

# **ALSEP 1 Science Reports**

**1970-1971**

# **ALSEP 1 Science Reports 1970 - 1971**

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ALSEP 1 SCIENCE REPORT  
February 16, 1970

Apollo Lunar Surface Experiments Package Status Report - 12:00 CST, 16 February

ALSEP 1 continues transmitting scientific and engineering data to Earth, after more than 89 days of uninterrupted operation. During the times that Mission Control support was not in effect, Phase III Operations, remoted site record of the downlink only, were actuated. In order to determine the optical terminator crossings of the deployed package, the Dust Detector east cell and west cell outputs are monitored. The east facing cell (AX-06) was monitored at the remoted sites during Phase III Operations, detecting the fourth lunar sunrise experienced by ALSEP 1 at 10:29 CST, 15 February. Real time support of the package for the optical terminator crossing was resumed at 14:00 CST, 15 February, and will be in effect until approximately 17:30 CST, 16 February. No real time support of ALSEP 1 occurred on 14 February due to Goddard Space Flight Center down time required for maintenance.

Central station engineering data indicates that temperatures are rising steadily as a function of increasing sun angle. The average thermal plate temperature has been rising at a rate of approximately 0.8 degrees F per hour since the C/S 10 watt heater (DSS-1) was commanded OFF when the average plate temperature was 42.9 degrees F at 18:03 CST, 15 February. Currently the average thermal plate temperature is 42.9 degrees F. Downlink telemetry signal strength remains steady at -140 dbm. A steady 74 watts of power is being provided by the thermoelectric generator. Since resumption of real time support 34 commands have been transmitted to and implemented by ALSEP, bringing the total to date to 2187.

During Phase III Operations two unexpected 12-hour timer pulse status changes (AL-03) were observed in the downlink at 10:13:01 CST and 10:13:54 CST, 13 February. At the resumption of Mission Control operations, 15 February, it was observed that the LSM housekeeping status was incorrect, while the PSE housekeeping status was correct. Review of the remoted site PSRM's (Post Site Report Messages) revealed that the scheduled timer pulses, preceding and succeeding the unexpected pulses, occurred on time. The first assumption was that two extra timer pulses could have caused the incorrect LSM status change. Further review indicated that LSM flip/cal inhibit was IN, which would also cause an incorrect status change. It appears that the remoted site saw a drop in decomm lock, causing AL-03 to change status within 53 seconds, appearing as two extra timer pulses. PSRM's continue to indicate that the scheduled timer pulses are occurring correctly, indicating that the ALSEP timer is running at the proper rate. Listed are the latest 12-hour timer pulses that have been observed:

<u>Pulse No.</u>	<u>PSE Uncage</u>	<u>LSM/Flip Calibration</u>	<u>Date</u>
163	04:13 CST		13 February
164	16:10 CST		13 February
165	04:12 CST	Phase III Operations	14 February
166	16:03 CST		14 February
167	04:12 CST		15 February
168	16:09 CST	*Flip/Cal Inhibit In	15 February
169	04:12 CST		16 February

\*Refer to Lunar Surface Magnetometer Section of this report.

No seismic activity has been detected by the Passive Seismic Experiment since resumption of Phase II Operations. Normal PSE tidal tilts are being observed in conjunction with the start of the fourth lunation. Throughout the entire lunar night the instrument sensor was thermally stabilized at 126.2 degrees F by commanding the Z axis leveling motor ON in the AUTO MODE, in addition to the normal operational procedure of commanding the PSE thermal control mode to AUTO ON. The Z axis leveling motor was commanded OFF at 21:29 CST, 15 February. The instrument sensor temperature (DL-07) slowly decreased for six hours before leveling off at 125.5 degrees F, and then starting a gradual increase of 0.1 degree F per hour. Currently the thermal control mode is AUTO ON. The Short Period Z axis pulse train reappeared at 07:30 CST, 16 February, with DL-07 indicating a sensor temperature of 125.6 degrees F. This interruption of the SPZ axis is identical to those which occurred during previous lunations.

The Lunar Surface Magnetometer flip/calibration inhibit status indicated IN at the resumption of Mission Control operations on 15 February. At the suspension of Phase II Operations on 13 February, the flip/cal inhibit status was OUT. The flip/cal inhibit status was then commanded OUT at 16:21 CST, 15 February. The LSM field axes sensors (X, Y, and Z) outputs returned on scale at 17:20 CST, 15 February, resulting in resumption of science output. The average sensor temperature was 33.1 degrees C, while the instrument's internal temperature was -14.1 degrees C, when the sensor outputs returned on scale. Presently the LSM sensor temperatures are stable and the internal temperature is increasing at a rate of 1.4 degrees C per hour. Considerable variant field activity has been indicated since the outputs have returned on scale.

There has been no significant change in Solar Wind Spectrometer activity since the last reporting period. The SWS sensor temperature is currently increasing at a rate of 2.0 degrees C per hour.

The Suprathermal Ion Detector has detected limited low energy activity since the optical terminator crossing. The SIDE was commanded to STANDBY SELECT at 10:24 CST, 16 February, interrupting the scientific output. It is planned to initiate cyclic commanding of the instrument from STANDBY SELECT to OPERATE SELECT to STANDBY SELECT to STANDBY OFF during real time support periods over the next several days in an effort to avoid immediate electrical arcing of the instrument following sunrise. It is desired to delay the internal instrument temperature increase as the sun angle increases, holding the unit below a temperature band where arcing has previously occurred, and then commanding the SIDE ON and obtaining scientific data at a higher sun angle elevation. The Cold Cathode Gauge high voltage remains OFF.

The Dust Detector east facing cell (AX-06) output returned on scale at 10:29 CST, 15 February, via the remoted site. At the resumption of real time support on 15 February, the top cell and west facing cell outputs were on scale. The cell outputs are tracking previously recorded lunar day data at the same sun angles.

Status as of 11:00 CST, 16 February was as follows:

Sun Angle	12 degrees
Input Power	73.59 watts
Reserve Power	34.87 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	49.1 F
PSE Sensor Assembly Temperature	125.6 F
LSM Sensor Temperature (Average)	31.0 C (87.8 F)
LSM Internal Temperature	17.2 C (63.0 F)
SWS Sensor Assembly Temperature	11.4 C (52.5 F)
SWS Internal Temperature Module 300	27.1 C (80.8 F)
SIDE Temperature (Average)	24.3 C (75.7 F)
CCIG Temperature	274.2 K (34.2 F)

ALSEP 1 SCIENCE REPORT  
February 17, 1970

Apollo Lunar Surface Experiments Package Status Report - 12:00 CST, 17 February

ALSEP 1 continues its superb performance after more than 2160 hours of continuous operation. Engineering data indicates normal temperature changes of the central station and all experiments as a function of increasing sun angle. No significant change in science data has been indicated by the Passive Seismic Experiment, Lunar Surface Magnetometer, Solar Wind Spectrometer, or the Suprathermal Ion Detector. The Cold Cathode Gauge high voltage remains in the OFF mode.

Real time support for the Suprathermal Ion Detector was suspended at 18:00 CST, 16 February and resumed at 07:00 CST, 17 February. Support consisted of Phase III operations, remoted site record of downlink only, during the non-real time support period. The support periods have thus far been successful in affecting the delay in the internal temperature increase, holding the temperature below that at which arcing has previously occurred. The SIDE has been commanded in a cyclical trend to allow the temperature to decrease as follows:

<u>Time (CST)</u>	<u>Commands to SIDE</u>	<u>SIDE Temperature (Average)</u>	<u>Number of Seconds of Power to SIDE</u>
10:24/16 Feb	STANDBY SELECT	27.6°C	N/A
11:21/16 Feb	OPERATE SELECT STANDBY SELECT	23.7°C	80
12:22/16 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	20.7°C	80
13:35/16 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	16.9°C	80
15:31/16 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	11.8°C	125
16:48/16 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	9.4°C	80
17:41/16 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	7.7°C	80

<u>Time (CST)</u>	<u>Commands to SIDE</u>	<u>SIDE Temperature (Average)</u>	<u>Number of Seconds of Power to SIDE</u>
17:53/16 Feb	OPERATE SELECT	7.4°C	*
08:44/17 Feb	STANDBY SELECT STANDBY OFF SELECT	41.8°C	*

\* The SIDE was in the OPERATE mode and power was on continuously during this time period.

The pulse train in the PSE short period Z axis had disappeared at resumption of real time support on 17 February.

No functional verification of the 170th 12-hour timer pulse has been received as of this reporting period.

Status as of 10:00 CST, 17 February was as follows:

Sun Angle	24 degrees
Input Power	73.59 watts
Reserve Power	41.91 watts
Heater and Power Dumps	All OFF
Experiment Status	SIDE OFF
Thermal Plate Temperature (Average)	67.9°F
PSE Sensor Temperature	126.2°F
LSM Sensor Temperature	30.1°C (86.2°F)
LSM Internal Temperature	37.3°C (99.1°F)
SWS Sensor Assembly Temperature	27.1°C (80.8°F)
SWS Internal Temperature Module 300	40.7°C (105.3°F)
SIDE Temperature (Average)	N/A (See Text)
CCIG Temperature	316.2°K (109.8°F)

ALSEP 1 SCIENCE REPORT  
February 18, 1970

Apollo Lunar Surface Experiments Package Status Report - 12:00 CST, 18 February

The ALSEP 1 system continues transmitting scientific and engineering data to Earth more than 91 days after placement on the lunar surface. All experiments continue to function within operational levels, with the scientific sensors indicating no significant variations in science data within the past 24 hours. Engineering data continues to be transmitted from the Cold Cathode Gauge, but no scientific data is available from the instrument as the high voltage is OFF. No attempts have been made to command the CCIG since the first lunation. Central station and experiment housekeeping telemetry indicate that component temperatures are steadily increasing as a function of the sun angle elevation change.

In an effort to hold the SIDE internal temperature below a temperature band where arcing has previously occurred, cyclical commanding of the instrument continues in effect. This cyclical commanding is being done in anticipation of collecting scientific data during the upcoming partial lunar eclipse predicted to occur on 21 February. Mission Control operations were terminated at 13:30 CST, 17 February. Real time support of SIDE was resumed at 19:00 CST, 17 February and suspended at 02:00 CST, 18 February. Remoted site record of the downlink telemetry only remains in effect during those times when Mission Control operations are suspended.

The SIDE commands transmitted, and effects observed, since the last reporting period are as follows:

<u>Time (CST)</u>	<u>Commands to SIDE</u>	<u>SIDE Temperature (Average)</u>	<u>Number of Seconds of Power to SIDE</u>
11:31/17 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	31.1 C	60
13:00/17 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	27.5 C	60
13:29/17 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	27.0 C	780
19:52/17 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	18.6 C	83
20:24/17 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	18.3 C	42



<u>Time (CST)</u>	<u>Commands to SIDE</u>	<u>SIDE Temperature (Average)</u>	<u>Number of Seconds of Power to SIDE</u>
21:33/17 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	17.8 C	89
22:31/17 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	17.3 C	59
23:30/17 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	17.2 C	21
00:31/18 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	17.1 C	84
01:29/18 Feb	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	16.9 C	198
01:50/18 Feb	OPERATE SELECT	16.9 C	*

\*Real time support of the SIDE is presently scheduled to resume at 11:00 CST, 18 February.

The last 12-hour timer pulse (169th pulse) occurred as anticipated at 04:12 CST, 16 February, with the PSE housekeeping status (AL-08) change verified at the remoted site. Since that time no timer pulse has been functionally verified in PSE or LSM housekeeping data by either a remoted site or during Mission Control operations.

Status as of 02:00 CST, 18 February was as follows:

Sun Angle	32 degrees
Input Power	73.59 watts
Reserve Power	42.18 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	73.2 F
PSE Sensor Temperature	126.4 F
LSM Sensor Temperature	30.1 C (86.2 F)
LSM Internal Temperature	44.7 C (112.5 F)
SWS sensor Assembly Temperature	35.7 C (96.3 F)
SWS Internal Temperature Module 300	50.3 C (122.5 F)
SIDE Temperature (Average)	16.9 C (62.4 F)
CCIG Temperature	323.8 K (123.4 F)

ALSEP 1 SCIENCE REPORT  
February 19, 1970

Apollo Lunar Surface Experiments Package Status Report - 12:00 CST, 19 February

After more than 2210 hours of continuous operation, ALSEP 1 is transmitting scientific and engineering data to Earth from the central station, Passive Seismic Experiment, Lunar Surface Magnetometer, Solar Wind Spectrometer, and Suprathermal Ion Detector. The Cold Cathode Gauge high voltage remains OFF and no scientific data is being received from it. The PSE X, Y, and Z long-period sensors indicated an event of natural origin beginning at 12:06 CST, 18 February and lasting fifteen minutes. Downlink telemetry indicates that all temperatures are increasing as a function of increasing sun angle. RTG output remains steady at 74 watts.

Real time support of the Suprathermal Ion Detector was resumed at 11:00 CST, 18 February, suspended at 19:00 CST on the same day, and again resumed at 07:00 CST, 19 February. Phase III operations (recorded downlink data at remotest sites only) were in effect during the non-real time support periods. Cyclical commanding to the SIDE continues in effect in order to attempt to hold the temperatures below the band where arcing has previously occurred. If this procedure is successful, scientific data should be available from the SIDE during the forthcoming partial lunar eclipse on 21 February.

The effects observed with the SIDE arcing and commands transmitted to the instrument since the last reporting period are as follows:

<u>Time (CST)</u>	<u>Effects of SIDE Arcing</u>	<u>Commands to SIDE</u>	<u>SIDE Temperature (Average)</u>
13:00/18 Feb	X10 MODE ON- CHANNELTRON HIGH VOLTAGE OFF	N/A	53.3°C
13:12/18 Feb	N/A	NRMAL MODE ON-CHANNELTRON HIGH VOLTAGE ON	53.4°C
13:32/18 Feb	X10 MODE ON	N/A	54.0°C
13:36/18 Feb	N/A	STANDBY SELECT	54.1°C
15:34/18 Feb	N/A	OPERATE SELECT NORMAL MODE ON- CHANNELTRON HIGH VOLTAGE ON	48.6°C
17:02/18 Feb	X10 MODE ON- CHANNELTRON HIGH VOLTAGE OFF	N/A	53.2°C

<u>Time (CST)</u>	<u>Effects of SIDE Arcing</u>	<u>Commands to SIDE</u>	<u>SIDE Temperature (Average)</u>
17:14/18 Feb	N/A	NORMAL MODE ON- CHANNELTRON HIGH VOLTAGE ON	53.6°C
18:31/18 Feb	N/A	STANDBY SELECT STANDBY OFF SELECT	54.6°C
07:13/19 Feb	N/A	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	34.1°C

Real time support is currently scheduled to be suspended at 18:00 CST, 19 February, and resumed at 06:00 CST, 20 February.

There has been no functional verification of a 12-hour timer pulse since 04:12 CST, 16 February.

At resumption of real time support at 11:00 CST, 18 February, it was discovered that the Lunar Surface Magnetometer range had changed to 200 gamma. Investigation led to the discovery of a spurious command verification word (CVW) octal 123 with parity that had been downlinked at 09:41 CST, 18 February. This spurious command had caused the change. The necessary commands were transmitted to the LSM in order to put the instrument back into its normal configuration of 100 gamma afterwards.

From 14:28 CST, to 16:13 CST, 18 February, signal fluctuations of up to eleven dbm were reported by the remoted site at Ascension Island, United Kingdom. The remoted site at Madrid, Spain, confirmed lesser fluctuations during the same time period. Causes for these fluctuations are now being investigated.

Status as of 08:00 CST, 19 February was as follows:

Sun Angle	47°
Input Power	73.59 watts
Reserve Power	41.64 watts
Heater and Power Dumps	All OFF
Experiment Status	SIDE OFF
Thermal Plate Temperature (Average)	83.7°F
PSE Sensor Temperature	127.3°F
LSM Sensor Temperature (Average)	49.2°C (120.6°F)
LSM Internal Temperature	59.4°C (138.9°F)
SWS Sensor Assembly Temperature	48.7°C (119.7°F)
SWS Internal Temperature Module 300	59.2°C (138.6°F)
SIDE Temperature (Average)	N/A (See Text)
CCIG Temperature	347.4 K (165.9°F)

ALSEP WEEKLY SCIENCE REPORT  
February 20, 1970

Apollo Lunar Surface Experiments Package Status Report - 12:00 CST, 20 February

ALSEP 1 continues to transmit scientific and engineering data to Earth after over 93 days of operation on the lunar surface. The package is now well into its fourth lunar day as lunar noon is theoretically predicted to occur at 20:09 CST, 22 February. During the times that Mission Control support (Phase II Operations) was not actuated, remoted site record of downlink only (Phase III Operations) was in effect. Real time support of the SIDE was suspended at 18:00 CST, 19 February, and resumed at 06:00 CST, 20 February. A partial lunar eclipse is predicted to occur between 23:00 CST, 20 February, and 07:30 CST, 21 February. Real time support is scheduled for this period in order to observe the effects of a partial lunar eclipse on scientific and engineering data from ALSEP.

Central station telemetry indicates that the average thermal plate temperature is rising at a rate of  $0.2^{\circ}\text{F}$  per hour. RTG input power remains constant at 74 watts. From 14:16 CST to 18:00 CST, 19 February, the remoted site at Ascension Island, United Kingdom reported signal fluctuations of up to nine dbm. The remoted site at the Canary Islands, Spain reported lesser fluctuations during the same time period. Investigation indicated that the signal strength fluctuations experienced in the downlink telemetry at this time period in the past four days is not peculiar to ALSEP 1. The Mariner deep space probe has also experienced relatively large signal strength fluctuations from 11:00 CST to 17:00 CST for, likewise, the past four days. It, too, is on an S-band downlink frequency. Further investigation continues relative to these fluctuations. At 09:29 CST, 19 February, the Timer Output Inhibit command (Octal 033) was transmitted to the command decoder. This caused a PSE Uncage and Short Period Calibration status change, and also caused the SIDE to change to OPERATE SELECT as it was in the STANDBY OFF SELECT mode at the time. These two functions are expected on transmission of this command. A change in the LSM flip/calibration status is not expected. There has been no functional verification of a 12-hour timer mechanism pulse since pulse number 169 at 04:12 CST, 16 February. A total of 208 commands have been transmitted to the command decoder during the past seven days, bringing the accumulative total transmitted to and implemented in ALSEP 1 to date to 2375.

The Passive Seismic Experiment has shown no significant change in scientific data since the February 19th report. The X, Y, and/or Z components have required infrequent releveled during the past four days. The thermal control mode was commanded to Forced OFF at 13:06 CST, 19 February when the PSE sensor temperature was  $127.3^{\circ}\text{F}$ .

The Lunar Surface Magnetometer indicated significant invariant activity throughout the past week until 19 February when the sensor outputs indicated very little or no activity. The LSM sensor and internal temperatures each show a slow increase as a function of sun elevation. The instrument continues normal operation in its fourth lunation.

The Solar Wind Spectrometer has shown no significant change in scientific data. The SWS continues to function normally as temperatures continue to increase slowly.

The Suprathermal Ion Detector Experiment continues to be commanded periodically in order to allow a cyclical rise in the temperatures. The temperature band at which arcing does not occur would not be exceeded at the time of the partial lunar eclipse if the procedure is successful. This, then, would allow collection of scientific data from the SIDE during this eclipse. The effects observed with the SIDE arcing and commands transmitted to the instrument since the last reporting period are as follows:

<u>Time (CST)</u>	<u>Effects of SIDE Arcing</u>	<u>Commands To SIDE</u>	<u>SIDE Temperature (Average)</u>
08:30/19 Feb	N/A	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	33.8°C
09:32/19 Feb	N/A	* STANDBY SELECT STANDBY OFF SELECT	34.1°C
11:01/19 Feb	N/A	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	33.4°C
13:01/19 Feb	N/A	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	33.3°C
15:02/19 Feb	N/A	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	33.4°C
17:55/19 Feb	N/A	OPERATE SELECT STANDBY SELECT STANDBY OFF SELECT	39.2°C
06:03/20 Feb	N/A	OPERATE SELECT	37.1°C

\*The Timer Output Inhibit command at 09:29 CST, caused the SIDE to go to the OPERATE SELECT mode.

The Cold Cathode Gauge high voltage remains in the OFF mode. The temperature is increasing slowly as the CCIG approaches maximum sun elevation.

The Dust Detector cell outputs are all tracking data recorded during previous lunations.

Status as of 10:00 CST, 20 February was as follows:

Sun Angle	60°
Input Power	73.59 watts
Reserve Power	36.76 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	88.9°F
PSE Sensor Temperature	127.6°F
LSM Sensor Temperature (Average)	57.1°C (134.8°F)
LSM Internal Temperature	69.5°C (157.1°F)
SWS Sensor Assembly Temperature	55.9°C (132.6°F)
SWS Internal Temperature Module 300	62.6°C (144.7°F)
SIDE Temperature (Average)	43.1°C (109.6°F)
CCIG Temperature	355.6°K (180.7°F)

ALSEP 1 SCIENCE REPORT  
February 24, 1970

Apollo Lunar Surface Experiments Package Status Report - 12:00 CST, 24 February

After more than 2330 hours of continuous operation, ALSEP 1 is transmitting scientific and engineering data to Earth via downlink telemetry from the central station. At 23:00 CST, 20 February, the ALSEP network initiated Phase II (real time) operations to support the package during a partial lunar eclipse. The minimum light intensity during the eclipse was 58% full scale at the ALSEP 1 site. Phase II operations were suspended at 06:00 CST, 21 February. Since that time, normal two-hour per day support periods have been actuated. All other times Phase III operations are in effect. This consists of recording of downlink data only at the various remoted sites.

ALSEP 1 was actually in the eclipse from 00:30 CST until 04:02 CST, 21 February. During this time, the external sunshield temperature (AT-01) experienced a maximum drop of 100.6°F. This was the highest temperature decrease indicated by any sensor on the package. The dust detector top cell output (AX-05) dropped a maximum of 76.8 mv during the eclipse. These outputs plus the CCIG temperature are displayed in the graph enclosed in this report. The graph covers the eclipse duration. A table is presented below to indicate the times of various significant parameter changes and the outputs of these parameters at these times during the eclipse.

All Times on February 21

<u>Time</u>	<u>Parameter</u>	<u>Measurement</u>
03:27 CST	Average Thermal Plate Temperature	78.1°F
02:13 CST	Top Cell Output (AX-05)	-55.9mv
02:35 CST	External Sunshield Temperature (AT-01)	56.4°F
03:01 CST	Central Station Base Temperature (AT-10)	115.0°F
02:35 CST	RTG Hot Frame Temperature (AR-01)	1118°F
02:32 CST	CCIG Temperature	331.5°K

Central station telemetry indicates that the average thermal plate temperature is currently stable. RTG output continues steady at 74 watts. There has been no functional verification of a 12-hour timer pulse since the last reporting period. A total of 2388 commands had been transmitted to and implemented by ALSEP 1 from deployment until the end of the real time support period for the eclipse.

The Passive Seismic Experiment showed the most significant scientific output activity during the eclipse. The activity began slowly and gradually increased to a maximum shortly before the mid-point of the eclipse. The activity was attributed to thermal instability of the PSE thermal shroud. This is the same sort of activity observed during optical terminator crossings. At the mid-point of the eclipse, the shroud showed thermal stability up until shortly before the end of the eclipse when activity substantially increased again. After the eclipse, the shroud became thermally stable again. The PSE temperature sensor had a temperature change lag of approximately three hours. There was no natural origin scientific data indicated during the eclipse. Releveling of the axes was not required during the eclipse. At the resumption of real time support on February 24, the PSE sensor temperature was OFF scale HIGH.

The Lunar Surface Magnetometer showed no significant change in scientific output during the eclipse. The Y axis sensor output experienced sporadic deflections of varying degrees during the eclipse but returned to normal afterwards. All temperatures have essentially stabilized.

The Solar Wind Spectrometer showed no significant variation in science output during the eclipse. Its temperatures are stabilized.

The Suprathermal Ion Detector Experiment was successfully commanded to OPERATE SELECT for the duration of the eclipse. Cyclical commanding of the SIDE during the preceding week held instrument temperature within a temperature band to prevent arcing. This procedure enabled commanding OPERATE SELECT for the duration of the eclipse, thus enhancing the possibility of obtaining scientific data during the eclipse without arcing. However, no significant change in scientific data was observed. The SIDE is now being commanded to OPERATE SELECT only for the duration of the nominal two hour per day support periods and then commanded to STANDBY OFF SELECT at the end of each period. The Cold Cathode Gauge high voltage remains in the OFF mode. The temperature has stabilized.

Dust Detector Cell outputs all continue to track data recorded during previous lunations at the same sun angles with the exception of the relatively short period of the lunar eclipse. Lunar noon occurred theoretically at 20:09 CST, 22 February.

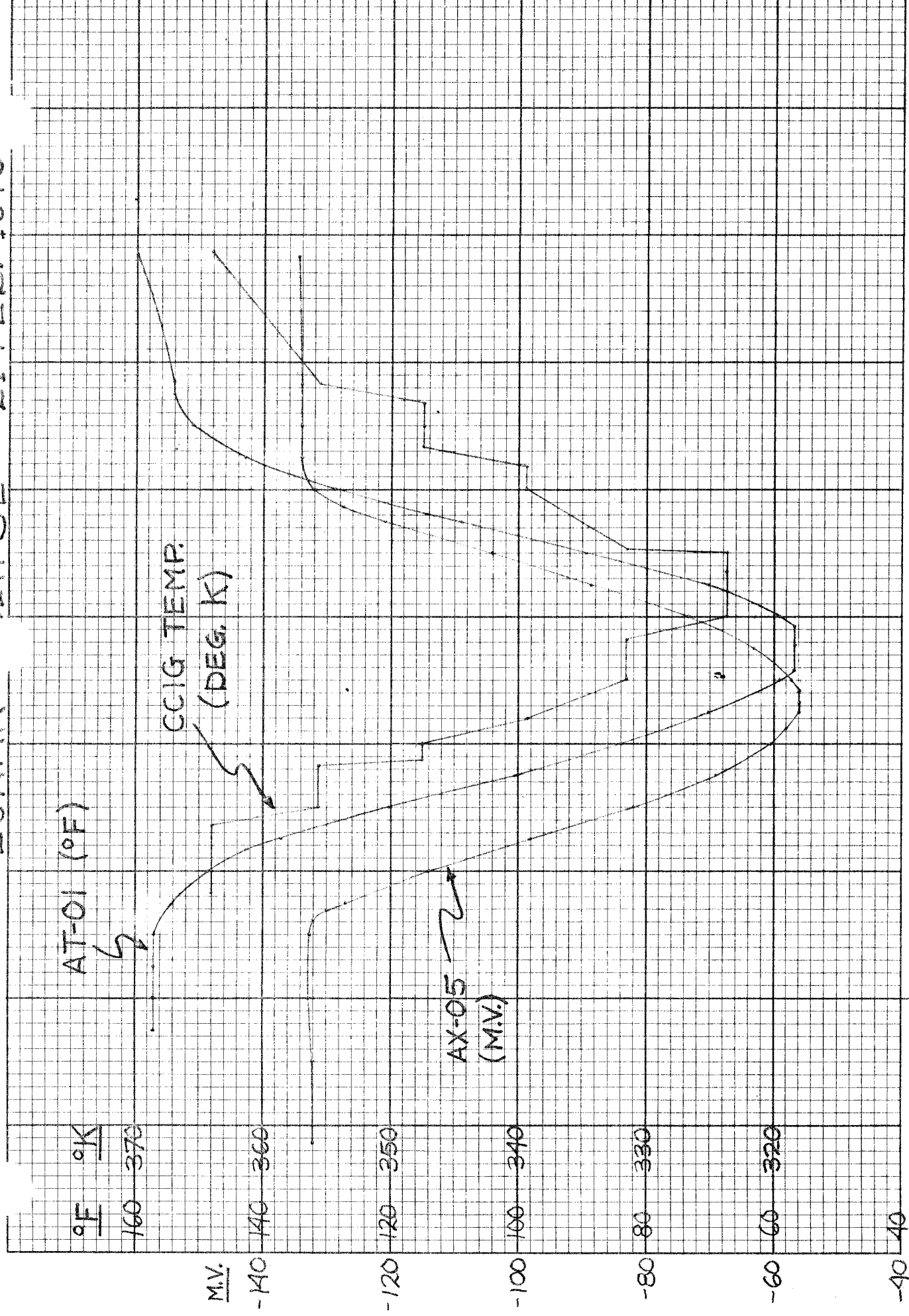


Status as of 10:00 CST, 24 February, was as follows:

Sun Angle	71°
Input Power	73.59 watts
Reserve Power	42.18 watts
Heater and Power Dumps	All OFF
Experiment Status	SIDE OFF
Thermal Plate Temperature ( Average )	91.2 °F
PSE Sensor Temperature	OFF Scale High
LSM Sensor Temperature (Average)	73.8 °C (164.8 °F)
LSM Internal Temperature	77.3 °C (171.7 °F)
SWS Sensor Assembly Temperature	59.7 °C (139.5 °F)
SWS Internal Temperature Module 300	63.5 °C (146.3 °F)
*SIDE Temperature (Average)	53.0 °C (127.4 °F)
CCIG Temperature	372.6 K (211.3 °F)

\*Temperature just prior to commanding the SIDE to Standby OFF.

# LUNAR ECLIPSE - 21 FEB. 1970



2300 0000 0100 0200 0300 0400 0500 0600 C.S.T.  
20 FEB. 21 FEB.

ALSEP 1 SCIENCE REPORT  
6 March 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, 5 March

The ALSEP 1 system continues transmitting scientific and engineering data to Earth more than 2565 hours after placement on the lunar surface. The package is currently in its fourth lunar night, lunar sunset having occurred at 04:51 CST, 2 March. Phase II (real time) operations were initiated at 04:00 CST, 2 March and suspended at 04:00 CST, 3 March in support of the package for the optical terminator crossing. Phase II operations were in effect for two hours on most other days since the last reporting period. No support was actuated on 28 February due to a computer maintenance operation at Mission Control Center. Because the package has thermally stabilized, it was not necessary to initiate support on 6 March. During the time that real time support is not in effect, Phase III (recorded downlink data only) operations were in effect at the various ALSEP network remoted sites.

The central station engineering telemetry indicates that the average thermal plate temperature is stable at 22.0°F. The 10 watt heater (DSS-1) was commanded ON at 04:00 CST, 2 March when the average thermal plate temperature was 24.8°F. No signal strength fluctuations in the downlink telemetry have been reported in the past seven days. The signal strength is -140 dbm. The RTG output remains steady at 74 watts. A test was performed on 2 March in order to ascertain whether or not the 12-hour timer was operational. The test consisted of transmitting the TIMER OUTPUT INHIBIT command (Octal 033) followed immediately by the TIMER OUTPUT ACCEPT command (Octal 032) eight times. A period of several minutes was allowed to pass between each set of commands. The TIMER OUTPUT INHIBIT command will input level changes to the hours and minutes counters of the delayed command sequencer and advance the counters by 12 hours and 1 minute generating the repetitive 12 hour timer pulse functions.

Repetitive 12 Hour Timer Functions

Normal Time of Execution

- |   |  |
|---|--|
| 1. Command receiver reset                             | Every 12 hours                                       |
| 2. Short period calibrate PSE (AL-07)                 | Every 12 hours                                       |
| 3. Uncage status PSE (AL-08)                          | Every 12 hours                                       |
| 4. LSM flip/calibrate ON sequence                     | 108 hours + 1 minute and every 12 hours thereafter.  |
| 5. Restore power to lowest priority experiment (SIDE) | 108 hours + 7 minutes and every 12 hours thereafter. |

When the TIMER OUTPUT ACCEPT command initiate occurs the eight bit one minute counter in the delayed command sequencer will start functioning if the timer is operational. The TIMER OUTPUT INHIBIT command and TIMER OUTPUT ACCEPT command sequence transmitted to ALSEP 1 verified operation of the timer accept/inhibit logic in the delayed command sequencer section of the Command Decoder. The command sequence also implies that the mechanical drive mechanism of the 12 hour timer is not functioning. A total of 2630 commands have been transmitted to and successfully implemented in ALSEP 1 to date.

The Passive Seismic Experiment sensor temperature has stabilized at 126<sup>o</sup>F. The instrument sensors were thermally stabilized by commanding the Z axis leveling motor ON in the AUTO MODE, in addition to the normal operational procedure of commanding the PSE thermal control mode to AUTO ON. The procedure resulted in stabilized sensors which have required infrequent releveling since the optical terminator crossing. No significant scientific data has been indicated by the PSE since the last reporting period.

The Lunar Surface Magnetometer X, Y, and Z axes field sensor outputs disappeared at 09:06 CST, 5 March interrupting science data. At that time, the sensor average temperature was 34.7<sup>o</sup>C and the internal temperature was -24.6<sup>o</sup>C. This event is characteristic of the LSM as it has occurred at the same point in each previous lunation. Limited activity had been indicated by the field sensor outputs until their disappearance. The initial temperature continues a slow decline while the sensor temperatures are stabilized.

The Solar Wind Experiment continues normal operation. No significant solar wind fluctuations have been indicated.

The Suprathermal Ion Detector Experiment is operating and measuring high and low energy particle counts. Activity is very low in the lunar night. The Cold Cathode Gauge remains in the OFF mode. Instrument temperatures continue to decline slowly.

The Dust Detector cell outputs all tracked previous lunar day data until sunset, at which time the west cell output (AX-04) went off scale LOW. The east and vertical outputs both went off scale LOW shortly prior to this.

Status as of 10:00 CST, 5 March was as follows:

Sun Angle	219°
Input Power	73.43 watts
Reserve Power	13.81 watts
Heater and Power Dumps	10 watts ON (DSS-1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	21.3°F
PSE Sensor Assembly Temperature	126.1°F
LSM Sensor Temperature (Average)	34.7°C (94.5°F)
LSM Internal Temperature	-24.6°C (-12.3°F)
SWS Internal Temperature Module 300	-14.8°C (5.4°F)
SWS Sensor Assembly Temperature	-131.7°C (-205.1°F)
SIDE Temperature (Average)	4.7°C (40.5°F)
CCIG Temperature	108.3°K (-264.5°F)

ALSEP 1 SCIENCE REPORT  
13 March 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, 13 March

The ALSEP 1 system continues to transmit data to Earth after more than 114 days of consecutive lunar operation. A plan to eliminate real time support to alternate days during lunar night was initiated on 6 March. Remoted site recording of downlink data continues in effect at all other times (Phase III operations). During the solar eclipse on 7 March, the Sun came well within the beamwidth of the 30 foot diameter antennas at the Guaymas, Mexico and Canary Islands, Spain, remoted sites. This occurrence caused the noise ratio to increase so that lock could not be maintained on the ALSEP downlink telemetry at the remoted sites during this period, thus, frequent loss of signal was observed. The fifth lunar sunrise is predicted for 00:14 CST, 17 March.

The central station continues to operate with the average thermal plate temperature stabilized at 21<sup>o</sup>F. RTG output continues steady at 74 watts. Downlink signal strength remains steady at -140 dbm. It was noted in the Guaymas post site report message that a spurious command, PSE LP CAL (Octal 066), was executed on 7 March at 14:56 CST. The executed command was verified in the PSE engineering status on 9 March, and a command transmitted to effect corrective action. This was the fifth such command executed to date. To date 2640 commands have been transmitted, received, and implemented by ALSEP 1.

The Passive Seismic Experiment continues normal operation with releveling of the sensors being accomplished as required. No significant seismic activity has been observed since the last reporting period. The sensor temperature is stable at 126<sup>o</sup>F.

The Lunar Surface Magnetometer field sensor outputs continue reading OFF scale interrupting science output. All LSM temperatures remain stabilized.

The Solar Wind Spectrometer has shown no significant change in scientific data, and continues to function normally with stabilized temperatures.

The Suprathermal Ion Detector continues to operate in full functional mode with Channeltron high voltage supply ON. The Calibration pulse in the Cold Cathode Gauge output had disappeared at resumption of real time support on 7 March. The CCIG high voltage remains OFF. All instrument temperatures are stabilized.

Status at 09:00 CST was as follows:

Sun Angle	317°
Input Power	73.43 watts
Reserve Power	12.99 watts
Heater and Power Dumps	10 watts ON (DSS-1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	21.0°F
PSE Sensor Assembly Temperature	125.9°F
LSM Sensor Temperature (Average)	34.9°C (94.8°F)
LSM Internal Temperature	-28.0°C (-18.4°F)
SWS Sensor Temperature	-134.3°C (-209.7°F)
SWS Module 300 Temperature	-15.6°C (3.9°F)
SIDE Temperature (Average)	4.2°C (39.6°F)
CCIG Temperature	101.3°K (-277.1°F)

ALSEP 1 SCIENCE REPORT

20 March 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, 20 March

Scientific and engineering data is being transmitted continuously from ALSEP 1 to Earth. The package is currently in its fifth lunar day; lunar sunrise having occurred at 00:13 CST, 17 March. During the times that Phase II operations (Mission Control support) were not actuated, remoted site record of downlink only (Phase III operations) was in effect. A modified plan of real time operation of the SIDE instrument was initiated 19 March, and will be effective through 30 March. The modified operational plan was initiated in order to affect cyclical commanding of the SIDE so that internal arcing of the instrument will not occur. The cyclical commanding sequence is identical to that followed during the last lunar day in which the SIDE temperatures were kept low enough to prevent arcing, thus fulfilling scientific data requirements.

Central station engineering data indicates that temperatures are rising steadily as a function of increasing sun elevation. The average thermal plate temperature is currently rising at a rate of  $0.3^{\circ}\text{F}$  per hour. The C/S DSS-1 heater (10 watt) was commanded OFF when the average thermal plate temperature was  $38.3^{\circ}\text{F}$  at 06:10 CST, 17 March. Thermoelectric generator output has decreased one watt since the optical terminator crossing due to the temperature change of the RTG. Downlink telemetry signal strength fluctuations have again been indicated at infrequent intervals. Data has thus far not been affected by the fluctuations. The fluctuations have been, at most, eight dbm in magnitude centered at the normal downlink telemetry signal strength of -140 dbm. Another 12 hour timer test was performed on 18 March. The test was identical to that performed on 2 March, with identical results (reference ALSEP 1 SCIENCE REPORT, 6 March, 1970). An undefined ground system problem at Guam on 19 March caused uplink command capability problems. The Canary Islands site was brought up in Phase II configuration. The same commands were uplinked successfully from CYI that were rejected at GWM. To date, 2761 commands have been transmitted to and implemented by ALSEP 1.

No seismic activity has been detected by the Passive Seismic Experiment since the last reporting period. The PSE sensor temperature remained stable during the entire lunar night as the Z axis leveling motor was ON in the AUTO MODE in addition to the normal operational procedure of commanding the PSE thermal control to AUTO ON. The Z motor was commanded OFF at 13:00 CST, 17 March when the PSE sensor temperature was  $126.3^{\circ}\text{F}$ . Leveling of the X, Y, and/or Z axes is presently being required at infrequent intervals.



The Lunar Surface Magnetometer field sensor outputs all returned on scale at 07:10 CST, 17 March, resulting in resumption of science output. The average sensor temperature was 33.5°C and the internal temperature was -12.8°C when the sensor outputs returned on scale. Currently, the LSM sensor temperatures are stable and the internal temperature is increasing at a rate of 0.7°C per hour. Considerable variant field activity has been indicated since the outputs have returned on scale.

No significant change in Solar Wind Spectrometer activity has been indicated since the last reporting period. The temperatures are on a gradual incline.

The Suprathermal Ion Detector is presently indicating considerable low energy activity. Cyclical commanding of the instrument from OPERATE SELECT to STANDBY SELECT to STANDBY OFF SELECT is taking place during real time support periods in order to keep the temperature below that at which arcing occurs. This will enable the SIDE to gather scientific data at high sun elevations. The Cold Cathode Gauge High Voltage ON command was transmitted at 15:25 CST, 18 March. No functional verification was obtained as the CCIG high voltage remains OFF and no scientific data is being transmitted by the instrument. Temperatures are rising slowly as sun angle increases.

The Dust Detector east cell output (AX-06) returned on scale coincident with sunrise, and the other two cell outputs returned on scale shortly thereafter. All outputs are tracking previous lunar day data.

Status at 09:00 CST was as follows:

Sun Angle	41°
Input Power	73.04 watts
Reserve Power	41.10 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	80.9°F
PSE Sensor Assembly Temperature	126.8°F
LSM Sensor Temperature (Average)	40.8°C (105.4°F)
LSM Internal Temperature	50.8°C (123.4°F)
SWS Sensor Temperature	42.0°C (107.6°F)
SWS Module 300 Temperature	55.9°C (132.6°F)
SIDE Temperature (Average)	28.6°C (83.5°F)
CCIG Temperature	339.4°K (151.5°F)

ALSEP 1 SCIENCE REPORT  
27 March 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, 27 March

The ALSEP central station and all experiments continue to function in their 128th day of continuous operation, with scientific data being transmitted from the Seismometer, the Magnetometer, Solar Wind Spectrometer, and Suprathermal Ion Detector experiment sensors. The modified plan of real time operation of the SIDE continues in effect in order to meet the scientific objective of obtaining high energy ion data prior to, and immediately after passing through the Earth's magnetic bow shock. Cyclical commanding of the SIDE is necessary in order to hold the temperatures of the instrument below that at which arcing would potentially occur, thus entailing the modified real time operation plan. During the times that Phase II operations (Mission Control support) were not actuated, Phase III operations (remoted site record of downlink only) were in effect.

Central station operation continues to be stable. Temperatures are decreasing as a function of decreasing sun angle. Lunar sunset is predicted to occur at 18:02 CST, 31 March. RTG output power remains steady at 73 watts. Sporadic periods of fluctuations in downlink signal strength continue to be indicated at infrequent intervals.

At the resumption of real time support at 07:45 CST, 24 March, it was noted that the C/S reserve power had unexpectedly dropped 10 watts since the previous support period. It was also noted in the Guaymas postpass summary report message that a spurious command, DSS 1 (10 watt heater) ON, was executed at 05:59 CST on the same day. The necessary commands were transmitted and executed in order to turn the heater OFF. To date, 2877 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment indicated a seismic event of 52 minutes in duration, on the X, Y, and Z axes long-period sensors beginning at 21:33 CST, 24 March. The X, Y, and/or Z axes have required infrequent leveling. The thermal control mode was commanded to Forced OFF at 08:02 CST, 24 March, when the sensor temperature was 127.3<sup>o</sup>F. The PSE sensor temperature was off scale HIGH at resumption of real time support at 19:45 CST, 25 March. The high frequency noise pattern in the short period Z axis sensor output (vertical) reappeared at resumption of real time support at 08:00 CST, 25 March. The pulse train also reappeared in the same output at this time. Both superfluous outputs have subsided since then, but they have not completely disappeared.

The Lunar Surface Magnetometer continues to show significantly variant outputs from each of the field sensors. The Y axis field sensor output has deflected in the following manner since lunar sunrise:

<u>Y Axis Field Sensor Output Status</u>	<u>Y Axis Field Sensor Temp.</u>	<u>LSM Internal Temperature</u>	<u>Date/Time (CST)</u>
-95% Full Scale Deflection	57.8°C	64.2°C	21 March 07:52
Normal (0% Deflection)	66.7°C	71.4°C	22 March 09:22
-95% Full Scale Deflection	71.9°C	77.3°C	23 March 07:40
Normal (0% Deflection)	73.7°C	77.3°C	24 March 09:00
-95% Full Scale Deflection	70.1°C	77.3°C	25 March 19:46

Each of these occurrences was corrected by a series of field offset commands in order to center the science output of the Y axis. Currently, temperatures are decreasing gradually.

The Solar Wind Spectrometer continues to indicate higher particle counts during lunar days as opposed to lunar nights. The temperatures are slowly decreasing.

The Suprathermal Ion Detector Experiment is indicating the presence of considerably high energy particles in the lunar environment. Significant counts of low energy particles are also being observed. These observations are being made as the SIDE has been commanded to OPERATE SELECT at resumption of the real time support periods and commanded to STANDBY OFF at the conclusion of each period. The Cold Cathode Gauge high voltage remains OFF and no science data is being provided by the instrument. No attempt to command the high voltage ON has been made since the last reporting period. Each instrument is indicated to be experiencing a slow decrease in temperature.

The three Dust Detector cell outputs are following the trend exhibited in each previous lunar cycle.

Status as of 10:00 CST, 27 March, was as follows:

Sun Angle	127°
Input Power	73.04 watts
Reserve Power	37.18 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature(Average)	84.3° F
PSE Sensor Assembly Temperature	OFF Scale High
LSM Sensor Temperature(Average)	64.2°C(147.6°F)
LSM Internal Temperature	69.5°C(157.1°F)
SWS Sensor Temperature	52.9°C(127.2°F)
SWS Module 300 Temperature	60.0°C(140.0°F)
SIDE Temperature(Average)	40.3°C(104.5°F)
CCIG Temperature	364.0° K(196.0° F)

ALSEP 1 SCIENCE REPORT  
March 30, 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, March 30

ALSEP 1 continues operation with the Passive Seismic Experiment, Lunar Surface Magnetometer, Solar Wind Spectrometer, and Suprathermal Ion Detector Experiment all transmitting science and engineering data to Earth. Modified real time support periods at Mission Control (Phase II operations) for the SIDE were terminated today.

At the resumption of real time support at 19:40 CST, 27 March, it was discovered that the SIDE was in the OPERATE SELECT mode after having been commanded to STANDBY OFF SELECT (09:43 CST, 27 March). Also, the mode register indicated that the instrument was in X10 MODE in addition to being operational. The SIDE was therefore commanded to STANDBY OFF SELECT in order to prevent overheating at 20:02 CST, 27 March. At 09:25 CST, 28 March, two Timer Output Inhibit commands (Octal 033) were transmitted in order to determine if there had been a count advancement in the hours and minutes register of the delayed command sequencer (reference ALSEP 1 SCIENCE REPORT, 6 March 1970). The register had been left in the LSM flip/calibration logic status and an advancement of six counts in the register would cause the SIDE turn ON. If the advancement of six counts had indeed taken place, the two Octal 033 commands would cause the logic to advance two more counts and perform an LSM flip/calibration sequence. This was the case as Functional change was noted in the data after the second transmission of Octal 033. A playback from Carnarvon on 28 March indicated that the SIDE became operational at 13:44 CST, 27 March, and switched into a X10 MODE at 18:48 CST, 27 March. The SIDE is currently operational in NORMAL MODE with Channeltron High Voltage ON.

Status as of 10:00 CST, 30 March, was as follows:

Sun Angle	163°
Input Power	73.04 watts
Reserve Power	37.58 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	55.9°F
PSE Sensor Assembly Temperature	136.1°F
LSM Sensor Temperature (Average)	37.5°C (99.5°F)
LSM Internal Temperature	41.4°C (106.5°F)
SWS Sensor Temperature	19.0°C (66.2°F)
SWS Module 300 Temperature	40.7°C (105.3°F)
SIDE Temperature (Average)	48.1°C (118.6°F)
CCIG Temperature	339.4°K (151.5°F)

ALSEP 1 SCIENCE REPORT  
April 3, 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, April 3

The ALSEP 1 system continues to transmit data to Earth after more than 3240 hours of consecutive lunar operation. All experiments are functioning in the operate mode. System temperatures are decreasing in the lunar night environment. Lunar sunset occurred at 18:02 CST, 31 March. During the times that Phase II operations were not actuated, remoted site record of the downlink only was in effect.

Central station engineering telemetry indicates that the average thermal plate temperature has stabilized at 22°F. The C/S 10 watt heater (DSS-1) was commanded ON at 15:57 CST, 31 March, when the average thermal plate temperature was 25.3°F. Sporadic periods of downlink signal strength fluctuations continue to be indicated at infrequent intervals. Normal downlink signal strength continues at -140 dbm. RTG output remains steady at 73 watts. To date, 2977 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment sensor temperature has stabilized at 126°F. The instrument sensors were thermally stabilized by commanding the Z axis sensor leveling motor ON in the AUTO mode, in addition to the normal operational procedure of commanding the PSE thermal control mode to AUTO ON. This procedure has resulted in stabilized sensors, and leveling is required infrequently. The PSE has indicated no significant scientific data since the last reporting period.

The Lunar Surface Magnetometer field sensor outputs have indicated limited science activity since the last reporting period. All instrument temperatures continue to gradually decrease. At the resumption of real time support on April 3, the three axes field sensor outputs experienced full scale deflection. This deflection is identical to that which occurred during previous lunations, interrupting science output.

The Solar Wind Experiment continues normal operations, with no significant fluctuations being detected.

The Suprathermal Ion Detector Experiment is indicating extremely low activity in the lunar night environment. The Cold Cathode Gage high voltage remains OFF. All instrument temperatures are decreasing slowly.

The Dust Detector cell outputs all tracked previous lunar day data until sunset, at which time the west cell output (AX-04) went off scale LOW. The east and vertical outputs preceded the west cell off scale.

ALSEP 1 Science Report  
April 3, 1970  
Page 2

Status as of 10:00 CST, 3 April was as follows:

Sun Angle	212°
Input Power	73.43 watts
Reserve Power	23.07 watts
Heater and Power Dumps	10 watts ON
Experiment Status	All ON
Thermal Plate Temperature (Average)	21.9°F
PSE Sensor Assembly Temperature	126.2°F
LSM Sensor Temperature (Average)	2.6°C (36.7°F)
LSM Internal Temperature	-31.5°C (-24.6°F)
SWS Internal Temperature Module 300	-26.0°C (-14.8°F)
SWS Sensor Assembly Temperature	-92.9°C (-133.7°F)
SIDE Temperature (Average)	-15.6°C (4.0°F)
CCIG Temperature	-110.3°K (-261.0°F)

ALSEP 1 SCIENCE REPORT  
April 10, 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, 10 April

ALSEP 1 has now operated for 142 consecutive days on the lunar surface. Scientific data is quiescent in the lunar night environment. Downlink telemetry indicates that the central station and experiments continue to maintain thermal equilibrium. ALSEP 1 will experience the start of its sixth lunation as lunar sunrise is predicted to occur at 13:05 CST, 15 April.

The central station continues its operation with the average thermal temperature stabilized at 21.0°F. Signal strength fluctuations continue at infrequent intervals. Normal downlink telemetry signal strength continues to be -140 dbm. No downlink frequency shifts have been indicated since the implementation of transmitter B. RTG output power is steady at 73 watts. A total of 3065 commands have been transmitted to and implemented by ALSEP 1 since its deployment.

The Passive Seismic Experiment sensor temperature remains stable at 126°F. As a result of this, infrequent leveling of the PSE has been required. The PSE has indicated no significant science data during any of the real time support periods during the past seven days.

The Lunar Surface Magnetometer axes field sensor outputs continue to read OFF scale, interrupting science outputs. This deflection has occurred during each previous lunation at the same instrument temperatures. Engineering parameters indicate that LSM temperatures remain stabilized.

The Solar Wind Spectrometer temperatures remain stabilized. No change in activity has been indicated as the instrument continues to function normally.

The Suprathermal Ion Detector Experiment is showing very little science data as the instrument continues to function with Channeltron High Voltage ON. The Cold Cathode Gauge high voltage remains in the OFF mode. Both the SIDE and CCIG temperatures continue to be stable.

Status as of 09:00 CST, 10 April was as follows:

Sun Angle	293°
Input Power	73.43 watts
Reserve Power	17.08 watts
Heater and Power Dumps	10 watts ON (DSS 1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	20.5°F
PSE Sensor Assembly Temperature	126.0°F
LSM Sensor Temperature (Average)	35.4°C (95.7°F)
LSM Internal Temperature	-28.0°C (-18.4°F)
SWS Sensor Assembly Temperature	-134.3°C (-209.7°F)
SWS Internal Temperature Module 300	-15.6°C (3.9°F)
SIDE Temperature (Average)	3.8°C (38.8°F)
CCIG Temperature	103.0°K (-274.0°F)



ALSEP 1 SCIENCE REPORT  
15 April 1970

Apollo Lunar Surface Experiments Package Status Report - 23:00 CST, 14 April

ALSEP 1 continues operation with scientific and engineering data being transmitted to Earth.

Real time support was initiated at Mission Control at 18:30 CST, 14 April in order to observe the effects of the lunar impact by the SIVB stage of the Apollo 13 Saturn V vehicle. The impact occurred at 19:09 CST, 14 April, and forty seconds later first indications of the event were indicated on the three long period (X, Y, and Z) axes sensors of the Passive Seismic Experiment. The initial amplitude of the seismic event produced by the impact was very large, and it decreased slowly over a period of three and one-half hours at which time no further indications of the event could be observed. The impact occurred at a latitude of 2.4° South and a longitude of 27.9° West, 74 nautical miles from the ALSEP 1 site. The velocity of the SIVB five seconds prior to impact was 2.05 Kilometers per second. No precise information on the SIVB mass at time of impact is available at this time.

Status as of 23:00 CST, 14 April, was as follows:

Sun Angle	353°
Input Power	73.43 watts
Reserve Power	22.52 watts
Heater and Power Dumps	10 watts ON (DSS 1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	20.5°F
PSE Sensor Assembly Temperature	125.9°F
LSM Sensor Temperature (Average)	35.1°C (95.2°F)
LSM Internal Temperature	-28.0°C (-18.4°F)
SWS Sensor Temperature	-15.6°C (3.9°F)
SWS Module 300 Temperature	-134.3°C (-209.7°F)
SIDE Temperature (Average)	3.8°C (38.8°F)
CCIG Temperature	101.3°K (-277.1°F)

ALSEP 1 SCIENCE REPORT  
17 April 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, 17 April 1970

Scientific and engineering data continues to be transmitted from ALSEP 1 to Earth after more than 149 consecutive days of lunar operation. The start of the system's sixth lunation occurred at 13:09 CST, 15 April, as indicated by the Dust Detector's east facing solar cell (AX-06). Lunar sunrise optical terminator crossing, Phase II operations, were initiated at 18:30 CST, 15 April, and terminated at 19:15 CST, 16 April.

Central station and experiment engineering data indicate that temperatures are rising steadily as a function of increasing sun elevation. The Central Station DSS-1 heater (10 watts) was commanded OFF when the average thermal plate temperature reached  $40.1^{\circ}\text{F}$  at 19:16 CST, 15 April. Downlink signal strength fluctuations occurred at 09:10 CST, 16 April, concurrent with LM spacecraft downlink fluctuations. Sporadic fluctuations in downlink signal strength continued at infrequent intervals for one hour. The normal downlink telemetry signal strength remains constant at  $-140\text{ dbm}$ . A total of 3179 commands have been transmitted to and implemented by ALSEP 1 since its deployment.

The Apollo 13 SIVB impact initiated the only seismic activity noted during Phase II operations since the last reporting period, reference ALSEP 1 Science Report, 15 April. The Passive Seismic Experiment Z axis motor was commanded OFF at 02:33 CST, 16 April, when the sensor temperature was  $126.3^{\circ}\text{F}$ . The pulse train pattern in the short period Z axis sensor output (vertical) re-appeared at 05:07 CST, 16 April. The pulse train is characteristic to that which has occurred in previous lunations. The pulse train disappeared at 13:18 CST, 16 April.

The Lunar Surface Magnetometer's X, Y and Z axes field sensor outputs returned on-scale when the instrument's internal temperature reached  $-10.9^{\circ}\text{C}$  at 20:25 CST, 15 April. All axes indicate variant activity as the moon approaches the Earth's magnetic bow shock.

The Solar Wind Spectrometer has experienced no difficulties since deployment, continuing to record solar wind plasma activity for long term analyses.

The Suprathermal Ion Detector is indicating considerable low energy activity, and detected an expanding gas cloud which presumably swept over the lunar surface from the SIVB impact point. The Cold Cathode Gauge high voltage remains OFF.

The Dust Detector outputs continue tracking previous lunar day data.

Status at 03:00 CST, 17 April, was as follows:

Sun Angle	19°
Input Power	73.04 watts
Reserve Power	35.68 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	65.1°F
PSE Sensor Assembly Temperature	126.0°F
LSM Sensor Temperature (Average)	22.6°C (72.7°F)
LSM Internal Temperature	32.0°C (89.6°F)
SWS Sensor Temperature	21.6°C (65.9°F)
SWS Module 300 Temperature	32.4°C (90.3°F)
SIDE Temperature (Average)	39.2°C (102.6°F)
CCIG Temperature	308.8°K (96.4°F)

ALSEP 1 SCIENCE REPORT  
24 April 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST, 24 April

Scientific and engineering data continues to be transmitted from ALSEP 1 to Earth after more than 156 consecutive days of lunar operation. A special schedule of operation has been used for the Suprathermal Ion Detector Experiment to reduce the instrument's maximum temperature near lunar noon. The objective was achieved, i.e., optimum collection of high energy ion data during passage through the Earth's magnetic bow shock, and during lunar noon. During the times that Phase II operations (Mission Control support) were not actuated, Phase III operations (remoted site record of downlink only) were in effect.

Central station operation continues to be normal. Temperatures are decreasing as a function of decreasing sun angle. Lunar sunset is predicted to occur at 7:19 CDT, 30 April. RTG output power remains steady at 73 watts. To date 3339 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment (PSE) short-period Z pulse train was noted at resumption of real time support at 07:00 CST, 23 April. The pulse train is characteristic to that which has occurred in previous lunations. The pulse train had disappeared when real time support was resumed at 20:00 CST, on 23 April. The PSE sensor temperature (DL-C7) went off scale HIGH at 22:00 CST, 23 April.

The Lunar Surface Magnetometer's X, Y and Z axes field sensor outputs indicated variant activity as the moon passed behind the geomagnetic tail of the earth.

The Solar Wind Spectrometer has experienced no difficulties since deployment, continuing to record solar wind plasma activity for long term analyses.

The Suprathermal Ion Detector has indicated considerable high and low energy activity as the moon passed through the earth's magnetic bow shock and during lunar noon. The Cold Cathode Gauge high voltage remains OFF.

The Dust Detector outputs continue tracking previous lunar day data.

Status at 10:00 CST, 24 April, was as follows:

Sun Angle	72°
Input Power	73.04 watts
Reserve Power	41.37 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	87.4°F
PSE Sensor Assembly Temperature	OFF Scale High
LSM Sensor Temperature (Average)	66.7°C (152.0°F)
LSM Internal Temperature	75.2°C (167.0°F)
SWS Sensor Temperature	59.7°C (139.4°F)
SWS Module 300 Temperature	62.6°C (144.8°F)
SLIDE Temperature (Average)	44.1°C (111.5°F)
CCIG Temperature	372.6°K (211.0°F)

ALSEP 1 SCIENCE REPORT  
1 May 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 1 May

After more than 163 consecutive days of lunar operation, scientific and engineering data continues to be transmitted to earth. The package experienced its sixth lunar sunset at 07:16 CDT, 30 April.

Central Station telemetry indicates that the average thermal plate temperature continues decreasing steadily. The C/S 10 watt heater (DSS-1) was commanded ON at 05:03 CDT, 30 April, when the average thermal plate temperature was 24.6°F. Average down link signal strength is -139.0 dbm. RTG output remains steady at 73 watts. To date 3486 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment detected a low amplitude seismic event of approximately 90 minutes duration, on the X, Y and Z axes long period sensors beginning at 09:30 CDT, 26 April. The high frequency noise pattern in the short period Z axis sensor output reappeared at 07:50 CST, 24 April. This output pattern subsided and then completely disappeared. A noise pattern of similar nature has appeared at indiscriminate times previously. In addition to the thermal control mode in AUTO ON, the Z motor was commanded ON in the AUTO MODE at 20:16 CDT, 30 April. PSE sensor temperature (DL-07) was 125.6°F at Z motor turn-on. Normal re-leveling of the PSE sensors has been required in conjunction with the optical terminator crossing.

The Lunar Surface Magnetometer has indicated limited science activity since the last reporting period. All instrument temperatures continue to decrease. The Y axis field sensor output deflection since the last lunar sunrise is as follows:

<u>Y Axis Field Sensor Output Status</u>	<u>Y Axis Field Sensor Temp.</u>	<u>LSM Internal Temp.</u>	<u>Date/Time (CDT)</u>
-95% full scale deflection	63.5°C	71.4°C	25 April 08:38
Normal (0% deflection)	63.5°C	71.4°C	25 April 09:34
-95% full scale deflection	59.2°C	67.7°C	25 April 20:35
Normal (0% deflection)	33.2°C	45.8°C	28 April 10:16

The Solar Wind Spectrometer continues to operate normally.

The Suprathermal Ion Detector Experiment continues operable, and measured normal High and Low energy particle counts till prior to sunset. The Cold Cathode Gauge high voltage remained off. Instrument temperatures continue to decrease slowly.

All Dust Detector cell outputs tracked previous lunar day data until sunset, at which time the west cell output (AX-04) went off-scale Low. The east and vertical outputs went off-scale Low prior to sunset.

Status at 0300 CDT, 1 May, was as follows:

Sun Angle	189°
Input Power	73.43 watts
Reserve Power	13.54 watts
Heater and Power Dumps	10 watts ON (DSS-1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	22.4°F
PSE Sensor Assembly Temperature	126.3°F
LSM Sensor Temperature (Average)	21.3°C (70.3°F)
LSM Internal Temperature	-11.5°C (11.3°F)
SWS Sensor Temperature	-129.0°C (-200.2°F)
SWS Module 300 Temperature	-8.2°C (17.2°F)
SIDE Temperature (Average)	10.1°C (50.2°F)
CCIG Temperature	125.9°K (-232.8°F)

## ALSEP 1 SCIENCE REPORT

8 May 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 8 May

ALSEP 1 continues to transmit scientific and engineering data to Earth after more than 170 consecutive days of operation. Scientific data is quiescent in the lunar night environment, as systems temperatures continue decreasing. At present telemetry data is being monitored in Mission Control on an intermittent schedule of two hours per day.

Central station downlink telemetry indicates that the average thermal plate temperature has stabilized at 21<sup>o</sup>F. RTG output power is steady at 73 watts. Downlink signal strength has experienced infrequent fluctuations since the last reporting period; however, the normal signal strength remains constant at -140 dbm. A total of 3562 commands have been transmitted to and implemented by ALSEP 1 since its deployment.

The Passive Seismic Experiment sensor temperature has stabilized at 126<sup>o</sup>F as a result of the Z axis sensor leveling motor being ON in the AUTO MODE. This is in addition to the normal procedure of commanding the PSE thermal control mode to AUTO ON. No seismic activity has been noted during Phase II operations since the last reporting period.

The Lunar Surface Magnetometer field sensor outputs have indicated limited science activity since the last reporting period. At the resumption of real time support on May 2, the three axes field sensor outputs indicated full scale deflection interrupting the science output. This deflection is identical to that which occurred during previous lunations. As of this reporting period, each output is still indicating full scale deflection.

The Solar Wind Spectrometer continues normal operations, with no significant fluctuations being detected.

The Suprathermal Ion Detector Experiment is indicating low activity, a normal indication in the lunar night environment. The Cold Cathode Gauge high voltage remains OFF.

Status as of 09:00 CDT, 8 May, was as follows:

Sun Angle	279 <sup>o</sup>
Input Power	72.89 watts
Reserve Power	12.99 watts
Heater and Power Dumps	10 watts ON (DSS-1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	20.5 <sup>o</sup> F
PSE Sensor Assembly Temperature	126.0 <sup>o</sup> F
LSM Sensor Temperature (Average)	35.2 <sup>o</sup> C (95.4 <sup>o</sup> F)
LSM Internal Temperature	-26.3 <sup>o</sup> C (-15.3 <sup>o</sup> F)
SWS Sensor Assembly Temperature	-134.3 <sup>o</sup> C (-209.7 <sup>o</sup> F)
SWS Internal Temperature Module 300	-15.6 <sup>o</sup> C (3.9 <sup>o</sup> F)
SIDE Temperature (Average)	4.0 <sup>o</sup> C (39.2 <sup>o</sup> F)
CCIG Temperature	103.0 <sup>o</sup> K (-274.0 <sup>o</sup> F)

ALSEP 1 SCIENCE REPORT  
15 May 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 15 May 1970

Scientific and engineering data continues to be transmitted from ALSEP 1 to Earth after more than 177 consecutive days of lunar operation. The package experienced the beginning of its seventh lunation at 02:10 CDT, 15 May, when the Dust Detector's east facing solar cell output (AX-06) returned on scale. Real time support for the optical terminator crossing was initiated at 08:00 CDT, 15 May, and will continue for 24 hours.

Engineering data indicates that the central station (c/s) and experiment temperatures are rising steadily as a function of increasing sun elevation. No signal strength fluctuations have been indicated since the last reporting period. The normal downlink signal strength remains constant at -140 dbm. To date a total of 3572 commands have been transmitted to and implemented by ALSEP 1. The number of commands indicated here does not include the SIDE load commands (octals 104, 105, 106 and 107). The number includes only the execute commands (octal 110). RTG output power is steady at 73 watts.

No seismic activity has been indicated by the Passive Seismic Experiment during the intermittent real time support schedule of the past seven days. The Z axis sensor leveling motor and thermal control mode continues in the AUTO ON MODE at the present time.

The Lunar Surface Magnetometer field sensor outputs continue to read OFF scale as of this reporting period. Therefore, interruption of science output continues.

The Solar Wind Spectrometer continues normal operations recording solar wind plasma activity for long term analyses.

The Suprathermal Ion Detector Experiment continues to function with Channeltron High Voltage ON. The Cold Cathode Gauge high voltage remains in the OFF mode.

The Dust Detector east cell output (AX-06) returned on scale coincident with sunrise, and the other two cell outputs returned on scale shortly thereafter. All outputs are tracking previous lunar day data.

Status as of 09:00 CDT, 15 May, was as follows:

Sun Angle	4°
Input Power	72.89 watts
Reserve Power	16.53 watts
Heater and Power Dumps	10 watts ON (DSS-1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	40.0°F
PSE Sensor Assembly Temperature	126.1°F
LSM Sensor Temperature (Average)	33.3°C (91.9°F)
LSM Internal Temperature	-15.5°C (4.1°F)
SWS Sensor Assembly Temperature	-16.0°C (3.2°F)
SWS Internal Temperature Module 300	-6.9°C (19.6°F)
SIDE Temperature (Average)	10.5°C (50.9°F)
CCIG Temperature	201.1°K (-97.4°F)



ALSEP 1 SCIENCE REPORT  
22 May 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 22 May 1970

ALSEP 1 continues to transmit scientific and engineering data to Earth after more than 184 consecutive days of operation. Real time support for the beginning of the seventh lunation of the package was initiated at 08:00 CDT, 15 May and terminated at 08:00 CDT, 16 May. Cyclical commanding of the SIDE was initiated 16 May to minimize internal aging of the instrument. The cyclical commanding sequence is identical to that followed during the three previous lunar days.

Control station (C/S) engineering data indicate that temperatures are rising steadily as a function of increasing exposure of the package to solar radiation during the seventh lunar day. The C/S DSS-1 heater (10 watts) has commanded OFF when the average thermal plate temperature was 46.9°F at 10:14 CDT, 15 May. RTG output power is steady at 73 watts. No significant signal strength fluctuations have been indicated during the past seven days. To date, a total of 3715 commands have been transmitted to and implemented by ALSEP 1.

No seismic activity has been indicated by the Passive Seismic Experiment sensors during the real time support schedule of the past seven days.

The Lunar Surface Magnetometer's X, Y, and Z axes field sensor outputs are indicating variant activity as the Moon passes through the Earth's geomagnetic tail.

The Solar Wind Spectrometer continues to record solar wind plasma activity for long term analyses.

The Suprathermal Ion Detector Experiment has indicated moderate low energy activity since lunar sunrise. The Cold Cathode Gauge high voltage remains OFF.

The Dust Detector cell outputs are exhibiting the same trend as during the six previous lunations.

Status as of 09:00 CDT, 22 May, was as follows:

Sun Angle	86°
Input Power	73.04 watts
Reserve Power	35.61 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	88.5°F
PSE Sensor Assembly Temperature	138.2°F
LSM Sensor Temperature (Average)	73.6°C (164.5°F)
LSM Internal Temperature	75.3°C (167.5°F)
SWS Sensor Assembly Temperature	59.7°C (139.5°F)
SWS Internal Temperature Module 300	62.6°C (144.7°F)
SIDE Temperature (Average)	43.4°C (110.1°F)
CCIG Temperature	372.6°K (211.3°F)

ALSEP 1 SCIENCE REPORT  
28 May 1970

Apollo Lunar Surface Experiments Package Status Report - 12:00 CDT, 28 May 1970

ALSEP 1 has now operated for 190 consecutive days on the lunar surface. Engineering data indicate normal temperature changes of the central station and all experiments as a function of decreasing exposure of the package to solar radiation. The package will experience the beginning of its seventh lunar night as lunar sunset is predicted to occur at 18:45 CDT, 29 May. Real time support for the optical terminator crossing will commence at 17:00 CDT, 29 May and continue for at least 24 hours.

Central station telemetry indicates that the average thermal plate temperature is currently decreasing at a rate of  $0.2^{\circ}\text{F}$  per hour. The RTG output power is varying between 72 and 73 watts. At 09:34 CDT, 26 May, a spurious command verification word, Timer Output Accept (Octal 032), was downlinked to the remoted site at Goldstone, California. At 10:28 CDT, 27 May, two Timer Output Inhibit Commands (Octal 033) were transmitted in order to determine if the Timer Output Accept command was executed (reference ALSEP 1 SCIENCE REPORT, 6 March 1970). The hours and minutes register of the delayed command sequencer had been left in the SIDE Operate Select logic status. If the Octal 032 had been executed, the two Octal 033 commands would cause the logic to advance two more counts and perform an LSM flip/calibration sequence. This was the case as functional change was noted in the data after the second transmission of Octal 033. A total of 3822 commands have been transmitted to and implemented by ALSEP 1 since its deployment.

The Passive Seismic Experiment continues normal operation with releveling of the sensors being accomplished as required. No significant seismic activity has been observed since the last reporting period.

The Lunar Surface Magnetometer X, Y, and Z axes sensor outputs all indicated activity in varying degrees as the moon moved from the magnetopause and then through the earth's magnetic bow shock. At the resumption of real time support on 25 May, the Y axis sensor output had again experienced a 95% full scale negative deflection. This deflection is identical to that which occurred during all previous lunations. The Y axis sensor temperature at the time was  $59.2^{\circ}\text{C}$  and the LSM internal temperature was  $67.7^{\circ}\text{C}$ . The Y Axis Steady Field Offset commands (Octal 124) were transmitted and functionally recentered the

the output. At the resumption of real time support on 27 May, the Y axis deflection had dissappeared. At this time the Y axis sensor temperature was  $34.6^{\circ}\text{C}$  and the LSM internal temperature was  $50.8^{\circ}\text{C}$ .

The Solar Wind Spectrometer continues to record data for long term analyses as the instrument continues to function normally.

The Suprathermal Ion Detector Experiment is presently functioning with Channeltron High Voltage ON. The Cold Cathode Gauge high voltage remains OFF.

The Dust Detector cell outputs are closely following trends exhibited during previous lunations.

Status as of 10:00 CDT, 28 May, was as follows:

Sun Angle	$163^{\circ}$
Input Power	73.04 watts
Reserve Power	37.30 watts
Heater and Power Dumps	ALL OFF
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	$54.1^{\circ}\text{F}$
PSE Sensor Assembly Temperature	$134.0^{\circ}\text{F}$
LSM Sensor Temperature (Average)	$37.0^{\circ}\text{C}$ ( $98.6^{\circ}\text{F}$ )
LSM Internal Temperature	$40.3^{\circ}\text{C}$ ( $104.5^{\circ}\text{F}$ )
SWS Sensor Assembly Temperature	$19.0^{\circ}\text{C}$ ( $66.2^{\circ}\text{F}$ )
SWS Internal Temperature Module 300	$39.3^{\circ}\text{C}$ ( $102.7^{\circ}\text{F}$ )
SIDE Temperature (Average)	$47.0^{\circ}\text{C}$ ( $116.6^{\circ}\text{F}$ )
CCIG Temperature	$331.5^{\circ}\text{K}$ ( $137.3^{\circ}\text{F}$ )

ALSEP 1 SCEINCE REPORT  
5 June, 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 5 June 1970

The ALSEP 1 system continues transmitting scientific and engineering data to earth more than 198 days after deployment on the lunar surface. Currently, the package is in its seventh lunar night. Lunar sunset occurred at 18:46 CDT, 29 May. Since that time Phase II operations (Mission Control support) during lunar night have been reduced from the previous intermittent two-hour support periods to intermittent one-hour support periods. The reduced Phase II operations schedule will not preclude Mission Control from requesting an extension of Phase II operations as required.

The central station engineering telemetry indicates that the average thermal plate temperature is stable at 20.7° F. The 10 watt heater (DSS 1) was commanded ON at 11:30 CDT, 29 May, when the average thermal plate temperature was 30.6° F. No signal strength fluctuations in the downlink telemetry have been reported in the past seven days. The RTG output is steady at 73 watts. A total of 3911 commands have been transmitted to and successfully implemented by ALSEP 1 to date.

The Passive Seismic Experiment sensor temperature has stabilized at 126° F. The instrument sensors were thermally stabilized by commanding the Z axis leveling motor ON in the AUTO MODE, in addition to the normal operational procedure of commanding the PSE thermal control mode to AUTO ON. Infrequent releveing has been required since the optical terminator crossing. No significant scientific data has been indicated by the PSE during real time operations.

The Lunar Surface Magnetometer X,Y and Z axes field sensor outputs deflected OFF scale, interrupting science data, at the resumption of real time support 09:45 CDT, 31 May. The average sensor temperature at that time was 35.1° C and the internal temperature was -21.4° C. This event is characteristic of the LSM occurring at the same point in each previous lunation.

The Solar Wind Spectrometer continues normal operation. No significant solar wind fluctuations have been indicated.

The Suprathermal Ion Detector Experiment is operating and measuring high and low energy particle counts. Particle activity is very low during lunar night. The Cold Cathode Gage remains in the OFF mode. The instrument temperatures continue to decline slowly.

The Dust Detector cell outputs tracked previous lunar day values. The East, Vertical, and West cell outputs sequentially went off scale low as a function of the lunar sunset.

Status as of 11:00 CDT, 3 June was as follows:

Sun Angle	237°
Input Power	72.89 watts
Reserve Power	12.99 watts
Heater and Power Dumps	10 watts ON (DSS-1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	20.7°F
PSE Sensor Assembly Temperature	126.1°F
LSM Sensor Temperature (Average)	32.2°C (91.7°F)
LSM Internal Temperature	-26.3°C (-15.3°F)
SWS Internal Temperature Module 300	-15.2°C (4.6°F)
SWS Sensor Assembly Temperature	-134.3°C (-209.7°F)
SIDE Temperature (Average)	3.8°C (38.8°F)
CCIG Temperature	106.5°K (-267.7°F)

ALSEP 1 SCIENCE REPORT  
12 June 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 12 June 1970

The ALSEP 1 system continues transmitting scientific and engineering data to earth more than 205 days after deployment on the lunar surface. At present, the system has stabilized in the lunar night environment and telemetry data is being monitored at MCC on an intermittent schedule (1 hour on alternate days) during lunar night. All data, 24 hours per day, is being recorded on magnetic tape at MSFN tracking stations for subsequent analysis.

The central station average thermal plate temperature is stable at 20.2<sup>o</sup>F. The normal downlink signal strength remains constant at -140 dbm. The RTG output is steady at 73 watts. A total of 3927 commands have been transmitted to and successfully implemented by ALSEP 1 to date.

The Passive Seismic Experiment sensor temperature has stabilized at 126<sup>o</sup>F. The instrument sensors were thermally stabilized by commanding the Z axis leveling motor ON in the AUTO MODE, in addition to the normal operational procedure of commanding the PSE thermal control mode to AUTO ON. No significant scientific data has been indicated by the PSE during real time operations.

The Lunar Surface Magnetometer field sensor outputs continue reading OFF scale interrupting science output. All LSM temperatures remain stabilized.

The Solar Wind Spectrometer has shown no significant change in scientific data, and continues to function normally with stabilized temperatures.

The Suprathermal Ion Detector continues to operate in full functional mode with Channeltron high voltage supply ON. The CCIG high voltage remains OFF. All instrument temperatures are stabilized.

Status at 09:00 CDT was as follows:

Sun Angle	346 <sup>o</sup>
Input Power	72.89 watts
Reserve Power	12.72 watts
Heater and Power Dumps	10 watts ON (DSS-1)
Experiment Status	All ON
Thermal Plate Temperature (Average)	20.2 <sup>o</sup> F
PSE Sensor Assembly Temperature	125.96 <sup>o</sup> F
LSM Sensor Temperature (Average)	35.2 <sup>o</sup> C (95.4 <sup>o</sup> F)
LSM Internal Temperature	-26.3 <sup>o</sup> C (-15.4 <sup>o</sup> F)
SWS Sensor Temperature	-134.3 <sup>o</sup> C (-209.7 <sup>o</sup> F)
SWS Module 300 Temperature	-15.6 <sup>o</sup> C (3.9 <sup>o</sup> F)
SLIDE Temperature (Average)	3.5 <sup>o</sup> C (38.3 <sup>o</sup> F)
CCIG Temperature	101.3 <sup>o</sup> K (-277.1 <sup>o</sup> F)

ALSEP 1 SCIENCE REPORT  
19 June 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 19 June 1970

ALSEP 1 continues to transmit scientific and engineering data to Earth after more than 212 consecutive days of operation. Real time support for the beginning of the eighth lunation of the package was initiated at 1930 CDT, 13 June and terminated at 2000 CDT 14 June. Cyclical commanding of the SIDE was initiated to minimize internal arcing of the instrument. The cyclical commanding sequence is identical to that followed during previous lunations.

Central Station (C/S) engineering data indicate that C/S temperatures are rising steadily as a function of increasing exposure of the package to solar radiation during the eighth lunar day. The C/S DSS-1 heater (10 watts) was commanded OFF when the average thermal plate temperature was  $41.8^{\circ}\text{F}$  at 16:03 CDT, 13 June. RTG output power is steady at 73 watts. The normal downlink signal strength remains constant at  $-140\text{ dbm}$ . To date, a total of 4070 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment long-period sensors detected activity beginning at 12:06 CDT on 14 June. The data observed was in the form of bursts of damped oscillation. The frequency of the oscillations were  $0.422\text{ Hz}$  and damped, resulting in as low as 3 cycles and as many as 7 cycles of signal in each burst. The peak to peak amplitude of the first cycle in the bursts were 16 times greater than a typical cal pulse height, with the average amplitude being 2 times greater than the cal pulse height. The frequency of occurrence of the bursts was  $0.0137\text{ Hz}$ . The damped oscillation was observed on all three long-period axes. The signals stopped abruptly at 15:29 CDT, 14 June. The characteristic of the signal that has not been observed previously is the high cyclic occurrence of the oscillations. Interpretation of these oscillations is currently under investigation.

The Lunar Surface Magnetometer axes field sensors returned on scale at 23:53 CDT on 13 June. LSM housekeeping data indicated that internal temperature was  $-1.07^{\circ}\text{C}$  at that time. At 01:00 CDT, 14 June, a flip calibrate command was initiated. The results were an abnormal flip calibrate data signal. Engineering parameters indicate functional operation. The cal signal frequency was normal but the signal amplitudes were not correct and appeared to be random. The flip calibrate command initiated at 05:55 CDT, 16 June, indicated a normal data signal. Engineering data indicated internal instrument temperature was  $41.5^{\circ}\text{C}$ . The LSM field sensors measured considerable activity on all axes as the moon moved through the earth's magnetic bow shock into the earth's geomagnetic tail.



The Solar Wind Spectrometer continues to record solar wind plasma activity for long term analysis.

The Suprathermal Ion Detector Experiment has indicated moderate low energy activity since lunar sunrise. Cyclical ON/OFF commanding of the SIDE was initiated 16 June to minimize internal arcing of the instrument. The Cold Cathode Gauge high voltage remains OFF.

The Dust Detector cell outputs are exhibiting the same trend as during the six previous lunations.

Status at 09:00 CDT was as follows:

Sun Angle	71°
Input Power	73.04 watts
Reserve Power	41.37 watts
Heater and Power Dumps	OFF
Experiment Status	ON
Thermal Plate Temperature (Average)	88.1°F
PSE Sensor Assembly Temperature	128.50°F
LSM Sensor Temperature (Average)	70.16°C (158.28°F)
LSM Internal Temperature	73.29°C (163.92°F)
SWS Sensor Temperature	59.70°C (139.46°F)
SWS Module 300 Temperature	60.86°C (141.55°F)
SIDE Temperature (Average)	39.21°C (102.58°F)
CCIG Temperature	364.01°K (195.82°F)

ALSEP 1 SCIENCE REPORT  
26 June 1970

Apollo Lunar Surface Experiments Package Status Report - 09:00 CDT, 26 June 1970

ALSEP 1 has now operated for 219 consecutive days on the lunar surface. Engineering data indicates normal temperature changes of the central station and all experiments as a function of decreasing exposure of the package to solar radiation. The package will experience the beginning of its seventh lunar night as lunar sunset is predicted to occur at 5:54 CDT, 28 June. Real time support for the optical terminator crossing will commence at 03:30 CDT, 28 June, and continue for at least 24 hours.

Central station telemetry indicates that the average thermal plate temperature is currently decreasing at a rate of 0.25°F per hour. The RTG output power is stable at a constant 73 watts. No significant signal strength fluctuations have been indicated during the past seven days. To date, a total of 4174 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment long period sensors detected activity during its last reporting period. The data observed was in the form of bursts of damped oscillations. The series of damped oscillations observed on all three long period axes have been investigated by Dr. Latham and are considered to be characteristic of the PSE shroud noise anomaly observed during previous terminator crossings. This noise anomaly could be due to thermal expansion of the thermal shroud. The Passive Seismic Experiment sensor temperature, D107, did not go off scale high as had occurred during previous lunations. This is the first occurrence of D107 not going off scale since the second lunar day. The experiment developed a pulse train anomaly on 24 June.

The Lunar Surface Magnetometer field sensor outputs continue to indicate variant activity as the moon continues through the Earth's magnetic bow shock into the Earth's geomagnetic tail and into interplanetary space. The abnormal flip/cal noted in the last period science report did not repeat during this report period. The experiment did experience a 75% shift in the Y axis on 23 June, at 10:15 CDT.

The Solar Wind Spectrometer continues to record solar wind plasma activity for long term analysis.

The Suprathermal Ion Detector Experiment has indicated moderate low energy activity since lunar noon. The cyclical ON/OFF commanding of the SIDE continues to minimize internal arcing of the instrument. The Cold Cathode Gauge high voltage remains off.

The Dust Detector cell outputs are exhibiting the same trend as during the six previous lunations.

Status as of 10:00 CDT, was as follows:

Sun Angle	158°
Input Power	72.5 watts
Reserve Power	35.68 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	55.78°F
PSE Sensor Assembly Temperature	131.77°F
LSM Sensor Temperature (Average)	37.47°C (99.45°F)
LSM Internal Temperature	44.66°C (112.39°F)
SWS Sensor Assembly Temperature	24.32°C (75.78°F)
SWS Internal Temperature Module 300	43.58°C (110.44°F)
SIDE Temperature (Average)	95.6°C (204.08°F)
CCIG Temperature	339.36°K (151.45°F)

ALSEP 1 SCIENCE REPORT  
July 2, 1970

Apollo Lunar Surface Experiments Package Status Report - 09:00 CDT, July 2, 1970

Scientific and engineering data continue to be transmitted from ALSEP 1 to Earth after more than 225 consecutive days of lunar operations. At present, the system has stabilized in the lunar night environment and telemetry data are being monitored at Mission Control on an intermittent schedule (1 hour on alternate days) during lunar night. ALSEP 1 eighth lunar night Phase II operations (real time support) will be terminated for a period of 95 hours beginning at 11:00 CDT, July 2. All data, 24 hours per day, is being recorded on magnetic tape at MSFN tracking stations for subsequent analysis.

Central station engineering telemetry indicates that the average thermal plate temperature is stable at 21 F. The C/S 10 watt heater (DSS-1) was commanded on at 04:30 CDT, June 28, when the average thermal plate temperature was 23.8 F. The normal downlink signal strength remains constant at -140 dbm. The RTG output is steady at 73 watts. A total of 4283 commands have been transmitted to and successfully implemented by ALSEP 1 to date. Lunar sunset occurred at 05:54 CDT, June 28.

The Passive Seismic Experiment sensor temperature has stabilized at 126 F. The instrument sensors were thermally stabilized by commanding the Z axis leveling motor ON in the AUTO MODE, in addition to the normal operational procedure of commanding the PSE thermal control mode to AUTO ON. No significant scientific data have been indicated by the PSE during real time operations.

The Lunar Surface Magnetometer experienced another unexpected abnormal flip calibrate data signal at 23:00 CDT on June 28. LSM engineering data indicated that internal instrument temperature was -8.9 C. The instruments scientific output and engineering status all appeared to be valid.

The LSM X, Y, and Z axes field sensor outputs were deflected OFF scale LOW, interrupting science data, at the resumption of real time support at 13:00 CDT, June 29. At that time the internal temperature was -19.9 C. This event is characteristic of the instrument occurring at the same point in each previous lunation, except that the Z axis field sensor output normally deflects OFF scale HIGH. The instruments digital filter was commanded OUF resulting in the three field sensor outputs returning ON scale (X axis 60%, Y axis 25%, and Z axis 3%).

At the start of Phase II operations on June 30, the LSM engineering data were static along with the science data outputs. The instruments scientific outputs are static at 60% X axis, 25% Y axis, and 3% Z axis, while all engineering data are static. A data tape playback was conducted by the MSFN tracking stations that had supported ALSEP 1 the previous 24 hours, searching for the point at which the engineering data became static. The Carnarvon, Australia, tracking station found that the data change occurred at 21:09 CDT, June 29.

Interpretation of the LSM abnormal flip calibrate data signal, and the static scientific and engineering data output are currently under investigation.

The Solar Wind Spectrometer continues normal operation. No significant solar wind fluctuations have been indicated during real time operations.

The Superthermal Ion Detector Experiment is operating and measuring high and low energy particle counts. Particle activity is very low during lunar night. The Cold Cathode Gauge remains in the OFF mode.

The Dust Detector cell outputs tracked similar previous lunar day values. The East, vertical, and West cell outputs sequentially went off scale LOW as a function of the lunar sunset.

Status as of 10:00 CDT was as follows:

Sun Angle	230°
Input Power	72.89 watts
Reserve Power	12.99 watts
Heater and Power Dumps	10w heaters on
Experiment Status	All on
Thermal Plate Temperature (Average)	20.58° F
PSE Sensor Assembly Temperature	126.03° F
SWS Sensor Assembly Temperature	-134.31° C (-209.76° F)
SWS Internal Temperature Module 300	-15.23° C (+4.58° F)
SIDE Temperature (Average)	+4.15° C (39.47° F)
CCIG Temperature	106.47° K (-267.8° F)

ALSEP 1 SCIENCE REPORT  
July 10, 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT

The ALSEP 1 system continues transmitting scientific and engineering data to Earth more than 233 days after deployment on the lunar surface. At present, the system has stabilized in the lunar night environment and telemetry data are being monitored at Mission Control on an intermittent schedule (1 hour on alternate days) during lunar night. All data, 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analysis. Lunar midnight occurred at 15:00 CDT, July 5.

Central station engineering telemetry indicates that the average thermal plate temperature is stable at 20°F. The normal downlink signal strength remains constant at -140 dbm. The RTG output is steady at 73 watts. A total of 4308 commands have been transmitted to and successfully implemented by ALSEP 1 to date.

The Passive Seismic Experiment sensor temperature is stabilized at 126°F. The instrument sensors were thermally stabilized by commanding the Z axis leveling motor ON in the AUTO MODE, in addition to the normal operational procedure of commanding the PSE thermal control mode to AUTO ON. The PSE has indicated no significant science data during any of the real time support periods the past eight days.

The Lunar Surface Magnetometer scientific and engineering data outputs remain static and unusable. A data tape playback was conducted by MCC and the Carnarvon, Australia, tracking station on 6 July, to review the point at which the instrument's engineering data became static.

A listing of those LSM data is provided below, and includes those status changes prior to and after 21:09 CDT, 29 June.

	<u>Data Point</u>	<u>Before</u>	<u>After</u>
1.	X axis field output	74.68	62.20
2.	Y axis field output	-51.28	-51.28
3.	Z axis field output	-93.60	-93.60
4.	X sensor temperature	40.0°C	120 pcm count
5.	Y sensor temperature	32.5°C	120 pcm count
6.	Z sensor temperature	36.1°C	120 pcm count
7.	Instrument base temperature	-30.2°C	120 pcm count
8.	Instrument internal temperature	-21.4°C	120 pcm count
9.	Flip calibrate mechanism operation	normal	normal
10.	Status data remains unaffected		

Interpretation of the LSM static scientific and engineering data outputs is currently under investigation.

The Solar Wind Spectrometer continues normal operation.

The Suprathermal Ion Detector Experiment is operating normally. Particle activity is very low during lunar night. The Cold Cathode Gauge high voltage power supply remains inoperative. The CCIG internal engineering temperature measurement continues to be recorded.

Status as of 10:00 CDT was as follows:

Sun Angle	211°
Input Power	72.9 watts
Reserve Power	12.7 watts
Heater and Power Dumps	10 watts (heater ON)
Experiment Status	All ON
Thermal Plate Temperature (Average)	19.9°F
PSE Sensor Assembly Temperature	125.9°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-134.3°C (-209.7°F)
SWS Internal Temperature Module 300	-15.6°C (3.9°F)
SIDE Temperature (Average)	4.27°C (39.7°F)
CCIG Temperature	101.3°K (-277.1°F)

ALSEP 1 SCIENCE REPORT  
17 July, 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 17 July 1970

ALSEP 1 system continues to transmit scientific and engineering data to Earth after more than 240 consecutive days of lunar operation. The start of the ninth lunation occurred at 00:14:58 CDT, 13 July, as indicated by the Dust Detector's east-facing solar cell (AX-06). Lunar sunrise optical terminator Phase II operations (real time support) were initiated at 06:30 CDT, 13 July and terminated 05:00 CDT, 14 July. Cyclical operation of the SIDE was initiated 09:00 CDT, 15 July, to minimize internal arcing of the instrument during the ninth lunar day. The cyclical commanding sequence is identical to that followed during previous lunations.

Central Station and experiment engineering data indicate that temperatures are rising steadily as a function of increasing exposure of the package to solar radiation during the ninth lunar day. The central station DSS-1 heater (10 watts) was commanded OFF when the average thermal plate temperature reached 43.0°F at 12:11 CDT, 13 July. RTG output power is steady at 73 watts. The downlink signal strength remains constant at -140 dbm. To date, a total of 4581 commands have been transmitted to and implemented by ALSEP 1 since its deployment.

No seismic activity has been indicated during Phase II operations by the Passive Seismic Experiment since the last reporting period. The PSE Z motor was commanded off at 13:16 CDT, 13 July. The PSE sensor heater remains in AUTO ON as requested by the P.I. The PSE short-period Z pulse train re-occurred at 14:00 CDT, 13 July, and disappeared at 23:10 CDT, 13 July. The pulse train is characteristic to that which has occurred in previous lunations. The PSE long-period (X, Y, and Z axes) oscillations reappeared at 22:11 CDT, 13 July and stopped at 02:22, 14 July. The oscillations are characteristic to that which occurred during the last lunation.

The Lunar Surface Magnetometer housekeeping channels indicated the return of valid engineering data at 09:48, 13 July. The LSM internal temperature was -3.18°C. The LSM axes field sensor outputs indicated valid science data at 12:10, 13 July. The instrument internal temperature was -0.05°C. The abnormal flip calibrate data signal disappeared at 10:30 CDT, 16 July, at an LSM internal temperature of 50.8°C. The LSM X, Y, and Z axes field sensor outputs all indicated variant activity as the moon moved from the magneto-pause and then through the Earth's magnetic bow shock.



The Solar Wind Spectrometer was commanded to High Gain Mode at 11:27 CDT, 13 July, due to increased proton activity. The SWS is to be left in High Gain Mode for a period of one week. SWS even sequence data was not displayed at MCC between 08:50, 25 June and 08:40, 16 July, due to a malfunction in the MCC software. All data, 24 hours per day, has been recorded on magnetic tape at the MSFN tracking stations for subsequent analysis.

The Suprathermal Ion Detector Experiment has indicated increased low energy activity associated with the Earth's magnetic bow shock. The Cold Cathode Gauge high voltage remains inoperative. Cyclical commanding of the SIDE is planned for this lunar day to minimize internal arcing of the instrument, and maximize scientific return.

The Dust Detector cell outputs are exhibiting similar trends as noted during previous lunations.

Status as of 10:00 CDT, was as follows:

Sun Angle	51°
Input Power	72.50 watts
Reserve Power	39.47 watts
Heater and Power Dumps	OFF
Experiment Status	ON
Thermal Plate Temperature (Average)	85.0°F
PSE Sensor Assembly Temperature	127.25°F
LSM Sensor Temperature (Average)	57.80°C (136.1°F)
LSM Internal Temperature	62.57°C (144.8°F)
SWS Sensor Assembly Temperature	52.18°C (125.9°F)
SWS Internal Temperature Module 300	59.16°C (138.4°F)
SIDE Temperature (Average)	31.10°C (88.0°F)
CCIG Temperature	347.41°K (165.9°F)

# ALSEP 1 SCIENCE REPORT

July 24, 1970

## Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 24 July 1970

ALSEP 1 has now operated for 247 consecutive days on the lunar surface. Engineering data indicates normal temperature changes of the central station and all experiments as a function of decreasing exposure of the package to solar radiation. The package will experience the beginning of its ninth lunar night as lunar sunset is predicted to occur at 1650 CDT, 27 July. Phase II, real time support for the optical terminator crossing will commence at 1430 CDT, 27 July, and continue for at least 24 hours.

Central station telemetry indicates that the average thermal plate temperature is currently decreasing at a rate of  $0.2^{\circ}\text{F}$  per hour. The RTG output power is stable at 73 watts. No significant downlink signal strength fluctuations have been indicated during the past seven days. To date, a total of 4847 commands have been transmitted to and implemented by ALSEP 1. A spurious command verification word, DSS 5-watt heater ON (octal 056) was downlinked to the remote site at Hawaii at 6:41 CDT, on July 19. The heater status was verified as ON. The heater OFF command (Octal 057) was transmitted to ALSEP 1 and executed at 09:15 CDT, 19 July. There were no temperatures or data out of tolerance as a result of this spurious command.

There has been no seismic activity recorded by the Passive Seismic Experiment since the last reporting period. The PSE sensor heater remains in the AUTO ON mode. The PSE sensor temperature, D107, did not go off scale high as has occurred in the past. This is second lunation where the sensor temperature did not go off scale high during lunar day operation. The PSE pulse train appeared at 14:14 CDT on 22 July and disappeared suddenly at 14:30 CDT. The anomalous pulse train was again present at the start of the Phase II operations (real time support), 13:42 CDT, on 23 July and is continuing at this time.

The Lunar Surface Magnetometer field sensor outputs continue to indicate variant activity as the moon continues through the Earth's magnetic bow shock into the Earth's geomagnetic tail and into interplanetary space. The LSM flip-calls were normal during this report period. The experiment indicated a 75% shift in the Y axis at 19:36 on 22 July. At the start of the Phase II operations on 23 July, at 13:42, the LSM Y axis offset was gone.

The Solar Wind Spectrometer is operating nominally, continuing to record solar wind plasma activity for long term analysis. A high/low gain SWS test was conducted during this report period. The test period was from 13:30 CDT on 22 July,

through 06:00 CDT on 23 July. The SWS sensor gain was changed by command each 30 minutes alternating its operation between high and low operation. This resulted in 30-minute segments of high gain data interlaced with 30-minute segments of low gain data. This operation was continued for the 16-hour support period. The resulting data will be analyzed by the P.I. for possible changes in the SWS future high/low gain operation.

The Suprathermal Ion Detector Experiment has indicated moderate low energy activity since lunar noon. The cyclical ON/OFF commanding of the SIDE continues to minimize internal arcing of the instrument. The Cold Cathode Gauge high voltage remains inoperative. The CCIG internal engineering temperature measurement continues to be recorded.

The Dust Detector cell outputs are exhibiting the same trend as during the eight previous lunations.

Status as of 10:00 CDT was as follows:

Sun Angle	137°
Input Power	72.12 watts
Reserve Power	4.69 watts
Heater and Power Dumps	OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	79.1°F
PSE Sensor Assembly Temperature	140.0°F
LSM Sensor Temperature (Average)	58.4°C (137.1°F)
LSM Internal Temperature	62.5°C (144.5°F)
SWS Sensor Assembly Temperature	42.0°C (107.6°F)
SWS Internal Temperature Module 300	56.7°C (134.1°F)
SIDE Temperature (Average)	35.4°C (95.7°F)
CCIG Temperature	364.0°K (195.9°F)

## ALSEP 1 SCIENCE REPORT

July 31, 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, July 31, 1970

The ALSEP 1 system continues transmitting scientific and engineering data to Earth more than 254 days after placement on the lunar surface. The package is currently in its ninth lunar night, lunar sunset having occurred at 16:51 CDT, 27 July. All data, 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analyses.

Central Station Engineering telemetry indicates that the average thermal plate temperature is stable at 21.0°F. The DSS-1 heater (10 watt) was commanded ON at 10:50 CDT, 26 July, when the average thermal plate temperature was 53.0°F. No downlink signal strength fluctuations have been reported during the past seven days. The signal strength remains constant at -140 dbm. The RTG output remains steady at 73 watts. A total of 4976 commands have been transmitted to and successfully implemented by ALSEP 1 to date.

There has been no seismic activity detected by the Passive Seismic Experiment during real time support operations since the last reporting period. The PSE thermal control mode remains in AUTO ON. The instruments Z axis leveling motor was commanded ON at 05:07 CDT, 28 July, as PSE sensor temperature, DL-07, declined to 125.4°F. The characteristic short-period Z axis pulse train appeared at 09:40 CDT, 26 July, and remained throughout the support period. The SP-Z pulse train reoccurred at 14:40 CDT, 27 July, and disappeared at 18:45 CDT, 27 July.

The Lunar Surface Magnetometer Experiment X, Y and Z axes field sensor outputs deflected Off scale HIGH, interrupting science data, at 01:51 CDT, 28 July. The LSM engineering data became static simultaneous with the sensor axes OFF scale deflection. At that time the internal temperature was 2.9°C. This event is characteristic to that which occurred during the previous lunation, except that the internal instrument temperature was -19.9°C.

The LSM experienced an abnormal flip calibrate status indication following execution of the scheduled flip calibration command at 04:33 CDT, 29 July. The LSM engineering status bits indicated that the Y axis sensor head failed to flip. Downlink telemetry indicated the X and Z axis sensor head positions were at zero degrees, while the Y axis head position remained at 180 degrees.

Contact with the LSM PI was established, and a unique commanding sequence supplied by the PI was implemented on 30 July in an effort to unlock the Y axis sensor head, and re-establish sensor head synchronization. The LSM failed to respond leaving the 3 sensor heads in the following positions; X = 0 degrees; Y = 180 degrees; and Z = 0 degrees.

Interpretation of the LSM abnormal static scientific and engineering data outputs, and the Y axis sensor head failure continue under investigation.

The Solar Wind Spectrometer continues to function normally (low gain mode). No significant change in activity has been indicated during real time support operations.

The Suprathermal Ion Detector Experiment is operating and measuring high and low energy particle counts, as the instrument continues to function with the Channeltron High Voltage ON in the lunar night environment. The Cold Cathode Gauge high voltage remains inoperative.

The Dust Detector cell outputs exhibited the same trend as previous lunar day data until sunset, at which time the west cell output (AX-04) went off scale LOW. The East and vertical cell outputs both went off scale LOW shortly prior to this.

Status as of 14:00 CDT, 30 July, was as follows:

Sun Angle	215°
Input Power	72.9 watts
Reserve Power	17.0 watts
Heater and Power Dumps	DSS#1 ON
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	21.0°F
PSE Sensor Assembly Temperature	126.13°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-131.70 °C (-205.1°F)
SWS Internal Temperature Module 300	-14.81 °C (5.3°F)
SIDE Temperature (Average)	4.37 °C (39.9°F)
CCIG Temperature	110.25 °K (-262.3°F)

# ALSEP 1 SCIENCE REPORT

August 7, 1970

## Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT

The ALSEP 1 system is transmitting scientific and engineering data to Earth more than 261 days after deployment on the lunar surface. At present, the system has stabilized in the lunar night environment and telemetry data are being monitored at Mission Control on an intermittent schedule (1 hour on alternate days) during lunar night. All data, 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analysis.

Central station engineering telemetry indicates that the average thermal plate temperature is stable at 20°F. The downlink signal strength remains constant at -140 dbm. The RTG output is steady at 73 watts. A total of 4993 commands have been transmitted to, and successfully implemented by, ALSEP 1 to date.

The Passive Seismic Experiment sensor temperature is stabilized at 126°F. The instrument sensors were thermally stabilized by commanding the Z axis leveling motor ON in the AUTO MODE to complement the usual procedure of commanding the PSE thermal control mode to AUTO ON. The PSE is recording low level science data.

The Lunar Surface Magnetometer scientific and engineering data outputs remain static and unusable. Interpretation of the LSM abnormal static scientific and engineering data outputs, and the Y axis sensor head flip anomaly continues under investigation.

The Solar Wind Spectrometer is operating normally.

The Suprathermal Ion Detector Experiment is indicating low level activity during lunar night. The Cold Cathode Gauge high voltage power supply remains inoperative. The CCGE internal engineering temperature measurement is being recorded.

Status as of 10:00 CDT was as follows:

Sun Angle	211°
Input Power	72.9 watts
Reserve Power	12.7 watts
Heater and Power Dumps	10 watts (heater ON)
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	19.9°F
PSE Sensor Assembly Temperature	125.9°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-134.3°C (-209.7°F)
SWS Internal Temperature Module 300	-15.6°C (3.9°F)
SIDE Temperature (Average)	4.27°C (39.7°F)
CCGE Temperature	101.3°K (-277.1°F)

## ALSEP 1 Science Report

14 August 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT 14 August 1970

The ALSEP 1 system continues to transmit scientific and engineering data to Earth after more than 268 consecutive days of operation. The package experienced the beginning of its tenth lunation at 11:09 CDT, 11 August, when the Dust Detector's east facing solar cell output (AX-06) returned on scale.

Central Station (C/S) engineering telemetry indicates that the C/S temperatures are rising steadily as a function of increasing sun elevation. The C/S DSS-1 (10 watt) heater was commanded OFF when the average thermal plate temperature reached 42°F at 18:03 CDT, 11 August. RTG output power is steady at 73 watts. The downlink signal strength remains constant at -140 dbm. A spurious command verification word, SIDE Load Command #2 (octal 105) was downlinked to the remoted site at Ascension Island at 17:53 CDT on August 13. To date, a total of 5090 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment Z axis leveling motor was commanded OFF at 23:00 CDT, 11 August, as the instruments sensor temperature, DL-07, increased to 126.3°F. The experiment long-period sensors detected activity beginning at 10:00 CDT on 12 August. The data observed was in the form of bursts of damped oscillation. The frequency of the oscillations were 0.33 Hz and damped, with a period of 90 seconds. Each burst contained approximately 17 cycles. This damped oscillation signal has the same characteristic of that previously observed during the eighth and ninth lunar days at the same approximate sun angle. Interpretation of these damped oscillations continue under investigation.

The Passive Seismic Experiment characteristic short-period Z axis pulse train appeared at 02:00 CDT, and remained until 12:27 CDT, 12 August.

The Lunar Surface Magnetometer field sensor outputs and engineering data returned, restoring valid science data at 12:28 CDT, 12 August.

The LSM internal temperature was 22.1°F. The instruments engineering status bits continue to indicate that the Y axis sensor head remains locked at a 180 degree position. Commanding sequences have been implemented in an effort to re-establish sensor head synchronization, with the LSM failing to respond.

The Solar Wind Spectrometer is operating normally in low gain mode. No significant change in activity has been indicated during real time support operations.

The Suprathermal Ion Detector Experiment data indicated that the instrument had changed from a normal operational mode prior to the start of real time support operations on 13 August at 18:30 CDT. The instruments operational mode was X10 Accumulation Interval, with an average temperature of 52.7°C. A command sequence was initiated to correct the abnormal operational mode. Cyclic ON/OFF commanding of the experiment was then initiated to minimize

internal activity of the instrument. The Cold Cathode Gauge high voltage power supply remains inoperative. The CCGE internal engineering temperature measurement is being recorded.

The Dust Detector cell outputs are exhibiting the same trend as during the nine previous lunations.

Status as of 01:00 CDT, 14 August 1970, was as follows:

Sun Angle	31°
Input Power	72.5 watts
Reserve Power	34.6 watts
Heater and Power Dumps	OFF
Experiment Status	ON
Thermal Plate Temperature (Average)	76.4°F
PSE Sensor Assembly Temperature	126.3°F
LSM Sensor Temperature (Average)	29.9°C (85.9°F)
SWS Sensor Assembly Temperature	32.8°C (91.0°F)
SWS Internal Temperature Module 300	46.5°C (115.8°F)
SIDE Temperature (Average)	53.9°C (129.2°F)
CCGE Temperature	323.8°K (123.4°F)



ALSEP 1 SCIENCE REPORT  
17 August 1970

Apollo Lunar Surface Experiment Package Status - 03:00 CDT, 17 August 1970

Phase II operations (Mission Control real time support) were initiated at 19:00 CDT, 16 August, to support the experiments package during the second lunar eclipse of 1970, and also the second since deployment of ALSEP 1. This eclipse, as the first, was a partial eclipse only. The minimum light intensity during the partial eclipse dropped to 90% at the ALSEP deployment site. Phase II operations in support of the eclipse were terminated at 03:00 CDT, 17 August.

The ALSEP 1 package was actually in the lunar eclipse from 20:36 CDT, 16 August until 00:10 CDT, 17 August, as indicated by AX-05, the dust detector top cell output. During this time, the external sunshield temperature (AT-01) experienced a maximum drop of 185.5°F, which was the greatest temperature decrease indicated by any sensor on the package.

A table is presented below to indicate the times of various significant parameter changes and the outputs of these parameters during the eclipse.

All Times on 16 August

Time	Telemetry Point	Eclipse Minimum	Normal Moon
20:36 CDT	Start of eclipse		
22:12 CDT	AX-05 Dust Detector Cell Output	-12.3 mv	-122.9mv
22:42 CDT	AT-01 External Sun- shield Temperature	-28.5°F	157°F
22:45 CDT	AR-01 RTG Hot Frame Temperature	1096°F	1137°F
22:46 CDT	CCGE Temperature	301.5°K	364.0°K
23:12 CDT	AT-10 Primary Structure Base Temperature	67.4°F	131.5°F
23:17 CDT	Average Thermal Plate Temperature	68.9°F	87.5°F

The attached graph is a plot of the central station external sunshield temperature (AT-01), dust detector top cell output (AX-05), and the CCGE temperature.

Central station telemetry indicated that the structural temperatures returned to previously recorded levels following the eclipse. During the eclipse the RTG power output increased to a peak value of 74.7 watts, before returning to a normal output of 72.5 watts. The MSFN tracking stations supporting the Phase II operations during the eclipse reported the downlink carrier frequency increased 20 KHz, returning to normal following the eclipse.

The Passive Seismic Experiment data indicated no significant scientific output during the eclipse. The activity on the 3 long-period components appears to have the same characteristic of that previously observed during optical terminator crossings. This activity is attributed to thermal instability of the PSE thermal shroud. Releveling of the long-period axes was not required during the eclipse.

The Lunar Surface Magnetometer indicated activity prior to, and during the eclipse. A high level of scientific output was observed from 23:45 CDT - 23:56 CDT, 16 August. Prior to the eclipse a flip calibrate command was initiated. The instruments engineering status bit continue to indicate that Y axis sensor head remains fixed at a 180 degree position. The LSM internal temperature was 71.4 °C.

The Solar Wind Spectrometer showed no significant variation in science output during the eclipse.

The Suprathermal Ion Detector was commanded to OPERATE SELECT for the duration of the eclipse. The experiment indicated a high level of activity (high-energy and low-energy counts) prior to, and during the eclipse. The instrument also experienced a significant burst of scientific activity from 23:45 CDT - 23:56 CDT, 16 August. The SIDE data during the eclipse is not characteristic of what has been seen previously. The Cold Cathode Gauge high voltage power supply remains inoperative.

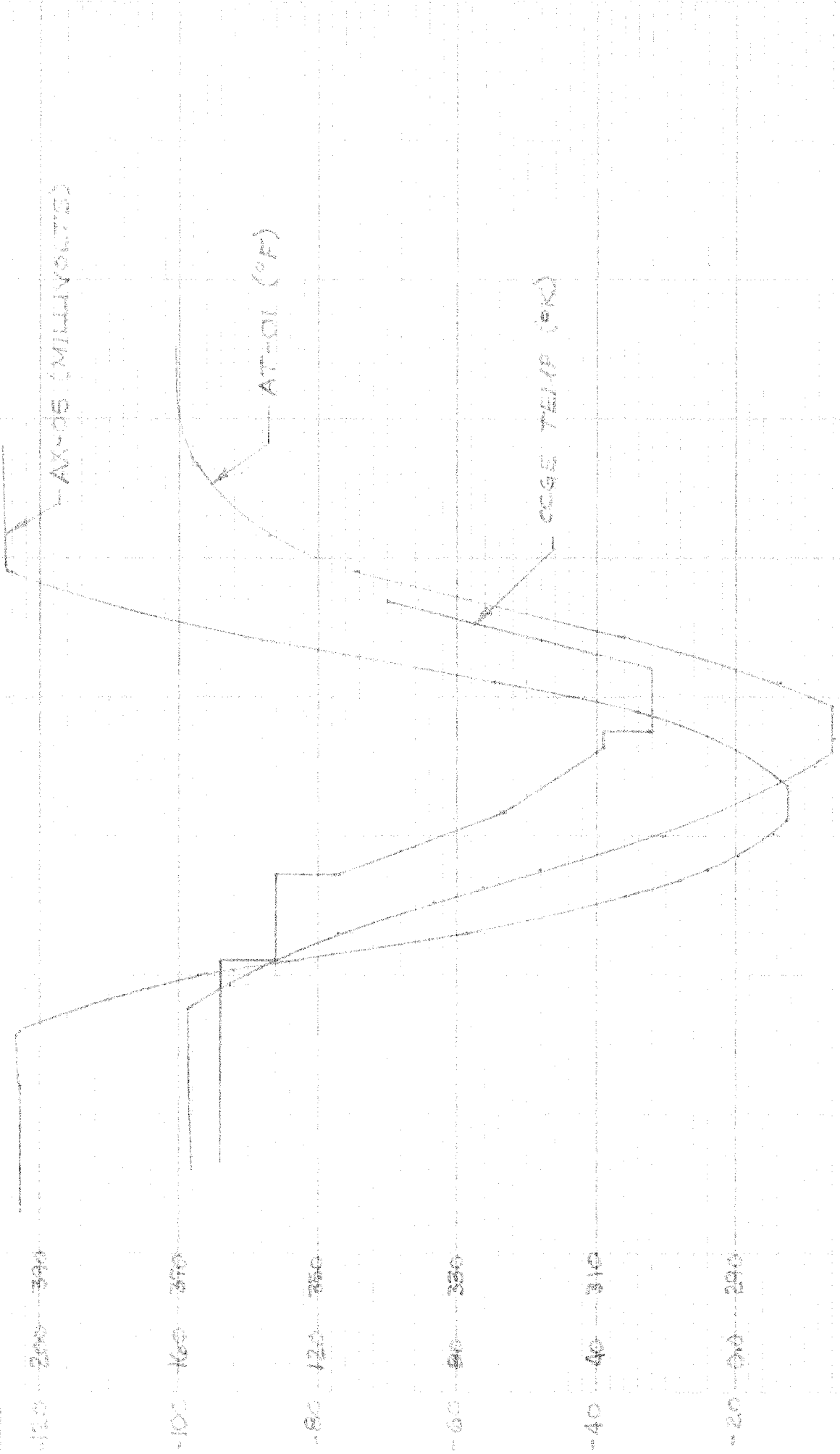
The Dust Detector Cell outputs all continue to track data recorded during previous lunations at the same sun angles with the exception of the period of the lunar eclipse.

Status as of 01:00 CST, 17 April, was as follows.

Sun Angle	68°
Input Power	72.5 watts
Reserve Power	39.95 watts
Heater and Power Dumps	All Off
Experiment Status	All On
Thermal Plate Temperature (Average)	74.9°F
PSE Sensor Assembly Temperature	127.21°F
LSM Sensor Temperature (Average)	46.1°C (115.0°F)
LSM Internal Temperature	59.4°C (138.8°F)
SWS Sensor Temperature	48.6°C (119.5°F)
SWS Module 300 Temperature	51.9°C (125.4°F)
SIDE Temperature (Average)	48.1°C (118.6°F)
CCIG Temperature	339.4°K (151.1°F)

# LUNAR ECLIPSE - 16 AUGUST, 1970

MAX  $\frac{mV}{\mu E}$   $\frac{\mu K}{\mu K}$



0.0 -40 270

2000 2100 2200 2300 0000 0100 0200 0300 G.S.T. 17 AUGUST

## ALSEP 1 SCIENCE REPORT

21 August, 1970

Apollo Lunar Surface Experiment Package Status Report - 10:00 CDT, 21 August, 1970

The ALSEP 1 system continues to transmit scientific and engineering data to Earth after more than 275 consecutive days of operation. Cyclical commanding of the Suprathermal Ion Detector Experiment has been in effect during this reporting period to minimize instrument mode changes during the tenth lunar day.

Engineering data indicates normal temperature changes of the central station and all experiments as a function of decreasing exposure of the package to solar radiation. The RTG output power is stable at 73 watts. The downlink signal strength remains constant at -140 dbm. To date, a total of 5254 commands have been transmitted to and implemented by ALSEP 1.

There has been no seismic activity detected by the Passive Seismic Experiment during real time support operations since the last reporting period.

The Lunar Surface Magnetometer field sensor outputs continue to indicate variant activity as the moon passed through the Earth's magnetic bow shock into interplanetary space. A unique commanding sequence was initiated to the instrument at 09:40 CDT, 18 August, in an effort to reset the instruments Y axis sensor head address logic, with the LSM failing to respond. The instruments engineering status bits continue to indicate that the Y axis sensor head remains fixed at a 180 degree position. A special flip calibrate commanding sequence has been implemented in order to keep the three axis sensor heads synchronized at the 180 degree position.

The Solar Wind Spectrometer is operating normally, continuing to record solar wind plasma activity for long term analysis.

The Suprathermal Ion Detector Experiment continues to indicate moderate low and high energy activity. The cyclical ON/OFF commanding of the SIDE continues to minimize mode changes of the instrument. The cyclical commanding sequence is identical to that followed during previous lunations. The Cold Cathode Gauge high voltage remains inoperative.

The Dust Detector cell outputs are exhibiting the same trend as during the nine previous lunar cycles.

Status as of 10:00 CDT, 21 August, was as follows:

Sun Angle	122°
Input Power	72.5 watts
Reserve Power	41.1 watts
Heater and Power Dumps	ALL OFF
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	85.8°F
PSE Sensor Assembly Temperature	141.2°F
LSM Sensor Temperature (Average)	70.3°C (158.1°F)
LSM Internal Temperature	69.5°C (157.0°F)
SWS Sensor Assembly Temperature	52.2°C (125.8°F)
SWS Internal Temperature Module 300	60.0°C (139.9°F)
SIDE Temperature (Average)	39.8°C (103.6°F)
CCGE Temperature	364.0 K (195.7°F)

ALSEP 1 SCIENCE REPORT  
28 August 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 28 August, 1970

No unusual scientific events were observed this week during the periods of Phase II operations (real-time monitoring) at the Mission Control Center. All data, 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analysis. In general, the experiments continue to follow the pattern of scientific and engineering measurements established during previous lunar cycles. The experiments package tenth lunar sunset occurred at ~~02:04~~ 04:12 CDT, 26 August.

After 282 consecutive days of lunar operation the RTG is still providing almost 20% more power than is required at peak load periods. The downlink signal strength remains constant at -140 dbm. To date, 5381 functional changes have been implemented in the system operational modes via the command uplink. The central station DSS-1 heater (10 watts) was commanded ON when the average thermal plate temperature reached 41.5<sup>0</sup>F, August 25.

The Passive Seismic Experiment is collecting continuous data to be analyzed in order to determine the repeatability of lunar oscillations seen during previous moon libration periods; with no significant long-period component activity detected during Phase II operations since the last reporting period. The PSE sensor temperature, DL-07, did not go OFF scale high as had occurred during the third thru seventh lunar day cycles. This is the third consecutive lunation (8th, 9th & 10th) where the sensor temperature remained ON scale. Telemetry data indicated that DL-07 peaked at 141.3<sup>0</sup>F on 21 August. The PSE SP-Z axis pulse train appeared at 18:24 CDT, 20 August, and was present during Phase II operations until 14:12 CDT, 25 August. The activity on the 3 long-period components appears to be characteristic of that previously observed during previous optical terminator crossings. This activity is attributed to thermal instability of the PSE thermal shroud. Releveling of the long-period axes is frequently required during this lunar cycle period. The anomalous SP-Z axis pulse train reappeared at 02:17 CDT, 26 August, and disappeared suddenly at 05:15 CDT. The PSE Z axis leveling motor was commanded ON at 14:12 CDT, 26 August, as the instruments sensor temperature, DL-07, decreased to 125.7<sup>0</sup>F.

After lunar sunset, the Lunar Surface Magnetometer stopped processing data; all scientific and engineering channels became static except the "flag" indicators of instrument operational mode. This simultaneous interruption of data occurred at 07:49 CDT, 26 August. At that time the internal temperature was 13.6<sup>0</sup>C. This event is characteristic to that which occurred after the previous lunar sunset and cleared up after sunrise, indicating a low-temperature effect. The instruments flag status bits continue to indicate that the Y axis sensor head remains fixed at a 180 degree position.

The Solar Wind Spectrometer continues to indicate higher particle counts during lunar days as opposed to lunar nights, as the instrument records scientific activity for long term analyses.

Suprathermal Ion Detector Experiment continued to indicate low and high energy activity thru the optical terminator crossing. During lunar night particle energy indicates a very low level of activity. The Cold Cathode Gauge high voltage remains inoperative.

The Dust Detector cell outputs exhibited the same trend during the optical terminator crossing as had been noted during the previous cycles.

Status as of 10:00 CDT, 28 August, was as follows:

Sun Angle	205°
Input Power	72.9 watts
Reserve Power	13.0 watts
Heater and Power Dumps	DSS HTR #1 ON (10 watts)
Experiment Status	All ON
Thermal Plate Temperature (Average)	21.0°F
PSE Sensor Assembly Temperature	126.16°F
LSM Sensor Temperature (Average)	Static
SWS Sensor Assembly Temperature	-131.70°C (-205.0°F)
SWS Internal Temperature (Module 300)	-14.39°C (6.1°F)
SIDE Temperature (Average)	4.03°C (39.3°F)
CCGE Temperature	110.25°K (-261.8°F)

ALSEP-1 Science Report  
4 September 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 4 Sept. 1970

The ALSEP-1 system continues transmitting scientific and engineering data to Earth more than 289 days after deployment on the lunar surface. At present, the system has stabilized its temperature in the lunar night environment. All data, scientific and engineering, are being continuously recorded by the remote tracking site with monitoring at Mission Control for a one hour period on alternate days. Lunar midnight occurred at 13:39 CDT on 2 September.

The central station average thermal plate temperature is stable at 20.2°F. A total of 5438 commands have been transmitted to and successfully implemented by ALSEP-1 to date. The RTG output is steady at 72.5 watts. An automatic switch-over from Transmitter B to Transmitter A occurred 1 September at 11:12 CDT. The remote site tracking the ALSEP-1 system and recording the downlink data was Corpus Christi, Texas. The site reported a 17dbm drop in signal strength (-138dbm to -155dbm) over a 4 second period starting at 11:12:40 CDT. The frequency of the downlink carrier was 2228.52576 MHz. At 11:13:10 CDT the downlink signal strength increased 18dbm over a 3 second period (-155dbm to -137dbm). Following the switch-over the downlink frequency was 2228.508672 MHz. The downlinked telemetry provided verification of the status change from Transmitter B to Transmitter A. The downlink data were not recorded by the remote site during the switch-over and therefore, whether the change was a result of a spurious command, a circuit breaker overload or a transmitter failure cannot be determined. Review of the pre-switch over data is continuing in an effort to determine the cause of the change.

The Passive Seismic Experiment sensor temperature has stabilized at 125.9°F. The instrument temperature is maintained at this value with the Z axis leveling motor and the PSE thermal control both in the AUTO ON mode of operation. At the start of the Phase II Support (real time Mission Control Operations) on 31 September the PSE sensor temperature was found to be higher than normal. Investigation revealed that a spurious X axis leveling motor ON command was received by ALSEP-1 at 00:53 CDT on 29 August resulting in a X motor ON condition. The DL-07 temperature before the spurious command was received, was 126.2°F. At the time the X axis leveling motor was turned OFF, (31 August, 11:10 CDT), 57 hr. 37 min. after the spurious command was received the sensor temperature reached 134.9°F. At the start of the Phase II support on 2 September the temperature had stabilized at 125.9°F. No significant scientific data has been indicated by the PSE during real time operations.

The Lunar Surface Magnetometer scientific and engineering data remains static during the report period. Also the Y sensor head system has not responded to a flip-cal command during this period. The X and Z sensors are returned to the 180° position following each attempted flip-cal to maintain sensor synchronization.



The Solar Wind Spectrometer has shown no significant changes in scientific data, and continues to function normally with stabilized temperatures.

The Suprathermal Ion Detector continues to operate recording low activity. The Cold Cathode Gauge high voltage remains inoperative. The CCGE internal temperature measurement continues to be recorded.

Status as of 10:00 CDT 4 September 1970 was as follows:

Sun Angle	287°
Input Power	72.8 watts
Reserve Power	16.5 watts
Heater and Power Dumps	LOW HEATER ON
Experiment Status	ALL On
Thermal Plate Temperature (Average)	19.9° F
PSE Sensor Assembly Temperature	125.9° F
LSM Sensor Temperature (Average)	STATIC
LSM Internal Temperature	STATIC
SWS Sensor Assembly Temperature	-134.3° C (-209.7° F)
SWS Internal Temperature Module 300	-15.6° C (+3.9° F)
SIDE Temperature (Average)	4.0° C (39.2° F)
CCIG Temperature	103.0° K (-274° F)

ALSEP-1 Science Report  
11 September 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 11 Sept. 1970

Scientific and engineering data continues to be transmitted from ALSEP-1 to Earth after more than 296 consecutive days of lunar operation. Real time support operations of the ALSEP-1 eleventh lunation were started 05:30 CDT, 10 September, and continue until 03:00 CDT, 11 September. The package detected sunrise at the ALSEP-1 site when the Dust Detector's east facing solar cell output (AX-06) returned on scale at 22:36 CDT, 9 September.

Central station (C/S) engineering telemetry indicates that the C/S temperatures are rising steadily as a function of increasing sun elevation. The C/S DSS-1 (10 watt) heater was commanded OFF at 6:05 CDT, 10 September. RTG output is steady at 72.5 watts. The downlink signal strength from ALSEP-1 Transmitter A is steady at -137 dbm. To date 5448 commands have been transmitted to, and implemented by, ALSEP-1.

The Passive Seismic Experiment (PSE) has not indicated any seismic data during real time support periods. The PSE Z axis leveling motor was commanded OFF at 8:40 CDT, 10 September. The PSE sensor heater remains in the AUTO ON mode of operation. Anomalous SP-Z axis pulse train reappeared at 12:46 CDT, 10 September, and was still present when real time support operations were suspended on 11 September.

The Lunar Surface Magnetometer (LSM) continues not processing data, as all scientific and engineering data remains static. The Y axis sensor head remains fixed at a 180° position, not responsive to flip-cal commands. The X and Z sensors are returned to the 180° position following each flip-cal to maintain sensor synchronization.

The Solar Wind Spectrometer continues to record solar wind plasma activity for long term analysis.

The Suprathermal Ion Detector Experiment (SIDE) has indicated moderate low energy activity since lunar sunrise. The Cold Cathode Gauge (CCGE) high voltage remains inoperative. The CCGE internal temperature measurement continues to be recorded.

The Dust Detector cell outputs are exhibiting the same trend as noted during previous sunrise terminator crossings.

Status as of 03:00 CDT, 11 September 1970 was as follows:

Sun Angle	18°
Input Power	72.5 watts
Reserve Power	29.7 watts
Heater and Power Dumps	OFF
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	53.8°F.
PSE Sensor Assembly Temperature	125.8°F.
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	16.4°C (61.6°F.)
SWS Internal Temperature Module 300	28.4°C (83.1°F.)
SIDE Temperature (Average)	32.1°C (89.8°F.)
CCIG Temperature	294.5°K (70.7°F.)

ALSEP-1 Science Report  
18 September 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 18 Sept. 1970

The ALSEP-1 system continues to transmit scientific and engineering data during the ALSEP-1 eleventh lunation to Earth after more than 303 consecutive days of operation. Engineering data indicates normal temperature changes of the central station and all experiments as a function of decreasing exposure of the package to solar radiation. The package will experience the beginning of its eleventh lunar night as lunar sunset is predicted to occur at 16:09 CDT, 24 September.

Central station telemetry indicates that the average thermal plate temperature is currently decreasing following lunar noon at 7:52 CDT, 17 September. The RTG power output is stable at 72.5 watts. No significant downlink signal strength fluctuations have been observed during the past reporting period. To date, a total of 5634 commands have been transmitted to and implemented by ALSEP-1. A spurious command verification word, Solar Wind Spectrometer (SWS) to Power Standby (Octal 046) was downlinked to the remoted site at Ascension Island at 12:23 CDT, 11 September. The SWS was returned to Power ON by command at 13:24 CDT, 11 September. There were no temperature, engineering or data out of tolerances as a result of this spurious command.

There has been no seismic activity recorded during real time support operations by the Passive Seismic Experiment (PSE) since the last reporting period. The anomalous SP-Z axis pulse train present at the time of publication of the ALSEP-1 Science Report on 11 September was gone at the start of the next real time support at 12:00 CDT, 11 September. The PSE sensor heater remains in the AUTO ON mode. The PSE sensor temperature, DL-07, did not go off scale high as has occurred in the past. The maximum temperature reached was 140.69<sup>o</sup>F. This is the fourth lunation where the sensor temperature did not go off scale high during lunar day operation.

The Lunar Surface Magnetometer (LSM) field sensor outputs continue to indicate activity as the moon moves from the Earth's geomagnetic tail into the Earth's magnetic bow shock and then into interplanetary space. The LSM field sensor outputs and engineering data returned, restoring valid science data at 13:54 CDT, 11 September, with an internal temperature of 31.13<sup>o</sup>C. The instruments flag status bits continue to indicate that the Y axis sensor head remains fixed at a 180 degree position. A special flip calibrate commanding sequence remains in effect in order to keep the three axis sensor heads synchronized at the 180 degree position.

The Solar Wind Spectrometer is operating normally, continuing to record solar wind plasmas activity for long term analysis.

The Suprathermal Ion Detector Experiment (SIDE) continues to indicate moderate low and high energy activity. The cyclical ON/OFF commanding of the SIDE continues to minimize mode changes of the instrument. As the instruments' environment approached lunar noon, the SIDE experienced two mode

changes. The first occurred at 21:05, 16 September with the average SIDE internal temperature of 41.7<sup>o</sup>F. and the second occurred at 22:56, 16 September at 42.1<sup>o</sup>F. The Cold Cathode Gauge high voltage remains inoperative.

The Dust Detector cell outputs are exhibiting the same trend as during the previous lunar cycles.

Status as of 07:00 CDT, 18 September 1970 was as follows:

Sun Angle	78 <sup>o</sup>
Input Power	72.5 watts
Reserve Power	38.7 watts
Heater and Power Dumps	Heaters OFF
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	90.7 <sup>o</sup> F.
PSE Sensor Assembly Temperature	140.4 <sup>o</sup> F.
LSM Sensor Temperature (Average)	79.0 <sup>o</sup> C. (174.2 <sup>o</sup> F.)
LSM Internal Temperature	77.3 <sup>o</sup> C. (171.1 <sup>o</sup> F.)
SWS Sensor Assembly Temperature	63.7 <sup>o</sup> C. (146.7 <sup>o</sup> F.)
SWS Internal Temperature Module 300	63.5 <sup>o</sup> C. (146.3 <sup>o</sup> F.)
SIDE Temperature (Average)	55.4 <sup>o</sup> C. (131.7 <sup>o</sup> F.)
CCIG Temperature	372.6 <sup>o</sup> K. (211.2 <sup>o</sup> F.)

ALSEP 1 Science Report  
25 September 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, Sept. 25, 1970

The ALSEP 1 system continues transmitting scientific and engineering data to Earth more than 310 days after placement on the lunar surface. The package is currently in its eleventh lunar night, lunar sunset having occurred at 16:12 CDT, 24 September. All data, 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analyses. A magnetic tape playback of the ALSEP 1 data from the MSFN site at Merritt Island, Florida, were monitored at Mission Control Center covering the time period of the Luna 16 landing and liftoff from the lunar surface. No unusual data signals above background were observed.

Central Station engineering telemetry continues to follow the pattern established in previous lunations. DSS-1 heater (10 watt) was commanded on at 10:58 CDT, 24 September, when the average thermal plate temperature was 56.8<sup>0</sup>F. The signal strength remains constant at -139 dbm. The RTG output remains steady at 73 watts. A total of 5745 command have been transmitted to and successfully implemented by ALSEP 1 to date.

There has been no seismic activity detected by the Passive Seismic Experiment during real time support operations since the last reporting period. The PSE thermal control mode remains in AUTO ON. The instruments Z axis leveling motor was commanded ON at 00:01 CDT, 25 September, as the PSE sensor temperature, DL-07, decreased to 125.7<sup>0</sup>F. The anomalous SP-Z axis pulse train reappeared at 05:31 CDT, 19 September, and disappeared at 18:00 CDT, 21 September. The pulse train reappeared on 22 September at 10:00 CDT and stopped abruptly at 18:59 CDT, 23 September. The PSE sensor temperature, DL-07, was OFF scale high at the beginning of real-time support at 05:30 CDT, 19 September, and returned on scale at 08:55 CDT, 21 September, when the sensor temperature reached 142.4<sup>0</sup>F. This OFF scale high condition is characteristic of the experiments third through seventh lunations.

Following lunar sunset, the Lunar Surface Magnetometer stopped processing data; all scientific and engineering channels became static except the "flag" indicators of instrument operational mode. This simultaneous interruption of data occurred at 17:32 CDT, 24 September. At the time the internal temperature was 18.8<sup>0</sup>C. This event is characteristic to that which occurred after the previous lunar sunset and cleared up after sunrise, indicating a low-temperature effect.

The Solar Wind Spectrometer continued to indicate higher particle counts during lunar days as opposed to lunar nights, as the instrument records scientific activity for long term analyses.

The Superthermal Ion Detector Experiment continues to indicate low and high energy activity thru the optical terminator crossing. During lunar

night, the particle energy indicates a very low level of activity. The Cold Cathode Gauge high voltage remains inoperative.

The Dust Detector cell outputs exhibited the same trend during the optical terminator crossing as had been noted during the previous cycles.

Status as of 09:00 CDT, 25 September, was as follows:

Sun Angle	188°
Input Power	72.9 watts
Reserve Power	12.7 watts
Heater and Power Dumps	DSS-1 ON
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	25.2° F
PSE Sensor Assembly Temperature	126.37° F
LSM Sensor Temperature (Average)	Static
SWS Sensor Assembly Temperature	-126.16° C (-195.3° F)
SWS Internal Temperature (Module 300)	-4.95° C (23.1° F)
SIDE Temperature (Average)	22.16° C (71.7° F)
CCGE Temperature	133.94° K (-218.0° F)

NOTE: The following correction should be made to the ALSEP-1 SCIENCE REPORT dated 18 September 1970. In the sixth paragraph, the fourth sentence should read:

"The first occurred at 21:05 CDT, 16 September, with an average SIDE internal temperature of 53.7° C, and the second occurred at 22:56 CDT, 16 September, when the instruments average internal temperature reached 55.9° C."

## ALSEP 1 Science Report

2 October 1970

### Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 2 October 1970

The ALSEP 1 system continues transmitting scientific and engineering data to Earth more than 317 days after placement on the lunar surface. At present, the system has stabilized in the lunar night environment. All data, scientific and engineering, are being continuously recorded by the remote tracking site with monitoring at Mission Control for a one hour period on alternate days. Lunar midnight occurred at 02:00 CDT, 2 October.

Central Station engineering telemetry indicates that the average thermal plate temperature is stable at 20.5<sup>o</sup>F. The RTG output remains steady at 72.5 watts. A total of 5804 commands have now been transmitted from the MSFN ground stations and processed by ALSEP 1.

Following the unexpected switchover from ALSEP transmitter "B" to transmitter "A" on 1 September, the downlink signal strength has varied between -137 dbm and -138 dbm. The MSFN tracking site at Corpus Christi, Texas, reported momentary loss of signal on 28 September and 30 September. The initial LOS on 28 September occurred at 07:37 CDT, lasting 7 seconds, being preceded by a 2-3 dbm signal drop in the negative direction. Another 6 second LOS occurred at 08:32 CDT, 28 September. The tracking site reported that neither LOS indicated a frequency change and that no signal strength retuning was required. The second LOS was not preceded by a dbm signal drop.

Texas reported LOS at 08:03 CDT, 30 September. The MSFN tracking site at Canary Islands, Spain, simultaneously monitoring the ALSEP downlink could not confirm LOS of the package signal as reported by the Texas site. The tracking station at Texas continued to report momentary LOS of ALSEP signal thru out its support period. Following real time operations with the experiments package Texas performed a ground station equipment check, and determined that the AR-7 amplifier in the antenna drive circuitry was intermittent in the Y axis, causing the antenna to drive off target.

On 28 September the Kokee Park, Hawaii, ground station reported that ALSEP 1 changed downlink data rate from the Normal Rate of 1060 bits per second to the Slow Data Rate of 530 bits per second at 17:33 CDT. The change in data rate interrupts the downlink data causing a momentary loss of sync, and the command verification word. The experiments package was returned to Normal Bit Rate by command at 19:56 CDT, 28 September. There were no temperature, engineering or data out of tolerances as a result of the functional change in the package.

There has been no seismic activity detected by the Passive Seismic Experiment during real time support operations since the last reporting period. The PSE Z axis leveling motor and thermal control both remain in AUTO ON. The Passive Seismic Experiment sensor temperature has stabilized at 126<sup>o</sup>F.



The Lunar Surface Magnetometer scientific and engineering data remains static during the report period. Also the Y sensor head system has not responded to a flip-cal command during this period. The X and Z sensors are returned to the 180° position following each attempted flip-cal to maintain sensor synchronization.

The Solar Wind Spectrometer has shown no significant changes in scientific data, and continues to function with stabilized temperatures.

The Suprathermal Ion Detector continues to operate recording low activity. The Cold Cathode Gauge high voltage remains inoperative.

Status as of 10:00 CDT, October 2, was as follows:

Sun Angle	271°
Input Power	72.35 watts
Reserve Power	12.45 watts
Heater and Power Dumps	Heater ON (10 watt)
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	20.2°F
PSE Sensor Assembly Temperature	126.0°F
LSM Sensor Temperature (Average)	STATIC
LSM Internal Temperature	STATIC
SWS Sensor Assembly Temperature	-134.3°C (-208.0°F)
SWS Internal Temperature Module 300	-15.6°C (2.9°F)
SIDE Temperature (Average)	4.2°C (39.6°F)
CCIG Temperature	103.0°K (-274.0°F)

ALSEP 1 Science Report  
9 October 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 9 Oct. 1970

ALSEP 1 continues to transmit scientific and engineering data after 324 days of consecutive lunar operation. Currently the system remains thermally stabilized in the lunar night environment. All data is being continuously recorded by the Manned Space Flight Network with real time monitoring at Mission Control Center for a one hour period on alternate days. The experiments package will experience the beginning of its twelfth lunar day as lunar sunrise is predicted to occur at 11:03 CDT, 9 October. Real time support of the optical terminator crossing is scheduled from 18:00 CDT, 9 October, for 24 hours.

Downlink telemetry indicates that the Central Station continues to maintain thermal equilibrium. The average thermal plate temperature is 19.9°F. The downlink signal strength continues to vary at -137 dbm and -138 dbm. The RTG power output is steady at 72.5 watts. A total of 5817 commands have been transmitted to and implemented by ALSEP 1 since its deployment. At 13:54 CDT, 6 October, a spurious command verification word, Suprathermal Ion Detector Experiment (SIDE) to Standby Power (Octal 053) was downlinked to the remoted tracking site at Bermuda. The SIDE was returned to Power ON by command at 15:09 CDT, 6 October. There were no temperature, engineering or data out of tolerances as a result of this spurious command.

The Passive Seismic Experiment, Solar Wind Spectrometer Experiment and Suprathermal Ion Detector Experiment continue to function, with their scientific data quiescent in the lunar night environment. At the start of the real time support period on 5 October, it was noted that the Cold Cathode Gauge sensor temperature (DI-04) indicated off scale HIGH. This temperature sensor anomaly continues under investigation. The Cold Cathode Gauge high voltage supply remains inoperative. The Lunar Surface Magnetometer scientific and engineering data remains static during the report period. Also the Y sensor head system has not responded to a flip-cal command during this period. The X and Z sensors are returned to the 180° position following each attempted flip-cal to maintain sensor synchronization.

Status as of 11:00 CDT, October 7, was as follows:

Sun Angle	336°
Input Power	72.35 watts
Reserve Power	11.90 watts
Heater and Power Dumps	Heater ON (10 watt)
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	19.9°F
PSE Sensor Assembly Temperature	125.9°F
LSM Sensor Temperature (Average)	STATIC
LSM Internal Temperature	STATIC
SWS Sensor Assembly Temperature	-134.3°C (-208.0°F)
SWS Internal Temperature Module 300	-15.6°C (2.9°F)
SIDE Temperature (Average)	4.0°C (39.3°F)
CCIG Temperature	Off Scale High

ALSEP 1 Science Report  
16 October 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 16 October 1970

The ALSEP 1 system continues to transmit scientific and engineering data to Earth after more than 330 days of operation. The package experienced the beginning of its twelfth lunation at 10:58 CDT, 9 October, when the Dust Detector's east facing solar cell output (AX-06) returned on scale. Real time support for the beginning of the twelfth lunation of the package was initiated at 17:00 CDT, 9 October and terminated at 15:00 CDT, 10 October. Cyclical commanding of the SIDE was initiated on 12 October to minimize internal arcing of the instrument. The cyclical commanding sequence is identical to that followed during previous lunations.

Central Station (C/S) engineering data indicate that C/S temperatures are rising steadily as a function of increasing exposure of the package to solar radiation during the twelfth lunar day. The C/S DSS-1 heater (10 watts) was commanded OFF when the average thermal plate temperature was 39.8°F at 18:00 CDT, 10 October. RTG output power is steady at 72.5 watts. Transmitter "A" continues to be characterized by sudden jumps in downlink signal. There have been many cases of ALSEP signal strength fluctuations (more than 2 dbm) generally attributed to "thick sky", a name for some undetermined phenomenon in the upper atmosphere. All MSFN stations have reported that downlink signal strength continues to vary at -137 dbm and -138 dbm. To date, a total of 5942 commands have been transmitted to and implemented by ALSEP 1.

A spurious command 052, Suprathermal Ion Detector Experiment (SIDE) Operational Power ON was decoded by ALSEP-1 at 04:06 CDT, 16 October, placing the SIDE to Operational Power ON. At the start of the Real Time Support period, 08:30 CDT, 16 October, the data indicates the SIDE was in a Power ON condition, "X10 mode" and with high voltage off. The SIDE temperature #2 indicated 61.4°C and temperature #6 read 66.6°C, well above the 55°C temperature where mode changes can be expected to occur. The SIDE was returned to Power Standby at 08:49 CDT, and Power Standby OFF at 08:50 CDT, 16 October. The spurious command appears not to have adversely affected the SIDE.

The Passive Seismic Experiment Z axis leveling motor was commanded OFF at 23:00 CDT, 9 October, as the instruments sensor temperature, DL-07, increased to 126.3°F. There has been no seismic activity detected by the Passive Seismic Experiment during real time support operations since the last reporting period.

The Lunar Surface Magnetometer (LSM) field sensor outputs continue to indicate activity as the moon moves from the Earth's magnetic bow shock into the Earth's geomagnetic tail. The LSM field sensor outputs and engineering data returned, restoring valid data at 05:30 CDT, 11 October, with an inter-instrument temperature of 33.7°C. The instruments flag status bits continue to indicate that the Y axis sensor head remains fixed at a 180 degree position. A special flip calibrate commanding sequence remains in effect in order to keep the three axis sensor heads synchronized at the 180 degree position.

The Solar Wind Spectrometer is operating, continuing to record solar wind plasmas activity for long term analysis.

The Suprathermal Ion Detector Experiment (SIDE) continues to indicate moderate low and high energy activity. The cyclical ON/OFF commanding of the SIDE continues in an effort to minimize mode changes of the instrument. As the instruments environment approached lunar noon, the SIDE experienced a mode change. It occurred at 23:40, 11 October, with the average SIDE internal temperature of 55.7°C. The Cold Cathode Gauge high voltage remains inoperative, while the temperature sensor continues to read OFF scale HIGH.

The Dust Detector cell outputs are exhibiting the same trend as during the previous lunar cycles.

Status as of 09:00 CDT, 16 October, was as follows:

Sun Angle	84°
Input Power	72.5 watts
Reserve Power	35.1 watts
Heater and Power Dumps	OFF
Experiment Status	ON
Thermal Plate Temperature (Average)	91.3°F
PSE Sensor Assembly Temperature	139.9°F
LSM Sensor Temperature (Average)	80.4°C (176.7°F)
LSM Internal Temperature	77.3°C (171.1°F)
SWS Sensor Assembly Temperature	63.7°C (146.7°F)
SWS Internal Temperature Module 300	64.3°C (147.7°F)
SIDE Temperature (Average)	66.4°C (151.5°F)
CCIG Temperature	OFF Scale HIGH

ALSEP 1 SCIENCE REPORT  
23 October 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CDT, 23 Oct. 1970

ALSEP 1 has now operated for 337 consecutive days on the lunar surface. Engineering data indicates normal temperature changes of the central station and all experiments as a function of decreasing exposure of the package to solar radiation. The package will experience the beginning of its twelfth lunar night as lunar sunset is predicted to occur at 5:12 CDT, 24 October. Real time support for the optical terminator crossing will commence at 02:30 CDT, 24 October, and continue for at least 24 hours. Central station telemetry indicates that the average thermal plate temperature is currently decreasing at a rate of 0.30<sup>o</sup>F per hour. The RTG output power is stable at 72.5 watts. No significant signal strength fluctuations have been indicated during the past seven days. To date, a total of 6029 commands have been transmitted to and implemented by ALSEP 1.

There has been no seismic activity recorded by the Passive Seismic Experiment during the Real Time Support. The PSE sensor temperature, DL07, went OFF scale high at 21:00 CDT, 16 October at a reading of 139.9<sup>o</sup>F. DL07 returned ON scale at 11:38 CDT, 22 October with a temperature reading of 139.8<sup>o</sup>F. An anomalous pulse train appeared at 21:27 CDT, 16 October (DL07, 139.9<sup>o</sup>F) and was gone 07:17 CDT, 18 October.

The Lunar Surface Magnetometer field sensor outputs continue to indicate variant activity as the moon continues through the Earth's geomagnetic tail into the Earth's magnetic bow shock and into interplanetary space. A special flip calibrate commanding sequence remains in effect in order to keep the three axis sensor heads synchronized at the 180 degree position. The LSM stopped processing data; all scientific and engineering elements became static at 10:06 CDT, 19 October. The LSM internal temperature at this time was 71.3<sup>o</sup>C. This interruption of data is characteristic of that seen in the previous lunar cycle. The Solar Wind Spectrometer is operating, continuing to record solar wind plasmas activity for long term analysis.

The Suprathermal Ion Detector Experiment continues to indicate moderate low and high energy activity. The cyclical ON/OFF commanding of the SIDE continued until lunar noon in an effort to minimize mode changes of the instrument. As the instruments environment approached lunar noon, the SIDE experienced a mode change. It occurred at 07:48 CDT, 17 October, with the average SIDE internal temperature of 55.5<sup>o</sup>C. The Cold Cathode Gauge high voltage remains inoperative, while the temperature sensor continues to read OFF scale HIGH.

The Dust Detector cell outputs are exhibiting the same trend as during the previous lunar cycles.

Status as of 09:30 CDT, 22 October, was as follows:

Sun Angle	157°
Input Power	72.50 watts
Reserve Power	34.9 watts
Heater and Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	68.5° F
PSE Sensor Assembly Temperature	139.9° F
LSM Sensor Temperature (Average)	37.0° C (98.5° F)
LSM Internal Temperature	47.0° C (116.6° F)
SWS Sensor Assembly Temperature	27.1° C (80.7° F)
SWS Internal Temperature Module 300	47.3° C (117.1° F)
SIDE Temperature (Average)	54.2° C (129.6° F)
CCIG Temperature	OFF scale HIGH

ALSEP 1 SCIENCE REPORT  
30 October 1970

The ALSEP 1 system continues transmitting scientific and engineering data to Earth more than 345 days after placement on the lunar surface. All data 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analysis. In general, the experiments continue to follow the pattern of scientific and engineering measurements established during previous lunar cycles. The experiments package twelfth lunar sunset occurred at 05:10 CDT, 24 October.

Downlink telemetry indicates that the RTG is still providing almost 20% more power than is required at peak load periods. Downlink signal strength has varied slightly depending on site characteristics, between -135 dbm and -138 dbm. To date, 6140 commands have been transmitted to and implemented by ALSEP 1 since its deployment. The central station DSS-1 heater (10 watts) was commanded ON at 10:59 CDT, 23 October, when the average thermal plate temperature reached 50.7° F.

The Passive Seismic Experiment, Solar Wind Experiment and Suprathermal Ion Detector Experiment continue to function, with scientific data quiescent in the lunar night environment. The Cold Cathode Gauge sensor temperature (DI-04) continues to indicate off scale HIGH, and the high voltage supply remains inoperative. The Lunar Surface Magnetometer stopped processing scientific and engineering data at 14:14 CDT, 24 October. At that time the internal temperature was 2.86° C. This event is characteristic to that which occurred after the previous lunar sunset and cleared up after sunrise, indicating a low-temperature effect.

Status as of 09:00 CST, October 30 was as follows:

Sun Angle	255°
Input Power	72.5 watts
Reserve Power	12.5 watts
Heater & Power Dumps	DSS-1 ON (10 watts)
Experiment Status	All ON
Thermal Plate Temperature (Average)	20.5° F
PSE Sensor Assembly Temperature	126.0° F
LSM Sensor Temperature (Average)	STATIC
LSM Internal Temperature	STATIC
SWS Sensor Assembly Temperature	-134.3° C (-209.7° F)
SWS Internal Temperature, Module 300	-15.6° C (4.0° F)
SIDE Temperature (Average)	4.0° C (39.2° F)
CCIG Temperature	Off Scale HIGH

NOTE: The following correction should be made to the ALSEP-1 SCIENCE REPORT dated 23 October, 1970. In the third paragraph, the third, fourth and fifth sentences should read:

"At 10:06 CDT, 19 October, the LSM Y-Axis field sensor experienced a negative (-) 100 gamma deflection. The LSM internal temperature at this time was 71.3<sup>0</sup>C. This anomalous deflection is characteristic of LSM operation from 22 December 1969 thru 25 June 1970 at this temperature range. This is the first reoccurrence of LSM Y-Axis field sensor deflection since 25 June."



ALSEP 1 SCIENCE REPORT  
November 6, 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

ALSEP 1 has now operated 352 consecutive days on the lunar surface. Scientific and engineering data continues quiescent in the lunar night environment. Downlink telemetry indicates that the central station and experiments continue to maintain thermal equilibrium. ALSEP 1 will experience the start of its thirteenth lunation as lunar sunrise is predicted to occur at 23:23 CST, 7 November. Real time support for the optical terminator crossing is scheduled from 06:00 CST, 8 November, and continue for 24 hours.

The central station continues its operation with the average thermal plate temperature stabilized at 20.0°F. The downlink telemetry signal strength continues to fluctuate at -137.0 dbm and -138.0 dbm. RTG output power is steady at 72.5 watts. A total of 6170 commands have been transmitted to and implemented by ALSEP 1 since its deployment.

The Passive Seismic Experiment sensor temperature remains stable at 125.9°F. The instrument sensors are thermally stabilized by commanding the Z axis leveling motor ON in the AUTO MODE, in addition to the normal operational procedure of commanding the PSE thermal control mode to AUTO ON. No seismic activity has been recorded during the intermittent periods of real-time data monitoring the past seven days.

All scientific and engineering data channels of the Lunar Surface Magnetometer remain static, except the status bit indicators of the instruments operational mode. The Y sensor head remains fixed at a 180° position, not having responded to a flip-cal command since 29 July 1970. The X and Z sensors are returned to the 180° positions following each flip-cal to maintain sensor synchronization. This event is characteristic of that which occurs after each lunar sunset and clears up after each sunrise, indicating a low temperature effect.

The Solar Wind Spectrometer temperatures remain stabilized, as the experiment continues to record activity for long term analysis.

The Suprathermal Ion Detector Experiment continues to operate in a full functional mode with Channeltron high voltage ON. SIDE housekeeping telemetry indicates that the various temperature measurements associated with the instrument remain stabilized. The Cold Cathode Gauge sensor temperature (DI-04) continues to indicate off scale HIGH, and the CCGE high voltage power supply remains inoperative.

Status as of 09:00 CST, November 6 was as follows:

Sun Angle	341°
Input Power	72.35 watts
Reserve Power	11.9 watts
Heater and Power Dumps	ON
Experiment Status	ON
Thermal Plate Temperature (Average)	19.9°F
PSE Sensor Assembly Temperature	125.93°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-134.31°C (-210.0°F)
SWS Internal Temperature Module 300	-15.64°C (3.8°F)
SIDE Temperature (Average)	+4.0°C (39.2°F)
CCIG Temperature	Off Scale High

ALSEP 1 Science Report  
13 November 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

The ALSEP 1 system continues to transmit scientific and engineering data to Earth after more than 359 consecutive days of operation. The package experienced the beginning of its twelfth lunation at sunrise, 23:16 CST, 7 November when the Dust Detector's east facing solar cell output (AX-06) returned on scale.

Central Station DSS-1 (10 watt) heater was commanded OFF when the average thermal plate temperature reached 39°F at 06:32 CST, 8 November. RTG output power is steady at 72.5 watts. The downlink signal strength remains constant at -137 dbm. To date, a total of 6297 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment Z axis leveling motor was commanded OFF at 10:03 CST, 8 November. The instruments sensor temperature, DL-07, was 126.1°F. The Passive Seismic Experiment characteristic short-period Z axis pulse train appeared at 14:10 CST, and remained until 23:50 CST, 8 November.

The Lunar Surface Magnetometer field sensor outputs and engineering data returned, restoring valid science data at 09:21 CST, 9 November. The LSM internal temperature was 28.9°C. The instruments engineering status bits continue to indicate that the Y axis sensor head remains locked at a 180 degree position. A special flip calibrate commanding sequence remains in effect in order to keep the three axis sensor heads synchronized at the 180 degree position.

The Solar Wind Spectrometer (SWS) sum cup 7 registered a reading of 41 during the RTS period on 8 November. In accordance with mission rules, the SWS gain was changed from normal to high. This was accomplished at 08:44 CST by transmitting 3, SWS dust cover remover commands within 10 seconds. At the time of the gain change, the sum cup 7 reading changed from 41 to 55. On 12 November the sum cup reading was 47 (SWS in high gain mode) and the experiment was returned to normal gain mode. The sum cup reading changed from 47 to 36 when returning to normal gain.

The Suprathermal Ion Detector Experiment (SIDE) continues to indicate moderate low and high energy activity. The cyclical ON/OFF commanding of the SIDE continues in an effort to minimize mode changes of the instrument. The Cold Cathode Gauge high voltage remains inoperative, while the temperature sensor continues to read OFF scale HIGH.

The Dust Detector cell outputs are exhibiting the same trend as during the previous lunar cycles.

Status as of 09:00 CST, 13 November 1970 was as follows:

Sun Angle	65°
Input Power	72.12 watts
Reserve Power	40.9 watts
Heater and Power Dumps	OFF
Experiment Status	ON
Thermal Plate Temperature (Average)	90.2° F
PSE Sensor Assembly Temperature	132.7° F
LSM Sensor Temperature (Average)	74.4° C (165.9° F)
LSM Internal Temperature	73.3° C (163.9° F)
SWS Sensor Assembly Temperature	63.7° C (146.7° F)
SWS Internal Temperature Module 300	64.3° C (147.7° F)
SIDE Temperature (Average)	42.5° C (108.5° F)
CCIG Temperature	HIGH

ALSEP 1 SCIENCE REPORT  
19 November 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

The ALSEP 1 carried aboard the Apollo 12 spacecraft last November continues to provide an uninterrupted flow of scientific and engineering data to Earth.

The lunar laboratory was activated by a "transmitter on" command at 08:21 CST on 19 November 1969. Since initiation, the experiment package has transmitted data to Earth continuously for twelve lunar day/night cycles, achieving its mission goal of one year's operation.

Live lunar measurements are transmitted to Earth by ALSEP at a rate of over 9 million data measurements per lunar day. Over 6400 commands have been transmitted to ALSEP and executed for switching heaters, performing instrument calibrations, and adjusting the scientific sensors.

Engineering data recorded by ALSEP temperature sensors indicate a "summer/winter" effect on the moon. The "mid-summer" conditions are observed in December and January and, typically, the peak temperature values were approximately 15<sup>o</sup>F higher than the June-July "mid-winter" values.

The Passive Seismic Experiment continues recording seismic signals at a rate of about one per day. All of these signals are classified by the scientists as type L; that is, they have characteristics which differ greatly from earthquakes. For example, the signals are very complex, they gradually increase and decrease in intensity, and do not show the familiar pattern of pulses observed in earthquakes. Of the events recorded, 58 are remarkable in the fact that the character of the signal is nearly identical and all occurred around the time when the Moon comes closest to the Earth (perigee) during its monthly cycle. At this point, the lunar tidal strains are at their greatest level. In summary, the Moon appears to be an extremely quiet and stable body in relation to the Earth.

The Lunar Surface Magnetometer detected a small, steady magnetic field of 36 gamma superimposed upon the geomagnetic tail, transition region, and interplanetary fields through which the Moon passes during each revolution about the Earth. The magnetometer also measured definite lunar magnetic response to the time-varying solar wind field during both the lunar day and night. Further gradient measurements of this field indicate that it was large in extent and was probably a fossil remnant of a larger field frozen in cooling lava. Analysis of the time dependent fields indicate that the large electric currents are generated deep in the interior of the Moon. Step transients or sharp changes in interplanetary field measurements simulated by Explorer 35 orbiting the Moon and by Apollo 12 instruments located on the lunar surface indicate an average temperature of approximately 800<sup>o</sup>K down to about 1/2 the radius of the Moon and greater than 1200<sup>o</sup>K for material in the inner core.

The Solar Wind Spectrometer has experienced no difficulties since deployment. During each lunar day the spectrometer has:

- (a) Measured plasma in the interplanetary regions;
- (b) Measured plasma in the Earth's magnetic bow shock followed by an abrupt change in plasma direction and velocity after passing through this region;
- (c) Indicated there is no solar wind of velocity great enough to measure in the Earth's magnetopause;
- (d) Measured sheath plasma immediately after passing through the bow shock.

The resultant spectra has been consistent with the theory that the Moon is an inert obstacle to solar wind plasma in lunar region space. During the lunar night, no plasma has been detected.

The Suprathermal Ion Detector Experiment has returned a large amount of interesting data on positively charged ions in the lunar environment, both during lunar daytime and lunar night. Major observations include the following:

- (a) The solar wind and its interaction with the Earth's magnetosphere;
- (b) Ions of solar wind energies which are present a few days before sunrise at ALSEP;
- (c) Protons which have escaped from the Earth's magnetic bow shock and field direction;
- (d) Mass spectra (of low intensity) believed to be due to rocket exhaust products of the Apollo 12 LM descent stage, Apollo 12 LM ascent stage, and Apollo 13 SIVB booster stage (the latter two just prior to lunar surface impact).

The Cold Cathode Ionization Gauge (CCIG) has not provided scientific data since shortly after deployment, due to an apparent failure in the high voltage circuits. However, its temperature sensor has been operating and served as an effective indicator of lunar surface temperature. The off-scale reading, since 5 October, is interpreted as a failure in the sensor circuit.

The Dust Detector Cell outputs continue to provide sun illumination data and preliminary analyses indicate no solar cell degradation due to solar radiation effects, dust accumulation, or lunar thermal effects.

Status as of 09:00 CST, 19 November 1970 was as follows:

Sun Angle	41°
Input Power	72.1 watts
Reserve Power	40.3 watts
Heater and Power Dumps	ALL OFF
Experiment Status	ALL ON
Thermal Plate Temperature (Average)	84.1°F
PSE Sensor Assembly Temperature	HIGH
LSM Sensor Temperature (Average)	60.3°C (140.5°F)
LSM Internal Temperature	64.2°C (147.6°F)
SWS Sensor Assembly Temperature	45.2°C (113.4°F)
SWS Internal Temperature Module 300	59.2°C (138.6°F)
SIDE Temperature (Average)	36.5°C (97.7°F)
CCIG Temperature	HIGH

ALSEP 1 Science Report  
25 November 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

Following successful completion of its assigned 1-year operational mission the ALSEP 1 system continues transmitting scientific and engineering data to Earth. The package is currently in its 13th lunar night, lunar sunset having occurred at 18:00 CST, 22 November. All data, 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analyses. Central Station engineering telemetry continues to follow the same temperature and operational profile established in previous lunations. The 10 watt heater (DSS-1) was commanded on at 16:25 CST, 22 November, when the average thermal plate temperature was 35.0 F. The signal strength from transmitter "A" continues to vary slightly depending on site characteristics, between -135 dbm and -139 dbm. The RTG output remains steady at 72.5 watts. A total of 6570 commands have been transmitted to and successfully implemented by ALSEP 1 to date.

The Passive Seismic Experiment recorded a minor seismic signal of approximately 30 seconds duration at 09:04 CST on 19 November, during real time support. The seismic event was recorded by the three long-period sensors. The PSE sensor temperature (DL-07) went OFF scale high on 15 November (lunar noon) and returned ON scale preceding lunar sunset at 08:40 CST, 21 November. The OFF scale/ON scale high condition is characteristic of experiment operation during the third lunar day (January 1970) through the seventh lunar day (May 1970), and the eleventh lunar day (September 1970) through the thirteenth lunar day (November 1970). The instruments Z axis sensor leveling motor was commanded ON in the AUTO MODE at 01:00 CST, on 23 November. The PSE sensor temperature had decreased to 125.8 F.

The Solar Wind Spectrometer continues to indicate higher particle counts during lunar days as opposed to lunar nights, as the instrument records scientific activity for long term analyses.

The Lunar Surface Magnetometer stopped processing data following lunar sunset. All scientific and engineering data channels of the instrument remain static, except the status bit indicators of the instruments operational mode. This simultaneous interruption of data occurred at 19:49 CST, 22 November. At that time the internal temperature was 22.1 C. This event is characteristic to that which occurs after each lunar sunset and clears up after each sunrise, indicating a low-temperature effect. The experiment experienced a 100% full scale negative deflection in the Y axis field sensor on 19 November, at 09:52 CST. The Y axis Steady Field Offset commands were transmitted and functionally recentered the sensor output at 25% full scale negative deflection. The Y axis deflection disappeared following resumption of real time support on 21 November. The Y axis field sensor negative deflection is not abnormal to instrument operation, as it was previously experienced at intervals from December 1969 through June 1970.



The Suprathermal Ion Detector Experiment continues to indicate low and high energy activity. Preceding lunar sunset the experiment was commanded to the Normal Operational Mode (Operational Power ON) at the end of real time support on 21 November. At that time the instrument sensor temperature #2 (DI-05) indicated 50.1°C, well below the 55°C temperature where mode changes can be expected to occur. At the resumption of support on 22 November downlink data indicated that the experiment switched from Normal Operational Mode to the X10 Mode. The SIDE temperature #2 (DI-05) indicated 28.1°C. The instrument was commanded out of the X10 Mode. The unexpected mode change appears not to have adversely affected the SIDE. The Cold Cathode Gauge high voltage remains inoperative and the temperature sensor continues to read OFF scale HIGH.

The Dust Detector cell outputs exhibited the same trend during the optical terminator crossing as had been noted during previous lunar cycles.

Status as of 09:00 CST, 25 November 1970 was as follows:

Sun Angle	212°
Input Power	72.5 watts
Reserve Power	12.7 watts
Heater and Power Dumps	ON
Experiment Status	ON
Thermal Plate Temperature (Average)	21.2°F
PSE Sensor Assembly Temperature	126.3°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-134.3°C (-210.0°F)
SWS Internal Temperature Module 300	-14.0°C (6.8°F)
SIDE Temperature (Average)	4.25°C (39.6°F)
CCIG Temperature	Off Scale High

ALSEP 1 SCIENCE REPORT  
4 December 1970

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

The ALSEP 1 system continues transmitting scientific and engineering data to Earth more than 380 days after placement on the lunar surface. All data 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analysis. In general, the experiments continue to follow the pattern of scientific and engineering measurements established during previous lunar cycles.

On 3 December the Carnarvon, Australia, ground station experienced loss of ALSEP 1 decomm lock, and a signal strength increase of 2 dbm to -135.7 dbm at 03:00 CST. Unscheduled Phase II operations were initiated, and a telemetry playback of the data requested. Subsequent real time analysis revealed no central station anomalies preceding the loss of decomm lock. The experiments package was returned to Normal Bit Rate by command, Normal Bit Rate Reset, octal 011, at 05:07 CST, 3 December. There were no temperature, engineering or data out of tolerances as a result of the functional change in the package. Downlink signal strength returned to a normal -137.0 dbm.

Further cursory real time analysis by the supporting ground station and mission control indicates that in all probability the ALSEP received its nineteenth functional change, without ground command transmission, in the form of High Bit Rate ON (octal 003).

Downlink telemetry indicates that the RTG is still providing almost 20% more power than is required at peak load periods. To date, over 6589 commands have been transmitted to and implemented by ALSEP 1 since its deployment.

The Passive Seismic Experiment, Solar Wind Experiment and Suprathermal Ion Detector Experiment continue to function, with scientific data stable in the lunar night environment. The Cold Cathode Gauge sensor temperature (DI-04) continues to indicate off scale HIGH, and the high voltage supply remains inoperative. The Lunar Surface Magnetometer stopped processing scientific and engineering data at 19:49 CST, 22 November. At that time the internal temperature was 22.1°C. This event is characteristic to that which occur after each lunar sunset and clears up after each sunrise, indicating a low temperature effect.

Status as of 09:00 CST, 4 December was as follows:

Sun Angle	322 <sup>o</sup>
Input Power	72.5 watts
Reserve Power	11.9 watts
Heater & Power Dumps	DSS-1 ON (10 watts)
Experiment Status	ON
Thermal Plate Temperature (Average)	20.2 <sup>o</sup> F
PSE Sensor Assembly Temperature	125.9 <sup>o</sup> F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-134.3 <sup>o</sup> C (-209.7 <sup>o</sup> F)
SWS Internal Temperature (Module 300)	-15.6 <sup>o</sup> C (4.0 <sup>o</sup> F)
SIDE Temperature (Average)	4.1 <sup>o</sup> C (39.4 <sup>o</sup> F)
CCIG Temperature	Off Scale High

# ALSEP 1 Science Report

11 December 1970

## Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

The ALSEP 1 system continues to transmit scientific and engineering data to Earth after more than 387 consecutive days of operation. The package experienced the beginning of its fourteenth lunation at 13:28 CST, 7 December, when the Dust Detector's east facing solar cell output (AX-06) returned on scale indicating sunrise at the ALSEP-1 site.

Central Station (C/S) engineering telemetry indicates that the C/S temperatures are rising steadily as a function of increasing sun elevation. The C/S DSS-1 (10 watt) heater was commanded OFF when the average thermal plate temperature reached 38<sup>o</sup>F at 20:14 CST, 7 December. RTG output power is steady at 72.5 watts. The downlink signal strength remains constant at -137 dbm. To date, a total of 6697 commands have been transmitted to and implemented by ALSEP 1.

The Passive Seismic Experiment Z axis leveling motor was commanded OFF at 00:36 CST, 8 December, as the instrument's sensor temperature, DL-07, increased to 126.3<sup>o</sup>F. The Passive Seismic Experiment characteristic short-period Z axis pulse train appeared at 05:45 CST, and remained until 14:00 CST, 8 December.

The Lunar Surface Magnetometer field sensor outputs and engineering data returned, restoring valid science data at 21:55 CST, 9 December. The LSM internal temperature was 42.4<sup>o</sup>F. The instruments engineering status bits continue to indicate that the Y axis sensor head remains locked at a 180 degree position.

The Solar Wind Spectrometer (SWS) was operating in normal gain mode during lunar night. The SWS PI has completed his review of the SWS data gathered during past high gain and normal gain operating modes of the experiment. The SWS operation has been revised at the request of the P.I.. The operating plan is that the SWS be operated in the high gain mode during lunar day and terminators and be placed in normal gain during lunar night. The P.I. has requested that the gain change (to "High") be commanded 24 to 12 hrs. before sunrise and (to "normal") 24 to 12 hrs. after sunset. The SWS gain change for the terminator and lunar day operation occurred at 09:39 CST, 4 December. The SWS is operating as expected in high gain mode.

The Suprathermal Ion Detector Experiment data indicated that the instrument had changed from a normal operational mode prior to the start of real time support operations on 21:55 CST, 9 December. The instruments operational mode was X10 Accumulation Interval, with an average temperature of 54.7<sup>o</sup>C. A command sequence was initiated to correct the abnormal operational mode. Cyclic ON/OFF commanding of the experiment was then initiated to minimize internal activity of the instrument. The Cold Cathode Gauge high voltage power and internal temperature sensor supply remains inoperative.

The Dust Detector cell outputs are exhibiting the same trend as during the previous lunations.

Status as of 10:00 CST, 11 December, 1970 was as follows:

Sun Angle	46.8°
Input Power	72.1 watts
Reserve Power	40.3 watts
Heater and Power Dumps	OFF
Experiment Status	ON
Thermal Plate Temperature (Average)	84.7°F
PSE Sensor Assembly Temperature	127.3°F
LSM Sensor Temperature (Average)	57.5°C (134.4°F)
LSM Internal Temperature	61.0°C (141.9°F)
SWS Sensor Assembly Temperature	52.2°C (126.0°F)
SWS Internal Temperature Module 300	63.5°C (146.2°F)
SIDE Temperature (Average)	31.8°C (89.3°F)
CCIG Temperature	Off scale high

## ALSEP 1 SCIENCE REPORT

18 December 1970

### Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

ALSEP 1 has now operated for 39<sup>4</sup> consecutive days on the lunar surface. Engineering data indicates normal temperature changes of the central station and experiments as a function of decreasing exposure of the package to solar radiation. The package will experience the beginning of its fourteenth lunar night as lunar sunset is predicted to occur at 08:18 CST, 22 December. The RTG output power remains stable at 72.5 watts. The signal strength from transmitter "A" continues to vary slightly depending on site characteristics, between -135 dbm and -139 dbm. During the past year of lunar operation by ALSEP the network has reported sporadic losses of downlink. The majority of telemetry dropouts have been explained as site operational problems. Since 13 December the ALSEP has experienced occasional dropouts of the downlink. No site or network problems have been discovered that could be attributive to causing the current intermittent losses of downlink. If the number of data dropouts exceeds 5 in 15 minutes during Phase III operations (record downlink data only) then Phase II support (real time) will be scheduled.

At the start of the real time support period on 16 December, Primary Structure Base Temperature (AT-10) indicated off-scale LOW. This parameter returned on-scale at 09:58 CST, off-scale LOW at 11:02 CST and back on-scale at 11:03 CST. The ALSEP 1 AT-10 temperature transducer has had a history of intermittent operation during pre-flight testing. To date, a total of 6787 commands have been transmitted to and implemented by ALSEP 1.

On 16 December, ALSEP implemented a PSE short period calibration ON function (octal 065) with no CVW in the downlink. This functional change has been attributed to a spurious command generated by random receiver noise. The Passive Seismic Experiment experienced no temperature, engineering or data out of tolerances as a result of the functional change in the instrument. The PSE sensor temperature, DL<sub>0</sub>-07, went off-scale HIGH at 08:38 CST, 15 December at a reading of 141.4 F.

The Lunar Surface Magnetometer field sensor outputs continue to indicate activity as the moon moves from the Earth's geomagnetic tail into the Earth's magnetic bow shock and into interplanetary space. A special flip calibrate commanding sequence remains in effect in order to keep the three axis sensor heads synchronized at the 180 degree position.

The Solar Wind Spectrometer continues to operate in the high gain mode, recording solar wind plasma activity for long term analysis.

The Suprathermal Ion Detector Experiment continues to indicate moderate low and high energy activity. The cyclical ON/OFF commanding of the SIDE has been utilized to minimize mode changes of the instrument. The Cold Cathode Gauge high voltage remains inoperative, while the temperature sensor continues to read off-scale HIGH.

The Dust Detector cell outputs are exhibiting the same trend as during the previous lunar cycles.

Status as of 09:00 CST, 18 December, was as follows:

Sun Angle	131 <sup>o</sup>
Input Power	72.1 watts
Reserve Power	40.0 watts
Heater and Power Dumps	OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	89.5 <sup>o</sup> F
PSE Sensor Assembly Temperature	Off-Scale HIGH
LSM Sensor Temperature (Average)	69.0 <sup>o</sup> C (156.2 <sup>o</sup> F)
LSM Internal Temperature	69.5 <sup>o</sup> C (161.8 <sup>o</sup> F)
SWS Sensor Assembly Temperature	52.2 <sup>o</sup> C (125.9 <sup>o</sup> F)
SWS Internal Temperature Module 300	62.6 <sup>o</sup> C (144.7 <sup>o</sup> F)
SIDE Temperature (Average)	38.8 <sup>o</sup> C (101.8 <sup>o</sup> F)
CCIG Temperature	Off-Scale HIGH

# ALSEP 1 SCIENCE REPORT

23 December 1970

## Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

Sunset of the 14th lunar night for ALSEP 1 occurred at 08:28 CST on 22 December. Since activation, the experiment package has transmitted data to Earth continuously for fourteen lunar day/night cycles (399 days), two solar eclipses, and one cycle of lunar seasons; it is now approaching mid-summer at the ALSEP location on the Moon. To date, a total of 6917 commands have been transmitted to and implemented by ALSEP.

On 13 December the ALSEP transmitter "A" started to experience occasional dropouts of the downlink. No site or network operational problems were discovered that could be attributive to causing intermittent losses of downlink. If the number of data dropouts exceeded 5 in 15 minutes during Phase III operations (record downlink data only) then Phase II support (real time) was to be scheduled. Over a 28 hour period (16:45 CST, 18 December - 20:30 CST, 19 December) transmitter "A" experienced 95 dropouts of the downlink. Due to the significant amount of downlink dropouts, and interpreted as a repeat of the 31 January 1970 transmitter "A" operation, ALSEP transmitter "B" was selected. The command to change transmitters was sent at 20:30 CST, 19 December. Transmitter "A" had operated without interruption since 1 September 1970 when an automatic switch-over from transmitter "B" to transmitter "A" was experienced. Transmitter "B" has experienced no signal dropouts since its implementation. The signal strength from transmitter "B" continues to vary slightly depending on site characteristics, between -138 dbm and -140 dbm.

The following correction should be made to the ALSEP-1 SCIENCE REPORT dated 18 December 1970. On 13 December, ALSEP implemented a Dust Cells OFF function (octal 031) with no CVW in the downlink. At 07:06 CST, 16 December, Goldstone telemetry data indicated that ALSEP experienced what appears to be a spurious timer output driver advance as the Passive Seismic Experiment indicated two simultaneous functional changes as listed below. At the time of this spurious change the ALSEP Timer Output Inhibit command was in effect.

<u>PSE Telemetry Parameter</u>	<u>WAS</u>	<u>IS</u>
AL-07 Cal Status		
LP	OFF	OFF
SP	OFF	ON
AL-08 Uncage Status	Uncaged	OT

A test was performed on 19 December in order to ascertain whether or not the 12-hour timer was operational. The test consisted of transmitting the Timer Output Inhibit command (Octal 033) followed immediately by the Timer Output Accept command (Octal 032) three times, to restore power to the lowest priority experiment (SIDE ON). The Timer Output Inhibit command will input level changes to the hours and minutes counters of the delayed command sequencer and advance the counters by 12



hours and 1 minute generating the repetitive 12 hour timer pulse functions. These downlink changes have been classified as the 20th, 21st, and 22nd uncommanded spurious functional changes. These spurious functions have not adversely affected operation of ALSEP.

The Passive Seismic Experiment Z axis leveling motor was commanded ON at 15:50 CST, 22 December, as the instruments temperature, DL-07, decreased to 125.9°F. The PSE sensors continue to exhibit characteristic activity of a typical optical terminator crossing.

The Lunar Surface Magnetometer stopped processing data by the start of Phase II support at 05:30 CST, 22 December. All scientific and engineering channels of the instrument remain static, except the status bit indicators of the instruments operational mode. This event is characteristic to that which occurs after each lunar sunset and clears up after each sunrise, indicating a low-temperature effect. The experiment experienced a 75% scale negative deflection in the Y axis field sensor at 09:00 CST, 18 December. The Y axis deflection disappeared following resumption of Phase II support on 19 December. The Y axis field sensor negative deflection is not abnormal to instrument operation, as it was previously experienced at intervals from December 1969 through June 1970.

The Solar Wind Experiment operation has been revised at the request of the P. I.. The operating plan is that the SWS be operated in the high gain mode during lunar day and optical terminator crossings, and be placed in normal gain during lunar night. The SWS gain change for lunar night operation occurred at 01:27 CST, 23 December. The SWS is operating as expected in the normal gain mode.

The Suprathermal Ion Detector Experiment continued to indicate moderate low energy activity through the optical terminator crossing. The Cold Cathode Gauge high voltage remains inoperative, while the temperature sensor continues to read off-scale HIGH.

The Dust Detector cell outputs exhibited the same trend during the optical terminator crossing as had been noted during the previous cycles.

Status as of 06:00, 23 December, was as follows:

Sun Angle	190.5°
Input Power	72.4 watts
Reserve Power	13.0 watts
Heater & Power Dumps	All OFF
Experiment Status	All ON
Thermal Plate Temperature (Average)	23.4°F
PSE Sensor Assembly Temperature	126.6°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-129.0°C (-200.2°F)
SWS Internal Temperature (Module 300)	-8.3°C (17.1°F)
SIDE Temperature (Average)	20.0°C (68.0°F)
CCIG Temperature	Off-Scale HIGH

## ALSEP 1 SCIENCE REPORT

30 December 1970

### Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

The ALSEP 1 system performance after 406 days of operation is stable and providing data typical of the lunar night environment. All data, scientific and engineering, are being continuously recorded by the MSFN tracking stations for subsequent analysis. Lunar midnight occurred at 19:00 CST, 29 December.

Transmitter "B" has experienced no signal dropouts since its implementation (19 December 1970). The signal strength from transmitter "B" continues to vary slightly depending on site characteristics, between -138 dbm and -140 dbm. The thermoelectric power source output remains steady at 72 watts. Central station telemetry data indicates that the average thermal plate temperature is stabilized at 20.4°F. To date, a total of 6969 commands have been transmitted to and implemented by ALSEP 1. On 27 December the Honeysuckle Creek, Australia, ground station experienced loss of ALSEP 1 decomm lock, when Mission Control inadvertently transmitted octal 003, ASE High Bit Rate On, during Phase II support. There were no temperature, engineering or data out of tolerances as a result of the functional change in the package.

At the start of the real time support on 24 December, the PSE Short Period Z Seismic Data Channel (DL-08) indicated off-scale LOW. Verification by the supporting MSFN ground station confirmed that DL-08 is outputting all zeros. The Passive Seismic Experiment experienced no other temperature, engineering or data out of tolerances as a result of DL-08 going off-scale. The Solar Wind Experiment and Suprathermal Ion Detector Experiment continue to function, with scientific data stable in the lunar night environment. The Cold Cathode Gauge sensor temperature (DI-04) continues to indicate off scale HIGH, and the high voltage supply remains inoperative. The Lunar Surface Magnetometer stopped processing scientific and engineering data on 22 December. This event is characteristic to that which occur after each lunar sunset and clears up after each sunrise, indicating a low temperature effect.

Status as of 10:00 CST, 28 December, was as follows:

Sun Angle	252°
Input Power	72.4 watts
Reserve Power	13.0 watts
Heater & Power Dumps	DDS-1 ON (10 watts)
Experiment Status	All ON
Thermal Plate Temperature (Average)	20.4°F
PSE Sensor Assembly Temperature	126.1°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static

SWS Sensor Assembly Temperature	-134.3°C (-209.7°F)
SWS Internal Temperature (Module 300)	-15.6°C (3.9°F)
SIDE Temperature (Average)	20.2°C (68.4°F)
CCIG Temperature	Off-Scale HIGH

ALSEP-1 Science Report  
7 January 1971

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

Scientific and engineering data continues to be transmitted from ALSEP-1 to Earth after more than 414 consecutive days of lunar operations. Real time support operations of the ALSEP 1 fifteenth lunation were started 09:50 GMT, 6 January. The package detected sunrise at the ALSEP-1 site when the Dust Detector's east facing solar cell output (AX-06) returned on scale at 10:09 GMT, 6 January.

Central station engineering telemetry data indicates that the electronics package temperatures are rising steadily as a function of increasing sun elevation. The Central Station DSS-1 heater (10 watt) was commanded OFF at 21:31 GMT, 6 January. RTG output is 72.0 watts. The downlink signal strength from ALSEP 1 transmitter "B" continues to vary slightly depending on MSFN site characteristics, between -137 dbm and -140 dbm. To date, 7015 commands have been transmitted to, and implemented by, ALSEP 1.

The Passive Seismic Experiment recorded a significant seismic signal of 18 minutes duration starting at 15:43 GMT, 31 December. The seismic event was recorded by all three long-period axis. The experiment indicates a loss of all Short Period Z axis data (DL-08) at 16:30 GMT, 28 December. The Sp-Z data channel returned ON scale (50% full scale is normal) unexpectedly at 11:42 GMT, 6 January. At that time the experiment's temperature sensor, DL-07, indicated 125.9<sup>0</sup>F. The instrument was experiencing a sun angle of 0.9 degrees. The Z axis motor was turned off at 21:41 GMT, 6 January.

The Lunar Surface Magnetometer continues not processing data, as all scientific and engineering data remains static. The Y axis sensor head remains fixed at a 180<sup>0</sup> position, not responsive to flip-cal commands. The X and Z sensors are returned to the 180<sup>0</sup> position following each flip-cal to maintain sensor synchronization.

The Solar Wind Spectrometer operation was changed from normal to high gain by command at 15:31 GMT, 4 January. The experiment continues to record solar wind plasma data for long term analysis.

The Suprathermal Ion Detector Experiment has indicated moderate low energy activity since lunar sunrise. The Cold Cathode Gauge high voltage remains inoperative. The CCGE internal temperature measurement continues off scale HIGH.

The Dust Detector cell outputs are exhibiting the same trend as noted during previous sunrise terminator crossings.

Status as of 9:00 CST was as follows:

Sun Angle	14.2°
Input Power	72.0 watts
Reserve Power	32.4 watts
Heater and Power Dumps	OFF
Experiment Status	All On
Thermal Plate Temperature (Average)	54.6°F
PSE Sensor Assembly Temperature	125.9°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	19.0°C (66.2°F)
SWS Internal Temperature Module 300	31.7°C (89.1°F)
SIDE Temperature (Average)	33.4°C (92.1°F)
CCIG Temperature	High

## ALSEP 1 SCIENCE REPORT

15 January 1971

### Apollo Lunar Surface Experiment Package Status Report - 09:00 CST

The ALSEP 1 system continues to transmit scientific and engineering data to Earth after more than 422 days of consecutive lunar operation. In general, the experiments continue to follow the pattern of measurements established during previous lunar cycles. Cyclical commanding of the Suprathermal Ion Detector Experiment has been in effect during this reporting period in an effort to minimize instrument mode changes during the lunar noon period. All data 24 hours per day, are being recorded on magnetic tape at MSFN tracking stations for subsequent analysis.

The Radioisotope Thermoelectric Generator output power is stable at 72 watts. The downlink signal strength from transmitter "B" continues to vary slightly depending on MSFN site characteristics, between -137 dbm and -140 dbm. To date, 7211 commands have been transmitted to, and implemented by the data subsystem.

Passive Seismic Experiment telemetry data indicated that the instrument had experienced an unexpected LPX and LPY Gain Change (octal 063) from 0db gain to -20db gain. The functional change occurred at 15:30 GMT, 14 January, with Carnarvon, Australia, supporting mission control Phase II operations. The experiments LPX and LPY gains were returned to 0db gain by command on 14 January. There were no engineering, or other data out of tolerances as a result of the functional change in the instrument. The PSE sensor temperature, DL-07, was off-scale HIGH at the start of Phase II support, at 14:51 GMT, 13 January. This interruption of data is characteristic of that seen in previous lunations.

The Lunar Surface Magnetometer field sensor outputs and engineering data returned, restoring valid science data, at 19:44 GMT, 8 January. The LSM internal temperature was 43.5°C. The instruments engineering status bits continue to indicate that the Y axis sensor head remains locked at a 180 degree position.

The Solar Wind Spectrometer continues to record solar wind plasma data in the high gain mode for subsequent long term analysis.

The Suprathermal Ion Detector Experiment continues to indicate moderate low and high energy activity. The instrument experienced a mode change at 19:22 GMT, 12 January with the instruments internal temperature at 55.5°C. Another mode change was experienced at 18:17 GMT, 13 January, at an internal temperature of 56.6°C. The Cold Cathode Gauge high voltage remains inoperative. The CCIG internal temperature measurement continues off scale HIGH.

The Dust Detector cell outputs are exhibiting the same trend as noted during previous lunar cycles.

The Status as of 15:00 GMT, 15 January, was as follows:

Sun Angle	111.7°
Input Power	71.9 watts
Reserve Power	41.6 watts
Heater & Power Dumps	OFF
Experiment Status	All On
Thermal Plate Temperature (Average)	93.6° F
PSE Sensor Assembly Temperature	Off scale HIGH
LSM Sensor Temperature (Average)	80.3°C (176.5° F)
LSM Internal Temperature	77.3°C (171.1° F)
SWS Sensor Assembly Temperature	63.7°C (146.6° F)
SWS Internal Temperature Module 300	66.1°C (151.0° F)
SIDE Temperature (Average)	45.9° (114.6° F)
CCIG Temperature	Off scale HIGH

## ALSEP 1 Science Report

22 January, 1971

### Apollo Lunar Surface Experiments Package Status Report - 09:00 CST

The experiment package continues to transmit scientific and engineering data to Earth after more than 429 consecutive days of lunar operation. Sunset of the ALSEP 1 15th lunar night occurred at 05:02 GMT, 21 January, when the Dust Detector's west facing solar cell output (AX-04) went off-scale indicating sunset at the deployment site. The Central Station DSS-1 heater (10-watt) was commanded ON when the average thermal plate temperature reached 47.3°F at 15:25, 20 January. Transmitter "B" downlink signal strength continues to fluctuate between -139.0 dbm and -142.0 dbm depending on MSFN site characteristics. To date, a total of 7340 commands have been transmitted to and implemented by ALSEP 1.

The following correction should be made to the ALSEP 1 SCIENCE REPORT dated 15 January 1971. Following termination of Phase II support (real time) on 13 January, ALSEP implemented an unexpected functional change of Dust Detector OFF (octal 031). Review of the MSFN post site report messages indicated no spurious CVW's. This was the second unexpected functional change of the Dust Detector within a month. The accumulated down time of the Dust Detector during lunar day operation is now approximately 12 days. The Dust Detector was commanded ON at 15:53 GMT, 17 January.

Central station telemetry data indicated that RTG Cold Frame Temperature (AR-05) went off scale LOW at 08:15 GMT, 21 January. This off scale deflection is a characteristic operations event of the generator. The RTG power output is constant at 72.3 watts.

The Passive Seismic Experiment sensor temperature (DL-07) returned on scale prior to the scheduled real time support on 20 January. The experiments characteristic Short Period Z axis pulse train appeared at 02:30 GMT, and remained until 08:15 GMT, 21 January. The instruments Z axis leveling motor was commanded ON at 12:14 GMT, 21 January, as the sensor temperature decreased to 125.9°F. At 12:22 GMT, 21 January the PSE Short Period Z Seismic data channel (DL-08) began a slow erratic negative direction degradation (50% full scale is normal). The SP-Z data channel degraded until 13:27 GMT, when DL-08 indicated off scale LOW (zero PCM count). Following an X axis leveling sequence at 13:46 GMT, 21 January, the SP-Z data channel returned to a normal output. At 22:49 GMT, 21 January, the SP-Z data channel (DL-08) drop off scale LOW (zero PCM count), following another erratic negative direction degradation period of approximately two hours. The SP-Z data channel has demonstrated unusually low sensitivity since deployment and the loss of this data has no effect on the validity of the other PSE data channels.



The Lunar Surface Magnetometer stopped processing data by the start of Phase II support at 14:40 GMT, 20 January. All scientific and engineering data channels of the instrument remain static, except the status bit indicators of the instruments operational mode. This event is characteristic to that which occurs after each lunar sunset and clears up after each sunrise, indicating a low-temperature effect. The experiment experienced a 75% scale negative deflection in the Y axis field sensor at 15:30 GMT, 16 January. The Y axis deflection disappeared following resumption of Phase II support on 18 January. The Y axis field sensor negative deflection is not abnormal to instrument operation, as it has been previously experienced.

The Solar Wind Spectrometer operation has been revised. The operating plan is that the experiment be operated in the high gain mode during lunar day and optical terminator crossings, and be placed in normal gain during lunar night. The SWS gain change for lunar night operation occurred at 02:08 GMT, 22 January. The instrument is operating as expected in the normal gain mode.

The Suprathermal Ion Detector Experiment data indicated that the instrument experienced a mode change to X10 mode at 16:30 GMT, 15 January, at an average sensor temperature of 52.7°C. The experiment experienced another mode change prior to the start of real time support operations at 14:40 GMT, 20 January. The SIDE continued to indicate moderate low energy activity through the optical terminator crossing. The Cold Cathode Gauge high voltage remains inoperative, while the temperature sensor continues to read off scale HIGH.

The Dust Detector cell outputs exhibited the same trend during the optical terminator crossing as had been noted during the previous cycles.

Status as of 09:00 GMT, 22 January, was as follows:

Sun Angle	196.8°
Input Power	72.3 watts
Reserve Power	13.5 watts
Heater & Power Dumps	DSS-1 ON (10 watts)
Experiment Status	ON
Thermal Plate Temperature (Average)	22.2°F
PSE Sensor Assembly Temperature	126.43°F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-131.7°C (-205°F)
SWS Internal Temperature (Module 300)	-13.2°C (8.3°F)
SIDE Temperature (Average)	21.3°C (70.3°F)
CCIG Temperature	Off Scale HIGH

ALSEP 1 SCIENCE REPORT

29 January 1971

Apollo Lunar Surface Experiments Package Status Report - 10:00 CST

The ALSEP 1 system performance after 436 days of operation is stable and providing data typical of the lunar night environment. All data, scientific and engineering, are being continuously recorded by the MSFN tracking stations for subsequent analysis. Lunar midnight occurred at 15:00 GMT, 28 January.

Transmitter "B" has experienced no signal dropouts since its implementation (19 December 1970). The signal strength from transmitter "B" continues to vary slightly depending on site characteristics, between -138 dbm and -140 dbm. The thermoelectric power source output remains steady at 72.3 watts. The RTG temperature AR05 remains off scale LOW. Central station telemetry data indicates that the average thermal plate temperature is stabilized at 20.4° F. To date, more than 7420 commands have been transmitted to and implemented by ALSEP 1.

The PSE Short Period Z Seismic Data Channel (DL-08) remains off scale LOW (0 PCM). The Solar Wind Spectrometer continues to function in normal gain mode. The Suprathermal Ion Detector Experiment continues to function in the lunar night environment. The Cold Cathode Gauge sensor temperature (DI-04) continues to indicate off scale HIGH, and the high voltage supply remains inoperative. The Lunar Surface Magnetometer scientific and engineering channels of the instrument remain static, except the status bit indicator of the instruments operational mode.

Status as of 14:00 GMT was as follows:

Sun Angle	282°
Input Power	72.3 watts
Reserve Power	12.5 watts
Heater and Power Dumps	10 watt ON
Experiment Status	All ON
Thermal Plate Temperature (Average)	20.2° F
PSE Sensor Assembly Temperature	125.9° F
LSM Sensor Temperature (Average)	Static
LSM Internal Temperature	Static
SWS Sensor Assembly Temperature	-134.3° C (-209.7° F)
SWS Internal Temperature Module 300	-15.6° C (+3.9° F)
SIDE Temperature (Average)	4.1° C (39.4° F)
CCIG Temperature	HIGH