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FEDERAL AVIATION AGENCY

BUREAU OF FLIGHT STANDARDS

/14 CFR Part 515/

/Regulatory Docket No. 653 ; Draft Release No. 61-3/

NOTICE OF PROPOSED RULE MAKING

MAINTENANCE STANDARD ORDERS FOR AIRCRAFT MAINTENANCE

Proposed New Part 515 and Proposed
MSO on Aircraft Retread High-Speed Tires

Pursuant to the authority delegated to me by the Administrator (14 CFR 405.27), notice is hereby given that there is under consideration a proposed new Part 515 of the Regulations of the Administrator, Maintenance Standard Orders for Aircraft Maintenance, as hereinafter set forth.

Interested persons may participate in the making of the proposed rules 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 B-316, 1711 New York Avenue, N. W., Washington 25, D. C., prior to April 20, 1961. Thereafter, such comments will be available in the Docket Section to all interested persons. After examination of the original comments received, interested persons may submit such additional comments in response thereto as they may desire. Such additional comments must be submitted prior to May 22, 1961. (Photostatic copies of comments on file in the Docket Section may be obtained upon payment of the cost of such copies.) All original comments and additional comments in response thereto received by the dates specified for receipt thereof will be considered by the Administrator before taking action on the proposed rules. The proposals contained in this notice may be changed in the light of comments received.

Maintenance Standard Orders (MSO's) would set forth minimum standards for maintenance, the equipment and facilities for such maintenance, and the periods for and the manner in which such maintenance shall be made. Such Maintenance Standard Orders would particularly implement the provisions of section 601(a)(3) of the Federal Aviation Act of 1958, which require the Administrator to prescribe, in addition to reasonable rules and regulations, "minimum standards governing, in the interest of safety, (A) the inspection, servicing, and overhaul of aircraft, aircraft engines, propellers, and appliances; (B) the equipment and facilities for such inspection, servicing, and overhaul; and (C) in the discretion of the Administrator, the periods for, and the manner in, which such inspection, servicing, and overhaul shall be made . . ." The term "maintenance," as used in this proposal, is defined in Part 18 of the Civil Air Regulations as follows: "Maintenance, which includes preventive maintenance, is the inspection, overhaul, repair, upkeep, and preservation of airframes, powerplants, propellers, and appliances, including the replacement of parts."

The regulations which govern the maintenance of civil aircraft are found in various parts of the Civil Air Regulations, such as Parts 18, 40, 41, 42, 43, 46, and 52. However, only Part 18 is applicable to all certificated civil aircraft, and all persons who operate or maintain certificated civil aircraft are required to comply with the appropriate provisions thereof. Section 18.30 requires that "All maintenance, repairs, and alterations shall be accomplished in accordance with methods, techniques, and practices approved by or acceptable to the Administrator,"

thus, it is appropriate that a uniform means be provided to state the approved standard of maintenance to be achieved by the use of such methods, techniques, and practices.

Heretofore, no clearly established and uniform means have been provided whereby persons affected by Part 18 could clearly determine that they were, in fact, in compliance with the provisions of section 18.30. Extensive information on maintenance methods, techniques, and practices has been published from time to time in the form of interpretations and policies in section 18.30 of Civil Aeronautics Manual 18. In addition, other information of similar nature on the same subject has been disseminated by circular letters, directives, or other policy material. It is now intended gradually to remove such material, and to issue MSO's setting forth the approved standards for the maintenance of certificated civil aircraft. The MSO's would contain only minimum conditions which must be met by persons affected thereby, and would not prohibit or hinder the use of maintenance to provide a higher level of safety or to provide for more maintenance than would be required by the minimum conditions.

Each new or amended MSO would be issued in accordance with the Administrative Procedure Act in the same manner as this proposal and other regulations. In addition, insofar as possible, interested persons within the industry would be afforded the opportunity of participating in the development of the substance of individual Maintenance Standard Orders before formal rule making action is proposed. Such participation usually would be afforded by prior correspondence, meetings, or conferences.

A substantial number of persons participated in an informal public Maintenance Requirements Conference held in Washington, D. C., on August 3, 4, and 5, 1960, in which the nature and purpose of the MSO were discussed. This meeting was initiated by the Bureau of Flight Standards to acquaint the aviation industry with the contemplated rule changes, and to seek constructive comments. The results of this meeting were well publicized in the aviation press, thus affording all interested persons preliminary notice of possible rule making action.

The most significant recommendation made at the conference concerned the acceptability of equivalent means of complying with the provisions of an MSO, particularly where these might involve methods, techniques, and practices. The informal proposal presented by the Bureau in the form of a sample MSO contained, in addition to minimum standard criteria, such methods, techniques, and practices which were working details intended to achieve the prescribed standard of maintenance. The proponents of the proposal stated that the purpose of an MSO would be to prescribe, to the maximum extent possible, a minimum end quality of maintenance. They also stated that the MSO was not intended to prescribe detailed methods, techniques, and practices as mandatory requirements, but that in some cases, it might not be possible to avoid this entirely. Accordingly, as proposed herein, each MSO will establish, as far as possible, only minimum standards which will provide a measure of quality governing the end product of maintenance. Detailed methods, techniques, or practices for the performance of maintenance will not be incorporated in MSO's, except for purposes of clarity or explanation, or as recommendations where

absolutely necessary to define a standard. In this latter case, they will be incorporated in the form of nonmandatory notes or references to the substance of the MSO. In any case where a method, technique, or practice is incorporated into an MSO, and the Director, Bureau of Flight Standards, or his authorized representative, can find that a proposed alternative will produce an equivalent result, he may accept the alternative in lieu of the specified method, technique, or practice.

Even though Part 18 includes rules for the accomplishment of alterations as well as maintenance, the Maintenance Standard Orders would pertain solely to maintenance. It is contemplated that the matter of alterations will be the subject of separate and subsequent regulatory proposals.

This proposal comprises a Subpart A and a Subpart B. Subpart A contains the general provisions applicable to all Maintenance Standard Orders, while Subpart B contains required standards governing specific conditions or types of maintenance.

The Subpart B, which is a part of this notice of proposed rule making, sets forth proposed standards for the retreading of high-speed tires for use on civil aircraft of United States registry having ground speeds in excess of 160 miles per hour. Such proposed standards are related to the standards for the manufacture of high-speed aircraft tires as set forth in a separate and previous notice of proposed rule making as a Technical Standard Order. Because of this relationship, a substantial portion of this proposal has been the subject of prior discussion with

interested tire manufacturers. Additional comments have been received on the specific subject of retreading high-speed tires by interested persons who are engaged in the business of retreading such tires. Such discussion and comments have been considered in the preparation of the proposed standards for tire retreading and, insofar as possible, they have been incorporated herein. Therefore, it is anticipated that such standards will be found to be in close accord with existing retreading practices. However, based on the comment of at least one manufacturer of high-speed aircraft tires, the proposed standard is considerably less stringent than that manufacturer would like to see as a means of retaining the standard of excellence in tires which, at least, that manufacturer would like to maintain. In this connection, it must be remembered that the MSO sets forth only minimum standards as a reasonable means of insuring safe operation of civil aircraft. As noted elsewhere in this notice, any person who would be affected by the proposed MSO for retreading high-speed tires may voluntarily utilize higher standards than set forth herein, but if this proposal is adopted, no person may use standards which are lower than those specified in such MSO.

In consideration of the foregoing, it is proposed to promulgate the attached new Part 515 of the Regulations of the Administrator.

This new part is proposed under the authority of sections 313(a), 601, 604, 605, and 607 of the Federal Aviation Act of 1958; (72 Stat. 752, 775, 778, 779; 49 U.S.C. 1354(a), 1421, 1424, 1425, 1427).

Director,
Bureau of Flight Standards

Issued in Washington, D. C., on February 8, 1961.

FEB 8 1961

PROPOSED NEW PART 515 -
MAINTENANCE STANDARD ORDERS FOR AIRCRAFT MAINTENANCE

SUBPART A - GENERAL

515.1 Basis. Sections 601, 604, 605, and 607 of the Federal Aviation Act of 1958, and section 18.30 of the Civil Air Regulations.

515.2 Scope. Subpart B of this part prescribes standards for the accomplishment of maintenance, the equipment and facilities for such maintenance, and the periods for and the manner in which such maintenance is made.

515.3 Applicability. Unless otherwise specified in Subpart B of this part, Maintenance Standard Orders issued pursuant to this part shall be applicable to all certificated civil aircraft of the United States.

SUBPART B - MAINTENANCE STANDARD ORDER MSO-A-1

515.10 Retread high-speed tires - MSO-A-1.

(a) Scope and applicability. Standards of this Maintenance Standard Order 1/ are for the retreading of high-speed tires for use on civil aircraft of United States registry. They shall apply to all tires installed on aircraft having ground speeds in excess of 160 miles per hour.

(b) General. Each retreaded tire shall comply with subparagraphs (1) through (3) of this paragraph. In addition, each tire shall be retreaded with materials and under a quality control in compliance with paragraphs (g) and (h) of this MSO to insure that it is in a condition enabling it to meet the tests prescribed in paragraph (e) of this MSO.

1/ Copies may be obtained upon request addressed to: Aeronautical Reference Branch, Correspondence Inquiry Section, MS-126, Federal Aviation Agency, Washington 25, D. C.

(1) Condition of tire to be retreaded. Tires having breaks in the fabric, due to flat spots, cuts, cracks, abrasions, etc., shall not be retreaded unless it is determined or demonstrated that such breaks will not adversely affect the safe operation of the retreaded tire. Damaged tires shall be determined to be acceptable for retreading in accordance with acceptable practices.

(2) Marking. The retread tire shall be permanently marked and shall include the markings listed in subdivisions (i) through (v) of this subparagraph. The marking data required of the original tire manufacturer shall not be obliterated.

(i) The letter "R" followed by a numeral "1", "2", etc., to signify the first, second, etc., time the tire has been retreaded.

(ii) If the dynamometer retread qualification speed is less than the new tire qualification speed, the retread speed shall be indicated in front of the letter "R".

(iii) The month and year of tread application.

(iv) The name of the retreading company.

(v) Applicable Maintenance Standard Order (MSO number).

(3) Balance. Each retreaded tire shall be balanced to determine that the static unbalance, in inch-ounces, does not exceed the following moment values:

(i) Actual tire diameters (d) up to and including 28 inches: $M = .01d^2 + .38d$.

(ii) Actual tire diameters (d) greater than 28 inches; $M = .034d^2 - .304d$.

(c) Proof of qualification. Critical tires shall be selected in accordance with paragraph (d) of this MSO and tested in accordance with paragraph (e) of this MSO. The tires shall be tested on each aircraft type and shall withstand the tests without failure or visible signs of deterioration other than expected tread wear. In establishing proof of qualification, the provisions of subparagraphs (1) through (4) of this paragraph shall apply.

(1) Substantiation of retread tires shall be based upon the aircraft manufacturer's data 2/ showing the aircraft's characteristics in terms of weight, speed, deceleration, and groundroll distance.

(2) The aircraft data indicated in subparagraph (1) of this paragraph shall be used in establishing conservatively representative load-speed-time schedules 3/ to be followed during the tests prescribed in paragraph (e) of this MSO. The representative load-speed-time schedules shall be established in terms of parameters defined in subdivisions (i) through (viii) of this subparagraph.

2/ Aircraft manufacturer's data applicable for the substantiation of retread tires indicate the aircraft's ground performance for the most critical combinations of takeoff weights, speeds, and center of gravity positions, with due consideration to operations at high ambient temperatures and from airports at high elevations.

3/ Illustrations of representative load-speed-time schedules are contained in Figures 1 and 2 of this MSO. It should be noted that in some instances the form of aircraft data available from the manufacturer needs replotting to put it into the form of Figures 1 and 2.

(i) S_1 - initial dynamometer test speed in miles per hour;

(ii) S_2 - speed in miles per hour at which the average deceleration between S_1 and S_2 does not exceed the specified value;

(iii) D - constant rate of deceleration in feet/second^2 between S_1 and S_2 speeds;

(iv) RD - roll distance in feet as determined from the aircraft data;

(v) L_1 - initial tire load in pounds corresponding with the intersection of the two lines representing the load-time curve from the aircraft data (see subparagraph (3) of this paragraph);

(vi) L_2 - maximum rated static load of tire in pounds;

(vii) T_1 - time in seconds for applying load L_1;

(viii) T_2 - elapsed time in seconds in applying load

$$L_2 = \frac{S_1 - \sqrt{S_1^2 - 2D(RD)}}{D}$$

(3) The critical load-time curve taken from the aircraft data shall be represented for test purposes by enveloping straight lines originating from the zero load point and the L_2 point.

(4) The critical speed-time (deceleration) curve taken from the aircraft data shall be represented for test purposes by a straight line between the speeds S_1 and S_2 in such a manner that the speed at any given load is not less than the speed at that load indicated by the aircraft data.

(d) Selection of tires for testing. For any specific tire size having different ply ratings, a critical tire shall be selected for testing. The tire considered critical shall be the one having the highest value of L_1/L_2 ratio (see paragraph (c)(2)(v) and (vi)). All tires of the same size having all equal or lower L_1/L_2 ratio, as well as an equal or lesser static load rating than the tire tested, shall be considered as having been substantiated by test. If a tire with a greater static load rating is to be substantiated, it shall be tested at that static load rating, and the value of L_1 in the test schedule shall be adjusted to result in the highest L_1/L_2 ratio of all tires of the same size being substantiated.

(e) Dynamometer tests. A critical tire, selected in accordance with paragraph (d) of this MSO shall comply with the conditions of subparagraph (1) of this paragraph and shall withstand the tests prescribed in subparagraph (2) of this paragraph without failure or visible signs of deterioration other than expected tread wear. In lieu of the applicable load-speed-time schedules specified herein, dynamometer tests incorporating a variable loading procedure which more realistically simulates actual airplane performance on the runway may be used.

(1) Conditions for tests. The conditions of subdivisions (i) through (vi) of this subparagraph shall apply.

(i) Only a manufacturer's approved tire shall be used for testing. Prior to retreading, the tire shall be at least 90 percent worn or, alternatively, shall have simulated service use by having been subjected to the tests prescribed in subparagraph (2) of this paragraph.

(ii) The dynamometer qualification speed for which the carcass was designed. The minimum dynamometer test speeds S_1 for the corresponding operational groundspeed ranges shall be as follows:

Maximum Operational Ground Speed of Aircraft, mph.	Dynamometer Test Speed S_1, mph.
160 - 180	180
181 - 200	200
201 - 225	225
226 - 250	250

(iii) In applying the dynamometer test schedule, a tolerance of $\pm$ one second shall be permissible for the T_1, and a tolerance of $\pm$ 10 percent shall be permissble for the time T_2. (See paragraph (c)(2)(vii) and (viii).) When T_2 is calculated by the formula (see paragraph (c)(2)(viii)), S_2 may be ignored and D is assumed constant throughout the roll distance RD (Ref. Figure 2).

(iv) The tire inflation during the tests shall be that necessary to give the same deflection on the flywheel under the L_2 load as the flat plate deflection of the tire at its rated static load and inflation.

(v) The measurement of carcass temperatures, as required by subparagraph (2) of this paragraph, shall be within one inch above the rim flange and in the shoulder or crown area.

(vi) It shall be permissible to run the tests on a test drum of a fixed mass, provided that the speeds, loads, and roll distance are identical to those which would exist if the tests were conducted on an inertia type dynamometer.

(2) Execution of tests. The tests shall consist of not less than 50 cycles of Test A as prescribed in subdivision (i) of this subparagraph, and 50 cycles of Test B as prescribed in subdivision (ii) of this subparagraph. The time between cycles of Test A and Test B shall be the minimum to insure carcass peak temperatures of not less than 160° F or contained air peak temperatures of not less than 140° F for each run. Unavoidable deviations from these temperatures shall be noted in the substantiating test data.

(i) Test A. Each cycle of the test shall include a speed cycle and a load cycle in accordance with (a) and (b) of this subdivision.

(a) Speed cycle. The tire shall be landed against the dynamometer flywheel rotating at a peripheral speed of S_1 mph. Immediately thereafter, the flywheel peripheral speed shall be decreased at an average deceleration of D ft./sec.^{2} until a value of S_2 is reached. No specific deceleration need be required below the speed S_2. The peripheral speed of the flywheel shall be decreased until the roll distance of RD feet has been covered, at which time the tire shall be unlanded.

(b) Load cycle. Upon landing the tire against the dynamometer flywheel, the load shall be increased from zero to L_1 pounds within T_1 seconds and further increased linearly with time to a value of L_2 pounds within T_2 seconds after landing, or at the moment of unlanding, whichever occurs first. If the required roll distance RD feet is not reached until after T_2, the load shall be maintained at L_2 pounds until RD is covered (Ref. Figure 1).

(ii) Test B. Each cycle of the test shall include a speed cycle and a load cycle in accordance with (a) and (b) of this subdivision. In executing this test, the dynamometer flywheel weight shall be such that the kinetic energy stored up in the dynamometer shall correspond with a speed of 120 mph. and the rated maximum static load of the tire. The kinetic energy shall be computed as follows:

$KE = CWV^2$; where KE = kinetic energy, ft.-lbs.,

C = 0.011,

W = tire load, lbs.,

V = 120 mph.

If the number of flywheel plates does not result in the exact calculated kinetic energy, a greater number of plates may be used and the landing speed decreased accordingly.

(a) Speed cycle. The tire shall be landed against the dynamometer flywheel rotating at a peripheral speed of 90 mph. and unlanded at zero speed.

(b) Upon landing the tire against the dynamometer flywheel, the rated maximum static load of the tire shall be applied and held until the tire is unlanded.

(f) Modified tread. Tires having skid depths or undertread thickness greater than those previously qualified shall not be acceptable unless they are substantiated by showing compliance with paragraph (e) of this MSO.

(g) Materials. Materials shall be of a quality which service experience and/or tests have demonstrated to be suitable and dependable for use in high-speed tires.

(h) Quality control. A quality control system shall be established by the renovating company to insure that each tire is in conformity with the provisions of this MSO and is in condition for safe operation. The retreading facility shall maintain a current file of complete data describing the inspection and test procedures applicable to his system. The Administrator shall be immediately notified of any subsequent changes to the system as it might affect the quality control. A representative of the Administrator shall be permitted to make such inspections and tests at the renovating facilities as might be necessary to determine compliance with the provisions of this MSO. Workmanship shall be consistent with high grade aircraft tire retreading practices.

(i) Conformance with aircraft type design limits.

(1) Retreaded tires intended for use on a specific aircraft must conform to type design limitations of such aircraft as may be applicable.4/

(2) Changes in tread design adversely affecting heat dissipation, which in turn could cause tread breakdown or separation, shall be substantiated by the applicable dynamometer test requirements contained herein.

4/ This is intended to alert the retreader to giving due consideration to conditions such as excessive dimensional and weight changes of the tire in the retreading process.

FIGURE 1

GRAPHIC REPRESENTATION OF LOAD-SPEED-TIME TEST WHEN TIME T_2 OCCURS BEFORE REQUIRED ROLL DISTANCE IS COMPLETED

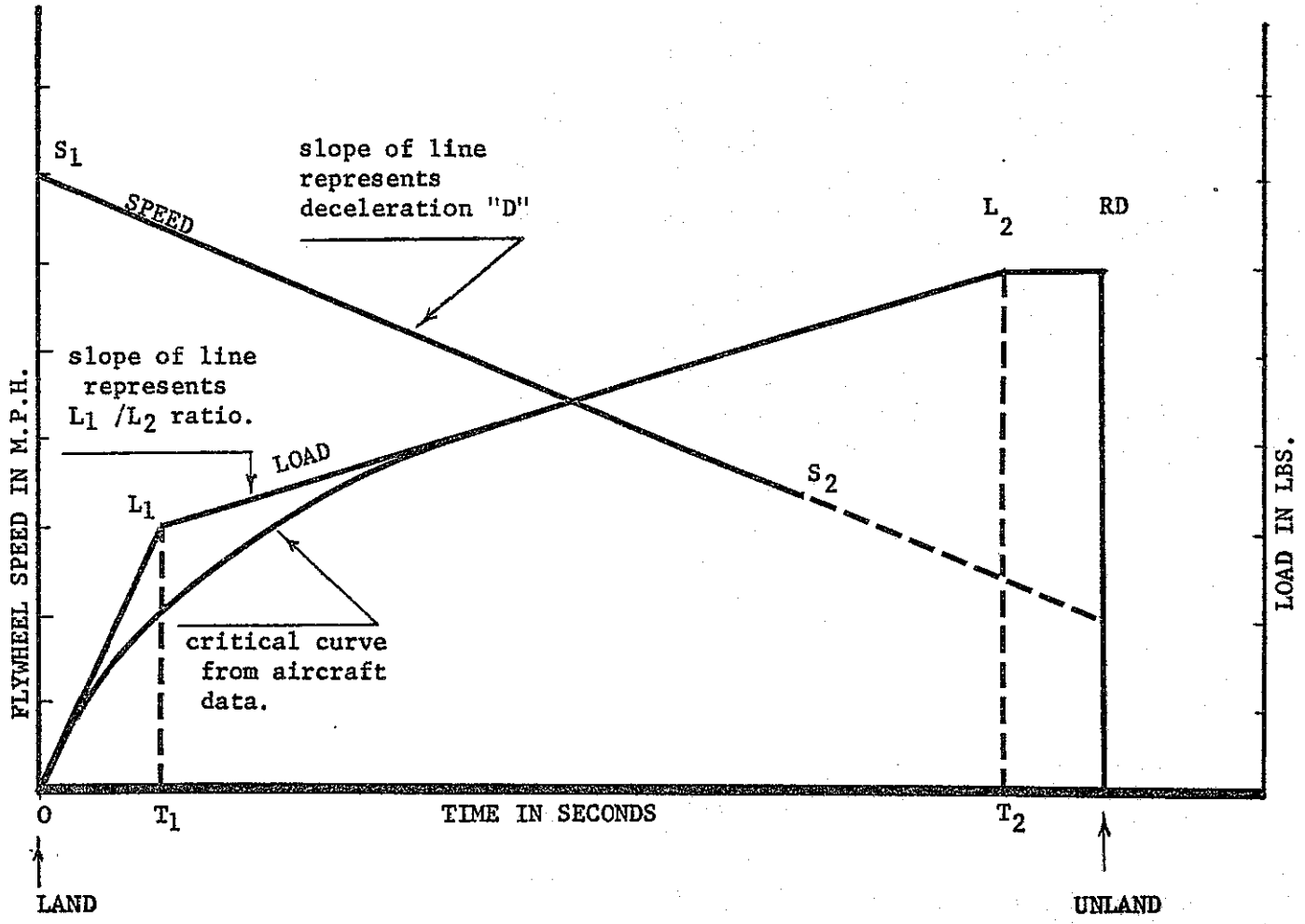

FIGURE 2

GRAPHIC REPRESENTATION OF LOAD-SPEED-TIME
TEST WHEN T_2 IS CALCULATED

