MILITARY SPECIFICATION

MOTOR, ROCKET, 2.75 INCH, MARK 66 MODS

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

1. SCOPE

1.1 Scope. This specification establishes the requirements for the manufacture and inspection of the 2.75 inch Rocket Motor, Mark 66 Mods.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks 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.

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-453	Inspection, Radiographic
MIL-STD-810	Environmental Test Methods
MIL-STD-1167	Ammunition Data Cards
MIL-STD-1168	Ammunition Lot Numbering
MIL-STD-1235	Single and Multi-level Continuous Sampling Procedures and Tables for Inspection by Attributes

Beneficial comments, (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the Naval Air Engineering Center, Engineering Specifications and Standards Department (Code 93), 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.

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings and publications form a part of this specification to the extent specified herein.

DRAWINGS

US ARMY

9335616	Packing and Marking for Container, Ammunition, Fiber PA 87 for Rocket Motor: 2.75 Inch MK 66, Mod 1 or Mod 2
9335617	Container, Ammunition, Fiber PA 87 for Rocket Motor: MK 66 Mod 1 or Mod 2
9335618	Packing and Marking of Hood Box for Rocket Motor 2.75 Inch MK 66, Mod 1 or Mod 2

NAVAL AIR SYSTEMS COMMAND

233AS400	Motor, Rocket, 2.75 Inch, Hark 66 Mod 1
233AS500	Motor, Rocket, 2.75 Inch, Mark 66 Mod 2
233AS424	MK 66 Mod 1 Shipping Container, Loaded Assembly
233AS425	MK 66 Mod 1 Shipping Container, Palletization of Loaded Assembly

PUBLICATIONS

CODE OF FEDERAL REGULATIONS

49 CFR 100-199 Transportation

(Copies of specifications, standards, handbooks, 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.)

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

3. REQUIREMENTS

3.1 First article. When specified, a sample shall be subjected to first article inspection (see 4.4 and 6.4).

3.2 Material. Unless otherwise specified in the contract or purchase order, material utilized in the fabrication of the rocket motor shall conform to the specifications and requirements on drawings 233AS400 and 233AS500 for Mod 1 and Mod 2 respectively.

3.2.? Recycled, virgin and reclaimed materials. There is no exclusion to the use of recycled or reclaimed materials and no mandate for the use of virgin materials provided it meets the requirements of this specification.

3.3 Parts. All component parts of each loaded motor shall be assembled and installed properly. The presence, condition, location and orientation of each component part shall conform to the requirements specified on drawings 233AS400 and 233AS500 Mod 1 and Mod 2 respectively. The motor shall be free from foreign material. O-rings and sealing rings shall show no evidence of cuts, twist or other damage resulting from assembly (see 4.6.2).

3.4 Design and construction. The rocket motor shall be of the design, construction and physical dimensions specitfied on 233A5400 and 233AS500 for Mod 1 and Mod 2 respectively.

3.5 Continuity. The ignition circuit of each loaded motor shall meet the requirements specified on 233AS400 and 233AS500 for Mod 1 and Mod 2 respectively (see 4.6.1).

3.6 Performance.

3.6.1 Static firing.

3.6.1.1 Maximum thrust. Motors fired at +66°C shall not exceed 2200 pounds thrust (early maximum or late maximum, see 6.5.1 and 6.5.2).

3.6.1.2 Motor tube. All motor tubes, after static firing, shall be free of any incipient failures that result in a bulge in the side of the motor tube 1/16 inch high or higher.

3.6.1.3 Thrust-time curves. Thrust-time curve traces shall lie entirely between the appropriate dotted lines of figure 1. The total impulse requirements at each temperature shall be as specified on figure 1.

3.6.1.4 Ignition delay. The maximum allowable ignition delay shall not exceed 30 milliseconds (ins) at -46°C or 15 ms at +66°C.

3.6.2 Field firing.

3.6.2.1 External ballistics. The lot sample standard deviation about the average lateral deflection shall not exceed 30 rolls. Each sample round shall accelerate such that the true velocity and time (from time of ignition, to) when rocket motor burnout occurs shall be within the following limits:

Warhead Type	Velocity (M/See) Lowe r Limit (-46°C)	Velocity (M/See) Upper Limit (+66°C)	Time (See) Lower Limit (+66°C)	Time (See) Upper Limit (-46°C)
M151	690	750	0.9	1.3
M267	580	640	0.9	1.3

3.6.2.2 Time of first motion. Delay of time of first motion at each temperature shall be as follows:

Temperatures, °C	First Motion Time (See) Upper Limit
-46°	0.060
+46°	0.050
+66°	0.040

3.6.2.3 Rupture.The motor tube shall not rupture or suffer loss of components.

3.6.2.4 Erratic behavior. The motor shall not exhibit erratic behavior (see 6.5.3).

3.7 Environmental requirements. The loaded assembly shall not leak, suffer damage, initiate or fail to meet the performance requirements after being subjected to the environmental tests of 4.6.5.

3.8 Finish. Rocket motors shall be treated and painted as specified on drawings 233AS400 and 233AS500 for Mod 1 and Mod 2 respectively.

3.9 Identification marking. Rocket motors shall be marked as specified on drawings 233AS400 and 233AS500 for Mod 1 and Mod 2 respectively.

3.10 Workmanship. All components shall be free from burrs or sharp edges that could be a safety hazard in handling. Mets? parts shall be free of rust and other foreign material. The cleaning method used shall not be injurious to any part nor shall the parts be contaminated by the ‘cleaning agent. Surface coatings shall be continuous except for a few light scratches which do not expose base material.

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 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.4).
b. Quality conformance inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified (see 6.2), inspection conditions shall be as specified in the applicable test method.

4,4 First article inspection. First article inspection shall be performed by the contractor, after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on sample units which have been produced wtth equipment and procedures normally used in production.

4.4.1 Sample size. The sample size shall be 100 loaded rocket motors.

4.4.2 Inspection routine. The sample shall be subjected to the tests as specified in figure 2.

4.4.3 Failures. Failure of any motor shall be cause for first article rejection.

4.5. Quality conformance inspection. Quality conformance inspection shall consist of the following inspections:

a. Individual inspections (see 4.5.1).
b. Sampling inspection (see 4.5.2).

4.5.1 Individual inspections. Individual inspections are those inspections conducted on each loaded motor. Individual inspections for the loaded motor are shown on table II. Failure to pass any of these inspections shall be cause for rejection of the loaded motor.

4.5.2 Sampling inspection. The sampling inspection shall consist of the tests and examinations shown on table III, 4.6.3 and 4.6.4 through 4.6.5.6 inclusive.

4.5.3 Inspection lot. The term "lot" as used throughout this specification refers to an inspection lot, which is defined as an essentially homogeneous collection of units of product from which a representative sample is drawn and inspected to determine conformance of the lot with applicable requirements. The sample selected shall represent only that quantity of units from which the sample was drawn and shall not be construed to represent any prior or subsequent quantities presented for inspection. Homogeneity shall be considered to exist provided the lot has been produced by one manufacturer, in one unchanged process using the same materials and methods in accordance with the same drawings, same drawing revisions, same specifications and same specification revisions. Changes to either the process, specifications, or drawings, not affecting safety, performance, Interchangeability, or storage, as determined by the Government, shall not be deemed to alter the homogeneity of the lot. Inspection lots shall comply with MIL-STD-105. Unless otherwise approved by the contracting officer, the Inspection lot size of major assemblies or end Items deliverable under the contract shall not be less than the smallest weekly estimate of quantities contractually scheduled for production during the contract period nor more than the largest quantity contractually scheduled for delivery during any month of the contract period. Unless otherwise approved by the contracting officer (see 6.2.1), the inspection lot size of motors deliverable under contract shall be approximately 20,000 units. Inspection lots of components or subassemblies, other than the items of delivery, shall be homogeneous and of a size mutually convenient to both the contractor and the Government Inspector. Lot numbering, as required, shall be in accordance with MIL-STD-1168. Ammunition data cards shall be prepared for each lot in accordance with MIL-STD-1167. The maximum number of lots of components and the source of each component lot which can be assembled Into one loaded motor lot shall be as specified in table I.

a. There shall be no intermingling of components between manufacturers except as noted above. Insofar as practicable, manufacturers lot numbers within an amunition lot and in consecutive ammunition lots shall be in consecutive numerical sequence.

b. Every effort shall be made to assemble components of metal parts lots together.

c. Lot numbers and quantities for each of the listed metal parts components shall be recorded on the reverse side of the ammunition data card.

4.5.4 Sampling plan. Sampling plans and procedures for the classification of major and minor defects shall be in accordance with MIL-STD-105, Inspection level 1, except that continuous sampling plans In accordance with MIL-STD-1235 may be used if approved by the acquiring activity. An AQL may be applied to individual charactersistics using an AQL of .40 percent for each individual major defect and an AQL of .65 percent for each Individual minor defect (see table III). These criteria shall also apply to shipping containers procured by the motor assembly contractor (see tables IV through VII).

4.5.5 Classification of defects. Defects shall be classified as shown in table II for critical defects and in tables III through VII inclusive for major and minor defects.

4.6 Methods of inspection.

4.6.1 Continuity. Each loaded motor shall be individually inspected for continuity of the ignition circuit in accordance with the applicable drawing.

4.6.2 Fluoroscopic or radiographic test. Each loaded motor shall be individually Inspected. If a fluoroscope is used, the loaded motors shall be slowly rotated about their longitudinal axis during viewing. The technique shall be judged correct when the image details of the component parts are sharply-defined on the Fluoroscopic screen. If a radiograph is used, the loaded motors shall be X-rayed in two planes, 90 degrees apart in accordance with MIL-STD-453 to determine compliance with the requirements of 3.3.

4.6.3 Static firing test. The loaded motor shall be static fired on a test stand. The test stand'- and recording equipment shall be approved by the Government. Sixteen motors from each lot shall be conditioned (8 at 66°C and 8 at -46°C) to assure a uniform temperature throughout its entire mass at the time of firing. Minfmbm-conditioning time shall be eight hours. During the last three hours of conditioning, the cabinet temperature shall be maintained within three degrees of the specified temperature. Any loaded motor not fired within ten minutes shall be returned to-the applicable temperature conditioning chamber for not less than one hour to achieve a 'stable temperature. -The motor thrust adapter, thrust load cell, and recording equipment used-to measure the performance data shall be approved by the Government. A direCt current (de) power supply shall provide a firing pulse of 1.3 to 1.5 amperes to the ignition circuit of the loaded motor. The resistance of the loaded motor shall be determined and recorded prior to firing with equipment which limits the test current to 25 milliamperes, maximum. Thrust-time curve traces shall lie entirely between the appropriate dotted lines of figure 1. All thrust-time curves shall be examined. Each curve shall be classified as being normal, or defective. The condition which would cause a thrust-time curve to be classified as defective is failure of the curve to meet the shape requirements of figure 1. A sudden change in thrust on the time curve which exceeds 150 pounds followed by an abrupt return to a normal thrust level calls for a thorough investigation as to the cause. The total impulse provided by the motor shall be within the limits as listed on Figure 1. Any loaded motor firing that results in a motor tube rupture shall be cause to reject the lot. Performance data acquired during the test shall be tabulated on a format similar to table VIII (see 6.2.2).

4.6.4 Field firing test. The loaded motor and warhead assembly shall be fired from a launcher and data acquisition system approved by the Government. -A sample of 24 loaded motore assemblies from each lot shall be selected for the field firing test. The motors shall be inspected for compliance with the drawing and specification requirements. Each sample motor assembly shall be radiographed in two planes and the X-rays identifiable to the appropriate motor for future reference. The sample shall be evenly divided and conditioned at three temperatures, -46°C, +46°C and +66°C, prior to field firing. A warhead shall be assembled and torqued onto each sample motor. The acceptance, rejection or re-test criteria are presented on table IX. Firing of the entire sample shall be performed regardless of the number of rejected units. If a retest is required, a double sample shall be tested at each temperature. The remaining assemblies or parts of a rejected motor shall be gathered and retained until an evaluation is performed.

4.6.4.1 Conditioning. Each complete round selected shall be weighed (nearest one hundredth kilograms) and conditioned to assure a uniform temperature throughout its entire mass at the time of firing. Minimum conditioning time shall be 8 hours. During the last three hours of conditioning. the cabinet temperature shall be maintained within three degrees of the temperatures specified. A complete round left out of the conditioning cabinet in excess of ten minutes prior to firing shall be returned to the applicable temperature conditioning chamber for not less than one hour to achieve a stable temperature. A direct current power supply shall provide a firing pulse of 1.3 to 1.5 amperes to the ignition circuit of the rocket motor.

4.6.4.2 Firing. Each sample round shall be fired from a pedestal mounted launcher. The launcher shall be constructed such that the launch quadrant elevation (QE) can be varied from +20 degrees to -20 degrees and azimuth varied ±30 degrees. The elevation of the longitudinal axis of the launch tubes directly above the launcher pedestal shall be considered O (zero) elevation reference. The launcher shall have a detent release force of 2OO ± 20 pounds or shall have a blast actuated detent. The launcher assembly shall be so fabricated and mounted that the azimuth and quadrant elevation (QE) shall remain fixed during firing of all sample rounds. The launcher azimuth and QE shall be recorded for each sample round fired. Performance data acquired during the test shall be tabulated on a format similar to table X (see 6.2.2).

4.6.4.3 Data. A data acquisition and reduction system shall be utilized that is capable of accurately monitoring the prelaunch, launch, flight and impact (and detonation); record the acquired data and be capable of rapid semi-automatic reduction of pertinent data to permit quality assessment of sample rounds by measurement of round parameters. The data recorded during the ballistic test shall be such that subsequent data reduction shall Provide accurate measurement (or detection) of the parameters of table X.

4.6.5 Environmental tests. The test sequence and sample size shall be as specified in figure 2. Each motor shall be inspected in accordance with the drawings and specifications prior to the environmental tests. Following the environmental conditioning, each motor shall be inspected for cracks, broken components, or other failures prior to static firing.

4.6.5.1 Leakage. Leakage testing shall be in accordance with MIL-STD-810, Method 512.2, Procedure 1.

4.6.5.2 Temperature cycling. Temperature cycling shall be in accordance with MIL-STD-810, Method 503.2, Procedure I except that the low temperature shall be -54°C and the high temperature +66°C.

4.6.5.3 Handling shock. Each motor, with inert 10 pound warhead, shall be dropped from 2 feet to impact on a concrete surface. The orientation shall be 45° with the nozzle end down. Two motors shail be dropped at -46°C and two at +66°C.

4.5.5 Class ification of defects. Defects shall be classified as shown in table II for critical defects and in tables III through VII Inclusive for major and minor defects.

4.6 Methods of inspection.

4.6,? Continuity. Each loaded motor shall be individually inspected for continuity of the ignition circuit in accordance with the applicable drawing.

4.6.2 Fluoroscopic or radiographic test. Each loaded motor shall be individually inspected. If a fluoroscope is used, the loaded motors shall be slowly rotated about their longitudinal axis during viewing. The technique shall be judged correct when the image details of the component parts are sharply defined on then fluoroscopic screen. If a radiograph is used, the loaded motors shall be X-rayed in two planes, 90 degrees apart in accordance with MIL-STD-453 to determine compliance with the requirements of 3.3.

4.6.3 Static firing test -The loaded motor shall be static fired on a test stand. The test Stand and recording equipment shall be approved by the Government. Sixteen-mtors-from each lot shall be conditioned (8 at 66°C and 8 at -46°C) to assure a uniform temperature throughout its entire mass at the time-of-ftring. Minimum-condttlonlng time shall be eight hours. During the last three hours of conditioning, the cabinet temperature shall be maintained within three degrees of the specified temperature. Any loaded motor not fired within ten minutes shall be returned to the applicable temperature conditioning chamber for hot-less than one hour to achieve a stable temperature. The motor thrust adapter, thrust load cell, and recording equipment used to measure the performance data shall be approved by the Government. A direct current (dc) power supply shall provide a firing pulse of 1.3 to 1.5 amperes to the ignition circuit of the loaded motor. The resistance of the loaded motor shall be determined and recorded prior to firing with equipment which limits the test current to 25 milliamperes, maximum. Thrust-ttme curve traces shall lie entirely between the appropriate dotted lines of figure 1. All thrust-time curves shall be examined. Each curve shall be classified as being normal, or defective. The condition which would cause a thrust-time curve to be classified as defective is failure of the curve to meet the shape requirements of figure 1. A sudden change in thrust on the time curve which exceeds 150 pounds followed by an abrupt return to a normal thrust level calls for a thorough investigation as to the cause. The total impulse provided by the motor shall be within the limits as listed on Figure 1. Any loaded motor firing that results in a motor tube rupture shall be cause to reject the lot. Performance data acquired during the test shall be tabulated on a format similar to table VIII (see 6.2.2).

4.6.4 Field firing test. The loaded motor and warhead assembly shall be fired from a launcher and data acquisition system approved by the Government. A sample of 24 loaded motor assemblies from each lot shall be selected for the field firing test. The motors shall be inspected for compliance with the drawing and specification requirements. Each sample motor assembly shall be radiographed in two planes and the X-rays identifiable to the appropriate motor for future reference. The sample shall be evenly divided and conditioned at three temperatures, -46°C, +46°C and +66°C, prior to field firing A warhead shall be assembled and torqued onto each sample motor. The acceptance, rejection or re-test criteria are presented on table IX. Firing of the entire sample shall be performed regardless of the number of rejected units. If a retest is required, a double sample shall be tested at each temperature. The remaining assemblies or parts of a rejected motor shall be gathered and retained until an evaluation Is performed.

4,6.4.1 Conditioning. Each complete round selected shall be weighed (nearest one hundredth kilograms) and conditioned to assure a uniform temperature throughout its entire mass at the time of firing. Minimum conditioning time shall be 8 hours. During the last three hours of conditioning. the cabinet temperature shall be maintained within three degrees of the temperatures specified, A complete round left out of the conditioning cabinet in excess of ten minutes prior to firing shall be returned to the applicable temperature conditioning chamber for not less than one hour to achieve a stable temperature. A direct current power supply shall provide a firing pulse of 1.3 to 1.5 amperes to the ignition ciruit of the rocket motor.

4.6.4.2 Firing. Each sample round shall be fired from a pedestal mounted launcher. The launcher shall be constructed such that the launch quadrant elevation (QE) can be varied from +20 degrees to -20 degrees and azimuth varied ±30 degrees. The elevation of the longitudinal axis of the launch tubes directly above the launcher pedestal shall be considered O (zero) elevation reference. The launcher shall have a detent release force of 200 ± 20 pounds or shall have a blast actuated detent, The launcher assembly shall be so fabricated and mounted that the azimuth and quadrant elevation (QE) shall remain fixed during firing of all sample rounds. The launcher azimuth and QE shall be recorded for each sample round fired. Performance data acquired during the test shall be tabulated on a format similar to table X (see 6.2.2).

4.6.4.3 Data. A data acquisition and reduction system shall be utilized that is capable of accurately monitoring the prelaunch, launch, flight and impact (and detonation); record the acquired data and be capable of rapid semi-automatic reduction of pertinent data to permit quality assessment of sample rounds by measurement of round parameters. The data recorded during the ballistic test shall be such that subsequent data reduction shall provide accurate measurement (or detection) of the parameters of table X.

4.6.5 Environmental tests. The test sequence and sample size shall be as specified in figure 2. Each motor shall be inspected in accordance with the drawings and specifications prior to the environmental tests. following the environmental conditioning, each motor shall be inspected for cracks, broken components, or other fal lures prior to static firing.

4.6.5.1 leakage. Leakage testing shall be in accordance with MIL-STD-810, Method 512.2, Procedure 1.

4,6.5.2 Temperature cycling. Temperature cycling shall be in accordance with MIL-STD-810, Method 503.2, Procedure I except that the low temperature shall be -54°C and the high temperature +66°C.

4.6.5.3 Handling shock. Each motor, with inert 10 pound warhead, shall be dropped from 2 feet to impact on a concrete surface, The orientation shall be 45° with the nozzle end down. Two motors shall be dropped at -46°C and two at +66°C.

4.6.5.4 Fixed wing shock. The motor and warhead assembly shall be Inserted into a LAU-61/68 launcher or tube assembly. Each motor shall be subjected to shock in all three axes. Testing shall be in accordance with MIL-STD-810, Method 516.3, Procedure I with the exception that 6 half sine shock pulses with a peak of 10.0 g's and 18 ms duration shall be generated in both the vertical and transverse axes (3 shocks in each direction) and 6 half sine shock pulses with a peak of 13.5 g's and 18 ms duration shall be generated in the longitudinal axis (three shocks in each direction). Testing shall be at ambient temperature.

4.6.5.5 Helicopter vibration. The M260 launcher shall be secured to the vibration equipment by means of an Army helicopter bomb rack and rigid fixture. The bomb rack shall suspend the launcher in the normal position. Sufficient instrumentation will be utilized to ascertain the major motions of the launcher and to limit the response of the launcher to the levels prescribed in table XI. The accelerometers shall be mounted in a plane parallel to the vibration axis. Testing shall be at ambient temperature.

4.6.5.6 Fixed wing vibration. Testing shall be in accordance with MIL-STD-810, Method 514.3, category 7A. The rocket motors with inert 10 lb warheads shall be subjected to the following vibration while loaded in a LAU-68 D/A Navy launcher: 0.02 g^2/Hz random vibration covering the frequency range of 10-20,000 Hz flat in each of (3) mutually perpendicular axes. Test duration per axis shall be 1 1/2 hours at ambient temperature.

4.6.6 Examination. Rocket motors shall be inspected for conformance to the requirements of this specification and applicable drawing with respect to material, design, construction, finish, marking and workmanship.

4.7 Inspection of packaging. The sampling and Inspection of the preservation-packaging, packing and container marking shall conform to this specification (see section 5). For classification of defects on containers and boxes, see tables IV through VII. The method of inspection for these defects snail be visual.

5. PACKAGING

5.1 Preservation-packag~ng and marking.

5.1.1 Army preservation-packaging and marking.

5.1.1.1 Level A. The rocket motors shall be preserved-packaged and marked in accordance with Drawing 9335616.

5.1.1.2 Level C. The rocket motors shall be preserved-packaged in accordance with Drawing 9335616.

5.1.2 Navy preservation-packaging and marking.

5.1.2.1 Level A. The rocket motors shall be preserved-packaged in accordance with Drawing 233AS424. Unit packages and shipping containers shall be marked in accordance with MIL-STD-129 and 49 CFR 170-190.

5.2 Packing and marking.

5.2.1 Army packing and marking.

5.2.1.1 Level A. The packaged motors shall be packed and marked in accordance with Drawing 9335618.

5.2.1.2 Level C. The packaged motors shall be packed in accordance with Drawing 9335618. Marking shall be on a shipping label.

5.2.2 Navy packing and marking.

5.2.2.1 Level A. Packing and marking shall be in accordance with 49 CFR 170-190, and Drawing 233AS425.

6. NOTES

6.1 Intended use. The MK 66 Mod 1 and Mod 2 Rocket Motors are intended to propel a wide assortment of warheads at ranges exceeding 6500 meters. They may be fired from either Army rotary-wing aircraft or Navy fixed-wing and rotary-wing aircraft. The basic difference between the MK 66 Mod 1 and Mod 2 Rocket Motors is that the Mod 2 contains a hazards of electromagnetic radiation to ordinance (HERO) filter which allows it to be handled and stored in standard electromagnetic radiation environments, making it HERO-SAFE. The MK 66 Mod 1 is not considered HERO-SAFE.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documetns should specify the following:

a. Title, number and date of this specification

b. If first article sample is required

c. Level of packaging required.

d. Lot size, If other than 4.5.3.

e. That the safety precaution requirements of the “Contractors’ 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, Naval Ordnance System Command Manual, are applicable.

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates 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:

Paragraph No.	Data Requirement Title	Applicable DID No. Option
4.6.3 and 4.6.4.2	Reports, Test, Specification Appendant	UDI-E-20602A

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000. Vol, Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.3 Contractor design, Special calibration and test equipment necessary to accomplish the requirements as stated herein may be designed and manufactured by the contractor. Contractor designs shall be supported by detailed drawings which depict all information necessary to completely fabricate, calibrate and operate an item of inspection equipment. This requires that the necessary views, dimensions, materials, finish, notes operating and calibrating instructions be properly depicted in accordance with approved practices to the extent that further calculations or clarification will not be required. Unless otherwise specified, contractor designs may be developed on the format the contractor normally employs in his equipment design procedure provided such format reflects the detail and information specified above, subject to the following controls: All submitted contractor designs shall conform to DOD-D-1000, LEVEL 2.

6.3.1 Submission of contractor design. All submitted design shall contain a reference to the applicable paragraphs of this specification and test equipment shall be approved by the Government prior to submission of first article sample. Partial submission of design is permissible. However, the completion date for design review will be based on the date of the final submission. Design review at the Government will be accomplished approximately 30 days after receipt.

6.4 First article. When a first article Inspection is required, the item will be tested and should be a first article sample. First article approval is valid only on the contract under which it is granted, unless extended by the Government to other contracts, The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, test approval of the documents and disposition of first article.

6.5 Definitions.

6.5.1 Early maximum thrust. Early maximum thrust Is defined as the highest maximum thrust reached during the first 0.020 second of burning. If the trace oscillates, it is the highest thrust reached by the line connecting the midpoints of the initial thrust oscillations.

6.5.2 Late maximum thrust. Late maximum thrust is defined as the highest thrust reached after 85 percent of the burning time.

6.5.3 Erratic behavior. Erratic behavior is defined as incidents that occur during field firings which in the judgment of the Government might cause the lot to be suspect from a safety or performance standpoint. These include abnormal noise during propellant burning, a corkscrewing trajectory (6.5.3.1), tumbling (6.5.3.2) and other deficiencies which indicate the motor is not performing satisfactorily.

6.5.3.1 Corkscrewing. Corkscrewing shall be defined as any spiral movement or displacement of the aft end of the motor about the predicted straightline trajectory of the rocket during flight. A round to be considered defective for corkscrewing shall exhibit an angle of 30° or more between the normal flight path and the furthest displacement of the aft end of the motor. Observance of the round and not of the smoke will be used to determine corkscrewing. This displacement shall be observed and recorded by a trained and experienced range observer. Range wind conditions should also be noted and observed because this factor may also lead to observations that may appear to be corkscrewing smoke trails.

6.5.3.2 Tumbling. Tumbling shall be defined as any end-over-end displacement of the motor during flight.

Custodians:
Navy - AS
Army - MI

Preparing activity:
Navy - AS
(Project No. 1340-0671)

TABLE I. Component lot numbers and sources.

Component	Maximum Number of lots	Source of component lots
Motor tube	Three	A single contractor's production
Nozzle assembly	Six	A single contractor's production
Igniter	Two	A single contractor's production
Propellant grain	One	A single contractor's production
Sealing ring	Two	A single contractor's production
O-ring	Two	A single contractor's production
Spacer assembly	Two	A single contractor's production
Stablizing rod assembly	Two	A single contractor's production
Charge support disc	Two	A single contractor's production
Inner and outer heat shields	Two	A single contractor's production
Immobilizer spring	Two	A single contractor's production
Lockwire	Two	A single contractor's production
Felt washer	Two	A single contractor's production

TABLE II. Individual inspections (rocket motor).

Classification of defect	Examination or test (after painting)	Requirement paragraph	Method paragraph
Critical			
1	Shielding for restraint band missing or improperly positioned	3.4	4.6.6
2	Continuity	3.5	4.6.1
3	Parts	3.3	4.6.2

TABLE III. Sampling inspections (rocket motor).

Classification of defect	Examination or test	AQL percent defective	Requirement paragraph	Method paragraph
Major				
101/102/105	Painting and marking incorrect	.40	3.8, 3.9	4.6.6
104	Lockwire flush with motor tube	.40	3.4	4.6.6
Minor				
201	Evidence of poor workmanship	.65	3.10	4.6.6

TABLE IV. Sampling inspections (Ammunition Container, Army dwg 9335617).

Classification of defect	Examination or test	AQL percent defective	Requirement paragraph	Method paragraph
Major				
101	Motor exposed or loose	.40	5.1.1	4.7
102	Container incomplete or damaged	.40	5.1.1	4.7
Minor				
201	Poor workmanship and marking	.65	5.1.1	4.7

TABLE V. Sampling inspections (Ammunition Box, Army dwg 9335618).

Classification of defect	Examination or test	AQL percent defective	Requirement paragraph	Method paragraph
Major				
101	Inadequate packing material	.40	5.2.1	4.7
102	Box damaged	.40	5.2.1	4.7
103	Strapping loose or broken	.40	5.2.1	4.7
Minor				
201	Poor workmanship and marking	.65	5.2.1	4.7

TABLE X. Field firing performance data.

Item Description	Program	Motor Lot No	Warhead Lot No	Fuze Lot No.	Location	Pad No.	Test Date
Operators	Launcher Type	Launcher Qt.	Launcher Elevation	Dist to RNG Marker	Video Tape ( ) Yes ( ) No ___ mm		Tape Record Speed
Time Code Format	Comments						

RU No	Fire Pulse Time (sec)	Time to 1st Motion (msec)	I.R.		Motor Burnout					Impact			Warhead Function		Wind		Air		Cond Temp. (°C)	Cont. Resis. (Ohms)	Wgt. (kg)	Track		Flight		Fuze Time		MPSM Func. (sec)	Comments
			Time (sec)	Vel (m/s)	Time (sec)	Vel. (m/s)	Rng. (m)	AZI (Deg)	Ele. (mil)	Time (sec)	Rng (mil)	AZI (Deg)	Set	Unset	Vel (m/s)	AZI (Deg)	Temp (°C)	Pres. (psia)				Y	N	Set	Unset	Set (sec)	Func. (sec)		
01																													
02																													
03																													
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14																													
15																													

TABLE XI. 2.75-Inch rocket motor vibration test levels (maximum).

Condition	Time per axis (hour)	Loc	Vertical axis 11 Hz g^2/Hz	Vertical axis 22 Hz g^2/Hz	Vertical axis 33 Hz g^2/Hz	Vertical axis 44 Hz g^2/Hz	Vertical axis Total grams	Transverse axis 11 Hz g^2/Hz	Transverse axis 22 Hz g^2/Hz	Transverse axis 33 Hz g^2/Hz	Transverse axis 44 Hz g^2/Hz	Transverse axis Total grams	Longitudinal axis 11 Hz g^2/Hz	Longitudinal axis 22 Hz g^2/Hz	Longitudinal axis 33 Hz g^2/Hz	Longitudinal axis 44 Hz g^2/Hz	Longitudinal axis Total grams
M260 Loaded	0.8	Fwd	0.018	0.07	0.02	0.045	0.54	0.008	0.21	0.01	0.025	0.63	0.007	0.06	0.014	0.016	0.35
		Aft	0.08	0.7	0.0037	0.08	1.3	0.0025	1.2	0.015	0.06	1.45	0.028	0.15	0.008	0.017	0.55
M260 3 Rocket load	0.63	Fwd	0.03	0.19	0.2	0.05	0.8	0.0025	0.02	0.29	0.03	0.8	0.003	0.014	0.01	0.015	0.23
		Aft	0.07	0.18	0.13	0.03	0.9	0.0015	0.42	0.1	0.055	0.76	0.018	0.008	0.01	0.04	0.3

NOTES:
1. For the loaded condition only, 4 minutes of the 0.8 hours per axis shall be at a level of twice (2x) the total grams.
2. Two Hz bandwidth at each test frequency.
3. Maximum vibration test level applies to either fwd or aft accelerometer, whichever occurs first.

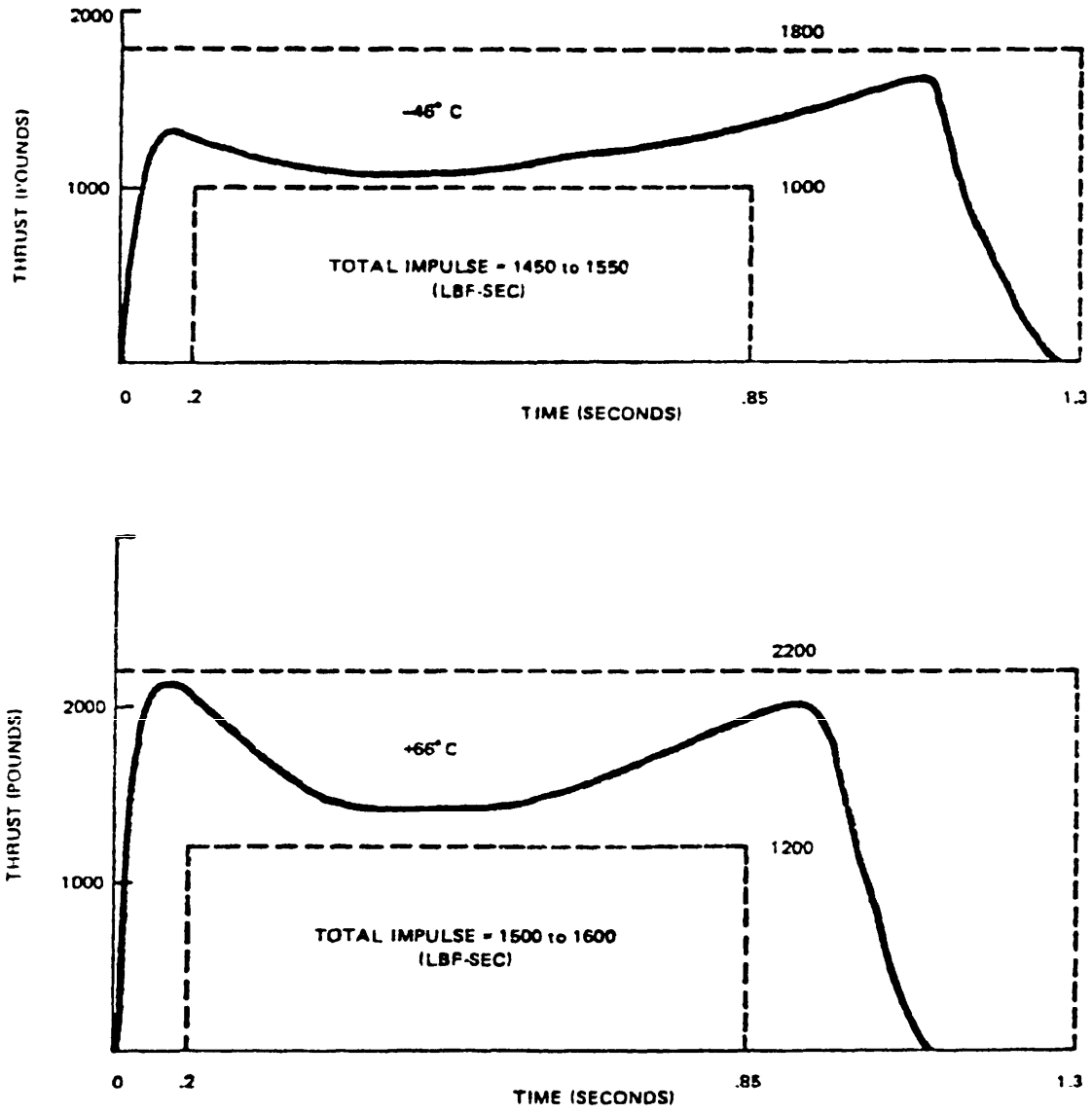
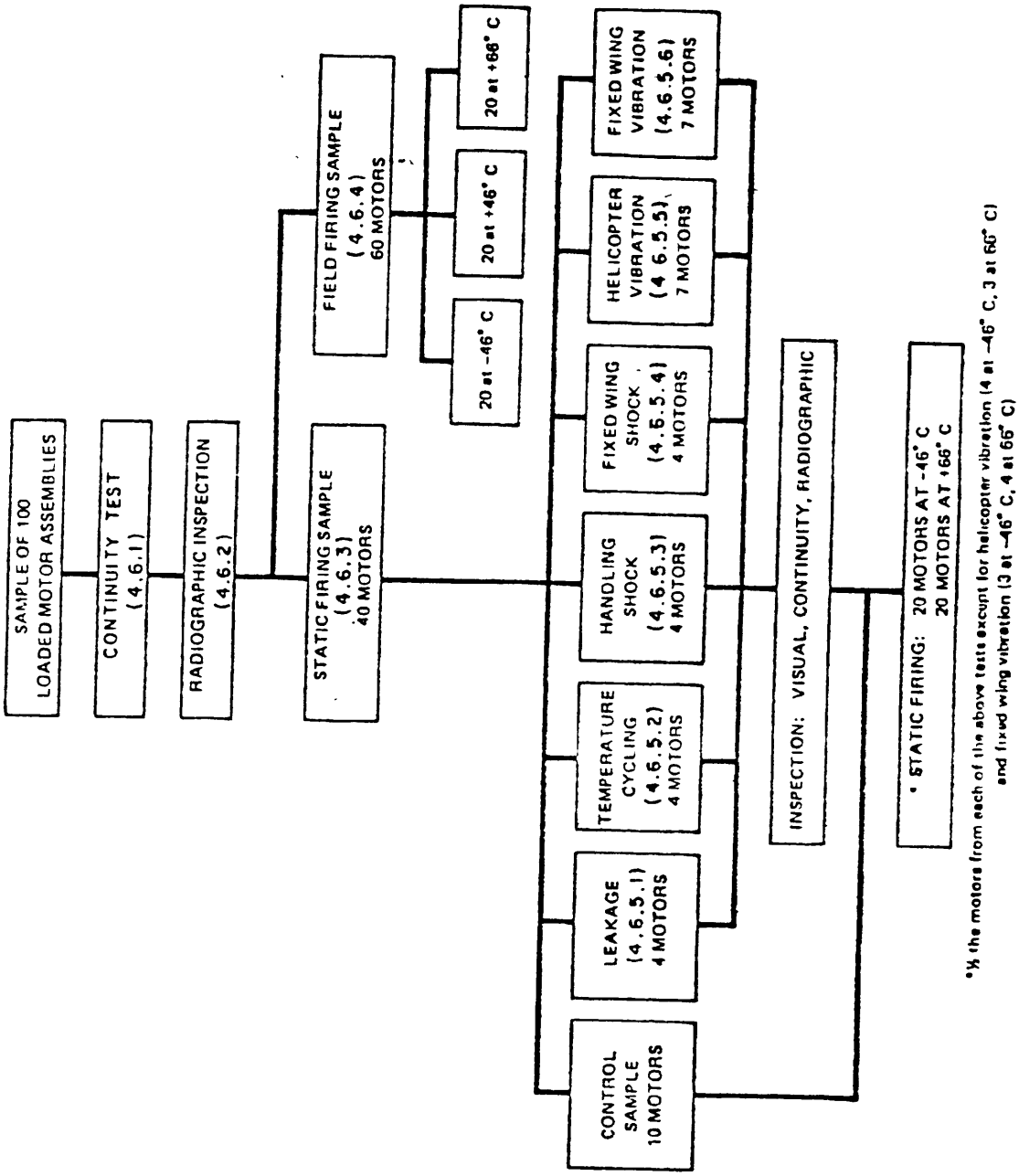


FIGURE 1. Thrust-time curve limits for rocket motor, 2.75 inch, Mk 66 Mods.



*¼ the motors from each of the above tests except for helicopter vibration (4 at -46° C, 3 at 66° C) and fixed wing vibration (3 at -46° C, 4 at 66° C)

FIGURE 2. First article tests.

APPENDIX A

STATIC FIRING PERFORMANCE DATA

10 SCOPE

10.1 Scope. This appendix details-the static-firing performance data required for submission for quality conformance inspection and is a mandatory part of the specification.- The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENT

This section is not applicable to this appendix.

30 SUBMISSION

30.1 Performance data acquired during the static-firing test shall be tabulated on a format similar to table VIII.

APPENDIX B

FIELD FIRING PERFORMANCE DATA

10 SCOPE

10.1 Scope. This appendix.details the field-firing performance data required for submission for quality conformance Inspection and is a mandatory part of this specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENT

This section is not applicable to this appendix.

30 SUBMISSION

30.1 Performance data acquired during the field-firing test shall be tabulated on a format similar to table X.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1 DOCUMENT NUMBER	2 DOCUMENT TITLE
MIL-M-85657	Motor, Rocket, 2.75 Inch, Mark 66 Mods

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS *(Street, City, State, ZIP Code)*

4. TYPE OF ORGANIZATION *(Mark one)*

- ☐ VENDOR
- ☐ USER
- ☐ MANUFACTURER
- ☐ OTHER *(Specify)* _____

5. PROBLEM AREAS

a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* - Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* - Optional
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INCH–POUND

NOTICE
OF VALIDATION

MIL-M-85657
NOTICE 1
2 October 1991

MILITARY SPECIFICATION

MOTOR, ROCKET, 2.75 INCH, MARK 66 MODS

MIL-M-85657, dated 30 March 1984, has been reviewed and determined to be valid for use in acquisition.

Custodians:
Army – Ml
Navy-AS
Air Force -20

Preparing activity:
Navy – AS

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