INCH-POUND

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DETAIL SPECIFICATION

BATTERY, THERMAL, MXU-792A/A

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for the manufacture and acceptance of the MXU-792A/A Thermal Battery, referred to herein as "battery pack".

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents specified in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

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

SPECIFICATIONS

Department of Defense

MIL-I-23659	Initiators, Electrical, General Design Specification for
MIL-C-83124	Cartridge Actuated Devices/Propellant Actuated Devices, General Design Specification for

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Indian Head Division, Naval Surface Warfare Center, Engineering Documentation Branch (Code 4230), 101 Strauss Avenue, Indian Head, MD 20640-5035 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by sending a letter.

AMSC N/A FSC 6135

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

MIL-C-83125	Cartridges for Cartridge Actuated Devices/Propellant Actuated Devices, General Design Specification for

STANDARDS

Department of Defense

MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-331	Test for Fuze and Fuze Components, Environmental and Performance
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1168	Ammunition Lot Numbering and Ammunition Data Card

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

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

DRAWINGS

NAVAL AIR SYSTEMS COMMAND (CAGE Code 30003)

MBEU147990	Battery, Thermal, MXU-792A/A
MBEU147991	Battery, Thermal
838AS229	MXU-792A/A Vibration/Shock Test Fixture
838AS231	MXU-792A/A Functional Test Setup

(Application for copies should be addressed to the Commanding Officer, Naval Aviation Supply Office, Cog I Support Branch (Code 03441), 5801 Tabor Avenue, Philadelphia, PA 19120!5099.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

E1742	Standard Practice for Radiographic Examination

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

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

3. REQUIREMENTS

3.1 First article. When specified in the contract or purchase order (see 6.2), a sample shall be subjected to the first article inspection (see 4.2.1 and 6.3).

3.2 Flight critical part. The battery pack is a flight critical item and the technical data package shall be identified and procured as such.

3.3 Design and construction. The following applies to the qualification status and configuration control of the battery pack over the entire life of the item.

3.3.1 Identical configuration. The battery pack design and construction shall be identical to that subjected to qualification testing and approved for service use by the Navy. The battery pack operational life shall be 225 seconds, minimum, in the operational environment of –65 to 200°F.

3.3.2 Configuration control. Only the thermal battery procured from the vendor(s) listed on Drawing MBEU147991 is approved for the application specified. A substitute thermal battery shall not be used without prior testing and approval by the Indian Head Division, Naval Surface Warfare Center, Indian Head, MD 20640-5035 and the Naval Air Systems Command Headquarters.

3.4 Primary components. The percussion primer and the thermal battery chemicals are primary components. Only one lot of each primary component shall be used in a battery pack lot. One primary lot may be used in more than one battery pack lot.

3.4.1 Percussion Primers. Only primers manufactured within the last 24 months or recertified within the last 12 months shall be used in the thermal battery.

3.5 Battery pack production. The battery packs shall be manufactured in accordance with MBEU147990 and the documents listed thereon. Each production battery pack shall meet the requirements of 3.4 and 3.5.1 through 3.5.8 as outlined in table I. Failure of any battery pack to meet the requirements of 3.4 and table I shall result in rejection of that battery pack.

3.5.1 Visual inspection. Battery packs shall be free of the following defects: illegible, missing or inaccurate identification markings, damage, burrs, dents, sharp edges, or other defects which may prevent installation of the battery pack into its mounting bracket and/or gas or electrical connections. Each battery pack shall meet the requirements of 3.4, 3.7, and Drawing MBEU147990.

3.5.2 Radiographic examination. When radiographically examined in accordance with 4.3.2, the battery pack shall show proper assembly, presence of parts, sealing and proper electrical connections, proper thread form, and presence of the battery chemicals. The radiographic inspection shall show no foreign materials present.

3.5.3 Leakage. The leakage rate of each thermal battery, prior to being installed into the battery pack manifold, shall not exceed 1.0×10^{-5} cc/sec of air when tested in accordance with 4.3.3.

3.5.4 Polarity. Each thermal battery in the battery pack shall have a polarity that matches the power and starter stack positive and negative lead configuration when tested in accordance with 4.3.4.

TABLE I. Production inspections.

Test Sequence	Test Paragraph	Requirement Paragraph
1. Visual	4.3.1	3.5.1, 3.7
2. Radiographic Inspection	4.3.2	3.5.2
3. Leakage	4.3.3	3.5.3
4. Polarity	4.3.4	3.5.4
5. Insulation Resistance	4.3.5	3.5.5
6. Dielectric Measurement	4.3.6	3.5.6
7. Firing Pin	-	3.5.7
8. Actuation	4.3.13	3.5.8

3.5.5 Insulation resistance. Each battery in the battery pack shall have a resistance greater than 1 megohm between the leads to case and between each set of output leads when tested in accordance with 4.3.5.

3.5.6 Dielectric measurement. Each battery in the battery pack shall not have a current drain exceeding 0.1 milliampere for a 60-second period between the leads to case and between each set of output leads when tested in accordance with 4.3.6.

3.5.7 Firing pin. Each firing pin shall have free movement (without O-ring installed) and proper alignment and protrusion in the manifold. This shall be verified during assembly of each firing pin in the manifold.

3.5.8 Actuation. The number of firing mechanisms selected from the manifold assembly production lot for the test shall be in accordance with table V. The retained sample shall be ignored. The mechanism shall shear between 400 to 650 psig when subjected to an onset rate of 20,000 to 40,000 psig/sec of air pressure to the inlet port when tested in accordance with 4.3.13. Failure to meet this requirement shall cause rejection of the lot. Any mechanism subjected to this test shall be discarded or certified acceptable by quality assurance before it is reworked for use.

3.6 Battery pack performance. Battery packs shall meet all requirements of 3.6.1 through 3.6.8 and the acceptance criteria of 4.4.

3.6.1 Vibration. The battery pack shall not initiate or incur any internal/external damage or degradation when vibration cycles are applied in accordance with 4.3.7.

3.6.2 Shock. The battery pack shall not initiate or incur any internal/external damage or degradation when a saw tooth shock is applied in accordance with 4.3.8.

3.6.3 Temperature-shock/humidity/altitude (TSHA) cycling. The battery pack shall not fire or incur any internal or external degradation or damage when a TSHA cycle is applied in accordance with 4.3.9.

3.6.4 Saltfog. The battery pack shall not initiate or incur any internal/external damage nor degradation when a saltfog test is applied in accordance with 4.3.10.

3.6.5 Six-foot drop. The battery pack shall not initiate or incur any major internal/external damage or degradation as a result of the six-foot drop test of 4.3.11.

3.6.6 Forty-foot drop. The battery pack shall not initiate or incur any internal/external damage or degradation which makes the battery pack unsafe for disposal as a result of the forty-foot drop test of 4.3.12.

3.6.7 Firing mechanism test. The battery pack shall not actuate upon an application of 400 +0, –25 psig of air pressure to the inlet port and shall actuate between 400 to 650 psig at a rate of 20,000 to 40,000 psig/sec when the firing mechanism test is applied in accordance of 4.3.13.

3.6.8 Functioning. The battery pack shall meet the requirements of 3.6.8.1 and 3.6.8.2 when fired in accordance with 4.3.14.

3.6.8.1 Rise time. Each battery in the battery pack shall be initiated and reach 22 volts within 105 milliseconds (ms) at 200°F and within 130 ms at –65°F.

3.6.8.2 Current.

3.6.8.2.1 Constant. Each battery in the pack shall supply a continuous load of 0.95 amp ± 1% for the total battery life of 225 seconds.

3.6.8.2.2 Pulsing. Each battery in the pack shall supply twenty-two 8-amp ± 1% pulses with a duration of 10 ms at the times specified in table II.

3.6.8.3 Voltage. Each battery in the battery pack shall have a maximum voltage output of 60 volts and a minimum voltage output of 22 volts.

3.6.8.4 Actuation pressure. The battery pack shall initiate between 400 to 650 psig with an air application rate of 20,000 to 40,000 psig/sec.

3.6.8.5 Activation indicator. Each battery in the battery pack upon initiation shall have its activation indicator turn from white to black or pink to purple by the end of the 225 seconds.

TABLE II. Pulsing profile parameter.

Pulse Number	Time (Second)	Pulse Number	Time (Second)
1	0.220	12	100.15
2	0.320	13	100.20
3	0.450	14	100.21
4	0.650	15	160.00
5	0.660	16	160.15
6	3.110	17	160.20
7	60.00	18	160.21
8	60.15	19	224.00
9	60.20	20	224.15
10	60.21	21	224.20
11	100.00	22	224.21

3.7 Workmanship. The battery pack shall be constructed and finished in a manner to assure compliance with all requirements of this specification. Particular attention shall be directed to dimensions, finishes, sealing, and assembly operations.

4. VERIFICATION

4.1 Classification of inspections.

a. First article inspection (see 4.2.1)
b. Production inspection (see 4.2.2)
c. Lot acceptance inspection (see 4.2.3)

4.2.1 First article inspection. Unless otherwise specified in the contract or purchase order (see 6.2), a first article sample of 36 battery packs conforming to Drawing MBEU147990 shall be subjected to first article testing. Thirty-three of these battery packs shall be expended in the tests listed in table III and three battery packs shall be retained for investigative purposes. Any damage inflicted by the environmental treatments which would adversely affect the performance of the item in service application shall be cause for rejection of the first article sample. Any further production prior to notification by the contracting agency of first article sample acceptability shall be at the contractor's risk. Failure of any battery pack to comply with the requirements of section 3 shall be cause for rejection of the first article represented.

4.2.2 Production inspection. All production battery packs manufactured under the contract shall be inspected and screened for defects. Battery packs failing to meet the requirements that are listed in table I shall be rejected and removed from the lot.

4.2.3 Lot acceptance inspection. Lot acceptance inspection shall consist of the examinations and tests specified in table IV. Failure of any sample battery pack to comply with the requirements listed in table IV shall be cause for rejection of the lot represented. Packaging defects shall be corrected before acceptance.

TABLE III. First article test plan.

Test Sequence	Test Para.	Req. Para.	Sample Group									
			I	II	III	IV	V	VI	VII	VIII	IX	X
1. Visual	4.3.1	3.5.1, 3.7	6	3	3	3	3	3	3	3	3	3
2. Radiographic	4.3.2	3.5.2	6	3	3	3	3	3	3	3	3	3
3. Leakage	4.3.3	3.5.3	6	3	3	3	3	3	3	3	3	3
4. Insul. Resistance	4.3.5	3.5.5	6	3	3	3	3	3	3	3	3	3
5. Dielectric	4.3.6	3.5.6	6	3	3	3	3	3	3	3	3	3
6. Vibration[1, 2]	4.3.7	3.6.1	6									
7. Shock[1]	4.3.8	3.6.2		3								
8. TSHA[1]	4.3.9	3.6.3			3							
9. Saltfog[1]	4.3.10	3.6.4				3						
10. Six-Foot Drop[1]	4.3.11	3.6.5					3					
11. Forty-Foot Drop	4.3.12	3.6.6						3				
12. Firing Mechanism	4.3.13	3.6.7							3			
13. Function test: −65 ± 5°F 70 ± 5°F 200 ± 5°F	4.3.14	3.6.8	 22 2	 11 1	 11 1	 11 1	 11 1		 11 1	 3	 3	 3

[1] A visual, radiographic, insulation resistance, dielectric measurement inspections shall be conducted following the specific test.
[2] Footnote 1 shall be conducted after the Non-Gunfire and the Gunfire Vibration test.

4.2.3.1 Sample size. A random sample of battery packs from each production lot, including the samples retained for investigative purposes, shall be selected in accordance with table V for lot acceptance inspection. Test sample battery packs and samples retained for investigative purposes shall not be applied as part of the quantity specified for delivery by the contract or purchase order.

4.3 Inspections and tests.

4.3.1 Visual inspections.

4.3.1.1 Battery pack inspection. The external condition and appearance of the battery packs shall be determined by comparison to Drawing MBEU147990. Specific inspections of the electrical connector, stainless steel battery case, aluminum manifold, and identification label shall be conducted at a minimum. Each battery pack shall meet the requirements of 3.5.1 and 3.7.

TABLE IV. Lot acceptance inspections and tests.

Inspection/Test	Test Paragraph	Requirement Paragraph	Quantity
1. Visual Inspection	4.3.1	3.5.1, 3.7	Test and retain sample
2. Radiographic Inspection	4.3.2	3.5.2	Test and retain sample
3. Leakage	4.3.3	3.5.3	Test and retain sample
4. Insulation Resistance	4.3.5	3.5.5	Test and retain samples
5. Dielectric measurement	4.3.6	3.5.6	Test and retain samples
6. Function Test: −65 ± 5°F 70 ± 5°F 200 ± 5°F	4.3.14	3.6.8	 1/3 Sample[1] 1/3 Sample 1/3 Sample

[1] Odd battery packs shall be conditioned at −65°F.

TABLE V. Lot acceptance sampling.

Lot Size	Test Sample Size	Retained Sample Size
2 - 50	4	1
51 - 90	6	1
91 - 150	10	2

4.3.1.2 Packaging inspection. The condition of the packaging (inner container), packing (outer container), and markings shall be determined by comparison to the requirements of the contract.

4.3.2 Radiographic examination. Radiographic examination shall be in accordance with ASTM E1742. All battery packs and thermal batteries shall be identified with serial numbers beginning with 001 prior to examination. The battery packs and thermal batteries shall be arranged on boards or trays in consecutive order with any missing serial numbers identified on the radiographic plate. Each radiograph shall carry a permanent identification of the items displayed thereon in a 4 x 6 inch region, maximum. The radiographic identification shall include the drawing number, the complete lot number in accordance with MIL-STD-1168 for the battery pack, the contract number, and the span of serial numbers displayed. Radiographs of the entire production lot shall accompany the ballistic sample to the activity conducting the tests. Any observable imperfections as outlined in 3.5.2 shall be cause for rejection of the battery pack, the thermal battery, or both. Defective battery packs or thermal batteries found during radiographic review are to be marked on the radiographic plate and removed from the production lot.

4.3.2.1 Thermal battery. Each thermal battery, prior to manifold incorporation, shall be radiographed in two directions, 90 degrees apart. Each radiograph orientation shall provide the best possible view of the internal wiring and components of the thermal battery.

4.3.2.2 Battery pack. Each battery pack, after manifold incorporation, shall be radiographed in one direction. The radiograph orientation shall be with the battery pack manifold lying flat to provide the best possible view of both internal firing mechanisms.

4.3.3 Leakage test. Leakage shall be measured after bombing in Helium gas for 60 +1.0, !0.0 minutes at a pressure of 1 +0.1, –0.0 atmospheres absolute and venting with air for 10 +2, –0.0 minutes or washed with dry nitrogen. The thermal batteries shall then be tested in a dry gas leak tester. Each thermal battery shall meet the requirements of 3.5.3.

4.3.4 Polarity test. The protective caps shall be installed on the inlet gas ports at all times during the test.

a. Each set of battery pins (S+, S–, and P+, P–) shall be tested to verify that the battery polarity conforms to the polarity indicated on the battery case. The meter used shall be capable of measurements approaching theoretical limits of sensitivity of 10^{13} ohms. Prior to the start of the test, the meter used shall be reset to zero.

b. This test shall be conducted with the battery packs conditioned to 70°F. The conditioning time shall be not less than 4 hours. Each battery pack shall be tested within 5 minutes after removal from the conditioning chamber. If there is any doubt on any polarity measurement, repeat the test after temperature conditioning at 180°F for at least 4 hours but not more than 24 hours.

c. Pins S+ and S–

(1) On the meter, set the function switch to the "V" (mv) position and set the range switch to the highest range and then, upon testing, adjust to make a more precise reading.

(2) Connect the S+ and S– pins to the positive and ground connection points. The reading of the meter shall be positive or positive going.

(3) Remove the connection and reconnect to the negative and ground connection points. The reading of the meter shall be negative or negative going.

d. Pins P+ and P–

(1) On the meter, set the function switch to the "V" (mv) position and set the range switch to the highest range and then, upon testing, adjust to make a more precise reading.

(2) Connect the P+ and P– pins to the positive and ground connection points. The reading of the meter shall be positive or positive going.

(3) Remove the connection and reconnect to the negative and ground connection points. The reading of the meter shall be negative or negative going.

e. Each battery pack shall meet the requirements of 3.5.4.

4.3.5 Insulation resistance test. The insulation resistance test outlined in MIL-STD-202, Method 302 shall be used with the requirements listed below. The protective caps shall be installed on the inlet gas ports at all times.

a. Test 1.

(1) The insulation resistance shall be measured twice in test 1: (1) between the S+/S– leads in parallel to the battery case and (2) between the P+/P– leads in parallel to the battery case. Test condition "B" shall be used as specified in Method 302. This indicates a 500 volts (dc) ± 10 percent test potential shall be applied.

(2) The insulation resistance measurement shall be made and the actual current recorded immediately after a 2-minute application of uninterrupted test voltage.

(3) However, if the instrument reading indicates that an insulation resistance meets the specified limit (1 megohm), and is steady state or increasing, the test may be terminated before the end of the 2 minutes.

b. Test 2.

(1) The insulation resistance in test 2 shall be measured between the S+/S– (in parallel) leads and the P+/P– (in parallel) leads connected together. The test condition shall be 250 volts (dc) ± 10 percent test potential.

(2) The insulation resistance measurement shall be made immediately after a 2-minute application of uninterrupted test voltage.

(3) However, if the instrument reading indicates that an insulation resistance meets the specified limit (1 megohm), and is steady state or increasing, the test may be terminated before the end of the 2 minutes.

c. For each test conducted, the actual meter value/reading shall be recorded along with the battery pack serial number and individual thermal battery serial number.

d. Each battery pack shall meet the requirements of 3.5.5.

4.3.6 Dielectric measurement test. The DWV test outlined in MIL-STD-202, Method 301 shall be used with the requirements listed below. The protective caps shall be installed on the inlet gas ports at all times.

a. Three DWV tests shall be conducted between pin combinations: (1) between the S+/S– leads in parallel to case; (2) between the P+/P– leads in parallel to case; and (3) between the S+/S– (in parallel) and P+/P– (in parallel) leads connected together.

b. The battery insulation of each battery shall be submitted to 500 volts (ac) for 60 seconds. This shall be conducted by using a voltage application rate of 500 volts RMS per second with the source having a nominal 60 ±3 Hz frequency, which shall approximate a true sine wave in form. The leakage current shall be measured with an accuracy of 5 percent.

c. For each test conducted, the actual meter value/reading shall be recorded along with the battery pack serial number and individual thermal battery serial number.

d. Each battery pack shall meet the requirements of 3.5.6.

4.3.7 Vibration test. The battery packs shall be submitted to the non-gunfire vibration test profile: 2 at −65°F, 2 at 70°F, and 2 at 200°F. After the non-gunfire vibration, one battery pack from each group (total of three) shall be subjected to the gunfire vibration test profile at 70°F. The test fixture shall conform to Drawing 838AS229. The battery packs, with their protective plugs and caps installed, shall be vibrated along each of the three mutually perpendicular axis orientations as shown in figure 1.

a. Non-gunfire vibration.

(1) Resonance search (5 Hz to 2,000 Hz): A resonance search shall be conducted on two of the battery packs at 70°F in the axis I orientation (one at a time). The frequency sweep shall be made from 5 Hz to 2,000 Hz in approximately 10 minutes at the test levels indicated in figure 2. The resonant points shall be noted and a transmissibility plot obtained. A resonant point is defined as a point which has a transmissibility (output/input) of two or greater. If more than four points are noted from the search, only the four most severe will be used for resonance dwell. The resonant points of separate battery packs shall be considered the same if the modes are identical and the resonant frequencies fall within 3 percent of the mean resonant frequency for each mode. If the resonant points are the same (frequencies as above and identical modes), the resonant frequency nearest the center of the 6 percent band shall be used and the battery packs vibrated simultaneously during resonance dwell. If the resonant points are not the same as defined above, the battery packs shall be vibrated separately during the dwell.

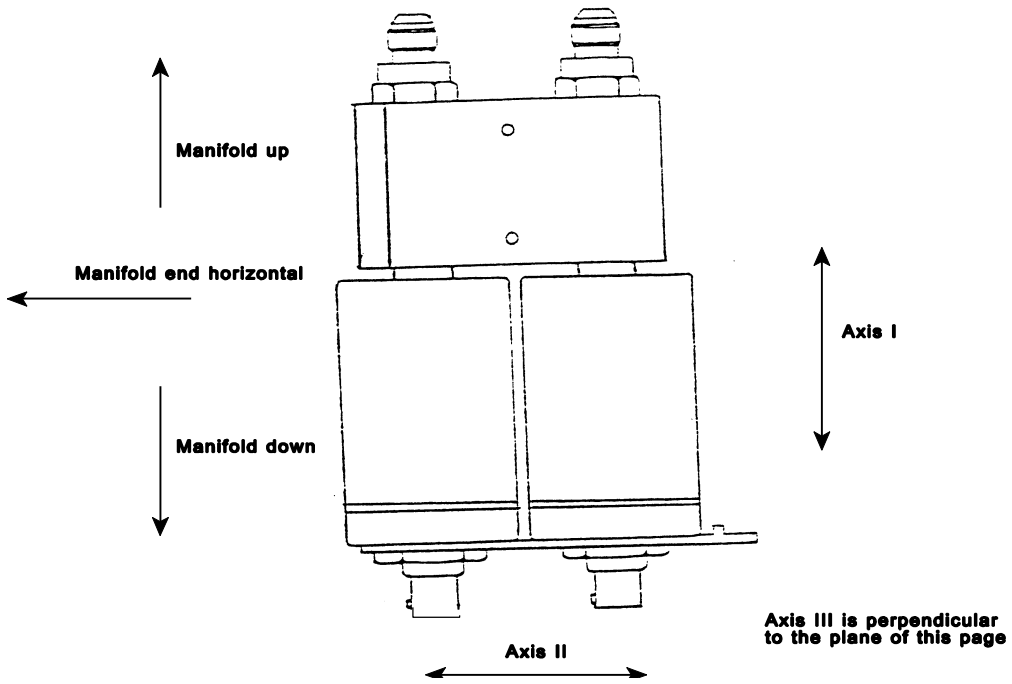

FIGURE 1. Axis orientation for the shock and vibration test and impact orientations for the six- and forty-foot drop tests.

(2) Resonance dwell (5 Hz to 2,000 Hz): The two battery packs shall be vibrated along axis I at 70°F for 30 minutes at each resonant point. In the event that more than four points are noted, the four most severe shall be used for resonance dwell. The response shall be peaked during the dwell period. The test levels and schedule are shown in figure 2 and table VI, respectively. After the resonance dwell along axis I, the battery packs shall be visually inspected for external damage.

(3) Sinusoidal Cycling (5 Hz to 2,000 Hz): The two battery packs shall be subjected to the sinusoidal vibration cycling along axis I at 70°F with the frequency varying logarithmically from 5 Hz to 2,000 Hz and back to 5 Hz in approximately 20 minutes. The test levels and schedule are shown in figure 2 and table VI, respectively. Depending on the number of resonant points found in the search, the battery pack shall be vibrated for 180 minutes minus the time spent in dwell. After the vibration cycling along axis I, the battery packs shall be visually inspected for external damage.

(4) After completion on the non-gunfire vibration along axis I, the procedure shall be repeated along the axis II orientation.

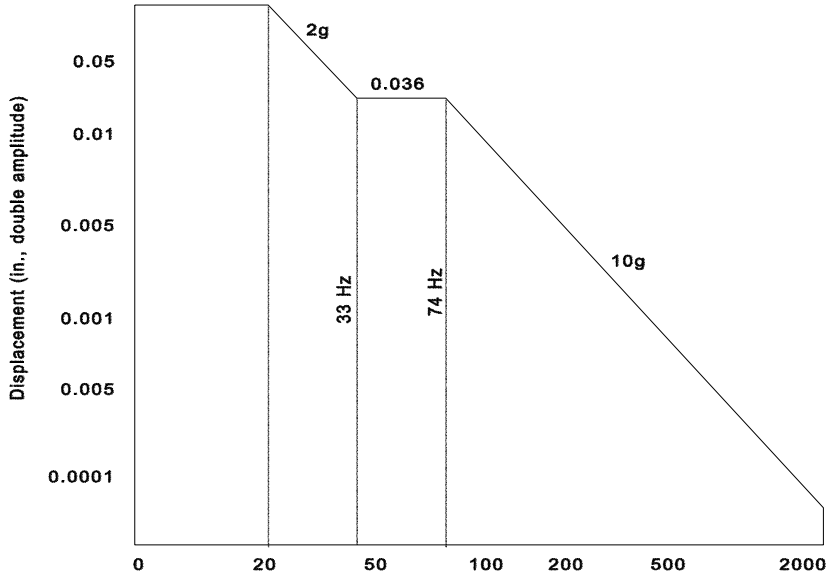

FIGURE 2. Non-gunfire vibration test levels.

TABLE VI. Non-gunfire vibration test schedule.

Test Time per Axis (Minutes)					
Number of Resonant Points	0	1	2	3	4
Dwell Time at Resonant Points	0	30	60	90	120
Total Vibration Cycling Time	180	150	120	90	60

Note: The vibration cycling sweep time from 5 Hz to 2,000 Hz and back to 5 Hz shall be 20 minutes.

(5) After completion on the non-gunfire vibration along axis II, the procedure shall be repeated along the axis III orientation.

(6) After completing the non-gunfire at 70°F, the procedure outlined above shall be conducted with two new battery packs at –65°F.

(7) After completing the non-gunfire at –65°F, the procedure outlined above shall be conducted with two new battery packs at 200°F.

(8) Three battery packs, one from each temperature group, shall then be stored at 70°F until functionally tested. The remaining three shall be submitted to the gunfire vibration test.

b. Gunfire vibration.

(1) Resonance search (50 Hz to 500 Hz): A resonance search shall be conducted on the remaining three battery packs at 70°F in the axis I orientation (one at a time). The frequency sweep shall be

made from 50 Hz to 500 Hz in approximately 7.5 minutes at the test levels indicated in figure 3. The resonant points shall be noted and a transmissibility plot obtained. A resonant point is defined as a point which has a transmissibility (output/input) of two or greater. If more than three points are noted from the search, only the three most severe will be used for resonance dwell. The resonant points of separate battery packs shall be considered the same if the modes are identical and the resonant frequencies fall within 3 percent of the mean resonant frequency for each mode. If the resonant points are the same (frequencies as above and identical modes), the resonant frequency nearest the center of the 6 percent band shall be used and the battery packs vibrated simultaneously during resonance dwell. If the resonant points are not the same as defined above, the battery packs shall be vibrated separately during the dwell.

(2) Resonance dwell (5 Hz to 500 Hz): The three battery packs shall be vibrated along axis I at 70°F for 7.5 minutes at each resonant point. In the event that more than three points are noted, the three most severe shall be used for resonance dwell. The response shall be peaked during the dwell period. The test levels and schedule are shown in figure 3 and table VII, respectively. After the resonance dwell along axis I, the battery packs shall be visually inspected for external damage.

(3) Sinusoidal cycling (50 Hz to 500 Hz): The three battery packs shall be subjected to the sinusoidal vibration cycling along axis I at 70°F with the frequency varying logarithmically from 50 Hz to 500 Hz and back to 50 Hz in approximately 7.5 minutes. The test levels and schedule are shown in figure 3 and table VII, respectively. Depending on the number of resonant points found in the search, the battery pack shall be vibrated for 30 minutes minus the time spent in dwell. After the vibration cycling along axis I, the battery packs shall be visually inspected for damage. Results of the inspection shall be noted.

(4) Fixed dwell testing: After sinusoidal cycling, the battery packs shall be subjected to a series of fixed dwells at 70°F along axis I as shown in table VII. The fixed narrow band dwell shall be performed by sweeping the frequency about ± 5 percent of the specified center frequency. For example, the 100 Hz dwell should be performed from 95 Hz to 105 Hz at the logarithmic sweep rate specified for the resonance search.

(5) Sinusoidal cycling (500 Hz to 2,000 Hz): After the fixed dwell testing, the battery packs shall be subjected to seven sinusoidal sweeps at 70°F along axis I. The frequency shall be varied logarithmically from 500 Hz to 2,000 Hz and return to 500 Hz in approximately 7.5 minutes with an applied input of ±10g. After testing along axis I, the battery packs shall be visually inspected and any damage shall be noted.

(6) After completion on the gunfire vibration along axis I, the procedure shall be repeated along the axis II orientation.

(7) After completion on the gunfire vibration along axis II, the procedure shall be repeated along the axis III orientation.

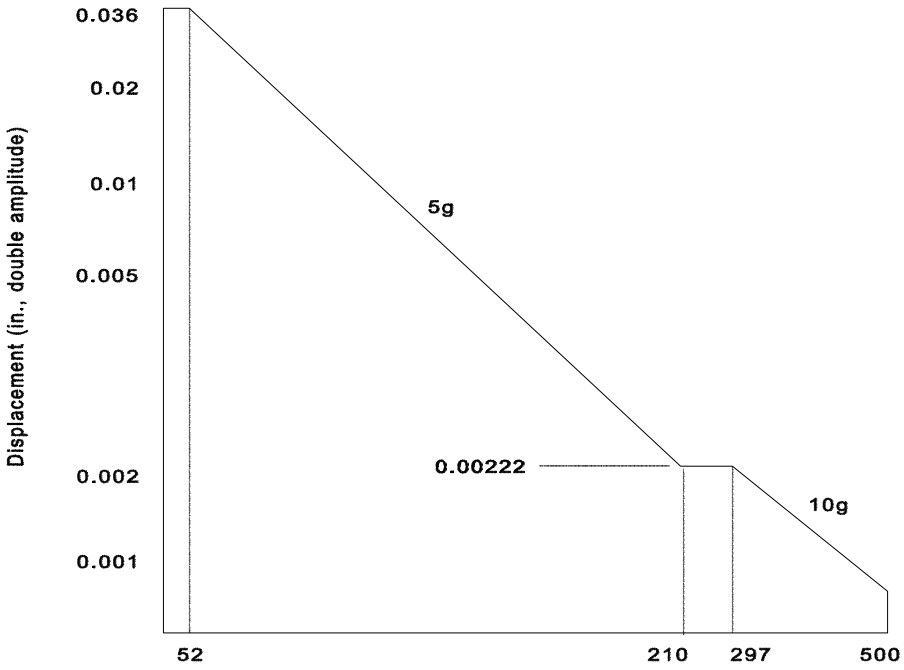

FIGURE 3. Gunfire vibration test levels.

TABLE VII. Gunfire vibration test schedule.

Test Times in Minutes per Axis				
Number of Resonances	0	1	2	3
Sweep Time	30.00	22.50	15.00	7.50
Resonance Dwell Time	-	7.50	15.00	22.50
Fixed Dwells[1/] at the following center frequencies:				
f_d = 67 Hz	7.50	7.50	7.50	7.50
100 Hz	7.50	7.50	7.50	7.50
135 Hz	7.50	7.50	7.50	7.50
200 Hz	15.00	15.00	15.00	15.00
267 Hz	7.50	7.50	7.50	7.50
300 Hz	7.50	7.50	7.50	7.50
335 Hz	7.50	7.50	7.50	7.50
400 Hz	15.00	15.00	15.00	15.00
467 Hz	7.50	7.50	7.50	7.50
500 Hz	7.50	7.50	7.50	7.50
Total Time Each Axis	120.00	120.00	120.00	120.00

1/ When the battery pack resonance occurs within 5 percent of a fixed dwell frequency, the fixed period shall be omitted and only the resonance dwell performed. The omitted fixed dwell shall then be added to the sweep time.

4.3.8 Shock test. The battery packs with protective plugs installed on the inlet ports and electrical connectors, shall be submitted to the shock test outlined in MIL-STD-810D, Method 516, Procedure I with the following requirements:

a. The shock pulse wave form shall be terminal peak sawtooth. The peak amplitude shall be 20g with a duration of 11 milliseconds as shown in figure 4. Three shocks shall be applied in each direction of the three mutually perpendicular axes orientations as shown in figure 1. Each battery pack shall be visually inspected after each axis direction test for evidence of mechanical failure or any defects which may affect proper installation or function. Result of inspection shall be noted.

b. Failure of any battery pack to comply with the requirements of 3.6.2 shall be cause for rejection of the lot and/or first article.

4.3.9 Temperature-Shock/Humidity/Altitude (TSHA) cycling test. The battery packs with protective plugs installed in the inlet and electrical ports shall be submitted to the temperature shock/humidity/altitude cycling test outlined in MIL-I-23659 with the following requirements:

a. The battery packs shall be supported in such a way that all areas are exposed to the prescribed atmospheric conditions at all times throughout the test. No battery pack shall be touched by another battery pack during the cycling schedule shown in table VIII.

b. Failure of any battery pack to comply with the requirements of 3.6.3 shall be cause for rejection of the lot and/or first article.

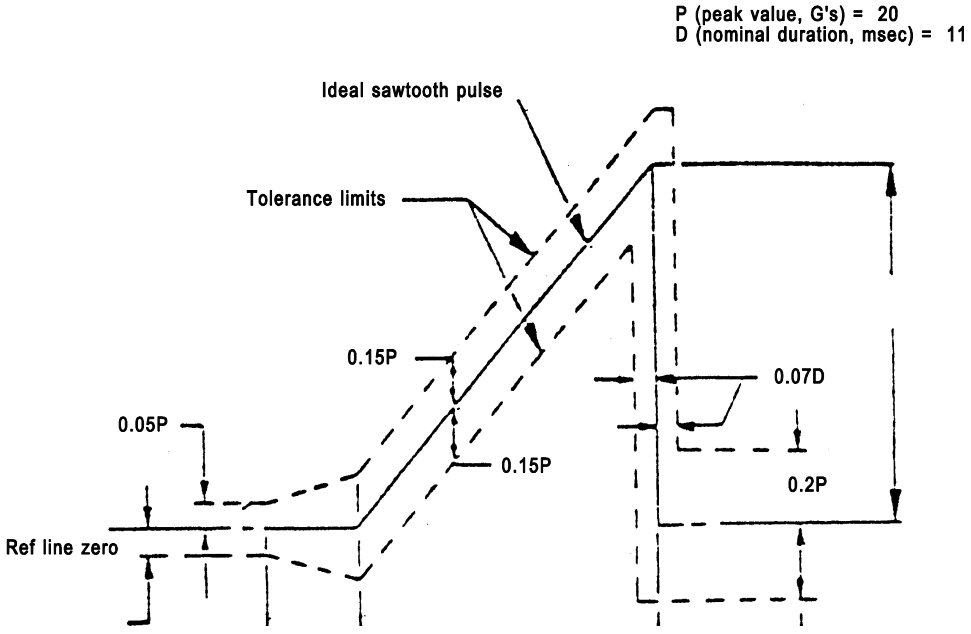

FIGURE 4. Terminal peak sawtooth shock pulse configuration and its tolerance limits.

TABLE VIII. Temperature shock/humidity/altitude cycling schedule.

	800	Place battery packs in a chamber at 70°F at 50% relative humidity (RH).
	1200	Raise chamber temperature to 160°F and the RH to 95%. The chamber temperature shall reach 160°F at 95% RH no later than 1300.
Monday	1600	Remove battery packs from chamber and immediately place in chamber maintained at –65°F at a pressure altitude of 70,000 feet - (0.65 psi)
	800	Remove battery packs from chamber and immediately place in chamber maintained at 70°F at 50% RH.
	1200	Remove battery packs from chamber and immediately place in chamber maintained at –65°F at a pressure altitude of 70,000 feet - (0.65 psi)
Tuesday	1600	Remove battery pack from chamber and immediately place in a chamber maintained at 160°F at 95% RH.
	800	Reduce chamber temperature to 70°F and RH to 50%. The chamber temperature shall reach 70°F at 50% RH no later than 0900.
	1200	Raise chamber temperature to 160°F and RH to 95%. The chamber temperature shall reach 160°F at 95% RH no later than 1300.
Wednesday	1600	Remove battery packs from chamber and immediately place in chamber maintained at –65°F at a pressure altitude of 70,000 feet - (0.65 psi)
	800	Remove battery packs from chamber and immediately place in chamber maintained at 70°F at 50% RH.
	1200	Remove battery packs from chamber and immediately place in chamber maintained at –65°F at a pressure altitude of 70,000 feet - (0.65 psi)
Thursday	1600	Remove battery pack from chamber and immediately place in a chamber maintained at 160°F at 95% RH.
	800	Reduce chamber temperature to 70°F and RH to 50%. The chamber temperature shall reach 70°F at 50% RH no later than 0900.
	1200	Raise chamber temperature to 160°F and RH to 95%. The chamber temperature shall reach 160°F at 95% RH no later than 1300.
Friday	1600	Remove battery pack from chamber and immediately place in a chamber maintained at –65°F at standard ambient pressure.

This schedule shall be followed for a total of four (4) weeks (28 days) except that on the second and fourth weekend the soak time shall be from 1200 on Friday until 0800 Monday at a temperature of 160°F at 95 percent relative humidity.

4.3.10 Salt fog test. The battery packs, with protective plugs installed in the inlet and electrical ports, shall be submitted to the salt fog test outlined in MIL-STD-810, method 509 with the following requirements:

a. Waxed string shall be used to support the battery packs in the chamber. The battery pack shall be oriented in the manifold up position as shown in figure 1. No change in orientation is required during the test. The battery packs shall be exposed to a 5 percent salt solution for 168 hours. Condensed fog shall be

collected at two points every 12 hours and the specific gravity, concentration, and PH of the solution measured.

b. After completing the 168 hours of testing, the salt deposits (if any) shall be removed, if necessary, for aiding in a visual inspection. To remove the salt deposits, a gentle washing technique shall be used with water not warmer than 38°C (100°F).

c. After completing the salt fog test, the battery packs shall be stored for 48 hours at 70°F. At the end of the 48 hours, a complete visual inspection shall be conducted. Any damage or degradation shall be noted.

d. Failure of any battery pack to comply with the requirements of 3.6.4 shall be cause for rejection of the lot and/or first article.

4.3.11 Six-foot drop test. The battery packs, with protective plugs removed from the inlet ports and electrical connectors, shall be submitted to the drop test outlined in MIL-C-83125 with the following requirements:

a. The battery packs shall be dropped from a height of 6 feet onto a 2-inch-thick steel plate supported by reinforced concrete. One new battery pack shall be used for each drop orientations. All impact orientations are given in figure 1.

b. After each battery pack is dropped, a visual inspection shall occur to document any minor/major external damage that occurred and to verify non-initiation of either battery.

c. If it is determined that the damage sustained by any one battery pack cause it to be unsafe for handling, all testing shall be stopped.

d. Failure of any battery pack to comply with the requirements of 3.6.5 shall be cause for rejection of the lot and/or first article.

4.3.12 Forty-foot drop test. The battery packs, with protective plugs removed from the inlet ports and electrical connectors and without shipping containers, shall be submitted to the drop test outlined in MIL-STD-331, test 103 with the following requirements:

a. The battery packs shall be dropped from a height of 40 feet onto a 2-inch-thick steel plate supported by reinforced concrete. One new battery pack shall be used for each drop orientations. All impact orientations are given in figure 1.

b. After each battery pack is dropped, a visual inspection shall occur to document any external damage that occurred and to verify non-initiation of either battery.

c. If it is determined that the damage sustained by any one battery pack cause it to be unsafe for handling (ruptured case), all testing shall be stopped.

d. At the conclusion of the forty-foot drop test, each battery pack shall again be visually inspected for external damage. After being inspected, each battery pack shall then be disposed of in a safe and appropriate manner.

e. Failure of any battery pack to comply with the requirements of 3.6.6 shall be cause for rejection of the lot and/or first article.

4.3.13 Firing mechanism test. The battery packs shall be submitted to the firing mechanism test outlined in MIL-C-83124 with the following requirements:

a. The battery packs shall be divided into three groups. Battery packs, which are to be conditioned prior to functional testing at 200°F and –65°F, shall be conditioned for at least 4 hours but not more than 24 hours. Battery packs, which are conditioned at 70°F, shall be conditioned for at least 4 hours at 70°F. Each test shall start within 3 minutes from conditioning chamber removal.

b. Non-Actuation: A pressure of 400 +0, –25 psig air pressure shall be gradually applied through a 0.013-inch orifice to one of the ports of each battery pack, (check valve removed) for 1 minute. The other inlet port shall be fitted with a pressure transducer to monitor leakage past the check valve.

c. Actuation: A pressure of 650 psig air pressure shall be applied at a rate of approximately 20,000 to 40,000 psig/sec to one port of each battery pack. The other inlet port shall be fitted with a pressure transducer to monitor leakage past the check valve.

d. Failure of any battery pack to comply with the requirements of 3.6.7 shall be cause for rejection of the lot and/or first article.

4.3.14 Functional test. Sample battery packs for the functional test shall be conditioned for not less than 4 hours and no more than 24 hours at the specified temperatures. The battery packs shall be removed from the conditioning chamber and test fired within 5 minutes. If any battery pack is not fired within 5 minutes after removal, it shall be reconditioned at the specified temperature for an additional 4 hours and then tested. The battery packs shall be initiated using an activation pressure of 900 +25, –0 psig of air. The battery pack shall be fired in the battery pack test firing setup shown on Drawing 838AS231. The battery packs shall meet the requirements specified in 3.6.8.

4.3.14.1 Rise time. The rise time shall be measured from the primer ignition (600 psig) to when the battery voltage reaches 22 volts when measured before the test firing circuit diodes. Each battery pack shall meet the requirements of 3.6.8.1.

4.3.14.2 Current. A constant and pulsing currents shall be measured over the first 225 seconds. The battery pack shall meet the requirements of 3.6.8.2.

4.3.14.3 Voltage. The four voltages shall be measured over the first 225 second before the diodes indicated on Drawing 838AS231, test firing circuit. Each battery pack shall meet the requirements of 3.6.8.3.

4.3.14.4 Test failure. If a test failure is attributable to an assignable cause, excluding the battery packs, the original test results shall be discarded and the test reconducted.

4.4 Acceptance criteria. Battery packs shall meet the requirements of 3.6 when tested as specified in 4.3.5 through 4.3.14. The acceptable number of defects is 0 and the rejection number is 1.

5. PACKING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2.). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Points packaging activity within the Military Department or Defense Activity, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended Use. The battery pack is intended for use on the Navy Aircrew Common Ejection Seat (NACES). The battery pack supplies voltage to the electronic sequencer which in turn initiates impulse cartridges to perform certain work functions during an emergency ejection from the T-45A, F-18C, F-18D, and F-14D Aircraft. This device was designed for military use and has no commercial application.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1, 2.2.2, and 2.3).

c. Whether first article inspection is required and, if so, specify the test activity (see 3.1 and 4.2.1).

d. Level of packing and marking (see 5.1).

6.3 First article. When a first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first production items, standard production item from the contractor's current inventory (see 3.1) and the number of items to be tested as specified in 4.2.1. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the U.S. Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the U.S. Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior U.S. Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Definitions.

6.4.1 Primary components. Primary components are all components in which a functional failure would result in a misfire or malfunction of the battery pack.

6.4.2 Flight critical part. A part, the single failure of which, during any operating condition, could cause loss of aircraft or one of its major components, loss of control, unintentional release of,or inability to release, or which may cause significant personnel injury, including during flight, escape, survival, or rescue.

6.5 Subject term (key word) listing.

Chemicals
Current
Polarity
Primer
Voltage

6.6 Changes from previous issue. Marginal notations are not used to identify changes with respect to the previous issue because of the extensiveness of the changes. MIL-DTL-82909A was updated under authority of ECP 035210P002.

Preparing Activity:
Navy - OS
(Project 6135- 0426)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. 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.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-82909A (OS)	2. DOCUMENT DATE (YYMMDD) 030313

3. DOCUMENT TITLE
BATTERY, THERMAL, MXU-792A/A

4. NATURE OF CHANGE (*Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.*)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (*Last, First, Middle Initial*)	b. ORGANIZATION	
C. ADDRESS (*Include Zip Code*)	d. TELEPHONE (*Include Area Code*) (1) Commercial (2) DSN (*If applicable*)	7. DATE SUBMITTED (*YYMMDD*)

8. PREPARING ACTIVITY

a. NAME Commander, Indian Head Division Naval Surface Warfare Center	b. TELEPHONE (*Include Area Code*) (1) Commercial 301-744-4700 (2) DSN 354-4700
c. ADDRESS (*Include Zip Code*) Standardization Team (Code 840M) 101 Strauss Avenue Indian Head, MD 20640-5035	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888

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