AEROSPACE RECOMMENDED PRACTICE

ARP5265™ REV. C

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Superseding ARP5265B

Minimum Operational and Maintenance Responsibilities for Aircraft Tire Usage

RATIONALE

ARP5265 has been updated to Revision C to incorporate technical and editorial changes.

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1. SCOPE

This SAE Aerospace Recommended Practice (ARP) sets forth criteria for the installation, inflation, inspection, and maintenance of aircraft tires and the maintenance of the operating environment to ensure the safety of support personnel and the safe operation of the aircraft.

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 +1 724-776-4970 (outside USA), www.sae.org.

ARP5542 Hand Held Aircraft Tire Inflation Pressure Gauges

ARP6137 Tire Pressure Monitoring Systems (TPMS) for Aircraft

ARP6225 Aircraft Tire Inspection – In-Service Removal Criteria

2.1.2 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

FAA AC20-97B Aircraft Tire Maintenance and Operational Practice

2.1.3 EASA Publications

Available from European Union Aviation Safety Agency, Konrad-Adenauer-Ufer 3, D-50668 Cologne, Germany (for visitors and for mail over 1 kg) and Postfach 10 12 53, D-50452 Cologne, Germany (for mail 1 kg or less); Tel: +49 221 8999 000, www.easa.europa.eu.

CS-25, Amendment 26, 25.733f Certification Specifications and Acceptable Means of Compliance for Large Aeroplanes, Tyres

2.1.4 U. S. Tire Manufacturers Association Publications

Available at www.ustires.org.

U. S. Tire Manufacturers Association Aircraft Tire Service Bulletin, Volume 1, Aircraft Tire Operational Inflation Pressure Criteria

2.2 Definitions

ACCEPTABLE OPERATING PRESSURE RANGE (AOPR): The range of pressure readings relative to the SSP or its associated OSP which are acceptable for aircraft dispatch.

AIRCRAFT: In the sense of this document refers principally to “fixed wing” and non-military fleets. Although rotary winged and military aircraft share many of the care and maintenance practices of the civilian community, certain operational regimes and unique duty cycles may not be covered by this document.

AIRCRAFT MAINTENANCE MANUAL (AMM): The maintenance instructions provided by the airframe manufacturer with each aircraft model.

BEAD: This term may be properly applied to entire zones that are in contact with the rim areas of the wheel, or it may be as specific as the coils of steel wire that provide anchors for the plies.

BIAS TIRE: A pneumatic tire in which the principal reinforcing cords are fabricated parallel to one another in layers called plies. These cords lie at an angle which is substantially less than 90 degrees to the centerline of the tire. Adjacent plies are at alternate angles. Most plies are anchored by the beads.

CASING: The structural part of a tire.

COMPONENT MAINTENANCE MANUAL (CMM): The maintenance instructions provided by the manufacturer with each component.

“COLD” TIRE: A tire for which the temperature of the contained gas has been conditioned to the local ambient for at least 3 hours.

FLATSPOTTING: This term covers two conditions:

1. A localized, accelerated wear condition associated with landings, or skid-throughs resulting from braking or other means.

2. A short lived “out-of-round” condition resulting from a loaded hot tire having not rotated while it cooled to ambient. (Most prevalent on bias nylon tires due to the “plastic memory” of the nylon cords.)

FOREIGN OBJECT DEBRIS (FOD): Objects that are foreign to the operational area of the aircraft that when rolled over cause damage to the tire.

“HOT” TIRE: A tire for which the temperature of the contained gas has risen 25 °F (14 °C) or more above the ambient.

MINIMUM SERVICE PRESSURE (MSP): The minimum gauge pressure reading for the dispatch of a tire.

OPERATIONAL SERVICE PRESSURE (OSP): The expected tire inflation pressure, as read on a pressure gauge, influenced by thermal conditions (ambient or rolling effects) when referenced from the SSP.

RADIAL TIRE: A pneumatic tire in which the ply cords that extend to the beads are laid substantially at 90 degrees to the centerline of the tire. Additional stabilizing is provided by belting in the area of the tread.

RATED PRESSURE: The inflation pressure associated with the maximum static rated load of the tire.

SIDEWALL: The rubber covering and the underlying structure that extends from the beads to the tread.

SPECIFIED SERVICE PRESSURE (SSP): The tire inflation pressure target defined by the airframe manufacturer, specific to an aircraft model and gross weight, as read on a pressure gauge in any ambient temperature. This is always a “cold” pressure value.

SUPPLEMENTAL TYPE CERTIFICATE (STC): A TYPE CERTIFICATE (TC) issued when an applicant has received regulatory approval to modify an aeronautical product from its original design.

TIRE (PNEUMATIC): The term “tire” refers to a complex engineered structure made of rubber and cables (of textiles or steel) providing, thereby, a protective enclosure for the inflating gas. It is resilient, yet dimensionally stable, possessing great strength and a capacity for the transferal of energy.

TREAD: The expendable rubber wearing surface of any pneumatic tire. It contains the groove pattern designed to facilitate water removal from the contact patch and may or may not possess integral fabric materials.

3. BACKGROUND

Aircraft tires are unique in their content, applications, and service requirements. To minimize physical size and weight, aircraft tires are rated at high deflections (32 to 35%) and inflated to high pressures (100 to 250 psi [0.7 to 1.7 MPa] for commercial aircraft) to carry the required loads. The duty cycle for an aircraft tire is relatively short (taxi and takeoff or landing/taxi) and intermittent (substantial rest periods between service usage). When the aircraft tire, given its design, is operated in its standard environment, safe and reliable performance is realized.

Reduced performance occurs when a tire experiences one of two types of damage: (1) overheating, or (2) invasion by foreign objects. Both of these conditions can be directly influenced by the operational practices of the operator and/or the local airport authority.

4. TIRE HANDLING AND PREPARATION FOR SERVICE

4.1 Mounting Tubeless Tires

Determine that the tire, the wheel, the valve assembly, and other components such as fuse plugs, over-pressure devices, tire pressure systems, etc. are correct for the particular application. Ensure that the wheel and tire are clean inside and out and devoid of burrs, roughness or any foreign material. Install a new O-ring that is approved by the wheel manufacturer. Carefully follow the wheel manufacturer's instructions with regard to lubricants and installation of the O-ring. Inspect the valve (the body and the valve core seat) for condition and install a new valve core.

Complete the assembly of the tire and wheel in accordance with the wheel manufacturer's CMM recommendations and/or in accordance with any applicable STC documents.

The use of tire mounting lubrication is not recommended. If lubrication is to be used, consult the aircraft, tire, and wheel manufacturer(s).

4.2 Mounting Tube Type Tires

Determine that the tire, wheel, and the tube are correct for the particular application. Dust the interior of the tire and the exterior of the tube with talc. Confirm that a new valve core is installed in the valve stem and partially inflate the tube to achieve a slightly rounded condition. Insert the tube into the tire so as to align the yellow stripe on the tube with the red spot on the tire. Mount the assembly on the wheel so that the valve stem is properly aligned with the valve hole in the wheel.

Complete the assembly of the tire and wheel in accordance with the wheel manufacturer's CMM recommendations and/or in accordance with any applicable STC documents.

The use of tire mounting lubrication is not recommended. If lubrication is to be used, consult the aircraft, tire, and wheel manufacturer(s).

4.3 Initial Inflation for Tubeless Tires

Inflate the assembly in a safety cage using dry nitrogen to ensure the tire does not contain more than 5% oxygen by volume. The regulator on the nitrogen source must be pre-set to a value no greater than 150% of the in-service tire pressure. A drop in inflation pressure will occur after initial inflation as a result of tire growth. Stabilization normally occurs within 12 hours. After an initial stabilization period, the tire should maintain the inflation pressure within 5% of the initial pressure for a period of 24 hours. If losses exceed the 5% value, the leak source must be discovered and corrected.

The tire is only one of many components in the pressure retention system. All components must be checked. Examples: valve stem seal, wheel half seal, over-inflation valve seal, etc.

NOTES:

a. For a leaking assembly: If no leak site is found, repeat the inflation pressure check. If the assembly still exceeds the 5% pressure loss value, demount the tire in accordance with 6.2. Tag the tire with appropriate comments and return tire to supplier.

b. It is normal for the sidewall vent holes of tubeless tires to exhibit some bubbling of leak-check fluid following initial inflation. Conclusions regarding a leaking assembly should not be based on sidewall vent hole bubbling.

c. Leak test results can be influenced by changes in ambient temperature. An ambient change of ±5 °F (±3 °C) absorbed by an inflated assembly undergoing leak testing will yield a corresponding gauge pressure change of 1%. Changes of this order can have a negative influence on the accuracy of the perceived losses being monitored, and consequently need to be taken into account.

4.4 Initial Inflation for Tube Type Tires

Inflate the assembly to rated pressure in a safety cage using dry nitrogen to ensure the tire does not contain more than 5% oxygen by volume. Deflate in accordance with 6.2 to optimize tube stretch. Re-inflate to rated pressure in a safety cage. Monitor pressure to determine that the loss does not exceed 5% of the initial pressure in a 24 hour period.

NOTES:

a. It is possible for air trapped between the tire and tube, and not released in the inflation process, to have affected the gauge pressure. The subsequent natural venting of this trapped air can impact negatively on the accuracy of the pressure loss test and consequently needs to be taken into account.

b. Leak test results can be influenced by changes in ambient temperature. An ambient change of ±5 °F (±3 °C) absorbed by an inflated assembly undergoing leak testing will yield a corresponding gauge pressure change of 1%. Changes of this order can have a negative influence on the accuracy of the perceived losses being monitored.

5. IN-SERVICE MAINTENANCE OF TIRE-WHEEL ASSEMBLY

Operator Responsibility: On Aircraft

Each aircraft operator manages a fleet of aircraft under a variety of conditions and schedules. No single practice for managing the inflation pressure level of in-service tires can be defined which can be acceptable to all operators under all circumstances. Therefore, this section defines WHAT is required and WHAT must be achieved under any inflation pressure maintenance program, but not HOW to achieve it. HOW these requirements are met must be addressed by the airframer or operator in conjunction with the tire manufacturer.

The requirements stated below are applicable to all aircraft tire/wheel fitments. These requirements are defined as the core principles to be used by engineering and maintenance personnel in the development of an effective maintenance program for implementation by the line mechanic.

5.1 Inflation Pressure Requirements

What MUST be achieved under any inflation pressure maintenance program can be summarized as follows:

a. To operate an aircraft with tire inflation pressures within an “acceptable operating range,” and

b. To address the “actual loss of inflation gas” from each tire/wheel assembly with the appropriate maintenance action.

5.2 Criteria for Tire Dispatch

Whichever tire pressure maintenance program has been implemented with line mechanic personnel, the first question to be addressed when maintaining the inflation pressure centers around whether the tire, and/or the aircraft can be dispatched based on the tire inflation pressure level findings under the circumstances.

5.2.1 Dispatchable Tires

Two requirements must be satisfied before dispatching a tire on aircraft with regard to inflation pressure: (a) what is the actual loss of inflation gas from the tire, and (b) is the tire within the acceptable operating pressure range?

5.2.1.1 Actual Loss of Inflation Gas

a. The “cold” inflation pressure check is the reference for correct pressure.

b. Once the inflation gas has been influenced by thermal effects, the elevated gauge reading of pressure can no longer be compared directly to the SSP value (a “cold” pressure value), to determine the actual loss of inflation gas.

c. The “actual loss of inflation gas” (▲P), the pressure difference between the SSP value and the actual gauge reading, both influenced by the same temperature effect, is of the same magnitude whether making a "hot" or a "cold" tire inflation pressure check.

d. The “actual loss of inflation gas” (▲P), is a key pressure measurement and the driver for maintenance actions.

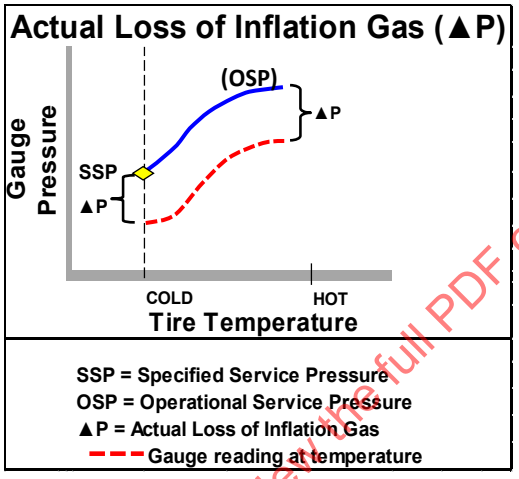

Figure 1 - Actual loss of inflation gas

5.2.1.2 Acceptable Operating Pressure Range (AOPR)

a. When the tire is “cold” (at the ambient temperature of the airport), the specified service pressure (SSP) defined in the airplane maintenance manual (AMM) is the reference pressure. Unless otherwise specified by the AMM, the SSP (“cold” value) has a tolerance of plus 5%, minus 0%, which defines the AOPR for the “cold” case.

b. When the tire is “hot” (due to rolling or the input from braking thermal effects), the tire’s operational service pressure (OSP) gauge reading will be higher than the SSP value by the temperature difference between the tire’s contained gas and the local ambient air by 1% for every 5 °F (3 °C). The tolerance on the OSP is plus 5%, minus 5%, which defines the AOPR for the “hot” case.

c. Before allowing dispatch of a tire for flight, the operational service pressure must be greater than the minimum service pressure of either the AOPR “cold” or AOPR “hot” as represented by the uniform dashed line on the chart (minimum service pressure).

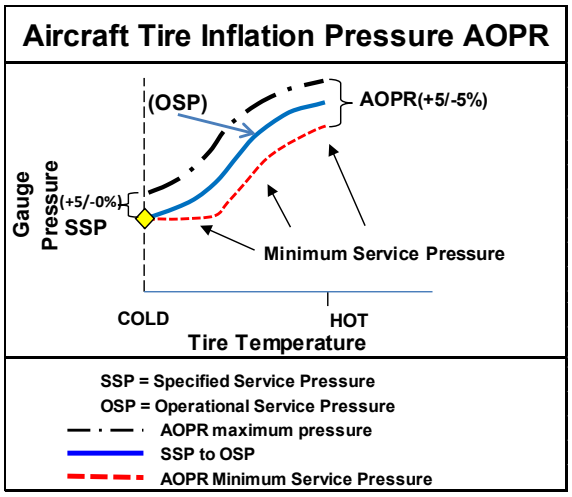

Figure 2 - Acceptable operating pressure range

5.2.1.3 Over Pressurized Tires

For tires found to be above the acceptable operating pressure range, confirm the reading accuracy, and relative thermal condition of the assembly, before adjusting the tire to the "target" level, namely, the upper end of the AOPR. NEVER release pressure from a "hot" tire without cause; rather, investigate the reason for the over inflation and then make the appropriate adjustment.

5.2.2 Non-Dispatchable Tires

Below the minimum service pressure, a tire is no longer dispatchable. The following maintenance actions must be taken based on ▲P inflation pressure losses.

NOTE: The non-dispatchable tire can be addressed by either removal or reinflation depending on the inflation pressure level.

5.2.2.1 Tires found to have a gauge pressure reading below the minimum service pressure threshold, but not having reached the pressure limit for tire removal, must be re-inflated to the upper end of the AOPR before aircraft dispatch, Should a significant amount of time lapse (24 hours or more) between the re-inflation and the next dispatch of the aircraft, a re-check of the inflation pressure should be made prior to dispatch.

5.2.2.2 Tires found to have inflation pressure levels below the "non-dispatchable but re-inflatable" level, should be removed per the criteria described below.