APOLLO PROGRAM

LUNAR SURFACE EQUIPMENT STATUS

1 MARCH 1974

NOTE: Discussions of closed problems will be deleted from subsequent issues.

Italics indicate change from previous issue.

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Experiments Manager

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APOLLO LUNAR SURFACE EQUIPMENT STATUS
1.0 INTRODUCTION

Scientific data gathering equipment and related communications and power equipment were deployed on the lunar surface by the crew on each of the six Apollo lunar landing missions from July 20, 1969, (Apollo 11 mission) through December 12, 1972, (Apollo 17 mission). This report covers the performance of the deployed equipment which was designed to continue to provide data after the return of the crew to earth.

The report is divided into four sections, section one being the Introduction. The second section is an overall summary in the form of a graphic presentation of the time history of the percent of full capability of the instruments from the time of deployment on the lunar surface, with a gross indication of when changes occurred. The third section includes a brief word status of each instrument in a listing which is grouped by experiment, so that the status for each of the experiments on each applicable mission can be seen at a glance. The fourth section discusses each problem encountered. *Problems are arranged in chronological order, by subject and number, along with a cross index by experiments to a chronological listing of problems.*

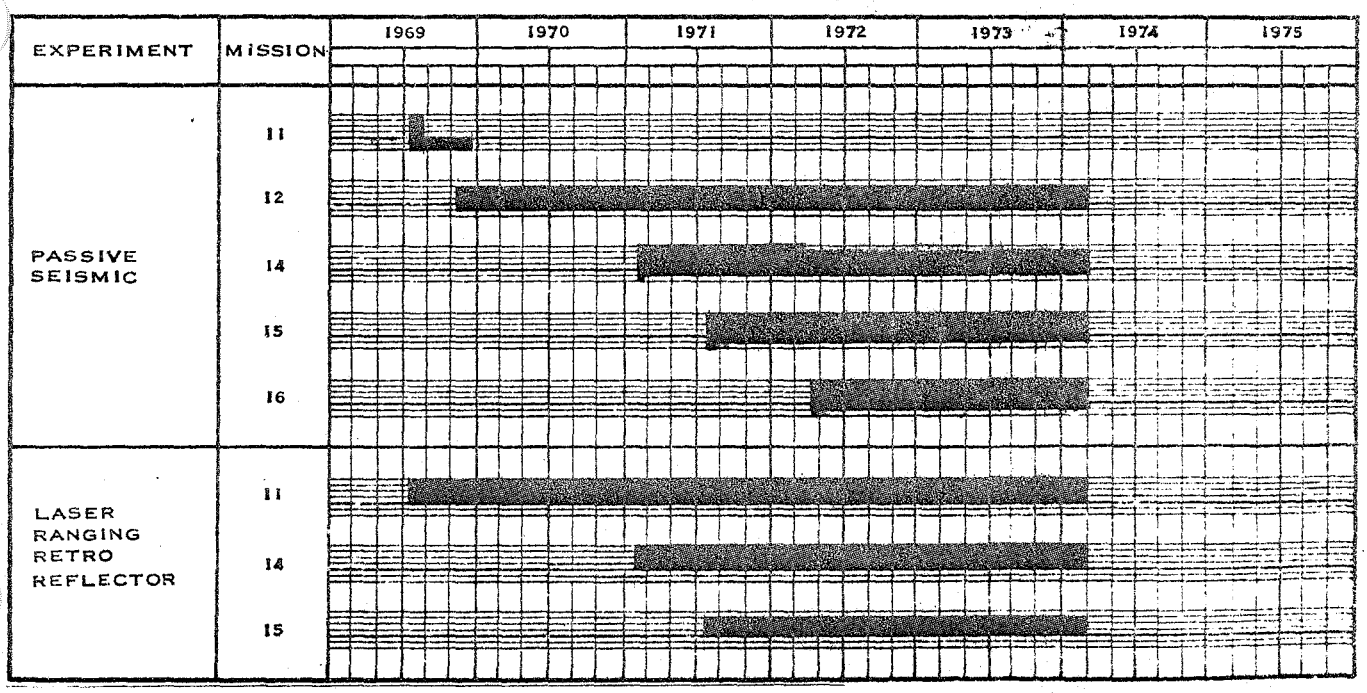
This issue of the Apollo Lunar Surface Equipment Status Report updates previous issues of the report. Problems which have been *CLOSED* in previous issues of the report are not included in the discussion portion of Section 4.0. However, the date of the issue in which the *CLOSED* discussion last appeared is so indicated in the Chronological Listing of Problems at the end of Section 4.1.

APOLLO LUNAR SURFACE EQUIPMENT STATUS

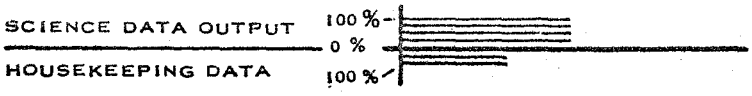
2.0 OVERALL SUMMARY

MISSION	LAUNCH DATE	LUNAR SURFACE DATA		
		START	END	
			UPLINK	DOWNLINK
11	Jul. 16, 1969	Jul. 21, 1969	Aug. 25, 1969	Dec. 14, 1969
12	Nov. 14, 1969	Nov. 19, 1969		
14	Jan. 31, 1971	Feb. 5, 1971		
15	Jul. 26, 1971	Jul. 31, 1971		
16	Apr. 16, 1972	Apr. 21, 1972		
17	Dec. 7, 1972	Dec. 12, 1972		

TIME – HISTORY PROPORTION OF FULL CAPABILITY OF INSTRUMENT

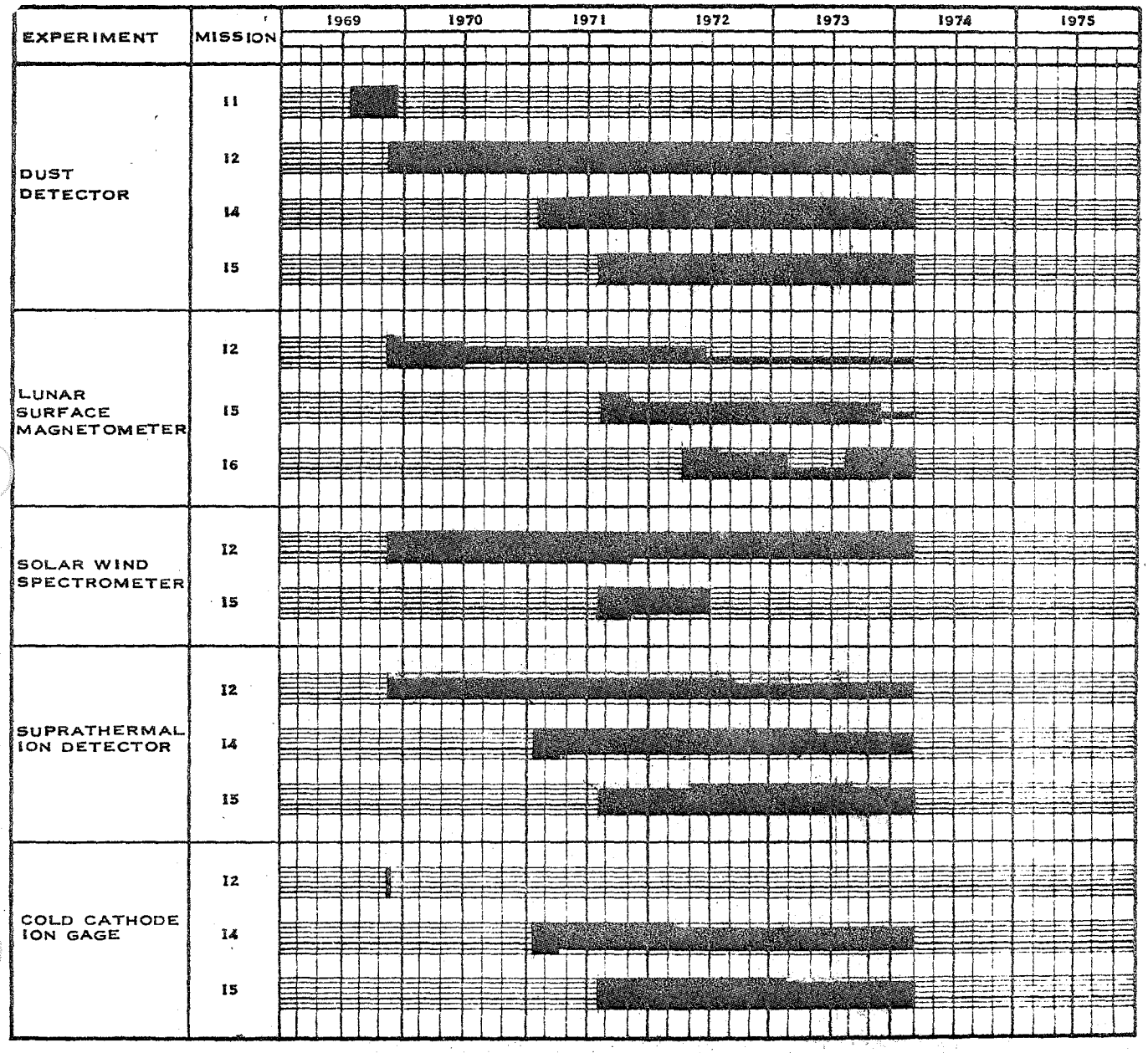


LEGEND :



APOLLO LUNAR SURFACE EQUIPMENT STATUS

2.0 OVERALL SUMMARY (continued)



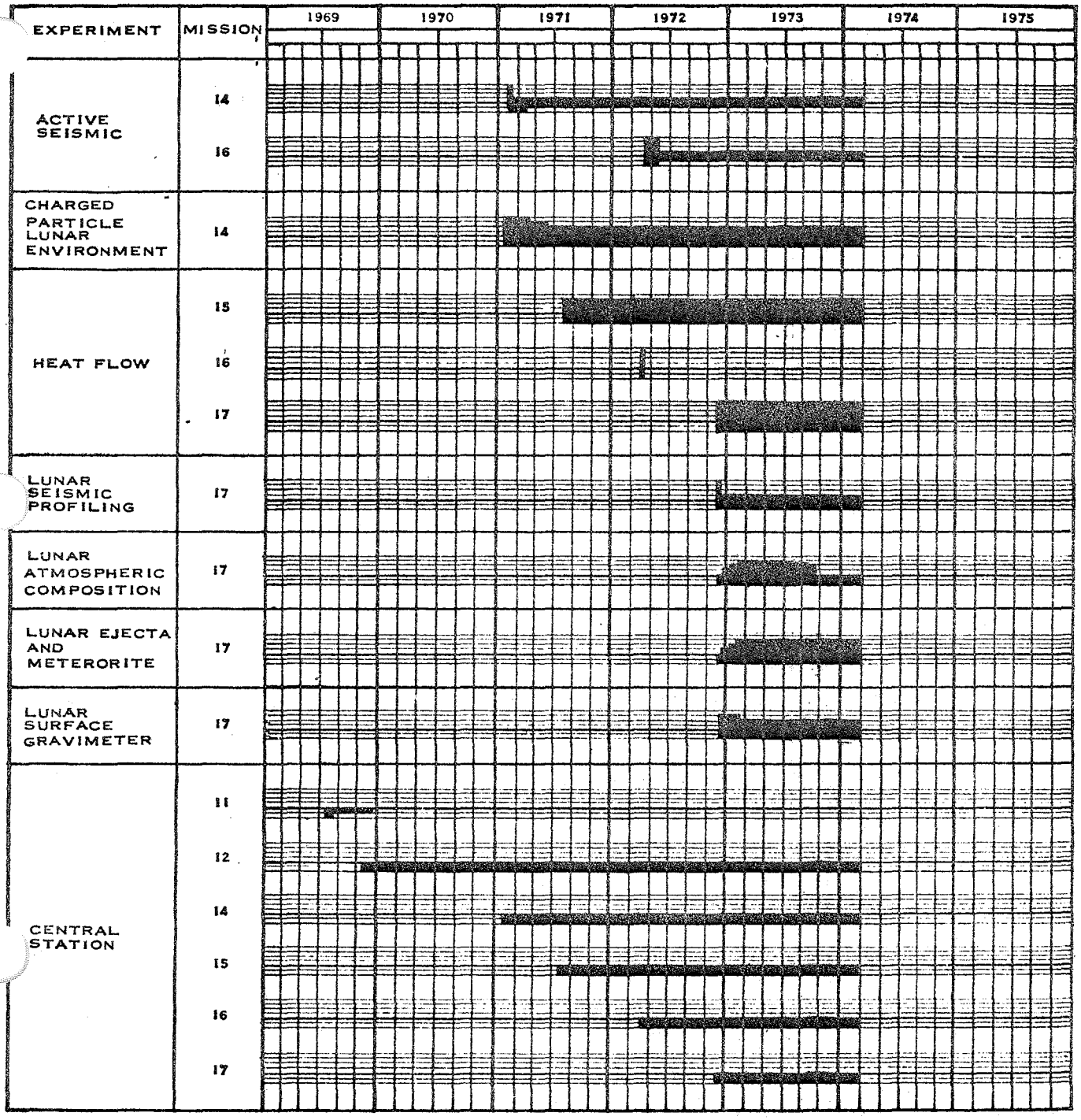
LEGEND :

SCIENCE DATA OUTPUT 100 % – 0 %

HOUSEKEEPING DATA 100 %

APOLLO LUNAR SURFACE EQUIPMENT STATUS

2.0 OVERALL SUMMARY
(concluded)



Note: All central station data is considered housekeeping rather than science data.

LEGEND :

SCIENCE DATA OUTPUT 100 %
0 %
HOUSEKEEPING DATA 100 %

APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS

	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
PSE	SPZ AXIS MALFUNCTIONED SINCE DEPLOYMENT. Z DRIVE MOTOR REQUIRED @ NIGHT FOR THERMAL CONTROL SINCE 2/1/70. *LPZ AXIS REAL-TIME DATA LOSS DURING LUNAR NIGHT (12/28/73 to 1/2/74 and parts of subsequent lunar nights).*	LPY AXIS OCCASIONALLY DIFFICULT TO LEVEL. LPZ AXIS INOPERATIVE SINCE 11/17/72. INTERMITTENT REAL TIME DIGITAL DATA DURING 33rd LUNAR NIGHT (9/30/73 TO 10/5/73).	FULL OPERATION	LPX, LPY, & LPZ AXES OCCASIONALLY DIFFICULT TO LEVEL.	N/A
ASE	N/A	*MORTARS NOT FIRED. #2 GEOPHONE DATA INVALID SINCE 1/3/74. #3 GEOPHONE NOISY SINCE 3/26/71. WEEKLY HBR OPERATIONS TERMINATED 12/7/73. REMAINS IN STANDBY WITH PERIODIC HBR CHECKS PERFORMED.*	N/A	LAUNCHED 3 OF 4 MORTARS. PITCH SENSOR AND ROLL SENSOR FAILED SINCE 5/23/73. *WEEKLY HBR OPERATIONS TERMINATED 12/7/73. REMAINS OFF WITH PERIODIC HBR CHECKS PERFORMED.*	N/A
LSM	DATA INTERMITTENT STARTING 12/11/69. DATA STATIC SINCE 6/4/72. FLIP CAL CMD WAS DISCONTINUED 6/14/72.	N/A	*TOTAL LOSS OF SCIENCE AND ENGINEERING DATA SINCE 12/10/73. INSTRUMENT REMAINS IN POWER ON.*	REAL TIME SCIENCE DATA INTERMITTENT FROM 2/15/73 TO 8/17/73. FULL RETURN OF SCIENCE DATA SINCE 8/17/73.	N/A

APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS
(continued)

	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
SWS	INTERMITTENT MODULATION DROP IN PROTON ENERGY LEVELS 13 AND 14 SINCE 11/5/71.	N/A	IN STANDBY SINCE 6/30/72, TM OUT OF SYNC & EXCESSIVE POWER DRAIN. PERIODIC CHECKING FOR POSSIBLE RECOVERY.	N/A	N/A
SIDE	CYCLIC COMMANDING REQUIRED BECAUSE OF HIGH VOLTAGE ARCING ABOVE 55°C. INTERMITTENT DIGITAL DATA (SCIENCE AND ENGINEERING SINCE 9/9/72.	LOSS OF SOME ENGINEERING DATA BECAUSE OF FAILURE OF POSITIVE PART OF A/D CONVERTER ON 4/5/71. LUNAR NIGHT OPERATION ONLY BECAUSE OF ANOMALOUS STANDBY OPERATIONS OF SIDE SINCE 4/15/73.	CYCLIC COMMANDING REQUIRED TO PRECLUDE SPURIOUS MODE CHANGES ABOVE 85°C. FULL OPERATION FROM 5/1/72 TO 9/13/73.	N/A	N/A
HFE	N/A	N/A	TEMP REF 2 OFF-SCALE HIGH SINCE 8/7/71. USING TEMP REF 1. PROBES NOT TO FULL DEPTH INTENDED.	INOPERATIVE: ELECTRICAL CABLE BROKEN DURING DEPLOYMENT.	FULL OPERATION

APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS
(continued)

	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
CCIG	FAILED 14 HRS AFTER TURN ON, 11/20/69.	INTERMITTENT NIGHT TIME SCIENCE DATA SINCE 2/19/72. FULL OPERATION UNTIL SIDE ANOMALY (4/15/73). LUNAR NIGHT OPERATION SINCE THEN AS DICTATED BY SIDE.	ERRATIC SCIENCE DATA THROUGHOUT LUNAR CYCLE SINCE 2/22/73. AUTOMATIC ZERO AND CALIBRATION FUNCTIONS NOT OPERATING.	N/A	N/A
LEAM	N/A	N/A	N/A	N/A	THERMAL PROBLEM: *196°F (MAX) TURN-OFF UNTIL FURTHER NOTICE.*
LSPE	N/A	N/A	N/A	N/A	HBR 30 MIN/WK.
LACE	N/A	N/A	N/A	N/A	APPARENT FAILURE OF MULTIPLIER HIGH VOLTAGE POWER SUPPLY ON 10/17/73, CAUSING TOTAL LOSS OF SCIENCE DATA. *CYCLED FROM ON TO OFF TO MAINTAIN TEMPERATURE BELOW 125°F LIMIT.*

APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS
(continued)

	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
LSG	N/A	N/A	N/A	N/A	*SENSOR BEAM RE-CENTERED 11/30/73 IN AN EFFORT TO IMPROVE SENSITIVITY. REAL-TIME DATA SAMPLES UNDER EVALUATION BY PI TO DETERMINE CURRENT PERFORMANCE PROFILE.*
CPLEE	N/A	ANALYZER B FAILED 4/8/71. ANALYZER A INTERMITTENT OPERATIONS SINCE 6/6/71.	N/A	N/A	N/A
C/S	FULL OPERATION WITH XMTR B & PROCESSOR Y. (12-HOUR TIMER FAILED ON 2/16/70).	FULL OPERATION WITH XMTR A & PROCESSOR Y. (12-HOUR TIMER FAILED ON 2/17/71.) ANTENNA SEATING PROBLEMS DURING DEPLOYMENT AFFECTS SIGNAL STRENGTH.	FULL OPERATION	FULL OPERATION WITH XMTR B & PROCESSOR Y.	FULL OPERATION
DTREM	FULL OPERATION	FULL OPERATION	FULL OPERATION	N/A	N/A

APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS
(concluded)

	APOLLO 11 ALSEP	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
LR[3]	FULL OPERATION	N/A	FULL OPERATION	FULL OPERATION	N/A	N/A

The signal strength fluctuations that are observed in the downlink signal of each of the five ALSEPs is of no consequence as no system telemetry is lost due to this phenomenon. These signal strength phenomenon are most probably caused by variations in the tracking stations characteristics, the Earth-Moon libration pattern, and associated atmospheric phenomenon.

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS

This section provides a chronological listing of problems encountered with the ALSEP stations. Although the original design requirement for ALSEP was a one year life, much longer useful lifetimes are being realized. Problems in this section, therefore, cover the period from deployment of Apollo 11 ALSEP (21 July 1969).

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
1	11	PSE	Level Indicator Not Stable	21 Jul 69	Apollo 11 Mission, 5-Day Report, Jul 69
2	11	PSE & C/S	Leveling Motor Inadvertently Triggered	21 Jul 69	Apollo 11 Mission, 5-Day Report, Jul 69
3	11	PSE & C/S	Thermal Control	21 Jul-3 Aug 69	Apollo Experience Report Thermal Design of ALSEP, Dec 71, NASA TN D-6738
4	11	C/S	Data Processor X Selected	23 Aug 69	EASEP 30-Day Report, Sep 69
5	11	C/S	Command Capability Loss	25 Aug 69	Apollo 11 Mission Report, Nov 69, Section 11.4.4
6	11	PSE	PSE STANDBY Mode	27 Aug 69	EASEP 30-Day Report, Sep 69
7	11	C/S	Power Dissipation Module Failure	16 Sep 69	Daily Science Report, 17 Sep 69
8	12	RTG	Fuel Element Difficult to Remove From Cask	EVA (19 Nov 69)	Apollo 12 Mission Report, Mar 70, Section 14.3.3

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
9	12	C/S	Shorting Plug Ammeter Did Not Indicate RTG Current During Deployment	EVA (19 Nov 69)	Apollo 12 P & D List, 16 Dec 69, Item GFE-7
10	12	PSE	Deployment Difficulties	EVA (19 Nov 69)	Apollo 12 Mission Report, Mar 70, Section 14.3.4
11	12	SIDE	Dust Covers Deployed Prematurely	EVA (19 Nov 69)	Apollo 12 P & D List, 16 Dec 69, Item GFE-15
12	12	SIDE/ CCIG	Deployment Difficulties	EVA (19 Nov 69)	Apollo 12 Mission Report, Mar 70, Section 14.3.5
13	12	PSE	SPZ Displaying Reduced Sensivity at Low Signal Levels	19 Nov 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-9
14	12	PSE	Negative Square Wave Like Pulses Appeared on SPZ Data Channel	19 Nov 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-10
15	12	SIDE/ CCIG	High Voltage Arcing Problems (CCIG Failure)	20 Nov 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-5
16	12	PSE	LPZ Displaying Unstable Period & a Long Time Constant After Releveling	22 Nov 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-4

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
17	12	LSM	Loss of Data above 50°C (Digital Filter Problem)	22 Nov 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-6
18	12	C/S	Failure Timer Functions	4 Dec 69	Apollo 12 P & D List, 26 Mar 70, Item ALSEP-2
19	12	LSM	X, Y, & Z Sensor Data Dropped Offscale Unexpectedly & Science Data was Lost	11 Dec 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-7
20	11	C/S	Loss of Downlink	14 Dec 69	Apollo 12 SMEAR, ALSEP 16
21	12	SIDE	High Voltage Power Supply Arcing	22 Dec 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-5
22	12	LSM	Science Data Offset Y-axis	22 Dec 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-8
23	12	LSM	Temperature Range Exceeded Predictions	23 Dec 69	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-14
24	12	C/S	Systematic Spurious CVW's	27 Dec 69	Apollo 12 P & D List, 26 Mar 70, Item ALSEP-3
25	12	PSE	Temperature Range Exceeded	25 Jan 70	Apollo 15 P & D List, 13 Sep 71, Item ALSEP-4

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
26	12	C/S	Transmitter A Switched Out of Service.	30 Jan 70	Apollo P & D List, 20 Aug 70, Item ALSEP-11
27	12	SIDE	Limited Operating Time During Lunar Noon (55°C Maximum)	18 Mar 70	Apollo 12 SMEARS, ALSEP 42, 66 & 73
28	12	PSE	LPX & LPY Shroud Noise	14 Jun 70	Apollo 12 SMEAR, ALSEP 46
29	12	LSM	Flip Cal Data Undefinable	14 Jun 70	Apollo 12 P & D List, 8 Oct 70, Item ALSEP-13
30	12	LSM	Y-axis Sensor Head Failure	29 Jun 70	Apollo 12 P & D List, 8 Oct 70, Item ALSEP-13
31	12	PSE	Thermal Effect of Lunar Seasonal Cycle	29 Jun 70	Apollo 12 P & D List, 20 Aug 70, Item ALSEP-12
32	12	LSM	Science & Engineering Data Static & Invalid	30 Jun 70	Apollo 12 P & D List, 8 Oct 70, Item ALSEP-13
33	12	C/S	Transmitter Switch from B to A	1 Sep 70	Apollo 12 P & D List, 8 Oct 70, Item ALSEP-15
34	12	C/S	Transmitter A Intermittent	13 Dec 70	Apollo 12 P & D List, 8 Oct 70, Item ALSEP-15

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
35	14	RTG Cask	Difficult to Latch RTG Dome Removal Tool in Cask Dome	EVA (5 Feb 71)	Apollo 14 P & D List, 12 Apr 71, Item ALSEP-13
36	14	SIDE	SIDE Boyd Bolt Blocked due to Compacted Lunar Dirt	EVA (5 Feb 71)	Apollo 14 P & D List, 12 Apr 71, Item ALSEP-2
37	14	SIDE/ CCIG	Difficult to Deploy	EVA (5 Feb 71)	Apollo 14 P & D List, 26 Mar 71, Item ALSEP-3
38	14	ASE	Geophone and Flag Easy to Knock Over	EVA (5 Feb 71)	Apollo 14 P & D List, 12 Mar 71, Item ALSEP-11
39	14	C/S	Sunshield Sags	EVA (5 Feb 71)	Apollo 14 P & D List, 26 Mar 71, Item AISEP-10
40	14	ASE	Thumper Misfired Five of Eighteen Times	EVA (5 Feb 71)	Apollo 14 Mission Report, May 71, Section 14.4.1
41	14	C/S	Received Signal Strength Lower Than Expected	EVA (5 Feb 71)	Apollo 14 P & D List, 26 Mar 71, Item ALSEP-6

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
42	14	SIDE	Exhibited Noisy Data During Initial Turn ON	6 Feb 71	Apollo 14 Mission Report, May 71, Section 14.4.2
43	14	C/S	12-hour Timer Pulses Did Not Occur	7 Feb 71	Apollo 14 Mission Report, May 71, Section 14.4.4
44	14	PSE	Y-axis Levelling Intermittent & Sluggish	9 Feb 71	Apollo 14 Mission Report, May 71, Section 14.4.5
45	14	PSE	Thermal Control Problem	12 Feb 71	Apollo 14 P & D List, 26 Mar 71, Item ALSEP-15
46	14	C/S	Systematic Spurious CVW's	16 Feb 71	Apollo 12 P & D List, 26 Mar 70, Item ALSEP-3
47	14	PSE	Long Period Vertical Feedback Filter Not Operating	2 Mar 71	Apollo 14 Mission Report, May 71, Section 14.4.6
48	14	ASE	Geophone 3 Data Noisy	26 Mar 71	Apollo 14 P & D List, 15 Jul 71, Item ALSEP-18 Apollo 14 Mission Anomaly Report No. 6, Dec 72

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
49	14	SIDE/ CCIG	Analog to Digital Converter Positive Section Data Loss	5 Apr 71	Apollo 14 Mission Report, May 71, Section 14.4.8
50	14	CPLEE	Analyzer B Data Loss	8 Apr 71	Apollo 14 Mission Report, May 71, Section 14.4.9
51	14	CPLEE	Analyzer A Data Decay and Undervoltage Condition	6 Jun 71	Apollo 14 P & D List, 15 Jul 71, Item ALSEP-21
52	15	C/S	Rear Curtain Retainer Removal Lanyard Broke	EVA (31 Jul 71)	Apollo 15 Mission Report, Dec 71, Section 14.4.2
53	15	SIDE/ CCIG	Experiment Connector was Difficult to Mate	EVA (31 Jul 71)	Apollo 15 P & D List, 13 Sep 71, Item ALSEP-17
54	15	C/S	Shorting Switch Actuated Early	EVA (31 Jul 71)	Apollo 15 P & D List, 8 Oct 71, Item ALSEP-18
55	15	SIDE/ CCIG	Intermittent Lock of UHT in Fitting of SIDE/CCIG Experiment	EVA (31 Jul 71)	Apollo 15 Mission Report, Dec 71, Section 14.4.3
56	15	HFE	Subpallet Boyd Bolts Did Not Release Immediately	EVA (31 Jul 71)	Apollo 15 P & D List, 13 Sep 71, Item ALSEP-13

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
57	15	PSE	LPZ Axis Leveling Difficulties	1 Aug 71	Apollo 15 SMEAR, SX-194
58	15	C/S	Systematic Spurious CVW's	5 Aug 71	Apollo 12 P & D List, 26 Mar 70, Item ALSEP-3
59	15	HFE	Probe 2 Reference Temperature Measurement Intermittent	7 Aug 71	Apollo 15 P & D List, 30 Nov 71, Item ALSEP-25
60	15	PSE	Thermal Control Degradation	13 Aug 71	Apollo 15 P & D List, 13 Sep 71, Item ALSEP-4
61	15	C/S	Loss of Science Data Due to Experiment Ripple Off	19 Aug 71	Apollo 15 SMEAR, ALSEP 16
62	15	LSM	Y-axis Sensor Head Failure to Flip On Command	30 Aug 71	Apollo 15 P & D List, 23 Feb 72, Item ALSEP-26
63	14	SIDE/ CCIG	Lunar Noon & Arcing Constraints	20 Oct 71	Apollo 14 SMEAR, ALSEP 58
64	15	LSM	Y-axis Sensor Data Loss	2 Nov 71	Apollo 15 P & D List, 14 Jan 72, Item ALSEP-27
65	12 15	SWS SWS	Intermittent Modulation Drop in Proton Energy Levels 13 and 14	5 Nov 71	Apollo 15 P & D List, 14 Jan 72, Item ALSEP-28

APOLLO LUNAR SURFACE EQUIPMENT STATUS

4.1 CHRONOLOGICAL LISTING OF PROBLEMS

(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
66	15	SIDE/ CCIG	Limited Operating Time During Lunar Noon (85°C Maximum)	16 Dec 71	Apollo 15 SMEAR, ALSEP 36
67	14	ASE	-60°C Minimum Operating Temperature	10 Feb 72	Apollo 14 SMEAR, ALSEP 67
68	15	C/S	Lunar Night Operating Temperature Limits	18 Feb 72	Apollo 15 SMEAR, ALSEP 40
69	14	PSE	LPZ Axis Inoperative	20 Mar 72	Apollo 14 SMEAR, ALSEP 72
70	16	Subpackage 2	Fell OFF Carry Bar	EVA (21 Apr 72)	Apollo 16 P & D List, 26 Jun 72, Item ALSEP-1
71	16	HFE	Electrical Cable Broke	EVA (21 Apr 72)	Apollo 16 Mission Report, Aug 72, Section 14.4.1
72	16	ASE	Number 3 Spike on Mortar Package Did Not Deploy	EVA (21 Apr 72)	Apollo 16 Mission Report, Aug 72, Section 14.4.2
73	16	ASE	Thumper Cables Stiff to Deploy	EVA (21 Apr 72)	Apollo 16 P & D List, 16 May 72, Item ALSEP-6

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
74	16	ASE	Mortar Box Roll Angle Telemetry Offscale HIGH	23 Apr 72	Apollo 16 Mission Report, Aug 72, Section 14.4.3
75	16	PSE	Temperature HIGH During Lunar Day	24 Apr 72	Apollo 16 P & D List, 16 May 72, Item ALSEP-11
76	16	ASE	Pitch Sensor Offscale HIGH After Launching 3rd Grenade	23 May 72	Apollo 16 Mission Report, Aug 72, Section 14.4.12
77	16	ASE	Mortar Package Pitched Down 9 Degrees as a Result of Launching Grenade 2	23 May 72	Apollo 16 P & D List, 13 Jun 72, Item ALSEP-17
78	12	LSM	Flip Cal Suspension	14 Jun 72	Apollo 12 SMEAR, ALSEP 76
79	12	SWS	AC Calibrate Measurements LOW (Sequence 15)	20 Jun 72	Apollo 12 SMEAR, ALSEP 77
80	16	C/S	Systematic Spurious CVW's	29 Jun 72	Apollo 12 P & D List, 26 Mar 70, Item ALSEP-3
81	15	SWS	Loss of Experiment, Science and Engineering	30 Jun 72	Apollo 15 SMEAR, ALSEP 42
82	16	LSM	Failure of all 3 Axes to Flip	24 Jul 72	Apollo 16 SMEAR, ALSEP 23
83	12	SIDE/ CCIG	Intermittent Failure of Digital Electronics to Process Data	9 Sep 72	Apollo 12 SMEAR, ALSEP 80

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
84	12	PSE	LPX Axis Leveling in Auto Mode Balky	4 Dec 72	Apollo 12 SMEAR, ALSEP 81
85	16	PSE	LPY Axis Leveling in Forced and Auto Mode Balky	4 Dec 72	Apollo 16 SMEAR, ALSEP 24
86	17	RTG	Cask Dome Removal was Difficult	EVA (12 Dec 72)	Apollo 17 Mission Report, Mar 73, Section 15.4.4
87	17	C/S	Downlink Signal Strength Fluctuations	EVA (12 Dec 72)	Apollo 17 P & D List, 12 Jan 73, Item SX-1
88	17	LSG	Sensor Beam Cannot be Stabilized in the Null Position	EVA (12 Dec 72)	Lunar Surface Equipment Status Report, *1 Mar 73*, Section 4.2 Apollo 17 Mission Report, Mar 73, Section 15.4.1
89	17	C/S	Power Dissipation Module HIGH Temperature	EVA (13 Dec 72)	ALSEP Status Report, 14 Dec 72
90	17	LEAM	Excessive Temperature	17 Dec 72	Lunar Surface Equipment Status Report, 1 Dec 73, Section 4.4 Apollo 17 Mission Report, Mar 73, Section 15.4.3

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(continued)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INIITAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
91	17	LACE	Excessive Temperature with Covers ON	17 Dec 72	Lunar Surface Equipment Status Report, 1 Dec 73, Section 4.3
92	17	LACE	Zero Offset in Data Output of Mass Channels	18 Dec 72	Lunar Surface Equipment Status Report, 18 Sep 73, Section 4.5 Apollo 17 Mission Report, Mar 73, Section 15.4.5
93	17	LACE	Mode Change - Sweep Lock	8 Jan 73	ALSEP Status Report, 9 Jan 73
94	16	LSM	Loss of Science Data	15 Feb 73	Apollo 16 SMEAR, ALSEP 25
95	16	C/S	Transmitter B and Processor Y Selected	26 Mar 73	ALSEP Status Report, 30 Mar 73
96	14	SIDE/ CCIG	Anomalous STANDBY Operations	15 Apr 73	Apollo 14 SMEAR, ALSEP 71
97	17	LACE	Limited Operation During Lunar Day (125°F Maximum)	5 Jun 73	Lunar Surface Equipment Status Report, 1 Dec 73, Section 4.3
98	14	CCIG	Intermittent Night Time Science Data Since 2/19/72.	1 Jul 73	Lunar Surface Equipment Status Report, 18 Sep 73, Section 4.6

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.1 CHRONOLOGICAL LISTING OF PROBLEMS
(concluded)

SEQUENCE NUMBER	APOLLO MISSION	EXPERIMENT OR SYSTEM	PROBLEM	INITIAL DATE OF OCCURRENCE	DISCUSSION REFERENCE
99	15	CCIG	Intermittent Night Time Science Data Since 2/22/73.	1 Jul 73	Lunar Surface Equipment Status Report, 18 Sep 73, Section 4.7
100	17	LACE	Loss of Intermediate Mass Range Output	18 Sep 73	Lunar Surface Equipment Status Report, 1 Dec 73, Section 4.8
101	17	LACE	Filament #1 Failure	23 Sep 73	Lunar Surface Equipment Status Report, 1 Dec 73, Section 4.9
102	14	PSE	Intermittent Digital Data From 9/30/73 Thru 10/5/73	30 Sep 73	Apollo 14 SMEAR, ALSEP 85
103	17	LACE	Loss of Science Data	17 Oct 73	Lunar Surface Equipment Status Report, *1 Mar 74* Section 4.10
104	*15*	*LSM*	*Loss of Scientific and Engineering Data*	*10 Dec 73*	*Apollo 15 SMEAR, ALSEP 48*
105	*12*	*PSE*	*Intermittent Real-Time Z Axis Data*	*28 Dec 73*	*ALSEP Status Report, 4 Jan 74*
106	*14*	*ASE*	*Loss of Geophone #2 Data*	*03 Jan 74*	*Apollo 14 SMEAR, ALSEP 87*

APOLLO LUNAR SURFACE EQUIPMENT STATUS
SECTION 4.1.1 CROSS INDEX BY EXPERIMENTS TO CHRONOLOGICAL LISTING OF PROBLEMS

EQUIPMENT	APOLLO MISSION	PROBLEM NUMBER SECTION 4.1
ACTIVE SEISMIC	14	38, 40, 48, 67, 106
	16	72, 73, 74, 76, 77,
CENTRAL STATION	11	2, 3, 4, 5, 7, 20
	12	9, 18, 24, 26, 33, 34
	14	39, 41, 43, 46
	15	52, 54, 58, 61, 68
	16	80, 95
	17	87, 89
CHARGED PARTICLE LUNAR ENVIRONMENT	14	50, 51
COLD CATHODE ION GAGE	12	12, 15, 83
	14	37, 49, 98
	15	53, 55, 66, 99
DUST DETECTOR	11	
	12	
	14	
	15	
HEAT FLOW	15	56, 59
	16	71
	17	
LASER RANGING RETRO REFLECTOR	11	
	14	
	15	
LUNAR ATMOSPHERIC COMPOSITION	17	91, 92, 93, 97, 100, 101, 103
LUNAR EJECTA AND METEORITE	17	90
LUNAR SEISMIC PROFILING	17	
LUNAR SURFACE GRAVIMETER	17	88

APOLLO LUNAR SURFACE EQUIPMENT STATUS
SECTION 4.1.1 CROSS INDEX BY EXPERIMENTS TO CHRONOLOGICAL LISTING OF PROBLEMS
(concluded)

EQUIPMENT	APOLLO MISSION	PROBLEM NUMBER SECTION 4.1
LUNAR SURFACE MAGNETOMETER	12	17, 19, 22, 23, 29, 30, 32, 78
	15	62, 64, 104
	16	82, 94
PASSIVE SEISMIC	11	1, 2, 3, 6
	12	10, 13, 14, 16, 25, 28, 31, 84, 105
	14	44, 45, 47, 69, 102
	15	57, 60
	16	75, 85
RADIOISOTOPE THERMOELECTRIC GENERATOR	12	8
	14	35
	15	
	16	
	17	86
SOLAR WIND SPECTROMETER	12	65, 79
	15	65, 81
SUPRATHERMAL ION DETECTOR	12	11, 12, 15, 21, 27, 83
	14	36, 37, 42, 49, 63, 96
	15	53, 55, 66

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.2 LUNAR SURFACE GRAVIMETER SENSOR BEAM

Problem Date	Problem
Initial: 12 December 1972 (1st lunar day)	Lunar Surface Gravimeter Experiment
Presence throughout lunar cycle	Lunar surface gravimeter sensor beam cannot be stabilized in the null position.
	Sensor beam could not be center balanced in normal configuration because 1/6-g weights were too light. Weights were too light because of an error in calculations converting from 1-g to 1/6-g requirements.

Remarks:

Cause: Following the initial experiment turn-on, the set-up procedure of nulling the sensor beam in the proper stable position between capacitor plates could not be accomplished.

When the command was given to add any or all of the nulling masses to the sensor beam assembly, the data indicated that the beam would not move away from the upper capacitor plate. The only way to bring the beam down was by caging it against the lower capacitor plate.

During the second and third extravehicular activities, the Lunar Module Pilot rapped the exposed top plate on the gimbal; rocked the experiment in all directions; releveled the instrument, working the base well against the surface; and verified the sunshade tilt. This was done in an attempt to free a mass/weight assembly or sensor beam thought to have been caught or bound. No apparent change or improvement was detected.

Review of sensor development test records revealed that an error in arithmetic resulted in the sensor mass weights being about 2 percent lighter than the proper nominal weight for 1/6-g operation of the flight unit. The sensor mechanism allows ground command adjustment of up to $\pm$1.5 percent from nominal to compensate for possible inaccuracies. Unfortunately, the 2 percent error in weight made in initial conversion calculations from 1-g to 1/6-g mass exceeded this for the qualification unit and was also passed on to the flight unit final calculations.

APOLLO LUNAR SURFACE EQUIPMENT STATUS

4.2 LUNAR SURFACE GRAVIMETER SENSOR BEAM

(continued)

Initial: 12 December 1972
(1st lunar day)

Lunar Surface Gravimeter Experiment

Activity: Several reconfigurations of the instrument have been implemented in an effort to determine if the LSG is functioning. The following chronology provides a synopsis of operations.

DATE	*CONFIGURATION*	*RESULTS*
12 Dec 72	*Following initial deployment the sensor beam could not be nulled in the proper stable position. Open loop mode.*	*Operation for first 45-days revealed no seismic signal, but possible free mode signal detected with beam centered by pulling down on the mass-adding/caging mechanism. Suspected electronic problems prompted scheduled reconfiguration.*
06 Apr 73	*The post amplifier gain was reduced from step 15 to step 10 in attempt to operate the instrument in a non-saturated condition. For the final configuration the instrument was returned to the higher gain configuration (step 15) with the beam centered and the integrator shorted for open loop mode operation.*	*Lower gain setting unsaturated the LSG amplifier and showed background noise higher than the PSE and LSPE instruments. Terminator crossing showed consistent thermoelastic events when shifting between the LSG and LSPE. LSG WAS DETECTING SIGNALS FROM LOCAL EVENTS.*

DATE	CONFIGURATION	RESULTS
19 Apr 73	The LSG beam was re-centered to improve its response by lowering the instruments resonant frequency. The seismic high gain amplifier was reconfigured to step 11. Open loop mode.	Lowered instrument natural frequency to about 2.2 Hz with Q ≈25, seismic bandpass 1 Hz to 16 Hz. Sensitivity calculated for signal and noise averaged over one second, 3.5A. Signal-to-noise improvement of noisy seismic channel accomplished by filtering; of free-mode channel by smoothing power spectrum through stacking multi-day records and averaging out noise.
26 Sep 73	Data was gathered to determine the spring constant of the beam assembly. The post-amplifier gain was returned to step 15. The instrument was configured to closed loop operation with integrator mode, normal; bias circuit, IN; and seismic gain high.	Calculated response of instrument showed closed loop gain for free mode output ≈40 db (100X) down from design closed loop, sharply peaked at ≈21 minutes rather than designed broad band. Commenced recording lunar solid-body tidal data. Processed data tape for moderate sized lunar event recorded all PSE's 21 Aug 73. Filtering revealed event, but primary and secondary wave arrivals not practical to pick. Power spectral density analysis of 40-days data from free mode channel showed no predominant periodicities.

4.2 LUNAR SURFACE GRAVIMETER SENSOR BEAM
(concluded)

DATE	*CONFIGURATION*	*RESULTS*
30 Nov 73	*The beam was re-centered using the mass caging mechanism in an effort to obtain a lower resonant frequency. The instrument was configured to the closed loop mode with the integrator mode, normal; bias, IN; and post amplifier gain at increment 15.*	*Lowered natural frequency from 2.2 Hz to 1.5 and increased free mode response to longer period signals. Tidal output roughly followed calculated lunar tides with overriding higher frequency distortion (temperature effect?). Tidal output failed ≈13 Nov 73 as shown by constant -80 microgal reading. Continued analysis of free mode data by power spectral density revealed no periodicities.*
07 Dec 73	*The instrument was exercised to determine whether or not the high gain amplifier system was going into oscillation. At the conclusion of the test the LSG was left in the integrator shorted mode (open loop), seismic gain, HIGH; bias, OUT; and post amplifier gain at increment 15.*	*No determination of why tidal output (feedback configuration) failed. Returned to open loop operation to continue recording seismic and free mode data.* *Univ. of Maryland received PDP-11 computer (late December 73) to assist in correlation studies from LSG data tapes. Analysis of feedback loop failure continues. Power spectral density analysis of free mode data continues utilizing 80 continuous days, 10 Dec 73 thru 28 Feb 74.*

Result: *The beam has been centered by using the mass caging motor to balance the beam, with the gravimeter screws in the extreme down position.* Signals being received are being processed and analyzed for seismic, free mode, and gravity wave information. Comparison with the LSP indicates the LSG is not adequate for detecting typical low level moonquake signals, although further processing of data needs to be done. Further analysis of data channels is also in process to determine if free mode oscillations and gravity waves are being detected.

APOLLO LUNAR SURFACE EQUIPMENT STATUS

4.10 LUNAR ATMOSPHERIC COMPOSITION EXPERIMENT LOSS OF SCIENCE DATA

Problem Date

Initial: 17 October 1973

CLOSED

Problem

Lunar Atmospheric Composition Experiment

Data playback of problem period indicated the sweep high voltage dropped to zero, the electronics noise data ramps disappeared from all three mass data channel outputs, with all science data outputs locked in the continuous calibrate mode with readings at offscale HIGH.

Remarks:

Cause: Preliminary results of the troubleshooting and analysis indicate that the multiplier high voltage power supply apparently failed. This common high voltage power supply also affected the sweep high voltage (AM-44), and cross-coupled into the mass data channel outputs (DM-03, DM-04, and DM-05).

Activity: Subsequent to the failure a series of high voltage and filament commands were executed during real-time support on 19 October 1973 in an unsuccessful attempt to correct the anomaly. The instrument was then allowed to cold soak (i.e., back-up heater OFF) and attempts to correct the anomaly were made again without success on 22 and 26 October 1973. Again on 17 November 1973 the instrument was commanded ON with high voltage ON to determine if any change in operational status had occurred. The scientific data outputs remained invalid. The experiment high voltage was commanded OFF.

A 30-minute operational status check of the LACE was performed on 18 January 1974. Experiment telemetry data indicated some change during the time that the multiplier high voltage power supply was operated. It was not a significant improvement since initial occurrence on 17 October 1973. The instrument's Filament #2 was not commanded ON.

Result: The instrument will be cycled from ON to OFF to maintain the electronics temperature below the previously established 125°F limit. The next periodic operational check is planned for mid-March.

APOLLO LUNAR SURFACE EQUIPMENT STATUS
4.11 APOLLO 15 LUNAR SURFACE MAGNETOMETER EXPERIMENT
LOSS OF SCIENTIFIC AND ENGINEERING DATA

Problem Date

Initial: 9 December 1973

CLOSED

Problem

Lunar Surface Magnetometer Experiment

The instrument's scientific and engineering data became incoherent following real time operations on 9 December 1973 and has remained invalid since the initial date of occurrence.

Remarks:

Cause: The probable cause of the magnetometer failure is the circuitry of the sensor electronics (the sensor drive circuit). This failure mode has been well identified with the instrument as an open weld in the drive circuit board.

Activity: In an effort to further characterize the anomaly the experiment was commanded through various modes of operation as follows:

DATE	*ACTIVITY*
10 Dec	*LSM commanded OFF.*
11 Dec	*LSM exercised (i.e., filter OUT, flip cal INHIBIT OFF/ON, flip cal INITIATE, etc.) without successful results. Commanded to STANDBY.*
12 Dec	*Experiment commanded ON and again exercised without positive results. Experiment remains ON.*
13 Dec	*LSM exercised without success.*

Result: The instrument remains in the power ON mode and will be monitored for any change in status.

APOLLO LUNAR SURFACE EQUIPMENT STATUS

4.12 APOLLO 14 ACTIVE SEISMIC EXPERIMENT LOSS OF GEOPHONE #2 DATA

Problem Date

Initial: 3 January 1974

CLOSED

Problem

Active Seismic Experiment

The output data for Geophone #2 during the high bit listening period on 3 January 1974, and the response data to calibration commands on 9 January 1974, were not normal.

Remarks:

Cause: *The experiment had been observed weekly in the high bit rate mode for approximately thrity-minute periods from the 5 February 1971, deployment, through 5 December 1973. Data from Geophone #2 appeared normal during these periods. In December 1973 the listening periods were changed to monthly checks.*

During the monthly operation check of the experiment on 3 January 1974, the data from Geophone #2 appeared to be invalid. On 9 January 1974, another operational check was conducted to further investigate the problem. Two geophone calibrations were commanded. In both cases the Geophone #2 data indicated a failure in the amplifier channel 2 circuitry. The data indicated a response to the commanded pulses, but the response was improper.

Activity: *Data is being reduced from the range tapes for possible additional analysis of the problem.*

Result: *Geophone #1 data continues to be valid and Geophone #3 provides some useable negative-going data, so meaningful science data may still be obtained from the experiment.*

APOLLO LUNAR SURFACE EQUIPMENT STATUS
APPENDIX A - LOSS OF ALSEP DOWNLINK DATA HISTORY

A.1 INTRODUCTION

Prior to 15 April 1973, the participating Spaceflight Tracking and Data Network ground stations receive/record equipment capability was restricted to receiving and recording of up to four ALSEP downlink data streams simultaneously. This limitation was resolved by the acquisition and implementation of additional receive/record equipments, enabling the primary supporting stations (those with 30-foot antennas) to receive and record up to six downlink data streams simultaneously.

A.2 ALSEP DATA LOSS HISTORY*

Spaceflight Tracking and Data Network ground station coverage for receiving and recording of the ALSEP downlink data stream was not available at the following times due to either programmatic or equipment constraints.

**NOTE: Only data losses subsequent to 1 November 1973 are listed herein. See the 1 December 1973 issue of this document for prior data outages.*

APOLLO LUNAR SURFACE EQUIPMENT STATUS
A.2 ALSEP DATA LOSS HISTORY

DATE	GROUND STATION	TIME (G.m.t.)	ALSEP SYSTEM	DATA TIME LOSS
1973				
06 Nov	BDA	LOS 06/1857 AOS 06/2034	15	1^h37^m
06 Nov	BDA	LOS 06/2033 AOS 06/2218	12	1^h45^m
15 Nov	TAN	LOS 15/2142 AOS 15/2223	14	41^m
18 Nov	HSK	LOS 18/2040 AOS 18/2140	14	1^h00^m
18 Nov	HSK	LOS 18/2140 AOS 18/2240	17	1^h00^m
18 Nov	HSK/CRO	LOS 18/2240 AOS 18/2350	12	1^h10^m
20 Nov	GULA	LOS 20/1835 AOS 20/1950	17	1^h15^m
21 Nov	MIL	LOS 21/1020 AOS 21/1244	15 & 17	2^h24^m
26 Nov	CRO/VAN	LOS 26/0948 AOS 26/1100	12	1^h12^m
26 Nov	VAN	LOS 26/1100 AOS 26/1200	14	1^h00^m
26 Nov	VAN	LOS 26/1200 AOS 26/1300	15	1^h00^m
26 Nov	VAN	LOS 26/1300 AOS 26/1352	16	52^m
28 Nov	ACN/MAD	LOS 28/1347 AOS 28/1442	14	55^m

APOLLO LUNAR SURFACE EQUIPMENT STATUS
A.2 ALSEP DATA LOSS HISTORY
(continued)

DATE	GROUND STATION	TIME (G.m.t.)	ALSEP SYSTEM	DATA TIME LOSS
28 Nov	MAD/MIL	LOS 28/1442 AOS 28/1520	12	38^{m}
29 Nov	MIL/GDS	LOS 29/0023 AOS 29/0040	12 & 15	17^{m}
29 Nov	ACN/TAN	LOS 29/1306 AOS 29/1450	12	$1^{h}44^{m}$
30 Nov	CRO/MAD	LOS 30/1225 AOS 30/1342	12	$1^{h}17^{m}$
30 Nov	MAD/TAN	LOS 30/1342 AOS 30/1500	14	$1^{h}18^{m}$
01 Dec	GWM/MAD	LOS 01/1249 AOS 01/1308	14-17	19^{m}
01 Dec	GWM/MAD	LOS 01/1249 AOS 01/1515	12	$2^{h}26^{m}$
01 Dec	MAD/ACN	LOS 01/1515 AOS 01/1607	14	52^{m}
06 Dec	MIL	LOS 06/2156 AOS 06/2340	14	$1^{h}44^{m}$
10 Dec	ACN	LOS 10/0124 AOS 10/0552	ALL	$4^{h}28^{m}$
12 Dec	MIL	LOS 12/0333 AOS 12/0413	15	40^{m}
18 Dec	MILA	LOS 18/0754 AOS 18/1518	17	$7^{h}24^{m}$
24 Dec	MILA	LOS 24/1250 AOS 24/1558	ALL	$3^{h}08^{m}$

APOLLO LUNAR SURFACE EQUIPMENT STATUS
A.2 ALSEP DATA LOSS HISTORY
(concluded)

DATE	GROUND STATION	TIME (G.m.t.)	ALSEP SYSTEM	DATA TIME LOSS
1974				
12 Jan	GWM/TAN	LOS 12/1855 AOS 12/1910	ALL	15^{m}
24 Jan	MIL	LOS 24/2122 AOS 24/2254	ALL Data Questionable	$1^{h}32^{m}$
01 Feb	MAD	LOS 01/1535 AOS 01/1600	12	25^{m}
15 Feb	ACN	LOS 15/0827 AOS 15/0852	14	25^{m}
27 Feb	MIL	LOS 27/2208 AOS 27/2236	16	28^{m}

APPENDIX B - ALSEP RTG STATUS

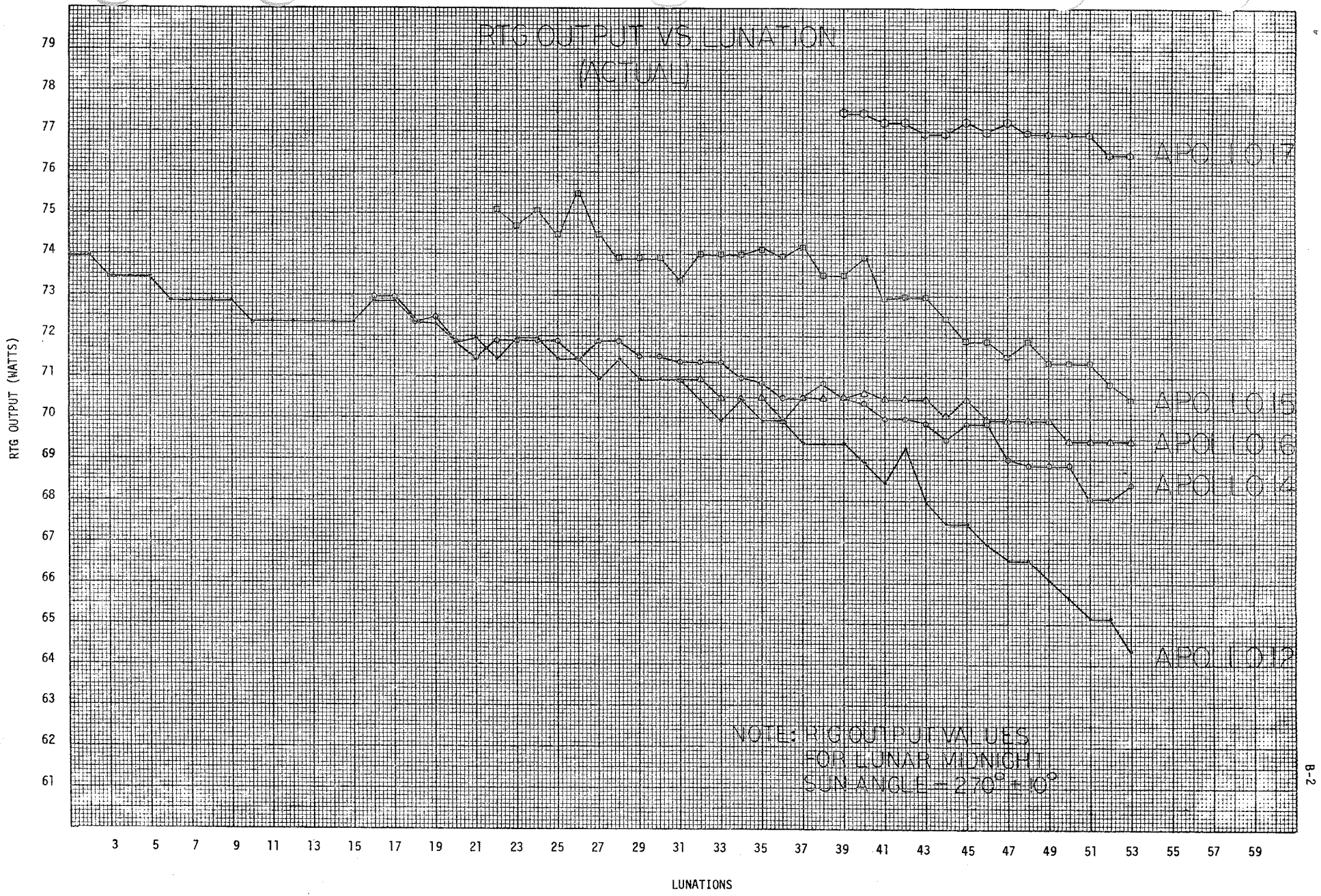
The ALSEP Radioisotope Thermoelectric Generators (specifically Apollo 12 and 14 ALSEP RTGs) are experiencing an expected but progressive gradual degradation. Cumulative operation of Apollo 12 and 14 ALSEP stations alone have provided over seven years of continuous operation, exceeding the initial design requirement of one year each. The graphical presentations on the following pages illustrate this power regression of the ALSEP RTGs over their total period of lunar operation.

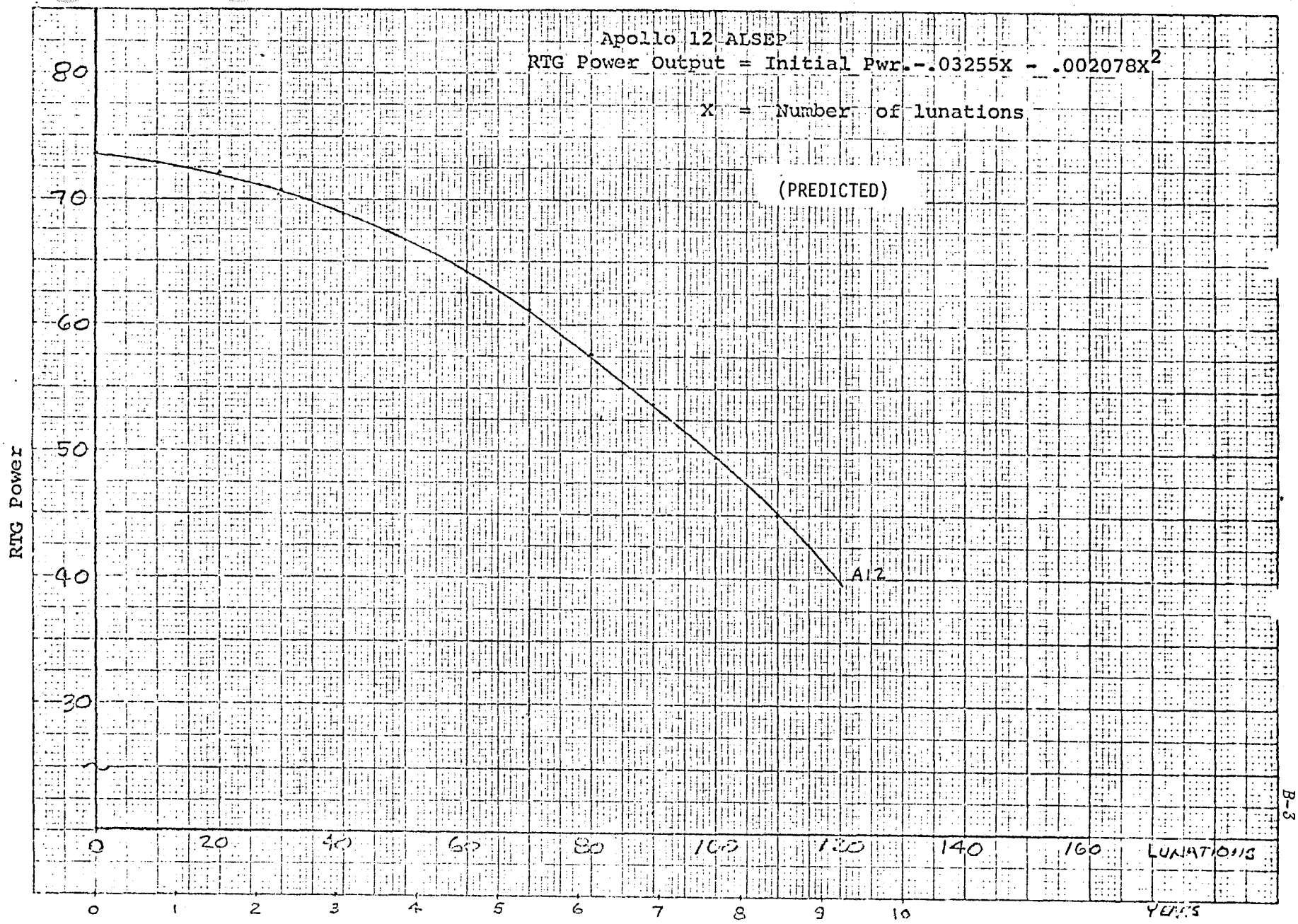
Based on current RTG data, no catastropic failure should occur through normal system operation. However, operation of the ALSEPs with reduced RTG power available has to be considered. Currently, alternate operational guidelines and procedures are being formulated.

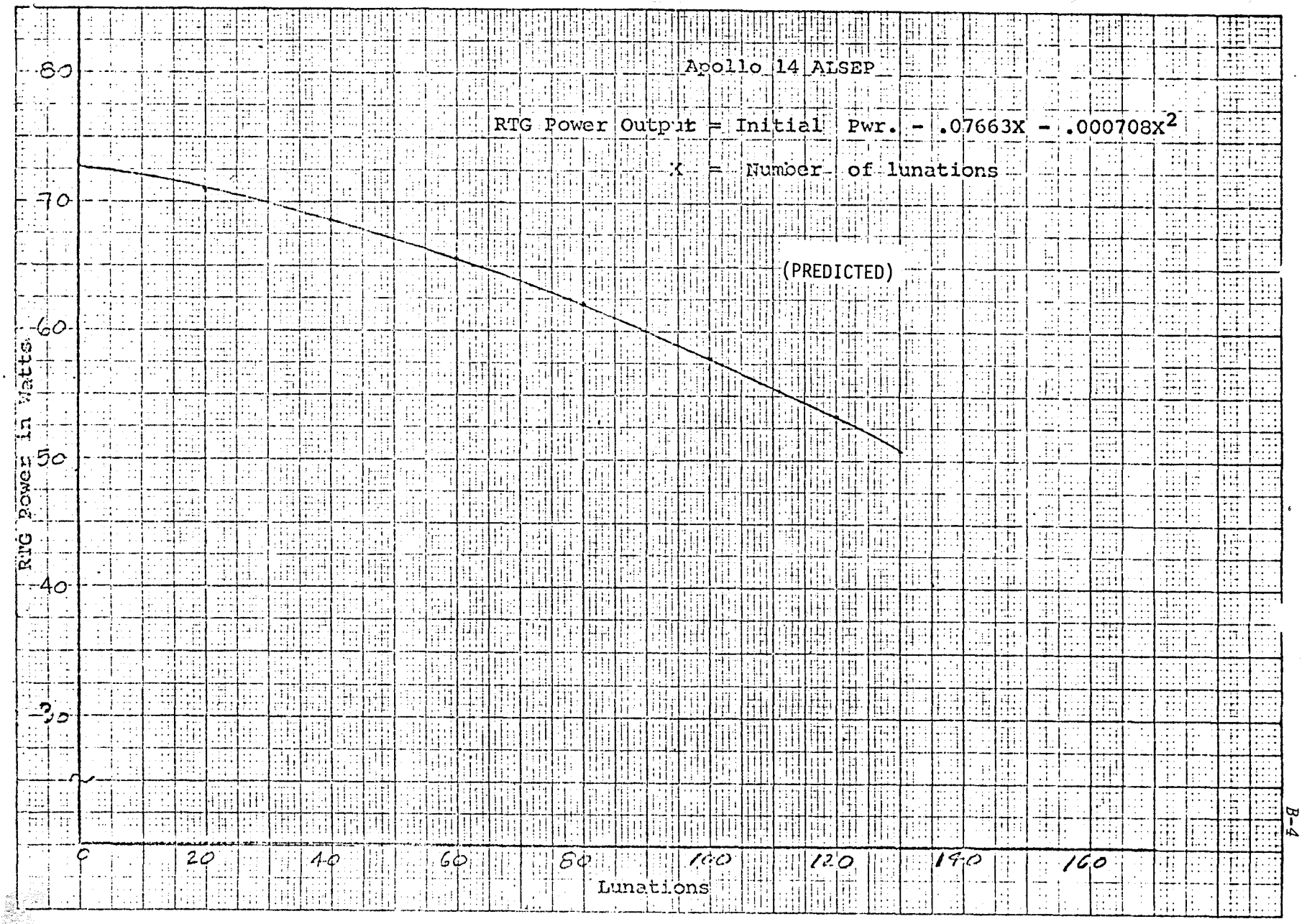
The operational approach assumes that system operation is a function of RTG power available and the distribution of this power for subsystem operation and thermal control. Thermal control (and, therefore, power consumption) will be based on minimum allowable thermal plate temperatures near the transmitters and receiver. The remaining power available will be utilized to support experiment subsystem operation. Eventually, in a power limited situation, experiments will be commanded to STANDBY or OFF to achieve a power/thermal balance. The sequence of experiment termination will be based on experiment priority in effect at that time.

Based on information currently available, RTG power regression has been extrapolated and plotted over a long duration. The graphs presented for Apollo 12 and 14 ALSEPs on the following pages provide an initial baseline guide for planning future system operation at reduced power levels.

Since there are five ALSEPs currently operational, each with a different system configuration, the effective operational procedure for each will be unique.


RTG OUTPUT VS LUNATION
(ACTUAL)
RTG OUTPUT (WATTS)
79
78
77
76
75
74
73
72
71
70
69
68
67
66
65
64
63
62
61
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59
LUNATIONS
APOLLO 17
APOLLO 15
APOLLO 16
APOLLO 14
APOLLO 12
NOTE: R/G OUTPUT VALUES
FOR LUNAR MIDNIGHT
SUN ANGLE = 270° ± 10°


Apollo 12 ALSEP
RTG Power Output = Initial Pwr. -.03255X - .002078X²
X = Number of lunations
(PREDICTED)
A12
RTG Power
80
70
60
50
40
30
0
20
40
60
80
100
120
140
160
LUNATIONS
0
1
2
3
4
5
6
7
8
9
10
YEARS


Apollo 14 ALSEP
RTG Power Output = Initial Pwr. - .07663X - .000708X²
X = Number of lunations
(PREDICTED)
RTG power in Watts
80
70
60
50
40
30
0
20
40
60
80
100
120
140
160
Lunations

APPENDIX C - ABBREVIATIONS AND ACRONYMS

ACN	Ascension Island, United Kingdom (30')
A/D	Analog-to-Digital
AGO	Santiago, Chile (40')
ALSEP	Apollo Lunar Surface Experiments Package
AOS	Acquisition of Signal
ASE	Active Seismic Experiment
BDA	Bermuda, United Kingdom (30')
BUR	Johannesburg, South Africa (40')
CCIG	Cold Cathode Ion Gauge
CMD	Octal Command Number
CPLEE	Charged Particle Lunar Environment Experiment
CRO	Carnarvon, Australia (30')
C/S	Central Station
CVW	Command Verification Word
CYI	Canary Islands, Spain (30')
EVA	Extravehicular Activity
GDS	Goldstone, California, U.S.A. (85')
GWM	Guam, U.S.A. (30')
HAW	Kokee Park, Hawaii, U.S.A. (30')
HBR	High Bit Rate
HFE	Heat Flow Experiment
HSK	Honeysuckle Creek, Australia (85')
LACE	Lunar Atmospheric Composition Experiment
LEAM	Lunar Ejecta and Meteorite Experiment
LM	Lunar Module
LOS	Loss of Signal
LP	Long Period (PSE sensors)
LSG	Lunar Surface Gravimeter
LSM	Lunar Surface Magnetometer
LSPE	Lunar Seismic Profiling Experiment
MAD	Madrid, Spain (85')
MIL	Merritt Island, Florida, U.S.A. (30')
ORR	Orroral Valley, Australia (85')

APPENDIX C - ABBREVIATIONS AND ACRONYMS (concluded)

P & D	Problem and Discrepancy List
PI	Principal Investigator
PSE	Passive Seismic Experiment
QUI	Quito, Ecquador (40')
ROS	Rosman, North Carolina, U.S.A. (85')
RTG	Radioisotope Thermoelectric Generator
SIDE	Suprathermal Ion Detector Experiment
SMEAR	Span/Mission Evaluation Action Request
SP	Short Period (PSE sensor)
SWS	Solar Wind Spectrometer
TAN	Tannanarive, Malagasy Republic (40')
TEX	Corpus Christi, Texas, U.S.A. (30')
TM	Telemetry
UHT	Universal Handling Tool
ULA	Fairbanks, Alaska, U.S.A. (85' & 40')
VAN	Vanguard, Tracking Ship, U.S.A. (30')
XMTR	Transmitter

APOLLO PROGRAM-LUNAR SURFACE EQUIPMENT STATUS

AC/G. Abbey
TA/T. Calio
TN/L. Haskins
TN3/W. Eichelman (6)
TN3/R. Baldwin
TN3/J. Bates
PA/G. Lunney
WA/D. Arabian
WA2/J. Lobb
WA2/R. Blount
EA/M. Faget
EA3/R. Gardiner
EA3/D. Gerke
ED/D. Grimm
ED1/V. Melliff
ED1/J. Lowery
PHO F222/E. Carr
C30/W. Rowe
FS/J. Stokes
FS4/P. Dell'osso
FA/H. Tindall
CA/K. Kleinknecht
CA/E. Kranz
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