English Translation Version for Reference Only

Number：CTSO-C209
Date of approval：Apr 29, 2019
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.

Electronic Flight Instrument System (EFIS) Display

1. Purpose.

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers applying for Electronic Flight Instrument System (EFIS) Display CTSO authorization (CTSOA). This CTSO prescribes the minimum performance standards (MPS) that Electronic Flight Instrument System (EFIS) Display 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-21-R4.

3. Requirements

New models of EFIS identified and manufactured on or after the effective date of this CTSO must meet the requirements in Society of Automotive Engineers (SAE) Aerospace Standard (AS) 6296 Electronic Flight Instrument System (EFIS) Displays, dated March 16, 2016 and section 4 of (AS) 8034B, Minimum Performance Standards for Airborne Multipurpose Electronic Displays, dated June 27, 2011.

Note: The hardware, physical, and optical (ocular) requirements of EFIS displays are addressed in SAE AS8034B. The EFIS display requirements, for a broad set of aircraft functions, are addressed in SAE AS6296.

a. Functionality.

This CTSO's standards apply to equipment intended for use as an electronic display in the flight deck by the flight crew in CCAR 23, 25, 27, and 29 aircraft. This CTSO covers basic display standards (SAE AS8034B) and specific displayed functions requirements (SAE AS6296). Specific displayed functions can include, but are not limited to, flight instrumentation, navigation, engine and system status, alerting, surveillance, communication, terrain awareness, weather, and/or other displays. This CTSO does not provide standards for head-up displays. Two functions covered within SAE AS6296 are required as a minimum. This CTSO does not address sensor requirements. This CTSO does not

address the display of single function equipment (e.g., airspeed). Sensor requirements and single function equipment requirements are located in their respective CTSO.

b. Failure Condition Classifications.

There is no standard minimum failure condition classification for this CTSO. The failure condition classification appropriate for the equipment will depend on the intended use of the equipment in a specific aircraft. Document the loss of function and malfunction failure condition classifications for which the equipment is designed.

c. Functional Qualification.

This CTSO does not define the test procedures to verify functional performance. The manufacturer must define the appropriate tests to verify compliance with section 4 of SAE AS6296 and section 4 of SAE AS8034B.

d. Environmental Qualification.

Demonstrate the required performance under the test conditions specified in SAE AS6296, Section 5, and SAE AS8034B, Section 5, using standard environmental conditions and test procedures appropriate for airborne equipment. Applicant may use a different standard environmental condition and test procedure than RTCA/DO-160G, provided the standard is appropriate for the EFIS.

Note: The use of RTCA/DO-160D (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.

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, dated December 1, 1992, or RTCA, Inc. document 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.

f. Electronic Hardware Qualification.

If the article includes complex custom airborne electronic hardware, then develop the component according to RTCA, Inc. Document RTCA/DO-254, Design Assurance Guidance for Airborne Electronic Hardware, dated April 19, 2000, to at least the design assurance level consistent with the failure condition classification defined in paragraph 3.b of this CTSO. For custom airborne electronic hardware determined to be simple, RTCA/DO-254, paragraph 1.6 applies.

g. Deviations.

For using alternative or equivalent means of compliance to the

criteria in the MPS of 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-R4.

4. Marking.

a. Mark at least one major component permanently and legibly with all the information in 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), and

(2) Each subassembly of the article that you 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 airborne electronic hardware configuration. The part numbering scheme can use separate, unique part numbers for software, hardware, and airborne electronic hardware.

d. 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-21-R4 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 all deviations.

(3) Installation procedures and limitations sufficient to ensure that the HUD, when installed according to the installation or operational procedures, still meets this CTSO’s requirements. Installation procedures must address the installation specific functional performance requirements of paragraph 3.c of this CTSO. 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.

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

b. Instructions covering periodic maintenance, calibration, and repair, to ensure that the EFIS 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. 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 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 compliance with the performance data defined in paragraph 5.f.(1).

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

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

g. The quality manual required by section 21.358 of CCAR-21-R4 including functional test specifications. The quality system must ensure that you will detect any change to the approved design that could adversely affect compliance with the CTSO MPS and reject the article accordingly. Applicants who currently hold CTSOAs must submit revisions to the existing quality manual as necessary.

h. Material and process specifications list.

i. A 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 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, of RTCA/DO-178B.

h. If the article includes complex custom airborne electronic hardware, the appropriate hardware life-cycle data in combination with design assurance level, as defined in RTCA/DO-254, Appendix A, Table A-l. For simple custom airborne electronic hardware, the following data are required: test cases or procedures, test results, test coverage analysis, tool assessment and qualification data, and configuration management records, including problem reports.

i. If the article contains non-CTSO function(s), you 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 EFIS.

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．Order SAE documents from:

Society of Automotive Engineers, Inc.

400 Commonwealth Drive, WARRENDALE, PA 15096-001, USA

You can also order copies online at: www.sae.org.

b．Order RTCA documents from:

Radio Technical Commission for Aeronautics, Inc.

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

You can also order copies online at : www.rtca.org .