



AEROSPACE RECOMMENDED PRACTICE

ARP597

REV. E

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Superseding ARP597D

Wheels and Brakes, Supplementary Criteria for Design Endurance
Civil Transport Aircraft

RATIONALE

This document is being stabilized in recognition by the A-5A committee that the supplemental criteria defined in this document is considered mature technology and has become a part of airframer's technical specifications for current state of the art aircraft. Other SAE documents such as AIR5490 Carbon Brake Contamination and AIR1934 Use of Structural Carbon Heat Sink Brakes on Aircraft offer additional guidance regarding supplemental design criteria such as addressing the damaging effects of alkali metal runway deicers on carbon brakes.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE A-5A Wheels, Brakes and Skid Controls Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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Documents

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1. SCOPE

This document recommends supplementary design criteria to enhance endurance and reliability of transport aircraft wheels and brakes.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

ARP813	Maintainability Recommendations for Aircraft Wheel and Brake Design
AIR1064	Brake Dynamics
ARP1619	Replacement and Modified Brakes and Wheels
AS5663	Minimum Performance Requirements for Transport Airplane Wheel and Brake Assemblies Using Electric Power Actuation

2.1.2 Federal Aviation Regulations

- a. 14 CFR Part 25 Airworthiness Standards: Transport Category Airplanes - paragraph 25.731 Wheel and paragraph 25.735 Brakes and Braking Systems
- b. 14 CFR Part 21 Subpart O
- c. TSO-C135 Transport Airplanes Wheels and Wheel and Brake Assemblies, dated May 2, 2002

2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 117 Standard Practice for Operating Salt Spray (Fog) Apparatus

2.2 Definitions

KE_{DL} - WHEEL/BRAKE RATED DESIGN LANDING STOP ENERGY: KE_{DL} is the minimum energy absorbed by the wheel/brake/tire assembly during every stop of the 100 stops design landing stop test of TSO-C135.

KE_{RT} - WHEEL/BRAKE RATED ACCELERATE-STOP ENERGY: KE_{RT} is the energy absorbed by the wheel/brake/tire assembly demonstrated in accordance with the accelerate-stop test of TSO-C135.

KE_{SS} - WHEEL/BRAKE RATED MOST SEVERE LANDING STOP ENERGY: KE_{SS} is the energy absorbed by the wheel/brake/tire assembly demonstrated in accordance with TSO-C135.

3. DISCUSSIONS

The Federal Aviation airworthiness standards for civil transport wheels and brakes are defined in 2.1.2 (a). Certification procedures for products and parts are defined in 2.1.2 (b). The minimum performance standards for the design and testing of civil transport wheels and brakes are defined in 2.1.2 (c) and are used by vendors/equipment manufacturers to qualify wheel and brake assemblies. Minimum performance standards of other airworthiness authorities (e.g., Transport Canada, European Aviation Safety Agency and other Civil Aviation Authorities) may result in additional design requirements and tests. Aircraft manufacturer specifications impose additional design requirements and tests which address performance, endurance, and reliability of wheel and brake systems. Ratings of the wheel and the brake are defined in 2.1.2 (c). The references in 2.1.1 provide additional guidance.

4. TYPICAL WHEEL ENDURANCE REQUIREMENTS

4.1 TSO-C135 Requirements

The performance standards in TSO-C135 require a minimum roll test of 2200 miles at maximum static load of which 200 miles includes 15% of the maximum static load applied as side loads (100 miles with inboard directed side load and 100 miles with outboard directed side load). This criterion yields a minimum weight wheel of adequate strength.

4.2 Supplemental Requirements

The following supplemental requirements are recommended which are pertinent to wheel performance and/or endurance. Suggested tests linked to those requirements are proposed in Section 6. Over the years, additional design practices were applied to increase wheel endurance to approximately 25 000 roll miles. The present trend for commercial aircraft has been to increase wheel design life from 25 000 to 50 000 roll miles. The design life should be defined taking into account its impact on wheel weight and maintenance cost.