[redacted]

9/29/98 RBrewer
10/06/98 W Layne
Classify + Release

OCT 1 2 1960

File No: XMC-1262, 3-2
T-No. 23472
Project No. 13.877.62
Completed: 9/20/60

TCG-NNT-1; TCG-SAFF-1

TO: DISTRIBUTION

Re: Activated Shock Testing of Prototype XMC-1262 Thermal Batteries Manufactured by Eagle Picher

Object of Test

This test was conducted as part of the development program on XMC-1262 thermal batteries. The effect of high g mechanical shock on battery electrical performance was to be studied.

Authorization for Test

This test was requested by 1323 in a Work Order Authorization dated 7/20/60. Mr. P. T. Boling was the consultant. The material for test was received 8/10/60.

Summary

Eight XMC-1262 thermal batteries, numbered 417-EO, 414-EO, 418-EO, 400-EO, 419-EO 425-EO, 391-EO and 415-EO, were subjected to Activated Mechanical Shock. Each unit was fired, then subjected to one 2000 ± 200g shock. All recorded functional results met TR specifications. No output voltage was recorded for the 28 volt section of Unit No. 419-EO because of equipment malfunction. None of the monitor circuits functioned in this group of batteries.

A second group of 15 test components, numbered 5133, 5134, 5105, 5108, 5131, 5091, 5094, 5107, 5103, 5090, 5093, 5096, 5130, 5092 and 5095, were received for Activated Mechanical Shock tests. At the consultant's request, the peak amplitude of the applied shock was varied between 1000 ± 100g and 2100 ± 210g for this group of units. Again all recorded electrical performance results were satisfactory. Because of erratic tester operation, the 70-second surge pulse was not applied to Unit No. 5131, and was applied 10-15 seconds on six other test batteries. The connector lock pins sheared on Unit No. 5103, allowing the mating connector to break contact, during shock impact. The test cable was reconnected to the unit and battery performance appeared to be normal. All monitor circuits functioned properly in the second test group.

RECEIVED
OCT 14 1960
CENTRAL RECORD FILE

CENTRAL RECORD FILE
ACCOUNTABLE CARD
FILE No. XMC-1262 3-2

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP
CLASSIFICATION CHANGED TO: U
AUTHORITY: W.C. Layne
Emelda Selph 10/08/98
PERSON CHANGING MARKING & DATE
RECORD ID: 99SN0052
W. C. Layne 10/12/98
PERSON VERIFYING MARKING & DATE
DATED: 10/06/98

UNCLASSIFIED

[redacted]

Functional Measurements and Methods

The equipment and instrumentation used in this test are listed in Tables I and II.

Each unit was activated for approximately 3 seconds, then subjected to one mechanical shock.

The XMC-1262 Test Console was used to perform all functional testing. Output voltages were monitored visually and recorded automatically on a Brush electric recorder incorporated in the test console. The oscilloscope was used to monitor and display the effect, if any, of high g shock on battery output voltages. Match No. 1 firing circuit was used to fire all the test components because the No. 2 firing circuit was used to supply an external trigger voltage for the oscilloscope.

All tests were conducted in accordance with TR-311058, Issue 2, and the consultant's instructions.

Procedure and Results

Eight XMC-1262 thermal batteries, numbered 417-EO, 414-EO, 418-EO, 400-EO, 425-EO, 391-DO, 415-EO and 419-EO, were received for Activated Mechanical Shock per paragraph 2.2.6.2 of TR-311058, Issue 2. (Note: See Discussion Item 1 for detailed information concerning changes in Activated Shock test requirements.)

At the consultant's request, each unit was subjected to one 2000 ± 200 g shock in the axis and direction noted on Table III. The three mutually perpendicular axes were maintained as designated in Figure 1 of TR-311058, Issue 2. All recorded functional results met specifications, as shown on page 1 of Table III. No data was recorded for the 28-volt section of Unit No. 419-EO after the shock impact. (See Discussion Item 2 for details.) None of the monitor circuits functioned in this group of batteries.

A second group of 15 test components, numbered 5133, 5134, 5105, 5108, 5131, 5091, 5094, 5107, 5103, 5090, 5093, 5096, 5130, 5092 and 5095, were received for Activated Mechanical Shock. At the consultant's request, the shock amplitude was varied between 1000 ± 100 g and 2100 ± 210 g. The amplitudes, axes and directions of shock applied to the test units, are recorded on Table III. All recorded test results met specifications. Test data are shown on pages 1 and 2 of Table III. The 70-second surge load was not applied to Unit No. 5131, and was applied erratically thereafter because of a tester malfunction. (See Discussion Item 3 for additional information.) No output voltages were recorded for Unit No. 5103 after shock impact. The mating connector lock pins sheared, inadvertently disconnecting the tester from the battery (Discussion Item 4). All monitor circuits functioned properly in this group of test units.

Upon completion of testing, all units were returned to Division 1323 for post-mortem and/or disposal.

Discussion

Item 1

Since TR-311058, Issue 2, is a Preliminary Print, the following changes have been made:

Par. 2.2.6.2 Activated Mechanical Shock--The shock amplitude has been reduced from 2000 ± 200 g to 1000 ± 100 g. The shock duration requirement has been reduced from 3 ± 1 milliseconds to 2 ± 1 milliseconds.

Par. 2.3.3.2d 28-Volt Section Activated Life--When subjected to Activated Mechanical Shock, the MC-1262 shall be required to maintain an output voltage of 24 volts for a period of 35 seconds. The original activated life requirement was 90 seconds under all environmental conditions.

The changes listed above were authorized by Mr. D. M. Olson, Division 7162, in a memo to Mr. R. D. Wehrle, Division 1323, dated 9/22/60. The revisions will be published in TR-311058, Issue 5.

Item 2

The 28-volt lead opened at the tester connector end of the external tester cable during the shock impact. The 28-volt section functioned properly during the recorded period approximately 3 seconds prior to the shock. The 12-volt section operated normally throughout the test.

Item 3

The XMC-1262 Test Console failed to apply the 70-second surge load to Unit No. 5131. The control timer did not operate, and so, did not trigger the load control relay. The faulty timer mechanism was freed, lubricated and made functional for the duration of this test series. Although the timer did function, its operation was very erratic. Some surge pulses were applied from 10 to 15 seconds late. Since this late pulse constituted an overtest condition, the tester was used to complete this shock test series. The timer was subsequently replaced.

Item 4

All three lock pins sheared from the connector of battery No. 5103 at shock impact. The connector was replaced approximately 45 seconds later and battery performance appeared to be normal. The mating connector was

reinforced with tape for all subsequent tests in the longitudinal axis, when the inertial force was applied to the connector end of the battery.

W E Bocken for

Test Conducted by: R. B. Frantz, 7321-3

RBF:7321-3:dc

Enc: Tables I, II, III

Distribution:
R. D. Wehrle, 1323
Attn: P. T. Boling
J. M. Wiesen, 1442
J. R. Harrison, 7523
E. H. Copeland, 7321
R. K. Smeltzer, 3421-3

T - 23472

UNCLASSIFIED

TABLE I
ENVIRONMENTAL
EQUIPMENT LIST

[redacted]

ITEM NO.	NAME	MFG. & MODEL	S-NO./ SER. NO.	DATE OF LAST CAL.	CAL. PER.	ACCURACY	RANGE	REMARKS	
1	GUILLOTINE SHOCK TABLE	SANDIA	SER # 1	PRIOR TO TEST	TEST	± 10%	15-2500 g .4-30 MS		
2	SHOCK CONSOLE	SANDIA	SER # 1	8-9-60 9-9-60	MONTHLY	G AMP. ± 10% DURATION ± 2%	—		
3	OSCILLOSCOPE	TEKTRONIK MOD. 531	S. # 98520	4-12-60	6 MONTHS	—	—		
4	ACCELEROMETER	ENDEVCO TYPE 2214	S # 3811	8-9-60	WEEKLY	G. AMP ± 10% DURATION ± 2%	15-2500 g		
5	ACCELEROMETER	ENDEVCO TYPE 2214	S # 5470	9-13-60	WEEKLY	G AMP. ± 10% DURATION ± 2%	15-2500 g		

[redacted]

UNCLASSIFIED

T - 23472

TABLE II
FUNCTIONAL
EQUIPMENT LIST

UNCLASSIFIED

[redacted]

ITEM NO.	NAME	MFG. & MODEL	S-NO./ SER. NO.	DATE OF LAST CAL.	CAL. PER.	ACCURACY	RANGE	REMARKS	
1	XMC-1262 TEST CONSOLE	SANDIA (DIV. 1323)	SER # 1	PRIOR TO TEST	TEST	* ½ %	0-25 V. 0-50 V.	*ACCURACY IS FOR PANEL METERS MONITORE	RECORDED VISUALLY.
2	VOM	SIMPSON MOD. 260	S # 111-96	7-25-60	6 MONTHS	—	0-∞ Ω	THIS METER WAS USED TO MONITOR	CHECK CIRCUIT.
3	~~OSCILLOSCOPE~~	TEKTRONIK TYPE 531	S # 80167	7-15-60	6 MONTHS	—	—		

[redacted]

UNCLASSIFIED

UNCLASSIFIED

TABLE III

XAC-126.2 ELECTRICAL PERFORMANCE

T-23472

[redacted]

Unit No:	417-EO	414-EO	418-EO	400-EO	425-EO	391-DO	415-EO	419-EO	5133	5134	5105	5108	5131
Rise 70:10 V.	.25 sec	.25 sec	.25 sec	.25 sec	.26 sec	.29 sec	.25 sec	.26 sec	.29 sec	.29 sec	.30 sec	.35 sec	.30 sec
Time 70:26 V.	.76 sec	.78 sec	.79 sec	1.31 sec	.85 sec	1.31 sec	.92 sec	.85 sec	.82 sec	.91 sec	.83 sec	.81 sec	.86 sec
Peak 12 V. Sec	19.1 V.	19.2 V.	19.1 V.	19.2 V.	19.2 V.	19.3 V.	19.0 V.	19.2 V.	19.4 V.	18.5 V.	19.2 V.	19.4 V.	19.2 V.
Voltage 26 Sec	29.0 V.	29.2 V.	29.4 V.	29.1 V.	29.3 V.	28.9 V.	29.4 V.	29.5 V.	29.6 V.	29.2 V.	29.5 V.	29.8 V.	29.8 V.
Accuracy 12 V. Sec	112 sec	117 sec	102 sec	106 sec	123 sec	132 sec	104 sec	110 sec	122 sec	116 sec	140 sec	136 sec	148 sec
Lag 26 V. Sec	130 sec	149 sec	156 sec	57 sec	217 sec	108 sec	221 sec	—	167 sec	128 sec	235 sec	294 sec	319 sec
Time (Sec.) 0	29.0 V.	29.2 V.	29.3 V.	29.9 V.	29.1 V.	28.8 V.	29.4 V.	No Data Recorded (See Discussion)	29.6 V.	29.2 V.	29.5 V.	29.4 V.	29.7
15	29.0	29.1	29.4	29.1	29.3	28.9	29.4		29.4	29.2	29.3	29.2	29.2
30	28.9	28.5	29.1	26.8	29.0	28.3	29.2		29.1	29.0	28.8	29.6	29.4
45	28.6	28.7	28.1	26.8	28.9	29.1	29.0		28.9	28.2	28.5	29.2	29.2
Decrease 60	28.8	28.4	28.2	—	29.7	27.6	28.9		28.4	26.6	28.3	29.0	29.0
75	27.7	27.9	27.1	19.0	27.9	25.9	28.1		26.9	26.0	27.3	28.2	29.0
90	27.4	27.8	27.0	15.8	27.9	24.8	28.0		26.0	25.8	27.2	28.2	28.8
120	26.9	26.9	25.8		27.1	23.1	27.7		25.7	24.5	26.9	28.0	28.3
150	26.1	25.2	24.1		26.8		27.0		24.7	22.2	26.1	27.3	28.1
180	24.0	23.0	22.5		25.5		26.1		23.2	21.0	25.3	26.9	27.8
210	21.8	20.9	21.0		24.2		24.7		21.9		24.7	25.9	
240											23.9	25.9	
Rise 1.5 sec	11.0 V.	11.3 V.	11.0 V.	11.2 V.	10.6 V.	10.5 V.	10.3 V.	10.7 V.	10.8 V.	10.5 V.	10.4 V.	10.0 V.	10.5 V.
Voltage 180	14.4 V.	14.5 V.	10.2 V.	13.9 V.	13.6 V.	13.6 V.	13.0	13.8 V.	14.0 V.	12.0 V.	13.7 V.	13.3 V.	13.6 V.
300	24.0 V.	24.3 V.	23.4 V.	17.3 V.	24.1 V.	23.9 V.	24.3	—	23.2 V.	22.2 V.	23.5 V.	24.2 V.	Instrument
Model #	1	1	1	1	1	1	1	1	1	1	1	1	1
Operator	Did Not Function	Did Not Function	Did Not Function	Did Not Function	Did Not Function	Did Not Function	Did Not Function	Did Not Function	OK	OK	OK	OK	OK
Environmental	2000 g	2000 g	2000 g	2000 g	2000 g	2000 g	2000 g	2000 g	1700 g	1700 g	1000 g	1500 g	1000 g
Test	Vert. Axis	Vert. Axis	Vert. Axis	Vert. Axis	Vert. Axis	Lat. Axis	Lat. Axis	Lat. Axis	Lat. Axis	Lat. Axis	Lat. Axis	Lat. Axis	Lat. Axis
Condition	→ Case	→ Case	→ Bkts	→ Bkts	→ Bkts	→ 2 Bkts	→ 2 Bkts	→ 2 Bkts	→ Sway Bar	→ Sway Bar	→ Sway Bar	→ 2 Bkt	→ 2 Bkt

UNCLASSIFIED

[redacted]

UNCLASSIFIED

TABLE III

XMC-1262 ELECTRICAL PERFORMANCE

T-23472

[redacted]

UNIT No:		5091	5094	5107	5108	5090	5093	5096	5130	5092	5095			
RISE	10 V.	.28 SEC	.30 SEC	.29 SEC	.29 SEC	.29 SEC	.31 SEC	.28 SEC	.31 SEC	.28 SEC	.29 SEC			
TIME	24 V.	.83 SEC	.82 SEC	.85 SEC	.90 SEC	.83 SEC	.90 SEC	.95 SEC	.84 SEC	.86 SEC	.87 SEC			
PEAK	12 V. SECT	19.3 V.	19.2 V.	19.2 V.	19.0 V.	19.2 V.	19.1 V.	19.3 V.	19.2 V.	19.2 V.	19.2 V.			
VOLTAGE	28 V. SECT	28.9 V.	29.0 V.	29.4 V.	29.0 V.	29.0 V.	29.2 V.	29.7 V.	29.2 V.	29.4 V.	29.4 V.			
ACTIVATED	12 V. SECT	168 SEC	162 SEC	139 SEC	—	112 SEC	133 SEC	140 SEC	141 SEC	133 SEC	131 SEC			
LIFE	28 V. SECT	145 SEC	102 SEC	238 SEC	—	60 SEC	69 SEC	211 SEC	188 SEC	154 SEC	210 SEC			
TIME-(SEC.)	5	28.9 V.	29.0 V.	29.1 V.	RECORDED	29.0 V.	29.2 V.	29.2 V.	29.2 V.	29.3 V.	29.1 V.			
[28 V. SECT]	15	28.9	28.8	29.4		28.4	29.1	29.7	29.2	29.4	29.4			
	30	28.8	29.3	29.2		27.6	27.9	29.4	28.9	29.1	29.2			
	45	28.4	26.1	29.1		26.8	25.9	29.1	28.9	29.0	29.1			
MONITORED	60	28.3	26.1	29.0		24.3	25.0	29.0	28.5	28.8	29.0			
	75	28.0	25.2	28.9		22.2	23.0	28.9	28.2	28.5	28.9			
VOLTAGE	90	27.0	24.8	28.0		21.5	21.0	27.9	27.2	27.1	28.0			
	120	25.2	21.9	27.8			18.5	27.0	26.9	26.0	27.8			
	150	22.4	20.0	27.1				26.8	25.9	24.8	26.9			
	180			26.2				25.8	24.2	21.8	25.9			
	210			25.2							24.0			
	240													
SURGE	1.5 SEC	10.7 V.	10.4 V.	11.0 V.	10.8 V.	10.8 V.	10.0 V.	10.6 V.	10.7 V.	10.5 V.	10.2 V.	* 70 SEC. SURGE		
VOLTAGES	18.0	14.1 V.	12.4 V.	13.4 V.	—	12.8 V.	12.1 V.	12.2 V.	13.7 V.	12.5 V.	12.5 V.	TIMES.		
	300	24.5 V.	* 22.9 V.	24.7 V.	—	19.4 V.	* 19.7 V.	* 21.9 V.	* 24.4 V.	* 24.4 V.	* 24.6 V.			
MATCH *		1	1	1	1	1	1	1	1	1	1	* 70 SEC. SURGE		
MONITOR		OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	[illegible]		
ENVIRONMENTAL		1700 g	1600 g	1150 g	1700 g	1950 g	1450 g	1100 g	2100 g	2000 g	1000 g			
TEST		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
CONDITIONS		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

NO DATA (SEE DISCUSSION)

UNCLASSIFIED [redacted]