



ITSO-C123b

Effective

Date : December 15, 2010

Government of India
Civil Aviation Department
Directorate General of Civil Aviation
Aircraft Engineering Directorate
New Delhi

Indian Technical Standard Order

Subject: COCKPIT VOICE RECORDER EQUIPMENT

1. **PURPOSE:** This Indian Technical Standard Order (ITSO) is issued for manufacturers of cockpit voice recorder (CVR) equipment applying for an ITSO authorization (ITSOA). This ITSO has been prepared in accordance with the procedural rules set forth in Subpart 'O' of CAR 21. The cockpit voice recorder must meet for approval and to be identified with the applicable ITSO marking, the Minimum Performance Standards (MPS) given in this ITSO.
2. **APPLICABILITY:** This ITSO is effective from the date of issue. Major design changes to CVR equipment approved under this ITSO will require a new authorization according to CAR 21.611(b).
3. **REQUIREMENTS:** The cockpit voice recorder identified and manufactured under this ITSO must meet the MPS in the European Organization for Civil Aviation Electronics (EUROCAE) document ED-112, *Minimum Operational Performance Specification for Crash Protected Airborne Recorder System*, dated March 2003, with amendments No. 1, dated 25.07.03 and amendment No. 2, dated 22.09.03. The CVR equipment would be certified based on the applicable section of ED-112 that pertains to the CVR type.

Shape, size and identification standards for crash protected enclosures are described in Appendix 1 of this ITSO.

- (a) **Exceptions to ED-112:** DGCA makes the first two exceptions to ED-112 to comply with CAR requirements. The last three items are exceptions to requirements for installation, flight testing, aircraft maintenance and others that do not pertain to MPS criteria specific to the ITSO equipment.

- *Recorder start and stop times, Chapter 2-1.5:* Chapter 2-1.5 is not required as part of this ITSO. Start and stop time must comply with applicable CAR requirements.
 - *Recorder location, Chapter 2-5.4.1:* Chapter 2-5.4.1 is not required as part of this ITSO. Recorder location must comply with applicable CAR certification regulations.
 - *Equipment Installation and Installed Performance (Deployable recorders), Chapter 3-4.*
 - *Equipment Installation and Installed Performance, Part 1-6.*
 - Other ED-112 requirements for installation, flight testing, aircraft maintenance and others that do not pertain to MPS specific criteria.
- (b) **Functionality:** This ITSO's standards apply to a device that uses a combination of microphones and other audio and digital inputs to collect and record the aural environment of the cockpit including communications among flight crew members.
- (c) **Failure Condition Classification:** Failure of the function defined in paragraphs 3 and 3b of this ITSO is a minor failure condition. Develop the system to, at least, the design assurance level equal to this failure condition classification. See appendix 2 of this ITSO.
- (d) **Functional Qualification:** Demonstrate the required performance listed under the test conditions in ED-112.
- (e) **Environmental Qualification:** Test the equipment according to RTCA / DO-160F, *Environmental Conditions and Test Procedures for Airborne Equipment* (latest revision).
- (f) **Software Qualification:** If the article contains a digital computer, develop the system according to RTCA / DO-178B, *Software Considerations in Airborne Systems and Equipment Certification* (latest revision), and to the design assurance level specified in ED-112, paragraph 2-1.9.
- (g) **Electronic Hardware Qualification:** If the article contains a complex custom micro-coded component, develop the electronic hardware according to FAA advisory circular (AC) 20-152, RTCA Inc. Document RTCA/DO-254, *Design Assurance Guidance for Airborne Electronic Hardware*. The hardware design assurance level should be consistent with the failure condition classification in paragraph 3.c of this ITSO.
- (h) **Deviations:** Applicant can use alternative or equivalent means of compliance to the criteria in the MPS of this ITSO. Under such circumstances it must be shown that the equipment maintains an equivalent level of safety. A deviation

(if any), may be applied as per the requirements of CAR 21.610, together with the data package.

4. MARKING:

- (a) Mark at least one major component permanently and legibly with the information in CAR 21.609(e) and 21.807(a), except:
- (1) CAR 21.807 (a) (2). Use the name, type, and part number. Do not use the model designation.
 - (2) CAR 21.807 (a) (3). Use both the date of manufacture and product serial number.
- (b) Mark the following permanently and legibly with at least the manufacturer's name, subassembly part number, and the ITSO number:
- (1) Each component that is easily removable (without hand tools),
 - (2) Each interchangeable element, and
 - (3) Each subassembly of the article that you determined may be interchangeability.
- (c) If the component contains a digital computer, then the part number must include hardware and software identification. Or, the applicant can use a separate part number for hardware and software. Either way, the applicant must include a means to show the modification status.
- [NOTE: Similar software versions, approved to different levels, must be differentiated by part number.]
- (d) If applicable, identify deviations granted to the article by marking "Deviation. See installation/instruction manual (IM)" after the ITSO number. The applicant can abbreviate the marking to "Dev. See IM".
- (e) When applicable, identify the equipment as an incomplete system or state that the article performs functions beyond those described in paragraphs 3 and 3(b) of this ITSO.

5. **Application Data Requirements:** As an applicant for ITSOA, the organisation must submit to DGCA (AED), a statement of compliance as specified in CAR 21.605 and one copy each of the following technical data to support the design and production approval:

- (a) Installation procedures and limitations in an installation/instruction manual (IM), sufficient to ensure that the CVR equipment, when installed according to the installation procedures, still meets this ITSO requirements. Describe any deviation in detail. If needed, identify equipment by part number, version, revision and criticality level of software, classification for use and environmental categories.
- (b) Installation procedures and limitations in an IM, sufficient to ensure that the CVR equipment, when installed according to the installation procedures, still meets this ITSO's requirements. Limitations must identify unique aspects of the installation. Finally, the limitation must include a note with the following statement:

The conditions and tests for ITSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the ITSO standards. ITSO article must have separate approval for installation in an aircraft. The CVR equipment may be installed and certified only in accordance with Aircraft Rules, 1937 and applicable Civil Aviation Requirements.

- (c) Schematic drawings of the installation procedures.
- (d) Wiring diagrams of the installation procedures.
- (e) List of components, by part number, that makes up the CVR equipment complying with the standards in this ITSO. Include vendor part number cross reference, when applicable.
- (f) A component maintenance manual (CMM), covering periodic maintenance, calibration and repair, for the continued airworthiness of installed CVR equipment. Instructions should include recommended inspection intervals and service life. Describe the details of deviations granted, as noted in paragraph 5(a) of this ITSO.
- (g) Material and process specifications list.
- (h) The quality control system (QCS) description required by CAR 21.143 and 21.605(d) including functional test specifications. The QCS should ensure detection of any change to the equipment that could adversely affect compliance with the ITSO MPS, and reject the item accordingly.
- (i) Manufacturer's ITSO qualification test reports.

- (j) Nameplate drawing with the information required by paragraph 4 of this ITSO.
 - (k) List of drawings and processes (including revision level), to define the article's design. For a minor change, the applicant only needs to make the revision to the list available on request.
 - (l) An environmental qualification form as described in RTCA/DO-160F, for each component of the system.
 - (m) If the article contains a digital computer: a plan for software aspects of certification (PSAC), software configuration index, and software accomplishment summary. It is recommended that the applicant should submit the PSAC early in the software development process. Early submittal allows DGCA to quickly resolve issues, such as partitioning and determining software levels.
 - (n) If the article contains a complex custom micro-coded component: a plan for hardware aspects of certification (PHAC), hardware verification plan, top-level drawing, and hardware accomplishment summary. It is recommended that the applicant should submit the PHAC early in the software development process. Early submittal allows DGCA to quickly resolve issues.
6. **Manufacturer Data Requirement:** Besides the data given directly to the DGCA, the applicant must have the following technical data available for review by the responsible ACO or civil aviation authority:
- (a) The functional qualification specifications for qualifying each production article to ensure compliance with this ITSO.
 - (b) Equipment calibration procedure.
 - (c) Corrective maintenance procedure within 12 months after ITSO authorization.
 - (d) Schematic Drawings.
 - (e) Wiring diagrams.
 - (f) Material and process specifications.
 - (g) The result of the environmental qualification tests conducted per RTCA/DO-160F.

(h) If the article contains a digital computer, the appropriate documentation defined in RTCA/DO-178B, including all data supporting the applicable objective in Annex. A, Process objectives and Outputs by Software Level.

(i) If the article contains a complex micro coded component, the appropriate hardware life cycle data in combination with design assurance level, as defined in AC 20-152.

7. **Furnished Data Requirements:** If giving one or more articles to one entity (such as an operator or repair station), provided the following for each article manufactured under this ITSO:

(a) One copy of the data in paragraph 5(a) through 5(f) of this ITSO. Add other data needed for the proper installation, calibration, and use, or for continued airworthiness or both, of the CVR equipment.

(b) One copy of the data in paragraph 5(k) through 5(n), if the article performs functions beyond those described in paragraph 3 and 3(b) of this ITSO.

(c) One copy of the data in ED-112 paragraph 2-1.3.4.

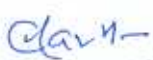
8. **How to get Referenced Documents.**

(a) RTCA documents can be purchased from: Radio Technical Commission for Aeronautics Inc., 1828 L Street, N.W., Suite 805, Washington, D.C. 20036-4001, USA. Telephone (202) 833-9339, fax (202)833-9434. Website www.rtca.org.

(b) Order EUROCAE documents from EUROCAE, 17 rue Hamelin, 75116 Paris, France. Telephone 33(0) 1 4505 7188, fax 33 (0) 1 4505 7230. The applicant can also order from the EUROCAE Internet website www.eurocae.org.

(c) CAR 21 including 'Handbook of Procedures' and other CARs are available on DGCA website (www.dgca.nic.in). For papercopy of the CAR, contact: The English Book Store, 17-L, Connaught Circus, New Delhi-110001 (India).

(d) SAE documents may be obtained from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001. Telephone (724) 776-4970, Fax (724) 776-0790. The applicant can also order copies through the SAE website at www.sae.org.


(CHARAN DASS)
Joint Director General of Civil Aviation
for Director General of Civil Aviation.

APPENDIX 1. STANDARDS FOR CRASH PROTECTED ENCLOSURES

1. **Physical Size.** As technology allows for increased miniaturization, manufacturers continue to shrink the crash enclosure. Now, the enclosures can be very difficult to find in wreckage. The sum of height (a), width (b) and depth (c) of the crash enclosure must be 9 inches or greater. Each of these major dimensions must be 2 inches or greater. Here are five examples of a crash enclosure and the minimum required dimensions:

[NOTE: The dimensions of crash protected enclosures shall not include the underwater locator beacon (ULB) or its attached hardware.]

2. **Identification.** Paint the crash enclosure according to FAR 23.1457(g), 25.1457(g), 27.1457(g) or 29.1457(g) and mark it identically to paragraph 4 of this ITSO.

Figure 1. Crash enclosure shaped like a rectangular prism

$a, b, c \geq 2.0$ inches (5.1 cm).

$a + b + c \geq 9.0$ inches (22.9 cm).

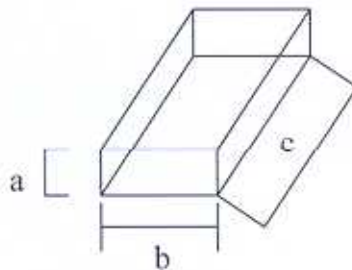


Figure 2. Crash enclosure shaped like an elliptical cylinder.

$a, b, c \geq 2.0$ inches (5.1 cm)
 $a+b+c \geq 9.0$ inches (22.9 cm)

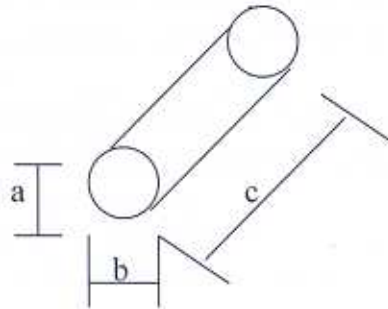
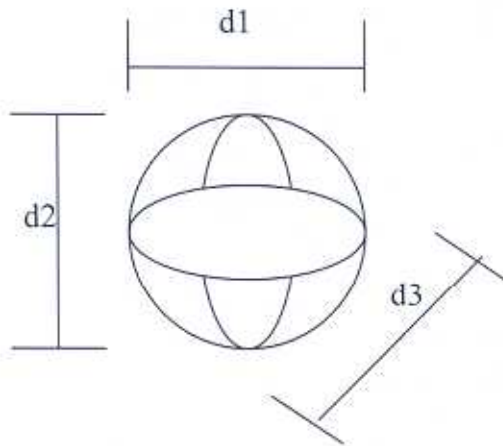


Figure 3. Crash enclosure shaped like a sphere.

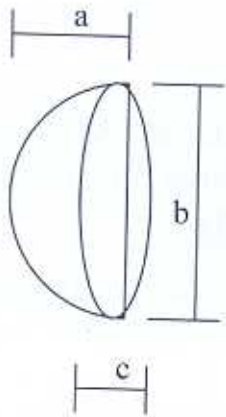


Height, width and depth are equal to the diameter of the sphere which must be equal to or greater than 3.0 inches (7.6 cm) because of the $a+b+c \geq 9$ inches (22.9 cm), requirement.

$d1 \geq 3.0$ inches (7.6 cm), $d1+d2+d3 \geq 9.0$ inches (22.9 cm)

Figure 4. Crash enclosure shaped like an ellipsoid hemisphere.

Dimensions a, b, c are not necessarily equal.

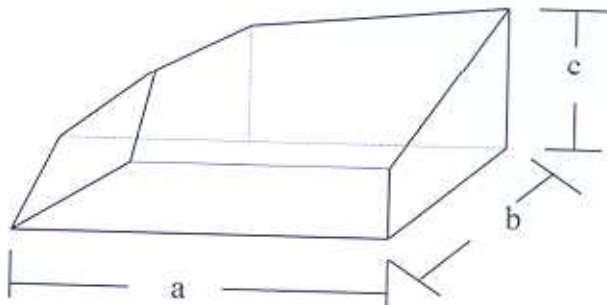


$a, b, c \geq 2.0$ inches (5.1 cm)
 $a + b + c \geq 9.0$ inches (22.9 cm)

Figure 5. Crash enclosure is generically shaped.

Width (a) is the largest width of the enclosure, depth (b) is the largest depth of the enclosure and height (c) is the largest height of the enclosure. Take each of these major dimensions from the outer surface of the enclosure. Do not include any protrusions such as mounting flanges or plates.

$a, b, c \geq 2.0$ inches (5.1 cm)
 $a + b + c \geq 9.0$ inches (22.9 cm)



APPENDIX 2. DESIGN ASSURANCE LEVEL GUIDANCE

Use the following references to develop design assurance guidance for failure condition classification.

- For systems, use SAE International's Aerospace Recommended Practice (ARP) 4754, *Consideration for Highly Integrated or Complex Aircraft Systems*, dated November 1, 1996.
- For electronic hardware, use FAA advisory circular (AC) 20-152, *RTCA Inc., Document RTCA/DO-254 Design Assurance Guidance for Airborne Electronic Hardware*.
- For software, use RTCA/DO-178B, *Software Considerations in Airborne Systems and Equipment Certification*, dated December 1, 1992 and
- For safety objectives for different installations, see the latest versions of FAA Acs 23.1309-1, Equipment, System and Installation in Part 23 Airplanes, AC 25-1309-1, System Design and Analysis, AC 27-1, Certification of Normal Category Rotorcraft and AC 29-2, Certification of Transport Category Rotorcraft (for FAR 23, 25, 27 and 29 certified aircraft respectively).
