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NIGERIAN CIVIL AVIATION (ORDER 002), 2014

ARRANGEMENT OF REGULATIONS

Regulation :

NIGERIAN CIVIL AVIATION AUTHORITY

An Order promulgating regulations in conformity with recent amendments to Standards and Recommended Practices (*Annexes*) to the Convention on International Civil Aviation.

PREAMBLE :

1. WHEREAS the Nigeria Civil Aviation Regulations (Nig. CARs 2009) Vol. I was issued in July, 2009 ;

2. WHEREAS the Nig. CARs 2009 was promulgated to correspond with the international civil aviation standards published by the International Civil Aviation Organisation (ICAO).

3. WHEREAS ICAO has amended the *Annexes* by adopting new Standards and Recommended Practices (SARPs) since July, 2009 ;

4. WHEREAS there has been observed some gaps between the Nig. CARs 2009 and the new ICAO SARPs : and

5. WHEREAS there is an urgent need to bring the Nig. CARs 2009 up to date with the ICAO SARPs.

S. I. No. 14 of 2014

NIGERIAN CIVIL AVIATION (ORDER 002), 2014

[*9th Day of June*, 2014] Commencement.

Pursuant to the powers vested by Section 30(5) of the Civil Aviation Act 2006, the Nigerian Civil Aviation Authority (NCAA) hereby Orders as follows :

1.0. AIRCRAFT EQUIPPED WITH HEAD-UP DISPLAYS (HUD) AND/OR ENHANCED VISION SYSTEMS (EVS)

Where aircraft are equipped with HUD and/or EVS, the use of such systems to gain operational benefit shall be approved by the State of the Operator.

FLIGHT RECORDERS

2.1.—(*a*) Crash protected flight recorders, for both aeroplanes and helicopters, comprise one or more of the following systems : Flight Recorders Systems.

(1) A flight data recorder (FDR) ;
(2) A cockpit voice recorder (CVR) ;
(3) An airborne image recorder (AIR) ; and/or
(4) A data-link recorder (DLR).

(*b*) Lightweight flight recorders for aeroplanes comprise one or more of the following systems :

(1) An aircraft data recording system (ADRS) ;
(2) A cockpit audio recording system (CARS) ;
(3) An airborne image recording system (AIRS) ; and/or
(4) A data link recording system (DLRS).

(*c*) Combination recorders (FDR/CVR) may be used to meet the equipage requirements for helicopters.

2.2.—(*a*) Flight recorders systems shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed. Construction and Installation.

(1) 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*) Flight recorder systems shall be installed so that :

(1) The probability of damage to the recordings is minimised ;

(2) They receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardising service to essential or emergency loads ;

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

(4) 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 ; and

(5) They meet the prescribed crashworthiness and fire protection specifications.

(*c*) The flight recorder systems, when tested by methods approved by the State of Design, 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 State of Design with the following information in respect of the flight recording systems :

(1) manufacturer's operating instructions, equipment limitations and installation procedures ;

(2) manufacturer's test reports ; and

(3) for aeroplane flight recording systems, parameter origin or source and equations which relate counts to units of measurement.

Operation.

2.3.—(*a*) Flight recorder systems shall not be switched off during flight time.

(*b*) To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident. The flight recorders shall not be reactivated before their disposition as determined in accordance with the accident/incident regulations of Nigeria.

Flight Recorder Electronic Documentation.

2.4. Operators shall provide to accident investigation authorities the documentation of flight recording systems parameters in electronic format and in accordance with industry specifications.

Combination Recorders.

2.5.—(*a*) (AAC) No person may operate an aeroplane of a maximum certificated take-off mass over 5700 required to be equipped with an FDR and a CVR unless it is equipped with :

(1) An FDR and a CVR ; or

(2) Two combination recorders (FDR/DVR).

(*b*) (AOC) No person may operate an aeroplane of a maximum certificated take-off mass of over 5700 kg and which is required to be equipped with both a FDR and CVR unless :

(1) The aeroplane is equipped with an FDR and a CVR or alternatively equipped with two combination recorders (FDR/CVR) ;

(2) The aeroplane is equipped with two combination recorders (FDR/CVR) for aeroplanes type certificated on or after 1st January 2016.

(*c*) (AOC) No person may operate an aeroplane of a maximum certificated take-off mass of over 15 000 kg which is required to be equipped with both a CVR and an FDR and type certificated on or after 1st January 2016, unless :

(1) The aeroplane is equipped with two combination recorders (FDR/CVR) ; and

(2) One recorder is located as close to the cockpit as practicable and the other recorder located as far aft as practicable.

(*d*) (AOC) No person may operate a multi-engined turbine-powered aeroplane of a maximum certificated take-off mass of 5700 kg or less, unless :

(1) The aeroplane is equipped with an FDR and/or a CVR ; or

(2) The aeroplane is equipped with one combination recorder (FDR/CVR).

FLIGHT DATA RECORDERS (FDR) AND AIRCRAFT DATA RECORDING SYSTEMS (ADRS)

Types and Parameters.

3.1.—(*a*) Aeroplane— Aeroplane FDR shall record the parameters as listed in IS 3.1(A) for the following FDR types :

(1) Types I and IA FDR shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation.

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

(*b*) *Helicopter*— Helicopter FDR shall record the parameters as listed in IS 3.1 (B) for the following FDR types :

(1) Type IV FDRs shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power and operation.

(2) Type IVA FDRs shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power, operations and configuration.

(3) Type V FDRs shall record the parameters required to determine accurately the helicopter flight path, speed, attitude and engine power.

Aircraft Equippage for Operation.

3.2.—(*a*) No person may operate the following aeroplane unless it is equipped with a flight data recorder capable of recording the aural environment of the flight deck during flight time.

(1) [AAC] All turbine-engined aeroplanes of a maximum certificated take-off mass of 5700kg or less for which the application is for a type certificate is first made to the appropriate CAA on or after 1st January 2016 ; shall be equipped with :

(*i*) a Type II FDR ; or

(*ii*) a Class C AIR capable of recording flight path and speed parameters displayed to the pilot(s) ; or

(*iii*) an ADRS capable of recording the essential parameters defined in the Table in IS 3.2.

(2) [AAC] All turbine-engined aeroplanes of a maximum certificated take-off mass of 5700kg or less for which the individual certificate of airworthiness is first issued on or after 1st January 2016 shall be equipped with :

(*i*) a Type II FDR ; or

(*ii*) a Class C AIR capable of recording flight path and speed parameters displayed to the pilot(s) ; or

(*iii*) an ADRS capable of recording the essential parameters defined in the Table in IS : 3.2.

(3) [AAC] All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1st January 1989 shall be equipped with a Type I FDR.

(4) [AAC] All aeroplanes of a maximum certificated take-off mass of over 5 700 kg. up to and including 27000 kg, for which the individual certificate of airworthiness is first issued on or after 1st January 1989, shall be equipped with a Type II FDR.

(5) [AOC] All multi-engined turbine-engined aeroplanes of a maximum certificated take-off mass of 5700kg or less for which the individual certificate of airworthiness is first issued on or after 1st January 1990 should be equipped with a Type IIA FDR.

(6) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued on or after 1st January 1987 but before 1st January 1989, with a maximum certificated take-off mass of over 5700kg, except those in Order 3.2 (a)(8), shall be equipped with an FDR which shall record time, altitude, airspeed, normal acceleration and heading.

(7) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued on or after 1st January 1987 but before 1st January 1989, with a maximum certificated take-off mass of over 5700 kg, except those in Order 3.2 (*a*)(8), should be equipped with an FDR which shall record time, altitude, airspeed, normal acceleration, heading and such additional parameters as are necessary to determine pitch attitude, roll attitude, radio transmission keying and power on each engine.

(8) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued on or after 1st January 1987 but before 1st January 1989, with a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30th September 1969 shall be equipped with a Type II FDR.

(9) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1st January 1987, with a maximum certificated take-off mass of over 5700kg shall be equipped with an FDR which shall record time, altitude, airspeed, normal acceleration and heading.

(10) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1st January 1987, with a maximum certificated take-off mass of over 27000kg that are of types of which the prototype was certificated by the appropriate national authority after 30th September 1969 should be equipped with an FDR which should record, in addition to time, altitude, airspeed, normal acceleration and heading, such additional parameters as are necessary to meet the objectives of determining :

(*i*) the attitude of the aeroplane in achieving its flight path ; and

(*ii*) the basic forces acting upon the aeroplane resulting in the achieved flight path and the origin of such basic forces.

(11) [AAC] All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued after 1st January 2005 shall be equipped with a Type IA FDR.

(12) [AOC] All aeroplanes which are required to record normal acceleration, lateral acceleration and longitudinal acceleration for which the application is for a type certificate is first made to the appropriate CAA on or after 1st January 2016 and which are required to be fitted with an FDR shall

record those parameters at a maximum sampling and recording interval of 0.0625 seconds.

(13) [AAC] All aeroplanes which are required to record pilot input and/or control surface position of primary controls (pitch, roll, yaw) for which the application for a type certificate is first made to the appropriate CAA on or after 1st January 2016 and which are required to be fitted with an FDR shall record those parameters at a maximum sampling and recording interval of 0.125 seconds.

(*b*) No person may operate the following helicopter unless it is equipped with a flight data recorder capable of recording the aural environment of the flight deck during flight time.

(1) [AAC] All helicopters with a maximum certificated take-off mass of over 3180kg for which the individual certificate of airworthiness is first issued on or after 1st January 2016 shall be equipped with a Type IVA FDR.

(2) [AAC] All helicopter with a certificated take off mass of over 7000kg, or having a passenger seating configuration of more than nineteen, for which the individual certificate of airworthiness is first issued on or after 1st January 1989 shall be equipped with a Type IV FDR.

(3) [AAC] All helicopters with a maximum certificated take-off mass of over 3180kg, up to and including 7000 kg, for which the individual certificate of airworthiness is first issued on or after 1st January 1989 shall be equipped with a Type V FDR.

(4) [AOC] All turbine-engined helicopter of a maximum certificated take-off mass of over 2250kg. up to and including 3180kg for which the which the application for a type certificate is first made to the appropriate CAA on or after 1st January 2018, unless is it equipped with :

(*i*) A Type IVA FDR ; or

(*ii*) A Class C AIR capable of recording fight path and speed parameters displayed to the pilot(s) ; or

(*iii*) An ADRS capable of recording the essential parameters in the Table in IS : 3.2.

(5) [AOC] All turbine-engined helicopter of a maximum certificated take-off mass of over 3 180 kg or less for which the individual certificate of airworthiness is first issued on or after 1st January 2018, unless is it equipped with :

(*i*) A Type IVA FDR ; or

(*ii*) A Class C AIR capable of recording fight path and speed parameters displayed to the pilot(s) ; or

(*iii*) An ADRS capable of recording the essential parameters in the Table in IS: 3.2.

3.3. Flight data recorder media not acceptable for use in aircraft registered in Nigeria, or operated in commercial air transport operations in Nigeria, are : Discontinuation.

(1) Engraving metal foil ;

(2) Photographic film ;

(3) Analogue data using frequency modulation (FM) ;

(4) Magnetic tape.

3.4. FDRs shall be capable of retaining the information recorded during the last : Duration.

(1) Type I and II — 25 hours of operation.

(2) Type IIA – 30 minutes of operation.

(3) Type IV, IVA and V – 10 hours of operation.

IMPLEMENTING STANDARDS

IS: 3.1(A) FLIGHT DATA RECORDERS—TYPE AND PARAMETERS — AEROPLANE

(*a*) 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 :

(1) *Type IA FDR.*—This FDR shall be capable of recording, as appropriate to the aeroplane, at least the 78 parameters in Table A.

(2) *Type I FDR.*— This FDR shall be capable of recording, as appropriate to the aeroplane, at least the first 32 parameters in Table A.

(3) *Types II and IIA FDRs.*—These FDRs shall be capable of recording, as appropriate to the aeroplane, at least the first 16 parameters in Table A.

(*b*) *Parameters—General* :

(1) The parameters that satisfy the requirements for FDRs are listed in the paragraphs below.

(2) The number of parameters to be recorded shall depend on aeroplane complexity.

(3) The parameters without an asterisk (*) are mandatory parameters which shall be recorded regardless of aeroplane complexity.

(4) 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.

(5) However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

(*c*) *Parameter—Flight Path and Speed*—The following parameters satisfy the requirements for flight path and speed :

(1) Pressure altitude.

(2) Indicated or calibrated airspeed.

(3) Air-ground status and each landing gear air-ground sensor when practicable.

(4) Total or outside air temperature.

(5) Heading (primary flight crew reference).

(6) Normal acceleration.

(7) Lateral acceleration.

(8) Longitudinal acceleration (body axis).

(9) Time or relative time count.

(10) Navigation data* : drift angle, wind speed, wind direction, latitude/ longitude.

(11) Groundspeed*.

(12) Radio altitude*.

(*d*) *Parameters–Altitude*—The following parameters satisfy the requirements for altitude :

(1) Pitch attitude.

(2) Roll attitude.

(3) Yaw or sideslip angle*.

(4) Angle of attack*.

(*e*) *Parameters–Engine Power*—The following parameters satisfy the requirements for engine power :

(1) Engine thrust power: propulsive thrust/power on each engine, cockpit thrust/power lever position.

(2) Thrust reverse status*.

(3) Engine thrust command*.

(4) Engine thrust target*.

(5) Engine bleed valve position*.

(6) Additional engine parameters* : EPR, N1, indicated vibration level, N2, EGT, TLA, fuel flow, fuel cut-off lever position, N3.

(*f*) *Parameters–Configuration*—The following parameters satisfy the requirements for configuration :

(1) Pitch trim surface position.

(2) Flaps* : trailing edge flap position, cockpit control selection.

(3) Slats*: leading edge flap (slat) position, cockpit control selection.

(4) Landing Gear*: landing gear, gear selector position.

(5) Yaw trim surface position*.

(6) Roll trim surface position*.

(7) Cockpit trim control input position pitch*.

(8) Cockpit trim control input position roll*.

(9) Cockpit trim control input position yaw*.

(10) Ground spoiler and speed brake* : Ground spoiler position, ground spoiler selection, speed brake position, speed brake selection.

(11) De-icing and/or anti-icing systems selection*.

(12) Hydraulic pressure (each system)*.

(13) Fuel quantity*.

(14) AC electrical bus status*.

(15) DC electrical bus status*.

(16) APU bleed valve position*.

(17) Computed centre of gravity*.

(g) *Parameters–Operation*—The following parameters satisfy the requirements for operation :

(1) Warnings.

(2) Primary flight control surface and primary flight control pilot input: pitch axis, roll axis, yaw axis.

(3) Marker beacon passage.

(4) Each navigation receiver frequency selection.

(5) Manual radio transmission keying and CVR/FDR synchronisation reference.

(6) Autopilot/autothrottle/AFCS mode and engagement status*.

(7) Selected barometric setting*: pilot first officer (co-pilot).

(8) Selected altitude (all pilot selectable modes of operation)*.

(9) Selected speed (all pilot selectable modes of operation)*.

(10) Selected MACH (all pilot selectable modes of operation)*.

(11) Selected vertical speed (all pilot selectable modes of operation)*.

(12) Selected heading (all pilot selectable modes of operation)*.

(13) Selected flight path (all pilot selectable modes of operation)*; course/DSTRK, path angle.

(14) Selected decision height*.

(15) EFIS display format* : pilot, first officer (co-pilot).

(16) Multi function/engine/alerts display format *.

(17) GPWS/TAWS/GCAS status*: selection of terrain display mode including pop-up display status, terrain alerts, both cautions and warning, and advisories, on/off switch position.

(18) Low pressure warning*: hydraulic pressure, pneumatic pressure.

(19) Computer failure*.

(20) Loss of cabin pressure*.

(21) TCAS/ACAS (traffic alert and collision avoidance system/airborne collision avoidance system)*.

(22) Ice detection*.

(23) Engine warning each engine vibration*.

(24) Engine warning each engine overtemperature*.

(25) Engine warning each engine oil pressure low*.

(26) Engine warning each engine overspeed*.

(27) Wind shear warning*.

(28) Operational stall protection, stick shaker and pusher activation*.

(*h*) All cockpit flight control forces* : control wheel, control column, rudder pedal cockpit input forces.

(*i*) Vertical deviation* : ILS glide path, MLS elevation, GNSS approach path.

(*j*) Horizontal deviation* : ILS localizer, MLS azimuth, GNSS approach path.

(*k*) DME 1 and 2 distances*.

(*l*) Primary navigation system reference* : GNSS, INS, VOR/DME, MLS, Loran C, ILS.

(*m*) Brakes*: left and right brake pressure, left and right brake pedal position.

(*n*) Date*.

(*o*) Event marker*.

(*p*) Head up display in use*.

(*q*) Para visual display on*.

Note 1: Parameter guidance for range, sampling, accuracy and resolution are as contained in the EUROCAE ED-112, Minimum Operational Performance Specification (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

Note 2: It is not intended that aeroplanes issued with an individual certificate of airworthiness before 1 January 2016 be modified to meet the range, sampling, accuracy or resolution guidance detailed in this Appendix.

(*r*) *Parameters–Flight Path and Speed as Displayed to the Pilot*— The parameters that satisfy the requirements for flight path and speed as displayed to the pilot(s) are listed below. The parameters without an (*) are mandatory parameters which shall be recorded. In addition, the parameters designed by an (*) shall be recorded if an information source for the parameter is displayed to the pilot and is practicable to record :

(1) Pressure altitude.

(2) Indicated airspeed or calibrated airspeed.

(3) Heading (primary flight crew reference).

(4) Pitch attitude.

(5) Roll attitude.

(6) Engine thrust/power.

(7) Landing-gear status*.

(8) Total or outside air temperature*.

(9) Time*.

(10) Navigation data*: drift angle, wind speed, wind direction, latitude/longitude.

(11) Radio altitude*.

TABLE

PARAMETER GUIDANCE FOR CRASH PROTECTED FLIGHT DATA RECORDERS—AEROPLANES

The first 16 (or 15) parameters satisfy the requirements for a Type II and Type IIA FDR.

The first 32 parameters satisfy the requirements for a Type I FDR.

The total 78 parameters satisfy the requirements for a Type IA FDR.

S/No.	*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 sync)	24 hours	4	±0.125% per hour	1 second
2.	Pressure-altitude–	-300 m (-1 000 ft) to maximum certificated altitude of aircraft 1.500m (5,000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)	1.5 m (5 ft)
3.	Indicated airspeed or calibrated airspeed	95 km/h (50 kt) to max VSo (Note 1) VSo to 1.2 VD (Note 2)	1	±5% ±3%	1 kt (0.5 kt recommended)
4.	Heading (primary flight crew reference)	360 degrees	1	±2°	0.5°
5.	Normal acceleration (Note 3)–	-3 g to +6 g	0.125	±1% of maximum range excluding datum errpr 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		

S/No.	Parameter	Measurement Range	Maximum Sampling and Recording Interval (seconds)	Accuracy Limits (sensor input compared to FDR read-out)	Recording Resolution
9.	Power on each engine (Note 4)	Full range	1 (per engine)	±2%	0.2% of full range or the resolution required to operate the aircraft.
10*.	Trailing edge flap and cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft.
11*.	Leading edge flap and cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft.
12*.	Thrust reverser position	Stowed, in transit, and reverse.	1 (per engine)		
13*.	Ground spoiler/speed brake selection (selection and position)	Full range or each discrete position	1	±2% unless higher accuracy uniquely required	0.2% of full range
14.	Outside air temperature	Sensor range	2	±2°C	0.3°C
15*.	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretes	1		
16.	Longitudinal acceleration (Note 3)	+/-1 g	0.25	±0.015 g excluding a datum error of ±0.05g	0.004g
17.	Lateral acceleration (Note 3)	±1 g	0.25	±0.015 g excluding a datum error of ±0.05g	0.004g

S/No.	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 control surface position-primary controls (pitch, roll, yaw) (Note 5) (Note 6)	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–	-6m to 750m (-20ft to 2,500ft)	1	0.6m (±2ft) or ±3% which ever is greater below 150m (500ft) and ±5% above 150m (500ft)	0.3m (1ft) below 150m (500ft); 0.3 m (1ft) + 0.5% of full range above 150m (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	Discreet	1		
24.	Master warning	Discrete	1		
25.	NAV receiver frequency selection (Note 7)	Full range	4	As installed	
26*	DME 1 and 2 distance (includes Distance to runway threshold (GLS) and Distance to missed	0 - 370 km (0-200 NM)	4	As installed	1,852m (1 NM)

S/No	Parameter	Measurement Range	Maximum Sampling and Recording Interval (seconds)	Accuracy Limits (sensor input compared to FDR read-out)	Recording Resolution
	approach point (IRNAV/IAN) (Notes 7 and 8)				
27.	Air/ground status	Discrete	1		
28*.	GPWS/TAWS/GCAS status (selection of terrain display mode including pop-up display status) and (Terrain alerts, both 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		0.5% of full range
31*.	Navigation data (latitude/longitude, ground speed and drift angle) (Note 9)	As installed	1	As installed	
32*.	Landing gear and gear selector position	Discrete	4	As installed	
33*.	Ground speed	As installed	1	Data should be obtained from the most accurate system	1kt
34.	Brakes (left and right brake pressure, left and right brake pedal position)	(Maximum metered brake range, discretes or full range)	1	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

S/No.	Parameter	Measurement Range	Maximum Sampling and Recording Interval (seconds)	Accuracy Limits (sensor input compared to FDR read-out)	Recording Resolution
36*.	TCAS/ACAS (traffic alert and collision avoidance system)	Discretes	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 operations)	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($)	4	As installed	

S/No	Parameter	Measurement Range	Maximum Sampling and Recording Interval (seconds)	Accuracy Limits (sensor input compared to FDR read-out)	Recording Resolution
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)	4	As installed	
53*.	Engine thrust command	As installed	2	As installed	
54*.	Engine thrust target	As installed	4	As installed	2% of full range
55*.	Computed centre of gravity	As installed	64	As installed	1% of full range
56*.	Fuel quantity in CG trim tank	As installed	64	As installed	1% of full range
57*.	Head up display in use	As installed	4	As installed	
58*.	Para visual display on/off	As installed	1	As installed	
59*.	Operational stall protection, stick shaker and pusher 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	

S/No.	Parameter	Measurement Range	Maximum Sampling and Recording Interval (seconds)	Accuracy Limits (sensor input compared to FDR read-out)	Recording Resolution
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	Descrete(s)	4		
70*.	Hydraulic pressure (each system)	Full range	2	±5%	100 psi
71*.	Loss of cabin pressure	Discrete	1		
72*.	Cockpit trim control input position Pitch	Full range	1	±5%	0.2% of full range or as installed
73*.	Cockpit trim control input position Roll	Full range	1	±5%	0.2% of full range or as installed
74*.	Cockpit trim control input position Yaw	Full range	1	±5%	0.2% of full range or as installed
75*.	All cockpit flight control input forces (control wheel, control column, rudder pedal)	Full range (±311 N (±70 lbf), ±378 N (±85 lbf), ±734 N (±165 lbf)	1	±5%	0.2% of full range or as installed
76*.	Event marker	Discrete	1		
77*.	Date	365 days	64		
78*.	ANP or EPE or EPU	As installed	4	As installed	

NOTE 1: *V_{so} stalling speed or minimum steady flight speed in the landing configuration.*

NOTE 2 : *VD design diving speed.*

NOTE 3 : *Refer to Regulations* 7.8.2.2(*a*)(12) *Reference to increased recording requirements.*

NOTE 4 : *Record sufficient inputs to determine power.*

NOTE 5 : *For aeroplanes with control systems in which movement of a control surface will back drive the pilot's control, "or" applies. For aeroplanes with control systems in which movement of a control surface will not back drive the pilot's control, "and" applies. In aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately.*

NOTE 6 : *Refer to Regulations* 7.8.2.2(*a*)(13) *Reference to increased recording requirements.*

NOTE 7 : *If signal available in digital form.*

NOTE 8 : *Recording of latitude and longitude from INS or other navigation system is a preferred alternative.*

NOTE 9 : *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 centralised aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority :

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

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

(3) warnings and alerts ;

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

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

IS : 3.1(B)—FLIGHT DATA RECORDERS—TYPE AND PARAMETERS - HELICOPTERS

(*a*) Flight data records shall be classified as Type IV, Type IVA, and Type V depending upon the number of parameters to be recorded.

(1) Type IV FDRs shall be capable of recording, as appropriate to the helicopter, at least the first 30 parameters in Table B below ;

(2) Type IVA FDRs shall be capable or recording, as appropriate to the helicopter, at least the first 48 parameters in Table B below ;

(3) Type V FDRs shall be capable of recording, as appropriate to the helicopter, at least the first 15 parameters in Table B below ;

(4) For all FDR types, if further recording capability is available, recording of the following additional information shall be considered ;

(5) Additional operational information from electronic displays, such as electronic flight instrument systems (EFIS), electronic centralised aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS) ; and

(6) Additional engine parameters (EPR, N1, fuel flow, etc.).

(*b*) The parameters that satisfy the requirements for a Type IV ; Type IVA, and Type V FDRs are listed below. The number of parameters to be recorded shall depend on helicopter complexity. The parameters without an asterisk (*) are mandatory parameters that shall be recorded. The parameters designated by an asterisk (*) shall also be recorded if an information data source for an asterisked parameter is used by helicopter systems or the flightcrew to operate the helicopter. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.

(*c*) The following parameters satisfy the requirements for flight path and speed :

(1) Pressure altitude.

(2) Indicated airspeed.

(3) Total or outside air temperature.

(4) Heading (primary flightcrew reference).

(5) Normal acceleration.

(6) Lateral acceleration.

(7) Longitudinal acceleration (body axis).

(8) Time or relative time count.

(9) Navigation data* : drift angle, wind speed, wind direction, latitude/ longitude.

(10) Radio altitude*.

(*d*) The following parameters satisfy the requirements for attitude :

(1) Pitch attitude.

(2) Roll attitude.

(3) Yaw rate.

(*e*) The following parameters satisfy the requirements for engine power :

(1) Power on each engine: free power turbine speed (Nf), engine torque, engine gas generator speed (Ng), cockpit power control position.

(2) Rotor : main rotor speed, rotor brake.

(3) Main gearbox oil pressure*

(4) Gearbox oil temperature*, main gearbox oil temperature, tail rotor gearbox oil temperature

(5) Engine exhaust gas temperature (T4)*

(6) Turbine inlet temperature (TIT)*

(*f*) The following parameters satisfy the requirements for configuration :

(1) Landing gear or gear selector position*.

(2) Fuel quality*

(3) Ice detector liquid water content*

(*g*) The following parameters satisfy the requirements for operation :

(1) Hydraulics low pressure

(2) Warnings

(3) Primary flight controls—pilot input and/or control output position : collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor petal, controllable stabilator, hydraulic selection.

(4) Marker beacon passage

(5) Each navigation receiver frequency selection

(6) AFCS mode and engagement status*

(7) Stability augmentation system engagement*

(8) Indicated sling load force*

(9) Vertical deviation*: ILS glide path, GNSS approach path.

(10) Horizontal deviation*: ILS localizer, GNSS approach path.

(11) DME 1 and 2 distances*

(12) Altitude rate*

(13) Ice detector liquid water content*

(14) Helicopter health and usage monitor system (HUMUS)* engine data, chip detectors, track timing, exceedance discretes, broadband average engine vibration.

Note : Parameter requirements, including range, sampling, accuracy and resolution are as contained in the Minimum Operational Performance Specification (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

TABLE—PARAMETERS FOR FLIGHT DATA RECORDINGS - HELICOPTERS

S/No.	*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	1s
2.	Pressure-altitude–	-300m (-1,000ft) to maximum certificated altitude of aircraft +1,500m (+5,000ft)	1	±30m to ±200m (±100 ft to ±700 ft)	1.5m (5ft)
3.	Indicated airspeed	As the installed measuring system	1	±3%	1 kt
4.	Heading	360 degrees	1	± 2°	0.5°
5.	Normal acceleration–	-3g to +6g	0.125	±0-.9g excluding a datum error of ±g	0.004g
6.	Pitch attitude	±75 or 100% of usable range whichever is greater	0.5	± 2° C	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 : Rotor brake	50-130% Main rotor speed Discrete	0.51	±2% —	0.3% of full range —
11.	Pilot input and/or control surface position-primary	Full range	0.5 (0.25 recomm-	±2% unless higher accuracy	0.5% of operating range

S/No.	Parameter	Measurement Range	Maximum Sampling and Recording Interval (seconds)	Accuracy Limits (sensor input compared to FDR read-out)	Recording Resolution
	controls (Collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal)		ended)	uniquely required	
12.	Hydraulics, each system and (low pressure and selection)	Discreet	1	—	—
13.	Outside air temperature	Sensor range	2	±2° C	0.3° C
14*.	Autopilot/auto throttle/ AFCS mode and engagement status	A suitable combination of discretes	1	—	—
15*.	Stability augmentation system engagement	Discrete	1	—	—
16*.	Main gearbox oil pressure	As installed	1	As installed	6.895 kN/m2 (1 psi)
17*.	Main gearbox oil temperature	As installed	2	As installed	1°C
18.	Yaw acceleration (or yaw rate)	±400U/second	0.25	±1.5% max range excluding datum error of ±5%	±2°s
19*	Sling load force	0-200% of certified load	0.5	±3% of max range	0.5% for maximum certified load
20.	Longitudinal acceleration	±1g	0.25	±0.015g excluding datum error of ± 0.05g	0.0004g
21.	Lateral acceleration	±1g	0.25	±0.015g excluding datum error of ± 0.05g	0.0004g

S/No.	Parameter	Measurement Range	Maximum Sampling and Recording Interval (seconds)	Accuracy Limits (sensor input compared to FDR read-out)	Recording Resolution
22*.	Radio altitude–	-6m to 750m (-20ft to 2500 ft)	1	±0.6m (±2ft) or ±3% whichever is greater below 150m (500ft) and ±5% above 150m (500ft)	0.3 m (1ft) below 150m (500ft), 0.3m (1 ft) = 0.5% of full range above 150m (500ft)
23*.	Vertical beam deviation	Signal range	1	±3%	0.3% of full range
24*.	Horizontal beam deviation	Signal range	1	±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 distance	0-370 km (0-200 NM)	4	As installed	1.852m (1 NM)
29*.	Navigation data (latitude/longitude, ground speed, drift angle, wind speed, wind direction)	As installed	2	As installed	As installed
30*.	Landing gear or gear selector position	Discrete	4	—	—
31*.	Engine exhaust gas temperature (T4)	As installed	1	As installed	
32*.	Turbine inlet temperature (ITI/ITT)	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	

S/No	Parameter	Measurement Range	Maximum Sampling and Recording Interval (seconds)	Accuracy Limits (sensor input compared to FDR read-out)	Recording Resolution
36*.	Helicopter health and usage monitor system	As installed	1	As installed	
37.	Engine control modes	Discrete	1	—	—
38*.	Selected barometric setting (pilot and co-pilot)	As installed	64	As installed	0.1mb (0.01 in Hg)39*
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	—	—

S/No.	*Parameter*	*Measurement Range*	*Maximum Sampling and Recording Interval (seconds)*	*Accuracy Limits (sensor input compared to FDR read-out)*	*Recording Resolution*
47*.	Multi-function/engine/ alerts display format	Discrete(s)	4	—	—
48*.	Event marker	Discrete	1	—	—

IS 3.2 : AIRCRAFT EQUIPPAGE FOR OPERATIONS — AIRCRAFT DATA RECORDING SYSTEM (ADRS)

(*a*) ADRS shall be capable of recording, as appropriate to the aircraft, at least the essential (E) parameters in the Table below.

(*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/maintenance information shall be maintained by the operator. The documentation shall be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

TABLE—PARAMETER GUIDANCE 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°	1	±2°	0.5°	*If not available, record rates
2.	Pitch attitude	E*	±90°	0.25	±2°	0.5°	*If not available, record rates
3.	Roll attitude	E*	±180°	0.25	±2°	0.5°	*If not available, record rates
4.	Yaw rate	E*	±300°	0.25	±1% + drift of 360"/hr	2°	*Essential heading available
5.	Pitch rate	E*	±300°	0.25	±1% + drift of 360"/hr	2°	*Essential if no pitch attitude available
6.	Roll rate	E*	±300°	0.25	±1% + drift of 360/hr	2°	*Essential if no roll rate available
7.	Positioning system : latitude/ longitude	E	Latitude : ±90° Longitude ±180°	2 (1 if available	As installed (0.00015° recommended	0.00005	—
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	2 (1 if available	As installed (±15m (±50ft) recommended)	1.5m (5ft)	—

No.	*Parameter Name*	*Parameter Category*	*Minimum Recording Range*	*Maximum Recording Interval in Seconds*	*Minimum Recording Accuracy*	*Minimum Recording Resolution*	*Remarks*
			aeroplane +1,500m (5,000ft)				
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	0-1 000 kt	2 (1 if available	As installed (±5 kt recommended)	1 kt	—
12.	Positioning system : channel	E	0-360°	2 (1 if available	As installed (±2° recommended)	0.5°	—
13.	Normal acceleration	E	-3g to + 6g(*)	0.25 (0.125 if available	As installed (±0.09g excluding a datum error of ±45g	0.004g	—
14.	Longitudinal acceleration	E	±1 g(*)	0.25 (0.125 if available	As installed (±0.015 g excluding a datum error of ±0.05g recommended)	0.004g	
15.	Lateral acceleration	E	±1 g(*)	0.25 (0.125 if available	As installed (±0.015 g excluding a datum error of	0.004g	—

No.	*Parameter Name*	*Parameter Category*	*Minimum Recording Range*	*Maximum Recording Interval in Seconds*	*Minimum Recording Accuracy*	*Minimum Recording Resolution*	*Remarks*
					±0.05g recommended)		
16.	External static pressure (or pressure altitude)	R	34.4 mb (3.44 in Hg) to 310.2 mb (31.03 in-Hg) or available sensor range	1	As installed (±1 mb 0.1 in-Hg) or ±30m(±100ft) to ±210 m (±700 ft) recommended)	0.1mb (0.01 in-Hg) or 1.5m 5ft)	—
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	R	As the installed pilot display measuring system or available sensor range	1	As installed (±3% recommended)	1kt (0.5 kt recommended)	—
19.	Engine RPM	R	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	—
20.	Engine Oil Pressure	R	Full range	Each engine each second	As installed (5% of full range)	2% of full range	—

No.	*Parameter Name*	*Parameter Category*	*Minimum Recording Range*	*Maximum Recording Interval in Seconds*	*Minimum Recording Accuracy*	*Minimum Recording Resolution*	*Remarks*
21.	Engine Oil temperature	R	Full range	Each engine each second	As installed (5% of full range)	2% of full range	—
22.	Fuel flow or pressure	R	Full range	Each engine each second	As installed	2% of full range	—
23.	Manifold pressure	R	Full range	Each engine each second	As installed	0.2% full range	—
24.	Engine thrust/ power/ torque parameters required to determine propulsive thrust/ power*	R	Full range	Each engine each second	As installed	0.1% of full range	*Sufficient parameters e.g. EPRN/ N1 or torque/Np as appropriate to the particular engine shall be recorded to determine power in both normal and reverse thrust. A margin for possible overspeed should be provided.
25.	Engine gas generator speed (Ng)	R	0-150%	Each engine each second	As installed	0.2% of full range	—

No.	*Parameter Name*	*Parameter Category*	*Minimum Recording Range*	*Maximum Recording Interval in Seconds*	*Minimum Recording Accuracy*	*Minimum Recording Resolution*	*Remarks*
26.	Free power turbine speed (Nf)	R	0-150%	Each engine each second	As installed	0.2% of full range	—
27.	Coolant temperature	R	Full range	1	As installed (±5°C recommended)	1°C	—
28.	Main voltage	R	Full range	Each engine each second	As installed	1 Volt	—
29.	Cylinder head temperature	R	Full range	Each cylinder each second	As installed	2% of of full range	—
30.	Flaps position	R	Full range or each discrete position	2	As installed	0.5°	—
31.	Primary 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 each second	As installed	2% of full range	—
34.	Emergency voltage	R	Full range	Each engine each second	As installed	1 Volt	—

No.	*Parameter Name*	*Parameter Category*	*Minimum Recording Range*	*Maximum Recording Interval in Seconds*	*Minimum Recording Accuracy*	*Minimum Recording Resolution*	*Remarks*
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 2 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 : ***Recorded parameters***

COCKPIT VOICE RECORDERS (CVR) AND COCKPIT AUDIO RECORDING SYSTEMS (CARS)

Signals to be Recorded—CVR and CARS

4.1.—(*a*) The CVR, and CARS as applicable to aeroplanes, shall start to record prior to the aircraft moving under its own power and record continuously until the termination of the flight when the aircraft is no longer capable of moving under its own power.

(*b*) In addition to (*a*) above, 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.

(*c*) The CVR shall record on four separate channels, or more, at least the following :

(1) Voice communication transmitted from or received in the aircraft by radio ;

(2) Aural environment on the flight deck ;

(3) Voice communication of flight crew members on the flight deck using the aircraft's interphone system, if installed ;

(4) Digital communications with ATS, unless recorded by the FDR.

(*d*) The CARS shall record on two separate channels, or more, at least the following :

(1) Voice communication transmitted from or received in the aeroplane by radio ;

(2) Aural environment on the flight deck ; and

(3) Voice communication of flight crewmembers on the flight deck using the aeroplane's interphone, if installed.

(*e*) The recorder shall be capable of recording on at least four channels simultaneously, except for the recorder in paragraph 3.2(*a*)(4) in the preferred channel allocation as follows :

(1) Channel 1—co-pilot headphones and live boom microphone ;

(2) Channel 2—pilot headphones and live boom microphone ;

(3) Channel 3—area microphone ;

(4) Channel 4 – time reference plus the third and fourth crewmembers.

(*f*) On a tape-based CVR, to ensure accurate time correlation between channels, the recorder shall record in an in-tine format. If a bi-directional configuration is used, the in-line format and channel allocation shall be retained in both directions.

Aircraft Equippage for Operations.

4.2. No person may operate an aeroplane unless it is equipped with a cockpit voice recorder as listed below :

(1) [AAC] All turbine-engined aeroplanes for which the application for a type certificate is first submitted to the appropriate CAA on or after 1st January 2016 and required to be operated by more than one pilot shall be equipped with either a CVR or a CARS.

(2) [AAC] All aeroplanes of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1st January 1987 shall be equipped with a CVR.

(3) [AAC] All aeroplanes of a maximum certificated take-off mass of over 5700 kg, up to and including 27000kg, for which the individual certificate of airworthiness is first issued on or after 1st January 1987, should be equipped with a CVR.

(4) [AOC] All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued on or after 1st January 2003, shall be equipped with a CVR capable of retaining the information recorded during at least the last two hours of its operation.

(5) [AOC] All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued on or after 1st January 1987 shall be equipped with a CVR.

(6) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1st January 1987, with a maximum certificated take-off mass of over 27000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30th September 1969 shall be equipped with a CVR.

(7) [AOC] All turbine-engined aeroplanes, for which the individual certificate of airworthiness was first issued before 1st January 1987, with a maximum certificated take-off mass of over 5700 kg up to and including 27000kg that are of types of which the prototype was certificated by the appropriate national authority after 30th September 1969 should be equipped with a CVR.

(*b*) No person may operate a helicopter unless it is equipped with a cockpit voice recorder as listed below :

(1) [AAC] All helicopters of a maximum certificated take-off mass of over 7000 kg for which the individual certificate of airworthiness is first issued on or after 1st January 1987 shall be equipped with a CVR. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.

(2) [AAC] All helicopters of a maximum certificated take-off mass of over 3 180 kg for which the individual certificate of worthiness is first issued on or after 1st January 1987 shall be equipped with a CVR. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.

(3) [AAC] All helicopters of a maximum certificated take-off mass of over 7,000 kg for which the individual certificate of worthiness is first issued on or after 1st January 1987 shall be equipped with a CVR. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.

4.3. CVR media not acceptable for use in aircraft registered in Nigeria, or operated in commercial air transport operations in Nigeria, are— Discontinuation.

(1) Magnetic tape and wire.

4.4. (*a*) A CVR shall be capable of retaining the information recorded during at least the last— Duration.

(1) 30 minutes of its operation ; or

(2) 2 hours, beginning no later than 1st January 2016.

Cockpit Voice Recorder Alternate Power.

4.5.—(*a*) [AOC] No person may operate an aeroplane required to be equipped with a CVR unless it is equipped with CVR alternate power that :

(1) automatically engages and provides ten minutes, plus or minus one minute, of operation whenever aeroplane power to the recorder ceases, either by normal shutdown or by any other loss of power ;

(2) powers the CVR and its associated cockpit area microphone components ; and

(3) is located as close as practicable to the alternate power source.

(*b*) [AOC] No person may operate an aeroplane of a maximum certificated take-off mass of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1st January 2018 unless is it equipped with an alternate power source, as described in (*a*) above, that powers—

(1) the forward CVR in the case of combination recorders, or

(2) at least one CVR.

DATA LINK RECORDERS (DLR) AND DATA LINK RECORDING SYSTEMS (DLRS)

Applicability.

5.1.—(*a*) No person may operate an aeroplane or helicopter for which the individual certificate of airworthiness is first issued on or after 1st January 2016, which utilise any of the data link communications applications listed in IS 5.1 and are required to carry a CVR, unless the aircraft records on a flight recorder the data link communications messages.

(*b*) No person may operate an aeroplane or helicopter modified on or after 1st January 2016, which utilise any of the data link communications applications listed in IS 5.1and are required to carry a CVR, unless the aircraft records on a flight recorder the data link communications messages.

(*c*) No person may operate an aeroplane or helicopter where the aircraft flight path is authorised or controlled through the use of data link messages, unless all data link messages, both uplinks (to the aircraft) and downlinks from the aircraft) are 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.

Duration.

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

Correlation.

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

5.4. Airborne image recorders are classified as follows :

Airborne Image Recorder (Air) and Airborne Image Recording System (AIRS)

(1) A Class A AIR captures the general cockpit area in order to provide data supplemental to conventional flight recorders.

(2) A Class B AIR captures data link message displays.

(3) A Class C AIR captures instruments and control panels.

(*b*) When AIRs are used, the AIR must start to record prior to the aircraft moving under its own power and record continuously until the termination of the flight when the aircraft 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.

IMPLEMENTING STANDARDS

IS 5.1. DATA LINK RECORDER APPLICABILITY

(*a*) 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 (*) shall be recorded only as far as is practicable given the architecture of the system—

(1) Data link initiation capability ;

(2) Controller-pilot data link communications ;

(3) Data link –flight information services ;

(4) Automatic dependent surveillance-contract ;

(5) Automatic dependent surveillance-broadcast* ;

(6) Aeronautical operational control*.

(*c*) Descriptions of the applications for data link recorders are contained in the table below.

TABLE—DESCRIPTION OF APPLICATIONS FOR DATA LINK RECORDERS

Item No.	*Application Type*	*Application Description*	*Recording Content*
1.	Data Link Initiation	This includes any applications used to 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 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 aircraft are reported within the message they shall be recorded unless data from the same sources are recorded on the FDR.	M*
6.	Aeronautical Operational Control Data.	This includes any application transmitting or receiving data used for AOC purposes.	M*

KEY :

C—*Complete contents recorded.*

M—*Information that enables correlation to any associated records stored separately from the aircraft.*

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

ADEQUACY OF OPERATING FACILITIES

6.0.—(*a*) An operator shall, as part of its safety management system, assess the level of rescue and fire fighting service (RFFS) protection available at any aerodrome intended to be specified in the operational flight plan in order to ensure that an acceptable level of protection is available for the aeroplane intended to be used.

(*b*) Information related to the level of RFFS protection that is deemed acceptable by the operator shall be contained in the operations manual.

FATIGUE MANAGEMENT

7.1. This section is applicable to the management of fatigue-related safety risks of crew members and flight operations officers/flight dispatchers engaged in commercial air transport flight operations. **Applicability.**

7.2. For the purpose of managing fatigue-related safety risks, an AOC holder shall establish either : **Managing Fatigue-Related Safety Risks.**

(1) flight time, flight duty period, duty period and rest period limitations that are within the prescriptive fatigue management regulations in Section 8.11 of the Nigeria Civil Aviation Regulations 2009 ; or

(2) a Fatigue Risk Management System (FRMS) in compliance with Sub-section 7.2(*e*) ; or

(3) a FRMS in compliance with Sub-section 6.2(*e*) for part of its operations and the requirements of Sub-section 8.11 of the Nigeria Civil Aviation Regulations 2009 for the remainder of its operations.

(*b*) Where the operator adopts prescriptive fatigue management regulations for part or all of its operations, the Authority may approve, in exceptional circumstances, variations to these regulations on the basis of a risk assessment provided by the operator. Approved variations shall provide a level of safety equivalent to, or better than that achieved through the prescriptive fatigue management regulations.

(*c*) The Authority shall approve an operator's FRMS before it may take the place of any or all of the prescriptive fatigue management regulations. An approved FRMS shall provide a level of safety equivalent to, or better than, the prescriptive fatigue management regulations.

(*d*) Operators using an FRMS must adhere to the following provisions of the FRMS approval process that allows the Authority to ensure that the approved FRMS meets the requirements of Sub-section 7.2(*c*) above :

(1) Establish maximum values for flight times and/or flight duty period(s) and duty period(s), and minimum values for rest periods that shall be based upon scientific principles and knowledge, subject to safety assurance processes :

(2) Adhere to Authority mandates to decrease maximum values and increase in minimum values in the event that the operator's data indicates these values are too high to too low, respectively ; and

(3) Provide justification to the Authority for any increase in maximum values or decrease in minimum values based on accumulated FRMS experience and fatigue-related data before such changes will be approved by the Authority.

(*e*) Operators implementing an FRMS to manage fatigue-related safety risks shall, as a minimum :

(1) Incorporate scientific principles and knowledge within the FRMS ;

(2) Identify fatigue-related safety hazards and the resulting risks on an ongoing basis ;

(3) Ensure that the remedial actions, necessary to effectively mitigate the risks associated with the hazards, are implemented promptly ;

(4) Provide for continuous monitoring and regular assessment of the mitigation of fatigue risks achieved by such actions ; and

(5) Provide for continuous improvement to the overall performance of the FRMS.

Portable Fire Extinguisher

8.0. Any agent used in a portable fire extinguisher in an aircraft for which the individual certificate of airworthiness is first issued on or after 31st December 2011, and any extinguishing agent used in a portable fire extinguisher in an aircraft for which the individual certificate of airworthiness is first issued on or after 31st December 2016, shall :

(1) Meet the applicable minimum performance requirements of the Authority ; and

(2) Not contain Halon 1211, Halon 1301, or Halon 2402.

9.0. Lavatory Fire Extinguisher

(*a*) Any agent used in a built-in fire extinguisher for each lavatory disposal receptacle for towels, or waste in an aircraft for which the individual certificate of airworthiness is first issued on or after 31st December 2011 shall :

(1) Meet the applicable minimum performance requirements of the Authority ; and

(2) Not contain Halon 1211, Halon 1301, or Halon 2402.

Requirements for Extended Diversion Time Operations (EDTO)—Aeroplanes [AOC].

10.0.—(*a*) An AOC holder shall not conduct operations beyond the threshold distance determined in accordance with Sub-section 8.6.2.10 of Nigeria Civil Aviation Regulations 2009 unless approved to do so by the Authority.

(*b*) In requesting EDTO approval, each AOC holder shall show to the satisfaction of the Authority that—

(1) For aeroplanes :

(*i*) For all aeroplanes ;

(*a*) the most limiting EDTO significant system time limitation, if any indicated in the Aeroplane Flight Manual (directly or by reference) and relevant to that particular operation is not exceeded ; and

(*b*) the additional fuel required by 6.8 of this order shall include the fuel necessary to comply with the EDTO critical fuel scenario as established by the Authority.

(*ii*) For aeroplanes with two turbine engines, the aeroplane is EDTO certified and has verified the—

(*a*) Reliability of the propulsion system ;

(*b*) Airworthiness certification for EDTO of the aeroplane type ; and

(*c*) EDTO maintenance programme.

(2) It has conducted a safety risk assessment which demonstrates how an equivalent level of safety will be maintained, taking into account the following :

(*i*) Capabilities of the operator ;

(*ii*) Overall reliability of the aeroplane ;

(*iii*) Reliability of each time limited system ;

(*iv*) Relevant information from the aeroplane manufacturer ; and

(*v*) Specific mitigation measures.

(*c*) Before conducting an EDTO flight, an AOC holder shall ensure that a suitable EDTO en-route alternate is available, within either the approved diversion time or a diversion time based on MEL generated serviceability status of the aeroplane whichever is shorter.

(*d*) No AOC holder shall commence a flight unless, during the possible period of arrival, the required en-route alternate aerodrome will be available and the available information indicates that conditions at the aerodrome will be at or above the aerodrome operating minima approved for the operation.

(*e*) No AOC holder shall conduct operations beyond 60 minutes, from a point on a route to an en-route alternate aerodrome unless it ensures that :

(1) For all aeroplanes ;

(*i*) En-route alternate aerodromes are identified ; and

(*ii*) The most up-to-date information is provided to the flight crew on identified en-route alternate aerodromes, including operational status and meteorological conditions.

(2) For aeroplanes with two turbine engines, the most up-to-date information provided to the flight crew indicates that conditions at identified en-route alternate aerodromes will be at or above the operator's established aerodrome operating minima for the operation at the estimated time of use.

(3) These requirements are incorporated into the operators :

(*i*) operational control and flight dispatch procedures ;

(*ii*) operating procedures ; and

(*iii*) training programmes.

(*f*) No AOC Holder shall proceed beyond the threshold time approved by the Authority unless :

(1) the identified en-route alternate aerodromes have been re-evaluated for availability ; and

(2) the most up to date information indicates that, during the estimated time of use, conditions at those aerodromes will be at or above the operator's established aerodrome operating minima for that operation ; or

(3) conditions are identified that would preclude a safe approach and landing at that aerodrome during the estimated time of use and an alternative course of action has been determined.

En-Route Alternate Aerodromes—EDTO Operations [AOC]

10.1.—(*a*) The PIC shall ensure that the required en route alternates for EDTO are selected and specified in ATC flight plans in accordance with the EDTO diversion time approved by the Authority.

(*b*) No person shall select an aerodrome as an EDTO en-route alternate aerodrome unless the appropriate weather reports or forecasts, or any combination thereof, indicate that during a period commencing 1 hour before and ending 1 hour after the expected time of arrival at the aerodrome, the weather conditions will be at or above the planning minima prescribed in the table below, and in accordance with the operator's EDTO approval.

(*c*) The ceiling and visibility requirements for operations conducted in accordance with paragraphs (*a*) and (*b*) may be reduced upon approval of the Authority for—

(*d*) Commercial air transport where the Authority has approved alternate minima as an equivalent level of safety based on the results of a specific safety risk assessment demonstrated by the operator, which contains the following:

(*e*) Capabilities of the operator ;

(*f*) Overall capability of the aeroplane and its systems ;

(*g*) Available aerodrome technologies, capabilities and infrastructure ;

(*h*) Quality and reliability of meteorological information ;

(*i*) Identified hazards and safety risks associated with each alternate aerodrome variation ;

(*j*) Specific mitigation measures.

MINIMUM FUEL SUPPLY FOR VFR FLIGHTS

(*a*) [AAC] Aeroplane. No person may commence a flight in an aeroplane under VFR unless, considering the wind and forecast weather conditions, there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed—

(1) For flights during the day, for at least 30 minutes thereafter ;

(2) For flights during the night, for at least 45 minutes thereafter, and

(*b*) [AAC] Helicopter. No person may commence a flight in a helicopter under VFR unless, considering the wind and forecast weather conditions, there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed—

(1) For 20 minutes thereafter ; and

(2) To have an additional amount of fuel sufficient to provide for the increased consumption on the occurrence of any of the potential contingencies specified by the operator to the satisfaction of the Authority.

Minimum Fuel Supply for IFR Flights

11.1.—(*a*) [AAC] Aeroplanes.—No person may commence a flight under IFR unless there is enough fuel supply, considering meteorological conditions and any delays that are expected in flight, to—

(1) When a destination alternate aerodrome is required, fly from the aerodrome of intended landing to an alternate aerodrome, and after that, for at least 45 minutes at normal cruising altitude ;

(2) When a destination alternate aerodrome is not required, fly to the aerodrome of intended landing and after that for at least 45 minutes at normal cruising altitude.

(*b*) [*AOC*] *Aeroplanes.*— No person may commence a flight under IFR, or continue past the point of in-flight re-planning, unless there is enough fuel supply, considering meteorological conditions and any delays that are expected in flight, to include the following :

(1) *Taxi Fuel*—which shall be the amount of fuel expected to be consumed before take-off ;

(2) *Trip Fuel*—which shall be the amount of fuel required to enable the aeroplane to fly from take-off, or the point of in-flight re-planning, until landing at the destination aerodrome taking into account the operating conditions in the data provided by the manufacturer ;

(3) *Contingency Fuel*—which shall be the amount of fuel required to compensate for unforeseen factors. It shall be five percent of the planned trip fuel or of the fuel required from the point of in-flight re-planning based on the consumption rate used to plan the trip fuel, but in any case, shall not be lower than the amount required to fly for five minutes at holding speed at 450 m (1500 ft) above the destination aerodrome in standard conditions;

(4) *Destination alternate Fuel*—which shall be :

(*i*) Where a destination alternate aerodrome is required, the amount of fuel required to enable the aeroplane to :

(*a*) Perform a missed approach at the destination aerodrome ;

(*b*) Climb to the expected cruising altitude ;

(*c*) Fly the expecting routing ;

(*d*) Descend to the point where the expected approach is initiated ; and

(*e*) Conduct the approach and landing at the destination alternate aerodrome ; or

(*ii*) Where two destination alternate aerodromes are required, the amount of fuel, as calculated in (4)(*i*) above, required to enable the aeroplane to proceed to the destination alternate aerodrome which requires the greater amount of alternate fuel ; or

(*iii*) Where a flight is operated without a destination alternate aerodrome, the amount of fuel required to enable the aeroplane to fly for 15 minutes at holding speed at 450 m (1,500ft) above destination aerodrome elevation in standard conditions ; or

(*iv*) Where the aerodrome of intended landing is an isolated aerodrome :

(*a*) For a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes plus 15 percent of the flight time planned to be spend at cruising level, including final reserve fuel, or two hours, whichever is less ; or

(*b*) For a turbine-engined aeroplane, the amount of fuel required to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel ;

(5) *Final Reserve Fuel*—which shall be the amount of fuel calculated using the estimated mass on arrival at the destination alternate aerodrome, or the destination aerodrome when no destination alternate aerodrome is required, or a pre-calculated value for each aeroplane type and variant in the fleet rounded up to an easily recalled figure :

(*i*) For a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes, under speed and altitude conditions specified by the Authority ; or

(*ii*) For a turbine-engined aeroplane, the amount of fuel required to fly for 30 minutes at holding speed at 450 m (1,500ft) above aerodrome elevation in standard conditions ;

(6) *Additional Fuel*—which shall be the supplementary amount of fuel required if the minimum fuel calculated in accordance with trip fuel, contingency fuel, destination alternate fuel and final reserve fuel above is not sufficient to :

(*i*) Allow the aeroplane to descend as necessary and proceed to an alternate aerodrome in the event of engine failure or loss or pressurization, whichever requires the greater amount of fuel based on the assumption that such a failure occurs at the most critical point along the route ;

(*a*) To fly for 15 minutes at holding speed at 450 m (1,500ft) above the aerodrome elevation in standard conditions ; and

(*b*) Make an approach and landing ;

(*c*) Allow an aeroplane engaged in EDTO to comply with the EDTO critical fuel scenario as established by the Authority ;

(*d*) Meet additional requirements not covered above.

(7) *Discretionary Fuel*—shall be the extra amount of fuel to be carried at the discretion of the PIC, or

(8) Notwithstanding the provisions in (1)-(7) above, the Authority may approve a variation to these requirements provided the operator can demonstrate an equivalent level of safety will be maintained through a safety risk assessment that includes at least the following :

(*i*) Flight fuel calculations ;

(*ii*) Capabilities of the operator to include :

(*a*) A data-driven method that includes a fuel consumption monitoring programme ; and/or

(*b*) The advanced use of alternate aerodromes ; and

(*iii*) Specific mitigation measures.

(*c*) [*AAC*] *and* [*AOC*] *Helicopters*.—No person may commence a flight under IFR unless there is enough fuel supply, considering meteorological conditions and any delays that are expected in flight, to—

(1) When a destination alternate is required,

(*i*) Fly to and execute an approach, and a missed approach, at the heliport to which the flight is planned, and thereafter

(*ii*) fly for 30 minutes at a holding speed at 450 m (1500 ft) above the alternate under standard temperature conditions, and approach and land ; and

(*iii*) have a reserve for contingencies specified by the operator and approved by the Authority.

(2) When a destination alternate is not required, to fly to the heliport to which the flight is planned and thereafter :

(3) fly for 30 minutes at a holding speed at 450 m (1,500 ft) above the alternate under standard temperature conditions, and approach and land; and

(4) have a reserve for contingencies specified by the operator and approved by the Authority.

FUEL MANAGEMENT

12.0.—(*a*) The pilot-in-command shall request delay information from ATC when unanticipated circumstances may result in landing at the destination aerodrome with less than the final reserve fuel plus any fuel required to proceed to an alternate aerodrome or the fuel required to operate to an isolated aerodrome.

(*b*) The pilot-in-command shall advise ATC of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific aerodrome, the pilot calculates that any change to the existing clearance to that aerodrome may result in landing with less than the planned final reserve fuel.

(*c*) The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL, when the calculated usable fuel predicted to be available upon landing at the nearest aerodrome where a safe landing can be made less than the planned final reserve fuel.

DONE this 9th June, 2014.

ENGR. BENEDICT ADEYILEKA
Ag. Director General