

Wheel Roll on Rim Criteria for Aircraft Application

FOREWORD

Changes in this Revision are format/editorial only.

1. SCOPE:

1.1 Purpose:

This Aerospace Recommended Practice (ARP) is to provide a recommended minimum laboratory roll performance for main landing gear aircraft wheel without tire.

1.2 Applicability:

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

1.3 Background:

If tire failure occurs, the tire carcass may or may not be 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 capability to roll on rim (minus tire carcass) at the most adverse loading condition.

Past tire incidents have been associated to main gear installations and have caused wheel failures prior to aircraft completing roll-out. Nose wheel tire incidents have been rare to non-existent. As such, attention is focused toward improving main wheel capability 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 criteria imposes constraints. Items such as foreign objects and bumps on runway cannot feasibly be accommodated. The effect upon wheel weight increase should be moderate. However, it is believed a substantially improved product will be achieved by the requirements herein established. This document may be used for commercial or military aircraft wheel-brake equipment.

The roll distance formula, expressed herein, is viewed as cumulatively equivalent to the take-off and landing roll-out distances for the aircraft. The formula computed distances would exceed 15,000 feet for aircraft which have high lift-off velocities. Since maximum runway lengths are less than 15,000 feet, the combined take-off and landing roll-out distances are viewed as 15,000 feet for these aircraft applications.

2. REQUIREMENTS:

2.1 Load-Distance:

The roll load shall be at the wheel maximum static load rating for a distance equivalent to $0.5 (V_R)^2$ in feet, but not exceed 15,000 feet where:

V_R = aircraft lift-off rotation velocity in knots at maximum gross weight.

2.2 Wheel-Runway Attitude:

The wheel shall be tested to simulate the aircraft wheel-runway attitude without tire. The wheel-runway attitude for the wheel maximum static load rating should be provided by the airframe manufacturer with consideration of axle deflection and runway crown. 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-wheel orientation with runway crown.

2.3 Wheel Flange Configuration:

The load-distance (para. 2.1) shall be demonstrated for the most adverse loading on the wheel flanges. Load variance will potentially occur because of runway crown conditions on the inboard and outboard mounted wheels on a multiple wheel axle landing gear.

2.4 Compatibility with Brake:

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