English Translation Version for Reference Only

Number：CTSO-C92c
Date of approval：Dec 8, 2018
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.

AIRBORNE GROUND PROXIMITY WARNING EQUIPMENT

1. Purpose.

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers applying for airborne ground proximity warning system (GPWS) equipment CTSO authorization(CTSOA). This CTSO prescribes the minimum performance standards(MPS) that airborne ground proximity warning system (GPWS) 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 airborne GPWS equipment identified and

manufactured on or after the effective date of this CTSO must meet RTCA Document No. DO-161A, “Minimum Performance Standards for Airborne Ground Proximity Warning Equipment,” dated May 27, 1976 .

(a) Additions .

(i) Fire Protection. All materials used shall be self-extinguishing except for small parts (such as knobs, fasteners, seals, grommets and small electrical parts) that would not contribute significantly to the propagation of a fire.

NOTE: One means of showing compliance is contained in CCAR, Part 25, Appendix F .

(ii) Aural and Visual Warnings. The required aural and visual warnings must initiate simultaneously. Each aural warning shall identify the reason for the warning such as “terrain,” “too low,” “glide slope,” or other acceptable annunciation.

(iii) Deactivation Control. If the equipment incorporates a deactivation control other than a circuit breaker, the control must be a switch with a protective cover. The cover must be safety wired so that the wire must be broken in order to gain access to the switch. A frangible lock or similar device may also be used to perform this function.

(iv) Mode 4 Flap Warning Inhibition. A separate guarded control may be provided to inhibit Mode 4 warnings based on flaps being in other than the landing configuration.

(v) Speed shall be included in the logic that determines GPWS warning time for Modes 2 and 4 to allow additional time for the aircrew to react and take corrective action.

(vi) Smart Callouts . Smart callouts of altitude above the terrain shall be provided during non precision approaches. These advisories are normally, but are not limited to 500 feet above the terrain or the height above airport (HAA) used in the terminal (approach) procedures.

b. Exceptions.

(i) An alternate means, with demonstrated equal or better accuracy, may be used in lieu of barometric altitude rate and/or radio altimeter altitude (accuracy specified in corresponding CTSO) to meet the warning requirements described in RTCA Document No. DO-161A.

(ii) In RTCA Document No.DO-161A, paragraph 2.3, the complete cycle of two tone sweeps plus annunciation is extended from “1.4” to “2” seconds.

c. Environmental Qualification.

Demonstrate the required performance under the test conditions specified in RTCA/DO-160F, titled Environmental Conditions and Test Procedures for Airborne 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.

d. Software Qualification. If the article includes software, develop the software according to RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, dated December 1, 1992.

e. Added Features.

If the manufacturer elects to add features to the GPWS equipment, those features shall at least meet the same qualification testing and software verification and validation requirements as provided under this CTSO. Examples of features that have been added to GPWS equipment are : using bank angle, acceleration, aircraft performance, and/or accurate aircraft positioning coupled with airport location data and terrain data in the logic that initiates a GPWS warning.

NOTE: This CTSO does not contain a performance standard for the display of terrain information.

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. 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 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 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-21R4 and one copy each of the following technical data:

a. Operating instructions and equipment limitations sufficient to

describe the equipment's operational capability.

b. Installation procedures and limitations sufficient to ensure that the airborne ground proximity warning system (GPWS) 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."

c. Schematic drawings of the installation procedures.

d. Wiring diagrams of the installation procedures.

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

f. List of components, by part number, that make up the GPWS complying with the standards prescribed under this CTSO. Include vendor part number cross-references, when applicable.

g. A component maintenance manual (CMM), covering periodic maintenance, calibration, and repair, for the continued airworthiness of the GPWS. Include recommended inspection intervals, and service life. Describe the details of deviations granted, as noted in this CTSO.

h. Material and process specifications list.

i. 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.

j. Manufacturer’s CTSO qualification test report.

k. Nameplate drawing with the information required by paragraph 4 of this CTSO.

l. 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-160F, Environmental Conditions and Test Procedures for Airborne Equipment, Appendix A.

m. The appropriate documentation as defined in RTCA Document DO-178B.

6. Manufacturer Data Requirements.

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

a. A drawing list, enumerating all the drawings and processes that are necessary to define the article's design.

b. The functional test specification to be used to test each production article to ensure compliance with this CTSO.

c. Equipment calibration procedures.

d. Corrective maintenance procedures (within 12 months after CTSO authorization).

e. Schematic drawings.

f. Wiring diagrams.

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

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

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 one copy or technical data and information specified in paragraphs 5.a to 5.g of this CTSO. Add any data needed for the proper installation, certification, use, or for continued compliance with the CTSO, of the airborne ground proximity warning system (GPWS) equipment.

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.