



**Civil Aviation
Advisory Publication
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This publication is only advisory. It gives a preferred method for complying with the Civil Aviation Regulations 1988 (CAR 1988).

It is not the only method, but experience has shown that if you follow this method you will comply with CAR 1988.

Always read this advice in conjunction with the appropriate regulations.

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COCKPIT VOICE RECORDER MAINTENANCE

The relevant regulations and other references

- References to CARs are references to CAR 1988
- CASA AD/Rec/1
- CAO 103.20
- CAR 42L
- ICAO Standards and Recommended Practices (SARPs) Annex 6 Parts I & II & III
- EUROCAE ED-56A

Why this publication was written

This CAAP provides guidance for:

- Maintenance of Cockpit Voice Recorder Systems (CVR).
- Maintenance personnel who may be required to carry out a functional check on the CVR where the instructions for continued airworthiness (ICA) are not provided in the aircraft maintenance manual or a Supplemental Type Certificate (STC), or approved modification.
- Maintenance personnel who may be required to carry out a functional check on the CVR where the instructions contained in the maintenance manual are inadequate or deficient. *(Note: it is not the intent of this advisory material to supersede aircraft manufacturer's maintenance instructions but to complement them)*

This CAAP does not provide advice or standards for the installation of a CVR, however the contents of this CAAP should be considered when preparing the ICA for a new installation.

Status of this CAAP

This is the first CAAP written on this subject

For further information

Contact the CASA Office closest to you

1. Introduction

1.1 CAR 42L prescribes matters to be included in a system of maintenance and specifically requires that the system contains a schedule that sets out the procedures to be followed in carrying out inspections and tests for the aircraft systems or equipment. The instructions should include the CVR, its ancillaries and the aircraft installation.

1.2 CVRs are fitted to aircraft as a significant aid to accident or incident investigation.

1.3 The installation of a CVR is required to meet an operational requirement, however as installed equipment the maintenance of it is an airworthiness responsibility.

1.4 The equipment standards and the mandatory recording requirements are set out in CAO 103.20.

2. Recommended functional test

2.1 To assess the serviceability of the CVR system the following checks and functional tests are recommended:

- Confirm the proper recording on each voice channel of all the required CAO 103.20 audio inputs (see items (i) thru (viii) below). For each channel ensure that the quality of reproduction has not deteriorated below an optimal audible level. *(Note: For solid state devices this may require the removal of the CVR from the aircraft and a bench check carried out to verify the integrity of the reproduction):*
 - (i) all voice communications transmitted from or received by the aircraft communications equipment;
 - (ii) all conversation on the flight deck;
 - (iii) voice communications of flight crew-members on the flight deck, using the aircraft's interphone system;
 - (iv) voice or audio signals identifying navigation aids introduced into the aircraft audio system;
 - (v) audio signals from alerting or warning devices on the flight deck, both fully integrated with the aircraft audio system and non integrated;
 - (vi) general flight deck sounds, monitor the Cockpit Area Microphone (CAM) to ensure that it satisfactorily picks up all cockpit sounds;

- (vii) voice communications of flight crew-members using the passenger address system; and
- (viii) ensure that the "Hot Microphone" facility is operational for each boom microphone station that the aircraft is equipped with.

Note 1: The quality of reproduction of some cockpit voice recorders can be affected by ground operation of auxiliary power units and ground power units.

Note 2: Some phone jacks in cockpit voice recorder cockpit monitors are not wired for operation.

- In installations incorporating crash sensors ("G" switches) in the cockpit voice recorder power feed, check the operation of these switches in accordance with the manufacturer's procedures. (This may necessitate removal from the aircraft and checking in a workshop).
- Confirm the proper functioning of the bulk erase inhibit logic.
- Confirm the correct operation of the CVR failure annunciator where fitted.
- Confirm that the self test indicator functions correctly. The aircraft flight manual will provide details if the Aircraft Maintenance Manual or STC does not specify the correct indications.

2.2 To determine what warnings are integrated with the audio system refer to the aircraft maintenance/wiring manual. The assistance of other trades may be required to generate those warnings.

3. The effect of modifications

3.1 Some aircraft with CVR have been modified by the installation of systems such as GPWS and TCAS which introduce an audible warning integrated with the existing aircraft audio system. When these modifications are made, suitable information about the introduced audible warning should be added to the maintenance instructions for the aircraft audio system. This information must enable the audible warnings to be checked to ensure correct recording on the CVR. Operators of such aircraft should ensure that suitable maintenance information is available for the audible warning introduced by the modification.

4. Underwater Locator Device (ULD) Maintenance

- 4.1 The maintenance program should specify:
- Life limits on the battery.
 - Cleaning of the switches (contacts).
 - Periodic checking of the device in accordance with the manufacturer's requirements.

4.2 Additional reference material on ULD maintenance is found in CAAP 42L-8.

5. System of Maintenance

5.1 The System of Maintenance should follow the aircraft manufacturer's recommendations however CASA AD/REC/1() requires a 12 monthly or 2000 hour (whichever comes first) functional check.

5.2 The System of Maintenance should follow the aircraft manufacturer's recommendations, however where the aircraft manufacturer's program is deficient or specifies the use of the component manufacturer's repair and overhaul limits, the following tasks must be considered:

- Overhaul (when required)
- Retirement of heat absorption material.

6. First of Type/First of Model CVR Installation

6.1 As the Australian Transport Safety Bureau (ATSB) has to be able to analyse the recorded data on the CVR in the event of an incident or accident a first of type / first of model installation must be validated as reliable and the recording maintained to allow identification of various sounds in the cockpit. For this reason the installation must be test flown and the CVR be sent to ATSB for analysis.

6.2 The flight check requirements are included in CAO103.20 however they are reproduced in Appendix 1 for convenience.

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APPENDIX I

COCKPIT VOICE RECORDER

FLIGHT TEST

1 — INTRODUCTION

1.1 First of type aircraft/recorder combinations must be flight tested and the recording, obtained during that flight, must be analysed. The test and analysis must demonstrate adequate recording quality during all normal regimes of flight including taxiing, take-off, cruise, approach and landing. For helicopters, hover and auto-rotation should be included.

1.2 Since the duration of the recording is limited to 30 minutes, the CVR circuit breaker should be tripped between each test phase and at the end of the landing run.

1.3 If time permits, systems which generate sounds on the flight deck and which might not otherwise be used during the test flight, should be operated with appropriate announcements.

1.4 This appendix provides guidance for flight testing both aircraft and helicopters. It may need to be adapted to suit the particular installation being tested.

1.5 The replay and analysis must be performed by the Technical Analysis section of the ATSB. The Bureau will ensure the privacy of the recordings.

1.6 Recordings offered for analysis may be released to the operator's engineering organisation, the ATSB and CASA. The agreement of the flight crew concerned is assumed unless instructions, in writing, are given by the flight crew stating any restrictions to be applied.

2 — PROCEDURE

IMPORTANT: To enable proper analysis of the recording, **it is essential that adequate commentary on the flight is provided**, e.g. crew actions altitudes and speed. Each test should be clearly announced and the crew member identified, e.g. "Co-pilot testing -oxygen mask microphone with interphone off".

2.1 Prior to Engine Start

2.1.1 Check that the CVR is operating.

2.1.2 Press the **ERASE** button.

2.1.3 Press the **CVR TEST** button.

2.1.4 Select **BOOM** microphone and interphone '**ON**' at all positions.

2.1.5 Call out aircraft type, registration, date, time and crew complement

2.2 Engine Start

2.2.1 (Helicopters only) During rotor spin-up, call out RPM at 50%, 80% and 100%.

2.2.2 Make a test announcement from each crew member position in turn using the boom microphones with interphone selected 'ON' followed by a second announcement with the interphone 'OFF' (to evaluate the 'hot' microphone):

(i) LEFT HAND SEAT POSITION

– INTERPHONE ON

“this is the Captain’s Position with boom microphone interphone on”

– INTERPHONE OFF

“this is the Captain’s Position with boom microphone interphone off”

(ii) RIGHT HAND SEAT POSITION

– INTERPHONE ON

“this is the First Officer’s Position with boom microphone interphone on”

– INTERPHONE OFF

“this is the First Officer’s Position with boom microphone interphone off”

(iii) ENGINEER/THIRD CREW POSITION

– INTERPHONE ON

“this is the Engineer’s Position/third crew Position with boom microphone interphone on”

– INTERPHONE OFF

“this is the Engineer’s Position/third crew Position with boom microphone interphone off”

2.2.3 Repeat 2.2.2 using the oxygen mask microphone.

2.2.4 (Aeroplanes only) Announce and test the stall warning stick shaker.

2.2.5 (Helicopters only) Close the flight deck windows.

2.3 Take-off

2.3.1 With headsets worn and boom microphones available for use, record a normal take-off and initial climb.

2.3.2 Announce landing gear and flap selections and other actions.

2.4 Cruise

2.4.1 With interphone OFF, announce and activate aural warnings.

2.4.2 (Aeroplanes only) Accelerate to, and announce V_{MO} . Continue until the overspeed warning sounds. Reduce speed as required.

2.4.3 Perform a test transmission from each pilot’s station using VHF and boom microphones.

2.4.4 Perform a test transmission from each pilot’s station using VHF, a hand-held microphone and the flight deck loudspeakers (for response from ground station).

2.4.5 Perform a test transmission from each pilot’s station using HF (if fitted) and boom microphones.

- 2.4.6 Perform a test transmission using the Marine radio if fitted.
- 2.4.7 Perform test broadcasts from the flight deck and the cabin using the passenger address system.
- 2.4.8 (Helicopters only) Call out rotor RPM.
- 2.4.9 Announce and open the flight deck cabin door. Announce and close the door after 30 seconds.
- 2.4.10 Where permitted by the AFM and in cruise, announce and open the flight deck windows. Announce and close the windows after 30 seconds.
- 2.4.11 Select and identify navigation aids on each navigation set (this may be carried out at any stage of the flight).

2.5 Helicopter Auto-Rotation and Hover

- 2.5.1 At a safe altitude, perform an auto-rotation descent with power recovery.
- 2.5.2 Announce and hover for approximately one minute.

2.6 Landing

- 2.6.1 Record final approach and landing including ILS and Marker audio identification. Announce landing gear and flap selection and other actions.
- 2.6.2 At end of landing run call out the time. (Note 30 minutes tape limitations).
- 2.6.3 Select **BOOM** microphone and interphone 'ON' at all positions and announce "End of Test".
- 2.6.4 **DO NOT ERASE.**
- 2.6.5 **PULL CVR CIRCUIT BREAKER.**

3 — REPLAY AND ANALYSIS

- 3.1 The CVR tape recording should be sent to:

Team Leader Technical Analysis
ATSB
GPO Box 594
CANBERRA ACT 2601
Phone 02 6274 7111 Fax 02 6274 6474.

- 3.2 A copy of the test schedule used during the flight should accompany the tape recording. In all cases, the manufacturer and model of the CVR and the position of the area microphone in the particular aircraft should be stated in the documentation supplied with the CVR tape.
- 3.3 ATSB will establish if recordings of adequate quality have been made on all channels for the test conditions stated in 2.
- 3.4 ATSB will furnish a report to the Applicant together with a copy to CASA. The report will identify the aircraft and test flight concerned and will confirm that all input channels were identified for the various test conditions. Details of any other observations made from the recording will be included.

4 — DISPOSAL OF RECORDING

4.1 The original recording will not be copied unless specific instructions have been given by the Applicant.

4.2 The original tape will be retained by the ATSB for use as a reference tape for the type of aircraft/recorder combination.
