FEDERAL AVIATION AGENCY
Washington 25, D.C.

TECHNICAL STANDARD ORDER

Regulations of the Administrator

Part 514

Subject: AIRCRAFT TIRES TSO-C62b

Technical Standards Orders for Aircraft Materials, Parts and Appliances

Part 514 which contains minimum performance standards and specifications for materials, parts, and appliances used in aircraft consists of two subparts. Subpart A contains the general requirements applicable to all Technical Standard Orders. Subpart B contains the technical standards and specifications to which a particular product must conform.

ANY TECHNICAL STANDARD ORDER MAY BE OBTAINED BY SENDING A REQUEST TO FAA, WASHINGTON 25, D.C.

Subpart A—GENERAL

§ 514.0 Definition of terms.

As used in this part:

(a) "Administrator" means the Administrator of the Federal Aviation Agency or any person to whom he has delegated his authority in the matter concerned.

(b) "FAA" means Federal Aviation Agency.

(c) "Manufacturer" means a person who controls the design and quality of an article produced under the TSO system, including all parts thereof and processes and services related thereto obtained from outside sources.

(d) "Article" means the materials, parts, or appliances for which approval is required under the Civil Air Regulations for use on civil aircraft.

§ 514.1 Basis and purpose.

(a) *Basis.* Section 601 of the Federal Aviation Act of 1958, and §§ 3.18, 4a.31, 4b.18, 5.18, 6.18, 7.18, 10.21, 13.18, and 14.18 of this title (Civil Air Regulations).

(b) *Purpose.* (1) This part prescribes in individual Technical Standard Orders the minimum performance and quality control standards for FAA approval of specified articles used on civil aircraft,[1] and prescribes the methods by which the manufacturer of such articles shall show compliance with such standards in order to obtain authorization for the use of the articles on civil aircraft.

(2) The performance standards set forth in the individual Technical Standard Orders are those standards found necessary by the Administrator to assure that the particular article when used on civil aircraft will operate satisfactorily, or accomplish satisfactorily its intended purpose under specified conditions.

§ 514.2 TSO authorization.

(a) *Privileges.* No person shall identify an article with a TSO marking unless he holds a TSO authorization and the article meets the applicable TSO standards prescribed in this part.

(b) *Letters of acceptance issued prior to July 1, 1962.* An FAA letter of acceptance of a statement of conformance issued for an article prior to July 1, 1962, is an authorization within the meaning of this part and the holder thereof may continue to manufacture such article without obtaining an additional TSO authorization, but shall comply with the requirements of § 514.3 through § 514.10.

(c) *Application.* The manufacturer or his duly authorized representative shall submit an application for a TSO authorization together with the following documents (See Appendix A of this subpart for sample application) to the Chief, Engineering and Manufacturing Branch, Flight Standards Division, in the region in which the manufacturer is located.[2]

(1) A statement of conformance certifying that the applicant has complied with the provisions of Subpart A and the article meets the applicable performance standards established in Subpart B of this part (See Appendix B of this subpart for sample statement of conformance);

(2) Copies of the technical data required in the performance standards set forth in Subpart B of this part for the particular article;

(3) A description of his quality control system in the detail specified in § 1.36 of this title (Civil Air Regulations). In complying with this provision the manufacturer may refer to current quality control data filed with the Agency, as a part of a previous application.

NOTE: When a series of minor changes in accordance with § 514.5 is anticipated, the manufacturer may set forth in his application the basic model numbered article with open brackets after it to denote that suffix change letters will be added from time-to-time e.g., Model No. 100 ( ).

(d) *Issuance.* (1) Upon receipt of the application and adequate supporting documents specified in paragraph (c) of this section to substantiate the manufacturer's statement of conformance with the requirements of this part and his ability to produce duplicate articles in accordance with the provisions of this part, the applicant will be given an authorization to identify his article with the applicable TSO marking.

(2) If the application is deficient in respect to any requirements, the applicant shall, upon request by the Chief, Engineering and Manufacturing Branch, submit such additional information as may be necessary to show compliance with such requirements. Upon the failure of the applicant to submit such additional information within 30 days after the date of the request therefor, his application will be denied and he will be so notified by the Chief, Engineering and Manufacturing Branch.

NOTE: The applicant will be issued an authorization or notified of the denial of his application within 30 days after the date of receipt of such application or, in the event that additional information has been requested, within 30 days after the date of receipt of such additional information.

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[1] Articles may also be approved and manufactured for use on civil aircraft as a part of the type design of a type certificate for an aircraft engine or propeller.

[2] Regional Offices are located at New York, Atlanta, Kansas City, Fort Worth, Los Angeles, Anchorage.

§ 514.3 Conditions on authorizations.

The manufacturer of an article under an authorization issued under the provisions of this part shall—

(a) Manufacture such article in accordance with the requirements of Subpart A and the performance standards contained in the applicable TSO of Subpart B of this part;

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

(c) Prepare and maintain for each type or model of such article a current file of complete technical data and records in accordance with § 514.6; and

(d) Permanently and legibly mark each such article with the following information:

(1) Name and address of the manufacturer,

(2) Equipment name, or type or model designation,

(3) Weight to the nearest tenth of a pound,

(4) Serial number and/or date of manufacturer, and

(5) Applicable Technical Standard Order (TSO) number.

§ 514.4 Deviations.

Approval for a deviation from the performance standards established in Subpart B may be obtained only if the standard or standards for which deviation is requested are compensated for by factors or design features which provide an equivalent level of safety. A request for such approval together with the pertinent data shall be submitted by the manufacturer to the Chief, Engineering and Manufacturing Branch of the Region in which the applicant is located.

§ 514.5 Design changes.

(a) *By Manufacturer*—(1) *Minor changes.* The manufacturer of an article under an authorization issued pursuant to the provisions of this part may make minor design changes to the article without further approval by the FAA. In such case the changed article shall retain the original model number and the manufacturer shall forward to the Chief, Engineering and Manufacturing Branch such revised data as may be necessary for compliance with § 514.2(c).

(2) *Major changes.* If the changes to the article are so extensive as to require a substantially complete investigation to determine compliance with the performance standards established in Subpart B, the manufacturer shall assign a new type or model designation to the article and submit a new application in accordance with the provisions of § 514.2(c).

(b) *By persons other than the manufacturer.* Design changes to an article by a person other than the manufacturer who submitted the statement of conformance for such article are not eligible for approval under this part, unless such person is a manufacturer as defined in § 514.0 and applies for authorization under § 514.2(c).

NOTE: Persons other than a manufacturer may obtain approval for design changes to a product manufactured under a TSO pursuant to the provisions of Part 18 or the applicable airworthiness regulations.

§ 514.6 Retention of data and records.

(a) A manufacturer holding an authorization issued pursuant to the provisions of this part shall, for all articles manufactured under such authorization on and after July 1, 1962, maintain and keep at his factory:

(1) A complete and current technical data file for each type or model of article which shall include the design drawings and specifications. This technical data shall be retained for the duration of his operation under the provisions of this part.

(2) Complete and current inspection records to show that all inspections and tests required to ensure compliance with this part have been properly accomplished and documented. These records shall be retained for at least two years.

(b) The data specified in paragraph (a)(1) of this section shall be identified and copies transferred to the FAA for record purposes in the event the manufacturer terminates his business or no longer operates under the provisions of this part.

§ 514.7 Inspection and examination of data, articles or manufacturing facilities.

The manufacturer shall, upon request, permit an authorized representative of the FAA to inspect any article manufactured pursuant to this part, and to observe the quality control inspections and tests and examine the manufacturing facilities and technical data files for such article.

§ 514.8 Service difficulties.

Whenever the investigation of an accident or a service difficulty report shows an unsafe feature or characteristic caused by a defect in design or manufacture of an article, the manufacturer shall upon the request of the Chief, Engineering and Manufacturing Branch, report the results of his investigation and the action, if any, taken or proposed by him to correct the defect in design or manufacture (e.g., service bulletin, design changes, etc.). If the defect requires a design change or other action to correct the unsafe feature or characteristic, the manufacturer shall submit to the Chief, Engineering and Manufacturing Branch, the data necessary for the issuance of an airworthiness directive containing the appropriate corrective action.

§ 514.9 Noncompliance.

Whenever the Administrator finds that a manufacturer holding an authorization issued pursuant to the provisions of this part has identified an article by a TSO marking and that such article does not meet the applicable performance standards of this part, the Administrator may, upon notice thereof to the manufacturer, withdraw the manufacturer's authorization and, where necessary, prohibit any further certification or operation of a civil aircraft upon which such article is installed until appropriate corrective action is taken.

§ 514.10 Transferability and duration.

An authorization issued pursuant to the provisions of this part shall not be transferred and is effective until surrendered, or withdrawn, or otherwise terminated by the Administrator.

APPENDIX A

SAMPLE APPLICATION FOR TSO AUTHORIZATION

_____
(Date)

(Addressed to: Chief, Engineering and Manufacturing Branch, Federal Aviation Agency, Region.)

Application is hereby made for authorization to use the Technical Standard Order procedures.

Enclosed is a statement of conformance for the article to be produced under TSO-C_____.

The required quality control data[1] are transmitted: (herewith) (under separate cover).

Signed _____

APPENDIX B

SAMPLE STATEMENT OF CONFORMANCE

_____
(Date)

(Addressed to: Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency.)

The undersigned hereby certifies that the article listed below by model, type or part number has been tested and meets the performance standards of Technical Standard Order C_____. In addition, all other applicable provisions of Part 514 of the Regulations of the Administrator have been met.

The technical data required by the TSO in the quantity specified are transmitted: (herewith) (under separate cover).

Authorization to use TSO identification on this article is requested.

Signed _____

[1] Reference may be made to data already on file with the FAA.

§ 514.67 Aircraft tires - TSO-C62b--(a) Applicability--(1) Minimum performance standards. Minimum performance standards are hereby established for aircraft tires, excluding tailwheel 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 § 514.3(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 the Chief, Engineering and Manufacturing Branch, Flight Standards Division, Federal Aviation Agency, in the region in 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.

(d) Effective date. September 1, 1962.

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

August 1, 1962

FEDERAL AVIATION AGENCY STANDARD
AIRCRAFT TIRES

1.0 Purpose. To specify minimum requirements for new aircraft tires, excluding tailwheel tires, for civil aircraft applications.

2.0 Scope. This specification covers minimum requirements for the following types of tires, having speed limitations as indicated.

(a) Type III, VII, and VIII (for ground speeds of 160 m.p.h. or less) hereinafter referred to as low speed tires.

(b) Type VII and VIII (for ground speeds greater than 160 m.p.h.) hereinafter referred to as high speed tires.

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 dynamometer tests.

4.0 Design and Construction.

4.1 Unbalance. The moment of static unbalance in ounce inches shall be no greater than the following moment values as applicable:

Type III tire diameters up to and including 28",
Moment = $1.5D - .023D^2$

Type III tire diameters greater than 28",
Moment = $.031D^2 - .253D$

Type VII and VIII tire diameters up to and including 28",
Moment = $.01D^2 + .38D$

Type VII and VIII tire diameters greater than 28",
Moment = $.034D^2 - .304D$

D = Tire diameter (Actual)

4.2 Balance Marker. A balance marker, consisting of a red dot, shall be permanently branded into the side wall of the tire immediately above the bead to indicate the lightweight point of the tire.

4.3 Burst Pressure. New tires shall be capable of withstanding without failure a burst pressure of at least 4.0 times the rated inflation pressure.

4.4 Temperature. The airworthiness of tires shall not be adversely affected as a result of their being subjected to extreme ambient temperatures expected to be encountered during normal airplane operation.

4.5 Tread Design. Decreases in the number of tread ribs and grooves and increases in skid depth, made subsequent to tire qualification, shall be substantiated by the dynamometer tests contained herein for the applicable ground speed range involved.

4.5.1 Underskid Thickness. For tires and casings having ribbed type or nonskid tread patterns, the thickness of the rubber between the carcass and the bottom of the tread pattern shall not be less than 30 percent of the mold skid depth, except for helicopter tires, in which case, the minimum thickness shall not be less than 1/32 inch.

4.6 Slippage. Mounted tires, when tested in accordance with the dynamometer tests specified herein, shall show no evidence of slippage on the wheel rim during the first five dynamometer landings. Such slippage as shall subsequently occur shall not damage the tube or valve nor damage the air seal of the tire bead in the case of tubeless tires.

4.7 Tire Airworthiness. The tire shall withstand the dynamometer landings specified herein without failure or visible signs of deterioration other than normal expected tread wear.

5.0 Ratings.

5.1 Static Load Rating (Airplane Tires). Static load ratings shall be established on the basis of 35% deflection for Type III tires and 32% deflection for Types VII and VIII tires.

5.1.1 Static Load Rating (Helicopter Tires). Airplane tires qualified in accordance with the provisions of this standard may also be used on helicopters. In such case, the maximum static load rating may be increased by 1.5 without any additional qualification testing.

5.1.2 Deflection. The vertical distance from the top of the rim flange to the outermost surface of the tire at no load is considered as the distance equivalent to 100% deflection.

5.1.3 Deflection Tolerances. Deflection tolerances to allow for manufacturing variations shall not exceed +1%, -4% for Type III tires and +3%, -4% for Type VII and VIII tires.

5.2 Dynamic Load Rating, Nose Wheel Tires. The dynamic load rating (maximum permissible nose wheel tire load during braking) shall be determined as follows:

(a) Type III tires - 1.45 x static load rating.
(b) Type VII tires - 1.50 x static load rating.
(c) Type VIII tires - 1.40 x static load rating.

5.3 Inflation Pressure. The rated inflation pressure shall be established for each specific tire and shall be used as a basis when complying with the tire deflection provisions of Sections 5.1, 5.1.2, and 5.1.3.

5.4 Ply Rating. The ply rating shall be established on the basis of the static or dynamic load requirement, whichever is more critical.

6.0 Dynamometer Test Requirements.

6.1 Low Speed Tires. The tire shall withstand 200 landings on a dynamometer having a stored up kinetic energy computed as follows:

$KE = CWV^2$, where KE = Kinetic energy, ft. lbs.
W = Tire load, lbs.
V = 120 m.p.h.
C = 0.011

6.1.1 Tire Load. At landing, and during the entire roll test, the tire shall be forced against the flywheel at the rated static load of the tire.

6.1.2 Kinetic Energy. The kinetic energy of the flywheel shall be calculated for the rated maximum static load of the tire. In the event that

the correct number of flywheel plates cannot be used to obtain the calculated kinetic energy value or proper flywheel width, a greater number of plates shall be selected and the dynamometer speed shall be adjusted in order that the required kinetic energy may be obtained.

6.1.3 Dynamometer Speeds. The total number of dynamometer landings shall be divided into two equal parts having speed ranges as follows:

(a) In the first series of landings, the landing shall be at 90 m.p.h. and the unlanding at 0 m.p.h. The landing speed shall be decreased as necessary in order that 56 percent of the calculated kinetic energy is absorbed by the tire during this series.

(b) In the second series of landings, the landing shall be at 120 m.p.h. and the unlanding at 90 m.p.h. The unlanding speed shall be increased as necessary in order that 44 percent of the calculated kinetic energy is absorbed by the tire during this series.

6.1.4 Test Inflation Pressure. The test inflation pressure shall be that which is necessary to accomplish the same deflection on the flywheel under the rated static load as the flat plate deflection of the tire at its rated static load and inflation. This determination is made on the unused tire prior to the start of the test.

6.1.5 Landing Interval. The time between landings shall be chosen to be the minimum which will assure 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 the above shall be noted in the substantiating test data. Carcass temperatures shall be measured within one inch above the rim flange and in the shoulder or crown area.

6.2 High Speed Tires. Substantiation of the tire on the dynamometer shall realistically simulate, insofar as is practicable, runway operation and tire performance for the most critical combination of takeoff weight and speed and airplane center of gravity position. Consideration shall also be given to increased speeds resulting from elevated airport operations and high ambient temperatures. Representative load-speed-time data, compiled by the airplane manufacturer, shall be the basis for establishing the applicable dynamometer tests.

6.2.1 Dynamometer Test Speeds. Applicable dynamometer test speeds for corresponding maximum operational ground speeds shall be as follows:

Maximum Operational Ground Speed of Aircraft, m.p.h.		Dynamometer Test Speed m.p.h.
Over	Not Over	
160	180	180
180	200	200
200	225	225

6.2.2 Dynamometer Tests. The tire shall withstand 150 dynamometer landings. Fifty of these landings shall be in accordance with the load-speed-time test procedures specified below. Refer to Figs. 1 and 2 for graphic representations of this test. The above tests shall be followed by 100 landings at 90-0 m.p.h. as specified in Paragraphs 6.1 through 6.1.3(a). The provisions of Paragraphs 6.1.4 and 6.1.5 shall apply.

6.2.2.1 Speed Cycle. The tire shall be landed against a dynamometer flywheel rotating at a peripheral speed of S_1 m.p.h. Immediately thereafter, the flywheel's peripheral speed shall be decreased at an average deceleration rate of D ft./sec./sec. until a value of S_2 is attained. No specific rate of deceleration is required after the flywheel's peripheral speed reaches a value of S_2. The peripheral speed of the flywheel shall be decreased in the above manner until a roll distance of RD feet has been covered, at which time, the tire shall be unlanded.

6.2.2.2 Load Cycle. After landing, the load shall be increased from zero to L_1 pounds within T_1 seconds. The load shall then be 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 it is necessary to continue the roll after T_2 seconds (Ref. Fig. 1) in order to complete the required distance, the load shall be maintained at L_2 pounds until the required roll distance RD is completed.

6.2.2.3 Symbol Definitions. The numerical values which are used for the following symbols shall be determined from the applicable airplane load-speed-time data.

S_1 = Initial dynamometer test speed
S_2 = Speed at which the average deceleration D between S_1 and S_2 does not exceed the specified value.
D = Constant rate of deceleration between S_1 and S_2 speeds.
RD = Roll distance in feet
L_1 = Initial tire load
L_2 = Maximum rated static load of the tire.
T_1 = Time for applying L_1 load. A T_1 tolerance of $\pm$ one second is acceptable.
T_2 The elapsed time in applying the L_2 load

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

A T_2 tolerance of $\pm$ 10% is acceptable. When T_2 is calculated by the aforementioned formula, S_2 may be ignored and D is assumed constant throughout roll distance RD. (Ref. Fig. 2)

6.2.2.4 Test Load Adjustment. If the test load curve, determined on the above basis,, results in loads at a given speed being less than those dictated by the applicable aircraft data then adjus tments should be made in T_2, L_1, and/or T_1 to eliminate this condition.

6.2.3 Taxi Test. The tire shall satisfactorily withstand at least three dynamometer tests under the following conditions.

Speed = 35 m.p.h.
Tire Load = Maximum static rating
Roll Distance = 35,000 feet

6.2.3.1 Tire Temperature. The tire shall be heated so that, at at the start of each of the three taxi test cycles, the tire test temperature shall be no less than 120°F. No adjustment shall be made in the inflation pressure to compensate for increases in air pressure due to temperature rise. Rolling the tire on the dynamometer is acceptable in obtaining the minimum 120°F. tire temperature.

6.2.4 Alternate Dynamometer Tests. Alternate dynamometer tests which more realistically simulate actual airplane performance on the runway may be used in lieu of the applicable load-speed-time deceleration schedule. In this respect, an acceleration load-speed-time schedule, wherein the dynamometer flywheel is accelerated to the applicable conditions, is acceptable. In any event, the dynamometer test speed shall be that as specified in the table shown in Paragraph 6.2.1.

6.2.4.1 Alternate Procedure for Reinforced Tread Tires. Qualification of a given ply rating, reinforced tread, high speed tire in accordance with Paragraph 6.2.2 will automatically qualify a lesser ply rating reinforced tread tire of the same size and skid depth provided:

(a) The lesser ply rating ti e, with a nonreinforced tread and identical carcass, has been qualified to the applicable requirements specified herein.

(b) The test conditions S_1, RD, D, S_2, T_1, and T_2 are not less severe than those applicable to the lesser ply rating tire.

(c) The ratio of the test loads L_1 to L_2 is not less than that applicable to the lesser ply rating tire. Any necessary adjustment in this ratio shall be accomplished by increasing L_1.

7.0 Optional Test Equipment. Dynamic tests may also be run on a test drum which is a fixed mass, provided the load, speed, time, and roll distance are identical to those which the tire would have if run on an inertia type ynamometer.

FIGURE 1

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

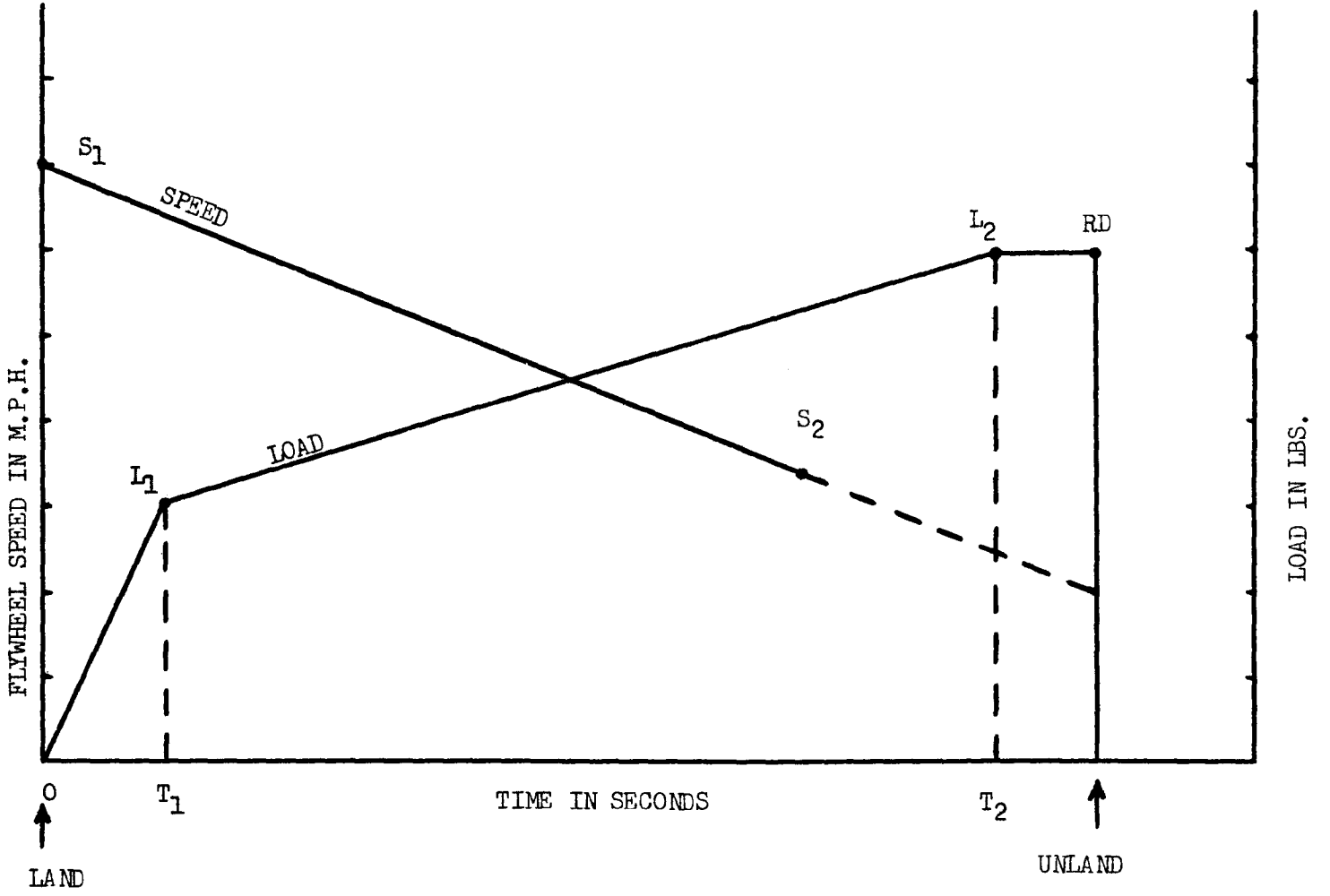

FIGURE 2

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