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2 July 1984
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18 June 1982

MILITARY STANDARD

FLIGHT DATA RECORDER

FUNCTIONAL STANDARDS FOR

FSC 5835

CONTENTS

TABLES

1. SCOPE

1.1 Scope. This standard establishes the functional characteristics of a DOD airborne Flight Data Recorder (FDR) used for flight incident, mishap, or crash analysis, and the parameters required to be recorded. Other uses of the FDR, such as aircraft maintenance, shall be as directed by the acquiring activity.

1.2 Application. The requirements of this standard are intended to apply to all military aircraft required to record flight data needed for analysis in the event of a flight incident, mishap or crash. Data shall be recorded in either a deployable non-volatile memory or a crash-hardened non-volatile memory for recovery and analysis. The deployable module (or airfoil) containing the memory shall be ejected from the host aircraft before or upon crash impact. The crash-hardened unit shall remain with the aircraft in its installed position in the most survivable portion of the aircraft.

1.3 Aircraft categories. This standard for FDR requirements shall apply to the following four broad categories of aircraft, each characterized by its field service applications:

Category I	Fixed wing, multi-engine aircraft. Includes ASW and cargo aircraft.
Category II	Fixed wing, fighter/attack/trainer (F/A/T) aircraft.
Category III	Rotary wing aircraft.
Category IV	Vertical and short take-off and landing (VSTOL) aircraft.

2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in the current Department of Defense Index of Specifications and Standads (DoDISS) and the supplement thereto (if applicable), form a part of this standard to the extent specified herein.

SPECIFICATION

Military

MIL-E-5400	Electronic Equipment, Airborne, General Specification for

STANDARDS

Military

MIL-STD-461	Electromagnetic Interference Characteristics, Requirements for Equipment
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-454	Standard, General Requirements for Electronic Equipment
MIL-STD-470	Maintainability Program Requirements (For Systems and Equipment)
MIL-STD-471	Maintainability Demonstration
MIL-STD-781	Reliability Tests: Exponential Distribution
MIL-STD-785	Reliability Program for Systems and Equipment Development and Production
MIL-STD-810	Environmental Test Methods
MIL-STD-882	System Safety Program Requirements
MIL-STD-1553	Aircraft Internal Time Division Command/Response Multiplex Data Bus

OTHER PUBLICATIONS

Federal

FIPS-46	Data Encryption Standard

(Copies of specifications, standards, handbooks, drawings and publications required by contractors in connection with specific acquisition functions should be obtained from the acquiring activity or as directed by the contracting officer.)

3. DEFINITIONS

3.1 Audio data. Any voice communications among flight crew, radio communications to/from the aircraft, or cockpit area sounds. These data usually are generated in analog form, but may be converted to digital form as appropriate for recording purposes.

3.2 Sensor parameter data. Data derived from sensing devices attached to, or a part of, avionic and airframe equipment. These sensor devices generate signals used to determine the status of the equipment to which they are connected, and to monitor the aircraft flight dynamics. Table VI lists the common parameter sensor types.

3.3 Flight incident data. Any data that assist in determining the cause of a flight incident, mishap, or crash. For the purpose of this standard, flight incident data shall consist of the audio and sensor parameter data that are monitored and recorded in the host aircraft for subsequent analysis.

3.4 Flight Data Recorder (FDR). The unit or units that receive and condition aircraft signals, process the gathered information, and retain(s) the information on a non-volatile storage medium.

3.5 Deployable module. The radio beacon, visual marker, and the removable FDR memory.

3.6 Bus Interface Unit/Aircraft Interface Unit (BIU/AIU). The portion of the FDR that interface(s) with the MIL-STD-1553 or other multiplex data bus and/or conditions sensor parameter data prior to processing and storage in the FDR.

3.7 Baseline data. Data recorded at the beginning of aircraft flight, to be used for referencing all other data recorded during flight.

3.8 Special event data. Data stored in write protected memory identified upon exceeding specified limits, such as airframe overstress.

3.9 Maintenance data. Data recorded and stored for use as directed by the acquiring activity. This includes data such as special events, tolerance problems, life history and the like which occur during the entire mission.

3.10 Data Storage Unit (DSU). Memory location which stores maintenance, mission or logistics management data but does not necessarily store data pertinent to flight incidents, mishaps or crash. Aircraft location for this memory module for accessibility shall be as directed by the acquiring activity.

4. GENERAL REQUIREMENTS

4.1 General. The purpose of the Flight Data Recorder is to record the data necessary to assist in flight incident, mishap, crash analysis as directed by the acquiring activity, maintenance, mission or logistics management. The data required to provide this information shall be recorded at a rate and for a time duration needed to reconstruct the events prior to and including the incident or mishap under investigation. Because engine, airframe, and flight dynamic sensor parameters and mission characteristics differ among aircraft types or categories, a single set of requirements suitable for all aircraft categories is precluded. Therefore, only typical parameters for various aircraft categories have been defined.

4.1.1 Flight Data Recorder requirements. Requirements for Flight Data Recorders are based primarily on the need for data recovery when the host aircraft crashes or is lost at sea. The recovered FDR data is intended to provide sufficient information to deduce the cause of the incident, or crash. A secondary requirement, as directed by the acquiring activity, is for data recovery of information which is related to maintenance, mission or logistics management. Depending upon the usual missions of the aircraft, a Type I or Type II crash survivable memory shall be installed to record aircraft parameters. The Type I memory shall be part of a deployable Crash Position Locator (CPL) package to assist in search and rescue as well as improve the survivability of stored data. The Type II memory shall be crash hardened and fireproofed to withstand crash impact and resultant fire.

4.1.2 Parameter groups. The flight parameters are organized into the following generalized groups for analysis purposes:

a. Flight profile.
b. Flight control systems:
    1. Flight control position.
    2. Crew input.
    3. Secondary control systems.
c. Aircraft subsystems:
    1. Engine(s).
    2. Hydraulic.
    3. Electrical.
    4. Other.
d. Non-flight parameters.

4.1.3 FDR power requirements. The FDR shall be designed to use minimal power supplied from an essential power bus to insure continuous recording.

4.2 FDR functional requirements. The FDR shall be designed to receive sensor parameter data from a multiplex data bus and/or aircraft sensors. Provisions for recording audio data shall be as specified by the acquiring activity or detailed equipment specification.

4.2.1 Data storage capacity. The FDR shall have the capacity to record a minimum of the last 15 minutes of sensor parameter data. The capability of storing special event data and that baseline data for the current flight in write protected memory shall be provided.

4.2.1.1 Data compression. Compression of data shall be permitted as long as accuracy and time correlation are maintained. Detailed data compression requirements shall be specified by the acquiring activity or detail specification.

4.2.1.2 Data encryption. Data encryption in accordance with FIPS-46 prior to storage shall be as required by the acquiring activity.

4.2.2 Recorded data. Multiplexing techniques may be used to combine all parameters. A means of synchronizing audio data, when recorded, with sensor parameter data shall be provided.

4.2.3 Data recovery. For data recovery purposes, the FDR memory unit(s) shall be capable of interfacing with standard accident recorder analysis center equipment and recovery equipment required to support maintenance, mission or logistic purposes as directed by the acquiring activity. Commercial and/or military standards shall be used in the design of mechanical, electrical, and data formats. As a design objective, consideration should be given to the possible need to extract data at the Shop Replaceable Assembly (SRA) or component level from a damaged FDR.

4.2.3.1 Data recovery software. The software program to decode/decompress the stored FDR data shall be considered a deliverable along with the FDR hardware.

4.3 Deployable module. The deployable airfoil module that contains the deployable FDR memory, radio beacon and visual marker shall be floatable and provide fire and impact protection for the FDR memory, radio beacon and visual marker. This module shall incorporate a secondary means that facilitates location after deployment (i.e., reflective tape, coating). Deployment shall be accomplished by means of ejection sensors as listed in Table VII.

4.3.1 Radio beacon. The radio beacon shall be activated upon being deployed from the host aircraft, and shall radiate an omnidirectional pattern.

4.3.2 Visual marker. Where space permits a visual marker consisting of a strobe light shall be activated upon being deployed from the host aircraft. The pattern shall approximate omnidirectional.

4.4 BIU/AIU. The interface between the FDR, the aircraft sensors, and the multiplex data bus shall be provided by a BIU/AIU. The BIU/AIU shall contain the processing capability necessary to receive data from the multiplex data bus, and to receive and condition audio and sensor parameter data for transmission to the memory. Signal conditioning of sensor parameter data not on a multiplex data bus shall be accomplished in the BIU/AIU.

4.5 Built-in test requirements. The FDR system shall have automatic built-in test and fault isolation capabilities.

4.6 System safety requirements. The FDR system shall be designed to meet the safety requirements of MIL-STD-882 and MIL-STD-454 (Requirement 1).

5. DETAILED REQUIREMENTS

5.1 Flight data characteristics. Typical data to be recorded for various aircraft categories shall be as listed in Tables I through V. The parameters are described in terms of range, accuracy, and sample rate (if applicable). Aircraft characteristics should be reviewed to determine additional parameter requirements. The listed parameter characteristics of the data to be recorded are based on sensor capabilities. Therefore, the required accuracies and sampling rates shall be reviewed for individual applications. The order in which the parameters are grouped is intended to demonstrate their relative importance for incident analysis purposes. Parameters within groups are not prioritized. Although most parameters are common to all aircraft categories or types, their characteristics and availability for recordation may vary.

5.2 Flight Data Recorder (FDR) system activation. The FDR shall begin operating as soon as aircraft power is applied and continue until power is removed, or as required by the detail specification.

5.2.1 Automatic cessation of recording. Means shall be provided in the FDR to automatically prevent the recorder from continuing to record or destroy information when the aircraft conditions are such that continued unpowered flight or self-powered taxi is not possible, and FDR input power remains active. (For example: Airspeed below 50 knots, and altitude constant, and engine speed below 15%.) Continued recording is permissible beyond the above conditions, providing not more than the oldest 33% of the data in memory is destroyed.

5.3 Environmental requirements. The FDR shall satisfy the requirements of MIL-E-5400 for Class 2 equipment using the specified test methods of MIL-STD-810 and MIL-STD-461/462. Detailed environmental test requirements shall be specified by the acquiring activity or detail specification.

5.4 Crash survivability (memory only). The crash-protected memory shall be designed to withstand simulated life testing followed by a simulated crash. Distortion, mechanical, electrical, and cosmetic damage to the unit shall be allowed, but the contents of the crash-proofed memory shall be recoverable with less than 1 ppm bit error rate, or for memories with less than 1 megabit, a one bit error following survivability testing. Penetration resistance and static crush shall apply only to the Type II memory. The pass/fail criteria of crash-survivability requirements shall be the recoverability of the data stored in the crash-survivable memory. Data shall be stored in the memory prior to crash-survivability testing, and if the data is recoverable at the conclusion of fluid immersion, the crash-survivability of the design shall be considered acceptable. Throughout the crash-survivability testing, the memory being tested shall be treated as a sealed unit. Memory data checks shall be allowed, however, data refresh and any attempt to disassemble or repair hardware shall be strictly disallowed. The listed sequential order of these test requirements is important. The tests shall be listed in the detail specification and shall include, but not be limited to the following:

a. Simulated life.
b. Impact shock.
c. Penetration resistance.
d. Static crush.
e. Fire protection (1100°C at a thermal flux of 50,000 BTU/ft^2/hr min.).
f. Fluid immersion.

5.5 Reliability/maintainability. Detailed reliability and maintainability requirements shall be as specified by the acquiring activity in addition to those specified by Military Standards 470, 471, 781 and 785.

5.6 FDR system error rate. The bit error rate shall be such that data shall be reconstructed to reflect the time history of each parameter.

Custodians:
Army - AV
Air Force - 99

Preparing activity:
Navy - AS
(Project No. 5835-0075)

TABLE I. Category I parameter groups - fixed wing multi-engine aircraft.

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
1	1	Time (Elapsed)	N/A	±1 sec	1
2	1	Altitude (Barometric)	-1000 to 50K ft	±100 at 500 ft ±1000 at 50K ft	1
3	1	Altitude (Radar)	0-5000 ft	±0.5%	1
4	1	Airspeed	Full Range	±5% of value or ±10 Kts, whichever is greater. Resolution of 2 Kts below 175 KIAS	1
5	1	Heading	0-360°	±5°	1
6	1	Angle of Attack (AOA)	Full Range	±1 Unit	1
7	1	Attitude (Pitch)	±180°	±2°	1
8	1	Attitude (Roll)	±180°	±2°	2
9	1	Attitude (Yaw)	±180°	±2°	1
10	1	Accel (Vertical)	-3g to 10g	±0.5g	4
11	1	Accel (Long.)	-6g to 2g	±0.5g	2
12	1	Accel (Lateral)	±3g	±0.5g	2
13	2	Rudder	Full Range	±3%	1
14	2	Aileron	Full Range	±3%	1
15	2	Elevator/ Stabilizer	Full Range	±3%	1

TABLE I. Category I parameter groups - fixed wing multi-engine aircraft (continued).

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
16	2	Flaps (Trailing Edge)	0-100% Down	±3%	0.5
17	2	Flaps (Leading Edge Slats)	0-100% Down	±3%	0.5
18	2	Stick/Wheel (Position or Force)	Full Range	±3%	1
19	2	Rudder Pedal Position	Full Range	±3%	0.5
20	2	Trim Position	Full Range	±0.5 Unit	1
21	2	Speedbrake	0-60°	±3%	0.25
22	2	Spoilers	0-60°	±3%	0.25
23	3	Master Warning/ Caution/ Advisory	On-off Discrete	N/A	0.5 ea
24	3	RPM (N_2)	0-120%	±5%	1 ea
25	3	RPM (N_1)	0-120%	±5%	1 ea
26	3	Torque	Full Range	±5%	1 ea
27	3	Power Lever (ECL)	0-100° Quad Angle	±5° up to 30° ±1° above 30°	1 ea
28	3	Thrust (EPR, etc.)	0-100%	±2%	1 ea
29	3	Turbine Inlet Temp (TIT)	Full Range	±50°C	1 ea

TABLE I. Category I parameter groups - fixed wing multi-engine aircraft (continued).

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
30	3	Exhaust Gas Temp (EGT)	Full Range	$\pm 50^{\circ}C$	1 ea
31	3	Fuel Flow	0-Max Capacity	$\pm 2\%$	1 ea
32	3	Fuel Qty (Total)	0-Max Capacity	± 100 lbs	0.5
33	3	Outside Air Temp (OAT)	-40° to $+55^{\circ}C$	$\pm 5\%$	1

TABLE II. Category II parameter groups - fixed wing fighter/attack/trainer (F/A/T) aircraft.

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
1	1	Time (Elapsed)	N/A	±1 sec	1
2	1	Altitude (Barometric)	-1000 to 70K ft	±75 at 500 ft ±2000 at 70K ft	1
3	1	Altitude (Radar)	0-5000 ft	±0.5%	1
4	1	Airspeed	Full Range	±5% of value or ±10 Kts, whichever is greater. Resolution of 2 Kts below 175 KIAS	1
5	1	Heading	0-360°	±5°	4
6	1	Angle of Attack (AOA)	Full Range	±1 Unit	4
7	1	Attitude (Pitch)	±180°	±1° within 5° of level flight ±2° otherwise	4
8	1	Attitude (Roll)	±180°	±1°	8
9	1	Attitude (Yaw)	±180°	±1°	1
10	1	Accel (Vertical)	-6g to 15g	±0.5g	8
11	1	Accel (Long.)	-6g to 2g	±0.5g	2
12	1	Accel (Lateral)	±4g	±0.5g	4
13	2	Rudder	Full Range	±3%	4
14	2	Aileron	Full Range	±3%	1 ea

TABLE II. Category II parameter groups - fixed wing fighter/ attack/trainer (F/A/T) aircraft (continued).

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
15	2	Elevator/ Stabilizer	Full Range	±3%	4 ea
16	2	Flaps (Trailing Edge)	0-100% Down	±3%	0.5 ea
17	2	Flaps (Leading Edge Slats)	0-100% Down	±3%	0.1 ea
18	2	Stick (Position or Force)	Full Range	±3%	4
19	2	Rudder Pedal Position	Full Range	±3%	0.5
20	2	Trim Position	Full Range	±0.5 Unit	1
21	2	Speedbrake	0-60°	±3%	0.25
22	2	Spoilers	0-60°	±3%	4
23	2	Wing Sweep	0-72°	±3%	1
24	3	Master Warning/ Caution/ Advisory	On-Off Discrete	N/A	0.5 ea
25	3	RPM (N_2)	0-120%	±5%	1 ea
26	3	RPM (N_1)	0-120%	±5%	1 ea
27	3	Torque	Full Range	±5%	1 ea
28	3	Power Lever (ECL)	0-100° Quad Angle	±5° up to 30° ±1° above 30°	1 ea
29	3	Thrust (EPR, etc.)	0-100%	±2%	1 ea

TABLE II. Category II parameter groups - fixed wing fighter/ attack/trainer (F/A/T) aircraft (continued).

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
30	3	Turbine Inlet Temp (TIT)	Full Range	±50°C	1 ea
31	3	Exhaust Gas Temp (EGT)	Full Range	±50°C	1 ea
32	3	Nozzle Position	0-100%	±1%	1 ea
33	3	Fuel Flow	0-Max Capacity	±2%	1 ea
34	3	Fuel Qty (Total)	0-Max Capacity	±100 lbs	1
35	3	Outside Air Temp (OAT)	-40° to +55°C	±5%	1

TABLE III. Category III parameter groups - rotary wing aircraft.

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
1	1	Time (Elapsed)	N/A	±1 sec	1
2	1	Altitude (Barometric)	-1000 to 10K ft	±75 at 1000 ft ±100 above 1K ft	1
3	1	Altitude (Radar)	0-5000 ft	±0.5%	1
4	1	Airspeed	Full Range	±5% of value or ±10 Kts, whichever is greater.	1
5	1	Heading	0-360°	±5°	1
6	1	Attitude (Pitch)	±180°	±2°	2
7	1	Attitude (Roll)	±180°	±2°	2
8	1	Attitude (Yaw)	±180°	±1°	4
9	1	Accel (Vertical)	-3g to 6g	±0.5g	4
10	1	Accel (Long.)	±3g	±0.5g	2
11	1	Accel (Lateral)	±3g	±0.5g	2
12	2	RPM (N_r)	0-120%	±5%	1 ea
13	2	Throttle Position	Full Range	±5%	1 ea
14	2	Elevator/ Stabilizer	Full Range	±3%	2 ea
15	2	Collective Position	Full Range	±3%	2

TABLE III. Category III parameter groups - rotary wing aircraft (continued).

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
16	2	Stick Position	Full Range	±3%	2
17	2	Rudder Pedal Position	Full Range	±3%	2
18	3	Master Warning/ Caution/ Advisory	On-Off Discrete	N/A	0.5 ea
19	3	RPM (N_f)	0-120%	±5%	1 ea
20	3	Torque	0-150%	±5%	1 ea
21	3	Turbine Inlet Temp (TIT)	Full Range	±50°C	1 ea
22	3	Exhaust Gas Temp (EGT)	Full Range	±50°C	1 ea
23	3	Fuel Flow	0-Max Capacity	±2%	1 ea
24	3	Fuel Qty (Total)	0-Max Capacity	±100 lbs	2
25	3	Outside Air Temp (OAT)	-40° to +55°C	±5%	1
26	3	Ice Rate	0-1 gm/m	0.04 gm/m	1
27	4	Impact Acceleration (Vertical)	±150 g	±2.4 g	600
28	4	Impact Acceleration (Lateral)	±150 g	±2.4 g	600
29	4	Impact Acceleration (Long.)	±150 g	±2.4 g	600

TABLE IV. Category IV parameter groups - VSTOL aircraft.

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
1	1	Time (Elapsed)	N/A	±1 sec	1
2	1	Altitude (Barometric)	-1000 to 70K ft	±75 at 500 ft ±2000 at 70K ft	1
3	1	Altitude (Radar)	0-5000 ft	±0.5%	1
4	1	Airspeed	Full Range	±5% of value or ±10 Kts, whichever is greater. Resolution 2 Kts below 175 KIAS	1
5	1	Heading	0-360°	±5°	4
6	1	Angle of Attack (AOA)	Full Range	±1 Unit	4
7	1	Attitude (Pitch)	±180°	±1° within 5° of level flight ±2° otherwise	4
8	1	Attitude (Roll)	±180°	±1°	8
9	1	Attitude (Yaw)	±180°	±1°	1
10	1	Accel (Vertical)	-6g to 10g	±0.5g	8
11	1	Accel (Long.)	±6g to 2g	±0.5g	4
12	1	Accel (Lateral)	±4g	±0.5g	4
13	2	Power Lever (ECL)	0-100° Quad Angle	±5° up to 30° ±1° above 30°	1 ea
14	2	Rudder	Full Range	±3%	4

TABLE IV. Category IV parameter groups - VSTOL aircraft (continued).

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
15	2	Aileron	Full Range	±3%	1 ea
16	2	Elevator/ Stabilizer	Full Range	±3%	4 ea
17	2	Flaps (Trailing Edge)	0-100% Down	±3%	0.5 ea
18	2	Flaps (Leading Edge Slats)	0-100% Down	±3%	0.5 ea
19	2	Stick (Position or Force)	Full Range	±3%	1
20	2	Rudder Pedal Position	Full Range	±3%	0.5
21	2	Trim Position (All)	Full Range	±0.5 Unit	1
22	2	Wing Rotation	Full Range	±3%	1
23	2	Speedbrake	0-60°	±3%	0.25
24	2	Center of Gravity Position	Full Range	±2%	1
25	2	Spoilers	0-60°	±3%	4
26	2	Nozzle Rotation Position	Full Range	±2%	4
27	2	Nozzle Rotation Control	Full Range	±2%	4

TABLE IV. Category IV parameter groups - VSTOL aircraft (continued).

No.	Group	Parameter	Range (Typical)	Overall Accuracy (Typical)	Minimum Sampling Rate (per sec)
28	3	Master Warning/ Caution/ Advisory	On-Off Discrete	N/A	0.5 ea
29	3	RPM (N_2)	0-120%	±5%	1 ea
30	3	RPM (N_1)	0-120%	±5%	1 ea
31	3	Torque	0-150%	±3%	1 ea
32	3	Thrust (EPR, etc.)	0-100%	±2%	1 ea
33	3	Turbine Inlet Temp (TIT)	Full Range	±50°C	1 ea
34	3	Exhaust Gas Temp (EGT)	Full Range	±50°C	1 ea
35	3	Fuel Flow	0-Max Capacity	±2%	1 ea
36	3	Fuel Qty (Total)	0-Max Capacity	±100 lbs	1
37	3	Outside Air Temp (OAT)	-40° to +55°C	±5%	1

TABLE V. Typical discrete parameter groups.

Warning/Caution/Advisory Signals may include but not limited to:

Group	Parameter	Group	Parameter
1	Low Altitude Warning	3	Fuel Transfer
2	Nose Gear Steering	3	Low Fuel
2	Flap Select (Multi-state)	3	Converter(s) Fail/Malfunction
2	Autopilot/AFCS Select	3	Inverter
2	AFCS Malfunction	3	Generator(s) Fail
2	SAS/SCAS Failure	3	Transmission(s) Oil Pressure
2	Thrust Reverser Select	3	Transmission Oil Bypass
2	Thrust Reverser Operations	3	Intermediate Gear Box Overtemp
2	Tailhook	3	Tail Rotor Gear Box Overtemp
2	Rotor Brake On	3	Battery Temp/Failures
2	Rotor RPM Low	3	Exterior Panel(s) Open/Unlatched
3	Master Caution	3	Canopy Unlock
3	Communication Transmit	3	Seat Ejection
3	Cabin Pressure	3	Weight on Wheels (Squat)
3	Oil Pressure	3	Anti-Ice Select
3	Hydraulic Pressure	3	Anti-Ice Fail
3	Fire Warning	3	Landing Gear Select
3	Low/Fail Power (All)	3	Landing Gear Position
3	Engine Stall	3	After Burner Select
3	Chip Lights	3	Bleed Air Select
3	Fuel Pump Fail	3	In-Flight Refuel Probe
3	APU/EPU Select	3	In-Flight Refuel Engage
3	APU/EPU Fail	3	Launch/Jettison Fail

TABLE V. Typical discrete parameter groups (continued).

Group	Parameter	Group	Parameter
3	Fuel Boost	3	Parking Brake On
3	Fuel Filter/Bypass	3	Anti-Skid/Brakes
3	Oxygen Conc Low (OBOGS)	3	Oxygen Back Up (OBOGS)

TABLE VI. Typical parameter sensor types.

1	Discrete (ON/OFF)	7	Magnesyn
2	Pull Counter/Torquer	8	Tachometer
3	AC Analog (Differential)	9	Frequency
4	DC Analog (Differential)	10	Thermocouple
5	Synchro	11	Resolver
6	Digital	12	Accelerometer

TABLE VII. FDR deployable module ejection sensors.

Aircraft Category	Switch Type	Location	Quantity
I	Frangible	Nose	2
	Frangible	Belly	2
	Water Activated	Belly	1
	Manual Electromechanical	Remote	1
II	Frangible	Nose	1
	Water Activated	Belly	1
	Electromechanical	Ejection Seat	1
	Manual Electromechanical	Remote	1
III	Frangible	Nose	1
	Frangible	Belly	2
	Frangible	Tail	1
	Water Activated	Belly	1
	Manual Electromechanical	Remote	1
IV	Frangible	Nose	1
	Frangible	Belly	2
	Water Activated	Belly	1
	Electromechanical	Ejection Seat	1
	Manual Electromechanical	Remote	1

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