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MIL-P-83126A
8 February 1980
SUPERSEDING
MIL-P-83126
15 May 1973 with
Amendment 1
19 July 1977 and
MIL-A-85041A(AS)
13 November 1978

MILITARY SPECIFICATION

PROPULSION SYSTEMS, AIRCREW ESCAPE, DESIGN SPECIFICATION FOR

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 minimum requirements for the design, development/adaptation, design verification, and service release criteria for Aircrew Escape Propulsion Systems (AEPS) and testing of units manufactured for Aircrew Escape System (AES) system and subsystem tests.

1.2 Classification. Rocket catapults, propellant actuated catapults, and rocket motors for aircrew escape propulsion systems shall be developed in phases as follows:

Phase I - Design and development/adaptation

Phase II - Design verification

Phase III - Service release

2. APPLICABLE DOCUMENTS

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Ordnance Station, Standardization/Documentation Division (501), Indian Head, MD 20640 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 1377

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

SPECIFICATIONS

FEDERAL

TT-E-516	Enamel, Lusterless, Quick-Drying, Styrenated Alkyd Type
PPP-B-621	Boxes, Wood, Nailed and Lock-Corner
PPP-T-66	Tape: Pressure-Sensitive Adhesive, Vinyl Plastic Film

MILITARY

MIL-P-116	Preservation-Packaging, Methods of
DOD-D-1000	Drawings, Engineering and Associated Lists
MIL-S-5002	Surface Treatments and Inorganic Coatings for Metal Surfaces of Weapons Systems
MIL-C-5501	Caps and Plugs, Protective, Dust and Moisture Seal; General Specification for
MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-C-6021	Castings; Classification and Inspection of
MIL-H-6088	Heat Treatment of Aluminum Alloys
MIL-I-6866	Inspection; Penetrant Method of
MIL-I-6868	Inspection Process, Magnetic Particle
MIL-H-6875	Heat Treatment of Steels (Aircraft Practice); Process for
MIL-F-7179	Finishes and Coatings, Protection of Aerospace Weapons Systems Structures and Parts: General Specification for
MIL-F-7190	Forgings, Steel, for Aircraft and Special Ordnance Application

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MIL-S-7742	Screw Threads, Standard, Optimum Selected Series, General Specification for
MIL-W-8611	Welding, Metal Arc and Gas, Steels, and Corrosion and Heat Resistant Alloys; Process for
MIL-A-8625	Anodic Coatings for Aluminum and Aluminum Alloys
MIL-E-9426	Escape System, Requirements, Conformance, Demonstrations and Performance Tests for; General Specification for
MIL-S-9479	Seat System, Upward Ejection, Aircraft; General Specification for
MIL-F-18240	Fastener, Externally Threaded, 250°F Self-Locking Element for
MIL-F-18264	Finishes, Organic, Weapons Systems, Application and Control of
MIL-S-18471	System, Aircrew Automated Escape, Ejection Seat Type; General Specification for
MIL-A-21180	Aluminum Alloy Castings, High Strength
MIL-D-21625	Design and Evaluation of Cartridges for Cartridge Actuated Devices
MIL-A-23121	Aircrew Environmental, Escape and Survival Cockpit Capsule System, General Specification for
MIL-P-23460	Pin, Quick Release, Self-Retaining, Positive Locking
MIL-D-23615	Design and Evaluation of Cartridge Actuated Devices
MIL-I-23659	Initiators, Electrical, General Design Specification for
MIL-C-45662	Calibration System Requirements
MIL-R-81128	Rocket Motors, Identification of Parts and Assemblies, Requirements of
MIL-H-81200	Heat Treatment of Titanium and Titanium Alloys

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MIL-C-83124	Cartridge Actuated Devices/Propellant Actuated Devices, General Design Specification for
MIL-C-83125	Cartridges for Cartridge Actuated/Propellant Actuated Devices, General Design Specification for
MIL-S-83490	Specifications, Types and Forms
MIL-P-85089	Painting of Aircrew Escape Propulsion System (AEPS)

STANDARDS

FEDERAL

FED-STD-595	Colors

STANDARDS

MILITARY

DOD-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-143	Specifications and Standards, Order of Precedence for the Selection of
MIL-STD-414	Sampling Procedure and Table for Inspection by Variables for Present Defective
MIL-STD-453	Inspection, Radiographic
DOD-STD-480	Configuration Control - Engineering Changes, Deviations, and Waivers
MIL-STD-490	Specification Practices
MIL-STD-785	Reliability Programs (for Systems and Development and Production)
MIL-STD-810	Environmental Test Methods
MIL-STD-838	Lubrication of Military Equipment
MIL-STD-882	System Safety Program for Systems and Associated Subsystems and Equipment, Requirements for

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MIL-STD-889	Dissimilar Metals
MIL-STD-1167	Ammunition Data Card
MIL-STD-1168	Ammunition Lot Numbering
MIL-STD-1252	Inertia Friction Welding Process, Procedure and Performance Qualification
MIL-STD-1385	Preclusion of Ordnance Hazards in Electromagnetic Fields; General Requirements for
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment, and Facilities
MIL-STD-1512	Electroexplosive Subsystems, Electrically Initiated, Design Requirements, and Test Methods
MIL-STD-2067	Aircrew Automated Escape Systems Reliability and Maintainability (R/M), Program Requirement for
MIL-STD-2100	Propellant, Solid, Characteristics of (Except Gun Propellant)
MIL-STD-2102	Aircraft Escape Propulsion Systems;(Vibration and Shock Tests for)

DRAWINGS

NAVAL AIR SYSTEMS COMMAND (Code Ident 30003)

2546994	Label, Warning
2846932	Label, Warning
4903620	Label, Identification, Rocket Motor
4904106	Label, Warning
4904107	Label, Warning
4904145	Label, Warning
4904217	Label, Identification, Rocket Motor
736AS103	Label, Identification, Rocket Catapult
946AS112	Label, Identification, Rocket Motor

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AIR FORCE (Code Ident 19200 or 14083, as applicable)

63C32091	Identification Plate - Metal Foil, CAD Items, Mechanism, Firing, etc.
63C32092	Identification Plate - Metal Foil, Initiators, etc.
63C32093	Identification - Plate - Metal Foil, Initiator, Delay
8593294	Label, Warning
10520571	Label, Warning

PUBLICATIONS

AIR FORCE-NAVY AERONAUTICAL BULLETIN

MIL Bulletin No. 147	Specifications and Standards of Non-Government Organizations Released for Flight Vehicle Construction

NAVAL SEA SYSTEMS COMMAND (Code Ident 10001)

WR 62	Specifications and Standards, Use of

NAVAL AIR SYSTEMS COMMAND (Code Ident 30003)

SD-24	General Specification for Design and Construction of Aircraft Weapon Systems

HANDBOOKS

MIL-HDBK-5	Metallic Materials and Elements for Aerospace Vehicle Structures
MIL-HDBK-132	Protective Finishes
MIL-HDBK-691	Adhesives
MIL-HDBK-694	Aluminum and Aluminum Alloys
MIL-HDBK-695	Rubber Products; Shelf Storage Life

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the Government Procuring Activity (GPA) or as directed by the Contracting Officer.)

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

CODE OF FEDERAL REGULATIONS

49 CFR Parts 171-190	Transportation

DEPARTMENT OF DEFENSE

DOD 4145.26M	DOD Contractor's Safety Manual for Ammunition, Explosives and Related Dangerous Materials

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Orders should cite current revisions.)

3. REQUIREMENTS

3.1 Item definition and program phases. The item shall be an AEPS consisting of a thrust producing pressure vessel in the form of a rocket motor, catapult or rocket catapult assembly with suitable fittings for attachment to the aircraft structure and/or ejectable portion of the escape system in conformance to MIL-S-9479, MIL-S-18471 or MIL-A-23121, as applicable. The propulsion system shall be of the simplest and most efficient design consistent with the proposed use. Specific consideration shall be given to minimum size and weight while adhering to performance, functional, reliability, and safety requirements. The program phases and description of components shall be as specified in the contract (see 6.2) and shall conform to the following:

3.1.1 Program phases. Each phase defines a significant segment of the development of the critical item. It further provides for examination of the design and the data due, analysis of the program and program direction, as required. Phases of the AEPS engineering program from development to final qualification are described in 3.1.1.1 through 3.1.1.3. The approval of the GPA of a phase is required before beginning the next one. TABLE I illustrates the correlation between the types of testing and the program phases.

3.1.1.1 Phase I - design and development/adaptation. Phase I covers all design and development/adaptation effort necessary to establish an AEPS capable of meeting the requirements of the applicable escape system as outlined in 3.1, and the requirements of this specification. Phase I also includes preparation and submittal of required data and all testing deemed necessary by the GPA to demonstrate the technical soundness of the basic design.

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TABLE I. Program phase/testing relationship.

Test / AEPS MFG	Component	Subsystem	System
Development	I	I	I
Design Verification	II	III	III
Service Release	III	III	III

3.1.1.2 Phase II - design verification. Phase II covers manufacture of all design verification AEPS test samples, the specified AEPS test programs required to determine the readiness of the AEPS for full service release testing and a Type I Release, and preparation and submittal of required data. Any manufacture of design verification test samples prior to GPA written approval of Phase I shall be at the contractor's risk. (Full approval of Phase I is normally required before approval to proceed with Phase II manufacture.)

3.1.1.2.1 Phase II - changes, deletions and additions. Any changes, deletions or additions, whether actual or anticipated, to the design, procedures, techniques, equipment, personnel, work environment or location, etc., previously proposed or described to the GPA in the contract or during Phase I shall be disclosed to the GPA by the contractor. All design changes made after Phase I shall have the written approval of the GPA prior to their incorporation into the AEPS design, hardware or documentation.

3.1.1.3 Phase III - service release. Phase III encompasses component (AEPS device), subsystem (WORD test, canopy remover test with canopy), and escape system (zero-zero, steel testing, etc.) testing, the manufacture of all AEPS samples for subsystem and system design verification testing and for all service release testing and the preparation and submittal of all required data. (See 6.5.26 for component test definition.) Any manufacture of test samples required for Phase III before GPA written approval shall be at the contractor's risk. (Full approval of Phase II is normally required prior to approval to proceed in Phase III manufacture.)

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3.1.1.3.1 Phase III - changes, deletions and additions. Any changes, deletions or additions (anticipated or proposed) to the design, procedures, techniques, equipment, personnel, work environment or location, etc., as established through completion of Phase II shall be disclosed to the GPA by the contractor. All design changes made during Phase III shall have the written approval of the GPA prior to their incorporation into the AEPS design, hardware or documentation.

3.2 Phase I (design/development). The minimum number of units to be tested shall be as specified in the contract. The design and construction, as applicable, shall conform but not be limited to, the documents of TABLE II and the following requirements:

3.2.1 Dissimilar metals. Contacts between dissimilar metals, as defined in MIL-STD-889, shall be avoided.

3.2.2 Materials. All materials, including but not limited to, propellant, propellant formulation materials, ignition material, liner, inhibitor, hardware components, O-ring grease and adhesives shall conform to existing Government specifications. For those materials not covered by existing Government specifications, the contractor shall prepare specifications in accordance with MIL-S-83490, Type E, Form 2; these shall be approved by the GPA prior to use.

3.2.3 Fungus-proof materials. Materials which are nutrients for fungi shall not be used without prior approval of the GPA. Where materials that are nutrients must be used and approval for use has been obtained, such materials shall be treated with a fungicidal agent. The agent shall be approved by the GPA before use by the contractor.

3.2.4 Nonexplosive, nonmetallic materials and components. Nonexplosive, nonmetallic materials and components shall be selected and designed to minimize deterioration caused by abrasion or exposure to, including but not limited to, sunlight, microorganisms, moisture, heat, chemicals, hydraulic and lubricating oil and grease, and salt spray.

3.2.5 Movement of internal components. There shall be no movement of internal parts or noise emitted from the AEPS at any time during the unfired life of the AEPS.

3.2.6 Locks. All locks used in the AEPS shall conform to the design requirements under all load conditions resulting from environmental tests, actuation, operation, propellant gas pressure, or torque caused by connection of gas line fittings. Maximum tension and compression operational loads for the devices shall be as specified in the design requirements.

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TABLE II. Design and construction documents.

Description		Document
Identification of parts		MIL-STD-130 and MIL-R-81128
Selection of materials and standard parts		SD-24, as applicable
Lubricants, corrosion preventives, etc.		MIL-STD-838
Adhesives		MIL-HDBK-691
Metallic materials		MIL-HDBK-5
Aluminum and aluminum alloys		MIL-HDBK-694
Dissimilar metals		MIL-STD-889
Finishes and coatings		MIL-F-7179
Castings, classification and inspection		MIL-C-6021, Class 1A, Grade B
Aluminum alloy castings		MIL-A-21180
Surface treatments and inorganic coatings for metal surfaces		MIL-S-5002
Application and control of protective and organic finishes, general		MIL-F-18264 and MIL-HDBK-132
Heat Treatments	Aluminum parts	MIL-H-6088
	Steel parts	MIL-H-6875
	Titanium and titanium alloy parts	MIL-H-81200
Steel forgings		MIL-F-7190 (Grade A for forgings identified by the contractor as critical)
Anodizing of aluminum and aluminum alloy parts		MIL-A-8625, Type II
Chemical conversion coatings		MIL-C-5541

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TABLE II. Design and construction documents.
(continued)

Description	Document
Selection of specifications and standards	MIL-STD-143, WR-62 (MIL Bulletin No. 147)
Engineering drawing practices	DOD-STD-100 (and all references therein)
Threads	MIL-S-7742
Welding	MIL-W-8611 or MIL-STD-1252 as applicable
Electroexplosive subsystems, electrically initiated-design requirements and test methods	MIL-STD-1512
Rubber products, shelf storage life	MIL-HDBK-695
Magnetic particle inspection of all ferromagnetic parts	MIL-I-6868
Penetrant inspection of all ferromagnetic parts	MIL-I-6866

3.2.7 Dimensions. If the AEPS envelope dimensions are furnished by the Government procuring activity, the dimensions of the AEPS shall be as prescribed by the GPA. Otherwise, AEPS dimensions shall be as prescribed by the system design activity in such a manner as to be compatible with the system requirements and shall be submitted to the GPA for approval. Unless otherwise specified, all dimensions shall apply after all manufacturing processes (machining, sizing, etc.), process treatments (plating, anodizing, heat treating, etc.) and testing have been completed but before application of painting and decals.

3.2.8 Weight. The weight of the AEPS including its components shall be kept to a minimum compatible with optimum safety and reliability and shall be approved by the GPA (see 6.2).

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3.2.9 Combustion chamber. The combustion chamber (tested as a pressure vessel) shall be capable of withstanding, without permanent deformation, hydrostatic test pressures 1.25 times the maximum expected operating pressure (MEOP) (including three standard deviations) of the AEPS at 165°F.

3.2.10 Ignition system. Dual initiation up to the AEPS primary igniter shall be used for each AEPS.

3.2.10.1 Cartridge actuated devices (CADS). All cartridges and CADS which are an integral part of an AEPS shall conform to the requirements as specified herein. All other cartridges and CADS shall conform to the requirements of MIL-D-21625, MIL-D-23615, MIL-C-83124 and MIL-C-83125, as applicable. Where feasible, cartridges and CADS previously qualified and released for service use shall be used in preference to developing and qualifying new cartridges or CADS. GPA written approval must be obtained for the development and qualification of new cartridges and/or CADS. Request for approval must be in writing and shall include a functional description of the device involved, the input and output (power, volume, etc.) requirements of the application and a list of existing ballistic components considered and reasons for the rejection.

3.2.10.2 Firing mechanism. The AEPS shall incorporate a firing mechanism which may be activated either mechanically, by gas, or by other means, as dictated by the applicable system requirements.

3.2.10.2.1 Mechanical firing mechanism. A precocked firing mechanism shall not be used. An AEPS that is mechanically initiated and makes use of a spring in the firing mechanism shall be designed so that the firing pin is in a noncocked position and will only be cocked by the act of initiating the AEPS. The force required to actuate the mechanical firing mechanism shall be as prescribed by the GPA. If no force is prescribed, the contractor shall submit and receive written approval from the GPA for their desired force. The minimum energy (striking force) shall be 2 times greater than $(\bar{H} + 5\sigma)$, the all fire limits, for the applicable percussion primer being used under all possible operating conditions (such as the maximum acceleration of the firing mechanism in the most adverse direction.

3.2.10.2.2 Gas-actuated firing mechanism. Upon application of a peak gas source pressure of 1000 pounds per square inch gage (psig) at a rate of pressurization of 10,000 to 50,000 psig/second on the firing pin, the firing mechanism shall actuate at a gas source pressure of 400 to 600 psig. Activation shall occur within 10 msec after the gas source pressure has reached 400 psig. The striking force imparted to the firing pin shall be the same as that required for mechanically actuated firing mechanism (see 3.2.10.2.1). Initiating gas pressure shall be instrumented during test firings and mechanism shall be capable of firing with a source of up to 10,000 psi.

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3.2.10.2.3 Other types of firing mechanisms. Detailed design approval of firing mechanisms other than mechanical or gas pressure initiated firing mechanisms shall be obtained from the GPA prior to initiation of Phase II testing. Electrical firing mechanisms shall conform to the requirements of MIL-I-23659.

3.2.10.3 Firing pin. The length to diameter ratio (L/D) of the pin shall be in the range of 1/1 to 2/1.

3.2.10.4 Primers. No stab type primers or detonators shall be used in the design.

3.2.11 Igniters and ignition materials. The contractor shall generate data for all igniters and ignition material formulations used in the AEPS final design. The data shall be forwarded to the GPA for approval. The tests and test data obtained for each igniter or ignition material characteristic shall conform to the requirements of 3.2.11.2 or 3.2.11.1, as applicable, and shall be approved by the GPA.

3.2.11.1 Chemical and physical ignition material characteristics. The contractor shall generate (unless already available) and furnish to the Government procuring activity for approval, all the test data obtained, the nominals for, and the acceptable tolerances for each ignition material characteristic listed below. Each test shall be conducted in accordance with the test procedure described by the test plan prepared and submitted by the contractor to, and approved by, the GPA. Ignition material characteristics shall include the following:

a. Differential thermal analysis data from -65°F to autoignition (heat rate of 1° Celsius/minute)

b. Safety

(1) Impact sensitivity

(2) Friction sensitivity

(3) Electrostatic discharge sensitivity

c. Explosive classification

d. Heat of explosion

e. Ageing study

(1) High temperature ageing at 160°F shall be conducted for 84 days, with an atmosphere of nitrogen: 0 percent relative humidity, 6 percent relative humidity and 22 percent relative humidity. At the end of 84 days, aged specimens shall be tested for heat of explosion (d),

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differential thermal analysis (a), ignitibility tests (f), and time to maximum pressure (closed bomb) at -65ΩF. Limits to demonstrate service life capability shall be generated by the contractor and submitted to the GPA for approval. Data shall also be generated for 28 and 56 day increments and submitted to the GPA.

f. Ignitibility tests

3.2.11.2 Igniter assembly characteristics.

a. The igniter development tests of 4.4.1.3 shall be performed.

b. The contractor shall design a closed bomb test for each igniter to be used in the AEPS and submit it to the GPA for approval. The closed bomb shall be designed to simulate as closely as possible the actual firing method and environment in the AEPS. Upon approval, the contractor shall test a minimum of 30 of each type of igniter at -65°F in the closed bomb to determine maximum pressure and time to maximum pressure.

3.2.12 Propellant, liner, and inhibitor (insulator).

3.2.12.1 Propellant. The propellant shall be mounted in the chamber in a manner which will preclude damage caused by the initiator or the environmental conditions specified herein which would tend to adversely affect the performance of the AEPS. The propellant shall be adequately protected from moisture and other environmental conditions which could be detrimental. The propellant shall be capable of meeting the requirements of 3.2.12.1.2 at any time during a minimum service life of 7 years.

3.2.12.1.1 Propellant formulations. The contractor shall generate data for all propellant formulations used in the rocket motor final design. Propellant formulations different from formulations previously accepted for service in AEPS applications shall be submitted for approval of the GPA. Dibutyl phthalate shall not be used in any new formulations. The tests and test data obtained for each propellant characteristic shall conform to the requirements of 3.2.12.1.2.

3.2.12.1.2 Chemical and physical propellant characteristics. The contractor shall generate (unless already available) and furnish to the Government procuring activity for approval, test data (nominals and the acceptable tolerances) for each propellant characteristic listed below. Each test shall be conducted in accordance with the test procedures described by the test plan prepared and submitted by the contractor to, and approved by, the GPA. Propellant characteristics shall include the following:

a. Burning rates over the entire operating pressure range (including three sigma) of the AEPS at a nominal 500 psi interval through the burning rate slope break point or at least 1000 psi beyond MEOP if there is no slope break.

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(1) At -65°F ± 5°F

(2) At 70°F ± 5°F

(3) At 165°F ± 5°F

b. Differential thermal analysis data from -65°F to autoignition (heat rate of 1° Celsius/minute).

c. Time to ignition (8 hour maximum) at 200° and 250°F for double-base propellant and at 350° and 400°F for other types of propellant.

d. Safety

(1) Impact sensitivity

(2) Friction sensitivity

(3) Electrostatic sensitivity

e. Physical properties

(1) Density

(2) Durometer A hardness

(3) Maximum tensile strength (-65°, 77° and 165°F)

(4) Tensile strength at break (-65°, 77° and 165°F)

(5) Elongation at maximum tensile strength (-65°, 77° and 165°F)

(6) Elongation at break (-65°, 77° and 165°F)

(7) Modulus of elasticity (-65°, 77° and 165°F)

(8) Glass transition point

(9) Tensile strength (high rate) (-65°, 77° and 165°F) (Rates to be specified by GPA)

f. Theoretical specific impulse

g. Explosive classification

h. Ageing tests (to demonstrate propellant characteristics and service life capability)

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(1) High temperature ageing shall be conducted at 160°F for 84 days under an atmosphere of nitrogen and air: 6 percent and 22 percent relative humidity. At the end of 84 days, aged specimens shall be tested for physical properties (3.2.12.1.2.e), burn rates (3.2.12.1.2.a) and differential thermal analysis (3.2.12.1.2.b). Data shall also be generated for 28 and 56 day increments and submitted.

(2) Pass/fail criteria for the ageing tests shall be based on the contractor's propellant grain stress analysis and internal ballistic analysis. The stress analysis shall consist of the stress and strain requirements of the propellant during post-cure cool down, temperature cycling between -65°F and 165°F, and ignition. A 50 percent safety factor shall be added to the minimum required stress/strain values generated from the ageing tests. The internal ballistic analysis shall demonstrate the burn rate limits at -65°F, 77°F and 165°F that the AEPS requirement shall meet. These analyses shall be submitted to the GPA for review and approval.

i. Exhaust constituents (calculated) at nozzle and ambient conditions of temperature and pressure.

j. Heat of explosion

3.2.12.1.3 Propellant surfaces. The propellant grain shall have all surfaces free from foreign materials potentially detrimental to proper ignition and burning.

3.2.12.1.4 Grain quality. The propellant grain shall be free from defects such as cracks, porosity, air holes, fuel pockets, fuel striations, and other defects which would degrade the performance of the AEPS. The contractor during Phase I may, at his discretion and expense, submit a standard (figure or comparative radiographs) depicting allowable number and size of defects per inch and total per AEPS. Sufficient supporting material shall be attached to allow the GPA to evaluate the proposed standard. Upon approval of the standard by the GPA, the standard will be included as an acceptance criterion during Phase II.

3.2.12.2 Liner and disbond. All designs using cast case-bonded propellant shall make use of an inert liner between the propellant and the tube in which it is cast. No disbond between propellant, liner, insulator, inhibitor, and motor case shall be permitted. The contractor shall generate data for all liner formulations used in AEPS final design which shall be forwarded to the GPA for approval. The tests and test data obtained for each liner characteristic shall conform to the requirements of 3.2.12.2.1.

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3.2.12.2.1 Chemical and physical liner characteristics. The contractor shall generate (unless already available) and furnish to the GPA, during Phase I, all the test data obtained for, the nominals for, and the acceptable tolerances for each liner characteristic listed below. Each test shall be conducted in accordance with the test procedures described by the test plan prepared and submitted by the contractor to, and approved by, the GPA. Liner characteristics shall include the following:

a. Density

b. Durometer A hardness

c. Maximum tensile strength (-65°, 77° and 165°F)

d. Tensile strength at break (-65°, 77° and 165°F)

e. Elongation at maximum tensile strength (-65°, 77° and 165°F)

f. Elongation at break (-65°, 77° and 165°F)

g. Modulus of elasticity (-65°, 77° and 165°F)

h. Peel strength

i. Liner bond strength to bonded surface at -65°, 77° and 165°F:

(1) Double plate: at strain rate of 0.74 in/in/min and test to failure.

(2) Ageing test: determination of bond strength as a function of ageing exposed to environmental conditions of 0 percent relative humidity, 20 percent relative humidity and 60 percent relative humidity at 165°F for 12 weeks.

3.2.12.3 Inhibitor (insulator) and disbond. No disbond between inhibitor (insulator) and bonds surfaces shall be permitted. The contractor shall generate data for all insulator formulations used in the AEPS final design which shall be forwarded to the GPA for approval. The tests and test data obtained for each inhibitor (insulator) characteristics shall conform to the requirements of 3.2.12.3.1.

3.2.12.3.1 Chemical and physical inhibitor (insulator) characteristics. The contractor shall generate (unless already available) and furnish to the GPA, during Phase I, all the test data obtained for, the nominals for, and the acceptable tolerances for each inhibitor (insulator) characteristic listed below. Each test shall be conducted in accordance with the test procedures described by the test plan prepared and submitted by the contractor to, and approved by, the GPA. Inhibitor (insulator) characteristics shall include the following:

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a. Density

b. Durometer A hardness

c. Maximum tensile strength (-65°, 77° and 165°F)

d. Tensile strength at break (-65°, 77° and 165°F)

e. Elongation at maximum tensile strength (-65°, 77° and 165°F)

f. Elongation at break (-65°, 77° and 165°F)

g. Modulus of elasticity (-65°, 77° and 165°F)

h. Peel strength

i. Inhibitor (insulator) bond strength to bonded surfaces at -65°, 77° and 165°F.

(1) Double plate: at strain rate of 0.74 in/in/minute and test to failure.

(2) Ageing test: determination of bond strength as a function of ageing exposed to environmental conditions of 0 percent relative humidity, 20 percent relative humidity, and 60 percent relative humidity at 165°F for 12 weeks.

3.2.13 Nozzle. The nozzle shall be designed to accommodate the range of thrust angles specified in the design requirement and shall be approved by the GPA (see 6.2). The location of the nozzle opening with respect to the aircraft mounting attachments shall be clearly indicated on the exterior of the unit near the aircraft/escape system attachment points.

3.2.14 Attachments. The provisions for attachments shall provide for locking and prevention of incorrect installation in conformance to MIL-S-9479, MIL-S-18471 and MIL-A-23121, as applicable.

3.2.14.1 Gas ports. Except for reversible systems, the mating inlet port shall be different from that of the opposite end.

3.2.15 Compatibility. The AEPS shall be compatible in all respects with the aircraft and the escape system in which the AEPS is intended for use (see 4.4.2.20).

3.2.16 Safety pins. The AEPS designed to be mechanically initiated shall use a safety pin in accordance with MIL-P-23460 to prevent inadvertent initiation during handling. In addition, such units shall be compatible with the escape system deactivating and bypass subsystems required by MIL-S-9479, MIL-S-18471 or MIL-A-23121, as applicable.

3.2.17 Verification of thrust angle. The effective thrust angle of the AEPS used to provide the primary impulse required for AEPS terrain clearance shall be verified by ballistic firings on a thrust stand.

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3.2.18 Seals. The AEPS shall be sealed to prevent exposure of interior components to environmental substances. The seals shall resist impacts from handling, installation and use, and pressure changes up to 1.5atmospheres when pressure tested at -65° and 165°F. Shelf storage life information for various sealing materials is furnished in MIL-HDBK-695.

3.2.18.1 O-rings. O-rings to be used shall be made from silicone rubber or a substitute material approved by the GPA.

3.2.19 Disassembly capability. Unless otherwise specified in the contract, the AEPS shall be designed so it can be easily disassembled. Special tooling required for disassembly shall be kept at a minimum and damage to or loss of piece parts shall be minimal. Large forces and torques shall not be required for disassembly and no unusual safety hazards shall exist during disassembly, (e.g., pre-cocked ignition system needing disconnection prior to or during disassembly).

3.2.20 Demagnetism. The propulsion system shall not deflect the indicator of a pilot's standby compass more than 3° in either direction when passed in front of the compass at a distance of 6 inches.

3.2.21 Torque requirements of threaded joints. The torque requirements of the system subassemblies which contain provisions for the attachment of pressure transmission hose to tube assemblies for the mounting or installation shall (a) be greater than the AES attachment assembly/ breakaway requirement and (b) withstand a minimum of 400 inch pounds of breakaway torque for thread diameters of 1 inch and larger and a minimum value of one-half the maximum torque value specified in MIL-F-18240 for thread sizes under 1 inch in diameter. The torque requirements of the system subassemblies which may be loosened or disassembled by handling vibration, or shipment shall withstand a minimum of 200 inch-pounds of breakaway torque for thread diameters of 1 inch and larger and a minimum value of one-third of the maximum torque specified in MIL-F-18240 for thread sizes under 1 inch in diameter. The maximum torque required shall be 200 inch-pounds above the minimum torque requirement.

3.2.22 Life. The AEPS shall have a minimum service life of 7 years counted from date of propellant manufacture.

3.2.23 Operating conditions. The AEPS shall be designed for operation under any of, or any combination of, the following conditions.

3.2.23.1 Position. The AEPS shall operate in accordance with requirements of 3.4 in any attitude and under any acceleration including in the direction opposite of the firing mechanism.

3.2.23.2 Stowage position. Stowage of the AEPS for up to 7 years in any position shall not adversely affect the performance or reliability of the AEPS.

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3.2.23.2.1 Forty-two and eighty-four day storage. The AEPS shall not sustain damage, initiate, or subsequently fail to operate in conformance with the requirements of 3.2.24 after exposure to sustained cold (-65 ± 5°F) or hot temperature (165 ± 5°F) storage for 42 or 84 days, as specified in the contract.

3.2.23.3 Temperature. The AEPS shall operate in conformance with the requirements of 3.2.24 when exposed to -65 ± 5°F and 165 ± 5°F, inclusive. Operating temperature is defined as the equilibrium temperature of the propellant and is not necessarily the surrounding air temperature.

3.2.23.3.1 Temperature cycling. The AEPS shall not sustain damage, initiate, or subsequently fail to operate in conformance with the requirements of 3.2.24 after being subjected to temperature cycling in the temperature range of -65 ± 5°F to 165 ± 5°F, inclusive (see 4.4.2.13). If a unit when stored or installed will be subjected to direct sunlight or hotter than normal (165°F) conditions, the high temperature and cycling procedure shall be changed to reflect the hotter temperature and shall be approved by the GPA.

3.2.23.4 Atmospheric. The AEPS shall not sustain damage, initiate, or subsequently fail to operate in conformance with the requirements of 3.2.24 after exposure to all atmospheric conditions encountered from sea level to 70,000 feet (see 4.4.2.23).

3.2.23.5 Dust (fine sand). The AEPS shall not initiate or subsequently fail to operate in conformance with the requirements of 3.2.24 after exposure to conditions of dust (fine sand) as defined by Method 510 of MIL-STD-810 (see 4.4.2.22).

3.2.23.6 Shock. The AEPS shall not sustain damage, initiate, nor subsequently fail to operate in conformance with the requirements of 3.2.24 after being subjected to an intensity of 15 g with 500 shocks along each of its three mutually perpendicular axes in accordance with MIL-STD-2102.

3.2.23.7 Vibration. The AEPS shall be capable of withstanding the vibratory accelerations when tested in accordance with 4.4.2.25 and shall subsequently meet the design performance requirements when test fired.

3.2.23.8 Rain, humidity, and salt spray. The AEPS shall not sustain damage, corrode, initiate, nor subsequently fail to operate in conformance with the requirements of 3.2.24 after exposure to rain equal to 4 ± 1 inches per hour for 2 hours, humidity of 100 percent at a temperature of 120°F for 10 days, and salt spray equal to that specified in MIL-STD-810, Method 509 (see 4.4.2.14).

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3.2.23.9 Loads. The AEPS shall not sustain damage, initiate, nor subsequently fail to operate in conformance with the requirements of 3.2.24 after preloading with the maximum loads (including three sigma) expected during actual use in an ejection. In some cases (e.g., when an AEPS will be required to withstand load during or after use), load testing shall incorporate both prefiring and postfiring load testing. The escape system design activity shall define the expected loads (including three sigma, the test procedure to be used, and the applicable conditions involved and shall furnish these data to the GPA for approval.

3.2.24 Performance. Unless otherwise stated in the contract, the escape system design activity shall determine the required performance parameter means and associated limits for each AEPS unit as required by the escape system to meet the requirements of MIL-S-9479, MIL-S-18471 or MIL-A-23121, as applicable, and shall furnish these data to the GPA for approval. Once determined, furnished, and approved, the AEPS shall be designed to meet these requirements.

3.2.24.1 Ballistics. The AEPS shall meet the ballistic performance parameter means and limits, including three standard deviations, as specified or approved by the GPA. Ballistic parameters normally required shall be, but not limited to, the following:

a. Catapult

(1) Total catapult impulse (lbf-sec)

(2) Stroke time (msec)

(3) Maximum catapult thrust (lbf)

(4) Catapult ignition delay time (msec)

(5) Maximum acceleration (g)

(6) Maximum rate of rise of acceleration (g/sec)

(7) Separation velocity (ft/sec)

(8) Initiation pressure (psig)/force (lbf)/voltage (volts)

(9) Maximum combustion chamber pressure (psig)

(10) Dynamic response index (DRI)

b. Rocket motor

(1) Total rocket motor impulse (lbf-sec)

(2) Action time (msec)

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(3) Maximum rocket motor thrust (lbf)

(4) Rocket motor ignition delay (msec)

(5) Initiation pressure (psig)/force (lbf)/voltage (volts)

(6) Maximum combustion chamber pressure (psig)

(7) Thrust angle (degrees)

3.2.24.1.1 Other requirements. In addition to meeting the ballistic requirements, the following shall be met during test firing of the AEPS:

a. No unit component or propellant pieces shall be ejected

b. No component subject to loading shall fail

c. No erosion, including abnormal nozzle-erosion, or burn-through/ hot spot shall occur

The occurrence of any of the above shall constitute failure of the sample, as applicable.

3.2.24.1.2 Ballistic parameter analysis. Based on the most probable ejection temperature range, establish the optimum ballistic performance parameters for that range for the pyrotechnic device. Using the Box-Behnken or equivalent analytical approach, establish maximum and/or minimum limits, based on the optimum parameters, for all required ballistic parameters over the specified temperature requirements (-65°F to 165°F)

3.2.24.2 Definition of parameter. Parameters shall be as defined in 6.5.

3.2.24 3 Acceleration. The upper limit of acceleration of the man/ escape system combination when propelled by the AEPS shall be within the limits established by MIL-S-9479, MIL-S-18471 or MIL-A-23121, as applicable (see 6.2). For rocket motors used to provide momentum to the man/escape system combination, acceleration shall be computed from ejected 3 percent and 98 percent man/escape system masses and from rocket motor thrust.

3.2.24.4 Rate of rise of acceleration. The upper limit of rate of acceleration of the man/escape system combination when propelled by the AEPS shall be within limits established by MIL-S-9497, MIL-S-18471 or MIL-A-23121, as applicable, as measured in accordance with MIL-E-9426 (see 6.2). For rocket motors used to provide momentum to the man/escape system combination, rate of rise of acceleration shall be computed from ejected 3 percent and 98 percent man/escape system masses, and from rocket motor thrust.

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3.2.24.5 Dynamic response index (DRI). The AEPS shall satisfy the DRI requirements of the applicable specification on aircraft aircrew escape systems.

3.2.24.6 Unstable burning. The thrust-time and pressure-time curves obtained from performance tests, when measured with high-frequency response equipment (600 Hz minimum) shall not indicate unstable propellant grain burning (see 6.5.14).

3.2.24.7 Exhaust. The AEPS exhaust shall not contain solid ejecta material greater than 0.03 inch diameter, including but not limited to, fragments of propellant potentially harmful to personnel, equipment, vehicles, and structures. Solid ejecta is defined to include all non-gaseous and nonplasma matter except smoke (see 6.5.13) and ejecta less than 0.03 inch diameter resulting from solid particles used as ingredients of the propellant or ignition material.

3.2.24.8 Smoke emission. Smoke or flame shall not be emitted from any part of the AEPS except the rocket nozzle (or expended catapult tube).

3.2.24.9 Dissipation interval. During the thrust dissipation interval, the thrust shall not rise above the 10 percent of maximum thrust level after the end of the action line.

3.2.24.9.1 Tailoff. The minimum thrust tailoff characteristic is required in the AEPS without any afterburning of the propellant. Maximum allowable tailoff shall be defined by the escape system design activity and approved by the GPA.

3.2.24.10 Ejected weight. The ejected weight (man/escape system) which the AEPS shall be capable of propelling shall be as specified by the escape system design activity applicable for each AEPS (see 6.2).

3.2.25 Other requirements.

3.2.25.1 Explosive classification. Explosive classification shall be determined by the contractor with the concurrence of the GPA. The transportation hazard classification of the AEPS, propellant, and ignition material shall be limited to class B, or less, as defined by 49 CFR 171-190.

3.25.2 Electromagnetic radiation hazard. The AEPS shall be designed to preclude hazards from electromagnetic radiation to ordnance (HERO) in accordance with the requirements of MIL-STD-1385.

3.2.25.3 Forty-foot drop tests. The AEPS, including the initiator, shall be safe to handle and dispose of, and shall not burn, initiate, deflagrate, or detonate when subjected to a drop of 40 feet (see 4.4.2.17).

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3.2.25.4 Three-foot drop tests. The AEPS shall not suffer damage, initiate, or subsequently fail to operate in conformance with requirements of 3.4 of this specification when dropped from a height of 3 feet (see 4.4.2.16).

3.2.25.5 Safety. The system safety program shall be in accordance with MIL-STD-882 to the extent specified by the GPA. (See 3.6.1).

3.2.25.5.1 Safety tests. The AEPS shall not detonate when exposed to an external heat source (see 4.4.2.18.1) or when impacted by a 20-millimeter or 50-caliber projectile (see 4.4.2.18.2). As a design goal, the AEPS when impacted by a 20-millimeter or 50-caliber projectile shall not rupture with sufficient force to emit shrapnel.

3.2.26 Reliability. As a design goal, the AEPS shall have a probability of meeting the requirements of this specification of not less than 0.999 with a confidence level of 90 percent when operated under the environmental and operational conditions specified herein. The demonstrated reliability shall be limted only by the maximum number of test motors to be fired as required by the specification.

3.2.26.1 Reliability plan. Using MIL-STD-785 as a guide, the contractor shall prepare, establish, implement, and document a reliability program plan. This plan shall provide a reliability program which is practical to achieve within a reasonable cost and shall provide minimum reliability levels for each phase.

3.2.27 Failure mode and effect analysis (FMEA). For each AEPS, the contractor shall prepare a detailed FMEA using MIL-STD-2067 as a guide and shall submit it to the GPA for approval.

3.2.28 Component compatibility tests. AEPS component compatibility tests shall be performed by the contractor during Phase I (unless already available) to determine the effects of interaction among propellant ingredients, propellant liner, propellant ignition material, and other ingredients such as adhesives, lubricants, etc. These tests shall include, but not be limited to, differential thermal analysis and accelerated ageing studies. These tests shall demonstrate to the GPA that the age life of the AEPS will not be reduced below 7 years because of incompatibilities with the AEPS. The GPA reserves the right to require and perform tests on any chemicals, materials, or combinations which, in its opinion, may degrade with age.

3.2.29 Cut-away model. During final stage of Phase I and prior to the beginning of Phase II, the contractor shall manufacture and submit a full scale cut-away model of the design unit to the GPA. The explosive components shall be replaced with inert material in the same configuration as the explosive components. The location of the cut shall be selected to reveal critical internal components and maximize the information obtained from the model.

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3.3 Phase II (design verification). Prior to beginning Phase II, the contractor shall meet the following:

a. All requirements of Phase I shall have been performed and approved by the GPA.

b. A cut-away model shall be available for review.

c. All Phase I data shall be submitted.

d. A preliminary design review of the current configuration shall be performed (see 3.6.5.1.).

3.3.1 Design verification test sample. Fourteen loaded AEPS, five of each igniter assembly, and 10 one-gallon blocks of propellant shall be submitted to the Naval Ordnance Station, Indian Head, MD (NOSIH) for design verification tests of TABLE III (see 3.8). Failure of any assembly/subassembly/component to meet all applicable requirements shall be cause for immediate suspension of the test program. At the option of the GPA, the preliminary design review of 3.3.d shall be reconvened to determine/agree upon future actions to be taken prior to test continuance. Restart will occur only after approval of the failure analyses and corrective action plan by the GPA.

3.4 Phase III (service release test). Before beginning Phase III, the contractor shall meet the following:

a. All requirements of Phase II shall have been performed and approved by the GPA.

b. An updated cut-away model of 3.3.b shall be available for review.

c. All Phase I and II data shall have been submitted.

d. A critical design review of the configuration identification formal documentation and all data shall be performed (see 3.6.5.2).

3.4.1 Phase III test samples. The test sample shall be as defined in 3.4.1.1 and 3.4.1.2.

3.4.1.1 Service release component test sample. A test sample consisting of 82 loaded AEPS, two inert AEPS, two one-gallon blocks of cured propellant (equally divided between at least two batches) for each propellant type used in the AEPS, and the required propulsion unit information shall be delivered to NOSIH for service release testing (see 3.8). The service release test sample units shall be manufactured to the design established by the critical design review and approved by the GPA. It shall be manufactured with the same equipment, environment and procedures as proposed for production units.

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TABLE III. Design Verification Test Program.

SECTION		TEST		UNIT														
3	4			1	2	3	4	5	6	7	8	9	10	11	12	13	14	
		Inspection		a	a	a	a	a	a	a	a	a	a	a	a	a	a	
3.2.23.3	4.4.2.13	Temperature cycling	-65°F							b				b				
			165°F								b				b			
3.2.23.7	4.4.2.25	Vibration	-65°F							c		b						
			165°F								c		b					
3.2.23.6	4.4.2.15	Shock								d	d			c	c			
3.2.25.4	4.4.2.16	3 foot drop	-65°F											d				
			165°F												d			
3.2.23.9	4.4.2.19	Load										c	c					
		Inspection								e	e	d	d	e	e			
3.2.24.1	4.4.2.3.b	Ballistic test	-65°F	b	b	b				f		e		f				
			165°F				b	b	b		f		e		f			
		Percentile weight		3	98	98	3	98	98	98	98	3	3	3	3			
3.5.7	4.4.2.5	Marginality of success		c	c	c	c	c	c	g	g	f	f	g	g			
3.5.8	4.4.2.26	Detailed breakdown															b	
		Contingency														b		
3.2.12.1.2	4.4.2.1	Propellant characteristics		Ten 1-gallon blocks of cured propellant														
3.2.11.2.b	4.4.2.2	Igniter to Pmax closed bomb at -65°F		1	2	3	4	5										

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3.4.1.1.1 Service release test. The sample of 3.4.1.1 shall be tested in accordance with TABLE IV. Failure of any assembly/subassembly to meet all applicable requirements shall be cause for immediate suspension of the test program. At the option of the GPA the critical review of 3.4d shall be reconvened to determine/agree upon future actions to be taken prior to test continuance. Restart will occur only after approval of the failure analysis and corrective action plan by the GPA.

3.4.1.1.2 Type-life study. Eighteen loaded AEPS from the service release test sample (equally divided between propellant batches) shall be designated for type-life study (accelerated aging). The units shall be retained by the contractor until completion of the service release test program. Following completion of service release testing, the units shall be delivered to the Naval Ordnance Station, Indian Head, MD (Code 3012). Tests conducted with type-life units shall not be applied to acceptability of the AEPS as determined during service release testing.

3.4.1.2 AES (Aircrew Escape System) system and subsystem test sample. For units that are manufactured for AES system/subsystem testing, the acceptance test sample size submitted to NOS/IH shall be in accordance with MIL-STD-414, inspection level III, for each temperature tested. The ballistic data shall be analyzed and the lot accepted in accordance with MIL-STD-414, standard deviation method, single or double specification limit (as applicable), variability unknown with an AQL of 2.5 percent.

3.5 General requirements. Unless otherwise specified, the following requirements shall be satisfied for all phases of the contract.

3.5.1 Life. All explosive components except propellant used in the AEPS, such as primers, ignition materials, cartridges, initiators, and igniters which were manufactured 12 or more months prior to the contract date shall not be used. The propellant cartridge and rocket motor shall not be manufactured prior to 150 days before the original contract scheduled delivery date for the applicable phase acceptance test units.

3.5.1.1 Primers. Except as otherwise specified, primers for contract requirements will be supplied as GFM by Naval Ordnance Station, Indian Head, MD. Primers will be supplied for proprietary items only on an exception basis, when use of GFM is determined, by the CFA, to be to the Government's advantage. Where primers are not supplied as GFM, the primers shall meet the life requirements of 3.5.1 and all applicable Government or commercial specification requirements for the primer. Additionally, the lot shall be subjected to a reliability dud test as follows:

(a) A sample of 2300 primers from the lot shall be functionally tested at the minimum all-fire energy established by the primer specification. A ball drop test fixture shall be used for the test. The primers shall be tested in cases or a die which reasonably simulates end item conditions (e.g., pocket diameter, primer reconsolidation).

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TABLE IV. Service Release Test Program.

SECTION		TEST		UNITS																							
3	4			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
		Inspection		a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
3.2.23.3	4.4.2.13	Temperature cycling	-65° F																b	b			b	b				
			165°F																		b	b			b	b		
		Inspection																					c	c	c	c		
3.2.23.8	4.4.2.14	Rain, salt and humidity																									b	b
3.2.24.1	4.4.2.3.b	Vibration	-65° F																				d	d				
			165°F																						d	d		
		Inspection																	c	c	c	c	e	e	e	e	c	c
3.2.24.1	4.4.2.3.b	Ballistic	-65°F	b	b	b	b	b											d		d		f		f		d	
			70°F						b	b	b	b	b															
			165°F											b	b	b	b	b		d		d		f		f		d
3.5.7	4.4.2.5	Marginality of success		c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	e	e	e	e	g	g	g	g	e	e

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TABLE IV. Service Release Test Program (Cont).

SECTION		TEST		UNITS																									
3	4			26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
		Inspection		a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
3.2.23.2.1	4.4.2.21	Forty-two day storage	-65°F																			b	b						
			165°F																					b	b				
		Inspection																					c	c					
3.2.23.3.1	4.4.2.13	Temperature cycling	-65°F	b		b	b			b	b												d						
			165°F		b			b	b			b	b											d						
		Inspection		c	c	c	c	c	c	c	c	c	c										e	e					
3.2.23.7	4.4.2.25	Vibration	-65°F							d	d												f						
			165°F									d	d											f						
3.2.23.5	4.4.2.22	Sand and Dust		d	d																								
3.2.23.6	4.4.2.15	Shock				d	d	d	d	e	e	e	e										g	g					
3.2.25.4	4.4.2.16	Three foot drop	-65°F											b	b	b													
			165°F														b	b	b										
3.2.25.3	4.4.2.17	Forty foot drop																		b	b								
3.2.23.2.1	4.4.2.20	Eighty-four day storage	-65°F																							b	b		
			165°F																									b	b
		Inspection		e	e	e	e	e	e	f	f	f	f	c	c	c	c	c	c	c	c	c	h	h	c	c	c	c	c
3.2.24.1	4.4.2.3.b	Ballistic	-65°F	f		f		f		g		g		d	d	d						d		i		d		d	
			165°F		f		f		f		g		g				d	d	d				i		d		d		d
3.5.7	4.4.2.5	Marginality of success		g	g	g	g	g	g	h	h	h	h	e	e	e	e	e	e			e	j	j	e	e	e	e	e

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TABLE IV. Service Release Test Program (Cont).

SECTION		TEST	UNITS																								
3	4		52	53	54	55	56	57	58	59	60	61	62	63	64	65	66										
		Inspection	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a										
3.2.3	4.4.2.7	Fungus resistance	b																								
3.2.25.5.1	4.4.2.18.1	External heat		b	b																						
3.2.25.5.1	4.4.2.18.2	Bullet impact				b	b																				
3.2.23.9	4.4.2.19	Loads						b																			
3.2.23.4	4.4.2.23	Atmospheric							b																		
3.2.17	4.4.2.24	Thrust stand firing								b	b	b	b	b													
		Inspection	c					c	c																		
3.2.24.1	4.4.2.3.6	Ballistic -65°F																									
		Ballistic 165°F						d	d																		
3.5.7	4.4.2.5	Marginality of success						e	e	c	c	c	c	c													
3.5.8	4.4.2.26	Detailed breakdown													b												
3.2.15	4.4.2.20	Compatibility (Inert)														b	b										
		Contingency	d																								
3.2.12.1.2	4.4.2.1	Propellant system characterization	Two 1-gallon blocks of propellant																								
3.4.1.1.2	4.4.2.27.8	Type-life study	18 Loaded units																								

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(b) No failures are permitted. A failure is defined as any one of the following primer malfunctions:

(1) Misfire - a failure wherein initiation of the primer mixture does not occur.
(2) Squib - a failure wherein a burning of the primer mixture occurs without detonation.
(3) Hangfire - a failure wherein an audible delay occurs between the instant of application of energy and the detonation report.

3.5.1.2 Lot composition. Only explosive components from a single explosive component lot shall be used in an AEPS lot. One explosive component lot may be used in more than one loaded AEPS lot. An AEPS lot may contain propellant from more than one batch of propellant as long as conformance to 3.5.1.2.1 is maintained.

3.5.1.2.1 Explosive component lot. To assure homogeneity, each explosive ingredient used in an explosive component lot shall be from a single raw material lot. As far as possible, all propellant ingredients needed for the entire AEPS lot shall be premixed at one time.

3.5.2 Identification.

3.5.2.1 Navy procurement. Each complete AEPS shall be marked in accordance with drawings 4903620, 4904217, 736AS103, 946AS112 or a GPA approved substitute, as applicable. Warning labels shall be in accordance with drawings 2546994, 2846932, 4904106, 4904107, 4904145 or a GPA substitute, as applicable. The location of the labels shall enhance readability when installed and shall be approved by GPA. All AEPS of the same designation shall be marked using the same method.

3.5.2.2 Air Force procurement. Each propulsion system shall be clearly and permanently identified by a nameplate conforming to MIL-STD-130 and drawing 63C32091, 63C32092 or 63C32093, as applicable. Warning labels shall be in accordance with drawings 8593294, 10520571 or a GPA substitute, as applicable.

3.5.2.3 Gas port marking. Gas ports shall be labeled Inlet or Outlet, whichever is applicable. The direction of gas flow shall be indicated by permanent red arrows.

3.5.3 Finish.

3.5.3.1 Ferromagnetic parts. All ferromagnetic parts of the AEPS shall be plated in accordance with the applicable Government drawing.

3.5.3.2 Corrosive resistant parts. All corrosive resistive alloys shall receive a surface treatment that has been approved by the GPA, e.g., stainless steel shall be passivated in accordance with MIL-S-5002.

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3.5.3.3 Aluminum parts. Aluminum parts shall be anodized in accordance with MIL-A-8625 Type I or II, Class 2. Minor damage may be repaired with a chemical film treatment in accordance with MIL-C-5541, Class 1A.

3.5.3.4 AEPS assembly. When specified by GPA, all external surfaces, except aircraft interface surfaces, shall be painted in accordance with MIL-P-85089.

3.5.3.4.1 Color. Unless otherwise specified, the color shall be white number 37875 in accordance with FED-STD-595.

3.5.3.5 Color coding. Unless otherwise specified, each unit shall be color coded with a brown band by applying one coat of brown enamel per TT-E-516 or brown tape per PPP-T-66, Type I, Class 2. Color shall be in accordance with FED-STD-595, Number 30117 or 30140. Location of band shall be determined and approved by the GPA during Phase I.

3.5.4 Magnetic particle inspection. All ferromagnetic parts shall be 100 percent inspected in accordance with MIL-I-6868.

3.5.5 Penetrant inspection. All non ferromagnetic parts shall be 100 percent inspected in accordance with MIL-I-6866.

3.5.6 Reliability growth curve. A reliability growth curve shall be developed through Phase III to assess the AEPS demonstrated (pass/fail) reliability at 90 percent confidence.

3.5.7 Marginality of success (MOS) evaluation. The contractor shall prepare for each AEPS an MOS plan including inspection procedure, check-off sheet and report format using MIL-STD-2067 as a guide and, shall submit it to the GPA for approval. After test firings of the AEPS, they shall be disassembled to determine if any marginal condition exists. The check-off sheet of the MOS plan shall be used for this purpose and shall be included in the report to the GPA.

3.5.8 Detailed breakdown (Phases II and III only). One loaded AEPS during each phase shall be disassembled to determine conformance to the established phase requirements.

3.5.9 Radiographic inspection. All loaded AEPS shall be radiographically inspected in accordance with 4.3.5. As specified in the contract, the supplier shall either submit all radiographs to the GPA or permit a GPA representative to examine the radiographs at the supplier's facility.

3.5.9.1 Radiographic procedure. Prior to any unit manufacture, a written procedure and sample film for radiographing the AEPS shall be submitted to the GPA for approval. Any subsequent change in radiographic procedures must be approved by the GPA.

3.5.10 Pressure transducers. All test units shall be adapted for pressure transducers as specified by the GPA.

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3.5.11 Sample identification. Each AEPS test sample shall be identified in accordance to MIL-STD-1168 as "Experimental Lots". The following illustrates the construction of the lot number:

AMC75D000E001
a b c d f e

a. Manufacturer's identification symbol.

b. Year in which the propellant was manufactured.

c. Month in which the oldest propellant batch used in the test sample was manufactured.

d. Lot interfix number (shall always be identified with the numeric characters "000").

e. Lot sequence number (identifies in sequence the number of experimental lots developed by a particular manufacturer).

f. Alpha suffix - "E" designating experimental lot.

Refer to MIL-STD-1168 for additional definitions and examples.

3.5.12 Workmanship. The workmanship shall be that required by the best industrial practices governing the quality production of interchangeable parts for maintaining the dimensions, finishes, tolerances and quality specified herein. All components and assemblies shall be free from burrs, chipped paint, contamination, corrosion, sharp edges, cracks, disbond, dents, excessive wear and foreign material.

3.5.13 Health and safety criteria. The AEPS shall not contain any part or component that provides adverse explosive, mechanical or biological (including toxicological and carcinogenic) effects to the handler or user when handled in accordance with approved procedures (see 3.6.1).

3.6 Other requirements.

3.6.1 Safety. The safety program for the AEPS, as a minimum, shall conform to MIL-STD-882 and the following criteria:

a. The safety requirements shall cover the following minimum elements of the life cycle of the AEPS.

(1) Propellant grain manufacturing and AEPS assembly

(2) Transportation

(3) Handling

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(4) Storage

(5) Environment

(6) Maintenance and checkout

b. The design shall include components and materials that will eliminate hazards and prevent accidents throughout the life cycle conditions relating to all aspects described in (a) including malfunctions and unexpected events.

c. Hazard analyses shall be performed, as required, that consider the life cycle, subsystems, operational safety, the complete AEPS and all aspects of each.

d. As a minimum, the detailed safety precautions for manufacturing, loading, assembly and handling of the AEPS assembly, igniter assemblies, and subassemblies thereof that involve hazardous operations shall conform to DOD 4145.26M.

3.6.1.1 Explosive classification. The explosive hazard classification shall be determined and the following criteria established:

a. Quantity distance class

b. Storage compatibility group

c. Department of Transportation classification and marking of explosives class shall be Class B or less as defined by 49 CFR 171-190.

3.6.2 Human performance/human engineering. The human performance/human engineering requirements for the AEPS shall conform to MIL-STD-1472 to the extent that it is applicable to an AEPS assembly and its environment. The engineering restraints shall be those applicable to working with hazardous materials as classified here in accordance with the directive for that operation. Human error shall be minimized to the extent that failure to perform an operation in the specified manner shall not pose a threat to human life. Personnel-equipment interface shall be optimized to achieve maximum effectiveness of personnel during handling, operation, and control to minimize demands upon personnel resources, skills, training, and costs.

3.6.3 Configuration management. The contractor shall develop, submit for GPA concurrence, and following approval, implement a plan for managing AEPS configuration. The plan shall apply to all stages of design, development and production and shall establish means for controlling and tracing all changes in AEPS configuration whether the changes are physical in nature or are changes in processing, assembly or inspection.

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3.6.3.1 Configuration control. Prior to submittal of an AEPS for Phase III testing, the contractor may approve configuration changes in-house in accordance with the procedures contained in the approved configuration management plan (see 3.6.4). Subsequent to submittal of the AEPS for Phase III testing, configuration changes shall be submitted to the GPA for concurrence prior to their implementation. All changes shall be processed in accordance with DOD-STD-480 as applicable.

3.6.4 Documentation. The documentation shall be product-peculiar and shall conform to the following:

a. All documentation shall be delivered in agreement with the schedule and format for data as specified in the contract (see 6.2).

b. Traceability of each AEPS assembly, subassembly, components, individual parts, and materials shall be incorporated in the documentation.

c. Phase I products, processes, and materials shall be identified by existing documentation to the greatest extent possible.

d. Existing Government data shall be screened in accordance with the contract (see 6.2).

e. Selection of specifications shall be in accordance with MIL-STD-143 except Group IV shall only be used during Phases I and II. New specifications shall be prepared for all Group IV selections before Phase III as described below.

f. Products, processes, and materials requiring specifications shall be documented in accordance with Types C, D, or E, as applicable, and Form 1b of MIL-S-83490 and MIL-STD-490 prior to Phase III. Identification of specifications shall be as specified in the contract (see 6.2).

g. Drawings and specifications defining parts and materials supplied as GFM shall be used in their present form. No documentation shall be prepared for GFM parts and materials.

h. New parts and assemblies (including shipping containers) requiring drawings shall be documented in accordance with Level 3 of DOD-D-1000 before Phase III. Identification of drawings shall be as specified in the contract (see 6.2).

i. Form 1b specifications shall be revised using Specification Change Notices (SCN) in accordance with MIL-STD-490 subsequent to Phase III critical design review. Change control prior to the critical design review shall be by internal documentation with copies supplied to the procuring activity.

j. Level 3 drawings shall be revised using Notices of Revision (NOR) in accordance with DOD-STD-480 after the critical design review. Change control prior to the critical design review shall be by internal documentation with copies supplied to the procuring activity.

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k. All other documentation shall be prepared and submitted in accordance with the contract data requirements list (CDRL) of the contract (see 6.2.6).

3.6.5 Design reviews.

3.6.5.1 Preliminary (Phase II). A preliminary design review of the current configuration identification (CI) documentation as defined in MIL-STD-490 and all data shall be performed after completing Phase I and prior to beginning Phase II. The time, place and participants of the preliminary design review shall be as specified in the contract (see 6.2).

3.6.5.2 Critical (Phase III). A critical design review of the CI formal documentation and all data shall be performed after completing Phase II and prior to Phase III. The time, place and participants of the critical design review shall be as specified in the contract (see 6.2).

3.6.6 Data cards. Data cards shall be prepared for each test sample/lot of AEPS. The card content and submittal shall be in accordance with MIL-STD-1167 and as defined in 6.2.2.

3.6.7 Logistics.

3.6.7.1 Maintenance. An AEPS shall not require maintenance other than inspection and removal/replacement during its service life.

3.6.8 Test reports. Following each phase of testing, test reports shall be prepared and submitted to the GPA for approval (see 6.6.4).

3.6.9 Types of service release.

3.6.9.1 Certification prior to flight (Type I). Before any installation, use in subsystem testing above the AEPS component level, sled testing, or flight testing of a seat with dummy; a Type I release shall be required from the Naval Air Systems Command (NAVAIR) (AIR-5422B1) or Aeronautical Systems Division (ASD), Wright Patterson Air Force Base, Dayton, OH, as applicable, attesting to safety of handling and installation. The minimum requirement for issuing a Type I release is approval by NAVAIR or ASD and successful completion of Phase II (Design Verification) testing except that propellant characterization test completion is not required before certification.

3.6.9.2 Interim service release (Type II). Before any flights or use of an AEPS or AEPS subsystem involving a possible or intended live ejection of Government personnel, a Type II release is required. A Type II release is limited to a maximum of one year. The minimum requirements for issuing a Type II release is approval by NAVAIR/ASD, as applicable, completion of Phase II (Design Verification) testing, and successful completion of Phase III (Service Release, both AEPS component and system) testing except that 84 day storage and Phase III propellant characterization test completion are not required before interim certification.

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3.6.9.3 Final release to service (Type III). Before final release for admission of the AEPS into the applicable supply system and for service use after the first year, a Type III certification (release) shall be required. The minimum requirement for issuing a Type III certificate is successful completion of all Phase II and Phase III component and system testing, NAVAIR or ASD approval, and submission and approval of all data in the required format.

3.6.10 Technical manual (Navy procurement). Following a Type III service release, the contractor shall prepare a description of maintenance, safety, and handling criteria for the AEPS for incorporation into NAVAIR 11-85-1. Applicable propellant and engineering data sheets shall also be prepared on new items for incorporation in the Chemical Propulsion Information Agency (CPIA) propellant and rocket motor manual (see 6.7).

3.7 Documentation precedence. The precedence of documentation shall conform to the following:

a. The contract takes precedence over this specification.

b. The contract takes precedence over phases of development.

c. This specification takes precedence over documents referenced herein.

d. All documentation shall be prepared in such a manner that conflict is avoided primarily by locating each requirement in the documentation where it is intended it be placed.

e. In any event, the resolution of conflict of documentation content shall be mutually agreeable between the GPA and contractor.

3.8 Reduction of test quantities. In the event an AEPS has satisfactorily completed a test or test program equivalent to the requirements of Phase I, II, or III of this specification, the contractor may propose and request approval of a reduced test program. The request shall be fully supported with design, configuration and test data.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor shall be responsible for performing all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for performing the inspection requirements specified herein, unless disapproved by the GPA. Quality conformance data shall include, but is not limited to waivers and deviations and all data on any AEPS unit or component rejected during test or inspection whether waived or not. The GPA 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.

4.1.1 Research, design and development/adaptation inspection (Phase I). The contractor shall devise and accomplish an inspection program to demonstrate compliance with the requirements of this specification. The inspection program shall include, but is not limited to, a test program sufficient in scope to demonstrate the technical soundness of the AEPS basic design.

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4.1.2 Responsibility for Phase II and III testing. All Phase II and III component testing, as outlined in Tables II and III, respectively, and lot acceptance tests for units manufactured for AES tests shall be performed at the NOSIH.

4.2 Test conditions and provisions.

4.2.1 Prerequisites to tests.

4.2.1.1 Test plan. Test apparatus, procedures, and examinations compatible with the testing requirements specified herein shall be developed and proposed by the manufacturer and approved by the GPA prior to testing for all tests required by the manufacturer's quality assurance and quality control procedures and by the GPA.

4.2.1.2 Test samples. All test samples submitted to NOSIH for tests shall have passed successfully such inspections and tests required by the individual unit data list, by this specification, by the manufacturer's quality assurance/quality control procedures, and by the GPA. All rocket motor units submitted to the NOSIH for tests shall be completely assembled in accordance with this specification, drawings, processes, and procedures specified herein.

4.2.2 Test equipment and facilities. Test equipment and inspection facilities shall be capable of producing the required conditions and of sufficient accuracy, quality, and quantity to permit the performance of the required tests and measurements under the conditions and to the accuracies specified herein. Each AEPS shall be adapted for pressure transducers, as required. The following fans and shelves, or equivalent, shall be used in the specified work area:

a. Fans for circulating the air in the work space of the chamber shall be capable of moving air at the rate of 20 ± 5 times/minute the volume of the chamber when measured at 70 ± 5°F.

b. The AEPS shall be supported in the chamber in such a manner as to provide uniform flow around it.

4.2.2.1 Calibration of test equipment. All test and measuring equipment used in performing the tests specified herein shall conform to the requirements set by the National Bureau of Standards and, when specified in the contract, shall be calibrated and maintained in accordance with MIL-C-45662.

4.2.2.2 Test equipment accuracies. Unless otherwise specified, and in addition to the accuracies specified in referenced documents, test equipment shall have the minimum accuracies shown in Table V.

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TABLE V. Test equipment accuracies.

Requirement	Equipment accuracy
Maximum thrust/pressure	± 2.0 percent
Time	± 0.001 second (sec)
Maximum acceleration	± 5.0 percent
Frequency	± 1.0 percent of measured or ± 1 Hz, whichever is greater
Temperature	± 2°F
Recording instruments	Permanent records
Weight	± 0.005 pound
Thrust Pressure	600 Hz minimum and minimum 100 Hz low pass filter for digital readout permissable. No filtering for analogy permitted.

4.2.2.3 Recording instruments. Recording instruments shall make permanent records of the test equipment.

4.2.2.4 Environmental and test records. An environmental and test log shall be maintained for the AEPS. This log shall contain sufficient information of specific environmental and test records to permit a thorough review of the environmental conditioning and testing of each AEPS unit. These logs and test records shall be maintained and preserved by the contractor for a minimum of 10 years after program completion. The logs shall be numbered and referenced in the final report.

4.2.2.5 Temperature conditioning. Each AEPS unit shall be conditioned at the specified temperature for a minimum of that time defined in 4.2.2.5.1.

4.2.2.5.1 Temperature conditioning time. The temperature conditioning time to assure equilibrium temperature shall be determined from an adequately thermocoupled, full scale AEPS during Phase I. Or it may be based, with the approval of the GPA, upon experience with similar AEPS manufactured for which sufficient substantiating data are available.

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A sufficient number of thermocouples shall be embedded in the grain and the conditioning time for the AEPS shall be such that the grain shall reach a temperature within ± 5°F of that specified. This conditioning time as determined above shall be used in conditioning for applicable tests. The conditioning time plus a safety factor of 20 percent shall be subject to approval of the GPA.

4.2.2.5.2 Make up time. If an AEPS unit must be removed from the temperature conditioning chamber or if the conditioning environment falls outside the specified temperature limits for a period of more than 10 minutes, the test effort shall stop and the unit shall be reconditioned to the specified temperature. A reconditioning time of 2 minutes for every minute the unit spent outside the specified temperature envelope shall be required, but the reconditioning time need not exceed that time defined in 4.2.2.5.1.

4.3 Examinations. Unless otherwise specified, the examinations pertain to all phases of this specification. All AEPS units shall be examined for damage and conformance with the requirements of this specification and applicable drawings. Units believed to be unsafe or not in compliance with requirements shall not be tested.

4.3.1 Component dimensional inspection. Each part of the AEPS unit shall be 100 percent dimensionally inspected for conformance to the applicable drawing. Should replacement of a part in the unit be necessary, the replacement part shall be 100 percent dimensionally inspected for conformance to the applicable drawing.

4.3.2 Safety of handling. Prior to handling, each AEPS unit shall be visually examined to ensure it is safe to handle.

4.3.3 Damage. Each AEPS unit shall be thoroughly examined for chipped paint, corrosion, contamination, cracks, burrs, sharp edges, dents, excessive wear, foreign material, missing components, incorrectly installed components, and other deformities or damage. Any noted damage and abnormalities shall be photographically documented in addition to clearly detailing observances in the AEPS log.

4.3.4 Weight. Each AEPS shall be weighed to within ± 0.01 pound. The weight shall be recorded in the applicable log before, between and after completing each test.

4.3.5 Radiographic examination. All units, assemblies and subassemblies shall be radiographically examined in accordance with MIL-STD-453 radiographic quality level I and the following criteria:

a. The image of the propellant shall be clearly defined on the film.

b. Radiographs shall be capable of detecting defects and component parts with a minimum dimension of 0.03 inch.

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c. As a minimum, the radiograph shall be taken in two views, 0° and 90°. The 0° position shall be determined by the contractor and approved by the GPA prior to radiographic inspection.

d. If additional views are required to define a condition, they shall be taken.

e. Any discrepancy i.e., including but not limited to, grain imperfection, defective material, missing or misplaced internal components, shall be cause for rejection of the unit.

4.3.5.1 Radiograph certification and acceptance. The contractor shall review all radiographs and certify that the units/components have no dimensional discrepancies. All radiographs taken shall be either forwarded to NOSIH, Code 515, or shall be inspected on site by a NOSIH representative to assure quality conformance to MIL-STD-453. A radiographic report shall also be generated describing the results. At the option of the GPA the radiographs of the contractor-certified/accepted units may also be reviewed for radiographic discrepancies by a NOSIH representative.

4.4 Tests. The tests and methods in section 4.4 are divided into two subsections as follows:

Subsection 4.4.1 covers the tests required to establish criteria for future program phases.
Subsection 4.4.2 covers tests that are performed during one or all phases.

4.4.1 Phase I. During Phase I the following tests shall be performed to establish acceptance criteria.

4.4.1.1 Propellant. The propellant shall be prepared and tested in accordance with MIL-STD-2100 to establish requirements of 3.2.12.1.2.

4.4.1.1.1 Propellant ageing. The contractor shall submit a stress-strain and internal ballistic analysis of 3.2.12.1.2h.(2) for approval (see 6.2). The propellant shall be prepared and tested per 3.2.12.1.2h.(1) to meet requirements established by the analyses.

4.4.1.2 Ignition material. Each ignition material shall be prepared and tested per the test procedure of 3.2.11.1. Limits for the characteristics shall be established from these tests.

4.4.1.3 Igniter. The contractor shall perform five AEPS igniter(s) tests. These tests shall incorporate the proposed AEPS igniter(s) and an inert grain mounted in the expected configuration. Sufficient thermocouples shall be mounted on the inert grain to obtain an accurate

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representation of the temperature profile produced by the igniter. A minimum of one pressure transducer shall be incorporated in the igniter cavity to obtain a pressure versus time history of the ignition phase of the motor operation. The contractor and the GPA shall mutually determine the marginality of the motor ignition phase. These tests shall be rerun if, during any subsequent phase of the program, the materials used in or the geometry of the igniter is changed in any manner that may alter the flame propagation characteristics. Any such change in the igniter shall be considrered a Class I change as specified in DOD-STD-480 and shall require GPA approval before implementation and shall be supported by appropriate data to indicate that motor ignition is not adversely affected.

4.4.1.3.1 Closed bomb. After completion of 4.4.1.3, the contractor shall test each type of igniter in a closed bomb in accordance with a written procedure approved by the GPA to establish limits for maximum pressure and time to maximum pressure (see 3.2.11.2.b).

4.4.1.4 Liner/Inhibitor. During Phase I each liner/inhibitor shall be prepared and tested per test procedures of 3.2.12.2.1 or 3.2.12.3.1, as applicable to establish requirements of 3.2.12.2.1 or 3.2.12.3.1, as applicable.

4.4.2 Phases I, II and/or III. The tests of this section shall be used to perform the requirements of one, two or all phases of the program.

4.4.2.1 Propellant (Phase II and III). Each batch of propellant shall be prepared and tested in accordance with MIL-STD-2100 to meet requirements established by 4.4.1.1 during Phase I for burn rates, differential thermal analysis and physical properties.

4.4.2.1.1 Propellant ageing. The propellant shall be prepared and tested in accordance with 3.2.12.1.2.h(1) to meet requirements established during Phase I.

4.4.2.2 Igniter (Phase II). Each type of igniter shall be tested in accordance with procedures established by 4.4.1.3.1 to meet requirements established during Phase I.

4.4.2.3 Performance

a. Phase I - AEPS shall be ballistically fired in accordance with GPA approved procedures to meet requirements of 3.2.24.

b. Phase II and III - Each AEPS shall be ballistically test fired at NOSIH to meet requirements of 3.2.24.

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4.4.2.3.1 Preparation. Each AEPS shall be conditioned to the required temperature by procedures established in 4.2.2.5 and ballistically fired within 10 minutes of removal from the conditioning chamber.

4.4.2.3.2 Ballistic data. The ballistic tests shall provide, but not be limited to the following:

4.4.2.3.2.1 Catapult.

a. Total impulse (lbf-sec)

b. Stroke time (msec)

c. Maximum thrust (lbf)

d. Thrust-time curve

e. Ignition delay time (msec)

f. Maximum acceleration (g)

g. Acceleration-time curve

h. Maximum rate-of-acceleration (g/sec)

i. Separation velocity (ft/sec)

j. Initiation pressure (psig)/force (lbf)/voltage (volts)

k. Maximum combustion chamber pressure (psig)

l. Combustion chamber pressure-time curve

m. Dynamic response index (DRI)

4.4.2.3.2.2 Rocket motor.

a. Total impulse (lbf-sec)

b. Action time (msec)

c. Maximum resultant thrust

d. Thrust-time curve

e. Ignition delay time (msec)

f. Initiation pressure (psig)/force (lbf)/voltage (volts)

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g. Maximum combustion chamber pressure (psig)

h. Combustion chamber pressure-time curve

4.4.2.4 Dynamic response index (DRI). The DRI shall be measured directly from the catapult or cartridge performance or shall be computed as specified in MIL-S-9479.

4.4.2.5 Failure/marginality of success evaluation. All AEPS units that have been ballistically tested shall be totally disassembled and each component thoroughly examined for excessive erosion, excessive wear, missing components, signs of improper gas leakage, and other deformities or damage not normally observed or expected (see 3.5.7).

4.4.2.6 Firing mechanism (Phase I).

4.4.2.6.1 Mechanical firing mechanism test. The firing mechanism shall be mounted in a test fixture and tested at -65°F, 77°F, and 165°F. The firing mechanism shall be actuated and the pull forces recorded. Force values shall be within the limits specified in 3.2.10.2.1. Direction of pull shall be "in line" with the axis of the firing mechanism.

4.4.2.6.2 Gas actuated firing mechanism. The unit shall be mounted in a test fixture and fired by gas pressure to determine compliance with 3.2.10.2.2. The test shall be conducted at -65°F, 77°F, and 165°F.

4.4.2.7 Fungus resistance. Where materials have been treated with a fungicidal agent, fungus resistance tests shall be performed in accordance with MIL-STD-810. During Phase III, one complete AEPS shall be tested for fungus resistance in accordance with Method 508, MIL-STD-810.

4.4.2.8 Threaded joint torque test. Each threaded joint of the unit shall be checked with an approved torque device to determine the break-away torque. Torque values shall be as specified in 3.2.21.

4.4.2.9 Demagnetization tests. The AEPS unit shall be checked for residual magnetism in an area free of local magnetic effects by placing the unit 6 inches from an approved compass in a north-south horizontal position with the compass placed in an east-west heading. The full length of the unit shall be moved past the compass in the common horizontal plane. This procedure shall be repeated for every 90° of rotation of the unit. The unit shall be free from magnetism as specified in 3.2.20.

4.4.2.10 Magnetic particle inspection. All ferromagnetic parts shall be 100 percent inspected in accordance with MIL-I-6868.

4.4.2.11 Penetrant inspection. All nonferromagnetic metal parts shall be 100 percent inspected in accordance with MIL-I-6868.

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4.4.2.12 Hydrostatic proof test. All combustion chambers shall be hydrostatically tested 100 percent as a pressure vessel to 1.25 times the MEOP (including three standard deviations) of the AEPS at 165 ± 5°F to show conformance to 3.2.9. Leakage or permanent deformation shall be cause for rejection of the part.

4.4.2.13 Temperature cycling. Temperature cycling shall be performed in accordance with the following:

a. Cycle each test unit 3 times as shown in FIGURES 1 and 2.

b. Precondition the test chamber to the initial temperature prior to placing the test unit in the chamber.

c. Condition the test unit for not less than the time defined in 4.2.2.5.1.

d. Transfer the test unit from one conditioning temperature to another within 10 minutes.

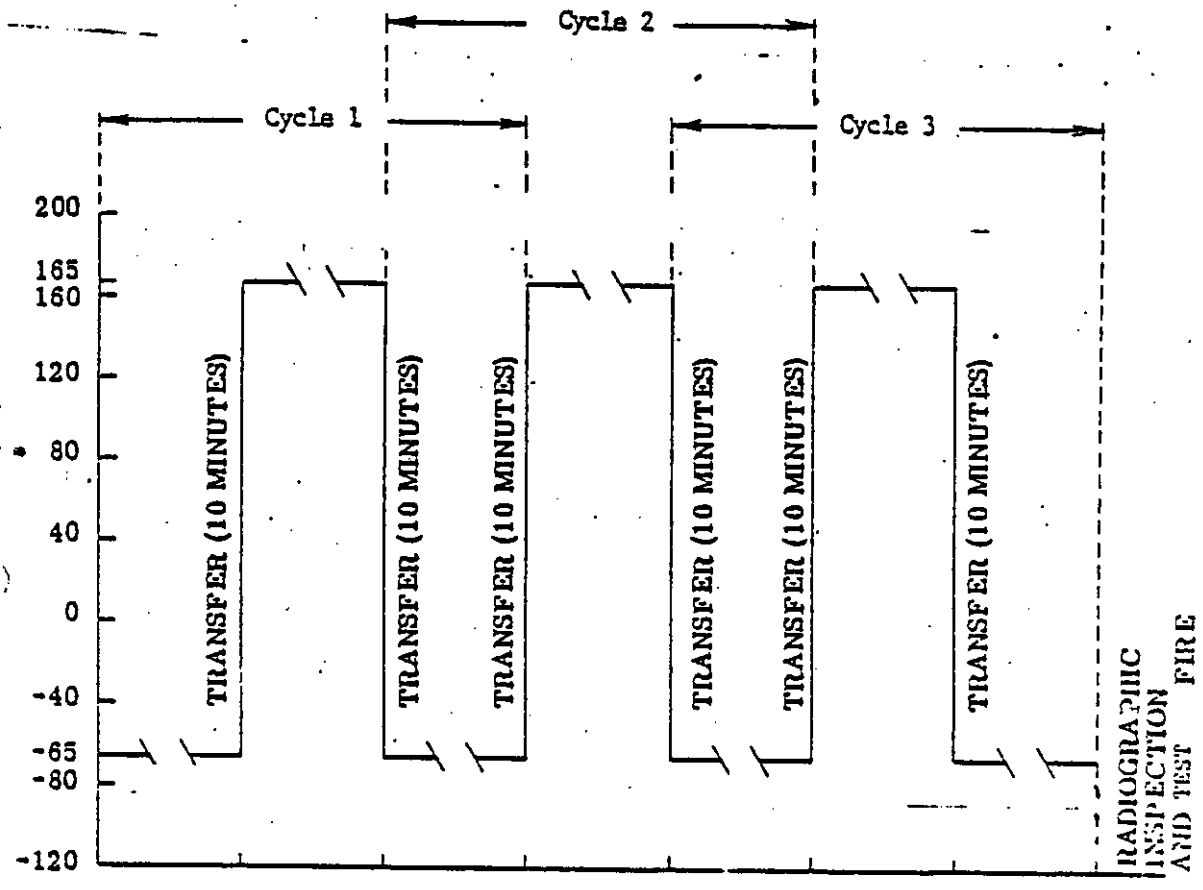
4.4.2.14 Rain, humidity, and salt spray. The AEPS specified in Table III shall be subjected to the following tests in the order listed.

4.4.2.14.1 Rain test. AEPS, as specified, shall be subjected to a simulated rainfall of 4 ± 1 inches per hour by means of water spray so designed that the water is emitted in small droplets rather than a mist. Duration of each test shall be 2 hours at ambient temperature. Each AEPS shall be examined for evidence of deterioration which would affect satisfactory performance.

4.4.2.14.2 Humidity test. The AEPS from rain test 4.4.2.14 .1 shall be stored at 120 ± 5°F and 100 percent relative humidity for a period of 10 days. The AEPS shall be examined for evidence of deterioration which would affect satisfactory performance.

4.4.2.14.3. Salt-spray test. AEPS from humidity tests 4.4.2.14 .2 shall be salt spray tested for a period of 168 hours in accordance with Method 509, MIL-STD-810. Amount of salt shall be 20 percent by weight. Operation prior to or during tests is not required. After completion of tests, the AEPS shall be cleaned of salt deposits and inspected for evidence of corrosion or other deterioration. One AEPS shall be conditioned and fired at -65 ± 5°F and the other at 165 ± 5°F.

4.4.2.15 Shock AEPS selected for shock testing shall be tested in accordance with the applicable table in this specification and in accordance with the shock tests of MIL-STD-2102.



Temperature cycling for initial temperature of -65°F.

FIGURE 1

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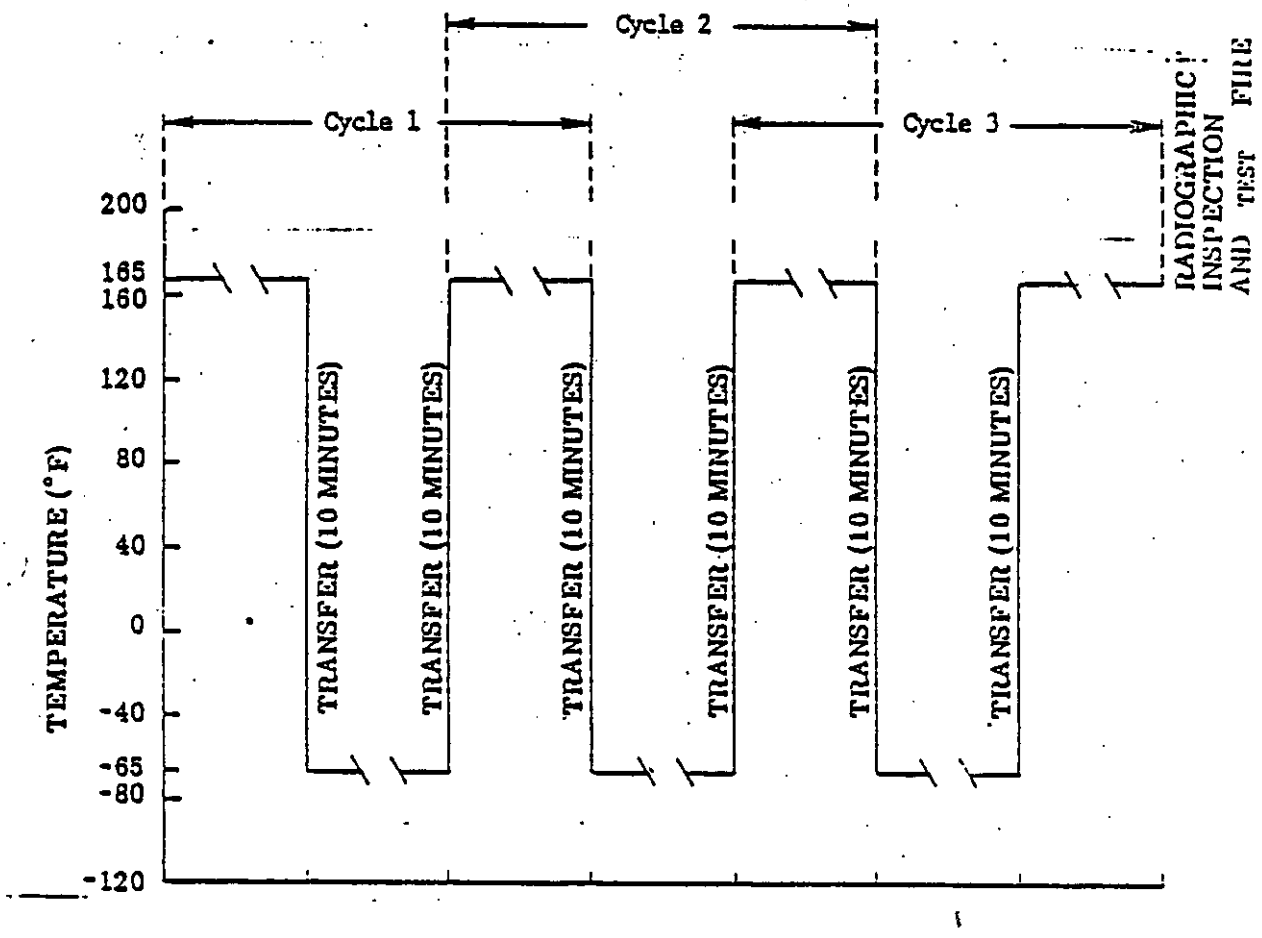

Temperature cycling for initial temperature of 165°F.

FIGURE 2

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4.4.2.16 Three-foot drop. In accordance with 4.2.2.5 three AEPS shall be temperature conditioned to -65 ± 5°F and three AEPS shall be temperature conditioned to 165 ± 5°F and dropped 3 feet onto a 2 inch thick steel plate (minimum Brinell hardness of 207) embedded in a minimum of 2 feet of concrete to determine conformance to 3.2.25.4. No AEPS shall be dropped more than once. Drop conditions shall be along each AEPS axis (x, y, and z), level and inverted. Axis for this test shall be as selected by the GPA.

4.4.2.17 Forty-foot drop. Two AEPS shall be dropped 40 feet free fall onto a 2 inch thick steel plate (minimum Brinell Hardness of 207) embedded in a minimum of 2 feet of concrete. One AEPS shall be dropped in a nozzle down attitude and the other in a horizontal attitude. The nozzles shall not be removed from the AEPS. AEPS shall be dropped at ambient temperature. No AEPS shall be dropped more than once. The AEPS shall not be fired; it shall be radiographically examined in accordance with 4.3.5 and disassembled to demonstrate the AEPS suitability for safe handling and disposition. If detonation, deflagration, or a pressure rupture occurs, a fragment map shall be prepared indicating distance, direction, and weight of both steel and propellant fragments, as well as locations of buried propellant fragments. The entire sequence of 40-foot drop tests shall be recorded on high speed (4,000 frames per second minimum) motion picture film (impact area only) and 24 frames per second (fps) motion picture film (the entire fall).

4.4.2.18 Safety tests. Safety tests shall include external heat and bullet impact tests and shall be performed as follows:

4.4.2.18.1 External heat test. The external heat test shall be conducted on two fully assembled AEPS. Each unit shall be adequately restrained from movement. Each AEPS shall be held in a horizontal position such that its centerline is 2 to 3 feet above the surface of the fuel. The fuel shall be a pool of JP5 or JP4 jet fuel with a minimum size of 5 by 5 feet. Fuel shall be used in sufficient quantity to cause a reaction of the unit or to burn for 15 minutes whichever is shorter. (In a 5 by 5 foot pool, 66 gallons of fuel will burn for approximately 15 minutes.) A dummy test shall be conducted to demonstrate that the temperature on the lower exterior surface of the unit will be a minimum of 165°F. The temperature obtained in this test shall be recorded and included in the test report. For the AEPS test, a minimum of three movie cameras shall be located such that they view the aft end and both sides of the AEPS. Color motion pictures shall be taken at 100 fps (one camera) and 16 to 24 fps (for others) and should be started just prior to ignition of the fuel and continue until all unit reactions cease. Ample protection of the cameras shall be provided to prevent damage in case of detonation. Should detonation, explosion, or pressure failure result, a fragment dispersion pattern shall be prepared. This pattern shall include, but not be limited to, fragment material, size, and distance projected.

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4.4.2.18.2 Bullet impact test. The bullet impact test shall be conducted on two fully assembled AEPS. The AEPS shall be restrained from movement in a horizontal position and placed in a suitable location sufficient for safety precautions in case a detonation occurs. The gun used shall be located at a firing distance of approximately 100 feet from and normal to the side of the item and suitably protected in the event of a detonation. Motion pictures shall be taken of the complete test both at 16 or 24 fps and at high speed (4,000 fps minimum). Ample protection of the cameras shall be provided to prevent damage in case of a detonation. Either a 20-millimeter or 50-caliber AP projectile shall be fired into the AEPS. If a detonation, deflagration, or a pressure rupture occurs, a fragmentation map shall be prepared indicating distance, direction, and weight of both steel and propellant fragments, as well as location of buried propellant fragments.

4.4.2.19 Load. A loaded AEPS shall be load tested at -65°F utilizing a test fixture approved by the GPA and test fired at 70°F to determine conformance to this specification.

4.4.2.20 Compatibility tests. These tests shall be conducted by an activity designated by the GPA. The purpose of these tests shall be to determine the compatibility of the AEPS for use with the designated aircraft. To perform the compatibility tests, two inert AEPS shall be supplied during the service release program. The AEPS selected for compatibility testing shall be shipped on a Government bill of lading to a designated activity.

4.4.2.21 Storage. The AEPS selected for storage tests shall be temperature conditioned at an equilibrium temperature of -65 ± 5°F and maintained at that temperature for 42 and 84 days as scheduled in the appropriate table.

4.4.2.22 Sand and dust. Sand and dust tests shall be carried out in accordance with Method 510, MIL-STD-810.

4.4.2.23 Atmospheric testing. The AEPS selected for atmospheric testing shall be tested as defined in MIL-STD-810, Method 504, except the motor shall not be operated. The motor shall be tested to the conditions of equipment, Class 2 - nonoperating, as depicted on TABLE 504-1, except the low cycle. The motors shall be ballistically fired as defined in 4.4.2.24. The motors shall meet the performance requirements of 3.2.24 when ballistically fired.

4.4.2.24 Thrust stand firings. The AEPS shall be ballistically fired on a test stand capable of verifying the thrust angle defined in accordance with the requirements of 3.2.24 within ± 20 minutes of arc.

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4.4.2.25 Vibration. AEPS selected for vibration testing shall be in accordance with the applicable table in this specification and tested in accordance with the vibration tests of MIL-STD-2102.

4.4.2.26 Detailed breakdown. One AEPS shall be radiographically, visually, and dimensionally inspected in detail to assure conformance to phase requirements. A detailed inspection shall be maintained throughout the process. If the unit fails to meet inspection requirements, the phase test sample shall be rejected.

4.4.2.27 Other procedures.

4.4.2.27.1 Materials, processes, and parts. Materials, processes, and parts shall be verified as conforming to the requirements herein by examination of their description and by the drawings and specifications requiring their use in the AEPS.

4.4.2.27.2 Electromagnetic radiation. Electromagnetic radiation conformance shall be determined in accordance with MIL-STD-1385.

4.4.2.27.3 Nameplates and product markings. Nameplates and product marking shall be verified by visual examination of the AEPS to determine conformance to the applicable drawing and the contract.

4.4.2.27.3.1 Identification. Identification shall be verified by examination of the applicable assembly drawing to determine that the correct drawing is referenced for the applicable identification criteria.

4.4.2.27.3.2 Gas port marking. Gas port marking shall be verified by visual examination of the parts involved.

4.4.2.27.3.3 Fluid connection marking. Fluid connection marking shall be verified by visual examination of the connection and method of marking.

4.4.2.27.3.4 Color coding. Color coding shall be verified by visual examination of the loaded AEPS.

4.4.2.27.4 Workmanship. The AEPS assembly, parts and components shall be examined for the conformance to the workmanship requirements.

4.4.2.27.5 Interchangeability. Interchangeability of parts and components shall be verified by the drawing and specification reviews. The documentation shall be examined for matched parts requirements, tolerancing that would prevent interchangeability, or any other facet that would prevent complete interchangeability.

4.4.2.27.6 Safety. Conformance to the safety requirements shall be verified in accordance with MIL-STD-882 and the following:

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a. All elements of the life cycle of the AEPS shall be examined.

b. The design shall be reviewed for the absence of hazardous materials and elimination of potential unexpected hazards to personnel and equipment.

c. Detail manufacturing and operating procedures for performing each task shall consider safety foremost and include appropriate warnings and instructions in case of emergencies.

4.4.2.27.6.1 Explosive classification. Explosive classification of the AEPS shall be determined in accordance with 46 CFR 171-190. Quantity distance class and storage compatibility group shall be determined in accordance with DOD 4145.26M.

4.4.2.27.6.2 Lock shut safety provision (Phase I). Lock shut safety provisions during Phase I shall be verified by physically restraining the rocket motor catapult system and static firing the unit.

4.4.2.27.7 Human performance/human engineering. Human performance/human engineering shall be verified in accordance with MIL-STD-1472 to the extent possible. Verification shall also be obtained during review of the design and accompanying documentation.

4.4.2.27.8 Type-life study. Type-life (accelerated aging) tests shall be conducted by Naval Ordnance Station, Indian Head, MD following completion of service release testing (see 3.4.1.1.2).

5. PACKAGING

5.1 Preservation-packaging. Unless otherwise specified in the contract, preservation-packaging shall be level A.

5.1.1 Level A.

5.1.1.1 Cleaning. Each loaded AEPS shall be thoroughly cleaned before packing.

5.1.1.2 Protective closures. All openings shall be covered with metal protective closures conforming to MIL-C-5501. Under no circumstances shall plastic closures be used.

5.1.1.3 Intermediate packaging. The loaded AEPS shall be packed in containers subject to the approval of the NOSIH. The package shall be cushioned adequately to protect the AEPS unit against handling and shipping shocks and vibrations and shall comply in general with the applicable requirements of MIL-P-116 and 49 CFR 171-190.

5.2 Packing. Unless otherwise specified in the contract, packing shall be level A.

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5.2.1 Level A. The loaded AEPS shall be packed singly or in pairs in a single container conforming to PPP-B-621, Class 2, Grade B, Style 2 or 3, Type 2, and 49 CFR 171-190.

5.3 Palletized loads. Loaded AEPS, packed as specified in 5.2, depending on the level of packing specified in the contract, shall be packed for shipment on a disposable wood pallet suited for mechanized handling by forklift, whenever total quantities for shipment to one destination equal 36 cubic feet or more. The pallet dimension (length and width) shall exceed the unit package length and width by approximately 12 inches. Palletized loads shall be uniform in size and quantities to the greatest extent practicable.

5.4 Marking. In addition to any special marking required by the contract, each unit package, intermediate package, shipping container, and palletized load shall be marked in accordance with MIL-STD-129 and 49 CFR 171-190. Marking shall include the following as a minimum.

a. Nomenclature (item designation)

b. National stock number and DODIC, if applicable

c. Quantity

d. Lot number

e. Serial number(s)

f. Contract number

g. Gross weight and cube

h. Applicable DOT explosive classification (see 3.6.1.1)

i. Warnings: HANDLE CAREFULLY, KEEP FIRE AWAY

6. NOTES

6.1 Intended use. The AEPS is composed of a variety of propellant actuated devices that when sequentially activated provides for aircrew safety during an emergency egress. Units such as catapults or the catapult phase of a rocket catapult will propel the ejection seat and its occupant out of the aircraft. Units such as under seat or seat back rocket motors or the rocket phase of a rocket catapult will propel the ejection seat and occupant safely away from the aircraft. Other rocket motors provide reactive impulse for seat subsystems such as man seat separation, seat rotational control, or parachute deployment. The system will propel the occupant of the seat at a sufficient velocity to ensure that he will

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clear a fast moving aircraft by a safe margin and attain a height required to permit parachute deployment and a normal descent.

6.2 Ordering data. Procuring activities should exercise any desired options offered herein and procurement documents should specify the following:

6.2.1 Ordering data. The procurement documents should specify, but not be limited to, the following:

a. Title, number, and date of this specification

b. Dimensions

c. Weight

d. Nozzle thrust angle range

e. Attachment relative motion and strength requirements

f. Atmospheric pressure conditions

g. Weight of propelled mass (man/escape system)

h. Performance (ballistic) requirements

i. Acceleration limit

j. Rate of rise of acceleration limit

k. Special preservation and packaging

l. Special marking

m. Data required (TABLE VI)

n. List of drawings and all drawings and revisions listed thereon

o. Number and types of test samples to be submitted

p. High rate for testing mechanical properties

q. The safety precaution requirements of the DOD 4145.26M shall be 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, should be made applicable.

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6.2.2 Data cards. DD Form 1650 in accordance with MIL-STD-1167 shall be completed for each AEPS test sample. FIGURE 3 is a sample data card applicable for AEPS. All primary components shall be identified in Block 23 of the form. Refer to MIL-STD-1167 for definitions and supplemental instructions.

6.2.2.1 Distribution. Distribution of data cards shall be as follows: Two data cards shall accompany the shipping ticket- one shall be forwarded to the contracting officer- one shall be forwarded to the test activity with each group of samples submitted for tests- two shall be forwarded to the Commanding Officer, NOSIH (Code 5151)- and one shall be forwarded to either the Commander, NAVAIR (AIR-5422B1), Washington, DC 20361 or Wright Patterson AFB, Dayton, Ohio, as applicable.

6.2.3 Radiographic inspection. The radiographs of the AEPS in accordance with 4.3.5 shall be either submitted to the GPA or presented to a Government representative for examination at the supplier's facility.

6.2.3.1 Qualification. A written procedure and sample film shall be submitted.

6.2.4 Primer dud test. The results of the dud test requirements of 3.5.1.a shall be submitted.

6.2.5 Administrative data. The following reports may be required to assist in the administrative management of the contract:

a. Project plan and schedule

b. Progress reports

c. Flash reports

When required, these reports shall be prepared and delivered in accordance with the approved Contract Data Requirements List (DD Form 1423) incorporated into the contract.

6.2.6 Contract data requirements. When this specification is used in a procurement which incorporates a DD Form 1423 and invokes the provisions of Defense Acquisition Regulations (DAR) 7-104.9(n), the data requirements identified in TABLE VI will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with an approved Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of DAR 7-104.9(n) are not invoked, the data specified below will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this specification is cited in TABLE VI.

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DEPARTMENT OF DEFENSE
AMMUNITION DATA CARD

Form Approved
Budget Bureau No. 22-R0269

1 ITEM NOMENCLATURE: Mk 82 Mod 0 Rocket Motor		2 FSN: 1377-00-119-2022M928	3 LOT NUMBER: IHM77D002E007
4 MANUFACTURING, LOADING OR ASSEMBLING ACTIVITY: A.B.C. Manufacturing Co. Anytown, USA		5 NET QUANTITY: 280 ea.	6 PACKING OF LOT: Dwg or Spec No. of shipping container
7 CONTRACTOR: A.B.C. Mfg. Co.	8 CONTRACT OR ORDER NO.: N00174-77-C-XXXX	9 DRAWING OR REVISION: 944AS100C	10 SPECIFICATION & REVISION: MIL-A-85097/5
11 DATE STARTED: August 1977	12 DATE COMPLETED: October 1977	13 DATE INSPECTED: October 1977	14 LINE: Bldg. 41 / 15 ZONE WT SHELL:
16 CHARGE WEIGHT: N/A	16a INDEX OF POWDER: N/A	16b. MPD IN INCHES: N/A	16c. PPDR IN INCHES: N/A
16d. EXPLOSIVE WEIGHT PER PKG: 0.6C lb.	17. EXPECTED MUZZLE VELOCITY: N/A	18 EXPECTED PRESSURE: N/A	19 SHELL WEIGHT: 2.3 lb.
20 NUMBER OF TEST SAMPLES: 20 ea.	21 SENT TO: NOS	22 DATE AND MODE OF SHIPMENT: October 1977 Air Freight Co.	

23 COMPONENTS (Continue on reverse, if necessary)

COMPONENT	DRAWING NO.	MODEL	MANUFACTURER	DATE MFG	LOT NO.	QUANTITY
Propellant Grain	XXXXXXX	- -	A.B.C. Mfg. Co.	April 1977	XXX	320
Igniter	XXXXXXX	- -	A.B.C. Mfg. Co.	May 1977	YYY	305

24 DISPOSITION: Lot accepted and shipped.

25 TYPED NAME OF GOVERNMENT INSPECTOR

SIGNATURE

DD FORM 1 FEB 66 1650

23a. COMPONENTS (Continued)

COMPONENT	DRAWING NO.	MODEL	MANUFACTURER	DATE MFG	LOT NO	QUANTITY
Igniter Pellets	Dwg or Spec	- -	X.Y. Mfg. Co.	Feb 1977	ZZZ	100 gms
Igniter Granules	Dwg or Spec	- -	X.Y. Mfg. Co.	Feb 1977	XYZ	50 gms
Primer	8700025	M42-5086	Remington Arms	Jan 1977	XYX	300

26 REMARKS (Identify by appropriate symbols. *Changes in process; **Deviations from drawing or specification; ***Unusual occurrences or difficulties)

(a) Ballistic values out of specification; if any
(b) List of serial numbers delivered
(c) Waivers and deviations; if any

Sample data card
FIGURE 3.

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TABLE VI. Contract data requirements.

Data Item	Paragraph
Ballistic parameter analysis & performance limits	3.2.24 3.3.24.1.2
Calibration of test equipment	4.2.2.1
Chemical Propulsion Information Agency (CPIA) data sheet	3.6.10 6.7
Configuration management plan	3.6.3 6.3
Cut away models	3.2.29
Data card	3.6.6 6.2.2
Design data	3.6.5.1 3.6.5.2
Design review report	3.6.5.1 3.6.5.2
Drawings	3.6.4 3.6.1/6.6.3
Electromagnetic interference Electromagnetic radiation control	3.2.25.2 4.4.2.27.2
Engineering change proposals/waivers/ deviations	3.6.3.1 4.1
Explosive classification	3.2.11.1 3.2.12.1.2 3.2.25.1 3.6.1.1 4.4.2.27.6.1
Failure analysis and corrective action plan	3.3.1 3.4.1.1.1
Failure mode and effect analysis	3.2.27
Failure report	3.3.1 3.4.1.1.1 4.4.2.5
Flash reports	6.2.5
Formulations: Igniters and ignition materials Propellant Liner Inhibitor (insulator)	 3.2.11 3.2.11 3.2.12.1.1 3.2.12.2 3.2.12.3
GPA approval	3.1.1
Hazard analyses	3.6.1
Human engineering plan	3.6.2 4.4.2.27.7
Ignition material Igniter Propellant Liner Inhibitor (insulator) data	3.2.11.1 3.2.11.2 3.2.12.1.2 3.2.12.2.1 3.2.12.3.1
Inprocess and inspection records	4.2.1.2 4.2.2.4
Maintenance plan	3.6.7.1
Marginality of success plan	3.5.7
Marginality of success report	3.5.7 4.4.2.5
Notice of revision/ specification change	3.6.4
Progress reports	3.2.5
Project plan and schedule	6.2.5
Quality inspection defect report	4.1
Quality inspection deviations and waivers	4.1
Quality program plan	4.1.1
Radiographic examination plan	3.2.12.1.4 3.5.9.1 4.3.5 6.2.3.1

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TABLE VI. Contract data requirements.
(Continued)

Data Item	Paragraph
Radiographic examination report	4.3.5.1
Reliability and maintainability plan/report	3.2.26.1 3.5.6
Request to reduce test quantities	3.8
Safety program plan	3.2.25.5 3.6.1 4.4.2.27.6
Safety report	3.2.25.5.1 3.6.1 4.4.2.27.6
Specifications: performance process material assembly processing	3.2.2 3.2.24 3.6.4 6.6.2
Stress/Strain and internal ballistics analysis	3.2.12.1.2h.(2) 4.4.1.1.1
Tech Manual 11-85-1	3.6.10 6.7
Test plan	3.2.11.1 3.2.12.1.2 3.2.12.2.1 4.2.1.1
Test reports DDT, DVT, SRT and final	3.6.8 4.2.2.4 6.6.4
Tolerance analyses	4.4.2.27.5

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6.3 Facilities. Many of the tests required to evaluate the propulsion system environment, performance, and hazard classification involve specialized facilities. The Government maintains facilities for these purposes which are available under contract. A list of facilities are available through the NAVAIR, Code AIR-5422.

6.4 Government witness. The Government reserves the right to have representatives witness all or any part of the work included in Phases I through III as defined herein. The representatives may be from the Defense Contracts Administration Service Office (DCAS), NOSIH, and as otherwise designated by the GPA. The test activity, contractor or sub-contractor, as applicable, shall give, as requested by the Government representatives, the DCAS, the NOSIH, and the GPA representatives 7 days notice prior to performing each work segment.

6.5 Definitions.

6.5.1 Catapult cartridge lot. A catapult cartridge lot shall consist of one lot of propellant.

6.5.2 Catapult separation velocity. Catapult separation velocity is defined as the average velocity of the simulated ejected weight propelled horizontally at catapult separation measured over the interval from 6 inches before to 6 inches after separation.

6.5.3 Catapult ignition delay time. Catapult ignition delay time is the elasped time from the shearing of the firing pin shear pin to first indication of catapult thrust.

6.5.4 Rocket motor ignition time.

6.5.4.1 Rocket catapult ignition delay. Rocket catapult ignition delay is the elapsed time from separation (the point on the catapult thrust trace where the trace begins to drop sharply) to 10 percent of maximum thrust, as measured on the rising portion of the normal component rocket thrust trace.

6.5.4.2 Rocket motor ingition delay. Rocket motor ignition delay is the elapsed time from the ignition signal (shear pin or lanyard release) to 10 percent of maximum thrust, as measured on the rising portion of the rocket thrust trace.

6.5.5 Action time. Action time is determined from the thrust-time curve, and is defined as the time interval from the 10 percent of maximum thrust on the initial rise of the curve to the corresponding 10 percent of maximum thrust on the declining portion of the curve. Use the normal curve on units with canted nozzles.

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6.5.6 Rocket motor impulse. The rocket motor impulse is obtained by vectorially adding the longitudinal and normal impulse of the rocket motor taken over the action time.

6.5.7 Rocket motor burn time. Rocket motor burn time is the time from 10 percent thrust on the increasing portion of the thrust-time curve until the thrust-time curve breaks sharply downward at web burnout using the tangential method.

6.5.8 Rocket motor resultant thrust. The rocket motor resultant thrust is obtained by vectorially adding all components of rocket thrust that occur in any one instant.

6.5.9 Three-component thrust. The three mutually perpendicular axis of thrust related to the rocket motor longitudinal center line.

6.5.10 Thrust angle. The time averaged angle of the thrust vector as measured on a three-component thrust stand in the time intervals of maximum thrust on the initial rise of the curve to the corresponding 50 percent of maximum thrust on the final declining portion of the curve.

6.5.11 Thrust dissipation interval. Thrust dissipation interval is the time interval from the end of the action time until the time when the thrust-time curve touches the zero thrust abscissa.

6.5.12 Smoke. A suspension, in gas, of solid particles (as distinguished from mist or fog, in which the particles are liquid).

6.5.13 Solid ejecta. All nongaseous and nonplasma matter except smoke or ejecta resulting from solid particles used as ingredients of the propellant or iginition material less than 0.03 inch in diameter.

6.5.14 Unstable burning . Unstable burning is a condition where fluctuations of thrust occur greater than 5 percent of maximum thrust within 0.010 second or less until burnout, excluding the initial rise interval.

6.5.15 Void. An area on a radiograph that indicates the absence of propellant where the propellant should be.

6.5.16 Primary components. Primary components are all components containing explosive ingredients including all primers, cartridges, ignition material, and propellant.

6.5.17 Batch. A batch of propellant is a mix of all ingredients including curative(s) manufactured at one time in one mixer/bucket.

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6.5.18 Propellant lot.

6.5.18.1 Composite propellant. A propellant lot may consist of more than one batch of propellant as long as each propellant ingredient used to manufacture the propellant lot is from one raw material lot to assure homogeneity. As far as possible, all propellant ingredients needed for the entire lot of rocket motors should be premixed at one time. Ideally, only the curative should be added just prior to the final mix cycle.

6.5.18.2 Double-base propellant. All propellant that is extruded using a single lot of sheetstock.

6.5.19 Rocket motor lot. A rocket motor lot shall consist of one propellant lot.

6.5.20 Rocket catapult lot. A rocket catapult lot shall consist of one lot of rocket motors and one lot of catapult cartridges and will be in compliance with 3.5.1.1.1 and 6.5.19.

6.5.21 Conditioning time. The conditioning time is the time to condition a unit after it is placed in a preconditioned chamber.

6.5.22 Rate of pressurization. The rate of pressurization shall be determined by measuring the slope of the pressure-time curve where first indication of firing pin movement is.

6.5.23 MEOP (Maximum Expected Operating Pressure). The maximum pressure at +165°F plus three standard deviations.

6.5.24 Liner. Material used to bond the propellant to its outer casing (motor tube, insulator, etc.).

6.5.25 Inhibitor/insulator. Material used to restrict the flame path during propellant burn (end inhibitor, spiral wrap, insulation tube, etc.).

6.5.26 Component test. A test of an AEPS device by itself independent of AES or subsystem.

6.5.27 Lock. A lock, such as a shear pin, key, tang, etc. is a device used to physically restrain components as required by the design requirement. The lock can be designed for an initial or final constraint of components. The firing pin shear pin is not considered a lock.

6.5.28 Service life. Service life is defined as the length of time that an AEPS can remain installed in its operating configuration or actual usage.

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6.5.29 Resonance. A resonance shall be defined as a frequency at which a clearly defined peak in the amplitude ratio (ratio of the output acceleration in any of the three AEPS axes to the input acceleration as measured at the excitation attachment points) exceeds a value of 1.5 to 1.

6.5.30 Detonate. Rocket case explodes into small fragments.

6.5.31 Inert AEPS. An AEPS that has no propellant, ignition material or any other material used to provide propulsion.

6.6 Contractor's design requirements and specifications. All inert and explosive materials used in the unit shall be referenced to approved Government specifications if such exist. Proprietary materials should not be used unless specifically approved in writing by the GPA. At the direction of the GPA, the contractor should submit unit drawings in sufficient detail as to parts, special processes, and techniques to permit the preparation of documentation in accordance with 6.6.1 through 6.6.4. The contract should specify whether the documentation is to be prepared by a Government activity or by the contractor.

6.6.1 Drawings. Drawings shall be in accordance with DOD-D-1000, Level 3.

6.6.2 Specifications. Material and process specifications shall be in accordance with MIL-S-83490, Types D and E, Form 2.

6.6.3 Submission of drawings. Complete manufacturing drawings of the unit and, where applicable, of test devices and equipment used in development of the devices should be submitted to the GPA no later than concurrently with the final test report.

6.6.4 Test reports. A report on the results of all tests performed by the prime contractor or sub-contractors during the development and evaluation of the AEPS unit shall be furnished to the GPA. These results shall include all statistical calculations made during evaluation testing.

6.7 Follow-up action (Navy procurement). After the AEPS has been granted a final service release (Type III), its requirements will be incorporated in MIL-P-85097 "Aircrew Escape Propulsion Systems (AEPS), Procurement Specification for". Applicable data and information will also be incorporated into NAVAIR 11-85-1 (Technical Manual for AEPS Devices) and the Chemical Propulsion Information Agency (CPIA) propellant and rocket motor manuals.

Custodians:
Army - AR
Navy - OS
Air Force - 11

Preparing Activity:
NAVY - OS

Project No. 1377-0699

Review Activities:
Army - TE
Navy - AS
Air Force - 99

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

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

DOCUMENT IDENTIFIER AND TITLE

MIL-P-83126A, Propulsion Systems, Aircrew Escape, Design Specification For

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

3. IS THE DOCUMENT RESTRICTIVE?

☐ YES ☐ NO *(If "Yes", in what way?)*

4. REMARKS

SUBMITTED BY *(Printed or typed name and address - Optional)*

TELEPHONE NO.

DATE

DD FORM 1 JAN 72 1426 REPLACES EDITION OF 1 JAN 66 WHICH MAY BE USED S/N 0102-LF-014-1802