Bendix

Aerospace Systems Division

ASTIR/
TM 39

PAGE _____ OF _____

DATE

Apollo 17

LEAM Temperature Slope Anomaly

Prepared by D. Perkins

Approved by D. Fithian

SUMMARY:

The LEAM temperature profile, during the 8th lunation of Apollo 17 Alsep, indicated an apparent unusually rapid rise in temperature from 176°F. to 179 F. This rise was reported as an anomaly on ASTIR 39.

This memo indicates that there was no anomolous behaviour in the experiment and that the effect is due to the digitization of the telemetry data.

INTRODUCTION:

The LEAM experiment temperature profile has been monitored closely throughout the Apollo 17 mission because the originally predicted temperatures were exceeded. The present mission plan is to maintain operation of the experiment up to a certain maximum temperature and to set the experiment to Standby if the maximum temperature is exceeded. The maximum temperature is increased by 5°F at each lunation. The allowed maximum temperature during the eighth lunation was 180°F. The anomaly occurred just prior to turn off at 179°F, while the previous temperature reading an hour earlier was 176°F. This increase was considered unusually high. Table 1 gives the temperature readings as presented with the anomaly report.

ANALYSIS:

The temperatures were plotted and compared with the expected curve which was derived during the LEAM Anomaly investigation. The expected curve was plotted using the simplified math model and is presented in Bendix ATM 1120, 22 March 1973. The temperature profile, including the point in question, agreed very closely with the predicted curve.

The temperature readings were then analyzed in relation to the telemetry digitization process. The temperature was recorded as 176.0°F from 13.30 GMT until 16.00 GMT., as 177.5°F at 16.52 GMT and 179.0°F at 17.00 GMT. The resolution of the A/D converter system inherently means that the temperature can only be stated to be between the switching points for the particular step, i.e. for octal count 327 we can only specify the temperature to be between 176 and 177.5°F.o The data indicates that the step change

to 179°F occurred between 16.52 and 17.00 GMT and it is reasonable to assume that the temperature was on the point of switching to 177.5°F at 16.00 GMT. In addition, because of slight inaccuracies in the computer curve fit of the temperature sensor calibration curve, the true temperatures at 16.00 and 17.00 GMT, were 177.8°F and 178.3°F respectively. This gives a temperature rate of change of 1/2°F per hour, which is very reasonable.

CONCLUSION:

The conclusion resulting from the analysis is that there is no anomaly in the LEAM temperature profile for the eighth lunation. This fact is borne out by the data for the ninth lunation which shows no deviation from the predicted curve.

The apparent anomaly was caused by the inherent inaccuracy of resolution of the conversion system, which does not allow for critical analysis of a step change of one bit, together with inaccuracies of calibration curve simulation.

TABLE I

Date	Time (GMT)	Octal	Temp °F	
7/7	1600	307	158.7	
	1700	310	159.8	
	1800	312	162.0	
	1900	312	162.0	
	2000	313	163.0	
	2100	314	164.1	
7/8	0740	324	172.8	
	0840	324	172.8	
	0940	325	173.8	
	1040	325	173.8	
	1100	326	174.9	
	1130	326	174.9	
	1230	326	174.9	
	1330	327	176.0	
	1430	327	176.0	
	1600	327	176.0	
	1700	331	179.0	
	1800	331	179.0	OFF
	1900	326	174.9	
	2000	324	172.8	

ALSEP SYSTEM TEST & INVESTIGATION REQUEST Sheet 1 of

Number	Originated by:	Reference Document(s)
39	Organization Bendix	Apollo 17 SMEAR, ALSEP 54
Date 8-1-73	Name R. Miley	

Short Title: LEAM Temperature Operation

Study/Task Description:

Apollo 17 SMEAR, ALSEP 54 indicates a concern by FOD about operating the LEAM above 176°F (see attachment).

Evaluate the viability of the above temperature question.

Scheduled Completion Date	Output(s)
☐ Interim _____ ☒ Final 6 Aug 73	Technical Memo

Authorization

NASA _____ BENDIX _____

Results (use supplementary sheets as necessary):

Completion Date	Approvals	Distribution:
☐ Interim _____	NASA _____	P. D. Gerke, W. Tosh, W. Eichelman, R. Miley, B. Rusky
☐ Final _____	Bendix _____	

USE BLACK BALLPOINT PEN

SPAN / MISSION EVALUATION ACTION REQUEST

USE BLACK BALLPOINT PEN

TIME (T- MINUS/GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER
July 31, 1973	FCD	MER	APOLLO 17 ALSEP 54

ACTION REQD BY (TIME): ASAP

REQUESTER R. KEELY

SUBJECT: LEAM OPERATION

APPROVAL

FOD REP Concurred 8-1-73

TIME :

SPAN MGR

TIME :

IT HAS BEEN NOTED THAT DURING THE 8th LUNATION, THE LEAM INTERNAL TEMPERATURE (ASII) PROFILE PICKED UP AN INCREASE IN RATE (+) AT A TEMPERATURE OF 176°E. WE FEEL THAT THIS INCREASE MAY BE DUE TO AN INCREASE IN CURRENT DRAIN OF A TEMPERATURE SENSITIVE ELECTRONICS COMPONENT. DUE TO THE UNCERTAINTY OF OPERATION AT TEMPERATURES ABOVE 176°, WE FEEL THAT THE INSTRUMENT SHOULD NOT BE OPERATED ABOVE THIS TEMPERATURE UNLESS DATA IS MONITORED IN REAL-TIME. REAL TIME SUPPORT FOR AUGUST 6 HAS BEEN EXTENDED 4 HOURS TO OBSERVE THIS PHENOMENON. WE REQUEST AN ANALYSIS BE PERFORMED FOR THIS ANOMALOUS TEMPERATURE INCREASE.

(CONTINUED)

RESPONSE:

CONCUR

TEAM LDR

TIME :

CON SR REP

TIME :

ME MGR

TIME :

SPAN MGR

TIME :

RESPONDER

FOD REP	CONTR SR. REP/S&AD MGR	SPAN MANAGER
TIME :		TIME :

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SPAN / MISSION EVALUATION ACTION REQUEST

USE BLACK BALLPOINT PEN

TIME (T-MINUS/GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER
			APOLLO 17 ALSEP 54

ACTION REQD BY (TIME): | REQUESTER

SUBJECT: LEAM OPERATIONS (CONTINUED)

APPROVAL

FOD REP TIME :

SPAN MGR TIME :

THE FOLLOWING GIVES THE TIME, OCTAL COUNT AND TEMPERATURE IN QUESTION FOR AJ-11.

TIME	OCTAL	TEMP
7 JULY/1600	307	158.7
1700	310	159.8
1800	312	162.0
1900	312	162.0
2000	313	163.0
2100	314	164.1
8 JULY/0740	324	172.8
0840	324	172.8
0940	325	173.8
1040	325	173.8
1100	326	174.9
1130	326	174.9
1230	326	174.9
1330	327	176.0
1430	327	176.0
1600	327	176.0
1700	331	179.0
1800	331	179.0
* OFF		
1900	326	174.9
2000	324	172.8

RESPONSE:

CONCUR

TEAM LDR TIME :

CON SR REP TIME :

ME MGR TIME :

SPAN MGR TIME :

RESPONDER

FOD REP	CONTR SR. REP/S&AD MGR	SPAN MANAGER
TIME :		TIME :

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