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AEROSPACE STANDARD

SAE AS5379

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Valves, Safety, Cabin Air, General Specification For

NOTICE

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1. SCOPE:

1.1 This specification covers the general requirements for cabin air safety valves for use in pressurized cabins of aircraft to prevent excess positive and negative pressures in the cabin and to provide a means of cabin pressure release in case of emergency.

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2. APPLICABLE DOCUMENTS:

2.1 The following specifications, standards, drawings, and publications, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

Federal

QQ-P-416	Plating, Cadmium (Electrodeposited)
QQ-Z-325	Zinc, Plating (Electrodeposited)

Military

MIL-A-8625	Anodic-Coatings, for Aluminum and Aluminum Alloys
MIL-C-5015	Connectors, Electrical, “AN Type”
MIL-D-5028	Drawings and Data Lists: Preparation of Manufacturers’ (For Production Aircraft, Guided Missiles, Engines, Accessories, and Other Auxiliary Equipment)
MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for
MIL-E-7894	Electric Power, Aircraft Characteristics of
MIL-I-6181	Interference Limits, Tests and Design Requirements, Aircraft Electrical and Electronic Equipment
MIL-L-6082	Lubricating Oil; Aircraft-Engine
MIL-L-7808	Lubricating Oil, Gas Turbine, Aircraft
MIL-M-7969	Motors; Alternating Current, 400 Cycles, 115/200 Volt System, Aircraft, General Specification for
MIL-M-8609	Motors, Direct-Current, 28-Volt System, Aircraft, General Specification for
MIL-P-5633	Packaging and Packing of Aircraft Material in Steel Shipping Containers
MIL-P-7105	Pipe Threads, Taper, Aeronautical National Form Symbol ANPT
MIL-R-5847	Rubber; Silicone, High and Low Temperature Resistant
MIL-R-6106	Relays, Electric, Aircraft
MIL-R-6855	Rubber; Synthetic, Sheet, Molded and Extruded, for Aircraft Applications
MIL-S-4040	Solenoid, Electrical, General Specification for
MIL-S-7742	Screw Threads, Standard, Aeronautical

STANDARDS

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U. S. Military Property
MS33586	Metals, Definition of Dissimilar

2.1 (Continued):

DRAWINGS

Air Force-Navy Aeronautical Standard Drawings

AN366 Nut - Plate, Non-Countersunk, 250°F

PUBLICATIONS

Air Force-Navy Aeronautical Bulletin

No. 143 Specifications and Standards; Use of

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS:

3.1 Preproduction sample:

Prior to beginning quantity production, preproduction samples shall be subjected to preproduction testing. (See 4.3.1.)

3.2 Materials:

3.2.1 Metals: Metals shall be of the corrosion-resistant type, unless suitably protected to resist corrosion during normal service life. The use of dissimilar metals shall be avoided whenever practicable, or used in accordance with Standard MS33586.

3.2.2 Nonmagnetic materials: Nonmagnetic materials shall be used for all parts of the safety valve, except where magnetic materials are essential.

3.2.3 Nonferrous materials: Nonferrous materials shall be used for all parts of the safety valve, except where ferrous materials are essential.

3.2.4 Diaphragm: Any rubber compound employed in the diaphragm construction shall be basically polychloroprene or silicone types, and shall conform either to Specification MIL-R-6855, type II, or Specification MIL-R-5847.

3.2.5 Castings: Castings shall be of high-grade quality, clean, sound, and free from blowholes, porosity, cracks, and any other defects.

3.2.6 Protective treatment: When materials are used in the construction of the safety valves that are subject to corrosion in salt air or other atmospheric conditions likely to occur during service usage, they shall be protected against such corrosion in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of atmospheric conditions shall be avoided.

3.2.7 Selection of materials: Specifications and standards for all materials, parts, and Government certification and approval of processes and equipment, which are not specifically designated herein and which are necessary for the execution of this specification, shall be selected in accordance with ANA Bulletin No. 143, except as provided in the following paragraph.

3.2.7.1 Standard parts: Standard parts (MS, AN, or JAN) shall be used wherever they are suitable for the purpose, and shall be identified on the drawing by their part numbers. Commercial utility parts such as screws, bolts, nuts, cotter pins, etc, may be used, provided they possess suitable properties and are replaceable by the standard parts (MS, AN, or JAN) without alteration, and provided the corresponding standard part numbers are referenced in the parts list and, if practicable, on the contractor's drawings. In the event there is no suitable corresponding standard part in effect on date of invitation for bids, commercial parts may be used provided they conform to all requirements of this specification.

3.3 Design and construction:

The cabin air safety valve shall combine three functions of cabin air pressure release. These functions shall be positive pressure relief, negative pressure relief, and emergency pressure release.

3.3.1 Capacity: The rated capacity shall be as required in the detail specification.

3.3.1.1 Rated capacity shall be considered as the flow through the valve with the outlet at standard conditions when the positive pressure differential is raised 0.25 inch Hg above an adjusted relief setting of 7.0 inches Hg.

3.3.2 Positive pressure relief: One component of the valve shall prevent the differential air pressure within the cabin from exceeding the ambient pressure by a differential great enough to detrimentally affect the cabin structure.

3.3.2.1 Range of adjustment: The pressure relief function of the valve shall be settable to relieve at any pressure differential between 2.5 and 10 psi.

3.3.2.1.1 Construction shall be such that operating parts cannot be damaged by excessive movement in the adjusting mechanism.

3.3.2.2 Under all of the conditions of testing as contained in Section 4 of this specification, the cracking point and pressure relief differential up to the rated capacity of the valve shall be maintained within ±0.30 inch Hg of the calibrated setting.

3.3.2.3 The valve shall be designed to keep the leakage rate at the lowest possible value. In no event shall the leakage exceed the maximum values shown by figure 1 during all conditions of testing specified in Section 4.

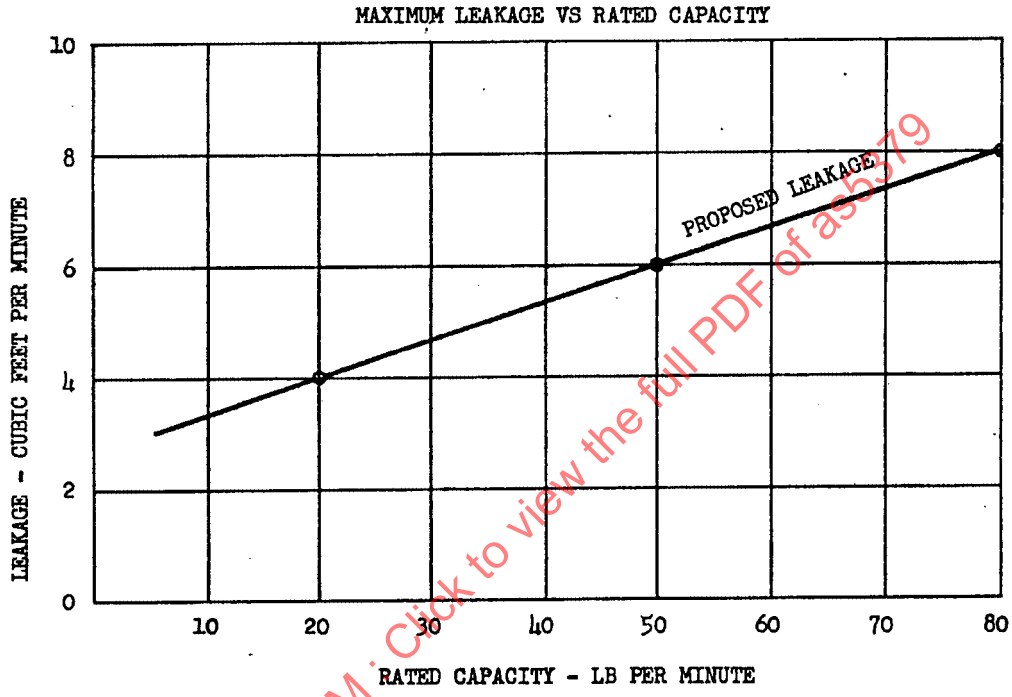

FIGURE 1. Leakage flow chart

3.3.3 Negative pressure relief: One component of the safety valve shall prevent ambient pressure from exceeding cabin pressure by more than 10 inches of water under all normal airplane conditions and all rates of descent up to the maximum for the airplane.

3.3.4 Emergency pressure release: One component of the safety valve shall permit the manual release of the cabin air pressure. Release of pressure shall be accomplished within the time interval required by the detail specification.

3.3.4.1 Electrical actuation: Means shall be provided on the valve in order that, if required in the detail specification, suitable electrical mechanisms can be installed to dump the valve remotely.

3.3.4.2 Power: The electrical actuation shall use either 28V dc or 200/115V 400-cycles ac, as defined in Specification MIL-E-7894 and as required by the detail specification.

3.3.4.3 Electrical requirements: The electric components shall meet the requirements of Specifications MIL-S-4040, MIL-R-6106, and MIL-C-5015, as applicable. Radio noise requirements shall be in accordance with Specification MIL-I-6181.

3.3.5 Ports and passages: Ports and passages shall be of adequate size to minimize lag in operation of all functions of the safety valve and to prevent unstable operation.

3.3.5.1 Dump control port: A port shall be so provided on the body of the safety valve that, if pneumatic operation of the dump function is required by the detail specification, suitable tubing can be attached.

3.3.6 The safety valve shall be so designed and constructed that no parts will work loose in service. It shall be built to withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, installations, and service.

3.3.6.1 Suitability: The valve shall meet the requirements and test conditions specified herein. The tests are intended to determine the suitability of the valve for operation in military aircraft. Some deterioration of parts during test is acceptable, provided the operation of the valve is not impaired.

3.3.6.2 It shall be the responsibility of the airframe manufacturer or prime contractor to provide to the procuring activity for approval, the detail valve specification incorporating the requirements of this specification for the specific application.

3.3.7 The safety valve shall be so constructed that adjustments and repairs can be easily made by the personnel of operating units and overhaul bases.

3.4 Interchangeability:

All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacturer's part numbers shall be governed by the drawing number requirements of Specification MIL-D-5028.

3.5 Threads:

3.5.1 Pipe: Pipe threads shall conform to Specification MIL-P-7105.

3.5.2 Screw: Screw threads shall conform to Specification MIL-S-7742.

3.5.3 Locking threaded parts: All internal or external parts that are threaded shall be positively locked, except in the case of pipe thread connections.

3.6 Lubrication:

No lubrication shall be required in the field.

3.7 Finishes and protective coating:

3.7.1 Plating: Steel parts in contact with aluminum or aluminum alloys shall be cadmium plated in accordance with Specification QQ-P-416 or zinc plated in accordance with Specification QQ-Z-325. Cadmium plating, if used, shall be type II or III, as applicable, and of a class that is adequate to achieve the degree of protection required.

3.7.2 Anodizing: All aluminum-alloy parts shall be anodized, unless otherwise required, in accordance with Specification MIL-A-8625.

3.8 Mounting flange:

The mounting flange shall be equipped with plate nuts conforming to Drawing AN366, and of a size as indicated in the detail specification.

3.9 Identification of product:

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

3.9.1 Calibration seal: The calibration of the valve shall be impressed on a lightweight material seal, and the seal attached to the lockwire of the adjusting mechanism. As calibration is altered, the seal shall be destroyed and a new seal impressed and attached for the changed calibration.

3.9.2 Diaphragm: The month and year in which the diaphragm is cured shall be permanently and legibly marked on the diaphragm with an oil-resistant marking fluid which is not deleterious to the diaphragm material. Marking shall be visible without disassembly of the valve.

3.10 Workmanship:

3.10.1 General: The safety valve, including all parts and accessories, shall be constructed and finished in a thoroughly workmanlike manner. Particular attention shall be given to neatness and thoroughness of soldering, wiring, marking of parts and assemblies, machine-screw assemblies, and freedom of parts from burrs and sharp edges.

3.10.2 Dimensions: Dimensions and tolerances not specified shall be as close as is consistent with the best shop practices. Where dimensions and tolerances may affect the interchangeability, operation, or performance of the safety valve, they shall be held or limited accordingly.

3.10.3 Screw assemblies: Assembly screws and bolts not having specific torque requirements shall be tight. The word "tight" means that the screw or bolt cannot be appreciably tightened further without damage or injury to the screw or bolt or threads.

3.10.4 Cleaning: The safety valve shall be thoroughly cleaned of loose metal chips, and other foreign material after final assembly. Burrs and sharp edges shall be removed.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Classification of tests:

The inspection and testing of safety valves shall be classified as follows:

(a) Preproduction tests
(b) Acceptance tests

4.2 Test conditions:

4.2.1 Standard atmospheric conditions: Whenever the pressures and temperatures existing at the time of tests are not specified definitely, it is understood that the test is to be made at atmospheric pressure (approximately 29.92 inches Hg) and at room temperature (approximately 25°C). When tests are made with atmospheric pressure or room temperature differing materially from the above values, proper allowance shall be made for the difference from the specified condition.

4.2.2 Cleaning: Before testing any safety valve, except as otherwise required under paragraph 4.3.3.3 all oil, grease, or any other temporary corrosion-resistant compound shall be removed from the interior and exterior parts of the safety valve.

4.2.3 Test chamber: The volume of the test chamber shall not exceed the cabin volume for which the valve is intended, as specified in the detail specification.

4.2.4 For the Positive pressure relief and the Manual dump characteristics tests, it is not required to raise the cabin pressures above the ambient facility pressure.

4.2.5 Dust contamination: Dust contamination shall consist of injecting the material with the following chemical analysis, which is commercially known as "140 mesh silica flour," into the airflow such that a concentration of 0.065 gram of dust per pound of air is produced:

Substance	Percent by weight
SIO_2	97 to 99
Fe_2O_3	0 to 2
AL_2O_2	0 to 1
TiO_2	0 to 2
MgO	0 to 1
Ign losses	0 to 2

4.2.6 Oil contamination: Oil contamination shall consist of injecting oil conforming to Specification MIL-L-6082, grade 1120, or MIL-L-7808 into the airflow at the rate of 0.017 cc per pound of air.

4.2.7 Smoke contamination: Smoke contamination shall consist of burning pipe tobacco at an average rate of 0.63 gram of tobacco per pound of air and causing the effluent smoke to pass through the safety valve.

4.2.8 Ducting: For Sampling tests, all ducting to be installed in the aircraft for exhausting air from the cabin safety valve as required by the detail specification shall be made a part of the test setup.

4.3 Qualification tests:

4.3.1 Sampling instructions: The Preproduction test samples shall consist of two safety valves. Samples shall be identified as required and forwarded to the activity responsible for testing, as specified in the detail specification.

4.3.1.1 The Qualification test shall be made on each of the two safety valves as follows, and shall be made in the order listed. Additional tests may be required, at the option of the procuring activity, to simulate actual service conditions:

Safety valve No. 1	Safety valve No. 2
Sampling tests	Sampling tests
Endurance	Vibration
High temperature	Fungus
Low temperature	Humidity
Contamination	Salt spray
	Explosion-proof (if required)

4.3.3 Tests: The Qualification tests shall consist of all the tests specified under Acceptance tests and, in addition, the following tests.

4.3.3.1 Endurance: The safety valve shall be placed in a cycling chamber, and with all air being relieved through the valve, shall be endurance tested as follows.

4.3.3.1.1 Either of the following tests may be performed at the option of the testing activity.

4.3.3.1.1.1 For 50 hours of the Endurance test, the differential shall be raised to open the valve and cause it to flutter at a rate of approximately 300 cpm. For a period of 25 hours, the airflow through the valve in the direction of positive pressure relief shall be increased from zero to rated positive pressure relief capacity, and then reduced to zero. The minimum cycling rate shall be 300 cycles per hour. At least every 100th cycle, the cabin chamber pressure shall be reduced to ambient by operating the dump mechanism.

4.3.3.1.1.2 For 200 hours, the airflow through the valve in the direction of pressure relief shall be increased from zero to rated positive pressure relief capacity, and then reduced to zero. The minimum cycling rate shall be 300 cycles per hour. At least every 300th cycle, the cabin chamber pressure shall be reduced to ambient by operating the dump mechanism.

4.4.3.1.2 For 25 hours, the airflow through the valve in the direction of negative relief shall be increased from zero to rated negative pressure relief capacity and then reduced to zero. The minimum cycling rate shall be 30 cycles per hour.

4.4.3.1.3 Upon completion of the Endurance test, the safety valve shall be subjected to the Sampling tests.

4.3.3.2 Vibration: Procedure I: The safety valve, while maintaining the pressure relief adjustment, shall be subjected to Vibration tests, Procedure I, of Specification MIL-E-5272. Upon completion of the Vibration test, the safety valve shall be subjected to the Sampling tests.

4.3.3.3 Contamination:

4.3.3.3.1 Dust and oil contamination: The safety valve shall be subjected to contamination by dust for a period of 24 hours, and in addition, by oil for 1 hour in every 6 hours of the 24-hour contamination period. The differential pressure across the valve shall be sufficiently high to maintain 25 percent of the rated flow capacity of the safety valve.

4.3.3.3.2 Smoke contamination: The safety valve shall be subjected to contamination by smoke for a period of 15 hours. The airflow through the valve shall be maintained at 100 percent of the rated capacity of the valve and shall burn the tobacco at the specified rate.

4.3.3.3.3 Operation: After contamination, the safety valve shall be subjected to the Sampling tests.

4.3.3.3.4 Extent of contamination: After operation, the safety valve shall be dissassembled and examined to determine the extent of contamination.

4.3.3.4 Environmental: The safety valve shall be subjected to the following tests conducted in accordance with the specified test procedures of Specification MIL-E-5272. After exposure, the safety valve shall be inspected for harmful or undue deterioration, which if present, shall constitute failure.

(a) Salt spray: Salt spray test for a period of 50 hours. After this exposure, the safety valve shall be subjected to the Sampling tests.

(b) Humidity: Humidity test, Procedure I.

(c) Fungus: Fungus test, Procedure I.

(d) Explosion-proof: Explosion-proof test shall be conducted as required.

4.3.3.5 Electric motors: When direct-current motors are incorporated in the dumping function, the motors shall be tested to, and shall meet the requirements of, Specification MIL-M-8609. When alternating-current motors are incorporated in the dumping function, the motors shall be tested according to and meet the requirements of Specification MIL-M-7969.