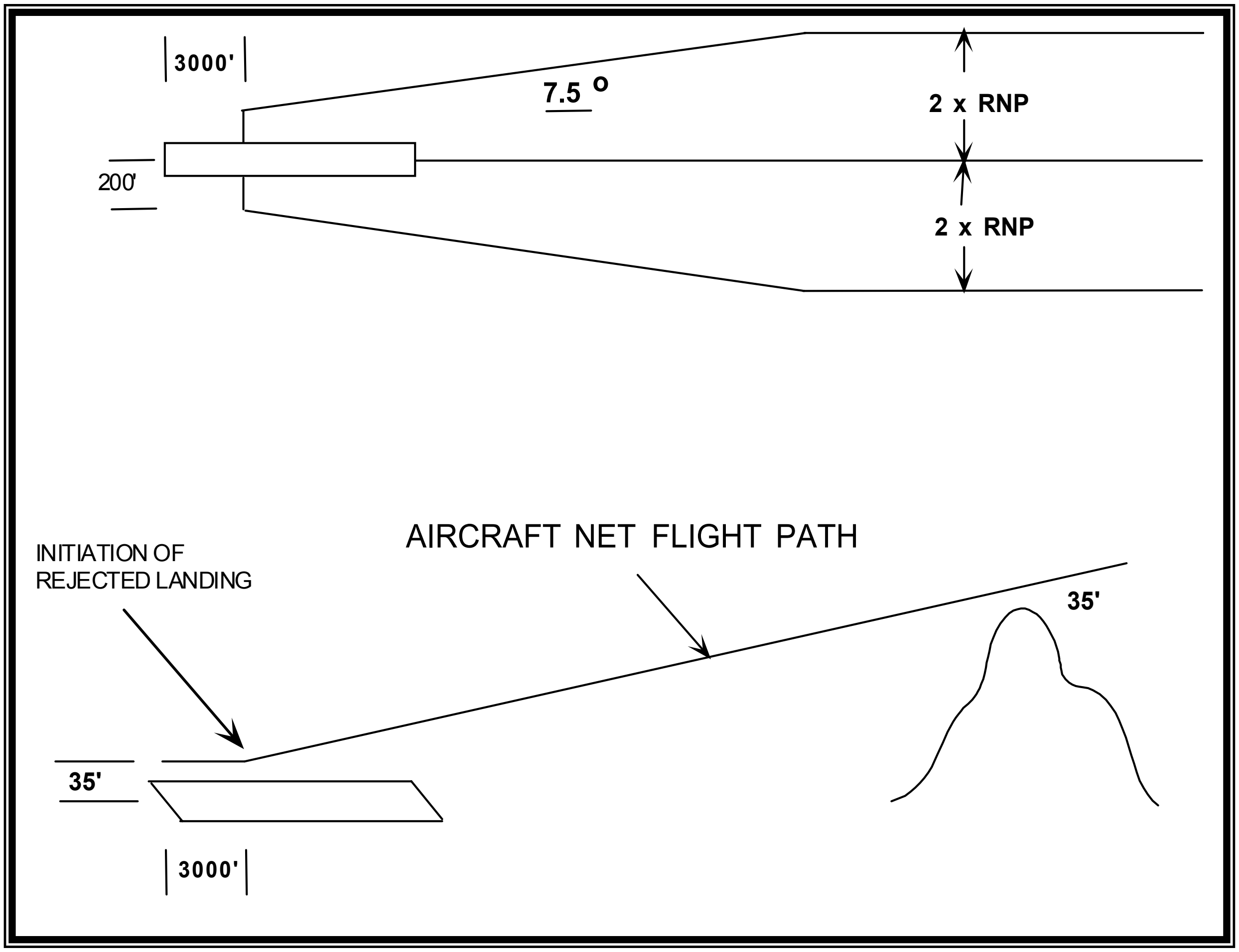
Figure A5-4

TBD

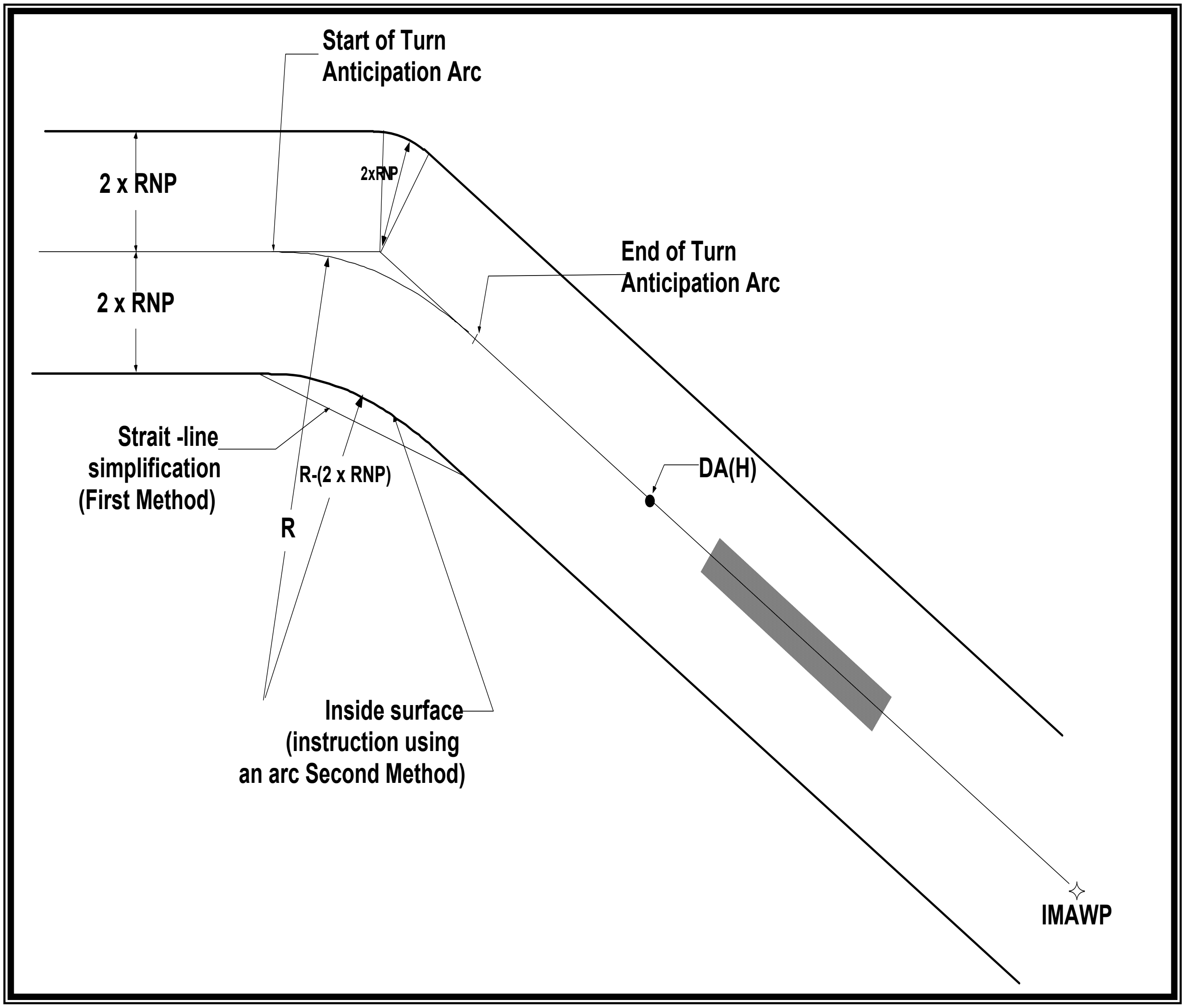
Figure A5-5

TBD

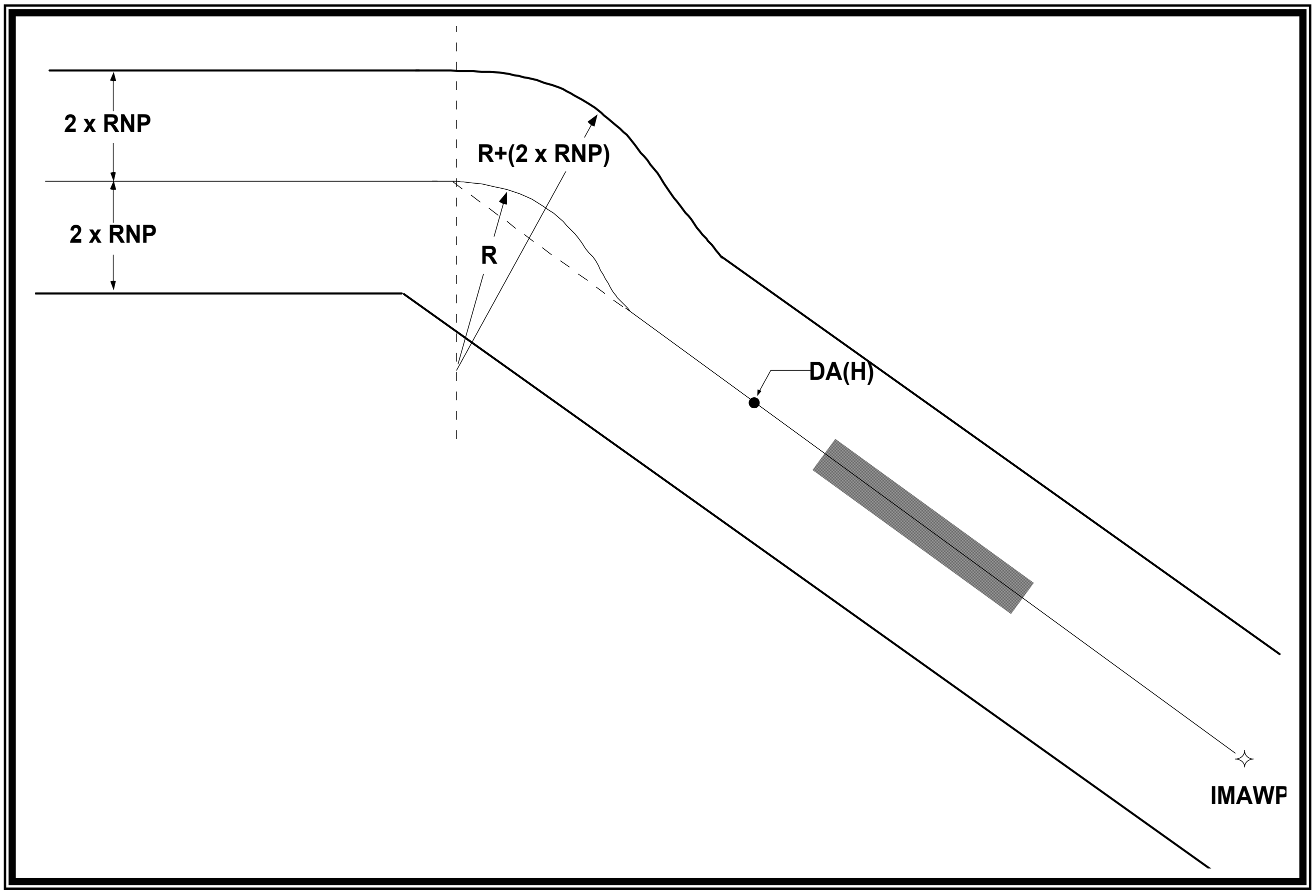
RNP LATERAL AREA TO CONSIDER - REJECTED LANDING
Figure A5-6



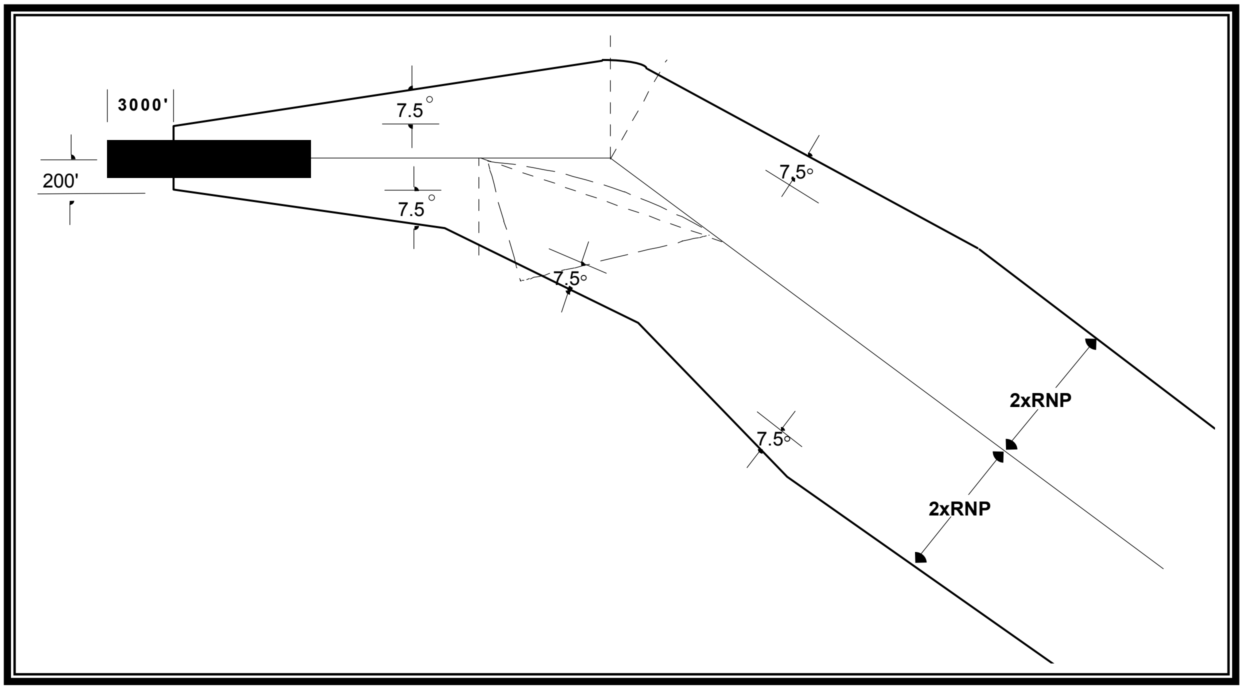
RNP LATERAL AREA TO CONSIDER - TURNS
Figure A5-7



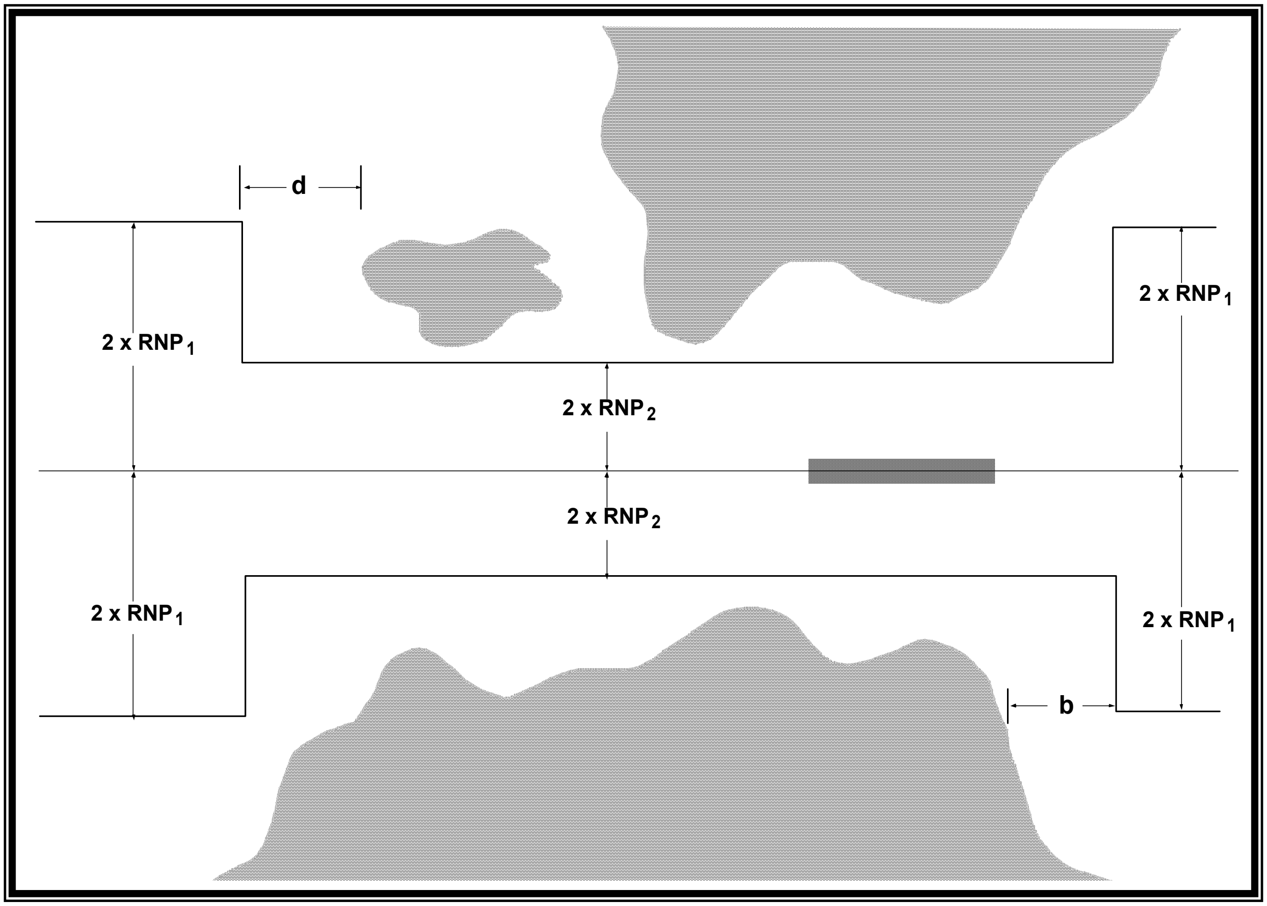
RNP LATERAL AREA TO CONSIDER - "FLY OVER WAYPOINTS"
Figure A5-8



RNP LATERAL AREA TO CONSIDER - REJECTED LANDING (WITH TURNS)
Figure A5-9



RNP LATERAL AREA TO CONSIDER - CHANGE OF RNP TYPE
Figure A5-10



DIVISION II
FINAL APPROACH OBSTACLE ASSESSMENT - OTHER THAN STANDARD RNP TYPES

(1) Obstacle Assessment for Non-Standard Required Navigation Performance Approaches. Category I or Category II instrument approach procedures may be based on various criteria for obstacle clearance. Standards for Terminal Instrument procedures, ICAO PANS-OPS, or other criteria such as that specified for RNP.

(2) This Attachment provides a standard criteria that may be used in lieu of the above criteria when it is desired to use ILS/or ILS equivalent criteria. The criteria may be used by procedure designers, may be used in conjunction with airworthiness demonstrations of airborne equipment, or in the assessment of other States criteria used in international operations for Lebanese Operators.

(3) This standard criteria is provided to make available a simplified and uniform application of angular obstacle clearance criteria for ILS, MLS, GNSS, FMS or other ILS like applications, when it is desired to use equivalent ILS criteria or non-standard RNP criteria. It is particularly intended to be used where systems other than ILS, or combinations of ILS equivalent systems are used (e.g., a Multi Mode Receiver [MMR] which may use either ILS, MLS, GNSS, or combination of these sensors).

(4) This criteria is not intended to replace criteria established by Civil Aviation Authorities for airspace planning (e.g., Air Traffic planning for simultaneous instrument approach operations) or construction of obstacles (e.g., part 77 Obstacle Identification analysis), except as otherwise noted in this Appendix.

OBSTACLE CRITERIA.

(5) The obstacle assessment criteria described below may be used for Category I or Category II procedures which are based on ILS, MLS, GNSS/Differential GNSS or other systems which provide equivalent performance.

(6) Airborne Systems previously assessed against earlier criteria of U.S. Advisory Circular (AC) 120-29 through Change 3, or Systems for Category III assessed using U.S. Advisory Circular AC 120-28 through AC 120-28C or equivalent ILS/MLS criteria (BCARs, JAR, etc.) are considered to have met the criteria below, without further demonstration.

(7) Airborne systems may be demonstrated to successfully perform to a value of HAT other than the lowest applicable standard HAT (e.g., 100 feet' [30 m] HAT for Cat II; or 200 feet [60 m] HAT for Cat I). When such demonstrations (e.g., for FMS) are conducted, the operational DA(H) authorized may be limited to corresponding higher minima, based on the lowest HAT successfully demonstrated (e.g., 250 feet [75 m] HAT, 300 feet [90 m] HAT).

(8) While the criteria of this Attachment is primarily intended for Category I or Category II, it also may have other applications such as for assuring acceptable performance along the final approach segment of a Category III procedure, down to 100 feet [30 m] HAT.

(9) USE OF THIS CRITERIA FOR AIRBORNE SYSTEM AIRWORTHINESS DEMONSTRATIONS. When this criteria is used in conjunction with airworthiness demonstrations of airborne systems the following standard assumptions should be applied, unless use of other assumptions is determined to be acceptable to the DGCA.

LATERAL PERFORMANCE.

(10) The lateral dimensions defined in Figure A5-13 should contain the structure of the aircraft, except that compensation for varying pitch attitudes, bank angles, or yaw/drift angles during approach need not be applied. A maximum wing semi-span of 115 feet is assumed.
(11) The lateral window at 100 feet [30 m] HAT is equivalent to that specified for a value of RNP.01, and its related containment (e.g., A 470 feet lateral window at 100 feet [30 m] HAT equivalent to RNP.01).

Information Note: *The 470 feet lateral window may be related to RNP.01 as follows:*

[(.01nm RNP x 2= 120 feet containment limit)+(115 feet wing semi-span) = ±235 feet half-lateral window, or a 470 feet lateral window at 100 feet [30 m] HAT]

VERTICAL PERFORMANCE.

(12) A maximum of 19 feet wheel to G/S antenna/nav reference point height, and a level terrain DA(H) of 81 feet RA is assumed at the 100 feet [30 m] HAT point.
(13) A value of ±12 feet (2 sigma) vertical tracking performance based on an equivalent performance level to that specified previously in U.S. FAA Advisory Circular AC 120-29 Change 3 is retained, and is assumed to be met at 100' [30 m] HAT (81 feet RA). This performance level provides for 4 sigma nav reference point containment of ± 24 feet [7.32 m] , or a vertical window of 48 feet at 100 feet [30 m] HAT.
(14) APPLICATION OF THIS CRITERIA AT OTHER THAN 100 FEET [30 m] HAT. When airworthiness demonstrations at other than 100 feet [30 m] HAT are conducted, the lateral and vertical window may be scaled proportionate to the intended HAT for the DA(H) to be used (linear proportionate adjustment for a 200 feet [60 m] HAT, 250 feet [75 m] HAT, etc., maintaining a 115 feet [35.05 m] maximum semi-span, and a 19 feet [5.79 m] maximum wheel to navigation reference point value).

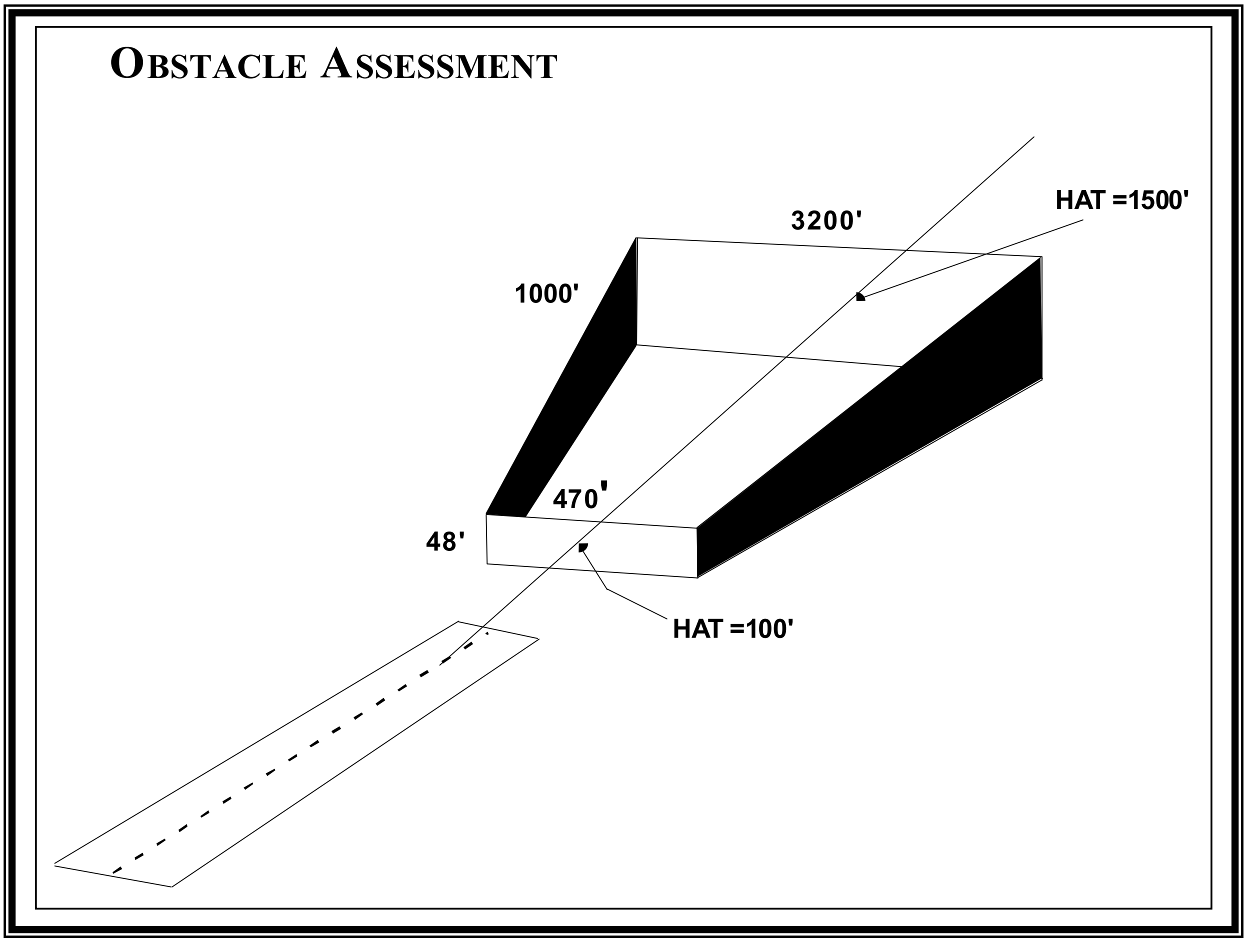
OTHER CONSIDERATIONS.

(15) Relationship of RNP to RSP, Separation Standards, and Obstacle Clearance.

When separation standards and obstacle assessment areas are being defined Required System Performance (RSP) must be addressed. Consideration must be also be given to the Required Communications Performance (RCP) and the Required Monitoring Performance (RMP) during the development of each route/procedure. In other words, aircraft RSP capability (which is the broad CNS element necessary to address separation and obstacle standards) is a function of RNP, RCP, and RMP, taken in combination. These considerations may be important for applications such as closely spaced approach operations.

The above obstacle clearance criteria or use of RNP does not affect application of other obstacle assessment processes related to construction or aeronautical studies assessing obstructions in navigable airspace.

Figure A5-13



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ATTACHMENT 6.
GROUND SYSTEM AND OBSTRUCTION CLEARANCE CRITERIA FOR CATEGORY II AND CATEGORY III APPROACH AND LANDING OPERATIONS

PURPOSE. This Attachment outlines ground system and obstruction clearance criteria for Category II and Category III approach and landing operations supported by ILS, MLS, or DGPS sensors, or operations based on RNP.

GENERAL. Category II and Category III procedures are based on both navigation and visual guidance systems. The navigation system must be capable of guiding an aircraft to the runway reference datum (e.g., the ILS, MLS or RNP glide path reference datum) with a high degree of accuracy. The visual guidance system must provide the correct visual cues to the pilot from the decision altitude (height), if applicable, down to and including the touchdown, and along the runway for rollout, under the appropriate visibility conditions.

In order for a runway to qualify for Category II or Category III operations, the runway must be capable of supporting the lowest Category I minimums.
Runways which do not meet the criteria established in this Attachment, but where an operational or other evaluation identifies that an equivalent level of safety exists, may be authorized appropriate Category II or Category III minimums. Such an evaluation shall be conducted by the DGCA on a case-by case basis as required.

This Appendix and OpSpecs, as amended, establish the lowest approach and landing minimums which can be authorized for Category II operations for air carriers operating under Part VI and Part VII of the LARs.

Foreign airports may be approved in accordance with the provisions of ICAO Annex 3 on a basis of a comparable level of safety.

CATEGORY II AND CATEGORY III SUPPORTING NAVIGATION AIDS OR SENSORS

(1) NAVAID System. A system which meets appropriate Category II and Category III integrity, continuity and reliability performance standards and provides continuous electronic guidance at least to the ILS reference datum or RNP reference datum must be provided consistent with the elements described below:

(a) localizer or Localizer Equivalent. The localizer or approach azimuth station, DGPS, or RNP equivalent azimuth guidance must be provided from the specified coverage limit down to the specified reference datum, or equivalent, as indicated in the U.S. Flight Inspection Manual, FAA Handbook, 8200.1, as amended or equivalent criteria.

(b) Glide Slope or Glide Slope Equivalent. The glide slope or elevation antenna, or DGPS or RNP equivalent must provide guidance in the vertical plane from the specified coverage limit down to the ILS reference datum, or equivalent, as indicated in the U.S. Flight Inspection Manual or equivalent.

(c) VHF Marker Beacons. In addition to the outer and middle marker beacons, a 75 MHz inner marker beacon must be provided at each runway intended for a Public Use Published Category II or Category III Procedure.

(2) Visual Guidance System. The lighting system must provide continuous visual guidance from the point where an approaching aircraft at the lowest published DA(H), if applicable, can begin to transition from instrument reference to visual reference. The visual system provides visual reference for the approach, flare, landing, and rollout. The system will consist of the following components:

(a) Approach Lighting System. Lighting standards outlined in U.S. FAA Selection Order 1010.39, or equivalent except that no negative gradient will be permitted in the inner 1500 ft.[457 m]. Where required, and when fixtures are available, approved flush approach lighting system may be installed, i.e., displaced landing threshold.

(b) Touchdown Zone Lighting System. A centerline lighting system will be provided defining the runway touchdown zone and conforming to U.S. Advisory Circular AC 150/5340-4C as amended or equivalent.

(c) Centerline Lighting System. A centerline lighting system defining the runway centerline and conforming to U.S. Advisory Circular AC 150/5340-4C, as amended, or equivalent using L-843 and L-850 runway centerline lighting systems should be provided.

(d) High Intensity Runway Edge Lighting. A high intensity runway edge lighting system will be provided defining the lateral and longitudinal limits of the runway and conforming to U.S. Advisory Circular AC 150-5340-24, as amended or equivalent.

(e) Taxiway Turnoff Lighting Systems. Taxiway turnoff lighting systems, stop bar, runway guard lighting, and critical area taxiway lighting designations should be provided in accordance with U.S. Advisory Circular AC 120-57 as amended, and the AC 150/5340 series as amended or equivalent.

(f) All-Weather Runway Markings. Runways will be marked with all-weather runway markings as specified in U.S. Advisory Circular AC 150/5340-1G, as amended or equivalent.

(3) Other Requirements. The following additional systems are required as part of the Category II and Category III procedures:

(a) Runway Visual Range (RVR). An RVR system is an automated computer controlled measurement and monitoring system reporting minimum visibility limits existing on airport runways to the air traffic controller. New RVR equipment being deployed measures RVR from 50 feet [15 m] to 6500 feet[198 m].

(i) RVR equipment is required to provide visibility information at the approach and rollout ends of any runway intended for Category II or Category III Public use Published procedures. For runways over 8000 [2438 m] length, or where otherwise designated by the DGCA Mid Field RVR equipment or equivalent is also required.

(ii) RVR equipment serving other runways may be used to provide the RVR information in the rollout area. Where transmissometers from other runways are used for this purpose, it must be located within a radius of 2000 ft.[600 m] of the rollout threshold of the runway and provide a minimum of 2000 ft.[600 m] coverage of the rollout area as measured from the rollout threshold.

(b) Radar (Radio) Altimeter Setting Height. Radar (radio) altimeter setting heights will be provided indicating the vertical distance at the 100/150 foot [30/50 m] DA(H) or alert height assuming a 19 wheel to navigation reference point height (e.g., glide slope antenna height) and the terrain beneath these points, on the runway centerline extended.

(c) Remote Monitoring. Remote monitoring shall be provided for the following elements of the NAVAID or visual aid systems:

(i) NAVAIDs.

(ii) approach lighting system.
(iii) power systems
(iv) runway edge, centerline and touchdown zone lights.
(v) critical taxiway lighting, runway guard lights, and stopbars.

(d) Manual Inspection. The following systems may not be remotely monitored and may require inspection by airport management or DGCA personnel or pilot reports to determine if they are operating in accordance with the criteria, reference U.S. Advisory Circular AC 120-57, as amended or equivalent. Remote monitoring systems must be capable of detecting when more than 10 percent of the lights are inoperative. The lighting system/configuration shall be considered inoperative when more than 10 percent of the lights are not functioning. Taxiway lights and individual airport/runway lights do not have to be remotely monitored; however, when visual Aid lights which support Category II or Category III are manually monitored they must be inspected at an interval which should ensure that it would be very unlikely that no more than 10 percent of the lights and two adjacent lights would be inoperative, taking into consideration lamp light, environmental conditions, etc. The procedure to visually verify operation of runway edge, centerline, and touchdown zone lights must ensure a visual inspection is conducted prior to commencement of Category II or Category III operations and repeated through physical inspections and/or pilot reports at least every two hours thereafter if still in Category II or Category II conditions.
(i) touchdown zone and centerline lights.
(ii) runway edge lights.
(iii) runway markings.
(iv) runway guard lights.
(v) taxiway centerline lights.
(vi) taxiway clearance bar lights.
(vii) taxiway signs.
(viii) taxiway markings.

(4) Critical Areas. Obstacle critical areas will be marked and lighted to insure that ground traffic does not violate these areas during specified operations. These areas may differ depending on the type of NAVAIDs used.

(a) Glide Path Critical Area. The glide path critical area for ILS installations is specified in U.S. FAA Order 6750.16B, as amended or equivalent. The glide path critical area of the elevation antenna for MLS installations is specified in U.S. FAA Order 6830.5, as amended or equivalent.
(b) Localizer Critical Area. The localizer critical area for ILS installations is specified in U.S. FAA Order 6750.16B, as amended or equivalent. The Azimuth Antenna critical area for MLS installations is specified in U.S. FAA Order 6830.5, as amended or equivalent.

(5) OBSTACLE CLEARANCE CRITERIA. The criteria found in U.S. FAA Handbook 8260.3B and U.S. FAA Order 8260.36 or equivalent will be used to establish Category II or Category III minimums for all new ILSs and MLSs. Use U.S. TERPS criteria or equivalent for previously established ILSs. Attachment 5 of this Appendix contains guidance for GPS and RNP final approach areas.

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ATTACHMENT 7
PROOF OF CONCEPT (PoC)

(1) Proof-of-Concept Requirements for New Systems/Methods. Proof-of-Concept [PoC] as used in this Appendix is defined as a generic demonstration in a full operational environment of facilities, weather, crew complement, aircraft systems and any other relevant parameters necessary to show concept validity in terms of performance, system reliability, repeatability, and typical pilot response to failures as well as to demonstrate that an equivalent level of safety is provided.

Proof-of-Concept may be established by a combination of analysis, simulation and/or flight demonstrations in an operational environment. PoC is typically a combined effort of an Authority's airworthiness and operational organizations with the applicant, with input from any associated or interested organizations.

A typical PoC program consists of the following elements:

(a) applicant submits a request to the applicable Authority.

(b) meetings are arranged to include all disciplines involved: Aircraft certification; Flight Standards; National Resource Specialists; the applicant, and supporting personnel as necessary (e.g., Air Traffic).

(c) a test plan is established which includes input from applicable CAA organizations, the applicant, and as applicable, industry user groups.

(d) the test plan should include as a minimum: system definition, operations procedures, qualification, training, weather and environment definition, normal, rare-normal, and non-normal conditions to be assessed, flightcrew, test subject, and test crew requirements, test procedures, test safety constraints as applicable, assessment criteria, and analysis, simulator and test aircraft requirements.

(e) PoC is conducted using agreed subject pilots, as appropriate.

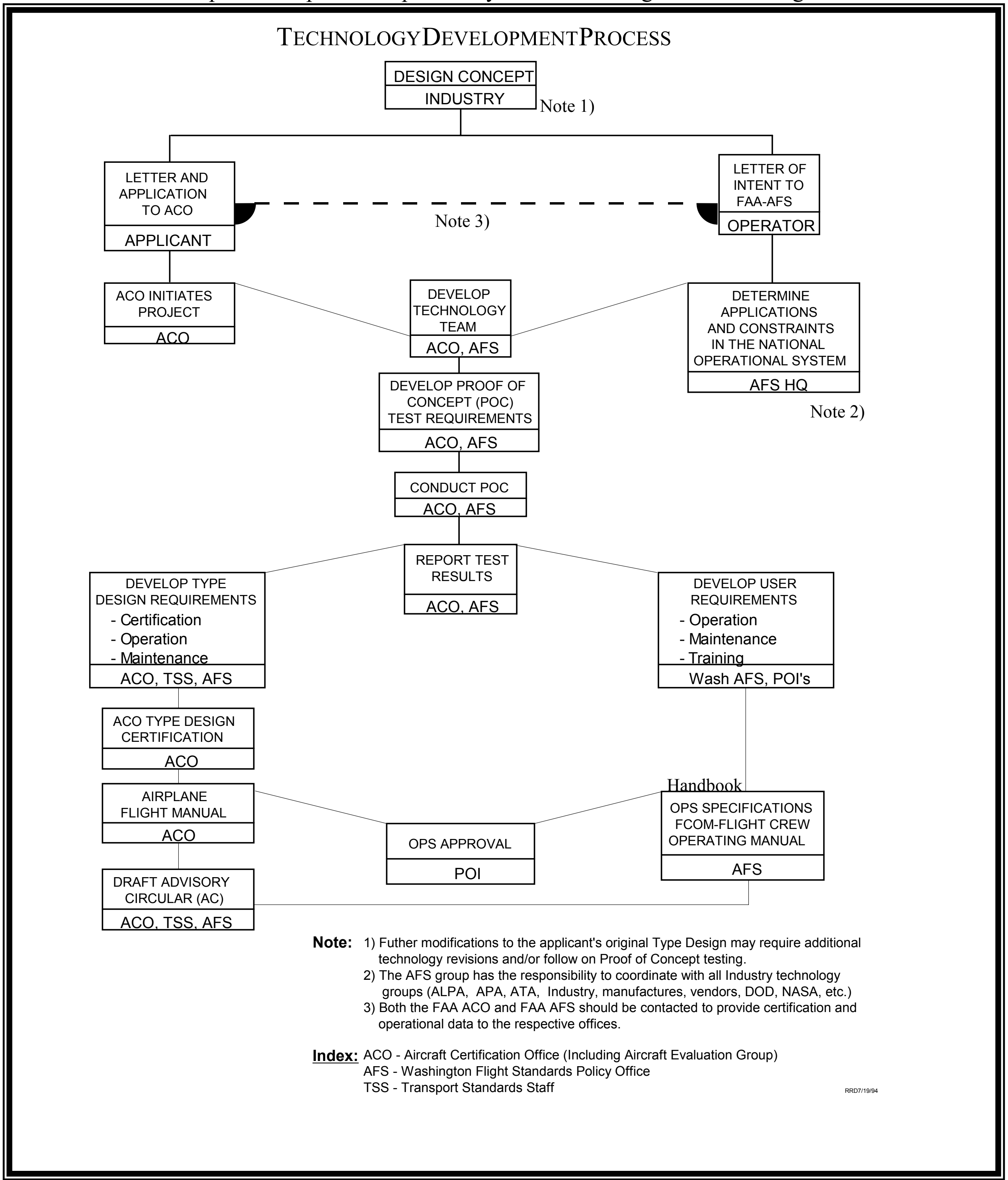
(f) PoC data is collected in a real-time simulator environment and validated in a realistic airplane environment.

(g) CAA is responsible for assessing the PoC data that is typically provided to CAA as agreed by CAA and the applicant. CAA reports relevant findings to the applicant and if applicable, interested industry representatives.

(h) CAA operations and airworthiness organizations use the data to develop criteria for approval of type designs, certification processes and procedures, operating concepts, facilities, flightcrew and maintenance qualification, OpSpecs, operations procedures, manuals, AFMs, maintenance procedures, and any criteria necessary.

(i) CAA regulatory criteria for airworthiness and operational approval typically is a product of PoC assessment.

This process is presented pictorially in the following U.S. FAA Diagram:



"ground icing operations program" – means a program consists of a set of procedures, guidelines, and processes, documented in manuals, that ensure that an operator's aircraft does not depart with frost, ice, or snow adhering to critical surfaces.

"holdover time" - means the estimated time that an application of de-icing/anti-icing fluid is effective in preventing frost, ice, or snow from adhering to treated surfaces. Holdover time is calculated as beginning at the start of the final application of de-icing/anti-icing fluid and as expiring when the fluid is no longer effective.

"pre-take-off contamination inspection" - means an inspection conducted by a qualified person, immediately prior to take-off, to determine if an aircraft's critical surfaces are contaminated by frost, ice, or snow. This inspection is mandatory under some circumstances.

s602.11 – Aircraft Icing

1. Program Elements

The following elements, which are described in the sections below, will be included in an operator's Ground Icing Operations Program and described in the appropriate manual(s):

(a) The Operator's Management Plan;
(b) Aircraft De-icing/Anti-icing Procedures;
(c) Holdover Timetables;
(d) Aircraft Inspection and Reporting Procedures; and
(e) Training and Testing.

2. The Operator's Management Plan

(1) According to Lebanese regulations, the aircraft operator is responsible for the operational control of an aircraft. In order to properly exercise operational control under ground icing conditions, a Management Plan to ensure proper execution of the operator's approved Ground Icing Operations Program must be developed and implemented.
(2) The Management Plan will identify the management position responsible for the overall Program, identify each subordinate position, and describe those functions and responsibilities needed to properly manage the Program. The Plan must also describe operational responsibilities and procedures, delineate the chain of command, define the relationship between its operations and maintenance groups, and ensure that all parties are informed of their responsibilities with regard to the Program. Although the Program is usually an operations responsibility, it may be shared between operations and maintenance. The Program may be the sole responsibility of operations, but never the sole responsibility of maintenance.

<u>Operations</u>

(1) The Plan must identify the management position responsible for ensuring that:

(a) all the necessary elements of the Program have been developed, properly integrated, and coordinated;
(b) the Program has been disseminated to all personnel who have duties, responsibilities, and functions to perform within the Program;
(c) a detailed description of the Program is incorporated in the appropriate operator's manuals;
(d) sufficient competent personnel and adequate facilities and equipment are available at each airport where the Program may be applied; and
(e) adequate management supervision of the Program is maintained.

(2) The Management Plan must also provide the following information:

(a) at each airport where de-icing/anti-icing operations will be conducted, the position that is responsible for deciding when ground de-icing/anti-icing operations are to begin and when they are to end must be identified and fully described in a position description;
(b) the functions, duties, and responsibilities of flight crew, aircraft dispatchers, and management personnel must be specified, as well as the instructions and procedures to be followed for the safe dispatch or release of aircraft during ground icing conditions; and
(c) the position responsible for authorizing and coordinating the applicable portions of the Program with Air Traffic Control and airport authorities must be identified and described in a position description.

Maintenance

Where maintenance shares responsibility for the Program, the Management Plan must identify the position responsible for ensuring that sufficient competent personnel and adequate facilities and equipment are available at each airport where the Program may be applied. The functions, duties, and responsibilities of maintenance personnel must also be specified, as well as the instructions and procedures to be followed for the safe dispatch or release of aircraft during ground icing conditions.

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Division II - Procedures

1. Aircraft De-icing/Anti-icing Procedures

In a well-organized, clearly identified, separate section of the appropriate manual, the operator's de-icing/anti-icing procedures must be described. In particular, the person responsible for a specific procedure must be identified, and procedures particular to a type of aircraft specified. The following minimum information must be covered in the operator's manual:

(a) a detailed description of the weather and aircraft surface conditions under which de-icing/anti-icing operations are required and the method whereby the Program is activated; and
(b) a detailed description of the procedures to be followed in the de-icing/anti-icing treatment process for each aircraft type. These procedures must be organized so as to minimize de-icing/anti-icing fluid application time and must specify the sequence in which critical surfaces are to be treated.

2. Holdover Timetables

The use of holdover timetables is not mandatory. Holdover timetables, as approved by the Director, Air Carrier , may be used either as guidelines or decision-making criteria in assessing whether it is safe to take off. When holdover timetables are used as decision-making criteria, only high confidence level times shall be used and the procedures to be followed after holdover time has expired must be clearly documented. Where applicable in a Program, an operator's manual will cover the following areas with regard to holdover timetables:

Responsibilities and Procedures

The operator's Program must define the following:

(a) the operational responsibilities of flight crew, flight watch system personnel, and maintenance and ground personnel;
(b) the procedures to be followed for the use of holdover timetables and the actions to be taken if holdover time is exceeded; and
(c) the procedures to be followed by ground and flight crew for establishing the start of holdover time.

Use of Holdover Timetables

Holdover timetables provide an estimate of the length of time de-icing/anti-icing fluids are effective. Because holdover time is influenced by a number of factors, established times may be adjusted by the pilot-in-command according to the weather or other conditions. Operators' manuals must describe the procedures to be followed for using holdover timetables. When the tables are used as decision-making criteria, the procedures to be followed by the pilot-in-command (PIC) for varying the established values must also be specified.

Take-off after Holdover Times have been Exceeded

When holdover timetables are used as decision-making criteria, take-off after holdover times have been exceeded can occur only if a pre-take-off contamination inspection is conducted or the aircraft is de-iced/anti-iced again. The operator's Program must specify the procedures to be followed when holdover time is exceeded, and these procedures must appear in the appropriate manuals.

3. Aircraft Inspection and Reporting

(1) When and where applicable, the operator's Program must document the guidelines and procedures to be followed by flight crew and other personnel for detecting contamination on the critical surfaces of aircraft. Included must be a description of the kinds of inspections permitted by the operator and at what point in the Program they must be conducted. These instructions must be aircraft specific.
(2) The Program shall outline the responsibility of the PIC under LAR Section 602.11 to inform the cabin crew and passengers of the decision to have the aircraft de/anti-iced, when the decision is made. The method by which this information is conveyed may be standardized in the operator's program or left to the discretion of the PIC. It will also be clear that, if the aircraft is de/anti-iced prior to the boarding of passengers, no announcement to that effect is required.

Inspection Procedures

Two types of inspections, as defined in Section 2.0 of these Standards, meet regulatory requirements. They are the Critical Surface Inspection and the Pre-take-off Contamination Inspection. Under icing conditions, the Critical Surface Inspection is mandatory; however, depending on the requirements of the operator's Program, the Pre-take-off Contamination Inspection may not be required. In its section on inspection procedures, the operator's manual must describe the techniques to be used in contamination recognition and the conduct of the two types of inspection.

Contamination Recognition

(1) Inspection procedures must describe the techniques to be used for detecting frost, ice, and snow and for determining if they are adhering to critical surfaces. These techniques must be specified in the operator's Program and may include the use of holdover timetables, tactile inspection, examination of one or more representative aircraft surfaces, or sensors.
(2) Holdover timetables, approved according to the conditions outlined in section 6 of these Standards, may be used to determine, without a tactile or visual Pre-take-off Contamination Inspection, that critical surfaces are not contaminated.
(3)Tactile inspection, under certain circumstances, may be the only way of confirming that the critical surfaces of an aircraft are not contaminated. This physical inspection shall be carried out by a qualified person and must include the leading edge and upper surface of the wings.
(4) Examination of one or more representative aircraft surfaces may be used for the Pre-take-off Contamination Inspection, which does not require a tactile examination. This technique may be used when the aircraft manufacturer has identified representative aircraft surfaces that can be readily and clearly observed by flight crew during day and night operations and that are suitable for judging whether critical surfaces are contaminated or not. When the aircraft is de-iced/anti-iced, the representative surface must be treated first during final application of fluid. If no representative aircraft surfaces have been identified by the aircraft manufacturer, an operator may offer one or more representative surfaces for approval by the Directorate General of Civil Aviation; such a submission must be accompanied by technical data supporting the use of these surfaces as representative.
(5) Sensors that provide information directly to the pilot-in-command may be used to determine whether critical surfaces are contaminated or not. The installation and use of sensors must meet applicable Directorate General of Civil Aviation airworthiness and operational requirements. The procedures for use of sensors must be detailed in the operator's Program.

Critical Surface Inspection

This inspection is mandatory whenever ground icing conditions exist, and if the aircraft is de-iced/anti-iced, must take place immediately after final application of the fluid. After the inspection, an inspection report must be made to the pilot-in-command by a qualified person.

Pre-take-off Contamination Inspection

The operator's Program must describe the methods to be used in this inspection, which may be conducted from the inside or outside of the aircraft, which may be visual or tactile, and which may use representative aircraft surfaces to judge the extent of contamination. Where only a visual inspection is done, the operator's Program must specify the conditions, such as weather, lighting, and visibility of critical surfaces, under which such an inspection can be conducted. Unless other procedures have been specifically approved, a tactile external inspection must be conducted on all aircraft without leading edge devices, such as the DC9-10 and the F-28, and on any other aircraft as designated by the Directorate General of Civil Aviation.

Inspection Reporting

(1) It is the pilot-in-command's responsibility to ensure that aircraft critical surfaces are not contaminated at take-off. When the pilot-in-command does not conduct the inspection, the delegated person must provide an inspection report in clear language to the pilot-in-command who must indicate that the report is complete and understood. A detailed description of the guidelines and procedures to be followed in communications between the inspector and the pilot-in-command, including the use of hand-signals, must be included in the appropriate operator's manual.
(2) For the purposes of these Standards, there are two types of inspection reports, which correspond to the two types of inspections described above.

Critical Surface Inspection Report

This report must be made to the pilot-in-command and, if applicable, state the time at which the last full application of de-icing/anti-icing fluid began, the type of fluid used, the ratio of the fluid mixture, and, if the standard documented method was not used, the sequence in which the critical surfaces were de-iced/anti-iced. In addition, the report must confirm that all critical surfaces are free of contamination.

Pre-take-off Contamination Inspection Report

This report must be made to the pilot-in-command and, when the standard documented inspection method has not been used, must describe how the inspection was conducted and it must also confirm that all critical surfaces are free of contamination.

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Division III - Training

1. Training and Testing

An operator's Ground Icing Operations Training Program shall include:

(a) initial and annual recurrent training for all operational and ground/maintenance personnel who have responsibilities within the program; and

(b) testing of crew members and other operations and ground/maintenance personnel who have responsibilities within the program.

Initial De-icing/Anti-icing Operations

(1) Flight crew and other operations personnel who have responsibilities within the operator's Ground Icing Operations Program shall receive training in at least the following subjects, which are further described below:

(a) the effects of contamination on critical surfaces;
(b) aircraft de-icing/anti-icing procedures;
(c) aircraft inspection and reporting procedures; and
(d) the use of holdover timetables.

(2) Training on the effects of contamination on critical surfaces, including:

(a) the reporting of contamination on arrival to the person responsible for coordinating the de-icing/anti-icing of aircraft;
(b) the effects of freezing precipitation, frost (including hoar-frost), freezing fog, snow, rain, and high humidity on cold-soaked critical surfaces and under wings;
(c) the identification, by aircraft type, of critical surfaces and, where applicable, representative aircraft surfaces;
(d) the types, purpose, characteristics and uses of de-icing/anti-icing fluids; and
(e) how de-icing/anti-icing fluids influence the performance and handling of aircraft, including their effect on rotation speeds, take-off distance, control pressures, stall margins, reduced thrust take-offs, and climb pitch attitudes, where applicable.

(3) Training in aircraft de-icing/anti-icing procedures, including:

(a) the safety precautions to be observed during fluid application;
(b) the methods for applying de-icing/anti-icing fluid;
(c) the composition and identification of de-icing/anti-icing fluids;
(d) remote de-icing/anti-icing procedures, including aircraft-specific and location-specific procedures, where applicable; and
(e) the supervisory responsibilities of flight crew with regard to contractor services when the operator does not arrange for the training and qualification of contractor personnel. (See 8.5 Contractor Training)

(4) Training in aircraft inspection procedures, which shall be aircraft specific, when necessary, and which shall include:

(a) identification of the critical surfaces and representative aircraft surfaces to be inspected;
(b) techniques for detecting and recognizing contamination on the aircraft;
(c) the different types of inspection techniques as well as when, where, by whom, and under what conditions (such as lighting and weather) they are to be used; and
(d) the communications procedures to be followed by flight crew when contacting ground personnel, Air Traffic Control, or company station personnel to coordinate aircraft inspections.

(5) Training in the Use of Holdover Timetables, both when Used for Guidance and as Decision-making Criteria

(6) For training in the use of holdover timetables as decision-making criteria, all of the following shall be covered. Only the first four items must be taught when holdover timetables are used for guidance. Training in the use of holdover timetables shall include:
- (a) the source of holdover timetable data;
- (b) instruction in precipitation category, precipitation intensity, and the relationship of a change in precipitation to holdover time;
- (c) the relationship between holdover time and different fluid concentrations for all types of fluid used;
- (d) the definition of when holdover time begins and ends;
- (e) communications procedures, which covers how to inform flight crew of the type of fluid used, start time of final fluid application, and any requirements for coordination with other agencies; and
- (f) the procedures to be followed when holdover time is exceeded, including inspection requirements, alternate means for determining whether surfaces are contaminated, and the requirements governing repeat de-icing/anti-icing.

Recurrent De-icing/Anti-icing Operations Training

Recurrent training must be given on an annual basis and shall include a review of current de-icing/anti-icing operations and inspection procedures. This training must highlight changes in procedures and cover the latest available research and development information on ground de-icing/anti-icing operations. Prior to the commencement of winter operations, the operator should distribute a ground de-icing/anti-icing operations information circular to all affected personnel reviewing procedures and presenting any new information not covered in the annual recurrent training.

Initial Ground/Maintenance Personnel Training

(1) Ground/maintenance personnel who have responsibilities within the operator's Ground Icing Operations Program shall receive training in at least the following three subjects:
(2) Training on the effects of surface contamination, including:
- (a) the items listed in Section 8.1.1 excluding 8.1.1e);
- (b) specific information on the effects of contamination on ram-air intakes and instrument pick-up points; and
- (c) potential damage to engines by foreign objects.

(3) Training in aircraft de-icing/anti-icing procedures, including:
- (a) the items listed in Section 8.1.2 excluding 8.1.2e);
- (b) a description of and the qualifications required for the operation of various types of equipment;
- (c) instruction in the operation of de-icing/anti-icing equipment; and
- (d) the determination of the start of holdover time.

(4) Training in aircraft inspection procedures, which shall be aircraft specific, when necessary, and which shall include:
- (a) the items listed in Section 8.1.3 excluding 8.1.3d); and
- (b) the inspection techniques for conducting a Critical Surface Inspection.

Recurrent Ground/Maintenance Personnel Training

Recurrent training must be given on an annual basis and shall include a review of current de-icing/anti-icing operations and inspection procedures. This training must highlight changes in procedures and cover the latest available research and development information on ground de-icing/anti-icing operations. Prior to the commencement of winter operations, the operator should distribute a ground de-icing/anti-icing operations information circular to all affected personnel reviewing procedures and presenting any new information not covered in the annual recurrent training.

Contractor Training

An operator who contracts de-icing/anti-icing services from another organization is responsible for ensuring that the training program of the contractor and application of de-icing/anti-icing operations standards meet the operator's own Ground Icing Operations Program criteria. Through the operator, the contractor's procedures and training programs shall be documented.

Testing

After both initial and recurrent training, the operator's Program must ensure that all personnel are tested on all information covered in the training program. Records documenting the initial and annual recurrent training of each person must also be maintained.

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ATTACHMENT 1
to
Appendix IV
General Operating Flight Rules Standards
s602.163 Air Navigation Requirements

Operational Approval of Airborne Long Range Navigation Systems for Flight Within the North Atlantic Minimum Navigation Performance Specifications Airspace – NAT/MNPS

DIVISION I

General

1. PURPOSE.

This Standard sets forth the means, for operators certificated under Parts VI Subpart 4, and Part VII of the Lebanese Aviation Regulations (LARs), to obtain approval to operate within a specific airspace over the North Atlantic designated as the North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) airspace.

2. INFORMATION.

(1) The concept of the MNPS was proposed on a worldwide basis at the International Civil Aviation Organization (ICAO) 9th Air Navigation Conference. The objective of MNPS is to ensure safe separation of aircraft and enable operators to derive maximum economic benefit from the improvement in navigation performance demonstrated in recent years.
(2) The MNPS concept is scheduled to be implemented on a regional basis, taking into account particular regional operating conditions. At the September 1976 Limited North Atlantic Regional Air Navigation Meeting, criteria for MNPS, and the introduction of these criteria within parts of the NAT Region, effective at 0001 GMT, December 29, 1977, were agreed upon. (This date corresponds to the initial decommissioning of Loran-A in the NAT Region.) The area concerned is designated as the "NAT-MNPS airspace."
(3) NAT-MNPS airspace is defined as follows:
- (a) between latitudes 27 °N and 67 °N.
- (b) the Eastern boundaries of Santa Maria Oceanic, Shanwick Oceanic, and Reykjavik Flight Information Regions (FIR).
- (c) the Western boundaries of Reykjavik and Gander Oceanic FIRs and New York Oceanic FIR East of longitude 60 °W.
- (d) between FL 275 and FL 400.

(4) When establishing the MNPS concept, it was decided by ICAO that all operators desiring to use the MNPS airspace must show that navigation equipment and procedures to be used are capable of continuously complying with the specifications. In the case of operators certificated under Parts VI and VII of the LARs, it is the responsibility of the Director General of Civil Aviation (DGCA) to make this determination. Acceptable means of showing original compliance with the MNPS requirements are contained herein. Continued compliance is the responsibility of the operator.
(5) As established by ICAO, the minimum navigation performance specifications required to operate in the airspace listed in section (3) are listed below. [An operational interpretation of the requirement is in brackets after the specification.]
- (a) the standard deviation (one sigma) of lateral track errors should be less than 6.3 nm.

(b) the proportion of the total flight time spent by aircraft 30 nm or more off track should be less than 5.3 x 10^-4. [The proportion of the total flight time spent by aircraft 30 nm or more off the cleared track should be less than 1 hour in 1900 hours. (Note that 30 nm is half of the lateral separation; thus, an aircraft with such an error is closer to the adjacent track than the cleared track.)]

(c) the proportion of total flight time spent by aircraft between 50 and 70 nm off track should be less than 1.3 x 10^-4. [The proportion of the total flight time spent by aircraft between 50 and 70 nm off the cleared track should be less than 1 hour in 8000 hours. (Note that between 50 and 70 nm off track is equivalent to flying on the adjacent track.)]

(6) If inflight equipment unserviceability reduces the navigation capability below the MNPS as established by ICAO, Air Traffic Control (ATC) should be immediately advised so that any necessary adjustments of aircraft separation may be accomplished.

(7) In evaluating a navigation system for compliance with ICAO MNPS, consideration should be given to maintaining the high level of navigation performance listed in Subsections 2. (5)(b) and (c). It should be noted that flight time spent between 50 and 70 nm off track [2. (5)(c)] is also flight time spent more than 30 nm off track [2. (5)(b)]. Applicants should consider equipment reliability and a human errors analysis when evaluating a navigation system for use in the NAT-MNPS airspace.

(8) To ensure that safety is not compromised through failure of operators to meet the conditions set forth in Subsections 2. (5)(b) and (c) above, ICAO is establishing procedures for monitoring of aircraft navigation performance using ATC radars near the boundaries of NAT-MNPS airspace. Lateral errors in excess of 25 nm will be reported for investigation as appropriate. Application of the ICAO MNPS requires contracting States to take appropriate action concerning operators who frequently fail to meet the navigation specifications, including restricting flights or withdrawing approval of those operators to fly in the NAT-MNPS airspace. If there is an excessive number of large errors, it may become necessary for ICAO to increase separation standards until improvement has been achieved.

3. OPERATIONAL APPROVAL.

(1) General.

(a) operators certificated in accordance with Part VI, Subpart 4 and Part VII of the LARs desiring approval to operate in NAT-MNPS airspace should contact the DGCA a minimum of 60 days prior to the start of the required evaluation.

(b) navigation equipment utilized and the associated operating procedures are the choice of the certificate holder. The essential provision is that the combination of equipment and method of operation meet the navigation accuracy established by ICAO for operations within the NAT- MNPS airspace.

(c) data gathered from operational experience with certain equipment now in service, such as Inertial Navigation Systems (INS), have demonstrated the capability of meeting the NAT-MNPS. Dual INS systems can be approved for operation in the NAT-MNPS airspace without further evaluation if the equipment has been installed operated and maintained in accordance with Attachment 2 of this Appendix.

(d) until more operational experience is obtained, OMEGA, or a combination of OMEGA/VLF, should not be authorized as a sole means of navigation within NAT-MNPS. Either OMEGA or OMEGA/VLF may be used as an update method for another navigation system previously approved by the DGCA. If a combination of OMEGA/VLF is proposed as a means of updating another previously approved navigation system, it should be demonstrated that the system is capable of operating with OMEGA only for update information. The combined navigation system performance, not just the updating means, should be evaluated for operation in NAT-MNPS airspace.

(e) since VLF communication stations are not dedicated to navigation, the use of VLF alone as a means of long range navigation, or as a sole update means to other methods of navigation, should not be authorized within NAT-MNPS airspace.
(f) approval to use a navigation system for flight in NAT-MNPS airspace does not constitute approval for that system in accordance with Attachment 2 of this Appendix. However, credit may be given for flights and evaluations conducted during MNPS certification towards gaining Part VI, Subpart 4 and Part VII of the LARs approval.

(2) Procedures.
(a) approval to operate within the NAT-MNPS airspace by use of navigation systems other than that listed in Subsection 3. (1)(c) should be based upon inflight data acquisitions and inflight evaluations that demonstrate NAT-MNPS compliance.
(b) data acquired during inflight evaluations should be tested for overall navigation system compliance with the NAT-MNPS by use of the statistical methods detailed in Division II of this Attachment.
(c) data gathering and evaluation flights should be conducted in the NAT-MNPS airspace over typical routes for which approval is requested. However, after sufficient operating experience has been gained, a portion of the flight testing may be conducted as outlined below in Subsection 3. (2)(g).
(d) the flights should be conducted over a period of not less than 30 days to allow for exposure to varying environmental and atmospheric conditions.
(e) the proposed system should be utilized for navigation purposes. However, the currently approved system should be monitored and used as necessary to keep the aircraft within present lateral offset limitations.
(f) a maximum of either two or four independent observation points per flight may be utilized to acquire data when conducting flights through MNPS airspace. These points are:
(i) for aircraft not equipped with INS:
A. overheading the inbound VOR/DME/NDB gateway.
B. a reliable radar fix upon initial acquisition by ground based radar as the aircraft approaches the inbound gateway.
(ii) aircraft equipped with INS:
A. the observation points listed in Subsection 3.(2)(f)(i)A. and B. above plus two additional comparisons to INS that have a minimum of 1 hour separation, and are at least 1 hour prior to either fix mentioned in 3.(2)(f)(i) above. Any INS comparison should be at least 1 hour past the outbound gateway.
B. the INS equipment used for this comparison should have shown a composite error rate of less than one nautical mile per hour averaged over the entire flight without any update. The comparisons should be post corrected, based upon the INS error rate experienced during flight.
(g) flight testing should be conducted in the MNPS airspace over representative routes. Alternatively, flight testing may be conducted over other geographical areas provided the following conditions are met:
(i) in the case of radio based navigation systems, the applicant shows by simulation or analysis that the radio signal environment in the area used is no better than that in the MNPS airspace. The simulation or analysis of the radio signal environment should include such factors as the number of stations, signal to noise ratio, station geometry, and any other pertinent factor(s). The signal environment in a given location may be artificially rendered less desirable so as to meet the above conditions through manual station deselection in the airborne receiver.
(ii) in the case of navigation systems which have errors that tend to increase as a function of time, the duration of test flights should be at least as long as a typical flight through MNPS airspace.

(iii) data points should be separated in time by at least 60 minutes, and should be overhead VOR/DME stations.

(h) if an applicant's equipment (including antenna type and location) is installed on an aircraft in a manner that duplicates the installation and operating performance of the same type equipment installed on the same type aircraft under an existing Supplemental Type Certificate (STC), credit may be given for data available from previous flights with the already approved system. The applicant's operating procedures and training should be equivalent to that of the operator already approved to use that system in the NAT-MNPS airspace. The credit given is for previously demonstrated navigation system equipment performance. This could decrease the number of flights required to obtain if a satisfactory level of navigation performance is demonstrated. In this instance, the graph in Figure 3 of Division II of this Attachment would be used.

(i) upon successful demonstration of the required level of certainty to meet the criteria, the operator's operations specifications will be amended to permit operations within NAT-MNPS airspace with the navigation system(s) demonstrated.

4. EXPANSION OF MNPS TO OTHER OCEANIC AIRSPACES.

In time, MNPS may be imposed on other oceanic airspace. The specifications imposed would be determined by the amount of air traffic anticipated, navigation aids available, etc. Specifications for other oceanic airspaces may or may not be as demanding as those imposed over the North Atlantic. Approval to operate within the NAT-MNPS airspace does not constitute approval to operate within any other MNPS airspace that may be imposed in the future.

5. CONTINUING AIRWORTHINESS (MAINTENANCE REQUIREMENTS).

The aircraft manufacturer should have an established maintenance program for the individual navigation systems. For others installing navigation systems, the operator will submit those changes appropriate to their existing maintenance manual for review and acceptability.

DIVISION II

COMPLIANCE GRAPHS FOR NAVIGATION SYSTEMS ATTEMPTING MNPS APPROVAL

1. BACKGROUND.

(1) A mathematical analysis was used by ICAO to ascertain that the target level of safety would be achieved in MNPS airspace with 60 nm lateral separation if certain requirements for navigation system performance were met. These requirements were calculated in the mathematical analysis to be those listed in Subsection 2.(5) of this Standard. This Division deals with a means of demonstrating compliance with Subsection 2.(5)(a) which states that the standard deviation (one sigma) of lateral track errors shall be less than 6.3 nm.
(2) An extension of the mathematical analysis was used to develop a fairly simple means for the DGCA and the operator to determine whether or not the performance capability listed in subsection 2.(5)(a) has been demonstrated.
(3) The mathematics used was that of sequential sampling. " This has the advantage of determining when satisfactory performance has been demonstrated as a function of the observed navigational accuracies. Thus, a system which consistently achieves superior accuracies will "pass" sooner than a system which is just marginally acceptable. This is a mathematically sound and more equitable means of compliance than one in which an arbitrary number of flights is set beforehand, and that number is fixed no matter how well or how poorly the system performs.

2. THE "PASS/FAIL" GRAPHS.

(1) The "Pass/Fail" Graphs are shown in Figures 1, 2 and 3. On these graphs are plotted successive points of the sum of the absolute value of lateral navigation errors (y axis) versus the number of independent observations taken (x axis). Figure 1 is a graph which depicts the entire evaluation process for mathematically determining the acceptability of a navigation system for MNPS operation. Figures 2 and 3 are enlargements of the applicable testing method concerned. Figure 2 applies to navigation systems which have never received prior approval for use in MNPS airspace. Figure 3 can be used to assist in determining satisfaction of MNPS criteria for applicants requesting credit for data gathered during a previously successful evaluation - see Subsection 3.(2)(h) of this standard.
(2) As an example for a system that has never received prior approval, assume that three independent observations were taken on the first evaluation flight. The three lateral navigation errors were 4 nm left of track, 1 nm left of track, and 3 nm right of track, respectively. The first point is plotted at 1 on the x axis and 4 nm on the y axis; the second at 2 on the x axis and 5 nm of the y axis; the third at 3 on the x axis and 8 nm on the y axis. (Note that the errors always add whether right or left; they do not cancel.) Data points from other flights continue to add sequentially - see Figure 2.
(3) As in the sample, the first data points will fall in the "Continue Testing" band. As more data points are added to the graph, a trend will normally develop toward the "pass" or "fail" region, depending on the observed navigational accuracy.
(4) Once the series of data points reaches the "pass" line and/or extends into the "pass" region, satisfactory performance has been successfully demonstrated. (Mathematically, the "pass" line was calculated so as to provide 95% certainty that the navigation system meets the MNPS.)
(5) If the series of data points reaches the "fail" line and/or extends into the "fail" region, unsatisfactory performance has been demonstrated with 95% certainty. The operator should then either withdraw the application or the problem(s) and start the evaluation flights over from the zero/zero point on the graph. (It is not permitted to restart at a position on the graph which takes into account previous data points where the navigation system was accurate, but ignores previous data points which showed inaccuracies.)

(6) It should be noted that the x axis is labeled "number of INDEPENDENT observations. " In this case, "independent" means that navigation errors for two or more successive data points must not be correlated. In order to insure that this procedure has been met, guidance has been given in the body of this Standard regarding an acceptable means of taking observations which can be considered independent.
(7) Should the sequential sampling procedure not yield a conclusion (pass or fail) after 200 independent observations, the testing should be terminated. The adequacy of the proposed navigation system should be determined by the following Chi-square procedures:

$$D1 = S\ d12 + d22 + d32 + ... + d2002$$

$$D2 = S\ d1 + d2 + d3 + ... + d200$$

Where d is the value of the individual lateral errors. Positive or negative errors must be consistently applied throughout the sampling procedure. If a deviation to the right is considered positive on one flight, it must be a positive error on all subsequent flights. D1 is the sum of the square of each lateral error observed; d1^2 + d2^2 + d3^2 etc. out to d200^2. D2 is the algebraic sum of all of the 200 lateral errors observed. As an illustration, assume that the data in the sample shown on Figure 2 had not yielded a pass result after 200 independent observations. Then, d1 = -4 nm; d2 = -1 nm; and, d3 = +3 nm.

$$D1 = S\ (-4)2 + (-1)2 + (+3)2 + ... + \text{etc.}$$

$$D1 = 16 + 1 + 9 + ... + \text{etc.}$$

$$D2 = S\ (-4) + (-1) + (+3) + ... + \text{etc.}$$

$$D2 = -5 + 3 + ... \quad .... + \text{etc.}$$

$$\text{Variance, } f2 = (D1 - D22/200) / 199$$

If f2 is equal to or less than 46.36, the system is acceptable.

FIGURE 1

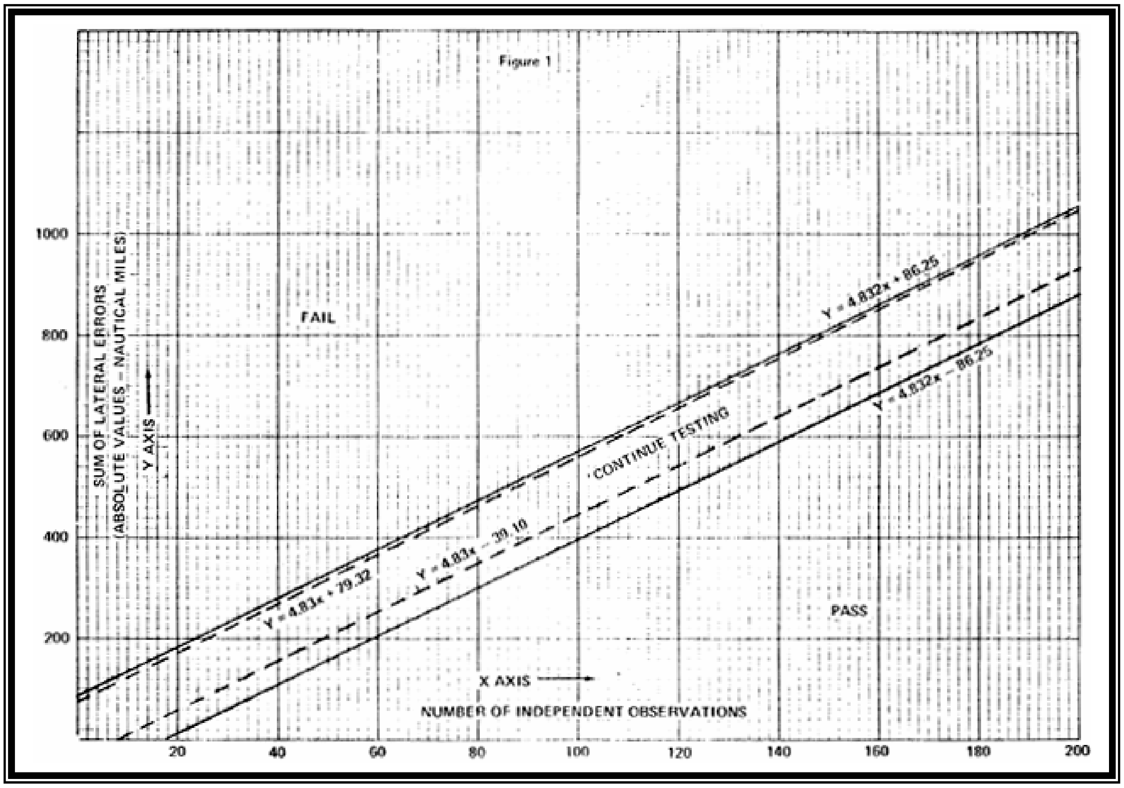
Figure 1
FAIL
CONTINUE TESTING
PASS
Y = 4.832x + 86.25
Y = 4.832x − 86.25
Y = 4.83x + 79.32
Y = 4.83x − 39.10
SUM OF LATERAL ERRORS
(ABSOLUTE VALUES – NAUTICAL MILES)
Y AXIS
X AXIS
NUMBER OF INDEPENDENT OBSERVATIONS
200
400
600
800
1000
20
40
60
80
100
120
140
160
180
200

FIGURE 2

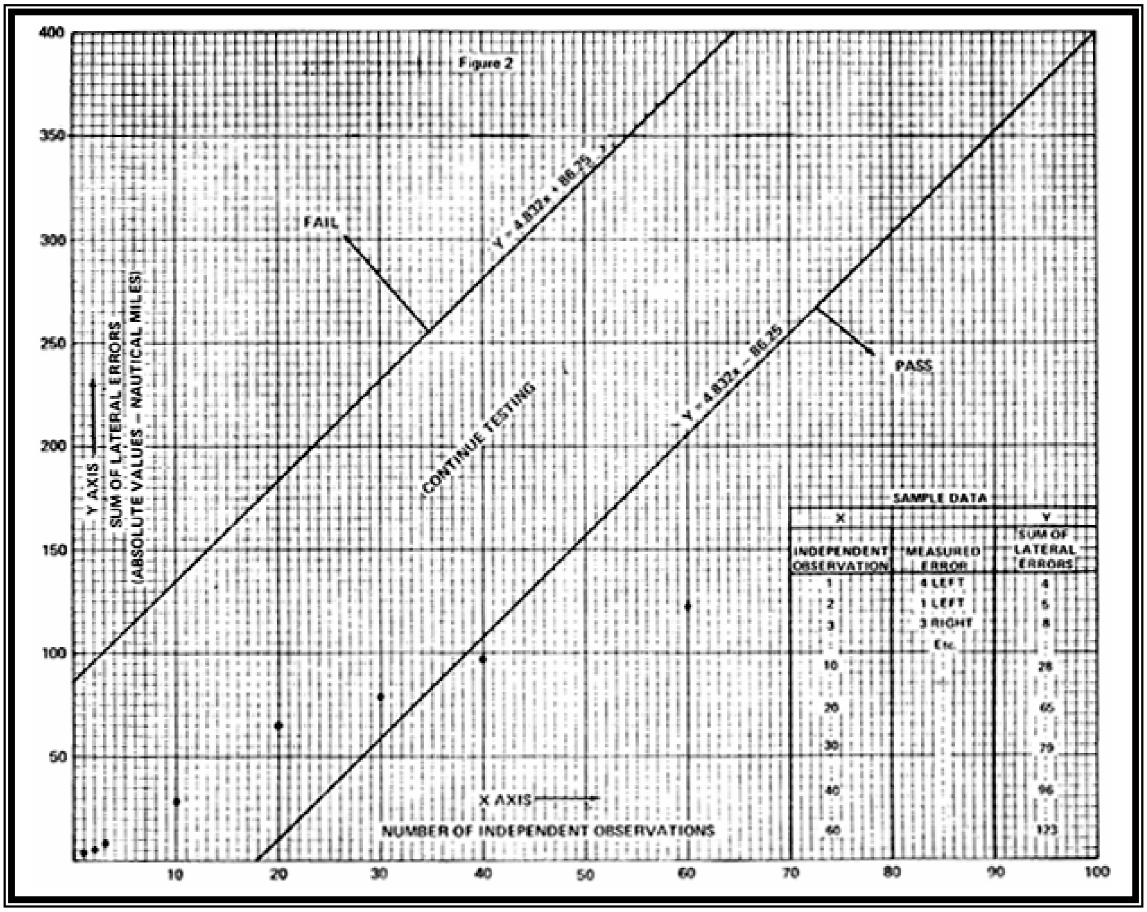
Figure 2
FAIL
Y = 4.832x + 86.25
CONTINUE TESTING
Y = 4.832x – 86.25
PASS
Y AXIS
SUM OF LATERAL ERRORS
(ABSOLUTE VALUES – NAUTICAL MILES)
X AXIS
NUMBER OF INDEPENDENT OBSERVATIONS
SAMPLE DATA
X
Y
INDEPENDENT OBSERVATION
MEASURED ERROR
SUM OF LATERAL ERRORS
1 4 LEFT 4
2 1 LEFT 5
3 3 RIGHT 8
Etc.
10 28
20 65
30 79
40 96
60 123
400
350
300
250
200
150
100
50
10
20
30
40
50
60
70
80
90
100

FIGURE 3

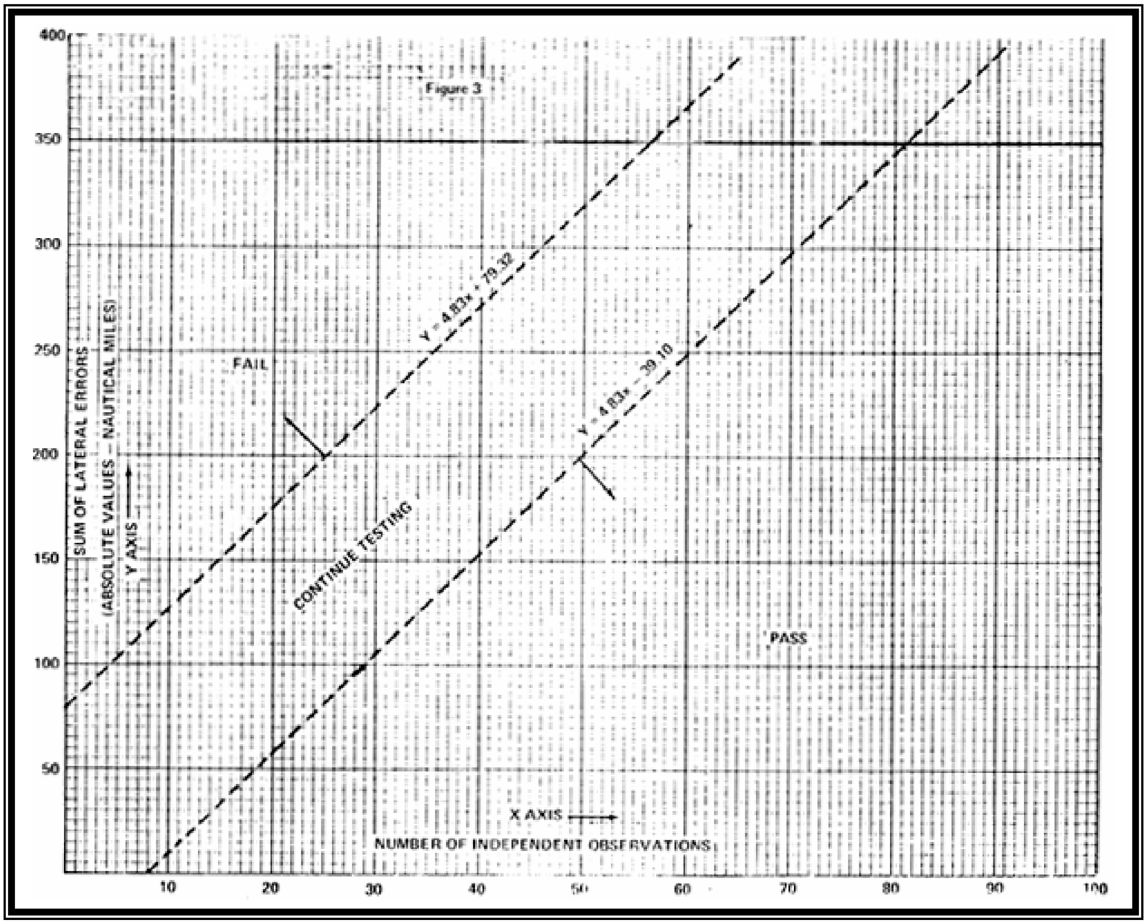
Figure 3
400
350
300
250
200
150
100
50
10
20
30
40
50
60
70
80
90
100
SUM OF LATERAL ERRORS
(ABSOLUTE VALUES – NAUTICAL MILES)
Y AXIS
FAIL
CONTINUE TESTING
PASS
Y = 4.83x + 79.32
Y = 4.83x – 39.10
X AXIS
NUMBER OF INDEPENDENT OBSERVATIONS

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ATTACHMENT 2
to
Appendix IV
General Operating and Flight Rules Standards
s602.163 Air Navigation Requirements

Doppler Radar and Inertial Navigation System (INS): Request for Evaluation; Equipment and Equipment Installation; Training Program; Equipment Accuracy and Reliability; Evaluation Program

(1) Application Authority.

(a) an applicant for authority to use a Doppler Radar or Inertial Navigation System must submit a request for evaluation of the system to the Director General of Civil Aviation (DGCA) 60 days prior to the start of evaluation flights.

(b) the application must contain:

(i) a summary of experience with the system showing to the satisfaction of the Minister a history of the accuracy and reliability of the system proposed to be used.

(ii) a training program curriculum for initial approval under the Lebanese Aviation Regulations (LARs).

(iii) a maintenance program for compliance with the LARs.

(iv) a description of equipment installation.

(v) proposed revisions to the Operations Manual outlining all normal and emergency procedures relative to use of the proposed system, including detailed methods for continuing the navigational function with partial or complete equipment failure, and methods for determining the most accurate system when an unusually large divergence between systems occurs. For the purpose of this Attachment, a large divergence is a divergence that results in a track that falls beyond clearance limits.

(vi) any proposed revisions to the minimum equipment list with adequate justification therefor.

(vii) a list of operations to be conducted using the system, containing an analysis of each with respect to length, magnetic compass reliability, availability of enroute aids, and adequacy of gateway and terminal radio facilities to support the system. For the purpose of this Attachment, a gateway is a specific navigational fix where use of long range navigation commences or terminates.

(2) Equipment and Equipment Installation - Inertial Navigation Systems (INS) or Doppler Radar System.

(a) Inertial Navigation and Doppler Radar Systems must be installed in accordance with applicable airworthiness requirements.

(b) cockpit arrangement must be visible and useable by either pilot seated at his duty station.

(c) the equipment must provide, by visual, mechanical, or electrical output signals, indications of the invalidity of output data upon the occurrence of probable failures or malfunctions within the system.

(d) a probable failure or malfunction within the system must not result in loss of the aircraft's required navigation capability.

(e) the alignment, updating, and navigation computer functions of the system must not be invalidated by normal aircraft power interruptions and transients.

(f) the system must not be the source of cause of objectionable radio frequency interference, and must not be adversely affected by radio frequency interference from other aircraft systems.

(g) the DGCA accepted approved airplane flight manual, or supplement thereto, must include pertinent material as required to define the normal and emergency operating procedures and applicable operating limitations associated with INS and Doppler performance (such as maximum latitude at which ground alignment capability is provided, or deviations between systems).

(3) Equipment and Equipment Installation - Inertial Navigation Systems (INS).

(a) if an applicant elects to use an Inertial Navigation System it must be at least a dual system (including navigational computers and reference units). At least two systems must be operational at takeoff. The dual system may consist of either two INS units, or one INS unit and one Doppler Radar unit.

(b) each Inertial Navigation System must incorporate the following:

(i) valid ground alignment capability at all latitudes appropriate for intended use of the installation.

(ii) a display of alignment status or a ready to navigate light showing completed alignment to the flight crew.

(iii) the present position of the airplane in suitable coordinates.

(iv) information relative to destinations or waypoint positions:

A. the information needed to gain and maintain a desired track and to determine deviations from the desired track.

B. the information needed to determine distance and time to go to the next waypoint or destination.

(c) for INS installations that do not have memory or other in-flight alignment means, a separate electrical power source (independent of the main propulsion system) must be provided which can supply, for at least 5 minutes, enough power (as shown by analysis or as demonstrated in the airplane) to maintain the INS in such condition that its full capability is restored upon the reactivation of the normal electrical supply.

(d) the equipment must provide such visual, mechanical, or electrical output signals as may be required to permit the flight crew to detect probable failures or malfunctions in the system.

(4) Equipment and Equipment Installation - Doppler Radar Systems.

(a) if an applicant elects to use a Doppler Radar System it must be at least a dual system (including dual antennas or a combined antenna designed for multiple operation), except that:

(i) a single operating transmitter with a standby capable of operation may be used in lieu of two operating transmitters.

(ii) single heading source information to all installations may be utilized, provided a compass comparator system is installed and operational procedures call for frequent cross checks of all compass heading indicators by crewmembers.

The dual system may consist of either two Doppler Radar units or one Doppler Radar unit and one INS unit.

(b) at least two systems must be operational at takeoff.

(c) as determined by the Minister and specified in the certificate holder's operations specifications, other navigational aids may be required to update the Doppler Radar for a particular operation. These may include Loran, Consol, DME, VOR, ADF, ground based radar, and airborne weather radar. When these aids are required, the cockpit arrangement must be such that all controls are accessible to each pilot seated at his duty station.

(5) Training Programs.

The initial training program for Doppler Radar and Inertial Navigation Systems must include the following:

(a) duties and responsibilities of flight crewmembers, dispatchers, and maintenance personnel.

(b) for pilots, instruction in the following:

(i) theory and procedures, limitations, detection of malfunctions, preflight and in-flight testing, and cross checking methods.

(ii) the use of computers, an explanation of all systems, compass limitations at high latitudes, a review of navigation, flight planning, and applicable meteorology.

(iii) the methods for updating by means of reliable fixes.
(iv) the actual plotting of fixes.
(c) abnormal and emergency procedures.

(6) Equipment Accuracy and Reliability.
(a) each Inertial Navigation System must meet the following accuracy requirements, as appropriate:
(i) for flights up to 10 hours' duration, no greater than 2 nautical miles per hour of circular error on 95 percent of system flights completed is permitted.
(ii) for flights over 10 hours' duration, a tolerance of ±20 miles cross track and ±25 miles along track on 95 percent of system flights completed is permitted.
(b) compass heading information to the Doppler Radar must be maintained to an accuracy of ±1° and total system deviations must not exceed 2°. When free gyro techniques are used, procedures shall be utilized to insure that an equivalent level of heading accuracy and total system deviation is attained.
(c) each Doppler Radar System must meet accuracy requirements of ±20 miles cross track and ±25 miles along track for 95 percent of the system flights completed. Updating is permitted.

A system that does not meet the requirements of this section will be considered a failed system.

(7) Evaluation Program.
(a) approval by evaluation must be requested in accordance with the Lebanese Aviation Regulations (LARs) as a part of the application for operational approval of a Doppler Radar or Inertial Navigation System.
(b) the applicant must provide sufficient flights which show to the satisfaction of the Minister the applicant's ability to use cockpit navigation in his operation.
(c) the Minister bases his evaluation on the following:
(i) adequacy of operational procedures.
(ii) operational accuracy and reliability of equipment and feasibility of the system with regard to proposed operations.
(iii) availability of terminal, gateway, area, and enroute ground based aids, if required, to support the self-contained system.
(iv) acceptability of cockpit workload.
(v) adequacy of flight crew qualifications.
(vi) adequacy of maintenance training and availability of spare parts.

After successful completion of evaluation demonstrations, the DGCA approval is indicated by issuance of amended operations specifications and enroute flight procedures defining the new operation. Approval is limited to those operations for which the adequacy of the equipment and the feasibility of cockpit navigation has been satisfactorily demonstrated.

(8) Continuing Airworthiness (Maintenance Requirements).

The aircraft manufacturer should have an established maintenance program for the individual navigation systems. For others installing navigation systems, the operator will submit those changes appropriate to their existing maintenance manual for review and acceptability.

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ATTACHMENT 3
to
Appendix IV
General Operating and Flight Rules Standards
s602.163 Air Navigation Requirements

Approval of Lebanese Operators and Aircraft to Operate Under Instrument Flight Rules (IFR) in European Airspace Designated for Basic Area Navigation (BRNAV/RNP-5)

DIVISION I

General

1. PURPOSE.

(1) This document provides guidance material regarding on-board Area Navigation (RNAV) equipment requirements for operators of Lebanese registered civil aircraft, operating in a Basic Area Navigation (BRNAV) environment in the European region. This document identifies types of RNAV equipment that the Director General of Civil Aviation (DGCA) has determined to be acceptable for BRNAV and contains guidelines for operators using global positioning system (GPS) equipment as the primary means for BRNAV. This Standard satisfies the intent of ICAO Doc. 9613-AN/937, Manual on RNP, First Edition, 1994.
(2) Regional Supplementary Procedures contained within International Civil Aviation Organization (ICAO) Doc. 7030/4-EUR, Part 1, Rules of the Air, Air Traffic Services and Search and Rescue, have been amended to require aircraft operating under Instrument Flight Rules (IFR) in designated European BRNAV airspace to meet the accuracy criteria of Required Navigation Performance Type 5 (RNP-5). The amendment also requires the State of Aircraft Registry or State of the Operator to verify conformance of the Air Operators Navigation System to RNP-5 and provide approval necessary for aircraft in a BRNAV environment.

2. INTERPRETATIONS.

(1) Area Navigation (RNAV). This is a method which permits aircraft navigation along any desired flight path within the coverage of the associated navigation aids or within the limits of the capability of self-contained aids, or a combination of these methods. For the purpose of this Standard, RNAV equipment is considered to be that equipment which operates by automatically determining aircraft position from one, or a combination, of the following sensors with the means to establish and follow a desired path:
- (a) VOR/DME
- (b) DME/DME
- (c) INS* or IRS*
- (d) LORAN C*
- (e) GPS*

Information Note: *Equipment marked with an asterisk (*) is subject to the limitations contained in Subsection 5. (4).*

(2) Class - I Navigation. Class-1 navigation is any en route flight operation or portion of a flight operation conducted in an area entirely within the officially designated operational service volumes of ICAO standard airways navigation facilities.

(3) Basic RNAV (BRNAV). For the purposes of this Standard, BRNAV is defined as RNAV, including the functions described in Division III of this Attachment, that meets a track keeping accuracy equal to or better than +/- 5 NM for 95% of the flight time (RNP-5). This value includes signal source error, airborne receiver error, display system error, and flight technical error. This navigation performance assumes the necessary coverage provided by satellite or ground based navigation aids is available for the intended route to be flown.
(4) Global Positioning System (GPS). This is a space-based positioning, velocity, and time system composed of space, control, and user elements. The space element, nominally is composed of 24 satellites in six orbital planes. The control element consists of five monitor stations, three ground antennas and a master control station. The user element consists of antennas and receiver processors that provide positioning, velocity, and precise timing to the user.
(5) Pseudorange. The distance from the user to a satellite plus an unknown user clock offset distance. With four satellite signals it is possible to compute position and offset distance. If the user clock offset is known, three satellite signals would suffice to compute a position.
(6) Receiver Autonomous Integrity Monitoring (RAIM). A technique whereby a GPS receiver/processor monitors the GPS. This integrity determination is achieved by a consistency check among redundant measurements.
(7) Required Navigation Performance (RNP). This is a statement of the navigation performance necessary for operation within a defined airspace.
(8) Required Navigation Performance Type (RNP Type). RNP types are established according to navigational performance accuracy in the horizontal plane, that is, lateral and longitudinal position fixing. The type is identified as an accuracy value expressed in nautical miles (e.g., RNP-5).

3. BACKGROUND.

(1) Implementation of RNAV is one of the key elements to obtain system capacity improvements and should allow airspace users to benefit from more direct routings and greater fuel savings. In European airspace, RNAV will allow greater flexibility in airspace design and reduce the need to depend totally on ground-based point source navigation aids when planning Air Traffic Services (ATS) routes.
(2) RNP-5 was chosen for the initial stage of RNAV operations in European airspace to take account of existing aircraft equipage and the current navigation infrastructure. Only RNAV equipped aircraft having a navigation accuracy meeting RNP-5 may plan for operations under IFR on the ATS routes of the Flight Information Regions (FIR)/Upper Information Regions (UIR) and/or designated Standard Instrument Departures (SID) and Standard Terminal Arrival Routes (STAR) in/out of Terminal Management Areas identified in ICAO Regional Supplementary Procedures Doc 7030/4, paragraph 14.2.1. The RNP-5 value includes signal source error, airborne receiver error, display system error, and flight technical error. This navigation performance standard assumes that the necessary coverage provided by satellite or ground based navigation aids is available for the intended route to be flown.
(3) Joint Aviation Authorities (JAA) first published advisory material for the Airworthiness Approval of Navigation Systems for use in designated European airspace for BRNAV operations in July 1996. This material was developed by EUROCAE WG-13 and was commonly referenced as AMJ 20X2. In May 1997, revision 1 to AMJ 20X2 was expanded to include specific guidance on the approval and use of GPS-based equipment for the purposes of conducting BRNAV operations.
(4) This Standard identifies eligible navigation system types and the criteria that may be used to determine acceptable means of compliance for Lebanese operators conducting Class I navigation in European BRNAV airspace. DGCA approval of Lebanese operators for European BRNAV operations is based on consideration of existing systems and previously completed airworthiness approvals, as described in the Airplane Flight Manual (AFM), or an assessment process described in this Standard.

4. APPROVAL PROCESS FOR BRNAV.

Operators should address the guidance contained in Section 5. on RNAV system equipage, eligibility and usage limitations; the general operating procedures specified in Section 6., the pilot knowledge items in Section 7., the flight plan procedures in Section 8., and any policy or procedures related to BRNAV operations that are required by European civil aviation authorities. Lebanese Aviation Regulations (LARs) require that the operator "when within a foreign country, comply with the regulations relating to the flight and maneuver of aircraft there in force"). Sections 5.(2) and (3) discuss the documents and the processes that should be used for approval of operators and RNAV systems.

5. OPERATOR/RNAV SYSTEM APPROVAL FOR BRNAV IN DESIGNATED EUROPEAN BRNAV AIRSPACE.

(1) Aircraft Equipment. An aircraft may be considered eligible for BRNAV approval if it is equipped with one or more RNAV systems approved and installed in accordance with the guidance contained in this document. The minimum level of availability and integrity required for BRNAV systems for use in designated European airspace can be met by a single installed system comprising one or more sensors, RNAV computer, control display unit, and navigation display(s) (e.g., HSI, or CDI), provided that the system is monitored by the flight crew and that in the event of a system failure, the aircraft retains the capability to navigate relative to ground based navigation aids (e.g., VOR, DME, and NDB). Aircraft not suitably equipped will not be permitted to operate in the designated BRNAV airspace.

(2) Operator/RNAV System Eligibility Based on the Airplane Flight Manual (AFM) (Supplement).

- (a) Aircraft BRNAV System Eligibility. The aircraft should be considered eligible for BRNAV operations, if the AFM shows that the navigation system installation has received airworthiness approval in accordance with one of the following U.S. FAA Advisory Circular's: AC 90-45A, AC 20-121A, AC 20-130A, AC 20-138, AC 25-15 or equivalent. The guidance for airworthiness approval contained in these AC's provides aircraft navigation performance that is equivalent to RNP-5 or better. (See Section 5.(4) for limitations on design and use of RNAV systems in European BRNAV airspace). Once equipment eligibility is established, operator approval should proceed in accordance with Section 5.(2)(b) or (c), as appropriate.
- (b) Part VI of the LARs Aircraft/Operator Approval. Lebanese Part VI operators should review their AFM to establish that it shows RNAV system eligibility as detailed in Section 5.(4)(a). Once RNAV system eligibility has been established, the operator should take steps to ensure that BRNAV operations are conducted in accordance with the guidance contained in Sections 5.(4),6.,7. and 8. as well as any other operational or airspace requirements that may be established by European authorities. When the operator has completed these actions, it may begin to conduct BRNAV operations. A Letter of Authorization (LOA) is not required when eligibility is based on the AFM. See Section 5.(3) for actions to take if the operator is not able to determine from the AFM that the aircraft RNAV system has been approved and installed in accordance with an appropriate U.S. FAA Advisory Circular or equivalent.
- (c) Part VII of the LARs operators should present the following documentation to the DGCA sections of the AFM that document airworthiness approval in accordance with an appropriate U.S. FAA AC or equivalent as detailed in Section 5.(2)(a) and training and operations manuals that reflect the operating policies of Sections 5.(4),6.,7. and 8. as well as any other operational or airspace requirements that may be established by European authorities. Once the operator has addressed the guidance in these sections to the satisfaction of the DGCA, the DGCA should update the Operations Specifications to reflect RNP-5 approval. See Section 5.(3) for guidance on actions to take if the operator is unable to determine from the AFM

whether the aircraft RNAV system has been approved in accordance with an appropriate U.S. FAA Advisory Circular or equivalent.

(3) Eligibility Not Based on the Airplane Flight Manual (Supplement).

(a) the operator may not be able to determine the airborne equipment's eligibility from the AFM, or may require a BRNAV time limit extension for non-radio updated INS-based RNAV systems beyond 2 hours. See Section 5.5.(4)(a). In this case, the operator should request that the DGCA assess the RNAV equipment for BRNAV eligibility. The operator should provide the DGCA with the RNAV system make, model and part number, evidence of meeting RNP-5 accuracy and the BRNAV requirements defined in Division III of this Attachment, crew operating procedures, bulletins, and any other pertinent information.

(b) for LARs Part VI operations other than Subpart 4, after the DGCA determines that the navigation equipment is eligible for BRNAV/RNP-5 operations based on the documentation provided by the operator, the DGCA will issue a letter documenting that finding to the operator. For LARs Part VII operators, the DGCA will establish aircraft RNAV system eligibility and determine that the operator's training and operations manuals reflect the operating policies of Sections 5.(4),6.,7. and 8. Once these steps are completed, the Operations Specifications for Part VI, Subpart 4 and Part VII operators may be revised to reflect RNP-5 approval.

(4) Limitations on the Design and/or Use of Navigation Systems. Although the following navigation systems have RNAV capability, limitations are required for their use when conducting operations in designated BRNAV airspace.

(a) Inertial Navigation Systems (INS). Those approved INS system installations which meet the required functions of Division III of this Attachment, but do not have automatic radio navigation updating of INS position, are limited to a maximum 2-hour time limit for operation in designated BRNAV airspace from the time that the system is placed in the navigation mode (NAV SELECT). The DGCA will give consideration to extending the 2-hour time limit for specific INS configurations. The DGCA will coordinate this effort with the JAA. Requests for time extensions should be submitted with supporting rationale and data through the DGCA.

Information Note: *Certain INS's perform automatic radio navigation aid updating after the pilot makes a manual selection of navigation aids. Such systems are not limited to the 2-hour time limit discussed in Section 5.(4)(a) provided that the operator has established procedures for pilots to follow.*

(b) Loran C. Use of Loran C, in compliance with U.S. Advisory Circular AC 20-121A or equivalent, is considered an acceptable means to comply with BRNAV in those areas of European airspace and on routes having acceptable Loran C coverage. Loran users must refer to the AFM to determine if operational use of the Loran system is limited to a specified Loran C Operational Area.

(c) GPS.

(i) GPS Design. GPS installed in accordance with U.S. Advisory Circular AC 20-138 or equivalent should provide pseudorange step detection and health word checking functions in accordance with TSO-C129a, paragraphs (a)(5)(vii)6 and a(6). Compliance with these requirements can be established by one of the following:

A. * a Statement in the AFM(s) that the GPS equipment meets the criteria for Primary Means of Navigation in Oceanic and Remote Airspace, or
B. a placard on the GPS receiver evidencing it meets TSO-129a, or
C. a Civil Aviation Authority's letter of design approval for the applicable equipment. Operators should contact the avionics installer or manufacturer to determine if the equipment complies and if a letter of design approval is available. Manufacturers

may obtain a letter by submitting appropriate documentation to their Aircraft Certification office. Operators should keep this letter with the AFM entry as evidence of BRNAV eligibility. Any limitations included in the letter of design approval should be reflected in a letter of finding to Part VI other than Subpart 4 of the LARs operators, (See Section 5.(3)(b) or in operations specifications for Part VI, Subpart 4 and Part VII operators) or

D. GPS equipment that has been approved in accordance with TSO C-129, but which does not satisfy the step detection and health word checking, may still obtain a letter of design approval for BRNAV. In this case, BRNAV operations are limited to flights where RAIM outages do not exceed 5 minutes. With this restriction, TSO C-129 equipment is equivalent to equipment that provides step detection and health word checking. The maximum RAIM outage should not be extended beyond 5 minutes for TSO C-129 equipment.

(ii) Flight Planning Restrictions for GPS. During pre-flight planning, if 24 satellites (23 if baro aiding is incorporated into the GPS installation) are projected to be operational for the flight, then the aircraft can depart without further action. If, however, 23 or fewer satellites (22 if baro aiding incorporated), are projected to be operational, then the availability of GPS integrity (RAIM) should be confirmed for the intended flight (route and time). This should be obtained from a prediction program that is provided in the GPS unit installed in the aircraft, a prediction program run outside the aircraft (such a program should use the same algorithms as those in the aircraft GPS units), or from an alternative method considered acceptable to the Minister after review of JAA comments on the method proposed. (Division II of this Attachment contains basic criteria for RAIM Prediction Programs). In the event of a predicted continuous loss of RAIM of more than 5 minutes for any part of the intended flight, the flight should be delayed, canceled, or rerouted on a track where RAIM requirements can be met.

(iii) Loss Of RAIM En Route. In the event of loss of the RAIM detection function, the GPS stand-alone equipment may continue to be used for navigation as long as the flight crew determines, by cross checking other on-board navigation systems, that the GPS system is continuing to provide an acceptable level of IFR navigation performance. Otherwise, the flight crew should notify ATC and revert to an alternative means of navigation (e.g., VOR, DME, or NDB).

(iv) Actions When Failure Detected. In the event of a detected failure (including detected failure of satellites for GPS-based RNAV systems), the flight crew should notify ATC and revert to an alternative means of navigation.

(v) availability of VOR, DME, OR ADF. VOR, DME or ADF capability should be installed and operative consistent with the applicable operating rules and intended route-of-flight to ensure availability of a suitable alternative means of navigation in the event of GPS/RNAV system failure.

6. BRNAV OPERATING PROCEDURES (GENERAL).

(1) For BRNAV operations, the flight crew should be familiar with the normal operating procedures and the contingency procedures detailed in Sections 6.(1)(a) and (b).

(a) Normal Procedures. The procedures for the use of navigational equipment on BRNAV routes should include the following:

(i) when a navigation database is installed, the database validity should be checked before the flight.

(ii) other NAVAIDs (e.g., VOR, DME, and ADF) should be selected so as to allow immediate cross-checking or reversion in the event of loss of RNAV capability.

(b) Contingency Procedures. The flightcrew should be familiar with the following general provision: Pilots should notify ATC of conditions (e.g., equipment failures and weather conditions) that may affect the ability of the aircraft to maintain position within the designated BRNAV airspace. In this case, flight crews should state their intentions, coordinate a plan of action, and obtain a revised ATC clearance. If unable to obtain an ATC clearance prior to deviating from the BRNAV airspace, the flight crew should follow established contingency procedures, as defined by the region of operation, and obtain an ATC clearance as soon as possible.

7. PILOT KNOWLEDGE.

(1) Pilots should be knowledgeable in the following areas:
- (a) RNP definition as it relates to BRNAV requirements in European airspace;
- (b) airspace where RNP-5 is required;
- (c) changes to charting and documents to reflect RNP-5;
- (d) navigation equipment required to be operational for flight in designated BRNAV airspace, limitations associated with the RNAV equipment;
- (e) flight planning requirements;
- (f) contingency procedures (e.g., for equipment failure);
- (g) en route, terminal, and approach procedures applicable to RNAV; and
- (h) the information in this Standard, Operations Specifications, and operator's procedures.

8. FLIGHT PLANS.

(1) Lebanese-registered aircraft filing flight plans into European BRNAV designated airspace are expected to meet the European BRNAV airspace requirements. Operators should indicate approval for BRNAV/RNP-5 operations by annotating block 10 (Equipment) of the ICAO flight plan with the letter "R." If there are any other flight plan annotations required by individual States, operators should make appropriate annotations.

9. CONTINUING AIRWORTHINESS (MAINTENANCE REQUIREMENTS).

The aircraft manufacturer 3 should have an established maintenance program for the individual navigation systems. For others installing navigation systems, the operator will submit those changes appropriate to their existing maintenance manual for review and acceptability.

Division II

GPS Integrity Monitoring (RAIM) Prediction Program

Where a GPS Integrity Monitoring (RAIM) Prediction Program is used as a means of compliance with Section 5. (4)(c)(ii) it should meet the following criteria:

(a) the program should provide prediction of availability of the integrity monitoring (RAIM) function of the GPS equipment, suitable for conducting RNP-5 (BRNAV) operations in designated European airspace.

(b) the prediction program software should be developed in accordance with at least RTCA DO 178B/EUROCAE 12B, level D guidelines.

(c) the program should use either a RAIM algorithm identical to that used in the airborne equipment, or an algorithm based on assumptions for RAIM prediction that give a more conservative result.

(d) the program should calculate RAIM availability based on a satellite mask angle of not less than 5 degrees, except where use of a lower mask angle has been demonstrated to be acceptable to the Minister.

(e) the program should have the capability to manually designate GPS satellites which have been notified as being out-of-service for the intended flight.

(f) the program should allow the user to select:
  (i) the intended route and declared alternates;
  (ii) the time and duration of the intended flight.

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Division III

Required Functions

The following system functions are the minimum required to conduct BRNAV/RNP-5 operations:

(a) continuous indication of aircraft position relative to track to be displayed to the pilot flying on a navigation display situated in his primary field of view;

Information Note: *In addition, where the aircraft type certificate requires more than one pilot, information to verify aircraft position must be displayed in the non-flying pilot's primary field of view.*

(b) display of distance and bearing to the active (To) waypoint;
(c) display of ground speed or time to the active (To) waypoint;
(d) storage of waypoints; minimum of 4; and
(e) appropriate failure indication of the RNAV system, including the sensors.

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ATTACHMENT 5
to
Appendix IV
General Operating and Flight Rules Standards
s602.163 Air Navigation Requirements

Approval of Aircraft and Operators for Flight in Airspace Above Flight Level (Fl) 290 Where a 1,000 Foot Vertical Separation Minimum is Applied / RVSM Operations

DIVISION I

General

1. PURPOSE.

This Attachment is intended to provide the Standards for the approval of aircraft and operators to conduct flight in airspace or on routes where Reduced Vertical Separation Minimum (RVSM) is applied. It contains guidance on airworthiness, continuing airworthiness, and operations programs for RVSM operations. (RVSM airspace is any airspace or route between FL 290 and FL 410 inclusive where aircraft are separated vertically by 1,000 ft (300 m).

2. BACKGROUND.

(1) In mid-1981, the U.S. FAA established a Vertical Studies program with the objective of collecting data on aircraft height-keeping performance, developing program requirements for the reduction of vertical separation, and providing technical and operational representation on the working groups studying the subject. In early 1982, the FAA hosted a Public meeting on vertical separation. This meeting recommended that the Radio Technical Commission for Aeronautics (RICA) should be the forum for the development of the minimum system performance standards (MSPS) for RVSM. RICA Special Committee (SC) 150 was formed in March 1982 for this purpose.
(2) In the international arena, the FAA committed resources to the ICAO RGCSP which was tasked in 1984 to add the study of vertical separation to its work program.
(3) The data and analysis developed in the FAA Vertical Studies Program was reviewed by the national and international working groups studying RVSM. The major results and conclusions of this program are contained in the "Summary Report of United States Studies on 1,000 foot Vertical Separation Above Flight Level 290" Which was completed in July 1988. (This report was incorporated in its entirety into Volume II of the RGCSP/6 report. Volume II is a compilation of reports from EUROCONTROL and four individual states on vertical studies).
(4) RTCA SC 150 was established with: the purpose of developing minimum system performance requirements, identifying required aircraft equipment improvements and operational procedure changes and assessing the impact of RVSM implementation on the aviation community. SC 150 served as the focal point for the study and development of RVSM criteria and programs in the U.S. from 1982 to 1987. SC 150 completed its "Initial Report on Minimum System Performance Standards for Vertical Separation Above Flight Level 290 in November 1984. This report contains information on the methodology for evaluating safety, factors influencing vertical separation, and strawman system performance standards. RICA also developed a draft "Minimum System Performance Standard for 1,000 - Foot Vertical Separation Above Flight Level 291" The draft MSPS continued to develop over a period of years. Draft 7 of the material was developed in August 1990.

(5) In 1987, the FAA concentrated its resources for the development of RVSM programs in the ICAO RGCSP. The U.S. delegation to RGCSP used the material developed by SC 150 in developing U.S. positions and proposals on RVSM criteria and programs.
(6) The ICAO RGCSP published two major reports which have provided the basis for the development of RVSM implementation documents. The Report of RGCSP/6 (Montreal, 28 November-15 December 1988) was published in two volumes. Volume 1 summarized the major conclusions reached by the panel and by individual states. Volume 2 presented the complete RVSM study reports of EUROCONTROL, the U.S., Japan, Canada, and the USSR. The major conclusions of this report are that:

(a) RVSM is "technically feasible without imposing unreasonably demanding technical requirements on the equipment."
(b) RVSM would provide "significant benefits in terms of economy and en route airspace capacity."

(7) The second major report published by RGCSP was the Report of RGCSP/7 (Montreal, 30 October - 20 November 1990). This report contains the draft "Manual on Implementation of a 300 M (1,000 ft) Vertical Separation Minimum (VSM) Between FL 290 and FL 410 Inclusive. " This material was approved by the ICAO Air Navigation Commission in February 1991 and published as ICAO Document 9574. This manual provides guidance for RVSM implementation planning, airworthiness requirements, flight crew procedures, ATC considerations, and system performance monitoring.
(8) Division VII provides a discussion of certain major conclusions detailed in DOC. 9574 which have served as the foundation for the development of the specific aircraft and operator approval criteria and programs contained in the Interim Guidance.

3. DEFINITIONS.

The following definitions are intended to clarify certain specialized terms used in this advisory material:

(a) Aircraft Group. A group of aircraft that are of nominally identical design and build with respect to all details that could influence the accuracy of height keeping performance (See Division I 7.(2)(b)).
(b) Altimetry System Error (ASE). The difference between the pressure altitude displayed to the flightcrew when referenced to ISA standard ground pressure setting (2992 in. Hg/1013.25 hPa) and free stream pressure altitude.
(c) Assigned Altitude Deviation (AAD). The difference between the transponded Mode C altitude and the assigned altitude/flight level.
(d) Automatic Altitude Control System. Any system which is designed to automatically control the aircraft to a referenced pressure altitude.
(e) Avionics Error (AVE). The error in the processes of converting the sensed pressure into an electrical output, of applying any static source error correction (SSEC) as appropriate, and of displaying the corresponding altitude.
(f) Basic RVSM Envelope. The range of Mach numbers and gross weights within the altitude ranges FL 290 to FL 410 (or max available altitude) where an aircraft can reasonably be expected to operate most frequently. (See Division I 7.(2)(d)(ii)).
(g) Full RVSM Envelope. The entire range of operational Mach numbers, w/d, and altitude values over which the aircraft can be operated within RVSM airspace. (See Division I 7.(2)(d)(i)).
(h) Height-Keeping Capability. Aircraft height-keeping performance which can be expected under nominal environmental operating conditions with, proper aircraft operating practices and maintenance.
(i) Height-Keeping Performance. The observed performance of an aircraft with respect to adherence to a flight level.

(j) Non-Group Aircraft. An aircraft for which the operator applies for approval on the characteristics of the unique airframe rather than on a group basis (See Division I 7.(2)(c)).
(k) Residual Static Source Error. The amount by which static source error (SSE) remains undercorrected or overcorrected after the application of SSEC.
(l) Static Source Error. The difference between the pressure sensed by the static system at the static port and the undisturbed ambient pressure.
(m) Static Source Error Correction (SSEC). A correction for static souse error
(n) Total Vertical Error (TVE). Vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).
(o) W/d. Aircraft weight, W, divided by the atmospheric pressure ratio, d.

4. THE APPROVAL PROCESS.

(1) General. Airspace where RVSM is applied should be considered special qualification airspace. Both the individual operator and the specific aircraft type or types which the operator intends to use should be approved by the DGCA before the operator conducts; flight in RVSM airspace. This Standard provides the procedures for the approval of aircraft types and operators for flight in airspace where RVSM is applied.
(2) Approval of Aircraft. Each aircraft type that an operator intends to use in RVSM airspace should have received DGCA approval in accordance with Division I, Section 7. prior to the operational approval being granted. Division I, Section 7. provides procedures for the approval of aircraft which have already entered service and for new build aircraft.
(a) In-service Aircraft: LARs Part VI, Subpart 4, and Part VII Operations. Aircraft manufacturers should coordinate with the appropriate Aircraft Certification Office (ACO) to determine the process and procedures for RVSM airworthiness approval. An individual operator seeking approval for its aircraft should contact the manufacturer of the specific aircraft type and the DGCA to determine/coordinate the process for RVSM approval. Final approval will require coordination between the operator, the DGCA, and the aircraft manufacturer or design organization.
(b) In-service Aircraft: LARs Part VI other than Subpart 4 Operations. An Aircraft manufacturer should coordinate with the appropriate Aircraft Certification Office (ACO) to determine the process and procedures for RVSM airworthiness approval. An individual operator seeking approval for its aircraft should contact the manufacturer of the specific aircraft type and the DGCA to determine/coordinate the process for RVSM approval.
(3) Operator Approval. Division I, Section 8. contains guidance on the continuous airworthiness (maintenance) programs for RVSM operations. Division I, Section 9. contains guidance on the operational procedures and programs which an operator should adopt for RVSM operation. Each individual operator should plan on presenting these programs to the DGCA at least 60 days prior to proposed operation. Division I, Section 9. discusses the, timing, process, and maintenance and operations material which the operator should submit for DGCA review and evaluation. The DGCA should be contacted to start the process as follows:
(a) LARs Part VI, Subpart 4 and Part VII Operators. The operator should notify the DGCA of its intent to obtain approval for RVSM operations which starts the process for issuance of RVSM OpSpecs. The operator can expect the DGCA to consult this Standard for procedures on RVSM approval and for sources of technical assistance.
(b) LARs Part VI, other than Subpart 4 Operators. LARs Part VI, other than Subpart 4 Operators should contact the DGCA to start the process to receive a letter of authorization (LOA) which will grant authorization for RVSM operations. The operator can expect the DGCA to consult this Standard for procedures on RVSM approval and for sources of technical assistance.

5. RVSM PERFORMANCE

(1) General. The statistical performance statements of ICAO Doc. 9574 for a population of aircraft (See Division VII) have been translated into airworthiness standards by assessment of the characteristics of ASE and altitude control. The following standards differ in some respects from that document, but they are consistent with the requirements of RVSM.
(2) RVSM Flight Envelopes For the Purposes of RVSM Approval. The aircraft flight envelope may be considered in two pans: the Basic RVSM Envelope and the Full RVSM Envelope. (The parameters for these envelopes are detailed in Division I 7.(2)(d)**.** The Basic RVSM Envelope is the part of the flight envelope where aircraft operate the majority of time. The Full RVSM Envelope includes parts of the Bight envelope where the aircraft operates less frequently and where a larger ASE tolerance is allowed (See Division I, Sections 5.(3)(c) and (d)).
(3) Altimetry System Error.

- (a) in order to evaluate a system against the ASE performance statements established by RGCSP (See Division VII, Section (3)), it is necessary to quantify the mean and three standard deviation values for ASE, expressed as ASE mean. and ASE3SD. In order to do this, it is necessary to take into account the different ways in which variations in ASE can arise. The factors which affect ASE are as follows:
  - (i) unit to unit variability of avionics.
  - (ii) effect of environmental operating conditions on avionics.
  - (iii) airframe to airframe variability of static source error.
  - (iv) effect of Bight operating condition on static source error.
- (b) assessment of ASE, whether based on measured or predicted data, must, therefore, cover Division I, Sections (5)(3)(a)(i), (ii), (iii), and (iv). The effect of item (0) as a variable can be eliminated by evaluating ASE at the most adverse flight condition in an RVSM flight envelope.
- (c) the requirements in the Basic RVSM Envelope are as follows:
  - (i) at the point in the Basic RVSM Envelope where mean ASE reaches its largest absolute value, the absolute value should not exceed 80 ft (25 m).
  - (ii) at the point in the Basic RVSM Envelope where mean ASE plus three standard deviations of ASE reaches its largest absolute value, the absolute value should not exceed 200 ft (60 m).
- (d) the requirements in the Full RVSM Envelope are as follows:
  - (i) at the point in the Full RVSM Envelope where mean ASE reaches its largest absolute value, the absolute value should not exceed 120 ft (37 m).
  - (ii) at the point in the Full RVSM Envelope where mean ASE plus three standard deviations of ASE reaches its largest absolute value, the absolute value should not exceed 245 ft (75 m).
  - (iii) if necessary, for the purpose of achieving RVSM approval for an aircraft group, an operating restriction may be established to restrict aircraft from conducting RVSM operations in areas of the Full RVSM Envelope where the absolute value of mean ASE exceeds 120 A (37 m) and/or the absolute value of mean ASE plus three standard deviations of ASE exceed 245 ft (75 m). When such a restriction is established, it should be identified in the data package and documented in appropriate aircraft operating manuals, however, visual or aural warning/indication systems should not be required to be installed on the aircraft.
- (e) aircraft types for which application for type certification was made after January 1, 1997 should meet the criteria established for the Basic Envelope in the Full RVSM Envelope. (See Division I, Section 5.(3)(c)). The DGCA will consider factors that provide an equivalent level of safety in the application of this criteria.

(f) the requirement of ICAO Doc. 9574 that each, individual aircraft in the group should be built to have ASE contained within (± 200) ft (± 60 m) is discussed in Division I, Section 7.(2)(e)(iv)F.
(g) the standards of Division I, Sections 5.(3)(c), (d), and (f) cannot be applied to nongroup aircraft approval because there can be no group data with which to develop airframe to airframe variability. Therefore, a single ASE value has been established that controls the simple sum of the altimetry system errors In order to control the overall population distribution, this limit has been set at a value less than that for group approval.
(h) accordingly the standard for aircraft submitted for approval as nongroup aircraft, as defined in Division I, Section 7.(2)(c) is as follows:
  (i) for all conditions in the Basic RVSM Envelope:
  (ii) [residual static source error + worst case avionics] <= 160 ft (50 m)
  (iii) for all conditions in the Full RVSM Envelope:
  (iv) [residual static source error + worst case avionics] <= 200 ft (60 m)

Information Note: *Worst case avionics means that combination of tolerance values, specified by the manufacturer for the altimetry fit into the aircraft, which gives the largest combined absolute value for residual SSE plus avionics errors.*

(4) Altitude Keeping . An automatic altitude control system should be installed and it should be capable of controlling altitude within ± 65 ft (± 20 m) about the acquired altitude when operated in straight and level flight under nonturbulent, nongust conditions.

Information Note: *Aircraft types for which application for type certification is made prior to January 1, 1997 which are equipped with automatic altitude control systems with flight management system/performance management system inputs allowing variations up to ± 130 ft (± 40 m) under nonturbulent, nongust conditions do not require retrofit or design alteration.*

6. AIRCRAFT SYSTEMS

(1) Equipment for RVSM Operations. The minimum equipment fit should be as follows:
(a) two independent altitude measurement systems. Each system should be composed of the following elements:
  (i) crosscoupled static source/system, provided with ice protection if located in areas subject to ice accretion;
  (ii) equipment for measuring static pressure sensed by the static source, converting it to pressure altitude and displaying the pressure altitude to the flightcrew;
  (iii) equipment for providing a digitally coded signal corresponding to the displayed pressure altitude, for automatic altitude reporting purposes;
  (iv) static source error correction (SSEC), if needed to meet the performance requirements of Division I, Section 5.(3)(c) and (d), or (h), as appropriate; and
  (v) the equipment & should provide reference signals for automatic control and alerting at selected altitude. These signals should preferably be derived from an altitude measurement system meeting the full requirements of this document, but must in all cases enable the requirements of Division I, Section 6.(2)(f) and 6.(3) to be met.
(b) one SSR altitude reporting transponder. If only one is fitted, it should have the capability for switching to operate from either altitude measurement system.
(c) an altitude alert system.
(d) an automatic altitude control system

(2) Altimetry.

- (a) System Definition. The altimetry system of an aircraft comprises all those elements involved in the process of sampling free stream static pressure and converting it to a pressure altitude output. The elements of the altimetry system fall into two main groups:
  - (i) airframe plus static sources.
  - (ii) avionics and/or instruments.
- (b) Altimetry System Outputs. The following altimetry system outputs are significant for RVSM operations:
  - (i) pressure altitude (Baro Corrected) display.
  - (ii) pressure altitude reporting data.
  - (iii) pressure altitude or pressure altitude deviation for an automatic altitude control device.
- (c) Altimetry System Accuracy. The total system accuracy should satisfy the requirements of Division I, Sections 5.(3)(c) and (d), or (h), as appropriate.
- (d) SSEC. If the design and characteristics of the aircraft and altimetry system are such that the standards of Division I, Sections 5.(3)(c) and (d), or (h), are not satisfied by the location and geometry of the static sources alone, then suitable SSEC should be applied automatically within the avionic part of the altimetry system. The design aim for static source error correction, whether aerodynamic/geometric or avionic, should be to produce a minimum residual static source error, but in all cases it should lead to satisfaction of the standards of Division I, Sections 5.(3)(c) and (d), or (h), as appropriate.
- (e) Altitude Reporting Capability. The aircraft altimetry system should provide an output to the aircraft transponder in accordance with regulations of the approving authority.
- (f) Altitude Control Output.
  - (i) the altimetry system shall provide an output which can be used by an automatic altitude control system to control the aircraft at a commanded altitude. The output may be used either directly or combined with other sensor signals. If SSEC is necessary in order to satisfy the requirements of Division I, Sections 5.(3)(c) and (d), or (h) of this document, then an equivalent SSEC must be applied to the altitude control output. The output may be an altitude deviation signal, relative to the selected altitude, or a suitable absolute altitude output.
  - (ii) whatever the system architecture and SSEC system the difference between the output to the altitude control system and the altitude displayed must be kept to the minimum .
- (g) Altimeter System Integrity. During the RVSM approval process it must be verified analytically that the predicted rate of occurrence of undetected altimetry system failures does not exceed 1 x 10-5 per flight hour. All failures and failure combinations whose occurrence would not be evident from cross cockpit checks, and which would lead to altitude measurement/display errors outside the specified limits, need to be assessed against this budget. No other failures or failure combinations need to be considered.

(3) Altitude Alert. The altitude deviation warning system should signal an alert when the altitude displayed to the flightcrew deviates from selected altitude by more than a nominal value. For aircraft for which application for type certification is made prior to January 1, 1997, the nominal value CCU not be greater than ± 300 ft (± 90 m). For aircraft for which application for type certification I made after January 1, 1997, the nominal value should not be greater than ± 200 ft (± 60 m). The overall equipment tolerance in implementing these nominal threshold values should not exceed ± 50 ft 15 m).

(4) Automatic Altitude Control System,

- (a) as a minimum, a single automatic altitude control system should be installed which is capable of controlling aircraft height within a tolerance band of ± 65 ft (± 20 m) about the acquired altitude when the aircraft is operated in straight and level flight under nonturbulent, nongust conditions.

Information Note: *Aircraft types for which application for type certification is made prior to January 4, 1997 which are equipped with automatic altitude control systems with flight management system/performance management system inputs allowing variations up to ± 130 ft ± 40 on) under nonturbulent; nongust conditions do not require retrofit or design alteration.*

(b) where an altitude select/acquire function is provided, the altitude select/acquire control panel should be configured such that an error of no more than ± 25 ft (± 8 m) exists between the display selected by the flightcrew and the corresponding output to the control system.

7. AIRWORTHINESS APPROVAL.

(1) General. Obtaining RVSM airworthiness approval is a 2 step process. First, the manufacturer or design organization develops the data package through which airworthiness approval should be sought and submits the package to the appropriate Authority for approval. Once the Authority approves the data package, the operator applies the procedures defined in the package to obtain approval from the DGCA to utilize its aircraft to conduct flight in RVSM airspace. Division I, Section 7.(2) specifically addresses the data package requirements.

(2) Contents of the Data Package

(a) Scope. As a minimum, the data package should consist of the following items:
- (i) a definition of the aircraft group or non-group aircraft to which the data package applies
- (ii) a definition of the flight envelope(s) applicable to the subject aircraft.
- (iii) the data needed to show compliance with the requirements of paragraphs 7 and 8.
- (iv) the compliance procedures to be used to ensure that all aircraft submitted for airworthiness approval meet RVSM requirements.
- (v) the engineering data, to be used to ensure continued in-service RVSM approval integrity.

(b) Definition of Aircraft Group. For aircraft to be considered as members of a group for purposes of RVSM approval they should satisfy all of the following conditions:
- (i) aircraft should have been manufactured to a nominally identical design and be approved by the same Type Certificate (TC), TC amendment, or supplemental TC, as applicable.

Information Note: *For derivative aircraft it may be possible to utilize the database from the parent configuration to minimize the amount of additional data required to show compliance. The went of additional data required will depend on the nature of the changes between the parent aircraft and the derivative aircraft.*

- (ii) the static system (if each aircraft should be installed in a nominally identical manner and position. The same SSE corrections should be incorporated in all aircraft of the group.
- (iii) the avionics units installed on each aircraft to meet the minimum RVSM equipment requirements of Division I, Section 6.(1) should be manufactured to the manufacturer's same specification and have the same part number.

Information Note: *Aircraft which have avionic units which are of a different manufacturer or part number may be considered part of the group if it is demonstrated that this standard of avionic equipment provides equivalent system performance.*

- (iv) the RVSM data package should have been produced or provided by the airframe manufacturer or design organization.

(c) Definition of Nongroup-Aircraft. If an airframe does not meet the conditions of Division I, Sections 7.(2)(b)(i), (ii), (iii), and (iv) to qualify as a member of a group or is presented as an individual airframe for approval, then it must be considered as a nongroup aircraft for the purposes of RVSM approval.

(d) Definition of Flight Envelopes. The RVSM operational flight envelope is defined as the Mach number, W/d, and altitude ranges over which an aircraft can be operated in cruising flight within the RVSM airspace (See Division II for an explanation of W/d). As noted in Division I, Section 5.(2), the RVSM operational flight envelope for any aircraft may be divided into two zones as defined below:

(i) full RVSM envelope:

A. the Full RVSM Envelope will comprise the entire range of operational Mach number, W/d, and altitude values over which the aircraft can be operated within RVSM airspace. Table 1 establishes the parameters which should be considered.

Table 1

Full RVSM Envelope Boundaries

	Lower Boundary is the lowest of the following:	Upper Boundary is the lowest of the following:
Altitude	• FL 290	• FL 410 • Airplane maximum certified altitude • Altitude limited by: cruise thrust; buffet; other aircraft flight limitations
Mach or Speed	• Maximum endurance (holding) speed • Maneuver speed	• Mmo/Vmo • Speed limited by: Cruise thrust; buffet; other aircraft flight limitations
Gross Weight	• The lowest gross weight compatible with operation in RVSM airspace	• The highest gross weight compatible with operation in RVSM airspace

(ii) basic RVSM envelope:

A. the boundaries for the Basic RVSM Envelope are the same as those for the Full RVSM Envelope except in regard to the upper Mach boundary

B. for the Basic RVSM Envelope, the upper Mach boundary may be limited to a range of airspeeds over which the aircraft group can reasonably be expected to operate most frequently. Ibis boundary should be declared for each aircraft group by the manufacturer or design organization. The boundary may be defined as equal to the upper Mach/airspeed boundary defined for the Full RVSM Envelope or a specified lower value. This lower value should not be less than the Long Range Cruise Mach Number plus .04 Mach, unless limited by available cruise thrust, buffet, or other aircraft flight limitations.

Information Note: *Long Range Cruise Mach Number is the Mach for 99% of best fuel mileage at the particular W/d under consideration.*

(e) Data Requirements. The data package should contain data sufficient to substantiate that the accuracy standards of Division I, Section 5.

(i) *General*.

A. ASE will generally vary with flight condition. The data package should provide coverage of the RVSM envelope sufficient to define the largest errors in the Basic and Full RVSM envelopes. Note that in the case of group approval the worst flight condition may be different for each of the requirements of Division I, Sections 5.(3)(c) and (d), and each should be evaluated.

B. where precision flight calibrations are used to quantify or verify altimetry system performance they may be accomplished by any of the following methods. Flight calibrations should only be performed once appropriate ground checks have been completed. Uncertainties in application of the method must be assessed and taken into account in the data package.

- precision tracking radar in conjunction with pressure calibration of atmosphere at test altitude.
- trailing cone.
- pacer aircraft
- any other method acceptable to the approving authority.

Information Note: *When using pacer aircraft it should be understood that the pacer aircraft must have been directly calibrated to a known standard. It is not acceptable to calibrate a pacer aircraft by another pacer aircraft.*

(ii) *Altimeter System Error Budget*. It is implicit in the intent of Division I, Section 5.(3), for group approvals and for non-group approvals, that a trade may be made between the various error sources which contribute to ASE (as noted in Division III). This document does not specify separate limits for the various error sources which contribute to the mean and variable components of ASE as long as the overall ASE accuracy requirements of Division I, Section 5.(3) are met. For example, in the case of group approval, the smaller the mean of the group and the more stringent the avionics standard, the larger the available allowance for SSE variations. In all cases the trade-off adopted should be presented in the data package in the form of an error budget which includes all significant error sources. This is discussed in more detail in the following sections and the discussion of altimetry system error sources is provided in Division III.

(iii) *Avionics*. Avionics equipment should be identified by function and part number. It must be demonstrated that the avionics equipment can meet the requirements established according to the error budget when the equipment is operated in the environmental conditions expected to be met during RVSM operations.

(iv) *Groups of Aircraft* Where approval is sought for an aircraft group, the data package must be sufficient to show that the requirements of Division I, Section 5.(3)(c) and (d) are met. Because of the statistical nature of these requirements, the content of the data package may vary considerably from group to group.

A. the mean and airframe-to-airframe variability of ASE should be established based on precision flight test calibration of a number of aircraft. Where analytical methods are available, it may be possible to enhance the flight test data base and to track subsequent change in the mean and variability based On geometric inspections and bench test or any other method acceptable to the approving authority. In the case of derivative aircraft it may be possible to utilize data from the parent as part of the data base. (An example would be the case of a fuselage stretch where the only difference in mean ASE between groups could be reliably accounted for by analytical means.)

B. an assessment of the aircraft-to-aircraft variability of each error source should be made. The error assessment may take various forms as appropriate to the nature and magnitude (A the source and the type of data available. For example, for some error sources (especially small ones) it may be acceptable to use specification values to represent 3SD. For other error sources (especially larger ones) a more comprehensive assessment may be required; this is especially true for airframe error sources where "specification" values of ASE contribution may not have been previously established.

C. in many cases one or more of the major ASE error sources will be aerodynamic in nature (such as variations in the aircraft surface contour in the vicinity of the static pressure source). If evaluation of these errors is based on geometric measurements, substantiation should be provided that the methodology used is adequate to ensure compliance. An example of the type of data which could be used to provide this substantiation is provided in figure 3-2 of Division IV.

D. an error budget should be established to ensure that the standards of Division I, Section 5.(3)(c) and (d) are met. As noted in Division I, Section 7.(2)(e)(i)A.**,** the worst flight condition may be different for each of these standards and therefore the component error values may also be different.

E. in showing compliance with the overall requirements, the component error sources should be combined in an appropriate manner. In most cases this will involve the algebraic summation of the mean components of the errors, root-sum-square (rss) combination of the variable components of the error; and summation of the rss value with the absolute value of the overall mean. (Care should be taken that only variable component error sources which are independent of each other are combined by rss.)

F. the methodology described above for group approval is statistical in nature. This is the remit of the statistical nature of the risk analysis and the resulting statistical statements of Division VII, Sections (5)(a) and (b). In the context of a statistical method, the statements of Division VII, Section (5)(c) required reassessment. This item states that "each individual aircraft in the group shall be built to have ASE contained within ± 200 feet". This statement has not been taken to mean that every airframe should be calibrated with a trailing cone or equivalent to demonstrate that ASE is within 200 ft. Such an interpretation would be unduly onerous considering that the risk analysis allows for a small proportion of aircraft to exceed 200 ft. - However, it is accepted that if any aircraft is identified as having an error exceeding ± 200 ft then it should receive corrective action.

(v) *Nongroup Aircraft*. Where an aircraft is submitted for approval as a nongroup aircraft, the data should be sufficient to show that the requirements of Division I, Section 5.(3)(h) are met. The data package should specify how the ASE budget has been allocated between residual SSE and avionics error. The operator and authority should agree on what data is needed to satisfy approval requirements. The following data should be established:

A. precision flight test calibration of the aircraft to establish its ASE or SSE over the RVSM envelope should be required. Flight calibration should be performed at points in the flight envelope(s) as agreed by the certifying authority. One of the methods prescribed in Division I, Section 7.(2)(e)(i)B. should be used.

B. calibration of the avionics used in the flight test as required to establish residual SSE. The number of test points should be agreed by the certifying authority. Since the purpose of the flight test is to determine the residual SSE, specially calibrated altimetry equipment may be used.

C. specifications for the installed altimetry avionics equipment indicating the largest allowable errors will be presented.

D. using Division I, Section 7.(2)(e)(v)A., B. and C., demonstration that the requirements of Division I, Section 5.(3)(h) are met. If subsequent to aircraft approval for RVSM operation avionic units which are of a different manufacturer or part number are fitted, it should be demonstrated that the standard of avionic equipment provides equivalent altimetry system performance.

(f) Compliance Procedure. The data package must include a definition of the procedures, inspections/tests and limits which will be used to insure that all aircraft approved against the data package "conform to type," that is all future approvals, whether of new build or in-service aircraft, meet the budget allowances developed according to Division I, Section 7.(2)(e)(ii). The budget allowances should be established by the data package and include a methodology that allows for tracking the mean and SD for new build aircraft. Compliance requirements must be defined for each potential source of error. A discussion of error sources is provided in Division III. Examples of compliance procedures are presented in Division IV.

(g) where an operating restriction has been adopted (See Division I, Section 5.(3)(d)(iii)), the package should contain the data and information necessary to document and establish that restriction.

(h) Continued Airworthiness.

(i) the following items should be reviewed and updated as appropriate to include the effects of RVSM implementation:

A. the Structural Repair Manual with special attention to the areas around the static source, angle of attack sensors and doors if their rigging can affect airflow around the previously mentioned sensors.

B. the MMEL

(ii) the data package would include descriptions of any special procedures which are not covered in. Division I, Section 7.(2)(h)(i) but may be needed to insure continued compliance with RVSM requirements as follows:

A. for nongroup aircraft where airworthiness approval has been based on flight test, the continuing integrity and accuracy of the altimetry system shall be demonstrated by periodic ground and flight tests of the aircraft and its altimetry system at periods to be agreed with the approving authority. However, alleviation of the flight test requirement may be given if it can be adequately demonstrated that the relationship between any subsequent airframe/system degradation and its effects on altimetry system accuracy is understood and adequately compensated/corrected for.

B. to the extent possible, in-flight defect reporting procedures should be defined to facilitate identification of altimetry system error sources. Such procedures could cover acceptable differences between primary and alternate static sources, and others as appropriate.

C. for groups of aircraft where approval is based on geometric inspector, there may be a need for periodic re-inspection, and the interval required should be specified.

(3) Data Package Approval. All necessary data should be submitted to the DGCA for action.

(4) RVSM Airworthiness Approval. The approved data package should be used by the operator to demonstrate compliance with RVSM performance standards.

(5) Post Approval Modification. Any variation/modification from the initial installation that affects RVSM approval should require clearance by the airframe Manufacturer or approved design organization and be cleared with the DGCA to show that RVSM compliance has not been impaired.

8. CONTINUED AIRWORTHINESS (MAINTENANCE REQUIREMENTS).

(1) General.

(a) the integrity of the design features necessary to ensure that altimetry systems' continue to meet RVSM standards should be verified by scheduled tests and/or inspections in conjunction with an approved maintenance program. The operator shall review its maintenance procedures and address all aspects of continuing airworthiness which are affected by RVSM requirements.
(b) each person or operator should demonstrate that adequate maintenance NO% are available to ensure continued compliance with the RVSM maintenance requirements.

(2) Maintenance Program Approval Requirements. Each operator requesting RVSM operational approval should submit a maintenance and inspection program which includes any maintenance requirements defined in the approved data package (Division I, Section 7.) as part of a continuous airworthiness maintenance program approval or an equivalent program approved by the DGCA.

(3) Maintenance Documents Requirements. The following items should be reviewed as appropriate for RVSM maintenance approval:
(a) Maintenance Manuals.
(b) Structural Repair Manuals.
(c) Standards Practices Manuals.
(d) Illustrated Parts Catalogs.
(e) Maintenance Schedule.
(f) MMEL/MEL.

(4) Maintenance Practices
(a) if the operator is subject to an ongoing approved maintenance program, that program should contain the maintenance practices outlined in the applicable aircraft and component manufacturer's maintenance manuals for each aircraft type. The following items should be reviewed for RVSM approval and if the operator is not subject to an approved maintenance program the following items should be followed:
(i) all RVSM equipment should be maintained in accordance with the component manufacturer's maintenance requirements and the performance requirements outlined in the approved WL package.
(ii) any modification, repair, or design change which in any way alters the initial RVSM approval, should be subject to a design review by persons approved by the approving authority.
(iii) any maintenance practices which may affect the continuing RVSM approval integrity, e.g., the alignment of pitot/static probes, dent, or deformation around static plates, should be referred to the approving authority or persons delegated by the authority.
(iv) Built-in Test Equipment (BITE) testing is not an acceptable basis for system calibrations, (unless it is shown to be acceptable by the airframe manufacturer with the approval authorities agreement) and should only be used for fault isolation and troubleshooting purposes.
(v) some aircraft manufacturers have determined that the removal and replacement of components utilizing quick disconnects and associated fittings, when properly connected, will not require a leak check. While this approach may allow the aircraft to meet static system certification standards when properly connected, it does not always ensure the integrity of the fittings and connectors, nor does it confirm system integrity during component replacement and reconnections. Therefore, a system leak check or visual inspection should be accomplished any time a quick disconnect static line is broken.
(vi) airframe and static systems should be maintained in accordance with the airframe manufacturer's inspection standards and procedures.
(vii) to ensure the proper maintenance of airframe geometry for proper surface contours and the mitigation of altimetry system error, surface measurements or skin waviness checks should be made if needed to ensure adherence to the airframe manufacturer's RVSM tolerances. These tests and inspections should be performed as established by the

airframe manufacturer. These checks should also be performed following repairs, or alterations having an effect of airframe surface and airflow.

(viii) the maintenance and inspection program for the autopilot shall ensure continued accuracy and integrity of the automatic altitude control system to meet the height-keeping standards for RVSM operations. This requirement will typically be satisfied with equipment inspections and serviceability checks.

(ix) where the performance of existing equipment is demonstrated as being satisfactory for RVSM approval, it should be verified that the existing maintenance practices are also consistent with continued RVSM approval integrity. Examples of these are:

A. altitude alert.
B. automatic altitude control system.
C. ATC altitude reporting equipment (transponders).
D. altimetry systems.

(5) Maintenance Practices for Noncompliant Aircraft Those aircraft positively identified as exhibiting height-keeping performance errors which require investigation as specified in Division I, Section 9.(9)(a) should not be operated in airspace where RVSM is applied until the following actions have been taken:

(a) the failure or malfunction is confirmed and isolated, maintenance action and,
(b) corrective action is carried out as required to comply with Division I, Section 7.(2)(e)(iv)F. and verified to ensure RVSM approval integrity.

(6) It is expected that new training requirements will be introduced by the RVSM approval processes. Areas that may need to be highlighted for initial and recurrent training of shop and line personnel are:

(a) aircraft geometric inspection techniques.
(b) test equipment calibration/usage techniques.
(c) any special documentation or procedures introduced by RVSM approval.

(7) Test Equipment.

(a) General. The test equipment should have the capability to demonstrate continuing compliance with all the parameters established for RVSM approval in the initial data package or as approved by the approving authority.
(b) Standards. Test equipment should be calibrated utilizing reference standards whose calibration is certified as being traceable to the national standard. It should be calibrated at periodic intervals as agreed by the approving authority. The approved maintenance program should encompass an effective quality control program which includes the following:
(i) definition of required test equipment accuracy.
(ii) regular calibrations of test equipment traceable to a master standard. Determination of calibration interval should be a function of the stability of the test equipment. The calibration interval should be established on the basis of historical data so that degradation is small in relation to the required accuracy.
(iii) regular audits of calibration facilities both inhouse and outside.
(iv) adherence to acceptable shop and line maintenance practices.
(v) procedures for controlling operator errors and unusual environmental conditions which may affect calibration accuracy.

9. OPERATIONAL APPROVAL.

(1) Purpose and Organization. Division I, Section 4. describes in general the administrative process which an operator should follow to receive approval to operate an aircraft in RVSM airspace. Division I, Section 9. is intended to provide detailed guidance on the content of operational programs, practices, and procedures. It also describes specifically the steps in the operational approval process: application for authority, DGCA evaluation of this application, and granting of approval to operate. Division V and VI are related to this Section and contain essential information for operational programs.

(2) General. The DGCA should ensure that each operator can maintain high levels of height-keeping performance.

(a) the DGCA should be satisfied that operational programs are adequate. Flightcrew training as well as operations manuals should be evaluated. Approval should be granted for each individual operator.

(b) approval should be granted for each individual aircraft group and each, individual aircraft to be used by the operator in RVSM operations. Each aircraft should receive airworthiness approval in accordance with Division I, Section 7. prior to being approved for use by the operator. (Aircraft group is defined in Division I, Section 7.(2)(b)).

(3) Preapplication Meeting. A preapplication meeting should be scheduled between the operator and the DGCA. The intent of this meeting is to inform the operator of DGCA expectations in regard to approval to operate in a RVSM environment. The content of the operator RVSM application, DGCA review and evaluation of the application, validation flight requirements, and conditions for removal of RVSM authority should be basic items of discussion.

(4) Content of Operator RVSM Application. The following Sections describe the material which an operator applying for RVSM authority should provide to the DGCA for review and evaluation at least 60 days prior to the intended start of RVSM operations.

(a) Airworthiness Documents. Sufficient documentation should be available to show that the aircraft has been approved by appropriate airworthiness authorities.

(b) Description of Aircraft Equipment. The applicant should provide a configuration list which details all components and equipment relevant to RVSM operations. (Division I, Section 6. discusses equipment for RVSM operations).

(c) Operations Training Programs Operating Practices and Procedures. LARs Part VI, Subpart 4, and Part VII operators should submit training syllabi and other appropriate material to the DGCA to show that the operating practices and procedures and training items related to RVSM operations are incorporated in initial and, where warranted, recurrent training programs. (Training for dispatchers should be included, where appropriate). LARs Part VI other than Subpart 4 operators should demonstrate to the DGCA through oral or written tests that their knowledge of RVSM operating practices and procedures is equivalent to LARs Part VII operators and is sufficient to warrant granting of approval to conduct RVSM operations. Practices and procedures in the following areas should be standardized using the guidelines of Division V flight planning, preflight procedures at the aircraft for each flight, procedures prior to RVSM airspace entry, inflight procedures, and flightcrew training procedures. Division VI presents procedures that are unique to North Atlantic airspace.

(d) Operations Manuals and Checklists. The appropriate manuals and checklists should be revised to include information/guidance on standard operating procedures detailed in Division V. Appropriate manuals should include a statement of the airspeeds, altitudes, and weights considered in RVSM aircraft approval to include identification of any operating restrictions established for that aircraft group. (See Division I, Section 5.(3)(d)(iii)). Manuals and checklists should be submitted for authority review as part of the application process.

(e) Past Performance. An operating history should be included in the application. The applicant should show any events or incidents related to poor height keeping performance which may indicate weaknesses in training, procedures, maintenance, or the aircraft group intended to be used.

(f) Minimum Equipment List. A minimum equipment list (MEL), adopted from the master minimum equipment list (MMEL), should include items pertinent to operating in RVSM airspace.

(g) Maintenance. The operator should submit a maintenance program for approval in accordance with Division I, Section 8. at the time the operator applies for operational approval.

(h) Plan for participation in Verifications/Monitoring Programs. The operator should provide a plan for participation in the verification/monitoring program. This program should normally entail a check of at least a portion of the operator's aircraft by an independent height-monitoring system (See Division I, Section 9.(8) for further discussion of verification/monitoring programs).

(5) Authority Review and Evaluation of Applications.

(a) once the application has been submitted, the DGCA will begin the process of review and evaluation. If the content of the application is insufficient, the DGCA will request additional information from the operator.

(b) when all the airworthiness and operational requirements of the application are met, the authority will proceed with the approval process.

(6) Validation Flight(s). The final step of the approval process is the completion of a validation flight. The DGCA will accompany the operator on a flight through airspace where RVSM is applied to verify that operations and maintenance procedures and practices are applied effectively. If the performance is adequate operational approval for RVSM airspace should be granted. If performance is not adequate, then approval should be delayed.

(7) Form of Authorizing Documents.

(a) LARS Part VI, Subpart 4 and Part VII operators approval to operate in RVSM airspace should be granted through the issuance of an operations specifications paragraph from Part B (En route Authorizations, Limitation, and Procedures). Each aircraft type group for which the operator is granted authority should be listed in OpSpecs.

(b) LARs Part VI other than Subpart 4 operators. These operators should be issued a letter of authorization (LOA) when the approval process has been completed. This LOA should be reissued on a biennial basis.

(8) Verification Monitoring Program. A program to monitor or verify aircraft height-keeping performance is considered a necessary element of RVSM implementation for at least the initial area where RVSM is implemented. Verification/Monitoring programs have the primary objective of observing and evaluating aircraft height-keeping performance to gain confidence that airspace users are applying the airplane/operator approval process in an effective manner and that an equivalent level of safety will be maintained when RVSM is implemented. It is anticipated that the necessity for such programs may be diminished or possibly eliminated after confidence is gained that RVSM programs are working as planned.

Information Note: *A height-monitoring system based on Global Positioning Satellites or an earth-based system may fulfill this function.*

(9) Conditions for Removal of RVSM Authority.

(a) the incidence of height-keeping errors which can be tolerated in an RVSM environment is very small. It is incumbent upon each operator to take immediate action to rectify the conditions which caused the error. The operator shall also report the event to the DGCA within 72 hours with initial analysis of causal factors and measures to prevent further events. The requirement for follow up reports should be: determined by the DGCA. Errors which should be reported and investigated are: TVE equal to or greater than ± 300 ft (± 90 m), ASE equal to or greater than ± 245 ft (± 75 m), and AAD equal to or greater than ± 300 ft (± 90 m).

(b) height-keeping errors fall into two broad categories: errors caused by malfunction of aircraft equipment and operational errors. An operator which consistently commits errors of either variety may be required to forfeit authority for RVSM operations. If a problem is identified which is related to one specific aircraft type, then RVSM authority may be removed for the operator for that specific type.

(c) the operator should make an effective, timely response to each height-keeping error. The DGCA may consider removing RVSM operational approval if the operator response to a height-keeping error is not effective or timely. The DGCA should also consider the operator's past performance record in determining the action to be taken. If an operator shows a history of operational and/or airworthiness errors, then approval may be removed until the root causes of these errors are shown to be eliminated and RVSM programs and procedures are shown to be effective. The DGCA will review each situation on a case-by-case basis.

DIVISION II

EXPLANATION OF W/d

(1) Division I, Section 7.(2)(d) describes the range of flight conditions over which conformity to the ASE rules must be shown. The description includes reference to the parameter W/d. The following discussion is provided for the benefit of readers who may not be familiar with the use of this parameter.

(2) It would be difficult to show all of the gross weight, altitude, and speed conditions which constitute the RVSM envelope(s) on a single plot. This is because most of the speed boundaries of the envelopes are a function of both altitude and gross weight. As a result, a separate chart of altitude vs. Mach would be required for each aircraft gross weight. Aircraft performance engineers commonly use the following technique to solve this problem.

(3) For most jet transports, the required flight envelope can be collapsed to a single chart, with good approximation, by use of the parameter W/d. (weight divided by atmospheric pressure ratio). This fact is due to the relationship between W/d and the fundamental aerodynamic variables M and lift coefficient as shown below.

$W/\delta = 1481.4 C_L M^2 S_{Ref}$, where:

δ = ambient pressure at flight altitude divided by sea level standard pressure of 29.92126 inches Hg
W/δ = Weight over Atmospheric Pressure Ratio
C_L = Lift Coefficient
M = Mach Number
S_{REF} = Reference Wing Area

(4) As a result, the RVSM flight envelope(s) may be collapsed into one chart by simply plotting W/d, rather than altitude, versus Mach Number. Since d is a fixed value for a given altitude, weight can be obtained for a given condition by simply multiplying the W/d, value by d.

(5) Over the RVSM altitude range, it is a good approximation to assume that position error is uniquely related to Mach Number and W/d for a given aircraft.

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DIVISION III

ALTIMETRY SYSTEM ERROR COMPONENTS

1 INTRODUCTION.

Division I, Section 7.(2)(e)(ii) states that an error budget must be established and presented in the approval data package. The requirements for this error budget are discussed in some detail in Division I, Section 7.(2)(e)(iii) thru (v) for group and nongroup aircraft. The purpose of this Division is to provide guidance to help ensure that all of the potential error sources are identified and included in the error budget for each particular model.

2. OBJECTIVE OF ASE BUDGET.

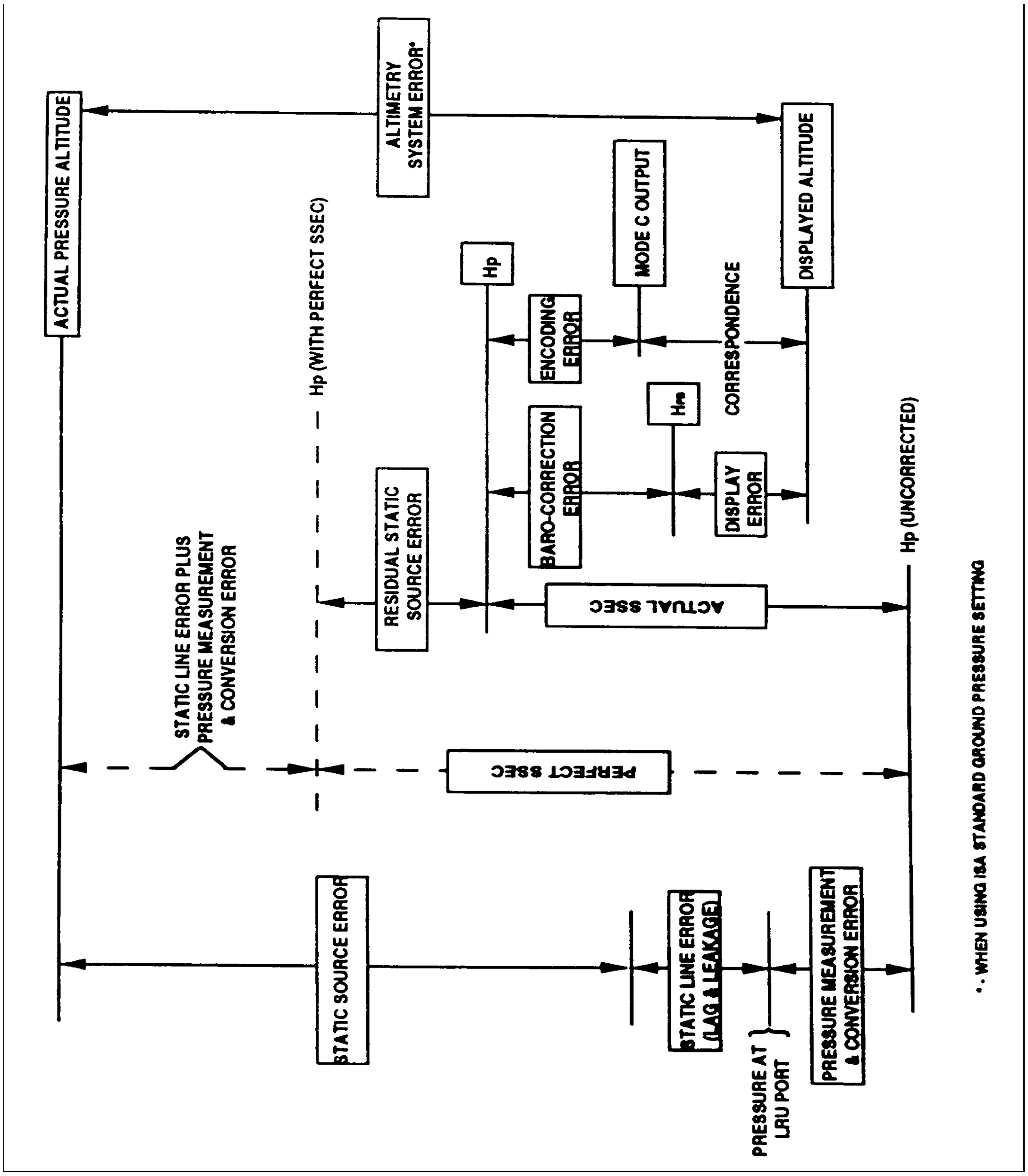
(1) The purpose of the ASE budget is to demonstrate that the allocation of tolerances amongst the various parts of the altimetry system is, for the particular data package, consistent with the overall statistical ASE requirements. These individual tolerances within the ASE budget also form the basis of the procedures, defined in the airworthiness approval data package, which will be used to demonstrate that aircraft satisfy the RVSM requirements.
(2) It is necessary to ensure that the budget was account of at contributory components of ASE.
(3) For group approval it is necessary to ensure either that the budget assesses the combined effect of the component errors in a way that is statistically realistic, or that the worst case specification values are used.

3. ALTIMETRY SYSTEM ERROR

(1) Breakdown. Figure 2-1 shows the breakdown of total ASE into its main components, with each error block representing the error associated with one of the functions needed to generate a display of pressure altitude. This breakdown encompasses all altimetry system errors which can occur, although different system architectures may combine the components in slightly different ways.

(a) The "Actual Altitude" is the pressure altitude corresponding to the undisturbed ambient pressure.
(b) "Static Source Error" is the difference between the undisturbed ambient pressure and the pressure within the static port at the input end of the static pressure line.
(c) "Static Line Error" is any difference in pressure along the length of the line.

Figure 2-1. Altimetry System Errors and Its Components



(d) "Pressure Measurement and Conversion Error" is the error associated with the processes of transducing the pneumatic input seen by the avionics, and converting the resulting pressure signal into altitude. As drawn, figure 2-1 represents a self-sensing altimeter system in which the pressure measurement and altitude conversion functions would not normally be separable. In an air data computer system the two functions would be separate, and SSEC would probably then be applied before pressure altitude (Hp) was calculated.

(e) "Perfect SSEC" would be that correction which compensated exactly for the SSE actually present at any time. If such a correction could be applied, then the resulting value of Hp calculated by the system would differ from the actual altitude only by the static line error plus the pressure measurement and conversion error. In general this cannot be achieved, so although the "Actual SSEC" can be expected to reduce the effect of SSE, it will do so imperfectly.

(f) "Residual Static Source Error" is applicable only in systems applying an avionic SSEC. It is the difference between the SSE and the correction actually applied. The corrected value of Hp will therefore differ from actual pressure altitude by the sum of static line error, pressure measurement and conversion error, and residual SSE.

(g) between Hp and displayed altitude occur the baro-correction error and the display error. Figure 2-1 represents their sequence for a self-sensing altimeter system. Air data computer systems can implement baro-correction in a number of ways which would modify slightly this part of the block diagram, but the errors would still be associated with either the baro-correction function or the display function. The only exception is that those systems which can be switched to operate the display directly from the Hp signal can eliminate baro-correction error where standard ground pressure setting is used, as in RVSM operations.

(2) Components. The altimetry system errors presented in table 2-1 and described in Division III, Section 3.(1) are discussed below in greater detail.

(a) Static Source Error. The component parts of SSE are presented in table 2-1, with the factors which control their magnitude:

(i) the reference SSE is the best estimate of actual SSF, for a single aircraft or an aircraft group, obtained from flight calibration measurements. It is variable with operating condition, characteristically reducing to a family of W/d curves which are functions of Mach. It includes the effect of any aerodynamic compensation which may have been incorporated in the design. Once it has been determined, the reference SSE is fixed for the single aircraft or group, although it may be revised in the light of subsequent data.

(ii) the test techniques used to derive the reference SSE will have some measurement uncertainty associated with them, even though known instrumentation errors will normally be eliminated from the data. For trailing-cone measurements the uncertainty arises from limitations on pressure measurement accuracy, calibration of the trailing-cone installation, and variability in installations where more than one are used. Once the reference SSE has been determined, the actual measurement error is fixed, but as it is unknown it can only be handled within the ASE budget as an estimated uncertainty.

(iii) the airframe variability and probe/port variability components arise from differences between the individual aflame and probe/port, and the example(s) of airframe and probe port used to derive the reference SSE.

(b) Residual Static Source Error.

(i) the components and factors are presented in table 2-2. Residual SSE is made up of those error components which make actual SSE different from the reference value, components 2, 3, and 4 from table 2-1, plus the amount by which the actual SSEC differs from the value which would correct the reference value exactly, components 2(a), (b) and (c) from table 2-2.

(ii) there will generally be a difference between the SSEC which would exactly compensate the reference SSE, and the SSEC which the avionics is designed to apply. This arises from practical avionics design limitations. The resulting error component 2(a) will therefore be fixed, for a particular flight condition, for the single aircraft or group. Additional variable errors 2(b) and 2(c) arise from those factors which cause a particular set of avionics to apply an actual SSEC which differs from its design value.

(iii) the relationship between perfect SSEQ reference SSEC, design SSEC and actual SSEC is illustrated in figure 2-2, for the case where static line errors and pressure measurements and conversion errors are taken as zero.

Table 2-1.

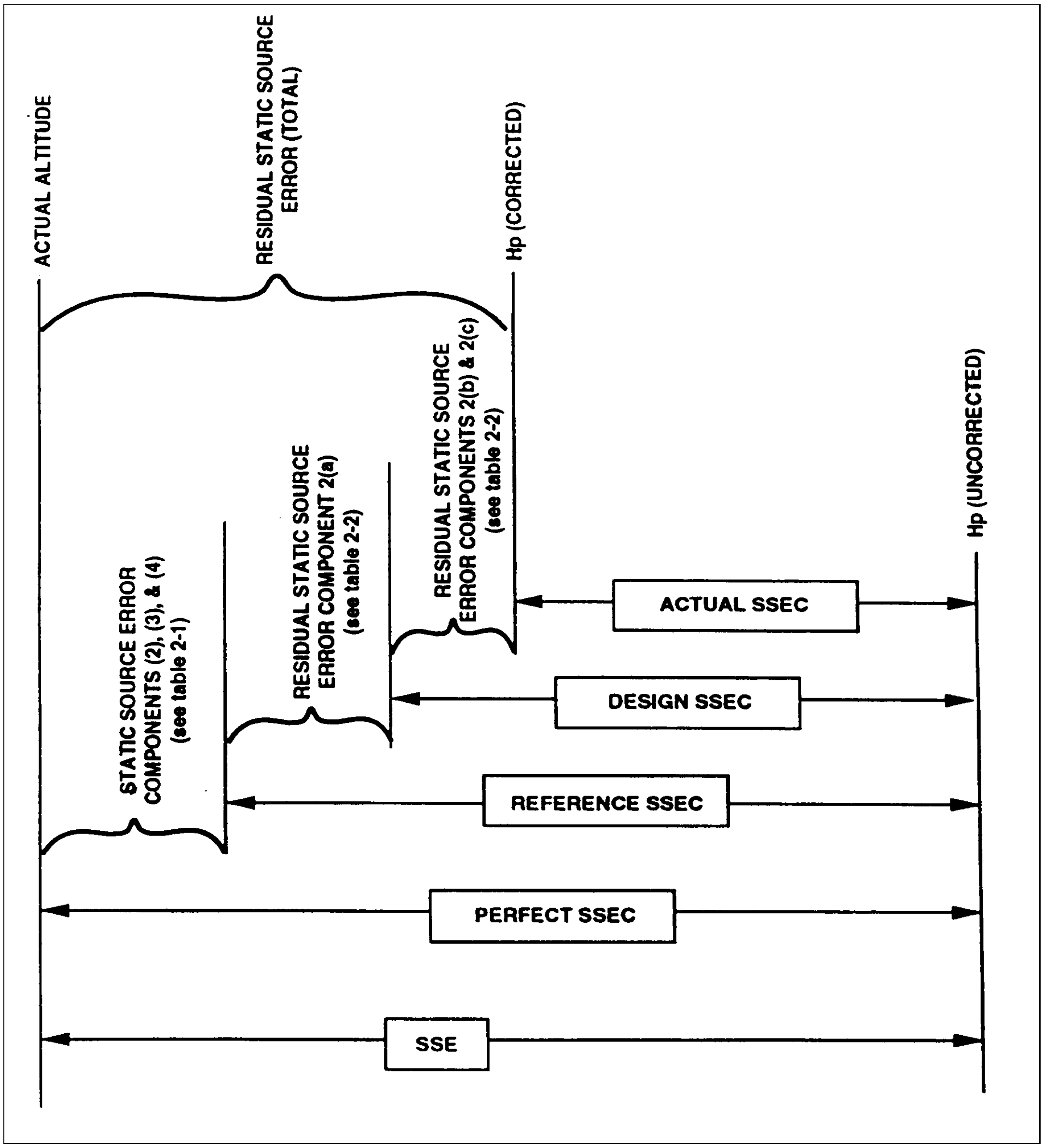
Static Source Error
(Cause: Aerodynamic Disturbance to Free-Stream Conditions)

Factors	Error Components
Airframe Effects Operating Condition (M, Hp, $\propto$, β) Geometry:shape of airframe location of static sources variations of surface contour near the sources variations in fit of nearby doors, skin panels or other items Probe/Port Effects Operating Condition (M, Hp, $\propto$, β) Geometry:shape of probe/port manufacturing variations installation variations	1) Reference SSE values from flight calibration measurements. 2) Uncertainty of flight calibration measurements. 3) Airframe to Airframe variability 4) Probe/Port to Probe/Port variability

Table 2-2. Residual Static Source Error (Aircraft with Avionic SSEC)
(Cause: Difference between the SSEC actually applied and the actual SSE)

Factors	Error Components
1) As for Static Source Error PLUS 2) Source of input data for SSEC function a) Where SSEC is a function of Mach: i) P_s sensing: difference in SSEC from reference SSE. ii) P_s measurement: pressure transduction error iii) P_T errors: mainly pressure transduction error b) Where SSEC is a function of Angle of Attack: i) geometric effects on alpha - sensor tolerances - installation tolerances - local surface variations ii) measurement error - angle transducer accuracy 3) Implementation of SSEC function a) Calculation of SSEC from input data b) Combination of SSEC with uncorrected height	1) Static Source Error Components (2), (3), and (4) from table 2-1 PLUS 2a) Approximation in fitting design 2b) Effect of production variability 2c) Effect of operating environment

Figure 2-2. Sse/Ssec Relationships For Ase Where Static Line, Pressure Measurement, & Conversion Errors are Zero.



(iv) factors which create variability of SSE relative to the reference characteristic must be accounted for in two ways. Firstly, as noted for the SSE itself in table 2-1, and secondly for its effect on the application of SSEC as in factor 2(a)(i) of table 2-2. Similarly the static pressure measurement error must be accounted for in two separate ways. The main effect will be via the "pressure measurement and conversion" component, but a secondary effect will be via Factor 2(a)(ii) table 2-2.

(c) Static Line Error. Static line errors arise from leaks and pneumatic lags. In level cruise these can be made negligible for a system which is correctly designed and correctly installed.

(d) Pressure Measurement and Conversion Error.
  (i) the functional elements are static pressure transduction, which may be mechanical, electromechanical or solid-state, and the conversion of pressure signal to pressure altitude.
  (ii) the error components axe:
    A. calibration uncertainty;
    B. nominal design performance;
    C. unit to unit manufacturing variations; and
    D. effect of operating environment.
  (iii) the equipment specification is normally taken to cover the combined effect of the error components. If the value of pressure measurements and conversion error used in the error budget is the worst case specification value, then it is not necessary to assess the above components separately. However, calibration uncertainty, nominal design performance and effect of operating environment can all contribute to bias errors within the equipment tolerance. Therefore if it is desired to take statistical account of the likely spread of errors within the tolerance band, then it will be necessary to assess their likely interaction for the particular hardware design under consideration.
  (iv) it is particularly important to ensure that the specified environmental performance is adequate for the intended application.

(e) Baro-Setting Error. This is defined as the difference between the value displayed and the value applied within the system. For RVSM operation the value displayed should always be ISA standard ground pressure, but setting mistakes, although part of TVE, are not components of ASE.
  (i) the components of Baro-Setting Error are:
    A. resolution of setting knob/display ("Setability");
    B. transduction of displayed value; and
    C. application of transduced value.
  (ii) the applicability of these factors and the way that they combine depends on the particular system architecture.
  (iii) for systems in which the display is remote from the pressure measurement function there may be elements of the transduction and/or application or transduced value error components which arise from the need to transmit and receive the setting between the two locations

(f) Display Error. Me cause is imperfect conversion from altitude signal to display. The components are:
  (i) conversion of display input signal;
  (ii) graticule/format accuracy, and
  (iii) readability

(g) in self-sensing altimeters the first of these would normally be separate from the pressure measurement and conversion error.

DIVISION IV

ESTABLISHING AND MONITORING STATIC SOURCE ERRORS

(1) The requirements for the data package are discussed in general terms in Division I, Section 7.(2). It is stated, in Division I, Section 7.(2)(e)(iv)C. that the methodology used to establish the static source error must be substantiated. It is further stated, in Division I, Section 7.(2)(f) that procedures be established to ensure conformity of newly manufactured airplanes. There may be many ways of satisfying these requirements; two examples are discussed below.

(2) Example 1.

(a) one process for showing compliance with RVSM requirements is shown in figure 3-1. Figure 3-1 illustrates that flight test calibrations and geometric inspections will be performed on a given number of aircraft. The flight calibrations mad inspections will continue until a correlation between the two is established. Geometric tolerances and SSEC will be established to satisfy RVSM requirements. For aircraft being manufactured, every Nth aircraft will be inspected in detail and every Mth aircraft will be flight test calibrated, where N and M are determined by the manufacturer and agreed to by the approving authority. The data generated by N inspections and M flight calibrations shall be used to track the mean and 3 SED values to insure continued compliance of the model with the requirements of Division I, Section 5. As additional data are acquired, they should be reviewed to determine if it is appropriate to change the values of 11 and 14 as indicated by the quality of the results obtained.

(b) there are various ways in which the flight test and inspection data might be used to establish the correlation. The example shown in figure 3-2 is a process in which each of the error sources for several airplanes is evaluated based on bench tests, inspections and analysis. Correlation between these evaluations and the actual flight test results would be used to substantiate the method.

(c) the method illustrated in figures 3-1 and 3-2 is appropriate for new models since it does not rely on any pre-existing data base for the group.

(3) Example 2.

(a) Figure 3-3 illustrates that flight test calibrations should be performed on a given number of aircraft and consistency rules for air data information between all concerned systems verified. Geometric tolerances and SSEC should be established to satisfy the requirements. A correlation should be established between the design tolerances and the consistency rules. For aircraft being manufactured, air data information for all aircraft should be checked in term of consistency in cruise conditions and every Mth aircraft should be calibrated, where TV is determined by the manufacturer and agreed in by the approving authority. The data generated by the M flight calibrations should be used to track the mean and 3SD values to ensure continued compliance of the group with the requirements of Division I, Section 5.

Figure 3-1. Process For Showing Initial And Continued Compliance of Airframe Static Pressure Systems

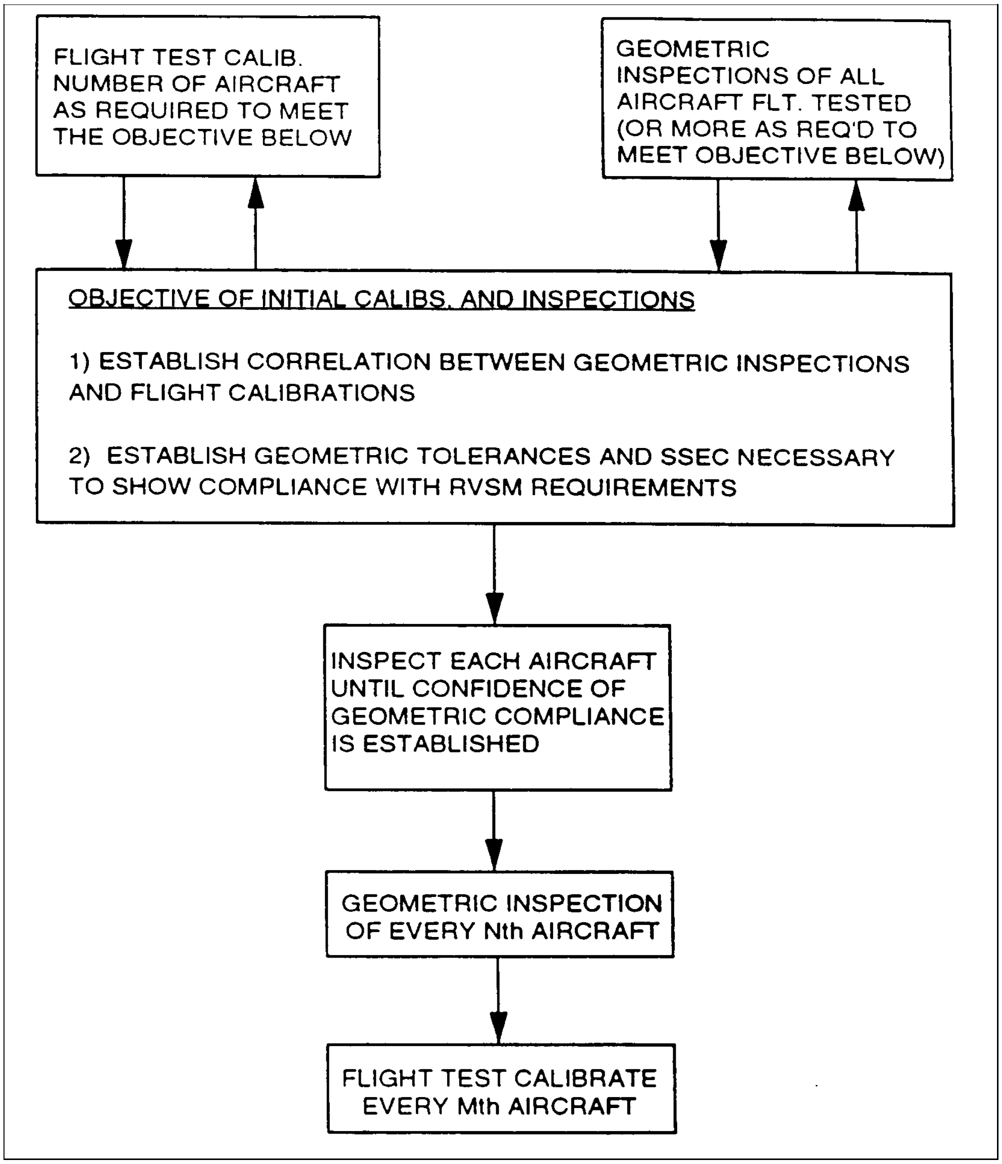


Figure 3-2. Compliance Demonstration Ground-to-flight Test Correlation Process Example.

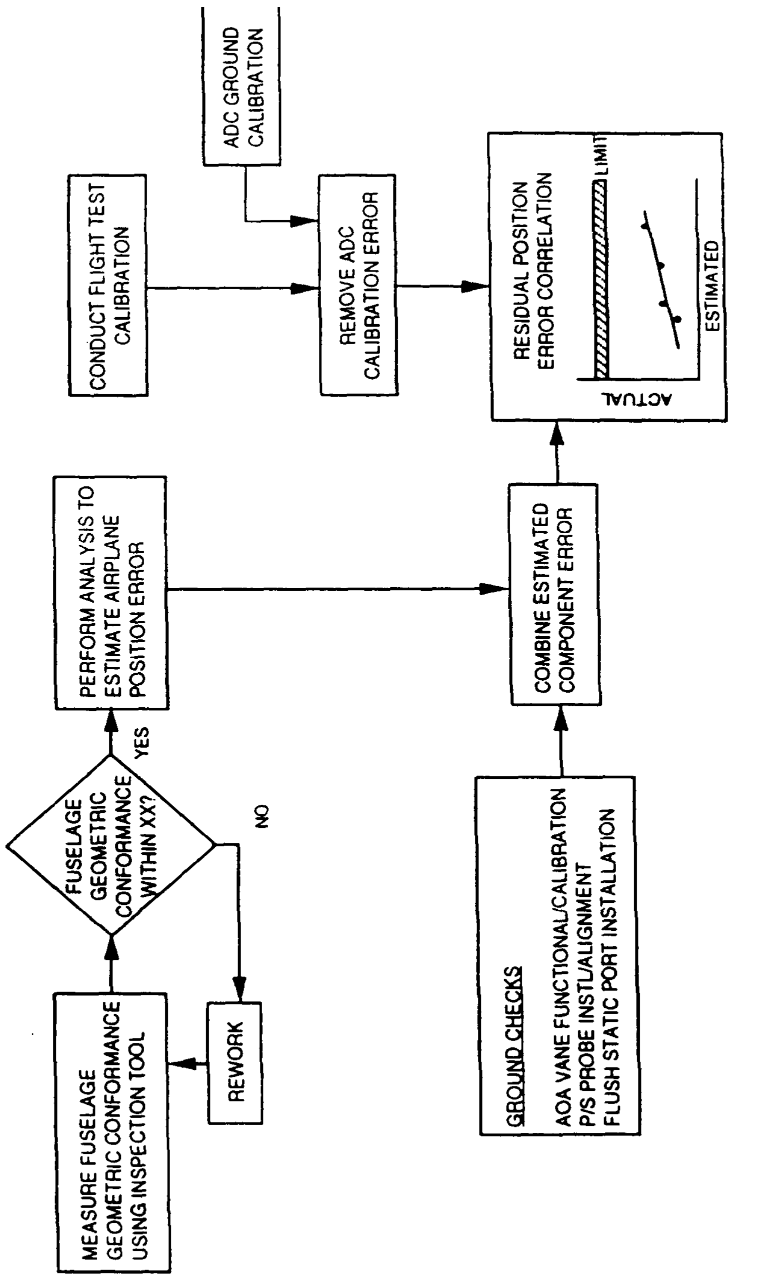
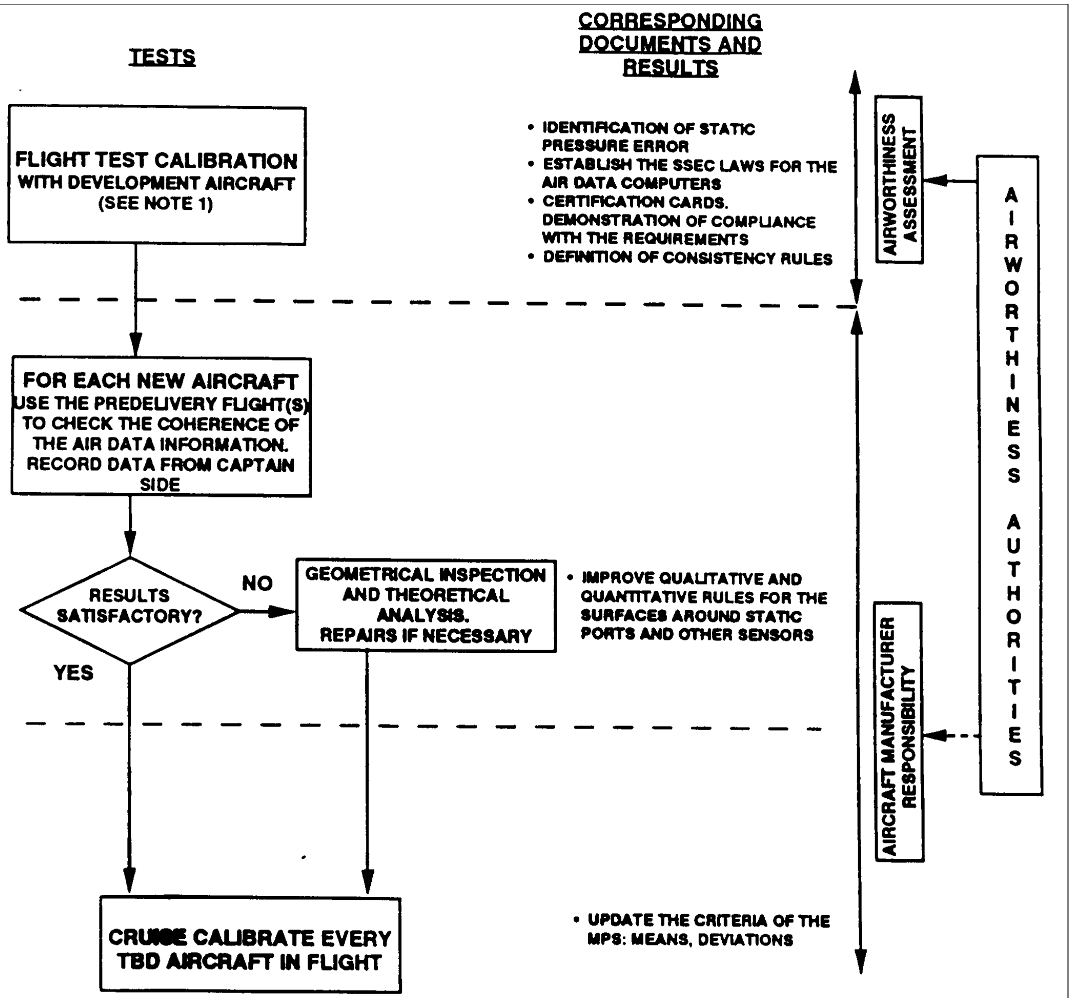


Figure 3-2. Compliance Demonstration Ground-to-flight Test Correlation Process Example.

Figure 3-3. Process For Showing Initial and Continued Compliance of Airframe Static Pressure Systems For In-service and New Model Aircraft



NOTE1: THE FLIGHT TEST INSTALLATION CHOSEN TO GET THE CALIBRATION DATA SHALL HAVE AN ACCURACY COMPATIBLE WITH THE LEVEL OF PERFORMANCE TO BE DEMONSTRATED AND AN ANALYSIS OF THIS ACCURACY SHALL BE PROVIDED. ANY POSSIBLE DEGRADATION OF THIS ACCURACY SHALL BE MONITORED AND CORRECTED DURING THE FLIGHT TEST PERIOD.

DIVISION V

TRAINING PROGRAMS AND OPERATING PRACTICES AND PROCEDURES

1. Introduction

The following items (detailed in Sections 2 through 6) should be standardized and incorporated into training programs and operating practices and procedures. Certain items may already be adequately standardized in existing operator programs and procedures. New technologies may also eliminate the need for certain crew actions. If this is found to be the case, then the intent of this guidance can be considered to be met.

Information Note: *The document has been written for use by a wide variety of operator types and therefore, certain items have been included for purposes of readability and completeness.*

2. Flight Planning

During flight planning the flightcrew should pay particular attention to conditions which may affect operation in RVSM airspace. These include, but may not be limited to:

(a) verifying that the aircraft is approved for RVSM operations.
(b) reported and forecast weather conditions on the route of flight;
(c) minimum equipment requirements pertaining to height-keeping systems; and
(d) if required for the specific aircraft group; accounting for any aircraft operating restriction related to RVSM airworthiness approval. (See Division I, Section 5.(3)(d)(iii)).

3. Preflight Procedures

Preflight procedures at the aircraft for each flight. The following actions should be accomplished during preflight:

(a) review maintenance logs and forms to ascertain the condition of equipment required for flight in the RVSM airspace. "Ensure that maintenance action has been taken to correct defects to required equipment;
(b) during the external inspection of aircraft, particular attention should be paid to the condition of static sources and the condition of the fuselage skin in the vicinity of each static source and any other component that affects altimetry system accuracy (this check may be accomplished by a qualified and authorized person other than the pilot, e.g., a flight engineer or maintenance personnel);
(c) before takeoff, the aircraft altimeters should be set to the local altimeter (QNH) setting and should display a known elevation (e.g. field elevation) within the limits specified in aircraft operating manuals. The two primary altimeters should also agree within limits specified by the aircraft operating manual. An alternative procedure using QFE may *also be used;

Information Note: *The maximum value for these checks cited in operating manuals should not exceed 75 ft.*

(d) before take-off, equipment required for flight in RVSM airspace should be operational, and indications of malfunction should be resolved.

4. Procedures Prior to RVSM Airspace Entry.

The following equipment should be operating normally at entry into RVSM airspace:
(a) two primary altitude measurement systems.
(b) one automatic altitude-control system.
(c) one altitude-alerting device.

Information Note: Dual equipment requirements for altitude-control systems may be established by regional agreement after an evaluation of criteria such as mean time between failures, length of flight segments and availability of direct pilot-controller communications and radar surveillance.

(d) should any of the required equipment fail prior to the aircraft entering RVSM airspace, the pilot should request a new clearance so as to avoid flight in this airspace;

Information Note: Operating Transponder. An operating transponder may not be required for entry into all designated RVSM airspaces. The operator should ascertain the requirement for an operational transponder in each RVSM area where operations are intended. The operator should also ascertain the transponder requirements for transition areas adjacent to RVSM airspace. Division VI, Section 7. discusses transponder failure for North Atlantic RVSM transition areas.

5. In-flight Procedures.

The following policies should be incorporated into flight crew training and procedures:
(a) flight crews should comply with aircraft operating restrictions (if required for the specific aircraft group) related to RVSM airworthiness approval. (**See** Division I, Section 5.(3)(d)(iii))**.**
(b) emphasis should be placed on promptly setting the sub-scale on all primary and standby altimeters to 29.92 in. Hg/1013.2 (hPa) when passing the transition altitude and rechecking for proper altimeter setting when reaching the initial cleared flight level (CFL);
(c) in level cruise it is essential that the aircraft is flown at the CFL. This requires that particular care is taken to ensure that ATC clearances are fully understood and followed. Except in contingency or emergency situations, the aircraft should not intentionally depart from CFL without a positive clearance from ATC;
(d) wing cleared transition between levels, the aircraft should not be allowed to overshoot or undershoot the cleared flight level by more than 150 ft (45 m);

Information Note: *It is recommended that the level off be accomplished using the altitude capture feature of the automatic altitude-control system, if installed.*

(e) an automatic altitude-control system should be operative and engaged during level cruise, except when circumstances such as the need to retrim the aircraft or turbulence require disengagement. In any event, adherence to cruise altitude should be done by reference to one of the two primary altimeters;
(f) the altitude-alerting system should be operational;

(g) at intervals of approximately one hour, cross-checks between the primary altimeters should be made. A minimum of two should agree within 200 ft (60 m). (Failure to meet this condition will require that the altimetry system be reported as defective and notified to ATC;)
  (i) the normal pilot scan of cockpit instruments should suffice for altimeter crosschecking on most flights.
  (ii) at least the initial altimeter crosscheck in the vicinity of the point where Class II navigation is begun should be recorded (e.g., on coast out). The readings of the primary and standby altimeters should be recorded and available for use in contingency situations. (Class II navigation is defined in the Lebanese Aviation Regulations (LARs).

Information Note: *Future systems may make use of automatic altimeter comparators in lieu of crosschecks by the crew.*

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(h) normally, the altimetry system being used to control the aircraft should be selected to provide the input to the altitude-reporting transponder transmitting information to ATC.
(i) if the pilot is advised in real time that the aircraft has been identified by a height-monitoring system as exhibiting TVE greater than 300 ft (90 m) and/or ASE greater than 245 ft (75 m) then the pilot should follow established regional procedures to protect the safe operation of the aircraft. (This assumes that the monitoring system will identify TVE or ASE within agreed levels of accuracy and confidence.)
(j) if the pilot is notified by ATC of an AAD error which exceeds 300 ft (90 m) then the pilot should take action to return to (All as quickly as possible.
(k) contingency procedures after entering RVSM airspace:
  (i) The pilot should notify ATC of contingencies (equipment failures, weather conditions) which affect the ability to maintain the CFL and co-ordinate a plan of action. Division VI contains detailed guidance for contingency procedures for North Atlantic airspace. (Other appendices may be added as necessary to address additional areas of operation.)
  (ii) Examples of equipment failures which should be notified to ATC are:
    A. failure of all automatic altitude-control systems aboard the aircraft;
    B. loss of redundancy of altimetry systems;
    C. loss of thrust on an engine necessitating descent; or
    D. any other equipment failure affecting the ability to maintain CFL;
  (iii) the pilot should notify ATC when encountering greater than moderate turbulence.
(l) if unable to notify ATC and obtain an ATC clearance prior to deviating from the assigned CFL, the pilot should follow established contingency procedures and obtain ATC clearance as soon as possible.

6. Post Flight.

(1) In making maintenance log book entries against malfunctions in height-keeping systems, the pilot should provide sufficient detail to enable maintenance to effectively troubleshoot and repair the system. The pilot should detail the actual defect and the crew action taken to try to isolate and rectify the fault. The following information should be noted when appropriate:
(a) primary and standby altimeter readings.
(b) altitude selector setting.
(c) subscale setting on altimeter.
(d) autopilot used to control the airplane and any differences when the alternate system was selected.
(e) differences in altimeter readings if alternate static ports selected.
(f) use of air data computer selector for fault diagnosis procedure.

(g) transponder selected to provide altitude information to ATC and any difference if alternate transponder or altitude source was manually selected.

7. Special Emphasis Items.

Flightcrew Training. The following items should also be included in flightcrew training program:

(a) knowledge and understanding of standard ATC phraseology used in each area of operations;
(b) importance of crew members cross checking each other to ensure that ATC clearances axe promptly and correctly complied with;
(c) use and limitations in terms of accuracy of standby altimeters in contingencies. Where applicable, the pilot should review the application of SSEC/PEC through the use of correction cards;
(d) problems of visual perception of other aircraft at 1,000 ft (300 m) planned separation during night conditions, when encountering local phenomena such as northern lights, for opposite and same direction traffic, and during turns;
(e) characteristics of aircraft altitude capture systems which may lead to the occurrence of overshoots;
(f) relationship between the altimetry, automatic altitude control, and transponder systems in normal and abnormal situations; and
(g) aircraft operating restrictions (if required for the specific aircraft group) related to RVSM airworthiness approval. (See Division I, Section 5.(3)(d)(iii)).

DIVISION VI

SPECIFIC PROCEDURES FOR THE NORTH ATLANTIC AIRSPACE

1. INTRODUCTION

(1) This Standard which follows will be applied when RVSM is implemented in North Atlantic Minimum Navigation Performance Specification (NAT MNPS) airspace. This Standard can be adapted for application in other areas where RVSM is applied. It is anticipated that regional authorities will develop similar guidance when planning for RVSM implementation in additional oceanic/remote areas or continental airspace.
(2) This Division contains procedures which are unique to North Atlantic RVSM airspace. Contingency procedures contained in regional supplementary procedures and guidance specifically related to RVSM are presented in this Division. Contingencies which relate to lateral as well as vertical navigation are discussed.

2. GENERAL INFORMATION: AIRSPACE DIMENSIONS

(1) Where RVSM is implemented in NAT MNPS airspace, NAT MNPS approval will encompass demonstration of special qualification for both lateral navigation and heightkeeping performance.
(2) NAT MNPS airspace have a ceiling of FL 420 and a floor of FL 285 with 1,000 ft (300 m) vertical separation applied between aircraft operating at and between FL 290 and FL 410.

3. INTENDED USE OF THIS MATERIAL

(1) Section 4., Basic Concepts For Contingencies. This Section is intended to provide an overview of contingency procedures. It is intended to orient the pilot's thinking to the concepts involved and aid in understanding the specific guidance detailed in Sections 5. and 6. This material should be included in training programs and appropriate flight crew manuals.
(2) Section 5., Guidance To The Pilot In the Event of Equipment Failures or Encounters With Turbulence After Entering NAT MNPS Airspace. This Section details guidance on specific actions for the pilot to take in the situations listed. The pilot actions should be considered required pilot knowledge and should be included in training/qualification programs and appropriate flight crew manuals.
(3) Section 6., Reprint of Doc. 7030 North Atlantic Contingency Procedures. In this Section, North Atlantic Regional Supplementary Procedures (Doc. 7030), paragraph 5.0, Special Procedures For In-flight Contingencies (applicable when RVSM is implemented) are reprinted for ease of reference. Doc. 7030 paragraph 5.0 details guidance on specific pilot actions to be taken. Pilot actions should be considered required pilot knowledge. The material may be condensed for ease of presentation and should be included in training/qualification programs and appropriate flight crew manuals.
(4) Sections 7. and 8. Section 7. discusses RVSM transition areas. Section 8. is a general discussion of pilot action in relation to the proposed RVSM monitoring system. These Sections should be addressed in training programs and manuals.
(5) Section 9., Expanded RVSM Equipment Failure and Turbulence Scenarios. This Section reviews the situations discussed in Section 5. in greater detail. The material may be used in training programs as an operator deems appropriate.

4. BASIC CONCEPTS FOR CONTINGENCIES

(1) General. The NAT Regional Supplementary Procedures document (Doc. 7030) provides for RVSM implementation in NAT MNPS airspace. Specifically, Doc 7030 paragraph 5.0 addresses RVSM operations.

(2) The basic concepts for contingencies described in this Section have been developed from the specific guidance contained in Doc. 7030 paragraph 5.0 and paragraph 5 of this Division. Contingency procedures are complicated when specific situations are detailed. However, if the details are examined in the context of certain basic concepts, then they are more easily understood. Reviewing these concepts should serve to aid pilots' understanding of the specific contingency procedures detailed in Doc. 7030 and Section 5. of this Division.

(3) The basic concepts for contingencies are:

- (a) Pilot in Command Responsibility. Guidance for contingency procedures should not be interpreted in any way which prejudices the final authority and responsibility of the pilot in command for the safe operation of the aircraft.
- (b) If the pilot is unsure of the vertical or lateral position of the aircraft or the aircraft deviates from its assigned altitude or track for cause without prior ATC clearance, then the pilot must take action to mitigate the potential for collision with aircraft on adjacent routes or flight levels.
  - (i) in this situation, the pilot should alert adjacent aircraft by making maximum use of aircraft lighting and broadcasting position, flight level, and intentions on 121.5 MHz (or 131.8 as a back-up);
- (c) unless the nature of the contingency dictates otherwise, the pilot should advise ATC as soon as possible of a contingency situation and if possible, request an ATC clearance before deviating from the assigned route or flight level.
- (d) if a revised AM clearance cannot be obtained in a timely manner and action is required to avoid potential conflict with other aircraft, then the aircraft should be flown at an altitude and/or on a track where other aircraft are least likely to be encountered:
  - (i) this can be accomplished by offsetting from routes or altitudes normally flown in the airspace. Doc. 7030 paragraph 5.0 provides recommendations on the order preference for the following pilot actions:
    - A. the pilot may offset half the lateral distance between routes or tracks.
    - B. the pilot may offset half the vertical distance between altitudes normally flown.
    - C. the pilot may also consider descending below FL 285 or climbing above FL 410. (The vast majority of North Atlantic traffic has been found to operate between levels 290 and 410. Flight above FL 410 or below FL 285 limits exposure to conflict with other aircraft).
- (e) when executing a contingency maneuver the pilot should:
  - (i) watch for conflicting traffic.
  - (ii) continue to alert other aircraft using 121.5 Mhz (or 131.8 as a back-up) and aircraft lights.
  - (iii) continue to by offset tracks or altitudes until an ATC clearance is obtained.
  - (iv) obtain an ATC clearance as soon as possible.

5. GUIDANCE TO THE PILOT (INCLUDING EXPECTED ATC ACTIONS) IN THE EVENT OF EQUIPMENT FAILURES OR ENCOUNTERS WITH TURBULENCE AFTER ENTRY INTO NAT MNPS AIRSPACE.

In addition to emergency conditions that require immediate descent, such as loss of thrust or pressurization, ATC should be made aware of the less explicit conditions that may make it impossible for an aircraft to maintain its CFL appropriate to RVSM. Controllers should react to such conditions but these actions cannot be specified, as they will be dynamically affected by the real-time situation.

(1) Objective of the Guidance Material. The following material is provided with the purpose of giving the pilot guidance on actions to take under certain conditions of equipment failure and encounters with turbulence. It also describes the expected ATC controller actions in these situations. It is recognized that the pilot and controller will use judgment to determine the action most appropriate to any given situation. The guidance material recognizes that for certain equipment failures, the safest course of action may the for the aircraft to continue in IMPS airspace while the pilot and controller take precautionary action to protect separation. For extreme cases of equipment failure, however, the guidance recognizes that the safest course of action may be for the aircraft to leave MNPS airspace by obtaining a reused ATC clearance or if unable to obtain prior ATC clearance, executing the established contingency maneuver to leave the assigned route or track.

Information Note: *Section 9. provides an expanded description of the scenarios detailed below.*

(2) Contingency Scenarios: The pilot is unsure of the vertical position of the aircraft due to loss or degradation of all primary altimetry systems or is unsure of the capability to maintain CFL due to turbulence or loss of all automatic altitude control systems.

(a) Pilot Actions. The pilot should maintain CFL while evaluating the situation and:
- (i) watch for conflicting traffic
- (ii) if considered necessary, alert nearby aircraft by:
  - A. making maximum use of exterior lights;
  - B. broadcasting position, flight level, and immediate intentions on 121.5 MHz (or 131.8 as a back-up);
- (iii) notify ATC of the situation and the intended course of action. Possible courses of action include:
  - A. continuing in MNPS airspace provided that the aircraft can maintain CFL.
  - B. requesting ATC clearance to climb above or descend below RVSM airspace if the aircraft cannot maintain CFL and ATC cannot establish adequate separation from other aircraft.
  - C. executing the Doc. 7030 contingency maneuver to leave the assigned track if prior ATC clearance cannot be obtained and the aircraft cannot maintain CFL.

(b) Expected ATC Actions. The following information is provided for information purposes. ATC can be expected to:
- (i) obtain the pilot's intentions
- (ii) if the pilot intends to continue in MNPS airspace, consider establishing increased vertical longitudinal, or lateral separation.
- (iii) pass traffic information.
- (iv) if the pilot requests clearance to exit MNPS airspace, accommodate expeditiously, if possible.
- (v) if adequate separation cannot be established and it is not possible to comply with the pilot's request for clearance to exit MNPS airspace, ATC can be expected to notify other aircraft in the vicinity and continue to monitor the situation.
- (vi) advise adjoining ATC facilities/sectors of the situation.

(3) Contingency scenario: Failure or loss of accuracy of one primary altimetry system (e.g., 200 feet or more difference between primary altimeters).

(a) Pilot Action. Cross check standby altimeter, confirm the accuracy of a primary altimeter system and notify ATC of the loss of redundancy. If unable to confirm primary altimeter system accuracy, follow pilot actions listed in the preceding scenario.

6. REPRINT OF DOC, 7030 NORTH ATLANTIC CONTINGENCY PROCEDURES

(1) Introduction. The paragraph 5.0 contingency procedures for RVSM are reprinted here for ease of reference, however Doc. 7030 should be considered the source document for NAT contingency procedures. Doc. 7030 and/or the North Atlantic MNPS Airspace Operations Manual should always be consulted before training material or manuals are developed.

5.0 SPECIAL PROCEDURES FOR FLIGHT CONTINGENCY

5.1 The following procedures are intended for guidance only. Although all possible contingencies cannot be covered, they provide for the more frequent cases of:

1) inability to maintain assigned level due to weather, aircraft performance, pressurization failure and problems associated with high level supersonic flight;
2) loss of, or significant reduction in, the navigation capability when operating in parts of the airspace where high accuracy, of navigation is a prerequisite to the safe conduct of flight operations; and
3) en route diversion across the prevailing NAT traffic flow guidance is recommended for aircraft operating within North Atlantic airspace.

With regard to 1) and 3) above, the procedures are applicable primarily when rapid descent and/or turn-back or diversion is required. The pilot's judgment shall determine the sequence of actions taken, and air traffic control AWE render all possible assistance having regard to the specific circumstances.

5.2 General Procedures. The following general procedures apply to both subsonic and supersonic aircraft.

5.2.1 If an aircraft is unable to continue flight in accordance with its air traffic control clearance, a revised clearance shall, whenever possible, be obtained prior to initiating any action. This shall also apply to aircraft which owe unable to maintain an accuracy of navigation on which the safety of the separation minima applied by air traffic control between it and adjacent aircraft depends. This shall be accomplished using the radiotelephony distress or urgency signal as appropriate. Subsequent air traffic control action with respect to that aircraft shall be based on the intentions of the pilot and the overall air traffic situation.

5.2.2 If prior clearance cannot be obtained, an air traffic control clearance shall be obtained at the earliest possible time and in the meantime, the pilot shall,

1) broadcast position (including the ATS route designator or the track code, as appropriate) and intentions on frequency 121.5 MHz at suitable intervals until air traffic control clearance is received;
2) make maximum use of aircraft lights to make the aircraft visible;
3) maintain a watch for conflicting traffic; and
4) initiate such action as necessary to ensure safety of the aircraft.

5.3 Special contingency procedures for subsonic aircraft

5.3.1 The following guidance is recommended for aircraft operating within north Atlantic airspace.

5.3.2 Initial action

5.3.2.1 If unable to comply with the provision of 5.2.1 to obtain prior air traffic control clearance, the aircraft should leave its assigned route or track by turning 90 degrees to the right or (C) whenever this is possible. The direction of the turn should where possible, be determined by the position of the aircraft relative to any organized route or track system (e.g., whether the aircraft is outside, at the edge of, or within the system). Other factors which may affect the direction of the turn are the direction of an alternate airport terrain clearance and the levels allocated to adjacent routes or tracks.

5.3.3 Subsequent action

5.3.3.1 An aircraft able to maintain its assigned flight level should;

1) turn to acquire and maintain in either direction a track laterally separated by 30 NM from its assigned route or track; and
2) if above FL 410, climb or descend 300 m (1000 ft); or
3) if below FL 410, climb or descend 150 m (500 ft); or
4) if at FL 410, climb 300 m (1000 ft) or descend 150 m (500 ft).

5.3.3.2 An aircraft not able to maintain its assigned flight level should

1) initially minimize its descent rate to the extent Mat it is operationally feasible;
2) turn while descending to acquire and maintain in either direction a track laterally separated by 30 NM from its assigned route or track, and
3) for the subsequent level flight, a level should be selected which differs from those normally used by 300 m (1000 ft) if above FL 410 or by 150 m (500 ft) if below FL 410.

5.3.4 En route diversion across the prevailing NAT air traffic flow.

5.3.4.1 The guidance in paragraph 5.3.4.3 applies to aircraft that.

1) are operating within the OTS or on random routes that are proximate to the OTS; and
2) can climb or descend to an altitude above or below those where die majority of NAT aircraft operate. Paragraph 5.3.4.4 contains guidance for other situations where diversion across adjacent tracks or routes is necessary.

5.3.4.2 The basic concept of this guidance is that, when operationally feasible, before diverting across tracks or routes with heavy traffic, the aircraft should offset from the assigned track or route by 30 NM and expedite a descent to an altitude below or a climb to an altitude above those where the vast majority of NAT aircraft operate before proceeding toward the alternate aerodrome flight below FL 285 or above FL 410 should meet this objective.

5.3.4.3 In the event of a contingency which necessitates an en route diversion to an alternate aerodrome, across the direction of the prevailing NAT Traffic flow, and prior ATC clearance cannot be obtained.

5.3.4.3.1 An aircraft able to maintain its assigned flight level flight should:

1) turn toward the alternate aerodrome to acquire a track which is separated laterally by 30 NM from the assigned route or track and
2) IF above FL 410, climb, or descend 300 m (1000 ft); or
3) if below FL 410, climb, or descend 150 m (500 ft); or
4) if at FL 410, climb 300 m (1000 ft) or descend 150 m (500 ft); and
5) fly the offset track while expediting its descent to an altitude below FL 285 or a climb to an altitude above FL 410; and
6) when below FL 285 or above FL 410, proceed towards the alternate aerodrome while maintaining a level which differs from those normally used by 150 m (500 ft) if below FL 410 or 300 m (1000 ft) if above FL 410; or
7) IF unable or unwilling to make a major climb, or descent, fly an altitude offset for the diversion until obtaining an ATC clearance. See paragraph 5.3.4.4 below.

5.3.4.3.2 An aircraft not able to maintain its assigned flight level should:

1) initially minimize its descent rate to the extent it is operationally feasible; and
2) start as descent while turning to acquire a track separated laterally by 30 nm from its assigned route or track, and

3) unless the nature of the contingency indicates otherwise; maintain the offset track while expediting its descent to an altitude below FL 285; and
4) Unless the nature of the contingency dictates otherwise, when below FL 285, it should proceed towards the alternate aerodrome; and
5) continue descent to a level which can be maintained and which differs from those normally used by 150 nm (500 ft) if below FL 410.

5.3.4.3.3 These contingency procedures eve employed by a twin-engined aircraft as a result of a shutdown of a power unit or a primary airplane system failure, the pilot should so advise ATC as soon as practicable, reminding ATC of the type of aircraft involved and requesting expeditious handling

5.3.4.4 Aircraft which are required to divert across the prevailing NAT air traffic flow and are:

1) unable or unwilling to descend to an altitude below those where the majority of NAT aircraft operate due to operational constraints; or
2) unsure of their proximity to other routes or tracks; or
3) assigned to a route which crosses the OTS at a significant angle;

should execute the actions specified in paragraphs 4.3.4.4.1 or 5.3.4.4.2 below.

5.3.4.4.1 An aircraft which is able to maintain its assigned flight level should

1) if above FL 410, climb or descend 300 m (1000 ft); or
2) if below FL 410, climb or descend 150 m (500 ft); or
3) if at FL 410, climb 300 m (1000 ft) or descend 150 m (500 ft)

while turning to proceed toward the alternate aerodrome

5.3.4.4.2 An aircraft which is unable to maintain its assigned flight level should.

1) expedite a descent to an Altitude below those where the majority of NAT aircraft operate while turning toward the alternate aerodrome; and
2) diligently follow the guidance in paragraph 5.2.2 above in regard to radio calls, aircraft lights and watching For conflicting traffic

7. TRANSPONDER FAILURE AND RVSM TRANSITION AREAS.

The specific actions that ATC will take in the event of transponder failure in RVSM transition areas will be determined by the provider States. (Transition areas are planned to be established between airspaces where different vertical separation standards are applied).

8. PROCEDURES TO BE FOLLOWED WHEN NOTIFIED OF TVE OR ASE ERRORS EXCEEDING ESTABLISHED LIMITS.

Height-monitoring system are an element of the RVSM program for the NAT. When the height-monitoring system is deployed, it is expected that regional procedures will be developed for their use. If the monitoring system allows for real-time notification, to the pilots of WE or AVE errors, then pilots should be aware of the actions which are expected to be taken.

9. EXPANDED EQUIPMENT FAILURES JND TURBULENCE ENCOUNTER SCENARIOS.

The following scenarios are expanded versions of those detailed in Section 5. Operators may consider the material for use in training programs.

(1) Contingency Scenarios.

(a) Scenario: All automatic altitude control systems fail (e.g., automatic altitude hold).

(i) initial actions, The pilot should:

A. maintain CFL.
B. evaluate the aircraft's capability to maintain altitude through manual control.

(ii) subsequent actions: The pilot should:

A. watch for conflicting traffic;
B. if considered necessary, alert nearby aircraft by;
- ❖ making maximum use of exterior light:
- ❖ broadcasting, position, flight level and immediate intentions on 121.5 MHz (131.8 MHz may be used as a back-up);

C. notify ATC of the failure and the intended course of action. Possible courses of action include:
- ❖ continuing in MNPS airspace provided that the aircraft can maintain the CFL.
- ❖ requesting ATC clearance to climb above or descend below MNPS airspace if the aircraft cannot maintain flight level and ATC cannot establish increased vertical, longitudinal, or lateral separation.

D. executing the Doc. 7030 contingency maneuver to leave the assigned route or track if prior ATC clearance cannot be obtained and the aircraft cannot maintain level.

(iii) expected ATC actions, ATC can be expected to:

A. obtain the pilot's intentions.
B. if the pilot intends to continue in MNPS airspace, consider establishing increased vertical, longitudinal, or lateral separation.
C. pass traffic information.
D. if the pilot requests clearance to exit MNPS airspace, accommodate expeditiously, if possible.
E. if increased vertical, longitudinal, or lateral separation cannot be established and it is not possible to comply with the pilot's request for clearance to exit MNPS airspace, ATC can be expected to notify other aircraft in the vicinity and continue to monitor the QUAIL In this situation, the pilot may be executing his emergency authority to protect the safety of the aircraft by flying the established contingency procedures to leave the assigned route or track.
F. advise adjoining ATC facilities/sectors of the situation.

(b) Scenario: Loss of redundancy in primary altimetry systems.

(i) Course of action The pilot should take the following action:

A. if the remaining altimetry system is functioning normally, couple that system to the automatic altitude control system, notify ATC of the loss of redundancy and maintain vigilance of altitude keeping.

(ii) ATC can be expected to Acknowledge the situation and continue to monitor progress.

(c) Scenario: All primary altimetry systems fail or are considered unreliable.

(i) Initial actions, The pilot should:

A. maintain altitude by reference to the standby altimeter (if the aircraft is so equipped);
B. alert nearby aircraft by:
- ❖ making maximum use of exterior lights; and
- ❖ broadcasting position, flight level and intentions on 121.5 MHz (131.8 Mhz can be used as a back-up).

C. notify ATC of the inability to meet MNPS performance requirements, consider declaring an emergency, and request clearance to exit MNPS airspace.

(ii) subsequent actions The pilot should:

A. if unable to obtain ATC clearance, fin a timely manner, execute Doc. 7060 contingency procedures to leave the assigned route or track and descend below RVSM airspace (if operationally feasible).
B. if it is not operationally feasible to execute Doc. 7030 contingency procedures, continue; to alert nearby aircraft and coordinate with ATC.

(iii) expected ATC actions. ATC can be expected to:

A. when notified by the pilot that the aircraft cannot meet MNPS performance requirements, ATC can be expected to accommodate the request for clearance to exit the airspace in an expeditious manner.
B. if unable to accommodate the request for clearance to exit the airspace, ATC should request the pilot's intentions, advise the pilot of traffic in the proximity, advise other aircraft and continue to monitor the situation.

(d) Scenario: Primary altimeters diverge by more than ± 200 ft (± 60 m).
(i) course of action The pilot should:
A. attempt to determine the defective system through established trouble shooting procedures and/or comparing the primary altimeter displays to the standby altimeter (as corrected by correction cards, if required)
B. if the defective system can be determined, couple the functioning altimetry system to the altitude keeping device.
C. if the altimeter displays differ by more than ± 200 ft (± 60 m) and it cannot be determined which system is defective, follow the guidance in paragraph 9a(3) for failure or unreliable altimeter indications of all primary altimeters.

(e) Scenario: Aircraft encounters turbulence (greater than moderate) which the pilot believes will impact the aircraft's capability to maintain flight level.
(i) course of action The pilot should:
A. watch for conflicting traffic and make maximum use of exterior lights.
B. broadcast call sign, position, flight level, nature and severity of turbulence, and intentions on 121.5 MHz (131.8 MHz may be used as a back-up).
C. notify ATC as soon as possible and request flight level change if necessary.
D. if the aircraft cannot maintain level, execute Doc. 7030 contingency procedures to leave the assigned route or track.
(ii) expected ATC actions. ATC can be expected to:
A. If possible, establish increased vertical, longitudinal, or lateral separation.
B. Accommodate the request for change in altitude, if possible.
C. If neither of the above actions are possible, notify other aircraft in the vicinity and monitor the situation.
D. Consider suspending RVSM operations in the affected area.

DIVISION VII

REVIEW OF ICAO DOCUMENT 9574 HEIGHT-KEEPING PARAMETERS

(1) ICAO Doc. 9574, Manual on the Implementation of a 300m (1,000 ft) Vertical Separation Minimum Between FL 290 aircraft FL 410 Inclusive, covers the overall analysis of factors for achieving an acceptable level of safety in a given airspace system. The major factors are: passing frequency, lateral navigation accuracy, and vertical overlap probability. Vertical overlap probability is a consequence of errors in adhering accurately to assigned flight level, and this is the only factor addressed in the present document.

(2) In ICAO Doc. 9574, Section 2.1.1.3, the vertical overlap probability requirement was restated as the aggregate of height keeping errors of individual aircraft, which must be within the total vertical error (TVE) distribution expressed as the simultaneous satisfaction of the following four requirements:

(a) "the proportion of height keeping errors beyond 300 ft (90 m) in magnitude must be less than 2.0 x 10-3;

(b) the proportion of height keeping errors beyond 500 ft (150 m) in magnitude must be less than 3.5 x 10-6

(c) the proportion of height keeping errors beyond 650 ft (200 m) in magnitude must be less than 1.6 x 10-7; and

(d) the proportion of height keeping errors between 950 ft (290 m) and 1,050 ft (320 m) in magnitude must be less than 1.7 x 10-8."

(3) The following characteristics presented in ICAO Doc. 9574 were developed in accordance with the conclusions of ICAO Doc. 9536, to satisfy the distributional limits in paragraph 2a, and to result in aircraft airworthiness having negligible effect on meeting the requirements in paragraphs 2b, 2c, and 2d. They are applicable statistically to individual groups of nominally identical aircraft operating in the airspace. These characteristics describe the performance which the groups need to be capable of achieving in service, exclusive of human factors errors and extreme environmental influences, if the airspace system TVE requirements are to be satisfied. The following characteristics are the basis for development of this document:

(a) the mean altimetry system error (ASE) of the group shall not exceed ± 80 ft (± 25 m);

(b) the sum of the absolute value of the mean ASE for the group and three standard deviations of ASE within the group shall not exceed 245 ft (75 m); and

(c) errors in altitude keeping shall be symmetric about a mean of 0 ft (0 m) and shall have a standard deviation not greater than 43 ft (13 m) and should be such that the error frequency decreases with increasing error magnitude at a rate which is at least exponential."

(4) ICAO Doc. 9574 recognized that specialist study groups would develop the detailed specifications to ensure that the TVE objectives can be met over the hid operational envelope in RVSM airspace for each aircraft group. In determining the breakdown of tolerances between the elements of the system, it was considered to be necessary to set system tolerances at levels which recognize that the overall objectives must be met operationally by aircraft and equipment subject to normal production variability, including that of the airframe static source error, and normal in-service degradation. It was also recognized that it would be necessary to develop specifications and procedures covering the means for ensuring that in-service degradation is controlled at an acceptable level.

(5) On the basis of studies reported in ICAO Doc. 9536, Volume 2; ICAO Doc. 9574 recommended that the required margin between operational performance and design capability should be achieved by ensuring that the performance requirements are developed to fulfill the following requirements, where the narrower tolerance in paragraph 5b is specifically intended to allow for some degradation with increasing age:

(a) "the mean uncorrected residual position error (static source error) of the group shall not exceed ± 80 ft (± 25 m.);

(b) the sum of the absolute value of the mean ASE for the group and three standard deviations of ASE within the group, shall not exceed 200 ft (60 m);
(c) each individual aircraft in the group shall be built to have ASE contained within ± 200 ft (± 60 m); and
(d) an automatic altitude control system shall be required and will be capable of controlling altitude within a tolerance band of ± 50 ft (± 15 m) about commanded altitude when operated in the altitude hold mode in straight and level flight under nonturbulent, nongust conditions."

(6) These standards provide the basis for the separate performance aspects of airframe, altimetry, altimetry equipment and automatic altitude control system. It is important to recognize that the limits are based on studies (Doc. 9536, Volume 2) which showed that ASE tends to follow a normal distribution about a characteristic mean value for the aircraft group, and that the in-service performance of the separate groups aggregate together to give an overall performance spread which is distributed about the population mean TVE which is nominally zero. The document should, therefore, provide controls which will preclude the possibility that individual aircraft approvals could create clusters operating with a mean significantly beyond 80 ft (25 m) in magnitude, such as could arise where elements of the altimetry system generate bias errors additional to the mean corrected static source error.

ATTACHMENT 6
to
Appendix IV
General Operating and Flight Rules Standards
s602.163 Air Navigation Requirements

Guidelines for Operational Approval of Global Positioning System (GPS) to Provide the Primary Means of Class II Navigation in Oceanic and Remote Areas of Operation

1. PURPOSE.

The purpose of this Attachment is to provide the Directorate General of Civil Aviation (DGCA) and Operators the Standards for granting operational approval of GPS to provide the primary means of Class II navigation in oceanic and remote areas including North Atlantic Minimum Navigation Performance Specification (MNPS) airspace.

2. BACKGROUND.

The approval of GPS to provide the primary means of Class II navigation requires equipment approval, installation approval and operational approval. This Attachment provides the information on the performance standards, procedures, and operational restrictions for using the GPS as a primary means of Class II navigation and the process to be used in granting operational approvals for the use of GPS.

3. DEFINITIONS.

(1). Primary Means of Navigation - Navigation equipment which provides the only required means on the aircraft of satisfying the necessary levels of accuracy, integrity, and availability for a particular area, route, procedure, or operation.
(2). Class II Navigation - Any en route flight operation or portion of an en route operation (irrespective of the means of navigation) which takes place outside (beyond) the designated Operational Service Volume of ICAO standard airway navigation facilities (VOR, VOR/DME, NDB).
(3). Fault Detection and Exclusion (FDE) - Capability of GPS to:
- (a) detect a satellite failure which effects navigation; and
- (b) automatically exclude that satellite from the navigation solution.

(4). Algorithm - A step-by-step procedure for solving a problem.

4. GPS EQUIPMENT APPROVAL AND INSTALLATION.

The DGCA must determine that the GPS equipment is approved and installed in accordance with the following.
- (a) GPS Equipment Approval. The equipment must be approved by an Authorities Aircraft Certification Office (ACO) in accordance with U.S. Advisory Circular (AC) 20-138, Airworthiness Approval of Global Positioning System (GPS) Navigation Equipment For Use As A VFR And IFR Supplemental Navigation System; or U.S. AC 20-130, Airworthiness Approval of Multi Sensor Navigation Systems for use in the U.S. National Airspace System (NAS) and Alaska; and Notice N8110.57, GPS As A Primary Means of Navigation For Oceanic/Remote Operations or an equivalent standard to the above.
- (b) Installation. The applicant must obtain initial installation approval of GPS equipment for primary use on a specific make and model aircraft via the Type Certificate (TC) or the Supplemental Type Certificate (STC) certification process. Forms acceptable to the Minister

for those operators with acceptable engineering organization will be used for the installation of the same GPS equipment in the same make/model aircraft provided the data developed for the initial certification is used.

(c) Aircraft Flight Manual Supplement (AFMS). Once the installation has been approved, the AFMS must be updated to state: "The ____ GPS equipment as installed has been found to comply with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace, when used in conjunction with the ____ prediction program. This does not constitute operational approval.

5. OPERATIONAL APPROVAL.

The DGCA must use the following guidance in granting operational approval.

(a) Technical/Operational Assistance: The DGCA should contact a Navigation Specialists to obtain assistance.

(b) Training and Manuals: Crew training must be modified to include modules that ensure crews are familiar with navigation equipment operations, data base updating procedures, pre-departure procedures, standard en route procedures, and contingency procedures.

(c) Crew Qualification: The required flight crew must have received training in the use of dual GPS as the only means of long-range navigation when completing PIC/SIC Initial New Hire and Initial Equipment Flight Training or when completing the latest Recurrent Training.

(d) Pre-departure Procedures. The DGCA must ensure that the following policies and procedures are incorporated into pilot and where appropriate, dispatcher training/qualification programs and manuals:

(i) *FDE Availability Prediction Program*. All operators conducting GPS primary means of Class II navigation in oceanic/remote areas must utilize a DGCA approved FDE prediction program for the installed GPS equipment that is capable of predicting, prior to departure, the maximum outage duration of the loss of fault exclusion, the loss of fault detection, and the loss of navigation function for flight on a specified route. The "specified route of flight" is defined by a series of waypoints (to include the route to any required alternates) with the time specified by a velocity or series of velocities. Since specific ground speeds may not be maintained, the pre-departure prediction must be performed for the range of expected ground speeds. This FDE prediction program must use the same FDE algorithm that is employed by the installed GPS equipment and must be developed using an acceptable software development methodology (e.g., RTCA/DO-178B). The FDE prediction program must provide the capability to designate manually satellites that are scheduled to be unavailable in order to perform the prediction accurately. The FDE prediction program will be evaluated as part of the navigation system's installation approval. Acceptable requirements for the FDE prediction algorithm can be found in U.S. FAA Notice N8110.57.

(ii) *Operational Control Restrictions*:

A. any predicted satellite outages that affect the capability of GPS equipment to provide the navigation function on the specified route of flight requires that the flight be canceled, delayed, or re-routed. (See Section 5.(e)(i).

B. if the fault exclusion capability outage (exclusion of a malfunctioning satellite) exceeds the acceptable duration on the specific route of flight, the flight must be canceled, delayed, or re-routed. (See Section 5.(e)(ii))

(iii) *Determination of the Capability to Navigate*. Prior to departure, the operator must use the FDE prediction program to demonstrate that there are no outages in the capability to navigate on the specified route of flight (the FDE prediction program determines whether the GPS constellation is robust enough to provide a navigation solution for the specified route of flight).

(iv) *Determination of Availability of Exclusion*. Once navigation function is assured (the equipment can navigate on the specified route of flight), the operator must use the FDE prediction program to demonstrate that the maximum outage of the capability of the equipment to provide fault exclusion for the specified route of flight does not exceed the acceptable duration (fault exclusion is the ability to exclude a failed satellite from the navigation solution). The acceptable duration (in minutes) is equal to the time it would take to exit the protected airspace (one-half the lateral separation minimum) assuming a 35-nautical mile per hour cross-track navigation system error growth rate when starting from the center of the route. For example, a 60-nautical mile lateral separation minimum yields 51 minutes acceptable duration (30 nautical miles divided by 35 nautical miles per hour). If the fault exclusion outage exceeds the acceptable duration, the flight must be canceled, delayed, or re-routed.

(e) Enroute Procedures. The DGCA must ensure that the following policies and procedures are incorporated into pilot and where appropriate, dispatcher training/qualification programs, and manuals:

(i) *Degraded Navigation Capability*. If the GPS displays a loss of navigation function alert, the pilot should immediately begin using dead reckoning procedures until GPS navigation is regained. The pilot will report degraded navigation capability to Air Traffic Control (ATC). Additionally, flight crew members operating under Lebanese Aviation Regulations (LARs), Part VI, Subpart 4 and Part VII will notify the appropriate dispatch or flight following facility of any degraded navigation capability in accordance with the air carrier's DGCA approved procedures.

(ii) *Satellite Fault Detection Outage*. If the GPS displays an indication of a fault detection function outage (Receiver Autonomous Integrity Monitoring (RAIM) is not available), navigation integrity must be provided by comparing the GPS position with a position computed by extrapolating the last verified position with true airspeed, heading, and estimated winds. If the positions do not agree to within 10 nautical miles, the pilot should immediately begin using dead reckoning procedures until the exclusion function or navigation integrity is regained and report degraded navigation capability to ATC.

(iii) *Fault Detection Alert*. If the GPS displays a fault detection alert (failed satellite), the pilot may choose to continue to operate using the GPS-generated position if the current estimate of position uncertainty displayed on the GPS from the FDE algorithm is actively monitored. If this number exceeds 10 nautical miles or is not available, the pilot should immediately begin using dead reckoning procedures until the failed satellite is excluded and report degraded navigation capability to ATC.

6. APPROVAL FOR OPERATION IN NORTH ATLANTIC MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS AIRSPACE.

(1) Until further notice, the Pass/Fail graphs contained in U.S. AC 120-33 or equivalent should be used confirm the operator's capability to meet the requirements of the LARs. A Navigation Specialists should be used to provide guidance on process and procedures for the Pass/Fail graphs and aid the DGCA in determining whether Figure 2 or Figure 3 should be utilized. The operator is not required to collect navigation performance data in NAT MNPS AIRSPACE to apply to the Pass/Fail graphs.

7. VALIDATION TESTS.

(1) General. Validation Tests are required. Such tests may consist of a single flight or series of flights. The tests will be conducted in accordance with the LARs.

(2) Program/Document Evaluation. As an element of the evaluation process, the DGCA should ensure that operator training programs and manuals contain the policies and procedures detailed in Section 4. of this Attachment.

(3) Technical Support. It is recommended that, whenever possible, a Navigation Specialists participate in the validation of operator programs and procedures for use of GPS as the primary means of Class II navigation. As a minimum, a qualified DGCA Inspector will oversee the Validation Test.

(4) Flight(s) Required for Validation Tests.

- (a) General. The following is intended to provide guidance for the development of GPS/Class II navigation validation tests. The DGCA should consider each application on its own merit and apply judgment when developing validation test requirements. The DGCA should communicate the objective, duration and number of validation test flights required to the operator during Phase One of the approval process.
- (b) Operator Without Previous Class II Navigation Experience. If an operator is requesting approval to conduct Class II Navigation with GPS, but has no previous experience in conducting Class II navigation, then the operator must conduct at least one flight in the Class II area of navigation where it intends to operate. This flight must be conducted as a non-revenue operation with the exception that cargo may be carried.
- (c) Operator with Previous Class II Navigation Experience. If an operator is requesting approval to conduct Class II Navigation with an aircraft/GPS equipment combination with which it has not previously conducted Class II operations, the operator should be required to conduct a validation test flight(s). If the flight(s) is conducted in a Class I navigation area to simulate operation in a Class II Navigation area, then the flight(s) may be conducted in revenue operations. If the flight is conducted in a Class II Navigation area, then it must be conducted as a non-revenue flight with the exception that cargo may be carried.
- (d) Conditions of Validation Test Flights. The following conditions apply to validation test flights:
  - (i) at least one flight should be observed by an qualified DGCA aviation safety inspector.
  - (ii) dispatch procedures must be demonstrated for the Class II Navigation area(s) where operations are intended to be conducted.
  - (iii) the flight(s) should be of adequate duration for the pilots to demonstrate knowledge of dispatch requirements, capability to navigate with the system, and to perform normal and non-normal procedures.

(5) Issuance of Operations Specifications: Operations Specifications authorizing flight in Class II airspace using GPS as the only means of Long-Range Navigation must be issued or modified, as appropriate, prior to any air carrier operations being conducted in the Class II airspace.

8. CONTINUING AIRWORTHINESS (MAINTENANCE REQUIREMENTS).

The aircraft manufacturer should have an established maintenance program for the individual navigation systems. For others installing navigation systems, the operator will submit those changes appropriate to their existing maintenance manual for review and acceptability.

Appendix V
to
General Operating and Flight Rules Standards
s602.164 Extended Twin Operations (ETOPS)

1. PURPOSE.

This Standard states the means for obtaining approval under the Lebanese Aviation Regulations (LARs) Part VI, Subpart 2, for two engine airplanes to operate over a route that contains a point farther than one hour flying time at the normal one engine inoperative cruise speed (in still air) from an adequate airport. Specific criteria are included for deviation of 75 minutes, 120 minutes or 180 minutes from an adequate airport.

2. DEFINITIONS.

Airport:

(a) Adequate. For the purpose of this Standard, an adequate airport is an airport certified as meeting the standards under ICAO.

(b) Suitable. For the purpose of this Standard, a suitable airport is an adequate airport with weather reports, or forecasts, or any combination thereof, indicating that the weather conditions are at or above operating minima, as specified in the operation specifications, and the field condition reports indicate that a safe landing can be accomplished at the time of the intended operation.

Auxiliary Power Units (APU):
A gas turbine engine intended for use as a power source for driving generators, hydraulic pumps, and other airplane accessories and equipment and/or to provide compressed air for airplane pneumatic systems.

(a) an essential APU installation provides the bleed air and/or mechanical power necessary for the dispatch of a transport category airplane for operations other than extended range operations with two-engine airplanes.

(b) an APU installation which is intended to serve as one of the three or more independent alternating current (AC) electrical power sources required for extended range operations provides the bleed air or mechanical power necessary for the safe flight of a two engine transport category airplane approved for extended range operation under LARs Part VI, Section 602.164 and is designed and maintained to provide a level of reliability necessary to perform its intended function.

ETOPS Configuration Maintenance and Procedures (CMP) Standard:
The particular airplane configuration minimum requirements including any special inspection, hardware life-limits, Master Minimum Equipment List (MMEL) constraints, and maintenance practices found necessary by the Authority to establish the suitability of an airframe-engine combination for extended range operation.

Engine:
The basic engine assembly as supplied by the engine manufacturer.

Extended Range Operations:
For the purpose of this Standard, extended range operations are those flights conducted over a route that contain a point further than one hour flying time at the approved one engine inoperative cruise speed (under standard conditions in still air) from an adequate airport.

Extended Range Entry Point:
The extended range entry point is the point on the aircraft's outbound route which is one-hour flying time at the approved single engine inoperative cruise speed (under standard conditions in still air) from an adequate airport.

Failsafe:
A design methodology upon which the U.S. FAR Part 25 airworthiness standards are based. It requires the effect of failures and combination of failures to be considered in defining a safe design. (Refer to Attachment 2 for a more complete definition of failsafe design concepts.)

In-flight Shutdown (IFSD):
When an engine ceases to function in flight and is shutdown, whether self-induced, crew initiated or caused by some other external influence (that is, IFSD for all causes; for example: due to flameout, internal failure, crew initiated shutoff, foreign object ingestion, icing, inability to obtain and/or control desired thrust, etc.).

System:
A system includes all elements of equipment necessary for the control and performance of a particular major function. It includes both the equipment specifically provided for the function in question and other basic equipment such as that necessary to supply power for the equipment operation.

(a) Airframe System. Any system on the airplane that is not a part of the propulsion system.
(b) Propulsion System. The airplane propulsion system includes: each component that is necessary for propulsion; components that effect the control of the major propulsion units; and components that effect the safe operation of the major propulsion units.

3. DISCUSSION.

(1) To be eligible for extended range operations, the specified airframe-engine combination should have been certificated to the airworthiness standards of transport category airplanes and should be evaluated considering the concepts in Section 5., evaluated considering the type design considerations in Section 6., evaluated considering in-service experience discussed in Section 7., and evaluated considering the continuing airworthiness and operational concepts outlined in Section 8**.**
(2) All two engine airplanes operated under Lebanese Aviation regulations (LARs) Part VI, Subpart 4, and Part VII are required to comply with LARs Part VI, Subpart 2.

4. APPLICABILITY.

Since large transport category airplanes are certificated in consideration of the applicable operating rules, any consideration for deviation from this operating rule for two engine airplanes necessitates an evaluation of the type design to determine suitability of that particular airframe-engine combination for the intended operation. This Standard provides the procedures for obtaining type design, continued airworthiness and operations approval for those two engine transport category airplanes intended for use in extended range operations. Although many of the criteria in this Standard may be currently incorporated into an operator's approved program for other airplanes or route structures, the unique nature of extended range operations with two engine airplanes necessitates an evaluation of these operations to ensure that the approved programs are effective. To the extent that changes in the airplane's type design, continued airworthiness, or the operations program are involved as a result of this evaluation, they are approved through the normal approval processes.

5. CONCEPTS.

Although it is self-evident that the overall safety of an extended range operation cannot be better than that provided by the reliability of the propulsion systems, some of the factors related to extended range operations are not necessarily obvious. For example, cargo compartment fire suppression/containment capability could be a significant factor or operational/maintenance practices may invalidate certain determinations made during the airplane type design certification, or the probability of system failures could be a more significant problem than the probability of propulsion system failures. Although engine reliability is a critical factor, it is not the only factor which should be seriously considered in evaluating extended range operations. Any decision relating to extended range operation with two engine airplanes should also consider the probability of occurrence of any condition which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions. The following is provided to define the concepts for evaluating extended range operations with two engine airplanes. This approach ensures that two engine airplanes are consistent with the level of safety required for current extended range operations with three and four engine turbine powered airplanes without unnecessarily restricting operation.

(a) Airframe System. A number of airframe systems have an effect on the safety of extended range operations; therefore, the type design certification of the airplane should be reviewed to ensure that the design of these systems are acceptable for the safe conduct of the intended operation.

(b) Propulsion System. A review of the historical data for transport aviation two engine turbofan powered large commercial airplanes indicates that the current safety record, as exemplified by the world accident rate (airworthiness causes), is sustained in part by a propulsion system IFSD rate of only about 0.02/1000 hours. Although the quality of this safety record is not wholly attributable to the IFSD rate, it is believed that maintaining an IFSD rate of that order is necessary to not adversely impact the world accident rate from airworthiness causes. Upon further review of the historical data base and in consideration of the required safety of extended range operation, it is necessary that the achieved performance and reliability of the airplane should be shown to be sufficiently high. When considering the impact of increasing diversion time, it must be shown that the operation can be conducted at a level of reliability resulting in no adverse change in risk.

(c) Maintenance Reliability Program Definition. Since the quality of maintenance and reliability programs can have an appreciable effect on the reliability of the propulsion system and the airframe systems required for extended range operation, an assessment should be made of the proposed maintenance and reliability program's ability to maintain a satisfactory level of airplane systems reliability for the particular airframe-engine combination.

(d) Maintenance and Reliability Program Implementation. Following a determination that the airframe systems and propulsion systems are designed to be suitable for extended range operations, an in-depth review of the applicant's training programs, operations, and maintenance and reliability programs should be accomplished to show ability to achieve and maintain an acceptable level of systems reliability to safely conduct these operations.

(e) Human Factors. System failures or malfunctions occurring during extended range operations could affect flight crew workload and procedures. Although the demands on the flight crew may increase, an assessment should be made to ensure that exceptional piloting skills or crew coordination are not required.

(f) Approval Basis. Each applicant (manufacturer or operator as appropriate) for extended range approval should show that the particular airframe-engine combination is sufficiently reliable. Systems required for extended range operations should be shown by the manufacturer to be designed to a failsafe criteria and should be shown by the operator to be continuously maintained and operated at levels of reliability appropriate for the intended operation.

(i) *Type Design ETOPS Approval*. Preceding the type design approval, the applicant should show that the airframe and propulsion systems for the particular airplane can achieve a sufficiently high level of reliability in service so that safe extended range operations may be conducted. The achievement of the required level of propulsion system reliability is determined in accordance with Attachment 1. (See Section 7. (2)) Evidence that the type design of the airplane is suitable for extended range operations is normally reflected by a statement in the Approved and Accepted Airplane Flight Manual (AFM) and Type Certificate Data sheet or Supplemental Type Certificate (See Section 6.), which specifies the CMP standard requirements for suitability.

(ii) *In-service Experience*. It is also necessary for each operator desiring approval for extended range operations to show that it has obtained sufficient maintenance and operations experience with that particular airframe-engine combination to safely conduct these operations. (See Section 7. (3))

(iii) *Operations Approval*. The type design approval does not reflect a continuing airworthiness or operational approval to conduct extended range operations. Therefore, before approval, each operator should demonstrate the ability to maintain and operate the airplane so as to achieve the necessary reliability and to train its personnel to achieve competence in extended range operations. The operational approval to conduct extended range operations is made by amendment to the operator's operations specifications (See Section 8.) which includes requisite items provided in the AFM.

(iv) *Continuing Airworthiness*. From time to time, the Authority may require that the type design CMP standard be revised to correct subsequent problems that impede the achievement of the required level of reliability. The Authority will initiate action as necessary to require a CMP standard revision to achieve and maintain desired level of reliability and, therefore, safety of the extended range operation. CMP standards in effect prior to revision will no longer be considered suitable for continued extended range operation.

6. TYPE DESIGN APPROVAL CONSIDERATION.

When a two engine type design airplane is intended to be used in extended range operations, a determination should be made that the design features are suitable for the intended operation. In some cases modifications to systems may be necessary to achieve the desired reliability. The essential airframe systems and the propulsion system for the particular airframe-engine combination should be shown to be designed to a failsafe criteria and through service experience it must be determined that it can achieve a level of reliability suitable for the intended operation.

(a) Request for Approval. An airplane manufacturer or other civil airworthiness authorities requesting a determination that a particular airframe-engine combination is a suitable type design for extended range operation, apply to the cognizant Authority. An operator will apply similarly, except through the DGCA. The DGCA will then initiate an assessment of the airframe-engine combination in accordance with Sections 6, 7, and Attachment 1 of this Standard.

(b) Criteria. The applicant will conduct an evaluation of failures and failure combinations based on engineering and operational consideration as well as acceptable failsafe methodology. The analysis will consider effects of operations with a single engine, including allowance for additional stress that could result from failure of the first engine. Unless it can be shown that equivalent safety levels are provided or the effects of failure are minor, failure and reliability analysis should be used as guidance in verifying that the proper level of failsafe design has been provided. The following criteria are applicable to the extended range operation of airplanes with two engines:

(i) airframe systems should be shown to comply with Section 25.1309, of the U.S. Federal Aviation Regulations, Amendment 25-41 or equivalent.

(ii) the propulsion systems should be shown to comply with Section 25.901, of the U.S. Federal Aviation Regulations, Amendment 25-40 or equivalent.

A. engineering and operational judgment applied in accordance with the guidance outlined in Attachment 1 should be used to show that the propulsion system can achieve the desired level of reliability. This determination of the propulsion system reliability is derived from a world fleet database containing all IFSD events, all significant engine reliability problems, and available data on cases of significant loss of thrust, including those where the engine failed or was throttled back/shut down by the pilot. This determination should take due account of the approved maximum diversion time and rectification of identified engine design problems, as well as events where in-flight starting capability may be degraded.

B. contained engine failure, cascading failures, consequential damage or failure of remaining systems or equipment should be assessed in accordance with Section 25.901 of the U.S. FARs or equivalent.

C. in addition to the flight crew fuel management discussed in Section 8.(6)(b)(ii)(G.), a means should be provided to alert the flight crew of a low fuel quantity condition. The alert should commence at a total fuel quantity available condition equivalent to no less than one-half hour operation at maximum continuous power.

D. it should be shown during type design evaluation that adequate engine limit margins exist (that is, rotor speed, exhaust gas temperatures) for conducting extended duration single engine operation during the diversion at all approved power levels and in all expected environmental conditions. This assessment should account for the effects of additional engine loading demands (for example, anti-ice, electrical, etc.) which may be necessary during the single engine flight phase associated with the diversion. (Reference Attachment 4, Section 1.(1)(e).)

(i) the safety impact of an uncontained engine failure should be assessed in accordance with Sections 25.903, 33.19, and 33.75 of the U.S. FAR. or equivalent

(ii) the APU installation, if required for extended range operations, should meet the applicable U.S. FAR, Part 25 provisions (Subpart E - Powerplant Provisions, through Amendment 25-46) or equivalent and any additional requirements necessary to demonstrate its ability to perform the intended function as specified by the DGCA following a review of the applicant's data. If a certain extended range operation may necessitate in-flight start and run of the APU, it must be substantiated that the APU has adequate reliability for that operation.

(iii) extended duration, single engine operations should not require exceptional piloting skills and/or crew coordination. Considering the degradation of the performance of the airplane type with a single engine inoperative, the increased flight crew workload, and the malfunction of remaining systems and equipment, the impact on flight crew procedures should be minimized. Consideration should also be given to the effects of continued flight with an engine and/or airframe system inoperative on the flight crew's and passengers' physiological needs (for example, temperature control).

(iv) it should be demonstrated for extended duration single engine operation, that the remaining power (electrical, hydraulic, pneumatic) will continue to be available at levels necessary to permit continued safe flight and landing, and to provide those services necessary for the overall safety of the passengers and crew. Unless it can be shown that cabin pressure can be maintained on single engine operation at the altitude necessary for continued flight to a suitable airport, oxygen should be available to sustain the passengers and crew for the maximum diversion time.

(v) in the event of any single failure, or any combination of failures not shown to be extremely improbable, it should be shown that electrical power is provided for essential flight instruments, warning systems, avionics, communications, navigation, required route or destination guidance equipment, supportive systems and/or hardware and any other equipment deemed necessary for extended range operation to continue safe flight and landing at a suitable airport. Information provided to each pilot should be of sufficient accuracy for the intended operation.

(vi) three or more reliable, independent alternating current (AC) electrical power sources should be available. As a minimum, each electrical source should be capable of powering the items specified in Section 6.(c)(iv) and (vii). If one or more of the required electrical power sources are provided by an APU, hydraulic system, or ram air turbine, the following criteria apply as appropriate:

A. the APU when installed, should meet the criteria in Section 6.(b)(iv).

B. the hydraulic power source should be reliable. To achieve this reliability, it may be necessary to provide two or more independent energy sources (for example, bleed air from two or more pneumatic sources).

C. ram air turbine (RAT) deployment should be demonstrated to be sufficiently reliable in deployment and use. The RAT should not require engine dependent power for deployment.

(ix) it should be shown that adequate status monitoring information and procedures on all critical systems are available for the flight crew to make preflight, in-flight go/no go and diversion decisions.

(x) extended range operations are not permitted with time related cargo fire limitations less than the approved maximum diversion time in still air conditions (including an allowance for 15 minutes holding and an approach and landing) determined by considering other relevant failures, such as an engine inoperative, and combinations of failures not shown to be extremely improbable.

(xi) airframe and propulsion ice protection should be shown to provide adequate capability (aircraft controllability, etc.) for the intended operation. This should account for prolonged exposure to lower altitudes associated with the engine-out diversion, cruise, holding, approach and landing.

(xii) although a hardware/design solution to a problem is preferred, if scheduled maintenance, replacement, and/or inspection are utilized to obtain type design approval for extended range operation, then the specific maintenance information should be easily retrievable and clearly referenced and identified in an appropriate maintenance document.

(c) Analysis of Failure Effects and Reliability.

(i) *General*. The analysis and demonstration of airframe and propulsion system failure effects and reliability provided by the applicant should be based on in-service experience as required by Section 7., and the expected longest diversion time for extended range routes likely to be flown with the airplane. If it is necessary in certain failure scenarios to consider less time due to time limited systems, the next lower time of 75 or 120 minutes will be established as the approved diversion time.

(ii) *Propulsion Systems*.

A. an assessment of the propulsion systems reliability for particular airframe-engine combinations should be made in accordance with Attachment 1.

B. the analysis should consider:

- ❖ effects of operation with a single propulsion system (that is high power demands, bleed requirements, etc.) and include probable damage that could result from failure of the first engine.
- ❖ effects of the availability and management of fuel for propulsion system operation (that is crossfeed valve failures, fuel mismanagement, ability to distinguish and isolate leaks, etc.).
- ❖ effects of other failures, external conditions, maintenance and crew errors that could jeopardize the operation of the remaining propulsion system should be examined.

- effect of inadvertent thrust reverser deployment, if not shown to be extremely improbable (includes design and maintenance).

(iii) *Hydraulic Power and Flight Control*. Consideration of these systems may be combined, since many commercial airplanes have full hydraulically powered controls. For airplanes with all flight controls being hydraulically powered, evaluation of hydraulic system redundancy should show that single failures or failure combinations not shown to be extremely improbable do not preclude continued safe flight and landing at a suitable airport. As part of this evaluation, the loss of any two hydraulic systems and any engine should be assumed to occur unless it is established during failure evaluation that there are no sources of damage or the location of the damage sources are such that this failure condition will not occur.

(iv) *Electrical Power*. Electric power is provided to a small group of instruments and devices required for continued safe flight and landing, and to a much larger group of instruments and devices needed to allow the flight crew to cope effectively with adverse operating conditions. Multiple sources (engine driven generators, APUs, etc.) should be provided to meet both the "continued safe flight and landing requirements" and the "adverse conditions requirements" as amplified in AC 25.1309-1A or equivalent. A review should be conducted of failsafe and redundancy features supported by a statistical analysis considering exposure times established in Section 6.(c)(i).

(v) *Equipment Cooling*. The data should establish that the necessary electronic equipment for extended range operation has the ability to operate acceptably considering failure modes in the cooling system not shown to be extremely improbable. Adequate indication of the proper functioning of the cooling system should be demonstrated to ensure system operation prior to dispatch and during flight.

(vi) *Cargo Compartment*. The cargo compartment design and fire protection system capability (if necessary) should be consistent with the following:

A. Design. The cargo compartment fire protection system integrity and reliability should be suitable for the intended operation considering fire detection sensors, liner materials, etc.

B. Fire Protection. An analysis or tests should be conducted to show, considering approved maximum diversion in still air (including an allowance for 15-minute holding and/or approach and land), that the ability of the system to suppress or extinguish fires is adequate to ensure safe flight and landing at a suitable airport.

(vii) *Communication, Navigation, and Basic Flight Instruments (Attitude, Airspeed, Attitude and Heading)*. It should be shown that, under all combinations of propulsion and/or airframe system failures which are not extremely improbable, reliable communication, sufficiently accurate navigation, basic flight instruments, and any route and destination guidance needed to comply with contingency procedures for intended operation will be available to each pilot.

(viii) *Cabin Pressurization*. A review of failsafe and redundancy features should show that the loss of cabin pressure is improbable under single engine operating conditions. DGCA approved airplane performance data should be available to verify the ability to continue safe flight and landing after loss of pressure and subsequent operation at a lower altitude.

(ix) *Cockpit and Cabin Environment*. It should be shown that an adequate cockpit and cabin environment is preserved following all combinations of propulsion and electrical system failures which are not shown to be extremely improbable.

(d) Assessment of Failure Conditions. In assessing the failsafe features and effects of failure conditions, account should be taken of:

(i) the variations in the performance of the system, the probability of the failure(s), the complexity of the crew action, and the type and frequency of the relevant crew training.

(ii) factors alleviating or aggravating the direct effects of the initial failure condition, including consequential or related conditions existing within the airplane which may affect the ability of the crew to deal with direct effects, such as the presence of smoke, airplane accelerations, interruption of air-to-ground communication, cabin pressurization problems, etc.

(iii) a flight test should be conducted by the manufacturer and witnessed by the Authority to validate expected airplane flying qualities and performance considering engine failure, electrical power losses, etc. The. adequacy of remaining airplane systems and performance and flight crew ability to deal with the emergency considering remaining flight deck information will be assessed in all phases of flight and anticipated operating conditions. Depending on the scope, content, and review, by the responsible Authority, of the manufacturer's data base, this flight test could be used as a means for approving the basic aerodynamic and engine performance data used to establish the airplane performance identified in Section 8.(5)(f).

(e) Authorities Airplane Assessment Report. The assessment of the reliability of propulsion and airframe systems for a particular airframe-engine combination will be contained in an Authorities Airplane Assessment Report. Following approval of the report, the propulsion and airframe system recommendations will be included in an Authorities approved document that establishes the CMP standard requirements for the candidate airplane. This document will then be referenced in the Operations Specification and the Airplane Flight Manual.

(f) ETOPS Type Design Approval. Upon satisfactory completion of the airplane evaluation through an engineering inspection and test program consistent with the type certification procedures of the Authorities Regulations and sufficient in-service experience data:

(i) the type design approval will be reflected in the approved AFM or supplement, and Type Certification Data Sheet or Supplemental Type Certificate which contain directly or by reference the following pertinent information, as applicable:

A. special limitations (if necessary), including any limitations associated with a maximum diversion time established in accordance with Section 6.(c)(i).
B. markings or placards (if required);
C. revision to the performance section in accordance with Section 8.(5)(f);
D. the airborne equipment, installation, and flight crew procedures required for extended range operations;
E. description or reference to a document containing the approved airplane configuration CMP standard;
F. a statement to the effect that:

"The type design reliability and performance of this airframe-engine combination has been evaluated in accordance with applicable regulations and found suitable for (state maximum diversion time) extended range operations with the incorporation of the approved airplane configuration CMP standard. This finding does not constitute approval to conduct extended range operations."

(g) Type Design Change Process. The Authority responsible for the certification of the type design will include the consideration of extended range operation in its normal monitoring and design change approval functions. Any significant problems which adversely effect extended range operation will be corrected. Modifications or maintenance actions to achieve or maintain the reliability objective of extended range operations will be incorporated into the type design CMP standard document. The Authority will normally coordinate this action with the affected industry. The Airworthiness Directive process will be utilized as necessary to effect a CMP standard change. The current CMP standard will be reflected in Part D of each ETOPS operator's Operations Specifications.

(h) Continued Airworthiness. The type design CMP standard which establishes the suitability of an airplane for extended range operations defines the minimum standards for the operation. Incorporation of additional modifications or maintenance actions generated by an operator or manufacturer to enhance or maintain the continued airworthiness of the airplane may be made through the normal approval process. The operator or manufacturer (as appropriate) should thoroughly evaluate such changes to ensure that they do not adversely effect reliability or conflict with requirements for extended range approval.

7. IN-SERVICE EXPERIENCE.

(1) In establishing the suitability of a type design in accordance with Section 6 of this Standard and as a prerequisite to obtaining any operational approval, in accordance with the criteria of Section 8 of this Standard, it should be shown that an acceptable level of propulsion system reliability has been achieved in service by the world fleet for that particular airframe-engine combination. The candidate operator needs also to obtain sufficient maintenance and operation familiarity with the particular airframe-engine combination in question.

(2) Prior to the type design approval, Section 6., it should be shown that the world fleet of the particular airframe-engine combination for which approval is sought can or has achieved, as determined by the Authority (See Attachment 1), an acceptable and reasonably stable level of single propulsion system in-flight shutdown (IFSD) rate and airframe system reliability. Engineering and operational judgment applied in accordance with the guidance outlined in Attachment 1 will then be used to determine that the IFSD rate objective for all independent causes can be achieved. This assessment is an integral part of the determination in Section 6.(b)(ii) for type design approval. This determination of propulsion system reliability is derived from a world fleet data base containing all in-flight shutdown events and significant engine reliability problems, in accordance with requirements of Attachment 1. This determination will take due account of the approved maximum diversion time, rectification of identified system problems, as well as events where in-flight starting capability may be degraded.

(3) Each operator requesting approval to conduct extended range operations should have operational in-service experience appropriate to the operation proposed. Subsections 7. (3)(a), (b) and (c) contain guidelines for requisite in-service experience. These guidelines may be reduced or increased following review and concurrence on a case-by-case basis by the DGCA. Any reduction or increase in in-service experience guidelines will be based on an evaluation of the operator's ability and competence to achieve the necessary reliability for the particular airframe-engine combination in extended range operations. For example, a reduction in in-service experience may be considered for an operator who can show extensive in-service experience with a related engine on another airplane which has achieved acceptable reliability. In contrast, an increase in in-service experience may be considered for those cases where heavy maintenance has yet to occur and/or abnormally low number of takeoffs have occurred.

(a) 75-Minute Operation. Consideration may be given to the approval of 75-minute extended range operations for operators with minimal or no in-service experience with the airframe-engine combination. This determination considers such factors as the proposed area of operations, the operator's demonstrated ability to, successfully introduce airplanes into operations, and the quality of the proposed maintenance and operations programs.

(b) 120-Minute Operation. Each operator requesting approval to conduct extended range operations with a maximum diversion time of 120 minutes (in still air) should have 12 consecutive months of operational in-service experience with the specified airframe-engine combination. In-service experience guidelines may be increased or decreased by the DGCA as noted in Section 7.(3).

(c) 180-Minute Operation. Each operator requesting approval to conduct extended range operations with a maximum diversion time of 180 minutes (in still air) should have previously gained 12 consecutive months of operational in-service experience with the specified airframe-engine combination in conducting 120-minute extended range operations. In-service experience guidelines may be reduced or increased by the DGCA, as noted in Section 7.(3). Likewise, the substitution of in-service experience which is equivalent to the actual conduct of 120-minute ETOPS operations will also be established by the DGCA, on a case-by-case basis.

8. OPERATIONAL APPROVAL CONSIDERATIONS.

(1) Sections 8.(2) through (9) detail the criteria for operational approval of extended range operations with a maximum diversion time of 120 minutes to an enroute alternate (at single engine inoperative cruise speed in still air). Attachments 4 and 5 serve two functions; first, they provide expanded explanation of the elements contained in this Standard and second, they serve to differentiate the criteria for approval of operations less than 120 minutes (75 minutes) and beyond 120 minutes (180 minutes). For approval of 75-minute operations, only certain requirements of this Standard apply. (See Attachment 5.)

(2) Requesting Approval. Any operator requesting approval under LARs Part VI, Subpart 2, Section 602.164 for extended range operations with two engine airplanes (after providing an acceptable evaluation of the considerations in Sections 6. and 7.) should submit the requests, with the required supporting data, to the DGCA at least 60 days prior to the proposed start of extended range operation with the specific airframe-engine combination. In considering an application from an operator to conduct extended range operations, an assessment should be made of the operator's overall safety record, past performance, flight crew training, and maintenance programs. The data provided with the request should substantiate the operator's ability and competence to safely conduct and support these operations and should include the means used to satisfy the considerations outlined in this Section. (Any reliability assessment obtained, either through analysis or service experience, should be used as guidance in support of operational judgments regarding the suitability of the intended operation.)

(3) Assessment of the Operator's Propulsion System Reliability. Following the accumulation of adequate operating experience by the world fleet of the specified airframe-engine combination and the establishment of an IFSD rate objective in accordance with Attachment 1 for use in ensuring the propulsion system reliability necessary for extended range operations, an assessment should be made of the applicant's ability to achieve and maintain this level of propulsion system reliability. This assessment should include trend comparisons of the operator's data with other operators as well as the world fleet average values, and the application of a qualitative judgment that considers all of the relevant factors. The operator's past record of propulsion system reliability with related types of power units should also be reviewed, as well as its record of achieved systems reliability with the airframe-engine combination for which authorization is sought to conduct extended range operations.

(4) Engineering Modifications and Maintenance Program Considerations. Although these considerations are normally part of the operator's continuing airworthiness program, the maintenance and reliability program may need to be supplemented in consideration of the special requirements of extended range operation (Attachment 4). The following items, as part of the operator's program, will be reviewed to ensure that they are adequate for extended range operations:

- (a) <u>Engineering Modifications</u>. The operator should provide to the DGCA all titles and numbers of all modifications, additions, and changes which were made in order to substantiate the incorporation of the CMP standard in the airplanes used in extended range operation.
- (b) <u>Maintenance Procedures</u>. Following approval of the changes in the maintenance and training procedures, substantial changes to maintenance and training procedures, practices, or limitations established to qualify for extended range operations should be submitted to the certificate holding district office 60 days before such changes may be adopted.
- (c) <u>Reliability Reporting</u>. The reliability reporting program as supplemented and approved, should be implemented prior to and continued after approval of extended range operation. Data from this process should result in a suitable summary of problem events, reliability trends and corrective actions and be provided regularly to the DGCA. Attachment 4 contains

additional information concerning propulsion and airframe system reliability monitoring and reporting.

(d) approved modifications and inspections which would maintain the reliability objective for the propulsion and airframe systems as a consequence of Airworthiness Directive (AD) actions and revised CMP standards should be promptly implemented. Other recommendations made by the engine and airframe manufacturers should also be considered for prompt implementation. This would apply to both installed and spare parts.

(e) procedures and centralized control process should be established which would preclude an airplane being dispatched for extended range operation after propulsion system shutdown or primary airframe system failure on a previous flight, or significant adverse trends in system performance, without appropriate corrective action having been taken. Confirmation of such action as being appropriate, in some cases, may require the successful completion of one or more nonrevenue or non-ETOP revenue flights (as appropriate) prior to dispatch on an extended range operation.

(f) the program used to ensure that the airborne equipment will continue to be maintained at the level of performance and reliability necessary for extended range operations.

(g) engine condition monitoring program.

(h) engine oil consumption monitoring program.

(5) Flight Dispatch Considerations.

(a) General. The flight dispatch considerations specified in this section are in addition to, or amplify, the requirements contained in the LARs and specifically apply to extended range operations. Although many of the considerations in this Standard are currently incorporated into approved programs for other airplanes or route structures, the unique nature of extended range operations with two engine airplanes necessitates a reexamination of these operations to ensure that the approved programs are adequate for this purpose.

(b) Master Minimum Equipment List (MMEL). System redundancy levels appropriate to extended range operations should be reflected in the MMEL. An operator's MEL may be more restrictive than the MMEL considering the kind of ER operation proposed and equipment and service problems unique to the operator. Systems considered to have a fundamental influence on flight safety may include, but are not limited to the following:

(i) electrical, including battery;
(ii) hydraulic;
(iii) pneumatic;
(iv) flight instrumentation;
(v) fuel;
(vi) flight control;
(vii) ice protection;
(viii) engine start and ignition;
(ix) propulsion system instruments;
(x) navigation and communications;
(xi) auxiliary power units;
(xii) air conditioning and pressurization;
(xiii) cargo fire suppression;
(xiv) emergency equipment; and
(xv) any other equipment necessary for extended range operations.

(c) Communication and Navigation Facilities. An airplane should not be dispatched on an extended range operation unless:

(i) communications facilities are available to provide under normal conditions, of propagation at the normal one engine inoperative cruise altitudes, reliable two-way voice communications between the airplane and the appropriate air traffic control unit over the planned route of flight and the routes to any suitable alternate to be used in the event of diversion;

(ii) nonvisual ground navigation aids are available and located so as to provide, taking account of the navigation equipment installed in the airplane, the navigation accuracy necessary for the planned route and altitude of flight, and the routes to any alternate and altitudes to be used in the event of an engine shutdown; and

(iii) visual and nonvisual aids are available at the specified alternates for the authorized types of approaches and operation minima.

(d) Fuel and Oil Supply.

(i) *General*. An airplane should not be dispatched on an extended range operation unless it carries sufficient fuel and oil to meet the requirements of the LARs, and any additional fuel that may be determined in accordance with Subsection 8.(5)(d)(ii). In computing fuel requirements, advantage may be taken of driftdown and at least the following should be considered as applicable:

A. current forecast winds and meteorological conditions along the expected flight path at one engine inoperative cruising altitude and throughout the approach and landing;

B. any necessary operation of ice protection systems and performance loss due to ice accretion on the unprotected surfaces of the airplane;

C. any necessary operation of auxiliary power units;

D. loss of airplane pressurization and air conditioning; consideration should be given to flying at an altitude meeting oxygen requirements in the event of loss of pressurization;

E. an approach followed by a missed approach and a subsequent approach and landing;

F. navigational accuracy necessary; and

G. any known Air Traffic Control (ATC) constraints.

(ii) *Critical Fuel Reserves*. In establishing the critical fuel reserves, the applicant is to determine the fuel necessary to fly to the most critical point and execute a diversion to a suitable alternate under the conditions outlined in Subsections 8.(5)(d)(iii) - the Critical Fuel Scenario. These critical fuel reserves should be compared to the normal LARs requirements for the flight. If it is determined by this comparison that the fuel to complete the critical fuel scenario exceeds the fuel that would be on board at the most critical point, as determined by LARs requirements, additional fuel should be included to the extent necessary to safely complete the critical fuel scenario. In consideration of the items listed in Subsection 8.(5)(d)(i)**,** the critical fuel scenario should allow for: a contingency figure of 5 percent added to the calculated fuel burn from the critical point to allow for errors in wind forecasts, a 5 percent penalty in fuel mileage /**/, any Configuration Deviation List items, both airframe and engine anti-icing; and account for ice accumulation on unprotected surfaces if icing conditions are likely to be encountered during the diversion. If the APU is a required power source, then its fuel consumption should be accounted for during the appropriate phase(s) of flight. (/**/ - In lieu of an applicant's established value for in-service deterioration in cruise fuel mileage.)

(iii) *Critical Fuel Scenario*. The following describes a scenario for a diversion at the most critical point. The applicant should confirm the scenario to be used in determining the critical fuel reserve necessary is operationally the most critical considering both time and airplane configuration (for example, 2 engine versus 1 engine at 10,000 feet, nonstandard airplane configuration not shown to be extremely improbable, Section 6.(c)(ii)(B.).

A. at the critical point, consider simultaneous failure of an engine and the pressurization system (critical point based on time to a suitable alternate at the approved one engine inoperative cruise speed).

B. immediate descent to and continued cruise at 10,000 feet at the approved one engine inoperative cruise speed or continued cruise above 10,000 feet if the airplane is equipped with sufficient supplemental oxygen in accordance with the LARs.

C. upon approaching destination, descent to 1,500 feet above destination, hold for 15 minutes, initiation of an approach followed by a missed approach and then execution of a normal approach and landing.

(e) Alternate Airports. An airplane should not be dispatched on an extended range operation unless the required takeoff, destination and alternate airports, including suitable enroute alternate airports to be used in the event of engine shutdown or airplane system failure(s) which require a diversion, are listed in the cockpit documentation (for example, computerized flight plan). Suitable enroute alternates should also be identified and listed in the dispatch release for all cases where the planned route of flight contains a point more than one hour flying time at the one engine inoperative speed from an adequate airport. Since these suitable enroute alternates serve a different purpose than the destination alternate airport and would normally be used only in the event of an engine failure or the loss of primary airplane systems, an airport should not be listed as a suitable enroute alternate unless:

(i) the landing distances required as specified in the AFM for the altitude of the airport, for the runway expected to be used, taking into account wind conditions, runway surface conditions, and airplane handling characteristics, permit the airplane to be stopped within the landing distance available as declared by the airport authorities and computed in accordance with the LARs.

(ii) the airport services and facilities are adequate for the applicant operator's approved approach procedures) and operating minima for the runway expected to be used; and

(iii) the latest available forecast weather conditions for a period commencing one hour before the established earliest time of landing and ending one hour after the established latest time of landing at that airport, equals or exceeds the authorized weather minima for enroute alternate airports in Attachment 3. In addition, for the period commencing one hour before the established earliest time of landing, and ending one hour after the established latest time of landing at that airport, the forecast crosswind component, including gusts, for the landing runway expected to be used should be less than the maximum permitted crosswind for landing.

(iv) during the course of the flight, the flight crew should be informed of any significant changes in conditions at designated enroute alternates. Prior to a 120-minute extended range flight proceeding beyond the extended range entry point, the forecast weather for the time periods established in Subsection 8.(5)(e)(iii), landing distances, and airport services and facilities at designated enroute alternates should be evaluated. If any conditions are identified (such as weather forecast below landing minima) which would preclude safe approach and landing, then the pilot should be notified and an acceptable alternates) selected, where safe approach and landing can be made.

(f) Airplane Performance Data. No airplane should be dispatched on an extended range flight unless the operator's Operations Manual contains sufficient data to support the critical fuel reserve and area of operations calculation. The following data should be based on approved (See Section 6.(d)(iii) information provided or referenced in the Airplane Flight Manual.

(i) detailed one engine inoperative performance data including fuel flow for standard and nonstandard atmospheric conditions and as a function of airspeed and power setting, where appropriate, covering

A. driftdown (includes net performance);
B. cruise altitude coverage including 10,000 feet;
C. holding;
D. altitude capability (includes net performance); and
E. missed approach.

(ii) detailed all engine operating performance data, including nominal fuel flow data, for standard and nonstandard atmospheric conditions and as a function of airspeed and power setting, where appropriate, covering:
A. cruise (altitude coverage including 10,000 feet); and
B. holding.

(iii) details of any other conditions relevant to extended range operations which can cause significant deterioration of performance, such as ice accumulation on the unprotected surfaces of the airplane, RAM Air Turbine (RAT) deployment, thrust reverser deployment, etc.

(iv) the altitudes, airspeeds, thrust settings, and fuel flow used in establishing the ETOPS area of operations for each airframe-engine combination must be used in showing the corresponding terrain and obstruction clearances in accordance with the LARs.

(6) Flight Crew Training, Evaluation, and Operating Manuals.

(a) <u>Adequacy of Flight Crew Training and Operating Manuals</u>. The DGCA will review in-service experience of critical and essential airplane systems. The review will include system reliability levels and individual event circumstances, including crew actions taken in response to equipment failures or unavailabilities. The purpose of the review will be to verify the adequacy of information provided in training programs and operating manuals. The aviation industry should provide information for and participate in these reviews. The DGCA will use the information resulting from these reviews to modify or update flight crew training programs, operating manuals, and checklists, as necessary.

(b) <u>Flight Crew Training and Evaluation Program</u>. The operator's training program in respect to extended range operations should provide training for flight crewmembers followed by subsequent evaluations and proficiency checks in the following areas:

(i) performance.
A. flight planning, including all contingencies.
B. flight performance progress monitoring.

(ii) procedures.
A. diversion procedures.
B. use of appropriate navigation and communication systems.
C. abnormal and emergency procedures to be followed in the event of foreseeable failures, including:
❖ procedures for single and multiple failures in flight that would precipitate go/no go and diversion decisions.
❖ operational restrictions associated with these failures including any applicable MEL considerations.
❖ procedures for air start of the propulsion systems, including the APU, if required.
❖ crew incapacitation.
D. use of emergency equipment including protective breathing and ditching equipment.
E. procedures to be followed in the event that there is a change in conditions at designated enroute alternates which would preclude safe approach and landing.
F. understanding and effective use of approved additional or modified equipment required for extended range operations.
G. <u>Fuel Management</u>. Flight crew should be trained on the fuel management procedures to be followed during the enroute portion of the flight. These procedures should provide for an independent cross-check of fuel quantity indicators. For example, fuel flows could be used to calculate fuel burned and compared to indicated fuel remaining.

(c) <u>ETOPS Check Airman</u>. The operator should designate specific ETOPS check airman. The objective of the ETOPS check airman program should be to ensure standardized flight crew practices and procedures and also to emphasize the special nature of ETOPS operations. Only airmen with a demonstrated understanding of the unique requirements of ETOPS should be designated as a check airman.

(7) Operational Limitations.

(a) Area of Operation.

(i) an operator may be authorized to conduct extended range operations within an area where the diversion time at any point along the proposed route of flight to an adequate airport is 75, 120 or 180 minutes at the approved one engine cruise speed (under standard conditions in still air). Attachments 1, 4, and 5 provide criteria for operation at the different diversion times.

(ii) the area which meets the considerations in Section 8.(7)(a) may be approved for extended range operations with two engine airplanes and should be specified in the operations specifications as the authorized area of operations.

(b) Flight Dispatch Limitation. The flight dispatch limitation should specify the maximum diversion time from a suitable airport an operator can conduct a particular extended range operation. The maximum diversion time at the approved one engine inoperative cruise speed (under standard conditions in still air) should not be any greater than the value established by Subsection 8.(7)(a)(i)**.**

(i) *Use of Maximum Diversion Time*. The flight dispatch considerations should ensure that extended range operation is limited to flight plan routes where the approved maximum diversion time to suitable airports can be met. Operators should provide for:

A. compliance with the LARs where, upon occurrence of an in-flight shutdown of an engine, the pilot should promptly initiate diversion to fly to and land at the nearest airport, in point of time, determined to be suitable by the flight crew.

B. a practice to be established such that in the event of a single or multiple primary system failure, the pilot will initiate the diversion procedure to fly and land at the nearest suitable airport, unless it has been demonstrated that no substantial degradation of safety results from continuation of the planned flight.

(ii) *Criteria for Maximum Diversion Times*. The criteria for different maximum diversion times are detailed in Attachments 1, 4, and 5.

(c) contingency procedures should not be interpreted in any way which prejudices the final authority and responsibility of the pilot in command for the safe operation of the airplane.

(8) Operations Specifications.

(a) an operator's two engine airplane should not be operated on an extended range flight unless authorized by operations specifications approval (both maintenance and operations).

(b) operations specifications for extended range operations should specifically include provisions covering at least the following:

(i) Part D should define the particular airframe-engine combinations, including the current approved CMP standard required for extended range operation as normally identified in the AFM (Section 6.(f).

(ii) authorized area of operation.

(iii) minimum altitudes to be flown along planned and diversionary routes.

(iv) the maximum diversion time, at the approved one engine inoperative cruise speed (under standard conditions in still air), that any point on the route the airplane may be from a suitable airport for landing.

(v) airports authorized for use, including alternates, and associated instrument approaches and operating minima.

(vi) the approved maintenance and reliability program (reference Attachment 4) for extended range operations including those items specified in the type design approved CMP standard.

(vii) identification of those airplanes designated for extended range operation by make and model as well as serial and registration numbers.

(viii) Airplane Performance Reference.

(9) Operational Validation Flight. The operator should demonstrate, by means of a DGCA witnessed validation flight using the specified airframe-engine combination, that it has the competence and capability to safely conduct and adequately support the intended operation. (This is in addition to the flight test required for type design approval in Section 6.(d)(iii). The Chief of Flight Safety, will determine the conditions for each operator's validation flight following a review on a case-by-case basis of the operator's experience and the proposed operation. The following emergency conditions should be demonstrated during the validation flight unless successful demonstration of these conditions has been witnessed by the DGCA in an acceptable simulation prior to the validation flight:

(a) total loss of thrust of one engine; and total loss of engine generated electrical power;

OR,

(b) any other condition considered to be more critical in terms of airworthiness, crew workload, or performance risk.

(10) Extended Range Operations Approval. Following a type design approval for extended range operations in accordance with Section 6. and satisfactory application of the criteria in paragraphs 9 and 10 and prior to the issuance of operations specifications, the operator's application, as well as, the DGCA principal inspectors' (Principal Maintenance Inspector, Principal Avionics Inspector, Principal Operations Inspector) recommendations and supporting data should be forwarded to the Chief of Flight Safety, for review and concurrence. Following the review and concurrence by the Chief of Flight Safety, the operational validation flight should be conducted in accordance with any additional guidance specified in the review and concurrence. When the operational validation flight has been evaluated and found acceptable, an applicant may be authorized to conduct extended range operations with the specified airframe-engine combination. Approval to conduct ETOP is made by the issuance of operations specifications containing appropriate limitations.

9. CONTINUING SURVEILLANCE.

The fleet average IFSD rate for the specified airframe-engine combination will continue to be monitored in accordance with Attachments 1 and 4. As with all other operations, the DGCA should also monitor all aspects of the extended range operations it has authorized to ensure that the levels of reliability achieved in extended range operations remain at the necessary levels as provided in Attachment 1, and that the operation continues to be conducted safely. In the event that an acceptable level of reliability is not maintained, significant adverse trends exist, or if significant deficiencies are detected in the type design or the conduct of the ETOPS operation, the DGCA will initiate a special evaluation, impose operational restriction, if necessary, and stipulate corrective action for the operator to adopt to resolve the problems in a timely manner. The DGCA should alert the Type Certification Office when a special evaluation is initiated and provide for their participation.

ATTACHMENT 1.
PROPULSION SYSTEM RELIABILITY ASSESSMENT

1. ASSESSMENT PROCESS.

(1) In order to establish if a particular airframe-engine combination has satisfied the current propulsion system reliability requirements for extended range operations, thorough assessment will be conducted by an Authorities specialists, the Propulsion System Reliability Assessment Board (PSRAB) utilizing all the pertinent propulsion system data and information available (includes the APU, if required). Engineering and operational judgment supported by the relevant statistics will be used to determine current propulsion system reliability. The findings of the specialist group will be included in the Authorities Airplane Assessment Report.

(2) Service Experience. To provide a reasonable indication of airplane propulsion system reliability trends and to reveal problem areas, a certain amount of service experience will be required. In general, extended range airframe-engine combination reliability assessments concern two major categories; those supporting up to 120 minutes maximum diversion time operations and those support operations beyond 120 minutes maximum diversion times. A special case-by-case operational approval may be granted for 75-minute diversion routes and require limited evaluation of service experience at the time of the application.

(a) <u>Operations up to 120 Minutes</u>. Normally, accumulation of at least 250,000 engine hours in the world fleet will be necessary before the assessment process can produce meaningful results. This number of hours may be reduced if adequate compensating factors are identified which give a reasonable equivalent data base as established by the PSRAB. Where experience on another airplane is applicable to a candidate airplane, a significant portion of the 250,000 hours experience should normally be obtained by the candidate airplane. In the event that a particular engine is derived from an existing engine, the required operational experience is subject to establishing the degree of hardware commonality and operating similarities.

(b) <u>Operations beyond 120 Minutes (180 minutes)</u>. Suitability to operate the airplane beyond 120 minutes will not be considered until operational experience in 120-minute extended range service clearly indicates further credit is appropriate. This would generally include at least one year of service experience with an ETOP configured fleet at 120-minute operation with a corresponding high level of demonstrated propulsion system reliability.

(c) <u>75-Minute Operation Authorization</u>. In this category, service experience of the airframe-engine combination may be less than the 250,000 hours as provided in Subsection (a). It must be shown that sufficient favorable experience has been accumulated, demonstrating a level of reliability appropriate for 75-minute extended range operation. As detailed earlier in the Standard, a particular operator may receive a special 75-minute authorization following review on a case-by-case basis by the DGCA.

(3) Reliability Data Base. To adequately assess propulsion system reliability, consideration of the proposed maximum diversion time, for extended range type design approval, certain world fleet data and information are required. The PSRAB intends to maximize the use of existing sources and kinds of data generally available; however, additional data may be required in certain cases. In support of applications for extended range type design approval, data should be provided from various sources to ensure completeness; that is, engine manufacturer, operator, and airplane manufacturer. Data so provided should include all event descriptions, qualifications, and any pertinent details necessary to help determine the impact on propulsion system reliability. These data should include:

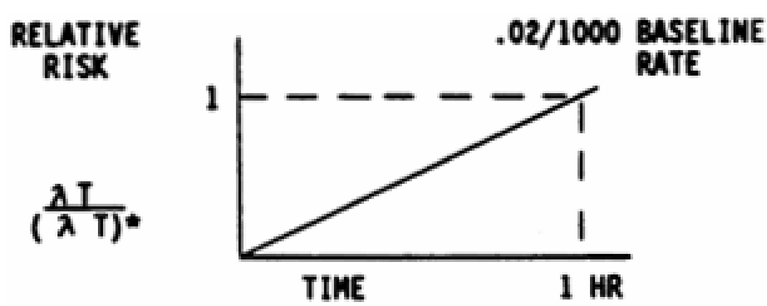
(a) a list of all engine shutdown events both ground and in flight for all causes (excluding normal training events) including flameout. The list should provide identification (engine and airplane model and serial number), engine configuration and modification history, engine position, circumstances leading up to the event, phase of flight or ground operation, weather/environmental conditions, and reason for shutdown. In addition, similar information on should be provided for all occurrences where control or desired thrust level was not attained.

(b) unscheduled engine removal rate (accumulated 6 and 12 months), removal summary, time history of removal rate and primary causes for unscheduled engine removal.
(c) dispatch delays, cancellations, aborted takeoffs (includes those induced by maintenance or crew error) and enroute diversions chargeable to the propulsion system.
(d) total engine hours and cycles and engine hour population (age distribution).
(e) mean time between failure of propulsion system components that affect reliability.
(f) IFSD rate based on a 6 and 12-month rolling average.
(g) additional data as specified by the PSRAB.

(4) Risk Management and the Risk Model. In order to assure that the risks of increased diversion times are acceptable, a risk model has been constructed. The risk model is based upon the known service records of an established large fleet of twin engine civil transport turbofan powered airplane. The service experience of this "base fleet" has been very satisfactory and reflective of a high level of safety in its propulsion systems. It has achieved an average in-flight shutdown rate of approximately 0.02/1000 hours for a 10-year period while flying predominately on routes conforming to the requirements of the LARs (that is, flight paths within 60 minutes flying time from a adequate airport).

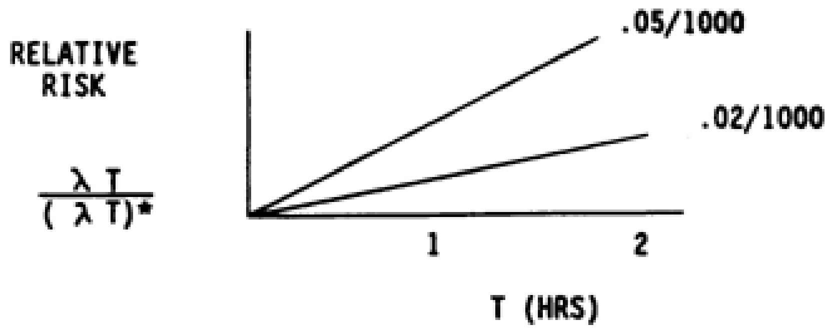
(a) the risk of engine failure during a single engine diversion event is directly related to the diversion flight time and the propulsion system reliability or IFSD rate. This assumes the failure of the first engine, which causes the diversion, is unrelated to the probability of failure of the second engine during the diversion. The product of IFSD rate and diversion time can be designated as a risk factor for the diversion and identified as (lT). For the base fleet of 0.02/1000 IFSD rate and 60 minutes maximum diversion, (lT) would be (0.02/1000) * (60). Identifying this base fleet risk factor as (lT)*, other combinations of IFSD rates and diversion times can be ratioed to this base risk factor to determine ETOP relative risk, (lT)/(lT)*. For ETOP diversion times of 60 minutes and IFSD rates of 0.02/1000, the relative risk factor equals 1.0. This relationship is shown in Figure 1.

FIGURE 1



(b) extending this model to a family of IFSD rates and diversion times, Figure 2 depicts the relationship between diversion time, IFSD rate, and risk relative to the base fleet during the diversion:

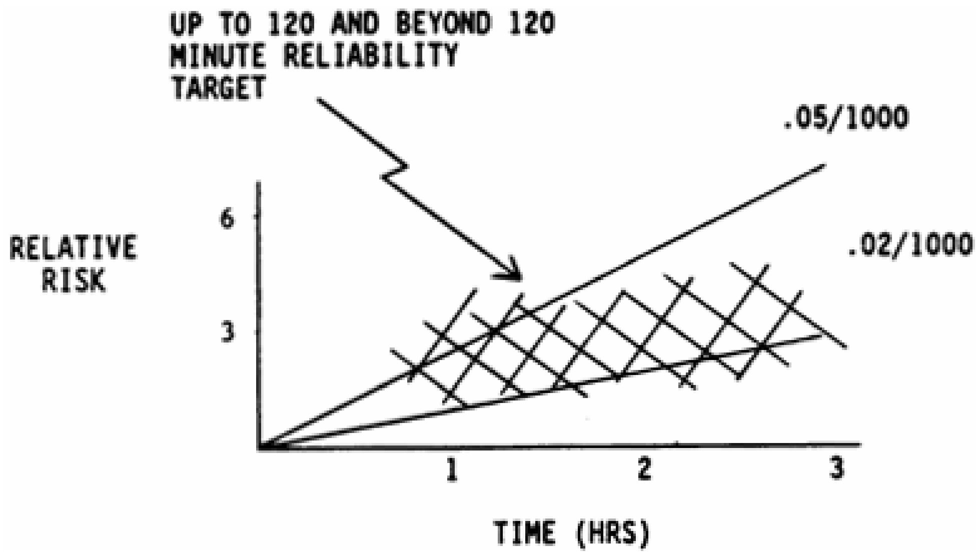
FIGURE 2



2. RELIABILITY LEVELS.

(1) As discussed in Section 1., in order to ensure that risks associated with increased diversion times are acceptable, reliabilities of ETOP propulsion systems must be shown to approach or equal those of the highly reliable base fleet of 0.02/1000 and the appropriate operational and maintenance requirements implemented (see Figure 3).
(2) Operations up to 120 Minutes. The overall fleet reliability should approach or achieve that of the highly reliable base fleet following incorporation of the appropriate configuration maintenance and operational requirements. Propulsion system maturity rates have suggested that incorporation of propulsion system improvements following review of 250,000 hours service experience have yielded an approximate 0.03/1000 improvement in IFSD reliability. Given the IFSD objective of approximately 0.02/1000 hours and the potential improvement rate of 0.03/1000 hours, the extended range operation start threshold can be established at approximately 0.05/1000 hours (see Figure 3). It should be noted that this is threshold and specific circumstances in fleet reliability data such as confidence in problem resolution, types of failures, etc., could be relevant in establishing a start threshold other than 0.05/1000.
(3) Operations Beyond 120 Minutes. The overall fleet reliability should achieve that of the highly reliable base fleet prior to approval. Only those airframe-engine combinations exhibiting the highest levels of overall reliability will be found satisfactory for this type of operation (see Figure 3). In addition, it will normally be a necessary prerequisite for these airplanes to have at least one year of satisfactory ETOP service involving 120 minutes or less operation under conditions of this Standard.
(4) Reliability Targets Summary. Utilizing the risk model, it can be shown that when progressing from the entry level required reliability to the target level reliability (achieved for 180 minutes), the overall risk is not adversely impacted considering respective increases in diversion time. (See Figure 3.)

FIGURE 3



(5) Risk Model Corroboration with Analysis. As a check of the conservatism for reliability levels identified by the risk model, an analysis can be performed which, given certain assumptions, can corroborate the model targets and identify areas of importance where ongoing design, operation, and maintenance vigilance must be continued. In the construction of such an analysis, it is assumed that the probability of total thrust loss on any given twin engine airplane flight is made up of those engine failure mechanisms which are independent events (for example, left engine failure independent from right engine failure) and these engine failure events which are related to a common source (for example, left and right engines fail as a result of a common or related event). This may be shown as:

P(TT) = P(TI) + P(TC)

P(TT) = Total probability of complete thrust loss on any given flight.
P(TI) = Probability of complete thrust loss on flight due to independent causes.
P(TC) = Probability of complete thrust loss on flight due to common causes.

In determination of the probability of total thrust loss due to independent causes (P(TI)), International Civil Aviation Organization Report No. AN-WP/5593 titled "Extended Range Operation of Twin Engine Commercial Air Transport Airplanes," dated February 15, 1984, contains an analytical assessment of in-flight shutdown rate, flight time, and diversion time as equated to an observed assessment of commercial transport aircraft accidents worldwide for a recent several year period. This relationship, as derived in this study, is shown as:

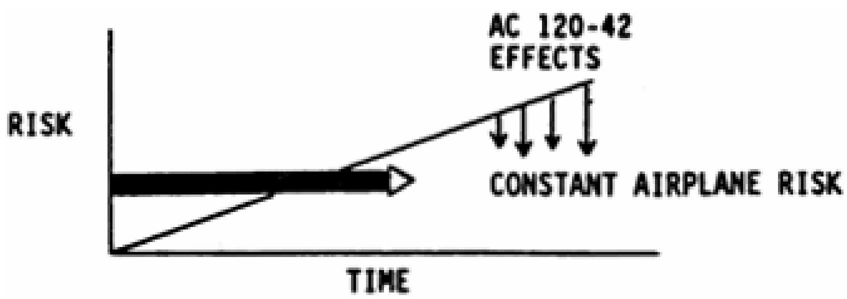
IFSD Rate = sqr rt ((10^8 * (0.6 + 0.4T))/(T * Y)) * (2)

Where: T = intended duration of flight
Y = diversion time

As an example, for a flight of seven hours and a diversion time of two hours, equation (2) identifies an IFSD of 0.05/1000 as necessary, while for a diversion time of three hours, 0.04/1000 is necessary to provide a level of probability supporting the reference world accident rate. As can be seen, the risk model identified in Section 1.(4) of this Attachment requires an achieved IFSD rate of one half that calculated using the ICAO assessment. It is believed essential that the ETOPS IFSD rate provided by Section 1.(4) of this Attachment be required considering the influence of common cause failure mechanisms (PTC) as well as the uncertainties associated with assumption identified in the ICAO study.

Although there has been no suitable analytical models developed for assessment of the probability of complete thrust loss in flight due to common cause events (PTC), it is considered that by establishment of highly reliable propulsion systems through achievement of low in-flight shutdown rates, continual engine and airplane design monitoring for those potential common mode service difficulties, and vigilant maintenance and operational practices as identified in Attachments 4 and 5, risks associated with total thrust loss can be maintained at acceptable low levels (Figure 4).

FIGURE 4



(6) Propulsion System Approval Considerations. The determination that a propulsion system is suitable per the assessment considerations of either of the two major categories is provided by the PSRAB. Table 1 identifies the constituent elements of the two major categories of approval considerations.

TABLE 1.
PROPULSION SYSTEM APPROVAL CONSIDERATIONS

KEY: A = Up to 120 minute operation
B = Greater than 120 minute operation

A = 250,000 engine hours (significant portion with experience candidate airplane).
B = same plus at least additional one year with the approved extended range configured fleet.

A = achieve an IFSD of approximately 0.05/1000 (the objective is continuing improvement towards a rate of 0.02/1000 hours).
B = achieve and maintain an IFSD of approximately .02/1000 hours.

A = Periodic review of propulsion system data and service experience, and revise the CMP standard as appropriate.
B = same - schedule for incorporation of CMP standards requirements may be shorter.

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3. ENGINEERING ASSESSMENT.

(1) The methodology to be used by an Authority in determining adequate propulsion system reliability will be a problem oriented approach using failsafe concepts, an assessment of the maturation of the propulsion system, the achieved level of IFSD rate, engineering and operational judgment and reliability analysis, and will consist of:

(2) An analysis, on a case-by-case basis, of all significant failures, defects and malfunctions experienced in service (or during testing) for the airframe-engine combination being addressed. Significant failures are principally those causing or resulting in in-flight shutdown or flameout of the engine(s), but may also include unusual ground failures, uncommanded thrust reduction, and/or unscheduled removal of engines from the airplane. In making the assessment, consideration will be given to the following:

- (a) the type of engine, previous experience, similarity in hardware and operating characteristics with other engines, and the engine operating rating limit to be used with one-engine shutdown.
- (b) the trends in cumulative and 6 and 12-month rolling average, updated quarterly, of in-flight shutdown rates versus propulsion system flight hours and cycles.
- (c) the effect of corrective modifications, maintenance, etc., on the possible future reliability of the propulsion system.
- (d) maintenance actions recommended and performed and their effect on engine and APU failure rates.
- (e) the accumulation of operational experience which covers the range of environmental limitations likely to be encountered.
- (f) intended maximum flight duration and approved maximum diversion time.

(3) An assessment of the corrective actions taken for each problem identified with the objective of verifying that the action is sufficient to correct the deficiency.

(4) When each identified significant deficiency has a corresponding Authorities approved corrective action and when all corrective actions are satisfactorily incorporated and verified, the PSRAB determines that an acceptable level of reliability can be achieved. Statistical corroboration will also be utilized. When foreign manufacturer's and/or operator's data are being evaluated, the respective civil airworthiness authorities will be offered the opportunity to participate. They will be briefed by the PSRAB during the proceedings and provided a copy of the final report for their review.

4. PSRAB FINDINGS.

(1) Once an assessment has been completed and the PSRAB has documented its findings, the Authority will declare whether or not the particular airframe-engine combination satisfies the relevant considerations of this Standard or equivalent. Items recommended to qualify the propulsion system, maintenance requirements, and limitations will be included in the Airplane Assessment Report (Section 6.(e)).

5. ONGOING FLEET MONITORING.

In order to ensure that the desired level of reliability is maintained, the PSRAB will continuously monitor reliability data and periodically review its original findings. In addition the Authorities document containing the CMP standard will be revised as necessary.

ATTACHMENT 2.
FAILSAFE DESIGN CONCEPT

1. FAILSAFE DESIGN CONCEPT.

(1) Airworthiness Standards such as U.S. FAR Part 25 are based on, and incorporate, the objectives, and principles or techniques, of the failsafe design concept, which considers the effects of failures and combinations of failures in defining a safe design. The following basic objectives pertaining to failures apply:
(2) In any system or subsystem, the failure of any single element, component, or connection during any one flight (brake release through ground deceleration to stop) should be assumed, regardless of its probability. Such single failures should not prevent continued safe flight and landing, or significantly reduce the capability of the airplane or the ability of the crew to cope with the resulting failure conditions.
(3) Subsequent failures during the same flight, whether detected or latent, and combinations thereof, should also be assumed, unless their joint probability with the first failure is shown to be extremely improbable.

2. FAILSAFE PRINCIPLES AND/OR TECHNIQUES.

(1) The failsafe design concept uses the following design principles or techniques in order to ensure a safe design. The use of only one of these principles or techniques is seldom adequate. A combination of two or more is usually needed to provide a failsafe design; that is, to ensure that major failure conditions are improbable and that catastrophic failure conditions are extremely improbable.
(2) Designed Integrity and Quality. Including Life-Limits, to ensure intended function and prevent failures.
(3) Redundancy or Backup Systems to enable continued function after any single (or other number of) failure(s); for example, two or more hydraulic systems, flight control systems, etc.
(4) Isolation of Systems, Components. and Elements so that the failure of one does not cause the failure of another. Isolation is also termed independence.
(5) Proven Reliability so that multiple, independent failures are unlikely to occur during the same flight.
(6) Failure Warning or Indication to provide detection.
(7) Flight Crew Procedures for use after failure detection, to enable continued safe flight and landing by specifying crew corrective action.
(8) Checkability: the capability to check a component's condition.
(9) Designed Failure Effect Limits, including the capability to sustain damage, to limit the safety impact or effects of a failure.
(10) Designed Failure Path to control and direct the effects of a failure in a way that limits its safety impact.
(11) Margins or Factors of Safety to allow for any undefined or unforeseeable adverse conditions.
(12) Error Tolerance that considers adverse effects of foreseeable errors during the airplane's design, test, manufacture, operation, and maintenance.

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ATTACHMENT 3.
SUITABLE ENROUTE ALTERNATE AIRPORTS

1. GENERAL.

(1) One of the distinguishing features of two engine extended range operations is the concept of a suitable enroute alternate airport being available to which an airplane can divert after a single failure or failure combinations which require a diversion. Whereas most two engine airplanes operate in an environment where there is usually a choice of diversion airports available, the extended range airplane may have only one alternate within a range dictated by the endurance of a particular airframe system (for example, cargo fire suppressant), or by the approved maximum diversion time for that route.
(2) It is, therefore, important that any airport designated as an enroute alternate has the capabilities, services, and facilities to safely support that particular airplane, and that the weather conditions at the time of arrival provide a high assurance that adequate visual references are available upon arrival at decision height (DH) or minimum descent altitude (MDA), and that the surface wind conditions and corresponding runway surface conditions are within acceptable limits to permit the approach and landing to be safely completed with an engine and/or systems inoperative.

2. ADEQUATE AIRPORT.

As with all other operations, an operator desiring any route approval should show that it is able to satisfactorily conduct scheduled operations between each required airport other than that route or route segment. Operators should show that the facilities and services specified in the LARs are available and adequate for the proposed operation.

3. SUITABLE AIRPORT.

For an airport to be suitable for the purpose of this Standard, it should have the capabilities, services, and facilities necessary to designate it as an adequate airport, and have weather and field conditions at the time of the particular operation which provide a high assurance that an approach and landing can be safely completed with an engine and/or systems inoperative in the event that a diversion to the enroute alternate becomes necessary. Due to the natural variability of weather conditions with time as well as the need to determine the suitability of a particular enroute airport prior to departure, the enroute alternate weather minima for dispatch purposes are generally higher than the weather minima necessary to initiate an instrument approach. This is necessary to assure that the instrument approach can be conducted safely if the flight has to divert to the alternate airport. Additionally, since the visual reference necessary to safely complete an approach and landing is determined, among other things, by the accuracy with which the airplane can be controlled along the approach path by reference to instruments and the accuracy of the ground based instrument aids, as well as the tasks the pilot is required to accomplish to maneuver the airplane so as to complete the landing, the weather minima for nonprecision approaches are generally higher than for precision approaches.

4. STANDARD ENROUTE ALTERNATE AIRPORT WEATHER MINIMA.

The following are established for flight planning and dispatch purposes with two engine airplanes in extended range operations. These weather minima recognize the benefits of precision approaches, as well as the increased assurance of safely completing an instrument approach at airports which are equipped with precision approaches to at least two separate runways, (two separate landing surfaces). A particular airport may be considered to be a suitable airport for flight planning and dispatch purposes for extended range operations if it meets the criteria of Section 3. of this Attachment and has one of the following combinations of instrument approach capabilities and enroute alternate airport weather minima:

(a) A Single Precision Approach: Ceiling of 600 feet [175 m] and a visibility of 2 statute miles [3200 m] or a ceiling of 400 feet [125 m] and a visibility of 1 statute mile [1600 m] above the lowest authorized landing minima; whichever is higher.
(b) Two or More Separate Precision Approach Equipped: Ceiling of 400 feet [125 m] and a visibility of 1 statute mile [1600 m] or a ceiling of 200 feet [60 m] and a visibility of 1/2 statute mile [800 m] above the lowest authorized landing minima; whichever is higher.
(c) Nonprecision approach(es): Ceiling of 800 feet [244 m] and a visibility of 2 statute miles [3200 m] or a ceiling of 400 feet [125 m] and a visibility of 1 statute mile [1600 m] above the lowest authorized landing minima; whichever is higher.

5. LOWER THAN STANDARD ENROUTE ALTERNATE AIRPORT WEATHER MINIMA.

Lower than standard enroute alternate airport weather minima may be considered for approval for certain operators on a case-by-case basis by the DGCA, at suitably equipped airports for certain airplanes which have the certificated capability to safely conduct Category II and/or Category III approach and landing operations after encountering any failure condition in the airframe and/or propulsion systems which would result in a diversion to an enroute alternate airport. Subsequent failures during the diversion, which would result in the loss of the capability to safely conduct and complete Category II and/or Category III approach and landing operations, should be shown to be improbable. The certificated capability of the airplane should be evaluated considering the approved maximum diversion time. Lower than standard enroute alternate weather minima may be considered at suitably equipped airports, if appropriate, for those airplanes which have these approved capabilities considering the established maximum diversion time.

6. ENROUTE ALTERNATE SUITABILITY IN FLIGHT.

The suitability of an enroute alternate airport for an airplane which encounters a situation in-flight which necessitates a diversion, including the provisions of the LARs, while enroute on an extended range operation is based on a determination that the airport is still suitable for the circumstances, and the weather and field conditions at that airport will permit an instrument approach to be initiated and a landing completed.

ATTACHMENT 4.
75, 120, and 180 MINUTE ETOPS MAINTENANCE REQUIREMENTS

1. GENERAL.

The maintenance program for airplanes used in 75, 120, and 180-minute ETOPS should contain the standards, guidance, and direction necessary to support the intended operations. Maintenance personnel involved in affecting this program should be made aware of the special nature of ETOPS and have the knowledge, skills and ability to accomplish the requirements of the program.

(1) ETOPS Maintenance Program.

(a) Airplane Suitability. The airframe-engine combination being submitted for ETOPS consideration will be reviewed by the Authorities, Propulsion System Reliability Assessment Board (PSRAB) and the DGCA. The Authority will review data accrued by the world fleet and the operator from operation of ETOPS candidate airplanes to help establish the operator's capability to conduct ETOPS operations. This candidate airplane should meet the requirements of Section 7. of this Standard. The Authority will review data on the airframe-engine combination and identify any conditions that exist which could prevent safe operation.

Information Note: *The candidate airplane for a 75-minute diversion time is not required to have achieved a predetermined number of hours or in-flight shutdown rate for this assessment.*

(b) Maintenance Program. The basic maintenance program for the airplane being considered for ETOPS is the continuous airworthiness maintenance program currently approved for that operator, for the make and model airframe-engine combination. This program should be reviewed by the PMI to ensure that it provides an adequate basis for development of a supplemental ETOPS maintenance program. ETOPS maintenance requirements will be expressed in, and approved as, supplemental requirements. This should include maintenance procedures to preclude identical action being applied to multiple similar elements in any ETOP critical system (for example, fuel control change on both engines). This relates to common cause concerns identified in Attachment 1, Section 2.(5).

(i) ETOPS related tasks should be identified on the operator's routine work forms and related instructions.

(ii) ETOPS related procedures, such as involvement of centralized maintenance control, should be clearly defined in the operators program.

(iii) an ETOPS service check should be developed to verify that the status of the airplane and certain critical items are acceptable. This check should be accomplished and signed off by an ETOPS qualified maintenance person immediately prior to an ETOPS flight.

Information Note: *The service check may not be required for the return leg of a 75-minute ETOPS flight in a benign area of operation (defined in Attachment 5).*

(iv) logbooks should be reviewed and documented as appropriate to ensure proper MEL procedures, deferred items, maintenance checks and that system verification procedures have been properly performed.

(c) ETOPS Manual. The operator should develop a manual for use by personnel involved in ETOPS. This manual need not be inclusive but should at least reference the maintenance programs and other requirements described by this Standard, and clearly indicate where they are located in the operator's manual system. All ETOPS requirements, including supportive programs, procedures, duties, and responsibilities, should be identified and subject to revision control. This manual should be submitted to the DGCA 60 days before implementation of ETOPS flights.

(d) Oil Consumption Program. The operator's oil consumption program should reflect the manufacturer's recommendations and be sensitive to oil consumption trends. It should consider the amount of oil added at the departing ETOPS stations with reference to the running average consumption; that is, the monitoring must be continuous up to, and including, oil added at the ETOPS departure station. If oil analysis is meaningful to this make and model, it should be included in the program. If the APU is required for ETOPS operation, it should be added to the oil consumption program.

(e) Engine Condition Monitoring. This program should describe the parameters to be monitored, method of data collection and corrective action process. The program should reflect manufacturer's instructions and industry practice. This monitoring will be used to detect deterioration at an early stage to allow for corrective action before safe operation is effected. The program should ensure that engine limit margins are maintained so that a prolonged single engine diversion may be conducted without exceeding approved engine limits (that is, rotor speeds, exhaust gas temperatures) at all approved power levels and expected environmental conditions. Engine margins preserved through this program should account for the effects of additional engine loading demands (for example, anti-ice, electrical, etc.) which may be required during the single engine flight phase associated with the diversion. (See Section 6.(b)(ii)(D.))

(f) Resolution of Airplane Discrepancies. The operator should develop a verification program or procedures should be established to ensure corrective action following an engine shutdown, primary system failure, adverse trends or any prescribed events which require verification flight or other action and establish means to assure their accomplishment. A clear description of who must initiate verification actions and the section or group responsible for the determination of what action is necessary should be identified in the program. Primary systems, like APU, or conditions requiring verification actions should be described in the operators ETOPS maintenance manual.

(g) Reliability Program. An ETOPS reliability program should be developed or the existing reliability program supplemented. This program should be designed with early identification and prevention of ETOPS related problems as the primary goal. The program should be event orientated and incorporate reporting procedures for significant events detrimental to ETOPS flights. This information should be readily available for use by the operator and DGCA to help establish that the reliability level is adequate, and to assess the operator's competence and capability to safely continue ETOPS. The DGCA will be notified within 72 hours of events reportable through this program.

(i) besides the items required to be reported by the LARs, the following items should also be included:
  A. in-flight shutdowns.
  B. diversion or turnback.
  C. uncommanded power changes or surges.
  D. inability to control the engine or obtain desired power.
  E. problems with systems critical to ETOPS.
  F. any other event detrimental to ETOPS.

(ii) the report should identify the following.
  A. airplane identification (type and N-Number).
  B. engine identification (make and serial number).
  C. total time, cycles, and time since last shop visit.
  D. for systems, time since overhaul or last inspection of the discrepant unit.
  E. phase of flight.
  F. corrective action.

(h) Propulsion System Monitoring. Firm criteria should be established as to what action is to be taken when adverse trends in propulsion system conditions are detected. When the propulsion system IFSD (computed on a 12-month rolling average) exceeds 0.05/1000 engine hours for a 120-minute operation, or exceeds 0.03/1000 engine hours for a 180-minute operation, an immediate evaluation should be accomplished by the operator and the DGCA with consultation of the PSRAB. A report of problems identified and corrective actions taken will be forwarded to the DGCA, Chief of Flight Safety. With advice of the PSRAB, additional corrective action or operational restriction may be recommended.

(i) Maintenance Training. The maintenance training program should focus on the special nature of ETOPS. This program should be included in the normal maintenance training program. The goal of this program is to ensure that all personnel involved in ETOPS are provided the necessary training so that the ETOPS programs are properly accomplished and to emphasize the special nature of ETOPS maintenance requirements. Qualified maintenance personnel are those that have completed the operator's extended range training program and have satisfactorily performed extended range tasks under the direct supervision of a DGCA certificated maintenance person; who has had previous experience with maintaining the particular make and model aircraft being utilized under the operator's maintenance program.

(j) ETOPS Parts Control. The operator should develop a parts control program that ensures the proper parts and configuration are maintained for ETOPS. The program includes verification that parts placed on ETOPS airplanes during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary ETOPS configuration for that airplane.

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ATTACHMENT 5.
ETOPS OPERATIONAL PROGRAM CRITERIA

1. GENERAL.

Sections 8.(2) through 8.(9) of this Standard detail the criteria for operational approval of extended range operations with a maximum diversion time of 120 minutes to an enroute alternate (at approved single engine inoperative cruise speed). This Attachment serves the function of differentiating the criteria for approval of operations less than 120 minutes (75 minutes) and beyond 120 minutes (180 minutes). For approval of 75-minute operations, not all of the requirements of this Standard need necessarily be met. For approval of 180-minute operations, all of the requirements of this Standard must be met along with the requirements identified in this Attachment as necessary for 180-minute operations.

2. 75-MINUTE OPERATION.

The criteria detailed below are the basis for evaluating different areas of operation and requirement for approving 75-minute operation:

(a) Benign Area of Operation. To be defined as a benign area of operation, the following considerations should apply:
- (i) numerous adequate airports.
- (ii) a high level of reliability and availability are required of communications, navigation, and ATC services and facilities.
- (iii) prevailing weather conditions are stable and generally do not approach extremes in temperature, wind, ceiling, and visibility.

(b) Criteria for Deviation to Operate in a Benign Area of Operation.
- (i) *Type Design*. The airframe-engine combination should be reviewed to determine if there are any factors which would effect safe conduct of operations. Type design ETOP approval criteria are not necessarily required.
- (ii) maintenance programs should follow the guidance in Attachment 4 for 75-minute programs.
- (iii) operational programs.
  - A. Minimum Equipment List. Provision of the FAA MMEL, excluding "Extended Range" provisos, apply.
  - B. Dispatch Limitations. Flight should be operated at a weight that permits the flight, at approved one engine inoperative cruise speed and power setting, to maintain flight altitude at or above the Minimum Enroute Altitude.

(c) Demanding Area of Operation. A demanding area of operations for the purpose of 75-minute approval has one or more of the following characteristics:
- (i) *Weather*. Prevailing weather conditions can approach extremes in winds, temperature, ceiling, and visibility for protracted periods of time.
- (ii) *Alternates*. Adequate airports are not numerous.
- (iii) due to remote or overwater area, a high level of reliability and availability of communications, navigation, and ATC facilities services may not exist.

(d) Criteria for Deviation to Operate in a Demanding Area of Operation.
- (i) *Type Design*. The airframe-engine combination should be reviewed to determine any factors which could effect safe operations in the demanding area of operations. Type design ETOP approval criteria are not necessarily required.
- (ii) maintenance programs should be instituted which follow the guidance in Attachment 4 for 120-minute operation.

(iii) operation programs should be instituted which follow the guidance contained in this Standard for 120-minute programs.

3. 180-MINUTE OPERATION.

(1) Each operator requesting approval to conduct extended range operations beyond 120 minutes should have approximately 12 consecutive months of operational in-service experience with the specified ETOPs configured airframe-engine combination in the conduct of 120-minute operations. The substitution of in-service experience which is equivalent to the actual conduct of 120 operators will be established by the DGCA, on a case-by-case basis. Prior to approval, the operator's capability to conduct operations and implement effective ETOP programs in accordance with the criteria detailed in Section 8. of this Standard will be examined. Only operators who have demonstrated capability to conduct a 120-minute program successfully will be considered for approval beyond 120 minutes. These operators should also demonstrate additional capabilities discussed in this Section. Approval will be given on a case-by-case basis for an increase to their area of operation beyond 120 minutes. The area of operation will be defined by a maximum diversion time of 180 minutes to an adequate airport at approved one engine inoperative cruise speed (under standard conditions in still air). The dispatch limitation will be a maximum diversion time of 180 minutes to a suitable airport at approved single engine inoperative speed (under standard conditions in still air).

(2) Dispatch Considerations.

(a) MEL. The MEL should reflect adequate levels of primary system redundancy to support 180-minute (still air) operations. The systems listed in Sections 8.(5)(b)(i) through (xv) should be considered.

(b) Weather. An operator should substantiate that the weather information system which it utilizes can be relied upon to forecast terminal and enroute weather with a reasonable degree of accuracy and reliability in the proposed area of operation. Such factors as staffing, dispatcher training, sources of weather reports and forecasts, and when possible, a record of forecast reliability should be evaluated.

(c) Fuel. The critical fuel scenario should also consider fuel required for all engine operations at 10,000 feet or above 10,000 feet if the airplane is equipped with sufficient supplemental oxygen in accordance with the LARs.

(d) Operational Control Practices and Procedures. During the course of the flight, the flight crew should be informed of any significant changes in conditions at designated enroute alternates. Prior to a 180-minute ETOP flight proceeding beyond the extended range entry point, the forecast weather for the time periods established in Section 8.(e)(iii)**,** landing distances, and airport services and facilities at designated enroute alternates should be evaluated. If any conditions are identified (such as weather forecast below landing minima) which would preclude safe approach and landing, the pilot should be notified and an acceptable alternates) selected where safe approach and landing can be made. The maximum diversion time to the newly selected alternates) should not exceed 180 minutes at the approved single engine inoperative cruise speeds (under standard conditions in still air).

(e) Flight Planning. Operators should provide for compliance with the LARs with respect to engine inoperative landing and reporting. The effects of wind and temperature at single engine inoperative cruise altitude should be accounted for. In addition, the operator's program should provide flight crews with information on suitable airports appropriate to the route to be flown which are not forecast to meet Attachment 3 enroute alternate weather minima. Airport facility information, and other appropriate planning data concerning these airports should be provided to flight crews for use in complying with the LARs when executing a diversion.

(3) Crew Training and Evaluation.

(a) if standby sources of electrical power significantly degrade cockpit instrumentation to the pilots, then approved training which simulates approach with the standby generator as the sole power source should be conducted during initial and recurrent training.

(b) Contingency Procedures. Flight crews should be provided detailed initial and recurrent training which emphasizes established contingency procedures for each area of operation intended to be used.

(c) Diversion Decisionmaking. Special initial and recurrent training to prepare flight crews to evaluate probable propulsion and airframe systems failures should be conducted. The goal of this training should be to establish crew competency in dealing with the most probable operating contingencies.

(4) Equipment.

(a) VHF/Satellite Data Link. Operators should consider enhancements to their operational control system as soon as they become feasible.

(b) Automated System Monitoring. Automated airplane system status monitoring should be provided to enhance the flight crew's ability to make timely diversion decisions.

4. VALIDATION FLIGHT OR FLIGHTS.

The operator should demonstrate by means of a DGCA witnessed validation flight that it has the capability to safely conduct 180-minute operations with the specified airframe-engine combination. The guidance for validation flights contained in Section 8.(9) of this Standard should be followed.

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Appendix VI
to
General Operating and Flight Rules Standards

s602.165 Validation Tests

1. INTRODUCTION

(1) These Commercial Air Services/Private Operator Passenger Transportation Standards and Procedures are the standards and procedures that must be met for the Director General of Civil Aviation (DGCA) to grant approval of operations requiring validation tests.
(2) For ease of reference the standards are published in "normal print", and the Information Notes which are meant to offer guidance are published in *"italicized print"*.

2. APPLICABILITY

These criteria are applicable to operators holding Private Operator Certificates issued pursuant to Part VI and Air Operator Certificates pursuant to Part VII of the Lebanese Aviation Regulations (LARs). The Director General of Civil Aviation grants approval of operations by amending an operator's Operations Specifications (OpSpecs).

3. INTERPRETATIONS

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DIVISION I

Approval Process

1. PHASE ONE.

(1) Phase one of the validation test process begins when an applicant requests authorization from the DGCA to conduct an operation for which a validation test is required by LARs Part VI, Subpart 2, Section 602.165. The term, "applicant," as used in this Standard, means either a candidate applying for an operating certificate or a certificate holder requesting additional operating authority. When an applicant's request requires proving test, the following steps apply:

Information Note: *The validation test process follows the general outline of the five phase approval process that is described in LARs Part VI, Subpart 2, Standards, Appendix VII.*

(2) *DGCA Test Team*. The Chief of Flight Safety shall organize a test team.

- (a) Team Leader. The team leader should normally be one of the principal inspectors assigned to the applicant and shall be responsible for the conduct, coordination, and evaluation of the test. In addition, the team leader will be the spokesperson for the DGCA on all matters pertaining to the test.
- (b) Team Personnel. The DGCA test team should include the following personnel, as required:
  - (i) the team leader
  - (ii) all assigned principal inspectors
  - (iii) an aviation safety inspector (ASI) (operations) qualified on the equipment
  - (iv) ASIs (maintenance and avionics) trained on the installed equipment
- (c) Familiarization. All members of the DGCA inspection team must become familiar with the pertinent parts of the applicant's general operations manual (GOM), procedures, and policies.

Information Note: *If qualified inspectors are not available within the DGCA, the Chief of Flight Safety must request assistance from another Authority.*

(3) *Preliminary Coordination*. The DGCA test team and the applicant must reach a common understanding of what the applicant must do, what role the DGCA will play, and what reports and documents must be prepared during the testing process. Both the test team and the applicant must research applicable regulatory and advisory material. If the test concerns special area navigation then the test team should consult a navigation specialist early in phase from another Authority. The navigation specialist can provide advice on testing requirements.

(4) *Validation Test Tracking and Reporting*. When the test team is formed, the team leader shall ensure that a Validation Test record is opened for the applicant. This file will remain open until the team completes its assignment. This procedure will create a complete record of the Validation Test and will serve as the record of certification to be maintained in the DGCA Documentation Control Center at the end of the certification project.

2. PHASE TWO.

Phase two is initiated when the applicant submits the test plan to the DGCA for evaluation. During this phase, the team leader must ensure that the plan is complete and in an acceptable format before a thorough review and analysis can be conducted.

3. PHASE THREE.

(1) Phase three is initiated when the team starts an in-depth review and analysis of the applicant's test plan for regulatory compliance, safe operating practices, logic of sequence, and other areas (such as training programs, crew and dispatcher qualifications, acceptable participants, and schedules). During this phase, the DGCA must plan to coordinate its activities with the demonstrations that the applicant will conduct during phase four.

(2) *Team Leader*. The team leader's responsibilities include the following:

- (a) notifying the Chief of Flight Safety of validation flight dates, times, and locations.
- (b) assigning appropriate sections of the test plan to inspectors or specialists for review and comment
- (c) ensuring that administrative requirements such as visas and diplomatic clearances are obtained in a timely manner

(3) *Team Members*. Team members are responsible for performing assigned tasks, keeping the team leader informed of all actions, and ensuring that the team leader concurs with all agreements made with the applicant. In addition, team members are responsible for recording each activity accurately and completely in writing. All correspondence will be processed through the Team Leader who will ensure that the certification file is up to date. All correspondence will be filed chronologically.

4. PHASE FOUR.

Phase four is the major phase of the test process. For validation flights, the applicant will conduct the enroute flight segment. Phase four is concluded when the test team is satisfied that all test objectives have been achieved or that the applicant is unable to complete them satisfactorily. Before concluding phase four, the team leader shall obtain the concurrence of the Chief of Flight Safety.

5. PHASE FIVE.

Phase five is accomplished after the successful completion or termination of the validation test. In this phase, the DGCA team either grants approval and issues the appropriate operations specifications (OpSpecs) or sends a letter of disapproval to the applicant. In either case, the team leader's final action is to complete the report by closing the original certification record that was opened in phase one.

DIVISION II

Validation Test Requirements

1. GENERAL.

(1) This section contains the Standards to be used by Directorate General of Civil Aviation Inspectors for conducting validation tests.
(2) *Regulatory Background*. Various regulations, such as Lebanese Aviation Regulations (LARs) Parts VI and VII, require applicants to show the capability to conduct specific line operations safely and in compliance with regulatory requirements. One process by which an applicant demonstrates this capability to the Director General of Civil Aviation (DGCA)is known as validation testing.

Information Note: *The term, "applicant," as used in this section, means either a candidate applying for an operating certificate or a certificate holder requesting additional operating authority.*

(3) *Validation Flights*. The most common method used by the DGCA to validate an applicant's capability is to observe the applicant conduct flight operations. The DGCA normally requires validation flights before initially issuing operations specifications (OpSpecs), which authorizes operations beyond the scope of Class I navigation.
(4) *Validation Testing*. The LARs do not require an applicant to conduct actual flights when flights are not necessary for safety, considering the availability of adequate facilities and of able personnel to conduct the operation. Validation flights are expensive for the DGCA and for the applicant. The DGCA should, therefore, avoid requiring applicants to conduct flights when they are not required. This section contains guidelines for teams to use in making this determination.
(5) *Areas of Emphasis*. When the DGCA conducts validation testing with or without an actual flight, an in-depth review is conducted of the applicable portions of the applicant's proposed procedures (especially flight following), training programs, manuals, facilities, and maintenance programs.
(6) *Combined Proving and Validation Flights*. Proving flights are conducted to show the applicant's capability to operate a specific type of aircraft. Validation tests are conducted so that an applicant can demonstrate its capability to operate over specific routes while using specific navigational equipment, or to operate within specified limitations in critical areas. Though proving and validation tests satisfy different regulatory requirements, it is acceptable for applicants to conduct both tests simultaneously.

2. SITUATIONS REQUIRING VALIDATION TESTS OR FLIGHTS.

(1) This section contains guidance for inspectors and test team leaders concerning those situations where validation flights or tests are required for compliance with Parts VI and VII of the LARs. LARs Part VI, Subpart 2, Section 602.165 outlines those operations requiring validation tests.
(2) *Operations Outside Lebanese Airspace*. When an applicant plans to operate to a destination outside of Lebanese airspace, the DGCA must verify that the applicant has the required economic authority, knowledge of applicable national operating rules, and has completed adequate planning for the proposed operation. Normally, validation for this purpose alone does not require a flight. However, all airport facilities an operator uses should be inspected under a national inspection program and for initial service.
(3) *Class II Navigation Authorizations*. There are four situations in which validation testing is required in association with approval of Class 11 navigation:

(a) initial approval
(b) approval of the addition of a long range navigation system or a flight navigator
(c) operations into new areas

(d) the addition of special or unique navigation procedures

(4) *Special Performance Authorizations*. Validation tests are required when an applicant proposes to conduct operations that require confirmation of the applicant's ability to operate an aircraft type within specified performance limitations. These limitations are based on the following situations:

(a) character of the terrain (or extended overwater areas)
(b) type of operation
(c) performance of the aircraft

(5) *Special Operational Authorizations*. Validation tests are required when an applicant proposes to conduct inflight or ground maneuvers that require special operational authorizations.

3. CLASS II NAVIGATION AUTHORIZATIONS.

(1) When applicants are initially certificated, they are issued OpSpecs paragraphs that authorize Class I navigation. Before adding a geographic area to OpSpecs, in which Class II navigation is required, test teams must validate the applicant's capability to safely conduct these operations.

(2) *Initial Approval*. When an applicant has no prior authorization to conduct Class II navigation, a validation flight is required before the team may issue OpSpecs or add appropriate geographic areas to the OpSpecs. These areas include the following:

(a) remote and extensive land areas not served by reliable International Civil Aviation Organization (ICAO) surface based navigational aids (NAVAID)
(b) extensive overwater areas beyond the range of surface based navigation facilities

(3) *Authorization for Long Range Navigation Systems or a Flight Navigator*. Validation is required when an applicant that already has Class II navigation authorization proposes to add authorization for a new long range system/aircraft combination or an authorization for a flight navigator to OpSpecs p.

(a) Long Range Systems. Long range navigation systems include the following:
  (i) Loran-C
  (ii) Omega
  (iii) Inertial navigation systems (INS) and inertial reference systems (IRS)
  (iv) Doppler
  (v) Global Navigation Satellite System (GNSS), when approved
  (vi) Any combination of the preceding systems

(4) *Validation Testing in Lieu of a Validation Flight*. When validation is conducted to add a new aircraft/navigation system combination to an applicant's OpSpecs, a validation is conducted by means of a flight. The DGCA may approve validation by means of testing only when the applicant can show that the combination of aircraft/navigation system and operation is not significantly different from those the applicant is currently authorized, or with which the applicant can show satisfactory current experience. When validation is conducted without a flight, the applicant must show training and qualification of flightcrews in accordance with DGCA guidance material and acceptable equipment procedures pursuant to this Standard. Test teams can determine the current level of flightcrew training and qualification by conducting oral tests of knowledge and procedures and by evaluating flight records. The following examples are situations where validation testing may be authorized in lieu of validation flights:

(a) an applicant with a satisfactory history of conducting Class II navigation by using an LR-55/Delco Carousel IV INS combination proposes to add the Delco IV INS to a G-II that the applicant is already authorized to operate in Class I airspace
(b) an applicant for an additional Class II route authorization can show a previous history of successful operation of that aircraft and equipment combination in extended Class II operations under Part VI or VII of the LARs.

(5) *Additional Geographic Areas*. Applicants requesting authority to operate in additional geographic areas (other than special areas) may be authorized to do so without the need to complete a validation flight. As a minimum for this situation, the test team must verify that the applicant has the required economic authority, knowledge of applicable national operating rules, and has completed adequate

planning for the proposed operation. Test teams may determine, however, that the specific circumstances require a flight.

(6) *Special Areas of Operation*. Certain areas of Class II airspace are considered special operating airspace for purposes of validation.

(a) Extensive Areas of Magnetic Unreliability. Due to the nature of the procedures involved, applicants are required to conduct validation flights through these areas before being issued OpSpecs. The DGCA may approve validation by means of testing in lieu of flights when an applicant that already holds applicable OpSpecs and proposes to operate new combinations of aircraft and navigation systems in these areas. The applicant must show that the required procedures are not significantly different from those currently authorized.

(b) North Atlantic Minimum Navigation Performance Specifications (NAT/MNPS) Airspace and Canadian MNPS Airspace. Approvals for these two blocks of airspace can be conducted concurrently. Due to the navigational tolerances and the procedures involved, applicants are required to conduct validation flights through these areas before being initially authorized to conduct revenue operations in these areas. In some cases (such as with the use of Omega systems), the applicant may be required to conduct flights and collect data outside MNPS airspace before conducting a final validation flight through the airspace. Initial validation flights, as described in this section, may be conducted in North Atlantic or Canadian MNPS airspace if the required navigational accuracy was demonstrated before the supplemental type certificate (STC) was issued. An applicant for an authorization to operate new combinations of aircraft and navigation systems (an applicant that already holds applicable OpSpecs may be required to conduct validation flights to have that combination added to paragraph B36, but the applicant is not normally required to conduct those flights through MNPS airspace.

Information Note: *Inspectors should inform operators seeking MNPS approval that they should collect Omega data in North Atlantic airspace, either under or over MNPS airspace.*

(c) Central East Pacific (CEPAC) Composite Airspace and North Pacific (NOPAC) Airspace. During validation for approval of CEPAC and NOPAC areas, test teams should focus on flight planning, especially for engine out and loss of pressurization contingencies. An applicant that already holds applicable OpSpecs and has a satisfactory operating history in extended Class II navigation is normally not required to conduct a validation flight to be issued CEPAC or NOPAC operating authorization. An applicant for an authorization to operate new combinations of aircraft and navigation systems may be required to conduct validation flights before that combination is added to OpSpecs, but the applicant is not normally required to conduct those flights through CEPAC or NOPAC airspace.

(d) Arctic Ocean and Antarctica Airspace. Applicants proposing to conduct terminal area operations within these areas are required to conduct validation flights. Applicants conducting over flight but not terminal area operations are not required to conduct validation flights. During validation for approval of over flight of these areas, test teams should focus on flight planning, especially for engine-out, loss of pressurization contingencies, and emergency airfield procedures.

Information Note: *Arctic and Antarctic operating approvals are separate and distinct from approval for areas of magnetic unreliability.*

(e) Politically Sensitive Areas of Operation. When the DGCA requires information concerning an operator's request to conduct operations into sensitive international areas, the DGCA should follow the guidance in (TBD).

(7) *Special or Unique Navigation Procedures*. Validation flights are required when an applicant proposes to use navigation procedures that have not been previously demonstrated. These procedures include the following:

(a) pilotage, including dead reckoning (DR)
(b) flight navigator procedures
(c) celestial navigation
(d) pressure pattern and Bellamy drift DR
(e) free gyro or grid procedures
(f) any combination of the preceding procedures

4. SPECIAL PERFORMANCE AUTHORIZATIONS.

The following are examples of operational situations that normally require validation tests and special performance authorizations for each type of aircraft to be used by an applicant:

(a) terminal area operations in areas of mountainous terrain requiring driftdown or specialized contingency procedures
(b) Parts VI and VII operations in the North Atlantic Area of Operations (NAT-OPS) when all points on routes are within 60 minutes of an adequate airport.
(c) Parts VI and VII extended-range operations with two-engine airplanes (ETOPS) over routes containing a point farther than 60 minutes' flying time from an adequate airport.
(d) high altitude airport operations.
(e) powerback operations (reverse thrust taxi).
(f) unimproved runway operations.
(g) helicopter or seaplane operations in highly congested urban areas.

5. SPECIAL OPERATIONAL AUTHORIZATIONS.

Validation tests are required when proposed operational situations require special equipment and a special operational authorization for each type of aircraft used. Some examples follow:

(a) Category II instrument approach and landing systems.
(b) Category III instrument approach and landing systems.
(c) use of automatic landing systems for landing operations.
(d) use of manually flown flight control guidance systems approved for landing operations (heads-up or heads-down flight control systems).
(e) use of airborne radar approach (ARA) systems.
(f) area navigation (RNAV) systems certified in accordance with U.S. FAA Advisory Circular (AC) 90-45 or equivalent.
(g) use of RNAV systems for approach and landing operations.

6. PLANNING THE VALIDATION TESTS.

(1) An applicant that is required to conduct a validation test must develop and submit a test plan. The plan and test objectives must be specifically tailored to the situation. The following guidelines should be followed by the DGCA team and the applicant in planning validation tests:

(a) Form and Content of the Test Plan. The variety of operational situations and requirements that determine the makeup of validation tests makes it impossible to specify the form and content for each validation test plan. Regulations; Advisory Circulars; specific instructions in this Standard, and other official sources have been developed to assist the applicant and the DGCA inspectors in determining the necessity of validation testing and the planning of validation tests. In many situations, these documents contain specific procedures that must be followed or that provide acceptable methods that an applicant can use to acquire a special authorization.

(b) DGCA Test Team and Applicant Coordination. The applicant and test team must agree on the form and content of the test plan, and they must establish mutual understandings of test objectives, the degree of demonstration required, and the criteria to be met. During development of the plan, the applicant should be encouraged to coordinate with and confer frequently with the DGCA team concerning the makeup of the validation tests and the methods to be used in conducting them.
(c) Operational Demonstrations. Most validation tests will require some form of operational demonstration. When operational demonstrations are required, the validation test plan must include a schedule for those demonstrations.
(d) Determining Number of Flight Hours. A required number of hours for a validation flight is not specified by regulation and must be determined on a case by case basis. When the test objectives can are adequately met, the test team may terminate the validation test.
(e) Revisions to Applicant Documents and Training Program. Most special authorizations require revisions to the applicant's checklists, minimum equipment lists (MEL), Configuration Deviation List (CDL), Dispatch Deviation Procedures Guide (DDPG), General Operations Manual (GOM), General Maintenance Manual (GMM), and Training Program. These revisions should be submitted with the validation test plan for DGCA review and approval.
(f) Amendment to OpSpecs. All special authorizations require an amendment to the OpSpecs; the applicant should apply for the amendment at the same time the validation plan is submitted.

7. AREAS EVALUATED ON VALIDATION TESTS OR FLIGHTS.

The types of activities and items that need to be inspected and evaluated on validation tests or flights vary with the type of authorization requested by the applicant. The following list provides examples of activities and items requiring inspection and evaluation.
(a) flightcrew training (and flight attendant training, if applicable)
(b) dispatch training.
(c) operations manual information and crew procedures
(d) checklists and MEL, CDL, and DDPG
(e) maintenance manual information and maintenance program
(f) equipment certifications and installation approvals
(g) reliability and accuracy of applicable operational and maintenance records
(h) operational flight control and company communication capabilities
(i) flightcrew competency in use of equipment, procedures, and techniques
(j) coordination procedures between the flightcrew, maintenance personnel, and other ground personnel

8. CARRIAGE OF REVENUE PASSENGERS ON VALIDATION FLIGHTS.

The LARs do not forbid the carriage of revenue passengers on validation tests. With the concurrence of the DGCA, the test team may authorize the applicant to carry revenue passengers aboard the validation flight when the proposed operation is similar to those in the applicant's previous experience. This paragraph contains guidelines for teams to use in making this determination.
(a) Nonpermissible Situations. The carriage of revenue passengers shall not normally be permitted during validation tests in the following situations:
  (i) when the applicant is seeking initial approval to conduct Class II navigation unless authorized by the Minister.
  (ii) when the applicant is seeking approval to conduct Class II navigation by a long range navigation system or using a flight navigator when the applicant has not previously been approved for that means of navigation.

(iii) when the applicant is seeking approval to conduct Class II navigation by means of a long range navigation procedure that has not previously been approved for that applicant.
(iv) when the applicant has not previously operated a specific aircraft type in operations that require a special performance authorization.

(b) Exceptions to Subsection (a). In the preceding situations, test teams may consider permitting the carriage of revenue passengers if the applicant meets the following conditions:
(i) *Use of a Previously Authorized System*. For those applicants seeking approval to conduct Class II navigation by means of a new system of long range navigation (using a flight navigator) or by means of a new procedure, the applicant may use a previously authorized navigation system as an independent means of verifying position.
(ii) *Previous Demonstration of Competence*. For operations requiring a special performance authorization, the applicant must have already successfully demonstrated competence by safely conducting those operations, using the necessary special performance, in the specific aircraft. This may have been accomplished through an approved flight simulation test program, or in an actual aircraft flight test program (nonrevenue) in the specific aircraft.

(c) Special Operational Authorization. For operations requiring a special operational authorization for approach and landing operations, the carriage of revenue passengers should normally be permitted, provided higher minimums or visual flight rules (VFR) operations are specified during the validation tests.

(d) Additional Considerations. The following factors should be considered in all cases:
(i) the applicant's previous experience with the proposed operation, the specific aircraft, and equipment combinations
(ii) the DGCA's previous experience with the proposed operation, the specific aircraft, and equipment combinations
(iii) the in service history and performance considerations of any new airplane, component, appliance, or other piece of equipment
(iv) the degree of backup system redundancy and sole dependency of any particular system, appliance, or component

Appendix VII
to
General Operating Flight Rules Standards
s602.166 Regulatory Required Approvals

1. GENERAL.

(1) The general process of approval or acceptance of certain operations, programs, documents, procedures, methods, or systems is an orderly method used by DGCA inspectors to ensure such items meet regulatory standards and provide for safe operating practices. It is a modular, generic process that can be applied to many types of approval or acceptance tasks. The process consists of five distinct yet related phases and can result in approving or not approving, accepting or not accepting an operator's proposal. It is important for an inspector to understand that the process described in this section is not all inclusive but rather a tool to be used with good judgment in conducting day to day duties and responsibilities.
(2) This section provides direction and guidance for understanding and applying this process. The logic diagram (figure X TBD) should be used for reference while reviewing the process.

Information Note: *It is essential for the inspector to understand that this process may result in a decision to not approve or not accept an operator's proposal. The process described is used to assist in making either positive or negative determinations*

(3) This general process applies to many tasks described throughout Lebanese Aviation Regulations (LARs) Standards. Each Standard describing an approval or acceptance task supplements the general process by outlining specific task requirements for each phase. For example, the specific items or actions required of the DGCA and the operator for each phase of the process concerning proving tests are delineated in the Standards for each Part of the LARs. The five phases of the operational approval or acceptance process are as follows:

2. PHASE ONE.

(1) The first phase starts when an operator, a person, an aviation interest, or the DGCA inquires about or states a need for a change in some aspect of an aviation activity. Phase one is initiated by the following two possible actions:

(a) a person or operator conveys to the DGCA a need which is related to his operation. This "need" may be a requirement for DGCA approval or acceptance. For example, an operator may need, want, or be required to have an MEL change. The operator initiates the process by inquiring about the correct procedures to receive approval from the DGCA for the change. During initial inquiries it is important for the DGCA and the operator to become familiar with the subject matter. If, for example, an operator requests an operational approval, the inspector must take the following actions:
  - (i) become thoroughly familiar with existing DGCA policy and approval requirements
  - (ii) become familiar with the appropriate technical material
  - (iii) accurately assess the character and scope of the proposal
  - (iv) determine if a demonstration is required
  - (v) determine the need for any coordination requirements

(vi) ensure the operator has a clear understanding of the minimum requirements which constitute an acceptable submission
(vii) determine the date the operator intends to implement the proposal

(b) phase one may also begin when the DGCA conveys to the operator or person a requirement related to his operation which must be approved or accepted. For example, a DGCA inspector may require an operator to publish in the company aircraft operating manual information on low speed buffet. The operator must research and understand that subject area before submitting a proposal to the DGCA for evaluation. The DGCA inspector should act in an advisory capacity to the operator during the preparation of the submission. Such advice may include the following:
(i) the necessity for a deviation, authorization, waiver, or exemption
(ii) the necessity for required demonstrations
(iii) clarification of LAR or Standards information
(iv) sources of specific technical information
(v) acceptable standards for submission

(c) the common element regardless of whether an action is initiated by an operator or the DGCA is the effort expended by the operator.

Information Note: *It is essential (particularly in phase one) for the operator to have a clear understanding that, although the inspector may provide advice and guidance to the company, the development of the final product submitted to the DGCA is solely the responsibility of the operator*

(d) in phase one, the inspector must ensure the operator clearly understands the form, content, and documents required for the submission to be acceptable to the DGCA. The operator must be informed of the need and benefits of submitting required documents as early as possible and of its responsibility to advise the DGCA, in a timely manner, of any significant changes in the proposal. Phase one of the process is illustrated as follows:
(i) operator makes inquiry or request to DGCA
- OR –
(ii) DGCA requires operator to take an action
(iii) DGCA and operator develop understanding of subject area
(iv) operator understands form, content, and documents required for acceptable submission

3. PHASE TWO.

(1) Phase two begins when the operator formally submits a proposal for DGCA evaluation. The request may be submitted in a variety of ways. The inspector's first action, in phase two, is to review the operator's submission to ensure that the proposal is clearly defined, and the documentation specified in phase one has been provided. The required information must be complete and detailed enough to permit a thorough evaluation of the operator's capability and competence to fully satisfy the applicable regulations, national policy, and safe operating practices. Phase two does not include a detailed operational and technical evaluation or analysis of the submitted information (see phase three). However, in phase two the submission must be examined in sufficient detail to assess the completeness of the required information. If the operator's submission is not complete or the quality is obviously unacceptable, it must be immediately returned with an explanation of the deficiencies, before any further review and

evaluation is conducted. Normally, unacceptable submissions should be returned with a written explanation of the reasons for its return. In many complex cases, a meeting with the operator and his key personnel may be necessary to resolve issues and agree on a mutually acceptable solution. If mutual agreements cannot be reached, the inspector must terminate the meeting, inform the operator that the submission is unacceptable, and return the submission. If all parties are able to reach agreement on measures to correct omissions or deficiencies, and the DGCA inspectors (operations, airworthiness, and avionics, if applicable) determine that the submission is acceptable, the operator will be so informed and phase three begins. Phase two of the process is illustrated as follows:

(a) operator submits proposal
(b) DGCA makes initial examination of the documents for completeness with respect to requirements established in phase one
(c) DGCA returns submitted proposal
OR –
(d) DGCA accepts submitted proposal

Information Note: *It is important for the inspector involved to keep the operator advised of the status of his proposal. If the inspector takes no other action, or if the submission is deficient and not returned in a timely manner, the applicant may assume the DGCA has tacitly accepted the submission and is continuing with the process. Timeliness of action depends on the situation as well as inspector judgement and is discussed in pertinent sections of the Operations Inspector's handbook.*

4. PHASE THREE.

(1) Phase three is the DGCA's detailed analysis, review, and evaluation of the operator's proposal. These actions may take place entirely within a field office, at the site of operations, or at both facilities. In phase three the DGCA evaluation is focused on the form, content, and technical quality of the submitted proposal to determine that the information in the proposal meets the following criteria:

(a) is not contrary to any applicable Lebanese Aviation Regulations
(b) is not contrary to the direction provided in the LARs Standards or other safety related documents
(c) provides for safe operating practices

(2) Criteria for evaluating the formal submission is found in the applicable chapters of this Standard. The inspector must ensure that the documents adequately establish the operator's capability and competence to safely conduct operations in accordance with the submitted proposal.

(3) During phase three the DGCA inspector must, in a timely manner, address any deficiencies in the submitted material, before proceeding to subsequent phases. Discussion with the operator may be sufficient to resolve certain discrepancies or questions, or to obtain additional information. It may be necessary to return certain sections of the submission to the operator for specific changes. However, when an inspector determines that, for specific reasons, the material is grossly deficient or unacceptable, he must return the entire submission to the operator with an appropriate explanation, and immediately terminate this phase. If the results of the evaluation are

acceptable and a demonstration requirement exists, the inspector may need to grant some form of conditional, initial, or provisional approval to the proposal before continuing with the process.
(4) An important aspect of phase three is for DGCA inspectors to begin planning the conduct of phase four. While evaluating the operator's formal submission, inspectors should begin to formulate plans to observe and evaluate the operator's ability to perform. These plans must be finalized before the actual demonstrations. Phase three is illustrated as follows:

(a) DGCA evaluates the formal submission for compliance with LARs, compliance with the direction provided in the LARs Standards, other safety related documents and safe operating practices
(b) when results of DGCA evaluation are unsatisfactory, return submission to the operator for correction and/or terminate the phase
(c) begin planning phase four (if required)
(d) when results of DGCA evaluation are satisfactory, proceed with phase four (if demonstration required) and if appropriate, grant conditional approval or acceptance. OR;
(e) proceed to phase five if demonstration not required

5. PHASE FOUR.

(1) In phase four the DGCA finalizes plans to observe and evaluate the operator's demonstration of its ability to perform in accordance with the procedures, guidelines, and parameters described in the formal proposal. Phase four is an operational evaluation of the operator's ability to function in accordance with the proposal evaluated in phase three. Usually these demonstrations are required by regulation and some examples include the following:

(a) training programs
(b) proving tests
(c) emergency evacuation demonstration
(d) all weather terminal operations
(e) air navigation operations
(f) simulator evaluation
(g) ETOPS

(2) Criteria and procedures for evaluating an operator's demonstrated ability are described in applicable Standards of the LARs. The inspector must plan for the conduct and observation of the demonstration to include such factors as participants, evaluation criteria, and sequence of events. During these demonstrations it is normal for minor discrepancies to occur. Discrepancies can often be resolved during the demonstration by obtaining commitments from responsible company officials. The inspector responsible for overseeing a demonstration must evaluate each discrepancy in terms of its overall impact on the operator's ability and competence to conduct the proposed operation. The inspector must stop the demonstration in phase four when gross deficiencies or unacceptable levels of performance are observed. The inspector must identify the phase of the general process for approval or acceptance to which the applicant must return, or decide to terminate the process entirely when it is clear that continuation would not result in approval or acceptance. For example, if an emergency evacuation demonstration is unsatisfactory due to equipment failure (a slide fails to inflate) it may be appropriate to require the operator to reenter the process at phase four and conduct another demonstration. If the demonstration is unacceptable because crewmembers were unable to perform their assigned duties, it may be appropriate to advise the operator that the process is terminated pending review and evaluation of his emergency training program, and that he may need to reenter the process at phase two (that is, submit a new proposal).

(3) If the DGCA evaluation of the operator's demonstrated ability is acceptable, the process continues. Phase four of the process is illustrated as follows:

(a) DGCA plans for the conduct and observation of the demonstration
(b) operator demonstrates ability
(c) demonstration unsatisfactory
OR;
(d) demonstration satisfactory

Information Note: *An operator will not, under any circumstances, be authorized or otherwise approved to conduct any particular operation until all airworthiness and operations, requirements are met and the operator is clearly capable of conducting a safe operation in compliance with Lebanese Regulations and safe operating practices.*

6. PHASE FIVE.

(1) In phase five the DGCA approves or accepts the operator's proposal. If the proposal is not approved or accepted, the operator is notified in phase three or four.
(2) Approval is granted by letter, a stamp of approval, the issuance of operations specifications, or some other official means of conveying approval. Each section of this standard which discusses a requirement for approval provides specific guidance concerning approval procedures and documentation. The following are examples of approvals granted by the DGCA:

(a) all-weather terminal operations
(b) training programs
(c) Minimum Equipment List
(d) cockpit checklist
(e) company Aircraft Operating Manual (limitations, performance, and operating procedures)
(f) air navigation operations
(g) simulators
(h) check airman authorizations
(i) OpSpecs

(3) Other proposals, submissions, or requests not requiring specific DGCA approval but required to be submitted to the DGCA are items that are presented for acceptance. Acceptance of an operator's proposal may be accomplished by various means including a letter, verbal acceptance, or by taking no action, which indicates there is no DGCA objection to the proposal. Methods and procedures used to accept operator proposals or submissions, when appropriate, are discussed in the applicable Sections of the LARs Standards. Phase five is illustrated as follows:

(a) DGCA approves submission
or –
(b) DGCA accepts submission

Information Note: *Sometimes DGCA approval or acceptance of an operator's proposal may be conditional in nature. For example, a training program may be initially approved provided the simulator to be used in that program receives approval from the DGCA.*

7. Process Audit

Following the approval or acceptance of an operator's program, the DGCA should plan to audit the program to determine if the objectives of the program have been met. This audit should be accomplished within a year and can be part of a surveillance program established by the DGCA.

8. SUMMARY OF PROCESS.

The general operational approval or acceptance process, as described, is referenced throughout the LARs Standards (in terms of the five phases) with the specific task requirements for each applicable job function. It is important for the inspector to understand the modular concepts inherent in the process, the overall interrelationship of the phases, and that this general process is not all-inclusive but a tool to be used in the inspector's day to day duties and responsibilities. The logic diagram in (figure X TBD) is intended to clarify this general process.

Appendix VIII
to
General Operating and Flight Rules Standards
s602.167 Required Operations Specifications (OpSpecs)

1. APPLICABILITY.

This Appendix contains direction and guidance for issuance of operations specifications to Part VI, Subpart 4, and Part VII air carriers. Direction and guidance is also included for amending, canceling, suspending, or revoking the operations specifications for these operators. Information on the processing of foreign flag air operator operations specifications is "To Be Developed" (TBD). In this standard the phrase "operations specifications" will be referred to as "OpSpecs." The U.S. OpSpecs paragraph numbering system has been adopted by the Directorate General of Civil Aviation (DGCA) in order to facilitate DGCA updates of the OpSpecs content.

2. HISTORY OF OPSPECS.

The Lebanese Aviation Regulations (LARs) are written using the United States Federal Aviation Administration (FAA) methodology of using OpSpecs as the means of granting authorizations to operators.

The following is the history of the U.S. OpSpecs:

Information Note: *OpSpecs were not provided for in the early U.S. civil air regulations. A valid certificate or temporary permit was the principal federal authorization for conducting any air commerce operations. In addition to the certificate or permit, each operator had to possess valid competency letters, or temporary letters, issued by the Secretary of Commerce. These letters, which contained information relating to the operator's services, routes, aircraft, maintenance, airmen, and weather procedures, were appended to and considered part of the operating certificate. For example, Civil Air Regulation (CAR) 61.01 required each air carrier to operate in compliance with the terms, conditions, specifications, limitations, or other provisions of its certificate or temporary permit which included the competency or temporary letters. In 1953, the CAB revised the CARs to require that each operator apply for OpSpecs at the time of application for an air carrier certificate. Air carriers who existed at that time were issued OpSpecs to be used instead of the competency or temporary letters. These revised rules specified that the OpSpecs were not part of an air carrier certificate.*

3. CONCEPTUAL NEED FOR OPSPECS.

Within the air transportation industry there is a need to establish and administer safety standards to accommodate many variables. These variables include: a wide range of aircraft; varied operator capabilities; the various situations requiring different types of air transportation; and the continual, rapid changes in aviation technology. It is impractical to address these variables through the promulgation of safety regulations for each and every type of air transport situation and the varying degrees of operator capabilities. Also it is impractical to address the rapidly changing aviation technology and environment through the regulatory process. Safety regulations would be extremely complex and unwieldy if all possible variations and situations were addressed by regulation. Instead, the safety standards established by regulation should usually have a broad application which allows varying acceptable methods of compliance. The OpSpecs provide an effective method for establishing safety standards which address a wide range of variables. In addition, OpSpecs can be adapted to a specific operator's class and size of aircraft and type and kind of operation. OpSpecs can be tailored to suit an individual operator's needs. Only those authorizations, limitations, standards, and procedures that are applicable to an operator need to be included.

4. LEGAL BASIS FOR OPSPECS.

The Lebanese Civil Aviation Safety Act, through the Minister of Transportation, empowers the Director General of Civil Aviation (DGCA) to issue certificates to qualified air operators. In Articles 53 and 54 of the Lebanese Civil Aviation Safety Act, each air carrier operating certificate is required to include the terms, conditions, and limitations reasonably necessary to ensure safety in air transportation. Included in DGCA certificates issued to air operators conducting operations under Parts VI, Subpart 4, and Part VII of the LARs is a stipulation that those operations must be conducted in accordance with the provisions and limitations specified in the OpSpecs. The LARs require that the OpSpecs issued to Parts VI, Subpart 4, and Part VII operators specify the authorizations, limitations, and certain procedures under which each type of operation must be conducted and under which each class and size of aircraft must be operated. Parts VI, Subpart 4, and Part VII specify in general terms the basic content of OpSpecs for each kind of operation. The regulations also state that a person engaged in operations governed by OpSpecs issued under Parts VI, Subpart 4, or Part VII, may not conduct those operations either without OpSpecs or in violation of the appropriate OpSpecs. These regulations also stipulate that the Minister may add other items to the contents of the OpSpecs whenever necessary to cover particular situations. For example in the U.S., FAR 91.1(b) stipulates that except for FARs 91.70(c) , 91.88 , and 91.90 , the flight rules of Subpart B of Part 91 do not apply to persons operating U.S. registered aircraft outside the U.S. The FAA determined that certain flight rules in Subpart B of Part 91 are appropriate to U.S. operators outside the U.S. and that these rules are not inconsistent with any foreign country's rules. Therefore, certain flight rules in Subpart B were incorporated in OpSpecs to cover particular situations in international operations.

5. STANDARD OPSPECS.

(1) Standard OpSpecs paragraphs are developed by the Director General of Civil Aviation, Lebanon. The process used by the Director for developing standard OpSpecs paragraphs ensures appropriate coordination with DGCA personnel and other Lebanese services and offices that could be affected by air carrier operations.
(2) The process also ensures that before the standard OpSpecs are finalized, appropriate coordination is accomplished with affected industry groups. Since standard OpSpecs specify limitations, conditions, and other provisions which operators must comply with, coordination with industry is essential to a mutual and clear understanding of the effect they will have on industry. After appropriate coordination has been completed, drafts of the new standard paragraphs, or amendments to existing paragraphs are finalized and incorporated into the OpSpecs program.
(3) Through the use of standard OpSpecs paragraphs, the DGCA and industry are assured that air carriers conducting comparable operations with comparable equipment are held to the same standards. Occasionally, a situation may occur in which it becomes necessary to issue a operator an OpSpecs paragraph that is nonstandard because of a unique situation not provided for in the standard paragraphs. Nonstandard OpSpecs paragraphs may not be less restrictive than, nor contrary to, the

provisions in standard paragraphs. In those cases when a nonstandard paragraph is more restrictive than the standard paragraph, justifiable reasons must exist, since the operator could be placed at a competitive disadvantage.

6. AVAILABILITY OF OPSPECS TO CREWMEMBERS AND OTHER EMPLOYEE PERSONNEL.

The Lebanese Aviation Regulations (LARs) require that OpSpecs information be included in operator manuals. Many operators meet this requirement by including a copy of the applicable parts of the OpSpecs in the appropriate sections of their manuals. The language used in OpSpecs, however, is not designed to apply to particular situations, but is written to specify absolute minimum conditions or provisions for a broad range of issues and situations. The application of a particular OpSpecs authorization, limitation, and/or provision may not be readily apparent to a particular situation. As a result, OpSpecs which are legal documents are not easy to use or interpret during any particular operational situation. Preferably, operators should extract information from the OpSpecs and include it in their manuals for ready use by their crewmembers and other employee personnel. The OpSpecs information in an operator's manual should pertain only to that operator's type of operation and be written in a manner that is directly applicable to the operator's crewmembers and/or other employee personnel.

7. FORMAT OF OPERATIONS SPECIFICATIONS.

Standard OpSpecs paragraphs are divided into the following six parts with each part containing standard paragraphs numbered consecutively from 1 to 120.
(1) Part A - General (paragraphs A001 through A030). Paragraphs A1 through A008, A028, and A029 are considered to be both airworthiness and operations paragraphs. Contents of these paragraphs must be carefully coordinated between operations and airworthiness inspectors before approval. Approval of these paragraphs will be indicated by the signature of the Directorate General of Civil Aviation, Chief of Flight Safety. Operations inspectors are primarily responsible for preparing the remaining paragraphs in Part A. Paragraphs A022 through A027 are reserved for future development of standard paragraphs by the Director General of Civil Aviation, if necessary.
(2) Part B - Enroute Authorizations, Limitations, and Procedures (paragraphs B031 through B050). Operations inspectors are primarily responsible for preparing Part B. Approval of these paragraphs will be indicated by the signature of the Directorate General of Civil Aviation, Chief of Flight Safety. Paragraphs B045 through B049 are reserved for future development of standard paragraphs by the Director General of Civil Aviation, if necessary.
(3) Part C - Airplane Terminal Instrument Procedures and Airport Authorizations and Limitations (paragraphs C051 through C070). Part C pertains to fixed wing airplanes only. Operations inspectors are primarily responsible for preparing the paragraphs in Part C. Approval of these paragraphs will be indicated by the signature of the Directorate General of Civil Aviation, Chief of Flight Safety. Paragraphs C068 and C069 are reserved for future development by the Director General of Civil Aviation, if necessary.
(4) Part D - Aircraft Maintenance (paragraphs D071 through D095). Airworthiness inspectors are primarily responsible for preparing the paragraphs in Part D. Either an airworthiness inspector or an operations inspector may prepare paragraph D095, Minimum Equipment List Authorization. Approval of these paragraphs will be indicated by the signature of the Directorate General of Civil Aviation, Chief of Flight Safety. Paragraphs D089 through D094 are reserved for future development by the Director General of Civil Aviation, if necessary.
(5) Part E - Weight and Balance (Paragraphs E096 through E100). Airworthiness inspectors are primarily responsible for preparing Part E. Part E must be carefully coordinated with operations inspectors. Approval of these paragraphs will be indicated by the signature of the Directorate General

of Civil Aviation, Chief of Flight Safety. Paragraphs E097 through E100 are reserved for future development by the Directorate General of Civil Aviation, if necessary.
(6) Part H - Helicopter Terminal Instrument Procedures and Airport Authorizations and Limitations (paragraphs H101 through H120). Part H pertains to rotorcraft aircraft only. Operations inspectors are primarily responsible for preparing the paragraphs in Part H. Approval of these paragraphs will be indicated by the signature of the Directorate General of Civil Aviation, Chief of Flight Safety. Paragraphs H115 through H119 are reserved for future development by the Directorate General of Civil Aviation, if necessary.

8. TABLE OF CONTENTS FOR OPERATIONS SPECIFICATIONS.

The OpSpecs table of contents is an integral section of an operator's OpSpecs. It is used as a control to account for the specific paragraphs issued to a particular operator. Inspectors will print a table of contents each time they generate a complete set of OpSpecs. In addition, if a revision to the OpSpecs causes a revision to the table of contents, the inspector will print out a revision to the table of contents. The final table of contents to be issued to the operator must be printed on the DGCA OPS Form TBD, "Operations Specifications".

9. COMPLETING THE APPROVAL SECTION OF OPERATIONS SPECIFICATIONS.

(1) The original operations specifications form must be completed and issued to the operator. The end of each paragraph contains the Approval Section. The copy must also be completed and sent to the operator, signed upon receipt by the operator, and returned to the Directorate General of Civil Aviation for retention. The Approval Section at the end of the operations specifications paragraph contains blocks 1 for indicating whether the operations specifications are being issued by the DGCA or the operator is applying for the OpSpecs. In either case, the appropriate box must be checked. Most of the standard paragraphs in Parts A, B, C, and H are issued by the DGCA. On occasion an operator may apply for a nonstandard paragraph or additional operational approval. In these situations the operator is responsible for preparing the paragraph and for entering a checkmark in the appropriate box. A supply of blank OpSpecs should be provided to the operator for this purpose. When the operator applies for a nonstandard paragraph or additional operation, he must also provide supporting data to justify the provisions. When the operator applies for a nonstandard paragraph or additional operation, the operator's authorized official must certify that the data supporting the application is true by entering his title, name, signature, and date of the application in the request.
(2) The Chief of Flight Safety who is assigned primary responsibility for approving the paragraph in the Approval Section, must indicate approval in the space provided in block 2. Approval is indicated by the following:

(a) the date approval is effective date must be entered in the appropriate space.
(b) if the paragraph being approved is an original issuance, the word "Original" must be entered in the space titled, "Amendment Number." If the paragraph being approved is not an original issuance, an appropriate sequential number (number of times the paragraph has been amended) must be entered in the space.
(c) the name, title, and Directorate of the approving official must be entered below block 2. " A space must be left for the signature.
(d) the approving official must sign his name in ink directly above his name. Signature stamps are not authorized on the original and DGCA copy of the OpSpecs form that is issued to the operator.

10. OPERATOR'S RECEIPT OF APPROVED OPERATIONS SPECIFICATIONS.

(1) After an OpSpecs paragraph has been approved, the original and one copy of the paragraph shall be forwarded to the operator with a letter. This letter must identify the paragraph and any associated

amendment numbers. This letter must also state that the original, DGCA-signed OpSpecs form is to be retained by the operator. The letter shall request that the copy be signed by the operator as received and then be returned to the DGCA. The operator's authorized official must enter his title, name, signature, and date in block 4 of the copy of the OpSpecs form. When the operator signs the copy as being received, he is acknowledging that he has reviewed and that he agrees to comply with the specifications appearing in the OpSpecs form.

(2) The Chief of Flight Safety shall keep the receipted copies of all OpSpecs including the table of contents on file in the DGCA Documentation Center. The OpSpecs paragraphs that are currently in effect for the operator shall be filed together. Superseded paragraphs and table of contents shall be kept in a separate file and retained for at least 5 years. If an operators certificate or OpSpecs are surrendered or revoked, the OpSpecs shall be retained in the DGCA Documentation Center for at least 5 years.

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Appendix IX
to
General Operating and Flight Rules Standards
s602.168 – Aircrew Designated Examiner Requirements

DIVISION I - GENERAL

1. GENERAL.

The Minister's certification tasks are delegated to the aviation safety inspectors within the Directorate General of Civil Aviation and to examiners outside of the Directorate General of Civil Aviation under the terms of Lebanese Aviation Regulations (LARs) Part VI, Subpart 2, "The Director General of Civil Aviation (DGCA) may select a pilot examiner whenever he determines there is a need for one." By regulation the designation of examiners is the responsibility of the DGCA. The DGCA will permit designations relating to air carriers to lapse when a need no longer exists.

The two broad categories of examiners designated for certification of airmen in flight operations are Designated Flight Test Examiners (FTE) and Aircrew Program Designees (ADE).

(a) FTE. Guidance relating to designated flight test examiners is contained in Part IV of the LARs.

(b) ADE. Guidance relating to aircrew program designees is contained in Part VI, Subpart 2 of the LARs. This Appendix is concerned with Aircrew Designated Examiners (ADE).

2. OVERVIEW OF THE ADE PROGRAM.

Aircrew Designated Examiners. ADE's are designated to conduct certification within specifically approved programs known as ADE programs. ADE's are restricted to examining only those applicants employed by their operator and trained in their approved training program. ADE candidates must be employed by the operator and qualified as check airmen for the operator before they may be designated as ADE's. The DGCA is authorized by regulation to designate ADE's to serve in any ADE program that the DGCA oversees. The specific functions of an ADE are named in the Letter of Authority that supplements the Certificate of Designation and Certificate of Authority.

3. GUIDANCE FOR DESIGNATING ADEs.

Guidance. The DGCA will designate ADEs under an ADE Program when an operator requests to perform its own certification activities. Justification for an operator to conduct its own certification activities are as follows:

(a) the operator conducts simulator training at remote locations making it difficult for the DGCA to support certification.

(b) the DGCA does not have the personnel to support an airlines certification activities.

(c) an operator introduces a new aircraft to its fleet.

Programs for ADE's.

Aircrew Designated Examiner (ADE) Program. Aircrew Designated Examiners (ADE) are trained in an ADE program. An ADE program is associated with an operator which conducts its own program of airman qualification using its own flight simulators. It is the preferred program for conducting the certification of flight crewmembers for complex Part VI, Subpart 4 and Part VII of the LARs operators. The ADE program is designed for operators with sophisticated training capabilities including flight simulators, with highly trained personnel. An ADE Program should be established before the operator's airman certification workload for any aircraft type exceeds the DGCA's ability to meet requirements using available inspector resources. They should also consider an ADE program as a means of making simulator training accessible to an operator which might not otherwise find simulator training practical. Simulator training is acknowledged as the safest and best training method.

4. ADE AUTHORITY AND RESPONSIBILITIES.

An ADE is authorized to conduct only those airman certification activities approved by the DGCA.

Privileges and Limitations. The following privileges and limitations apply to ADEs conducting evaluations of personnel in air transportation.

An ADE may:

(a) conduct only those tests indicated on DGCA Form (TBD), "Certificate of Authority," and specifically named in the Letter of Authority;
(b) issue temporary certificates to applicants that the ADE has evaluated and found qualified for the certificate or rating sought;
(c) amend or alter a certificate only:
  (i) when adding a rating to the certificate of an applicant whom that ADE has tested and found to be competent; or
  (ii) when removing a restriction on a certificate which the ADE is authorized to issue;
(d) be authorized to conduct certification tests within a Part VI, Subpart 4, or Part VII of the LARs training program at any base or facility approved for the operator's use by the DGCA.

An ADE may not:

(a) conduct a test for a certificate or rating that the ADE does not hold;
(b) conduct an evaluation of any applicant whom the designated examiner has instructed in preparation for the certificate or rating sought by the applicant. Exceptions may be granted by the DGCA only on a case-by-case basis;
(c) conduct an evaluation of any applicant whose performance the designated examiner has found to be unsatisfactory on the previous evaluation (i.e., a different examiner is required on a "re-take"). Exceptions may be granted by the DGCA only on a case-by-case basis;
(d) conduct special medical evaluations, tests for waivers, or any test for competency under the LARs. The DGCA shall instruct designated examiners to direct applicants for waivers, special medical evaluations, and competency tests under the LARs to the DGCA.

Professional Conduct. Each ADE must represent the Minister in a manner which credits the Directorate General of Civil Aviation. Qualities such as promptness, courtesy, and professionalism are essential. Each designated examiner must continuously exhibit a positive personal attitude toward safety and present a positive image of the DGCA in respect to aviation safety.

Aircrew Designated Examiner Responsibilities. Designated examiners are responsible for the following:

(a) conducting all practical tests in air transportation programs in accordance with the applicable sections of this Appendix. The DGCA will ensure that Aircrew Designated Examiners are aware that all operators must have a document covering procedures and maneuvers which contains specific training and testing standards. This document should be based on the applicable practical test standards (PTS);
(b) submitting complete and accurate certification packages to the DGCA within 5 working days of administering a test.

Information Note: *A designated examiner may be issued only one DGCA Form (TBD), "Examiner Designation/Qualification Record"; one DGCA Form (TBD), "Certificate of Designation"; and one DGCA Form (TBD), "Certificate of Authority."*

5. DGCA RESPONSIBILITIES.

The DGCA is responsible for ensuring that ADEs are trained in certification duties and procedures, that surveillance is scheduled, and that ADEs maintain certification standards. For ADEs designated in accordance with this Standard, these responsibilities include the following:

(a) Initial Training and Observation. The DGCA is responsible for ensuring that, before designation, each ADE candidate is properly trained to conduct certification and is observed while conducting an evaluation by a qualified (type rated) DGCA Inspector.

(b) Surveillance. The DGCA must ensure that each ADE is observed a minimum of once a quarter by a qualified (type rated) DGCA Inspector who is trained under the carrier's Training Program, and that this observation has been accomplished before the ADE's designation is renewed. The responsibility for scheduling surveillance lies with the DGCA. The DGCA is responsible for establishing procedures by which the ADE provides schedules of proposed activities as far in advance as is practical or required.

(c) Airman Certification Standards. The DGCA is responsible for ensuring that ADEs maintain airman certification standards as prescribed by the LARs, by practical test standards (PTS), and by applicable DGCA guidance. The DGCA must conduct an active program of meetings and surveillance to achieve this objective.

(d) Certification Paperwork. The DGCA is responsible for establishing administrative procedures for the expedient and efficient processing of certification paperwork within the office.

(e) Data Processing Support. The DGCA is responsible for establishing administrative procedures for entering the data generated by ADEs into the DGCA tracking system.

(f) Resources. The DGCA is responsible for the personnel, training, and budget resources necessary to accomplish the surveillance of ADEs. Personnel, training, and budget forecasts must contain adequate provisions for the surveillance of ADEs. The DGCA should anticipate changes in personnel requirements due to either growth in operator programs or public demand.

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DIVISION II

MANAGING ADE PROGRAMS

1. SELECTION OF ADEs.

This section applies to the selection of ADEs in the Air Crew Designator Examiner (ADE) program described in Division 1 of this Standard.

Application. ADE candidates must submit the following:

(a) a complete statement of professional qualifications on DGCA Form (TBD), "Examiner Designation and Qualification Record," before designation. The DGCA shall review the candidate's qualifications to ensure that the candidate meets the requirements and standards for an ADE designation.
(b) copies of any current check airman letters of approval issued to the candidate

Qualifications of ADE's. Candidates must have the following qualifications:

(a) a recommendation from the operator that includes a resume of training and professional experience;
(b) status as a pilot check airman in the operator's training program;
(c) a good record as a pilot and flight instructor and a good record of compliance with the LARs;
(d) approval as a check airman for the operator in its Part VI, Subpart 4 or Part VII of the LARs training program;
(e) a reputation for integrity and dependability in the industry and the community;
(f) an airline transport pilot (ATP) Certificate and applicable type rating for pilot examiners, or the appropriate airman certificate for flight engineer;
(g) aircrew program designee's (ADE) must have successfully completed the operator's approved training program in which the candidate will be authorized to conduct evaluations for the issuance of certificates; and
(h) have satisfactorily completed a formal ground school conducted by the DGCA that includes the subjects contained in this Standard.

Qualifications of Candidates Other Than Pilots. ADE candidates who are not pilots must have the following qualifications:

(a) ADE flight engineer candidates must have successfully completed the operator's approved training program in which the candidate will be authorized to conduct evaluations for the issuance of certificates;
(b) ADE flight engineer candidates must have satisfactorily completed a formal ground school conducted by the DGCA that includes the subjects contained in this Standard;
(c) hold the appropriate airman certificate and rating(s), if applicable;
(d) status as a flight engineer check airman in the operator's training program;
(e) a recommendation from the operator that includes a resume of training and professional experience; and
(f) a good record of compliance with the LARs.

2. ADE CANDIDATE TRAINING AND OBSERVATION.

The DGCA shall ensure that ADE candidates are trained and observed in their functions prior to designation by a qualified (type rated) DGCA Inspector.

Candidate Training. ADE candidates must be trained in certification policies, procedures, and standards. The DGCA must ensure that the candidate is trained in the following specific areas:

(a) the knowledge, abilities, and skill requirements for the original issuance of the certificate and added ratings, as applicable;
(b) the procedures, methods, and techniques associated with administering the required certification tests;
(c) ADE responsibilities, authority, and limitations under the LARs and applicable DGCA Decrees and Arrêtés**;**
(d) the use of DGCA forms and job aids associated with the particular examiner function; and
(e) administrative procedures and relationships with the DGCA

Representing the DGCA. The DGCA shall stress to ADE candidates that in performing the functions of an ADE, they are representatives of the Minister. Candidates must understand that matters such as company loyalties, economic conditions, syndicate affiliations, and seniority are not relevant to the certification of airmen.

DGCA Observation of the Candidate. After the ADE candidate has been trained, a qualified (type rated) DGCA Inspector shall observe the ADE candidate conducting a complete certification test consisting of oral, simulator, and aircraft portions, (or practical evaluation) as applicable.

Proficiency Checks for ADEs. The DGCA shall administer a proficiency check to each designated ADE once every six months. The check will be administered by a qualified (type rated) DGCA Inspector.

Recording ADE Training. The DGCA Inspector who conducts the training for an ADE candidate shall complete DGCA Form (TBD), "DGCA Tracking System Data Sheet," for each ADE candidate trained

3. OVERSIGHT AND SUPPORT OF DESIGNATED EXAMINERS.

The DGCA is responsible for the oversight and support of ADEs. The following guidance applies:

(a) Meeting with Examiners. The DGCA shall ensure competent performance by each ADE respect to handling of applicants, maintenance of desired test standards, and accurate completion and processing of certification paperwork. ADEs should be encouraged to contact the DGCA to resolve questions or difficulties. Sufficient contact is essential, and shall include regular and special meetings and annual briefings, as follows:
   (i) *Regular Safety Standardization Meetings*. at least annually, the DGCA shall conduct regularly scheduled meetings with designated examiners for the purpose of maintaining desirable standards and effective working relationships. These meetings shall be recorded in the DGCA Tracking System.
   (ii) *Special Safety Standardization Meetings*. The DGCA shall call special meetings whenever a significant change affects the process of DGCA airman certification in respect to air transportation ADEs.
   (iii) *Annual DGCA Briefing of ADEs*. Each ADE shall attend an annual briefing conducted by the DGCA which specifically addresses the functions of an ADE. This briefing may be accomplished in conjunction with a safety standardization meeting, but must be accomplished as a condition of renewal.

4. ADE RECORDS FILE.

The DGCA shall maintain a records file for each ADE. This file shall contain the following

(a) DGCA Form (TBD), "Examiner Designation and Qualification Record" for each original designation and renewal;
(b) DGCA Form (TBD), "Certificate of Authority" for each original designation of authority and renewal;
(c) DGCA Form (TBD), "Certificate of Designation" for each original designation and renewal
(d) Record of proficiency check;
(e) violations history, if any, available from the DGCA Tracking System.; and
(f) any pertinent correspondence

5. REVIEW OF ADE DECISIONS.

If an airman is dissatisfied with an ADE decision, the airman may appeal to the DGCA for a retest. The airman must submit the appeal in writing and indicate the reasons for protesting the ADEs decision. The DGCA shall review the matter and decide if retesting is appropriate. If the DGCA grants a retest, a new application must be completed and the entire test must be accomplished again by a qualified (type rated) DGCA Inspector who is qualified in the carrier's Training Program.

6. TERMINATION AND CANCELLATION OF ADE DESIGNATION.

An ADE designation normally terminates at the expiration date, but may be terminated early or canceled for cause.

Normal and Early Termination. The termination of an ADE designation may be based on any of the following administrative factors:

(a) a change in needs for ADE services;
(b) a change in the ADE Program policy;
(c) a change in the ADE's employment, base of operations, or professional activities, such as loss of check airman status;
(d) voluntary surrender of the designation, by the ADE's written request for termination; or
(e) a request for termination of ADE authority made by the ADE's employer

Cancellation for Cause. An ADE designation may be canceled for cause by the DGCA under certain circumstances. The cancellation of an examiner designation may be based on any of the following causes:

(a) evidence of malpractice, fraudulent use of the designation, or any actions by the ADE which discredit the DGCA;
(b) unsatisfactory performance in any aspect of the ADE's functions, including failure to complete certification paperwork accurately or unwillingness or inability to carry out the DGCA's instructions;
(c) evidence indicating that requirements for the original designation were not met at the time of designation; or
(d) failure of the ADE to meet annual requirements for renewal in a conscientious and timely manner

7. CANCELLATION FOR CAUSE PROCEDURES.

The following steps shall be followed when implementing cancellation for cause:

(a) Hand Carried. The DGCA shall notify an ADE of the cancellation of the ADE's designation for cause by hand carried mail. A letter will be sent to the ADE and the carrier. A signed copy of the letter will be retained by the courier. The letter shall be prepared by the DGCA and shall contain the following:

- (i) a notification that the cancellation is effective immediately;
- (ii) a statement that prohibits the ADE from conducting any further examinations until the matter is resolved;
- (iii) a clear statement of the reasons for the cancellation action;
- (iv) the specific reasons for the proposed action, together with relevant LAR guidance;
- (v) in the case of unacceptable conduct by an ADE, specific examples of this conduct;
- (vi) a statement that the ADE has the option to respond in writing or to appear in person within 10 days of receipt of the letter;
- (vii) a statement that if the ADE chooses to appear in person, the ADE may be accompanied by counsel;
- (viii) a statement that a record will be made of any meeting concerning appeal; and
- (ix) a statement that directs the ADE to return to the DGCA the DGCA Form (TBD), "Certificate of Authority," and DGCA Form (TBD), "Certificate of Designation."

APPENDIX X
to
General Operating and Flight Rules Standards
s602.169 to s602.172 Proving Tests

THE PROVING TEST PROCESS

DIVISION I

Approval Process

1 PHASE ONE.

(1) Phase one of the proving test process begins when an applicant requests authorization from the DGCA to conduct an operation for which a proving test is required by LARs Part VI, Subpart 2, Section 602.169. The term, "applicant," as used in this Standard, means either a candidate applying for an operating certificate or a certificate holder requesting additional operating authority. When an applicant's request requires proving test, the following steps apply:

Information Note: *The proving and validation test process follows the general outline of the five phase approval process that is described in LARs Part VI, Subpart 2, Standards, Appendix VII.*

(2) *DGCA Test Team*. The Chief of Flight Safety shall organize a test team.
- (a) Team Leader. The team leader should normally be one of the principal inspectors assigned to the applicant and shall be responsible for the conduct, coordination, and evaluation of the test. In addition, the team leader will be the spokesperson for the DGCA on all matters pertaining to the test.
- (b) Team Personnel. The DGCA test team should include the following personnel, as required:
  - (i) the team leader
  - (ii) all assigned principal inspectors
  - (iii) an aviation safety inspector (ASI) (operations) qualified on the equipment
  - (iv) ASIs (maintenance and avionics) trained on the installed equipment
- (c) Familiarization. All members of the DGCA inspection team must become familiar with the pertinent parts of the applicant's general operations manual (GOM), procedures, and policies.

Information Note: *If qualified inspectors are not available within the DGCA, the Chief of Flight Safety must request assistance from another Authority.*

(3) *Preliminary Coordination*. The DGCA test team and the applicant must reach a common understanding of what the applicant must do, what role the DGCA will play, and what reports and documents must be prepared during the testing process. Both the test team and the applicant must research applicable regulatory and advisory material. If the test concerns special area navigation then the test team should consult a navigation specialist early in phase from another Authority. The navigation specialist can provide advice on testing requirements.
(4) *Proving Test Tracking and Reporting*. When the test team is formed, the team leader shall ensure that a Proving Test record is opened for the applicant. This file will remain open until the team completes its assignment. This procedure will create a complete record of the Proving Test and will serve as the record of certification to be maintained in the DGCA Documentation Control Center at the end of the certification project.

2. PHASE TWO.

Phase two is initiated when the applicant submits the test plan to the DGCA for evaluation. During this phase, the team leader must ensure that the plan is complete and in an acceptable format before a thorough review and analysis can be conducted.

3. PHASE THREE.

(1) Phase three is initiated when the team starts an in-depth review and analysis of the applicant's test plan for regulatory compliance, safe operating practices, logic of sequence, and other areas (such as training programs, crew and dispatcher qualifications, acceptable participants, and schedules). During this phase, the DGCA must plan to coordinate its activities with the demonstrations that the applicant will conduct during phase four.

(2) *Team Leader*. The team leader's responsibilities include the following:

- (a) notifying the Chief of Flight Safety of proving flight dates, times, and locations.
- (b) assigning appropriate sections of the test plan to inspectors or specialists for review and comment
- (c) coordinating with the office of aviation security (as necessary) to obtain security assistance for evaluating specific areas, such as hazardous materials and passenger screening
- (d) ensuring that administrative requirements such as visas and diplomatic clearances are obtained in a timely manner

(3) *Team Members*. Team members are responsible for performing assigned tasks, keeping the team leader informed of all actions, and ensuring that the team leader concurs with all agreements made with the applicant. In addition, team members are responsible for recording each activity accurately and completely in writing. All correspondence will be processed through the Team Leader who will ensure that the certification file is up to date. All correspondence will be filed chronologically.

4. PHASE FOUR.

Phase four is the major phase of the test process. For proving flights, the applicant will conduct the enroute flight segment and the maintenance test portion of the proving plan. Phase four is concluded when the test team is satisfied that all test objectives have been achieved or that the applicant is unable to complete them satisfactorily. Before concluding phase four, the team leader shall obtain the concurrence of the Chief of Flight Safety.

5. PHASE FIVE.

Phase five is accomplished after the successful completion or termination of the proving test. In this phase, the DGCA team either grants approval and issues the appropriate operations specifications (OpSpecs) or sends a letter of disapproval to the applicant. In either case, the team leader's final action is to complete the report by closing the original certification record that was opened in phase one.

DIVISION II

PROVING TEST REQUIREMENTS

1. GENERAL.

(1) Each applicant must demonstrate the ability to operate safely by conducting proving tests in accordance with the operating, maintenance, aircraft dispatch, flight release, and flight locating requirements of either LARs Part VI, Subpart 4 or Part VII as appropriate. Proving tests must be conducted in a manner that closely simulates the regulatory conditions that will apply after approval has been granted.

(2) *Types of Flights*. The only types of flights that can be credited towards proving test requirements are described in the following subsections:

- (a) Representative Enroute Flights. Representative enroute flights are conducted in compliance with either LARs Part VI, Subpart 4, or Part VII, and applicable Sections of LARs Part VI, and other applicable rules. Before an applicant may conduct these flights, the test team must be satisfied that the applicant's phase three review has been completed.
- (b) Ferry Flights or Flights of Provisionally Certificated Aircraft. Ferry flights conducted under the provisions of the LARs may be credited towards proving test requirements. In rare situations, an applicant may propose to use a provisionally certificated aircraft during proving flights under LARs Part VII. To obtain DGCA approval, the applicant must show that no feature, characteristic, or condition of the aircraft would make it unsafe when operated in accordance with LARs Part VI or Part VII.
- (c) Training Flights. Training flights may be credited towards proving test requirements, provided that each flight is observed by a DGCA inspector.
- (d) Positioning Flights. A positioning flight is a flight conducted to move an airplane over a nonrepresentative route, such as from the aircraft factory to the applicant's main base.

(3) *Additional Requirements*. To credit ferry hours, hours flown in provisionally certificated aircraft, or training flight hours towards proving test requirements, the applicant's phase three review must have been completed. Also, the applicable manual must be in a state of completion that is acceptable to the test team for that applicant. Flights must be conducted in accordance with the following:

- (a) proposed LARs Part VI, Subpart 4,or Part VII operations manual
- (b) proposed LARs Part VII inspection or maintenance programs
- (c) proposed minimum equipment list (MEL), CDL, and DDPG
- (d) flight control requirements (dispatch, flight following, or locating) of LARs Part VII.
- (e) operations and maintenance recordkeeping requirements of LARs Part VI, Subpart 4, and Part VII.

2. SITUATIONS REQUIRING PROVING TESTS.

LARs Part VI, Subpart 4 or Part VII, Subparts 3, 4, and 5 require aircraft proving tests for the following situations:

- (a) during the certification process of an applicant proposing to conduct operations under Part VI, subpart 4, or Part VII, Subparts 3, 4, or 5.
- (b) when a Part VI, Subpart 4 or a Part VII, Subparts 3, 4, or 5 applicant proposes to operate an aircraft that the applicant has not previously used
- (c) when a Part VI, Subpart 4, or a Part VII, Subparts 3, 4, or 5 applicant proposes to use an aircraft that has been materially altered in design
- (d) when an operator applies for a class of operations not currently authorized by the operator's OpSpecs (For example, an operator may request to transition from cargo operations, to passenger operations.)

3. PART VII, SUBPART 5 APPLICANT PROVING TEST REQUIREMENTS.

Requirements for newly manufactured aircraft, aircraft new to the applicant, and materially altered aircraft are as follows:

(a) Newly Manufactured Aircraft. LARs VII, Subpart 5 requires at least 100 hours of proving tests (in addition to aircraft certification tests) before a new type of aircraft can initially be introduced into Part VII, Subpart 5 operation. This requirement applies to any foreign manufactured aircraft that has not been operated previously by a Lebanese certificate holder.

(b) Aircraft New to the Applicant. The LARs require that at least 50 hours of proving tests be conducted by an applicant proposing to use a type of aircraft for the first time when that type of aircraft has been previously proven by another operator in Part VII, Subpart 5 operations.

(c) Materially Altered Aircraft. The LARs require an applicant to conduct at least 50 hours of proving tests when the type of aircraft to be used has been materially altered in design. Examples of materially altering an aircraft design include the following:

  (i) installation of engines that are a different type from those originally installed on the aircraft for type certification (for example, reciprocating powered engines to turbine powered engines, or low bypass jet engines to high bypass jet engines)

  (ii) any design alterations that significantly affect flight characteristics

(d) Nighttime Requirements. In situations where applicants are required by the LARs to conduct 100 hours of aircraft proving tests, at least 10 of those proving test hours must be conducted at night.

4. PART VI, SUBPART 4 AND PART VII, SUBPARTS 3 AND 4 APPLICANT PROVING TEST REQUIREMENTS.

Requirements for newly manufactured aircraft, aircraft new to the applicant, and materially altered aircraft are as follows:

(a) Newly Manufactured Aircraft. LARs Part VI, Subpart 2, Division XVII requires at least 25 hours of proving tests (in addition to aircraft certification tests) before a new type of aircraft can initially be introduced into Part VI, Subpart 4 and Part VII, Subpart 3 and 4 operation. This requirement applies to any foreign manufactured aircraft that has not been operated previously by a Lebanese certificate holder.

(b) Aircraft New to the Applicant. The LARs require that at least 25 hours of proving tests be conducted by an applicant proposing to use a type of aircraft for the first time when that type of aircraft has been previously proven by another operator in Part VI, Subpart 4 or Part VII, Subpart 3 or 4 operations.

(c) Materially Altered Aircraft. The LARs require an applicant to conduct at least 25 hours of proving tests when the type of aircraft to be used has been materially altered in design. Examples of materially altering an aircraft design include the following:

(d) Engines. Installation of engines that are a different type from those originally installed on the aircraft for type certification (for example, reciprocating powered engines to turbine powered engines, or low bypass jet engines to high bypass jet engines)

(e) Design Alterations. Any design alterations that significantly affect flight characteristics

(f) Nighttime Requirements. In situations where applicants are required by the LARs to conduct 25 hours of aircraft proving tests, at least 5 of those proving test hours must be conducted at night.

5. REPRESENTATIVE NUMBER OF FLIGHTS INTO AIRPORTS.

LARs Part VI, Subpart 2, Division XVII require an applicant to conduct a representative number of proving flights into enroute airports. These are airports which the applicant plans to use in scheduled operations or is likely to use in nonscheduled operations. Representative airports must be within the applicant's proposed areas of enroute operations. If an applicant plans to conduct overseas and/or international operations, the applicant must conduct proving flights into domestic, overseas, and/or international areas. A determination of what constitutes a representative airport or area of enroute operation (and the number of representative airports and areas) must be made by the DGCA test team. This determination should include a consideration of factors pertinent to the proposed type of operation.

6. CARRIAGE OF PASSENGERS AND CARGO.

Carriage of revenue passengers on proving flights is prohibited by LARs Part VI, Subpart 2, Division XVII. The carriage of revenue cargo should be approved for any applicant that has appropriate economic authority to carry revenue cargo. Applicants seeking DGCA certification that do not have appropriate economic authority are not permitted to carry revenue cargo; however, the carriage of company or simulated cargo should be encouraged. It is DGCA policy to encourage the carriage of cargo on representative enroute proving flights, when possible. The carriage of cargo allows for a more comprehensive test of the applicant's capabilities.

7. CREW QUALIFICATIONS FOR PROVING TESTS.

Training flights may be credited towards proving test requirements, provided crewmembers are undergoing training according to the applicant's initially approved flight training curriculum. Ferry flights may be credited towards proving tests, provided crewmembers and initial cadre check airmen have completed applicable proficiency, competency, and type rating checks. Line checks and operating experience (OE) may be accomplished on proving flights.

8. PROVISIONALLY CERTIFICATED AIRCRAFT.

Provisionally certificated aircraft are aircraft in the process of receiving either a type certificate or an amendment to an existing type certification. The use of provisionally certificated aircraft involves extensive coordination between the DGCA and the appropriate certification directorate. Each proposal is uniquely processed and is beyond the scope of this Standard.

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DIVISION III

PLANNING THE PROVING TEST

1. APPLICANT'S PLAN FOR PROVING TESTS.

An applicant must submit a proving test plan at least 15 days in advance of any in-flight demonstration (including training or ferry flights) that the applicant desires to have credited toward the proving test requirements. Any subsequent change to the plan must be coordinated with the test team. The plan must contain at least the following information:

(a) identification of the company coordinator who will serve as the primary proving test spokesperson

(b) a detailed schedule of all proposed flights, including dates, times, and airports to be used (The schedule should clearly differentiate which flights will be conducted for training, ferry, or representative enroute flights.)

Information Note: *It is DGCA policy for 50 percent of the scheduled proving flight hours to consist of representative enroute flights over routes and into airports which the applicant intends to serve.*

(c) a list of names and positions of the flight crewmembers who will be participating on each flight

(d) a list of names, titles, and company affiliations of noncrewmember personnel whom the applicant intends to have on board each flight

(e) any other information that the test team determines is necessary to properly plan and conduct the proving flight

2. DGCA PLANNING FOR PROVING TESTS.

(1) *Early Planning*. Development and implementation of the DGCA's plan for observation and evaluation is of crucial importance to any proving test. The DGCA inspection team should begin planning in phase one of the proving test process. DGCA planning should be completed as soon as possible after the inspection team receives the applicant's plan.

(2) *Initial Review*. The inspection team must review the applicant's plan initially to determine if the appropriate documentation has been submitted. The plan must contain a realistic proposal that will permit the DGCA to adequately observe and evaluate the applicant's overall abilities. This review should be accomplished within 5 working days after receipt of the applicant's plan. Based on the results of this initial review, one of the following actions must be taken:

(a) Accept the Plan. If the applicant's plan is feasible and satisfies regulatory and DGCA policy requirements, the inspection team leader should notify the applicant in writing. Any changes should be negotiated and mutually agreed upon at this time.

(b) Return the Plan with Explanation. If the applicant's plan lacks appropriate documentation or does not satisfy regulatory or DGCA policy requirements, it must be returned to the applicant as soon as possible. A letter that briefly describes the principal reasons for the plan's return should accompany the plan.

3. OTHER PROVING TEST PARTICIPANTS.

(1) Part VI, Subpart 2, Division XVII limits the individuals who can participate in the in-flight portion of the proving tests to those who are required by the applicant to conduct the tests and to those "designated by the Minister."
(2) *Lebanese Government Participants*. During the demonstration phase, an applicant exercises all aspects of its operation, such as flight control, communications, flight planning, and line maintenance. It is essential that this phase be devoid of distractions created by nonessential personnel. The test team may authorize the participation of any government or contractor employee, including those from other agencies. These personnel should be limited to those having specific tasks to perform and to inspectors accomplishing on the job training.
(3) *The Applicant's Participants*. Many situations occur during proving flights that require decisions by company supervisory personnel to correct deficiencies observed during the flights. Therefore, the applicant's participants should include the following personnel:
- (a) initial cadre check airmen
- (b) directors of operations and maintenance (if applicable)
- (c) those supervisory personnel needed to act on behalf of the company if actions are required to resolve discrepancies

(4) *Other Personnel*. Other personnel, such as representatives of engine and aircraft manufacturers, may be authorized to participate if their presence materially enhances the process.

4. COORDINATION.

During the development of the DGCA plan to conduct proving tests, the DGCA proving test team leader is responsible for coordinating all parts of the proposed tests. The applicant's representatives and crewmembers, and DGCA participants, must understand and agree on which tasks must be accomplished to show compliance with regulatory requirements. The proving test team leader should notify the Chief of Flight Safety of proving flight dates, times, and locations.1615.

5. PREDEMONSTRATION TEST MEETING (DGCA TEAM).

The proving test team leader shall conduct as many predemonstration test meetings as necessary to accomplish the following:
- (a) <u>Provide Schedules and Assignments</u>. The proving test team leader shall provide specific team members with schedules and assignments for the proving flights (including flight times, locations, inspections, and reporting requirements).
- (b) <u>Evaluate the Applicant's Capabilities</u>. The proving test team leader shall establish in-flight and ground scenarios, simulated emergencies, and other means of testing the ability of crewmembers and the applicant to cope with actual operational contingencies independently and safely. The use of such scenarios is effective when evaluating the applicant's overall and specific abilities.
  - (i) *In-flight and Ground Scenarios*. Scenarios must be clearly understood by all team members in terms of individual roles and responsibilities. The proving flight team leader, however, must ensure that the applicant is not encumbered with so many simulated scenarios that a proper evaluation of its proposed routine operation is inhibited.
  - (ii) *Emergency Scenarios*. Since the primary purpose of proving flights is to ensure basic compliance with the regulations and safe operating practices during routine operations, the proving flight team leader shall not permit compound emergency scenarios to occur. When other agencies, such as air traffic control (ATC) and airport authorities, need to be involved for safety reasons, the proving flight team leader must ensure that all scenarios

are well coordinated. Should an actual emergency occur, all simulated scenarios shall be terminated.

(iii) *Examples of Typical Scenarios*. The following scenarios may be useful for evaluating the applicant's capabilities:

A. diversion to alternate airports for reasons such as weather or maintenance (This tests the company's communications, maintenance, and other operational capabilities.)

B. minimum equipment list (MEL) or configuration deviation list (CDL) situations (This tests the crewmembers' understanding of specific operational limitations and the company's operations and maintenance procedures. (For example, dispatching with a simulated inoperative generator tests the company's ability to comply with the operational and maintenance provisions of the MEL.)

C. performance problems (This requires the aircrew and dispatch, or flight control personnel, to demonstrate competency and knowledge of items, such as aircraft performance, airport analysis programs, and alternative company procedures. For example, simulating an inoperative antiskid or thrust reverser while operating on contaminated runways (ice, slush, or snow) tests the company's ability to deal with performance issues.)

D. security and hazardous cargo situations (This requires the aircrew and other company personnel to function in accordance with established company procedures and DGCA regulations.)

Information Note: *Hijack scenarios are prohibited during proving flights. Aircrew knowledge and company procedures must be examined by inspectors or security inspectors through other methods. The company's antihijack program shall not be exercised during proving flights.*

E. situations that exercise dispatch, flight-following, or flight locating centers (This tests communications, weather information dissemination, and other flight information distribution abilities. An effective means for testing this capability is to position an inspector who has specialized dispatch knowledge in the flight control or flight locating facility and (at a prearranged time) to initiate a scenario such as adverse destination weather that would require a diversion. This action tests the communications and weather reporting capability of the facility and also the company's procedural contingencies as demonstrated by the flightcrew.)

F. maintenance scenarios (A maintenance problem simulated at any location that the operator operates into should be planned, however minor, to test the company's ability to communicate and resolve problems that flightcrews may experience. Maintenance scenarios should be flexible enough to accommodate any real maintenance problems that could arise during a proving flight. Examples of the many possible maintenance problems include the following: an indicator out, a minor fluid leak, or the need to determine tire wear.)

G. simulated aircraft emergencies, such as an engine failure (This tests the flightcrew's knowledge and competency in handling emergency situations. It also tests company communications, maintenance, and other operational capabilities. Under no circumstances shall an inspector require an actual engine shutdown. Typically, this situation would result in a diversion.)

H. simulated incapacitated passengers in need of immediate medical assistance

I. simulated lavatory fire

J. simulated loss of pressurization

K. simulated landing gear extension or retraction problems

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DIVISION IV

PROVING TESTS: THE DEMONSTRATION PHASE

1. GENERAL.

The demonstration phase consists of the observation and evaluation of the applicant by Directorate General of Civil Aviation (DGCA) inspectors during proving flights. Proving flights consist of enroute flights and other acceptable flights. These flights are described in more detail in the following Sections.

2. CONDUCT OF ENROUTE FLIGHTS.

(1) Enroute flights (representative enroute) closely simulate the routine line operations that the applicant proposes to conduct. All flights in the enroute segment must be observed and evaluated either in flight or at ground facilities. All enroute flights must be observed and evaluated by DGCA inspectors on board the aircraft. The Minister may grant a deviation to this requirement. In no case will the observed flights be less than 50%.

(2) *Inspection Team Composition*. The on board team of DGCA inspectors must include an operations inspector, qualified on the specific aircraft, who directly observes the flightcrew and in-flight events, and reports those observations. For those operations that include Class II navigation or special use airspace, a navigation specialist or a pilot qualified inspector who is knowledgeable in Class II operations should be a member of the test team. A dispatch qualified inspector should also be included to observe the operational control functions. The majority of enroute flights should also be observed by maintenance and avionics inspectors on board the aircraft. In addition to the in-flight activities, operations and airworthiness inspectors must also evaluate flight initiation, servicing and unscheduled maintenance, and flight termination activities. While representative enroute flights are being conducted, other inspectors should observe the applicant's activities at appropriate ground facilities, such as operational or maintenance control centers.

(3) *Predemonstration Test Briefing with Applicant*. The proving test team leader shall conduct briefings with the applicant daily or as necessary to establish what the test team expects the applicant to accomplish during each proving test. Briefings shall include at least the following items:

- (a) the purpose of the proving test
- (b) status of the inspector in the jumpseat
- (c) status of the on board team of inspectors (They shall be treated as passengers.)
- (d) changing status of passenger to DGCA inspector when a DGCA credential is revealed
- (e) how simulated scenarios will be initiated, and what action is expected from the applicant
- (f) how to react to an actual emergency during the proving test
- (g) copies of flight plans, load manifests, and other documents that are expected and that should be provided
- (h) how maintenance discrepancies will be treated or terminated
- (i) debriefing at the conclusion of each day unless major problems require it sooner (Major discrepancies must be resolved before the proving test may resume the following day.)

(4) *Determining Applicant Competency*. The DGCA plan for inspecting and evaluating an applicant's competency during the enroute segment should include scenarios and other testing mechanisms designed to test the applicant's effectiveness in each of the following five general areas:

- (a) flightcrew
- (b) cabin crew
- (c) airport/station facilities
- (d) operational control
- (e) company procedures

(i) *Flightcrew*. The DGCA Team shall evaluate the competency and ability of the flightcrew throughout the enroute segment. Examples of areas to be inspected and evaluated are as follows:
A. flightcrew qualification
B. aircraft performance (including flight characteristics)
C. aircraft flight manual limitations
D. aircraft normal, abnormal, and emergency procedures
E. aircraft systems and equipment
F. airport data (including knowledge of required runway lengths, field elevation, facilities, and gates or parking areas)
G. flight management and cruise control
H. company manuals and procedures
I. crew discipline, situational awareness, and crew management
J. crew vigilance and collision avoidance procedures
K. knowledge of enroute structure, long range navigation procedures (if applicable), and unique enroute and area of operation requirements
L. knowledge of minimum equipment list (MEL) and configuration deviation list (CDL) procedures
M. knowledge of, and competency in, departure and arrival procedures
N. air/ground communications with the company and also with air traffic control (ATC)
O. check airman performance and effectiveness
P. adequacy of aircraft training program as demonstrated by the flightcrew
Q. cabin crew and passenger briefings

(ii) *Cabin Crew*. The DGCA Team shall evaluate the cabin crew competency and ability during the enroute segment. Examples of areas to be inspected and evaluated are as follows:
A. competency in all normal procedures associated with their assigned positions
B. knowledge of emergency procedures (including evacuation, fire fighting, pressurization problems, passenger illness or injury, baggage in the cabin, and exit seating)
C. knowledge of applicable manual procedures pertaining to duties and responsibilities
D. knowledge of procedures to follow when a crewmember is incapacitated
E. knowledge of verbal and nonverbal communication procedures between the cabin and cockpit (such as the number of chimes indicating imminent takeoff or landing)
F. training program effectiveness
G. cockpit coordination

(iii) *Airport/Station Facilities*. The DGCA Team shall determine whether the airports and the applicant's station facilities are adequate to support the specific aircraft and type of operation proposed by evaluating the following:
A. runways and taxiways
B. runway/taxiway lighting
C. approach lighting
D. navigational aids (NAVAID)
E. gate/ramp/loading areas (such as markings, congestion, and lighting)
F. station operations manuals, maintenance manuals, and facilities
G. ground crew qualifications and training (if applicable)
H. passenger enplaning and deplaning procedures
I. baggage and cargo loading
J. aircraft fueling and servicing
K. gate arrival and departure procedures and equipment

(iv) *Flight Control, Dispatch, Flight Following, and Flight Locating Centers*. Examples of items to be inspected and evaluated at applicable locations are as follows:

A. flight planning
B. dispatch and flight release procedures
C. airport and route information collection and dissemination
D. drift down and diversionary procedures
E. weather information collection and dissemination
F. dispatch and flight control personnel competency
G. communications capability with the company, with the aircraft, and with other agencies
H. load control (for example, the accuracy of the passenger count and the ability to convey weight and balance changes to and from the aircraft before takeoff)
I. scheduling
J. crew flight and rest time
K. manuals
L. high minimums captains
M. maintenance control (procedures and records)
N. flightcrew briefings

(v) *Company Procedures*. Examples of company procedures and programs to be inspected and evaluated are as follows:

A. aircraft operations
B. ground operations/maintenance personnel
C. fueling facilities and equipment
D. security (public protection and restricted articles)
E. adequacy of training programs
F. MEL, CDL, and DDPG procedures
G. procedures for accomplishing unscheduled and scheduled maintenance
H. hazardous materials (HAZMAT)
I. ability to conduct operations at unscheduled stops or alternate airports

3. CONDUCT OF OTHER FLIGHTS.

(1) Other flights, such as training, positioning, or ferry flights may be counted toward proving flight hours. DGCA observation of these flights allows inspection of the applicant's training, maintenance, and other programs.

Information Note: *All training Rights that are to be credited toward the proving test requirements must be observed by a qualified operations inspector.*

(2) *Enroute Training*. During the enroute segment, the company trains its initial cadre check airmen, instructors, and line crewmembers. Crewmembers also gain operating experience (OE) so that revenue operations may begin with minimum delay after certification. Since DGCA inspectors function as observers during this phase, it is not appropriate for them to require simulated in-flight scenarios that would either disrupt airman training or delay these flights.
(3) *Flight Attendant Training*. Flight attendant training may be conducted on board flights when flightdeck and flight attendant training goals are compatible.

4. TERMINATION OF THE ENROUTE SEGMENT.

The test team may conclude the proving flight as follows:

(a) Completion as Planned. Complete the planned proving flight schedule without significant change.
(b) Early Completion. The tests may be concluded sooner than planned when all test objectives have been met and the applicant has demonstrated a repetitive ability to conduct line operations in compliance with regulations and safe operating practices. The team should be satisfied that the applicant will continue to function in a satisfactory manner. Before authorizing an early completion of the test, the team shall obtain the concurrence of the Chief of Flight Safety. The team must document the decision to terminate the enroute segment earlier than planned with an appropriate written documentation.
(c) Extension. The tests may be extended beyond the point of scheduled termination. This action should be taken when the applicant has not completely demonstrated the ability to conduct operations in compliance with regulations and safe operating practices, but shows the potential to do so in a reasonable number of hours.
(d) Unacceptable Performance. The team may terminate testing when it is apparent that the applicant is not capable of correcting deficiencies. When a decision is made to terminate proving tests due to extensive deficiencies, the following must be accomplished:
    (i) *Chief of Flight Safety Concurrence*. The team leader shall immediately inform the Chief of Flight Safety of the reasons for the decision and receive the Chief's concurrence before concluding testing.
    (ii) *Notification of Applicant*. The team leader shall then notify the applicant of the decision. A letter confirming the reasons for this decision shall be forwarded to the applicant. The letter should list deficient areas and specify corrective actions that must be taken before further enroute testing may continue. This letter should also specify that a new proving test plan will have to be developed by the applicant and submitted to the DGCA before further enroute testing may resume.

5. REPORT CONSTRUCTION.

(1) The test team shall create a written report of proving tests.
(2) Recording Individual Job Functions. Each job function performed by a team member shall be reported in writing and maintained as part of the certification package.
(3) After the team has completed the project, the team leader shall ensure that a closing summary is placed in the certification package. This summary should be written as an executive overview and should avoid lengthy discussions or repetition of explanations contained in the certification package. Once the summary has been completed, the master record should be closed. The following are suggested items for the summary:
(a) total test hours planned and actually flown
(b) major deficiencies that required significant collective actions, and nature of corrections
(c) major delays encountered in completing the project and reasons for those delays

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MINISTRY OF TRANSPORT
DIRECTORATE GENERAL OF CIVIL AVIATION

LARs

LEBANESE AVIATION REGULATIONS

Part VI

General Operating and Flight Rules

Subpart 3

Special Flight Operations

***** Revision No. 1 *****
International Civil Aviation Organization
Richard B. Fauquier

LEBANESE AVIATION REGULATIONS (LARs)

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Division I - Special Aviation Events

603.01 Certification Requirements for Special Aviation Events

No person shall conduct a special aviation event unless the person complies with the provisions of a special flight operations certificate - special aviation event issued by the Minister pursuant to Section 603.02 of the Lebanese Aviation Regulations (LARs).

603.02 Issuance of Special Flight Operations Certificate - Special Aviation Event

Subject to the Lebanese Aeronautics Act, the Minister shall, on receipt of an application submitted in the form and manner required by the Special Flight Operations Standards, issue a special flight operations certificate - special aviation event to an applicant who demonstrates to the Minister the ability to conduct a special aviation event in accordance with the Special Flight Operations Standards.

603.03 Contents of Special Flight Operations Certificate - Special Aviation Event

A special flight operations certificate - special aviation event shall contain the following information:

- (a) the name and address of the certificate holder;
- (b) the number of the certificate;
- (c) the date of issue of the certificate;
- (d) the validity period of the certificate;
- (e) the general conditions identified in Section 603.04 of the LARs; and
- (f) specific conditions with respect to
  - (i) the types of aircraft authorized to operate at the special aviation event and, if applicable, their registration,
  - (ii) the names and, if applicable, the qualifications of the flight crew members authorized to participate in the special aviation event, and
  - (iii) any other condition pertaining to the special aviation event that the Minister deems necessary for aviation safety.

603.04 General Conditions of Special Flight Operations Certificate - Special Aviation Event

A special flight operations certificate - special aviation event shall contain the following general conditions:

- (a) the certificate holder shall maintain an adequate management organization;
- (b) the certificate holder shall ensure that participants are
  - (i) qualified for the type of demonstration to be flown, and
  - (ii) provided with a briefing that meets the Special Flight Operations Standards; and
- (c) the certificate holder shall conduct the special aviation event in a safe manner.

603.05 Event Management

No person shall conduct a special aviation event unless the person has a management organization that

- (a) is capable of exercising supervision and operational control over
  - (i) persons attending the special aviation event, and
  - (ii) any flight that is to be operated at the special aviation event; and

(b) meets the Special Flight Operations Standards.

603.06 Participant Qualifications

No person shall operate an aircraft in a special aviation event unless the person

(a) meets the eligibility requirements specified in the Special Flight Operations Standards; and
(b) is authorized to do so in a special flight operations certificate - special aviation event.

603.07 Distance or Altitude from Spectators

No person shall operate an aircraft in a special aviation event at a distance from, or at an altitude above, a spectator enclosure or unofficial secondary spectator area, where that distance or altitude is less than the minimum specified in the Special Flight Operations Standards.

603.08 Weather Conditions

No person shall operate an aircraft in a special aviation event in weather conditions that are below the minimum conditions specified in the Special Flight Operations Standards.

603.09 Participant Briefing

No person shall operate an aircraft in a special aviation event unless the person has received a participant briefing that meets the Special Flight Operations Standards.

603.10 to 603.15 Reserved

Division II - Balloons with Fare-paying Passengers

603.16 Application

This Division applies in respect of the operation of a balloon where fare-paying passengers are carried on board.

603.17 Certification Requirements for Balloon Operations

No person shall operate a balloon under this Division unless the person complies with the provisions of a special flight operations certificate - balloons issued by the Minister pursuant to Section 603.18 of the LARs.

603.18 Issuance of Special Flight Operations Certificate - Balloons

Subject to the Lebanese Aeronautics Act , the Minister shall, on receipt of an application submitted in the form and manner required by the Special Flight Operations Standards, issue a special flight operations certificate - balloons to an applicant who demonstrates to the Minister the ability to conduct the flight operation in accordance with the Special Flight Operations Standards.

603.19 Contents of Special Flight Operations Certificate - Balloons

A special flight operations certificate - balloons shall contain the following information:

- (a) the name and address of the balloon operator;
- (b) the number of the certificate;
- (c) the date of issue of the certificate;
- (d) the general conditions identified in Section 603.20 of the LARs; and
- (e) specific conditions with respect to
  - (i) the types and AX class of balloons authorized and, where the balloon is of a special shape or is a foreign-registered balloon, its registration,
  - (ii) the external carriage of passengers, and
  - (iii) any other condition pertaining to the operation that the Minister deems necessary for aviation safety.

603.20 General Conditions of Special Flight Operations Certificate - Balloons

A special flight operations certificate - balloons shall contain the following general conditions:

- (a) the balloon operator shall maintain balloons that are properly equipped for the area of operation and the type of operation;
- (b) the balloon operator shall maintain its balloons in accordance with the requirements of Subpart 5 of the LARs;
- (c) the balloon operator shall employ flight crew members who meet the Special Flight Operations Standards; and
- (d) the balloon operator shall conduct a safe operation.

603.21 Crew Member Qualifications

No balloon operator shall permit a person to act and no person shall act as the pilot-in-command of a balloon unless the person meets the qualification and currency requirements set out in the Special Flight Operations Standards.

603.22 Briefing of Passengers

The pilot-in-command of a balloon shall ensure that passengers are given a safety briefing that meets the Special Flight Operations Standards.

603.23 Operations at Night

No person shall operate a balloon in free flight at night unless

(a) the balloon is equipped in accordance with Subpart 575 of the LARs; and
(b) landings are conducted during the day.

603.24 Tethered Flight

(1) No person shall operate a balloon in tethered flight with passengers on board unless the pilot-in-command is on board.
(2) The pilot-in-command shall record all time spent in tethered flight as air time for the purpose of maintenance.

603.25 External Carriage of Passengers

(1) Subject to subsection (2), no person shall operate a balloon with passengers on board unless each passenger is carried in the basket.
(2) A person may operate a balloon with passengers carried outside the basket if the person

(a) is authorized to do so in a special flight operations certificate - balloons; and
(b) complies with the procedures specified in the Special Flight Operations Standards.

603.26 Leaving a Balloon in Flight

For the purposes of Subsection 602.25(2)(b) of the LARs, a person may leave a balloon in flight if the person

(a) is authorized to do so in a special flight operations certificate - balloons; and
(b) complies with the procedures specified in the Special Flight Operations Standards.

603.27 to 603.35 Reserved

Division III - Parachuting

603.36 Application

This Division applies in respect of the conduct of parachute descents

(a) in or into controlled airspace or an air route; and
(b) over or into a built-up area or open-air assembly of persons.

603.37 Certification Requirements for Parachute Operations

For the purposes of Section 602.26 of the LARs, a pilot-in-command may permit and a person may conduct a parachute descent under this Division if the person complies with the provisions of a special flight operations certificate - parachuting issued by the Minister pursuant to Section 603.38 of the LARs.

603.38 Issuance of Special Flight Operations Certificate - Parachuting

Subject to the Lebanese Aeronautics Act , the Minister shall, on receipt of an application submitted in the form and manner required by the Special Flight Operations Standards, issue a special flight operations certificate - parachuting to an applicant who demonstrates to the Minister the ability to conduct the flight operation in accordance with the Special Flight Operations Standards.

603.39 Contents of Special Flight Operations Certificate - Parachuting

A special flight operations certificate - parachuting shall contain the following information:

(a) the name and address of the certificate holder;
(b) the number of the certificate;
(c) the date of issue of the certificate;
(d) the validity period of the certificate;
(e) the type of flight operation authorized; and
(f) any condition pertaining to the operation that the Minister deems necessary for aviation safety.

603.40 to 603.64 Reserved

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Division IV - Miscellaneous Special Flight Operations

603.65 Application

This Division applies in respect of the following flight operations when not conducted under Part VII of the LARs:

(a) the operation of an aircraft, other than a balloon, for the purpose of conducting a take-off or landing within a built-up area of a city or town at a place other than an airport or military aerodrome;
(b) the operation of an aircraft for the purpose of conducting aerial application, aerial inspection or aerial photography at altitudes and distances less than those specified in Subsection 602.14(2)(a) of the LARs;
(c) the operation of a helicopter while conducting Class B, C or D external load operations over a built-up area or open-air assembly of persons, including flight at altitudes and distances less than those specified in Subsection 602.14(2)(a) of the LARs;
(d) the operation of a non-piloted aircraft;
(e) the operation of a powered aircraft while persons enter or, except for parachute descents, leave the aircraft in flight; and
(f) the operation of an aircraft while conducting aerobatic maneuvers
    (i) in or into controlled airspace or an air route, or
    (ii) below 2,000 feet AGL.

603.66 Certification Requirements

No person shall conduct a flight operation referred to in Section 603.65 of the LARs unless the person complies with the provisions of a special flight operations certificate issued by the Minister pursuant to Section 603.67 of the LARs.

603.67 Issuance of Special Flight Operations Certificate

Subject to the Lebanese Civil Aviation Safety Act, the Minister shall, on receipt of an application submitted in the form and manner required by the Special Flight Operations Standards, issue a special flight operations certificate to an applicant who demonstrates to the Minister the ability to conduct the flight operation in accordance with the Special Flight Operations Standards.

603.68 Contents of Special Flight Operations Certificate

A special flight operations certificate shall contain the following information:

(a) the name and address of the certificate holder;
(b) the number of the certificate;
(c) the date of issue of the certificate;
(d) the validity period of the certificate;
(e) the type of flight operation authorized; and
(f) any condition pertaining to the operation that the Minister deems necessary for aviation safety.

603.69 to 603.75 Reserved

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Division I - Special Aviation Events

1. INTRODUCTION

(1) These Special Flight Operations Standards and Procedures - Special Aviation Events - Air Shows are the standards and procedures that must be met for the issue and continuing validity of a Special Aviation Events Operating Certificate - Air Show as provided for in the Lebanese Aviation Regulations (LARs), Subpart 603, Division I, and the related guidance material.
(2) For ease of reference the standards are published in **"**normal print**"**, and the Information Notes which are meant to offer guidance are published in *"italicized print"*.
(3) Military performances must be authorized by the Minister of Defense.
(4) Additional information on the organization and administration of Special Aviation Events may be obtained by contacting the Director General of Civil Aviation, Beirut Lebanon.

2. APPLICABILITY

These criteria are applicable to flight operations pursuant to Part VI, Subpart 3 of the Lebanese Aviation Regulations.

3. INTERPRETATION

In these Standards:

"special aviation event" - means an air show, a low-level air race, an aerobatic competition, a fly-in or a balloon festival;

"air show" - means an aerial display or demonstration before an invited assembly of persons by one or more aircraft;

"fly-in" - means a prearranged meeting of a number of aircraft at a specified aerodrome which will take place before an invited assembly of persons and at which no:
(a) competitive flying; or
(b) aerial demonstrations will take place;

"low-level air race" - means a closed course pylon air race or a low level cross country air race flown at altitudes below the minima specified in the LARs;

"balloon festival" - means an event at which one or more manned balloons will launch from or fly in into an area before an invited assembly of persons;

"flight line" - means a predetermined directional line of flight within a flying display area. A flight line must be marked to be clearly visible to pilots from the air;

"flying display area" - means that airspace at the special aviation event site, where an aircraft participating in an air show may perform not including ingress and egress routes;

"Minister" - means the Minister of Transport;

"sponsor" - means the person or agency responsible for the organization and conduct of a special aviation event;

"participant" - means special aviation event performers, which includes flight crews, flight crew support staff, parachutists, and ground performers (eg. pyrotechnic teams, announcers, etc.);

"invited assembly of persons" - means any number of persons who have been invited by any means of solicitation, to view a Special Aviation Event but does not include competition judges, event organizers, or members of a participants support team;

"aerobatic maneuver" - for the purposes of civilian aircraft participating in an air show, means stalls; spins; inverted flight; pitch angles exceeding plus or minus 30 degrees; and bank angles of 60 degrees or greater;

"designated spectator area (crowd)" - means the area identified to Director General of Civil Aviation on the site Figure submitted with a sponsor's application to conduct a special aviation event, as the area in which "the invited assembly of persons" will be positioned to view the special aviation event;

"unofficial spectator area" - means an area adjacent to the flying display area, where persons have congregated to observe a special aviation event. This includes, but is not limited to, private property or property not under control of the sponsor, public roads and rights of way;

"formation flight" - for the purpose of aircraft participating in a Lebanese Special Aviation Event, means when an aircraft is flown solely with reference to another aircraft.

Chapter One - Air Shows

s603.01 Reserved

s603.02 Issuance of a Special Flight Operations Certificate - Special Aviation Event

(1) The following constitutes an application to conduct a Special Aviation Event:
- (a) the name, location and date of the event;
- (b) the expected number of spectators, fly-in aircraft and public vehicles;
- (c) the name, address, telephone and facsimile numbers of the Sponsor of the event;
- (d) the names, addresses, telephone and facsimile numbers of the key management personnel of the event (ie. Program Director, Director of Flight Operations, Ground Operations, Event Safety);
- (e) identification of proposed participating aircraft (Lebanese Civil, Lebanese Military, Foreign Civil, Foreign Military);
- (f) identification of what, if any, air safety support facilities are required, (eg. airport, control tower, mobile tower, or other);
- (g) a site Figure of the event site. This Figure shall be on a 1: 50,000 topographic chart or a large scale aerial photograph and shall clearly indicate a minimum of the following:
  - (i) location and marking of flight lines;
  - (ii) location of the boundaries of the flying display area;
  - (iii) location and type of fencing around the designated spectator area including gates;
  - (iv) location of emergency vehicles;
  - (v) location of medical facilities;
  - (vi) location of emergency access routes to and from the event site;
  - (vii) aircraft movement areas;
  - (viii) parachuting drop zone (if any);
  - (ix) static display aircraft parking;
  - (x) air show aircraft parking area;
  - (xi) visiting aircraft parking area;
  - (xii) refuelling area;
  - (xiii) helipad;
  - (xiv) air show central control;
  - (xv) pyrotechnic areas.

(2) The application should be received by the Director General of Civil Aviation Licensing office ninety (90) days prior to the proposed date of the event, or by the date mutually agreed upon in writing, between the Director General of Civil Aviation and the Sponsor. Failure to meet the 90 day or agreed upon date could result in the non-issue of the Special Flight Operations Certificate required for the event.

(3) The following information and/or documentation forms part of an application and unless mutually agreed upon between the Sponsor and Director General of Civil Aviation licensing staff, shall be submitted to the Director General of Civil Aviation Licensing office no later than 90 days prior to the date of the proposed event:
- (a) Completed Special Aviation Event Flight Program (DGCA-OPS Form 100-1) identifying all anticipated participants. An alternate format may be used, providing it contains all the information required by DGCA-OPS Form 100-1;
- (b) for foreign pilots, legible copies of pilot's licenses and medical certificates;
- (c) for aerobatic performers, a sequential listing of all maneuvers to be flown, including:
  - (i) distance from spectators including, where applicable, the point of entry into and recovery from the maneuver;
  - (ii) point of entry to, and/or departure from the flying display area, where applicable;

(iii) direction(s) of flight relative to the spectators;
(iv) location of water drops, pyrotechnics, helicopter rappelling, etc, relative to the spectators;
(v) maximum and minimum speeds, for the entire performance; and
(vi) minimum altitudes for each maneuver to be performed.

(d) where applicable, legible copies of each performer's:
(i) a Director General of Civil Aviation "Statement of Aerobatic Competency" (DGCA-OPS Form 100-2);
(ii) a FAA "Statement of Acrobatic Competency" (form 8710-7);
(iii) an International Council of Air Shows "Aerobatic Competency Recommendation to the FAA or Directorate General of Civil Aviation Lebanon"; or
(iv) an equivalent certificate recognized by Director General of Civil Aviation Lebanon.

(e) for foreign aircraft with non-standard flight authorities, a Lebanese Validation of the aircraft's foreign flight authority;
(f) for information purposes, a copy of the event's proposed Emergency Procedures referred to in Section s603.14 of these standards Emergency Facilities, para. (2) of these standards; and
(g) for information purposes, a copy of the event's proposed Air Display Traffic Control procedures referred to in Section s603.14 of these standards Air Display Traffic Control, para. (1) of these standards;
(h) where applicable, an "Application to Conduct a Parachute Descent" as outlined in Section s603.37 of these standards applicable to parachute descents.

s603.03 to s603.04 Reserved

s603.05 Event Management

Information Notes: *The sponsorship/management of a special aviation event will vary according to circumstances. Small events may be sponsored by a local flying club while a large show will require the services of a number of persons with expertise in a variety of areas. The scope of any event will depend on the aviation interests of the community and other local conditions.*

It is most important that the sponsor is aware that, since the Special Flight Operations Certificate is issued to him/her by the Minister, it is his/her responsibility to ensure that the event is conducted in such a way that the safety of persons and property on the ground is not jeopardized. In this regard, performers in air shows and air races are aware of the hazards to themselves, but the Director General of Civil Aviation , by means of the LARs and Special Flight Standards pertaining to Special Aviation Events, establishes standards of safety for the protection of the general public.

(1) The sponsor of a Special Aviation Event may be an individual or an organization incorporated under the laws of Lebanon.
(2) The sponsor of a Special Aviation Event has the overall responsibility for the conduct of the event in a safe manner and in accordance with the conditions contained in the Special Flight Operations Certificate issued for the event. In order to accomplish this the sponsor may delegate to other persons the authority to organize and control particular aspects of the event.

Information Note: *At a small event, one person may be able to coordinate more than one activity, while at a large event, an activity may be controlled by a committee of persons whose chairman has been delegated the appropriate authority.*

(3) The duties and responsibilities of persons delegated the responsibility for safety related activities for which a Special Flight Operations Certificate to conduct a Special Aviation Event is issued are as follows:

(a) The <u>sponsor</u> is responsible for:
  (i) provision for a sufficient number of capable and informed persons to handle the operation of the event with efficiency and safety, and for their identification as officials. This shall include persons responsible for flight and ground operations and event safety;
  (ii) ensuring appointing a person selected for his/her broad background in aviation operations and ability to coordinate the various air, ground, safety and administrative activities at an event (Program Director);
  (iii) establishing liaison with airport management and concerned local agencies;
  (iv) studying airport facilities and accommodation and preparing a draft plan for the safe handling of spectators, aircraft, automobiles, etc. on a comprehensive, overall basis;
  (v) making application to the Director General of Civil Aviation with sufficient advance notice to complete the administrative and coordination duties required to prepare the Special Flight Operations Certificate for the event.

(b) The <u>Program Director</u> is responsible for the overall coordination of activities at the event including:
  (i) making that all staff members are properly informed of their duties and responsibilities in detail, well in advance of the event date;
  (ii) in consultation with the person in charge of the flight operations at the event (Director of Flight Operations), canceling or postponing the flight program in the event of an accident, bad weather, or any other circumstances relating to the safety of the spectators or participants;
  (iii) ensuring that when an event requires prior practice or rehearsals, these activities are included in the Special Flight Operations Certificate if necessary and that emergency services are available.

Information Note: *Others duties for the <u>Program Director</u> may include:*
  (a) Establishing liaison with resident aircraft operators and scheduled Air Carriers with a view to arranging the flight program so as to avoid disruption to commercial service; arranging for customs service at airports which are not Ports of Entry, if sufficient trans-border visitors are expected;
  (b) Making prior arrangements with participating pilots and crew arriving by air concerning arrival dates, accommodation, customs, program performance, flight authority, etc.

(c) The <u>Director of Flight Operations</u> is responsible for the conduct of the flight operations at the event including:
  (i) finalizing the flight program in accordance with the conditions of the authorization;
  (ii) obtaining and reviewing maneuver profiles from all participants and to ensure they are safe and suitable for the air show site;

(iii) submitting the information above to the Director General of Civil Aviation no less than ten working days prior to the event;
(iv) ensuring that all civilian personnel participating in the air event are competent to conduct their performances in accordance with the conditions of the Special Flight Operations Certificate issued for the event;
(v) where applicable, establishing liaison with military participants and the Military Air Display Director;
(vi) providing a briefing/operations area of adequate size to accommodate the persons being briefed in accordance with Section s603.09 of these standards;
(vii) liaising with the Director General of Civil Aviation with regard to the publication of a Notice to Airmen (NOTAM) concerning the air event. The NOTAM will cover at least the horizontal and vertical limits of airspace and the duration of the event; and
(viii) conducting a participant's briefing in accordance with the standards contained in Section s603.09 of these standards, and ensuring that performers who do not attend this briefing do not participate in the air display on that day.

Information Note: *It is suggested the person delegated these responsibilities confirm all participating pilots are aware of the aviation documentation requirements for themselves and for their aircraft.*

(4) During the air display, the Director of Flight Operations shall:
(a) station himself/herself so as to have an unrestricted view of the flying display area;
(b) terminate any performance or demonstration being conducted in an unsafe manner;
(c) have ready communication with other air event officials, air traffic control personnel, etc.;
(d) be readily accessible to all pilots taking part in the flying program and other air show officials:
(i) The Ground Operations Officer is primarily responsible for crowd control, automobile and aircraft parking, and liaison with his/her airport or local governing counterparts. His or duties include:
A. ensuring that sufficient personnel are available to effectively control the anticipated crowd and providing these persons with complete instructions as to their duties;
B. arranging for communications facilities including air/ground, ground control and those required by personnel controlling the air display or the spectators. This includes arranging for the use of special radio frequencies if required;
C. arranging for the availability and use of support vehicles; (This may include first response vehicles for responding to emergencies, aircraft "follow me" vehicles, shuttle buses to move spectators from parking to viewing areas, etc.)
D. establishing an operations center, in conjunction with other key event officials to coordinate and control the activities he/she is responsible for.

Information Note: *Other duties that may be assigned to this person are:*

(a) Establishing effective liaison with the airport operator and local police to ensure that adequate facilities can be provided for spectators, and to provide for off-site traffic control;
(b) Arranging for refuelling of aircraft, both participating and visiting; and establishing liaison with military participants.

(iv) The Event Safety Officer cooperates closely with the Ground Operations Officer as many of their responsibilities overlap. The scope of the responsibilities concerning event safety will vary in accordance with the size of the show and its location. The Event Safety Officer's duties includes:

A. ensuring that the Emergency Procedures referred to in Section s603.05 of these standards Emergency Facilities, are developed in concurrence with and approved by the delegated agency appropriate to the event site. (*i.e. at an airport - the airport authority; at an over water event - this could be the military or local law enforcement authorities*).

(5) As a minimum, event Emergency Procedures should include:

- (a) arranging for the presence of crash/fire/rescue vehicles and personnel appropriate to the size of the event;
- (b) arranging for the possible reception of accident casualties at local hospitals;
- (c) arranging for the availability of medical personnel and evacuation vehicles appropriate to the size of the event;
- (d) ensuring that all persons, including crowd control personnel and the public address announcer, who may be required to respond to emergency situations are briefed and are provided with written instructions well in advance of the event;
- (e) establishing a control center from which activities at the event can be monitored and emergency activity can be coordinated if required;
- (f) ensuring, in cooperation with ground operations, the availability of emergency access routes, and the personnel to ensure that they remain clear;
- (g) the production and placement of signs and instructions to the public regarding accident, fire, injuries, lost children, no smoking areas, etc.

Emergency Facilities

A sponsor shall ensure that procedures have been developed and published and facilities, equipment and personnel are in place to respond to anticipated emergencies, including aircraft accident or medical emergency involving the spectators.

Information Note: *Local police and hospitals should be aware of the event dates and the expected size of the crowd.*

Many airports have complete crash/fire/rescue equipment and personnel on the site and which is available on request. At other localities, the local Fire Department may be willing to provide equipment and personnel. For very small events, a jeep or other vehicle carrying fire fighting equipment may suffice.

Appropriate medical facilities and personnel must be provided at all Special Aviation Events. At large air events, full medical aid facilities should be provided on site, including doctor, nurse, ambulance and medical center. At small events, facilities should be provided for the treatment of minor injuries. The local Ambulance Association may provide this assistance by prior arrangement. Arrangements should be made to have a local doctor on call.

A station wagon, van or light truck, suitably identified, may be used where full ambulance service is not available.

It is expected that there will be a police presence at all Special Aviation Events. A close liaison should be established in the *early planning stages between the sponsor and law enforcement agencies concerned to ensure the adequacy of public safety, crowd control, traffic direction, etc.*

In the event of an aircraft accident at a Special Aviation Event, the sponsor should be aware of the Regulations regarding aircraft accidents. Special Aviation Event officials should be aware that the release of names in fatal accidents is at the discretion of the Coroner. The sponsor should designate a single spokesperson to deal with the media should problems occur.

Crowd Control

Information Note: *Control or lack of control in the handling of spectators can result in either an orderly assembly of people or an undisciplined crowd which is potentially dangerous to itself or to aircraft. A properly controlled crowd can only result from thorough planning and the provision of adequate facilities and personnel.*

The great majority of Special Aviation Events are held at aerodromes and the major factors affecting crowd control are discussed accordingly. For those events which are held at other locations, several of these factors may not apply.

The standards for Crowd Control at a Lebanese Special Aviation Event are as follows:

<u>Designated Spectator Area</u>

(1) The Designated Spectator Area shall be laid out so that no spectator is closer than the minimum distance from aircraft in flight, taking off, landing, or performing as specified in Section s603.07 of these standards.
(2) The spectators shall be isolated from aircraft maneuvering on the ground.

Information Note: *Propeller, jet blast or rotor downwash can cause injuries to persons or damage to property nearby.*

<u>Aircraft and Vehicle Parking</u>

(1) Many sponsors arrange for participating air show aircraft to be on static display to the public prior to the event. During the flight program of the special event, if this becomes a maneuvering area all non-participants shall be kept out.
(2) Visiting aircraft or vehicle parking areas that cannot be kept clear of persons during the flight program of a special aviation event are deemed to be spectator areas and the separation and overflight provisions of these standards apply to these parking areas.

<u>Crowd Control Personnel</u>

(1) A sponsor shall ensure that sufficient crowd control personnel are available, briefed on crowd control and emergency procedures and that these persons are clearly identified.

(a) Crowd control personnel should be adults and wear some form of distinctive clothing (eg. jacket, vest, t-shirt), that clearly identifies them as such. A small colored name tag or similar device may be difficult for a lost child or disoriented person to identify.
(b) Properly briefed adults should be employed for crowd control in restricted and spectator enclosure areas. Youth groups if properly utilized and directed, can be of great public assistance for direction, vehicle parking, etc.

Fencing/Barriers

The Sponsor shall ensure separation between spectators and flight lines, aircraft movement areas and access routes for emergency vehicles can be maintained.

Information Note: *There are no specific requirements regarding the type of fence used, but the sponsor must ensure that if, for example, a rope barrier is used, sufficient crowd control personnel are on duty to ensure that the spectators remain behind it.*

Emergency Entrances, Access Lanes and Exits

(1) The sponsor shall ensure that emergency entrances, access lanes and exits are available to and from the event site and procedures are in place to keep them clear in an emergency situation.
(2) Emergency entrances, access lanes and exits shall be clearly identified on the site Figure submitted in support of the application to conduct the Special Aviation Event.

Public Address System

(1) A public address system or other means of communicating instructions to spectators shall be in place. The system shall be used in the event of an emergency.
(2) The public address announcer shall be thoroughly briefed on emergency procedures and be prepared to assist in spectator control in case of need.

Site Cleanliness

Information Note: *Trash discarded by spectators can be a hazard to persons or to aircraft. Cans, cups, or other objects can be turned into projectiles by rotor downwash, propeller or jet blast and can cause severe damage to aircraft engines if ingested.*

It has been noted that, at air shows where the public address announcer describes the potential hazards and then reminds them from time to time, the spectators have been more than usually cooperative in depositing their trash in the receptacles provided. This has the additional benefit of reducing the costs of clean up.

Air Display Traffic Control

The standards for Air Display Traffic Control at a Lebanese Special Aviation Event are as follows:

(1) At Special Aviation Events where Air Traffic Control or advisory service is provided, the Air Display Traffic Procedures shall be developed in cooperation with, and approved by the air traffic service agency responsible for the event site and airspace.

Information Note: *At airports with established Air Traffic Control service, any additional requirements associated with a Special Aviation Event will normally be on hand or readily available. Where temporary control service is required, timely arrangements must be made to ensure that the required facilities, equipment and manpower can be made available.*

Temporary control service is normally provided from a mobile control tower, van or station wagon equipped with the appropriate facilities. It is essential that the control unit be situated so as to permit the controller an unobstructed view of the approached to the airport and the landing areas. In many cases, an uncontrolled airport will have an unused control tower suitably situated for the purpose. If this is the case, Air Traffic Control requirements can be met at reduced cost. Such use is subject to the approval of the Director General of Civil Aviation and the concurrence of the owner of the structure.

(2) A visual means of indicating the runway in use and the landing direction is required at aerodromes where NORDO aircraft will be operating. The indicator must be readily visible from the air and be of the variable type which can be realigned to indicate a change in the landing direction.
(3) A method of communication shall be established between Air Traffic Control staff and the person designated the responsibility for the conduct of the flight operations at the event.

s603.06 Participant Qualifications

Participant Eligibility

To be eligible to operate an aircraft in a special aviation event, a person shall meet the following requirements:
(1) Each person shall hold a valid pilot license and medical certificate appropriate to the aircraft to be operated in the special aviation event.
(2) To conduct solo aerobatic maneuvers at a Lebanese Special Aviation Event a person shall be in possession of one of the following documents:
- (a) a Director General of Civil Aviation "Statement of Aerobatic Competency" (DGCA-OPS Form 100-2);
- (b) a FAA "Statement of Acrobatic Competency" (form 8710-7);
- (c) an International Council of Air Shows "Aerobatic Competency Recommendation to the FAA; or the Director General of Civil Aviation Lebanon.
- (d) an equivalent certificate recognized by the Director General of Civil Aviation.

(3) To conduct formation or "team" aerobatic maneuvers at a Lebanese Special Aviation Event each member of the team shall meet the following requirements:
- (a) each member of the team shall be in possession of one of the following documents on which is annotated "Formation":
  - (i) a Director General of Civil Aviation "Statement of Aerobatic Competency" (DGCA-OPS Form 100-2);
  - (ii) a FAA "Statement of Acrobatic Competency" (form 8710-7);
  - (iii) an International Council of Air Shows "Aerobatic Competency Recommendation to the FAA; or Director General of Civil Aviation Lebanon.
  - (iv) an equivalent certificate recognized by the Director General of Civil Aviation.
- (b) the members of the team shall have within the preceding 12 months;

(i) performed together in 8 aerobatic performances; or
(ii) carried out a minimum of 25 aerobatic practice sessions.

(4) To conduct formation non-aerobatic maneuvers at a Lebanese Special Aviation Event the following requirements shall be met:

(a) Each pilot-in-command must be experienced in flying in formation in the aircraft intended for the flight;
(b) For formation flights of four (4) aircraft or less, all members of the formation shall have practiced together within the previous 30 days;
(c) For any formation larger than four aircraft, the pilots shall:
   (i) have flown their proposed sequences at an authorized event under FAA, CAA or JARs regulations within the previous 15 days; or
   (ii) have practiced the proposed sequences within 15 days prior to the event.
(d) Minimum crew only shall be carried on board the aircraft, except where an additional person is required as a lookout;
(e) Each member of the formation shall attend a briefing or review, conducted by the formation lead or other designated formation member. This briefing is in addition to the briefing referred to in Section s603.09 of these standards.

(5) The briefing or review shall be attended by a representative of the sponsor, preferably the person in charge of flight operations, and shall cover at least the following topics:

(a) leader(s) and alternate(s);
(b) maneuvers to be performed and their sequence;
(c) formation positions;
(d) alternate positions in case of aborts;
(e) radio procedures and call signs;
(f) visual signals;
(g) expected speeds/power settings; take-off and turn out;
(h) join up and break;
(i) emergency procedures.

<u>Aircraft Eligibility</u>

To be eligible to participate in a Lebanese Special Aviation Event, an aircraft must meet the following requirements:

(1) The aircraft must be registered in a member state of ICAO.
(2) The aircraft must have one of the following valid flight authorities.
   (a) Standard Certificate of Airworthiness issued by the country of registration; or
   (b) Lebanese validation of a foreign non-standard flight authority issued by the country of registration. (eg. Special Certificate of Airworthiness, Flight Permit); and
(3) Operators of foreign civil aircraft with non-standard flight authorities must obtain a Lebanese validation of a Foreign Flight Authority prior to entering Lebanese airspace. A Lebanese validation may be obtained by providing the following information to the Director General of Civil Aviation Lebanon, at least 90 days in advance of the event:
   (a) a clear and legible copy of the aircraft's Certificate of Registration;
   (b) a clear and legible copy of the aircraft's flight authority including all operating conditions/limitations; and
   (c) the planned itinerary for the aircraft while in Lebanon, including dates and point of entry and departure from Lebanese airspace.

Information Note: *Although the responsibility for applying for a Lebanese validation rests with the owner of the foreign aircraft, sponsors may coordinate compliance with this requirement in order to avoid confusion, last minute delays, or possible enforcement* *action against a pilot who flies such an aircraft in Lebanon without authority.*

(4) The aircraft shall be approved to carry out all the maneuvers to be conducted, by the country of manufacture, by means of a Type Approval or Type Certificate, or otherwise approved by the country in which the aircraft is registered.
(5) Ultra-light Airplanes shall not perform aerobatic maneuvers.

Foreign Military Aircraft

Information Note: *While in Lebanon, foreign military aircraft operate under the authority of the Minister of Defense. Sponsors must therefore ensure that prior permission is obtained from the Minister of Defense in order that foreign military aircraft may perform in an air display or be flown to the site for static display. Foreign military aircraft may not participate in a Special Aviation Event without such authority.*

Requests for Lebanese Forces authority for the operation of foreign military aircraft must contain full particulars as to the number and type of aircraft, and the nature of their participation, ie, flying, static, or fly-over. They must be sent 90 days in advance of the event date, to Minister of Defense Lebanon.

s603.07 Distance or Altitude from Spectators

Information Note: *This section provides the minimum safety distances, both horizontal and vertical, which must be maintained between aircraft in flight and the designated spectator area, unofficial spectator areas, built-up areas, and occupied building(s) during Special Aviation Events.*

Following are the standards by which aircraft shall be operated at Special Aviation Events in Lebanon. Outlined are the flight line/crowd separation distances which will apply to all Special Flight Operations Certificates issued to conduct a Special Aviation Event. For ease of reference they have been divided into the following categories:

(a) Standard Conditions of Aircraft Operation which must be adhered to by all participants unless authorized differently by an applicable Special Condition of Aircraft Operation contained in a Special Flight Operations Certificates issued to conduct a Special Aviation Event; and
(b) Special Conditions of Aircraft Operation which must be adhered to by aircraft and performers described in each specific special condition.

Standard Conditions of an Aircraft Operation

Maneuvers Toward the Crowd

(1) Aerobatic maneuvers with a descending recovery and a pull or push on a flight path, which when extended, would intersect the designated spectator area, are prohibited.
(2) Single, powered aircraft may demonstrate 360° turns where the resultant energy of the aircraft is directed toward a designated spectator area at a distance no closer than 500 feet horizontally from the designated spectator area provided the maneuver is flown at an indicated airspeed of a 156 knots or less at a maximum altitude of 250 feet [75 m] above ground level. (see Figure 1)
(3) For other maneuvers other than those described in Subsections (1) and (2) above, no person shall carry out a maneuver where the resultant energy of an aircraft is directed towards the designated spectator area unless:

- (a) for powered aircraft with an indicated airspeed of 300 knots or less, no part of the maneuver is performed closer than 1500 feet [457.2 m] horizontally from a designated spectator area; (see Figure 2)
- (b) for powered aircraft with an indicated airspeed more than 300 knots, no part of the maneuver is performed closer than 3000 feet [1,000 m] horizontally from a designated spectator area; (see Figure 3) and
- (c) for gliders, no part of the maneuver is performed closer than 500 feet [150 m] horizontally from a designated spectator area.

(4) For the purposes of this section, maneuvers such as hammerhead turns, spins, inverted flat spins, or those maneuvers in which the aircraft is recovering from a tail slide, torque roll, Lomcevak, or other similar maneuvers in which the aircraft, but not the energy vector of the aircraft may be momentarily pointed in the direction of the designated spectator area are not considered "maneuvers toward the crowd".

Information Note: *The distances outlined in paragraphs 1, 2 and 3 above are the absolute minimum safety distances for aircraft conducting "toward the crowd maneuvers". Toward the crowd maneuvers include repositioning turns where the resultant energy of the aircraft is directed toward the crowd. (see Figures 4 and 5)*

FIGURE #1

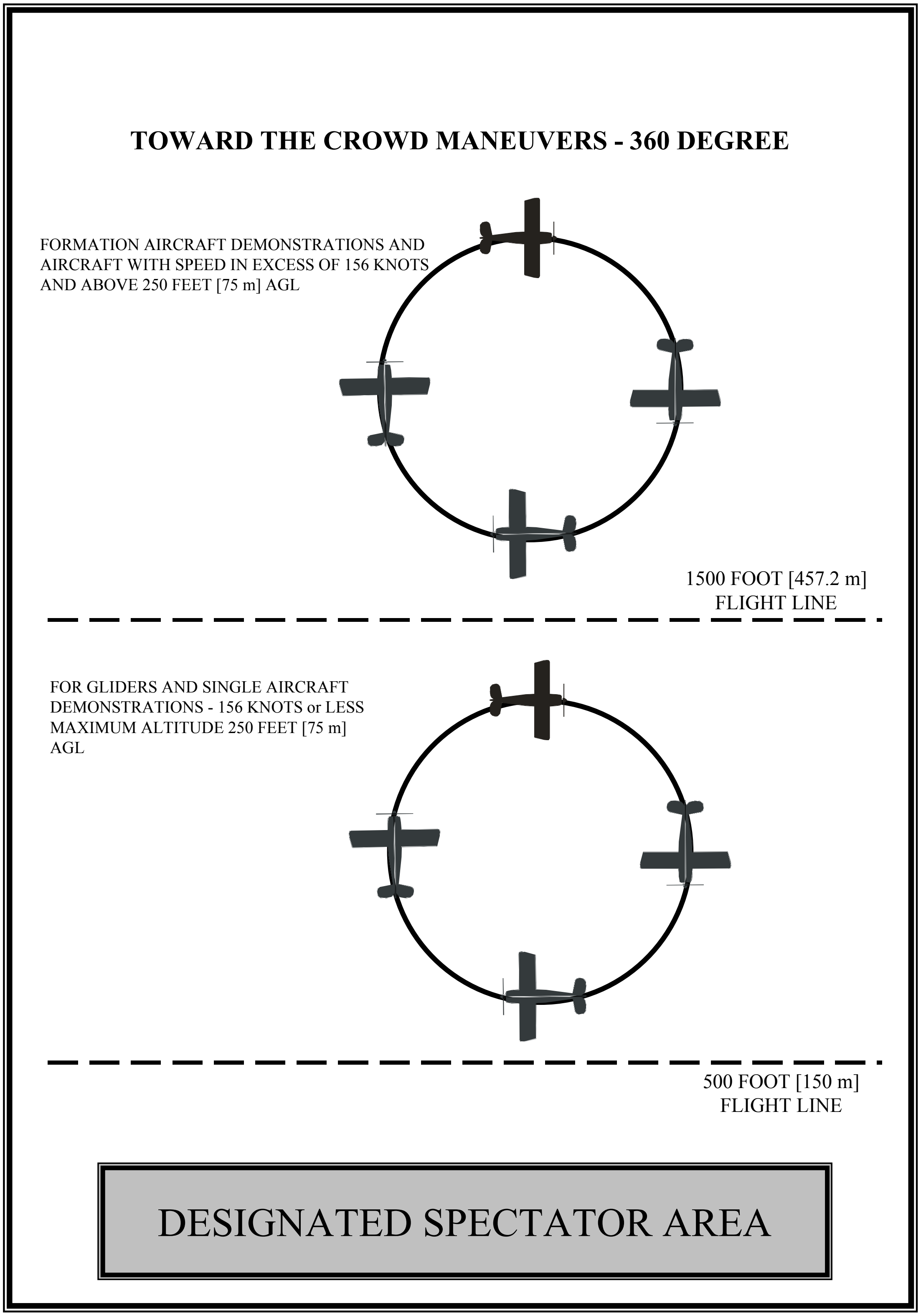

TOWARD THE CROWD MANEUVERS - 360 DEGREE
FORMATION AIRCRAFT DEMONSTRATIONS AND AIRCRAFT WITH SPEED IN EXCESS OF 156 KNOTS AND ABOVE 250 FEET [75 m] AGL
1500 FOOT [457.2 m] FLIGHT LINE
FOR GLIDERS AND SINGLE AIRCRAFT DEMONSTRATIONS - 156 KNOTS or LESS MAXIMUM ALTITUDE 250 FEET [75 m] AGL
500 FOOT [150 m] FLIGHT LINE
DESIGNATED SPECTATOR AREA

FIGURE #2

TOWARD THE CROWD MANEUVERS
AIRCRAFT WITH INDICATED AIRSPEED OF 300 KNOTS OR LESS (EXCLUDING SAILPLANES OR GLIDERS)

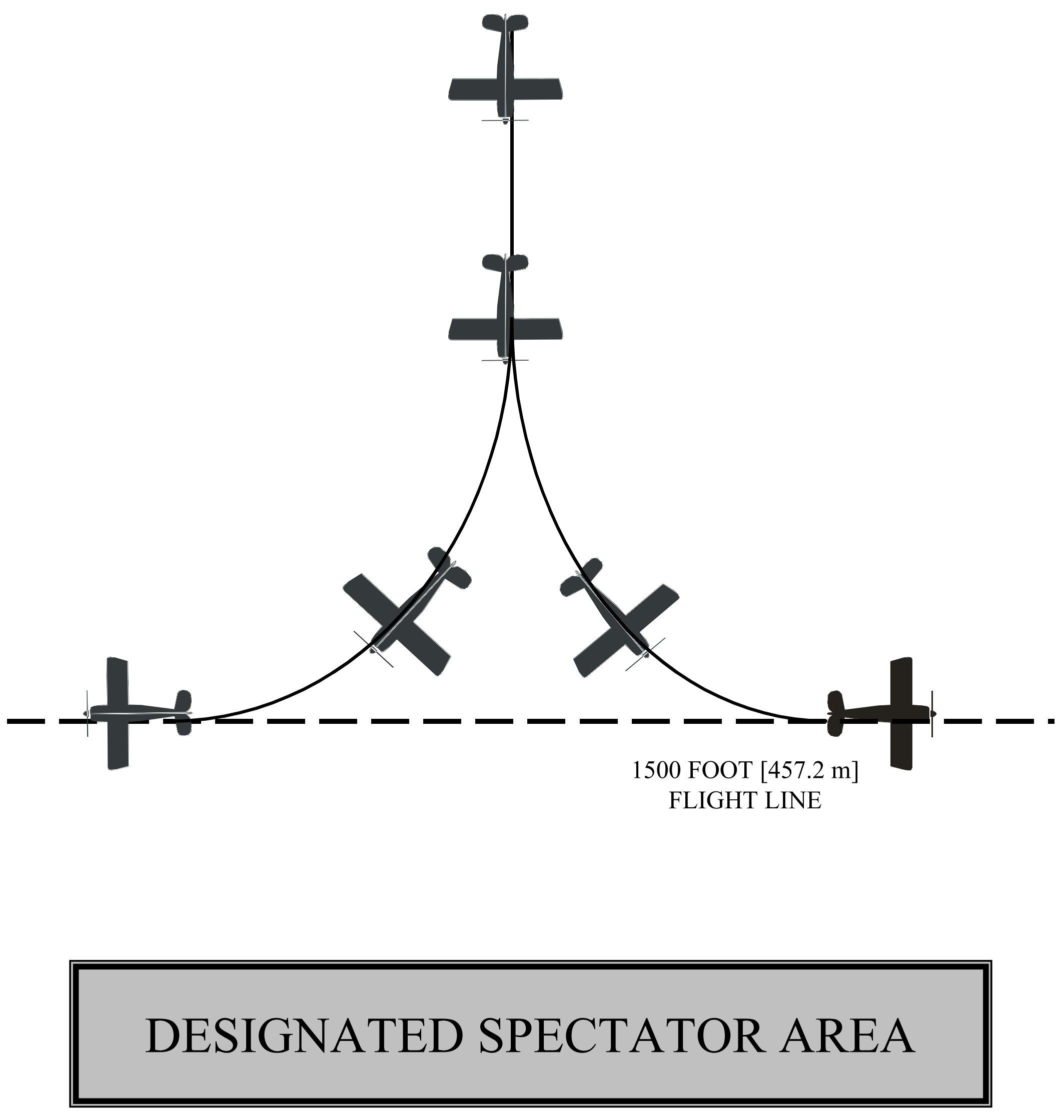
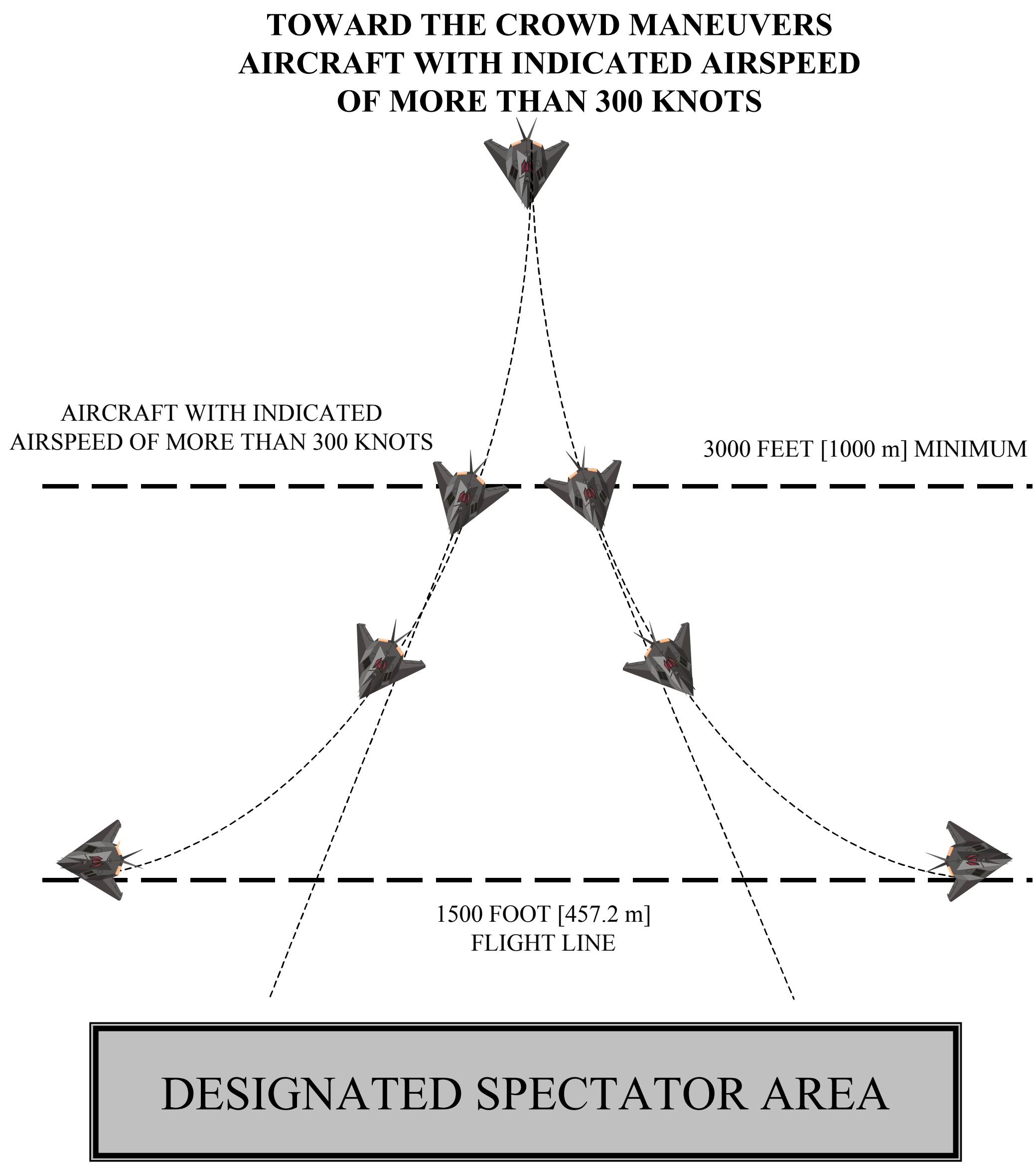


FIGURE #3



EXPLANATION NOTE

THE INTENT OF THE ABOVE DIAGRAM IS TO DEPICT:

1) AT NO POINT IN THE MANEUVER SHALL THE AIRCRAFT BE DIRECTED AT THE SPECTATORS ANY CLOSER THAN 3000 FEET [1000 m]
2) THE AIRCRAFT SHALL AT NO POINT CROSS THE 1500 FOOT [457.2 m] FLIGHT LINE

FIGURE #4

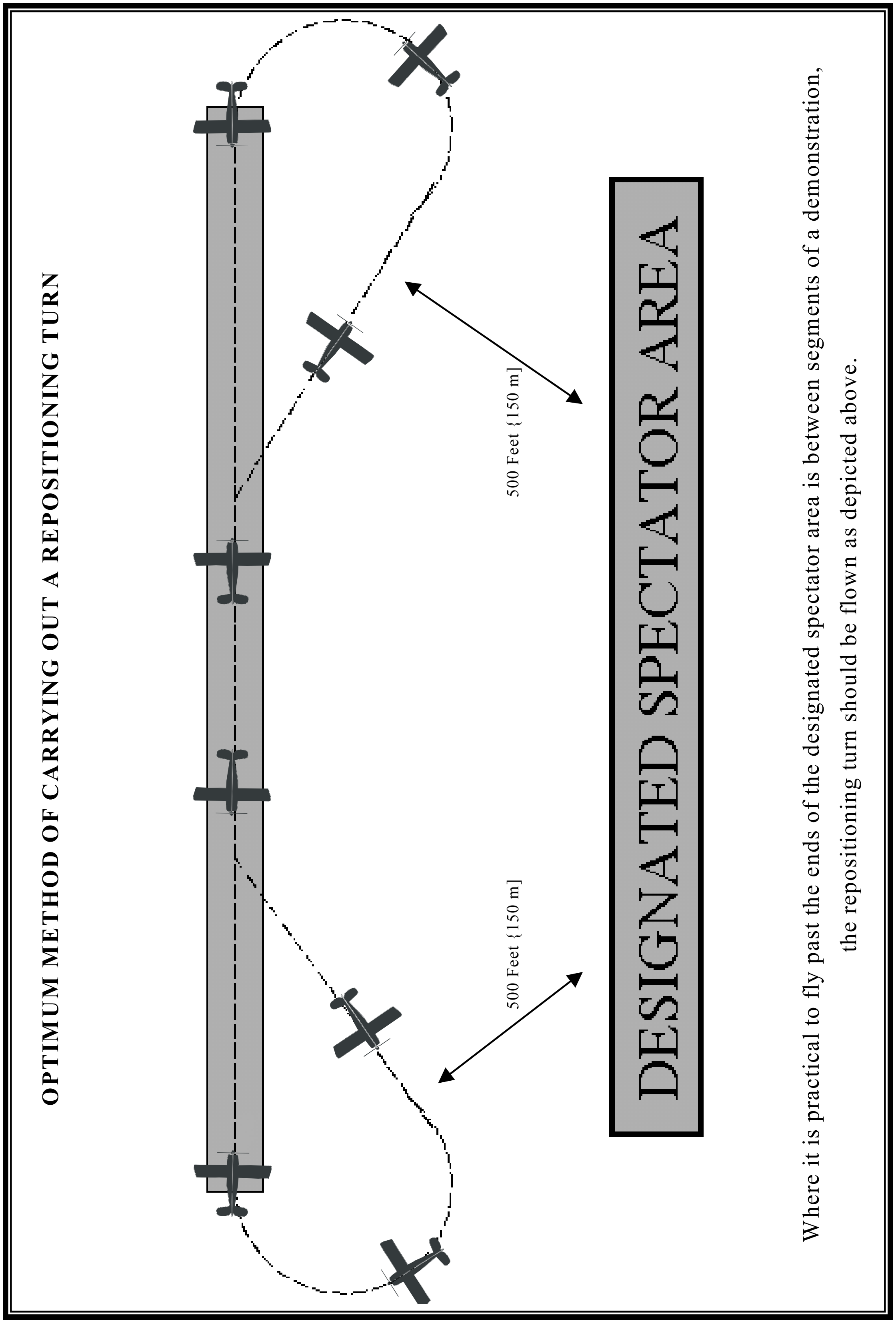
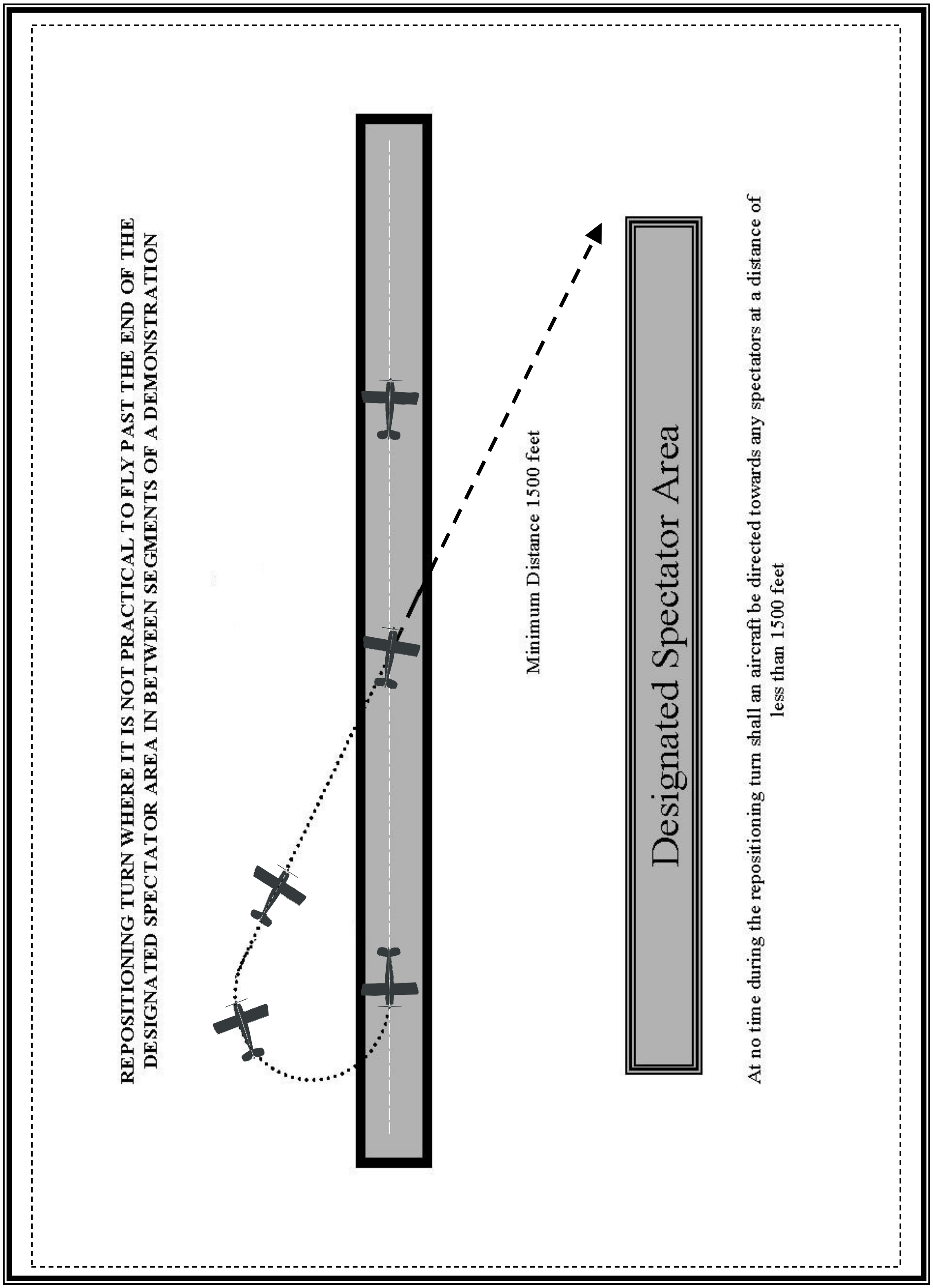

OPTIMUM METHOD OF CARRYING OUT A REPOSITIONING TURN
500 Feet {150 m]
500 Feet {150 m]
DESIGNATED SPECTATOR AREA
Where it is practical to fly past the ends of the designated spectator area is between segments of a demonstration,
the repositioning turn should be flown as depicted above.

FIGURE #5


REPOSITIONING TURN WHERE IT IS NOT PRACTICAL TO FLY PAST THE END OF THE DESIGNATED SPECTATOR AREA IN BETWEEN SEGMENTS OF A DEMONSTRATION
Minimum Distance 1500 feet
Designated Spectator Area
At no time during the repositioning turn shall an aircraft be directed towards any spectators at a distance of less than 1500 feet

Maneuvers Along Flight Lines

(2) Unless an aircraft meets the applicable requirements of the Special Conditions of Aircraft Operation outlined in Sections 5 and 6, each aircraft shall be flown only in the flying display area and along a flight line, the distance of which from designated spectator areas, unofficial spectator areas, built-up areas and occupied buildings shall not be less than:

(a) 1500 feet [457.2 m], in the case of aircraft flying at a speed of 245 knots or more; (Category I) (see Figure 6)

(b) 1000 feet [300 m], in the case of aircraft flying at a speed of more than 156 knots but less than 245 knots;(Category II) (see Figure 7) or

(c) 500 feet 150 m], in the case of aircraft flying at a speed of 156 knots or less; (Category III) (see Figure 8)

NOTE: Section titled "Flying Display Area" contains more information and clarification on the subject of Minimum Safety Distances.

Information Note: *The aircraft speeds outlined in section (2) above, are predicated on 75 percent power in straight and level flight for piston aircraft and on demonstrated normal cruise speed for turbine aircraft.*

FIGURE #6

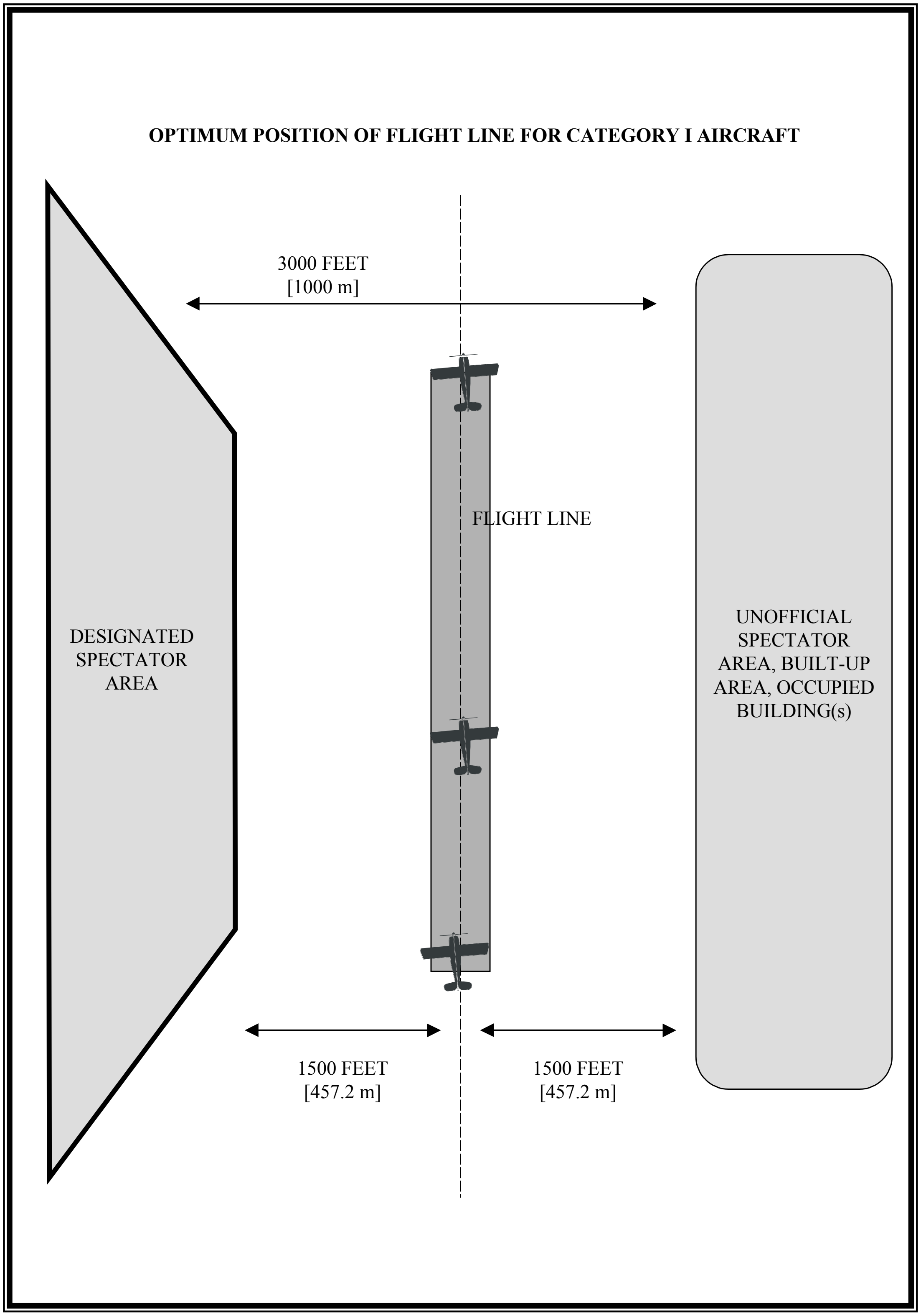

OPTIMUM POSITION OF FLIGHT LINE FOR CATEGORY I AIRCRAFT
3000 FEET
[1000 m]
FLIGHT LINE
DESIGNATED SPECTATOR AREA
UNOFFICIAL SPECTATOR AREA, BUILT-UP AREA, OCCUPIED BUILDING(s)
1500 FEET
[457.2 m]
1500 FEET
[457.2 m]

FIGURE # 7

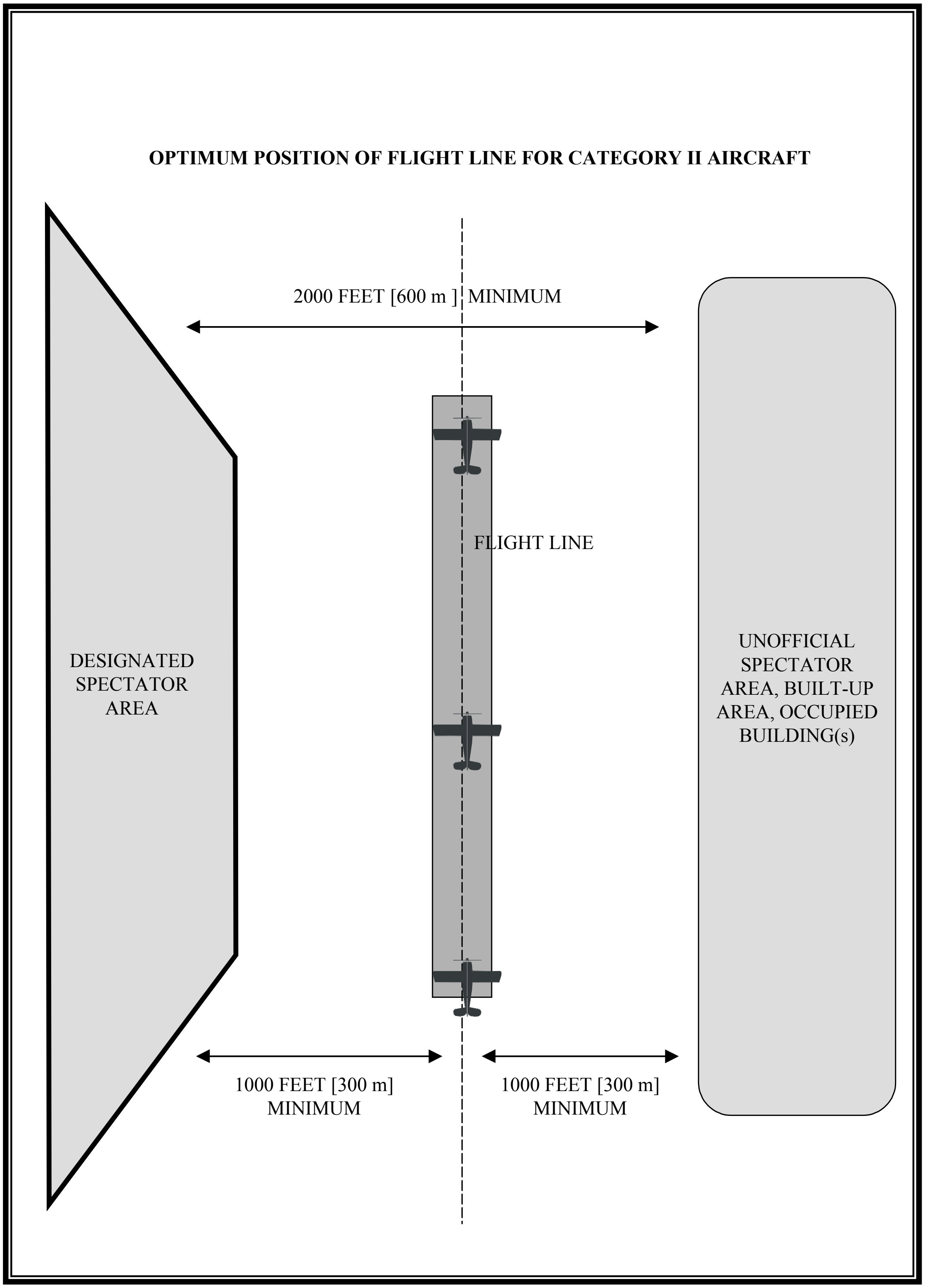
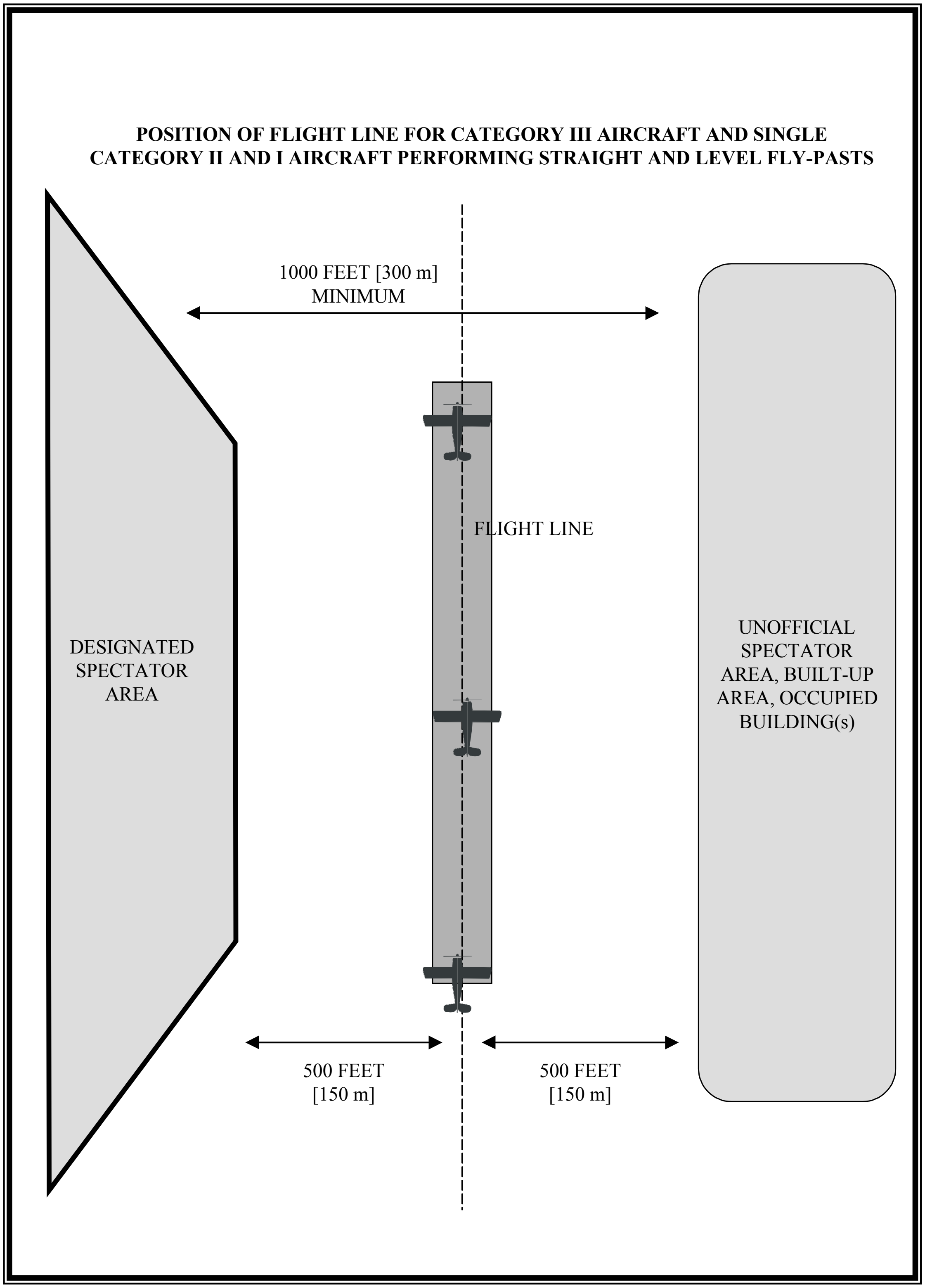

OPTIMUM POSITION OF FLIGHT LINE FOR CATEGORY II AIRCRAFT
2000 FEET [600 m] MINIMUM
FLIGHT LINE
DESIGNATED SPECTATOR AREA
UNOFFICIAL SPECTATOR AREA, BUILT-UP AREA, OCCUPIED BUILDING(s)
1000 FEET [300 m] MINIMUM
1000 FEET [300 m] MINIMUM

FIGURE # 8


POSITION OF FLIGHT LINE FOR CATEGORY III AIRCRAFT AND SINGLE CATEGORY II AND I AIRCRAFT PERFORMING STRAIGHT AND LEVEL FLY-PASTS
1000 FEET [300 m] MINIMUM
FLIGHT LINE
DESIGNATED SPECTATOR AREA
UNOFFICIAL SPECTATOR AREA, BUILT-UP AREA, OCCUPIED BUILDING(s)
500 FEET [150 m]
500 FEET [150 m]

Flying Display Area

Information Note: *The size of the flying display area required will vary dependent upon the type of aircraft participating in a specific special aviation event.*

A flying display area, whether over ground or over water, should be kept clear of persons other than persons designated as "essential" by an event sponsor. Special aviation event sponsors are required to have control over this area, to ensure that non-essential persons are kept clear of the area, and to ensure that any person entering the flying display area can be removed. Buildings normally occupied by non-essential persons lying within a flying display area must be kept vacant during any display. Access roads leading into the flying display area shall be blocked by security personnel. (see Figure 11)

Information Note: *The inability to keep these areas clear of people may limit the types of aircraft and maneuvers that aircraft may be able to perform at an event site. It is imperative in the initial planning stages that an event sponsor consider aircraft speed and maneuvers to ensure that the proposed flight lines are located at the distances specified in these standards.*

Category I - Aircraft Flying 245 knots or more

(1) Unless authorized in accordance with paragraph (b) or (c) below, the spectator safety distance from the flight line to the designated spectator areas, unofficial spectator areas, built-up areas and occupied buildings for Category I aircraft shall be 1,500 feet [457.2 m] or greater, for a minimum total distance of 3000 feet [1,000 m] between the designated spectator area and the unofficial spectator area, built-up area or occupied buildings. (see Figure 6)
(2) Where a prominent terrain feature exists that may be utilized to mark the flight line, upon application, the distance between the flight line and the designated spectator area may be reduced from 1500 feet [457.2 m] to a minimum of 1200 feet [350 m]. (see Figure 9)
(3) Upon application, the distance between the flight line and the unofficial spectator area, built-up area or occupied building(s) on the reverse side of the flight line may be reduced from 1500 feet [457.2 m] to a minimum of 1200 feet 350 m]. This reduction may be authorized if it eliminates the requirement to move the flight line off a prominent terrain feature in order to keep non-essential persons clear of the flying display area. (see Figure 10)

Information Note: *The reduction of the distances outlined in paragraph (b) and (c) above will be authorized only when flight safety can be enhanced by providing pilots with improved visibility of the flight line.*

(4) A reduction in the distance may be approved on one side of the flight line only. The optimum distance between the designated spectator area and the unofficial spectator area, built-up area or on the reverse side of the flight line is at least 3000 feet [1,000 m]. When a reduction in accordance with paragraph (b) or (c) above is authorized, the distance can be reduced to no less than 2700 feet [822.96 m].
(5) A reduction to allow enlargement of a spectator area will not be considered.

(6) A reduction of the distances will not be authorized where the designated spectator area may be moved at least 1500 feet [457.2 m] from a prominent feature that could be used as a flight line.

FIGURE # 9

POSITION OF FLIGHT LINE FOR CATEGORY I AIRCRAFT WHEN REDUCED DISTANCE BETWEEN DESIGNATED SPECTATOR AREA AND FLIGHT LINE IS APPROVED

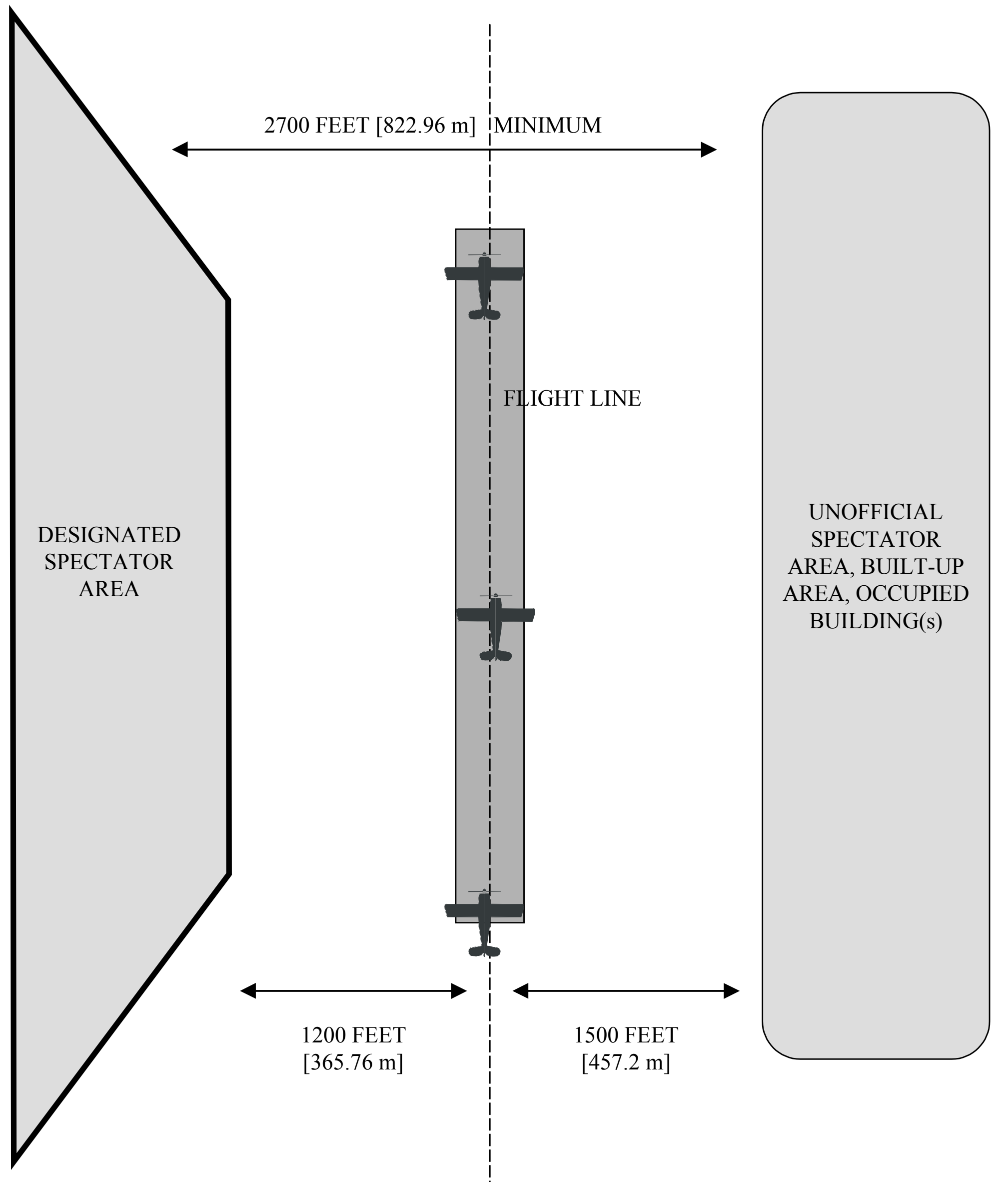


FIGURE # 10

POSITION OF FLIGHT LINE FOR CATEGORY I AIRCRAFT WHEN REDUCED DISTANCE BETWEEN UNOFFICIAL SPECTATOR AREA, BUILT-UP AREA, OCCUPIED BUILDING(S) HAS BEEN APPROVED

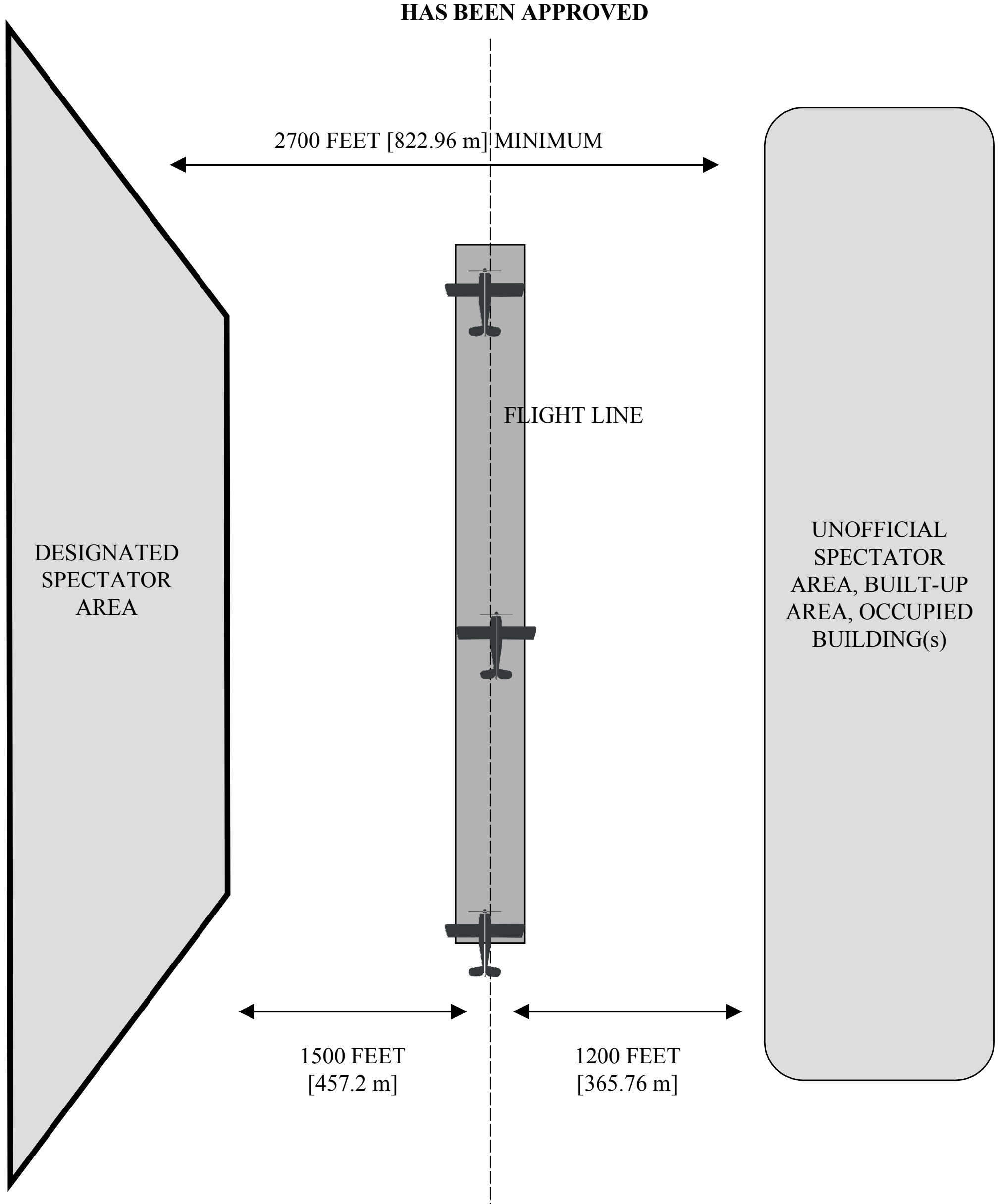
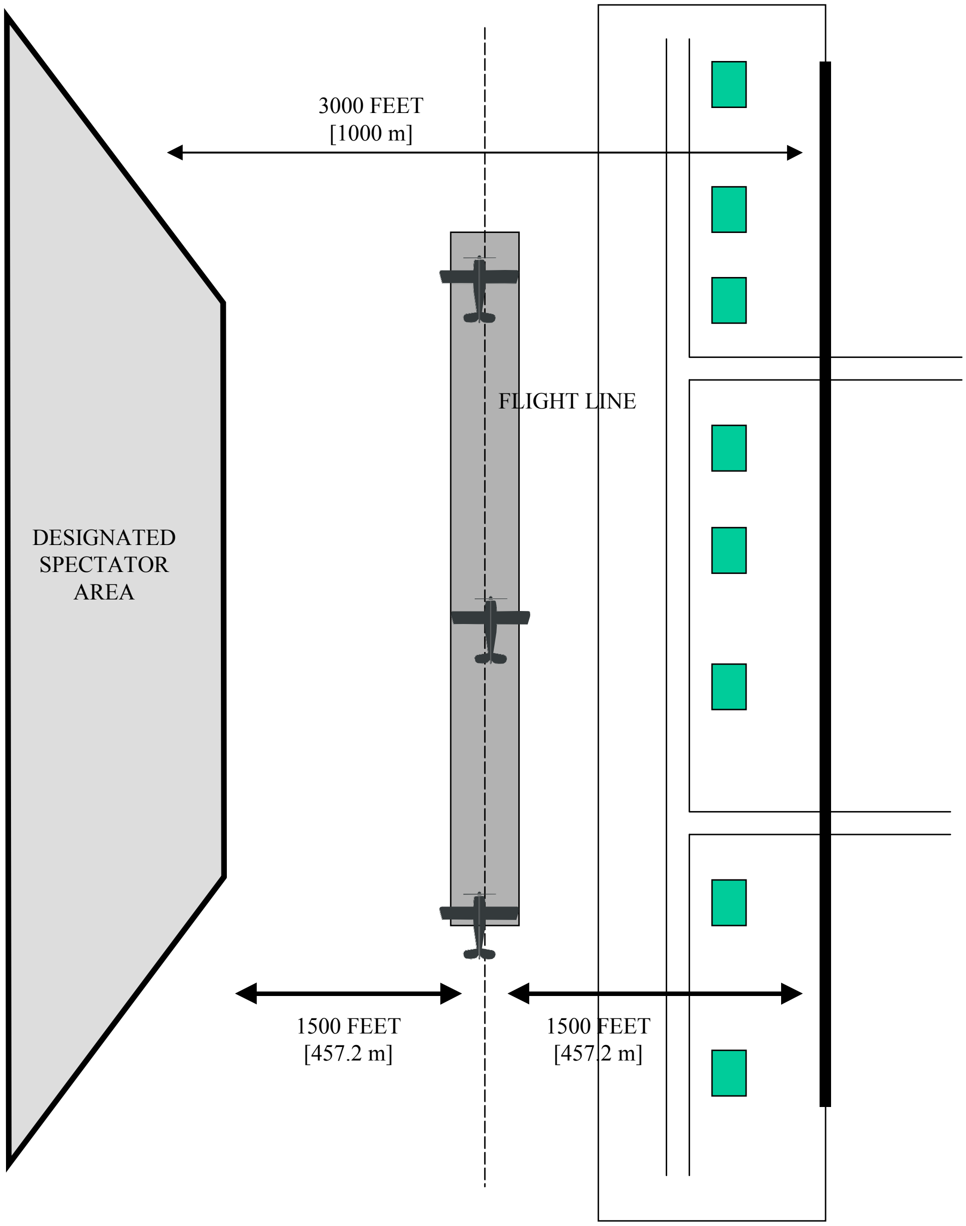


FIGURE # 11

EXAMPLE OF " CATEGORY I AIRCRAFT" FLYING DISPLAY AREA REQUIRING BUILDING EVACUATION AND ROAD CLOSURES



Category II - Aircraft Flying in Excess of 156 knots but less than 245 knots

(1) The spectator safety distance from the flight line to the designated spectator areas, unofficial spectator areas or built-up areas for Category II aircraft shall be 1,000 feet [300 m] or greater, for a minimum total distance of 2000 feet [600 m] between the designated spectator area and the unofficial spectator area, built-up area or occupied buildings. (see Figure 7).
(2) Where a prominent terrain feature exists that may be utilized to mark the flight line, upon application, the distance between the flight line and the designated spectator area may be reduced from 1000 feet [300 m] to a minimum of 800 feet [244 m]. (see Figure 12)
(3) Upon application, the distance between the flight line and the unofficial spectator area, built-up area or occupied building(s) on the reverse side of the flight line may be reduced from 1000 feet [300 m] to a minimum of 800 feet [244 m]. This reduction may be authorized if it eliminates the requirement to move the flight line off a prominent terrain feature in order to keep non-essential persons clear of the flying display area. (See Figure 13)

Information Note: *The reduction of the distances outlined in paragraph (b) and (c) above will be authorized only when flight safety can be enhanced by providing pilots with improved visibility of the flight line.*

A reduction in the distance may be approved on one side of the flight line only. The optimum distance between the designated spectator area and the unofficial spectator area, built-up area, or occupied building(s) on the reverse side of the flight line is 2000 feet [600 m] minimum. When a reduction in accordance with paragraph (b) or (c) above is authorized, the distance can be reduced to no less than 1800 feet [550 m].

A reduction to allow enlargement of a spectator area will not be considered.

A reduction of the distances will not be authorized where the designated spectator area may be moved at least 1000 feet [300 m] from a prominent feature that could be used as a flight line.

FIGURE # 12

POSITION OF FLIGHT LINE FOR CATEGORY II AIRCRAFT WHEN REDUCED DISTANCE BETWEEN DESIGNATED SPECTATOR AREA AND FLIGHT LINE IS APPROVED

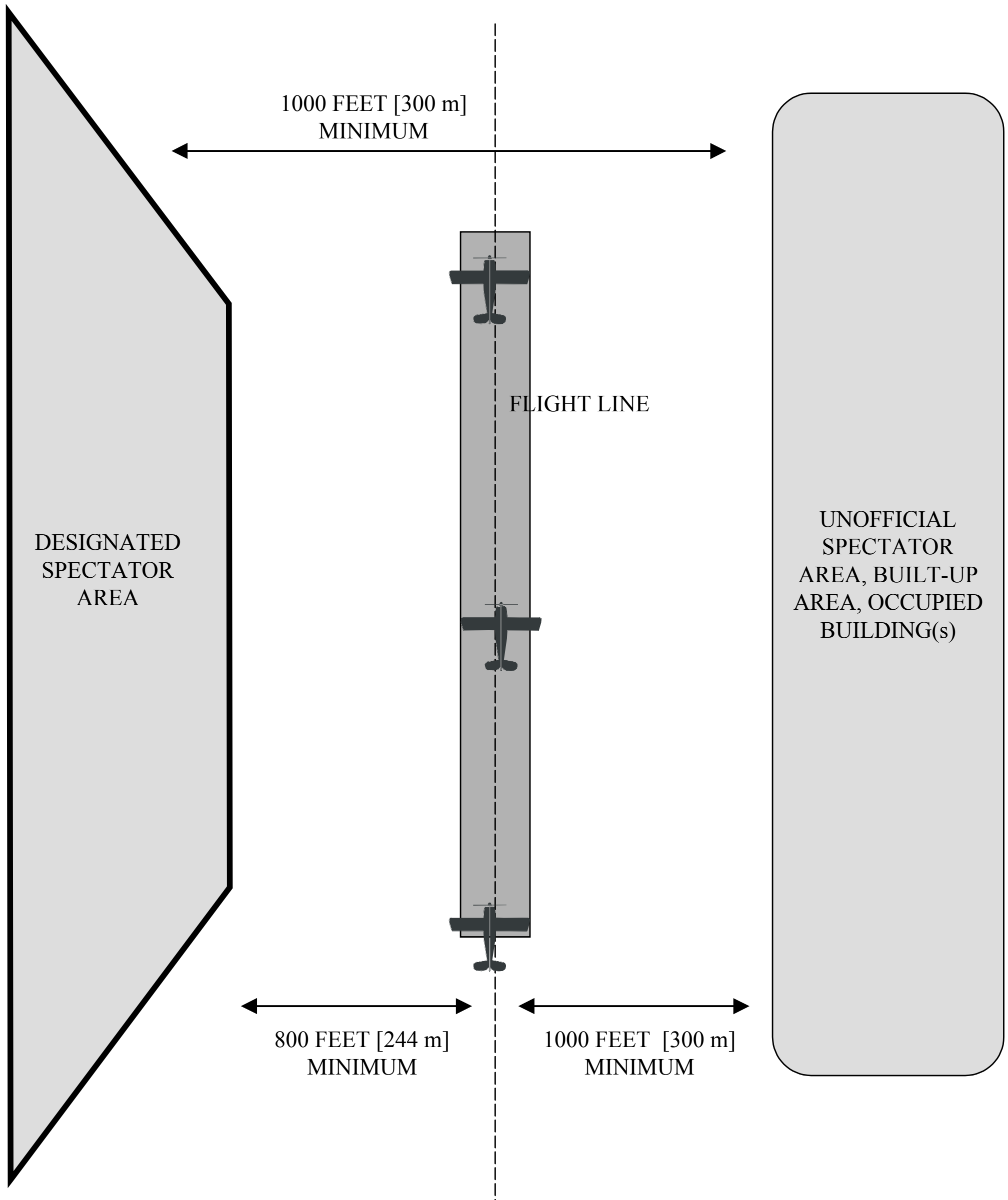
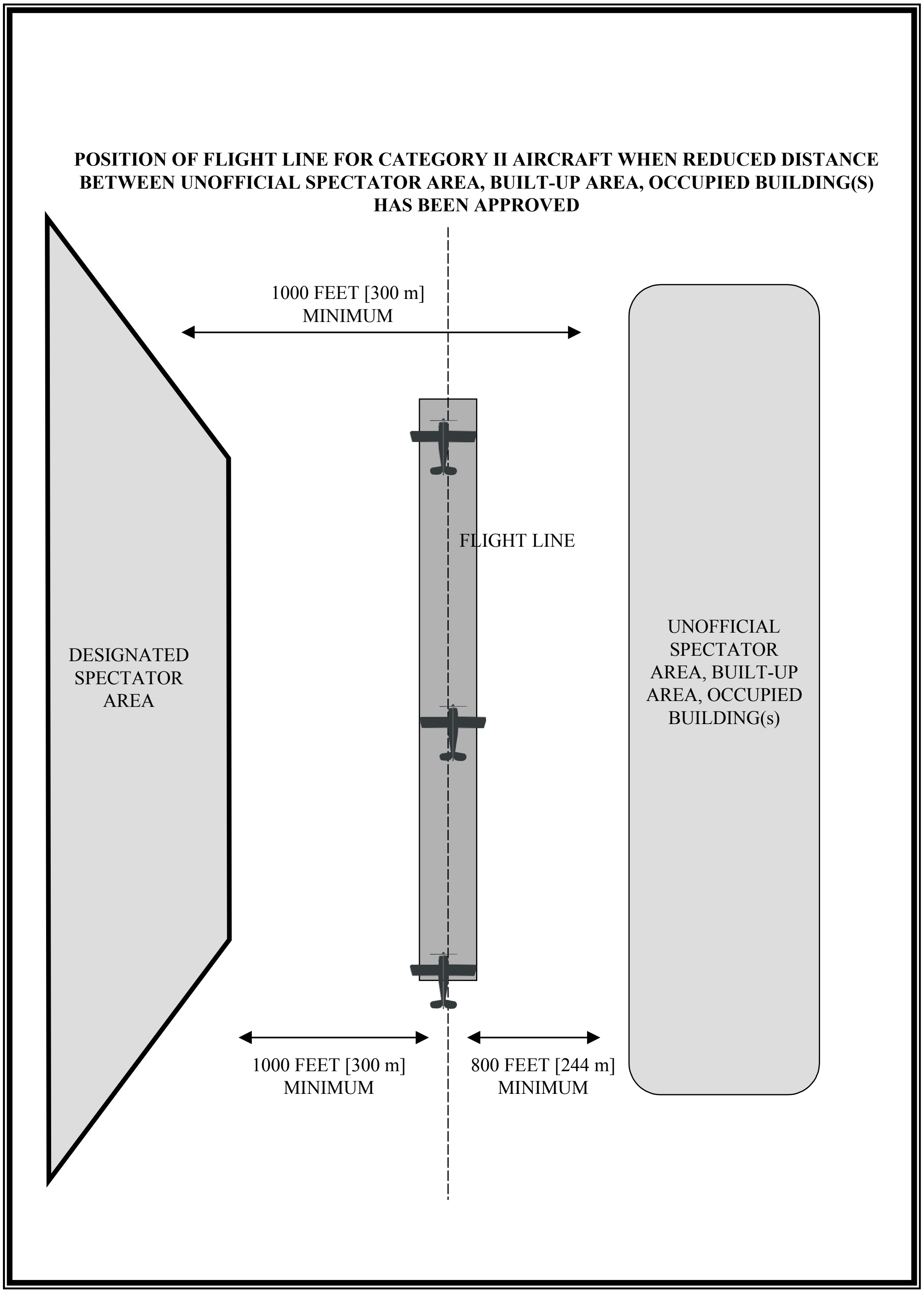


FIGURE # 13

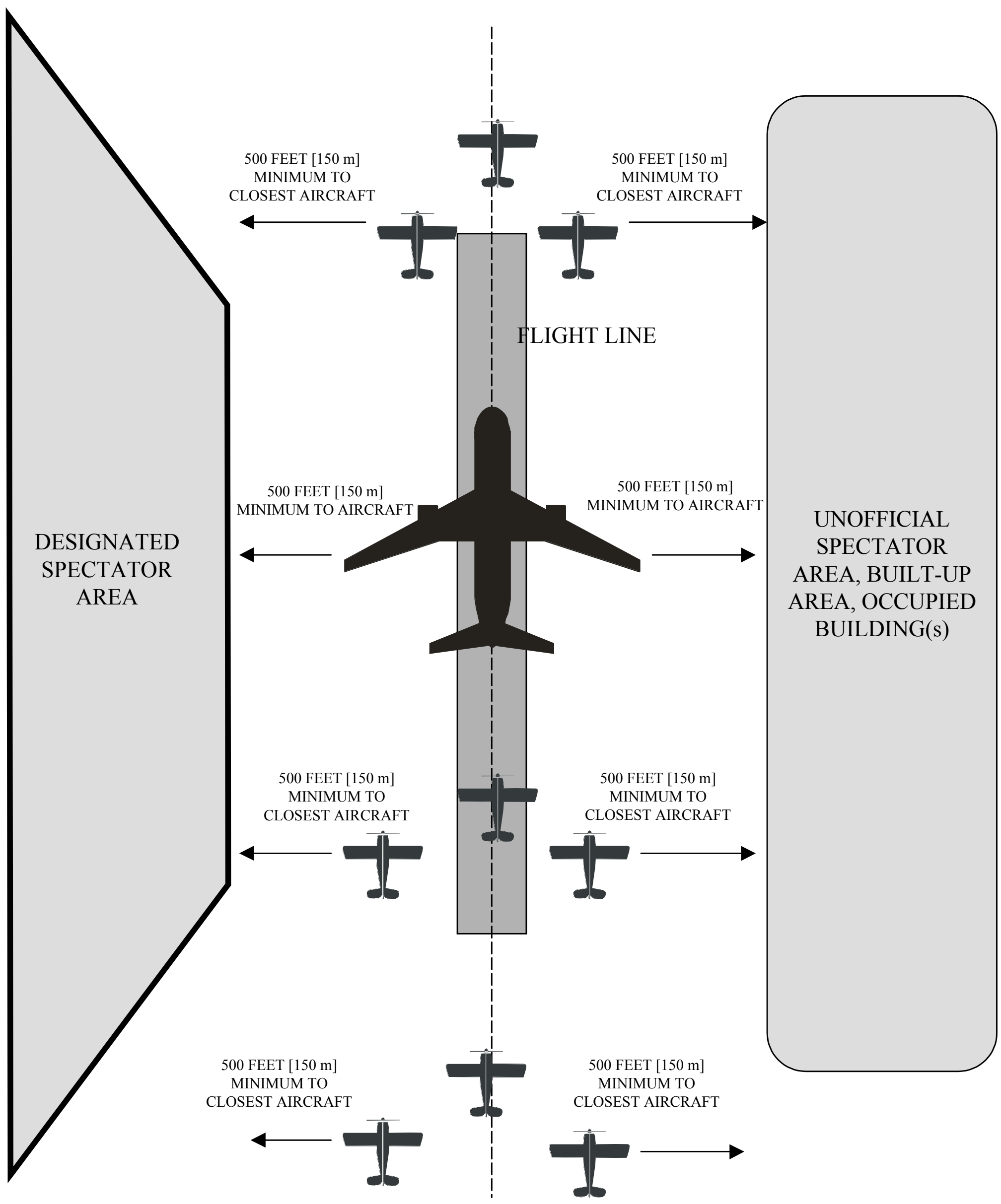

POSITION OF FLIGHT LINE FOR CATEGORY II AIRCRAFT WHEN REDUCED DISTANCE BETWEEN UNOFFICIAL SPECTATOR AREA, BUILT-UP AREA, OCCUPIED BUILDING(S) HAS BEEN APPROVED
1000 FEET [300 m] MINIMUM
FLIGHT LINE
DESIGNATED SPECTATOR AREA
UNOFFICIAL SPECTATOR AREA, BUILT-UP AREA, OCCUPIED BUILDING(s)
1000 FEET [300 m] MINIMUM
800 FEET [244 m] MINIMUM

Category III - Aircraft Flying 156 knots or less

(1) The spectator safety distance from the flight line to the designated spectator areas, unofficial spectator areas or built-up areas for Category III aircraft shall be 500 feet [150 m] or greater, for a total minimum distance of 1000 feet [300 m] between the designated spectator area and the unofficial spectator area, built-up area or occupied buildings. (see Figure 8).
(2) Category II and I aircraft may use the Category III flight line if performing non-aerobatic straight and level flying maneuvers parallel to the designated and unofficial spectator areas. (see Figure 14)
(3) For demonstrations involving large aircraft or several aircraft in formation or non-aerobatic flybys, the flight line must be positioned to ensure no aircraft in the formation is closer than 500 feet [150 m] from the designated or unofficial spectator areas. This may require the flight line to be positioned more than 500 feet [150 m] from the designated or unofficial spectator areas, built-up areas, and occupied buildings. (see Figure 14).

FIGURE # 14

EXAMPLE OF FLIGHT LINE POSITION FOR LARGE CATEEGORY I or II AIRCRAFT AND CATEGORY III AIRCRAFT IN FORMATION FLIGHT



Minimum Altitudes

(1) Unless a pilot and aircraft are identified specifically in a Special Condition of Aircraft Operation Pertaining to Low Altitude Performances, no aircraft shall be flown at an altitude of less than:

(a) 300 feet [100 m] above ground level, in the case of aircraft flown at a speed of 156 knots or less; and

(b) 500 feet [150 m] above ground level, in the case of aircraft flown at a speed of more than 156 knots.

Take-off and Landing Areas

(1) Except for aircraft that satisfy the Special Conditions of Aircraft Operation outlined in Section 8, no aircraft shall take-off or land on a runway or area closer than a distance of 500 feet [150 m] horizontally from any spectators. (See Figure 15)

(2) Helicopters may, following the completion of a landing or coming to a stable hover, no closer than 500 feet [150 m] from spectators, hover taxi to a clearly marked landing area, no closer than 200 feet [60 m] from a spectator enclosure. (see Figure 16)

Information Note: *For the purpose of this authorization "Hover Taxi" means helicopter movement conducted above the surface and in ground effect at airspeeds less than 20 knots.*

(3) Helicopters may take-off from a staging area that is no closer than 200 feet [60 m] from any spectators provided the departure path flown is at least 15° away from any spectator enclosures until the helicopter reaches the 500 foot [150 m] flight line. (see Figure 16).

FIGURE # 15

MINIMUM SEPARATION DISTANCE BETWEEN RUNWAY OR TAKE-OFF AREA AND DESIGNATED SPECTATOR AREA FOR AIRVRAFT WITH APPROACH SPEEDS IN EXCESS OF 100 KNOTS

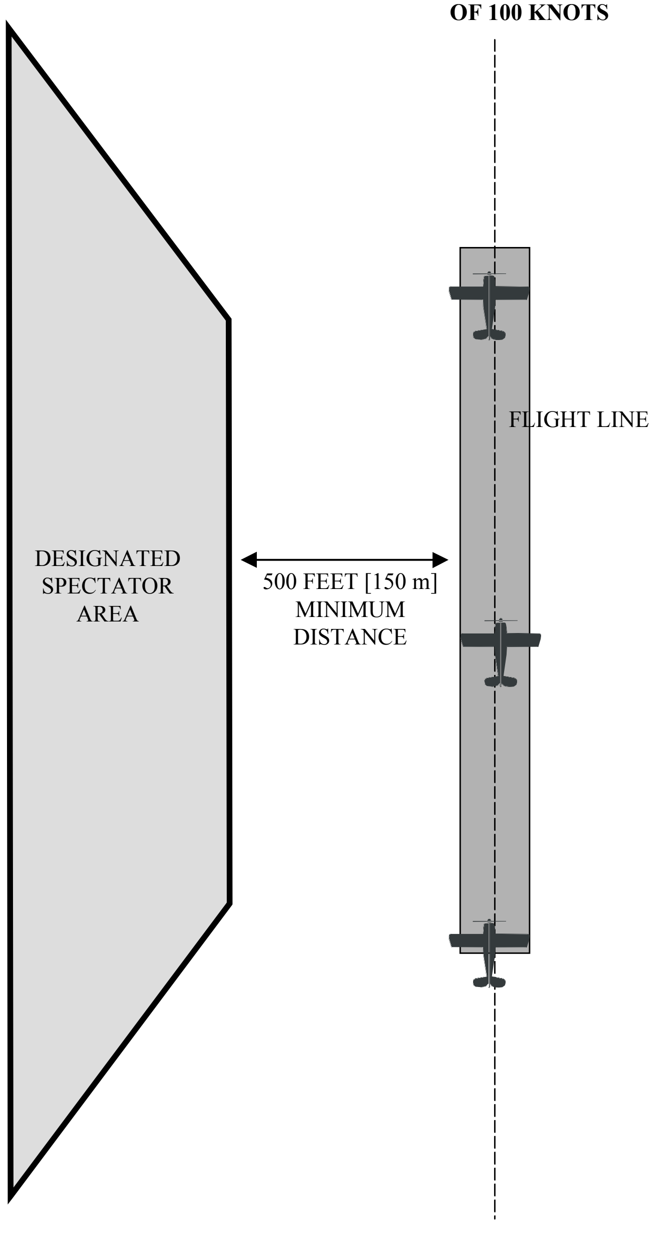
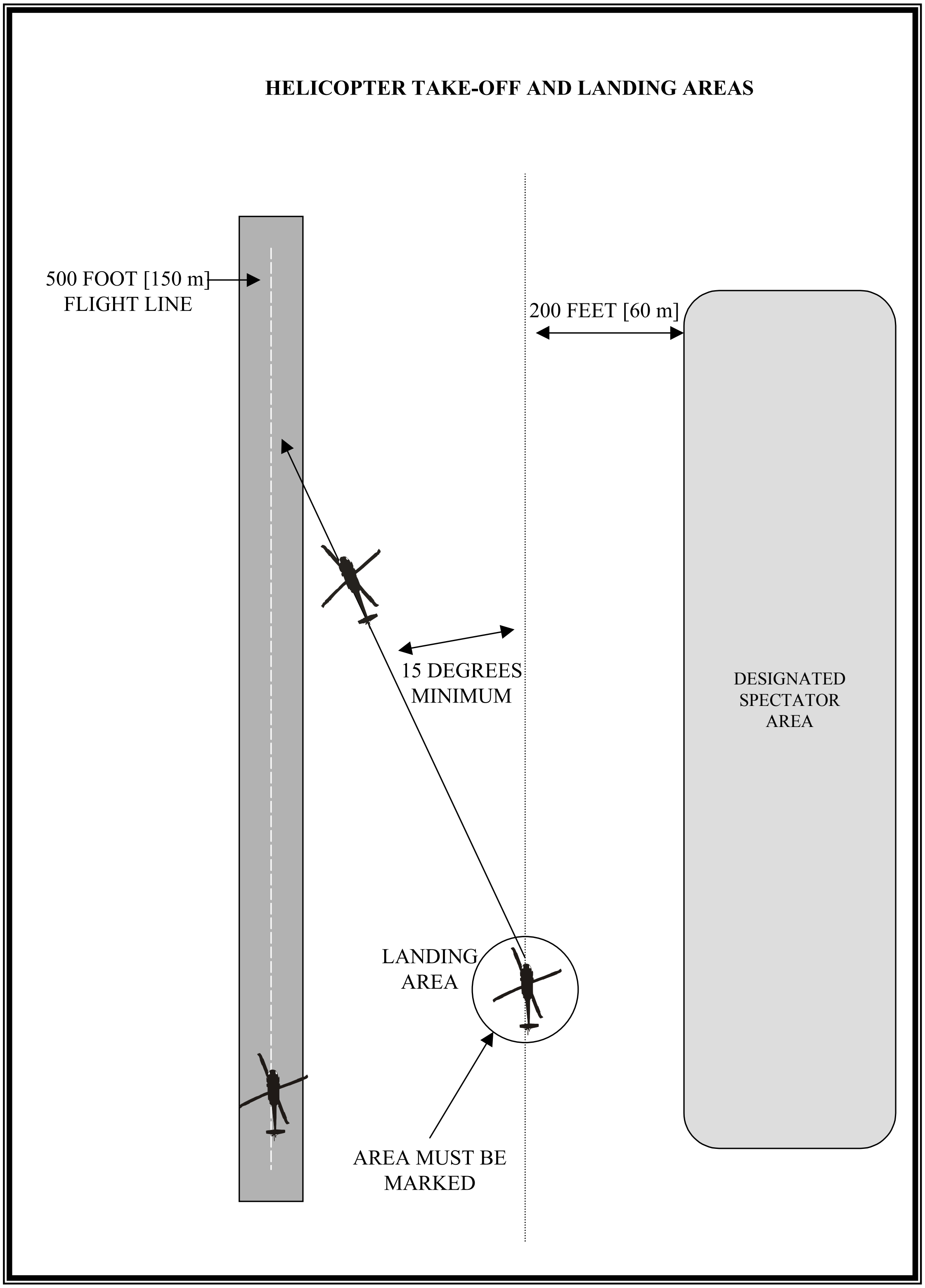


FIGURE # 16


HELICOPTER TAKE-OFF AND LANDING AREAS
500 FOOT [150 m]
FLIGHT LINE
200 FEET [60 m]
15 DEGREES
MINIMUM
DESIGNATED
SPECTATOR
AREA
LANDING
AREA
AREA MUST BE
MARKED

Special Conditions of Aircraft Operation

(1) Where applicable, aircraft that meet the following Special Conditions of Aircraft Operation may be operated as follows:

(a) Powered Parachute demonstrations (including take-off and landings) may be flown along a flight line, the distance of which from the designated spectator area shall not be less than 100 feet [30 m];

(b) BD-5J Microjet aircraft may perform aerobatic demonstrations along a flight line, the distance of which from the designated spectator area shall not be less than 500 feet [150 m];

(c) Aircraft whose demonstrations include only straight and level fly pasts, flying at speeds of more than 156 knots, may perform their demonstration along a flight line, the distance of which from the designated spectator area shall not be less than 500 feet [150 m];

(d) Aircraft carrying out aerobatic demonstration sequences and flying at speeds of more than 156 knots may perform a sequence "opening or closing" straight and level fly past along a flight line, the distance of which from the designated spectator area shall not be less than 500 feet [150 m]. All other maneuvers in their approved sequence must be carried out along the flight lines appropriate to the speed of their aircraft outlined in the Standard Conditions of Aircraft Operation;

(e) Helicopters may perform aerobatic maneuvers no closer than 1,000 feet [300 m] horizontally from the designated spectator area. These maneuvers include a 900 pitch down, a split "S", loop, and a barrel roll;

(f) Helicopters may perform agility maneuvers along a flight line no closer than 500 feet [150 m] horizontally from the designated spectator area. These maneuvers include abrupt pedal turns, sideward and rearward flight maneuvers, out-of-ground effect hovering, and continued operation in the avoid area of the height velocity Figure.

Special Conditions of Aircraft Operation Pertaining to Take-off and Landing Areas

(1) Where applicable, aircraft that meet the following Special Conditions of Aircraft Operation may be operated as follows:

(a) Subject to Subsection 8(b) aircraft with approach speeds of less than 100 knots (excluding helicopters), may take-off and land on a runway or area no closer than a distance of 200 feet [60 m] horizontally from any spectators; (See Figure 17)

(b) "Flying farmer" or similar routines that involve excessive maneuvering immediately after take-off or just before landing must take-off or land on a runway or area no closer than a distance of 500 feet [150 m] horizontally from any spectators;

(c) Sailplanes being towed for launch by either airplanes or automobiles may take-off from a runway or area that is no closer than a distance of 200 feet [60 m] horizontally from any spectators;

(d) Sailplanes may land on a runway or area that is no closer than a distance of 200 feet [60 m] horizontally from any spectators;

(e) When the take-off runway or area is less than 500 feet [150 m] from spectators, aerobatic maneuvers may not be performed until the aircraft passes the end of the designated spectator area and no spectators or built-up areas are beneath the aircraft; (See Figure 18)

(f) When the take-off runway or area is less than 500 feet [150 m] from spectators, aerobatic maneuvers may be performed after take-off, prior to reaching the end of the designated spectator area providing a turn of a minimum of 10 degrees away from the spectators is carried out and the maneuver is initiated at the 500 foot [150 m] flight line. (See Figure 19)

FIGURE # 17

MINIMUM SPECTATOR SEPARATION DISTANCE OF TAKE-OFF AND LANDING AREA FOR AIRCRAFT WITH APPROACH SPEEDS OF LESS THAN 100 KNOTS, NO EXCESSIVE MANEUVERING DURING TAKE-OFF OR LANDING (i.e. "Flying Farmer Acts") AND GLIDER LAUNCHES AND TOWS

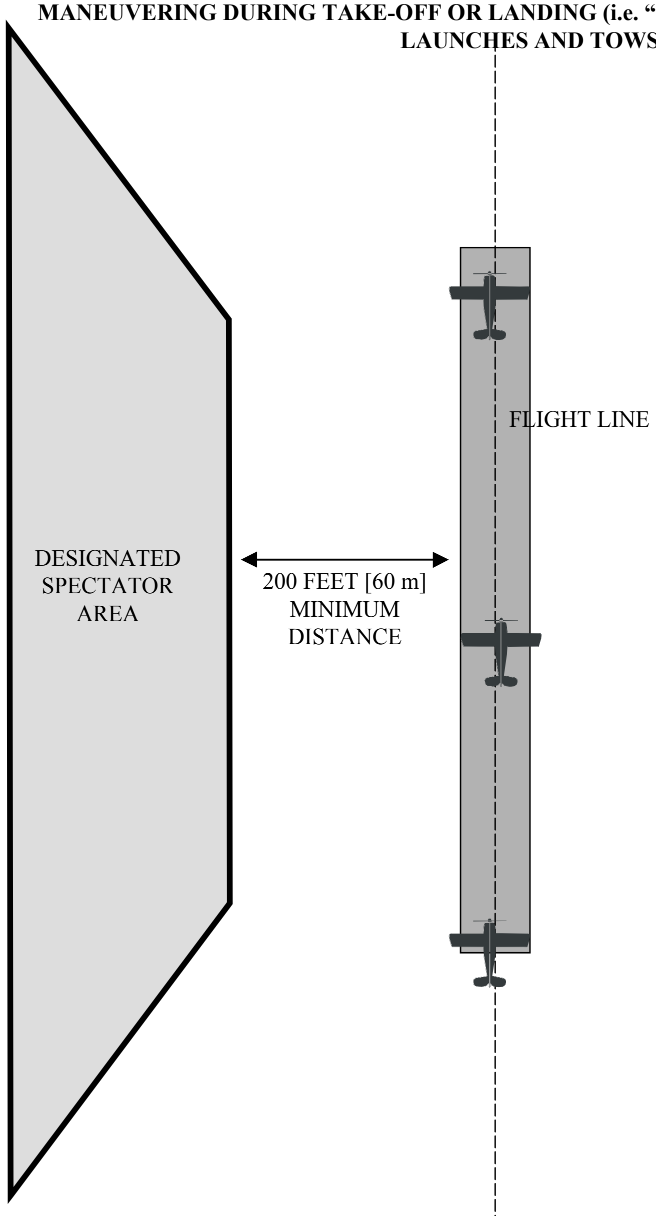


FIGURE # 18

WHEN THE RUNWAY OR TAKE-OFF AREA IS LESS THAN 500 FEET [150 m] FROM ′ DESIGNATED SPECTATOR AREA, AEROBATIC MANEUVERS MAY NOT BE PERFORMED AFTER TAKE-OFF UNTIL THE AIRCRAFT IS BEYOND THE END OF THE SPECTATOR AREA

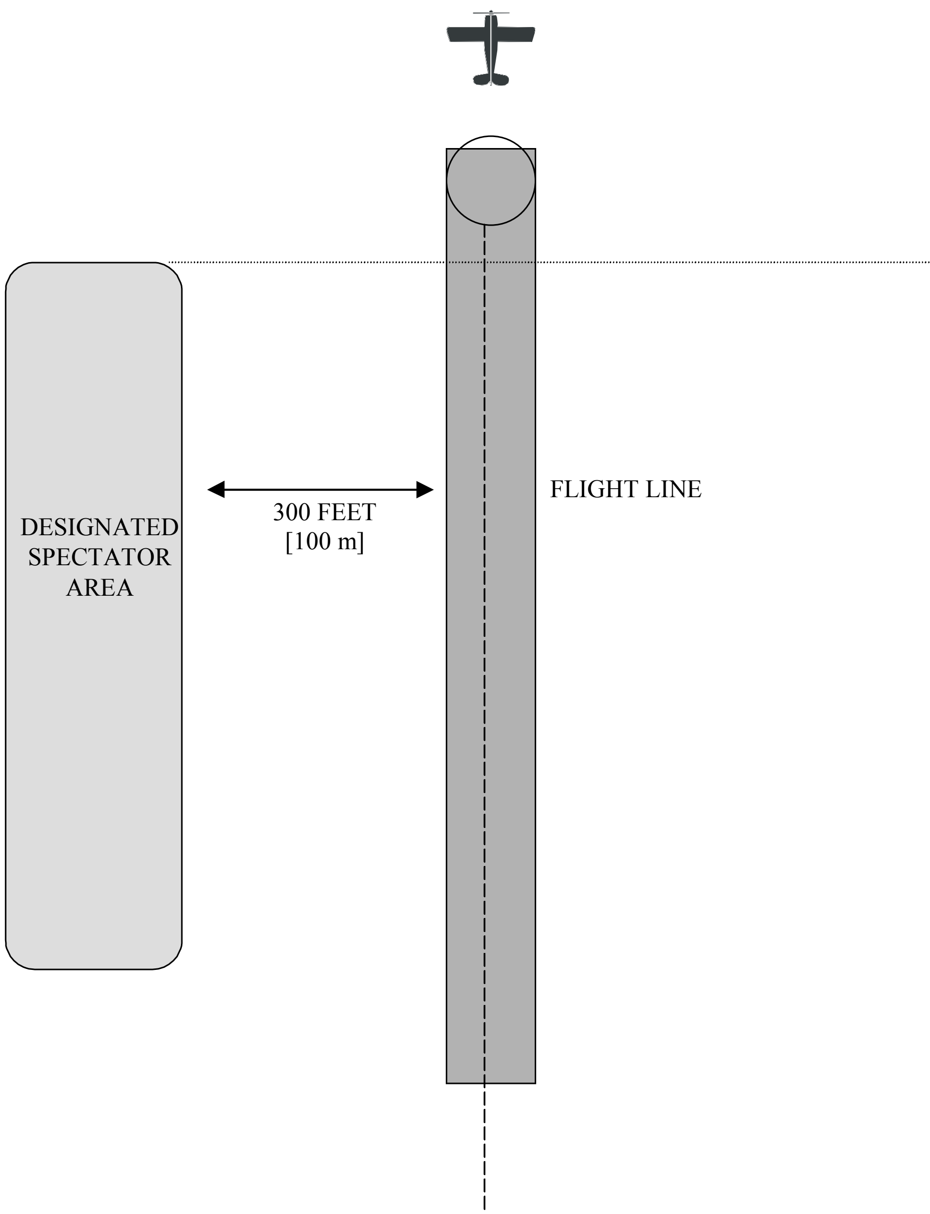
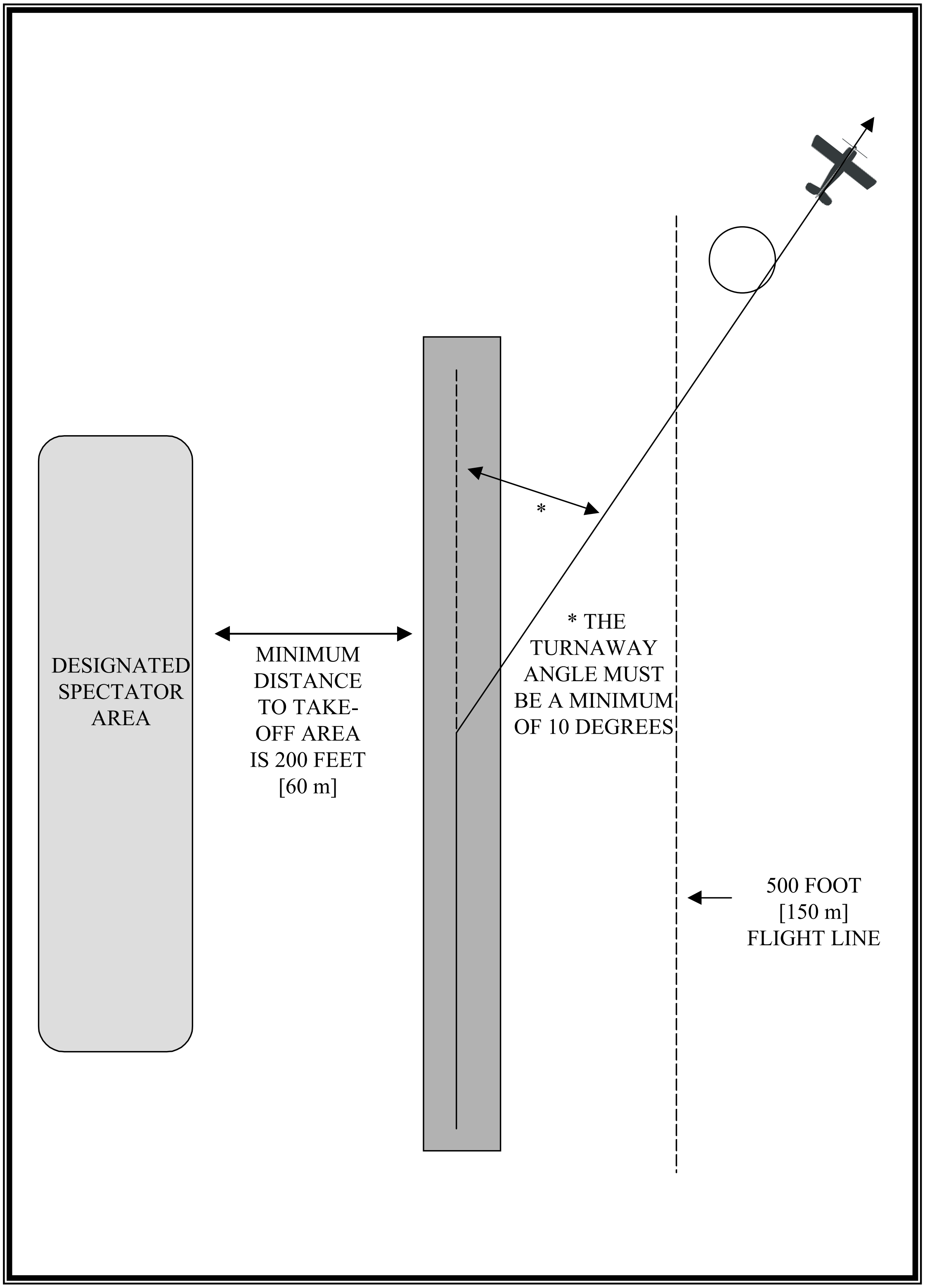


FIGURE # 19


*
* THE TURNAWAY ANGLE MUST BE A MINIMUM OF 10 DEGREES
DESIGNATED SPECTATOR AREA
MINIMUM DISTANCE TO TAKE-OFF AREA IS 200 FEET [60 m]
500 FOOT [150 m] FLIGHT LINE

Special Conditions of Aircraft Operation Pertaining to Low Altitude Performances

Information Note: *Aircraft may be authorized by way of Special Conditions of Aircraft Operation contained in a Special Flight Operations Certificate issued for a Special Aviation Event, to be flown at altitudes lower than 300 feet AGL for aircraft travelling at 156 knots or less or 500 feet [150 m] AGL for aircraft travelling at more than 156 knots. The authorizations may be granted specific to individual performers or groups of performers and may be granted for complete routines or individual maneuvers.*

(1) To have performers authorized in the Special Conditions of Aircraft Operation Pertaining to Low Altitude Performances to carry out low level performances, a sponsor must comply with the following procedures:

(a) The Sponsor shall make the request in writing, outlining the minimum altitude requested and the type of performance to be carried out by the participant. This may be submitted to the Director of Civil Aviation Lebanon on DGCA-OPS form 100-1(Special Aviation Event Flight Program) or in letter form containing the information found on the DGCA-OPS form 100-1;

(b) The Sponsor shall ensure each participant meets all applicable requirements and that all the required documentation has been submitted as outlined in Section s603.06 of these standards, Participant Eligibility;

(c) Other flying performances such as water bombing or similar demonstrations by airplanes, helicopter operations and single aircraft straight and level flypasts may be authorized at lower than the specified altitude upon written request by a Sponsor;

Information Note: *It is important to note that it is the decision of the sponsor as to whether low altitude performances and demonstrations are appropriate to the air show site. Factors such as spectator visibility, adverse terrain, etc. must be considered in this decision. It is then the sponsor's responsibility to request low level authorization. Low level performances must be listed in the Special Flight Operations Certificate issued for an event in order to be flown in the event.*

(d) Possession of a Director of Civil Aviation Lebanon "Acrobatic Flight Demonstration Certificate" or a FAA "Statement of Acrobatic Competency", does not, by itself, provide the necessary authority for low altitude flight at a special aviation event. Each performer, the maneuvers to be performed and the minimum altitude shall be identified in the Special Flight Operations Certificate.

Special Conditions of Aircraft Operation Pertaining to Night Special Aviation Events

(1) Aircraft participating in a Lebanese Special Aviation Event held at night shall be operated as follows:

(a) Night aerobatic demonstrations shall be performed within an area confined to 1 nautical mile (NM) on either side of the show center along a well-defined, lighted flight line;

(b) Night aerobatic demonstrations shall be performed to an altitude of no lower than 500 feet [150 m] AGL or higher than an altitude of 5,000 feet [1,600 m] AGL;

(c) No aircraft shall carry out aerobatic demonstrations at night in weather conditions where the ceiling is less than 2,500 feet [762 m] above ground level or ground visibility is less than 3 statute miles;

(d) Aircraft position lights must be operating at night except while pyrotechnics on the aircraft are illuminated.

Air Display Flight Lines

(1) The following standards apply to the positioning and marking of flight lines:
- (a) Flight lines shall be placed at distances from designated spectator, unofficial spectator or built-up areas appropriate to aircraft speed and category as outlined in Section s603.07 of these standards;
- (b) Flight lines must be marked so as to be clearly visible from the air at distances needed by participating pilots to line up their aircraft for their performances;
- (c) Appropriate flight lines must be in place and clearly visible for pilots performing "toward the crowd maneuvers";
- (d) Flight lines for events held at night shall be lighted in a manner such that they are clearly visible and identifiable by the participating pilots;
- (e) The location of all flight lines and the method by which they will be marked must be clearly indicated on the site Figure submitted in support of an application to conduct a Special Aviation Event.

Information Note: *An ideal flight line is the center line or edge of an aerodrome runway and should be used even if it means moving the flight line out a short distance further than that specified in Section s603.07 of these standards. However, for sites at which there are no appropriately located runways, alternative marking methods must be used. The Director of Civil Aviation has no specific requirements as to the type of marking used except that the markings must be of a color contrasting with the terrain on which they are placed, and clearly visible from the air. The use of terrain features such as roads, creeks, etc. could also be considered if available.*

Flight over Designated Spectator Area

No aircraft shall be flown by a participant as part of his/her demonstration over any designated spectator area at a Lebanese Special Aviation Event.

Flight over Unofficial Spectator Areas

Information Note: *It is recognized that "unofficial secondary spectator" areas often exist or form in close proximity to air display sites. Examples of this are boats congregating off the end or parallel to flight lines at "over the water shows" and people congregating in areas adjacent to, but outside airport property.*

(1) The following standards apply to flight over unofficial spectator areas:
- (a) Sponsors shall keep person(s) clear of the flying display area;
- (b) No aerobatic maneuvers are permitted;
- (c) Aircraft shall not descend or use the area for turning to position themselves over a flight line for upcoming segments of their performances.

Flight over Built-up Areas Adjacent to Flying Display Areas

(1) Flight over built-up areas adjacent to flying display areas shall be carried out as follows:

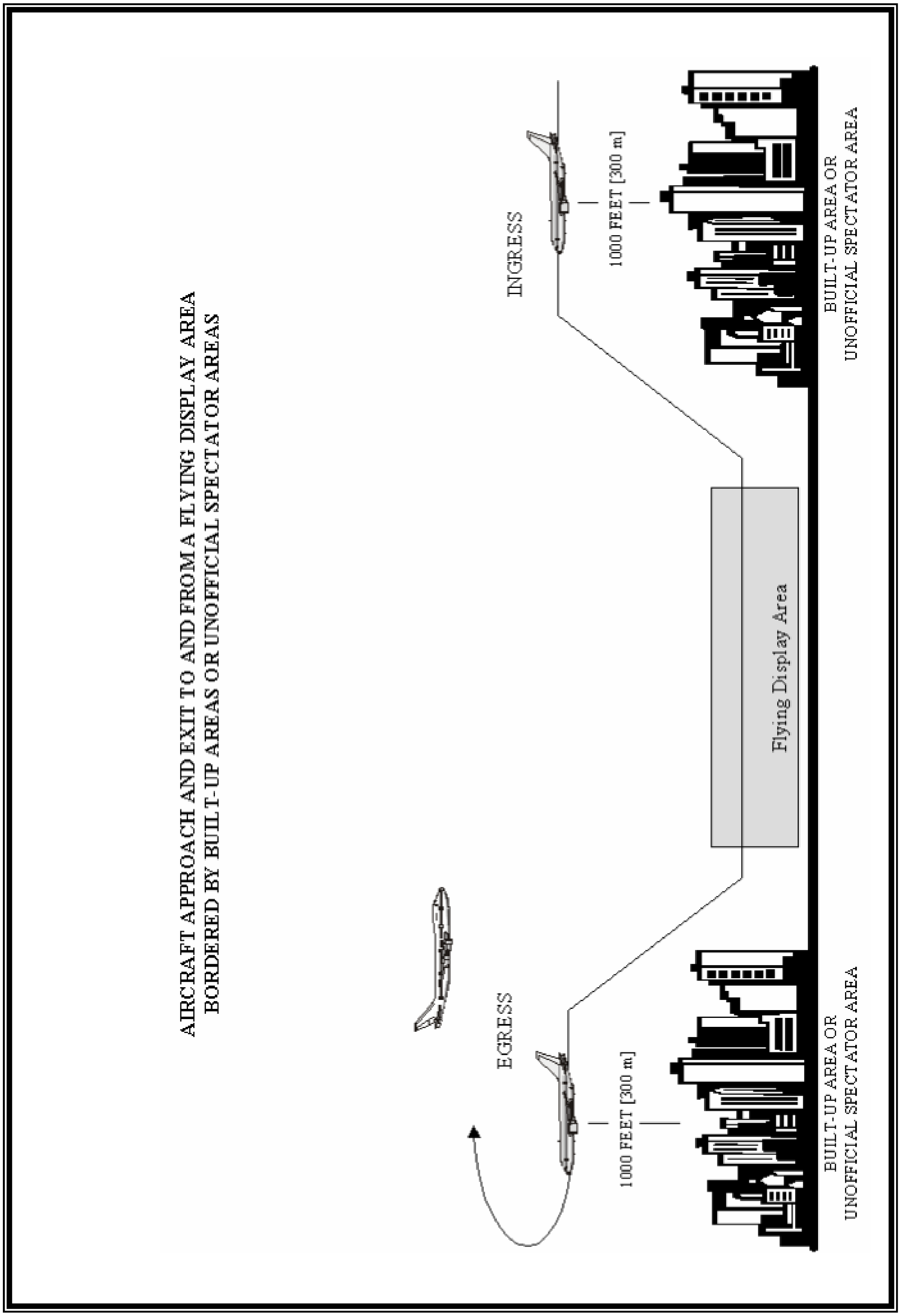
(a) No aerobatic maneuvers are permitted;

(b) Minimum Altitude - At least 1000 feet [300 m] above the highest obstacle within a radius of 2000 feet [600 m] from the aircraft;.

(c) From Adjacent Built-up Areas to Flying Display Areas - Aircraft entering an air display site from flight over a built-up area for approach to the flying display area shall leave the altitude specified in Subsection 14(b) to effect a smooth transition to the aircraft's performance altitude on the flight line. Steep approaches are permitted but in no case shall the angle of descent to the air display flight line be lower than that of the normal approach for the aircraft type; (See Figure 20)

(d) From Flying Display Areas to Adjacent Built-up Areas - Aircraft exiting a flight line whose flight path will take them over a built-up area shall climb at a rate consistent with the safe operation or best pitch attitude for the aircraft type. If extended flight over the built-up area is expected, then compliance with the minimum altitude restriction of Subsection 14(b) is required. (See Figure 20)

FIGURE # 20


AIRCRAFT APPROACH AND EXIT TO AND FROM A FLYING DISPLAY AREA
BORDERED BY BUILT-UP AREAS OR UNOFFICIAL SPECTATOR AREAS
INGRESS
1000 FEET [300 m]
BUILT-UP AREA OR
UNOFFICIAL SPECTATOR AREA
Flying Display Area
EGRESS
1000 FEET [300 m]
BUILT-UP AREA OR
UNOFFICIAL SPECTATOR AREA

s603.08 Weather Conditions

(1) The minimum weather conditions for the conduct of a Special Aviation Event referred to in Section 603.08 of the LARs are a ceiling of 1500 feet [457.2 m] above ground level and a ground visibility of 3 statute miles.
(2) The minima may be adjusted, by means of a Special Condition of Aircraft Operation contained in the Special Flight Operations Certificate issued for a specific Special Aviation Event, as follows:
- (a) a higher ceiling and/or visibility may be specified if required by terrain or other considerations; or
- (b) the minimum ceiling may be reduced to 1000 feet [300 m] above ground provided the visibility is 3 statute miles or greater and:
  - (i) safety is not be compromised;
  - (ii) a low ceiling program is approved in advance;
  - (iii) the low ceiling program must be briefed. AD HOC scheduling is prohibited.

s603.09 Participant Briefing

Information Note: *The importance of the Participant's Briefing to the safe and successful conduct of a Special Aviation cannot be emphasized enough. Although entitled Participant's Briefing, it is a safety briefing at which all aspects of the flying, ground, and emergency procedures of the proposed event should be reviewed. The briefing should be conducted in such a way, that every performer and event personnel in charge of the air, ground and emergency operations leaves the briefing with a clear understanding of their responsibilities and procedures to be followed in normal or emergency situations that may occur during the course of the event.*

(1) The standards for a Participant's Briefing at a Lebanese Special Aviation Event are as follows:
- (a) A briefing shall be conducted prior to the commencement of any flight program of a special aviation event.
- (b) The briefing shall be carried out in an area as free of noise and other distractions as possible and attendance should be limited to flight crews, flight crew support staff, parachutists, ground performers (eg. pyrotechnic teams, announcers, etc.) and key event personnel. Key event personnel are the persons responsible for the air, ground, safety and emergency operations for the event.
- (c) Each participant's attendance at the briefing shall be verified by roll call or otherwise and a record retained for submission to the Director of Civil Aviation Lebanon , if requested.
- (d) Performers who are not briefed, shall not be permitted to participate in the flight program on that day.
- (e) For team performances, only the team leader or his/her delegate is required to attend the briefing. A team delegate must be a performing member of the team.
- (f) For aircraft that are to be launched from a remote airfield, the briefing may be given to the pilots by telephone.
- (g) The briefing shall be conducted at a time as close to the performance time as practicable.

Briefing Content

(1) The briefing shall cover the following subjects, as a minimum:

(a) The key air show personnel shall be introduced and the means of communication with them shall be described;
(b) A weather briefing covering aspects of the weather which are significant to the conduct of the event shall be given. (i.e. cloud cover (ceiling) visibility, winds and temperature, density altitude etc., forecast for the period of the event). The weather briefing should be given by a Weather Specialist if one is available, but may be given by an experienced pilot;

Information Note: *If a low ceiling program (marginal weather) has been approved, the revised low show program shall be briefed.*

(c) The airport air traffic zone details i.e. position, dimensions, height above MSL, and including the airspace in accordance with the NOTAM issued for the air show shall be described. Local obstructions, warnings and other pertinent information such as bird activity and other nearby aerial activity shall be included;
(d) The method of coordinating air traffic, including type of coordination, i.e. positive control by ATS, or other shall be described. This shall include show frequencies and assignment of radio call signs if necessary. The method(s) of suspending the performance or recalling a performer by both radio and visual signals shall be described;
(e) The event site, including the position of the spectators, civilian and military flight lines, direction of entry/exit lanes, holding areas and alternate aerodromes shall be described. This should be done using aerial photographs, maps, scale diagrams, etc;
(f) The performance schedule, including start-up, taxi, takeoff, show routine and landing timings shall be briefed. Performers shall note "on" and "off" stage for timing purposes and shall be aware of the position of the act they follow. Other programmed flying events before, during or after the flying display portion itself i.e. balloons, parachutists, flybys etc., shall be outlined;
(g) Wake turbulence and dangers associated with it shall be discussed. The wake turbulence factor should be considered in preparing the flight program;
(h) The fire fighting and emergency services equipment available including their location and the access routes to be kept clear shall be described;
(i) A "time check or time hack" shall be carried out to ensure all participants are using the same time for event coordination;
(j) The person designated by the sponsor the responsibility of flight operations shall ensure each performer understands the applicable written authorized limits with respect to individual low level authorizations contained in the Special Flight Operations Certificate;

Information Note: *Items in section (j) above, need not be discussed during the participants briefing, if personally covered by the person designated by the sponsor to brief the participants and the performer earlier at the site Items in section (j) above, need not be discussed during the participants briefing, if personally covered by the person designated by the sponsor to brief the participants and the performer earlier at the site.*

(k) Any other subjects deemed necessary.

Information Note: *Examples of topics that have been included in briefings are medical factors affecting pilot performance, eg. over the counter medication, pilot fatigue, heat stress and factors affecting orientation of flight over water demonstrations or unusual terrain.*

It is suggested that at the briefing on the final day of an event, a "Departure Briefing" be included to advise participant's of ATC procedures, etc. to be followed on leaving the event site.

Pilots should be reminded that their departures are to be normal and that no "ad hoc" demonstrations are to take place during their departures.

<u>Participant's Statement</u>

(1) Personnel designated by the sponsor shall ensure:

(a) that each participant is given the opportunity to read the Special Flight Operations Certificate issued for the special aviation event;
(b) that each participant has signed the Participant's Statement found in Appendix A of these standards;
(c) performers who have not done so shall not be allowed to participate in the air display;
(d) that for performers who received a telephone briefing, he or she signs the statement on behalf of the performer and so indicates on the form; and
(e) that at the end of a briefing a copy of the Statement is given to the monitoring Civil Aviation Inspector or, if an Inspector is not on site, that a copy of the Statement is forwarded to the Director of Civil Aviation Lebanon, the first business day following the event.

Appendix "A"
Participant's Statement

Date: __________________ Page: _____________ of ______________

This is to certify that I have read and thoroughly understand and will comply with all the Conditions of Authorization contained in the Special Aviation Event Authorization issued for:

____
(Name of Special Event)

Participant's Name:	Participant's Signature:
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

s603.10 to s603.15 Reserved

Chapter Two - Balloon Festivals

Reserved

Chapter Three - Aerobatic Competitions

Reserved

Chapter Four - Low Level Air Races

Reserved

Chapter Five - Fly-ins

Reserved

Division II - Balloons with Fare-Paying Passengers

s603.16 to s603.17 Reserved

s603.18 Issuance of a Special Flight Operations Certificate - Balloons

The following constitutes an application for the issuance of a Special Flight Operations Certificate - Balloons:
(1) The name, address, and where applicable, the telephone and facsimile number of the balloon operator;
(2) The types and registration marks of balloons to operated;
(3) The name, address, and where applicable, the telephone and facsimile number of the person to be designated to act as maintenance coordinator; and
(4) If the applicant intends to operate more then one balloon, the name, address, and where applicable, the telephone and facsimile number of the person designated
the responsibilities of operational control over the flight operations.

s603.19 to s603.20 Reserved

s603.21 Crew Member Qualifications

Qualifications

(1) Subject to subsection (2) balloon pilots operating balloons carrying fare-paying passengers shall:
- (a) be at least eighteen years of age;
- (b) hold a Balloon Pilot License issued by the Minister;
- (c) hold a Medical Certificate, Category 1 or 3; and
- (d) have accumulated a minimum of 50 hours flight-time in untethered balloons or be the holder of a Lebanese Balloon License with a valid Flight Instructor Rating - Balloon Category.

(2) Where the pilot-in-command is a foreign licensed pilot operating a foreign registered balloon in accordance with a Special Flight Operations Certificate – Special Aviation Event, the pilot-in-command shall:
- (a) be at least eighteen years of age;
- (b) have accumulated a minimum of 50 hours flight-time in untethered balloons;
- (c) hold a balloon pilot license that satisfies the minimum ICAO standard issued or validated by the country of registry of the balloon; and
- (d) possess a medical status equivalent to that of the ICAO Class 2 Medical Assessment.

Currency

(1) Prior to operating a balloon, a pilot must demonstrate within the preceding twelve (12) months, a satisfactory level of knowledge and ability to perform normal and emergency operating procedures on the specific AX class of balloon to be operated.
(2) The holder of a Special Flight Operations Certificate - Balloons shall maintain, for a period of two years, records of when and how the determinations in subparagraphs (3) were made (oral or written examination, flight evaluation, or a combination thereof) and make such records available to the Minister upon request.

s603.22 Briefing of Passengers

(1) Passengers shall be given a safety briefing prior to the commencement of the inflation of a balloon.
(2) A passenger safety briefing shall include, as a minimum, the following topics:

(a) a general overview of the flight (expected length of the flight, different phases of the flight from inflation to landing, etc.);
(b) where to position themselves during inflation;
(c) the location of emergency equipment (fire extinguisher, drop line, first aid kit, etc.)
(d) the rules pertaining to smoking;
(e) the dangers relating to the fan;
(f) the dangers relating to the hot phase of the balloon inflation;
(g) the procedures to be followed for entering and exiting the basket;
(h) where the passengers are to position themselves in the basket;
(i) the procedures to be followed during landing (handholds, bracing, not to leave basket until directed to do so, etc.); and
(j) the procedures to be followed during the deflation of the balloon.

s603.23 to s603.24 Reserved

s603.25 External Carriage of Passengers

Standards to be developed as required.

s603.26 Leaving a Balloon in Flight

Standards to be developed as required.

s603.27 to s603.35 Reserved

Division III - Parachute Descents

s603.36 to s603.37 Reserved

s603.38 Issuance of a Special Flight Operations Certificate - Parachuting

(1) Application for Issuance of a Special Flight Operations Certificate

- (a) The following constitutes an application to conduct a parachute descent over or into a built-up area or an open-air assembly of persons:
  - (i) the name, address and where applicable, the telephone and facsimile numbers of the applicant;
  - (ii) the dates and times of the proposed parachute descents;
  - (iii) for information purposes, the make, model and registration of the parachute jump aircraft;

Information Note: *It is not the intent of these standards to prevent an applicant from making substitutions for proposed aircraft that are not available.*

  - (iv) declaration that the landowner(s) or tenants have granted permission for the proposed operation;
  - (v) declaration that the governing municipality has been informed of the proposed operation and has no objection;
  - (vi) the number of persons exiting the aircraft on each jump run;
  - (vii) the requested altitude of the parachute descent above sea level;
  - (viii) the location of the proposed parachute landing area;

Information Note: *This shall include the latitude/longitude, an accurate geographical description and where the parachute landing area is within a 20 nautical mile radius of a navigation aid, the bearing and distance from the navigation aid.*

  - (ix) a scale Figure of the area 1,000 feet [300 m] in all directions of the intended parachute landing area which shall include:
    - A. the type of terrain, ie. grass, asphalt;
    - B. the location of all hazards, obstructions, etc., and including height above the ground;
    - C. provisions for crowd control;
    - D. the location of the Parachute Landing Area Supervisor; and
    - E. the location and description of alternate landing sites;
  - (x) the name and qualifications of the Parachute Landing Area Supervisor;
  - (xi) the method by which the parachute landing area supervisor shall communicate with the jump aircraft; and
  - (xii) the names, addresses and telephone numbers of all parachutists participating in the descent, including proposed substitutes and evidence the parachutists meet the qualification requirements as outlined in paragraph (C) - Qualifications of Parachutists of these standards;

<u>Parachute Descents in or into Controlled Airspace or an Air Route</u>

This section contains the standards applicable to conducting parachute descents in or into controlled air space or an air route.

(1) Application for Issuance of a Special Flight Operations Certificate

Information Note: *It is not the intent or policy of the Director General of Civil Aviation Lebanon to prevent parachute descents in or into controlled airspace. Parachute operations can be carried out safely in airspace shared by others users (gliders, flight training, etc.) with proper coordination. The purpose of these standards is to ensure that adequate coordination with Air Traffic Services is carried out and that sufficient notice to other airspace users is given prior to the activity taking place.*

(a) The following constitutes an application to conduct a parachute descent in or into controlled air space or an air route:
  (i) the name, address and where applicable, the telephone and facsimile numbers of the applicant;
  (ii) the dates and times of the proposed parachute descents;
  (iii) for information purposes, the make, model and registration of the parachute jump aircraft;

Information Note: *It is not the intent of these standards to prevent an applicant from making substitutions for proposed aircraft that are not available.*

  (iv) the requested altitude(s) of the parachute descents, above sea level;
  (v) the location of the proposed parachute landing area;

Information Note: *This shall include the latitude/longitude, an accurate geographical description and where the parachute landing area is within a 20 nautical mile radius of a navigation aid, the bearing and distance from the navigation aid.*

  (vi) where the proposed parachute descents are to take place at an airport or aerodrome, declaration that the airport manager or aerodrome operator have been advised of the proposed parachute descents and have no objection;
  (vii) where the proposed parachute descents are to take place onto private property, declaration that the landowner or tenants have been advised of the proposed parachute descents and have no objection;
  (viii) the method by which the Parachute Landing Area Supervisor shall communicate with the jump aircraft.

(b) The application shall be received by the Director General of Civil Aviation Lebanon a minimum of 90 days prior to the date of the proposed parachute descent(s), or by a date mutually agreed upon between the applicant and the Director General of Civil Aviation Lebanon.

(2) Standards for the Conduct of Parachute Descents in or into Controlled Airspace or an Air Route

(a) No parachute descents shall be carried out unless authorized by the certificate holder or authorized by a person designated by the certificate holder;

(b) Prior to authorizing any parachute descents, the certificate holder shall ensure the pilot-in-command of the jump aircraft and all persons making a parachute descent:
  (i) have been made aware of the conditions of the certificate;
  (ii) have been made aware of their duties and responsibilities associated with the parachute descents; and
  (iii) are capable of carrying out any such duties and responsibilities;

(c) A wind drift indicator drop or procedure shall be conducted within one hour prior to the commencement of any parachute descents;

Information Note: *A wind drift indicator drop or procedure is required only where a parachute descent has not been conducted in the previous hour.*

(d) Parachute descents shall not be initiated without the permission of the pilot-in-command of the aircraft;
(e) Parachute descents shall not be initiated where any part of the descent, including the freefall will be through clouds;
(f) Parachute descents shall not be initiated where another aircraft in the area presents a hazard;
(g) The aircraft shall be a minimum of 500 feet [150 m] below and 2000 feet [600 m] horizontally from cloud with a minimum flight visibility of 5 miles when dropping parachutists;
(h) Parachute descents shall be initiated no lower than 2200 feet [670.56 m] above ground level and no higher than the maximum altitude established for the operation;

Information Note: *This information will be contained in the certificate.*

(i) Aircraft conducting parachute operations shall be equipped with a functioning two-way radio capable of communication with the air traffic control agency responsible for the airspace;

Information Note: *This information will be contained in the certificate.*

(j) The pilot-in-command of the aircraft shall comply with all Air Traffic Control procedures established for the operations;

Information Note: *This information will be contained in the certificate.*

(k) The parachute landing area shall be supervised by a Parachute Landing Area Supervisor who possesses a means of communicating with the pilot-in-command of the jump aircraft; and
(l) Where the intended parachute landing area is within 1 kilometer of open water, all parachutists shall wear a personal flotation device capable of supporting the parachutist and his or her equipment.

(3) Parachute Descents in or into Controlled Airspace or an Air Route at Night
(a) The parachute landing area shall be illuminated in a manner that enables the pilot-in-command of the aircraft to clearly identify the landing area from the maximum altitude established for the parachute descents;
(b) Parachute descents shall not be initiated unless the illuminated parachute landing area is clearly visible; and
(c) Each parachutist shall be equipped with a steady or flashing light visible through 360 degrees.

(4) Wind Limitations
Parachute descents shall not be initiated when wind speed measured at ground level at the intended parachute landing area is greater than:
(a) 15 mph. for student parachutists;
(b) 18 mph. for holders of a parachuting association Certificate of Proficiency (COP) levels A and B or equivalent level of experience from a contracting state;
(c) 25 mph. for holders of a parachuting association Certificate of Proficiency (COP) levels C, D or E equivalent level of experience from a contracting state;
or
(d) 10 mph. for parachute descents at night, for all levels of experience.

Parachute Descents over or into a Built-up Area or Open-air Assembly of Persons

This section contains the standards applicable to conducting parachute descents over or into a built-up area or open-air assembly of persons.

Parachuting

Information Note: *Parachuting when properly organized and conducted by qualified, experienced parachutists, can be an asset to an air show or other aviation event.*

Parachute descents, other than emergency descents, must be authorized in accordance with the provisions of Section 603.37 of the LARs. Where parachuting by other than military personnel is to be conducted at a special aviation event, application may be made by the sponsor on behalf of the parachutists.

Parachute descents at Lebanese Special Aviation Events shall be made in accordance with the standards applicable to Section 603.37 of the LARs; and

(1) Parachutists shall not exit the jump aircraft over any spectator or built-up area in a position that in the event of a parachute malfunction, the parachutist(s) or associated equipment would land within these areas.

(2) Once under a fully functioning parachute canopy, parachutists may glide and descend to an altitude of no lower than 100 feet [30 m] above spectator areas. This means 100 feet [30 m] from the lowest part of any equipment the parachutist is carrying (ie. flag or smoke canisters).

(3) Aircraft may "circle the jumpers" as part of the demonstration subject to the following:

- (a) the pilots of the jump aircraft and "circling aircraft" shall determine the procedures to be followed to ensure separation is maintained between the aircraft and the parachutists;
- (b) all pilots and parachutists participating have been briefed and understand the procedures to be followed;
- (c) the "circling aircraft" shall not begin circling the parachutists until such time as the pilot-in command has been notified that "all jumpers are away" and all canopies are open and he/she has all the canopies in sight;
- (d) two way radio communication is maintained between the aircraft involved in the demonstration, air traffic control personnel, and the landing zone supervisor/Director of Flight Operations until the demonstration is completed; and
- (e) the spectator safety distances contained in Section s603.07 of these standards are adhered to by the aircraft circling parachutists. The restrictions pertaining to "toward the crowd maneuvers" apply and flight over the crowd is prohibited.

(4) Standards for the Conduct of Parachute Descents over or into Built-up Areas or Open-air Assembly of Persons

- (a) Only those persons identified in the certificate shall conduct a parachute descent;
- (b) Prior to any parachute descents being conducted, the certificate holder shall ensure the pilot-in-command of the jump aircraft and all persons making a parachute descent:
  - (i) have been made aware of the conditions of the certificate;
  - (ii) have been made aware of their duties and responsibilities associated with the parachute descents; and
  - (iii) are capable of carrying out any such duties and responsibilities;
- (c) A wind drift indicator drop or procedure shall be conducted within 15 minutes prior to the parachutists exiting the aircraft;

(d) Parachute descents shall not be initiated without the permission of the pilot-in-command of the aircraft;
(e) Parachute descents shall not be initiated where any part of the descent, including the freefall will be through clouds;
(f) Parachute descents shall not be initiated where another aircraft in the area presents a hazard;
(g) The aircraft shall be a minimum of 500 feet [150 m] below and 2000 feet [600 m] horizontally from cloud with a minimum flight visibility of 5 miles when dropping parachutists;
(h) Parachute descents shall be initiated no lower than 2200 feet [670.56 m] above ground level and no higher than the maximum altitude established for the operation;

Information Note: *This information will be contained in the certificate.*

(i) Aircraft conducting parachute operations shall be equipped with a functioning two-way radio capable of communication with the air traffic control agency responsible for the airspace;

Information Note: *This information will be contained in the certificate.*

(j) The pilot-in-command of the aircraft shall comply with all Air Traffic Control procedures established for the operations;

Information Note: *This information will be contained in the certificate;*

(k) Where the intended parachute landing area is within 1 kilometer of open water, all parachutists shall wear a personal flotation device capable of supporting the parachutist and his or her equipment;
(l) Exit of parachutists over open-air assemblies of persons or in such a manner that in the event of a malfunction, a parachutist would land among an assembly of persons is prohibited; and
(m) Under a fully functioning parachute canopy, parachutists may descend to an altitude no lower than 100 feet [30 m] above an assembly of persons. This means 100 feet [30 m] from the lowest part of any equipment a parachutist is carrying. (i.e. flags or smoke canisters).

Qualifications of Parachutists

(a) Each parachutist conducting a parachute descent over or into a built-up area an open air assembly of persons shall be in the possession of one of the following:
   (i) a valid Canadian Sport Parachuting Association (CSPA) Exhibition Jump Rating (EJR);
   (ii) a valid United States Parachute Association (USPA) PRO Rating; or
   (iii) a valid equivalent rating issued by a parachute organization other than the CSPA or USPA, that meets the standards set by the CSPA and has been approved in writing by the Director General of Civil Aviation Lebanon.

Parachute Equipment

(a) For the purpose of this section, an approved parachute means a parachute manufactured to the standards applicable to the Federal Aviation Administration (FAA), Technical Standard Order (TSO) C23 series.
(b) Only parachute equipment that meets the following standards shall be used by parachutists conducting a parachute descent over or into a built-up area or over or into an open-air assembly of persons:
   (i) Each parachutist shall wear a single harness dual parachute pack, having at least one main parachute and one approved reserve parachute.

(ii) Both the main and reserve parachutes shall be "Ram-Air" type canopies.
(iii) The main canopy used by a parachutist shall be meet the performance characteristics and wing loading of the parachute on which he or she qualified for their CSPA Exhibition Jump Rating or USPA Pro Rating.

Parachute Packing Requirements

(a) For the purpose of this section a certificated parachute rigger means a person who holds a valid certificate issued by:
  (i) The Canadian Sport Parachuting Association; or
  (ii) The Federal Aviation Administration (FAA).
(b) Parachutes used to conduct a parachute descent over or into a built-up area or an open-air assembly of persons shall be packed as follows:
  (i) The main parachute canopy shall be packed by the person making the parachute descent, or a certificated parachute rigger, within 120 days prior to the date of the parachute descent; and
  (ii) The reserve parachute canopy shall be packed by a certificated and appropriately rated parachute rigger within 120 days of the parachute descent.

Parachute Landing Area

(a) The parachute landing area into which parachutists land when conducting a parachute descent over or into a built-up area or an open-air assembly persons shall:
  (i) for all wind directions be a level area, clear of obstacles with a minimum average radius of 25 meters (80 feet); (see Figure #1) or
  (ii) be a level rectangular area, clear of obstacles with minimum dimensions of 40 meters long and 25 meters wide where the longer side of the rectangle is positioned into wind; (see Figure #2) and
  (iii) be clear of any buildings or any other obstructions bordering the perimeter of the landing zone that lie in a plane of 45 degrees extending outwards from the center of the landing zone chosen which obstruct the planned final approach path to the landing zone; (see Figure #3)
  (iv) have adequate crowd control measures in place to ensure spectators do not enter the landing zone;
  (v) have a suitable alternate landing site, in the event of an undershoot or overshoot. The location of the alternate site must be identified on the Figure submitted with the application for the parachute descent; and
  (vi) be supervised by a parachutist that holds a CSPA Class "B" Certificate of Proficiency (CoP) or equivalent level of experience or by a person who has acted as a qualified judge in parachuting competitions and the supervisor possesses a means of communicating with the pilot-in-command of the jump aircraft.

Information Note: *Paragraph 1(e) of this section does not apply to parachute descents taking place at Special Aviation Events where the participants of the parachute descent and the aircraft are under the direct control of the Director of Flight Operations.*

(b) A parachute landing area into which parachutists land when conducting a parachute descent over or into a built-up area or an open-air assembly persons at night shall be illuminated in a manner that enables the pilot-in-command of the aircraft to clearly identify the landing area from the maximum altitude established for the parachute descents;
(c) Parachute descents at night shall not be initiated unless:

(i) the illuminated parachute landing area is clearly visible; and
(ii) each parachutist is equipped with a steady or flashing light visible through 360 degrees.

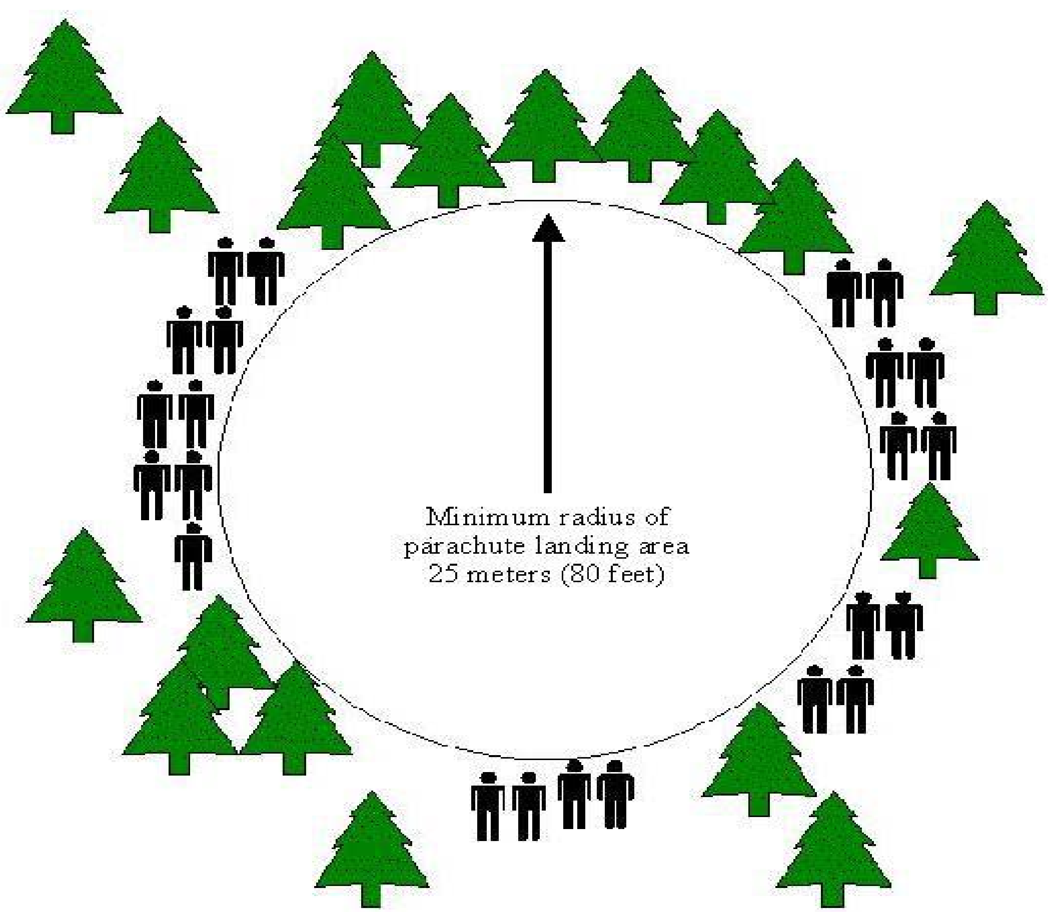
Wind Limitations

Parachute descents shall not be initiated in winds speeds measured at ground level at the intended parachute landing area above 18 MPH.

s603.39 to s603.64 Reserved

Figure # 1

Minimum Dimensions of a Parachute Landing Area For Unrestricted Wind Direction



The Parachute Landing Area indicated above may be used for parachute descents with the wind in any direction

Figure #2

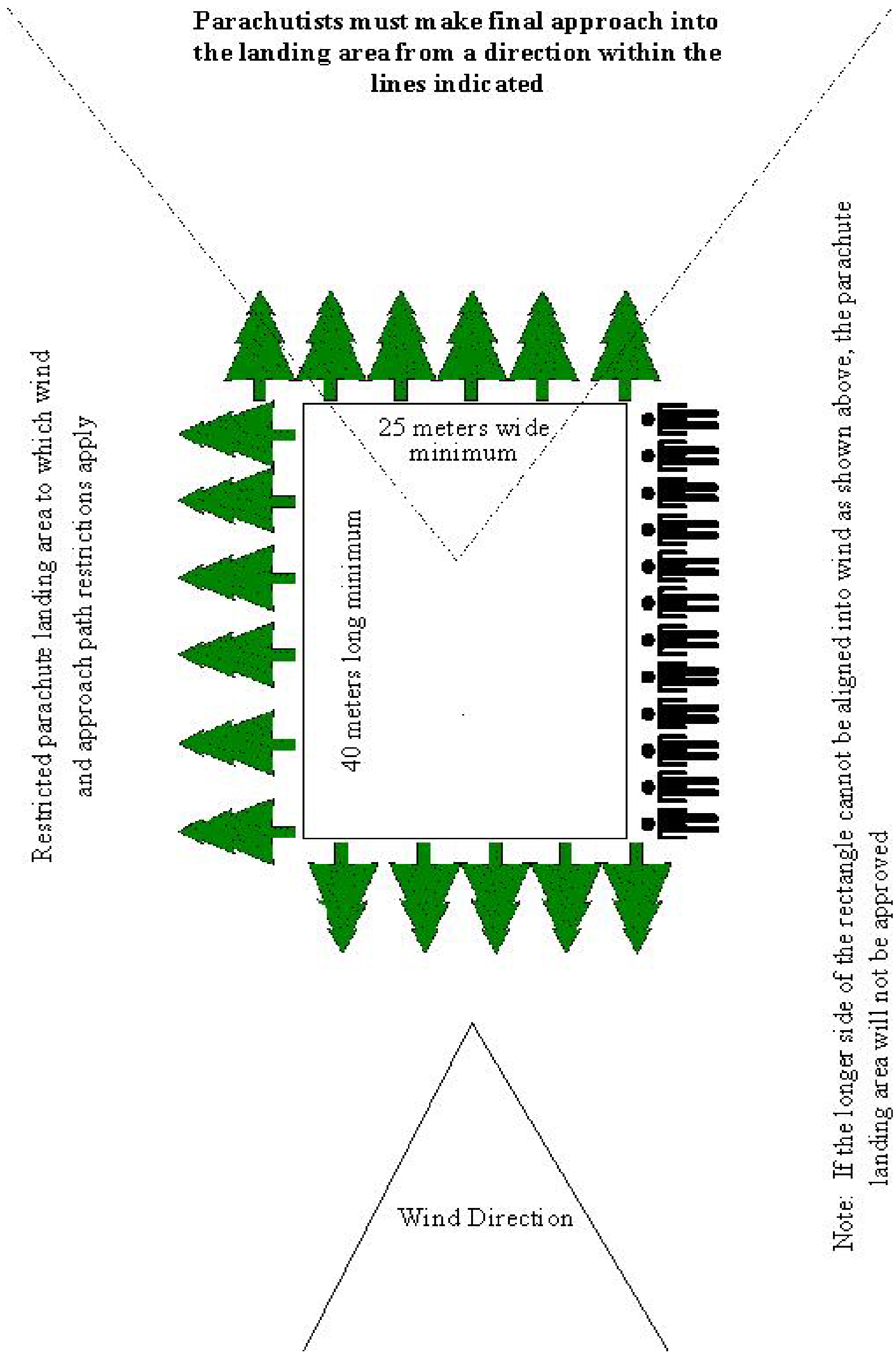
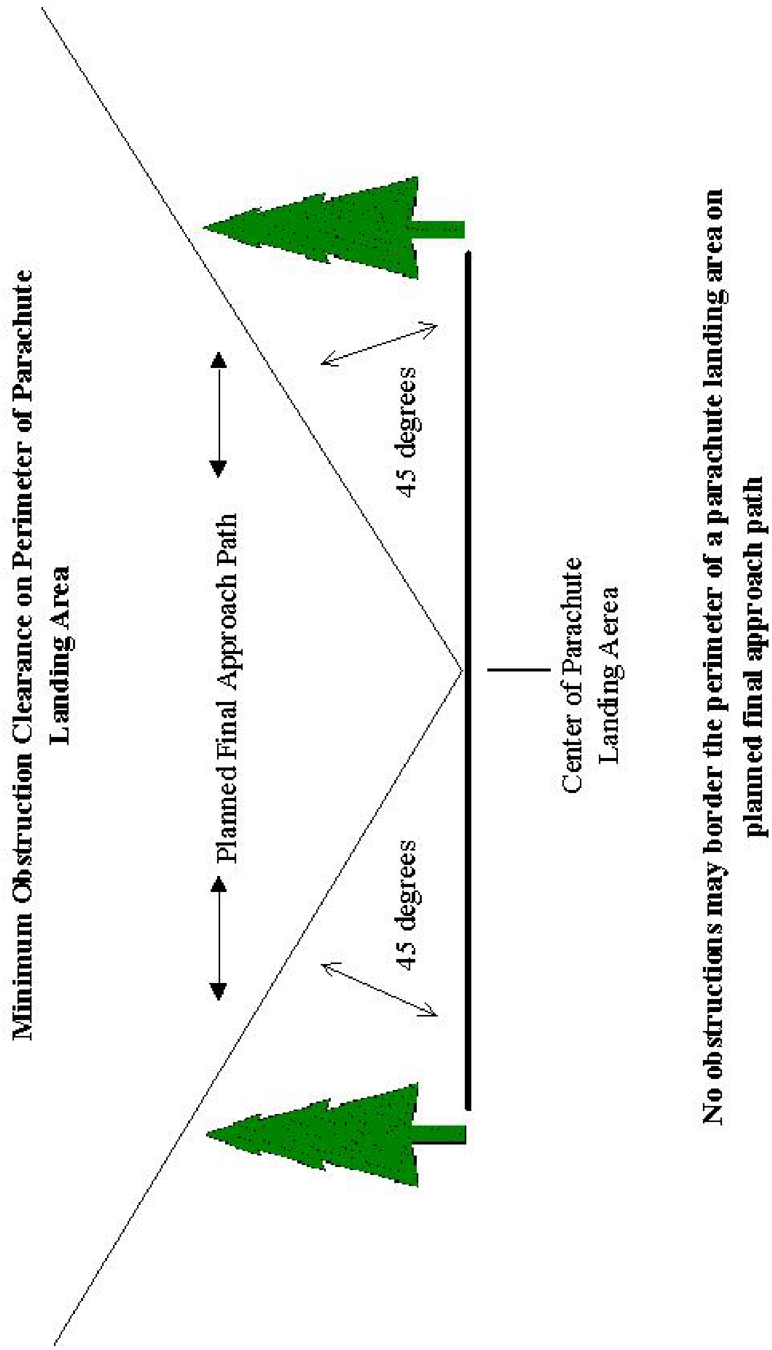

Parachutists must make final approach into the landing area from a direction within the lines indicated
Restricted parachute landing area to which wind and approach path restrictions apply
25 meters wide minimum
40 meters long minimum
Note: If the longer side of the rectangle cannot be aligned into wind as shown above, the parachute landing area will not be approved
Wind Direction

Figure #3


Minimum Obstruction Clearance on Perimeter of Parachute Landing Area
Planned Final Approach Path
45 degrees
45 degrees
Center of Parachute Landing Aerea
No obstructions may border the perimeter of a parachute landing area on planned final approach path

Division IV - Miscellaneous Special Flight Operations

s603.65 Application

Take-offs, Approaches and Landings Within Built-up Areas
(s603.65(a))

The following standards apply to the application for and the conduct of a flight operation in accordance with Subsection 602.13(1) of the LARs:

(1) An application for a Special Flight Operations Certificate for the purpose of take-offs, approaches or landings within the built-up areas of cities or towns in accordance with Subsection 602.13(1) of the LARs shall be received by the Director General of Civil Aviation Lebanon at least 90 days prior to the date of the proposed operation, or by a date mutually agreed upon between the applicant and the Director General of Civil Aviation Lebanon.
(2) The following constitutes an application for a Special Flight Operations Certificate for the purpose of take-offs, approaches or landings within the built-up areas of cities or towns in accordance with Subsection 602.13(1) of the LARs:
- (a) the name, address, and where applicable, the telephone number and facsimile number of applicant;
- (b) the location of the area to be used for take-off or landing;
- (c) the dates, alternate dates and times of the proposed operation;
- (d) a clear, legible presentation of the area to be used for the take-off or landing. This presentation may be in the form of a scale Figure, aerial photograph or large scale topographical chart and must include at least the following information:
  - (i) the location and size of the area to be used for the take-off or landing;
  - (ii) the location and height above ground of all obstacles in the approach and departure path to the site;
  - (iii) the position and type of security control (eg. fences) to be used to ensure the area will be kept clear of persons during any take-offs or landings;
  - (iv) the location of any refueling area;
  - (v) the location and type of wind indicator;
  - (vi) the altitudes and routes to be used on approach and departure to and from the site;
- (e) the purpose of the operation;
- (f) the type(s) and registration(s) of all aircraft using the site;
- (g) certification that the landowner has granted his or her permission for the proposed operation;
- (h) certification that the governing municipality has been informed of the proposed operation and has no objection;
- (i) the procedures and precautions to be taken to ensure no hazard is created to persons or property on the surface;
- (j) the name, address, and where applicable, the telephone and facsimile numbers of the person designated to be responsible for supervision of the site (Ground Supervisor) during the operation; and
- (k) the method by which the Ground Supervisor shall communicate with the pilot-in-command of aircraft using the site.

Take-off and Landing Areas

The following standards apply to areas to be used for take-offs and landings in built-up areas of cities or towns:

(1) For aircraft other than balloons and helicopters, the applicant shall submit documentation that the site chosen is suitable for the proposed aircraft type.
(2) For helicopters, the take-off/landing area shall meet the following standards:
- (a) the take-off/landing area shall be a minimum of 1.5 times the overall length of the largest helicopter proposed to use the site;
- (b) the touchdown area shall be clearly marked;
- (c) except for helicopter operations taking place at a Lebanese Special Aviation Event, a safety area of a minimum of 200 feet [60 m] around the take-off/landing area shall be maintained clear of obstacles and persons not required for the operation;
- (d) in areas where an assembly of persons congregate to observe the operation, the safety area shall be fenced and sufficient trained ground personnel shall be present to ensure security of the area;
- (e) for helicopter operations at a Lebanese Special Aviation Event, the operation is conducted in accordance with the standards contained in Section s603.07 of these standards - Division I, Special Aviation Events of these Standards.

(3) Approach and departure paths to the take-off/landing areas shall be in accordance with the standards published for normal airport certification.

Minimum Altitudes and Distances
s603.65(b) and (c)

(1) The following standards apply to the application for and the operation of an aircraft for the purpose of conducting aerial application, aerial inspection, aerial photography or helicopter class B, C, or D external load operations at altitudes and distances less than those set out in Subsections 602.14(2)(a) and (16)(2) of the LARs.
(2) An application shall be received by the Director General of Civil Aviation Lebanon, at least 90 days prior to the date of the proposed operation, or by a date mutually agreed upon between the applicant and the Director General of Civil Aviation Lebanon.
(3) The following constitutes an application for a Special Flight Operations Certificate for the purpose of operations in paragraph (1) above:
- (a) the name, address, and where applicable, the telephone number and facsimile number of the applicant;
- (b) the name, address, and where applicable the telephone number and facsimile number of the person designated by the applicant to have operational control over the operation (Operation Manager);
- (c) method by which the Operation Manager may be contacted directly during operation by those involved in the operation;
- (d) the type and purpose of the operation;
- (e) the dates, alternate dates and times of the proposed operation;
- (f) certification that the landowner(s) has/have granted their permission for the proposed operation;
- (g) certification that the governing municipality has been informed of the proposed operation and has no objection;
- (h) the type(s) and registration(s) of all aircraft involved in the operation;
- (i) the names and pilot license numbers of all the pilots involved in the operation;
- (j) for proposed pilots that hold licenses not issued by the Minister, copies of their licenses and medical certificates;
- (k) the security plan for the area(s) of operation and security plan for the area(s) to be overflown to ensure no hazard is created to persons or property on the surface;
- (l) the emergency contingency plan to deal with any disaster resulting from the operation;

(m) the name, address, and where applicable the telephone and facsimile numbers of the person designated to be responsible for supervision of the operation area (Ground Supervisor), if different from the Operation Manager during the operation;
(n) the method by which the Ground Supervisor shall communicate with the pilot-in-command of aircraft participating in the operation;
(o) a clear, legible presentation of the area to be used during the operation. The presentation may be in the form of a scale Figure, aerial photograph or large scale topographical chart and must include at least the following information:
   (i) the altitudes and routes to be used on the approach and departure to and from the area where the operation will be carried out;
   (ii) the location and height above ground of all obstacles in the approach and departure path to the areas where the operation will be carried out;
   (iii) the exact boundaries of the area where the actual operation will be carried out;
   (iv) the altitudes and routes to be used while carrying out the operation; and
(p) any other information required by the Minister to ensure the operation may be carried out in a safe manner.

<u>Non-piloted Aircraft</u>
s603.65(d)

(1) The following standards apply to the application for and the operation of an unmanned airplane, rotorcraft or airship pursuant to Section 602.41 of the LARs.
(2) An application for a Special Flight Operations Certificate for the purpose of conducting the flight of an unmanned aircraft other than an unmanned free balloon or a model aircraft shall be received by the Director General of Civil Aviation Lebanon, at least 90 working days prior to the date of the proposed operation or by a date mutually agreed upon between the applicant and the Director General of Civil Aviation Lebanon.
(3) The following constitutes an application for a Special Flight Operations Certificate for the purpose of operations in paragraph (1) above:
(a) the name, address, and where applicable, the telephone number and facsimile number of the applicant;
(b) the name, address, and where applicable the telephone number and facsimile number of the person designated by the applicant to have operational control over the operation (Operation Manager);
(c) method by which the Operation Manager may be contacted directly during operation;
(d) the type and purpose of the operation;
(e) the dates, alternate dates and times of the proposed operation;
(f) a complete description, including all pertinent flight data on the aircraft to be flown;
(g) the security plan for the area(s) of operation and security plan for the area(s) to be overflown to ensure no hazard is created to persons or property on the surface;
(h) the emergency contingency plan to deal with any disaster resulting from the operation;
(i) the name, address, telephone and facsimile numbers of the person designated to be responsible for supervision of the operation area (Ground Supervisor), if different from the Operation Manager during the operation;
(j) a detailed plan describing how the operation shall be carried out. The plan shall include a clear, legible presentation of the area to be used during the operation. The presentation may be in the form of a scale Figure, aerial photograph or large scale topographical chart and must include at least the following information:
   (i) the altitudes and routes to be used on the approach and departure to and from the area where the operation will be carried out;
   (ii) the location and height above ground of all obstacles in the approach and departure path to the areas where the operation will be carried out;

(iii) the exact boundaries of the area where the actual operation will be carried out;
(iv) the altitudes and routes to be used while carrying out the operation;
(k) any other information pertinent to the safe conduct of the operation requested by the Minister.

<u>Entering or Leaving an Aircraft in Flight</u>
s603.65(e)

(1) The following standards apply to the application for and the operation of aircraft pursuant to Subsection 602.25(b) of the LARs.
(2) An application for a Special Flight Operations Certificate for the purpose of operating a powered aircraft while persons enter, or except for parachute descents, leave powered aircraft in flight shall be received by the Director General of Civil Aviation Lebanon, at least 90 days prior to the date of the proposed operation or by a date mutually agreed upon between the applicant and the Director General of Civil Aviation Lebanon.
(3) The following constitutes an application for a Special Flight Operations Certificate for the purpose of operations in paragraph (2) above:
(a) the name, address, and where applicable, the telephone number and facsimile number of the applicant;
(b) the name, address, and where applicable the telephone number and facsimile number of the person designated by the applicant to have operational control over the operation (Operation Manager);
(c) method by which the Operation Manager may be contacted directly while the operation is taking place;
(d) a description and purpose of the operation;
(e) the dates, alternate dates and times of the proposed operation;
(f) certification that the governing municipality has been informed of the proposed operation and has no objection;
(g) the type(s) and registration(s) of all aircraft involved in the operation;
(h) the names and pilot license numbers of all the pilots involved in the operation;
(i) for proposed pilots that hold licenses not issued by the Minister, copies of their licenses and medical certifications;
(j) the security plan for the area(s) of operation and security plan for the area(s) to be overflown to ensure no hazard is created to persons or property on the surface;
(k) a detailed plan describing how the operation will be carried out including a clear, legible presentation of the area to be used during the operation. The presentation may be in the form of a scale Figure, aerial photograph or large scale topographical chart and must include a minimum of the following information:
(i) the altitudes and routes to be used on the approach and departure to and from the area(s) where the operation will be carried out;
(ii) the location and height above ground of all obstacles in the approach and departure path to the area(s) where the operation will be carried out;
(iii) the exact boundaries of the area(s) where the actual operation will be carried out;
(iv) the altitudes and routes to be used while carrying out the operation;
(l) any other information pertinent to the safe conduct of the operation requested by the Minister.

<u>The Operation of an Aircraft while Conducting Aerobatic Maneuvers in or into Controlled Airspace or an Air Route</u>
s603.65(f)(i)

(1) The following standards apply to the application for and the operation of an aircraft while conducting aerobatic maneuvers in or into controlled airspace or an air route pursuant to Subsection 602.27(b) of the LARS.

(2) An application for a Special Flight Operations Certificate for the purpose of conducting aerobatic maneuvers in or into controlled airspace or an air route shall be received by the Director General of Civil Aviation Lebanon, at least 90 days prior to the date of the proposed operation, or by a date mutually agreed upon between the applicant and the Director General of Civil Aviation Lebanon.
(3) The following constitutes an application for a Special Flight Operations Certificate for the purpose of operations in paragraph (1) above:

- (a) the name, address, and where applicable, the telephone number and facsimile number of the applicant;
- (b) the location and dimensions of the airspace requested; and
- (c) the dates and times the use of the airspace is requested.

The Operation of an Aircraft while Conducting Aerobatic Maneuvers Below 2000 feet AGL
s603.65(f)(ii)

(1) The following standards apply to the application for and the operation of an aircraft while conducting aerobatic maneuvers below 2000 feet [600 m] AGL pursuant to Subsection 602.27(d) of the LARs.

Information Note: *These requirements do not apply to persons authorized to conduct aerobatic maneuvers in a Special Aviation Event pursuant to Section 603.02 of the LARs.*

(2) An application for a Special Flight Operations Certificate for the purpose of conducting aerobatic maneuvers below 2000 feet [600 m] AGL shall be received by the Director General of Civil Aviation Lebanon, at least 90 days prior to the date of the proposed operation, or by a date mutually agreed upon between the applicant and the Director General of Civil Aviation Lebanon.
(3) The following constitutes an application for a Special Flight Operations Certificate for the purpose of operations in paragraph (1) above:

- (a) the name, address, and where applicable, the telephone number and facsimile number of the applicant;
- (b) the location and dimensions of the airspace requested;
- (c) the dates and times the use of the airspace is requested;
- (d) where the operation is to take place at an airport or aerodrome, evidence that the airport manager or aerodrome operator has been made aware of the proposed operation and has no objection; or
- (e) where the operation is to take place over private property, evidence that the landowners have been made aware of the proposed operation and have no objection.

Information Note: *Applicants must be cognizant of the Ministerial Public Interest responsibilities pertaining to noise in selecting a site to carry out low level aerobatics. Sites that are located in the vicinity of noise sensitive areas such as residential areas, livestock areas, etc. may not be authorized. The onus is on the applicant to provide adequate information with the application for this determination to be reached.*

s603.66 to s603.75 Reserved

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REPUBLIC OF LEBANON
MINISTRY OF TRANSPORT
DIRECTORATE GENERAL OF CIVIL AVIATION

LARs

LEBANESE AVIATION REGULATIONS

Part VI
General Operating and Flight Rules

Subpart 4
Private Operator Passenger Transportation

***** Revision No. 1 *****
International Civil Aviation Organization
Richard B. Fauquier

LEBANESE AVIATION REGULATIONS (LARs)

Part VI – General Operating and Flight Rules

Subpart 4 - Private Operator Passenger Transportation

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Division I - General

604.01 Application

This Subpart applies in respect of the operation of a Lebanese aircraft that is used for the transport of passengers, where the aircraft

(a) is a turbine-powered pressurized airplane or a large airplane; and
(b) is not required to be operated under Subpart 6 of Part IV or under Part VII of the LARs.

604.02 Aircraft Operation

No person shall operate an aircraft under this Subpart unless the person complies with the conditions and specifications in

(a) a private operator certificate issued to that person by the Minister pursuant to Section 604.05 of the LARs; or
(b) an air operator certificate issued to that person by the Minister pursuant to Part VII of the LARs.

604.03 and 604.04 Reserved

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Division II - Certification

604.05 Issuance or Amendment of Private Operator Certificate

(1) Subject to the Act, the Minister shall, on receipt of an application submitted in the form and manner required by the Private Operator Passenger Transportation Standards, issue or amend a private operator certificate where the applicant demonstrates to the Minister the ability to
- (a) meet training program requirements;
- (b) comply with maintenance requirements;
- (c) meet the Private Operator Passenger Transportation Standards for the operation; and
- (d) conduct the operation safely.

(2) For the purposes of Subsection (1), an applicant shall have
- (a) aircraft that are properly equipped for and crew members who are qualified for the proposed operation;
- (b) managerial personnel who meet the Private Operator Passenger Transportation Standards and perform the functions related to the following positions, namely,
  - (i) director of operations,
  - (ii) chief pilot, and
  - (iii) director of maintenance
    - A. the person responsible for the maintenance control system;
- (c) a maintenance control system that meets the requirements of Division VI;
- (d) a training program that meets the requirements of Section 604.73 of the LARs; and
- (e) an operations manual that meets the requirements of Sections 604.80 and 604.81 of the LARs.

604.06 Contents of a Private Operator Certificate

A private operator certificate shall contain
- (a) the name and address of the private operator;
- (b) the number of the private operator certificate;
- (c) the effective date of certification;
- (d) the date of issue of the certificate;
- (e) the types of aircraft authorized;
- (f) the general conditions identified in Section 604.07 of the LARs;
- (g) specific conditions; and
- (h) where the private operator complies with the Private Operator Passenger Transportation Standards, operations specifications and maintenance specifications with respect to
  - (i) special weather minima authorizations,
  - (ii) crew member complement authorizations,
  - (iii) navigation system authorizations,
  - (iv) pilot training and pilot proficiency checks,
  - (v) maintenance control procedures, and
  - (vi) any other condition pertaining to the operation that the Minister deems necessary for aviation safety.

604.07 General Conditions of a Private Operator Certificate

A private operator certificate shall contain the following general conditions:
- (a) the private operator shall conduct flight operations in accordance with its operations manual;
- (b) the private operator shall conduct training in accordance with its training program;
- (c) the private operator shall maintain aircraft that are properly equipped for and crew members who are qualified for the type of operation;

(d) the private operator shall maintain its aircraft in accordance with the requirements of Part 5 of the LARs; and
(e) the private operator shall conduct a safe operation.

604.08 Operations Specifications

(1) No person may engage in operations governed by this part unless that person holds Operations Specifications that comply with Part VI, Subpart 2, Section 602.167.
(2) No person is eligible for Operations Specifications under this part if the person holds Operations Specifications necessary to conduct operations under Part VII of the LARs.

604.09 Reserved

Division III - Flight Operations

604.10 Checklist

(1) Every private operator shall establish the checklist referred to in Subsection 602.60(1)(a) of the LARs for each aircraft type that it operates and shall make the appropriate parts of the checklist readily available to the crew members.
(2) Every crew member shall follow the checklist referred to in Subsection (1) in the performance of the crew member's assigned duties.

604.11 Operational Flight Data Sheet

(1) No private operator shall permit a person to commence a flight unless an operational flight data sheet that meets the Private Operator Passenger Transportation Standards has been completed in accordance with the procedures specified in the private operator's operations manual.
(2) A private operator shall retain a copy of the operational flight data sheet, including any amendments to that flight data sheet, for at least 180 days.

604.12 VFR Flight Minimum Flight Visibility - Uncontrolled Airspace

Where an airplane is operated in day VFR flight within uncontrolled airspace at less than 1,000 feet AGL, a person may, for the purposes of Subsection 602.115(c)(i) of the LARs, operate the aircraft when flight visibility is less than two miles if the person

(a) is authorized to do so in a private operator certificate; and
(b) complies with the Private Operator Passenger Transportation Standards.

604.13 No Alternate Aerodrome - IFR Flight

For the purposes of Section 602.122 of the LARs, a person may conduct an IFR flight where an alternate aerodrome has not been designated in the IFR flight plan or in the IFR flight itinerary, if the person

(a) is authorized to do so in a private operator certificate; and
(b) complies with the Private Operator Passenger Transportation Standards.

604.14 Take-off Minima

For the purposes of Section 602.126 of the LARs, a person may conduct a take-off in an aircraft in IMC where weather conditions are below the take-off minima specified in the instrument approach procedure, if the person

(a) is authorized to do so in a private operator certificate; and
(b) complies with the Private Operator Passenger Transportation Standards.

604.15 Instrument Approach Procedures

No person shall conduct a CAT II or CAT III instrument approach unless

(a) the private operator is authorized to do so in its private operator certificate; and
(b) the approach is conducted in accordance with the Private Operator Passenger Transportation Standards.

604.16 Cabin Attendant Requirement

(1) Subject to Subsection (2), no private operator shall operate an aircraft with more than 12 passengers on board unless the crew includes at least one cabin attendant for each unit of 30 passengers or portion thereof.
(2) Unless otherwise specified in the aircraft flight manual, a cabin attendant is not required on board an aircraft with fewer than 20 passengers on board if
  (a) the aircraft is equipped with a pilot-in-command station and a second-in-command station and is operated by a pilot-in-command and a second-in-command;
  (b) the passenger cabin is easily accessible from the flight deck; and
  (c) the flight crew can exercise supervisory control over the passengers during flight by visual and aural means.

604.17 Cabin Safety Procedures

(1) A private operator shall establish procedures to ensure that
  (a) all passengers are seated and secured in accordance with Section 605.26;
  (b) subject to Subsection (2), the back of each seat is in the upright position and all chair tables are stowed during movement on the surface, take-off and landing and at such other times as the pilot-in-command considers necessary for the safety of the persons on board the aircraft; and
  (c) seats located at emergency exits are not occupied by passengers whose presence in those seats could adversely affect the safety of passengers or crew members during an emergency evacuation.
(2) A private operator may, for the transportation of any passenger who has been certified by a physician as unable to sit upright, allow the back of the seat occupied by such a passenger to remain in the reclining position during movement on the surface, take-off and landing if
  (a) the passenger is seated in a location that will not restrict the evacuation of other passengers from the aircraft;
  (b) the passenger is not seated in a row that is next to or immediately in front of an emergency exit; and
  (c) the seat immediately behind the passenger's seat is vacant.
(3) No private operator shall permit an aircraft with passengers on board to be fuelled unless the fuelling is carried out in accordance with procedures that meet the Private Operator Passenger Transportation Standards and that are specified in the private operator's operations manual.

604.18 Briefing of Passengers

(1) The pilot-in-command shall ensure that passengers are given a safety briefing in accordance with the Private Operator Passenger Transportation Standards.
(2) Where the safety briefing referred to in Subsection (1) is insufficient for a passenger because of that passenger's physical, sensory or comprehension limitations or because that passenger is responsible for another person on board the aircraft, the pilot-in-command shall ensure that the passenger is given an individual safety briefing that
  (a) is appropriate to the passenger's needs; and
  (b) meets the Private Operator Passenger Transportation Standards.
(3) The pilot-in-command shall ensure that, in the event of an emergency and where time and circumstances permit, all passengers are given an emergency briefing in accordance with the Private Operator Passenger Transportation Standards.
(4) The pilot-in-command shall ensure that each passenger who is seated next to an emergency exit is made aware of how to operate that exit.

604.19 Safety Features Card

A private operator shall provide each passenger, at the passenger's seat, with a safety features card containing, in printed or pictographic form, the information required by the Private Operator Passenger Transportation Standards.

604.20 to 604.25 Reserved

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Division IV - Flight Time and Flight Duty Time Limitations and Rest Periods

604.26 Flight Time Limitations

No private operator shall assign a flight crew member for flight time, and no flight crew member shall accept such an assignment, if the flight crew member s total flight time in all flights conducted under Part IV, this Subpart or Part VII of the LARs will, as a result, exceed

- (a) 1,200 hours in any 12 consecutive months;
- (b) 300 hours in any 90 consecutive days;
- (c) 120 hours in any 30 consecutive days; or
- (d) where the flight crew member conducts single-pilot IFR flights, 8 hours in any 24 consecutive hours.

604.27 Flight Duty Time Limitations and Rest Periods

(1) Subject to Sections 604.28 to 604.30 of the LARs, no private operator shall assign a flight crew member for flight duty time, and no flight crew member shall accept such an assignment, if the flight crew member s flight duty time will, as a result, exceed

- (a) 14 consecutive hours in any 24 consecutive hours; or
- (b) 15 consecutive hours in any 24 consecutive hours, where
  - (i) the flight crew member's total flight time in the previous 30 consecutive days does not exceed 70 hours, or
  - (ii) the rest period prior to the flight is at least 24 hours.

(2) A private operator shall ensure that, prior to any flight duty period, a flight crew member is provided with the minimum rest period plus any additional rest period required by this Division.

(3) A flight crew member shall use the rest periods referred to in Subsection (2) to obtain the necessary rest and shall be adequately rested prior to reporting for flight duty.

604.28 Split Flight Duty Time

(1) Where flight duty time includes a rest period, flight duty time may be extended beyond the maximum flight duty time referred to in Subsection 604.27(1) of the LARs by one-half the length of the rest period, to a maximum of 4 hours, if

- (a) the private operator provides the flight crew member with advance notice of the extension of flight duty time; and
- (b) the private operator provides the flight crew member with a rest period of at least 4 consecutive hours in suitable accommodation.

(2) The minimum rest period following flight duty time referred to in Subsection (1) shall be increased by an amount at least equal to the extension to the flight duty time.

604.29 Extension of Flight Duty Time

Flight duty time may be extended beyond the maximum flight duty time referred to in Subsection 604.27(1) of the LARs if

- (a) the extension of flight duty time is authorized in the private operator certificate; and
- (b) the private operator and the flight crew member comply with the Private Operator Passenger Transportation Standards.

604.30 Unforeseen Operational Circumstances

Flight duty time may be extended beyond the maximum flight duty times referred to in Subsections 604.27(1) and 604.28(1) of the LARs if

(a) the pilot-in-command, after consultation with the other flight crew members, considers it safe to do so;
(b) the flight duty time is extended as a result of unforeseen operational circumstances; and
(c) the private operator and the pilot-in-command comply with the Private Operator Passenger Transportation Standards.

604.31 Delayed Reporting Time

Where a flight crew member is notified of a delay in reporting time within the two hours preceding that reporting time and the delay is in excess of three hours, the flight crew member's flight duty time starts three hours after the original reporting time.

604.32 Requirements for Time Free from Duty

A private operator shall provide each flight crew member with the following time free from duty:

(a) at least one period of 36 consecutive hours within each 7 consecutive days; or
(b) at least one period of 3 consecutive calendar days within each 17 consecutive days.

604.33 Flight Crew Positioning

Where a flight crew member is required by a private operator to travel for the purpose of positioning after the completion of flight duty time, the private operator shall provide the flight crew member with an additional rest period at least equal to one-half the time spent travelling that is in excess of the flight crew member's maximum flight duty time.

604.34 to 604.37 Reserved

Division V - Emergency Equipment

604.38 Survival Equipment

No person shall conduct a take-off in an aircraft unless the survival equipment required by Subsection 602.61(1) and 602.63(6)(c) of the LARs meets the Private Operator Passenger Transportation Standards.

604.39 First Aid Kits

(1) No person shall conduct a take-off in an aircraft unless the following number of first aid kits are carried on board the aircraft and, in the case of an aircraft that is configured for 20 or more passengers, unless each kit meets the Private Operator Passenger Transportation Standards:
- (a) 0 to 50 passenger seats, one kit;
- (b) 51 to 150 passenger seats, two kits;
- (c) 151 to 250 passenger seats, three kits; and
- (d) 251 or more passenger seats, four kits.

(2) First aid kits shall be
- (a) distributed throughout the aircraft cabin;
- (b) readily available to crew members and passengers;
- (c) clearly identified and, when located in a stowage compartment, the compartment shall be clearly marked as to its contents; and
- (d) marked with the date of the last inspection.

604.40 Protective Breathing Equipment

(1) No private operator shall operate a pressurized aircraft with cabin attendants on board unless, at each station listed in Subsection (3), protective breathing equipment with a 15-minute supply of breathing gas at a pressure-altitude of 8,000 feet is provided in accordance with this Section.
(2) The protective breathing equipment referred to in Subsection (1) may be used to meet the crew member oxygen requirements specified in Section 605.31 of the LARs.
(3) Protective breathing equipment shall be conveniently located and readily available with a portable breathing gas supply for use by the crew members in combating fires, as follows:
- (a) one unit for use in each Class A, B and E cargo compartment that is accessible to crew members in the cabin during flight;
- (b) one unit for each hand-held fire extinguisher located in each isolated galley;
- (c) one unit on the flight deck; and
- (d) one unit located within one meter of each hand-held fire extinguisher required in the passenger compartment by Section 604.41 of the LARs, except if the Minister has authorized the location of protective breathing equipment more than one meter from each hand-held fire extinguisher where special circumstances exist that make compliance with this Subsection impractical and that location provides an equivalent level of safety.

604.41 Hand-held Fire Extinguishers

(1) No person shall conduct a take-off in an aircraft unless hand-held fire extinguishers for use in the passenger compartment and, where applicable, cargo compartment are carried on board.
(2) The type and quantity of extinguishing agent shall be suitable for extinguishing fires that are likely to occur in the passenger compartment or cargo compartment where the extinguisher is intended to be used and, in the case of the extinguishing agent for extinguishers intended to be used in the passenger compartment, shall be designed to minimize the hazard of toxic gas concentrations.

(3) At least one hand-held fire extinguisher shall be conveniently located and readily available for use in each class E cargo compartment that is accessible to crew members during flight, and at least one hand-held fire extinguisher shall be located in each isolated galley.
(4) The following number of hand-held fire extinguishers shall be conveniently located and uniformly distributed throughout the passenger compartment:

(a) 19 or fewer passenger seats, one extinguisher;
(b) 20 to 60 passenger seats, two extinguishers;
(c) 61 to 200 passenger seats, three extinguishers; and
(d) 201 or more passenger seats, one extra extinguisher for each additional unit of 100 passenger seats.

(5) At least one hand-held fire extinguisher shall contain Halon 1211 (bromochlorodifluoromethane) or its equivalent.
(6) A stowage compartment or stowage container that contains a hand-held fire extinguisher shall be clearly marked as to its contents.

604.42 to 604.47 Reserved

Division VI - Maintenance

604.48 Maintenance Control System

(1) Subject to Subsection (2), no private operator shall operate an aircraft unless the aircraft is maintained in accordance with a maintenance control system that meets

- (a) the requirements of this Division; and
- (b) the requirements specified in the Private Operator Passenger Transportation Standards.

(2) A private operator may deviate from the procedures required by its maintenance control system where

- (a) the private operator demonstrates to the Minister that the deviation will not affect the safety of the product or service; and
- (b) the deviation has been authorized in writing by the Minister.

604.49 Description of Maintenance Control System in Operations Manual

Every private operator shall describe its maintenance control system in its operations manual in accordance with the Private Operator Passenger Transportation Standards.

604.50 Person Responsible for Maintenance Control System

(1) Every private operator shall

- (a) appoint a person to be responsible for its maintenance control system; and
- (b) authorize the person who is responsible for its maintenance control system to remove aircraft from operation, where the removal is justified because of non-compliance with the requirements of these Regulations or because of a risk to the safety of the aircraft, persons or property.

(2) Where a private operator is the holder of an approved maintenance organization (AMO) certificate that is appropriate to the aircraft being operated, the person appointed pursuant to Subsection (1)(a) shall be the person responsible for the maintenance control system of the AMO, appointed pursuant to Subpart 545 of the LARs.

604.51 Maintenance Personnel and Facilities

(1) Every private operator shall provide the person who is responsible for its maintenance control system with the staff and facilities necessary to meet the requirements specified in the Private Operator Passenger Transportation Standards.

(2) The person who is responsible for a maintenance control system may assign to another person management functions for specific maintenance control activities if the assignment and the assigned functions

- (a) are described in the part of the operations manual that describes the maintenance control system; and
- (b) meet the Private Operator Passenger Transportation Standards.

604.52 Defect Reporting and Rectification Control Procedures

Every private operator shall include in the part of its operations manual that describes its maintenance control system defect reporting and rectification control procedures that meet the Private Operator Passenger Transportation Standards for

- (a) recording aircraft defects;
- (b) ensuring that defects are rectified in accordance with the requirements of these Regulations;

(c) detecting defects that recur and identifying those defects as recurring defects; and
(d) scheduling the rectification of defects whose repair has been deferred pursuant to Sections 605.09 and 605.10 of the LARs.

604.53 Service Difficulty Reporting

Every private operator shall report to the Minister any service difficulties related to the aircraft that it operates, in accordance with the requirements specified in Subpart 585 of the LARs.

604.54 Technical Dispatch Instructions

Every private operator shall include in the part of its operations manual that describes its maintenance control system technical dispatch instructions that
(a) ensure that aircraft are
  (i) airworthy,
  (ii) appropriately equipped, configured and maintained for the intended use, and
  (iii) maintained in accordance with the operations manual; and
(b) meet the Private Operator Passenger Transportation Standards.

604.55 Service Information Review

Every private operator shall establish procedures to ensure that aircraft service information is assessed and that action is taken in accordance with the Private Operator Passenger Transportation Standards.

604.56 Maintenance Agreements

(1) No private operator shall permit a person to perform maintenance on an aircraft unless the person is an employee of the private operator or has been authorized to perform the work under the terms of a written maintenance agreement.
(2) Every maintenance agreement referred to in Subsection (1) shall specify the maintenance required and clearly define the tasks to be performed and the conditions under which they must be performed.
(3) A private operator is responsible for defining the tasks to be performed by any external agent and for ensuring the completion of those tasks.

604.57 Maintenance Training

No private operator shall authorize a person to perform or request the performance of maintenance, elementary work or servicing unless the person has satisfactorily completed maintenance training that meets the Private Operator Passenger Transportation Standards.

604.58 to 604.64 Reserved

Division VII - Personnel Requirements

604.65 Designation of Pilot-in-command and Second-in-command

A private operator shall designate for each flight a pilot-in-command and, where the crew includes two pilots, a second-in-command.

604.66 Crew Member Qualifications

No private operator shall permit a person to act and no person shall act
- (a) as the pilot-in-command or second-in-command of an aircraft unless the person
  - (i) holds the license and ratings required by Part IV of the LARs,
  - (ii) has successfully completed a pilot proficiency check, the validity period of which has not expired, for an aircraft of that type, in accordance with the Private Operator Passenger Transportation Standards, and
  - (iii) has fulfilled the requirements of the private operator's ground and flight training program referred to in Subsection 604.73(3)(a) of the LARs;
- (b) as a cabin attendant on board an aircraft unless the person has fulfilled the requirements of the private operator's ground and flight training program referred to in Subsection 604.73(3)(b) of the LARs; or
- (c) as a crew member other than a flight crew member or a cabin attendant unless the person has fulfilled the requirements of the private operator's ground and flight training program referred to in Subsection 604.73(3)(c) of the LARs.

604.67 Check Authority

(1) A pilot proficiency check shall be conducted by the Minister.
(2) Any other check required under this Subpart may be conducted by the Minister.

604.68 Validity Period

(1) Subject to Subsections (2) and (3), the validity period of a pilot proficiency check referred to in Subsection 604.66(a) of the LARs and of the annual training referred to in Section 604.73 of the LARs expires on
- (a) in the case of a pilot proficiency check, the first day of the twenty-fifth month following the month in which the proficiency check was completed; and
- (b) in the case of annual training, the first day of the thirteenth month following the month in which the training was completed.

(2) Where a pilot proficiency check or annual training is renewed within the last 60 days of its validity period, its validity period is extended
- (a) in the case of a pilot proficiency check, by 24 months; and
- (b) in the case of annual training, by 12 months.

(3) The Minister may extend the validity period of a pilot proficiency check or annual training by up to 60 days where the Minister is of the opinion that aviation safety is not likely to be affected.
(4) Where the validity period of a pilot proficiency check or annual training has been expired for 24 months or more, the person shall requalify in accordance with the Private Operator Passenger Transportation Standards.

604.69 to 604.72 Reserved

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Division VIII - Training

604.73 Training Program

(1) Every private operator shall establish and maintain a ground and flight training program that
- (a) is designed to ensure that each person who receives training acquires the competence to perform the person's assigned duties; and
- (b) meets the Private Operator Passenger Transportation Standards.

(2) A private operator shall
- (a) ensure that adequate facilities and qualified personnel are provided for its ground and flight training program, in accordance with the Private Operator Passenger Transportation Standards; and
- (b) include a detailed syllabus of its ground and flight training program in its operations manual.

(3) A private operator's ground and flight training program shall include
- (a) for flight crew members,
  - (i) upgrading training, and
  - (ii) initial and annual training, including
    - A. aircraft type training,
    - B. emergency procedures training, and
    - C. aircraft surface contamination training;
- (b) for cabin attendants, initial and annual training, including
  - (i) aircraft type training,
  - (ii) safety procedures training,
  - (iii) emergency procedures training,
  - (iv) aircraft surface contamination training, and
  - (v) first aid training;
- (c) training for other personnel who are assigned to perform duties on board an aircraft; and
- (d) any other training required to ensure a safe operation under this Subpart.

604.74 Training and Qualification Records

(1) Every private operator shall, for each person who is required to receive training under this Subpart, establish and maintain a record of
- (a) the person's name and, where applicable, personnel license number, type and ratings;
- (b) if applicable, the person's medical category and the expiry date of that category;
- (c) the dates on which the person, while in the private operator's employ, successfully completed any training, pilot proficiency check or examination required under this Subpart or obtained any qualification required under this Subpart;
- (d) information relating to any failure of the person, while in the private operator's employ, to successfully complete any training, pilot proficiency check or examination required under this Subpart or to obtain any qualification required under this Subpart; and
- (e) the type of aircraft or flight training equipment used for any training, pilot proficiency check or qualification required under this Subpart.

(2) A private operator shall retain the records referred to in Subsections (1)(c) and (d) and a record of each pilot proficiency check for at least three years.
(3) A private operator shall retain the most recent written examination completed by each pilot for each type of aircraft for which the pilot has a qualification.

604.75 to 604.79 Reserved

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Division IX - Manuals

604.80 Requirements Relating to Operations Manual

(1) Every private operator shall establish and maintain an operations manual that meets the requirements of Section 604.81 of the LARs.
(2) A private operator shall submit its operations manual, and any amendments to that manual, to the Minister.
(3) Where there is a change in any aspect of a private operator's operation or where the operations manual no longer meets the Private Operator Passenger Transportation Standards, the private operator shall amend its operations manual.
(4) The Minister shall, where the Private Operator Passenger Transportation Standards are met, approve those parts of an operations manual, and any amendments to those parts, that relate to
- (a) the take-off minima referred to in Section 604.14 of the LARs;
- (b) the flight crew member and cabin attendant training required by Subsections 604.73(3)(a) of the LARs and (b); and
- (c) the maintenance control system required by Section 604.48 of the LARs.

604.81 Contents of Operations Manual

(1) A private operator's operations manual, which may be issued in separate parts corresponding to specific aspects of an operation, shall include the instructions and information necessary to enable the personnel concerned to perform their duties safely and shall contain the information required by the Private Operator Passenger Transportation Standards.
(2) A private operator's operations manual shall be such that
- (a) all parts of the manual are consistent and compatible in form and content;
- (b) the manual can be readily amended;
- (c) the manual contains an amendment control page and a list of the pages that are in effect; and
- (d) the manual has the date of the last amendment to each page specified on that page.

604.82 Distribution of Operations Manual

(1) Subject to Subsection (2), a private operator shall provide a copy of the appropriate parts of its operations manual, including any amendments to that manual, to each of its crew members and to its ground operations and maintenance personnel.
(2) A private operator may place a copy of the appropriate parts of its operations manual in each aircraft that it operates, instead of providing a copy to each crew member.
(3) Every person who has been provided with a copy of an operations manual pursuant to Subsection (1) shall keep it up to date with the amendments provided and shall ensure that the appropriate parts are accessible when the person is performing assigned duties.

604.83 Aircraft Operating Manual

(1) A private operator may establish and maintain an aircraft operating manual that provides guidance to crew members in the operation of its aircraft and that meets the Private Operator Passenger Transportation Standards.
(2) An aircraft operating manual shall contain
- (a) the aircraft operating procedures; and
- (b) where the aircraft flight manual is not carried on board the aircraft, the aircraft performance data and limitations specified in the aircraft flight manual, which shall be clearly identified as aircraft flight manual requirements.

(3) A private operator that has established an aircraft operating manual shall ensure that a copy of the manual is carried on board each aircraft to which it relates.

604.84 Standard Operating Procedures

(1) A private operator may establish and maintain standard operating procedures for an aircraft that enable the crew members to operate the aircraft within the limitations specified in the aircraft flight manual and that meet the Private Operator Passenger Transportation Standards.
(2) A private operator that has established standard operating procedures for an aircraft shall ensure that a copy of the standard operating procedures is carried on board the aircraft.
(3) Where a private operator has established an aircraft operating manual, the standard operating procedures for the aircraft shall form part of that manual.

604.85 to 604.89 Reserved

REPUBLIC OF LEBANON
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Standards

s604.01 to s604.89

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LEBANESE AVIATION REGULATIONS (LARs)

General Operating and Flight Rules Standards

Subpart 4 - Private Operator Passenger Transportation
s604.01 to s604.89

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GENERAL OPERATING AND FLIGHT RULES STANDARDS

Subpart 4 - Private Operator Passenger Transportation
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DIVISION I - GENERAL

INTRODUCTION

These Private Operator Passenger Transportation Standards outline the standards that must be met to comply with the requirements of Subpart 604 of the Lebanese Aviation Regulations (LARs).

For ease of cross reference, the divisions and numbers of the standards are assigned to correspond to the regulations, therefore Standards Section s604.13 would reflect a standard required by Section 604.13 of the LARs.

The Standard is incorporated by reference in the Lebanese Aviation Regulations respecting Private Operator Passenger Transportation.

Standards are printed in “normal print” and use the operative verb "shall" and Information Notes and Recommended Practices are printed in “italicized print” and use the operative verb "should". Information Notes are indicated by the prefix "Information Note:" and Recommended Practices are indicated by the prefix "Recommended Practice:"

s604.01 to s604.04 Reserved

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DIVISION II - CERTIFICATION

s604.05 Issuance or Amendment of Private Operator Certificate

(1) The following constitutes an application for a private operator certificate:
- (a) mailing address of the private operator;
- (b) location of main operating base and any sub-bases;
- (c) registration and serial number of each airplane operated under this Subpart;
- (d) subject to Subsection (2), information on personnel supported by resumes or statements of qualifications;
- (e) information on the Approved Maintenance Organization or copy of Maintenance Contract if applicable;
- (f) proposed Operations Manual;
- (g) safety features card;
- (h) where applicable, nomination for Company Check Pilot;
- (i) where applicable, proposed Minimum Equipment List(s); and
- (j) if the type has not previously been operated in Lebanon, airplane crash charts.

(2) To meet the requirements specified in Section (1)(d), an applicant shall designate personnel who meet the requirements specified in subsection (4) and who perform the functions related to the following positions:
- (a) director of operations;
- (b) chief pilot; and
- (c) director of maintenance,
  - (i) this person is responsible for the maintenance control system.

(3) Notwithstanding the above, where the operator is a small operation of less than four airplanes, (a), (b) and (c) may be the same person.
(4) Qualifications of Operational Personnel. The Director of Operations and Chief Pilot shall possess knowledge with respect to:
- (a) the applicable regulations and standards; and
- (b) the content of the operations manual, private operator's certificate and operations specifications.

In addition to the above, the Chief Pilot shall hold an Airline Transport Pilot License with at least one type rating in a aircraft operated by the operator if applicable.

Information Note: *Operators who choose to operate an airplane in accordance with a Minimum Equipment List shall follow the procedures specified in the Aircraft Requirements Standards pursuant to Sections 605.07 and 605.09 of the LARs.*

s604.06 Navigation System Authorizations

1. Minimum Performance Capability for Long Range Area Navigation System

To meet the requirements of this standard, a long range area navigation system shall, as a minimum:
- (a) have a standard deviation of lateral track deviations of less than 6.3 nautical miles;
- (b) have a proportion of the total flight time spent by the aircraft 30 nautical miles or more from cleared track of less than 5.3 x 10-4;
- (c) have a proportion of the total flight time spent by aircraft at or between 50 and 70 nautical miles from the cleared track of less than 1.3 x 10-4; and

(d) in Subsection (d) below, if a GPS receiver(s) provides the only means of long range navigation, then requirements acceptable to the Minister must be met before using GPS as a Primary Means of Navigation in Oceanic/Remote Operations.

2.Authorizations

Required Navigation Performance (RNP) Airspace

The standard requirements for authorization to flight plan published high level fixed RNAV routes in Required Navigation Performance (RNP) airspace, or to be accommodated by Air Traffic Control (ATC) on other routes using RNP separation criteria, are:

(a) airplanes equipped with at least two independent navigation systems, one of which being a long range area navigation system; and
(b) flight crew training on operation of the long range area navigation system in accordance with training pursuant to Section s604.73 of these standards.
(c) Meet the Standards in Part VI, Subpart 2, Section 602.163.

North Atlantic Minimum Navigation Performance Specification (NAT MNPS), CMNPS and RNPC Airspace

The standard requirements for authorization to operate in North Atlantic Minimum Navigation Performance Specification (NAT MNPS) airspace, CMNPS airspace, to flight plan published high level fixed RNAV routes in Required Navigation Performance Capability (RNPC) airspace, and to be accommodated by Air Traffic Control (ATC) on other routes using RNPC separation criteria are:

(a) subject to clauses (A) and (B) airplanes shall be equipped with at least two independent long range area navigation systems.
    (i) airplanes equipped with at least two independent navigation systems, one of which being a long range area navigation system, may be approved for NAT MNPS operations restricted to routes approved for airplanes with one long range RNAV system; and
    (ii) airplanes equipped with at least two independent navigation systems based on short range ground transmitters may be approved for NAT MNPS operations restricted to routes approved for aircraft with no long range RNAV capability; and
(b) flight crew training on operation of long range area navigation systems in accordance with training requirements set out in Section s604.73 of these standards.
(c) Meet the Standards in Part VI, Subpart 2, Section 602.163.

Reduced Vertical Separation Minima (RVSM) in NAT MNPS, CMNPS and RNPC Airspace

The standard requirement for authorization to operate in NAT MNPS Reduced Vertical Separation Minima (RVSM) airspace, CMNPS airspace, to flight plan published high level fixed RNAV routes in Required Navigation Performance Capability (RNPC) airspace, and to be accommodated by Air Traffic Control (ATC) on other routes using RNPC separation criteria is as follows:

(a) that the private operator shall comply with and the aircraft shall be certified in accordance with the Minimum Aircraft System Performance Specifications (MASPS) and other requirements of ICAO NAT DOC 002 and ICAO/FAA Document 91-RVSM.
(b) flight crew training in equipment monitoring requirements and flight procedures must be in accordance with Section s604.73 of these standards.
(c) Meet the Standards in Part VI, Subpart 2, Section 602.163.

Information Note: *For this authorization, the authority for NAT MNPS operation is not dependent on RVSM capability. If the aircraft is not certified for RVSM or is being operated in accordance with an MEL for an unserviceable equipment item required for RVSM, the aircraft may still be operated in the NAT MNPSA at a flight level that does not require that capability.*

3. Instrument Approaches - Global Positioning System (GPS) (refers to subsection 604.06(h)(iii) of the LARs)

(1) The standard requirements for authorization to fly instrument approach procedures using only GPS navigation information are:

(a) an operational evaluation in accordance with Section s604.06 of these standards has been completed by the Minister on each aircraft type/GPS/FMS model installation for which approach authorization is sought;

(b) an air operator has an approved flight crew training and qualifications program for use of the GPS/FMS system that meets the requirements of Section s604.73 of these standards ; and

(c) standard operating procedures have been amended to reflect GPS approach operations and approved by the Minister (where required).

(2) The following items will be assessed in the operational evaluation prior to the approval of the operator's GPS approach standard operating procedures (where applicable) and training program. Identical installations of the same model of GPS in the same type of aircraft with the same operator do not need separate evaluations.

<u>Database</u>

The geographical coverage area for the database shall be compatible with the type of operations conducted by the company. The air operator shall have procedures in place to ensure that the database will be updated in accordance with the appropriate data revision cycle. This shall include a contract with a database supplier and the inclusion, in the appropriate company manuals, of the person responsible for installing the updates in the aircraft. The company shall have a procedure in place for pilots to report database errors and for information on database errors to be passed on to other company pilots, the avionics manufacturer and the Minister.

<u>Unit Installation and Operation</u>

The handling and procedures associated with the GPS avionics shall be such that all operations required for GPS approach can be accomplished without an adverse impact on normal crew duties and responsibilities. GPS related tasks shall not consume the attention of the pilot not flying (PNF) during critical phases of flight (i.e. between the time the aircraft turns inbound on the final approach course and the time the aircraft is established in the climb configuration on a missed approach).

<u>Control Display Unit (CDU) and Course Deviation Indicator (CDI) / Distance Display</u>

If the GPS/FMS control unit is not adequately accessible from each pilot position, or if GPS course deviation and distance displays are not within the primary field of view at both pilot stations, air operators shall designate in the standard operating procedures the position that the pilot flying (PF) and pilot not flying (PNF) are required to occupy during GPS approach for that type of installation. Aircraft types that are certified for operation by two crew members shall have GPS course deviation and distance displays at each pilot station. An Operation Specification authorizing GPS approaches shall not be issued unless the PNF has a means acceptable to the Minister of monitoring the PF during an approach.

Distance Display on the HIS

Installations where GPS guidance information (course tracking, To/From and NAV flags) are switched onto the HSI for display, but the DME distance information is not switched out (i.e. DME distance rather than GPS distance is displayed continuously on the HSI even when GPS source is selected to HSI), shall require air operators, in their standard operating procedures for GPS approach to deselect other NAV/DME sources to eliminate distance displays in the pilot's primary field of vision not related to the approach procedure being flown.

Annunciation

Responses to system annunciation (including Receiver Autonomous Integrity Monitoring (RAIM) warnings), the means of selecting GPS track information to the CDI/HSI and the means of coupling GPS steering information to the aircraft automatic flight control system shall be compatible with the safe operation of the aircraft type/category. Standard operating procedures shall specify the procedure whereby the control unit is programmed, approach waypoints are verified against an independent source, approach mode is armed, and cockpit NAV source and AFC guidance source switches are selected and verified. Any switch selection or programming errors that the Minister believes are likely to occur and that could lead to a serious incident shall, if possible, be identified and addressed in training and in the standard operating procedures. Otherwise, the installation shall not be approved for approach use.

Airborne Evaluation

The Minister shall observe the pre-flight and in-flight operation of the unit on at least two GPS approaches and missed approaches. If the PF is allowed to occupy either seat during GPS approaches, then one approach from each pilot position shall be demonstrated. An airborne evaluation in an aircraft must take place under VFR. Emphasis will be on crew co-ordination, pilot workload (PF and PNF), and switch selections.

s604.07 to s604.10 Reserved

DIVISION III - FLIGHT OPERATIONS

s604.11 Operational Flight Data Sheet

The minimum required information to be entered on the operational flight data sheet is:

(a) private operators name;
(b) date;
(c) airplane registration;
(d) airplane type and model;
(e) captain's name;
(f) departure aerodrome;
(g) destination aerodrome;
(h) alternate aerodrome, if applicable;
(i) estimated time enroute;
(j) fuel endurance;
(k) weights:
  (i) total fuel on board,
  (ii) zero fuel weight, and
  (iii) planned maximum take-off weight;
(l) number of persons on board, crew and passengers;
(m) time of departure; and
(n) time of arrival.

s604.12 to s604.13 Reserved

s604.14 Take-off Minima

The standard for take-off in IMC below the weather minima specified in the Jeppesen Manual for a Lebanese operator or an equivalent foreign publication is:

1. Take-off Minima Reported Visibility RVR 1,200 feet or 1/4 SM Visibility

(1) for each airport at which the authority is to be exercised the private operator and the pilot-in-command shall determine the significant obstructions which exist in the take-off path and determine by the use of the approved airplane performance charts that the airplane will safely clear obstructions on the take-off path and maintain at least the minimum enroute altitude to the take-off alternate, with the critical engine inoperative;
(2) the Operations Manual shall contain detailed guidance on how to determine departure one engine inoperative climb gradient and obstacle clearance;
(3) the runway is equipped with serviceable and functioning high intensity runway lights or runway center line lights or runway centerline markings that are plainly visible to the pilot throughout the take-off run;
(4) the pilot-in-command is satisfied that the required RVR 1,200 feet [350 m] or 1/4 SM visibility exists for the runway to be used before commencing take-off;
(5) the pilot-in-command and second-in-command attitude indicators on the airplane shall incorporate pitch attitude index lines in appropriate increments above and below reference line to at least 150, and provide a ready depiction of total airplane attitude. The approved Failure Warning Systems which will immediately detect essential instrument and equipment failures or malfunctions shall be operative. For the purpose of reduced visibility take-offs, essential instruments are defined as attitude indicators, directional gyros and HSI's; and

(6) the chief pilot has certified in the training and qualification records required in Section 604.52 of the LARs that the pilot-in-command, and if authorized by the operator for take-off at lower than normal limits, the second-in-command, is competent to conduct an RVR 1,200 feet [350 m] take-off or 1/4 SM.

2. Take-off Minima - Reported Visibility RVR 600 feet [175 m]

(1) for each airport at which the authority is to be exercised the private operator and the pilot-in-command shall determine the significant obstructions which exist in the take-off path and determine by the use of the approved airplane performance charts that the airplane will safely clear obstructions on the take-off path and maintain at least the minimum enroute altitude to the take-off alternate, with the critical engine inoperative;
(2) the Operations Manual shall contain detailed guidance on how to determine departure one engine inoperative climb gradient and obstacle clearance;
(3) the runway has the following equipment:
- (a) serviceable and functioning high intensity runway lights, runway center line lights and center line markings that are plainly visible to the pilot throughout the take-off run;
- (b) at least two transmissometers, one situated at the approach end and one at the mid-point of the runway, each reading not less than RVR 600 feet [175 m]; and
- (c) if three transmissometers are available and the mid-point transmissometer is unserviceable, take-off is authorized provided the transmissometers at the approach end and the departure end of the runway, each is reading not less than RVR 600 feet [175 m];

(4) the pilot-in-command is satisfied that the required RVR 600 feet [175 m] visibility exists for the runway to be used before commencing take-off;
(5) the pilot-in-command and second-in-command attitude indicators (artificial horizons) on the airplane shall incorporate pitch attitude index lines in appropriate increments above and below the zero pitch reference line to at least 15 degrees, and provide a ready depiction of total airplane attitude. The approved Failure Warning Systems which will immediately detect essential instrument and equipment failure or malfunctions shall be operative. For the purpose of reduced visibility take-offs, essential instruments are defined as attitude indicators, directional gyros and HSI's; and
(6) the pilot-in-command, and the second-in-command if authorized by the private operators for lower than normal take-off limits, shall be checked within the preceding 12 months in an approved simulator by a person authorized by the Minister and shall be certified as competent to use these minima in the training and qualification records required in Section 604.74 of the LARs.

s604.15 Instrument Approach Procedures

CAT I, Cat II, and CAT III procedures are contained in Part VI, Subpart 2, Section 602.131 of the LARs.

s604.16 Reserved

s604.17 Cabin Safety Procedures

Fuelling with Passengers on Board

Airplanes may be fuelled with passengers on board, embarking or disembarking under the following conditions:
- (a) in order to ensure that crew members receive prompt notification of a situation threatening safety such as major fuel spill or a fire, two way communication is maintained between the ground crew supervising the fuelling and the qualified personnel on board the airplane so that the airplane can be disembarked or evacuated as necessary;

(b) a means of communication among the qualified personnel on board the airplane, ground/maintenance crews and fuelling agencies is determined and established and the procedures are provided to the appropriate personnel;
(c) the airplane engines are not running unless the aircraft incorporates a propeller brake and the brake is set. The Aircraft Flight Manual must refer to the propeller brake/engine as an auxiliary power unit (APU);
(d) during the fuelling process:
 (i) airplane ground power generators or other electrical ground power supplies are not being connected or disconnected;
 (ii) combustion heaters installed on the airplane (e.g. wing and tail surface heaters, integral cabin heaters) are not operated;
 (iii) other combustion heaters used in the vicinity of the airplane are manufactured to a standard acceptable to the Minister for use in hazardous atmosphere;
 (iv) known high energy equipment such as High Frequency (HF) radios are not operated, unless in accordance with the airplane manufacturer's approved flight manual where the manual contains procedures for the use of this equipment during fuelling;
 (v) weather-mapping radar equipment in the airplane is not operated unless in accordance with the manufacturer's approved airplane flight manual where the manual contains procedures for use during fuelling;
 (vi) airplane batteries are not being removed or installed;
 (vii) external battery chargers are not being connected, operated or disconnected;
 (viii) airplane-borne auxiliary power units which have an efflux discharging into the zone are not started after filler caps are removed or fuelling connections are made;
 (ix) if an auxiliary power unit (APU) is stopped for any reason during fuelling it shall not be restarted until the flow of fuel has ceased and there is no risk of igniting fuel vapors, however, the APU may be operated in accordance with the manufacturer's approved airplane flight manual if the manual contains procedures for starting the APU during fuelling;
 (x) electric tools or similar tools likely to produce sparks or arcs are not being used; and
 (xi) photographic equipment is not used within 10 ft. [3 m] of the fuelling equipment or the fill or vent points of the airplane fuel systems.
(e) fuelling is immediately suspended when there are lightning discharges within 8 km of the aerodrome;
(f) the airplane is fuelled in accordance with manufacturer's procedures for that type of airplane;
(g) the airplane emergency lighting system is armed or on, (if applicable);
(h) "No Smoking" signs on board the airplane are illuminated, as applicable;
(i) procedures are established to ensure that passengers do not smoke, operate portable electronic devices or otherwise produce sources of ignition;
(j) a minimum of two exits are designated evacuation exits during fuelling; one of which must be the entry doors through which the passengers embarked;
(k) the designated evacuation exits during fuelling are identified by airplane type and published in the Company Operations Manual, and are clear and available for immediate use by passengers and crew members should an evacuation be required;
(l) the air operator has procedures in place to ensure that there is a ready escape route from each designated evacuation exit during fuelling;
(m) a means of evacuation, such as a deployed integral stair, a loading stair or stand, is in place at the airplane door used for the embarking and disembarking of passengers and is free of obstruction and available for immediate use by the airplane occupants if necessary;
(n) a qualified person trained in the operation and use of emergency exits and in emergency evacuation procedures who is ready to initiate and direct an evacuation is at or near the door at which there is a deployed integral stair, a passenger loading stair or stand;

(o) where desirable for climatic reasons, and provided a crew member is on board, an airplane embarking door that is inward opening or can be fully opened to the exterior without repositioning of loading stairs or stand may be closed, and latched if necessary to keep it closed, but may not be locked.

s604.18 Briefing of Passengers

1. Standard Safety Briefing

(1) The standard safety briefing shall consist of an oral briefing provided by a trained crew member or by audio or audio-visual means which includes the following information as applicable to the airplane, equipment, and operation:

(a) prior to take-off:
  - (i) when, where, why and how carry-on baggage is required to be stowed;
  - (ii) the fastening, unfastening, tightening and general use of safety belts or safety harnesses;
  - (iii) when seat backs must be secured in the upright position and chair tables must be stowed;
  - (iv) the location of emergency exits and for passengers seated next to an exit, how that exit operates;
  - (v) the location, purpose of, and advisability of reading the safety features card;
  - (vi) the requirement to obey crew instructions regarding safety belts and no smoking or fasten seat belt signs and no smoking signs and the location of these signs;
  - (vii) the location of any emergency equipment the passenger may have a need for in an emergency situation such as the ELT, fire extinguisher, survival equipment (including the means to access if in a locked compartment), first aid kit, life preserver or flotation device and life raft; and
  - (viii) the private operator's procedures regarding the use of portable electronic devices;

(b) after take-off, if not included in the pre take-off briefing:
  - (i) on flights where smoking is permitted, when and where smoking is prohibited on board the airplane;
  - (ii) the advisability of using safety-belts or safety harnesses during flight;

(c) in-flight when the "Fasten Seat Belt" sign has been turned on for reasons of turbulence:
  - (i) when the use of seat belts is required; and
  - (ii) the requirement to stow carry-on baggage.

(d) prior to passenger deplaning, the safest direction and most hazard-free route for passenger movement away from the airplane following deplanement; and any dangers associated with the airplane type such as pitot tube locations, propellers, or engine intakes.

(2) The standard safety briefing may be shortened for regular/recurring passengers who are familiar with aircraft, route and have repeated exposure (eg. company president) to that type of flight.

2. Individual Safety Briefing

(1) The individual safety briefing shall include:

(a) any information contained in the standard safety briefing and the safety features card that the passenger would not be able to receive during the normal conduct of that safety briefing; and

(b) additional information applicable to the needs of that person as follows:
  - (i) the most appropriate brace position for that passenger in consideration of his/her condition, injury, stature, and/or seat orientation and pitch;
  - (ii) the location to place any service animal that accompanies the passenger;
  - (iii) for a mobility restricted passenger who needs assistance in moving expeditiously to an exit during an emergency:

A. a determination of what assistance the person would require to get to an exit;
B. the route to the most appropriate exit;
C. the most appropriate time to begin moving to that exit; and
D. a determination of the most appropriate manner of assisting the passenger

(iv) for a visually impaired person:
A. detailed information of and facilitating a tactile familiarization with the equipment that he/she may be required to use;
B. advising the person where to stow his/her cane if applicable;
C. the number of rows of seats between his/her seat and his/her closest exit and alternate exit;
D. an explanation of the features of the exits, and
E. if requested, facilitating a tactile familiarization of the exit;

(v) for a comprehension restricted person:
A. while using the safety features card pointing out the emergency exits and alternate exits to use, and any equipment that he/she may be required to use;

(vi) for persons with a hearing impairment:
A. while using the safety features card pointing out the emergency exits and alternate exits to use, and any other equipment that the person may be required to use;
B. communicating detail information by: pointing, face-to-face communication permitting speech reading, pen and paper, through an interpreter or through their attendant.

(vii) for a passenger who is responsible for another person on board, information pertinent to the needs of the other person as applicable:
A. in the case of an infant:
1. seat belt instructions;
2. method of holding infant for take-off and landing;
3. instructions pertaining to the use of a child restraint system;
4. oxygen mask donning instructions;
5. recommended brace position;
6. location and use of life preservers, as required;

B. in the case of any other person:
1. oxygen mask donning instructions;
2. instructions pertaining to the use of a child restraint system;
3. evacuation responsibilities

(viii) for an unaccompanied minor, instructions to pay close attention to the normal safety briefing and to follow all instructions.

(2) A passenger that has been provided with an individual safety briefing need not be re-briefed following a change in crew if the crew member that provided the individual safety briefing has advised a member of the new crew of the contents of that briefing including any information respecting the special needs of that passenger.
(3) A passenger may decline an individual safety briefing.

3. Passenger Preparation for an Emergency Landing

The emergency briefing provided in the event of an emergency where time and circumstances permit shall consist of instructions pertaining to:
(a) safety belts or safety harnesses
(b) seat backs and chair tables
(c) carry-on baggage
(d) safety features cards
(e) brace position (when to assume, how long to remain)

(f) if applicable, life preservers

s604.19 Safety Features

The safety feature card referred to in Section 604.19 of the LARs shall contain the following information as applicable to that specific airplane and equipment carried:

1. Aircraft with Seating for 19 or Less

Information respecting the emergency equipment and exits on the airplane in either printed or pictographic form;

2. Aircraft with Seating for 20 or More

(1) General safety information including:
- (a) when and where smoking is prohibited on board the airplane;
- (b) each type of safety belt or safety harness installed for passenger use, including when to use, and how to fasten, tighten and release;
- (c) when and where carry on baggage must be stowed; and any other related requirements and restrictions pertinent to that particular airplane;
- (d) correct positioning of seat backs and chair tables for take-off and landing;

(2) Emergency procedures and equipment including:
- (a) fixed passenger oxygen system showing:
  - (i) mask location and presentation; the actions to be performed by the seated passenger in order to obtain the mask, activate the flow of oxygen and correctly don and secure the mask;
  - (ii) priority for persons assisting others with oxygen;
  - (iii) smoking restrictions;
- (b) location of first aid kit(s);
- (c) location of fire extinguisher(s) that would be accessible to the passengers;
- (d) location of Emergency Locator Transmitter(s);
- (e) location of survival equipment, and if the stowage compartment is locked, the means of access or location of the key;
- (f) passenger brace position for impact, as appropriate for each type of seat and restraint system installed for passenger use; including the brace position for an adult holding an infant;
- (g) the location, operation and method of using each emergency exit type on the airplane, including identification of those emergency exits known to be rendered unusable in a ditching or because of airplane configuration such as a combi configuration;
- (h) the safest direction and most hazard-free escape route for passenger movement away from the airplane following evacuation;
- (i) the attitude of the airplane while floating;
- (j) location of life preservers and correct procedures for removal from stowage/packaging; donning and use of the life preserver for adult, child and infant users including when to inflate;
- (k) location and use of life rafts;
- (l) location, removal and use of flotation devices; and
- (m) the form, function, color and location of any Floor Proximity Emergency Escape Path lighting system if installed.

(3) The safety card shall bear the name of the airplane type and shall contain only safety information.

(4) The safety information provided by the card shall:
- (a) be accurate for that specific airplane type and configuration in which it is carried and in respect of the equipment carried;

(b) be presented with clear separation between each instructional procedure. All actions required to complete a multi-action procedure to be presented in correct sequence and the sequence of actions to be clearly identified;

(c) be depicted in a clear and distinct manner.

Information Note: *The safety information provided by the card may also be in languages as dictated by the private operator's destinations.*

s604.20 to s604.28 Reserved

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DIVISION IV - FLIGHT TIME AND FLIGHT DUTY TIME LIMITATIONS AND REST PERIODS

s604.29 Extension of Flight Duty Time

(1) Where a flight crew is augmented by the addition of at least one flight crew member, the division of duty and rest is balanced between the flight crew members and a flight relief facility is provided, flight duty time may be extended if:
- (a) where a flight relief facility - seat is provided, the flight duty time may be extended to 17 consecutive hours, in which case the maximum flight deck duty time for any flight crew member shall be 12 hours;
- (b) where a flight relief facility - bunk is provided, the flight duty time may be extended to 20 consecutive hours, in which case the maximum flight deck duty time for any flight crew member shall be 14 hours; and
- (c) the subsequent minimum rest period shall be at least equal to the length of the preceding flight duty time.

(2) Where a flight crew is augmented by the addition of at least one flight crew member in accordance with subsection (1), the total flight time of the flight or series of flights shall be logged by each flight crew member for the purposes of calculating the maximum flight times in Section 604.26 of the LARs.

s604.30 Unforeseen Operational Circumstances

The standards for compliance with this Section are:
(1) Flight duty time may be extended by up to 3 consecutive hours provided that:
- (a) the subsequent minimum rest period shall be increased by an amount at least equal to the extension to the flight duty time;
- (b) the pilot-in-command shall notify the air operator, in accordance with procedures outlined in the company operations manual, of the length of and the reason for the extension; and
- (c) the air operator shall retain the notifications until the completion of the next Directorate of Civil Aviation audit.

(2) Flights shall be planned to be completed within the maximum flight duty time taking into account the time necessary for pre-flight and post-flight duties, the flight or series of flights, forecast weather, turn-around times and the nature of the operation.

s604.31 to s604.37 Reserved

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DIVISION V - EMERGENCY EQUIPMENT REQUIREMENT

s604.38 Survival Equipment

(1) For flights over land
- (a) the private operator shall show how compliance with Section 602.61 of the LARs is to be achieved by setting out in the company operations manual, a list of equipment that is carried on board the private operator's aircraft; and
- (b) include with the survival equipment, information on how to use it and a survival manual appropriate for the season and climate.

(2) Where life rafts are required to be carried they shall be equipped with an attached survival kit containing at least the following:
- (a) a pyrotechnic signaling device;
- (b) a radar reflector;
- (c) a life raft repair kit;
- (d) a bailing bucket and sponge;
- (e) a signaling mirror;
- (f) a whistle;
- (g) a raft knife;
- (h) an inflation pump;
- (i) dye marker;
- (j) a waterproof flashlight;
- (k) a two day supply of water, calculated using the overload capacity of the raft, consisting of one pint of water per day for each person or a means of desalting or distilling salt water sufficient to provide an equivalent amount;
- (l) a fishing kit;
- (m) a book on sea survival;
- (n) a first aid kit containing antiseptic swabs, burn dressing compresses, bandages and anti-motion sickness pills.

s604.39 First Aid Kits

For the purposes of this Section, the contents of the first aid kit required by Section 602.59 of the LARs are the supplies and equipment for a Type A Kit shown below and one pair of latex gloves.

Item	Supplies and Equipment	Quantity for First Aid Kit Type A
1.	Antiseptic – wound solution, 60 ml or antiseptic swabs (10 pack)	1
2.	Applicator – disposable (10 pack) (not needed if antiseptic swabs used)	1
3.	Bandage – adhesive strips	25
4.	Bandage - gauze 7.5 cm x 4.5 m	2
5.	Bandage – triangular 100 cm folded and 2 safety pins	2
6.	Container - First Aid Kit	1
7.	Dressing - burn 10 cm x 10 cm	4
8.	Dressing – compress, sterile 7.5 cm x 12 cm approx.	2
9.	Dressing - gauze, sterile 7.5 cm x 7.5 cm approx.	4
10.	Hand cleaner or cleansing towelettes, 1 package	1
11.	Manual - First Aid, current edition	1
12.	Pad with shield or tape for eye	1
13.	Record - First Aid	1
14.	Scissors - 10 cm	1
15.	Splint set with padding - assorted sizes	1
16.	Tape – Adhesive, surgical 1.2 cm x 4.6 cm	1
17.	Tweezers – splinter	1

s604.40 to s604.47 Reserved

DIVISION VI - MAINTENANCE

s604.48 Maintenance Control System

(1) These standards are applicable to the control of maintenance and the performance of elementary work and servicing in respect of aircraft used by a private operator.

(2) Sections 604.48 through 604.57 of the LARs detail the requirements for maintenance of a private operator's aircraft. When procedures are developed as required by those regulations, the total of those procedures is referred to as the maintenance control system. The private operator must not permit any person to perform maintenance or elementary work unless that maintenance or elementary work is conducted in conformance with the requirements of that maintenance control system.
(3) Persons performing work on the private operator's aircraft must be made aware of the maintenance control procedures in effect. For this reason those procedures must be contained in the Operations Manual Section that details the maintenance control system required by Section 604.48 of the LARs. This Section of the Operations Manual represents a descriptive disclosure to the Director General of Civil Aviation, of the methods the private operator has chosen to achieve compliance with the Lebanese Aviation Regulations respecting the control of maintenance.
(4) It is intended that the maintenance control system describe what work is required to maintain the aircraft in conformity to the applicable type design and any additional operational requirements. This system is not intended to provide information on how to perform maintenance.

s604.49 Description of the Maintenance Control System in Operations Manual

(1) The operations manual Section that details the maintenance control system of a private operator shall contain at least the following information:

- (a) unless provided elsewhere in the manual, a statement signed by the private operator confirming that the operations manual Section that details the maintenance control system and any incorporated documents identified therein reflect the operator's means of compliance with the Regulations;
- (b) a means of identifying each page of the operations manual Section which details the maintenance control system that has been submitted for approval. This shall meet the requirements specified in Section 604.81 of the LARs.
- (c) where functions have been assigned pursuant to Subsection 604.51(2) of the LARs:
  - (i) the name and title of the person to whom functions have been assigned,
  - (ii) a description of the functions that have been assigned to each person, and
  - (iii) where necessary for clarity, a chart depicting the distribution of functions;
- (d) where the organization uses, pursuant to Subpart 575 of the LARs, standards for the performance of elementary work or servicing that are other than those recommended by the manufacturer, the identification of those standards;
- (e) procedures to ensure that regulatory information and technical data appropriate to the work performed are used in respect of elementary work and servicing, as required by Subpart 575 of the LARs;
- (f) details of the methods used to record the maintenance, elementary work or servicing performed, and ensure that any defects are recorded in the technical record established pursuant to Subpart 575 of the LARs;

Information Note: *Although a private operator Certificate does not confer maintenance privileges under the provisions of Subpart 575 of the LARs, the private operator must establish the record system that will be used to record the maintenance of his aircraft. For this reason, among others, the Section of the private operator's operations manual that details the maintenance control system must be made available to all persons performing maintenance, elementary work or servicing.*

(g) the identification of any maintenance schedule approved in respect of the private operator's aircraft;

Information Note: *It is not intended that the complete schedule be included in the operations manual Section which details the maintenance control system. Although an operator may append a maintenance schedule to their manual, the maintenance schedule must be controlled under its own List of effective pages as required by the Aircraft Maintenance Standards.*

(h) a detailed description of the procedure used to ensure that any maintenance tasks required by the maintenance schedule, an airworthiness directive, or any task required for the rectification of a defect is completed within the time constraints specified in Subpart V of Part VI of the LARs;
(i) a description of the assessment program required by Section 604.55 of the LARs;
(j) a description of the defect reporting and rectification control procedures required by Section 604.52 of the LARs, including details of:
  (i) the methods used to detect and report recurring defects;
  (ii) unless incorporated into the MEL preamble, the procedures for scheduling the rectification of defects whose repair has been deferred, and
  (iii) the procedures used to report service difficulties;
(k) procedures to ensure that only parts and materials that meet the requirements of Subpart 575 of the LARs are used in the performance of elementary work or servicing, including any details respecting part pooling arrangements that have been entered into;

Information Note: *This is intended to include any stores procedures which may be used by a private operator, including those procedures used for the control of petroleum, oil and other lubricants, as required by national regulation.*

(l) a description of the maintenance training specified in Section s604.57 of these standards**;**
(m) a description of the kinds of personnel and training records kept;
(n) a description of the procedure used to ensure that the empty weight and balance of an aircraft is recorded in accordance with the requirements of LARs;

Information Note: *Standards applicable to weight and balance reports, including the use of reports made in respect of multiple-configurations are contained in Part V of the LARs.*

(o) a compliance statement, indicating which Sections of the operations manual section which details the maintenance control system are intended to address each of these requirements; and

(p) the identification of any person eligible to apply for flight authorities in respect of the private operator's aircraft.

Information Note: *Some activities of the organization which are subject to frequent change can more effectively be addressed in manuals separate from the operations manual section which details the maintenance control system thereby avoiding the necessity for frequent amendments for routine changes in the organization. The Incorporation by reference provisions of Subpart 604 of the LARs are intended to provide a means for this, allowing the company to make changes without the requirement for Directorate General of Civil Aviation (DGCA) approval. Under these provisions the person designated in accordance with the assignment of responsibility provisions is required to ensure that the incorporated manuals, documents or lists continue to comply with the requirements established in the policy contained in the operations manual section which details the maintenance control system.*

(2) Under the provisions of Subpart 575 of the LARs each person responsible for an incorporated reference must certify in writing that the referenced manual meets the requirements of the operations manual section which details the maintenance control system policies established with respect to that reference. This shall take the form of a certification statement in the front of the incorporated document or list. This certification must be made on initial incorporation of the incorporated document, and on each amendment thereof.
(3) The Minister will approve each page of an operations manual section which details the maintenance control system in writing. This will normally be done by approving a list of effective pages. Alternatively in the case of manuals containing a small number of pages approval may be shown on each page. Acceptance of the procedure for maintaining the referenced manual will be indicated by approval of the operations manual Section which details the maintenance control system.
(4) Where an operations manual Section which details the maintenance control system does not meet the requirements of this part, whether through a change in the requirements, a change in the organization or its activities, or through an inadequacy shown to exist by the assessment program, or any other reason that affects the manuals conformity to requirements, the certificate holder is responsible to promulgate and seek approval for an amendment to the operations manual section which details the maintenance control system.
(5) A private operator must provide a copy of the operations manual section that details the maintenance control system, or relevant portions thereof, to each person who performs or certifies work. In the case where only a portion of the manual is provided, it must be sufficiently comprehensive that the person performing the tasks has all relevant information. For non-scheduled work, temporary copies of the relevant portions of the operations manual section which details the maintenance control system, or any incorporated reference, may be sent via facsimile transmission.

s604.50 Person Responsible for Maintenance

Information Notes: *Section 604.50 of the LARs establishes that, where a private operator also holds an AMO certificate with an aircraft rating for a type of aircraft operated by the private operator, the person responsible for the maintenance control system shall also be the person responsible for all maintenance activities of the AMO under Part V, Subpart 545 of the LARs.*

This provision is required to avoid ambiguity or duplication of responsibilities between the private operator and the AMO, when the certificate holder is really the same person. It also obviates the need for extensive documented communication between the Air Operating and Maintenance arms of the organization.

s604.51 Maintenance Personnel and Facilities

(1) Subsection 604.51(1) of the LARs requires that a sufficient number of personnel must be employed to ensure the control of all required maintenance. This control includes but is not limited to:

(a) the initial development of the maintenance schedules required by Subpart 575 of the LARs;
(b) scheduling maintenance, elementary work and servicing to be performed within the time constraints specified in the approved maintenance schedule;
(c) scheduling compliance with any airworthiness directives;
(d) review and action of applicable service information as required by Section 604.55 of the LARs;
(e) the proper dispatch of aircraft, with regard to the control of defects, conformity with type design and the requirements of other operating rules;
(f) the issuance of authorizations to personnel who are assigned to perform elementary work;
(g) liaison with persons and organizations for the performance of maintenance;
(h) the initial development and the updating of the Section of the company operations manual that describes the maintenance control system.

(2) Subsection 604.51(1) of the LARs also require that facilities be provided to ensure the control of all required maintenance. These facilities include but are not limited to:

(a) a place of business, with a fixed address;
(b) communications equipment including telephones, facsimile machines, etc. This may also include messaging systems such as Telex;
(c) any devices used to establish when a particular aircraft requires maintenance. This may include planning bulletin boards, card files, or a computer system that meets the standards applicable to computer devices used for planning purposes;
(d) where the private operator performs elementary work or servicing, the equipment and tools necessary to comply with the Subpart 575 of the LARs performance rules; and
(e) a secure, dry storage area to retain aircraft records.

(3) The person responsible for the maintenance control system may assign management functions for specific activities relating to the controlling of maintenance where that assignment of functions is detailed in the maintenance control system. These details must include:

(a) a description of the function being assigned. The description of the function should be pertinent to those duties required to ensure compliance with the Lebanese Aviation Regulations, and need not address duties related to other company administrative functions; and
(b) for each person not reporting directly to the person appointed pursuant to Section 604.50 of the LARs, the identity of the person to whom they report.

s604.52 Defect Reporting and Control

(1) Each private operator's maintenance control system shall include procedures to ensure that defects detected during aircraft operation or during the performance of elementary work or servicing are recorded in accordance with Subpart 5 and the remainder of this Subpart.
(2) Each private operator's maintenance control system must include procedures to ensure that defects are rectified as soon as possible, but in no case later than the times established to ensure compliance

with Lebanese Aviation Regulations Subpart 575 of the LARs requirements, including any repair time category intervals established in the private operator's Minimum Equipment List.
(3) The defect recording system must include a method to highlight defects that recur, so that they are readily identifiable by flight crews and by the maintenance personnel at all bases where the aircraft is operated. The private operator is responsible for identifying recurring defects, as such, to maintenance personnel in order to avoid the duplication of unsuccessful attempts at rectification.
(4) For the purposes of these standards, unless other criteria are established and approved in the maintenance control Section of the operations manual, a recurring defect is considered to exist whenever a particular failure mode is repeated three times within 15 flight segments.
(5) The defect control system must ensure that the rectification of recurring defect will take into account the methodology used in previous repair attempts.

s604.53 Technical Dispatch Instructions

Information Note: *The purpose of the technical instructions is to form the basis upon which the pilot in command will determine aircraft serviceability in respect of airworthiness directive, maintenance, operational or corporate requirements. Where an approved MEL is in use, no further technical instructions are required, provided use of the MEL is adequately described in either the MEL document, or the description of the defect control system required by Section s604.52 of these standards.*

(1) Where no approved MEL is in use, the private operator shall include procedures and instructions to ensure that the flight crew can assess defective aircraft equipment against the requirements set out in Subpart 575 of the LARs. These shall be directed to other personnel employed to dispatch the aircraft, provided the duties and responsibilities of those persons is described in the Section of the operations manual that addresses the maintenance control system.
(2) Where a private operator deploys an aircraft to a remote location that is outside of its main area of operation, the private operator must ensure that the technical dispatch instructions required by Section 604.54 of the LARs remain effective.

s604.54 Reserved

s604.55 Service Information Review

(1) The private operator is responsible for remaining aware of any service information produced by the manufacturer of the aircraft operated. Where the aircraft service information refers to the engine, propeller, or component manufacturers instructions, this awareness shall extend to those instructions also. This service information must be assessed and actioned where the private operator determines it to be necessary. The private operator is not obliged to comply with this kind of information unless the service information is mandated through the issue of an airworthiness directive.

Information Note: *Service information normally includes documents such as Service Letters, Bulletins or Instructions, All Operator Letters, etc. Service information also includes maintenance manuals and any other documents containing information relating to the continuing airworthiness of the aircraft, its engines, propellers and installed components.*

(2) Records made in respect of the assessment program must be retained for six years. This applies to records made in respect of assessments applied to maintenance schedules and to the monitoring of

company maintenance control procedures. For the purposes of recording the evaluation of manufacturer's service information, pen annotations to the documents themselves may serve as the record provided the entry:

(a) contains a disposition of the assessment;
(b) is made in permanent ink;
(c) is dated and signed by the person responsible for the maintenance control systems, or a person who has been assigned this function pursuant to Section 604.50 of the LARs.

s604.56 Maintenance Agreements

Information Notes: *Section 604.56* of the LARs *require that all maintenance agreements must be made in writing unless the person performing the work is an employee by the person or organization holding the Private Operator Certificate.*

For the purposes of this Section a person will be considered an employee where payment for maintenance services is made directly by the private operator to that person.

Nothing in the regulation prevents the private operator from dealing with more than one AMT or more than one AMO, or from changing established arrangements, provided the new arrangement also meets the requirements of Section 604.56 of the LARs.

s604.57 Maintenance Training

Information Notes: *Under the provisions of the Aeronautics Act, elementary work is a form of maintenance; however, for the purpose of the Lebanese Aviation Regulations (LARs), elementary work has been identified as a list of specific tasks that are not subject to a maintenance release. Because these tasks are not subject to a maintenance release, they need not be performed by the holder of an AMT license, or by a person working under an AMO certificate. For these reasons, the private operator is responsible for controlling the authorization of persons to perform elementary work.*

A private operator may authorize any person to perform elementary work provided that person has been trained to perform the specific task and has completed the task at least once under the supervision of the holder of an AMT license or an organization holding an Approved Training Organization Certificate issued pursuant to Part IV of the Lebanese Aviation Regulations (LARs). There is no requirement for the supervising AMT to hold any special rating. The training requirements applicable to these provisions are contained below.

The provisions of Section 604.57 of the LARs do not require that individual authorizations be issued to persons performing servicing, or persons who request the performance of *servicing. The regulations only require that a private operator develop a system to ensure those persons are competent to carry out assigned tasks.*

Where a private operator does not service aircraft, that private operator is responsible to ensure that any persons who request the performance of servicing be trained. This will typically include flight crew members of the private operator's staff. For example, in the case of aircraft refueling, it is often the responsibility of the flight crew, as the persons requesting the servicing, to specify the type and quantity of fuel to be uploaded, and in doing so also specify any special precautions, such as aircraft balance considerations, during the fuelling process. These provisions are also compatible with the requirement for the private operator to specify maintenance task requirements.

The standards for the maintenance training referred to in Section 604.57 of the LARs are:
(1) Airplane Servicing and Ground Handling Training for Pilots
- (a) refueling procedures
  - (i) types of fuel, oil and fluids used in the airplane;
  - (ii) correct refueling procedures;
  - (iii) procedures for checking fuel, oil and fluids and proper securing of caps;
- (b) use of tow bars and maximum nose wheel deflection when towing.
- (c) seasonal use of the parking brake.
- (d) installation of protective covers on the airplane.
- (e) procedures for operating in cold weather such as:
  - (i) moving the airplane out of a warm hangar when precipitation is present;
  - (ii) procedures for applying de-icing and anti-icing fluids for the airplane type including critical flight control post application inspections; and
  - (iii) engine and cabin pre-heating procedures, including proper use of related equipment.

(2) Maintenance Training
- (a) the training program must ensure that personnel trained are familiar with the regulations, standards and private operator procedures associated with certain work.
- (b) the training program shall include:
  - (i) initial training to ensure that persons authorized to perform or request the performance of maintenance, elementary work or servicing are aware of the regulations, standards and private operator procedures associated with that work; and
  - (ii) update training to ensure that personnel remain competent and are made aware of any changes to those regulations, standards and private operator procedures.
- (c) training made in respect of the Regulations must ensure that personnel are aware of their responsibilities with regard to the performance rules defined in Section 575.02 of the LARs, and maintenance records, pursuant to Subpart 575 of the LARs.
- (d) the standards applicable to servicing are normally limited to the procedures contained in those publications produced in respect of Subpart 575 of the LARs performance rules. These will typically include manufacturer's maintenance publications, servicing manuals, etc. Where the standards used are not the standards specified by the manufacturer, they must be listed in the operations manual section which details the maintenance control system required by s604.48 of these standards.
- (e) the initial cycle for update training is three years.

Information Notes: *Where a private operator contracts maintenance to an AMO, the AMO training program will meet the training requirements for persons performing maintenance, elementary work and servicing. The private operator must still ensure, however, that persons authorized to request the performance of maintenance, elementary work and servicing are aware of the applicable standards.*

For administrative reasons, a private operator may establish many company procedures. The intent of the training requirements under this Section is to address only those company procedures established in respect of the Lebanese Aviation Regulations (LARs). However, it is advisable that the operator also use this opportunity to incorporate any training requirements stemming from other national or provincial codes. These might include training in the handling of fuels and other dangerous goods, etc.

Minimum Equipment Lists often contain a requirement for a technical action ("M" procedure) as a condition of operation with a particular item of equipment inoperative. Where flight crew members are appropriately trained, they may perform the "M" procedure indicated in the MEL, provided that no disassembly and subsequent re-assembly of components is involved, that require a maintenance release.

s604.58 to s604.65 Reserved

DIVISION VII - PERSONNEL REQUIREMENTS

s604.66 Crew Member Qualifications

The standard for the pilot proficiency check referred to in Section 604.66 of the LARs is:

(1) The pilot proficiency check in an airplane shall be conducted in accordance with Schedule I;
(2) A pilot proficiency check shall be conducted in a manner that enables the pilot to demonstrate to a Directorate General of Civil Aviation Inspector or a Directorate General of Civil Aviation approved check pilot, the knowledge and the skill respecting:
- (a) the private operator's airplane, its systems and components;
- (b) proper control of airspeed, direction, altitude, attitude and configuration of the airplane, in accordance with normal, abnormal and emergency procedures and limitations set out in the airplane operating manual where applicable, the airplane flight manual, the private operator's standard operating procedures, the check list, and any other information relating to the operation of the airplane type; and
- (c) departure, enroute and arrival instrument procedures and other applicable procedures; and
- (d) Crew Resource Management principles, objectives and procedures.

(3) Each maneuver or procedure within a phase of flight specified in these standards, may be performed in a simulator approved by the Director General of Civil Aviation for use by a private operator. Simulators are approved by the Directorate General of Civil Aviation. Where there is no flight simulator for the type of airplane, the maneuvers shall be conducted in the airplane.
(4) A proficiency check of a pilot-in-command shall be completed in the seat normally occupied by the pilot-in-command and a check of a second-in-command shall be completed in the seat normally occupied by the second-in-command. The pilot proficiency check shall consist of a demonstration of both pilot flying (PF) duties and pilot not flying (PNF) duties.
(5) Each member of the crew shall demonstrate to the satisfaction of a Directorate General of Civil Aviation Inspector or a Directorate General of Civil Aviation approved check pilot, knowledge and skill in accordance with the following:
- (a) the crew's adherence to approved procedures;
- (b) the crew's communication, workload management, coordination and conflict resolution skills; and
- (c) the crew's problem solving and decision making abilities.

(6) Where a pilot successfully completes the full pilot proficiency check set forth in Schedule I the pilot successfully completes the flight check for the renewal of the applicable instrument rating.
(7) Where a private operator has been authorized airplane grouping for renewal pilot proficiency checks, the following standards shall apply:
- (a) the pilot shall have passed a pilot proficiency check within the preceding 12 months in one type of airplane in the grouping.
- (b) the pilot shall have completed the private operator's approved ground and flight training programs for each airplane type to be flown;
- (c) the pilot shall have successfully passed a written systems and limitations examination on each airplane type at least once per year and the said examination shall have been corrected by operator and reviewed with the pilot;
- (d) the pilot proficiency check shall be conducted by a Directorate General of Civil Aviation Inspector or Directorate General of Civil Aviation approved check pilot on the pilot in the airplane types authorized. A different type of airplane authorized and flown by the pilot shall be used for each successive pilot proficiency check;
- (e) a failure to pass the pilot proficiency check on the selected airplane type shall be considered to be a failure on all types in that airplane grouping;

(8) Each simulator used for training and/or checking shall be approved by the Directorate General of Civil Aviation in the operators training program approval process for each airplane type. Training and checking procedures not approved for the simulator shall be completed in the airplane.

Airplane Type Simulators

(9) The initial and recurrent PPC required by Section 604.66 of the LARs may be conducted in an approved flight simulator.
(10) For an initial PPC, the take-off and landing exercises shall be demonstrated in the airplane. An exception may be made for those who have previous experience on a similar type airplane. Similar airplane type refers to an airplane possessing the following relationship: turbo-jet to turbo-jet, turbo-prop to turbo-prop, or reciprocating engine to reciprocating engine. All checking shall be completed in a Level C flight simulator that duplicates the airplane type and model flown by the private operator.

s604.67 Reserved

s604.68 Validity Period - PPC and Training

(1) Where a crew member's training has expired for a period of 24 months or more that crew member shall, successfully complete an approved initial training program on the type of airplane.
(2) Where the flight crew member's pilot proficiency check has expired for a period of 24 months or more that flight crew member shall, following completion of the initial ground and flight training, successfully complete the initial pilot proficiency check on the type of airplane.

Recommended Practice: *Airplane Grouping for PPC Purposes:*

Although regulations require a PPC in each type of airplane the pilot is to fly, certain airplane groups have flight characteristics, systems and emergency procedures that are sufficiently similar to allow a single PPC to be valid for all types in that group. The following airplane groupings are provided for the guidance of those operators who may wish to include in their operations manual a provision for Pilot Proficiency Checks on only one aircraft type within a grouping, on an alternating basis:

AERO COMMANDER …………………………………	1121, 1123 and 1124
AERO COMMANDER …………………………………	600 Series Turbine
BEECH…………………………………………………….	90, A90, B90, C90, E90 and A100
BEECH…………………………………………………….	200, 300, 350, F90 and 1900
BEECH…………………………………………………….	400/MU3 Diamond
BEECH…………………………………………………….	B100
CESSNA ………………………………………………..	500, 501, 550, 551 and 560
CESSNA ………………………………………………..	All models 650
CANADAIR CHALLENGER…………………………….	All models 600, 601, 604 and RJ
DASSAULT-BREGUET MYSTERE …………………..	All models Falcon 10, 20 and 21
DASSAULT-BREGUET MYSTERE …………………..	All models Falcon 50 and 90
DE HAVILLAND DASH 8 …………………………….	All models
DE HAVILLAND DH125 …………………………….	All models
DOUGLAS DAKOTA …………………………………	All models DC3
FAIRCHILD FRIENDSHIP …………………………….	All models F27 and F227
GRUMMAN GULFSTREAM…………………………….	G2(DC), G3(DC)
LEAR …………………………………………………….	23, 24 and 25
LEAR …………………………………………………….	35, 36, 55, 31 and 60
LOCKHEED JETSTAR …………………………………	L359
NORTH AMERICAN SABRELINER …………………..	All models 40, 60 and 75
PIPER CHEYENNE …………………………………...	I, II and III
PIPER CHEYENNE …………………………………...	IV
ROCKWELL INTERNATIONAL – MITCHELL …….	B25, B26

s604.69 to s604.72 Reserved

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DIVISION VIII - TRAINING

s604.73 Training Programs

(1) This Section outlines the standards for training programs referred to in Section 604.73 of the LARs, as applicable to a private operator's type of operation. Private operators shall submit a training program for pilot training on the appropriate airplane or a the Directorate General of Civil Aviation approved simulator.

(2) The standard for training programs, training facilities and for instructors of ground training programs is:

1. TRAINING FACILITIES

Training facilities shall have an environment conducive to learning and take into consideration, privacy, furnishings, audio visual requirements and current training aids.

2. INSTRUCTOR, GROUND TRAINING

A ground training instructor shall have successfully completed a program covering but not restricted to, the teaching/learning process, instructional technique, and student/instructor relationship.

3. CREW TRAINING ON A CONTRACT BASIS

A private operator may contract crew member training to another organization in accordance with the following:

(a) the training organization shall use the manuals, publications, check lists and other relevant documents used by the private operator receiving the training;
(b) airplane training shall be given on the same type and model as that used by the operator`; and
(c) the private operator is responsible to ensure that the contracted training is conducted in accordance with a Directorate General of Civil Aviation approved program.

4. AIRPLANE GROUND TRAINING

(1) This training is to ensure that each flight crew member is knowledgeable with respect to airplane systems and all normal, abnormal, and emergency procedures. The following subjects shall be included:

(a) airplane systems operation and limitations as contained in the airplane flight manual and airplane operating manual and standard operating procedures;
(b) operation of all the airplane equipment;
(c) differences in equipment, operation, and layout between airplanes of the same type if applicable;
(d) standard operating procedures for normal, abnormal and emergency procedures for the airplane;
(e) airplane performance and limitations;
(f) weight and balance system procedures;
(g) airplane servicing and ground handling.

(2) For all turbo-jet-airplanes the use of an approved flight simulator in the training program is necessary unless the operator can demonstrate that the proficiency objectives can be otherwise met. When assessing the Private Operator's Training Program, consideration will be given to personnel experience, aircraft operating experience and aircraft flight characteristics.

5. SIMULATOR TRAINING PROGRAM FOR PILOTS

A private operator with an approved program using an approved Level C or higher simulator is permitted to conduct initial and upgrade training in the simulator. All recurrent and 6 month take-off and landing day/night currency requirements to carry passengers may be carried out in this level simulator. Simulators are approved in accordance with standards set forth by the Minister.

6. CONTENT OF FLIGHT SIMULATOR TRAINING PROGRAM

Flight simulator programs require the following subjects to be covered as contained in the Airplane Flight Manual and the Airplane Operating Manual used by the private operator.

(a) procedures for normal, abnormal and emergency operation of the airplane systems and components including:
- (i) use of airplane checklists;
- (ii) flight and cabin crew cooperation, command and coordination;
- (iii) airplane fire on the ground and while airborne;
- (iv) engine fire or failure;
- (v) effects of engine icing and anti-ice operation;
- (vi) take-off, landing and flight with critical engine inoperative including driftdown and engine inoperative performance capabilities;
- (vii) loss of pressurization and emergency decent (as applicable);
- (viii) flight control failures and degraded states of operation;
- (ix) hydraulic, electrical and other system failures;
- (x) failure of navigation and communication equipment;
- (xi) pilot incapacitation during take-off, landing and in-flight;
- (xii) approach to the stall (ground contact imminent and ground contact not a factor) (as applicable);
- (xiii) normal and abnormal flight characteristics applicable to the aircraft type. These may include such items as: dutch roll, buffet boundary onset, jet upset, steep turns, etc.;
- (xiv) airplane performance for climb, cruise, holding, descent, landing and diversion;
- (xv) normal, noise abatement and maximum performance take-off;
- (xvi) aircraft performance calculations, including take-off and landing speeds, weight and balance and center of gravity;
- (xvii) rejected take-off procedures and rejected landings;
- (xviii) passenger and crew evacuation; and
- (xix) FMCS, GPWS, TCAS, and other specialized airplane equipment as applicable;

(b) Flight planning and instrument flight procedures.
- (i) departure, enroute, holding, arrival and in-flight diversion;
- (ii) precision, non-precision, and as applicable circling approaches, and missed approaches in minimum visibility conditions;
- (iii) precision, non-precision, and, as applicable, circling approaches, and missed approaches using automatic, flight director and degraded states of operation; and
- (iv) Category II and Category III approaches, as applicable;
- (v) testing and reviews.

7. FLIGHT SIMULATOR ONLY

(1) A private operator utilizing an approved Level C flight simulator is permitted zero flight time training for candidates with previous experience on a similar airplane type. Similar airplane type refers to an airplane possessing the following relationship: turbo-jet to turbo-jet, turbo-prop to turbo-prop, or reciprocating engine to reciprocating engine. All training and checking shall be completed in

a Level C flight simulator that duplicates the airplane type and model flown by the private operator. Where the private operator flies different models of the same type, provided the differences are limited and adequate differences training is provided, one type flight simulator shall be approved for training and checking on all the models.

(2) Where the flight simulator has differences in performance, systems, or cockpit layout and configuration, from a private operator's airplane, such differences are to be listed in the syllabus and additional training on these differences may be required on the private operator's airplane model.

(3) In addition to the training required in para Flight Simulator Only, the items specified below shall also be included:

- (a) maneuvering of the airplane on the ground;
- (b) crosswind take-off and landings to 100% of the certificated crosswind component;
- (c) contaminated runway and crosswind take-off and landings to published demonstrated crosswind component (as applicable);
- (d) a mix of no electronic aids, day, night and dusk visual circuits, approaches and landings. A visual flight training program in the flight simulator is required to ensure visual flight skills are developed in the airplane type. The training must be a minimum of 4 hours per crew. The training shall cover the following using both day and night scenarios where the flight simulator capability permits:
  - (i) normal and crosswind take-offs, visual circuits and landings with variable winds, runway illusion and surface conditions;
  - (ii) engine inoperative approaches and landings;
  - (iii) engine failure procedures during take-off and missed approach;
  - (iv) no electronic aids approaches and landings; and
  - (v) approach and landings with degraded flight controls (as applicable).

(4) A private operator using an approved Level D flight simulator is permitted zero flight time training for candidates without previous airplane experience in a similar type airplane. To qualify, an pilot must hold a Type Endorsement for an aircraft requiring two pilots and have 1,000 hours pilot flight time.

(5) For pilots who do not qualify, training in the airplane is required as in para Flight Simulator Only. For flight simulators that have minor differences in performance, systems, or cockpit layout and configuration from the private operator's airplane, additional training on these differences shall be provided in the airplane.

8. EMERGENCY PROCEDURES TRAINING FOR PILOTS

This training is required annually and shall include instruction on the location and operation of all emergency equipment. During initial training and every two years thereafter, flight crew members shall perform the function or action, or obtain a suitable demonstration by other means eg audio visual, for the following:

- (a) fire in the air and on the ground;
- (b) use of fire extinguishers;
- (c) operation and use of emergency exits;
- (d) passenger preparation for an emergency landing/ditching;
- (e) emergency evacuation procedures;
- (f) donning and inflation of life preservers (when equipped);
- (g) removal from stowage, deployment, inflation and boarding of life rafts (when equipped);
- (h) pilot incapacitation;
- (i) hijacking, bomb threat and other security procedures;
- (j) special emergency procedures when the airplane is used on Medical Evacuation (MEDEVAC) operations including patient evacuation in emergency situations.

9. AIRPLANE ONLY FLIGHT TRAINING PROGRAM

(1) Where training has not been conducted in a approved simulator, the following flight training is required, as applicable.
(2) Procedures for normal, abnormal and emergency operation of airplane systems and components including:
- (a) use of airplane checklists;
- (b) maneuvering of the airplane on the ground;
- (c) crew cooperation, command and coordination;
- (d) simulated airplane fire on the ground and while airborne;
- (e) simulated engine fire or failure;
- (f) briefings on effects of airframe and engine icing and anti-ice operation;
- (g) take-off, landing and simulated flight with critical and two engine inoperative flight (3 and 4 engine airplanes) including driftdown and engine(s) inoperative performance capabilities;
- (h) simulated loss of pressurization and emergency descent (as applicable);
- (i) simulated flight control failures and degraded states of operation, while in-flight, and during take-off and landing (as applicable);
- (j) simulated hydraulic, electrical and other system failures;
- (k) operation and simulated failure of navigation and communication equipment;
- (l) briefing on pilot incapacitation during take-off, landing and in-flight;
- (m) briefing for recognition and recovery from turbulence and windshear on approach, landing and take-off;
- (n) normal and abnormal flight characteristics applicable to the aircraft type. These may include such items as: dutch roll, buffet boundary onset, jet upset, steep turns, etc.;
- (o) airplane performance for climb, cruise, descent, landing and diversion;
- (p) normal, noise abatement and maximum performance take-off and landing;
- (q) crosswind take-off and landings, and briefing on simulated contaminated runway take-off and landings;
- (r) aircraft performance calculations, including take-off and landing speeds, weight and balance and center of gravity;
- (s) simulated rejected take-offs and landings;
- (t) passenger and crew emergency evacuation;
- (u) FMCS, GPWS, TCAS, and other specialized airplane equipment (as applicable);

10. HIGH ALTITUDE TRAINING

High altitude (HAI) training is required annually for all flight crew members operating airplanes above 13,000 feet ASL and shall cover at least the following:
- (a) physiological phenomena in a low pressure environment, including:
  - (i) respiration;
  - (ii) hypoxia;
  - (iii) duration of consciousness at altitude without supplemental oxygen; and
  - (iv) gas expansion and gas bubble formation;
- (b) physiological phenomena associated with rapid or explosive loss of pressurization including:
  - (i) most likely causes;
  - (ii) noise;
  - (iii) cabin temperature change;
  - (iv) cabin fogging;
  - (v) effects on objects located near the point of fuselage failure; and
  - (vi) actions of flight crew members immediately following the event and the likely resultant attitude.

11. NORTH ATLANTIC MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (NAT MNPS)

(1) To qualify for certification, flight crew shall have completed the appropriate training and have satisfactorily completed an in-flight check conducted by a Directorate General of Civil Aviation qualified inspector (type rated).
(2) Training shall be given in the following areas as applicable:
- (a) normal operating procedures, including navigation system pre-flight data entry and periodic cross-checking of system position display against airplane position;
- (b) method of monitoring and cross-checking the system that is coupled to the auto-pilot;
- (c) action in the event of discrepancy between systems, method of determining which is the most accurate or reliable system;
- (d) NAT MNPS contingency procedures;
- (e) action in the event of single or multiple systems failure;
- (f) procedure for manual updating of systems;
- (g) airborne emergency procedures, including re-alignment (if applicable);
- (h) procedure for regaining track after deliberate or accidental deviation from cleared track; and
- (i) equipment monitoring requirements and flight procedures for Reduced Vertical Separation Minima (RVSM).

12. CATEGORY II/III OPERATIONS

The standards for the training and conduct of Category II operations are contained in Part VI, Subpart 2, Section 602.131 of the LARs.

13. LOWER THAN STANDARD TAKE-OFF WEATHER MINIMA (RVR 1200 FEET 1/4 SM AND RVR 600 FEET) FOR PILOTS

(1) Ground Training
- (a) take-off alternate requirements;
- (b) pilot-in-command minimum experience;
- (c) pilot-in-command responsibility for visibility and obstacle clearance requirements; and
- (d) minimum airplane and runway equipment requirements;

(2) Flight Simulator Training (RVR 600 feet [175 m] only)
- (a) one completed take-off at RVR 600 feet [175 m];
- (b) one rejected take-off at RVR 600 feet [175 m] that will include an engine failure;

(3) The above training is required for the pilot-in-command only, except, if the operator authorizes in the operations manual, the second-in-command to conduct take-offs in lower than standard weather minima, the second-in-command shall undergo the same training as the pilot-in-command.

14. UPGRADE TRAINING FOR PILOTS

Upgrade training to pilot-in-command for pilots who have qualified and served as a second-in-command on that airplane type shall include the following:
- (a) command and decision making;
- (b) train and demonstrate proficiency as a pilot-in-command in all areas of airplane handling and operation as outlined in the in the initial course; and
- (c) special authorization qualification (e.g. lower take-off limits, etc.).

15. ENGINE OUT TAKE-OFF AND FERRY

Where a private operator wishes to obtain authority for engine-out ferry, the training as specified in the manufacturers aircraft operating manual shall be completed in the simulator prior to making application for a special flight authority.

16. TRANSPORTABILITY OF PILOT PROFICIENCY CHECK - TRAINING

Transportability of Pilot Proficiency Checks from one operator to another is permitted subject to written approval by the Directorate General of Civil Aviation and the new operator providing the following training which shall be specified in the approved Operations Manual.:

- (a) company Operations Manual;
- (b) emergency procedures on each type of airplane the pilot is assigned to fly;
- (c) pilot ground training on each type of airplane the pilot is assigned, sufficient to cover the operator procedures, equipment differences and special authorizations.

17. AIRCRAFT SURFACE CONTAMINATION TRAINING

Private operator personnel shall receive training in the following areas:

- (a) initial de-icing/anti-icing, Operations Personnel Training including;
  - (i) the effect of contamination on a critical surface;
  - (ii) airplane de-icing/anti-icing procedures; and
  - (iii) airplane inspection procedures;
- (b) recurrent de-icing/anti-icing; Operational Procedures training on annual basis;
- (c) initial de-icing/anti-icing, ground/maintenance personnel training; including:
  - (i) the effect of contamination on critical surfaces;
  - (ii) airplane de-icing/anti-icing procedures; and
  - (iii) airplane inspection procedures;
- (d) recurrent de-icing/anti-icing ground maintenance procedures training on an annual basis.

18. CARRIAGE OF DANGEROUS GOODS AND MAGNETIZED MATERIAL TRAINING (IF APPLICABLE)

If the Private Operator is engaged in the carriage of cargo pursuant to the Transportation of Dangerous Goods Regulations, the training program required by Section 604.73 of the LARs shall cover at least:

- (a) general philosophy;
- (b) labeling and marking;
- (c) pilot's notification;
- (d) emergency procedures;
- (e) compatibility of carriage; and
- (f) loading procedures.

19. FLIGHT DISPATCHER SPECIFIC TRAINING (AS APPLICABLE)

(1) Where a private operator chooses to use an Operational Control System (OCS) that requires a dispatcher, the person(s) assigned these duties shall receive training in accordance with the dispatcher training program as detailed in the Commercial Air Service Standard for Commuter Operations.

(2) This standard shall apply only to the training of flight dispatchers who will exercise operational control within an approved full co-authority dispatch system.

20. PERSONS ASSIGNED ONBOARD DUTIES

Where a private operator has assigned on board duties to a non-flight crew member, that person shall be given adequate initial and annual training to perform the procedures relevant to the duties with which the person is to be involved including, as applicable:

(a) authority of the pilot-in-command;
(b) means of communication;
(c) a general description of the airplane in which the person is to serve and the proper use of cabin installed systems controls;
(d) procedures for the handling of normal, abnormal, and emergency situations including:
  (i) safe movement in the vicinity of the airplane and safe movement to and from the airplane;
  (ii) briefing of passengers;
  (iii) handling of passengers;
  (iv) securing of cabin;
  (v) location, operation and use of emergency, life saving and survival equipment carried, including practical training;
  (vi) fire fighting, including practical training;
  (vii) decompression;
  (viii) location, operation and use of emergency exits, including practical training;
  (ix) passenger preparation for an emergency landing or ditching, including practical training;
  (x) evacuation, including practical training; and
(e) knowledge of the relationship of the procedures with respect to those of the other crew members.

Recommended Practice: *Where the persons referred to above are flight attendants, it is recommended that the training for those persons be in accordance with the Commercial Air Services Standards.*

21. INSTRUMENT APPROACHES - GLOBAL POSITIONING SYSTEM (GPS)

(1) General Training
(a) to qualify for approval to conduct GPS approaches in IFR, an air operator shall have a flight crew training program approved by the Minister. Flight crew shall have completed the appropriate training prior to conducting GPS approaches.
(b) where pilots are required to use more than one type of GPS for approach, an air operator shall ensure the training program addresses the differences between the units, unless the units have been determined by the Minister to be sufficiently similar.
(c) an air operator shall ensure the ground training includes "hands on" training using a desk top simulator, a computer based simulation of the unit to be used, a static in-aircraft unit, or other ground training devices acceptable to the Minister.

(2) Ground Training - Non-integrated Receivers (Panel Mount GPS Receivers). An air operator shall ensure that the training program candidates are trained to proficiency in each of the elements associated with the following areas:
(a) knowledge with respect to the following:
  (i) the GPS system, including:
    A. GPS system components and aircraft equipment;
    B. the composition of satellite constellation;
    C. the minimum number of satellites required for 2-D and 3-D navigation;
    D. the basic concept of satellite ranging;

E. factors affecting the accuracy of GPS signals; and
F. the World Geodetic Survey 1984 (WGS 84) datum and the effect of using any other datum;

(ii) human factors applicable to the use of GPS and how errors may be reduced or eliminated;
(iii) company standard operating procedures for the use of GPS; and
(iv) procedures for reporting GPS problems and database errors.

(b) ability to perform the following operational tasks:
(i) select appropriate operational modes;
(ii) recall categories of information contained in the database;
(iii) predict RAIM availability;
(iv) enter and verify user defined waypoints;
(v) recall and verify database waypoints;
(vi) interpret typical GPS navigational displays including latitude/longitude, distance and bearing to waypoint, course deviation indication (CDI), desired track (DTK), track made good (TMG), actual track (TK), cross track error and any other information appropriate for the equipment used;
(vii) intercept and maintain GPS defined tracks;
(viii) determine navigation information appropriate for the conduct of the flight including ground speed (GS), estimated time of arrival (ETA) for next waypoint and destination;
(ix) indications of waypoint passage;
(x) use of 'direct to' function;
(xi) link en-route portion of GPS flight plan to approach;
(xii) conduct SIDs, STARs, terminal area procedures and holds;
(xiii) retrieve, verify and conduct GPS stand alone approaches; and
(xiv) conduct GPS missed approaches.

(c) ability to conduct the following operational and serviceability checks:
(i) database currency and area of operation;
(ii) receiver serviceability;
(iii) RAIM status;
(iv) CDI sensitivity;
(v) position indication; and
(vi) number of satellites acquired and, if available, satellite position information.

(d) ability to recognize and take appropriate action for all GPS warning and messages including, where applicable:
(i) "loss of RAIM";
(ii) "2D navigation";
(iii) "In Dead Reckoning Mode";
(iv) "data base out of date";
(v) "GPS fail";
(vi) "barometric input fail";
(vii) "power/battery low or fail";
(viii) "parallel offset on"; and
(ix) "satellite fail".

(3) Ground Training - Integrated Receivers (Flight Management Systems). An air operator shall ensure that he training program candidates are trained to proficiency in each of the elements associated with the following areas:

(a) knowledge with the respect to following:
(i) the GPS system and theory of operation, including:
A. GPS system components and aircraft equipment;
B. the composition of satellite constellation;
C. the minimum number of satellites required for 2-D and 3-D navigation;

D. the basic concept of satellite ranging;
E. factors affecting the accuracy of GPS signals;
F. the WGS84 datum and the effect of using any other datum;

(ii) human factors applicable to the use of GPS and how errors may be reduced or eliminated (ie. maintaining situational awareness); and

(b) ability to perform the following operational tasks:
(i) predict RAIM availability;
(ii) link enroute portion of GPS flight plan to approach;
(iii) conduct GPS stand alone approaches; and
(iv) conduct GPS missed approaches.

(c) ability to conduct the following operational and serviceability checks:
(i) RAIM status;
(ii) CDI sensitivity;
(iii) number of satellites acquired and, if available, satellite position information;

(d) ability to recognize and take appropriate action for all GPS warning and messages including, where applicable:
(i) "loss of RAIM";
(ii) "2D navigation";
(iii) "GPS fail";
(iv) "barometric input fail"; and
(v) "satellite fail".

(4) Flight Training

(a) pilots shall complete flight training in the use of GPS for approach and other associated duties for each crew position they are authorized to occupy. Flight training may be completed in an aircraft, or in a level A or higher simulator that is equipped with the same model of GPS receiver (or a model determined by the Minister to be sufficiently similar) that is installed in company aircraft.

(b) flight training shall be conducted by a designated training pilot who has completed the approved company ground training program approved by the Minister, and demonstrated proficiency in the use of the model of GPS (or a model determined by the Minister to be sufficiently similar) or to an approved check pilot.

s604.74 to s604.79 Reserved

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DIVISION IX - MANUALS

s604.80 Contents of an Operations Manual

The Operations Manual shall contain at least the following as applicable;

(a) a table of contents;
(b) amendment control page and list of effective pages;
(c) duties, responsibilities and succession;
  (i) of the chief pilot,
  (ii) of the operations manager,
  (iii) of the person responsible for aircraft maintenance,
  (iv) of the flight crew members (by individual position), and
  (v) of the flight attendants;
(d) qualifications and training;
  (i) flight crew licenses and ratings,
  (ii) flight crew qualifications and competency,
  (iii) flight attendant qualifications and competency,
  (iv) initial and recurrent crew member training,
  (v) emergency procedures training,
  (vi) flight simulator training, and
  (vii) airplane critical surface contamination;
(e) weather limitations;
  (i) severe weather,
  (ii) windshear, and
  (iii) icing;
(f) flight control;
  (iii) dispatch and control,
  (iv) reporting airplanes overdue,
  (v) closing flight plans/flight itineraries, and
  (vi) dangerous goods;
(g) operations;
(h) aerodrome standards,
  (iii) airplane performance requirements,
  (iv) communications,
  (v) navigation,
  (vi) uncontrolled airspace,
  (vii) flights over water,
  (viii) mountainous areas,
  (ix) take-off and landing minima (IFR/VFR),
  (x) crew co-ordination (for each airplane type), and
  (xi) carriage of passengers or passengers and cargo,
  (xii) alternate aerodrome requirements,
  (xiii) company approaches,
  (xiv) crew scheduling (if applicable),
  (xv) minimum crew complement and single pilot operation;
  (xvi) flight and duty time limitations;
(i) emergency operation;
  (i) declaration of emergency,
  (ii) declaration of termination of emergency,
  (iii) use of transponder/radar assistance, and
  (iv) emergency procedures (including evacuation procedures);

(j) accidents/incidents;
   (i) reporting, and
   (ii) continuation of flight after accident/incident;
(k) records;
   (i) crew member (training/qualifications), and
   (ii) routes and flight time; and
(l) a description of the maintenance control system required pursuant to Section 604.49 of the LARs.

s604.81 to s604.82 Reserved

s604.83 Aircraft Operating Manual

An airplane operating manual shall consist of the following:
(a) table of contents;
(b) list of effective pages;
(c) amending procedures;
(d) preamble;
(e) identification of the airplane by the type and registration it is applicable to; and
(f) airplane operating procedures and limitations that are not less restrictive than those contained in the airplane flight manual and LARs as amended.

s604.84 Standard Operating Procedures

(1) The Standard Operating Procedures Manual (SOP) shall contain the following information for each type of airplane operated. Where there is significant differences in equipment and procedures between airplanes of the same type operated, the Standard Operating Procedures Manual (SOP) shall show the registration mark of the airplane, it is applicable to.
(2) A private operator may choose to use standard operating procedures and the development and use of SOP's is strongly recommended. However, where used, it is recommended that the following procedures be included in the SOP document:
(a) table of contents;
(b) list of effective pages;
(c) amending procedure;
(d) communications;
(e) crew coordination;
(f) use of check lists;
(g) standard briefings;
(h) standard calls;
(i) battery/APU engine starts;
(j) taxi;
(k) rejected take-off;
(l) take-off and climb;
(m) cruise;
(n) descent;
(o) instrument approach procedures and circling, arrival and departure procedures at controlled/uncontrolled airports;
(p) landing;
(q) missed approaches and balked landing procedures;
(r) stall recovery;
(s) refueling with passengers onboard; and
(t) use of onboard navigation and alerting aids;

Emergencies

(a) pilot incapacitation; (2 pilot crew);
(b) bomb threat and hijacking;
(c) engine fire/failure/shutdown;
(d) fire, internal/external;
(e) smoke removal;
(f) rapid decompression;
(g) flapless approach and landing; and
(h) check lists.

(3) Airborne Training Considerations

Safe Training and Checking Practices

(a) to preserve the highest degree of safety during training or checking, those conducting such exercises are to ensure that candidates are completely briefed on all aspects of the flight. No precipitate or unbriefed engine shutdowns are permitted. The check or training pilot shall state the exercise required. i.e., "engine fire drill". The pilots under training or being checked shall complete the check in accordance with published Flight Manual Procedures and Aircraft Operating Manual. The left seat pilot will primarily fly the aircraft and delegate duties to the right seat pilot. The right seat pilot will action the memory items then using the emergency (written) check list, complete the remainder of the check. Emergency procedures requiring the closing of a throttle, condition lever, mixture control, feathering of a propeller or shutting down of any major system must be confirmed by both pilots before the lever or switch is moved.
(b) in the single pilot aircraft, the candidate must initiate and perform the procedure and maintain control of the aircraft. The lack of an independent source of confirmation requires emphasis on the completion of checks in a timely but deliberate manner.
(c) actuation of fire "T" handles, fuel firewall shutoff valves, fuel/oil shutoffs, are to be "simulated" only.
(d) multiple emergencies, except those which follow logically from the first malfunction, shall not be completed at the same time.
(e) safe training practices for each aircraft type shall be detailed in the Company Operations Manual.
(f) when carrying out touch and go landings, the captain shall ensure that sufficient runway remains for a safe take-off.
(g) it is not possible to compile safe training practices for all emergency procedures. Training sequences not specified may be conducted by training or check pilots. Common sense is essential in the preservation of flight safety.

Schedule I - Pilot Proficiency Check - Table of Requirements

When a candidate is combining an instrument flight test with a PPC, all items required for the satisfactory assessment of the instrument portion as set forth in the Flight Test Examiner's Guide.

The mandatory items presented below must be satisfactorily assessed in order to constitute the completion of a PPC.

1. PILOT KNOWLEDGE OF EQUIPMENT EXAMINATION

(a) the completion of a practical oral equipment examination meeting the requirements of Section (b);
(b) an equipment examination shall be closely co-ordinated and related to the flight procedures portion of the PPC and shall cover:
    (i) subjects requiring a practical knowledge of the airplane, its powerplants, systems, components, and its operational and performance factors;
    (ii) normal, abnormal and emergency procedures, and the operations limitations relating thereto, and
    (iii) the appropriate provisions of the approved Aircraft Flight Manual.

2. AIRPLANE INSPECTION

The pre-flight inspection shall include:
(a) a visual inspection of the exterior and interior of the airplane, and
(b) the use of the pre-start check list, appropriate control system checks, starting procedures and checks of all radio and electronic equipment.

3. TAXIING

This maneuver includes taxiing (in the case of a second-in-command PPC, to the extent practical from the second-in-command crew position), sailing or docking procedures in compliance with instructions issued by the appropriate traffic control authority or by a Directorate General of Civil Aviation Inspector or a Directorate General of Civil Aviation approved check pilot.

4. POWERPLANT CHECKS

Powerplant checks will be conducted as appropriate to the airplane type.

5. NORMAL TAKE-OFF

One take-off to be performed as follows: taxi the airplane into position on the runway to be used for departure, take-off and fly the airplane in the climbing configuration until the landing gear and flaps are fully retracted or to the point where an altitude of 1500 feet above the airport elevation is reached, whichever occurs first.

6. CROSSWIND TAKE-OFF

One crosswind take-off if practicable under the existing meteorological, airport and traffic conditions.

7. SIMULATED POWERPLANT FAILURE ON TAKE-OFF

One take-off with a simulated failure of the critical engine:

(a) in an approved airplane type simulator:
   (i) at a point after V1 and before V2 that in the judgement of the check pilot is appropriate to the airplane type; or
   (ii) at a point as close as possible after V1 when V1 and V2 or V1 and Vr are identical; or
(b) in an airplane in flight, at a safe altitude, at an airspeed not less than V2 + 10 as is appropriate to the airplane type under the prevailing conditions.

8. REJECTED TAKE-OFF

One rejected take-off to be performed:
(a) in an approved airplane type simulator with an approved visual system; or
(b) aurally in an airplane prior to the first take-off.

9. APPROACHES TO STALLS (REQUIRED ON AN INITIAL PPC ONLY)

For the purpose of this procedure the required approach to a stall is reached when there is a perceptible buffet or other response to the initial stall entry, and except as provided below there shall be at least three approaches to stalls, one of which shall be performed while in a turn with a bank angle of between 15 and 30 degrees including:
(a) one in the take-off configuration (except where a zero-flap take-off configuration is normally used in that type and model of airplane);
(b) one in a clean configuration; and
(c) one in a landing configuration.

10. INSTRUMENT PROCEDURES

Instrument procedures will consist of IFR pre-flight preparation, departure and enroute procedures, terminal procedures and system malfunctions as follows:
(a) an area departure and an area arrival procedure shall be performed where the pilot:
   (i) adheres to actual or simulated air traffic control clearances and instructions; and
   (ii) properly uses the available navigation facilities;
(b) a holding procedure, which may be combined with an area arrival or area departure procedure and includes entry to, maintenance of and leaving a holding pattern;
(c) at least two instrument approaches (one asymmetric) performed in accordance with procedures and limitations in the Jeppesen Manual or approved company approach procedure for the approach facility used and where practicable one of the approaches shall be a precision approach;
(d) circling approach, except where prohibited in the private operators manual and or local conditions beyond the control of the pilot prevent a circling approach from being performed.

11. SPECIFIC FLIGHT CHARACTERISTICS (REQUIRED ON AN INITIAL PPC ONLY)

Recovery from specific flight characteristics that are peculiar to the airplane type and which do not exceed the normal flight envelope of the airplane type may be demonstrated.

12. ENGINE FAILURES

In addition to the specific requirements for maneuvers with simulated engine failure, the check pilot may cause a simulated engine failure at any time during the check consistent with established safety procedures. For the purposes of this proficiency check, at least two simulated engine failures, are conducted as follows:

(a) one simulated failure of critical engine, to be completed at altitude while the airplane is in the normal take-off configuration and at a speed of not less than the take-off safety speed (V2) or more than V2 plus 10 knots; and
(b) one landing and maneuvering to that landing with simulated failure of the critical engine.

13. NORMAL LANDING

One normal landing.

14. CROSSWIND LANDING

One crosswind landing, if practical under existing meteorological, airport and traffic conditions.

15. LANDING WITH SIMULATED ENGINE FAILURE

One landing and maneuvering to that landing with simulated failure of 50% of the available engines and the simulated loss of power shall be on one side of the airplane, except that:
(a) the simulated loss of power shall be on one outboard engine on three-engine airplanes;
(b) in the case of turbo-jet airplanes, the following may be substituted;
 (i) in the case of a four-engine turbo-jet airplane, maneuvering to a landing with simulated failure of the critical engine and performance of the maneuver either in an approved simulator or simulated in flight at altitude, with simulated failure to 50% of available engines, and
 (ii) in the case of a three engine turbojet airplane, maneuvering to a landing using an approved procedure that approximates the loss of two engines at a safe altitude.

16. REJECTED LANDING

One rejected landing that includes a normal missed approach procedure after the landing is rejected, and for the purpose of this maneuver the landing shall be rejected at a height not lower than 50 feet AGL.

17. COMBINATION LANDINGS

More than one type may be combined where appropriate.

18. NORMAL AND ABNORMAL PROCEDURES

A qualifying pilot shall demonstrate that proper use of as many of the systems and devices listed below and other systems, devices or aids available as the approved check pilot deems necessary to determine that the pilot has practical knowledge of the use of the systems and devices (appropriate to the airplane type);
(a) anti-icing and de-icing systems;
(b) auto-pilot systems;
(c) automatic or other approach aid systems;
(d) stall warning and avoidance devices, stability augmentation devices;
(e) airborne radar devices; and
(f) Flight Management Systems (FMS)

19. EMERGENCY PROCEDURES

(a) A pilot shall demonstrate as many of the emergency procedures outlined in the appropriate approved Aircraft Flight Manual and as many of the emergency procedures for the following emergency situations as in the opinion of the Directorate General of Civil Aviation Inspector or Directorate General of Civil Aviation approved check pilot are necessary to determinate that the pilot has an adequate knowledge of and ability to perform such procedures including:
   (i) fire in flight,
   (ii) smoke control,
   (iii) rapid decompression,
   (iv) emergency descent,
   (v) hydraulic and electrical system failures and malfunctions,
   (vi) landing gear and flap systems failure and malfunctions, and
   (vii) failure of navigation or communication equipment;

Emergency descents and hydraulic and electrical system failures and malfunctions may be simulated in an appropriate systems trainer, approved by the Director General of Civil Aviation for that purpose.

Emergency procedures may be performed in an approved appropriate airplane type simulator if the Director General of Civil Aviation is of the opinion that the pilot's competency can be adequately determined.

20. PERFORMANCE CRITERIA

When performing any of the procedures, a pilot shall demonstrate judgement commensurate with a high level of safety, and, in determining whether the pilot has shown such judgement, a Directorate General of Civil Inspector or Directorate General of Civil Aviation approved check pilot shall consider:

(a) the pilot's adherence to approved procedures;
(b) the pilot's actions in situations requiring a decision based on the pilot's analysis where there is no prescribed procedures or recommended practice;
(c) the pilot's qualities of airmanship in selecting a course of action; and
(d) the crew co-ordination when operating in the multi-crew concept.

Information Note: *A PPC for IFR flight operations on aircraft other than the primary type shall consist of IFR and VFR exercises. The demonstrated IFR exercises shall be at the discretion of the Director General of Civil Aviation, but will consist of a minimum of one instrument approach. This procedure is acceptable if the full PPC/IFT is conducted the following year on the alternate aircraft type.*

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REPUBLIC OF LEBANON
MINISTRY OF TRANSPORT
DIRECTORATE GENERAL OF CIVIL AVIATION

LARs

LEBANESE AVIATION REGULATIONS

Part VI
General Operating and Flight Rules

Subpart 5
Aircraft Requirements

***** Revision No. 1 *****
International Civil Aviation Organization
Richard B. Fauquier

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LEBANESE AVIATION REGULATIONS (LARs)

Part VI – General Operating and Flight Rules

Subpart 5 – Aircraft Requirements

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Subpart 5 – Aircraft Requirements

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Subpart 5 - Aircraft Requirements

605.01 Application

(1) This Subpart applies to
- (a) persons operating Lebanese aircraft other than ultra-light airplanes or hang gliders; and
- (b) persons operating foreign aircraft in Lebanon where those persons are Lebanese citizens, permanent residents or corporations incorporated by or under the laws of Lebanon.

(2) The following requirements apply to persons operating foreign aircraft, other than persons referred to in Subsection (1)(b), of this Subpart while those aircraft are operated in Lebanon:
- (a) the requirement to carry a flight authority on board the aircraft in accordance with Section 605.03 of the Lebanese Aviation Regulations (LARs);
- (b) the requirement that an aircraft be equipped with transponder and automatic pressure-altitude reporting equipment in accordance with Section 605.35 of the LARs;
- (c) the requirement that an aircraft be equipped with one or more ELTs in accordance with Section 605.38 of the LARs; and
- (d) radio communication and radio navigation equipment requirements that are specific to the aircraft and types of flight referred to in Sections 605.14 to 605.21 of the LARs.

605.02 Reserved

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Division I - Aircraft Requirements - General

605.03 Flight Authority

(1) No person shall operate an aircraft in flight unless
- (a) a flight authority is in effect in respect of the aircraft;
- (b) the aircraft is operated in accordance with the conditions set out in the flight authority; and
- (c) subject to Subsections (2) and (3), the flight authority is carried on board the aircraft.

(2) Where a specific-purpose flight permit has been issued pursuant to Section 525.04 of the LARs, an aircraft may be operated without the flight authority carried on board where
- (a) an entry is made into the journey log indicating
  - (i) that the aircraft is operating under a specific-purpose flight permit, and
  - (ii) where applicable, any operational conditions that pertain to flight operations under the specific-purpose flight permit.

(3) A balloon may be operated without the flight authority carried on board where the flight authority is immediately available to the pilot-in-command
- (a) prior to commencing a flight; and
- (b) on completion of the flight.

605.04 Availability of Aircraft Flight Manual

(1) No person shall conduct a take-off in an aircraft for which an aircraft flight manual is required by the applicable standards of airworthiness, unless the aircraft flight manual or, where established pursuant to Section 604.83 or Part VII of the LARs, the aircraft operating manual is available to the flight crew members at their duty stations.
(2) The aircraft flight manual or, where an aircraft operating manual is established pursuant to Section 604.83 or Part VII of the LARs, those parts of the aircraft flight manual that are incorporated into the aircraft operating manual shall include all of the amendments and supplementary material that are applicable to the aircraft type.

605.05 Markings and Placards

No person shall conduct a take-off in an aircraft in respect of which markings or placards are required by the applicable standards of airworthiness unless the markings or placards are affixed to the aircraft or attached to a component of the aircraft in accordance with those standards.

605.06 Aircraft Equipment Standards and Serviceability

No person shall conduct a take-off in an aircraft, or permit another person to conduct a take-off in an aircraft in their custody and control, unless the aircraft equipment required by these Regulations
- (a) meets the applicable standards of airworthiness; and
- (b) is serviceable and, where required by operational circumstances, functioning, except if otherwise provided in Sections 605.08, 605.09 or 605.10 of the LARs.

605.07 Minimum Equipment Lists

(1) The Minister may accept a master minimum equipment list that has been issued by the competent authority of a foreign state in respect of a type of aircraft where necessary to ensure compliance with the Aircraft Requirements Standards.

(2) Where a master minimum equipment list has been established for an aircraft type pursuant to Subsection (1), the Minister shall approve a minimum equipment list in respect of each operator of that type of aircraft, if the requirements set out in the Aircraft Requirements Standards are met.
(3) Where a master minimum equipment list has been established for an aircraft type pursuant to subsection (1) or supplemented pursuant to subsection (2), the Minister shall approve a minimum equipment list in respect of each operator of that type of aircraft, if the requirements set out in the Aircraft Requirements Standards are met.

605.08 Unserviceable and Removed Equipment - General

(1) Notwithstanding Subsection (2) and Sections 605.09 and 605.10 of the LARS, no person shall conduct a take-off in an aircraft that has equipment that is not serviceable or from which equipment has been removed if, in the opinion of the pilot-in-command, aviation safety is affected.
(2) Notwithstanding Sections 605.09 and 605.10 of the LARs, a person may conduct a take-off in an aircraft that has equipment that is not serviceable or from which equipment has been removed where the aircraft is operated in accordance with the conditions of a flight permit that has been issued specifically for that purpose.

605.09 Unserviceable and Removed Equipment - Aircraft with a Minimum Equipment List

(1) Subject to Subsection (2), where a minimum equipment list has been approved by the Minister in respect of the operator of an aircraft pursuant to Section 605.07 of the LARs, no person shall conduct a take-off in the aircraft with equipment that is not serviceable or that has been removed unless:

- (a) the aircraft is operated in accordance with any conditions or limitations specified in the minimum equipment list; and meets the requirements in the Aircraft Requirements Standards.
- (b) a copy of the minimum equipment list is carried on board or an alternative method acceptable to the Minister of ensuring that the flight crew has access to the minimum equipment list before take-off.

(2) Where the conditions or limitations specified in a minimum equipment list are in conflict with the requirements of an airworthiness directive, the airworthiness directive prevails.

605.10 Unserviceable and Removed Equipment - Aircraft without a Minimum Equipment List

(1) Where a minimum equipment list has not been approved in respect of the operator of an aircraft, no person shall conduct a take-off in the aircraft with equipment that is not serviceable or that has been removed, where that equipment is required by:

- (a) the standards of airworthiness that apply to day or night VFR or IFR flight, as applicable;
- (b) any equipment list published by the aircraft manufacturer respecting aircraft equipment that is required for the intended flight;
- (c) an air operator certificate, a private operator certificate, a special flight operations certificate or a flight training organization operating certificate;
- (d) an airworthiness directive; or
- (e) these Regulations.

(2) Where a minimum equipment list has not been approved in respect of the operator of an aircraft and the aircraft has equipment, other than the equipment required by Subsection (1), that is not serviceable or that has been removed, no person shall conduct a take-off in the aircraft unless

- (a) where the unserviceable equipment is not removed from the aircraft, it is isolated or secured so as not to constitute a hazard to any other aircraft system or to any person on board the aircraft;
- (b) the appropriate placards are installed as required by the Aircraft Requirements Standards; and
- (c) an entry recording the actions referred to in paragraphs (a) and (b) is made in the journey log, as applicable.

605.11 to 605.13 Reserved

Division II - Aircraft Equipment Requirements

605.14 Power-driven Aircraft - Day VFR

No person shall conduct a take-off in a power-driven aircraft for the purpose of day VFR flight unless it is equipped with

(a) where the aircraft is operated in uncontrolled airspace, an altimeter;
(b) where the aircraft is operated in controlled airspace, a sensitive altimeter adjustable for barometric pressure;
(c) an airspeed indicator;
(d) a magnetic compass or a magnetic direction indicator that operates independently of the aircraft electrical generating system;
(e) a tachometer for each engine and for each propeller or rotor that has limiting speeds established by the manufacturer;
(f) an oil pressure indicator for each engine employing an oil pressure system;
(g) a coolant temperature indicator for each liquid-cooled engine;
(h) an oil temperature indicator for each air-cooled engine having a separate oil system;
(i) a manifold pressure gauge for each
    (i) reciprocating engine equipped with a variable-pitch propeller,
    (ii) reciprocating engine used to power a helicopter,
    (iii) supercharged engine, and
    (iv) turbocharged engine;
(j) a means for the flight crew, when seated at the flight controls to determine
    (i) the fuel quantity in each main fuel tank, and
    (ii) if the aircraft employs retractable landing gear, the position of the landing gear;
(k) subject to Subsections 601.08(2) and 601.09(2) of the LARs, a radio communication system adequate to permit two-way communication on the appropriate frequency when the aircraft is operated within
    (i) Class B, Class C or Class D airspace,
    (ii) an MF area, unless the aircraft is operated pursuant to Subsection 602.97(3) of the LARs, or
(l) where the aircraft is operated under Subpart 4 of this Part, or under Subpart 3, 4 or 5 of Part VII of the LARs, radio communication equipment adequate to permit two-way communication on the appropriate frequency;
(m) where the aircraft is operated in Class B airspace, radio navigation equipment that will enable it to be operated in accordance with a flight plan; and
(n) where the aircraft is operated under Subpart 4 of this Part or under Subpart 5 of Part VII of the LARs, radio navigation equipment that is adequate to receive radio signals from a transmitting facility.

605.15 Power-driven Aircraft - VFR OTT

(1) No person shall conduct a take-off in a power-driven aircraft for the purpose of VFR OTT flight unless it is equipped with

(a) the equipment referred to in Subsections 605.14(c) to (j) of the LARs;
(b) a sensitive altimeter adjustable for barometric pressure;
(c) a means of preventing malfunction caused by icing for each airspeed indicating system;
(d) a gyroscopic direction indicator or a stabilized magnetic direction indicator;
(e) an attitude indicator;
(f) subject to Subsection (2), a turn and slip indicator or turn coordinator;

(g) radio communication equipment adequate to permit two-way communication on the appropriate frequency; and
(h) radio navigation equipment adequate to permit the aircraft to be navigated safely.

(2) Where the aircraft is equipped with a standby attitude indicator that is usable through flight attitudes of 360 degrees of pitch and roll for an airplane, or ± 80 degrees of pitch and ± 120 degrees of roll for a helicopter, the aircraft may be equipped with a slip-skid indicator in lieu of a turn and slip indicator or turn coordinator.

605.16 Power-driven Aircraft - Night VFR

(1) No person shall conduct a take-off in a power-driven aircraft for the purpose of night VFR flight, unless it is equipped with
(a) the equipment referred to in Subsections 605.14(c) to (n) of the LARs;
(b) a sensitive altimeter adjustable for barometric pressure;
(c) subject to Subsection (2), a turn and slip indicator or turn coordinator;
(d) an adequate source of electrical energy for all of the electrical and radio equipment;
(e) in respect of every set of fuses of a particular rating that is installed on the aircraft and accessible to the pilot-in-command during flight, a number of spare fuses that is equal to at least 50 per cent of the total number of installed fuses of that rating;
(f) where the aircraft is operated so that an aerodrome is not visible from the aircraft, a stabilized magnetic direction indicator or a gyroscopic direction indicator;
(g) where the aircraft is an airship operated within controlled airspace, radar reflectors attached in such a manner as to be capable of a 360-degree reflection;
(h) a means of illumination for all of the instruments used to operate the aircraft;
(i) when carrying passengers, a landing light; and
(j) position and anti-collision lights that conform to the Aircraft Requirements Standards.

(2) Where the aircraft is equipped with a standby attitude indicator that is usable through flight attitudes of 360 degrees of pitch and roll for an airplane, or ± 80 degrees of pitch and ± 120 degrees of roll for a helicopter, the aircraft may be equipped with a slip-skid indicator in lieu of a turn and slip indicator or turn coordinator.

(3) No person shall operate an aircraft that is equipped with any light that may be mistaken for, or downgrade the conspicuity of, a light in the navigation light system, unless the aircraft is being operated for the purpose of aerial advertising.

(4) In addition to the equipment requirements specified in Subsection (1), no person shall operate an aircraft in night VFR flight under Subpart 4 of this Part or Subparts 2 to 5 of Part VII of the LARs, unless the aircraft is equipped with
(a) an attitude indicator;
(b) a vertical speed indicator;
(c) a means of preventing malfunction caused by icing for each airspeed indicating system; and
(d) an outside air temperature gauge.

605.17 Use of Position and Anti-collision Lights

(1) Subject to Subsection (2), no person shall operate an aircraft in the air or on the ground at night, or on water between sunset and sunrise, unless the aircraft position lights and anti-collision lights are turned on.

(2) Anti-collision lights may be turned off where the pilot-in-command determines that, because of operating conditions, doing so would be in the interests of aviation safety.

605.18 Power-driven Aircraft - IFR

No person shall conduct a take-off in a power-driven aircraft for the purpose of IFR flight unless it is equipped with

(a) when it is operated by day, the equipment required pursuant to Subsections 605.16(1)(a) to (h) of the LARs;
(b) when it is operated by night, the equipment required pursuant to Subsections 605.16(1)(a) to (k) of the LARs;
(c) an attitude indicator;
(d) a vertical speed indicator;
(e) an outside air temperature gauge;
(f) a means of preventing malfunction caused by icing for each airspeed indicating system;
(g) a power failure warning device or vacuum indicator that shows the power available to gyroscopic instruments from each power source;
(h) an alternative source of static pressure for the altimeter, airspeed indicator and vertical speed indicator;
(i) sufficient radio communication equipment to permit the pilot to conduct two-way communications on the appropriate frequency; and
(j) sufficient radio navigation equipment to permit the pilot, in the event of the failure at any stage of the flight of any item of that equipment, including any associated flight instrument display,
    (i) to proceed to the destination aerodrome or proceed to another aerodrome that is suitable for landing, and
    (ii) where the aircraft is operated in IMC, to complete an instrument approach and, if necessary, conduct a missed approach procedure.

605.19 Balloons - Day VFR

No person shall conduct a take-off in a balloon for the purpose of day VFR flight unless it is equipped with

(a) an altimeter;
(b) a vertical speed indicator;
(c) in the case of a hot air balloon,
    (i) a fuel quantity gauge, and
    (ii) an envelope temperature indicator;
(d) in the case of a captive gas balloon, a magnetic direction indicator; and
(e) subject to Subsections 601.08(2) and 601.09(2) of the LARs, a radio communication system adequate to permit two-way communication on the appropriate frequency when the balloon is operated within
    (i) Class C or Class D airspace,
    (ii) an MF area, unless the aircraft is operated pursuant to Subsection 602.97(3) of the LARs, or

605.20 Balloons - Night VFR

No person shall conduct a take-off in a balloon for the purpose of night VFR flight unless it is equipped with

(a) equipment required pursuant to Section 605.19 of the LARs;
(b) position lights;
(c) a means of illuminating all of the instruments used by the flight crew, including a flashlight; and
(d) in the case of a hot air balloon, two independent fuel systems.

605.21 Gliders - Day VFR

No person shall operate a glider in day VFR flight unless it is equipped with
- (a) an altimeter;
- (b) an airspeed indicator;
- (c) a magnetic compass or a magnetic direction indicator; and
- (d) subject to Subsections 601.08(2) and 601.09(2) of the LARs, a radio communication system adequate to permit two-way communication on the appropriate frequency when the glider is operated within
  - (i) Class C or Class D airspace,
  - (ii) an MF area, unless the aircraft is operated pursuant to Subsection 602.97(3) of the LARs, or

605.22 Seat and Safety Belt Requirements

(1) Subject to Section 605.23 of the LARs, no person shall operate an aircraft other than a balloon unless it is equipped with a seat and safety belt for each person on board the aircraft other than an infant. (2) Subsection (1) does not apply to a person operating an aircraft that was type-certificated with a safety belt designed for two persons.
(3) A safety belt referred to in Subsection (1) shall include a latching device of the metal-to-metal type.

605.23 Restraint System Requirements

An aircraft may be operated without being equipped in accordance with Section 605.22 of the LARs in respect of the following persons if a restraint system that is secured to the primary structure of the aircraft is provided for each person who is
- (a) carried on a stretcher or in an incubator or other similar device;
- (b) carried for the purpose of parachuting from the aircraft; or
- (c) required to work in the vicinity of an opening in the aircraft structure.

605.24 Shoulder Harness Requirements

(1) No person shall operate an airplane, other than a small airplane manufactured before July 18, 1978, unless each front seat or, if the airplane has a flight deck, each seat on the flight deck is equipped with a safety belt that includes a shoulder harness.
(2) Except as provided in Section 705.75 of the LARs, no person shall operate a transport category airplane unless each flight attendant seat is equipped with a safety belt that includes a shoulder harness.
(3) No person shall operate a small airplane manufactured after December 12, 1986, the initial type certificate of which provides for not more than nine passenger seats, excluding any pilot seats, unless each forward- or aft-facing seat is equipped with a safety belt that includes a shoulder harness.
(4) No person shall operate a helicopter manufactured after September 16, 1992, the initial type certificate of which specifies that the helicopter is certified as belonging to the normal or transport category, unless each seat is equipped with a safety belt that includes a shoulder harness.
(5) No person operating an aircraft shall conduct any of the following flight operations unless the aircraft is equipped with a seat and a safety belt that includes a shoulder harness for each person on board the aircraft:
- (a) aerobatic maneuvers;
- (b) helicopter class B, C or D external load operations conducted by a helicopter; and

(c) aerial application, or aerial inspection other than flight inspection for the purpose of calibrating electronic navigation aids, conducted at altitudes below 500 feet [150 m] AGL.

605.25 General Use of Safety Belts and Restraint Systems

(1) The pilot-in-command of an aircraft shall direct all of the persons on board the aircraft to fasten safety belts
- (a) during movement of the aircraft on the surface;
- (b) during take-off and landing; and
- (c) at any time during flight that the pilot-in-command considers it necessary that safety belts be fastened.

(2) The directions referred to in Subsection (1) also apply to the use of the following restraint systems:
- (a) a child restraint system;
- (b) a restraint system used by a person who is engaged in parachute descents; and
- (c) a restraint system used by a person when working in the vicinity of an opening in the aircraft structure.

(3) Where an aircraft crew includes flight attendants and the pilot-in-command anticipates that the level of turbulence will exceed light turbulence, the pilot-in-command shall immediately direct each flight attendant to
- (a) discontinue duties relating to service;
- (b) secure the cabin; and
- (c) occupy a seat and fasten the safety belt provided.

(4) Where an aircraft is experiencing turbulence and the in-charge flight attendant considers it necessary, the in-charge flight attendant shall
- (a) direct all of the passengers to fasten their safety belts; and
- (b) direct all of the other flight attendants to discontinue duties relating to service, to secure the cabin and to occupy their seats and fasten the safety belts provided.

(5) Where the in-charge flight attendant has given directions in accordance with Subsection (4), the in-charge flight attendant shall so inform the pilot-in-command.

605.26 Use of Passenger Safety Belts and Restraint Systems

(1) Where the pilot-in-command or the in-charge flight attendant directs that safety belts be fastened, every passenger who is not an infant shall
- (a) ensure that the passenger's safety belt or restraint system is properly adjusted and securely fastened;
- (b) if responsible for an infant for which no child restraint system is provided, hold the infant securely in the passenger's arms; and
- (c) if responsible for a person who is using a child restraint system, ensure that the person is properly secured.

(2) No passenger shall be responsible for more than one infant.

605.27 Use of Crew Member Safety Belts

(1) Subject to Subsection (2), the crew members on an aircraft shall be seated at their stations with their safety belts fastened
- (a) during take-off and landing;
- (b) at any time that the pilot-in-command directs; and
- (c) in the case of crew members who are flight attendants, at any time that the in-charge flight attendant so directs pursuant to Subsection 605.25(4)(b) of the LARs.

(2) Where the pilot-in-command directs that safety belts be fastened by illuminating the safety belt sign, a crew member is not required to comply with Subsection (1)(b) of this Section.

(a) during movement of the aircraft on the surface or during flight, if the crew member is performing duties relating to the safety of the aircraft or of the passengers on board;
(b) where the aircraft is experiencing light turbulence, if the crew member is a flight attendant and is performing duties relating to the passengers on board; or
(c) if the crew member is occupying a crew rest facility during cruise flight and the restraint system for that facility is properly adjusted and securely fastened.

(3) The pilot-in-command shall ensure that at least one pilot is seated at the flight controls with safety belt fastened during flight time.

605.28 Child Restraint System

(1) No operator of an aircraft shall permit the use of a child restraint system on board the aircraft unless
(a) the person using the child restraint system is accompanied by a parent or guardian who will attend to the safety of the person during the flight;
(b) the weight and height of the person using the child restraint system are within the range specified by the manufacturer;
(c) the child restraint system bears a legible label indicating the applicable design standards and date of manufacture;
(d) the child restraint system is properly secured by the safety belt of a forward-facing seat that is not located in an emergency exit row and does not block access to an aisle; and
(e) the tether strap is used according to the manufacturer's instructions or, where Subsection (2) of this Section applies, secured so as not to pose a hazard to the person using the child restraint system or to any other person.

(2) Where a seat incorporates design features to reduce occupant loads, such as the crushing or separation of certain components, and the seat is in compliance with the applicable design standards, no person shall use the tether strap on the child restraint system to secure the system.

(3) Every passenger who is responsible for a person who is using a child restraint system on board an aircraft shall be
(a) seated in a seat adjacent to the seat to which the child restraint system is secured;
(b) familiar with the manufacturer's installation instructions for the child restraint system; and
(c) familiar with the method of securing the person in the child restraint system and of releasing the person from it.

605.29 Flight Control Locks

No operator of an aircraft shall permit the use of a flight control lock in respect of the aircraft unless
(a) the flight control lock is incapable of becoming engaged when the aircraft is being operated; and
(b) an unmistakable warning is provided to the person operating the aircraft whenever the flight control lock is engaged.

605.30 De-icing or Anti-icing Equipment

No person shall conduct a take-off or continue a flight in an aircraft where icing conditions are reported to exist or are forecast to be encountered along the route of flight unless
(a) the pilot-in-command determines that the aircraft is adequately equipped to operate in icing conditions in accordance with the standards of airworthiness under which the type certificate for that aircraft was issued; or
(b) current weather reports or pilot reports indicate that icing conditions no longer exist.

605.31 Oxygen Equipment and Supply

(1) No person shall operate an unpressurized aircraft unless it is equipped with sufficient oxygen dispensing units and oxygen supply to comply with the requirements set out in the table to this Subsection.

Table

Oxygen Requirements for Unpressurized Aircraft

	COLUMN I	**COLUMN II**
Item	**Persons for Whom Oxygen Supply Must Be Available**	**Period of Flight and Cabin-Pressure-Altitude**
1.	All crew members and 10 per cent of passengers and, in any case, no less than one passenger	Entire period of flight exceeding 30 minutes at cabin-pressure-altitudes above 10,000 feet [3,048 m] ASL but not exceeding 13,000 feet [3,962.4 m] ASL
2.	All persons on board the aircraft	*(a)* Entire period of flight at cabin-pressure-altitudes above 13,000 feet [3,962.4 m] ASL *(b)* For aircraft operated in an air transport service under the conditions referred to in paragraph (a), a period of flight of not less than one hour.

(2) No person shall operate a pressurized aircraft unless it is equipped with sufficient oxygen dispensing units and oxygen supply to provide, in the event of cabin pressurization failure at the most critical point during the flight, sufficient oxygen to continue the flight to an aerodrome suitable for landing while complying with the requirements of the table to this Subsection.

Table

Minimum Oxygen Requirements for Pressurized Aircraft Following Emergency Descent

(Note 1)

Item	COLUMN I Persons for Whom Oxygen Supply Must Be Available	COLUMN II Period of Flight and Cabin-Pressure-Altitude
1.	All crew members and 10 per cent of passengers and, in any case, no less than one passenger	*(a)* Entire period of flight exceeding 30 minutes at cabin-pressure-altitudes above 10,000 feet [3,048 m] ASL but not exceeding 13,000 feet [3,962.4 m] ASL *(b)* Entire period of flight at cabin-pressure-altitudes above 13,000 feet [3,962.4 m] ASL *(c)* For aircraft operated in an air transport service under the conditions referred to in paragraph (a) or (b), a period of flight of not less than (i) 30 minutes (Note 2), and (ii) (ii) for flight crew members, two hours for aircraft the type certificate of which authorizes flight at altitudes exceeding FL 250 (Note 3)
2.	All passengers	*(a)* Entire period of flight at cabin-pressure-altitudes exceeding 13,000 feet [3,962.4 m] ASL *(b)* For aircraft operated in an air transport service under the conditions referred to in paragraph (a), a period of flight of not less than 10 minutes

Note 1 In determining the available supply, the cabin pressure altitude descent profile for the routes concerned must be taken into account.

Note 2 The minimum supply is that quantity of oxygen necessary for a constant rate of descent from the aircraft's maximum operating altitude authorized in the type certificate to 10,000 feet [3,048 m] ASL in 10 minutes, followed by 20 minutes at 10,000 feet [3,048 m] ASL.

Note 3 The minimum supply is that quantity of oxygen necessary for a constant rate of descent from the aircraft's maximum operating altitude authorized in the type certificate to 10,000 feet [3,048 m] ASL in 10 minutes, followed by 110 minutes at 10,000 feet [3,048 m] ASL.

605.32 Use of Oxygen

(1) Where an aircraft is operated at cabin-pressure-altitudes above 10,000 feet [3,048 m] ASL but not exceeding 13,000 feet [3,962.4 m] ASL, each crew member shall wear an oxygen mask and use

supplemental oxygen for any part of the flight at those altitudes that is more than 30 minutes in duration.

(2) Where an aircraft is operated at cabin-pressure-altitudes above 13,000 feet [3,962.4 m] ASL, each person on board the aircraft shall wear an oxygen mask and use supplemental oxygen for the duration of the flight at those altitudes.

(3) The pilot at the flight controls of an aircraft shall use an oxygen mask if
- (a) the aircraft is not equipped with quick-donning oxygen masks and is operated at or above flight level 250; or
- (b) the aircraft is equipped with quick-donning oxygen masks and is operated above flight level 410.

605.33 Flight Data Recorder and Cockpit Voice Recorder Requirements

(1) Subject to Section 605.34 of the LARs, no person shall conduct a take-off in any of the following aircraft unless the aircraft is equipped with a flight data recorder that conforms to the Aircraft Requirements Standards:
- (a) a multi-engined turbine-powered pressurized airplane that has a Maximum Certified Take-off Weight (MCTOW) of more than 5 700 kg (12,500 pounds) and that
  - (i) has a passenger seating configuration, excluding any pilot seats, of 10 or more,
  - (ii) was manufactured after October 11, 1991, and
  - (iii) is operated under Subpart 4 of Part VII of the LARs;
- (b) any multi-engined turbine-powered airplane operated under Subpart 5 of Part VII of the LARs; and
- (c) after July 31, 1997 or, for an aircraft operated under Part VII of the LARs, after February 28, 1997, any other multi-engined turbine-powered aircraft that has a passenger seating configuration, excluding any pilot seats, of 10 or more and that was manufactured after October 11, 1991.

(2) Subject to Section 605.34 of the LARs, no person shall conduct a take-off in any of the following aircraft unless the aircraft is equipped with a cockpit voice recorder that meets the Aircraft Requirements Standards:
- (a) a multi-engined, turbine-powered pressurized airplane that has a MCTOW of more than 5 700 kg (12,500 pounds) and that
  - (i) has a passenger seating configuration, excluding any pilot seats, of six or more,
  - (ii) is required to be operated by two pilots pursuant to the type certificate or Section 704.106, and
  - (iii) is operated under Subpart 4 of Part VII of the LARs;
- (b) any multi-engined turbine-powered airplane operated under Subpart 5 of Part VII of the LARs; and
- (c) after July 31, 1997 or, for an aircraft operated under Part VII, after February 28, 1997, any other multi-engined turbine-powered aircraft that has a passenger seating configuration, excluding any pilot seats, of six or more, and for which two pilots are required by the type certificate of the aircraft or the Subpart under which the aircraft is operated.

605.34 Use of Flight Data Recorders and Cockpit Voice Recorders

(1) Except where otherwise permitted in this Section, no person shall operate an aircraft for which a flight data recorder or cockpit voice recorder is required by these Regulations unless
- (a) in the case where a flight data recorder is required, the flight data recorder is operated continuously from the start of the take-off until the completion of the landing; and
- (b) in the case where a cockpit voice recorder is required, the cockpit voice recorder is operated continuously from the time at which electrical power is first provided to the recorder before the flight to the time at which electrical power is removed from the recorder after the flight.

(2) No person shall erase any communications pertaining to the flight being undertaken that have been recorded by a cockpit voice recorder.
(3) Where a minimum equipment list has been approved by the Minister in respect of the operator of an aircraft pursuant to Subsection 605.07(3) of the LARs, the operator may operate the aircraft without a serviceable flight data recorder or cockpit voice recorder if the aircraft is operated in accordance with the minimum equipment list.
(4) Where a minimum equipment list has not been approved by the Minister in respect of the operator of an aircraft, the operator may operate the aircraft without a serviceable flight data recorder for a maximum period of 90 days after the date of failure of the flight data recorder if

(a) where a cockpit voice recorder is required by these Regulations, the cockpit voice recorder is serviceable; and
(b) the aircraft technical records show the date of the failure of the flight data recorder.

(5) Where a minimum equipment list has not been approved by the Minister in respect of the operator of an aircraft, the operator may operate the aircraft without a serviceable cockpit voice recorder for a maximum period of 90 days after the date of failure of the cockpit voice recorder if

(a) where a flight data recorder is required by these Regulations, the flight data recorder is serviceable; and
(b) the aircraft technical records show the date of the failure of the cockpit voice recorder.

605.35 Transponder and Automatic Pressure-altitude Reporting Equipment

(1) Subject to Subsections (2) and (3) of this Section, no person shall operate an aircraft, other than a balloon or a glider, in airspace referred to in Section 601.03 of the LARs, unless the aircraft is equipped with a transponder and automatic pressure-altitude reporting equipment.
(2) The aircraft referred to in Subsection (1) may be operated without a serviceable transponder and automatic pressure-altitude reporting equipment if

(a) where a minimum equipment list has been approved by the Minister in respect of the operator of the aircraft pursuant to Subsection 605.07(3) of the LARs, the aircraft is operated in accordance with the minimum equipment list; or
(b) where a minimum equipment list has not been approved by the Minister in respect of the operator of the aircraft, the aircraft is operated
    (i) to the next aerodrome of intended landing, and
    (ii) thereafter, in accordance with an air traffic control clearance, to complete a planned flight schedule or to proceed to a maintenance facility.

(3) An air traffic control unit may authorize a person to operate an aircraft that is not equipped in accordance with Subsection (1) within airspace referred to in Section 601.03 of the LARs where

(a) the air traffic control unit provides an air traffic control service in respect of that airspace;
(b) the air traffic control unit received a request from the person to operate the aircraft within that airspace before the aircraft entered the airspace; and
(c) aviation safety is not likely to be affected.

605.36 Altitude Alerting System or Device

(1) Subject to Subsection (2) of this Section, no person shall conduct a take-off in a turbo-jet-powered airplane unless it is equipped with an altitude alerting system or device that conforms to the Aircraft Requirements Standards.
(2) An airplane referred to in Subsection (1) may be operated without a serviceable altitude alerting system or device if

(a) where a minimum equipment list has been approved by the Minister in respect of the operator of the airplane pursuant to Subsection 605.07(3) of the LARs, the airplane is operated in accordance with the minimum equipment list; or

(b) where a minimum equipment list has not been approved by the Minister in respect of the operator of the airplane, the airplane is operated
  (i) from the place where the operator or pilot-in-command takes possession of the airplane to a place where the airplane can be equipped with such a system or device,
  (ii) for the sole purpose of conducting a flight test, a pilot proficiency check or flight crew member training, or
  (iii) where the system or device becomes unserviceable after take-off, until it reaches an aerodrome at which the system or device can be repaired or replaced.

605.37 Ground Proximity Warning System

(1) Subject to Subsections (2) and (3) of this Section, no person operating under Subpart 4 or 5 of Part VII of the LARs shall conduct a take-off in a turbo-jet-powered airplane that has a MCTOW of more than 15 000 kg (33,069 pounds) and for which a type certificate has been issued authorizing the transport of 10 or more passengers, unless the airplane is equipped with a ground proximity warning system.
(2) An airplane referred to in Subsection (1) may be operated without a serviceable ground proximity warning system if a minimum equipment list has been approved by the Minister in respect of the operator of the airplane pursuant to Subsection 605.07(3) of the LARs and the airplane is operated in accordance with the minimum equipment list.
(3) Where, in the interests of aviation safety, it is necessary during a flight to deactivate any mode of a ground proximity warning system, the pilot-in-command of the airplane may deactivate that mode if the deactivation is performed in accordance with the aircraft flight manual, aircraft operating manual, flight manual supplement or minimum equipment list.

605.38 ELT

(1) Subject to Subsection (3) of this Section, no person shall operate an aircraft unless it is equipped with one or more ELTs in accordance with Subsection (2) of this Section.
(2) An aircraft set out in column I of an item of the table to this Subsection shall, for the area of operation set out in column II of the item, be equipped with the quantity and type of ELTs referred to in column III of that item, which ELTs shall be armed, if so specified in the aircraft flight manual, aircraft operating manual, pilot operating handbook or equivalent document provided by the manufacturer.

Table

ELT Requirements

Item	COLUMN I Aircraft	COLUMN II Area of Operation	COLUMN III Minimum Equipment
1.	All aircraft except those referred to in Subsection (3)	Over land	One ELT of Type AD, AF, AP, A or F
2.	Large multi-engined turbo-jet airplanes engaged in an air transport service carrying passengers	Over water at a distance from land that requires the carriage of life rafts pursuant to Section 602.63 of the LARs	Two ELTs of Type W or S or one of each
3.	All aircraft that require an ELT other than those set out in item 2	Over water at a distance from land that requires the carriage of life rafts pursuant to Section 602.63 of the LARs	One ELT of Type W or S

(3) An aircraft referred to in Subsection (1) of this Section may be operated without an ELT on board where the aircraft is

- (a) a glider, balloon, airship, ultra-light airplane or gyroplane;
- (b) a multi-engined turbo-jet airplane of more than 5 700 kg (12,500 pounds) MCTOW that is being operated
  - (i) in IFR flight within controlled airspace over land, and
  - (iii) south of latitude 66 30' N;
- (c) registered under the laws of a contracting state or a state that is a party to an agreement entered into with Lebanon, and is equipped with a serviceable radio transmitter that
  - (iv) is approved by the state of registry for search and rescue purposes, and
  - (v) has a distinctive audio signal and is capable of communication on the frequency of 121.5 MHz, or simultaneously on the frequencies of 121.5 MHz and 243.0 MHz;
- (d) operated by the holder of a flight training organization operating certificate, engaged in flight training and operated within 25 nautical miles of the aerodrome of departure;
- (e) engaged in a flight test;
- (f) a new aircraft engaged in flight operations incidental to manufacture, preparation or delivery of the aircraft; or
- (g) operated in accordance with Section 605.39 of the LARs.

605.39 Use of ELTs

Where an aircraft is required to be equipped with an ELT pursuant to Section 605.38 of the LARs, the aircraft may be operated without a serviceable ELT if

(a) where a minimum equipment list has been approved by the Minister in respect of the operator of the aircraft pursuant to Subsection 605.07(3) of the LARs, the aircraft is operated in accordance with the minimum equipment list; or
(b) where a minimum equipment list has not been approved by the Minister in respect of the operator of the aircraft, the operator
   (i) repairs or removes the ELT at the first aerodrome at which repairs or removal can be accomplished,
   (ii) on removal of the ELT from the aircraft, sends the ELT to a maintenance facility,
   (iii) displays on a readily visible placard within the aircraft cockpit, for the period of removal of the ELT from the aircraft, a notice stating that the ELT has been removed and setting out the date of removal, and
   (iv) re-equips the aircraft with a serviceable ELT within 90 days after the date of removal.

605.40 ELT Activation

(1) Subject to Subsection (2) of this Section, no person shall activate an ELT except in an emergency.
(2) A person may activate an ELT during the first five minutes of any hour for a duration of not more than five seconds for the purpose of testing it.
(3) Where an ELT has been inadvertently activated during flight, the pilot-in-command of the aircraft shall ensure that
(a) the nearest air traffic control unit, flight service station or community aerodrome radio station is so informed as soon as possible; and
(b) the ELT is switched off.

605.41 Standby Attitude Indicator

(1) No person shall conduct a take-off in a turbo-jet-powered airplane operated under Part VII unless that airplane is equipped with a standby attitude indicator that meets the Aircraft Requirements Standards.
(2) After July 31, 1997, no person shall conduct a take-off in a transport category aircraft unless that aircraft is equipped with a standby attitude indicator that meets the Aircraft Requirements Standards.

605.42 to 605.83 Reserved

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Division III - Aircraft Maintenance Requirements

605.84 Aircraft Maintenance - General

(1) Subject to Subsections (3) and (4) of this Section, no person shall conduct a take-off, or permit a take-off to be conducted in an aircraft that is in the legal custody and control of the person, unless the aircraft is maintained in accordance with
- (a) any airworthiness limitations applicable to that aircraft type design;
- (b) the requirements of any airworthiness directives issued by the Minister pursuant to Subpart 595 of the LARs; and
- (c) except as provided in Subsection (2), the requirements of any notices equivalent to airworthiness directives issued by
  - (i) the competent authority of the foreign state that, at the time the notice was issued, is responsible for the type certification of the aircraft, engine, propeller or appliance, or
  - (ii) for an aeronautical product in respect of which no type certificate has been issued, the competent authority of the foreign state that manufactured the aeronautical product.

(2) In the case of a conflict between an airworthiness directive issued pursuant to Subpart 595 of the LARs and an equivalent foreign notice, the airworthiness directive prevails.

(3) The Minister shall exempt the owner of a Lebanese aircraft from the requirement to comply with all or part of an airworthiness directive, subject to appropriate conditions relating to aviation safety, as specified in Appendix H of the Aircraft Requirements Standards**,** where the owner demonstrates to the Minister that
- (a) under circumstances specified in the exemption request, compliance is impractical or unnecessary; and
- (b) the exemption will provide a level of safety that is equivalent to that required by the airworthiness directive.

(4) The Minister shall approve an alternative means of compliance with an airworthiness directive, for reasons set out in the approval, where the Minister is satisfied that the proposed alternative will maintain the level of safety that is provided for by the compliance time, the modification, the restriction, the replacement, the special inspection or the procedure set out in the airworthiness directive.

605.85 Maintenance Release and Elementary Work

(1) Subject to Subsections (2) and (3) of this Section, no person shall conduct a take-off in an aircraft, or permit a take-off to be conducted in an aircraft that is in the legal custody and control of the person, where that aircraft has undergone maintenance, unless the maintenance has been certified by the signing of a maintenance release pursuant to Section 575.10 of the LARs.

(2) Where a maintenance release is conditional on the satisfactory completion of a test flight pursuant to Subsection 575.10(4) of the LARs, the aircraft may be operated for the purpose of the test flight if no person is carried on board other than flight crew members and persons necessary for the purpose of making observations that are essential to the test flight.

(3) Following a test flight conducted pursuant to Subsection (2) of this Section, the pilot-in-command shall enter the results of the test flight in the journey log and, where the entry indicates that the results of the test flight are satisfactory, that entry completes the maintenance release required by Subsection (1).

(4) No maintenance release is required in respect of tasks identified as elementary work in the Aircraft Requirements Standards.

605.86 Maintenance Schedule

(1) Subject to Subsection (3) of this Section, no person shall conduct a take-off in an aircraft, or permit a take-off to be conducted in an aircraft that is in the person's legal custody and control, unless the aircraft is maintained in accordance with
- (a) a maintenance schedule that conforms to the Aircraft Requirements Standards; and
- (b) where the aircraft is operated under Subpart 6 of Part IV or under Part VII of the LARs, or is a large aircraft, a turbine-powered pressurized aircraft or an airship, a maintenance schedule approved by the Minister in respect of the aircraft operator pursuant to Subsection (2).

(2) The Minister shall approve a maintenance schedule in respect of an aircraft if the schedule conforms to the Aircraft Requirements Standards.
(3) The Minister shall authorize an operator to deviate from the requirements of the applicable maintenance schedule where the operator
- (a) submits a request in writing to the Minister in accordance with the Aircraft Requirements Standards; and
- (b) demonstrates that the deviation will not affect aviation safety.

605.87 Transfer of Aeronautical Products between Maintenance Schedules

No aeronautical product shall be maintained in accordance with a maintenance schedule that is different from the one under which it was previously maintained unless
- (a) the aeronautical product has been subjected to an inspection that establishes it on the new maintenance schedule; and
- (b) the times remaining until each action on the new maintenance schedule is to be taken have been established in accordance with the Aircraft Requirements Standards.

605.88 Inspection after Abnormal Occurrences

(1) No person shall conduct a take-off in an aircraft that has been subjected to any abnormal occurrence unless the aircraft has been inspected for damage in accordance with Appendix G of the Aircraft Requirements Standards.
(2) Where the inspection referred to in Subsection (1) does not involve disassembly, it may be performed by the pilot-in-command.

605.89 to 605.91 Reserved

Division IV - Technical Records

605.92 Requirement to Keep Technical Records

(1) Every owner of an aircraft shall keep the following technical records in respect of the aircraft:
- (a) a journey log;
- (b) subject to Subsections (2) and (3) of this Section , a separate technical record for the airframe, each installed engine and each variable-pitch propeller; and
- (c) except where otherwise provided under the terms of a fleet empty weight and balance program referred to in Subsection 706.06(3) of the LARs, an empty weight and balance report that meets the applicable standards set out in Part V, Subpart 575 of the LARs.

(2) The technical records required by Subsection (1)(b) of this Section may consist of separate technical records for each component installed in the airframe, engine or propeller.
(3) In the case of a balloon or a glider, all entries in respect of the technical records referred to in Subsections (1)(b) and (c) of this Section may be kept in the journey log.

605.93 Technical Records - General

(1) Every person who makes an entry in a technical record shall
- (a) make the entry accurately, legibly and in a permanent manner;
- (b) enter the person's name and signature or employee identifier or, where the record is kept as electronic data, enter the person's user code or an equivalent security designation; and
- (c) date the entry.

(2) Where the owner of an aircraft keeps the technical records for the aircraft as electronic data, the owner shall ensure that the electronic data system that is used complies with an approved electronic record keeping program approved by the Minister and the Aircraft Requirements Standards.
(3) The owner of an aircraft shall ensure that all of the necessary measures are taken to protect the technical records for the aircraft from damage and loss.
(4) Every person who brings into use a new volume of an existing technical record shall make the entries relating to the preceding volume that are necessary to ensure that an unbroken chronological record is maintained.
(5) Subject to Subsection (6) of this Section, where a person alters an entry on a technical record for the purpose of correcting the entry, the person shall do so by striking out the incorrect entry in such a manner that the underlying information remains legible, and inserting the correct entry together with
- (a) the date of the alteration;
- (b) the reason for the alteration, if it is necessary to clarify why the alteration was made; and
- (c) the person's name and signature or employee identifier or, where the record is kept as electronic data, the person's user code or equivalent security designation.

(6) Where a correction referred to in Subsection (5) of this Section is being made to a technical record that is maintained as electronic data, the correction shall be made in a manner that does not render the original data inaccessible.

605.94 Journey Log Requirements

(1) The particulars set out in column I of an item in Schedule I to this Division shall be recorded in the journey log at the time set out in column II of the item and by the person responsible for making entries set out in column III of that item.
(2) No person shall make a single entry in a journey log in respect of a series of flights unless
- (a) the aircraft is operated by the same pilot-in-command throughout the series; or
- (b) a daily flight record is used pursuant to Section 406.56 of the LARs.

(3) The owner of an aircraft shall retain every entry in a journey log for a period of not less than

(a) one year; or
(b) three years, where the aircraft is registered pursuant to Lebanese registration regulations and the journey log is used for the purpose of recording particulars of aircraft flight time.

(4) Unless recorded in the operational flight plan or operational flight data sheet, the pilot-in-command of an aircraft engaged in a commercial air service and operating in international flight shall record in the journey log the following particulars in respect of each flight:
(a) the names of all of the crew members and their duty assignments;
(b) the places and times of departure and arrival;
(c) the flight time;
(d) the nature of the flight, such as private, aerial work, scheduled or non-scheduled; and
(e) any incidents or observations relating to the flight.

605.95 Journey Log - Carrying on Board

(1) Subject to Subsection (2) of this Section, no person shall conduct a take-off in an aircraft unless the journey log is on board the aircraft.

(2) A person may conduct a take-off in an aircraft without carrying the journey log on board where
(a) it is not planned that the aircraft will land and shut down at any location other than the point of departure; or
(b) the aircraft is a balloon and the journey log is immediately available to the pilot-in-command
(i) prior to commencing a flight, and
(ii) on completion of the flight.

605.96 Requirements for Technical Records Other Than the Journey Log

(1) The particulars set out in column I of an item in Schedule II to this Division shall be recorded in the appropriate technical record at the time set out in column II of the item and by the person responsible for making entries set out in column III of that item.

(2) Where particulars of any maintenance performed on an aircraft are transferred from the journey log at the time set out in column II of item 4 of Schedule II to this Division, the person responsible for the entry shall
(a) transcribe the particulars and include the name and identification number of the person who made the original entry; or
(b) where the pages of the journey log have detachable copies, attach the copy of the page containing these particulars to the applicable technical record.

(3) Where a component is installed on a higher assembly, the technical record for that component shall become a part of the technical record for the higher assembly.

(4) Except in the case of the journey log, the owner of an aircraft shall retain each technical record for the applicable period set out in the Aircraft Requirements Standards.

605.97 Transfer of Records

Every owner of an aircraft who transfers title of an aircraft, airframe, engine, propeller or appliance to another person shall, at the time of transfer, also deliver to that person all of the technical records that relate to that aeronautical product.

605.98 to 605.110 Reserved

SCHEDULE I

Subsection 605.94(1)

JOURNEY LOG

Item	COLUMN I Particulars to Be Entered	COLUMN II Time of Entry	COLUMN III Person Responsible for Entry
1.	Aircraft nationality and registration marks Aircraft manufacturer, type, model and serial number	On commencing keeping a journey log and on bringing a new volume of an existing log into use	The owner of the aircraft
2.	Aircraft empty weight and empty center of gravity and any change to the aircraft empty weight and empty center of gravity Where an additional flight authority has been issued in respect of an aircraft pursuant to Section 525.08, any change to the flight authority	On commencing keeping a journey log and on bringing a new volume of an existing log into use and, when a change occurs, as soon as practicable after the change but, at the latest, before the next flight	The owner of the aircraft and, for any change, the person who made the change
3.	Air time of each flight or series of flights and cumulative total air time and, where applicable, number of operating cycles or landings since date of manufacture	Daily, on completion of each flight or series of flights	The pilot-in-command of the aircraft or a person designated by an air operator, a private operator or a flight training organization
4.	Where no technical dispatch procedure is in place pursuant to Section 706.06 *(a)* a description of the applicable maintenance schedule; and *(b)* the date, air time, operating cycle or landing at which the next scheduled maintenance action is required	On bringing the maintenance schedule into use and on completion of each maintenance action referred to in column I of this item	The owner of the aircraft

SCHEDULE I (continued)
Subsection 605.94(1))
JOURNEY LOG

Item	COLUMN I Particulars to Be Entered	COLUMN II Time of Entry	COLUMN III Person Responsible for Entry
5.	Particulars of any abnormal occurrence to which the aircraft has been subjected	As soon as practicable after the abnormal occurrence but, at the latest, before the next flight	The pilot-in-command of the aircraft or, where maintenance was being conducted, the operator of the aircraft at the time of the abnormal occurrence
6.	Particulars relating to a conditional maintenance release signed pursuant to Section 575.11	As soon as practicable after the aircraft has received a conditional maintenance release for a test flight but, at the latest, prior to that test flight	The person who signed the conditional maintenance release
7.	Particulars relating to the results of a test flight entered in accordance with Subsection 605.85(3)	On completion of the test flight but, at the latest, before the next flight	The pilot-in-command of the aircraft who conducted the test flight
8.	Particulars of any defect in any part of the aircraft or its equipment	As soon as practicable after defect is discovered but, at the latest, before the next flight	The person who discovered the defect
9.	Particulars of any maintenance action or elementary work performed in respect of item 2, 5 or 8	As soon as practicable after the maintenance action or elementary work is performed but, at the latest, before the next flight	The person who performed the maintenance action or elementary work

SCHEDULE II

Subsections 605.96(1) and (2))

TECHNICAL RECORD FOR AN AIRFRAME, ENGINE, PROPELLER OR COMPONENT

	COLUMN I	COLUMN II	COLUMN III
Item	**Particulars to Be Entered**	**Time of Entry**	**Person Responsible for Entry**
1.	Manufacturer's name, type, model designation and serial number and, in the case of an airframe, the aircraft nationality and registration marks In the case of an engine, propeller or component, the identification number of the aircraft or higher assembly on which the aeronautical product is, or has been, installed The identification of any features of the configuration of the airframe, engine, propeller or component that would affect its use or its suitability for installation on a higher assembly	On commencing keeping a technical record, on bringing a new volume of an existing record into use, after any change in the data on the manufacturer's data plate, or following the installation or removal of an engine, propeller or component	The owner of the aircraft
2.	Where no maintenance control system is in place pursuant to Subpart 4 of this Part or Subpart 6 of Part VII, the details outlining the scheduling provisions of any applicable airworthiness directive that relates to the airframe, engine, propeller or component, or any part thereof	On the coming into effect of the airworthiness directive	The owner of the aircraft

SCHEDULE II (continued)

Subsections 605.96(1) and (2))

TECHNICAL RECORD FOR AN AIRFRAME, ENGINE, PROPELLER OR COMPONENT

	COLUMN I	**COLUMN II**	**COLUMN III**
Item	**Particulars to Be Entered**	**Time of Entry**	**Person Responsible for Entry**
3.	Any abnormal occurrence to which the airframe, engine, propeller or component has been subjected and that has been recorded in the journey log pursuant to item 5 of Schedule I	No later than 30 days after the abnormal occurrence	The owner of the aircraft
4.	The particulars of any maintenance performed, including the particulars of any maintenance performed to comply with the requirements of an airworthiness directive	As soon as practicable after the maintenance action is performed but, at the latest, before the next flight or, in the case of particulars transferred from the journey log, no later than 30 days after the maintenance action is performed	The person who performed the maintenance action or, where particulars are transferred from the journey log, the owner of the aircraft
5.	Total air time and, where applicable, the number of operating cycles or landings since date of manufacture, at the time of each abnormal occurrence or maintenance action recorded pursuant to item 3 or 4	At the time the abnormal occurrence or maintenance action is recorded pursuant to item 3 or 4	The person responsible for the entry pursuant to item 3 or 4

REPUBLIC OF LEBANON
MINISTRY OF TRANSPORT
DIRECTORATE GENERAL OF CIVIL AVIATION

LARs

LEBANESE AVIATION REGULATIONS

Part VI
General Operating and Flight Rules

Subpart 5
Aircraft Requirements

Standards
s605.01 to s605.110

***** Revision No. 1 *****
International Civil Aviation Organization
Richard B. Fauquier

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GENERAL OPERATING AND FLIGHT RULES STANDARDS

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APPENDIX A
Elementary Work

The following lists are exhaustive in nature; if a task is not listed, it is not elementary work.

Elementary work is a form of maintenance that is not subject to a maintenance release. Hence, it need not be performed by a holder of an AMT license, or by persons working under an AMO certificate. The owner is responsible for controlling authorizations to persons who may perform elementary work.

Subpart 575 of the Lebanese Aviation Regulations (LARs) requires that all tasks designated as elementary work be detailed in the technical record.

Elementary Work Task Listings

(1) Balloons

For this type of aircraft, the following tasks are elementary work:
- (a) repair of upholstery and trim;
- (b) removal and installation of fuses, light bulbs and reflectors;
- (c) removal and installation of parts of communications equipment that are line replaceable units designed for rapid replacement;
- (d) cleaning of balloon burner nozzles;
- (e) removal and installation of balloon baskets, burners and gas tanks that are designed for rapid change in service.

(2) Gliders or Small, Unpressurized, Piston-engine Aircraft, Not Engaged in Commercial Air Service

For those types of aircraft, the following tasks are elementary work:
- (a) fabric patches measuring not more than 15 cm (6 in) in any direction and not requiring rib stitching or the removal of control surfaces or structural parts;
- (b) removal and installation of tires, wheels, landing skids or skid shoes, not requiring separation of any hydraulic lines;
- (c) removal and installation of skis on fixed landing gear, not requiring separation of any hydraulic lines;
- (d) removal and installation of seats, safety belts and harnesses;
- (e) repair of non-structural fairings, cover plates and cowlings;
- (f) repair of upholstery and cabin trim;
- (g) removal and installation of glider wings and tail surfaces that are designed for quick assembly;
- (h) removal and installation of co-pilot flight control levers and pedals that are designed for quick removal and installation;
- (i) cleaning and installation of spark plugs;
- (j) checking of cylinder compression;
- (k) cleaning or changing of fuel, oil, and air filters;
- (l) draining and replenishing engine oil;
- (m) adjustment of generator or alternator drive belt tension;
- (n) removal and installation of aircraft batteries;
- (o) checking the electrolyte level and specific gravity of lead acid batteries;
- (p) removal and installation of fuses, light bulbs and reflectors;
- (q)

APPENDIX A
Elementary Work

(r) removal and installation of parts of communications equipment that are line replaceable units (LRUs) designed for rapid replacement;
(s) installation of anti-misfuelling devices to reduce the diameter of fuel tank filler openings, when the installation does not involve disassembly of the existing fuel filler opening, drilling, riveting or welding.

(3) Airplanes and Helicopters Operated Pursuant to LAR 406 - Flight Training Organizations; or Aircraft Operated Pursuant to LAR Part VI, Subpart 4 - Private Operator Passenger Transportation; Aircraft Operated Pursuant to LAR Part VII - Commercial Air Services

For those types indicated above, the following tasks are elementary work:
(a) performance of a pre-flight or turnaround check;
(b) removal and installation of passenger seats and passenger seat belts;
(c) repairs to upholstery and cabin furnishings;
(d) removal, installation or repositioning of non structural partitions in the passenger cabin;
(e) opening and closing of non-structural access panels;
(f) removal and installation of cabin doors on unpressurized aircraft, where the door is designed for rapid removal and installation;
(g) removal and installation of co-pilot flight control levers and pedals that are designed for quick removal and installation;
(h) removal and installation of fuses and light bulbs;
(i) removal and installation of aircraft batteries;
(j) adjustment of generator or alternator drive belt tension;
(k) inspection and continuity checking of self-sealing chip detectors;
(l) the replacement of line replaceable units (LRUs) that are designed for rapid replacement that, following replacement, do not require testing other than an operational check.

Information Note: *An operational check is used to determine that a unit is working, and does not involve measuring degradation of the unit's output or functionality. Where the post-replacement procedures require measurements, the LRU replacement is not Elementary Work.*

Appendix B
Maintenance Schedules

General Procedures

(1) The Maintenance Schedule includes:
- (a) Part I - Scheduled Inspections for Aircraft other than Balloons;
- (b) Part II - Scheduled Inspections for Balloons.

(2) The Maintenance Schedule must be supplemented by the applicable requirements of Appendix C, for out of phase tasks and equipment maintenance requirements.
(3) Each person performing inspections required by the maintenance schedule shall record the inspections in the aircraft technical record, using a check list that includes all items in Parts I or II that are applicable to the aircraft concerned. Additionally, all tasks required by Appendix C shall be recorded in the aircraft technical record.

Information Note: *Aircraft manufacturers' check lists can be used, provided that they include all the applicable items listed herein.*

(4) The tasks listed in the maintenance schedule are described in general terms only, as the specific items applicable to particular aircraft will vary according to aircraft type.
(5) The method of inspection for each item on the maintenance schedule shall be in accordance with the manufacturer's recommendations or standard industry practice.

Information Note: *The following is provided as a quick reference chart. The specific details are contained in : Section s605.86 of these standards; the relevant sections of this Appendix (B); Appendix C; and Appendix D of these standards.*

Appendix B
Maintenance Schedules

MAINTENANCE SCHEDULES – QUICK REFERENCE CHART	
Type of Aircraft and Operation	Content and Interval
Non-commercial	
Small aircraft – Excluding pressurized turbine-powered aircraft & balloon.	Appendix B, Part I @ 12 months + Appendix C
Balloon	Appendix B, Part II @ 12 months + Appendix C
Commercial	
Small aircraft – Excluding pressurized turbine-powered aircraft & balloons	Program approved for operator in accordance with Appendix D. May be based upon Appendix B, Part I @ 100 hours or 12 months, whichever comes first, + Appendix C.
Balloon	Appendix B, Part II @ 100 hours + Appendix C
Commercial and Mon-commercial	
Large airplanes and helicopters operated by flight training organizations.	Program approved for operator in accordance with Appendix D. Must include the applicable items of Appendix C.
Large aircraft operated under Part VII of the Lebanese Aviation Regulations (LARs).	
Pressurized turbine-powered aircraft.	
Airships.	
Other large aircraft	

(6) The depth of inspection of each item on the schedule shall be determined by the person performing the inspection, and shall be consistent with the general condition and operating role of the aircraft.
(7) Pursuant to Subsection 605.86(2) of the LARs, the schedule is considered to be approved for use by owners of small non-commercial operation aircraft and all balloons. Owners need only to make an entry in the aircraft technical records that the aircraft is maintained pursuant to the maintenance schedule.
(8) Pursuant to Subsection 605.86(2) of the LARs, the maintenance schedule can be used as the basis for a commercial air operator's maintenance schedule. With the exception of a balloon inspection schedule, commercial air operator's maintenance schedules based on this document are subject to approval by the Minister in accordance with Appendix D. Schedules for aircraft operated in commercial air service (including balloons pursuant to the LARs) shall include an inspection of the items listed in Part I or II of this Appendix, as applicable, and the accomplishment of out of phase tasks and equipment maintenance requirements specified in Appendix C.

Appendix B
Maintenance Schedules

(9) Pursuant to Subsection 605.86(2) of the LARs, there the aircraft utilization is sufficient to ensure that all items listed in Parts I or II of this Appendix are performed within a 12 month period, an owner can request that inspections under this maintenance schedule be performed progressively. In this case, a revised maintenance schedule shall be submitted for the Minister's approval in accordance with the procedures outlined in Subsection s605.86(2) of these standards.
(10) Pursuant to Subsection 605.86(2) of the LARs, where a flight training organization operating airplanes and helicopters pursuant to Subpart 406 of the LARs chooses to use Part I of this Appendix as a basis for inspections to be carried out at 100 hour intervals, it must be approved in accordance with the procedures outlined in Appendix D of these standards.
(11) This maintenance schedule is not an inspection checklist. Prior to performing the inspections tabled herein, an appropriate checklist containing these requirements must be developed.

Information Note: *Many aircraft manufacturers produce detailed inspection checklists. In many cases the location of system components is clearly identified on those documents. In the interest of efficiency an owner may wish to use a manufacturers checklist in order to accomplish this inspection. Manufacturer's checklists may be used, provided they include at least the items listed in Part I or Part II of this Appendix, as applicable. Where an owner has chosen to use a manufacturer's checklist, it should be clearly marked to indicate that the check is following the general maintenance schedule. In addition, any references in those checklists concerning compliance with Airworthiness Directives must be stricken out as not applicable, as it is the owner's responsibility to advise the AMT of any outstanding Airworthiness Directives or airworthiness limitations.*

Large aircraft comply with a detailed maintenance schedule as per Appendices C and D of these standards.

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Appendix B
Maintenance Schedules

Part I - Scheduled Inspections for Small Aircraft other than Balloons

At intervals prescribed in the General Procedures to this Appendix, inspect the aircraft as follows:

(1) Aircraft Generally

(a) remove or open all necessary inspection plates, access doors, fairings and cowlings. thoroughly clean the aircraft and engine.
(b) inspect panel, door and cowling closing and locking mechanisms for improper installation and function.
(c) lubricate in accordance with the manufacturer's recommendations.

(2) Fuselage and Hull Group

(a) structure - inspect for deterioration, distortion, evidence of failure and defective or insecure attachment of fittings.
(b) systems and components - inspect for improper installation, apparent defects and unsatisfactory operation.

(3) Cabin and Cockpit Group

(a) generally - inspect for dirt and loose equipment that might foul the controls;
(b) seats and safety belts - inspect for poor condition, fraying, and any other apparent defects;
(c) windows and windshields - inspect for deterioration and breakage;
(d) instruments - inspect for poor condition, mounting, marking and, where practicable, for improper operation;
(e) flight and engine controls - inspect for improper installation and improper operation;
(f) batteries - inspect for improper installation and improper charge;
(g) all systems - inspect for improper installation, poor general condition, apparent and obvious defects and insecurity of attachment.

(4) Engine and Nacelle Group

(a) leaks - inspect for oil, fuel or hydraulic leaks;
(b) studs and nuts - inspect for defects, evidence of improper torque and safety locking;
(c) cylinder compression - check; if compression test indicates problems, check internal condition and tolerances;
(d) screens and sump drain plugs - check for metal particles or foreign matter;
(e) engine mounts - inspect for cracks, looseness of mounting and looseness of engine to mount;
(f) flexible vibration dampeners - inspect for poor condition and deterioration;
(g) engine controls - inspect for defects, improper travel and improper safety locking;
(h) lines, hoses and clamps - inspect for leaks, improper condition and looseness;
(i) exhaust stacks - inspect for cracks, defects and improper attachment;
(j) accessories - inspect for apparent defects in security of mounting;
(k) all systems - inspect for improper installation, poor general condition, defects and insecure attachment;
(l) cowlings - inspect for cracks and other defects.

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Maintenance Schedules

(m) internal corrosion - inspect engines which have not been inhibited and have been out of service in excess of 12 months.
(n) engine performance - during the ground run, run the engine in accordance with the manufacturer's recommendation to determine satisfactory performance of the following:
  (i) idle and maximum RPM;
  (ii) magneto RPM drop;
  (iii) fuel and oil pressures;
  (iv) cylinder and oil temperatures.
(o) Engines maintained to an On-condition program - check reference RPM.

(5) Landing Gear Group

(a) all units - inspect for condition and security of attachment;
(b) shock absorbing devices - check oleo fluid level;
(c) linkage, trusses and members - inspect for undue or excessive wear, fatigue and distortion;
(d) retracting and locking mechanism - inspect for improper operation;
(e) hydraulic lines - inspect for leakage;
(f) electrical system - inspect for chafing and improper operation of switches;
(g) wheels - inspect for cracks, defects and condition of bearings;
(h) tires - inspect for wear, cuts and incorrect inflation; inspect for improper installation and improper operation.
(i) brakes - inspect for improper adjustment;
(j) floats and skis - inspect for insecure attachment and apparent defects;

(6) Wing and Center Section Assembly

Inspect structure for general condition, deterioration, distortion, evidence of failure and insecurity of attachment.

(7) Empennage Assembly

Inspect structure for general condition, deterioration, distortion, evidence of failure, insecure attachment, improper component installation and improper component operation.

(8) Propeller Group

(a) propeller assembly - inspect for cracks, nicks, binding and oil leakage;
(b) bolts - inspect for improper torque and safety locking;
(c) anti-icing devices - inspect for improper operation and defects;
(d) control mechanisms - inspect for improper operation, insecure mounting and improper range of travel.

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Maintenance Schedules

(9) Radio Group

(a) radio and electronic equipment - inspect for improper installation and insecure mounting.
(b) Emergency Locator Transmitters - test performance in accordance with the procedure specified in Subpart 575 of the LARs.
(c) wiring and conduits - inspect for improper routing, insecure mounting and apparent defects.
(d) bonding and shielding - inspect for improper installation and poor condition.
(e) antennas, including trailing antennas - inspect for poor condition, insecure mounting and improper operation.

(10) Miscellaneous Items Not Otherwise Covered by this Listing:

Inspect for improper installation and improper operation

(11) Aircraft Generally, Including Technical Records

(a) enter details of all deficiencies found during the inspection in the aircraft technical records.
(b) upon completion of the inspection, replace or close all inspection plates, access doors, fairings and cowlings.

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Appendix B
Maintenance Schedules

Part II - Scheduled Inspections for Balloons

(1) At intervals prescribed in the General Procedures, inspect the:
- (a) envelope;
- (b) basket (gondola) and its attachments;
- (c) load tapes and support lines;
- (d) instruments;
- (e) controls;
- (f) burners;
- (g) fuel tanks, hoses and clamps; and
- (h) radios and other installed equipment.

(2) Where the check list used differs from the manufacturer's recommended check list, the list shall be approved by the Minister.

(3) Where the balloon is a foreign registered balloon operating in accordance with an authorization issued by the Minister pursuant to LAR 603, it shall be inspected and maintained in accordance with a program which complies with the requirements of this Appendix.

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APPENDIX C
Out of Phase Tasks and Equipment Maintenance Requirements

(1) This appendix lists the maintenance requirements for specific equipment. Unless otherwise specified, these intervals apply to all installed equipment of a type listed herein.
(2) In the case of operators having maintenance schedules approved in accordance with Appendix D, the intervals specified in this appendix are initial intervals that must be used by a new operator of the type. They may be amended once experience on that type has been gained, based on the results of the owner's maintenance monitoring program.
(3) Nothing in these standards relieves the owner from the responsibility for determining the applicability of these requirements to his aircraft, or for identifying any other maintenance requirements relating to equipment not listed here.

Information Note: *Where doubt exists as to the compliance requirements in respect of a specific aircraft installation, the owner can contact the Directorate General of Civil Aviation Office for assistance.*

Operators with an approved maintenance schedule may obtain approval to deviate from the standard where acceptable documentation can be provided to the Director General of Civil Aviation.

Out of Phase Task Listings

Carry out the following tasks at the times indicated:

All Aircraft

Ensure that any applicable equipment maintenance task required by this appendix is performed at, or before, the next inspection interval listed therein.

Aircraft Used in Dual Role Operations

Upon conversion between roles, inspect to ensure that contamination, structural damage and other defects incurred during operation in the special purpose role, are rectified prior to operation in the normal role.

Rotorcraft Dynamic Components

At the intervals recommended by the aircraft manufacturer, inspect:
- (a) the drive shafts or similar systems;
- (b) the main rotor transmission gearboxes;
- (c) the main rotors and hubs;
- (d) the tail rotor.

Variable Pitch Propellers

(1) Where the manufacturer has recommended a TBO in flying hours or cycles, this recommendation shall apply.

APPENDIX C
Out of Phase Tasks and Equipment Maintenance Requirements

(2) Where the manufacturer has not made any recommendations regarding TBO, the propeller(s) shall be overhauled at the following intervals:
(a) in the case of propellers installed on turbine engines:
- 2,000 hours air time;

(b) in the case of single acting propellers installed on piston engines:
- 1,500 hours air time;

(c) in the case of double acting propellers installed on piston engines:
- 2,000 hours air time.

(3) At intervals of not more than 5 years, the propeller shall be subjected to an internal inspection for corrosion by an AMO holding an applicable rating in the propeller category. The dismantling of the propeller shall be to the extent that will allow for the complete inspection of the propeller; including, as required, removal of blade root ferrules, de-icer boots, decals, etc.

Information Note: *The inspection described in paragraph (c) does not constitute overhaul. It is intended to meet the needs of those owners who operate in a benign environment and have extremely low utilization.*

(4) The interval of 5 years, required by paragraph (c), starts following the first installation of the propeller on the aircraft, subject to the following conditions:
(a) the propeller is new, properly packaged and protected against corrosion while in shipment or storage; or
(b) the propeller is newly overhauled or has been inspected as per paragraph (c), properly protected and packaged against corrosion while in shipment or storage.
(5) The interval of 5 years, required by paragraph (c), may be interrupted by a period of storage following the first installation of the propeller, subject to the following conditions:
(a) the propeller shall be completely cleaned of all residual oil and foreign deposits, e.g. lead, in accordance with the manufacturer's recommendations; and
(b) it shall be completely inhibited, properly protected and packaged against corrosion while in storage using the manufacturer's recommendations, or other procedures acceptable to the Minister.

Fixed Pitch and Ground Adjustable Propellers

At intervals of not more than 5 years, the propeller shall be removed from the aircraft and inspected for corrosion or other defects over its entire surface, including the hub faces and the mounting hole bores. While the propeller is removed, it shall also be checked for correct dimensions. However, if defects which require repairs beyond those recommended as field repairs by the propeller manufacturer are found, the propeller shall be repaired by an organization approved for the overhaul of propellers.

Information Note: *The dimensional check requirement does not include a check on blade twist. The dimensional check refers to changes in blade dimension resulting from repairs, particularly cropping of the tips. It is intended to ensure that the blade diameter remains within service limits.*

APPENDIX C
Out of Phase Tasks and Equipment Maintenance Requirements

Engines

All piston and turbine engines installed in aeroplanes and helicopters operated pursuant to Subpart 406 of the Lebanese Aviation Regulations (LARs), in large aircraft operated pursuant to Subpart 604 of the LARs, and in aircraft operated pursuant to Part VII of the LARs, shall be overhauled at the intervals recommended by the engine manufacturer, or in accordance with an alternative hard time interval or an engine on-condition maintenance program approved in accordance with Appendix D.

Information Note: *No hard time, including calendar time, between overhauls need be observed in the case of small aircraft reciprocating engines in non-commercial private operation.*

Tachometers

The accuracy of the tachometer system shall be checked at least at each annual inspection.

Weight and Balance

Except as provided for in an approved fleet empty weight and balance control program, all aircraft shall be reweighed and an updated report prepared every five years and submitted to the DGCA.

Non-stabilized Magnetic Direction Indicators (MDIs)

(1) Except as provided in (2), non-stabilized magnetic direction indicators shall be calibrated, and a dated correction card installed for each indicator, at at intervals not exceeding 12 months;
(2) The annual calibration requirement of (a) does not apply to an aircraft operating under an air operator certificate, or to any large or turbine-powered pressurized aircraft, where:

- (a) the aircraft is equipped with two independent stabilized magnetic direction indicators in addition to the non-stabilized direct reading magnetic direction indicator; and
- (b) a procedure for monitoring and recording the performance of the magnetic direction-indicators is detailed in the flight training organization’s, or in the air operator's approved maintenance control manual approved pursuant to LAR 406 and LAR 706 respectively.

Survival and Emergency Equipment

Survival and emergency equipment shall be overhauled at the intervals recommended by the manufacturer.

Emergency Locator Transmitters (ELTs)

(1) Except where powered by water activated batteries, the ELT shall be checked at intervals not exceeding 12 months, in accordance with Subpart 575 of the LARs.
(2) ELTs powered by water activated batteries shall be performance-tested at intervals not exceeding 5 years.
(3) ELT batteries shall be replaced at the interval recommended by the ELT manufacturer.

APPENDIX C
Out of Phase Tasks and Equipment Maintenance Requirements

Altimetry Devices

Altimeters and other Altimetry devices installed in aircraft operating under Instrument Flight Rules, or under visual flight rules in Class B Airspace shall be calibrated at intervals not exceeding 24 months, to the standard outlined in Subpart 575 of the LARs.

Information Note: *For the purpose of this section, the term "other altimetry devices" includes any air data computer, or other barometric device, providing a flight crew station, or an auto pilot, or automatic pressure altitude reporting system with altitude data derived from static pressure.*

Air Traffic Control (ATC) Transponders

ATC Transponders, including any associated altitude sensing reporting mechanisms, where installed, shall be tested every 24 calendar months, in accordance with Subpart 575 of the LARs.

Cockpit Voice Recorders (CVRs)

(1) Cockpit Voice Recorders (CVR), where installed for compliance with the basis of certification listed on the type certificate, or where required by operating rule, shall be subject to the following maintenance, in accordance with a maintenance schedule meeting the following requirements:
- (a) an operational check;
- (b) a functional check;
- (c) an intelligibility check; and
- (d) unit overhaul, at the interval recommended by the CVR manufacturer.

(2) An operational check shall be performed, in accordance with the manufacturers instructions, as follows:
- (a) by maintenance personnel during each line check and following any system maintenance;
- (b) by each new, or partial change of, flight crew; and
- (c) upon installation in the aircraft.

(3) A functional check shall be completed in accordance with manufacturers maintenance instructions at 3,000 hours, or 12 months, whichever comes first.

(4) An intelligibility check shall be performed by means of a test procedure which, when completed under operational conditions, shall enable verification of intelligible recorded audio information from all the various input sources required by the regulations:
- (a) upon initial installation;
- (b) at 3,000 hours, or 12 months, whichever comes first.

(5) CVR maintenance and overhaul shall be performed in accordance with manufacturer's recommendations.

Information Note: *EUROCAE ED-56A document provides guidelines for CVR maintenance in general; it also provides information relative to equipment required to adequately evaluate the quality of voice recording.*

(6) CVR maintenance details can be found in Subpart 575 of the LARs.

APPENDIX C
Out of Phase Tasks and Equipment Maintenance Requirements

Underwater Locating Devices (ULDs)

(1) The beacon case and water switch shall be cleaned at the interval, specified by the ULD manufacturers' recommendations.
(2) Operational checks shall be conducted on ULDs upon installation, and once a year thereafter. The ULD battery shall be replaced on or before the expiry date stamped on the battery, and a label affixed to the ULD case indicating the next replacement date.
(3) The ULD shall be inspected and tested at the intervals specified below:
- (a) cleaning of the water switch at interval as recommended by the ULD manufacturer;
- (b) recertification of the ULD at 12 month intervals; and
- (c) replacement of the ULD battery at the interval as recommended by the battery manufacturer.

Flight Data Recorders (FDRs)

Information Note: *Operators with an approved maintenance schedule may obtain approval to deviate from the standard where acceptable documentation can be provided to Director General of Civil Aviation.*

At the intervals specified in the table below, and where installed for compliance with the basis of certification listed on the type certificate, or where required by operating rules, FDRs shall be inspected and tested in accordance with Appendix I of Subpart 575 of the LARs.

FDR MAINTENANCE SCHEDULE	
Task	Interval
Correlation check to ensure all required parameters are being recorded and usable	3,000 flight hours or 12 months, whichever occurs first
Accelerometer functional check	As specified by the FDR manufacturer
Overhaul FDR	As specified by the FDR manufacturer
Cleaning of heads	As specified by the FDR manufacturer

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APPENDIX D
Operator's Approved Maintenance Schedule

(1) Pursuant to Subsection 605.86(2) of the LARs, applications for approval of maintenance schedules shall be submitted to the Minister through the Director General of Civil Aviation, Lebanon.
(2) Pursuant to Subsection 605.86(1) of the LARs, an air operator's approved maintenance schedule shall ensure that the maintenance requirements listed in Appendix C are complied with.
(3) Pursuant to Subsection 605.86(1) of the LARs, the following information shall accompany an application for approval of a maintenance schedule:

- (a) the instructions and procedures for the conduct of scheduled maintenance on the particular make and model of aircraft, provided in the form of a check list, including the following information:
  - (i) the name of any part or areas of the airframe, engines, propellers, appliances, and emergency equipment to be inspected or otherwise maintained;
  - (ii) the nature of the inspections or other maintenance tasks to be performed;
  - (iii) an outline of the proposed intervals for performing the inspections or other maintenance tasks, expressed in flying hours, calendar time, or cycles;
  - (iv) any tolerances applicable to the intervals between scheduled inspections or maintenance tasks;

Information Note: *No tolerances are permitted with respect to tasks recognized by airworthiness limitations or airworthiness directives.*

  - (v) where the maintenance of any part or areas of the airframe, engines, propellers, appliances, or emergency equipment is required because that part or area of the airframe, engines, propellers, appliances, or emergency equipment is subject to an airworthiness limitation, its identification as such; and
  - (vi) in the case of schedules approved in respect of air operators and flight training units that develop work instructions for maintenance personnel to be used in place of the manufacturer's maintenance manuals, a link to those work instructions.
- (b) Details of the substantiating data on which the proposed schedule is based.

(4) Pursuant to Subsection 605.86(2) of the LARs, an operator of a small aircraft who wishes to use a progressive maintenance schedule, including a schedule recommended by the manufacturer, shall submit a written request for approval to the Minister. The progressive maintenance schedule shall provide for a complete inspection of the aircraft, to at least the same extent as the schedule contained in Appendix B, within each 12 month period. Once established on such a progressive schedule, if for any reason, the qualifying terms of the schedule cannot be met, the aircraft shall undergo an inspection for conversion to the schedule required by Appendix B of these standards. Such inspection shall not be less in scope than the inspection detailed in Parts I or II of Appendix B of these standards.

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APPENDIX E
Maintenance Monitoring Programs

Information Note: *For information regarding the Maintenance Review Board (MRB) note the following:*

(a) The Airline Transport Association (ATA), Airline/Manufacturer, Maintenance Program Development Document, MSG-3 (Revision 2), "Maintenance Review Board Procedures" is the industry standard when developing initial scheduled maintenance programs using MSG logic.

(b) *Additionally, the Federal Aviation Administration AC 121-22A provides the policy on how to implement the standard (ATA MSG-3, Rev. 2), including the guidelines that should be followed during the MRB process.*

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Appendix F
Transfer of Aeronautical Products Between Maintenance Schedules

General

(1) Background - Maintenance schedules are approved for the use of particular operators, and take into account the operators' individual circumstances and demonstrated reliability. They are not interchangeable between operators. Scheduled maintenance requirements for aeronautical products may also vary within the fleet of a single operator, according to the type of aircraft on which they are installed, or the role in which they are operated. When aeronautical products (either complete aircraft or components) are transferred between inspection programs, it is the responsibility of the operator (where two operators are involved the responsibility is that of the new operator) to review the maintenance status of the products to establish them on the new program.
(2) Review - The review procedure consists of a comparison of the content of the previous inspection program with that of the new program. If the programs are found to be identical, no further action is required. Any differences between the two programs will require either a recalculation of the times remaining to the maintenance task(s) involved, an out of phase inspection of the product, or both, as explained in the following paragraphs.
(3) Differences - Differences between the two inspection programs will fall under one of the following methods or headings:

- (a) tasks which appear on both programs, but at different intervals;
- (b) tasks which appear on both programs, but use different accomplishment
- (c) tasks which appear on one program but not on the other.

(4) The procedure for calculating the times remaining to overhaul, or other maintenance tasks(s) for those items having different intervals on the new program, is given in section 12.

Information Notes: *As detailed in Subsection s605.87(2) of these standards, provided that a flight training unit or an air operator's approved maintenance control manual contains procedures for the use of borrowed parts, they can borrow an aircraft part from another person and can use such part for a maximum of 100 hours, or 90 days, whichever is greater, without compliance to the requirements in this appendix, even though the time in service of such part exceeds the borrower's approved inspection intervals.*

As specified in Subsection s605.93(1) of these standards, the "time" referred to when calculating time between maintenance activities is considered the actual air time.

(5) Both Program Tasks - Where a task appears on both programs, but the task uses different accomplishment methods, calculation to the new program interval is not permitted, unless the document which requires the inclusion of that task into the maintenance schedule is consulted to ensure methodology does not affect interval. Where the interval is based on methodology, the task will be accomplished at the interval appropriate to the methodology used in the new program.

Appendix F
Transfer of Aeronautical Products Between Maintenance Schedules

(6) Old Program Tasks - Tasks which form part of the old program but not the new must normally be performed one final time before being eliminated totally by the new program. The tasks may be performed either at the time of transfer or at some later convenient time, provided that the approved interval (of the previous program) is not exceeded (i.e. time remaining to task will be the same on both programs). In some circumstances Directorate General of Civil Aviation can, upon application, waive the requirement to perform tasks in this category. Such a waiver would be appropriate in the case of tasks introduced because of a specialized operating role, when the aircraft had operated in that role for only a small proportion of the approved interval. It would not, however, be appropriate in the case of tasks introduced in response to problems which could result from short term exposure to risks. For example, if an underfloor inspection has been included in a program to cater for the carriage of cattle, then use in that role for even a single occasion will necessitate the performance of the inspection.
(7) New Program Tasks - Tasks which are required by the new program, but do not appear on the old, can be performed at the completion of the appropriate interval, commencing at the time of transfer (i.e. time remaining to task and approved interval will be identical).
(8) Airworthiness Limitations - The prorating procedures described in section (4) above do not apply to items designated in the type approval document as "airworthiness limitations", or "life limits". This will not normally be a problem, since such limitations apply equally to all operators. Certain life-limited items, however, can have different limits depending on the installation or the aircraft role. Because of the critical nature of parts subject to life limits or other airworthiness limitations, when transferring identical life-limited products between programs to which different limits apply, the lower limit shall be observed, irrespective of whether that limit forms part of the old or the new program, unless written approval for some other procedure is obtained from the Director General of Civil Aviation.

Information Note: *The new operator shall perform an acceptance inspection at the time of transfer. This inspection shall confirm that the aircraft or component is in compliance with airworthiness directives and other mandatory requirements, and provide an opportunity to perform those tasks required by one program only, or those tasks required at such frequent intervals that prorating would be inconvenient. In cases where the transfer involves a complete change of program format (e.g. from a "block" to an "equalized" program, or vice-versa) the acceptance inspection can be performed in a number of stages over a period of operation time, to provide the necessary "stagger" for future task performance.*

(9) Records - At the time of transfer, the new operator shall make entries in the appropriate sections of the technical records recording any recalculations which have been made. For example, a typical engine log entry might read:

> "Engine acquired by ABC Airlines 15/2/86. Previous TBO (XYZ Airlines) 5,500 hrs. Time since overhaul at transfer 3,086 hrs. ABC Airlines approved TBO 4,500 hrs. Prorated time remaining = 1975 hrs: Overhaul at 5061 hrs."

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Transfer of Aeronautical Products Between Maintenance Schedules

(10) Subsequent Transfers - If, after prorating and a period of operation on the new program, a subsequent transfer occurs, either to a third program or back to the original program (as would occur on the termination of a lease, for example) the procedure shall be repeated. If further calculations are required, value Y (see section (12) below) shall be taken as the time(s) remaining to task at the time of transfer, irrespective of the actual hours flown or the previous calculations made. The details of previous calculations are not required, since only the time remaining is being adjusted. The principle involved is that the time remaining to overhaul shall be a direct indication of the unused service life potential of the component.
(11) Differences in Build Standard - The procedures required by paragraph (12) is intended for transfers between programs which have been approved for use with identical products. Where the programs have been developed for products having significant differences in build standard, no upward adjustment of the times remaining to overhaul is permitted without specific Directorate General of Civil Aviation approval. "Significant" differences are any differences in material specification, dimensions or tolerances, or any differences in modification standard which could affect the potential TBO.

Information Note: *As an example, most engine structural modifications (Air Transport Association (ATA) Chapter 72 dealing with Engine-Turbine/Turboprops) would fall into this category. Operators who are bringing into use products with build standards different to those for which the inspection program was developed, and who wish to adjust the times remaining to overhaul upwards, shall list the differences and forward them to the Director General of Civil Aviation, together with the prorating calculations, and their assessment of the effect of the build standard differences on the times remaining to overhaul. The Director General of Civil Aviation will assess the proposals, and notify the operator of the maximum time(s) which can be permitted to elapse before the task(s) are performed.*

(12) Calculations - The procedure for calculating the times remaining to overhaul or other maintenance tasks(s) for those items having different intervals on the new program is known as "prorating." It is based on the following formula:

$$X = Y \times \frac{a}{b}$$

where:

X = time remaining to task on the new program;
Y = time remaining to task on the previous program;
a = interval between tasks on the new program; and
b = interval between tasks on the previous program.

The following examples will illustrate the use of this formula. Note that the approved intervals (TBOs) of the respective programs are unaffected. It is the times remaining to the task(s) which are recalculated.

For the purpose of these calculations, all times can be rounded out to the nearest hour or, in the case of calendar times, to the nearest complete month.

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Transfer of Aeronautical Products Between Maintenance Schedules

Example 1

An aircraft is transferred (by sale or lease) between two operators. The first operator's inspection program requires an overhaul of the flap actuator gear boxes at 10,000 hrs. The new operator (who has a short haul route structure requiring more frequent flap extensions) is approved for a TBO of 5,000 hrs. The No. 1 flap gear box has been in service for 6,000 hrs.

Time remaining to task on the previous program (Y) = 10,000 - 6,000 = 4,000 hrs.

Interval between tasks on new program (a) = 5,000 hrs.

Interval between tasks on previous program (b) = 10,000 hrs.

Time remaining to overhaul $(X) = Y \times \frac{a}{b} = 4{,}000 \times \frac{5{,}000}{10{,}000} = \underline{2{,}000\text{ hrs.}}$

Example 2

An operator has a DC-3 and a Canso and keeps one spare engine for use in both aircraft. Approved TBO in the DC-3 installation is 1,000 hrs. Approved TBO in the Canso installation is 800 hrs. The spare engine is required for use in the DC-3 and has 650 hrs since overhaul, acquired while installed in the Canso. Time remaining to overhaul in the DC-3 installation (X) will be:

$150 \times \frac{1{,}000}{800}$ Rounded to nearest complete hour = 188 hrs.

Example 3

An operator having an approved time between "C" checks of 2,500 hrs., obtains an aircraft from an operator having an approved time between "C" checks of 3,000 hrs. Time since last "C" check is 2,150 hrs. A comparison of the two "C" check packages shows the check content to be the same in both cases.

Y = 3,000 - 2,150 = 850

Time remaining to "C" check on new program $(X) = 850 \times \frac{2{,}500}{3{,}000} = 708$ hrs.

Where differences exist between the contents of the two check packages, the operator can elect to calculate the times remaining to each of the items involved as a separate task, to be performed out of phase with the rest of the check cycle, or to treat the items in accordance with paragraph (6) above, as appropriate.

Where the two inspection programs are based on different units (e.g. flying hrs., operating cycles or calendar time) all intervals and times remaining to tasks shall be converted to the units used by the new operator prior to prorating. This conversion should be done, where possible, according to the conversion factor expressed in the previous operator's program. Where no such factor exists, the

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Transfer of Aeronautical Products Between Maintenance Schedules

conversion shall be based on the actual experience of the previous operator, as shown in the following example:

Example 4

An operator having an approved time between "C" checks of 12 months, obtains an aircraft from an operator having an approved time between "C" checks of 3,000 hrs. Aircraft time since last "C" check is 2,150 hrs.

Step 1. (Convert to calendar times)

Previous operator's utilization (past 12 months) = 2,365 hrs.

Therefore monthly utilization $= \frac{2365}{12} = 197$ (rounded)

Approved "C" check interval in calendar time $= \frac{\text{interval in hrs.}}{\text{monthly utilization}} = \frac{3{,}000}{197} = 15$ mth (rounded)

Time remaining to check in calendar time $= \frac{\text{time in hours}}{\text{monthly utilization}} = \frac{850}{197} = 4$ mths (rounded)

Step 2. (prorate)

New operator's time remaining to "C" check $= 4 \times \frac{12}{15} = 3$ mths (rounded)

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Appendix G
Inspection after Abnormal Occurrences

(1) Pursuant to Section 575 of the LARs, all maintenance shall be performed using the methods, techniques, practices, parts, materials, tools, equipment, and test apparatus specified by the manufacturer of the aeronautical product.

Information Note: *This appendix details the requirements for the inspection of aircraft after abnormal occurrences and gives general advice on the performance of such inspections.*

(2) Aircraft are approved to operate within certain limits which are considered to constitute normal operation. If these limits are exceeded due to abnormal occurrences, or if the aircraft is exposed to some hazard or stress which was not catered for in the original design, the integrity of the structure or the performance of the powerplant(s) or systems could be impaired. Any report or evidence which indicates that approved limits have been exceeded, or that the aircraft may have sustained damage, shall necessitate an inspection to ensure that the aircraft is still airworthy. The following sections outline in general terms the inspections required after some of the more common occurrences. The procedures described are intended to supplement manufacturer's recommendations, or to cater for those instances where the manufacturer has not provided any detailed instructions. In case of any conflict, the manufacturer's instructions shall prevail. The procedures described are not intended to be complete, or to cover all circumstances. It is the responsibility of the person performing the inspection to assess the circumstances of each case and decide on the appropriate course of action. In doubtful cases, the Directorate General of Civil Aviation office can be consulted.

(3) The inspections detailed in this Appendix shall usually be performed by a licensed Aircraft Maintenance Technician (AMT). In some cases, the nature of the work will be such that the involvement of an AMT will be mandatory. This would be the case, for example, where some degree of disassembly was required. It is not possible, however, to state that an AMT is required in all cases. Often, at the time of the occurrence, only the pilot of the aircraft is able to assess the severity of the incident or is available to decide the course of action. Some manufacturers recognize this by allowing for the inspection to be performed in two stages. To cater for situations when an AMT is not available, the following procedure is recommended.

(4) Following any abnormal occurrence, including but not limited to those described in this Appendix, an entry shall be made in the journey log describing the event Where possible, the entry shall include some indication of the relative severity of the incident. Prior to the next flight, the aircraft shall be inspected, preferably by an appropriately licensed AMT. If no AMT is available, the inspection can be conducted by the captain of the aircraft. In this case, the inspection will of necessity be limited to those items which do not require a maintenance release (i.e. does not involve disassembly).

(5) If in the opinion of the captain, the condition of the aircraft is satisfactory for the intended flight, albeit without passengers, he shall make an entry in the log to that effect calling for a full inspection by an AMT when available. The captain can then proceed, at his discretion, on the intended flight(s) until such time as the aircraft reaches a base where the required additional inspection can be performed. No special flight authority is required under these circumstances. At the first opportunity, the aircraft shall be inspected and a maintenance release shall be issued by an appropriately licensed AMT.

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(6) If in the opinion of the captain, the aircraft is unairworthy, or if the severity of the incident was such that even after a satisfactory preliminary inspection its airworthiness is in doubt, then the aircraft shall be inspected by an AMT, and a maintenance release signed, before further flight.
(7) In the following sections, no attempt is made to differentiate between those actions which may be part of a pilot's preliminary inspection, and those which must be performed by an AMT. This distinction will vary according to the type of aircraft and the severity of the incident, and will be primarily governed by the need for a maintenance release. Where there is any doubt regarding the airworthiness of the aircraft, certification by an AMT shall be required prior to flight.
(8) Heavy or Overweight Landings - An aircraft landing gear is designed to withstand landings at a particular aircraft weight and vertical descent velocity. If either of these parameters is exceeded during a landing, it is then probable that some damage can be caused to the landing gear or its supporting structure. Overstressing can also be caused by landing with drift or landing in an abnormal attitude (e.g. nose or tail wheel striking the runway before the main wheels).

Some aircraft have structural elements which are known to give a visual indication that specified "g" forces have been exceeded, but in all cases of suspected heavy landings, the flight crew shall be consulted for details of aircraft weight, fuel distribution, landing conditions and whether any noises indicative of structural failure were heard.

The damage resulting from a heavy landing is normally concentrated around the landing gear, its supporting structure in the wings or fuselage, the wing and stabilizer attachments and the engine mounts. Secondary damage can be found on the fuselage upper and lower skin and structure, and wing skin and structure, depending on the configuration and loading of the aircraft. On some aircraft the manufacturer can recommend that if no damage is found in the primary areas, the secondary areas need not be inspected; but if damage is found in the primary areas, then the inspection shall be continued.

Because of the number of factors involved, it is not possible to lay down precise details of the inspections which must be made after any incident, on any type of aircraft, but a preliminary inspection shall normally include the items detailed below.

(a) landing gear
- (i) examine tires for creep, flats, bulges, cuts, pressure loss and enlargement.
- (ii) examine wheels and brakes for fluid leaks, cracks and other damage.
- (iii) examine axles, struts and stays for distortion and other damage.
- (iv) check shock struts for fluid leaks, scoring and abnormal extension.
- (v) examine landing gear attachments for cracks, other damage and signs of movement. In some instances this can require the removal of certain bolts in critical locations, for detailed nondestructive testing.
- (vi) examine the structure in the vicinity of the landing gear attachments for signs of cracks, distortion, movement of rivets or bolts and fluid leakage.
- (vii) examine doors and fairings for damage and distortion.
- (viii) jack the aircraft and carry out retraction and nose-wheel steering tests; check for correct operation of locks and warning lights, clearances in wheel bays, fit of doors and signs of fluid leaks.

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(b) wings
- (i) examine the upper and lower skin surfaces for signs of wrinkling, pulled rivets, cracks and movement at skin joints. Inertia loading on the wing will normally result
- (ii) in wrinkles on the lower surface and cracks or rivet damage on the upper surface, but stress induced by wing-mounted engines can result in wrinkles on either surface.
- (iii) check for signs of fuel leaks and seepage from integral tanks.
- (iv) examine wing root fillets for cracks and signs of movement.
- (v) check flying controls for freedom of movement.
- (vi) check balance weights, powered flying control unit mountings and control surface hinges for cracks, and control surfaces for cracks or bucking.
- (vii) check spars for distortion and cracks.

(c) fuselage
- (i) examine fuselage skin for wrinkling or other damage particularly at skin joints and adjacent to wing and landing gear attachments.
- (ii) examine pressure bulkheads for distortion and cracks.
- (iii) examine the supporting structure of heavy components such as galley modules, batteries, water tanks, fire extinguishers, auxiliary power units, etc. for distortion and cracks.
- (iv) check that the inertia switches for fire extinguishers, emergency lights, etc, have not tripped.
- (v) check instruments and instrument panels for damage and security.
- (vi) check ducts and system pipelines for leaks and buckling.
- (vii) check fit of access doors, emergency exits, etc., and surrounding areas for distortion and cracks.
- (viii) check loading and unloading operation of cargo containers and condition of cargo restraint system.

(d) engines
- (i) check engine and propeller controls for full and free movement.
- (ii) examine engine mounts and pylons for damage and distortion, tubular members for bowing and cracks at welds, mounting bolts and attachments for damage and evidence of movement.
- (iii) check freedom of rotating assemblies - on piston engines, check freedom of rotation with spark plugs removed.
- (iv) examine engine cowlings for wrinkling and distortion, and integrity of fasteners.
- (v) check for oil, fuel and hydraulic fluid leaks.
- (vi) check propeller shaft for alignment.

(e) empennage
- (i) check flying controls for freedom of movement.
- (ii) examine rudder and elevator hinges for cracks, and control surfaces for cracks and distortion, particularly near balance weight fittings.
- (iii) examine stabilizer attachments and fairings, screw jacks and mountings for distortion and signs of movement.

(f) engine runs

Provided that no major structural distortion has been found, engine runs shall be carried out to establish the satisfactory operation of all systems and controls. A general check for system leaks shall be carried out while the engines are running, and on turbine engines the rundown time shall be checked.

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(g) helicopters
The inspections necessary on helicopters are broadly similar to those detailed in the preceding paragraphs, but additional checks are normally specified for the main rotor blades, head and shaft, tail rotor and transmission. The inspections outlined below are typical.
  (i) examine the rear fuselage or tail boom for evidence of strike damage from the main rotor blades, and if damage is found, check for cracks, security, and symmetry.
  (ii) remove the main rotor blades and examine them for twisting and distortion. Check the surface for cracks, wrinkles or other damage, and check the security of the skin attachment rivets or structural bonding. If the main rotor blades are badly damaged through impact with the tail boom or ground, certain components in the transmission can be shockloaded, and it shall be necessary to refer to the instructions for rotor strikes (see section13 below).
  (iii) for the main rotor head, disconnect pitch change rods and dampers, and check that the flapping hinges, drag hinges and blade sleeves move freely, without signs of binding or roughness. Examine the rotor head and blade stops for cracks or other damage, and the dampers for signs of fluid leaks. Damage in this area can be an indication of further damage inside the main gearbox.
  (iv) examine the tail rotor blades for damage and security, and the coning stops for evidence of damage. Damage to the tail rotor blades which is beyond limits shall entail either further inspection, or replacement of the hub, pitch change links, tail rotor gear box and drive shaft.

(9) Flight in Severe Turbulence - The type of damage that results from flight through severe turbulence is similar to that resulting from a heavy landing, the major difference being that the damage is less localized, and that wheel and brake assemblies are unlikely to be affected.
(a) on some aircraft an indication of the severity of the loads experienced can be obtained from accelerometers or fatigue meters. These instruments, however, are designed to record steady loads, and peak forces recorded during flight through turbulence can be exaggerated due to instrument inertia. Generally, readings outside the range of -.5 g to + 2.5 g on transport category aircraft are cause for investigation. Most aircraft do not have such instrumentation, and all incidents of flight through turbulence shall be investigated.
(b) severe turbulence can cause excessive vertical or lateral forces on the aircraft structure, and the effects can be increased by the inertia of heavy components such as engines, fuel tanks, water tanks and cargo. Damage can be expected at main assembly points such as the wing to fuselage joints, tail to fuselage joints and engine mountings. Damage can also occur in those areas of the wings, fuselage, stabilizer and control surfaces where the greatest bending moment takes place (i.e. part way along their length, and can be indicated by skin wrinkles, pulled rivets or similar faults).
(c) an inspection for damage after a report of flight through severe turbulence shall include the inspections detailed in Section (8) above, except, in most cases, those covering the landing gear.

Information Note: *Further dismantling and, in some cases, removal of some portions of the skin can be necessary in order to inspect supporting structure where skin damage has been found.*

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(10) Exceeding of Airspeed/Acceleration Limits - Where it is reported that an aircraft has exceeded its approved airspeed or acceleration limits, the inspection required is the same as that required following flight through severe turbulence.

Where the limit exceeded was that applicable to a particular configuration (e.g. gear or flap extension limits), or where the report relates to failure to observe loading or wing bending relief limits (e.g. application of excessive loads prior to depletion of center wing tanks), then the subsequent investigation can be limited to the affected areas of the structure.

(11) Burst Tire Incidents - If a tire bursts during taxiing, take-off or landing, fragments of the tire can cause damage to parts of the aircraft in line with the wheel disc. Damage can also occur due to the wheel rolling on the paved runway and transmitting shocks to the landing gear leg and supporting structure.

(a) multiple wheel landing gears will generally be less seriously affected by a single burst tire, but the axles, bogies, torque links or steering mechanism can become bowed or strained as a result of the effects of uneven loading. In most cases, the wheel on which the burst occurred shall require repair or removal from service.

(b) in addition, the following inspections shall be carried out:

(i) examine the wheels and tires which have not burst.

Information Note: *Where one of the tires on a multiwheel undercarriage has burst, it can be specified by the aircraft manufacturer that all tires on that leg or axle shall be discarded, or removed for detailed examination.*

(ii) examine the brake units on the affected leg for damage. On those wheels which are not fitted with fusible plugs, the tire burst can have resulted from overheating caused by a binding brake, and when the replacement wheel is fitted, attention shall be given to the operation of the associated brake including, in particular, freedom of rotation of the wheel with brake released.

(iii) examine the landing gear bay for damage and hydraulic fluid leaks.

(iv) examine the affected leg, including pipelines, operating jacks, etc., for damage and hydraulic fluid leaks.

(v) inspect the supporting structure and attachments of the affected leg for cracks, warped panels and loose rivets. In some instances it can be specified that certain highly stressed bolts in the supporting structure or retraction mechanism shall be removed for nondestructive testing.

(vi) examine the adjacent fuselage or wing skins and landing gear doors for damage.

(vii) check engines for possible ingestion of debris.

(12) Immersion in Water - The following requirements are based on immersion in non-contaminated water. It is the responsibility of the AMT performing the inspection to determine if any contaminating elements exist, and extend the scope of the inspection as necessary. Examples of contaminants which may have to be taken into consideration include alkali, sulphur, salt, etc. Other important considerations are the length of time the aircraft has been submerged, especially if contaminants exist, and the temperature of the water. If temperatures are below freezing, tubing in the fuselage structure is liable to have been distorted or split through the formation of ice.

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The general inspection requirements for aircraft which have been immersed in water are listed below. To them shall be added any additional requirements specified by the manufacturer, and additional inspections for any damage incurred during the entry into the water or during the recovery operation.

The inspections listed below are considered the absolute minimum required following short term immersion in uncontaminated water. If the aircraft has been immersed for a period in excess of 30 days (or 24 hrs. in the case of salt water), additional inspections shall be necessary.

(a) aircraft structure
- (i) examine all structure for damage (i.e. skin wrinkles, warping, bulges or splits in tubular structures).
- (ii) remove or open all inspection panels to allow complete draining and drying. Cabin lining, flooring and side panels shall be opened sufficiently to allow drying and inspection. On fabric covered components, cut sufficient circular holes to allow draining, drying and inspection of the structure. Special attention shall be paid to glued joints on wooden structures.
- (iii) check tubular structure for trapped water. Examine tape wrappings on tubular frames for thorough drying.
- (iv) lubricate with grease where fittings are provided, and all other moving parts with light engine oil.
- (v) drain fuel tanks and lines and flush tanks with a suitable rapidly evaporating solvent.

Information Note: *Maintenance personnel should ensure that the solvents used for flushing have no detrimental effect on the flexible hose construction material.*

(b) instruments
- (i) remove all instruments, open sufficiently to allow drying. Lubricate and test. All primary flight instruments shall be forwarded to an approved overhaul organization for recertification.
- (ii) disconnect all lines and drain thoroughly, paying particular attention to low spots where water can be trapped.

(c) electrical and Avionics Equipment
- (i) loosen all wire bundles and shielded cables sufficiently to allow complete drying.
- (ii) check all connections and remove corrosion.
- (iii) clean switches (open type), solenoids, reverse current relays and voltage regulators (except carbon pile type) with a suitable rapidly evaporating solvent. Carbon pile type voltage regulators shall be returned to an approved overhaul facility.
- (iv) replace toggle switches and circuit breakers.
- (v) clean and test all radio units and accessories.

(d) engines (if immersed while cold)
- (i) examine engine and propeller for damage. Bent propeller blades shall necessitate the examination of the engine for propeller strike damage.
- (ii) drain oil from sumps, oil cooler and tank.

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(iii) lower intake pipes loosened.
(iv) drain carburetor, flush with fuel or alcohol, and then flush with very light oil. Injection type carburetors shall be forwarded to an overhaul agency for dismantling, inspection and testing.
(v) remove magnetos, drain, oven dry, relubricate and reinstall.
(vi) remove all accessories, drain, dry, relubricate and reinstall.
(vii) clean spark plugs and ignition harness, dry and test.
(viii) drain and replenish oil tank with oil of the correct grade.
(ix) start engines, if oil pressure is normal, continue running until operating temperatures are obtained (cylinder head and oil).
(x) stop engines and check oil screens.
(xi) carry out complete power run and ensure that all applicable specifications are met, and that all accessories are operating normally.

(e) additional checks if engine immersed while hot
(i) piston engines - Due to the thermal shock encountered with the sudden cooling of the cylinder assemblies, all cylinders shall be removed and dismantled; cylinders, cylinder heads, pistons, valves, valve seats and valve springs shall be inspected for distortion and cracks.
(ii) turbine engines - Turbine engines shall be completely dismantled for internal inspection by an approved turbine engine overhaul organization.

(f) additional Checks if Engine Immersed while Running
(i) piston engines - Due to the danger of forming a hydraulic lock which can result from the entry of water into the cylinders, the engine shall be completely dismantled for internal inspection by an approved overhaul organization.
(ii) turbine engines - Turbine engines shall be completely dismantled for internal inspection by an approved overhaul organization.

(g) propellers - Cleaned and re-lubricated. Propellers with control domes or cylinders which are removable in the field shall be opened and checked internally.

(13) Propeller and Rotor Strikes - Engines and transmission systems which have been shockloaded as a result of the propeller or rotor striking the ground or some object while the engine is running shall be inspected in accordance with the following paragraphs:

(a) a preliminary inspection shall be made of the blade itself and, if possible, of the object which was struck to aid in estimating the level of shock which can have been transmitted. It is not expected that an accurate assessment be made, but rather that the inspector shall form a general impression of whether the impact was severe or mild. If the level of impact is in doubt, it shall be assumed that a severe shock has been transmitted. In addition to a visual examination, the propeller or rotor shall be checked for correct tracking. Out of track limits shall be found in the appropriate maintenance manual but, as a general guide, a propeller which is out of track by more than 0.125 inch (3,18 mm.) is cause for further investigation. A visual inspection of the reduction gear case for oil leaks or cracks shall also be carried out.
(b) the need for further investigation will depend upon the results of the preliminary examination, and on the AMT's assessment of the probability of further damage, based on the nature of the incident. If further investigation is indicated, the propeller shaft or flange shall be checked for eccentricity (run out check). Limits are those specified by the manufacturer. If the propeller shaft or flange is out of limits, an internal inspection shall be required. In the case of a geared

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piston engine this shall entail removal of the reduction gear for a check of the crankshaft run out. With a direct drive engine the crankcase shall have to be opened and checked for distortion, cracks or other damage. This check shall include the crankshaft damper assemblies. If the impact was severe, consideration shall also be given to the possibility of structural damage due to loads being transmitted through the engine mounts.

(c) in the case of helicopters, the following additional checks shall be made:

(i) remove the main rotor blades and examine them for twisting and distortion. Check the surface for cracks, wrinkles or other damage, and check the security of the skin attachment rivets or structural bonding. If the main rotor blades are badly damaged through impact with the tail boom or ground, check the main rotor shaft, pitch change rods and main gear box mounting bolts for cracks and distortion.

(ii) for the main rotor head, disconnect pitch change rods and dampers, and check that the flapping hinges, drag hinges and blade sleeves move freely without signs of binding or roughness. Examine the rotor head and blade stops for cracks or other damage, and the dampers for signs of fluid leaks. Damage in this area can be an indication of further damage inside the main gearbox.

(iii) examine the tail rotor blades for damage and security, and coning stops for evidence of damage. Damage to the tail rotor blades which is beyond limits shall normally entail either inspection or replacement of the hub, pitch change links, tail rotor gear box and drive shaft.

(iv) examine tail rotor drive shafts, universal joints, bearings and support structure for cracks and distortion. Check for freedom of rotation.

(14) Lightning Strikes - Lightning strikes usually cause damage at two points on an aircraft: strike damage where the discharge enters the aircraft; and static discharge damage subsequent to the strike.

(a) strike damage is generally found at the wing tips, propellers, leading edges of wings and tail unit, and at the fuselage nose, but on some aircraft types other areas can be particularly susceptible, and this information shall be obtained from the appropriate maintenance manual. Static discharge damage can usually be found at wing tips, trailing edges and antennae.

Information Note: *Strike damage is usually in the form of small circular holes in the exterior skin, either in clusters or spread out over a wide area, and often accompanied by burning or discoloration, blisters on radomes and cracks in glass fiber. Static discharge damage is usually in the form of local pitting and burning at trailing edges.*

(b) since both lightning and turbulence occur in thunderstorms, an inspection for lightning damage shall often coincide with an inspection following reported flight through severe turbulence. The areas mentioned in subsection (a) above shall be examined for signs of strike or static discharge damage, and bonding strips and static discharge wicks shall be examined for burning and disintegration. All control surfaces, including flaps, spoilers and tabs, shall be inspected for damage at their hinge bearings; unsatisfactory bonding can have allowed static discharge and tracking across the bearings, causing burning, break up or seizure. A check for roughness and resistance to movement at each bearing will usually indicate damage at such points. In addition, the following inspections shall be carried out:

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(i) examine engine cowlings and engines for signs of burning or pitting. If a lightning strike is evident, tracking through the bearings can have occurred, and some manufacturers recommend that the oil filters and chip detectors should be examined for signs of contamination; this check shall be repeated periodically for a specified number of running hours after the occurrence;
(ii) examine the fuselage skin and rivets generally for burning or pitting;
(iii) if the landing gear was extended when the lightning strike occurred, examine the lower parts of the gear for static discharge damage. Check for residual magnetism and demagnetize where necessary;
(iv) functionally check the radio and radar equipment, instruments, electrical circuits and flying controls in accordance with the relevant chapters of the maintenance manual. On some aircraft, a bonding resistance check on radomes can also be specified; and,
(v) carry out a compass swing.

(15) High Winds or Jet Blast - Considerable damage can be caused to parked aircraft by high winds or by jet blast/prop wash from other aircraft taxiing or running up in the vicinity. Small aircraft are particularly vulnerable to this type of damage, which can be caused by the blast itself or by debris blown into the aircraft. Following such incidents, the aircraft shall be inspected as follows:
(a) inspect flying control surfaces for distortion and loose rivets or other signs of internal damage. If the surfaces were unlocked at the time of the incident the control stops, stop cables and surrounding structure should also be checked;
(b) inspect the structure generally, including windows, for impact damage such as chips and dents, and examine the air intakes of engines, heat exchangers, cooling ducts, etc. for debris;
(c) in the case of small aircraft, and particularly where the blast has been strong enough to move the entire aircraft, consideration shall be given to the need for an internal inspection for damaged structural elements and/or a symmetry check of the complete aircraft.

(16) Spillage of Corrosive Substances - The action taken following spillage of a corrosive substance shall depend upon many factors, including the nature of the substance, the location of the spill and the time elapsed between the occurrence and its discovery. In general, the procedure consists of:
(a) Removal of the Spilt Substance. - This shall preferably be done by draining at the nearest drain hole but, if this is not possible, a vacuum cleaner can be used, or the spill mopped up with rags. In the case of mercury, the use of a velvet cloth can help to prevent "beading". The use of blowing hoses to disperse corrosive deposits is not recommended, as this will tend to distribute the substance over a wider area. Care shall be taken to avoid contact with the substance (use masks, gloves, goggles, etc.);
(b) Neutralizing the Residue. - Acid spills can be neutralized with a bicarbonate of soda solution. Alkaline spills can be neutralized with a boric acid solution. Chlorine can be treated with water to which acetic acid (vinegar) has been added. Litmus paper will indicate when a neutral ph level has been achieved. Mercury spills can be treated by sprinkling calcium sulphide on the affected area, while phosphates, nitrates and carbonates can be treated by the application of bleach or a strong soap solution;
(c) the entire area shall be rinsed with copious amounts of clean water;
(d) access panels shall be removed, and the aircraft positioned to ensure a flow of fresh air through the affected area;

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(e) radiographic inspection can be required to detect small particles of mercury, or corrosion pits out of the direct line of sight; and
(f) re-protect the area by painting, lubrication, etc, as applicable.

Information Note: *Depending on the nature of the spill, and the amount of damage caused, it may be necessary to schedule additional follow-up inspections of the area until it can be determined that no danger of further corrosion exists.*

(17) Overspeed-Overtemp-Overtorque Incidents - Manufacturers' manuals usually contain detailed instructions on the procedures to be followed after this type of incident. If no instructions are available, the manufacturer shall be contacted and provided with full details of the incident. Collateral information can be of importance (e.g. in the case of a turbine engine overtemp, the RPM at which the overtemp occurred is usually an important factor).

(18) Misfuelling - The term misfuelling can include filling with contaminated fuel or with fuel of an incorrect grade. The latter is sometimes difficult to detect, as the incorrect fuel can mix with the fuel already in the tanks, and appear identical to the naked eye. The most common error (and one of the most dangerous) is fuelling piston engined aircraft with jet fuel. Sophisticated analysis techniques are available to detect contamination of this kind, but one method of detection which is readily available in the field is the "kraft paper" test.
(a) this consists of allowing a drop of the suspected fuel to fall on to a sheet of plain brown paper of the type used for grocery bags, and observing the results. Uncontaminated gasoline will evaporate within 1 to 5 minutes (depending on the temperature), leaving an irregularly shaped stain. Fuel containing as little as 2% kerosene can take 15 minutes or longer to evaporate, and will leave a circular stain.
(b) if an aircraft has been refueled with contaminated fuel, or with the wrong grade of fuel, the action taken will depend primarily upon whether the engine(s) have been operated on the fuel in question. If the misfuelling is detected before the engines have been run, it is merely necessary to ensure that the fuel is drained.
(c) the aircraft (or the affected tanks) shall be completely defuelled, and the tanks drained at the lowest point. With tail wheel equipped aircraft this can entail placing the aircraft in the flying attitude to ensure that no residue of contaminated fuel remains in the lowest part of the tanks. After draining and replenishing with the correct grade of fuel, the engine supply lines shall be flushed, and an engine ground run carried out.
(d) if the engines have been run on the contaminated fuel, the action taken will depend on the type of engine and the nature of the contamination. Turbine engines are generally more tolerant of misfuelling than piston engines, and some turbine engine manufacturers specify that their engines can be run for a certain period of time on aviation gasoline. Reference shall be made to the maintenance manual and the engine type certificate data sheet for details.
(e) piston engines which have been operated on unapproved fuels can have experienced detonation and shall be inspected for damage which could result. The inspection shall commence with an examination of the spark plugs, valves and valve seats, and the piston crowns. If any damage is detected the engine shall be dismantled completely for internal examination.

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(19) Exposure to Volcanic Ash - Volcanic eruptions are rare, but when they do occur the ashes which are ejected can spread over a wide area and can potentially affect a great number of aircraft. Volcanic ash is highly abrasive, and can be acidic. If the particles are ingested by a running engine, they will melt when exposed to combustion chamber temperatures and form a glass-like ceramic coating on internal engine parts.

(a) a number of manufacturers have provided instruction for the treatment of aircraft which have been exposed to volcanic ash, and these instructions shall be followed. In general, they consist of the removal of debris by vacuum cleaner (avoid the use of water, which can combine with the ash to form a cement like substance, and can exacerbate the corrosive effects). Care shall be taken to avoid the scratching of polished surfaces, such as transparencies or the exposed pistons of hydraulic actuators. Air filters shall be changed, and system which are open to the atmosphere (pitot static systems, pressure sensing vents, etc.) checked. If the engines were running at the time of the exposure, borescope checks of the internal components shall also be required.

(20) Ingestion of Dry Chemical Extinguishant - Dry chemical extinguishant, if ingested into a running piston engine, can be deposited on the inlet valve stems in the form of a sticky, shellac-like substance. This deposit can cause sticking of the valves and subsequent damage to the engine.

Whenever dry chemical extinguishers are used on an aircraft engine, the induction system and surrounding area shall be thoroughly cleaned prior to engine starting. If any signs of ingestion of powder into the engine are found, the valve stems shall be inspected for deposits, and if necessary, a top overhaul carried out.

(21) Bird Strikes - Reserved

(22) Ground Collisions - Reserved

(23) Other Occurrences - Occurrences not covered in the preceding sections, or peculiar to a particular aircraft type, can also necessitate special inspections, and these are usually specified in the appropriate maintenance manual. Where no specific instructions exist, experience on the type of aircraft, combined with a knowledge of the structure and systems, will normally enable a satisfactory inspection to be carried out.

Information Note: *In cases of doubt, the aircraft manufacturer and/or the Directorate General of Civil Aviation Office can be consulted.*

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Appendix H
Airworthiness Directives

1. Responsibilities

Pursuant to Section 605.84 of the LARs, owners of aircraft are responsible for ensuring that their aircraft are not flown with any Airworthiness Directive (AD) outstanding against that aircraft or its components. Owners are to ensure that:

(a) applicable ADs are scheduled in accordance with Subpart 605 Schedule II, or with Subpart 706 of the LARs; and

(b) the requirements of all ADs issued relating to their aircraft or aeronautical product are complied with, applicable entries made in the aircraft technical records in accordance with Subpart 605 of the LARs.

Information Note: *Failure to comply with an AD causes the Certificate of Airworthiness to be out of force, and makes it an offence to fly the aircraft.*

2. Exemptions and Alternative Means of Compliance

(1) Pursuant to Subsection 605.84(4) of the LARs Alternative Means of Compliance (AMOC) with the requirements of an AD can be used only if approved by the Director General of Civil Aviation, as offering a degree of safety at least equivalent to that offered by compliance with the AD.

(2) An AMOC can be, but is not necessarily, limited to the following:

(a) an alternative modification;

(b) an alternative inspection procedure;

(c) a different inspection schedule;

(d) an extension to the compliance deadline; or

(e) a specified operating procedure or limitation.

Information Notes: *The exemption or AMOC will be given an approval number to be quoted in the technical records of the affected aeronautical product.*

An example of this approval number would be "DGCA 97/A02" broken down as follows:

- *"DGCA" = the routing symbol for the Director General of Civil Aviation, who approves the exemption or AMOC;*
- *"97" = the year (1997);*
- *"A" = alleviation;*
- *"02" = the sequential number of the alleviation.*

Foreign ADs are sometimes received late by DGCA and warrant an extension of compliance deadline prior to their transmission by DGCA. These foreign ADs are distinctly stamped with a suitable revised effective date, annotated with an AMOC approval number, and signed by the Director General of Civil Aviation.

Appendix H
Airworthiness Directives

(3) The manufacturer of an aeronautical product may apply for an exemption, or AMOC, on behalf of the owners of his/her product. If granted, the manufacturer is advised of the exemption, or AMOC, and instructed to communicate it to the owners, with the approval number and any conditions under which it may be exercised. Exemptions and AMOCs issued through the manufacturer by the foreign authority who issued the related foreign AD are tacitly accepted by the DGCA. However, the DGCA reserves the right to overrule the foreign exemption or AMOC, by virtue of Subsection 605.84(2) of the LARs.

Information Notes: *Following the publication of an AD, the US Federal Aviation Administration (FAA) also occasionally issues, by the means of a manufacturer's service bulletin, an exemption or AMOC to such an AD. This exemption or AMOC normally requires that the American aircraft owners request individual approval from their local FAA office. This FAA exemption or AMOC does not apply in Lebanon in the case of those FAA ADs which are mandatory in Lebanon; affected Lebanese owners have to apply to the Director General of Civil Aviation for an exemption or AMOC to these FAA Ads.*

However, the information required by items vi), vii), and viii) in subsection 3(c) of this appendix can be satisfied by including a copy of the FAA approval document as transmitted by the American manufacturer.

Information about the existence of any DGCA approved exemption, or AMOC, is available upon request from the Directorate General of Civil Aviation. Details of an AMOC, however, are often proprietary to the owner of that approval, and in all cases will have to be requested directly from that owner.

3. Application for Approval of an Exemption or Alternative Means of Compliance

(1) Application for exemptions and AMOC to a Lebanese or foreign AD are to be made, in writing, to the Directorate General of Civil Aviation office. In no circumstance is a request for an exemption to a foreign AD applicable to a Lebanese registered aircraft to be made directly to the issuing foreign authority.
(2) When submitting an application for an exemption or AMOC, evidence shall be provided by the applicant that the requested exemption or AMOC will provide a level of safety equivalent to that of the original AD requirements.

Appendix H
Airworthiness Directives

(3) The application shall provide complete details regarding the requested exemption or AMOC, including:

(a) aircraft type;
(b) aircraft serial number;
(c) owner's name;
(d) organization making the application with name of contact, if not the owner;
(e) AD number;
(f) parts and/or components involved;
(g) exact details of the proposed change together with reasons for the application;
(h) drawings and/or sketches to clearly describe repairs or modifications; and
(i) date required by.

4. Foreign Airworthiness Directives or Other Equivalent Foreign Notices

Section 605.84 of the LARs recognizes the mandatory status of foreign ADs and equivalent notices issued by the aviation authority that has jurisdiction over the type design of the aeronautical product. In the case of a conflict between an AD issued by the Director General of Civil Aviation and one issued by the foreign aviation authority that has jurisdiction over the type design, the AD issued by The Director General of Civil Aviation prevails.

Appendix H
Airworthiness Directives

Information Notes: *Equivalent notices normally take the form of a manufacturer's service bulletin which is prefaced by a statement to the effect that the civil aviation authority having jurisdiction over the type design has declared the bulletin to be mandatory.*

In states where the civil aviation authorities issue ADs separately from the applicable service bulletins, some aeronautical product manufacturers occasionally mark their service bulletins "mandatory". Such categorization simply indicates the manufacturers' evaluation of the importance of specific bulletins and has, by itself, no regulatory obligation, even if the bulletins are shown to be approved by those authorities. The latter approval applies only to the work description section of the bulletins and indicates that the aircraft or component will still conform to its type certificate as a result of the rework. This statement of authoritative approval, in conjunction with the manufacturer's use of "mandatory" is not to be confused with the official mandating mentioned in i) above. In short, service bulletins themselves are not mandatory unless mandated by the foreign civil aviation authority, or referenced by an AD.

All foreign aviation authorities responsible for aeronautical products installed in aircraft registered in Lebanon have been requested to provide the Director General of Civil Aviation with all ADs, equivalent notices, or airworthiness information regarding such products under their jurisdiction. This ensures that the Director General of Civil Aviation is informed of such matters affecting the airworthiness of foreign designed aeronautical products in use in Lebanon.

5. Specific Purpose Flight Permit - Ferry Flight

(1) When a C of A is out of force due to an outstanding AD, no flight is to be made unless a flight permit has been issued by the Minister pursuant to Subpart 525 of the LARs.
(2) Ferry flight instructions included in applicable foreign ADs do not apply in Lebanon, or to Lebanese registered aircraft.

Information Note: *For example, reference to FAR 21.197 in an FAA AD, or other similar statements in a foreign AD regarding ferry to a base where maintenance can be performed, do not constitute an authority to carry out a ferry-flight in Lebanon. They can only be taken to mean that safe ferry for the specific purpose is possible.*

(3) The flight permit application (DGCA-OPS Form 100-3) has to confirm that the aircraft is airworthy, except for the outstanding AD, and define the proposed ferry flight conditions, including any appropriate precautions.

Appendix H
Airworthiness Directives

(4) Persons authorized to issue a Specific Purpose Flight Permit - Ferry, pursuant to a Flight Permit Authorization granted to an air operator, cannot issue a flight authority if a C of A is out of force due to an outstanding AD.

Information Notes: *Preliminary communication with the Directorate General of Civil Aviation office can be useful in identifying specific procedures or additional information that will facilitate the application. This will be especially advisable if ferry is not mentioned in the Lebanese AD.*

If any part of a ferry flight will take place in foreign airspace, the Lebanese flight permit has to be validated by the foreign civil aviation authority for that part of the flight.

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APPENDIX I
SPECIFICATION TABLES

SCHEDULE 1
Position and Anti-collision Light Systems

COLUMN I	COLUMN II	COLUMN III	COLUMN IV	COLUMN V
Type of Aircraft Light	**Quantity & Color of Light Projection**	**Characteristic**	**Location**	**Projection**
1. Position Light	1 - Red	steady light	from a source located on the left side or left wing of the aircraft as far outboard as is practicable.	above and below the horizontal plane of the aircraft through an unobstructed angle from dead ahead to 110° to the left.
2. Position Light	1 - Green	steady light	from a source located on the right side or right wing of the aircraft as far outboard as is practicable.	above and below the horizontal plane of the aircraft through an unobstructed angle from dead ahead to 110° to the right.
3. Position Light	1 or 2 - White	steady light	from a source located as far aft on the aircraft as possible except that where a single source is impracticable two sources located elsewhere than as far aft on the aircraft as possible may be approved.	above and below the horizontal plane of the aircraft rearward through an unobstructed angle of 140° equally distributed on the left and right sides.
4. Anti-collision Light	1 or more Red, White or Red/White segmented	flashing light (NOTE: Each flashing light, when viewed from a distance, shall exhibit the flashing characteristics specified in Subpart 575 of the LARs).	from a source, or sources, located in accordance with the requirements set out in Subpart 575 of the LARs.	in all directions within 30° above and 30° below the horizontal plane of the aircraft in accordance with the requirements set out in Subpart 575 of the LARs.

APPENDIX I
SPECIFICATION TABLES

Schedule 2
Airplane Flight Data Recorder (FDR) Specifications LAR 605.33

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
Parameters	**Range**	**Installed System [1] Minimum Accuracy (to recovered data)**	**Sampling interval (in seconds)**	**Resolution [4] read-out**
Relative Time (from recorded on prior to take-off)	8 hour minimum	± 0.125% per hour	1	1 sec.
Altitude	-1,000 ft. to maximum certificated altitude of aircraft.	± 100 ft. to ± 700 ft. (see table 1 TSO C 51-a)	1	25 to 150 ft.
Indicated Airspeed	V_{SO} to V_D (KIAS)	± 5% or ± 10 kts., whichever is greater. Resolution 2 kts. below 175 KIAS	1	1% [3]
Magnetic Heading	360°	± 5°	1	1°
Vertical acceleration	-3g to +6g	± 0.2g in addition to ±0.3g maximum datum	4 (or 1 where peaks, ref. to 1g are recorded)	0.03g
Longitudinal acceleration	± 1.0g	± 1.5% max. range excluding datums error of ±5%	2	0.8°
Pitch attitude	100% of usable range	± 2°	1	0. 8°
Roll attitude	± 60° or 100% of usable range, whichever is greater	± 2°	1	0. 8°
Stabilizer trim positionor	Full range	± 3% unless higher uniquely required	1	1% [3]
Pitch control position	Full range	± 3% unless higher uniquely required	1	1% [3]
Engine power, each engine Fan or N1 speed or EPR or cockpit indications used for aircraft certification or Prop. speed and torque (sample once/sec as close together as practable)	Maximum range	± 5%	1 1 (prop speed) 1 (torque)	1% [3]

"continued"

Schedule 2

Airplane Flight Data Recorder (FDR) Specifications LAR 605.33

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
Parameters	**Range**	**Installed System [1] Minimum Accuracy (to recovered data)**	**Sampling interval (in seconds)**	**Resolution [4] read-out**
Altitude rate[2] (need depends on altitude resolution)	± 8,000 fpm	±10% Resolution 250 fpm below 12,000 ft. indicated	1	250 fpm below 12,000 ft.
Angle of attack[2] (need depends on altitude resolution)	-20° to +40° or 100% of usable range	± 2°	1	0.8% [3]
Radio transmitter keying (discrete)	On/off		1	
Trailing edge flaps (discrete or analog)	Each discrete position (Up, Down, Take-off, Approach) or Analog 0-100% range	± 3°	1	1% [3]
Leading edge flaps (discrete or analog)	Each discrete position (Up, Down, Take-off, Approach) or Analog 0-100% range	± 3°	1 1	1% [3]
Thrust reverser, each engine (discrete)	Stowed or full reverse		1	
Spoiler/speedbrake (discrete)	Stowed or out		1	
Autopilot engaged (discrete)	Engaged or Disengaged		1	

Notes for Schedule 2

1. When data sources are aircraft instruments (except altimeters) of acceptable quality to fly the aircraft, the recording system excluding these sensors (but including all other characteristics of the recording system) shall contribute no more than half of the values in this column.
2. If data from the altitude encoding altimeter (100 ft. resolution) is used, then either one of these parameters should be recorded. If however, altitude is recorded at a minimum resolution of 25 ft., then these two parameters can be omitted.
3. Percent of full range
4. This column applies to aeroplanes manufactured after October 11, 1991.

APPENDIX I
SPECIFICATION TABLES

Schedule 3
Airplane Flight Data Recorder (DFDR) Specifications LAR 605.33

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
Parameters	**Range**	**Accuracy sensor input to DFDR read-out**	**Sampling interval (in seconds)**	**Resolution [4] read-out**
Time (GMT or Frame Counter) (range 0 to 4095, sampled 1 per frame)	24 hrs	±0.125% per hour	0.25 (1 per 4 seconds)	1 sec.
Altitude	-1,000 ft. to maximum certificated altitude of aircraft	±100 ft. to ±700 ft. (See table 1 in TSO-C51a)	1	5 ft. to 35 ft. 1
Airspeed	50 KIAS to V_{SO} and V_{SO} to 1.2 V_D	±5%, ±3%	1	1kt
Heading	360°	±2°	1	0.5°
Normal (vertical) acceleration	-3g to +6g	±1% of max range excluding datum error of ±5%	8	0.01g
Pitch attitude	±75°	±2°	1	0.5°
Roll attitude	±180°	±2°	1	0.5°
Radio transmitter keying	On/off (discrete)		1	
Thrust/power on each engine	Full range forward	±2%	1 (per engine)	0.2% ²
Trailing edge flap or cockpit control selection	Full range or each discrete position	±3° or as pilot's indicator	0.5	0.5% ²
Leading edge flap on or cockpit control selection Thrust reverser position	Full range or each discrete position Stowed, in transit, and reverse (discrete)	±3° or as pilot's indicator	0.5 1 (per 4 seconds per engine)	0.5% ²
Ground spoiler position/speed brake selection	Full range or each discrete position	±2% unless higher accuracy required	1	0.2% ²
Marker beacon passage	discrete		1	
Autopilot engagement	discrete		1	
Longitudinal acceleration	±1g	±1.5% max. range excluding datum error of ±5%	4	0.01g

"continued"

Schedule 3

Airplane Flight Data Recorder (DFDR) Specifications LAR 605.33

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
Parameters	**Range**	**Accuracy sensor input to DFDR read-out**	**Sampling interval (in seconds)**	**Resolution [4] read-out**
Pilot input and/or surface position-primary controls (Pitch, Roll, Yaw)	Full range	±2° unless higher accuracy uniquely required	1	0.2% ²
Lateral acceleration	±1g	±1.5% max. range excluding datum error of ±5%	4	0.01g
Pitch trim position	Full range	±3% unless higher accuracy uniquely required	1	0.3% ²
Glideslope deviation	±400 Microamps	±3%	1	0.3% ²
Localizer deviation	±400 Microamps	±3%	1	0.3% ²
AFCS mode and engagement status	discrete		1	
Radio altitude	-20 ft. to 2,500 ft.	±2 ft. or ±3% whichever is greater below 500 ft. and ±5% above 500 ft	1	1 ft. + 5% ² above 500 ft.
Master warning	discrete		1	
Main gear squat switch status	discrete		1	
Angle of attack (if recorded directly)	As installed	As installed	1	0.3% ²
Outside air temperature or total air temperature	-50°C to +90°C	±2°C	1	0.3°C
Hydraulics, each system low pressure	discrete		0.5	0.5% ²
Groundspeed	As installed	Most accurate system installed (IMS equipped a/c only)	1	0.2% ²
If additional recording capacity is available, recording of the following parameters is recommended. The parameters are listed in order of significance:				
Drift Angle	When available. As installed.	As installed	4	
Wind Speed and Direction	When available. As installed.	As installed	4	
Latitude and Longitude	When available. As installed.	As installed	4	

"continued"

Schedule 3

Airplane Flight Data Recorder (DFDR) Specifications LAR 605.33

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
Parameters	**Range**	**Accuracy sensor input to DFDR read-out**	**Sampling interval (in seconds)**	**Resolution [4] read-out**
Brake pressure/Brake pedal position	As installed	As installed	1	
Additional engine parameters EPR N1 N2 EGT	As installed As installed As installed	As installed As installed As installed	1 (per engine) 1 (per engine) 1 (per engine)	
EGT	As installed	As installed	1 (per engine)	
Throttle Lever Position	As installed	As installed	1 (per engine)	
Fuel Flow	As installed	As installed	1 (per engine)	
TCAS TA RA Sensitivity level (as selected by crew)	 As installed As installed As installed	 As installed As installed As installed	 1 1 2	
GPWS (ground proximity warning system).	Discrete		1	
Landing gear or gear selector position	Discrete		0.25 (1 per 4 seconds)	
DME 1 and 2 Distance	0 - 200 NM	As installed	0.25	1 mile
Nav 1 and 2 Frequency Selection	Full range	As installed	0.25	

Notes for Schedule 3:

1. When altitude rate is recorded. Altitude rate must have sufficient resolution and sampling to permit the derivation of altitude to 5 feet.

2. Percent of full range.

3. For airplanes that can demonstrate the capability of deriving either the control input on control movement (one from the other) for all modes of operation and flight regimes, the "or" applies. For aeroplanes with non-mechanical control systems (fly-by-wire) the "and" applies. In areoplanes with split surfaces, suitable combination of inputs is acceptable in lieu of recording each surface separately.

4. This column applies to aeroplanes manufactured after October 11, 1991.

APPENDIX I
SPECIFICATION TABLES

Schedule 4
Helicopter Flight Data Recorder (FDR) Specifications

Column 1	Column 2	Column 3	Column 4	Column 5
Parameters	**Range**	**Installed System1 Minimum Accuracy (to recovered data)**	**Sampling interval (in seconds)**	**Resolution &sup3 read out**
Relative Time (from recorded on prior to take-off)	8 hour minimum	±0.125% per hour	1	1 sec.
Indicated Airspeed	V_{min} to V_D (KIAS) (minimum airspeed signal attainable with installed pitot-static system).	±5% or ±10 kt., whichever is greater.	1	1 kt.
Altitude	-1,000 ft. to 20,000 ft. pressure altitude	±100 ft. to ±700 ft. (see table 1 in TSO C51-a)	1	25 to 150 ft.
Magnetic Heading	360°	±5°	1	1°
Vertical acceleration	-3g to +6g	±0.2g in addition to ±0.3g maximum datum	4 (or 1 per second where peaks, ref. to 1g, are recorded)	0.05g
Longitudinal acceleration	±1.0g	±1.5% max. range excluding datums error of ±5%	2	0.03g
Pitch attitude	100% of usable range	±2°	1	0. 8°
Roll attitude	±60° or 100% of usable range, whichever is greater	±2°	1	0. 8°
Altitude Rate	±8,000 fpm	±10% Resolution 250 fpm below 12,000 ft. indicated	1	250 fpm below 12,000
Engine Power Each Engine Main rotor speed Free or power turbine Engine Torque	 Maximum range Maximum range Maximum range	 ±5% ±5% ±5%	 1 1 1	 1%² 1%² 1%²
Flight Control, Hydraulic Pressure Primary (discrete) Secondary if applicable (discrete)	High / Low High / Low		1 1	
Radio transmitter keying (discrete)	On / Off		1	
Autopilot engaged (discrete)	Engaged or disengaged		1	

“continued”

Schedule 4

Helicopter Flight Data Recorder (FDR) Specifications

Column 1	Column 2	Column 3	Column 4	Column 5
Parameters	**Range**	**Installed System1 Minimum Accuracy (to recovered data)**	**Sampling interval (in seconds)**	**Resolution &sup3 read out**
SAS status – engaged (discrete)	Engaged / disengaged	Y	1	
SAS fault status (discrete)	Fault / OK		1	
Flight Controls Collective Pedal position Lateral cyclic Longitudinal cyclic Controllable stabilator position	 Full range Full range Full range Full range Full range	 ±3% ±3% ±3% ±3% ±3%	 2 2 2 2 2	 ±1%[2] ±1%[2] ±1%[2] ±1%[2] ±1%[2]

<u>Scededule 4 Notes:</u>

1. When data sources are aircraft instruments (except altimeters) of acceptable quality to fly the aircraft, the recording system (excluding these sensors, but including all other characteristics of the recording system) shall contribute no more than half of the values in this column.

2. Percent of full range.

3. This column applies to helicopters manufactured after October 11, 1991.

APPENDIX I
SPECIFICATION TABLES

Schedule 5
Helicopter Digital Flight Data Recorder (DFDR) Specifications

Column 1	Column 2	Column 3	Column 4	Column 5
Parameters	**Range**	**Accuracy sensor input to DFDR readout**	**Sampling interval (in seconds)**	**Resolution ² read-out**
Time (GMT)	24 hrs	±0.125% per hour	0.25 (1 per 4 seconds)	1 sec.
Altitude	-1,000 ft. to maximum certificated altitude of aircraft	±100 ft. to ±700 ft. (See table 1 in TSO-C51a)	1	5 ft. to 30 ft.
Airspeed	As the installed measuring system	±3%	1	1kt
Heading	360°	±2°	1	0.5°
Normal (vertical) acceleration	-3g to +6g	±1% of max range excluding datum error of ±5%	8	0.01g
Pitch attitude	±75°	±2°	2	0.5°
Roll attitude	±180°	±2°	2	0.5°
Radio transmitter keying	On/off (discrete)		1	0.25 sec.
Power in each engine: Free power turbine speed and engine torque	0 - 130% (power turbine speed) Full range (torque)	±2%	1 speed, 1 torque per engine	0.2%¹ to 0.4%¹
Main Rotor Speed	0 - 130%	±2%	2	0.3%¹
Altitude rate	±6,000 ft/min	As installed	2	0.2%¹
Pilot Input - primary controls (collective, longitudinal cyclic, lateral cyclic, pedal)	full range	±3%	2	0.5%¹
Flight control hydraulic pressure low	discrete, each circuit		1	
Flight control hydraulic pressure selector switch position, 1st & 2nd stage	discrete		1	
AFCS Mode & engagement status	discrete (5 bits necessary)		1	

"continued"

Schedule 5

Helicopter Digital Flight Data Recorder (DFDR) Specifications

Column 1	Column 2	Column 3	Column 4	Column 5
Parameters	**Range**	**Accuracy sensor input to DFDR readout**	**Sampling interval (in seconds)**	**Resolution [2] read-out**
Stability Augmentation System engage	discrete		1	
SAS Fault status	discrete		0.25	
Main Gearbox Temperature Low	As installed	As installed	0.25	0.5%[1]
Main Gearbox Temperature High	As installed	As installed	0.5	0.5%[1]
Controllable Stabilator Position	full range	±3%	2	0.4%[1]
Longitudinal acceleration	±1g	±1.5% of max range excluding datum error of ±5%	4	0.01g
Lateral acceleration	±1g	±1.5% of max range excluding datum error of ±5%	4	0.01g
Master Warning	discrete		1	
Nav 1 and 2 frequency selection	full range	As installed	0.25	
Outside Air Temperature	-50° C to +90° C	±2°C	0.5	0.3° C

<u>Notes for Schedule 5:</u>

1. Percent of full range
2. This column applies to helicopters manufactured after October 11, 1991.

Appendix J

s605.09
Unserviceable and Removed Equipment – Aircraft with Minimum Equipment List

1. INTRODUCTION

(1) These Aircraft Requirements Standards are the standards and procedures that shall be met for the Director General of Civil Aviation to grant approval for an operator to use a Minimum Equipment List (MEL).
(2) This Standard has been prepared for the use and guidance of Directorate General of Civil Aviation personnel and operators in Lebanon. This Standard contains all the relevant information with respect to the philosophy, development and approval of the Master Minimum Equipment List (MMEL) and Minimum Equipment List (MEL).
(3) Directorate General of Civil Aviation Inspectors are expected to use good judgment in matters where specific guidance has not been given and be aware of the need for revision to the present information as new requirements evolve.
(4) For ease of reference the standards are published in "normal print", and the Information Notes which are meant to offer guidance are published in *"italicized print"*.

2. APPLICABILITY

These criteria are applicable to flight operations pursuant to Part VI, Subpart V of the Lebanese Aviation Regulations. The Director General of Civil Aviation grants approval for the use of an MEL by amending an operator's Operating Certificate, Operations Specifications (OPSPECS).

3. INTERPRETATIONS

The following definitions are used throughout this Standard:

(a) Aircraft Evaluation Group (AEG). The AEG is the United States (U.S.) Federal Aviation Administration (FAA) Flight Standards point of contact with aircraft certification and is responsible for the development, revision and publication of an MMEL for those aircraft within the U.S.
(b) Airplane Flight Manual (AFM)/Rotorcraft Flight Manual (RFM). The approved flight manual is the document approved by the responsible Authority's aircraft certification office (ACO) during type certification. The approved flight manual for the specific aircraft is listed on the applicable type certificate data sheet. The approved flight manual is the source document for operational limitations and performance parameters for an aircraft. The term, approved flight manual, can apply to either an AFM or an RFM. Authorities normally require an approved flight manual for aircraft type certification.
(c) The Aircraft Maintenance Manual (AMM). The AMM is the source document for aircraft maintenance procedures. The term AMM can apply to either an airplane or a rotorcraft manual. Authorities normally require an AMM for aircraft certification.
(d) Air Transportation Division Bulletin Board System (BBS). In the U.S., FAA Air Transportation Division operates an electronic BBS that is available to the public. The BBS was established to provide policy information and current MMELs to the public. The BBS is accessible to anyone with a standard personal computer and modem. The BBS will accept data communication at up to 14,400 baud on 4 data lines simultaneously. The telephone number for the BBS is: U.S. (202) 267-5231.

(e) Air Transport Association of America (ATA) Specification 100. ATA Specification 100, Manufacturer's Technical Data, is an international industry numbering standard developed to identify systems and components on different aircraft in the same format and manner.

(f) Authority. Means the government organization that has responsibility for aviation safety oversight in a ICAO contracting state.

(g) Configuration Deviation List (CDL). Aircraft certified under the provisions of a foreign Authority, and intended for use under Parts VI and VII of the LARs may be approved for operations with missing secondary airframe and engine parts. The aircraft source document for such operations is the CDL. The CDL is approved by an amendment to the type certificate. For U.S. certificated aircraft, the CDL is incorporated into the limitations section of the approved flight manual as an appendix.

(h) Flight Operations Evaluation Board (FOEB). In the U.S. FOEB is a board of FAA personnel assigned for each type of aircraft. The FOEB is composed of FAA personnel who are operations, avionics, airworthiness, and aircraft certification specialists. The FOEB develops an MMEL for a particular aircraft type under the direction of the AEG and the FAA Air Transportation Division.

(i) Flight Operations Policy Board (FOPB). The FOPB develops FOEB and flight standardization board (FSB) policy recommendations, which are approved by the FAA.

(j) Inoperative. Inoperative means that a system or component has malfunctioned to the extent that it does not accomplish its intended purpose and/or is not consistently functioning normally within its approved operating limits or tolerances.

(k) Master Minimum Equipment List (MMEL). The MMEL is a list of equipment that the Authority has determined may be inoperative under certain operational conditions and still provide an acceptable level of safety. The MMEL contains the conditions, limitations and procedures required for operating the aircraft with these items inoperative. The MMEL is used as a starting point in the development and review of an individual operator's MEL.

(l) Minimum Equipment List (MEL). The MEL is derived from the MMEL and is applicable to an individual operator. The operator's MEL takes into consideration the operator's particular aircraft configuration, operational procedures and conditions. When approved and authorized for use, the MEL permits operation of the aircraft under specified conditions with certain inoperative equipment.

(m) Proposed Master Minimum Equipment List (PMMEL). The PMMEL is a list developed by the manufacturer or operator that is submitted to the Authority’s FOEB as a basis for the development of an MMEL.

DIVISION I

GENERAL

1. BACKGROUND.

MEL procedures were developed to allow the continued operation of an aircraft with specific items of equipment inoperative under certain circumstances. The Directorate General of Civil Aviation has found that for particular situations, an acceptable level of safety can be maintained with specific items of equipment inoperative for a limited period of time, until repairs can be made. The MEL document describes the limitations that apply when an operator wishes to conduct operations when certain items of equipment are inoperative. The Director General of Civil Aviation (DGCA) has adopted the MEL program for Lebanese Aviation Regulations (LARs) Part VI and Part VII operations.

2. GENERAL.

Section 1 of this chapter contains definitions and a general overview of the MEL system. Section 2 contains information on the development and approval process of master minimum equipment lists (MMEL). Section 3 contains information and guidance on developing and approving MELs. Section 4 contains information and guidance for MEL use during operations. Section 5 contains information about the development, approval, and usage of the CDL. Certain foreign technical groups, boards, and national resources related to these topics are referred to throughout this chapter.

3. APPLICABILITY.

This chapter applies to those operators operating Lebanese-registered aircraft in accordance with LARs Part VI

4. DGCA RESPONSIBILITIES.

The DGCA is the primary official responsible for the overall process of administering, evaluating, and approving an operator's MEL. It is essential that the DGCA work with the inspectors in each discipline, and other individuals or groups involved in this process. Should the DGCA require additional TECHNICAL information related to a specific MEL ITEM, he should consult the appropriate Authority’s Flight Operations Evaluation Board (FOEB) chairman responsible for the aircraft.

5. PURPOSE OF MEL.

The LARs permit the authorization of an MEL if the Minister finds that compliance with all the aircraft equipment requirements is not necessary in the interest of safety for a particular operation. Through the use of appropriate conditions or limitations, the MEL provides for improved scheduled reliability and aircraft utilization with an equivalent level of safety. This process is possible because of the installation of additional and redundant instruments, equipment and/or systems in present transport aircraft. Without an approved MEL, inoperative equipment would ground the airplane until repair or replacement of the nonfunctioning equipment. An MEL is approved for a specific make and model of aircraft, and the use of it is authorized by its operations specifications (OpSpecs).

6. ITEMS LISTED ON THE MEL.

There are three categories of items that may be contained in the operator's MEL:

- ❖ MMEL items
- ❖ Passenger convenience items
- ❖ Administrative control items:

(a) MMEL Items. The MEL will list all of the items for which the operator seeks relief and that are appropriate for its operation. The operator, by not listing at its discretion certain items in its MEL, may be more restrictive than permitted by the MMEL.

(b) Passenger Convenience Items. The passenger convenience items, as contained in the operator's approved MEL, are those related to passenger convenience, comfort, or entertainment, such as, but not limited to, galley equipment, movie equipment, inflight phones, ashtrays, stereo equipment, and overhead reading lamps. It is incumbent on the operator and the DGCA to develop procedures to ensure that those inoperative passenger convenience items are not used. Passenger convenience items do not have fixed repair intervals. Items addressed elsewhere in the MMEL shall not be authorized relief as a passenger convenience item. "M" and "O" procedures may be required and shall be developed by the operator, approved by the DGCA, and included in the air carrier's appropriate document.

(c) Administrative Control Items. An operator may use an MEL as a comprehensive document to control items for administrative purposes. In such cases, the operator's MEL may include items not listed in the MMEL; however, relief may not be granted for these items unless conditions and limitations are contained in approved documents other than the MMEL or meet the regulatory requirements of the LARs. Examples of items considered to be administrative control items would be cockpit procedure cards, medical kits, delaminated windshields, and life vests.

7. TIMELY REPAIR OF ITEMS THAT ARE INOPERATIVE.

The MEL is intended to permit the operation of an aircraft with certain inoperative items for a limited period of time until repairs can be accomplished. The operator is responsible for establishing a controlled and effective repair program.

(a) Repair Interval. Operators shall make repairs within the time period specified by the MEL. Although the MEL might permit multiple days of operation with certain inoperative equipment, operators shall repair the affected item as soon as possible.

(b) Day of Discovery. The day of discovery is the calendar day an equipment malfunction was recorded in the aircraft maintenance log or record. This day is excluded from the calendar days or flight days specified in the MMEL for the repair of an inoperative item of equipment. This provision is applicable to all MMEL items, such as categories "A," "B," "C," and "D." The operator and the DGCA shall establish a reference time in which the calendar day or flight day begins and ends 24 hours later. This reference time is established to ensure compliance with timely repair of equipment and items.

(c) MMEL Definitions. More than one set of MMEL definitions exist due to years of evolving changes during which not all MMELs have been updated to the latest revision of the definitions. However, only one set of definitions may be used with a specific MMEL. Only certain portions of the latest definitions may be appropriate for a specific air carrier's MEL. Definitions found in global changes, such as administrative control and repair intervals, may be adopted by the operator.

(d) Continuing Authorizations. Approval of an MEL authorizes an operator to use a continuing authorization to approve extensions to the maximum repair interval for category "B" and "C" items, provided the DGCA is notified within 24 hours of the operator's exercise of extension authority. The certificate holder is not authorized to extend the maximum repair time for category "A" and "D" items, as specified in the approved MEL. Misuse of the continuing authorization may result in an amendment of the operator's OpSpecs by removing the operator's authority to use an MEL.

8. RECORDKEEPING.

When an item of equipment becomes inoperative, the operator shall report it by making an entry in the aircraft maintenance record, as prescribed by LARs Part VI.

9. MULTIPLE ITEMS THAT ARE INOPERATIVE.

Individual MEL requirements are designed to provide coverage for single failures enroute. When operating with multiple inoperative items, the operator shall consider the interrelationships between those items and the effect on aircraft operation and crew workload, including consideration of a single additional failure occurring enroute.

10. FLEET APPROVAL.

An operator who has a single MEL for multiple aircraft may reflect equipment in its MEL that is not installed on all aircraft in its fleet. In this case, the item's title in the operator's MEL need not reference any specific airplane identification (usually registration number) unless the operator determines that there is need to do so.

11. MEL REVISIONS.

It is the operator's responsibility to ensure that their MEL is reviewed and updated as required. The MEL shall be reviewed by the operator at least annually to ensure that it incorporates any changes to the operation, aircraft or to the Lebanese Aviation Regulations. A revision to the MMEL will require that the operator review and amend their MEL, as necessary. The MEL development, processing and approval procedures shall be reviewed as part of the operator's quality assurance program.

12. ACCESS TO MEL.

Section 605.09 of the LARs require that the MEL be carried aboard the aircraft or that the flightcrew have direct access to the MEL information prior to take-off. Other means of direct access requires DGCA approval.

13. CONFLICT WITH OTHER DGCA APPROVED DOCUMENTS.

The MEL may not conflict with other approved documents such as the approved flight manual limitations and airworthiness directives (AD). The operator's MEL may be more restrictive than the MMEL, but under no circumstances may the operator's MEL be less restrictive.

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DIVISION II

MASTER MINIMUM EQUIPMENT LISTS (MMEL) DEVELOPMENT AND APPROVAL PROCESS

1. GENERAL.

This section contains background information concerning the development, approval, and revision process of MMELs.

2. PROPOSED MASTER MINIMUM EQUIPMENT LIST (PMMEL).

The first requirement for producing an initial MMEL is the development of a PMMEL that reflects the manufacturer's or operator's concepts of which items can be inoperative. Authorities encourage the aircraft manufacturer to develop a PMMEL during the aircraft certification process. In the U.S. the aircraft manufacturer coordinates with the aircraft evaluation group (AEG) and the aircraft operators throughout the PMMEL development process. Manufacturers and operators seeking consideration for relief for operating with certain items of equipment inoperative shall provide supporting documentation that sufficiently substantiates their request. In addition to including an evaluation of the potential outcome of operating with items that are inoperative, this documentation shall consider the subsequent failure of the next critical component, the interrelationships between items that are inoperative, the impact on approved flight manual procedures, and the increase in crew workload. The PMMEL must not conflict with the approved flight manual limitations, configuration maintenance procedures (CMP), or airworthiness directives (AD). The PMMEL should specify suitable limitations in the form of placards, maintenance procedures, crew operating procedures, and other restrictions as necessary to ensure an acceptable level of safety. To substantiate these considerations, the manufacturer must provide demonstrations that include evaluation flights as necessary. AEG participation or observation in demonstration flights may be required and are scheduled in conjunction with the certification test program or the Flight Standardization Board's (FSB) operational evaluation. The PMMEL, which is submitted to the AEG for review, is developed by the manufacturer in a format acceptable to the Authority.

3. INITIAL MMEL APPROVAL PROCESS.

In the U.S. to initiate the MMEL approval process, the AEG schedules Flight Operations Evaluation Board (FOEB) meetings to review and evaluate the PMMEL for technical accuracy and acceptability. Interested parties, such as the manufacturer, operators, and interested aviation community representatives, are invited to participate in these meetings. The FOEB discusses each PMMEL item with the interested participants and recommends approval, modification or disapproval for each item. If consensus cannot be reached, an item may be held open for further consideration or until more information is gathered. The manufacturer or operator shall resubmit, with additional justification, items not acceptable or held open by the FOEB. The PMMEL is the initial manufacturer and AEG working document used to develop the draft MMEL and establishes the working relationship between the initial operators and the FOEB chairman. The FOEB chairman arranges to have the draft MMEL on the FAA bulletin board system (BBS) for operator and industry review and then will receive comments within the time period indicated. The FOEB will review and discuss the recommendations and comments and revise the draft MMEL as necessary. After ensuring that the coordination of the draft MMEL with field and industry has been properly completed, the Authority will post the MMEL as approved on the BBS for access by industry for preparing individual operator MELs.

4. MMEL REVISION PROCEDURES.

While an MEL is approved at the DGCA level, an MMEL revision is reviewed and approved by the appropriate AEG. An individual operator, the Authority, or industry may request changes to an MMEL. The AEG will consider those items requested by users based on operational considerations that indicate needed relief. Proposed changes that are generated by an operator shall be submitted through the DGCA when the need becomes apparent. Proposed changes are forwarded by the DGCA, with recommendations, to the appropriate AEG for consideration at the next scheduled FOEB meeting or electronic FOEB via a BBS approval system. MMEL revisions are either interim, global, or standard. A description of the types of MMEL revisions is contained in section 4 of this chapter. Revisions to the MMELs are approved in the same manner as initial MMELs; that is, after the Authority has ensured that proper coordination has been completed, they post the revision on the BBS for industry to revise individual MELs.

5. LEAD AIRLINE CONCEPT.

For certain air carrier airplanes, an air carrier representative will be designated by industry as Lead Airline representative to coordinate with the aircraft manufacturer, other operators, and the FOEB chairman. The purpose of the Lead Airline representative is to expedite the FOEB process and MMEL revision for the affected airplane. The Lead Airline representative conducts coordination meetings, as required, and will develop the FOEB agenda in a manner acceptable to the FOEB chairman. The Lead Airline representative will also coordinate industry participation at the FOEB meeting and will assist the manufacturer and the FOEB chairman in finalizing the MMEL revision after the meeting.

DIVISION III

MEL APPROVAL PROCESS

1. GENERAL.

This section contains specific direction, guidance, and procedures to be used when evaluating and approving MELs. The operator's MEL is developed by the operator from the appropriate master minimum equipment list (MMEL), then approved by the DGCA. This section contains the DGCA approval process for the MEL.

2. MEL ACCEPTABILITY.

The general criteria for MEL acceptability are as follows:

(a) Equally or More Restrictive. The operator's MEL shall not be less restrictive than the MMEL, the Lebanese Aviation Regulations (LARs), the operations specifications (OpSpecs), the approved flight manual limitations, certification maintenance procedures, or airworthiness directives (AD).

(b) Appropriate. The MEL shall be appropriate to the individual aircraft make and model.

(c) Specific. The operator's operations ("O") and maintenance ("M") procedures shall be specific to the aircraft and the operations conducted.

(d) Applicability. An MEL shall be applicable for the LAR under which the operator is certificated.

3. INITIAL PHASE OF MEL APPROVAL.

In this phase of the MEL approval process, the operator should consult with the DGCA regarding requirements for either developing an MEL or for revising an existing MEL. The DGCA should consult with and seek the participation of a DGCA maintenance inspector and an avionics inspector during the entire approval process. During the review of the "O" and "M" procedures, the DGCA, may consult with an appropriate Flight Operations Evaluations Board (FOEB) chairman as necessary concerning specific procedures.

(a) Operator Familiarization. In phase one of the MEL approval process, the DGCA should determine the scope of the task, based on the operator's experience with MELs. The DGCA should adapt the discussion to fit the operator's needs and experience, and should provide advice and guidance to the operator as necessary. DGCAs shall ensure that the operator clearly understands that MEL document preparation is solely the operator's responsibility.

(b) Required Document Submittal. The DGCA should advise the operator that, for an MEL to be approved, the following documents must be submitted:

(i) the proposed MEL or MEL changes

(ii) necessary "O" and "M" procedures, which may be based on the aircraft manufacturer's recommended procedures, Supplemental Type Certificate (STC) modifier's procedures, or equivalent operator procedures

(iii) a description of the MEL management program and its procedures as required by paragraph D95 of the OpSpecs, unless an MEL management program is already in place

(iv) any required guidance material developed by the operator, such as training material, guidance, and deferral procedures for both maintenance and operations personnel

Information Note: *Several manufacturers have produced manuals of recommended procedures for operating with inoperative equipment. The Lockheed and McDonnell Douglas MEL Procedures Manual and the Boeing Dispatch Deviation Guide (DDG) are examples of these manuals. When a manufacturer's recommended procedures exist, operators may use them or may develop alternate procedures. When contract services are used to develop the operator's MEL along with acceptable "O" and "M" procedures, the DGCA should review the "O" and "M" procedures in light of the type of operations being conducted and shall ensure the acceptability of the procedures. The DGCA shall ensure that the developed MEL procedures can be adequately implemented by the operator.*

(c) Materials Provided to the Operator. It is preferred that the operators obtain a copy of the MMEL by computer and modem directly from an MMEL bulletin board or other means. If the MMEL is furnished to the operator on computer disk, the MMEL should be in standard ASCII (DOS text) format. This allows the operator to use different word processing packages and different types of computers when editing the document. The DGCA should provide the operator with one of the following:
   (i) a computer disk containing the appropriate MMEL (computer disk to be provided by the operator); or
   (ii) a hard copy of the MMEL document and appropriate guidance material.

(d) Document Form. The operator may submit MEL draft documents to the DGCA either on hard copy (printed on paper) or on computer disk, as mutually agreed upon between the operator and the DGCA. The operator and the DGCA should discuss the techniques that will be used for revising and editing the proposed document. It is important that the operator understand that when the process is complete, the final proposed MEL shall be submitted on paper unless otherwise approved by the Minister.

(e) MEL Format. The MMEL format has been standardized to facilitate the development, revision, and approval of both master and operator documents. While the master document contains eight total sections, six of these sections are considered basic for MEL development and shall be included in each operator's MEL. Refer to Subsection 4.(f) of this section for a detailed list of each MMEL section and whether or not it shall be included in the operator's MEL.

(f) Generic Single Engine MMELs. A generic MMEL for single engine aircraft is published by a Civil Aviation Authority and acceptable to the Minister. This MMEL is applicable to all single engine airplanes and helicopters for which a specific MMEL has not been issued. When an operator is approved to use this generic MMEL, and a specific MMEL for the individual aircraft type is subsequently issued, the operator's MEL shall be revised within the specified time frame to conform to the specific MMEL.

4. FINAL PHASE OF MEL APPROVAL PROCESS.

The final phase begins when the operator formally submits the proposed MEL or MEL changes to the DGCA. The DGCA will initially review the operator's submittal to verify that it is complete, contains the required elements, as listed in Subsection 4.(f) of this section, and is detailed enough to permit a thorough evaluation of the MEL:

(a) Unacceptable Submittal. If the DGCA finds the proposed MEL package to be incomplete or unacceptable at this time or at any other juncture in the approval process, the DGCA should contact the operator. A sample letter is provided in figure 1. If a mutually acceptable correction cannot be immediately agreed upon, the entire package shall be immediately returned to the operator, or its representative, along with an explanation of the problems found within the documents.

(b) Acceptable Submittal. If the DGCA finds the proposed MEL package to be complete and to contain the required information in an acceptable format, the detailed analysis begins. During this analysis, the DGCA should coordinate with the maintenance and avionics inspectors to perform a detailed examination of the proposed MEL document and other supporting documents and procedures. If the operator does not currently have an MEL program, its MEL management program shall also be reviewed for acceptability. DGCA Inspectors will examine the technical content and quality of the proposed MEL document and other supporting documents and procedures as follows.

(i) Timely Review. The DGCA should promptly address all deficiencies and notify the operator of any discrepancies or outstanding issues. The DGCA and the operator may informally coordinate by telephone to clarify minor discrepancies or misunderstandings.

(ii) Reference Material. Inspectors will use the MMEL as the primary reference document when reviewing and approving the MEL. In addition, inspectors should use the following references:

A. Related LARs
B. Appropriate Standards
C. Approved Flight Manual
D. Operator's OpSpecs
E. Operator's Manuals
F. MMEL Policy Letters

(c) Coordination with Technical Groups. During this phase, the DGCA may wish to coordinate with an Authority's aircraft evaluation group (AEG) for guidance.

(d) Document Deficiencies. Refer to Subsection 4.(f) of this Section.

(e) Change in Schedule. If certain MMEL items shall be addressed within a specific time frame, the DGCA should notify the operator of this requirement as soon as possible. If the operator is unable to meet these schedule requirements, the DGCA should negotiate a new schedule with the operator.

(f) MEL Evaluation. DGCA Inspectors will compare the operator's MEL changes against the corresponding items in the current MMEL for the specific aircraft type. In addition, inspectors will verify that the operator's MEL contains the following required items:

(i) Cover Page (Required). The MEL cover page contains the operator's name and the make and model of the aircraft to which the MEL applies.

(ii) Table of Contents (Required). The table of contents contains a list of all of the pages in the MEL by title and the corresponding page identification (usually a page number).

(iii) Revision record (Required). The log contains the revision identification (usually a number) and date of the revision. It will contain a list of the revised pages, a block for the initials of the person posting the change, and additional enhancements for use by the operator. This page will contain a synopsis of the changes made by the operator in each revision

(iv) Preamble and Definitions (Required). The standard MMEL preamble and definitions section shall be reproduced word for word in each MEL, without modification, except as approved by the Minister.

(v) List of Effective Pages (Required). The List of Effective Pages are used as a method for keeping track of the status of the MEL and includes a record of the revision status or the date of each page of the operator's MEL. It is also be used as a means of conveying DGCA approval of the MEL.

A. *Minimum Contents*. At a minimum, The List of Effective Pages shall contain the following:
- the operator's name
- a listing of all of the pages in the MEL (including the date of each page and its page number or revision number)
- the MMEL revision number on which the MEL is based
- a signature block containing space for signature of the DGCA.

B. *Optional Contents*. The operator may include additional information on The List of Effective Pages to provide flexibility and additional approval functions.

(vi) Additional Items. The operator may include additional information sections in excess of the six DGCA sections.

(g) Individual Air Transport Association of America (ATA) System Page Evaluation. These pages contain a list of individual items of equipment in the aircraft together with provisions for the operation of the aircraft when the items are inoperative. The reviewing inspector will examine the individual ATA system pages, ensuring that the MEL is at least as restrictive as the MMEL and that operator's procedures are adequate and appropriate. The inspector should also examine the material contained on these pages for conflict with the LARs, with the approved flight manual emergency procedures and limitations, and with the operator's OpSpecs. The following elements are included:

(i) The ATA Numbering System. Operators shall use the standard ATA numbering system, similar to the manner used in the MMEL, for numbering individual pages in this section. An example of this numbering system would be the communications page; the first page would be 23-1; the second page would be 23-2.

(ii) Individual Items of Equipment. The MMEL contains listed items of installed equipment that may be inoperative.

A. *MMEL Items not Listed on the Operator's MEL*. If items listed on the MMEL are not listed on the MEL there is no relief.

B. *MMEL Items Listed on the Operator's MEL*. Each piece of equipment that is installed on the aircraft and that is contained in the MMEL, for which the operator seeks relief and that is appropriate for its operation, shall be listed on the appropriate page of the operator's MEL within the associated ATA system. The operator may be more restrictive than permitted by the MMEL by not listing certain items in its MEL. Each item title on the operator's MEL will generally be entered exactly as it is shown on the MMEL. Exceptions include the following:
- when the MMEL uses a generic term to address equipment that serves a similar function but various operators use different names for that equipment; or
- when the MMEL lists functions rather than individual pieces of equipment within that category (Examples include "Navigation Equipment" or "Communications Equipment." In such cases, the MEL shall contain a list of the individual equipment or systems within that category that are actually installed on the aircraft, such as "VHF Communications Transceivers." When items of this type consist of several components of a system, the item may be listed as a complete system, such as "VOR Navigation System," consisting of a VOR navigation receiver and its associated indicator. The inspector should ensure that the operator has not listed inappropriate items or items that are listed individually elsewhere in the MMEL. However, the DGCA is authorized to approve generic MMEL relief for navigation or communication equipment that is appropriate such as ILS, VOR, VHF, HF and GPS.)

(iii) Items Listed on the MMEL but not Installed on the Operator's Aircraft. The DGCA may follow several acceptable methods of dealing with an item of equipment being listed on the MMEL but not installed on the operator's aircraft. One method is to simply omit the item from the MEL altogether, renumbering individual items within an ATA category as necessary to provide proper continuity. (It should be noted that individual item numbers on a page are not necessarily ATA code numbers, but are simply sequential item numbers within an ATA category.) Another method is to list the item as shown on the MMEL, and to show the Number Installed as zero. In this case, the "Number Required for Dispatch" would also be zero, and the remark "Not Installed" may be noted under "Remarks and Exceptions"; repair category designators shall be omitted.

(iv) Triple Asterisk Symbol (***). The triple asterisk symbol is used in an MMEL to indicate that an item is not installed on some models of the aircraft. Operators will not produce or use this symbol in the MEL.

(v) Repair Category. Each item of equipment listed in the operator's MEL, except for Administrative Control Items and Passenger Convenience Items, shall include the repair category designator for that item as shown on the MMEL. These designators, categorized as "A," "B," "C," or "D," indicate the maximum time that an item may remain inoperative before repair is made. The actual repair categories corresponding to these letters are provided in the "Notes and Definitions" section of the MMEL. The operator may choose to adopt a more restrictive repair category than the one shown on the MMEL, but may not relax the requirement. Components or subsystems of items categorized in the MMEL, such as items of communications or navigation equipment that are not listed individually in the MMEL, shall retain the repair category shown on the MMEL when listed as separate items on the MEL.

(vi) Passenger Convenience Items. Passenger convenience items relate to the convenience, comfort, and entertainment of passengers and shall never affect the airworthiness of the aircraft. These items do not carry a specific repair category; however, the operator shall make repairs to convenience items within a reasonable time frame. Normally, the operator lists these items individually in ATA chapters 25 and 38. Passenger convenience items may be included elsewhere in the MEL if clearly identified as passenger convenience items. The DGCA should review the proposed MEL to decide which passenger convenience items are components of an item appearing in the MMEL. When listing passenger convenience items on the MEL, the operator shall list each item for which the operator wishes relief. The operator may make a list of passenger convenience items that, once it is acceptable to the DGCA, is held at the Directorate General of Civil Aviation Office. Passenger convenience items also apply to cargo airplanes, as appropriate.

(vii) Administrative Control Items. "Administrative control item" means an item listed by the operator in the MEL for tracking and informational purposes. It may be added to an operator's MEL by approval of the DGCA, provided no relief is granted, or provided conditions and limitations are contained in an approved document (such as Structural Repair Manual or airworthiness directive (AD)). If relief other than that granted by an approved document is sought for an administrative control item, the operator shall submit a request to the Minister. If the request results in review and approval by the FOEB, the item becomes an MMEL item rather than an administrative control item. Examples of items that could be considered administrative control items are cockpit procedure cards, medical kits, and life vests. These items shall appear in the appropriate ATA chapter and would not have a repair category. When the operator chooses this course of action, the DGCA shall examine each proposed administrative control item on the operator's proposed MEL to ensure that the following conditions are met:

A. no item is included as an administrative control item if it is included elsewhere in the MMEL

B. administrative items are not included as a subsystem of items listed in the MMEL
C. administrative items are not granted relief in the MEL unless the release conditions or limitations are contained in another approved document

(viii) Number of Items Installed. The MEL will normally contain the actual number of items of particular equipment installed on the aircraft. This number may be either greater or less than the number shown on the MMEL. The MMEL shows the number of items installed as the number of those items normally installed on a particular aircraft type. Individual aircraft operated by an operator may have a different number of items. Frequently the MMEL shows a dash in the "Number Installed" column. This dash indicates that a variable quantity of these items are generally installed on the aircraft. If the operator has an MEL for a single aircraft or identical aircraft, the actual number of these items on the particular aircraft shall be listed in the MEL. If the operator has an MEL for multiple aircraft, and the equipment is not installed on all aircraft or there is a variable quantity between aircraft, the operator's MEL will not reference specific aircraft identifications; the "Number Installed" column may contain a dash.

(ix) Number of Items Required for Dispatch. Normally, the number of items required for dispatch is determined by the FOEB and may be modified in the MEL in only two cases:
A. when the item is not installed on the aircraft, in which case a zero may be shown as the number required for dispatch
B. when the item is shown in the MMEL as being a variable number required for dispatch

Information Note: *In this case, the reviewing inspector should ascertain that the operator has made a determination as to the number required for dispatch. There can be several factors that establish this number. In some cases, it is determined by a reference to specific requirements listed in the "Remarks or Exceptions" column of the MMEL. An example would be cabin lights. In this case, the MMEL may show a variable number installed while the "Remarks or Exceptions" column might state that 50 percent of those items be operable. The number required for dispatch would therefore be 50 percent of the number of lights determined to be actually installed on the individual aircraft. Another case where the MMEL may show a variable number required for dispatch is when the "Remarks or Exceptions" column of the MMEL contains the statement, "As Required by FAR." In this case, the number is the minimum quantity of these items that shall be installed for operations under the least restrictive regulation under which the operator conducts operations.*

(ix) "Remarks or Exceptions." Certain items demand specific relief developed by the operator as authorized through OpSpecs, area of operation and the LARs. "As required by the LARs" is an example of this type of relief

(x) Other Items. Other items in which relief has been specifically written to reflect actions or restrictions to the operation may be changed only when the FOEB chairman makes a change to the MMEL. Generally they contain "O" and "M" procedures in which the operator develops its company procedures to comply with the MEL.

(h) Evaluation of Associated Documentation. The inspector should evaluate the supporting documentation submitted by the operator to ensure that it is complete and appropriate.

(i) The Operator's Manual. Inspectors should evaluate the operator's manual to ensure that it contains adequate guidance for the operator's personnel in conducting operations using the MEL. Generally, if the operator does not presently have an MEL program, the applicable portions of its manual and other guidance material shall be submitted at the time the MEL is submitted for initial review. When evaluating the operator's manual, inspectors should use the following guidance:

(ii) Documentation Procedures. The procedures for documenting inoperative equipment and any required maintenance release procedures shall be clear. At a minimum, provisions for recording the following items shall be developed:

A. an identification of the item of equipment involved
B. a description of the nature of the malfunction
C. an identification of the person making the entry
D. the MEL item number for the equipment involved

(i) Crew Notification. The operator shall establish procedures for advising the pilot in command (PIC) of inoperative items and required procedures such as affixing placards, alternate operating procedures, and instructions for the isolation of malfunctions. The PIC and the operator are both responsible for ensuring that flights are not dispatched or released until all of the requirements of the "O" procedures and "M" procedures have been met.

(j) Flight Restrictions. The operator shall establish procedures to ensure that dispatch or other operational control personnel, as well as the flightcrew, are notified of any flight restrictions required when operating with an item of equipment that is inoperative. These restrictions may involve maximum altitudes, limitations for the use of ground facilities, weight limitations, or a number of other factors.

(k) Training Program Material. Inspectors will ensure that the operator's flight and ground personnel training programs contain adequate instruction for MEL use.

(l) MEL Management Program. The DGCA should coordinate closely with both the maintenance inspectors and the operator on the MEL management program. Operators shall develop an MEL management program as a comprehensive means of controlling the repair of items listed in the approved MEL. Operators shall include a description of the program in their maintenance manual or other documents. The MEL management plan shall include the following:

(i) a method for tracking the date and time of deferral and repair
(ii) the procedures for controlling extensions to maximum repair categories
(iii) a plan for coordinating parts, maintenance, personnel, and aircraft at a specific time and place for repair
(iv) a review of items deferred due to unavailability of parts
(v) the specific duties and responsibilities of the managers of the MEL management program, listed by job title

5. TERMS AND CONDITIONS OF RELIEF.

This section contains the terms and conditions of relief granted to an operator for operating the aircraft with items of installed equipment that are inoperative. The operator shall state the terms and conditions under which operations may be conducted with inoperative items for the operator's particular organization and aircraft. The reviewing inspector shall address the following elements of this section:

(a) Standard Phraseology. When reviewing the MEL, inspectors should ensure that the operator generally uses the phraseology used in the MMEL to ensure clarity and standardization. In some cases modified phraseology is appropriate for the operator's specific installation. The DGCA should refer questions about non MMEL phraseology to the FOEB chairman for resolution.

(b) "As Required by FAR." The general term, "As Required by FAR," applies to ATA chapters 23 (Communications), 31 (Instruments), 33 (Lights), and 34 (Navigation Equipment). When this term appears in the "Remarks or Exceptions" section of an MMEL, the operator's MEL shall contain the specific conditions that apply. The operator usually must research the applicable LARs in detail to develop the appropriate provisions that apply to that operator's particular operations. An example of a typical distance measuring equipment (DME) remark could read, "Not required for flights below FL 240."

Information Note: *The operator's MEL shall clearly establish the actual requirement for its operation when the MMEL stipulates "As Required by FAR." It is not acceptable for the MEL to simply refer to the Regulations.*

(c) "O" and "M" Procedures.

(i) "O" and "M" procedures shall contain descriptions of the individual steps necessary to accomplish each process. For example, if the MMEL contains an "M" symbol with a provision that a valve shall be closed, the operator shall include the appropriate procedures to close the valve as part of the operator's manual or MEL. The reviewing inspector shall ensure that the procedure addresses the following:

A. how the procedure is accomplished
B. the order of accomplishing the elements of the procedure
C. the actions necessary to complete the procedure

(ii) for example, if the MMEL contains an "M" symbol with a provision that a valve shall be closed, the operator shall include detailed steps and actions for closing and testing the valve and installing the placard. The actual written procedures may be contained within the "Remarks or Exceptions" section of the MEL, in separate documents, or attached as an appendix. Inspectors will consult the Guidelines for "O" and "M" Procedures of the MMEL when evaluating these procedures. The section about the Guidelines for "O" and "M" Procedures does not have to be contained within the operator's MEL. If the "O" and "M" procedures are not contained within the MEL, the MEL shall include a reference to the location of the procedures.

Information Note: *While inspectors will ensure that the procedures are detailed and explicit, it is not necessary that the operator repeat obvious requirements of the MEL item, of the REGULATIONS, or of other established standards.*

(iii) "O" Procedures. The "(O)" symbol indicates a requirement for a specific operations procedure, that shall be accomplished in planning for and/or operating with the listed item inoperative. Normally, these procedures are accomplished by the flightcrew; however, other personnel may be qualified and authorized to perform certain functions. The satisfactory accomplishment of all procedures, regardless of who performs them, is the responsibility of the operator. Appropriate procedures are required to be published as a part of the operator's manual or MEL.

(iv) "M" Procedures. The "(M)" symbol indicates a requirement for a specific maintenance procedure which shall be accomplished prior to operation with the listed item inoperative. Normally these procedures are accomplished by maintenance personnel; however, other personnel may be qualified and authorized to perform certain functions. Procedures requiring specialized knowledge or skill, or requiring the use of tools or test equipment shall be accomplished by maintenance personnel. The satisfactory accomplishment of all maintenance procedures, regardless of who performs them, is the responsibility of the operator. Appropriate procedures are required to be published as part of the operator's manual or MEL.

(v) Provisos. The "Remarks and Exceptions" section of the MMEL generally contains provisos that include specific conditions under which an item of equipment may be inoperative. These provisos shall be carried over either verbatim into the operator's MEL or by using equivalent terminology. Provisos are distinct from "O" and "M" procedures. A procedure is an action that shall be performed. A proviso is a condition that must exist. For a proviso that operations shall be conducted under VFR, an operation under an IFR flight plan is not permitted, regardless of the weather conditions. When reference is made to visual meteorological conditions (VMC), operations may be conducted under an IFR flight plan, but only in VMC.

6. DEMONSTRATION PHASE.

A demonstration phase is normally not required for an MEL approval. When an operator is developing an MEL in conjunction with original certification for initial issuance of an operating certificate, or when instituting service with a new aircraft type, a demonstration of the operator's ability to use an MEL may be conducted during any required aircraft proving tests.

7. DGCA APPROVAL OF THE OPERATOR'S MEL.

After the DGCA is satisfied that the MEL is in full compliance with all applicable requirements, the DGCA shall sign the MEL control page or the individual MEL pages to signify approval. If the operator has not previously been authorized to operate under an MEL, the DGCA will issue paragraph D95 of the OpSpecs concurrently. The DGCA may send a letter of approval if desired (figure 2).

8. DGCA MEL Tracking System (TBD).

After receiving the proposed MEL from the operator, the DGCA will open a record for the approval and documentation of each phase of the approval process in the MEL Tracking System (TBD).

9. FINAL STEP.

As the final step in the MEL approval process, the DGCA enters the operator and MEL information into the Master Minimum Equipment List Tracking System (TBD).

10. Sample Letters

Starts next page

FIGURE 1
EXAMPLE OF LETTER TO OPERATOR DENYING APPROVAL OF MEL

Republic of Lebanon
Ministry of Transport
Directorate General of Civil Aviation

July 16, 1999

Mr. Robert Smith
Director of Operations
Lebanese Airlines (LEB)
Beirut Lebanon

Gentlemen:

This letter is to inform you that the Minimum Equipment List (MEL) submitted for approval on June 6, 1999 is being returned to your office. A comparison of LEB's MEL against the current Master Minimum Equipment List (MMEL) shows that in the following places LEB's MEL is less restrictive than the MMEL.

Specifically, these System and Sequence Numbers do not comply with acceptable procedures:
1. Page 24-1, item 3. DC Loadmeter
2. Page 28-1, item 1. Boost Pumps
3. Page 30-3, item 13. Pitot Heater

Additionally, LEB's MEL does not include the required Revision Control Page.

If you have further questions on the MEL approval process, please feel free to contact me.

Sincerely,

John Doe
DGCA Inspector

FIGURE 2
EXAMPLE OF LETTER TO OPERATOR APPROVING AN MEL

Republic of Lebanon
Ministry of Transport
Directorate General of Civil Aviation

July 16, 1999

Mr. Robert Smith
Director of Operations
Lebanese Airlines (LEB)
Beirut Lebanon

Gentlemen:

This letter is to inform you that the Minimum Equipment List (MEL) submitted for approval on June 6 has been approved. The control page has been signed and paragraph D95 of the Operations Specifications has been issued.

Sincerely,

John Doe
DGCA Inspector

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DIVISION IV

MEL USE IN SERVICE

1. GENERAL.

This section contains specific direction, guidance, and procedures for DGCA inspectors on the revision, administration, and policy application for administering MELs that have been approved for use by air carriers operating under the provisions of Lebanese Aviation Regulations (LAR) Part VI.

2. REVISION PROCEDURES.

(1) Revisions to an MEL. Revisions to an operator's MEL may be initiated by either the operator or the DGCA. Operator initiated revisions may be equal to or more restrictive than the Master Minimum Equipment List (MMEL). It is not necessary for an operator to submit an entire MEL when requesting the approval of a revision. The minimum submission would consist of only the affected pages; the approval by the DGCA inspector may only consist of specific items. These items are approved within a controlled process, and the carrier will produce the final MEL document. If the revision results in individual pages either being added or deleted, a revised table of contents page is also required. The issuance of an airworthiness directive (AD) will not be the basis for change to an operator's MEL. Instead, ADs will be referred to the Flight Operations Evaluations Board (FOEB) chairman for appropriate changes to the MMEL.

Information Note: *When operations ("O") or maintenance ("M") procedures are required per the MMEL, it is the operator's responsibility to develop appropriate procedures or to use manufacturer developed procedures in order to meet the requirements for inclusion of the item on the MEL. The DGCA is not authorized to grant MEL relief unless acceptable "O" and "M" procedures are provided by the operator.*

(2) MEL Revision Initiated by an Operator. An operator initiated MEL revision will normally fit into one of the following three categories:

- (a) Items Not Requiring an MMEL Change. Operators may propose changes to an MEL that are equal to, or more restrictive than, the MMEL. These revisions are approved by the DGCA using the same procedures as those required for an original MEL approval.
- (b) Items Requiring an MMEL Change. Operators may request changes to an MEL that are less restrictive than the MMEL. However, the MEL cannot be revised until the MMEL has been revised to permit the proposed MEL change. The most common instance of a revision request of this type occurs when an operator installs additional equipment on an aircraft and provisions for that equipment are not included on the current MMEL.
- (c) Major Aircraft Modifications. Major aircraft modifications, such as a supplemental type certificate (STC), a major alteration or a type certificate (TC) amendment, may invalidate the MEL for that aircraft. Operators shall review the MEL to assess the impact of any planned modification and shall immediately notify the DGCA of these modifications and the impact on the MEL. The DGCA should obtain guidance from the appropriate aircraft evaluation group (AEG) to determine if a revision to the MMEL is required.

(3) MEL Revisions Initiated by an Authority. When an Authority revises an MMEL, the DGCA, operators, and manufacturers should receive notification by a postcard or other acceptable means.

- (a) Nonmandatory Revision. MMEL revisions that only provide additional relief are reflected by a lower case letter suffix following the MMEL numeric revision number; for example, MMEL Revision No. 8 would become Nonmandatory Revision No. 8a. Any MMEL changes that are less restrictive than the operator's MEL may be ignored by the operator. An example of a nonmandatory revision is when the MMEL has been revised to provide for optional equipment normally not installed on all aircraft of a particular type, such as logo lights. Operators that operate aircraft with logo lights may choose to revise the MELs, while operators operating without logo lights would not.

(b) Global Change. A global change is another type of nonmandatory revision. A global change generally applies to items of equipment that are required to be installed by a new regulatory requirement, such as a cockpit voice recorder (CVR), or a traffic alert and collision avoidance system (TCAS).Items affected by Authority policy decisions, such as Observer Seat Notice are also global changes. The global change does not replace the normal MMEL revision process (section 2 of this chapter). When a standard revision to an MMEL is issued, it will include all global changes issued to date. However, since the process for revising the MMEL can be lengthy, and the operator's MEL shall be based on the MMEL, a global change will allow an operator to revise its MEL prior to the change in the MMEL. The DGCA has the authority to approve the operator's MEL revision on the basis that the global change is an approved addendum to the existing MMEL. Availability of global changes will be transmitted to the DGCA by the appropriate Authority.

(c) Mandatory Revisions. Mandatory changes, which are more restrictive and may remove relief from the current MMEL, are reflected by the next successive change to the basic MMEL revision number itself. For example, the next mandatory revision following the nonmandatory revisions 6a, 6b, or 6c would be revision 7. Any MMEL changes that are more restrictive than the operator's MEL will be implemented by the operator as soon as possible. In some cases when relief is removed from the MMEL, there will be a specific date for compliance, or guidance for an acceptable date to be negotiated between the DGCA and the operator.

(d) DGCA Initiated Revision. The DGCA may initiate an MEL revision that is not based on a revision to the MMEL. The DGCA should make such a request to the operator in writing, stating specific reasons why the revision is necessary. A DGCA initiated revision may be made upon the discovery that an operator has modified an aircraft or that faulty maintenance or operations procedures exist. The DGCA should work closely with the operator and make every effort to resolve the matter in a mutually agreeable manner. The operator should be given a reasonable time period to make the required changes depending on whether safety of flight is affected. In the event that the operator declines to make the required change, the DGCA may consult with airworthiness inspectors to initiate an amendment of the operator's OpSpecs to rescind the authority for the MEL.

(4) Modifications Within a Fleet. If an operator has been granted approval to use the MEL for a fleet, and the operator installs a new piece of equipment in one or more aircraft, the operator may continue to operate that aircraft under the provisions of the currently approved MEL. The operator may not defer repair of the new item until an appropriate revision to the MEL has been approved.

3. TRACKING OF REVISION STATUS.

The DGCA shall maintain a copy of the current MEL for each assigned operator's aircraft type. The DGCA shall update the MMEL Tracking System **(TBD)** to record and track the revision status of the operator's MEL (see section 5 of this chapter).

4. AVAILABILITY OF MEL FOR FLIGHT CREWMEMBERS.

LAR Part VI requires that flight crewmembers have direct access to the MEL at all times prior to flight. Although not required, the easiest method of compliance with this requirement is for the operator to carry the MEL aboard each aircraft. The operator may choose to use some system of access to the MEL other than the MEL document. For example, the flightcrew may obtain access to the MEL through the ARINC Communications Addressing and Reporting System (ACARS). The critical element in approving an alternate form of access is whether or not the flightcrew has a direct means of access to the appropriate information in the MEL, specifically "O" and "M" procedures. Direct access shall not be construed to mean access through telephone or radio conversations with maintenance or other personnel. If the operator chooses to provide the flightcrew with access to the MEL by other than printed means, the method shall be approved in the operator's MEL program.

5. METHOD OF AUTHORIZING FLIGHT CREWMEMBER ACCESS TO MEL.

The DGCA may approve a method other than printed means for providing the flightcrew with access to the MEL as provided in Section 605.09 of the LARs. Before authorizing such a method, the DGCA must be confident that the operator has an adequate means in place to provide flightcrews with the complete equivalent of the actual text of the MEL. This method shall be described in detail in the operator's DGCA approved general operating manual or equivalent. When the decision is made to authorize this alternative method, the DGCA should use appropriate provisions. In this case, the "Applicable LAR Section" of the OpSpecs would be Section 605.09 of the LARs, and the "Remarks and/or References" section would refer to the appropriate section of the operator's manual.

6. DISCREPANCIES DISCOVERED DURING FLIGHT.

Use of the MEL is applicable to discrepancies or malfunctions that occur before after take-off pursuant to Section 605.09 of the LARs. Once an aircraft starts the take-off roll, the flightcrew shall handle any equipment failure in accordance with the approved flight manual. For those operators who are required to use a dispatch or flight release, the PIC shall handle a discrepancy that occurs after the issuance of the release, but before the take-off roll in accordance with the MEL. The PIC shall obtain a new or amended dispatch or flight release, as well as any required airworthiness release. This new or amended release shall contain any applicable flight restrictions necessary for operation with any item of equipment that is inoperative.

7. DOCUMENTATION OF DISCREPANCIES.

Provisions of the MMEL preamble require that an airworthiness release be issued or an entry be made in the aircraft maintenance record or logbook prior to conducting any operations with items of equipment that are inoperative. LAR Part VI operators generally require the use of a formal airworthiness release issued by an authorized maintenance person. Operators shall have adequate methods for recording the authorization to operate the aircraft with items of equipment that are inoperative. This does not imply that the involvement of a DGCA certified mechanic or other person authorized under Subpart 575 of the LARs to approve an aircraft for return to service is required in all cases. Unless maintenance actions are performed on the aircraft, LAR Part VI flightcrews may make appropriate documentation in the aircraft maintenance log required by Part VI, Subpart 5 of the LARs.

8. CONFLICT WITH AIRWORTHINESS DIRECTIVES.

Occasionally an AD may apply to an item of equipment that may be authorized to be inoperative under the MEL. The item may not simply be deferred under the MEL in order to avoid or delay compliance with the AD or a DGCA approved alternate means of compliance with the AD. In all cases, when an AD has been issued, the operator shall comply fully with the terms of the AD or a DGCA approved alternate means of compliance with the AD. The DGCA shall approve any alternative method of compliance with the AD as provided in the AD. In other cases, the provisions of an AD may allow operation of the aircraft on the condition that certain items of installed equipment be used or be operable. In those cases, the affected items shall be operable even though the MEL may provide for deferral of repair.

9. INTERRELATIONSHIPS OF INOPERATIVE COMPONENTS.

When the MEL authorizes a component of a system to be inoperative, only that component may be affected. When a system is authorized to be inoperative, individual components of that system may also be inoperative. Any warning or caution systems associated with that system shall be operative unless specific relief is authorized in the MEL. The operator shall consider the interrelationship of inoperative components. This consideration shall include the following:

(a) the interrelationship of one piece of equipment on another
(b) the crew workload
(c) the operation of the aircraft
(d) the flight restrictions

10. REPAIR CATEGORIES.

When an item of equipment becomes inoperative, and repair is deferred under an MEL, the operator shall make repairs as specified by the associated repair category designator ("A," "B," "C," or "D") and the operator's MEL management system. In the event that more items are installed then those that are required for normal operation, the "C" repair category may be used. For example, if one altitude alerting system is required and the associated repair category is "B," but there are two such systems installed, failure of the first system could be deferred as specified for a "C" category item (10 days). Failure of the remaining system would limit at least one system to the repair category for the "B" category item (3 days). See the definitions section of the MMEL for an explanation of repair categories.

11. PROGRAM TRACKING AND REPORTING SUBSYSTEM (PTRS) INPUT.

Operations inspectors should use the DGCA MMEL Tracking System **(TBD)** to record each MEL revision. The inspector keeping the record open until the revision is approved shall document the revision process in the DGCA MMEL Tracking System **(TBD)**.

DIVISION V

CONFIGURATION DEVIATION LISTS

1. GENERAL.

This section contains information for operators concerning the development and approval processes of configuration deviation lists (CDL). Aircraft certificated under the provisions of an Authority may be approved for operations with missing secondary airframe and engine parts. Approval for operating with these parts missing would be authorized by the appropriate aircraft directorate, under an amendment to the type certificate. Evaluation and approval of CDLs are functions of an Authority's aircraft certification office (ACO).

2. DEVELOPMENT AND APPROVAL OF A CDL.

An aircraft manufacturer develops a proposed CDL for a specific aircraft type. The proposed CDL is submitted to the responsible ACO for approval by engineering specialists. The ACO will then coordinate with the appropriate aircraft evaluation group (AEG) to resolve any problems and discrepancies prior to approving the CDL. For United States (U.S.) certificated airplanes, the CDL, once approved, is incorporated into the limitations section of the airplane flight manual (AFM) as an appendix. For manufacturers outside the U.S., the CDL may be a stand alone document and part of the Structure Repair Manual, or another manufacturer's document. Some operators may choose to attach a copy of the CDL to their MEL for easy and ready reference by flightcrews.

3. USE OF THE CDL.

Operators shall follow the CDL limitations when operating with a configuration deviation. Operators are required to observe the following:

(a) the limitations in the CDL when operating with certain equipment missing (except as noted in the appendix to the approved flight manual)

(b) the flight operations, restrictions, or limitations that are associated with each missing airframe and engine part

(c) any placard(s) required by the CDL describing associated limitations, which must be affixed in the cockpit in clear view of the pilot in command (PIC) and other appropriate crewmembers

4. OPERATIONAL CONTROL.

The DGCA shall ensure that the operator has developed appropriate procedures for the PIC and, if appropriate, procedures for notifying dispatch of the CDL missing parts by an appropriate notation in the aircraft logbook or other acceptable means.

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REPUBLIC OF LEBANON
MINISTRY OF TRANSPORT
DIRECTORATE GENERAL OF CIVIL AVIATION

LARs

LEBANESE AVIATION REGULATIONS

Part VI

General Operating and Flight Rules

Subpart 6

Miscellaneous

***** Revision No. 1 *****
International Civil Aviation Organization
Richard B. Fauquier

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LEBANESE AVIATION REGULATIONS (LARs)

Part VI – General Operating and Flight Rules

Subpart 6 – Miscellaneous

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Subpart 6 - Miscellaneous

606.01 Munitions of War

No person shall carry weapons, ammunition or other equipment designed for use in war on board an aircraft unless the aircraft is a Lebanese aircraft approved by the Minister or the Minister has authorized the carriage of such equipment.

606.02 Liability Insurance

(1) This Section applies to every owner of an aircraft that is registered in Lebanon, or registered pursuant to the laws of a foreign state and operated in Lebanon, who is not required to subscribe for liability insurance in respect of the aircraft pursuant to the Lebanese Civil Aviation Safety Act.
(2) Subject to subsection (3), none of the following aircraft owners shall operate an aircraft unless, in respect of every incident related to the operation of the aircraft, the owner has subscribed for liability insurance covering risks of injury to or death of passengers in an amount that is not less than the amount determined by multiplying $300,000 by the number of passengers on board the aircraft:
- (a) an air operator;
- (b) the holder of a flight training unit operator certificate; or
- (c) the operator of a balloon in which fare-paying passengers are carried on board pursuant to Subpart 3.

(3) The insurance coverage referred to in subsection (2) need not extend to any passenger who
- (a) is an employee of an owner referred to in paragraph (2)(a), (b) or (c), if workers' compensation legislation governing a claim for damages against the owner by the employee is applicable; or
- (b) is carried on board the aircraft for the purpose of conducting a parachute descent, where the air operator has posted a readily visible notice to inform passengers, before embarking, that there is no insurance coverage for parachutists.

(4) No aircraft owner not referred to in paragraph (2)(a), (b) or (c) shall operate an aircraft of more than 2,268 kg (5,000 pounds) maximum permissible take-off weight unless the owner has, in respect of the aircraft, subscribed for liability insurance covering risks of injury to or death of passengers, other than passengers carried on board that aircraft for the purpose of conducting a parachute descent, in an amount not less than the amount determined by multiplying $300,000 by the number of passengers on board the aircraft.
(5) No aircraft owner referred to in paragraph (2)(a), (b) or (c) shall operate an aircraft unless, in respect of every incident related to the operation of the aircraft, the owner has subscribed for liability insurance covering risks of public liability in an amount that is not less than
- (a) $1,000,000, where the maximum permissible take-off weight of the aircraft is not greater than 3,402 kg (7,500 pounds);
- (b) $2,000,000, where the maximum permissible take-off weight of the aircraft is greater than 3,402 kg (7,500 pounds) but not greater than 8,165 kg (18,000 pounds); and
- (c) where the maximum permissible take-off weight of the aircraft is greater than 8,165 kg (18,000 pounds), $2,000,000 plus an amount determined by multiplying $150 by the number of pounds by which the maximum permissible take-off weight of the aircraft exceeds 8,165 kg (18,000 pounds).

(6) No aircraft owner referred to in paragraph (2)(a), (b) or (c) shall, in order to comply with subsections (2), (4) and (5), subscribe for any liability insurance that contains an exclusion or waiver provision that reduces the insurance coverage for any incident below the applicable minimum determined pursuant to those subsections, unless that provision

(a) is a standard exclusion clause adopted by the international aviation insurance industry that applies in respect of
   (i) war, hijacking and other perils,
   (ii) noise, pollution and other perils, or
   (iii) radioactive contamination;
(b) is in respect of a chemical drift;
(c) includes a statement that the insurance does not apply in respect of liability assumed by the owner under any contract or agreement unless the liability would have attached to the owner even in the absence of such a contract or agreement; or
(d) includes a statement that the policy is void if the owner has concealed or misrepresented any material fact or circumstance concerning the insurance or the subject thereof or if there is any fraud, attempted fraud or false statement by the owner touching any matter relating to the insurance or the subject thereof, either before or after an incident.

(7) An aircraft owner referred to in paragraph (2)(a), (b) or (c) may comply with subsections (2), (4) and (5) by subscribing for comprehensive single limit liability insurance that consists of a single policy or a combination of primary and supplementary policies.
(8) No aircraft owner not referred to in paragraph (2)(a), (b) or (c) shall operate an aircraft unless, in respect of every incident related to the operation of the aircraft, the owner has subscribed for liability insurance covering risks of public liability in an amount that is not less than
(a) $100,000, where the maximum permissible take-off weight of the aircraft is 1,043 kg (2,300 pounds) or less;
(b) $500,000, where the maximum permissible take-off weight of the aircraft is greater than 1,043 kg (2,300 pounds) but not greater than 2,268 kg (5,000 pounds);
(c) $1,000,000, where the maximum permissible take-off weight of the aircraft is greater than 2,268 kg (5,000 pounds) but not greater than 5,670 kg (12,500 pounds);
(d) $2,000,000, where the maximum permissible take-off weight of the aircraft is greater than 5,670 kg (12,500 pounds) but not greater than 34,020 kg (75,000 pounds); and
(e) $3,000,000, where the maximum permissible take-off weight of the aircraft is greater than 34,020 kg (75,000 pounds).

(9) Subject to subsection (10), no owner or operator of an aircraft shall operate the aircraft unless there is carried on board the aircraft proof that liability insurance is subscribed for in accordance with this Section.
(10) A balloon may be operated without the proof of insurance referred to in subsection (9) being carried on board if that proof is immediately available to the pilot-in-command
(a) prior to commencing a flight; and
(b) on completion of a flight.

606.03 Synthetic Flight Training Equipment

(1) No person shall use synthetic flight training equipment for Pilot or Flight Engineer training or a Pilot or Flight Engineer proficiency check required pursuant to Part IV, VI or Part VII of the LARs unless there is in force in respect of that equipment a flight simulator certificate or flight training device certificate issued pursuant to subsection (2) or an equivalent approval or certificate issued under the laws of a foreign state with which Lebanon has an agreement respecting such equipment.
(2) The Minister shall, where it is determined that the synthetic flight training equipment meets the standards set out for that equipment in Part VII of the LARs, Commercial Air Services Standards , issue to the operator of that equipment a flight simulator certificate or flight training device certificate.
(3) A certificate issued pursuant to subsection (2) shall set out the following information:
(a) the name of the operator of the synthetic flight training equipment;
(b) the type, model or series number of aircraft represented;
(c) the qualification level of the synthetic flight training equipment; and

(d) the date of issuance of the certificate.

(4) No certificate issued pursuant to subsection (2) remains in force unless the synthetic flight training equipment in respect of which the certificate has been issued:

(a) maintains the performance, function and other characteristics that are required for the issuance of the certificate, except in the cases set out in the Simulator Component Inoperative Guide (SCIG);

(b) is maintained in accordance with the procedures set out in Part VII of the LARs, Commercial Air Services Standards ; and

(c) is changed as required, where the aircraft type, model or series number represented by the synthetic flight training equipment undergoes a change as a result of the issuance of an airworthiness directive or an amendment to this Part or Part VII that affects the training being conducted.

(5) A certificate issued pursuant to subsection (2) remains in force where the synthetic flight training equipment in respect of which the certificate has been issued is re-evaluated:

(a) in the case of a flight simulator, at least every six months; or

(b) in the case of a flight training device, at least every 12 months.

(6) Subject to subsection (7), the certificate referred to in subsection (5) remains in force

(a) in the case of a flight simulator, until the first day of the seventh month following the month in which the flight simulator was evaluated; or

(b) in the case of a flight training device, until the first day of the thirteenth month following the month in which the flight training device was evaluated.

(7) The Minister may extend the period in respect of which a flight simulator certificate or a flight training device certificate is in force by up to 60 days where the Minister is of the opinion that aviation safety is not likely to be affected.

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