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 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 133A of the Aircraft Rules, 1937.

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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 (ADS), controller-pilot data link communications (CPDLC), data link flight information services (D-FIS) and aeronautical operational control (A OC) messages

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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

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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

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(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 shall 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.

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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 shall 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.

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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 1st 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 3,180 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.

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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 discretes, broadband average engine vibration

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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 3,180 kg up to and including 7,000 kg shall 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.

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5. Not withstanding 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 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.

6.2 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.

6.3 The Flight recorders shall not be switched off during flight time.

6.4 In order to preserve the recorded information, the Flight Data Recorder shall be deactivated upon completion of flight time following an accident or incident. The FDR shall not be re-activated before their disposition in accordance with instructions issued by DGCA.

6.5 Aeroplanes equipped with QAR/PMR systems shall be capable of storing the recorded data for the atleast 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.

7. OPERATIONAL REQUIREMENTS

7.1 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, shall be monitored.

7.2 All operators shall carry out FDR readout at their own or any approved facility under the FOQA programme.

7.3 All Operators shall, at the beginning of the calendar year, prepare and submit an annual plan for submission of the FDR readout to DGCA Hqrs, (Attn. Director (AED)) covering all aircraft in their fleet.

7.4 The readout after evaluation by the operator/ approved agency as per the above plan, shall be forwarded to DGCA Hqrs, (Attn. Director (AED)), Technical Centre, Opposite Safdarjung Airport, New Delhi 110 003 for carrying out a confirmation test on the proper recording and calibration of FDR/DFDR.

The FDR readout should be clearly marked with the following information:

1) Model and the Serial number of the FDR/DFDR unit
2) Registration marking of the aircraft on which installed and period of operation

8. MAINTENANCE REQUIREMENTS

8.1 The periodicity, nature of maintenance and life of recorders should be based on manufacturer's recommendations and included in the maintenance programme which shall approved by DGCA office.

8.2 The recorder shall be maintained by an appropriately qualified engineer in an approved manner.

8.3 All FDRs shall be checked annually.

8.3.1 The annual inspection shall 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;

8.3.2 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

Draft

of the mandatory parameters is not recorded correctly.

8.3.3 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 shall be authenticated by the QM or a person acceptable to DGCA for satisfactory recording and for completion of the specified hours of the FDR.

8.3.4 A report of the annual inspection shall be made available on request to DGCA for monitoring purposes.

8.4 Calibration of the FDR system:

a) the FDR system shall 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 shall be a re-calibration performed as recommended by the sensor manufacturer, or at least every two years.

9. Airworthiness Advisory Circular no. 2 of 2004, dated 4th October 2004, on the subject is hereby cancelled.

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