



GOVERNMENT OF INDIA

OFFICE OF DIRECTOR GENERAL OF CIVIL AVIATION
TECHNICAL CENTRE, OPP SAFDARJANG AIRPORT, NEW DELHI

**CIVIL AVIATION REQUIREMENTS
SECTION 2 - AIRWORTHINESS
SERIES 'I', PART V
ISSUE I, 12TH DECEMBER 1996**

EFFECTIVE: FORTHWITH

Subject: FLIGHT DATA RECORDERS

1. PURPOSE:

Rule 57 of Aircraft Rules, 1937 requires that every aircraft shall be fitted and equipped with instruments and equipment, including radio apparatus and special equipment as may be specified according to the use and circumstances under which the flight is to be conducted.

This part of Civil Aviation Requirement lays down the requirements for fitment of Flight Data Recorders on aircraft registered in India. All aircraft imported/purchased or leased for operation in India shall meet the applicability requirements laid down in this CAR.

This CAR has been issued under the provisions of Rule 29C of the Aircraft Rules, 1937.

2. DEFINITIONS :

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

Note: Detailed guidance on flight data recorders is contained in Appendix I.

3. APPLICABILITY REQUIREMENTS:

3.1 AEROPLANES - Flight data recorders — types

3.1.1 A Type I FDR shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation.

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

Note: Parameters of Type I and Type II flight data recorders is contained in Appendix II.

3.1.3 Following types of FDRs shall not be used:

- a) Engraving metal foil FDRs
- b) Analogue FDRs using frequency modulation (FM)
- c) Photographic film FDRs

3.1.4 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2005, which utilize data link communications and are required to carry a CVR, shall record on a flight recorder, all data link communications to and from the aeroplane. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

3.1.4.1 From 1 January 2007, all aeroplanes which utilize data link communications and are required to carry a CVR shall record on a flight recorder, all data link communications to and from the aeroplane. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

3.1.4.2 Sufficient information to derive the content of the data link communications message and, whenever practical, the time the message was displayed to or generated by the crew shall be recorded.

Note.— Data link communications include, but are not limited to, automatic dependent surveillance – contract (ADS-C), controller-pilot data link communications (CPDLC), data link flight information services (D-FIS) and aeronautical operational control (AOC) messages

3.1.5 It is recommended that all aeroplanes of a maximum certificated take-off mass over 5 700 kg, required to be equipped with a FDR and a CVR, may alternatively be equipped with two combination recorders (FDR/CVR).

3.1.6 It is recommended that all multi-engined turbine powered aeroplanes of a maximum certificated take-off mass of 5 700 kg or less, required to be equipped with a FDR and/or a CVR, may alternatively be equipped with one combination recorder (FDR/CVR).

3.1.7 A Type IA FDR shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation. The parameters that satisfy the requirements for a Type IA FDR are listed below. The parameters without an asterisk (*) are mandatory parameters which shall be recorded. 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.

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

- Pressure altitude
- Indicated airspeed or calibrated airspeed

- Air-ground status and each landing gear air-ground sensor when practicable
- Total or outside air temperature
- Heading (primary flight crew reference)
- Normal acceleration
- Lateral acceleration
- Longitudinal acceleration (body axis)
- Time or relative time count
- Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
- Groundspeed*
- Radio altitude*

3.1.7.2 The following parameters satisfy the requirements for attitude:

- Pitch attitude
- Roll attitude
- Yaw or sideslip angle*
- Angle of attack*

3.1.7.3 The following parameters satisfy the requirements for engine power:

- Engine thrust/power: propulsive thrust/power on each engine, cockpit thrust/power lever position
- Thrust reverse status*
- Engine thrust command*
- Engine thrust target*
- Engine bleed valve position*
- Additional engine parameters*: EPR, N1, indicated vibration level, N2, EGT, TLA, fuel flow, fuel cut-off lever position, N3

3.1.7.4 The following parameters satisfy the requirements for configuration:

- Pitch trim surface position
- Flaps*: trailing edge flap position, cockpit control selection
- Slats*: leading edge flap (slat) position, cockpit control selection
- Landing gear*: landing gear, gear selector position
- Yaw trim surface position*
- Roll trim surface position*
- Cockpit trim control input position pitch*
- Cockpit trim control input position roll*
- Cockpit trim control input position yaw*
- Ground spoiler and speed brake*: Ground spoiler position, ground spoiler selection, speed brake position, speed brake selection
- De-icing and/or anti-icing systems selection*
- Hydraulic pressure (each system)*
- Fuel quantity*
- AC electrical bus status*
- DC electrical bus status*
- APU bleed valve position*
- Computed centre of gravity*

3.1.7.5 The following parameters satisfy the requirements for operation:

- Warnings
- Primary flight control surface and primary flight control pilot input: pitch axis, roll axis, yaw axis
- Marker beacon passage
- Each navigation receiver frequency selection
- Manual radio transmission keying and CVR/FDR synchronization reference
- Autopilot/auto throttle/AFCS mode and engagement status*
- Selected barometric setting*: pilot, first officer
- Selected altitude (all pilot selectable modes of operation)*
- Selected speed (all pilot selectable modes of operation)*
- Selected Mach (all pilot selectable modes of operation)*
- Selected vertical speed (all pilot selectable modes of operation)*
- Selected heading (all pilot selectable modes of operation)*
- Selected flight path (all pilot selectable modes of operation)*: course/DSTRK, path angle
- Selected decision height*
- EFIS display format*: pilot, first officer
- Multi-function/engine/alerts display format*
- GPWS/TAWS/GCAS status*: selection of terrain display mode including pop-up display status, terrain alerts, both cautions and warnings, and advisories, on/off switch position
- Low pressure warning*: hydraulic pressure, pneumatic pressure
- Computer failure*
- Loss of cabin pressure*
- TCAS/ACAS (traffic alert and collision avoidance system/airborne collision avoidance system)*
- Ice detection*
- Engine warning each engine vibration*
- Engine warning each engine over temperature*
- Engine warning each engine oil pressure low*
- Engine warning each engine over speed*
- Wind shear warning*
- Operational stall protection, stick shaker and pusher activation*
- All cockpit flight control input forces*: control wheel, control column, rudder pedal cockpit input forces
- Vertical deviation*: ILS glide path, MLS elevation, GNSS approach path
- Horizontal deviation*: ILS localizer, MLS azimuth, GNSS approach path
- DME 1 and 2 distances*
- Primary navigation system reference*: GNSS, INS, VOR/DME, MLS, Loran C, ILS
- Brakes*: left and right brake pressure, left and right brake pedal position
- Date*
- Event marker*
- Head up display in use*
- Para visual display on*

Note 1.— Parameter requirements, including range, sampling, accuracy and resolution, as contained in the Minimum Operational Performance Specification

(MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

Note 2.— The number of parameters to be recorded will depend on aeroplane complexity. Parameters without an () are to be recorded regardless of aeroplane complexity. Those parameters designated by an (*) are to be recorded if an information source for the parameter is used by aeroplane systems and/or flight crew to operate the aeroplane.*

3.2 Flight data recorders – duration (aeroplanes)

All FDRs shall be capable of retaining the information recorded during at least the last 25 hours of their operation, except for the Type IIA FDR which shall be capable of retaining the information recorded during at least the last 30 minutes of its operation.

3.3 Flight data recorders - aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1989

3.3.1 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg shall be equipped with a Type I FDR.

3.3.2 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg, up to and including 27 000 kg and engaged in commercial operations shall be equipped with a Type II FDR. It is recommended that such aeroplanes when engaged in General Aviation operations should be equipped with Type II FDR.

3.3.3 It is recommended that all multi-engined turbine powered aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 1990 should be equipped with a Type IIA FDR.

3.4 Flight data recorders — aeroplanes for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989

3.4.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 5 700 kg, except those in 3.4.2 shall be equipped with a FDR which shall record time, altitude, airspeed, normal acceleration and heading. These FDRs may record such additional parameters as are necessary to determine pitch attitude, roll attitude, radio transmission keying and power on each engine.

3.4.2 All turbine-engined aeroplanes of 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 Type II FDR.

3.5 Flight data recorders — aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1987

3.5.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 5 700 kg shall be equipped with a FDR which shall record time, altitude, airspeed, normal acceleration and heading.

3.5.2 It is recommended that all turbine-engined aeroplanes of 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 should be equipped with a FDR which should record, in addition to time, altitude, airspeed, normal acceleration and heading, such additional parameters as are necessary to meet the objectives of determining:

- 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.

3.6 Flight data recorders — aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2005

All aeroplanes of a maximum certificated take-off mass of over 5 700 kg shall be equipped with a Type IA FDR.

3.7 Requirements given in para 3.1.7 and para 3.3.3. to para 3.5.2. are not applicable to General Aviation aeroplanes.

4.1 HELICOPTERS - Flight data recorders — types

4.1.1 A Type IV FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power and operation.

4.1.2 A Type V FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude and engine power.

Note: Parameters of Type IV and Type V flight data recorders is contained in Appendix III.

4.1.3 The use of engraving metal foil FDRs, analogue FDRs using frequency modulation (FM) and photographic film FDRs is not acceptable.

4.1.4 All helicopters for which the individual certificate of airworthiness is first issued after 1 January 2005, which utilize data link communications and are required to carry a CVR, shall record on a flight recorder, all data link communications to and from the helicopter. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

- 4.1.4.1 From 1 January 2007, all helicopters which utilize data link communications and are required to carry a CVR, shall record on a flight recorder, all data link communications to and from the helicopter. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.
- 4.1.4.2 Sufficient information to derive the content of the data link communications message, and, whenever practical, the time the message was displayed to or generated by the crew shall be recorded.

Note.— Data link communications include, but are not limited to, automatic dependent surveillance (ADS), controller-pilot data link communications (CPDLC), data linkflight information services (D-FIS) and aeronautical operational control (AOC) messages.

- 4.1.5 It is recommended that all helicopters of a maximum certificated take-off mass over 2 700 kg, required to be equipped with an FDR and/or a CVR, may alternatively be equipped with one combination recorder (FDR/CVR).
- 4.1.6 A Type IVA FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power, configuration and operation. The parameters that satisfy the requirements for a Type IVA FDR are listed in the paragraphs below. The parameters without an asterisk (*) are mandatory parameters which shall be recorded. 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.

- 4.1.6.1 The following parameters 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*

- 4.1.6.2 The following parameters satisfy the requirements for attitude:

- Pitch attitude
- Roll attitude
- Yaw rate

- 4.1.6.3 The following parameters satisfy the requirements for engine power:

- Power on each engine: free power turbine speed (Nf), engine torque, engine gas generator speed (Ng), cockpit power control position
- Rotor: main rotor speed, rotor brake
- Main gearbox oil pressure*
- Gearbox oil temperature*: main gearbox oil temperature, intermediate gearbox oil temperature, tail rotor gearbox oil temperature
- Engine exhaust gas temperature (T4)*
- Turbine inlet temperature (TIT)*

4.1.6.4 The following parameters satisfy the requirements for configuration:

- Landing gear or gear selector position*
- Fuel quantity*
- Ice detector liquid water content*

4.1.6.5 The following parameters satisfy the requirements for operation:

- Hydraulics low pressure
- Warnings
- Primary flight controls — pilot input and/or control output position: collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal, controllable stabilator, hydraulic selection
- Marker beacon passage
- Each navigation receiver frequency selection
- AFCS mode and engagement status*
- Stability augmentation system engagement*
- Indicated sling load force*
- Vertical deviation*: ILS glide path, MLS elevation, GNSS approach path
- Horizontal deviation*: ILS localizer, MLS azimuth, GNSS approach path
- DME 1 and 2 distances*
- Altitude rate*
- Ice detector liquid water content*
- Helicopter health and usage monitor system (HUMS)*: engine data, chip detectors, track timing, exceedance discrettes, broadband average engine vibration

Note 1.— Parameter requirements, including range, sampling, accuracy and resolution, as contained in the Minimum Operational Performance Specification (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

Note 2.— The number of parameters to be recorded will depend on helicopter complexity. Parameters without an () are to be recorded regardless of helicopter complexity. Those parameters designated by an (*) are to be recorded if an information source for the parameter is used by helicopter systems and/or flight crew to operate the helicopter.*

4.1.7 Flight data recorders – duration (helicopters)

Types IV and V FDRs shall be capable of retaining the information recorded during at least the last ten hours of their operation.

4.1.8 Flight data recorders - helicopters for which the individual certificate of airworthiness is first issued on or after 1 January 1989

- 4.1.8.1 All helicopters of a maximum certificated take-off mass of over 7 000 kg shall be equipped with a Type IV FDR.
- 4.1.8.2 It is recommended that all helicopters of a maximum certificated take-off mass of over 2 730 kg up to and including 7 000 kg should be equipped with a Type V FDR.

4.1.9 Flight data recorders - helicopters for which the individual certificate of airworthiness is first issued after 1 January 2005

- 4.1.9.1 All helicopters of a maximum certificated take-off mass of over 3 180 kg shall be equipped with a Type IVA FDR with a recording duration of at least 10 hours.

Note.— A single, combination CVR/FDR is acceptable.

5. Notwithstanding the provisions of para 3 and 4 of this CAR, all multi-engined aircraft (aeroplanes and helicopters) shall be equipped with FDR where STC is available.

6. GENERAL REQUIREMENTS:

- 6.1 The flight recorder shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information is preserved, recovered and transcribed. The recorder shall meet the prescribed crashworthiness and fire protection specifications.
- 6.2 The Flight recorders shall not be switched off during flight time.
- 6.3 In order to preserve the recorded information, the Flight Data Recorder shall be deactivated upon completion of flight following an accident or incident. The FDR shall not be re-activated before their disposition in accordance with instructions issued by DGCA.
- 6.4 Operational checks and evaluation of recordings from the flight data and cockpit voice recorder systems shall be conducted as per the manufacturer's recommendations to ensure the continued serviceability of the recorders. Proper records shall be maintained for the readouts and evaluation carried out by the operator for each serial number of the FDR installed on the aircraft which should be authenticated by the QCM or a person acceptable to DGCA for satisfactory recording and for completion of the specified hours of the FDR.

Note.— Procedures for the inspections of the FDR systems are given in Appendix IV.

- 6.5 The Flight Data Recorders shall be of an approved type and shall meet the specification of TSO C-51 (a) or any other specification acceptable to DGCA.

- 6.6 The recorder shall be maintained by an appropriately qualified engineer in an approved manner.
- 6.7 Aeroplanes equipped with QAR/PMR systems should be capable of storing the recorded data for the at least last 50 hours of operation. The QAR/PMR tape should be removed on or before completion of the tape and preserved for a period of 30 days. The cassettes pertaining to incidents should be preserved unless cleared by DGCA.
- 6.8 All operators shall carry out FDR readout at their own or any approved facility after such duration as required by DGCA for each serial number of the unit installed on the aircraft in order to ensure the following:
- a) all parameters are recorded and the parameter values are logical.
 - b) monitoring the performance of aircraft and its systems.
- 6.9 At the time of issue and renewal of Certificate of Airworthiness, the latest readout of the FDR shall be submitted to DGCA to confirm that all parameters are being recorded and the parameter values are logical. In particular the following parameters of FDR should be checked:
- a) Altitude: For ground level and cruising altitude
 - b) Airspeed: On ground and in cruise
 - c) Heading: As aligned with runway for takeoff, landing and enroute
 - d) 'g': At ground, cruise and at touch down
 - e) Engine parameters: EPR, EGT and Fuel Flow should be checked for their expected values during various phases of flight.
 - f) Discrete parameters:
 - Landing Gear position
 - Flaps positions
 - Slats positions
 - Radio Transmission key positions, etc.

Similar evaluation of the FDR printout shall be carried out every time a print out is taken.

- 6.10 The COSL shall specify the reliability control of DFDR, which is arrived at, on the basis of the recommendations of the manufacturer of the unit.
- 6.11 The procedure for compliance with the requirements shall be documented in the Operator's Quality Control Manual.

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APPENDIX 'I'

Guidance on Flight data recorder (FDR)

1. General requirements
 - 1.1 The FDR is to record continuously during flight time.
 - 1.2 The FDR container is to:
 - a) be painted a distinctive orange or yellow colour;
 - b) carry reflective material to facilitate its location; and
 - c) have securely attached an automatically activated underwater locating device.
 - 1.3 The FDR is to be installed so that:
 - a) the probability of damage to the recording is minimized. To meet this requirement it should be located as far aft as practicable. In the case of pressurized aeroplanes it should be located in the vicinity of the rear pressure bulkhead;
 - b) it receives its electrical power from a bus that provides the maximum reliability for operation of the FDR without jeopardizing service to essential or emergency loads; and
 - c) there is an aural or visual means for pre-flight checking that the FDR is operating properly.
2. Parameters to be recorded
 - 2.1 *Type I FDR*. This FDR will be capable of recording, as appropriate to the aeroplane, at least the 32 parameters in Appendix II. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.
 - 2.2 *Types II and IIA FDRs*. These FDRs will be capable of recording, as appropriate to the aeroplane, at least the first 15 parameters in Appendix II. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.
 - 2.3 *Type IV FDR*. This FDR will be capable of recording, as appropriate to the helicopter, at least the thirty parameters in Appendix III. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.
 - 2.4 *Type V FDR*. This FDR will be capable of recording, as appropriate to the helicopter, at least the first fifteen parameters in Appendix III. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.
3. Additional information

- 3.1 A Type IIA FDR, in addition to a 30-minute recording duration, is to retain sufficient information from the preceding take-off for calibration purposes.
- 3.2 The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by approved methods.
- 3.3 The manufacturer usually provides the following information in respect of the FDR:
 - a) manufacturer's operating instructions, equipment limitations and installation procedures;
 - b) parameter origin or source and equations which relate counts to units of measurement; and
 - c) manufacturer's test reports.
- 3.4 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/ maintenance information should be maintained by the operator. The documentation must be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

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APPENDIX 'II'

AEROPLANES - PARAMETERS FOR FLIGHT DATA RECORDERS

Serial Number	Parameter	Measurement Range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
1.	Time (UTC when available, otherwise elapsed time)	24 hours	4	±0.125% per hour
2.	Pressure altitude	-300m (-1000 ft) to maximum certified altitude of aircraft + 1500 m (+5000 ft)	1	±30 m to ± 200 m (±100 ft to ±700 ft)
3.	Indicated Airspeed	95km/h (50 kt) to max V _{So} (Note 1) V _{So} to 1.2 V _D (Note 2)	1	±5% ±3%
4.	Heading	360	1	±2°
5.	Normal Acceleration	-3 g to + 6g	0.125	±1% of maximum range excluding datum error of 5%
6.	Pitch Altitude	±75°	1	±2°
7.	Roll attitude	±180°	1	±2°
8.	Radio transmission keying	On-off (one discrete)	1	
9.	Power on each engine (Note 3)	Full range	1 (per engine)	±2%
10.	Trailing edge flap or cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator
11.	Leading edge flap or cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator
12.	Thrust reverser position	Stowed, in transit, and reverse	1 (per engine)	
13.	Ground spoiler/speed brake position	Full range or each discrete	1	±2% unless higher accuracy uniquely required
14.	Outside air temperature	sensor range	2	±2°C
15.	Autopilot/ auto throttle/ AFCS mode and engaged status	A suitable combination of discreties	1	
Note :- The preceding 15 parameters satisfy the requirements for a Type II FDR.				
16.	Longitudinal acceleration	±1 g	0.25	±1.5% max range excluding datum error of ± 5 %
17.	Lateral acceleration	±1 g error of ±5 %	0.25	±1.5% max range excluding datum
18.	Pilot input and/or control surface position-primary controls (pitch, roll, yaw) (Note 4)	Full range	1	±2% unless higher accuracy uniquely required

Serial Number	Parameter	Measurement Range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
19.	Pitch Trim Position	Full range	1	±3% unless higher accuracy uniquely required
20.	Radio altitude	- 6 m to 750 m (-20 ft to 2500 ft)	1	±0.6m (±2 ft) or ±3% whichever is greater below 150m (500 ft) and ±5% above 150 m (500 ft)
21.	Glide path deviation	Signal range	1	±3%
22.	Localizer deviation	Signal range	1	±3%
23.	Marker beacon passage	Discrete	1	
24.	Master warning	Discrete	1	
25.	NAV 1 and 2 frequency selection (Note 5)	Full range	4	As installed
26.	DME 1 and 2 distance (Notes 5 and 6)	0-370km	4	As installed
27.	Landing gear squat switch status	Discrete	1	
28.	GPWS (ground proximity warning system)	Discrete	1	
29.	Angle of attack	Full range	0.5	As installed
30.	Hydraulics, each system (low pressure)	Discrete	2	
31.	Navigation data (latitude/ longitude, ground speed and drift angle) (Note 7)	As installed	1	As installed
32.	Landing gear or gear selector position	Discrete	4	As installed

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

Notes:

1. V_{So} stalling speed or minimum steady flight speed in the landing configuration.
2. V_D design diving speed.
3. Record sufficient inputs to determine power.
4. For aeroplanes with conventional control systems "or" applies. For aeroplanes with non-mechanical control systems "and" applies. In aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface 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.

If further recording capacity is available, recording of the following additional information should be considered:

- a) operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority:
- 1) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source;
 - 2) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, etc.;
 - 3) warning and alerts data;
 - 4) the identity of displayed pages for emergency procedures and checklists.
- b) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs; and
- c) additional engine parameters (EPR, N1, EGT, fuel flow, etc.).

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APPENDIX 'III'

HELICOPTERS - PARAMETERS FOR FLIGHT DATA RECORDERS

Serial Number	Parameter	Measurement Range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
1.	Time (UTC when available, otherwise elapsed time)	24 hours	4	± 0.125% per hour
2.	Pressure altitude	-300m (-1000 ft) to max. certified altitude of aircraft +1500m(+5000 ft)	1	±30 m to ± 200 m (±100 ft to ± 700 ft)
3.	Indicated Airspeed	As the installed measuring system	1	±3%
4.	Heading	360°	1	±2°
5.	Normal Acceleration	-3 g to + 6g	0.125	±1%
6.	Pitch Altitude	±75°	0.5	±2°
7.	Roll attitude	±180°	0.5	±2°
8.	Radio transmission keying	On-off (one discrete)	1	
9.	Power on each engine	Full range	1 (per engine)	±2%
10.	Main rotor speed	50-130%	0.5	±2%
11.	Pilot input and/or control surface position-primary controls (collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal (Note 2))	Full range	1	±2% unless higher accuracy uniquely required.
12.	Hydraulics, each system (low pressure)	Discrete	2	
13.	Outside air temperature	Sensor range	2	±2°C
14.	Autopilot/ auto throttle/ AFCS mode and engagement status	A suitable combination of discretely	1	
15.	Stability augmentation system engagement	Discrete	1	
Note :- The preceding 15 parameters satisfy the requirements for a Type V FDR				
16.	Main gearbox oil pressure	As installed	1	As installed
17.	Main gearbox oil temperature	As installed	2	As installed
18.	Yaw acceleration (or yaw rate)	±1 g	0.25	±1.5% max range excluding datum (or yaw rate) error of ±5%
19.	Sling load force	0-200% of certified load	0.5	±3% of max range
20.	Longitudinal acceleration	±1 g	0.25	±1.5% max range excluding datum error of ± 5 %

Serial Number	Parameter	Measurement Range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
21.	Lateral acceleration	±1 g	0.25	±1.5% max range excluding datum error of ± 5 %
22.	Radio altitude	- 6 m to 750 m (-20ft to 2500 ft)	1	±0.6 m (±2 ft) or √3% whichever is greater below 150m (500 ft) and ±5% above 150 m (500 ft)
23.	Glide path deviation	Signal range	1	±3%
24.	Localizer deviation	Signal range	1	±3%
25.	Marker beacon passage	Discrete	1	
26.	Master warning	Discrete	1	
27.	NAV 1 and 2 frequency selection (Note 3)	Full range	4	As installed
28.	DME 1 and 2 distance (Notes 3 and 4)	0-370 km	4	As Installed
29.	Navigation data (latitude/longitude, ground speed) (Note 5)	As installed	2	As installed
30.	Landing gear or gear selector position	Discrete	4	As installed
Note:- The preceding 30 parameters satisfy the requirements for a Type IV FDR.				

Notes:

1. Record sufficient inputs to determine power.
2. For helicopters with conventional control systems "or" applies. For helicopters with non-mechanical control systems "and" applies.
3. If signal available in digital form.
4. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
- 5 If signals readily available.

If further recording capacity is available, recording of the following additional information should be considered:

a) operation 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).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) warning and alerts data;
- 4) the identity of displayed pages for emergency procedures and checklists.

b) additional engine parameters (EPR, N1, EGT, fuel flow, etc.).

Appendix IV

INSPECTION OF FLIGHT DATA RECORDERS
Supplementary to Para 6.4

This Appendix provides procedure to be followed by the operators of aircraft fitted with FDR.

1. Prior to the first flight of the day, the built-in test features on the flight deck for the FDR and Flight Data Acquisition Unit (FDAU), when installed, should be monitored.
2. Annual inspections should be carried out as follows:
 - a) the read-out of the recorded data from the FDR should ensure that the recorder operates correctly for the nominal duration of the recording;
 - b) the analysis of the FDR should evaluate the quality of the recorded data to determine if the bit error rate is within acceptable limits and to determine the nature and distribution of the errors;
 - c) a complete flight from the FDR should be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention should be given to parameters from sensors dedicated to the FDR. 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 read-out facility should have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;
3. Flight Data Recorder systems should 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. A report of the annual inspection should be made available on request to DGCA for monitoring purposes.
5. Calibration of the FDR system:
 - a) the FDR system should be re-calibrated at least every five years 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 should be a re-calibration performed as recommended by the sensor manufacturer, or at least every two years.

END