INCH-POUND

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SUPERSEDING
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MILITARY SPECIFICATION

THRUSTER, CARTRIDGE ACTUATED, M1A2 ASSEMBLY

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

1. SCOPE

1.1 Scope. This specification covers the requirements for the M1A2 Cartridge Actuated Thruster Assembly (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplements thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

MILITARY

MIL-A-2550	Ammunition, General Specification For
MIL-T-45498	Thruster, Cartridge Actuated, M1A2 Metal Parts Assembly
MIL-T-50356	Thruster, Cartridge Actuated, M1A2 Remanufactured Metal Parts Assembly

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Indian Head Division, Naval Surface Warfare Center, Standardization Branch (Code 8420), 101 Strauss Avenue, Indian Head, MD 20640-5035, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by sending a letter.

AMSC N/A FSC 1377

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures And Tables For Inspection By Attributes

MIL-STD-109	Quality Assurance Terms And Definitions
MIL-STD-453	Inspection, Radiographic
MIL-STD-1168	Ammunition Lot Numbering
MS28741	Hose Assembly, Detachable End Fitting, Medium Pressure

(Unless otherwise indicated, copies of federal and military specifications and standards are available from Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following Government drawings form a part of this specification to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation (see 6.2).

DRAWINGS

Naval Surface Warfare Center, Indian Head (CAGE Codes 19200 and 19203)

DL8593854	Thruster, Cartridge Actuated, M1A2 Assembly
8593889	Cartridge, Impulse, M42A1 Assembly
8797631	Box, Fiberboard (Inner), Packing, Ammunition, For Thruster, Cartridge Actuated, M1A2
8797632	Box, Packing, Ammunition, For Thruster, Cartridge Actuated, M1A2
9221261	Box, Fiberboard (Outer), Alternative, Packing Ammunition, for Thruster, Cartridge Actuated, M1A2

U.S. Air Force

TPO 00-891-5488	Thruster, Cartridge Actuated, M1A2

(Application for copies should be addressed to: Commander, Indian Head Division, Naval Surface Warfare Center, Attn: Data Control Branch (Code 8410), Indian Head, MD 20640-5035.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Materials. All materials used in the manufacture of the thrusters shall conform to the specifications referred to on the respective drawings unless specific approval in writing covering a departure therefrom has been obtained from the cognizant Navy design activity prior to manufacture. When alternate materials or methods of manufacture are specified on the drawings, the bidder's selections shall be clearly stated in the proposal.

3.2 Components.

3.2.1 Primary components. For the purpose of this specification, the M42A1 impulse cartridge (Drawing 8593889) is defined as a primary component. Only primary components from a single lot shall be used in a production lot of thrusters; however, one primary component production lot may be used in more than one thruster production lot.

3.2.2 Component parts. All component parts shall meet the applicable requirements of MIL-T-45498 or MIL-T-50356 prior to assembly.

3.3 Torque. Torque requirements shall be as specified in table I. No movement shall occur upon application of the breakaway torque.

TABLE I. Torque requirements.

Components	A	B	C
	Run On, min (inch pounds)	Seating or bottoming (including A) (inch pounds)	Breakaway, min (inch pounds)
Head and cartridge retainer	40	300 ± 20	200
Head and body	40	600 ± 20	400

3.4 Trunnion rotation. Upon completion of assembly, the trunnion shall be free to rotate 360 degrees.

3.4.1 Structural strength. The assembled thruster shall withstand a static tensile force of 2000 pounds, minimum, for 15 seconds, minimum, between mounting points without unlocking and without mechanical failure (see 6.5.1).

3.4.2 End sleeve rotation. Upon completion of assembly and after the structural strength test, the end sleeve shall be free to rotate 360 degrees in a clockwise direction.

3.5 Residual magnetism. The thruster shall not deflect the indicator of the compass more than five degrees in either direction (see 4.3.3).

3.6 Radiographic examination. Each thruster assembly shall be radiographically examined for defects (see 4.3.4).

3.7 Functional.

3.7.1 Load. The thruster, loaded with an acceptable lot of cartridges and fired under load (see 6.3), shall perform as follows: With the piston connected to a 20-pound weight, the piston shall push the weight along a horizontal path of travel, and simultaneously the moving piston and weight shall overcome restraining forces of 1000 pounds, 6000 pounds, 3200 pounds, and 1000 pounds, the restraining forces being located from the initial point of travel, a distance of zero inches, 0.25 inches, 0.40 inches, and 0.75 inches, respectively. After completely overcoming the restraining forces, the piston shall complete its stroke of 2 inches, minimum.

3.7.2 Temperature. The thruster shall comply with all the ballistic requirements throughout the temperature range of •65 to +200•F.

3.7.3 Initiation. The thruster shall be fired by a source delivering an output pressure of 700 + 25, • 0 pounds per square inch gage (psig) at the end of 15 feet of aircraft hose, MS28741-4 at 70 ± 5•F.

3.7.4 Misfires. There shall be no misfires.

3.7.5 Mechanical failures. The thruster shall function without mechanical failure (see 6.5.1).

3.8 Workmanship. Thrusters shall be free of cracks, splits, or other defects which might prevent proper mating with connecting parts or proper functioning of the device.

3.8.1 Metal defects. All components shall be free from cracks, splits, cold shuts, inclusions, porosity, or any similar defect.

3.8.2 Burr. No part shall have a burr which might interfere with the assembly or function of the item or which might be injurious to personnel handling the item.

3.8.3 Foreign matter. No part or assembly shall contain chips, dirt, grease, rust, corrosion, or other foreign matter.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements (see 6.2).

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements; however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Quality assurance terms and definitions. Reference shall be made to MIL-STD-109 to define the quality assurance terms used.

4.1.3 Inspections. Inspections shall be in accordance with MIL-A-2550 and MIL-STD-453.

4.2 Inspection provisions.

4.2.1 Lot.

4.2.1.1 Submission of product. Unless otherwise specified by the contracting activity, formation, and identification of lots shall be in accordance with MIL-STD-105.

4.2.1.2 Size of lot. The production lot size shall be as specified in the contract (see 6.2).

4.2.2 Examination. One hundred percent examination shall be performed for all critical defects. Examination for major and minor defects shall be performed in accordance with the classification of defects. Four power (4x) magnification may be used for inspection of such defects as burr and foreign matter. When compliance with the applicable requirement is in doubt as a result of visual examination, the characteristic shall be measured or gaged to determine acceptability. All nonconforming material shall be rejected.

4.2.2.1 Cartridge, Drawing 8593889, covering a detail of Drawing 8593854.

Characteristics	Defect	Method of Inspection
Critical		
1	Mixed cartridges	Visual
2	Metal defective	Visual
3	Marking missing, incorrect, or illegible	Visual
Major		
101	Foreign matter present	Visual
Minor		
201	Case scratched or dented	Visual

4.2.2.2 Firing Pin Guide, Subassembly, consisting of Drawings 8593284, 8593863, 8593864, and MS28775-012 covering a detail of Drawing 8593854.

Critical		
1	Striker hole obstructed	Visual
Major		
101	Firing pin base not flush or below firing pin guide	Manual/Visual
102	Foreign matter	Visual
Minor		
None defined		

4.2.2.3 Assembly, (Head), Drawing 8593854 less all components except Drawings 8593284, 8593862, 8593863, 8593864, 8593889, 8593870, MS28775-012 and MS28775-212.

Critical

1	Cartridge loose or missing	Manual/Visual
Major		
101	Any part missing, except as otherwise classified	Visual
102	Thread damaged or not full	Visual
103	Protective finish inadequate or defective	Visual
104	Metal defective	Visual
105	Burr	Visual
106	Foreign matter	Visual
Minor		
None defined		

4.2.2.4 Assembly, Drawing 8593854, less MIL-C-5501/10 and MIL-C-5501/11.

Critical		
1	Foreign matter in gas port	Visual
2	Shear pin not engaged in firing pin	Gage
Major		
101	Total length	Gage
102	Thread damaged	Visual
Minor		
201	Sealant or coating compound missing	Visual

4.2.2.5 Assembly, Drawing 8593854.

Critical		
1	Improper assembly	Visual/X-ray
2	Any part missing	Visual/X-ray
3	Metal defective	Visual
Major		
101	Marking missing, incorrect, or illegible	Visual
102	Foreign matter	Visual
103	Trunnion not free to rotate 360 degrees	Manual
Minor		
201	Location of labels incorrect	Visual
202	Protective cap or plug missing	Visual
203	Total length	Visual
204	Varnish missing or inadequate	Visual

4.2.2.6 Box, Fiberboard (Inner), Ammunition, Drawing 8797631.

Critical		
None defined		

Major
None defined

Minor

201	Contents loose	Manual
202	Box damaged	Visual
203	Sealing strip broken or missing	Visual
204	Marking missing, incorrect, or illegible	Visual
205	Cut, damaged, or improperly sealed bag	Visual

4.2.2.7 Box, Ammunition, Packing, Drawing 8797632.

Critical
None defined

Major
None defined

Minor

201	Contents loose	Manual
202	Strapping missing, loose, broken, or improperly engaged	Visual/Manual
203	Contents of box exposed	Visual
204	Box damaged	Visual
205	Marking missing, incorrect, or illegible	Visual
206	Number of units incorrect	Visual

4.2.2.8 Box, Fiberboard (Outer), Alternative, Ammunition, Packing, Drawing 9221261.

Critical
None defined

Major
None defined

Minor

201	Contents loose	Manual/Visual
202	Carton broken or damaged	Visual
203	Number of units contained incorrect	Visual
204	Marking missing, incorrect, or illegible	Visual
205	Tape incomplete	Visual

4.2.3 Inspection testing. The following tests shall be performed in accordance with 4.3.

4.2.3.1 Breakaway torque.

4.2.3.1.1 Head and cartridge retainer. Each head and cartridge retainer subassembly shall be subjected to a breakaway torque. Failure of any subassembly to comply with the requirements of column C, table I in 3.3 shall be cause for rejection of the subassembly.

4.2.3.1.2 Head and body. Each head and body assembly shall be subjected to a breakaway torque. Failure of any assembly to comply with the requirements of column C, table I in 3.3 shall be cause for rejection of the assembly.

4.2.3.2 Residual magnetism. Each assembly shall be subjected to the test for excessive residual magnetism as specified in 4.3.3. Failure of any unit to comply with 3.5 shall be cause for rejection of the assembly.

4.2.3.3 Structural strength. Each thruster shall be subjected to the structural strength test. Failure of any unit to comply with the structural strength requirement of 3.4.1 shall be cause for rejection of the thruster.

4.2.3.4 Functional tests. The following tests shall be performed by the Government.

4.2.3.4.1 Ballistics. Twenty-one units shall be tested to determine compliance with 3.7. The units shall be temperature conditioned as provided in table II and 4.3.5.2. Failure of any unit to comply with 3.7.1 through 3.7.5 shall be cause for rejection of the lot.

TABLE II. Conditioning temperature.

Sample size	Method	Temperature (•F)
7	Load (see 3.7.1)	•65 to •70
7	Load (see 3.7.1)	65 to 75
7	Load (see 3.7.1)	195 to 205

4.2.3.4.2 Retest. There shall be no retests.

4.2.3.4.3 Test failure. If a test failure is attributable to an assignable cause, excluding the test thruster, the original test results shall be discarded and that test reconducted.

4.3 Test methods and procedures.

4.3.1 Breakaway torque. A torque wrench, set at the torque requirements specified in table I, shall be used in conjunction with a fixture to determine the adequacy of the joints.

4.3.2 Structural strength. The thruster shall be tested in a tensile testing machine or similar device by the application of the static tensile load between the trunnion lugs and the end sleeve.

4.3.3 Residual magnetism. The assembly shall be tested for excessive residual magnetism using an approved compass in an area free of local magnetic effects by placing the assembly 5 inches from the end at the same height as the compass, in the north-south horizontal position (head end at south) with the compass set in an east-west heading. The assembly shall be moved at a speed no greater than 10 feet per minute past the compass for its entire length, rotated 90 degrees in the horizontal position about its longitudinal axis, and

moved slowly back past the compass. This procedure shall be repeated for each 90 degree rotation of the assembly for four full passes.

4.3.4 Radiographic examination. All assembled thrusters shall be radiographically examined in accordance with MIL-STD-453, with the exception that an thruster assembly will be used for the penetrameter. Any observable imperfections in components or assembly shall be cause for rejection. The thrusters shall be positioned for the most revealing exposure, with the long axis of each assembly perpendicular to the rays of the X-ray machine. All thrusters shall be identified with serial numbers prior to X-ray examination. The serial numbers shall be in consecutive order beginning with the number 001 in each production lot. Any missing numbers are to be identified on the X-rays. The thrusters shall be arranged on trays or boards in consecutive numerical order, and each radiograph shall carry a permanent identification of the units displayed thereon. The radiographic plate identification shall include item nomenclature, the complete lot number, the span of serial numbers displayed, and the contract number. The radiographs of the entire production lot shall accompany the ballistic sample to the activity conducting the production lot acceptance test. Defective thrusters found during X-ray review are to be marked on the X-ray prior to shipment and those defective items shall be removed from the production lot. Film interpretation of the radiographs shall verify the presence and correct positioning of the following parts:

a. Guide, Firing Pin, P/N 8593863
b. Firing Pin, P/N 8593864
c. Retainer Cartridge, P/N 8593862
d. Cartridge M42A1, P/N 8593889
e. Pin, Shear, P/N 8593284
f. Piston, P/N 8594750
g. Cap, Screw, P/N 8593885
h. Spring, Piston Locking, P/N 8593871
i. 4-keys, P/N 8593857
j. Washer, P/N MS35338-136
k. Trunnion, P/N 8593860
l. Head, P/N 8593870
m. Body, P/N 8593859
n. Sleeve End, P/N 8593869

4.3.5 Functional.

4.3.5.1 Ballistics. The test sample shall be rigidly supported so that the entire thrust is borne by the thruster mounting points. The samples shall be tested within 10 minutes after removal from the temperature conditioning chamber. When this time limit is exceeded, the sample units shall be reconditioned at the original temperatures.

4.3.5.2 Temperature conditioning. Each assembled thruster shall be conditioned for not less than 4 hours nor greater than 24 hours. When reconditioning thrusters at •65•F, all condensation shall be removed from the exterior surfaces before returning the thruster to the conditioning chamber.

4.4 Inspection of packaging. The sampling and inspection of the packaging, packing, and container marking shall be in accordance with section 5.

5. PACKAGING

5.1 Packing and marking. Packing and marking shall be Level A or B, as specified by the contracting activity (see 6.2). Level A shall be in accordance with Drawings 8797631 and 8797632. Level B shall be in accordance with Drawings 8797631 and 9221261.

5.1.1 Lot numbers. Lot numbers shall be in accordance with MIL-STD-1168.

5.2 Air Force packaging. Air Force packaging shall be in accordance with TPO 00-891-5488.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful but is not mandatory.)

6.1 Intended use. The thruster assembly is used in conjunction with other propellant actuated devices in Aircrew Emergency Escape Systems.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and revision letter of this specification

b. Issue of DODISS to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.1.1 and 2.1.2)

c. Production test activity and lot size (see 4.1 and 4.2.1)

d. Directions for shipping radiographs of entire production lot along with ballistic sample to the activity conducting production lot acceptance tests (see 4.3.4)

e. Level of packing and marking (see 5.1)

f. That the safety precaution requirements of the ``Contractor's Safety Manual for Ammunition, Explosives, and Related Dangerous Material," DOD 4145.26M are applicable. NOTE: When this specification is used as part of the description of work to be accomplished by a Government activity, the safety precaution requirements of ``Ammunition and Explosives Ashore," OP 5 are applicable.

6.3 Load firing. The expected performance of the thruster, under conditions simulating those existing in aircraft, is obtained when the thruster satisfactorily meets the conditions of the "load" firing.

6.4 Hazard notice. The thruster described herein and certain of its components are flammable, toxic, or explosive and present hazards in manufacture, handling, storage, and shipment. The contractor should recognize these properties and take appropriate measures to guard and protect against fire, explosion, adverse environment, corrosive atmosphere, rough handling, and electrically induced incidents.

6.5 Definition.

6.5.1 Mechanical failure. Mechanical failure is any deformation or breakage of a part, the occurrence of which is other than a design function.

6.6 Subject term (keyword) listing.

Ejection systems, aircrew
Emergency escape systems, aircrew
Escape systems, aircrew
Life-saving systems, aircrew

6.7 Changes from previous issue. Marginal notations are not used to identify changes with respect to the previous issue because of the extensiveness of the changes.

Custodian:

Preparing activity
Navy - OS

Navy - OS

Air Force - 99

(Project 1377-0E13)

Review activity:
Air Force - 70