

MIL-C-81975B
1 April 1982
~~SUPERSEDING~~
MIL-C-81975A
9 June 1980

MILITARY SPECIFICATION
COUPLING, REGULATED, AERIAL PRESSURE REFUELING
TYPE MA-3

This specification is approved for use by all the Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification defines the requirements for an aerial refueling coupling, utilizing an internal pressure regulator and surge suppression device. This coupling is compatible with Type MA-2 probe and drogue refueling systems.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-C-320	Plating, Chromium (Electrodeposited)
QQ-P-416	Plating, Cadmium (Electrodeposited)
TT-S-735	Standard Test Fluids, Hydrocarbon

MILITARY

MIL-P-116	Preservation, Methods of
-----------	--------------------------

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 1680

MIL-C-81975B

SPECIFICATIONS

MILITARY

DoD-D-1000	Drawings, Engineering and Associated Lists
MIL-J-5161	Jet Fuel, Referee
MIL-P-5315	Packing, Preformed, Hydrocarbon Fuel Resistant
MIL-C-5501	Caps and Plugs, Protective, Dust and Moisture Seal
MIL-G-5572	Gasoline, Aviation: Grades 80/87, 100/130, 115/145
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-C-6021	Castings, Classification and Inspection of
MIL-F-7024	Fluids, Calibrating for Aircraft Fuel Systems Components
MIL-I-8500	Interchangeability and Replaceability of Component Parts for Aircraft and Missiles
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-S-8879	Screw Threads, Controlled Radius Root with Increased Minor Diameter, General Specification for
MIL-A-19736	Air Refueling Systems, General Specification for
MIL-P-23377	Primer Coatings, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-N-25027	Nut, Self-Locking, 250°F, 450°F, and 800°F 125 KSI FTU, 60 KSI FTU and 30 KSI FTU
MIL-N-25161	Nozzle, Aerial Pressure Refueling, Type MA-2
MIL-R-25897	Rubber, Fluorocarbon Elastomer, High Temperature Fluid Resistant

MIL-C-81975B

SPECIFICATIONS

MILITARY

MIL-R-25988	Rubber, Fluorosilicone Elastomer, Oil and Fuel Resistant
MIL-R-27426	Ring, Retaining, Spiral
MIL-L-81352	Lacquer, Acrylic
MIL-R-83248	Rubber, Fluorocarbon Elastomer, High Temperature, Fluid, and Compression Set Resistant

STANDARDS

FEDERAL

FED-STD-595	Color
-------------	-------

MILITARY

DoD-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking for US Military Property
MIL-STD-143	Specification and Standards, Order of Precedence for the Selection of
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-831	Test Reports, Preparation of
MIL-STD-889	Dissimilar Metals
MIL-STD-1523	Age Controls of Age Sensitive Elastomeric Materials
MS20995	Wire, Safety or Lock
MS24354	Drogue Cone, Nozzle and Reception Coupling, Type MA-2, Flight Pressure Refueling System, Assembly of

MIL-C-81975B

STANDARDS

MILITARY

MS24356	Nozzle - Type MA-2, Flight Pressure Refueling,
MS24358	Fitting, Hose End, Flight Pressure Refueling, Type MA-2, Outline of
MS24361	Ring, Split, Reception Flight Pressure Refueling Coupling
MS24362	Sleeve, Reception Flight Pressure Refueling Coupling
MS29513	Packing, "O"-Ring, Hydrocarbon Fuel Resistant
MS33540	Safety Wiring and Cotter Pinning, General Practices for
MS33588	Nut, Self-Locking, Aircraft Design and Usage Limitations of

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

Society of Automotive Engineers

ARP 868 Pressure Drop Test for Fuel System Components

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

American National Standards Institute

ANSI B46.1 Surface Texture (Surface Roughness, Waviness and Lay)

(Applications for copies should be addressed to the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

MIL-C-81975B

3. REQUIREMENTS

3.1 Qualification. The coupling furnished under this specification shall be a product which has been qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3 and 6.3). In addition, the retention of the coupling on the applicable Qualified Products List shall be dependent on verification, by the supplier, of continued compliance with the requirements of this specification (see 4.3.3).

3.2 Components. The coupling shall consist of an assembled unit conforming to the envelope shown on Figure 1. Attachment parts (MS24358, MS24361, MS24362, MS29513, and a spiral retaining ring conforming to MIL-R-27426) are not considered a portion of the coupling. Installation features of these attachments are shown on MS24354. The coupling shall be compatible with MS24356.

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 Material. All materials used in construction of this coupling shall be fuel resistant when tested in any sequence with fluids conforming to the following specifications:

- a. MIL-J-5161
- b. MIL-G-5572
- c. MIL-T-5624
- d. TT-S-735 Type I and III
- e. MIL-F-7024 Type II

3.4.1 Corrosion-resistant materials. Metals and nonmetals shall be corrosion-resistant or suitably treated to resist corrosion from fuels, salt sprays, or atmospheric conditions likely to be met in storage or normal service. Magnesium shall not be used.

3.4.1.1 Protective coatings. The couplings shall be adequately protected against corrosion by the use of corrosion-resistant materials or protective coatings. Such coatings shall not chip or flake and shall prevent deterioration of the base metal under all conditions of service. Aluminum-alloy parts shall be anodized in accordance with MIL-A-8625. Cadmium and chromium plating, when used, shall conform to QQ-P-416 Type II, Class 2 and QQ-C-320 Class 2, respectively. Cadmium shall not be used on parts in contact with fuel. Painted surfaces are not allowed as a protective coating.

MIL-C-81975B

3.4.2 Castings. Castings shall be clean, sound, and free from holes, porosity, cracks, and other defects. Casting shall be classified Class 1B in accordance with MIL-C-6021.

3.4.3 Dissimilar metals. Unless suitably protected against electrolytic corrosion, dissimilar metals especially brass, copper, and steel shall not be used in contact with each other or with aluminum and aluminum alloys. Dissimilar metals are defined in MIL-STD-889.

3.5 Design. The MA-3 coupling shall conform to Figure 1 and shall be in accordance with MIL-A-19736 for use with Type MA-2 nozzles conforming to MIL-N-25161, to accomplish fuel transfer in flight at inlet pressures up to 120 psig. The design provides surge pressure protection for the receiver aircraft along with steady state pressure control to prevent excessive pressures from entering the receiver during the refueling. Changes in design or construction subsequent to qualification approval shall be processed in accordance with MIL-STD-480.

3.5.1 Regulation. The coupling outlet pressure shall be regulated to not greater than 60 psig for all inlet pressures up to 100 psig, over the flow range of 10 cc/min to 600 gpm.

3.5.2 Surge suppression. The coupling shall be capable of suppressing surges generated downstream by the CRC valve during the tests of paragraph 4.6.6.1, to not greater than 120 psig without sustaining damage.

3.5.3 Relief valves. Regulator designs, which allow trapping of high pressures within the coupling that could hamper engagement, shall provide an internal pressure relief system to dissipate the trapped pressure within 10 seconds.

3.5.4 Pressure sensing ports. Internal cavities which join the ambient pressure sensing ports shall drain when the coupling is in the stowed position so that any water condensate will not accumulate.

3.5.5 Alignment. The reception coupling shall incorporate a ball joint having a movement within a 45-degree or greater included angle cone, the centerline of which coincides with the centerline of the coupling. The ball joint action shall facilitate alignment of a nozzle and minimize the force applied to the equipment by "hose oscillations". The force required to move the coupling ball (without fuel pressure) throughout the complete range of movement shall not exceed 20 pounds as applied to the coupling outlet flange.

3.5.6 Reliability. The coupling shall be designed and constructed as specified herein in a manner that will insure the highest degree of operational reliability under all service conditions.

MIL-C-81975B

3.5.7 Maintainability. The coupling shall have a minimum number of parts consistent with reliability. It shall permit easy assembly, disassembly, location of trouble sources, and maintenance with tools and equipment normally available commercially by service maintenance personnel with a minimum of training.

3.5.8 Assembly. The coupling shall be designed to prevent incorrect assembly. All component parts shall be incapable of being reinstalled incorrectly.

3.6 Construction. The coupling shall be so constructed that no parts will work loose in service. The unit shall be built to withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, installation and service use.

3.6.1 "O"-ring packing and seals. "O"-ring packing and associated seals shall conform to MIL-P-5315, MIL-R-25897, MIL-R-25988, or MIL-R-83248. Their design and construction shall be such as to insure maximum protection against friction and leakage.

3.6.2 Threads.

3.6.2.1 Screw threads. Machine screw threads shall conform to MIL-S-8879.

3.6.2.2 Pipe threads. Pipe threads shall not be used.

3.6.2.3 Locking parts. All threaded parts shall be positively locked by safety wiring, self-locking nuts, or other approved methods. Safety wire shall conform to MS20995 and shall be installed in accordance with MS33540. Self-locking nuts shall conform to MIL-N-25027 and be used in accordance with MS33588. The use of lockwashers, set screws, cotter pins, hollow pins, roll pins, or staking is not permitted, unless specifically approved by the qualifying activity.

3.6.3 Dimensions. Coupling dimensions shall be in accordance with Figure 1.

3.6.4 Weight. The total weight of the coupling shall not exceed 18 pounds.

3.7 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable in accordance with MIL-I-8500. The item identification and part number requirements of DoD-STD-100 shall govern the manufacturer's part numbers and changes thereto.

MIL-C-81975B

3.8 Finish. The coupling finish shall be smooth and free from sharp edges. Surface roughness, where indicated on Figure 1, shall be interpreted in accordance with ANSI B46.1-78.

3.9 Performance. The coupling shall satisfy all performance requirements as specified in section 4.6, when subjected to the following tests in the order listed.

- | | |
|--|----------|
| a. Examination of product | (4.6.1) |
| b. Functional | (4.6.2) |
| c. Pressure drop | (4.6.3) |
| d. Fuel resistance and low temperature | (4.6.4) |
| e. Leakage and spillage | (4.6.5) |
| f. Pressure control | (4.6.6) |
| g. Latching mechanism | (4.6.7) |
| h. Normal operating loads | (4.6.8) |
| i. Impact and endurance | (4.6.9) |
| j. Vibration | (4.6.10) |
| k. Contaminated fuel | (4.6.11) |
| l. Accelerated corrosion | (4.6.12) |
| m. Proof pressure | (4.6.13) |
| n. Burst pressure | (4.6.14) |
| o. Altitude | (4.6.15) |
| p. Disassembly and inspection | (4.6.16) |

3.9.1 Operation. The coupling shall allow passage of fuel and regulate downstream pressures when fully engaged with a nozzle conforming to MIL-N-25161. Upon disengagement, fuel flow shall be automatically shut off in both the coupling and nozzle prior to release of the coupling master seal. The operation shall be effected without the use of any external source of power, such as high-pressure hydraulic, pneumatic or electrically operated mechanisms. It shall not be possible for the nozzle to bind or cock when off-center engagements or disengagements are made. The coupling shall be so designed that damage or malfunctions of the coupling will not occur when disengagements are effected by a force acting up to 22-1/2 degrees from the longitudinal axis of the nozzle. In addition, the coupling shall be capable

MIL-C-81975B

of extreme angle disengagements without compromise of flight safety due to breakage of coupling parts. The engagement of the nozzle, its sealing in the coupling, and the complete disengagement of the nozzle from the coupling shall constitute one complete cycle of operation. The coupling shall suppress high downstream surge pressures due to valve closure in the receiver aircraft.

3.9.2 Lubrication. The coupling shall operate satisfactorily without requiring lubrication, other than the fluid being transferred.

3.9.3 Latching mechanism.

3.9.3.1 Engagement. The force required to engage the coupling with a nozzle having a 50-pound sleeve force shall not exceed 155 pounds with 0 to 10 psi static fuel pressure in the coupling.

3.9.3.2 Disengagement. The latching mechanisms (3 minimum) shall be such that the force required to disengage the nozzle from the coupling is adjustable between 300 and 550 pounds with zero psi fuel pressure in the coupling, and without change or addition of components. The force required to disengage the nozzle shall increase at the rate of 4 ± 0.5 pounds for each psi increase in regulated pressure at any fixed adjustment. The coupling shall not disengage when subjected to a surge pressure of 120 psi. Unless otherwise specified by the qualifying activity, the setting of the latching mechanism shall be 320 ± 20 pounds with zero psi fuel pressure. Under these conditions the disengagement force at 50 psi shall be 520 ± 45 pounds.

3.10 Identification of product. The coupling shall be marked for identification in accordance with MIL-STD-130. The identification shall be permanent and shall not peel off, crack, or loosen with age and environmental conditions. The location selected for marking shall not affect the performance of the coupling. The external surface of the coupling housing assembly shall be identified with one coat of epoxy primer conforming to MIL-P-23377, and two coats of acrylic lacquer in accordance with MIL-L-81352, color number 17875 (gloss white) per FED-STD-595.

3.10.1 Synthetic rubber parts. Equipment and assemblies containing synthetic rubber parts shall be marked in accordance with MIL-STD-1523.

3.11 Workmanship. The coupling shall be uniform in quality, clean, and free from faults. Attention shall be given to neatness and thoroughness of assembly, alignment of parts, tightness of assembly, and removal of burrs.

MIL-C-81975B

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 and may use his own or any other facilities suitable for the performance of the inspection requirements unless disapproved by the Government. The Government reserves the right to perform any of the inspections specified herein.

4.2 Classification of inspection. The inspection of couplings shall be classified as follows:

- a. Qualification inspection (4.3)
- b. Quality conformance inspection (4.4)

4.3 Qualification inspection. Qualification inspection shall consist of qualification tests on two couplings by the supplier, and verification tests on two couplings at a Government facility. The qualification tests shall consist of the complete inspection methods stipulated in 4.6, and performed in the order listed. The verification tests shall consist of any of the tests of 4.6 which the Government desires to perform. Successful completion of this inspection is required for qualification.

4.3.1 Test samples. Test samples submitted for government verification shall consist of two couplings identified with the manufacturer's own part number. Samples submitted shall be accompanied by two complete sets of detail and assembly drawings and a complete test report (see 4.3.1.1 and 4.3.1.2). Samples shall be submitted to the Naval Air Propulsion Center, P.O. Box 7176, Trenton, N. J. 08628.

4.3.1.1 Drawings. The contractor's drawings submitted with the verification test samples shall conform to DoD-D-1000. The drawings shall show a cutaway section of all parts in their normal assembled position and shall specify part numbers of all parts and subassemblies. The following data shall be furnished on or together with the assembly drawings:

- a. Over-all dimensions
- b. Materials and construction, treatment and finish
- c. Performance requirements and limitations
- d. Contractors or subvendors

MIL-C-81975B

4.3.1.2 Test report. The test report submitted with the verification test samples shall conform to MIL-STD-831 and include the following:

- a. Detailed report on all qualification tests, indicating the degree of conformance to the specification requirements.
- b. Diagrams and photographs of all test set-ups and a listing of equipment used.
- c. Copies of test log sheets.
- d. Accuracy of instrumentation used.
- e. Description of coupling after each test.

4.3.2 Rejection and retest. When the coupling fails to meet any of the requirements of the qualification tests, the program will be halted until the extent and cause of failure are determined. The action required to correct the fault will be reported to the qualifying activity prior to reinitiation of the test program. After corrections have been made, all qualification tests shall be repeated.

4.3.3 Retention. The retention of qualification shall consist of a two year review and verification to determine compliance of the qualified coupling with the requirements of this specification. Each supplier shall forward to the preparing activity a certification that the listed product is still available from the listed plant, can be produced under the same conditions as originally qualified and meets the requirements of the current issue of the specification.

4.4 Quality conformance inspection. Quality conformance inspection shall be performed under the surveillance of the Government Inspector on lots submitted for acceptance under contract. The quality conformance tests shall consist of individual tests and sampling tests.

4.4.1 Individual tests. Each coupling shall be subjected to the following tests:

- a. Examination of product (4.6.1)
- b. Functional (4.6.2)
- c. Regulation capability (4.6.6.2 less a,b,c)
- d. Proof pressure (4.6.13)

MIL-C-81975B

4.4.2 Sampling tests. One coupling selected by the inspectors from each lot of 100 or fraction thereof that has passed the individual tests shall be subjected to the following tests as specified in 4.6:

- a. Leakage and spillage (4.6.5)
- b. Regulation capability (4.6.6.2)
- c. Normal operating loads (4.6.8)
- d. Burst pressure (4.6.14)
- e. Disassembly and inspection (4.6.16)

4.4.3 Rejection and retest. When one or more couplings from a lot fail to meet the specification, acceptance of all couplings in the lot will be withheld until the extent and cause of failure are determined. Before resubmitting, full particulars concerning previous rejection and the action taken to correct the defects found in the original shall be furnished the qualifying activity. After corrections have been made, all quality conformance inspections shall be repeated. Couplings rejected after retest shall not be submitted without specific approval of the qualifying activity. A decision will be made by the qualifying activity concerning the degree of re-test required and to verify the design improvement.

4.4.4 Test report. A test report detailing the results of the quality conformance inspection shall be submitted to the qualifying activity. The report shall conform to MIL-STD-831 and include the following:

- a. Details on all quality conformance inspections, indicating the degree of conformance to the specifications.
- b. Diagrams and photographs of all test set-ups and a listing of equipment used.
- c. Copies of the test log sheets.

4.5 Test conditions.

4.5.1 Test fluid. Unless otherwise specified, Type II fluid conforming to MIL-F-7024 shall be used for all tests.

4.5.2 Pressure and temperature. Unless otherwise specified, tests shall be performed at atmospheric pressure (approximately 29.92 inches of mercury) and at an ambient temperature of between 60°F and 90°F.

MIL-C-81975B

4.5.3 Test nozzle. A nozzle conforming to the requirements of MIL-N-25161 shall be used.

4.6 Test methods.

4.6.1 Examination of product. Each coupling shall be subjected to inspection for adherence to the dimensional requirements of the applicable drawings and Figure 1. The coupling shall be examined to determine conformance to the requirements of this specification with respect to materials, design, interchangeability, construction, finish, identification, and workmanship. The foregoing shall be noted and recorded.

4.6.2 Functional. The coupling shall be checked at static pressures of 2 and 60 psi for one minute durations. There shall be no evidence of external leakage. After relieving the 60 psi pressure the ball joint shall be moved from the coupling centerline $\pm 22\text{-}1/2$ degrees. The force required to move the coupling about the ball shall not exceed 20 pounds. The coupling latching mechanism shall be adjusted to produce a nominal disengaging force of 320 pounds at zero psi fuel pressure, unless otherwise specified by the procuring activity. A testing and production tolerance of ± 30 pounds will be allowed for the disengaging force.

- a. A fuel pressure of 50 psi shall be applied to the coupling outlet and the latching mechanism shall be checked. The disengagement force shall increase 200 ± 45 pounds from the nominal setting at zero fuel pressure.
- b. Using a stand similar to Figure 2, the test coupling shall be filled with fuel and pressurized at 10 psi. Weights shall be added to the coupling until engagement with the nozzle is made. The engaging force (weight of fuel, coupling, and weights) shall not exceed 155 pounds. Tapping of the mast is not allowed.
- c. The coupling, with a nozzle engaged, shall be pressurized to 2 and 60 psig for one minute periods. No external leakage shall occur. If the coupling incorporates a pressure relief valve, a pressure of 160 psi shall be applied to the nozzle while maintaining 60 psi at the coupling inlet. Coupling inlet pressure variation will be monitored and a record of its variation with time shall be recorded. Pressures shall equalize within 10 seconds.
- d. While maintaining a 10 psi fuel pressure in the coupling, the nozzle shall be disengaged and engaged five times. No evidence of binding, chattering, or excessive forces shall occur.

MIL-C-81975B

4.6.3 Pressure drop. The pressure drop test (ΔP) shall be performed in accordance with ARP 868-66 over a flow range from 0 to 600 gpm. Tubing size shall be 3.25 inch O.D., 0.120 inch wall thickness. Sufficient data points shall be recorded to permit plotting a family of curves at inlet pressures of 20, 50, and 100 psi. Figure 3 defines maximum pressure drops. Data obtained during the regulation capability test can be incorporated. The pressure drop graphs shall show ΔP of the coupling and nozzle engaged, using the test fluid (ΔP observed), and ΔP of the components corrected (ΔP correct) as shown below. With the regulator inactive, the maximum pressure drop through the engaged nozzle and coupling shall not exceed 12.0 psi at 600 gpm. The following formula shall be used to correct ΔP :

$$\Delta P_{\text{corr.}} = \Delta P_{\text{obs.}} \times \left(\frac{1.34}{\text{Fluid Viscosity, cs}} \right)^{0.25} \times \frac{0.770}{\text{Fluid Specific Gravity}}$$

4.6.4 Fuel resistance and low temperature. The fuel resistance and low temperature test shall be performed in accordance with Table I.

4.6.5 Leakage and spillage. This test shall be performed as follows:

- a. The coupling engaged with a nozzle shall be subjected to fluid flows up to 600 gpm in 100 gpm increments at a constant inlet pressure of 120 \pm 2 psi. There shall be no evidence of external leakage.
- b. The coupling, engaged with a nozzle, shall be subjected to inlet fluid pressure of 120 psi and a fluid flow of 100 to 600 gpm in increments of 100 gpm. The nozzle shall be disengaged at every increment. The spillage shall not exceed 100 cc per disengagement.
- c. The coupling shall be engaged with a nozzle and subjected to a fuel pressure of 10 psi. The coupling shall be fitted with a 2,000 cc fuel reservoir providing unrestricted fuel flow during disengagement. A minimum of 1,100 cc of fuel shall be in the reservoir at all times. With this condition existing, the nozzle shall be disengaged a minimum of five times, and the fluid spillage shall not exceed 25 cc per disengagement.
- d. The coupling shall be subjected to 10 psi fuel pressure while fitted with a 2,000 cc fuel reservoir. A minimum of 1,100 cc of fuel shall be in the reservoir. A nozzle shall be engaged a minimum of five times. Spillage shall not exceed 25 cc per engagement.

MIL-C-81975B

TABLE I

Fuel Resistance and Extreme Temperature Tests

Test	Fuel Resistance				Extreme Temperature
	Phase I Soak	Phase I Dry	Phase II Soak	Phase II Dry	Low Temperature
Period 1/ Configuration	Reception Coupling disengaged during the first 72 hours and engaged with the nozzle the last 24 hours. 2/	Reception coupling only drained and blown dry.	Reception coupling and a nozzle disengaged. 2/	Reception coupling only drained and blown dry.	Test nozzle and reception coupling disengaged. 2/
Test Fluid	Specification TT-S-735, Type III	None	Specification TT-S-735, Type III	None	Specification TT-S-735, Type I
Minimum Period Duration	96 Hours	24 Hours	18 Hours	30 Hours	18 Hours
Ambient and Test Fluid Temperature	158±2°F	Circulating air at 158±2°F	158±2°F	Circulating air at 158±2°F	-67±2°F
Operation and Tests During Period	Engage nozzle with the reception coupling every 6 hours. At no time during the test shall the force required to engage the nozzle be in excess of 155 pounds.	None	Engage nozzle with the reception coupling every 6 hours. At no time during the test shall the force required to engage the nozzle be in excess of 155 pounds.	None	None

MIL-C-81975B

TABLE I (Cont'd)

Fuel Resistance and Extreme Temperature Tests

Test	Fuel Resistance			Extreme Temperature	
	Phase I Soak	Phase I Dry	Phase II Soak	Phase II Dry	Low Temperature
Operation and tests immediately after period	Perform functional test of para. 4.6.2 using TT-S-735 Type III.	Perform functional test using TT-S-735 Type I	Perform functional test using TT-S-735 Type III.	Perform functional test using TT-S-735 Type I.	With ambient temperature and test fluid at -67°±2°F, engage nozzle with the reception coupling and check for leakage while maintaining the pressure conditions of para. 4.6.2 (c) for 15 minutes. There shall be no leakage. With the ambient temp. and test fluid at -40° ±5°F, engage and disengage the nozzle with the reception coupling 50 times. During this test, maintain 10-PSI-

MIL-C-81975B

TABLE I (Cont'd)

Fuel Resistance and Extreme Temperature Tests

Test	Fuel Resistance			Extreme Temperature	
	Phase I Soak	Phase I Dry	Phase II Soak	Phase II Dry	Low Temperature
Period 1/					fluid-pressure on the nozzle and the coupling. Upon completion, there shall be no leakage after 15 min at 2-PSI and 60-PSI pressure in engaged and disengaged condition. Record total leakage.

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

2/ During periods of soaking in the test fluid, the coupling shall be filled with the test fluid in such a manner as to insure complete contact of all parts with the fluid as would be expected under service conditions.

MIL-C-81975B

4.6.6 Pressure control.

4.6.6.1 Surge suppression. The following test shall be conducted with the coupling and nozzle engaged using a facility, similar to Figure 4. With a nozzle inlet fluid pressure of 50 ± 5 psig and fluid flow rates as shown, surge pressures shall be generated by closure of the CRC valve. Surge pressures shall be recorded upstream and downstream of the coupling. Surge pressure peaks recorded downstream of the coupling shall not exceed 120 psi. Repeat the test five times for each configuration shown on the Figure.

4.6.6.2 Regulation capability. With a coupling inlet fluid pressure of 80 psig the coupling outlet pressure shall be monitored as the flow rate is increased from 10 cc/min to 600 gpm and then decreased back to 10 cc/min. The maximum regulated outlet pressure observed shall be 60 psig. Sufficient data shall be recorded to plot the regulating characteristics.

- a. With inlet coupling fuel pressures of 40, 60, and 100 psig, the flow conditions of paragraph 4.6.6.2 shall be repeated. Sufficient data shall be recorded to plot the regulating characteristics. Maximum regulated downstream pressure shall be 60 psig.
- b. While maintaining a flow rate of 600 gpm the inlet pressure shall be cycled from 60 to 100 psig and back to 60 for a total of 2,000 cycles, at a rate of 6 cycles per minute. If equipped with ambient sensing ports, the attitude of the coupling shall be most conducive for the drainage of leakage which may be retained internally by the coupling. The outlet pressure shall not exceed 60 psig and there shall be no external leakage. The coupling shall be subjected to and meet the requirements of paragraph 4.6.2 following this test.
- c. With a coupling inlet fluid pressure of 60 psig, the coupling outlet pressure shall be monitored as the flow rate is decreased from 10 cc/min to 10 drops per minute. The regulated outlet pressure shall not increase by more than 10% of the inlet pressure. The test shall be repeated at inlet pressures of 80 and 100 psig.

4.6.7 Latching mechanism. The test coupling shall be engaged with a nozzle and the latching mechanism adjusted to produce a disengagement force of 550 ± 30 pounds at zero psi fuel pressure. With the nozzle pressure increased to 50 psi (no flow), the disengaging force shall increase 200 ± 25 pounds. The test shall be repeated with a latching mechanism setting of 320 ± 30 pounds and the values recorded. Then with a coupling outlet pressure of 50 psi and a flow of 600 ± 25 gpm, the disengaging force shall be rechecked. The force shall change no more than 25 pounds from that obtained in the "no flow" test.

MIL-C-81975B

4.6.8 Normal operating loads. The coupling shall be subjected to the following loads:

- a. A 1,000 pound tensile load in combination with a 3,000 pound radial load.
- b. A 1,000 pound compression load with a 3,000 pound radial load.
- c. A 2,000 pound tensile load.
- d. A 2,000 pound compression load.

The tensile loads shall be applied between the toggle latches and the hose attachment point by inserting a nozzle and locking the toggles in place. The radial load shall be applied on the coupling body 4.25 inches from the drogue cone attachment flange. No malfunction or deformation shall be evident upon completion of this test. The coupling shall then be subjected to and meet the requirements of the tests specified in 4.6.2.

4.6.9 Impact and endurance. The impact and endurance test shall be conducted in accordance with Table II. The test setup for this test shall be as shown on Figure 2, or equivalent. Unless otherwise specified, fuel pressure of 10 ± 2 psi shall be so applied to the reception coupling that this pressure is sustained in the coupling during the engagement and disengagement sequences. Leakage during impact and in line engagements and disengagements shall not exceed 25 ml. During angular disengagements leakage shall not exceed 100 ml. Upon completion of this test the coupling shall be subjected to and meet the requirements of the tests specified in 4.6.2.

4.6.10 Vibration. The vibration test shall be performed in accordance with Figure 5. This test shall be accomplished with the coupling in a dry condition. For the purpose of this test, a tensile load of 500 ± 25 pounds shall be applied to the hose attachment end of the coupling to simulate the forces applied during stowage in flight. The coupling shall be subjected to and meet the requirements of the tests specified in 4.6.2 upon conclusion of this test.

4.6.11 Contaminated fuel. Test fluid containing the type and concentration of contamination specified in Table III shall be pumped through the engaged nozzle and coupling at not less than 50 gpm. The nozzle and coupling shall be operated for 1,000 cycles. A cycle shall consist of engaging for 30 seconds and disengaging. The test fluid shall be agitated to maintain a uniform dispersion of the contaminant throughout the test. If a recirculating system is used, the solid contaminant shall not be recirculated. Upon completion of the test, the nozzle and coupling shall be flushed and drained. The coupling shall then be subjected to and meet the requirements of the tests specified in 4.6.2 and 4.6.6.2.

MIL-C-81975B

TABLE II. Impact and endurance test.

Condition <u>7/</u>	Engagement		Disengagement		
	Displacement of coupling centerline from nozzle centerline (inches)	Drop distance nozzle nose to coupling poppet	Angle of disconnect (degrees)	Latching mechanism setting (1 ± 20)	Cycles <u>2/</u>
Impact <u>1/</u>	0	18	0	500	100 <u>3/</u>
	2	18	0	500	400
	4	20	0	500	500
Endurance <u>4/</u>	0	9	15	500	1000 <u>3/</u>
	0	9	15	500 <u>5/</u>	250
	0	9	0	500 <u>6/</u>	2750 <u>3/</u>

- 1/ During the impact test, engagement shall be complete. If impact does not cause engagement, manual force shall be applied as required to complete engagement.
- 2/ A cycle is defined as one engagement and one disengagement.
- 3/ 50 cycles shall be accomplished with zero fuel pressure and a dry nozzle.
- 4/ Drop test not required. Mechanical engagement permissible, provided engaging velocity is not less than 5 fps just prior to seating the sleeve upon the master coupling seal.
- 5/ Disengagement shall be accomplished with 50 ± 2 psi fuel pressure applied to the reception coupling.
- 6/ The 1,000 cycles called out for the contaminated fuel test (see 4.6.11) may be considered as part of this test provided the engaging velocity during the contaminated fuel test is not less than 5 fps.
- 7/ Thirty percent of the cycles at each condition shall be performed at $-67 \pm 2^\circ\text{F}$.

MIL-C-81975B

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 Co. Part No. 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%)	8.0 gm/400 gal.
Cotton linters	Grade 6, staple below 7, second cut linters (US Department of Agriculture Grading Standards).	0.1 gm/400 gal.
Crude naphthenic acid		0.03% by volume
Salt water solution shall contain 4 parts NaCl to 96 parts H ₂ O by weight.		0.01% entrained

4.6.12 Accelerated corrosion.

4.6.12.1 Salt water immersion. The coupling shall be immersed in a solution consisting of 5 percent by weight of sodium chloride in distilled water and drained. If equipped with ambient sensing ports, inspection shall be made to verify the draining requirements of paragraph 3.5.4. The coupling shall then be placed in an oven and heated at 130° ±5°F for a period of not less than one hour. The immersion and heating cycles shall be repeated 50 times. Immediately after completing the above cycles, the coupling shall be flushed with warm water to remove all salt accumulation. The coupling shall be dried, wetted with test fluid, and subjected to and meet the requirements of the tests specified in 4.6.2. Corrosion to an extent which could cause malfunction of the coupling or contamination of the aircraft fuel system shall be cause for rejection.

MIL-C-81975B

4.6.12.2 Salt fog. The coupling shall be subjected to the salt fog test specified as Method 509 of MIL-STD-810. Corrosion to an extent which could cause malfunction of the coupling or contamination of the aircraft fuel systems shall be cause for rejection. The coupling shall be subjected to and meet the requirements of the tests specified in 4.6.2.

4.6.13 Proof pressure. With the coupling engaged with a nozzle and the nozzle outlet blanked off, the coupling shall be subjected to a hydrostatic proof pressure of 120 psig for a minimum period of one minute. There shall be no evidence of external leakage, distortion, or other injury to any part of the coupling. The coupling alone shall be subjected to 240 psig fluid pressure for one minute. No external leakage, distortion, or other injury to any coupling part shall be allowed.

4.6.14 Burst pressure. With the coupling engaged with a nozzle and the nozzle outlet blanked off, the coupling shall be subjected to a hydrostatic burst pressure of 180 psig for a minimum period of one minute. There shall be no evidence of distortion, external leakage, or other injury to any coupling part. When the pressure is lowered to 60 psig, there shall be no evidence of leakage. The coupling alone shall be subjected to 360 psig fluid pressure for one minute. No external leakage, distortion, or other injury to any coupling part shall be allowed. When the pressure is lowered to 60 psig, there shall be no evidence of leakage.

4.6.15 Altitude. The coupling, when equipped with pressure sensing ports and engaged with a nozzle, shall be subjected to a fluid flow of 400 gpm at an inlet pressure of 80 psig. While maintaining this condition the ambient coupling pressure shall be reduced gradually to 8.5 inches HgA. Sufficient data points shall be taken to plot a curve of regulated output versus ambient pressure. The sensing ports shall then be closed and the test repeated. The regulated outlet pressure shall not decrease more than 15 psig. There shall be no measurable leakage of fuel from the ports.

4.6.16 Disassembly and inspection. The coupling shall be disassembled for inspection of all parts and measurements taken, as necessary, to disclose excessively worn, distorted, or weakened parts, which shall constitute failure. The measurements shall be compared with the contractor's drawing dimensions or with similar measurements made prior to the test. The findings of this inspection, together with photographs, where necessary, shall be included in the test report.

MIL-C-81975B

5. PACKAGING

5.1 Application. The requirements of Section 5 apply only to direct purchases by or shipments to the Government.

5.2 Preservation and packaging. All couplings shall be completely drained of fuel and dried prior to delivery.

5.2.1 Level A. Couplings shall be preserved and packaged in accordance with Method I, Ia or II of MIL-P-116, as applicable. Openings shall be protected against the entrance of dirt and foreign matter by closures in accordance with MIL-C-5501.

5.2.2 Level C. Couplings shall be preserved and packaged in accordance with standard commercial practice.

5.3 Packing.

5.3.1 Level A. Couplings shall be packed as specified in MIL-STD-794 for overseas shipment.

5.3.2 Level B. Couplings shall be packed as specified in MIL-STD-794 for domestic shipment and storage.

5.3.3 Level C. Couplings shall be packed in exterior type shipping containers in a manner that will insure safe transportation and arrival at the lowest rate to the point of delivery. Containers shall conform to the Uniform Freight Classification Rules or regulations of other common carriers, as applicable to the mode of transportation, in effect at time of shipment.

5.4 Marking of shipments. Interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129. The identification shall be composed of the following information listed in the order shown:

- a. Stock No. or other identification number as specified in the purchase document. When no number is specified leave space therefor, and enter when provided.
- b. Coupling, Regulated Aerial Pressure Refueling - MA-3.
- c. Specification MIL-C-81975B.
- d. Manufacturer's Part Number.

5.4.1 The following instructions shall be marked on the unit and intermediate packages and shipping containers:

IF IN STORAGE AFTER (DATE)*, THE COUPLING
SHALL BE TESTED AND INSPECTED BEFORE USE.

*Insert date 18 months after curing date of
oldest synthetic rubber part used in the coupling.

MIL-C-81975B

6. NOTES

6.1 Intended use. The aerial pressure refueling coupling covered by this specification is used by Navy tanker aircraft to fuel service aircraft in flight. The coupling is extended by a hose from the tanker aircraft which is engaged by a nozzle installed on the front of the aircraft being serviced, thereby facilitating the transfer of fuel. The coupling provides a regulated fuel supply.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. The disengaging force required, if other than 320 pounds (see 4.6.2).
- c. The address to whom the Quality Conformance Inspection Test Reports are to be sent.
- d. Whether overseas packing is required.

6.2.2 Data requirements. When this specification is used in an acquisition which incorporate a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n) (2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

<u>Paragraph No.</u>	<u>Data Requirements</u>	<u>Applicable DID No.</u>
4.3.1	Drawings and Test Report	DI-E-6105
4.4.4	Test report	DI-T-2072

(Copies of DID's required by contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

MIL-C-81975B

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening bids, qualified 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 contractors is called to these requirements, 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 purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Department of the Navy, Naval Air Propulsion Center, Trenton, New Jersey 08628, and information pertaining to qualification of products may be obtained from that activity.

6.4 International standardization agreements. Certain provisions (3.5) of this specification are the subject of international standardization agreement (ASCC Air Standard 17/29 and NATO STANAG 3447). When amendment, revision, or cancellation of this specification is proposed, which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels including departmental standardization offices to change the agreement or make other appropriate accommodations.

Custodians:

Navy - AS

Air Force - 11

Preparing Activity

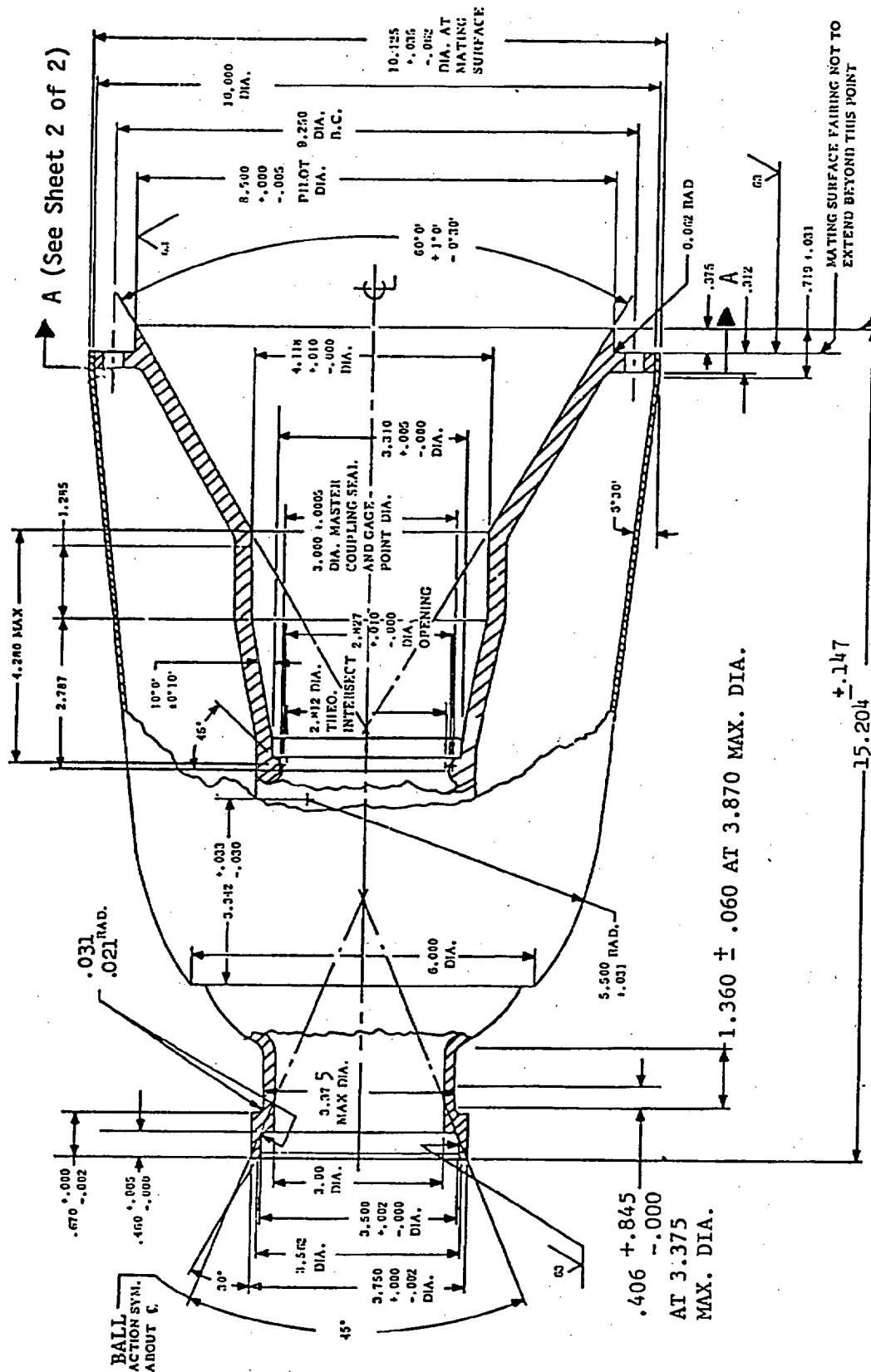
Navy - AS

(Proj. No. 1680-0489)

Review:

Air Force - 82

MIL-C-81975B.



DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCES: DECIMALS .XX = ±.03
.XXX = ±.010
ANGLES ± 1°

FIGURE 1. Coupling dimensions.

MEASUREMENTS TO THIS
PLANE BASED ON THEORETICAL
INTERSECTION OF 60° ANGLE
AND PILOT DIA.

(SHEET 1 of 2)

MIL-C-81975B

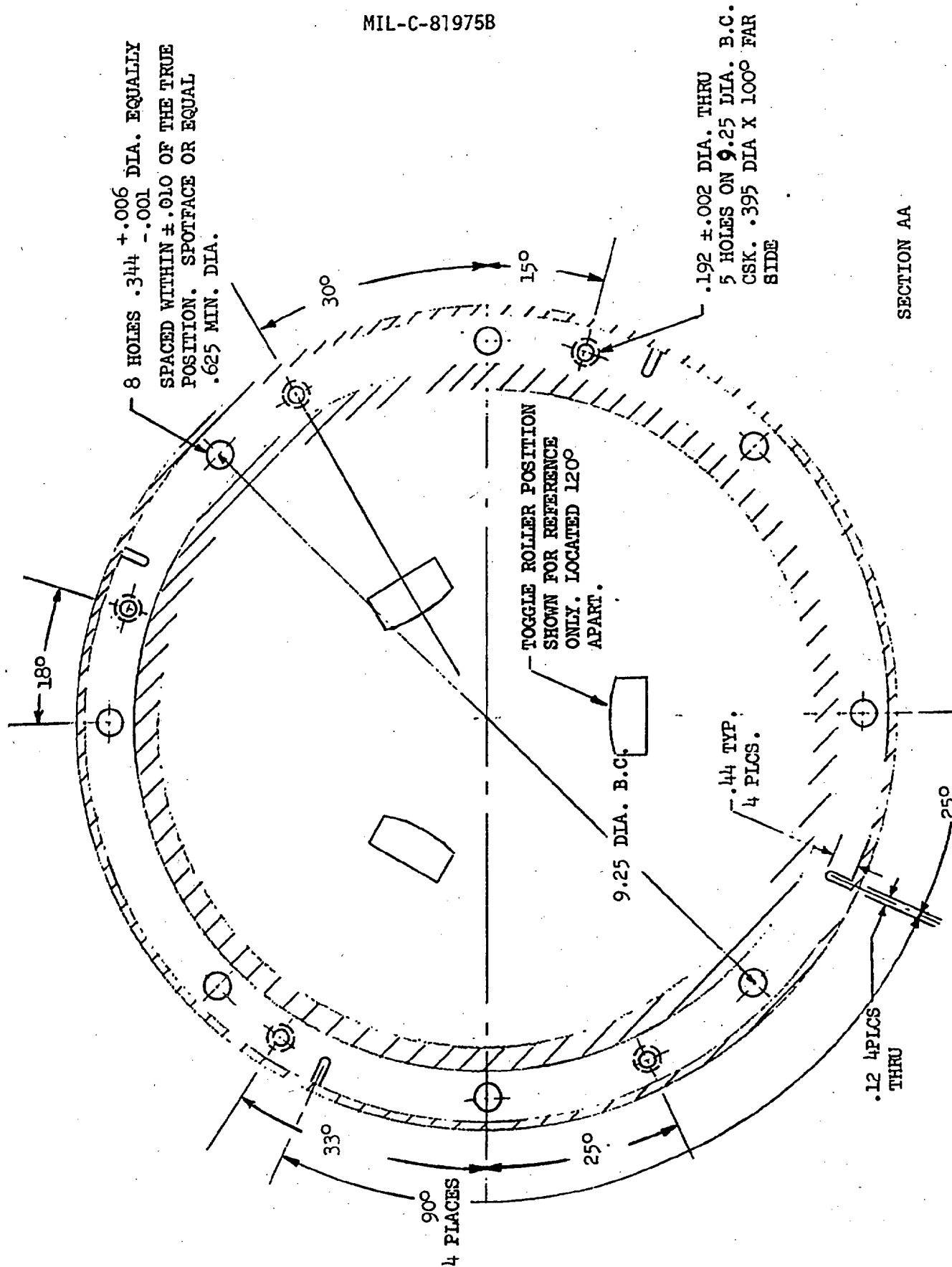
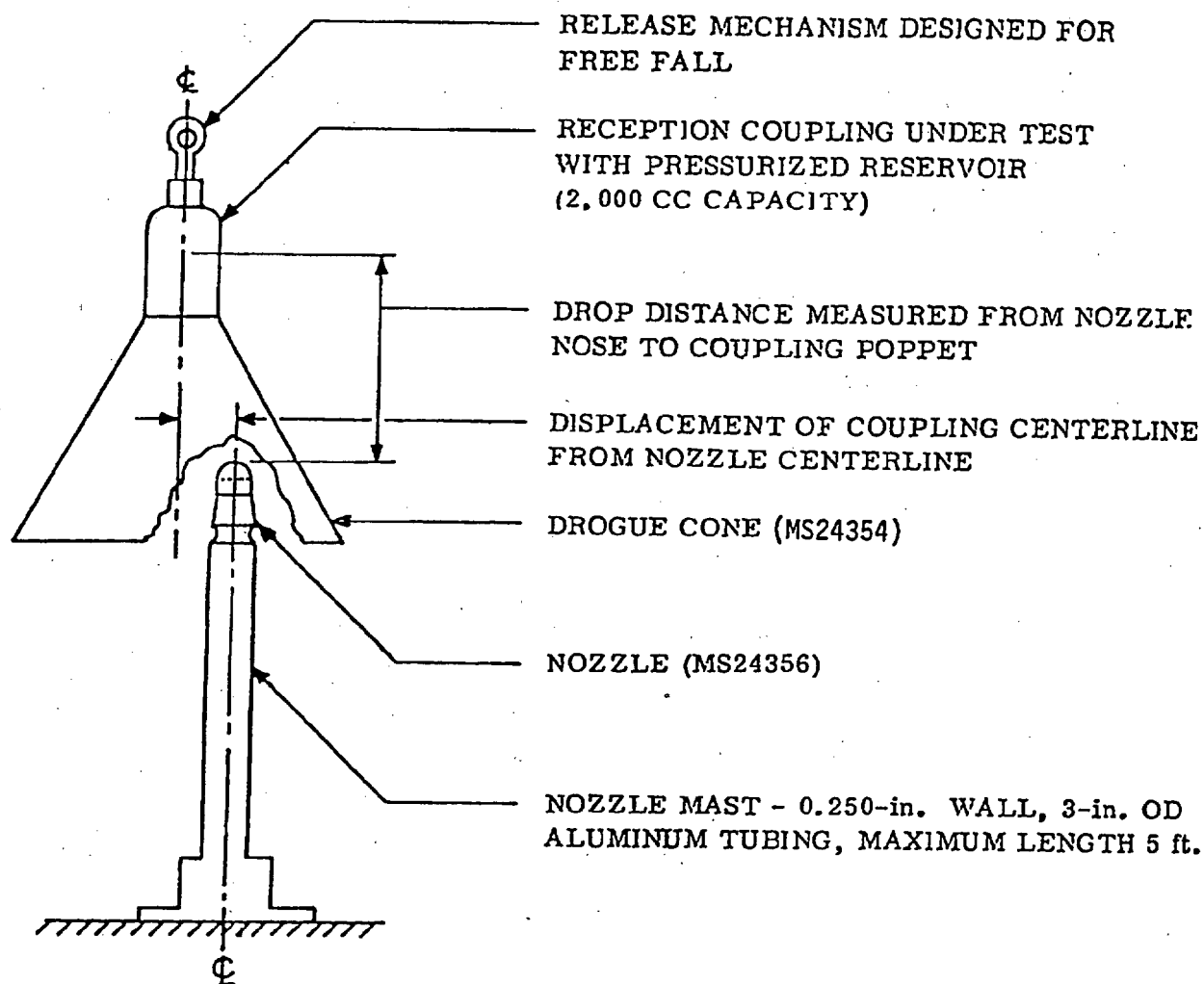


FIGURE 1. Coupling dimensions. - (continued)

(SHEET 2 of 2)

MIL-C-81975B-



FOR THE PURPOSE OF THE IMPACT TEST, THE COMBINED WEIGHT OF DROGUE AND RECEPTION COUPLING SHALL BE 40^{+1}_{-0} LB.

FIGURE 2. Impact and endurance test set up.

MIL-C-81975B

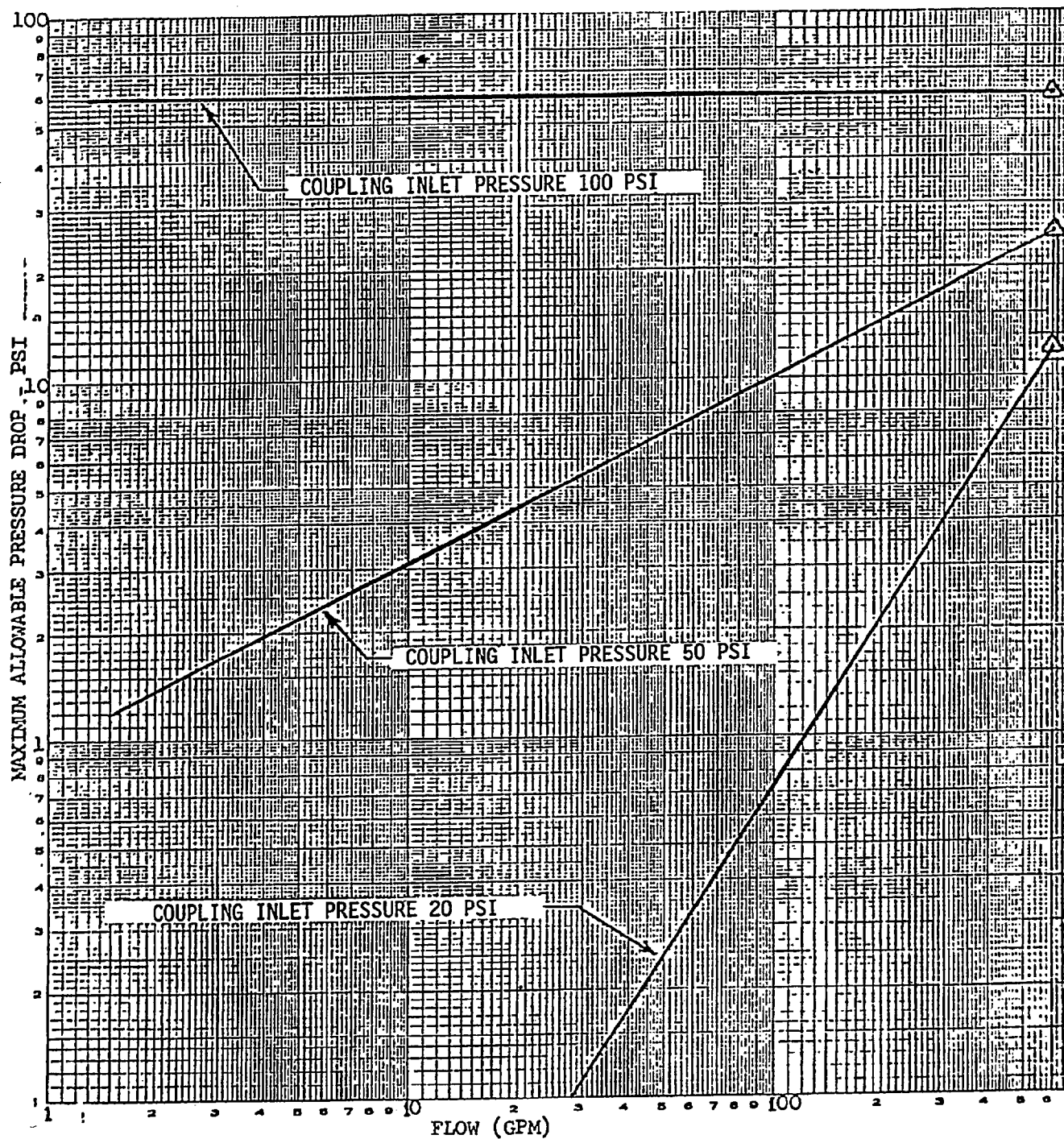


FIGURE 3. MA-3 coupling pressure drop performance characteristics.

MIL-C-81975B

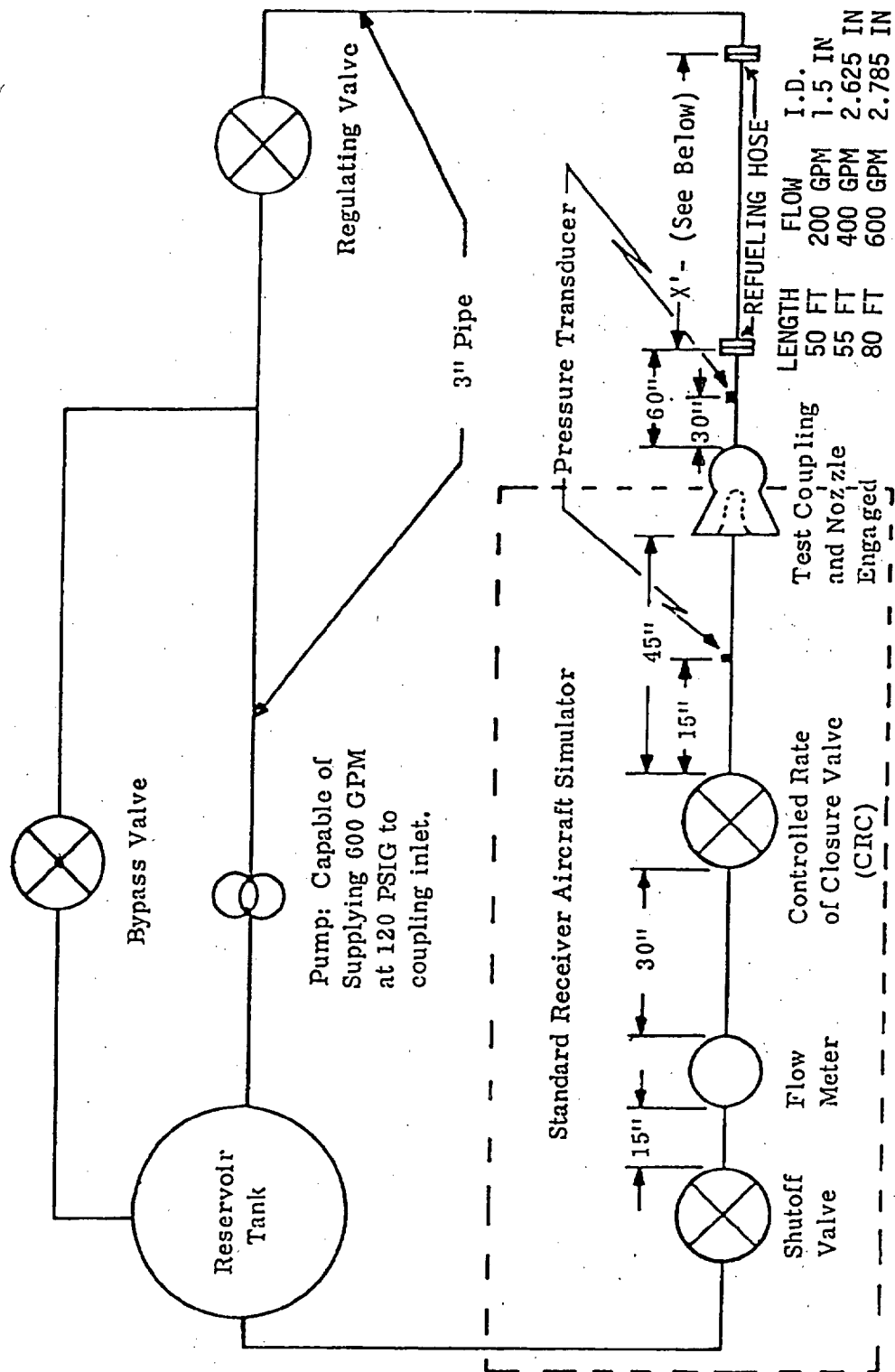
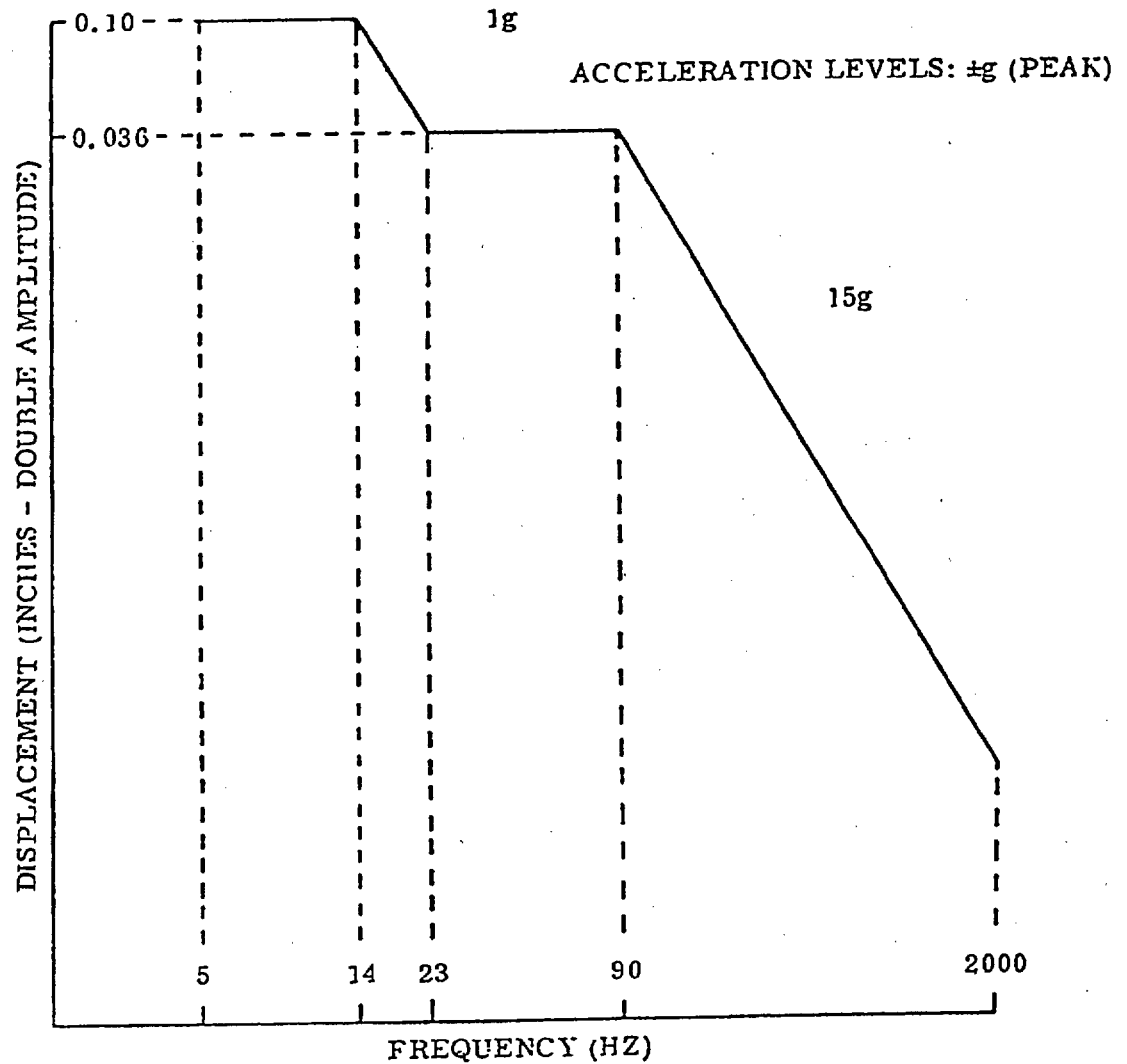


FIGURE 4. Surge suppression & pressure regulation test set-up.

MIL-C-81975B

1/ Instructions For Test Are
Contained In Test Method 514
Of MIL-STD-810

1/FIGURE 5. Vibration test curve.

★U.S. GOVERNMENT PRINTING OFFICE: 1982-505-022/2172

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS: This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. 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. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.

NOTE: This form shall not be used to submit requests for waivers, deviations or clarification of specification requirements on current contracts. 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.

DOCUMENT IDENTIFIER (Number) AND TITLE

MIL-C-81975B

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

1. ☐ HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? ☐ IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY (Printed or typed name and address — Optional)

TELEPHONE NO.

DATE

DD FORM 1426
 1 OCT 76

Replaces edition of 1 Jan 72 which may be used.

S/N 0102-LF-001-4260