技 术 标 准 规 定

航 空 轮 胎

（CTSO—C62d）

中 国 民 用 航 空 总 局

中国民用航空总局

编　　号：CTSO—C62d
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民航总局局长授权：
批　准　人：吴湘如

技 术 标 准 规 定

本技术标准规定根据中国民用航空规章《技术标准规定》(CCAR37)颁发。每份技术标准规定是对用于民用航空器上的航空材料、零部件和机载设备接受适航审查时，必须遵守的准则。

航 空 轮 胎

1. 适用范围

本项技术标准规定制定了航空轮胎为取得相应的机载设备批准标记(CTSO)所必须符合的最低性能标准。预期根据本规定审定的，并且在本规定生效之日以后生产的新型航空轮胎必须符合本规定的附录《航空轮胎最低性能标准》。

2. 标记

为符合中国民用航空规章CCAR 21.84.(四)的标记要求，航空轮胎必须标有含下述内容的持久而清晰的标记：

(1)对符合性负责的制造人的注册名称或商标名称。

(2)额定速度,额定负荷,规格,花纹沟深度,序号,日期,制造人零部件号和出厂号,如果该轮胎是不允许翻新的,还须标出"不可翻新"。

(3)技术标准规定编号CTSO－C62d(对于国内使用的航空轮胎)。

(4)技术标准规定编号TSO－C62d(对于出口的航空轮胎)。

3. 资料要求

(1)除中国民用航空规章CCAR21.82.(三)规定的资料外,制造人还须向民航总局航空器适航司提交以下技术资料一份:额定速度,额定负荷,额定充气内压,轮胎规格,宽度,外直径,模型花纹沟深度,额定负荷和充气内压的标称负荷半径,标称负荷半径的允许误差,试验轮胎在额定负荷及充气内压下的实际负荷半径,重量,试验轮胎的静不平衡性,轮辋规格,制造人零部件号;对于高速轮胎还应包括将负荷加大至1.5倍额定负荷量的负荷下沉量曲线;以及用于动力试验的载荷－速度－时间参数的曲线概述。这里所说的高速轮胎系指在大于120mph的速度下进行试验的轮胎。

(2)制造人还必须向民航总局航空器适航司提交适用的维护修理说明。制造人所提供的维护资料必须包括用以判明在用轮胎能否继续使用的检查准则,该维护资料中,除包括有关该轮胎的任何特殊修理方法和专用的无损探伤工艺外,可翻新轮胎还必须包括该轮胎的翻新工艺的规程。

(3)制造人应提供一套完整的轮胎设计图纸和轮胎横截面的

照片。轮胎重新审定时，则制造人还应提供设计更改的具体细节。

4. 随产品提供的资料

有CTSO批准并不表明自动取得在航空器上安装使用的权利。随产品提供的资料中必须含有下述内容的声明：

“取得本产品机载设备批准(CTSOA)所要求的试验和条件是最低性能标准。若欲将本产品安装在某具体型号或类别的航空器上，则有责任确定该航空器的运行条件是否在本CTSO标准范围内。如果不在本CTSO标准范围内，则只有在使用人或安装人进一步评估并提供资料证明安装是可接受的，且经过适航部门批准，本产品才可安装。如果在本CTSO标准范围内，则只有使用人或安装人提供资料证明安装是可接受的。且经过适航部门批准，本产品才能安装”。

5. 溯及力

(1)任何人不得使用CTSO－C62d的编号来标志本项技术标准规定生效之前获得批准的轮胎。

(2)本项技术标准规定生效以前获得批准的航空器轮胎。除5.3段中所述情况外，可以根据其原先批准的条款继续生产。

(3)任何人不得采用本技术标准规定以外的任何标准(CTSO－C62C除外)对额定速度超过160mph的轮胎进行适航审定或标记。

附录：**航空器轮胎最低性能标准**

1.0 **目的** 本标准为新型和重新审定的改型轮胎(不包括尾轮轮胎)规定了最低性能标准。

2.0 **范围** 本最低性能标准所适用的航空器轮胎，必须根据轮胎试验得到的速度和载荷值，确定其额定速度和额定载荷。

3.0 **材料要求** 轮胎材料必须适合预期用途，这一点必须根据满意的使用经验或测功器试验加以证实。

4.0 **设计构造**

4.1 **不平衡** 静不平衡力矩(英寸－盎斯)不得超过用以下公式计算值(向偏小方向园整)：

静不平衡力矩(M)＝$0.025D^2$

其中：

D－轮胎最大外径，英寸。

4.2 **平衡标记** 在紧靠胎缘的轮胎壁上应制出指示轮胎重量最轻位置的红点平衡标记，这个标记应在轮胎贮存期加上原始胎纹寿命期内保持清晰可见。

4.3 **过压** 在环境温度条件下，轮胎必须能承受至少4倍的额定充气压力(按5.2条)。并至少维持3秒钟。

4.4 **温度**

4.4.1 **环境温度** 必须通过适当的试验验证或分析表明，轮胎暴露于不高于－40° F和不低于＋160° F的两种极限温度环境下，各保持24小时，不会使轮胎材料的物理性能退化。

4.4.2 **轮辋加热** 必须通过适当的试验验证或分析表明，轮胎安装于胎缘座温度不低于300° F的轮辋上保持至少1小时，不会使轮胎材料的物理性能退化。对于低速轮胎和前起轮胎，可按正常操作中预期会遇到的最高胎缘座温度进行试验或分析。

4.5 **胎面花纹设计** （参看7.0节）

4.6 **滑移** 轮胎进行6.0条要求的测功器试验时，最初5个试验循环内，轮胎不得相对轮辋产生滑移，以后的循环期内发生滑移时，对无内胎轮胎不得损坏其胎缘密封件，对有内胎轮胎不得损坏其内胎和气阀。

4.7 **泄漏** 在经初始的至少12小时稳定以后，轮胎必须能保持气压，24小时内的压力损失不得超过初始压力（即为额定气压）的5%。

5.0 **额定值**

5.1 **载荷额定值** 应制订航空器轮胎的额定载荷，并选定的额定载荷完成6.0条要求的相应测功器试验。

5.1.1 **额定载荷** （直升机轮胎）按本标准条款鉴定合格的飞机轮胎，也可用于直升机。此时，轮胎的最大额定载荷 可以在其额定充气压力相应增高的情况下增大到1.5倍，不必作任何补充鉴定试验。

5.2 **额定充气压力** 应当按5.1条制订的额定载荷制定一定环境温度下的额定充气压力。

5.3 **轮胎负载半径** 定义如下：将轮胎充到额定充气压力后置于平板，对轮胎加压至额定载荷时，自轮胎中心至平板表面的距

离。对试验轮胎应确定其名义负载半径，负载半径容差和实际负载半径。

6.0 **测功器试验要求** 轮胎在按本标准规定完成相应的测功能器试验后，除正常预期的胎纹磨损外不得有其它结构损伤痕(6.3.3.3款规定的除外)。

6.1 **总则** 以下试验条件下适用于高、低速两种轮胎的测功器试验。

6.1.1 **轮胎试验载荷** 除非本标准对某一试验另有规定，轮胎在其测功器试验的全部滚动距离内必须压紧于飞轮上，压紧力不得低于其额定载荷。

6.1.2 **试验用充气压力** 试验采用的充气压力必须使轮胎在规定的环境温度下，相对测功器飞轮压紧时所得到的负荷半径等于本文5.3条定义的相对平板表面的负荷半径值试验期因温升而引起的轮胎增压不得以调节试验用充气压力予以补偿。

6.1.3 **试件** 必须用同一个轮胎试件完成本文规定的有关测功器试验。

6.2 **低速轮胎** 使用地面速度不大于120英里／小时的轮胎，必须能够在以下试验温度和功能条件下，承受200次测功器着陆循环。试验方法A、B可任选。

6.2.1 **试验温度** 轮胎充气温度或在其最热点测得的胎体温度不低于105° F的循环，应至少占总循环次数的90%；其余10%的试验循环中，轮胎充气温度或胎体温度不得低于80° F。可以通过轮胎在飞轮上滚转摩擦获得上述最低起始温度。

6.2.2 **动能** 轮胎吸收飞轮功能应按如下公式计算：

$KE=CWV^2=162.7W$=功能(英寸－磅)

式中： C－0.0113

W－轮抬额定载荷，磅

V－120英里／小时。

6.2.3 **试验方法A－－变质量飞轮** 测功器总着陆次数应按以下速度范围分成两相等部分，如果飞轮的盘片数不能正好得出计算动能值、亦即没有正好的飞轮宽度时，必须选择偏多的飞轮盘片，然后通过调节测功器速度以获得所要求的功能。

6.2.3.1 **低速着陆** 第1组100次着陆循环采用的着陆速度最低为90英里／小时，而最小完成着陆速度为0英里／小时。

必须通过调节着陆速度，使6.2.2条规定的计算功能有56%由轮胎吸收。若经计算，调节后的着陆速度低于80英里／小时，就应按下述规定处理：将速度为64英里／小时的飞轮功能加上28%的6.2.2条计算值，以此得出的功能值确定着陆速度，而以上述两项动能之差确定完成着陆速度。

6.2.3.2 **高速着陆** 第2组100次着陆循环采用的着陆速度最低为120英里／小时，名义完成着陆速度为90英里／小时，必要时，应通过调节完成着陆速度，使轮胎能吸收6.2.2条功能计算值的44%。

6.2.4 **试验方法B－－恒定质量飞轮** 测功器总着陆次数应按以下速度范围分成两相等部分。完成每次着陆的时间周期T，应按轮胎吸收6.2.2条动能计算值的要求，根据以下公式计算：

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

而对于90英里／小时至0英里／小时的试验，方程简化为：

$$T_C=\frac{KE_C}{\frac{KE_{W(UL)}}{T_{L(UL)}}-\frac{KE_{W(UL)}}{T_{W(UL)}}}$$

式中 T_C—轮胎吸收规定动能的时间计算值，秒。

KE_C—每次着陆循环由轮胎吸收的动能，英尺—磅。

KE_W—给定速度下的飞轮动能，英尺—磅。

T_L—额定轮胎载荷作用于飞轮时的惯性降转时间，秒。

T_W—无轮胎载荷作用于飞轮时的惯性降能时间，秒。

$(_{UL})$—指速度上限的脚标。

$(_{LL})$—指速度下限的脚标。

6.2.4.1 **低速着陆** 第1组100次着陆时，轮胎接触飞轮时的飞轮圆周速度不得低于90英里／小时，并在T_C时间内，飞轮必须从90英里／小时均减速至0英里／小时。

6.2.4.2 **高速着陆** 第2组100次着陆时，轮胎接触飞轮时的飞轮圆周速度不得低于120英里／小时，并在T_C时间内，飞轮必须从120英里／小时均减速至90英里／小时。

6.3 **高速轮胎** 地面使用速度超过120英里／小时的轮胎除非采用其他代用试验，否则必须按6.3.3条规定作测功器试验，试验基准曲线应按6.3.3.2条的要求确定。每一次试验的初始载荷必须等于轮胎额定载荷。对于地面使用速度大于120英里／小时，低于160英里／小时的轮胎，6.3.4条提出了用一系

列着陆代替的试验。

6.3.1 **试验温度** 进行6.3.3.4条规定的循环试验时，轮胎初始充气温度或在轮胎最热点测得的胎体温度不低于120° F的循环次数至少应占总循环次数的90%。而进行6.3.3.3条的超载试验以及6.3.2条与6.3.4条规定的循环试验时，这个温度不低于105° F的循环次数至少应占总循环次数的90%。对于每组试验的其余10%循环，开始时的轮胎充气温度或胎体温度均不得低于80° F，可以通过轮胎在测功器飞轮上滚动摩擦获得上述最低起始温度。

6.3.2 **测功器试验速度** 相应最大地面适用的测功器试验速度如下：

航空器最大地面速度 英里／小时	轮胎额定速度 英里／小时	S2时的测功器 最低速度，英里／小时
＞120 ≤160	160	160
＞160 ≤190	180	180
＞140 ≤210	210	210
＞210 ≤225	225	225
＞225 ≤235	235	235
＞235 ≤245	245	245

对于地面速度超过245英里／小时的航空器，轮胎必须按适用的最大载荷一速度一时间的要求进行试验，并相应地规定其适用的额定速度。

6.3.3 **测功器循环** 试验轮胎必须按以下规定承受50次起飞循

环、1次超载起飞循环及10次滑行循环。循环顺序任选。

6.3.3.1 **符号定义** 下述符号所定义的数字值必须根据相应的航空器载荷—速度—时间数据确定：

L_0—起飞起始时的轮胎载荷(不低于额定载荷)，磅

L_1—飞机轮前轮时的轮胎载荷，磅

L_2—飞机离地时的零轮胎载荷；

R_D—滑行距离，英尺

S_0—零轮胎速度；

S_1—飞机抬前轮时的轮胎速度，英里／小时；

S_2—飞机离地时的轮胎速度(不小于额定速度)，英里／小时；

T_0—开始起飞时间；

T_1—至抬前轮的时间，秒；

T_2—至离地的时间，秒。

6.3.3.2 **起飞循环** 对于这些循环，载荷速度和距离必须符合图1或图2。图1规定了一种试验循环，它通常适合于任何飞机。如果使用图2来规定试验循环，这载荷、速度和距离必须选择由申请人提供的最严重的起飞条件。

6.3.3.3 **超载起飞循环** 这循环必须重复6.3.3.2节规定的起飞循环，但轮胎负荷在此循环中必须增加至少1.5的系数。轮胎在完成超载起飞循环后必须能保持压力。24小时后的压力损失不得超过试验初始压力的10%。完成试验后不要求轮胎胎面完好。

6.3.3.4 **滑行循环** 轮胎必须在下述试验条件下能承受至少10次的测功器滑行循环：

试验循环数	最小轮胎载荷	最小速度（英里／小时）	最小滚动距离（英尺）
8	额　定	40	35000
2	1.2	40	35000

6.3.4 **代用测功器试验** 对于额定速度为160英里／小时的轮胎，可以用模拟着陆循环试验代替6.3.3.2和6.3.3.3条规定的起飞循环试验。轮胎必须在额定载荷条件下先完成6.3.4.1条规定的100次试验循环，再进行6.3.4.2条规定的100次试验循环。

6.3.4.1 **低速着陆** 第1组100次着陆应按要求遵循6.2.3条或6.2.4条规定的低速着陆试验程序。

6.3.4.2 **高速着陆** 第2组100次着陆同样应遵循6.2.3或6.2.4条规定的着陆试验程序，但轮胎压上飞轮时，飞轮的转速不得低于160英里／小时，并在试验过程保持额定载荷。必要时应通过调节完成着陆速度，使轮胎在本组试验中能吸收6.2.2条计算功能值的44%。

7.0 **重新鉴定试验** 轮胎更改材料、花纹设计和制造工艺时，除非能证明更改对性能无影响，否则均应按胎纹沟槽凸筋位置更改和胎纹深度更改情况一样作重新鉴定，即必须重新按6.0节规定作测功器试验。已知额定载荷的轮胎因更改花纹设计或材料而按6.0节规定重新鉴定时，其鉴定结果亦可适用于同样尺寸、额定速度与花纹深度，作同样更改，但其额定载荷较低的轮胎，其条件是：

7.1 额定载荷较低的轮胎已按本标准规定的适用要求鉴定合格；以及；

7.2 在任何给定试验条件下，额定载荷较低的轮胎鉴定试验载荷与额定载荷之比，未超过较高额定载荷轮胎的这一比值。

Technical Standard Order
——Aircraft Tires
(CTSO-C62d)

1. Applicability

This Technical Standard Order prescribes the minimum performance standards that aircraft tires must meet in order to be identified with the applicable CTSO marking. Tirse that are to be so identified and that are manufactured on or after the effective date of this order must meet the requirements of the "Minimum Performance Standards for Aircraft Tires" (Appendix).

2. Marking

In lieu of the marking requirements of Chinese Civil Aviation Regulation CCAR 21.84(4), each tire must be legibly and permanently marked with the following:

(1) Registered name or brand name of the manufacturer responsible for compliance.

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

(3) Technical standard order number CTSO-C62d(for aircraft tires used in domestic).

(4) Technical standandards order number TSO-C62d(for exportted aircraft tires).

3. Data Requirements

(1) In addition to the data specified in Chinese Civil Aviation Regulation CCAR21.82(3), the manufacturer must furnish the Aircraft Airworthiness Department (AAD) of CAAC one copy each of the following technical data: tire speed rating, load rating, rated inflation pressure, size, width, outside diameter, mold skid depth, nominal loaded radius at rated load and inflation

pressure, and permissible tolerance on the nominal loaded radius; the actual loaded radius of the test tire at rated load and inflation pressure, weight, and static unbalance of the test tire, wheel rim designation; manufacturer's tire part numder; for a high-speed tire, a load deflection curve at loads up to 1.5 times load rating and a summary of the load-speed-time parameters used in the dynamometer tests. As used in this section, the term "high-speed-tire" means a tire tested at a speed greater than 193 km/h(120 mph).

(2) The manufacturer must also furnish the applicable maintenance and repair instructions to AAD of CAAC. The maintenance data provided by the manufacturer must include inspection criteria for the tire to determine eligibility for used tires of the same number part to be continued in service, special nondestructive inspection techniques, and retreading procedures must be included in the maintenance information along with any special repair methods applicable to the tire.

(3) The manufacturer shall furnish one complete set of design drawings for the tire and a photograph of the tire cross section. The manufacturer shall also furnish details of design changes if the tire is being requalified.

4. Data to be Furnished With Manufactured Units

The existence of CTSO approval does not automatically constitute authority to install and use the article on an aircraft. A note with the following statement must be included:

The conditions and tests required for this CTSO of this article are minimum performance standards, it is the responsibility of those desiring to install the artcle on or within a specific type or class of aircraft to determine that the aircraft operating conditions are within the CTSO-C62d standards.

If not within the CTSO standards, the article may be installed only if further evaluation by the user/installer documents an acceptable installation that is approved by the Airworthiness organization of CAAC. If within the CTSO standards, the article may be installed only if the user/installer documents an acceptable installation that is approved by the Airworthiness

organization of CAAC.

5. Previously Approved Articles

(1) No person may identify or mark a tire approved prior to effect of the technical standard order with CTSO number CTSO-C62d.

(2) A aircraft tire approved prior to effect of this technical standards order, except for those specified in paragraph 5. (3), may continue to be manufactured under the provision of its original approval.

(3) No person may identify or mark a tire having a speed rating above 160 mph with any standard other than this technical standards order (except for CCAR TSO-C62c).

APPENDIX. Minimum Performance Standards for Aircraft Tires

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 CTSO-C62d.

2.0 Scope, These minimum performance standards apply to aircraft tires having speed and load ratings that are eatablished 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 , 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 specifiod in paragraph 5.2)at ambient temperature.

4.4 Temperature.

4.4.1 Ambient. It ahall 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 temperaturc 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 propertices of the tire materials have not been degraded by exposure of the tire to a wheelbead 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 dynamemeter 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 tire 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 exceding 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 tires 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 tire 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 dynamometor 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 = 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 followling must be done, the landing speed must be determined by adding 28 percent of the kinetic energy calculated under paragraph 8.2.2 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 form 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:

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

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:

T_C = Calculated time, in seconds, for the tire to absorb the required kinetic energy.

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

KE_W = Kinetic energy, in seconds, with rated tire load in flywheel.

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

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

$(_{UL})$ = Subscript for upper speed linit.

$(_{LL})$ = Subscript for lowcr 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 T_C.

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 alternats test, a tire operationg 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 in 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 maximum applicable load-speed-time requirements and appropriately identified with the proper speed rating.

6.3.3 Dynamometer cycles. The test tire must withstand 50 takeoff cycles, 1 overload takeoff cycle, and 10 taxi cyclesa 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 takeoff, pounds(not less than rated load).

L_1 = Tire load at rotation, pounds.

L_2 = Zero tire load(liftoff).

R_D = Roll distance, feet.

S_0 = Zero tire speed.

S_1 = Tire speed at rotation, mph.

S_2 = Tire speed at liftoff, mph (not less than speed rating)

T_0 = Start of takeoff.

T_1 = Time to rotation, seconds.

T_2 = 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 dynamometar under the following test conditions:

Number of Test Cycles	Minimum Tire Load lbs	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 takeoff 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 landing, 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 of location of tread ribs and grooves or increases in skid depth, made subsequent to the tire qualiflication, 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 reqirements 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 ration for the higher load rated tire at any given test condition.