



WELLINGTON NEW ZEALAND

PURSUANT to Section 28 of the Civil Aviation Act 1990

I, MAURICE WILLIAMSON, Minister of Transport,

HEREBY MAKE the following ordinary rules.

SIGNED AT Wellington

This *25* day of *March* 1998

by **MAURICE WILLIAMSON**

Minister of Transport

A handwritten signature in black ink, appearing to read 'M. Williamson', written over a large, stylized, and somewhat illegible signature.

Civil Aviation Rules

Part 135, Amendment 4

**Air Transport Operations - Helicopters and Small
Aeroplanes**

Docket 97/CAR/1243

Civil Aviation Rules
Part 135, Amendment 4

**Air Transport Operations - Helicopters and
Small Aeroplanes**

RULE OBJECTIVE, EXTENT OF CONSULTATION AND COMMENCEMENT

The objective of the amendment to Part 135 is to introduce the requirements to equip some existing aircraft types and new aircraft entering the aviation system from 2000 onwards with updated flight data recorders (FDR).

The FDR amendments were developed by the Rules and Standards Group from comments received since the associated rules came into force, consultation with industry representatives, and a petition for rulemaking submitted in accordance with Part 11.

A draft of the proposed FDR amendments to Parts 121 and 135 was developed by the Rules and Standards Group in consultation with members of the CAA and industry most likely to be affected. This culminated in the issue of Notice of Proposed Rulemaking 97-1 under Docket 98/CAR/1243 on 19 February 1997.

The publication of this notice was advertised in the daily newspapers in the five main provincial centres on 22 February 1997. The notice was mailed to industry members most likely to be affected and to other parties, including overseas Aviation Authorities and organisations, who were considered likely to have an interest in the proposal.

A period of 49 days was allowed for comment on the proposed rules. Eight comments were received. The submissions and verbal comments were considered and where appropriate the proposed rules amended to take account of the comments made.

The rules as amended were then referred to and signed by the Minister of Transport.

Amendment 4 to Part 135 comes into force on 23 April 1998.

List of Rules

Part 135 Amendments

3

Part 135 Amendments

135.369 is revoked and the following new rule inserted”

“135.369 Flight data recorder

(a) Except as provided in paragraph (b), each holder of an air operator certificate shall ensure each of its aircraft is equipped with a flight data recorder in accordance with B.4 of Appendix B if that aircraft—

- (1) is multi-engine turbine powered; and
- (2) has a certificated seating capacity, excluding any pilot seat, of 10 seats or more.

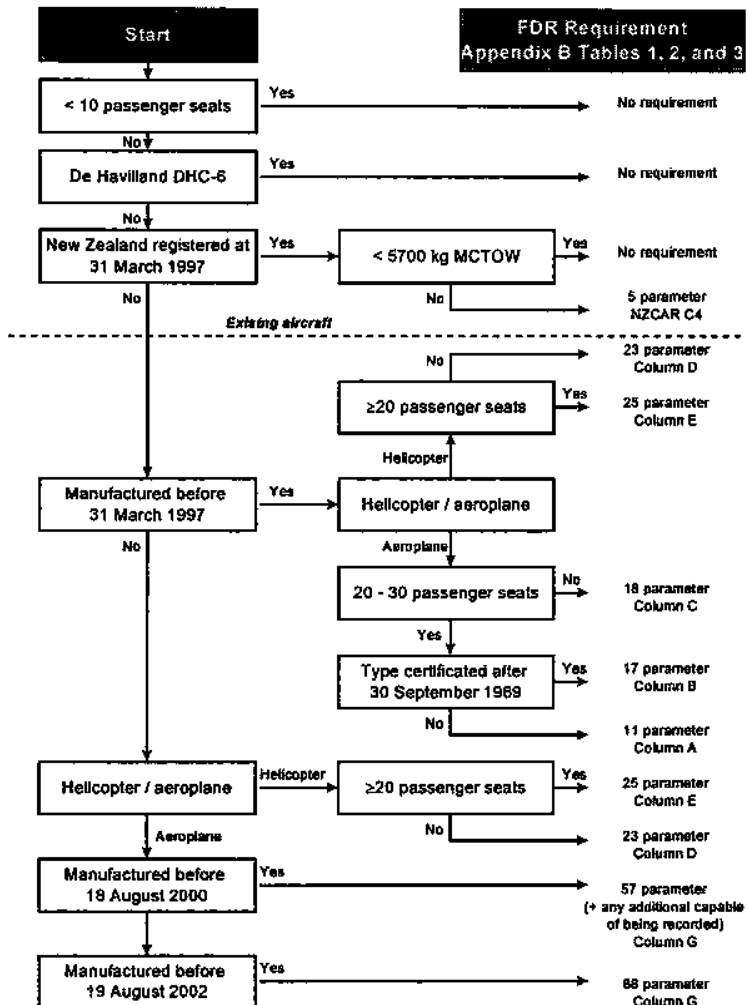
(b) Paragraph (a) shall not apply to the holder of an air operator certificate operating—

- (1) de Havilland DHC-6 aircraft; and
- (2) aircraft registered on or before 31 March 1997 with a MCTOW of less than 5 700 kg.”

Appendix B, B.4 Flight data recorders is amended by revoking paragraph (4) and inserting the following new paragraph (4):

- “ (4) record the parameters as detailed in—
- (i) Figure 1; and
 - (ii) as applicable, Table 1, Table 2, and Table 3—
- of Appendix B.”

Appendix B is amended by revoking Figure 1 and inserting the following new Figure 1.



Appendix B is amended by revoking Table 1 and inserting the following new Table 1, Table 2, and Table 3.

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
1	Time	Time	Time	Time	Time	Time	Time or Relative time counts
2	Altitude	Altitude	Airspeed	Airspeed	Altitude	Altitude	Pressure Altitude
3	Airspeed	Airspeed	Altitude	Altitude	Airspeed	Airspeed	Indicated airspeed or Calibrated airspeed
4	Vertical acceleration	Vertical acceleration	Heading	Heading	Heading	Heading	Heading (primary flight crew reference)
5	Heading	Heading	Vertical acceleration	Vertical acceleration	Vertical acceleration	Vertical acceleration	Normal acceleration (vertical)
6	Time of radio transmission to/from ATC	Time of radio transmission to/from ATC	Longitudinal acceleration	Longitudinal acceleration	Pitch attitude	Pitch attitude	Pitch attitude
7	Pitch attitude	Pitch attitude	Pitch attitude	Pitch attitude	Roll attitude	Roll attitude	Roll attitude

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
8	Roll attitude	Roll attitude	Roll attitude	Roll attitude	Radio transmitter keying	Radio transmitter keying	Manual radio transmitter keying or CVR/DFDR synchronisation reference
9	Longitudinal acceleration	Longitudinal acceleration	Stabiliser trim position OR pitch control position	Altitude rate	Power in each engine; power speed and engine torque	Thrust/power on each engine	Thrust/power on each engine (primary flight crew reference)
10	Control column OR pitch control surface position	Pitch position	FANM1 speed/ EPR/cockpit indications used for aircraft certification OR prop speed and torque	Main rotor speed	Main rotor speed	Trailing edge flap OR cockpit control selection	Autopilot engagement

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
11	Thrust of each engine	Control: column OR pitch control surface position	Altitude rate	Free or power turbine for each engine	Altitude rate	Leading edge flap on cockpit control selection	Longitudinal acceleration
12		Control: wheel OR lateral control surface position	Angle of attack	Engine torque for each engine	Pilot input - primary controls	Thrust reverser position	Pitch control(s) position (non fly-by-wire systems)
13		Rudder pedal OR yaw control surface position	Radio transmitter keying	Primary hydraulic pressure	Flight hydraulic pressure low	Ground spoiler position / speed brake selection	Pitch control(s) position (fly-by-wire systems) Lateral control(s) position (non fly-by-wire systems) Lateral control(s) position (fly-by-wire systems)

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
14		Thrust of each engine	Trailing edge flaps	Secondary hydraulic pressure (if available)	Flight hydraulic pressure selector switch position, 1 st and 2 nd stage	Marker beacon passage	Yaw control(s) position (non fly-by-wire systems)
15		Position of each thrust reverser	Leading edge flaps	Radio transmitter keying	AFCS mode and engagement status	Autopilot engagement	Yaw control(s) position (fly-by-wire systems)
16		Trailing edge flap OR cockpit flap control position	Thrust reverser each engine	Autopilot engaged	SAS status engaged	Longitudinal acceleration	Lateral control surface(s) position
17		Leading edge flap OR cockpit control position	Spoker/ speedbrake	SAS status engaged	SAS fault status	Pilot input and/or surface position - primary controls	Yaw control surface(s) position

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
18			Autopilot engaged	SAS fault status	Main gearbox temperature low	Lateral acceleration	Lateral acceleration
19				Collective	Main gearbox temperature high	Pitch position	Pitch trim surface position
20				pedal position	Controllable stabilator position	Glide slope deviation	Trailing edge flap or cockpit control position
21				Lateral cyclic	Longitudinal position	Localiser deviation	Leading edge flap or cockpit control position
22				Longitudinal cyclic	Lateral acceleration	AFCS mode and engagement status	Each thrust reverser position or equivalent for propeller aeroplane
23				Controllable stabilator position	Master warning	Radio altitude	Ground spoiler position or speed brake position

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 83 Parameter Aeroplane
24					Nav 1 and Nav 2 frequency selection	Master warning	Outside air temperature or total air temperature
25					Outside air temperature	Main gear squat switch status	Autopilot/ autothrottle/AFCS mode and engagement status
26 *						Angle of attack	Radio altitude
27						Outside air temperature OR total temperature	Localiser deviation or MLS azimuth

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
28						Hydraulics, each system, low pressure	Glideslope deviation or
29						Ground speed	M.S. elevation
30						Drift angle	Marker beacon passage
31						Wind speed and direction	Master warning
32*						Latitude and longitude	Air/ground sensor (primary aeroplane sensor, nose or main gear)
33						Brake pressure /pedal position	Angle of attack (if measure directly)
34*						Additional engine parameters: EPR, N ₁ , N ₂	Hydraulic pressure low, each system
							Groundspeed

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
35						Exhaust Gas Temperature	GPWS
36						Throttle lever position	Landing gear position or landing gear cockpit control selection
37*						Fuel flow	Drift angle
38*						TCAS - TA	Wind speed and direction
39*						TCAS - RA	Latitude and longitude
40*						TCAS - Sensitivity level	Stick shaker and pusher activation
41*						Ground Proximity Warning System	Windshear detection
42						Landing gear or gear selector position	Throttle/power lever position

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
43						DME 1 and 2 distance	Additional engine parameters
44						Nav 1 and 2 frequency selection	TCAS
45							DME 1 and 2 distances
46							Nav 1 and 2 selected frequency
47*							Selected barometric setting
48*							Selected altitude
49*							Selected speed
50*							Selected Mach
51*							Selected vertical speed
52*							Selected heading

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
53*							Selected flight path
54*							Selected decision height
55							EFIS display format
56							Multi-function/engine alerts display format
57*							Thrust command
58*							Thrust target
59*							Fuel quantity in CG trim tank
60							Primary navigation system reference
61*							Ice detection

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
62*							Engine warning each engine - vibration
63*							Engine warning each engine - over temp
64*							Engine warning each engine - oil pressure low
65*							Engine warning each engine - over speed
66							Yaw trim surface position
67							Roll trim surface position
68							Brake pressure - left and right

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
69							
70*							Brake pedal application - left and right
71*							Yaw and side-slip angle
72*							Engine bleed valve position
73							De-icing or anti-icing system selection
74							Computed centre of gravity
75							AC electrical bus status
76*							DC electrical bus status
							APU bleed valve position

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
77							Hydraulic pressure each system
78							Loss of cabin pressure
79							Computer failure - critical flight and engine control systems
80*							HUD
81*							Para-visual display
82							Cockpit trim control input position - pitch
83							Cockpit trim control input position - roll

Table 1. Part 135 - Flight Data Recorder Parameter Requirements

When reading the parameter specifications from Tables 2 and 3 the corresponding shaded specification should be chosen for each parameter

Parameter * if sensor installed	(A) 11 Parameter Aeroplane	(B) 17 Parameter Aeroplane	(C) 18 Parameter Aeroplane	(D) 23 Parameter Helicopter	(E) 25 Parameter Helicopter	(F) 44 Parameter Aeroplane	(G) 88 Parameter Aeroplane
84							Cockpit trim control input position - yaw
85							Trailing edge flap and cockpit flap control position
86							Leading edge flap and cockpit flap control position
87							Ground spoiler position and speed brake selection
88							All cockpit flight control input forces - control wheel, control column, rudder pedal

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Time or Relative time counts	0 to 4095	$\pm 0.125\%$ per hour	4	1s	UTC time preferred when available. Counter increments each 4 seconds of system operation
Pressure Altitude	1000' to maximum certified altitude -1000' to maximum certified altitude	$\pm 100'$ to $\pm 700'$ (refer TSO C124a, C51a)	1	25' to 750' 5' to 35'	Data should be obtained from the air data computer when practicable
Indicated airspeed or Calibrated airspeed	V_{MO} to V_{LO} (KIAS) 50 KIAS or minimum value to Max V_{MO} and V_{LO} to 1.2 V_{LO}	$\pm 5\%$ or ± 10 kts whichever is the greater. Resolution 2kts below 175KIAS $\pm 5\%$ and $\pm 3\%$	1	1% 1kt	Data should be obtained from the air data computer when practicable
Heading (primary flight crew reference)	360° 0 - 360° and discrete 'true' or 'mag'	$\pm 5^\circ$ $\pm 2^\circ$	1	1° 0.5°	When true or magnetic heading can be selected as the primary heading reference, a discrete indicating selection must be recorded

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Normal acceleration (vertical)	-3g to +6g	±1% maximum range excluding datum error of ±5%	0.125	0.05g 0.01g	
Pitch attitude	100% of usable ±75°	±2°	1 or 0.5 for aeroplanes manufactured after 2002	0.2° 0.5°	A sampling rate of 0.25 is recommended
Roll attitude	±80° or 100% of usable range, whichever is the greater ±180°	±2°	1 or 0.5 for aeroplanes manufactured after 2002	0.8° 0.5°	A sampling rate of 0.5 is recommended
Manual radio transmitter keying or CVR/DFDR synchronisation reference	Discrete 'on' or 'off'		1		Preferably each crew member but one discrete acceptable for all transmission provided the CVR/DFDR system complies with TSO C124a CVR synchronisation requirements
Fan Nr, speed or EPR or cockpit indications used for aircraft identification or Propeller speed and torque (sample enclosed as close together as practicable)	Maximum range	±5%	1 per engine	1%	Sufficient parameters (e.g. EPR, Nr or Torque, Nr) as appropriate to the particular engine be recorded to determine power in forward and reverse thrust, including potential overspeed conditions

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Thrust/power on each engine (primary flight crew reference)	Full range forward	±2%		0.2% of full range	
Autopilot engagement	Discrete - 'on' or 'off'		1		
Longitudinal acceleration	±1g	±1.5% maximum range excluding datum error of ±5%	0.25	0.01g	
Stabiliser trim position or Pitch control(s) position (non fly-by-wire systems)	Full range	±3% unless higher uniquely specified ±2°	1 or 0.5 for aeroplanes manufactured after 2002	1% 0.2% of full range	For aeroplanes that have a flight control break away capability that allows either pilot to operate the controls independently, record both control inputs. The control inputs may be sampled alternately once per second to produce the sampling interval of 0.5 or 0.25, as applicable
Pitch control(s) position (fly-by-wire systems)	Full range	±2°	1 0.5 0.25 for aeroplanes manufactured after 2002	0.2% of full range	

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Lateral control(s) position (non fly-by-wire systems)	Full range	±2°	1 0.5 or 0.25 for aeroplanes manufactured after 2002	0.2% of full range	For aeroplanes that have a flight control break away capability that allows either pilot to operate the controls independently, record both control inputs. The control inputs may be sampled alternately once per second to produce the sampling interval of 0.5 or 0.25, as applicable
Lateral control(s) position (fly-by-wire systems)	Full range	±2°	1 0.5 or 0.25 for aeroplanes manufactured after 2002	0.2% of full range	
Yaw control(s) position (non fly-by-wire systems)	Full range	±2°	1 0.5	0.2% of full range	For aeroplanes that have a flight control break away capability that allows either pilot to operate the controls independently, record both control inputs. The control inputs may be sampled alternately once per second to produce the sampling interval of 0.5
Yaw control(s) position (fly-by-wire systems)	Full range	±2°	1 0.5	0.2% of full range	

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters		Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Pitch control surface(s) position	Full range		$\pm 2^\circ$	1 0.5 or 0.25 for aeroplanes manufactured after 2002	0.2% of full range	For aeroplanes fitted with multiple or split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. The control surfaces may be sampled alternately to produce the sampling interval of 0.5 or 0.25
Lateral control surface(s) position	Full range		$\pm 2^\circ$	1 0.5 or 0.25 for aeroplanes manufactured after 2002	0.2% of full range	A suitable combination of surface position sensors is acceptable in lieu of recording each surface separately. The control surfaces may be sampled alternately to produce the sampling interval of 0.5 or 0.25
Yaw control surface(s) position	Full range		$\pm 2^\circ$	1 0.5	0.2% of full range	A suitable combination of surface position sensors is acceptable in lieu of recording each surface separately. The control surfaces may be sampled alternately to produce the sampling interval of 0.5
Lateral acceleration	$\pm 1g$		$\pm 1.5\%$ maximum range excluding datum error of $\pm 5\%$	0.25	0.01g	Twin engine aircraft only
Pitch trim surface position	Full range		$\pm 3\%$	1	0.3% of full range	

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Trailing edge flap or cockpit control position	Full range or discrete each position	±3° or pilot's Indicator	2	0.5% of full range	Flap position and cockpit control may each be sampled alternately at 4 second intervals, to give a data point every 2 seconds
Leading edge flap or cockpit control position	Full range or discrete each position	±3° or pilot's Indicator	2	0.5% of full range	Left and right sides, or flap position and cockpit control may each be sampled at 4 second intervals, so as to give a data point each 2 seconds
Each thrust reverser position or equivalent for propeller aeroplane	Discrete - 'stowed' or 'full reverse' Discrete - 'stowed', 'in transit', 'reverse'		1 per engine		Turbo-jet - 2 discretises enable the 3 states to be determined Turbo-prop - 1 discrete
Ground spoiler position or speed brake position	Full range or discrete each position	±2°	1 0.5 for aeroplanes manufactured after 2002	0.2% of full range	
Outside air temperature or total air temperature	-50°C to +90°C	±2° C	2	0.3° C	
Auto pilot/ auto throttle/AFC S mode and engagement status	Discretises - suitable combination		1		Discretises should show which systems are engaged and which primary modes are controlling the flight path and speed of the aircraft
Altitude rate	±500 to 1000 ft/min	±10% Resolution 2500ft/min Below 12,000ft indicated	1	250ft/min below 12,000ft	For auto land/category 3 operations, each radio altimeter should be recorded, but arranged

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Radio altitude	-20' to +2 500'	±2' or ±3% whichever is the greater below 500' and ±5% above 500'		1' ±5% above 500'	so that at least one is recorded each second.
Localiser deviation or MLS azimuth	±400 microamps or available sensor range as installed ±62°	As installed - ±3% recommended	1	0.3+ of full range	For autoland/category 3 operations, each radio altimeter should be recorded, but arranged so that at least one is recorded each second. It is not necessary to record ILS and MLS at the same time, only the approach aid in use need be recorded
Glide slope deviation or MLS elevation	±400 microamps or available sensor range as installed +0.9° to +30°	As installed - ±3% recommended	1	0.3+ of full range	For autoland/category 3 operations, each radio altimeter should be recorded, but arranged so that at least one is recorded each second. It is not necessary to record ILS and MLS at the same time, only the approach aid in use need be recorded
Marker beacon passage	Discrete - 'on' or 'off'		1		A single discrete is acceptable for all markers

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Master warning	Discrete		1		Record the master warning and record each 'red' warning that cannot be determined from other parameters or from the cockpit voices recorder
Air/ground sensor (primary aeroplane sensor, nose or main gear)	Discrete - 'air' or 'ground'		1 (0.25 recommended)		
Angle of attack (measured depends on altitude resolution)	20° to 40° or of usable range As installed	±2%	1	0.8% 0.3% of full range	If left and right sensors are available, each may be recorded at 4 second intervals so as to give a data point each 0.5 second
Angle of attack (if measure directly)	As installed	As installed	2 0.5 for aeroplanes manufactured after 2002		
Hydraulic pressure low, each system	Discrete - 'low' or 'normal' or available sensor range As installed	±5%	2	0.5% of full range	
Groundspeed	As installed	Most accurate system installed	1	0.2% of full range	
GPWS	Discrete - 'warning' or 'off'		1		A suitable combination of discrete unless recorder capacity is limited in which case a single discrete for all modes is acceptable
Landing gear position or landing gear cockpit control selection	Discrete		4		A suitable combination of discrete should be recorded

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Drift angle	As installed	As installed	4	0.1°	
Wind speed and direction	As installed	As installed	4	1kt and 1°	
Latitude and longitude	As installed	As installed	4	0.002°	Provided by the Primary Navigation System Reference. Where capacity permits latitude/longitude resolution should be 0.0002°
Stick shaker and pusher activation	Discrete - 'on' or 'off'		1		A suitable combination of discretes to determine activation
Windshear detection	Discrete - 'warning' or 'off'		1		
Throttle/power position	Full range	±2%	1 per lever	2% of full range	For aeroplanes with non-mechanically linked cockpit engine controls
Additional parameters	As installed	As installed	Each engine each second	2% of full range	Where capacity permits, the preferred priority is - Indicated vibration level, N ₂ , EGT, Fuel Flow, Fuel Cut-off lever position, and N ₁ , unless the engine manufacturer recommends otherwise

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
TCAS	Discretes	As installed	1		A suitable combination of discretes should be recorded to determine the status of - Combined Control, Vertical Control, Up Advisory, and Down Advisory. (refer ARINC Characteristic 735 - Attachment 6E, TCAS VERTICAL RA DATA OUTPUT WORD)
DIME 1 and 2 distances	0 - 200nm	As installed	4	1nm	1 mile
Nav 1 and 2 selected frequency	Full range	As installed	4		Sufficient to determine selected frequency
Selected barometric setting	Full range	±5%	1 per 64 seconds	0.2% of full range	
Selected altitude	Full range	±5%	1	100'	
Selected speed	Full range	±5%	1	1kt	
Selected Mach	Full range	±5%	1	0.01	
Selected vertical speed	Full range	±5%	1	100ft/min	
Selected heading	Full range	±5%	1	1°	
Selected flight path	Full range	±5%	1	1°	
Selected decision height	Full range	±5%	64	1'	

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
EFIS display format	Discretes		4		Discretes should show the display system status (off, normal, fail, composite, sector, plan, navigation aids, weather radar, range, copy)
Multi-function/engine alerts display format	Discretes		4		Discretes should show the display system status (off, normal, fail) and the identity of display pages for emergency procedures need not be recorded
Thrust command	Full range	±2%	2	2% of full range	
Thrust target	Full range	±2%	4	2% of full range	
Fuel quantity in CG trim tank	Full range	±5%	1 per 64 seconds	1% of full range	
Primary navigation system reference	Discretes - 'GPS', 'INS', 'VOR/DME', 'MLS', 'Loran C', 'Omega', 'Localiser Glideslope'		4		A suitable combination of discretes to determine the Primary Navigation System reference
Ice detection	Discrete - 'ice' or 'no ice'		4		
Engine warning each engine - vibration	Discrete		1		
Engine warning each engine - over temp	Discrete		1		
Engine warning each engine - oil pressure low	Discrete		1		

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Engine warning each engine - over speed	Discrete		1		
Yaw trim surface position	Full range	±3%	2	0.3% of full range	
Roll trim surface position	Full range	±3%	2	0.3% of full range	
Brake pressure - left and right	As installed	±5%	1		To determine braking effort applied by pilots or by autobrakes
Brake pedal application - left and right	Discrete or analogue 'applied' or 'off'	±5%	1		To determine braking applied by pilots
Yaw and side-slip angle	Full range	±5%	1	0.5°	
Engine bleed valve position	Discrete - 'open' or 'closed'		4		
De-icing or anti-icing system selection	Discrete - 'on' or 'off'		4		
Computed centre of gravity	Full range	±5%	1 per 64 seconds	1% of full range	
AC electrical bus status	Discrete - 'power' or 'off'		4		Each bus
DC electrical bus status	Discrete - 'power' or 'off'		4		Each bus
APU bleed valve position	Discrete - 'open' or 'closed'		4		
Hydraulic pressure each system	Full range	±5%	2	100psi	
Loss of cabin pressure	Discrete - 'loss' or 'normal'		1		
Computer failure - critical flight and engine control systems	Discrete - 'fail' or 'normal'		4		
HUD	Discrete - 'on' or 'off'		4		

Table 2. Part 135 - Aeroplane Flight Data Recorder Parameter Specifications

Parameters	Range	Sensor input accuracy	Seconds per sampling interval	Resolution	Remarks
Para-visual display	Discrete - 'on' or 'off'		1		
Cockpit trim control input position - pitch	Full range	±5%	1	0.2% of full range	
Cockpit trim control input position - roll	Full range	±5%	1	0.2% of full range	
Cockpit trim control input position - yaw	Full range	±5%	1	0.2% of full range	
Trailing edge flap and cockpit flap control position	Full range or discrete each position	±5%	2	0.5% of full range	Trailing edge flaps and cockpit flap control position may each be sampled alternately at 4 second intervals to provide a sample each 0.5 second
Leading edge flap and cockpit flap control position	Full range or discrete each position	±5%	1	0.5% of full range	
Ground spoiler position and speed brake selection	Full range or discrete each position	±5%	0.5	0.2% of full range	
All cockpit flight control input forces - wheel, control column, rudder pedal	Full range - wheel, column, pedals	±5% - ±70lbs, ±85lbs, ±165lbs respectively	1	0.2% of full range	For fly-by-wire flight control systems, where flight control surface position is a function of the displacement of the control input device only, it is not necessary to record this parameter

Table 3. Part 135 - Helicopter Flight Data Recorder Parameter Specifications

Parameters	Range	Sampling interval (per second)	Resolution read out ²
Relative time (from recorded on prior to takeoff)	24 hours	0.25	1 sec
Indicated airspeed	Varies by (IAS) (maximum airspeed signal available with installed pitot/static system)	±5% of ±10 knots whichever is greater	1 kt.
	As the installed measuring system	±3%	
Altitude	-1,000 ft to 20,000 ft pressure altitude	1	25 to 150 ft
	-1,000 ft to max certified altitude of aircraft	±100 to ±700 ft (see Table 1, TSO C51-a)	5' to 30'
Magnetic heading	360°	1	1°
		±2°	0.5°

Table 3. Part 135 - Helicopter Flight Data Recorder Parameter Specifications

Parameters	Range	Accuracy	Sampling interval (per second)	Resolution read out ²
Vertical acceleration	-3 g to +6 g	±0.2 g in maximum usable range ±1% of max range excluding datum error of ±5%	8	0.05 g 0.01g
Longitudinal acceleration	±1.0 g	±1.5% max. range excluding datum error of ±5%	2	0.05 g
Lateral Acceleration	±1.0 g	±1.5% max. range excluding datum error of ±5%	4	0.01g
Pitch attitude	100% of usable range ±75°	±2°	1	0.8°
Roll attitude	±60° or 100% of usable range, whichever is greater ±180°	±2°	2	0.5° 0.8° 0.5°

Table 3. Part 135 - Helicopter Flight Data Recorder Parameter Specifications

Parameters		Range	Sampling interval (per second)	Resolution read out ²
Altitude rate	±5,000 fpm	±10% Resolution 250 fpm below 12,000 ft indicated	1	250 fpm below 12,000
	±6,000 fpm	As installed	2	0.2%
Engine power each engine				
Main rotor speed	Maximum range	±5%	1	1% of full range
	0-130%	±2%	2	0.3% of full range
Free or power turbine	Maximum range	+5%	1 (per engine)	1% of full range
	0-130% (power Turbine Speed)	+2%		0.2% to 0.4% of full range
Engine torque	Maximum range	±5%	1 (per engine)	1% of full range
		±2%		0.2% to 0.4% of full range
Flight Control - Hydraulic Pressure				
Hydraulic Pressure Low	Discrete, each circuit		1	
Hydraulic Pressure Selector Switch Position, 1 st and 2 nd Stage	Discrete		1	

Table 3. Part 135 - Helicopter Flight Data Recorder Parameter Specifications

Parameters		Range	Sampling interval (per second)	Resolution read out ?
Primary (discrete)	High/Low		1	
Secondary - if applicable (discrete)	High/Low		1	
Radio transmitter keying (discrete)	On/off		1	
Autopilot engaged (discrete)	Engaged or disengaged		1	
AFCS Mode and Engagement	Discrete (5 bits necessary)		1	
SAS status - engaged (discrete)	Engaged/disengaged		1	
SAS fault status (discrete)	Fault/OK		1	
			0.25	
Flight Controls				
Collective	Full range	±3%	2	1% of full range 0.5% of full range

Table 3. Part 135 - Helicopter Flight Data Recorder Parameter Specifications

Parameters	Range	Accuracy	Sampling Interval (per second)	Resolution read out ²
Pedal position	Full range	±3%	2	1% of full range 0.5% of full range
Lateral cyclic	Full range	±3%	2	1% of full range 0.5% of full range
Longitudinal cyclic	Full range	±3%	2	1% of full range 0.5% of full range
Controllable stabilator position	Full range	±3%	2	1% of full range 0.4% of full range
Main Gearbox Temperature Low	As installed	As installed	0.25	0.5% of full range
Main Gearbox Temperature High	As installed	As installed	0.5	0.5% of full range
Master Warning	Discrete		1	
Nav 1 and Nav 2 Frequency Selection	Full range	As installed	0.25	

Table 3. Part 135 - Helicopter Flight Data Recorder Parameter Specifications

Parameters	Range	Sampling interval (per second)	Resolution read out ²
Outside Air Temperature	-50°C to +90°C	0.5	0.3°C

Notes:

1. When data sources are aircraft instruments (except altimeters) of acceptable quality to fly the aircraft the recording system excluding these sensors (but including all other characteristics of the recording system) shall contribute no more than half of the values in this column.
2. This column applies to aircraft manufactured after October 11, 1991.

CONSULTATION DETAILS

(This statement does not form part of the rules contained in Part 135. It provides details of the consultation undertaken in making the rules.)

The consultation details relating to the amendment to Part 135 are contained with the associated amendment to Part 121. The comments and all the background material used in developing the rules are held on the docket and are available for public scrutiny. Persons wishing to view the docket should call at Aviation House, 1 Market Grove, Lower Hutt and ask for docket 97/CAR/1243.