



Number:CTSO-2C612
Date of approval: February 26, 2026
Approved by: Xu Feng

China Civil Aviation Technical Standard Order

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.

Airborne Voice over Internet Protocol (VoIP) Phones

1. Purpose.

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers seeking airborne Voice over Internet Protocol (VoIP) phone CTSO authorization (CTSOA). This CTSO specifies the minimum performance standards that airborne VoIP phone equipment must meet for approval and identification with the applicable CTSO marking.

2. Applicability.

This CTSO applies to applications submitted after its effective date.

a. From the effective date of this CTSO, applicants seeking CTSOA for airborne VoIP phone equipment on aircraft shall submit applications in accordance with this CTSO.

b. For equipment approved in accordance with this CTSO, any major design change shall require re-application for CTSOA in accordance with the requirements of Article 21.353 of CCAR-21-R5.

3. Requirements

Equipment manufactured after the effective date of this CTSO and intended to be identified with the CTSO marking shall meet the following requirements:

a. Functionality

These CTSO's standards apply to airborne VoIP phone equipment, providing minimum performance standards and test procedures. The audio systems and devices integrated in airborne VoIP telephone equipment, including aircraft microphones (excluding carbon granule microphones), headsets, receivers and loudspeakers, shall meet the minimum performance standards specified in Aircraft Audio Systems and Devices (CTSO-C139a). Airborne VoIP telephones incorporating such audio systems and devices shall be tested in accordance with the requirements of Appendix 1 to ensure proper functionality.

b. Failure Condition Categories

The failure condition categories applicable to this CTSO depend on the intended use of the equipment on a specific aircraft. The failure condition categories for loss of function and malfunctions shall be documented during equipment design.

c. Functional Qualification

The equipment performance shall be demonstrated to meet the requirements in accordance with the minimum performance standards

specified in Chapter 5 of YD/T 1686-2011 “Speech quality and transmission performance requirements and testing methods for IP telephony equipment”.

d. Environmental Qualification

The equipment performance shall be demonstrated to meet the requirements by applying the standard environmental conditions and test procedures applicable to this equipment, in accordance with the test conditions specified in RTCA/DO-160G Environmental Conditions and Test Procedures for Airborne Equipment. Applicants may also adopt other standard environmental conditions and test procedures applicable to airborne VoIP phone equipment, other than those specified in RTCA/DO-160G.

Note: Typically, RTCA/DO-160D (including Change 1 and Change 2, excluding Change 3) or earlier versions are no longer applicable. If such versions are used, demonstration shall be conducted in accordance with the deviation requirements in Section 3.g of this CTSO.

e. Software Qualification

If the equipment includes software, the software shall be developed in accordance with RTCA/DO-178C “ Software Considerations in Airborne Systems and Equipment Certification ” (December 13, 2011) or its latest version, including referenced supplements (if applicable).

f. Electronic Hardware Qualification

If the equipment includes complex electronic hardware, it shall be developed in accordance with the requirements of RTCA/DO-254 “Design Assurance Guidance for Airborne Electronic Hardware” (April 19, 2000). The hardware design assurance level shall be consistent with the failure condition categories specified in Section 3.b of this CTSO. For hardware determined to be simple airborne electronic hardware, it may be handled in accordance with Section 1.6 of RTCA/DO-254.

g. Deviations

For using alternative or equivalent means of compliance to the criteria in this CTSO, the applicant must show that the equipment maintains an equivalent level of safety. Apply for a deviation under the provision of 21.368(a) in CCAR-21-R5.

4. Marking.

a. Mark at least one major component permanently and legibly with all the information of 21.423(b) in CCAR-21-R5. The marking must include the equipment serial number.

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);

and,

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

c. If the equipment includes software and/or airborne electronic hardware, the part number must indicate the configuration of the software and airborne electronic hardware. When assigning part numbers, separate fields may be allocated for software and airborne electronic hardware within the part number.

d. Electronic marking may be used to identify software and airborne electronic hardware, this marking may be written into the hardware component via software without being marked on the equipment nameplate. If electronic marking is used, it must be easily readable without the use of special tools or equipment.

5. Application Data Requirements.

The applicant must furnish the responsible certification personnel with the related data to support design and production approval. The application data include a statement of conformance as specified in section 21.353(a) in CCAR-21-R5 and one copy each of the following technical data:

a. A Manual(s) containing the following:

(1) Operating (usage) instructions and article limitations sufficient to describe the equipment's operational capability.

(2) Describe in detail any deviations.

(3) Installation procedures and limitations sufficient to ensure that the cargo restraint strap assembly, when installed according to the installation or operational procedures, still meets this CTSO requirements. Limitations must identify any unique aspects of the installation. The limitations must include a note with the following statement: “This article meets the minimum performance and quality control standards required by a CTSO. Installation of this article on an aircraft requires separate approval.”

(4) For all software and airborne electronic hardware configurations, including:

(i) Software part number, including revision and design assurance level;

(ii) Airborne electronic hardware part number, including revision and design assurance level;

(iii) Functional description.

(5) Summary of environmental qualification test conditions for each component of the equipment. For example, the table format in Appendix A of RTCA/DO-160G “Environmental Conditions and Test Procedures for Airborne Equipment” may be used.

(6) Schematic diagrams, wiring diagrams, and other documents necessary for equipment installation.

(7) List of replaceable parts for the equipment (with part numbers

indicated). If applicable, include cross-references to vendor part numbers.

b. Instructions covering periodic maintenance, calibration, and repair to ensure that cargo restraint strap assemblies continue to meet the CTSO approved design. Include recommended inspection intervals and service life, as appropriate.

c. If the equipment includes software, also provide: software certification plan, software configuration index, and software accomplishment summary.

d. If the equipment includes simple or complex electronic hardware, also provide: hardware certification plan, hardware verification plan, top-level drawings, and hardware accomplishment summary (or similar documents, if applicable).

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

f. Identify functionality or performance contained in the article not evaluated under paragraph 3 of this CTSO (that is, non-CTSO functions). non-CTSO functions are 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 the CTSO application:

(1) Description of the non-CTSO function(s), such as performance specifications, failure condition classifications, software, hardware, and

environmental qualification levels. Include a statement confirming that the non-CTSO function(s) do not interfere with the article's compliance with the requirements of paragraph 3.

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

(3) Instructions for continued performance applicable to the non-CTSO function(s) described in paragraph 5.f.(1).

(4) Interface requirements and applicable installation test procedures to ensure non-CTSO function(s) compliance with the performance data defined in paragraph 5.f.(1).

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

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

g. Provide a manual describing the quality system for review by the authority in accordance with CCAR-21-R5 Article 21.358. The quality system should ensure that it will detect any change to the approved design that could adversely affect compliance with the CTSO MPS, and reject the article accordingly.

- h. Material and process specifications list.
- i. List of all drawings and processes (including revision level) that define the article's design.
- j. Manufacturer's CTSO qualification report showing results of testing accomplished according to paragraph 3.c of this CTSO.

6. Manufacturer Data Requirements.

Besides the data given directly to the authorities, have the following technical data available for review by the authorities:

- a. Functional qualification specifications for qualifying each production article to ensure compliance with this CTSO;
- b. Article calibration procedures (if applicable);
- c. Schematic diagrams;
- d. Wiring diagrams;
- e. Material and process specifications;
- f. The results of the environmental qualification tests conducted according to paragraph 3.d of this CTSO.
- g. If the equipment includes software, provide relevant documents as specified in RTCA/DO-178C, including all data supporting the applicable objectives in RTCA/DO-178C Annex A "Process Objectives and Outputs by Software Level";
- h. If the equipment includes complex electronic hardware, provide data related to the design assurance level and hardware life cycle as

defined in RTCA/DO-254 Appendix A Table A-1. For simple electronic hardware, provide the following data: test cases or procedures, test results, test coverage analysis, tool assessment and qualification data, configuration management records including problem reports.

i. If the article contains non-CTSO function(s), the manufacturer must also make available items 6.a through 6.h as they pertain to the non-CTSO function(s).

7. Furnished Data Requirements.

a. If furnishing one or more articles manufactured under this CTSO to one entity (such as an operator or repair station), provide one copy of the data in paragraphs 5.a and 5.b of this CTSO. Add any other data needed for the proper installation, certification, use, or for continued compliance with the CTSO, of the aircraft audio system and equipment.

b. If the article contains declared non-CTSO function(s), include one copy of the data in paragraphs 5.f.(1) through 5.f.(4).

8. Availability of Referenced Documents.

a. Industry standard documents may be purchased from Industry Standard Information Service Platform: <https://hbba.sacinfo.org.cn/>, where industry standard content can be queried and downloaded.

b. RTCA documents may be purchased from Radio Technical Commission for Aeronautics, Inc. 1150 18th Street NW, Suite 910, Washington D.C. 20036, USA. They may also be purchased online from

www.rtca.org.

c. ITU documents may be obtained from International Telecommunication Union (ITU) official website: <https://www.itu.int/>, where ITU standards can be accessed and downloaded.

Appendix 1 Test Requirements for Airborne VoIP Phones Incorporating Audio Systems and Equipment

For airborne Voice over Internet Protocol (VoIP) telephones approved in accordance with this CTSO, if they incorporate aircraft microphones (excluding carbon granule microphones), headsets, receivers, loudspeakers and other audio systems and devices, such systems and devices shall meet the minimum performance standards specified in Aircraft Audio Systems and Equipment (CTSO-C139a).

Airborne Voice over Internet Protocol (VoIP) telephones incorporating aircraft microphones (excluding carbon granule microphones), headsets, receivers, loudspeakers and other audio systems and devices shall undergo testing under the standard conditions meeting the requirements of this CTSO and CTSO-C139a to ensure proper functionality, with the test requirements and procedures for testing specified in Table 1.

Table 1: Airborne Voice over Internet Protocol (VoIP) Telephone Test Requirements and Procedures

Test Functions	Test Requirements and Procedures
Transmitted Voice Quality	<p>1. During a call using the airborne Voice over Internet Protocol (VoIP) phone, the tester shall be able to clearly hear the sentences transmitted by both parties of the call, with a good auditory experience.</p> <p>2. Adopt the subjective MOS scoring scheme: (1) Use the Chinese voice signals specified in ITU-T P.501, specifically as follows: F Behind the warehouse is a small house. The sun rises in the east. F Harbin is in the northernmost part of China. Breakfast is set on the kitchen table.</p>

	<p>M The pharmacy is always closed. Mom is resting in another room.</p> <p>M Every time he comes, he carries a heavy bag. He looks no more than 18 or 19 years old.</p> <p>(2) Adopt a 5-point scale and the Absolute Category Rating (ACR) method. Four people shall score the subjective call quality in the receiving and transmitting directions respectively, and the average score shall be taken.</p> <p>(3) Scoring criteria:</p> <table border="1"> <thead> <tr> <th>Rating</th> <th>Impairment Level</th> </tr> </thead> <tbody> <tr> <td>5 Excellent</td> <td>Imperceptible</td> </tr> <tr> <td>4 Good</td> <td>Perceptible but not annoying</td> </tr> <tr> <td>3 Fair</td> <td>Perceptible and slightly annoying</td> </tr> <tr> <td>2 Poor</td> <td>Annoying</td> </tr> <tr> <td>1 Bad</td> <td>Very annoying</td> </tr> </tbody> </table>	Rating	Impairment Level	5 Excellent	Imperceptible	4 Good	Perceptible but not annoying	3 Fair	Perceptible and slightly annoying	2 Poor	Annoying	1 Bad	Very annoying
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Received Voice Quality	<p>1. During a call using the airborne Voice over Internet Protocol (VoIP) phone, the tester shall be able to clearly hear the sentences transmitted by both parties of the call, with a good auditory experience.</p> <p>2. Adopt the subjective MOS scoring scheme:</p> <p>(1) Use the Chinese voice signals specified in ITU-T P.501, specifically as follows:</p> <p>F Behind the warehouse is a small house. The sun rises in the east.</p> <p>F Harbin is in the northernmost part of China. Breakfast is set on the kitchen table.</p> <p>M The pharmacy is always closed. Mom is resting in another room.</p> <p>M Every time he comes, he carries a heavy bag. He looks no more than 18 or 19 years old.</p> <p>(3) Adopt a 5-point scale and the Absolute Category Rating (ACR) method. Four people shall score the subjective call quality in the receiving and transmitting directions respectively, and the average score shall be taken.</p> <p>(3) Scoring criteria:</p> <table border="1"> <thead> <tr> <th>Rating</th> <th>Impairment Level</th> </tr> </thead> <tbody> <tr> <td>5 Excellent</td> <td>Imperceptible</td> </tr> <tr> <td>4 Good</td> <td>Perceptible but not annoying</td> </tr> <tr> <td>3 Fair</td> <td>Perceptible and slightly annoying</td> </tr> <tr> <td>2 Poor</td> <td>Annoying</td> </tr> <tr> <td>1 Bad</td> <td>Very annoying</td> </tr> </tbody> </table>	Rating	Impairment Level	5 Excellent	Imperceptible	4 Good	Perceptible but not annoying	3 Fair	Perceptible and slightly annoying	2 Poor	Annoying	1 Bad	Very annoying
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(The English version is for reference only. In case of any discrepancy

or ambiguity of meaning between this English translation and the Chinese version, the latter shall prevail.)