MIL-C-83124
30 October 1969

MILITARY SPECIFICATION

CARTRIDGE ACTUATED DEVICES/PROPELLANT ACTUATED DEVICES
GENERAL DESIGN SPECIFICATION FOR

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

1. SCOPE

1.1 This specification covers the general requirements for design and establishes uniform methods for testing cartridge actuated devices (CAD)/ propellant actuated devices (PAD) such as crew escape devices, webbing cutters, cable cutters, guillotines, explosive bolts, and thrust reversers used in aircraft and weapons systems. The purpose of the testing program is to determine performance, safety, soundness of mechanical design, and resistance to environments encountered during storage, handling, and service use.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Military

MIL-C-5541	Chemical Films and Chemical Film Materials for Aluminum and Aluminum Alloys
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-F-18240	Fastener, Externally Threaded, 250°F, Self-Locking Elements for
MIL-P-23460	Pin, Quick-Release, Positive Locking
MIL-I-23659	Initiator, Electric, Design and Evaluation of
MIL-H-25579	Hose Assembly, Tetrafluoroethylene, High Temperature, Medium Pressure
MIL-C-52078	Cap-Plug, Cap and Plug, Protective, Plastics, Dust and Moisture Seal
MIL-C-83125	Cartridges for Cartridge Actuated/ Propellant Actuated Devices, General Design Specification for

FSC 1377

STANDARDS

Military

MIL-STD-130	Identification Marking of US Military Property
MIL-STD-143	Specifications and Standards, Order of precedence for the Selection of
MIL-STD-331	Fuze and Fuze Components, Environmental and Performance Tests for
~~MIL-STD-810~~	Environmental Test Methods
MS17983	Compass - Magnetic, Pilots Standby
MS33586	Metals, Definition of Dissimilar

DRAWINGS

Air Force

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

Navy

BuWeps 2518380	Identification Plate and Loading Instructions for Cartridge Actuated Devices

PUBLICATIONS

Department of the Army Pamphlet

AMCP 706-110	Engineering Design Handbook - Experimental Statistics, Section 1

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

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

National Bureau of Standards Handbook

H28	Screw-Thread Standards for Federal Services

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20325.)

National Aerospace Standards Committee

NAS 618	Fasteners, - Recommended Shank, Hole and Head to Shank Fillet Radius Limits for

(Copies of these standards may be obtained from the Aerospace Industries Association of America Inc., 1725 DeSales Street, Washington, D. C. 20036.)

3. REQUIREMENTS

3.1 Engineering design tests.- This specification makes provisions for engineering design testing.

3.2 Selection of specifications and standards.- Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.3 Materials.- Materials for the CAD/PAD, propellant, explosive, delay composition, pyrotechnics, propellant gas, and buffing fluid (if used) shall be compatible and shall withstand environmental, electromagnetic, functional, service, and storage conditions to which the devices will be exposed. Pyrocellulose materials shall not be included as wads, spacers, or closure discs. Acceptance or approval of materials for design or during the course of manufacture shall in no case be construed as a guarantee of acceptance of the finished device.

3.3.1 Metals.- Exposed metals shall be of the corrosion-resisting type or suitably treated to resist the corrosive effect of fuels, salt spray, or atmospheric conditions to which the devices may be subjected in storage or normal service. The use of magnesium shall be subject to the approval of the cognizant design agency for the specific application involved.

3.3.1.1 Dissimilar metals.- Dissimilar metals shall not be used in intimate contact with each other unless suitably protected against electrolytic corrosion. Dissimilar metals are defined in MS33586.

3.3.1.2 Aluminum-alloy parts.- Unless otherwise specified all aluminum-alloy parts shall be covered with anodic/chemical film(s) conforming to MIL-A-8625 or as applicable MIL-C-5541.

3.4.7 Seals.- The devices shall be provided with suitable seals to preclude leakage of toxic gases into closed crew compartments.

3.4.8 Firing mechanism.- The devices shall incorporate a firing mechanism which may be actuated mechanically, by gas, or by mild detonating cord, dependent upon the system requirements in which the devices are to be used. Provision shall be made for a safety pin which will block actuation. There shall be no press-fit washers in the firing mechanism.

3.4.8.1 Mechanical firing mechanism.- The force required to actuate the mechanism shall be 15 pounds minimum and 35 pounds maximum. Precocked firing mechanisms shall not be used.

3.4.8.1.1 Safety devices.- Mechanical firing mechanisms shall be restrained by a safety device approved by the cognizant design agency. Safety devices shall be accesible and visible when the CAD/PAD is installed and shall not interfere with installation or removal of the CAD/PAD or any other maintenance operation.

a. For Navy applications. The safety device shall be single acting safety pins which meet the requirements of MIL-P-23460 (Type I). Interference between the safety pin and the restrained member shall be the full diameter of the safety pin. The safety pin hole diameter (in the CAD) shall be within the hole limits for clearance fits specified by Column C of NAS 618.

b. For Other applications. Safety pins may be used as safety devices; however, if used the minimum interference between the housing of the safety pin and restrained member shall be the full diameter of the safety pin and the pin shall be so designed as to be self-restraining and not be removable by normal handling methods or vibration.

3.4.8.2 Gas-actuated firing mechanism.- The firing mechanism shall not actuate upon application of 400 psig gas pressure on the firing pin. The firing mechanism shall actuate from a minimum peak gas pressure on the firing pin of 500 psig.

3.4.9 CAD/PAD initial lock, final lock, and shear pins.- Shear pin used in the device, the initial lock for the device, and the final lock shall meet 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. The devices shall be capable of withstanding 3,000 cycles of alternating tension and compression maximum loads without failure.

3.4.10 Electric initiators/ignition elements.- Electric initiators/ignition elements must meet the applicable requirements of MIL-I-23659.

3.4.11 Nonelectric ignition system evaluation.- In a device where the propellant is integral, the ignition system shall be capable of passing the test of 4.5.13 prior to conducting any performance tests.

3.5 Performance.- The CAD/PAD shall satisfy all design requirements specified herein after subjection to the applicable environmental tests. Performance shall be measured and values recorded in accordance with 4.3.1 for the ballistic operation of the devices. When temperature requirements for a device are outside the -65° to +200°F limits, the temperatures included in the design requirements shall apply in lieu of -65° to +200°F. In those instances where submerged or ice condition firing of the device are required the performance parameters will be specified by the cognizant design agency.

3.5.1 Leakage.- In a device where the propellant is integral, the chamber containing the propellant shall pass a dry gas leak test, when specified by the cognizant design agency. A chamber which exhibits a leak rate in excess of 10^{-5} cc per second of air at a pressure differential of 1 ± 0.1 atmosphere shall be considered defective. In addition, those items selected for the environmental tests of 4.5.11 shall be capable of passing a leak test at the conclusion of the environmental tests. The leak test shall be as specified in 4.5.3.

3.5.2 Environmental conditions

3.5.2.1 Vibration.- The devices shall not fire when subjected to vibration as specified in 4.5.11.1. After subjection to such vibration, the devices shall meet the design performance requirements when test fired.

• 3.5.2.2 Shock.- The devices shall not fire when subjected to shocks as specified in 4.5.11.4. After subjection to such shock conditions, the devices shall meet the design performance requirements when test fired.

3.5.2.3 Six-foot drop.- The devices shall not fire when dropped from a height of 6 feet as specified in 4.5.11.5. After being subjected to such a drop, the devices shall meet the design performance requirements when test fired.

3.5.2.4 Forty-foot drop.- The devices shall not fire when dropped from a height of 40 feet as specified in 4.5.11.6 and shall be safe for handling and disposal.

3.5.2.5 Temperature-shock/humidity/altitude.- The devices shall be capable of withstanding temperature-shock/humidity/altitude cycling conditions as specified in 4.5.11.7 and shall meet design performance requirements when test fired.

3.5.2.6 High temperature.- The devices shall be capable of withstanding high temperatures of 200°F as specified in 4.5.11.3 and shall meet the design performance requirements when test fired.

3.5.2.7 Low temperature.- The devices shall be capable of withstanding low temperatures of -65°F as specified in 4.5.11.2 and shall meet the design performance requirements when test fired.

3.5.2.8 Salt fog.- The devices shall be capable of withstanding exposure to salt fog as specified in 4.5.11.8 and shall meet design performance requirements when test fired.

3.5.2.9 Dust.- The devices shall be capable of withstanding exposure to dust as specified in 4.5.11.9 and shall meet design performance requirements when test fired.

3.5.2.10 Operation under iced conditions - For Navy Application only.- The device shall be capable of withstanding exposure to icing conditions as specified in 4.5.11.10 and shall meet design performance requirements when test fired.

3.5.2.11 Submerged operation - For Navy Application only.- The device shall be capable of operation while submerged in water to a depth of 40 feet.

3.5.3 Locked-shut firing.- All devices shall be designed to withstand the internal gas pressures developed upon firing the devices locked shut at any temperature between -65° and +200°F without external mechanical failure.

3.5.4 No-load firing.- For a stroking device which is designed to remain intact at the end of a power stroke, parts shall not separate when it is fired at any temperature between -65° and +200°F with no restraining load applied to the device; e.g., the piston shall not separate from the device at the end of stroke nor shall fragmentation of components occur.

3.6 Interchangeability.- All parts bearing the same part number shall be directly and completely interchangeable with respect to installation and performance.

3.7 Threads.- All screw threads shall be in accordance with the National Bureau of Standards Handbook H28.

3.8 Demagnetization.- Each CAD/PAD shall be demagnetized to remove residual magnetism induced by manufacturing or inspection processes. The assembled devices shall not deflect a pilot's standby compass more than 3° when placed 6 inches from the face of the compass.

3.9 Dimensions.- Unless otherwise specified, dimensions shall apply after all machining, process treatments (plating, anodizing, heat treating), and nondestructive testing have been completed. No part of the assembly shall deviate from the drawing configuration, dimensions, and tolerances.

3.10 Weight.- Specific consideration shall be given to the factors of minimum weight in the design of the CAD/PAD. The total weight shall not exceed the design requirements for the device.

3.11 Gas ports.- Except for reversible devices the mating of the inlet port shall be different from the opposite end. Gas ports shall be labeled INLET or OUTLET, whichever is applicable and the direction of gas flow shall be indicated by red arrows. Gas ports shall be closed with suitable and effective shipping caps or plugs in accordance with MIL-C-52078 when the CAD/PAD are not installed.

3.12 Fluid connection marking.- Where applicable, all ports for tube connections shall be clearly and permanently marked to indicate the connections to be made, and the directions of flow shall be indicated. The use of abbreviations should be avoided. Decalcomanias shall not be considered permanent markings.

3.13 Nameplates or product markings.

3.13.1 Nameplate.- Each CAD/PAD shall be clearly and permanently identified by a durable nameplate conforming to MIL-STD-130.

3.13.2 Air Force nameplates.- The nameplates for Air Force CAD/PAD shall conform to Drawings 63C32091, 63C32092, or 63C32093, as applicable.

3.13.3 Navy nameplates.- The nameplate for Navy CAD/PAD of the sealed type shall conform to Drawing 2518380.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.- Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the supplier may utilize his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

TABLE I. Metal Parts Assembly Tests for CAD/PAD (Cont'd)

Test	Applicable Test Paragraph	Units Required	Temperature Degrees F
Demagnetization	4.5.7	All samples	+70
Structural	4.5.4	2	+70
Endurance	4.5.5	2	+70
Firing mechanism			
Mechanical	4.5.9.1	All samples	+70
		6	-65
		6	+200
Gas actuated	4.5.9.2	6	-65
Gas actuated	4.5.9.2	6	+70
Gas actuated	4.5.9.2	6	+200

TABLE II. Engineering Design Tests

Test	Applicable Test Paragraph	Units Required
Leakage test (see 3.5.1)	4.5.3	All samples
Vibration	4.5.11.1	*
Low Temp (-65°F)	4.5.11.2	*
High temp (+200°F)	4.5.11.3	3
Shock	4.5.11.4	*
6-foot drop	4.5.11.5	3
40-foot drop	4.5.11.6	3
Temp-shock/hmd/alt	4.5.11.7	*
Salt fog	4.5.11.8	3
Dust	4.5.11.9	3
Iced conditions	4.5.11.10	3
Submerged operation	4.5.11.11	3
Locked-shut firings at -65°F	4.5.12.1	3
Locked-shut firings at +200°F	4.5.12.1	3
No-load firings at -65°	4.5.12.2	3
No-load firings at +200F	4.5.12.2	3
Performance at -65°F	4.5.10	20**
Performance at +70°F	4.5.10	20**
Performance at +200°F	4.5.10	20**
Nonelectric ignition system	4.5.10	12

*Test units are part of sequence tests, Table III

**For cartridge-actuated itiators, additional firings shall be conducted to establish a hose length vs pressure relationship such as that shown on Figure I. Twenty firings shall be conducted at 200°F with a 6-inch hose length or the shortest hose length that can withstand the gas pressure. Twenty firings shall be conducted with the longest hose length at -65°F where a 1,000 psi pressure is nominal. Initiators shall be fired with no less than four intermediate hose lengths, but in no case shall incremental hose lengths be greater than 5 feet. A minimum of 10 new units shall be fired at each temperature of -65°, +70°, and +200°F for each hose length, except as noted otherwise above for the shortest and longest hose.

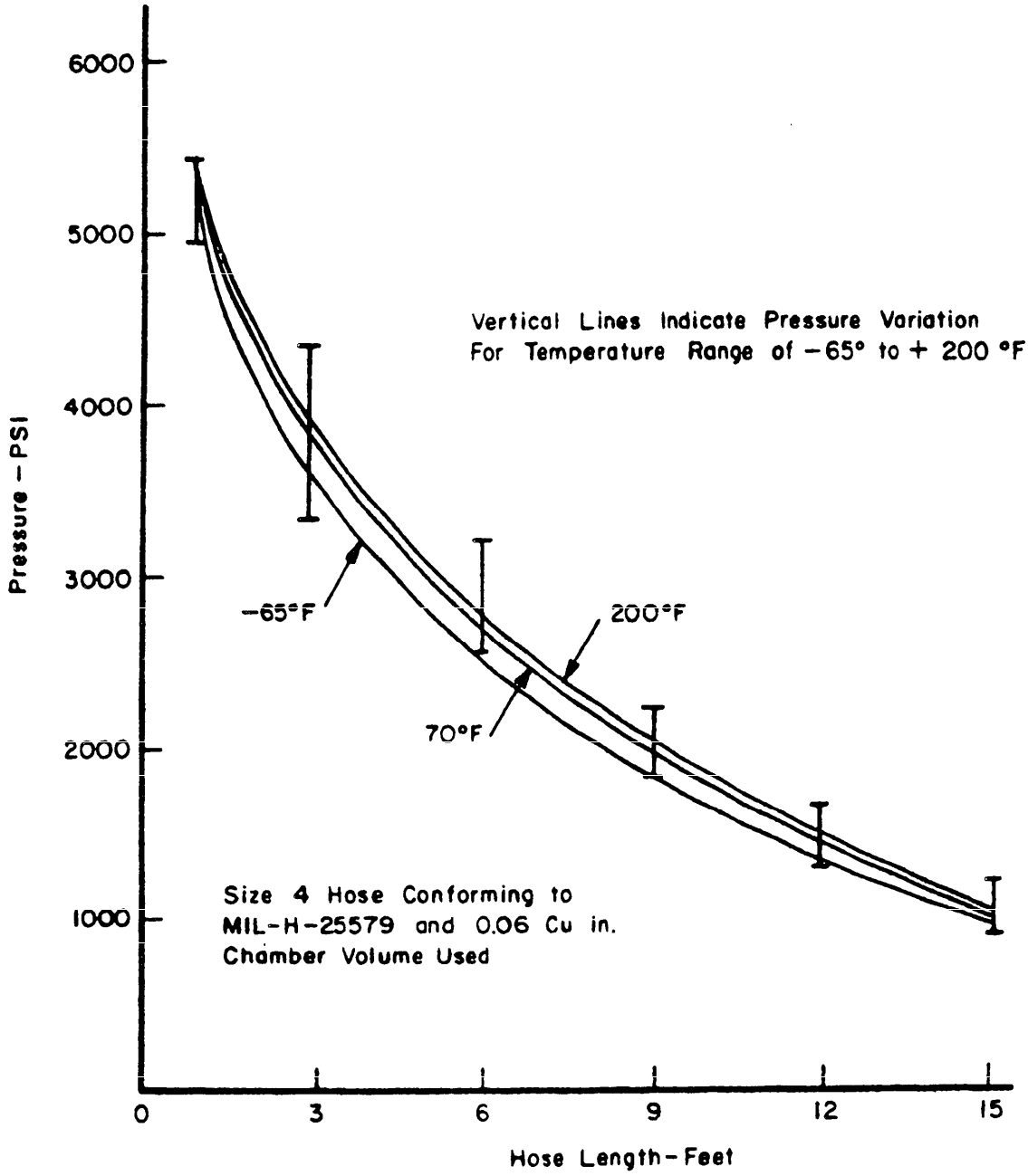

FIGURE 1. Terminal Pressure - Hose Length Relationship for Initiator

TABLE III. Sequence Tests for CAD/PAD

Test	Applicable Test Paragraph	No. Tested & No. Diverted to Additional Tests		No. Examined & Test Fired +70°F	-65°F	+200°F
Shock	(4.5.11.4 (4.5.13	36*	9	3	3	3
Temp-shock/	(4.5.11.7 (4.5.13	27	9	3	3	3
Low temp (-65°F)	(4.5.11.2 *** (4.5.13	18	9	3	3	3
Vibration	(4.5.11.1 (4.5.13	9	9	3 / 12**	3 / 12**	3 / 12**

*Each of the 36 units shall be a new item. At the option of the supplier, these 36 units may be reconditioned three times, after firing, to conform to the original configuration, and may be utilized for the additional tests listed in Table II.

**The 36 test firings during sequence tests may be counted as part of the 60 performance firings specified in Table II proivded it can be shown that they are within the same population.

***Test firings at -65°F shall comply with 4.5.11.2. Units for test firing at other temperatures shall be reconditioned in accordance with 4.5.10.

4.4.1 Reliability analysis.- The performance necessary to demonstrate the required 99.9 percent reliability (or probability) of the engineering design test lot at 90 percent confidence level shall be determined by the upper limit (UL) and lower limit (LL) as computed from the sample size in accordance with the method of Statistical Tolerance Limits as outlined in Section 1 of Pamphlet AMCP 706-110, Engineering Design Handbook. This analysis applies only to those 60 devices from the performance test of Table II. The computations will be made with the formulae:

$$UL = \bar{X} + KS$$
$$LL = \bar{X} - KS$$

where

$\bar{X}$ = mean (sample)
K = tolerance factor
S = standard deviation (sample)
N = sample size
P = reliability

The K values to be used for determining the tolerance limits are specified in Table IV of this specification. Analysis shall include the performance parameters listed in 4.3.1, and acceptable performance shall be in accordance with 3.5. If the computed UL or LL is outside design tolerance limits of any required parameter, it shall be cause for rejection.

TABLE IV. Tolerance Factors (K) for Normal Distributions

N	90% Confidence Level	
	Two Sided P = 99.9	One Sided P = 99.9
5	6.879	6.112
6	6.188	5.556
7	5.750	5.201
8	5.446	4.955
9	5.220	4.772
10	5.046	4.629
11	4.906	4.515
12	4.792	4.420
13	4.697	4.341
14	4.615	4.274
15	4.545	4.215
16	4.484	4.164
17	4.430	4.118
18	4.382	4.078
19	4.339	4.041
20	4.300	4.009
21	4.264	3.979
22	4.232	3.952
23	4.203	3.927
24	4.176	3.904
25	4.151	3.882
26	4.049	3.794

4.4.2 Test plan.- The contractor shall submit a test plan prior to engineering design testing as specified in the data requirements of the contract.

4.4.3 Test report.- After completion of engineering design te ting, the contractor shall submit a test report as specified in the data requirements of the contract.

4.4.4 Rejection and retest (engineering design tests).- Failure of any device subjected to engineering design tests to conform to the applicable requirements of this specification or the approved design requirements shall be cause for rejection of the item. However, if it can be determined that failure to meet the requirements was due to previous firing of the device, the failure and reason for failure shall be noted and the firing repeated using another device. If the failure can be attributed to design or other defect, the devices to be utilized in the engineering design testing may be reworked, have parts replaced, or redesigned to correct the defects, and all the tests shall be repeated. Before the tests are repeated, full particulars concerning the failure and action taken to correct the defects shall be submitted to the cognizant design agency for concurrence and permission to proceed with testing.

4.5 Test methods.

4.5.1 Component inspection.- Each part of the devices shall be 100 percent inspected for conformance to the applicable drawing.

4.5.2 Examination of product.- Examination of the devices shall be made to detect visible defects and to determine that the items meet the requirements of this specification with respect to weight, finish, and marking, and that they conform to the applicable drawing.

4.5.2.1 X-ray test.- When specified by the cognizant design agency all devices shall be x-rayed to assure presence and proper orientation of all components and to determine whether defects exist.

4.5.3 Leakage test.- The chamber containing the propellant shall be tested with a dry gas leak tester of sufficient sensitivity to ascertain whether the propellant chamber meets the leak rate requirements of 3.5.1.

4.5.4 Structural tests.- The devices shall be mounted in a tensile testing machine using the device mountings and shall be subjected to the maximum tension and compression operational loads. Both the initial and final locks of the devices shall be subjected to maximum loads at +70°F.

4.5.5 Endurance tests.- For CAD/PAD which are subjected to alternate tension and compression loads, the devices shall be mounted in a tensile testing machine using the device mountings. The devices shall be subjected to alternate maximum tension and compression loads for 3,000 cycles as required in 3.4.9. The rate of load application shall be defined in the design requirements.

4.5.6 Hydrostatic tests.- To check the design requirements of 3.4.4, the pressure chamber of the devices shall be subjected to an internal hydrostatic pressure of 1.5 times the expected maximum pressure for a minimum of 15 seconds. The chamber shall withstand the internal hydrostatic pressure without permanent deformation or evidence of metal defect as determined by visual inspection.

4.5.7 Demagnetization tests.- The devices shall be checked for residual magnetism in an area free of local magnetic effects by placing them 6 inches from an approved compass in a north-south horizontal position with the compass placed in an east-west heading as shown on Figure 2. The full length of the devices shall be moved past the compass in the common horizontal plane. This procedure shall be repeated for every 90° of rotation of the devices. The devices shall be free from magnetism as required in 3.8.

4.5.8 Threaded joint torque test.- Each threaded joint of the devices shall be checked to determine the breakaway torque. Torque values shall be as specified in 3.4.6.

4.5.9 Firing mechanism tests.

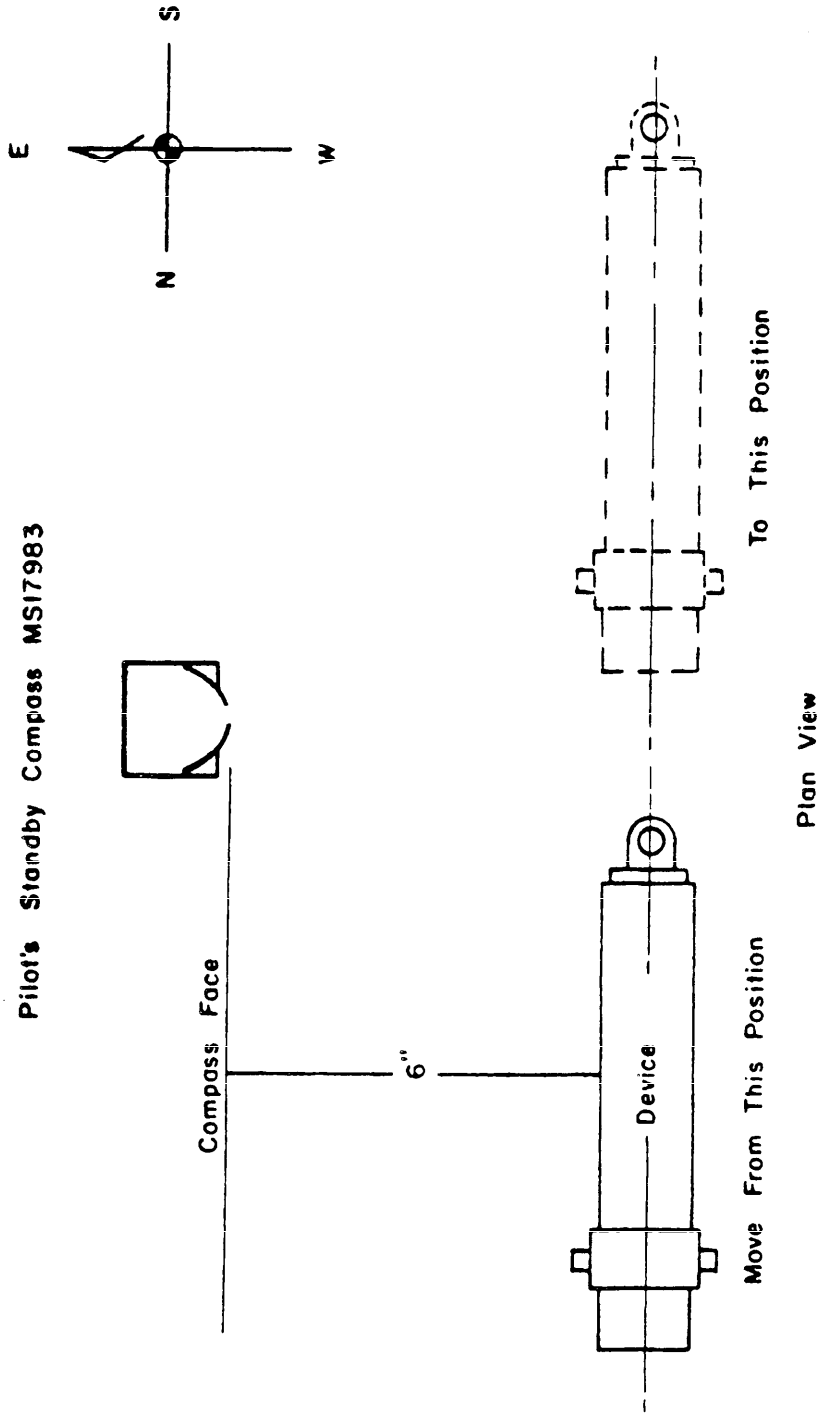

FIGURE 2. Layout for Determination of Residual Magnetism in Device

4.5.9.1 Mechanical firing mechanism.- The firing mechanism shall be mounted in a test fixture and tested at temperatures specified in Table I. The firing mechanism shall be actuated and the pull forces recorded. Force values shall be as specified in 3.4.8.1. Direction of pull shall be "in line" with the axis of the firing mechanism.

4.5.9.2 Gas actuated firing mechanism.- To check the requirement of 3.4.8.2, the devices shall be mounted in a test fixture and fired by gas pressure. The devices shall not function when 400 psig gas pressure is applied to the firing pin. They shall function when a sudden pressure of 500 psig is delivered to the firing pin. These firings shall be conducted at each of the following temperatures: -65°, +70°, and +200°F.

4.5.10 Performance test.- The devices, where practicable, shall be temperature conditioned and maintained at the required temperature for at least 1 hour after the temperature of all parts, cartridges, and propellants has been stabilized; then the devices shall be test fired. A simulated device and cartridge with a temperature sensitive element within the cartridge charge shall be used as a grain temperature monitor during temperature conditioning. Performance shall comply with the requirements of 3.5. If the devices cannot be test fired within the temperature chamber, they shall be fired within 5 minutes after removal from the chamber. Whenever it is necessary to repeat low (-65°F) temperature conditioning of a cold device, all condensation shall be removed from the device before it is returned to the temperature conditioning chamber.

4.5.11 Environmental tests.- Environmental testing shall be conducted to determine compliance with the requirements of 3.5.2.

4.5.11.1 Vibration.- This test shall be conducted in accordance with method 514 (aircraft category, procedure I, parts 1, 2, and 3 and curve Z up to and including 2000 cps) of MIL-STD-810, except that for each resonant and cycling period the test devices shall be divided equally for vibration at -65°, +70°, and +200°F. After vibration testing has been completed, the test specimens shall be allocated to the tests specified in Table III.

4.5.11.2 Low temperature.- This test shall be conducted in accordance with method 502, procedure I of MIL-STD-810 at -65°F and then allocated to the tests specified in Table III. When necessary, the test specimens may be removed from the conditioning cabinet, set up, and fired within a period of time not to exceed 5 minutes.

4.5.11.3 High temperature.- This test shall be conducted in accordance with method 501, procedure I of MIL-STD-810 except that the devices shall be exposed to a temperature of 200°F until thermal stabilization is reached, and maintained at that temperature for a period of 50 hours. Then the devices shall be test fired. When necessary, the test specimens may be removed from the conditioning cabinet, set up, and fired within a period of time not to exceed 5 minutes.

4.5.11.4 Shock.- This test shall be conducted in accordance with method 516, procedure I of MIL-STD-810. The shock pulse waveform shall be a terminal peak sawtooth. The peak amplitude shall be 20g and the duration shall be 11 ms. The shock test specimens shall be allocated to the tests specified in Table III.

4.5.11.5 Six-foot drop test.- The devices shall be fired at 70°F after a vertical drop of 6 feet onto a 2-inch thick steel plate embedded in concrete. A new device shall be used for each of the following drop tests:

a. The firing mechanism end of the device shall strike the steel with the longitudinal axis of the device perpendicular to the steel.

b. The opposite end of the device shall strike the steel with the longitudinal axis of the device perpendicular to the steel.

c. The side of the device shall strike the steel with the longitudinal axis of the device parallel to the steel.

4.5.11.6 Forty-foot drop test.- This test shall be conducted in accordance with test 103 of MIL-STD-331. Three devices shall be dropped in the following positions: One with the firing mechanism up. one with mechansim down, and one horizontal. A new device shall be used for each drop. The devices shall meet the requirement of 3.5.2.4.

4.5.11.7 Temperature shock/humidity/altitude.- The devices shall be subjected to the temperature shock/humidity/altitude test as outlined below. The schedule has been arranged in such a manner that operations are not required outside normal working hours except for such supervision as may be necessary to insure proper operation of the test equipment. It is not mandatory that the day/clock time schedule given below be followed; however, it is mandatory that the time, environmental, and sequence requirements be adhered to. It is also noted that only two conditioning chambers are required to accomplish this test. No less than two chambers may be used and still accomplish the temperature shock portion of this test. If it is desired to use three chambers, it is permissible provided the time, environmental, and sequence requirements are met. The fluctuations from the specified temperatures shall not exceed 5°F. When the temperature/altitude chamber door is opened to place test items inside, the chamber pressure will become atmospheric. The time required to return the chamber pressure to 0.65 psi shall not exceed 1 hour.

Procedure

Monday 0800 - Place test items in a chamber maintained at +70°F at 50 percent relative humidity (RH).

1200 - Raise chamber temperature to +160F and the RH to 95 percent. The chamber temperature shall reach +160°F at 95 percent RH not later than 1300.

1600 - Remove test items from above chamber and immediately place in a chamber maintained at -65°F at a pressure altitude of 70,000 feet. (0.65 psi)

Tuesday 0800 - Remove test items from above chamber and immediately place in a chamber maintained at +70°F at 50 percent RH.

1200 - Remove test items from above chamber and immediately place in a chamber maintained at -65°F at a pressure altitude of 70,000 feet. (0.65 psi)

1600 - Remove test items from above chamber and immediately place in a chamber maintained at +160°F at 95 percent RH.

Wednesday 0800 - Reduce chamber temperature to +70°F at 50 percent RH. The chamber temperature shall reach +70°F at 50 percent RH not later than 0900.

1200 - Raise chamber temperature to +160°F at 95 percent RH. The chamber temperature shall reach +160°F at 95 percent RH not later than 1300.

1600 - Remove test items from above chamber and immediately place in a chamber maintained at -65°F at a pressure altitude of 70,000 feet (0.65 psi)

Thursday 0800 - Remove test items from above chamber and immediately place in a chamber maintained at +70°F at 50 percent RH.

1200 - Remove test items from above chamber and immediately place in a chamber maintained at -65°F at a pressure altitude of 70,000 feet (0.65 psi)

1600 - Remove test items from above chamber and immediately place in a chamber maintained at +160°F at 95 percent RH.

Friday 0800 - Reduce chamber temperature to +70°F at 50 percent RH. The chamber temperature shall reach +70°F at 50 percent RH not later than 0900.

1200 - Raise chamber temperature to +160°F at 95 percent RH. The chamber temperature shall reach +160°F at 95 percent RH not later than 1300.

1600 - Remove test items from above chamber and immediately place in a chamber maintained at -65°F at standard ambient pressure.

This schedule shall be followed for a total of 4 weeks (28 days) except that on the second and fourth weekends the soak time shall be from 1200 on

Friday until 0800 on Monday at a temperature of +160°F at 95 percent RH. At the conclusion of the temperature shock/humidity/altitude test, the test items shall be allocated to the tests specified in Table III.

4.5.11.8 Salt fog.- This test shall be conducted in accordance with method 509 of MIL-STD-810. After the salt fog test has been completed, the specimens shall be test fired at 70°F.

4.5.11.9 Dust.- This test shall be conducted in accordance with method 510 of MIL-STD-810 except that the high temperature shall be 200°F. After the dust test has been completed, the specimens shall be test fired at 70°F.

4.5.11.10 Iced conditions.- The temperature of the cartridge actuated device shall be reduced to -80°F ± 5°F and stabilized. The cartridge actuated device shall be transferred to an atmosphere having a temperature of approximately 100°F and a relative humidity of approximately 90 percent until all evidence of frost has disappeared. Retaining all the condensation practicable, the temperature of the cartridge actuated device shall again be stabilized at -80°F ± 5°F and the functional test conducted. If firing is conducted outside the conditioning chamber, it shall be done within three minutes after removal from the chamber.

4.5.11.11 Submerged operation.- Cartridge actuated devices shall be fired while submerged in water to a depth of 40 feet or, as an alternate method, cartridge actuated devices may be tested for submerged operation in a pressurized water chamber at a pressure corresponding to that experienced at a depth of 40 feet (17.75 psig) and functionally tested.

4.5.12 Safety firing tests.

4.5.12.1 Locked-shut firings.- With the devices locked shut, firings shall be conducted at -65° and +200°F and shall meet the requirements of 3.5.3.

4.5.12.2 No-load firings.- With the devices subjected to the no-load condition, or under a load which tends to aid the motion of the device, firings shall be conducted at -65° and +200°F. The devices shall meet the requirements of 3.5.4.

4.5.13 Ignition system evaluation.- Ignition system installation in the applicable PAD shall be evaluated prior to conducting any other tests listed in Table II. The test is a "go-no-go" type test in which it is not necessary to measure any performance parameters. Success or "go" will be determined by auditory and visual means, i.e., it sounded right and it appeared to burn properly without hangfire. The method of test is as follows: Conduct 12 tests at -90°F. If any ignition system is not a success or "go", conduct 12 more tests with new ignition systems at -80°F. If any ignition system is not a success or "go" at -80°F, conduct 12 more tests with new ignition systems at -70°F. If any ignition system fails to meet the success or "go" criteria at -70°F, the ignition system shall be redesigned to pass this test. These tests shall be conducted to ensure that the ignition system is reliable at -65°F.

5. PREPARATION FOR DELIVERY (Not applicable)

6. NOTES

6.1 Data.- For the information of contractors and contracting officers, any of the data specified in (1) 4.4.2, 4.4.3, 6.1.1, (2) applicable documents listed in section 2 of this specification, or (3) referenced lower-tier documents need not be prepared for the Government and should not be furnished to the Government unless specified in the contract or order. The data to be furnished should be listed on DD Form 1423 (Contractor Data Requirement List) which should be attached to an made a part of the contract or order.

6.1.1 Contractor's design requirements and specifications.

6.1.2 All inert and explosive materials used in CAD/PAD shall be referenced to approved Government specifications if such exist. Proprietary materials should not be used unless specifically approved in writing by the cognizant design agency. At the direction of the cognizant design agency, the contractor should submit CAD/PAD drawings, in sufficient detail as to parts, special processes, and techniques to permit the preparation of documentation in accordance with 6.1.2 through 6.1.7. The contract should specify whether the documentation is to be prepared by a Government activity or by the contractor.

6.1.3 Drawings should be in accordance with MIL-D-1000, category E, form 1.

6.1.4 Production and acceptance specifications should be in accordance with Defense Standardization Manual DSM 4120.3-M.

6.1.5 Classification of characteristics should be in accordance with the cognizant design agency requirements.

6.1.6 Complete manufacturing drawings of the CAD/PAD and, where applicable, of test devices and equipment used in development of the devices should be submitted to the cognizant design agency no later than concurrently with the test report.

6.1.7 Copies of results of all tests performed by the prime or subcontractors during the development and evaluation of CAD/PAD should be furnished to the cognizant design agency as directed. These results should include all statistical calculations made during evaluation testing.

6.2 Definitions

6.2.1 CAD/PAD.- Propellant actuated devices utilize energy producted by explosives, propellants, or pyrotechnics or combination thereof to accomplish work. The term cartridge-actuated device is used for devices which contain a removable cartridge.

6.2.2 Locked-shut firing.- A locked-shut firing is achieved when the exit port of the CAD/PAD is capped or when the motion of the piston or movin; part is fully restrained.

6.2.3 No-load firing.- A no-load firing is achieved when the piston or moving part of the CAD/PAD has no restraining load applied or the exit port of the device is not capped.

Custodians:

Army - MU
Navy - AS
Air Force - 11

Preparing activity:

Army - MU

Project No. 1377-0246

Review activities:
Air Force - 11

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 22-R255

INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

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

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

YES NO *(If "yes", in what way?)*

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

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

DATE

DD, FORM 1 JAN 66 1426

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

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