CS-ETSO AMENDMENT 7 - CHANGE INFORMATION

The Agency publishes amendments to Certification Specifications-European Technical Standard Orders (CS-ETSO) as consolidated text for each constituent European Technical Standard Order (ETSO) individually.

Consequently, except for the revision indication letter and revised issue date in the header of the ETSO, the consolidated text of each individual ETSO does not allow readers to see the detailed changes introduced by the amendment. To allow readers to see these detailed changes this document has been created. The same format as for publication of Notices of Proposed Amendments has been used to show the changes:

1. deleted text is shown with a strike through: ~~deleted~~
2. new or changed text is highlighted with grey shading: new
3. ... indicates that remaining text is unchanged in front of or following the reflected amendment.
   ....

I. Decision CS-ETSO

SUBPART A – GENERAL

2.1 Environmental standards:

Unless otherwise stated in the paragraph 3.1.2 of the specific ETSO, the applicable environmental standards are contained in EUROCAE/RTCA document ED-14D change 3/DO-160D "Environmental Conditions and Test Procedures for Airborne Equipment", change 3 dated December 2002, or ED-14E/DO-160E dated March 2005 or ED-14F/DO-160F dated March 2008 or ED-14G/RTCA-160G dated December 2010.

It is not permissible to mix versions within a given qualification programme.

SUBPART B – LIST OF ETSOs (INDEX 1 AND INDEX2)

INDEX 1

~~ETSO-C31d~~	~~HF Transmitting Equipment~~	Cancelled
~~ETSO-C32d~~	~~HF Receiving Equipment~~	Cancelled
ETSO-C55a	Fuel and Oil Quantity Instruments ~~(Reciprocating Engine Aircraft)~~	
ETSO-C62~~d~~e	Aircraft Tyres	
ETSO-C90~~c~~d	Cargo Pallets, Nets and Containers	
ETSO-C95a	Mach Meters	
ETSO-C126a	406MHz Emergency Locator Transmitter	
~~ETSO-C129a~~	~~Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)~~	Cancelled
ETSO-C154c	Universal Access Transceiver (UAT) Automatic Dependent Surveillance - Broadcast (ADS-B) Equipment Operating on the Frequency of 978 MHz	
ETSO-C157a	Aircraft Flight Information Services-Broadcast (FIS-B) Data Link Systems and Equipment	
ETSO-C158	Aeronautical Mobile High Frequency Data Link (HFDL) Equipment	
ETSO-C159a	Avionics Supporting Next Generation Satellite Systems (NGSS) = Airborne Iridium Satellite Transceiver for Voice or Data	
ETSO-C161a	Ground Based Augmentation System Positioning and Navigation Equipment	
ETSO-C162a	Ground Based Augmentation System Very High Frequency Data Broadcast Equipment	
ETSO-C166~~a~~b	Extended Squitter Automatic Dependent Surveillance - Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)	
ETSO-C170	High Frequency (HF) Radio Communications Transceiver Equipment Operating Within the Radio Frequency 1.5 to 30 Megahertz	
ETSO-C172	Cargo Restraint Strap Assemblies	
ETSO-C179a	Permanently Installed Rechargeable Lithium Cells, Batteries, and Battery Systems	
ETSO-C184	Airplane Galley Insert Equipment, Electrical/Pressurised	
ETSO-C194	Helicopter Terrain Awareness and Warning System (HTAWS)	
ETSO-C195a	Avionics Supporting Automatic Dependent Surveillance - Broadcast (ADS-B) Aircraft Surveillance	
ETSO-C196a	Airborne Supplemental Navigation Sensors for Global Positioning System Equipment Using Aircraft-Based Augmentation	

INDEX 2

ETSO-2C70~~a~~b	Liferafts (reversible and nonreversible)	
~~ETSO-2C126~~	~~406MHz Emergency Locator Transmitter (ELT)~~	Cancelled
ETSO-2C197	Information Collection and Monitoring Systems	

ETSO- C55a
~~Date : 24.10.03~~
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Fuel and Oil Quantity Instruments ~~(RECIPROCATING ENGINE AIRCRAFT)~~

1 - Applicability

This ETSO gives the requirements which Fuel and Oil Quantity Instruments that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None.

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in the SAE AS 405~~B~~C, Fuel and oil quantity Instruments, dated July 2001, as amended and supplemented by this ETSO:

(i) Conformance with the following paragraphs of AS 405~~B~~C is not required: 3.1; 3.1.1, 3.1.2, 3.2 and 4.2.1.

(ii) Substitute the following for paragraph 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".

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

As specified in the SAE Aerospace Standard AS 405~~-B~~C.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

See CS-ETSO Subpart A paragraph 2.3.

3.2 - Specific

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~~None~~

3.2.1 Failure Condition Classification

See CS-ETSO Subpart A paragraph 2.4.

The failure condition classification will depend on the system on which the fuel and oil quantity instrument is installed. The classification must be determined by the safety assessment conducted as part of the installation approval. Develop each fuel and oil quantity instrument to at least the design assurance level assigned to the system on which the fuel and oil quantity instrument is installed.

4 - Marking

4.1 - General

Marking as detailed in CS-ETSO Subpart A paragraph 1.2.

4.2 - Specific

~~None~~

a. Mark at least one major component permanently and legibly with all the information in SAE AS405C, Section 3.2 (except paragraph 3.2.b). Also, mark the component with the following information:

(1) The basic type and accuracy classification, and

(2) The fluids for which the instrument is substantiated

b. If the fuel and oil quantity instrument includes a digital computer, then the part number must include hardware and software identification. Or, you can use a separate part number for hardware and software. Either way, you must include a means to show the modification status.

NOTE: Similar software versions, approved for different software levels, must be differentiated by part number.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO- C62~~d~~e
~~**Date : 24.10.03**~~
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Aircraft Tyres

1 - Applicability

This ETSO gives the requirements which tyres excluding tailwheel tyres that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None.

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in the attached Appendix 1, “Federal Aviation Administration Standard for Aircraft Tyres”, dated 29/09/2006.

3.1.2 - Environmental Standard

As stated in the Federal Aviation Administration Standard.

3.1.3 – Computer Software

None

3.1.4 - Electronic Hardware Qualification

None

3.2 - Specific

None

3.2.1 Failure Condition Classification

N/A

4 - Marking

4.1 - General

Marking as detailed in CS-ETSO Subpart A paragraph 1.2.

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~~In lieu of the marking requirements of CS-ETSO Subpart A paragraph 1.2, a tyre must be legibly and permanently marked at least with the following:~~

~~(1) Brand name or registered trademark of the manufacturer responsible for compliance.~~

~~(2) Speed rating, load rating, size, skid depth, serial number, date, manufacturer's part number and plant code, and nonretreadable, if appropriate.~~

~~(3) Applicable ETSO number.~~

4.2 - Specific

~~None~~

1. Balance marker, consisting of a red dot, on the sidewall of the tire immediately above the bead to indicate the lightweight point of the tire.
2. Production date code (may be included in the established serial number).
3. Ply rating must be established. Submit these ratings to the Tire and Rim Association, Inc. (TRA) or European Tyre and Rim Technical Organization (ETRTO). If the ply rating is marked on the tire, the load rating marked on the tire must be consistent with the ply rating established.

   NOTE: for a new programme aircraft, define new tire dimensions and submit them to ETRTO for publication in the ETRTO Data Book. You do not have to wait until your submitted dimensions are incorporated into the Data Book before applying for the ETSO.
4. Serial number: the plant code and production date code may be included.
5. Size and load ratings, established and identified in a timely manner in the TRA *Aircraft Year Book*, latest edition or in the ETRTO *Aircraft Tyre and Rim Data Book*, latest revision. See the NOTE at paragraph g.
6. Skid depth, marked in inches to the nearest one-hundredth as defined in appendix 1.
7. Speed rating, in MPH and as identified in appendix 1, paragraph 4.b that is equal to or less than the speed at which the tire has been qualified.
8. Tire type. Mark tires requiring a tube with the words "Tube type."
9. Non-re-treadable tires must be marked accordingly.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

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~~Date : 24.10.03~~
Date: xx.xx.2011

APPENDIX 1. FEDERAL AVIATION ADMINISTRATION STANDARD FOR AIRCRAFT TIRES DATED SEPTEMBER 7, 1990

1.0 Purpose. This document contains minimum performance standards for new and requalified aircraft tires, excluding tailwheel tires, that are to be identified as meeting the standards of TSO-C62d.

2.0 Scope. These minimum performance standards apply to aircraft tires having speed and load ratings that are established on the basis of the speeds and loads to which the tires have been tested.

3.0 Material requirement. Materials must be suitable for the purpose intended. The suitability of the materials must be determined on the basis of satisfactory service experience or substantiating dynamometer tests.

4.0 Design and construction.

4.1 Unbalance. The moment (M) of static unbalance in inch-ounces may not be greater than the value determined using the formula, moment (M) = $0.025D^2$, rounded off to the next lower whole number: where D = maximum outside diameter of the tire in inches.

4.2 Balance marker. A balance marker, consisting of a red dot, must be affixed on the sidewall of the tire immediately above the bead to indicate the lightweight point of the tire. The dot must remain for any period of storage plus the original tread life of the tire.

4.3 Overpressure. The tire shall withstand for at least 3 seconds a pressure of at least 4.0 times the rated inflation pressure (as specified in paragraph 5.2) at ambient temperature.

4.4 Temperature.

4.4.1 Ambient. It shall be substantiated by applicable tests or shown by analysis that the physical properties of the tire materials have not been degraded by exposure of the tire to the temperature extremes of not higher than -40°F and not lower than +160°F for a period of not less than 24 hours at each extreme.

4.4.2 Wheel rim heat. It must be substantiated by the applicable tests or shown by analysis that the physical properties of the tire materials have not been degraded by exposure of the tire to a wheel-bead seat temperature of not lower than 300°F for at least 1 hour, except that low-speed tires or nose-wheel tires may be tested or analyzed at the highest wheel-bead seat temperatures expected to be encountered during normal operations.

4.5 Tread design. Moved. (See paragraph 7.0)

4.6 Slippage. A tire tested in accordance with the dynamometer tests provided in paragraph 6.0 may not slip on the wheel rim during the first five dynamometer cycles. Slippage that subsequently occurs may neither damage the gas seal of the tyre bead of a tubeless tire nor otherwise damage the tube or valve.

4.7 Leakage. After an initial 12-hour minimum stabilization period, the tire must be capable of retaining inflation pressure with a loss of pressure not exceeding 5 percent in 24 hours from the initial pressure equal to the rated inflation pressure.

5.0 Ratings.

5.1 Load ratings. The load ratings of tyres shall be established. The applicable dynamometer tests in paragraph 6.0 must be performed at the selected rated load.

5.1.1 Load rating (helicopter tires). Airplane tires qualified in accordance with provisions of this standard may also be used on helicopters. In such cases, the maximum static load rating may be increased by 1.5 with a corresponding increase in rated inflation pressure without any additional qualification testing.

5.2 Rated inflation pressure. The rated inflation pressure shall be established at an identified ambient temperature on the basis of the rated load as established under paragraph 5.1.

5.3 Loaded radius. The loaded radius is defined as the distance from the axle centerline to a flat surface for a tire initially inflated to the rated inflation pressure and then loaded to its rated load against the flat surface. The nominal loaded radius, the allowable tolerance on the nominal loaded radius, and the actual loaded radius for the test tire shall be identified.

6.0 Dynamometer test requirements. The tyre may not fail the applicable dynamometer tests specified herein or have any signs of structural deterioration other than normal expected tread wear except as provided in paragraph 6.3.3.3.

6.1 General. The following conditions apply to both low-speed and high-speed tires when these tires are subjected to the applicable dynamometer tests:

6.1.1 Tire test load. Unless otherwise specified herein for a particular test, the tire must be forced against the dynamometer flywheel at not less than the rated load of the tire during the entire roll distance of the test.

6.1.2 Test inflation pressure. The test inflation pressure must be the pressure required at an identified ambient temperature to obtain the same loaded radius against the flywheel of the dynamometer at the loaded radius for a flat surface as defined in paragraph 5.3. Adjustments to the test inflation pressure may not be made to compensate for increases created by temperature rises occurring during the tests.

6.1.3 Test specimen. A single tire specimen must be used in the applicable dynamometer tests specified herein.

6.2 Low-speed tire. A tire operating at ground speeds of 120 mph or less must withstand 200 landing cycles on a dynamometer at the following test temperature and kinetic energy and using either test method A or test method B.

6.2.1 Test temperature. The temperature of the gas contained in the tire or of the carcass measured at the hottest point of the tire may not be lower than 105°F at the start of at least 90 percent of the test cycles. For the remaining 10 percent of the test cycles, the contained gas or carcass temperature may not be lower than 80°F at the start of each cycle. Rolling the tire on the flywheel is acceptable for obtaining the minimum starting temperature.

6.2.2 Kinetic energy. The kinetic energy of the flywheel to be absorbed by the tire must be calculated as follows:

$K.E. = CWV^2 = 162.7W$ = Kinetic energy in foot-pounds.

where:

C = 0.0113,

W = Load rating of the tire in pounds, and

V = 120 mph.

6.2.3 Test method A - variable mass flywheel. The total number of dynamometer landings must be divided into two equal parts having speed ranges shown below. If the exact number of flywheel plates cannot be used to obtain the calculated kinetic energy value or proper flywheel width, a greater number of plates must be selected and the dynamometer speed adjusted to obtain the required kinetic energy.

6.2.3.1 Low-speed landings. In the first series of 100 landings, the maximum landing speed is 90 mph and the minimum unlanding speed is 0 mph. The landing speed must be adjusted so that 56 percent of the kinetic energy calculated under paragraph 6.2.2 will be absorbed by the tire. If the adjusted landing speed is calculated to be less than 80 mph, the following must be done: the landing speed must be determined by adding 28 percent of the kinetic energy calculated under paragraph 6.2.2 to the flywheel kinetic energy at 64 mph, and the unlanding speed must be determined by subtracting 28 percent of the kinetic energy calculated under paragraph 6.2.2 from the flywheel kinetic energy at 64 mph.

6.2.3.2 High-speed landings. In the second series of 100 landings, the minimum landing speed is 120 mph and the nominal unlanding speed is 90 mph. The unlanding speed must be adjusted as necessary so that 44 percent of the kinetic energy calculated under paragraph 6.2.2 will be absorbed by the tire.

6.2.4 Test method B - fixed mass flywheel. The total number of dynamometer landings must be divided into two equal parts having speed ranges indicated below. Each landing must be made in a time period, T, calculated so that the tire will absorb the kinetic energy determined under paragraph 6.2.2. The time period must be calculated using the equation:

$$T_c = \frac{KE_c}{\left[\frac{KE_{W(UL)} - KE_{W(LL)}}{T_{L(UL)} - T_{L(LL)}}\right] - \left[\frac{KE_{W(UL)} - KE_{W(LL)}}{T_{W(UL)} - T_{W(LL)}}\right]}$$

For the 90 mph to 0 mph test, the equation reduces to:

$$T_c = \frac{KE_c}{\left[\frac{KE_{W(UL)}}{T_{L(UL)}}\right] - \left[\frac{KE_{W(UL)}}{T_{W(UL)}}\right]}$$

Where:

Tc = Calculated time, in seconds, for the tyre to absorb the required kinetic energy.

KE_c = Kinetic energy, in foot pounds, the tyre is required to absorb during each landing cycle.

KE_W = Kinetic energy, in foot pounds, of the flywheel at given speed.

T_L = Coast down time, in seconds, with rated tyre load on flywheel.

T_W = Coast down time, in seconds, with no tyre load on flywheel.

(UL) = Subscript for upper speed limit.

(LL) = Subscript for lower speed limit.

6.2.4.1 Low-speed landings. In the first series of 100 landings, the tire must be landed against the flywheel with the flywheel having a peripheral speed of not less than 90 mph. The flywheel deceleration must be constant from 90 mph to 0 mph in the time Tc.

6.2.4.2 High-speed landings. In the second series of 100 landings, the tire must be landed against the flywheel with the flywheel having a peripheral speed of not less than 120 mph. The flywheel deceleration must be constant from 120 mph to 90 mph in the time T_c.

6.3 High-speed tire. Except as provided in the alternate test, a tire operating at ground speeds greater than 120 mph must be tested on a dynamometer in accordance with paragraph 6.3.3. The curves to be used as a basis for these tests shall be established in accordance with paragraph 6.3.3.2. The load at the start of each test must be equal to the rated load of the tire. Alternate tests involving a landing sequence for a tire operating at ground speeds greater than 120 mph and not over 160 mph are set forth in paragraph 6.3.4.

6.3.1 Test temperature. The temperature of the gas contained in the tire or of the carcass measured at the hottest point of the tire may not be lower than 120°F at the start of at least 90 percent of the test cycles specified in paragraph 6.3.3.4 and at least 105°F at the start of the overload test (6.3.3.3) and of at least 90 percent of the test cycles specified in paragraphs 6.3.3.2 and 6.3.4. For the remaining 10 percent of each group of cycles, the contained gas or carcass temperature may not be lower than 80°F at the start of each cycle. Rolling the tire on the dynamometer is acceptable for obtaining the minimum starting temperature.

6.3.2 Dynamometer test speeds. Applicable dynamometer test speeds for corresponding maximum ground speeds are as follows:

Maximum Ground Speed of Aircraft, mph		Speed Rating of Tire, mph	Minimum Dynamometer Speed at S_2, mph
Over	Not Over		
120	160	160	160
160	190	190	190
190	210	210	210
210	225	225	225
225	235	235	235
235	245	245	245

For ground speeds over 245 mph, the tire must be tested to the maximun applicable load-speed-time requirements and appropriately identified with the proper speed rating.

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~~6.3.3 Dynamometer cycles. The test tire must withstand 50 take-off cycles, 1 overload take-off cycle, and 10 taxi cycles described below. The sequence of the cycles is optional.~~

~~6.3.3.1 Symbol definitions. The numerical values which are used for the following symbols must be determined from the applicable aircraft load-speed-time data:~~

~~L_0 = Tire load at start of take-off, pounds (not less than rated load).~~
~~L_1 = Tire load at rotation, pounds.~~
~~L_2 = Zero tyre load (lift-off).~~
~~RD = Roll distance, feet.~~
~~S0 = Zero tyre speed.~~
~~S1 = Tire speed at rotation, mph.~~
~~S_2 = Tire speed at liftoff, mph (not less than speed rating).~~
~~T_0 = Start of takeoff.~~
~~T1 = Time to rotation, seconds.~~
~~T2 = Time to liftoff, seconds.~~

~~6.3.3.2 Takeoff cycles. For these cycles the loads, speeds, and distance must conform to either Figure 1 or Figure 2. Figure 1 defines a test cycle that is generally applicable to any aircraft. If Figure 2 is used to define the test cycle, the loads, speeds, and distance must be selected based on the most critical takeoff conditions established by the applicant.~~

~~6.3.3.3 Overload takeoff cycle. The cycle must duplicate the takeoff cycles specified under paragraph 6.3.3.2 except that the tire load through the cycle must be increased by a factor of at least 1.5. Upon completion of the overload takeoff cycle, the tire must be capable of retaining inflation pressure with the loss of pressure not exceeding 10 percent in 24 hours from the initial test pressure. Good condition of the tire tread is not required after completion of this test cycle.~~

~~6.3.3.4 Taxi cycles. The tire must withstand at least 10 taxi cycles on a dynamometer under the following test conditions:~~

~~Number of Test Cycles~~	~~Minimum Tire Load, 1bs.~~	~~Minimum Speed, mph~~	~~Minimum Roll Distance, ft.~~
~~8~~	~~Rated load.~~	~~40~~	~~35,000~~
~~2~~	~~1.2 times rated load.~~	~~40~~	~~35,000~~

~~6.3.4 Alternative dynamometer tests. For a tire with a speed rating of 160 mph, test cycles which simulate landing may be used in lieu of the take-off cycles specified in paragraphs 6.3.3.2 and 6.3.3.3. The tire must withstand 100 test cycles at rated load in accordance with paragraph 6.3.4.1 followed by 100 test cycles at rated load in accordance with paragraph 6.3.4.2.~~

~~6.3.4.1 Low-speed landings. In the first series of 100 landings, the test procedures for low-speed landings established under paragraph 6.2.3 or 6.2.4, as appropriate, must be followed.~~

~~6.3.4.2 High-speed landings. In the second series of 100 landings, the test procedures for low-speed landings established under paragraph 6.2.3 or 6.2.4, as~~

~~appropriate, must be followed, except that the tire must be landed against the flywheel rotating at a speed of 160 mph with the rated load applied for the duration of the test. The unlanding speed must be adjusted as necessary so that 44 percent of the kinetic energy, as calculated in paragraph 6.2.2, is absorbed by the tire during the series of tests.~~

~~7.0 Requalification tests. A tire shall be requalified unless it is shown that changes in materials, tire design, or manufacturing processes could not affect performance. Changes in materials, tire design, or manufacturing processes that affect performance or changes in number or location of tread ribs and grooves or increases in skid depth, made subsequent to the tire qualification, must be substantiated by dynamometer tests in accordance with paragraph 6.0. Requalification in accordance with paragraph 6.0 of a given load rated tire required as a result of a tread design or material change will automatically qualify the same changes in a lesser load rated tire of the same size, speed rating, and skid depth provided —~~

~~7.1 The lesser load rated tire has been qualified to the applicable requirements specified in this standard; and~~

~~7.2 The ratio of qualification testing load to rated load for the lesser load rated tire does not exceed the same ratio for the higher load rated tire at any given test condition.~~

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~~**FIGURE 1**~~
~~GRAPHIC REPRESENTATION OF A UNIVERSAL LOAD-SPEED TIME TEST CYCLE~~

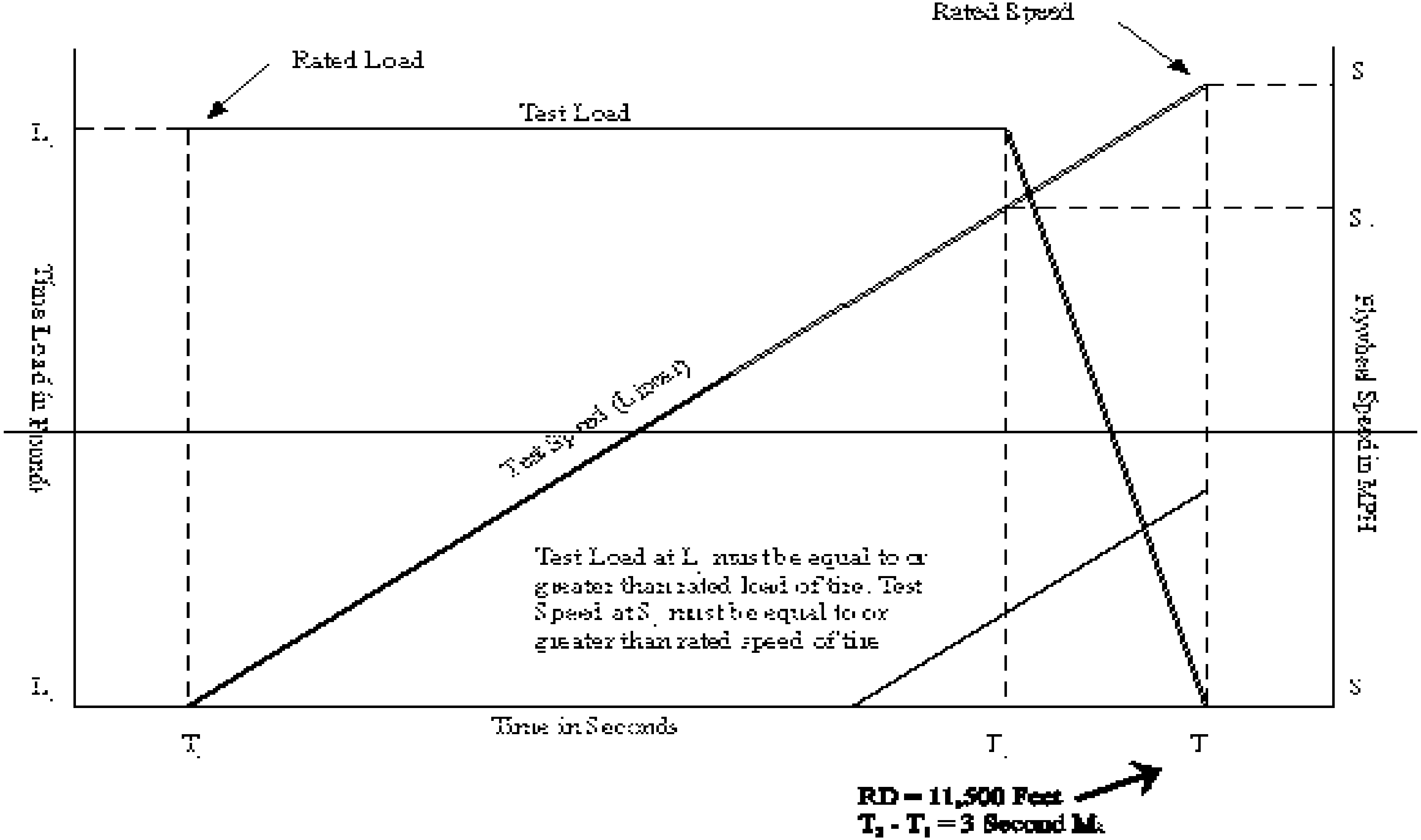

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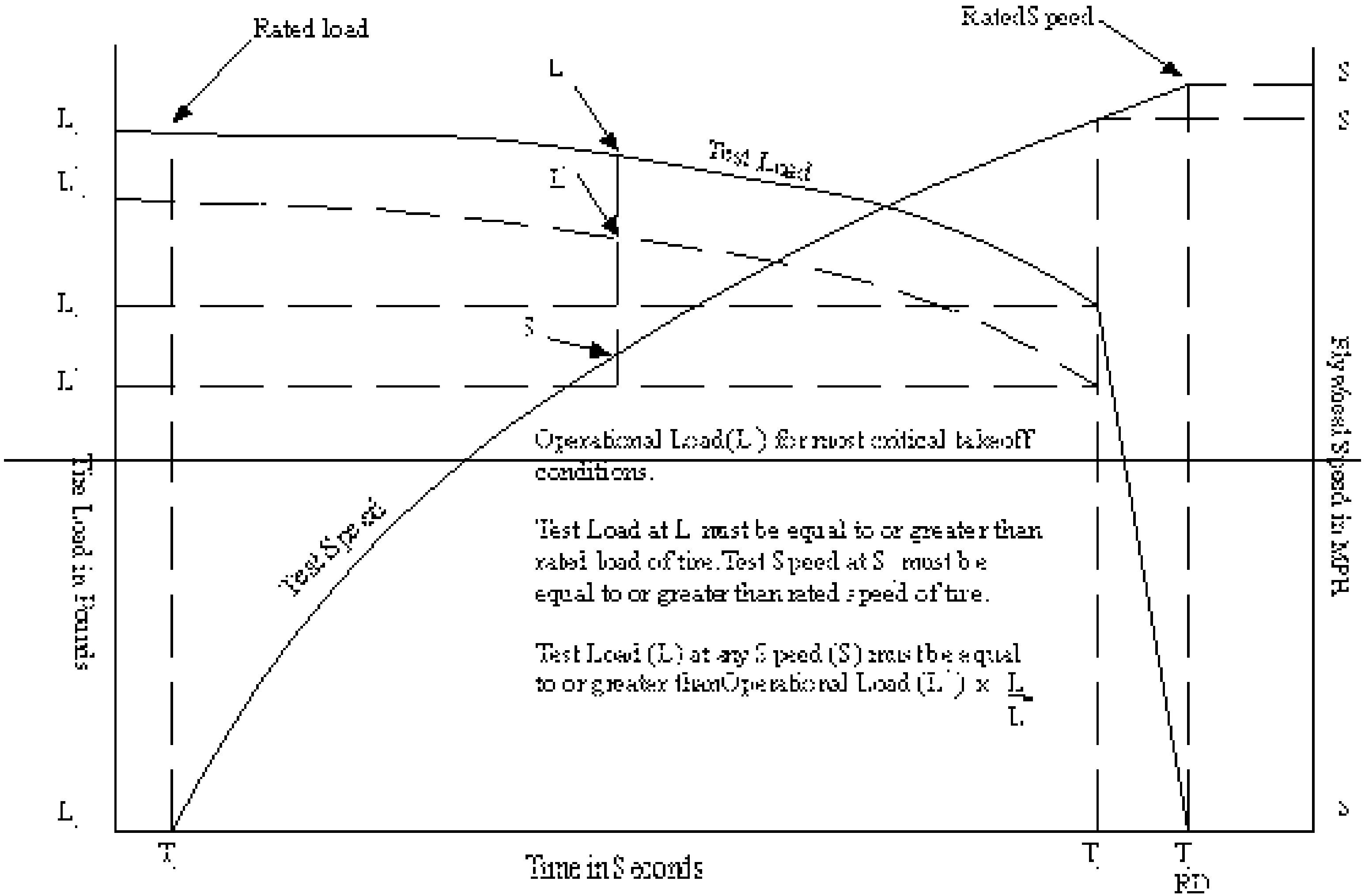
FIGURE 2

GRAPHIS REPRESENTATION OF A RADIONAL LOAD-SPEED-TIME TEST CYCLE

ETSO- C62~~d~~e
~~**Date : 24.10.03**~~
Date: xx.xx.2011



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APPENDIX 1. FAA STANDARD FOR AIRCRAFT TIRES

1. PURPOSE. Minimum performance standards for new and re-qualified radial and bias tires, excluding tailwheel tires, to be identified as meeting the standards of ETSO-C62e.

2. SCOPE. Minimum performance standards apply to aircraft tires having speed and load ratings based on the speeds and loads to which the tires have been tested.

3. DEFINITIONS.

Bias tire: a pneumatic tire whose ply cords extend to the beads and are laid at alternate angles substantially less than 90º to the centerline of the tread. May also have a bias belted tire with a circumferential belt.

Radial tire: a pneumatic tire whose ply cords extend to the beads and are laid approximately at 90º to the centerline of the tread, the carcass being stabilised by an essentially inextensible circumferential belt.

Load rating: maximum permissible static load at a specific inflation pressure. Use the rated load combined with the rated inflation pressure when selecting tires for application to an aircraft, and for testing to the performance requirements of this ETSO.

Rated inflation pressure: specified unloaded inflation pressure which will result in the tire deflecting to the specified static loaded radius when loaded to its rated load against a flat surface.

Static loaded radius (SLR): perpendicular distance between the axle centerline and a flat surface for a tire initially inflated to the unloaded rated inflation pressure and then loaded to its rated load.

Ply rating: an index of tire strength from which a rated inflation pressure and its corresponding maximum load rating are determined for a specific tire size.

Speed rating: maximum ground speed at which the tire has been tested in accordance with this ETSO.

Skid depth: distance between the tread surface and the bottom of the deepest groove as measured in the mold.

4. DESIGN AND CONSTRUCTION .

a. General Standards. Tires selected for use on a specific aircraft must demonstrate suitability through appropriate laboratory simulations described in paragraphs 5.a or 5.b of this appendix, as appropriate. Determine material suitability by:

(1) Temperature: show by tests or analysis that the physical properties of the tire materials are not degraded by exposure to temperature extremes of -40°C (-40ºF) and +71,1°C (+160ºF) for a period of not less than 24 hours at each extreme.

(2) Wheel rim heat: substantiate by the applicable tests or show by analysis that the physical properties of the tire materials have not been degraded by exposure of the tire to a wheel-bead seat temperature of not lower that 148,9°C (300°F) for at least 1 hour, except that low-speed tires or nose-wheel tires may be tested or analysed at the highest wheel-bead seat temperatures expected to be encountered during normal operations.

b. Speed Rating. See Table 1 below for applicable dynamometer test speeds for corresponding maximum takeoff ground speeds. For takeoff speeds over 245 mph, the tire must be tested to the maximum applicable load-speed-time requirements and identified with the proper speed rating.

TABLE 1. Applicable Dynamometer Test Speeds

Max Takeoff Speed *Mph at liftoff over:*	*But not over:*	Max takeoff Speed Of Aircraft *Max Tire mph:*	Min Dynamometer Speed (Figures 1, 2 or 3) *Min Tire mph*:
0	120	120	120
120	160	160	160
160	190	190	190
190	210	210	210
210	225	225	225
225	235	235	235
235	245	245	245

c. Overpressure. The tire must successfully withstand a hydrostatic pressure of at least four times its rated inflation pressure for 3 seconds without bursting.

d. Helicopter tires. You may use aircraft tires qualified according to this ETSO on helicopters. In such cases for standard tires, you may increase the maximum static load rating by a factor of 1.5 with a corresponding increase in rated inflation pressure without additional qualification testing (round loads to the nearest 10 lbs and inflation pressures to the nearest whole psi.). If significant taxi distance is expected, these guidelines may not apply. Consult tire and rim manufacturers for appropriate tire size selection. Maximum permissible inflation for aircraft tires used on helicopters is 1.8 times the rated inflation pressure.

e. Dimensions. Maintain the tire size (outside diameter, shoulder diameter, section and shoulder width), within specified tolerances.

NOTE: for a new programme aircraft, define new tire dimensions and submit them to TRA for publication in the TRA Data Book. You do not have to wait until your submitted dimensions are incorporated into the Data Book before applying for the ETSO.

(1) Outside diameter, shoulder diameter, section width and shoulder width: For the bias ply tire, outside diameter and section width are specified to a maximum and minimum value after a 12 hour growth period at rated inflation pressure. Shoulder diameter and width dimensions are specified to a maximum value after a 12-hour growth period at rated inflation pressure. Radial tire dimensions are limited by the grown tire envelope according to the static loaded radius (SLR) requirements in paragraph 4.e.(3) below.

(2) Due to the increased inflation pressures permitted when using an aircraft tire in a helicopter application, we permit tire dimensions to be 4% larger.

(3) Static loaded radius (SLR):

(a) Bias tires: provide the nominal SLR. The actual SLR is determined on a new tire stretched for a minimum of 12 hours at rated inflation pressure.

(b) Radial tires: provide the nominal SLR. The actual SLR of a radial tire is determined at rated inflation pressure after running 50 takeoffs, following paragraph **5.a.(2)** requirements.

(4) Helicopter tires: maximum dimensions for new tires used on helicopters are 4% larger than maximum aircraft tire dimensions. (In calculating maximum overall and shoulder diameters, rim diameter should be deducted before applying 4%.)

f. Inflation retention. After an initial 12-hour minimum stabilisation period at rated inflation pressure, the tire must retain the inflation pressure with a loss of pressure not exceeding 5% of the initial pressure for 24 hours. Measure the ambient temperature at the start and finish of the test to ensure that any pressure change was not caused by an ambient temperature change.

g. Balance. Test all tires for static unbalance. A balance marker, consisting of a red dot, must be affixed on the sidewall of the tire immediately above the bead to indicate the lightweight point of the tire. The dot must remain for any period of storage plus the original tread life of the tire.

(1) Auxiliary tires (not main or tailwheel tires): the moment of static unbalance (M) for auxiliary tires shall not be greater than the value determined using this equation:

$M = 0.025D^2$

Round the computed equation values to the next lower whole number where M is in inch-ounces and D is the standardised maximum new tire inflated outside diameter in inches. Your design must include requirements to measure the level of unbalance on each tire, and approved procedures to correct the unbalance within the above limits if necessary.

(2) All main tires and all tires with 46-inch and larger outside diameter: the moment of static unbalance (M) for main tires shall not be greater than the value determined using this equation:

$M = 0.035D^2$

Round the computed equation values to the next lower whole number where M is in inch-ounces and D is the standardised maximum new tire inflated outside diameter in inches. Your design must include requirements to measure the level of unbalance on each tire, and approved procedures to correct the unbalance within the above limits if necessary.

5. TIRE TEST REQUIREMENTS.

a. Use a single test specimen for a qualification test. The tire must withstand the following dynamometer cycles without detectable signs of deterioration, other than normal expected tread surface abrasion, except when the overload takeoff condition is run last (see paragraph **5.a.(8)** below).

(1) Dynamometer cycle requirements: all aircraft tires must satisfactorily withstand 58 dynamometer cycles as a demonstration of overall performance, plus 3 overload dynamometer cycles as a demonstration of the casing's capability under overload. The 58 dynamometer cycles consists of 50 takeoff cycles, per **5.a.(2)**, and 8 taxi cycles, per **5.a.(7)**. The overload cycles consist of 2 taxi cycles, per **5.a.(7)** at 1.2 times rated load and 1 overload takeoff cycle per **5.a.(8)** starting at 1.5 times rated load. Run the dynamometer cycles in any order.

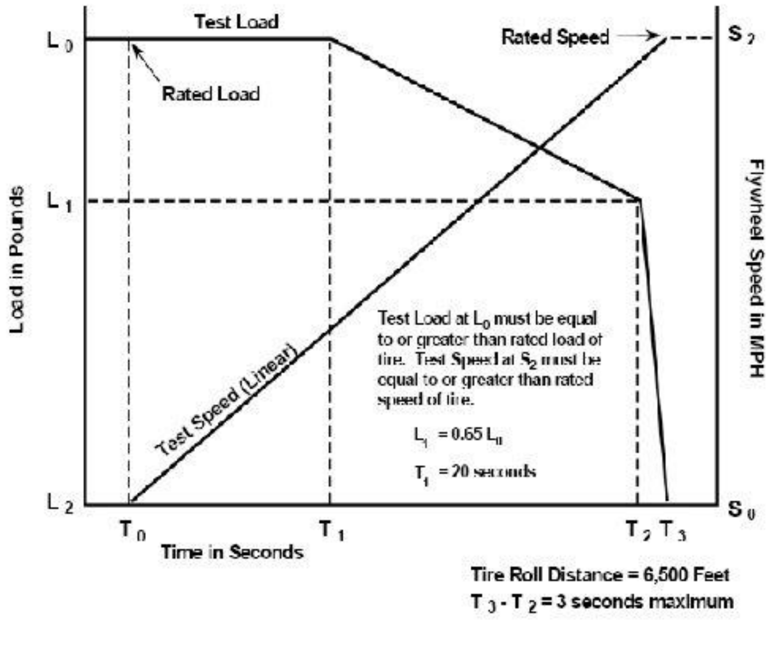
However, if the overload takeoff cycle is not run last, the tire must not show detectable signs of deterioration after the cycle completion, other than normal expected tread surface abrasion.

(2) Takeoff cycles: the 50 takeoff cycles shall realistically simulate tire performance during runway operations for the most critical combination of takeoff weight and speed, and aircraft center-of-gravity position. When determining the most critical combination of the above, be sure to account for increased speeds resulting from high field elevation operations and high ambient temperatures, if applicable. Specify the appropriate load-speed-time data or parameters that correspond to the test envelope in which the tire is to be tested. Figures 1, 2, and 3 are graphic representations of the test. Starting at zero speed, load the tire against the dynamometer flywheel. The test cycles must simulate one of the curves illustrated in Figure 1 or 2 (as applicable to speed rating), or Figure 3.

- Figure 1 defines a test cycle that applies to any aircraft tire with a speed rating of 120 mph or 160 mph.
- Figure 2 defines a test cycle that applies to any aircraft tire with a speed rating greater than 160 mph.
- Figure 3 defines a test cycle that applies for any speed rating, is based on the most critical takeoff loads, speeds, and distances, and is aircraft specific.

Figure 1

Graphic Representation of a Universal Load-Speed-Time Test Cycle
(For 120 MPH and 160 MPH Tires)



Symbol Definitions (Figures 1, 2, and 3)

L_0 Tire load (lbs) at start of takeoff (not less than the load rating), Figures 1, 2, and 3.

L_0^1 Tire load (lbs) at start of takeoff for the operational load curve, Figure 3.

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L_1 Tire load (lbs) at rotation, Figures 1 and 3.

L_1^1 Tire load (lbs), Figure 3.

L_2 Tire load at liftoff, 0 lbs, Figures 1, 2, and 3.

S_0 Zero (0) mph, Figures 1, 2, and 3.

S_1 Speed at rotation in mph, Figure 3.

S_2 Tire speed at liftoff in mph (not less than the speed rating), Figures 1, 2, and 3.

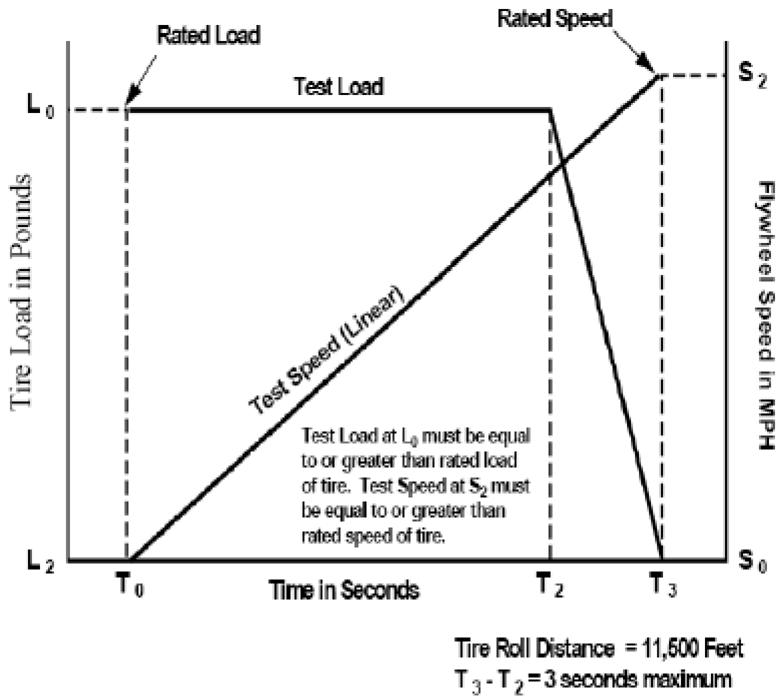
T_0 Time at start of takeoff, 0 s, Figures 1, 2, and 3.

T_1 20 seconds, Figure 1.

T_2 Time to rotation in seconds, Figures 1, 2, and 3.

T_3 Time to liftoff in seconds, Figures 1, 2, and 3.

Figure 2
Graphic Representation of a Typical Universal Load-Speed-Time Test Cycle
(For Tires Rated above 160 MPH)



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~~**Date : 24.10.03**~~
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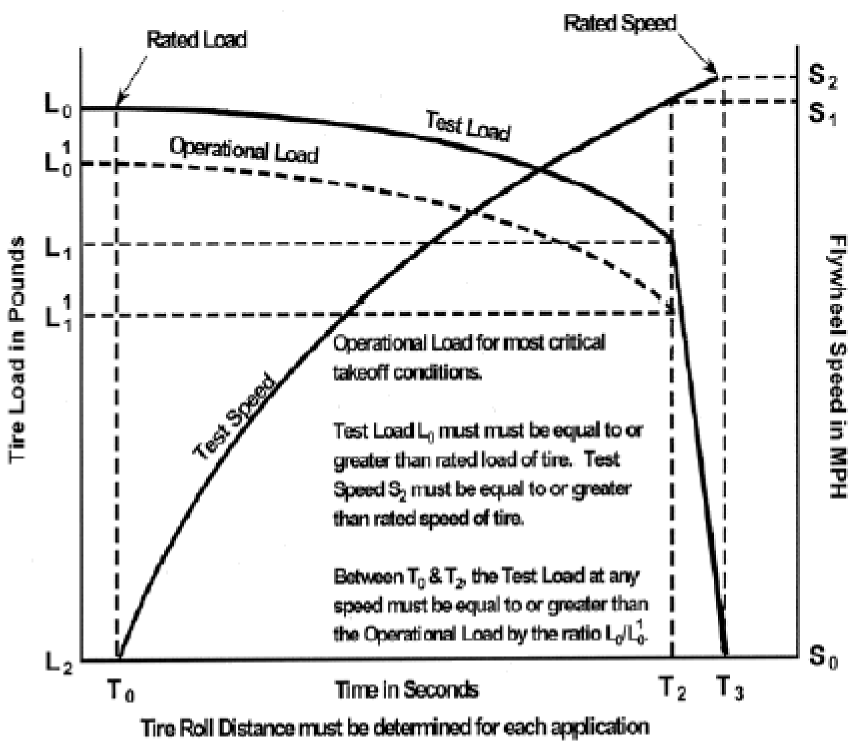
Figure 3
Graphic Representation of a Typical Rational Load-Speed-Time Test Cycle



(3) Test load: the minimum allowable load at the start of the test is the rated load of the tire. The test loads must conform to Figures 1 or 2 (as applicable), or Figure 3. Figures 1 and 2 define a test cycle generally applicable to any aircraft. If you use Figure 3 to define the test cycle, select the loads based on the most critical takeoff conditions you established. At any speed throughout the test cycle, the ratio of the test load to the operational load must be the same as, or greater than, the ratio at the start of the test.

(4) Test inflation pressure: the pressure needed to provide the same loaded radius on the flywheel as was obtained on a flat surface at the rated tire load and inflation pressure. Make both determinations at the same ambient temperature. Do not adjust the test inflation pressure to compensate for changes created by temperature variations during the test.

(5) Test temperatures and cycle interval: the temperature of the gas in the tire or the casing temperature measured at the hottest point of the tire may not be:

(a) Lower than 40,6°C (105ºF) at the start of the overload takeoff cycle and at the start of at least 45 of the 50 takeoff cycles, and

(b) Lower than 48,9°C (120ºF) at the start of at least 9 of the 10 taxi cycles.

For the remaining cycles, the contained gas or casing temperature may not be lower than 26,7°C (80ºF) at the start of each cycle. Rolling the tire on the dynamometer flywheel is an acceptable method for obtaining the minimum starting temperature.

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(6) Dynamometer takeoff cycle speeds: see Table 1 for the dynamometer test speeds for the corresponding maximum aircraft takeoff speeds.

(7) Taxi cycles: tire must withstand 10 taxi cycles on a dynamometer under the test conditions in Table 2 below.

TABLE 2. Test Conditions

Number of Taxi Runs	Min Tire Load (lbs)	Min Speed (mph)	Tire speed rating 120/160 mph Min Rolling Distance (ft)	Tire speed rating Over 160 mph Min Rolling Distance (ft)
8	Rated	40	25,000	35,000
2	1.2 x Rated	40	25,000	35,000

(8) Overload takeoff cycle: the overload takeoff cycle shall duplicate the test described in paragraph **5.a.(2)** with the test load increased by a factor of 1.5 throughout. Good condition of the tire tread is not required after completion of this test cycle, if you run this test last. If the overload takeoff cycle is not run last, the tire must withstand the cycle without detectable signs of deterioration, other than normal expected tread surface abrasion.

(9) Diffusion test: after completing the 61 test cycles, the tire must retain the inflation pressure to within 10% of the initial test pressure for a period of 24 hours. Measure the ambient temperature at the start and finish of this test to ensure that any pressure change was not caused by an ambient temperature change.

(10) Tire/wheel slippage: tires should not slip on the wheel rim during the first five dynamometer cycles. Any slippage that subsequently occurs must not damage the tube valve of tube type tires, or the gas seal of the tire bead of tubeless tires.

b. Alternate qualification procedures: 120 mph rated tires. For 120 mph speed rating tires, you may use the following variable mass flywheel procedure:

(1) Test load: load must meet or exceed the tire rated load throughout the entire test roll distance.

(2) Test inflation pressure: pressure needed to provide the same loaded radius on the flywheel as was obtained on a flat surface at the rated tire load and inflation pressure. Make both determinations at the same ambient temperature. Do not adjust the test inflation pressure to compensate for changes created by temperature variations during the test.

(3) Temperature and cycle interval: the temperature of the gas in the tire, or the casing temperature measured at the hottest point of the tire, may not be lower than 40,6°C (105ºF) at the start of at least 180 of the 200 landing cycles. For the remaining cycles, the contained gas or casing temperature may not be lower than 26,7°C (80ºF) at the start of each cycle. Rolling the tire on the dynamometer is an acceptable method for obtaining the minimum starting temperature.

(4) Kinetic energy: calculate the kinetic energy of the flywheel to be absorbed by the tire using this equation:

$$KE = CW(V^2) = \text{Kinetic energy (ft-lbs)}$$

where
C = 0.0113
W = Load rating of the tire (lbs)
V = 120 mph

(5) Dynamometer cycle requirements: tire must satisfactorily withstand 200 landing cycles on a variable mass dynamometer flywheel. If you cannot use the exact number of flywheel plates to obtain the calculated kinetic energy value, select a greater number of plates and adjust the dynamometer speed to obtain the required kinetic energy. Divide the total number of dynamometer landings into two equal parts having the speed ranges provided in paragraphs **5.b.(5)(a)** and **5.b.(5)(b)**.

(a) Low speed landings: in the first series of 100 landings, the maximum landing speed is 90 mph and the minimum unlanding speed is 0 mph. Adjust the landing speed so the tire will absorb 56% of the kinetic energy calculated using the equation in paragraph **5.b.(4)** above. If the adjusted landing speed is calculated to be less than 80 mph, then determine the landing speed by adding 28% of the calculated kinetic energy (see paragraph **5.b.(4)** above) to the flywheel kinetic energy at 64 mph, and determine the unlanding speed by subtracting 28% of the calculated kinetic energy from the flywheel kinetic energy at 64 mph.

(b) High speed landings: in the second series of 100 landings, the minimum landing speed is 120 mph and the nominal unlanding speed is 90 mph. Adjust the unlanding speed as needed to ensure that the tire will absorb 44% of the calculated kinetic energy (see paragraph **5.b.(4)** above).

6. REQUALIFICATION TESTS.

a. Re-qualify altered tires, with changes in materials, design and/or manufacturing processes that could adversely affect the performance and reliability, to the dynamometer tests described under paragraph **5**. Some examples include **(1)** or **(2)** below, or both:

(1) Changes in casing construction, such as the number of plies and/or bead bundles, ply cord makeup (material, denier, number of strands) and configuration (radial and bias).

(2) Changes in tread construction, such as number or composition of tread reinforcing and/or protector plies, tread compound formulations, number and location of tread grooves, and an increase in skid depth.

b. Re-qualification by similarity (based on load rating). Re-qualifying a given load rated tire due to a change in material or tread design, automatically qualifies the same changes in a lesser load tire of the same size, speed rating, and skid depth, if:

(1) The lesser load rated tire was qualified to the applicable requirements specified in this ETSO, and

(2) The ratio of qualification test load to rated load for the lesser load rated tire does not exceed the same ratio to the higher load rated tire at any given test condition.

c. Re-qualification by similarity (blanket change). You can gain re-qualification of any change that affects all sizes by similarity, if:

(1) Five representative sizes, including tires of the highest load rating, speed rating and angular velocity, were qualified to the minimum performance standard with the change, and

(2) You submit data supporting the change in the listed sizes to EASA.

ETSO-C90ed
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Cargo Pallets, Nets and Containers (Unit Load Devices)

1 - Applicability

This ETSO gives the requirements which Cargo Unit Load Devices that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None.

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

For new models of Type I ULDs sStandards set forth in standard of Aerospace Industries Association of America, Inc. (AIA), National Aerospace Standard, NAS 3610, "Cargo Unit Load Devices.- Specification for," Revision 10, dated November 1, 1990~~, as amended and supplemented by this ETSO:~~

~~Il lieu of NAS 3610, paragraph 3.5, paragraph 4 of this ETSO provides the marking requirements.~~

When using NAS 3610 Revision 10, the following errors must be corrected:

- in lieu of Figure 31, sheet 87, substitute Figure 31, sheet 88;
- in lieu of Figure 31, sheet 88, substitute Figure 32, sheet 87 of NAS 3610 Revision 8 dated April 1987

For new models of Type II ULDs standards set forth in the Society of Automotive Engineers, Inc. (SAE) Aerospace Standard (AS) 36100, "Air Cargo Unit Load Devices - Performance Requirements and Test Parameters", Revision A, dated April 2006.

For Type I and II ULDs, the standards set forth in SAE AS 36102, Air Cargo Unit Load Devices - Testing Methods, dated March 2005 are applicable.

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Date: xx.xx.2012

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

None

3.1.4 - Electronic Hardware Qualification

None

3.2 - Specific

Environmental degradation due to ageing, ultra-violet (UV)-exposure, weathering, etc. for any non-metallic materials used in the construction of pallets, nets and containers must be considered.

In lieu of NAS 3610 Rev. 10, paragraph 3.7 and SAE AS 36100 Rev. A, paragraph 4.7 use the following paragraph which provides the fire protection requirements for ULDs:

The materials used in the construction of pallets, nets and containers must meet the appropriate provisions in CS-25, Appendix F, Part I, paragraph (a)(2)(iv).

Textile Performance: See SAE Aerospace Information Report (AIR) 1490B, Environmental Degradation of Textiles, dated December 2007, for available data for textile performance when exposed to environmental factors. These data shall be taken into account for consideration of the effects of environmental degradation on nets commensurate with the expected storage and service life to satisfy SAE AS 36100 Rev. A, paragraph 4.11.

NOTE: Environmental degradation data other than that documented in AIR1490B may be used if substantiated by the applicant and approved by EASA.

~~None~~

3.2.1 Failure Condition Classification

N/A

4 - Marking

4.1 - General

Marking is detailed in CS-ETSO Subpart A paragraph 1.2.

~~In addition, the following information shall be legibly and permanently marked on the major components:~~

~~- The identification of the article in the code system set out in paragraph 1.2.1 of NAS 3610, Revision 8.~~

~~- If the article is not omnidirectional, the words „FORWARD", „AFT", and „SIDE" must be conspicuously and appropriately placed.~~

~~- The burning rate determined for the article under NAS 3610, paragraph 3.7, Revision 8.~~

4.2 - Specific

~~None~~

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Date: xx.xx.2012

In addition, the following information shall be legibly and permanently marked on the ULD:

1. The identification of the article in the code system explained in
   a. NAS 3610, Revision 10, paragraph 1.2.1, for Type I ULDs.
   b. SAE AS 36100, Rev. A, paragraph 3.5 for Type II ULDs.
2. The nominal weight of the article in kilogram and pound in the format: Weight: …kg (…lb)
3. If the article is not omni-directional, the words “FORWARD”, “AFT”, and “SIDE” must be conspicuously and appropriately placed.
4. The manufacturer’s serial number of the article, with the option to add the date of manufacture.
5. The burning rate determined for the article under paragraph 3.2 of this ETSO.
6. If applicable, the expiration date in the format “ EXP YYYY-MM” must be marked on the ULD.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C95a
~~**Date : 24.10.03**~~
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Mach Meters

1 - Applicability

This ETSO gives the requirements which Mach Meters that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None.

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in the SAE AS 8018A, Mach Meters, dated 01/09/1996.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

See CS-ETSO Subpart A paragraph 2.3.

3.2 - Specific

~~None~~

3.2.1 Failure Condition Classification

See CS-ETSO Subpart A paragraph 2.4.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a major failure condition.

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4 – Marking

4.1 - General
Marking as detailed in CS-ETSO Subpart A paragraph 1.2.

4.2 - Specific
None, marking in accordance with AS 8018A addendum 1 section 2 is optional.

5 - Availability of Referenced Document
See CS-ETSO Subpart A paragraph 3.

ETSO-~~2~~C126a
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: 406MHz Emergency Locator Transmitter

1 - Applicability

This ETSO gives the requirements which 406MHz Emergency Locator Transmitter that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None.

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in the EUROCAE ED-62A, Minimum Operational Performance Specification for Aircraft Emergency Locator Transmitters 406 MHz and 121.5 MHz (Optional 243 MHz), dated February 2009.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

See CS-ETSO Subpart A paragraph 2.3.

3.2 - Specific

3.2.1 Failure Condition Classification

See CS-ETSO Subpart A paragraph 2.4.

ETSO-~~2~~C126a
Date: xx.xx.2012

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a minor failure condition.

4 - Marking

4.1 - General

Marking as detailed in CS-ETSO Subpart A paragraph 1.2.

4.2 - Specific

See EUROCAE ED-62A paragraph 2.7.3.~~None~~

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C154c
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Universal Access Transceiver (UAT) Automatic Dependent Surveillance - Broadcast (ADS-B) Equipment Operating on the Frequency of 978 MHz

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Note: Newly introduced standard

ETSO-C157a
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Aircraft Flight Information Services-Broadcast (FIS-B) Data Link Systems and Equipment

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Note: Newly introduced standard

ETSO-C158
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Aeronautical Mobile High Frequency Data Link (HFDL) Equipment

…….

Note: Newly introduced standard

ETSO-C159a
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Avionics Supporting Next Generation Satellite Systems (NGSS) = Airborne Iridium Satellite Transceiver for Voice or Data

……

Note: Newly introduced standard

ETSO-C161a
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Ground Based Augmentation System Positioning and Navigation Equipment

…..

Note: Newly introduced standard

ETSO-C162a

Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Ground Based Augmentation System Very High Frequency Data Broadcast Equipment

……

Note: Newly introduced standard

ETSO-C166~~a~~b

~~**Date : 24.10.03**~~
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)

1 - Applicability

- This ETSO gives the requirements which Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services - Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz) that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None.

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

~~Section 2 of RTCA DO-260A " *Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services - Broadcast (TIS-B)",* dated April 10, 2003, as modified by Change 1 to RTCA/DO-260A, dated June 27, 2006, and Change 2 to DO-260A, dated December 13, 2006. The 1090 MHz equipment classes applicable to this ETSO are defined in RTCA/DO-260A, Section 2.1.11.~~

Standards set forth in the RTCA DO-260B, Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services - Broadcast (TIS-B), dated 02/12/2009, section 2.

This ETSO supports two major classes of 1090 MHz ADS-B and TIS-B equipment:
(a) Class A equipment, consisting of transmit and receive subsystems; and
(b) Class B equipment, containing a transmit subsystem only

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Date: xx.xx.2012

(a) Class A equipment includes Classes A0, A1, A1S, A2 and A3. This standard requires 1090 MHz airborne Class A equipment to include the capability of receiving both ADS-B and TISB messages and delivering both ADS-B and TIS-B reports, as well as transmitting ADS-B messages. A Receive-only Class of equipment is allowed.

(b) Class B equipment includes Classes B0, B1, and B1S. Classes B0, B1, and B1S are the same as A0, A1, and A1S, except they do not have receive subsystems. Note that Classes B2 and B3 are not for aircraft use.

3.1.2 - Environmental Standard

~~EUROCAE ED-14E (RTCA DO160E) "Environmental Conditions and Test Procedures for Airborne Equipment" from March 2005.~~

~~The means for verifying equipment performance must be consistent with the test procedures specified in section 2.3 of RTCA/DO-260A dated April 10, 2003 Change 1 to RTCA/DO-260A, dated June 27, 2006, and Change 2 to DO-260A, dated December 13, 2006.~~

See CS-ETSO Subpart A paragraph 2.1. The required performance under test conditions is defined in RTCA/DO-260B section 2.4

3.1.3 – Computer Software

~~If the article includes a digital computer, the software must be developed according to EUROCAE ED-12B (RTCA DO-178B) "Software Considerations in Airborne Systems and Equipment Certification" from 1992.~~

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

See CS-ETSO Subpart A paragraph 2.3.

3.2 - Specific

~~None~~

3.2.1 Failure Condition Classification

See CS-ETSO Subpart A paragraph 2.4.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a major failure condition.

NOTE: The major failure condition for transmission of incorrect ADS-B messages is based on use of the data by other aircraft or Air Traffic Control for separation services.

ETSO-C166ab
Date: xx.xx.2012

4 - Marking

4.1 - General

Marking as detailed in CS-ETSO Subpart A paragraph 1.2.

4.2 - Specific

Transmitting and receiving components must be permanently and legibly marked.

The following table explains how to mark components.

RTCA/DO-260AB provides the equipment class in Section 2.1.11, and the receiving equipment type in Section 2.2.6.

If component can:	***Mark it with:***	***Sample marking pattern:***
Transmit and receive	Equipment class it supports, and Receiving equipment type	Class A0/Type 1
Transmit, but not receive	Equipment class it supports	Class B1, or Class A3-Transmitting Only
Receive, but not transmit	Equipment class it supports, and Receiving equipment type	Class A2/Type 2-Receiving Only

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C170
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: High Frequency (HF) Radio Communications Transceiver Equipment Operating Within the Radio Frequency 1.5 to 30 Megahertz

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Note: Newly introduced standard

ETSO-C172
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Cargo Restraint Strap Assemblies

…..

Note: Newly introduced standard

ETSO-C179a
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Permanently Installed Rechargeable Lithium Cells, Batteries, and Battery Systems

……

Note: Newly introduced standard

ETSO-C184
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Airplane Galley Insert Equipment, Electrical/Pressurised

……

Note: Newly introduced standard

ETSO-C194
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Helicopter Terrain Awareness and Warning System (HTAWS)

…..

Note: Newly introduced standard

ETSO-C195a
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Avionics Supporting Automatic Dependent Surveillance - Broadcast (ADS-B) Aircraft Surveillance Applications (ASA)

…..

Note: Newly introduced standard

ETSO-C196a
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Airborne Supplemental Navigation Sensors for Global Positioning System Equipment Using Aircraft-Based Augmentation

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Note: Newly introduced standard

ETSO-2C70~~a~~b
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: LIFERAFTS (REVERSIBLE AND NONREVERSIBLE)

....

4 -**Marking**

4.1 - General Marking is detailed in CS-ETSO Subpart A paragraph 1.2.

4.2 - Specific
~~As given in Appendix 1.~~ In addition, weight and rated and overload capacities of the liferaft must be shown also. The weight of the liferaft includes any accessories required in this ETSO.

...

APPENDIX 1. STANDARD FOR LIFERAFTS (REVERSIBLE AND NONREVERSIBLE)

...

3.1.8 Flammability. The device (including carrying case or stowage container) must be constructed of materials which meet CS 25.853, as follows:

Type I rafts must meet CS 25 Appendix F Part 1 ~~a(ii)~~ (a)(1)(ii)

Type II rafts must meet CS 25 Appendix F Part 1 ~~a(v)~~ (a)(1)(v)

...

ETSO-2C197
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Information Collection and Monitoring Systems

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Note: Newly introduced standard