This ATM documents Task 1 of the Operational Contingency Study defined in ATM-396.

Major functional failure modes for the ALSEP Central Station and for each experiment (both Array A and Array B) have been tabulated in the format of the attachment. The format includes an estimate of the gross operational effect of each listed contingency. The referenced notes justify the assignment of each contingency to its respective degradation category and indicate the mode of recovery, where one exists.

The following ground rules have been observed in the preparation of the contingency table:

1. ALSEP performance is normal except for the contingency under consideration. Exceptions are clarified in the notes, e.g., the commanding ON of a redundant unit is assumed to have been preceded by failure of the primary unit.

2. Where a range of degradation effects exists, the reference note index appears in the most likely category column; the range is then indicated by parenthetical X's in the other possible columns.

3. Central Station contingencies are rated from a Program standpoint, but the experiment contingencies are rated by consideration of the single experiment. Thus, the loss of an experiment would be categorized as "Serious Degradation" under the Central Station section but as "Complete Loss of Data" under the pertinent experiment section.

The cognizant Project Engineers are requested to report significant additions, deletions or modifications to System Design.

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OPERATIONAL CONTINGENCY SUMMARY

A. Central Station Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
1. No power from RTG				X
2. Low power from RTG			X (1)	(X)
3. Loss of regulation in PCU	X (2) Backup PCU (A)			
4. No response to PCU Set Command (PC-1)		(X)	X (3)	(X)
5. No response to PCU Reset Command (PC-2)		(X)	X (3)	(X)
6. Loss of command Receiver LO	X (4) Backup LO (A)			
7. Loss of Up Link			X (5)	
8. Malfunction of Signal Conditioner			X (6)	
9. Loss of Back-up Timer	X (7) Backup Gnd Cmd (M)			
10. Loss of Transmitter	X (8) Backup Xmitter (M)			

NOTE: 7. this occurs there is no Here is no R/T data

A = A function   M = Manual

A. Central Station Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
11. Loss of Data Processor	X (8) Backup D/p (m)			
12. Complete loss of down link				X
13. No response to Normal Data Rate Command (DP-3) *What if in ASE mode?*		X (9)		
14. No response to Slow Data Rate Command (DP-4)		X (10)		
15. No response to Reset X and Y Processor Command (DP-5)	X (11) Auto every 90 frames			
16. No response to Transmitter A Select Command (PD-1)			X (12)	(X)
17. No response to Transmitter ON Command (PD-2)				X (13) Astro backup
18. No response to Transmitter OFF Command (PD-3)	X (14)			
19. No response to Transmitter B Select Command (PD-4)			X (12)	(X)

A. Central Station	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
20. No response to PDM Load #1 ON Command (PD-5)		X (15)		
21. No response to PDM Load #1 OFF Command (PD-6)		X (16)		
22. No response to PDM Load #2 ON Command (PD-7)		X (15)		
23. No response to PDM Load #2 OFF Command (PD-8)		X (16)		
24. No response to Back-up Heater ON Command (PD-9)			X (17)	
25. No response to Back-up Heater OFF Command (PD-10)	X (18)			
26. No response to Data Processor X ON Command (PD-11)			X (19)	(X)
27. No response to Data Processor Y ON Command (PD-12)			X (19)	(X)
28. No response to Experiment 1 Power ON Command (PD-13)			X (20)	
29. No response to Experiment 1 Power STANDBY Command (PD-14)		X (21)		
30. No response to Experiment 1 Power OFF Command (PD-15)		X (22)		

A. Central Station Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
31. No response to Experiment 2 Power ON Command (PD-16)	(X)		X (23)	
32. No response to Experiment 2 Power STANDBY Command (PD-17)		X (21)		
33. No response to Experiment 2 Power OFF Command (PD-18)		X (22)		
34. No response to Experiment 3 Power ON Command (PD-19)			X (24)	
35. No response to Experiment 3 Power STANDBY Command (PD-20)		X (21)		
36. No response to Experiment 3 Power OFF Command (PD-21)		X (22)		
37. No response to Experiment 4 Power ON Command (PD-22)			X (24)	
38. No response to Experiment 4 Power STANDBY Command (PD-23)		X (21)		

A. Central Station Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
39. No response to Experiment 4 Power OFF Command (PD-24)		X (22)		
40. No response to Experiment 5 Power ON Command (PD-25)			X (24)	
41. No response to Experiment 5 Power STANDBY Command (PD-26)		X (21)		
42. No response to Experiment 5 Power OFF Command (PD-27)		X (22)		
No Telemetry Of:				
43. Command verification (Word 46 of Array A or word 5 of Array B)		X (25)		
44. One sunshield temperature (STT-1 or STT-2)	X (26)			
45. One thermal plate temperature (STT-3 through STT-7)	X (26)			
46. One primary structure temperature (STT-8 through STT-11)	X (26)			

A. Central Station Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No Telemetry Of:				
47. Inner temperature of multilayer insulation (STT-12)		X		
48. Outer temperature of multilayer insulation (STT-13)		X		
49. Local oscillator crystal temperature (ET-1 or ET-2)				
50. Transmitter crystal temperature (ET-3 or ET-5)		X (27)		
51. Transmitter heat sink temperature (ET-4 or ET-6)		X (27)		
52. Analog Multiplexer base temperature (ET-7)		X		
53. Analog Multiplexer internal temperature (ET-8)		X		
54. Data processor base temperature (ET-9)		X		
55. Data processor internal temperature (ET-10)		X		
56. Command decoder base temperature (ET-11)		X		

A. Central Station Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No. Telemetry Of:				
57. Command decoder internal temperature (ET-12)		X		
58. Command demodulator VCO temperature (ET-13)		X		
59. Power distribution unit base temperature (ET-14)		X		
60. Power distribution unit internal temperature (ET-15)		X		
61. PCU Power oscillator temperature (ET-16 or ET-17)		X (27)		
62. PCU regulator temperature (ET-18 or ET-19)		X (27)		
63. One analog calibration voltage (CE-1 or CE-2)		X (28)		
64. Converter input voltage (CE-3)		X (29)		
65. Convertor input current (CE-4)		X (29)		
66. Shunt regulator current (CE-5 or CE-6)		X (29)		

A. Central Station Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No Telemetry Of:				
67. One PCU output voltage (CE -7 through CE-12)		X		
68. Prelimiting level of receiver (CE-13)		X		
69. Receiver LO level (CE-14)		X		
70. RF output of one transmitter (CE-15 or CE-16)		X (27)		
71. RF level of one transmitter's 2nd PA (CE-17 or CE-18)		X (27)		
✳ 72. Command decoder 1 kHz subcarrier status (CB-1)	X (30)			
✳ 73. Experiment ON/OFF status (CB-4 or CB-5)	X (30)			
74. One RTG temperature (RT-1 through RT-6)	X (26)			
75. Dust accretion Unit temperature DA-1		X		
76. One dust accretion unit cell voltage (DA-2 through DA-4)		X		

B. Passive Seismic Experiment Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following commands:				
1. Change gain LP horizontal (PS-1)		(X)	X (31)	
2. Change gain LP vertical (PS-2)		(X)	X (31)	
3. Calibration SP (PS-3)				
a. Locked in OFF mode			X (32)	
b. Locked in ON mode		X		
4. Calibration LP (PS-4)				
a. Locked in OFF mode			X (32)	
b. Locked in ON mode		X		
5. Change gain SP (PS-5)		(X)	X (31)	
6. X Level power (PS-6)				
a. Locked in OFF mode			X (33)	
b. Locked in ON mode	X			
7. Y Level power (PS-7)				
a. Locked in OFF mode			X (33)	
b. Locked in ON mode	X			

B. Passive Seismic Experiment Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following commands:				
8. Z Level power (PS-8)				
a. Locked in OFF mode			X (33)	
b. Locked in ON mode	X			
9. Uncage (PS-9)				X
10. Level Direction (PS-10) (AUTO mode failed)			X (33)	
11. Level Speed (PS-11)		X (35)		
12. Heater Control (PS-12)				
a. Locked in AUTO, failed			X	(X)
b. Locked in COMMAND			X	(X)
13. Filter IN/OUT (PS-13)				
a. Locked IN			X	
b. Locked OUT			X (36)	
14. Coarse Level (PS-14)				
a. Locked OUT (AUTO mode failed)			X (33)	
b. Locked IN (AUTO mode failed)	X			
15. Level Mode (PS-15)				
a. Locked in AUTO (failed)			X (33)	

B. Passive Seismic Experiment Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No Telemetry of Following Data:				
16. LP Amplifier Gain Status, X or Y (PS-1)		X (34)		
17. LP Amplifier Gain, Z Axis (PS-2)		X (34)		
18. SP Amplifier Gain Status, (PS-3)		X (34)		
19. Level Mode and Coarse Level Status (PS-4)	X			
20. Level Speed and Direction (PS-5)		X (35)		
21. Thermal Control Mode & Heater Status (PS-6)		X (34)		
22. LP and SP Calibrate Mode Status (PS-7)	X			
23. Cage Status (PS-8)	X (34)			
24. LP Scientific Data One (or more) Axis			X	
25. LP Tidal Data, One (or more) Axis			X	
26. Temperature			X	
27. SP Scientific Data			X	

C. Lunar Surface Magnetometer Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following:				
1. Range Selection Command (MG-1)			X	
2. Steady Field Offset Command (MG-2)			X	
3. Steady Field Hold Command (MG-3)			X	
4. Flip/Cal. Inhibit Command (MG-4)				
a. Locked in ENABLE mode		X (37)		
b. Locked in INHIBIT mode			X (32)	
5. Flip/Cal. Initiate Command (MG-5)		X (37)		
6. Filter Failure Bypass Command (MG-6)				X
7. Site Survey Command (MG-7)			X	
8. Thermal Control Select Command (MG-8)				X (40)

C. Lunar Surface Magnetometer Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No Telemetry of Following:				
9. Subframe marker		X (38)		
10. Temperature data from any one magnetic field sensor		X (26)		
11. Base Temperature	X			
✳ 12. Internal Electronics Temp.	X (30)			
✳ 13. Supply Voltage	X (30)			
✳ 14. Flip Position of any one sensor	X (30)			
✳ 15. Gimbal Position of any one sensor	X (30)			
✳ 16. Thermal Control Address	X (30)			
17. Sensitivity range data		X (34)		
18. Offset field status of any one sensor		X		
19. Mode status data	X			
20. Offset ratchet address data	X			

C. Lunar Surface Magnetometer Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No Telemetry of Following:				
21. Filter status data	X			
22. Calibrate Inhibit Status data		X		
23. Scientific data from one sensor			X (39)	

D. Solar Wind Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
1. No response to dust cover removal command (SW-1)				X
No Telemetry of following data:				
2. A/D converter calibration		X		
3. Electrometer calibration			X	
4. Experiment Temperatures		X		
5. DC component of high voltage			X	
6. AC component of high voltage			X	
7. Cycle count		X		
8. Plasma magnitude (electron)			X	
9. Plasma magnitude (proton)			X	
10. Output of one or more sensors.			X	

E. SIDE Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following commands:				
1. Ground Plane Step Programmer (ST-1)				
a. Locked in OFF mode			X	
b. Locked in ON mode		X (42)		
2. Reset Frame Counter at 10 (ST-2)		X (41)		
3. Reset Frame Counter at 39 (ST-3)		X (41)		
4. Reset Velocity Counter at 9 (ST-4)		X (41)		
5. Reset Frame Counter at 79 (ST-5)		X (41)		
6. Reset Frame Counter at 79 and Velocity Counter at 9 (ST-6)		X (41)		
7. X 10 Accumulation Interval (ST-7)				
a. Locked in ON mode	X (47)			
b. Locked in OFF mode		X (42)		
8. Master Reset (ST-8)			X (43)	X

E. SIDE Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following commands:				
9. Velocity Filter Voltage (ST-9)				
a. Locked in OFF mode			X (44)	
b. Locked in ON mode		X (42)		
10. LE CPA High Voltage (ST-10)				
a. Locked in OFF mode			X (45)	
b. Locked in ON mode		X (42)		
11. HE CPA High Voltage (ST-11)				
a. Locked in OFF mode			X (46)	
b. Locked in ON mode		X (42)		
12. Force Continuous Calibration (ST-12)		X (48)		
13. CCIG (ST-13)				
a. Locked in OFF mode			X (49)	
b. Locked in ON mode		X (42)		
14. Channeltron High Voltage (ST-14)				
a. Locked in OFF mode			X (50)	
b. Locked in ON mode		X (42)		

| E. SIDE | OPERATIONAL EFFECT | | | |
Contingencies	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following commands:				
15. Reset Command Register (ST-20)	X (51)			
No Telemetry of Following Data:				
16. LE Detector Count Rate (SI-1, Channel 70, ALSEP Word 33)	X (52)			
17. HE Detector Count Rate (SI-2, channel 85)	X (52)			
18. Dust Cover Status	X (53)			
19. CCIG Seal Status	X (53)			
20. Ground Plane ON/OFF Status	X (53)			
21. Ground Plane Step Count	X (52)			
22. Experiment Temperatures		X		
23. Supply voltages		X		
24. Calibration voltages			X (28)	
25. Command Input Register Contents	X			

E. SIDE Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No Telemetry of following data:				
26. Mode Register Contents		X (53)		
27. Velocity Selector Voltage (SIDE word No. 7)		X (54)		
28. SIDE Frame Count (SIDE word No. 1)			X (55)	
29. Calibration Rates (SIDE word No. 6)			X (28)	
30. CCIG data (SIDE word No. 2)			X (49)	
31. LE CPA Voltage (SIDE word No. 8)			X (45)	
32. HE CPA Voltage (SIDE word No. 3)			X (46)	
33. LE Count (SIDE words 9 and 10)		X (52)		
34. HE Count (SIDE words 4 and 5)		X (52)		

F. Active Seismic Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following commands:				
1. Active Seismic ON (DP-1)				X (23)
2. Active Seismic OFF (DP-2)	X (56)			
3. Geophone Calibrate (AS-1)			X (28)	
4. Set Seismic Data Mode (AS-2)		X (42)		
5. Sequential Fire (AS-3)		X (57)		
6. Fire Grenade (AS-4 through AS-7)		X (58)		
7. Arm Grenades (AS-8)				X
8. Set Engineering Data Mode (AS-9)	X (59)			
9. Geophone Sequence (AS-10)		X (60)		

F. Active Seismic Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
10. Failure of Thumper Arm Switch (or Arm Grenades Command) to Set Seismic Data Mode		X (61)		
11. Failure of any one squib to fire		X		
12. Failure of all squibs to fire				X
13. Failure of system to return to Engineering Data Mode after firing of squib (or grenade)		X (62)		
14. Failure of any one grenade to fire		X		
15. Failure of all grenades				X
No Telemetry of Following Data:				
16. Mortar Box (AS-2) or Geophone (AS-4) temperature	X			
17. Central Station Package (AS-1) or Grenade Launcher Assembly (AS-3) Temperature	X (52)			
18. Calibration Pulse Voltage			X (28)	
19. 5 - volt Reference		X		
20. A/D Calibration Voltage		X		

F. Active Seismic Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No Telemetry of Following Data:				
21. Either angle voltage	X (27)			
22. Any one geophone output			X	
23. All geophone outputs				X
24. Central Station measurements	X (63)			
25. Thumper real time event			X	
26. Grenade launch or 20-foot range RTE		X (64)		
27. Grenade explosion RTE			X (64)	

G. Heat Flow Operation Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following commands:				
1. Gradient Mode Select (HF-1)			X	
2. Ring Source Conductivity Mode Select (HF-2)			X	
3. Heat Pulse Conductivity Mode Select (HF-3)			X	
4. Probe Select (HF-5 or HF-6)		X		
5. One of Measurement Select (HF-7 through HF-10)		X		
6. Full Sequence (HF-4)			X	
7. Heater Advance (HF-11)			X	
No Telemetry of the following data:				
8. ✦ 5V Supply (HF-1)		X		
9. -5V Supply (HF-2)		X		
10. ✦ 15V Supply (HF-3)		X		
11. -15V Supply (HF-4)		X		
12. 29V Input (HF-5)	X (26)			

G. Heat Flow Operation Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No Telemetry of the following data:				
13. High Conductivity Heater Volts (HF-6)		X		
14. Low Conductivity Heater Volts (HF-7)		X		
15. One probe bridge output			X	
16. One bridge excitation			X	
17. One probe thermocouple output		X (26)		
18. Reference bridge output			X	
19. Reference bridge excitation			X	
20. Amplifier offset or gain calibration			X (28)	
21. Subsequence register I.D. Bits			X (55)	
22. Program sequence register I.D. Bits			X (55)	
23. Mode identification		X (53)		
24. Heater identification		X (53)		

G. Heat Flow Operation Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
Loss of following:				
25. One to four heaters		X		
26. Five or more heaters			X	
27. Automatic sequencer				X
28. Amplifier or A/D converter				X

H. CPLEE Operational Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No response to following commands:				
1. Thermal Control Bypass ON (CP-1)				X (65)
2. Thermal Control Bypass OFF (CP-2)		X (66)		
3. Dust Cover Removal (CP-3)		X (67)		(X)
4. Automatic Voltage Sequencer ON (CP-4)		X (42)		
5. Step Voltage Level (CP-5)			X (41)	
6. Automatic Voltage Sequencer OFF (CP-6)		X (41)		
7. Channeltron Voltage Increase ON (CP-7)		X (41)		
8. Channeltron Voltage Increase OFF (CP-8)	(X)	X (41)		
No telemetry of following data:				
9. Switchable Power Supply Voltage (CP-1 Channel 25, ALSEP word 33)		X (64)		

H. CPLEE Operational Contingencies	OPERATIONAL EFFECT			
	No Degradation	Minor Degradation	Serious Degradation	Complete Loss of Data
No telemetry of following data:				
10. Analyzer A Channeltron Power Supply Voltage (CP-2, Channel 89)		X (64)		
11. Analyzer B Channeltron Power Supply Voltage (CP-3, Channel 40)		X (64)		
12. DC - DC Converter Voltage (CP-4, Channel 54)	X (30)			
13. One experiment temperature (CP-5 or CP-6, Channel 69 or 90)	X (27)			
14. Analyzer identification (ID Bit No. 1)		X (64)		
15. Voltage Polarity (ID Bit No. 2)		X (64)		
16. Deflection Plate Voltage Step (ID Bits 3 and 4)	X (53)			
17. One channel count		X		
18. One analyzer output			X	
19. Loss of program sequencer				X

NOTES:

(1) Degree of degradation depends upon how low the RTG power output is, e.g.; at 30 watts, only the Central Station can be operated, at 40 watts any one experiment can be exercised, and at 50 watts, any two experiments can be simultaneously operated.

(2) Output voltage sensors result in switch-over to redundant unit upon detection of malfunction.

(3) Could result in complete loss of data or degradation depending upon nature of fault which prompted initiation of command.

(4) Redundant oscillator automatically switched in.

(5) Data restricted to automatic sequences of those experiments (and modes) active at time of up-link failure.

(6) One or more channels of analog data lost.

(7) Functions of timer can be accomplished by ground command.

(8) Redundant unit can be switched in by ground command.

(9) Slower retrieval of data only.

(10) Possible slightly higher telemetry error rate.

(11) Processor internally reset at end of 90th frame.

(12) Degree of degradation dependent upon nature of fault in other transmitter, which prompted initiation of command.

(13) While astronaut is on lunar surface, he can energize transmitter by actuating Back-up Switch #1.

(14) Transmitter turned off by timer at end of ALSEP life.

(15) Equivalent load must be dissipated by PCU regulator and experiments. The other PDM load may be employed unless it is already in use.

(16) May require shutdown of one experiment to restore regulation.

NOTES: (Cont)

(17) Marginally low temperature may result in erratic performance during lunar night.

(18) Heater is thermostatically controlled.

(19) Degree of degradation dependent upon nature of fault in other processor, which prompted initiation of command.

(20) Results in complete loss of Passive Seismic data.

(21) Experiment left ON; power budget must handle additional drain.

(22) Experiment left ON or in STANDBY; power budget must handle drain.

(23) For initial turn-on, command is backed up by astronaut - actuated switch. However, if a subsequent turn-on attempt fails, experiment is lost.

(24) Results in complete loss of experiment data.

(25) Execution of most commands is readily apparent from other telemetry.

(26) Equivalent data available from another sensor.

(27) Data available on redundant unit.

(28) Reduced confidence in accuracy of analog data.

(29) Desirable data for system power monitoring and adjustment.

(30) Diognostic value only.

(31) Possible noise problems, (or saturation if gain is too high).

(32) No capability of calibrating instrument.

(33) No capability of leveling instrument; SP OK.

(34) Setting can be deduced by response to commands.

(35) Prolongs the leveling period.

(36) Loss of Tidal data and LP fine level.

NOTES: (Cont.)

(37) Initiation by timer at 12 hour intervals must be anticipated.

(38) Content of telemetry words identifies sequence.

(39) Data can be grossly synthesized from Site Survey results.

(40) Assuming primary control has failed.

(41) Limits intensive investigation capability.

(42) Limits operational flexibility.

(43) Degree of degradation depends upon operating mode prior to attempted reset.

(44) Loss of mass discrimination capability.

(45) Loss of LE data.

(46) Loss of HE data.

(47) Can be defeated by Master Reset Command.

(48) Prolongs calibration period.

(49) Loss of CCIG data.

(50) Loss of SIDE data.

(51) Recovery by transmission of alternative commands.

(52) Equivalent data available in other experiment telemetry.

(53) Status can be deduced from experiment performance.

(54) Data can be approximated from other telemetry.

(55) Complicates retrieval and analysis of data

(56) Initial turn-off is backed up by astronaut - actuated switch; second turn-off (after mortar sequence) is not essential since all other experiments will have been completed.

NOTES: (Cont.)

(57) Grenades can be individually fired by use of commands AS-4 through AS-7.

(58) Grenades can be sequentially fired by use of command AS-3; if this fails, data are lost.

(59) Mode can be set by commanding experiment power to OFF, then to ON.

(60) May lose response of one geophone.

(61) Back-up by command AS-2.

(62) Back-up by command AS-9.

(63) Data can be checked by switching to NORMAL data rate (AS OFF).

(64) Complicates data analysis.

(65) Assuming prior failure of thermal control.

(66) Subjects experiment to widely varying temperatures.

(67) Backed up by timer-generated command (4-days after ALSEP is energized); if back-up fails, experiment is lost.