



Australian Government

Civil Aviation Safety Authority

I, WILLIAM BRUCE BYRON, Director of Aviation Safety, on behalf of CASA, make this instrument under subregulation 21A (1) of the *Civil Aviation Regulations 1988*.

[Signed Bruce Byron]

Bruce Byron

Director of Aviation Safety and
Chief Executive Officer

17 December 2007

Civil Aviation Order 103.20 Instrument 2007

1 Name of instrument

This instrument is the *Civil Aviation Order 103.20 Instrument 2007*.

2 Commencement

This instrument commences on the day after it is registered.

3 New Civil Aviation Order 103.20

Civil Aviation Order 103.20 is repealed and a new Civil Aviation Order 103.20 substituted as set out in Schedule 1.

Schedule 1 Civil Aviation Order 103.20

Equipment standards — cockpit voice recorders

1 Application

- 1.1 This Civil Aviation Order applies to cockpit voice recorders installed in aircraft in compliance with Civil Aviation Order 20.18.
- 1.2 An aircraft which receives its initial issue Australian Certificate of Airworthiness after 1 January 1985 must have a cockpit voice recorder installed in compliance with this Order.

2 Design requirements

- 2.1 For this Order, the cockpit voice recorder system includes components of the installation which satisfy the requirements of paragraph 2.2. These components would normally include the following:
- (a) flight deck mounted equipment, including a control unit, a monitor display, all microphones at each flight crew position, an area microphone and associated preamplifier stages;
 - (b) a crash protected recorder.
- 2.2 The equipment must be approved and installed so that it will record simultaneously on at least 4 channels:
- (a) voice communications transmitted from, or received in, the aircraft by radio; and
 - (b) all conversation on the flight deck; and
 - (c) voice communications of flight crew members on the flight deck, using the aircraft's interphone system; and
 - (d) voice or audio signals identifying navigation or approach aids introduced into a headset or speaker; and
 - (e) audio signals from alerting or warning devices on the flight deck and general flight deck sounds; and
 - (f) voice communications of flight crew — members using the passenger address system, if a channel is available in accordance with the requirements of sub-subparagraph 3.1 (a) (vi) of this Order.
- 2.3 A cockpit voice recorder must comply with the requirements of Technical Standard Order C84 or later amendment of the Federal Aviation Administration of the United States of America and be of a type approved by the Director.
- 2.4 The cockpit voice recorder must be provided with the following means to facilitate its identification in conditions following a crash:
- (a) each cockpit voice recorder container must be coloured either bright orange or bright yellow;
 - (b) reflective tape must be affixed to the external surface of the cockpit voice recorder container to facilitate its location under water.

3 Installation

- 3.1 Each cockpit voice recorder must be installed so that:
- (a) the part of the signals mentioned in paragraph 2.2 obtained from each of the following sources is recorded on a separate channel:
 - (i) for the first channel, from each microphone and headset used at the first pilot station;
 - (ii) for the second channel, from each microphone and headset used at the second pilot station;
 - (iii) for the third channel, from the flight deck mounted area microphone;

- (iv) for the fourth channel, from each microphone and headset used at the station for the third and fourth crew members;
 - (v) if the stations in sub-subparagraph (iv) of this paragraph are not required, from each microphone and headset used at other flight deck stations having audio selection and transmit facilities;
 - (vi) if the stations in sub-subparagraphs (iv) and (v) of this paragraph are not required, from each microphone on the flight deck that is used with the passenger address system, if its signals are not recorded on another channel;
- (b) all sounds received by the microphones listed in sub-subparagraphs 3.1 (a) (i), (ii), (iv) and (v) must be recorded, irrespective of the position of the Radio Transmission/Intercommunication Selector switch (this configuration for microphones is commonly called “hot”), and:
- (i) the wiring must be such that side tone is produced only when Radio Transmission or Intercommunication is selected; and
 - (ii) impedances and signal levels must be selected to avoid unwanted coupling between the microphone and headset circuits listed in sub-subparagraphs 3.1 (a) (i), (ii), (iv) and (v); and
 - (iii) the gain should be adjusted such that for the microphones listed in sub-subparagraphs 3.1 (a) (i), (ii), (iv) and (v), the microphone signal exceeds the level of the headset side tone signal from other sources on a high percentage of occasions.

Note This paragraph does not apply to hand-held microphones incorporating an ON/OFF switch. For such microphones, the sounds received need only be recorded when the switch is selected ON.

- 3.2 The flight deck mounted area microphone referred to in sub-subparagraph 3.1 (a) (iii) must be located and mounted in a position to pick up all the general cockpit sounds and the flight crew speech. The preamplifiers and filters must be so adjusted or supplemented, that the intelligibility of the recorded signals is as high as practical or when recorded under flight noise conditions, and played back.

Note The most desirable location for the microphone is in a central position forward of a vertical plane orientated laterally through the pilots and co-pilots normal sitting positions. The presence and location of flight deck loudspeaker(s) and the strength of the signals from these speakers must be considered when determining the optimum location for the microphone, so that other signals are not obliterated.

- 3.3 The quality of the recording on each channel must be as high as practicable. Before approval is given for each first type of aircraft/recorder system combination the quality must be established by play back of in-flight recorded information in accordance with Appendix I.
- 3.4 Each cockpit voice recorder must be installed so that:
- (a) it receives its electrical supply from the bus that provides the maximum reliability for operation of the cockpit voice recorder without jeopardising service to essential or emergency loads; and
 - (b) there is a means of monitoring the cockpit voice recorder for proper operation, as part of the flight deck preflight procedure; and

- (c) there is an automatic means to simultaneously stop the recorder and prevent any erasure feature from functioning, within 10 minutes after crash impact.
- 3.5 The cockpit voice recorder must be installed as far to the rear of the aircraft as possible, consistent with reasonable maintenance access, in a position to minimise the probability of damage from crash impact and subsequent fire.
- Note* It need not be outside the pressurised compartment but the probability of damage from aft mounted engines, baggage, cargo and structural collapse must be minimised.
- 3.6 Facilities must be provided on the flight deck for erasure of the record on the ground after the aircraft has come to a stop at the completion of the flight. The installation must be designed to prevent in-flight erasure and to minimise inadvertent erasure during crash impact.

Appendix I

Cockpit voice recorder

Flight test

1 Introduction

- 1.1 First of type aircraft/recorder combinations must be flight tested and the recording, so obtained, 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 Australian Transport Safety Bureau. The Australian Transport Safety Bureau will ensure the privacy of the recordings.
- 1.6 Recordings offered for analysis may be released to the operator's engineering organisation and the Australian Transport Safety Bureau. 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 of".

- 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's 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):
- (a) 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."
 - (b) 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."
 - (c) 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, 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 1 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 the Australian Transport Safety Bureau. 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.
- 3.2 The Australian Transport Safety Bureau will establish if recordings of adequate quality have been made on all channels for the test conditions stated in 2.
- 3.3 The Australian Transport Safety Bureau will furnish a report to the applicant. 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 Australian Transport Safety Bureau for use as a reference tape for the type of aircraft/recorder combination.
-