



AEROSPACE RECOMMENDED PRACTICE

ARP1616™

REV. B

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Superseding AIR1616A

Self-Sealing Breakaway Valves for Crash-Resistant Aircraft Fuel and Oil Systems

RATIONALE

This document should have been cancelled previously, when it was replaced by AIR1616A, which contains the same information, with updated references to other specifications, and was stabilized in 2012. It is now confusing to have two specifications covering exactly the same subject, which are virtually word for word identical. Since AIR1616A has been more recently updated than ARP1616A, then ARP1616A should be cancelled. AIR1616A will be updated to state that it supersedes ARP1616A.

CANCELLATION NOTICE

This Technical Report has been declared "CANCELLED" as of August 2017 and has been superseded by AIR1616A. By this action, this document will remain listed in the respective index, if applicable. Cancelled Technical Reports are available from SAE.

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TABLE OF CONTENTS

1.	SCOPE	2
2.	REFERENCES	2
3.	REQUIREMENTS	3
4.	QUALITY ASSURANCE PROVISIONS	9
5.	PREPARATION FOR DELIVERY	16
6.	NOTES	18

1. SCOPE:

- 1.1 This document defines design, performance, and test criteria for self-sealing breakaway valves for use in crash-resistant aircraft fuel systems.

2. REFERENCES:

2.1 Applicable Documents:

The following documents of issue in effect on the date of invitation for bids or request for proposal form a part of this document to the extent specified herein. In the event of conflict between these documents and the text of this document, the latter shall govern.

- 2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

ARP868 Pressure Drop Test for Fuel System Components
AS1055 Fire Testing of Flexible Hose Tube Assemblies, Coils, Fittings & Similar System Components

- 2.1.2 Military Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-276	Impregnation of Porous, Nonferrous Metal Castings
MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-889	Dissimilar Metals
MIL-STD-970	Standards and Specification, Order of Preference for the Selection of
MIL-STD-1290	Light Fixed - and Rotary-Wing Aircraft Crashworthiness
MIL-STD-2073-1	DOD Material, Procedures for Development and Application of Packaging Requirements
MIL-STD-2175	Castings, Classification and Inspection of
MIL-STD-45662	Calibration System Requirements
MS20995	Wire, Safety or Lock
MS33540	Safety Wiring and Cotter Pinning, General Practices for
MS33588	Nuts, Self-Locking, Aircraft, Reliability and Maintainability Usage Requirements for
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-B-5087	Bonding, Electrical, and Lightning Protection, for Aerospace Systems
MIL-C-7024	Calibrating Fluid for Aircraft Fuel System Components
MIL-F-8615	Fuel System Components, General Specification for
MIL-I-8500	Interchangeability and Replaceability, Physical, of Component Parts for Aerospace Vehicles
MIL-N-25027	Nut, Self Locking, 250 Degree F, 450 Degree F, and 800 Degree F, 125 Ksi Ftu, 60 Ksi Ftu, and 30 Ksi Ftu

2.1.2 (Continued)

MIL-S-7742	Screw Threads, Standard, Optimum Selected Series, General Specification for
MIL-S-8879	Screw Threads, Controlled Radius Root with Increased Minor Diameter; General Specification for
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-T-31000	Technical Data Packages, General Specification for
MIL-T-83133	Turbine Fuel, Aviation, Kerosene Type, Grade JP-8

2.1.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

P-D-680	Dry Cleaning and Degreasing Solvent
QQ-A-367	Aluminum Alloy Forgings
QQ-S-763	Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting
TT-S-735	Standard Test Fluids, Hydrocarbon

FED-STD-No. 595 Colors

2.1.4 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM D 910	Standard Specification for Aviation Gasoline
ASTM D 1655	Standard Specification for Aviation Turbine Fuels

3. REQUIREMENTS:

3.1 Quality Assurance:

This document makes provisions for recommended qualification and quality conformance testing.

3.2 Description:

The requirement of this section applies to the design of breakaway self-sealing valves including the performance and design of the self-sealing mechanism and the frangible section of the valve.

3.3 Materials:

Materials and processes used by the manufacturer of fuel system components shall conform to applicable Government and Industry Documents. Materials conforming to contractor's documents may be used, provided prior approval is obtained from the procuring activity. The use of contractor's documents shall not constitute waiver of Government inspection. All materials used in the component shall be sufficiently resistant to liquids shown in 3.8.3.

3.3.1 Selection of Materials: Specifications and standards for all materials, parts, and processes which are not specifically designated herein and which are necessary for the execution of this specification shall be selected in accordance with MIL-STD-970.

3.3.2 Metals: All metals used in the construction of fuel-system components that are not of a corrosion-resistant type shall be suitably protected to resist corrosion during the normal service life of the component. Unless suitably protected against electrolytic corrosion, dissimilar metals as defined in MIL-STD-889 shall not be used in intimate contact with each other. Magnesium shall not be used in fuel system components. Cadmium plate and copper shall not be used where in contact with fuel.

3.3.3 Castings: Classification and inspection of ferrous and non-ferrous metal castings shall be in accordance with MIL-STD-2175. If necessary to prevent leakage due to porosity, parts shall be treated in accordance with MIL-STD-276.

3.3.4 Forgings: Forgings shall be in accordance with QQ-A-367 or QQ-S-763.

3.3.5 Fungus-Proof Materials: Materials that are nutrients for fungi shall not be used.

3.4 Finish:

Anodizing, plating, protective treatment, and painting of fuel system components shall be as specified in the model specification and applicable detail drawings.

3.5 Identification of Product:

Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.6 Color Identification:

Each fuel system component shall be identified by a red color, in approximate conformance with Federal Standard No. 595, color number 11136. The color shall be permanent and, when applied to parts that may come in contact with fuel, shall not soften, chip, crack, or cause the fuel to be affected in any way. The entire component may be red anodized but not less than 20% of the external surface area of the component shall be red.

3.7 Parts:

- 3.7.1 **Standard Parts:** Standard parts (MS, AN or NAS) shall be used wherever they are suitable for the purpose and shall be identified on the drawing by their part number. Commercial utility parts; i.e., screws, bolts, nuts, and cotter pins, may be used, provided; (1) they possess suitable properties and are replaceable by the standard parts without alteration, and (2) the corresponding standard number is referenced in the parts list and, if practicable, on the vendor's drawing. In event there are not suitable corresponding standard parts in effect on date of invitation for bids, commercial parts may be used if they conform to all requirements of this specification.
- 3.7.2 **Threaded Parts:** Threads shall be in accordance with MIL-S-8879 or MIL-S-7742. The use of pipe threads is prohibited.
- 3.7.3 **Locking of Parts:** All threaded parts shall be locked by safety wiring, self-locking nuts, cotter pins, or other methods approved by the procuring activity. Safety wiring shall be installed in accordance with MS33540 and shall conform to MS20995. Self-locking nuts shall be in accordance with MIL-N-25027 and MS33588. Lockwashers or staking are not permitted. Components installed within a fuel cell shall not have safety wire.

3.8 Design and Construction:

The valve frangible mechanisms shall be designed to meet all operational and service forces of the aircraft while being designed to separate at a predetermined point and load. Upon separation, internal self-sealing mechanisms in each valve section shall automatically close and seal, preventing leakage of system fluids. The design shall consider visual indication of valve position and a means to prevent external leakage after separation due to foreign object contact with the sealing mechanisms. Provisions shall be designed into the valve to prevent fuel leakage in the event of a partial fracture of the frangible section before the valve closes. Spillage during separation and valve closure shall not exceed the values listed in Table 1. The design of the valve shall be such that no external power source or control is required for valve closure.