

Rules and Regulations

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Agency

[Regulatory Docket No. 5065]

PART 37—TECHNICAL STANDARD ORDER AUTHORIZATIONS [NEW]

This amendment adds Part 37 "Technical Standard Order Authorizations" [New] to the Federal Aviation Regulations to replace the requirements contained in Part 514 of the Regulations of the Administrator and is part of the Agency recodification program. Part 37 [New] was published as a notice of proposed rule making in the FEDERAL REGISTER on May 19, 1964 (29 F.R. 6499).

A number of changes have been made in the proposal, both as a result of comments received and as a result of further review by the Agency. Some of the comments received recommended substantive changes of the regulations. Although some of these recommendations might, upon further study, appear to be meritorious, they cannot be adopted as a part of the recodification program. However, all comments of this nature will be preserved and considered in any later substantive revision of this part.

A number of comments urged that the footnote contained in § 514.1(b) be retained to show that an article may be approved by measures other than a Part 37 Technical Standard Order. Although it is true that the Technical Standard Order is only one method of approval of an article, the present footnote is, itself, too restrictive. In addition to the one alternative set out in the footnote—approval as a part of the type design of a product—an article may also be approved on an individual basis by an authorized representative of the Administrator. To prevent any misunderstanding, all three of these methods will be listed specifically in § 21.305 of Part 21 [New].

In accordance with several comments, the note after § 514.5(b) of the regulations of the Administrator has been retained in § 37.11(c).

A comment also pointed out the deletion of the note following § 514.2(d) (2) of the regulations of the Administrator. The note contained a 30-day time restriction on notification of approval or denial of an application for a TSO authorization. In order to assure an applicant of notification within 30 days of receipt of his application, or addition thereto, a new § 37.5(d) incorporating that note has been added to Part 37 [New].

Deleted from proposed Part 37 [New] was the last sentence of § 514.2(d) (2) of the regulations of the Administrator, relating to the time for filing of additional information. The Agency now believes that inclusion in Part 37 [New] of this sentence will eliminate the possi-

bility of a premature denial of an application as well as any unnecessary prolongation of the period during which an application must remain open, pending receipt of additional information. Therefore, a new § 37.5(c) has been added to Part 37, incorporating the last sentence of proposed § 37.5(a) and the last sentence of § 514.2(d) (2).

The functions of an "Engineering and Manufacturing Branch, Flight Standards Division" are conducted in the Western Region by the "Aircraft Engineering Division". Parenthetical additions to §§ 37.5(a), 37.9(b), 37.11(a), and 37.17 reflect this difference in Western Region organization.

No changes have been made to the TSO's in Subpart B of Part 514 except to renumber the sections and to reflect the fact that they are no longer issued by the Civil Aeronautics Administration under delegated authority from the Civil Aeronautics Board.

Other minor changes of a technical nature have been made. They are not substantive and do not impose any burden on regulated persons.

The definitions, abbreviations, and rules of construction contained in Part 1 [New] of the Federal Aviation Regulations apply to Part 37 [New].

In consideration of the foregoing, Chapter III of Title 14 of the Code of Federal Regulations is amended, effective January 4, 1965, by deleting Part 514 and Chapter I of Title 14 is amended by adding Part 37 [New] reading as hereinafter set forth.

This amendment is made under the authority of sections 313(a) and 601 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a) and 1421).

Issued in Washington, D.C., on October 7, 1964.

N. E. HALABY,
Administrator.

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AUTHORITY: The provisions of this Part 37 issued under secs. 313(a), 601, 72 Stat. 752, 775; 49 U.S.C. 1354(a), 1421.

Subpart A—General

§ 37.1 Applicability.

- (a) This part prescribes—
(1) Requirements for the issue of Technical Standard Order Authorizations; and
(2) Technical Standard Orders (hereafter referred to in this part as "TSO's") containing minimum performance and quality control standards for specified materials, parts, or appliances (hereafter referred to in this part as "articles") used on civil aircraft.
(b) The performance standards in each TSO are those that the Administrator finds necessary to ensure that the article concerned will operate satisfactorily or will accomplish satisfactorily its intended purpose under specified conditions.
(c) An article manufactured under a TSO authorization or an FAA letter of acceptance as described in § 37.3(b), is an approved article for the purpose of meeting the regulations of this chapter that require the article to be approved.
(d) For the purposes of this part, a manufacturer is a person who controls the design and quality of an article produced under the TSO system (or to be produced, in the case of an application) including the parts thereof and any processes or services related thereto that are procured from an outside source.

§ 37.3 TSO authorization required.

- (a) Except as provided in paragraph (b) of this section, no person may identify an article with a TSO marking unless he holds a TSO authorization and the article meets applicable TSO standards.
(b) The holder of an FAA letter of acceptance of a statement of conformance issued for an article before July 1, 1962, may continue to manufacture that article without obtaining a TSO authorization, but shall comply with the requirements of §§ 37.7 through 37.21.

§ 37.5 Application and issue.

- (a) The manufacturer (or his authorized agent) must submit an application for a TSO authorization, together with the following documents, to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, of the region in which the manufacturer is located (or, in the case of the Western Region, the Chief, Aircraft Engineering Division):

(1) A statement of conformance certifying that the applicant has met the requirements of this subpart and that the article concerned meets the applicable performance standards of Subpart B of this part.

(2) Copies of the technical data required in the applicable performance standards of Subpart B of this part.

(3) A description of his quality control system in the detail specified in § ----- (§ 1.36) of this chapter.

In complying with this paragraph, the manufacturer may refer to current quality control data filed with the FAA as a part of a previous application. When a series of minor changes in accordance with § 37.11 is anticipated, the manufacturer may set forth in his application the basic model number of the article with open brackets after it to denote that suffix change letters will be added from time to time.

(b) After receiving the application and other documents required by paragraph (a) of this section to substantiate the manufacturer's compliance with this part and his ability to produce duplicate articles under this part, the Administrator issues a TSO authorization to the manufacturer to identify the article with the applicable TSO marking.

(c) If the application is deficient, the applicant must, when requested by the Administrator, submit any additional information necessary to show compliance with this part. If the applicant fails to submit the additional information within 30 days after the Administrator's request, his application is denied and the applicant is so notified.

(d) The Administrator issues or denies the application within 30 days after its receipt or, if additional information has been requested, within 30 days after receiving that information.

§ 37.7 General rules governing holders of TSO authorizations.

Each manufacturer of an article for which a TSO authorization has been issued under this part must—

(a) Manufacture the article in accordance with Subpart A of this part and the applicable requirements of Subpart B of this part;

(b) Conduct all required tests and inspections, and establish and maintain a quality control system adequate to ensure that the article meets the requirements of paragraph (a) of this section and is in condition for safe operation;

(c) Prepare and maintain, for each model of each article for which a TSO authorization has been issued, a current file of complete technical data and records in accordance with § 37.13; and

(d) Permanently and legibly mark each article to which this section applies with the following information:

(1) The name and address of the manufacturer.

(2) The name, type, or model designation of the article.

(3) The weight of the article to the nearest 1/10 of a pound.

(4) The serial number or the date of manufacture of the article, or both.

(5) The applicable TSO number.

§ 37.9 Approval for deviation.

(a) Each manufacturer who requests approval to deviate from any performance standard of Subpart B of this part must show that the standards from which a deviation is requested are compensated for by factors or design features providing an equivalent level of safety.

(b) The request for approval to deviate, together with all pertinent data, must be submitted to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, of the region in which the manufacturer is located (or, in the case of the Western Region, the Chief, Aircraft Engineering Division).

§ 37.11 Design changes.

(a) *Minor changes by the manufacturer holding the authorization.* The manufacturer of an article under an authorization issued under this part may make minor design changes (any change other than a major change) without further approval by the Administrator. In this case, the changed article keeps the original model number and the manufacturer shall forward to the appropriate Chief, Engineering and Manufacturing Branch (in the case of the Western Region, the Chief, Aircraft Engineering Division), any revised data that is necessary for compliance with § 37.5 (a).

(b) *Major changes by manufacturer holding the authorization.* Any design change by the manufacturer that is extensive enough to require a substantially complete investigation to determine compliance with Subpart B of this part is a major change. Before making such a change, the manufacturer must assign a new type or model designation to the article and apply for an authorization under § 37.5.

(c) *Changes by person other than manufacturer.* No design change by any person (other than the manufacturer who submitted the statement of conformance for the article) is eligible for approval under this part, unless the person seeking the approval is a manufacturer and applies under § 37.5(a). Persons other than a manufacturer may obtain approval for design changes under Part 43 [New] or under the applicable airworthiness regulations.

§ 37.13 Recordkeeping requirements.

(a) *Keeping of records.* Each manufacturer holding a TSO authorization under this part shall, for each article manufactured under that authorization, keep the following records at his factory:

(1) A complete and current technical data file for each type or model article, including design drawings and specifications.

(2) Complete and current inspection records showing that all inspections and tests required to assure compliance with this part have been properly done and documented.

(b) *Retention of records.* The manufacturer shall retain the records described in paragraph (a) (1) of this section until he no longer manufactures the article concerned under this part. At

that time, he shall send copies of these records to the Administrator. The manufacturer shall retain the records described in paragraph (a) (2) of this section for a period of at least two years.

§ 37.15 FAA inspection.

Upon the request of the Administrator, each manufacturer of an article under a TSO authorization shall allow the Administrator to inspect—

(a) Any article manufactured under that authorization;

(b) The manufacturer's quality control inspections and tests;

(c) The manufacturing facilities; and

(d) The technical data files on that article.

§ 37.17 Manufacturing and design defects.

Whenever the investigation of an accident or service difficulty report shows that an article manufactured under a TSO authorization is unsafe because of a manufacturing or design defect, the manufacturer shall, upon the request of the Administrator, report to the Administrator the results of his investigation and any action, taken or proposed by the manufacturer, to correct that defect. If action is required to correct the defect in existing articles, the manufacturer shall submit to the appropriate Chief, Engineering and Manufacturing Branch (in the case of the Western Region, the Chief, Aircraft Engineering Division), the data necessary for the issue of an appropriate airworthiness directive.

§ 37.19 Noncompliance.

The Administrator may, upon notice, withdraw the TSO authorization of any manufacturer who identifies with a TSO marking an article not meeting the applicable performance standards of this part.

§ 37.21 Transferability and duration.

An authorization issued under this part is not transferable and is effective until surrendered, or withdrawn or otherwise terminated by the Administrator.

Subpart B—Technical Standard Orders

§ 37.111 Technical Standard Order Class—“Smoke Detectors”.

(a) *Introduction.* (1) This Technical Standard Order is intended to serve as a criterion by which the product manufacturer can obtain approval of his smoke detector.

(2) In the establishment of this Technical Standard Order, consideration has been given to existing Government and industry standards for smoke detectors for the purpose of adopting the performance requirements of one of the recognized aeronautical standards as the minimum safety requirements for smoke detectors which are intended for use in civil aircraft. The specification of the Society of Automotive Engineers for smoke detectors contains such requirements.

(b) *Directive—(1) Provisions.* The performance requirements for smoke detectors as set forth in SAE Specification

AS-400, Smoke Detectors, dated July 1, 1947,¹ stated below, with the exceptions hereinafter noted, are established as the minimum safety requirements for smoke detectors which are intended for use in civil aircraft:

1. *Purpose.* To specify minimum requirements for smoke detection instruments for use in aircraft, the operation of which may subject the instrument to environmental conditions specified in section 3.4.

2. *Scope.* This specification covers two basic types as follows:

Type I. Carbon monoxide.

Type II. Photoelectric cell.

3. *General requirements.*

3.1. *Material and workmanship.*

3.1.1. *Material.* Materials shall be of a quality which experience or tests have demonstrated to be suitable and dependable for use in aircraft instruments.

3.1.2. *Workmanship.* Workmanship shall be consistent with high-grade aircraft instrument manufacturing practice.

3.2. *Radio interference.* The instrument shall not be the source of objectionable interference, under operating conditions at any frequencies used on aircraft, either by radiation or feed-back, in radio sets installed in the same aircraft as the instrument.

3.3. *Identification.* The following information shall be legibly and permanently marked on the instrument or attached thereto:

(a) Name of instrument (smoke detector).

(b) SAE Spec. AS-400.

(c) Rating (electrical, vacuum, etc.).

(d) Manufacturer's part number.

(e) Manufacturer's serial number or date of manufacture.

(f) Manufacturer's name and/or trademark.

3.4. *Environmental conditions.* The following conditions have been established as design criteria only. Tests shall be conducted as specified in sections 5, 6, and 7.

3.4.1. *Temperature.* When mounted in accordance with the instrument manufacturer's instructions, the instrument shall function over the range of ambient temperature of -55° C. to 60° C. and shall not be adversely affected by exposure to temperatures in the range -65° C. and to 70° C.

3.4.2. *Humidity.* The instrument shall function and not be adversely affected when exposed to a relative humidity of up to and including 95% at a temperature of approximately 32° C.

3.4.3. *Altitude.* The instrument shall function and not be adversely affected when subjected to a pressure and temperature range equivalent to -1,000 feet to +40,000 feet standard altitude.

3.4.4. *Vibration.* When mounted in accordance with the instrument manufacturer's instructions, the units shall function and shall not be adversely affected when subjected to the following vibrations:

Type of instrument mounting	Cycles per minute ¹	Amplitude ¹	Max. acceleration
Shock mounted panel instruments.....	500-3000	<i>inch</i> 0.005	0.8 g
Unshock mounted panel instruments.....	500-3000	.010	1.3 g
Airframe structure mounted instruments.....	500-3000	.030	3.8 g

¹ It is understood that the unit shall withstand vibrations at higher frequencies, but the acceleration values need not exceed those shown above.

When specified by the purchaser for use in rotary wing aircraft, the frequency range shall be 150-3000 cycles per minute.

¹ Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, New York.

4. Detail requirements.

4.1. Design.

4.1.1. The instrument shall consist of a means for:

Type I: Testing air for contamination with gaseous products of combustion. It shall include an alarm circuit or control circuit which will indicate the presence of contamination when it reaches a concentration of not more than 0.010% of carbon monoxide by volume.

Type II: Testing air for contamination with smoke or gas of all colors or particle sizes. It shall include an alarm circuit or control circuit which will indicate the presence of contamination which reduces the light transmission to not less than 90% of that of clean air. Percentage of transmission is defined as the light falling on a photoelectric cell through a one foot distance as compared to the light transmitted in clear air.

4.1.2. A means shall be incorporated in the design to admit the air sample to the sensitive element of the instrument in a positive manner.

4.2. Indicating method. The instrument shall be capable of actuating both visual and aural alarm indicators.

4.3. Reliability. False signals in the instrument shall not result from variations in voltage (+25% and -100% of the rated), flight altitude, accelerations encountered in flight or landing, and from normal amounts of dust they may accumulate within the instrument under normal flight operation.

4.4. Integrity test provision. The instrument shall be provided with a means for being tested in flight. The test shall cause operation of the alarm circuit or control circuit by initiating the sequence of actions through a disturbance in the instrument.

4.5. Sampling characteristics. When an instrument installation is designed to divert the air samples from more than one sampling station, it shall cycle at a rate not to exceed 30 seconds per sampling station, in which case, flow of air through all the sampling conduits shall be maintained continuously. In addition, when a smoke alarm is indicated, an alarm shall be actuated to indicate the location in which the smoke or gas is being generated and to continue to indicate the alarm until the condition is eliminated. It shall begin cycling in a normal manner within 30 seconds after releasing the alarm signal.

5. Test conditions.

5.1. Atmospheric conditions. Unless otherwise specified, all tests required by this specification shall be made at an atmospheric pressure of approximately 29.92 inches of mercury and at an ambient temperature of 22° C. When tests are made with the atmospheric pressure or the temperature substantially different from these values, allowance shall be made for the variations from the specified conditions.

5.2. Vibration (to minimize friction). Unless otherwise specified, all tests for performance may be made with the instrument subjected to a vibration of 0.002 to 0.005 inch amplitude at a frequency of 1,500 to 2,000 cycles per minute. The term amplitude as used herein indicates the total displacement from positive maximum to negative maximum.

5.3. Vibration stand. A vibration stand shall be used which will vibrate at any desired frequency between 500 and 3,000 cycles per minute and shall subject the instrument to vibration such that a point on the instrument will describe, in a plane inclined 45 degrees to the horizontal plane, a circle, the diameter of which is equal to the amplitude specified herein.

5.4. Test position. Unless otherwise specified, the instrument shall be mounted and tested in its normal operation position.

5.5. Air sample. Unless otherwise specified, air samples shall be as follows:

(1) Air containing 0.01% plus or minus 0.005% carbon monoxide, or

(2) Air containing smoke or gas having a light transmission value of 85% to 92% of that of clear air.

5.6. Power conditions. Unless otherwise specified all tests for performance shall be conducted at the power rating recommended by the manufacturer.

6. Individual performance requirements. All instruments, or components of such, shall be subjected to whatever tests the manufacturer deems necessary to demonstrate specific compliance with this specification including the following requirements where applicable.

6.1. Response time. The instrument shall be tested, so that, when an air sample per section 5.5 is introduced into the instrument under normal room temperature and atmospheric pressure conditions the alarm circuit or control circuit shall be energized within a maximum of 30 seconds.

6.2. Dielectric. The insulation shall be subjected to a dielectric test with an R. M. S. voltage at a commercial frequency applied for a period of 5 seconds equivalent to 5 times normal circuit operating voltage, except where circuits include components for which such a test would not be appropriate the test voltage shall be 1.25 times the normal circuit operating voltage. The insulation response shall not be less than 20 megohms at that voltage.

7. Qualification tests. As many instruments as deemed necessary to demonstrate that all instruments will comply with the requirements of this section shall be tested in accordance with the manufacturer's recommendations. The tests of each instrument shall be conducted consecutively and after the tests have been initiated, no further adjustments of the instrument shall be permitted. For those instruments which employ a cycling device for testing a multiplicity of locations with one instrument, these tests shall be conducted on the basis of a single sample station. During these tests no false alarm shall result.

7.1. Stability. The instrument shall be operated continuously for 24 hours at room temperature. At the end of the first and twenty-fourth hour of operation a sample of air, per section 5.5, shall be introduced into the instrument and the time required for operation of the alarm circuit or control circuit shall not exceed 30 seconds.

7.2. Suction variation. The instrument shall be operated continuously by varying the suction from 25% below to 25% above the rated. At each of these values a sample of air, per section 5.5, shall be introduced into the instrument and the time required for operation of the alarm circuit or control circuit shall not exceed 30 seconds.

7.3. Voltage variation. The instrument shall be operated with the voltage varying from 110% to 85% of the rated voltage. The instrument shall then be tested with an air sample, per section 5.5, and the response time shall not exceed 30 seconds.

7.4. High temperature. The instrument shall be exposed to a temperature of 70° C. for a period of 8 hours after which it shall be tested with air at 60° C. for a period of 30 minutes without giving a false alarm. The instrument shall then be tested with an air sample, per section 5.5, and the response time shall not exceed 30 seconds.

7.5. Low temperature. The instrument shall be exposed to a temperature of -65° C. for a period of 24 hours, after which it shall be raised to a temperature of -55° C. for a period of 8 hours. After operating for 30 minutes at a temperature -55° C., without giving a false alarm, the response time to the air sample in section 5.5 shall not exceed 30 seconds.

7.6. Humidity. The instrument shall be subjected to an atmosphere 32° C. with a relative humidity of 95%, with the air sample being taken from the same atmosphere.

After operating in this manner for 5 hours, an air sample per section 5.5, shall be introduced into the instrument and the time required for operation of the alarm circuit or control circuit shall not exceed 30 seconds.

7.7. Altitude effect. The instrument shall be subjected to an altitude pressure equivalent to 40,000 feet. After operating in this manner continuously for five hours the time required for reaction of the alarm circuit or control circuit, on a sample of air per section 5.5, shall not exceed 30 seconds.

7.8. Vibration. The instrument shall be mounted on a vibration stand, in its own shock-mounted base, if provided with one, in its normal operating plane. The test shall be conducted with the instrument in normal operation condition. The instrument shall be subjected to vibration with an amplitude between 0.003 and 0.005 inch at frequencies from 500 to 3,000 cycles per minute, in order to determine whether the natural frequency of the instrument does occur in this frequency range.

7.9. Vibration endurance. With the instrument mounted on a vibration stand, per section 7.8 and with the instrument in a normal operating condition, it shall be vibrated continuously at a total amplitude of 0.03 inch for a period of 24 hours at the natural frequency, if applicable, as determined in section 7.8, or if not applicable at a frequency of 2,000 cycles per minute. At the completion of this test the instrument shall be examined to determine that no looseness in the mechanism nor damage to any part has resulted from the vibration and also, it shall be subjected to a sample of air introduced into it as per section 5.5 and the response time shall not exceed 30 seconds.

(2) Exceptions. Section 4.1.1. Design. Second sentence of Type II: "It shall include an alarm circuit or control circuit which will indicate the presence of contamination which reduces the light transmission to not less than 84 percent nor more than 96 percent of that of clear air."

Section 5.5. Air sample. Subparagraph (2): "Air containing smoke or gas having a light transmission value of 84 percent to 96 percent of that of clear air. A bar placed across light path to provide necessary light cut-off which has been calibrated against smoke may be used in place of actual smoke samples."

Section 7.3. Voltage variation. "The instrument may be operated with the voltage varying from 110 percent to 90 percent of the rated voltage. The response time to an air sample per section 5.5 shall not exceed 30 seconds."

Section 7.4. High temperature. "An air temperature of 45° C. is acceptable for the test after six hours of exposure at 70° C. The response time to an air sample per section 5.5 shall not exceed 30 seconds."

Section 7.5. Low temperature. "The instrument may be exposed to a temperature of -54° C. for a period of 24 hours after which time it shall be operated for a period of 30 minutes at -54° C. without giving a false alarm. The response time to an air sample per section 5.5 shall not exceed 30 seconds."

(3) Application. (i) Smoke detectors complying with the specifications appearing in this order are hereby approved for all aircraft. Smoke detectors already approved may continue to be installed in aircraft:

(a) For which an application for original type certificate is made prior to the effective date of this order.

(b) The prototype of which is flown within 1 year after the effective date of this order, and

(c) The prototype of which is not flown within 1 year after the effective date of this order if due to causes beyond the applicant's control.

(ii) If a major change is made in the installation within 9 months after the effective date of this order involving a change in type or model of smoke detector, previously approved types of smoke detectors may be installed. However, in any such change made after the 9-month period, new types of smoke detectors installed shall meet the specifications contained in this section.

(c) *Specific instructions*—(1) *Marking*. In addition to the identification information required in the referenced specification, each smoke detector shall be permanently marked with the Technical Standard Order designation, "FAA-TSO-C1a" to identify the smoke detector as meeting the requirements of this order in accordance with the manufacturer's statement of conformance outlined below. The Administrator accepts this identification as evidence that the established minimum safety requirements for the smoke detector have been met.

(2) *Data requirements*. Ten copies of the following technical information shall be submitted to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency in the region in which the manufacturer is located:

Installation recommendations prepared by the manufacturer covering the proper location, mounting, test circuits, and related technical information essential to insure proper functioning and maintenance of the unit as installed in the aircraft.

(3) *Effective date*. After June 1, 1948, specifications contained in this Technical Standard Order will constitute the basis for approval of smoke detectors for use in certificated aircraft.

(4) *Deviations*. Requests for deviation from, or waiver of, the requirements of this order, which affect the basic airworthiness of the component, should be submitted for approval by the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(5) *Conformance*. (i) The manufacturer shall furnish to the FAA (address as noted under "Data requirements" above), a written statement of conformance signed by a responsible official of his company, setting forth that the smoke detector to be produced by him meets the minimum safety requirements established in this order. Immediately thereafter distribution of the smoke detector conforming with the terms of this order may be started and continued.

(ii) The prescribed identification on the smoke detector does not relieve the aircraft manufacturer or owner of responsibility for the proper application of the smoke detector in his aircraft, nor waive any of the requirements concerning type certification of the aircraft in accordance with existing Federal Aviation Regulations.

(iii) If complaints of nonconformance with the requirements of this order are brought to the attention of the Federal Aviation Agency and investigation indicates that such complaints are justified, the Administrator will take appropriate action to restrict the use of the product involved.

(iv) Copies of this Technical Standard Order may be obtained from the Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

§ 37.112 Airspeed indicator (pitot static)—TSO-C2b.

(a) *Applicability*—(1) *Minimum performance standards*. Minimum performance standards are hereby established for airspeed indicators which specifically are required to be approved for use in the civil aircraft of the United States. New models of airspeed indicators (pitot static) manufactured for installation on civil aircraft on or after November 1, 1957, shall meet the standards set forth in SAE Aeronautical Standard AS-391B, "Airspeed Indicator (Pitot Static)," dated December 15, 1954.¹ Airspeed indicators (pitot static) approved by the Civil Aeronautics Administration prior to November 1, 1957, may continue to be manufactured under the provisions of their original approval.

(b) *Marking*. In lieu of the marking requirement of § 37.7(c) the range shall be shown.

(c) *Data requirements*. With the statement of conformance, one copy of manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.113 Technical Standard Order C3a: "Turn-and-Bank Indicator".

(a) *Introduction*. (1) This Technical Standard Order is intended to serve as a criterion by which the product manufacturer can obtain approval of his turn-and-bank indicator.

(2) In the establishment of this Technical Standard Order, consideration has been given to existing Government and industry standards for turn-and-bank indicators for the purpose of adopting the performance requirements of one of the recognized aeronautical standards as the minimum safety requirements for turn-and-bank indicators which are intended for use in civil aircraft. The specification of the Society of Automotive Engineers for turn-and-bank indicators contains such requirements.

(b) *Directive*—(1) *Provision*. The performance requirements for turn-and-bank indicators as set forth in SAE Specification AS-395, Turn-and-Bank Indicator, dated July 1, 1947,¹ stated below, are hereby established as minimum safety requirements for turn-and-bank indicators which are intended for use in civil aircraft:

¹ Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, New York.

1. *Purpose*. To specify minimum requirements for turn and bank indicators for use in aircraft, the operation of which may subject the instruments to the environmental conditions specified in section 3.4.

2. *Scope*. This specification covers three basic types of instruments as follows:

- Type I. Air driven.
- Type II. DC operated.
- Type III. AC operated.

3. General requirements.

3.1. Materials and workmanship.

3.1.1. *Materials*. Materials shall be of a quality which experience and/or tests have demonstrated to be suitable and dependable for use in aircraft instruments.

3.1.2. *Workmanship*. Workmanship shall be consistent with high grade aircraft instrument manufacturing practice.

3.2. *Radio interference*. The instrument shall not be the source of objectionable interference, under operating conditions at any frequencies used on aircraft, either by radiation or feed back, in radio sets installed in the same aircraft as the instrument.

3.3. *Identification*. The following information shall be legibly and permanently marked on the instrument or attached thereto:

- (a) Name of instrument (Turn and bank indicator).
- (b) SAE Specification, AS-395.
- (c) Rating (nominal electric or vacuum, etc.).
- (d) Manufacturer's part number.
- (e) Manufacturer's serial number or date of manufacture.
- (f) Manufacturer's name or trademark.

3.4. *Environmental conditions*. The following are established design criteria only. All tests shall be run as per sections 5, 6, and 7.

3.4.1. *Temperature*. When installed in accordance with the instrument manufacturer's instructions the instrument shall function over the range of ambient temperature from -30° C. to 50° C. and shall not be adversely affected by exposure to temperatures in the range of -65° C. to 70° C.

3.4.2. *Humidity*. The instrument shall function and shall not be adversely affected when exposed to a relative humidity of up to and including 95% at a temperature of approximately 32° C.

3.4.3. *Altitude*. The instrument shall function and shall not be adversely affected when subjected to a pressure and temperature range equivalent to -1,000 to 40,000 feet standard altitude except that the instrument temperature shall not be lower than -30° C.

3.4.4. *Vibration*. When installed in accordance with the instrument manufacturer's instructions the instruments shall function and not be adversely affected when subjected to vibrations of not more than 0.010 inch at a frequency from 500 to 3,000 cycles per minute or of not more than 1.3 g. When specified by the purchaser for use in rotary wing aircraft, the frequency range shall be 150-3,000 cycles per minute.

NOTE: It is understood that the unit shall withstand vibration at higher frequencies, but the acceleration values need not exceed those shown above.

4. Detail requirements.

4.1. *Indicating method*. Turns shall be indicated by means of a pointer, deflecting in direction of turn. Banks shall be indicated by means of a black ball, free to move in a curved transparent tube.

4.2. *Visibility*. Both bank and turn indications shall be visible from any point within the frustum of a cone whose side makes an angle of not less than 30 degrees with the perpendicular to the dial and whose small diameter is the aperture of the instrument case. The distance between the dial and the cover glass shall be a practical minimum and shall not exceed 0.187 inch.

4.3. Dial markings.

RULES AND REGULATIONS

4.3.1. *Finish.* Unless otherwise specified, luminescent (self-activating) material shall be applied to all markings, pointer and the inclinometer backing.

4.3.2. *Letters.* Letters "L" and "R" shall be legibly marked on the dial.

4.3.3. *Instrument name.* The words "Turn and Bank" shall be marked and may be indicated in the same finish as the letters.

4.4. *Power variations.* The instrument shall properly function with a voltage and frequency variation of $\pm 10\%$ of the rated value (provided the a. c. voltage and frequency vary in the same direction) and/or $\pm 30\%$ of the rated vacuum pressure.

5. Test conditions.

5.1. *Atmospheric conditions.* Unless otherwise specified, all tests required by this specification shall be made at an atmospheric pressure of approximately 29.92 inches of mercury and at an ambient temperature of approximately 22° C. When tests are made with atmospheric pressure or temperature substantially different from these values allowance shall be made for the variation from the specified conditions.

5.2. *Vibration (to minimize friction).* Unless otherwise specified all tests for performance may be made with the instrument subjected to a vibration of 0.002 to 0.005 inch amplitude at a frequency of 1,500 to 2,000 cycles per minute. The term amplitude as used herein indicates the total displacement from positive maximum to negative maximum.

5.3. *Vibration stand.* A vibration stand shall be used which will vibrate at any desired frequency between 500 and 3,000 cycles per minute and shall subject the instrument to vibration such that a point on the instrument case will describe in a plane inclined 45 degrees to the horizontal plane, a circle, the diameter of which is equal to the amplitude specified herein.

5.4. *Turntable.* A turntable which can be operated smoothly through the ranges specified herein shall be used for making calibration tests.

5.5. *Power conditions.* Unless otherwise specified all tests for performance shall be conducted at the power rating recommended by the manufacturer.

5.6. *Normal operation.* All instruments shall be operated at normal power for at least five minutes prior to conducting any tests (unless otherwise specified).

6. *Individual performance requirements.* All instruments or components of such shall be subjected to whatever tests the manufacturer deems necessary to demonstrate specific compliance with this specification including the following requirements where applicable.

6.1. *Bank indicator zero position.* With the instrument in normal position with the lower mounting holes on a horizontal line, the position of the ball shall be within $\frac{1}{16}$ inch of the zero position.

6.2. *Bank indicator friction.* The ball shall move smoothly and without sticking throughout the full length of the tube.

6.3. *Bank indicator visibility.* With the ball in the extreme position at each end of the tube at least one half of it shall be visible from a point 12 inches directly in front of the zero mark.

6.4. *Bank indicator filling.* The instrument shall be rotated so that all the air in the tube is trapped in the expansion chamber. Then, with the plane of the dial vertical, the instrument shall be rotated to an angle of roll of 45°. With the expansion chamber end of the tube low, no part of the air bubble shall be visible from a point 12 inches directly in front of the bank indicator zero position.

6.5. Turn indicator starting.

6.5.1. *Type I requirements.* The gyro rotor shall start to rotate and continue to run on a suction not to exceed 50% of rated value. Rated instrument performance speed

shall be reached within five minutes after normal rated suction is applied.

6.5.2. *Types II and III requirements.* The gyro rotor shall start to rotate and continue to operate at a speed sufficient for proper performance of the instrument on an applied voltage not to exceed 80% of the rated voltage. This speed shall be reached within five minutes after application of the voltage.

6.6. *Turn indicator sensitivity, room temperature.* Starting in normal position and operating under rated power, the instrument shall be rotated about the vertical axis at the rates specified in Table I. Deflections of the turn indicator pointer shall be of the magnitude shown in Table I. Pointer motion shall be smooth.

6.7. *Dielectric test.* (Types II and III only.) The insulation shall be subjected to a dielectric test with a R. M. S. voltage at a commercial frequency applied for a period of five seconds equivalent to five times normal circuit operating voltage. Except where circuits include components for which such a test would not be appropriate, then the test voltage shall be 1.25 times normal circuit operating voltage. The insulation resistance shall not be less than 20 megohms at that voltage.

7. *Qualification tests.* As many instruments as deemed necessary to demonstrate that all instruments will comply with the requirements of this section shall be tested in accordance with the manufacturer's recommendations.

7.1. *Case leakage.* (Type I only.) A differential pressure of 15 inches of mercury between the inside and outside of the case shall not result in a leakage greater than that which will cause a pressure drop of 0.4 inch of mercury in 10 seconds.

7.2. *Bank indicator damping (room temperature).* When the instrument is suddenly rotated from a position of 12 degrees bank through the vertical to 12 degrees opposite bank, the time for the ball to move from the bank indicator zero position to the rest position at the end of the tube shall be 0.2 second or more.

7.3. *Bank indicator damping (low temperature).* The instrument shall be exposed without operating to a temperature of -65° C., for one hour. Then the instrument shall be tested as specified in Paragraph 7.2 except that the instrument shall operate at a temperature of -30° C. The time for ball motion from the zero position of the bank indicator to the rest position at the end of the tube shall not exceed four seconds.

7.4. *Bank indicator leakage.* The exposure of the instrument to a temperature of 70° C. for two hours shall not cause appreciable change in the size of the air bubble at room temperature.

7.5. *Magnetic effect.* The magnetic effect of the indicator shall be determined in terms of the deflection of a free magnet, approximately $1\frac{1}{2}$ inches long, in a magnetic field with a horizontal intensity of 0.18 (± 0.01) gauss when the indicator is held in various positions on an east-west line with its nearest part 5 inches from the center of the magnet. An aircraft compass with the compensating magnets removed therefrom may be used as the free magnet for this test. This test shall be made first with the instrument not operating and then shall be repeated with the instrument in normal operation. The maximum deflection of the magnet shall not exceed 2 degrees for any pointer position.

7.6. *Turn indicator damping, room temperature.* The instrument operating under rated power in normal position, shall be rotated about the vertical axis at a rate which causes full scale pointer deflection. The turn shall be stopped suddenly and the pointer shall return to the zero mark without crossing it in not less than two nor more than four seconds.

7.7. *Turn indicator sensitivity, low temperature.* After exposure to temperature of -30° C. for three hours, without operating,

the instrument while still at -30 C. shall meet the requirements of paragraph 6.6 except that pointer deflection shall be as indicated in Table II. The performance shall be checked within ten minutes after power is applied. When turning is stopped the pointer shall return smoothly to zero within $\frac{1}{2}$ inch.

7.8. *Turn indicator sensitivity, high temperature.* The conditions of paragraph 6.6 shall also be met at a test temperature of 70 C.

7.9. *Vibration.* With the gyro operating under rated power the instrument shall be vibrated at 500 cycles per minute and describe a circle of 0.003 to 0.005 inch diameter. The frequency shall be slowly increased to 3,000 cycles per minute and then decreased to 500 cycles per minute, to determine whether the natural frequency of the instrument occurs in this range. At no time shall the pointer leave the zero position more than $\frac{1}{16}$ inch. After three hours exposure $\frac{1}{2}$ inch, and the ball shall remain at posture to vibration amplitude as specified in section 3.4.4 and at the natural frequency of between 500 and 3,000 cycles per minute, otherwise at 2,000 cycles per minute, no damage shall be evident and the instrument shall meet the requirements of section 6.

7.10. *Humidity.* The instrument shall be operated under the extreme conditions specified in section 3.4.2 for a period of 10 hours after which it shall meet the requirements of section 6.

TURN INDICATOR SENSITIVITY

TABLE I

Reference: Paragraph 6.6:	Deflection of pointer tip (inches)
Rate of turning (degree per minute):	
0-----	0 \pm .015
36-----	$\frac{1}{16} \pm \frac{1}{64}$
180-----	$\frac{1}{16} \pm \frac{1}{64}$
360-----	$\frac{1}{2} \pm \frac{1}{16}$
1,080-----	1 $\pm \frac{1}{8}$

TABLE II

Reference: Paragraph 7.7:	Deflection of pointer tip (inches)
Rate of turning:	
180°-----	$\frac{1}{16} \pm \frac{1}{64}$
360°-----	$\frac{1}{2} \pm \frac{1}{16}$

(2) *Application.* (i) Turn-and-bank indicators complying with the specifications appearing in this Technical Standard Order are hereby approved for all aircraft. Turn-and-bank indicators already approved may continue to be installed in aircraft.

(a) For which an application for original type certificate is made prior to the effective date of this order,

(b) The prototype of which is flown within 1 year after the effective date of this order, and

(c) The prototype of which is not flown within 1 year after the effective date of this order if due to causes beyond the applicant's control.

(ii) If a major change is made in the installation within 9 months after the effective date of this order involving a change in type or model of turn-and-bank indicator, previously approved types of turn-and-bank indicators may be installed. However, in any such change made after the 9-month period, new types of turn-and-bank indicators installed in aircraft used in instrument flight shall meet the specifications contained in this section.

(c) *Specific instructions*—(1) *Marking.* In addition to the identification information required in the referenced

specification, each turn-and-bank indicator shall be permanently marked with the Technical Standard Order designation "FAA-TSO-C3" to identify the turn-and-bank indicator as meeting the requirements of this order in accordance with the manufacturer's statement of conformance outlined below. The Administrator accepts this identification as evidence that the established minimum safety requirements for turn-and-bank indicators have been met.

(2) *Data requirements.* None.

(3) *Effective date.* After July 1, 1948 specifications contained in this Technical Standard Order will constitute the basis for approval of turn-and-bank indicators for use in certificated aircraft used in instrument flight.

(4) *Deviations.* Requests for deviation from, or waiver of, the requirements of this order, which affect the basic airworthiness of the component, should be submitted for approval by the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(5) *Conformance.* (i) The manufacturer shall furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located, a written statement of conformance signed by a responsible official of his company, setting forth that the turn-and-bank indicator to be produced by him meets the minimum safety requirements established in this order. Immediately thereafter distribution of the turn-and-bank indicator conforming with the terms of this order may be started and continued.

(ii) The prescribed identification on the turn-and-bank indicator does not relieve the aircraft manufacturer or owner of responsibility for the proper application of the turn-and-bank indicator in his aircraft, nor waive any of the requirements concerning type certification of the aircraft in accordance with existing Federal Aviation Regulations.

(iii) If complaints of nonconformance with the requirements of this order are brought to the attention of the Administrator and investigation indicates that such complaints are justified, the Administrator takes appropriate action to restrict the use of the product involved.

(iv) Copies of this Technical Standard Order may be obtained from the Library Services Division HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

§ 37.114 Bank and pitch instruments (indicating gyro-stabilized type) (gyroscopic horizon, attitude gyro)—TSO-C4c.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for bank and pitch instruments (indicating gyro-stabilized type) (gyroscopic horizon, attitude gyro) which specifically are required to be approved for use on civil aircraft of the United States. New models of bank and pitch instruments (indicating gyro-stabilized type) (gyroscopic horizon, attitude gyro)

manufactured for installation on civil aircraft on or after April 1, 1959, shall meet the standards set forth in SAE Aeronautical Standard AS-396B, "Bank and Pitch Instruments (Indicating Stabilized Type) (Gyroscopic Horizon, Attitude Gyro)," dated July 15, 1958¹ with the exceptions listed in subparagraph (2) of this paragraph. Bank and pitch instruments (indicating gyro-stabilized type) (gyroscopic horizon, attitude gyro) approved prior to April 1, 1959, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) Conformance with the following sections is not required: 3.1; 3.1.1; 3.1.2; 3.2; 4.3.5.

(ii) Substitute the following for section 7: "Performance tests: The following tests, in addition to any others deemed necessary by the manufacturer, shall be the basis for determining compliance with the performance requirements of this standard."

(b) *Marking.* In lieu of the weight specified in paragraph (c) of § 37.7, the rating if applicable, i.e., electrical, vacuum, etc., shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.115 Direction instrument, non-magnetic, gyro-stabilized type (directional gyro)—TSO-C5c.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for direction instruments, non-magnetic, gyro-stabilized type (directional gyro) which specifically are required to be approved for use on civil aircraft of the United States. New models of direction instruments, non-magnetic, gyro-stabilized type (directional gyro) manufactured for installation on civil aircraft on or after April 1, 1959, shall meet the standards set forth in SAE Aeronautical Standard AS-397A, "Direction Instrument, Non-Magnetic, Stabilized Type (Directional Gyro)," dated July 15, 1958¹ with the exceptions listed in subparagraph (2) of this paragraph. Direction instruments, non-magnetic gyro-stabilized type (directional gyro) approved prior to April 1, 1959, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) Conformance with the following sections is not required: 3.1; 3.1.1; 3.1.2; 3.2; 4.3.3.

(ii) Substitute the following for section 7: "Performance tests: The following tests, in addition to any others deemed necessary by the manufacturer, shall be the basis for determining compliance with the performance requirements of this standard."

¹ Copies may be obtained from the Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York 17, New York.

(b) *Marking.* In lieu of the weight specified in paragraph (c) of § 37.7, the following shall be shown:

(1) Instrument type (I or II).

(2) Rating if applicable, i.e., electrical, vacuum, etc.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams and installation procedures shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.116 Direction instrument, magnetic (gyro-stabilized type)—TSO-C6c.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for direction instruments, magnetic (gyro-stabilized type) which specifically are required to be approved for use on civil aircraft of the United States. New models of direction instruments, magnetic (gyro-stabilized type) manufactured for installation on civil aircraft on or after April 1, 1959, shall meet the standards set forth in SAE Aeronautical Standard AS-399A, "Direction Instrument, Magnetic (Stabilized Type)," dated July 15, 1958¹ with the exceptions listed in subparagraph (2) of this paragraph. Direction instruments, magnetic (gyro-stabilized type) approved prior to April 1, 1959, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) Conformance with the following sections is not required: 3.1; 3.1.1; 3.1.2; 3.2; 4.3.3.

(ii) Substitute the following for section 7: "Performance tests: The following tests in addition to any others deemed necessary by the manufacturer, shall be the basis for determining compliance with the performance requirements of this standard."

(b) *Marking.* In lieu of the weight specified in paragraph (c) of § 37.7, the rating if applicable, i.e., electrical, vacuum, etc., shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.117 Direction instrument, magnetic, non-stabilized type (magnetic compass)—TSO-C7c.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for direction instruments, magnetic, non-stabilized type (magnetic compass) which specifically are required to be approved for use on civil aircraft of the United States. New models of direction instruments, magnetic, non-stabilized type (magnetic compass) manufactured for installation on civil aircraft on or after April 1, 1959, shall meet the standards set forth

in SAE Aeronautical Standard AS-398A, "Direction Instrument, Magnetic, Non-Stabilized Type (Magnetic Compass)," dated July 15, 1958,¹ with the exceptions listed in subparagraph (2) of this paragraph. Direction instruments, magnetic, non-stabilized type (magnetic compass) approved prior to April 1, 1959, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) Conformance with the following sections is not required: 3.1; 3.1.1; 3.1.2; 3.2; 4.3.3.

(ii) Substitute the following for section 7.: "Performance tests: The following tests in addition to any others deemed necessary by the manufacturer, shall be the basis for determining compliance with the performance requirements of this standard."

(b) *Marking.* In lieu of the weight specified in paragraph (c) of § 37.7, the following shall be shown:

(1) Instrument type (I or II).

(2) Rating if applicable, i.e., electrical, vacuum, etc.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.118 Rate of climb indicator, pressure actuated (vertical speed indicator)—TSO-C8b.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for rate of climb indicators, pressure actuated (vertical speed indicator) which specifically are required to be approved for use on civil aircraft of the United States. New models of rate of climb indicators, pressure actuated (vertical speed indicator) manufactured for installation on civil aircraft on or after April 1, 1959, shall meet the standards set forth in SAE Aeronautical Standard AS-394A, "Rate of Climb Indicator, Pressure Actuated (Vertical Speed Indicator)," dated July 15, 1958,¹ with the exceptions listed in subparagraph (2) of this paragraph. Rate of climb indicators, pressure actuated (vertical speed indicator) approved prior to April 1, 1959, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) Conformance with the following sections is not required: 3.1; 3.1.1; 3.1.2; 3.2; 4.2.1.

(ii) Substitute the following for section 7.: "Performance tests: The following tests in addition to any others deemed necessary by the manufacturer, shall be the basis for determining compliance with the performance requirements of this standard."

(b) *Marking.* In lieu of the weight specified in paragraph (c) of § 37.7, the following shall be shown:

(1) Instrument type (I, II, III or IV).

¹ Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, N.Y.

(2) Range (feet per minute climb and descent).

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.119 Automatic pilots—TSO-C9c.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for automatic pilots to maintain flight and/or to provide maneuvering about the three axes through servo control which specifically are required to be approved for use in civil aircraft of the United States. New models of autopilots manufactured for such use on or after September 15, 1960, shall meet the standards set forth in SAE Aeronautical Standard AS-402A, "Automatic Pilots," dated February 1, 1959,¹ with the exceptions listed in subparagraph (2) of this paragraph and the additions listed in subparagraph (3) of this paragraph. Automatic pilots approved prior to September 15, 1960, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) Conformance with the following section is not required: 3.1, 3.1.1, 3.1.2, 3.2.

(ii) Substitute the following for section 7.: "Performance tests: The following tests, in addition to any others deemed necessary by the manufacturer, shall be the basis for determining compliance with the performance requirements of this standard."

(3) *Additions.* In addition to the means of indication specified in section 4.3 of AS-402A, the following shall be included:

(i) *Power malfunction indication.* Means shall be provided to indicate readily to the pilot in a positive manner when each phase of the primary power (voltage and/or current) to the automatic pilot is not adequate for safe operation.

(ii) *Airborne navigation reference indication.* A visual means shall be provided to indicate readily to the pilot in a positive manner when the automatic pilot is not engaged to the airborne navigation reference.

(b) *Marking.* In addition to the markings required in § 37.7, range and/or rating if definable shall be shown on each component of the system.

(c) *Data requirements.* With the statement of conformance, one copy each of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

(1) Manufacturer's operating instructions

(2) Manufacturer's typical installation instructions

(3) Exploded views for each major component of the system

(4) Schematic diagrams for each major component and the system

(5) The manufacturer's compliance test report.

§ 37.120 Aircraft, altimeter, pressure, actuated, sensitive type—TSO-C10b.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for aircraft altimeters which specifically are required to be approved for use on civil aircraft of the United States. New models of altimeters manufactured for such use on or after September 1, 1959, shall meet the standards set forth in SAE Aeronautical Standard AS 392C, "Altimeter, Pressure Actuated Sensitive Type," revision date February 1, 1959,² with the exceptions listed in subparagraph (2) of this paragraph. Altimeters approved under prior issuances of this section may continue to be manufactured under the earlier provisions.

(2) *Exceptions.* (i) The following specifically numbered paragraphs in AS 392C do not concern minimum performance and therefore are not essential to compliance with this section: 3.1, 3.1.1, 3.1.2, 3.2, 3.2(a) (b) (c) (d) (e) (f).

(ii) In lieu of section 7. in AS 392C, it is a requirement that the altimeters covered by this section be capable of successfully passing the tests in paragraphs 7.1 through 7.5 and an External Case Pressure Test which is as follows:

External Case Pressure Test. The static pressure source of the instrument shall be sealed when an ambient temperature of 25°C and an ambient pressure of 29.92 inches (absolute) of mercury have been achieved. The ambient pressure shall then be increased at a rate of 20 inches of mercury in two seconds to 50 inches (absolute) of mercury and held at that pressure for three minutes. There shall be no adverse effect on the instrument or its accuracy.

(iii) The "Reference Section" under Table II of AS 392C is not applicable.

(b) *Marking.* In lieu of the weight specified in § 37.7(c) the range shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy each of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

(1) Manufacturer's operating instructions.

(2) Complete set of instrument's drawings of major components and a test report.

(3) Installation procedures with applicable schematic drawings.

§ 37.121 Fire detectors (thermal sensing and ionization sensing types)—TSO C11d.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby es-

¹ Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Ave., New York 17, New York.

² In addition to the performance standards herein, altimeters when installed in aircraft must meet installation requirements as well as functional and reliability flight tests of the pertinent airworthiness sections of the Federal Aviation Regulations.

established for fire detectors of the subject types which are required to be approved for use on piston and/or turbine engine-powered civil aircraft of the United States. New models of these types of fire detectors manufactured for use on civil aircraft of the United States on or after the effective date of this section, shall meet the standards specified in Federal Aviation Agency Standards "Fire Detectors (Thermal Sensing and Ionization Sensing Types)," dated August 1, 1961. Fire detectors approved prior to the effective date of this section, may continue to be manufactured under the provisions of their original approval.

(b) *Marking.* In lieu of information required in § 37.7(c), the alarm temperature shall be shown. Compliance of the detector with the piston or turbine engine requirements, or both, shall be designated by -P, -T, or -PT, respectively, as a suffix following the TSO designation, as TSO-C11d-P.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his equipment. (See paragraph (d) of this section.)

(3) Six copies each, except where noted, of the following, shall be furnished with the statement of conformance certifying that the instrument conforms to this section, to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

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

(ii) Installation procedures with applicable schematic drawings, wiring diagrams, and specifications. Indicate any limitations, restrictions, or other conditions pertinent to the installation. This data shall include the following:

(a) Starting ambient temperature used in determining the response time (see § 7.1.1);

(b) Maximum allowable normal ambient temperature at the point of sensor location;

(c) Maximum allowable rate of temperature rise at point of sensor location as a result of normal operation;

(d) Operating voltage;

(e) Mounting or support method; and

(f) Maximum or minimum number of units or detector length which can be used in one circuit or one fire zone without adversely affecting sensitivity or causing false indications due to temperature associated with normal operation.

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

(d) *Quality control.* Fire detectors shall be produced under a quality control system, established by the manufacturer, which will assure that each detector is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and

tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

§ 37.122 Life rafts (twin tube)—TSO-C12c.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for life rafts (twin tube) which specifically are required to be approved for use on civil aircraft of the United States. New models of life rafts manufactured on or after October 15, 1959, shall meet the standards set forth in the ATA Specification No. 800, "Airline Life Rafts," dated May 1, 1958,¹ with the additional requirements shown in subparagraph (2) of this paragraph, and the exceptions listed in subparagraph (3) of this paragraph. Life raft models approved prior to the effective date of this section may continue to be used under the provisions of their original approval until they are no longer seaworthy.

(2) *Additional requirements.* The degree of inflation shall be such that the raft will be "rounded-out" (i.e., attain its design shape and approximate dimensions) to be able to receive the first occupant within one minute after the start of inflation. Thereafter, inflation during boarding by the remainder of occupants shall be sufficient to ensure a serviceable and rigid raft.

(3) *Exceptions.* For the purpose of this section, conformance is not required with the provision of section 4.2.8 of ATA Specification No. 800 that the length of the installed gas release cables be identical and not exceed 30 inches.

(b) *Marking.* In lieu of the marking requirements specified by § 37.7, the marking instructions contained in ATA Specification No. 800 shall be acceptable and, in addition, each life raft shall be permanently marked with the Technical Standard Order designation, FAA-TSO-C12c, to identify the life raft as meeting the requirements of this section.

(c) *Data requirements.* (1) With the statement of conformance, one copy each of the manufacturer's operation and inflation instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(2) The raft manufacturer must also provide the purchaser with applicable limitations pertaining to installation of rafts on aircraft. These limitations shall include the minimum and maximum stowage area temperatures and any other limitations which will prevent the raft from performing its intended function and complying with the minimum performance standards under all reasonably foreseeable emergency conditions.

§ 37.123 Life preservers—TSO-C13c.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby

established for life preservers which specifically are required to be approved for use on civil aircraft of the United States. New models of life preservers manufactured on or after October 15, 1960, shall meet the standards set forth in ATA Specification No. 801, "Airline Life Jackets," dated July 1, 1958,¹ with the exceptions listed in subparagraph (2) of this paragraph. Life preservers approved prior to October 15, 1960, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) Compliance with section 4.1.1. of ATA Specification No. 801 is optional. Life preservers may be non-reversible provided the design of the preservers is such so as to preclude the probability of improper donning.

(ii) In addition to the placarding instructions contained in section 4.2.2 of ATA Specification No. 801, the preserver shall also be marked with instructions which will describe the proper donning procedure.

(b) *Marking.* Each life preserver shall be marked in accordance with § 37.7 except that the weight specified in § 37.7(c) may be omitted, and the following additional information shall be shown:

(1) Date of manufacture of fabric (month and year);

(2) "Adult" or "child", as the case may be.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operation and inflation instructions shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Quality control.* Each life preserver shall be produced under a quality control system, established by the manufacturer, which will assure that each life preserver is in conformity with the requirements of this standard and is in condition for use. This system shall be described in the records required by section 4.3.1 of ATA Specification No. 801. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this standard.

§ 37.124 Aircraft fabric, intermediate grade; external covering material—TSO-C14a.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for aircraft fabric, intermediate grade, for use as an external covering on civil aircraft of the United States with wing loadings of less than 9 p.s.f. and never exceed speeds of less than 160 m.p.h. Fabric manufactured on or after July 31, 1959, shall meet the requirements set forth in section 3 of SAE Aeronautical Material Specification 3804A, "Cloth, Airplane, Cotton, Mercerized; 65 lb Breaking Strength," revised May 1, 1954.¹ Fabric approved prior to July 31,

¹Copies may be obtained from the Air Transport Association, 1000 Connecticut Avenue NW., Washington 6, D.C.

¹Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, New York.

1959, may continue to be manufactured under the provisions of its original approval.

(b) *Marking.* The weight required in § 37.7 need not be included. The TSO number shall be marked continuously along the selvage edge of the fabric.

§ 37.125 Aircraft fabric, grade A; external covering material—TSO—C15c.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for aircraft fabric, grade A, for use as an external covering on civil aircraft of the United States. Fabric manufactured on or after September 23, 1959, shall meet the requirements set forth in section 3 of SAE Aeronautical Material Specification 3806A, "Cloth, Airplane, Cotton, Mercerized; 80 lb Breaking Strength," revised June 15, 1952, with the exception listed in subparagraph (2) of this paragraph. Fabric approved prior to September 23, 1959, may continue to be manufactured under the provisions of its original approval.

(2) *Exception.* The elongation limits specified in AMS 3806A 3.2.4. are amended as follows for the purpose of this section.

Nominal width (inches):	Maximum elongation (percent)
36-----	13
42-----	13
60-----	14
69-----	15
90-----	16

(b) *Marking.* The weight required in § 37.7 need not be included. The TSO number shall be marked continuously along the selvage edge of the fabric.

§ 37.126 Technical Standard Order C16: "Air-Speed Tubes (Electrically Heated)".

(a) *Introduction.* (1) This Technical Standard Order is intended to serve as a criterion by which the product manufacturer can obtain approval of his electrically heated air-speed tube.

(2) In the establishment of this Technical Standard Order, consideration has been given to existing Government and industry standards for air-speed tubes for the purpose of adopting the performance requirements of one of the recognized aeronautical standards as the minimum safety requirements for air-speed tubes which are intended for use in civil aircraft. The specification of the Society of Automotive Engineers for electrically heated air-speed tubes contains such requirements.

(b) *Directive*—(1) *Provision.* The performance requirement for air-speed tubes as set forth in sections 5 and 6 of SAE Specification AS-393, Air-Speed Tubes, Electrically Heated, dated December 1, 1947,¹ stated below, are hereby established as minimum safety requirements for electrically heated air-speed tubes which are intended for use in civil aircraft.

1. *Purpose.* To specify minimum requirements for Electrically Heated Air-Speed Tubes for use on aircraft the operation of which may subject the instrument to envi-

ronmental conditions specified in section 3.4.

2. *Scope.* This specification covers the following basic types:

Type I. Pitot Pressure, Straight and L-shaped, 12 and 24 volt nominal, 2 wire circuit.

Type II. Pitot and Static Pressures, Straight and L-shaped 12 and 24 volt nominal, 2 wire circuit.

3. *General requirements.*

3.1 *Materials and workmanship.*

3.1.1 *Materials.* Materials shall be of a quality which experience and/or tests have demonstrated to be suitable and dependable for the purpose intended.

3.1.2 *Workmanship.* Workmanship shall be consistent with high grade instrument manufacturing practice.

3.2 *Radio interference.* The instrument shall not be the source of objectionable interference under operating conditions at any frequencies used on aircraft, either by radiation or feedback, in radio sets installed in the same aircraft as the instrument.

3.3 *Identification.* The following information shall be legibly and permanently marked on the units or attached thereto:

- Name of instrument.
- SAE Spec. AS 393.
- Rating (Nominal Voltage).
- Manufacturer's Part No.
- Manufacturer's Serial No. or date of manufacture.
- Manufacturer's name and/or trademark.

3.4 *Environmental conditions.* The following conditions have been established as design criteria only. Tests shall be conducted as specified in sections 5, 6, 7.

3.4.1 *Temperature.* When the instruments are mounted in accordance with manufacturer's instructions, they shall function over the range of ambient temperatures of -65°C to $+70^{\circ}\text{C}$ and shall not be adversely affected by exposure to temperatures of -65°C to $+70^{\circ}\text{C}$.

3.4.2 *Vibration.* When the instruments are mounted in accordance with the manufacturer's instructions, they shall function and shall not be adversely affected when subjected to the following vibration:

- Frequency: 500-3,000 cycles per minute.
- Amplitude: 0.250 inch.
- Maximum Acceleration: 32.5 g.

NOTE: It is understood that the unit shall withstand vibration at higher frequencies but the acceleration value need not exceed that shown above.

When specified by the purchaser for use in rotary wing aircraft, the frequency range shall be 150-3,000 cycles per minute.

4. *Detail requirements.*

4.1 *Drainage.* The tube shall be designed to provide maximum drainage of water, resulting from rain or melting ice, consistent with maintaining the calibration specified in sections 6.3, 6.4 and 6.5.

4.2 *Marking.* Pitot pressure and static pressure lines shall be identified by the letters P and S, respectively, stamped, etched, engraved or otherwise permanently marked on the lines or fittings. The top of the tube shall be identified.

5. *Individual performance tests.* All instruments shall be subjected to whatever tests the manufacturer deems necessary to demonstrate specific compliance with the specification including the following requirements, where applicable.

5.1 *Leakage.* With a pressure of 10 inches of mercury applied separately to the pitot pressure and/or the static pressure lines, there shall be no evidence of leakage when the corresponding pitot or static pressure openings and drain holes are sealed.

5.2 *Dielectric.* The insulation shall withstand without evidence of damage the application of a sinusoidal voltage at a commercial frequency between the terminals of the heater circuit and the shell (case) for a

period of 5 seconds. The R. M. S. value of the sinusoidal voltage applied shall be 500 volts.

5.3 *Heater operation.* When mounted in its normal position, the tube shall be tested for heater operation by applying the minimum rated voltage (12 or 24 volts) for a period of 2 minutes. The power consumption at that time shall be within ± 30 percent of the power consumption at rated voltage.

6. *Qualification tests.* As many instruments as deemed necessary to demonstrate that all instruments will comply with the requirements of this section shall be tested in accordance with the manufacturer's recommendations, where applicable.

6.1 *Vibration.* The tubes shall be subjected to vibration for three hour periods in each of the three perpendicular reference planes such that a point on the tip of the tubes will oscillate $\frac{1}{4}$ inch. The test shall be conducted such that each period of three hours shall consist of one hour at 1,000, 2,000 and 3,000 cycles per minute. Rated voltage shall be applied to the terminals continuously during this test. Ambient temperature shall be 20°C to 30°C . There shall be no failure of any kind.

6.2 *Endurance.* The tubes shall be made to operate continuously in still air at 15 or 30 volts (as applicable) for, at least, five hours. Ambient temperature shall be 70°C . There shall be no damage of any kind except discoloration, which will not affect corrosion resistance.

6.3 *Calibration at zero angle of attack.* The tube shall be mounted in a wind tunnel in line with the airflow and tested separately for pitot pressure and for static pressure at the values for air speeds specified in table I. The test shall be made by comparison with the results obtained under similar conditions with a calibrated tube. The error of the tube expressed in terms of indicated air speed shall not exceed 1 percent of the indication or 1 MPH, whichever is greater, and the static pressure shall be within the tolerances specified in table I.

TABLE I—PERMISSIBLE ERRORS IN STATIC PRESSURE

Indicated air speed m. p. h.:	Tolerance inches of water
50-----	0.10
75-----	.15
100-----	.20
125-----	.25
150-----	.30
175-----	.35
200-----	.40
225-----	.45
250-----	.50

6.4 *Calibration at various angles of attack.* The tube shall be tested as specified for "Error at Zero Angle of Attack" at approximately 125 MPH except that the angle of attack shall be varied by 2-degree intervals from $+16$ to -10 degrees inclusive. The indicated error expressed in terms of indicated air speed shall not differ from the indicated error at zero angle of attack by more than 3 miles per hour, and the error in static pressure shall not differ from the static pressure at zero angle of attack by more than 0.20 inch of water.

6.5 *Calibration at various angles of yaw.* The tube shall be tested as specified in section 6.3 at approximately 125 MPH except that the angle of yaw shall be varied between plus and minus five degrees. The indicated error expressed in terms of indicated air speed shall not differ from the error at zero angle of yaw by more than 3 miles per hour and the error in static pressure shall not differ from the static pressure at zero angle of yaw by more than 0.20 inch of water.

6.6 *Magnetic effect.* The magnetic effect of the tube shall be determined in terms of the deflection of a free magnet approximately $1\frac{1}{2}$ inches long in a magnetic field with a

horizontal intensity of 0.18 ± 0.01 gauss, when the tube is held in various positions and with rated voltage applied on an east-west line with its nearest part five inches from the center of the magnet. (An aircraft Compass with the compensating magnets removed therefrom may be used as the free magnet for this test.) The maximum deflection of the magnet shall not exceed 5 degrees for any pointer deflection.

6.7 De-icing. The tube shall be tested in an icing wind tunnel at a temperature of -10° to -20° C. and at an indicated tunnel air speed of 200 miles per hour. When the tube is coated with $\frac{1}{4}$ inch of ice at the nose, the minimum rated voltage shall be applied to the terminals. The time required to clear the ice cap shall not be more than 2 minutes after the potential is applied. No re-icing shall occur.

6.8 Cold resistance. The tube shall be subjected to a temperature of -65° C. or colder for a minimum period of 48 hours. There shall be no evidence of damage. After this test, the tube shall be capable of successfully passing all tests described heretofore.

(2) **Application.** (i) Air-speed tubes complying with the specifications appearing in this Technical Standard Order are hereby approved for all aircraft. Air-speed tubes already approved may continue to be installed in aircraft:

(a) For which an application for original type certificate is made prior to the effective date of this order.

(b) The prototype of which is flown within 1 year after the effective date of this order, and

(c) The prototype of which is not flown within 1 year after the effective date of this order if due to causes beyond the applicant's control.

(ii) If a major change is made in the installation within 9 months after the effective date of this order involving a change in type or model of air-speed tube, previously approved types of air-speed tubes may be installed. However, in any such change made after the 9-month period, new types of air-speed tubes installed in aircraft used in instrument flight shall meet the specifications contained in this section.

(c) **Specific instructions—**(1) **Marking.** In addition to the identification information required in the referenced specification, each air-speed tube shall be permanently marked with the Technical Standard Order designation "FAA-TSO-C16" to identify the air-speed tube as meeting the requirements of this order in accordance with the manufacturer's statement of conformance outlined below. This identification will be accepted by the Administrator as evidence that the established minimum safety requirements for air-speed tubes have been met.

(2) **Data requirements.** None.

(3) **Effective date.** After September 1, 1948, specifications contained in this Technical Standard Order will constitute the basis for approval of air-speed tubes for use in certificated aircraft used in instrument flight.

(4) **Deviations.** Requests for deviation from, or waiver of, the requirements of this order, which affect the basic airworthiness of the component, should be submitted for approval by the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Avia-

tion Agency, in the region in which the manufacturer is located.

(5) **Conformance.** (i) The manufacturer shall furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located, a written statement of conformance signed by a responsible official of his company, setting forth that the air-speed tube to be produced by him meets the minimum safety requirements established in this order. Immediately thereafter distribution of the air-speed tube conforming with the terms of this order may be started and continued.

(ii) The prescribed identification on the air-speed tubes does not relieve the aircraft manufacturer or owner of responsibility for the proper application of the air-speed tube in his aircraft, nor waive any of the requirements concerning type certification of the aircraft in accordance with existing Federal Aviation Regulations.

(iii) If complaints of nonconformance with the requirements of this order are brought to the attention of the Administrator and investigation indicates that such complaints are justified, the Administrator takes appropriate action to restrict the use of the product involved.

(iv) Copies of this Technical Standard Order may be obtained from the Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

§ 37.127 Technical Standard Order C17: "Fire-Resistant Aircraft Material".

(a) **Introduction.** (1) This Technical Standard Order is intended to serve as a criterion by which the product manufacturer can obtain approval of his fire-resistant aircraft material.

(2) In the establishment of this Technical Standard Order, consideration has been given to existing Government and industry standards for fire-resistant aircraft material for the purpose of adopting the performance requirements of one of the recognized aeronautical standards as the minimum safety requirements for fire-resistant materials which are intended for use in civil aircraft. The specification of the Society of Automotive Engineers for fire-resistant aircraft materials contains such requirements.

(b) **Directive—**(1) Provision. The performance requirements for fire-resistant aircraft material as set forth in section 3 of SAE Specification AMS-3851, Fire-Resistant Properties for Aircraft Materials, dated May 1, 1948,¹ stated below, are hereby established as minimum safety requirements for fire-resistant material which is intended for use in civil aircraft.

1. **Acknowledgment.** A vendor shall mention his specification number in all quotations and when acknowledging purchase orders.

2. **Application.** Primarily intended to cover materials which may be used without further treatment in areas in air carrier aircraft where a fire-resistant material is required.

¹ Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, New York.

3. **Technical requirements.** The material as supplied shall be capable of meeting the following test:

If the material is rigid an 8 x 8 in. specimen shall be used. If flexible, the material shall be placed in a frame, exposing an area 8 x 8 in. Where backing material is used, the specimen shall be provided with the same backing. The test specimen shall be supported at an angle of 45 degrees. The Bunsen or Tirrill burner shall rest upon a horizontal surface. The burner shall be adjusted for no air intake, giving a yellow tipped, $1\frac{1}{2}$ in. flame. Suitable precautions shall be taken to avoid drafts. The period of application shall be 30 sec with $\frac{1}{2}$ of the flame in contact with the material at the approximate center of the specimen. Upon removal of the flame source from the specimen, the flame shall extinguish itself within 15 sec and no smoldering or glowing shall be visible 10 sec thereafter. No complete penetration of the material shall result.

4. **Reports.** Unless otherwise specified, the vendor shall furnish, with the original sample submitted for approval, three copies of a notarized report of the results of the test noted above showing duration of flaming, time of smoldering, char width, and penetration. After approval, unless otherwise specified, vendor shall furnish with each shipment three copies of a notarized report of the results of the above test made on each grade or type of each lot or shipment of material contained in the order. This report shall include the purchase order number, this specification number, vendor's material number, and quantity.

5. **Packing and identification.**

5.1 Packaging shall be accomplished in such a manner as to insure that the materials being shipped will not be torn or damaged and will be protected against exposure and undue weathering and harmful materials of any kind.

5.2 Each package shall be permanently and legibly marked, and the material tagged or stamped to give the following information:
Material description -----
AMS 3851

Meets fire resistance requirement AMS 3851
Vendor's identification-----
Purchase order number-----

6. **Approval.** A vendor shall not supply material until samples have been approved by the purchaser. After approval changes in composition, production manufacturing procedures and processes shall not be made without prior written approval by purchaser. Results of tests on incoming shipments shall be essentially equal to those obtained on approved samples.

7. **Rejections.** Material not conforming to this specification or to authorized modifications will be subject to rejection. Unless otherwise stipulated, rejected material will be returned to vendor at vendor's expense, unless purchaser receives, within three weeks of notification of rejection, other instructions for disposition.

(2) **Application.** Fire-resistant materials complying with the specifications appearing in this Technical Standard Order are hereby approved for all aircraft.

(c) **Specific instructions—**(1) **Marking.** In addition to the identification information required in the referenced specification, the material shall be permanently marked with the Technical Standard Order designation "FAA-TSO-C17" to identify the materials as meeting the requirements of this order in accordance with the manufacturer's statement of conformance outlined below. This identification will be accepted by the Administrator as evidence that the established minimum safety require-

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ments for fire-resistant materials have been met.

(2) *Data requirements.* None.

(3) *Effective date.* See paragraph (b) (2) of this section.

(4) *Deviations.* Requests for deviation from or waiver of, the requirements of this order, which affect the basic airworthiness of the component, should be submitted for approval by the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(5) *Conformance.* (1) The manufacturer shall furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located, a written statement of conformance signed by a responsible official of his company, setting forth that the fire-resistant material to be produced by him meets the minimum safety requirements established in this order. Immediately thereafter distribution of the material conforming with the terms of this order may be started and continued.

(ii) The prescribed identification on the fire-resistant material does not relieve the aircraft manufacturer or owner of responsibility for the proper application of the fire-resistant material in his aircraft, nor waive any of the requirements concerning type certification of the aircraft in accordance with existing Federal Aviation Regulations.

(iii) If complaints of nonconformance with the requirements of this order are brought to the attention of the Administrator, and investigation indicates that such complaints are justified, the Administrator takes appropriate action to restrict the use of the product involved.

(iv) Copies of this Technical Standard Order may be obtained from the Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

§ 37.128 Position light flashers (air-carrier aircraft)—TSO-C18c.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for position light flashers which will be used on civil aircraft of the United States engaged in air-carrier operations. New models of position light flashers manufactured for installation in civil air-carrier aircraft on or after July 15, 1957, shall meet the standards set forth in SAE Specification AS211, "Flasher, Position Light," dated November 1, 1948,¹ with the exceptions listed in subparagraph (2) of this paragraph.

(2) *Exceptions.* (1) For the purpose of this section, the following shall apply in lieu of section 4.2 of AS211: The flashing cycle and its frequency shall conform to either (a) or (b) of this subparagraph. A maximum deviation of 5% from the specified periods is permissible.

(a) Red and green forward position lights, top and bottom fuselage lights and white rear position light "ON"-----	130°
Dark-----	50°
Red and green forward position lights, top and bottom fuselage lights and red rear position light "ON"-----	130°
Dark-----	50°

This cycle shall be repeated at not less than 32.5 nor more than 42.5 times per minute.

(b) Red and green forward position lights and white rear position light "ON"-----	130°
Dark-----	50°
Top and bottom fuselage lights and red rear position light "ON"-----	130°
Dark-----	50°

This cycle shall be repeated at not less than 65 nor more than 85 times per minute.

(ii) The following shall apply in lieu of the last sentence of section 4.3 of AS211: The flasher contacts shall be adequate for the intended purpose.

(b) *Marking.* In lieu of the marking requirement of § 37.7(c), the following shall be shown:

- (1) Voltage,
- (2) Normal motor current—amps, and
- (3) Flasher contact capacity—amps.

(c) *Data requirements.* Six copies each of installation, operating, and maintenance recommendations or instructions shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.129 Portable water-solution type fire extinguishers—TSO-C19b.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for portable water-solution type fire extinguishers which are to be used in civil aircraft of the United States. New models of portable water-solution type fire extinguishers manufactured for installation in civil aircraft on or after the effective date of this order shall meet the standards of sections 5 and 6 and subsections 4.1.1, 4.1.4, 4.1.5, 4.2.3, 4.3.1 and 4.3.2 of SAE Specification AS-245A, dated December 15, 1956, with the exceptions listed in subparagraph (2) of this paragraph. Portable water-solution type fire extinguishers approved by the Civil Aeronautics Administration prior to the effective date of this order may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* For the purpose of this order, the dischargeable capacity specified in 4.1.1 of AS-245A may be at least one quart.

(b) *Marking.* In addition to the information required in § 37.7, the following also must be legibly and permanently marked on the extinguisher: 1- capacity, 2- test pressure of container and 3- operating and maintenance instructions.

§ 37.130 Technical Standard Order C20: "Combustion Heaters".

(a) *Introduction.* This Technical Standard Order is intended to serve as a criterion by which the product manufac-

turer may obtain approval of his combustion heaters.

(b) *Directive.*—(1) *Provision.* The requirements for combustion heaters, as set forth in SAE Aeronautical Standard AS143B; Heaters, Airplane, Internal Combustion Heat Exchanger Type, dated February 1, 1949,¹ stated below, are hereby established as minimum safety standards for combustion heaters intended for use in civil aircraft:

1. *Purpose.* To specify standards covering minimum safety and performance requirements for internal combustion heaters and certain auxiliary devices which are considered necessary to the safety and performance of the heaters as used in aircraft. These standards are to be considered currently applicable and necessarily subject to revision from time to time due to rapid development of the aeronautical industry. The following standards are based on practical engineering requirements for such internal combustion heat exchanger type heaters as are now used on airplanes and for such as may be developed to meet later requirements.

2. *Scope.* These standards are written to cover internal combustion heat exchanger type heaters used in the following applications:

- 2.1 Cabin heating. (All occupied regions and windshield heating.)
- 2.2 Wing and empennage heating.
- 2.3 Engine and accessory heating. (When heater is installed as part of the aircraft.)

3. *Definition.* An internal combustion heat exchanger type heater as used for airplane heating is one that utilizes through a heat exchanger the heat produced by combustion of a fuel within the heater for the purpose of heating the air being supplied to the airplane.

4. *General requirements.*

4.1 *Heater components.* An internal combustion type heater shall include all of the following:

- 4.1.1 Combustion chamber and heat exchanger assembly.
- 4.1.2 Casing or shroud for combustion chamber and heat exchanger assembly.
- 4.1.3 Igniter.
- 4.1.4 Burner.
- 4.1.5 Ventilating air inlet.
- 4.1.6 Ventilating air outlet.
- 4.1.7 Combustion air inlet.
- 4.1.8 Exhaust outlet.
- 4.1.9 Fuel inlet.

4.2 *Additional devices.* In addition to the heater, the following additional devices are considered necessary to the safety and performance of the heater and will be covered in that respect by these standards. These devices may be furnished separately or as part of the heater. These standards do not cover all tests necessary on these devices, but only those required in their relationship to the heater.

4.2.1 Fuel system.

4.2.1.1 Fuel nozzle, restrictor, orifice, or equivalent.

4.2.1.2 Fuel shutoff valve.

4.2.1.3 Fuel filter.

4.2.2 Safety controls.

4.2.2.1 A device to prevent the heater from becoming overheated.

4.2.2.2 A device to prevent fuel flow to the heater when combustion air is insufficient for safe operation.

4.2.3 Ignition system. (Required for spark ignition only.)

4.2.3.1 Device to provide high voltage power.

4.2.3.2 High voltage ignition lead assembly or equivalent electrical linkage between high voltage device and spark plug.

¹ Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, New York.

¹ Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, New York.

4.3 Materials and workmanship.

4.3.1 The heater and auxiliary equipment shall be constructed throughout of materials which are considered acceptable for the particular use intended and shall be made and furnished with a degree, uniformity, and grade of workmanship generally accepted in the aircraft industry.

4.3.2 The heater casing or shroud shall be constructed of fireproof material.

4.4 Design features.

4.4.1 The design shall be such as to preclude the possibility of discharging harmful concentrations of carbon monoxide into the ventilating air stream. See test, paragraph 6.5.4.1.

4.4.2 Where specified, the design shall be such as to preclude excessive loss of pressurized fuselage air. See test, paragraphs 6.5.4.2 and 6.5.4.3.

4.4.3 The design shall include protection against excessive radio interference. See test, section 6.4.

4.4.4 The design shall be such as to preclude harmful effects on construction or performance due to vibration. See test, section 6.3.

4.4.5 The design shall be such that the life of the heater and accompanying devices shall be comparable to other similar airframe components and accessories. See test, section 6.5.

4.4.6 Unless otherwise specified, the design shall be such that the heater and accompanying devices shall operate satisfactorily within normal ranges of power, fuel, and air supplies available in aircraft.

4.5 Heater identification. The following minimum information shall be legibly and permanently marked on the heater or on a nameplate attached thereto:

(a) Manufacturer's name and/or trademark.

(b) Manufacturer's part number.

(c) Manufacturer's serial number.

(d) SAE rated output, ----- B. t. u. hr. (See section 5.1.)

(e) Rated fuel pressure, ----- psig.

(f) Electrical characteristics.

(g) SAE Spec. AS-143B. For Use: Unpr. cabin -----, Press. cabin -----, Wing ----- (Stamp "X" in one or more blanks as applicable.)

5. Detail requirements.

5.1 SAE rating conditions. Heater shall deliver at least SAE rated output at following conditions:

5.1.1 Sea level ambient pressure.

5.1.2 Rated fuel pressure, as specified by manufacturer.

5.1.3 Rated sea level combustion air rate, as specified by manufacturer.

5.1.4 Ventilating air temperature rise of 260° F.

5.1.5 Inlet temperature of fuel and air between 50° F. and 125° F.

5.2 Air supply.

5.2.1 When sufficient combustion or ventilating air for safe operation is not available the heater shall be made automatically inoperative. See tests, paragraphs 6.5.7.1 and 6.5.7.2.

5.2.2 The combustion air and ventilating air inlets on the heater shall be separated from each other.

5.3 Fuel supply.

5.3.1 The fuel lines and fittings under pressure in the heater shall be enclosed in such manner as to prevent any fuel leakage from entering the ventilating air stream, and the enclosure shall have adequate provision for draining to the combustion chamber or to a fuel drain fitting.

5.3.2 A fuel drain outlet or equivalent safety device shall be provided to prevent accumulation of fuel in the combustion chamber and heat exchanger assembly in case the fuel flows without igniting.

5.3.3 All fuel lines in the heater shall be constructed of steel or other fire resistant material. Where flexibility is required in

these lines, flexible fire resistant coupled hose assemblies shall be used to eliminate the possibility of using hose clamp connections. Connections in metal fuel lines shall not employ solder nor other relatively low melting point materials which cannot withstand a 2000° F. flame for five minutes.

5.3.4 All gaskets, synthetic rubber seals, etc. shall be suitable for use with aromatic fuels and shall be satisfactory for use at the temperatures encountered within the overheating limits of the heater.

5.3.5 The fuel system lines, fittings and controls shall be sufficiently isolated from the combustion side of the heater to prevent their being damaged by flame, radiant heat or backfire.

5.4 Combustion chamber and heat exchanger assembly.

5.4.1 The combustion chamber and heat exchanger assembly shall be constructed from a corrosion and heat resistant material in accordance with SAE Aeronautical Material Specification AMS 5540, or equivalent.

5.4.2 Means shall be provided to minimize malfunctioning due to lead deposits and to permit disassembly and cleaning of all parts affected by products of combustion.

5.4.3 The accumulation of lead scale or products of combustion deposits shall not cause functional failure before 500 hours of heater operation.

5.4.4 The heater combustion chamber and heat exchanger assembly shall be so designed that it will not rupture under the most severe explosion conditions that can occur with any possible fuel air mixture as demonstrated by test procedure outlined in section 6.1.6.

5.5 Exhaust.

5.5.1 The temperature of the exhaust gases at the point of discharge from the heater shall not exceed 1200° F. at rating. (See section 5.1.)

5.6 Ignition.

5.6.1 Ignition may be accomplished by:

5.6.1.1 Electrically heated resistance hot wire.

5.6.1.2 Electric high-voltage spark plug.

5.6.2 Ignition may be sustained during operation of the heater or discontinued if satisfactory combustion is assured.

5.6.3 The igniter shall be capable of functioning over a period of 200 hours without service. See test, section 6.5.5.

5.6.4 In event of ignition delay for an indefinite period, either with or without fuel supply, no hazardous condition shall result.

5.6.5 Heaters which are intended for wing-empennage heating shall ignite within 15 seconds under conditions of paragraph 6.1.2.3 except that the temperature shall not be higher than -20° F.

5.7 Safety controls. The following automatic safety controls shall be furnished separately or as part of the heater. These controls shall be independent of and in addition to the normal operating controls.

5.7.1 A control to shut off the heater fuel flow in case combustion air supply is insufficient for safe operation.

5.7.2 A control to prevent the heater from becoming overheated under any condition of ventilating air flow.

5.8 Lines and fittings.

5.8.1 All pipe and tubing fittings used shall comply with applicable AN standards.

5.8.2 Other fittings not covered above shall conform to accepted aircraft practice.

5.9 Electrical equipment.

5.9.1 All electrical equipment, including wiring, instruments, motors, insulation, shielding, relays, etc., shall conform to acceptable aircraft practice.

6. Test requirements and methods.

6.1 Performance tests. Tests shall be conducted to establish the following:

6.1.1 Ignition characteristic curve, plotting altitude as the ordinate and combustion air pressure differential as the abscissa such that the area under the curve represents the region of reliable starting and burning at

-65° F. Include information on temperature of fuel and combustion air supplied to heater. The service ceiling of the heater and its accompanying ignition devices shall be defined as the peak of the ignition characteristic curve. A time record shall be kept on each test start.

6.1.2 Heat output, ventilating air pressure drop, combustion air pressure drop, exhaust temperature, ventilating air temperature rise, fuel rate at—

6.1.2.1 Sea level rating. (See section 5.1.)

6.1.2.2 Sea level rating, except with -65° F. inlet ventilating air, combustion air, and fuel temperatures.

6.1.2.3 20,000 feet pressure altitude with: (a) Sea level rated weight of ventilating air at -65° F. inlet temperature.

(b) Combustion air at -65° F. inlet temperature, and combustion air pressure differential midway between 20,000 feet altitude ignition limits determined in 6.1.1.

(c) Sea level rated values of voltage and fuel pressure.

(d) Fuel at -65° F. inlet temperature.

NOTE: Temperature measurements for output shall be made in a manner which will provide a representative average temperature of the discharge air. Temperature sensing elements used in test shall be protected against effects of radiation from the heater.

6.1.3 Maximum starting and maximum running amperages required with normal voltage for operation of the heater and accompanying devices at sea level.

6.1.4 Voltage range within which the heater and accompanying devices will operate at sea level and service ceiling.

6.1.5 Collapsing pressure of the combustion chamber and heat exchanger assembly.

6.1.5.1 The heater shall be set up with an adjustable restriction on the combustion air inlet, and a source of vacuum connected to the exhaust outlet. The ventilating air shall discharge freely to atmosphere (sea level). A static pressure tap shall be provided in the exhaust pipe within 12" of the connection to the heater.

6.1.5.2 For a non-pressurized cabin heater or a wing-empennage heater, the heater shall be operated at sea level rating, except that the exhaust outlet pressure is to be maintained at a value which is at least 4 psi below the ventilating air outlet pressure. After operating the heater for at least one hour at these conditions, there must be no permanent distortion of any part of the heater, unless it can be demonstrated that such distortion does not affect the performance or life of the heater.

6.1.5.3 For pressurized cabin heaters, the test shall be the same as 6.1.5.2 except that the exhaust outlet pressure shall be maintained at a value which is at least 10 psi below the ventilating air outlet pressure.

6.1.6 **Combustion chamber burst pressure.** The following design test shall demonstrate compliance with section 5.4.4.

6.1.6.1 With the combustion chamber and heat exchanger assembly at room temperature, introduce a gaseous fuel air mixture in a ratio of from .085 to .095. Purge the combustion chamber and heat exchanger assembly with this mixture to the extent of at least ten times the volume of the combustion chamber and heat exchanger assembly. Ignite the mixture with the heater igniter. Repeat procedure to complete 50 explosions. The heater shall then meet the leakage requirements of section 6.5.4.2.

6.1.7 Radio interference noise levels. See test, section 6.4.

6.1.8 Effect of vibration of heater and accompanying devices. See test, section 6.3.

6.1.9 Minimum life and service requirements of heater and accompanying devices. See test, section 6.5.

6.2 **Test report.** The manufacturer shall furnish a report, on request, covering tests. This report shall include an introduction, a

summary, a description of apparatus, instrumentation, and tests, the results, a discussion, and conclusions.

6.3 *Vibration test.* The heater and auxiliary equipment shall be capable of withstanding and satisfactorily operating when subjected to a steady vibration over a range of frequencies from 600 to 2,700 cycles per minute with a total excursion of 1/16", and from 2,700 to 3,200 cycles per minute with an acceleration not exceeding 6 G's. Unless otherwise specified in detail specifications, the equipment shall be mounted on the vibrating apparatus with the longitudinal axis of the heater in a plane parallel to the vibrating surface of the apparatus and normal to the direction of vibration.

6.3.1 The heater shall be vibrated over a range of from 600 to 2,700 cycles per minute with a total excursion of 1/16". The frequencies at which resonance occurs, if any, shall be observed and noted.

6.3.2 The heater will be vibrated over a range of from 2,700 to 3,200 cycles per minute with an acceleration of not less than 5 G's and not more than 6 G's. The frequencies at which resonance occurs, if any, shall be observed and noted.

6.3.3 If resonance is observed under the test of either 6.3.1 or 6.3.2, a vibration test shall be conducted for fifteen hours at the frequency showing the maximum resonance.

6.3.4 If no resonance is observed under the tests of 6.3.1 or 6.3.2, a vibration test shall be conducted for 15 hours at 2,700 cycles per minute with 1/16" total excursion.

6.3.5 At the conclusion of the vibration test there shall be no evidence of structural failure and the heater and accompanying devices shall operate satisfactorily.

6.4 *Radio interference test.*

6.4.1 The heater shall be set up with a sleeve of bare metal ductwork having the same diameter as the heater casing connected at each end of the casing. The length of each piece of ductwork shall be not less than five diameters and shall be connected to the heater with a clamp of the type normally used in an installation.

6.4.2 In the same manner as 6.4.1, connect ductwork or tubing to the combustion air inlet and to the exhaust outlet with respective dimensions determined by diameters of the combustion air inlet and exhaust outlet fittings.

6.4.3 If the ignition voltage transformer is not part of the heater, mount in external to the heater and connect the high voltage terminal to the spark plug by means of the high voltage ignition lead assembly.

6.4.4 With the ignition system operating, check the complete assembly including heater, high voltage device, and high voltage ignition lead assembly using the recommended procedure of specification JAN-I-225 dated June 14, 1945, and Radio Interference Noise Limit Specification AAF-32486-A dated October 17, 1945.

6.5 *Life tests.* Life tests may be conducted in such manner as to qualify the heater and accompanying devices for cabin heating, wing-empennage anti-icing, or both. For cabin heating only, the duration of the test shall be at least 850 hours "on" time. For wing-empennage anti-icing only, the duration of the test shall be at least 500 hours "on" time. For qualification of the heater and accompanying devices under both cabin heating and wing-empennage classifications, the duration of the test may be 850 hours heater "on" time providing at least 500 hours "on" time is performed at wing-empennage conditions.

6.5.1 *General conditions.* The general conditions applying to both cabin and wing-empennage heater life tests shall be as follows:

6.5.1.1 Tests shall be performed at sea level rated fuel pressure and sea level rated combustion air rate.

6.5.1.2 Inlet air temperature shall not exceed 125° F.

6.5.1.3 Approximately 50% of the life test shall be with "continuous" operation, and the remainder of the test with "rapid cycling" operation.

6.5.1.3.1 During "continuous" operation, the ventilating air rate shall be adjusted as required to give the specified temperature rise under steady conditions. At least once, and not more than twice, during each two hours of operating time, the fuel and ignition system shall be shut off and the heater permitted to cool for at least 10 minutes with continuous ventilating air and combustion air flow. In calculating total "on" time for the heater, the 10-minute cooling periods shall not be included.

6.5.1.3.2 During "rapid cycling" operation, a thermostatic switch in the ventilating air outlet stream shall cycle the fuel on and off and maintain a specified outlet air temperature. The ventilating air rate shall be adjusted so that the average heat output (assuming that the setting of the cycling switch represents the average outlet air temperature) is between 60 and 75% of the rated output. At least once, and not more than twice during each 2 hours of operating time, the fuel and ignition system shall be shut off and the heater permitted to cool for at least 10 minutes with continuous ventilating air and combustion air flow. For cycling operation "on" time is defined as the total elapsed time during which the rapid cycling switch controls the heater operation; it does not include the 10-minute cooling periods.

6.5.2 *Cabin heater life tests.* The cabin heater life tests shall be divided into four periods, as follows:

6.5.2.1 *First period—250 hours.* Continuous operation, with the ventilating air rate adjusted to maintain a temperature rise of at least 200° F. and an outlet air temperature of at least 250° F.

6.5.2.2 *Second period—250 hours.* Rapid cycling operation, with the cycling switch set to control at 250±10° F. outlet air temperature.

6.5.2.3 *Third period—175 hours.* Same conditions as first period.

6.5.2.4 *Fourth period—175 hours.* Same conditions as second period.

6.5.3 *Wing-empennage anti-icing heater life tests.* Wing-empennage anti-icing heater life tests shall be divided into two periods, as follows:

6.5.3.1 *First period—250 hours.* Continuous operation, with the ventilating air rate adjusted to maintain a temperature rise of at least 300° F. and an outlet air temperature of at least 350° F.

6.5.3.2 *Second period—250 hours.* Rapid cycling operation, with the cycling switch set to control at 350±10° F. outlet air temperature.

6.5.4 *Performance after tests.* At the end of the life and vibration tests the heater shall meet the following requirements:

6.5.4.1 *Carbon monoxide contamination.* At rating conditions, and with the burner operating, carbon monoxide concentration in the heated ventilating air stream shall not exceed one part in 20,000 or 0.005 of 1%. This test shall be run with the heater exhaust discharging to atmosphere. The ventilating air samples shall be taken from an unrestricted duct fastened to the heater ventilating air outlet. The duct shall be the same diameter as the heater casing and at least 5 diameters in length. Use carbon monoxide detector assembly AAF No. 46B1790 or Navy Stock No. R-83-BUA-9258, or equivalent.

6.5.4.2 *Leakage.* With an air pressure of 8 psig inside the combustion chamber and heat exchanger assembly, leakage shall not exceed 9 lbs/hr. (sea level and 59° F.). There shall be no leaks which could allow liquid fuel to enter the ventilating air stream in event of ignition failure, when the heater is mounted in any normal position, with drains open.

6.5.4.3 For pressurized cabin heaters, with pressurized jacket, air leakage through the ventilating air shroud or casing shall not exceed 10 lbs/hr. at sea level and room temperature when air pressure of 16 psig is applied to the ventilating air passages.

6.5.4.4 When heater is to be used for wing-empennage anti-icing, the output shall be not less than 90% of the original rating after the life test. If the heater is to be used for cabin heating, the manufacturer shall record in the test report the heater output at the end of the life test.

6.5.5 *Igniter.* Whenever it becomes necessary due to ignition failure during the life test, the igniter may be cleaned, adjusted, or replaced. However, the igniter shall not require servicing or replacement more than twice during the life test of a wing-empennage heater or more than four times during the life test of a cabin heater.

6.5.6 *Fuel system.*

6.5.6.1 Whenever necessary due to stoppage or failure, the fuel orifice or nozzle may be cleaned or replaced. Such servicing shall not be required more than once during a wing-empennage heater life test or twice during a cabin heater life test.

6.5.6.2 The fuel shut off valve may be cleaned once during a wing-empennage heater life test and twice during a cabin heater life test. It shall not be cleaned, serviced, or replaced due to failure to close during the life test. At the end of the life test the valve leakage in the closed position with rated fuel pressure shall not exceed two cubic centimeters of fuel in ten minutes.

6.5.6.3 The fuel filter may be cleaned or the filter element replaced but the filter body shall not be replaced during the life test. At the end of the life test there shall be no leakage through the case or body.

6.5.7 *Safety controls.*

6.5.7.1 The device used to prevent the heater from becoming overheated shall not be serviced or replaced during the life test due to failure to shut off the heater. At the beginning of the life test and at the end of each test period (section 6.5.2 or 6.5.3), any cycling or intermediate controls shall be bypassed and the ventilating air rate gradually reduced over a period of 15 minutes to permit operation of this device. Operation shall be within ±25° F. of the value obtained at the beginning of the life test.

6.5.7.2 The device to prevent fuel flow when combustion air is insufficient for safe operation shall be sensitive to heater combustion air pressure differential or to combustion air pressure. The device may be an air actuated electrical switch designed for use with an electrical fuel shut off valve, or an air actuated mechanical valve designed to control the flow of fuel.

6.5.7.2.1 If an air actuated electrical switch is used, it shall be checked as follows at the end of each test period (section 6.5.2 or 6.5.3) with the heater in operation:

6.5.7.2.1.1 Reduce the combustion air differential pressure or combustion air pressure gradually (approximately 30 seconds) from normal rating to a point where the switch closes the electrical fuel shut off valve. The combustion air differential pressure or combustion air pressure at which the fuel shut off valve closes shall not be less than the minimum value required for safe heater operation. At the end of 15 minutes "fuel off" time, the combustion air differential pressure or combustion air pressure, as applicable, shall be gradually increased at the same rate and the switch shall open the electrical fuel shut off valve at or above the rated combustion air pressure differential.

6.5.7.2.2 If an air actuated mechanical fuel valve is used it shall be checked as follows at the end of each test period (sections 6.5.2 or 6.5.3):

6.5.7.2.2.1 With the heater operating and with the fuel shut off valve "open", the combustion air differential pressure shall be reduced gradually (approximately 30 sec-

onds) from normal rating to value required for safe heater operation. Leakage through the air actuated mechanical fuel valve shall then be measured and shall not exceed two cubic centimeters in ten minutes. At the end of 15 minutes "fuel off" time, the combustion air differential pressure shall be gradually increased at the same rate and the valve shall permit rated fuel flow when the rated combustion air pressure differential is reached.

6.5.7.3 Ignition system.

6.5.7.3.1 If necessary, the high voltage device may be serviced or parts replaced once during the life test.

6.5.7.3.2 If necessary, the high voltage ignition lead assembly or equivalent may be serviced or replaced once during the life test.

6.5.7.4 Unless otherwise specified, items 6.5.7.1, 6.5.7.2, 6.5.7.2.1, 6.5.7.2.2, 6.5.7.3, and 6.5.7.3.2, if furnished separately, not as part of the heater, need not be tested more than once providing no changes are made in their design, construction, or adjustment.

6.5.7.5 In case of life test failure of one or more of the devices in items 6.5.7.1, 6.5.7.2, 6.5.7.2.1, 6.5.7.2.2, 6.5.7.3, and 6.5.7.3.2, the test may be continued to qualify the heater or devices that have not failed. A separate life test shall apply only to the failed device if necessary to establish reliability.

7. Desirable features (Not Mandatory).

7.1 Operation.

7.1.1 The operation of the heater and accompanying devices should require a minimum of moving parts.

7.1.2 The heater should start operation within five seconds at -65° F. at sea level and at its service ceiling, and should reach its maximum output within three minutes after being started.

7.1.3 The heater should be designed in such a manner as to preclude violent explosions on being started.

7.1.4 The heater should be designed in such a manner and made from such materials as to withstand deteriorating effects of high humidity, condensation, fungus, and abrasive particles in the air.

7.1.5 The heater and its accompanying devices should not be adversely affected if subjected to ambient temperatures up to 160° F. for indefinite periods.

7.1.6 The heater should be designed to give low air pressure drop at high altitudes.

7.1.7 Where necessary, additional devices such as the following, may be provided to improve heater operation.

7.1.7.1 Air pressure regulator.

7.1.7.2 Fuel pressure regulator.

7.1.7.3 Combustion air blower.

7.1.7.4 Ventilating air blower.

7.1.7.5 Fuel air ratio control.

7.1.7.6 Thermal cycling switch.

7.1.7.7 Cabin heat controls.

7.2 Igniter. The igniter should be accessible for quick replacement or servicing.

7.3 Fuel nozzle. The fuel nozzle should be accessible for quick replacement or servicing.

(2) *Application.* (1) Combustion heaters complying with the specifications appearing in this order are hereby approved for all aircraft. Heaters already approved may continue to be installed in aircraft:

(a) For which an application for original type certificate is made prior to the effective date of this order.

(b) The prototype of which is flown within one year after the effective date of this order, and

(c) The prototype of which is not flown within one year after the effective date of this order if due to causes beyond the applicant's control.

(1) If an alteration involving a change in type or model of heater is made within

nine months after the effective date of this order, previously approved types of heaters may be installed. However, in any such change made after the nine-month period, new types of heaters installed shall meet the specifications contained in this section.

(c) *Specific instructions—(1) Marking.* In addition to the identification information required in the referenced specification, each heater shall be permanently marked with the Technical Standard Order designation, FAA-TSO-C20, to identify the heater as meeting the requirements of this order in accordance with the manufacturers' statement of conformance outlined in subparagraph (5) of this paragraph. This identification will be accepted by the Administrator as evidence that the established minimum safety requirements for combustion heaters have been met.

(2) *Data requirements.* Ten copies of the following technical information shall be submitted by the manufacturer of the heater with his Statement of Conformance to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

(i) Rated combustion air flow rates (or pressure drop) including minimum safe rate and variation with altitude.

(ii) Rated ventilating air flow rates (or pressure drop) including minimum safe rate and variation with altitude.

(iii) Ignition characteristics curve established in accordance with section 6.1.1 of Specification AS143B.

(iv) Minimum operating voltage used for subdivision (iii) of this subparagraph.

(v) Maximum operating altitude.

(vi) Operating fuel pressure.

(vii) Installation diagram showing installation of safety devices necessary to achieve compliance with sections 4.2, 5.7 and 6.5.7 through 6.5.7.2.2.1 of Specification AS143B.

(viii) Recommended electrical arrangement and any necessary limitations and pressure or temperature settings which are considered essential to proper and safe installation and operation.

(3) *Effective date.* After June 15, 1949, specifications contained in this order will constitute the basis for approval of combustion heaters for use in certificated aircraft.

(4) *Deviations.* Requests for deviation from, or waiver of, the requirements of this order, which affect the basic airworthiness of the component, should be submitted for approval by the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(5) *Conformance.* (1) The manufacturer shall furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located, a written statement of conformance signed by a responsible official of his company, setting forth that the heater to be produced by him meets the minimum safety requirements

established in this order. This statement shall indicate whether the heater meets the standards for cabin or wing-empennage heaters as prescribed in SAE Aeronautical Standard AS-143B and whether it has met the standards of this specification pertinent to pressurized systems. Immediately thereafter distribution of the heaters conforming with the terms of this order may be started and continued.

(ii) The prescribed identification on the heater does not relieve the aircraft manufacturer or owner of responsibility for the proper application of the heater in his aircraft, nor waive any of the requirements concerning type certification of the aircraft in accordance with existing Federal Aviation Regulations.

(iii) If complaints of nonconformance with the requirements of this order are brought to the attention of the Administrator and investigation indicates that such complaints are justified. The Administrator takes appropriate action to restrict the use of the product involved.

(iv) Copies of this Technical Standard Order Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

§ 37.131 Special aircraft turnbuckle assemblies and/or turnbuckle safetying devices—TSO-C21a.

(a) *Applicability.* (1) Minimum performance standards: Minimum performance standards are hereby established for special turnbuckle assemblies and/or safetying devices which are to be used on civil aircraft of the United States.

(2) New models of special turnbuckle assemblies and/or safetying devices manufactured on or after July 1, 1958, shall meet the performance requirements as set forth in sections 3 and 4 of Military Specification MIL-T-5685A dated April 6, 1950,¹ with the additional tests, when applicable, listed below. Special turnbuckle assemblies and/or safetying devices already approved may continue to be used for the purposes for which approved.

(3) Tests: The following tests, when applicable, are required in addition to those set forth in MIL-T-5685A, and shall be conducted to substantiate the strength and reliability of special turnbuckle assemblies and/or safetying devices. A minimum of six samples each shall be used in conducting the tests for torsion, tension, fatigue (tensile), and fatigue (torsion).

(i) *Torsion.* At least one sample of each size turnbuckle assembly and safetying device shall be tested in torsion to determine that the torque necessary to overcome the turnbuckle thread friction and break the safetying device is equal to or greater than that required when the conventional safety wire is used in accordance with the safetying procedure recommended in Civil Aeronautics

¹Copies may be obtained from the Commander, Air Materiel Command, Attn: MCSIFF-2, Wright-Patterson Air Force Base, Ohio, or from the Commanding Officer, Naval Aviation Supply Depot, 700 Robbins Ave., Philadelphia 11, Pa., Code AD.

Manual 4b.329-2 effective April 30, 1955 [20 F.R. 2278].

(ii) *Tension*. At least one sample of each size turnbuckle and safetying device assembly shall be tested to determine that the turnbuckle assembly (including safetying device) will not fail at any tensile load under the maximum (ultimate) tensile strength for which the comparable standard MIL or NAS turnbuckle is rated. For this test, the sample shall consist of the turnbuckle assembly (including safetying device) with a two (2) foot length of cable appropriately attached to each terminal (end) of the turnbuckle. In making the determination, the sample shall be tested for tensile strength in accordance with Federal Test Method Std. No. 151.² If the sample does not fail under the specified maximum load, it need not be tested further to destruction.

(iii) *Vibration*. At least one sample of each of 3 representative sizes of turnbuckle assemblies, i. e., the smallest, the largest, and an intermediate size, shall be vibrated to determine that the lock wire, or other safetying device which relies upon spring action or clamping to safety the turnbuckle, can be depended upon not to jump out of place or otherwise lose its safetying properties, under vibratory conditions apt to be encountered in aircraft service. It is suggested that a cable tension load equal to 25 percent of rated ultimate cable strength and a frequency of 3600 cpm with an overall amplitude of $\frac{1}{8}$ inch (parallel to the axis of the hole through the barrel) for 25 hours, be used for this determination.

(iv) *Fatigue (tensile)*. At least one sample of each size turnbuckle assembly shall be given a repeated load test, in which a load equal to two-thirds the ultimate tensile strength requirement is applied repeatedly in tension for 300 applications of the load without failure of any component part. For this test, the sample shall consist of the turnbuckle assembly (including safetying device) with a two (2) foot length of cable appropriately attached to each terminal (end) of the turnbuckle.

(v) *Fatigue (bending)*. The safety wire used in the conventional lock wire safetying procedure recommended in CAM 4b.329-2 is not considered to be reusable. If the safety device used with the special aircraft turnbuckle assembly is to be considered re-usable, at least three (3) samples of the shortest formed non-standard safety wire (or other finished safetying device) shall be tested by alternate fastening and unfastening of the wire (or other safetying device), to determine that the device will not break after repeated applications of the bending loads involved. 200 on and off cycles, simulating rough treatment apt to be experienced during maintenance should substantiate a reasonable service life. It is felt that the shortest safety wire (or other safetying device) will be subjected to the greatest bending stresses. However, if the stresses may be greater in a longer wire (or other safety-

ing device) intended for a larger size turnbuckle, the larger size turnbuckle and the longer wire (or other safetying device) shall be used for this test.

(vi) *Fatigue (torsion)*. At least one sample of each size turnbuckle assembly and/or safetying device shall be given a repeated load test in which a load equal to two-thirds the torque (determined in test No. 1 above) required to overcome the turnbuckle thread friction and break the conventional safety wire (CAM 4b.329-2) is applied in torsion first in one direction and then reversed for 3000 complete cycles of reversal without failure of any component part.

§ 37.132 Safety belts—TSO-C22e.

(a) *Applicability*—(1) *Minimum performance standards*. Minimum performance standards are hereby established for safety belts which are to be used on civil aircraft of the United States. New models of safety belts manufactured for installation on civil aircraft on or after the effective date of this section shall meet the standards of National Aircraft Standards Specification 802, revised May 15, 1950,³ with the exceptions covered in subparagraph (2) of this paragraph. Belts approved under prior issuances of this section may continue to be manufactured under the earlier provisions.

(2) *Exceptions*. (i) For the purpose of this section the strengths specified in section 4.1.1 of NAS 802 shall be 1,500 pounds and 3,000 pounds instead of 3,000 pounds and 6,000 pounds.

(ii) In complying with section 4.3.2.2 of NAS 802, the curved portion of the test form may be padded with no more than one inch of medium density sponge rubber, or equivalent, and covered with suitable fabric to simulate a person's body and clothing.

(iii) *Synthetic material webbing* which is not subject to loss of strength due to the influence of humidity, temperature variations, etc., need not be subjected to the first six-month retest period specified in section 3.1.2 of NAS 802. Retesting at succeeding six-month periods will be necessary if the belt manufacturer is unable to ascertain by means of textile data available to him that the webbing is unaffected by ambient storage conditions for the period of time involved.

(iv) In complying with section 4.1.3 of NAS 802, the two-inch webbing width shall be considered a nominal width. Thus, after considering all manufacturing processes as are necessary such as weaving, dyeing, mildew proofing, flame resistance and abrasion treatments, a webbing width of $1\frac{1}{16}$ inches $\pm \frac{1}{16}$ inch shall be acceptable.

(v) The slots or openings in the hardware for attachment of the safety belt webbing shall not be less than two inches.

(b) *Marking*. (1) Each half of each safety belt shall be marked in accordance with § 37.7 except that the weight required by paragraph (c) of § 37.7 need not be shown and the rated

strength of the safety belt assembly shall be shown, and

(2) In lieu of the marking requirement in paragraph (d) of § 37.7 the date of manufacture is required. The serial number may also be marked on the belt but not in lieu of the date of manufacture.

(c) *Data requirements*. (1) The manufacturer shall maintain a current file on complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product. (See paragraph (d) of this section.)

(3) One copy of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located: A drawing of the complete belt assembly showing the manufacturer's part numbers together with a notation indicating the minimum webbing strength specified by the belt manufacturer. If the test belts were tested to destruction, the average strength of the belt assembly should also be indicated.

(d) *Quality control*. Each safety belt shall be produced under a quality control system, established by the manufacturer, which will assure that each belt is in conformity with the requirements of this standard. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this standard.

§ 37.133 Parachutes—TSO C23b.

(a) *Applicability*—(1) *Minimum performance standards*. Minimum performance standards are hereby established for parachutes which are to be used in civil aircraft of the United States. New models of parachutes manufactured for use in civil aircraft of the United States on or after the effective date of this section shall meet the minimum performance standards of National Aircraft Standards Specification 804 dated August 24, 1949,⁴ with the exceptions covered in subparagraph (2) of this paragraph. Parachutes approved prior to the effective date of this section may continue to be manufactured under the provisions of the original approval.

(2) *Exceptions*. (i) The auxiliary parachute used in combination with a standard parachute shall be designed for use in combination with the specific main parachute.

(ii) For the purpose of testing an auxiliary type parachute used in combination with a standard parachute the speed specified in section 4.3.8 of NAS Specification 804 shall be 25 feet per second instead of 21 feet per second.

(b) *Marking*. The auxiliary parachute and its pack shall be marked "Auxiliary Parachute" in addition to the

² Copies may be obtained from the General Services Administration, Business Service Center, Region 3, Seventh and D Streets, S.W., Washington 25, D. C., for 70¢ each.

³ Copies may be obtained from the National Standards Association, 616 Washington Loan and Trust Building, Washington 4, D.C.

⁴ Copies may be obtained from the National Standards Association, 616 Washington Loan and Trust Building, Washington 4, D.C.

other marking requirements contained in § 37.7.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product. (See paragraph (d) of this section.)

(d) *Quality control.* Each parachute shall be produced under a quality control system, established by the manufacturer, which will assure that each parachute is in conformity with the requirements of this section. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

§ 37.134 Technical Standard Order C24: "Landing Flares".

(a) *Introduction.* (1) This Technical Standard Order is intended to serve as a criterion by which the product manufacturer may obtain approval of his landing flares.

(b) *Directive — (1) Provision.* (1) The performance requirements for landing flares as set forth in sections 4.1 and 4.3 of National Aircraft Standards Specification NAS 805 dated February 15, 1950,¹ stated below, are hereby established as minimum performance requirements for landing flares intended for use in civil aircraft.

1. *Applicable specifications.*

1.1 None.

2. *Types.*

2.1 This specification covers four types of landing flares suitable for use in certificated civil aircraft.

- Class 1.
- Class 1A.
- Class 2.
- Class 3.

3. *Material and workmanship.*

3.1 Materials shall be of a quality which experience and/or tests have conclusively demonstrated to be suitable for use in landing flares. Workmanship shall be consistent with high-grade landing flare manufacturing practice.

3.2 The flare body should be so sealed as to reduce to a minimum deterioration of the ignition element and to increase, insofar as possible the service life of the unit. All metal parts should be suitably protected against corrosion. All fabric except nylon material should be mildew-proofed.

4. *Detail requirements.*

4.1 *Design and construction.*

4.1.1 *Light duration.* Flares shall have a minimum light duration as follows:

- Classes 1 and 1A—3 minutes.
- Class 2—1½ minutes.
- Class 3—1 minute.

4.1.2 *Light intensity.* Flares shall have a minimum light intensity as follows:

- Classes 1 and 1A—300,000 candlepower.
- Class 2—110,000 candlepower.
- Class 3—70,000 candlepower.

4.1.3 *Rate of descent.* Flares shall have an average rate of descent not greater than 550 feet per minute.

4.1.4 *Delaying fuse.* Class 1A flares shall incorporate a 90 second plus or minus 10 seconds delaying fuse.

¹ Copies may be obtained from the American Aeronautical Forum, 527 Washington Loan and Trust Building, Washington 4, D. C.

4.1.5 *Firing cord.* Flares incorporating a manual firing cord actuating cable shall have cord length not less than 20 feet.

4.2 *Marking and instructions.*

4.2.1 Each flare shall carry the following information legibly marked on or attached to the flare and the flare container:

Manufacturer's name.

Model number or model name.

Instructions for installation procedures and safety precautions.

Date of manufacture (month and year).

National Aircraft Standard Number NAS 805.

4.3 *Qualification tests.* The following qualification tests shall be conducted.

4.3.1 *Functional tests.* Five flares of each model shall be installed in an airplane according to the manufacturer's instructions and shall be dropped from an altitude adequate to insure complete burning of the flare prior to ground contact.

4.3.1.1 In the event that there is one failure out of the five flares subjected to the functional tests, five additional flares shall be subjected to the functional tests.

4.3.1.2 Failure of two or more flares out of the ten dropped shall be sufficient grounds for rejection. The flare model will be considered to be satisfactory only if all five original flares function satisfactorily or in the event of one failure in the original five, if the second five function satisfactorily.

(2) *Application.* (i) Landing flares complying with the specifications appearing in this Technical Standard Order are hereby approved for use in all aircraft. Landing flares already approved may continue to be installed in aircraft.

(ii) If an installation change involving a new type or model landing flare is made within nine months after the effective date of this section, previously approved types of landing flares may be installed. However, in any such change made after the nine-month period, new types of landing flares installed in aircraft shall meet the specifications contained herein.

(c) *Specific instructions—(1) Marking.* (i) In addition to the identification information required in the referenced specification, except that the NAS 805 number is not required) each flare shall be permanently marked with the Technical Standard Order designation, FAA-TSO-C24, to identify the landing flare as meeting the requirements of this section in accordance with the manufacturers' statement of conformance outlined below. The Administrator accepts this identification as evidence that the established minimum safety requirements for landing flares have been met.

(2) *Data requirements.* (i) None.

(3) *Effective date.* (i) After October 10, 1950, specifications contained in this section will constitute the basis for approval of landing flares for use in civil aircraft.

(4) *Deviations.* (i) Requests for deviation from, or waiver of, the requirements of this section, which affect the basic airworthiness of the component, should be submitted for approval by the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(5) *Conformance.* (i) The manufacturer shall furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Avia-

tion Agency, in the region in which the manufacturer is located, a written statement of conformance signed by a responsible official of his company, setting forth that the landing flares to be produced by him meet the minimum safety standards established in this section. Immediately thereafter distribution of the landing flares conforming with the terms of this section may be started and continued.

(ii) The prescribed identification on the landing flares does not relieve the aircraft manufacturer or owner of responsibility for the proper installation of the landing flares in his aircraft, nor waive any of the requirements concerning type certification of the aircraft in accordance with existing Federal Aviation Regulations.

(iii) If complaints of nonconformance with the requirements of this section are brought to the attention of the Administrator and investigation indicates that such complaints are justified, the Administrator takes appropriate action to restrict the use of the product involved.

(iv) Copies of this Technical Standard Order and other Technical Standard Orders may be obtained from the Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

§ 37.135 Aircraft seats and berths (Type I transport, 6g forward load)—TSO-C25a.

(a) *Applicability—(1) Minimum performance standards.* Minimum performance standards are hereby established for aircraft seats and berths (Type I transport, 6g forward load) which are to be used in civil aircraft of the United States. These standards apply to Type I transport seats for use in transport category aircraft for which an application for type certificate was made prior to March 5, 1952.² New models of seats and berths (Type I transport, 6g forward load) manufactured for installation in civil aircraft on or after January 15, 1957 shall meet the standards of National Aircraft Standard Specification 806, revised January 1, 1956,⁴ with the changes and exceptions listed in subparagraph (2) of this paragraph. Seats and berths approved by the Civil Aeronautics Administration prior to January 15, 1957, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) The ultimate loads corresponding to the aircraft reduced weight gust load factor or the airplane designer's special requirements may exceed the ultimate down loads for Type I seats specified in subsection 4.1.2 of NAS 806. For the purpose of this section, in order to provide for such loading conditions, the ultimate down loads specified in Table I of 4.1.2 for Type I seats shall be 1,000 pounds (6g) instead of 765 pounds.

(ii) To insure that pilot and copilot seats will provide for the rearward loads

² Standards for Types II, III, IV, and I (for installation in aircraft for which an application for type certificate was made after March 5, 1952), are contained in § 37.136 (TSO-C39).

⁴ Copies may be obtained from the National Standards Association, 616 Washington Loan and Trust Building, Washington 4, D. C.

resulting from the application of pilot forces to the flight controls, such seats shall withstand a rearward load of 450 pounds. The load shall be applied 8 inches above the intersection of the seat back with the seat bottom.

(iii) The weight of the seat or berth times the appropriate "g" value shall be added to the design ultimate load specified in subdivision (i) of this subparagraph and in subsection 4.1.2 of NAS 806.

(iv) For the purpose of this section, 4.3 (c) of NAS 806 should read: "that the structure is capable of supporting without failure for at least 3 seconds the ultimate loads specified in this order when applied separately."

(b) *Marking.* The weight required in § 37.7 need not be included.

§ 37.136 Aircraft seats and berths—TSO-C39.

(a) *Applicability.* (1) *Minimum performance standards.* (i) Minimum performance standards are hereby established for aircraft seats and berths of the following types which are to be used in civil aircraft of the United States:

- Type I—Transport (9g forward load).
- Type II—Normal and utility.
- Type III—Acrobatic.
- Type IV—Rotorcraft.

(ii) New models of seats and berths manufactured for installation in civil aircraft on or after the effective date of this order shall meet the standards of National Aircraft Standards Specification 809, dated January 1, 1956,¹ with the exception in subparagraph (2) of this paragraph. Seats and berths approved by the Civil Aeronautics Administration prior to January 15, 1957, may continue to be manufactured under the provisions of their original approval.

(2) *Exception.* The sideward loads as specified in 4.1.2 Table I need not exceed the requirements of the applicable Federal Aviation Regulations.

(b) *Marking.* The weight required in § 37.7 need not be included.

§ 37.137 Airborne radio marker receiving equipment operating on 75 mc. (for air carrier aircraft)—TSO-C35c.

(a) *Applicability.* (1) Minimum performance standards are hereby established for airborne radio marker receiving equipment operating on 75 mc. which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne radio marker receiving equipment operating on 75 mc. manufactured for use on civil air carrier aircraft on or after the effective date of this section shall meet the minimum performance standards contained in Federal Aviation Agency Standard entitled "Minimum Performance Standards for Airborne Radio Marker Receiving Equipment Operating on 75 mc."² dated April 6, 1962, and Radio Technical Commission for

Aeronautics Paper 120-61/DO-108³ entitled, "Environmental Test Procedures Airborne Electronic Equipment", dated July 13, 1961, with the exceptions to these standards listed in subparagraph (2) of this paragraph.

(2) Radio Technical Commission for Aeronautics Paper 120-61/DO-108 outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have categories established and some do not. Where categories are established, only equipment which qualifies under the following categories, as specified in RTCA Paper 120-61/DO-108, is eligible under this order:

- (i) Temperature-Altitude Test—Categories A, B, C, or D;
- (ii) Humidity Test—Categories A or B;
- (iii) Vibration Test—Categories A, B, C, D, E, or F;
- (iv) Audio-Frequency Magnetic Field Susceptibility Test—Categories A or B;
- (v) Radio-Frequency Susceptibility Test—Category A; and
- (vi) Emission of Spurious Radio-Frequency Energy Test—Category A.

(b) *Marking.* (1) In addition to the marking requirements of § 37.7(d), the equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are seven environmental test procedures outlined in RTCA Paper 120-61/DO-108 which have categories established. These should be identified on the nameplate by the words "environmental categories" or, as abbreviated, "Env. Cat." followed by seven letters which identify the categories designated in RTCA Paper 120-61/DO-108. 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) Humidity Test Category;
- (iii) Vibration Test Category;
- (iv) Audio-Frequency Magnetic Field Susceptibility Test Category;
- (v) Radio-Frequency Susceptibility Test Category;
- (vi) Emission of Spurious Radio-Frequency Energy Test Category; and
- (vii) Explosion Test.

(2) Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirement shall be identified by the letter "X". A typical nameplate identification would be as follows: Env. Cat. DABAAAX.

(3) 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 shall be marked with both categories in the space designated for that category by placing one

letter above the other in the following manner: Env. Cat. ^ADABAAAX.

(4) Each major component of equipment (antenna, power supply, 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 the provisions of § 37.5, the manufacturer shall 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) Six copies of the manufacturer's operating instructions and equipment limitations;

(2) Six copies of the 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.

§ 37.138 VOR radio receiving equipment operating within the radio-frequency range of 108-118 megacycles (for air carrier aircraft)—TSO-C40a.

(a) *Applicability.* (1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne VOR radio receiving equipment operating within the radio-frequency range of 108-118 megacycles which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne VOR radio receiving equipment manufactured for use on civil air carrier aircraft on or after September 1, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards Airborne VOR Receiving Equipment Operating Within the Radio Frequency Range of 108-118 Megacycles," as amended (Paper 225-55/DO-69 dated December 13, 1955, and amendment, Paper 253-58/EC-363 dated November 13, 1958).⁴ Radio Technical Commission for Aeronautics' Paper 100-54/DO-60⁵ which is incorporated by reference in and thus is a part of Paper 225-55/DO-69 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.

(2) *Exception.* (i) Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for

⁴ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 225-55/DO-69, 30 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

¹ Copies may be obtained upon request addressed to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

² Copies of this paper may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets, NW., Washington, D.C., 20006, at a cost of 75 cents per copy.

equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne VOR radio receiving equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(ii) The vibration values specified below may be used for equipment designed exclusively for installation on the instrument panel of aircraft in lieu of those specified in Paper 100-54/DO-60 as amended. No shock mounting shall be used during the conduct of this test if the vibration values specified below are used.

Amplitude: 0.01" (0.02" total excursion).
Frequency: Variable 5-50 cps.
Maximum Acceleration: 1.5 g.

(iii) Equipment which is designed exclusively for installation on the instrument panel of aircraft need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(iv) Indicating instruments which are a part of the system, but which are not designed exclusively for installation on the instrument panel of aircraft, may also be tested to the vibration requirements specified in subdivision (ii) of this subparagraph and need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment. Equipment which has been designed exclusively for installation on the instrument panel of aircraft and which meets only the amended vibration requirements outlined above shall be identified with the letters I.P. following the category of equipment, such as CAT. A-I.P.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne VOR radio receiving equipment approved prior to September 1, 1959, may continue to be manufactured under the provisions of its original approval.

§ 37.139 Airborne radio receiving and direction finding equipment operating within the radio frequency range of 200-415 kilocycles (for air carrier aircraft)—TSO-C41b.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne radio receiving and direction finding equipment operating within the radio frequency range of 200-415 kilocycles which is to be used on civil

aircraft of the United States engaged in air carrier operations. New models of airborne radio receiving and direction finding equipment manufactured for use on civil air carrier aircraft on or after the effective date of this section shall meet the standards as set forth in Radio Technical Commission for Aeronautics Papers 158-61/DO-111¹ dated August 10, 1961, and 120-61/DO-108¹ dated July 13, 1961. Exceptions to these standards are listed in subparagraph (2) of this paragraph.

(2) *Exception.* Radio Technical Commission for Aeronautics Paper 120-61/DO-108 outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have categories established and some do not. Where categories are established, only equipment which qualifies under the following categories as specified in RTCA Paper 120-61/DO-108, is eligible under this order:

(i) Temperature-Altitude Test—Categories A, B, C, or D.

(ii) Humidity Test—Categories A or B.

(iii) Vibration Test—Categories A, B, C, D, E, or F.

(iv) Audio-Frequency Magnetic Field Susceptibility Test—Categories A or B.

(v) Radio-Frequency Susceptibility Test—Category A.

(vi) Emission of Spurious Radio-Frequency Energy Test—Category A.

(b) *Markings.* (1) In addition to the marking requirements of § 37.7(d), the equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are seven environmental test procedures outlined in RTCA Paper 120-61/DO-108 which have categories established. These should be identified on the nameplate by the words "environmental categories" or, as abbreviated, "Env. Cat." followed by seven letters which identify the categories designated in RTCA Paper 120-61/DO-108. Reading from left to right, the category designations should appear on the nameplate in the following order, so that they may be readily identified:

(i) Temperature-Altitude Test Category.

(ii) Humidity Test Category.

(iii) Vibration Test Category.

(iv) Audio-Frequency Magnetic Field Susceptibility Test Category.

(v) Radio-Frequency Susceptibility Test Category.

(vi) Emission of Spurious Radio-Frequency Energy Test Category; and

(vii) Explosion Test.

(2) Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirement shall be identified by the letter "X". A typical nameplate identification would be as follows: Env. Cat. DABAAAX.

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006, Paper 158-61/DO-111, 60 cents per copy; Paper 120-61/DO-108, 75 cents per copy.

(3) (i) Two classes of equipment are specified as follows:

(a) Class A—For equipment intended for operation in the European-Mediterranean area (EUM) and in other areas where the frequency and geographical separation of ground facilities and their output powers are similar to those in the (EUM) area.

(b) Class B—For equipment intended for operation in the United States and in other areas where the frequency and geographical separation of ground facilities and their output powers are similar to those in the United States area.

(ii) The class of the equipment shall be identified on the nameplate. Equipment which complies with both Class A and Class B requirements need only be marked as Class A equipment. A typical nameplate identification would be as follows: Env. Cat. DABAAAX Class A.

(4) In some cases, such as under the Temperature-Altitude Test Category, a manufacturer may elect to qualify his equipment under two categories. In this case, the nameplate shall be marked with both categories in the space designated for that category by placing one letter above the other in the following manner:

Env. Cat. ^ADABAAAX Class A.

(5) Each major component of equipment (antenna, power supply, 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 the provisions of § 37.5, the manufacturer shall 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) Six copies of the manufacturer's operating instructions and equipment limitations;

(2) Six copies of the installation procedures with applicable schematic drawings, wiring diagrams, and specifications (indicate any limitations, restrictions, or other conditions pertinent to installation); and

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

§ 37.140 Propeller feathering hose assemblies (rubber and wire braid construction)—TSO-C42a.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for propeller feathering hose assemblies of the following types which are to be used in civil aircraft of the United States:

(i) Type 1 (pressure line) hose assemblies which are intended to be used in the line connecting the feathering pump outlet to the propeller governor.

(ii) Type 2 (supply line "fire-resistant") hose assemblies which are intended to be used in the line connecting the oil supply to the feathering pump where this entire line is located aft of the firewall.

(iii) Type 3 (supply line "fireproof") hose assemblies which are intended to be

used in the line connecting the oil supply to the feathering pump where this line is located wholly or in part forward of the firewall.

New models of propeller feathering hose assemblies manufactured for use in civil aircraft on or after March 1, 1957, shall meet the "performance" section of Military Specification MIL-H-8795 (ASG) dated January 6, 1956,¹ or MIL-H-8790 dated August 22, 1956,¹ with the following exception and shall also meet the appropriate fire test requirements listed below.

(2) *Exception.* The hydraulic impulse test requirements in MIL-H-8795 (ASG) and MIL-H-8790 need not be met for the purposes of this section.

(3) *Pressure line (type 1) hose assembly fire test—(1) Test setup and flame requirements.* (a) For the purpose of this test, a length of hose five times the outside diameter or longer shall be subjected to a flame of the size and temperature specified in (d) and (e) of this subdivision while the hose is in a horizontal position. The entire end fitting shall also be subjected to this flame.

(b) The hose assembly shall be installed horizontally in the test setup in such a manner that it includes at least one full 90° bend so that the pressure existing inside the hose will exert an axial force on the end fitting equal to the inside area of the hose multiplied by the internal pressure.

(c) During the test the end fitting which is subjected to flame shall be vibrated at the rate of 2,000 cycles per minute through a total amplitude of not less than 1/8 inch, i. e., a displacement of 1/16 inch on each side of the neutral position.

(d) The flame temperature shall be 2,000° F., plus or minus 50° F. as measured within 1/4 inch of the surface of the hose and end fitting at the point nearest the flame. Suitable shielded thermocouples or equivalent temperature measuring devices shall be used for measuring the flame temperature. A sufficient number of these shall be used to assure that the specified temperature exists at least along the entire end fitting and along the hose for a distance of not less than three times its outside diameter.

(e) The flame diameter shall not be less than three times the maximum diameter of the hose or three times the maximum diameter of the end fitting (whichever is greater). The length of the flame shall be such that it extends beyond the end fitting and hose when they are in place during the test, for a distance of not less than three times the maximum diameter of the hose or three times the maximum diameter of the end fitting, whichever is greater.

(f) During the test SAE 20 oil or equivalent shall be circulated through the hose assembly, and the oil shall enter the hose assembly at a temperature of not less than 200° F.

NOTE: Items (d) and (e) of this subdivision, concerning flame size and distribution, will be revised in accordance with agreements reached with the SAE A-3 Flame Test Subcommittee, when its study of this problem is completed.

(ii) *Fire test procedure—(a) Part I.*

Pressure: 150 psi (minimum).

Oil flow rate: 1.3 quarts/minute (maximum).

Duration: 4 minutes, 30 seconds.

(b) *Part II (which shall immediately follow Part I).*

Pressure: 1,650 psi (minimum).

Oil flow rate: 14 quarts/minute (maximum; any lower flow rate is acceptable).

Duration: 30 seconds.

(iii) *Criteria for acceptability.* The hose assembly under test shall be considered acceptable if it complies with these test conditions without evidence of leakage.

(4) *Supply line "fire-resistant" (type 2) hose assembly fire test—(1) Test setup and flame requirements.* Same as subparagraph (3) (i) of this paragraph.

(ii) *Fire test procedure.*

Pressure: 30 psi (minimum).

Oil flow rate: 1.3 quarts/minute (maximum).

Duration: 5 minutes.

(iii) *Criteria for acceptability.* Same as subparagraph (3) (iii) of this paragraph.

(5) *Supply line "fireproof" (type 3) hose assembly fire test—(1)—Test setup and flame requirements.* Same as subparagraph (3) (i) of this paragraph.

(ii) *Fire test procedure.* Test shall be conducted as described in subparagraph (4) (ii) of this paragraph except that upon completion thereof test shall be extended for an additional 10 minutes, making the total duration 15 minutes.

(iii) *Criteria for acceptability.* Same as subparagraph (3) (iii) of this paragraph.

(b) *Marking.* The following marking is required in lieu of that specified in § 37.7:

(1) Name or trademark of the manufacturer responsible for compliance with this TSO.

(2) Model designation.

(3) Date of manufacture.

(4) Applicable TSO number, followed immediately by "Type Number" (as "Type 1", etc.). This identification must be legibly stamped on a steel (or other fireproof material) band securely affixed to the hose assembly.

§ 37.141 Aircraft position lights—TSO-C30b.

(a) *Applicability—(1) Minimum performance standards.* Minimum performance standards are hereby established for position lights which are to be used in civil aircraft of the United States.¹ New models of position lights

¹ The number and types of position lights for each aircraft category are established in Federal Aviation Regulations Parts 23, 25, 27 and 29 of this title. In general, air-carrier aircraft use all five types listed in AS271, section 2, while other aircraft are equipped with types I, II, and III only.

manufactured for installation on civil aircraft on or after March 31, 1957, shall meet the standards set forth in SAE Specification AS271, "Aircraft Position Lights," dated October 15, 1952,² with the exception listed in subparagraph (2) of this paragraph. Position lights approved by the Civil Aeronautics Administration prior to March 31, 1957, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* For the purpose of this section only the standards set forth in subsection 3.3 and section 4 (except subsection 4.3.2.3 and 4.7) need be complied with.

(b) *Marking.* In lieu of the marking requirements of paragraph (c) of § 37.7, the minimum lamp candle power or lamp part number shall be shown.

§ 37.142 Temperature indicators—TSO-C43.

(a) *Applicability—(1) Minimum performance standards.* Minimum performance standards are hereby established for temperature indicators which specifically are required to be approved for use in civil aircraft of the United States. New models of temperature indicators manufactured for installation in civil aircraft on or after October 15, 1957, shall meet the standards set forth in SAE Aeronautical Standard AS-413A, "Temperature Indicator," dated December 15, 1954.² Temperature indicators approved by the Civil Aeronautics Administration prior to October 15, 1957, may continue to be manufactured under the provisions of their original approval.

(b) *Marking.* In lieu of the weight specified in § 37.7(c), the rating shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.143 Fuel flow meters—TSO-C44.

(a) *Applicability—(1) Minimum performance standards.* Minimum performance standards are hereby established for fuel flow meters which specifically are required to be approved for use in civil aircraft of the United States. New models of fuel flow meters manufactured for installation in civil aircraft on or after October 15, 1957, shall meet the standards set forth in SAE Aeronautical Standard AS-407A, "Fuel Flow Meters," dated December 14, 1954.² Fuel flow meters approved by the Civil Aeronautics Administration prior to October 15, 1957, may continue to be manufactured under the provisions of their original approval.

(b) *Marking.* In lieu of the weight specified in § 37.7(c), the range and rating shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy

¹ Copies of these specifications may be obtained by addressing a request to the Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio.

² Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, New York.

each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.144 Manifold pressure indicating instruments—TSO-C45.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for manifold pressure indicating instruments which specifically are required to be approved for use in civil aircraft of the United States. New models of manifold pressure indicating instruments manufactured for installation in civil aircraft on or after October 15, 1957, shall meet the standards set forth in SAE Aeronautical Standard AS-411, "Manifold Pressure Indicating Instruments," dated November 1, 1948.¹ Manifold pressure indicating instruments approved by the Civil Aeronautics Administration prior to October 15, 1957, may continue to be manufactured under the provisions of their original approval.

(b) *Marking.* In lieu of the weight specified in § 37.7(c), the range shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.145 Maximum allowable airspeed indicators—TSO-C46a.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for maximum allowable airspeed indicators which specifically are required to be approved for use in civil aircraft of the United States. New models of maximum allowable airspeed indicators manufactured for installation in civil aircraft on or after October 15, 1957, shall meet the standards set forth in SAE Aeronautical Standard AS-418, "Maximum Allowable Airspeed Indicators," dated December 15, 1956.¹ Maximum allowable airspeed indicators approved by the Civil Aeronautics Administration prior to October 15, 1957, may continue to be manufactured under the provisions of the original approval.

(b) *Marking.* In lieu of the weight specified in § 37.7(c), the range shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

¹ Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, New York.

§ 37.146 Pressure instruments—fuel, oil, and hydraulic—TSO-C47.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for pressure instruments—fuel, oil, and hydraulic—which specifically are required to be approved for use in civil aircraft of the United States. New models of pressure indicators—fuel, oil, and hydraulic—manufactured for installation in civil aircraft on or after October 15, 1957, shall meet the standards set forth in SAE Aeronautical Standard AS-408A, "Pressure Instruments—Fuel, Oil, and Hydraulic," dated December 15, 1954.¹ Pressure instruments—fuel, oil, and hydraulic—approved by the Civil Aeronautics Administration prior to October 15, 1957, may continue to be manufactured under the provisions of their original approval.

(b) *Marking.* In lieu of the weight specified in § 37.7(c), the rating and range shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.147 Carbon monoxide detector instruments—TSO-C48.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for carbon monoxide detector instruments which specifically are required to be approved for use in civil aircraft of the United States. New models of carbon monoxide detector instruments manufactured for installation in civil aircraft on or after October 15, 1957, shall meet the standards set forth in SAE Aeronautical Standard AS-412A, "Carbon Monoxide Detector Instruments," dated December 15, 1956.¹ Carbon monoxide detector instruments approved by the Civil Aeronautics Administration prior to October 15, 1957, may continue to be manufactured under the provisions of their original approval.

(b) *Marking.* In lieu of the weight specified in § 37.7(c), the rating shall be shown.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.148 Electric tachometer: magnetic drag (for air carrier aircraft)—TSO-C49a.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for electric tachometers which specifically are required to be approved for use on civil aircraft of the United States. New models of electric tachometers manufactured for installation on

civil aircraft on or after October 15, 1960, shall meet the standards set forth in SAE Aeronautical Standard AS-404B, "Electric Tachometer: Magnetic Drag (Indicator and Generator)," dated February 1, 1959¹ with exceptions, additions, and substitutions to the standards listed in subparagraph (2) of this paragraph.² Electric tachometers approved prior to October 15, 1960, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) The following specifically numbered parts in AS-404B do not concern minimum performance and therefore are not essential to compliance with this section: Parts 3.1, 3.1.1, 3.1.2, 3.2, 3.2 (a) (b) (c) (d) (e) (f), 4.1.3.1, 4.1.3.2, 4.1.3.3, 4.1.3.4, and 4.1.3.5.

(ii) In lieu of part 7 in AS-404B, it is a requirement that tachometers covered by this section be capable of successfully passing the tests in parts 7.1 through 7.8.

(b) *Marking.* In addition to the markings specified in § 37.7, range and rating shall be shown.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product. (See paragraph (d) of this section.)

(3) Six copies each of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(i) Manufacturer's operating instructions and instrument limitations.

(ii) Drawing or photograph showing exploded view of instruments.

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

(d) *Quality control.* Each electric tachometer shall be produced under a quality control system, established by the manufacturer, which will assure that each tachometer is in conformity with the requirements of this section and is in condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

§ 37.149 Aircraft audio and interphone amplifiers (for air carrier aircraft)—TSO-C50a.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for aircraft audio and interphone amplifiers which are to be used on civil aircraft of the United States engaged in air carrier operation. New models of aircraft audio and interphone amplifiers

² When electric tachometers are installed on civil aircraft, the installation must comply with the functional and installation requirements of Parts 23, 25, 27, or 29 of the Federal Aviation Regulations as applicable.

manufactured for use on civil air carrier aircraft on or after September 1, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards Aircraft Audio and Interphone Amplifiers," as amended (Paper 45-57/DO-78 dated March 15, 1957, and amendment, Paper 255-58/EC-365 dated November 13, 1958).¹⁰ Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹⁰ which is incorporated in by reference and thus is a part of Paper 45-57/DO-78 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.

(2) *Exception.* Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only aircraft audio and interphone amplifiers which meet the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, are eligible under this section.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne audio and interphone amplifiers approved prior to September 1, 1959, may continue to be manufactured under the provisions of their original approval.

§ 37.150 Aircraft flight recorder—TSO-C51.

(a) *Applicability—(1) Minimum performance standards.* Minimum performance standards are hereby established for aircraft flight recorders which specifically are required to be approved for use in civil aircraft of the United States. Aircraft flight recorders eligible for installation in civil aircraft shall meet the standards set forth in CAA-

CAB Standard, "Aircraft Flight Recorder", dated June 12, 1958.¹

(b) *Marking.* In addition to the markings in § 37.7, the rating (nominal voltage and wattage) shall also be marked on the recorder.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.151 Flight directors—TSO-C52a.

(a) *Applicability—(1) Minimum performance standards.* Minimum performance standards are hereby established for flight directors which specifically are required to be approved for use on civil aircraft of the United States. New models of flight directors manufactured for installation on civil aircraft on or after the effective date of this section shall meet the standards set forth in SAE Aeronautical Standard AS-420A, "Flight Directors," revised November 15, 1959,² with exceptions and additions to the standards listed in subparagraph (2) of this paragraph.

(2) *Exceptions and additions.* (i) The following specifically numbered parts in AS-420A do not concern minimum performance and therefore are not essential to compliance with this section: parts: 3.1; 3.1.1; 3.1.2; 3.2(a), (b), (c), (d), (e); and 4.1.1.3.

(ii) In lieu of part 7, it is a requirement that flight directors covered by this section be capable of successfully passing the tests in parts 7.1 through 7.6.

(iii) *Thermal shock:* This test shall apply to any hermetically sealed components. The component shall be subjected to four cycles of exposure to water at $85^{\circ}\pm 2^{\circ}$ C. and $5^{\circ}\pm 2^{\circ}$ C. without evidence of moisture penetration or damage to coating or enclosure. Each cycle of the test shall consist of immersing the component in water at $85^{\circ}\pm 2^{\circ}$ C. for a period of 30 minutes, and then within 5 seconds of removal from the bath, the component shall be immersed for a period of 30 minutes in the other bath maintained at $5^{\circ}\pm 2^{\circ}$ C. This cycle shall be repeated continuously, one cycle following the other until four cycles have been completed. Following this test, the component shall be subjected to the Sealing test specified in subdivision (iv) of this subparagraph. No leakage shall occur as a result of this test.

(iv) *Sealing:* This performance test shall apply to each hermetically sealed instrument. The instrument shall be immersed in a suitable liquid, such as water. The absolute pressure of the air above the liquid shall then be reduced to approximately one inch of mercury

(Hg) and maintained for one minute, or until air bubbles cease to be given off by the liquid, whichever is longer. The absolute pressure shall then be increased by $2\frac{1}{2}$ inches Hg. Any bubbles coming from within the indicator case shall be considered as leakage and shall be cause for rejection. Bubbles which are the result of entrapped air in the various exterior parts of the case shall not be considered as leakage. Other test methods which provide evidence equal to the immersion test of the integrity of the instrument's seals may be used. If the instrument incorporates nonhermetically sealed appurtenances, such as a case extension, these appurtenances may be removed prior to the sealing test.

(v) In addition to paragraph 4.6.2, the indicating means shall be readily discernible under any lighting condition normally encountered in aircraft.

(b) *Marking.* In addition to the markings specified in § 37.7 range and rating shall be shown.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product. (See paragraph (d) *Quality control* of this section.)

(3) Six copies each, except where noted, of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

(i) Manufacturer's operating instructions and instrument limitations.

(ii) Drawings of major components or photographs showing exploded views of instruments.

(iii) Installation procedures with applicable schematic drawings, wiring diagrams, and specifications. Indicate any limitations, restrictions, or other conditions pertinent to installation with the statement of conformance certifying that the instrument conforms to this section.

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

(d) *Quality control.* Each flight director shall be produced under a quality control system, established by the manufacturer, which will assure that each flight director is in conformity with the requirements of this section and is in condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

(e) *Previously approved equipment.* Flight directors approved prior to the effective date of this section may continue to be manufactured under the provisions of their original approval.

§ 37.152 Fuel and engine oil system hose assemblies (rubber or tetrafluoroethylene tube and wire braid construction)—TSO-C53a.

(a) *Applicability—(1) Minimum performance standards.* Minimum per-

¹⁰ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 45-57/DO-78, 25 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

¹ Copies may be obtained from the Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

² Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, N.Y.

formance standards are hereby established for new models of fuel and engine oil system hose assemblies¹ of the following types manufactured on or after the effective date of this section, which are to be used on civil aircraft of the United States. Fuel and engine oil system hose assemblies of the following types approved prior to the effective date of this section may continue to be manufactured under the provisions of their original approval.

(i) *Type A.* Non-fire-resistant "normal" temperature hose assemblies which are intended to be used in locations outside fire zones where the fluid and ambient air temperatures do not exceed 250° F.

(ii) *Type B.* Non-fire-resistant "high" temperature hose assemblies which are intended to be used in locations outside fire zones where the fluid and ambient air temperatures do not exceed 450° F.

(iii) *Type C.* Fire-resistant "normal" temperature hose assemblies which are intended to be used in locations within fire zones where the fluid and ambient air temperatures do not exceed 250° F.

(iv) *Type D.* Fire-resistant "high" temperature hose assemblies which are intended to be used in locations within fire zones where the fluid and ambient air temperatures do not exceed 450° F.

(a) New models shall comply with the following minimum requirements. Three samples of each size shall be tested.

(1) Type A hose assemblies shall comply with the "3.3 Performance" section requirements of Specification MIL-H-8795A, dated July 25, 1958,² except as noted in subparagraph (2) of this paragraph. The hose incorporated therein shall conform to "3.6 Performance" section of Specification MIL-H-8794A, dated July 25, 1958,² except as noted in subparagraph (2) of this paragraph.

(2) Type B hose assemblies shall comply with the "3.6 Performance" section of Specification MIL-H-25579 (USAF) Amendment 2, dated March 19, 1959,² except as noted in subparagraph (2) of this paragraph.

(3) Type C hose assemblies shall comply with the above requirements for Type A hose assemblies and in addition shall pass the fire test described in subparagraph (3) of this paragraph.

(4) Type D hose assemblies shall comply with the above requirements for Type B hose assemblies and in addition shall pass the fire test described in subparagraph (3) of this paragraph.

(2) *Exceptions.* (i) Type A hose assemblies are not required to comply with sections 3.6.1.2 and 3.6.2.7 of Specification MIL-H-8794A. The operating and proof pressures referred to in Table 1 of that specification shall be those values listed in the "Fuel" column thereof. The burst pressures to be utilized shall be twice the proof pressures listed in the "Fuel" column in Table 1. The foregoing shall likewise apply in showing

compliance with Specification MIL-H-8795A.

(ii) Type B hose assemblies are not required to comply with sections 3.6.5, 3.6.7 and 3.6.10 of Specification MIL-H-25579 (USAF). The burst pressures to be utilized shall be twice the proof pressures listed in Table 1 of that specification.

(3) *Fire test procedure and requirements.* A description of the standard fire test apparatus and its use is in FAA "Standard Fire Test Apparatus and Procedure" (Power Plant Engineering Report No. 3).³ The use of a protective sleeve over the hose and/or end fittings is permitted to facilitate compliance with the fire test requirements. Sleeves or covers shall be secured to the hose assembly so that fire-resistant properties will be maintained.

(i) Oil pressure during fire test: Type C hose assemblies—the operating pressure specified in the "Fuel" column of Table 1 in Specification MIL-H-8795A. Type D hose assemblies—the operating pressure specified in Table 1 of Specification MIL-H-25579 (USAF).

(ii) Oil flow rate: $5 \times (\text{Hose assembly actual ID in inches})^2$. Example: Flow rate for -16 size = $5 \times (\frac{1}{8})^2 = 3.8$ GPM.

(iii) Duration: 5 minutes.

(iv) Criteria for acceptability: The hose assembly shall be considered acceptable if it complies with these test conditions without evidence of leakage.

(b) *Marking.* The markings required are specified in § 37.7 with the following exceptions:

(1) Trademark may be used in lieu of name, and manufacturer's address is not required.

(2) In lieu of the weight specified in paragraph (c) of § 37.7, the size of the hose assembly shall be shown.

(3) The applicable TSO number shall be followed immediately by the appropriate type designation, as TSO-C53-Type B. Where a protective sleeve is employed, the information should be legibly stamped on a steel (or other fire-proof) band securely affixed to the hose assembly.

(c) *Data requirements.* The following information and data should be submitted with the letter of conformance.

(1) One copy of drawing showing the hose assembly construction, materials, part numbers and the recommended maximum and minimum fluid and ambient temperatures for continuous operation. The following data should be shown for each size: Proof and burst pressure (minimum), Operating pressure (maximum), Bending radius (minimum).

(2) One copy of any installation instructions and/or other pertinent information (may be shown on drawing).

§ 37.153 Stall warning instruments—TSO-C54.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby estab-

³Copies of Power Plant Engineering Report No. 3 may be obtained by addressing a request to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

lished for stall warning instruments which specifically are required to be approved for use on civil aircraft of the United States. New models of stall warning instruments manufactured for installation on civil aircraft on or after the effective date of this section shall meet the standards set forth in SAE Aeronautical Standard AS 403A, "Stall Warning Instrument," revised July 15, 1958,¹ with exceptions, and additions to the standards listed in subparagraph (2) of this paragraph.

(2) *Exceptions and additions.* (i) The following specifically numbered parts in AS 403A do not concern minimum performance and therefore are not essential to compliance with this section: Parts 3.1; 3.1.1; 3.1.2; 3.2 (a), (b), (c), (d), (e), and (f).

(ii) In lieu of Part 7 of AS 403A, it is a requirement that stall warning instruments covered by this section be capable of successfully passing the tests in Parts 7.1 through 7.7 of AS 403A.

(iii) *Thermal shock:* This test shall apply to any hermetically sealed component. The component shall be subjected to four cycles of exposure to water at $85 \pm 2^\circ$ C. and $5 \pm 2^\circ$ C. without evidence of moisture penetration or damage to coating or enclosure. Each cycle of the test shall consist of immersing the component in water at $85 \pm 2^\circ$ C. for a period of 30 minutes, and then within 5 seconds of removal from the bath, the component shall be immersed for a period of 30 minutes in the other bath maintained at $5 \pm 2^\circ$ C. This cycle shall be repeated continuously, one cycle following the other until four cycles have been completed. Following this test, the indicator shall be subjected to the Sealing test specified in subdivision (iv) of this subparagraph. No indicator leakage shall occur as a result of this test.

(iv) *Sealing:* This performance test shall apply to each hermetically sealed instrument. The instrument shall be immersed in a suitable liquid, such as water. The absolute pressure of the air above the liquid shall then be reduced to approximately 1 inch of mercury (Hg) and maintained for 1 minute, or until air bubbles cease to be given off by the liquid, whichever is longer. The absolute pressure shall then be increased by $2\frac{1}{2}$ inches Hg. Any bubbles coming from within the indicator case shall be considered as leakage and shall be cause for rejection. Bubbles which are the result of entrapped air in the various exterior parts of the case shall not be considered as leakage. Other test methods which provide evidence equal to the immersion test of the integrity of the instrument's seals may be used. If the instrument incorporates nonhermetically sealed appurtenances, such as a case extension, these appurtenances may be removed prior to the sealing test.

(v) *Power malfunction indication:* Means shall be incorporated in the instrument to indicate when adequate power (voltage and/or current) is not being made available to all phases required for the proper operation of the

¹Hose assemblies for use in propeller feathering lines are covered in TSO-C42.

²Copies of these specifications may be obtained by addressing a request to: Commander, USAF, Administrative Services Office, Attention EWBE, Wright-Patterson Air Force Base, Ohio.

¹Copies may be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York 17, N.Y.

instrument. The indicating means shall indicate a failure or a malfunction in a positive manner, and be readily discernible under any lighting condition normally encountered in aircraft.

(b) *Marking.* In addition to the markings specified in § 37.7 range or rating (voltage) shall be shown.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product.

(3) Six copies each, except where noted, of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(i) Manufacturer's operating instructions and instrument limitations.

(ii) Drawings of major components or photographs showing exploded views of instruments.

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

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

(d) *Quality control.* Each stall warning instrument shall be produced under a quality control system, established by the manufacturer, which will assure that each stall warning instrument is in conformity with the requirements of this section and is in condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this standard.

(e) *Previously approved equipment.* Stall warning instruments approved prior to the effective date of this section may continue to be manufactured under the provisions of their original approval.

§ 37.154 Fuel and oil quantity instruments (for reciprocating engine aircraft)—TSO-C55.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for fuel and oil quantity instruments (for reciprocating engine aircraft) which specifically are required to be approved for use on civil aircraft of the United States. New models of fuel and oil quantity instruments (for reciprocating engine aircraft) manufactured for installation on civil aircraft on or after April 1, 1959, shall meet the standards set forth in SAE Aeronautical Standard AS-405B, "Fuel and Oil Quantity Instruments," dated July 15, 1958,¹ with the exceptions listed in subparagraph (2) of this paragraph. Fuel and oil quantity instruments (for reciprocating engine aircraft) approved prior to

April 1, 1959, may continue to be manufactured under the provisions of their original approval.

(2) *Exceptions.* (i) Conformance with the following sections is not required: 3.1; 3.1.1; 3.1.2; 3.2; 4.2.1.

(ii) Substitute the following for section 7.: "Performance tests: The following tests, in addition to any others deemed necessary by the manufacturer, shall be the basis for determining compliance with the performance requirements of this standard."

(b) *Marking.* In lieu of the weight specified in § 37.7(c), the following shall be shown:

- (1) Instrument type (I or II),
- (2) Range,
- (3) Rating if applicable, i.e., electrical, vacuum, etc.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.155 Engine-driven direct current generators for aircraft certificated under Part 25—TSO-C56.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for engine-driven direct current generators which are to be used on civil aircraft of the United States certificated under Part 25. New models of engine-driven direct current generators manufactured for use on civil aircraft on or after April 1, 1959, shall meet the minimum performance standards as set forth below.

(i) *Test conditions.* Unless otherwise specified in this section, each test shall be made under the following conditions:

(a) *Mounting.* The generator shall be mounted on a suitable drive stand capable of driving the generator continuously within the speed range. The longitudinal axis of the generator shall be horizontal.

(b) *Excitation.* The generator shall be self-excited and controlled by a suitable variable resistance in series with the shunt field. The shunt field current shall not be considered as part of the generator load current.

(c) *Ambient temperature.* The ambient temperature shall be $95^{\circ} \pm 9^{\circ}$ F.

(d) *Altitude.* The tests shall be run at approximately sea level altitude.

(e) *Location of load.* The load for the generator shall be so located that it will not appreciably affect the ambient temperature or the blast-cooling air temperature (if blast cooling is used).

(f) *Warm-up.* Prior to the test, the generator shall be operated at continuous operating speed delivering rated load at rated voltage for sufficient time to reach a substantially constant temperature.

(ii) *Test methods.*—(a) *Manufacturer's declaration.* The manufacturer shall declare the following generator ratings and characteristics. (These values are the "rated" and "declared"

quantities referred to in subsequent paragraphs describing test methods.)

- (1) Rated terminal voltage.
- (2) Rated load current.
- (3) Minimum blast cooling requirement (if blast cooling is to be used).
- (4) Rated speed range.
- (5) Continuous operating speed.
- (6) Minimum speed for regulation.
- (7) Maximum speed for regulation.
- (8) Maximum overspeed.
- (9) Minimum and maximum external field resistance in series with the shunt field.
- (10) Maximum operating altitude.
- (11) Allowable brush and commutator wear.
- (12) Maximum static torque.
- (13) Equalizing voltage (if provided) at rated load current.
- (14) Overhang moment, with respect to the drive pad.

(b) *Maximum speed for regulation.* The generator shall not be given an operational warm-up prior to this test. The generator shall be operated at the maximum speed for regulation and it shall deliver the rated terminal voltage at no load with no more than the declared maximum external field resistance in series with the shunt field.

(c) *Heating, commutation, minimum speed and equalizing voltage.* Provision shall be made for determining speed, terminal voltage, load current, field voltage, field current and the resistance in series with the shunt field. The declared minimum blast cooling requirement shall be supplied to the generator air inlet. The temperature of the cooling air shall be determined by means of a suitable temperature indicating device whose responsive element is located within the cooling air duct. While the generator is cold, the resistance and temperature of the shunt field shall be determined for use in calculating the field temperature rise (average) during continuous operation at the declared full load current. The generator shall be considered to have reached a continuous operating condition when the rate of rise of the shunt field temperature, above the then existing ambient temperature, does not exceed 2° F. in five minutes.

(1) *Heating.* The ability of the generator to deliver the rated load current at rated terminal voltage at the declared continuous operating speed shall be demonstrated. Immediately following the above run, the ability of the generator to deliver rated load current at rated terminal voltage for both the minimum speed for regulation and the maximum rated speed shall be demonstrated. Following this test, the generator shall demonstrate its ability to deliver rated load current at minimum rated speed, at a terminal voltage not less than 85 percent of the rated terminal voltage.

(2) *Commutation.* Immediately following the above heat runs, with the generator hot, the commutation of the generator shall be observed over the rated speed range for no load, half load, and rated load current. There shall be no more than fine, pin-point sparking of the brushes during this test.

(3) *Minimum speed.* At no time during the above heat runs shall the re-

¹ Copies may be obtained from the Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York 17, New York.

quired resistance external to the shunt field be less than the declared minimum external field resistance.

(4) *Equalizing voltage.* Where an equalizing voltage is provided, it shall be within 5 percent of the declared equalizing voltage when the generator is stabilized in temperature and operating at rated load current at the declared continuous operating speed. The declared minimum blast cooling requirement shall be supplied at the generator air inlet.

(d) *Overspeed.* This test shall be made while the generator is hot as a result of testing and shall be made at no load with the field circuit open and at the declared maximum overspeed. The generator shall demonstrate its ability to operate under overspeed conditions for five minutes without mechanical failure, throwing of varnish, or impairing electrical performance.

(e) *Dielectric strength.* While the generator is hot as a result of testing, it shall withstand the following test voltage at commercial frequency, applied between windings, and between each winding and frame, for the specified time:

500 volts (rms) for one minute, or
600 volts (rms) for one second.

(f) *Ripple voltage.* Ripple voltage shall be determined by means of a peak reading vacuum tube voltmeter in series with a 4.0 microfarad capacitor. The generator shall be operated at 120 percent of minimum rated speed at 50 percent of rated load current, with a manually operated field rheostat, and without a battery in parallel. Peak voltage readings shall be taken with the voltmeter successively connected for each of the two polarities and the higher of the two readings shall not exceed 1.5 volts.

(g) *Humidity.* The relative humidity for this test shall be 95 ± 5 percent. Subject equipment to test condition at $160 \pm 4^\circ$ F. for six hours. The heat source shall be turned off for 16 hours without changing total moisture content in the test space. During the 16-hour period, the temperature shall drop to 100° F. or less. The test shall be repeated ten times, allowing a two-hour period to stabilize to 160° F. Check for corrosion, distortion, and general deterioration. At the end of this test, the generator shall deliver rated load current at the declared continuous operating speed for two hours.

(h) *Flexible drive.* The flexible drive test shall be conducted on a universal joint torsional vibration machine which has a fly-wheel of at least 20 times the amount of inertia of the generator armature being tested. Testing procedure shall be as follows:

(1) 100 hours with ± 1 degree torsional amplitude input to drive shaft at critical frequencies. The flexible drive shall limit the armature amplitude within ± 5 degrees.

(2) 50 hours with ± 2 degrees torsional amplitude input to drive shaft at frequencies of 20 to 24 cps. The flexible drive shall limit the armature amplitude within ± 7 degrees.

(3) 15 minutes with ± 2 degrees torsional amplitude input to drive shaft at

critical frequencies. The flexible drive shall limit the armature amplitude within ± 7 degrees.

(i) *Performance of commutator, bearings, and brushes.* The generator shall be operated under the following conditions. New brushes may be installed for this test.

(1) 100 hours at the declared continuous operating speed, at rated load current with the test conditions specified in subdivision (1) of this subparagraph.

(2) Four continuous cycles consisting of the following: 24 hours at the declared continuous operating speed and rated load current, at altitude conditions approximating 115 percent of the declared maximum operating altitude. The ambient temperature (and cooling air temperature, if blast cooling is used) shall be related to the test altitude by the formula $T = 104 - (0.005)h$ (where T is the temperature in degrees F. and h is the test altitude in feet), except that the lower temperature limit, regardless of altitude, shall be -67° F.; at least one hour at the declared continuous operating speed and rated load current, with the test conditions specified in subdivision (1) of this subparagraph. The time interval between successive 24-hour runs at altitude shall not exceed two hours. The rate of change of altitude need not be controlled, but the temperature at any transition altitude shall be within 18° F. of that obtained from the temperature-altitude formula above.

(3) Two continuous cycles consisting of the following: Nine hours at the declared continuous operating speed and 75 percent rated load current, at altitude conditions approximating 115 percent of the declared maximum operating altitude. The ambient temperature (and cooling air temperature, if blast cooling is used) shall be related to the test altitude by the formula $T = 160 - (0.004)h$ (where T is the temperature in degrees F. and h is the test altitude in feet); at least one hour at the declared continuous operating speed and 75 percent rated load current, with the test conditions specified in subdivision (1) of this subparagraph. The time interval prior to each nine-hour run at altitude shall not exceed two hours. The rate of change of altitude need not be controlled, but the temperature at any transition altitude shall be within 18° F. of that obtained from the temperature-altitude formula above.

(4) Evaluation of results of tests (1), (2), and (3) above: Cumulative brush or commutator wear shall not exceed 20 percent of the declared allowable wear after tests (1) and (2) and shall not exceed 4 percent of the declared allowable wear after test (3). No mechanical failure or electrical malfunction shall occur during this test.

(j) *Drive shear section.* Sufficient torsional force shall be applied to the drive shear section (or to the armature shaft itself, if no shear section is provided) to result in its failure. The necessary torque indicating instrumentation shall be provided. Failure shall occur at an applied torque of less than the declared maximum static torque.

(b) *Marking.* In addition to the marking required in § 37.7, the nameplate shall contain the following information:

- (1) Rated terminal voltage.
- (2) Rated load current.
- (3) Rated speed range.

(c) *Data requirements.* The manufacturer shall submit a tabulation of the declared generator ratings and characteristics (called for in paragraph (a) (1) (ii) (a) of this section to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

§ 37.156 Aircraft headsets and speakers (for air carrier aircraft)—TSO-C57.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for aircraft headsets and speakers which are to be used on civil aircraft of the United States engaged in air carrier operations. New models of aircraft headsets and speakers manufactured for use on civil aircraft on or after August 14, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards—Aircraft Headsets and Speakers" (Paper 257-58/DO-90 dated November 13, 1958).¹ Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 257-58/DO-90 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. Exceptions to these standards are covered in subparagraph (2) of this paragraph.

(2) *Exceptions.* (i) Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only aircraft headsets and speakers which meet the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, are eligible under this section.

(ii) Radio Technical Commission for Aeronautics' Paper 257-58/DO-90 dated November 13, 1958, paragraph 2.3, Pilot Operated Gain Control. The provisions of this paragraph are applicable only to attenuators which are a part of the headset assembly.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions as out-

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 257-58/DO-90, 25 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

lined in Procedure B of this same paper, as amended, shall be marked as Category B equipment.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Aircraft headsets and speakers approved prior to August 14, 1959, may continue to be manufactured under the provisions of their original approval.

§ 37.157 Aircraft microphones (for air carrier aircraft)—TSO-C58.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for aircraft microphones which are to be used on civil aircraft of the United States engaged in air carrier operations. New models of aircraft microphones manufactured for use on civil aircraft on or after August 14, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards—Aircraft Microphones" (Paper 258-58/DO-91 dated November 18, 1958).² Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 258-58/DO-91 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.

(2) *Exception.* Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedure A, B, and C. Only aircraft microphones which meet the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, are eligible under this section.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions as outlined in Procedure B of this same paper, as amended, shall be marked as Category B equipment.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and

installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Aircraft microphones approved prior to August 14, 1959, may continue to be manufactured under the provisions of their original approval.

§ 37.158 High frequency (HF) radio communication transmitting equipment operating within the radio frequency range of 1.5-30 megacycles (for air carrier aircraft)—TSO-C31b.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne high frequency radio communication transmitting equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne HF radio communication transmitting equipment manufactured for use on civil air carrier aircraft on or after September 1, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards—Airborne Radio Communication Transmitting Equipment Operating Within the Radio-Frequency Range of 1.5-30 Megacycles," as amended (Paper 14-53/DO-48 dated January 26, 1953, and amendment, Paper 247-58/EC-357, dated November 13, 1958).¹ Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 14-53/DO-48 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.

(2) *Exception.* Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne high frequency radio communication transmitting equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne high frequency radio communication transmitting equipment approved prior to September 1, 1959, may continue to be manufactured under the provisions of its original approval.

§ 37.159 High frequency (HF) radio communication receiving equipment operating within the radio frequency range of 1.5-30 megacycles (for air carrier aircraft)—TSO-C32b.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne high frequency radio communication receiving equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne HF radio communication receiving equipment manufactured for use on civil air carrier aircraft on or after September 1, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards Airborne Radio Communication Receiving Equipment Operating Within the Radio Frequency Range of 1.5-30 Megacycles," as amended (Paper 15-53/DO-49 dated January 26, 1953, and amendment, Paper 248-58/EC-358 dated November 13, 1958).² Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 15-53/DO-49 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.

(2) *Exception.* Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne high frequency radio communication receiving equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 258-58/DO-91, 25 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

² Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 14-53/DO-48, 30 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

³ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 15-53/DO-49, 25 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne high frequency radio communication receiving equipment approved prior to September 1, 1959, may continue to be manufactured under the provisions of its original approval.

§ 37.160 Airborne ILS glide slope receiving equipment (for air carrier aircraft)—TSO-C34b.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne ILS glide slope receiving equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne ILS glide slope receiving equipment manufactured for use on civil air carrier aircraft on or after the effective date of this section shall meet the minimum performance standards contained in Federal Aviation Agency Standard entitled "Minimum Performance Standards for Airborne ILS Glide Slope Receiving Equipment",¹ dated May 9, 1962, and Radio Technical Commission for Aeronautics Paper 120-61/DO-108² entitled, "Environmental Test Procedures Airborne Electronic Equipment", dated July 13, 1961, with the exceptions to these standards as listed in subparagraph (2) of the paragraph.

(2) *Exception.* Radio Technical Commission for Aeronautics Paper 120-61/DO-108 outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have categories established and some do not. Where categories are established, only equipment which qualifies under the following categories, as specified in RTCA Paper 120-61/DO-108, is eligible under this order:

- (i) Temperature-Altitude Test—Categories A, B, C, or D.
- (ii) Humidity Test—Categories A or B.
- (iii) Vibration Test—Categories A, B, C, D, E, or F.
- (iv) Audio-Frequency Magnetic Field Susceptibility Test—Categories A or B.
- (v) Radio-Frequency Susceptibility Test—Category A.
- (vi) Emission of Spurious Radio-Frequency Energy Test—Category A.

(b) *Marking.* (1) In addition to the markings specified in § 37.7(d), the

equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are seven environmental test procedures outlined in RTCA Paper 120-61/DO-108 which have categories established. These should be identified on the nameplate by the words "environmental categories" or, as abbreviated, "Env. Cat." followed by seven letters which identify the categories designated in RTCA Paper 120-61/DO-108. 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) Humidity Test Category.
 - (iii) Vibration Test Category.
 - (iv) Audio-Frequency Magnetic Field Susceptibility Test Category.
 - (v) Radio-Frequency Susceptibility Test Category.
 - (vi) Emission of Spurious Radio-Frequency Energy Test Category.
 - (vii) Explosion Test.
- (2) Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirement shall be identified by the letter "X". A typical nameplate identification would be as follows: Env. Cat. DABAAAX.

(3) 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 shall be marked with both categories in the space designated for that category by placing one letter above the other in the following manner: Env. Cat. ^ADABAAAX.

(4) Each major component of equipment (antenna, power supply, etc.) shall be identified with at least the manufacturers' name, TSO number, and the environmental categories over which the equipment component is designed to operate.

(c) *Data requirements.* Six copies each of the following, except where noted, together with the statement of conformance, shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

- (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.

§ 37.161 Airborne ILS localizer receiving equipment operating within the radio-frequency range of 108-112 megacycles—TSO-C36b.

(a) *Applicability.* (1) Minimum performance standards are hereby established for airborne ILS localizer receiving equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne ILS localizer receiving equipment manufactured for use on civil air

carrier aircraft on or after the effective date of this section shall meet the minimum performance standards contained in Federal Aviation Agency Standard entitled "Minimum Performance Standards for Airborne ILS Localizer Receiving Equipment", dated June 15, 1962, and Radio Technical Commission for Aeronautics Paper 120-61/DO-108 entitled "Environmental Test Procedures Airborne Electronic Equipment",² dated July 13, 1961, with the exceptions to these standards listed in subparagraph (2) of this paragraph.

(2) Radio Technical Commission for Aeronautics Paper 120-61/DO-108 outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have categories established and some do not. Where categories are established, only equipment which qualifies under the following categories, as specified in RTCA Paper 120-61/DO-108, is eligible under this order:

- (i) Temperature-Altitude Test—Categories A, B, C, or D;
- (ii) Humidity Test—Categories A or B;
- (iii) Vibration Test—Categories A, B, C, D, E, or F;
- (iv) Audio-Frequency Magnetic Field Susceptibility Test—Categories A or B;
- (v) Radio-Frequency Susceptibility Test—Category A; and
- (vi) Emission of Spurious Radio-Frequency Energy Test—Category A.

(b) *Marking.* (1) In addition to the markings specified in § 37.7(d), the equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are seven environmental test procedures outlined in RTCA Paper 120-61/DO-108 which have categories established. These should be identified on the nameplate by the words "environmental categories" or, as abbreviated, "Env. Cat." followed by seven letters which identify the categories designated in RTCA Paper 120-61/DO-108. 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) Humidity Test Category;
- (iii) Vibration Test Category;
- (iv) Audio-Frequency Magnetic Field Susceptibility Test Category;
- (v) Radio-Frequency Susceptibility Test Category;
- (vi) Emission of Spurious Radio-Frequency Energy Test Category; and
- (vii) Explosion Test.

(2) Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirement shall be identified by the letter "X". A typical nameplate identifica-

¹ Copies may be obtained upon request addressed to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

² Copies of this paper may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006, at a cost of 75 cents per copy.

¹ Copies may be obtained upon request addressed to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

² Copies of this paper may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006, at a cost of 75 cents per copy.

tion would be as follows: Env. Cat. DABAAAX.

(3) 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 shall be marked with both categories in the space designated for that category by placing one letter above the other in the following manner: Env. Cat. ^ADABAAAX.

(4) Each major component of equipment (antenna, power supply, 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 the provisions of § 37.5 the manufacturer shall 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) Six copies of the manufacturer's operating instructions and equipment limitations;

(2) Six copies of the installation procedures with applicable schematic drawings, wiring diagrams, and specifications, indicating any limitations, restrictions, or other conditions pertinent to installation; and

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

§ 37.162 VHF radio communications transmitting equipment operating within the radio-frequency range of 118-136 megacycles—TSO-C37b.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne VHF radio communications transmitting equipment operating within the radio-frequency range of 118-136 megacycles which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne VHF radio communications transmitting equipment manufactured for use on air carrier aircraft on or after the effective date of this section shall meet the standards as set forth in Radio Technical Commission for Aeronautics Papers 134-61/DO-110¹ dated July 13, 1961, and 120-61/DO-108¹ dated July 13, 1961, with the exceptions to these standards listed in subparagraph (2) of this paragraph.

(2) *Exceptions.* (i) Only VHF transmitters which are designed for selection of frequency channels on discrete frequencies spaced 50 kc. apart or closer are eligible under this section.

(ii) Radio Technical Commission for Aeronautics Paper 120-61/DO-108 outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have

categories established and some do not. Where categories are established, only equipment which qualifies under the following categories, as specified in RTCA Paper 120-61/DO-108, is eligible under this section:

(a) Temperature-Altitude Test—Categories A, B, C, or D;

(b) Humidity Test—Categories A or B;

(c) Vibration Test—Categories A, B, C, D, E, or F;

(d) Audio-Frequency Magnetic Field Susceptibility Test—Categories A or B;

(e) Radio-Frequency Susceptibility Test—Category A; and

(f) Emission of Spurious Radio-Frequency Energy Test—Category A.

(b) *Marking.* (1) In addition to the markings specified in § 37.7 the equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are seven environmental test procedures outlined in RTCA Paper 120-61/DO-108 which have categories established. These shall be identified on the nameplate by the words "environmental categories" or, as abbreviated, "Env. Cat." followed by seven letters which identify the categories designated in RTCA Paper 120-61/DO-108. 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) Humidity Test Category;

(iii) Vibration Test Category;

(iv) Audio-Frequency Magnetic Field Susceptibility Test Category;

(v) Radio-Frequency Susceptibility Test Category;

(vi) Emission of Spurious Radio-Frequency Energy Test Category; and

(vii) Explosion Test.

Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirements shall be identified by the letter "X".

(2) Each major component of equipment (antenna, power supply, 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.

(3) The equipment shall be marked to indicate the distance range over which it is designed to operate. Three classes of equipment have been established in RTCA Paper 134-61/DO-110 based upon maximum radio line-of-sight distances as follows:

Class I: 200 nautical miles—Not less than 16 watts output.

Class II: 100 nautical miles—Not less than 4 watts output.

Class III: 50 nautical miles—Not less than 1 watt output.

NOTE: A typical nameplate identification would be as follows: Env. Cat. DABAAAX Class I.

(4) 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 shall be marked with both categories in the space designated for that category by placing one letter above the other in the following manner: Env. Cat. ^ADABAAAX Class I.

(c) *Data requirements.* Six copies each of the following, except where noted, shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

(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.

§ 37.163 VHF radio communications receiving equipment operating within the radio-frequency range of 118-136 megacycles—TSO-C38b.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for VHF radio communications receiving equipment operating within the radio-frequency range of 118-136 megacycles which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne VHF radio communications receiving equipment manufactured for use on air carrier aircraft on or after the effective date of this section shall meet the standards as set forth in Radio Technical Commission for Aeronautics Papers 130-61/DO-108² dated July 13, 1961, and 120-61/DO-108² dated July 13, 1961, with the exceptions to these standards listed in subparagraph (2) of this paragraph.

(2) *Exceptions.* (i) Radio Technical Commission for Aeronautics Paper 130-61/DO-109, Paragraph 2.8, Selectivity, outlines selectivity requirements for receivers designed for selection of frequency channels in discrete increments of 50 kc. or 100 kc. Only VHF receivers which are designed for selection of frequency channels on discrete frequencies spaced 50 kc. apart or closer are eligible under this section.

(ii) Radio Technical Commission for Aeronautics Paper 120-61/DO-108 outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have categories established and some do not. Where categories are established, only equipment which qualifies under the following categories, as specified in RTCA Paper 120-61/DO-108, is eligible under this order:

(a) Temperature-Altitude Test—Categories A, B, C, or D;

(b) Humidity Test—Categories A or B;

²Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 130-61/DO-109, 45 cents per copy; Paper 120-61/DO-108, 75 cents per copy.

¹Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 134-61/DO-110, 40 cents per copy; Paper 120-61/DO-108, 75 cents per copy.

(c) Vibration Test—Categories A, B, C, D, E, or F;

(d) Audio-Frequency Magnetic Field Susceptibility Test—Categories A or B;

(e) Radio-Frequency Susceptibility Test—Category A;

(f) Emission of Spurious Radio-Frequency Energy Test—Category A.

(b) *Marking.* (1) In addition to the markings specified in § 37.7, the equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are seven environmental test procedures outlined in RTCA Paper 120-61/DO-108 which have categories established. These shall be identified on the nameplate by the words "environmental categories" or, as abbreviated, "Env. Cat." followed by seven letters which identify the categories designated in RTCA Paper 120-61/DO-108. 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) Humidity Test Category;

(iii) Vibration Test Category;

(iv) Audio-Frequency Magnetic Field Susceptibility Test Category;

(v) Radio-Frequency Susceptibility Test Category;

(vi) Emission of Spurious Radio-Frequency Energy Test Category, and

(vii) Explosion Test.

Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirement shall be identified by the letter "X".

(2) Each major component of equipment (antenna, power supply, 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.

NOTE: A typical nameplate identification would be as follows: Env. Cat. DABAAAX.

(3) 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 shall be marked with both categories in the space designated for that category by placing one letter above the other in the following manner: Env. Cat. ^ADABAAAX.

(c) *Data requirements.* Six copies each of the following, except where noted, shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

(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.

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

§ 37.164 Airborne selective calling equipment (for air carrier aircraft)—TSO-C59.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne selective calling equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne selective calling equipment manufactured for use on civil air carrier aircraft on or after July 31, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards—Airborne Selective Calling Equipment," Paper 25-59/DO-93 dated February 10, 1959.¹ Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 25-59/DO-93 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.

(2) *Exception.* Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne selective calling equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne selective calling equipment approved prior to July 31, 1959, may continue to be manufactured under the provisions of its original approval.

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 25-59/DO-93, 30 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

§ 37.165 Airborne Loran A receiving equipment operating within the radio-frequency range of 1800-2000 kilocycles (for air carrier aircraft)—TSO-C60.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne Loran A receiving equipment operating within the radio-frequency range of 1800-2000 kilocycles which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne Loran A receiving equipment manufactured for use on civil air carrier aircraft on or after July 31, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards—Airborne Loran A Receiving Equipment Operating Within the Radio-Frequency Range of 1800-2000 Kilocycles" (Paper 226-58/DO-92¹ dated November 18, 1958). Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 226-58/DO-92 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.

(2) *Exceptions.* (1) Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne Loran A receiving equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(ii) The vibration values specified below may be used for equipment designed exclusively for installation on the instrument panel of aircraft in lieu of those specified in Paper 100-54/DO-60 as amended. No shock mounting shall be used during the conduct of this test if the vibration values specified below are used.

Amplitude: 0.01" (0.02" total excursion).
Frequency: Variable 5-50 cps.
Maximum acceleration: 1.5 g.

(iii) Equipment which is designed exclusively for installation on the instrument panel of aircraft need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(iv) Indicating instruments which are a part of the system, but which are not designed exclusively for installation on the instrument panel of aircraft, may also be tested to the vibration require-

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 226-58/DO-92, 30 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

ments specified in subdivision (ii) of this subparagraph, and need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment. Equipment which has been designed exclusively for installation on the instrument panel of aircraft and which meets only the amended vibration requirements outlined above shall be identified with the letters I.P. following the category of equipment, such as CAT. A—I.P.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne Loran A receiving equipment approved prior to July 31, 1959, may continue to be manufactured under the provisions of its original approval.

§ 37.166 Portable aircraft emergency communications equipment (for air carrier aircraft)—TSO-C61a.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for portable aircraft emergency communications equipment which specifically is required to be carried on civil aircraft of the United States engaged in particular air carrier operations. The radio frequencies to be utilized by such equipment shall be selected from 500 kc., 8364 kc., or 121.5 mc. A single frequency or a combination of the above frequencies may be used. New models of portable aircraft emergency communications equipment manufactured for use on air carrier aircraft on or after the effective date of this section shall meet the standards in the following Radio Technical Commission for Aeronautics Papers:

49-59/DO-95¹ dated March 10, 1959, for 500 or 8364 kc. equipment; 26-59/DO-94¹ dated February 10, 1959, for 121.5 mc. equipment; 100-54/DO-60¹ dated April 13, 1954, Environmental Test Procedures; 256-58/EC-366¹ dated November 13, 1958, Amendment to 100-54/DO-60.

Exceptions, additions, and substitutions to these standards are listed in subparagraph (2) of this paragraph.

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 49-59/DO-95, 30 cents per copy; Paper 26-59/DO-94, 30 cents per copy; Paper 100-54/DO-60, with Amendment Paper 256-58/EC-366, 20 cents per copy.

(2) *Exceptions.* (i) Radio Technical Commission for Aeronautics Paper 100-54/DO-60, and Amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(ii) (a) The vibration values specified below may be used in lieu of those specified in Paper 100-54/DO-60, as amended. If these values are used, no external shock mounting shall be used during the conduct of the test.

(b) Constant total excursion of 0.020" from 10 to 55 c.p.s. with a maximum acceleration of 3g.

(iii) Paper 26-59/DO-94, Paragraph 2.1, Operating Life. The capacity of the power supply shall be sufficient to provide continuous operation for at least 24 hours under the condition of maximum power consumption. At the end of the 24-hour period, the radiated power output shall not have deteriorated by more than 3 db from that specified in paragraph 2.2.1, as amended by subdivision (iv) of this subparagraph. These values also apply to the test procedures contained in Paragraph T-1, Appendix A.

(iv) Paper 26-59/DO-94, Paragraph 2.2.1, Radiated Power. The effective radiated power (ERP) from the antenna shall be at least 225 milliwatts. This value also applies to the test procedures contained in Paragraph T-2, Appendix A.

(v) Paper 26-59/DO-94, Paragraph 2.2.2, Modulation Capability. The transmitter output carrier shall be capable of being tone amplitude modulated a minimum of 90 percent downward and 10 percent upward by an audiofrequency signal between 900 and 1600 c.p.s. and by a 1000 c.p.s. signal applied to the microphone, if voice modulation is provided.

(vi) Paper 49-59/DO-95, Paragraph 2.1, Operating Life. The capacity of the power supply shall be sufficient to provide continuous operation for at least 24 hours under the condition of maximum power consumption. At the end of the 24-hour period, the radiated power output shall not have deteriorated by more than 3 db from that specified in paragraph 2.2.1. These values also apply to the test procedures contained in Paragraph T-1, Appendix A.

(b) *Marking.* In addition to the markings specified in § 37.7, equipment which has been designed to operate over the environmental conditions outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describ-

ing the inspection and test procedures applicable to his product. (See paragraph (d) of this section.)

(3) Six copies each, except where noted, of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

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

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

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

(d) *Quality control.* Portable aircraft emergency communications equipment shall be produced under a quality control system, established by the manufacturer, which will assure that each equipment is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c)(2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

(e) *Previously approved equipment.* Portable aircraft emergency communications equipment approved prior to the effective date of this section may continue to be manufactured under the provisions of its original approval.

§ 37.167 Aircraft tires—TSO-C62b.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for aircraft tires, excluding tail-wheel tires, which are to be used on civil aircraft of the United States. New design tires, manufactured on or after the effective date of this section, which are to be used on civil aircraft of the United States shall meet the standards specified in Federal Aviation Agency Standard, "Aircraft Tires" dated August 1, 1962.¹

(b) *Marking.* In lieu of the marking requirements of § 37.7(d), aircraft tires shall be legibly and permanently marked with the following information:

(1) Brand name or name of the manufacturer responsible for compliance and the country of manufacture if outside the United States.

(2) The size, ply rating, and serial number.

(3) The qualification test speed and skid depth when the test speed is greater than 160 m.p.h., also, the word "reinforced" if applicable.

(4) Applicable Technical Standard Order (TSO) number.

(c) *Data requirements.* Six copies each of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in

¹ Copies may be obtained upon request addressed to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

which the manufacturer is located: tire size, static and dynamic load rating, ply rating, rated inflation pressure, outside diameter, skid depth, static unbalance, tire weight and a summary of the load-speed-time parameters used in the high speed dynamometer tests.

§ 37.168 Airborne weather radar equipment (for air carrier aircraft)—TSO-C63.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne weather radar equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne weather radar equipment manufactured for use on civil air carrier aircraft on or after December 1, 1959, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards—Airborne Weather and Ground Mapping Radar Operating Within the Radio Frequency Bands of 5250 to 5440 Mc and 9300 to 9500 Mc," Paper 148-59/DO-96 dated August 11, 1959.¹ Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 148-59/DO-96 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.²

(2) *Exception.* (i) Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne weather radar equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(ii) The vibration values specified below may be used for indicators designed exclusively for installation in the cockpit area of aircraft in lieu of those specified in Paper 148-59/DO-96.

Amplitude: 0.015" (0.03" total excursion).
Frequency: Variable 10-55 cps.
Maximum Acceleration: 3.0 g.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 148-59/DO-96, 50 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

² In addition to the performance standards herein, airborne weather radar when installed in aircraft must meet installation requirements as well as functional and reliability flight tests of the pertinent airworthiness sections of the Federal Aviation Regulations.

DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne weather radar equipment approved prior to the effective date of this section, may continue to be manufactured under the provisions of its original approval.

§ 37.169 Oxygen mask assembly, continuous flow, passenger (for air carrier aircraft)—TSO-C64.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for passenger oxygen mask assemblies which are to be approved for use on civil aircraft of the United States. New models of passenger oxygen mask assemblies manufactured for installation on civil aircraft on or after the effective date of this section shall meet the standards set forth in National Aircraft Standard, NAS 1179, "Oxygen Mask Assembly, Passenger", Revision 2, dated March 31, 1961,¹ with exceptions to the standard listed in subparagraph (2) of this paragraph.

(2) *Exceptions.* (i) The following specifically numbered subparagraphs in NAS 1179 are not concerned with minimum performance and, therefore, are not essential to compliance with this section: 2.0 in its entirety, 3.1.1, 3.1.2, 3.1.3.7, 3.1.12, 3.3.11 in its entirety, 4.2, 4.3.5, 5.3, 5.6, 5.7, and 5.8.

(ii) Conformance to "NAS Standard Part Number" and "NAS Standard Drawing" referred to throughout NAS 1179 is not required.

(iii) Paragraph 1.4 of NAS 1179 shall be revised and made a part of this standard, as follows:

1.4 *Coding of performance classification.* An eight digit performance classification number shall be assigned to each class of masks. This number shall correspond to the number assigned to the minimum performance curve established in paragraph 4.1.7.2.2 and shall appear in the part callout as the first dash number following specification No. NAS 1179. Each pair of digits, starting with the first pair to the left, shall represent the required minimum oxygen flow rates (NTPD) to the mask shown on curve "C" of Figure 2 at cabin pressure altitudes of 15,000, 25,000, 30,000 feet and the maximum approved altitude, respectively. Flow rates shall be to one decimal.

Typical example. NAS 1179-08233248-XX*
0.8—required minimum oxygen flow, LPM, NTPD, at 15,000 ft.

¹ Copies of this standard may be obtained from the National Standards Association, Inc., 1815 Fourteenth Street NW., Washington 5, D.C.

*XX—Additional coding which the mask manufacturer may desire to add.

- 2.3—required minimum oxygen flow, LPM, NTPD, at 25,000 ft.
- 3.2—required minimum oxygen flow, LPM, NTPD, at 30,000 ft.
- 4.8—required minimum oxygen flow, LPM, NTPD, at maximum approved altitude.

(b) *Marking.* Each oxygen mask assembly shall be marked in accordance with § 37.7 except that the weight specified in § 37.7 may be omitted, and the following additional information shall be shown:

(1) The performance classification number.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his products. (See paragraph (d) of this section.)

(3) Six copies each, except where noted, of the following, shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

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

(ii) Installation procedures with applicable drawings and specifications, limitations, restrictions, or other conditions pertinent to installation. These limitations shall include the regulators which are capable of providing an oxygen partial pressure specified in the applicable Federal Aviation Regulations.

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

(iv) Manufacturer's cleaning and sterilizing procedures.

(d) *Quality control.* Passenger oxygen masks shall be produced under a quality control system, established by the manufacturer, which will assure that each mask assembly is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and production tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

(e) *Previously approved equipment.* Passenger oxygen masks approved prior to the effective date of this section may continue to be manufactured under the provisions of its original approval.

§ 37.170 Airborne doppler radar ground speed and/or drift angle measuring equipment (for air carrier aircraft)—TSO-C65.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne doppler radar ground speed and/or drift angle measuring equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne doppler radar ground speed and/or drift angle measuring equipment manufactured for use on civil air carrier aircraft on or after April 20, 1960, shall meet the minimum perform-

ance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards—Airborne Doppler Radar Ground Speed and/or Drift Angle Measuring Equipment" (Paper 166-59/DO-98¹ dated September 8, 1959). Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 166-59/DO-98 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.²

(2) *Exceptions.* (i) Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne doppler radar ground speed and/or drift angle measuring equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(ii) The vibration values specified below may be used for equipment designed exclusively for installation on the instrument panel of aircraft in lieu of those specified in Paper 100-54/DO-60 as amended. No shock mounting shall be used during the conduct of this test if the vibration values specified below are used.

Amplitude: 0.01" (0.02" total excursion).
Frequency: Variable 10-55 cps.
Maximum Acceleration: 1.5 g.

(iii) Equipment which is designed exclusively for installation on the instrument panel of aircraft need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(iv) Indicating instruments which are a part of the system, but which are not designed exclusively for installation on the instrument panel of aircraft, may also be tested to the vibration requirements specified in subdivision (ii) of this subparagraph, and need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment.

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 166-59/DO-98, 40 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

² In addition to the performance standards herein, airborne doppler radar ground speed and/or drift angle measuring equipment when installed in aircraft must meet installation requirements as well as functional and reliability flight tests of the pertinent airworthiness sections of the Federal Aviation Regulations.

Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment. Equipment which has been designed exclusively for installation on the instrument panel of aircraft and which meets only the amended vibration requirements outlined above shall be identified with the letters I.P. following the category of equipment, such as CAT. A—I.P.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne doppler radar ground speed and/or drift angle measuring equipment approved prior to April 20, 1960, may continue to be manufactured under the provisions of its original approval.

§ 37.171 Airborne distance measuring equipment (DMET) (for air carrier aircraft)—TSO-C66.

(a) *Applicability—(1) Minimum performance standards.* Minimum performance standards are hereby established for airborne distance measuring equipment (DMET) which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne distance measuring equipment (DMET) manufactured for use on civil air carrier aircraft on or after August 1, 1960, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards—Airborne Distance Measuring Equipment (DMET) Operating Within the Radio Frequency Range of 960-1215 Megacycles," (Paper 167-59/DO-99)¹ dated September 8, 1959. Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 167-59/DO-99 has been amended by Paper 256-58/EC-366 dated November 13, 1958. This amendment is also a part of the minimum performance standards. An exception to these standards is covered in subparagraph (2) of this paragraph.²

(2) *Exceptions.* (i) Radio Technical Commission for Aeronautics' Paper 100-54/DO-60 and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A,

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 167-59/DO-99, 50 cents per copy; Paper 100-54/DO-60, 20 cents per copy.

² In addition to the performance standards herein, airborne distance measuring equipment (DMET) when installed in aircraft must meet installation requirements as well as functional and reliability flight tests of the pertinent airworthiness sections of the Federal Aviation Regulations.

B, and C. Only airborne distance measuring equipment (DMET) which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(ii) The vibration values specified below may be used for equipment designed exclusively for installation on the instrument panel of aircraft in lieu of those specified in Paper 100-54/DO-60 as amended. No shock mounting shall be used during the conduct of this test if the vibration values specified below are used.

Amplitude: 0.01" (0.02" total excursion).
Frequency: Variable 10-55 c.p.s.
Maximum Acceleration: 1.5 g.

(iii) Equipment which is designed exclusively for installation on the instrument panel of aircraft need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(iv) Indicating instruments which are a part of the system, but which are not designed exclusively for installation on the instrument panel of aircraft, may also be tested to the vibration requirements specified in subdivision (ii) of this subparagraph, and need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(v) The following test condition may be substituted for that specified in paragraph 3.3, *Altitude Test*, of RTCA Paper 167-59/DO-99 for equipment intended for installation in heated and pressurized locations of aircraft:

With the equipment operating, adjust the atmospheric pressure to that equivalent to 40,000 plus-minus 5 percent feet at the ambient room temperature. Maintain this pressure for 10 minutes, then increase the pressure to that equivalent to 20,000 plus-minus 5 percent feet. Apply standard primary test voltage and frequency to the equipment and operate at maximum duty cycle for 15 minutes. Following this, with standard test voltage and frequency applied, and the equipment maintained at a pressure equivalent to 20,000 plus-minus 5 percent feet, the standards of paragraphs 2.1, 2.7, and 2.9 shall be met. During this test, the test chamber wall shall not be colder than -40° C.

(b) *Marking.* In addition to the information required in § 37.7, equipment which has been designed to operate over the environmental conditions as outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment. Equipment which has been designed exclusively for installation on the instrument panel of aircraft and which meets only the amended vibration requirements outlined above shall be identified with the letters I.P. following the category of equipment, such as CAT. A—I.P.

(c) *Data requirements.* With the statement of conformance, one copy each of the manufacturer's operating instructions, schematic diagrams, and installation procedures shall be furnished the

Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(d) *Previously approved equipment.* Airborne distance measuring equipment (DMET) approved prior to August 1, 1960, may continue to be manufactured under the provisions of its original approval.

§ 37.172 Aircraft wheels and brakes—TSO-C26a.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for aircraft wheels and brakes which are to be used on United States civil aircraft of the following categories:

Wheels—Transport and non-transport category airplanes.

Wheels—Transport and non-transport category rotorcraft.

Brakes—Transport category airplanes.

New models of wheels and brakes manufactured for installation on the above aircraft on or after June 1, 1961, shall meet the standards of Aeronautical Standard AS-227-C revised February 1, 1959,¹ with the exceptions in subparagraph (2) of this paragraph.

(2) *Exceptions.* (i) Unless determined to be unnecessary, means shall be provided to minimize the probability of wheel and tire explosions which result from elevated brake temperatures.

(ii) Reference paragraph 5.4.7.1 of AS 227-C, Braking Capacity Calculations. The deceleration effects of propeller reverse pitch, drag parachutes and engine thrust reversers shall not be considered in determining brake kinetic energy ratings.

(iii) Taxi and Parking Test. At least one maximum weight landing test followed by a taxi roll, one taxi stop and parking test, which realistically simulate normal airplane operation, shall be conducted on the dynamometer. The taxi speed and distance shall be obtained from the airplane manufacturer.

(iv) Reference Table II of AS 227-C. Change 65 to 100 normal energy dynamometer stops in Method I and II.

(v) Reference Table II of AS 227-C. Change Note 2 to read as follows: One change of brake lining and attached discs is permissible in making the 100 normal energy stops. The remainder of the brake assembly parts shall withstand the 100 normal energy stops without failure or impairment of operation.

(vi) Reference Notes 3, 6, and 8 of Table II of AS 227-C. The most critical speeds used in the analysis shall include consideration for high ambient temperatures and airport elevations.

(vii) ARP 586 "Wheel Castings" dated March 1, 1960.¹

(a) Add the following sentence at the end of paragraph 2. "Acceptance of the provisions contained herein is predicated on the use of a casting factor of not less than 1.33 on ultimate radial and side loads."

(b) Add the words "in accordance with paragraph 4.1 or 4.2" to the end of paragraph 4.3.

¹ Copies may be obtained from the Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York 17, New York.

(c) Paragraph 5.2.2. Replace the words "When at least five consecutive acceptable quality castings have been produced" by the following: "When quality control history is established, * * *."

(d) Revise the end of paragraph 9.1 to read as follows " * * * in lieu of the procedures outlined above when authorized by the FAA."

(b) *Marking.* In lieu of the marking requirements of § 37.7, the aircraft wheels and brakes shall be legibly and permanently marked with the following information:

(1) Name of the manufacturer responsible for compliance.

(2) Serial number and drawing number.

(3) Applicable technical standard order (TSO) number.

(4) Size (this marking applies to wheels only). All stamped, etched or embossed markings shall be located in noncritical areas.

(c) *Data Requirements.* (1) The manufacturer shall maintain a current file of complete data regarding all his inspection work and tests required to determine compliance with the standards specified herein. (See paragraph (e) of this section.)

(2) Two copies of the following data shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(i) Weight of brake assembly.

(ii) Maximum rejected takeoff kinetic energy in foot-pounds.

(iii) Normal kinetic energy in foot-pounds.

(iv) Maximum operating brake pressure.

(v) Applicable speed specified in Note 1 or Note 5 of Table II of AS-227-C.

(vi) Type of hydraulic fluid used.

(vii) Weight of wheel assembly.

(viii) Maximum static load rating in pounds.

(ix) Maximum limit load rating in pounds.

(d) *Previously Approved Equipment.* Wheels and brakes approved prior to the effective date of this section may continue to be manufactured under the provisions of their original approval.

(e) *Quality control.* Each wheel and brake shall be produced under a quality control system, established by the manufacturer, which will assure that each wheel and brake is in conformity with the requirements of this standard and is in an airworthy condition. This system shall be described in the data required under paragraph (c) (1) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this standard.

§ 37.173 Airborne radar altimeter equipment (for air carrier aircraft)—TSO-C67.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne radar altimeter equipment which is to be used on civil

aircraft of the United States engaged in air carrier operations. New models of airborne radar altimeter equipment manufactured for use on civil air carrier aircraft on or after November 15, 1960, shall meet the minimum performance standards as set forth in Radio Technical Commission for Aeronautics' Paper entitled "Minimum Performance Standards for Airborne Radar Altimeter Equipment Intended for Determining Pressure Gradients and Operating Within the Radio Frequency Band of 420-460 Megacycles" (Paper 73-60/DO-103)¹ dated April 12, 1960. Radio Technical Commission for Aeronautics' Paper 100-54/DO-60¹ which is incorporated by reference in and thus is a part of Paper 73-60/DO-103 has been amended by Paper 256-58/EC-366. This amendment is also a part of the minimum performance standards. Exceptions, additions, and substitutions to these standards are covered in subparagraph (2) of this paragraph.²

(2) *Exceptions.* (i) Radio Technical Commission for Aeronautics' Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne radar altimeter equipment which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(ii) The vibration values specified below may be used for equipment designed exclusively for installation on the instrument panel of aircraft in lieu of those specified in Paper 100-54/DO-60 as amended. No shock mounting shall be used during the conduct of this test if the vibration values specified below are used,

Amplitude: 0.01" (0.02" total excursion).
Frequency: Variable 10-55 c.p.s.
Maximum Acceleration: 1.5 g.

(iii) Equipment which is designed exclusively for installation on the instrument panel of aircraft need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(iv) Indicating instruments which are a part of the system, but which are not designed exclusively for installation on the instrument panel of aircraft, may also be tested to the vibration requirements specified in subdivision (ii) of this subparagraph, and need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 73-60/DO-103, 40 cents per copy; Paper 100-54/DO-60 with Amendment Paper 256-58/EC-366, 20 cents per copy.

² When airborne radar altimeter equipment is installed on civil aircraft, the installation must comply with the functional and installation requirements of Parts 23, 25, 27 or 29 of the Federal Aviation Regulations as applicable.

(b) *Marking.* (1) In addition to the markings specified in § 37.7, equipment which has been designed to operate over the environmental conditions outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment. Equipment which has been designed exclusively for installation on the instrument panel of aircraft and which meets only the amended vibration requirements outlined above shall be identified with the letters I.P. following the category of equipment, such as CAT. A-I.P.

(2) Each major component of airborne radar altimeter equipment (antenna, power supply, etc.) shall be identified with at least the manufacturer's name and TSO number.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product. (See paragraph (d) of this section.)

(3) Six copies each, except where noted, of the following, shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

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

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

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

(d) *Quality control.* Airborne radar altimeter equipment shall be produced under a quality control system, established by the manufacturer, which will assure that each equipment is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

(e) *Previously approved equipment.* Airborne radar altimeter equipment approved prior to November 15, 1960, may continue to be manufactured under the provisions of its original approval.

§ 37.174 Airborne automatic dead reckoning computer equipment utilizing aircraft heading and doppler-obtained ground speed and drift angle data (for air carrier aircraft)—TSO-C68.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne automatic dead reckoning computer equipment utilizing aircraft heading and doppler-obtained ground speed and drift angle data which

is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne automatic dead reckoning computer equipment utilizing aircraft heading and doppler-obtained ground speed and drift angle data manufactured for use on civil air carrier aircraft on or after January 16, 1961, shall meet the standards in Radio Technical Commission for Aeronautics Papers 101-60/DO-104¹ dated June 8, 1960; 100-54/DO-60¹ dated April 13, 1954; and 256-58/EC-366¹ dated November 13, 1958. Exceptions, additions, and substitutions to these standards are listed in subparagraph (2) of this paragraph.

(2) *Exceptions.* (i) Radio Technical Commission for Aeronautics Paper 100-54/DO-60, and amendment Paper 256-58/EC-366 dated November 13, 1958, outline environmental test procedures for equipment designed to operate under three environmental test conditions as specified therein under Procedures A, B, and C. Only airborne automatic dead reckoning computer equipment utilizing aircraft heading and doppler-obtained ground speed and drift angle data which meets the operating requirements as outlined under Procedure A or Procedure B of Paper 100-54/DO-60, as amended, is eligible under this section.

(ii) The vibration values specified below may be used for equipment designed exclusively for installation on the instrument panel of aircraft in lieu of those specified in Paper 100-54/DO-60 as amended. No shock mounting shall be used during the conduct of this test if the vibration values specified below are used.

Amplitude: 0.01" (0.02" total excursion).
Frequency: Variable 10-55 c.p.s.
Maximum Acceleration: 1.5 g.

(iii) Equipment which is designed exclusively for installation on the instrument panel of aircraft need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(iv) Indicating instruments which are a part of the system, but which are not designed exclusively for installation on the instrument panel of aircraft, may also be tested to the vibration requirements specified in subdivision (ii) of this subparagraph, and need not be subjected to the shock requirements outlined in Paper 100-54/DO-60 as amended.

(b) *Marking.* (1) In addition to the markings specified in § 37.7, equipment which has been designed to operate over the environmental conditions outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended, shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment. Equipment which has been designed

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006. Paper 101-60/DO-104, 45 cents per copy; Paper 100-54/DO-60 with Amendment Paper 256-58/EC-366, 20 cents per copy.

exclusively for installation on the instrument panel of aircraft and which meets only the amended vibration requirements outlined above shall be identified with the letters I.P. following the category of equipment, such as CAT. A-I.P.

(2) Each major component of equipment (antenna, power supply, etc.) shall be identified with at least the manufacturer's name and TSO number.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product. (See paragraph (d) of this section.)

(3) Six copies each, except where noted, of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

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

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

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

(d) *Quality control.* Airborne automatic dead reckoning computer equipment utilizing aircraft heading and doppler-obtained ground speed and drift angle data shall be produced under a quality control system, established by the manufacturer, which will assure that each equipment is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

(e) *Previously approved equipment.* Airborne automatic dead reckoning computer equipment utilizing aircraft heading and doppler-obtained ground speed and drift angle data approved prior to January 16, 1961, may continue to be manufactured under the provisions of its original approval.

§ 37.175 Emergency evacuation slides—TSO-C69.

(a) *Applicability*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for emergency evacuation slides which are required to be of an approved type to be eligible for use on civil aircraft of the United States. New models of emergency evacuation slides manufactured on or after August 15, 1961, shall meet the standards set forth in FAA standard "Emergency Evacuation Slides".¹ Emergency evacuation slides

¹ Copies of the FAA Standard may be obtained upon request addressed to: Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

approved prior to August 15, 1961, may continue to be manufactured under the provisions of their original approval.

(b) *Marking.* The slide shall be permanently marked in accordance with the marking provisions of § 37.7 except that (1) a part number which shall vary with length or any other change in the slide, (2) serial number, and (3) date of manufacture shall be included.

(c) *Data requirements.* (1) One copy each of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

(i) Packing instructions.
 (ii) Operation instructions.
 (iii) Assembly drawing.
 (iv) Applicable limitations pertaining to installation of slides on aircraft. These limitations shall include the minimum and maximum stowage area temperatures and any other limitations which will prevent the slide from performing its intended function and from complying with the minimum performance standards under all reasonable foreseeable emergency conditions. The slide manufacturer shall also provide the purchaser with such limitations.

(2) The manufacturer shall maintain a current file of complete design data.

(3) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his evacuation slide. (See paragraph (d) of this section.)

(d) *Quality control.* Emergency evacuation slides shall be produced under a quality control system, established by the manufacturer, which will assure that each slide is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c) (3) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

§ 37.176 Liferrafts (nonreversible)—TSO-C70.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for liferafts (nonreversible) which are required to be of an approved type to be eligible for use on civil aircraft of the United States. Nonreversible liferaft models manufactured on or after the effective date of this section shall meet the standards set forth in FAA Standard "Nonreversible Liferrafts"¹ dated March 1, 1961.

(b) *Marking.* The raft shall be permanently marked in accordance with the marking provisions of § 37.7 except for the following:

(1) The serial number of the raft need not be included.

¹ Copies may be obtained upon request addressed to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

(2) Include the rated and the overload capacity of the raft.

(3) Include the type of raft, i.e., Type I or Type II.

(c) *Data requirements.* (1) One copy each of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located:

(i) Packing instructions.
 (ii) Operation instructions.
 (iii) Assembly drawing.
 (iv) Applicable limitations pertaining to installation of rafts on aircraft. These limitations shall include the minimum and maximum stowage area temperatures and any other limitations which will prevent the raft from performing its intended function and from complying with the minimum performance standards under all reasonably foreseeable emergency conditions. The raft manufacturer shall also provide the purchaser with such limitations.

(2) The manufacturer shall maintain a current file of complete design data.

(3) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his liferafts. (See paragraph (d) of this section.)

(d) *Quality control.* Liferrafts shall be produced under a quality control system, established by the manufacturer, which will assure that each raft is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c) (3) of this section. The Administrator shall be permitted to make such inspections and production tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

§ 37.177 Airborne static ("DC to DC") electrical power converter (for air carrier aircraft)—TSO-C71.

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne static ("DC to DC") electrical power converter equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of such equipment manufactured for use on civil air carrier aircraft on or after the effective date of this section shall meet the standards set forth in FAA Standard, "Airborne Static ('DC to DC') Electrical Power Converter (For Air Carrier Aircraft)" dated April 15, 1961,² and Radio Technical Commission for Aeronautics Paper 100-54/DO-60 as amended by Paper 256-58/EC-366 dated November 13, 1958.² Manufacturers of such equipment shall also comply with the requirements of paragraphs (b), (c), and (d)

² Copies of the FAA Standard may be obtained upon request addressed to: Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553. Copies of RTCA Paper 100-54/DO-60 may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington, D.C., 20006, for 20 cents per copy.

of this section for acceptance of their equipment under this section.

(b) *Marking.* In addition to the markings specified in § 37.7, equipment which has been designed to operate over the environmental conditions outlined in Procedure A of RTCA Paper 100-54/DO-60, as amended shall be marked as Category A equipment. Equipment which has been designed to operate over the environmental conditions outlined in Procedure B of this same paper shall be marked as Category B equipment.

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product. (See paragraph (d) of this section.)

(3) Six copies each, except where noted, of the following shall be furnished to the Chief Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

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

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

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

(d) *Quality control.* Airborne static ("DC to DC") electrical power converter equipment shall be produced under a quality control system, established by the manufacturer, which will assure that each equipment is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

(e) *Previously approved equipment.* Airborne static ("DC to DC") electrical power converter equipment approved prior to the effective date of this section may continue to be manufactured under the provisions of its original approval.

§ 37.178 Individual flotation devices—TSO-C72.

(a) *Applicability.* Minimum performance standards are hereby established for individual flotation devices for use on civil aircraft of the United States. New models of individual flotation devices manufactured on or after the effective date of this section shall meet the standards specified in the Federal Aviation Agency Standard, "Individual Flotation Devices",¹ dated July 15, 1963.

(b) *Marking.* The markings specified in § 37.7(d) shall be shown except that the weight need not be included.

(c) *Data requirements.* In addition to the data specified in § 37.5, the manufacturer shall furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the

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manufacturer is located, the following technical data:

- (1) Six copies of the descriptive information on the device;
- (2) Six copies of the manufacturers' equipment operating instructions and limitations;
- (3) Six copies of the applicable installation instructions indicating any restrictions or other conditions pertinent to installation;
- (4) One copy of the manufacturers' test report; and
- (5) One copy of the manufacturers' special cleaning and maintenance instructions.

§ 37.179 Static electrical power inverter—TSO-C73.

(a) *Applicability.* Minimum performance standards are hereby established for airborne static electrical power inverter equipment which is to be used on United States civil aircraft engaged in air carrier operations. New models of airborne static electrical power inverter equipment manufactured on or after the effective date of this section shall meet the standards specified in Federal Aviation Agency Standard, "Airborne Static Electrical Power Inverter", dated July 25, 1963.¹

(b) *Marking.* In addition to the marking requirements of § 37.7(d), each static inverter shall be marked with the following:

- (1) Rated terminal voltage, frequency, and the number of phases;
- (2) Rated power in volt amperes;
- (3) Output load power factor; and
- (4) Maximum operating altitude.

(c) *Data requirements.* In addition to the data required by § 37.5, the manufacturer shall 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) Six copies of the manufacturer's operating instruction and the equipment limitations. Installation procedures with applicable schematic drawings, wiring diagrams, and specifications. Indicate any restrictions or conditions pertinent to installation, and

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

§ 37.180 Airborne ATC transponder equipment (for air carrier aircraft—TSO-C74).

(a) *Applicability.*—(1) *Minimum performance standards.* Minimum performance standards are hereby established for airborne ATC transponder equipment which is to be used on civil aircraft of the United States engaged in air carrier operations. New models of airborne ATC transponder equipment manufactured for use on civil air carrier aircraft on or after the effective date of this section shall meet the standards as set forth in Radio Technical Commission for Aeronautics Papers 181-

61/DO-112¹ dated December 14, 1961, and 120-61/DO-108¹ dated July 13 1961, with the exceptions to these standards listed in subparagraph (2) of this paragraph.

(2) *Exceptions.* Radio Technical Commission for Aeronautics Paper 120-61/DO-108 outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have categories established and some do not. Where categories are established, only equipment which qualifies under the following categories, as specified in RTCA Paper 120-61/DO-108, is eligible under this order:

- (i) Temperature-Altitude Test—Categories A, B, C, or D.
- (ii) Humidity Test—Categories A or B.
- (iii) Vibration Test—Categories A, B, C, D, E, or F.
- (iv) Audio-Frequency Magnetic Field Susceptibility Test—Categories A or B.
- (v) Radio-Frequency Susceptibility Test—Category A.
- (vi) Emission of Spurious Radio-Frequency Energy Test—Category A.

(b) *Marking.* (1) In addition to the markings specified in § 37.7, the equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are seven environmental test procedures outlined in RTCA Paper 120-61/DO-108 which have categories established. These shall be identified on the nameplate by the words "environmental categories" or, as abbreviated, "Env. Cat." followed by seven letters which identify the categories designated in RTCA Paper 120-61/DO-108. Reading from left to right, the category designations shall appear on the nameplate in the following order so that they may be readily identified:

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

Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirement shall be identified by the letter "X".

(2) Equipment which is intended for installation in aircraft which operate at altitudes above 15,000 feet shall be identified on the nameplate as Class I equipment.

(3) Equipment which is intended for installation in aircraft which operate at altitudes not exceeding 15,000 feet shall be identified on the nameplate as Class II equipment. 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 shall be marked with both categories in the space designated for that category by placing one letter above the other in the following manner:

Env. Cat. ^AABAAAX Class I.
D

(4) Each major component of equipment (antenna, power supply, 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.

NOTE: A typical nameplate identification would be as follows:

Env. Cat. DABAAAX
Class I

(c) *Data requirements.* (1) The manufacturer shall maintain a current file of complete design data.

(2) The manufacturer shall maintain a current file of complete data describing the inspection and test procedures applicable to his product. (See paragraph (d) of this section.)

(3) Six copies each, except where noted, of the following shall be furnished to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in which the manufacturer is located.

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

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

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

(d) *Quality control.* Airborne ATC transponder equipment shall be produced under a quality control system, established by the manufacturer, which will assure that each equipment is in conformity with the requirements of this section and is in a condition for safe operation. This system shall be described in the data required under paragraph (c) (2) of this section. The Administrator shall be permitted to make such inspections and tests at the manufacturer's facility as may be necessary to determine compliance with the requirements of this section.

(e) *Previously approved equipment.* Airborne ATC transponder equipment approved prior to the effective date of this section may continue to be manufactured under the provisions of its original approval.

§ 37.181 Hydraulic hose assemblies—TSO-C75.

(a) *Applicability.* Minimum performance standards are hereby established for hydraulic hose assemblies which are to be used on U.S. civil transport category aircraft. New models of hydraulic hose assemblies, manufactured on or after the effective date of this section, which are to be used on U.S. civil transport category aircraft shall meet the standards specified in Federal Aviation Agency Standard, "Hydraulic Hose Assemblies",

¹ Copies may be obtained upon request addressed to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

¹ Copies of these papers may be obtained from the RTCA Secretariat, Suite 302, NADA Building, 20th and K Streets NW., Washington D.C., 20006. Paper 181-61/DO-112, 55 cents per copy; Paper 120-61/DO-108, 75 cents per copy.

dated December 15, 1962.¹ Hydraulic hose assemblies approved prior to the effective date of this section may continue to be manufactured under the provisions of their prior approval.

(b) *Marking.* Articles shall be marked in accordance with the requirements of § 37.7(d) with the following exceptions:

(1) Trademark may be used in lieu of name, and manufacturer's address is not required;

(2) Size, type, and maximum operating pressure of the hose assembly shall be shown in lieu of the weight in paragraph (d) (3) of § 37.7;

(3) Part number shall be shown;

(4) Date of manufacture in terms of month and year is to be shown and serial number omitted;

(5) In lieu of paragraph (d) (2) of § 37.7 hose assemblies suitable for use with synthetic base fluids shall be marked with the letter "S" immediately following the type designation. Assemblies suitable for use with petroleum base fluids shall be marked with the letter "P". Assemblies suitable for use with both synthetic and petroleum base fluids shall be marked with "S/P", i.e., Type II-B-S, Type II-B-P, or Type II-B-S/P; and

(6) Hose assemblies complying with the fire resistant requirements shall be identified by the letter "F" immediately following the type and fluid designation, i.e., Type II-B-S/P-F.

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

(1) Type;

(2) Size;

(3) Maximum operating pressure;

(4) Part number; and

(5) Installation instructions and limitations, if any.

(d) Effective date. September 4, 1963.

§ 37.182 Fuel drain valves—TSO-C76.

(a) *Applicability.* Minimum performance standards are hereby established for fuel drain valves to be used in civil aircraft of the United States. New models of fuel drain valves manufactured on or after the effective date of this section shall meet the standards specified in the Federal Aviation Agency Standards, "Fuel Drain Valves", dated October 1, 1962.¹

(b) *Marking.* Articles shall be marked in accordance with the requirements of § 37.7(d) except that:

(1) The size shall be shown in lieu of the weight required by § 37.7(d) (3); and

(2) Parts too small to contain all the required information shall be marked with the TSO number and the manufacturer's name or identifying mark. For such parts, the other marking data required by § 37.7(d) shall be placed on the shipping container of the part.

¹ Copies may be obtained upon request addressed to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.

(c) *Data requirements.* In addition to the data specified in § 37.5 the manufacturer shall 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) Six copies of an instruction manual describing the product and supplying information on maintenance, overhaul, and installation.

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

§ 37.183 Gas turbine auxiliary power units—TSO-C77.

(a) *Applicability.* Minimum performance standards are hereby established for gas turbine auxiliary power units for use on civil aircraft of the United States. New models of gas turbine auxiliary power units manufactured for use on civil aircraft on or after the effective date of this section shall meet the standards specified in the Federal Aviation Agency Standard, "Gas Turbine Auxiliary Power Units", dated January 3, 1963.¹

(b) *Marking.* Articles shall be marked in accordance with the requirements of § 37.7(d) except that the weight need only be shown to the nearest pound. In addition, the following shall also be shown:

(1) Maximum rated speeds and temperature;

(2) Maximum allowable speeds and temperature;

(3) Maximum rated output;

(4) Category and class of service;

(5) Fuel grade and specification; and

(6) Lubricating oil grade and specification.

(c) *Data requirements.* In accordance with the provisions of § 37.5, the manufacturer shall 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) Instruction manual containing instructions for the installation, operation, servicing maintenance, repair, and overhaul of the unit.

(2) Model specification.

§ 37.185 Fire detectors (radiation sensing type)—TSO-C79.

(a) *Applicability.* Minimum performance standards are hereby established for radiation sensing type fire detectors which are for use on both piston and turbine engine-powered civil aircraft of the United States. New models of fire detectors (radiation sensing type) manufactured on or after the effective date of this section, which are to be used on civil aircraft of the United States, shall meet the standards specified in Federal Aviation Agency Standard, "Fire Detectors (Radiation Sensing Type)", dated May 15, 1963.¹

(b) *Marking.* In lieu of the weight required in § 37.7(d) (3), the operating voltage for the detector shall be shown. Compliance of the detector with the piston or turbine engine requirements, or both, shall be designated by -P, -T, or

-PT, respectively, as a suffix following the technical standard order designation as TSO-C79-P.

(c) *Data requirements.* (1) In accordance with the provisions of § 37.5, the manufacturer shall 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:

(i) Six copies of the manufacturer's operating instructions and equipment limitations;

(ii) Six copies of the installation procedures with applicable schematic drawings, wiring diagrams, and specifications, indicating any limitations, restrictions, or other conditions pertinent to installation; and

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

(2) The data required under subparagraph (1) (i) and (ii) of this paragraph shall include the following:

(i) Cone of vision expressed in degrees (apex of the cone is to be at the center of the sensor and the axis of the cone is to be at right angles to the face of the sensor).

(ii) Maximum effective range at field extremities;

(iii) Maximum allowable normal ambient temperature at the point of detector location;

(iv) Maximum and minimum allowable rate of temperature rise at point of detector location as a result of normal operation;

(v) Operating voltage;

(vi) Mounting or support method;

(vii) Maximum or minimum number of units which can be used in one circuit or one fire zone without adversely affecting sensitivity or causing false indications due to temperature;

(viii) Maximum allowable vibration at point of detector location;

(ix) Installation limitations (minimum distance) because of magnetic effect;

(x) Peak RF voltage and corresponding frequency;

(xi) Whether instrument is for pressurized area, nonpressurized area or both;

(xii) Which of the conditions in paragraphs 7.3.3, 7.3.4, 7.3.5 and 7.3.6 adversely affect the detector; and

(xiii) Whether detector meets the fire resistance requirements of paragraph 7.14.

§ 37.186 Flexible fuel and oil cell material—TSO-C80.

(a) *Applicability.* Minimum performance standards are hereby established for flexible fuel and oil cell liner material. New types of flexible fuel and oil cell material manufactured after the effective date of this section for use in civil aircraft of the United States shall meet the standards specified in Federal Aviation Agency Standard, "Flexible Fuel and Oil Cell Material", dated August 1, 1963.¹

(b) *Marking.* In lieu of the marking requirements of § 37.7(d), flexible fuel and oil cell material shall be legibly and permanently marked with the following information:

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(1) Name and address of the manufacturer;

(2) Type of fluid for which approved, i.e. fuel, or MIL-L-6082 oil, or MIL-L-7808 oil;

(3) For oil cell material, the minimum and maximum temperature limit;

(4) For oil cell material, the oil-dilution suitability;

(5) Month and year manufactured; and

(6) Applicable Technical Standard Order (TSO) number.

(c) *Data requirements.* In accordance with the provisions of § 37.5, the manufacturer shall 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) Six copies of the manufacturer's end product typical assembly instructions and limitations;

(2) Six copies of the recommended installation procedures, limitations, restrictions, or other conditions pertinent to a satisfactory installation;

(3) Six copies of the instructions for the inspection, repair and storage of material and/or cells including age limits on material, i.e. shelf life and service time;

(4) Six copies of the following descriptive information:

(i) construction number and description (ply by ply) of the construction buildup complete with weight and gage of each ply,

(ii) support means (type of fastener and locations),

(iii) total weight per square foot of cell constructions, and

(iv) total thickness of cell construction; and

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

(d) *Effective date.* May 26, 1964.

§ 37.190 Cockpit voice recorder—TSO C-84.

(a) *Applicability.* (1) Minimum performance standards are hereby established for cockpit voice recorders for use on United States civil aircraft. New models of cockpit voice recorders manufactured for use on civil aircraft on or after September 2, 1964, shall meet the standards specified in Federal Aviation Agency Standard, "Minimum Performance Standards for Cockpit Voice Recorders," dated November 1, 1963,¹ and Federal Aviation Agency document entitled, "Environmental Test Procedures for Airborne Electronic Equipment," August 31, 1962,¹ except as provided in subparagraph (2) of this paragraph.

(2) Federal Aviation Agency document, "Environmental Test Procedures

for Airborne Electronic Equipment," outlines various test procedures which define the environmental extremes over which the equipment shall be designed to operate. Some test procedures have categories established and some do not. Where categories are established, only equipment which qualifies under one or more of the following categories, as specified in the FAA document, is eligible for approval under this order:

(i) Temperature-Altitude Test—Categories A, B, C, or D;

(ii) Vibration Test—Categories A, B, C, D, E, or F;

(iii) Audio-Frequency Magnetic Field Susceptibility Test—Categories A or B;

(iv) Radio-Frequency Susceptibility Test—Category A; and

(v) Emission of Spurious Radio-Frequency Energy Test—Category A.

(b) *Marking.* (1) In addition to the markings specified in § 37.7(d), the equipment shall be marked to indicate the environmental extremes over which it has been designed to operate. There are six environmental test 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 under which the equipment is qualified. 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 Category;

(ii) Vibration Test Category;

(iii) Audio-Frequency Magnetic Field Susceptibility Test Category;

(iv) Radio-Frequency Susceptibility Test Category;

(v) Emission of Spurious Radio-Frequency Energy Test Category; and

(vi) Explosion Test.

(2) Equipment which meets the explosion test requirement shall be identified by the letter "E". Equipment which does not meet the explosion test requirement shall be identified by the letter "X". A typical nameplate identification would be as follows: Env. Cat. DBAAAX.

(3) 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 shall be marked with both categories in the space designated for that category by placing one letter above the other in the following

manner: Env. Cat. ^A_D BAAAX.

(c) *Data requirements.* In accordance with the provisions of § 37.5, the manufacturer shall 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) Six copies of the manufacturer's operating instructions and equipment limitations;

(2) Six copies of the installation procedures with applicable schematic drawings, wiring diagrams, and specifications, indicating any limitations, restrictions, or other conditions pertinent to installation; and

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

§ 37.191 Survivor locator lights—TSO-C85.

(a) *Applicability.* Minimum performance standards are hereby established for survivor locator lights intended for installation on life preservers (adult and child) and life rafts for use in civil aircraft of the United States. New models of survivor locator lights manufactured on or after the effective date of this section shall meet the requirements specified in Federal Aviation Agency Standard, "Survivor Locator Lights", dated April 22, 1964.¹

(b) *Marking.* The survivor locator light shall be permanently marked in accordance with the provisions of § 37.7(d), except that the weight of the light assembly may be omitted.

(c) *Data requirements.* In accordance with the provisions of § 37.5, as applicable, manufacturers of survivor locator lights shall 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:

Six copies of an instruction manual containing descriptive information of the device, information for its maintenance and overhaul, instruction concerning the proper mounting of the light on the life preservers or life rafts to ensure continued compliance with prescribed minimum performance standards and pertinent operating instructions and limitations for the device.

(d) *Effective date.* July 6, 1964.

DISTRIBUTION TABLE

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514.2 (less (a) and (b))	37.5
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514.10	37.21
514.11—514.91	37.111—37.191

[F.R. Doc. 64-11725; Filed, Nov. 16, 1964; 8:50 a.m.]

¹ Copies may be obtained upon request addressed to the Federal Aviation Agency, Attention HQ-630, Washington, D.C., 20553.

¹ Copies may be obtained upon request addressed to Library Services Division, HQ-630, Federal Aviation Agency, Washington, D.C., 20553.