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CONTENTS

Page

General Notice

MINISTRY OF WORKS, TRANSPORT AND COMMUNICATION

No. 81 2003

PROPOSED CIVIL AVIATION TECHNICAL STANDARDS
NAM-CATS-OPS 135 "AIR TRANSPORT OPERATIONS -
SMALL AEROPLANES"

The Ministry of Works, Transport and Communication recently initiated the project to update the current Namibian aviation legislation. There are two main reasons for updating the aviation legislation, namely, the current legislation does not adequately reflect the policies of Namibia for the aviation sector and does not reflect recent developments within SADC. The project further aims to enhance the safety of civil aviation by ensuring that the Namibian legislation complies with the minimum standards prescribed by the International Civil Aviation Organization.

In this regard the legislative reform process involves the updating of the regulations made under the Aviation Act (Act No. 74 of 1962). It also involves the issuing Technical Standards by the Director of Civil Aviation.

The Technical Standard proposed in this General Notice is one of thirty four (34) technical standards associated with the Namibian Civil Aviation Regulations, 2001.

Pursuant to the provisions of regulation 11.03.2 the Director: Civil Aviation hereby invites all interested parties to comment on the proposed NAM-CATS-OPS 135 "Air Transport Operations - Small Aeroplanes".

Comments or representations should be lodged in writing and should reach the Ministry no later than 30 days from the date of publication of this notice. Correspondence should be addressed to:

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REPUBLIC OF NAMIBIA

CIVIL AVIATION

DOCUMENT NAM-CATS-OPS 135 (AIR TRANSPORT OPERATIONS - SMALL AEROPLANES)

NAMIBIAN CIVIL AVIATION TECHNICAL STANDARDS RELATING TO AIR TRANSPORT OPERATIONS : SMALL AEROPLANES

1. GENERAL

Section 22A of the Aviation Act, 1962 (as amended by section 5 of the Aviation Amendment Act, 1998) empowers the Director: Civil Aviation to issue technical standards for civil aviation on the matters which are prescribed by regulation.

The Director: Civil Aviation has pursuant to the empowerment mentioned above, on (date) issued technical standards relating to air transport operations: small aeroplanes to be known as Document NAM-CATS-OPS 135.

2. PURPOSE

Document NAM-CATS-OPS 135 contains the standards, rules, requirements, methods, specifications, characteristics and procedures which are applicable in respect of air transport operations: small aeroplanes.

Each reference to a technical standard in this document, is a reference to the corresponding regulation in the Namibian Civil Aviation Regulations, 2001, for example, technical standard 135.02.8 refers to regulation 8 of Subpart 2 of Part 135 of the Regulations.

The abbreviation "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

135.01.5 INFORMATION ON EMERGENCY AND SURVIVAL EQUIPMENT CARRIED
1. Emergency and survival list

135.01.9 ELECTRONIC DEVICES
1. Operation of electronic devices on board a small aeroplane during flight time

135.01.15 SUBCHARTERING
1. Subchartering

135.02.7 DUTIES OF PILOT-IN-COMMAND REGARDING FLIGHT PREPARATION
1. Category II approach
2. Category III approach
3. Adequate and suitable aerodromes

135.02.10 FLIGHT TIME AND DUTY SCHEME
1. Definitions
2. Requirements of the Civil Aviation Regulations, 2001
3. Operators' schemes and their approval
4. General principles of control of flight, duty and rest time
5. Responsibilities of flight crew members
6. Standard provisions required for an operator's scheme
7. Limitations of single flight duty periods - flight crew

8. Rest periods
9. Duty periods
10. Days off
11. Cumulative duty and flying hours
12. Records to be maintained

135.03.1 TRAINING OF FLIGHT CREW MEMBERS
1. Training syllabus

135.03.3 CONVERSION TRAINING
1. Operator's type conversion training course syllabus
2. Crew resource management training

135.03.5 UPGRADING TO PILOT-IN-COMMAND
1. Crew resource management training

135.03.7 RECURRENT TRAINING AND CHECKING
1. Crew resource management training

135.03.8 PILOT QUALIFICATION TO OPERATE IN EITHER PILOT'S SEAT
1. Training

135.04.3 OPERATIONS MANUAL
1. Structure of operations manual
2. Contents of operations manual
3. General

135.04.6 OPERATIONAL FLIGHT PLAN
1. Items in operational flight plan

135.04.7 FLIGHT PLAN
1. Items in a flight plan

135.04.8 TECHNICAL LOG
1. Information to be contained in a technical log

135.04.14 RECORDS OF EMERGENCY AND SURVIVAL EQUIPMENT
1. Emergency and survival equipment list

135.04.17 DOCUMENT STORAGE PERIODS

135.05.9 FLIGHT RECORDER
1. Flight recorder specifications

135.05.11 COCKPIT VOICE RECORDER
1. Types of aeroplanes

135.05.12 FLIGHT DATA RECORDER
1. Types of aeroplanes

135.05.17 STANDARD FIRST AID KIT
1. Standard first aid kits

135.05.18 FIRST AID OXYGEN
1. Supply of first aid oxygen
2. Oxygen equipment

135.05.19 SUPPLEMENTAL OXYGEN IN CASE OF PRESSURISED AEROPLANE

1. General
2. Oxygen equipment and supply requirements
3. Minimum requirements for supplemental oxygen for pressurised aeroplane
4. Quick donning mask

135.05.20 SUPPLEMENTAL OXYGEN IN CASE OF NON-PRESSURISED AEROPLANE

1. General
2. Oxygen supply requirements
3. Minimum requirements for supplemental oxygen for non-pressurised aeroplanes

135.05.22 HAND HELD FIRE EXTINGUISHERS

1. Definitions
2. Hand fire extinguishers

135.05.24 AUTOMATIC EMERGENCY LOCATOR TRANSMITTER

1. Distress frequencies
2. Types of ELTs
3. Installation

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

1. Equipment

135.05.27 SURVIVAL EQUIPMENT

1. Survival equipment
2. Interpretation
3. Additional survival equipment
4. Duplicates
5. Location

135.05.29 COMMUNICATION EQUIPMENT

1. General
2. Radio equipment
3. Audio selector panel
4. Radio equipment for operations under VFR over routes navigated by reference to visual landmarks
5. Communication and navigation equipment for operations under IFR, or under VFR over routes not navigated by reference to visual landmarks
6. Communication and navigation equipment using the Global Positioning System
7. Operational standards for inertial navigation and reference systems

135.06.2 QUALITY ASSURANCE SYSTEM

1. Minimum standards for a quality assurance system
2. Compliance with procedures for operations inspection, certification and continued surveillance

135.06.5 APPLICATION FOR AIR OPERATOR CERTIFICATE OR AMENDMENT THEREOF

1. Form of application

135.06.6 ASSESSMENT OF APPLICATION AND ISSUING OF CERTIFICATE

24. Form of certificate

135.06.11 STATISTICAL INFORMATION
25. Statistical information

135.06.15 RENEWAL OF CERTIFICATE
1. Form of application

135.07.2 APPLICATION FOR FOREIGN AIR OPERATOR PERMIT OR AMENDMENT THEREOF
1. Form of application

135.07.3 ADJUDICATION OF APPLICATION AND ISSUING OF PERMIT
1. Form of permit

135.07.7 RENEWAL OF PERMIT
1. Form of application

135.08.1 ROUTES AND AREAS OF OPERATION
1. Time/distance limitations
2. Adequate aerodrome

135.08.10 AERODROME OPERATING MINIMA
1. Take-off minima
2. Non-precision approach
3. Precision approach - Category I operations
4. Precision approach - Category II operations
5. Precision approach - Category III operations
6. Circling
7. Visual approach
8. Conversion of reported meteorological visibility to RVR

135.08.11 PLANNING MINIMA FOR IFR FLIGHTS
1. Planning minima for destination alternate aerodromes
2. Planning minima for en route alternate aerodromes (Non-ETOPS Flights)
3. Planning minima for an ETOPS en route alternate aerodrome

135.08.14 MASS AND BALANCE
1. Definition
2. Loading, mass and balance
3. Mass values for crew
4. Mass values for passengers and baggage
5. Mass and balance documentation

135.08.16 FUEL POLICY
1. Contingency fuel

135.08.17 FUEL AND OIL SUPPLY
1. Planning criteria for aeroplanes

135.08.20 NOISE ABATEMENT PROCEDURES
1. Procedures

135.08.29 COMMENCEMENT AND CONTINUATION OF APPROACH
1. Conversion of reported visibility

135.07.37 CARRY-ON BAGGAGE
1. Procedures for stowing of carry-on baggage

135.09.1 AEROPLANE PERFORMANCE CLASSIFICATION
1. Classification

TABLE 6 : GPS TRAINING SYLLABUS

ANNEXURES

ANNEXURE A : PILOT-IN-COMMAND'S DISCRETION REPORT

ANNEXURE B : GLOBAL POSITIONING SYSTEM VERIFICATION DATA SHEET

ANNEXURE C : APPLICATION FOR THE ISSUING OF AN AIR OPERATOR CERTIFICATE
APPLICATION FOR THE AMENDMENT OF AN AIR OPERATOR CERTIFICATE
APPLICATION FOR THE RENEWAL OF AN AIR OPERATOR CERTIFICATE

ANNEXURE D : AIR OPERATOR CERTIFICATE

ANNEXURE E : APPLICATION FOR THE ISSUING OF A FOREIGN AIR OPERATOR PERMIT
APPLICATION FOR THE AMENDMENT OF A FOREIGN AIR OPERATOR PERMIT
APPLICATION FOR THE RENEWAL OF A FOREIGN AIR OPERATOR PERMIT

ANNEXURE F : FOREIGN AIR OPERATOR PERMIT

135.01.5 INFORMATION ON EMERGENCY AND SURVIVAL EQUIPMENT CARRIED

1. Emergency and survival list

The 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.

135.01.9 ELECTRONIC DEVICES

1. Operation of electronic devices on board a small aeroplane during flight time

a) Electronic devices which are not intentional transmitters of radio signals, may, with the prior permission of the pilot-in-command, be operated on board a small aeroplane, but only in the cruise phase of flight.

Examples of such devices are -

(1) laptop computers;

(2) video cameras;

(3) tape recorders;

(4) electronic entertainment devices; and

(5) hand held calculators.

b) Cellular telephones/mobile telephones shall not be operated on board a small aeroplane once the engines have been stated in preparation for a flight and shall remain switched off untill the doors of the aeroplane are opened at the completion of the flight.

135.01.15 SUBCHARTERING

1. Subchartering

An operator may subcharter an aeroplane or crew, or both an aeroplane and crew in circumstances where the operator is faced with an immediate, urgent and unforeseen need for a replacement aeroplane and/or crew.

135.02.7 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, in the case of a manual landing, or 300 m, in the case of an automatic landing.

2. Category III approach

A Category III approach is divided into a -

(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 75 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 135.02.7(1)(s) -

(1) an adequate aerodrome is an aerodrome licensed or approved or a heliport in an urban area approved 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.

135.02.10 FLIGHT TIME AND DUTY SCHEME

1. Definitions

Any word or expression to which a meaning has been assigned in the Aviation Act, 1962, and the Namibian Civil Aviation Regulations, 1999, bears, when used in this technical standard, the same meaning unless the context indicates otherwise, and -

"days off" means periods available for leisure and relaxation, no part of which forms part of a duty period. A single day off must include two local nights. Consecutive days off must include a further local night for each consecutive day off. Whenever possible, and if required by the crew member, days off should be taken in the home environment;

"duty period" means any continuous period throughout which either a flight crew member flies in any aeroplane, whether as a flight crew member or as a passenger, at the behest of his or her employer, or otherwise carries out a required duty in the course of his or her employment. It includes any flight duty period, positioning at the behest of the operator, ground training, office duties, flight watch, home reserve and standby duty;

"flight duty period" means any time during which a person operates in an aeroplane as a member of its flight crew. It starts when the flight crew member is required by an operator to report for a flight, and finishes at on-chocks or engines off, on the final sector for that flight crew member and include 15 minutes of post-flight activities for small operators and 30 minutes for large operators i.e. operators who operate more than 50 aircraft;

"flight watch" means a period of time during which a flight crew member be required to check with the operator at specified times as to whether his or her services as a flight crew member will be required and, should this be the case, will report for duty at the time then specified;

"home reserve" means a period of time during which a flight crew member must be prepared to respond to a call out for flight duties as yet unspecified. The flight crew member must report for duty within a specified time from call out;

"late finish/early start" means any duty that is carried out within any part of the period 0100 to 0650 hours local time, to which a crew member is acclamitized;

"local night" means a period of eight hours falling within the ten hour period from 21h00 to 07h00 local time;

"positioning" means the practice of transferring flight crew from place to place as passengers in surface or air transport at the behest of the operator;

"reporting time" means the time at which a crew member is required by an operator to report for any duty;

"rest period" means a period before starting a flight duty period which is intended to ensure that a flight crew member is adequately rested before a flight;

"sector" means the time between an aircraft first moving under its own power until it next comes to rest after landing, on the designated parking position;

"split duty" means a flight duty period which consists of two or more flight duties which are separated by less than the minimum rest period;

"standby duty" means a period of time during which a flight crew member is in a position to commence a flight duty at once.

2. Requirements of the Namibian Civil Aviation Regulations, 2001

(1) CAR 135.02.10 requires that an operator of an aeroplane must have a scheme for the regulation of flight time and duty periods of the flight crew.

(2) CAR 135.02.10 also requires that a flight crew member may not fly, and an operator may not require that flight crew member to fly, if either has reason to believe that he or she is suffering or is likely to suffer while flying, from such fatigue as may endanger the safety of the aeroplane or of its occupants.

(3) Every flight crew member is required to inform the operator of all flying he or she has undertaken if the cumulative amount of such flying and any scheduled duties is likely to exceed the maximum laid down in the Regulations.

3. Operators' schemes and their approval

(1) An operator must submit a proposed scheme for the regulation of flight time and duty periods and minimum rest periods to the Director for approval.

(2) Any deviation from the approved scheme must be submitted to the Director for approval.

(3) Non-availability of auto pilot or auto stabilisation systems requires a reduction in flight time and duty period in respect of commercial air transport and IFR operations.

4. General principles of control of flight, duty and rest time

(1) The prime objective of any scheme of flight time limitations is to ensure that flight crew members are adequately rested at the beginning of each flight duty period. Aeroplane operators will therefore need to take account of interrelated planning constraints on -

(a) individual duty and rest periods;

(b) the length of cycles of duty and the associated periods of time off; and

(c) cumulative duty hours within specific periods.

(2) Duties must be scheduled within the limits of the operator's scheme. To allow for unforeseeable delays the pilot-in-command may, within conditions prescribed in paragraph 7, 6, use his or her discretion to exceed the limits on the day.

(3) Other general considerations in the sensible planning of duties are -

(a) the need to construct consecutive work patterns which will avoid, as far as possible, such undesirable rostering practices as alternating day/night duties and the positioning of flight crew in a manner likely to result in a serious disruption of established sleep/work patterns;

(b) the need, particularly where flights are carried out on a programmed basis, to allow a reasonable period for the pre-flight notification of duty to flight crew, other than those on standby; and

(c) the need to plan time off and also to ensure that flight crew members are notified of their allocation well in advance.

5. Responsibilities of flight crew members

It is the responsibility of all flight crew members to make optimum use of the opportunities and facilities for rest provided by the operator, and to plan and use their rest periods properly so as to minimise the risk of fatigue.

6. Standard provisions required for an operator's scheme

(1) The standard provisions which the Director regards as the basis for an acceptable scheme of flight and duty limitations and which, if included in an operator's scheme, will facilitate approval by the Director are contained in paragraphs 7 to 13 below.

(2) Although operators are expected to plan their schemes in accordance with the requirements, it is however, recognised that the standard provisions will not necessarily be completely adaptable to every kind of operation. In exceptional circumstances, operators may apply to have variations from the standard provisions included in their schemes. However, such variations should be kept to a minimum and approval will only be granted where an operator can show that these proposed provisions will ensure an equivalent level of protection against fatigue.

7. Limitations of single flight duty periods - flight crew

7.1 **Maximum rostered flight duty periods**

Standard reporting times prior to flight must be specified by the operator. Pre-flight duties are part of the FDP. A period of duty must be allowed for post flight activities: the minimum for large operators i.e. more than 50 aircraft, is 30 minutes and 15 minutes for others. The time spent between reporting for a flight and the completion of post-flight duties determines the length of the subsequent rest period.

The maximum rostered flight duty period (FDP) (in hours) must be in accordance with Table 1, or Table 2 or 3, or Table 4 or 5. Rostering limits in the tables may be extended by in-flight relief or split duty under the terms of paragraphs 7.2 and 7.3. On the day, the pilot-in-command may at his or her discretion further extend the FDP actually worked in accordance with paragraph 7.6.

(1) Maximum FDP - Two-pilot crews : aeroplanes

Table 2 applies when the FDP starts at a place where the flight crew member is acclimatised to local time, and Table 3 applies to other times. To be considered acclimatised for the purpose of this technical standard, a flight crew member must be allowed three consecutive local nights free of duty within a local time zone band which is two hours wide. He or she will thereafter be considered to remain acclimatised to that same time zone band until he or she ends a duty period at a place where local time falls outside this time zone band.

(2) Maximum FDP - Two-pilots plus additional flight crew member : aeroplanes

Table 4 applies when the FDP starts at a place where the flight crew member is acclimatised to local time, and Table 5 applies at other times. To be considered acclimatised for the purposes of this technical standard, a flight crew member must be allowed three consecutive local nights free of duty within a local time zone band which is two hours wide. He or she will thereafter be considered to remain acclimatised to that same time zone band until he or she ends a duty period at a place where local time falls outside this time zone band.

(3) Limits on two flight crew long range operations

(This paragraph does not apply to cabin crew members)

When an aeroplane flight crew comprises only two pilots, the allowable FDP is calculated as follows: A sector scheduled for more than 7 hours is considered as a multi-sector flight, as below:

Scheduled sector times	**Acclimatised to local time Sectors**	**Not acclimatised to local time Sectors**
Sector length over 7 hrs but not more than 9 hrs	2	4
Sector length over 9 hrs but not more than 11 hrs	3	4
Sector length over 11 hrs	4	Not applicable

Table 2 is then entered with the start time of the duty period and the "modified" number of sectors, to determine the allowable FDP.

When an additional, current, type rated pilot is a flight crew member, then these limits do not apply and the permissible FDP is determined by entering Table 2 or 3 with time of start and the actual sectors planned.

7.2 **Extension of flight duty period by in-flight relief**

(1) When any additional flight crew member is carried to provide in-flight relief for the purpose of extending a FDP, he or she must hold qualifications which are equal or superior to those held by the crew member who is to be rested.

(2) When in-flight relief is provided, there must be available, for the flight crew member who is resting, a comfortable reclining seat or bunk separated and screened from the flight deck and passengers.

(3) A total of in-flight rest of less than three hours will not count towards extension of an FDP, but where the total of in-flight rest (which need not be

consecutive) is three hours or more, the rostered FDP may be extended beyond that permitted in Tables 2 and 3 or 4 and 5 by:

(a) If rest is taken in a bunk, a period equal to one half of the total of rest taken, provided that the maximum FDP permissible is 18 hrs (or 19 hrs in the case of cabin crew members); and

(b) if rest is taken in a seat, a period equal to one third of the total of rest taken, provided that the maximum FDP permissible is 15 hrs (or 16 hrs in the case of cabin crew members).

(4) Where a flight crew member undertakes a period of in-flight relief and after its completion is wholly free of duty for the remainder of the flight, that part of the flight following completion of duty may be classed as positioning and be subject to the controls on positioning detailed in paragraph 7.4.

7.3 **Extension of flight duty period by split duty**

When a FDP consists of two or more duties separated by less than a minimum rest period, then the FDP may be extended beyond that permitted in the tables by the amounts indicated below:

Consecutive hour rest	**Maximum extension of the FDP**
Less than 3	Nil
3 - 10	Period equal to half of the consecutive hours rest taken

The rest period must not include the time required for immediate post-flight and pre-flight duties. When the rest period is not more than six hours, it will be sufficient if a quiet and comfortable place is available, not open to the public, but if the rest period is more than six consecutive hours, then a bed must be provided.

7.4 **Positioning**

All time spent on positioning as required by the operator is classed as duty, but positioning does not count as a sector when assessing the maximum permissible FDP. Positioning, as required by the operator, which immediately precedes a FDP, is included as part of the FDP for the purpose of paragraph 7.1.

7.5 **Travelling time**

(1) Travelling time other than that time spent on positioning may not be classed as duty time and may not be included in cumulative totals of duty hours.

Note: Travelling time from home to departure aerodrome can become an important factor if long distances are involved. If the journey time from home to the normal departure aerodrome is lengthy, flight crew members should make arrangements for accommodation nearer to their bases to ensure adequate pre-flight rest.

(2) Where travelling time between the aerodrome and sleeping accommodation provided by the operator exceeds thirty minutes each way, the rest period must be increased by the amount of the excess, or such lesser time as is consistent with a minimum of ten hours at the sleeping accommodation.

(3) When flight crew members are required to travel from their home to an aerodrome other than the one from which they normally operate, the assumed

travelling time from the normal aerodrome to the other aerodrome is classed as positioning and is subject to the controls of positioning detailed in paragraph 7.4.

7.6 **Pilot-in-command's discretion to extend a flight duty period**

(1) A pilot-in-command may, after taking note of the circumstances of other members of the crew, at his or her discretion, extend a FDP beyond the maximum normally permitted in Tables 1, 2, 3, 4 and 5, provided he or she is satisfied that the flight can safely be made. In these circumstances the maximum normally permitted is calculated according to what actually happens, not on what was planned to happen. An extension of 3 hours is the maximum permitted, except in cases of emergency (see Note 2). The operator's scheme must include guidance to pilots-in-command on the limits within which discretion to extend a FDP may be exercised.

(2) Whenever a pilot-in-command so exercises his or her discretion, he or she must report it to the operator and, should the maximum normally permitted be exceeded by more than two hours, both the pilot-in-command and the operator must submit a written pilot-in-command's discretion report - extension of flight duty period, to the Director within thirty days.

Notes: 1. Discretion reports either concerning extension of a flight duty period or reduction of a rest period must be submitted in the form contained in Annexure A. Those reports will be used by the Director when assessing the realism of particular schedules.

2. An emergency in respect of an extension of a flight duty period is a situation which in the judgement of the pilot-in-command presents serious risk to health or safety of crew, passengers, or endangers the lives of others.

7.7 **Delayed reporting time**

When flight crew members are informed of a delay before leaving their place of rest the FDP starts at the new reporting time or four hours after the original reporting time, whichever is the earlier. The maximum FDP is based on the original reporting time. This paragraph does not apply if flight crew members are given ten hours or more notice of a new reporting time.

7.8 **Mixed Simulator and Aircraft Flying**

This paragraph does not apply to cabin attendants.

When a crew member flies in the simulator, either on a check or training flight, or as a Training Captain or Instructor, and then within the same duty period flies as a crew member on a public transport flight, all the time spent in the simulator is counted in full towards the subsequent FDP. Similator flying does not count as a sector, but the FDP allowable is calculated from the report time of the simulator detail.

7.9 **Late Finish/Early Start**

The condition set in this paragraph only applies when a crew member is acclimatized.

(a) Sleep deprivation, leading to the onset of fatigue, can arise if a crew member is required to report early for duty, or finishes a duty late, on a number of consecutive days. Therefore, not more than 3 consecutive duties that occur in any part of the period 0100 to 0659 local time can be undertaken, nor may there be more than 4 such duties in any 7 consecutive days. When a

crew member is occupying suitable accomodation provided by the operator, and the normal journey time from that accommodation to the reporting point at the airfield does not exceed 15 minutes, then 0659 local time may be changed to 0559 local time.

(b) However, crew members who are employed on a regular early morning duty for a maximum of 5 consecutive duties shall work to the following:

(i) The minimum rest period before the start of such a series of duties is 24 hours.

(ii) The duty will not exceed 9 hours, irrespective of the sectors flown.

(iii) At the finish of such a series of duties, crew members will have a minimum of 63 hours free from all duties.

(c) Should a crew member be scheduled for duty that occurs during any part of the period 0200 to 0459 local time, for a minimum of 2 and a maximum of 3 consecutive nights, then crew members must be free from all duties by 2100 hours local time before covering the block of consecutive night duties, such that the crew members can take a rest period during a local night.

(d) However, crew members who are employed on a regular night duty for a maximum of 5 consecutive nights shall work to the following:

(i) The minimum rest period before the start of such a series of duties in 24 hours.

(ii) The duty will not exceed 8 hours, irrespective of the sectors flown.

(iii) At the finish of such a series of duties crew members will have a minimum of 54 hours free from all duties.

8. Rest periods

(1) It is the responsibility of the operator to notify flight crew members of a flight duty period so that adequate and, within reason, uninterrupted pre-flight rest can be obtained by the flight crew. Away from base, the operator must provide the opportunity and facilities for the flight crew to obtain adequate pre-flight rest. It is the operator's responsibility to ensure that rest accommodation is satisfactory. When operations are carried out at such short notice that it is impracticable for an operator to ensure that rest accommodation is satisfactory, it will be the pilot-in-command's responsibility to obtain satisfactory accommodation.

(2) (a) Each duty period, including flight watch and home reserve, must be preceded by a rest period of at least:

(i) at least as long as the preceding duty period, or

(ii) 12 consecutive hours; whichever is the greater.

(3) Pilot-in-command's discretion to reduce a rest period

A pilot-in-command may, after taking note of the circumstances of other members of the crew, at his or her discretion, reduce a rest period to below the minimum required by paragraph 8(2) and 12(2)(b). The exercise of such discretion must be considered exceptional and should not be used to reduce successive rest periods. A rest period must be long enough to allow flight crew members at least ten hours, at the accommodation where the rest is taken. If a rest period is reduced, the pilot-in-command must submit a report

to his or her employer, and if the reduction exceeds one hour, must submit a written report to the Director within fourteen days. (See note 1 to paragraph 7.6(2)).

(4) For the purpose of calculating the minimum rest period before commencement of duties, the required post flight duties on completion of the previous FDP is added to such FDP.

9. Duty periods

(1) The following limits apply:

Duty	Maximum duration
Flight watch	No limit*
Home reserve	No limit*
Positioning	No maximum**
Standby	Maximum 12 hours (not necessarily consecutive) in any 24 hour period
Standby + FDP	20 hours

* However, the provisions of item (2) applies.

** However, the provisions of paragraph 7.4 applies.

(2) For the purpose of calculating duty time, the following applies:

(a) For the calculation of accumulated duty time in terms of paragraph 11, flight watch and home reserve is credited on the basis of eight hours for every period of twenty four or fewer consecutive hours, or on a one-for-one basis, whichever is the lesser.

(b) Standby duty time must count fully as duty time for the calculation of accumulated duty time in terms of paragraphs 8(2)(c) and (d) and 11.

(c) See paragraph 7.4 in respect of positioning time.

10. Days off

Flight crew members must -

(1) not work more than seven consecutive days between days off; and

(2) have two consecutive days off in any consecutive fourteen days; and

(3) have a minimum of six days off in any consecutive four weeks at the aerodrome from which they normally operate; and

(4) have an average of at least eight days off in each consecutive four week period, averaged over three such periods.

11. Cumulative duty and flying hours

Maximum cumulative duty hours for flight crew shall not exceed;

55 hours in 1 week, but may be increased to
60 hours, when a rostered duty covering a
series of duty periods, once commenced, is
subject to unforseen delays

95 hours in any 2 consecutive weeks and
190 hours in any 4 consecutive weeks.

When a crew member is not rostered for either standby or flying duties for 28 or more consecutive days then any duty hours worked need to be added to cumulative totals. However, when a crew member is anticipated to return to either standby or flying duties the duty hours worked in the 28 days preceding that duty must be recorded. Before allocating a flying duty to a crew member the operator must be satisfied that the crew member is in compliance with the scheme.

Calculation of Cumulative Duty Hours (all aircraft)

Duty hours shall be added to cumulative totals in accordance with the following:

(a) To count in full:

(i) Duty periods and flying duty periods, plus subsequent post-flight duties.
(ii) All standby duty, except that specified in (b)(i) and (ii) below
(iii) The time spent on positioning

(b) To count as half the time on duty:

(i) The standby duty, when the period of notice given to the crew member by the operator before reporting for duty, is treble or more the specified minimum report time.
(ii) The standby duty when undertaken at home, or in suitable accommodation provided by the operator, takes place during the period 2200 to 0800 hours, and the crew member can take undisturbed rest and is not called out for duty.

12. Cabin crew members

(1) The requirements detailed in this paragraph are applicable to all cabin crew members carried as cabin crew members.

(a) The limitations which apply to cabin crew members are those contained in paragraphs 7 to 11.

12. Records to be maintained

An operator must retain all pilot-in-command discretion reports of extended flight duty periods and reduced rest periods for a period of at least six months.

135.03.1 TRAINING OF FLIGHT CREW MEMBERS

1. Training syllabus

The training syllabus for flight crew members required in terms of CAR 135.03.1, is -

(1) the syllabi prescribed in Part 61, for initial training;

(2) the syllabi prescribed in TS 135.03.3 for conversion training;

(3) the syllabi prescribed in TS 135.03.4 and 135.03.6, for differences training and familiarisation training and recurrent training and checking; and

(4) the syllabi prescribed in Part 92 for initial and refresher dangerous goods training.

135.03.3 CONVERSION TRAINING

1. Operator's type conversion training course syllabus

(1) An operator's type conversion course syllabus must include the following items:

(a) Ground training and checking including aeroplane systems, normal, abnormal and emergency procedures;

(b) emergency and safety equipment training and checking which must be completed before aeroplane training commences;

(c) crew resource management training;

(d) aeroplane/simulator training and checking; and

(e) operational flying under supervision and check.

(2) The type conversion course must be conducted in the order set out in subparagraph (1) above.

2. Crew resource management training

2.1 **Procedures**

(1) If the flight crew member has not previously completed an operator's conversion course, the operator must ensure that a crew resource management (CRM) course with a full length syllabus is completed. The flight crew member should not be assessed either during or upon completion of this course.

(2) If the flight crew member undergoes a subsequent conversion course with the same or another operator, he or she should complete the appropriate elements of the CRM course. The flight crew member should not be assessed either during or upon completion of this training.

(3) Recurrent training:

(a) Where an operator utilises line orientated flying training (LOFT) in the recurrent training programme, the flight crew member should complete elements of CRM training. The flight crew member should not be assessed.

(b) Where an operator does not utilise LOFT, the flight crew member should complete elements of CRM training every year. The flight crew member should not be assessed.

(c) An operator should ensure that flight crew members complete the major elements of the full length CRM course over a four year recurrent training cycle. The flight crew member completing this refresher training should not be assessed.

(d) When a flight crew member undergoes an operator proficiency check, operational check or command course, then CRM skills should be included in the overall assessment.

(4) The successful resolution of aeroplane emergencies requires interaction between flight crew and emphasis should be placed on the importance of effective coordination and two-way communication between all flight crew members in various emergency situations. Initial and recurrent CRM training should include joint practice in aeroplane evacuations so that all who are involved are aware of the duties each flight crew member should perform. When such practice is not possible, the training should include joint discussion of emergency scenarios.

2.2 **Objective and contents**

(1) CRM is the effective utilisation of all available resources (e.g. flight crew members, aeroplane systems and supporting facilities) to achieve safe and efficient operation.

(2) The objective of CRM is to enhance the communication and management skills of the flight crew member concerned. The emphasis is placed on the non-technical aspects of flight crew performance.

(3) CRM training should include the following elements:

(a) Statistics and examples of human factor related accidents;

(b) human perception, learning process;

(c) situational awareness;

(d) management of workload, tiredness or fatigue, and vigilance - management of stress;

(e) operator's standard operating procedures;

(f) personality type, delegation, leadership, effective communication skills;

(g) the CRM loop:

Notion of energy { Inquiry (or explore, examine, scrutinise)
Conflict resolution
Decision making
Critique
Feedback

(h) effective communication and co-ordination within the flight crew, and between flight crew members and other operational personnel (air traffic service, maintenance personnel, etc.);

(i) error chain and taking actions to break the error chain; and

(j) implications of automation on CRM.

(4) CRM training should also address the nature of the operator's operations as well as the associated flight crew operating procedures. This will include areas of operations which produce particular difficulties, adverse climatological conditions and any unusual hazards.

(5) CRM training should include both:

(a) Classroom training; and

(b) practical exercises including group discussions and accident reviews to analyse communication problems and instances or examples of a lack of information or flight crew management.

(6) Ideally, the CRM training course should last a minimum of 3 days, but providing the whole syllabus is covered, then a 2 day course may be acceptable. A one day course for single-pilot operations may be acceptable.

(7) As part of the operations manual, the CRM course (for conversion and recurrent training) is approved by the Director. An operator may use a course provided by another operator, if that course has already been approved.

135.03.8 PILOT QUALIFICATION TO OPERATE IN EITHER PILOT'S SEAT

1. Training

(1) A pilot-in-command required to operate in the right-hand seat and carry out the duties of co-pilot, or a pilot-in-command required to conduct training or examining duties from the right-hand seat, must complete additional training and checking as specified in the operations manual, concurrent with the operator proficiency checks prescribed in CAR 135.03.7. This additional training must include at least the following:

(a) An engine failure during take-off;

(b) a one-engine inoperative approach and go-around;

(c) a one-engine inoperative landing; and

(d) Category II or Category III operations, if applicable.

(2) When engine-out manoeuvres are carried out in the aeroplane, the engine failure must be simulated.

(3) When operating in the right-hand seat, the checks required for operating in the left-hand seat must, in addition, be valid and current.

(4) A pilot relieving as pilot-in-command, must demonstrate practice of drills and procedures, concurrent with the operator proficiency checks prescribed in CAR 135.03.7, which would otherwise have been the responsibility of the pilot-in-command. Where the differences between left and right seats are not significant (for example because of use of autopilot) then practice may be conducted in either seat.

(5) A pilot other than the pilot-in-command occupying the left-hand seat, must demonstrate practice of drills and procedures, concurrent with the operator proficiency checks prescribed in CAR 135.03.7, which would otherwise have been the pilot-in-command's responsibility acting as pilot non-flying. Where the differences between left and right seats are not significant (for example because of use of autopilot) then practice may be conducted in either seat.

135.04.3 OPERATIONS MANUAL

1. Structure of operations manual

(1) An operator must ensure that the main structure of the operations manual is as follows:

Part 1 : General

This part must comprise all non type-related operational policies, instructions and procedures needed for a safe operation and must comply with all relevant CARs.

Part 2 : Aeroplane operating matters

This part must comprise all type-related instructions and procedures needed for a safe operation. It must take account of the different types of aeroplanes or variants used by the operator.

Part 3 : Route and aerodrome instructions and information

This part must comprise all instructions and information needed for the area of operation.

Part 4 : Training

This part must comprise all training instructions for personnel required for a safe operation.

(2) An operator must ensure that the contents of the operations manual are in accordance with paragraph 2 of this technical standard, and relevant to the area and type of operation.

(3) An operator must ensure that the detailed structure of the operations manual is approved by the Director.

2. Contents of operations manual

2.1 **PART 1 : GENERAL**

2.1.1 **Administration and control of operations manual**

(1) Introduction

(a) A statement that the manual complies with all applicable CARs and with the terms and conditions of the applicable air operator certificate.

(b) A statement that the manual contains operational instructions that are to be complied with by the relevant personnel.

(c) A list and brief description of the various parts, their contents, applicability and use.

(d) Explanations and definitions of terms and words needed for the use of the manual.

(2) System of amendment and revision

(a) Who is responsible for the issuance and insertion of amendments and revisions.

(b) A record of amendments and revisions with insertion dates and effective dates.

(c) A statement that handwritten amendments and revisions are not permitted except in situations requiring immediate amendment or revision in the interests of aviation safety.

(d) A description of the system for the annotation of pages and their effective dates.

(e) A list of effective pages.

(f) Annotation of changes (on text pages and, as far as practicable, on charts and diagrams).

(g) Temporary revisions.

(h) A description of the distribution system for the manuals, amendments and revisions.

2.1.2 **Organisation and responsibilities**

(1) Organisational structure

A description of the organisational structure including the general organogram and operations department organogram. The organogram must depict the relationship between the Operations Department and the other Departments of the organisation. In particular, the subordination and reporting lines of all Divisions, Departments etc., which pertain to the safety of flight operations, must be shown.

(2) Nominated postholders

The name of each nominated postholder responsible for flight operations, the maintenance system, flight crew training and ground operations. A description of their function and responsibilities must be included.

(3) Responsibilities and duties of operations management personnel

A description of the duties, responsibilities and authority of operations management personnel pertaining to the safety of flight operations and the compliance with the applicable CARs.

(4) Authority, duties and responsibilities of the pilot-in-command

A statement defining the authority, duties and responsibilities of the pilot-in-command.

(5) Duties and responsibilities of flight crew members other than the pilot-in-command.

A statement defining the duties and responsibilities of flight crew members other than the pilot-in-command.

2.1.3 **Operational control and supervision**

(1) Supervision of the operation by the operator

(a) A description of the system for supervision of the operation by the operator. This must show how the safety of flight operations and the qualifications of personnel are supervised. In particular, the procedures related to the following items must be described:

(b) Licence and qualification validity;

(c) competence of operations personnel; and

(d) control, analysis and storage of records, flight documents, additional information and data.

(2) System of promulgation of additional operational instructions and information

A description of any system for promulgating information which may be of an operational nature but is supplementary to that in the operations manual. The applicability of this information and the responsibilities for its promulgation must be included.

(3) Accident prevention and flight safety programme

(a) A description of the main aspects of the flight safety programme including -

(b) programmes to achieve and maintain risk-awareness by all persons involved in flight operations; and

(c) evaluation of aviation accidents and incidents and the promulgation of related information.

(4) Operational control

A description of the procedures and responsibilities necessary to exercise operational control with respect to flight safety.

2.1.4 **Quality assurance system**

A description of the quality assurance system adopted.

2.1.5 **Flight crew composition**

(1) Flight crew composition

An explanation of the method for determining flight crew compositions taking account of the following:

(a) The type of aeroplane being used;

(b) the area and type of operation being undertaken;

(c) the phase of the flight;

(d) the minimum flight crew requirement and flight time and duty period planned;

(e) experience (total and on type), recency and qualification of the flight crew members; and

(f) the designation of the pilot-in-command and, if necessitated by the duration of the flight, the procedures for the relief of the pilot-in-command or other members of the flight crew.

(2) Designation of the pilot-in-command

The rules applicable to the designation of the pilot-in-command.

(3) Flight crew incapacitation

Instructions on the succession of command in the event of flight crew incapacitation.

2.1.6 **Qualification requirements**

(1) A description of the required licence, rating(s), qualification/competency (e.g. for routes and aerodromes), experience, training, checking and recency for operations personnel to conduct their duties. Consideration must be given to the aeroplane type, kind of operation and composition of the flight crew.

(2) Flight crew

(a) Pilot-in-command

(b) Co-pilot

(c) Pilot under supervision

(d) Operation on more than one type or variant.

(3) Training, checking and supervision personnel for flight crew.

(4) Other operations personnel.

2.1.7 **Flight crew health precautions**

(1) Flight crew health precautions

The relevant regulations and guidance to flight crew members concerning health including -

(a) alcohol and other intoxicating liquor;

(b) narcotics;

(c) drugs;

(d) sleeping tablets;

(e) pharmaceutical preparations;

(f) immunisation;

(g) scuba diving;

(h) blood donation;

(i) meal precautions prior to and during flight;

(j) sleep and rest; and

(k) surgical operations.

Note: See Document NAM-CATS-MR.

2.1.8 **Flight time limitations**

(1) Flight time and duty period limitations and rest requirements

A description of the flight time and duty period limitations and rest requirements prescribed in TS 135.02.10 as applicable to the operation.

(2) Exceedances of flight time and duty period limitations and/or reductions of rest periods

Conditions under which flight time and duty period may be exceeded or rest periods may be reduced and the procedures used to report these modifications.

2.1.9 **Operating procedures**

(1) Flight preparation instructions

As applicable to the operation:

(a) Minimum flight altitudes

A description of the method of determination and application of minimum altitudes including -

(i) a procedure to establish the minimum altitudes/flight levels for VFR flights; and

(ii) a procedure to establish the minimum altitudes/ flight levels for IFR flights.

(b) Criteria for determining the usability of aerodromes

(c) Methods for the determination of aerodrome operating minima

The method for establishing aerodrome operating minima for IFR flights in accordance with TS 135.08.11. Reference must be made to procedures for the determination of the visibility and/or runway visual range and for the applicability of the actual visibility observed by the pilots, the reported visibility and the reported runway visual range.

(d) En route operating minima for VFR flights or VFR portions of a flight and, where single-engine aeroplanes are used, instructions for route selection with respect to the availability of surfaces which permit a safe forced landing.

(e) Presentation and application of aerodrome and en route operating minima

(f) Interpretation of meteorological information

Explanatory material on the decoding of MET forecasts and MET reports relevant to the area of operations, including the interpretation of conditional expressions.

(g) Determination of the quantities of fuel, oil and water methanol carried

The methods by which the quantities of fuel, oil and water methanol to be carried, are determined and monitored in flight. This section must also include instructions on the measurement and distribution of the fluid carried on board. Such instructions must take account of all circumstances likely to be encountered on the flight, including the possibility of in-flight replanting and of failure of one or more of the aeroplane's power plants. The system for maintaining fuel and oil records must also be described.

(h) Mass and centre of gravity

The general principles of mass and centre of gravity including:

(i) Definitions;

(ii) methods, procedures and responsibilities for preparation and acceptance of mass and centre of gravity calculations;

(iii) the policy for using either standard and/or actual masses;

(iv) the method for determining the applicable passenger, baggage and cargo mass;

(v) the applicable passenger and baggage masses for various types of operations and aeroplane types;

(vi) general instruction and information necessary for verification of the various types of mass and balance documentation in use;

(vii) last minute changes procedures;

(viii) specific gravity of fuel, oil and water methanol; and

(ix) seating policy/procedures.

(i) Flight plan

Procedures and responsibilities for the preparation and submission of the flight plan. Factors to be considered include the means of submission for both individual and repetitive flight plans.

(j) Operational flight plan

Procedures and responsibilities for the preparation and acceptance of the operational flight plan. The use of the operational flight plan must be described including samples of the operational flight plan formats in use.

(k) Operator's flight folio

The responsibilities and the use of the operator's flight folio must be described, including samples of the format used.

A technical log may be used in place of a flight folio, if it contains the required information.

(l) List of documents, forms and additional information to be carried.

(2) Ground handling instructions

(a) Fueling procedures

A description of fueling procedures, including -

(i) safety precautions during refueling and defueling including when an APU is in operation or when a turbine engine is running and the prop-brakes are on;

(ii) refueling and defueling when passengers are embarking, on board or disembarking ; and

(iii) precautions to be taken to avoid mixing fuels.

(b) Aeroplane, passengers and cargo handling procedures related to safety

A description of the handling procedures to be used when allocating seats and embarking and disembarking passengers and when loading and unloading the aeroplane. Further procedures, aimed at achieving safety whilst the aeroplane is on the apron, must also be given. Handling procedures must include -

(i) disembarkation of persons;

(ii) sick passengers and persons with reduced mobility;

(iii) transportation of inadmissible passengers, deportees or persons in custody;

(iv) permissible size and weight of hand baggage;

(v) loading and securing of items in the aeroplane;

(vi) special loads and classification of load compartments;

(vii) positioning of ground equipment;

(viii) operation of aeroplane doors;

(ix) safety on the apron, including fire prevention, blast and suction areas;

(x) start-up, apron departure and arrival procedures;

(xi) servicing of aeroplanes;

(xii) documents and forms for aeroplane handling; and

(xiii) multiple occupancy of aeroplane seats.

(c) Procedures for the refusal of embarkation and for disembarkation

Procedures to ensure that persons who appear to be intoxicated or who demonstrate by manner or physical indications that they are under the influence of drugs, except medical patients under proper care, are refused embarkation.

(d) De-icing and anti-icing on the ground

A description of the de-icing and anti-icing policy and procedures for aeroplanes on the ground. These must include descriptions of the types and effects of icing and other contaminants on aeroplanes whilst stationary during ground movements and during take-off. In addition, a description of the fluid types used must be given including -

(i) proprietary or commercial names;

(ii) characteristics;

(iii) effects on aeroplane performance;

(iv) hold-over times; and

(v) precautions during usage.

(3) Flight procedures

(a) VFR/IFR policy

A description of the policy for allowing flights to be made under VFR, or of requiring flights to be made under IFR, or of changing from one to the other.

(b) Navigation procedures

A description of all navigation procedures relevant to the type(s) and area(s) of operation.

Consideration must be given to -

(i) standard navigation procedures including policy for carrying out independent cross-checks of keyboard entries where these affect the flight path to be followed by the aeroplane;

(ii) MNPS and POLAR navigation and navigation in other designated areas;

(iii) RNAV;

(iv) in-flight replanning; and

(v) procedures in the event of system degradation.

(c) Altimeter setting procedures

(d) Altitude alerting system procedures

(e) Ground proximity warning system procedures

(f) Policy and procedures for the use of TCAS/ACAS

(g) Policy and procedures for in-flight fuel management

(h) Adverse and potentially hazardous atmospheric conditions

Procedures for operating in, and/or avoiding, potentially hazardous atmospheric conditions including -

(i) thunderstorms;
(ii) icing conditions;
(iii) turbulence;
(iv) windshear;
(v) jetstream;
(vi) volcanic ash clouds;
(vii) heavy precipitation;
(viii) sand storms;
(ix) mountain waves; and
(x) significant temperature inversions.

(i) Wake turbulence

Wake turbulence separation criteria, taking into account aeroplane types, wind conditions and runway location.

(j) Flight crew members at their stations

The requirements for flight crew members to occupy their assigned stations or seats during the different phases of flight or whenever deemed necessary in the interests of aviation safety.

(k) Use of safety belts for flight crew and passengers

The requirements for flight crew members and passengers to use safety belts and/or harnesses during the different phases of flight or whenever deemed necessary in the interests of aviation safety.

(l) Admission to flight deck

The conditions for the admission to the flight deck of persons other than the flight crew.

(m) Use of vacant flight crew seats

The conditions and procedures for the use of vacant flight crew seats.

(n) Incapacitation of flight crew members

Procedures to be followed in the event of incapacitation of flight crew members in flight. Examples of the types of incapacitation and the means for recognising them, must be included.

(o) Cabin safety requirements

Procedures covering:

(i) Cabin preparation for flight, in-flight requirements and preparation for landing including procedures for securing cabin and galleys;

(ii) procedures to ensure that passengers are seated where, in the event that an emergency evacuation is required, they may best assist and not hinder evacuation from the aeroplane;

(iii) procedures to be followed during passenger embarkation and disembarkation;

(iv) procedures in the event of fueling with passengers on board or embarking and disembarking; and
(v) smoking on board.

(p) Passenger briefing procedures

The contents, means and timing of passenger briefing in accordance with CAR 135.08.24.

(q) Procedures for aeroplanes operated whenever required cosmic or solar radiation detection equipment is carried.

(r) Procedures for the use of cosmic or solar radiation detection equipment and for recording its readings including actions to be taken in the event that limit values specified in the operations manual are exceeded. In addition, the procedures, including ATS procedures, to be followed in the event that a decision to descend or re-route is taken.

(4) All weather operations

(5) ETOPS

(6) Use of the minimum equipment and configuration deviation list(s)

(7) Non revenue flights

Procedures and limitations for -

(a) training flights;
(b) test flights;
(c) delivery flights;
(d) ferry flights;
(e) demonstration flights; and
(f) positioning flights,

including the kind of persons who may be carried on such flights.

(8) Oxygen requirements

(a) An explanation of the conditions under which oxygen must be provided and used.

(b) The oxygen requirements specified for -

(i) flight crew; and
(ii) passengers.

2.1.10 **Dangerous goods and weapons**

(1) Information, instructions and general guidance on the conveyance of dangerous goods including -

(2) operator's policy on the conveyance of dangerous goods;

(a) guidance on the requirements for acceptance, labelling, handling, stowage and segregation of dangerous goods;

(b) procedures for responding to emergency situations involving dangerous goods;

(c) duties of all personnel involved as referred to in a Part 92; and

(d) instructions on the carriage of the operator's employees.

(3) The conditions under which weapons, munitions of war and sporting weapons may be carried.

2.1.11 **Security**

(1) Security instructions and guidance of a non-confidential nature which must include the authority and responsibilities of operations personnel. Policies and procedures for handling and reporting crime on board such as unlawful interference, sabotage, bomb threats, and hijacking must also be included.

(2) A description of preventative security measures and training.

Note: Parts of the security instructions and guidance may be kept confidential.

2.1.12 **Handling of aviation accidents and incidents**

Procedures for the handling, notifying and reporting of aviation accidents and incidents. This section must include -

(1) definitions of aviation accidents and incidents and the relevant responsibilities of all persons involved;

(2) the description of which operator departments, authorities or other institutions have to be notified by which means and in which sequence in case of an aviation accident;

(3) special notification requirements in the event of an aviation accident or incident when dangerous goods are being carried;

(4) a description of the requirements to report specific aviation accidents and incidents;

(5) the forms used for reporting and the procedure for submitting them to the relevant authority must also be included; and

(6) if the operator develops additional safety related reporting procedures for its own internal use, a description of the applicability and related forms to be used.

2.1.13 **Rules of the air**

Rules of the air including -

(1) visual and instrument flight rules;

(2) territorial application of the rules of the air;

(3) communication procedures including COM-failure procedures;

(4) information and instructions relating to the interception of civil aircraft;

(5) the circumstances in which a radio listening watch is to be maintained;

(6) signals;

(7) time system used in operation;

(8) ATC clearances, adherence to flight plan and position reports;

(9) visual signals used to warn an unauthorised aeroplane flying in or about to enter a restricted or prohibited area;

(10) procedures for pilots observing an aviation accident or receiving a distress transmission;

(11) the ground/air visual codes for use by survivors, description and use of signal aids; and

(12) distress and urgency signals.

135.04.3 OPERATIONS MANUAL

2.2 **PART 2 : AEROPLANE OPERATING MATTERS - TYPE RELATED**

Taking account of the differences between types, and variants of types, under the following headings:

2.2.1 **General information and units of measurement**

General information (e.g. aeroplane dimensions), including a description of the units of measurement used for the operation of the aeroplane type concerned and conversion tables.

2.2.2 **Limitations**

A description of the certified limitations and the applicable operational limitations including -

(1) certification status;

(2) passenger seating configuration for each aeroplane type including a pictorial presentation;

(3) types of operation that are approved (e.g. IFR/VFR, CAT II/III, flights in known icing conditions, etc.);

(4) flight crew composition;

(5) mass and centre of gravity;

(6) speed limitations;

(7) flight envelope(s);

(8) wind limits including operations on contaminated runways;

(9) performance limitations for applicable configurations;

(10) runway slope;

(11) limitations on wet or contaminated runways;

(12) airframe contamination; and

(13) system limitations.

2.2.3 **Normal procedures**

The normal procedures and duties assigned to the flight crew, the appropriate checklists, the system for use of the checklists and a statement covering the necessary coordination procedures between flight crew. The following normal procedures and duties must be included:

(1) Pre-flight;

(2) pre-departure;

(3) altimeter setting and checking;

(4) taxi, take-off and climb;

(5) noise abatement;

(6) cruise and descent;

(7) approach, landing preparation and briefing;

(8) VFR approach;

(9) instrument approach;

(10) visual approach and circling;

(11) missed approach;

(12) normal landing;

(13) post landing; and

(14) operation on wet and contaminated runways.

2.2.4 **Abnormal and emergency procedures**

The abnormal and emergency procedures and duties assigned to the flight crew, the appropriate checklists, the system for use of the checklists and a statement covering the necessary coordination procedures between flight crew. The following abnormal and emergency procedures and duties must be included:

(1) Fight crew incapacitation;

(2) fire and smoke drills;

(3) unpressurised and partially pressurised flight;

(4) exceeding structural limits such as overweight landing;

(5) exceeding cosmic radiation limits;

(6) lighting strikes;

(7) distress communications and alerting ATC to emergencies;

(8) engine failure;

(9) system failures;

(10) guidance for diversion in case of serious technical failure;

(11) ground proximity warning;

(12) TCAS warning;

(13) windshear; and

(14) emergency landing/ditching.

2.2.5 **Performance**

(1) Performance data must be provided in a form in which it can be used without difficulty.

(2) Performance data

Performance material which provides the necessary data for compliance with the performance requirements prescribed in Part 1 of this technical standard must be included to allow the determination of -

(a) take-off climb limits - mass, altitude, temperature;

(b) take-off field length (dry, wet, contaminated);

(c) net flight path data for obstacle clearance calculation or, where applicable, take-off flight path;

(d) the gradient losses for banked climbouts;

(e) *en route* climb limits;

(f) approach climb limits;

(g) landing climb limits;

(h) landing field length (dry, wet, contaminated) including the effects of an in-flight failure of a system or device, if it affects the landing distance;

(i) brake energy limits; and

(j) speeds applicable for the various flight stages (also considering wet or contaminated runways).

(3) Supplementary data covering flights in icing conditions

Any certificated performance related to an allowable configuration, or configuration deviation, such as anti-skid inoperative, must be included.

If performance data, as required for the appropriate performance class, is not available in the approved AFM, then other data acceptable to the Director must be included. Alternatively, the operations manual may contain cross-reference to the approved data contained in the AFM where such data is not likely to be used often or in an emergency.

(4) Additional performance data

Additional performance data, where applicable, including -

(a) all engine climb gradients;

(b) drift-down data;

(c) effect of de-icing/anti-icing fluids;

(d) flight with landing gear down;

(e) for aeroplanes with 3 or more engines, one-engine inoperative ferry flights; and

(f) flights conducted under the provisions of the CDL.

2.2.6 **Flight planning**

(1) Data and instructions necessary for pre-flight and in-flight planning including factors such as speed schedules and power settings. Where applicable, procedures for engine(s)-out operations. ETOPS and flights to isolated aerodromes must be included.

(2) The method for calculating fuel needed for the various stages of flight in accordance with TS 135.08.16.

2.2.7 **Mass and balance**

Instructions and data for the calculation of the mass and balance including -

(1) calculation system (e.g. index system);

(2) information and instructions for completion of mass and balance documentation, including manual and computer generated types;

(3) limiting masses and centre of gravity of the various versions; and

(4) dry operating mass and corresponding centre of gravity or index.

2.2.8 **Loading**

Procedures and provisions for loading and securing the load in the aeroplane.

2.2.9 **Configuration deviation list**

The Configuration Deviation List(s) (CDL), if provided by the manufacturer, taking account of the aeroplane types and variants operated including procedures to be followed when an aeroplane is being despatched under the terms of its CDL.

2.2.10 **Minimum equipment list**

The Minimum Equipment List (MEL) taking into account the aeroplane types and variants operated and the type(s)/area(s) of operation.

2.2.11 **Survival and emergency equipment including oxygen**

(1) A list of the survival equipment to be carried for the routes to be flown and the procedures for checking the serviceability of this equipment prior to take-off. Instructions regarding the location, accessibility and use of survival and emergency equipment and its associated checklist(s) must also be included.

(2) The procedure for determining the amount of oxygen required and the quantity that is available. The flight profile, number of occupants and possible cabin decompression must be considered. The information provided must be in a form in which it can be used without difficulty.

2.2.12 **Emergency evacuation procedures**

(1) Instructions for preparation for emergency evacuation including flight crew coordination and emergency station assignment.

(2) Emergency evacuation procedures

A description of the duties of all members of the flight crew for the rapid evacuation of an aeroplane and the handling of the passengers in the event of a forced landing, ditching or other emergency.

2.2.13 **Aeroplane systems**

A description of the aeroplane systems, related controls and indications and operating instructions.

2.3 **PART 3 : ROUTE AND AERODROME INSTRUCTIONS AND INFORMATION**

Instructions and information relating to communications, navigation and aerodromes including minimum flight levels and altitudes for each route to be flown and operating minima for each aerodrome planned to be used, including -

(1) minimum flight level/altitude;

(2) operating minima for departure, destination and alternate aerodromes;

(3) communication facilities and navigation aids;

(4) runway data and aerodrome facilities;

(5) approach, missed approach and departure procedures including noise abatement procedures;

(6) COM-failure procedures;

(7) search and rescue facilities in the area over which the aeroplane is to be flown;

(8) a description of the aeronautical charts that must be carried on board in relation to the type of flight and the route to be flown, including the method to check their validity;

(9) availability of aeronautical information and MET services;

(10) *en route* COM/NAV procedures including holding; and

(11) aerodrome categorisation for flight crew competency qualification.

2.4 **PART 4 : TRAINING**

(1) Training syllabi and checking programmes for all operations personnel assigned to operational duties in connection with the preparation and/or conduct of a flight.

(2) Training syllabi and checking programmes must include:

(a) For flight crew

(i) All relevant items prescribed in Part 61 and Subpart 3 of Part 135;

(b) For operations personnel concerned, including flight crew members:

(i) All relevant items prescribed in Part 92; and

(ii) All relevant items regarding operator security.

(c) For operations personnel other than flight crew members (e.g. dispatcher, handling personnel, etc.)

(i) All other relevant items pertaining to their duties.

(3) Procedures

(a) Procedures for training and checking.

(b) Procedures to be applied in the event that personnel do not achieve or maintain the required standards.

(c) Procedures to ensure that abnormal or emergency situations requiring the application of part or all of abnormal or emergency procedures and simulation of IMC by artificial means, are not simulated during commercial flights.

(4) Description of documentation to be stored and storage periods.

3. General

The operations manual must be drawn up in accordance with the current edition of ICAO Doc 9376-AN/914, "Preparation of an Operations Manual".

135.04.6 OPERATIONAL FLIGHT PLAN

1. Items in operational flight plan

(1) An operator must ensure that the operational flight plan used and the entries made during flight contain the following items:

(a) Aeroplane registration;

(b) aeroplane type and variant;

(c) date of flight;

(d) flight identification;

(e) names of flight crew members;

(f) duty assignment of flight crew members;

(g) place of departure;

(h) time of departure (actual off-block time, take-off time);

(i) place of arrival (planned and actual);

(j) time of arrival (actual landing and on-block time);

(k) type of operation (ETOPS, VFR, ferry flight, etc.);

(l) route and route segments with checkpoints/waypoints, distances, time and tracks;

(m) planned cruising speed and flying times between check-points/ waypoints. Estimate and actual times overhead;

(n) safe altitudes and minimum levels;

(o) planned altitudes and flight levels;

(p) fuel calculations (records of in-flight fuel checks);

(q) fuel on board when starting engines;

(r) alternate(s) for destination and, where applicable, take-off and *en route*, including information required in subparagraphs (l), (m), (n) and (o) above;

(s) initial flight plan clearance and subsequent re-clearance;

(t) in-flight re-planning calculations; and

(u) relevant meteorological information.

(2) Items which are readily available in other documentation or from an acceptable source, or which are irrelevant to the type of operation, may be omitted from the operational flight plan.

(3) The operator must ensure that the operational flight plan and its use is described in the operations manual.

(4) The operator must ensure that all entries in the operational flight plan are made concurrently and that they are permanent in nature.

135.04.7 FLIGHT PLAN

1. Items in a flight plan

(1) A flight plan filed prior to departure must contain the following items:

(a) Aeroplane identification and transponder data;

(b) flight rules and type of flight;

(c) number and type(s) of aeroplane(s) 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) destination aerodrome 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 aeroplane;

(o) other pertinent information; and

(p) name, postal address, telephone and telefax number of the operator or pilot-in-command of the aeroplane which must be completed in field 18 of the standard flight plan form.

(2) A flight plan filed in flight to comply with CAR 135.04.7(6) must contain the following items:

(a) Aeroplane registration;

(b) flight rules;

(c) type of aeroplane;

(d) aerodrome of departure;

(e) cruising speed and flight level;

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

(g) destination aerodrome 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 operator or pilot-in-command of the aeroplane.

135.04.8 TECHNICAL LOG

1. Information to be contained in a technical log

(1) The following information for each flight must be contained in the technical log:

(a) Aeroplane registration;

(b) date;

(c) name(s) 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 operator or pilot-in-command need not keep a technical log or part thereof, if the relevant information is available in other documentation.

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

135.04.14 RECORDS OF EMERGENCY AND SURVIVAL EQUIPMENT

1. Emergency and survival equipment list

The minimum information to be contained in an emergency and survival equipment list, is prescribed in TS 135.01.5.

135.04.17 DOCUMENT STORAGE PERIODS

An operator shall ensure that the following information/documentation is stored in an acceptable form accessible to the Director, for the periods shown in the table below.

Note: ***Additional information relating maintenance records is prescribed in Subpart 10***

Table 1 - Information used for the Preparation and execution of a flight

Information used for the preparation and execution of the flight as described in CAR 135.04.1	
Operation flight plan	3 months
Aeroplane Technical Log	24 months after the date of the last entry
Route specific NOTAM/AIS briefing documentation edited by the operator	3 months
Mass and balance documentation	3 months
Notification of special loads including dangerous goods	3 months

Table 2 - Reports

Reports	
Journey log	3 months
Flight report(s) for recording details of any occurrence, as prescribed in CAR 135.08.41, or any event which the commander deems necessary to report/record	3 months
Reports on exceedances of duty and/ or reducing rest periods	3 months

Table 3 - Flight crew records

Flight Crew Records	
Flight, duty and rest time	15 months
Licence	As long as the flight crew member is exercising the privileges of thelicence for the operator
Conversion training and checking	3 years
Command course (including checking)	3 years
Recurrent training and checking	3 years
Training and checking to operate in either pilot's seat	3 years
Recent experience	15 years
Route and aerodrome competence	3 years
Training and qualification for specific operations when required by Part 135 (e.g. ETOPS CATII/III Operations)	3 years
Dangerous goods training as appropriate	3 years

Table 4 - Cabin crew records

Table 5 - Records for other operations personnel

Records for other operations personnel	
Training/qualification records of other personnel for whom an approved training programme is required by Part 135	*Last 2 training records*

Table 6 - Other records

Other Records	
Records on cosmic and solar radiation dosage	*Until 12 months after the crew member has left the employ of the operator*
Quality system records	*5 years*

135.05.9 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.

135.05.11 COCKPIT VOICE RECORDER

1. Types of aeroplanes

(Reserved.)

135.05.12 FLIGHT DATA RECORDER

1. Types of aeroplanes

(Reserved.)

135.05.17 STANDARDS FIRST AIDKIT

1. Standard first aid kits

(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-diarrhoeal medication e.g. loperamide +;

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

(r) disposable glove; and

(s) a list of contents. This should include information on the effects and side effects of drugs carried.

Note: ***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 aeroplanes 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) The operator or pilot-in-command must ensure that the standard first aid kit is readily accessible for use.

(4) An aeroplane must be equipped with at least one standard first aid kit.

135.05.18 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 litres Standard Temperature Pressure Dry (STPD)/minute/person and provided for the entire flight after cabin depressurisation 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.

(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 litres per minute, STPD. Means may be provided to decrease the flow to not less than two litres per minute, STPD, at any altitude.

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

135.05.19 SUPPLEMENTAL OXYGEN IN CASE OF PRESSURISED AEROPLANE

1. General

(1) The operator or pilot-in-command may not operate a pressurised aeroplane 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 pressurisation 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 aeroplane will descend in accordance with emergency procedures specified in the aeroplane flight manual to a safe altitude for the route to be flown that will allow continued safe flight and landing.

(3) Following a cabin pressurisation failure, the cabin altitude must be considered the same as the aeroplane altitude, unless it is demonstrated to the Director that no probable failure of the cabin or pressurisation system will result in a cabin pressure altitude equal to the aeroplane 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 crew members

(a) Each flight 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, they must be considered as flight crew members on flight deck duty for the purpose of oxygen supply. Flight deck seat occupants, not supplied by the flight crew source, are to be considered as passengers for the purpose of oxygen supply.

(b) Flight 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 crew members whilst at their assigned duty stations.

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

(2) Additional crew members and passengers

(a) Additional crew members and passengers must be supplied with supplemental oxygen in accordance with paragraph 3. Additional 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 additional crew member regardless of his or her location at the time of cabin pressurisation 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 aeroplanes 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 additional crew members and for at least 10% of the passengers if, at all points along the route to be flown, the aeroplane is able to descend safely within 4 minutes to a cabin pressure altitude of 14 000 feet.

135.05.19 SUPPLEMENTAL OXYGEN IN CASE OF PRESSURISED AEROPLANE

3. Minimum requirements for supplemental oxygen for pressurised aeroplane

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 then 25 000 feet (Note 3)
2. 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).
3. 30% of passengers (Note 5)	Entire flight time when the cabin pressure altitude exceeds 14 000 feet but does not exceed 15 000 feet.
4. 10% of passengers (Note 5)	Entire flight time when the cabin pressure altitude exceeds 10 000 feet but does not exceed 14 000 feet after the first 30 minutes at these altitudes.

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

Note 2: ***The required minimum supply is that quantity of oxygen necessary for a constant rate of descent from the aeroplane's maximum certificated operating altitude to 10 000 feet in 10 minutes and followed by 20 minutes at 10 000 feet.***

Note 3: ***The required minimum supply is that quantity of oxygen necessary for a constant rate of descent from the aeroplane's maximum certificated operating altitude to 10 000 feet in 10 minutes and followed by 110 minutes at 10 000 feet.***

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

Note 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 crew members over the aeroplane intercommunication system;

(4) does not inhibit radio communications.

135.05.20 SUPPLEMENTAL OXYGEN IN CASE OF NON-PRESSURISED AEROPLANE

1. General

(1) The operator or pilot-in-command may not operate a non-pressurised aeroplane at altitudes above 10 000 feet and up to 12 000 feet for longer than 60 minutes, 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 and with the routes to be flown, and with the emergency procedures, if applicable.

2. Oxygen supply requirements

(1) Flight crew members

Each flight 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 crew members on flight deck duty for the purpose of oxygen supply.

(2) Additional crew members and passengers

Additional crew members and passengers must be supplied with oxygen in accordance with paragraph 3. Additional crew members are to be considered as passengers for the purpose of oxygen supply.

3. Minimum requirements for supplemental oxygen for non-pressurised aeroplanes

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 60 minutes at pressure altitudes above 10 000 feet but not exceeding 12 000 feet.
2. 100% of passengers (See Note)	Entire flight time at pressure altitudes above 12 000 feet.
3. 10% of passengers (See note)	Entire flight time after 60 minutes at pressure altitudes great than 10 000 feet but not exceeding 12 000 feet.

Note: For the purpose of this table 'passengers' means passengers actually carried and indicates infants.

135.05.22 HAND FIRE EXTINGUISHERS

1. Definitions

Any word or expression to which a meaning has been assigned in the Aviation Act, 1962, and the Civil Aviation Regulations, 2001, 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 station;

(3) "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 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 crew emergency exits are accessible under any cargo

loading conditions.

2. Hand fire extinguishers

The operator or pilot-in-command may not operate an aeroplane unless hand fire extinguishers are provided for use in flight crew, passenger and, as applicable, cargo compartments 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 1351 (bromochlorodifluoromethane, $CBrClF_2$), or equivalent as the extinguishing agent, must be conveniently located on the flight deck for use by the flight crew.

(3) 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.

(4) At least one hand fire extinguisher must be conveniently located in the passenger compartment.

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

(6) 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.

(7) 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.

135.05.24 AUTOMATIC EMERGENCY LOCATOR TRANSMITTER

1. Distress frequencies

The operator or pilot-in-command must ensure that the automatic emergency locator transmitter (ELT) is capable of transmitting on the distress frequencies 135,5 MHz and 243 MHz, except that, where the whole of a proposed flight is within an area where, for search and rescue purposes, only one of these frequencies is required, the use of that single frequency may be specifically authorised, if so agreed by the authority responsible for search and rescue in the area concerned.

2. Types of ELTs

Types of ELTs are defined as follows:

2.1 **Automatic Fixed (ELT (AF))**

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

2.2 **Automatic Portable (ELT (AP))**

This type of ELT is intended to be rigidly attached to the aeroplane before a crash, but readily removable from the aeroplane after a crash. It functions as an ELT

during the crash sequence. If the ELT does not employ an integral antenna, the aeroplane-mounted antenna may be disconnected and an auxiliary antenna (stores 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);

2.3 **Automatic Deployable (ELT (AD))**

This type of ELT is intended to be rigidly attached to the aeroplane 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.

3. Installation

To minimise the possibility of damage in the event of crash impact, the ELT should be rigidly fixed to the aeroplane structure as far aft as practicable with its antenna and connections so arranged as to maximise the probability of the signal being radiated after a crash.

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

1. Equipment

(1) The operator or pilot-in-command must ensure that the aeroplane 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 aeroplane 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 TS 135.11.10;

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

- 100 g glucose tablets;

- 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 aeroplane must be equipped with at least two sets of survival radio equipment capable of transmitting on 135,5 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.

135.05.27 SURVIVAL EQUIPMENT

1. Survival equipment

The operator or pilot-in-command may not operate an aeroplane 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 in TS 135.11.10;

(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 aeroplane 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 aeroplanes 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 aeroplanes; or

(b) for aeroplanes 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 must 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 one third of 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 crew member carried.

4. Duplicates

If any item of equipment contained in the above list is already carried on board the aeroplane 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.

135.05.29 COMMUNICATION EQUIPMENT

1. General

(1) The operator or pilot-in-command must ensure that a flight does not commence unless the communication equipment required under Subpart 5 of Part 135, 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 communication purposes, will not result in the inability to communicate 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 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 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 equipment minimum performance standards are those prescribed in the applicable NAM-TSO, unless different performance standards are prescribed. Communication equipment complying with design and performance specifications other than NAM-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 Part 135.

2. Radio equipment

(1) The operator or pilot-in-command may not operate an aeroplane unless it is equipped with radio equipment required for the kind of operation being conducted.

(2) Where two independent (separate and complete) radio systems are required, 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

The operator or pilot-in-command may not operate an aeroplane under IFR unless it is equipped with an audio selector panel accessible to each required crew member.

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

The operator or pilot-in-command may not operate an aeroplane 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) The operator or pilot-in-command may not operate an aeroplane under IFR, or under VFR over routes that cannot be navigated by reference to visual landmarks, unless the aeroplane 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) The operator or pilot-in-command may operate an aeroplane 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 Director. 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

Any word or expression to which a meaning has been assigned in the Aviation Act, 1962, and the Civil Aviation Regulations, 2001, bears, when used in this technical standard, the same meaning unless the context indicates otherwise, and -

"sole means navigation system" means a navigation system that, for a given phase of flight, must allow the aeroplane 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 Namibian 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 CAD approved equivalent) authorisation;

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

(3) the aeroplane 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 and pilots-in-command should be 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 and pilots-in-command 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 and pilots-in-command 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 Director, have completed a course of ground training based on the syllabus contained in Table 6; 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 aeroplane equipment. Pilots who have completed the course and who wish to use a different type of GPS aeroplane 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;

(b) included in the operations manual;

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

(3) in addition to GPS, aeroplanes 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 aeroplanes 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 the Director.

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) Aeroplane 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,

in which case ATS may 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 aeroplane 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 (e.g. 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 - e.g. 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" - e.g. 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 pilot-in-command (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 pilot-in-command.

(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 (e.g. 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 - e.g. 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 Namibia, 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.

Note: Operators or pilots-in-command using GPS for the purposes of this technical standard, are requested to submit integrity reports for the first 30 flights after installation of approved GPS equipment. After this period, operators should 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 should submit information on GPS interference as it occurs.
Pilots-in-command should particularly note cases of GPS degradation/ interference around aerodromes, over populated areas, near radio or television transmission towers, and during radio or SATCOM trans-missions.

Information about the additional types of data required as detailed on the data sheet. This data will be used to verify the predic-ted integrity of the GPS system in Namibian airspace, and will, in part, form the basis for future extension of GPS approvals and revisions to ATC separation minima.

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

6.12 **Flight plan notification**

Pilots-in-command of aeroplanes equipped with GPS systems, that comply with the requirements of this technical standard, should insert the following in addition to other indicators in the 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 Namibian registered aeroplanes, inertial navigation may be used to satisfy the requirements of the CAD. 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 if:***

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

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

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

(iv) the system is included in the operators' maintenance system.

2. Outside Namibia (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 a long track error must not 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 aeroplane'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 or pilot-in-command must 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 aeroplane'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 must 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. If the use of INS/IRS as the sole means of navigation does not exceed the time limit, the aeroplane 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:

(1) Overhead a VOR beacon.

(2) Within 25 nm of a co-located VOR/DME beacon.

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

(ii) Automatically:

(1) Within 200 nautical miles of a DME site when the aeroplane's track will pass within 140 nm of the site.

(2) Within 200 nm of both DME sites for a DME/DME Fix.

(3) 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 aeroplane.

Notes: ***1. En route VOR and DME sites separated by not more than 500 metres are considered to be co-located.***

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 aeroplane 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 general-y 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 aeroplane 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 reasonableness, 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:

(1) Prior to each compulsory reporting point.

(2) At or prior to arrival at each en route way point during RNAV operation along RNAV routes.

(3) At hourly intervals during area type operation off established RNAV routes.

(4) 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∇ 3nm 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:

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

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

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

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

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:

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

(7) Triple installations

If three INS/IRS are installed and Atriple 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.

$$= 3 + 3T^2 + 0.1^2 + 3^3\text{mm}$$

135.06.2 QUALITY ASSURANCE SYSTEM

1. Minimum standards for a quality assurance system

(1) The quality assurance system referred to in CAR 135.06.2(4), must include -

(a) a clear definition of the level of quality the operator intends to achieve;

(b) a quality assurance programme that contains procedures designed to verify that all operations are being conducted in accordance with all the applicable requirements, standards and procedures;

(c) a procedure that sets out the level and frequency of the internal reviews;

(d) a procedure to record the findings and communicate them to management;

(e) a list of responsible persons;

(f) procedures by which other quality indicators such as facility malfunction reports, incidents, occurrences, complaints and defects are brought into the quality assurance system;

(g) procedures for management analysis and overview;

(h) procedures for rectifying any deficiencies which may be found; and

(i) procedures for documenting the complete review process from the inspection to the satisfactory management review so that this is available to the Director during a safety inspection and audit.

(2) For maintenance purposes, the quality assurance system must, in addition, include at least the following functions:

(a) Monitoring that the activities of maintenance responsibility are being performed in accordance with the approved procedures;

(b) monitoring that all contracted maintenance is carried out in accordance with the contract; and

(c) monitoring the continued compliance with the requirements prescribed in Subpart 10 of Part 135.

(3) Measures must be taken to ensure that the system is understood, implemented and complied with at all levels.

(4) The quality assurance system must be documented in the operations manual referred to in CAR 135.04.3.

2. Compliance with procedures for operations inspection, certification and continued surveillance

The quality assurance system must be established in accordance with the current edition of ICAO Doc 8335, "Manual of Procedures for Operations Inspection, Certification and Continued Surveillance", 4th edition, 1995.

135.06.5 APPLICATION FOR AIR OPERATOR CERTIFICATE OR AMENDMENT THEREOF

1. Form of application

The form referred to in CAR 135.06.5, in which application must be made for the issuing of an air operator certificate, or an amendment thereof, is contained in Annexure C.

135.06.6 ADJUDICTATION OF APPLICATION AND ISSUING OF CERTIFICATE

1. Form of certificate

The form referred to in CAR 135.06.6(4), on which an air operator certificate is issued, is contained in Annexure D.

135.06.11 STATISTICAL INFORMATION

1. Statistical information

The statistical information referred to in CAR 135.06.11, that must be furnished to the Director, is the appropriate statistical information required by -

(1) The current edition of the International Civil Aviation Organisation, in the Manual on the ICAO Statistics Programme, Doc 9060; and

(2) the Southern African Development Community Protocol on Transport, Communications and Meteorology of 24 August 1996, Chapter 9.

135.06.15 RENEWAL OF CERTIFICATE

1. Form of application

The form in which an application for the renewal of an air operator certificate must be made, is contained in Annexure C.

135.07.2 APPLICATION FOR FOREIGN AIR OPERATOR PERMIT OR AMENDMENT THEREOF

1. Form of application

The form referred to in CAR 135.07.2, in which application must be made for the issuing of a foreign air operator permit, or an amendment thereof, is contained in Annexure E.

135.07.3 ADJUDICATION OF APPLICATION AND ISSUING OF PERMIT

1. Form of permit

The form referred to in CAR 135.07.3(4), on which a foreign air operator permit is issued, is contained in Annexure F.

135.07.7 RENEWAL OF PERMIT

1. Form of application

The form in which an application for the renewal of a foreign air operator permit must be make, is contained in Annexure E.

135.08.1 ROUTES AND AREAS OF OPERATION

1. Time/distance limitations

(1) An operator may not, unless specifically approved by the Director (ETOPS approval), operate a twin-engine performance Class A aeroplane, with a maximum certificated mass of less than 45 454 kg and a maximum approved passenger seating configuration of more than 19 seats, over a route that contains a point further from an adequate aerodrome than the distance flown, under standard conditions in still air, in 60 minutes at the one-engined inoperative cruise speed.

(2) An operator may not operate a twin-engined performance Class B aeroplane on a route that contains a point further, from an adequate aerodrome, than the distance flown, under standard conditions in still air, in 90 minutes at the all-engines maximum-range cruise speed, or 300 nautical miles, whichever is the lesser.

(3) An operator may not, unless specially approved by the Director (ETOPS approval), operate a twin-engined aeroplane other than the aeroplanes referred to in paragraph (1) or (2) above including cargo aeroplanes, on a route that contains a point further, from an adequate aerodrome, than the distance flown, under standard conditions in still air, in 120 minutes at the one-engine-inoperative cruise speed.

(4) In the case of approved ETOPS operation, the operator must ensure than an *en route* alternate aerodrome is available within the authorised diversion time.

2. Adequate aerodrome

(1) When defining aerodromes for the type of aeroplane(s) and operation(s) concerned, an operator must take into account the following:

(a) An adequate aerodrome is an aerodrome which the operator considers to be satisfactory, taking account of the applicable performance requirements and runway characteristics. In addition, it should be anticipated that, at the expected time of use, the aerodrome will be available and equipped with necessary ancillary services, such as ATS, sufficient lighting, communications, weather reporting, navigation aids and emergency services.

(2) For an ETOPS *en route* alternate aerodrome, the following additional points must be considered:

(a) The availability of an ATS facility;

(b) the availability of at least one letdown aid (ground radar would so qualify) for an instrument approach; and

(c) the weather at the aerodrome must meet the criteria prescribed for ETOPS in TS 135.08.11.

Note: Guidance material for the granting of ETOPS approval is contained in the Information Leaflet No. 20 "Tem-porary Guidance Material for Extended Range Operation with Two-Engine Aeroplanes ETOPS Cer-tification and Operation", July 1995, JAR/IL No. 20, issued by the Joint Aviation Authorities.

135.08.10 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

(a) 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-engined 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: RVR/Visibility for take-off

Take-off RVR/Visibility	
Facilities	**RVR/Visibility (Note 3)**
Nill (Day only)	500 m
Runway edge lighting and/or centreline marking	250/300 m (Notes 1 and 2)
Runway edge and centreline lighting	20/250 m (note 1)
Runway edge and centreline lighting and multiple RVR information	150/200 m (Notes 1 and 4)

Note: 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-engined 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 : Assumed engine failure height above the runway versus RVR/ Visibility

Take-off RVR/Visibility - flight path	
Assumed engine failure height above the take-off runway	**RVR/Visibility (Note 2)**
< 50 ft	200 m
51 - 100 ft	300 m
101 - 150 ft	400 m
151 - 200 ft	500 m
201 - 300 ft	1 000 m
> 300 ft	(1 500 m (Note 1)

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

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

(a) 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 Director, 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 Director, the 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, if runway protection and facilities equivalent to Category III landing operations are available.

2. Non-precision approach

(1) System minima

(a) The 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	
Facility	**Lowest MDH**
ILS (no glide path - LLZ)	250 ft
SRA (terminating at 1/2 NM)	250 ft
SRA (terminating at 1 NM)	300 ft
SRA (terminating at 2 NM)	350 ft
VOR	300 ft
VOR/DME	250 ft
NDB	300 ft
VDF (QDM and QGH)	300 ft

(2) Minimum descent height

The 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 Director.

(4) Required RVR

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

Table 4(a) : RVR for non-precision approach - full facilities

Non-precision approach minima Full facilities (Notes (1), (5), (6) and (7)				
MDH	**RVR/Aeroplane category**			
	A	**B**	**C**	**D**
250 ft - 299 ft	800 m	800 m	800 m	1 200 m
300 ft - 499 ft	900 m	1 000 m	1 000 m	1 400 m
450 ft - 649 ft	1 000 m	1 200 m	1 200 m	1 600 m
650 ft and above	1 200 m	1 400 m	1 400 m	1 800 m

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

Non-precision approach minima Intermediate facilities (Notes (2), (5), (6) and (7)				
MDH	**RVR/Aeroplane category**			
	A	**B**	**C**	**D**
250 ft - 299 ft	1 000 m	1 100 m	1 200 m	1 400 m
300 ft - 499 ft	1 200 m	1 300 m	1 400 m	1 600 m
450 ft - 649 ft	1 400 m	1 500 m	1 600 m	1 800 m
650 ft and above	1 500 m	1 500 m	1 800 m	2 000 m

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

Non-precision approach minima Basic facilities (Notes (2), (5), (6) and (7)				
MDH	**RVR/Aeroplane category**			
	A	**B**	**C**	**D**
250 ft - 299 ft	1 200 m	1 300 m	1 400 m	1 600 m
300 ft - 499 ft	1 300 m	1 400 m	1 600 m	1 800 m
450 ft - 649 ft	1 500 m	1 500 m	1 800 m	2 000 m
650 ft and above	1 600 m	1 500 m	2 000 m	2 000 m

Table 4(d): RVR for non-precision approach - Nil approach light facilities

Non-precision approach minima Nil approach light facilities (Notes (4), (5), (6) and (7)				
MDH	**RVR/Aeroplane category**			
	A	**B**	**C**	**D**
250 ft - 299 ft	1 500 m	1 500 m	1 600 m	1 800 m
300 ft - 499 ft	1 500 m	1 500 m	1 800 m	2 000 m
450 ft - 649 ft	1 500 m	1 500 m	2 000 m	2 000 m
650 ft and above	1 500 m	1 500 m	2 000 m	2 000 m

Note: 1. Full facilities comprise runway markings, 720 m or more of HI/MI approach lights, runway edge lights, treshold 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 135.08.7 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

The 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 subparagraph (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 the operator for Category I operations are:

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

Category I minima				
	Facilities/RVR/(Note 5)			
Decision height (Note 7)	**Full** (Notes 1 and 6)	**Interm.** (Notes 2 and 6)	**Basic** (Notes 3 and 6)	**Nil** (Notes 4 and 6)
200 ft	550 m	700 m	800 m	1 000 m
201 - 250 ft	600 m	700 m	800 m	1 000 m
251 - 200 ft	650 m	800 m	900 m	1 200 m
301 ft and above	800 m	900 m	1 000 m	1 200 m

Note 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.***

Note 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.***

Note 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.***

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

Note 5: ***The above figures are either the reported RVR or meteorological visibility converted to RVR as in accordance with TS 135.08.7.***

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

Note 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 CAR 135.08.7 and this technical standard. An RVR of less than 800 m is not permitted except when using a suitable autopilot coupled to an ILS or MLS, 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, in the case of a manual landing, or 300 m, in the case of an automatic landing.

(2) Decision height

The 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 authorised 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 subparagraph (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 the operator for Category II operations are:

Table 6: RVR for CAT II approach vs DH

Category II minima		
	Auto-coupled to below DH (Note 1)	
Decision height	**RVR/Aeropolane Category A, B and C**	**RVR/Aeroplane Category D**
100 ft - 120 ft	300 m	300 m (Note 2)/350 m
135 ft - 140 ft	400 m	400 m
141 ft and above	450 m	450 m

Note 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.***

Note 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 authorised 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 authorised 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 subparagraph (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

(a) The lowest minima to be used by an operator for Category III operations, are:

Table 7 : RVR for CAT III approach vs flight control systems and DH

	Category III minima				
		Flight control system/RVR (metres)			
		Fail passive	Fail Operational		
			Without roll-out system	With roll-out guidance or control system	
Approach category	Decision height (ft)			Fail passive	Fail operational
IIIA	Less than 100 ft	200 m (Note 1)	200 m	200 m	200 m
IIIB	Less than 50 ft	Not authorised	Not authorised	125 m	75 m
IIIC	No DH	Not authorised	Not authorised	Not authorised	75 m

Note 1: ***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. 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 ft	500 ft	600 ft	700 ft
Minimum meteorological visibility	1 500 m	1 600 m	2 400 m	3 600 m

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

7. Visual approach

The 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) The 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 circumstances other than those in subparagraph (1) above, the operator must ensure that the following table is used:

Table 9: Conversion of visibility to RVR

Lighting elements in operation	RVR = Reported Met. Visibility x	
	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

135.08.11 PLANNING MINIMA FOR IFR FLIGHTS

1. Planning minima for destination alternate aerodromes

(1) The operator or pilot-in-command may only select the destination aerodrome and/or destination alternate 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:

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 135.08.7
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.

(a) Planning minima for the destination aerodrome

(i) RVR/visibility must be in accordance with that specified in CAR 135.08.7; 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.

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

The operator or pilot-in-command 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 aerodrome

The operator or pilot-in-command 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 approcah 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 minima	Non-precision approach minima Circling minima or, if not available, non-precision ap-	
Precision approach CAT I (ILS MLS)	Non-precision approach minima	proach minima plus 200 ft / 1 000 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	
Circling approach	Minima	Circling minima	

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 the 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.

135.08.14 MASS AND BALANCE

1. Definitions

Any word or expression to which a meaning has been assigned in the Aviation Act, 1962, and the Namibian Civil Aviation Regulations, 2001, bears, when used in this technical standard, the same meaning unless the context indicates otherwise, and -

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

"Maximum structural take off mass" means the maximum permissible total aeroplane mass at the start of the take-off run; and

"Maximum zero fuel mass" means the maximum permissible mass of an aeroplane 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 aeroplane flight manual limitations;

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

2. Loading, mass and balance

The operator must specify, in the operations manual, the principles and methods involved in the loading and in the mass and balance system which comply with the provisions of CAR 135.08.14. This system must cover all types of intended operations.

3. Mass values for crew

(1) The operator or pilot-in-command must use the following mass values to determine the dry operating mass:

(a) Actual masses including any crew baggage; or

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

(2) The operator or pilot-in-command 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 aeroplane.

4. Mass values for passengers and baggage

(1) The operator or pilot-in-command 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, the operator or pilot-in-command 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 standard 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 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 in an aeroplane 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 and more		30 and 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	1-9	10-19
Male	96 kg	92 kg
Female	78 kg	74 kg
Children	35 kg	35 kg

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

(b) 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 in the aeroplane is 20 or more, the standard mass values given in Table 3 are applicable for each piece of checked baggage. For aeroplanes 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 the operator or pilot-in-command wishes to use standard mass values other than those contained in Tables 1 to 3 above, he or she must advise the Director of his or her reasons and gain such approval in advance. After verification and approval by the Director 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, the operator or pilot-in-command 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, the operator or pilot-in-command must determine the actual mass of such baggage by weighing or by adding an adequate mass increment.

(10) The 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 mass and balance documentation.

5. Mass and balance documentation

5.1 **General**

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

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 aeroplane are not exceeded.

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

Acceptance of the loading of the aeroplane 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 aeroplane registration and type;

(b) the flight identification number and date;

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

(d) the identity of the person who prepared the document;

(e) the dry operating mass and the corresponding centre of gravity of the aeroplane;

(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 aeroplane centre of gravity positions; and

(l) the limiting mass and centre of gravity values.

5.2 **Last minute change**

(1) The operator must specify procedures for last minute changes to the load.

(2) If any last minute change occurs after the completion of the mass and balance documentation, this must be brought to the attention of the pilot-in-command and the last minute change must be entered on the mass and balance documentation.

The maximum allowed change in the number of passengers or hold load acceptable as a last minute change, must be specified in the operations manual.

If this number is exceeded, new mass and balance documentation must be prepared.

5.3 **Computerised systems**

(1) Where mass and balance documentation is generated by a computerised mass and balance system, the operator must verify the integrity of the output data.

(2) The operator must establish a system to check that amendments of the input data are incorporated properly in the system and that the system is operating correctly on a continuous basis by verifying the output data at intervals not exceeding six months.

5.4 **Onboard mass and balance systems**

The operator must obtain the approval of the Director if the operator wishes to use an onboard mass and balance computer system as a primary source of despatch.

5.5 **Datalink**

When mass and balance documentation is sent to aeroplanes via datalink, a copy of the final mass and balance documentation as accepted by the pilot-in-command, must be available on the ground.

135.08.16 FUEL POLICY

1. Contingency fuel

At the planning stage, not all factors which could have an influence on the fuel consumption to the destination aerodrome can be foreseen. Therefore, contingency fuel is carried to compensate for items such as -

(1) deviations of an individual aeroplane from the expected fuel consumption data;

(2) deviations from forecast meteorological conditions; and

(3) deviations from planned routings and/or cruising levels/altitudes.

135.08.17 FUEL AND OIL SUPPLY

1. Planning criteria for aeroplanes

The 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:

(1) 5% of the planned trip fuel or, in the event of in-flight replanning, trip fuel for the remainder of the flight; or

(2) 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 Director, provided that an *en route* alternate aerodrome is available; or

(3) an amount of fuel sufficient for 20 minutes flying time based upon the planned trip fuel consumption: Provided that the operator or pilot-in-command 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

(4) 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 the operator or pilot-in-command has established a programme, approved by the Director, 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 15 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 alternate aerodromes 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 aerodrome or the destination aerodrome, when no alternate aerodrome 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 aerodrome; and

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

(i) descend as necessary and proceed to an adequate aerodrome; and

(ii) hold there for 15 minutes at 1 500 feet (450 m) above aerodrome elevation in standard conditions; and

(iii) 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 the 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) the 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 aerodrome;

(iv) final reserve fuel;

(v) additional fuel; and

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

(3) Isolated aerodrome procedure

If the operator's fuel policy includes planning to an isolated aerodrome for which a destination alternate aerodrome 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 the operator's fuel policy includes planning to a destination alternate aerodrome where the distance between the destination aerodrome and the destination alternate aerodrome 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 -

(1) 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

(2) 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 -

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

(2) 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.

135.08.20 NOISE ABATEMENT PROCEDURES

1. Procedures

Aeroplane operating procedures for noise abatement must comply with the provisions of the current edition of PANS-OPS (Doc 8168), Volume I, Part V, published by ICAO.

135.08.29 COMMENCEMENT AND CONTINUATION OF APPROACH

1. Conversion of reported visibility

(1) The pilot-in-command 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 circumstances other than those in subparagraph (1) above, the pilot-in-command must ensure that the following table is used:

Conversion of visibility to RVR

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

135.08.37 CARRY-ON BAGGAGE

1. Procedures for stowing of carry-on baggage

Procedures established by an operator to ensure that carry-on baggage is adequately and securely stowed, must take account of the following:

(1) Each item carried in a cabin must be stowed only in a location that is capable of restraining it;

(2) mass limitations placarded on or adjacent to stowages must not be exceeded;

(3) underseat stowages must not be used unless the seat is equipped with a restraint bar and the baggage is of such size that it may adequately be restrained by this equipment;

(4) items must not be stowed in toilets or against bulkheads that are incapable of restraining articles against movement forwards, sideways or upwards and unless the bulkheads carry a placard specifying the greatest mass that may be placed there;

(5) baggage and cargo placed in lockers must not be of such size that they prevent latched doors from being closed securely;

(6) baggage and cargo must not be placed where it can impede access to emergency equipment; and

(7) checks must be made before take-off, before landing, and whenever the pilot-in-command illuminates the fasten seat belts sign (or otherwise so orders) to ensure that baggage is stowed where it cannot impede evacuation from the aeroplane or cause injury by failing (or other movement) as may be appropriate to the phase of flight.

135.09.1 AEROPLANE PERFORMANCE CLASSIFICATION

1. Classification

(Reserved).

135.09.2 CLASS B AND CLASS D AEROPLANES

(Reserved).

135.10.6 OPERATOR'S MAINTENANCE MANAGEMENT MANUAL

1. Information to be contained in the manual

The operator's maintenance management manual must contain details of the organisation structure, including:

(1) the competent person responsible for the maintenance system;

(2) the personnel responsible for planning, performing, supervising and inspecting all maintenance to ensure -

(a) that such maintenance is carried out on time to an approved standard so that the maintenance responsibility referred to in CAR 135.10.3 is satisfied; and

(b) the functioning of the quality assurance system referred to in CAR 135.06.2; and

(3) the procedures to be followed to satisfy such maintenance responsibility and quality assurance functions.

135.11.7 LIGHTS TO BE DISPLAYED BY SMALL AEROPLANE

1. Aeroplane operating lights

1.1 **Definitions**

Any word or expression to which a meaning has been assigned in the Aviation Act, 1962, and the Civil Aviation Regulations, 2001, 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.

1.2 **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.

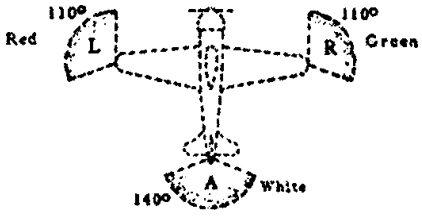


Figure 1

1.3 **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.

(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.

(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).

(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).

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 are not signals of aeroplanes in distress and requiring assistance.

135.11.10 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) 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) 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) 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 prevents the use, by an aeroplane 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 aeroplane 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 aeroplane 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 aeroplane 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 aeroplane 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 aeroplane that it is flying in, or about to enter a restricted, prohibited or danger area, and that the aeroplane is to take such remedial action as may be necessary.

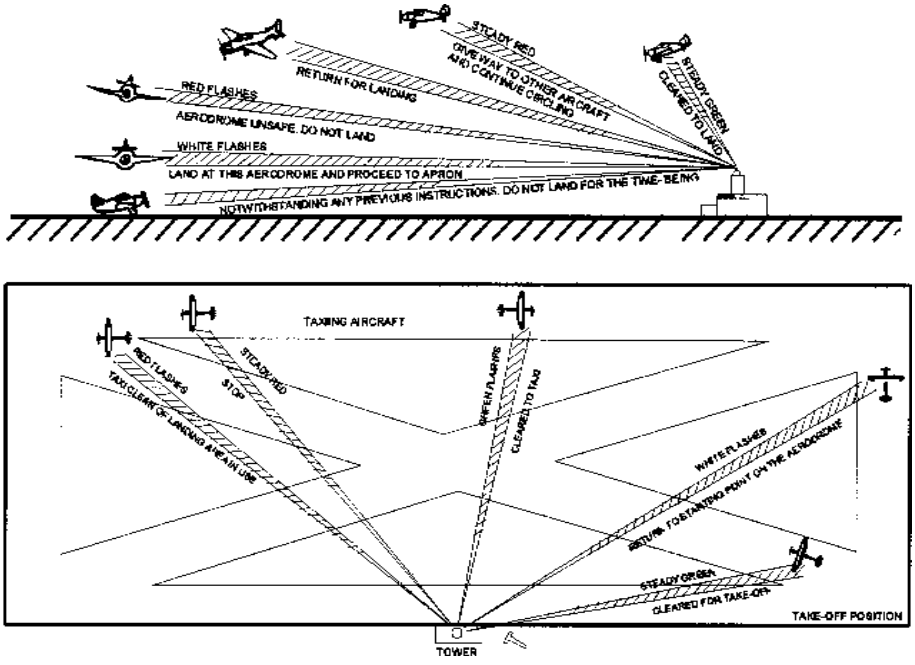
4. Signals for aerodrome traffic

(1) Light and pyrotechnic signals

Instructions

135.11.10 SIGNALS

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-off
	Steady red	Give way	Stop
	Series of green flashes	Return for landing*	Cleared to taxi
	Series of red flashes	Aerodrome at this acrodrome and proceed to apron*	Taxi clear of landing area in use
	Series of white flashes	Notwithstanding any previous instructions, do not land for the time being	Return to starting point on the aerodrome
	Steady red on final approach		
* Clearance to land and to taxi will be given in due course.			



Acknowledgement by aeroplane

(i) When in flight:

(1) During the hours of daylight:

by rocking the aeroplane's wings;

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

(2) during the hours of darkness:

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

(ii) when on the ground:

(1) During the hours of daylight:

by moving the aeroplane's ailerons or rudder;

(2) during the hours of darkness:

by flashing on and off twice the aeroplane's landing lights or, if not so equipped, by switching on and off twice its navigation lights.

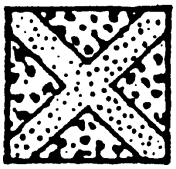
(2) Visual ground signals

(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



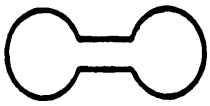
A horizontal red square panel with one yellow diagonal (Figure 1.3) when displayed in a signal area indicates that owing to the bad state of the manoeuvring area, or for any other reason, special precautions must be observed in approaching to land or in landing.

Figure 1.3

(c) Use of runways and taxiways

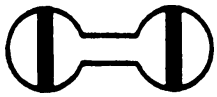
(i) A horizontal white dumb-bell (Figure 1.4) when displayed in a signal area indicates that aeroplanes are required to land, take off and taxi on runways and taxiways only.

Figure 1.4



(ii) The same horizontal white dumb-bell as in Figure 1.4 but with a black bar placed perpendicular to the shaft across each circular portion of the dumb-bell (Figure 1.5) when displayed in a signal area indicates that aeroplanes are required to land and take off on runways only, but other manoeuvres need not be confined to runways and taxiways.

Figure 1.5



(d) Closed runways or taxiways

Crosses of a single contrasting colour, yellow or white (Figure 1.6), displayed horizontally on runways and taxiways or parts thereof indicate an area unfit for movement of aeroplanes

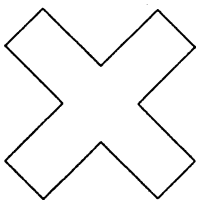


Figure 1.6

(e) Directions for landing or take-off

(i) A horizontal white or orange landing T (Figure 1.7) indicates the direction to be used by aeroplanes 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

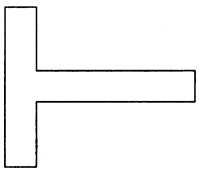


Figure 1.7

(ii) A set of two digits (Figure 1.8) displayed vertically at or near the aerodrome control tower indicates to aeroplanes 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 1.8

(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 1.9) indicates that turns are to be made to the right before landing and after take-off.

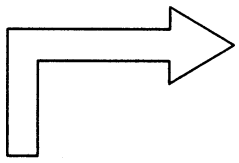


Figure 1.9

(g) Air traffic services reporting office

The letter C displayed vertically in black against a yellow background (Figure 1.10) indicates the location of the air traffic services reporting office.

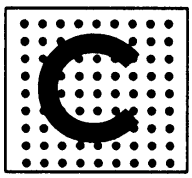


Figure 1.10

(h) Glider flights in operation

A double white cross displayed horizontally (Figure 1.11) in the signal area indicates that the aerodrome is being used by gliders and that glider flights are being performed.

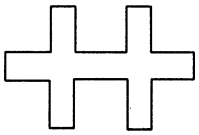


Figure 1.11

(i) Agricultural flights in operation

A figure A (figure 1.12) in the signal area indicates that the aerodrome is being used for agricultural flights.

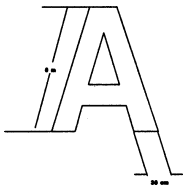


Figure 1.12

5. Marshalling signals

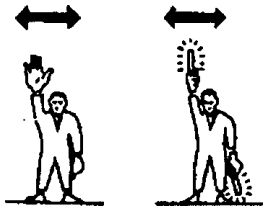
(1) From a signalman to an aeroplane

Prior to using the following signals, the signalman must ascertain that the area within which an aeroplane is to be guided is clear of objects which the aeroplane, in complying with this technical standard, might otherwise strike.

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

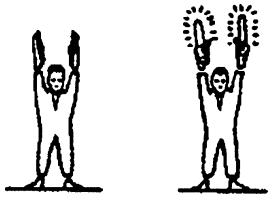
1. Proceed under further guidance by signalman

Signalman directs pilot if traffic conditions on aerodrome require this action.



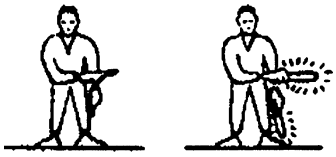
2. This bay

Arms above head in vertical position with palms facing inward.



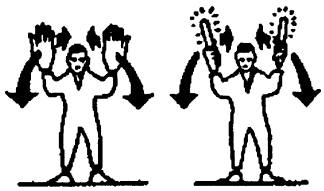
3. Proceed to next signalman

Right or left arm down, other arm moved across the body and extended to indicate direction of next signalman.



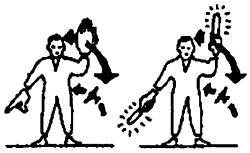
4. Move ahead

Arms a little aside, palms facing backward and repeatedly moved upward-backward from shoulder height.



5. Turn

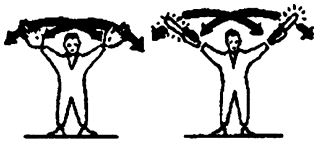
(a) Turn to your left: right arm downward, left arm repeatedly moved upward-backward. Speed of arm movement indicating rate of turn.



(b) Turn to your right: left arm downward, right arm repeatedly moved upward-backward. Speed of arm movement indicating rate of turn.

6. Stop

Arms repeatedly crossed above head (the rapidity of the arm movement should be related to the urgency of the stop, i.e. the faster the movement the quicker the stop.



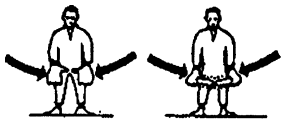
7. Brakes

(a) Engage brakes: raise arm and hand, with fingers extended, horizontally in front of body, then clench fist.

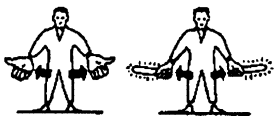
(b) Release brakes: raise arm, with fist clenched, horizontally in front of body, then extend fingers.

8. Chocks

(a) Chocks inserted: arms down, palms facing inwards, move arms from extended position inwards.



(b) Chocks removed: arms down, palms facing outwards, move arms outwards.

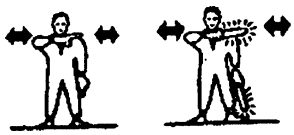


9. Start engine(s)

Left hand overhead with appropriate number of fingers extended, to indicate the number of the engine to be started, and circular motion of right hand at head level.

10. Cut engines

Either arm and hand level with shoulder, hand across throat, palm downward. The hand is moved sideways with the arm remaining bent.

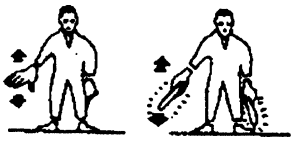


11. Slow down

Arms down with palms toward ground, then moved up and down several times.

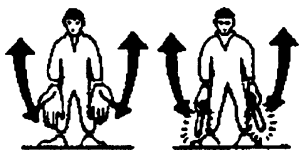
12. Slow down engine(s) on indicated side

Arms down with palms toward ground, then either right or left hand waved up and down indicating the left or right side engine(s) respectively should be slowed down.



13. Move back

Arms by sides, palms facing forward, swept forward and upward repeatedly to shoulder height.



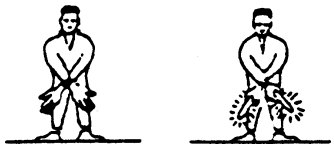
14. Turns while backing

(a) For tail to startboard: point left arm down, and right arm brought from overhead, vertical position to horizontal forward position, repeating right arm movement.

(b) For tail to port: point right arm down, and left arm brought from overhead, vertical position to horizontal forward positioin, repeating left arm movement.

15. All clear

Right arm raised at elbow with thumb erect.



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 aeroplane in a position forward of the left-wing tip within view of the pilot.

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

3. The aeroplane engines are numbered, for the signalman facing the aeroplaNotes:

(2) From the pilot of an aeroplane to a signal-man

(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

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

Brakes released

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

(b) Chocks

(i) Insert chocks

Arms extended, palms out-wards, move hands inwards to cross in front of face.

Remove chocks

(ii) 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.

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

135.11. 13 MANDATORY RADIO COMMUNICATION IN CONTROLLED ARISPACE

1. Radio communication failure procedures

The radio communication failure procedures referred to in CAR 135.11.11, are the procedures contained in Chapter 5 of the current edition of ICAO Annex 10, Volume II.

135.11.14 MANDATORY RADIO COMMUNICATION IN ADVISORY AIRSPACE

1. Radio communication failure procedures

The radio communication failure procedures referred to in CAR 135.11.14, are the procedures contained in Chapter 5 of the current edition of Annex 10, Volume II.

135.11.18 VISIBILITY AND DISTANCE FROM CLOUD

1. Conditions of visibility and distance from cloud

Airspace class	B	C D E	F G	
			ABOVE 900m (3 000 ft) AMSL or above 300 m (1 000 ft) above terrain, whichever is the higher.	At and below 900 m (3 000ft) AMSL or 300 m (1 000 ft) above terrain, whichever is the higher.
Distance from cloud	Clear of cloud	1 500 m horizontally 300 m (1 000 ft) vertically		Clear of cloud and in sight of the surface
Flight visibility	8 km at and above 3 050 m (10 000 ft) AMSL 5 km below 3 050 m (10 000 ft) ASML			5 km

135.11. 28 SEMI-CIRCULAR RULE

1. Semi-circular rule

MAGNETIC TRACK			
Flight level			
From 000^0 to 179^0		From 180^0 to 359^0	
IFR	VFR	IFR	VFR
30	15	20	24
50	35	40	45
70	55	60	65
90	75	80	85
110	95	100	105
130	115	120	125
150	135	140	145
170	155	160	165
190	175	180	185
210	195	200	
230		220	
250		240	
270		260	
290		280	
330		310	
370		350	
410		390	
450		430	
490		470	
etc.		510	
		etc.	

135.12.4 TRAINING AND QUALIFICATIONS FOR LOW-VISIBILITY OPERATIONS

1. General

(1) The operator must ensure that flight crew member training programmes for low-visibility operations include structured courses of ground, simulator and/or flight training. The operator may abbreviate the course content as prescribed in subparagraphs (2), (3) and (4) below, if the content of the abbreviated course is approved by the Director.

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

(4) Flight deck crew members with Category II or Category III experience with the 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

The 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 aeroplane 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) The 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) The operator must ensure that each flight 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 simulators for this purpose.

(3) Training must be divided into phases covering normal operation with no aeroplane or equipment failures but including all weather conditions which may be encountered and detailed scenarios of aeroplane and equipment failure which could affect Category II or III operations. If the aeroplane system involves the use of hybrid or other special systems (such as head up displays or enhanced vision equipment), flight 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 aeroplanes with no type specific simulator, 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 Director. Such training must include a minimum of 4 approaches. The training and procedures that are type specific must be practised in the aeroplane.

(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 aeroplane, 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 aeroplane 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 (e.g. 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 aeroplane 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 aeroplane 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

The operator must ensure that each flight crew member completes the following low-visibility procedures training if converting to a new type or variant of aeroplane in which low-visibility take-off and Category II and III operations will be conducted. The flight 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 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, in the aeroplane.

(c) Appropriate additional training if any special equipment is required such as head-up displays or enhanced vision equipment.

(3) Flight crew qualification

The flight crew qualification requirements are specific to the operator and the type of aeroplane operated.

(a) The operator must ensure that each flight 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) Operational flying under supervision

The operator must ensure that each flight crew member undergoes the following operational 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 pilots-in-command who are new to the aeroplane 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 operator.

(3) The Director may authorise 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) The operator must ensure that prior to authorisation 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 authorised conditions or RVR conditions;

(b) take-off in minimum authorised conditions or RVR conditions with an engine failure between V_1 and V_2, or as soon as safety considerations permit; and

(c) take-off in minimum authorised conditions or RVR conditions with an engine failure before V_1 resulting in a rejected take-off.

(2) The operator must ensure that the training required in subparagraph (1) above, is carried out in a simulator. This training must include the use of any special procedures and equipment. Where no simulator exists, the Director may approve such training in an aeroplane without the requirement for minimum conditions or RVR conditions.

(3) The 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 aeroplane type.

7. Recurrent training and checking - Low-Visibility Operations

(1) The 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 authorised, 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, the operator must use a simulator approved for Category III training.

(3) The 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 Director may authorise recurrent training for Category II operations in an aeroplane type where no simulator is available.

8. LVTO and Category II or III recency requirements

(1) The 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 aeroplane.

(2) Recency for LVTO is maintained by retaining the Category II or III qualification prescribed in subparagraph (1) above.

(3) The operator may not substitute this recency requirement for recurrent training.

TABLE 1: MAXIMUM FLIGHT DUTY PERIOD: SINGLE-PILOT CREW-AEROPLANES CERTIFIED FOR SINGLE-PILOT OPERATIONS

Local time of start	Sectors				
	Up to 4	5	6	7	8 or more
0500 - 0659	10	93	8½	8	8
0700 - 1359	11	103	9½	8	8
1400 - 2059	10	93	8½	8	8
2100 - 0459	9	83	8	8	8

Note: Pilots engaged in repetitive short flights, with an average of eight or more take-offs and landings per hour, must have break of at least thirty minutes within any continuous period of three hours, away from the aeroplane; however for the purpose of these technical standards, each such series of repetitive flights must be counted as a single sector.

TABLE 2: MAXIMUM FLIGHT DUTY PERIOD: TWO-PILOT CREW - AEROPLANES ACCLIMATISED TO LOCAL TIME

Local time of start	Sectors							
	1	2	3	4	5	6	7	8 or more
0500 - 0659	13	123	11½	10:	10	93	9	9
0700 - 1359	14	133	12½	11:	11	103	9½	9
1400 - 2059	13	123	10½	10:	10	93	9	9
2100 - 2159	12	113	10½	9:	9	9	9	9
2200 - 0459	11	103	9½	9:	9	9	9	9

TABLE 3: MAXIMUM FLIGHT DUTY PERIOD: TWO-PILOT CREW - AEROPLANES NOT ACCLIMATISED TO LOCAL TIME.

Length of preceding rest (hours)	Sectors						
	1	2	3	4	5	6	7 or more
Up to 18 or over 30	13	123	11½	10:	10	93	9
Between 18 and 30	12	113	10½	9:	9	9	9

Note: The reason that available duty times are less following rest periods inside 18 - 30 hours, is the aeromedical advice that the quality of rest is less due to the disturbance of the body's natural rhythm.

TABLE 4: MAXIMUM FLIGHT DUTY PERIOD: BASIC CREW CONSISTING OF THREE FLIGHT CREW MEMBERS - AEROPLANES ACCLIMATISED TO LOCAL TIME

Local time of start	Sectors							
	1	2	3	4	5	6	7	8 or more
0500 - 0659	13	123	11½	10:	10	93	9	9
0700 - 1359	14	133	12½	11:	11	103	9½	9
1400 - 2059	13	123	10½	10:	10	93	9	9
2100 - 2159	12	113	10½	9:	9	9	9	9
2200 - 0459	11	103	9½	9:	9	9	9	9

TABLE 5: MAXIMUM FLIGHT DUTY PERIOD: BASIC CREW CONSISTING OF THREE FLIGHT CREW MEMBERS - AEROPLANES NOT ACCLIMATISED TO LOCAL TIME.

Length of preceding rest (hours)	Sectors						
	1	2	3	4	5	6	7 or more
Up to 18 or over 30	13	123	11½	10:	10	93	9
Between 18 and 30	12	113	10½	9:	9	9	9

Note: The reason that available duty times are less following rest periods inside 18 - 30 hours, is the aeromedical advice that the quality of rest is less due to the disturbance of the body's natural rhythm.

TABLE 6: GPS TRAINING SYLLABUS

1. GPS system components and principle of operation

Demonstrate an understanding of the GPS system and its principles of operation:

(a) GPS system components, constellation, control and user

(b) Aeroplane equipment requirements

(c) GPS satellite signal and pseudo random code

(d) Principle of position fixing

(e) Method of minimising receiver clock error

(f) Minimum satellites required for navigation functions

(g) Masking function

(h) Performance limitations of various equipment types

(i) GPS use of WGS84 coordinate system.

2. Navigation system performance requirements

Define the following terms in relation to a navigation system and recall to what extent the GPS system meets the associated requirements:

(a) Accuracy

(b) Integrity

Means of providing GPS integrity; RAIM; procedural systems integration

(a) Availability

(b) Continuity of service.

3. Authorisation and documentation

Recall the requirements applicable to pilots and equipment for GPS operations:

(a) Pilot training requirements

(b) Logbook certification

(c) Aeroplane equipment requirements

(d) GPS NOTAM.

4. GPS errors and limitations

Recall the cause and magnitude of typical GPS errors:

(a) Ephemeris

(b) Clock

(c) Receiver

(d) Atmospheric / ionospheric

(e) Multipath

(f) SA (Selected availability)

(g) Typical total error associated with C/A code

(h) Effect of PDOP / GDOP on position accuracy

(i) Susceptibility to interference

(j) Comparison of vertical and horizontal errors

(k) Tracking accuracy and collision avoidance.

5. Human factors and GPS

Be aware of the human factors limitations associated with the use of GPS equipment. Apply GPS operating procedures which provide safeguards against navigation errors and loss of situational awareness due to these causes:

(a) Mode errors

(b) Data entry errors

(c) Data validation and checking including independent cross-checking procedures

(d) Automation induced complacency

(e) Non-standardisation of the GPS - pilot interface

(f) Human information processing and situational awareness.

6. GPS equipment - Specific navigation procedures

Recall and apply knowledge of appropriate GPS operating procedures to typical navigation tasks using a specific type of aeroplane equipment:

(a) Select appropriate operational modes

(b) Recall categories of information contained in the navigation database

(c) Predict RAIM availability

(d) Enter and check user defined waypoints

(e) Enter / retrieve and check flight plan data

(f) Interpret typical GPS navigation displays LAT / LONG, distance and bearing to waypoint, CDI

(g) Intercept and maintain GPS defined tracks

(h) Determine TMG, GS, ETA, time and distance to WPT, WV in flight

(i) Indications of waypoint passage

(j) Use of direct to function

(k) Use of nearest aerodrome function

(l) Use of GPS in GPS and VOR/DME/GPS arrival procedures.

7. GPS equipment checks

For the specific type of aeroplane equipment, carry out the following GPS operational and serviceability checks at appropriate times:

(a) TSO status

(b) Satellites acquired

(c) RAIM status

(d) PDOP / GDOP status

(e) IFR database currency

(f) Receiver serviceability

(g) CDI sensitivity

(h) Position indication

8. GPS warning and messages

For the specific type of aeroplane equipment, recognise and take appropriate action for GPS warnings and messages, including the following:

(a) Loss of RAIM

(b) 2D navigation

(c) In Dear Reckoning mode

(d) Database out of date

(e) Database missing

(f) GPS fail

(g) Barometric input fail

(h) Power / battery fail

(i) Parallel offset on

(j) Satellite fail.

Annexure A

PILOT-IN-COMMAND'S DISCRETION REPORT

SECTION 1 : EXTENSION OF FLIGHT TIME AND DUTY PERIOD

Part A: Operator

Aeroplane type

Flight number

Pilot-in-command

Date

Note: If discretion exercised for part crew or individual, state name(s) and operating capacity below.

Part B: Flight details

1. Crew acclimatised to time zone YES / NO *
2. Length of preceding rest eighteen to thirty hrs/under eighteen or over thirty hours *
3. Split duty : actual time off ..... time on .....
4. Extended FDP for in-flight relief YES / NO *

* *Delete inapplicable items*

FLIGHT DETAILS						
Schedule (planned)				**Actual**		
	Place	**UTC**	**Local**		**UTC**	**Local**
Start of duty				Duty started		
Depart				Departed		
Arrive				Arrived		
Depart				Departed		
Arrive				Arrived		
Depart				Departed		
Arrive				Arrived		
Depart				Departed		
Arrive				Arrived		
FDP to end				FDP ended		
Schedule FDP				Actual FDP		
				Maximum permitted FDP		

Part C: Pilot-in-command's report giving reasons

Signed : .....

Date : .....

Operator's remarks / Action taken

Signed : .....

Date : .....

Forwarded to DCA Namibia

Date : .....

SECTION 2 : REDUCTION OF REST

Note: All times to be recorded as date/time six-figure groups, expressed in both UTC and Local Time.

Part A: Operator

Flight number

Aeroplane type

Pilot-in-command

Date

Note: If discretion exercised for part crew or individual, state name(s) and operating capacity below.

Part B:

Last duty started	UTC/Local
Last duty ended	UTC/Local
Rest earned	Hours
Calculated earliest next available	UTC/Local
Actual start of next FDP	UTC/Local
Rest period reduced by crew affected	UTC/Local

Part C: Pilot-in-command's report

Signed : .....

Date : .....

Operator's remarks/action

Signed : .....

Date : .....

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Annexure B

GLOBAL POSITIONING SYSTEM

VERIFICATION DATA SHEET

A. GENERAL

Name : ..... Company : .....

Telephone / Facsimile : .....

(Address is only used in the event of clarification. Please report each occurrence separately)

Make and type of receiver and any special features in use at the time that may have affected its performance:

.....

.....

B. INTERFERENCE REPORT

Purpose for which GPS was being used (survey, navigation, etc) and its mode of use (eg. Stationary, In flight, OCA, over land, etc.):

.....

Location of receiver antenna (eg. remote mounted on A/C)

.....

Date, time and nature of GPS malfunction and variation with time / distance travelled:

.....

.....

C. INTEGRITY / RAIM LOSS REPORT

RAIM mode: En route	**Date and time**	**Period of loss**	**Location**

Comments:

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Please forward completed form to: Director: Civil Aviation