

Schedule 7

Instruments & Equipment

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SUBPART A: GENERAL**7.001 APPLICABILITY**

- (a) This Schedule prescribes the requirements of the Bahamas for the aircraft instruments and equipment applicable to—
- (1) All domestic and international flight operations of Bahamas-registered aircraft;
 - (2) All aircraft operated in commercial air transport by the holder of an Air Operator Certificate issued by the Bahamas; and
 - (3) Operations of aircraft from other ICAO Contracting States within the Bahamas.
- (b) This Schedule is applicable to all owners, operators and flight crew of aircraft registered in the Bahamas and the persons and organizations that provide maintenance services for those aircraft.

7.005 DEFINITIONS

- (a) In addition to any aviation-related terms in Schedule 1, the following definitions shall apply to this Schedule—

Airborne collision avoidance system (ACAS). An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.

Altimetry system error (ASE). The difference between the altitude indicated by the altimeter display, assuming a correct altimeter barometric setting, and the pressure altitude corresponding to the undisturbed ambient pressure.

Emergency locator transmitter (ELT). A generic term describing equipment which broadcast distinctive signals on designated frequencies and, depending on application, may be automatically activated by impact or be manually activated. An ELT may be any of the following—

- (i) *Automatic fixed ELT (ELT(AF)).* An automatically activated ELT which is permanently attached to an aircraft.
- (ii) *Automatic portable ELT (ELT(AP)).* An automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft.
- (iii) *Automatic deployable ELT (ELT(AD)).* An ELT which is rigidly attached to an aircraft and which is automatically deployed and activated by impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided.
- (iv) *Survival ELT (ELT(S)).* An ELT which is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by survivors.

Engine. A unit used or intended to be used for aircraft propulsion. It consists of at least those components and equipment necessary for functioning and control, but excludes the propeller/rotors (if applicable).

Enhanced ground proximity warning. A forward looking warning system that uses the terrain data base for terrain avoidance.

Enhanced vision system. A system to display electronic real-time images of the external scene achieved through the use of image sensors.

Head-up display. A display system that presents flight information into the pilot's forward external field of view.

Flight recorder. Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

Integrated survival suit. A survival suit which meets the combined requirements of the survival suit and life jacket

Performance-based navigation (PBN). Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace. Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept.

Reflectance. The ratio of the luminous flux reflected by a body to the luminous flux it receives.

Required communication performance (RCP). A statement of the performance requirements for operational communications in support of specific ATM functions.

Required communication performance type (RCP type). A label (e.g. RCP 240) that represents the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity.

Total vertical error (TVE). The vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

Visible. When this term is used in this Schedule relative to the function of lights, it denotes that the lights will be visible on a dark night with a clear atmosphere.

7.010 ABBREVIATIONS & ACRONYMS

(a) The following abbreviations and acronyms are used in this Schedule—

- AOC – Air Operator Certificate
- DME – Distance Measuring Equipment
- ELT – Emergency Locator Transmitter
- EVS – Enhanced vision system
- HUD – Head-up display
- ILS – Instrument Landing System
- IFR – Instrument Flight Rules
- IMC – Instrument Meteorological Conditions
- MEL – Minimum Equipment List
- MNPS – Minimal Navigation Performance Specifications
- PBE – Protective Breathing Equipment
- PBN – Performance Based Navigation
- RCP – Required Communications Performance
- RNP – Required Navigation Performance
- RVSM – Reduced Vertical Separation Minimum
- SSR – Secondary Surveillance Radar
- TVE – Total Vertical Error
- VFR – Visual Flight Rules
- VMC – Visual Meteorological Conditions
- VOR – VHF Omnidirectional Range

7.015 GENERAL INSTRUMENT & EQUIPMENT REQUIREMENTS

- (a) All aircraft shall be equipped with instruments which will enable the flight crew to
- (1) Control the flight path of the aircraft;
 - (2) Carry out any required maneuvers; and
 - (3) Observe the operating limitations of the aircraft in the expected operating conditions.
- (c) In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments and equipment prescribed in this Schedule shall be—
- (1) Installed or carried, as appropriate, in the aircraft;

- (2) According to the specific aircraft used; and
 - (3) To the circumstances under which the flight is to be conducted; and
 - (4) As approved by the Authority.
- (b) All required instruments and equipment shall be approved and installed in accordance with applicable airworthiness requirements.
- (c) Prior to operation in The Bahamas of any aircraft not registered in The Bahamas that uses an airworthiness inspection program approved or accepted by the State of Registry, the owner/operator shall ensure that instruments and equipment required by The Bahamas but not installed in the aircraft are properly installed and inspected in accordance with the requirements of the State of Registry.
- (d) No flight shall be allowed to commence unless the required equipment—
- (1) Meets the minimum performance standard and the operational and airworthiness requirements of all relevant standards, including Annex 10, Volume I of the International Civil Aviation Organization;
 - (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; and
 - (3) Is in operable condition for the kind of operation being conducted, except as provided in the MEL.
- (e) If equipment is to be used by one flight crew member at his station during flight, it shall be installed so as to be readily operable from his or her station.
- (f) 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.
- (g) The aircraft shall be equipped with spare fuses and bulbs of appropriate ratings for the replacement of those accessible in flight. There shall be three spares for each specific rating and type of fuses and bulbs.

SUBPART B: AIRCRAFT INSTRUMENTS & EQUIPMENT

7.020 POWER SUPPLY, DISTRIBUTION & INDICATION SYSTEM

- (a) No person 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 applicable category, as specified by the Authority, or
 - (2) For large and turbine powered aircraft, 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 external 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.
 - (4) The use of common elements in the power system may be approved if the Authority finds that they are designed to be reasonably protected against malfunctioning.
- (b) For large and turbine powered aircraft, engine-driven sources of energy, when used, shall be on separate engines.

7.025 ENGINE INSTRUMENTS: ALL FLIGHTS

- (a) No person may operate an aircraft in flight unless it is equipped with—
- (1) A tachometer for each engine;
 - (2) An oil pressure gauge for each engine using pressure system;
 - (3) A temperature gauge for each liquid-cooled system;
 - (4) An oil temperature gauge for each air-cooled system;
 - (5) A manifold pressure gauge for each altitude engine; and

- (6) A means for indicating the fuel quantity in each tank to be used.
- (b) For commercial air transport, no person may operate a reciprocating engine aircraft with a maximum gross weight of more than 5700 kg max takeoff mass unless it also is equipped with-
 - (1) A device for each reversible propeller, in indicate to the pilot when the propeller is in reverse pitch;
 - (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.
 - (2) A carburetor air temperature indicator for each engine;
 - (3) A cylinder head temperature indicator for each air-cooled engine;
 - (4) A fuel pressure indicator for each engine
 - (5) A fuel flow meter An oil quantity indicator for each oil-tank when a transfer or separate oil reserve supply is used.
 - (6) An oil-in temperature indicator for each engine.
 - (7) 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.
- (c) The Authority may allow or require different instrumentation for turbine engine powered aircraft to provide an equivalent level of safety.

7.027 TREND & HEALTH MONITORING SYSTEMS: COMMERCIAL AIR TRANSPORT

- (a) *For commercial air transport operations*, no person may operate a—
 - (1) Single-engine turbine-engined aircraft at night or in IFR unless that aircraft is equipped with an automatic engine trend monitoring system;
 - (2) Performance Class 3 helicopter in IMC unless equipped with a vibration health monitoring for the tail-rotor drive system; or
 - (3) Helicopter which has a maximum certificated take-off mass in excess of 3175 kg or a maximum passenger seating configuration of more than 9, unless that aircraft is equipped with a vibration health monitoring system.

7.030 FLIGHT INSTRUMENTS: ALL FLIGHTS

- (a) No person may operate an aircraft in flight unless it is equipped with—
 - (1) A magnetic compass;
 - (2) A accurate method indicating the time in hours, minutes and seconds;
 - (3) A sensitive pressure altimeter calibrated in feet with sub-scale settings, calibrated in hectopascals or millibars, adjustable for any barometric pressure likely to be set in flight;
 - (4) A airspeed indicator calibrated in kmh (or mph or knots); and
 - (5) Such additional instruments or equipment as my be prescribed by the Authority.
- (b) No person may operate an aeroplane with speed limitations expressed in terms of Mach number unless there is a properly installed Mach number indicator.
- (c) Those flight instruments that are used by any one pilot shall be so arranged as to permit that pilot to see the indications readily from their station, with the minimum practical deviation from the position and line of vision normally assumed when looking forward along the flight path.
- (d) 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.

7.035 ADDITIONAL FLIGHT INSTRUMENTS: CONTROLLED, NIGHT OR IFR FLIGHT

- (a) In addition to the requirements of Section 7.030, no person may operate an aircraft in IFR or controlled flight unless it is equipped with—
- (1) A gyroscopic rate-of-turn indicator;
 - (2) A slip-skid indicator;
 - (3) An attitude indicator (artificial horizon);
 - (4) A stabilized heading indicator (directional gyroscope);
 - (5) A vertical speed indicator to provide rate of climb and descent;
 - (6) A minimum of two sensitive pressure altimeters with counter drum-pointer or equivalent presentation are required for those operations that are—
 - (i) Commercial air transport; or
 - (ii) Subject to the requirements of Subpart L.
- (b) The exceptions to the requirements of paragraph (a) of this Section are—
- (1) The requirements of (2), (3) and (4) may be met by combinations of instruments or integrated flight director systems provided that the safeguards against total failure in three separate instruments are retained; and
 - (2) Single pilot operations in propeller driven aircraft of less than 5700 kg max takeoff mass are only required one sensitive pressure altimeter.

7.040 INSTRUMENTS FOR OPERATIONS REQUIRING TWO PILOTS

- (a) No person may operate an aircraft in operations requiring two pilots unless each pilot's station has the following flight instruments—
- (1) An airspeed indicator;
 - (2) A sensitive press altimeter;
 - (3) A vertical speed indicator
 - (4) A turn and slip indicator (or turn coordinator)
 - (5) An attitude indicator; and
 - (6) A stabilized direction indicator.
- (b) The second-in-command's flight instruments shall meet the same requirements for markings, indications and illumination as those required for the pilot-in-command.

7.045 STANDBY ATTITUDE INDICATOR

- (a) No person may operate the following aircraft unless they are equipped with a standby attitude indicator—
- (1) A turbojet-engined aircraft;
 - (2) An aircraft having a maximum certificated takeoff mass of more than 5700 kg; or
 - (3) An aircraft having a maximum approved passenger configuration of more than 19 passengers.
- (b) This standby attitude indicator shall—
- (1) Operate independently of any other attitude indicating system;
 - (2) Be powered continuously during normal operation;
 - (3) After a total failure of the normal electrical generating system, be powered for a minimum of 30 minutes from a source independent of the normal electrical system; and
 - (4) Have an indication clearly evident to the flight crew when the emergency power source is being used.
- (c) If this standby attitude indicator is usable through flight attitudes of 360 degrees of pitch and roll, it may be used as basis for not having a rate-of-turn gyroscopic instrument.
- (d) 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 pane when this supply is in use.

7.047 ADVANCED COCKPIT AUTOMATION SYSTEMS (GLASS COCKPIT)

- (a) No person may operate an aircraft with advanced cockpit automation systems (glass cockpits) unless it is has adequate system redundancy that provides the flight crew with attitude, heading, airspeed and altitude indications in case of failure of the primary system or display.

7.050 SYSTEM REQUIREMENTS FOR IFR

- (a) No person may operate an aircraft in IFR without—
- (1) An airspeed indicating system with a heated pitot tube or equivalent means of preventing malfunctions due to either condensation or icing;
 - (2) *For commercial air transport*: Two independent static pressure systems;
 - (i) *Exception*: Propeller driven aircraft of less than 5700 kg max takeoff mass may have one static pressure system which includes an alternate static source.
 - (3) A means of indicating whether the power supply to the gyroscopic instruments is adequate;
 - (4) A means of indicating in the flight crew compartment the outside air temperature; and
 - (5) An adequate source of electrical energy for all installed electrical and radio equipment, that
 - (6) *for commercial air transport* shall include—
 - (i) For multi-engine aircraft, at least two generators or alternators each of which is on a separate engine, of which any combination of one-half of the total number are rated sufficiently to supply the electrical loads of all required instruments and equipment necessary for safe emergency operation of the aircraft except that for multi-engine helicopters, the two required generators may be mounted on the main rotor drive train; and
 - (ii) Two independent sources of energy (with means of selecting either) of which at least one is an engine-driven pump or generator, each of which is able to drive all required gyroscopic instruments powered by, or to be powered by, that particular source and installed so that failure of one instrument or source, does not interfere with the energy supply to the remaining instruments or the other energy source unless, for single-engine aircraft in all cargo operations only, the rate of turn indicator has a source of energy separate from the bank and pitch and direction indicators.

Note: For the purpose of this paragraph, for multi-engine aircraft, each engine-driven source of energy must be on a different engine.

Note: For the purpose of this paragraph, a continuous inflight electrical load includes one that draws current continuously during flight, such as radio equipment, electrically driven instruments, and lights, but does not include occasional intermittent loads.

7.055 AUTOPILOT

- (a) No person may operate an aircraft above FL 290 unless that aircraft is equipped with an autopilot capable of automatically maintaining a selected flight level.
- (b) No person may operate an aircraft in airspace for which minimum navigation performance specifications are prescribed unless that aircraft is equipped with an autopilot capable of receiving and automatically tracking the selected navigational equipment inputs.
- (c) *For commercial air transport operations*, no person may operate an aeroplane with a single pilot under IFR unless that aeroplane is equipped with an autopilot with at least altitude hold and heading mode.

7.060 IFR HELICOPTER STABILIZATION SYSTEM FOR COMMERCIAL AIR TRANSPORT

- (a) No person may operate a helicopter in IFR commercial air transport operations without a stabilization system, unless that helicopter was certificated by the State of Design as having adequate stability without such a system.

7.065 EQUIPMENT FOR NIGHT FLIGHTS

- (a) No person may operate an aircraft at night unless it is also equipped with properly installed—
- (1) Aircraft navigation lights;
 - (2) An anti-collision beacon;
 - (3) A landing light [for helicopter operations, one landing light shall be trainable in the vertical plane];
 - (4) Illumination for all instruments and equipment that are essential for the safe operation of the aircraft by the flight crew;
 - (5) An independent portable light for each crew member station; and
 - (6) *For commercial air transport operations—*
 - (i) Lights in all passenger compartments;
 - (i) A means of displaying charts that enables them to be readable in all ambient light conditions; and
 - (ii) Two landing lights, except that aircraft which are equipped with a single landing light having two separately energized filaments will be in compliance with the two landing light requirement.

Note: See Appendix 1 to 7.065 for the requirements for aircraft lights.

7.067 EQUIPMENT FOR SPECIAL ALTIMETRY ACCURACY (RVSM)

- (a) No person may operate an aircraft in RVSM airspace unless the aircraft is equipped with—
- (1) Two independent altitude reporting systems;
 - (2) An altitude alerting systems;
 - (3) An automatic altitude holding system; and
 - (4) A transponder with altitude reporting capability which can be connected to altitude holding system.
- (b) The standards for compliance with RVSM tolerances are detailed in Appendix 1 to 7.067.
- (c) To maintain qualification for RVSM approval, an operator shall have the height-keeping performance monitored for—
- (1) A minimum of two aeroplanes of each aircraft type grouping, at least once every two years or within intervals of 1 000 flight hours per aeroplane, whichever period is longer; and
 - (2) An aircraft type grouping consists of a single aeroplane, at least every two years.

7.070 WINDSHIELD WIPERS

- (a) No person may operate an aircraft with a maximum certificated takeoff mass of more than 5700 kg unless it is equipped at each pilot station with a windshield wiper or equivalent means to clear a portion of the windshield during precipitation.

7.075 FLIGHT IN ICING CONDITIONS

- (a) No person may operate an aircraft in icing conditions unless it is equipped with suitable anti-icing or de-icing devices adequate for flight in the conditions that are reported to exist or are expected to be encountered.
- (b) The anti-icing or de-icing equipment shall provide for prevention or removal of ice on windshield, wings, empennage, propellers and other parts of the aeroplane where ice formation will adversely affect the safety of the aircraft.
- (c) No person may operate an aeroplane in expected or actual icing conditions at night unless it is equipped with a means to illuminate or detect the formation of ice. This illumination must be of a type that will not cause glare or reflections that would handicap crew members in the performance of their duties.

7.080 WEATHER DETECTING EQUIPMENT

- (a) No person may operate an aircraft carrying passengers in commercial air transport unless it has an operative weather radar or significant weather detection equipment installed if that aircraft—
 - (1) Is turbojet-engined or pressurized;
 - (2) Has a maximum certificated takeoff mass of more than 5700 kg or a maximum approved passenger seating configuration in excess of than 9 seats.
- (b) No person may begin a flight carrying passengers at night or in instrument meteorological conditions, when current weather reports indicate that thunderstorms or other potentially hazardous conditions than could be detected by the installed weather radar or significant weather detection equipment may reasonably be expected along the route, unless that equipment is installed and operating satisfactorily.
- (c) If the weather radar or significant weather detection equipment becomes inoperative on a passenger aircraft en route, the aircraft must be operated under the instructions and procedures specified in the AOC holder's Operations Manual.
- (d) An alternate electrical power supply is not required for the weather radar or thunderstorm detection device.

7.085 SPECIAL SEAPLANE EQUIPMENT

- (a) No person may operate a seaplane unless it is equipped with—
 - (1) An anchor;
 - (2) A sea anchor (drogue), to assist in maneuvering;
 - (3) An air horn for making the sound signals prescribed in the International Regulations for Preventing Collisions at Sea; and
 - (4) Individual flotation devices as required by Section 7.273.

Note: "Seaplanes" includes amphibians operated as seaplanes.

SUBPART C: COMMUNICATIONS & NAVIGATION EQUIPMENT**7.090 RADIO COMMUNICATION EQUIPMENT: GENERAL**

- (a) Unless it is equipped with radio communications equipment required for the type of operation being conducted, no person may operate an aircraft in—
 - (1) Controlled flight;
 - (2) Flight under instrument flight rules; or
 - (3) Night.
- (b) The required radio communication equipment shall be capable of—
 - (1) Conducting two-way communication for aerodrome control purposes;
 - (2) Receiving meteorological information at any time during flight; and
 - (3) Conducting two-way communication at any time during flight with at least one aeronautical station and with such other aeronautical stations and on such frequencies as may be prescribed by the appropriate authority;
 - (4) Communications on the aeronautical emergency frequency 121.5 MHz and/or 406 MHz; and
 - (5) Compliance with the RCP type prescribed by the Authority.
- (c) Aircraft operated under IFR will have two independent methods of receiving communications from air traffic service.
- (d) When more than one radio communications unit is required for the flight operation, each unit 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) No person may operate an aircraft in IFR operations requiring two pilots unless it is equipped with an audio selector panel accessible to both pilots.
- (f) Each person operating an aircraft that does not have the required radio communication equipment shall obtain prior permission before operating in airspace requiring such equipment.

7.092 REQUIRED COMMUNICATION PERFORMANCE

- (a) *For flights in defined portions of airspace* or on routes where a Required Communication Performance (RCP) type has been prescribed, no person may operate an aircraft unless—
 - (1) The communication equipment which will enable it to operate in accordance with the prescribed RCP types is installed and operational; and
 - (2) The Authority has authorized the operator for operations in such airspace.

7.095 RADIO COMMUNICATION EQUIPMENT: COMMERCIAL AIR TRANSPORT

- (a) No person may operate an aircraft in commercial air transport unless equipped with two independent radio communications equipment installations which, for the route and airspace flown, are capable of conducting two-way radio communication at any time during flight—
 - (1) With at least one aeronautical station;
 - (2) With any other aeronautical stations and frequencies which may be prescribed by the appropriate authority; and
 - (3) In accordance with the RCP type(s) authorized by the Authority for operations in that airspace..
- (b) No person may operate an aircraft in commercial air transport unless equipped with radio communications equipment capable of receiving meteorological information at any time during the flight.

7.100 HEADSET & BOOM MICROPHONE

- (a) No person may operate an aircraft in commercial air transport unless there is a boom or throat microphone available at each required flight crew member duty station.
- (b) No person may operate an aircraft with a single pilot under IFR or at night in commercial air transport unless that aircraft is equipped with a headset with boom microphone or equivalent and a transmit button on the control wheel.
- (c) No person may operate a helicopter in controlled flight unless that aircraft is equipped with a headset with boom microphone or equivalent and a transmit button on the control wheel.
- (d) Persons operating aeroplanes in controlled flight should have a boom or throat microphone available at each required flight crew member duty station.

7.105 ALTITUDE REPORTING TRANSPONDER

- (a) No person may operate an aircraft in airspace that requires a pressure reporting transponder unless that equipment is operative and operates in accordance with the provisions of ICAO Annex 10, Volume IV.
 - (1) The aircraft will be assigned a distinct serialized 24-bit address identity code supplied by the Authority for the transponder, this must be programmed prior to operation of the aircraft.
- (b) 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) No person may operate an aircraft in commercial air transportation unless it is equipped with a pressure-altitude reporting transponder—
 - (1) *For domestic flights*, that operates in accordance with the requirements of the Bahamas ATS.
 - (2) *For international flights*, with a data source that provides pressure-altitude information with a resolution of 7.62 m (25 ft), or better.

- (d) Due to upgrading international requirements, operators should endeavour to ensure that installations of Mode S transponders are provided with the airborne/on-the-ground status, if the aeroplane is equipped with an automatic means of detecting such status.

7.110 NAVIGATION EQUIPMENT: GENERAL

- (a) No person may operate an aircraft unless it is equipped with navigation equipment which will enable it to proceed in accordance with—
 - (1) The flight plan;
 - (2) The navigation specification for the performance-based navigation prescribed; and
 - (3) The requirements of air traffic services.
- (b) Navigation under visual flight rules (VFR) may be accomplished without navigation equipment by visual reference to landmarks, if not precluded by the appropriate authority for the route and airspace.
- (c) No person may operate an aircraft unless that aircraft is equipped with sufficient navigation equipment to ensure that, in the event of failure of one item of equipment at any stage of the flight, the remaining equipment will enable the aircraft to continue navigating in accordance with the requirements of this Section.
- (d) Each radio navigation system shall have an independent antenna installation, except that, where rigidly supported non-wire antenna installations of equivalent reliability are used, only one antenna is required.
- (e) When more than one navigation unit is required for the flight operation, each unit 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.

7.115 ELECTRONIC NAVIGATION DATA MANAGEMENT

- (a) No person may operate an aircraft employing 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.
- (b) No person may operate an aircraft employing electronic navigation data products unless the current and unaltered electronic navigation data has been inserted prior to flight.

7.120 SPECIAL NAVIGATION ACCURACY (RNP & MNPS)

- (a) For flights in defined portions of airspace where a navigation specification for performance-based navigation has been prescribed, the navigational equipment shall continuously provide indications to the flight crew of the adherence to or departure from track to the required degree of accuracy at any point along that track.
- (b) No person may operate an aircraft where MNPS are prescribed, unless it is equipped with—
 - (1) For unrestricted operations, two independent long range navigation systems; or
 - (2) For notified special routes, one long range navigation system.
- (c) The navigation equipment required for operations in MNPS airspace shall be visible and usable by either pilot seated at their duty stations.
- (d) No person may operate an aircraft unless it has installed and operational navigation equipment which will enable it to be operated in accordance with the navigational accuracy required for the RNP type prescribed for the airspace or routes included in the flight plan.

7.125 NAVIGATION EQUIPMENT: IFR APPROACH

- (a) No person may operate an aircraft in situations which would require a landing approach to an airport in instrument meteorological conditions unless that aircraft is equipped with the appropriate radio equipment required to accomplish the published instrument approach for the planned destination and alternate airports.
- (b) The navigation equipment installed on the aircraft will be capable of receiving signals providing guidance to a point from which a visual landing can be effected.

7.127 ALL-WEATHER OPERATIONS

- (a) No person may operate an aircraft in the following operations unless the aircraft is equipped as prescribed by the Authority—
 - (1) Category II Instrument Approaches;
 - (2) Category III Instrument Approaches; or
 - (3) Low Visibility (below 800 m RVR [2400 ft]) Takeoffs.

Note: See Appendix 1 to 7.047 for the combined instruments and navigational equipment requirements.

7.128 HEAD-UP DISPLAYS & ENHANCED VISION SYSTEMS

- (a) Unless the installation and procedures are approved by the Authority, no person may operate an aircraft using a HUD and/or EVS to conduct—
 - (1) Descent or takeoff in weather conditions below VFR minimums; or
 - (2) Instrument approach operations below Category I instrument approach minimums.

SUBPART D: WARNING EQUIPMENT & INDICATORS**7.130 WARNING SYSTEMS: GENERAL**

- (a) No person may operate a turbojet aircraft unless it is equipped with an installed aural mach overspeed warning.
- (b) Pressurized aeroplanes intended to be operate at flight altitudes at which the atmospheric pressure is less than 376 hPa (25,000 ft) shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.
- (c) No person may operate an aircraft of more than 5700 kg certificated takeoff mass in commercial air transport without a means of indicating pitot heater failure.

7.135 LANDING GEAR AURAL WARNING DEVICE

- (a) No person may operate an aircraft with retractable landing gear unless it is equipped with an aural warning device that functions continuously anytime the landing gear is not fully extended and locked and the wing-flap setting exceeds the position—
 - (1) Specified in the AFM for maximum certificated go-around climb configuration; or
 - (2) Where landing gear extension is normally performed.
- (b) This warning system—
 - (1) May not have a manual shutoff;
 - (2) Must be in addition to the any power lever-actuated device; and
 - (3) May utilize any part of the power lever-actuated device.

7.140 ALTITUDE ALERTING SYSTEM

- (a) No person may operate the following aircraft unless it is equipped with an altitude alerting system—

- (1) A turbojet powered aeroplane; or
 - (2) A turbine powered aeroplane—
 - (i) Having a maximum approved passenger seating of more than nine seats; or
 - (ii) With a certificated takeoff mass of more than 5700 kg.
- (b) The altitude alerting system will be capable of alerting the flight crew—
- (1) Upon approaching a pre-selected altitude in either ascent or descent; and
 - (2) By at least an aural signal, when deviating above or below a pre-selected altitude.
- (c) The threshold for the alert shall not exceed plus or minus 90 m (300 ft).

7.145 GROUND PROXIMITY WARNING SYSTEM

- (a) No person may operate an aircraft unless it is equipped with a ground proximity warning system, if the aircraft has—
- (1) For aeroplanes, an approved passenger seating in excess of—
 - (i) if piston-engined, nine seats.
 - (ii) If turbine-engined; five seats;
 - (2) For helicopters engaged in IFR operations—
 - (i) A maximum takeoff mass in excess of 3,175 kg; or
 - (ii) A maximum passenger configuration in excess of 9 seats.
- (b) A ground proximity warning system shall provide automatically a timely and distinctive warning to the flight crew when the aircraft is in potentially hazardous proximity to the earth's surface.
- (c) The installed ground proximity warning system shall include a forward looking terrain avoidance function which provides warning of unsafe terrain clearance.
- (d) The ground proximity warning system must automatically provide by means of aural signals, which may be supplemented by visual signals, and distinctive warning to the flight crew of when the aircraft is in potentially hazardous proximity to the earth's surface, including—
- (1) Excessive descent rate;
 - (2) Excessive terrain closure rate;
 - (3) Excessive altitude loss after takeoff or go-around;
 - (4) Unsafe terrain clearance while not in landing configuration—
 - (i) Gear not locked down;
 - (ii) Flaps not in landing position; and
 - (5) Excessive descent below the instrument glide path.

7.150 AIRBORNE COLLISION AVOIDANCE SYSTEM (ACAS)

- (a) No person may 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) that conforms to the relevant portions of ICAO Annex 10, Volume IV.
- (b) All commercial air transport passenger aircraft should be equipped with an ACAS II.

7.155 FORWARD LOOKING WIND SHEAR WARNING SYSTEM: TURBOJET AEROPLANES

- (a) All turbojet aeroplanes of a maximum certificated takeoff mass in excess of 5700 kg or authorised to carry more than nine passengers shall be equipped with a forward-looking wind shear warning system.
- (b) This system should be capable of providing the pilot with an 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) This 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.

7.160 RADIATION INDICATOR

- (a) No person may operate an aeroplane above 15,000 m (49,000 ft) unless that aircraft is equipped with equipment to measure and indicate continuously—
- (1) The dose rate of total cosmic radiation being received (i.e. the total of ionizing and neutron radiation of galactic and solar origin; and
 - (2) The cumulative dose on each flight.
- (b) The display unit of the radiation equipment shall be readily visible to a flight crew member.

7.161 PITOT & STATIC SYSTEM WARNINGS

- (a) No person may operate an aircraft under IFR unless that aircraft has a means of indicating pitot heat failure with an amber light is in clear view of a flight crew member.
- (b) The indication provided shall be designed to alert the flight crew if either—
- (1) The pitot heating system is switched "off," and
 - (2) The pitot heating system is switched "on" and any pitot tube heating element is inoperative.
- (c) An integrated flight crew alerting system that will notify the crew if the pitot system is malfunctioning is an acceptable alternative to paragraph (b) of this Section.

SUBPART E: RECORDERS

7.165 FLIGHT RECORDERS

General Requirements

- (a) Flight recorders shall—
- (1) 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;
 - (2) Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.
 - (3) Not be switched off during flight;
 - (4) Be deactivated upon completion of a flight following an accident or incident;
 - (5) Following an accident or serious incident, the flight recorders shall not be reactivated before their disposition as determined in accordance with Schedule 19 and Annex 13.
- (b) The FDR system shall be recalibrated—
- (1) At least every five years to determine any discrepancies in the engineering conversion routines for the mandatory parameters, in accordance with the requirements of the aircraft manufacturer to ensure that the parameters are being recorded within the calibration tolerances; and
 - (2) When the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there shall be a re-calibration performed as recommended by the sensor manufacturer, or
 - (3) At least every two years.
- (c) The general characteristics and capability of the flight recorders shall include—
- (1) The parameters for recording required to determine accurately the—
 - (i) *For Types I and IA FDRs:* aeroplane flight path, speed, attitude, engine power, configuration and operation.
 - (ii) *Types II and IIA FDRs:* aeroplane flight path, speed, attitude, engine power and configuration of lift and drag devices.

- (iii) *For a Type IV FDR:* helicopter flight path, speed, attitude, engine power and operation.
- (iv) *For a Type IVA FDR:* helicopter flight path, speed, attitude, engine power, operation and configuration.
- (v) *For a Type V FDR:* helicopter flight path, speed, attitude and engine power.

The Authority has prescribed the essential parameters in Appendix 1 to 7.165 (Aeroplanes) and Appendix 2 to 7.165 (Helicopters).

- (2) The capability to retain the information recorded during the last—
 - (i) *For a Type I and II:* 25 hours of operation.
 - (ii) *For a Type IIA:* 30 minutes of operation.
 - (iii) *For a Type IV and V:* 10 hours of operation.
- (d) Flight data recorder media not acceptable for use in Bahamas-registered aircraft include—
 - (1) Engraving metal foil;
 - (2) Photographic film;
 - (3) Analogue data using frequency modulation; or
 - (4) Magnetic tape.

For Aeroplanes

- (e) No person shall operate a turbine-engined aeroplane of a maximum certificated take-off mass of 5 700 kg or less for which an individual certificate of airworthiness or a type certificate is first issued on or after 1 January 2016 unless it is equipped with—
 - (1) A Type II FDR; or
 - (2) A Class C AIR capable of recording flight path and speed parameters displayed to the pilot(s); or
 - (3) An ADRS capable of recording the essential parameters prescribed in Appendix 3 to 7.165.
- (f) No person shall operate an aeroplane of a maximum certificated take-off mass of over 27,000 kg for which the individual certificate of airworthiness is first issued after 1 January 1989, unless it is equipped with a Type I FDR.
- (g) *For commercial air transport,* no person shall operate an aeroplane of a maximum certificated take-off mass of over 5,700 kg, up to and including 27,000 kg, for which the individual certificate of airworthiness is first issued after 1 January 1989, unless it is equipped with a Type II FDR.
- (h) No person should operate a multi-engined turbine powered aeroplanes of a maximum certificated take-off mass of 5,700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 1990 unless it is equipped with a Type IIA FDR.
- (i) No person shall operate a turbine-engined aeroplane, 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 5 700 kg, except those in paragraph (k), unless it is equipped with an FDR which shall record time, altitude, airspeed, normal acceleration and heading.
- (j) No person shall operate a turbine-engined aeroplane, 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 5 700 kg, except those in paragraph (k), unless it is equipped with an FDR which shall record time, altitude, airspeed, normal acceleration, heading and such additional parameters as are necessary to determine pitch attitude, roll attitude, radio transmission keying and power on each engine.
- (k) No person shall operate a turbine-engined aeroplane, 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 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 unless it is equipped with a Type II FDR.

- (l) No person shall operate a turbine-engined aeroplane of a maximum certificated take-off mass of over 5,700 kg, for which the individual certificate of airworthiness is first issued before 1 January 1987, unless it is equipped with an FDR which shall record time, altitude, airspeed, normal acceleration and heading.
- (m) No person shall operate a turbine-engined aeroplane, for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 unless it is equipped with an FDR which should record, in addition to time, altitude, airspeed, normal acceleration and heading, 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.
- (n) No person shall operate an aeroplane of a maximum certificated take-off mass of over 5,700 kg, for which the individual certificate of airworthiness is first issued after 1 January 2005, unless it is equipped with a Type IA FDR.

Sampling & Recording Intervals for Aeroplanes

- (o) All aeroplanes for which the application for type certification is submitted to a Contracting State on or after 1 January 2016 and which are required to be fitted with an FDR shall record the following parameters at a maximum sampling and recording interval of—
- (1) *0.0625 seconds*: for normal, lateral and longitudinal acceleration; and
 - (2) *0.125 seconds*: for pilot input and/or control surface position of primary controls (pitch, roll, yaw).

For Helicopters

- (p) No person shall operate a helicopter of a maximum certificated take-off mass of over 3,180 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2016 unless it is equipped with a Type IVA FDR
- (q) No person shall operate a helicopter of a maximum certificated take-off mass of over 7,000 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 unless it is equipped with a Type IV FDR.
- (r) No person shall operate a helicopter of a maximum certificated take-off mass of over 3,180 kg, up to and including 7 000 kg, for which the individual certificate of airworthiness is first issued on or after 1 January 1989, unless it is equipped with a Type V FDR.
- (s) No person shall operate a turbine-engined helicopters of a maximum certificated take-off mass of over 2 250 kg, up to and including 3 180 kg for which the application for type certification or individual certificate of airworthiness was submitted to a Contracting State on or after 1 January 2018 shall be equipped with—
- (1) A Type IV A FDR; or
 - (2) A Class C AIR capable of recording flight path and speed parameters displayed to the pilot(s); or
 - (3) An ADRS capable of recording the essential parameters defined in Appendix 4 to 7.165.
- (t) All helicopters of a maximum certificated take-off mass of 3 180 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2018 should be equipped with one of the choices provided in paragraph (s) of this Section.

7.167 COCKPIT VOICE RECORDERS & AUDIO RECORDING SYSTEMS

- (a) No person may operate a turbine-engined aeroplane for which an individual certificate of airworthiness or a type certificate is first issued on or after 1 January 2016 and required to be operated by more than one pilot unless it is equipped with either a CVR or a CARS.

- (b) No person may operate an aeroplane of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2003, unless it is equipped with a CVR capable of retaining the information recorded during at least the last two hours of its operation.
- (c) No person may operate an aeroplane of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 unless it is equipped with a CVR
- (d) No person may operate a turbine-engined aeroplane, for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 unless it is equipped with a CVR
- (e) No person may operate a 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 up to and including 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 unless it is equipped with a CVR.
- (f) No person may operate a helicopter of a maximum certificated take-off mass of over 3.180 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 unless it is equipped with a CVR. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.
- (g) No person may operate a helicopter of a maximum certificated take-off mass of over 7,000 kg for which the individual certificate of airworthiness was first issued before 1 January 1987 unless it is equipped with a CVR.
- (h) The use of magnetic tape or wire CVRs is not authorized.
- (i) A CVR shall be capable of retaining the information recorded during at least the last—
 - (1) 30 minutes of its operation; or
 - (2) 2 hours, for aeroplanes of a maximum certificated take-off mass of over 5,700 kg or helicopters that receives type certification after 1 January 2003.
- (j) For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on one track of the CVR.

7.170 RECORDING OF DATA LINK COMMUNICATIONS

- (a) All aircraft which utilize data link communications and are required to carry a CVR shall record on a flight recorder, all data link communications to and from the aircraft, where the aircraft is capable of being modified. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.
- (b) Sufficient information to derive the content of the data link communications message and, whenever practical, the time the message was displayed to or generated by the crew shall be recorded.

Note: Refer to Appendix 1 to 7.170 for

7.173 COMBINATION RECORDERS

- (a) No person may operate an aeroplane of a maximum certificated take-off mass of over 5,700 kg for which the type certificate is first issued on or after 1 January 2016 and which are required to be equipped with both a CVR and an FDR, unless it is equipped with two combination recorders (FDR/CVR).
- (b) No person may operate an aeroplanes of a maximum certificated take-off mass of over 15 000 kg for which the type certificate is first issued on or after 1 January 2016 and which are required to be equipped with both a CVR and an FDR, unless it is equipped with two combination recorders (FDR/CVR). One recorder

shall be located as close to the cockpit as practicable and the other recorder located as far aft as practicable.

- (c) All aeroplanes of a maximum certificated take-off mass over 5 700 kg, required to be equipped with an FDR and a CVR, may alternatively be equipped with two combination recorders (FDR/CVR).
- (d) All multi-engined turbine-powered aeroplanes of a maximum certificated take-off mass of 5 700 kg or less, required to be equipped with an FDR and/or a CVR, may alternatively be equipped with one combination recorder (FDR/CVR).

7.175 CONSTRUCTION & LOCATION OF FDR & CVR

- (a) To facilitate location and identification in case of an accident, the cockpit voice recorder shall—
 - (1) Be either bright orange or bright yellow;
 - (2) Have reflective tape affixed to the external surface to facilitate its location under water; and
 - (3) Have an approved underwater locating device on or adjacent to the recorder, which is secured in such a manner that it is not likely to be separated during a crash impact
- (b) Flight recorders 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. Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.
- (c) aeroplanes required to be equipped with a FDR and a CVR may alternatively be equipped with the following number of combination (FDR/CVR) recorders—
 - (1) Two - for all aeroplanes of a certificated takeoff mass of over 5 700kg.
 - (2) One - for all multi-engined turbine powered aeroplanes of less than 5 700kg.

SUBPART F: CREW PROTECTION EQUIPMENT

7.178 SECURITY OF THE FLIGHT DECK

- (a) In all aeroplanes which are equipped with a flight crew compartment door, this door shall be capable of being locked, and means shall be provided by which cabin crew can discreetly notify the flight crew in the event of suspicious activity or security breaches in the cabin.
- (b) No person may operate an aircraft having a maximum seating capacity of more than 19 passengers unless there is installed a lockable door to restrict entry to the flight deck. This door shall be lockable from within the flight deck only.
- (c) All passenger-carrying aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 shall be 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.
 - (1) This door shall be capable of being locked and unlocked from either pilot's station.
 - (1) A 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.

7.180 FLIGHT CREW SAFETY HARNESS

- (a) No person may operate an aircraft unless there is an operational safety harness installed for each required flight crew member.
- (b) The safety harness shall incorporate a device that will automatically restrain the occupant's torso in the event of a rapid deceleration.

- (c) The safety harness should incorporate a device to prevent a suddenly incapacitated pilot from interfering with the flight controls.

7.181 QUICK DONNING TYPE OXYGEN MASK

- (a) No person may operate a pressurized aircraft at altitudes above 25,000 feet unless there is available at each flight crew duty station a quick donning type of oxygen mask which will readily supply oxygen upon demand.

7.182 CABIN CREW SEATS & SAFETY HARNESS

- (a) No person may operate an aircraft for which a cabin attendant(s) is required unless each seat provided is—
 - (1) Forward or rearward facing (within 15 degrees of the longitudinal axis of the aircraft, and
 - (2) Fitted with a safety harness.
- (b) Each seat shall be located at floor level in the passenger compartment and adjacent to the emergency exits as prescribed by the Authority to facilitate emergency evacuation.
- (c) Each cabin attendant seat shall be provided with an oxygen mask for the occupant when, in accordance with Section 7.270, they must—
 - (1) Use supplemental oxygen; or
 - (2) Be ready to use it in event of a rapid depressurization.

7.183 PROTECTIVE BREATHING EQUIPMENT (PBE)

- (a) No person may operate the following aircraft in commercial air transport, unless it is equipped with a PBE to protect the eyes, nose and mouth of all required crew members and provide oxygen or breathing gas for a period not less than 15 minutes—
 - (1) An aircraft with a maximum certified takeoff mass of more than 5700 kg, or
 - (2) An aircraft with a maximum seating capacity of more than 19 seats.
- (b) This equipment shall be conveniently located and easily accessible from each required duty station.
- (c) The PBE for each cabin attendant shall be portable.
- (d) The PBE, while in use, shall not prevent required communication.
- (e) For cargo aircraft, a PBE shall not be located in the cargo compartment, but immediately prior to entry into that compartment, and near a required fire extinguisher.

SUBPART G: PASSENGER-RELATED EQUIPMENT

7.185 PASSENGER SEATS & SEAT BELTS

- (a) No person may operate an aircraft carrying passengers unless it is equipped with—
 - (1) An approved seat or berth for each occupant on board who has reached their second birthday, and
 - (2) A seat belt for each seat and a restraining belt for each berth.

7.190 PASSENGER INFORMATION

- (a) No person shall operate an aircraft having an approved passenger seating configuration of more than 9 passengers unless it is equipped with at least one passenger information sign notifying when—
 - (1) Safety belts should be fastened; and
 - (2) Smoking is prohibited.
- (b) These signs shall be so constructed that a crew member can turn them on and off from a duty station.
- (c) There shall be sufficient signs located in the passenger cabin so that, when illuminated, they will be legible to each passenger under all probable conditions of cabin illumination.

7.195 PUBLIC ADDRESS SYSTEM

- (a) No person may operate an aircraft with a maximum approved seating configuration of more than 19 passengers unless it is equipped with a public address system.
- (b) This public address system shall—
 - (1) Be audible and intelligible at all passenger seats, toilets and cabin crew duty and work stations;
 - (2) Be capable of operation within 10 seconds by any required crew member;
 - (3) Be accessible by at least one seated crew member at each separate or pair of floor level emergency exits;

7.200 INTERPHONE SYSTEMS

- (a) No person may operate an aircraft on which a flight crew of more than one is required unless it is equipped with a flight deck interphone system, including headsets and microphones, which provides audible and intelligible communications between the required crew members.
- (b) No person may operate an aircraft having a maximum approved passenger seating configuration of more than 19 passengers unless it is equipped with a crew member interphone system which provides for signaling and two-way communications between all required crew members.
- (c) This crew member interphone system required by paragraph (b) of this Section shall—
 - (1) Be capable of operation independently of the public address system;
 - (2) Be capable of operation within 10 seconds by any required crew member, including those at remote work stations;
 - (3) Be accessible by at least one seated crew member at each separate or pair of floor level emergency exits.
 - (4) Have a signaling capability which provides for differentiation between normal and emergency calls; and
 - (5) Provide, on the ground, a means of two-way communication between ground personnel and at least two flight crew members.

7.205 MEGAPHONES

- (a) No person may operate an aircraft carrying more than 59 passengers unless it is equipped with the required number of battery-powered megaphones readily accessible to the crew members assigned to direct emergency evacuation.
- (b) The required number and location of megaphones are—
 - (1) For an aircraft with a seating capacity of 60 to 99 passengers - one megaphone at the most rearward location readily accessible to a cabin attendant duty station.
 - (2) For an aircraft with more than 99 passengers - an additional megaphone installed at the forward end of the passenger compartment.

7.210 EMERGENCY EXITS

- (a) No person may operate an aircraft carrying passengers unless it has adequate emergency exit provisions for emergency evacuations and ditching.
- (b) Each passenger-carrying 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.
- (c) Each passenger emergency exit, its means of access and its means of opening shall be conspicuously marked both inside and outside.
- (d) The location of each passenger emergency exit shall be indicated by a sign visible to occupants approaching along the main passenger aisle.

- (e) Each passenger carrying aeroplane shall be equipped with a slip-resistant escape route that meets the requirements under which that aeroplane was type-certificated.
- (f) Each passenger carrying aeroplane that is required to have cabin attendant(s) shall have flashlight stowage provisions accessible from their duty stations.

See Appendix 1 to 7.210 for specific requirements regarding these standards.

7.215 PASSENGER COMPARTMENT & EXITS

- (a) No person may conduct any passenger-carrying operation unless it has—
 - (1) A key for each door that separates a passenger compartment from another compartment that has emergency exit provisions;
Note: The key shall be readily available for each crew member.
 - (2) 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; and
 - (3) A placard on each door used to access a required passenger emergency exit, indicating that such door shall be open during takeoff and landing.

7.220 MATERIALS FOR CABIN INTERIORS

- (a) Upon the first major overhaul of an aeroplane cabin or refurbishing of the cabin interior, all materials in each compartment used by the crew or passengers that do not meet the current airworthiness requirements pertaining to materials used in the interior of the cabin for type certification in the transport category as cited by the Authority, shall be replaced with materials that meet the requirements specified by the Authority.
- (b) Seat cushions, except those on flight crew member seats, in any compartment occupied by crew or passengers shall meet requirements pertaining to fire protection as specified by the Authority.

7.225 MATERIALS FOR CARGO & BAGGAGE COMPARTMENTS

- (a) Each Class C or D cargo compartment greater than 200 cubic feet in volume in a transport category aeroplane type certified after January 1, 1958 shall have ceiling and sidewall liner panels which are constructed of—
 - (1) Glass fibre reinforced resin;
 - (2) Materials which meet the test requirements for flame resistance of cargo compartment liners as prescribed for type certification; or
 - (3) In the case of installations approved prior to March 20, 1989, aluminium.
- (b) The term "liner" includes any design feature, such as a joint or fastener, which would affect the capability of the liner to safely contain fire.

7.230 EMERGENCY LIGHTING SYSTEM

- (a) No person may operate an aircraft with a maximum approved passenger configuration of more than nineteen passengers unless it is equipped with an emergency lighting system that is independent of the main lighting system.
- (b) The emergency light system must—
 - (1) Illuminate each passenger exit marking and locating sign;
 - (2) Provide enough general lighting in the passenger cabin; and
 - (3) Include floor proximity emergency escape path marking.

SUBPART H: EMERGENCY EQUIPMENT

7.235 EMERGENCY EQUIPMENT: ALL AIRCRAFT

- (a) 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.

7.240 FIRST AID KIT

- (a) No person may operate an aircraft unless it is equipped with at least the minimum number of accessible first aid kits specified in the adjacent table—
- (b) The installed first aid kits shall contain the minimum contents specified by the Authority.

Number of passenger seats installed§	Number of first-aid kits required§
0 to 99§	1§
100 to 199 §	2§
200 to 299 §	3§
300 and more §	4§

7.245 MEDICAL KIT: COMMERCIAL AIR TRANSPORT

- (a) No person may operate an aircraft authorized to carry more than 100 passengers, on a sector length of more than 2 hours, unless it has a properly installed medical kit for the use of the medical doctors or other qualified persons in treating in-flight medical emergencies.
- (b) The installed medical kit shall contain the minimum contents prescribed by the Authority.

7.247 UNIVERSAL PRECAUTION KIT: COMMERCIAL AIR TRANSPORT

- (a) No person may operate an aircraft in commercial air transport that is required to carry cabin crew as part of the operating crew, unless it is equipped with one universal precaution kit for the use of cabin crew members in managing incidents of ill health associated with a case of suspected communicable disease, or in the case of illness involving contact with body fluids.
- (b) A minimum of two universal precaution kits are required for aeroplanes authorized to carry more than 250 passengers)
- (c) The installed universal precaution kit shall contain the minimum contents prescribed by the Authority.

7.250 PORTABLE FIRE EXTINGUISHERS

- (a) No person may operate an aircraft unless it has the minimum number of portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the aeroplane. 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.

Note: For passenger compartments, the extinguisher shall be designed to minimise the hazard of toxic gas concentrations.

- (b) The minimum number of portable fire extinguishers shall not be less than—
- (1) One properly installed in the pilot's compartment; and
 - (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) One properly installed in 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 airworthiness of a helicopter may count as one of the required extinguishers.

- (4) At least one portable fire extinguisher shall be conveniently located in the passenger compartment of aircraft having a passenger seating capacity of 30 or less.
- (5) For each aircraft having a passenger seating capacity of more than 30, there shall be at least the minimum number of portable fire extinguishers to passenger capacity depicted in the adjacent graph.
- (6) These fire extinguishers shall be conveniently located and uniformly distributed throughout the compartment.

Minimum Hand Fire Extinguishers (Passenger Seating Capacity)§	
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§

7.255 LAVATORY FIRE EXTINGUISHER

- (a) No person may operate an passenger carrying aircraft of more than 5700 kg maximum certificated takeoff mass unless each lavatory is equipped with a built-in fire extinguisher for the wastepaper disposal.
- (b) This built-in fire extinguisher must 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 aircraft 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 aircraft for which the individual certificate of airworthiness is first issued on or after 31 December 2016 shall—
 - (1) Meet the applicable minimum performance requirements of the State of Registry; 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.

7.260 LAVATORY SMOKE DETECTOR

- (a) No person may operate a passenger carrying aircraft of more than 5700 kg maximum certificated takeoff mass unless each lavatory in the aeroplane is equipped with a smoke detector system that provides a warning light—
 - (1) Warning light in the flight deck; or
 - (2) Warning light or audio warning in the passenger cabin, taking into account the position of the cabin attendants during various phases of flight.

7.265 CRASH AXE: COMMERCIAL AIR TRANSPORT

- (a) No person may operate an aircraft with a maximum certificated takeoff mass of more than 5700 kg unless it is equipped with a crash axe appropriate to effective use in that type of aeroplane, stored in a place not visible to passengers on the aeroplane.

7.270 OXYGEN STORAGE & DISPENSING APPARATUS

- (a) 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) 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) No AOC holder may operate an aeroplane 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) No person may operate a pressurized aeroplane at altitudes above 25,000 feet unless—
- (1) Flight crew member oxygen masks 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 location at the time of cabin pressurisation failure
 - (3) 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.
- (e) 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.

Note: See Appendix 1 and Appendix 2 to 7.270 to determine the amount of supplemental oxygen needed for non-pressurized and pressurized aircraft.

7.273 INDIVIDUAL FLOTATION DEVICES

- (a) No person shall operate an aircraft on flights over water unless it is equipped with one life jacket or equivalent individual flotation device for each person on board.
- (b) All life jackets or equivalent individual flotation devices shall be stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.
- (c) For all flights in which a survival raft is required, each individual flotation devices shall be fitted with an approved survivor locator light.
- (d) For single-engine and restricted performance aircraft operations overwater outside of gliding or autorotational distance from shore, the life jacket shall be worn constantly unless the occupant is wearing an integrated survival suit that includes the functionality of the life jacket;

7.274 SURVIVAL SUIT

- (a) *For commercial air transport*, no person may operate a helicopter offshore unless equipped with a survival suit for all occupants when the—
 - (1) Sea temperature is less than 10 degrees Centigrade; or
 - (2) Estimated rescue time exceeds the calculated survival time based on the sea state and ambient flight conditions.

7.275 LIFE RAFTS

- (a) No person may operate an aircraft in extended over water operations unless it is equipped with life rafts in sufficient number to accommodate all of the persons on board in the event of ditching when the flight is more than—
 - (1) 120 minutes at cruising speed or 400 nautical miles, whichever is lesser, for aeroplanes capable of continuing the flight to an airport with the critical power unit(s) becoming inoperative at any point along the route or planned diversions;
 - (2) 30 minutes at cruising speed or 100 nautical miles, whichever is lesser, for all other aircraft.
- (b) The operator of aircraft any flight over water shall consider the necessity to carry life rafts and life-saving equipment on any other flight based on a determination of the risks to survival of the occupants of the aeroplane in the event of a ditching, taking into account the operating environment and conditions such as, but not limited to—
 - (1) Sea state and sea and air temperatures;

- (2) The distance from land suitable for making an emergency landing; and
 - (3) The availability of search and rescue facilities.
- (c) *For commercial air transport passenger-carrying operations in aircraft of more than 5700 kg (3175 kg for helicopters), the buoyancy and overload capacity of the rafts must accommodate all occupants of the aircraft in the event of a loss of one raft of the largest rated capacity.*
- (d) The required life rafts and associated equipment must be readily accessible in the event of ditching without appreciable time for preparatory procedures. This equipment shall be installed in conspicuously marked, approved locations.
- (e) *For commercial air transport passenger-carrying operations in helicopters, 50% of all required rafts (where the quantity is two or more) will have a means of deployment by remote control.*
- (f) *For helicopters, life 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.*

7.280 SURVIVAL KIT

- (a) No person may operate an aircraft over designated land or sea areas where search and rescue would be especially difficult without carrying life saving equipment including means of sustaining life.
- (b) No person may operate over water at distances which require the carriage of life rafts unless each raft is equipped with life saving equipment including means of sustaining life.
- (c) The survival kit shall contain the minimum contents specified by the Authority.

7.285 DEVICES FOR EMERGENCY SIGNALLING

- (a) No person may operate an aircraft over designated land or sea areas where search and rescue would be especially difficult without carrying devices to make the necessary ground-to-air emergency signals to facilitate rescue.
- (b) No person may operate over water at distance which require the carriage of life rafts unless each raft contains the equipment for make the necessary pyrotechnical distress signals.
- (c) The devices for emergency signaling shall be acceptable to the Authority.

7.290 EMERGENCY LOCATOR TRANSMITTER (ELT)

- (a) No person may operate an aircraft unless it is equipped with an automatically activated ELT.
- (b) No person may operate an aircraft authorized to carry more than 19 passengers unless it is equipped with at least two ELTs, one of which shall be automatic.
- (c) No person may operate an aircraft over designated land or sea areas where search and rescue would be especially difficult unless it is equipped with a second ELT.
- (d) No person may operate an aircraft overwater outside gliding distance to land unless there is immediately available at least one ELT(S) in a raft or life jacket.
- (e) No person may operate an aircraft on long range over water at distances that require the carriage of life rafts unless it is equipped—
 - (1) *For aeroplanes, with a second ELT(S).*
 - (1) *For helicopters, a ELT(S) in each life raft.*
- (f) Batteries used in an ELT shall be replaced (or recharged if the battery is rechargeable) when—
 - (1) The transmitter has been in use for more than one cumulative hour; or
 - (2) 50 percent of their useful life, or for rechargeable batteries, 50 percent of their useful life of charge, has expired. (The battery useful life, or useful life of charge, requirements do not apply to batteries, such as water-activated batteries, that are essentially unaffected during probable storage intervals).

- (3) The expiration date for a replacement or recharged ELT battery shall be legibly marked on the outside of the transmitter.
- (g) The ELT shall be located to 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, with attention to—
- (1) The type and numbers selected and installed;
 - (2) Their placement on the aircraft and with associated floatable life support systems;
 - (3) Locating the ELT transmitter units to ensure optimum crash and fire protection; and
 - (4) The placement of the control and switching devices (activation monitors) of automatic fixed ELTs and their associated operational procedures to facilitate rapid detection of inadvertent activation and convenient manual switching by crew members.
- (h) All ELTs shall operate in accordance with the relevant provisions of ICAO Annex 10, Volume III.

7.291 UNDERWATER LOCATING DEVICE

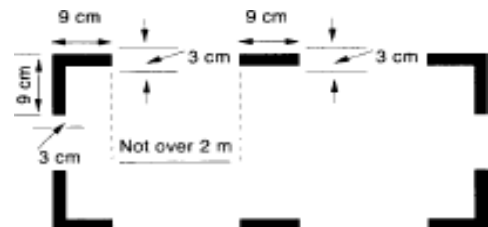
- (a) At the earliest practicable date but not later than 1 January 2018, no person may operate an aeroplane of a maximum certificated take-off mass of over 27 000 kg, unless an underwater locating device operating at a frequency of 8.8 kHz is securely attached to the aircraft.
- (b) This automatically activated underwater locating device shall be capable of operation for a minimum of 30 days and shall not be installed in wings or empennage.

7.295 HELICOPTER EMERGENCY FLOTATION MEANS

- (a) No person may operate a helicopter intentionally over water unless it has a properly installed permanent or rapidly deployable means of flotation to ensure a safe ditching of the helicopter when the flight is—
- (1) Engaged in offshore operations, or other overwater operations as prescribed by the Authority; or
 - (2) *When operating in Performance Class 1 and 2*, flying over water in a non-hostile or hostile environment at a distance from land corresponding to more than 10 minutes at normal cruise speed; or
 - (3) *When operating in Performance Class 3*, flying over water beyond autorotational or safe forced landing distance from land.

7.300 MARKING OF BREAK-IN POINTS

- (a) No person may operate an aircraft for which areas of the fuselage suitable for break-in by rescue in an emergency are marked unless those markings correspond to the adjacent diagram and meet the following requirements—
- (1) The color of the markings shall be red or yellow, and if necessary, they shall be outlined in white to contrast with the background; and
 - (2) 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.



Note: This regulation does not require any aircraft to have break-in areas.

7.305 FIRST AID OXYGEN DISPENSING UNITS

- (a) 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 depressurisation; 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) The amount of first-aid oxygen required in paragraph (a) of this Section for a particular operation and route shall be determined on the basis of—
 - (1) Flight duration after cabin depressurisation at cabin altitudes of more than 8,000 feet;
 - (1) An average flow rate of at least 3 litres Standard Temperature Pressure Dry/minute/person; and
 - (2) At least 2% of the passengers carried, but in no case for less than one person.

APPENDICES

APPENDIX 1 TO 7.065: LIGHTS TO BE DISPLAYED BY AEROPLANES

3.0 Navigation lights to be displayed in the air

(a) The lights specified herein are intended to meet the requirements of Annex 2 for navigation lights—

(1) Angles of coverage.

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

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

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

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

(2) Horizontal plane. The plane containing the longitudinal axis and perpendicular to the plane of symmetry of the aeroplane.

(3) Longitudinal axis of the aeroplane. A selected axis parallel to the direction of flight at a normal cruising speed, and passing through the centre of gravity of the aeroplane.

(4) Making way. An aeroplane on the surface of the water is "making way" when it is under way and has a velocity relative to the water.

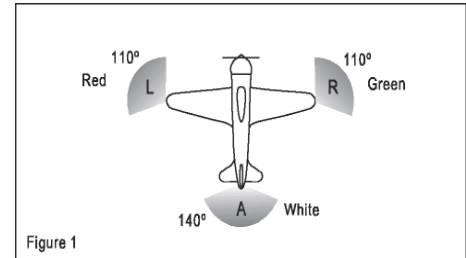
(5) Under command. An aeroplane on the surface of the water is "under command" when it is able to execute manoeuvres as required by the International Regulations for Preventing Collisions at Sea for the purpose of avoiding other vessels.

(6) Under way. An aeroplane on the surface of the water is "under way" when it is not aground or moored to the ground or to any fixed object on the land or in the water.

(7) Vertical planes. Planes perpendicular to the horizontal plane.

(1) As illustrated in Figure 1, the following unobstructed navigation lights shall be displayed—

- (i) a red light projected above and below the horizontal plane through angle of coverage L;
- (ii) a green light projected above and below the horizontal plane through angle of coverage R;
- (iii) a white light projected above and below the horizontal plane rearward through angle of coverage A.



3.1 Lights to be Displayed on the Water: General

(b) The lights specified herein are intended to meet the requirements of Annex 2 for lights to be displayed by aeroplanes on the water.

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

- (1) when under way;
- (2) when towing another vessel or aeroplane;

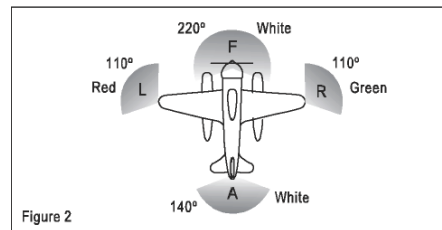
- (3) when being towed;
- (4) when not under command and not making way;
- (5) when making way but not under command;
- (6) when at anchor;
- (7) when aground.

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

3.2 Lights to be displayed when under way on the water

(e) As illustrated in Figure 2, the following appearing as steady unobstructed lights—

- (1) a red light projected above and below the horizontal through angle of coverage L;
- (2) a green light projected above and below the horizontal through angle of coverage R;
- (3) a white light projected above and below the horizontal through angle of coverage A; and
- (4) a white light projected through angle of coverage F.

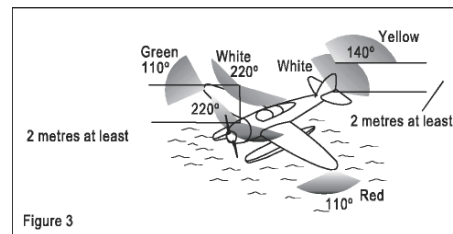


(f) The lights described in 3.2(a)(1),(2) and (3) should be visible at a distance of at least 3.7 km (2 NM). The light described in 3.2(a)(4) should be visible at a distance of 9.3 km (5 NM) when fitted to an aeroplane of 20 m or more in length or visible at a distance of 5.6 km (3 NM) when fitted to an aeroplane of less than 20 m in length.

3.3 Lights to be displayed when towing another vessel or aeroplane

(g) As illustrated in Figure 3, the following appearing as steady, unobstructed lights—

- (1) the lights described in 3.2;
- (2) a second light having the same characteristics as the light described in 3.2(a)(4) and mounted in a vertical line at least 2 m above or below it; and
- (3) a yellow light having otherwise the same characteristics as the light described in 3.2(a)(3) and mounted in a vertical line at least 2 m above it.

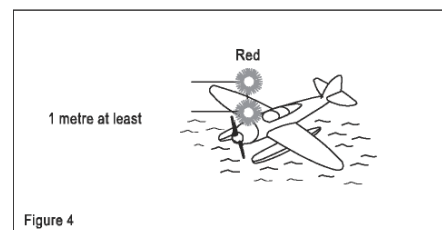


3.4 Lights to be displayed when being towed

(h) The lights described in 3.2(a)(1), (2) and (3) appearing as steady, unobstructed lights.

3.5 Lights to be displayed when not under command and not making way

(i) As illustrated in Figure 4, two steady red lights placed where they can best be seen, one vertically over the other and not less than 1 m apart, and of such a character as to be visible all around the horizon at a distance of at least 3.7 km (2 NM).



3.6 Lights to be displayed when making way but not under command

- (j) As illustrated in Figure 5, the lights described in 3.5 plus the lights described in 3.2(a)(1), (2) and (3).
- (k) The display of lights prescribed in 3.5 and 3.6 is to be taken by other aircraft as signals that the aeroplane showing them is not under command and cannot therefore get out of the way.
- (l) They are not signals of aeroplanes in distress and requiring assistance.

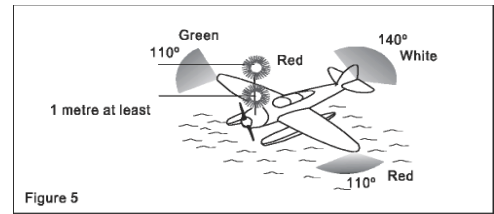


Figure 5

3.7 Lights to be displayed when at anchor

- (m) If less than 50 m in length, where it can best be seen, a steady white light (Figure 6), visible all around the horizon at a distance of at least 3.7 km (2 NM).
- (n) If 50 m or more in length, where they can best be seen, a steady white forward light and a steady white rear light (Figure 7) both visible all around the horizon at a distance of at least 5.6 km (3 NM).

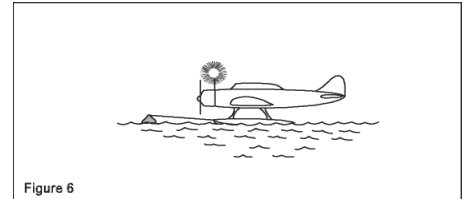


Figure 6

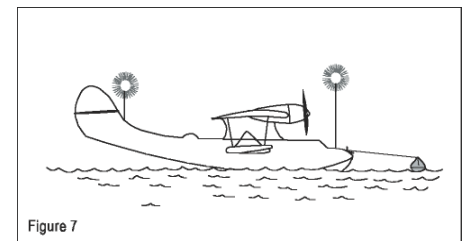


Figure 7

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

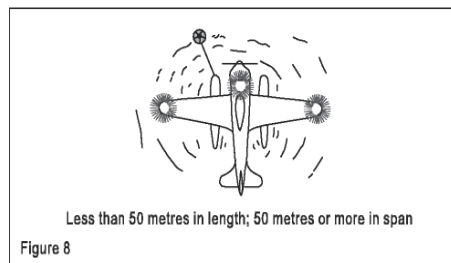


Figure 8

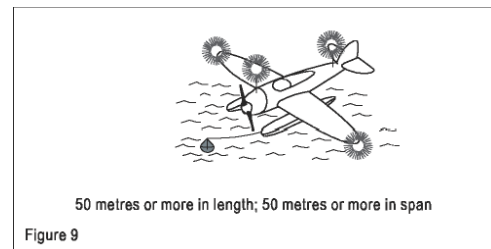


Figure 9

3.8 Lights to be displayed when aground

- (p) The lights prescribed in 3.7 and in addition two steady red lights in vertical line, at least 1 m apart so placed as to be visible all around the horizon.
- (q)

APPENDIX 1 TO 7.067: ALTIMETRY SYSTEM PERFORMANCE REQUIREMENTS.

- (a) 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 $28 - 0.013z^2$

for $0 \leq z \leq 25$ when z is the magnitude of the mean TVE in metres, or $92 - 0.004z^2$ for $0 \leq z \leq 80$ 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
 - (4) 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.
- (b) 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—
- (1) The ASE of the aeroplane shall not exceed 60 m (200 ft) in magnitude under all flight conditions; and 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
 - (2) In addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

APPENDIX 1 TO 7.127: REQUIREMENTS FOR ALL-WEATHER OPERATIONS

- (a) **Category II Approach Minima.** In addition to the instrument and equipment requirements for aircraft operated under IFR with 2 pilots and the specific requirements for the type of aircraft, the following additional equipment and instruments requirements apply—
- (1) A flight control guidance system that consists of either an automatic approach coupler or a flight director system conforming to the following—
 - (i) 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.
 - (ii) An automatic approach coupler must provide at least automatic steering in relation to an ILS localizer.
 - (iii) The flight control guidance system may be operated from one of the required receiving systems.
 - (2) For decision heights below 150 feet, a radio altimeter
 - (3) Warning systems for immediate detection by the pilot of system faults.
- (b) **Category IIIA Approach Minima (not less than RVR600 (200 m)).** In addition to the instrument and equipment requirements for aircraft operated under IFR with 2 pilots, the specific requirements for the type of aircraft and the requirements of Category II, the following additional equipment and instruments requirements apply—
- (1) A redundant, acceptable flight guidance or control systems that provides—
 - (i) A Fail Operational or Fail Passive automatic landing system at least to touchdown;
 - (ii) A Fail Operational or Fail Passive manual flight guidance system with 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 wind shield rain removal, ice protection, or defog capability as specified in the AFM.
- (c) **Category IIIB Approach Minima (less than RVR600 (200 m) but not less than RVR400).** The following equipment in addition to the instrument and navigation equipment required by paragraphs (a) and (b) of this Appendix—
- (1) A redundant flight control or guidance system demonstrated in accordance with international acceptable criteria.
 - (2) 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 RVR600 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.
- (d) **Category IIIC Approach Minima (less than RVR300 (75 m)).** The following equipment is required in addition to or as a replacement for the instrument and navigation equipment required by paragraphs (a), (b) and (c) of this Appendix—
- (1) A Fail Operational Automatic Flight Control System, or
 - (2) A manual flight guidance system designed to meet fail operational system criteria, or
 - (3) 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
 - (4) A fail operational automatic, manual, or hybrid rollout control system.

APPENDIX 1 TO 7.165: FDR PARAMETERS FOR 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 time 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 V_{SO} (Note 1) V_{SO} to 1.2 V_D (Note 2)	1	±5% ±3%	1 kt (0.5 kt recommended)
4	Heading (primary flight crew reference)	360°	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
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
15*	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretely	1		
16	Longitudinal acceleration (Note 3)	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
<i>Note.— The preceding 16 parameters satisfy the requirements for a Type II FDR.</i>					
17	Lateral acceleration (Note 3)	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	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
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 lateral deviation)	Signal range	1	±3%	0.3% of full range
23	Marker beacon passage	Discrete	1		
24	Master warning	Discrete	1		
25	Each 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	1 852 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 selector position	Discrete	4	As installed	

Note.— The preceding 32 parameters satisfy the requirements for a Type I FDR.

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
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, discrete or full range)	1	±5%	2% of full range
35*	Additional engine parameters (EPR, N ₁ , indicated vibration level, N ₂ , EGT, fuel flow, fuel cut-off lever position, N ₃)	As installed	Each engine each second	As installed	2% of full range
36*	TCAS/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 mb (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 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
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

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
56*	Fuel quantity in CG trim tank	As installed	64	As installed	1% of full 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 (each system)	Full range	2	±5%	100 psi
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 install
73*	Cockpit trim control input position, Roll	Full range	1	±5%	0.2% of full range or as install
74*	Cockpit trim control input position, Yaw	Full range	1	±5%	0.2% of full range or as install
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 install
76*	Event marker	Discrete	1		
77*	Date	365 days	64		
78*	ANP or EPE or EPU	As installed	4	As installed	

Note.— The preceding 78 parameters satisfy the requirements for a Type IA FDR.

Notes.—

1. V_{S0} stalling speed or minimum steady flight speed in the landing configuration is in Section “Abbreviations and Symbols”.
2. V_D design diving speed.
3. Refer to 6.3.1.2.11 for increased recording requirements.
4. Record sufficient inputs to determine power.
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.
6. Refer to 6.3.1.2.12 for increased recording requirements.
7. If signal available in digital form.
8. Recording of latitude and longitude from DNS or other navigation system is a preferred alternative.
9. If signals readily available.

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 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;
 - 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.

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APPENDIX 2 TO 7.165: FDR PARAMETERS FOR HELICOPTERS

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
1	Time (UTC when available, otherwise relative time count or GPS time sync)	24 hours	4	±0.125% per hour	1 s
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 pilot display measuring system	1	±3%	1 kt
4	Heading	360°	1	±2°	0.5°
5	Normal acceleration	-3 g to +6 g	0.125	±0.09 g excluding a datum error of ±0.045 g	0.004 g
6	Pitch attitude	±75° or 100% of useable 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 system (low pressure and selection)	Discrete	1	—	—
13	Outside air temperature	Sensor range	2	±2°C	0.3°C
14*	Autopilot/ autothrottle/AFCS mode and engagement status	A suitable combination of discretes	1	—	—
15*	Stability augmentation system engagement	Discrete	1	—	—
<i>Note.— The preceding 15 parameters satisfy the requirements for a Type V FDR.</i>					
16*	Main gearbox oil pressure	As installed	1	As installed	6.895 kN/m ² (1 psi)
17*	Main gearbox oil temperature	As installed	2	As installed	1°C

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
18	Yaw rate	$\pm 400^\circ/\text{second}$	0.25	$\pm 1.5\%$ maximum range excluding datum error of $\pm 5\%$	$\pm 2^\circ/\text{s}$
19*	Sling load force	0 to 200% of certified load	0.5	$\pm 3\%$ of maximum range	0.5% for maximum certified load
20	Longitudinal acceleration	$\pm 1 \text{ g}$	0.25	$\pm 0.015 \text{ g}$ excluding a datum error of $\pm 0.05 \text{ g}$	0.004 g
21	Lateral acceleration	$\pm 1 \text{ g}$	0.25	$\pm 0.015 \text{ g}$ excluding a datum error of $\pm 0.05 \text{ g}$	0.004 g
22*	Radio altitude	-6 m to 750 m (-20 ft to 2 500 ft)	1	$\pm 0.6 \text{ m}$ ($\pm 2 \text{ ft}$) or $\pm 3\%$ whichever is greater below 150 m (500 ft) and $\pm 5\%$ 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)
23*	Vertical beam deviation	Signal range	1	$\pm 3\%$	0.3% of full range
24*	Horizontal beam deviation	Signal range	1	$\pm 3\%$	0.3% of full range
25	Marker beacon passage	Discrete	1	—	—
26	Warnings	Discrete(s)	1	—	—
27	Each navigation receiver frequency selection	Sufficient to determine selected frequency	4	As installed	—
28*	DME 1 and 2 distances	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 and gear selector position	Discrete	4	—	—
<i>Note.— The preceding 30 parameters satisfy the requirements for a Type IV FDR.</i>					
31*	Engine exhaust gas temperature (T_e)	As installed	1	As installed	—
32*	Turbine inlet temperature (TIT/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	—	As installed	—
37	Engine control modes	Discrete	1	—	—
38*	Selected barometric setting (pilot and co-pilot)	As installed	64 (4 recommended)	As installed	0.1 mb (0.01 in Hg)

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
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
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	—	—

Note.— The preceding 48 parameters satisfy the requirements for a Type IVA FDR.

APPENDIX 3 TO 7.165: ADRS PARAMETERS FOR AEROPLANES

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 degrees	1	±2 degrees	0.5 degree	* If not available, record rates
2	Pitch attitude	E*	±90 degrees	0.25	±2 degrees	0.5 degree	* If not available, record rates
3	Roll attitude	E*	±180 degrees	0.25	±2 degrees	0.5 degree	* If not available, record rates
4	Yaw rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no heading available
5	Pitch rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no pitch attitude available
6	Roll rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no roll attitude available
7	Positioning system : latitude/longitude	E	Latitude: ±90 degrees Longitude: ±180 degrees	2 (1 if available)	As installed (0.00015 degree recommended)	0.00005 degree	
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 degrees	2 (1 if available)	As installed (± 2 degrees recommended)	0.5 degrees	
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 ±0.45 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 ±0.05 g recommended)	0.004 g	
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	

No.	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
16	External static pressure (or pressure altitude)	R	34.4 mb (3.44 in-Hg) to 310.2 mb (31.02 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 $+90^{\circ}$ C or available sensor range	2	As installed ($\pm 2^{\circ}$ C recommended)	1 $^{\circ}$ 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 recommended)	2% of full range	
21	Engine oil temperature	R	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full 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. EPR/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 overspeed 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 ($\pm 5^{\circ}$ C recommended)	1 degree Celsius	
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 degree	

No.	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
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 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 two 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	

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Essential parameters
Recommended parameters

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APPENDIX 4 TO 7.170: ADRS PARAMETERS FOR HELICOPTERS

N°	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 rotational rates
2	Pitch attitude	E*	±90°	0.25	±2°	0.5°	*If not available, record rotational rates
3	Roll attitude	E*	±180°	0.25	±2°	0.5°	*If not available, record rotational rates
4	Yaw rate	E*	±300°/s	0.25	±1% + drift of 360°/h	2°/s	*Essential if no heading available
5	Pitch rate	E*	±300°/s	0.25	±1% + drift of 360°/h	2°/s	*Essential if no pitch attitude available
6	Roll rate	E*	±300°/s	0.25	±1% + drift of 360°/h	2°/s	*Essential if no roll attitude 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 helicopter + 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 s	0.1 s	*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: track	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 ±0.05 g recommended)	0.004 g	

N ^o	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
14	Longitudinal 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	
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 hPa (1.02 in-Hg) to 310.2 hPa (9.16 in-Hg) or available sensor range	1	As installed (±1 hPa (0.3 in-Hg) or ±30 m (±100 ft) to ±210 m (±700 ft) recommended)	0.1 hPa (0.03 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	Main rotor speed (Nr)	R	50% to 130% or available sensor range	0.5	As installed	0.3% of full range	
20	Engine RPM (*)	R	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	*For piston engined helicopters
21	Engine oil pressure	R	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
22	Engine oil temperature	R	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
23	Fuel flow or pressure	R	Full range	Each engine each second	As installed	2% of full range	
24	Manifold pressure (*)	R	Full range	Each engine each second	As installed	0.2% of full range	*For piston engined helicopters

N°	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remark
14	Longitudinal 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	
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 hPa (1.02 in-Hg) to 310.2 hPa (9.16 in-Hg) or available sensor range	1	As installed (±1 hPa (0.3 in-Hg) or ±30 m (±100 ft) to ±210 m (±700 ft) recommended)	0.1 hPa (0.03 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	Main rotor speed (Nr)	R	50% to 130% or available sensor range	0.5	As installed	0.3% of full range	
20	Engine RPM (*)	R	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	*For piston engined helicopters
21	Engine oil pressure	R	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
22	Engine oil temperature	R	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
23	Fuel flow or pressure	R	Full range	Each engine each second	As installed	2% of full range	
24	Manifold pressure (*)	R	Full range	Each engine each second	As installed	0.2% of full range	*For piston engined helicopters

N°	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
25	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. EPR/N1 or torque/Np as appropriate to the particular engine shall be recorded to determine power. A margin for possible overspeed should be provided. Only for turbine-engined helicopters.
26	Engine gas generator speed (Ng) (*)	R	0-150%	Each engine each second	As installed	0.2% of full range	*Only for turbine-engined helicopters
27	Free power turbine speed (Nf) (*)	R	0-150%	Each engine each second	As installed	0.2% of full range	*Only for turbine-engined helicopters
28	Collective pitch	R	Full range	0.5	As installed	0.1% of full range	
29	Coolant temperature (*)	R	Full range	1	As installed (±5°C recommended)	1° C	*Only for piston-engined helicopters
30	Main voltage	R	Full range	Each engine each second	As installed	1 Volt	
31	Cylinder head temperature (*)	R	Full range	Each cylinder each second	As installed	2% of full range	*Only for piston-engined helicopters
32	Fuel quantity	R	Full range	4	As installed	1% of full 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 two 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	

ey:

Essential parameters

: Recommended parameters

APPENDIX 1 TO 7.170: APPLICATION OF 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 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 source are recorded on the FDR.	M *
6	Aeronautical Operational Control Data	This includes any application transmitting or receiving data used for AOC purposes (per the ICAO definition of AOC).	M *

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.

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APPENDIX 1 TO 7.210: EMERGENCY EXIT EQUIPMENT

- (a) The assisting means for a floor level emergency exit shall meet the requirements under which the aeroplane was type certified.
- (b) The location of each passenger emergency exit shall be—
 - (1) Recognisable from a distance equal to the width of the cabin.
 - (2) Indicated by a sign visible to occupants approaching along the main passenger aisle.
- (c) There shall be an emergency exit locating sign—
 - (1) 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;
 - (2) 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
 - (3) 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.
- (d) 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.

Note: No sign may continue to be used if its luminescence (brightness) decreases to below 250 microlamberts.

- (e) 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.
- (f) 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 centreline of the main passenger aisle, is at least 0.05 foot-candles.
- (g) Each emergency light shall—
 - (1) 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;
 - (2) Have a means to prevent inadvertent operation of the manual controls; and
 - (3) When armed or turned on at either station, remain lighted or become lighted upon interruption of the aeroplane's normal electric power.
 - (4) Provide the required level of illumination for at least 10 minutes at the critical ambient conditions after emergency landing.
 - (5) Have a cockpit control device that has an "on", "off", and "armed" position.
- (h) 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.
- (i) No operating handle or operating handle cover may continue to be used if its luminescence (brightness) decreases to below 100 microlamberts.
- (j) Access to emergency exits shall be provided as follows for each passenger carrying aeroplane—
 - (1) 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.
 - (2) 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 (f)1. of this Section.

- (3) 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.
 - (4) 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.
 - (5) No door may be installed in any partition between passenger compartments.
 - (6) 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.
- (k) 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.
- (l) 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—
- (1) If the reflectance of the darker colour is 15 percent or less, the reflectance of the lighter colour shall be at least 45 percent.
 - (2) 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.
 - (3) 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.
- (m) 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.
- (n) 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.
- (o) 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.
- (p) 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 Appendix and shall be readily accessible.
- (q) On each large passenger-carrying turbojet powered aeroplane each ventral exit and tail cone exit shall be—
- (1) Designed and constructed so that it cannot be opened during flight; and
 - (2) 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.

APPENDIX 1 TO 7.270: SUPPLEMENTAL OXYGEN: NON PRESSURIZED AIRCRAFT

- (a) Flight crew members—
 - (1) Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with the following 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) Cabin crew members, additional crew members and passengers shall be supplied with oxygen in accordance with the following table.

Note: 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.

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	Entire flight time at pressure altitudes above 13,000 ft
6. 10% of passengers	Entire flight time after 30 minutes at pressure altitudes greater than 10,000 ft but not exceeding 13,000 ft

APPENDIX 2 TO 7.270: SUPPLEMENTAL OXYGEN: PRESSURIZED AIRCRAFT

- (c) 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.
- (d) Following a cabin pressurisation failure, the cabin pressure altitude shall be considered the same as the aeroplane 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 altitude.

Note: Under these circumstances, this lower cabin pressure altitude may be used as a basis for determination of oxygen supply.

- (e) Flight crew members—
 - (1) Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with the following 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.
 - (3) Flight deck seat occupants, not supplied by the flight crew source, are to be considered as passengers for the purpose of oxygen supply.
- (f) Cabin crew members, additional crew members, and passengers—
 - (1) Cabin crew members and passengers shall be supplied with supplemental oxygen in accordance with the following 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.
- (g) The oxygen supply requirements, as specified in the following table, for aeroplanes not certificated to fly at altitudes above 25,000 ft, may be reduced to—
 - (1) The entire flight time between 10,000 ft and 14,000 ft cabin pressure altitudes for all required cabin crew members and
 - (2) For at least 10% of the passengers if, at all points along the route to be flown, the aeroplane is able to descend safely within 4 minutes to a cabin pressure altitude of 14,000 ft.

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 13,000 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>(i) 30 minutes for aeroplanes certificated to fly at altitudes not exceeding 25,000 ft (Note 2)</i> <i>(ii) 2 hours for aeroplanes certificated to fly at altitudes more than 25,000 ft (Note 3).</i>
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 15,000 ft whichever is the greater (Note 4)
6. 30% of passengers	Entire flight time when the cabin pressure altitude exceeds 14,000 ft but does not exceed 15,000 ft
5. 10% of passengers	Entire flight time when the cabin pressure altitude exceeds 10,000 ft but does not exceed 14,000 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 Schedule 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.

End of BASR Schedule 7

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