

AEROSPACE RECOMMENDED PRACTICE

SAE ARP1786

REV.
B

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Superseding ARP1786A

(R) Wheel Roll on Rim Criteria for Aircraft Application

1. SCOPE:

1.1 Purpose:

This SAE Aerospace Recommended Practice (ARP) is to provide a recommended minimum laboratory roll performance for main landing gear aircraft wheels without tires installed and applies to both split wheel hub and lock-ring wheel designs.

1.2 Applicability:

This document sets forth minimum roll performance capability for a main landing gear wheel to be rolled without tire installed. The recommended test requirements establish a laboratory dynamometer demonstration level to equate with satisfactory experience on aircraft.

1.3 Background:

If tire failure occurs, the tire carcass may or may not become separated from the wheel. Relative to wheel structural capability, the most adverse occurrence is for the tire to be thrown from the wheel rim with the subsequent condition of the wheel flanges rolling in direct contact on the runway. Therefore, demonstration is recommended to verify that the wheel possesses the structural integrity to roll on the rim without the tire carcass under the most adverse loading condition.

Past tire incidents have been associated to main gear installations and have caused wheel failures prior to the aircraft completing takeoff roll-out. Nose wheel tire incidents have been rare to non-existent. Consequently, attention is focused toward improving main wheel capability and to minimize hazards should a main gear tire failure occur.

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1.3 (Continued):

It is recognized that prescribing a roll on rim criterion imposes constraints. Items such as foreign objects and bumps on the runway cannot feasibly be accommodated. Therefore, the subject roll-on-rim criterion does not attempt to simulate an actual on-runway occurrence, but rather establish a simple, but relevant, dynamometer test to verify the general robustness of the wheel when subjected to a roll-on-rim occurrence. The minimum requirements were originally established by running dynamometer tests both on wheels that had successfully completed actual roll-on-rim occurrences in service, and wheels that had not.

The effect upon wheel weight increase is moderate. However, it is believed that a substantially improved product will be achieved by meeting the minimum requirements established herein. This document may be used for commercial or military aircraft wheel-brake equipment.

NOTE: The primary focus of the roll-on-rim test is to prevent fragmentation of the wheel and associated foreign object damage, but does not address the potential secondary damage to the brake or landing gear.

2. 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 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

ARP1493	Wheel and Brake Design and Test Requirements for Military Aircraft
ARP5265	Minimum Operational and Maintenance Responsibilities for Aircraft Tire Usage

2.2 Federal Specifications:

Available from the Federal Aviation Administration by downloading an electronic copy of Advisory Circular No. 20-110 and TSO-C135 from the Internet at the following address: http://www.faa.gov/certification/aircraft/air_index.htm or by submitting a document request to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue SW, Washington, DC 20591.

TSO-C135	Minimum Performance Specification for Transport Airplane Wheels, Brakes, and Wheel and Brake Assemblies
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3. REQUIREMENTS:

3.1 Load and Distance:

For single wheel gear and two and four wheel bogies the roll load shall be at the wheel maximum static rated load for a distance equivalent to $0.5 (V_R)^2$ in feet, but not to exceed 15,000 feet (4572 meters) where: V_R = aircraft lift-off rotational velocity in knots at the aircraft maximum gross weight.

For more complex aircraft landing gear configurations on which flat or no-tire conditions may result in wheel loads greater than the static rated wheel load then a load as determined by analysis performed on the specific gear configuration shall be used.

3.2 Wheel to Runway Attitude:

The wheel shall be tested to simulate the aircraft wheel to runway attitude without tire installed. The wheel to runway attitude for the wheel maximum static rated load should be provided by the airframe manufacturer with consideration of axle deflection. For multiple wheel landing gear, having inboard and outboard mounted wheels; the most adverse loading orientation on the wheel flanges shall be selected for test. To avoid confusion, the airframe manufacturer shall supply a diagram showing axle to wheel orientation with the runway.

3.3 Wheel Flange Configuration:

The load and distance of 3.1 shall be demonstrated for the most adverse loading on the wheel flanges. Load variance will potentially occur because of runway conditions on the inboard and outboard mounted wheels on a multiple wheel axle landing gear.

3.4 Compatibility With Brakes:

The most adverse loading condition on the wheel shall not cause interference with the brake so as to prevent the wheel from freely rotating.