

LEGAL NOTICE No. 194

REPUBLIC OF TRINIDAD AND TOBAGO

THE CIVIL AVIATION ACT, CHAP. 49:03

REGULATIONS

MADE BY THE AUTHORITY WITH THE APPROVAL OF THE MINISTER  
UNDER SECTION 33 OF THE CIVIL AVIATION ACT AND SUBJECT TO  
NEGATIVE RESOLUTION OF PARLIAMENT

THE CIVIL AVIATION [(NO. 7) INSTRUMENTS AND  
EQUIPMENT] (AMENDMENT) REGULATIONS, 2011

1. These Regulations may be cited as the Civil Aviation [(No. 7) Citation  
Instruments and Equipment] (Amendment) Regulations, 2011.

2. In these Regulations, “the Regulations” means the Civil Aviation Interpretation  
[(No. 7) Instruments and Equipment] Regulations, 2004.

3. Regulation 2 of the Regulations is amended by inserting in the Regulation 2  
appropriate alphabetical sequence the following definitions: amended

“airworthy” means the status of an aircraft, engine, propeller  
or part when it conforms to its approved design and is in a  
condition for safe operation;

“continuing airworthiness” means the set of processes by  
which all aircraft comply with the applicable airworthiness  
requirements and remain in a condition for safe operations  
throughout their operating life;

“engine” means a unit used or intended to be used for aircraft  
propulsion consisting of at least those components and  
equipment necessary for functioning and control, but  
excludes propellers and rotors;

“enhanced vision system (EVS)” means a system to display  
electronic real-time images of the external scene achieved  
through the use of image sensors;

“head-up display system” means a display system that  
presents flight information into the pilot’s forward external  
field of view;”.

- Regulation 5 amended
4. Regulation 5(1B) of the Regulations is revoked.
- Regulation 13 amended
5. Regulation 13(4) of the Regulations is amended—
- (a) in paragraph (a)(iv), by deleting the word “and”;
- (b) in paragraph (b), by deleting the full stop and substituting the words “; and”; and
- (c) by inserting after paragraph (b), the following paragraph:
- “(c) has demonstrated a vertical navigation performance in accordance with Schedule 12—Implementing Standards, Regulation 143A of the Civil Aviation [(No. 2) Operations] Regulations, 2004.”.
- Regulation 15 amended
6. Regulation 15 of the Regulations is amended by inserting after subregulation (7), the following subregulations:
- “(8) An operator of an aeroplane shall ensure that each flight crew member required to be on flight deck duty communicates through boom or throat microphones below the transition level or transition altitude.
- (9) An operator of a helicopter engaged in commercial air transport operations shall ensure that each flight crew member required to be on flight deck duty communicates through boom or throat microphones.”.
- Regulation 29 through 35 revoked and substituted
7. The Regulations are amended by revoking regulations 29 through 35 and substituting the following regulations:

***“Flight Recorders—General***

Flight  
Recorders  
General

29. (1) Flight recorders under this part comprise the following four systems:

- (a) a flight data recorder;
- (b) a cockpit voice recorder;
- (c) an airborne image recorder; and
- (d) a data link recorder.

(2) Image and data link information may be recorded on either the cockpit voice recorder or the flight data recorder.

***Flight Recorders for Aeroplane engaged in  
Commercial Air Transport Operations***

Flight  
Recorders for  
Aeroplane  
engaged in  
Commercial  
Air Transport  
Operations

30. An operator of an aeroplane engaged in commercial air transport operations under this regulation shall ensure such aeroplane meets the following requirements and the standards set out in Part A of Schedule 2, applicable to the aeroplane, for flight recorders:

(1) Types I and IA flight data recorders shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation as set out in Part A of Schedule 2.

(2) Types II and IIA flight data recorders shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power and configuration of lift and drag devices as set out in Part A of Schedule 2.

(3) A turbine-engined aeroplane of a maximum certified take-off mass of five thousand and seven hundred kilogrammes or less for which a type certificate is first issued after 31st December, 2015 shall be equipped with—

(a) a Type II flight data recorder;

(b) a Class “C” airborne image recorder capable of recording flight path and speed parameters displayed to the pilot; or

(c) an aircraft data recording system capable of recording the essential parameters as set out in Table 1 of Part A of Schedule 2.

(4) An aeroplane of a maximum certified take-off mass of over twenty-seven thousand kilogrammes for which the certificate of airworthiness is first issued after 31st December, 1988 shall be equipped with a Type I flight data recorder.

(5) An aeroplane of maximum certified take-off mass of over five thousand and seven hundred kilogrammes, up to and including twenty-seven thousand kilogrammes for which the individual certificate of airworthiness is first issued after 31st December, 1988 shall be equipped with a Type II flight data recorder.

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(6) A turbine-engined aeroplane for which the individual certificate of airworthiness was first issued after 31st December, 1986 but before 1st January, 1989, with a maximum certified take-off mass of over five thousand and seven hundred kilogrammes, except an aircraft specified in subregulation (7), shall be equipped with a flight data recorder which shall record time, altitude, airspeed, normal acceleration and heading.

(7) A turbine-engined aeroplane for which the individual certificate of airworthiness was first issued after 31st December, 1986 but before 1st January, 1989, with a maximum certified take-off mass of over twenty-seven thousand kilogrammes that is of the type for which the prototype was certified by the appropriate national authority after 30th September, 1969 shall be equipped with a Type II flight data recorder.

(8) A turbine-engined aeroplane, for which the individual certificate of airworthiness was first issued before 1st January, 1987, with a maximum certificated take-off mass of over five thousand and seven hundred kilogrammes shall be equipped with a flight data recorder which shall record time, altitude, airspeed, normal acceleration and heading.

(9) An aeroplane of a maximum certificated take-off mass of over five thousand and seven hundred kilogrammes for which the individual certificate of airworthiness is first issued after 1st January, 2005 shall be equipped with a Type IA flight data recorder.

(10) An aeroplane which is required to record normal acceleration, lateral acceleration and longitudinal acceleration for which a type certificate is first issued after 31st December, 2015 and which is required to be fitted with a flight data recorder shall record those parameters at a maximum sampling and recording interval of 0.0625 seconds.

(11) An aeroplane which is required to record pilot input or control surface position of primary controls for pitch, roll and yaw, for which a type certificate is first issued after 31st December, 2015 and which is required to be fitted with a flight data recorder shall record those parameters at a maximum sampling and recording interval of 0.125 seconds.

- (12) A flight data recorder system shall not use—
- (a) engraving metal foil;
  - (b) photographic film;
  - (c) analogue frequency modulation after 31st December, 2011; and
  - (d) magnetic tape after 31st December, 2015.

(13) All flight data recorders shall be capable of retaining the information recorded during at least the last twenty-five hours of their operation, except for the Type IIA flight data recorder which shall be capable of retaining the information recorded during at least the last thirty minutes of its operation.

(14) A turbine-engined aeroplane for which a type certificate is first issued after 31st December 2015 and required to be operated by more than one pilot shall be equipped with either—

- (a) a cockpit voice recorder; or
- (b) cockpit audio recording system.

(15) Notwithstanding subregulation (19), an aeroplane of a maximum certificated take-off mass of over five thousand and seven hundred kilogrammes for which the individual certificate of airworthiness is first issued on or after 1st January, 2003, shall be equipped with a cockpit voice recorder capable of retaining the information recorded during at least the last two hours of its operation.

(16) An aeroplane of a maximum certificated take-off mass of over five thousand and seven hundred kilogrammes for which the individual certificate of airworthiness is first issued after 31st December, 1986, shall be equipped with a cockpit voice recorder.

(17) A turbine-engined aeroplane for which the individual certificate of airworthiness was first issued before 1st January, 1987, with a maximum certificated take-off mass of over twenty-seven thousand kilogrammes that is of a type for which the prototype was certificated by the appropriate national authority after 30th September, 1969 shall be equipped with a cockpit voice recorder.

(18) A cockpit voice recorder system shall not use magnetic tape and wire after 31st December, 2015.

(19) A cockpit voice recorder shall be capable of retaining the information recorded during at least the last thirty minutes of operation.

(20) Notwithstanding subregulation (19), from 1st January, 2016, a cockpit voice recorder shall be capable of retaining the information recorded during at least the last two hours of operation.

(21) An aeroplane for which the individual certificate of airworthiness is first issued after 31st December, 2015, which utilize any of the data link communications applications listed in clause 5(b) of Part A of Schedule 2 and is required to carry a cockpit voice recorder, shall record on a flight recorder the data link communications messages.

(22) An aeroplane which is modified after 31st December, 2015, to install and utilize any of the data link communications applications listed in clause 5(b) of Part A of Schedule 2 and is required to carry a cockpit voice recorder, shall record on a flight recorder the data link communications messages.

(23) The minimum data link recording duration shall be equal to the recording duration of the cockpit voice recorder.

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

(25) All flight recorders shall be constructed to meet crashworthiness and fire protection specifications, 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.

(26) A flight recorder shall not be switched off during flight time.

(27) To preserve the flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident and shall not be reactivated before their disposition as determined in accordance with the Civil Aviation [(No. 14) Aircraft Accident and Incident Investigations] Regulations, 2006.

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

(29) An aeroplane of a maximum certificated take-off mass of over fifteen thousand kilogrammes for which the type certificate is first issued after 31st December, 2015, and which is required to be equipped with both a cockpit voice recorder and flight data recorder, shall be equipped with two cockpit voice recorder/flight data recorder combination recorders, one located as close to the cockpit as practicable and the other recorder located as far aft as practicable.

***Flight Recorders for Aeroplane not engaged in Commercial Air Transport Operation***

Flight Recorders for Aeroplane not engaged in Commercial Air Transport Operations 31. An operator of an aeroplane not engaged in commercial air transport operations under this regulation, shall ensure such aeroplane meets the following requirements and the standards set out in Part A of Schedule 2, applicable to the aeroplane, for flight recorders:

(1) Types I and IA flight data recorders shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation as set out in Part A of Schedule 2.

(2) Type II flight data recorders shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power and configuration of lift and drag devices as set out in Part A of Schedule 2.

(3) An aeroplane of a maximum certificated take-off mass of over five thousand and seven hundred kilogrammes for which the individual certificate of airworthiness is first issued after 31st December, 2004, shall be equipped with a Type IA flight data recorder.

(4) An aeroplane of a maximum certificated take-off mass of over twenty-seven thousand kilogrammes for which the individual certificate of airworthiness is first issued after 31st December, 1988, shall be equipped with a Type I flight data recorder.

(5) An aeroplane for which a type certificate is first issued after 31st December, 2015, and which is required to be fitted with a flight data recorder, shall record the following parameters

at a maximum recording interval of 0.125 seconds:

- (a) Pilot input or control surface position; and
- (b) primary controls for pitch, roll, yaw.

(6) A flight data recorder system shall not use—

- (a) engraving metal foil;
- (b) photographic film;
- (c) analogue frequency modulation,

after 31st December, 2011; and

- (d) magnetic tape after 31st December, 2015.

(7) All flight data recorders shall be capable of retaining the information recorded during at least the last twenty-five hours of their operation.

(8) A turbine-engined aeroplane for which a type certificate is first issued after 31st December, 2015 and is required to be operated by more than one pilot shall be equipped with either—

- (a) a cockpit voice recorder; or
- (b) cockpit audio recording system.

(9) An aeroplane of a maximum certificated take-off mass of over twenty-seven thousand kilogrammes for which the individual certificate of airworthiness is first issued after 31st December, 1986 shall be equipped with a cockpit voice recorder.

(10) A cockpit voice recorder system shall not use magnetic tape and wire after 31st December, 2015.

(11) A cockpit voice recorder shall be capable of retaining the information recorded during at least the last thirty minutes of their operation.

(12) Notwithstanding subregulation (11), from 1st January, 2016, all cockpit voice recorders shall be capable of retaining the information recorded during at least the last two hours of their operation.

(13) An aeroplane for which the individual certificate of airworthiness is first issued after 31st December, 2015, which utilize any of the data link communications applications listed in clause 5(b) of Part A of Schedule 2 and is



required to carry a cockpit voice recorder, shall record on a flight recorder all data link communications messages.

(14) An aeroplane which is modified after 31st December, 2015, to install and utilize any of the data link communications applications listed in clause 5(b) of Part A of Schedule 2 and is required to carry a cockpit voice recorder, shall record on a flight recorder the data link communications messages.

(15) The minimum recording duration for data link information shall be equal to the duration of the cockpit voice recorder.

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

(17) Flight recorders shall be constructed to meet crashworthiness and fire protection specifications, 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.

(18) A flight recorder shall not be switched off during flight time.

(19) To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident and shall not be reactivated before their disposition as determined in accordance with the Civil Aviation [(No. 14) Aircraft Accident and Incident Investigation] Regulations, 2006.

(20) The pilot-in-command, the owner or operator, shall ensure, to the extent possible, in the event the aeroplane becomes involved in an accident or incident, the preservation of all related flight recorder records, and if necessary the associated flight recorders, and their retention in safe custody pending their disposition as determined in accordance with the Civil Aviation [(No. 14) Aircraft Accident and Incident Investigation] Regulations, 2006.

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

(22) An aeroplane of a maximum certificated take-off mass over five thousand and seven hundred kilogrammes, required to have a flight data recorder and a cockpit voice recorder, may alternatively be equipped with two flight data recorder/cockpit voice recorder combination recorders.

***Flight Recorders for Helicopters***

Flight  
Recorders for  
Helicopters

32. An operator of a helicopter under this regulation shall ensure such helicopter meets the following requirements and the standards set out in Part B of Schedule 2, applicable to the helicopter, for flight recorders:

(1) A Type IV flight data recorder shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power and operation as set out in Part B of Schedule 2.

(2) A Type IVA flight data recorder shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power, operation and configuration as set out in Part B of Schedule 2.

(3) A Type V flight data recorder shall record the parameters required to determine accurately the helicopter flight path, speed, attitude and engine power as set out in Part B of Schedule 2.

(4) A helicopter of a maximum certificated take-off mass of over three thousand, one hundred and eighty kilogrammes for which the individual certificate of airworthiness is first issued after 31st December, 2015, shall be equipped with a Type IVA flight data recorder.

(5) A helicopter of a maximum certificated take-off mass of over seven thousand kilogrammes, or having a passenger seating configuration of more than nineteen, for which the individual certificate of airworthiness is first issued after 31st December, 1988, shall be equipped with a Type IV flight data recorder.

(6) A flight data recorder system shall not use—

- (a) engraving metal foil;
- (b) photographic film;
- (c) analogue frequency modulation,

after 31st December, 2011; and

- (d) magnetic tape after 31st December, 2015.

(7) Types IV, IVA and V flight data recorders shall be capable of retaining the information recorded during at least the last ten hours of their operation.

(8) A helicopter of a maximum certificated take-off mass of over seven thousand kilogrammes for which the individual certificate of airworthiness is first issued after 31st December, 1986, shall be equipped with a cockpit voice recorder.

(9) A helicopter of a maximum certificated take-off mass of over seven thousand kilogrammes for which the individual certificate of airworthiness was first issued before 1st January, 1987, shall be equipped with a cockpit voice recorder.

(10) A helicopter not required to be equipped with a flight data recorder, shall have recorded on the cockpit voice recorder at least the main rotor speed.

(11) A cockpit voice recorder system shall not use magnetic tape and wire after 31st December, 2015.

(12) A cockpit voice recorder shall be capable of retaining the information recorded during at least the last thirty minutes of its operation.

(13) Notwithstanding subregulation (12), from 1st January, 2016, a helicopter required to be equipped with a cockpit voice recorder shall be equipped with a cockpit voice recorder capable of retaining the information recorded during the last two hours of its operation.

(14) A helicopter for which the individual certificate of airworthiness is first issued after 31st December, 2015, which utilize any of the data link communications applications listed in clause 5(b) of Part B of Schedule 2, and is required to carry a cockpit voice recorder, shall record on a flight recorder the data link communications messages.

(15) A helicopter which is modified after 31st December, 2015, to install and utilize any of the data link communications applications listed in clause 5(b) of Part B of Schedule 2, and is required to carry a cockpit voice recorder, shall record on a flight recorder the data link communications messages.

(16) The minimum recording duration for data link information shall be equal to the recording duration of the cockpit voice recorder.

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

(18) All flight recorders shall be constructed to meet crashworthiness and fire protection specifications, 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.

(19) All flight recorders shall not be switched off during flight time.

(20) To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident and not be reactivated before their disposition as determined in accordance with the Civil Aviation [(No. 14) Aircraft Accident and Incident Investigation] Regulations, 2006.

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

(22) A helicopter required to be equipped with a flight data recorder and a cockpit voice recorder, may alternatively be equipped with two flight data recorder or cockpit voice recorder, combination recorders.”.

Regulation 71  
revoked and  
substituted

8. The Regulations is amended by revoking regulation 71 and substituting the following regulation:

***“Airborne Collision Avoidance System***

Airborne  
Collision  
Avoidance  
System

71. (1) An operator of a turbine-engined aeroplane engage in commercial air transport operations, of a maximum certified take-off mass in excess of five thousand and seven hundred kilogrammes or authorized to carry more than 19 passengers shall ensure that such aircraft is equipped with an airborne collision avoidance system (ACAS II).

(2) An operator of a turbine-engined aeroplane not engaged in commercial air transport operations, of a maximum certified take-off mass in excess of fifteen thousand kilogrammes or authorized to carry more than thirty passengers, for which the individual airworthiness certificate is first issued after 1st January, 2007, shall be equipped with an airborne collision avoidance system (ACAS II).

(3) An operator of a turbine-engined aeroplane under subregulation (1) shall ensure that the airborne collision avoidance system (ACAS II) operates in accordance with the relevant provisions of Volume IV of Annex 10 to the Chicago Convention.”.

9. Regulation 72 of the Regulations is amended in subregulation (3),  
by deleting the words “or helicopter”. Regulation 72  
amended

10. The Regulations are amended by inserting after regulation 72,  
the following regulation: Regulation  
72A inserted

**“Aircraft equipped with head-up displays or  
enhanced vision systems**

Aircraft  
equipped  
with head-up  
displays or  
enhanced  
vision  
systems      72A. An operator of an aircraft shall not install or  
use a head-up display or an enhanced vision system  
on his aircraft to gain operational benefits unless  
the installations and their use have been accepted  
or approved by the Authority.”.

11. The Regulations are amended by repealing Schedule 2 and  
substituting the following Schedule: Schedule 2  
repealed and  
substituted

“SCHEDULE 2

PART A

(Regulations 30 and 31)

***Flight Recorders***

The following are the flight recorders standards for aeroplane under  
Regulations 30 and 31:

**1. General requirements**

- (a) A flight recorder systems container shall—
- (i) be painted a distinctive orange or yellow colour;
  - (ii) carry reflective material to facilitate their location; and
  - (iii) have securely attached an automatically activated underwater locating device.
- (b) A flight recorder systems shall be installed so that—
- (i) the probability of damage to the recordings is minimized;
  - (ii) they receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardizing service to essential or emergency loads;
  - (iii) there is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and

- (iv) if the flight recorder systems have a bulk erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact.
- (c) A flight recorder system, 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.
- (d) Means shall be provided for an accurate time correlation between the flight recorder systems recordings.
- (e) The manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recording systems:
  - (i) manufacturer's operating instructions, equipment limitations and installation procedures;
  - (ii) parameter origin or source and equations which relate counts to units of measurement; and
  - (iii) manufacturer's test reports.

## **2. Flight Data Recorder**

- (a) The flight data recorder 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.
- (b) Flight data recorders shall be classified as Type I, Type IA, Type II and Type IIA depending upon the number of parameters to be recorded and the duration required for retention of the recorded information.
- (c) The parameters that satisfy the requirements for flight data recorders are listed in the paragraphs below. The number of parameters to be recorded shall depend on aeroplane complexity. The parameters without an asterisk (\*) are mandatory parameters which shall be recorded regardless of aeroplane complexity. In addition, the parameters designated by an asterisk (\*) shall be recorded if an information data source for the parameter is used by aeroplane systems or the flight crew to operate the aeroplane. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.
- (d) The following parameters shall satisfy the requirements for flight path and speed:
  - (i) pressure altitude;
  - (ii) indicated airspeed or calibrated airspeed;
  - (iii) air-ground status and each landing gear air-ground sensor when practicable;
  - (iv) total or outside air temperature;
  - (v) heading such as primary flight crew reference;

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- (vi) normal acceleration;
  - (vii) lateral acceleration;
  - (viii) longitudinal acceleration;
  - (ix) time or relative time count;
  - (x) navigation data\* such as drift angle, wind speed, wind direction, and latitude and longitude;
  - (xi) groundspeed\*;
  - (xii) radio altitude\*;
- (e) The following parameters shall satisfy the requirements for attitude:
- (i) pitch attitude;
  - (ii) roll attitude;
  - (iii) yaw or sideslip angle\*;
  - (iv) angle of attack\*;
- (f) The following parameters shall satisfy the requirements for engine power:
- (i) engine thrust or power such as propulsive thrust or power on each engine and cockpit thrust/power lever position;
  - (ii) thrust reverse status\*;
  - (iii) engine thrust command\*;
  - (iv) engine thrust target\*;
  - (v) engine bleed valve position\*; and
  - (vi) additional engine parameters\* such as EPR, N1, indicated vibration level, N2, EGT, TLA, fuel flow, fuel cut-off lever position and N3;
- (g) The following parameters shall satisfy the requirements for configuration:
- (i) pitch trim surface position;
  - (ii) flaps\* such as trailing edge flap position, cockpit control selection;
  - (iii) slats\* such as leading edge flap (slat) position, cockpit control selection;
  - (iv) landing gear\* such as landing gear, gear selector position;
  - (v) yaw trim surface position\*;
  - (vi) roll trim surface position\*;
  - (vii) cockpit trim control input position pitch\*;
  - (viii) cockpit trim control input position roll\*;
  - (ix) cockpit trim control input position yaw\*;
  - (x) ground spoiler and speed brake\* such as Ground spoiler position, ground spoiler selection, speed brake position, and speed brake selection;
  - (xi) de-icing or anti-icing systems selection\*;

- (xii) hydraulic pressure (each system)\*;
  - (xiii) fuel quantity in CG trim tank \*;
  - (xiv) AC electrical bus status\*;
  - (xv) DC electrical bus status\*;
  - (xvi) APU bleed valve position\*;
  - (xvii) computed centre of gravity\*;
- (h) The following parameters shall satisfy the requirements for operation:
- (i) warnings;
  - (ii) primary flight control surface and primary flight control pilot input for pitch axis, roll axis, yaw axis;
  - (iii) marker beacon passage;
  - (iv) each navigation receiver frequency selection;
  - (v) manual radio transmission keying and cockpit voice recorders and flight data recorders synchronization reference;
  - (vi) autopilot and auto throttle and auto flight control system mode and engagement status\*;
  - (vii) selected barometric setting\* for pilot and first officer;
  - (viii) selected altitude for all pilot selectable modes of operation\*;
  - (ix) selected speed for all pilot selectable modes of operation\*;
  - (x) selected Mach for all pilot selectable modes of operation\*;
  - (xi) selected vertical speed for all pilot selectable modes of operation\*;
  - (xii) selected heading for all pilot selectable modes of operation\*;
  - (xiii) selected flight path for all pilot selectable modes of operation\* such as course/desired track and path angle;
  - (xiv) selected decision height\*;
  - (xv) EFIS display format\* for pilot and first officer;
  - (xvi) multi-function/engine/alerts display format\*;
  - (xvii) Ground Proximity Warning System, Terrain Awareness Warning System and Ground Collision Avoidance System status\* such as selection of terrain display mode including pop-up display status terrain alerts, both cautions and warnings, and advisories, on/off switch position;
  - (xviii) low pressure warning\* for hydraulic pressure, pneumatic pressure;
  - (xix) computer failure\*;
  - (xx) loss of cabin pressure\*;
  - (xxi) traffic Collision Avoidance System and Airborne Collision Avoidance System\*;



- (xxii) ice detection\*;
- (xxiii) engine warning each engine vibration\*;
- (xxiv) engine warning each engine over temperature\*;
- (xxv) engine warning each engine oil pressure low\*;
- (xxvi) engine warning each engine over speed\*;
- (xxvii) wind shear warning\*;
- (xxviii) operational stall protection, stick shaker and pusher activation\*;
- (xxix) all cockpit flight control input forces\* such as control wheel, control column, rudder pedal cockpit input forces;
- (xxx) vertical deviation\* such as Instruments Landing System glide path, Microwave Landing System elevation, Global Navigation Satellite System approach path;
- (xxxii) horizontal deviation\* such as Instruments Landing System localizer, Microwave Landing System azimuth, Global Navigation Satellite approach path;
- (xxxii) DME 1 and 2 distances\*;
- (xxxiii) primary navigation system reference\* such as Global Navigation Satellite, Inertial Navigation System, Very High Frequency Omni-Range and Distance Measuring Equipment, Instruments Landing System and Microwave Landing System;
- (xxxiv) brakes\* such as left and right brake pressure and left and right brake pedal position;
- (xxxv) date\*;
- (xxxvi) event marker\*;
- (xxxvii) head-up display in use\*;
- (xxxviii) para visual display on\*;
- (i) Type IA flight data recorder shall be capable of recording, as appropriate to the aeroplane, at least the 78 parameters in Table 1;
- (j) Type I flight data recorder shall be capable of recording, as appropriate to the aeroplane, at least the first 32 parameters in Table 1;
- (k) Types II and IIA flight data recorders shall be capable of recording, as appropriate to the aeroplane, at least the first 16 parameters in Table 1;
- (l) The parameters that satisfy the requirements for flight path and speed as displayed to the pilots 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:

  - (i) pressure altitude;
  - (ii) indicated airspeed or calibrated airspeed;

- (iii) heading from primary flight crew reference;
  - (iv) pitch attitude;
  - (v) roll attitude;
  - (vi) engine thrust/power;
  - (vii) landing-gear status\*;
  - (viii) total or outside air temperature\*;
  - (ix) time\*;
  - (x) navigation data\* such as drift angle, wind speed, wind direction, latitude and longitude; and
  - (xi) radio altitude\*;
- (m) Type IIA flight data recorder, in addition to a 30-minute recording duration, shall retain sufficient information from the preceding take-off for calibration purposes;
- (n) The measurement range, recording interval and accuracy of parameters on installed equipment shall be verified by methods approved by the appropriate certificating authority;
- (o) Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability and 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;

### **3. Cockpit Voice Recorder and Cockpit Audio Recording System**

(a) Signals to be recorded—

The cockpit voice recorder and cockpit audio recording system 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 and 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.

(b) A cockpit voice recorder shall record on four separate channels, or more, at least the following:

- (i) voice communication transmitted from or received in the aeroplane by radio;
- (ii) aural environment on the flight deck;
- (iii) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed;
- (iv) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker; and
- (v) voice communication of flight crew members using the passenger address system, if installed.

- (c) A cockpit audio recording system shall record on two separate channels, or more, at least the following:
  - (i) voice communication transmitted from or received in the aeroplane by radio;
  - (ii) aural environment on the flight deck; and
  - (iii) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed.
- (d) A cockpit voice recorder shall be capable of recording on at least four channels simultaneously. For tape-based cockpit voice recorder, to ensure accurate time correlation between channels, the cockpit voice recorder is to record in an in-line format. Where a bi-directional configuration is used, the in-line format and channel allocation shall be retained in both directions.
- (e) The preferred channel allocation shall be as follows:
  - (i) Channel 1—co-pilot headphones and live boom microphone;
  - (ii) Channel 2—pilot headphones and live boom microphone;
  - (iii) Channel 3—area microphone; and
  - (iv) Channel 4—time reference plus the third and fourth crew members' headphone and live microphone, if applicable.

#### **4. Airborne image recorder**

- (a) A Class A airborne image recorder captures the general cockpit area in order to provide data supplemental to conventional flight recorders.
- (b) A Class B airborne image recorder captures data link message displays.
- (c) A Class C airborne image recorder captures instruments and control panels.
- (d) The airborne image recorder must 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 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.

#### **5. Data link recorder**

- (a) 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.

- (b) Messages applying to the applications listed below shall be recorded. Applications without the asterisk are mandatory applications which shall be recorded regardless of the system complexity. Applications with an asterisk shall be recorded only as far as is practicable given the architecture of the system—
- (i) Data link initiation capability;
  - (ii) Controller–pilot data link communications;
  - (iii) Data link–flight information services;
  - (iv) Automatic dependent surveillance–contract;
  - (v) Automatic dependent surveillance–broadcast\*;
  - (vi) Aeronautical operational control\*.
- (c) Description of the data link recorder applications is contained in Table 2.

#### **6. Aircraft data recording systems**

- (a) Aircraft data recording system shall be capable of recording, as appropriate to the aeroplane, at least the essential (E) parameters in Table 3.
- (b) The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by methods approved by the appropriate certificating authority.
- (c) Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability and 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.

#### **7. Inspections of flight recorder systems**

- (a) Prior to the first flight of the day, the built-in test features for the flight recorders and flight data acquisition unit, when installed, shall be monitored by manual or automatic checks.
- (b) Annual inspections shall be carried out as follows:
- (i) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;
  - (ii) the analysis of the flight data recorder shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the aeroplane and by the tools used to extract the data from the recorder) is within acceptable limits and to determine the nature and distribution of the errors;

- (iii) a complete flight from the flight data recorder 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 flight data recorder. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;
  - (iv) 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;
  - (v) an annual examination of the recorded signal on the cockpit voice recorder shall be carried out by replay of the cockpit voice recorder recording. When installed in the aircraft, the cockpit voice recorder shall record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards;
  - (vi) where practicable, during the annual examination, a sample of in-flight recordings of the cockpit voice recorder shall be examined for evidence that the intelligibility of the signal is acceptable; and
  - (vii) an annual examination of the recorded images on the airborne image recorder shall be carried out by replay of the airborne image recorder recording. While installed in the aircraft, the airborne image recorder shall record test images from each aircraft source and from relevant external sources to ensure that all required images meet recording quality standards.
- (c) Flight recorder systems 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.
- (d) A report of the annual inspection shall be made available on request to regulatory authorities for monitoring purposes.
- (e) Calibration of the flight data recorder system—
- (i) for those parameters which have sensors dedicated only to the flight data recorder 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
  - (ii) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the flight data recorder system, there shall be a recalibration performed as recommended by the sensor manufacturer, or at least every two years.

**Table 1**  
**Parameter Standards for Flight Data Recorders**

| Serial Number   | Parameter   | 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 GPS time sync) | 24 hours  | 4   | ±0.125% per hour  | 1 second  |
| 2   | Pressure-altitude   | -300 m (-1 000 ft) to maximum certificated altitude of aircraft<br>+1 500 m (+5 000 ft)           | 1   | ±30 m to ±200 m<br>(±100 ft to ±700 ft)                 | 1.5 m (5 ft)  |
| 3   | Indicated airspeed or calibrated airspeed                                 | 95 km/h (50 kt) to max V <sub>So</sub> (Note 1) V <sub>So</sub> to 1.2 V <sub>D</sub> (Note 2)±3% | 1   | ±5%<br>±3%  | 1 kt (0.5 kt recommended)   |
| 4   | Heading (primary flight crew reference)                                   | 360°  | 1   | ±2°   | 0.5°  |
| 5   | Normal acceleration (Note 3)  | -3 g to +6 g  | 0.125   | ±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   | ±2%   |   |
| 9   | Power on each engine (Note 4)   | Full range  | 1 (per engine)                                    |   | 0.2% of full range or the resolution required to operate the aircraft |
| 10*   | Trailing edge flap or 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 or and cockpit control selection                        | Full range or each discrete position  | 2   | ±5% or as pilot's indicator                             | 0.5% of full range or the resolution required to operate the aircraft |
| 12*   | Thrust reverser position  | Stowed, in transit, and reverse   | 1 (per engine)                                    |   |   |
| 13*   | Ground spoiler/speed brake selection (Selection and position)             | Full range or each discrete position  | 1   | ±2% unless higher accuracy uniquely required            | 0.2% of full range  |
| 14  | Outside air temperature   | Sensor range  | 2   | ±2° C   | ±3° C   |
| 15*   | Autopilot/auto throttle/AFCS mode and engagement status                   | A suitable combination of discrettes  | 1   |   |   |
| 16  | Longitudinal acceleration (Note 3)  | ±1 g  | 0.25  | ±0.015 g excluding a datum error of 0.05 g<br>0.004 g   |   |
| <i>Note.— The preceding 16 parameters satisfy the requirements for a Type II FDR.</i> |   |   |   |   |   |
| 17  | Lateral acceleration (Note 3)   | ±1 g  | 0.25  | ±0.015 g excluding a datum error of ±0.05 g             | 0.004 g   |

**Table 1**  
**Parameter Standards for Flight Data Recorders—Continued**

| Serial Number   | Parameter  | Measurement range                  | Maximum sampling and recording interval (seconds) | Accuracy limits (sensor input compared to FDR read-out)                                      | Recording resolution  |
|---|--|------------------------------------|---|--|---|
| 18  | Pilot input and/or controlsurface position-primary controls (pitch, roll, yaw) (Note 5)  | Full range                         | +0.25   | ±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 (500ft) |
| 21*   | Vertical beam deviation (ILS/GPS/GLS glide path, MLS elevation, IRNAV/IAN vertical deviation)  | Signal range                       | 1   | ±3%  | 0.3% of full range  |
| 22*   | Horizontal beam deviation (ILS/GPS/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 frequency selection (Note 6)  | Full range                         | 4   | As installed   |   |
| 27  | Air/ground status  | Discrete                           | 1   |  |   |
| 28*   | GPWS (ground proximity warning system) /TAWS/GCAS status (selection of terrain display mode including pop-up display status) and (terrain alerts, both cautions 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   |  | 05% of full range   |
| 31*   | Navigation data (latitude/longitude, ground speed and drift angle) (Note 8)  | As installed                       | 1   | As installed   |   |
| 32*   | Landing gear and gear selector position  | Discrete                           | 4   | As installed   |   |
| <i>Note.—The preceding 32 parameters satisfy the requirements for a Type I FDR.</i> |  |                                    |   |  |   |
| 33*   | Groundspeed  | As installed                       | 1   | Data should be obtained from the most accurate system  | 1 kt  |

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**Table 1**  
**Parameter Standards for Flight Data Recorders—Continued**

| Serial Number | Parameter  | Measurement range                                       | Maximum sampling and recording interval (seconds) | Accuracy limits (sensor input compared to FDR read-out) | Recording resolution                   |
|---------------|--|---|---|---|--|
| 34            | Brakes (left and right brake pressure, left and right brake pedal position)  | (Maximum metered brake range, discretess 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)     | As installed  | Each engine each second                           | As installed  | 2% of full range                       |
| 36*           | TCAS/ACAS (traffic alert and collision avoidance system)   | Discrete  | 1   | As installed  |  |
| 37*           | Windshear warning  | Discrete  | 1   | As installed  |  |
| 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 |
| 44*           | Selected flight path (all pilot selectable modes of operation) (course/DSTRK, path angle, final approach path (IRNAV/IAN)) |   | 1   | As installed  |  |
| 45*           | Selected Decision Height   | As installed  | 64  | As installed  | Sufficient to determine crew selection |
| 46*           | EFIS display format (pilot, co-pilot)  | Discrete(s)   | 4   | As installed  |  |
| 47*           | Multi-function/engine/alerts display format  | Discrete(s)   | 4   | As installed  |  |
| 48*           | AC electrical bus status   | Discrete(s)   | 4   | As installed  |  |
| 49*           | DC electrical bus status   | Discrete (s)  | 4   | As installed  |  |
| 50*           | Engine bleed valve position  | Discrete(s)   | 4   | As installed  |  |
| 51*           | APU bleed valve position   | Discrete(s)   | 4   | As installed  |  |
| 52*           | Computer failure   | Discrete(s)   |   | As installed  |  |
| 53*           | Engine thrust command  | As installed  | 2   | As installed  |  |



**Table 1**  
**Parameter Standards for Flight Data Recorders—Continued**

| Serial Number | Parameter  | Measurement range | Maximum sampling and recording interval (seconds) | Accuracy limits (sensor input compared to FDR read-out) | Recording resolution               |
|---------------|--|-------------------|---|---|------------------------------------|
| 54*           | Engine thrust target   | As installed      | 4   | As installed  | 2% of full range                   |
| 55*           | Computed centre of gravity   | As installed      | 64  | As installed 1  | % of full range                    |
| 56*           | Fuel quantity in CG trim tank  | As installed      | 64  | As installed  | 1% of full range                   |
| 57*           | Head up display in use   | As installed      | 4   | As installed  |                                    |
| 58*           | Para visual display on/off   | As installed      | 1   | As installed  |                                    |
| 59*           | Operational stall protection, stick shaker and pusher activation                             | As installed      | 1   | As installed  |                                    |
| 60*           | Primary navigation system reference (GNSS, INS, VOR/DME, MLS, Loran C, localizer glideslope) | As installed      | 4   | As installed  |                                    |
| 61*           | Ice detection  | As installed      | 4   | As installed  |                                    |
| 62*           | Engine warning each engine vibration   | As installed      | 1   | As installed  |                                    |
| 63*           | Engine warning each engine over temperature  | As installed      | 1   | As installed  |                                    |
| 64*           | Engine warning each engine oil pressure low  | As installed      | 1   | As installed  |                                    |
| 65*           | Engine warning each engine over speed  | As installed      | 1   | As installed  |                                    |
| 66*           | Yaw Trim Surface Position  | Full range        | 2   | ± 3% unless higher accuracy uniquely required           | 0.3% of full range                 |
| 67*           | Roll Trim Surface Position   | Full range        | 2   | ± 3% unless higher accuracy uniquely required           | 0.3% of full range                 |
| 68*           | Yaw or sideslip angle  | Full range        | 1   | ± 5%  | 0.5°                               |
| 69*           | De-icing and/or anti-icing systems selection   | Discrete(s)       | 4   |   |                                    |
| 70*           | Hydraulic pressure (each system)   | Full range        | 2   | ± 5%  | 100 psi                            |
| 71*           | Loss of cabin pressure   | Discrete          | 1   |   |                                    |
| 72*           | Cockpit trim control input Position Pitch  | Full range        | 1   | ± 5%  | 0.2% of full range or as installed |
| 73*           | Cockpit trim control input Position Roll   | Full range        | 1   | ± 5%  | 0.2% of full range or as installed |

**Table 1**  
**Parameter Standards for Flight Data Recorders—Continued**

| <i>Serial Number</i> | <i>Parameter</i>  | <i>Measurement range</i>   | <i>Maximum sampling and recording interval (seconds)</i> | <i>Accuracy limits (sensor input compared to FDR read-out)</i> | <i>Recording resolution</i>        |
|----------------------|---|--|--|--|------------------------------------|
| 74*                  | Cockpit trim control input position Yaw   | Full range   | 1  | ± 5%   | 0.2% of full range or as installed |
| 75*                  | All cockpit flight control input forces (control wheel, control column, rudder pedal) | Full range (±311 N (±70 lbf), ± 378 N (±85 lbf), ± 734 N (±165 lbf)) | 1  | ± 5  | 0.2% of full range or as installed |
| 76*                  | Event marker  | Discrete   | 1  |  |                                    |
| 77*                  | Date  | 365 days   | 64   |  |                                    |
| 78*                  | ANP or EPE or EPU   | As installed   | 4  | As installed   |                                    |

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

**Notes—**

1. V<sub>So</sub> stalling speed or minimum steady flight speed in the landing configuration is in section “Abbreviations and Symbols”.
2. VD design diving speed.
3. Refer to 6.3.1.2.11 for increased recording requirements.
4. Record sufficient inputs to determine power.
5. For aeroplanes with conventional control systems in which movement of a control surface will back drive the pilot’s control, “or” applies. For aeroplanes with non-mechanical 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.
6. If signal available in digital form.
7. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
8. 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:
  - (i) 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;
  - (ii) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, ETC.;
  - (iii) warnings and alerts;
  - (iv) 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.).

**Table 2  
Description of Applications for Data Link Recorders**

| Item No. | Application Type                      | Application Description  | Recording Contract |
|----------|---------------------------------------|--|--------------------|
| 1        | Data link Initiation                  | This includes any applications used to logon to or initiate data link 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 (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, D-METAR, D-ATIS, D-NOTAM and other textual data link services.   | C                  |
| 5        | Aircraft Broadcast Surveillance       | This includes Elementary and Enhanced Surveillance Systems, as well as 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 *                |
| 6        | Aeronautical Operational Control Data | This includes any application transmitting or receiving data used for AOC purposes (per the ICAO definition of AOC).   | M *                |

Key:  
 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 3  
Parameter Standards for Aircraft Data Recording Systems**

| No. | Parameter Name             | Parameter Category | Minimum Recording Range | Maximum Recording interval in seconds | Minimum Recording Accuracy | Minimum Recording Resolution | Remarks                            |
|-----|----------------------------|--------------------|-------------------------|---------------------------------------|----------------------------|------------------------------|------------------------------------|
| 1   | Heading (Magnetic or True) | R*                 | ±180 degrees            | 1                                     | ±2 degrees                 | 0.5 degree                   | *If not available, record rates    |
| 2   | Pitch attitude             | E*                 | ±90 degrees             | 0.25                                  | ±2 degrees                 | 0.5 degree                   | *If not available, record rates    |
| 3   | Roll attitude              | E*                 | ±180 degrees            | 0.25                                  | ±2 degrees                 | 0.5 degree                   | *If not available, record rates    |
| 4   | Yaw rate                   | E*                 | ±300 degrees/s          | 0.25                                  | ±1% + drift of 360°/hr     | 2 degree/s                   | *Essential if no heading available |

**Table 3**  
**Parameter Standards for Aircraft Data Recording Systems—Continued**

| No. | Parameter Name                                  | Parameter Category | Minimum Recording Range  | Maximum Recording interval in seconds | Minimum Recording Accuracy   | Minimum Recording Resolution           | Remarks                                   |
|-----|---|--------------------|--|---------------------------------------|--|--|---|
| 5   | Pitch rate                                      | E*                 | ±300 degrees/s   | 0.25                                  | ±1% + drift of 360°/hr   | 2 degree/s                             | *Essential if no pitch attitude available |
| 6   | Roll rate                                       | E*                 | ±300 degrees/s   | 0.25                                  | ±1% + drift of 360°/hr   | 2 degree/s                             | * Essential if no roll attitude available |
| 7   | Positioning system: latitude/longitude          | E                  | Latitude: ± 90 Degrees<br>Longitude: ± 180 degrees                                   | 2 (1 if available)                    | As installed (0.00015 degree recommended)  | 0.00005 degree                         |   |
| 8   | Positioning system estimated error              | E*                 | Available range  | 2 (1 if available)                    | As installed   | As installed                           | * If available                            |
| 9   | Positioning system: altitude                    | E                  | 300 m (-1 000 ft) to maximum certificated altitude of aeroplane + 1 500 m (5 000 ft) | 2 (1 if available)                    | As installed (±15 m (±50 ft) recommended)  | 1.5 m (5 ft)                           |   |
| 10  | Positioning system: time*                       | E                  | 24 hours   | 1                                     | ±0.5 second  | 0.1 second                             | * UTC time preferred where available.     |
| 11  | Positioning system: ground speed                | E                  | 0-1000 kt 2 (1 if available)   |                                       | As installed (±5kt recommended)  | 1 kt                                   |   |
| 12  | Positioning system: channel                     | E                  | 0 - 360 degrees  |                                       | 2 (1 if available)   | As installed (± 2 degrees recommended) | 0.5 degrees                               |
| 13  | Normal acceleration                             | E                  | -3 g to + 6 g (*)  | 0.25 (0.125 if available)             | As installed (±0.09 g excluding a datum error of ±0.45 g recommended)                                      | 0.004 g                                |   |
| 14  | Longitudinal acceleration                       | E                  | ±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                                |   |
| 15  | Lateral acceleration                            | E                  | ±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                                |   |
| 16  | External static pressure (or pressure altitude) | R                  | 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 refer to table IIA. 2) | 0.1 mb (0.01 in-Hg) or 1.5 m (5 ft)    |   |

**Table 3**  
**Parameter Standards for Aircraft Data Recording Systems—Continued**

| No. | Parameter Name  | Parameter Category | Minimum Recording Range                  | Maximum Recording interval in seconds | Minimum Recording Accuracy                  | Minimum Recording Resolution | Remarks  |
|-----|---|--------------------|--|---------------------------------------|---|------------------------------|--|
| 17  | Outside air temperature (or total air temperature)                                    | R                  | 50° to +90°C or available sensor range   | 2                                     | As installed (±2°C recommended)             |                              | 1°C  |
| 18  | Indicated air speed Pilot display measuring system or available sensor range          | R                  | As the installed                         | 1                                     | As installed (±3 % recommended)             | 1 kt (0.5 kt recommended)    |  |
| 19  | Engine RPM  | R                  | Full range including overspeed condition | Each engine<br>Each second            | As installed                                | 0.2% of full range           |  |
| 20  | Engine oil pressure   | R                  | Full range                               | Each engine<br>Each second            | As installed (5% of full range recommended) | 2% of full range             |  |
| 21  | Engine oil temperature  | R                  | Full range                               | Each engine<br>Each second            | As installed (5% of full range recommended) | 2% of full range             |  |
| 22  | Fuel flow or pressure   | R                  | Full range                               | Each engine<br>Each second            | As installed                                | 2% of full range             |  |
| 23  | Manifold pressure   | R                  | Full range                               | Each engine<br>Each second            | As installed                                | 0.2% of full range           |  |
| 24  | Engine thrust/power /torque parameters required to determine propulsive thrust/power* | R                  | Full range                               | Each engine<br>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 over speed should be provided. |
| 25  | Engine gas generator speed (Ng)   | R                  | 0-150%                                   | Each engine<br>Each second            | As installed                                | 0.2% of full range           |  |
| 26  | Free power turbine speed (Nf)   | R                  | 0-150%                                   | Each engine<br>Each second            | As installed                                | 0.2% of full range           |  |
| 27  | Coolant temperature   | R                  | Full range                               | 1                                     | As installed (±5°C recommended)             | 1 degree Celsius             |  |
| 28  | Main voltage  | R                  | Full range                               | Each engine<br>Each second            | As installed                                | 1 Volt                       |  |
| 29  | Cylinder head temperature   | R                  | Full range                               | Each cylinder<br>Each second          | As installed                                | 2% of full range             |  |

**Table 3**  
**Parameter Standards for Aircraft Data Recording Systems—Continued**

| No. | Parameter Name                        | Parameter Category | Minimum Recording Range              | Maximum Recording interval in seconds | Minimum Recording Accuracy | Minimum Recording Resolution                                       | Remarks |
|-----|---------------------------------------|--------------------|--------------------------------------|---------------------------------------|----------------------------|--|---------|
| 30  | Primary position control              | R                  | Full range or each discrete position | 2                                     | As installed               | 0.5 degree   |         |
| 31  | Pitch flight control surface position | R                  | Full range                           | 0.25                                  | As installed               | 0.2% of full range   |         |
| 32  | Fuel quantity                         | R                  | Full range                           | 4                                     | As installed               | 1% of full range   |         |
| 33  | Exhaust gas temperature               | R                  | Full range                           | Each engine<br>Each second            | As installed               | 2% of full range   |         |
| 34  | Emergency voltage                     | R                  | Full range                           | Each engine<br>Each second            | As installed               | 1 Volt   |         |
| 35  | Trim surface position                 | R                  | Full range or each discrete position | 1                                     | As installed               | 0.3 % of full range  |         |
| 36  | Landing gear position*                | R                  | Each discrete position               | Each gear every two seconds           | As installed               | *Where available record up and locked and down and-locked position |         |
| 37  | Novel/unique aircraft features        | R                  | As required                          | As required                           | As required                | As required  |         |

Key: E: Essential parameters.  
R: Recommended parameters

## PART B

(Regulation 32)

The following are the flight recorders standards for helicopters under Regulation 32:

### 1. General requirements

- (a) The flight recorder systems containers shall—
- (i) be painted a distinctive orange or yellow colour;
  - (ii) carry reflective material to facilitate their location; and
  - (iii) have securely attached an automatically activated underwater locating device.
- (b) The flight recorder systems shall be installed so that—
- (i) the probability of damage to the recordings is minimized;
  - (ii) they receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardizing service to essential or emergency loads;

- (iii) there is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and
  - (iv) if the flight recorder systems have a bulk erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact.
- (c) 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.
- (d) Means shall be provided for an accurate time correlation between the flight recorder systems functions.
- (e) The manufacturer usually provides the appropriate certificating authority with the following information in respect of the flight recorder systems:
- (i) manufacturer's operating instructions, equipment limitations and installation procedures; and
  - (ii) manufacturer's test reports.

## **2. Flight data recorder**

- (a) The flight data recorder shall start to record prior to the helicopter moving under its own power and record continuously until the termination of the flight when the helicopter is no longer capable of moving under its own power.
- (b) Flight data recorders for helicopters shall be classified as Type IV, IVA and V depending upon the number of parameters to be recorded.
- (c) The parameters that satisfy the requirements for Types IV, IVA and V flight data recorders, are listed in the paragraphs below.
- (d) The number of parameters to be recorded shall depend on helicopter complexity. The parameters without an asterisk (\*) are mandatory parameters which shall be recorded regardless of helicopter complexity. In addition, the parameters designated by an asterisk (\*) shall be recorded if an information data source for the parameter is used by helicopter systems or the flight crew to operate the helicopter. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.
- (e) The following parameters shall satisfy the requirements for flight path and speed:
- (i) pressure altitude;
  - (ii) indicated airspeed;
  - (iii) outside air temperature;
  - (iv) heading;
  - (v) normal acceleration;
  - (vi) lateral acceleration;

- (vii) longitudinal acceleration (body axis);
  - (viii) time or relative time count;
  - (ix) navigation data\* such as drift angle, wind speed, wind direction, latitude and longitude; and
  - (x) radio altitude\*.
- (f) The following parameters shall satisfy the requirements for attitude:
- (i) pitch attitude;
  - (ii) roll attitude; and
  - (iii) yaw rate.
- (g) The following parameters shall satisfy the requirements for engine power:
- (i) power on each engine such as free power turbine speed (Nf), engine torque, engine gas generator speed (Ng), cockpit power control position;
  - (ii) rotor such as main rotor speed, rotor brake;
  - (iii) main gearbox oil pressure\*;
  - (iv) gearbox oil temperature\* such as main gearbox oil temperature, intermediate gearbox oil temperature, tail rotor gearbox oil temperature;
  - (v) engine exhaust gas temperature (T4)\*;
  - (vi) turbine inlet temperature (TIT)\*.
- (h) The following parameters shall satisfy the requirements for operation:
- (i) hydraulics low pressure;
  - (ii) warnings;
  - (iii) primary flight controls such as pilot input and/or control output position: collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal, controllable stabilator and hydraulic selection;
  - (iv) marker beacon passage;
  - (v) each navigation receiver frequency selection;
  - (vi) auto flight control systems mode and engagement status\*;
  - (vii) stability augmentation system engagement\*;
  - (viii) indicated sling load force\*;
  - (ix) vertical deviation\* such as instruments landing system glide path, microwave landing system elevation, global navigation system approach path;
  - (x) horizontal deviation\* such as instrument landing system localizer, microwave landing system azimuth, global navigation satellite system approach path;
  - (xi) distance measuring equipment 1 and 2 distances\*;
  - (xii) altitude rate\*;
  - (xiii) ice detector liquid water content\*;



(xiv) helicopter health and usage monitor system\*  
such as engine data, chip detectors, channel  
timing, exceedance discretes, broadband average  
engine vibration.

- (i) The following parameters shall satisfy the  
requirements for configuration:
- (i) landing gear or gear selector position\*;
  - (ii) fuel contents\*;
  - (iii) ice detector liquid water content\*.

**Note**—*Parameter guidance for range, sampling, accuracy and resolution are as contained in the EUROCAE ED-112, Minimum Operational Performance Specifications (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.*

- (j) A Type IVA flight data recorder shall be capable of recording, as appropriate to the helicopter, at least the 48 parameters in Table 1.
- (k) A Type IV flight data recorder shall be capable of recording, as appropriate to the helicopter, at least the first 30 parameters in Table 1.
- (l) A Type V flight data recorder shall be capable of recording, as appropriate to the helicopter, at least the first 15 parameters in Table 1.
- (m) If further recording capacity is available, recording of the following additional information shall be considered:
- (i) additional operational information from electronic displays, such as electronic flight instrument systems (EFIS); electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS); and
  - (ii) additional engine parameters (EPR, N1, fuel flow, etc.).
- (n) The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by methods approved by the appropriate certificating authority.
- (o) Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability and maintenance information shall be maintained by the operator/owner. The documentation shall be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units

### 3. Cockpit voice recorder

- (a) The cockpit voice recorder shall start to record prior to the helicopter moving under its own power and record continuously until the termination of the flight when the helicopter is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the CVR 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.

- (b) A cockpit voice recorder shall record on four separate channels, or more, at least the following:
  - (i) voice communication transmitted from or received in the aircraft by radio;
  - (ii) aural environment on the flight deck;
  - (iii) voice communication of flight crew members on the flight deck using the interphone system, if installed;
  - (iv) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker; and
  - (v) voice communication of flight crew members using the passenger address system, if installed.
- (c) A cockpit voice recorder shall be capable of recording on at least four channels simultaneously. For tape-based cockpit voice recorder, to ensure accurate time correlation between channels, the cockpit voice recorder shall record in an in-line format. If a bi-directional configuration is used, the in-line format and channel allocation shall be retained in both directions.
- (d) The preferred channel allocation shall be as follows:
  - (i) Channel 1—co-pilot headphones and live boom microphone;
  - (ii) Channel 2—pilot headphones and live boom microphone;
  - (iii) Channel 3—area microphone; and
  - (iv) Channel 4—time reference, main rotor speed or the flight deck vibration environment, the third and fourth crew member’s headphone and live microphone, if applicable.

**Note 1**—*Channel 1 is located closest to the base of the recording head.*

**Note 2**—*The preferred channel allocation presumes use of current conventional magnetic tape transport mechanisms and is specified because the outer edges of the tape have a higher risk of damage than the middle. It is not intended to preclude use of alternative recording media where such constraints may not apply*

#### **4. Airborne image recorder**

- (a) A Class “A” airborne image recorder 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 AIRs in this document.*

- (b) A Class “B” airborne image recorder captures data link message displays.
- (c) A Class “C” airborne image recorder captures instruments and control panels.

**Note**—*It may be considered as a means for recording flight data where it is not practical or prohibitively expensive to record on an FDR, or where an FDR is not required.*

- (d) An airborne image recorder will start to record prior to the helicopter moving under its own power and record continuously until the termination of the flight when the helicopter is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the AIR will 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.

#### 5. Data link recorder

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

- (b) Messages applying to the applications listed below shall be recorded. Applications without the asterisk are mandatory applications which shall be recorded regardless of the system complexity. Applications with an are to be recorded only as far as is practicable given the architecture of the system—
- (i) Data link initiation capability;
  - (ii) Controller—pilot data link communications;
  - (iii) Data link—flight information services;
  - (iv) Automatic dependent surveillance—contract;
  - (v) Automatic dependent surveillance—broadcast\*;
  - (vi) Aeronautical operational control\*.
- (c) Descriptions of the data link recorders applications are contained in Table 2.

#### 6. Inspections of flight recorder systems

- (a) Prior to the first flight of the day, the built-in test features for the flight recorders and flight data acquisition unit, when installed, shall be monitored by manual and/or automatic checks.
- (b) Annual inspections shall be carried out as follows:
- (i) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;

- (ii) the analysis of the flight data recorder shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the helicopter and by the tools used to extract the data from the recorder) is within acceptable limits and to determine the nature and distribution of the errors;
  - (iii) a complete flight from the flight data recorder 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 flight data recorder. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;
  - (iv) 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;
  - (v) an annual examination of the recorded signal on the cockpit voice recorder shall be carried out by replay of the cockpit voice recorder recording. While installed in the aircraft, the cockpit voice recorder shall record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards;
  - (vi) where practicable, during the annual examination, a sample of in-flight recordings of the cockpit voice recorder shall be examined for evidence that the intelligibility of the signal is acceptable; and
  - (viii) an annual examination of the recorded images on the airborne image recorder shall be carried out by replay of the airborne image recorder recording. While installed in the aircraft, the airborne image recorder shall record test images from each aircraft source and from relevant external sources to ensure that all required images meet recording quality standards.
- (c) Flight recorder systems 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.
- (d) A report of the annual inspection shall be made available on request to regulatory authorities for monitoring purposes.

(e) Calibration of the flight data recorder system—

(i) for those parameters which have sensors dedicated only to the flight data recorder 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

(ii) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the flight data recorder system, there shall be a recalibration performed as recommended by the sensor manufacturer, or at least every two years.

**Table 1**  
**Parameter Standards for Flight Data Recorders**

| Serial Number | Parameter  | 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 GPS time sync)        | 24 hours   | 4   | ±0.125% per hour  | 1 second             |
| 2             | Pressure-altitude maximum certificated altitude of aircraft +1 500 m (+5 000 ft) | -300 m (-1 000 ft) to                              | 1   | ±30 m to ±200 m (±100 ft to ±700 ft)                    | 1.5 m (5 ft)         |
| 3             | Indicated airspeed display measuring system                                      | As the installed pilot                             | 1   | ±3%   | 1 kt                 |
| 4             | Heading  | 360°   | 1   | ±2°   | 0.5°                 |
| 5             | Normal acceleration  | -3 g to +6 g                                       | 0.125   | ±0.09 g excluding a datum error of ±0.045 g             | 0.004 g              |
| 6             | Pitch attitude   | ±75° or 100% of useable range whichever is greater | 0.5   | ±2°   | 0.5°                 |
| 7             | Roll attitude  | ±180°  | 0.5   | ±2°   | 0.5°                 |
| 8             | Radio transmission keying  | On-off (one discrete)                              | 1   | —   | —                    |
| 9             | Power on each engine   | Full range   | 1 (per engine)                                    | ±2%   | 0.1% of full range   |
| 10*           | Main rotor:<br>Main rotor speed<br>Rotor brake                                   | 50-130% Discrete                                   | 0.51  | ±2%   | 0.3% of full range   |

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**Table 1**  
**Parameter Standards for Flight Data Recorders—Continued**

| <i>Serial Number</i>   | <i>Parameter</i>  | <i>Measurement range</i>                   | <i>Maximum sampling and recording interval (seconds)</i> | <i>Accuracy limits (sensor input compared to FDR read-out)</i>  | <i>Recording resolution</i>   |
|--|---|--|--|---|---|
| 11*  | Pilot input and/or control surface position —primary controls (collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal) | Full range                                 | 0.5  | (0.25 recommended) $\pm 2\%$ unless higher accuracy uniquely required   | 0.5% of operating range   |
| 12   | Hydraulics, each system (low pressure and selection)  | Discrete                                   | 1  | —   | —   |
| 13   | Outside air temperature   | Sensor range                               | 2  | $\pm 2^\circ\text{C}$   | $0.3^\circ\text{C}$   |
| 14*  | Autopilot/autothrottle /AFCS mode and engagement status   | A suitable combination of discretets       | 1  | —   | —   |
| 15*  | Stability augmentation system engagement  | Discrete                                   | 1  | —   | —   |
| <i>Note.—The preceding 15 parameters satisfy the requirements for a Type VFDR.</i> |   |  |  |   |   |
| 16*  | Main gearbox oil pressure   | As installed                               | 1  | As installed  | 6.895 (kN/m <sup>2</sup> 1 psi)   |
| 17*  | Main gearbox oil temperature  | As installed                               | 2  | As installed  | $1^\circ\text{C}$   |
| 18   | Yaw   | $\pm 400^\circ/\text{second}$              | 0.25   | rate $\pm 1.5\%$ maximum range excluding datum error of $\pm 5\%$   | $\pm 2^\circ/\text{s}$  |
| 19*  | Sling load force  | 0 to 200% of certified load                | 0.5  | $\pm 3\%$ of maximum range  | 0.5% for maximum certified load   |
| 20   | Longitudinal acceleration   | $\pm 1\text{ g}$                           | 0.25   | $\pm 0.015\text{ g}$ excluding a datum error of $\pm 0.05\text{ g}$   | 0.004 g   |
| 21   | Lateral acceleration  | $\pm 1\text{ g}$                           | 0.25   | $\pm 0.015\text{ g}$ excluding a datum error o $\pm 0.05\text{ g}$  | 0.004   |
| 22*  | Radio altitude  | –6 m to 750 m (–20 ft to 2 500 ft)         | 1  | $\pm 0.6\text{ m}$ ( $\pm 2\text{ ft}$ ) or $\pm 3\%$ whichever is greater below 150 m (500 ft) and $\pm 5\%$ above 150m (500 ft) | 0.3 m (1 ft) below 150 m (500 ft), 0.3 m (1 ft) + 0.5% of full range above 150 m (500 ft) |
| 23*  | Vertical beam deviation   | Signal range                               | 1  | $\pm 3\%$   | 0.3% of full range  |
| 24*  | Horizontal beam deviation   | Signal range                               | 1  | $\pm 3\%$   | 0.3% of full range  |
| 25   | Marker beacon passage   | Discrete                                   | 1  | —   | —   |
| 26   | Warnings  | Discrete(s)                                | 1  | —   | —   |
| 27   | Each navigation receiver frequency selection  | Sufficient to determine selected frequency | 4  | As installed  | —   |
| 28*  | DME 1 and 2 distances   | 0–370 km(0–200 NM)                         | 4  | As installed  | 1 852 m (1 NM)  |
| 29*  | Navigation data (latitude/longitude, ground speed, drift angle, wind speed, wind direction)   | As installed                               | 2  | As installed  | As installed  |

**Table 1**  
**Parameter Standards for Flight Data Recorders—Continued**

| Serial Number   | Parameter   | Measurement range | Maximum sampling and recording interval (seconds) | Accuracy limits (sensor input compared to FDR read-out) | Recording resolution                   |
|---|---|-------------------|---|---|--|
| 30*   | Landing gear and gear selector position                           | Discrete          | 4   | —   | —                                      |
| <i>Note.—The preceding 30 parameters satisfy the requirements for a Type IV FDR.</i>  |   |                   |   |   |  |
| 31*   | Engine exhaust gas temperature (T4)                               | As installed      | 1   | As installed  |  |
| 32*   | Turbine inlet temperature (TIT/TTT)                               | As installed      | 1   | As installed  |  |
| 33*   | Fuel contents   | As installed      | 4   | As installed  |  |
| 34*   | Altitude rate   | As installed      | 1   | As installed  |  |
| 35*   | Ice detection   | As installed      | 4   | As installed  |  |
| 36*   | Helicopter health and usage monitor system                        | As installed      | —   | As installed  | —                                      |
| 37  | Engine control modes  | Discrete          | 1   | —   | —                                      |
| 38*   | Selected barometric setting (pilot and co-pilot)                  | As installed      | 64 (4 recommended)                                | As installed  | 0.1 mb (0.01 in Hg)                    |
| 39*   | Selected altitude (all pilot selectable modes of operation)       | As installed      | 1   | As installed  | Sufficient to determine crew selection |
| 40*   | Selected speed (all pilot selectable modes of operation)          | As installed      | 1   | As installed  | Sufficient to determine crew selection |
| 41*   | Selected Mach (all pilot selectable modes of operation)           | As installed      | 1   | As installed  | Sufficient to determine crew selection |
| 42*   | Selected vertical speed (all pilot selectable modes of operation) | As installed      | 1   | As installed  | Sufficient to determine crew selection |
| 43*   | Selected heading (all pilot selectable modes of operation)        | As installed      | 1   | As installed  | Sufficient to determine crew selection |
| 44*   | Selected flight path (all pilot selectable modes of operation)    | As installed      | 1   | As installed  | Sufficient to determine crew selection |
| 45*   | Selected decision height  | As installed      | 4   | As installed  | Sufficient to determine crew selection |
| 46*   | EFIS display format (pilot and co-pilot)                          | Discrete(s)       | 4   | —   | —                                      |
| 47*   | Multi-function/engine/alerts display format                       | Discrete(s)       | 4   | —   | —                                      |
| 48*   | Event marker  | Discrete          | 1   | —   | —                                      |
| <i>Note.—The preceding 48 parameters satisfy the requirements for a Type IVA FDR.</i> |   |                   |   |   |  |

**Table 2**  
**Description of Applications for Data Link Recorders**

| Item No.   | Application Type                      | Application Description  | Recording Contract |
|--|---------------------------------------|--|--------------------|
| 1  | Data link Initiation                  | This includes any applications used to logon to or initiate data link 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 (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, D-METAR, D-ATIS, D-NOTAM and other textual data link services.   | C                  |
| 5  | Aircraft Broadcast Surveillance       | This includes Elementary and Enhanced Surveillance Systems, as well as 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 *                |
| 6  | Aeronautical Operational Control Data | This includes any application transmitting or receiving data used for AOC purposes (per the ICAO definition of AOC).   | M *                |
| <p>Key:<br/>           C: Complete contents recorded.<br/>           M: Information that enables correlation to any associated records stored separately from the aeroplane.<br/>           *: Applications to be recorded only as far as is practicable given the architecture of the system.</p> |                                       |  |                    |

Made by the Civil Aviation Authority this 8th day of July, 2011.

R. LUTCHMEDIAL  
*Civil Aviation*

Approved by the Minister of Works and Transport this 8th day of July, 2011.

J. WARNER  
*Minister of Works and Transport*