SAE INTERNATIONAL

# AEROSPACE RECOMMENDED PRACTICE

ARP1322 | REV. B

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Superseding ARP1322A

## (R) Overpressurization Release Devices

RATIONALE

ARP1322B has been reaffirmed to comply with the SAE five-year review policy.

## 1. SCOPE

This SAE Aerospace Recommended Practice (ARP) specifies the minimum design and test recommendations for aircraft wheel overpressurization release devices used with tubeless aircraft tires to protect from possible explosive failure of the contained air chamber due to overinflation. Devices of this type provide a means, but not the only means, for showing compliance to Subsection 25.731(d) of Part 25 of Title 14 of the Code of Federal Regulations. Devices of this type will not protect against flash fire explosive conditions within the air chamber which may occur due to extremely overheated brakes. To help protect against this condition, nitrogen or other inert gas should be used for inflation.

### 1.1 Purpose

This document recommends minimum requirements for overpressurization release devices used with aircraft tubeless tire and wheel assemblies.

### 1.2 Classification

Overpressurization Release Devices should be furnished in a range of sizes to accommodate the sizes and inflation pressure requirements of tubeless tire and wheel assemblies used on aircraft.

## 2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications should apply. The applicable issue of other publications should 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 U.S. Government Publications

Available from the United States Government Printing Office, 732 North Capital Street, NW, Washington, DC 20401, Tel: 202-512-0000, www.gpoaccess.gov.

Title 14 of the Code of Federal Regulations (14 CFR), Part 25





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## 3. GENERAL REQUIREMENTS

### 3.1 Materials

Materials used in the construction of the devices should be suitable for the purpose intended. All metals should be corrosion resistant unless suitably plated or treated to resist corrosion during stocking and normal service life use. The use of dissimilar metals, especially brass, copper, or steel in contact with aluminum, magnesium, or alloys thereof, should be avoided where practicable. Where the use of dissimilar metals cannot be avoided, they should be insulated from contact with each other.

### 3.2 Workmanship

Workmanship and finish should be in accordance with highgrade aircraft accessory manufacturing practice and be free of defects which affect proper functioning in service.

### 3.3 Identification

The Overpressurization Release Device should be plainly marked as follows:

a. Assembly No.

b. Manufacturer's Name

c. Nominal Release Pressure

Devices too small to carry the complete identification on the part should be suitably tagged or stored in suitable sealed containers which have been clearly marked. The device should carry as a minimum the manufacturer's assembly number and the nominal release pressure in 0.06 in (1.5 mm) metal stamped or etched characters.



## 4. PERFORMANCE REQUIREMENTS

### 4.1 General

The Overpressurization Release Device should be designed to aid in preventing unsafe pressure buildup in a tubeless tire and wheel assembly. To the maximum extent practicable all such devices should be designed to preclude the inadvertent installation of any unit having a different Nominal Release Pressure than the one intended.

### 4.2 Release Device

The Overpressurization Release Device mounted in the wheel may be furnished as either a part of the inflation valve or as a separate unit.

4.2.1 Each device should be designed to release at rated Nominal Release Pressure established in 4.2.3 within ±15%.

4.2.2 The device should prevent pressure buildup in the intended tire and wheel installation beyond Maximum Allowable Pressure established in 4.2.4 while a 3000 psig (20 700 kPa) unlimited supply source of the Operating Medium of 4.3 is connected to the largest flow rate inflation valve approved for use in the intended wheel and tire installation.

4.2.3 Nominal Release Pressure should be selected to ensure inflation pressure of the intended wheel and tire installation pressure is maintained for all operational load and environmental conditions for which the tire is expected to remain inflated, and should be minimized. Consideration should be given to pressures expected during all limit load cases and temperature combinations including non-emergency brake heating.

4.2.4 Maximum Allowable Pressure should be selected to minimize the risk of tire or wheel failure due to overpressurization, particularly explosive failure during tire and wheel assembly inflation.

4.2.5 For bypass or reseatable devices, after release the device should cease deflation (reset) at a pressure below the rated inflation pressure of the intended wheel and tire installation and greater than 100 psig (689 kPa), except where intended for installation in tire and wheel assemblies rated for inflation of 100 psig (689 kPa) or less, which should cease deflation (reset) at a pressure below the rated inflation pressure of the intended wheel and tire installation and greater than 50 psig (344 kPa).

4.2.6 During pressure release, deflation should be accomplished with no malfunction from the formation of ice crystals during pressure reduction.

4.2.7 Leakage should not occur at any pressure below the lower limit of the nominal release pressure.

4.2.8 During pressure release, particles expelled from the device must not be hazardous to personnel properly outfitted with eye and hearing protection.

4.3 Operating Medium

The unit should function as specified herein when used with either air, Nitrogen ($N_2$), or other inert gas with any content of water vapor from zero to saturation at the operating temperatures and pressures.

4.4 Contamination Acceptance

The unit should not malfunction due to contamination of the Operating Media that falls within accepted industry practices for such media.

4.5 Operating Environment

The unit should function as specified herein when subjected to the temperature and pressure altitude ranges specified for the intended tire and wheel installation combined with device and surrounding air temperatures expected during operation up to those corresponding to thermal fuse release. In lieu of specified ranges, ambient temperatures from -65 to 250 °F (-54 to 121 °C) and ambient pressure altitudes from -1000 ft (-305 m) to +80 000 ft (+24 400 m) should apply.

The unit should function as specified herein when subjected to loads resulting from wheel operation including those associated with flight, landing impact, gear extension, wheel spinup, wheel rolling, braking operations including despin, and vibration and shock loads associated with these operations.

5. DESIGN AND CONSTRUCTION

5.1 Sealing

All components of the Overpressurization Release Device should be sealed against dust, dirt, moisture, and water insofar as is practical.

5.2 Installation

5.2.1 Location of the device in the wheel should be in a protected area to prevent damage during wheel assembly and during service.

5.2.2 The installation port and associated passageways should be sized to support the flow rates required to meet this specification. Consideration should be given to the selection of port size to help prevent installation errors.

5.2.3 The device should be replaceable without removing the tire from the wheel.

## 6. QUALIFICATION TESTS

The following are the minimum recommended tests for validating compliance of a device designed to the requirements of this ARP. When developing requirements for specific applications, consideration should be given to the operating environment, particularly temperature and pressure.

### 6.1 Pressure Impulse Cycling

The test unit should be installed in a suitable manifold. The manifold pressure should be cycled from a low pressure of 5 psig (34.5 kPa) maximum to a maximum pressure at least equal to 75% of the Nominal Release Pressure for the unit. During each cycle, the pressure should be increased from the minimum to the maximum value in no more than 2 s. The maximum pressure should be sustained for at least 3 s and then released. The test should be continued for a minimum of 25 cycles for bypass and reseatable devices or for 5000 cycles for blowout plug, rupture disk or equivalent permanent release devices without leakage. Leakage should be determined by formation of bubbles in a soap solution or other bubble forming liquid applied to the exterior of the device with at least 75% of Nominal Release Pressure applied to the manifold.

### 6.2 Pressure Release Function Test

The test unit should be installed in a wheel and tire assembly for which the unit is intended or in a suitable manifold to represent the wheel and tire. For a manifold, the installation port and passageways between the inflated chamber and the device should be representative of the flow restriction of the port and passageways in the intended wheel installation. Means should be provided to record the pressure of the supply source at the inflation valve, the pressure in the inflated chamber and the initiation of flow through the device under test. The manifold should be pressurized through a tire inflation valve utilizing a valve core and core chamber similar to the intended installation. A 3000 psig (20 700 kPa) pressure source should be applied at the inflation valve and the inlet pressure should be maintained above 2500 psig (17 238 kPa) throughout the test until the inflated chamber pressure maximizes then stabilizes or begins to drop. The device should begin to release manifold pressure within the limits of the Nominal Release Pressure. During the test, the inflated chamber pressure should not exceed the Maximum Allowable Pressure.

### 6.3 Bypass or Reseatable Device Reset Test

For units designed to reset (cease deflation) after release, the test unit should be installed in a wheel and tire assembly for which the device is intended or in a suitable manifold to represent the wheel and tire. For a manifold, the installation port and passageways between the inflated chamber and the device should be representative of the flow restriction of the port and passageways in the intended wheel installation. Means should be provided to record the pressure of the supply source at the inflation valve, the pressure in the inflated chamber, and the initiation of flow through the device under test. The manifold should be pressurized through a tire inflation valve utilizing a valve core and core chamber similar to the intended installation The pressure at the inlet connection to the inflation valve should be rapidly increased above Nominal Release Pressureuntil sustained release occurs, then the inlet supply should be shut off. The unit should reset (cease deflation) at or within the pressure limits of this specification. Following a 10 s stabilization period after reset, no leakage should be detected for a period of at least one minute. This test should be repeated for a total of at least 5 cycles.

### 6.4 High Temperature Test

The test unit should be installed in a suitable manifold and maintained at a temperature of at least 250 °F (121 °C) for 24 h with manifold pressure maintained at 75% ± 5% of the Nominal Release Pressure. After 24 h the unit should be cooled to not less than 150 °F (65.5 °C), pressure in the manifold should be reduced to ambient, then increased at a rate approximating that of the test of 6.2 until pressure releases. For inflation valve type devices, pressure should be applied through the inflation valve inlet port. The device should begin to release manifold pressure within the limits of the Nominal Release Pressure.