

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Agency

SUBCHAPTER C—AIRCRAFT

[Regulatory Docket No. 3065; Amdt. No. 37-1;
TSO C66a]

PART 37—TECHNICAL STANDARD ORDER AUTHORIZATIONS

Airborne Distance Measuring Equip- ment Operating Within Radio Fre- quency Range of 960-1215 Mega- cycles

The purpose of this amendment is to incorporate new environmental test procedures into the present standard for airborne distance measuring equipment and to specify the new categories which have been developed for the various environmental parameters. This action was published as a Notice of Proposed Rule Making and circulated as Federal Aviation Agency Notice No. 64-5 (29 F.R. 615).

Interested persons have been given an opportunity to comment on this regulation and due consideration has been given to all relevant matter presented. The majority of the comments received concerning Notice 64-5 expressed opposition to the proposal to change the applicability provision of the Technical Standard Order (TSO) to cover all civil aircraft. In response to such comments, and after further consideration, the Agency issued an amended notice (Notice No. 64-5B) deleting the reference to "and all other civil aircraft" in the proposed applicability provision. This action was taken (as explained in the preamble to Notice No. 64-5B) because the Agency recognized the need for less sophisticated equipment (i.e., low-cost, lightweight) for general aviation than that described in the proposed TSO and was planning to develop, with the cooperation of the industry, minimum performance standards specifically designed to meet the needs of DME equipment that is to be used in general aviation operations. In line with this last objective, the Agency has issued Notice 65-9 (Airborne Radio Navigation and Communication Equipment for General Aviation Aircraft, and Related Considerations, 1965-1975) which solicits the advice of the general aviation industry on (among other things) the formulation of minimum performance requirements for general aviation DME. Accordingly, the applicability statement in the revised TSO (TSO-C66a) restricts it to distance measuring equipment that is to be used on U.S. civil aircraft engaged in air carrier operations.

In addition, the comments clearly indicate the need for a further clarification with respect to the applicability of this, as well as other TSOs. As Part 37 (for-

merly Part 514) indicates, the minimum performance standards set forth in the TSOs are the standards with which a manufacturer must show compliance in order to identify his article with the applicable TSO marking. Technical Standard Orders are merely one system under which equipment may be approved. In meeting a regulatory requirement that a certain piece of equipment be "approved," an operator may use equipment that is "approved" by the FAA under any applicable system, unless the operating rule concerned specifically requires the use of equipment "approved" under the TSO system.

The marking requirement of the TSO has been changed to reflect the fact that the accuracy requirement for the DME is no longer based on altitude.

In addition to the foregoing changes to the provisions of the TSO, the performance standards set forth in the proposed FAA document entitled "Minimum Performance Standards for Airborne Distance Measuring Equipment Operating Within the Radio Frequency Range 960-1215 Megacycles" have also been changed in response to comments received. In this connection, the provisions of paragraph 1.5 of the Standard concerning the alarm signal have been changed to make it clear that a means must be provided to alert the flight crew when the equipment is no longer tracking a DME signal or is not operating in memory. The accuracy provisions set forth in paragraph 2.1 have been changed to remove the reference to altitude. Further studies have shown that an accuracy of ± 0.5 nautical mile or 3 percent of the distance, whichever is greater, is satisfactory for a DME regardless of the altitude at which the aircraft in which the equipment is installed, is operated. Several comments indicated that the interrogator power required under paragraph 2.7 is a function of the range rather than the altitude of the operation. The Agency agrees that the power output should be expressed as a function of the expected range of operation and that the interrogator peak output power should be limited. In this connection, paragraph 2.7a has been changed so that the output power of the interrogator at the peak of the weakest transmitter pulse must be at least 250 watts for equipment intended to be operated to a maximum range of 200 nautical miles and 50 watts for equipment intended to be operated to a maximum range of 100 nautical miles. Furthermore, the provisions of paragraph 2.7b have been revised to require that the output power of the interrogator at the peak of the weakest transmitter pulse must be within 1 db of the peak power of the strongest pulse and the Note following this paragraph has been deleted. Consistent with the foregoing changes, the references to altitude in subparagraphs a and b of paragraph 2.9 have been changed to the appropriate nautical miles.

Comments were also received concerning the searching speed for DME as set forth in paragraph 2.12. In response to such comments, the requirement has been changed to require that the total search cycle after warmup must not exceed 35 seconds. This change constitutes a relaxation of the proposal and is considered to be a more reasonable design requirement for equipment having various operational ranges.

Finally, a clarifying change has been made to the requirements concerning the antenna voltage standing wave ratio (VSWR) set forth in paragraph 2.18. The Agency is now aware that while the VSWR on an antenna transmission line might not exceed 5:1 over the radio frequency range for which the antenna is designed, it is possible that the radio frequency range for which an antenna is designed could be less than the DME frequency band. To take care of this possibility, the Standard has been changed to specifically require that the VSWR produced on the antenna transmission line by the antenna not exceed 5:1 over the entire DME frequency band.

In addition to the aforementioned changes, certain minor changes of an editorial nature have also been incorporated in the revised performance standards referenced in this TSO.

These amendments are issued under the authority of sections 313(a) and 601 of the Federal Aviation Act of 1958 (72 Stat. 752, 775; 49 U.S.C. 1354(a), 1421).

In consideration of the foregoing, and pursuant to the authority delegated to me by the Administrator (25 F.R. 6489), § 37.171 of Part 37 of the Federal Aviation Regulations (14 CFR Part 37) is amended as follows:

§ 37.171 Airborne distance measuring equipment (air carrier aircraft)—TSO-C66a.

(a) *Applicability.* This Technical Standard Order prescribes the minimum performance standards which airborne distance measuring equipment, to be used on U.S. civil aircraft engaged in air carrier operations, must meet in order to be identified with the applicable TSO marking. New models of such equipment which are to be so identified and which are manufactured on or after the effective date of this section shall meet the requirements set forth in the Federal Aviation Agency standard entitled "Minimum Performance Standards for Airborne Distance Measuring Equipment Operating Within the Radio Frequency Range 960-1215 Megacycles"¹ dated February 15, 1965, and Federal Aviation Agency document "Environmental Test Procedures for Airborne Electronic Equipment" dated August 31, 1962.¹

¹ Copies may be obtained upon request addressed to: The Library Services Division, HQ-600, Federal Aviation Agency, Washington, D.C., 20563.

(b) *Marking.* (1) In addition to the marking specified in § 37.7, the equipment must be marked to indicate the environmental extremes over which it has been designed to operate. There are six environmental procedures outlined in the FAA document "Environmental Test Procedures for Airborne Electronic Equipment" which have categories established. These shall be identified on the nameplate by the words "Environmental Categories" or, as abbreviated, "Env. Cat.," followed by six letters which identify the categories designated in the FAA document. Reading from left to right, the category designations shall appear on the nameplate in the following order so that they may be readily identified—

- (i) Temperature-Altitude Test Category;
- (ii) Vibration Test Category;
- (iii) Audio-Frequency Magnetic Field Susceptibility Category;
- (iv) Radio-Frequency Susceptibility Category;
- (v) Emission of Spurious Radio-Frequency Energy Test Category; and
- (vi) Explosion Test Category.

(2) In some cases, such as under the temperature-altitude test category, a manufacturer may wish to substantiate his equipment under two categories. In this case, the nameplate must be marked with both categories in the space designated for that category by placing one letter above the other in the following

A

manner: Env. Cat. D BAAAX.

(3) Each separate component of equipment (antenna, indicator, etc.) shall be identified with at least the manufacturer's name, TSO number, and the environmental categories over which the equipment component is designed to operate.

(c) *Data requirements.* In accordance with § 37.5, the manufacturer must furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located, the following technical data:

(1) Manufacturer's operating instructions and equipment limitations.

(2) Installation procedures with applicable schematic drawings, wiring diagrams, and specifications. Indicate any limitations, restrictions, or other conditions pertinent to installation.

(3) One copy of the manufacturer's test report.

(d) *Previously approved equipment.* Airborne distance measuring equipment approved prior to the effective date of this section may continue to be manufactured and identified with the applicable TSO marking under the provisions of its original approval.

Effective date: September 10, 1965.

Issued in Washington, D.C., on June 8, 1965.

G. S. MOORE,
Director,
Flight Standards Service.