AZƏRBAYCAN RESPUBLİKASININ
NƏQLİYYAT, RABİTƏ VƏ YÜKSƏK TEXNOLOGİYALAR NAZİRLİYİ
DÖVLƏT MÜLKİ AVİASİYA AGENTLİYİ

Ə M R

№ 31

Bakı şəhəri "08" aprel 2021

"Azerbaijan Aviation Rules - Flight Recorders (Part I - Airplanes)" adlı sənədlərə düzəlişinlərin qüvvəyə minməsi barədə

Beynəlxalq Mülki Aviasiya haqqında Konvensiyanın 06 saylı Əlavəsinə edilmiş 46 saylı dəyişikliyi tədbiq etmək məqsədilə "Azerbaijan Aviation Rules - Flight Recorders (Part I - Airplanes)" ("Azərbaycan Aviasiya Qaydaları - Uçuş yazma cihazı (Hissə I-Təyyarələr)) adlı sənədin 4-cü nəşrinə 02 saylı düzəliş işlənib hazırlanmışdır..

Sözügedən sənədin tətbiqini təmin etmək məqsədilə "Azərbaycan Respublikasının Nəqliyyat, Rabitə və Yüksək Texnologiyalar Nazirliyi yanında Dövlət Mülki Aviasiya Agentliyi haqqında Əsasnamə"nin 5.6.6-cı yarımbəndini rəhbər tutaraq, **əmr edirəm:**

1. "Azerbaijan Aviation Rules - Flight Recorders (Part I - Airplanes)" sənədinin 4-cü nəşrinə 02 saylı düzəliş 15.04.2021-ci il tarixindən qüvvəyə minsin.
2. Sənəddə göstərilən tələblərə uyğun olaraq bütün zəruri prosedurların tətbiqi təmin edilsin.
3. Sənədin Dövlət Mülki Aviasiya Agentliyinin (DMAA) və "Mülki Aviasiyada Uçuşların Təhlükəsizliyi üzrə Dövlət Müfəttişliyi"nin aidiyyəti mütəxəssisləri tərəfindən öyrənilməsi və bütün zəruri prosedurların təmin olunması təşkil edilsin.
4. Sənəd DMAA-nın rəsmi internet saytında yerləşdirilsin.
5. Əmr bütün şəxsi heyətə çatdırılsın.
6. Əmrin icrasına nəzarət direktorun müavini Hacıağa Hacıyevə həvalə edilsin.

Direktor **Arif Məmmədov**

APPROVED
by SCAA Director Order
№ 31 dd. 08 April 2021

AZERBAIJAN AVIATION RULES – FLIGHT RECORDERS (PART I – AIRPLANES)

COCKPIT VOICE RECORDERS, FLIGHT DATA RECORDERS, COMBINATION RECORDERS, DATALINK RECORDERS, AIRBORNE IMAGE RECORDERS, AIRBORNE IMAGE RECORDING SYSTEM AND AIRCRAFT DATA RECORDING SYSTEM

State Civil Aviation Agency of the Republic of Azerbaijan

Document № AAR-AIR-006

Edition № 04

Effective date: 15.SEP.2019

Revision № 02, dd. 15.APR.2021

Baku

https://www.caa.gov.az

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0.4. RECORD OF AMENDMENTS AND REVISIONS

Edition / Revision №	Date of issue/revision	Inserted by	Para/Page	Effective date
Edition № 04	15.SEP.2019	QC	ALL	15.SEP.2019
Rev. № 01	19.FEB.2021	AIR Dep,		19.FEB.2021
Rev. № 02	15.APRIL.2021	AIR Dep	2-1	15.APRIL.2021

***Edition**: - Release of a document having incorporated all previous revisions until the current version. New edition of a document will not show revised text in blue color. Current edition of a document shown on each page in footer.*

***Revision**: - A change made to a part of document, where it is reflected with blue text or accompanied with a vertical line on right side of a document. Basic information on revisions (number and date) given in the List of effective Pages and indicated in header of affected page and in context itself.*

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0.5. ABBREVIATION

A/C	Aircraft
AOC	Air Operator Certificate
CAA	Civil Aviation Authority
CVR	Cockpit Voice Recorder
FDR	Flight Data Recording
SCAA	State Civil Aviation Agency of the Republic of Azerbaijan

0.6. TERMS SHALL, SHOULD, MAY

The following terms shall have the meaning outlined below:

“Shall” - An action verb in the imperative sense means that the application of a rule or procedure or provision is mandatory.

“Should” - Means that the application of a procedure or provision is recommended.

“May” - Means that the application of a procedure or provision is optional.

0.7. ADMINISTRATION AND CONTROL

This document is published as a book on A4-sized sheets. The PDF files will be locked and signed to prevent changes.

This document is regularly revised and amended. All personnel must be familiarized with all revisions done.

This document will be Amended and Revised in accordance with requirements of “Documentation and Control” procedure.

SUBJECT: COCKPIT VOICE RECORDERS, FLIGHT DATA RECORDERS, COMBINATION RECORDERS, DATALINK RECORDERS, AIRBORNE IMAGE RECORDERS, AIRBORNE IMAGE RECORDING SYSTEM AND AIRCRAFT DATA RECORDING SYSTEM INSTALLED ON AIRPLANES

A. PURPOSE:

These Azerbaijan Aviation Rules lays down the requirements for fitment of Cockpit Voice Recorders, Flight Data Recorders, and Combination Recorders, Data link Recorders, Airborne Image Recorders, Airborne Image Recording System and Aircraft Data Recording System on airplanes registered in Azerbaijan. All airplanes imported/ purchased or leased for operation in Azerbaijan shall meet the applicability requirements laid down in this AAR.

B. DEFINITIONS:

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

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

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

C. FLIGHT RECORDER COMPOSITION:

C.1 Crash-protected flight recorders comprise one or more of the following:

- a flight data recorder (FDR);
- a cockpit voice recorder (CVR);
- an airborne image recorder (AIR) ;
- a data link recorder (DLR).

As per Appendix 1. image and data link information may be recorded on either the CVR or the FDR.

C.2 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).

As per Appendix 1 image and data link information may be recorded on either the CARS or the ADRS.

Note 1: *Detailed requirements on flight recorders are contained in Appendix 1.*

Note 2: *For aeroplanes for which the application for type certification is submitted to a Contracting State 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 3: *For aeroplanes for which the application for type certification is submitted to a Contracting State 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 4*: Specifications applicable to lightweight flight recorders may be found in EUROCAE ED- 155, Minimum Operational Performance Specification (MOPS), or equivalent documents.*

1. FLIGHT DATA RECORDERS AND AIRCRAFT DATA RECORDING SYSTEMS

Note: *Parameters to be recorded are listed in Tables A1-1 and A1-3 of Appendix 1.*

1.1. APPLICABILITY

All turbine-engined aeroplanes of a maximum certificated take-off mass of 5700 kg or less for which the application for type certification is submitted to a Contracting State 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 A1-1 of Appendix 1; 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 2.2.3 of Appendix 1; or

(c) an ADRS which shall record at least the first 7 parameters listed in Table A1-3 of Appendix 1.

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

Note 2: *AIR or AIRS classification is defined in 6.2 of Appendix 1.*

All aeroplanes 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 1 January 1989 shall be equipped with an FDR which shall record at least the first 32 parameters listed in Table A1-1 of Appendix 1.

All aeroplanes of a maximum certificated take-off mass of over 5 700 kg, up to and including 27 000 kg, for which the individual certificate of airworthiness is first issued on or after 1 January 1989, shall be equipped with an FDR which shall record at least the first 16 parameters listed in Table A1-1 of Appendix 1.

All multi-engined turbine-engined aeroplanes of a maximum certificated take-off mass of 5700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 1990 should be equipped with an FDR which shall record at least the first 16 parameters listed in Table A1-1 of Appendix 1.

All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1989, with a maximum certificated take-off mass of over 5 700 kg, except those in 1.1.6, shall be equipped with an FDR which shall record at least the first 5 parameters listed in Table A1-1 of Appendix 1.

All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989, with a maximum certificated take-off mass of over 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 an FDR which shall record at least the first 16 parameters listed in Table A1-1 of Appendix 1.

All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued after 1 January 2005 shall be equipped with an FDR which shall record at least the first 78 parameters listed in Table A1-1 of Appendix 1.

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 Contracting State on or after 1 January 2023 shall be equipped with an FDR capable of recording at least the 82 parameters listed in Table A1-1 of Appendix 1.

1.2. RECORDING TECHNOLOGY

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

1.3. DURATION

All FDRs shall retain the information recorded during at least the last 25 hours of their operation, with the exception of those installed on aeroplanes referenced in 1.1.4 for which the FDR shall retain the information recorded during at least the last 30 minutes of its operation, and in addition sufficient information from the preceding take-off for calibration purposes

2. COCKPIT VOICE RECORDERS AND COCKPIT AUDIO RECORDING SYSTEMS

2.1. APPLICABILITY

2.1.1 All turbine-engined 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.

2.1.2 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 shall be equipped with a CVR.

2.1.3 All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 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.

2.2. RECORDING TECHNOLOGY

CVRs and CARS shall not use magnetic tape or wire

2.3. DURATION

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

2.3.1 All aeroplanes 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 1 January 2022 shall be equipped with a CVR which shall retain the information recorded during at least the last 25 hours of its operation.

2.3.2 All aeroplanes that are required to be equipped with CARS, and for which the individual certificate of airworthiness is first issued on or after 1 January 2025, shall be equipped with a CARS which shall retain the information recorded during at least the last two hours of their operation.

2.4. COCKPIT VOICE RECORDER ALTERNATE POWER SOURCE

2.4.1 An alternate power source shall 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. 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.*

2.4.2 All aeroplanes of a maximum certificated take-off mass of over 27 000 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 2.4.1, that powers the forward CVR in the case of combination recorders.

3. DATA LINK RECORDERS

3.1. APPLICABILITY

3.1.1 All aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2016, which use any of the data link communications applications referred to in 5.1.2 of Appendix 1 and are required to carry a CVR, shall record the data link communications messages on a crash-protected flight recorder.

3.1.2 All aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2016, that are required to carry a CVR and are modified on or after 1 January 2016 to use any of the data link communications applications referred to in 5.1.2 of Appendix 1, shall record the data link communications messages on a crash-protected flight recorder unless the installed data link communications equipment is compliant with a type certificate issued or aircraft modification first approved prior to 1 January 2016.

Note 1: *Refer to Table A2-1 in Attachment 2 for examples of data link communication recording requirements.*

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

Note 3: *The "aircraft modifications" refer to modifications to install the data link communications equipment on the aircraft (e.g. structural, wiring).*

3.2. DURATION

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

3.3. CORRELATION

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

3.4. FLIGHT CREW-MACHINE INTERFACE RECORDINGS.

3.4.1 Applicability

All aeroplanes of a maximum take-off mass of over 27 000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2023 shall be equipped with a crash-protected flight 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 Appendix 1.

3.4.2 Duration

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

3.4.3 Correlation

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

4. FLIGHT RECORDERS – GENERAL

4.1. 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.

4.2. OPERATION

Flight recorders shall not be switched off during flight time.

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 AAR-OPS 1.

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

Note 2: *The operator's responsibilities regarding the retention of flight recorder records are contained in AAR – OPS 1.*

4.3. 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: *Procedures for the inspections of the flight recorder systems are given in Appendix 1.*

4.4. FLIGHT RECORDER ELECTRONIC DOCUMENTATION

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

4.5. COMBINATION RECORDERS

All aeroplanes 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, 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.

All aeroplanes of a maximum certificated take-off mass of over 27 000 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 combination recorder as close to the cockpit as practicable and an

automatic deployable flight recorder (ADFR) located as far aft as practicable in accordance with Appendix 1.

Note 1: *A combination recorder that includes a FDR meets the requirements of.Item 1.*

Note 2: *A combination recorder that includes a CVR meets the requirements of Item 2.*

Notwithstanding the provisions in 4.5.2 , the State of the Operator may, based on the results of a specific performance assessment conducted by the operator which demonstrates how an equivalent level of performance will be maintained, specifically approve equipage variations to recover, at a minimum, CVR and mandatory FDR data for the mandated duration in a timely manner. The specific performance assessment shall include at least the following:

(a) the capabilities of the operator;

(b) overall capability of the aeroplane and its systems;

(c) the reliability of the means to recover the appropriate CVR channels and FDR data in a timely manner and avoiding the need for underwater retrieval;

(d) the capability to establish the location where an aircraft terminates controlled flight;

(e) the ability to contribute with finding the location of an accident site; and

(f) specific mitigation measures.

Note 3: *Guidance on the specific performance assessment, appropriate CVR data and FDR parameters, duration of recordings and timely recovery of CVR and FDR data is contained in Attachment.*

Note 4: *The specific approval for an equipment variation should be included in the Operation Specification under "Other".*

5. FLIGHT RECORDER DATA RECOVERY

5.1. All aeroplanes of a maximum certificated take-off mass of over 27 000 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.

5.2. 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 State of Design;

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

(d) the capability to establish the location where an aircraft terminates controlled flight;

(e) the ability to contribute with finding the location of an accident site; and

(f) 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).*

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APPENDIX 1: FLIGHT RECORDERS

The material in this Appendix concerns flight recorders intended for installation in aeroplanes engaged in international air navigation. Crash-protected flight recorders comprise one or more of the following:

- a flight data recorder (FDR),
- a cockpit voice recorder (CVR),
- an airborne image recorder (AIR),
- a data link recorder (DLR).

When image or data link information is required to be recorded on a crash-protected flight recorder, it is permissible to record it on either the CVR or the FDR.

Lightweight flight recorders comprise one or more of the following systems:

- an aircraft data recording system (ADRS),
- a cockpit audio recording system (CARS),
- an airborne image recording system (AIRS),
- a data link recording system (DLRS).

When image or data link information is required to be recorded on a lightweight flight recorder, it is permissible to record it on either the CARS or the ADRS.

1. General Requirements

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

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

(a) carry reflective material to facilitate their location; and

(b) have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kHz. At the earliest practicable date, but not later than 1 January 2018, this device shall operate for a minimum of 90 days.

1.3 Automatic deployable flight recorder containers shall:

(a) be painted a distinctive orange color, however the surface visible from outside the aircraft may be of another color;

(b) carry reflective material to facilitate their location; and

(c) have an integrated automatically activated ELT.

1.4 The flight recorder systems shall be installed so that:

(a) the probability of damage to the recordings is minimized;

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

(c) if the flight recorder systems have an erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact; and

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

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

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

1.6 The lightweight flight recorders shall be connected to a power source having the characteristics which ensure proper and reliable recording in the operational environment.

1.7 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.

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

1.9 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 AIRCRSFT DATA RECORDING SYSTEMS (ADRS)

2.1 Start and stop logic

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

2.2 Parameters to be recorded

2.2.1 The parameters that satisfy the requirements for FDRs are listed in Table A1-1. The number of parameters to be recorded shall depend on aeroplane complexity. The parameters without an asterisk (*) are mandatory parameters which shall be recorded regardless of aeroplane complexity. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by aeroplane systems or the flight crew to operate the aeroplane. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

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

a) operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority:

1) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source;

2) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, ETC.;

3) warnings and alerts; and

4) the identity of displayed pages for emergency procedures and checklists; and

b) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs.

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

— Pressure altitude

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

2.2.4 Radio altitude*The parameters that satisfy the requirements for ADRS are the first 7 parameters listed in Table 1-1.

2.2.5 If further ADRS recording capacity is available, the recording of any parameters from 8 onwards defined in Table A1-3 shall be considered.

2.3 Additional information

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

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

2.4 Operation with not working FDR

2.4.1 It is allowed to operate aircraft with non-working FDR if:

2.4.1.1 Departure airdrome is not the station of the Operator and there is no opportunity or worthiness to fix it before flight; and

2.4.1.2 Aircraft performed not more than 8 consecutive flights out-side base airdrome with failed on-board recording system; and

2.4.1.3 Not more than 3 calendar days (72 hours) passed since the moment detection of recorder failure (only during international flights); and

2.4.1.4 On-board voice recorder, envisaged by requirements is in working condition, except for conditions, when it is coupled with on-board voice recorder, - then it is allowed to perform only non-commercial flights in accordance with conditions set forth in para. 2.4.1.1, 2.4.1.2 and 2.4.1.3.

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

3.1 Start and stop logic

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

3.2 Signals to be recorded

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

(a) voice communication transmitted from or received in the aeroplane by radio;

(b) aural environment on the flight deck;

(c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed;

(d) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker; and

(e) voice communication of flight crew members using the passenger address system, if installed

3.2.2 The preferred CVR audio allocation should be as follow:

(a) pilot-in-comand audio panel;

(b) co-pilot audio panel;

(c) additional flight crew positions and time reference; and

(d) cockpit area microphone.

3.2.3 The CARS shall simultaneously record on two separate channels, or more, at least the following:

(a) voice communication transmitted from or received in the aeroplane by radio;

(b) aural environment on the flight deck; and

(c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed.

3.2.4 The preferred CARS audio allocation should be as follow:

(a) voice communication; and

(b) aural environment on the flight deck.

3.3 Operation with not working voice recording system

3.3.1 It is allowed to perform flight with not operating voice recording system if:

3.3.2 Departure airdrome is not Operator's station airdrome and there is no possibility or worthiness to fix on-board voice recorder before flight; and

3.3.3 Aircraft performed not more than 8 consecutive flights outside of base airdrome with failed on-board voice recorder; and

3.3.4 Not more than 3 calendar days (72 hours) passed since detection of on-board voice recorder failed (only during international flights); and

3.3.5 On-board flight data registration system, envisaged by requirements is operating.

4. Automatic Deployable Flight Recorder (ADFR)

4.1 Operation

4.1.1 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; Recovery (Doc 10054) for more information on ADFR.

Note 1: *If an integrated ELT of a type that is activated in flight is used within an ADFR it could be-*
an alert shall be made to the flight crew when the ADFR is no longer captive to the aircraft;

- *the flight crew shall have no means to disable ADFR deployment when the aircraft is airborne;*

- *the ADFR shall contain an integrated ELT, which shall activate automatically during the deployment sequence. Such ELT may be of a type that is activated in-flight and provides information from which a position can be determined; and*
- *the integrated ELT of an ADFR shall satisfy the same requirements as an ELT required to be installed on an aeroplane. The integrated ELT shall at least have the same performance as the fixed ELT to maximize detection of the transmitted signal.*

Note 2: *Refer to the Manual on Location of Aircraft in Distress and Flight Recorder Data a means to comply with requirements of OPS 1.821.*

5. Data Link Recorder (DLR)

5.1 Applications to be recorded

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

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

5.1.2 Messages applying to the applications listed in Table A1-2 shall be recorded. Applications without the asterisk (*) are mandatory applications which shall be recorded regardless of the system complexity. Applications with an (*) shall be recorded only as far as is practicable given the architecture of the system

6. Glight Crew-Machine Interface Recording

6.1 Operation Start and Stop Logic

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

6.2 Classes

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

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

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

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

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

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

6.3 Applications to be recorded

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

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

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

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

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

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

7. Inspections of Flight Recorder Systems

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

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

7.3 Recording inspections shall be carried out as follows:

(a) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;

(b) the 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;

(c) 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;

(d) 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;

(e) 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

(f) 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.

(g) An examination of the recorded messages on DLR or DLRS shall be carried out by replay of the DLR or DLRS recording.

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

7.5 A report of the recording system shall be made available to SCAA for surveillance purposes within 7 days after issue CRS on A/C with inspected the recording system.

7.6 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 A 1-1. PARAMETER GUIDANCE FOR CRASH PROTECTED FLIGHT DATA RECORDERS

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 or calibrated airspeed		95 km/h (50 kt) to max V_{So} *(Note 1)* V_{So} to 1.2 V_D *(Note 2)*	1	±5% ±3%	1 kt (0.5 kt recommended)
4.	Heading (primary flight crew reference)		360°	1	±2°	0.5°

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
5.	Normal acceleration (*Note 3*)	Application for type certification is submitted to a Contracting State 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 to a Contracting State 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)*		Full range	1 (per engine)	±2%	0.2% of full range or the resolution required to operate the aircraft

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
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

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
14.	Outside air temperature		Sensor range	2	±2°C	0.3°C
15. *	Autopilot/auto throttle/AFCS mode and engagement status		A suitable combination of discretes	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

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
18.	Pilot Input and/or control surface position primary controls (pitch, roll,yaw) *(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	0.2% 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

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
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)

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
27.	Air/ground status		Discrete	1		
28. *	GPWS/TAWS/GCAS status (selection of terrain display mode including pop-up display status) and (terrain alerts, both caution and warnings, and advisories) and (on/off switch position)		Discrete	1		
29. *	Angle of attack		Full range	0.5	As installed	0.3 % of full range
30. *	Hydraulics, each system (low pressure)		Discrete	2		0.5% of full range
31. *	Navigation data (latitude/longitude, ground speed and drift angle) (Note 7)		As installed	1	As installed	
32. *	Landing gear and gear selector position		Discrete	4	As installed	

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
33. *	Groundspeed		As installed	1	Data should be obtained from the most accurate system	1 kt
34.	Brakes (left and right brake pressure, left and right brake pedal position)		(Maximum metered brake range, discretes or full range)	1	±5%	2% of full range
35. *	Additional engine parameters (EPR, N1, indicated vibration level, N2, EGT, fuel flow, fuel cut-off lever position, N3, engine fuel metering valve position)	Engine fuel metering valve position: Application for type certification is submitted to a Contracting State 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)		Discretes	1	As installed	
37. *	Windshear warning		Discrete	1	As installed	

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
38. *	Selected barometric setting (pilot, co-pilot)		As installed	64	As installed	0.1 mb (0.01 in-Hg)
39. *	Selected altitude (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
40. *	Selected speed (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
41. *	Selected Mach (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
42. *	Selected vertical speed (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
43. *	Selected heading (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection

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. *	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	

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
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		As installed	1	As installed	

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
60. *	Primary navigation system reference (GNSS, INS, VOR/DME, MLS, Loran C, localizer glideslope)		As installed	4	As installed	
61. *	Ice detection		As installed	4	As installed	
62. *	Engine warning each engine vibration		As installed	1	As installed	
63. *	Engine warning each engine over temperature		As installed	1	As installed	
64. *	Engine warning each engine oil pressure low		As installed	1	As installed	
65. *	Engine warning each engine over speed		As installed	1	As installed	
66. *	Yaw Trim Surface Position		Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range
67. *	Roll Trim Surface Position		Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range

Serial number	Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
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		

Serial number		Parameter	Applicability	Measurement range	Maximum Sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
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 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 recommended)	16 ft/min

Note: *At least first 16 parameters satisfy the requirements for a Type II FDR.*
At least first 32 parameters satisfy the requirements for a Type I FDR.
At least all 78 parameters satisfy the requirements for a Type IA FDR.

Other Notes:

1. *V_{So} 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 airplanes with independed pilot input on primary controls, each pilot input on primary controls need 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 A 1-2. 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 datalink 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 aeroplane are reported within the message they shall be recorded unless data from the same source are recorded on the FDR.	M*

Item No.	Application type	Application description	Recording content
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*

KKey:

C: *Complete contents recorded.*

M: *Information that enables correlation to any associated records stored separately from the aeroplane.*

****:*** *Applications to be recorded only as far as is practicable given the architecture of the system.*

TABLE A 1-3. PARAMETER GUIDANCE FOR AIRCRAFT DATA RECORDING SYSTEMS

No.	Parameter name	Minimum recording range	Maximum recording interval seconds in	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	

No.	Parameter name	Minimum recording range	Maximum recording interval seconds in	Minimum recording accuracy	Minimum recording resolution	Remarks
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		2 (1 if available)	As installed (±15 m (±50 ft) recommended)	1.5 m (5 ft)	
	d) Ground speed	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 ±0.45gr 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	

No.	Parameter name	Minimum recording range	Maximum recording interval seconds in	Minimum recording accuracy	Minimum recording resolution	Remarks
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°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	Engine RPM	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	

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

No.	Parameter name	Minimum recording range	Maximum recording interval seconds in	Minimum recording accuracy	Minimum recording resolution	Remarks
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 (±5°C recommended)	1° Celsius	
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	

No.	Parameter name	Minimum recording range	Maximum recording interval seconds in	Minimum recording accuracy	Minimum recording resolution	Remarks
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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ATTACHMENT 1. FLIGHT DATA RECOVERY

Supplementary to Chapter 4.5.3.

Guidance for flight data recovery

1. PURPOSE AND SCOPE

1.1. As indicated above crash protected flight recorders may include one or more of the following systems: a FDR, CVR, AIR and/or DLR. A combination recorder includes at least a CVR and FDR and any combination of other systems in a single flight recorder. The flight recorder provisions aim at improving the overall probability of timely recovery of flight data needed for accident investigation. The systems and related procedures should significantly improve the overall probability of recovering flight data when compared to conventional flight recorders with 30 day underwater location device (ULD) batteries.

1.2. Standard 4.5.1 requires two combination recorders (FDR/CVR) to be included in the design specifications when the application for type certification is submitted after 1 January 2016.

Additionally, to address the timely recovery of flight data, a Standard and Recommendation applicable in 2021 and 2019, .4.5.2, require/recommend replacing the rear combination recorder with an automatic deployable flight recorder (ADFR). An ADFR as defined in Appendix 1,

Section 4, is a technology that is believed to provide the desired level of increased probability of recovering flight data and can contribute to locating an accident site.

1.3. Standard 4.5.3 is a performance base alternative to the prescriptive Standards described in 1.2 above. Scenarios for maintaining an equivalent level of performance when applying 4.5.3 may be the following:

(a) On an aeroplane that is required to have a combination recorder (FDR/CVR) and an ADFR, the ADFR could be substituted by:

(b) A means of making the full dataset available, as it would be recorded on a combination recorder, in a timely manner after an accident, as what would have been the case with an ADFR. The aeroplane would also need to be equipped with a means of contributing to the location of an accident site such as a system for locating an aeroplane in distress.

(c) Having two combination recorders (FDR/CVR), a system for locating an aeroplane in distress and a means of making a set of flight data available in a timely manner after an accident, as what would have been the case with an

ADFR. The dataset could be limited to a subset of FDR and CVR data because the full dataset will be available from at least one of the two combination recorders when recovered.

1.4. Other technologies may be brought to bear to meet the performance improvement goal.

This Attachment provides guidance to aid in the evaluation of systems and procedures intended to support this means of flight data recovery.

2. BACKGROUND

2.1. When an accident occurs over water it is beneficial for the investigation to recover critical flight data in a timely manner. Once recovered, flight recorders have been highly reliable.

However, there have been instances in which the search for recorders has been very long, flight data has never been recovered or where data were lost due to damage from exposure to severe fire or underwater conditions. Examples of these scenarios may be found in the GADSS CONOPS, Appendix C: Concept Scenario.

2.2. When an aeroplane has an accident in water and becomes submerged, deployable recorders are a technology that can be used to recover flight data without the delay of a long underwater recovery. However, in many cases an underwater search and recovery of wreckage may still be required to determine the cause of an accident. Also, ADFR, if installed will complement a fixed combination recorder (FDR/CVR) to improve the probability that at least one recorder is recovered successfully.

2.3. Other technologies based on transmission of flight data, prior to an accident may be useful to recover some CVR and FDR data quickly without any search required. Furthermore, such data streamed from an aircraft in a distress situation or streamed continuously throughout the flight may enable near real time trend analysis on the ground that could potentially allow early detection and mitigation of factors that might lead to an accident. Such streaming technology is evolving and already exists to some° on some airframes. As the performance of datalink technology improves, these practices are expected to be more widely adopted due to the potential economic and safety benefits that result from the availability of near real time flight data.

2.4. The CVR/FDR data required for timely flight data availability depends on the configuration and the impact on the overall probability of meeting the needs of accident investigation in a timely manner. In the scenario where the ADFR replaces one of two combination recorders (FDR/CVR), the ADFR should meet all the requirements for data recording as defined in Item 1 and 2 (i.e. the full dataset). For flight data systems that stream data and operate in addition to two installed combination recorders (FDR/CVR), a subset of the required parameters over a specified duration may be provided as described in the following sections. The objective is to provide flight data that allows a timely determination of the cause of the accident to the extent possible. In many cases

the ultimate root cause of an accident can only be definitively determined after physical examination of the wreckage.

2.5. The requirements for CVR information are detailed in Item 2. Systems that provide timely flight data recovery in addition to two combination recorders, should at a minimum include CVR recorded data from the time the airplane enters the distress phase (refer to table for distress events as per Table XX-1 in Appendix XX to OPS1.821) to the end of the flight. To the extent possible historical data prior to the declaration of distress should also be provided. In cruise the crew is not wearing the headset with the microphones and in such case most of the time all useable audio data from the CVR is contained on the Cockpit Area Microphone (CAM) Channel. The subset data from a CVR then could be limited to the audio from the CAM channel. Data streaming in support of timely flight data recovery may also support accident site location and consequently shorten the duration of any subsequent underwater search and recovery that may be required.

2.6. The list of mandatory FDR parameters depends on the date of individual certificate of airworthiness of each aircraft and are listed in Item 1 “Flight data recorders and aircraft data recording systems”. Systems for the timely recovery of flight data in addition to two combination recorders should at a minimum provide all the mandatory parameters from the time the airplane enters the distress phase to the end of the flight. A subset of parameters may be used if that subset is shown to provide a high likelihood of supporting initial accident investigation needs with respect to identifying the cause of the accident. Also to the extent possible, historical data prior to the time the flight enters the distress phase should be provided. The availability of a subset parameters soon after an accident, with enough information to provide an indication of malfunctions that may have led to the accident, could support immediate safety recommendations. For example, soon after one of the major accidents over the ocean, aircraft monitoring parameters provided enough information to introduce recommendations that led to maintenance actions and training actions well in advance of recovery of the aircraft’s recorders.

The following is the subset of parameters that should be transmitted during the distress phase of flight:

- Time;
- Altitude (pressure or radio);
- Airspeed (indicated or calibrated);
- Heading (primary flight crew reference);
- Acceleration (normal, lateral and longitudinal);
- Attitude (pitch, roll, yaw or sideslip angle);
- Manual radio transmission keying (for CVR/FDR synchronization reference);
- Engine thrust/power on each engine;
- Autopilot/auto throttle/AFCS mode or engagement status;

- Primary flight control surface position and/or primary flight control pilot input (pitch, roll, yaw);
- Red or master warnings; and
- Angle of attack (if available).

2.7. The operator collecting CVR and FDR data via data streaming for the purpose of an investigation should make the data available to the appropriate accident investigation authorities without delay. Procedures for retrieval, packaging and transmission of data to the appropriate authorities should be established in advance with due consideration for data security, confidentiality and authenticity.

3. PERFORMANCE ASSESSMENTS

3.1. As stated in Standard 4.5.3, a specific performance assessment must be conducted to demonstrate that the system maintains an equivalent level of performance. The specific performance assessment should consider the entire system including operational procedures, airborne equipment and ground based infrastructure. The assessment must include at least the following elements which are discussed in the following sections:

(a) Capabilities of the operator: The assessment should take into account the capabilities of the operator or an agent thereof to collect, archive, protect, and disseminate CVR/FDR data collected from an airplane that was involved in an accident. The assessment should include an evaluation of the operators total use of datalink for near real time collection of maintenance data, or other relevant operational data. The overall sophistication of the operator with respect to tracking of aircraft under normal and distress situations should be included in the assessment as well as the operators established processes and procedures for handling data streamed from aircraft.

(b) Capability of the aeroplane and its systems: The assessment should include the total airplane equipage with respect to:

(1) Number and location of FDRs/CVRs and their historical reliability. At a minimum, two combination recorders (FDR/CVR) should be installed where one may optionally be of a deployable type.

The historical reliability can be derived based on in-service use of similar devices. Consideration should be given to the history or aircraft accidents where similar equipment was deployed in order to determine the probability of recovery of at least one working combination recorder (FDR/CVR);

(2) Number and location of Underwater Location Devices (ULD). At a minimum an ULD should be attached to each fixed combination recorder (FDR/CVR).

Additionally a third ULD operating at 8.8 kHz may be included to increase the probability of finding the wreckage underwater;

(3) Overall Communication and Navigation Capabilities. The assessment should take into account the complete suite of navigation and communications capabilities that are available for aircraft tracking under normal, abnormal or distress situations. The operator's Standard Operational Procedures (SOP) for aircraft tracking should be considered;

(4) ELT Transmitters: Type, availability and performance of ELT transmitters that may improve accident site location. The historical reliability can be derived based on in-service use of similar devices. Consideration should be given to the history of aircraft accidents where similar equipment is used in order to determine the probability of recovery of at least one operational combination recorder (FDR/CVR); and

(5) System to locate an aeroplane in distress: Type, availability and performance of the system to locate an aeroplane in distress that may improve accident site location. Consideration should be given to the solution reliability and any interdependencies with the data streaming capabilities.

(c) Reliability of the means to recover the appropriate CVR channels and FDR data in a timely manner and avoiding the need for underwater retrieval: The assessment should include an evaluation of the reliability of each component of the system to provide timely flight data recovery. For example, the reliability of any satcom link used to transmit data should be evaluated including the joint reliability of multiple datalinks. The reliability of various datalinks under the condition of unusual aircraft attitudes or aircraft power outages should be considered. Ultimately, the joint reliability of all datalinks used for data streaming, the reliability of ULD and reliability or each fixed combination recorder (FDR/CVR) should be assessed.

(d) The capability to establish the location where an aircraft terminates controlled flight:

The assessment should include all aeroplane systems and other systems that may be used to locate an accident site. For example, the role that space based ADS-B may someday play in accident site location should be considered as well as the potential for ATS surveillance. The expected performance of any installed system to locate an aeroplane in distress should be included in the analysis.

(e) The ability of the data recovery mechanism to contribute to finding the location of an accident site: When flight data is streamed during a distress situation, the data may include aeroplane position information at a relatively high rate. This

data may lead to even more accurate accident site location than would be provided by any ELT or a system to locate an aeroplane in distress. The ability of such improved accuracy of accident site location to reduce the duration of an underwater search should be considered.

(f) Other specific mitigation measures: Where streaming of flight data is used in a system to do trend monitoring that may reduce the probability of an accident, this capability should also be included in the evaluation.

3.2. Overall performance evaluations should be a combination of quantitative and qualitative criteria. A quantitative analysis which aims to show the overall improvement in the probability of recovering flight data should be included. However, some value may also be given to qualitative criteria such as relative improvements in overall safety that may be achieved through the implementation of timely flight data recovery systems

4. EXAMPLE PERFORMANCE ASSESSMENTS

It’s possible to find in ICAO State Letter Ref.: SP 55/4-15/15 from 15 May 2015

ATTACHMENT 2. GUIDE TO CURRENT FLIGHT RECORDER PROVISIONS

(Supplementary to Chapter 3.1)

Table A2-1. Data link communications (DLC) recording installation clarification

Rows	Date individual certificate of airworthiness was first issued	Date aircraft type certificate issued or modification for DLC equipment first approved	Date of activation for use of DLC equipment	DLC recording required	SARP Reference
1	On or after 1 January 2016	On or after 1 January 2016	On or after 1 January 2016	Yes	6.3.3.1.1
2	On or after 1 January 2016	Before 1 January 2016	On or after 1 January 2016	Yes	6.3.3.1.1
3	Before 1 January 2016	On or after 1 January 2016	On or after 1 January 2016	Yes	6.3.3.1.2
4	Before 1 January 2016	Before 1 January 2016	Before 1 January 2016	No	6.3.3.1.2
5	Before 1 January 2016	Before 1 January 2016	On or after 1 January 2016	No*	6.3.3.1.2 6.3.3.1.3

* Not required but recommended.

1. TABLE HEADINGS

1.1 Date individual certificate of airworthiness was first issued is self-explanatory.

1.2 Date aircraft type certificate issued or modification for DLC equipment first approved is the date that allows the installation of DLC equipment on the aircraft and refers to the airworthiness approval of the installation of aircraft components such as the structural and wiring provisions with which the DLC equipment needs to be compliant. These airworthiness approvals are usually in a form of a type certificate, a supplemental type certificate or an amended type certificate.

1.2.1 It is not uncommon for original customers of an aircraft that have airworthiness approvals related to DLC capability, to choose not to install the DLC equipment or choose not to have it activated even if the aircraft is prepared for it.

1.3 Date of activation for use of DLC equipment refers to the date that a DLC application referred to in 5.1.2 of Appendix 1 was first activated for use.

1.3.1 Datalink communication (DLC) equipment as used in these provisions, refer to the physical unit(s) (e.g. box(es)) that was approved to a minimum performance standard issued by a certification authority (e.g. TSO or ETSO).

1.3.2 The activation of DLC functions refer to approved software activation of DLC functions or software updates.

1.4 DLC recording required refers to the requirement to record DLC message in accordance with provisions 3.1.1 and 3.1.2.

2. GENERAL

2.1 It is the date on which the CVR capabilities of the aircraft were approved that determines the DLC recording requirement. The date in which the DLC equipment was approved to a minimum performance standard is not relevant for CVR recording requirement purposes.

2.2 For the DLC equipment to be compliant with an airworthiness approval, it needs to be able to use, without modification, the installed aircraft components that are necessary to provide the DLC function such as the:

a) datalink router (e.g. hosted in the communications management unit);

b) radios (e.g. VHF, HF datalink, Satcom) and related antennas.

2.3 Approved software updates to installed equipment or software activation of functions normally do not alter the DLC equipment compliance with the rest of the aircraft systems.

3. EXAMPLES

3.1 For rows 1 and 2:

– The recording requirement is driven by Standard 3.1.1 which is based on when the individual certificate of airworthiness was first issued. Any subsequent airworthiness modifications related to DLC capability do not exempt the aircraft from the requirement to record DLC messages.

3.2 For rows 3 to 5 — General:

– The recording requirement is driven by Standard 3.1.2 and is based on whether or not the aircraft has an airworthiness approval for DLC capabilities and the date of its issue.

– Since there was no requirement to record DLC messages prior to 1 January 2016, airworthiness approvals related to DLC capability issued before that date did not necessarily include this function.

3.3 For row 3:

– The recording requirement applies regardless of when the certificate of airworthiness was issued, because an airworthiness approval related to DLC capability was issued on or after 1 January 2016. The date of installation of the equipment would typically be after the airworthiness approval.

3.4 For row 4:

– The recording requirement does not apply because the aircraft's certificate of airworthiness and an airworthiness approval related to DLC capability was issued before 1 January 2016. The date of installation of DLC equipment is not a factor for DLC message recording requirements as long as the equipment is compliant with that airworthiness approval.

3.5 For row 5:

– The recording requirement does not apply because the aircraft's certificate of airworthiness and an airworthiness approval related to DLC capability was issued before 1 January 2016. The date of installation of DLC equipment is not a factor for DLC message recording requirements as long as the equipment is compliant with that airworthiness approval.

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