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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.

Aeronautical Mobile Airport Communication System (AeroMACS)

Airborne Mobile Station (AMS) Equipment

1. Purpose.

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers applying for Aeronautical Mobile Airport Communication System (AeroMACS) Airborne Mobile Station (AMS) Equipment CTSO authorization (CTSOA). This CTSO prescribes the minimum performance standards (MPS) that Aeronautical Mobile Airport Communication System (AeroMACS) Airborne Mobile Station (AMS) equipment must first meet for approval and identification with the applicable CTSO marking.

2. Applicability.

This CTSO affects new application submitted after its effective date. Major design changes to article approved under this CTSO will require a

new authorization in accordance with section 21.353 of CCAR-21R4.

3. Requirements

New models of AeroMACS AMS equipment identified and manufactured on or after the effective date of this CTSO must meet the MPS qualification and documentation requirements applicable to AMS equipment in RTCA Document RTCA/DO-346, Minimum Operational Performance Standard for Aeronautical Mobile Airport Communication System (AeroMACS), dated February 20, 2014, Section 2.

a. **Functionality.** This CTSO's standards apply to AeroMACS equipment intended to provide data link communication in the airport environment. AeroMACS equipment may provide access in the airport environment to one or more of the following services: Air Traffic Services (ATS), Aeronautical Operational Communication (AOC) including aeronautical information services and meteorological (AIS/MET) information, Airline Administrative Communication (AAC), and Airport Authority communication, as well as Aircraft Access to System Wide Information Management (SWIM) services. AeroMACS AMS equipment is intended for use while on the airport surface only. Passenger Information and Entertainment Service and passenger-owned devices are not included in this CTSO.

AeroMACS is considered supplemental to communication

equipment required by the operating rules. AeroMACS is based on the Institute of Electrical and Electronics Engineers 802.16-2009 standard, Air Interface for Broadband Wireless Access Systems, and is only intended for operation on the airport surface.

b. Failure Condition Classifications.

(1) Failure of the function defined in paragraph 3.a is a minor failure condition. The minor failure condition classification is based on the network protocol and or application system layers above the AeroMACS AMS equipment to detect and annunciate errors that would result in misleading or missing ATS messages.

Note: Installing, replacing or modifying CTSO functions that provide potential for connectivity to unauthorized access may require security risk assessment based on the change impact analysis. Security measures added as a non-CTSO function need to be evaluated during the aircraft installation approval process. A security risk assessment may be needed for this equipment. For more information, see Aircraft Certification Service (AIR) policy statement PS-AIR-21.16-02, Revision 2, Establishment of Special Conditions for Cyber Security.

(2) Loss of the function defined in paragraph 3.a is a minor failure condition, provided that for equipment used for ATS communications, the loss of function is annunciated.

(3) Design the system to at least the above failure condition

classifications.

c. **Functional Qualification.** Demonstrate the required functional performance under the test conditions specified in RTCA/DO-346 section 2.4. Applicants must propose a method to demonstrate interoperability with a CAAC authorized AeroMACS data link.

d. **Environmental Qualification.** Demonstrate the required performance under the test conditions specified in RTCA/DO-346 section 2.3 using standard environmental conditions and test procedures appropriate for airborne equipment. You may use a different standard environmental condition and test procedure than RTCA/DO-160G, provided the standard is appropriate for the AeroMACS AMS equipment.

Note: The use of RTCA/DO-160D (with Changes 1 and 2 only, incorporated) or earlier versions is generally not considered appropriate and will require substantiation via the deviation process as discussed in paragraph 3.g of this CTSO.

e. **Software Qualification.** If the article includes software, develop the software according to RTCA/DO-178C, Software Considerations in Airborne Systems and Equipment Certification, dated December 13, 2011, including referenced supplements as applicable, to at least the software level consistent with the failure condition classification defined in paragraph 3.b of this CTSO. The applicant may also develop the software according to RTCA/DO-178B, dated December 1, 1992.

f. 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-21R4.

4. Marking.

a. Mark at least one major component permanently and legibly with all the information in 21.423(b) of CCAR-21R4. The marking must include the serial number.

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

c. The applicant may use electronic part marking to identify software or airborne electronic hardware components by embedding the identification within the hardware component itself (using software) rather than marking it on the equipment nameplate. If electronic marking is used, it must be readily accessible 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)(1) in CCAR-21R4 and one copy each of the following technical data:

a. A Manual(s) containing the following:

(1) Operating instructions and equipment 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 AeroMACS AMS equipment, when installed according to the installation or operational procedures, still meet this CTSO's 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 requires separate approval.”

(4) For each unique configuration of software and airborne electronic hardware, reference the following:

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

(b) Airborne electronic hardware part number including revision and

design assurance level;

(c) Functional description.

(5) A summary of the test conditions used for environmental qualifications for each component of the article. For example, a form as described in RTCA/DO-160G, Environmental Conditions and Test Procedures for Airborne Equipment, Appendix A.

(6) Schematic drawings, wiring diagrams, and any other documentation necessary for installation of the AeroMACS AMS equipment.

(7) List of replaceable components, by part number, that makes up the AeroMACS AMS equipment. Include vendor part number cross-references, when applicable.

b. Instructions covering periodic maintenance, calibration, and repair, for the continued airworthiness of the AeroMACS AMS equipment. Include recommended inspection intervals and service life, as appropriate.

c. If the article includes software: a plan for software aspects of certification (PSAC), software configuration index, and software accomplishment summary.

d. If the article includes simple or complex custom airborne electronic hardware: a plan for hardware aspects of certification (PHAC), hardware verification plan, top-level drawing, and hardware

accomplishment summary (or similar document, as 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 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) don't 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 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. The quality system description required by section 21.358 of CCAR-21R4, including functional test specifications. 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.
- c. Schematic drawings.
- 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 article includes software, the appropriate documentation defined in RTCA/DO-178B or RTCA/DO-178C as specified in paragraph 3.e of this CTSO, including all data supporting the applicable objectives in Annex A, Process Objectives and Outputs by Software Level.
- h. If the article contains non-CTSO function(s), the applicant must also make available items 6.a through 6.g 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 or technical data and information specified in paragraphs 5.a and 5.b of this CTSO. Add any data needed for the proper installation, certification, use, or for continued compliance with the CTSO, of the AeroMACS AMS 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.

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.