MOZAMBIQUE CIVIL AVIATION TECHNICAL STANDARDS

PART 91

MOZ-CATS-OPS 91

GENERAL OPERATING AND FLIGHT RULES

AUTORIDADE DE AVIAÇÃO CIVIL DE MOÇAMBIQUE

APPROVAL

By Powers granted to the Chairman and CEO of the Instituto de Aviação Civil de Moçambique (IACM) through, n.° 2, Article 15 of Civil Aviation Law n.°5/2016 of 14 of June, this amendment of the Technical Standards (MOZCATS Part 91) is hereby approved and published for implementation, from the day of approval.

Comments and recommendations for revision/amendment action to this publication should be forwarded to the head of Legal Office of Instituto de Aviação Civil de Moçambique.

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Maputo, 05 September 2018

Approved by Board

Captain João Martins De Abreu

The Chairman and Chief Executive Officer

REGISTER OF REVISIONS

Revision	Revision of Parts	No of pages	New Date
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LIST OF EFFECTIVE PAGES

The list of effective pages below will be used to assist in keeping track of revisions and updates to the **Mozambique Civil Aviation Technical Standards – Part 91 – Airworthiness of Aircraft.** The list shows the number of the last revision for each page of the Mozambique Civil Aviation Technical Standards. Accordingly, with each revision to the Mozambique Civil Aviation Technical Standards a new list of effective pages will be published and distributed to all Mozambique Civil Aviation Technical Standards holders.

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MOZAMBIQUE CIVIL AVIATION TECHNICAL STANDARDS: CATS RELATING TO GENERAL OPERATING AND FLIGHT RULES

INTRODUCTION

1. GENERAL

Article 15 (2) of Civil Aviation law Nº 5/2016 empowers the Director General for Civil Aviation to issue technical standards for civil aviation on the matters which are prescribed by regulation.

2. PURPOSE

Document MOZ-CATS-OPS 91 contains the standards, rules, requirements, methods, specifications, characteristics and procedures, which are applicable in respect of Air Operator.

Each reference to a technical standard in this document, is a reference to the corresponding regulation in the Mozambique Civil Aviation Regulations, for example, technical standard 91.01.5 refers to regulation 5 of Subpart 01 of Part 91 of the Regulations.

The abbreviation "MOZ-CAR" is used throughout this document when referring to any regulation.

The abbreviation "TS" refers to any technical standard.

3. SCHEDULES AND NOTES

Guidelines and recommendations in support of any particular technical standard are contained in schedules to, and/or notes inserted throughout the technical standards.

LIST OF TECHNICAL STANDARDS

91.01.5 INFORMATION ON EMERGENCY AND SURVIVAL EQUIPMENT CARRIED

1. Emergency and survival list

An owner or operator must have a list containing the following minimum information regarding the emergency and survival equipment carried on board:

(1) The number, colour and type of life rafts and pyrotechnics;

(2) Details of emergency medical supplies;

(3) Water supplies; and

(4) Type and frequencies of emergency portable radio equipment.

91.02.7 DUTIES OF PILOT-IN-COMMAND REGARDING FLIGHT PREPARATION

1. Category II approach

A Category II approach is an ILS approach procedure which provides for an approach to a decision height lower than 200 feet but not lower than 100 feet and a RVR of not less than 350 m.

2. Category III approach

A Category III approach is divided into either a CAT (A) (B) or (C) approach as below:

(1) Category III A approach, which is an ILS approach procedure which provides for an approach with either a decision height lower than 100 feet or with no decision height and with a RVR of not less than 200 m;

(2) Category III B approach, which is an ILS approach procedure which provides for an approach with either a decision height lower than 50 feet or with no decision height and with a RVR of less than 200 m but not less than 50 m; and

(3) Category III C approach which is an ILS approach procedure which provides for an approach with no decision height and no RVR limitations.

3. Adequate and suitable aerodromes

For the purposes of CAR 91.02.7(1)(s) –

(1) An adequate aerodrome is an aerodrome licensed in terms of Part 139 or is found to be equivalent to the safety requirements prescribed in Part 139; and

(2) a suitable aerodrome is an adequate aerodrome 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, the field condition reports indicate that a safe landing can be accomplished at the time of the intended operation and the facilities necessary to complete an approach at such aerodrome is operational.

91.03.4 AIR TRAFFIC SERVICE FLIGHT PLAN

1. Form of an air traffic service flight plan

(1) An air traffic service flight plan filed prior to departure must contain the following items:

a) Aircraft identification and transponder data;

(b) flight rules and type of flight;

(c) Number and type(s) of aircraft and wake turbulence category;

(d) radio communication, navigation and approach-aid equipment;

(e) aerodrome of departure and time;

(f) Flight information region boundaries and estimated times;

(g) cruising speed and flight level;

(h) Route to be followed;

(i) Aerodrome of destination and estimated times of arrival;

(j) alternate aerodrome(s);

(k) Alerting action required;

(l) fuel endurance;

(m) Total number of persons on board;

(n) Emergency and survival equipment and colour of aircraft;

(o) other pertinent information; and

(p) Name, postal address, telephone and telefax number of the owner or operator of the aircraft which must be completed in field 18 of the standard flight plan form.

(2) An air traffic service flight plan filed in flight to comply with MCAR 91.03.4(6) must contain the following items:

(a) Aircraft registration;

(b) flight rules;

(c) Type of aircraft;

(d) Aerodrome of departure;

(e) Cruising speed and flight level;

(f) Route to be followed and estimates as applicable;

(g) Aerodrome of destination and estimated time of arrival;

(h) alternate aerodrome for IFR flights;

(i) Alerting action required;

(j) Fuel endurance if alerting action required;

(k) total number of persons on board; and

(l) Name, postal address, telephone and telefax number of the owner or operator of the aircraft.

91.03.5 FLIGHT FOLIO

1. Information to be contained in a flight folio

(1) An owner or operator must retain the following information for each flight in the form of a flight folio:

(a) Aircraft registration;

(b) date;

(c) Names of flight crew member(s);

(d) Duty assignment of flight crew member(s);

(e) place of departure;

(f) Place of arrival;

(g) Time of departure (off-block time);

(h) time of arrival (on-block time);

(i) Hours of flight;

(j) nature of flight;

(k) Incidents, observations (if any);

(l) signature of pilot-in-command;

(m) The current maintenance statement giving the aeroplane maintenance status of what maintenance, scheduled or out of phase, is next due;

(n) All outstanding deferred defects which affect the operation of the aeroplane;

(o) fuel used; and

(p) Fuel uplift.

(2) The owner or operator need not keep a flight folio or parts thereof, if the relevant information is available in other documentation.

(3) The owner or operator must ensure that all entries are made concurrently and that they are permanent in nature.

91.04.10 FLIGHT RECORDER

1. Flight recorder specifications

All digital flight recorders must comply with one of the following specifications as applicable:

(1) ARINC 542A

(2) ARINC 573-717

(3) ARINC 717

(4) ICAO

2. Parameters

(1) The parameters of flight recorders are prescribed in MOZCAR 91.04.13.

(2) Documentation

(a) Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator.

(b) The documentation needs to be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

91.04.12 COCKPIT VOICE RECORDER

1. The technical standards with respect to aircraft required by subsection (1) to be operated with a serviceable cockpit voice recorder, are specified in this TS.

(1) Subject to sub-sections 4) and (5), no person shall conduct a take-off in a multi-engined turbine-powered aircraft that is configured for six or more passenger seats and for which two pilots are required by the aircraft type certificate or by the subpart under which the aircraft is operated, unless the aircraft is equipped with a cockpit voice recorder that conforms to section 2. of this TS.

(2) In the case where a cockpit voice recorder is required, the cockpit voice recorder shall be 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.

(3) No person shall erase any communications pertaining to the flight being undertaken that have been recorded by a cockpit voice recorder.

(4) Where a minimum equipment list has been approved by the Director in respect of the operator of an aircraft pursuant to any MCAR, the operator may operate the aircraft without a serviceable cockpit voice recorder if the aircraft is operated in accordance with the minimum equipment list.

(5) Where a minimum equipment list has not been approved by the Director in respect of the operator of an aircraft, the operator may operate the aircraft without a serviceable cockpit voice recorder provided that -

(a) The aircraft shall not take-off from an aerodrome where repairs or replacements to such cockpit voice recorder can be made;

(b) The aircraft does not exceed six further consecutive flights with the cockpit voice recorder unserviceable;

(c) Not more. than 48 hours have elapsed since the cockpit voice recorder became unserviceable; and

(d) any flight data recorder required to be carried is operative, unless the flight data recorder is combined with a cockpit voice recorder.

2. The minimum performance required herein shall apply to all cockpit voice recorders operated pursuant to this TS.

(1) A CVR installed on board an aircraft shall continuously record:

(a) voice communications transmitted from, or received by, the aircraft concerning the operation of the aircraft;

(b) the aural environment of the flight deck, including:

(i) The audio signals received from each microphone being used by a flight crew member;

(ii) Voice communications of flight crew members using the aircraft's interphone system and the public address system, and

(iii) Voice communications or audio signals identifying navigation or approach aids detected by a headset or speaker.

(2) A CVR installed on board an aircraft with a date of manufacture after October 11, 1991 and brought onto the register after the coming into force date of this section, shall record continuously the information specified in (1) with reference to a time scale.

(3) A CVR installed on board an aircraft manufactured after December 31, 2002, shall retain all information recorded during the aircraft's operation, or all information recorded during the last two hours of the aircraft's operation, whichever is less.

(4) A CVR installed on board any aircraft other than one referred to in subsection (3), shall retain all the information recorded during the aircraft's operation, or all the information recorded during the last 30 minutes of the aircraft's operation, whichever is less.

(5) An aircraft with a date of manufacture after October 11, 1991, or on which a CVR has been installed after the coming into force of this section, shall be equipped to record the uninterrupted audio signals received by a boom or mask microphone

(6) Each flight crew member of an aircraft equipped to record the uninterrupted audio signals received by boom or mask microphone in accordance with subsection (5), shall use the boom or mask microphone when operating below 10,000 feet mean sea level.

(7) An aircraft in respect of which a type certificate has been issued authorizing the transport of more than 30 passengers shall have an approved underwater locating device on or adjacent to the recorder container which is secured in such a manner that they are not likely to be separated during crash impact, unless the FDR and CVR required by this section are installed adjacent to each other in such a manner that they are not likely to be separated during crash impact.

91.04.13 FLIGHT DATA RECORDER

1. Types of aircraft

(1) An aeroplane or helicopter in respect of which an individual certificate of airworthiness was issued on or after 1 January 1989 which –

(a) is an aeroplane with a MCM exceeding 27 000 kg;

(b) is an aeroplane with a MCM exceeding 5 700 kg, up to and including 27 000 kg, classified in the public transport or transport of cargo category; or

(c) is a helicopter with a MCM exceeding 7 000 kg and is engaged in international operations, may not be operated unless such aeroplane or helicopter is equipped with the appropriate flight data recorder prescribed in paragraph (3).

(2) A turbine-engine aeroplane with a MCM exceeding 27 000 kg of which the prototype was certified by an appropriate authority after 30 September 1969, may not be operated unless such aeroplane is equipped with the appropriate flight data recorder prescribed in paragraph (3).

(3) (a) An aeroplane referred to in paragraph (1)(a) must be equipped with a Type I flight data recorder prescribed in Table 1.

(b) An aeroplane referred to in paragraph (1)(b) must be equipped with a Type II flight data recorder prescribed in Table 1.

(c) A helicopter referred to in paragraph (1)(c) must be equipped with a Type IV flight data recorder prescribed in Table 2.

(d) A turbine-engine aeroplane referred to in paragraph (2) must be equipped with a Type II flight data recorder prescribed in Table 1.

(4) A turbine-engine aeroplane with a MCM exceeding 5 700 kg which is classified for operation in the public transport or transport of cargo category, and –

(a) in respect of which an individual certificate of airworthiness was first issued on or after 1 January 1987, but before 1 January 1989; or

(b) in respect of which an individual certificate of airworthiness was first issued before 1 January 1987, may not be operated unless such aeroplane is equipped with a flight data recorder which records –

(i) time;

(ii) altitude;

(iii) airspeed;

(iv) normal acceleration;

(v) heading; and

(vi) pitch.

(5) In the case of an aeroplane or helicopter referred to in paragraph (1), in respect of which an individual certificate of airworthiness was first issued before 1 January 1987, the flight data recorder may be combined with the cockpit voice recorder.

2. Parameters

Table 1: Parameters for aeroplane flight data recorders

Serial Nr	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (Sensor input compared to FDR read-out)
1	Time (UTC when available, otherwise elapsed time)	24 hours	4	± 0.125% per hour
2	Pressure altitude	– 300 m (–1 000 ft) to maximum certificated altitude of aircraft + 1 500m (+ 5 000 ft)	1	± 30 m to ± 200 m (± 100 ft to ± 700 ft)
3	Pressure altitude	Indicated airspeed 95 km/h (50 kt) to max Vso (Note 1) Vso to 1.2 VD (Note 2)	1	± 5% ± 3%
4	Heading	360	° 1	± 2°
5	Normal acceleration	– 3 g to + 6 g	0.125	± 1% of maximum range excluding datum error of ± 5%
6	Pitch altitude	± 75°	1	± 2°
7	Roll altitude	± 180°	1	± 2°
8	Radio transmission Keying	On-off (one discrete)	1	
9	Power on each engine (Note 3)	Power on each engine (Note 3)	1 (per engine)	± 2°
10	Trailing edge flap or cockpit control section	Full range on each discrete position	2	± 5% or as pilot's indicator
11	Leading edge flap or cockpit control section	Leading edge flap or cockpit control section	2	± 5% or as pilot's indicator

12	Thrust reverser Position	Stowed, in transit, and reverse	1 (per engine)	
13	Ground spoiler/speed brake selection	Full range or each discrete position	1	± 2% unless higher accuracy uniquely required
14	Outside air Temperature	Sensor range	2	± 2°C
15	Autopilot/auto throttle /AFCS mode and Engagement status	A suitable combination of discretes	1	
Note: The preceding 15 parameters satisfy the requirements for a Type II FDR				
16	Longitudinal acceleration	± 1 g	0.25	± 1.5% max range excluding datum error of ± 5%
17	Lateral acceleration	± 1 g	0.25	± 1.5% max range including datum error of ± 1.5%
18	Pilot input and/or control surface position –primary controls(pitch, roll, yaw) (Note 4)	Full range	1	± 2° unless higher accuracy uniquely required.
19	Pitch trim Position	Full range	1	± 3% unless higher accuracy uniquely required
20	Radio altimeter	– 6 m to 750 m (– 20 ft to 2 500 ft)	1	± 0.6 m (± 2 ft) or± 3% which ever is greater below 150 m (500 ft)and ± 5% above 150 m (500 ft)
21	Glide path deviation	Signal range	1	± 3%
22	Localizer deviation	Signal range	1	± 3%
23	Marker beacon Passage	Discrete	1	
24	Master Warning	Discrete	1	
25	NAV 1 and 2 freq selection (Note 5)	Full range	4	As installed
26	DME 1 and 2 distance (Notes 5 and 6)	0 – 370 km	4	As installed
27	Landing gear squat switch status	Discrete	1	

28	GPWS (ground proximity warning system)	Discrete	1	
29	Angle of attack Full range 0.5 As installed	Full range	0.5	As installed
30	Hydraulics, each system (low pressure)	Discrete	2	
31	Navigation data (latitude/longitude, ground speed and drift angle) (Note 7)	As installed	1	As installed
32	Landing gear or gear selector position	Discrete	4	As installed
Note: The preceding 32 parameters satisfy the requirements for a Type I FDR				

Notes:

1. VSO stalling speed or minimum steady flight speed in the landing configuration.

2. VD design diving speed.

3. Record sufficient inputs to determine power

4. For aeroplanes with conventional control systems "or" applies. For aeroplanes with non-mechanical control systems "and" applies. In aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately.

5. If signal available in digital form.

6. If signals readily available.

7. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.

Table 2: Parameters for aeroplane flight data recorders

Serial Nr	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (Sensor input compared to FDR read-out)
1	Time (UTC when available, otherwise elapsed time)	24 hours	4	± 0.125% per hour
2	Pressure altitude	– 300 m (–1 000 ft) to maximum certificated altitude of aircraft + 1 500m (+ 5 000 ft)	1	± 30 m to ± 200 m (± 100 ft to ± 700 ft)

3	Indicated Airspeed	As the installed measuring system	1	± 3%
4	Heading	360	° 1	± 2°
5	Normal acceleration	– 3 g to + 6 g	0.125	± 1%
6	Pitch altitude	± 75°	0.5	± 2°
7	Roll altitude	± 180°	0.5	± 2°
8	Radio transmission Keying	On-off (one discrete)	1	
9	Power on each engine (Note 1)	Full range	1 (per engine)	± 2°
10	Main rotor speed	50 –130 %	0.5	± 2°
11	Pilot input and/or control surface position –primary controls (collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal) (Note 2)	Full range	2	± 2% unless higher accuracy uniquely required
12	Hydraulics, each system (low pressure)	Discrete	2	
13	Outside Air Temp.	Sensor range	2	± 2°C
14	Autopilot /auto throttle /AFCS mode and engagement status	A suitable combination of discretes		
15	SAS engaged	Discrete	1	
Note: The preceding 15 parameters satisfy the requirements for a Type V FDR				
16	Main gearbox oil pressure	As installed	1	As installed
17	Main gearbox oil temp	As installed	1	As installed
18	Taw acceleration (or yaw rate)	± 1	0.25	± 1.5% max range excluding datum error of± 5%
19	Sling Load force	0 – 200% of certified load	0.5	± 3% of max range
20	Longitudinal acceleration	± 1.g	0.25	± 1.5% max range excluding datum error of± 5%

21	Lateral acceleration	± 1.g	1	± 1.5% max range excluding datum error of± 5%
22	Radio Altimeter	-6m to 750m (-20 ft to 2500 ft)	1	± 0.6 m (± 2 ft) or± 3% whichever is greater below 150 m (500 ft)and ± 5% above 150 m (500 ft)
23	Glide Path Deviation	Signal range	1	± 3%
24	Localizer deviation	Signal range	1	± 3%
25	Marker beacon Passage	Discrete	1	
26	Master Warning	Discrete	1	
27	NAV 1 and 2 freq selection (Note 5)	Full range	4	As installed
28	DME 1 and 2 distance (Notes 3 and 4)	0 – 370 km	4	As installed
29	Navigation data (latitude/longitude, ground speed and drift angle) (Note 7)	As installed	1	As installed
30	Landing gear or gear selector position	Discrete	4	As installed
Note : The preceding 30 parameters satisfy the requirements for a Type IV FDR				

Notes:

1. Record sufficient inputs to determine power.

2. For helicopters with conventional control systems “or” applies. For helicopters with non-mechanical control systems “and” applies.

3. If signal available in digital form.

4. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.

5. If signals readily available.

91.04.16 STANDARD FIRST-AID KIT

1. First-aid kit

(1) The following must be included in the first aid kit:

(a) Bandage (unspecified);

(b) Burns dressings (unspecified);

(c) wound dressings, large and small;

(d) Adhesive tape, safety pins and scissors;

(e) small adhesive dressings;

(f) Antiseptic wound cleaner;

(g) adhesive wound closures;

(h) adhesive tape;

(i) Disposable resuscitation aid;

(j) Simple analgesic e.g. paracetamol;

(k) antiemetic e.g. cinnarizine;

(l) Nasal decongestant;

(m) first aid handbook;

(n) Splints, suitable for upper and lower limbs;

(o) gastrointestinal antacid +;

(p) anti-diarrheal medication e.g. loperamide +;

(q) ground/air visual signal code for use by survivors;

(r) disposable glove; and

(s) a list of contents in at least 2 languages (Portuguese and one other). This should include information on the effects and side effects of drugs carried.

Notes:

1. An eye irrigator whilst not required to be carried in the first aid kit should, where possible, be available for use on the ground.

2. + indicates aircraft with more than 9 passenger seats installed.

(2) Unless the standard first aid kit is clearly visible, its location must be indicated by a placard or sign, and appropriate symbols may be used to supplement the placard or sign.

(3) An owner or operator must ensure that the standard first aid kit is readily accessible for use.

(4) An aircraft must be equipped with the following number of standard first aid kits, (SFAK):

Number of Passenger Seats Installed	Number of SFAK required
From 0 to 99	1
From 100 to199	2
From 200 to 299	3
From 300 and over	4

91.04.17 FIRST-AID OXYGEN

1. Supply of first aid oxygen

(1) The amount of oxygen must be calculated using an average flow rate of at least 3 liters Standard Temperature Pressure Dry (STPD)/minute/person and provided for the entire flight after cabin depressurization at cabin altitudes of more than 8 000 ft for at least 2% of the passengers carried, but in no case for less than one person. There must be a sufficient number of dispensing units, but in no case less than two, with a means for cabin crew to use the supply.

(2) The amount of first aid oxygen required for a particular operation must be determined on the basis of cabin pressure altitudes and flight duration, consistent with the operating procedures established for each operation and route.

2. Oxygen equipment

(1) The oxygen equipment provided must be capable of generating a mass flow to each user of at least four liters per minute, STPD. Means may be provided to decrease the flow to not less than two liters per minute, STPD, at any altitude.

(2) The dispensing units may be of a portable type.

91.04.18 SUPPLEMENTAL OXYGEN IN THE CASE OF PRESSURIZED AIRCRAFT

1. General

(1) An owner or operator may not operate a pressurized aircraft above 10 000 feet unless supplemental oxygen equipment, capable of storing and dispensing the oxygen supplies required by this technical standard, is provided.

(2) The amount of supplemental oxygen required must be determined on the basis of cabin altitude, flight duration and the assumption that a cabin pressurization failure will occur at the altitude or point of flight that is most critical from the standpoint of oxygen need, and that, after the failure, the aircraft will descend in accordance with emergency procedures specified in the aircraft flight manual to a safe altitude for the route to be flown that will allow continued safe flight and landing.

(3) Following a cabin pressurization failure, the cabin altitude must be considered the same as the aircraft altitude, unless it is demonstrated to the Commissioner that no probable failure of the cabin or pressurization system will result in a cabin pressure altitude equal to the aircraft altitude. Under these circumstances, this lower cabin pressure altitude may be used as a basis for determination of oxygen supply.

2. Oxygen equipment and supply requirements

(1) Flight deck crew members

(a) Each flight deck crew member on flight deck duty must be supplied with supplemental oxygen in accordance with paragraph 3. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply then they must be considered as flight deck crew members on flight deck duty for the purpose of oxygen supply. Flight deck seat occupants, not supplied by the flight deck crew source, are to be considered as passengers for the purpose of oxygen supply.

(b) Flight deck crew members, not covered by subparagraph (1)(a) above, are to be considered as passengers for the purpose of oxygen supply.

(c) Oxygen masks must be located so as to be within the immediate reach of flight deck crew members whilst at their assigned duty station.

(d) Oxygen masks for use by flight deck crew members in pressurized aeroplanes operating above 25 000 ft must be a quick donning type of mask.

(2) Cabin crew members, additional flight crew members and passengers

(a) Cabin crew members and passengers must be supplied with supplemental oxygen in accordance with paragraph 3. Cabin crew members carried in addition to the minimum number of cabin crew members required, and additional flight crew members, are to be considered as passengers for the purpose of oxygen supply.

(b) When operating above 25 000 feet there must be provided sufficient spare outlets and/or portable oxygen units are to be distributed evenly throughout the cabin to ensure immediate availability of oxygen to each required cabin crew member regardless of his or her location at the time of cabin pressurization failure.

(c) When operating above 25 000 feet there must be an oxygen dispensing unit connected to oxygen supply terminals immediately avail-able to each occupant, wherever seated. The total number of dispensing units and outlets must exceed the number of sets by at least 10%. The extra units are to be evenly distributed throughout the cabin.

(d) The oxygen supply requirements, as specified in paragraph 3 for aircraft not certificated to fly at altitudes above 25 000 feet, may be reduced to the entire flight time between 10,000 feet and 14 000 feet cabin pressure altitudes for all required cabin crew members and for at least 10% of the passengers if, at all points along the route to be flown, the aircraft is able to descend safely within 4 minutes to a cabin pressure altitude of 14 000 feet.

3. Minimum requirements for supplemental oxygen for pressurised aircraft

Supply for	Duration and cabin pressure altitude
1. All occupants of flight deck seats on flight deck duty	Entire flight time when the cabin pressure altitude exceeds 13 000 feet and entire flight time when the cabin pressure altitude exceeds 10 000 feet but does not exceed 13 000 feet after the first 30 minute at those altitudes, but in no case less than: (i) 30 minutes for aircraft certificated to fly at altitudes not exceeding 25 000 feet (Note 2); (ii) 2 hours for aircraft certificated to fly at altitudes more than 25 000 feet (Note 3).
2. All required cabin crew members	Entire flight time when cabin pressure altitude exceeds 13 000 feet but not less than 30 minutes (Note 2), and entire flight time when cabin pressure altitude is greater than 10 000 feet but does not exceed 13 000 feet after the 30 minutes at these altitudes.
3. 100% of passengers (Note 5)	10 minutes or the entire flight time when the cabin pressure altitude exceeds 15 000 feet whichever is the greater (Note 4).
4. 30% of passengers (Note 5)	Entire flight time when the cabin pressure altitude exceeds 14000 feet but does not exceed 15 000 feet.
5. 10% of passengers (Note 5)	Entire flight time when the cabin pressure altitude exceeds 10000 feet but does not exceed 14 000 feet after the first 30 minutes at these altitudes.

Notes:

1. The supply provided must take account of the cabin pressure altitude and descent profile for the routes concerned.

2. The required minimum supply is that quantity of oxygen necessary for a constant rate of

Descent from the aircraft's maximum certificated operating altitude to 10 000 feet in 10 minutes and followed by 20 minutes at 10 000 feet.

3. The required minimum supply is that quantity of oxygen necessary for a constant rate of descent from the aircraft's maximum certificated operating altitude to 10 000 feet in 10 minutes and followed by 110 minutes at 10 000 feet. The oxygen required in MCAR 91.04.20 may be included in determining the supply required.

4. The required minimum supply is that quantity of oxygen necessary for a constant rate of descent from the aircraft's maximum certificated operating altitude to 15 000 feet.

5. For the purpose of this table 'passengers' means passengers actually carried and includes infants.

4. Quick donning mask

A quick donning mask is the type of mask that –

(1) can be placed on the face from its ready position, properly secured, sealed, and supplying oxygen upon demand, with one hand and within 5 seconds and will thereafter remain in position, both hands being free;

(2) Can be put on without disturbing eye glasses and without delaying the flight crew member from proceeding with assigned emergency duties;

(3) After being put on, does not prevent immediate communication between the flight deck crew members and other flight crew members over the aeroplane intercommunication system;

(4) Does not inhibit radio communications.

91.04.19 SUPPLEMENTAL OXYGEN IN THE CASE OF NON-PRESSURIZED AIRCRAFT

1. General

(1) An owner or operator may not operate a non-pressurized aircraft at altitudes between 10 000 feet and 12 000 feet for longer than 120 minutes intended flight time, or above 12 000 feet unless supplemental oxygen equipment, capable of storing and dispensing the oxygen supplies required, is provided.

(2) The amount of supplemental oxygen for sustenance required for a particular operation must be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures established for each operation in the operations manual and with the routes to be flown, and with the emergency procedures specified in the operations manual, if applicable.

2. Oxygen supply requirements

(1) Flight deck crew members

Each flight deck crew member on flight deck duty must be supplied with supplemental oxygen in accordance with paragraph 3. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply, then they are to be considered as flight deck crew members on flight deck duty for the purpose of oxygen supply.

(2) Cabin crew members, additional flight crew members and passengers

Cabin crew members and passengers must be supplied with oxygen in accordance with paragraph 3. Cabin crew members carried in addition to the minimum number of cabin crew members required, and additional flight crew members, are to be considered as passengers for the purpose of oxygen supply.

3. Minimum requirements for supplemental oxygen for non-pressurized aero planes

Supply for	Duration and cabin pressure altitude
1. All occupants of flight deck seats on flight deck duty	Entire flight time at pressure altitudes above 12 000 feet and for any period exceeding 120 minutes intended flight time at pressure altitudes above 10 000 feet but not exceeding 12 000 feet.
2. All required cabin crew members	Entire flight time at pressure altitudes above 12 000 feet and for any period exceeding 120 minutes intended flight time at pressure altitudes above 10 000 feet but not exceeding 12 000 feet.
3. 100% of passengers (See Note)	Entire flight time at pressure altitudes above 12 000 feet.
4. 10% of passengers (See Note)	Entire flight time after 120 minutes intended flight time at pressure altitudes greater than 10 000 feet but not exceeding 12 000 feet.

Note: For the purpose of this table "passengers" means passengers actually carried and Includes infants under the age of 2.

91.04.21 HAND FIRE EXTINGUISHERS

1. Definitions

Any word or expression to which a meaning has been assigned in the Mozambique Aviation Law, and the Mozambique Civil Aviation Regulations, bears, when used in this technical standard, the same meaning unless the context indicates otherwise, and –

(1) "Class A cargo or baggage compartment" means a cargo or baggage compartment in which –

(a) The presence of a fire would be easily discovered by a flight crew member while at his or her station; and

(b) Each part of the compartment is easily accessible in flight;

(2) "Class B cargo or baggage compartment" means a cargo or baggage compartment in which –

(a) there is sufficient access in flight to enable a flight crew member to effectively reach any part of the compartment with the contents of a hand fire extinguisher;

(b) when the access provisions are being used, no hazardous quantity of smoke, flames or extinguishing agent will enter any compartment occupied by the flight crew or passengers; and

(c) There is a separate approved smoke detector or fire detector system to give warning at the pilot or flight engineer station;

(3) "Class C. C cargo or baggage compartment" is one not meeting the requirements for either a Class A or B compartment but in which:

(a) There is a separate approved smoke detector or fire detector system to give warning at the pilot or flight engineer station;

(b) There is an approved built-in fire extinguishing or suppression system controllable from the cockpit;

(c) There are means to exclude hazardous quantities of smoke, flames, or extinguishing agent, from any compartment occupied by the crew or passengers; and

(d) There are means to control ventilation and drafts within the compartment so that the extinguishing agent used can control any fire that may start within the compartment;

(4) "Class E cargo compartment" means a cargo compartment used only for the carriage of cargo and in which –

(a) There is a separate approved smoke or fire detector system to give warning at the pilot or flight engineer station;

(b) There are means of shutting off the ventilating airflow to or within the compartment, and the controls for these means are accessible to the flight crew in the flight crew compartment;

(c) There are means of excluding hazardous quantities of smoke, flames, or noxious gases, from the flight crew compartment; and

(d) The required flight crew emergency exits are accessible under any cargo loading conditions.

2. Hand fire extinguishers

An owner or operator may not operate an aircraft unless hand fire extinguishers are provided for use in flight crew, passenger and, as applicable, cargo compartments and galleys in accordance with the following:

(1) The type and quantity of extinguishing agent must be suitable for the kinds of fires likely to occur in the compartment where the extinguisher is intended to be used and, for personnel compartments, must minimise the hazard of toxic gas concentration.

(2) At least one hand fire extinguisher, containing Halon 1211 (bromochlo-rodifluoromethane, CBrCIF2), or equivalent as the extinguishing agent, must be conveniently located on the flight deck for use by the flight deck crew.

(3) At least one hand fire extinguisher must be located in, or readily accessible for use in, each galley not located on the main passenger deck.

(4) At least one readily accessible hand fire extinguisher must be available for use in each Class A or Class B cargo or baggage compartment and in each Class E cargo compartment that is accessible to flight crew members in flight.

(5) At least the following number of hand fire extinguishers must be conveniently located in the passenger compartment(s):

Maximum approved passenger seating configuration	Number of extinguishers
7 to 30	1
31 to 60	2
61 to 200	3
201 to 300	4
301 to 400	5
401 to 500	6
501 to 600	7
601 or more	8

When two or more extinguishers are required, they must be evenly distributed in the passenger compartment.

(6) At least one of the required fire extinguishers located in the passenger compartment of an aircraft with a maximum approved passenger seating configuration of at least 31, and not more than 60, and at least two of the fire extinguishers located in the passenger compartment of an aircraft with a maximum approved passenger seating configuration of 61 or more must contain Halon 1211, equivalent as the extinguishing agent.

(7) The number and location of hand fire extinguishers must be such as to provide adequate availability for use, account being taken of the number and size of the passenger compartments, the need to minimize the hazard of toxic gas concentrations and the location of toilets, galleys, etc. These considerations may result in the number being greater than the minimum prescribed.

(8) There must be at least one fire extinguisher suitable for both flammable fluid and electrical equipment fires installed on the flight deck. Additional extinguishers may be required for the protection of other compartments accessible to the flight crew in flight. Dry chemical fire extinguishers should not be used on the flight deck, or in any compartment not separated by a partition from the flight deck, because of the adverse effect on vision during discharge and, if non-conductive, interference with electrical contacts by the chemical residues.

(9) Where only one hand fire extinguisher is required in the passenger compartments it must be located near the cabin crew member's station, where provided.

(10) Where two or more hand fire extinguishers are required in the passenger compartments and their location is not otherwise dictated by consideration of subparagraph (7) above, an extinguisher must be located near each end of the cabin with the remainder distributed through the cabin as evenly as is practicable.

(11) Unless an extinguisher is clearly visible, its location must be indicated by a placard or sign, and appropriate symbols may be used to supplement such a placard or sign.

91.04.24 MEGAPHONES

1. Megaphones

(1) An owner or operator may not operate an aircraft with a maximum approved passenger seating configuration of more than 60 seats and carrying one or more passengers unless it is equipped with portable battery-powered megaphones readily accessible for use by flight crew members during an emergency evacuation, to the following scales:

(a) For each passenger deck:

Passenger seating configuration	Number of megaphones required
61 to 99	1
100 or more	2

(b) For aircraft with more than one passenger deck, in all cases when the total passenger seating configuration is more than 60 seats, at least 1 megaphone is required.

(2) When one megaphone is required, it must be readily accessible from a cabin crew member's assigned seat. Where two or more megaphones are required, they must be suitably distributed in the passenger cabin(s) and readily accessible to cabin crew members assigned to direct emergency evacuations. This does not necessarily require megaphones to be positioned such that they can be reached by a cabin crew member when strapped in a cabin crew member's seat.

(3) Unless the megaphone is clearly visible, its location must be indicated by a placard or sign, and appropriate symbols may be used to supplement the placard or sign.

91.04.25 EMERGENCY LIGHTING

1. Emergency lighting

(1) An owner or operator may not operate a passenger carrying aircraft which, in accordance with its individual certificate of airworthiness, has a maximum approved passenger seating configuration of more than nine seats unless it is provided with an emergency lighting system having an independent power supply to facilitate the evacuation of the aircraft. The emergency lighting system must include –

(a) for aircraft which, in accordance with their individual certificate of airworthiness, have a maximum approved passenger seating configuration of more than 19 seats:

(i) sources of general cabin illumination;

(ii) internal lighting in floor level emergency exit areas;

(iii) illuminated emergency exit marking and locating signs;

(iv) when flying by night, exterior emergency lighting at all overwing exits, and at exits where descent assist means are required or aircraft for which an application for the issuing of a type certificate was made before 1 May 1972;

(v) floor proximity emergency escape path marking system in the passenger compartments for aircraft in respect of which a type certificate was first issued on or after 1 January 1958;

(b) for aircraft which, in accordance with their individual certificate of airworthiness have a maximum approved passenger seating configuration of less than 20 seats or are certificated to the MOZ-CATS as applicable

(i) sources of general cabin illumination;

(ii) internal lighting in emergency exit areas;

(iii) illuminated emergency exit marking and locating signs;

(c) for aircraft which in accordance with their individual certificate of airworthiness have a maximum approved passenger seating configuration of less than 20 seats and are not certificated to the MOZ-CATS as applicable:

(i) sources of general cabin illumination.

(2) An owner or operator may not operate a passenger carrying aircraft which, in accordance with its individual certificate of airworthiness, has a maximum approved passenger seating configuration of less than ten seats, when flying by night, unless it is provided with a source of internal cabin illumination to facilitate the evacuation of the aircraft. The system may use dome lights or other sources of illumination already fitted on the aircraft and which are capable of remaining operative after the battery has been switched off.

91.04.26 AUTOMATIC EMERGENCY LOCATOR TRANSMITTER

1. Distress frequencies

Emergency locator transmitters (ELT), required to be fitted in terms of regulation 91.04.26, shall –

(1) until 1 January 2005 be capable of transmitting on both the frequencies of 121,5 MHz and 406 MHz, or at least on the frequency of 121,5 MHz;

(2) from 1 January 2005 onwards be capable of transmitting on the frequencies 121,5 MHz and 406 MHz simultaneously: Provided that from the date on which this technical standard is put in place all ELTs to be installed in an aircraft used in international commercial air transport operations shall be capable of transmitting on the frequencies 121,5 MHz and 406 MHz simultaneously.

2. Minimum number of ELTs to be carried

(1) Aeroplanes on long-range over-water flights, engaged in scheduled or non-scheduled commercial air transport operations:

(a) until 1 January 2005: at least two ELTs;

(b) from 1 January 2005 onwards: at least two ELTs, of which one automatic; and

(c) if individual C of A issued after 1 January 2002: at least two ELTs, of which one automatic.

(2) Other aeroplanes engaged in scheduled or non-scheduled commercial air transport operations: at least one ELT.

(3) Aeroplanes engaged in a general air service:

(a) until 1 January 2005: at least one ELT;

(b) from 1 January 2005 onwards: at least one automatic ELT; and

(c) if individual C of A issued after 1 January 2002: at least one automatic ELT.

(4) Performance Class 1 and Class 2 helicopters on extended flights over water, and Class 3 helicopters on over-water flights outside autorotation range from shore:

(a) until 1 January 2005: at least one ELT per raft, but not more than two per helicopter;

(b) from 1 January 2005 onwards: at least one automatic ELT per helicopter and at least one ELT per raft; and

(c) if individual C of A issued after 1 January 2002: at least one automatic ELT per
helicopter and at least one ELT per raft.

(5) Helicopters, other than those referred to in paragraph 4:

(a) until 1 January 2005: at least one ELT;

(b) from 1 January 2005 onwards: at least one automatic ELT; and

(c) if individual C of A issued after 1 January 2002: at least one automatic ELT.

3. Types of emergency locator transmitters

(1) It is an ICAO recommendation that all ELTs should be automatic emergency locator transmitters.

(2) The ELT equipment required by regulation 91.04.26 shall meet the minimum performance standard defined in FAA's TSO C91a or TSO C126: Provided that any ELT installed prior to 1 January 1997 may meet the minimum performance standard defined in FAA's TSO C90 until such time it becomes unserviceable other than through the need for routine maintenance, and furthermore provided that the ELT shall not be fitted with a lithium-sulphur dioxide battery that does not meet the requirements of FAA's TSO C97.

(3) The following are types of ELT's in use:

(a) Automatic Fixed – ELT/AF

This type of ELT is intended to be permanently attached to the aircraft before and after a crash and is designed to aid search and rescue teams in locating a crash site.

(b) Automatic Portable – ELT/AP

This type of ELT is intended to be rigidly attached to the aircraft before a crash, but readily removable from the aircraft after a crash. It functions as an ELT during the crash sequence. If the ELT does not employ an integral antenna, the aircraft-mounted antenna may be disconnected and an auxiliary antenna (stored on the ELT case) attached to the ELT. The ELT can be tethered to a survivor or a life raft. This type of ELT is intended to aid search and rescue teams in locating the crash site or survivor/s.

(c) Automatic Deployable – ELT/AD

This type of ELT is intended to be rigidly attached to the aircraft before the crash and automatically ejected and deployed after the crash sensor has determined that a crash has occurred. This type of ELT should float in water and is intended to aid search and rescue teams in locating the crash site.

(d) Portable – ELT/P

This type of ELT is not intended to be rigidly attached to the aircraft before a crash, but carried in such a way that it is readily removable from the aircraft after a crash. The ELT employs an integral antenna, and can be tethered to a survivor or a life raft. This type of ELT is intended to aid search and rescue

teams in locating the crash site or survivor/s.

4. Specification

(1) Information on technical characteristics and operational performance of 121,5 MHz ELTs is contained in RTCA Document DO-183 and EUROCAE Document ED.62.

(2) Specification for the 121.5 MHz component of ELT for search and rescue:

(a) The ELT shall operate on 121,5 MHz. The frequency tolerance shall not exceed plus or minus 0,005%;

(b) The emission from an ELT under normal conditions and attitudes of the antenna shall be vertically polarised and essentially omni-directional in the horizontal plane;

(c) Over a period of 48 hours of continuous operation, at an operating temperature of minus 20° Celsius, the peak effective radiated power (PERP) shall at no time be less than 50 mW;

(d) The type of emission shall be A3X. Any other type of modulation that meets the requirements of sub-paragraphs (e), (f) and (g) below may be used, provided that it will not prejudice precise location of the beacon by homing equipment;

Note: Some ELTs are equipped with an optional voice capability (A3E) in addition to the A3X emission.

(e) The carrier shall be amplitude modulated at a modulation factor of at least 0,85;

(f) The modulation applied to the carrier shall have a minimum duty cycle of 33%;

(g) The emission shall have a distinctive audio characteristics achieved by amplitude modulating the carrier with an audio frequency sweeping downward over a range of not less than 700 Hz within the range 1600 Hz to 300 Hz and with a sweep repetition rate of between 2 Hz and 4Hz;

(h) The emission shall include a clearly defined carrier frequency distinct from the modulation sideband components. In particular, at least 30% of the power shall be contained at all times within plus or minus 30Hz of the carrier frequency on 121,5 MHz.

(3) Specification for the 406 MHz component of ELT for search and rescue:

(a) Transmission characteristics for ELTs operating on 406 MHz are contained in ITU M633/1;

(b) Information on technical characteristics and operational performance of 406 MHz ELTs is contained in RTCA Document DO-204 and EUROCAE Document ED.62;

(c) ELTs shall operate on a frequency of 406,025 MHz plus or minus 2 kHz. The transmitted frequency shall not vary more than plus or minus 5 kHz in five years including the initial frequency offset. It shall not vary more than 2 parts in 109 milliseconds;

(d) The period between transmissions shall be 50 seconds plus or minus 5%;

(e) Over a period of 24 hours of continuous operation at an operating temperature of minus 20° Celsius, the transmitter power output shall be within the limits of
5 W plus or minus 2 dB;

(f) The 406 MHz ELT shall be capable of transmitting a digital

message. (4) Transmitter identification coding:

(a) ELTs operating on 406 MHz shall be assigned a unique coding for identification of the transmitter or aircraft on which it is carried;

(b) The ELT shall be coded in accordance with the aviation user protocol or one of the serialised user protocols and shall be registered with the IACM

5. Installation

(1) The installation of an ELT constitutes a modification of an aircraft and must therefore be completed in accordance with acceptable technical data. The acceptable standards should produce reliable and effective ELT systems, and keep unwanted activations to a minimum. Acceptable standards are based on those set out in the following sources: * FAA AC91-44A * RTCA papers DO-182 and DO-183 and are complimented by the following:

(2) Each ELT, required to be carried in terms of regulation 91.04.26, must be attached to the aircraft in such a manner that the probability of damage to the transmitter in the event of crash impact is minimised. Fixed and deployable automatic ELTs must be attached to an aeroplane as far aft as possible.

(3) When an aeroplane is upright, an antenna located externally on top of the rear fuselage provides better overall efficiency than an internal cockpit area antenna.

(4) When an aeroplane is inverted –

(a) an internal antenna exhibits the best overall efficiency in a high-wing aeroplane;

(b) neither antenna location has a significant advantage in a low-wing aeroplane.

(5) In helicopter installations, care needs to be taken to site the antenna so as to minimise vibratory response which could lead to premature fatigue failure.

(6) The presence of an ELT whip antenna in close proximity to a second antenna can cause some detuning and distortion of the radiation pattern of the second antenna and possible interference by re-radiation of other signals. E.g., there have been reports of an ELT radiating a weak harmonic signal to VHF transmissions, causing interference with GPS equipment.

(7) The ELT mount must provide a load path from aircraft primary structural elements directly to the automatic activation system. The attachment should also be free and clear of cables and pulleys, etc., and be designed to minimise vibration. Excessive vibration may prevent satisfactory crash impact detection or may generate false crash signals. Attachments to thin partitions or to panels, such as the sides of baggage compartments, should be avoided. Attachments solely by means of Velcro strips and

other flexible material, such as tie-wrap, are not acceptable.

(8) As approximately one fifth of light aircraft accidents result in fire, the coaxial cable between the ELT and its external antenna should be sleeved with fire-resistant materials.

(9) Automatic fixed-type, inertially-activated ELTs are activated by an inertial force parallel to the longitudinal axis of the aircraft. However, many inadvertent activations have been caused by inertial switches actuating in other directions. For portable ELTs, the manufacturer's installation instructions must be followed precisely since placement and orientation may be critical.

(10) The interaction of components in the ELT is often critical in arriving at acceptable overall performance. Component parts from other sources, such as batteries, coaxial cables and antennae, should not be substituted for the original manufacturer's parts.

(11) Tests after installation and tests and inspections of ELTs shall be as prescribed by MCAR 43.02.9.

(12) On completion of the modification to install the ELT the certifying person shall –

(a) ensure that the installation is recorded in the aircraft's logbook; and

(b) place the ELT manufacturer's operating instructions in the aircraft flight manual, unless the relevant information is already given in a flight manual supplement.

Note: A release to service statement for the modification must be issued in accordance with the provisions of Part 43.

6. Batteries

(1) Battery types in ELTs are as follows:

(a) * Most commonly: zinc-manganese dioxide (alkaline)

(b) * Magnesium-manganese dioxide (magnesium)

(c) * Early models: lithium-sulphur dioxide (lithium)

(2) Lithium-sulphur dioxide batteries may be used only if they meet the requirements of FAA's TSO C97. See also sub-paragraph 3 (2) above.

(3) The ELT battery expiration date must be visible without having to remove the ELT from its mount in the aircraft.

91.04.28 LIFE RAFTS AND SURVIVAL RADIO EQUIPMENT FOR EXTENDED OVER-WATER FLIGHTS

1. Equipment

(1) An owner or operator must ensure that the aircraft is equipped with sufficient life rafts to carry all persons on board. Unless excess rafts or enough capacity are provided, the buoyancy and seating capacity beyond the rated capacity of the rafts must accommodate all occupants of the aircraft in the event of a loss of one raft of the largest rated capacity.

(2) The life rafts must be equipped with –

(a) a survivor locator light; and

(b) life saving equipment including means of sustaining life as appropriate to the flight to be undertaken.

(3) The following should be included in each life-raft –

(a) means for maintaining buoyancy;

(b) a sea anchor;

(c) life-lines and means of attaching one life-raft to another;

(d) paddles for life-rafts with a capacity of 6 or less;

(e) means of protecting the occupants from the elements;

(f) a water resistant torch;

(g) signalling equipment to make the pyrotechnical distress signals prescribed in MCAR 91.06.13;

(h) for each 4, or fraction of 4, persons which the life-raft is designed to carry:

(I) 100 g glucose tablets;

(II) 500 ml of water.

This water may be provided in durable containers or by means of making seawater drinkable or a combination of both; and

(i) first aid equipment.

Note: Items (g) – (i), inclusive, should be contained in a pack.

(4) An aircraft must be equipped with at least two sets of survival radio equipment capable of transmitting on 121.5 MHz and 243 MHz.

(5) Unless the life rafts and survival radio equipment are clearly visible, its location must be indicated by a placard or sign, and appropriate symbols may be used to supplement the placard or sign.

91.04.29 SURVIVAL EQUIPMENT

1. Survival equipment

An owner or operator may not operate an aircraft across areas in which search and rescue would be especially difficult unless it is equipped with the following:

(1) Signalling equipment to make the pyrotechnical distress signals prescribed inRegulation 91.06.13;

(2) at least one ELT; and

(3) additional survival equipment for the route to be flown taking account of the number of persons on board as prescribed in paragraph 3: Provided that the additional equipment need not be carried when the aircraft either –

(a) remains within a distance from an area where search and rescue is not especially difficult corresponding to:

(i) 120 minutes at the one engine inoperative cruising speed for aircraft capable of continuing the flight to an aerodrome with the critical power unit(s) becoming inoperative at any point along the route or planned diversions; or

(ii) 30 minutes at cruising speed for all other aircraft; or

(b) for aircraft certificated to TS 21.02.3(4), no greater distance than that corresponding to 90 minutes at cruising speed from an area suitable for making an emergency landing.

2. Interpretation

For the purposes of this technical standard, the expression "area in which search and rescue would be especially difficult" means –

(1) an area so designated by the State responsible for managing search and rescue; or

(2) an area which is largely uninhabited and where –

(a) the State responsible for managing search and rescue has not published any information to confirm that search and rescue would not be especially difficult; and

(b) the State referred to in (a) does not, as a matter of policy, designate areas as being especially difficult for search and rescue.

3. Additional survival equipment

(1) The following additional survival equipment should be carried when required:

(a) 500 ml of water for each 4, or fraction of 4, persons on board;

(b) one knife;

(c) first aid equipment;

(d) one set of air/ground codes.

(2) In addition, when polar conditions are expected, the following should be carried:

(a) a means for melting snow;

(b) one snow shovel and one ice saw;

(c) sleeping bags for use by all persons on board and space blankets for the remainder or space blankets for all passengers on board; and

(d) one Arctic/polar suit for each flight crew member carried.

4. Duplicates

If any item of equipment contained in the above list is already carried on board the aircraft in accordance with another requirement, there is no need for this to be duplicated.

5. Location

Unless the survival equipment is clearly visible, its location must be indicated by a placard or sign, and appropriate symbols may be used to supplement the placard or sign.

91.05.1 COMMUNICATION EQUIPMENT

1. General

(1) An owner or operator must ensure that a flight does not commence unless the communication and navigation equipment required under Subpart 5 of the Part 91 is –

(a) approved and installed in accordance with the requirements applicable to them, including the minimum performance standard and the operational and airworthiness requirements;

(b) installed in such manner that the failure of any single unit required for either communication or navigation purposes, or both, will not result in the inability to communicate and/or navigate safely on the route being flown;

(c) in an operable condition for the kind of operation being conducted except as provided in the MEL; and

(d) so arranged that if equipment is to be used by one flight deck crew member at his or her station during flight, it must be readily operable from his or her station. When a single item of equipment is required to be operated by more than one flight deck crew member, it must be installed so that the equipment is readily operable from any station at which the equipment is required to be operated.

(2) Communication and navigation equipment minimum performance standards are those prescribed in the applicable ZA-TSO as listed in the ZA-TSO, unless different performance standards are prescribed. Communication and navigation equipment complying with design and performance specifications other than ZA-TSO on the date of commencement of the CARs may remain in service, or be installed, unless additional requirements are prescribed in Subpart 5 of the Part 91.

2. Radio equipment

(1) An owner or operator may not operate an aircraft unless it is equipped with radio required for the kind of operation being conducted.

(2) Where two independent (separate and complete) radio systems are required under Subpart 5 of the Part 91, each system must have an independent antenna installation except that, where rigidly supported non-wire antennae or other antenna installations or equivalent reliability are used, only one antenna is required.

3. Audio selector panel

An owner or operator may not operate an aircraft under IFR unless it is equipped with an audio selector panel accessible to each required flight crew member.

4. Radio equipment for operations under VFR over routes navigated by reference to visual landmarks

An owner or operator may not operate an aircraft under VFR over routes than can be navigated by reference to visual landmarks, unless it is equipped with the radio equipment (communication and SSR transponder equipment) necessary under normal operating conditions to fulfil the following:

(1) Communicate with appropriate ground stations;

(2) communicate with appropriate air traffic service facilities from any point in controlled airspace within which flights are intended;

(3) receive meteorological information; and

(4) reply to SSR interrogations as required for the route being flown.

5. Communication and navigation equipment for operations under IFR, or under VFR over routes not navigated by reference to visual landmarks

(1) An owner or operator may not operate an aircraft under IFR, or under VFR over routes that cannot be navigated by reference to visual landmarks, unless the aircraft is equipped with communication and navigation equipment in accordance with the requirements of air traffic services in the area(s) of operation, but not less than –

(a) two independent radio communication systems necessary under normal operating conditions to communicate with an appropriate ground station from any point on the route including diversions;

(b) one VOR receiving system, one ADF system, one DME and one Marker Beacon receiving system;

(c) one ILS or MLS where ILS or MLS is required for approach navigation purposes;

(d) an area navigation system when area navigation is required for the route being flown;

(e) an additional VOR receiving system on any route, or part thereof, where navigation is based only on VOR signals;

(f) an additional ADF system on any route, or part thereof, where navigation is based only on NDB signals; and

(g) SSR transponder equipment as required for the route being flown.

(2) An owner or operator may operate an aircraft that is not equipped with the navigation equipment specified in subparagraph (1)(e) or (f), provided that it is equipped with alternative equipment authorised, for the route being flown, by the Commissioner. The reliability and the accuracy of alternative equipment must allow safe navigation for the intended route.

6. Communication and navigation equipment using the Global Positioning System

6.1 Definitions

"sole means navigation system" means a navigation system that, for a given phase of flight, must allow the aircraft to meet all four navigation system performance requirements, accuracy, integrity, availability and continuity of service;

"primary means navigation system" means a navigation system that, for a given operation or phase of flight, must meet accuracy and integrity requirements, but need not meet full availability and continuity of service requirements. Safety is achieved by either limiting flights to specific time periods, or through appropriate procedural restrictions and operational requirements;

"supplemental means navigation system" means a navigation system that must be used in
conjunction with a sole means navigation system;

"integrity" means that quality which relates to the trust which can be placed in the correctness of information supplied by a system. It includes the ability of a system to provide timely warnings to users when the system should not be used for navigation;

"receiver autonomous integrity monitoring" means a technique whereby an airborne GPS
receiver/processor autonomously monitors the integrity of the navigation signals from GPS satellites, and where reference to RAIM occurs, it includes other approved equivalent integrity monitoring systems.

6.2 Purpose

(1) This paragraph prescribes the requirements for the use of a GPS within South African airspace, for the purpose of –

(a) position fixing;

(b) long range navigation including operations on designated RNAV routes;

(c) deriving distance information, for en route navigation, traffic information and ATC separation; and

(d) application of RNAV based separation.

(2) GPS must not be used as a sole means navigation system or for instrument approaches.

(3) GPS may continue to be used as an en route supplemental navigation aid.

6.3 GPS signal integrity

(1) System integrity is an essential element of the approval for use of GPS as a primary means navigation system. GPS receivers certified to TSO-C129 provide integrity through the use of RAIM, or an approved equivalent integrity system. When RAIM is lost or not available, the accuracy of the system cannot be assumed to meet the required standard for navigation, or for the application of ATC separation standards.

(2) GPS integrity is also dependent on the number of operational satellites in view, or available for use. Loss of one or more satellites can result in degraded system availability (see paragraph 6.4).

(3) RAIM availability is greatly improved through the use of barometric aiding.

(4) Except as provided in this paragraph, GPS must not be used to fix position, provide distance information or provide primary navigation, unless RAIM is available.

6.4 GPS satellite constellation

(1) The approvals contained in this paragraph are based on the availability of the US DoD GPS standard positioning service (SPS) operating to its defined full operational capability (FOC). This service does not meet the requirements of a sole means navigation system.

(2) Disruption to the GPS may result in degradation in GPS service to such a level that some or all of the operational approvals for the IFR primary use of GPS contained in the technical standards may need to be withdrawn. When known, these changes or restrictions will be advised by NOTAM.

(3) Prior knowledge of RAIM availability will enable operators to use the system more efficiently, by allowing operations to be planned around gaps in RAIM coverage (RAIM holes). To achieve these efficiencies, appropriate RAIM prediction capabilities should be available at dispatch locations. Flights should be planned to ensure the safe completion of flight in the event of loss of GPS integrity.

6.5 Airworthiness requirements

The following airworthiness requirements must be satisfied:

(1) GPS navigation equipment must have US FAA Technical Standard Order (TSO) C-129 (or CAA approved equivalent) authorisation;

(2) if the GPS is installed in such a way that it is integrated with the aircraft's autopilot and navigation system, the GPS must be de-energised when ILS is selected;

(3) the aircraft must be placarded that the GPS is not approved as a sole navigation and/or approach aid; and

(4) automatic barometric aiding function, as provided by TSO C-129, must be connected.

Notes:

1. **Operators should be made aware that not all TSO C-129 receivers will meet the requirements for future non-precision approaches, other than "GPS Arrivals", and "DME or GPS Arrivals".**

2. Operators should also be aware that TSO C-129 receivers may not be able to take advantage of future enhanced GPS capabilities, such as wide area or local area augmentation systems (WAAS or LAAS).

3. Operators should ensure that receivers are upgradable to accommodate future augmentation which will be required in terminal areas and for approaches.

6.6 Pilot training

The following pilot training requirements must be satisfied:

(1) Prior to using GPS in IFR operations for any of the purposes specified in this paragraph, the holder of a valid instrument rating must, unless exempted by the Commissioner, have completed a course of ground training based on the syllabus contained in Annexure A. The course must be conducted by an aviation training organisation approved in terms of the Part 141; and

(2) the course must cover both general information and procedures applicable to all types of GPS equipment, as well as the essential operating procedures for a specific type of aircraft equipment. Pilots who have completed the course and who wish to use a different type of GPS aircraft equipment, must ensure that they are familiar with, and competent in, the operating procedures required for that type of equipment, before using it in flight for any of the purposes approved in this paragraph.

6.7 Operational requirements

The following operational requirements must be satisfied:

(1) Operating instructions for GPS navigation equipment must be –

(a) carried on board; and

(b) incorporated into the operations manual for commercial operations;

(2) GPS navigation equipment must be operated in accordance with the operating instructions and any additional requirements specified in the aircraft flight manual or flight manual supplement;

(3) in addition to GPS, aircraft must be equipped with serviceable radio navigation systems as prescribed in paragraphs 1 to 5 of this technical standard;

(4) when within rated coverage of ground based navigation aids, pilots must monitor the ground based system, and maintain track as defined by the most accurate ground based radio navigation aid (VOR or NDB) available. If there is a discrepancy between the GPS and ground based system information, pilots must use the information provided by the ground based navigation system;

(5) ATS may require GPS equipped aircraft to establish on, and track with reference to, a particular VOR radial or NDB track for the application of separation;

(6) GPS must not be used as a navigation reference for flight below the MSA, except as otherwise authorised by CAA.

6.8 Operations without RAIM

(1) GPS systems normally provide three modes of operation:

(a) Navigation (Nav) Solution with RAIM;

(b) 2D or 3D Nav Solution without RAIM; and

(c) Dead Reckoning (DR), or Loss of Nav Solution.

(2) ATS services, and in particular ATC separation standards, are dependent on accurate navigation and position fixing. If RAIM is lost, the accuracy of the system is assumed not to meet the required standard for both navigation and application of ATC separation. Accordingly, when RAIM is lost, the following procedures must be adopted:

(a) Aircraft tracking must be closely monitored against other on board systems;

(b) in controlled airspace, the ATS unit must be advised if:

(i) RAIM is lost for periods greater than ten minutes, even if GPS is still providing positional information;

(ii) RAIM is not available when the ATS unit requests GPS distance, or if an ATC clearance or requirement based on GPS distance is imposed;

(iii) the GPS receiver is in DR mode, or experiences loss of navigation function, for more than one minute; or

(iv) indicated displacement from track centreline is found to exceed 2 nm; and

(v) ATS may then adjust separation;

(c) if valid position information is lost (2D and DR Mode), or non-RAIM operation exceeds ten minutes, the GPS information is to be considered unreliable, and another means of navigation should be used until RAIM is restored and the aircraft is re-established on track;

(d) following re-establishment of RAIM, the appropriate ATS unit should be notified of RAIM restoration, prior to using GPS information. This will allow the ATS unit to reassess the appropriate separation standards;

(e) when advising the ATS unit of the status of GPS the phrases “RAIM FAILURE” or “RAIM RESTORED” must be used.

6.9 GPS distance information to air traffic service units

(1) When a DME distance is requested by an ATS unit, DME derived distance information should normally be provided. Alternatively, GPS derived distance information may be provided to an ATS unit, unless RAIM is currently unavailable, and has been unavailable for the preceding ten minutes.

(2) Notwithstanding subparagraph (1), if an ATS unit has issued a clearance or requirement based upon GPS distance (eg. a requirement to reach a certain level by a GPS distance), pilots must inform the ATS unit if RAIM is not available.

(3) When a DME distance is not specifically requested, or when the provision of a DME distance is not possible, distance information based on GPS derived information may be provided. When providing GPS distance, transmission of distance information must include the source and point of reference – eg 115 nm GPS JSV, 80 nm GPS VAL NDB, 267 nm GPS ORNAD etc.

(4) If a GPS distance is provided to an ATS unit, and RAIM is not currently available, but has been available in the preceding 10 minutes, the distance report should be suffixed “NEGATIVE RAIM” – eg 26 nm GPS BLV NEGATIVE RAIM.

(5) Databases sometimes contain waypoint information which is not shown on published AIP charts and maps. Distance information must only be provided in relation to published waypoints unless specifically requested by an ATS unit.

(6) Where GPS distance is requested or provided from an NDB, VOR, DME, or published waypoint, the latitude and longitude of the navigation air or waypoint must be derived from a validated database which cannot be modified by the operator or flight crew (see paragraph 6.10).

6.10 Data integrity

(1) As a significant number of data errors, in general applications, occur as a result of manual data entry errors, navigation aid and waypoint latitude and longitude data should be derived from a database, if available, which cannot be modified by the operator or flight crew.

(2) When data is entered manually, data entries must be cross-checked by at least two flight crew members for accuracy and reasonableness, or, for single pilot operations, an independent check (eg. GPS computed tracks and distances against current chart data) must be made.

(3) Both manually entered and database derived position and tracking information should be checked for reasonableness (confidence check) in the following cases:

(a) Prior to each compulsory reporting point;

(b) at or prior to arrival at each en route waypoint;

(c) at hourly intervals during area type operations when operating off established routes; and

(d) after insertion of new data – eg creation of new flight plan.

6.11 Integrity and interference data sheets

Co-incident with the approvals contained in this technical standard, and in order to build up the data base on GPS integrity in South Africa, a system validation period has been established to verify operationally the availability of RAIM, and the quality of navigation provided by GPS at other times.

Notes:

1. Operators or pilots using GPS for the purposes of this technical standard are requested to provide GPS system information, as detailed below:

(a) Private operators: Private operators are requested to submit information on GPS interference as it occurs;

(b) Commercial operators: Commercial operators are requested to submit integrity reports for the first 30 flights after installation of approved GPS equipment. After this period, operators are requested to monitor and record the performance of GPS, and provide details of the system accuracies and reliabilities from time to time. In addition to these reports, operators are requested to submit information on GPS interference as it occurs.

2. Pilots should particularly note cases of GPS degradation/interference around aerodromes, over populated areas, near radio or television transmission towers, and during radio or SATCOM transmissions.

3. Data should be entered on the System Verification Data Sheet contained in Annexure B.

6.12 Flight plan notification

Pilots of aircraft equipped with GPS systems, that comply with the requirements of this technical standard, should insert the following in addition to other indicators in the air traffic service flight plans.

7. Operational standards for inertial navigation and reference systems

7.1 General

Inertial navigation may be used by approved operators only. For approved operators of SA registered aircraft, inertial navigation may be used to satisfy the requirements of the CAA. The inertial navigation system (INS) or inertial reference system (IRS) and its installation must be certified by the State of registry as meeting the airworthiness standards prescribed in Part 21.

Notes:

1. Airworthiness requirements will be satisfied provided that:

(a) the equipment has been installed to the manufacturer's requirements;

(b) the installation is listed in the aircraft type certificate or has a supplemental type certificate for the specific aircraft type;

(c) there is a flight manual supplement covering any system limitations; and

(d) the system is included in the operator's maintenance program.

2. Outside SA (for example, in Europe and over the North Atlantic) other State authorities might require navigation performance different to that required by these standards.

7.2 Minimum performance for operational approval

(1) An INS/IRS must meet the following criteria for operational approval and must be maintained to ensure performance in accordance with the criteria:

(a) with a 95% probability to radial error rate is not to exceed 2 nm per hour for flights up to 10 hours duration;

(b) with a 95% probability the cross-track error is not to exceed ± 20 nm and along track error is not to exceed ± 25 nm at the conclusion of a flight in excess of 10 hours.

(2) The INS/IRS should have the capability for coupling to the aircraft's autopilot to provide steering guidance.

(3) The navigation system should have the capability for updating the displayed present position.

7.3 Serviceability requirements

(1) An INS/IRS may be considered as serviceable for navigation purposes until such time as its radial error exceeds 3 + 3t nm (t being the hours of operation in the navigation mode).

(2) Maintenance corrective action must also be taken when an INS/IRS is consistently providing radial error rates in excess of 2 nm per hour and/or track and along track errors in excess of the tolerances given at subparagraph (1) on more than 5% of the sectors flown.

7.4 System performance monitoring

The operator is to monitor and record the performance of INS/IRS and may be required to provide details of the system accuracies and reliabilities from time to time.

7.5 Navigation criteria

(1) Navigation using INS/IRS as the primary navigation means is permitted in accordance with the following conditions:

(a) Initial confidence check. The INS/IRS must be checked for reasonable navigation accuracy by comparison with ground-referenced radio navigation aids (which may include ATC radar) before proceeding outside the coverage of the short range radio navigation aids system;

(b) maximum time.

(2) Single INS/IRS:

(a) The maximum operating time since the last ground alignment is not to exceed 10 hours;

(b) On flights of more than 5 hours, any route sector may be planned for navigation by INS/IRS within the appropriate time limits (given in (c) below) but contingency navigation procedures must be available in the event of an INS/IRS inflight unserviceability which would preclude the aircraft's operation on a subsequent route sector for which area navigation is specified;

(c) INS/IRS may be used as a sole source of tracking information for continuous period not exceeding –

(i) 3 hours in controlled airspace other than oceanic control area (OCA); or

(ii) 5 hours in OCA or outside controlled airspace (OCTA).

(3) Two or more INS/IRS

(a) If, during a flight, 10 hours elapsed time since the last ground alignment will be exceeded, ground alignment is to be included in the pre-flight flight deck procedures prior to pushback/taxi for departure;

(b) INS/IRS may be used as the sole source of tracking information for continuous periods not exceeding –

(i) 5 hours in controlled airspace other than OCA; or

(ii) 12 hours in OCA or OCTA.

Notes:

1. Provided that the use of INS/IRS as the sole means of navigation does not exceed the time limit, the aircraft may be operated for longer periods using the INS/IRS with either manual or automatic updating.

2. The 5 hour limit on single INS/IRS ensures 99.74% (3 sigma) probability that loss of satisfactory navigation capability will not occur with equipment mean time between failures (MTBF) of approximately 1900 hours. If the demonstrated MTBF exceeds 2000 hours, the maximum time may be increased.

(c) Updating present position. Updating inertial present position in flight is permitted in the following instances only:

(i) Manually:

- Overhead a VOR beacon;

- Within 25 nm of a co-located VOR/DME beacon;

- Over a visual fix when at a height not more than 5 000 ft above the feature.

(ii) Automatically:

- Within 200 nautical miles of a DME site when the aircraft's track will pass within 140 nm of the site;

- Within 200 nm of both DME sites for a DME/DME Fix;

- From a co-located VOR/DME beacon provided that updates from a receding beacon are not accepted when the beacon is more than 25 nm from the aircraft.

Notes:

1. En route VOR and DME sites separated by not more than 500 metres are considered to be

2. DME slant range error correction might be necessary in some circumstances.

3. Updating a present position from a visual fix may not be planned for IFR flights.

4. A receding beacon is one from which the distance to the aircraft is increasing.

5. Updating in other circumstances (for example, over a NDB) will not provide sufficient accuracy to ensure that the INS/IRS operates within the prescribed tolerances for navigation.

6. Because INS/IRS are essentially accurate and reliable, and ground alignment is more accurate than in-flight updating, updating of present position is usually not warranted especially during the initial few hours of operation. However, INS/IRS errors generally increase with time and are not self-correcting. Unless the error is fairly significant (for example, more than 4 nm or 2 nm/hr) it may be preferable to retain the error rather than manually update.

(d) Limitation on use. Wherever track guidance is provided by radio navigation aids, the pilot-in-command must ensure that the aircraft remains within the appropriate track-keeping tolerances of the radio navigation aids. INS/IRS is not to be used as a primary navigation reference during IFR flight below lowest safe altitude (LSALT).

(e) Pre-flight and en route procedures. The following practices are required:

(i) New data entries are to be cross-checked between at least two flight crew members for accuracy and reasonable-ness, or, for single pilot operations, an independent check (for example, of INS/IRS-computed tracks and distances against the flight plan) must be made.

(ii) As a minimum, position and tracking information is to be checked for reasonableness (confidence check) in the following cases:

- Prior to each com-pulsory reporting point;

- At or prior to arrival at each en route way point during RNAV operation along

- RNAV routes;

- At hourly intervals during area type operation off established RNAV routes;

- After insertion of new data.

7.6 Operating criteria

(1) Two or more INS/IRS installations

For two or more INS/IRS installations:

(a) If one INS/IRS fails or can be determined to have exceeded a radial error of 3+3t nm, operations may continue on area navigation routes using the serviceable system(s) in accordance with the navigation criteria applicable to the number of INS/IRS units remaining serviceable.

(b) If –

(i) the difference of pure inertial readouts between each pair of INS/IRS is less than 1.4 (3+3t) nm, no action is required;

(ii) the difference of pure inertial readouts between any pair of INS/IRS exceeds 1.4 (3+3t) nm and it is possible to confirm that one INS/IRS has an excessive drift error, that system should be disregarded and/or isolated from the other systems) and the apparently serviceable system(s) should be used for navigation;

Note: This check and its isolation action are unnecessary if a multiple INS/IRS installation is protected by a serviceability self-test algorithm

(iii) if neither condition (i) or (ii) can be satisfied, another means of navigation should be used, and the pilot-in-command must advise the appropriate ATS unit.

(2) Single INS/IRS installations

For single INS/IRS installations, if the INS/IRS fails or exceeds the serviceability tolerance:

(a) The pilot-in-command must advise the appropriate ATS unit of INS/IRS failure;

(b) another means of navigation is to be used; and

(c) the aircraft is not to begin a route sector for which area navigation is specified unless it is equipped with an alternative, serviceable, approved area navigation system.

(3) Autopilot coupling

Autopilot coupling to the INS/IRS should be used, whenever practicable, if this feature is available. If for any reason the aircraft is flown without autopilot coupling, the aircraft is to be flown within an indicated cross-track tolerance of ± 2 nm. In controlled airspace the ATS unit is to be advised if this tolerance is exceeded.

7.7 Navigation tolerances

(1) The maximum drift rate expected from INS/IRS is 2 nm per hour (2 sigma probability). For the purposes of navigation and determining aircraft separation, the 3 sigma figure of 3 nm is allowed so that the maximum radial error with 3 sigma confidence equals 3+3t nm where t equals the time in hours since the INS/IRS was switched into the navigation mode.

(2) DME and other inputs can automatically influence the INS/IRS to improve the accuracy of its computed position. The pilot may also insert known position co-ordinates to update the INS/IRS. Therefore, if the system is updated with known position information the position error is reduced and the INS/IRS can be assumed to operate within the radial error tolerance of 3+3T nm where T is the time (hours elapsed since the last position update).

(3) The accuracy of the data used for updating must be considered. The navigation aid positions used for updating inertial present position are accurate to within 0.1 nm. However, the aircraft in flight cannot be “fixed” to the same order of magnitude. The accuracy of the position fix is taken as ± 3 nm radial error.

(4) Because the INS/IRS error, the navigation aid position accuracy and the position fix errors are independent of each other, the total radial error is determined by the root-sum-square method:

$$\text{Total error} = \sqrt{(3+3T)^2 + 0.1^2 + 3^2}\ nm$$

(5) The effect of navigation aid position accuracy on the total error is negligible, and so,

$$\text{Total error} = \sqrt{(3+3T)^2 + 3^2}\ nm = \sqrt{(1+T)^2 + 1}\ nm$$

Substituting values for T at time of update, total

radial error = 4,2 nm

after 1 hour = 6,7 nm

after 2 hours = 9,5 nm

after 3 hours = 12,4 nm

after 4 hours = 15,3 nm

after 5 hours = 18,2 nm

after 6 hours = 21,2 nm

(6) Dual installation

If two INS/IRS are installed and the aircraft is navigated by averaging, the inertial present
position formula for the total radial error given in subparagraph (4) is modified by multiplying
by:

$$\frac{1}{\sqrt{2}} \quad (= 0.7)$$

(7) Triple installations If three INS/IRS are installed and “triple mix” is used, the total radial error is further reduced.

For simplicity for navigation and aircraft separation the tolerances applicable to dual installations apply and the third system provides redundancy.

91.05.2 NAVIGATION EQUIPMENT

1. MNPS specifications

An owner or operator may not operate an aircraft in MNPS airspace unless it is equipped with navigation equipment that complies with minimum navigation performance specifications prescribed in ICAO Doc 7030 in the form of Regional Supplementary Procedures.

91.06.10 LIGHTS TO BE DISPLAYED BY AIRCRAFT

1. Aircraft

At night all aircraft in flight or operating on the manoeuvring area of an aerodrome must display the lights prescribed in paragraph 2, unless otherwise instructed by the Director or by an air traffic service unit: Provided that such aircraft must display no other lights if these are likely to be mistaken for the lights prescribed in paragraph 2.

2. Aeroplane operating lights

2.1 Definitions

Any word or expression to which a meaning has been assigned in the Mozambique Aviation Law, and the MCARS, bears, when used in this technical standard, the same meaning unless the context indicates otherwise, and –

"angles of coverage" means –

(1) Angle of coverage A is formed by two intersecting vertical planes making angles of 70 degrees to the right and 70 degrees to the left respectively, looking aft along the longitudinal axis to a vertical plane passing through the longitudinal axis.

(2) Angle of coverage F is formed by two intersecting vertical planes making angles of 110 degrees to the right and 110 degrees to the left respectively, looking forward along the longitudinal axis to a vertical plane passing through the longitudinal axis.

(3) Angle of coverage L is formed by two intersecting vertical planes one parallel to the longitudinal axis of the aeroplane, and the other 110 degrees to the right of the first, when looking forward along the longitudinal axis.

(4) Angle of coverage R is formed by two intersecting vertical planes one parallel to the longitudinal axis of the aeroplane, and the other 110 degrees to the right of the first, when looking forward along the longitudinal axis.

"horizontal plane" means the plane containing the longitudinal axis and perpendicular to the plane of symmetry of the aeroplane;

"longitudinal axis of the aeroplane" means a selected axis parallel to the direction of flight at a normal cruising speed, and passing through the centre of gravity of the aeroplane;

"making way" means that an aeroplane on the surface of the water is under way and has a velocity relative to the water;

"under command" means that an aeroplane on the surface of the water is able to execute manoeuvres as required by the International Regulations for Preventing Collisions at Sea for the purpose of avoiding other vessels;

"under way" means that an aeroplane on the surface of the water is not aground or moored to the ground or to any fixed object on the land or in the water;

"vertical planes" means planes perpendicular to the horizontal plane; and

"visible" means visible on a dark night with a clear atmosphere.

2.2. Navigation lights to be displayed in the air

As illustrated in Figure 1, the following unobstructed navigation lights must be displayed:

(1) a red light projected above and below the plane through angle of coverage L;

(2) a green light projected above and below the horizontal plane through angle of coverage R;

(3) a white light projected above and below the horizontal plane rearward through angle of coverage A.

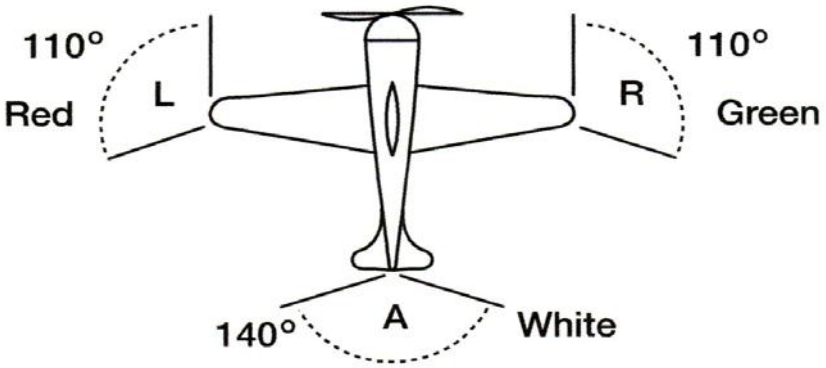


Figure 1

2.3 Lights to be displayed on the water

(1) General

(a) The International Regulations for Preventing Collisions at Sea require different lights to be displayed in each of the following circumstances:

(i) when under way;

(ii) when towing another vessel or aeroplane;

(iii) when being towed;

(iv) when not under command and not making way;

(v) when making way but not under command;

(vi) when at anchor;

(vii) when aground.

(b) The lights required by aeroplanes in each case are described below.

(2) When under way

(a) As illustrated in Figure 2, the following appearing as steady unobstructed lights:

(i) a red light projected above and below the plane through angle of coverage L;

(ii) a green light projected above and below the horizontal plane through angle of coverage R;

(iii) a white light projected above and below the horizontal plane rearward through angle of coverage A; and

(iv) a white light projected through angle of coverage F.

(b) The lights described in the first three items should be visible at a distance of at least 3.7 km (2 nm). The light described in the fourth item should be visible at a distance of 9.3 km (5 nm) when fitted to an aeroplane of 20 m or more in length or visible at a distance of 5.6 km (3 nm) when fitted to an aeroplane of less than 20 m in length.

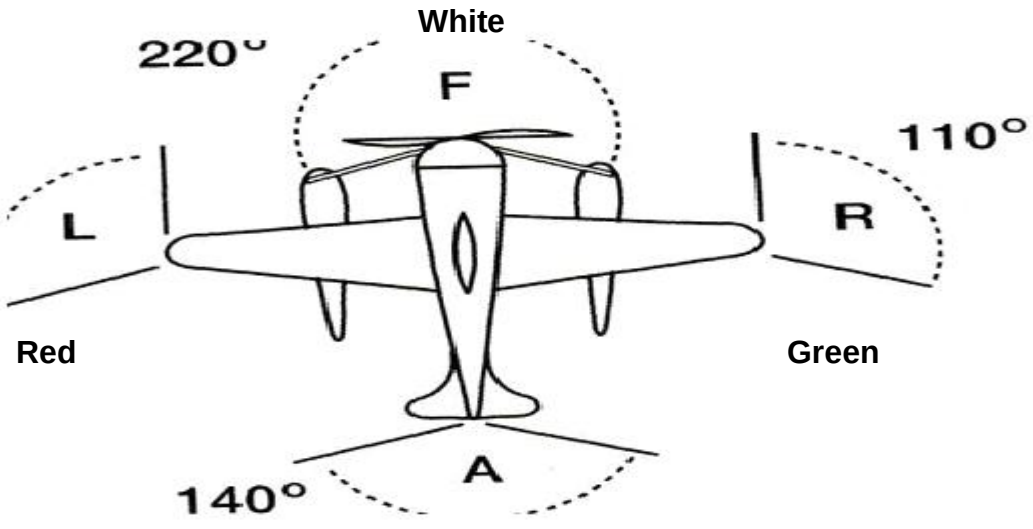


Figure 2

(3) When towing another vessel or aeroplane

As illustrated in Figure 3, the following appearing as steady, unobstructed lights:

(a) the lights described in subparagraph (2);

(b) a second light having the same characteristics as the light described in the fourth item of subparagraph (2) and mounted in a vertical line at least 2 m above or below it; and

(c) a yellow light having otherwise the same characteristics as the light described in the third item of subparagraph (2) and mounted in a vertical line at least 2 m above it.

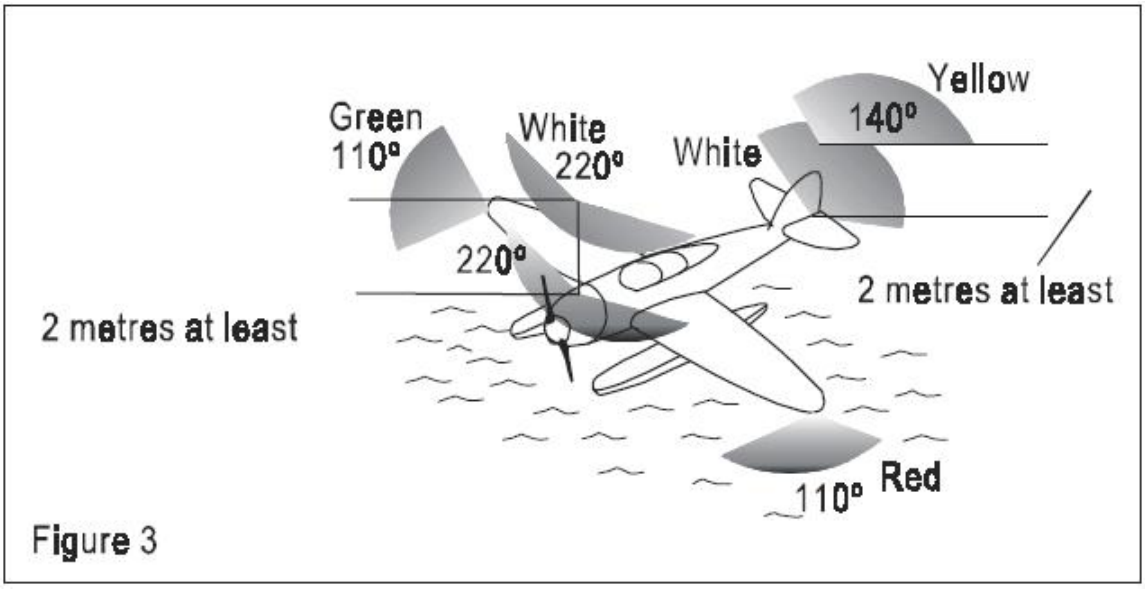


Figure 3

(4) When being towed

The lights described in the first three items of subparagraph (2) appearing as steady unobstructed lights.

(5) When not under command and not making way

As illustrated in Figure 4, two steady red lights placed where they can best be seen, one vertically over the other and not less than 1 m apart, and of such a character as to be visible all around the horizon at a distance of at least 3,7 km (2 nm).

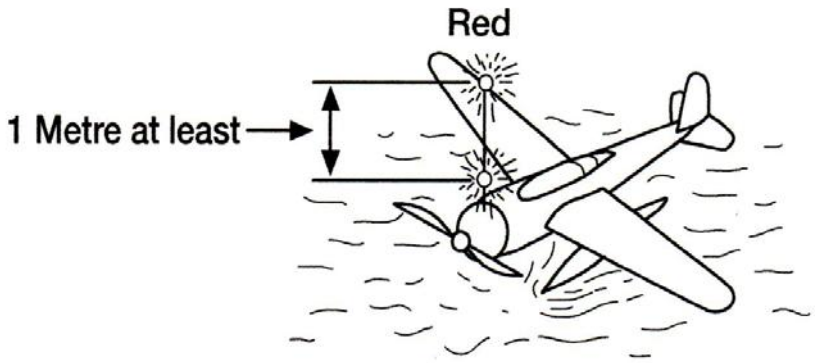


Figure 4

(6) When making way but not under command

As illustrated in Figure 5, the lights described in subparagraph (5) and the first three items of subparagraph (2).

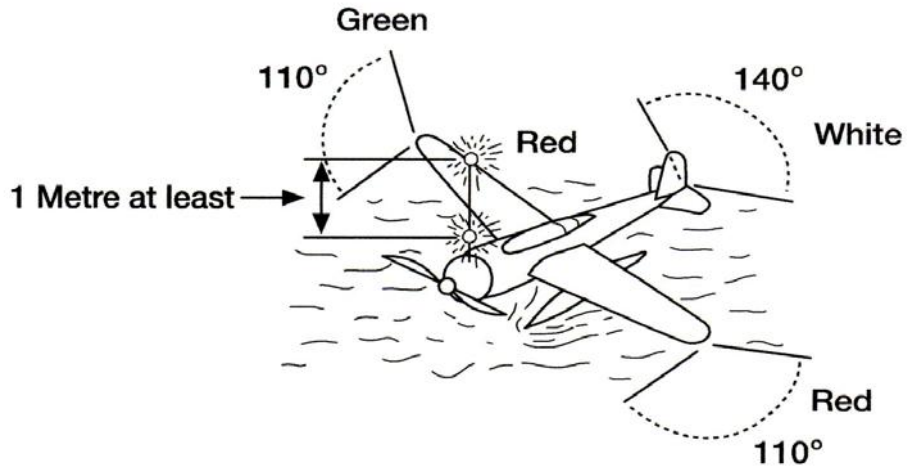


Figure 5

Note: The display of lights prescribed in subparagraphs (5) and (6) above is to be taken by other aircraft as signals that the aeroplane showing them is not under command cannot therefore get out of the way. They dare not signals of aeroplanes in distress and requiring assistance.

(7) When at anchor

(a) If less than 50 m in length, where it can best be seen, a steady white light (Figure 6), visible all around the horizon at a distance of at least 3.7 km (2 nm).

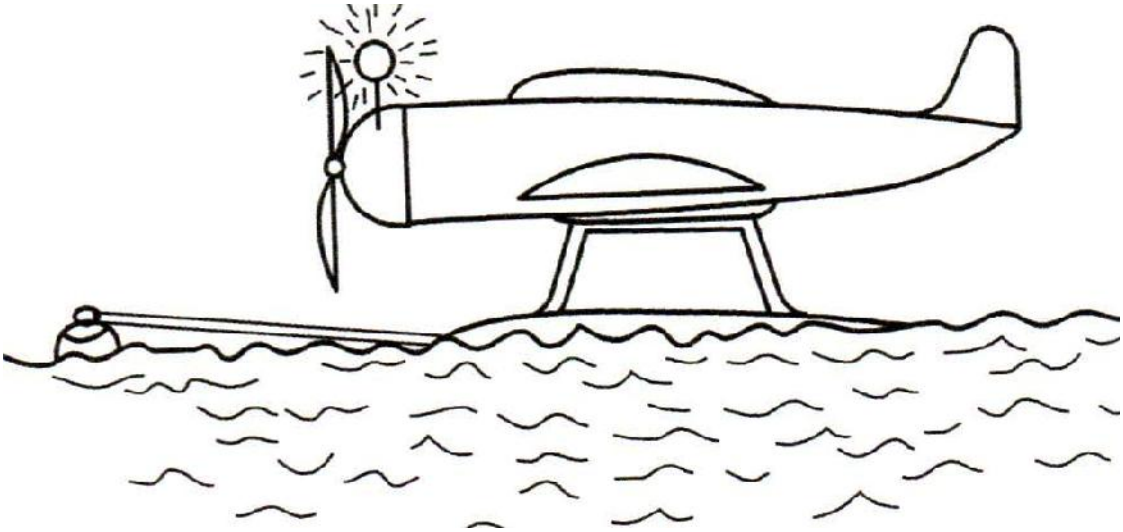


Figure 6

(b) If 50 m or more in length, where they can best be seen, a steady white forward light and a steady white rear light (Figure 7) both visible all around the horizon at a distance of at least 5.6 km (3 nm).

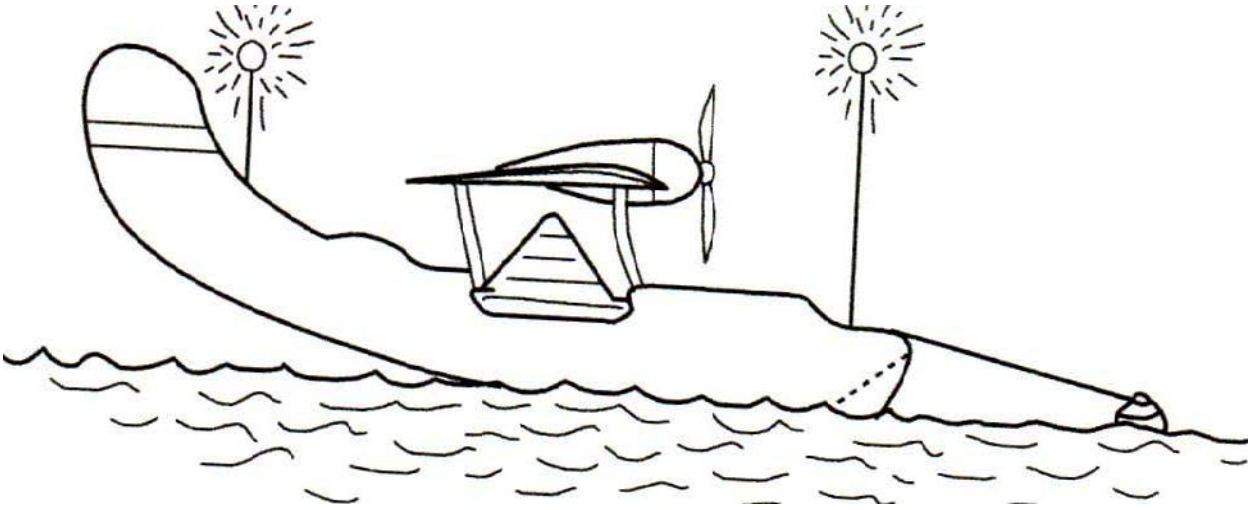


Figure 7

(c) If 50 m or more in span a steady white light on each side (Figures 8 and 9) to indicate the maximum span and visible, so far as practicable, all around the horizon at a distance of at least 1.9 km (1 nm).

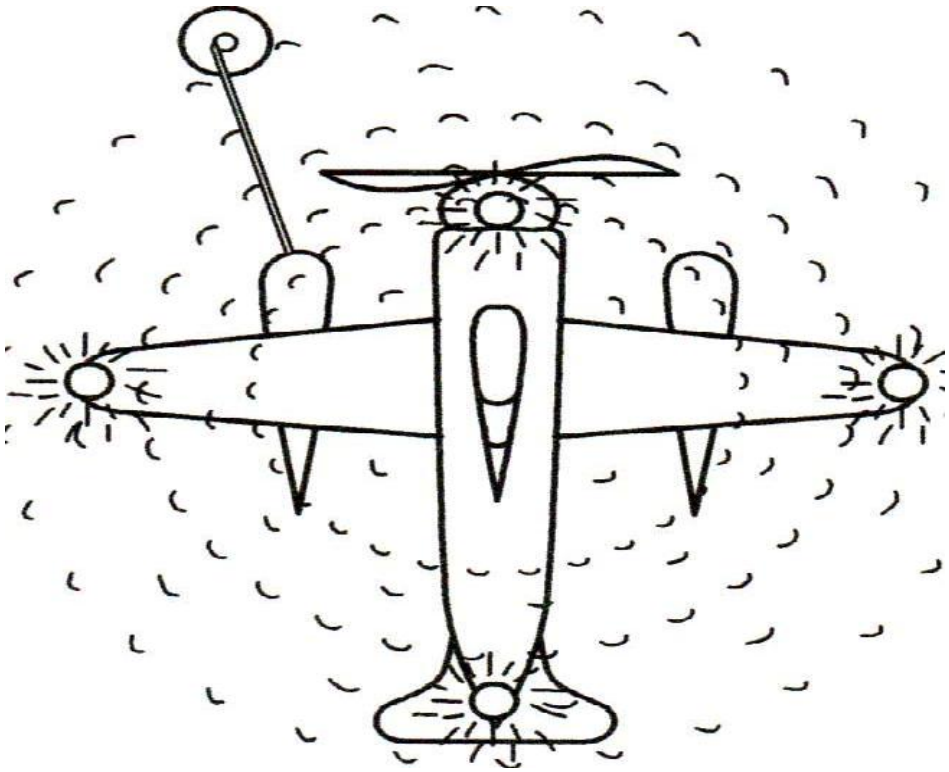


Figure 8

(8) When aground

The lights prescribed in paragraph (7) and in addition two steady red lights in vertical line, at least 1 m apart so placed as to be visible all around the horizon.

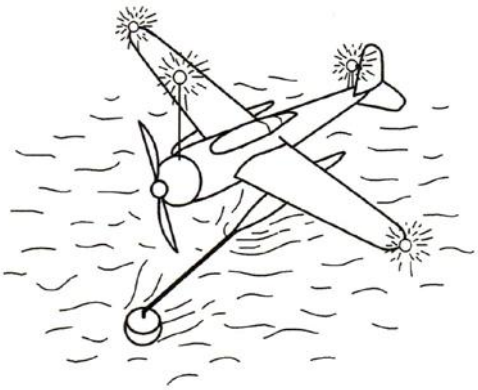


Figure 9

91.06.13 SIGNALS

1. Distress signals

(1) The following signals, used either together or separately, mean that grave and imminent danger threatens, and immediate assistance is requested:

(a) a signal made by radiotelegraphy or by any other signalling method consisting of the group SOS (. . . _ _ _ . . . in the Morse Code);

(b) a signal sent by radiotelephony consisting of the spoken word MAYDAY;

(c) rockets or shells throwing red lights, fired one at a time at short intervals;

(d) a parachute flare showing a red light.

(2) Alarm signals for actuating radiotelegraph and radiotelephone auto-alarm systems:

(a) 3268 The radiotelegraph alarm signal consists of a series of twelve dashes sent in one minute, the duration of each dash being four seconds and the duration of the interval between consecutive dashes one second. It may be transmitted by hand but its transmission by means of an automatic instrument is recommended.

(b) 3270 The radiotelephone alarm signal consists of two substantially sinusoidal audio frequency tones transmitted alternately. One tone has a frequency of 2 200 Hz and the other a frequency of 1 300 Hz, the duration of each tone being 250 milliseconds.

(c) 3271 The radiotelephone alarm signal, when generated by automatic means, must be sent continuously for a period of at least thirty seconds but not exceeding one minute; when generated by other means, the signal must be sent as continuously as practicable over a period of approximately one minute.

(3) None of the provisions in this paragraph prevent the use, by an aircraft in distress, of any means at its disposal to attract attention, make known its position and obtain help.

2. Urgency signals

(1) The following signals, used either together or separately, mean that an aircraft wishes to give notice of difficulties which compel it to land without requiring immediate assistance:

(a) The repeated switching on and off of the landing lights; or

(b) the repeated switching on and off of the navigation lights in such manner as to be distinct from flashing navigation lights.

(2) The following signals, used either together or separately, mean that an aircraft has a very urgent message to transmit concerning the safety of a ship, aircraft or other vehicle, or of some person on board or within sight:

(a) A signal made by radiotelegraphy or by any other signalling method consisting of the group XXX;

(b) a signal sent by radiotelephony consisting of the spoken words PAN, PAN.

(3) None of the provisions in this paragraph prevent the use, by an aircraft in distress, of any means at its disposal to attract attention, make known its position and obtain help.

3. Visual signals used to warn an unauthorised aircraft flying in, or about to enter a restricted, prohibited or danger area

By day and by night, a series of projectiles discharged from the ground at intervals of 10 seconds, each showing, on bursting, red and green lights or stars will indicate to an unauthorised aircraft that it is flying in or about to enter a restricted, prohibited or danger area, and that the aircraft is to take such remedial action as may be necessary.

4. Signals for aerodrome traffic

(1) Light and pyrotechnic signals

(a) Instructions

Light		**From aerodrome control to**	
		Aircraft in flight	**Aircraft on the ground**
Directed towards aircraft concerned (see Figure 1.1)	Steady green	Cleared to land	Cleared for take of
	Steady red	Give way to other aircraft and continue circling	Stop
	Series of green Flashes	Return for landing	Cleared to Taxi
	Series of red flashes	Aerodrome unsafe, do not land	Taxi clear of landing area
	Series of white flashes	Land at this aerodrome taxi to apron	Return to starting point on aerodrome
	Steady red on final approach	Notwithstanding any previous instructions, do not land for the time being	
Note: Clearance to land and to taxi will be given in due course.			

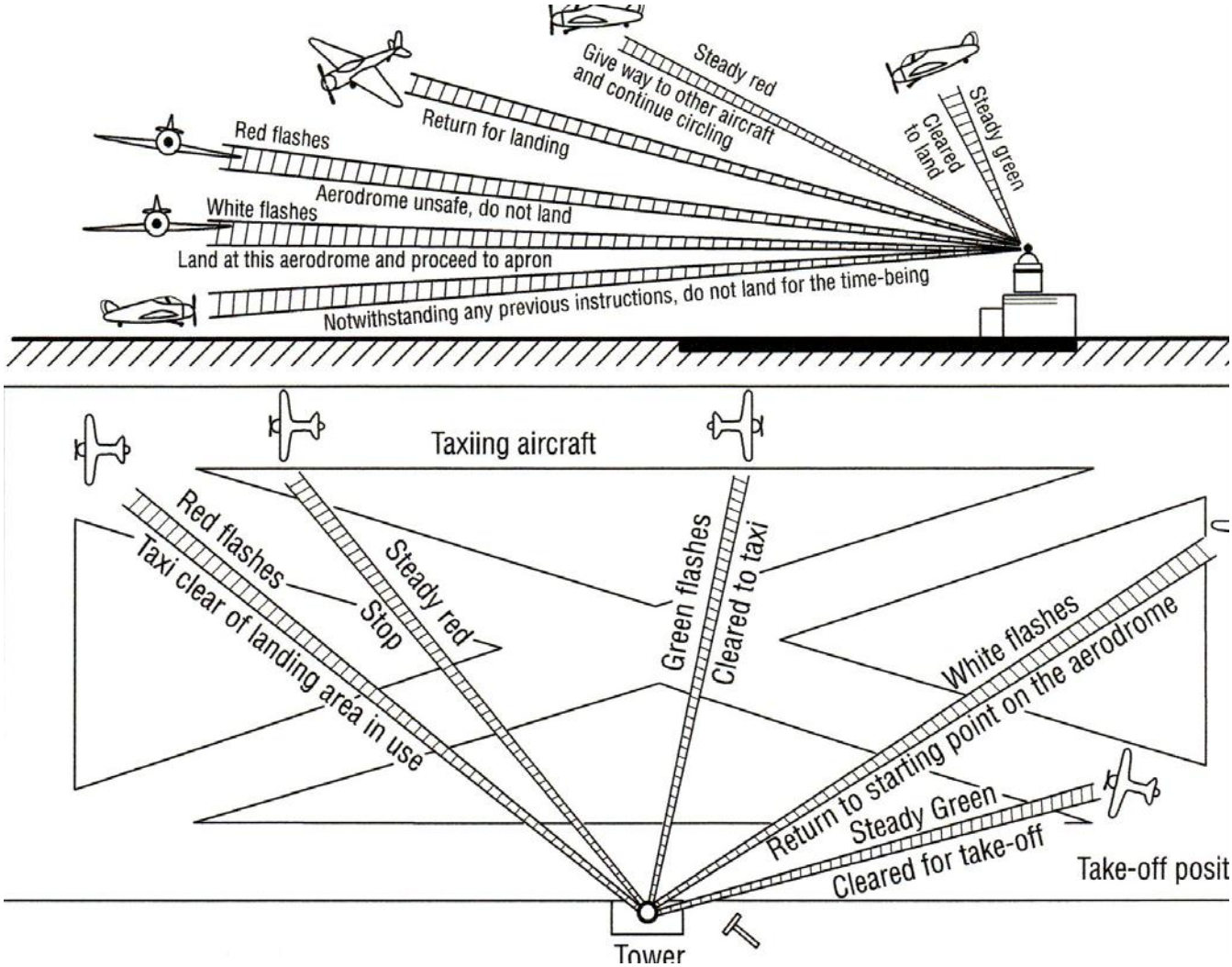


Figure 1.1

(b) Acknowledgement by aircraft

(i) When in flight:

During the hours of daylight:

• by rocking the aircraft's wings;

Note: This signal should not be expected on the base and final legs of the approach -

(a) during the hours of darkness:

(b) by flashing on and off twice the aircraft's landing lights, or if not so equipped, by switching on and off twice its navigation lights;

(ii) when on the ground:

During the hours of daylight:

- by moving the aircraft's ailerons or rudder;

During the hours of darkness:

- by flashing on and off twice the aircraft's landing lights or, if not so equipped,

- by switching on and off twice its navigation lights.

(2) Visual ground signals

(a) Prohibition of landing

A horizontal red square panel with yellow diagonals (Figure 1.2) when displayed in a signal area indicates that landings are prohibited and that the prohibition is liable to be prolonged.

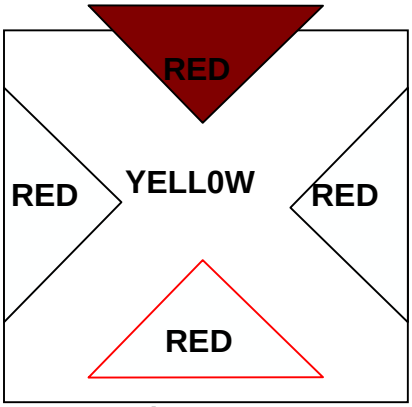


Figure 1.2

(b) Need for special precautions while approaching or landing

A horizontal red square panel with one yellow diagonal (Figure 1.3) when displayed in a signal area indicates that owing to the bad state of the manoeuvring area, or for any other reason, special precautions must be observed in approaching to land or in landing.

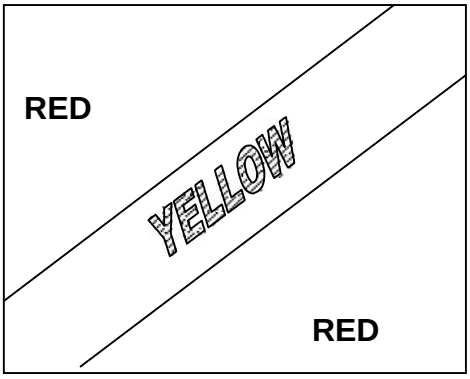


Figure 1.3

(c) Use of runways and taxiways

(i) A horizontal white dumb-bell when displayed in a signal area indicates that aircraft are required to land, take off and taxi on runways and taxiways only.

(ii) The same horizontal white dumb-bell as in (i), but with a black bar placed perpendicular to the shaft across each circular portion of the dumb-bell when displayed in a signal area indicates that aircraft are required to land and take off on runways only, but other manoeuvres need not be confined to runways and taxiways.

(d) Closed runways or taxiways

Crosses of a single contrasting colour, yellow or white (Figure 1.4), displayed horizontally on runways and taxiways or parts thereof indicate an area unfit for movement of aircraft.

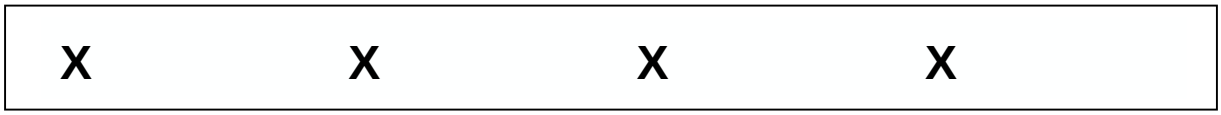


Figure 1.4

(e) Directions for landing or take-off

(i) A horizontal white or orange landing T (Figure 1.5) indicates the direction to be used by aircraft for landing and take-off, which must be in a direction parallel to the shaft of the T towards the cross arm.

Note: When used at night, the landing T is either illuminated or outlined in white coloured lights.

Figure 1.5

(ii) A set of two digits (Figure 1.6) displayed vertically at or near the aerodrome control tower indicates to aircraft on the manoeuvring area

the direction for take-off, expressed in units of 10 degrees to the nearest 10 degrees of the magnetic compass.

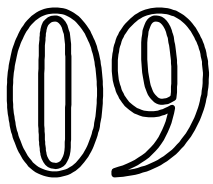


Figure 1.6

(f) Right-hand traffic

When displayed in a signal area, or horizontally at the end of the runway or strip in use, a right-hand arrow of conspicuous colour (Figure 1.7) indicates that turns are to be made to the right before landing and after take-off.

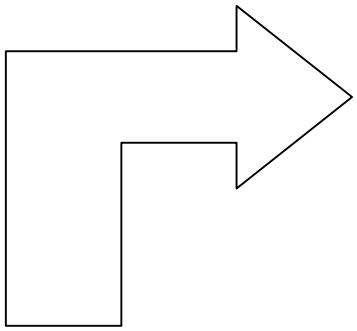


Figure 1.7

(g) Air traffic services reporting office

The letter C displayed vertically in black against a yellow background (Figure 1.8) indicates the location of the air traffic services reporting office.

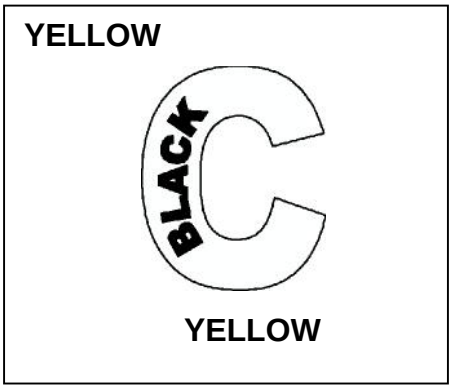


Figure 1.8

(h) Glider flights in operation

A double white cross displayed horizontally (Figure 1.9) in the signal area indicates that the aerodrome is being used by gliders and that glider flights are being performed.

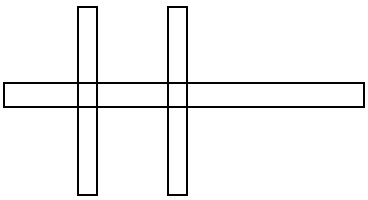


Figure 1.9

(i) Agricultural flights in operation

A figure A (figure 1.10) having sides of 6 meters and letter width of 38 cm, in the signal area indicates that the aerodrome is being used for agricultural flights.

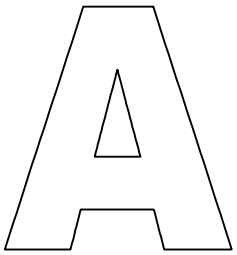


Figure 1.10

5. Marshalling signals

(1) From a signalman to an aircraft

Prior to using the signals outlined in (figure 1.11), the signalman must ascertain that the area within which an aircraft is to be guided is clear of objects which the aircraft, in complying with this technical standard, might otherwise strike.

Note: The design of many aircraft is such that the path of the wing tips, engines and other extremities cannot always be monitored visually from the flight deck while the aircraft is being manoeuvred on the ground.

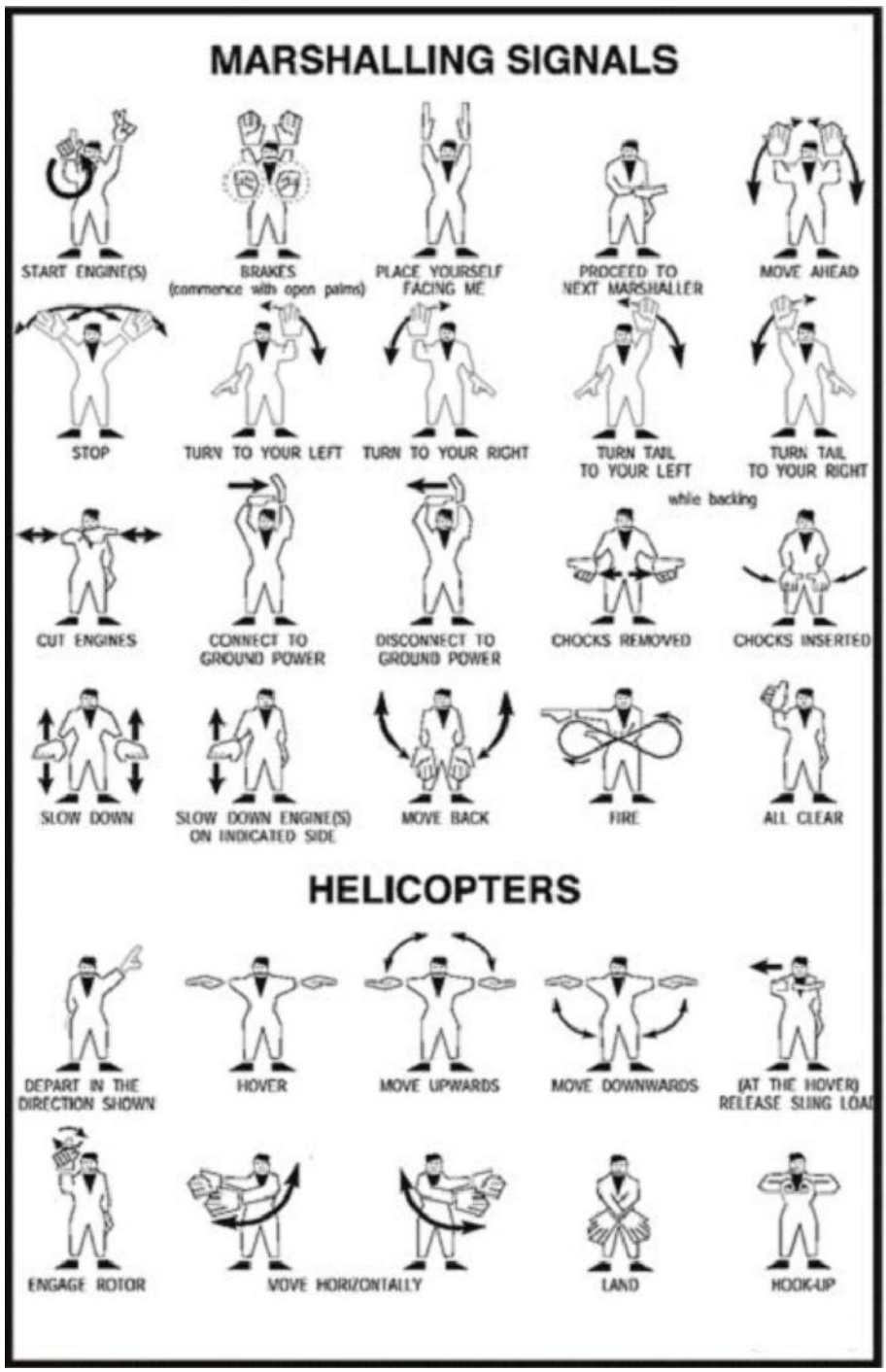


Figure 1.11

Notes:

1. These signals are designed for use by the signalman, with hands illuminated as necessary to facilitate observation by the pilot, and facing the aircraft in a position:

(a) For fixed-wing aircraft, forward of the left-wing tip within view of the pilot; and

(b) for helicopters, where the signalman can best be seen by the pilot.

2. The meaning of the relevant signals remains the same if bats, illuminated wands or torch lights are held.

3. The aircraft engines are numbered, for the signalman facing the aircraft, from right to left (i.e. No. 1 engine being the port outer engine).

4. Signals marked with an asterisk are designed for use to hovering helicopter.

(2) From the pilot of an aircraft to a signalman

(a) Brakes

Note: The moment the fist is clenched or the fingers are extended indicates, respectively, the moment of brake engagement or release.

(i) Brakes engaged

(ii) Raise arm and hand, with fingers extended, horizon-tally in front of face, then clench fist

(iii) Brakes released

(iv)Raise arm, with fist clenched, horizontally in front of face, then extend fingers.

(b) Chocks

Insert chocks

(i) Arms extended, palms outwards, move hands inwards to cross in front of face.

Remove chocks

(i) Hands crossed in front of face, palms outwards, move arms outwards.

(c) Ready to start engine

Raise the appropriate number of fingers on one hand indicating the number of the engine to be started.

Notes:
1. These signals are designed for use by a pilot in the cockpit with hands plainly visible to the signalman, and illuminated as necessary to facilitate observation by the signalman.

2. The aircraft engines are numbered in relation to the signalman facing the aircraft, from right to left (i.e. No. 1 engine being the port outer engine).

91.06.29 IDENTIFICATION AND INTERCEPTION OF CIVIL AIRCRAFT

91.06.29 Interception of civil aircraft

1. **Principles to be observed by states**

(1) The following principles shall be observed in Mozambique regarding the interception of civil aircraft.

(a) Interception of civil aircraft will be undertaken only as a last resort.

(b) If undertaken, an interception will be limited to determining the identity of the aircraft, unless it is necessary to return the aircraft to its planned track, direct it beyond the boundaries of national airspace, guide it away from a prohibited, restricted or danger area or instruct it to effect a landing at a designated aerodrome.

(c) Practice interception of civil aircraft will not be undertaken.

(d) Navigational guidance and related information will be given to an intercepted aircraft by radiotelephony, whenever radio contact can be established.

(e) In the case where an intercepted civil aircraft is instructed to land, the aerodrome designated for the landing shall be suitable for the safe landing of the aircraft type concerned.

(2) The PIC of an aircraft flying in Mozambican airspace when intercepted shall comply with the standards specified in these standards when interpreting and responding to visual signals and communication

(3) The PIC of an aircraft registered in Mozambique or operated by a Mozambican operator flying in foreign airspace when intercepted shall comply with the interception instructions and procedures of the competent Authority.

(4) No PIC may conduct an international flight unless the procedures and signals relating to interception of aircraft, as specified in these regulations, are readily available on the flight deck

2. **Action by intercepted aircraft**

(1) The PIC of an aircraft that is intercepted by another aircraft shall immediately:

(a) Follow the instructions given by the intercepting aircraft, interpreting and responding to visual signals in accordance with the specifications in item **3(2) below**.

(b) Notify, if possible, the appropriate air traffic services unit.

(c) Attempt to establish radio communication with the intercepting aircraft or with the appropriate intercept control unit, by making a general call on the emergency frequency 121.5 MHz, giving the identity of the intercepted aircraft and the nature of the flight; and

if no contact has been established and if practicable, repeating this call on the emergency frequency 243 MHz.

(d) If equipped with SSR transponder, select Mode A, Code 7700, unless otherwise instructed by the appropriate air traffic services unit.

(e) If equipped with ADS-B or ADS-C, select the appropriate emergency functionality, if available, unless otherwise instructed by the appropriate air traffic services unit.

(2) If any instructions received by radio from any sources conflict with those given by the intercepting aircraft by visual signals, the PIC of the intercepted aircraft shall request immediate clarification while continuing to comply with the visual instructions given by the intercepting aircraft.

(3) If any instructions received by radio from any sources conflict with those given by the intercepting aircraft by radio, the PIC of the intercepted aircraft shall request immediate clarification while continuing to comply with the radio instructions given by the intercepting aircraft.

3. Radio communication during interception and signals

(1) If radio contact is established during interception but communication in a common language is not possible, the PIC of each involved aircraft shall attempt to convey instructions, acknowledgement of instructions and essential at information by using the phrases and pronunciations in Table 1 below and transmitting each phrase twice:

Table 1

Phrases for use by INTERCEPTING aircraft			Phrases for use by INTERCEPTED aircraft		
Phrase	**Pronunciation 1**	**Meaning**	**Phrase**	**Pronunciation 1**	**Meaning**
CALL SIGN	KOL SA-IN	What is your call sign?	CALL SIGN (call sign)2	KOL SA-IN (call sign)	My call sign is (call sign)
FOLLOW	FOL-LO	Follow me	WILCO	VILL-KO	Understood Will comply
DESCEND	DEE-SEND	Descend for landing	CAN NOT	KANN NOTT	Unable to comply
YOU LAND	YOU LAAND	Land at this aerodrome	REPEAT	REE-PEET	Repeat your instruction
PROCEED	PRO-SEED	You may proceed	AM LOST	AM LOSST	Position unknown
			MAYDAY	MAYDAY	I am in distress
			HIJACK3	HI-JACK	I have been hijacked
			LAND. (place name)	LAAND (place name)	I request to land at (place name)
			DESCEND	DEE-SEND	I require descent

1. In the second column, syllables to be emphasised are underlined.
2. The call sign required to be given is that used in radiotelephone, communications with air traffic services units and corresponding to the aircraft identification in the flight plan.
3. Circumstances may not always permit, nor make desirable, the use of the phrase "HIJACK".

(2) The signals in Table 2 shall be used by the pilots of each involved aircraft in the event of interception. Signals initiated by intercepting aircraft and responses by intercepted aircraft.

Table 2

Series	INTERCEPTING Aircraft Signals	Meaning	INTERCEPTED Aircraft Responds	Meaning
1	DAY or NIGHT — Rocking aircraft and flashing navigational lights at irregular intervals (and landing lights in the case of a helicopter) from a position slightly above and ahead of, and normally to the left of, the intercepted aircraft (or to the right if the intercepted aircraft is a helicopter) and, after acknowledgement, a slow level turn, normally to the left, (or to the right in the case of a helicopter) on the desired heading. *Note: Meteorological conditions or terrain may require the intercepting aircraft to reverse the positions and direction of turn given above in Series 1.* *Note: If the intercepting aircraft is not able to keep pace with the intercepting aircraft, the latter is expected to fly a series of race-track patterns and to rock the aircraft each time it passes the intercepted aircraft.*	You have been intercepted. Follow me.	DAY or NIGHT —Rocking aircraft. flashing navigational lights at irregular intervals and following.	Understood, will comply.
2	DAY or NIGHT — An abrupt break-away manoeuvre from the intercepted aircraft consisting of a climbing turn of 90 degrees or more without crossing the line of flight of the intercepted aircraft.	You may proceed.	DAY or NIGHT —Rocking the aircraft.	Understood, will comply.
3	DAY or NIGHT — Lowering landing gear (if fitted), showing steady landing lights and overflying runway in use or, if the intercepted aircraft is a helicopter, overflying the helicopter landing area. In the case of helicopters, the intercepting helicopter makes a landing approach, coming to hover hear to the landing area.	Land at this aerodrome.	DAY or NIGHT —Lowering landing gear (if fitted), showing steady landing lights and following the intercepting aircraft and, if, after overflying the runway in use or helicopter landing area, landing is considered safe, proceeding to land.	Understood, will comply.
Series	**INTERCEPTED Aircraft Signals**	**Meaning**	**INTERCEPTING Aircraft Responds**	**Meaning**
4	DAY or NIGHT — Raising landing gear (if fitted) and flashing landing lights while passing over runway in use or helicopter landing area at a height exceeding 300 m (1000 ft) but not exceeding 600 m (2000 ft) (in the case of a helicopter, at a height exceeding 50 m (170 ft) but not exceeding 100 m (330 ft) above the aerodrome level, and continuing to circle runway in use or helicopter landing area. If unable to flash landing lights, flash any other lights available.	Aerodrome you have designated is inadequate.	DAY or NIGHT — If it is desired that the intercepted aircraft follow the intercepting aircraft to an alternate aerodrome, the intercepting aircraft raises its landing gear (if fitted) and uses he Series 1 signals prescribed for intercepting aircraft. If it is decided to release the incepted aircraft, the intercepting aircraft uses the Series 2 signals prescribed for intercepting aircraft.	Understood, follow me. Understood, you may proceed.
5	DAY or NIGHT — Regular switching on and off of all available lights but in such a manner as to be distinct from flashing lights.	Cannot comply.	DAY or NIGHT — Use Series 2 signals prescribed for intercepting aircraft.	
6	DAY or NIGHT — Irregular flashing of all available lights.	In distress.	DAY or NIGHT — Use Series 2 signals prescribed for intercepting aircraft.	Understood

91.06.33 SEMI-CIRCULAR RULE

MAGNETIC TRACK			
FLIGHT LEVEL			
From 000° to 179		From 180° to 359°	
VFR	IFR	IFR	VFR
30 50 70 90 110 130 150 170 190 210 230 250 270 290 330 370 410 450 490 etc.	15 35 55 75 95 115 135 155 175 195	20 40 60 80 100 120 140 160 180 200 220 240 260 280 310 350 390 430 470 510 etc.	25 45 65 85 105 125 145 165 185

91.07.2 MINIMUM FLIGHT ALTITUDES

1. Minimum flight altitude formula

An operator must use the following method to calculate minimum flight altitudes: MORA is a minimum flight altitude computed from current ONC or WAC charts.

(1) Two types of MORAs are charted which are:

(a) Route MORAs e.g. 9800a; and

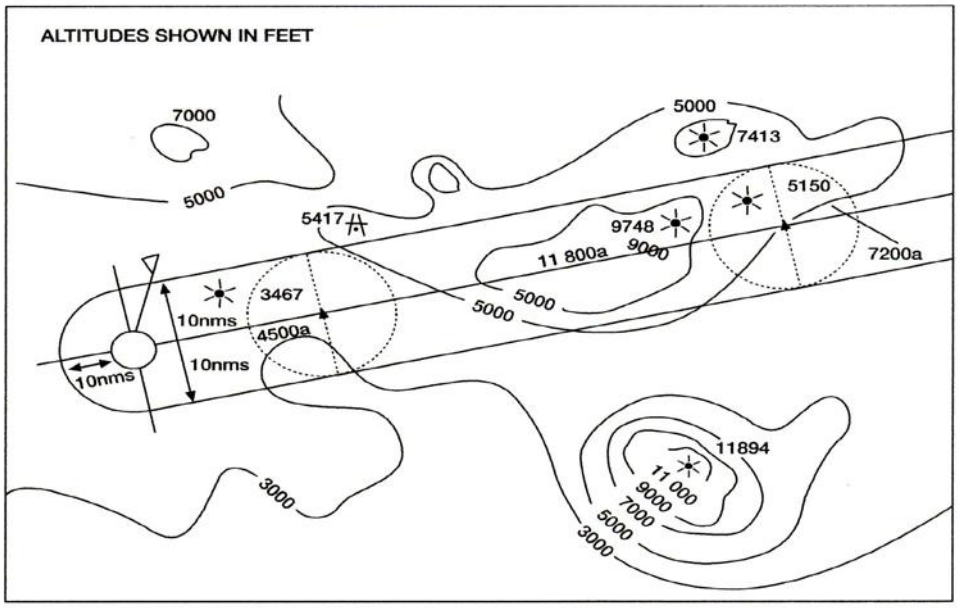
(b) Grid MORAs e.g. 98.

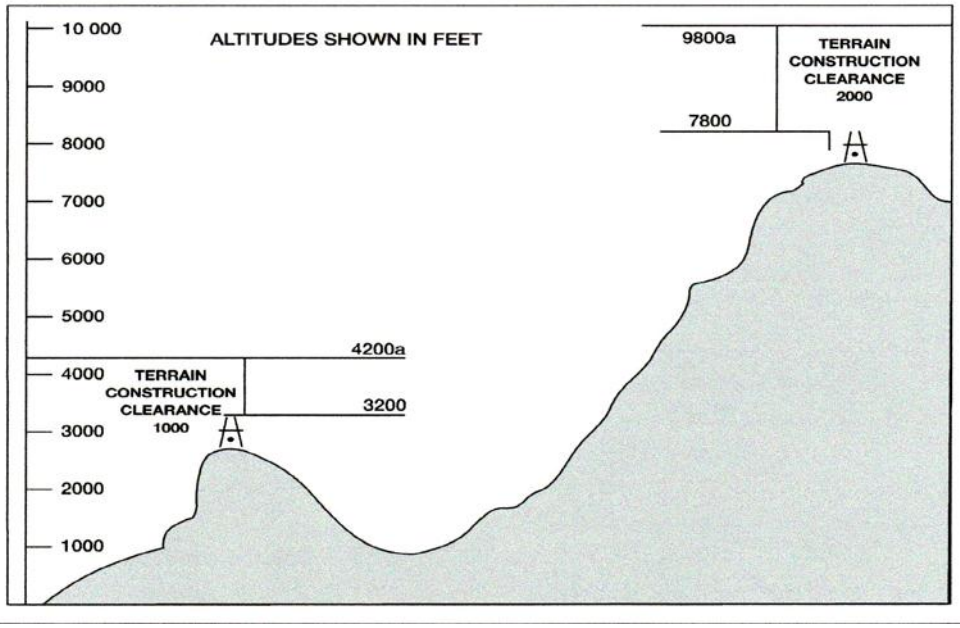
(2) Route MORA values are computed on the basis of an area extending 10 nm to either side of route centreline and including a 10 nm radius beyond the radio fix/reporting point or mileage break defining the route segment.

(3) MORA values clear all terrain and man-made obstacles by 1 000 feet in areas where the highest terrain elevation or obstacles are up to 5 000 feet. A clearance of 2 000 feet is provided above all terrain or obstacles which are 5 001 feet and above.

(4) A grid MORA is an altitude computed by the formula and the values are shown within each grid formed by charted lines of latiitude and longitude. Figures are shown in thousands and hundreds of feet (omitting the last two digits so as to avoid chart congestion). Values followed by ± are believed not to exceed the altitudes shown. The same clearance criteria as explained in subparagraph (3) above apply.

MORA CLEARANCE DIAGRAM





91.07.5 AERODROME OPERATING MINIMA

1. Take-off minima

(1) General

(a) Take-off minima established by the operator must be expressed as visibility or RVR limits, taking into account all relevant factors for each aerodrome planned to be used and the aeroplane characteristics. Where there is a specific need to see and avoid obstacles on departure and/or for a forced landing, additional conditions (e.g. ceiling) must be specified.

(b) The pilot-in-command may not commence take-off unless the weather conditions at the aerodrome of departure are equal to or better than applicable minima for landing at that aerodrome unless a suitable take-off alternate aerodrome is available.

(c) When the reported meteorological visibility is below that required for take-off and RVR is not reported, a take-off may only be commenced if the pilot-in-command can determine that the RVR/visibility along the take-off runway is equal to or better than the required minimum.

(d) When no reported meteorological visibility or RVR is available, a take-off may only be commenced if the pilot-in-command can determine that the RVR/visibility along the take-off runway is equal to or better than the required minimum.

(2) Visual reference

The take-off minima must be selected to ensure sufficient guidance to control the aeroplane in the event of both a discontinued take-off in adverse circumstances and a continued take-off after failure of the critical power unit.

(3) Required RVR/Visibility

For multi-engine aeroplanes, whose performance is such that, in the event of a critical power unit failure at any point during take-off, the aeroplane can either stop or continue the take-off to a height of 1 500 feet above the aerodrome while clearing obstacles by the required margins, the take-off minima established by an operator must be expressed as RVR/Visibility values not lower than those given in Table 1 below except as provided in paragraph (4) below:

Table 1: Minimum take-off RVR/visibility

Take-off RVR/Visibility	
Facilities	**RVR/Visibility (Note 3)**
Nil (Day only)	500 m
Runway edge lighting and/or centreline marking	250/300 m (Notes 1 and 2)
Runway edge and centreline lighting	200/250 m (Note 1)
Runway edge and centreline lighting and multiple RVR information	150/200 m (Notes 1 and 4)

Notes:

1. **The higher values apply to Category D aeroplanes.**

2. **For night operations at least runway edge and runway end lights are required.**

3. **The reported RVR/Visibility value representative of the initial part of the take-off run can be replaced by pilot assessment.**

4. **The required RVR value must be achieved for all of the relevant RVR reporting points with the exception given in Note 3 above.**

(b) For multi-engine aeroplanes whose performance is such that they cannot comply with the performance conditions in subparagraph (3)(a) above in the event of a critical power unit failure, there may be a need to re-land immediately and to see and avoid obstacles in the take-off area. Such aeroplanes may be operated to the following take-off minima provided they are able to comply with the applicable obstacle clearance criteria, assuming engine failure at the height specified. The take-off minima established by an operator must be based upon the height from which the one engine inoperative net take-off flight path can be constructed. The RVR minima used may not be lower than either of the values given in Table 1 above or Table 2 below.

Table 2: Minimum take-off RVR/visibility – assuming engine failure

Engine Failure Height Above Runway (feet)		Minimum RVR (meters)
From	**To**	
Lift off	50	200
51	100	300
101	150	400
151	200	500
201	300	1,000
Above 300		1,500 (see note 1)

Notes:
1. 1,500 m is also applicable if no positive take-off flight path can be constructed.

2. The reported RVR/Visibility value representative of the initial part of the take-off run can be replaced by pilot assessment.

(c) When reported RVR, or meteorological visibility is not available, the pilot-in-command may not commence take-off unless he or she can determine that the actual conditions satisfy the applicable take-off minima.

(4) Exceptions to paragraph (3)(a):

(a) Subject to the approval of the Commissioner, and provided the requirements in paragraphs (i) to (v) below have been satisfied, an operator may reduce the take-off minima to 125 m RVR (Category A, B and C aeroplanes) or 150 m RVR (Category D aeroplanes) when –

(i) Low visibility procedures are in force;

(ii) High intensity runway centreline lights spaced 15 m or less and high intensity edge lights spaced 60 m or less are in operation;

(iii) Flight deck crew members have satisfactorily completed training in a simulator approved for this procedure;

(iv) a 90 m visual segment is available from the cockpit at the start of the take-off run; and

(v) The required RVR value has been achieved for all of the relevant RVR reporting points.

(b) Subject to the approval of the Commissioner, an operator of an aeroplane using an approved lateral guidance system for take-off may reduce the take-off minima to an RVR less than 125 m (Category A, B and C aeroplanes) or 150 m (Category D aeroplane) but not lower than 75 m provided runway protection and facilities equivalent to Category III landing operations are available.

2. Landing minima (non-precision approach)

(1) System minima

(a) An operator must ensure that system minima for non-precision approach procedures, which are based upon the use of ILS without glidepath (LLZ only), VOR, NDB, SRA and VDF are not lower than the MDH values given in Table 3 below.

Table 3: System minima for non-precision approach aids

System minima	
Approach Aid	**MDH (feet)**
ILS (no glide path) – LLZ	250
SRA (terminating at ½ NM from Threshold)	250
SRA (terminating at 1 NM from Threshold)	300
SRA (terminating at 2 NM from Threshold)	350
VOR	300
VOR/DME	250
NDB	300
VDF (QDM and QGH)	300

(2) Minimum descent height

An operator must ensure that the minimum descent height for a non-precision approach is not lower than either –

(a) The OCH/OCL for the category of aeroplane; or

(b) The system minimum.

(3) Visual reference

A pilot may not continue an approach below MDA/MDH unless at least one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:

(a) Elements of the approach light system;

(b) the threshold;

(c) The threshold markings;

(d) The threshold lights;

(e) The threshold identification lights;

(f) The visual glide slope indicator;

(g) The touchdown zone or touchdown zone markings;

(h) the touchdown zone lights;

(i) Runway edge lights; or

(j) Other visual references accepted by the Commissioner.

(4) Required RVR

The lowest minima to be used by an operator for non-precision approaches are:

Table 4A: RVR for non-precision approach – full facilities

MDA (feet)		Aeroplane Category/RVR (meters)			
From	**To**	**Cat A**	**CAT B**	**CAT C**	**CAT D**
250	299	800	800	800	1,200
300	449	900	1,000	1,000	1,400
450	649	1,000	1,200	1,200	1,600
650	Above	1,200	1,400	1,400	1,800

Notes (1), (5), (6) and (7)

Table 4(B): RVR for non-precision approach – intermediate facilities

MDH (feet)		Aeroplane Category/RVR (meters)			
From	**To**	**Cat A**	**CAT B**	**CAT C**	**CAT D**
250	299	1,000	1,100	1,200	1,300
300	449	1,200	1,300	1,400	1,600
450	649	1,400	1,500	1,600	1,800
650	Above	1,500	1,500	1,800	2,000

Notes (2), (5), (6) and (7)

Table 4(C): RVR for non-precision approach – basic facilities

MDH (feet)		Aeroplane Category/RVR (meters)			
From	**To**	**Cat A**	**CAT B**	**CAT C**	**CAT D**
250	299	1,200	1,300	1,400	1,600
300	449	1,300	1,400	1,600	1,800
450	649	1,500	1,500	1,800	2,000
650	Above	1,500	1,500	2,000	2,000

Notes (3), (5), (6) and (7)

Table 4(D): RVR for non-precision approach - NIL approach light facilities

MDA (feet)		Aeroplane Category/RVR (meters)			
From	**To**	**Cat A**	**CAT B**	**CAT C**	**CAT D**
250	299	1,500	1,500	1,600	1,800
300	449	1,500	1,500	1,800	2,000
450	649	1,500	1,500	2,000	2,000
650	Above	1,500	1,500	2,000	2,000

Notes (4), (5), (6) and (7)

Notes:

1. **Full facilities comprise runway markings, 720 m or more of HI/MI approach lights, runway edge lights, threshold lights and runway end lights. Lights must be on.**

2. Intermediate facilities comprise runway markings, 420 – 719 m of HI/MI approach lights, runway edge lights, threshold lights and runway end lights. Lights must be on.

3. Basic facilities comprise runway markings, < 420 m of HI/MI approach lights, any length of LI approach lights, runway edge lights, threshold lights and runway end lights. Lights must be on.

4. Nil approach light facilities comprise runway markings, runway edge lights, threshold lights, runway end lights or no lights at all.

5. The tables are only applicable to conventional approaches with a nominal descent slope of not greater than 4°. Greater descent slopes will usually require that visual glide slope guidance (e.g. PAPI) is also visible at the Minimum Descent Height.

6. The above figures are either reported RVR or meteorological visibility converted to RVR as in TS 91.07.7.8 below.

7. The MDH mentioned in Table 4(a), 4(b), 4(c) and 4(d) refers to the initial calculation of MDH. When selecting the associated RVR, there is no need to take account of a rounding up to the nearest ten feet, which may be done for operational purposes, e.g. conversion to MDA.

(5) Night operations

For night operations at least runway edge, threshold and runway end lights must be on.

3. Precision approach – category I operations

(1) General

A Category I operation is a precision instrument approach procedure which provides for an approach to a decision height not lower than 200 ft and a visibility not less than 800 m or RVR not less than 550 m.

(2) Decision height

An operator must ensure that the decision height to be used for a Category I Precision approach is not lower than –

(a) The minimum decision height specified in the aeroplane flight manual (AFM) if stated;

(b) The minimum height to which the precision approach aid can be used without the required visual reference;

(c) The OCH/OCL for the category of aeroplane; or

(d) 200 ft.

(3) Visual reference

A pilot may not continue an approach below the Category I decision height, determined in accordance with paragraph (2) above, unless at least one of the

following visual references for the intended runway is distinctly visible and identifiable to the pilot:

(a) Elements of the approach light system;

(b) The threshold;

(c) The threshold markings;

(d) The threshold lights;

(e) The threshold identification lights;

(f) The visual glide slope indicator;

(g) The touchdown zone or touchdown zone markings;

(h) The touchdown zone lights; or

(i) Runway edge lights.

(4) Required RVR

The lowest minima to be used by an operator for Category I operations are:

Table 5: RVR for Cat 1 approach vs facilities and DH

MDH (feet)		**Facilities/Minimum RVR (meters) (**Note 5)			
From	**To**	**Full** (Notes 1&6)	**Interm.** (Notes 2&6)	**Basic** (Notes 3&6)	**Nil** (Notes 4&6)
200		550	700	800	1,000
201	250	600	700	800	1,000
251	300	650	800	900	1,200
301and Above		1,500	1,500	2,000	2,000

Notes:

1. **Full facilities comprise runway markings, 720 m or more of HI/MI approach lights, runway edge lights, threshold lights and runway end lights. Lights must be on.**

2. **Intermediate facilities comprise runway markings, 420 – 719 m of HI/MI approach lights, runway edge lights, threshold lights and runway end lights. Lights must be on.**

3. **Basic facilities comprise runway markings, < 420 m of HI/MI approach lights, any length of**

LI approach lights, runway edge lights, threshold lights and runway end lights. Lights must be on.

4. **Nil approach light facilities comprise runway markings, runway edge lights, threshold lights, runway end lights or no lights at all.**

5. **The above figures are either the reported RVR or meteorological visibility converted to RVR as in accordance with technical standard 131.6.**

6. **The table is applicable to conventional approaches while a glide slope angle up to and including 4°.**

7. **The DH mentioned in Table 5 refers to the initial calculation of DH. When selecting the associated RVR, there is no need to take account of a rounding up to the nearest ten feet, which may be done for operational purposes, e.g. conversion to DA.**

(5) Single pilot operations

For single-pilot operations, the operator must calculate the minimum RVR for all approaches in accordance with MOZ.CAR 91.07.5 and this technical standard. An RVR of less than 800 m is not permitted except when using a suitable autopilot coupled to an ILS, in which case normal minima apply. The decision height applied may not be less than 1.25 x the minimum disengagement height for the autopilot.

(6) Night operations

For night operations at least runway edge, threshold and runway end lights must be on.

4. Precision approach – category II operations

(1) General

A Category II operation is an ILS approach procedure which provides for an approach to a decision height lower than 200 feet but not lower than 100 feet and a RVR of not less than 350 m.

(2) Decision height

An operator must ensure that the decision height for a Category II operation is not lower than:

(a) The minimum decision height specified in the AFM, if stated;

(b) The minimum height to which the precision approach aid can be used without the required visual reference;

(c) The OCH/OCL for the category of aeroplane; or

(d) The decision height to which the flight crew is authorized to operate; or

(e) 100 ft.

(3) Visual reference

A pilot may not continue an approach below the Category II decision height determined in accordance with paragraph (2) above, unless visual references containing a segment of at least 3 consecutive lights being the centre line of the approach lights, or touchdown zone lights, or runway Centre line lights, or runway edge lights, or a combination of these is attained and can be maintained. This visual reference must include a lateral element of the ground pattern, i.e. an approach lighting crossbar or the landing threshold or a barrette of the touchdown zone lighting.

(4) Required RVR

The lowest minima to be used by an operator for Category II operations are:

Table 6: RVR for Cat II approach vs DH

CAT II MINIMA			
Decision Height (DH) (feet)		**Auto-coupled to below DH /RVR (meters)** (Note 1)	
From	**To**	**Aeroplane Category A, B & C**	**Aeroplane Category D**
100	120	300	300 (Note 2)/350
91	140	400	400
141and Above		450	450

Notes:

1. **The reference to "auto-coupled to below DH" in this table means continued use of the automatic flight control system down to a height which is not greater than 80% of the Applicable DH. Thus airworthiness requirements may, through minimum engagement height for the automatic flight control system, affect the DH to be applied.**

2. **300 m may be used for a Category D aeroplane conducting an Autoland.**

5. Precision approach – category III operations

(1) General

Category III operations are subdivided as follows:

(a) Category III A operations

An ILS approach procedure which provides for an approach to a decision height lower

Than 100 feet or with no decision height and with a RVR of not less than 200 m.

(b) Category III B operations

An ILS approach procedure which provides for approach with either decision height lower than 50 feet or no decision height and a RVR lower than 200 m but not less than 75 m.

(c) Category III C operations

An ILS approach procedure which provides for approach with no decision height and no Runway visual range limitations.

(2) Decision height

For operations in which a decision height is used, an operator must ensure that the decision height is not lower than –

(a) The minimum decision height specified in the AFM, if stated;

(b) The minimum height to which the precision approach aid can be used without the required visual reference; or

(c) The decision height to which the flight crew is authorized to

operate. (3) No decision height operations

Operations with no decision height may only be conducted if:

(a) The operation with no decision height is authorized in the AFM;

(b) The approach aid and the aerodrome facilities can support operations with no decision height; and

(c) The operator has an approval for CAT III operations with no decision height.

Note: In the case of a CAT III runway it may be assumed that operations with no decision height can be supported unless specifically restricted as published in the AIP or NOTAM.

(4) Visual reference

(a) For Category III A operations, a pilot may not continue an approach below the decision height determined in accordance with paragraph (2) above unless a visual reference containing a segment of at least 3 consecutive lights being the centreline of the approach lights, or touchdown zone lights, or runway centre line lights, or runway edge lights, or a combination of these is attained and can be maintained.

(b) For Category III B operations with a decision height a pilot may not continue an approach below the decision height, determined in accordance with

paragraph (2) above, unless a visual reference containing at least one centreline light is attained and can be maintained.

(c) For Category III operations with no decision height there is no requirement for visual contact with the runway prior to touchdown.

(5) Required RVR

The lowest minima to be used by an operator for Category III operations are:

Table 7: Cat III approach RVR vs flight control system and DH

Category III minima					
		Flight control system/RVR (metres)			
			No roll-out System	**With roll-out guidance or control system**	
App CAT	DH (ft)	Fail passive	Fail Operational	Fail passive	Fail Operational
III A	Less than 100	200 note 1	200	200	200
III B	Less than 50	Not authorized	Not authorized	125	75
III C	No DH	Not authorized	Not authorized	Not authorized	75

Note: For operations to actual RVR values less than 300 m a go-around is assumed in the event of an autopilot failure at or below DH.

6. Aerodrome operating minima circling

(1) The lowest minima to be used by an operator for circling are:

Table 8: Visibility and MDH for circling vs. aeroplane category

Aeroplane category				
	A	**B**	**C**	**D**
MDH	400	500	600	700
Minimum Visibility	1,500	1,600	2,400	3,600

(2) Circling with prescribed tracks is an accepted procedure within the meaning of this paragraph.

7. Aerodrome operating minima visual approach

An operator may not use an RVR of less than 1 500 m for a visual approach.

8. Conversion of reported meteorological visibility to RVR

(1) An operator must ensure that a meteorological visibility to RVR conversion is not used for calculating take-off minima, Category II or III minima or when a reported RVR is available.

(2) When converting meteorological visibility to RVR in all other circumstances than those in paragraph (1) above, an operator must ensure that the following table is used:

Table 9: Conversion of visibility to RVR

Lighting elements in operation	RVR = Reported Met Visibiity	
	Day	Night
HI approach and runway lighting	1.5	2
Any type of lighting installation other than above	1	1.5
No lighting	1	Not applicable

91.07.8 PLANNING MINIMA FOR IFR FLIGHTS

1. Planning minima for destination alternate aerodromes

(1) An owner or operator may only select the destination aerodrome or alternate destination aerodrome when the appropriate weather reports or forecasts, or any combination thereof, indicate that, during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the aerodrome, the weather conditions will be at or above the applicable planning minima as follows:

(a) Planning minima for the destination aerodrome

(i) RVR/visibility must be in accordance with that specified in CAR 91.07.5; and

(ii) for a non-precision approach or a circling approach, the ceiling at or above MDH;

(b) Planning minima for destination alternate aerodrome must be in accordance with Table 1.

Table 1: Planning minima – En route and destination alternates

Type of approach	Planning minima
Cat II and III	Cat I minima with RVR in accordance with TS 91.07.5
Cat I	Non-precision minima and ceiling must be above the MDH
Non-precision	Non-precision minima plus 200 ft added to MDH and 1 000 m added to RVR/Visibility. Ceiling must be above the MDH + 200 ft.
Circling	Circling

Note: Only operators approved for Cat II and III operations may use planning minima based on a Cat II and III approach in Table 1.

2. Planning minima for en route alternate aerodromes (Non-ETOPS Flights)

An owner or operator may not select an aerodrome as an en route alternate aerodrome unless the appropriate weather reports or forecasts, or any combination thereof, indicate that, during a period commencing 1 hour before and ending 1 hour after the expected time of arrival at the aerodrome, the weather conditions will be at or above the planning minima prescribed in Table 1 above.

3. Planning minima for an ETOPS en route alternate

An owner or operator may not select an aerodrome as an ETOPS en route alternate aerodrome unless the appropriate weather reports or forecasts, or any combination thereof, indicate that, during a period commencing 1 hour before and ending 1 hour after the expected time of arrival at the aerodrome, the weather conditions will be at or above the planning minima prescribed in Table 2 below, and in accordance with the operator's ETOPS approval.

Table 2: Planning minima – ETOPS

Type of approach	**Planning minima** (RVR/visibility required and ceiling if applicable)		
	Aerodrome with		
	at least 2 separate approach procedures based on 2 separate aids serving 2 separate runways	at least 2 separate approach procedures based on 2 separate aids serving 1 runway	at least 1 approach procedure based on 1 aid serving 1 runway
Precision approach **Cat II, III (ILS MLS)**	Precision approach Cat I	Non-precision approach minima	
Precision approach Cat I (ILS MLS)	Non-precision approach minima	Circling minima or, if not available,non-precision approach minima plus 200 ft/1000 m	
Non-precision **approach**	The lower of non-precision approach minima plus 200 ft/1 000 m or circling	The higher of circling minima or non-precision approach minima plus 200 ft/1 000 m	

Notes:

1. **"Tempo" and "Inter" conditions published in the forecast are not limiting unless these conditions are forecast to be below published planning minima. Where a condition is forecast as "Prob", provided the probability percent factor is less than 40%, it is not limiting. However the pilot-in-command will be expected to exercise good aviation judgement in assessing he overall "Prob" conditions.**

2. **Runways on the same aerodrome are considered to be separate runways when –**

   (a) They are separate landing surfaces which may overlay or cross such that if one of the runways is blocked, it will not prevent the planned type of operations on the other runway; and

   (b) each of the landing surfaces has a separate approach procedure based on a separate aid.

3. **Only operators approved for Category II or III operations may use the planning minima applicable to Categories II and III in Table 2 and then only if the aeroplane is certificated for a one engine inoperative Category II or III approach as applicable.**

4. **The JAA Information Leaflet No. 20, IL20, may be used by an operator to conduct an ETOPS operation, together with the ETOPS alternate weather criteria determined in this technical standard.**

91.07.11 MASS AND BALANCE

1. Definitions

"Maximum structural landing mass" means the maximum permissible total aircraft mass upon landing under normal circumstances;

"maximum structural take off mass" means the maximum permissible total aircraft mass at the start of the take-off run or lift-off; and

"Maximum zero fuel mass" means the maximum permissible mass of an aircraft with no usable fuel. The mass of the fuel contained in particular tanks must be included in the zero fuel mass when it is explicitly mentioned in the aircraft flight manual limitations;

"Traffic load" means the total mass of passengers, baggage and cargo, including any non-revenue load.

2. Mass values for flight crew

(1) An owner or operator must use the following mass values to determine the dry operating mass:

(a) Actual masses including any flight crew baggage; or

(b) standard masses, including hand baggage, of 85 kg for flight deck crew members and 75 kg for cabin crew members.

(2) An owner or operator must correct the dry operating mass to account for any additional baggage. The position of this additional baggage must be accounted for when establishing the centre of gravity of the aircraft.

3. Mass values for passengers and baggage

(1) An owner or operator must compute the mass of passengers and checked baggage using either the actual weighed mass of each person and the actual weighed mass of baggage or the standard mass values specified in Tables 1 to 3 below except where the number of passenger seats available is less than 6, when the passenger mass may be established by a verbal statement by or on behalf of each passenger or by estimation. The procedure specifying when to select actual or standard masses must be included in the operations manual.

(2) If determining the actual mass by weighing, an owner or operator must ensure that passengers' personal belongings and hand baggage are included. Such weighing must be conducted immediately prior to boarding and at an adjacent location.

(3) If determining the mass of passengers using standards mass values, the standard mass values in Tables 1 and 2 below must be used. The standard masses include hand baggage and the mass of any infant below 2 years of age carried by an adult on

one passenger seat. Infants occupying separate passenger seats are to be considered as children for the purpose of this paragraph.

(4) Mass values for passengers – 20 seats or more

(a) Where the total number of passenger seats available on an aircraft is 20 or more, the standard masses of male and female in Table 1 are applicable. As an alternative, in cases where the total number of passenger seats available is 30 or more, the 'All Adult' mass values in Table 1 are applicable.

(b) For the purpose of Table 1, holiday charter means a charter flight solely intended as an element of a holiday travel package.

Table 1

Passenger seats	20 or more		30 or more
	Male	Female	All Adult
All flights except holiday charters	88 kg	70 kg	84 kg
Holiday charters	83 kg	69 kg	76 kg
Children	35 kg	35 kg	35 kg

(5) Mass values for passengers – 19 seats or less

Table 2

Passenger seats	1 to 5	6 to 9	10 to 19
Male	104 kg	96 kg	92 kg
Female	86 kg	78 kg	74 kg
Children	35 kg	35 kg	35 kg

(a) Where the total number of passenger seats available on an aircraft is 19 or less, the standard masses in Table 2 are applicable.

(c) On flights where no hand baggage is carried in the cabin or where hand baggage is accounted for separately, 6 kg may be deducted from the above male and female masses. Articles such as an overcoat, an umbrella, a small handbag or purse, reading material or a small camera are not considered as hand baggage for the purpose of this paragraph.

(6) Mass values for baggage

Where the total number of passenger seats available on the aircraft is 20 or more, the standard mass values given in Table 3 are applicable for each piece of checked baggage. For aircraft with 19 passenger seats or less, the actual mass of the checked baggage, determined by weighing, must be used.

Table 3: 20 or more seats

Type of flight	Baggage standard mass
Domestic	11 kg
International	15 kg

(7) If an owner or operator wishes to use standard mass values other than those contained in Tables 1 to 3 above, he or she must advise the Commissioner of his or her reasons and gain such approval in advance. After verification and approval by the Commissioner of the results of the weighing survey, the revised standard mass values are only applicable to that operator. The revised standard mass values can only be used in circumstances consistent with those under which the survey was conducted. Where revised standard masses exceed those in Tables 1 to 3, then such higher values must be used.

(8) On any flight identified as carrying a significant number of passengers whose masses, including hand baggage, are expected to exceed the standard passenger mass, an owner or operator must determine the actual mass of such passengers by weighing or by adding an adequate mass increment.

(9) If standard mass values for checked baggage are used and a significant number of passengers check-in baggage that is expected to exceed the standard baggage mass, an owner or operator must determine the actual mass of such baggage by weighing or by adding an adequate mass increment.

(10) An owner or operator must ensure that a pilot-in-command is advised when a non-standard method has been used for determining the mass of the load and that this method is stated in the load and trim sheet.

4. Mass and balance documentation

(1) The operator must establish mass and balance documentation prior to each flight specifying the load and its distribution.

(a) The mass and balance documentation must enable the pilot-in-command to determine by inspection that the load and its distribution is such that the mass and balance limits of the aircraft are not exceeded.

(b) The person supervising the loading of the aircraft must confirm by signature that the load and its distribution are in accordance with the mass and balance documentation.

(c) Acceptance of the loading of the aircraft by the pilot-in-command, must be indicated by countersignature or equivalent.

(2) The mass and balance documentation must contain the following information:

(a) The aircraft registration and type;

(b) The flight identification number and date;

(b) the identity of the pilot-in-command;

(d) The identity of the person who prepared the documentation;

(e) The dry operating mass and the corresponding center of gravity of the aircraft;

(f) the mass of the fuel at take-off and the mass of trip fuel;

(g) The mass of consumables other than fuel;

(h) The components of the load including passengers, baggage, cargo and ballast;

(i) the take-off mass, landing mass and zero fuel mass;

(j) The load distribution;

(k) The applicable aircraft center of gravity positions; and

(l) The limiting mass and center of gravity values.

91.07.12 FUEL AND OIL SUPPLY

1. Planning criteria for aeroplanes

An owner or operator must base the fuel policy, including calculation of the amount of fuel to be carried, by an aeroplane on the following planning criteria:

(1) The amount of –

(a) Taxi fuel, which must not be less than the amount, expected to be used prior to take-off. Local conditions at the departure aerodrome and APU consumption must be taken into account;

(b) Trip fuel, which must include –

(i) Fuel for take-off and climb from aerodrome elevation to initial cruising level/altitude, taking into account the expected departure routing;

(ii) Fuel from top of climb to top of descent, including any step climb/descent;

(iii) Fuel from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure; and

(iv) Fuel for approach and landing at the destination aerodrome;

(c) contingency fuel, which must be the higher of item (i) or (ii) below:

(i) Either:

• 5% of the planned trip fuel or, in the event of in-flight replanning, trip fuel for the remainder of the flight; or

• not less than 3% of the planned trip fuel or, in the event of in-flight replanning, trip fuel for the remainder of the flight, subject to the approval of the Commissioner, provided that an en route alternate is available; or

• an amount of fuel sufficient for 20 minutes flying time based upon the planned trip fuel consumption: Provided that the owner or operator has established a fuel consumption
monitoring programme for individual aeroplanes and uses valid data determined by means of such a programme for fuel calculation; or

• an amount of fuel of not less than that which would be required to fly for 15 minutes at holding speed at 1 500 feet (450 m) above the destination aerodrome in standard conditions, when an owner or operator has established a programme, approved by the Commissioner, to monitor the fuel consumption on each individual route/aeroplane

Combination and uses this data for a statistical analysis to calculate contingency fuel for that route/aeroplane combination; or

(ii) An amount to fly for 5 minutes at holding speed at 1 500 feet (450 m) above the destination aerodrome in standard conditions;

(d) Alternate fuel, which must be sufficient for –

(i) a missed approach from applicable MDA/DH at the destination aerodrome to missed approach altitude, taking into account the complete missed approach procedure;

(ii) A climb from missed approach altitude to cruising level/altitude;

(iii) the cruise from top of climb to top of descent;

(iv) Descent from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure; and

(v) executing an approach and landing at the destination alternate aerodrome;

(vi) if two destination alternates are required, alternate fuel must be sufficient to proceed to the alternate which requires the greater amount of alternate fuel;

(e) Final reserve fuel, which must be –

(i) For aeroplanes with reciprocating engines, fuel to fly for 45 minutes; or

(ii) For aeroplanes with turbine power units, fuel to fly for 30 minutes at holding speed at 1 500 feet (450 m) above aerodrome elevation in standard conditions, calculated with the estimated mass on arrival at the alternate or the destination, when no alternate is required;

(f) The minimum additional fuel which must permit –

(i) Holding for 15 minutes at 1 500 feet (450 m) above aerodrome elevation in standard conditions, when a flight is operated under IFR without a destination alternate; and

(ii) Following the possible failure of a power unit or loss of pressurization, based on the assumption that such a failure occurs at the most critical point along the route, the aeroplane to:

• descend as necessary and proceed to an adequate aerodrome; and

• hold there for 15 minutes at 1 500 feet (450 m) above aero-drome elevation in standard conditions; and

• make an approach landing, except that additional fuel is only required, if the minimum amount of fuel calculated in accordance with subparagraphs (1)(b) to (e) above is not sufficient for such an event;

(g) Extra fuel, which is at the discretion of the pilot-in-command.

(2) Decision point procedure

If an owner's or operator's fuel policy includes planning to a destination aerodrome via a decision point along the route, the amount of fuel should be the greater of item (a) or (b) below:

(a) The sum of –

(i) taxi fuel;

(ii) Trip fuel to the destination aerodrome, via the decision point;

(iii) contingency fuel equal to not less than 5% of the estimated fuel consumption from the decision point to the destination aerodrome;

(iv) Alternate fuel, if a destination alternate is required;

(v) final reserve fuel;

(vi) Additional fuel; and

(vii) extra fuel, if required by the pilot-in-command; or

(b) The sum of –

(i) taxi fuel;

(ii) T he estimated fuel consumption from the departure aerodrome to a suitable en route alternate, via the decision point;

(iii) contingency fuel equal to not less than 3% of the estimated fuel consumption from the departure aerodrome to the en route alternate;

(iv) Final reserve fuel;

(v) additional fuel; and

(vi) Extra fuel, if required by the pilot-in-command.

(3) Isolated aerodrome procedure

If an owner's or operator's fuel policy includes planning to an isolated aerodrome for which a
destination alternate does not exist, the amount of fuel at departure must include –

(a) taxi fuel;

(b) trip fuel;

(c) Contingency fuel calculated in accordance with subparagraph (1)(c) above;

(d) Additional fuel if required, but not less than –

(i) for aeroplanes with reciprocating engines, fuel to fly for 45 minutes plus 15% of the flight time planned to be spent at cruising level, or two hours, whichever is the lesser; or

(ii) for aeroplanes with turbine engines, fuel to fly for two hours at normal cruise consumption after arriving overhead the destination aerodrome including final reserve fuel; and

(e) Extra fuel, if required by the pilot-in-command.

(4) Pre-determined point procedure

If an owner's or operator's fuel policy includes planning to a destination alternate where the distance between the destination aerodrome and the destination alternate is such that a flight can only be routed via a predetermined point to one of these aerodromes, the amount of fuel must be the greater of item (a) or (b) below:

(a) The sum of –

(i) taxi fuel;

(ii) Trip fuel from the departure aerodrome to the destination aerodrome, via the predetermined point;

(iii) Contingency fuel calculated in accordance with subparagraph (1)(c) above;

(iv) Additional fuel if required, but not less than –

• for aeroplanes with reciprocating engines, fuel to fly for 45 minutes plus 15% of the flight time planned to be spent at cruising level or two hours, whichever is less; or

• for aeroplanes with turbine engines, fuel to fly for two hours at normal cruise consumption after arriving overhead the destination aerodrome, including final reserve fuel; and

(v) Extra fuel, if required by the pilot-in-command; or

(b) the sum of –

(i) taxi fuel;

(ii) Trip fuel from the departure aerodrome to the alternate aerodrome, via the predetermined point;

(iii) Contingency fuel calculated in accordance with subparagraph (1)(c) above;

(iv) Additional fuel if required but not less than –

• for aeroplanes with reciprocating engines, fuel to fly for 45 minutes; or

• for aeroplanes with turbine engines, fuel to fly for 30 minutes at holding speed at 1 500 feet (450 m) above aerodrome elevation in standard conditions, including final reserve fuel; and

(v) extra fuel, if required by the pilot-in-command.

2. Fuel and oil supply for helicopters

(1) A helicopter employed in the public transport operation category or public transport of cargo operation category, from one landing site to another, on a flight which is in whole or in part an IFR or a night flight, must carry fuel and oil reserves to provide for contingencies to fly to and to execute an approach and a missed approach at the destination landing site, and thence –

(a) To fly to a suitable alternative landing site;

(b) To fly for 30 minutes at holding speed at 1 500 feet above the elevation of the alternative landing site, under standard temperature conditions; and

(c) To execute an approach and landing:

Provided that further reserves equal to 5% of the total required in terms ofitems (a), (b) and (c) must be carried.

(2) helicopter employed in the aerial work category, industrial aid operation category, flying training operation category or private operation category, from landing site to another on a flight which is in whole or in part an IFR or a night flight, must carry fuel and oil reserves to provide for contingencies at least to fly to the destination landing site after having carried out its planned task or tasks (if any) en route, thence to a suitable alternative landing site, and thereafter to fly for a further 20 minutes.

(3) helicopter employed in the public transport category, public transport of cargo category, industrial aid operation category, flying training operation category or private operation category, from one landing site to another on a VFR flight by day, must carry fuel and oil reserves to provide for contingencies –

(a) O fly to the destination landing site, and thereafter for 20 minutes; or

(b) if the flight is over water, to fly to the destination landing site, thence to fly to either a suitable alternative landing site or to the nearest point of land, and thereafter for 30 minutes.

(4) Helicopter employed in the aerial work category must carry fuel and oil reserves to provide for contingencies –

(a) O complete its task or tasks;

(b) O execute an approach and landing at a suitable landing site; and

(c) Hereafter to fly for 10 minutes, or a length of time considered to be the minimum for a safe flight for the particular helicopter, whichever is the longer.

(5) A helicopter employed in any category on a VFR flight by day may carry fuel and oil additional to that available to the powerplant, provided that this is carried in a safe manner. The additional fuel and oil may be included in the quantities specified in subparagraphs (3) and (4): Provided that for the purpose of self-refuelling there must be a safe landing site en route, which can be reached before the levels specified in subparagraph (4)(c) are reached.

91.07.25 COMMENCEMENT AND CONTINUATION OF APPROACH

1. Conversion of reported visibility

The RVR value may be obtained by converting the reported visibility in accordance with TS 91.07.5.

91.07.29 ADDITIONAL REQUIREMENTS FOR SINGLE-PILOT OPERATIONS UNDER IFR

1. Single Pilot IFR Requirements

The standard for the operation of an aeroplane with passengers on board in IFR flight without a second-in-command is:

(1) The pilot shall have a minimum of 1000 hours of flight time which shall include, if the type to be flown is multi-engined, 100 hours on multi-engined aeroplanes. In addition, the pilot shall have 50 hours of simulated or actual flight in IMC, and a total of 50 hours flight time on the aeroplane type;

(2) The Pilot Proficiency Check shall be in the aeroplane type flown or if applicable in one of the types grouped for Pilot Proficiency Check renewals and shall include the following:

(a) Knowledge of the auto-pilot operations and limitations;

(b) Performance of normal and emergency procedures without assistance;

(c) Passenger briefing with respect to emergency evacuation; and

(d) Demonstration of the use of the auto-pilot during appropriate phases of flight;

(3) Flight in pressurized aeroplanes shall be conducted at or below FL 250; and

(4) A pilot's single pilot proficiency, if still valid, is transferable between air operators which have an Air Operator Certificate authority to conduct such operations and utilize the same type and model of aeroplane.

2. Aircraft equipment

Each aircraft operated under single pilot IFR flight must meet the additional equipment requirements prescribed in MCAR 91.04.6.

91.08.4 TRAINING AND QUALIFICATIONS FOR LOW VISIBILITY

1. General

(1) An owner or operator must ensure that flight deck crew member training programmes for low visibility operations include structured courses of ground, simulator and/or flight training. The owner or operator may abbreviate the course content as prescribed by subparagraphs (2), (3) and (4) below provided the content of the abbreviated course is acceptable to the Commissioner.

(2) Flight deck crew members with no Category II or Category III experience must complete the full training programme prescribed in paragraphs 2, 3 and 4 below.

(3) Flight deck crew members with Category II or Category III experience with another owner or operator may undertake an abbreviated ground training course.

(4) Flight deck crew members with Category II or Category III experience with the owner or operator may undertake an abbreviated ground simulator and/or flight training course. The abbreviated course is to include at least the requirements of paragraph 4(1) or 4(4)(a) or (b) as appropriate.

2. Ground training

An owner or operator must ensure that the initial ground training course for low visibility operations covers at least –

(1) The characteristics and limitations of the ILS and/or MLS;

(2) The characteristics of the visual aids;

(3) The characteristics of fog;

(4) The operational capabilities and limitations of the particular airborne system;

(5) The effects of precipitation, ice accretion, low level wind shear and turbulence;

(6) the effect of specific aircraft malfunctions;

(7) The use and limitations of RVR assessment systems;

(8) The principles of obstacle clearance requirements;

(9) Recognition of and action to be taken in the event of failure of ground equipment;

(10) the procedures and precautions to be followed with regard to surface movement during operations when the RVR is 400 m or less and any additional procedures required for take-off in conditions below 150 m (200 m for Category D aeroplanes) or with visibility less than 225 m;

(11) The significance of decision heights based upon radio altimeters and the effect of terrain profile in the approach area on radio altimeter readings and on the automatic approach/landing systems;

(12) The importance and significance of alert height, if applicable, and the action in the event of any failure above and below the alert height;

(13) The qualification requirements for pilots to obtain and retain approval to conduct low visibility take-offs and Category II or III operations; and

(14) The importance of correct seating and eye position.

3. Simulator training and/or flight training

(1) An owner or operator must ensure that simulator and/or flight training for low visibility operations includes –

(a) Checks of satisfactory functioning of equipment, both on the ground and in flight;

(b) Effect on minima caused by changes in the status of ground installations;

(c) Monitoring of automatic flights control systems and Autoland status annunciators with emphasis on the action to be taken in the event of failures of such systems;

(d) Actions to be taken in the event of failures such as engines, electrical systems, hydraulics or flight control systems;

(e) The effect of known unserviceabilities and use of minimum equipment lists;

(f) operating limitations resulting from airworthiness certification;

(g) guidance on the visual cues required at decision height together with information on maximum deviation allowed from glidepath or localiser; and

(h) The importance and significance of alert height, if applicable, and the action in the event of any failure above and below the alert height.

(2) An owner or operator must ensure that each flight deck crew member is trained to carry out his or her duties and instructed on the coordination required with other flight crew members. Maximum use must be made of suitably equipped flight simulators for this purpose.

(3) Training must be divided into phases covering normal operation with no aircraft or equipment failures but including all weather conditions which may be encountered and detailed scenarios of aircraft and equipment failure which could affect Category II or III operations. If the aircraft system involves the use of hybrid or other special systems (such as head up displays or enhanced vision equipment) then flight deck crew members must practise the use of these systems in normal and abnormal modes during the simulator phase of training.

(4) Incapacitation procedures appropriate to low visibility take-offs and Category II and III

Operations must be practised.

(5) For aircraft with no type specific simulator, owners or operators must ensure that the flight training phase specific to the visual scenarios of Category II operations is conducted in a simulator approved for that purpose by the Commissioner. Such training must include a minimum of 4 approaches. The training and procedures that are type specific must be practiced in the aircraft.

(6) Category II and III training must include at least the following exercises:

(a) Approach, using the appropriate flight guidance, autopilots and control systems installed in the aircraft, to the appropriate decision height and to include transition to visual flight and landing;

(b) approach with all engines operating using the appropriate flight guidance systems, autopilots and control systems installed in the aircraft down to the appropriate decision height followed by missed approach, all without external visual reference;

(c) Where appropriate, approaches utilising automatic flight systems to provide automatic flare, landing and roll-out; and

(d) Normal operation of the applicable system both with and without acquisition of visual cues at decision height.

(7) Subsequent phases of training must include at least –

(a) Approaches with engine failure at various stages on the approach;

(b) Approaches with critical equipment failures (eg electrical systems, autoflight systems, ground and/or airborne ILS/MLS systems and status monitors);

(c) Approaches where failures of autoflight equipment at low level require either –

(i) reversion to manual flight to control flare, landing and roll out or missed Approach; or

(ii) Reversion to manual flight or a downgraded automatic mode to control missed approaches from, at or below decision height including those which may result in a touchdown on the runway;

(d) Failures of the system which will result in excessive localiser and/or glideslope deviation, both above and below decision height, in the minimum visual conditions authorised for the operation. In addition, a continuation to a manual landing must be practised if a head-up display forms a downgraded mode of the automatic system or the head-up display forms the only flare mode; and

(e) Failures and procedures specific to aircraft type or variant.

(8) The training programme must provide practice in handling faults which require a reversion to higher minima.

(9) The training programme must include the handling of the aircraft when, during a fail passive Category III approach, the fault causes the autopilot to disconnect at or below decision height when the last reported RVR is 300 m or less.

(10) Where take-offs are conducted in RVRs of 400 m and below, training must be established to cover systems failures and engine failure resulting in continued as well as rejected take-offs.

4. Conversion training requirements to conduct low-visibility take-off and Category II and III operations

An owner or operator must ensure that each flight deck crew member completes the following low visibility procedures training if converting to a new type or variant of aircraft in which low visibility take-off and Category II and III operations will be conducted. The flight deck crew member experience requirements to undertake an abbreviated course are prescribed in paragraphs 1(3) and (4).

(1) Ground training

The appropriate requirements prescribed in paragraph 2 above, taking into account the flight deck crew member's Category II and Category III training and experience.

(2) Simulator training and/or flight training

(a) A minimum of 8 approaches and/or landings in a simulator approved for the purpose.

(b) Where no type-specific simulator is available, a minimum of 3 approaches including at least 1 go-around is required on the aircraft.

(c) Appropriate additional training if any special equipment is required such as head-up displays or enhanced vision equipment.

(3) Flight deck crew qualification

The flight deck crew qualification requirements are specific to the owner or operator and the type of aircraft operated.

(a) The owner or operator must ensure that each flight deck crew member completes a check before conducting Category II or III operations.

(b) The check prescribed in item (a) above may be replaced by successful completion of the simulator and/or flight training prescribed in paragraph 4(2).

(4) Line flying under supervision

An owner or operator must ensure that each flight crew member undergoes the following line flying under supervision –

(a) For Category II when a manual landing is required, a minimum of 3 landings from autopilot disconnect; and

(b) for Category III, a minimum of 3 autolands except that only 1 autoland is required when the training required in paragraph 4(2) above has been carried out in a full flight simulator usable for zero flight time training.

5. Type and command experience

The following additional requirements are applicable to pilot-in-commands who are new to the aircraft type:

(1) 50 hours or 20 sectors as pilot-in-command on the type before performing any Category II or Category III operations; and

(2) 100 hours or 40 sectors as pilot-in-command on the type. 100 m must be added to the applicable Category II or Category III RVR minima unless he or she has previously qualified for Category II or III operations with another owner or operator.

(3) The Commissioner may authorize a reduction in the above command experience requirements for flight crew members who have Category II or Category III command experience.

6. Low-visibility take-off with RVR less than 150/200 m or visibility less than 225 m

(1) An owner or operator must ensure that prior to authorization to conduct take-offs in RVRs below 150 m (below 200 m for Category D aeroplanes) or with visibility less than 225 m the following training is carried out:

(a) Normal take-off in minimum authorized conditions or RVR conditions;

(b) take-off in minimum authorized conditions or RVR conditions with an engine failure between V1 and V2, or as soon as safety considerations permit; and

(c) take-off in minimum authorized conditions or RVR conditions with an engine failure before V1 resulting in a rejected take-off.

(2) An owner or operator must ensure that the training required by subparagraph (1) above is carried out in an approved simulator. This training must include the use of any special procedures and equipment. Where no approved simulator exists, the Commissioner may approve such training in an aircraft without the requirement for minimum conditions or RVR conditions.

(3) An owner or operator must ensure that a flight crew member has completed a check before conducting low visibility take-offs in RVRs of less than 150 m (less than 200 m for Category D aeroplanes) or in visibility less than 225 m if applicable. The check may only be replaced by successful completion of the simulator and/or flight training prescribed in subparagraph (1) on initial conversion to an aircraft type.

7. Recurrent training and checking – low-visibility operations

(1) An owner or operator must ensure that, in conjunction with the normal recurrent training and proficiency checks, a pilot's knowledge and ability to perform the tasks associated with the particular category of operation, including LVTO, for which he or she is authorized, is checked. The required number of approaches to be conducted during such recurrent training is to be a minimum of two, one of which is to be a

Missed approach and at least one low visibility take off to the lowest applicable minima. The period of validity for this check is 6 months including the remainder of the month of issue.

(2) For Category III operations an owner or operator must use a flight simulator approved for Category III training.

(3) An owner or operator must ensure that, for Category III operations on aeroplanes with a fail passive flight control system, a missed approach is completed at least once every 18 months as the result of an autopilot failure at or below decision height when the last reported RVR was 300 m or less.

(4) The Commissioner may authorize recurrent training for Category II operations in an aircraft type where no approved simulator is available.

8. LVTO and Category II or III recency requirements

(1) An owner or operator must ensure that, in order for pilots to maintain a Category II and Category III qualification, they have conducted a minimum of 3 approaches and landings using approved Category II or III procedures during the previous six month period, at least one of which must be conducted in the aircraft.

(2) Recency for LVTO is maintained by retaining the Category II or III qualification prescribed in subparagraph (1) above.

(3) An owner or operator may not substitute this recency requirement for recurrent training.

91.10.2 REPORT OF DEFECTS

(1) An owner or operator of aircraft over 5,700 kg maximum take-off weight shall report to the Director General any failures, malfunctions, or defects that result in at least the following:

(a) Fires during flight and whether the related fire-warning system properly operated;

(b) Fires during flight not protected by a related fire-warning system;

(c) false fire warning during flight;

(d) An engine exhaust system that causes damage during flight to the engine, adjacent structure, equipment, or components;

(e) An aircraft component that causes accumulation or circulation of smoke, vapour, or toxic or noxious fumes in the crew compartment or passenger cabin during flight;

(f) Engine shutdown during flight because of flameout;

(g) Engine shutdown during flight when external damage to the engine or aircraft structure occurs;

(i) Engine shutdown during flight due to foreign object ingestion or icing;

(j) shutdown during flight of more than one engine;

(k) A propeller feathering system or ability of the system to control overspeed during flight;

(l) a fuel or fuel-dumping system that affects fuel flown or causes hazardous leakage during flight;

(m) An unintended landing gear extension or retraction, or opening or closing of landing gear doors during flight;

(n) Brake system components that result in loss of brake actuating force when the aircraft is in motion on the ground;

(o) aircraft structure that requires major repair;

(p) Cracks, permanent deformation, or corrosion of aircraft structure, if more than the maximum acceptable to the manufacture or the Director General;

(q) Aircraft components or system malfunctions that result in taking emergency actions during flight, except action to shut down an engine;

(r) each interruption to a flight, unscheduled change of aircraft en route, or unscheduled stop or diversion from a route, caused by knowing or suspected technical difficulties or malfunctions;

(s) Any abnormal vibration or buffeting caused by a structural or system malfunction, defect, or failure;

(t) a failure or malfunction of more than one attitude, airspeed, or altitude instrument during a given operation of the aircraft;

(u) the number of engines removed prematurely because of malfunction, failure or defect, listed by make and model and the aircraft type in which it was installed; or

(v) The number of propeller featherings in flight, listed by type of propeller and engine and aircraft on which it was installed.

(2) Each report required by paragraph (1) above shall -

(a) be made within 3 days after determining that the failure, malfunction, or defect required to be reported has occurred; and

(b) Include as much of the following information as is available and applicable -

(i) aircraft serial number;

(ii) When the failure, malfunction, or defect is associated with an article approved under a TSO authorization, the article serial number and model designation, as appropriate;

(iii) When the failure, malfunction or defect is associated with an engine or propeller, the engine or propeller serial number, as appropriate;

(iv) Product model;

(v) Identification of the part, component, or system involved, including the part number; and

(vi) Nature of the failure, malfunction, or defect.

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