

# CIVIL AVIATION NOTICES

## CAN 3-38

### Flight Recorders

#### Contents

38.1	General.....	3
38.2	Purpose .....	3
38.3	Applicability.....	3
38.4	Cancellation.....	3
38.5	Effective Date .....	3
38.6	Definitions: .....	3
38.7	Flight Recorder Composition: .....	3
38.8	Applicability.....	5
8.1	Aeroplane- Commercial Air Transport .....	5
8.2	Aeroplane- General Aviation.....	6
8.3	Helicopter- Commercial Air Transport & General Aviation .....	7
8.4	Recording Technology.....	8
8.5	Duration .....	8
38.9	Combination Recorders.....	8
38.10	Data Link Recorders .....	9
10.1	Applicability.....	9
10.2	Duration .....	10
10.3	Correlation .....	10
10.4	Applications to be recorded.....	10
10.5	Flight Crew-Machine Interface Recordings.....	10
10.6	Start and stop logic.....	11
10.7	Applications to be recorded.....	11
38.11	Flight Recorder Data Recovery.....	12
38.12	Flight Recorders .....	12
12.1	Construction and Installation.....	12
12.2	Operation .....	12
12.3	Continued Serviceability .....	13
12.4	Flight Recorder Electronic Documentation.....	13

12.5 Flight Recorder Records .....13

38.13 Cockpit voice recorder (CVR) and cockpit audio recording system (CARS) ..... 13

13.0 Start and stop logic..... 13

13.1 Signals to be recorded..... 13

13.2 Cockpit voice recorders and cockpit audio recording systems for aeroplane ..... 14

13.3 Cockpit voice recorders and cockpit audio recording systems for Helicopter..... 15

38.14 Retention of FDR and CVR..... 15

APPENDIX A ..... 16

1 – FLIGHT RECORDERS CONTAINERS AND INSTALLATION REQUIREMENTS ..... 16

2 - FLIGHT DATA RECORDER (FDR) AND AIRCRAFT DATA RECORDING SYSTEMS (ADRS) ..... 17

3. RECORDING INTERVAL ..... 19

4. INSPECTION OF FLIGHT RECORDER SYSTEM..... 19

Table-1..... 21

Table-2..... 27

### **38.1 General**

This CANs are issued by the Director-General of Civil Aviation and Regulation from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. CANs contain information about standards, practices and procedures acceptable to PACA. This CAN will be used to demonstrate compliance with the legislative requirements.

### **38.2 Purpose**

This Civil Aviation Notice states the PACA requirements for fitment of Flight Data Recorders, Combination Recorders, Data link Recorders, Airborne Image Recorders, Airborne Image Recording System and Aircraft Data Recording System, cockpit Voice Records and Cockpit Audio Recording Systems on aircraft registered in Sultanate of Oman.

### **38.3 Applicability**

This CAN is applicable to All Omani registered aeroplanes and Helicopters purchased or leased for operation in Sultanate of Oman that shall meet the applicability requirements laid down in this Notice.

### **38.4 Cancellation**

Not applicable.

### **38.5 Effective Date**

This CAN is effective from 7 November 2019.

### **38.6 Definitions:**

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

**Automatic deployable flight recorder (ADFR):** A combination flight recorder installed on the aircraft which is capable of automatically deploying from the aircraft.

**Commercial Operation:** An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

**General Aviation:** An aircraft operation other than a commercial air transport operation or an aerial work operation.

### **38.7 Flight Recorder Composition:**

Crash protected flight recorders comprise one or more of the following Systems: a flight data recorder (FDR), a cockpit voice recorder (CVR), an airborne image recorder (AIR), a data link recorder (DLR).

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

Light weight flight recorders comprise one or more of the following systems: an aircraft data recording system (ADRS), a cockpit audio recording system (CARS), an airborne image recording system (AIRS), a data link recording system (DLRS).

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

Note 1: - For aeroplanes / helicopters for which the application for type certification is submitted before 1 January 2016, specifications applicable to crash protected flight recorders may be

found in EUROCAE ED-112, ED-56A, ED-55, Minimum Operational Performance Specifications (MOPS), or earlier equivalent documents.

Note 2: - For aeroplanes / helicopters for which the application for type certification is submitted on or after 1 January 2016, specifications applicable to crash protected flight recorders may be found in EUROCAE ED-112A, Minimum Operational Performance Specification (MOPS), or equivalent documents.

Note 3: Specifications applicable to lightweight flight recorders may be found in EUROCAE ED 155, Minimum Operational Performance Specification (MOPS), or equivalent documents.

Note 4: Detailed requirements on flight data recorders are contained in Appendix A.

Note 5: As of 7 November 2019, the below paragraph contains PACA requirements regarding the use of voice, image and/or data recordings and transcripts.

As of 7 November 2019, PACA will not allow the use of recordings or transcripts of CVR, CARS, Class A AIR and Class A AIRS for purposes other than the investigation of an accident or incident as per ICAO Annex 13 / PACA Equivalent requirements, except where the recordings or transcripts are:

- a) related to a safety-related event identified in the context of a safety management system; are restricted to the relevant portions of a de-identified transcript of the recording; and are subject to the protections accorded by ICAO Annex 19 as amended;
- b) sought for use in criminal proceedings not related to an event involving an accident or incident investigation and are subject to the protections accorded by ICAO Annex 19/ PACA Equivalent requirements; or
- c) used for inspections of flight recorder systems as provided in ICAO Annex 6, Appendix 8, Section 7. (See Appendix A, paragraph 4 of this CAN)

Note: Provisions on the protection of safety data, safety information and related sources are contained in Appendix 3 to Annex 19 amended. When an investigation under ICAO Annex 13 is instituted, investigation records are subject to the protections accorded by ICAO Annex 13 as amended.

As of 7 November 2019, PACA not allow the use of recordings or transcripts of FDR, ADRS as well as Class B and Class C AIR and AIRS for purposes other than the investigation of an accident or incident as per Annex 13 as amended / PACA Equivalent requirements, except where the recordings or transcripts are subject to the protections accorded by PACA equivalent requirement to ICAO Annex 19 as amended and are:

- a) used by the operator for airworthiness or maintenance purposes;
- b) used by the operator in the operation of a flight data analysis programme required in this Annex;
- c) sought for use in proceedings not related to an event involving an accident or incident investigation;
- d) de-identified; or
- e) disclosed under secure procedures.

Note: Provisions on the protection of safety data, safety information and related sources are contained in Appendix 3 to ICAO Annex 19 as amended / PACA Equivalent requirements.

As of 7 November 2019, the Omani operator shall establish a flight safety documents system, for the use and guidance of operational personnel, as part of its safety management system.

## **38.8 Applicability**

### **8.1 Aeroplane- Commercial Air Transport**

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

- a) the attitude of the aeroplane in achieving its flight path; and
- b) the basic forces acting upon the aeroplane resulting in the achieved flight path and the origin of such basic forces.

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

8.1.3 All turbine-engine aeroplanes, for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989, with a maximum certificated take-off mass of over 5700kg, except those in 8.1.2 shall be equipped with an FDR which should record at least the first 9 parameters listed in Table 1 of Appendix A

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

8.1.5 All aeroplanes of a maximum certificated take-off mass of over 5700kg, up to and including 27000kg, for which the individual certificate of Airworthiness is first issued on or after 1 January 1989, shall be equipped with an FDR which shall record at least the first 16 parameters listed in Table 1 of Appendix A.

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

8.1.7 All multi-engine turbine powered aeroplanes of a maximum certificated take-off mass of 5700kg or less for which the individual Certificate of airworthiness is first issued on or after 1 January 1990, should be equipped with an FDR which should record at least the first 16 parameters listed in Table 1 of Appendix A.

8.1.8 All turbine-engine aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1989, with a maximum certificated take-off mass of over 5700 kg, except those in 8.1.2, shall be equipped with an FDR which shall record at least the first 5 parameters listed in Table 1 of Appendix A.

8.1.9 All turbine-engine aeroplanes of a maximum certificated take-off mass of 5700kg or less for which the application for type certification is submitted on or after 1 January 2016 shall be equipped with:

- a) an FDR which shall record at least the first 16 parameters listed in Table 1 of Appendix A; or
- b) a Class C AIR or AIRS which shall record at least the flight path and speed parameters displayed to the pilot(s), as defined in Appendix A; or
- c) an ADRS which shall record at least the first 7 parameters defined listed in Table-4 of Appendix A.

Note 1: "The application for type certification is submitted refers to the date of application of the original "Type Certificate" for the aeroplane type, not the date of certification of particular aeroplane variants or derivative models.

Note 2: AIR or AIRS classification is defined in 10.6.2.

8.1.10 All turbine-engine aeroplanes of a maximum certificated take-off mass of 5700kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2016 should be equipped with:

- a) an FDR which should record at least the first 16 parameters listed in Table 1 of Appendix A; or
- b) a Class C AIR or AIRS which should record at least the flight path and speed parameters displayed to the pilot(s), as defined in Appendix A; or
- c) an ADRS which should record at least the first 7 parameters listed in Table 4 of Appendix A.

8.1.11 All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the application for type certification is submitted on or after 1st January,2023 shall be equipped with an FDR capable of recording at least the 82 parameters listed in Table-1 of Appendix A.

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

## **8.2 Aeroplane- General Aviation**

8.2.1 All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued on or after 1st January, 2005 shall be equipped with an FDR which shall record at least first 78 parameters listed in Table 1 of Appendix A.

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

8.2.3 All aeroplanes of a maximum certificated take-off mass of over 5700 kg, up to and including 27000 kg, for which the individual certificate of airworthiness is first issued on or after 1st January, 1989, shall be equipped with an FDR which shall record at least first 16 parameters listed in Table 1 of Appendix A.

8.2.4 All multi-engined turbine powered aeroplanes of a maximum certificated takeoff mass of 5700kg or less for which the individual certificate of airworthiness is first issued on or after 1st January, 1990, should be equipped with an FDR which should record at least the first 16 parameters listed in Table 1 of Appendix .

8.2.5 All turbine-engine aeroplanes with a seating configuration of more than five passenger seats and a maximum certificated take-off mass of 5700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2016 should be equipped with:

- a) an FDR which should record at least the first 16 parameters in Table-1 of Appendix-I; or
- b) a Class C AIR or AIRS which should record at least the flight path and speed parameters displayed to the pilot(s), as defined in Appendix-I; or
- c) an ADRS which should record at least first 7 parameters listed in Table-4 of Appendix-I.

Note: AIR or AIRS classification is defined in Para 10.6.2.

8.2.6 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the application for type certification is submitted to a DGCA on or after 1st January, 2023 shall be equipped with an FDR capable of recording at least the 82 parameters listed in Table-1 of Appendix-I.

8.2.7 All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued on or after 1st January, 2023 should be equipped with an FDR capable of recording at least the 82 parameters listed in Table-1 of Appendix-I.

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

### **8.3 Helicopter- Commercial Air Transport & General Aviation**

8.3.1 All helicopters of a maximum certificated take-off mass of over 7000kg, or having a passenger seating configuration of more than nineteen, for which the individual certificate of airworthiness is first issued on or after 1st January, 1989 shall be equipped with an FDR which shall record at least the first 30 parameters in Table 2 of Appendix A.

8.3.2 All helicopters of a maximum certificated take-off mass of over 3175 kg, up to and including 7000kg, for which the individual certificate of airworthiness is first issued on or after 1 January 1989, shall be equipped with a FDR which should record at least the first 15 parameters in Table 2 of Appendix A;

8.3.3 All helicopters of a maximum certificated take-off mass of over 3175kg for which the individual certificate of airworthiness is first issued on or after 1 January 2016 shall be equipped with an FDR which shall record at least the first 48 parameters listed in Table 2 of Appendix A.

8.4.3.4 All turbine-engine helicopters of a maximum certificated take-off mass of over 2250 kg, up to and including 3175 kg for which the application for type certification was submitted to a contracting state on or after 1 January 2018 shall be equipped with:

- a) an FDR which shall record at least the first 48 parameters in Table 2 of Appendix A; or
- b) a Class C AIR or AIRS which shall record at least the flight path and
- c) speed parameters displayed to the pilot(s), as defined in Table 5 of Appendix A; or
- d) an ADRS which shall record the first 7 parameters listed in Table 5 of Appendix A.

Note: The "application for type certification was submitted to a contracting state refers to the date of application of the original "Type Certificate" for the helicopter type, not the date of certification of particular helicopter variants or derivative models.

8.4.3.5 All helicopters of a maximum certificated take-off mass of 3175 kg or less for which the individual certificate of airworthiness is first issued on or after 1st January 2018 should be equipped with:

- a) an FDR which should record at least the first 48 parameters listed in Table-2 of Appendix A; or
- b) a Class C AIR or AIRS which should record at least the flight path and speed parameters displayed to the pilot(s), as defined in Table 5 of Appendix A; or
- c) an ADRS which should record the first 7 parameters listed in Table 5 of Appendix A;

Note: AIR or AIRS classification is defined in Para 10.6.2.

8.3.6 All helicopters of a maximum certificated take-off mass of over 3175kg for which the application for type certificate is submitted to a contracting state on or after 1st January 2023 shall be equipped with an FDR capable of recording at least the first 53 parameters listed in Table 2 of Appendix A.

8.3.7 All helicopters of a maximum certificated take-off mass of over 3175kg for which the individual certificate of airworthiness is first issued on or after 1st January, 2023 shall be equipped with an FDR capable of recording at least the first 53 parameters listed in Table 2 of Appendix A.

#### **8.4 Recording Technology**

For Commercial Air Transport aircraft: FDRs or ADRS shall not use engraving metal foil, frequency modulation (FM), photographic film or magnetic tape.

For Helicopter: FDRs, ADRS, AIRs or AIRS shall not use engraving metal foil, frequency modulation (FM), photographic film or magnetic tape.

#### **8.5 Duration**

8.5.1 All FDRs (installed on aeroplanes) shall retain the information recorded during at least the last twenty-five (25) hours of their operation with the exception of those installed on aeroplane referred in paragraph 8.1.7 for which the FDR shall retain the information recorded during at least the last thirty (30) minutes of its operations and in addition sufficient information from the preceding take off for calibration purpose.

8.5.2 All FDRs (installed on helicopters) shall retain the information recorded during at least the last ten (10) hours of their operation.

#### **38.9 Combination Recorders**

9.1 Combination recorders (FDR/CVR) may be used to meet the flight recorder equipage requirements in this CAN.

9.2 All aeroplanes of a maximum certificated take-off mass of over 5700kg, but less than 15000kgs (included) for which the application for type certification is submitted to a contracting state on or after 1 January 2016, and which are required to be equipped with both a CVR and an FDR, should be equipped with two combination recorders (FDR/CVR).

9.3 All aeroplanes of a maximum certificated take-off mass of over 15000kg for which the application for type certification is submitted to a contracting state on or after 1 January 2016, and which are required to be equipped with both a CVR and an FDR, shall be equipped with two combination recorders (FDR/CVR). One recorder shall be located as close to the cockpit as practicable and the other recorder located as far aft as practicable.



9.4 All aeroplanes of a maximum certificated take-off mass over 5700kg, required to be equipped with an FDR and a CVR, may alternatively be equipped with two combination recorders (FDR/CVR).

Note: The requirement of paragraphs 9.1, 9.2, 9.3 and 9.4 may be satisfied by equipping the aeroplanes with two combination recorders (one forward and one aft) or separate devices.

9.5 All multi-engine turbine-powered aeroplanes of a maximum certificated take-off mass of 5700kg or less, required to be equipped with an FDR and a CVR, may alternatively be equipped with one combination recorder(FDR/CVR).

9.6 Automatic Deployable Flight Recorder (ADFR)

The following requirements shall apply to an ADFR:

- a) deployment shall take place when the aeroplane structure has been significantly deformed;
- b) deployment shall take place when an aeroplane sinks in water;
- c) ADFR shall not be capable of manual deployment;
- d) the ADFR shall be able to float on water;
- e) the ADFR deployment shall not compromise the safe continuation of the flight;
- f) the ADFR deployment shall not significantly reduce the chance of survival of the recorder and of successful transmission by its ELT;
- g) the ADFR deployment shall not release more than one piece;
- h) an alert shall be made to the flight crew when the ADFR is no longer captive to the aircraft.
- i) the flight crew shall have no means to disable ADFR deployment when the aircraft is airborne;
- j) the ADFR shall contain an integrated ELT, which shall activate automatically during the deployment sequence. Such ELT may be of a type that is activated in flight and provides information from which a position can be determined; and
- k) the integrated ELT of an ADFR shall satisfy the same requirements as an ELT required to be installed on an aeroplane. The integrated ELT shall at least have the same performance as the fixed ELT to maximize detection of the transmitted signal.

Note 1: Refer to the Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery ICAO (Doc 10054) for more information on ADFR.

Note 2: If an integrated ELT of a type that is activated in flight is used within an ADFR it could be a means to comply with requirements of ICAO Document Location of Aircraft in Distress (Doc 10054).

## 38.10 Data Link Recorders

### 10.1 Applicability

10.1.1 All aeroplanes and helicopters for which the individual certificate of airworthiness are first issued on or after 1 January 2016, which utilize any of the data link communications applications listed in para 10.4 and are required to carry a CVR, shall record on a crash protected flight recorder the data link communications messages.

10.1.2 All aeroplanes and helicopter which are modified on or after 1 January 2016 to install and utilize any of the data link communications applications listed in para 10.4 and are required to carry a CVR, shall record on a crash protected flight recorder the data link communications messages.

Note: A Class B AIR (Airborne Image Recorder) could be a means for recording data link communications applications messages to and from the aeroplanes/helicopters where it is not practical or is prohibitively expensive to record those data link communications applications messages on FDR or CVR.

## **10.2 Duration**

The minimum recording duration shall be equal to the duration of the CVR.

## **10.3 Correlation**

Data link recording shall be able to be correlated to the recorded cockpit audio.

## **10.4 Applications to be recorded**

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

10.4.2 Messages applying to the applications listed at Table-3 of Appendix A 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.

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/helicopter.

## **10.5 Flight Crew-Machine Interface Recordings**

### **10.5.1 Applicability**

All aeroplanes of a maximum take-off mass of over 27000 kg for which the application for type certification is submitted on or after 1 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 Para 10.6.

All aeroplanes of a maximum take-off mass of over 5700 kg, up to and including 27000 kg, for which the application for type certification is submitted on or after 1 January 2023 should be equipped with a crash-protected flight recorder which should 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 Para 10.6

### **10.5.2 Duration**

The minimum flight crew-machine interface recording duration shall be at least for the last two (2) hours.

### **10.5.3 Correlation**

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

## 10.6 Start and stop logic

10.6.1 The Airborne Image Recorder (AIR) and Airborne Image Recording System (AIRS) shall start to record prior to the aeroplane/helicopter moving under its own power and record continuously until the termination of the flight when the aeroplane/helicopter is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the AIR or AIRS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

### 10.6.2 Classes

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

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

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

Note 1: There are no provisions for Class "A" AIRs or AIRS in this CAR.

Note 2: 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.

Note 3: 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.

## 10.7 Applications to be recorded

The operation of switches and selectors and the information displayed to the flight crew from electronic displays shall be captured by sensors or other electronic means.

The recording of operation of switches and selectors by the flight crew shall include the following:

- any switch or selector that will affect the operation and the navigation of the aircraft; and
- selection of normal and alternate systems.

The recording of the information displayed to the flight crew from electronic displays shall include the following:

- primary flight and navigation displays;
- aircraft system monitoring displays;
- engine indication displays;
- traffic, terrain, and weather displays;
- crew alerting systems displays;
- stand-by instruments; and
- installed EFB to the extent it is practical.

If image sensors are used, the recording of such images shall not capture the head and shoulders of the flight crew members whilst seated in their normal operating position.

### 38.11 Flight Recorder Data Recovery

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

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

- a) the capabilities of the operator;
- b) overall capability of the aeroplane 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.

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

### 38.12 Flight Recorders

#### 12.1 Construction and Installation

Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed. Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.

#### 12.2 Operation

- 1) Flight recorders shall not be switched off during flight time.
- 2) To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident. The flight recorders shall not be reactivated before their disposition as determined in accordance with the instructions issued by PACA / ICAO Annex 13.

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

Note 2: The operator's responsibilities regarding the retention of flight recorder records are contained in 12.5.

Note 3: All Aircraft operating within Oman FIR fitted with FDR, CVR ,etc. has to comply with Paragraph 2 of this section. Any non-compliance with this paragraph 2 will be considered as a violation.

### 12.3 Continued Serviceability

Operational checks and evaluations of recordings from the flight recorder systems shall be conducted to ensure the continued serviceability of the recorders.

Note: Procedure for inspection of flight recorder systems are given in Appendix-1.

### 12.4 Flight Recorder Electronic Documentation

It is recommended that the documentation requirement concerning FDR and ADRS parameters provided by operators to accident investigation authorities should be in electronic format and take account of industry specifications.

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

### 12.5 Flight Recorder Records

The pilot in-command, and/or owner/operator, shall ensure, to the extent possible, in the event the aeroplane/helicopter becomes involved in an accident or incident, the preservation of all related flight recorder records and, if necessary, the associated flight recorders, and their retention in safe custody pending their disposition in accordance with instruction issued by PACA.

## 38.13 Cockpit voice recorder (CVR) and cockpit audio recording system (CARS)

### 13.0 Start and stop logic

The CVR or CARS shall start to record prior to the Aircraft /helicopter moving under its own power and record continuously until the termination of the flight when the helicopter is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the CVR or CARS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

### 13.1 Signals to be recorded

- a) The CVR shall record simultaneously on four separate channels, or more, at least the following:
  - 1) voice communication transmitted from or received in the aircraft by radio;
  - 2) aural environment on the flight deck;
  - 3) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed;
  - 4) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker; and
  - 5) voice communication of flight crew members using the passenger address system, if installed.
- b) The preferred CVR audio allocation should be as follows:
  - 1) a) pilot-in-command audio panel;
  - 2) b) co-pilot audio panel;
  - 3) c) additional flight crew positions and time reference; and

- 4) d) cockpit area microphone.
- c) The CARS shall record simultaneously on two separate channels, or more, at least the following:
  - 1) voice communication transmitted from or received in the aeroplane by radio;
  - 2) aural environment on the flight deck; and
  - 3) voice communication of flight crew members on the flight deck using the aeroplane's/helicopter's interphone system, if installed.
- d) The preferred CARS audio allocation should be as follows:
  - 1) voice communication; and
  - 2) aural environment on the flight deck.

## 13.2 Cockpit voice recorders and cockpit audio recording systems for aeroplane

### 13.2.1 Applicability

All turbine-engine aeroplanes of a maximum certificated take-off mass of over 2 250 kg, up to and including 5 700 kg, for which the application for type certification is submitted to a Contracting State on or after 1 January 2016 and required to be operated by more than one pilot shall be equipped with either a CVR or a CARS.

**Recommendation:** All turbine-engine aeroplanes of a maximum certificated take-off mass of 5700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2016 and required to be operated by more than one pilot shall be equipped with either a CVR or a CARS.

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

All turbine-engine aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 shall be equipped with a CVR.

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

### 13.2.2 Recording technology

CVRs and CARS shall not use magnetic tape or wire.

### 13.2.3 Duration

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

All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2021 shall be equipped with a CVR which shall retain the information recorded during at least the last twenty-five (25) hours of its operation.

### 13.2.4 Cockpit voice recorder alternate power source

An alternate power source shall automatically engage and provide ten (10) minutes, plus or minus one (1) minute, of operation whenever aeroplane power to the recorder ceases, either by normal shutdown or by any other loss of power. The alternate power source shall power the CVR and its associated cockpit area microphone components. The CVR shall be located as close as practicable to the alternate power source.

Note 1: "Alternate" means separate from the power source that normally provides power to the CVR. The use of aeroplane batteries or other power sources is acceptable provided that the requirements above are met and electrical power to essential and critical loads is not compromised.

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

All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2018 shall be provided with an alternate power source, as defined in 13.2.4, that powers the forward CVR in the case of combination recorders.

**Recommendation:** All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2018 should be provided with an alternate power source, as defined in paragraph 13.2.4. Note 1, that powers at least one CVR.

### 13.3 Cockpit voice recorders and cockpit audio recording systems for Helicopter

#### 13.3.1 Applicability

All helicopters of a maximum certificated take-off mass of over 7000 kg shall be equipped with a CVR. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.

**Recommendation:** All helicopters of a maximum certificated take-off mass of over 3175 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 should be equipped with a CVR. For helicopters not equipped with an FDR, at least main rotor speed should be recorded on the CVR.

#### 13.3.2 Recording technology

CVRs and CARS shall not use magnetic tape or wire.

#### 13.3.3 Duration

All helicopters required to be equipped with a CVR, shall be equipped with a CVR which shall retain the information recorded during at least the last two hours of its operation.

### 38.14 Retention of FDR and CVR

Retention of FDR and CVR recordings following an accident, or occurrence requiring immediate notification to the PACA, the operator of an aeroplane/Helicopter on which an CVR and/or FDR is carried shall, to the extent possible, preserve the original recorded data pertaining to that accident, as retained by the recorder for at least sixty (60) days or a longer period as requested by the PACA.

**APPENDIX A****1 – FLIGHT RECORDERS CONTAINERS AND INSTALLATION REQUIREMENTS**

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

1.2 Non-deployable crash-protected flight recorder containers shall:

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

Note: this ULD (37.5 Khz) is deferent from the LF-ULD (8.8 Khz) fitted to the fuselage

1.3 Automatic deployable flight recorder containers shall:

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

1.4 The flight recorder systems shall be installed so that:

- a) the probability of damage to the recordings is minimized;
- b) there is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and
- c) if the flight recorder systems have an erasure device, the installation shall be designed to prevent operation of the erasure device during flight time or crash impact; and
- d) for aeroplanes and helicopters for which the individual certificate of airworthiness is first issued on or after 1 January 2023, a flight crew-operated erase function shall be provided on the flight deck which, when activated, modifies the recording of a CVR and AIR so that it cannot be retrieved using normal replay or copying techniques. The installation shall be designed to prevent activation during flight. In addition, the probability of an inadvertent activation of an erase function during an accident shall also be minimized.

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

1.5 The flight recorder systems shall be installed so that they receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardizing service to essential or emergency loads.

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

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

1.8 The manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recorder systems:

- a) manufacturer's operating instructions, equipment limitations and installation procedures;



- b) parameter origin or source and equations which relate counts to units of measurement; and
- c) manufacturer's test reports.

## 2 - FLIGHT DATA RECORDER (FDR) AND AIRCRAFT DATA RECORDING SYSTEMS (ADRS)

### 2.1 Aeroplanes

#### 2.1.1 Start and stop logic

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

#### 2.1.2 Parameters to be recorded

2.1.2.1 The parameters that satisfy the requirements for FDRs are listed in the table 1 below. The number of parameters to be recorded shall depend on aeroplane complexity. The parameters without an asterisk (\*) are mandatory parameters which shall be recorded regardless of aeroplane complexity. In addition, the parameters designated by an asterisk (\*) shall be recorded if an information data source for the parameter is used by aeroplane systems or the flight crew to operate the aeroplane. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

2.1.2.2 If further FDR recording capacity is available, recording of the following additional information shall be considered:

- a) Operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority:
  - 1) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and auto flight system engagement and mode indications if not recorded from another source;
  - 2) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, ETC.;
  - 3) warnings and alerts; and
  - 4) the identity of displayed pages for emergency procedures and checklists; and
- b) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs.

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

- Pressure altitude
- Indicated airspeed or calibrated airspeed
- Heading (primary flight crew reference)
- Pitch attitude
- Roll attitude
- Engine thrust/power

- Landing-gear status\*
- Total or outside air temperature\*
- Time\*
- Navigation data\*: drift angle, wind speed, wind direction, latitude/longitude
- Radio altitude\*

2.1.2.4 The parameters that satisfy the requirements for ADRS are listed in Table 4.

2.1.2.5 The measurement range, recording interval and accuracy of parameters on installed equipment shall be verified by methods approved by the appropriate certificating authority.

2.1.2.6 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator. The documentation needs to be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

## 2.2 Helicopters

### 2.2.1 Start and stop logic

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

### 2.2.2 Parameters to be recorded

2.2.2.1 The parameters that satisfy the requirements for FDRs, are listed in Table 2. The number of parameters to be recorded shall depend on helicopter complexity. The parameters without an asterisk (\*) are mandatory parameters which shall be recorded regardless of helicopter complexity. In addition, the parameters designated by an asterisk (\*) shall be recorded if an information data source for the parameter is used by helicopter systems or the flight crew to operate the helicopter. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.

2.2.2.2 The following parameters shall satisfy the requirements for flight path and speed:

- Pressure altitude
- Indicated airspeed
- Outside air temperature
- Heading
- Normal acceleration
- Lateral acceleration
- Longitudinal acceleration (body axis)
- Time or relative time count
- Navigation data\*: drift angle, wind speed, wind direction, latitude/longitude
- Radio altitude\*.

2.2.2.3 If further FDR recording capacity is available, recording of the following additional information shall be considered:

- a) operational information from electronic displays, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS); and
- b) additional engine parameters (EPR, N1, fuel flow, etc.).

2.2.2.4 The parameters that satisfy the requirements for ADRS are listed in Table 5.

2.2.2.5 The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by methods approved by the appropriate certificating authority.

2.2.2.6 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

### **3. RECORDING INTERVAL**

The flight recorders FDR or Aircraft Data Recording System (ADRS) shall start to record prior to the aeroplane/helicopter moving under its own power and record continuously until the termination of the flight when the aeroplane/helicopter is no longer capable of moving under its own power.

### **4. INSPECTION OF FLIGHT RECORDER SYSTEM**

4.1 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.

4.2 FDR systems or ADRS and AIR systems or AIRS shall have recording inspection intervals of one year; subject to the approval from the appropriate regulatory authority, this period may be extended to two years provided these systems have demonstrated a high integrity of serviceability and self-monitoring. DLR systems or DLRS shall have recording inspection intervals of two years; subject to the approval from the appropriate regulatory authority, this period may be extended to four years provided these systems have demonstrated high integrity of serviceability and self-monitoring.

4.3 Recording inspections shall be carried out as follows:

- a) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;
- b) the analysis of the FDR or ADRS recording shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the aeroplane and by the tools used to extract the data from the recorder) is within acceptable limits and to determine the nature and distribution of the errors;
- c) The FDR or ADRS recording from a complete flight shall be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention shall be given to parameters from sensors dedicated to the FDR or ADRS. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;
- d) the readout facility shall have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;
- e) an examination of the recorded signal on the CVR or the 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.

4.4 A flight recorder system shall be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

4.5 The operator must submit a PACA application AWR Form 034 to Flight Safety Department upon receiving this CAN, in case of any change of the data need it into the PACA form and shall be made available on request to PACA for monitoring purposes.

4.6 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 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 years.

**Table-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 (UTC when available, otherwise relative time count or GNSS time sync)		24 hours	4	±0.125% /h	1s
2	Pressure-altitude		-300 m (-1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)	1.5 m (5 ft)
3	Indicated airspeed or calibrated airspeed		95 km/h (50 kt) to max V <sub>So</sub> (Note 1) V <sub>So</sub> to 1.2 V <sub>U</sub> (Note 2)	1	±5% ±3%	1 kt (0.5 kt recommended)
4	Heading (primary flight crew reference)		360°	1	±2°	0.5°
5	Normal acceleration (Note 8)	Application for type certification is submitted on or before 1 January 2016	-3 g to +6 g	0.125	±1% of maximum range excluding datum error of ±5%	0.004 g
		Application for type certification is submitted on or after 1 January 2016	-3 g to +6 g	0.0625	±1% of maximum range excluding datum error of ±5%	0.004 g
6	Pitch attitude		±75° or usable range whichever is greater	0.25	±2°	0.5°
7	Roll attitude		±180°	0.25	±2°	0.5°
8	Radio transmission keying		On-off (one discrete)	1		
9	Power on each engine (Note 4 -3)		Full range	1 (per engine)	±2%	0.2% of full range or the resolution required to operate the aircraft
10*	Trailing edge flap and cockpit control selection		Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
11*	Leading edge flap and cockpit control selection		Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
12*	Thrust reverser position		Stowed, in transit, and reverse	1 (per engine)		
13*	Ground spoiler/speed brake selection (selection and position)		Full range or each discrete position	1	±2% unless higher accuracy uniquely required	0.2% of full range
14	Outside air temperature		Sensor range	2	±2°C	0.3°C
15*	Autopilot/auto throttle/AFCS		A suitable combination	1		

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
	mode and engagement status		of discrete			
16	Longitudinal acceleration (Note 8)	Application for type certification submitted 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 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 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 on or after 1 January 2016	Full range	0.125	±2° unless higher accuracy uniquely required	0.2% of full range or as installed
19	Pitch trim position		Full range	1	±3% unless higher accuracy uniquely required	0.3% of full range or as installed
20*	Radio altitude		-6 m to 750 m (-20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)	0.3 m (1 ft) below 150 m (500 ft) 0.3 m (1 ft) + 0.5% of full range above 150 m (500 ft)
21*	Vertical beam deviation (ILS/ 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 Distance to runway threshold (GLS) and Distance to missed approach point (IRNAV/IAN)) (Notes 5 and 6)		0 – 370 km (0 – 200 NM)	4	As installed	1 852 m (1 NM)
27	Air/ground status		Discrete	1		
28*	GPWS/TAWS/GCAS status (selection of terrain		Discrete	1		

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
	display mode including pop-up display status) and (terrain alerts, both cautions and warnings, and advisories) and (on/off switch position)					
29*	Angle of attack		Full range	0.5	As installed	0.3 % of full range
30*	Hydraulics, each system (low pressure)		Discrete	2		0.5% of full range
31*	Navigation data (latitude/longitude, ground speed and drift angle) (Note 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, discretised or full range)	1	±5%	2% of full range
35*	Additional engine parameters (EPR, N <sub>1</sub> , indicated vibration level, N <sub>2</sub> , EGT, fuel flow, fuel cut-off lever position, N <sub>3</sub> , engine fuel metering valve position)	Engine fuel metering valve position: Application for type certification is submitted on or after 1 January 2023	As installed	Each engine each second	As installed	2% of full range
36*	TCAS/ACAS (traffic alert and collision avoidance system)		Discrete	1	As installed	
37*	Wind shear warning		Discrete	1	As installed	
38*	Selected barometric setting (pilot, co-pilot)		As installed	5-1	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

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
44*	Selected flight path (all pilot selectable modes of operation) (course /DSTRK, path angle, final approach path (IRNAV/IAN))			1	As installed	
45*	Selected decision height		As installed	64	As installed	Sufficient to determine crew selection
46*	EFIS display format (pilot, co-pilot)		Discrete(s)	4	As installed	
47*	Multi-function/engine/alerts display format		Discrete(s)	4	As installed	
48*	AC electrical bus status		Discrete(s)	4	As installed	
49*	DC electrical bus status		Discrete(s)	4	As installed	
50*	Engine bleed valve position		Discrete(s)	4	As installed	
51*	APU bleed valve position		Discrete(s)	4	As installed	
52*	Computer failure		Discrete(s)	4	As installed	
53*	Engine thrust command		As installed	2	As installed	
54*	Engine thrust target		As installed	4	As installed	2% of full range
55*	Computed centre of gravity		As installed	64	As installed	1% of full range
56*	Fuel quantity in CG trim tank		As installed	64	As installed	1% of full range
57*	Head up display in use		As installed	4	As installed	
58*	Para visual display on/off		As installed	1	As installed	
59*	Operational stall protection, stick shaker and pusher activation		As installed	1	As installed	
60*	Primary navigation system reference (GNSS, INS, VOR/DME, MLS, Loran C, localizer glideslope)		As installed	4	As installed	
61*	Ice detection		As installed	4	As installed	
62*	Engine warning each engine vibration		As installed	1	As installed	
63*	Engine warning each engine over temperature		As installed	1	As installed	
64*	Engine warning each engine oil pressure low		As installed	1	As installed	
65*	Engine warning each engine over speed		As installed	1	As installed	
66*	Yaw trim surface position		Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range



Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
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, control column, rudder pedal)		Full range (±311 N (±70 lbf), ± 378 N (±85 lbf), ± 734 N (±165 lbf))	1	±5%	0.2% of full range or as installed
76*	Event marker		Discrete	1		
77*	Date		365 days	64		
78*	ANP or EPE or EPU		As installed	4	As installed	
79*	Cabin pressure altitude	Application for type certification submitted to 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 on or after 1 January 2023	As installed	64	As installed	1% of full range
81*	Flight director command	Application for type certification submitted on or after 1 January 2023	Full range	1	± 2°	0.5°

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
82*	Vertical speed	Application for type certification submitted on or after 1 January 2023	As installed	0.25	As installed (32 ft/min recommended)	16 ft/min

**Notes:**

- (1) *V<sub>So</sub> stalling speed or minimum steady flight speed in the landing configuration is in Section "Abbreviations and Symbols".*
- (2) *VD 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 Appendix*

**Table-2**  
**PARAMETER CHARACTERISTICS FOR FLIGHT DATA RECORDERS -**  
**HELICOPTER**

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	1	$\pm 0.125\%$ /h	1 s
2	Pressure-altitude		-300 m (-1000 ft) to maximum certified altitude of aircraft +1500 m (+5000 ft)	1	$\pm 30$ m to $\pm 200$ m ( $\pm 100$ ft to $\pm 700$ ft)	1.5 m (5 ft)
3	Indicated airspeed		As installed pilot display measuring system	1	$\pm 3\%$	1 kt (0.5 kt recommended)
4	Heading		$360^\circ$	1	$\pm 2^\circ$	$0.5^\circ$
5	Normal acceleration (Note 8)		-3 g to +6 g	0.125	$\pm 0.09$ g excluding a datum error of $\pm 0.05$ g	0.004 g
6	Pitch attitude		$\pm 75^\circ$ or 100% of usable range whichever is greater	0.5	$\pm 2^\circ$	$0.5^\circ$
7	Roll attitude		$\pm 180^\circ$	0.5	$\pm 2^\circ$	$0.5^\circ$
8	Radio transmission keying		On-off (one discrete)	1		
9	Power on each engine (Note 4-3)		Full range	1 (per engine)	$\pm 2\%$	0.1% of full range
10	Main Rotor					
	Main Rotor Speed		50-130%	0.51	$\pm 2\%$	0.3% of full range
	Rotor Brake		Discrete			
11	Pilot input and/or control surface - primary controls (collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal)		Full range	0.5 (0.25 recommended)	$\pm 2\%$ 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	$\pm 2^\circ\text{C}$	$0.3^\circ\text{C}$
14*	Autopilot/auto throttle/AFCS mode and engagement status		A suitable combination of discretely	1		
15*	Stability Augmentation System Engagement		Discrete	1		
16*	Main Gearbox Oil Pressure		As installed	1	As installed	6.895 kN/m <sup>2</sup> (1 psi)
17*	Main Gearbox Oil Temperature		As installed	2	As installed	$1^\circ\text{C}$
18	Yaw Rate		$\pm 400^\circ$ /second	0.25	$\pm 1.5\%$ maximum range excluding datum error of $\pm 5\%$	$\pm 2^\circ$ /s

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
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 (Note 8)		±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 2500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)	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 direction)		As installed	2	As installed	As installed
30*	Landing gear and gear selector position		Discrete	4		
31*	Engine Exhaust Gas Temperature (T <sub>4</sub> )		As installed	1	As installed	
32*	Turbine Inlet Temperature (TIT/ITT)		As installed		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, 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

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
42*	Selected vertical speed (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
43*	Selected heading (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
44*	Selected flight path (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
45*	Selected decision height		As installed	4	As installed	Sufficient to determine crew selection
46*	EFIS display format (pilot, co-pilot)		Discrete(s)	4		
47*	Multi-function/engine/alerts display format		Discrete(s)	4		
48*	Event Marker		Discrete	1		
49*	GPWS/TAWS/GCAS status ( selection of terrain display modes including pop-up display status) and (Terrain Alerts, both cautions and warnings, and advisories) and (on/off switch position) and (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 on or after 1 January, 2023	Discrete(s)	1	As installed	
51*	Primary Flight controls - Pilot input forces	Application for type certification is submitted 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

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
52*	Computed Centre of Gravity	Application for type certification is submitted 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 on or after 1 January 2023	As installed	64	As installed	1% of full range



Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
52*	Computed Centre of Gravity	Application for type certification is submitted 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 on or after 1 January 2023	As installed	64	As installed	1% of full range

**Anwar Abdullah Al-Raisi**

**Acting Director General of Civil Aviation Regulation**

