English Translation Version for Reference Only

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Approved by：Xu Chaoqun

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.

Next Generation Satellite Systems (NGSS) Equipment

1. Purpose.

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers applying for Next Generation Satellite Systems (NGSS) equipment CTSO authorization (CTSOA). This CTSO prescribes the minimum performance standards(MPS) that Next Generation Satellite Systems (NGSS) 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 NGSS equipment (including the Aircraft Earth

Station (AES) transceiver equipment, auxiliary equipment, and associated antenna) identified and manufactured on or after the effective date of this CTSO must meet the MPS qualification and documentation requirements in RTCA, Inc., document RTCA/DO-262B, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS), dated June 17, 2014, including Change 1 to Appendix D, dated December 15, 2015. However, they are not required to meet any requirement of RTCA/DO-326 or RTCA/DO-326A, Airworthiness Security Process Specification, dated December 8, 2010 and August 6, 2014 respectively, in Normative Appendix D (including Change 1) or E (as applicable) where referenced.

a. The MPS allows for different equipment classes and subclasses as defined by RTCA/DO-262B, including Appendix D Change 1, supporting an aircraft SATCOM Short Burst Data (SBD) and SATCOM Swift Broad Band (SBB) system. There are 6 applicable equipment classes and 11 equipment subclass components identified (see RTCA/DO-262B, appendix D, including Change 1 SATCOM (SBD), and appendix E SATCOM (SBB)). The manufacturer must declare the equipment class requirements from those identified in the applicable appendix. The equipment configuration must satisfy the relevant requirements of RTCA/DO-262B. minimum operational performance standards (MOPS), including Change 1 to Appendix D if applicable, as identified in tables

1A/B and 2A/B of this CTSO.

Table 1A. Equipment Class Identifiers supporting SATCOM (SBD)

Equipment Class Identifier	Description	Requirement
AES1	AES using a single channel Satellite Data Unit (SDU) that contains one transceiver for data only applications. AES1 is a Short Burst Data (SBD)-only transceiver and cannot support voice calling. A passive Low Gain Antenna (LGA) is required for use with the AES1.	Appendix D, Section 2.2.1.1
AES2	AES2 is capable of multiple services using a single or dual channel SDU that contains one or two transceivers for data and/or voice applications. A passive LGA is required for use with the AES2.	Appendix D, Section 2.2.1.2
AES3	AES using two or more transceivers for multiple data and/or voice applications. A passive LGA is required for use with the AES3.	Appendix D, Section 2.2.1.3

Table 1B. Equipment Class Identifiers supporting SATCOM (SBB)

Equipment Class Identifier	Description	Requirement
AES4	AES using an Enhanced Low Gain Antenna (ELGA). AES4	Appendix E, Section 2.2.1.1, AES4

	is configured as a complete system.	Definition and Requirements
AES6	AES using a High Gain Antenna (HGA), transceiver, and Diplexer Low Noise Amplifier (DLNA).	Appendix E, Section 2.2.1.1, AES6 Definition and Requirements
AES7	AES using an Intermediate Gain Antenna (IGA), transceiver, and DLNA.	Appendix E, Section 2.2.1.1, AES7 Definition and Requirements

Table 2A. Equipment Sub-Class Identifiers supporting SATCOM (SBD)

Sub-Class Identifier	Description	Requirement
LGA	Passive LGA for use with AES1, AES2 or AES3.	Appendix D, Section 2.2.3.1.1

Table 2B. Equipment Sub-Class Identifiers supporting SATCOM (SBB)

Sub-Class Identifier	Description	Requirement
HGA	HGA for AES6.	Appendix E, Section 2.2.3.1.2
IGA	IGA for AES7.	Appendix E, Section 2.2.3.1.2
6MA	Transceiver, SDU Configuration Module (SCM), SDU, Modified Type A (DMA) DLNA, and HGA for use with AES6.	Appendix E, Section 2.2.1.1, 6MA Definition and Requirements
7MA	Transceiver, SDU, SCM, DMA DLNA, and IGA for use with	Appendix E, Section 2.2.1.1,

	AES7.	7MA Definition and Requirements
6D	Transceiver and DLNA combination includes SDU, High Power Amplifier (HPA), DLNA, SCM, and HGA functions for use with AES6.	Appendix E, Section 2.2.1.1, 6D Definition and Requirements
7D	Transceiver and DLNA combination includes SDU, HPA, DLNA, SCM, and IGA functions for use with AES7.	Appendix E, Section 2.2.1.1, 7D Definition and Requirements
6F	Transceiver and Type F (DF) DLNA includes SDU, HPA, SCM, and HGA functions for use with AES6.	Appendix E, Section 2.2.1.1, 6F Definition and Requirements
7F	Transceiver and DF DLNA includes SDU, HPA, SCM, and IGA functions for use with AES7.	Appendix E, Section 2.2.1.1, 7F Definition and Requirements
DMA	DLNA with standard Transmitter (Tx) filter configures with 6MA transceiver and HGA for use with AES6, or 7MA transceiver and IGA for use with AES7.	Appendix E, Section 2.2.1.1, DMA Definition and Requirements
DF	DLNA with enhanced Tx filter configures with 6MA or 6F transceiver and HGA for use with AES6, or with 7MA or 7F transceiver and IGA for use with AES7	Appendix E, Section 2.2.1.1, DF Definition and Requirements

b. Functionality. This CTSO's standards apply to equipment intended for long-range communication services, aeronautical mobile satellite (route) services (AMS(R)S) by means of satellite communications between AES, corresponding satellites, and ground earth stations (GES). The NGSS supports data communications, or data and voice communications, between aircraft users and ground-based users, such as air navigation service providers (ANSP) and aircraft operators. AES1 supports data communications only. All other equipment classes support both data and voice communications. The functionality of NGSS supports four categories of communication service. Two are in the safety of flight category: air traffic services (ATS) and aeronautical operational control (AOC). The other two are in the non-safety of flight category: aeronautical administrative communication (AAC) and aeronautical passenger communication (APC).

c. Failure Condition Classifications. The failure condition specified in paragraphs 3.c.(1) and 3.c.(2) of this CTSO is based on NGSS equipment supplementing primary HF voice communications in procedural airspace area operations.

(1) Failure of the function defined in paragraph 3.b of this CTSO is a minor failure condition.

(2) Loss of the function as defined in paragraph 3.b of this CTSO is a minor failure condition.

(3) Develop the system to, at least, the design assurance level equal to this failure condition classification.

Note: Use of NGSS equipment for primary voice or data communications may include a need to develop the NGSS equipment to a higher design assurance level than specified in paragraphs 3.c.(1) through 3.c.(3) and drive a revision to this CTSO.

d. Functional Qualification. Demonstrate the required functional performance under the test conditions specified in the Normative Appendix D (including Change 1) or E (as applicable), section 2.4, of RTCA/DO-262B.

e. Environmental Qualification. Demonstrate the required performance under the test conditions specified in the Normative Appendix D (including Change 1) or E (as applicable), section 2.3, of RTCA/DO-262B using standard environmental conditions and test procedures appropriate for airborne equipment. The applicant may use a different standard environmental condition and test procedure than RTCA/DO-160G, provided the standard is appropriate for the NGSS equipment.

Note: The use of RTCA/DO-160D, Environmental Conditions and Test Procedures for Airborne Equipment (with Changes 1 and 2 only, without Change 3 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.

f. 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.c of this CTSO. You may also develop the software according to RTCA/DO-178B, dated December 1, 1992.

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-21R4.

4. Marking.

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

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

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

(2) Each subassembly of the article that manufacturer determined

may be interchangeable.

Note: The NGSS class and subclass markings should include the complete equipment class identifier reference (such as AES1, AES4, or AES7). An example subclass component (such as HGA, Transceiver, or DLNA) marking would display AES6-2/HGA, Type A Transceiver AES7-7/7MA, or Type F Diplexer AES6-3/DF, etc. For valid combinations of system component marking, see table 3.

Table 3. Valid Combinations of System Components

Valid Combinations		DO-262 Normative Appendix	Transceiver						Transceiver & DLNA		DLNA		Antenna			Complete System
			SBD	LBT	6MA	6F	7MA	7F	6D	7D	DMA	DF	LGA (passive)	HGA	IGA	
AES1	1	D														X
	2	D	X										X			
AES2	3	D														X
	4	D		X									X			
AES3	5	D														X
	6	D	X	X									X			
AES4	1	E														X
AES6	2	E			X						X			X		
	3	E				X						X		X		
	4	E							X					X		
	5	E			X							X		X		
	6	E														X
AES7	7	E					X				X				X	
	8	E						X				X			X	
	9	E								X					X	
	10	E					X					X			X	
	11	E														X

c. If the article includes software and/or airborne electronic hardware, 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.

d. Electronic part marking may be used 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) A detailed description of any deviations.

(3) Installation procedures and limitations sufficient to ensure the NGSS equipment class and subclass components, when installed according to the original equipment manufacturers (OEM) installation

manual or operational procedures, still meet this CTSO's requirements for NGSS equipment. Limitations must identify any unique aspects of the installation, according to the valid combination of system components identified in RTCA/DO-262B (including Change 1 to Appendix D, if applicable). The OEM's installation manual should identify the components to be installed based on the valid combination of system class. For example:

Appendix D:

- Short Burst Data (SBD) and L Band Transceivers (LBT) are configured with a passive (LGA) for all AES1, AES2 or AES3 class systems.

Appendix E:

- High Gain Antenna (HGA) is combined with the AES6 class systems.
- Intermediate Gain Antenna (IGA) is combined with AES7 class systems.
- DMA diplexer is used with AES6-2 and AES7-7 class systems.
- DF diplexer is used with AES6-3/5 and AES7-8/10 class systems.
- 6MA transceiver is used with AES6-2/5 class systems.
- 7MA transceiver is used with AES7-7/10 class systems.
- 6F transceiver is used with AES6-3 class system.
- 7F transceiver is used with AES7-8 class systems.

- Transceiver & DLNA Combination 6D is used with AES6-4 class system.
- Transceiver 7D will be used with AES7-9 class systems.

See Table 3 for the valid combinations of components used for complete system installation and marking. 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 class and subclass 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; and,

(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 NGSS equipment.

(7) List of major components, such as an antenna, transceiver, or diplexer by part number, that make up the aircraft earth station, complying with the standards prescribed under this CTSO. Include vendor part number cross-references, when applicable. If the equipment can satisfy the requirements of RTCA/DO-262B (including Change 1 to Appendix D, if applicable) only when used with a particular component, make the use of that component (by part number) a requirement for the installation. If the equipment is installed with standard components applicable only to single operational class equipment, include these requirements in the installation manual as a limitation.

(8) List of replaceable class and subclass components, by part number, that make up the NGSS equipment. Include vendor part number cross-references, when applicable.

b. Instructions covering periodic maintenance, calibration, and repair, to ensure that the NGSS continues to meet the CTSO approved design. 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. A drawing depicting how the article will be marked with the information required by paragraph 4 of this CTSO.

e. 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, you must declare these functions and include the following information with your 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 of this CTSO.

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

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

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

(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.e.(1) of this CTSO.

f. 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.

g. Material and process specifications list.

h. List of all drawings and processes (including revision level) that define the article's design.

i. Manufacturer's CTSO qualification report showing results of testing accomplished according to paragraph 3.d 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. Equipment 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.e of this CTSO.

g. If the article includes software, the appropriate documentation defined in the version of RTCA/DO-178 specified by paragraph 3.f 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 the items in paragraphs 6.a through 6.g of this CTSO 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 online access to 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 NGSS equipment.

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