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AEROSPACE STANDARD

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THERMAL SENSITIVE PRESSURE RELEASE DEVICES FOR TUBELESS AIRCRAFT WHEELS

1. SCOPE: This standard establishes minimum design, installation, qualification, and operational requirements for thermally actuated, pressure release devices for use only in tubeless tire type aircraft wheels. These devices are designed to completely release the contained air pressure from a tubeless tire and wheel assembly when absorbed and/or brake generated heat causes the tire or wheel to exceed a safe pressure/temperature/load operating level. The objective is to prevent tire or wheel rupture from brake generated heat which could cause serious personnel injuries or serious aircraft operational hazards.

2. DESIGN REQUIREMENTS:

2.1 Materials and Finish: Materials and finishes shall be of aircraft quality, and shall be electrolytically and thermally compatible with the wheel material. If fusible materials are used, it is desirable that they be of eutectic type.

2.2 Wheel Deflection: The installation and fit between the wheel and the device shall be such as to allow for wheel deflections under all static and dynamic operating conditions. The clearance and strength of the thermal sensitive pressure release device shall be sufficient to allow cyclic deflections of the wheel without leading to failure, impairment of function, or leakage of the device or its associated seal.

2.3 Environment: The devices shall be capable of withstanding the same environmental conditions as are imposed on the wheel.

2.4 Function: The devices shall be designed to function consistently within ±10°F of their setting or rating. When the installed device has reached the selected temperature level as a result of absorbed heat, it shall function to completely release the contained air pressure of the tire. The installation shall be such that the device properly functions consistently prior to the tire bead seat exceeding critical rim or tire temperatures (usually 400°F (204°C)). Provisions shall be considered to prevent inadvertent functioning.

2.5 Identification: Each device shall be identified with regard to temperature range either by part number, code number, color code, or other permanent type marking as established by the manufacturer. It is desirable that this marking be visible for inspection with the tire installed on the wheel.

2.6 Design Considerations: The design and location of the devices shall be such as to permit inspection without removal of the tire from the wheel. However, changing the device without removal of the tire is a procuring agency option. The location and temperature setting of the release devices shall be selected so that a release of tire inflation pressure occurs before a tire bead or wheel rim temperature critical to a safe operation of the wheel and tire assembly (nominally, 400°F (204°C)) is reached. A minimum of three devices shall be used on wheels with 14-inch diameter bead seats and up and two devices on smaller wheels. The devices shall be approximately equally spaced around the wheel. Restrictions around the orifice shall not cause deflation times to exceed allowables. If the device expels material when it releases pressure, it shall be located to assure that any expelled material will not strike personnel in the vicinity of the aircraft or any vulnerable equipment in the aircraft or wheel assembly. The devices shall be located in such a manner so as to be protected against normal handling damage.

2.7 Orifice: The orifice in each device shall be sufficiently large to assure a steady decrease in tire pressure under all conditions, and in particular, during the time that the wheel is being overheated. The size of each orifice shall be such as to permit the tire inflation pressure to decrease to 50% of its initial value in not more than two minutes when only one device functions.

2.8 Wheel Interface: Consideration shall be given to the installation of the device in the wheel at a location which minimizes the effect on fatigue life of the wheel structure. Details of installation of the devices shall receive approval of the procuring agency.

3. QUALIFICATION TESTING:

3.1 General: The devices, when installed in the wheel assembly, shall be capable of satisfying the tests specified below. These tests shall be conducted and the requirements met for the purpose of demonstrating satisfactory performance of the release devices. In addition, the release devices shall be subjected to the entire wheel and brake qualification tests or equivalent tests based on the original qualification test measurements.

3.2 Release Temperature Test: The manufacturer shall demonstrate and provide substantiating data that the release device shall function consistently within plus or minus 10°F (+6°C) of its rating and in no case shall the tire bead seat exceed 410°F (210°C).

3.3 Rate of Flow Test: A tire shall be mounted and the wheel assembled in the normal manner. After the tire has been inflated to the rated inflation pressure, one release device shall be thermally actuated. The inflation pressure shall decrease at the rate specified in paragraph 2.7.

3.4 Static Leakage Test: When subjected to a pressure of 1.5 times its rated operating pressure, there shall be no evidence of leakage from any device as evidenced by bubbles when immersed in water.

3.5 Extreme Temperature Leakage Test: The device shall be installed in a fixture which dimensionally duplicates the fit specified for production. A constant pressure equal to the pressure rating of the tire shall be applied while thermally cycling the fixture and installed device alternately between an elevated temperature 40°F (27°C) below the rated temperature of the device and the low temperature intended for the application. This cycle shall be repeated five times. The test fixture and release device shall then be heated to the upper test limit and the pressure adjusted to 1.5 times the rated pressure of the device or its application pressure, whichever is greater. The temperature shall be maintained for 72 hours. Upon completion of the elevated temperature leakage check, the fixture and device shall again be subjected to the low test temperature extreme. The pressure shall be adjusted to 1.5 times the rated pressure of the device or its application pressure, whichever is greater and the temperature maintained for a period of 24 hours. There shall be no leakage at or through the device during all portions of these tests. An alternate test procedure using a wheel and tire may be used, provided that prior approval is obtained from the procuring agency. Appropriate allowance should be made for the diffusion rate through the tire when establishing the amount of leakage permissible for this alternate procedure.

3.6 Dynamic Pressure Test: The tire and wheel shall be rolled for a distance of 25 miles under the wheel rated load and tire rated inflation pressure, adjusted for testing. The pressure loss shall not exceed 5 psi (34 kPa) when measured with the wheel and tire assembly at a temperature no higher than existed at the start of the test. The temperatures measured at the beginning and end of the test shall be of the contained air.

3.7 Dynamic Brake Test: The wheel with the release devices installed in the normal manner shall be used during the entire dynamic torque test of the brake assembly. The devices shall not function to release tire pressure at a wheel temperature associated with the normal or overload energy stops. However, the device shall function to release tire pressure prior to attaining a temperature which would result in explosive failure of the tire or wheel after completion of the maximum energy or aborted takeoff at maximum takeoff gross weight. The wheel-tire assembly shall remain landed during demonstration of the pressure release.