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SUPERSEDING
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MILITARY SPECIFICATION

ROCKET MOTORS, M5, M5E1, AND M88, METAL PARTS FOR

1. SCOPE

1.1 This specification sets forth requirements for the metal parts for three types of rocket motors.

1.2 Classification. The rocket motors shall be of the following types as specified:

Type I—M5 Rocket Motor Metal Parts Assembly
Type II—M5E1 Rocket Motor Metal Parts Assembly
Type III—M88 Rocket Motor Metal Parts Assembly

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-S-571 —Solder: Lead Alloy, Tin Lead Alloy, and Tin Alloy: Flux Cored Ribbon and Wire, and Solid Form-Q
TT-P-664 —Primer, Coating, Synthetic, Rust Inhibiting, Lacquer Resisting

MILITARY

MIL-P-116 —Preservation, Methods of
MIL-V-173 —Varnish, Moisture and Fungus-Resistant for the Treatment of Communications, Electronic, and Associated Electrical Equipment
MIL-A-2550—General Specification for Ammunition, Except Small Arms Ammunition
MIL-I-6865 —Inspection, Radiograph
MIL-I-6868 —Inspection Process, Magnetic Particle
MIL-S-6872 —Soldering Process, General Specification for
MIL-W-6873 —Welding, Flash, Carbon and Alloy Steel
MIL-H-6875—Heat Treatment of Steels (Air-Craft Practice) Process for
MIL-W-8611 —Welding, Metal Arc and Gas, Steels and Corrosion and Heat Resistant Alloys: Process for
MIL-R-11468 —Radiographic Inspection, Soundness Requirements for Arc and Gas Welds in Steel
MIL-M-11473 —Magnetic-Particle Inspection; Soundness Requirements for Weldments

STANDARDS

FEDERAL

FED-STD-151 —Metals, Test Method

FSC 1336

MILITARY

MIL–STD–105 —Sampling Procedures and Tables For Inspection by Attributes
MIL–STD–129 —Marking for Shipment and Storage
MIL–STD–130 —Identification Marking for U.S. Military Property
MIL–STD–171 —Preparation, Painting, and Finishing for Metal and Wood Surfaces

DRAWINGS

ORDNANCE CORPS

8025074 —Rocket Motor, M5, Metal Parts Assembly
8030046 —Rocket Motor, M5E1, Metal Parts Assembly
8080062 —Crate, Wood, Jato M13 A1 Assembly and Details
8030810 —Rocket Motor, M88, Metal Parts Assembly

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

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

CODE OF FEDERAL REGULATIONS

49 CFR 71–90—Interstate Commerce Commission, Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Orders for copies should cite "49 CFR 71–90 (Revised, 1956)".)

3. REQUIREMENTS

3.1 Applicability. Unless otherwise indicated, all requirements, examination, and tests specified herein shall be applicable to Type I, Type II, and Type III motors (see 6.3).

3.2 Preproduction sample. Unless otherwise specified (see 6.2), the contractor shall furnish preproduction samples for preproduction inspection in accordance with 4.3. The preproduction samples shall be produced by the same methods, processes and techniques to be employed in subsequent production of the contract quantity.

3.3 Materials.

3.3.1 *Type I.* Materials shall be in accordance with Drawing 8025074 and applicable drawings and specifications referenced thereon and as specified herein.

3.3.2 *Type II.* Materials shall be in accordance with Drawing 8030046 and applicable drawings and specifications referenced thereon and as specified herein.

3.3.3 *Type III.* Materials shall be in accordance with Drawing 8030810 and applicable drawings and specifications referenced thereon and as specified herein.

3.4 Design.

3.4.1 *Type I.* Parts and assemblies shall conform to dimensions, tolerance limits, physical properties and degree of surface roughness specified by drawings and specifications referenced on Drawing 8025074.

3.4.2 *Type II.* Parts and assemblies shall conform to dimensions, tolerance limits, physical properties and degree of surface roughness specified by drawings and specifications referenced on Drawing 8030046.

3.4.3 *Type III.* Parts and assemblies shall conform to dimensions, tolerance limits, physical properties and degree of surface roughness specified by drawings and specifications referenced on Drawing 8030810.

3.5 Construction.

3.5.1 *Type I.* Parts and assemblies shall be constructed in accordance with Drawing 8025074 and applicable drawings and specifications referenced thereon and as specified herein.

3.5.2 *Type II.* Parts and assemblies shall be constructed in accordance with Drawing 8030046 and applicable drawings and specifications referenced thereon and as specified herein.

3.5.3 *Type III.* Parts and assemblies shall be constructed in accordance with Drawing 8030810 and applicable drawings and specifications referenced thereon and as specified herein.

3.5.4 *Propellant case insulation.* The interior surface of the propellant case shall be lined with an insulating material which has a low heat transfer coefficient, bonds well with metal and does not bond with the cellulose acetate restrictive container for the propellant grain. The insulation shall be "Flamemastic", fine, color white, or equal (see 6.4) for the intended purpose.

3.5.4.1 The applied insulation shall be .035 inch thick and shall be applied after completion of all tests and within 24 hours after cleaning the propellant case. In the event that the application of the insulation is not feasible within the prescribed time, the interior surface of the propellant case shall be protected from corrosion with a material which is compatible with both the case and the insulation to be applied and otherwise suitable for the intended purpose. The insulation shall be cured a minimum of 24 hours at 180° F. after application to the case interior.

3.5.5 *Welding.* Welding shall be arc process in accordance with Specification MIL–W–8611 except that the ring specified on Drawing 8030123, covering a detail of Drawings 8025074, 8030046, and 8030810, may be flash welded in accordance with Specification MIL–W–6873. Weld beads shall be not more than 3/32 inch high. Weldments shall be stress relieved.

3.5.6 *Soldering.* (Types I and II). Soldering shall be performed in accordance with Specification MIL–S–6872, using solder conforming to Specification QQ–S–571, Class A, Comp–SN–50.

3.5.7 *Heat treatment.* Parts requiring heat treatment shall be heat treated to the hardness ratings specified on the applicable drawings in accordance with Specification MIL–H–6875.

3.6 Performance and product characteristics.

3.6.1 *Rocket motor body assembly.* Each body assembly shall withstand an internal hydrostatic pressure of 1,575 pounds per square inch (psi) for a period of 3 minutes without leakage, rupture or distortion of configuration in excess of tolerances specified on the applicable drawings.

3.6.2 *Soundness requirements of weldments.* Weldments shall meet the soundness requirements of Specifications MIL–R–11468, Standard I, and MIL–M–11473.

3.7 Pretreatment and protective finish. Unless otherwise specified on detail drawings, preparation and finish of metal surfaces shall be as follows:

3.7.1 *Pretreatment.* All metal surfaces shall be cleaned and treated, prior to finishing, in accordance with Standard MIL–STD–171, Finish No. 4.1 and 5.1.

3.7.2 *Protective finish.* A protective finish conforming to Standard MIL–STD–171, System 20.5 shall be applied to all metal surfaces except as follows:

3.7.2.1 *Threads and mating surfaces.* Threads and mating surfaces shall be kept free of finishing materials.

3.7.2.2 *Interior nonmating surfaces.* A coat of primer conforming to Specification TT–P–664 shall be applied to all interior nonmating surfaces except the nozzle area aft of the point of smallest diameter of the exit nozzle throat.

3.7.2.3 *Soldered connections.* (Types I and II). A coat of varnish conforming to Specification MIL–V–173 shall be applied to all soldered connections.

3.8 Marking.

3.8.1 *Product marking.* Parts and assemblies shall be marked for identification in accordance with Standard MIL–STD–130.

3.8.2 *Special marking.* Upon satisfactory completion of hydrostatic pressure tests, the body assembly shall be marked with the letter "H" and shall be impressed in the location specified on Drawing 8030044, covering a detail of Drawings 8025074, and 8030046 and as specified on Drawing 8030809, covering a detail of Drawing 8030810, respectively.

3.9 **Workmanship.** Assemblies and parts shall be free of dirt, grease, chips, rust or other foreign matter. There shall be no cracks, bends, breaks, dents, grooves or other defects which would make any part or assembly unsuitable for the intended purpose. The workmanship shall be of such quality that will insure uniformity of performance and interchangeability of parts and assemblies having the same part numbers.

4. QUALITY ASSURANCE PROVISIONS

4.1 The supplier is responsible for performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 **Lot size.** A lot of metal parts for Types I, II, or III Rocket Motors shall consist of that quantity produced in not more than 24 hours of continuous production with no change in facilities, process or specifications which would change the chemical and physical properties or interchangeability of the parts within like motors.

4.3 **Preproduction provisions.**

4.3.1 *Sample.* Unless otherwise specified, a sample shall consist of one complete metal parts assembly of Type I, II or III Rocket Motor, as specified in the contract or order.

4.3.2 *Inspection location.* Preproduction inspection shall be performed by the Government at a place specified by the procuring activity (see 6.2).

4.3.3 *Inspection.* The sample specified in 4.3.1 shall be subjected to the examination and tests specified in 4.4.2.

4.4 **Production provisions.**

4.4.1 *Sampling.*

4.4.1.1 *For examination.* Sampling for examination shall be in accordance with Standard MIL–STD–105 at inspection level II, Also, at the option of the procuring activity, AQL's and sampling plans may be applied to the individual characteristics listed, using an AQL of 0.25 percent for each major defect and 0.40 percent for each minor defect.

4.4.1.2 *Test samples.* All parts, welds, and body assemblies shall be subjected to the tests as specified herein.

4.4.2 *Inspection.*

4.4.2.1 *Examination.* Examination of the samples selected in 4.4.1.1 shall be in accordance with classification of defects as follows:

4.4.2.1.1 *Classification of defects.*

4.4.2.1.1.1 *Bolt.* (Drawing 8025044, covering a detail of Drawings 8025074 and 8030046; Types I and II, respectively.)

Categories	*Defects*	*Gage or other method of inspection*
	AQL 0.40 percent	
Major	Thread size	Measure
	Overall length	Measure
	Length of taper	Measure
	AQL 1.0 percent	
Minor	Finish	Visual
	Chamfer	Visual

4.4.2.1.1.2 *O-ring.* (Drawing 8025016, covering a detail of Drawings 8025074, 8030046, and 8030810; Types I, II, and III, respectively.)

Categories	*Defects*	*Gage or other method of inspection*
	AQL 0.25 percent	
Major	Inside diameter	Measure
	Thickness	Measure

4.4.2.1.1.3 *Snap ring.* (Drawing 8025082, covering a detail of Drawings 8025074, 8030046 and 8030810; Types I, II and II respectively.)

Categories	Defects	Gage or other method of inspection
	AQL 0.40 percent	
Major	Outside diameter	Measure
	Thickness	Measure
	Hardness	See 4.5.3
	AQL 1.0 percent	
Minor	Finish	Visual
	Marking	Visual

4.4.2.1.1.4 *Spring.* (Drawing 8025098, covering a detail of Drawings 8025074, 8030046, and 8030810; Types I, II, and III, respectively.)

Categories	Defects	Gage or other method of inspection
	AQL 0.40 percent	
Major	Hardness	See 4.5.3
	Loaded Height	Measure
	Diameter	Measure
	Flatness of spring face	Measure
	AQL 1.0 percent	
Minor	Number of coils	Visual
	Finish	Visual

4.4.2.1.1.5 *Gasket.* (Drawing 8025103, covering a detail of Drawings 8025074, 8030046, and 8030810; Types I, II, and III, respectively.)

Categories	Defects	Gage or other method of inspection
	AQL 1.50 percent	
Minor	Outside diameter	Measure
	Inside diameter	Measure
	Thickness	Measure

4.4.2.1.1.6 *Clip, spring.* (Drawing 8025043, covering a detail of Drawings 8025074 and 8030046; Types I and II respectively.)

Categories	Defects	Gage or other method of inspection
	AQL 0.40 percent	
Major	Hardness	See 4.5.3
	Length	Measure
	Width	Measure
	Radius	Measure
	AQL 1.0 percent	
Minor	Hole location	Measure
	Hole size	Measure

4.4.2.1.1.7 *Body, Jato.* (Drawing 8030044, covering a detail of Drawings 8025074 and 8030046; and Drawing 8030809, covering a detail of Drawing 8030810; Types I, II, and III, respectively.)

Categories	Defects	Gage or other method of inspection
Critical	Evidence of having passed hydro-test missing.	Visual
	AQL 0.25 percent	
Major	Aft diameter of nozzle	Measure
	Aft fin yoke anchoring holes, radial location incorrect.	Measure
	Threads incorrect	Measure
	Dimension incorrect, fin stud to fin yoke.	Measure
	Datum dimensions of nozzle incorrect.	Measure
	Hole locations incorrect	Measure
	Incorrect nozzle length	Measure
	Length of assembly incorrect.	
	Inside diameter fwd end	Measure
	Outside diameter fwd end	Measure
	Incorrect threaded holes fwd end.	Measure
	Wall thickness of nozzle	Measure
	Ovalness of tube	Measure
	Rockwell Hardness incorrect (*see note on drawing*).	See 4.5.3
	Hole in welded area	Visual
	Improper Welds	Visual
	Improper flamemastic coating.	Visual
	Flamemastic improperly cured.	Visual
	AQL 1.00 percent	
Minor	Incorrect width of aft yoke	Visual
	Sharp edges not broken	Visual
	Finish	Visual
	Marking	Visual
	Max height of weld	Measure
	Preservative	Visual

4.4.2.1.1.8 *Head.* (Drawing 8025069, covering a detail of Drawings 8025074 and 8030046; and Drawing 8030784, covering a detail of Drawing 8030810; Types I, II, and III, respectively.)

Categories	Defects	Gage or other method of inspection
	AQL 0.65 percent	
Major	Outside diameter incorrect	Measure
	Incorrect threads	Measure
	Diameter, snap ring groove incorrect.	Measure
	Diameter, O-ring groove incorrect.	Measure
	Thickness incorrect	Measure
	Finish	Visual
	AQL 1.50 percent	

Minor	Surface finish not met	Visual
	Marking missing	Visual
	Burrs or sharp edges not removed.	Visual

4.4.2.1.1.9 *Harness assembly.* (Drawing 8030004, covering a detail of Drawings 802-5074 and 8030046; Types I and II, respectively.)

Categories	*Defects*	*Gage or other method of inspection*
	AQL 0.65 percent	
Major	Continuity failure	Voltmeter
	Insulation not molded into plug.	Visual
	Length incorrect	Measure
	Loose components	Manual
	Plug size incorrect	Measure
	AQL 1.00 percent	
Minor	Plug location incorrect	Measure
	Marking missing	Visual

4.4.2.1.1.10 *Closure, shipping.* (Drawing 8030837, covering a detail of Drawings 802-5074, 8030046 and 8030810; Types I, II, and III, respectively.)

Categories	*Defects*	*Gage or other method of inspection*
	AQL 0.40 percent	
Major	Threads incorrect	Measure
	Outside diameter incorrect	Measure
	Depth of holes incorrect	Measure
	AQL 2.50 percent	
Minor	Color incorrect	Visual
	Not opaque	Visual
	Shoulder thickness incorrect.	Measure
	Overall thickness incorrect	Measure
	Marking incorrect	Visual

4.4.2.1.1.11 *Rod, resonance.* (Drawing 8025087, covering a detail of Drawings 802-5074, 8030046 and 8030810; Types I, II, and III, respectively.)

Categories	*Defects*	*Gage or other method of inspection*
	AQL 0.40 percent	
Major	Component missing	Visual
	Hole locations incorrect	Measure
	Rod threads incorrect	Measure
	AQL 1.50 percent	
Minor	Grommets inadequately compressed.	Visual
	Part number missing	Visual
	Finish	Visual
	Rod length incorrect	Measure

4.4.2.1.1.12 *Closure, nozzle.* (Drawing 8030041, covering a detail of Drawing 802-5074 and 8030046; and Drawing 8030782, covering a detail of Drawing 8030810; Types I, II, and III, respectively.)

Categories	*Defects*	*Gage or other method of inspection*
	AQL 0.40 percent	
Major	Diameter incorrect	Measure
	Inadequate cement	Manual
	Cord clip missing (Types I and II).	Visual
	AQL 1.0 percent	
Minor	Component incorrectly assembled (Type I and II).	Visual
	Overall length incorrect	Measure

4.4.2.2 *Testing.*

4.4.2.2.1 *Weldments.* All arc process weldments shall be subjected to magnetic particle inspection as specified in 4.5.1, after hydrostatic testing. Flash weldments shall be subjected to radiographic inspection as specified in 4.5.2.

4.4.2.2.2 *Body assemblies.* Each body assembly shall be subjected to hydrostatic pressure test as specified in 4.5.4.

4.4.3 *Examination of preservation, packing and marking.* Preservation, packing, and marking shall be examined to determine conformance with the requirements specified in section 5.

4.5 Tests.

4.5.1 *Magnetic particle inspection.* Magnetic particle inspection shall be conducted in accordance with Specification MIL-I-6868.

4.5.2 *Radiographic inspection.* Radiographic inspection shall be conducted in accordance with Specification MIL-I-6865.

4.5.3 *Rockwell hardness.* Rockwell hardness of parts and assemblies shall be determined in accordance with Federal Test Method Standard 151.

4.5.4 *Hydrostatic pressure test.* The hydrostatic pressure test shall be conducted in such a manner to insure that the assembly components are free to expand in any direction. There shall elapse at least 48 hours between heat treatment of the components and

hydrostatic test of the assembly. The assembly shall be subjected to a pressure of 1,575, plus or minus 10, psi for a period of 3 minutes and shall be inspected to determine compliance with the requirements of 3.6.1.

4.6 Preservation, packing and marking. Visual and tactile examination of preservation, packing and marking shall be performed to determine compliance with the requirements of section 5.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packing and marking.

5.1.1 *Preservation.* Cleaning and the application of preservatives shall be in accordance with Specification MIL–P–116.

5.1.1.1 *Preservative coating.* All cleaned, unpainted ferrous metal shall be coated with type P–2 preservative.

5.1.2 *Packing and marking.* Unless otherwise specified (see 6.2), packing and marking for Types I, II and III motor assemblies shall be in accordance with Drawing 8030062, Standard MIL–STD–129 and Interstate Commerce Commission requirements specified in Code of Federal Regulations 49 CFR 71–90.

5.2 Data cards. Data cards shall be furnished in accordance with Specification MIL–A–2550.

6. NOTES

6.1 Intended use. These metal parts are intended for use in 3 separate motor applications serving as boosters for the Nike-Ajax and Nike-Hercules Guided Missiles (see 6.3).

6.2 Ordering data. Procurement documents shall specify the following:

(a) Title, number and date of this specification.
(b) Specifically which type motor is required (see 1.2 and 6.3).
(c) Whether a preproduction sample is required (see 3.2 and 4.3).
(d) Preproduction inspection location (see 4.3.2).
(e) Packing and marking requirements, if other than specified (see 5.1.2).

6.3 Definitions.

6.3.1 *Type I. (M5).* For procurement of motors under this specification, to be used for Nike-Ajax application only, Type I is preferred. This type motor cannot be utilized for Nike-Hercules application.

6.3.2 *Type II. (M5E1).* For procurement of repair parts under this specification, that may be utilized for either Nike-Ajax or Nike-Hercules application, Type II is preferred.

6.3.3 *Type III. (M88).* For procurement of motors under this specification, to be used for Nike-Hercules application only, Type III is preferred. This type motor cannot be utilized for Nike-Ajax application.

6.4 Flamemastic insulation. Flamemastic (fine, color white) may be procured from Falemastic Chemicals Inc., 3313 Hoke Avenue, Culver City, California (see 3.5.3).

Custodian:
Army—(MI)

Preparing activity:
Army—(MI)