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MILITARY SPECIFICATION

VALVE, FUEL SYSTEM PRESSURIZATION AND VENT

This specification has been approved by the Naval Air Systems Command, Department of the Navy.

1. SCOPE

1.1 This specification covers one type of valve assembly for use in aircraft fuel tanks to sense and relieve positive or negative tank pressures and control pressurization and venting of the tank during fuel transfer and refueling operations.

2. APPLICABLE DOCUMENTS

2.1 Government documents normally furnished. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

Federal

TT-S-735 - Standard Test Fluids; Hydrocarbons

Military

MIL-V-3C - Valve, Fittings, and Flanges; Packaging Of

MIL-D-1000 - Drawings, Engineering and Associated Lists

MIL-T-5624 - Turbine Fuel, Aviation, Grades JP-4 and JP-5

MIL-F-7024 - Fluids, Calibrating, For Aircraft Fuel Systems Components

MIL-S-8879 - Screw Threads, Controlled Radius Root with Increased Minor Diameter; General Specification For

STANDARDS

Military

MIL-STD-129D - Marking For Shipment and Storage

MIL-STD-130 - Identification Marking of U.S. Military Property

STANDARDS

Military (Cont'd)

MIL-STD-480 - Configuration Control-Engineering Changes Deviations and Waivers

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing Of

MIL-STD-810 - Environmental Test Methods

MIL-STD-889 - Metals, Definition of Dissimilar

MIL-STD-1523 - Age Control of Age Sensitive Elastomeric Parts

MS9020 - Packing, Preformed - AMS 7271, "O" Ring

MS9021 - Packing, Preformed - AMS 7271, "O" Ring

MS20995 - Wire, Lock

MS33540 - Safety Wiring, General Practices For

MS33649 - Bosses Fluid Connection Internal Straight Thread

(When requesting applicable documents, refer to both title and number. Copies of unclassified documents may be obtained from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia Pennsylvania 19120. Requests for copies of classified documents should be addressed to the Naval Publications and Forms Center, via the cognizant Government representative).

2.2 Other publications - The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issue in effect at the time of submitting samples for qualification shall apply:

Specifications

AMS2406 - Chromium Plating, Hard Deposit
AMS2416 - Nickel-Cadmium Plating, Diffused
AMS7271 - Rings, Sealing, Synthetic Rubber, Fuel and Low Temperature Resistant

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096).

3. REQUIREMENTS

3.1 Qualification - The valve assembly furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein and has been listed on, or approved for listing on, the applicable Qualified Products List (QPL). In addition, the retention of the qualification for the valve on the applicable Qualified Products List shall be dependent on periodic verification, by means of test data, of continued compliance with the requirements of this specification.

3.2 Data - Unless otherwise specified in the contract or purchase order, no data (other than reports and drawings accompanying qualification samples) are required by this specification or any of the documents referenced in Section 2, herein (see 4.3.1 and 6.2).

3.3 Selection of specifications and standards - Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.4 Materials - Materials and processes used in the manufacture of the valve assembly shall conform to applicable Government specifications. Materials conforming to contractor's or industry specifications may be used provided the specifications are released by the Government and contain provision for adequate tests. The use of contractor's or industry specifications shall not constitute waiver of Government inspection. All materials used in the component shall be sufficiently resistant to fluids conforming to MIL-T-5624, having aromatic content from 0 to 30 percent, to assure operation as specified herein.

3.4.1 Metals - All metals that are not of a corrosion-resistant type, shall be suitably protected to resist corrosion during the normal service life of the component. The use of dissimilar metals, especially brass, copper, or steel in contact with aluminum or aluminum alloy, shall be avoided where practicable. Dissimilar metals are defined by MIL-STD-889. Magnesium shall not be used.

3.5 Design and construction -

3.5.1 Design - The design of the valve assembly shall be such that disassembly and replacement of parts can be accomplished without the use of special tools.

3.5.2 Detailed design requirements -

3.5.2.1 Installation characteristics - Installation characteristics and envelope dimensions shall be as shown in Figure 1.

3.5.3 Reliability - The component shall be constructed to withstand the strains, jars, vibrations, and other conditions incident to installation, and service use.

3.5.4 O-Ring packing - O-rings shall be MS9020 or MS9021, as applicable.

3.5.5 Weight - The component weight shall not exceed 2.7 pounds.

3.5.6 Changes - Changes in design or consturction subsequent to qualification approval shall be processed in accordance with MIL-STD-480.

3.6 Maintainability -

3.6.1 Interchangeability - All parts having the same manufacturer's part number shall be directly and completely interchangeable with respect to installation and performance. Detail parts, including standard parts, which are altered or selected shall be assigned an identifying number by the design activity responsible for the alteration or selection. Items of other than the valve manufacturer's own design, used without alteration or selection, shall be identified by the original design activity part number.

3.6.2 Accessibility - In so far as practicable, parts requiring adjustment after assembly shall be accessible without teardown of the equipment or removal of any major part.

3.6.3 Human error - The following general requirements are established to reduce the possibility of human errors during assembly and maintenance:

a. Fluid connections in close proximity to each other shall be of different sizes (as shown in Figure 1).

b. Right-hand and left-hand parts shall have some special design feature to prevent their interchange during assembly.

c. Where practicable, the location of part numbers on parts shall be such that the part numbers are visible after the parts are assembled.

d. Where reversed or rotated mounting of a part cannot be tolerated, nonsymmetrical mounting arrangements (including key ways or pins) shall be used. Parts that are capable of proper operation when mounted in any orientation are more desirable.

3.7 Finish - Anodizing, plating and protective treatments shall be such that the finish will not chip, crack, or cause the fuel or the fuel system to be affected in any way. Neither paint nor cadmium plating shall be used. Chromium plating shall conform to AMS2406. Diffused nickel-cadmium plating shall conform to AMS2416.

3.8 Elastomeric parts -

3.8.1 Maintainability - All age-sensitive parts shall be readily replaceable with minimum replacement of attaching parts.

3.8.2 Age controls - Age controls for age-sensitive parts shall conform to MIL-STD-1523.

3.9 Threaded connections -

3.9.1 Pipe threads - Pipe threads shall not be used except for permanent closures.

3.9.2 Security of parts - All parts of the assembly shall be adequately secured to ensure continued integrity of the complete article and retention of its performance within prescribed limits during normal shipment and service operation. Where threaded fasteners, pins and other methods are used to secure parts of the assembly, they shall be safetied by means of self-locking nuts, cotter pins, lockwashers, retaining rings or safety wire. The use of such securing devices shall comply with military standards listed under Section 2. Where the securing devices are selected from envelope or performance type military or industry specifications, they shall be fully controlled by specification or source control drawings issued by the design manufacturer of the valve assembly to ensure that the same product utilized during qualification tests will be used in service operation.

3.9.3 Installation and inspection connections - Female threaded connections for tube fittings shall conform to MS33649. All other female threaded connections in aluminum or aluminum alloy, where used for installation and inspection, shall have steel inserts the internal threads of which shall conform to the requirements of MIL-S-8879.

3.10 Performance - The valve assembly, when installed in a fuel tank, shall meet the following performance requirements.

3.10.1 Venting -

a. With the float down and no pressure applied at the bleed-air port, the vent port shall be open to overboard. (Free flow from fuel tank to overboard).

b. With the float up, the vent port shall be closed.

c. With the float down and with an air pressure of 3 to 20 PSI applied to the bleed-air port, the vent port of the valve assembly shall close and remain closed as long as bleed-air port pressure equals or exceeds tank pressure, but shall reopen when tank pressure exceeds bleed-air pressure by 1.0 $\pm$.5PSI. The valve assembly shall allow air flow into the tank with the vent port closed.

d. With the float uncovered and the aircraft in a 20 degree through 35 degree climb attitude or a 20 degree through 45 degree dive attitude, the vent valve shall close to prevent fuel flowing out of the vent line.

e. At a flow of 30 SCFM of air, the pressure drop through the vent port of the valve assembly shall not exceed 1.50 PSI at room temperature.

3.10.2 Pressurizing -

a. When an increasing or stable air pressure in the range of 3 to 20 PSI is applied to the bleed-air port while the vent port is closed, tank pressure shall not drop below bleed-air pressure by more than 0.5 PSI and the maximum total inlet to static outlet pressure differential across the bleed-air valve of the assembly shall be not more than 0.7 PSI when flowing 2.4 SCFM of air at room temperature.

b. The valve assembly shall not be damaged by the application of 75 PSI pressure for two minutes on the bleed-air pressure port.

c. With the valve assembly submerged and with the tank pressurized to 13 PSI by means other than through the bleed-air line, leakage in the reverse direction through the bleed-air port shall not exceed 5 drops per minute.

d. If a diaphragm actuated valve is used in the assembly to control venting and pressurizing, the bleed-air side of the diaphragm shall be vented to the overboard vent through an orifice of .017 inch to .033 inch diameter to provide drainage and thermal relief.

3.10.3 External leakage -

a. With the fuel at the vent shut-off level (1.44±.22 inch from the top of valve), fuel leakage to overboard port shall not exceed 10 drops per minute at any tank pressure up to 30 PSI.

b. With the fuel level over the top of the unit, total fuel leakage to overboard shall not exceed the limits shown in Figure 2.

3.10.4 Shut-off and reopening levels -

a. At all fuel levels above the vent shut-off level of 1.44±.22 inch the vent port shall be closed.

b. To prevent spillage from the vent port during catapult take-off with a full or partially filled tank, the valve assembly shall hold the vent port closed at all rearward accelerations to a maximum of 8.59 g.

c. At all fuel levels above vent shut-off level and when tank pressure is at any value from zero up to relief valve cracking pressure, the vent port shall be closed. At all rising fuel levels below vent shut-off level, and with no pressurizing air applied, the vent port shall be open to overboard.

3.10.5 Pressure relief valve assembly - The assembly shall incorporate a relief valve set to relieve tank pressure at 35 to 50 PSI and capable of flowing 50 SCFM of air to maximum tank pressure of 50 PSI.

3.10.6 Suction relief - The component shall incorporate a suction relief valve capable of flowing 80 SCFM from the overboard vent port into the tank with a net pressure drop of 3.5 PSI maximum.

3.11 Identification of product - Assemblies and parts shall be marked for identification in accordance with MIL-STD-130. In addition, special markings shall be added, as follows:

Nomenclature
Manufacturer's Assembly Part Number (including dash number, if any)
Manufacturer's Serial Number
Federal Stock Number
Manufacturer's Name, Code Number, or Trademark
U.S. Property

3.12 Drawings - Manufacturer's assembly and detail drawings shall conform to MIL-D-1000.

3.13 Workmanship - Attention shall be given to quality and thoroughness of assembly, alignment of parts, tightness of assembly screws and bolts, marking of parts, and removal of burrs and sharp edges. Workmanship during follow-on production shall be as good or better than workmanship found in the qualification samples.

3.13.1 Cleaning - All parts shall be clean and free of dirt, sand, metal chips, and other foreign matter during and after assembly.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the procuring activity. The Government reserves the right to conduct qualification inspections (see 6.3).

4.2 Classification of inspections - Inspection and testing shall be classified as follows:

a. Qualification inspections ----- (4.3)

(1) Retention of qualification - Retention of qualification consists of a periodic verification to determine compliance of the qualified product with the requirements of this specification (see 3.1 and 4.3).

b. Quality conformance inspections (4.4)

4.3 Qualification inspections -

4.3.1 Sampling instructions - Four (4) qualification test samples shall be submitted consisting of the part number for which approval is desired. Two (2) of the samples shall have been inspected by the manufacturer in accordance with this specification prior to

being forwarded to the testing facility. The samples shall be accompanied by a report of the inspections and a complete set of drawings to permit technical evaluation of compliance with design and construction requirements herein.

4.3.2 Qualification inspection - Qualification inspections shall consist of the inspections of Table I in the order indicated.

4.4 Quality conformance inspections - The quality conformance inspections shall consist of individual inspections and sampling inspections.

4.4.1 Individual tests - Each component shall be subject to the following tests:

a. Examination - - - - - - - - - - - - - - - - - (4.6.1)

b. Calibration - - - - - - - - - - - - - - - - - (4.6.3)

c. External Proof Pressure and Leakage - 30 PSI - - - - - - - - - - - - - - - - - - - (4.6.2 a)

The inspections may be performed with protective cover removed and the unit installed in a test setup as shown in Figure 3.

4.4.2 Sampling inspections - At the intervals specified in the contract or order, one (1) valve shall be selected from each lot of 200 or fraction thereof manufactured and submitted for acceptance at the same time (see 6.2). Failure of any representative sample shall be cause for rejection of the lot represented.

4.4.2.1 Inspections - The sampling inspections shall consist of individual inspections, and the following inspections:

a. Leakage - - - - - - - - - - - - - - - - - - - (4.6.2

b. Strength - - - - - - - - - - - - - - - - - - - (4.6.7)

TABLE I - QUALIFICATION INSPECTIONS

	INSPECTION	REQUIREMENT PARAGRAPH	INSPECTION METHOD	SAMPLE NO. 1
a.	EXAMINATION	(3.4 thru 3.9) (3.11 thru 3.13)	(4.6.1)	X
b.	EXTERNAL PROOF PRESSURE AND LEAKAGE TESTS	(3.10.2) (3.10.3)	(4.6.2)	X
c.	CALIBRATION	(3.10.1 and .2) (3.10.4 thru .6)	(4.6.3)	X
d.	FUEL RESISTANCE AND EXTREME TEMPERATURE	(3.3)	(4.6.4)	X
e.	ENDURANCE I	(3.5.3)	(4.6.5)	X
f.	ACCELERATED CORROSION	(3.3.1)	(4.6.6)	X
g.	STRENGTH	(3.10.2 and .3) (3.5.3)	(4.6.7)	X
h.	VIBRATION	(3.9.2) (3.5.3)	(4.6.8)	X
i.	ENDURANCE II	(3.5.3)	(4.6.9)	X
j.	DISASSEMBLY AND INSPECTION	(3.5) (3.1)	(4.6.10)	X

Note: Second sample of 4.3.1 shall be used for verification inspections.

4.5 Inspection conditions - Unless otherwise specified, the following inspection conditions shall apply during the inspections performed in accordance with this specification.

4.5.1 Cleaning - Prior to testing the component, all lubricants and preservative compounds, except permanent protective coatings, shall be removed from the external parts which are normally wetted with fuel.

4.5.2 Test fluid - Unless otherwise specified herein, the fluid used for testing shall be the fluid for which the component is intended. If the valve assembly incorporates synthetic rubber parts of a type affected by aromatics and subject to flexing or other motion during operation, MIL-F-7024 fluid shall be used for production acceptance tests.

4.5.3 Room temperature and pressure - Unless otherwise specified herein, all tests shall be conducted at a temperature of 60° to 90°F and at atmospheric pressure.

4.5.4 Attitude - Unless otherwise specified, all tests shall be conducted with the component installed in the normal mounting attitude.

4.6 Test methods - With the unit installed in the test setup, as shown in Figure 3, the unit shall be subjected to the following tests to demonstrate compliance with the requirements specified in Section 3.

4.6.1 Examination - Each component submitted for acceptance shall be carefully examined to determine conformance with the requirements of this specification (including the contractor's approved drawings and specifications) not covered by tests.

4.6.2 External pressure and leakage test - The following tests shall be conducted with the relief valve secured closed:

a. Raise the level of the test fluid to the vent shut-off level, 1.44±.22 inch. Apply 30 PSI pressure to the test tank. Fuel leakage to overboard shall not exceed 10 drops per minute after a 3-minute waiting period. Record overboard vent leakage.

b. Raise the test fluid level until the valve is completely submerged. Pressurize the tank to 13 PSI and record reverse leakage through the bleed-air pressure port. Leakage shall not exceed 5 drops per minute after a 3-minute waiting period.

c. With the valve completely submerged, pressurize the tank as shown in Figure 2. Record leakage overboard. Leakage shall be within the limits shown.

4.6.3 Calibration -

4.6.3.1 Relief valve - The relief valve shall be pretested to relieve at 35 to 50 PSI. Pressurize the test tank to obtain an air flow of 50 SCFM overboard. Tank pressure shall be not greater than 50 PSI.

4.6.3.2 Suction relief valve - With the test tank empty and vented to atmosphere, pressurize the overboard vent port. The unit shall flow at least 80 SCFM of air with a net pressure drop of 3.5 PSI.

4.6.3.3 Overboard vent control - With the test tank empty of fuel, slowly pressurize the bleed-air port to 20 PSI. The vent port shall close at or before 3 PSI and remain closed as long as bleed-air pressure equals or exceeds tank pressure. Tank pressure shall not drop below bleed-air pressure by more than 0.5 PSI after the vent port has closed. After tank pressure has stabilized with bleed-air pressure at 20 PSI, reduce the bleed-air pressure to zero at a rate of 17 PSI per minute. The vent port shall open by the time bleed-air pressure has dropped 1.5 PSI below tank pressure.

4.6.3.4 Pressure drop -

4.6.3.4.1 Bleed-air pressure drop - With the tank vented to atmosphere, apply an air pressure of .7 PSI at the bleed-air pressure port. Air flow into the tank shall be not less than 2.4 SCFM.

4.6.3.4.2 Vent pressure drop - With the overboard vent-port vented to atmosphere, apply an air pressure of .86 PSI to the test tank. The vent valve shall open and the air flow through the vent valve shall be not less than 30 SCFM.

4.6.3.5 Fuel level control -

a. Establish an air flow of 5 SCFM into the test tank. Raise fuel level until air flow ceases at overboard vent port. Record fuel level.

b. Lower fuel level until vent port opens. Record fuel level.

c. Repeat the above for five (5) cycles. At all fuel levels below vent shut-off level, the vent valve shall allow free air flow out of the vent port and for all fuel levels at or above vent shut-off level, the vent valve shall close regardless of tank pressure.

4.6.3.6 Attitude - With the float just uncovered, the vent valve shall close under the following conditions to prevent fuel from flowing out the overboard vent line.

4.6.3.6.1 Climb attitude - The vent port shall close at not more than 20° and shall remain closed through 35°.

4.6.3.6.2 Dive attitude - The vent port shall close at not more than 20° and shall remain closed through **45°.**

4.6.4 Fuel resistance and extreme temperature - The fuel resistance and extreme temperature tests shall be conducted on the valve assembly in accordance with the procedure outlined in Table II.

4.6.5 Endurance I - The valve assembly shall be subjected to 9000 endurance cycles. One cycle shall consist of raising the fuel level to vent shut-off level **(1.44±.22 inch), then lowering the fuel level allowing the** vent valve to open. At least once every 500 cycles, perform the calibration test of paragraph 4.6.3.3 during each portion of Endurance I.

4.6.5.1 Room temperature endurance - The valve assembly shall be subjected to 4000 cycles as described in paragraph 4.6.5. Test fluid shall be jet fuel MIL-T-5624. Monitor fuel level (valve opening and closing) and conduct leakage tests specified in paragraph 4.6.2, and calibration tests specified in paragraphs 4.6.3.4 and 4.6.3.5 at the completion of each 500 cycles.

4.6.5.2 High temperature endurance - The valve assembly shall be subjected to 2000 cycles as described in paragraph 4.6.5. Monitor fuel level (valve opening and closing) and conduct leakage tests specified in paragraph 4.6.2, and calibration tests specified in paragraphs 4.6.3.3, 4.6.3.4, and 4.6.3.5, at completion of each 500 cycles.

a. The temperature of the assembly and fuel shall be held at 125° ±5°F for 4 hours prior to and during the test. Test fluid is to be TT-S-735, Type III.

b. Bleed-air temperature shall be maintained at 350°F during the portion of calibration testing specified per paragraphs 4.6.3.3 and 4.6.3.4.

c. **The cycles conducted during the high temperature portion of the fuel resistance tests specified in paragraph 4.6.4 may be credited toward the total cycles of this endurance test.**

TABLE II. Fuel resistance and low temperature test schedule for components incorporating moving parts but no electrical equipment

Test period[1]	Fuel Resistance				Low temperature
	Phase I soak	Phase I dry	Phase II soak	Phase II dry	
Component configuration	(2) ----------	Drained and blown dry, normal condition as would be expected under service conditions, ports open.	(2)----------	Drained and blown dry, normal condition as would be expected under normal service conditions, ports open	Mounted as would be expected under normal service conditions.[2]
Test fluid-----	TT-S-735, type III----	None----------	TT-S-735, type III--------	None----------	TT-S-735, type I.
Period duration-Ambient and test fluid temperature	96 hours (4 days)----- 158 ±2°F or the normal operating temperature of the system in which the component is used, whichever is higher.	24 hours---------- Circulating air at 158° ±2°F or the normal operating temperature of the system in which the component is used, whichever is higher.	18 hours---------- 158° ±2°F or the normal operating temperature of the system in which the component is used, whichever is higher.	30 hours---------- Circulating air at 158° ±2°F or the normal operating temperature of the system in which the component is used, whichever is higher.	18 hours. Lower the fluid temperature to -67° ±2°F, then maintain the fluid temperature at -67° ±2°F for a minimum of 18 hours.[3]
Operation or tests during period.	Actuate component at least 4 cycles per day in a normal manner.	None----------	Actuate component at least 4 cycles in a normal manner.	None----------	None.
Operation or test immediately after period.	Conduct leakage test, using TT-S-735, type III fluid (4.6.2)	(a) Actuate components for 5 cycles. (b) Conduct leakage test, using TT-S-735, type I fluid. (4.6.2)	Conduct leakage test, using TT-S-735, type III fluid. (4.6.2)	(a) Actuate components for 5 cycles. (b) Conduct leakage test, using TT-S-735 type I fluid. (4.6.2)	With temperature not higher than -65°F, conduct functional and leakage tests, using TT-S-735, type I fluid.

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

2. The component shall be maintained in such a manner as to insure complete contact of all non-metallic parts with the test fluid as would be expected under normal service conditions.

3. Unless an increased test period is specified by the procuring activity.

4.6.5.3 Low temperature endurance -

a. The valve assembly shall be subjected to 2000 cycles as described in paragraph 4.6.5. Monitor fuel level (valve opening and closing) and conduct leakage tests specified in paragraph 4.6.2 and calibration tests specified in paragraphs 4.6.3.4, and 4.6.3.5, at completion of each 500 cycles.

b. The temperature of the assembly and fuel shall be held at -65° ±5°F for four (4) hours prior to and during the test. Test fluid to be TT-S-735, type I.

4.6.5.4 Contaminated fuel endurance - Fuel containing contaminants of the types and concentrations specified in Table III and properly agitated to keep the contaminates in suspension throughout the test shall be used.

a. The valve shall be subjected to 1000 cycles as described in paragraph 4.6.5 with the exception that the tank side of the vent valve shall be supplied with contaminated fuel.

b. After completion of this test the valve assembly shall be flushed out with clear fuel and drained, and the leakage tests specified in paragraph 4.6.2 and calibration tests specified in paragraphs 4.6.3.3, 4.6.3.4, and 4.6.3.5 shall be conducted.

4.6.6 Accelerated corrosion - The valve assembly with bleed-air, overboard vent, and relief valve ports open, shall be submerged three (3) times in a saturated salt solution. The unit shall then be drained for 30 seconds and operated if necessary to remove trapped salt solution. The component shall be placed immediately in a test chamber maintained at a temperature of 85° ±5°F with a relative humidity of 100 percent for a period of 20 minutes. Upon completion of the humidity exposure period, the unit shall be placed, in a normal operating attitude, in an air oven maintained at a temperature of 130°F for a period of 20 minutes. The component shall not be functionally operated until a total of 50 immersions, high humidity, and drying cycles have been completed. Immediately after completion, the component shall be washed with warm water to remove all exposed salt accumulations, after which the component may be dried with an air hose, installed in the test setup and subjected to the calibration tests specified in paragraphs 4.6.3.3, 4.6.3.4, and 4.6.3.5.

TABLE III

FUEL ENDURANCE TEST CONTAMINANT

Contaminant	Particle Size	Quantity
Iron oxide	0-5 microns 5-10 microns	28.5 gm/400 gal. 1.5 gm/400 gal.
Sharp silica sand	150-300 microns 300-420 microns	1.0 gm/400 gal. 1.0 gm/400 gal.
Prepared dirt conforming to AC Spark Plug Div. P/N 1543637 (Coarse Arizona road dust)	Mixture as follows: 0-5 microns (12%) 5-10 microns (12%) 10-20 microns (14%) 20-40 microns (23%) 40-80 microns (30%) 80-200 microns (9%)	9.0 gm/400 gal.
Cotton linters	Staple below 7, second cut linters (U.S. Department of Agriculture Grading Standards).	0.1 gm/400 gal.
Crude napthenic acid Salt Water solution shall contain 4 parts NaCl to 96 parts H_2O by weight		0.03% by volume 0.01% entrained

4.6.7 Strength -

4.6.7.1 Proof pressure test - With the relief valve secured closed and after the valve has been subjected to a bleed-air pressure of 75 PSI for a period of two (2) minutes, the unit shall pass the leakage tests specified in paragraph 4.6.2 and calibration tests specified in paragraphs 4.6.3.3, 4.6.3.4, and 4.6.3.5.

4.6.7.2 Acceleration test - With the test speciment completely submerged in fuel it shall be subjected to the following:

a. Functional Evaluation - Using a linear accelerator, the valve shall be subjected to 3 simulated catapult launches. Each launch shall have a duration of 1.2±0.2 seconds, during which a peak rearward acceleration of 8.59 g shall be imposed. Valve leakage shall not exceed 25 cc per launch.

b. Structural Evaluation - The valve, mounted on a centrifuge shall be subjected to one minute periods of steady acceleration at the following levels:

10 g - Vertically Downward
7.75 g - Horizontally Forward

Leakage shall be recorded. The unit shall then pass the leakage tests of paragraph 4.6.2.

4.6.7.3 Shock test - A shock testing machine, designed and fabricated according to MIL-STD-810, or equivalent, shall be used. The test specimen shall be subjected to 18 impact shocks of 30 g, each shock impulse having a time duration of 11 ±1 milliseconds. The intensity shall be within ±10 percent when measured with a filter having a band width of 5 to 100 cycles per second. The shock shall be applied in the following directions:

a. Vertically, 3 shocks in each direction.

b. Parallel to the fore and aft axis, 3 shocks in each direction.

c. Horizontally at 90 degrees to the fore and aft axis, 3 shocks in each direction.

The unit shall then pass the leakage tests of paragraph 4.6.2.

4.6.8 Vibration - The specimen shall be attached to a rigid fixture capable of transmitting the vibration conditions specified herein. Attachment of the specimen to the fixture shall be made at the mounting pads provided on the specimen. The amplitude of applied vibration shall be monitored on the test fixture near the specimen mounting points and shall vary with frequency as shown in Figure 4. Tests shall be conducted under both the resonant and cycling conditions specified herein, the order being optional. Upon completion of the tests, the specimen shall pass the leakage tests (4.6.2) and calibration tests (4.6.3).

4.6.8.1 Resonance - Resonant modes of the test specimen shall be determined by varying the frequency of applied vibration slowly through the range of 5 through 200 HZ with amplitudes not exceeding those shown in Figure 4. Individual resonance surveys shall be conducted with vibration applied along each of three (3) mutually perpendicular axes. The test specimen shall be vibrated at the indicated resonant conditions for the periods shown in Table IV and with the applied double amplitudes of vibratory accelerations in Figure 4. These periods of vibration shall be accomplished along each of the axes surveyed. When more than one resonance is encountered with vibration applied along any one axis, each resonance shall be sustained for the period shown in the applicable portion of Table IV.

4.6.8.2 Cycling - The specimen shall be vibrated under the cycling conditions specified herein for the applicable periods listed in Table IV.

The frequency shall be cycled between 5 and 200 HZ at an applied double amplitude of 0.036 inch or an applied acceleration of 10 g, whichever is the lower value. The rate of change of frequency shall be logarithmic, and such that 15 minutes are required to traverse the range in both directions. When there are no provisions for logarithmic cycling, a linear rate of frequency change may be used.

TABLE IV

VIBRATION TEST SCHEDULE

Number of Resonances	0	1	2	3	4
Total time at resonance (30 minutes at each resonance)	-	30 min.	1 hr.	1 1/2 hrs.	2 hrs.
Cycling time	3 hrs.	2 1/2 hrs.	2 hrs.	1 1/2 hrs.	1 hr.

4.6.9 Endurance II - The valve assembly shall be subjected to 1000 endurance cycles. One cycle shall consist of raising the fuel level **to vent shutoff level (1.44±.22 inch), then lowering the fuel level allowing the vent valve to open. Monitor fuel level (valve opening and closing), and** once every 500 cycles perform the calibration test of paragraph 4.6.3.3. At the completion of the 1000 cycles, conduct leakage tests specified in paragraph 4.6.2, and calibration tests specified in paragraphs 4.6.3.3, 4.6.3.4, and 4.6.3.5.

4.6.10 Disassembly and inspection - The test specimen shall be disassembled and visually examined. Evidence of excessive wear or deterioration of any part shall be cause for rejection.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging - Preservation and packaging shall be level A or C of MIL-STD-794, as specified in the contract or order (see 6.2). Level A shall be in accordance with MIL-V-3C.

5.2 Packing - Packing shall be level A, B, or C of MIL-STD-794, as specified in the contract or order (see 6.2). Level A and B shall be in accordance with MIL-V-3C.

5.3 Marking - In addition to any special marking required by the contract or order (see 6.2), interior and exterior containers shall be marked in accordance with MIL-STD-129D.

6. NOTES

6.1 Intended use - The valve covered by this specification is intended for use in aircraft fuel tanks to sense and relieve positive or negative tank pressures and to control venting during fuel transfer.

6.2 Information for contracting officer - Contracts or orders should specify following:

a. Title, number, and date of this specification.

b. Applicable level of preservation and packing (see 5.1).

c. Marking of containers (see 5.2).

d. Whether or not sampling tests will be required (see 4.4.2).

e. Items of data required.

6.3 Qualification - With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Department of the Navy (AIR 53632E) Washington, D.C. 20360, and information pertaining to qualification of products may be obtained from that activity.

6.4 Definitions and symbols - The letter "g" as used herein stands for the acceleration of gravity, i.e., 32.2 feet per second/per second. The letters PSIG stands for pounds per square inch gage. The letters SCFM stands for Standard Cubic Feet per minute, i.e., cubic feet at standard pressure and temperature. One cycle shall consist of raising the fuel level to vent shutoff level (1.44±.22 inch), then lowering the fuel level allowing the vent valve to open.

Preparing Activity
Navy - AS
(Project No. 2910-N137)

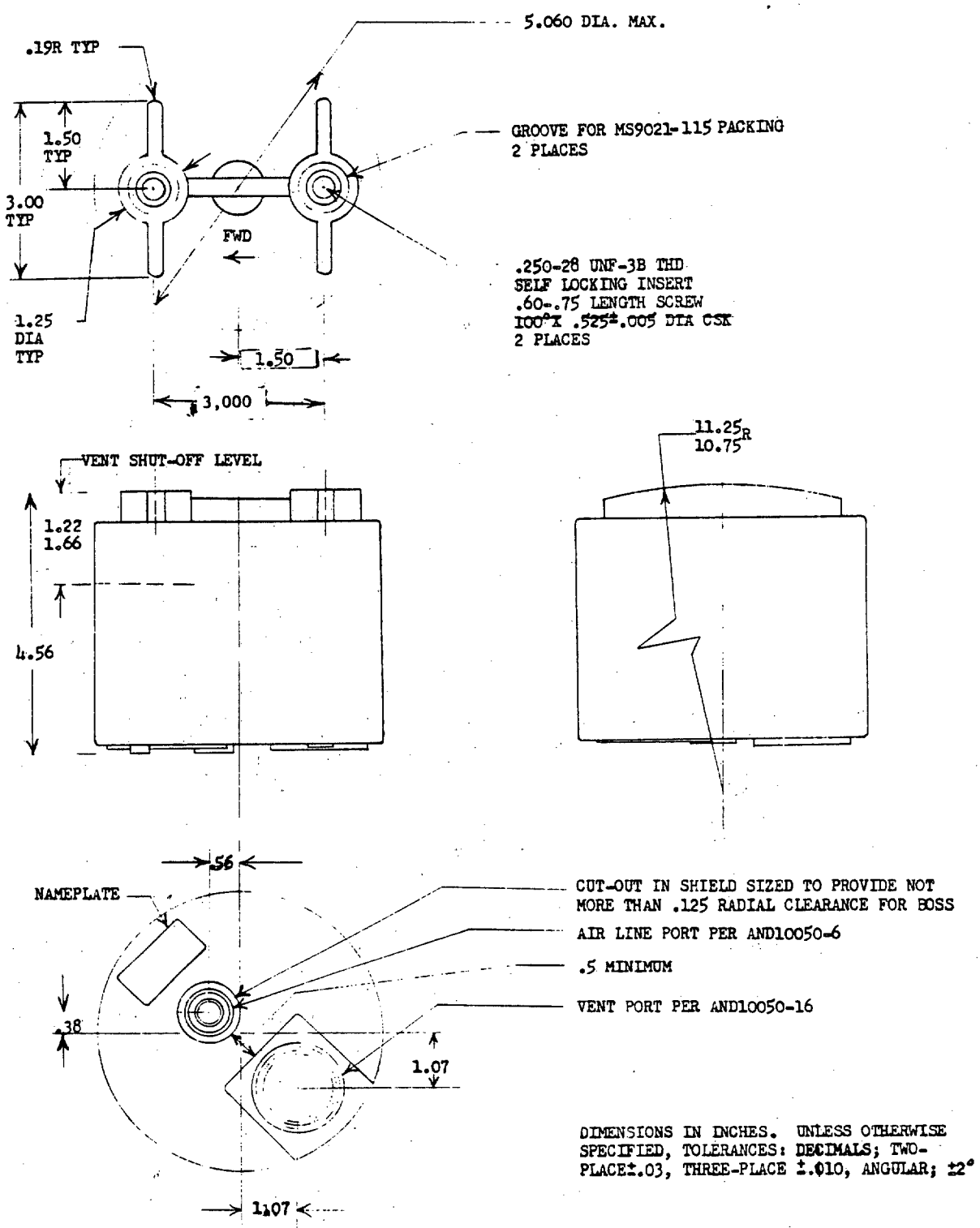


Figure 1

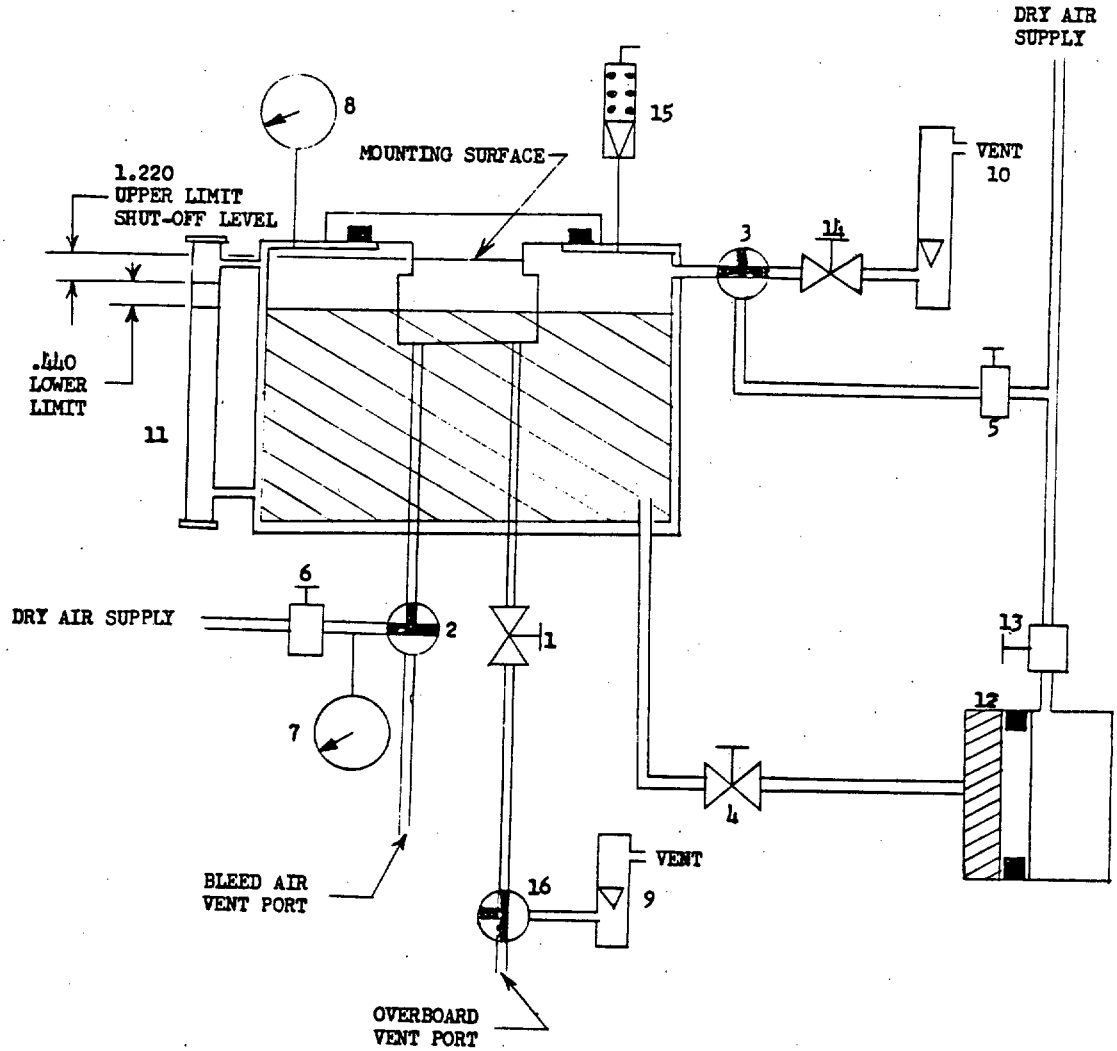


Figure 3

1. Valve, shut-off vent line
2. Valve, selector, 2-way - 3 position, bleed air
3. Valve, selector, 2-way - 3 position, tank
4. Valve, needle, fuel level control
5. Regulator, pressure, tank
6. Regulator, pressure, bleed air
7. Gauge, pressure, 0-100 PSI
8. Gauge, pressure, 0-100 PSI
9. Flowrator, 4 to 40 SCFM, air
10. Flowrator, 1.1 to 11 SCFM, air (21-0039)
11. Sight glass
12. Fuel transfer cylinder
13. Regulator, pressure, fuel transfer
14. Valve, needle, air flow
15. Relief valve, 100 PSI overboard
16. Valve selector, 2-way - 3 position overboard vent

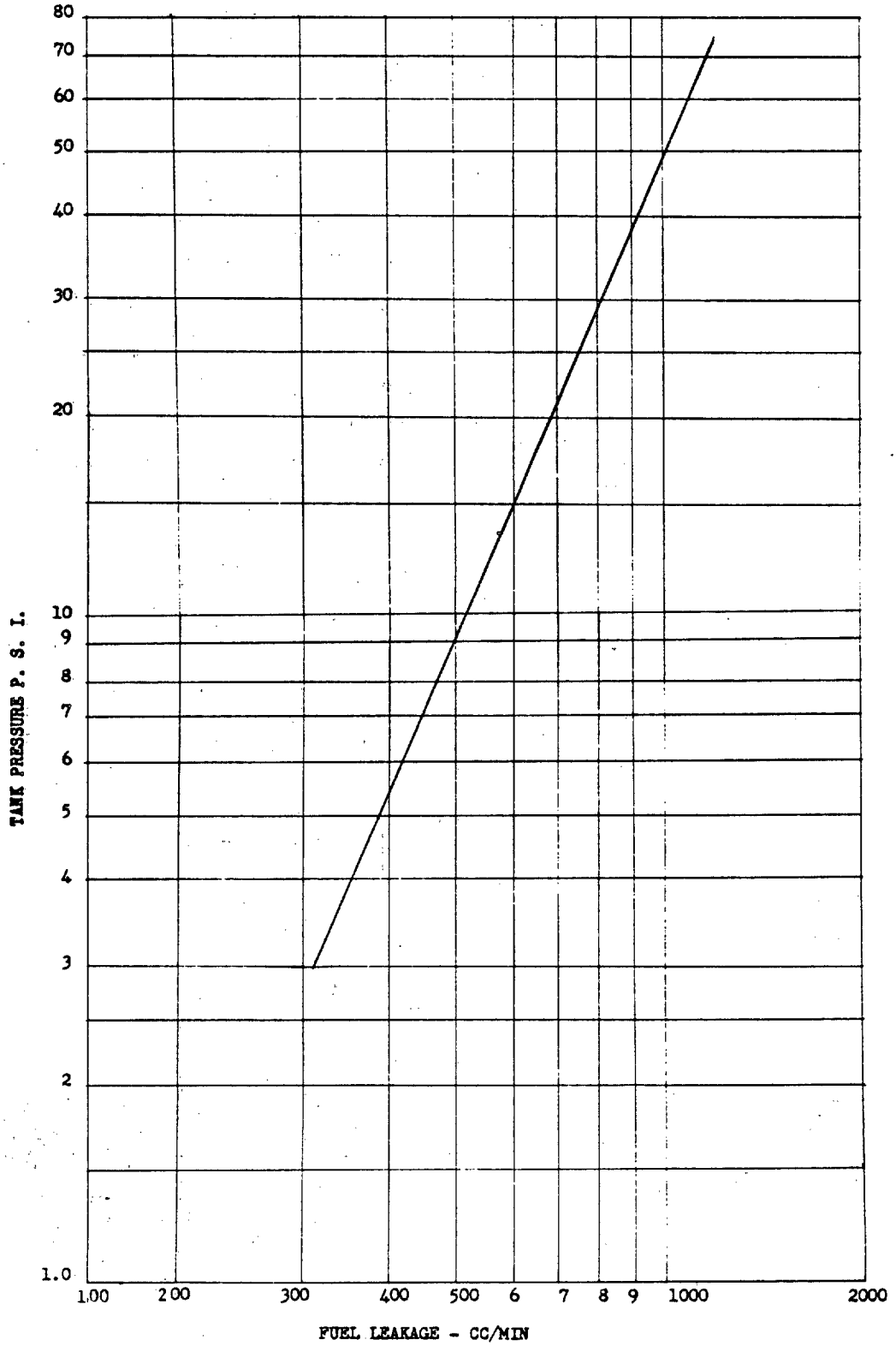
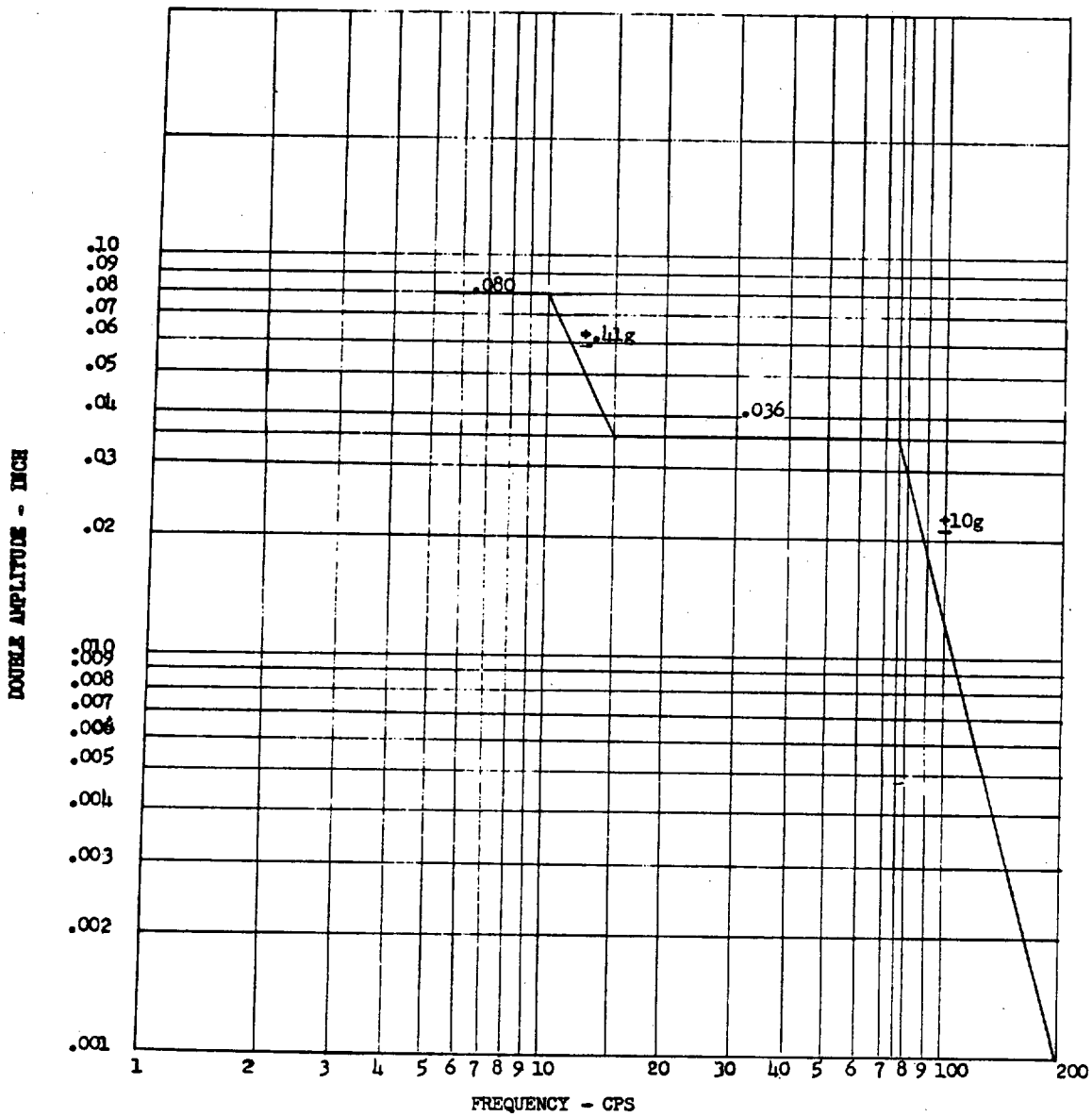


Figure 2



Figure

RANGE CURVE FOR VIBRATION TESTS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

INSTRUCTIONS: The purpose of this form is to solicit beneficial comments which will help achieve procurement of suitable products at reasonable cost and minimum delay, or will otherwise enhance use of the document. DoD contractors, government activities, or manufacturers/vendors who are prospective suppliers of the product are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.

DOCUMENT IDENTIFIER AND TITLE

MIL-V-81356A(AS) VALVE, FUEL SYSTEM PRESSURIZATION AND VENT

NAME OF ORGANIZATION AND ADDRESS	CONTRACT NUMBER
	MATERIAL PROCURED UNDER A ☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

3. IS THE DOCUMENT RESTRICTIVE?
   ☐ YES ☐ NO *(If "Yes", in what way?)*

4. REMARKS

SUBMITTED BY *(Printed or typed name and address - Optional)*	TELEPHONE NO.
	DATE

DD FORM 1 JAN 72 1426 REPLACES EDITION OF 1 JAN 66 WHICH MAY BE USED

S/N 0102-014-1802