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October 5, 1960

File No: MC-1264, 3-2
T-No: 23437
Project No: 13.877.62
Completed: 9-26-60

9/29/98
RB Craner
10/06/98
W Layne
Declassify
OK for permit
TCG-NNT-1; TCG-SAFF-1

TO: DISTRIBUTION

Re: Environmental Testing of Prototype XMC-1264 Thermal Batteries, Manufactured by Eagle Picher

Object of Test

This test was performed as part of the Development Program on XMC-1264 Thermal Batteries.

The effects of vibration (Unactivated and Activated), mechanical shock (Unactivated and Activated), and activated linear acceleration on electrical performance results were to be studied.

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Authorization for Test

This test was requested by Organization 1323 in a Work Order Authorization dated 5/11/60. Mr. B. G. Neeld was the consultant. The material for test was received 7/8/60.

Summary

Eight XMC-1264 Thermal Batteries, numbered 566-EO, 557-EO, 565-EO, 558-EO, 564-EO, 568-EO, 567-EO and 554-EO, were received for vibration testing and were subjected to unactivated and activated vibration. Each component met all electrical performance requirements. All monitor circuits functioned properly in this group of batteries.

Three units, numbered 636-FO, 630-FO and 637-FO, were subjected to unactivated and activated mechanical shock. All recorded discharge results met specifications. The monitor circuits of units numbered 637-FO and 636-FO did not function.

The final group of three batteries, numbered 632-FO, 555-EO and 556-EO were subjected to activated linear acceleration. At the consultant's request, all units were overtested. A constant acceleration of 25 g was applied to each component for the duration of its activated life. Discharge results met all test requirements. Monitor circuits functioned properly.

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Functional Measurements and Methods

The equipment and instrumentation used in this test are listed in Tables

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Emilda Selph 10/06/98	RECORD ID: 99SN0055
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W C Layne 10/12/98	DATED: 10/06/98
PERSON VERIFYING MARKING & DATE	

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I and II.

All testing was conducted in accordance with TR-311059, Issue 3.

At the consultant's request, Match Resistance Tests (Par. 2.1.3) were conducted upon completion of the nondestructive environmental tests.

All functional testing was performed as prescribed in Par. 2.3, Discharge Requirements.

Procedure and Results

Eight XMC-1264 Thermal Batteries, numbered 566-EO, 557-EO, 565-EO, 558-EO, 564-EO, 568-EO, 567-EO and 554-EO, were received for vibration tests. Each unit was subjected to a total of six hours of unactivated vibration, as specified in Par. 2.2.5.1. Upon completion of this test, the Match Resistances of each battery were measured. Results were as follows:

Unit No.	A-B (Match 1)	B-F (Match 2)
566-EO	4.63 ohms	4.19 ohms
557-EO	4.69	4.45
565-EO	4.17	4.52
558-EO	4.37	4.27
564-EO	4.32	4.39
568-EO	4.3	4.7
567-EO	4.38	4.19
554-EO	4.11	4.36

All eight units were then subjected to activated vibration (Par. 2.2.5.2). Each battery met all performance requirements. All test data are recorded on Table III. Some noise was noted on unit no. 568-EO during activation. (See Discussion Item 1 for additional details.) All monitor circuits functioned properly, as shown on Table III.

A second group of six XMC-1264 Batteries were received for environmental testing.

Three units, numbered 636-FO, 630-FO and 637-FO, were subjected to unactivated mechanical shock. All conditions were maintained as prescribed in Par. 2.2.6.1 of TR-311059, Issue 3. After this test, the Match Resistances were checked, with the following results:

Unit No.	A-B (Match 1)	B-F (Match 2)
630-FO	4.68 ohms	4.2 ohms
636-FO	4.06	4.62
637-FO	4.19	4.66

Each component was activated, then subjected to one impact shock in one of the three mutually perpendicular axes. All shocks were in accordance with Par. 2.2.6.2, condition b. All recorded functional results were

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satisfactory, as shown on Table III. Load conditions b and c (Par. 2.3.2) were not applied to unit no. 637-FO because of an error in testing procedure. (See Discussion Item 2.) The monitor circuits of units numbered 637-FO and 636-FO did not function.

The final group of three batteries, numbered 632-FO, 555-EO and 556-EO, were subjected to activated linear acceleration (Par. 2.2.7.2). At the consultant's request, the specified amplitude of 25 g was applied to each component for the duration of its activated life. This overtest condition was applied along the longitudinal axes, with the applied force in the direction noted on Table III. All performance results met discharge requirements. Functional data are recorded on Table III. All monitor circuits functioned properly.

The components were returned to Division 1323 for post-mortem and/or disposal after testing.

Discussion

Item 1 - Some noise occurred in the output of unit no. 568-EO at approximately 240 seconds after activation. The voltage fluctuated between 27.75-29.5 volts for a period of 20 seconds, then stabilized, and functioned normally for the duration of the activated life.

Item 2 - The one ohm and 21.6 ohm loads were not applied to unit no. 637-FO. The tester firing switch was not held in the closed position long enough to allow the servo cam to engage. Since the load switching servo did not engage, the 100 ohm load was applied to the battery during the entire functional test. The activated life of this battery was approximately 100 seconds longer than any other component. This increase in performance would indicate that the battery should have functioned properly under normal load conditions.

Robert B. Frantz
ROBERT B. FRANTZ - 7321-3
7463

RBF:7321-3:map

Encs Tables I, II, III

Copy to:
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ITEM NO.	NAME	MFG. & MODEL	S-NO./ SER. NO.	DATE OF LAST CAL.	CAL. PER.	ACCURACY	RANGE	REMARKS	
1	VIBRATION TABLE	MB	II	PRIOR TO TEST	TEST	± 10%	5-2000 CPS		
2	INPUT CONTROL VOLTMETER	BALLANTINE MOD. 320	S-No. 98615	9-5-60	WEEKLY	± 10%	6.4 V. TO 640 V.		
3	INPUT ACCELEROMETER	ENDEVCO MOD. 2213	S-No. 4688	PRIOR TO TEST	TEST	± 10%	0-2500 CPS		
4	GUILLOTINE SHOCK TABLE	SANDIA	No. 1	PRIOR TO TEST	TEST	± 10%	15-2500 g .4-30 MILLI-SEC	* THIS SYSTEM USED FOR ACTIVATED SHOCK	
5	SHOCK CONSOLE	SANDIA	No. 3	9-5-60	MONTHLY	± 10%	—		
6	OSCILLOSCOPE	TEKTRONIX MOD. 531	S-No. 87481	9-13-60	6 MONTHS	—	—		

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TABLE I
ENVIRONMENTAL
EQUIPMENT LIST

ITEM NO.	NAME	MFG. & MODEL	S-NO./ SER. NO.	DATE OF LAST CAL.	CAL. PER.	ACCURACY	RANGE	REMARKS	
7	ACCELEROMETER	STATHAM TYPE ASA-200-350	S-No. 5420	9-12-60	MONTH	± 10%	0-300g		
8	150 LB. DROP TESTER	[redacted] CONTROLS	No. 3	PRIOR TO TEST	TEST	± 10%	0-2000 g .3-65 ms	*THIS SYSTEM USED FOR UNACTIVATED SHOCK	
9	[redacted]	HUGHES MOD. 104	S-No. 49134	7-22-60	MONTH	—	—		
10	ACCELEROMETER	STATHAM TYPE ASA-100-300	S-No. 617	7-27-60	MONTH	± 10%	0-100 g		
11	CENTRIFUGE	GENISCO	S-No. 80325	PRIOR TO TEST	TEST	± 1%	0-120g		

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TABLE II
FUNCTIONAL
INSTRUMENT LIST

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ITEM NO.	NAME	MFG. & MODEL	S-NO./ SER. NO.	DATE OF LAST CAL.	CAL. PER.	ACCURACY	RANGE	REMARKS	
1	MC-1264 TESTER	SANDIA (DIV. 7312)	Ser. No. 1	PRIOR TO TEST	TEST	± 1%	PER T.R.		
2	VISICORDER RECORDER	MINN. HONEYWELL MOD. 906	S-No. 98 884	PRIOR TO TEST	TEST	± .01 V.	0-35 V.		
3	TIME MARK GENERATOR	SANDIA	S-No. 421-6	PRIOR TO TEST	TEST	± .01 SEC.	—		
4	POWER SUPPLY	JOHN FLUKE MOD. 407	S-No. 106859	PRIOR TO TEST	TEST	—	0-600 V.		
5	DC VOLTMETER	WESTON MOD. 931	S-No. 114-34	7-60	6 MONTHS	1/2 %	0-50 V.	* USED TO CALIBRATE TEST [redacted]	
6	SQUIB RESISTANCE BRIDGE	SANDIA	SER. No 1	PRIOR TO TEST	TEST	± .01 Ω	0-15 Ω		

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TABLE III XMC-1264 ELECTRICAL PERFORMANCE T-23437

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Unit No.	Rise Time to 26 V.	Axes	Peak Voltage (Para. 2.2.5.2)	Surge Voltage	Activated Life	S#	Mean Res.
Activated Vibration-							
554-EO	3.68 sec.	* a	30.3 V.	20.1 V.	702 sec.	1	500K
567-EO	3.72	a	30.2	20.4	788	2	120K
568-EO	2.74	c	30.2	19.7	640	1	150K
557-EO	2.89	c	30.2	20.0	671	2	∞
565-EO	2.72	b	30.4	19.6	749	1	[illegible]
564-EO	2.63	b	30.4	19.8	734	2	140K
558-EO	2.60	c	30.3	20.1	766	1	60K
566-EO	2.56	c	30.5	19.1	730	2	∞
Activated Mech. Shock-							
637-FO	2.79 sec.	a	29.7 V.	Not Applied	886 sec	1	0
630-FO	2.80	c	29.6	19.8 V.	723	2	∞
636-FO	2.92	b	29.8	19.3	711	1	0
Activated Lin. Acceleration-							
632-FO	2.76 sec.	Toward Connector	30.2 V.	19.4 V.	717 sec	1	[illegible]
555-EO	2.75	Toward Bottom	30.3	19.7	762	2	∞
556-EO	2.70	Toward Connector	30.1	20.5	788	1	20 [illegible]

* Axes are defined in Par. 2.2.5.2, TR-311059, Issue 3.

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