



Number: CTSO-2C603  
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Approved by: Xu Chaoqun

## China Civil Aviation Technical Standard Order

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This China Civil Aviation Technical Standard Order (CTSO) is issued according to Part 37 of the China Civil Aviation Regulations (CCAR-37). Each CTSO is a criterion which the concerned aeronautical materials, parts or appliances used on civil aircraft must comply with when it is presented for airworthiness certification.

### Quick Access Cockpit Voice Recorder

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#### **1. Purpose.**

This China technical standard order (CTSO) is applicable to the manufacturer applying for a China technical standard order approval (CTSOA) for quick access cockpit voice recorder. This CTSO provides the minimum performance standards(MPS) that quick access cockpit voice recorder must first meet for approval and identification with the applicable CTSO marking.

#### **2. Applicability.**

This CTSO applies to applications submitted from the date of its effective date. Major design changes to article approved under this CTSO will require a new CTSOA in accordance with section 21.353 of CCAR-21-R4.

### **3. Requirements**

This CTSO applies to applications submitted from the date of its entry into force. The quick access cockpit voice recorder manufactured on or after the effective date of this CTSO and intended to be identified using this CTSO marking shall meet the minimum performance standards set forth below.

#### **a. Functionality**

The CTSO's standards apply to equipment that records audio information in the cockpit from four channels: captain voice panel, the co-pilot voice panel, the cockpit area and other crew member's position microphone. The device can be approached quickly and can easily obtain cockpit audio information over a certain period of time. The equipment shall comply with the design specification of "The Minimum Operational Performance Requirements for The Anti-crash Airborne Recorder System" of the EUROCAE ED-112A (2013.9, hereinafter referred to as ED-112A) as amended in table 1 of the appendix to this CTSO.

#### **b. Failure Condition Classification**

As defined in section 3.a in this CTSO, a system function failure of quick access cockpit voice recorder will not affect the operation of aircraft and workload of crew. The device failure condition classification is defined as no effect.

#### **c. Functional Qualification**

Demonstrate the minimum performance under the standard test conditions in table 2 of appendix1 (section I-3 of ED-112A amended) in accordance with the test procedures in table 4 of appendix1 (section I-5 of ED-112A amended).

d. Environmental Qualification

According to RTCA/DO-160G Environmental Conditions and Test Procedures for Airborne Equipment (December 8,2010) and the test procedure in table 4 of appendix1(amended section I-5 of ED-112A amended), demonstrate the minimum performance required by the environmental conditions in table 3 of appendix1(section I-4 of ED-112A amended).

e. Software Qualification

If the article includes software, develop the software according to RTCA, Inc. document RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification( December 1, 1992). The software level shall be consistent with the failure condition defined in paragraph 3.b of this CTSO.

f. Electronic Hardware Qualification

If the article includes complex electronic hardware, develop the hardware according to RTCA, Inc. document RTCA/DO-254, Assurance Guidance for Designing Airborne Electronic Hardware, dated April 19, 2000. The hardware level shall be consistent with the failure

condition defined in paragraph 3.b of this CTSO.

g. Deviation

For using alternative or equivalent means of compliance to the criteria in the MPS of this CTSO, the applicant must demonstrate that the equipment maintains an equivalent level of safety. The applicant must apply for a deviation approval in accordance with section 21.368(a) of CCAR-21-R4.

**4. Marking.**

a. Mark at least one major part permanently and legibly with all the information in section 21.423 (b) of CCAR-21-R4.

b. Also, mark the following permanently and legibly, with at least the manufacturer's name, subassembly part number, and the CTSO number:

(1) Each component that is easily removable (without hand tools);

(2) Each subassembly of the article that manufacturer determined may be interchangeable.

c. If the article includes software and/or airborne electronic hardware, then the article part numbering scheme must identify the software and hardware configuration. The part numbering scheme can use separate, unique part numbers for hardware, software and airborne electronic hardware.

NOTE: Similar software versions approved at different software levels must be distinguished by the part number.

d. (If applicable) approved deviation of the device, shall be marked with "Deviation. See installation/instruction manual(IM)" after the CTSO number, or simply "Dev. See IM".

e. (If applicable) marks shall indicate that the device is an incomplete system or declare that the functions performed by the device exceed those described in section 3 of this CTSO.

## **5. Application Data Requirements.**

The applicant must furnish the responsible certification personnel with technical data to support design and production approval. The data includes a statement of conformance specified in section 21.353 (a) (1) of CCAR-21-R4 and one copy each of the following:

a. Operating instructions and limitations sufficient to describe the operating capacity of the equipment, including a detailed description of any deviations. If required, the device's part number, version, software/hardware level, usage category and environment type should be marked.

b. Installation procedures and limitations sufficient to ensure that the equipment, when installed according to the installation or operational procedures, still meets this CTSO's requirements. Limitations must

identify any unique aspects of the installation. The limitations must include a note with the following statements:

**“This article meets the minimum performance and quality control standards required by a CTSO. Installation of this article requires separate approval.”**

c. Installation schematic diagram.

d. Installation wiring diagram.

e. List of components (indicating part number) that make up the equipment. Include vendor part number cross-references, when applicable.

f. Component maintenance manual (CMM), covering requirements of periodic maintenance, calibration and repair for the continued airworthiness of the equipment. Include recommended inspection intervals and service life, as appropriate. The deviation approved in section 3.g of this CTSO shall be specified in detail.

g. Material and process specifications list.

h. The quality system description required by section 21.358 of CCAR-21-R4, including functional test specifications. The quality control system should ensure that it will detect any changes to the approved design that could adversely affect the compliance with the CTSO MPS, and reject the article accordingly.

i. Manufacturer's CTSO qualification report.

j. A drawing depicting how the article will be marked with the information required by section 4 of this CTSO.

k. List of all drawings and process (including revision edition) that define the article's design. Minor design changes shall meet the requirements of article 21.369 of CCAR-21-R4. Amendments to the list of drawings shall be approved by the authority.

l. A summary of the test conditions used for environmental qualifications for each component of the article. For example, a form as appendix A of RTCA/DO-160G, Environmental Conditions and Test Procedures for Airborne Equipment may be used.

m. If the article includes software: a plan of software aspects of certification (PSAC), software configuration index and software accomplishment summary shall be provided.

n. If the article includes complex electronic hardware: a plan of hardware aspects of certification (PHAC), a plan of hardware validation, top-level drawings, and hardware accomplishment summary shall be provided.

o. Identify functionality or performance contained in the article not evaluated under paragraph 3 of this CTSO (i.e., non-CTSO functions). Non-CTSO functions are also accepted in parallel with the CTSO authorization. For those non-CTSO functions to be accepted, the applicant must declare these functions and include the following

information with CTSO application:

(1) Description of non-CTSO functions, such as performance specification, failure condition classification, software, hardware, and environment qualification category. Include a statement confirming that the non-CTSO function(s) don't interfere with the article's compliance with the requirements of section 3 of this standard.

(2) Installation procedures and limitations sufficient to ensure that the non-CTSO function(s) meets the declared function and performance specifications described in paragraph 5.o.(1).

(3) Continued airworthiness requirement of non-CTSO function(s) described in paragraph 5.o.(1).

(4) Interface requirements and applicable installation test procedures to ensure compliance with the performance data defined in paragraph 5.o.(1).

(5) Test plan, analysis and results, as appropriate, to verify that performance of the hosting CTSO article is not affected by non-CTSO function(s).

(6) Test plan, analysis and results, as appropriate, to verify the function and performance of the non-CTSO function(s) as described in paragraph 5.o.(1).



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## **6. Manufacturer Data Requirements.**

Besides the data submitted directly to the authorities, have the following technical data available for review by the airworthiness department:

a. Functional qualification specifications for qualifying each production article to ensure compliance with this CTSO.

b. Equipment calibration procedures.

c. Continued airworthiness document (submitted within 12 months after CTSOA is issued).

d. Schematic drawings.

e. Wiring diagram.

f. Material and process specifications.

g. The results of the environmental qualification tests conducted according to paragraph 3.d of this CTSO.

h. If the article includes software, the appropriate documentation defined in RTCA/DO-178B including all the data supporting the applicable objectives in RTCA/DO-178B Annex A, Process Objectives and Outputs by Software Level.

i. If the article includes complex electronic hardware, the appropriate documentation defined in RTCA/DO-254 Annex A, table A-1, including all the data relating to design assurance levels and hardware life cycles.

j. If the article contains non-CTSO function(s), the applicant must also provide data related to non-CTSO function described in paragraph 6.a through 6.i.

## **7. Furnished Data Requirements.**

If furnishing one or more articles manufactured under this CTSO to one entity (such as an operator or repair station), provide the following data:

a. The data required in paragraphs 5.a to 5.f and 5.l of this CTSO, as well as any other data needed for the proper installation, certification, use or for continued airworthiness of the equipment.

b. If the article contains functions beyond those declared in section 3 of this CTSO, provide the data requested from paragraph 5.o.(1) to 5.o.(4) of this CTSO.

## **8. Availability of Referenced Documents.**

Order RTCA documents from:

Radio Technical Commission for Aeronautics, Inc.

1150 18th Street NW, Suite 910, Washington D.C. 20036

You may also order them online from the RTCA Internet website at:

[www.rtca.org](http://www.rtca.org).

b. Order EUROCAE documents from:

European Organisation for Civil Aviation Equipment

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102 rue Etienne Dolet, 92240 Malakoff, France

You can also order them online from [www.eurocae.net](http://www.eurocae.net).

Appendix 1 Minimum Performance Standards for Quick Access

Cockpit Voice Recorder (QACVR)

The functions, functional and environmental qualification of QACVR shall meet with the design specification, minimum performance under the standard condition, minimum performance under environmental condition and test procedures defined in 2-1, 2-2, 2-3 of section 2 and I-1, I-2, I-3, I-4, I-5 defined in part I of ED-112A, Minimum Performance Requirements for Anti-crash Airborne Recorder System, as well as the amendments listed in the following tables 1, 2, 3 and 4.

**Table 1 Amendments of Design Specification in ED-112A**

No.	ED-112A reference	Amendments
1	2-1.2.1 Physical Size	No requirement.
2	2-1.3 Airworthiness and Certification	No requirement.
3	2-1.4 Controls	Amend to: “QACVR at least can show the following abnormal operating status: a. Power supply failure b. Failure of data collection and processing processes c. Failure of the recording medium d. Fail to record the message to the recording medium. If reasonable and feasible, judge the failure according to results of checking data input (e.g. accuracy of input information).
4	2-1.5 Start and Termination of Recording	No requirement.
5	2-1.9 Software management	Amend to: Software level is E.
6	2-1.13 Means of damage assessment for the recording medium	No requirement.

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7	2-1.16 Crash Survival	No requirement.
8	I-1.2.2 Helicopter Rotor Speed Recording	No requirement.
9	I-1.3.1 Equipment	para. a:Amended to Cockpit equipment including microphones and associated preamplifiers for transmitting cockpit voice. No requirement for para. e and para. f.
10	I-1.3.2 Classes of Voice Recorder	No requirement.
11	I-1.3.3 Operational Considerations	No requirement for para. a.vii; No requirement for NOTE 1; No requirement for para. b; Following requirements added: " QACVR can record cockpit audio information for a long period and quickly obtain cockpit audio information"
12	I-2.1.1 General	No requirement for para. b.
13	I-2.1.3 Digital Recording and Retrieval Characteristics	No requirement for para. b; No requirement for loss of data in detection section.
14	I-2.1.5 Recorder Capacity and Format	Amend to "QACVR shall record and store audio message for at least 72 hours, and record and store audio message of each channel throughout the recording period."
15	I-2.1.6 Means for Replay of Recorded Information	Para a amend to "Audio information can be obtained without removing the QACVR device from the aircraft and can be played back using ground specific equipment"
16	I-2.1.7 Bulk Erase	Amend to: " Bulk Erase function means the audio message will be changed or removed, and cannot be extracted by normal playback/replica technique. Bulk Erase function is not allowed for QACVR during data recording process.
17	I-2.1.8 Recording and Recording Medium Characteristics	Para a. Amend to "The period of time from receiving analog audio signal to converting to digital signal and starting recording: The area microphone channel requires no more than 50ms and the rest channels no more than 200ms." Para b. amend to "When play back the recording information, the synchronization time between channels should not exceed

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		50ms"	No requirement for para. c.
18	I-2.1.10 Area Microphone Polarity		No requirement.

**Table 2 Amendment of Minimum Performance under Standard Condition in ED-112A**

No.	ED-112A reference	Amendments			
1	I-3.2.1 Start-up and Effects of Power Interruptions	This para. amend to:			
		Power Interruption	Interruption Duration	Initial Power Level	Recording Requirement
		Cold Start	>2s	No Power	Following initial application of power to the recorder system, the system shall be capable for recording information in the recording medium as soon as possible but no later than 25s. Any built-in test function shall be completed within 60s.
		Warm Restart	Within 200ms to 2s	Normal, Abnormal and Emergency	Power interruption time is 200ms to 2s, When the power supply return back to normal, it will meet the cold start requirement.
		Transient	0 to 200ms	Normal	At normal voltage, interruptions with a duration of 0 to 200ms shall have no effect on the QACVR.
		Power-fail	>200ms	Normal	All information available at the start of an interruption together with that available in the following 200ms shall be recorded in the crash-protected recording medium.
		No requirement of NOTE1			
2	I-3.2.4	STI Quality Index not less than 0.65 for Non Area Microphone .			

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	Quality Index	STI Quality Index not less than 0.75 for Cockpit Area Microphone .
3	I-3.3 Area Microphone and Preamplifier	No requirement.

**Table 3 Amendments of the Minimum Performance under Environmental Condition in ED-112A**

No.	ED-112A reference	Amendments
1	2-3.2 Standard Environmental Tests	Table 2.3.1 item 21 amend to as "on demand"
2	I-4.1 Introduction	Table I-4.2 is not required
3	I-4.2 Exceptions to General Requirements	No requirement.

**Table 4 Amendments of Test Procedures in ED-112A**

No.	ED-112A reference	Amendments
1	I-5.2.8 Frequency Response - (Microphone Only)	No requirement.
2	I-5.2.9 Harmonic Distortion - (Microphone Only)	No requirement.
3	I-5.2.10 Polar Response - Area Microphone	No requirement.
4	I-5.2.11 Frequency Response - (Pre-amplifier)	No requirement.
5	I-5.2.12 Harmonic Distortion - (Pre-amplifier)	No requirement.
6	I-5.2.13 Signal to Noise Ratio - (Pre-amplifier)	No requirement.
7	I-5.2.14 Power Input Level - (Pre-amplifier)	No requirement.