AN AMERICAN NATIONAL STANDARD

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AEROSPACE RECOMMENDED PRACTICE

ARP 813A
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MAINTAINABILITY RECOMMENDATIONS FOR AIRCRAFT WHEELS AND BRAKES

REAFFIRMED

1. PURPOSE

This Aerospace Recommended Practice (ARP) designs features for aircraft wheels and brakes which should enhance their maintainability.

2. SCOPE

This ARP suggests the maintainability features which should be considered in the design of aircraft wheels and brakes. The effect on such factors as cost, weight, reliability, and compatibility with other systems should be considered before incorporation of any of these features in the design.

3. GENERAL REQUIREMENTS

3.1 Wheels:

3.1.1 Ø Heat shields, if used, should be readily removable without the removal of brake rotor drive keys so as not to prevent or hinder wheel inspection procedures. Reasonable care should be exercised in the design of the shield to prevent destructive abrasion between the shield and basic wheel material. Heat shields should be designed to preclude damage, hole breakout, excessive wear or looseness in attachment areas. Heat shields should be nonhygroscopic.

3.1.2 Ø Bearing seal rubbing surfaces should be readily replaceable and have adequate abrasion resistance such as that possessed by steel and chrome plate. The design should provide for ease of replacement and/or repair of the rubbing surface.

3.1.2.1 Ø Grease dams integral with the forgings should be avoided where the design could cause undesirable grain flow or forging defects.

3.1.3 The wheel and/or brake should be designed so that the rotor drive keys cannot be improperly aligned with the brake rotors after wheel installation.

3.1.3.1 If it is required that a device be mounted on the wheel to prevent improper alignment of the wheel with the brake rotors, the device should be readily replaceable, sturdy and attached with bolts or screws.

3.1.4 Fretting between wheel halves at mating surfaces (also between wheel and mounting surfaces and between wheel and tie bolts) shall be minimized by the use of adequate bearing area, tie bolts of sufficient number, size and preload, and/or spacers of selected materials.

3.1.5 Ø Any wheel processes, finishes, and coatings used to protect the wheel from corrosion should anticipate maintenance inspection procedures. Special consideration should be given to corrosion preventative finishes other than paints.

3.1.6 Ø Each wheel half should be permanently marked with part and serial numbers and should be visible when installed on aircraft. Objectionable stress raisers should not be created in critical areas by impression stamping.

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3.1.7 Provisions for dynamically balancing the tire and wheel assembly should be considered. The individual wheel halves should be static balanced as a minimum requirement. Ø

3.1.8 Materials used for impregnation of wheels should be resistant to paint stripping solutions and hydraulic fluids.

3.1.9 Standard bearings should be used.

3.1.9.1 When selecting aircraft wheel bearings, consideration should be given to: a) standardization with existing wheel bearings, b) making foolproof designs to prevent installations of matching parts with different load ratings, and c) making foolproof designs to prevent installations of the same diameter bearings that are not identical matching parts. Ø

3.1.10 Adequate material in the hubs to allow for rework to install oversize bearing cups or bushings should be provided. Adequate material should be designed into the nose wheel rim to allow rework to remove tow bar damage. Adequate material should be allowed in the bead seat and tubewell to compensate for corrosion and fretting damage. Ø

3.1.11 Tubeless wheel seal areas should be designed so as to be protected from handling damage.

3.1.12 Aircraft standard hardware should be used.

3.1.13 Thermal sensitive pressure release devices should be located so that they are accessible for inspection when the wheel/tire assembly is installed.

3.1.14 Provision should be made for removal of all steel parts, such as inserts or bushings, to accommodate necessary overhaul operations without damage to the wheel areas around these parts.

3.1.15 As an anticorrosion measure, provision should be made for adequate drainage of the installed wheel so that water will not be trapped or held in pockets. Adequate material should be provided to permit rework of areas which commonly encounter corrosion. The design should provide treatments or coatings to inhibit galvanic corrosion. Ø

3.1.16 Adequate space should be provided around the bolt heads and nuts to accommodate standard socket wrenches without damaging the finish by contact with adjacent structure. Adequate material should be provided to allow corrosion and damage removal around bolt holes and hole faces and installation of bushings to restore to size. Ø

3.1.17 The wheel should be designed so that it can be maintained with commercially available tools.

3.1.18 The wheel should be designed to permit disassembly with relative ease for tire mounting.

3.1.19 The inflation valve should be located in an accessible location for tire servicing, and adequate clearance for valve extension should be provided to permit the use of standard air chucks. Location of the valve should be such as to permit valve removal without wheel dissassambly. Space should be provided for possible installation of tire pressure gage/fill valve assembly.

3.1.20 Thread inserts should be provided in tapped holes, or space provisions should be made to accommodate them for repair.

3.1.21 The wheel should be designed to prevent the improper assembly of parts insofar as possible.

Ø 3.1.22 The wheel should be designed to allow for growth of the brake.

3.1.23 Provisions should be considered to provide an indicator in the wheel to identify the tire pressure in a reasonable + or - serviceable range. This indicator should be visible after wheel installation for quick pressure reference. Ø

3.2 Brakes:

3.2.1 All inlet and bleeder ports should be equipped with replaceable threaded bushings or self-dealing couplings.

3.2.2 Ø The bleeder fittings and inlet ports should be readily accessible for servicing the brake when it is installed on the aircraft with the wheel mounted in place. Bleeder ports should be located to permit easy bleeding without using forced bleeding methods.

3.2.3 Interconnector passages in brake housings should be designed to provide complete bleeding as installed on the aircraft.

3.2.4 Ø Piston cavities should be designed to utilize piston sleeves for wear surfaces. It is desirable that the seal be retained on the piston rather than in the sleeve. Adequate wall thickness should be provided in the cylinder housing and sleeves so that oversized pistons or sleeves may be used for repair.

3.2.4.1 The brake pistons should be designed to use the larger of the standard cross-sectional hydraulic seals to provide superior service life. Consideration should be given to positive piston retention in case of heat sink structural failure. Adequate material should be provided to permit rework of I.D. due to wear or damage.

3.2.5 The brake attachment should be designed so that the brake/wheel combination can be removed as a unit.

3.2.6 The design of the brake should be such that nomina shrinkage of the rotors or stators will not prevent their removal nor cause damage to the wheel and brake.

3.2.7 The brake design should be such that minimum disassembly is required to replace friction components.

3.2.8 The automatic adjustment or manual adjustment mechanism should be accessible for servicing without brake removal and preferably without wheel removal.

3.2.9 Metallic coatings applied to surfaces normally exposed to elevated temperatures should be governed by the following limits:

	°C	°F
Aluminum	496	925
Zinc	260	500
Cadmium	232	450
Tin	204	400

3.2.10 Aircraft standard hardware should be used.

3.2.11 Each brake assembly should be permanently marked with part and serial numbers. Objectionable stress raisers should not be created in critical areas by impression stamping. These numbers should be readable as installed on the aircraft.

3.2.12 Thread inserts should be provided in tapped holes, or space provisions should be made to accommodate them for repair.

3.2.13 The brake should be designed so that it can be maintained with commercially available tools.

3.2.14 The brake should be designed to prevent the improper assembly of parts as far as practical.

3.2.15 Space provisions for repair bushings should be made in the brake mounting flange.