Advisory Circular
AC136-2

Original

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Installation, Testing, Operation and Maintenance of Flight Data Recorders and Related Equipment in Helicopters Operated Under Part 136

General

Civil Aviation Authority advisory circulars contain information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rule.

An acceptable means of compliance is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate advisory circular.

An advisory circular also includes **guidance material** to facilitate compliance with the rule requirements. Guidance material must not be regarded as an acceptable means of compliance.

Purpose

This Advisory Circular provides methods acceptable to the CASA for showing compliance with the requirements on the Installation, Testing, Operation and Maintenance of Flight Data Recorders installed in helicopters operating under Papua New Guinea Rule Part 136.

Related Rules and Guidance Material

This advisory circular relates specifically to Civil Aviation Rule Part 136. The following is some of the guidance material consulted in the production of this AC.

- FAA AC 20-141B.
- EASA Safety Information Bulletin SIB No.: 2009-28R1.
- ICAO Annex 6, Part III, Appendix 4 (helicopters) Attachment ATT B 1 and ATT B 4.

- CASA Australia AC 21-24 Flight recorder and underwater locating device maintenance.
- US FAR 29.1459 at amendment 25.
- US FAR 135.607 and 135.152(k).

It is recommended that installers, operators and maintainers familiarise themselves with this material.

Change Notice

No change.

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1. Applicability

(a) Flight Data Recorder (FDR) systems installed in or to be installed in PNG registered helicopters to be operated in accordance with Part 136.

(b) FDR Systems approved through a FAA, CASA Australia, DOT Canada, EASA, NZ CAA or UK CAA Type Certification or Supplemental Type Certification process are acceptable provided the FDR unit and Underwater Locator Devices (ULD) meet the design standards of Part 136 Appendix A2.

2. Introduction

Part. 136.515 require that;

(a) A holder of an air operator certificate must ensure that every helicopter with a MCTOW of greater than 3180 kg is equipped with a flight data recorder in accordance with A.2 of Appendix A.

(b) A holder of an air operator certificate must ensure that every helicopter with MCTOW greater than 7000 kg or having a certificated passenger seating of more than nineteen seats is equipped with a flight data recorder in accordance with A.2 of Appendix A.

This Advisory Circular provides guidance to designers, operators and maintainers of the requirements to be satisfied with FDRs and related systems to ensure they perform their proper function.

3. Design Standards

FDR Systems installed in Part 136 helicopters should comply with the design standard specified in the aircraft's Type Certificate Data Sheet or to a later design standard acceptable to the Director.

However the certification basis for some types was issued prior to the requirement for the installation of a FDR system. For these types and types not certificated to a Western standard CASA advises that US FAR Part 29.1459 at amendment 25 is an acceptable means of compliance.

In addition some types set down in US FAR Part 135.152(k) are exempt from the installation of a FDR. The result is that there are few or no STCs or equivalent for FDR installation on these older design helicopters. To assist in these situations CASA has decided to permit the use of certain video recording equipment provided the general requirements of Part 29.1459 at amendment 25 are determined to have been met.

Non Western design helicopters have early type FDRs installed which will not meet the current Part 136 requirements. However there are FDRs of non Western design available. These are claimed by the makers to comply with the requirements of TSO C124. CASA will review these units and determine if they may be accepted under Part 136 Appendix A2 - *(2)*

be one that meets a standard equivalent to TSO C124 that has been approved by an ICAO Contracting State acceptable to the Director.

In respect to ULDs there would be great difficulty in attaching one to a video recorder or non TSO C124 FDR. In such cases CASA will accept the use of an operator's flight tracking system that is continuously monitored for every effected helicopter operating under their Part 136 certificate. The Director may also impose a prohibition on over-water flights.

This AC sets down acceptable means of compliance; but not necessarily the sole means, with Part 136. Appendix A2.

4. Helicopter Groups

To simplify the situation, helicopters effected by Part 136. 515 and Appendix A2 have been placed in three groups, Group A, Group B and Group C.

Group A. Those helicopters for which:

(i) The FDR is part of the helicopter's type design; or

(ii) A FDR installation meeting at least FAR 29.1459 amendment 25 and approved by the FAA, CASA Australia, DOT Canada, EASA, NZ CAA or UK CAA has been installed or is available.

Group B. Those helicopters with MCTOW of greater than 3180 kg but below MCTOW of 7000 kg or not having a certificated passenger seating of more than nineteen seats for which:

(i) no approved FDR installation meeting FAR 29.1459 amendment 25 approved by the FAA, CASA Australia, DOT Canada, EASA, NZ CAA or UK CAA is available; or

(ii) no TSO C124 FDR is available.

Group C. Helicopters with MCTOW greater than 7000 kg or having a certificated passenger seating of more than nineteen seats for which:

(i) no approved FDR installation meeting FAR 29.1459 amendment 25 approved by the FAA, CASA Australia, DOT Canada, EASA, NZ CAA or UK CAA is available; or

(ii) no TSO C124 FDR is available. That currently is Mil 8 series helicopters.

5. Installation Recommendations for FDRs and Related Equipment

Group A.

Provided the installation is performed exactly in accordance with the Supplemental Type Certificate (STC) or other National Aviation Authority (NAA) approved documents no additional installation action is required.

Any installation variation from the approved data may render the STC or other NAA approved document invalid. CASA recommends that in such cases the holder of the STC or NAA approved document should be contacted for advice.

The system should be tested as specified in the approved data to ensure all parameters are being recorded.
The operator should verify that the parameters being recorded are in accordance with those set down in Part 136 Appendix A2 Figure 1 and Table 1 or Table 2 as applicable. Where all the required parameters are not capable of being recorded CASA should be notified of the actual parameters that are being recorded. These can then be "*determined as satisfactory by the Director"* per Part 136 Appendix A2 (7).

Group B.

CASA hereby notifies that the Appaero Vision 1000 is acceptable for use in helicopters of above 3180 kg MCTOW but below 7000 kg MCTOW; provided the installation is in accordance of the paragraphs below.

(a) The audio/video unit must receive electrical power from the bus that provides the maximum reliability for operation without jeopardizing service to essential or emergency loads, and

(b) The audio/video unit must be operated from the application of electrical power before takeoff until the removal of electrical power after termination of flight.

(c) There is an automatic means to simultaneously stop a recorder that has a data erasure feature and prevent each erasure feature from functioning, within 10 minutes after any crash impact.

(d) The location of the audio/video unit should comply with the requirements of FAR 29.785 at amendment 25 or later to avoid injury to crew members in the event of an accident or heavy landing.

(e) The attachment of the audio/video unit should meet the inertial factors specified in FAR 29.561 at amendment 25 or latter.

(f) There must be a visual or audible means to indicate to the crew that the audio/video system is correctly operating prior to flight.

(g) The audio/video unit must be coloured bright orange or bright yellow.

(h) At least the following instrument indications should be recorded by the video function:

(i) Airspeed.

(ii) Altitude.

(iii) Attitude.(pitch and roll)

(iv) Heading

(v) Vertical speed

(vi) Engine RPMs (Gas generator and Power Turbine)

(vii) Engine fuel flow/s

(viii) Engine turbine temperature/s

(ix) Engine torque/s

(x) Engine oil pressure/s

(xi) Engine oil temperature/s

(xii) Fuel quantity

(xiii) Hydraulic pressure primary

(xiv) Hydraulic pressure secondary (if displayed)

(xv) Main rotor RPM

(xvi) Gearbox oil temperature and oil pressure.

(xvii) Gear box temperature warning high and low (if available)

(xviii) Generator output/s

(xix) Engine fire warning/s

(xx) Mast moment indicator (if installed)

Where any of the listed instrument indications cannot be recorded CASA should be contacted to ascertain if the instrument indications remaining meet the standards for Papua New Guinea operating conditions.

Group C.

This section sets down a means of complying with Part 136 Appendix A.2(2). That is, Crash Resistant Digital Flight Data Records not compliant with FAA TSO C124. Other means may be submitted to CASA for assessment.

Operators seeking to have a non-TSO C124 FDR accepted by CASA should provide:

(a) A letter signed by their CEO requesting acceptance of the proposed FDR.

(b) Copies in English of any data they hold showing the proposed FDR is compliant with a design standard equivalent to a FAA TSO C124 FDR.

(c) A letter from the manufacturer verifying the FDR meets a design standard equivalent to TSO C124 FDR. The original letter with an attached English translation is acceptable.

(d) A statement signed by the CEO that the means to download and read the FDR data is readily available.

CASA, after examining the above will provide a formal notification of the acceptance or rejection of the request.

If a FDR is accepted the following installation recommendations should be followed. Variation from this may be made subject to CASA's formal agreement.

The installation should be in accordance with US FAR 29.1459 at amendment 25 dated 11 October 1988 or later amendment except for item 29.1459(d)(3) dealing with installation of ULDs.

Any variations from FAR 29.1459 at amendment 25 or later amendment should be referred to CASA for consideration and decision as to acceptability.

The operator should verify that the parameters being recorded are in accordance with those set down in Part 136 Appendix A2 Figure 1 and Table 1 or Table 2 as applicable. Where all the required parameters are not capable of being recorded CASA should be notified of the actual parameters that are being recorded. These may then be "determined as satisfactory by the Director" per Part 136 Appendix A2 (7).

The system should be tested as specified in the approved installation data to ensure all parameters are being recorded.

Underwater Locator Devices (ULD)

ULDs should be installed in accordance with their manufacturer's instructions. Any change made to the ULD may affect its TSO status and the manufacturer should be contacted for advice if a change, e.g. mounting system, is proposed. The Director may prohibit flights over-water if ULDs are not installed.

Flight Tracking Systems

These systems will require an STC or an Engineering Order approved by a PNG Part 146 design organisation.

In approving a Tracking System installation the following matters should be considered:

a) Power supply must be via a circuit breaker from the bus that provides the maximum reliability for operation without jeopardizing service to essential or emergency loads. The use of cigar lighter power supplies is unacceptable.

b) There must be a means to indicate to the crew that the tracking system is operative before and during flight.

c) The location of the tracking system components should comply with the requirements of FAR 29.785 at amendment 25 or later to avoid injury to crew members in the event of an accident or heavy landing

d) Attachment of the tracking system components should meet the inertial factors specified in FAR 29.561 at amendment 25 or latter.

e) The tracking system installation should comply with FAR 29.773 Pilot Compartment View.

6. Operational Requirements

Part 136.71(b)(1) requires: *Flight crew members must ensure that, when a flight data recorder is required by 136.515—*

(1) the flight data recorder is operated continuously from the instant the helicopter begins the take-off until it has completed the landing

This means that pre-take off checklists should include an item to ensure that the recorder system equipment is operative including those rotorcraft that have a flight tracking system installed as part of their compliance with Part 136 Appendix A2.

7. Maintenance of FDRs and Related Equipment

Certain maintenance tasks must be undertaken to ensure the installed FDR system is operating as required to enable valid information to be derived in the case of an accident. Guidelines for the maintenance requirements have been set down by ICAO in Annex 6 and in other regulators advisory documents.

Maintenance of Digital FDRs (applicable to Class A and Class C helicopters)

These systems should be maintained in accordance with the Instructions for Continuing Airworthiness (ICA) provided with the document authorising the FDR installation. For example, STC, Engineering Order or aircraft manufacturer's requirements where the installation is approved by the holder of the aircraft's Type Certificate.

For inclusion in the Maintenance Programme required by PNG Rules the inspections must include the following:

Operational check	Flight recorder indications.	Daily (pre-flight)
Functional check	Download and analyse at least one complete flight. Check all mandatory parameters are serviceable.	12 months or 3,000 hours (whichever occurs first)
Sensor calibration	Check serviceability and calibration of the measuring and processing chain from sensors to recorder	As determined by analysis of the system

The FDR system should be re-calibrated at least every five years to determine any discrepancies in the engineering conversion routines for the mandatory parameters and to ensure that parameters are being recorded within the calibration tolerances.

When the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there should be a re-calibration performed as recommended by the sensor manufacturer, or at least every two years.

Maintenance of Vision 1000 Audio/Video Recorders.

Vision 1000 units should be maintained in accordance with the manufacturer's Maintenance Schedule contained in the Vision 1000 Instructions for Continued Airworthiness provided with the Vision 1000 recorder.

For inclusion in the Maintenance Programme required by PNG Rules the inspections must include the following:

Daily Inspection

Operational check of the recorder, this may be performed by the flight crew.

Annual Inspection

Inspect the following for condition, corrosion and security:

a) Vision 1000 recorder.

b) Wiring, connectors, connector contacts and attachment hardware.

c) Mounting bracket.

In addition;

a) Check the fluorescent red or yellow tape on the recorder for condition and adhesion.

b) Check the G Switch that removes power from the recorder in an impact for correct operation.

c) Check the quality of the audio and video recordings on the internal memory and the removable SD card.

Conditional Inspections

Inspect in accordance with the Vision 1000 Instructions for Continued Airworthiness following:

a) A hard landing.

b) A lightning strike

c) A blade strike

Perform an alignment check and a functional check after each Vision 1000 recorder change.

Maintenance of Underwater Locator Devices (ULDs)

Carryout battery replacement, functional testing and cleaning of the ULD in accordance with the manufacturer's instructions.

Maintenance of Tracking Systems

Components and wiring of these systems should be inspected for condition and security in accordance with manufacturer’s recommendations.

8. Minimum Equipment Lists (MEL)

The following MEL items for FDRs and related equipment or systems will be acceptable to CASA. Of course alternate submission may be made. These should be accompanied with a justification for the MEL item or system.

All FDR (and CVR) Repair Intervals should be category (A).

a) For rotorcraft with a CVR and FDR both with separate ULDs attached:
The FDR may be inoperative for three flight days provided the CVR is operative.

b) For rotorcraft with a CVR and FDR with a ULD attached only on the CVR:
The FDR may be inoperative for three flight days provided the CVR is operative.

c) For rotorcraft required to have an audio/video recorder fitted:
The audio/video recorder may be inoperative for three flight days provided the flight tracking system is operative.

d) For rotorcraft required to have a flight tracking system installed:
The flight tracking system may be inoperative for three flight days.

FAA Policy Letter 25 defines "Flight Day" as a 24 hour period (from midnight to midnight) either Universal Coordinated Time (UCT) or local time, as established by the operator, during which at least one flight is initiated for the affected aircraft.