CIVIL AVIATION RULES AND STANDARDS

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

PART 7 — INSTRUMENTS AND EQUIPMENT

June 2021

[THIS PAGE INTENTIONALLY LEFT BLANK]

[THIS PAGE INTENTIONALLY LEFT BLANK]

AMENDMENTS

Number	Date	Description
Original	July 2013	Original Issue
01	20 November 2013	New And Updated Provisions Regarding Flight Recorders
02	3 April 2015	Aircraft Equipped With Automatic Landing Systems, A Head-Up Display ((HUD) or Equivalent Displays, Enhanced Vision Systems (EVS), Synthetic Vision Systems (SVS) and/or Combined Vision Systems (CVS)
02	3 April 2015	Communications Equipment
02	3 April 2015	Aircraft Communication And Navigation Equipment
02	3 April 2015	Reduced Vertical Separation Minimum
02	3 April 2015	Aeroplanes required to be equipped with A Pressure-Altitude reporting Transponder
02	3 April 2015	Loss Of Pressurisation Indicator
02	3 April 2015	Ground Proximity Warning System
02	3 April 2015	Cockpit Voice Recorders
02	3 April 2015	Flight Data Recorders
02	3 April 2015	Flight Recorder Electronic Documentation
02	3 April 2015	Combination Recorders
02	3 April 2015	Flight Recorder Records
02	3 April 2015	Continued Serviceability
02	3 April 2015	Records Of Emergency And Survival Equipment Carried
02	3 April 2015	Emergency Locator Transmitter
02	3 April 2015	Lavatory Fire Extinguisher
02	3 April 2015	Oxygen Supply
02	3 April 2015	Individual Flotation Devices
02	3 April 2015	Life Rafts
02	3 April 2015	All Helicopters On Flights Over Designated Sea Areas
02	3 April 2015	All Helicopters On Flights Over Designated Land Areas
02	3 April 2015	Flight Data Recorders
03	November 2017	Editorial, Definitions transferred to ECARAS Part 1
03	November 2017	All Aeroplanes On Flights Over Water
04	November 2019	All aeroplanes on high altitude flights
04	November 2019	All aeroplanes on flights over designated land areas
04	November 2019	Flight Recorder Systems Amended
04	November 2019	Navigation Equipment amended
04	November 2019	Surveillance Equipment Added
05	June 2021	Surveillance Equipment amended

TABLE OF CONTENTS

7.1 GENERAL

Part 7 has been written so that approvals to AOC holder are done through operations specifications and approvals to non-AOC holders, such as general aviation, are done through letters of authorization.

7.1.1.1 APPLICABILITY

(a) Part 7 prescribes the minimum instrument and equipment requirements for all aircraft in all operations.

(b) Part 7 requirements use the following key designators:-

(1) AAC: all aircraft — non-AOC Holders and AOC Holders.

(2) AOC: AOC Holders are operators engaged in commercial air transport. Where AOC requirements are more detailed, the AOC requirements will be followed.

7.1.1.2 DEFINITIONS

Definitions are contained in ECARAS Part 1.

7.1.1.3 ABBREVIATIONS

(a) The following acronyms are used in Part 7:

(1) AAC – All aircraft.

(2) ADF – Automatic Direction Finder.

(3) AFM – Aeroplane Flight Manual.

(4) ELT (AD) - Automatically deployable ELT.

(5) ELT(AF) -. Automatic fixed ELT.

(6) ELT(AP) - Automatic portable ELT.

(7) ELT(S) – Survival ELT.

(8) AOC - Air Operator Certificate.

(9) CAT - Commercial Air Transport.

(10) CAT I – Category One.

(11) CAT II – Category Two.

(12) CAT IIIA – Category Three A.

(13) CAT IIIB – Category Three B.

(14) CAT IIIC – Category Three C.

(15) CFIT -- Controlled Flight Into Terrain.

(16) CVR – Cockpit Voice Recorder.

(17) DH – Decision Height.

(18) DME – Distance Measuring Equipment

19) ELT – Emergency Locator Transmitter.

(20) FDR – Flight Data Recorder.

(21) GPS – Global Positioning System.

(22) GPWS – Ground Proximity Warning System.

(23) ILS – Instrument Landing System.

(24) IFR – Instrument Flight Rules.

(25) IMC - Instrument Meteorological Conditions.

(26) LRNS - Long Range Navigation Systems.

(27) MACH – Mach Number Indicator.

(28) MEL – Minimum Equipment List.

(29) MHz – Megahertz.

(30) MLS – Microwave Landing System.

(31) MNPS - Minimum Navigation Performance Specifications.

(32) NDB – Non-directional Beacon.

(33) PBE - Protective Breathing Equipment.

(34) RNAV – Area Navigation.

(35) RNP – Required Navigation Performance.

(36) RVR – Runway Visual Range.

(37) RVSM – Reduced Vertical Separation Minimum.

(38) SSR – Secondary Surveillance Radar.

(39) TAWS – Terrain Awareness Warning System.

(40) VFR – Visual Flight Rules.

(41) VMC - Visual Meteorological Conditions.

(42) VOR – VHF Omni-directional Radio range.

(43) VSM – Vertical Separation Minimum.

7.1.1.4 GENERAL INSTRUMENTS, EQUIPMENT AND MANUALS

(a) [AAC] In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments, equipment and flight documents prescribed in Part 7 shall be installed or carried, as appropriate, in aircraft according to the aircraft used and to the circumstances under which the flight is to be conducted.

(b) [AAC] All required instruments and equipment shall be approved and installed in accordance with applicable airworthiness requirements.

(c) A helicopter shall be equipped with instruments which will enable the flight crew to control the flight path of the helicopter, carry out any required procedural manoeuvre, and observe the operating limitations of the helicopter in the expected operating conditions.

(d) [AAC] Prior to operation in Ethiopia of any aircraft not registered in Ethiopia that uses an airworthiness inspection program approved or accepted by Ethiopia, the owner/operator shall ensure that instruments and equipment required by Authority but not installed in the aircraft are properly installed and inspected in accordance with the requirements of Ethiopia.

(e) [AOC] No person shall commence a flight in commercial air transport operations unless the required equipment:-

(1) Meets the minimum performance standard, all operational and airworthiness requirements and the relevant provisions of Surveillance and Collision Avoidance Systems.

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

(3) Is in operable condition for the kind of operation being conducted, except as provided in the MEL.

(f) [AAC] If equipment is to be used by one flight crew member at his or her station during flight, it shall be installed so as to be readily operable from that flight crewmember's station.

(g) [AAC] When a single item of equipment is required to be operated by more than one flight crew member, it shall be installed so that the equipment is readily operable from any station at which the equipment is required to be operated.

(h) the following manuals, charts and information:

(1) the flight manual or other documents or information concerning any operating limitations prescribed for the helicopter by the certificating authority, required for the application of Chapter 3;

(2) current and suitable charts for the route of the proposed flight and all routes along which it is reasonable to expect that the flight may be diverted;

(3) procedures, as prescribed in Annex 2, for pilots-in-command of intercepted aircraft; and

(4) a list of visual signals for use by intercepting and intercepted aircraft, as contained in ICAO Annex 2; and

(i) if fuses are used, spare electrical fuses of appropriate ratings for replacement of those accessible in flight.

7.2 FLIGHT INSTRUMENTS

7.2.1.1 GENERAL REQUIREMENTS

(a) [AAC] All aircraft shall be equipped with flight instruments which will enable the flight crew to:

(1) Control the flight path of the aircraft;

(2) Carry out any required procedural manoeuvres; and

(3) Observe the operating limitations of the aircraft in the expected operating conditions.

(b) [AAC] When a means is provided for transferring an instrument from its primary operating system to an alternative system, the means shall include a positive positioning control and shall be marked to indicate clearly which system is being used.

(c) [AAC] those instruments that are used by any one pilot shall be so arranged as to permit the pilot to see the indications readily from his or her station, with the minimum practicable deviation from the position and line of vision which he normally assumes when looking forward along the flight path.

7.2.1.2 ALL AIRCRAFT OPERATED AS VFR FLIGHTS

(a) All aircraft when operated as VFR flights shall be equipped with:

(1) a magnetic compass;

(2) an accurate timepiece indicating the time in hours, minutes and seconds;

(3) a sensitive pressure altimeter;

(i) For non-AOC operations, either equipage or carriage is acceptable.

(4) an airspeed indicator; and

(5) such additional instruments or equipment as may be prescribed by the appropriate authority.

(b) [AAC] No person may operate an aeroplane in VFR flight as a controlled flight unless it is equipped in with the instruments in 7.2.1.4.

7.2.1.3 ALL AIRCRAFT OPERATED AS VFR AT NIGHT

(a) All aircraft when operating in accordance with VFR at night shall be equipped with:

(1) the equipment specified in 7.2.1.2;

(2) an attitude indicator (artificial horizon) for each required pilot;

(3) a slip indicator;

(4) a heading indicator (directional gyroscope);

(5) a rate of climb and descent indicator;

(6) such additional instruments or equipment as may be prescribed by the appropriate authority; and the following lights:

(7) the lights required by Annex 2 for aircraft in flight or operating on the movement area of a heliport;

(8) a landing light;

(9) illumination for all flight instruments and equipment that are essential for the safe operation of the helicopter;

(10) lights in all passenger compartments; and

(11) a flash light for each crew member station.

(12) The landing light shall be trainable, at least in the vertical plane

7.2.1.4 ALL AIRCRAFT OPERATED AS IFR FLIGHTS

(a) All aircraft, when operating in accordance with IFR, or when the helicopter cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with::

(1) a magnetic compass;

(2) a sensitive pressure altimeter;

(3) an airspeed indicating system with a means of preventing malfunctioning due to either condensation or icing;

(4) a slip indicator;

(5) an attitude indicator (artificial horizon) for each required pilot and one additional attitude indicator;

(6) a heading indicator (directional gyroscope);

(7) a means of indicating whether the supply of power to the gyroscopic instruments is adequate;

(8) a means of indicating in the flight crew compartment the outside air temperature;

(9) a rate of climb and descent indicator;

(10) such additional instruments or equipment as may be prescribed by the appropriate authority;

(11) if operated by night, the lights specified in 7.2.1.3 **(** g) to(k).

7.2.1.5 INSTRUMENTS FOR OPERATIONS REQUIRING TWO PILOTS IN DAY VFR

(a) [AAC] whenever two pilots are required, each pilot's station shall have separate flight instruments as follows:

(1) An airspeed indicator calibrated in knots, miles per hour or kilometers per hour;

(2) A sensitive pressure altimeter calibrated in feet with a sub-scale setting calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(3) A vertical speed indicator;

(4) A turn and slip indicator, or a turn co-coordinator incorporating a slip indicator;

(5) An attitude indicator;

(i) A stabilized direction indicator, and

(ii) Any other equipment as required by the Authority.

7.2.1.6 INSTRUMENTS REQUIRED FOR IFR OPERATIONS

(a) [AAC] In addition to the requirements in 7.2.1.1, all aircraft when operated in IFR, or when the aircraft cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:-

(1) An airspeed indicating system with a means of preventing malfunctioning due to either condensation or icing;

(2) [AOC] An additional sensitive pressure altimeter calibrated in feet with a sub-scale setting calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(3) A turn and slip indicator for aeroplanes or a slip indicator for helicopters;

(4) Attitude indicator (artificial horizon):

(i) For aeroplane – one attitude indicator,

(ii) For helicopters :-

(A) [AOC] three attitude indicators, one of which may be replaced by a turn indicator;

(B) [AAC] – two attitude indicators, one of which may be replaced by a turn indicator;

(5) A heading indicator (directional gyroscope);

(6) A means of indicating whether the supply of power to the gyroscopic instruments is adequate;

(7) A means of indicating in the flightcrew compartment the outside air temperature;

(8) A rate-of-climb and descent indicator;

(9) [AOC] helicopters – a stabilization system, unless it has been demonstrated to the satisfaction of the certifying Authority that the helicopter possesses, by nature of its design, adequate stability without such a system;

(10) The requirements of items 3, 4, 5 may be met by combinations of instruments or by integrated flight director systems provided that the safeguards against total failure, inherent in the separate instruments are retained; and

(11) Such additional instruments or equipment as may be prescribed by the Authority.

(b) [AOC] No person may 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 navigation equipment in accordance with the requirements of air traffic services in the area(s) of operation.

(c) [AOC] No person may conduct single pilot IFR operations unless the aeroplane is equipped with an autopilot with at least altitude hold and heading mode.

(d) [AAC] No person may operate an aeroplane under IFR unless it is equipped with an audio selector panel accessible to each required flight crewmember.

(e) [AOC] No person may conduct single pilot IFR or night operations in commercial air transport operations unless the aeroplane is equipped with a headset with boom microphone or equivalent and a transmit button on the control wheel.

7. 2.1.7 AEROPLANES OPERATED IN ACCORDANCE WITH THE INSTRUMENT FLIGHT RULES

(a) All aeroplanes when operated in accordance with the instrument flight rules, or when the aeroplane cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

(1) a magnetic compass;
(2) an accurate timepiece indicating the time in hours, minutes and seconds;
(3) two sensitive pressure altimeters with counter drum-pointer or equivalent presentation;
(4) an airspeed indicating system with means of preventing malfunctioning due to either condensation or icing;
(5) a turn and slip indicator;
(6) an attitude indicator (artificial horizon);
(7) a heading indicator (directional gyroscope);
(8) a means of indicating whether the power supply to the gyroscopic instrument is adequate;
(9) a means of indicating in the flight crew compartment the outside air temperature;
(10) a rate-of-climb and descent indicator; and
(11) such additional instruments or equipment as may be prescribed by the Authority.

(b) All aeroplanes over 5 700 kg — Emergency power supply for electrically operated Attitude indicating instruments

(1) Aeroplanes of a maximum certificated take-off mass of over 5,700kg newly introduced into service after 1 January 1975 shall be fitted with an emergency power supply, independent of the main electrical generating system, for the purpose of operating and illuminating, for a minimum period of 30 minutes, an attitude indicating instrument (artificial horizon), clearly visible to the pilot-in-command. The emergency power supply shall be automatically operative after the total failure of the main electrical generating system and clear indication shall be given on the instrument panel that the attitude indicator(s) is being operated by emergency power.

(2) Aircraft with advanced cockpit automation systems (glass cockpits) should have system redundancy that provides the flight crew with attitude, heading, airspeed and altitude indications in case of failure of the primary system or display.

(3) Those instruments that are used by any one pilot shall be so arranged as to permit the pilot to see their indications readily from his or her station, with the minimum practicable deviation from the position and line of vision normally assumed when looking forward along the flight path.

7.2.1.8 STANDBY ATTITUDE INDICATOR

(a) [AAC] No person may operate an aeroplane with a maximum certified take-off mass exceeding 5,700 kg or a performance Class 1 or 2 helicopter unless it is equipped with a single standby attitude indicator (artificial horizon) that:-

(1) Operates independently of any other attitude indicating system;

(2) Is powered continuously during normal operation; and

(3) After a total failure of the normal electrical generating system, is automatically powered for a minimum of 30 minutes from a source independent of the normal electrical generating system.

(b) [AAC] when the standby attitude indicator is being operated by emergency power, it shall be clearly operating and illuminated to the flight crew.

(c) [AAC] where the standby attitude indicator has its own dedicated power supply there shall be an associated indication, either on the instrument or on the instrument panel when this supply is in use.

(d) [AAC] If the standby attitude instrument system is installed and usable through flight attitudes of 360°of pitch and roll, the turn and slip indicators may be replaced by slip indicators.

7.2.1.9 INSTRUMENTS AND EQUIPMENT FOR CATEGORY II OPERATIONS

(a) The instruments and equipment listed in this subsection shall be installed, approved and maintained in accordance with IS: 7. 2.1.6 for each aircraft operated in a Category II operation:

(1) Group I is comprised of the following equipment and this equipment must be inspected both

within three calendar months of the previous inspection and must also have a bench inspection within 12 months of the previous bench inspection using procedures contained in the approved maintenance program.

(i) Two localizer and glide slope receiving systems.

(ii) A communications system that does not affect the operation of at least one of the ILS Systems.

(iii) A marker beacon receiver that provides distinctive aural and visual indications of the outer and the middle markers.

(iv) Two gyroscopic pitch and bank indicating systems.

(v) Two gyroscopic direction indicating systems.

(vi) Two airspeed indicators.

(vii) Two sensitive altimeters adjustable for barometric pressure, having markings at 20 foot intervals and each having a placarded correction for altimeter scale error and for the wheel height of the aircraft.

(viii) One self-monitoring radio altimeter with dual display.

(ix) Two vertical speed indicators.

(x) A flight control guidance system that consists of either an automatic approach coupler or a flight director system.

(xi) A flight director system must display computed information as steering command in relation to an ILS localizer and, on the same instrument, either computed information as pitch command in relation to an ILS glide slope or basic ILS glide slope information. An automatic approach coupler must provide at least automatic steering in relation to an ILS localizer. The flight control guidance system may be operated from one of the receiving systems required by paragraph (a)(1)(i).

(xii) For Category II operations with decision heights below 150 feet a radio altimeter is required.

(2) Group II is comprised of the following equipment and this equipment which, with the exception of the static system, does not require special maintenance procedures other than those necessary to retain the original approval condition. Group II equipment must be inspected within 12 months of the previous inspection using procedures contained in the approved maintenance program.

(i) Warning systems for immediate detection by the pilot of system faults in items (a)(1)(I), (a)(1)(iv), (a)(1)(iv) and (a)(1)(ix), of Group I

(ii) Dual controls.

(iii) An externally vented static pressure system with an alternate static pressure source.

(iv) A windshield wiper or equivalent means of providing adequate cockpit visibility for a safe visual transition by either pilot to touchdown and rollout.

(v) A heat source for each airspeed system pitot tube installed or an equivalent means of preventing malfunctioning due to icing of the pitot system.

7.2.1.10 INSTRUMENTS AND EQUIPMENT FOR CATEGORY III OPERATIONS

(a) The instruments and equipment listed in this subsection shall be installed, approved and maintained in accordance with acceptable criteria and the AFM in each aircraft operated in a Category III operation. This subsection does not require duplication of instruments and equipment required by IS: 7.2.1.2, and IS: 7. 2.1.6 or any other provisions of Part 7.

(b) Airborne systems for CAT IIIA minima not less than RVR 200 m (600 ft). The following equipment in addition to the instrument and navigation equipment required by this Part for IFR flight and CAT II operations is the minimum aircraft equipment required for CAT IIIA:

(1) A redundant flight control or guidance system demonstrated in accordance with international acceptable criteria. Acceptable flight guidance or control systems include the following—

(i) A Fail Operational or Fail Passive automatic landing system as least to touchdown;

(ii) A Fail Operational or Fail Passive manual flight guidance system providing suitable head-up or head-down command guidance, and suitable monitoring capability at least to touchdown;

(iii) A hybrid system, using automatic landing capability as the primary means of landing at least to touchdown; or

(iv) Other system that can provide an equivalent level of performance and safety.

(2) An automatic throttle or automatic thrust control system that meets approved criteria as specified in the AFM. However, for operations with a 15 m (50 ft) DH, or other operations that have been specifically evaluated such as for engine inoperative landing capability, automatic throttles may not be required if it has been demonstrated that operations can be safely conducted, with an acceptable work load, without their use.

(3) At least two independent navigation receivers/sensors providing lateral and vertical position or displacement information, typically with the first pilot's station receiving the information from one and the second pilot's station receiving the information from the other. The navigation receivers/sensors shall meet the criteria specified for CAT IIIA operations.

(4) At least two approved radio altimeter systems that meet the performance requirements criteria as specified in the AFM, typically with the first pilot's station receiving information from one and the second pilot's station receiving information from the other.

(5) Failure detection, annunciation, and warning capability, as determined acceptable by criteria in the AFM.

(6) Missed approach guidance provided by one or more of the following means:

(i) Attitude displays that include suitable pitch attitude markings or a pre-established computed pitch command display.

(ii) An approved flight path angle display, or

(iii) An automatic or flight guidance go-around capability.

(7) Suitable forward and side flight deck visibility for each pilot as specified in the AFM.

(8) Suitable windshield rain removal, ice protection, or defog capability as specified in the AFM.

(c) Airborne systems for CAT IIIB minima less than RVR 200 m (600 ft) but not less than RVR 125 m (400 ft). The following equipment in addition to the instrument and navigation equipment required by this Part for IFR flight and CAT II and CAT IIIA operations is the minimum aircraft equipment required for CAT IIIB plus the following extra equipment requirements:

(1) A redundant flight control or guidance system demonstrated in accordance with international acceptable criteria. Acceptable flight guidance or control systems include the following –

(i) A Fail Operational landing system with a Fail Operational or Fail Passive automatic rollout system; or

(ii) A Fail Passive landing system, limited to touchdown zone RVR not less than RVR 200m (600 ft), with Fail Passive rollout provided automatically or by a flight guidance system providing suitable head-up or head-down guidance, and suitable monitoring capability, or

(iii) A Fail Operational hybrid automatic landing and rollout system with comparable manual flight guidance system, using automatic landing capability as the primary means of landing; or

(iv) Other system that can provide an equivalent level of performance and safety.

(2) An automatic throttle or automatic thrust control that meets the appropriate criteria as specified in the AFM. However for operations with a 15 m (50 ft) DH, automatic throttles may not be required if it has been demonstrated that operations can safely be conducted, with an acceptable work load, without their use.

(3) At least two independent navigation receivers/sensors providing lateral and vertical position or displacement information, typically with the first pilot's station receiving information from one and the second pilot's station receiving information from the other. The navigation receivers/sensors shall meet the criteria specified in the AFM.

(4) At least two approved radio altimeter systems that need the performance criteria outlined in the AFM, typically with the first pilot's station receiving information from one and the second pilot's station receiving information from the other.

(5) Failure detection, annunciation and warning capability as specified in the AFM.

(6) Missed approach guidance provided by one or more of the following means:

(i) Attitude displays that include calibrated pitch attitude markings, or a pre-established computed pitch command display; or

(ii) An approved flight path angle display, or

(iii) An automatic or flight guidance go-around capability.

(7) Suitable forward and side flight deck visibility for each pilot, as specified in the AFM.

(8) Suitable windshield rain removal, ice protection, or defog capability as specified in the AFM.

(d) Airborne systems for CAT IIIC minima less than RVR 75 m (300 ft). The following equipment in addition to the instrument and navigation equipment required by this Part for IFR flight and CAT II, CAT IIIA and CAT IIIB operations is the minimum aircraft equipment required for CAT IIIC:

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

(2) A fail operational automatic, manual, or hybrid rollout control system.

7.2.1.11 AIRCRAFT EQUIPPED WITH AUTOMATIC LANDING SYSTEMS, A HEAD-UP DISPLAY (HUD) OR EQUIVALENT DISPLAYS, ENHANCED VISION SYSTEMS (EVS), SYNTHETIC VISION SYSTEMS (SVS) AND/OR COMBINED VISION SYSTEMS (CVS)

(a) Where aircraft are equipped with automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS, or any combination of those systems into a hybrid system, the use of such systems for the safe operation of an aircraft shall be approved by the State of the Operator.

(b) In order to get approval for operational use of automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS, the operator shall ensure to the satisfaction of the Authority that:

(1) the equipment meets appropriate airworthiness certification requirements;

(2) the operator has carried out a safety risk assessment of the operations supported by the automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS;

(3) the operator has established and documented the procedures for the use of, and training requirements for, automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS.

7.2.1.12 ELECTRONIC FLIGHT BAGs (EFBs)

(a) EFB equipment

Where portable EFBs are used on board an aeroplane, the operator shall ensure that they do not affect the performance of the aeroplane systems, equipment or the ability to operate the aeroplane.
.

(b) EFB functions

(1) Where EFBs are used on board an aircraft the pilot-in-command and/or the owner/operator shall:

(i) assess the safety risk(s) associated with each EFB function;

(ii) establish and document the procedures for the use of, and training requirements for, the device and each EFB function; and

(iii) ensure that, in the event of an EFB failure, sufficient information is readily available to the flight crew for the flight to be conducted safely.

(2) No person may use EFB functions on an aircraft unless Ethiopian Civil Aviation Authority approved the operational use of EFB functions to be used for the safe operation of aircraft.

(c) EFB operational approval/criteria

In approving the use of EFBs, the Authority shall ensure that:

(i) the EFB equipment and its associated installation hardware, including interaction with aircraft systems if applicable, meet the appropriate airworthiness certification requirements;

(ii) the operator/owner has assessed the safety risks associated with the operations supported by the EFB function(s);

(iii) the operator/owner has established requirements for redundancy of the information (if appropriate) contained in and displayed by the EFB function(s);

(iv) the operator/owner has established and documented procedures for the management of the EFB function(s) including any database it may use; and

(v) the operator/owner has established and documented the procedure for the use of and training requirements for the EFB and EFB function(s).

7.3 COMMUNICATIONS EQUIPMENT

7.3.1.1 RADIO EQUIPMENT

(a) [AAC] No person may operate an aircraft unless it is equipped with radio communication equipment required for the kind of operation being conducted.

(b) [AAC] All aircraft operated in VFR as a controlled flight, in IFR, at night, extended flight over water, or over land designated by the Authority as especially difficult for search and rescue, shall be equipped with radio communication equipment:-

(1) Capable of conducting two-way communication at any time with air traffic services or aeronautical stations;

(2) Capable of conducting communications on those frequencies prescribed by the Authority,

(3) Capable of receiving meteorological information at any time during the flight;

(4) Capable of conducting communications on the aeronautical emergency frequency 121.5 MHz;

(5) Approved and installed in accordance with the requirements applicable to them, including the minimum performance requirements;

(6) Installed such that the failure of any single unit required for communication equipment, will not result in the failure of another unit required for communications purposes; and

(7) Meeting any other requirements as prescribed by the Authority.

Note: This requirement is considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

(c) [AOC] No person may operate an aircraft in commercial air transport operations, or as otherwise specified by the Authority, unless it is equipped with two independent radio communications systems, appropriate to the route and airspace used.

(d) [AOC] When more than one communications equipment unit is required, each shall be independent of the other or others to the extent that a failure in any one will not result in failure of any other.

(e) [AOC] No person may operate an aircraft in commercial air transport operations unless it is equipped with a boom or throat microphone available at each required flight crew member flight duty station.

(f) For operations where communication equipment is required to meet a Required Communication Performance (RCP) specification for performance-based communication (PBC), an aeroplane shall, in addition to the requirements specified in paragraph (b):

(1) be provided with communication equipment which will enable it to operate in accordance with the prescribed required communication performance (RCP) specification(s);

(2) have information relevant to the aeroplane RCP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or Ethiopian Civil Aviation Authority; and;

(3) have information relevant to the aeroplane RCP specification capabilities included in the MEL.

(g) No person may operate flights in defined portions of airspace or on routes where an RCP specification for performance based communication (PBC) has been prescribed unless the operator has established and documented:

(1) normal and abnormal procedures, including contingency procedures;
(2) flight crew qualification and proficiency requirements, in accordance with appropriate RCP specifications;
(3) a training programme for relevant personnel consistent with the intended operations; and
(4) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RCP specifications.

(h) In respect of aeroplanes mentioned in paragraph (f), the aircraft operator shall:

(1) report to the Authority, communication performance reports observed and issued by Regional Monitoring Agencies; and
(2) take immediate corrective action for individual aircraft, aircraft types, identified in such reports as not complying with the RCP specification(s).

7.3.1.2 FLIGHT CREW AND CREW MEMBER INTERPHONE SYSTEM FOR AEROPLANES

(a) [CAT] No person may operate an aeroplane in commercial air transport operations on which a flight crew of more than one is required unless it is equipped with a flight crew interphone system, including headsets and microphones, not of a handheld type, for use by all members of the flight crew.

(b) All flight crew members required to be on flight deck duty shall communicate through boom or throat microphones.

(c) [CAT] No person may operate an aeroplane in commercial air transport operations with a maximum certified take-off mass exceeding 15,000 kg, or having an approved passenger seating capacity of 19 or more, or having a flight crew compartment door, unless it is equipped with a crew member interphone system that:-

(1) Operates independently of the public address system except for handsets, headsets, microphones, selector switches and signaling devices.

(2) Provides a means of two-way communication between the flight crew compartment and each:-

(i) Passenger compartment;

(ii) Galley located other than on a passenger deck level; and

(iii) Remote crew compartment that is not on the passenger deck and is not easily accessible from a passenger compartment.

(3) Is readily accessible for use:-

(i) From each of the required flight crew stations in the flight crew compartment; and

(ii) At required cabin crew member stations close to each separate or pair of floor level emergency exits.

(4) Has an alerting system incorporating aural or visual signals for use by flight crewmembers to alert the cabin crew and for use by cabin crewmembers to alert the flight crew in the event of suspicious activity or security breaches in the cabin.

(5) Has a means for the recipient of a call to determine whether it is a normal call or an emergency call.

(6) Provides on the ground a means of two-way communication between ground personnel and at least two flight crew members.

7.3.1.3 PUBLIC ADDRESS SYSTEM – AOC HOLDERS

(a) [AOC] No AOC holder may operate a passenger carrying aeroplane with a maximum approved passenger seating configuration of more than 19 unless a public address system is installed that:-

(1) Operates independently of the interphone systems except for handsets, headsets, microphones, selector switches and signaling devices.

(2) Be readily accessible for immediate use from each required flight crew member station.

(3) For each required floor level passenger emergency exit which has an adjacent cabin crew seat, has a microphone which is readily accessible to the seated cabin crew member, except that one microphone may serve more than one exit, provided the proximity of the exits allows unassisted verbal communication between seated cabin crew members.

(4) Is capable of operation within 10 seconds by a cabin crew member at each of those stations in the compartment from which its use is accessible.

(5) Is audible and intelligible at all passenger seats, toilets, and cabin crew seats and workstations.

(b) [AOC] No AOC holder may operate a passenger carrying helicopter with a maximum approved passenger seating configuration of more than 19 unless a public address system is installed that:-

(1) Operates independently of the interphone systems except for handsets, headsets, microphones, selector switches and signaling devices.

(2) Be readily accessible for immediate use from each required flight crew member station.

(3) For each required floor level passenger emergency exit which has an adjacent cabin crew seat, has a microphone which is readily accessible to the seated cabin crew member, except that one microphone may serve more than one exit, provided the proximity of the exits allows unassisted verbal communication between seated cabin

crew members.

(4) Is capable of operation within 10 seconds by a cabin crew member at each of those stations in the compartment from which its use is accessible.

(5) Is audible and intelligible at all passenger seats, toilets, and cabin crew seats and workstations.

(6) Following a total failure of the normal electrical generating system, provide reliable operation for a minimum of 10 minutes.

(c) [AOC] No AOC holder may operate a passenger carrying helicopter with a maximum approved passenger seating configuration of more than 9 but less than 19 without a public address system installed unless:-

(1) The helicopter is designed without a bulkhead between pilot and passengers; and

(2) The operator is able to demonstrate in a manner acceptable to the Authority that when in flight, the pilot's voice is audible and intelligible at all passenger seats.

7.4 NAVIGATION EQUIPMENT

7.4.1.1 AIRCRAFT NAVIGATION EQUIPMENT

(a) [AAC] No person may operate an aircraft unless it is equipped with navigation equipment that will enable it to proceed in accordance with:-

(1) Its operational flight plan; and

(2) The requirements of air traffic services.

(b) The requirement in paragraph (a) does not apply in instances where the Authority has authorized VFR by visual reference to landmarks.

(c) For operations where a navigation specification for performance-based navigation (PBN) has been prescribed, an aeroplane shall, in addition to the requirements specified in paragraph (a):

(1) be provided with navigation equipment which will enable it to operate in accordance with the prescribed navigation specification(s);

(2) have information relevant to the aeroplane navigation specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or Ethiopian Civil Aviation Authority; and

(3) have information relevant to the aeroplane navigation specification capabilities included in the MEL.

(d) No person may operate flights in defined portions of airspace or on routes where a navigation specification for performance-based navigation (PBN) has been prescribed unless it has established and documented:

(1) normal and abnormal procedures including contingency procedures;

(2) flight crew qualification and proficiency requirements in accordance with the appropriate navigation specifications;

(3) a training programme for relevant personnel consistent with the intended operations; and

(4) appropriate maintenance procedures to ensure continued airworthiness in accordance with the appropriate navigation specifications.

(e) No person may engage in flight operations based on PBN authorization required (AR) navigation specifications unless specific operations approvals is issued by the Authority.

(f) No person may operate flights in defined portions of air space, including MNPS, RVSM, or on any other routes where a navigation specification for a Performance-based Navigation (PBN) has been prescribed unless it:-

(1) Has received authorization from the Authority in either operations specifications for AOC holders or letter of authorization for non-AOC holders;

(2) Is equipped with the navigation equipment to enable it to operate in accordance with the prescribed navigation specification(s); and

(3) is equipped with navigation equipment that continuously provides information to the flight crew of adherence to or departure from track with respect to the required degree of accuracy at any point along that track.

(g) No person may operate an aircraft unless it has sufficient navigation equipment that will enable the aircraft to navigate in accordance with paragraphs (a) and (b) above, such that:-

(1) In the event of the failure of any piece of navigation equipment at any stage of flight, the remaining equipment will enable the aircraft to continue to navigate; and

(2) The failure of any single unit required for either communications or navigation purposes or both will not result in the failure of another unit required for communications or navigation purposes.

Note:- The requirements of (g) are considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

(h) [AAC] No person may 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 navigation equipment in accordance with the requirements of air traffic services in the area(s) of operation.

(i) A helicopter to be operated in accordance with IFR or at night shall be provided with radio communication equipment. Such equipment shall be capable of conducting two-way communication with those aeronautical stations and on those frequencies prescribed by the appropriate authority.

(j) When compliance with (g) requires that more than one communication equipment unit be provided, each shall be independent of the other or others to the extent that a failure in any one will not result in failure of any other.

(k) A helicopter to be operated in accordance with VFR, but as a controlled flight, shall, unless exempted by the appropriate authority, be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

(l) A helicopter to be operated on a flight to which the provisions of 8.7.2.4 or 7.9.1.21 apply shall, unless exempted by the Authority, be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

(m) The radio communication equipment required in accordance with (g) to (j) shall be provided for communication on the aeronautical emergency frequency.

(n) For flights in defined portions of airspace or on routes where an RCP type has been prescribed, a helicopter shall, in addition to the requirements specified in (g) to (k):

(1) be provided with communication equipment which will enable it to operate in accordance with the prescribed RCP type(s); and

(2) be authorized by Authority for operations in such airspace.

(o) A helicopter shall be provided with navigation equipment which will enable it to proceed:

(1) in accordance with its flight plan; and

(2) in accordance with the requirements of air traffic services; except when, if not so precluded by the appropriate authority, navigation for flights under VFR is accomplished by visual reference to landmarks. For international general aviation, landmarks shall be located at least every 110 km (60 NM).

(p) For operations where a navigation specification for performance-based navigation has been prescribed, a helicopter shall, in addition to the requirements specified in (l):

(1) be provided with navigation equipment which will enable it to operate in accordance with the prescribed navigation specification(s); and

(2) be authorized by the State of the Operator for such operations.

Note: - Information on performance-based navigation and associated procedures, and guidance concerning the implementation and operational approval process, are contained in the Performance-based Navigation (PBN) Manual (Doc 9613). This document also contains a comprehensive list of references to other documents produced by States and international bodies concerning navigation systems.

(q) The helicopter shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the helicopter to navigate in accordance with (l) and, where applicable, (m).

(r) On flights in which it is intended to land in instrument meteorological conditions, a helicopter shall be provided with appropriate navigation equipment providing guidance to a point from which a visual landing can be effected. This equipment shall be capable of providing such guidance at each heliport at which it is intended to land in instrument meteorological conditions and at any designated alternate heliports.

(s) [AAC] All aircraft intended to land in IMC or at night shall be provided with radio navigation equipment

capable of receiving signals providing guidance to

(1) A point from which a visual landing can be effected; or

(2) Each aerodrome at which it is intended to land in IMC; and

(3) Any designated alternate aerodromes.

7.4.1.2 MINIMUM NAVIGATION PERFORMANCE SPECIFICATION

(a) [AAC] No person may operate an aeroplane in MNPS airspace unless it is equipped with navigation equipment that-

(1) Continuously provides indications to the flight crew of adherence to or departure from track to the required degree of accuracy at any point along that track; and

(2) Has been authorized by the Authority for MNPS operations concerned through either operations specifications for AOC holders or letter of authorization for general aviation.

(i) Equipment shall comply with minimum navigation performance specifications prescribed in ICAO Doc 7030 in the form of Regional Supplementary Procedures.

(b) [AAC] The navigation equipment required for operations in MNPS airspace shall be visible and usable by either pilot seated at his duty station.

(c) [AAC] For unrestricted operation in MNPS airspace an aeroplane shall be equipped with two independent Long-Range Navigation Systems (LRNS).

(a) [AAC] For operation in MNPS airspace along notified special routes, an aeroplane shall be equipped with one LRNS, unless otherwise specified.

7.4.1.3 REDUCED VERTICAL SEPARATION MINIMUM

(a) [AAC] For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, a reduced vertical separation minimum (RVSM) of 300 m (1,000 ft) is applied between FL 290 and FL 410 inclusive, an aeroplane:

(1) Shall be provided with equipment that is capable of:

(i) Indicating to the flight crew the flight level being flown;

(ii) Automatically maintaining a selected flight level;

(iii) Providing an alert to the flight crew when a deviation occurs from the selected flight level. The threshold for the alert shall not exceed + or – 90 m (300 ft); and

(iv) Automatically reporting pressure-altitude and

(2) Shall be authorized for operations in the airspace concerned by –

(i) The State of Operator for AOC holders through operations specifications, or

(ii) Ethiopia for non-AOC holders through letter of authorization.

(b) Prior to granting an RVSM approval required by paragraph (a)(2), the Authority shall be satisfied that:

(1) The vertical navigation performance capability of the aeroplane satisfies the specified requirements

(2) The operator has instituted appropriate procedures in respect of continued airworthiness (maintenance and repair) practices and programmes; and

(3) The operator has instituted appropriate flightcrew procedures for operations in RVSM airspace.

(c) RVSM. The Authority in consultation with Ethiopia, if appropriate, shall ensure that, in respect of those aeroplanes mentioned in paragraph (a) (2) above, adequate provisions exist for:

(1) Receiving the reports of height-keeping performance issued by the regional monitoring agencies; and

(2) The State of the Operator that has issued an RVSM approval to an operator shall establish a requirement which ensures that a minimum of two aeroplanes of each aircraft type grouping of the operator have their height-keeping performance monitored, at least once every two years or within intervals of 1000 flight hours per aeroplane, whichever period is longer. If an operator aircraft type grouping consists of a single aeroplane, monitoring of that aeroplane shall be accomplished within the specified period.

(3) Taking immediate corrective action for individual aircraft, or aircraft type groups, identified in such reports as not complying with the height-keeping requirements for operations in airspace where RVSM is applied.

(b) RVSM. The Authority will take appropriate action in respect of aircraft and operators found to be operating in RVSM airspace in Ethiopia without a valid RVSM approval.

7.4.1.4 SURVEILLANCE EQUIPMENT

(a) An aeroplane shall be provided with surveillance equipment which will enable it to operate in accordance with the requirements of air traffic services.

(b) For operations where surveillance equipment is required to meet Required Surveillance Performance (RSP) specification for performance-based surveillance (PBS), an aeroplane shall, in addition to the requirements specified in (a):

1) be provided with surveillance equipment which will enable it to operate in accordance with the prescribed RSP specification(s);

2) have information relevant to the aeroplane RSP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design and accepted by Ethiopian Civil Aviation Authority; and

3) have information relevant to the aeroplane RSP specification capabilities included in the MEL.

(c) No person may operate flights in defined portions of airspace or on routes where an RSP specification for PBS has been prescribed unless it has established and documented:

(1) normal and abnormal procedures, including contingency procedures;

(2) flight crew qualification and proficiency requirements, in accordance with appropriate RSP specifications;

(3) a training programme for relevant personnel consistent with the intended operations; and

(4) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RSP specifications.

(d) In respect of aeroplanes mentioned in 7.4.1.4 (b), the aircraft operator shall:

(1) report to the Authority, surveillance performance reports observed and issued by Regional Monitoring Agencies; and

(2) take immediate corrective action for individual aircraft, aircraft types, identified in such reports as not complying with the RSP specification(s).

7.4.1.5 EQUIPMENT INSTALLATION

The equipment installation shall be such that the failure of any single unit required for communication, navigation or surveillance purposes or any combination thereof will not result in the failure of another unit required for communication, navigation or surveillance purposes.

7.4.1.6 ELECTRONIC NAVIGATION DATA MANAGEMENT

(a) [AAC] No person shall employ electronic navigation data products that have been processed for application in the air and on the ground unless the Authority has approved:

(1) The operator's procedures for ensuring that the process applied and the products delivered have acceptable standards of integrity and that the products are compatible with the intended function of the equipment that will use them;

(2) The operator's program for continual monitoring of both process and products; and

(3) The operator's procedures to ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

7.4.1.7 AEROPLANES REQUIRED TO BE EQUIPPED WITH A PRESSURE ALTITUDE REPORTING TRANSPONDER

(a) [AAC] No person may operate an aircraft in airspace that requires a pressure reporting transponder unless that equipment is operative.

(b) [AAC] No person may operate an aircraft at altitudes above FL 290 unless it is equipped with a system that is automatically reporting pressure altitudes.

(c) [CAT] No person may operate an aircraft in commercial air transport operations unless it is equipped with a pressure-altitude reporting transponder that operates in accordance with the requirements of Ethiopian air traffic services and Surveillance and Collision Avoidance system requirements. All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2009 shall be equipped with a data source that provides pressure-altitude information with a resolution of 7.62 m (25 ft), or better.

(d) All aeroplanes shall be equipped with a data source that provides pressure-altitude information with a resolution of 7.62 m (25 ft), or better.

(e) The Mode S transponder should be provided with the airborne/on-the-ground status if the aeroplane is equipped with an automatic means of detecting such status.

Note 1:- These provisions will improve the effectiveness of airborne collision avoidance systems as well as air traffic services that employ Mode S radar. In particular, tracking processes are significantly enhanced with a resolution of 7.62 m (25 ft), or better.

Note 2:- Mode C replies of transponders always report pressure altitude in 30.50 m (100 ft) increments irrespective of the resolution of the data source.

(f) Aeroplanes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of Surveillance and Collision Avoidance Systems.

(g) Unless exempted by the appropriate authorities, aeroplanes operating as VFR flights shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provision of Surveillance and Collision Avoidance Systems requirements.

Note: - These provisions are intended to support the effectiveness of ACAS as well as to improve the effectiveness of air traffic services.

(h) From 1 January 2003, unless exempted by the appropriate authorities, all helicopters shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of Surveillance and Collision Avoidance Systems requirements.

(i) All helicopters shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of ------- Surveillance and Collision Avoidance Systems requirements.

7.5 AIRCRAFT LIGHTS AND INSTRUMENT ILLUMINATION

7.5.1.1 REQUIRED AIRCRAFT LIGHTS AND INSTRUMENT ILLUMINATION

(a) [AAC] All aircraft operated at night by, shall be equipped with:

(1) A landing light;

(2) Navigation/position lights;

(3) Illumination for all flight instruments and equipment those are essential for the safe operation of the aircraft;

(4) Lights in all passenger compartments; and

(5) A flashlight for each crew member station (approval not required).

(b) All aircraft type certificated with aviation red or aviation white anti-collision system shall have the anti- collision system operative in both day and night. In the event of the failure of any light of the anti- collision light system, operation of the aircraft may continue to a location where repairs or replacement can be made.

7.5.1.2 REQUIRED AIRCRAFT LIGHTS AND INSTRUMENT ILLUMINATION FOR COMMERCIAL AIR TRANSPORT OPERATIONS

(a) [AOC] No person may operate an aircraft in commercial air transport operations unless it is equipped with:

(1) Two landing lights or a single light having two separately energised filaments;

(2) An anti-collision light system;

(3) Illumination for all flight instruments and equipment that are essential for the safe operation of the aircraft;

(4) Lights in all passenger compartments;

(5) A flashlight for each crew member station;

(6) Navigation/position lights; and

(7) Lights to conform to the International regulations for preventing collisions at sea if the aircraft is a seaplane or an amphibian aircraft.

(8) For helicopters — a landing light that is trainable, at least in the vertical plane.

7.6 ENGINE INSTRUMENTS

7.6.1.1 ENGINE INSTRUMENTS

(a) [AAC] Unless the Authority allows or requires different instrumentation for turbine engine powered aeroplanes to provide equivalent safety, no person may operate any powered aircraft without the following engine instruments:

(1) A means for indicating fuel quantity in each fuel tank to be used;

(2) An oil pressure indicator for each engine;

(3) An oil temperature indicator for each engine;

(4) A manifold pressure indicator for each altitude engine; and

(5) A tachometer for each engine.

(b) [AOC] Unless the Authority allows or requires different instrumentation for turbine engine powered aeroplanes to provide equivalent safety , in addition to the listed equipment requirements in paragraph (a), no person may operate any powered aircraft without the following engine instruments:

(1) A carburettor air temperature indicator for each piston engine;

(2) A cylinder head temperature indicator for each air-cooled piston engine;

(3) A fuel pressure indicator for each engine;

(4) A fuel flowmeter or fuel mixture indicator for each engine not equipped with an automatic altitude mixture control;

(5) An oil quantity indicator for each oil-tank when a transfer or separate oil reserve supply is used;

(6) An independent fuel pressure warning device for each engine or a master warning device for all engines with a means for isolating the individual warning circuits from the master warning device; and

(7) A device for each reversible propeller, to indicate to the pilot when the propeller is in reverse pitch, which complies with the following:

(i) The device may be actuated at any point in the reversing cycle between the normal low pitch stop position and full reverse pitch, but it may not give an indication at or above the normal low pitch stop position.

(ii) The source of indication shall be actuated by the propeller blade angle or be directly responsive to it.

7.7 WARNING INSTRUMENTS AND SYSTEMS

7.7.1.1 MACH NUMBER INDICATOR

(a) [AAC] All aircraft with speed limitations expressed in terms of Mach number shall be equipped with a mach number indicator.

7.7.1.2 LOSS OF PRESSURIZATION INDICATOR

(a) [AAC] All pressurized aircraft intended to be operated at flight altitudes above 25,000 feet shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.

(b) Pressurized aeroplanes introduced into service before 1 July 1962 and intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.

7.7.1.3 LANDING GEAR INDICATOR POSITION AND AURAL WARNING DEVICE

(a) [AAC] Each powered civil aircraft with retractable landing gear shall have a landing gear position indicator.

(b) [AOC] Each aeroplane with retractable landing gear shall have an aural warning device that functions continuously under the following conditions:

(1) For aeroplanes with an established approach wing-flap position, whenever the wing flaps are extended beyond the maximum certified approach climb configuration position in the Aeroplane Flight Manual and the landing gear is not fully extended and locked.

(2) For aeroplanes without an established approach climb wing-flap position, whenever the wing flaps are extended beyond the position at which landing gear extension is normally performed and the landing gear is not fully extended and locked.

(c) [AOC] The warning system required by paragraph (b) of this section:

(1) May not have a manual shutoff;

(2) Shall be in addition to the throttle-actuated device installed under the type certification airworthiness requirements; and

(3) May utilise any part of the throttle-actuated system including the aural warning device.

(d) [AOC] The flap position-sensing unit required in paragraph (b) may be installed at any suitable place in the aeroplane.

7.7.1.4 ALTITUDE ALERTING SYSTEM

(a) [AAC] No person may operate a turbine powered aeroplane with a maximum certified take-off mass in excess of 5,700 kg or having a maximum approved passenger seating configuration of more than 9 seats, or a turbojet powered aeroplane, unless it is equipped with an altitude alerting system capable of:-

(1) Alerting the flight crew upon approaching preselected altitude in either ascent or descent; and

(2) Alerting the flight crew by at least an aural signal, when deviating above or below a preselected altitude.

(b) [AAC] For operations in defined portions of airspace where, based on Regional Air Navigation Agreement, a VSM of 300 m (1,000 ft) is applied above FL 290, an aircraft shall be provided with equipment which is capable of providing an alert to the flight crew when a deviation occurs from the selected flight level. The threshold for the alert may not exceed ±90 m (300 ft).

7.7.1.5 GROUND PROXIMITY WARNING SYSTEM

(a) [AAC] No operator may operate a turbine-powered aeroplane, or piston-engined aeroplane of a maximum certificated take-off mass in excess of 5,700kg or authorized to carry more than nine passengers, unless it is equipped with a ground proximity warning system that has a forward looking terrain avoidance function.

(b) All turbine engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg or authorized to carry more than 30 passengers shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

(c) All turbine engined aeroplanes of a maximum certificated take-off mass of 5700 kg or less and authorized to carry more than five but not more than nine passengers should be equipped with a ground proximity warning system which provides the warnings of 7.7.1.5 (b) (1) and (3), warning of unsafe terrain clearance and a forward looking terrain avoidance function.

(d) [AAC] Each ground proximity warning system shall automatically provide, by means of aural signals which may be supplemented by visual signals, timely and distinctive warning to the flight crew of the following circumstances--:

(1) Excessive descent rate.

(2) Excessive terrain closure rate.

(3) Excessive altitude loss after take-off or go-around.

(4) Unsafe terrain clearance while not in landing configuration;

(i) Gear not locked down;

(ii) Flaps not in a landing position; and

(5) Excessive descent below the instrument glide path.

(e) Helicopter when operating in accordance with IFR and which has a maximum certificated take-off mass in excess of 3 175 kg or a maximum passenger seating configuration of more than shall be equipped with a ground proximity warning system which has a forward-looking terrain avoidance function.

7.7.1.6 WEATHER RADAR

(a) [AOC] No person may operate a pressurized aeroplane in commercial air transport when carrying passengers in an area where thunderstorms or other potentially hazardous weather conditions, regarded as detectable by airborne weather radar, may be expected unless it is equipped with operative weather radar.

(b) [AOC] No person may operate a helicopter in commercial air transport when carrying passengers in an area where thunderstorms or other potentially hazardous weather conditions may be expected unless it is equipped with weather radar.

7.7.1.7 AIRBORNE COLLISION AVOIDANCE SYSTEM (ACAS)

(a) [AAC] No person shall operate a turbine-engined aeroplane with a maximum certificated takeoff mass in excess of 5700 kg or authorized to carry more than 19 passengers, unless it is equipped with an Airborne Collision Avoidance System **(**ACAS II).

(b) [AAC] Each person operating an aircraft equipped with an airborne collision avoidance system shall have that system on and operative.

(c) [AAC] Any airborne collision avoidance system installed on an aircraft registered in Ethiopia shall be approved by the Authority.

(d) [AAC] An airborne collision avoidance system shall operate in accordance with the relevant provisions of Surveillance and Collision Avoidance Systems requirements.

7.7.1.8 FORWARD LOOKING WIND SHEAR WARNING SYSTEM—TURBOJET AEROPLANES

(a) [AOC] All turbojet aeroplanes of a maximum certificated takeoff mass in excess of 5700 kg or authorized to carry more than nine passengers should be equipped with a forward-looking wind shear warning system.

(b) [AOC] The system should be capable of providing the pilot with a timely aural and visual warning of wind shear ahead of the aircraft and the information required to permit the pilot to safely commence and continue a missed approach or go-around or to execute an escape maneuver if necessary.

(c) [AOC] The system should also provide an indication to the pilot when the limits specified for the certification of automatic landing equipment are being approached, when such equipment is in use.

7.8. FLIGHT RECORDERS

7.8.1.1 FLIGHT RECORDER SYSTEMS

(a) Crash protected flight recorders, for both aeroplanes and helicopters, comprise one or more of the following systems:

(1) A flight data recorder (FDR);

(2) A cockpit voice recorder (CVR);

(3) An airborne image recorder (AIR); and/or

(4) A data-link recorder (DLR).

Note: Image and data link information may be recorded on either the CVR or the FDR.

(b) Lightweight flight recorders for aeroplanes comprise one or more of the following systems:

(1) An aircraft data recording system (ADRS);

(2) A cockpit audio recording system (CARS);

(3) An airborne image recording system (AIRS); and/or

(4) A data link recording system (DLRS).

Note: Image and data link information may be recorded on either the CARS or the ADRS.

(c) Combination recorders (FDR/CVR) may be used to meet the equipage requirements for helicopters.

7.8.1.2 CONSTRUCTION AND INSTALLATION

(a) Flight recorder systems shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed.

(1) The flight recorder systems containers shall:

(i) Be painted a distinctive orange or yellow colour;

(ii) Carry reflective material to facilitate their location; and

(iii) Have securely attached an automatically activated underwater locating device.

(b) Flight recorder systems shall be installed so that:

(1) The probability of damage to the recordings is minimized;

(2) They receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardizing service to essential or emergency loads;

(3) There is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and

(4) If the flight recorder systems have a bulk erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact.

(5) They meet the prescribed crashworthiness and fire protection specifications.

(c) The flight recorder systems, when tested by methods approved by the appropriate certificating authority, shall be demonstrated to be suitable for the environmental extremes over which they are designed to operate.

(d) Means shall be provided for an accurate time correlation between the flight recorder systems recordings.

(e) The manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recording systems:

(1) manufacturer's operating instructions, equipment limitations and installation procedures;

(2) manufacturer's test reports; and

(3) for aeroplane flight recording systems, parameter origin or source and equations which relate counts to units of measurement.

Note 1: The term "appropriate certificating authority" refers to the State of Design.

Note 2: Industry crashworthiness and fire protection specifications for FDR, CVR, AIR and DLR are as contained in the EUROCAE ED-112, Minimum Operational Performance Specifications (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

Note 3: Industry crashworthiness and fire protection specifications for ADRS and CARS are as contained in the EUROCAE ED-155, Minimum Operational Performance Specifications (MOPS) for Lightweight Flight Recording Systems, or equivalent documents.

7.8.1.3 OPERATION

(a) Flight recorder systems shall not be switched off during flight time.

(b) To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident. The flight recorders shall not be reactivated before their disposition as determined in accordance with the accident/incident regulations.

Note 1: The need for removal of the flight recorder records from the aircraft will be determined by the investigation authority in the State conducting the investigation with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.

Note 2: The operator's responsibilities regarding the retention of flight recorder records are contained in Part 9.2.2.6.

7.8.1.4 CONTINUED SERVICEABILITY AND INSPECTION OF FLIGHT RECORDER SYSTEMS

(a) The operator shall conduct operational checks and evaluations of recordings from the flight recorder systems to ensure the continued serviceability of the recorders.

(b) The procedures for the inspections of the flight recorder systems are given in IS: 7.8.1.2.

7.8.1.5 FLIGHT RECORDER ELECTRONIC DOCUMENTATION

(a) Operators shall provide to accident investigation authorities the documentation of flight recording systems parameters in electronic format and the format should take account of industry specifications.

Note: Industry specification for documentation concerning flight recorder parameters may be found in the ARINC 647A, Flight Recorder Electronic Documentation, or equivalent document.

7.8.1.6 COMBINATION RECORDERS

(a) [AAC] No person may operate an aeroplane of a maximum certificated take-off mass of over 5700 kg and which are required to be equipped with both a CVR and an FDR, unless it is equipped with–

(1) An FDR and a CVR; or

(2) Two combination recorders (FDR/DVR).

(b) [AOC] No person may operate an aeroplane of a maximum certificated take-off mass of over 5700 kg and which is required to be equipped with both a FDR and CVR unless—

(1) The aeroplane is equipped with an FDR and a CVR or alternatively equipped with two combination recorders (FDR/CVR).

(2) The aeroplane is equipped with two combination recorders (FDR/CVR) for aeroplanes type certificated on or after 1 January 2016.

Note: The requirement may be satisfied by equipping the aeroplanes with two combination recorders (one forward and one aft) or separate devices.

(c) [AOC] No person may operate an aeroplane of a maximum certificated take-off mass of over 15000 kg which is required to be equipped with both a CVR and an FDR and type certificated on or after 1 January 2016, unless—

(1) The aeroplane is equipped with two combination recorders (FDR/CVR), and

(2) one recorder is located as close to the cockpit as practicable and the other recorder located as far aft as practicable.

(d) [AOC] No person may operate a multi-engined turbine-powered aeroplane of a maximum certificated take-off mass of 5700 kg or less, unless –

(1) The aeroplane is equipped with an FDR and/or a CVR, or

(2) The aeroplane is equipped with one combination recorder (FDR/CVR).

7.8.1.7 FLIGHT RECORDER DATA RECOVERY

(a) All aeroplanes of a maximum certificated take-off mass of over 27000 kg and authorized to carry more than nineteen passengers for which the application for type certification is submitted to a Certificating

Authority on or after 1 January 2021, shall be equipped with a means approved by the Authority to recover flight recorder data and make it available in a timely manner.

(b) In approving the means to make flight recorder data available in a timely manner, the State of the Operator shall take into account the following:

(1) the capabilities of the operator;

(2) overall capability of the aeroplane and its systems as certified by the State of Design;

(3) the reliability of the means to recover the appropriate CVR channels and appropriate FDR data; and

(4) specific mitigation measures.

Note. Guidance on approving the means to make flight recorder data available in a timely manner is contained in the Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery Doc 10054

7.8.2 FLIGHT DATA RECORDERS (FDR) AND AIRCRAFT DATA RECORDING SYSTEMS (ADRS)

Note 1: FDR and AIR performance requirements are as contained in the EUROCAE ED-112, Minimum Operational Performance Specification (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

Note 2: ADRS performance requirements are as contained in the EUROCAE ED-155, Minimum Operational Performance Specification (MOPS) for Lightweight Flight Recording Systems, or equivalent documents.

7.8.2.1 TYPES AND PARAMETERS

(a) Aeroplane. Aeroplane FDR shall record the parameters as listed in IS 7.8.1.2 (A) for the following FDR types:

(1) Types I and IA FDR shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation.

(2) Types II and IIA FDRs shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power and configuration of lift and drag devices.

(b) Helicopter. Helicopter FDR shall record the parameters as listed in IS 7.8.1.2 Table (D) for the following FDR types:

(1) Type IV FDRs shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power and operation.

(2) Type IVA FDRs shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power, operations and configuration.

(3) Type V FDRs shall record the parameters required to determine accurately the helicopter flight path, speed, attitude and engine power.

7.8.2.2 AIRCRAFT EQUIPPAGE FOR OPERATION

(a) No person may operate the following aeroplane unless it is equipped with a flight data recorder capable of recording the parameters during flight time.

(1) [AAC] All turbine-engined aeroplanes of a maximum certificated take-off mass of 5700 kg or less for which the application for type certification is submitted to the appropriate Certificating Authority on or after 1 January 2016; shall be equipped with:

(i) FDR which shall record at least the first 16 parameters listed in Table 1 of IS 7.8.1.2..; or

(ii) a Class C AIR or AIRS which shall record at least the flight path and speed parameters displayed to the pilot(s), as defined in 2.2.3 of IS 7.8.1.2; or

(iii) an ADRS capable of recording the essential parameters defined in the Table (B) of IS 7.8.1.2.

Note: "The application for type certification is submitted to a Contracting State" refers to the date of application of the original "Type Certificate" for the aeroplane type, not the date of certification of particular aeroplane variants or derivative models.

(2) [AOC] All turbine-engined aeroplanes of a maximum certificated take-off mass of 5700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2016 shall be equipped with:

(i) an FDR which should record at least the first 16 parameters listed in Table 1 of IS 7.8.1.2..; or

(ii) a Class C AIR or AIRS which should record at least the flight path and speed parameters displayed to the pilot(s),as defined in 2.2.3 of IS 7.8.1.2 ; or

(iii) an ADRS which should record at least the first 7 parameters listed in Table (C) of IS 7.8.1.2.

(3) [AAC) All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1989 shall be equipped with an FDR which shall record at least the first 32 parameters listed in Table (A) of IS 7.8.1.2..

(4) (AAC) All aeroplanes of a maximum certificated take-off mass of over 5700 kg, up to and including 27 000 kg, for which the individual certificate of airworthiness is first issued on or after 1 January 1989, shall be equipped with an FDR which shall record at least the first 16 parameters listed in Table (A) of IS 7.8.1.2.

(5) [AOC] All multi-engine turbine-engined aeroplanes of a maximum certificated take-off mass of 5700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 1990 should be equipped with an FDR which should record at least the first 16 parameters listed in Table (A) of IS 7.8.1.2..

(6) (AOC) All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1989, with a maximum certificated take-off mass of over 5700 kg, except those in paragraph (8) below, shall be equipped with an FDR which shall record at least the first 5 parameters listed in Table (A) of IS 7.8.1.2..

(7) (AOC) All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989, with a maximum certificated

take-off mass of over 5700 kg, except those in paragraph (8) below, should be equipped with an FDR which should record at least the first 9 parameters listed in Table (A) of IS 7.8.1.2..

(8) (AOC) All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989, with a maximum certificated take-off mass of over 27000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 shall be equipped with an FDR which shall record at least the first 16 parameters listed in Table (A) of IS 7.8.1.2.

(9) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 5 700 kg shall be equipped with an FDR which shall record time, altitude, airspeed, normal acceleration and heading.

(10) (AOC) All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 27000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 should be equipped with an FDR which should record, in addition to the first 5 parameters listed in Table (A) of IS 7.8.1.2., such additional parameters as are necessary to meet the objectives of determining:

(1) the attitude of the aeroplane in achieving its flight path; and
(2) the basic forces acting upon the aeroplane resulting in the achieved flight path and the origin of such basic forces.

(11) (AOC) All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued after 1 January 2005 shall be equipped with an FDR which shall record at least the first 78 parameters listed in Table (A) of IS 7.8.1.2.

(12) (AOC) All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2023 shall be equipped with an FDR capable of recording at least the 82 parameters listed in Table (A) of IS 7.8.1.2.

(13) (AOC) All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2023 shall be equipped with an FDR capable of recording at least the 82 parameters listed in Table (A) of IS 7.8.1.2.

(14) [AOC] All aeroplanes which are required to record normal acceleration, lateral acceleration and longitudinal acceleration for which application for a type certification is first made to the appropriate CAA on or after 1 January 2016 and which are required to be fitted with an FDR shall record those parameters at a maximum sampling and recording interval of 0.0625 seconds.

(15) [AAC] All aeroplanes which are required to record pilot input and/or control surface position of primary controls (pitch, roll, yaw) for which the application for a type certificate is first made to the appropriate CAA on or after 1 January 2016 and which are required to be fitted with an FDR shall record those parameters at a maximum sampling and recording interval of 0.125 seconds.

Note: For aeroplanes with control systems in which movement of a control surface will back drive the pilot's control, "or" apply. For aeroplanes with control systems in which movement of a control surface will not back drive the pilot's control, "and" apply. In aeroplanes with

independent moveable surfaces, each surface needs to be recorded separately. In aeroplanes with independent pilot input on primary controls, each pilot input on primary controls needs to be recorded separately.

(b) No person may operate the following helicopter unless it is equipped with a flight data recorder capable of recording the aural environment of the flight deck during flight time.

(1) [AAC] All helicopters with a maximum certificated take-off mass of over 3180 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2016 shall be equipped with a Type IVA FDR.

(2) [AAC] All helicopter with a certificated takeoff mass of over 7000 kg, or having a passenger seating configuration of more than nineteen, for which the individual certificate of airworthiness is first issued on or after 1, January 1989 shall be equipped with a Type IV FDR.

(3) [AAC] All helicopters with a maximum certificated take-off mass of over 3180 kb, up to and including 7000 kg, for which the individual certificate of airworthiness is first issued on or after 1 January 1989 shall be equipped with a Type V FDR.

(4) [AOC] All turbine-engined helicopter of a maximum certificated take-off mass of over 2250 kg, up to and including 3180 kg for which the which the application for a type certificate is first made to the appropriate CAA on or after 1 January 2018, unless is it equipped with:

(i) A Type IVA FDR; or

(ii) A Class C AIR capable of recording fight path and speed parameters displayed to the pilot(s); or

(iii) An ADRS capable of recording the essential parameters in the Table in IS: 7.8.2.2.

(5) [AOC] All turbine-engined helicopter of a maximum certificated take-off mass of over 3180 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2018, unless is it equipped with:

(i) A Type IVA FDR; or

(ii) A Class C AIR capable of recording fight path and speed parameters displayed to the pilot(s); or

(iii) An ADRS capable of recording the essential parameters in the Table in IS: 7.8.2.2.

7.8.2.3 RECORDING TECHNOLOGY

(a) FDRs or ADRS on aircraft registered in Ethiopia, or operated in commercial air transport operations in Ethiopia shall not use:

(1) Engraving metal foil;

(2) Photographic film;

(3) frequency modulation (FM);

(4) Magnetic tape.

7.8.2.4 DURATION

(a) All FDRs shall retain the information recorded during at least the last 25 hours of their operation, with the exception of those installed on aeroplanes referenced in paragraph 7.8.2.2 (a) (5) for

which the FDR shall retain the information recorded during at least the last 30 minutes of its operation, and, in addition, sufficient information from the preceding take-off for calibration purposes.

(b) Helicopter FDRs shall be capable of retaining the information recorded during the last 10 hours of operation.

7.8.3 COCKPIT VOICE RECORDERS (CVR) AND COCKPIT AUDIO RECORDING SYSTEMS (CARS)

Note 1: CVR performance requirements are as contained in the EUROCAE ED-112, Minimum Operational Performance Specification (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

Note 2: CARS performance requirements are as contained in the EUROCAE ED-155, Minimum Operational Performance Specification (MOPS) for Lightweight Flight Recording Systems, or equivalent documents.

7.8.3.1 SIGNALS TO BE RECORDED – CVR AND CARS

(a) The CVR, and CARS as applicable to aeroplanes, shall start to record prior to the aircraft moving under its own power and record continuously until the termination of the flight when the aircraft is no longer capable of moving under its own power.

(b) In addition to (a) above, the CVR and CARS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

(c) The CVR shall record on four separate channels, or more, at least the following:

(1) Voice communication transmitted from or received in the aircraft by radio;

(2) Aural environment on the flight deck;

(3) Voice communication of flight crew members on the flight deck using the aircraft's interphone system, if installed;

(4) Digital communications with ATS, unless recorded by the FDR.

(d) The CARS shall record on two separate channels, or more, at least the following:

(1) Voice communication transmitted from or received in the aeroplane by radio;

(2) Aural environment on the flight deck; and

(3) Voice communication of flight crewmembers on the flight deck using the aeroplane's interphone, if installed.

(e) The recorder shall be capable of recording on at least four channels simultaneously, except for the recorder in paragraph 7.8.2.2(a)(4) in the preferred channel allocation as follows:

(1) Channel 1 – co-pilot headphones and live boom microphone;

(2) Channel 2 – pilot headphones and live boom microphone;

(3) Channel 3 – area microphone;

(4) Channel 4 – time reference plus the third and fourth crewmembers.

Note 1: Channel 1 is located closest to the base of the recording head.

Note 2: The preferred channel allocation presumes the use of current conventional magnetic tape transport mechanisms and is specified because the outer edges of the tape have a higher risk of damage than the middle. It is not intended to preclude use of alternative recording media where such constraints may not apply.

(f) On a tape-based CVR, to ensure accurate time correlation between channels, the recorder shall record in an in-tine format. If a bi-directional configuration is used, the in-line format and channel allocation shall be retained in both directions.

7.8.3.2 AIRCRAFT EQUIPPAGE FOR OPERATIONS

(a) No person may operate an aeroplane unless it is equipped with a cockpit voice recorder as listed below:

(1) [AAC] All turbine-engined aeroplanes for which the application for a type certificate is first submitted to the appropriate CAA on or after 1 January 2016 and required to be operated by more than one pilot shall be equipped with either a CVR or a CARS.

(2) [AAC] All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 shall be equipped with a CVR.

(3) All turbine-engined aeroplanes of a maximum certificated take-off mass of over 2250 kg, up to and including 5700 kg, for which the application for type certification is submitted to a Contracting State on or after 1 January 2016 and required to be operated by more than one pilot shall be equipped with either a CVR or a CARS.

(4) [AAC] All aeroplanes of a maximum certificated take-off mass of over 5700 kg, up to and including 27000 kg, for which the individual certificate of airworthiness is first issued on or after 1 January 1987, should be equipped with a CVR.

(5) [AOC] All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2003, shall be equipped with a CVR capable of retaining the information recorded during at least the last two hours of its operation.

(6) [AOC] All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 shall be equipped with a CVR.

(7) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 27000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 shall be equipped with a CVR.

(8) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 5700 kg up to and including 27000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 should be equipped with a CVR.

(b) No person may operate a helicopter unless it is equipped with a cockpit voice recorder as listed below:

(1) [AAC] All helicopters of a maximum certificated take-off mass of over 7000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 shall be equipped with a CVR. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.

(2) [AAC] All helicopters of a maximum certificated take-off mass of over 3180 kg for which the individual certificate of worthiness is first issued on or after 1 January 1987 should be equipped with a CR. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.

(3) [AAC] All helicopters of a maximum certificated take-off mass of over 7000 kg for which the individual certificate of worthiness is first issued on or after 1 January 1987 should be equipped with a CR. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.

7.8.3.3 DISCONTINUATION

(a) CVRs and CARS installed on aircraft registered in Ethiopia and/or operated in commercial air transport operations in Ethiopia shall not use magnetic tape or wire as recording medium.

7.8.3.4 DURATION

(a) All CVRs shall retain the information recorded during at least the last 2 hours of their operation.

(b) All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2021 shall be equipped with a CVR capable of retaining the information recorded during at least the last twenty-five hours of its operation.

7.8.3.5 COCKPIT VOICE RECORDER ALTERNATE POWER

(a) [AOC] No person may operate an aeroplane required to be equipped with a CVR unless it is equipped with CVR alternate power source that:

(1) automatically engages and provides ten minutes, plus or minus one minute, of operation whenever aeroplane power to the recorder ceases, either by normal shutdown or by any other loss of power;

(2) powers the CVR and its associated cockpit area microphone components, and

(3) is located as close as practicable to the alternate power source.

(b) (AOC) All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2018 shall be provided with an alternate power source, as defined in paragraph (a) above that powers the forward CVR in the case of combination recorders.

(c) [AOC] No person may operate an aeroplane of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2018 unless is it equipped with an alternate power source, as described in (a) above, that powers at least one CVR.

Note 1 – "Alternate" means separate from the power source that normally provides power to the CVR. The use of aeroplane batteries or other power sources is acceptable provided that the

requirements are above are met and electrical power to essential and critical loads is not compromised.

Note 2 – When the CVR function is combined with other recording functions within the same unit, powering the other functions is allowed.

7.8.4 DATA LINK RECORDERS (DLR) AND DATA LINK RECORDING SYSTEMS (DLRS)

Note: Data link recorders performance requirements are as contained in the EUROCAE ED-112, Minimum Operational Performance Specifications (MOPS) for Crash-protected Airborne Recorder Systems, or equivalent documents.

7.8.4.1 APPLICABILITY

(a) No person may operate an aeroplane or helicopter for which the individual certificate of airworthiness is first issued on or after 1 January 2016, which utilize any of the data link communications applications listed in 5.1.2 of IS 7.8..1.2 and are required to carry a CVR, unless the aircraft records on a flight recorder the data link communications messages.

(b) No person may operate an aeroplane or helicopter modified on or after 1 January 2016, which utilize any of the data link communications applications listed in 5.1.2 of IS 7.8..1.2 and are required to carry a CVR, unless the aircraft records on a flight recorder the data link communications messages.

(c) No person may operate an aeroplane or helicopter where the aircraft flight path is authorized or controlled through the use of data link messages, unless all data link messages, both uplinks (to the aircraft) and downlinks from the aircraft) are recorded on the aircraft. As far as practicable, the time the messages were displayed to the flight crew and the time of the responses shall be recorded.

Note 1: Data link communications are currently conducted by either ATN-based or FANS 1/A-equipped aircraft.

Note 2: A Class B AIR could be a means for recording data link communications applications messages to and from the aircraft where it is not practical or is prohibitively expensive to record those data link communications applications messages on FDR or CVR.

7.8.4.2 DURATION

(a) The minimum recording duration shall be equal to the duration of the CVR

7.8.4.3 CORRELATION

(a) Data link recording shall be correlated to the recorded cockpit audio.

7.8.5 AIRBORNE IMAGE RECORDER (AIR) AND AIRBORNE IMAGE RECORDING SYSTEM (AIRS)

(a) Airborne image recorders are classified as follows.

(1) A Class A AIR captures the general cockpit area in order to provide data supplemental to conventional flight recorders.

(2) A Class B AIR captures data link message displays.

(3) A Class C AIR captures instruments and control panels.

Note 1: To respect crew privacy, the cockpit area view may be designed as far as practical to exclude the head and shoulders of crewmembers whilst seated in their normal operating position.

Note 2: A Class C AIR may be considered as a means for recording flight data where it is not practical or is prohibitively expensive to record on an FDR, or where an FDR is not required.

(b) When AIRs are used, the AIR must start to record prior to the aircraft moving under its own power and record continuously until the termination of the flight when the aircraft is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the AIR must start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

7.8.6 FLIGHT CREW-MACHINE INTERFACE RECORDINGS

7.8.6.1 APPLICABILITY

(a) All aeroplanes of a maximum take-off mass of over 27000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2023 shall be equipped with a crash-protected flight data recorder which shall record the information displayed to the flight crew from electronic displays, as well as the operation of switches and selectors by the flight crew as defined in IS 7.8.1.2

(b) All aeroplanes of a maximum take-off mass of over 5700 kg, up to and including 27000 kg, for which the application for type certification is submitted to a Contracting State on or after 1 January 2023 should be equipped with a crash-protected flight data recorder which shall record the information displayed to the flight crew from electronic displays, as well as the operation of switches and selectors by the flight crew, as defined in IS: 7.8.1.2.

7.8.6.2 DURATION

The minimum flight crew-machine interface recording duration shall be at least for the last two hours.

7.8.6.3 CORRELATION

Flight crew-machine interface recordings shall be able to be correlated to the recorded cockpit audio.

7.8.7 AVAILABILITY OF MAINTENANCE DOCUMENTATION OF FLIGHT DATA RECORDER SYSTEMS

(a) The flight recorder system manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recorder systems:
- (1) manufacturer's operating instructions, equipment limitations and installation procedures;
- (2) parameter origin or source and equations which relate counts to units of measurement;
- (3) manufacturer's test reports.; and
- (4) detailed instructions for continuing airworthiness (ICAs) covering all the tasks required by the users of the system, (e.g. design approval holder or operator), to ensure the continued serviceability of the flight recorder system.

(b) The holder of the airworthiness approval for the installation design of the flight recorder system shall make available the relevant information from the related ICAs to the operator of the aeroplane to be incorporated in the continuing airworthiness maintenance programme. These ICAs shall cover in detail all the tasks required to ensure the continued serviceability of the flight recorder system.

7.9 EMERGENCY, RESCUE, AND SURVIVAL EQUIPMENT

7.9.1.1 EMERGENCY EQUIPMENT: ALL AIRCRAFT

(a) [AAC] each item of emergency and flotation equipment shall be:-

(1) Readily accessible to the crew and, with regard to equipment located in the passenger compartment, to passengers without appreciable time for preparatory procedures;

(2) Clearly identified and clearly marked to indicate its method of operation;

(3) Marked as to date of last inspection; and

(4) Marked as to contents when carried in a compartment or container.

7.9.1.2 RECORDS OF EMERGENCY AND SURVIVAL EQUIPMENT CARRIED

(a) Operators shall at all times have available for immediate communication to rescue coordination centres, lists containing information on the emergency and survival equipment carried on board any of their aircraft engaged in international air navigation. The information shall include, as applicable, the number, colour and type of life rafts and pyrotechnics, details of emergency medical supplies, water supplies and the type and frequencies of the emergency portable radio equipment.

7.9.1.3 EMERGENCY EXIT EQUIPMENT - PASSENGERS

(a) No person shall operate an aeroplane without the following emergency exit equipment:

(1) [AAC] Each passenger-carrying land plane emergency exit (other than over-the-wing) that is more than 6 feet from the ground with the aeroplane on the ground and the landing gear extended, shall have an approved means to assist the occupants in descending to the ground.

(2) [AAC] Each passenger emergency exit, its means of access, and its means of opening shall be conspicuously marked by a sign visible to occupants approaching along the main passenger aisle.

(3) [AAC] Each passenger-carrying aeroplane shall have an emergency lighting system, independent of the main lighting system that—

(i) Illuminates each passenger exit marking and locating sign;

(ii) Provides enough general lighting in the passenger cabin; and

(iii) [AOC] Includes floor proximity emergency escape path marking.

(4) [AAC] Each passenger emergency exit and the means of opening that exit from the outside shall be marked on the outside of the aeroplane.

(5) [AAC] Each passenger-carrying aeroplane shall be equipped with a slip-resistant escape route that meets the requirements under which that aeroplane was type certified.

(6) Each passenger carrying aeroplane shall meet the detailed requirements contained in IS: 7.9.1.2.

(b) No person shall operate a helicopter certificated with a maximum take-off mass of 7 000 pounds or less and nine or less passenger seats without the following emergency exit equipment:

(1) Number and location.

(i) There must be at least one emergency exit on each side of the cabin readily accessible to each passenger. One of these exits must be usable in any probable attitude that may result from a crash.

(ii) Doors intended for normal use may also serve as emergency exits, provided that they meet the requirements of this section.

(iii) If emergency flotation devices are installed, there must be an emergency exit accessible to each passenger on each side of the cabin that is shown by test, demonstration, or analysis to:-

(A) Be above the waterline; and

(B) Be open without interference from flotation devices, whether stowed or deployed.

(2) Type and operation. Each emergency exit prescribed by paragraph (a) of this section must:-

(i) Consist of a movable window or panel, or additional external door, providing an unobstructed opening that will admit a 19-by 26-inch ellipse;

(ii) Have simple and obvious methods of opening, from the inside and from the outside, which do not require exceptional effort;

(iii) Be arranged and marked so as to be readily located and opened even in darkness; and

(iv) Be reasonably protected from jamming by fuselage deformation.

(3) Ditching emergency exits for passengers. If certification with ditching provisions is requested, the markings required by (1)(iii) of this paragraph must be designed to remain visible if the rotorcraft is capsized and the cabin is submerged.

(c) No person shall operate a helicopter certificated with a maximum take-off mass of more than 20 000 pounds and ten or more passenger seats without the following emergency exit equipment:

(1) Passenger emergency exits and openings. Openings with dimensions larger than those specified below may be used, regardless of shape, if the base of the opening has a flat surface of not less than the specified width. For the purpose of this part, the types of passenger emergency exit shall be as follows:

(i) Type I. This type shall have a rectangular opening of not less than 24 inches wide by 48 inches high, with corner radii not greater than one-third the width of the exit, in the passenger area in the side of the fuselage at floor level and as far away as practicable

from areas that might become potential fire hazards in a crash;

(ii) Type II. This type is the same as Type I, except that the opening shall be at least 20 inches wide by 44 inches high;

(iii) Type III. This type is the same as Type I, except that:-

(A) The opening shall be at least 20 inches wide by 36 inches high; and

(B) The exits need not be at floor level.

(iv) Type IV. This type shall have a rectangular opening of not less than 19 inches wide by 26 inches high, with corner radii not greater than one-third the width of the exit, in the side of the fuselage with a step-up inside the rotorcraft of not more than 29 inches.

(2) Passenger emergency exits; side-of-fuselage. Emergency exits shall be accessible to the passengers and, except as provided in (c)(4) of this paragraph, must be provided in accordance with the following table: Emergency exits for each side of the fuselage.

Passenger seating capacity	**Emergency exits for each side of the fuselage**			
	Type I	**Type II**	**Type III**	**Type IV**
1 through 10				1
11 through 19			1 or	2
20 through 39		1		1
40 through 59	1			1
60 through 79	1		1 or	2

(3) Passenger emergency exits; other than side-of-fuselage. In addition to the requirements of item (2) of this paragraph:-

(i) There shall be enough openings in the top, bottom, or ends of the fuselage to allow evacuation with the rotorcraft on its side; or

(ii) The probability of the rotorcraft coming to rest on its side in a crash landing must be extremely remote.

(4) Ditching emergency exits for passengers. If the helicopter was certificated with ditching provisions, ditching emergency exits shall be provided in accordance with the following:

(i) For rotorcraft that have a passenger seating configuration, excluding pilots seats, of nine seats or less, one exit above the waterline in each side of the rotorcraft, meeting at least the dimensions of a Type IV exit;

(ii) For rotorcraft that have a passenger seating configuration, excluding pilots seats, of 10 seats or more, one exit above the waterline in a side of the rotorcraft meeting at least the dimensions of a Type III exit, for each unit (or part of a unit) of 35 passenger seats, but no less than two such exits in the passenger cabin, with one on each side of the

rotorcraft.

However, where it has been shown through analysis, ditching demonstrations, or any other tests found necessary, that the evacuation capability of the rotorcraft during ditching is improved by the use of larger exits, or by other means, the passenger seat to exit ratio may be increased; and

(iii) Flotation devices, whether stowed or deployed, may not interfere with or obstruct the exits.

(5) Ramp exits. One Type I exit only, or one Type II exit only, that is required in the side of the fuselage under paragraph (b) of this section, may be installed instead in the ramp of floor ramp rotorcraft if:-

(i) Its installation in the side of the fuselage is impractical; and

(ii) Its installation in the ramp meets emergency exit access requirements in paragraph (g) below.

(d) Emergency exit arrangement.

(1) Each emergency exit shall consist of a movable door or hatch in the external walls of the fuselage and must provide an unobstructed opening to the outside.

(2) Each emergency exit shall be openable from the inside and from the outside.

(3) The means of opening each emergency exit shall be simple and obvious and may not require exceptional effort.

(4) There shall be means for locking each emergency exit and for preventing opening in flight inadvertently or as a result of mechanical failure.

(5) There shall be means to minimize the probability of the jamming of any emergency exit in a minor crash landing as a result of fuselage deformation under the ultimate inertial forces :-

(i) Upward - 1.5g;

(ii) Forward – 4.0g;

(iii) Sideward – 2.0g; and

(iii) Downward – 4.0g.

(6) Except as provided in item (8) of this paragraph, each land-based rotorcraft emergency exit must have an approved slide as stated in paragraph (g) of this subsection, or its equivalent, to assist occupants in descending to the ground from each floor level exit and an approved rope, or its equivalent, for all other exits, if the exit threshold is more that 6 feet above the ground:

(i) With the rotorcraft on the ground and with the landing gear extended;

(ii) With one or more legs or part of the landing gear collapsed, broken, or not extended;

and

(iii) With the rotorcraft resting on its side, provided this was accomplished during the emergency evacuation test during type certification of the helicopter.

(7) The slide for each passenger emergency exit shall be a self-supporting slide or equivalent, and shall be designed to meet the following requirements:

(i) It shall be automatically deployed, and deployment shall begin during the interval between the time the exit opening means is actuated from inside the rotorcraft and the time the exit is fully opened. However, each passenger emergency exit which is also a passenger entrance door or a service door shall be provided with means to prevent deployment of the slide when the exit is opened from either the inside or the outside under non-emergency conditions for normal use;

(ii) It shall be automatically erected within 10 seconds after deployment is begun;

(iii) It shall be of such length after full deployment that the lower end is self-supporting on the ground and provides safe evacuation of occupants to the ground after collapse of one or more legs or part of the landing gear;

(iv) It shall have the capability, in 25-knot winds directed from the most critical angle, to deploy and, with the assistance of only one person, to remain usable after full deployment to evacuate occupants safely to the ground; and

(v) For helicopters having 30 or fewer passenger seats and having an exit threshold more than 6 feet above the ground, a rope or other assist means may be used in place of the slide specified in item (6) of this paragraph, provided this was accomplished during the emergency evacuation test during type certification of the helicopter.

(8) If a rope, with its attachment, is used for compliance with items(6), (7), or (8) of this paragraph, it shall:-

(i) Withstand a 400-pound static load; and

(ii) Attach to the fuselage structure at or above the top of the emergency exit opening, or at another approved location if the stowed rope would reduce the pilot's view in flight.

(e) Emergency exit marking.

(1) Each passenger emergency exit, its means of access, and its means of opening shall be conspicuously marked for the guidance of occupants using the exits in daylight or in the dark. Such markings shall be designed to remain visible for rotorcraft equipped for overwater flights if the rotorcraft is capsized and the cabin is submerged.

(2) The identity and location of each passenger emergency exit shall be recognizable from a distance equal to the width of the cabin.

(3) The location of each passenger emergency exit shall be indicated by a sign visible to occupants approaching along the main passenger aisle. There shall be a locating sign:-

(i) Next to or above the aisle near each floor emergency exit, except that one sign may serve two exits if both exists can be seen readily from that sign; and

(ii) On each bulkhead or divider that prevents fore and aft vision along the passenger cabin, to indicate emergency exits beyond and obscured by it, except that if this is not possible the sign may be placed at another appropriate location.

(4) Each passenger emergency exit marking and each locating sign shall have white letters 1 inch high on a red background 2 inches high, be self or electrically illuminated, and have a minimum luminescence (brightness) of at least 160 micro lamberts. The colors may be reversed if this will increase the emergency illumination of the passenger compartment.

(5) The location of each passenger emergency exit operating handle and instructions for opening shall be shown:-

(i) For each emergency exit, by a marking on or near the exit that is readable from a distance of 30 inches; and

(ii) For each Type I or Type II emergency exit with a locking mechanism released by rotary motion of the handle, by:-

(A) A red arrow, with a shaft at least three-fourths inch wide and a head twice the width of the shaft, extending along at least 70 degrees of arc at a radius approximately equal to three-fourths of the handle length; and

(B) The word "open" in red letters 1 inch high, placed horizontally near the head of the arrow.

(6) Each emergency exit, and its means of opening, shall be marked on the outside of the rotorcraft. In addition, the following apply:-

(i) There shall be a 2-inch colored band outlining each passenger emergency exit, except small rotorcraft with a maximum weight of 12,500 pounds or less may have a 2-inch colored band outlining each exit release lever or device of passenger emergency exits which are normally used doors.

(ii) Each outside marking, including the band, shall have color contrast to be readily distinguishable from the surrounding fuselage surface. The contrast shall be such that, if the reflectance of the darker color is 15 percent or less, the reflectance of the lighter color must be at least 45 percent. "Reflectance" is the ratio of the luminous flux reflected by a body to the luminous flux it receives. When the reflectance of the darker color is greater than 15 percent, at least a 30 percent difference between its reflectance and the reflectance of the lighter color must be provided.

(f) Emergency lighting. The following apply:

(1) A source of light with its power supply independent of the main lighting system shall be installed to:-

(i) Illuminate each passenger emergency exit marking and locating sign; and

(ii) Provide enough general lighting in the passenger cabin so that the average illumination, when measured at 40-inch intervals at seat armrest height on the center line of the main passenger aisle, is at least 0.05 foot- candle.

(1) Exterior emergency lighting shall be provided at each emergency exit. The illumination may not be less than 0.05 foot-candle (measured normal to the direction of incident light) for minimum width on the ground surface, with landing gear extended, equal to the width of the emergency exit where an evacuee is likely to make first contact with the ground outside the cabin. The exterior emergency lighting may be provided by either interior or exterior sources with light intensity measurements made with the emergency exits open.

(2) Each light required by item (1) or (2) of this paragraph shall be operable manually from the cockpit station and from a point in the passenger compartment that is readily accessible. The cockpit control device must have an "on," "off," and "armed" position so that when turned on at the cockpit or passenger compartment station or when armed at the cockpit station, the emergency lights will either illuminate or remain illuminated upon interruption of the rotorcraft's normal electric power.

(4) Any means required to assist the occupants in descending to the ground shall be illuminated so that the erected assist means is visible from the rotorcraft.

(i) The assist means must be provided with an illumination of not less than 0.03 foot-candle (measured normal to the direction of the incident light) at the ground end of the erected assist means where an evacuee using the established escape route would normally make first contact with the ground, with the rotorcraft in each of the attitudes corresponding to the collapse of one or more legs of the landing gear.

(ii) If the emergency lighting subsystem illuminating the assist means is independent of the rotorcraft's main emergency lighting system, it:-

(A) Will automatically be activated when the assist means is erected;

(B) Will provide the illumination required by (4)(i) above; and

(C) Will not be adversely affected by stowage.

(5) The energy supply to each emergency lighting unit shall provide the required level of illumination for at least 10 minutes at the critical ambient conditions after an emergency landing.

(6) If storage batteries are used as the energy supply for the emergency lighting system, they may be recharged from the rotorcraft's main electrical power system provided the charging circuit is designed to preclude inadvertent battery discharge into charging circuit faults.

(g) Emergency exit access.

(1) Each passageway between passenger compartments, and each passageway leading to Type I and Type II emergency exits, shall be:-

(i) Unobstructed; and

(ii) At least 20 inches wide.

(2) For each emergency exit covered by (d)(6) in this paragraph, there shall be enough space adjacent to that exit to allow a crewmember to assist in the evacuation of passengers without reducing the unobstructed width of the passageway below that required for that exit.

(3) There shall be access from each aisle to each Type III and Type IV exit, and

(i) For rotorcraft that have a passenger seating configuration, excluding pilot seats, of 20 or more, the projected opening of the exit provided shall not be obstructed by seats, berths, or other protrusions (including seatbacks in any position) for a distance from that exit of not less than the width of the narrowest passenger seat installed on the rotorcraft;

(ii) For rotorcraft that have a passenger seating configuration, excluding pilot seats, of 19 or less, there may be minor obstructions in the region described in (g)(3) (i) of this paragraph, if there are compensating factors to maintain the effectiveness of the exit.

(h) Main aisle width. The main passenger aisle width between seats must equal or exceed the values in the following table:

Passenger seating capacity	Minimum main passenger aisle width	
	Less than 25 inches from floor (inches)	25 Inches and more from floor (inches)
10 or less	12	15
11 through 19	12	20
20 or more	15	20

[1]A narrower width not less than 9 inches may be approved when substantiated by tests found necessary by the State of Manufacturer.

7.9.1.4 VISUAL SIGNALLING DEVICES

(a) [AAC] No person may operate an aircraft over water or across land areas which have been designated by the Authority as areas in which search and rescue would be especially difficult, unless equipped with such signaling devices as may be appropriate to the area over flown, to include:-

(1) At least one pyrotechnic signaling device for each life raft required for overwater operations; and

(2) Any other requirements specified by the Authority.

7.9.1.5 SURVIVAL KITS

(a) [AAC] No person may operate an aircraft across land areas which have been designated by the Authority as areas in which search and rescue would be especially difficult, unless equipped with enough survival kits for the number of occupants of the aeroplane appropriate for the route to be flown.

7.9.1.6 EMERGENCY LOCATOR TRANSMITTER

(a) No person shall operate an aeroplane without the following emergency locator equipment:

(1) [AAC] All aeroplanes on all flights shall be equipped with an automatically activated ELT that transmit simultaneously on 121.5 MHz or 406 MHz, and meet the technical standards specified by the Authority and the relevant portions of Communication Systems requirements.

(2) [AAC] Batteries used in ELTs shall be replaced (or recharged if the battery is rechargeable) When:-

(i) The transmitter has been in use for more than one cumulative hour; or

(ii) 50 percent of their useful life (or for rechargeable batteries, 50 percent of their useful life of charge) has expired.

(3) [AAC] The date for a replacement of the battery in the ELT shall be legibly marked on the outside of the transmitter.

(4) [AOC] No person may operate an aeroplane in long-range overwater operations or over designated land areas where search and rescue would be especially difficult, without having on the aeroplane at least two ELTs, one of which shall be automatic,

(5) Except as provided for in , all a 7.9.1.6 (a) (6) aeroplanes authorized to carry 19 passengers or less shall be equipped with at least one ELT of any type.

(6) All aeroplanes authorized to carry 19 passengers or less for which the individual certificate of airworthiness is first issued after 1 July 2008 shall be equipped with at least one automatic ELT.

(7) [AOC] At least one survival type ELT shall be located with each life-raft carried.

(b) From 1 July 2008, all helicopters operating in performance Class 3 shall be equipped with at least one automatic ELT and, when operating on flights over water with at least one automatic ELT and one ELT(S) in a raft or life jacket. ELT equipment carried shall operate in accordance with the relevant provisions of Communication Systems requirements.

Note:- The judicious choice of numbers of ELTs, their type and placement on aircraft and associated floatable life support systems will ensure the greatest chance of ELT activation in the event of an accident for aircraft operating over water or land, including areas especially difficult for search and rescue. Placement of transmitter units is a vital factor in ensuring optimal crash and fire protection. The placement of the control and switching

devices (activation monitors) of automatic fixed ELTs and their associated operational procedures will also take into consideration the need for rapid detection of inadvertent activation and convenient manual switching by crew members.

(c) No person shall operate helicopter without the following emergency locator equipment:

(1) [AAC] All helicopters on all flights shall be equipped with an automatically activated ELT that transmit simultaneously on 121.5 MHz or 406 MHz, and meet the technical standards specified by the Authority and the relevant portions of Communication Systems requirements.

(2) From 1 July 2008, all helicopters operating in performance Class 1 and 2 shall be equipped with at least one automatic ELT and, when operating on flights over water with at least one automatic ELT and one ELT(S) in a raft or life jacket.

(3) From 1 July 2008, all helicopters operating in performance Class 3 shall be equipped with at least one automatic ELT and, when operating on flights over water with at least one automatic ELT and one ELT(S) in a raft or life jacket.

(4) ELT equipment carried to satisfy the requirements shall operate in accordance with the relevant provisions of Communication Systems requirements.

Note:- The judicious choice of numbers of ELTs, their type and placement on aircraft and associated floatable life support systems will ensure the greatest chance of ELT activation in the event of an accident for aircraft operating over water or land, including areas especially difficult for search and rescue. Placement of transmitter units is a vital factor in ensuring optimal crash and fire protection. The placement of the control and switching devices (activation monitors) of automatic fixed ELTs and their associated operational procedures will also take into consideration the need for rapid detection of inadvertent activation and convenient manual switching by crew members.

(5) [AAC] Batteries used in ELTs shall be replaced (or recharged if the battery is rechargeable) when:-

(i) The transmitter has been in use for more than one cumulative hour; or

(iii) 50 percent of their useful life (or for rechargeable batteries, 50 percent of their useful life of charge) has expired.

(6) [AAC] the date for a replacement of the battery in the ELT shall be legibly marked on the outside of the transmitter.

(7) [AAC] No person may operate helicopter in long-range overwater operations or over designated land areas where search and rescue would be especially difficult, without having on the helicopter at least two survival type ELTs, one of which shall be automatic,

(8) [AAC] At least one survival type ELT shall be located with each life-raft carried.

7.9.1.7 PORTABLE FIRE EXTINGUISHERS

(a) [AAC] No person may operate an aircraft unless it is equipped with portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the aircraft. At least one shall be located in:-

(1) The pilot's compartment; and

(2) Each passenger compartment that is separate from the pilot's compartment and not readily accessible to the flight crew.

(b) [AOC] No person may operate an aircraft unless it is equipped with portable fire extinguishers accessible for use in crew, passenger, and cargo compartments as follows:

(1) The type and quantity of extinguishing agent shall be suitable for the kinds of fires likely to occur in the compartment where the extinguisher is intended to be used;

(2) At least one portable fire extinguisher shall be provided and conveniently located for use in each Class E cargo compartment which is accessible to crew members during flight, and at least one shall be located in each upper and lower lobe galley;

(3) At least one portable fire extinguisher shall be conveniently located on the flight deck for use by the flight crew;

(4) At least one portable fire extinguisher shall be conveniently located in the passenger compartment if the passenger compartment is separate from the flight deck and not readily accessible to the flight crew; and

(5) For each aeroplane having a passenger seating capacity of more than 30, there shall be at least the following number of portable fire extinguishers conveniently located and uniformly distributed throughout the compartment.

Minimum Number of Hand Fire Extinguishers Passenger Seating Capacity	
7 through 29	1
30 through 60	2
61 through 200	3
201 through 300	4
301 through 400	5
401 through 500	6
501 through 600	7
601 or more	8

7.9.1.8 LAVATORY FIRE EXTINGUISHER

(a) [AOC] No person may operate a passenger-carrying transport category aeroplane unless each lavatory in the aeroplane is equipped with a built-in fire extinguisher for each disposal receptacle for

towels, paper, or waste located within the lavatory.

(b) [AOC] Built-in lavatory fire extinguishers shall be designed to discharge automatically into each disposal receptacle upon occurrence of a fire in the receptacle.

(c) Any agent used in a built-in fire extinguisher for each lavatory disposal receptacle for towels, paper or waste in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2011 and any extinguishing agent used in a portable fire extinguisher in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2018 shall:

(1) meet the applicable minimum performance requirements of Ethiopia; and

(2) not be of a type listed in the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer as it appears in the Eighth Edition of the Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer, Annex A, Group II..

(d) A helicopter shall be equipped with portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the helicopter. At least one shall be located in:

(1) the pilot's compartment; and

(2) each passenger compartment that is separate from the pilot's compartment and that is not readily accessible to the flight crew.

Note:- *Any portable fire extinguisher so fitted in accordance with the certificate of air worthiness of the helicopter may count as one prescribed.*

(e) Any agent used in a built-in fire extinguisher for each lavatory disposal receptacle for towels, paper or waste in a helicopter for which the individual certificate of airworthiness is first issued on or after 31 December 2011 and any extinguishing agent used in a portable fire extinguisher in a helicopter for which the individual certificate of airworthiness is first issued on or after 31 December 2018 shall:

(1) meet the applicable minimum performance requirements of Ethiopia; and

(2) not be of a type listed in the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer as it appears in the Eighth Edition of the Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer, Annex A, Group II.

Note: - Information concerning extinguishing agents is contained in the UNEP Halons Technical Options Committee Technical Note No. 1 – New Technology Halon Alternatives and FAA Report No. DOT/FAA/AR-99-63, Options to the Use of Halons for Aircraft Fire Suppression Systems.

7.9.1.9 LAVATORY SMOKE DETECTOR

(a) [AOC] No person may operate a passenger-carrying transport category aeroplane unless each lavatory in the aeroplane is equipped with a smoke detector system or equivalent that provides:-

(1) A warning light in the cockpit; or

(2) A warning light or audio warning in the passenger cabin which would be readily detected by a cabin crew member, taking into consideration the positioning of cabin crew members throughout the passenger compartment during various phases of flight.

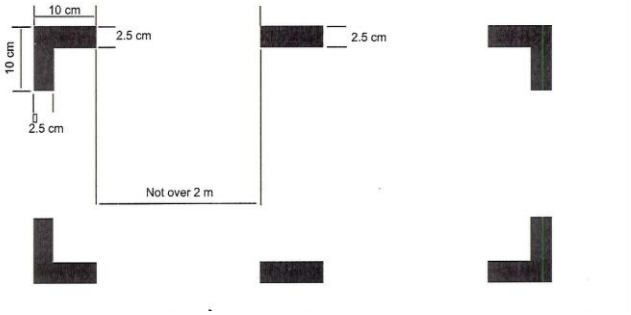
7.9.1.10 CRASH AXE

(a) [AAC] No person shall operate an aeroplane certificated with a take-off mass of 5 700 kg or more unless it is equipped with a crash axe appropriate for effective use in that type of aeroplane, stored in a place not visible to passengers on the aeroplane.

7.9.1.11 MARKING OF BREAK-IN POINTS

(a) [AAC] If areas of the fuselage suitable for break-in by rescue crews in an emergency are marked on an aeroplane, such areas shall be marked as shown below, and the colour of the markings shall be red or yellow and, if necessary, they shall be outlined in white to contrast with the background.

(b) If the corner markings are more than 2 m apart, intermediate lines 9 cm x 3 cm shall be inserted so that there is no more than 2 m between adjacent markings.



7.9.1.12 FIRST-AID KIT

(a) [AAC] No person may operate an aircraft unless it is equipped with an accessible, approved first-aid kit(s).

(b) The type, number, location and contents of first-aid kits to be carried shall comply with Implementing Standard: IS: 7. 9.1.11

7.9.1.13 EMERGENCY MEDICAL KIT - AEROPLANES

(a) [AOC] No person may operate a passenger flight in an aeroplane with 30 seats or more unless the aeroplane is equipped with an approved emergency medical kit for treatment of injuries or medical emergencies that might occur during flight time or in minor accidents.

(b) [AOC] The location and contents of emergency medical kits to be carried shall comply with Implementing Standard: IS: 7. 9.1.12.

7.9.1.14 OXYGEN STORAGE AND DISPENSING APPARATUS

(a) [AAC] All aircraft intended to be operated at altitudes requiring the use of supplemental oxygen shall be equipped with adequate oxygen storage and dispensing apparatus.

(b) [AAC] The oxygen apparatus, the minimum rate of oxygen flow, and the supply of oxygen shall meet applicable airworthiness standards for type certification in the transport category as specified by the Authority.

(c) [AAC] No person may operate an aircraft at altitudes above 10,000 feet unless it is equipped with oxygen masks, located so as to be within the immediate reach of flight crew members while at their assigned duty station.

(d) [AAC] No person may operate a pressurized aeroplane at altitudes above 25,000 feet unless:

(1) Flight crew member oxygen masks are available at the flight duty station and are of a quick donning type;

(2) Sufficient spare outlets and masks and/or sufficient portable oxygen units with masks are distributed evenly throughout the cabin to ensure immediate availability of oxygen to each required cabin crew member regardless of his or her location at the time of cabin pressurization failure

(e) [AAC] an oxygen-dispensing unit connected to oxygen supply terminals is installed so as to be immediately available to each occupant, wherever seated. The total number of dispensing units and outlets shall exceed the number of seats by at least 10%. The extra units are to be evenly distributed throughout the cabin.

(f) [AAC] The amount of supplemental oxygen for sustenance required for a particular operation shall be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures established for each operation in the Operations Manual and with the routes to be flown, and with the emergency procedures specified in the Operations Manual. See Implementing Standard: IS: 7.9.1.13 to determine the amount of supplemental oxygen needed for non-pressurized and pressurized aircraft.

7.9.1.15 OXYGEN SUPPLY

(a) Approximate altitudes in the Standard Atmosphere corresponding to the values of absolute pressure used in the text are as follows:

Absolute pressure	Metres	Feet
700 hPa	3 000	10 000
620 hPa	4 000	13 000
376 hPa	7 600	25

(b) A flight to be operated at flight altitudes at which the atmospheric pressure in personnel compartments will be less than 700 hPa shall not be commenced unless sufficient stored breathing oxygen is carried to supply:

(1) all crewmembers and 10 percent of the passengers for any period in excess of 30 minutes that

the pressure in compartments occupied by them will be between 700 hPa and 620 hPa; and

(2) the crew and passengers for any period that the atmospheric pressure in compartments occupied by them will be less than 620 hPa.

(c) A flight to be operated with a pressurized aircraft shall not be commenced unless a sufficient quantity of stored breathing oxygen is carried to supply all the crewmembers and passengers, as is appropriate to the circumstances of the flight being undertaken, in the event of loss of pressurization, for any period that the atmospheric pressure in any compartment occupied by them would be less than 700 hPa. In addition, when the helicopter is operated at flight altitudes at which the atmospheric pressure is more than 376 hPa and cannot descend safely to a flight altitude at which the atmospheric pressure is equal to 620hPa within four minutes, there shall be no less than a 10-minute supply for the occupants of the passenger compartment.

(d) An aircraft intended to be operated at flight altitudes at which the atmospheric pressure is more than 376 hPa which cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa, and for which the individual certificate of airworthiness was issued on or after 9 November 1998, shall be provided with automatically deployable oxygen equipment to satisfy the requirements of paragraph (b). The total number of oxygen dispensing units shall exceed the number of passenger and cabin crew seats by at least 10 per cent.

7.9.1.16 FIRST AID OXYGEN DISPENSING UNITS

(a) [AOC] No AOC holder may conduct a passenger carrying operation in a pressurized aeroplane at altitudes above 25,000 feet, when a cabin crew member is required to be carried, unless it is equipped with:-

(1) Undiluted first-aid oxygen for passengers who, for physiological reasons, may require oxygen following a cabin de-pressurization; and

(2) A sufficient number of dispensing units, but in no case less than two, with a means for cabin crew to use the supply.

(b) [AOC] The amount of first-aid oxygen required in paragraph (a) for a particular operation and route shall be determined on the basis of:-

(1) Flight duration after cabin depressurization at cabin altitudes of more than 8,000 feet;

(2) An average flow rate of at least 3 litres Standard Temperature Pressure Dry (STPD)/minute/person; and

(3) At least 2% of the passengers carried, but in no case for less than one person.

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

(d) The oxygen equipment provided shall 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 minutes, STPD, at any altitude.

7.9.1.17 MEGAPHONES

(a) [AOC] Each person operating a passenger-carrying aeroplane shall have a portable battery-powered megaphone or megaphones readily accessible to the crew members assigned to direct emergency evacuation.

(b) [AOC] The number and location of megaphones required in paragraph (a) shall be determined as follows:

(1) On aeroplanes with a seating capacity of more than 60 and less than 100 passengers, one megaphone shall be located at the most rearward location in the passenger cabin where it would be readily accessible to a normal cabin crew member seat;

(2) On aeroplanes with a seating capacity of more than 99 passengers, two megaphones in the passenger cabin on each aeroplane one installed at the forward end and the other at the most rearward location where it would be readily accessible to a normal cabin crew member seat; and

(3) For aeroplanes with more than one passenger deck, in all cases when the total passenger seating configuration of a deck is more than 60, at least one megaphone is required on the deck.

7.9.1.18 ALL AEROPLANES ON FLIGHTS OVER WATER

1. SEAPLANES

(a) All seaplanes for all flights shall be equipped with:

(1) one life jacket, or equivalent individual flotation device, for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided;
(2) equipment for making the sound signals prescribed in the International Regulations for Preventing Collisions at Sea, where applicable; and

(3) one sea anchor (drogue).

Note. — "Seaplanes" includes amphibians operated as seaplanes.

2. LANDPLANES

(a) An operator shall not operate a Landplane unless the landplane carries the equipment prescribed in paragraph (b) below.

(1) When flying over water and at a distance of more than 93 km (50 NM) away from the shore, in the case of landplanes operated in accordance with ECARAS Part 8, Section 8.7.2.8 or 8.7.2.9;

(2) When flying en route over water beyond gliding distance from the shore, in the case of all other landplanes; and

(3) When taking off or landing at an aerodrome where the Authority has determined the takeoff or approach path is so disposed over water that in the event of a mishap there would be the likelihood of a ditching.

(b) The equipment referred to in (a) shall comprise one life jacket or equivalent individual flotation device for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.

Note. — "Landplanes" includes amphibians operated as landplanes.

7.9.1.19 ALL AEROPLANES ON LONG-RANGE OVER-WATER FLIGHTS

(a) In addition to the equipment prescribed in 7.9.1.18 (1) or 7.9.1.18 (2) whichever is applicable, the following equipment shall be installed in all aeroplanes when used over routes on which the aeroplane may be over water and at more than a distance corresponding to 120 minutes at cruising speed or 740 km (400 NM), whichever is the lesser, away from land suitable for making an emergency landing in the case of aircraft operated in accordance with ECARAS Part 8,Section 8.7.2.8 or 8.7.2.9; and 30 minutes or 185 km (100 NM), whichever is the lesser, for all other aeroplanes:

(1) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken;

(2) equipment for making the pyrotechnical distress signals described in ECARAS Part 8; and;

(3) Effective 1 January 2018, on all aeroplanes of a maximum certificated takeoff mass of over 27000 kg, a securely attached underwater locating device operating at a frequency of 8.8 kHz. This automatically activated underwater locating device shall operate for a minimum of 30 days and shall not be installed in wings or empennage.

Note.— Underwater locator beacon (ULB) performance requirements are as contained in the SAE AS6254, Minimum Performance Standard for Low Frequency Underwater Locating Devices (Acoustic) (Self-Powered), or equivalent documents.

(b) Each life jacket and equivalent individual flotation device, when carried in accordance with 7.9.1.18 (1) (a) (1), 7.9.1.18. (2) (a) & (b) shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons, except where the requirement of 7.9.1.18 (2) (a) (3) is met by the provision of individual flotation devices other than life jackets.

(c) [AAC] Lifesaving rafts in sufficient numbers to carry all persons on board shall be installed in aeroplanes operated on long range over-water flights, and all other aeroplanes when they are operated over water away from land suitable for making an emergency landing at a distance of more than 185 km (100 NM) in the case of single-engine aeroplanes, and more than 370 km (200 NM) in the case of multi-engine aeroplanes capable of continuing flight with one engine inoperative.

(d) [AOC] An aircraft shall have lifesaving rafts with a sufficient capacity to carry all persons on board in the event of the loss of one raft of the largest capacity.

(e) All lifesaving rafts shall be stowed so as to facilitate their ready use in an emergency.

(f) Life rafts shall be equipped with the following life sustaining equipment:-

(1) A electric survivor locator light;

(2) A survival kit;

(3) A pyrotechnic signaling device; and

(3) An ELT (See IS 7.9.1.5).

7.9.1.20 ALL AEROPLANES ON FLIGHTS OVER DESIGNATED LAND AREAS

Aeroplanes when operated across land areas which have been designated by the State concerned as areas in which search and rescue would be especially difficult, shall be equipped with such signaling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area overflown.

7.9.1.21 ALL AEROPLANES ON HIGH ALTITUDE FLIGHTS

(a) Approximate altitude in the Standard Atmosphere corresponding to the value of absolute pressure used in this text is as follows:

Absolute pressure	Metres	Feet
700 hPa	3 000	10 000
620 hPa	4 000	13 000
376 hPa	7 600	25 000

(b) An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 700 hPa in personnel compartments shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 7.9.1.15 (b).

(c) An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 700 hPa but which is provided with means of maintaining pressures greater than 700 hPa in personnel compartments shall be provided with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 7.9.1.15 (c).

(d) Pressurized aeroplanes newly introduced into service on or after 1 July 1962 and intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.

(e) Pressurized aeroplanes introduced into service before 1 July 1962 and intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa should be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.

(f) An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa, or which, if operated at flight altitudes at which the atmospheric pressure is more than 376 hPa, cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa and for which the individual certificate of airworthiness is first issued on or after 9 November 1998, shall be provided with automatically deployable oxygen equipment to satisfy the requirements of 7.9.1.15 (b). The total number of oxygen dispensing units shall exceed the number of passenger and cabin crew seats by at least 10 per cent.

7.9.1.22 ALL HELICOPTERS ON FLIGHTS OVER DESIGNATED SEA AREAS

(a) Helicopters, when operating over sea areas which have been designated by the State concerned as areas in which search and rescue would be especially difficult, shall be equipped with life-saving equipment (including means of sustaining life) as may be appropriate to the area over flown.

(b) For offshore operations, a survival suit shall be worn by all occupants when the sea temperature is less than 10°C or when the estimated rescue time exceeds the calculated survival time. When the elevation and strength of the sun results in a high temperature hazard on the flight deck, considerations shall be given to alleviating the flight crew from this recommendation.

Note: - *When establishing rescue time, the sea state and the ambient light conditions should be taken into consideration.*

7.9.1.23 ALL HELICOPTERS ON FLIGHTS OVER DESIGNATED LAND AREAS

(a) Helicopters, when operated across land areas which have been designated by the State concerned as areas in which search and rescue would be especially difficult, shall be equipped with such signalling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area over-flown.

7.9.1.24 FLOTATION DEVICE FOR HELICOPTER DITCHING

(a) [AAC] All helicopters flying over water at a distance from land corresponding to more than 10 minutes at normal cruise speed in the case of performance Class 1 or 2 helicopters, or flying over water beyond auto rotational or safe forced landing distance from land in the case of performance Class 3 helicopters, shall be fitted with a permanent or rapidly deployable means of floatation so as to ensure a safe ditching of the helicopter.

(b) For offshore operations, when operating beyond auto rotational distance from land, the life jacket shall be worn unless the occupant is wearing an integrated survival suit that includes the functionality of the life jacket.

(2) All helicopters intended to be flown over water shall be fitted with a permanent or rapidly deployable means of flotation so as to ensure a safe ditching of the helicopter when:

(i) engaged in offshore operations, or other overwater operations as prescribed by the Authority; or

(ii) flying over water in a hostile environment at a distance from land corresponding to more than 10 minutes at normal cruise speed when operating in performance Class1or 2; or

(iii) flying over water in an on-hostile environment at a distance from land specified by the appropriate authority of the responsible State when operating in performance Class1; or

(iv) flying over water beyond auto rotational or safe forced landing distance from land when operating in performance Class 3.

(c) [AOC] In helicopters, life rafts which are not deployable by remote control and which have a mass of more than 40 kg shall be equipped with a means of mechanically assisted deployment.

(d) [AOC] In helicopters, life rafts which are not deployable by remote control and which have a mass of more than 40 kg shall be equipped with a means of mechanically assisted deployment.

(e) On any helicopter for which the individual certificate of airworthiness is first issued on or after 1 January 1991, at least 50 per cent of the life rafts carried in accordance with the provisions of 7.9.1.17 shall be deployable by remote control.

(f) Rafts which are not deployable by remote control and which have a mass of more than 40 kg shall be equipped with some means of mechanically assisted deployment.

(g) On any helicopter for which the individual certificate of airworthiness was first issued before1 January 1991, the provisions of (e)and (f) shall be complied with no later than 31 December1992.

7.9.1.25 CARGO COMPARTMENT PROTECTION

(a) Each cargo compartment shall be equipped with a built-in fire detection system and a means to suppress a fire, except when the presence of a fire would be easily discovered by a crew member while at their station and the crew member has a means to extinguish it rapidly.

(b) The means to suppress a fire for each cargo compartment not accessible to a crew member shall include a built-in fire suppression system.

(c) For those aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2025, the elements of the aeroplane design associated with cargo compartment fire protection, and a summary of the demonstrated standards that were considered in the process of aeroplane certification shall be included in the required aeroplane documentation and made available to the operator.

7.10 MISCELLANEOUS SYSTEMS AND EQUIPMENT

7.10.1.1 SEATS, SAFETY BELTS, AND SHOULDER HARNESSES

(a) [AAC] Each aircraft used in passenger carrying operations shall be equipped with the following seats, safety belts, and shoulder harnesses that meet the airworthiness requirements for type certification of that aircraft:

(1) A seat with safety belt for each person on board over an age to be determined by the Authority; and a restraining belt for each berth on board the aircraft.

(2) A safety harness for each flight crewmember seat.

(i) The safety harness for each pilot seat shall incorporate a device, which will automatically restrain the occupant's torso in the event of rapid deceleration.

(ii) The safety harness for each pilot seat, which includes shoulder straps and a seat belt, should incorporate a device to prevent a suddenly incapacitated pilot from interfering with the flight controls.

(3) A forward or rearward facing (within 15 degrees of the longitudinal axis of the aeroplane) seat equipped with a safety harness for each cabin crew member station in the passenger compartment.

(4) The cabin crew member's seats shall be located near floor level and other emergency exits as required by the Authority for emergency evacuation.

7.10.1.2 PASSENGER AND PILOT COMPARTMENT DOORS –AEROPLANES

(a) [AOC] Pilot compartment door:-

(1) No person may operate a passenger carrying aeroplane:
(i) of a maximum certificated takeoff mass in excess of 54 5000 kg or;
(ii) of a maximum certificated take-off mass in excess of 45500 kg with a passenger seating capacity greater than 19; or
(iii) with a passenger seating capacity greater than 60;

unless that aircraft is equipped with an approved flight crew compartment door that is designed to resist penetration by small arms fire and grenade shrapnel, and to resist forcible intrusions by unauthorized persons.

(2) Each pilot compartment door shall be capable of being locked and unlocked from either pilot's station.

(b) In all aeroplanes which are equipped with a flight crew compartment door in accordance with paragraph (a):
(1) this door shall be closed and locked from the time all external doors are closed following embarkation until any such door is opened for disembarkation, except when necessary to permit access and egress by authorized persons; and
(2) means shall be provided for monitoring from either pilot's station the entire door area outside the flight crew compartment to identify persons requesting entry and to detect suspicious behaviour or potential threat.

(c) [CAT] Passenger compartment doors:-

(1) Each passenger compartment door shall have:

(i) A means for the crew, in an emergency, to unlock each door that leads to a compartment that is normally accessible to passengers and that can be locked by passengers;

(ii) A placard on each door used to access a required passenger emergency exit, indicating that such door shall be open during takeoff and landing; and

(iii) A means readily available for each crewmember to unlock any door that separates a passenger compartment from another compartment that has emergency exit provisions.

7.10.1.3 PASSENGER INFORMATION SIGNS

(a) [CAT] No person shall operate a passenger carrying aeroplane with a maximum certificated take-off weight of 5,700 kg (12,500 lbs) or more unless it is equipped with:-

(1) At least one passenger information sign (using either letters or symbols) notifying when smoking is prohibited and one sign (using either letters or symbols) notifying when safety belts should be fastened, which shall, when illuminated, be legible to each person seated in the passenger cabin under all probable conditions of cabin illumination;

(2) Signs which notify when safety belts should be fastened and when smoking is prohibited shall be so constructed that the crew can turn them on and off;

(3) A sign or placard affixed to each forward bulkhead and each passenger seat back that reads "Fasten Seat Belt While Seated."

(b) [AAC] Notwithstanding paragraph (a), no person shall operate an aircraft in which all passenger seats are not visible from the flight deck, unless it is equipped with a means of indicating to all passengers and cabin crew when seat belts shall be fastened and when smoking is not allowed.

7.10.1.4 MATERIALS FOR CABIN INTERIORS

(a) No person shall operate an aircraft unless each compartment used by the crew or passengers meet the following requirements of the State of Design:-

(1) Materials must be at least flash resistant;

(2) The wall and ceiling linings and the covering of upholstering, floors and furnishings must be flame resistant;

(3) Each compartment where smoking is to be allowed must be equipped with self-contained ash trays that are completely removable and other compartments must be placarded against smoking; and

(4) Each receptacle for used towels, papers and wastes must be of fire-resistant material and must have a cover or other means of containing possible fires started in the receptacles.

(b) For aircraft for which the State of Design has developed new airworthiness requirements for cabin interiors since original type certification, the owner of the aircraft shall ensure that all materials that do not meet current State of Design requirement shall have them replaced upon the first major

overhaul of the aircraft cabin or refurbishing of the cabin interior with materials that meet the new requirements.

7.10.1.5 MATERIALS FOR CARGO AND BAGGAGE COMPARTMENTS

(a) [AAC] Each cargo compartment shall have ceiling and sidewall liner panels which are constructed of materials which meet the test requirements for flame resistance of cargo compartment liners as prescribed for type certification.

7.10.1.6 POWER SUPPLY, DISTRIBUTION, AND INDICATION SYSTEM

(a) [AOC] No AOC holder may operate an aeroplane unless it is equipped with:-

(1) A power supply and distribution system that meets the airworthiness requirements for certification of an aeroplane in the transport category, as specified by the Authority, or

(2) A power supply and distribution system that is able to produce and distribute the load for the required instruments and equipment, with use of an auxiliary power supply if any one power source or component of the power distribution system fails.

(3) A means for indicating the adequacy of the power being supplied to required flight instruments.

(b) [AOC] Engine-driven sources of energy, when used, shall be redundant.

7.10.1.7 PROTECTIVE CIRCUIT FUSES

[AOC] No person may operate an aeroplane in which protective fuses are installed unless there are spare fuses available of appropriate ratings for replacement of those accessible in flight.

7.10.1.8 ICING PROTECTION EQUIPMENT

(a) [AAC] No person shall operate an aircraft in expected or actual icing conditions unless it is equipped with suitable de-icing and/or anti-icing for the prevention or removal of ice on windshields, wings, control surfaces, empennage, propellers, rotor blades, or other parts of the aircraft where ice formation will adversely affect the safety of the aircraft.

(b) [AAC] No person may operate an aircraft in expected or actual icing conditions at night unless it is equipped with a means to illuminate or detect the formation of ice. Any illumination that is used shall be of a type that will not cause glare or reflection that would handicap crew members in the performance of their duties.

7.10.1.9 PITOT HEAT AND INDICATION SYSTEMS

(a) [AAC] No person may operate an aircraft in instrument flight conditions unless it is equipped with a

pitot heat system.

(b) [AOC] No AOC holder may operate an aeroplane equipped with a flight instrument pitot heating system unless the aeroplane is also equipped with an operable pitot heat indication system that complies with the following requirements:

(1) The indication provided shall incorporate an amber light that is in clear view of a flight crew member. The indication provided shall be designed to alert the flight crew if either:

(i) The pitot heating system is switched "off", and

(ii) The pitot heating system is switched "on" and any pitot tube heating element is inoperative, or

(2) An integrated flight crew alerting system that will notify the crew if the pitot system is malfunctioning.

7.10.1.10 STATIC PRESSURE SYSTEM

(a) [AAC] No person may operate an aircraft unless it is equipped with a static pressure system vented to the outside atmospheric pressure so that they will be least affected by airflow variation or moisture or other foreign matter, and installed so as to be airtight except for the vent.

(b) [AAC] No person may operate an aircraft in IFR or VFR at night unless it is equipped with a static pressure system vented to the outside atmospheric pressure so that they will be least affected by airflow variation or moisture or other foreign matter, and installed so as to be airtight except for the vent and a means of selecting an alternative source of static pressure.

(c) [AOC] No person may operate an aircraft unless it is equipped with two independent static pressure systems, vented to the outside atmospheric pressure so that they will be least affected by airflow variation or moisture or other foreign matter, and installed so as to be airtight except for the vent.

7.10.1.11 WINDSHIELD WIPERS

(a) [AOC] No AOC holder may operate an aeroplane with a maximum certified take-off mass of more than 5700 kg unless it is equipped at each pilot station with a windshield wiper or equivalent means to maintain a clear portion of the windshield during precipitation.

7.10.1.12 CHART HOLDER

(a) [AOC] No person may operate an aeroplane in commercial air transport operations under single pilot IFR or at night unless a chart holder is installed in an easily readable position that can be illuminated for night operations.

7.10.1.13 COSMIC RADIATION DETECTION EQUIPMENT

(a) [AOC] No person shall operate an aeroplane in commercial air transport operations in an aeroplane intended to be operated above 15000 m (49, 000 ft) unless it is equipped with:-

(1) an instrument to measure and indicate continuously the dose rate of total cosmic radiation being received (i.e., the total of ionising and neutron radiation of galactic and solar origin) and the cumulative dose on each flight or

(2) A system of on-board quarterly radiation sampling acceptable to the Authority as described in IS 7.10.1.13.

7.10.1.14 MARITIME SOUND SIGNALLING DEVICE

(a) [AAC] All seaplanes for all flights shall be equipped with equipment for making the sound signals prescribed in the International Regulations for Preventing Collisions at Sea, where applicable.

7.10.1.15 ANCHORS

(a) [AAC]. No person shall operate a seaplane unless it is equipped with—

(1) One anchor, and

(2) One sea anchor (drogue).

PART 7— IMPLEMENTING STANDARDS

IS: 7.2.1.6 CATEGORY II: INSTRUMENTS AND EQUIPMENT APPROVAL AND MAINTENANCE REQUIREMENTS

(a) General. The instruments and equipment required by 7.2.1.6 shall be approved as provided in this implementing standard before being used in Category II operations. Before presenting an aircraft for approval of the instruments and equipment, it must be shown that since the beginning of the 12th calendar month before the date of submission—

(1) The ILS localizer and glide slope equipment were bench checked according to the manufacturer's instructions and found to meet those standards specified in RTCA Paper 23- 63/DO-177 dated March 14, 1963, "Standards Adjustment Criteria for Airborne Localizer and Glide slope Receivers."

(2) The altimeters and the static pressure systems were tested and inspected; and

(3) All other instruments and items of equipment specified in 7. 2.1.6 that are listed in the proposed maintenance program were bench checked and found to meet the manufacturer's specifications.

(b) Flight control guidance system. All components of the flight control guidance system shall be approved as installed by the evaluation program specified in paragraph (e) if they have not been approved for Category III operations under applicable type or supplemental type certification procedures. In addition, subsequent changes to make, model, or design of the components must be approved under this paragraph. Related systems or devices, such as the auto-throttle and computed missed approach guidance system, shall be approved in the same manner if they are to be used for Category II operations.

(c) Radio altimeter. A radio altimeter must meet the performance criteria of this paragraph for original approval and after each subsequent alteration.

(1) It shall display to the flight crew clearly and positively the wheel height of the main landing gear above the terrain.

(2) It shall display wheel height above the terrain to an accuracy of ±5 feet or 5 percent, whichever is greater, under the following conditions:

(i) Pitch angles of zero to ±5° about the mean approach attitude.

(ii) Roll angles of zero to 20° in either direction.

(iii) Forward velocities from minimum approach speed up to 200 knots.

(iv) Sink rates from zero to 15 feet per second at altitudes from 100 to 200 feet.

(3) Over level ground, it must track the actual altitude of the aircraft without significant lag or oscillation.

(4) With the aircraft at an altitude of 200 feet or less, any abrupt change in terrain representing no more than 10 percent of the aircraft's altitude must not cause the altimeter to unlock, and indicator response to such changes must not exceed 0.1 seconds and, in addition, if the system unlocks for greater changes, it must reacquire the signal in less than 1 second.

(5) Systems that contain a push to test feature must test the entire system (with or without an antenna) at a simulated altitude of less than 500 feet.

(6) The system must provide to the flight crew a positive failure warning display any time there is a loss of power or an absence of ground return signals within the designed range of operating altitudes.

(d) Other instruments and equipment. All other instruments and items of equipment required by § 7.2.1.6 shall be capable of performing as necessary for Category II operations. Approval is also required after each subsequent alteration to these instruments and items of equipment.

(e) Evaluation program.

(1) Application. Approval by evaluation is requested as a part of the application for approval of the Category II manual.

(2) Demonstrations. Unless otherwise authorised by the Authority, the evaluation program for each aircraft requires the demonstrations specified in this paragraph. At least 50 ILS approaches shall be flown with at least five approaches on each of three different ILS facilities and no more than one half of the total approaches on any one ILS facility. All approaches shall be flown under simulated instrument conditions to a 30 m (100 foot) decision height and 90 percent of the total approaches made shall be successful. A successful approach is one in which—

(i) At the 30 m (100 foot) decision height, the indicated airspeed and heading are satisfactory for a normal flare and landing (speed must be ±5 knots of programmed airspeed, but may not be less than computed threshold speed if auto-throttles are used);

(ii) The aircraft at the 30 m (100 foot) decision height, is positioned so that the cockpit is within, and tracking so as to remain within, the lateral confines of the runway extended;

(iii) Deviation from glide slope after leaving the outer marker does not exceed 50 percent of full-scale deflection as displayed on the ILS indicator;

(iv) No unusual roughness or excessive attitude changes occur after leaving the middle marker; and

(v) In the case of an aircraft equipped with an approach coupler, the aircraft is sufficiently in trim when the approach coupler is disconnected at the decision height to allow for the continuation of a normal approach and landing.

(3) Records. During the evaluation program the following information shall be maintained by the applicant for the aircraft with respect to each approach and made available to the Authority upon request:

(i) Each deficiency in airborne instruments and equipment that prevented the initiation of an approach.

(ii) The reasons for discontinuing an approach, including the altitude above the runway at which it was discontinued.

(iii) Speed control at the 30 m (100 foot) DH if auto throttles are used.

(iv) Trim condition of the aircraft upon disconnecting the auto coupler with respect to continuation to flare and landing.

(v) Position of the aircraft at the middle marker and at the decision height indicated both on a diagram of the basic ILS display and a diagram of the runway extended to the middle marker. Estimated touchdown point shall be indicated on the runway diagram.

(vi) Compatibility of flight director with the auto coupler, if applicable.

(vii) Quality of overall system performance.

(4) Evaluation. A final evaluation of the flight control guidance system is made upon successful completion of the demonstrations. If no hazardous tendencies have been displayed or are otherwise known to exist, the system is approved as installed.

(f) Each maintenance program for Category II instruments and equipment shall contain the following:

(1) A list of each instrument and item of equipment specified in § 7. 2.1.6 that is installed in the aircraft and approved for Category II operations, including the make and model of those specified in § 7. 2.1.6 (a)(1).

(2) A schedule that provides for the performance of inspections under subparagraph (5) of this paragraph within 3 calendar months after the date of the previous inspection. The inspection shall be performed by a person authorised by Part 5, except that each alternate inspection may be replaced by a functional flight check. This functional flight check shall be performed by a pilot holding a Category II pilot authorisation for the type aircraft checked.

(3) A schedule that provides for the performance of bench checks for each listed instrument and item of equipment that is specified in § 7.2.1.6 (a)(1) within 12 calendar months after the date of the previous bench check.

(4) A schedule that provides for the performance of a test and inspection of each static pressure system within 12 calendar months after the date of the previous test and inspection.

(5) The procedures for the performance of the periodic inspections and functional flight checks to determine the ability of each listed instrument and item of equipment specified in § 7.2.1.6 (a)(1) to perform as approved for Category II operations including a procedure for recording functional flight checks.

(6) A procedure for assuring that the pilot is informed of all defects in listed instruments and items of equipment.

(7) A procedure for assuring that the condition of each listed instrument and item of equipment upon which maintenance is performed is at least equal to its Category II approval condition before it is returned to service for Category II operations.

(8) A procedure for an entry in the maintenance records that shows the date, airport, and reasons for each discontinued Category II operation because of a malfunction of a listed instrument or item of equipment.

(g) Bench check. A bench check required by this section shall comply with this paragraph.

(1) Except as specified in paragraph (g)(2) of this subsection, it shall be performed by a certificated repair station holding one of the following ratings as appropriate to the equipment checked:

(i) An instrument rating.

(ii) An avionics rating.

(2) It shall be performed by a certificated air operator on aircraft identified in its approved specific operating provisions with the approved authorizations to perform maintenance and approve for return to service its own aircraft maintained under a continuous maintenance program under an equivalent system identified in Part 9.

(3) It shall consist of removal of an instrument or item of equipment and performance of the following:

(i) A visual inspection for cleanliness, impending failure, and the need for lubrication, repair, or replacement of parts;

(ii) Correction of items found by that visual inspection; and

(iii) Calibration to at least the manufacturer's specifications unless otherwise specified in the approved Category II manual for the aircraft in which the instrument or item of equipment is installed.

(h) Extensions. After the completion of one maintenance cycle of 12 calendar months, a request to extend the period for checks, tests, and inspections is approved if it is shown that the performance of particular equipment justifies the requested extension.

IS 7.4.1.3 REDUCED VERTICAL SEPARATION MINIMUM - ALTIMETRY SYSTEM PERFORMANCE REQUIREMENTS FOR OPERATIONS IN RVSM AIRSPACE

In respect of groups of aeroplanes that are nominally of identical design and build with respect to all details that could influence the accuracy of height-keeping performance, the height-keeping performance capability shall be such that the total vertical error (TVE) for the group of aeroplanes shall have a mean no greater than 25 m (80 ft) in magnitude and shall have a standard deviation no greater than 28 – 0.013z2 for 0 ≤ z ≤ 25 when z is the magnitude of the mean TVE in meters, or 92 – 0.004z2 for 0 ≤ z ≤ 80 where z is in feet. In addition, the components of TVE shall have the following characteristics:

(1) the mean altimetry system error (ASE) of the group shall not exceed 25 m (80 ft) in magnitude;

(2) the sum of the absolute value of the mean ASE and of three standard deviations of ASE shall not exceed 75 m (245 ft); and

(3) the differences between cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

In respect of aeroplanes for which the characteristics of the airframe and altimetry system fit are unique and so cannot be classified as belonging to a group of aeroplanes encompassed by paragraph 1, the height-keeping performance capability shall be such that the components of the TVE of the aeroplane have the following characteristics:

(4) the ASE of the aeroplane shall not exceed 60 m (200 ft) in magnitude under all flight conditions; and

(5) the differences between the cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

IS 7.8.1.2 FLIGHT RECORDERS

The material in this Implementing Standards concerns flight recorders intended for installation in aeroplanes engaged in international air navigation. Crash-protected flight recorders comprise one or more of the following systems:

- a flight data recorder (FDR),
- a cockpit voice recorder (CVR),
- an airborne image recorder (AIR),
- a data link recorder (DLR).

Lightweight flight recorders comprise one or more of the following systems:

- an aircraft data recording system (ADRS),
- a cockpit audio recording system (CARS),
- an airborne image recording system (AIRS),
- a data link recording system (DLRS).

1. GENERAL REQUIREMENTS

1.1 Non-deployable flight recorder containers shall be painted a distinctive orange colour.

1.2 Non-deployable crash-protected flight recorder containers shall:

a) carry reflective material to facilitate their location; and

b) have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kHz. Effective from 1 January 2018, this device shall operate for a minimum of 90 days.

1.3 Automatic deployable flight recorder containers shall:

a) be painted a distinctive orange colour, however the surface visible from outside the aircraft may be of another colour;

b) carry reflective material to facilitate their location; and

c) have an integrated automatically activated ELT.

1.4 The flight recorder systems shall be installed so that:

a) the probability of damage to the recordings is minimized;

b) there is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and

c) if the flight recorder systems have an erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact; and

d) for aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2023, a flight crew-operated erase function shall be provided on the flight deck which, when activated, modifies the recording of a CVR and AIR so that it cannot be retrieved using normal replay or copying techniques. The installation shall be designed to prevent activation during flight. In addition, the probability of an inadvertent activation of an erase function during an accident shall also be minimized.

Note.— The erase function is intended to prevent access to CVR and AIR recordings by normal replay or copying means, but would not prevent accident investigation authorities access to such recordings by specialized replay or copying techniques.

1.5 The flight recorder systems shall be installed so that they receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardizing service to essential or emergency loads.

1.6 The flight recorder systems, when tested by methods approved by the appropriate certificating authority, shall be demonstrated to be suitable for the environmental extremes over which they are designed to operate.

1.7 Means shall be provided for an accurate time correlation between the flight recorder systems recordings.

1.8 The manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recorder systems:

a) manufacturer's operating instructions, equipment limitations and installation procedures;

b) parameter origin or source and equations which relate counts to units of measurement; and

c) manufacturer's test reports.

2. FLIGHT DATA RECORDER (FDR) AND AIRCRAFT DATA RECORDING SYSTEMS (ADRS)

2.1 START AND STOP LOGIC

The FDR or ADRS shall start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power.

2.2 PARAMETERS TO BE RECORDED

2.2.1 The parameters that satisfy the requirements for FDRs are listed in Table A8-1. The number of parameters to be recorded shall depend on aeroplane complexity. The parameters without an asterisk (*) are mandatory parameters which shall be recorded regardless of aeroplane complexity. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by aeroplane systems or the flight crew to operate the aeroplane. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

2.2.2 If further FDR recording capacity is available, recording of the following additional information shall be considered:

a) operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority:

1) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source;

2) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, ETC.;

3) warnings and alerts; and

4) the identity of displayed pages for emergency procedures and checklists; and

b) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs.

2.2.3 The parameters that satisfy the requirements for flight path and speed as displayed to the pilot(s) are listed below. The parameters without an (*) are mandatory parameters which shall be recorded. In addition, the parameters designated by an (*) shall be recorded if an information source for the parameter is displayed to the pilot and is practicable to record:

- Pressure altitude
- Indicated airspeed or calibrated airspeed
- Heading (primary flight crew reference)
- Pitch attitude
- Roll attitude
- Engine thrust/power
- Landing-gear status*

- Total or outside air temperature*
- Time*
- Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
- Radio altitude*

2.2.4 The parameters that satisfy the requirements for ADRS are listed in Table A8-3.

2.3 ADDITIONAL INFORMATION

2.3.1 The measurement range, recording interval and accuracy of parameters on installed equipment shall be verified by methods approved by the appropriate certificating authority.

2.3.2 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator. The documentation needs to be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

3. COCKPIT VOICE RECORDER (CVR) AND COCKPIT AUDIO RECORDING SYSTEM (CARS)

3.1 START AND STOP LOGIC

The CVR or CARS shall start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the CVR or CARS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

3.2 SIGNALS TO BE RECORDED

3.2.1 The CVR shall record simultaneously on four separate channels, or more, at least the following:

a) voice communication transmitted from or received in the aeroplane by radio;

b) aural environment on the flight deck;

c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed;

d) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker; and

e) voice communication of flight crew members using the passenger address system, if installed.

3.2.2 The preferred CVR audio allocation should be as follows:

a) pilot-in-command audio panel;

b) co-pilot audio panel;

c) additional flight crew positions and time reference; and

d) cockpit area microphone.

3.2.3 The CARS shall record simultaneously on two separate channels, or more, at least the following:

a) voice communication transmitted from or received in the aeroplane by radio;

b) aural environment on the flight deck; and

c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed.

3.2.4 The preferred CARS audio allocation should be as follows:

a) voice communication; and

b) aural environment on the flight deck.

4. AUTOMATIC DEPLOYABLE FLIGHT RECORDER (ADFR)

4.1 OPERATION

The following requirements shall apply to an ADFR:

- deployment shall take place when the aeroplane structure has been significantly deformed;
- deployment shall take place when an aeroplane sinks in water;
- ADFR shall not be capable of manual deployment;
- the ADFR shall be able to float on water;
- the ADFR deployment shall not compromise the safe continuation of the flight;
- the ADFR deployment shall not significantly reduce the chance of survival of the recorder and of successful transmission by its ELT;
- the ADFR deployment shall not release more than one piece;
- an alert shall be made to the flight crew when the ADFR is no longer captive to the aircraft;
- the flight crew shall have no means to disable ADFR deployment when the aircraft is airborne;
- the ADFR shall contain an integrated ELT, which shall activate automatically during the deployment sequence.

  Such ELT may be of a type that is activated in-flight and provides information from which a position can be determined; and

- the integrated ELT of an ADFR shall satisfy the same requirements as an ELT required to be installed on an aeroplane. The integrated ELT shall at least have the same performance as the fixed ELT to maximize detection of the transmitted signal.

the transmitted signal.

Note 1.— Refer to the Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery (Doc 10054) formore information on ADFR.

Note 2.— If an integrated ELT of a type that is activated in flight is used within an ADFR, it could be a means to comply with the requirements of Chapter 6, 6.18.

5. DATA LINK RECORDER (DLR)

5.1 APPLICATIONS TO BE RECORDED

5.1.1 Where the aircraft flight path is authorized or controlled through the use of data link messages, all data link messages, both uplinks (to the aircraft) and downlinks (from the aircraft), shall be recorded on the aircraft. As far as practicable, the time the messages were displayed to the flight crew and the time of the responses shall be recorded.

Note.— Sufficient information to derive the content of the data link communications message and the time the messages were displayed to the flight crew is needed to determine an accurate sequence of events on board the aircraft.

5.1.2 Messages applying to the applications listed in Table A8-2 shall be recorded. Applications without the asterisk (*) are mandatory applications which shall be recorded regardless of the system complexity. Applications with an (*) shall be recorded only as far as is practicable given the architecture of the system.

6. FLIGHT CREW-MACHINE INTERFACE RECORDINGS

6.1 START AND STOP LOGIC

The AIR or AIRS shall start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the AIR or AIRS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

6.2 CLASSES

6.2.1 A Class A AIR or AIRS captures the general cockpit area in order to provide data supplemental to conventional flight recorders.

Note 1.— To respect crew privacy, the cockpit area view may be designed as far as practical to exclude the head and shoulders of crew members whilst seated in their normal operating position.

Note 2.— There are no provisions for Class A AIR or AIRS in this document.

6.2.2 A Class B AIR or AIRS captures data link message displays.

6.2.3 A Class C AIR or AIRS captures instruments and control panels.

Note.— A Class C AIR or AIRS may be considered as a means for recording flight data where it is not practical or is prohibitively expensive to record on an FDR or an ADRS, or where an FDR is not required.

6.3 APPLICATIONS TO BE RECORDED

6.3.1 The operation of switches and selectors and the information displayed to the flight crew from electronic displays shall be captured by sensors or other electronic means.

6.3.2 The recording of operation of switches and selectors by the flight crew shall include the following:

- any switch or selector that will affect the operation and the navigation of the aircraft; and
- selection of normal and alternate systems.

6.3.3 The recording of the information displayed to the flight crew from electronic displays shall include the following:

- primary flight and navigation displays;
- aircraft system monitoring displays;
- engine indication displays;
- traffic, terrain, and weather displays;
- crew alerting systems displays;
- stand-by instruments; and
- installed EFB to the extent it is practical.

6.3.4 If image sensors are used, the recording of such images shall not capture the head and shoulders of the flight crew members while seated in their normal operating position.

7. INSPECTION OF FLIGHT RECORDER SYSTEMS

7.1 Prior to the first flight of the day, the built-in test features for the flight recorders and flight data acquisition unit (FDAU), when installed, shall be monitored by manual and/or automatic checks.

7.2 FDR systems or ADRS, CVR systems or CARS, and AIR systems or AIRS shall have recording inspection intervals of one year; subject to the approval from the appropriate regulatory authority, this period may be extended to two years provided these systems have demonstrated a high integrity of serviceability and self-monitoring. DLR systems or DLRS shall have recording inspection intervals of two years; subject to the approval from the Authority, this period may be extended to four years provided these systems have demonstrated high integrity of serviceability and self-monitoring.

7.3 Recording inspections shall be carried out as follows:

a) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;

b) the analysis of the FDR or ADRS recording shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the aeroplane and by the tools used to extract the data from the recorder) is within acceptable limits and to determine the nature and distribution of the errors;

c) the FDR or ADRS recording from a complete flight shall be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention shall be given to parameters from sensors dedicated to the FDR or ADRS. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;

d) the readout facility shall have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;

e) an examination of the recorded signal on the CVR or CARS shall be carried out by replay of the CVR or CARS recording. While installed in the aircraft, the CVR or CARS shall record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards;

f) where practicable, during the examination, a sample of in-flight recordings of the CVR or CARS shall be examined for evidence that the intelligibility of the signal is acceptable; and

g) an examination of the recorded images on the AIR or AIRS shall be carried out by replay of the AIR or AIRS recording. While installed in the aircraft, the AIR or AIRS shall record test images from each aircraft source and from relevant external sources to ensure that all required images meet recording quality standards.

7.4 A flight recorder system shall be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

7.5 A report of the recording inspection shall be made available on request to regulatory authorities for monitoring purposes.

7.6 Calibration of the FDR system:

a) for those parameters which have sensors dedicated only to the flight recorder system (FDR) and are not checked by other means, recalibration shall be carried at an interval determined by the instructions for continuing airworthiness (ICAs) for the FDR system. In the absence of such ICAs, a recalibration shall be carried out at least every five years. The recalibration shall determine any discrepancies in the engineering conversion routines for the mandatory parameters and ensure that parameters are being recorded within the calibration tolerances.

b) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there shall be a recalibration performed at an interval determined by the ICAs for the FDR system. In the absence of such ICAs, a recalibration shall be carried out at least every two years.

Table (A) Parameter characteristics for flight data recorders – Aeroplanes

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
1	Time (UTC when available, otherwise relative time count or GPS sync)	24 hours	4	±0.125% per hour	1 second
2	Pressure-altitude–	-300 m (-1 000 ft) to maximum certificated altitude of aircraft 1 500 m (5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)	1.5 m (5 ft)
3	Indicated airspeed or calibrated airspeed	95 km/h (50 kt) to max VSo (Note 1) VSo to 1.2 VD (Note 2)	1	±5% ±3%	1 kt (0.5 kt recommended)
4	Heading (primary flight crew reference)	360 degrees	1	±2°	0.5°
5	Normal acceleration (Note 3)–	-3 g to +6 g	0.125	±1% of maximum range excluding datum error of ±5%	0.004 g

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
6	Pitch attitude	±75 ° or usable range whichever is greater	±0.25	±2 ˚	0.5˚
7	Roll attitude	±180˚	±0.25	±2˚	0.5˚
8	Radio transmission keying	On-off one discrete)	1		
9	Power on each engine (Note 4)	Full range	1 (per engine)	±2%	0.2% of full range or the resolution required to operate the aircraft
10*	Trailing edge flap and cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
11*	Leading edge flap and cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
12*	Thrust reverser position	Stowed, in transit, and reverse	1 (per engine)		
13*	Ground spoiler/speed brake selection (selection and position)	Full range or each discrete position	1	±2% unless higher accuracy uniquely required	0.2% of full range
14	Outside air temperature	Sensor range	2	±2˚ C	0.3˚C

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
15*	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretes	1		
16	Longitudinal acceleration (Note 3)	+/-1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
17	Lateral acceleration (Note 3)	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
18	Pilot input and/or control surface position-primary controls (pitch, roll, yaw) (Note 5) (Note 6)	Full range	±0.25	±2° unless higher accuracy uniquely required	0.2% of full range or as installed
19	Pitch trim position	Full range	1	±3% unless higher accuracy uniquely required	0.3% of full range or as installed
20*	Radio altitude–	-6 m to 750 m (–20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)	0.3 m (1 ft) below 150 m (500 ft); 0.3 m (1 ft) + 0.5% of full range above 150 m (500 ft)
21*	Vertical beam deviation (ILS/GPS/GLS glide path, MLS elevation, IRNAV/IAN vertical deviation)	Signal range	1	±3%	0.3% of full range
22*	Horizontal beam deviation (ILS/GPS/GLS localizer, MLS azimuth, IRNAV/IAN	Signal range	1	±3%	0.3% of full range

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
	lateral deviation)				
23	Marker beacon passage	Discrete	1		
24	Master warning	Discrete	1		
25	NAV receiver frequency selection (Note 7)	Full range	4	As installed	
26*	DME 1 and 2 distance (includes Distance to runway threshold (GLS) and Distance to missed approach point (IRNAV/IAN) (Notes 7 and 8	0 – 370 km (0-200 NM)	4	As installed	1852 m (1 NM)
27	Air/ground status	Discrete	1		
28*	GPWS/TAWS/GCAS status (selection of terrain display mode including pop-up display status) and (Terrain alerts, both cautions and warnings, and advisories) and (on/off switch position)	Discrete	1		
29*	Angle of attack	Full range	0.5	As installed	0.3% of full range
30*	Hydraulics, each system (low pressure)	Discrete	2		0.5% of full range
31*	Navigation data (latitude/longitude, ground speed and drift angle) (Note 9)	As installed	1	As installed	
32*	Landing gear and gear	Discrete	4	As installed	

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
	selector position				
33*	Groundspeed	As installed	1	Data should be obtained from the most accurate system	1 kt
34	Brakes (left and right brake pressure, left and right brake pedal position)	(Maximum metered brake range, discretes or full range)	1	1±5%	2% of full range
35*	Additional engine parameters (EPR, N1, indicated vibration level, N2; EGT, fuel flow, fuel cut-off lever position, N3)	As installed	Each engine each second	As installed	2% of full range
36*	TCAQS/ACAS (traffic alert and collision avoidance system)	Discretes	1	As installed	
37*	Windshear warning	Discrete	1	As installed	
38*	Selected barometric setting (pilot, co-pilot)	As installed	64	As installed	0.1 mh (0.01 in-Hg)
39*	Selected altitude (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
40*	Selected speed (all pilot selectable modes of operations)	As installed	1	As installed	Sufficient to determine crew selection
41*	Selected Mach (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
42*	Selected vertical speed (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
43*	Selected heading (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
44*	Selected flight path (all pilot selectable modes of operation) (course/DSTRK, path angle; final approach path (IRNAV/IAN))		1	As installed	
45*	Selected Decision Height	As installed	64	As installed	Sufficient to determine crew selection
46*	EFIS display format (pilot, co-pilot)	Discrete(s)	4	As installed	
47*	Multi-function/engine/ alerts display format	Discrete(s)	4	As installed	
48*	AC electrical bus status	Discrete(s)	4	As installed	
49*	DC electrical bus status	Discrete(s)	4	As installed	
50*	Engine bleed valve position	Discrete(s)	4	As installed	
51*	APU bleed valve position	Discrete(s)	4	As installed	
52*	Computer failure	Discrete(s)	4	As installed	
53*	Engine thrust command	As installed	2	As installed	
54*	Engine thrust target	As installed	4	As installed	2% of full range
55*	Computed centre of gravity	As installed	64	As installed	1% of full range
56*	Fuel quantity in CG	As installed	64	As installed	1% of full

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
	trim tank				range
57*	Head up display in use	As installed	4	As installed	
58*	Para visual display on/off	As installed	1	As installed	
59*	Operational stall protection, stick shaker and pusher activation	As installed	1	As installed	
60*	Primary navigation system reference (GNSS, INS, VOR/DME, MLS, Loran C, localizer glideslope)	As installed	4	As installed	
61*	Ice detection	As installed	4	As installed	
62*	Engine warning each engine vibration	As installed	1	As installed	
63*	Engine warning each engine over temperature	As installed	1	As installed	
64*	Engine warning each engine oil pressure low	As installed	1	As installed	
65*	Engine warning each engine over speed	As installed	1	As installed	
66*	Yaw Trim Surface Position	Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range
67*	Roll Trim Surface Position	Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range
68*	Yaw or sideslip angle	Full range	1	±5%	0.5%
69*	De-icing and/or anti-icing systems selection	Discrete(s)	4		
70*	Hydraulic pressure	Full range	2	±5%	100 psi

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
	(each system)				
71*	Loss of cabin pressure	Discrete	1		
72*	Cockpit trim control input position Pitch	Full range	1	±5%	0.2% of full range or as installed
73*	Cockpit trim control input position Roll	Full range	1	±5%	0.2% of full range or as installed
74*	Cockpit trim control input position Yaw	Full range	1	±5%	0.2% of full range or as installed
75*	All cockpit flight control input forces (control wheel, control column, rudder pedal)	Full range (±311 N (±70 lbf), ±378 N (±85 lbf), ±734 N (±165 lbf)	1	±5%	0.2% of full range or as installed
76*	Event marker	Discrete	1		
77*	Date	365 days	64		
78*	ANP or EPE or EPU	As installed	4	As installed	
79*	Cabin pressure altitude	As installed (0 ft to 40 000 ft recommended)	1	As installed	100ft
80*	Aeroplane computed weight	As installed	64	As installed	1% of full range
81*	Flight director command	Full range	1	± 2°	0.5°
82*	Vertical speed	As installed	0.25	As installed (32 ft/min recommended)	16 ft/min

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
Note 1: V_{So} stalling speed or minimum steady flight speed in the landing configuration. Note 2: VD design diving speed. Note 3: Refer to §7.8.2.2(a)(12) for increased recording requirements. Note 4: Record sufficient inputs to determine power. Note 5: For aeroplanes with control systems in which movement of a control surface will back drive the pilot's control, ''or'' applies. For aeroplanes with control systems in which movement of a control surface will not back drive the pilot's control, 'and'' applies. In aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. Note 6: Refer to §7.8.2.2(a)(13) for increased recording requirements. Note 7: If signal available in digital form. Note 8: Recording of latitude and longitude from INS or other navigation system is a preferred alternative. Note 9: If signals readily available. *Note 10: 79,80,81 & 82 are applicable to aircraft for which application for type certification submitted to a Contracting State on or after 1 January 2023*					
If further recording capacity is available, recording of the following additional information should be considered: (a) Operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority: (1) parameters selected by the flightcrew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source; (2) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, ETC.; (3) warnings and alerts; (4) the identity of displayed pages for emergency procedures and checklists; (b) Retardation information including brake application for use in the investigation of landing overruns and rejected take-offs.					

IS: 7.8.1.2 (B) DATA LINK RECORDER APPLICABILITY

(a) Messages applying to the applications listed below shall be recorded. Applications without the asterisk (*) are mandatory applications which shall be recorded regardless of the system complexity. Applications with an (*) shall be recorded only as far as is practicable given the architecture of the system.

(1) Data link initiation capability;

(2) Controller-pilot data link communications;

(3) Data link –flight information services;

(4) Automatic dependent surveillance- contract;

(5) Automatic dependent surveillance- broadcast*;

(6) Aeronautical operational control*.

(b) Descriptions of the applications for data link recorders are contained in the table below.

Table (B) —Description of Applications for Data Link Recorders

Item No.	Application Type	Application Description	Recording Content
1	Data link Initiation	This includes any applications used to logon to or initiate data link service. In FANS-1/A and ATN, these are ATS Facilities Notification (AFN) and Context Management (CM) respectively.	C
2	Controller/Pilot Communication	This includes any application used to exchange requests, clearances, instructions and reports between the flight crew and controllers on the ground. In FANS-1/A and ATN, this includes the CPDLC application. It also includes applications used for the exchange of oceanic (OCL) and departure clearances (DCL) as well as data link delivery of taxi clearances.	C
3	Addressed Surveillance	This includes any surveillance application in which the ground sets up contracts for delivery of surveillance data. In FANS-1/A and ATn, this includes the Automatic Dependent Surveillance (ADS-C) application. Where parametric data are reported within the message they shall be recorded within the message they shall be recorded unless data from the same source are recorded on the FDR.	C
4	Flight Information	This includes any service used for delivery of flight information to specific aircraft. This includes, for example, D-METAR, D-ATIS, D-NOTAM and other textual data link services.	C
5	Aircraft Broadcast Surveillance	This includes Elementary and Enhanced Surveillance Systems, as well as ADS-B output data. Where parametric data sent by the aircraft are reported within the message they shall be recorded unless data from the same sources are recorded on the FDR.	M*
6	Aeronautical Operational Control Data	This includes any application transmitting or receiving data used for AOC purposes.	M*

Item No.	Application Type	Application Description	Recording Content

Key:
C Complete contents recorded.
M Information that enables correlation to any associated records stored separately from the aircraft.
*** Applications to be recorded only as far as is practicable given the architecture of the system.**

IS 7.8.1.2 (C) AIRCRAFT DATA RECORDING SYSTEM (ADRS)

(a) ADRS shall be capable of recording, as appropriate to the aircraft, at least the essential (E) parameters in the Table below.

(b) The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by methods approved by the [appropriate certificating Authority].

(c) Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator. The documentation shall be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

Table (C) —Parameter Guidance for Aircraft Data Recording Systems

No.	Parameter Name	Parameter Category	Minimum Recording Range	Maximum Recording Interval in Seconds	Minimum Recording Accuracy	Minimum Recording Resolution	Remarks
1	Heading (Magnetic or True)	R*	±180˚	1	±2˚	0.5˚	*If not available, record rates
2	Pitch attitude	E*	±90˚	0.25	±2˚	0.5˚	*If not available, record rates
3	Roll attitude	E*	±180˚	0.25	±2˚	0.5˚	*If not available, record rates
4	Yaw rate	E*	±300˚	0.25	±1% + drift of 360˚/hr	2˚	*Essential if no heading available
5	Pitch rate	E*	±300˚	0.25	±1% + drift of 360˚/hr	2˚	*Essential if no pitch attitude available

No.	Parameter Name	Parameter Category	Minimum Recording Range	Maximum Recording Interval in Seconds	Minimum Recording Accuracy	Minimum Recording Resolution	Remarks
6	Roll rate	E*	±300˚	0.25	±1% + drift of 360˚/hr	2˚	*Essential if no roll rate available
7	Positioning system: latitude/ longitude	E	Latitude: ±90˚; Longitude: ±180˚	2 (1 if available)	As installed (0.00015˚ recommended	0.00005˚	--
8	Positioning system: estimated error	E*	Available range	2 (1 if available)	As installed	As installed	*If available
9	Positioning system: altitude	E	-300 m (-1 000 ft) to maximum certificated altitude of aeroplane +1 500 m (5 000 ft)	2 (1 if available)	As installed (±15 m (±50 ft) recommended)	1.5 m (5 ft)	--
10	Positioning system: time	E	24 hours	1	±0.5 second	0.1 second	*UTC time preferred where available
11	Positioning system: ground speed	E	0-1 000 kt	2 (1 if available)	As installed (±5 kt recommended)	1 kt	--
12	Positioning system: channel	E	0-360˚	2 (1 if available)	As installed (±2˚ recommended)	0.5˚	--
13	Normal acceleration	E	-3 g to + 6 g(*)	0.25 (0.125 if available)	As installed (±0.09 g excluding a datum error of ±45 g recommended)	0.004 g	--
14	Longitudinal acceleration	E	±1 g(*)	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of	0.004 g	--

No.	Parameter Name	Parameter Category	Minimum Recording Range	Maximum Recording Interval in Seconds	Minimum Recording Accuracy	Minimum Recording Resolution	Remarks
					±0.05 g recommended)		
15	Lateral acceleration	E	±1 g(*)	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	--
16	External static pressure (or pressure altitude)	R	34.4 mb (3.44 in-Hg) to 310.2 mb (31.03 in-Hg) or available sensor range	1	As installed (±1 mb (0.1 in-Hg) or ±30 m (±100 ft) to ±210 m (±700 ft) recommended)	0.1 mb (0.01 in-Hg) or 1.5 m (5 ft)	--
17	Outside air temperature (or total air temperature)	R	-50˚ to +90˚C or available sensor range	2	As installed (±2˚C recommended)	1˚C	--
18	Indicated air speed	R	As the installed pilot display measuring system or available sensor range	1	As installed (±3% recommended)	1 kt (0.5 kt recommended)	--
19	Engine RPM	R	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	--
20	Engine oil pressure	R	Full range	Each engine each second	As installed (5% of full range)	2% of full range	--
21	Engine oil temperature	R	Full range	Each engine each second	As installed (5% of full	2% of full range	--

No.	Parameter Name	Parameter Category	Minimum Recording Range	Maximum Recording Interval in Seconds	Minimum Recording Accuracy	Minimum Recording Resolution	Remarks
					range)		
22	Fuel flow or pressure	R	Full range	Each engine each second	As installed	2% of full range	--
23	Manifold pressure	R	Full range	Each engine each second	As installed	0.2% of full range	--
24	Engine thrust/ power/ torque parameters required to determine propulsive thrust/ power*	R	Full range	Each engine each second	As installed	0.1% of full range	*Sufficient parameters e.g. EPRN/N1 or torque/Np as appropriate to the particular engine shall be recorded to determine power in both normal and reverse thrust. A margin for possible over speed should be provided.
25	Engine gas generator speed (Ng)	R	0-150%	Each engine each second	As installed	0.2% of full range	--
26	Free power turbine speed (Nf)	R	0-150%	Each engine each second	As installed	0.2% of full range	--
27	Coolant temperature	R	Full range	1	As installed (±5˚C recommended)	1˚C	--
28	Main voltage	R	Full range	Each engine each second	As installed	1 Volt	--
29	Cylinder head temperature	R	Full range	Each cylinder each second	As installed	2% of full range	--
30	Flaps position	R	Full range or each discrete position	2	As installed	0.5˚	--
31	Primary flight control surface position	R	Full range	0.25	As installed	0.2% of full range	--
32	Fuel quantity	R	Full range	4	As installed	1% of full	--

No.	Parameter Name	Parameter Category	Minimum Recording Range	Maximum Recording Interval in Seconds	Minimum Recording Accuracy	Minimum Recording Resolution	Remarks
						range	
33	Exhaust gas temperature	R	Full range	Each engine each second	As installed	2% of full range	--
34	Emergency voltage	R	Full range	Each engine each second	As installed	1 Volt	--
35	Trim surface position	R	Full range or each discrete position	1	As installed	0.3% of full range	--
36	Landing gear position	R	Each discrete position*	Each gear every 2 seconds	As installed	--	*Where available, record up-and-locked and down-and-locked position
37	Novel/ unique aircraft features	R	As required	As required	As required	As required	--

Key:
E Essential parameters
R Recorded parameters

IS: 7.8.1.2 (D) FLIGHT RECORDERS - HELICOPTERS

The material in this Implementing Standards concerns flight recorders intended for installation in helicopters engaged in international air navigation.

a) Flight data records shall be classified as Type IV, Type IVA, and Type V depending upon the number of parameters to be recorded.

(1) Type IV FDRs shall be capable of recording, as appropriate to the helicopter, at least the first 30 parameters in Table B below.

(2) Type IVA FDRs shall be capable or recording, as appropriate to the helicopter, at least the first 48 parameters in Table B below.

(3) Type V FDRs shall be capable of recording, as appropriate to the helicopter, at least the first 15 parameters in Table B below.

(4) For all FDR types, if further recording capability is available, recording of the following additional information shall be considered:

(5) Additional operational information from electronic displays, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS); and

(6) Additional engine parameters (EPR, N1, fuel flow, etc.).

b) The parameters that satisfy the requirements for a Type IV; Type IVA, and Type V FDRs are listed below. The number of parameters to be recorded shall depend on helicopter complexity. The parameters without an asterisk (*) are mandatory parameters that shall be recorded. The parameters designated by an asterisk (*) shall also be recorded if an information data source for an asterisked parameter is used by helicopter systems or the flightcrew to operate the helicopter. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.

c) The following parameters satisfy the requirements for flight path and speed:

(1) Pressure altitude

(2) Indicated airspeed

(3) Total or outside air temperature.

(4) Heading (primary flightcrew reference)

(5) Normal acceleration

(6) Lateral acceleration.

(7) Longitudinal acceleration (body axis)

(8) Time or relative time count

(9) Navigation data*: drift angle, wind speed, wind direction, latitude/longitude.

(10) Radio altitude*

d) The following parameters satisfy the requirements for attitude:

(1) Pitch attitude.

(2) Roll attitude.

(3) Yaw rate.

e) The following parameters satisfy the requirements for engine power:

(1) Power on each engine: free power turbine speed (Nf), engine torque, engine gas generator speed (Ng), cockpit power control position.

(2) Rotor: main rotor speed, rotor brake.

(3) Main gearbox oil pressure*

(4) Gearbox oil temperature*, main gearbox oil temperature, tail rotor gearbox oil temperature

(5) Engine exhaust gas temperature (T4)*

(6) Turbine inlet temperature (TIT)*

f) The following parameters satisfy the requirements for configuration:

(1) Landing gear or gear selector position*.

(2) Fuel quality*

(3) Ice detector liquid water content*

g) The following parameters satisfy the requirements for operation:

(1) Hydraulics low pressure

(2) Warnings

(3) Primary flight controls —pilot input and/or control output position: collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor petal, controllable stabilator, hydraulic selection.

(4) Marker beacon passage

(5) Each navigation receiver frequency selection

(6) AFCS mode and engagement status*

(7) Stability augmentation system engagement*

(8) Indicated sling load force*

(9) Vertical deviation*: ILS glide path, GNSS approach path.

(10) Horizontal deviation*: ILS localizer, GNSS approach path.

(11) DME 1 and 2 distances*

(12) Altitude rate*

(13) Ice detector liquid water content*

(14) Helicopter health and usage monitor system (HUMUS)* engine data, chip detectors, track timing, exceedance discretes, broadband average engine vibration.

Note: Parameter requirements, including range, sampling, accuracy and resolution are as contained in the Minimum Operational Performance Specification (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

Table (D)— Parameters for Flight Data Recorders – Helicopters

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
1	Time (UTC when available, otherwise relative time count or GPS time sync)	24 hours	4	±0.125% per hour	1s
2	Pressure-altitude–	-300 m (–1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)	1.5 m (5 ft)
3	Indicated airspeed	As the installed measuring system	1	±3%	1 kt
4	Heading	360 degrees	1	± 2˚	0.5˚
5	Normal acceleration–	-3 g to +6 g	0.125	±0-.9 g excluding a datum error of ±g	0.004 g
6	Pitch attitude	±75 ˚ or 100% of usable range whichever is greater	0.5	± 2˚	0.5˚
7	Roll attitude	±180˚	0.5	±2˚	0.5˚
8	Radio transmission keying	On-off (one discrete)	1	---	---
9	Power on each engine	Full range	1 (per engine)	±2%	0.1% of full range
10	Main rotor :				
	Main rotor speed	50-130%	0.51	±2%	0.3% of full range
	Rotor brake	Discrete		---	---
11	Pilot input and/or control surface position-primary controls (Collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal)	Full range	0.5 (0.25 recommended)	±2% unless higher accuracy uniquely required.	0.5% of operating range
12	Hydraulics, each	Discrete	1	---	---

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
	system (low pressure and selection)				
13	Outside air temperature	Sensor range	2	±2˚C	0.3˚C
14*	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretes	1	---	---
15*	Stability augmentation system engagement	Discrete	1	---	---
16*	Main gearbox oil pressure	As installed	1	As installed	6.895 kN/m2 (1 psi)
17*	Main gearbox oil temperature	As installed	2	As installed	1˚C
18	Yaw acceleration (or yaw rate)	±400˚/second	0.25	±1.5% max range excluding datum error of ±5%	±2˚s
19*	Sling load force	0-200% of certified load	0.5	±3% of max range	0.5% for maximum certified load
20	Longitudinal acceleration	±1 g	0.25	±0.015 g excluding datum error of ± 0.05 g	0.0004 g
21	Lateral acceleration	±1 g	0.25	±0.015 g excluding datum error of ± 0.05 g	0.0004 g
22*	Radio altitude–	-6 m to 750 m (–20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)	0.3 m (1ft) below 150 m (500 ft), 0.3 m (1 ft) = 0.5% of full range above 150 m (500 ft)
23*	Vertical beam deviation	Signal range	1	±3%	0.3% of full range
24*	Horizontal beam deviation	Signal range	1	±3%	0.3% of full range
25	Marker beacon passage	Discrete	1	---	---
26	Warnings	Discrete(s)	1	---	---

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
27	Each navigation receiver frequency selection	Sufficient to determine selected frequency	4	As installed	----
28*	DME 1 and 2 distance	0-370 km (0-200 NM)	4	As installed	1.852 m (1 NM)
29*	Navigation data (latitude/longitude, ground speed, drift angle, wind speed, wind direction)	As installed	2	As installed	As installed
30*	Landing gear or gear selector position	Discrete	4	---	---
31*	Engine exhaust gas temperature (T4)	As installed	1	As installed	
32*	Turbine inlet temperature (ITI/ITT)	As installed	1	As installed	
33*	Fuel contents	As installed	4	As installed	
34*	Altitude rate	As installed	1	As installed	
35*	Ice detection	As installed	4	As installed	
36*	Helicopter health and usage monitor system	As installed	1	As installed	
37	Engine control modes	Discrete	1	-----	-----
38*	Selected barometric setting (pilot and co-pilot)	As installed	64	As installed	0.1 mb (0.01 in Hg)39*
39*	Selected altitude (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
40*	Selected speed (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
41*	Selected Mach (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
42*	Selected vertical speed (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection

Serial number	Parameter	Measurement range	Maximum Sampling and Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
43*	Selected heading (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
44*	Selected flight path (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
45*	Selected decision height	As installed	4	As installed	Sufficient to determine crew selection
46*	EFIS display format (pilot and co-pilot)	Discrete(s)	4	---	---
47*	Multi-function/engine/ alerts display format	Discrete(s)	4	---	---
48*	Event marker	Discrete	1	---	---

IS: 7.9.1.2 EMERGENCY EXIT EQUIPMENT - PASSENGERS

(a) The emergency exit equipment for aeroplanes in 7. 9.1.2(a) shall meet the following requirements.

(1) The assisting means for a floor level emergency exit shall meet the requirements under which the aeroplane was type certified.

(2) The location of each passenger emergency exit shall be—

(i) Recognisable from a distance equal to the width of the cabin.

(ii) Indicated by a sign visible to occupants approaching along the main passenger aisle.

(3) There shall be an emergency exit locating sign—

(i) Above the aisle near each over-the-wing passenger emergency exit, or at another ceiling location if it is more practical because of low headroom;

(ii) Next to each floor level passenger emergency exit, except that one sign may serve two such exits if they both can be seen readily from that sign; and

(iii) On each bulkhead or divider that prevents fore and aft vision along the passenger cabin, to indicate emergency exits beyond and obscured by it, except that if this is not possible, the sign may be placed at another appropriate location.

(4) Each passenger emergency exit marking and each locating sign shall be manufactured to meet the interior emergency exit marking requirements under which the aeroplane was type certified, unless the Authority cites different requirements for compliance with this paragraph.

(5) Note: No sign may continue to be used if its luminescence (brightness) decreases to below 250 micro lamberts.

(6) Sources of general cabin illumination may be common to both the emergency and the main lighting systems if the power supply to the emergency light system is independent of the power supply to the main lighting system.

(7) The emergency lighting system shall provide enough general lighting in the passenger cabin so that the average illumination, when measured at 40-inch intervals at seat armrest height, on the centerline of the main passenger aisle, is at least 0.05 foot-candles.

(8) Each emergency light shall—

(i) Be operable manually both from the flight crew station and from a point in the passenger compartment that is readily accessible to a normal cabin crew member seat;

(ii) Have a means to prevent inadvertent operation of the manual controls;

(iii) When armed or turned on at either station, remain lighted or become lighted upon interruption of the aeroplane's normal electric power;

(iv) Provide the required level of illumination for at least 10 minutes at the critical ambient conditions after emergency landing; AND

(v) Have a cockpit control device that has an "on", "off", and "armed" position.

(9) The location of each passenger emergency exit operating handle and instructions for opening the exit shall be shown in accordance with the requirements under which the aeroplane was type certified, unless the Authority cites different requirements for compliance with this paragraph.

(10) No operating handle or operating handle cover may continue to be used if its luminescence (brightness) decreases to below 100 micro lamberts.

(11) Access to emergency exits shall be provided as follows for each passenger carrying aeroplane:

(i) Each passageway between individual passenger areas, or leading to a Type I or Type II emergency exit, shall be unobstructed and at least 20 inches wide.

(ii) There shall be enough space next to each Type I or Type II emergency exit to allow a crew member to assist in the evacuation of passengers without reducing the unobstructed width of the passageway below that required in paragraph (j)1. of this section.

(iii) There shall be access from the main aisle to each Type III and Type IV exit. The access from the aisle to these exits shall not be obstructed by seats, berths, or other protrusions in a manner that would reduce the effectiveness of the exit. In addition, the access shall meet the emergency exit access requirements under which the aeroplane was type certificated, unless the Authority cites different requirements for compliance with this paragraph.

(iv) If it is necessary to pass through a passageway between passenger compartments to reach any required emergency exit from any seat in the passenger cabin, the passageway shall not be obstructed. However, curtains may be used if they allow free entry through the passageway.

(v) No door may be installed in any partition between passenger compartments.

(vi) If it is necessary to pass through a doorway separating the passenger cabin from other areas to reach any required emergency exit from any passenger seat, the door shall have a means to latch it in open position, and the door shall be latched open during each takeoff and landing. The latching means shall be able to withstand the loads imposed upon it when the door is subjected to the ultimate inertia forces, relative to the surrounding structure, prescribed in the airworthiness standards for type certification in the transport category as cited by the Authority.

(12) Each passenger emergency exit and the means of opening that exit from the outside shall be marked on the outside of the aeroplane with a 2-inch coloured band outlining the exit on the side of the fuselage.

(13) Each passenger emergency exit marking, including the band, shall be readily distinguishable from the surrounding fuselage area by contrast in colour and shall comply with the following:

(i) If the reflectance of the darker colour is 15 percent or less, the reflectance of the lighter colour shall be at least 45 percent.

(ii) If the reflectance of the darker colour is greater than 15 percent, at least a 30 percent difference between its reflectance and the reflectance of the lighter colour shall be provided.

(iii) Note: “Reflectance" is the ratio of the luminous flux reflected by a body to the luminous flux it receives.

(iv) Exits that are not in the side of the fuselage shall have external means of opening and applicable instructions marked conspicuously in red or, if red is inconspicuous against the background colour,

in bright chrome yellow and, when the opening means for such an exit is located on only one side of the fuselage, a conspicuous marking to that effect shall be provided on the other side.

(14) Each passenger-carrying aeroplane shall be equipped with exterior lighting that meets the requirements under which that aeroplane was type certificated, unless the Authority cites different requirement for compliance with this paragraph.

(15) Each passenger-carrying aeroplane shall be equipped with a slip-resistant escape route that meets the requirements under which that aeroplane was type certificated, unless the Authority cites different requirements for compliance with this paragraph.

(16) Each floor level door or exit in the side of the fuselage (other than those leading into a cargo or baggage compartment that is not accessible from the passenger cabin) that is 44 or more inches high and 20 or more inches wide, but not wider than 46 inches, each passenger ventral exit and each tail cone exit, shall meet the requirements of this section for floor level emergency exits.

Note: The Authority may grant a deviation from this paragraph if he finds that circumstances make full compliance impractical and that an acceptable level of safety has been achieved.

(17) Approved emergency exits in the passenger compartments that are in excess of the minimum number of required emergency exits shall meet all of the applicable provisions of this subsection section and shall be readily accessible.

(18) On each large passenger-carrying aeroplane with a ventral exit and tail cone exit shall be—

(i) Designed and constructed so that it cannot be opened during flight; and

(ii) Marked with a placard readable from a distance of 30 inches and installed at a conspicuous location near the means of opening the exit, stating that the exit has been designed and constructed so that it cannot be opened during flight.

(19) Portable lights. No person may operate a passenger carrying aeroplane unless it is equipped with flight stowage provisions accessible from each cabin crew member seat.

IS: 7.9.1.11 FIRST- AID KITS

(a) [AAC] Types. One type of first-aid kit shall be provided for carriage in all aircraft.

(b) [AOC] Contents. The required first-aid kits shall include at least the following:

(1) A handbook on first aid.

(2) ‘‘Ground-air visual signal code for use by survivors’’ as contained in Search and Rescue Rules and Standards.

(3) Materials for treating injuries.

(4) Ophthalmic ointment.

(5) A decongestant nasal spray.

(6) Insect repellent.

(7) Emollient eye drops.

(8) Sunburn cream.

(9) Water-miscible antiseptic/skin cleanser.

(10) Materials for treatment of extensive burns.

(11) Oral drugs as follows: analgesic, antispasmodic, central nervous system stimulant, circulatory stimulant, coronary vasodilator, anti-diarrheic and motion sickness medications.

(12) An artificial plastic airway and splints.

(c) [AOC] Number of first-aid kits. Each aircraft shall carry first-aid kits in accordance with the following schedule.

Number Of Passenger Seats	Number Of First-Aid Kits
0 – 50	1
51 – 150	2
151 – 250	3
More than 250	4

(d) [AOC] Location.

(1) The required first-aid kits be distributed evenly throughout the aircraft, and shall be readily accessible to cabin crew members, if cabin crew members are required for the flight; and

(2) The first-aid kits shall be located near the aircraft exits should their use be required outside the aircraft in an emergency situation.

IS: 7.9.1.12 EMERGENCY MEDICAL KIT – AEROPLANES

(a) [CAT] The required medical kit shall include the following equipment:

(1) One pair of sterile surgical gloves.

(2) Sphygmomanometer.

(3) Stethoscope.

(4) Sterile scissors.

(5) Haemostatic forceps.

(6) Haemostatic bandages or tourniquet.

(7) Sterile equipment for suturing wounds.

(8) Disposable syringes and needles.

(9) Disposable scalpel handle and blade.

(b) [CAT] The required medical kit shall include the following drugs:

(1) Coronary vasodilators.

(2) Analgesics.

(3) Diuretics.

(4) Anti-allergics.

(5) Steroids.

(6) Sedatives.

(7) Ergometrine.

(8) Where compatible with regulations of the appropriate authority, a narcotic drug in injectable form.

(9) Injectable broncho dilator.

(c) [CAT] The medical kit shall be stored in a secure location.

IS: 7.9.1.13 OXYGEN STORAGE AND DISPENSING APPARATUS

(a) The supplemental oxygen supply requirements for non-pressurised aeroplanes are as follows:

(1) An operator shall not operate a non-pressurised aeroplane at pressure altitudes above 10 000 ft 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 shall be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures, established for each operation in the Operations Manual and with the routes to be flown, and with the emergency procedures specified in the Operations Manual.

(3) An aeroplane intended to be operated above 10 000 ft pressure altitude shall be provided with equipment capable of storing and dispensing the oxygen supplies required.

(4) Oxygen supply requirements.

(i) Flight crew members. Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with Table 1. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply then they shall be considered as flight crew members on flight deck duty for the purpose of oxygen supply.

(ii) Cabin crew members, additional crew members and passengers. Cabin crew members and passengers shall be supplied with oxygen in accordance with Table 1. Cabin crew members

carried in addition to the minimum number of cabin crew members required, and additional crew members, shall be considered as passengers for the purpose of oxygen supply.

Table 1- Supplemental Oxygen for Non-Pressurised Aeroplanes

(a)	(b)
SUPPLY FOR:	**DURATION AND PRESSURE ALTITUDE**
1. All occupants of flight deck seats on flight deck duty	Entire flight time at pressure altitudes above 10 000 ft
2. All required cabin crew members	Entire flight time at pressure altitudes above 13 000 ft and for any period exceeding 30 minutes at pressure altitudes above 10 000 ft but not exceeding 13 000 ft
3. 100% of passengers (see note)	Entire flight time at pressure altitudes above 13 000 ft
4. 10% of passengers (see note)	Entire flight time after 30 minutes at pressure altitudes greater than 10 000 ft but not exceeding 13 000 ft

Note: For the purpose of this table "passengers" means passengers actually carried and includes infants.

(b) The supplemental oxygen supply requirements for pressurised aeroplanes are as follows:

(1) An operator shall not operate a pressurised aeroplane at pressure altitudes above 10 000 ft unless supplemental oxygen equipment, capable of storing and dispensing the oxygen supplies required by this paragraph, is provided.

(2) The amount of supplemental oxygen required shall be determined on the basis of cabin pressure 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 pressure altitude shall be considered the same as the aeroplane pressure altitude, unless it is demonstrated to the Authority that no probable failure of the cabin or pressurisation system will result in a cabin pressure altitude equal to the aeroplane pressure altitude. Under these circumstances, the demonstrated maximum cabin pressure altitude may be used as a basis for determination of oxygen supply.

(4) Oxygen equipment and supply requirements.

(i) Flight crew members.

(A) Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with Table 2. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply then they shall be considered as flight crew members on flight deck duty for the purpose of oxygen supply.

(B) Flight deck seat occupants, not supplied by the flight crew source, are to be considered as passengers for the purpose of oxygen supply.

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

(D) Oxygen masks for use by flight crew members in pressurised aeroplanes operating at pressure altitudes above 25 000 ft shall be a quick donning type mask.

(ii) Cabin crew members, additional crew members, and passengers.

(A) Cabin crew members and passengers shall be supplied with supplemental oxygen in accordance with Table 2. Cabin crew members carried in addition to the minimum number of cabin crew members required, and additional crew members, shall be considered as passengers for the purpose of oxygen supply.

(B) Aeroplanes intended to be operated at pressure altitudes above 25 000 ft shall be provided sufficient spare outlets and masks and/or sufficient portable oxygen units with masks for use by all required cabin crew members. The spare outlets and/or portable oxygen units are to be distributed evenly throughout the cabin to ensure immediate availability of oxygen to each required cabin crew member regardless of his location at the time of cabin pressurisation failure.

(C) Aeroplanes intended to be operated at pressure altitudes above 25 000 ft shall be provided an oxygen dispensing unit connected to oxygen supply terminals immediately available to each occupant, whenever seated. The total number of dispensing units and outlets shall exceed the number of seats by at least 10 percent. The extra units shall be evenly distributed throughout the cabin.

(D) Aeroplanes intended to be operated at pressure altitudes above 25 000 ft or which, if operated at or below 2 000 ft, cannot descend safely within four minutes to 13 000 ft, and for which the individual certificate of airworthiness was first issued on or after 9 November 1998, shall be provided with automatically deployable oxygen equipment immediately available to each occupant, wherever seated. The total number dispensing units and outlets shall exceed the number of seats by at least 10 percent. The extra units shall be evenly distributed throughout the cabin.

(E) The oxygen supply requirements, as specified in Table 2, for aeroplanes not certificated to fly at altitudes above 25 000 ft, may be reduced to the entire flight time between 10 000 ft and 13 000 ft cabin pressure altitudes for all required cabin crew members and for at least 10% of the passengers if, at all points along the route to be flown, the aeroplane is able to descend safely within 4 minutes to a cabin pressure altitude of 13 000 ft.

Table 2 - Requirements for Supplemental Oxygen - Pressurised Aeroplane During and Following Emergency Descent (Note)

SUPPLY FOR:	DURATION AND CABIN PRESSURE ALTITUDE
1. All occupants of flight deck seats on flight deck duty flight	Entire flight time when the cabin pressure altitude exceeds 13000 and entire time when the cabin pressure altitude exceeds 10 000 ft but does not exceed 13 000 ft after the first 30 minutes at those altitudes, but in no case less than: (i) 30 minutes for aeroplanes certificated to fly at altitudes not exceeding 25,000 ft (Note 2) (ii) 2 hours for aeroplanes certificated to fly at altitudes more than 25 000 ft (Note 3).

2. All required cabin crew members	Entire flight time when cabin pressure altitude exceeds 13 000 ft but not less than 30 minutes (Note 2), and entire flight time when cabin pressure altitude is greater than 10 000 ft but does not exceed 13 000 ft after the first 30 minutes at these altitudes.
3. 100% of passengers	10 minutes or the entire flight time when the cabin pressure altitude exceeds 13 000 ft whichever is the greater (Note 4)
4. 10% of passengers	Entire flight time when the cabin pressure altitude exceeds 10 000 ft but does not exceed 13 000 ft after the first 30 minutes at these altitudes.

Note 1: The supply provided shall 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 ft in 10 minutes and followed by 20 minutes at 10 000 ft.

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 ft in 10 minutes and followed by 110 minutes at 10 000 ft. The oxygen required to meet the Crew Protective Breathing Equipment provisions of this Part may be included in determining the supply required.

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 ft.

Note 5: For the purpose of this table "passengers" means passengers actually carried and includes infants.

(c) The supplemental oxygen supply requirements for non-pressurised helicopters are as follows:

(1) An operator shall not operate a non-pressurised helicopter at pressure altitudes above 10 000 ft 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 shall be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures, established for each operation in the Operations Manual and with the routes to be flown, and with the emergency procedures specified in the Operations Manual.

(3) A helicopter intended to be operated above 10 000 ft pressure altitude shall be provided with equipment capable of storing and dispensing the oxygen supplies required.

(4) Oxygen supply requirements:

(i) Flight crew members. Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with Table 3. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply then they shall be considered as flight crew members on flight deck duty for the purpose of oxygen supply.

(ii) Cabin crew members, additional crew members and passengers. Cabin crew members and passengers shall be supplied with oxygen in accordance with Table 3.

Cabin crew members carried in addition to the minimum number of cabin crew members required, and additional crew members, shall be considered as passengers for the purpose of oxygen supply.

Table 3- Supplemental Oxygen for Non-Pressurized Helicopters

(a)	(b)
SUPPLY FOR:	**DURATION AND PRESSURE ALTITUDE**
1. All occupants of flight deck seats on flight deck duty	Entire flight time at pressure altitudes above 10 000 feet
2. All required cabin crew members	Entire flight time at pressure altitudes above 13 000 ft and for any period exceeding 30 minutes at pressure altitudes above 10 000 ft but not exceeding 13 000 ft
3. 100% of passengers (see note)	Entire flight time at pressure altitudes above 13 000 ft
4.. 10% of passengers (see note)	Entire flight time after 30 minutes at pressure altitudes greater than 10 000 ft but not exceeding 13 000 ft

Note: For the purpose of this table "passengers" means passengers actually carried and includes infants.

IS: 7.10.1.13 COSMIC RADIATION DETECTION EQUIPMENT

(a) Compliance with the sampling requirements in 7. 10.1.13 (a)(2)may be accomplished as follows:

(1) The sampling shall be carried out in conjunction with a Radiological Agency or similar organization acceptable to the Authority.

(2) Sixteen route sectors, which include flight above 15 000 m (49 000 ft), shall be sampled every quarter (three months). Where less than sixteen route sectors which include flight above 15000m (49 000 ft) are achieved each quarter, then all sectors above 15 000 m (49 000 ft) shall be sampled.

(3) The cosmic radiation recorded should include both the neutron and non-neutron components of the radiation field.

(4) The results of the sampling, including a cumulative summary quarter on quarter, should be reported to the Authority under arrangements acceptable to the Authority.