FEDERAL AVIATION AGENCY
FLIGHT STANDARDS SERVICE
Washington 25, D. C.

November 29, 1962

REGULATIONS OF THE ADMINISTRATOR DRAFT RELEASE NO. 62-49

SUBJECT: Revision to Technical Standard Order C21a "Special Aircraft Turnbuckle Assemblies and Turnbuckle Safetying Devices"

The Flight Standards Service of the Federal Aviation Agency has under consideration an amendment to Part 514 of the Regulations of the Administrator to revise Technical Standard Order C21a "Special Aircraft Turnbuckle Assemblies and Turnbuckle Safetying Devices". The reasons therefor are set forth in the explanatory statement of the attached proposal which is being published in the Federal Register as a notice of proposed rule making.

The Flight Standards Service desires that all persons who will be affected by the requirements of this proposal be fully informed as to its effect upon them and is therefore circulating copies in order to afford interested persons ample opportunity to submit comments as they may desire.

Because of the large number of comments which we anticipate receiving in response to this draft release, we will be unable to acknowledge receipt of each reply. However, you may be assured that all comment will be given careful consideration.

It should be noted that comments should be submitted, preferably in duplicate, to the Docket Section of the Federal Aviation Agency, and in order to insure consideration must be received on or before January 23, 1963.

J. S. Moore

Acting Director
Flight Standards Service

FEDERAL AVIATION AGENCY

FLIGHT STANDARDS SERVICE

(14 CFR 514)

[Regulatory Docket No. 1504; Draft Release No. 62-49]

TECHNICAL STANDARD ORDERS FOR AIRCRAFT MATERIALS,

PARTS AND APPLIANCES

NOTICE OF PROPOSED RULE MAKING

Pursuant to the authority delegated to me by the Administrator (§ 11.45 27 F. R. 9585) notice is hereby given that the Federal Aviation Agency has under consideration a proposal to revise Section 514.31 of Part 514 of the Regulations of the Administrator (14 CFR Part 514) by adding a new technical standard order. This Technical Standard Order establishes minimum performance standards for new models of special aircraft turnbuckle assemblies and turnbuckle safetying devices for use on civil aircraft of the United States.

This proposal revises the strength values for turnbuckles contained in the current TSO to make them more nearly equivalent to the cable strengths, and provides for the current design practice of using aluminum as well as brass in turnbuckle components. Under this proposal, the requirements would be now incorporated into an FAA standard, instead of referring to military specifications as was done in the previous TSO.

Interested persons may participate in the making of the proposed rule by submitting such written data, views or arguments as they may desire. Communications should be submitted in duplicate to the Docket Section of the Federal Aviation Agency, Room A-103, 1711 New York Avenue, N. W., Washington 25, D. C. All communications received on or before January 23 1963, will be considered by the Administrator before taking action on the proposed rule. The proposals contained in this notice may be changed in light of the comments received. All comments submitted will be available in the Docket Section for examination by interested persons at any time.

This amendment is proposed under the authority of Sections 313(a) and 601 of the Federal Aviation Act of 1958 (72 Stat. 752, 775; 49 U.S.C. 1354(a), 1421).

In consideration of the foregoing it is proposed to amend Part 514 as follows:

By revising section 514.31:

§ 514.31 Special aircraft turnbuckle assemblies and turnbuckle safetying devices - TSO-C21b--(a) Applicability. Minimum performance standards are hereby established for special aircraft turnbuckle assemblies and turnbuckle safetying devices for use on civil aircraft of the United States. New models of special turnbuckle assemblies and safetying devices manufactured on or after the effective date of this section shall meet the standards specified in the Federal Aviation Agency Standard "Special Aircraft Turnbuckle Assemblies and Turnbuckle Devices", dated October 15, 1962.[1/]

(b) Marking. Articles shall be marked in accordance with the requirements of § 514.3(d) except that 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 514.3(d) shall be placed on the shipping container of the part.

(c) Data Requirements. In accordance with the provisions of § 514.2, 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 descriptive information on the device;

1/Copies may be obtained upon request addressed to Publishing and Graphics Branch, Inquiry Section, MS-158, Federal Aviation Agency, Washington 25, D. C.

October 15, 1962

FAA STANDARD

SPECIAL AIRCRAFT TURNBUCKLE ASSEMBLIES AND TURNBUCKLE SAFETYING DEVICES

1.0 PURPOSE: To establish minimum performance standards for special aircraft turnbuckle assemblies and turnbuckle safetying devices which are to be used on civil aircraft.

2.0 SCOPE: This standard covers special aircraft turnbuckle assemblies and turnbuckle safetying devices designed to supplement or replace conventional wire safetying methods.

3.0 GENERAL REQUIREMENTS:

3.1 Materials and Workmanship

3.1.1 Materials. Materials shall be suitable for the purpose intended. The suitability of the materials shall be determined on the basis of satisfactory service experience or substantiating tests.

3.1.2 Workmanship. Finished parts shall be smooth and free from burrs, cracks, flaws, pronounced tool marks, or other injurious defects which would prevent proper functioning or performance.

3.2 Protection.

3.2.1 Protective Treatment. Any parts constructed of carbon and alloy steel shall be cadmium plated in accordance with an established specification to a minimum thickness of 0.00020 inches on all visible surfaces. Interior openings of steel turnbuckle bodies shall be coated with a suitable corrosion preventive compound. Aluminum parts shall be anodized in accordance with an established specification.

4.0 DESIGN AND CONSTRUCTION.

4.1 Turnbuckle Body and Ends. Turnbuckle body and ends shall contain means for employing a device that will provide positive safetying of mating parts in assembly. The overall design shall be such that there are no protuberances on the device which may foul controls or interfere with control operation.

4.2 Safetying Device. The means employed to ensure positive safetying shall be designed to prevent rotational movement between adjacent mating parts of the turnbuckle assembly within the requirements of this standard without structural failure of the components or safetying device. The safetying device shall be self-retaining in the assembly to the extent specified in Section 5.0 of this standard.

5.0 TESTS:

5.1 Number of Samples. Except as noted under Sections 5.3.8 and 5.3.9 of this standard, at least one sample of each size special turnbuckle assembly, but not less than six samples shall be subjected to the following tests, where applicable, to substantiate the strength and reliability of the part.

5.2 Load Application. The load required in the tests, Sections 5.3.1 Tension, and 5.3.2 Fatigue (Tensile), shall be applied through a two (2) foot length of cable attached to each terminal (end) of the assembly. In the tests, Sections 5.3.3 Torsion, 5.3.4 Fatigue (Torsion) and 5.2.5 Rotational movement, the load shall be applied to the end terminal unless the design of the turnbuckle assembly is such that the loading is not representative. In those cases a load shall be applied through a short length of cable attached to each terminal (end) of the assembly which will result in the required load being applied to the turnbuckle assembly.

5.3 Tests. For the tests specified herein, the turnbuckle assembly must include the safetying device.

5.3.1 Tension. The turnbuckle assembly shall be subjected to the tension load in Table A corresponding to the turnbuckle cable size. There shall be no evidence of flaws, cracks, or permanent deformation of any component part as a result of this loading.

5.3.2 Fatigue (Tensile). The turnbuckle assembly shall be given a repeated load test, in which a load equal to 60 percent of the tensile load in Table A corresponding to the turnbuckle - cable size is applied repeatedly in tension for 300 applications of the load. There shall be no failure of any component part.

5.3.3 Torsion. The turnbuckle assembly shall be subjected to the torque load of Table A, corresponding to the turnbuckle - cable size and applied in a clockwise and counterclockwise direction for five complete cycles. There shall be no evidence of flaws, cracks, or permanent deformation in the part.

5.3.4 Fatigue (Torsion). The turnbuckle assembly shall be given a repeated load test in which a load equal to 60 percent of the torque load of Table A corresponding to the turnbuckle - cable size is applied in torsion first in one direction and then reversed for a total of 3000 complete cycles of reversal. There shall be no evidence of failure of any component part.

5.3.5 Rotational Movement. The turnbuckle assembly shall be subjected to 10 percent of the torque load in Table A corresponding to the Turnbuckle cable size, applied in a clockwise and counter-clockwise direction. Maximum rotational movement between the body and end of the turnbuckle or between adjacent mating parts of a special turnbuckle assembly shall not exceed the corresponding values specified in Table A.

5.3.6 Bending. The turnbuckle end shall be held in a square-nosed vise and the shank bent through an angle of 90 degrees. There shall be no evidence of failure or cracking of the part.

5.3.7 Safetying Device Retention. The safetying device shall be installed in the turnbuckle assembly and subjected to an outward pull of 15 pounds. The safetying device shall not break or the retention feature become displaced as a result of this load.

5.3.8 Vibration. At least one sample of each of 3 representative sizes of the turnbuckle assemblies, i.e. the smallest, the largest, and an intermediate size, shall be vibrated for 25 hours at a frequency of 3600 cpm and an overall amplitude of 1/8 inch perpendicular to the longitudinal axis of the assembly. The cable tension load for this test shall be 25 percent of the tensile load in Table A corresponding to the turnbuckle - cable size. The safetying device shall not jump out of place or otherwise lose its safetying properties.

5.3.9 Fatigue (Bending). If the safetying device used with the special turnbuckle assembly is to be considered reusable, at least three (3) samples of the shortest formed nonstandard safety wire (or other finished safetying device) shall be subjected to two hundred (200) applications of alternating fastening and unfastening of the wire or safetying device. The device shall not break after repeated applications of the bending loads involved. If bending stresses may be greater in a longer wire (or other safetying 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.

5.3.10 Internal Strain. If the turnbuckle is brass, the finished barrel shall be immersed in an aqueous solution composed of 100 g. of mercurous nitrate and 13 ml nitric acid (spc. gr. 1.42) per liter for 15 minutes. There shall be no evidence of cracks. Specimens subjected to the internal strain test shall be discarded.

TABLE A

Cable Size inches	Tensile Load pounds	Torque (in. - lb.)	Rotational Movement (degrees max.)
1/16	480	8	15
3/32	920	26	11
1/8	2000	82	8
5/32	2800	82	8
3/16	4200	163	7
7/32	5600	318	6
1/4	7000	318	6
9/32	8000	523	5
5/16	9800	750	4