



AEROSPACE STANDARD

AS5714™**REV. A**

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Superseding AS5714

Minimum Performance Standard for Parts 23, 27, and 29
Aircraft Wheels, Brakes, and Wheel and Brake Assemblies

RATIONALE

This document defines the minimum performance standard for TSO-C26e for wheels and brakes on Parts 23, 27, and 29 aircraft with either hydraulic or electric actuation. This also includes requirements for Accelerate-stop tests for Commuter category aircraft and jets over 6000 pounds.

AS5714A has been reaffirmed to comply with the SAE Five-Year Review policy.

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1. SCOPE

This SAE Aerospace Standard (AS) prescribes the Minimum Performance Standards (MPS) for wheel, brake, and wheel and brake assemblies to be used on aircraft certificated under 14 CFR Parts 23, 27, and 29.

Compliance with this specification is not considered approval for installation on any aircraft.

1.1 Application

Compliance with this minimum specification by the TSO applicant is required as a means of assuring that the equipment will have the capability to satisfactorily perform its intended function(s).

NOTE: Certain performance capabilities may be affected by aircraft operational characteristics and other external influences. Consequently, anticipated aircraft braking performance should be verified by aircraft testing.

1.2 Composition of Equipment

The words “equipment” or “brake assembly” or “wheel assembly” or “wheel and brake assembly” as used in this document, include all components that form part of the particular unit.

For example, a wheel assembly typically includes a hub or hubs, bearings, flanges, drive bars, heat shields, and fuse plugs. A hydraulically actuated brake assembly typically includes a backing plate, torque tube, cylinder assemblies, pressure plate, wear pin, heat sink, and other axle mounted components integral to the braking activity.

Also as an example, an electrically actuated brake assembly typically includes a backing plate, torque tube, electro-mechanical actuators, pressure plate, wear indicator, heat sink, and other axle mounted components integral to the braking activity.

It should not be inferred from these examples that each wheel assembly and brake assembly will necessarily include either all or any of the above example components; the actual assembly will depend on the specific design chosen by the TSO applicant.

For the purpose of this specification, the interface boundaries of the equipment are the wheel and brake attachments to the landing gear and the electrical connectors to the aircraft brake control system. The aircraft brake control system is a reference to any equipment related to the control of wheel braking that is not assembled to the brake on axle and provides either hydraulic energy to the hydraulic actuators or electrical energy to the Electro Mechanical Actuators (EMAs) and/or monitors sensors mounted in or on the brake assembly. This may also include hydraulic lines and fittings or wiring and connectors as applicable, if not integral to the brake.

2. REFERENCES

2.1 Applicable Documents

There are no referenced publications specified herein.

2.2 Definitions and Abbreviations

2.2.1 Wheel Definitions

2.2.1.1 L - WHEEL RATED RADIAL LIMIT LOAD

L is the wheel rated maximum radial limit load in 4.2.1.

2.2.1.2 S - WHEEL RATED STATIC LOAD

S is the maximum static load (see 14 CFR 23.731(a), 27.731(b), and 29.731(b)).

2.2.1.3 T_{SWR} - WHEEL RATED TIRE TYPE(S) AND SIZE(S)

T_{SWR} is the wheel rated tire type(s) and size(s) defined for use and approved for installation on the wheel, normally by the aircraft manufacturer.

2.2.1.4 T_{WT} - SUITABLE TIRE FOR WHEEL TEST

T_{WT} is the wheel rated tire type and size for wheel test. T_{WT} is the tire type and size determined as being the most appropriate to introduce loads and/or pressure that would induce the most severe stresses in the wheel. T_{WT} must be a tire type and size approved for installation on the wheel (T_{SWR}), normally by the aircraft manufacturer. The suitable tire may be different for different tests.

2.2.1.5 WRP - WHEEL RATED INFLATION PRESSURE

WRP is the wheel rated inflation pressure (wheel unloaded).

2.2.2 Hydraulically Actuated Brake Definitions

2.2.2.1 BROP_{MAX} - BRAKE RATED MAXIMUM OPERATING PRESSURE

BROP_{MAX} is the maximum design metered pressure that is available to the brake to meet aircraft stopping performance requirements.

2.2.2.2 BRP_{MAX} - BRAKE RATED MAXIMUM PRESSURE

BRP_{MAX} is the maximum pressure to which the brake is designed to be subjected (typically the nominal aircraft maximum system pressure).

2.2.2.3 BRP_{RET} - BRAKE RATED RETRACTION PRESSURE

BRP_{RET} is the pressure to which the brake inlet pressure must be reduced to cause full piston retraction after a brake is sufficiently pressurized to extend all pistons. Applicable only when adjustment means are provided.

2.2.2.4 BRPP_{MAX} - BRAKE RATED MAXIMUM PARKING PRESSURE

BRPP_{MAX} is the maximum parking pressure available to the brake

2.2.2.5 BRSP₁₀ - BRAKE RATED MINIMUM SLOPE PRESSURE

BRSP₁₀ = Brake Rated Minimum 10° Slope Pressure. BRSP₁₀ is the minimum pressure required to hold the rotorcraft applications on a 10° slope at the design takeoff weight.

2.2.2.6 BRSP₂₀ - BRAKE RATED MINIMUM 20° SLOPE PRESSURE

BRSP₂₀ is the minimum pressure required to hold the rotorcraft on a 20° slope at the design takeoff weight as used for the overpressure hydraulic brake tests of 4.4.1.

2.2.3 Electrically Actuated Brake Definitions

The maximum voltage, current and power ratings refer to the maximum values for voltage, current and power at the actuators in total for all the actuators in an individual brake on test.

2.2.3.1 BOP - BRAKE OFF POSITION

BOP is a retracted EMA position that permits free rotation of the wheel and brake assembly after a brake application and release cycle.

2.2.3.2 EMA - ELECTRO-MECHANICAL ACTUATOR

The EMA is a subassembly of the brake that converts electrical power to brake clamping force.

2.2.3.3 I_{BMAX} - MAXIMUM BRAKE CURRENT

I_{BMAX} is the maximum simultaneous current drawn by all the EMAs of the brake assembly in the most critical of the dynamic tests of 4.3.2 or 4.3.3 as determined by test or analysis of test results.

2.2.3.4 L_{BMAX} - MAXIMUM BRAKE LOAD

L_{BMAX} is the maximum clamping load the brake assembly is designed to generate with maximum brake control system command under normal conditions as established by analysis or test.

2.2.3.5 L_{DL} - BRAKE DESIGN LANDING LOAD

L_{DL} is the average of the 100 peak clamping loads generated in the brake assembly during the KE_{DL} stop test of 4.3.2 as determined by test or analysis of test results.

2.2.3.6 L_{LMT} - BRAKE LIMIT LOAD

L_{LMT} is the maximum clamping load the brake structure may be subjected to in its operation which would not result in permanent deformation that would prevent it from performing its intended function.

2.2.3.7 P_{BMAX} - MAXIMUM EMA BRAKE POWER

P_{BMAX} is the maximum simultaneous power drawn by all the EMAs of the brake assembly in the most critical of the dynamic tests of 4.3.2 or 4.3.3 as determined by test or analysis of test results.

2.2.3.8 PBC - PARKING BRAKE COMMAND

PBC is the configuration to which the EMAs are commanded following a high energy stop as normally defined by the aircraft manufacturer associated with the parking brake applications in 4.3.3.5.

2.2.3.9 V_{BMAX} - MAXIMUM EMA BRAKE VOLTAGE

V_{BMAX} is the maximum voltage applied to the brake assembly during the most critical of the dynamic tests of 4.3.2 or 4.3.3 as determined by test or analysis of test results.

2.2.3.10 $V_{10\ MIN}$ - BRAKE RATED MINIMUM SLOPE VOLTAGE

$V_{10\ MIN}$ is the minimum voltage required to hold the rotorcraft on a 10° slope at the maximum aircraft design takeoff weight.

2.2.3.11 $V_{20\ MIN}$ - BRAKE RATED MINIMUM SLOPE VOLTAGE

$V_{20\ MIN}$ is the minimum voltage required to hold the rotorcraft on a 20° slope at the maximum aircraft design takeoff weight as used for the brake tests of 4.4.1.

2.2.4 Common Definitions

These definitions apply to both Hydraulically Actuated and Electrically Actuated wheel and brake assemblies.

2.2.4.1 BRAKE LINING

Brake lining is individual blocks of wearable material, discs that have wearable material integrally bonded to them, or discs in which the wearable material is an integral part of the disc structure.

2.2.4.2 BRWL - BRAKE RATED WEAR LIMIT

BRWL is the brake maximum wear limit to ensure compliance with 4.3.4.1 and 4.3.3.2 if applicable.

2.2.4.3 D - DISTANCE AVERAGED DECELERATION

$D = ((\text{Initial brakes-on speed})^2 - (\text{Final brakes-on speed})^2) / (2 (\text{braked flywheel distance}))$. D is the distance averaged deceleration to be used in all deceleration calculations.

2.2.4.4 D_{DL} - RATED DESIGN LANDING DECELERATION

D_{DL} is the minimum of the distance averaged decelerations demonstrated by the wheel/brake/tire assembly during the 100 KE_{DL} stops in 4.3.2.

2.2.4.5 D_{RT} - RATED ACCELERATE-STOP DECELERATION (FOR COMMUTER CATEGORY AIRCRAFT)

D_{RT} is the minimum of the distance averaged decelerations demonstrated by the wheel/brake/tire assembly during the KE_{RT} stops in 4.3.3.

2.2.4.6 V_{DL} - WHEEL/BRAKE DESIGN LANDING STOP SPEED

V_{DL} is the initial brakes-on speed for a design-landing stop in 4.3.2.

2.2.4.7 V_{RT} - WHEEL/BRAKE ACCELERATE-STOP SPEED

V_{RT} is the initial brakes-on speed used to demonstrate KE_{RT} in 4.3.3.

2.2.4.8 HEAT SINK

The heat sink is the mass of the brake that is primarily responsible for absorbing energy during a stop. For a typical brake, this would consist of the stationary and rotating disc assemblies.

2.2.4.9 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 stop design landing stop test in 4.3.2.

2.2.4.10 KE_{RT} - WHEEL/BRAKE RATED ACCELERATE-STOP ENERGY (FOR COMMUTER CATEGORY AIRCRAFT)

KE_{RT} is the energy absorbed by the wheel/brake/tire assembly demonstrated in accordance with the accelerate-stop test in 4.3.3.

2.2.4.11 R - WHEEL RATED TIRE LOADED RADIUS

R is the static radius at load "S" for the wheel rated tire size at WRP. The static radius is defined as the minimum distance from the axle centerline to the tire/ground contact interface.

2.2.4.12 ST_R - WHEEL/BRAKE RATED STRUCTURAL TORQUE

ST_R is the maximum structural torque demonstrated in 4.3.4.

2.2.4.13 TS_{BR} - BRAKE RATED TIRE TYPE(S) AND SIZE(S)

TS_{BR} must be the tire type and size (approved for installation on the wheel (TS_{WR})) which transfers the most kinetic energy and torque into the brake during the design landing and rejected takeoff dynamic torque tests, if applicable.