



Aerospace  
Systems Division

LSPE THERMAL BATTERY TEST

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ATM 1086	
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DATE	2/25/72

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### Introduction

The purpose of this ATM is to document the results of a Thermal Battery test for the Lunar Seismic Profiling Experiment (LSPE). The test was made to verify the Catalyst Research Corporations data (see page 5) on the Thermal Batteries and to demonstrate that the LSPE thermal batteries (inactivated) are not degraded or damaged by application of voltages to thermal battery output terminals during functional tests of circuitry directly connected to the thermal battery terminals.

### General

Six Thermal Batteries (T/B) were tested. To each thermal battery, +26.4 volts was applied to the 24.75V terminal and +6.4 volts was applied to the +5.5 volt terminal. The batteries were soaked at 200°F with the test voltages applied for 28 hours continuously, and measurements made to determine if there was a change in the current to the inactive cells of the batteries. Measurements were taken every two hours for the first six hours and final measurements taken 22 hours later. No change in current was detected. See Table 1.

A thermal battery timer was used to fire the batteries and the output of the thermal batteries recorded on a strip chart recorder. The output voltages were within their specified limits of AL900332. (See Table 2). Analysis of the data indicates that no degradation was caused by exposure to test voltages for time durations.

### Conclusion

The Thermal Batteries tested operated satisfactorily and within the designated specifications and tolerances. Application of test voltages to battery terminals has no adverse or degrading effect on the LSP Thermal Batteries.

	Thermal Battery S/N	27	34	49	31	58	43
011:00		6.37V	6.36V	6.37V	6.35V	6.36V	6.38V
2-16-72		24.04V	24.05V	24.02V	24.00V	24.02V	23.95V
013:00		6.37V	6.37V	6.37V	6.36V	6.36V	6.38V
		24.05V	24.06V	24.03V	24.00V	24.03V	23.96V
01500		6.37V	6.37V	6.37V	6.35V	6.36V	6.38V
		24.05V	24.05V	24.02V	24.00V	24.03V	23.95
017:30		6.37V	6.37V	6.37V	6.35V	6.36V	6.38V
		24.04V	24.05V	24.02V	24.00V	24.02V	23.95V
08:45		6.37V	6.37V	6.37V	6.35V	6.36V	6.38V
2-17-72		24.04V	24.04V	24.02V	23.99V	24.02V	23.94V

Temperature = 200°F

Initial Voltages = 6.39V & 26.4V

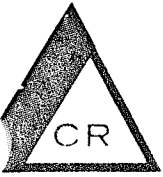
Table 1

	Thermal Battery S/N	Primer Activation To full Voltage	Activation Time to Minimum Voltage	T/B Voltage Decrease	Operating Life	Voltage Break .5 to 60 sec
1.	58	.9 sec	21V=.24 sec 11.7V=.57sec 4.7V=.55 sec	32.2 sec	21V=116.7 sec 11.7V=72.2 sec	None on any part of data
2.	27	.98 sec	21V=.28 sec 11.7V=.51 sec 4.7V=.48 sec	14.2 sec	21V=126.25 sec 11.7V=70.9 sec 4.7V=124 sec	None on any part of data
3.	49	.88 sec	21V=.29 sec 11.7V=.53 sec 4.7V=.45 sec	20 sec	21V=134 sec 11.7V=70.1 sec 4.7V=132 sec	None on any part of data
4.	31	.98 sec	21V=.23 sec 11.7=.51 sec 4.7=.41 sec	19.1 sec	21V=128 sec 11.7V=89 sec 4.7V=125 sec	None on any part of data
5.	43	.9 sec	21V=.25 sec 11.7V=.5 sec 4.7V=.4 sec	20.6	21V=129 sec 11.7V=67.6 sec 4.7V=123.7 sec	None on any part of data
6.	34	.96 sec	21V=.32 sec 11.7V=.6 sec 4.7V=.56 sec	20.2	21V=122.1 sec 11.7V=712 sec 4.7V=110 sec	None on any part of data

Test was run on 2-16-72

Definitions (Table 2)

1. T/B Full Output: Time required to reach full voltage from T/B primer activation.
2. Activation Time: Time required to reach minimum operating voltage of T/B from primer activation.
3. T/B Voltage Decrease: Time after primer activation that T/B voltages start to decrease simultaneously.
4. Operating Life: Time required to reach T/B minimum voltages from T/B full output.
5. Voltage Breaks: Any change in the output of the T/B of 1.0 Volt<sup>t</sup> or greater in any .5 sec or shorter and no Voltage breaks between .5 sec and 60 sec after primer activation



CATALYST RESEARCH CORPORATION

February 17, 1972

Bendix Aerospace Systems Division  
3300 Plymouth Road  
Ann Arbor, Michigan 48107

Attention: Mr. J. Zimmer

Reference: Thermal Battery, Bx Part No. 2348416,  
CRC Part No. 404380

Subject: Application of voltage to output terminals

Dear Mr. Zimmer:

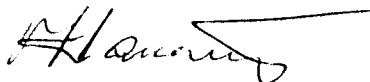
In response to your telephone inquiry in February of 1972 regarding external current application to output terminals of subject unactivated battery, we concur that:

- (1) the battery will not be degraded in any way as result of application of electrical current from an external source to the output terminals, providing
  - (a) the DC voltage does not exceed ten (10) times the specified output voltage of the battery section, or
  - (b) if higher voltage is applied, it is current limited to 250 milliamperes. Maximum test voltage 500 VDC.
- (2) The battery may be degraded or activated if a current of more than 500 milliamperes is applied across monitor circuit.

If there are any further questions or comments concerning the above, please contact the undersigned.

Very truly yours

CATALYST RESEARCH CORPORATION

  
V. Klasons  
Engineering Supervisor

CC: R. B. Fisher  
/rrk