ETSO-C76
Date : 24.10.03

European Aviation Safety Agency

European Technical Standard Order

Subject: FUEL DRAIN VALVES

1 - Applicability

This ETSO gives the requirements which fuel drain valves that are manufactured on or after the date of this ETSO, must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None.

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in the attached „Federal Aviation Administration Standard, Fuel Drain Valves“ dated October 1, 1962.

3.1.2 - Environmental Standard

As stated in the Federal Aviation Administration Standard.

3.1.3 – Computer Software

None

3.2 - Specific

None.

4 - Marking

4.1 - General

Marking is detailed in CS-ETSO Subpart A paragraph 1.2.

4.2 - Specific

None.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

FAA Standard associated with ETSO-C76

October 1, 1962

FAA STANDARD – FUEL DRAIN VALVES

1. PURPOSE: To specify minimum requirements for fuel drain valves that are intended to drain fuel or water from low points in aircraft fuel systems. Fluid discharge from the valve is intended to be drained to a container for inspection.

2. SCOPE: This standard covers the requirements for acceptance of fuel drain valves used as a quick means of draining fuel or water from aircraft fuel systems. These valves are intended to be used in fuel tank sumps, strainers and gascolators.

3. GENERAL REQUIREMENTS:

3.1 Materials. Materials shall be of a high quality which experience and/or tests have demonstrated to be suitable for use with aviation fuels having an aromatic content from 0 to 30 percent. Synthetic rubber parts shall be age dated in accordance with ANA Bulletin No. 438. All metals used in the construction of fuel drain valves shall be of corrosion resisting type or shall be suitably protected to resist corrosion during the normal service life of the valve.

3.2 Design and Construction.

3.2.1 Fuel Spillage. The drain valve shall be designed to permit operation without spillage or leakage of fuel on operating personnel.

3.2.2 Position Indication. Indication shall be provided for the open and closed position of valves. The valve shall utilize detents or other suitable means to retain the valve in the full-closed position. When manually released from the open position, the valve shall automatically return to the closed position.

3.2.3 Self-locking. The valve shall be provided with a means to prevent accidental opening or opening due to vibration or air loads.

3.2.4 Seals. The valve shall be designed so that the inlet pressure does not tend to open the valve, and so that the inlet pressure keeps the valve in the closed and sealed condition.

3.2.5 Loss of Parts. Fuel drain valves shall be designed to preclude the loss of parts. Design consideration shall be given so that the main seal will remain in place and prevent fuel leakage in the event of possible damage to or loss of the valve stem from operational loads to be anticipated in service. If threaded fittings are employed to support the valve, positive design provisions shall be included to prevent operational loads from rotating the valve body out of its boss.

3.2.6 Screens. The design of the valve shall include no features, such as screens or baffles, which could impair the valves effectiveness in draining fuel containing water and other contaminants.

4. TEST CONDITIONS:

4.1 Atmospheric Conditions. Unless otherwise specified, all tests required by this standard shall be conducted at an atmospheric pressure of approximately 29.92 inches of mercury and at an ambient temperature of approximately 25° C.

4.2 Fluids. Unless otherwise specified, commercial grade aviation fuels shall be used for all tests.

5. TEST METHODS AND PERFORMANCE REQUIREMENTS:

5.1 Functional. This test shall demonstrate the ability of the valve to meet the design requirements specified in Sections 3.2.1, 3.2.2, 3.2.3, 3.2.4, and 3.2.5.

5.2 Flow Test. The drain valve shall be connected to a suitable container and the time required to pass a 1 quart quantity of fuel shall be determined when conducted with a maximum head of six inches of fuel. The time to flow 1 quart shall not take longer than 1 minute.

5.3 Leakage Tests.

5.3.1 Fuel Leakage. The fuel leakage test shall be conducted at pressures of four inches of fuel, one p.s.i., 20 p.s.i., and 60 p.s.i. The pressure shall be applied to the drain valve inlet with the valve in the closed position; there shall be no leakage.

5.3.2 Air Leakage. The air leakage test shall be conducted with the valve installed in a suitable test setup so that the valve inlet port is covered by fuel. Air pressure varying from 0 to five p.s.i. shall be applied to the valve outlet port with the valve in the closed position. There shall be no air leakage evident.

5.4 Fuel Resistance and Extreme Temperature. The fuel resistance and extreme temperature tests shall be conducted in accordance with the following table:

Fuel Resistance and Extreme Temperature
Test Schedule

Test	Fuel Resistance		
Period 1/	Phase I Soak	Phase I Dry	Low Temperature
Component configuration	2/	Drained and blown dry, normal condition as would be expected under service conditions, ports open.	Mounted as would be expected under normal service conditions 2/
Test Fluid	MIL-S-3136, type III	None	MIL-S-3136, type I
Period duration	96 hours (4 days)	24 hours	18 hours
Ambient and test fluid temperature.	158° ±2° F. or the normal operating temperatureof the system in which the component is used, whichever is higher.	Circulating air at 158° ±2° F. or the normal operating temperatureof the system in which the component is used, whichever is higher.	Lower the fluid temperature to maintain -67° ±2° F., then maintain the fluid temperature at -67° ±2° F. for a minimum of of 18 hours.
Operation or tests during period	Actuate component at least 4 cycles per day in a normal manner.	None	None

Operation or tests immediately after period	Conduct leakage test, using MIL-S-3136, type III fluid. 3/	(a) Actuate components for 5 cycles. (b) Conduct functional and leakage tests, using MIL-S-3136, type I fluid. 3/	With temperature not higher than -65° F., conduct functional and leakage tests, using MIL-S-3136, type I fluid. 3/

1/ Each period shall follow immediately after the preceding one in the order noted.

2/ The component sha11 be maintained in such a manner as to insure complete contact of all nonmetallic parts with the test fluid as would be expected under normal service conditions

3/ No leakage is allowed at any time during the test except for the first 15 minutes of the leakage test of the dry cycle.

5.5 Vibration.

5.5.1 Resonance. The valve shall be subjected to a resonant frequency survey of the range specified in the following table in order to determine if there exists any resonant frequencies of the parts. If resonance is encountered, the valve shall be successively vibrated along the three axes for four hours at the critical frequency.

5.5.2 Cycling. The valve, in the closed positions shall be mounted on a vibration device, fluid pressure shall be applied to the inlet port. The valve shall be subjected to the three vibration scanning cycle tests contained in the following table:

Vibration Test			
Scanning cycle	1	2	3
Axis of vibration	X	Y	Z
Fluid pressure	60 p.s.i.	60 p.s.i.	60 p.s.i.
Scanning cycle	15 min.	15 min	15 min.
Number of scanning cycles per test	2	2	2
Procedure	The vibration test shall be conducted on the valve along three mutually perpendicular axes herein referred to as the X, Y, and Z axes; the X axis being defined as lying along center lines of the valve. The frequency shall be uniformly increased with respect to time through a frequency range from 10 to 500 c.p.s. with an applied double amplitude of 0.036 inch up to 75 c.p.s. and from there an applied vibration acceleration not less than ±10g. The frequency shall be similarly decreased such that the complete cycle is accomplished in the specified cycle time.		

The test shall also be conducted at pressures of 1/2 p.s.i. and five p.s.i. There shall be no fluid leakage during the test.

The test shall also be conducted with air pressure varying from 0-5 p.s.i. gage at the outlet port. Air leakage shall not exceed 10 cc. per minute of free air during the five p.s.i. air suction test.

There shall be no evidence of damage to the valve or loosening of parts as a result of the test.

5.6 Proof Pressure. The valve shall be in the closed position and shall be subjected to a fuel pressure of 100 ±2 p.s.i. for a period of one minute at the inlet port, with the outlet port open to atmospheric pressure. There shall be no evidence of permanent distortion or other damage to the valve. There shall be no external leakage when the pressure is reduced to 60 p.s.i.

5.7 Reliability Tests. (Cycling Operations)

5.7.1 Dry. The valve shall be dried in an oven at 158° ±2° F. for four hours and then, in the dry condition, be subjected to 2,000 complete cycles of operation.

5.7.2 Wet. The valve shall be moistened with fuel, supplied with a six inch head of fuel and then be subjected to 6,000 complete cycles of operation.

5.7.3 Post Reliability Test. Upon completion of the cycling operations, the valve shall be subjected to the Leakage Test. There shall be no leakage from any portion of the valve as the result of the Reliability Test.