

Statutory Instrument No. 69 of 2022

CIVIL AVIATION ACT
(Cap. 71:01)

**CIVIL AVIATION (EQUIPMENT AND INSTRUMENTS)
(AMENDMENT) REGULATIONS, 2022**
(Published on 13th June, 2022)

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IN EXERCISE of the powers conferred on the Minister of Transport and Public Works by section 89 of the Civil Aviation Act and on the recommendation of the Civil Aviation Authority, the following Regulations are hereby made —

- Citation 1. These Regulations may be cited as the Civil Aviation (Equipment and Instruments) (Amendment) Regulations, 2022.
- Amendment of regulation 2 of Cap. 71:01 (Sub. Leg.) 2. The Civil Aviation (Equipment and Instruments) (Amendment) Regulations (hereinafter referred to as “the Regulations”) are amended in regulation 2 by inserting in their correct alphabetical order, the following new definitions —
- “Automatic Deployable Flight Recorder (ADFR)” means a combination flight recorder installed on the aircraft which is capable of automatically deploying from the aircraft;
 - “ARDS” means Aircraft Data Recording System;
 - “ATS” means Air Traffic Services;
 - “CARS” means Cockpit Audio Recording System;
 - “CVR” means Cockpit Voice Recorder;
 - “Electronic Flight Bag (EFB)” means an electronic information system, comprised of equipment and applications for flight crew, which allows for the storing, updating, displaying and processing of EFB functions to support flight operations or duties;
 - “enhanced vision system (EVS)” means a system to display electronic real-time images of the external scene achieved through the use of image sensors;
 - “FDR” means Flight Data Recorder;
 - “head-up display (HUD)” means a display system that presents aircraft information into the pilot’s forward external field of view;
 - “Required Communication Performance (RCP) specification” means a set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication;
 - “Required Surveillance Performance (RCP) specification” means a set of requirements for air traffic service provision and associated ground equipment, aircraft capability and operations needed to support performance-based surveillance;
 - “State of Design” means the state having jurisdiction over the organisation responsible for the type design; and
 - “State of Manufacture” means the state having jurisdiction over the organization responsible for the final assembly of the aircraft, engine or propeller.
- Amendment of regulation 3 of the Regulations 3. Regulation 3 of the Regulations is amended by —
- (a) substituting for subregulation (1), the following new subregulation —
 - “(1) In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness under the Civil Aviation (Airworthiness) Regulations, a person shall not fly an aircraft unless appropriate equipment, instrument and flight documents, specified in these Regulations are installed or carried in the aircraft”;
- Cap. 71:01 (Sub. Leg.)

- (b) inserting immediately after subregulation (2), the following new subregulation —
 “(2A) The instruments, equipment and documents referred to in subregulation (1), shall be determined in accordance with the aircraft used under the circumstances which the aircraft is to be conducted.”; and
- (c) inserting immediately after subregulation (5), the following new subregulations —
 “(5A) Instruments and equipment shall —
 (a) be provided with approved instrument and equipment necessary for safe operation of the aircraft in the anticipated operating conditions; and
 (b) include the instruments and equipment necessary to enable the crew to operate the aircraft within its operating limits.
 (5B) Equipment and instruments required under these regulations, including their installation, shall be approved or accepted by the Authority.
 (5C) A helicopter shall be provided with approved equipment and instrument designed to observe human factors principles necessary —
 (a) for the safe operation of the helicopter in anticipated operating conditions; and
 (b) to enable the crew to operate the helicopter within its operating limitations.”.

4. The Regulations are amended by substituting for regulation 5, the following new regulation —

“General
 requirement
 -aircraft
 instruments

5. (1) An aircraft shall be equipped with aircraft instruments to enable the aircraft crew to —
 (a) control the aircraft path;
 (b) carry out any required procedural manoeuvres; and
 (c) observe the operating limitations of the aircraft in the expected operating conditions.
- (2) An aircraft shall be equipped with —
 (a) accessible and adequate medical supplies which shall comprise —
 (i) one or more first-aid kit for the use of cabin crew in managing incidents of ill health,
 (ii) one universal precaution kit for an aircraft required to carry cabin crew as part of the operating crew,
 (iii) two universal precaution kits for an aircraft authorised to carry more than 250 passengers for —
 (aa) the use of the cabin crew in managing incidents of ill health; and
 (bb) managing incidents of ill health associated with a case of suspected communicable disease or illness involving contact with body fluid,
 (iv) a medical kit for —
 (aa) an aircraft authorised to carry 100 passengers on a sector length of more than two hours;
 (bb) medical doctors; or
 (cc) other qualified persons to use in treating medical emergencies in the aircraft;

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- (b) a portable fire extinguisher which —
 - (i) will not cause dangerous contamination of the air within the aircraft when discharged,
 - (ii) shall be located in —
 - (aa) the pilots' compartment; and
 - (bb) each passenger compartment that is separate from the pilots' compartment;
- (c) a seat or berth —
 - (i) for each person over the age of 2 years,
 - (ii) for each seat and restraining,
 - (iii) comprising of a safety harness for each —
 - (aa) aircraft crew;
 - (bb) pilot seat;
 - (iv) comprising of a safety harness for each pilot seat which shall incorporate a device —
 - (aa) that will automatically restrain the occupant's torso in the event of rapid deceleration; and
 - (bb) to prevent a suddenly incapacitated pilot from interfering with the aircraft controls; and
- (d) means of ensuring that the following information and instructions are conveyed to passengers —
 - (i) when seat belts are to be fastened,
 - (ii) when and how oxygen equipment is to be used if the carriage of oxygen is required,
 - (iii) restrictions on smoking,
 - (iv) location and use of life jackets or equivalent individual flotation devices where their carriage is required,
 - (v) location and method of opening emergency exits, and
 - (vi) spare electrical fuses of appropriate ratings for replacement of those accessible in aircraft.”.

Amendment of regulation 6 of the Regulations

5. The Regulations are amended by substituting for regulation 6, the following new regulation —

“Minimum flight instruments 6. (1) An aircraft that is operated as a VFR flights shall be equipped with —

- (a) a magnetic compass;
- (b) an accurate timepiece indicating the time in hours, minutes and seconds;
- (c) a sensitive pressure altimeter;
- (d) an airspeed indicator; and
- (e) such additional instruments or equipment as may be specified by the Authority.

(2) An aircraft that is operated in accordance with the instrument flight rules or which cannot be maintained in a desired attitude without reference to one or more aircraft instruments, shall be equipped with —

- (a) a magnetic compass;
- (b) an accurate timepiece indicating the time in hours, minutes and seconds;
- (c) two sensitive pressure altimeters with counter drum-pointer or equivalent presentation;
- (d) an airspeed indicating system with means of preventing malfunctioning due to either condensation or icing;

- (e) a turn and slip indicator;
- (f) an attitude indicator (artificial horizon);
- (g) a heading indicator (directional gyroscope);
- (h) a means of indicating whether the power supply to the gyroscopic instrument is adequate;
- (i) a means of indicating in the flight crew compartment the outside air temperature;
- (j) a rate-of-climb and descent indicator; and
- (k) such additional instruments or equipment as may be specified by the Authority.

6. Regulations 7 is amended 7 by inserting immediately after subregulation (1), the following new subregulation —

Amendment of regulation 7 of the Regulations

“(1A) A VFR flight which is operated as a controlled flight shall be equipped in accordance with subregulation (1).”.

7. The Regulations are amended by inserting immediately after regulation 12, the following new regulations —

Insertion of regulations 12A, etc. in the Regulations

“Emergency power supply for electrically operated attitude indicating 12A. (1) An airplane of a maximum certificated take-off mass of over 5 700 kg newly introduced into service after 1 January 1975 shall, be fitted with an emergency power supply independent of the main electrical generating system, for the purpose of operating and illuminating, for a minimum period of 30 minutes, an attitude instrument indicating instrument (artificial horizon), clearly visible to the pilot-in-command.

- (2) The emergency power supply shall —
- (a) be automatically operative after the total failure of the main electrical generating system; and
 - (b) give clear indication on the instrument panel that the attitude indicator is being operated by emergency power.
- (3) The instruments used by a pilot shall be arranged to permit the pilot to see indications readily from his or her station, with the minimum practicable deviation from the position and line of vision normally assumed when looking forward along the aircraft path.

Aircraft equipped with automatic landing systems

12B. (1) Where an aircraft is equipped with the following systems, the Authority shall approve the use of such systems for the safe operation of the aircraft —

- (a) automatic landing systems;
 - (b) a head-up display (HUD);
 - (c) equivalent displays;
 - (d) enhanced vision systems (EVS);
 - (e) synthetic vision systems (SVS) or combined vision systems (SVS) (CVS); or
 - (f) any combination of those systems into a hybrid system.
- (2) The Authority shall ensure the following in approving the operational use of automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS —
- (a) the equipment meets the appropriate airworthiness certification requirements;
 - (b) the operator has carried out a safety risk assessment of the operations supported by the automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS; and

- (c) the operator has established and documented the procedures for the use of, and training requirements for, automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS.
- EFB equipment 12C. (1) The operator shall ensure that where EFB are used on board, the performance of the aircraft systems, equipment or the ability to operate the aircraft is not affected.
- (2) Where an EFB is used on board of an aircraft, the operator shall —
- (a) assess the safety risk associated with each EFB function;
 - (b) establish and document the procedures for the use of, and training requirements for, the EFB and each EFB function; and
 - (c) ensure that, in the event of an EFB failure, sufficient information is readily available to the flight crew for the aircraft to be conducted safely.
- (3) The Authority shall approve the operational use of EFB functions to be used for the safe operations of an aircraft.
- (4) The Authority shall ensure that, in approving the use of EFB —
- (a) the EFB equipment and its associated installation hardware, including interaction with the aircraft system if applicable, meet the appropriate airworthiness certification requirements;
 - (b) the operator has assessed the safety risks associated with the operations supported by the EFB functions;
 - (c) the operator has established requirements for redundancy of the information contained in and displayed by the EFB functions if appropriate;
 - (d) the operator has established and documented procedure for the management of the EFB functions including any database it may use; and
 - (e) the operator has established and documented the procedures for the use of, and training requirements for, the EFB and the EFB functions.
- Aircraft icing conditions 12D. An aircraft shall be equipped with suitable de-icing or anti-icing devices when operated in circumstances in which icing conditions are reported to exist or are expected to be encountered.”
- Amendment of regulation 13 of the Regulations 8. Regulation 13 of the Regulations is amended by substituting for that regulation, the following new regulation —
- “Radio equipment 13. (1) A person shall not operate an aircraft unless it is equipped with radio communication equipment required for the kind of operation being conducted.
- (2) An aircraft, shall be equipped with radio communication equipment capable of —
- (a) conducting two-way communication for aerodrome control purposes;
 - (b) receiving meteorological information at any time during the flight;
 - (c) conducting communications on those frequencies specified by the Authority;
 - (d) conducting two-way communications at any time during the flight —

- (i) with at least one aeronautical station, and with such other aeronautical stations; and
 - (ii) on such frequencies as may be specified by the Authority.
- (3) The radio communication equipment required in these Regulations shall be approved and installed in accordance with the requirements applicable to them, including the minimum performance requirements, and shall meet any other requirements as may be specified by the Authority.
- (4) The radio communication equipment required in accordance with subregulation (2), shall provide for communications on the aeronautical emergency frequency 121.5 MHz.
- (5) An aircraft shall, where communication equipment is required to meet an RCP specification for performance-based communication and in addition to the requirements specified in subregulation (2) —
- (a) be equipped with communication equipment which will enable it to operate in accordance with the approved RCP specifications;
 - (b) have information relevant to the aircraft RCP specification capabilities listed in the aircraft manual or other aircraft documentation approved by the State of Design or State of Registry; and
 - (c) information relevant to the aircraft RCP specification capabilities included in the MEL.
- (6) The Authority shall ensure that for operations where an RCP specification has been prescribed, the operator has established and documented —
- (a) normal and abnormal procedures, including contingency procedures;
 - (b) flight crew qualification and proficiency requirements, in accordance with appropriate RCP specifications;
 - (c) a training programme for relevant personnel consistent with the intended operations; and
 - (d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RCP specifications.
- (7) The Authority shall ensure that, in respect of the aircraft mentioned in subregulation (4), adequate provisions exist for —
- (a) receiving the reports of observed communication performance issued by monitoring programmes established in accordance with Civil Aviation (Rules and Air Traffic Services) Regulations; and
 - (b) taking immediate corrective action for individual aircraft, aircraft type or operators, identified in such report as not complying with the RCP specifications.

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9. Regulation of the Regulations is amended —

- (a) in subregulation (1), by substituting for that subregulation, the following new subregulation —
 - “ (1) A person shall not operate an aircraft unless it is equipped with navigation equipment that enables it to proceed in accordance with —

Amendment of
regulation 16 of
the Regulations

- (a) its operational flight plan; and
 - (b) the requirements of air traffic services except when, navigation for flights under VFR is accomplished by visual reference to landmarks.”.
 - (b) by deleting subregulation (2);
 - (c) in subregulation (3) by deleting the words “and (2)”.”.
- 10.** The Regulations are amended by inserting immediately after regulation 16, the following new regulation —
- Insertion of regulation 16A in the Regulations
- “Performance based navigation 16A. (1) In addition to the requirements under regulation 16 (1), for operations where a navigation specification for performance-based navigation has been specified, an aircraft shall —
- (a) be provided with navigation equipment which will enable it to operate in accordance with the prescribed navigation specification;
 - (b) have information relevant to the aircraft navigation specification capabilities listed in the flight manual or other aircraft documentation approved by the Authority; and
 - (c) have information relevant to the aircraft navigation specification capabilities included in the MEL.
- (2) The Authority shall ensure that for operations where an PBN specification has been provided, the operator has established and documented —
- (a) normal and abnormal procedures, including contingency procedures;
 - (b) aircraft crew qualification and proficiency requirements, in accordance with appropriate navigation specifications;
 - (c) a training programme for relevant personnel consistent with the intended operations; and
 - (d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate navigation specifications.
- (3) The Authority shall issue a specific approval for operations based on PBN authorisation required navigation specifications.”.
- 11.** Regulation 17 of the Regulations is amended by substituting for subregulation (1) , the following new subregulation —
- Amendment of regulation 17 of the Regulations
- “(1) A person shall not operate an aircraft in portions of airspace where, based on a Regional Air Navigation Agreement, minimum navigation performance specifications are specified, unless the aircraft is equipped with navigation equipment that —
- (a) continuously provides indication to the flight crew of adherence to or departure from track to the required degree of accuracy at any point along that track; and
 - (b) has been authorised by the Authority for the minimum navigation performance specification operations concerned.”.

12. Regulation 18 of the Regulations is amended —

Amendment of regulation 18 of the Regulations

 - (a) in paragraph (a) by substituting for subparagraph (iii), the following new subparagraph —

“(iii) providing an alert level to the flight crew when a deviation occurs from the selected flight level and threshold for the alert shall not exceed ± 90 m (300 ft.)”; and

- (b) by substituting for paragraph (b), the following new paragraph —
 “(b) authorised by the Authority for operations in the airspace concerned through —
 (i) operations specifications for air operator certificate holders, or
 (ii) letter of authorisation for non-air operator certificate holders.”; and
 (c) by deleting subregulations (5) and (6).

13. The Regulations are amended by inserting immediately after regulation 18, the following new regulations —

“Monitoring
 height-keeping
 performance

18A. (1) An operator shall ensure that a minimum of two aircraft of each aircraft type grouping have height-keeping performance monitored, at least once every two years or within intervals of 1 000 aircraft hours per aircraft, whichever period is longer.

(2) If an aircraft type grouping consists of a single aircraft, monitoring of that aircraft by an operator shall be accomplished within the specified period under subregulation (1).

(3) The Authority shall ensure that appropriate action is taken in respect of aircraft and operators found to be operating in RVSM airspace without a valid RVSM approval.

(4) An aircraft shall be sufficiently equipped with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment enables the aircraft to navigate in a reduced vertical separation minimum space.

(5) A group of aircraft that have identical design and built with respect to details that could influence the accuracy of height-keeping performance, such height-keeping performance capability shall —

- (a) be such that the total vertical error (TVE) for the group of aircraft have a mean no greater than 25m (80 ft) in magnitude; and
 (b) have a standard deviation no greater than —
 (i) $28 - 0.013z^2$ for $0 \leq z \leq 25$ when z is the magnitude of the mean TVE in meters, or
 (ii) have a $92 - 0.004z^2$ for $0 \leq z \leq 80$ where z is in feet.

(6) In addition, the components of TVE shall have the following characteristics —

- (a) the mean altimetry system error (ASE) of the group shall not exceed 25 m (80 ft) in magnitude;
 (b) the sum of the absolute value of the mean ASE and of three standard deviations of ASE not exceed 75m (245 ft); and
 (c) the differences between cleared flight level and the indicated pressure altitude flown be —
 (i) symmetric about a mean of 0m, with a standard deviation no greater than 13.3 m (43.7ft), and
 (ii) at least exponential in decrease in frequency of differences with increasing difference magnitude.

(7) Notwithstanding subregulation (6), the height-keeping performance capability in respect of aircraft which characteristics of the airframe and altimetry system fit are unique and not classified as belonging to a group of aircraft shall be such that, the components of the TVE of the aircraft have the following characteristic —

Insertion of
 regulation
 18A, etc. in the
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- (a) the ASE of the aircraft not exceed 60m (200 ft) in magnitude under all flight conditions; and
 - (b) the differences between the cleared flight level and the indicated pressure altitude flown be —
 - (i) symmetric about a mean of 0m, with a standard deviation no greater than 13.3m (43.7ft);and
 - (ii) at least exponential in decrease in frequency of differences with increasing difference magnitude.
- Surveillance equipment 18B. (1) An aircraft shall be provided with surveillance equipment that will enable it to operate in accordance with the requirements of air traffic services.
- (2) For operations where surveillance equipment is required to meet an RSP specification for performance-based surveillance, an aircraft shall, in addition to the requirements specified under this subregulation —
- (a) be provided with surveillance equipment that will enable it to operate in accordance with the provided RSP specification;
 - (b) have information relevant to aircraft RSP specification capabilities listed in the flight manual or other aircraft documentation approved by State of Design or State of Registry; and
 - (c) have information relevant to aircraft RSP specification capabilities included in the MEL.
- (3) The Authority shall ensure that for operations where an RSP specification for PBS has been specified, the operator has established and documented —
- (a) normal and abnormal procedures, including contingency procedures;
 - (b) flight crew qualification and proficiency requirements, in accordance with appropriate RSP specifications;
 - (c) a training programme for relevant personnel consistent with the intended operations; and
 - (d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RSP specifications.
- (4) The Authority shall ensure that, in respect of the aircraft mentioned in subregulation (2), adequate provisions exist for —
- (a) receiving the reports of observed surveillance performance, issued by monitoring programmes established in accordance with Civil Aviation (Air Traffic Services) Regulations;
 - (b) taking immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RSP specification.
- Installation 18C. The equipment installation shall be such that failure of any single unit required for communication, navigation, surveillance purposes or any combination thereof will not result in the failure of another unit required for communication, navigation, surveillance purposes or any combination thereof will not result in the failure of another unit required for communication, navigation or surveillance purposes.”.

Amendment of regulation 19 of the Regulations

14. The Regulations are amended by substituting for regulation 19, the following new regulation —

- “Electronic navigation data management” 19. (1) A person shall not employ electronic navigation data products that have been processed for application in the air and on the ground unless the Authority has approved —
- (a) the operator’s procedures for ensuring that the process applied and the products delivered have met acceptable standards of integrity and that the products are compatible with the intended function of the existing equipment; and
 - (b) the operator’s programme for continual monitoring of both process and product.
- (2) An operator shall implement procedures to ensure the timely distribution and insertion of current and unaltered electronic navigation data to aircraft that require it.”.
- 15.** The Regulations are amended by inserting immediately after regulation 19, the following new regulation —
- “Microphones 19A. (1) A person shall not operate the following aircraft or in the following conditions unless the aircraft is equipped with a boom or throat microphone available for each required flight crew member and at each flight duty station —
- (a) any aeroplane in IFR conditions;
 - (b) any aeroplane in commercial air transport operations; or
 - (c) any helicopter.
- (2) All flight crew members required to be on flight deck duty shall communicate through boom or throat microphones under the following operations or conditions —
- (a) when operating any aeroplane during IFR operations;
 - (b) any aeroplane in commercial air transport operations below the transition level or altitude; or,
 - (c) any helicopter at all times.
- 16.** Regulation 20 of the Regulations is amended in by substituting for subregulation (1), following new subregulation —
- “(1) An aircraft shall be equipped with pressure-altitude reporting transponder which operates in accordance with requirements provided by the Authority.”.
- 17.** Regulation 21 of the Regulations is amended by substituting for subregulation (1), the following new subregulation —
- “(1) An aircraft operated at night shall be equipped with —
- (a) equipment and instruments required for IFR operations;
 - (b) two landing lights;
 - (c) navigation or position lights;
 - (d) illumination for all aircraft equipment and instruments that are essential for the safe operation of the aircraft used by the aircraft crew;
 - (e) lights in all passenger compartments;
 - (f) an independent portable light for each crew member station; and
 - (g) the lights required by the Civil Aviation (Rules of the Air and Air Traffic Services) Regulations for an aircraft in flight or operating on the movement area of an aerodrome.”.

18. The Regulations are amended by inserting immediately after regulation 22, the following new regulation —

“Noise certification 22A. (1) An operator shall not operate an aircraft without a document or statement attesting noise certification approved by the Authority.

Insertion of regulation 19A in the Regulations

Amendment of regulation 20 of the Regulations

Amendment of regulation 21 of the Regulations

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Insertion of regulation 22A in the Regulations

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- (2) If a document or statement attesting noise certification is issued in a language other than English, it shall include an English translation.”.
- Amendment of regulation 28 of the Regulations
- 19.** The Regulations are amended by substituting for regulation 28, the following new regulation —
- “Ground proximity warning system
28. (1) An operator in Botswana shall not operate a turbine-powered aeroplane of a maximum certificated take-off mass in excess of 5,700kg or authorised to carry more than nine passengers, unless it is equipped with a ground proximity warning system that has a forward looking terrain avoidance function.
- (2) An operator in Botswana shall not operate a turbine-powered aeroplane of a maximum certificated take-off mass in excess of 15,000kg or authorised to carry more than 30 passengers, unless it is equipped with a ground proximity warning system that has a forward looking terrain avoidance function.
- (3) A turbine-engined aeroplane of a maximum certificated take-off mass in excess of 5 700kg or authorised to carry more than nine passengers, for which the individual certificate of airworthiness is first issued on or after 1st January, 2004 shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.
- (4) A turbine-engined aeroplane of a maximum certificated take-off mass of 5 700kg or less and authorised to carry more than five but not more than nine passengers, shall be equipped with a ground proximity warning system as set out under subregulation (6) paragraph (a), (c) and (d).
- (5) A piston-engined aeroplane of a maximum certificated take-off mass in excess of 5 700kg or authorised to carry more than nine passengers, shall be equipped with a ground proximity warning system as set out under subregulation (6) paragraph (a), (c) and (d).
- (6) A ground proximity system warning shall automatically provide by means of aural signals which may be supplemented by visual signals, timely and distinctive warning to the aircraft crew of the following circumstances —
- (a) excessive descent rate;
- (b) excessive terrain closure rate;
- (c) excessive altitude loss after take-off or go-around;
- (d) unsafe terrain clearance while not in landing configuration such as —
- (i) gear not locked down, or
- (ii) flaps not in a landing position; and
- (e) excessive descent below the instrument glide path.
- Amendment of regulation 30 of the Regulations
- 20.** Regulation 30 is amended —
- (a) by substituting for subregulation (1) the following new subregulation —
- “(1) any Airborne Collision Avoidance System (ACAS II) installed in an aircraft in Botswana shall be approved by the Authority.”;
- (b) by substituting for subregulation (3), the following new subregulation—
- “(3) A person shall not operate a turbine-engine aeroplane with a maximum certificated take-off mass in excess of 5700kg or authorised to carry more than 19 passengers, unless it is equipped with an Air borne Collision Avoidance System II .”;

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- (c) by substituting for subregulation (4), the following new subregulation —
“(4) An Airborne Collision Avoidance System shall operate in accordance with the Civil Aviation (Surveillance and Collision Avoidance) Regulations”;
- (d) by deleting subregulations (5) and (6).

21. The Regulations are amended by substituting for regulation 32, the following new regulation —

- “Cockpit voice recorders
32. (1) A person shall not operate the following aircraft unless it is equipped with a cockpit voice recorder capable of recording the aural environment of the flight deck during flight time —
- (a) all commercially operated aeroplanes with a maximum certificated take-off mass of over 5 700kg;
- (b) all aeroplanes of a maximum certificated take-off mass of over 5 700kg for which the individual certificate of airworthiness was first issued on or after 1 January 1987;
- (c) all aeroplanes with a maximum certificated take-off mass of more than 27 000kg;
- (d) all commercially operated helicopters with a maximum certificated take-off mass of over 3 175kg; and
- (e) all helicopters with a certificated take-off mass of over 7 000kg.
- (2) Cockpit voice recorders and cockpit audit recording system installed in aircraft registered in Botswana or operated in commercial air transport operations in Botswana, shall not use magnetic tape or wire.
- (3) Where a helicopter is not equipped with a flight data recorder, at least a main rotor speed shall be recorded on one track of the cockpit voice recorder.
- (4) A turbine-powered aeroplane of maximum certificated take-off mass of over 2 250kg, up to and including 5 700kg, for which the application for a type certification is submitted to a Contracting State on or after 1st January, 2016 and required to be operated by more than one pilot shall be equipped with either a Cockpit Voice Recorder (CVR) or a Cockpit Audio Recording System (CARS).
- (5) A turbine-powered aeroplane of a maximum certificated take-off mass of 5 700kg or less for which the individual certificate of airworthiness was first issued on or after 1st January, 2016 and required to be operated by more than one pilot, shall be equipped with either a CVR or a CARS.
- (6) An aircraft required to be equipped with CVR shall have a CVR capable of retaining information recorded during at least two hours of operation.
- (7) An aeroplane of a maximum certificated take-off mass of over 27 000kg for which the individual certificate of airworthiness was first issued on or after 1st January, 2021 shall be equipped with a CVR capable of retaining the information recorded during at least the last 25 hours of its operation.
- (8) A CVR or CARS shall start to record prior to the aircraft moving under its own power and record continuously until the termination of the flight when the aircraft is no longer capable of moving under its own power.

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regulation 32 of
the Regulations

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(9) In addition, depending on the availability of electrical power, the CVR or CARS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.”.

Amendment of regulation 33 of the Regulations

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Insertion of regulation 33A of the Regulations

22. Regulation 33 is amended in subregulation (3), by substituting for paragraph (c) the following new paragraph —

“(c) the cockpit voice recorder shall after an accident not be re-activated before disposition as provided for by the Civil Aviation (Accident and Incident Investigation) Regulations.”.

23. The Regulations are amended by inserting immediately after regulation 33, the following new regulation —

“Cockpit voice recorder- alternate power 33A. (1) An alternate power source shall —

(a) automatically engage and provide 10 minutes, plus or minus one minute of operation whenever aeroplane power to the recorder ceases, either by normal shutdown or by any other loss of power; (b) power the CVR and associated cockpit area microphone components; and

(c) be located as close as practicable to the CVR.

(2) for the purpose of subregulation (1), “alternate” means —

(a) separate from the power source that normally provides power to the CVR; or

(b) the use of aeroplane batteries or other power sources that meet the requirements of subregulation (1):

provided that electrical power for essential and critical loads is not compromised.

(3) An aeroplane of a maximum certificated take-off mass of over 27 000kg for which the application for type certification is submitted to the Authority on or after 1st January, 2016 shall be provided with an alternate power source, that powers the forward CVR in the case of combination recorders.

(4) An aeroplane of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1st January, 2018 shall be provided with an alternate power source, which powers at least one CVR.”.

Amendment of regulation 34 of the Regulations

24. The Regulation are amended by substituting for regulation 34, the following new regulation —

“Flight data recorders and aircraft data recording system 34. (1) A person shall not operate the following aircraft unless it is equipped with a flight data recorder —

(a) an aeroplane with a maximum certificated take-off mass of over 5700 kg up to and including 27 000 kg for which the individual certificate of airworthiness was first issued on or after 1st January, 1989 shall be equipped with FDR which shall record at least the first 16 parameters listed in Table A3-1 in Schedule 3;

(b) An aeroplane with a maximum certificated take-off mass of more than 27 000 kg for which the individual certificate of airworthiness was first issued on or after 1st January, 1989 shall be equipped with FDR, which shall record at least the first 16 parameters listed in Table A3-1 in the Schedule 3;

- (c) a turbine-powered aeroplane used in commercial air transport operations with a maximum certificated take-off mass of 5 700kg or less, for which the individual certificate of airworthiness was first issued on or after 1st January, 2016, shall be equipped with —
 - (i) an FDR which shall record at least the first 16 parameters listed in Table A3-1 in the Schedule 3,
 - (ii) a Class C AIR or AIRS capable of recording flight path and speed parameters displayed to the pilot, as defined in Paragraph 3.2.4 in Schedule 3, or;
 - (iii) an ADRS capable of recording at least the first seven parameters listed in Table A3-3 in Schedule 3.
- (d) a turbine powered aeroplane in commercial air transport operations, for which the individual certificate of airworthiness was first issued on or after 1st January, 1987 but before 1st January 1989, with a maximum certificated take-off mass of more than 5 700kg, except those in subregulation (1) (f), shall be equipped with an FDR which should record at least the first nine parameters listed in Table A3-1 in the Schedule 3;
- (e) a turbine powered aeroplane used in commercial air transport operations, for which the individual certificate of airworthiness was first issued on or after 1st January, 1987 but before 1st January 1989, with a maximum certificated take-off mass of more than 27 000 kg that is of a type of which the prototype was certificated by the appropriate national authority after 30th September, 1969, shall be equipped with an FDR which shall record at least the first 16 parameters listed in Table A3-1 in the Schedule 3;
- (f) a turbine-powered aeroplane used in commercial air transport operations, for which the individual certificate of airworthiness was first issued before 1st January, 1987, with a maximum certificated take-off mass of over 27 000kg that is of a type of which the prototype was certificated by the appropriate national authority after 30th September, 1969 shall be equipped with a FDR which shall record, in addition to the first 5 parameters listed in Table A3-1 in Schedule 3, such additional parameters as are necessary to meet the objectives of determining —
 - (i) the attitude of the aircraft in achieving its flight path, and
 - (ii) the basic forces acting upon the aircraft resulting in the achieved flight path and the origin of such basic forces.
- (g) a turbine-powered aeroplane used in commercial air transport operations, for which the individual certificate of airworthiness was first issued before 1st January, 1989, with a maximum certificated take-off mass of more than 5 700 kg, except those in subregulation (1)(f), shall be equipped with an FDR which shall record at least the first five parameters listed in Table A3-1 in the Schedule 3;
- (h) an aeroplane with a maximum certificated take-off mass of more than 5, 700 kg for which the individual certificate of airworthiness was first issued after 1st January, 2005 shall be equipped with an FDR which shall record at least the first 78 parameters listed in Table A3-1 in the Schedule 3;

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- (i) a multi-engined turbine-powered aeroplane in commercial air transport operations with a maximum certificated take-off mass of 5700 kg or less for which the individual certificate of airworthiness was first issued on or after 1 January 1990 shall be equipped with an FDR which shall record at least the first 16 parameters listed in Table A3-1 in the Schedule 3;
- (j) a helicopter with a certificated take-off mass of over 7 000 kg or having a passenger seating configuration of more than 19, shall be equipped with an FDR which shall record at least the first 30 parameters listed in Table A3-2 under Schedule 3;
- (k) a helicopter with a certificated take-off mass of over 3, 175 kg shall be equipped with an FDR which shall record at least the first 48 parameters listed in Table A3-2 under Schedule 3; and
- (l) all turbine-engined helicopters of a maximum certificated take-off mass of over 2250 kg, up to and including 3 175 kg for which the application for type certification was submitted to a Contracting State on or after 1st January, 2018 shall be equipped with —
 - (i) an FDR which shall record at least the first 48 parameters listed in Table A3-2 under Schedule 3,
 - (ii) a Class C AIR or AIRS which shall record at least the flight path and speed parameters displayed to the pilot as defined under Schedule 3 Table A3-4, or
 - (iii) an ADRS which shall record the first 7 parameters listed in Table A3-4 under Schedule 3.
- (2) A flight data recorder referred to in subregulation (1), shall —
 - (a) 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;
 - (b) be calibrated as required by the Authority;
 - (c) have an approved device to assist in locating a recorder that may be underwater and can be automatically activated; and
 - (d) be capable of retaining the information recorded during the last —
 - (i) 25 hours of operation of an aeroplane except, those installed on an aeroplane referred to in subregulation 1 (i),
 - (ii) 30 minutes of operation in case of an aeroplane referred to in subregulation 1 (i),
 - (iii) 10 hours of operation in the case of a helicopter, and
 - (iv) sufficient information from preceding take-off for calibration purposes;
 - (e) comply with the requirements specified under Schedule 3.
- (3) The following media shall not be used in FDRs, ADRs, AIRs and AIRS installed in aircraft registered in Botswana —
 - (a) engraving metal foil;
 - (b) photographic film;
 - (c) analogue data using frequency modulation; or
 - (d) magnetic tape.
- (4) A flight data recorder shall —
 - (a) not be turned off during flight time;

- (b) be deactivated upon completion of flight time following an accident or incident; and
 - (c) not be re-activated before disposition is determined in accordance with Civil Aviation (Accident Investigation) Regulations after an accident.
- (5) An operator shall undertake operational checks and evaluations of recordings from the flight recorder systems conducted to ensure the continued serviceability of the recorders.
- (6) The documentation requirement concerning FDR and ADRS parameters provided by operators to accident investigation authorities, shall be in electronic format and take account of industry specifications.
- (7) An aeroplane of a maximum certificated take-off mass of over 5 700 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2016, which are required to be equipped with a CVR and an FDR, shall be equipped with both combination recorders.
- (8) An aeroplane of a maximum certificated take-off mass of over 15 000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2016, which are required to be equipped with a CVR and an FDR, shall be equipped with both combination recorders —
- (a) one recorder located as close to the cockpit as possible; and
 - (b) the other recorder located as far rear of the aeroplane as possible.
- (9) An aeroplane 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 the recorders.
- (10) A multi-powered turbine aeroplane of a maximum certificated take-off mass of 5 700 kg or less, required to be equipped with both an FDR and CVR, may alternatively be equipped with one of the combination recorders.”.

25. The Regulations are amended by inserting immediately after regulation 34, the following new regulation —

“Combination recorders 34A.

(1) An aeroplane of a maximum certificated take-off mass of over 5 700 kg for which the application for type certification was submitted to a Contracting State on or after 1 January 2016, and which is required to be equipped with both a CVR and an FDR, shall be equipped with two combination recorders (FDR and CVR).

(2) An aeroplane of a maximum certificated take-off mass of over 15 000 kg for which the application for type certification is submitted to a Contracting State on or after 1st January, 2016, and which is required to be equipped with both a CVR and an FDR, shall be equipped with two combination recorders (FDR and CVR) —

- (a) one combination recorder located as close to the cockpit as possible; and
- (b) the other combination recorder located as far as possible.

Insertion of regulation 34A in the Regulations

- (3) An aeroplane of a maximum certificate 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 and CVR).
- (4) A multi-engine turbine-powered aeroplane 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 and CVR).”.
- Amendment of regulation 35 of the Regulations
- 26.** The Regulations are amended by substituting for regulation 35, the following new regulation —
- “Data link communications
35. (1) An aircraft for which the individual certificate of airworthiness is first issued on or after 1st January 2016, which utilises any of the data link communications applications listed in Paragraph 6.1.2 of Schedule 3 and is required to carry a CVR, shall record on a crash-protected flight recorder the data link communications messages.
- (2) An aircraft which is modified on or after 1st January 2016 to install and utilise any of the data link communications applications listed in 6.1.2 of Schedule 3 and are required to carry a CVR, shall record on a flight recorder data link communications messages.
- (3) Where it is not practical or prohibitively expensive to record the data link communications applications messages on FDR or CVR, a Class B AIR shall be a means for recording data link communications messages to and from the aircraft.
- (4) The minimum recording duration shall be equal to the duration of the cockpit voice recorder.
- (5) Data link recording shall be able to be correlated to the recorded cockpit audio.”.
- Insertion of regulation 35A etc. in the Regulations
- 27.** The Regulations are amended by inserting immediately after regulation 35, the following new regulation —
- “Flight recorder data
- 35A. (1) An aeroplane of a maximum certificated take-off mass of over 27 000 kg, used in international commercial air transport, and authorised to carry more than 19 passengers for which the application for type certification was submitted to a Contracting State on or after 1 January 2021, shall be equipped with a means approved by the State of the Operator, to recover flight recorder data and make it available in a timely manner.
- (2) The Authority shall take into account the following in approving the means to make flight recorder data available in a timely manner —
- (a) the capabilities of the operator;
- (b) overall capability of the aircraft and its systems as certified by the State of Design;
- (c) the reliability of the means to recover the appropriate CVR channels and appropriate FDR data; and
- (d) specific mitigation measures.”.
- Flight crew-machine interface recordings
- 35B. (1) An aeroplane of a maximum take-off mass of over 27 000kg used in international commercial air transport and for which the application for type certification is submitted to a Contracting State on or after 1st January, 2023 shall be equipped with a crash-protected flight recorder which shall record the information displayed to the flight crew from electronic displays, as well as the operation of switches and selectors by the flight crew as defined in Schedule 3.

- “Flight recorders-general
- (2) The minimum flight crew-machine interface recording duration shall be at least for the last two hours.
- (3) Flight crew-machine interface recordings shall be able to be correlated to the recorded cockpit audio.
- 35C. (1) Flight recorders shall be constructed, located and installed so as to provide maximum practicable 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) Flight recorders shall not be switched off during flight time.
- (4) To preserve flight recorder records, flight recorders shall —
- (a) be deactivated upon completion of flight time following an accident or incident; and
- (b) not be reactivated before their disposition as determined in accordance with the Civil Aviation (Accident and Incident Investigation) Regulations.
- (5) An investigation authority shall determine the need for removal of the flight recorder from the aircraft in the State conducting the investigation with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.
- (6) The operator shall conduct operational checks and evaluations of recordings from the flight recorders to ensure the continued serviceability of the recorders in accordance with procedures specified in Schedule 3.
- (7) The operator shall comply with any other requirements for flight recorders specified in Schedule 3.”

28. The Regulations are amended by substituting for regulation 47, the following new subregulations —

- “Emergency locator transmitters
47. (1) All aircraft registered in Botswana shall carry an automatic ELT.
- (2) A person shall not operate, for commercial air transport, an aeroplane authorised to carry more than 19 passengers for which the individual certificate of airworthiness was first issued after 1st July 2008, unless it is equipped with —
- (a) at least two ELTs, one of which shall be automatic; or
- (b) at least one ELT and a capability to autonomously transmit information from the position that can be determined by the operator at least once every minute, when in distress, in accordance with this regulation.
- (3) A person shall not operate a helicopter unless it is equipped with emergency locator transmitter equipment as follows —
- (a) a helicopter operating in performance Class 1 and 2 shall be equipped with at least one automatic ELT and, when operating on flights over water as described in regulation 61, with at least one automatic ELT and one ELT in a raft or life jacket; and
- (b) a helicopter operating in performance Class 3 shall be equipped with at least one automatic ELT and, when operating on flights over water as described under regulation 61, with at least one automatic ELT and one ELT in a raft or life jacket.

Amendment of regulation 47 of the Regulations

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Cap. 71:01 (Sub. Leg.)	(4) ELT equipment carried to satisfy the requirements of this regulation shall be capable of transmitting on the frequencies 121.5 MHz and 406 MHz simultaneously, and operate in accordance with the relevant provisions of the Civil Aviation (Air Navigation Services) Regulations.
Insertion of regulation 47A of the Regulations	(5) The manner in which the ELTs shall be registered, carried, the specifications to which they shall adhere, the frequencies on which they shall be able to transmit and the manner in which they are to be maintained are set out in Schedule 7.”
Insertion of regulation 47A of the Regulations	29. The Regulations are amended by inserting immediately after regulation 47, the following new regulation —
“Location of an aircraft in distress	47B. (1) An aircraft of a maximum certificated take-off mass of over 27 000 kg used for commercial air transport operations for which the individual certificate of airworthiness was first issued on or after January 2021, shall autonomously transmit information from a position which can be determined by the operator at least once every minute, when in distress in accordance with Schedule 13.
	(2) An aeroplane of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness was first issued on or after 1st January, 2021, shall autonomously transmit information from a position which can be determined at least once every minute, when in distress, in accordance with Schedule 13.
	(3) The operator shall make position information of a flight in distress available to the appropriate organisations, as established by the State of the Operator.”
Amendment of regulation 48 of the Regulations	30. Regulation 48 is amended by inserting immediately after subregulation (3), the following new subregulation —
	“(4) A flight shall be planned so that the diversion time to an aerodrome where a safe landing may be made does not exceed the cargo compartment fire suppression time capability of the aeroplane, when one is identified in the relevant aeroplane documentation, reduced by an operational safety margin specified by the State of the Operator.”
Amendment of regulation 49 of the Regulations	31. Regulation 49 is amended by inserting immediately after subregulation (2), the following new subregulations —
	“(3) 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 was first issued on or after 31 December 2011 shall —
	(a) meet the applicable minimum performance requirements of the State of Registry; and
	(b) 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 the Montreal Protocol on Substances that Deplete the Ozone Layer, Annex A, Group II.
	(4) Any extinguishing agent used in a portable fire extinguisher in an aircraft for which the individual certificate of airworthiness was first issued on or after 31 December 2018 shall —

- (a) meet the applicable minimum performance requirements of the State of Registry; and
- (b) 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 the Montreal Protocol on Substances that Deplete the Ozone Layer, Annex A, Group II.”.

32. The Regulations are amended by substituting for regulation 52, the following new subregulation —

“Marking of break-in points 52. (1) Where areas of the fuselage suitable for break-in by rescue crews in an emergency are marked on an aeroplane, such area shall be marked as set out in Schedule 9.
(2) The colour of markings shall be red or yellow, and if necessary outlined in white to contrast with the background.”.

Amendment of regulation 52 of the Regulations

33. The Regulation are amended by substituting for regulation 55, the following new regulation —

“Oxygen storage pressure and dispensing apparatus 55. (1) An aircraft intended to be operated at altitudes requiring the use of supplemental oxygen shall be equipped with adequate oxygen storage and dispensing apparatus.
(2) The oxygen storage and dispensing 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 set out in Schedule 12.
(3) A person shall not operate an aircraft at altitudes above 10 000ft 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.
(4) A person shall not operate a pressurised aeroplane at altitudes above 25000 ft unless —
(a) flight crew member oxygen masks are available at the flight duty station and are of a quick donning type; and
(b) sufficient spare outlets and masks or sufficient portable oxygen units with masks are distributed evenly throughout the cabin to ensure immediate availability of oxygen to each required cabin crew member regardless of his or her location at the time of cabin pressurisation failure.
(5) An oxygen-dispensing unit connected to oxygen supply masks shall be installed so as to be immediately available to each occupant, wherever seated.
(6) The total number of oxygen dispensing units and oxygen supply terminals shall exceed the number of seats by at least 10 percent and the extra oxygen portable units are to be evenly distributed throughout the cabin.
(7) 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.
(8) The process to determine the amount of supplemental oxygen needed for non-pressurized and pressurized aircraft is contained in Schedule 12.”.

Amendment of regulation 55 of the Regulations

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- Amendment of regulation 59 of the Regulations
- 34.** The Regulations are amended by inserting immediately after subregulation (1), the following new subregulation —
- “(1A) The equipment under subregulation (1), shall comprise one life jacket or equivalent individual flotation device for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.”.
- Amendment of regulation 62 of the Regulations
- 35.** The Regulation are amended by substituting for regulation 62, the following new regulation —
- “Seats, safety belts and harnesses
62. (1) An aircraft used in passenger carrying operations shall be equipped with the following seats, safety belts and shoulder harnesses that meet the airworthiness requirements for type certification of that aircraft —
- (a) meet the applicable minimum performance requirements of the State of Registry; and
- (a) a seat with safety belt for each person on board over two years of age and a restraining belt for each berth on board the aircraft;
- (b) a safety harness for each pilot seat which shall —
- (i) incorporate a device which can automatically restrain the occupant’s torso in the event of rapid deceleration, and
- (ii) includes shoulder straps and a seat belt with a device to prevent an incapacitated pilot from interfering with the aircraft controls;
- (c) a forward or rearward facing (within 15 degrees of the longitudinal axis of the aeroplane) seat, equipped with a safety harness for each cabin crew member station in the passenger compartment.
- (2) Cabin crew seats provided in accordance with these Regulations shall be located near floor level and other emergency exits as required by the State of Registry for emergency evacuation.”.
- Amendment of regulation 73 of the Regulations
- 36.** The Regulations are amended by substituting for regulation 73, the following new regulation —
- “Cosmic radiation detection equipment
73. (1) A person shall not operate an aircraft intended to be operated above 15 000m (49 000 ft) unless it is equipped with —
- (a) an instrument to measure and indicate continuously the dose rate of total cosmic radiation being received and the cumulative dose on each flight; or
- (b) a system of on-board quarterly radiation sampling acceptable to the Authority.
- (2) The display unit of the equipment in subregulation (1) shall be readily visible to a flight crew member.
- (3) An operator shall maintain records for each aircraft above 15 000 m (49 000 ft.) so that the total cosmic radiation dose received by each crew member over a period of 12 consecutive months is determined.”.
- Amendment of PART IX of the Regulations
- 37.** The Act is amended in PART IX of the Regulations by substituting for the words “Flight and cockpit Voice Recorders”, the words “Flight recorders”.
- Substitution of Schedule 3 to the Regulations
- 38.** The Regulations are amended by substituting for Schedule 3, the following new Schedule —

“SCHEDULE 3

FLIGHT DATA RECORDERS AND AIRCRAFT DATA RECORDING SYSTEM
(Regulation 34)

1. Flight Recorder Systems

1.1 Crash-protected flight recorders comprise one or more of the following systems —

- (a) A flight data recorder (FDR);
- (b) A cockpit voice recorder (CVR);
- (c) An airborne image recorder (AIR); and
- (d) A data link recorder (DLR).

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

1.2 Lightweight flight recorders comprise one or more of the following systems —

- (a) An aircraft data recording system (ADRS);
- (b) A cockpit audio recording system (CARS);
- (c) An airborne image recording system (AIRS); and
- (d) A data link recording system (DLRS).

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

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

2. General Requirements

2.1 Non-deployable flight recorder containers shall be painted a distinctive orange colour.

2.2 Non-deployable crash-protected flight recorder containers shall —

- (a) carry reflective material to facilitate their location; and
- (b) have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kilohertz (kHz). At the earliest practical date, but not later than 1st January, 2018, this device shall operate for a minimum of 90 days.

2.3 Automatic deployable flight recorder containers shall —

- (a) be painted a distinctive orange colour, however the surface visible from outside the aircraft may be of another colour;
- (b) carry reflective material to facilitate their location; and
- (c) have an integrated automatically activated ELT.

2.4 The flight recorder systems shall be installed so that —

- (a) the probability of damage to the recordings is minimized;
- (b) there is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and
- (c) if the flight recorder systems have an erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact; and

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- (d) aircraft for which the individual certificate of airworthiness is first issued on or after 1st January, 2023, a flight crew-operated erase function shall be provided on the flight deck which, when activated, modifies the recording of a CVR and AIR so that it cannot be retrieved using normal replay or copying techniques. The installation shall be designed to prevent activation during flight. In addition, the probability of an inadvertent activation of an erase function during an accident shall also be minimized.

Note: — *The erase function is intended to prevent access to CVR and AIR recordings by normal replay or copying means, but would not prevent accident investigation authorities access to such recordings by specialized replay or copying techniques.*

- 2.5 The flight recorder systems shall be installed so that they receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardizing service to essential or emergency loads.
- 2.6 The flight recorder systems, when tested by methods approved by the appropriate certificating authority, shall be demonstrated to be suitable for the environmental extremes over which they are designed to operate.
- 2.7 Means shall be provided for an accurate time correlation between the recorder systems recordings.
- 2.8 The manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recorder systems —
- (a) manufacturer's operating instructions, equipment limitations and installation procedures;
 - (b) parameter origin or source and equations which relate counts to units of measurement;
 - and
 - (c) manufacturer's test reports.

3. Flight Data Recorder (FDR) and Aircraft Data Recording System (ADRS)

3.1 Start and stop logic

The FDR or ADRS shall start to record prior to the aircraft moving under its own power and record continuously until the termination of the flight when the aircraft is no longer capable of moving under its own power.

3.2 Parameters to be recorded

Note: — *In previous editions of Annex 6, Part II, types of recorders were defined to capture the first evolutions of FDRs.*

- 3.2.1 The parameters that satisfy the requirements for FDRs are listed in Tables A3-1 and A3-2 (for aeroplanes and helicopters, respectively). The number of parameters to be recorded shall depend on aircraft complexity. The parameters without an asterisk (*) are mandatory parameters which shall be recorded regardless of aircraft complexity.
- 3.2.2 In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by aircraft systems or the flight crew to operate the aircraft. However, other parameters may be substituted with due regard to the aircraft type and the characteristics of the recording equipment.
- 3.2.3 If further FDR 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;
 - (3) warnings and alerts; and
 - (4) the identity of displayed pages for emergency procedures and checklists;
- (b) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs.

3.2.4 The parameters that satisfy the recommendations for flight path and speed as displayed to the pilot(s) are listed below. The parameters without an (*) are mandatory parameters which shall be recorded. In addition, the parameters designated by an (*) are to be recorded if an information source for the parameter is displayed to the pilot and is practicable to record:

- Pressure altitude
- Indicated airspeed or calibrated airspeed
- Heading (primary flight crew reference)
- Pitch attitude
- Roll attitude
- Engine thrust/power
- Landing gear status*
- Total or outside air temperature*
- Time*
- Navigation data*: Drift angle, wind speed, wind direction, latitude/longitude
- Radio altitude*

3.2.5 The parameters that satisfy the requirements for ADRS are listed in Tables A3-3 and A3-4 (for aeroplanes and helicopters, respectively).

3.3 Additional information

- 3.3.1 The measurement range, recording interval and accuracy of parameters on installed equipment shall be verified by methods approved by the Authority.
- 3.3.2 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator/owner. The documentation shall be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

4. Cockpit Voice Recorder (CVR) and Cockpit Audio Recording System (CARS)

4.1 Start and stop logic

- 4.1.1 The CVR or CARS shall start to record prior to the aircraft moving under its own power and record continuously until the termination of the flight when the aircraft is no longer capable of moving under its own power.

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4.1.2 In addition, depending on the availability of electrical power, the CVR or CARS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

4.2 Signals to be recorded

4.2.1 The CVR shall record simultaneously on four separate channels, or more, at least the following —

- (a) voice communication transmitted from or received in the aircraft by radio;
- (b) aural environment on the flight deck;
- (c) voice communication of flight crew members on the flight deck using the aircraft's interphone system, if installed;
- (d) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker; and
- (e) digital communications with ATS, unless recorded by the FDR.

4.2.2 The preferred CVR audio allocation should be as follows —

- (a) pilot-in-command audio panel;
- (b) co-pilot audio panel;
- (c) additional flight crew positions and time reference; and
- (d) cockpit area microphone.

4.2.3 The CARS shall record simultaneously on two (2) separate channels, or more, at least the following —

- (a) voice communication transmitted from or received in the aircraft by radio;
- (b) aural environment on the flight deck; and
- (c) voice communication of flight crew members on the flight deck using the aircraft's interphone system, if installed.

4.2.4 The preferred CARS audio allocation should be as follows:

- (a) voice communication; and
- (b) aural environment on the flight deck.

5. Airborne Image Recorder (AIR) and Airborne Image Recording System (AIRS)

5.1 Start and stop logic

5.1.1 The AIR or AIRS shall start to record prior to the aircraft moving under its own power and record continuously until the termination of the flight when the aircraft is no longer capable of moving under its own power.

5.1.2 In addition, depending on the availability of electrical power, the AIR or AIRS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

5.2 Classes

5.2.1 A Class A AIR or AIRS captures the general cockpit area in order to provide data supplemental to conventional flight recorders.

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

Note 2:— *There are no provisions for Class A AIR or AIRS in this document.*

5.2.2 A Class B AIR or AIRS captures data link message displays.

5.2.3 A Class C AIR or AIRS captures instruments and control panels.

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

6. Data Link Recorder (DLR)

6.1 Applications to be recorded

6.1.1 Where the aircraft flight path is authorized or controlled through the use of data link messages, all data link messages, both uplinks (to the aircraft) and downlinks (from the aircraft), shall be recorded on the aircraft. As far as practicable, the time the messages were displayed to the flight crew and the time of the responses shall be recorded.

Note:— *Sufficient information to derive the content of the data link communications message and the time the messages were displayed to the flight crew is needed to determine an accurate sequence of events on board the aircraft.*

6.1.2 Messages applying to the applications listed in Table A3-5 shall be recorded. Applications without the asterisk (*) are mandatory applications which shall be recorded regardless of the system complexity. Applications with an (*) shall be recorded only as far as is practicable given the architecture of the system.

7. Inspection of Flight Recorder Systems

7.1 Prior to the first flight of the day, the built-in test features for the flight recorders and flight data acquisition unit (FDAU), when installed, shall be monitored by manual and or automatic checks.

7.2 FDR systems or ADRS, CVR systems or CARS, and AIR systems or AIRS shall have recording inspection intervals of one (1) year; subject to the approval from the Authority, this period may be extended to two (2) years provided these systems have demonstrated a high integrity of serviceability and self-monitoring.

7.3 DLR systems or DLRS shall have recording inspection intervals of two (2) years; subject to the approval from the Authority, this period may be extended to four (4) years provided these systems have demonstrated high integrity of serviceability and self-monitoring.

7.4 Recording inspections shall be carried out as follows:

- (a) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;
- (b) the analysis of the FDR or ADRS recording shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the, and by the tools used to extract the data from the recorder) is within acceptable aircraft limits and to determine the nature and distribution of the errors;

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- (c) the FDR or ADRS recording from a complete flight shall be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention shall be given to parameters from sensors dedicated to the FDR or ADRS. Parameters taken from the aircraft's electrical bus system need not be checked if their service ability can be detected by other aircraft systems;
 - (d) the readout facility shall have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;
 - (e) an examination of the recorded signal on the CVR or CARS shall be carried out by replay of the CVR or CARS recording. While installed in the aircraft, the CVR or CARS shall record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards;
 - (f) where practicable, during the examination, a sample of in-flight recordings of the CVR or CARS shall be examined for evidence that the intelligibility of the signal is acceptable; and
 - (g) an examination of the recorded images on the AIR or AIRS shall be carried out by replay of the AIR or AIRS recording. While installed in the aircraft, the AIR or AIRS shall record test images from each aircraft source and from relevant external sources to ensure that all required images meet recording quality standards.
- 7.5 A flight recorder system shall be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.
- 7.6 A report of the recording inspection shall be made available on request to regulatory authorities for monitoring purposes.
- 7.7 Calibration of the FDR system:
- (a) for those parameters which have sensors dedicated only to the FDR and are not checked by other means, recalibration shall be carried out at least every five (5) years or in accordance with the recommendations of the sensor manufacturer to determine any discrepancies in the engineering conversion routines for the mandatory parameters, and to ensure that parameters are being recorded within the calibration tolerances; and
 - (b) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there shall be a recalibration performed as recommended by the sensor manufacturer, or at least every two (2) years.

TABLE A3-1: Parameter Characteristics for Flight Data Recorders – Aeroplanes

Serial Number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read out)	Recording resolution
1	Time (<i>UTC when available, otherwise relative time count or GNSS time sync</i>)		24 hours	4	$\pm 0.125\%/h$	1 s
2	Pressure-altitude		-300 m (-1 000 ft) to maximum certificated altitude of aircraft +1 500m (+5 000 ft)	1	± 30 m to ± 200 M (± 100 ft to ± 700 ft)	1.5 m (5 ft)
3	Indicated airspeed or calibrated airspeed		95 km/h (50 kt) to max V _{So} (<i>Note 1</i>) V _{So} to 1.2 V _D (<i>Note 2</i>)	1	$\pm 5\%$	1 kt (0.5 kt recommended)
4	Heading (primary flight crew reference)		360°	1	$\pm 2^\circ$	0.5°
5	Normal acceleration (<i>Note 8</i>)	Application for type certification is submitted to a Contracting State before 1st January, 2016 Application for type certification is submitted to a Contracting State on or after 1st January, 2016	-3g to +6g -3g to +6g	0.125 0.0625	$\pm 1\%$ of maximum range excluding datum error of $\pm 5\%$ $\pm 1\%$ of maximum range excluding datum error of $\pm 5\%$	0.004 g 0.004 g

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6	Pitch attitude		$\pm 75^\circ$ or usable range whichever is greater	0.25	$\pm 2^\circ$	0.5°
7	Roll attitude		$\pm 180^\circ$	0.25	$\pm 2^\circ$	0.5°
8	Radio transmission keying		On-off (one discrete)	1		
9	Power on each engine (<i>Note 3</i>)		Full range	1 (per engine)	$\pm 2\%$	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	$\pm 5\%$ 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	$\pm 5\%$ 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	$\pm 2\%$ unless higher accuracy uniquely required	0.2% of full range
14	Outside air temperature		Sensor range	2	$\pm 2^\circ\text{C}$	0.3°C
15*	Autopilot/auto throttle/AFCS mode and engagement status		A suitable combination of discrettes	1		

16	Longitudinal acceleration (Note 8)	Application for type certification submitted to a Contracting State before 1 January 2016	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
		Application for type certification submitted to a Contracting State on or after 1 January 2016	±1 g	0.0625	±0.015 g excluding a datum error of ±0.05 g	0.004 g
17	Lateral acceleration (Note 8)	Application for type certification submitted to a Contracting State before 1 January 2016	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
		Application for type certification submitted to a Contracting State on or after 1 January 2016	±1 g	0.0625	±0.015 g excluding a datum error of ±0.05 g	0.004 g
18	Pilot input and/or Control surface position primary controls (pitch, roll, yaw) (Notes 4 and 8)	Application for type certification submitted to a Contracting State before 1 January 2016	Full range	0.25	±2° unless higher accuracy uniquely required	0.2% of full range or as installed
		Application for type certification submitted to a Contracting State on or after 1 January 2016	Full range	0.125	±2° unless higher accuracy uniquely required	0.3% of full range or as installed

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		January 2016				
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/GNSS/GLS glide path, MLS elevation, IRNAV/IAN vertical deviation)		Signal range	1	±3%	0.3% of full range
22 *	Horizontal beam deviation (ILS/GNSS/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 5)		Full range	4	As installed	
26 *	DME 1 and 2 distance (includes		0 – 370 km (0 – 200 NM)	4	As installed	1 852 m (1 NM)

	Distance to runway threshold (GLS) and Distance to missed approach point (IRNAV/IAN)) (Notes 5 and 6)					
27	Air/ground status		Discrete	1		
28 *	GPWS/TAWS/GC AS 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
a 31 *	Navigation data (latitude/longitude, ground speed and drift angle) (Note 7)		As installed	1	As installed	
32 *	Landing gear and gear selector position		Discrete	4	As installed	
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, discretized or full range)	1	±5%	2% of full range
35 *	Additional engine parameters (EPR, N1, indicated vibration level, N2,	Engine fuel metering valve position:	As installed	Each engine each second	As installed	2% of full range

C.1174

	EGT, fuel flow, fuel cut-off lever position, N3, engine fuel metering valve position)	Application for type certification is submitted to a Contracting State on or after 1 January 2023				
36 *	TCAS/ACAS (traffic alert and collision avoidance system)		Discretes	1	As installed	
37 *	Wind shear warning		Discrete	1	As installed	
38 *	Selected barometric setting (pilot, copilot)		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 *	Multifunction/engine/alerts display format		Discrete(s)	4	As installed	
48 *	AC electrical bus status		Discrete(s)	4	As installed	
49 *	DC electrical bus status		Discrete(s)	4	As installed	
50 *	Engine bleed valve position		Discrete(s)	4	As installed	
51 *	APU bleed valve Position		Discrete(s)	4	As installed	
52 *	Computer failure		Discrete(s)	4	As installed	
53 *	Engine thrust command		As installed	2	As installed	
54 *	Engine thrust target		As installed	4	As installed	2% of full range
55 *	Computed centre of gravity		As installed	64	As installed	1% of full range
56 *	Fuel quantity in CG 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	

C.1176

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 installed
73 *	Cockpit trim control input position, Roll		Full range	1	±5%	0.2% of full range or as installed
74 *	Cockpit trim control input position, Yaw		Full range	1	±5%	0.2% of full range or as installed
75 *	All cockpit flight control input forces (control wheel,		Full range (±311 N (±70 lbf), ± 378	1	±5%	0.2% of full range or as installed

C.1177

	control column, rudder pedal)		N (±85 lbf), ± 734 N (±165 lbf)			
76 *	Event marker		Discrete	1		
77 *	Date		365 days	64		
78 *	ANP or EPE or EPU		As installed	4	As installed	
79 *	Cabin pressure altitude	Application for type certification submitted to a Contracting State on or after 1 January 2023	As installed (0 ft to 40 000 ft recommended)	1	As installed	100 ft
80 *	Aeroplane computed weight	Application for type certification submitted to a Contracting State on or after 1 January 2023	As installed	64	As installed	1% of full range
81 *	Flight director command	Application for type certification submitted to a Contracting State on or after 1 January 2023	Full range	1	± 2°	0.5°
82 *	Vertical speed	Application for type certification submitted to a Contracting State on or after 1 January 2023	As installed	0.25	As installed (32 ft/min recomme nded)	16 ft/min

C.1178

Notes: -
1. V_{S0} stalling speed or minimum steady flight speed in the landing configuration.
2. V_D design diving speed.
3. Record sufficient inputs to determine power.
4. 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. In aeroplanes with independent pilot input on primary controls, each pilot input on primary controls needs to be recorded separately.
5. If signal available in digital form.
6. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
7. If signals readily available.
8. It is not intended that aeroplanes issued with an individual certificate of airworthiness before 1 January 2016 be modified to meet the measurement range, maximum sampling and recording interval, accuracy limits or recording resolution description detailed in this Schedule.

TABLE A3-2: Parameter Characteristics for Flight Data Recorders - Helicopters

Serial Number	Parameter	Applicability	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 GNSS time sync)		24 hours	4	±0.125%/h	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 including a datum error of ±0.045 g	0.004 g
6	Pitch attitude		±75° or 100% of usable range whichever is greater	0.5	±2°	0.5°
7	Roll attitude		±180°	0.5	±2°	0.5°
8	Radio transmission keying		On-off (one discrete)	1	-	-
9	Power on each engine		Full range	1 (per engine)	±2%	0.1% of full range
10	Main rotor 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/auto throttle/AFCS mode and engagement status		A suitable combination of discretes	1	-	-

C.1180

15 *	Stability augmentation system engagement		Discrete	1	-	-
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
18	Yaw rate		±400°/second	0.25	±1.5% maximum range excluding datum error of ±5%	±2°/s
19 *	Sling load force		0 to 200% of certified load	0.5	±3% of maximum range	0.5% for maximum certified load
20	Longitudinal acceleration		±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
21	Lateral acceleration		±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
22 *	Radio altitude		-6 m to 750 m (-20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)	0.3 m (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	±3%	0.3% of full range
24 *	Horizontal beam deviation		Signal range	1	±3%	0.3% of full range
25	Marker beacon passage		Discrete	1	-	-
26	Warnings		Discrete(s)	1	-	-
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		As installed	2	As installed	As installed

C.1181

	direction)					
30 *	Landing gear and gear selector position		Discrete	4	-	-
31 *	Engine exhaust gas temperature (T4)		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)
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

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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, co-pilot)		Discrete(s)	4	-	-
47 *	Multifunction/engine/alerts display format		Discrete(s)	4	-	-
48 *	Event marker		Discrete	1	-	-
49 *	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) operational status	Application for type certification is submitted to a Contracting State on or after 1 January 2023	Discrete(s)	1	As installed	
50 *	TCAS/ACAS (traffic alert and collision avoidance system) and (operational status)	Application for type certification is submitted to a Contracting State on or after 1 January 2023	Discrete(s)	1	As installed	

C.1183

51 *	Primary flight controls – pilot input forces	Application for type certification is submitted to a Contracting State on or after 1 January 2023	Full range	0.125 (0.0625 recommended)	±3% unless higher accuracy is uniquely required	0.5% of operating range
52 *	Computed centre of gravity	Application for type certification is submitted to a Contracting State on or after 1 January 2023	As installed	64	As installed	1% of full range
53 *	Helicopter computed weight	Application for type certification is submitted to a Contracting State on or after 1 January 2023	As installed	64	As installed	1% of full range

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A3-3: Parameter Characteristics for Aircraft Data Recording Systems – Aeroplanes

Serial Number	Parameter name	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
1	Heading					
	(a) Heading (Magnetic or True)	±180°	1	±2°	0.5°	Heading is preferred, if not available, yaw rate shall be recorded
(b) Yaw rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s		
2	Pitch					
	(a) Pitch attitude	±90°	0.25	±2°	0.5°	Pitch attitude is preferred, if not available, pitch rate shall be recorded
(b) Pitch rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s		
3	Roll					
	(a) Roll attitude	±180°	0.25	±2°	0.5°	Roll attitude is preferred, if not available, roll rate shall be recorded
(b) Roll rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s		
4	Positioning system:					
	(a) Time	24 hours	1	±0.5 s	0.1 s	UTC time preferred where available.
	(b) Latitude/longitude	Latitude:±90° Longitude:±180°	2 (1 if available)	As installed (0.00015° recommended)	0.00005°	
	(c) Altitude	-300 m (-1 000 ft) to maximum certified altitude of aeroplane	2 (1 if available)	As installed (±15 m (±50 ft) recommended)	1.5 m (5 ft)	
	(d) Ground speed	+1 500 m (5 000 ft) 0-1 000 kt	2 (1 if available)	As installed (±5 kt recommended)	1 kt	
	(e) Track	0-360°	2 (1 if available)	As installed (± 2° recommended)	0.5°	
(f) Estimated error	Available range	2 (1 if available)	As installed	As installed		

Shall be recorded if readily Available

5	Normal acceleration	-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	
6	Longitudinal acceleration	± 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	
7	Lateral acceleration	± 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	
8	External static pressure (or pressure altitude)	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)	
9	Outside air temperature (or total air temperature)	-50° to $+90^{\circ}$ C or available sensor range	2	As installed ($\pm 2^{\circ}$ C recommended)	1 $^{\circ}$ C	
10	Indicated air speed	As the installed pilot display measuring system or available sensor range	1	As installed (± 3 % recommended)	1 kt (0.5 kt recommended)	
11	Engine RPM	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	

C.1186

12	Engine oil pressure	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
13	Engine oil temperature	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
14	Fuel flow or pressure	Full range	Each engine each second	As installed	2% of full range	
15	Manifold pressure	Full range	Each engine each second	As installed	0.2% of full range	
16	Engine thrust/power/torque parameters required to determine propulsive thrust/power*	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.
17	Engine gas generator speed (Ng)	0-150%	Each engine each second	As installed	0.2% of full range	
18	Free power turbine speed (Nf)	0-150%	Each engine each second	As installed	0.2% of full range	
19	Coolant temperature	Full range	1	As installed ($\pm 5^{\circ}\text{C}$ recommended)	1° C	
20	Main voltage	Full range	Each engine each second	As installed	1 Volt	
21	Cylinder head temperature	Full range	Each cylinder each second	As installed	2% of full range	

22	Flaps position	Full range or each discrete position	2	As installed	0.5°	
23	Primary flight control surface position	Full range	0.25	As installed	0.2 % of full range	
24	Fuel quantity	Full range	4	As installed	1% of full range	
25	Exhaust gas temperature	Full range	Each engine each second	As installed	2% of full range	
26	Emergency voltage	Full range	Each engine each second	As installed	1 Volt	
27	Trim surface position	Full range or each discrete position	1	As installed	0.3% of full range	
28	Landing gear position	Each discrete position*	Each gear every two seconds	As installed		*Where available, record up-and-locked and down-and-locked position
29	Novel/unique aircraft features	As required	As required	As required	As required	

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TABLE A3-4: Parameter Characteristics for Aircraft Data Recording Systems - Helicopters

Serial Number	Parameter name	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
1	Heading					
	(a) Heading (Magnetic or True)	±180°	1	±2°	0.5°	*Heading is preferred, if not available, yaw rate shall be recorded
(b) Yaw rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s		
2	Pitch					
	(a) Pitch attitude	±90°	0.25	±2°	0.5°	*Pitch attitude is preferred, if not available, pitch rate shall be recorded
(b) Pitch rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s		
3	Roll					*Roll attitude is preferred, if not available, roll rate shall
		±180°	0.25	±2°	0.5°	

	(a) Roll attitude	$\pm 300^\circ/\text{s}$	0.25	$\pm 1\% + \text{drift of } 360^\circ/\text{h}$	$2^\circ/\text{s}$	be recorded
	(b) Roll rate					
4	Positioning system:	24 hours	1	$\pm 0.5 \text{ s}$	0.1 s	UTC time preferred where available.
	(a) Time					
	(b) Latitude/longitude	Latitude: $\pm 90^\circ$ Longitude: $\pm 180^\circ$	2 (1 if available)	As installed (0.00015° recommended)	0.00005°	
	(c) Altitude	-300 m (-1000 ft) to maximum certificated altitude of aircraft	2 (1 if available)	As installed ($\pm 15 \text{ m}$ ($\pm 50 \text{ ft}$) recommended)	1.5 m (5 ft)	
	(d) Ground speed	$+1500 \text{ m}$ (5000 ft) $0-1000 \text{ kt}$	2 (1 if available)	As installed ($\pm 5 \text{ kt}$ recommended)	1 kt	
	(e) Track	$0-360^\circ$	2 (1 if available)	As installed ($\pm 2^\circ$ recommended)	0.5°	Shall be recorded if readily available
(f) Estimated error	Available range	2 (1 if available)	As installed	As installed		
5	Normal acceleration	-3 g to $+6 \text{ g}$	0.25 (0.125 if available)	As installed ($\pm 0.09 \text{ g}$ excluding a datum error of $\pm 0.45 \text{ g}$ recommended)	0.004 g	
6	Longitudinal acceleration	$\pm 1 \text{ g}$	0.25 (0.125 if available)	As installed ($\pm 0.015 \text{ g}$ excluding a datum error of $\pm 0.05 \text{ g}$ recommended)	0.004 g	

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7	Lateral acceleration	±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	
8	External static pressure (or pressure altitude)	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)	
9	Outside air temperature (or total air temperature)	-50° to +90°C or available sensor range	2	As installed (±2°C recommended)	1°C	
10	Indicated air speed	As the installed pilot display measuring system or available sensor range	1	As installed (±3 % recommended)	1 kt (0.5 kt recommended)	
11	Main rotor speed (Nr)	50% to 130% or available sensor range	0.5	As installed	0.3% of full range	
12	Engine RPM (*)	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	*For piston engine helicopters
13	Engine oil pressure	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
14	Engine oil temperature	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
15	Fuel flow or pressure	Full range	Each engine each second	As installed	2% of full range	

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16	Manifold pressure (*)	Full range	Each engine each second	As installed	0.2% of full range	*For piston engine helicopters
17	Engine thrust/power/torque parameters required to determine propulsive thrust/power*	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.
18	Engine gas generator speed (Ng) (*)	0-150%	Each engine each second	As installed	0.2% of full range	*Only for turbine-engined helicopters
19	Free power turbine speed (Nf) (*)	0-150%	Each engine each second	As installed	0.2% of full range	*Only for turbine-engined helicopters
20	Collective pitch	Full range	0.5	As installed	0.1% of full range	
21	Coolant temperature (*)	Full range	1	As installed ($\pm 5^{\circ}\text{C}$ recommended)	1° C	*Only for piston-engined helicopters
22	Main voltage	Full range	Each engine each second	As installed	1 Volt	
23	Cylinder head temperature (*)	Full range	Each cylinder each second	As installed	2% of full range	*Only for piston-engined helicopters
24	Fuel quantity	Full range	4	As installed	1% of full range	
25	Exhaust gas temperature	Full range	Each engine each second	As installed	2% of full range	
26	Emergency voltage	Full range	Each engine each second	As installed	1 Volt	
27	Trim surface position	Full range or each	1	As installed	0.3% of full	

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		discrete position			range	
28	Landing gear position	Each discrete position*	Each gear every two seconds	As installed		*Where available, record up-and-locked and down-and-locked position
29	Novel/unique aircraft features	As required	As required	As required	As required	

TABLE A3-5: Description of Applications for Data Link Recorders

Item No.	Application type	Application description	Recording content
1	Data link initiation	This includes any applications used to log on 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 — contract (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, data link aviation weather report service (D-METAR), data link-automatic terminal service (D-ATIS), digital Notice to Airmen (D-NOTAM) and other textual data link services.	C
5	Aircraft broadcast surveillance	This includes elementary and enhanced surveillance systems, as well as automatic dependent surveillance — broadcast (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 aeronautical operational control purposes (per the ICAO definition of operational control).	M*
<p>Key:</p> <p>C: Complete contents recorded.</p> <p>M: Information that enables correlation to any associated records stored separately from the aircraft.</p> <p>*: Applications to be recorded only as far as is practicable given the architecture of the system.</p>			

Amendment of Schedule 7 to the Regulations

39. The Regulations are amended in Schedule 7 at paragraph (c) (1) by substituting for the words “SGR 7.9.1.5” the words “Regulation 47”.

Insertion of Schedule 13 in the Regulations

40. The Regulations are amended by inserting immediately after Schedule 12, the following new Schedule –

“SCHEDULE 13

LOCATION OF AN AEROPLANE IN DISTRESS
(regulations 47A and 47B)

1. PURPOSE AND SCOPE

Location of an aeroplane in distress aims at establishing, to a reasonable extent, the location of an accident site within a 6 nautical mile (NM) radius.

2. OPERATION

2.1 An aircraft is in a distress condition when it is in a state that, if the aircraft behaviour event is left uncorrected, can result in an accident. Autonomous transmission of position information shall be active when an aircraft is in a distress condition. This will provide a high probability of locating an accident site to within a 6 NM radius.

2.2 An aeroplane in distress shall automatically activate the transmission of information from which its position can be determined by the operator and the position information shall contain a time stamp. It shall also be possible for this transmission to be activated manually.

2.3 The system used for the autonomous transmission of position information shall be capable of transmitting that information in the event of aircraft electrical power loss, at least for the expected duration of the entire flight.

Note.— Guidance on the location of an aeroplane in distress will be provided by the Authority.

2.4 The operator shall be alerted when an aircraft is in a distress condition with an acceptable low rate of false alerts. In case of a triggered transmission system, initial transmission of position information shall commence immediately or no later than five seconds after the detection of the activation event.

Note 1: Aircraft behaviour events can include, but are not limited to, unusual attitudes, unusual speed conditions, collision with terrain and total loss of thrust/propulsion on all engines and ground proximity warnings.

Note 2: A distress alert can be triggered using criteria that may vary as a result of aircraft position and phase of flight.

Further guidance regarding in-flight event detection and triggering criteria may be found in the EUROCAE ED-237, Minimum Aviation System Performance Specification (MASPS) for Criteria to Detect In-Flight Aircraft Distress Events to Trigger Transmission of Flight Information.

2.5 When an aircraft operator or an air traffic service unit (ATSU) has reason to believe that an aircraft is in distress, coordination shall be established between the ATSU and the aircraft operator.

- 2.6 The State of the Operator shall identify the organizations that will require the position information of an aircraft in an emergency phase. These shall include, as a minimum:
- (a) air traffic service unit(s) (ATSU); and
 - (b) SAR rescue coordination centre(s) (RCC) and sub-centres.

Note 1.— Refer to Annex 11 for emergency phase criteria.

Note 2.— Refer to Annex 12 for required notifications in the event of an emergency phase.

- 2.7 When autonomous transmission of position information has been activated, it shall only be able to be deactivated using the same mechanism that activated it.
- 2.8 The accuracy of position information shall, as a minimum, meet the position accuracy requirements established for ELTs.”

MADE this 8th day of June, 2022.

ERIC MOTHIBI MOLALE,
Minister of Transport and Public Works.