FINAL SYSTEMS MISSION RULES FOR APOLLO LUNAR SURFACE EXPERIMENTS PACKAGE ALSEP 4

DECEMBER 18, 1970

PREPARED BY
FLIGHT CONTROL DIVISION

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

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This document contains the Systems Mission Rules for ALSEP 4 as of November 1, 1970. This and all subsequent revisions to this document will be printed on different colored pages for easy recognition.

It is requested that any organization having comments, questions, or suggestions concerning these mission rules contact Mr. David P. Nicolson, Flight Control Operations Branch, Building 30, Room 2044A, Phone 483-3938.

Any requests for additional copies or changes to the distribution list in Appendix B of this document must be made in writing to Mr. Sigurd A. Sjoberg, Director of Flight Operations, Manned Spacecraft Center, Houston, Texas.

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Approved by ---

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DIRECTOR OF FLIGHT OPERATIONS

Concurred by ---

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JAMES A. McDIVITT

COLONEL

MANAGER, APOLLO SPACECRAFT PROGRAM
MISSION RULES

SECTION 1 - INTRODUCTION AND PURPOSE

MISSION RULES ARE PROCEDURAL STATEMENTS WHICH PROVIDE FLIGHT CONTROLL PERSONNEL WITH GUIDELINES TO EXPEDITE THE DECISION-MAKING PROCESS. THE RULES ARE BASED ON AN ANALYSIS OF MISSION EQUIPMENT CONFIGURATION, SYSTEMS OPERATIONS AND CONSTRAINTS, AND MISSION OBJECTIVES. THE DIRECTOR OF FLIGHT OPERATIONS, MANNED SPACECRAFT CENTER, HOUSTON, TEXAS, HAS THE OVERALL RESPONSIBILITY FOR THE PREPARATION, CONTENTS, AND CONTROL OF THE SYSTEMS MISSION RULES FOR ALSEP.

THE ALSEP MISSION RULES ARE PUBLISHED UNDER SEPARATE COVER FROM THE FLIGHT MISSION RULES BECAUSE OF THE DIFFERENCE IN LIFETIME OF THE ALSEP OPERATION AND SPECIFIC MISSION ORIENTED ACTIVITIES. THE ALSEP MISSION RULES DOCUMENT WILL CONTAIN ALL ALSEP MISSION RULES INCLUDING:

A. ALL MISSION RULES AFFECTING CREW INTERFACE WITH THE ALSEP AND

B. ALL MISSION RULES AFFECTING MCC INTERFACE WITH THE ALSEP THROUGH ALSEP SYSTEMS LIFETIME.

THE FLIGHT MISSION RULES ALSO WILL CONTAIN ALL ALSEP RULES INVOLVING FLIGHT CREW INTERFACE.

THE FLIGHT MISSION RULES WILL TAKE PRECEDENCE SHOULD ANY CONFLICTS EXIST BETWEEN THIS DOCUMENT AND THE FLIGHT MISSION RULES BECAUSE OF REVISION CYCLES.

MISSION RULES CAN BE CATEGORIZED AS GENERAL AND SPECIFIC. GENERAL MISSION RULES CONTAIN THE BASIC PHILOSOPHIES USED IN THE DEVELOPMENT OF THE ALSEP MISSION RULES. SPECIFIC MISSION RULES PROVIDE THE BASIC CRITERIA FROM WHICH REAL-TIME DECISIONS ARE MADE AND WILL BE FORMATTED AS FOLLOWS:

A. THE CONDITION/MALFUNCTION COLUMN DEFINES THE FAILURE.

B. THE PHASE COLUMN IDENTIFIES THE TIME INTERVAL IN WHICH THE CONDITION/MALFUNCTION OCCURS.

C. THE RULING COLUMN DEFINES FLIGHT CONTROLLER ACTION AND/OR PROCEDURES THAT MUST BE ACCOMPLISHED AS A RESULT OF THE CONDITION.

D. THE CUES/NOTES/COMMENTS COLUMN PROVIDES THE FLIGHT CONTROLLER WITH ADDITIONAL INFORMATION CONCERNING THE CONDITION/MALFUNCTION AND/OR RULING.

THERE WILL BE A SEPARATE SET OF MISSION RULES FOR EACH ALSEP PACKAGE.

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MISSION REV DATE SECTION GROUP PAGE
ALSEP 4 FNL 12/18/70 INTRODUCTION AND PURPOSE 1-1
2-1 THE ALSEP MISSION RULES OUTLINE PREPLANNED DECISIONS DESIGNED TO MINIMIZE THE AMOUNT OF REAL-TIME RATIONALIZATION REQUIRED WHEN NON-NOMINAL SITUATIONS OCCUR AFTER CREW ACTIVATION.

2-2 WHEN A CONFLICT OF PLANNED ACTIVITIES OCCURS, THE ALSEP SENIOR ENGINEER WILL DETERMINE THE PRIORITY OF ACTIVITIES.

2-3 IN SOME INSTANCES, THE SPECIFIC MISSION RULES MAY DEVIATE FROM THE GENERAL GUIDELINES OR FROM THESE GENERAL RULES. THE SPECIFIC MISSION RULE WILL APPLY IN ALL CASES, AND THE DEVIATIONS FROM THE GENERAL GUIDELINES WILL BE NOTED.

2-4 THE ALSEP SENIOR ENGINEER MAY, AFTER ANALYSIS OF THE OPERATION, CHOOSE TO TAKE ANY NECESSARY ACTION REQUIRED FOR SUCCESSFUL COMPLETION OF ALSEP TEST OBJECTIVES.

2-5 MISSION RULE LIMITS THAT ARE CONSIDERED TO BE INTERIM OR UNCONFIRMED NUMBERS WILL BE UNDERLINED IN THIS PUBLICATION AND ALL SUBSEQUENT REVISIONS UNTIL THE NUMBERS ARE CONFIRMED BY THE RESPONSIBLE NASA AGENCY.

2-6 THE SYSTEMS LIMITS LISTED IN THESE RULES ARE THE ACTUAL VEHICLE LIMITS AS WELL AS THEY ARE KNOWN AND UNDERSTOOD AND ARE NOT BIASED TO COMPENSATE FOR TIME DELAYS OR INSTRUMENTATION ERRORS WITHIN THE ALSEP AND MSFN DATA/DISPLAY SYSTEMS.
GENERAL

A. These ALSEP General Operational Guidelines are based on objectives in the following priorities:

1. PSE
2. DTEK (PSL)
3. ASE
4. SEG
5. CPLEE

NOTE - RIPPLE-OFF SEQUENCE --- 1) CPLEE; 2) SIDE; and 3) PSE.

B. The gathering of scientific data will not be compromised for engineering or test purposes.

C. Redundant or backup systems will not be selected unless a failure warrants such action. Switching to redundant systems will not be accomplished to satisfy engineering tests unless all scientific mission objectives have been completed.

D. Bit rates will not be changed on the ALSEP unless this action will correct certain sync problems (from the Operational MSFN site) or unless a change of bit rate is necessary to satisfy certain scientific objectives. If the bit rate is changed from the normal because of a MSFN problem, the ALSEP will be configured back to normal (1.06 KBPS) prior to termination of support from that site.

E. Before implementing any mission rule action based on an apparent ALSEP malfunction, it will be ascertained that there is no problem with the MSFN supporting site.

F. The timer inhibit command will not be sent prior to all experiments being on and properly adjusted for optimum scientific data return.

G. The timer will never be inhibited while the ALSEP transmitter is off, and the ALSEP transmitter will never be commanded on, while the timer is inhibited. During normal operation the timer will not be inhibited and the transmitter will not be commanded off.

H. The timer will not be inhibited while ALSEP is in high bit rate.

I. ALSEP experiments will not be commanded to "standby off" unless the action is justified by an anomaly.

J. Anytime there is an automatic switchover to PCU No. 2 not identifiable to a failure in PCU No. 1, a one-time command will be attempted to return to PCU No. 1 if the +12 VDC bus is greater than +11 VDC.

K. No command function can be executed other than "standby off", "standby select" or "operate select" in an experiment by ground command or by onboard timer, unless the experiment is in the "operate" mode.

L. The ALSEP turn-on sequence is:

1. Astronaut activates shorting plug switch asap after deployment.
2. Check will activate astro switch No. 1 and No. 5 per direction from the ground. Switches No. 1 and No. 5 will be activated based on predicted availability of 38.2 watts from the RTG (see Figure 3-2-2A, ALSEP SOD).

M. If the ground is unable to command a transmitter on and/or experiments on, the astronaut will turn on astro switches No. 2 and/or No. 3 and/or No. 4 during EVA No. 1 when requested from the ground. The transmitter will normally be initiated by the tripping of the hold off circuit. The ASE thumper activity will be performed regardless of ground command capability.

N. The central station heaters and PDR's will be utilized to maintain an average internal thermal plate temperature with the lowest temperature greater than 20 deg F., and the highest temperature less than 125 deg F., unless there is an anomaly requiring the C/S heaters to be off.

P. WHENEVER CMD 003 (HBR ON) IS USED TO GO TO HIGH BIT RATE, CMD 009 (HBR OFF) WILL BE USED TO RETURN TO NORMAL BIT RATE (TO PREVENT LOSS OF CVW'S).

U. THE ASE IS THE ONLY EXPERIMENT THAT WILL BE COMMANDED WHILE IN HIGH BIT RATE.

R. A SINGLE COMMAND CARRIER WILL BE MAINTAINED ON AND IN THE SAFED CONFIGURATION EXCEPT TO SEND COMMANDS AND REMOTE SITE HANDOVERS FROM DEPLOYMENT INITIATION UNTIL AFTER LM LIFT-OFF TO PROVIDE ADDITIONED PROTECTION AGAINST THE GENERATION OF SPURIOUS COMMANDS.

S. THE ASE WILL NOT BE ACTIVATED BY GROUND COMMAND UNTIL THE ASC THUMPER ACTIVITY HAS BEEN COMPLETED.

T. THE ASE WILL BE COMMANDED TO STAND-BY SELECT IF THE THUMPER ARM OR GRENADE ARM WATTING OCCURS WITHOUT GROUND COMMAND OR CREW ACTION.

U. THE ALSEP WILL BE IN NORMAL BIT RATE DURING LM LIFT-OFF.
ALSEP OPERATIONAL GUIDELINES (CONT)

91-72 PSE

A. THE PSE WILL BE UNCAGED ASAP AFTER THE PSE IS COMMANDED TO OPERATE SELECT.
B. THE HEATERS WILL BE TURNED OFF PRIOR TO LEVELING OPERATIONS.
C. THE PSE LEVELING MOTORS WILL NOT BE ACTIVATED PRIOR TO UNCAGING.
E. FOR PROPER OPERATION OF THE PSE, THE FEEDBACK FILTER MUST BE IN THE FOLLOWING MODES (CMD 101); PSE FILTER IN/OUT ---
   (1) LEVELING MODE --- FILTER OUT
   (2) LONG PERIOD CALIBRATION --- FILTER IN
   (3) NORMAL OPERATIONAL MODE --- FILTER IN
G. THE PSE WILL BE RELEVELLED AS INFREQUENTLY AS POSSIBLE.
H. DURING FORCED LEVELING OPERATIONS, CAUTION SHALL BE EXERCISED PRIOR TO INITIATING LEVELING MOTOR OPERATION TO INSURE THAT PROPER MODE DIRECTION AND SPEED HAVE BEEN SELECTED.
I. THE PSE WILL BE COMMANDED TO STANDBY PRIOR TO ASE MORTAR FIXING.
   THE COMMAND WILL BE SENT PRIOR TO HIGH BIT RATE.
ALSEP OPERATIONAL GUIDELINES (CONT)

A. OPERATION OF THE ASE, IN ANY MODE, WILL BE PERFORMED ONLY WHEN AS-1 (CENTRAL STATION PACKAGE TEMP.) IS ABOVE -20 DEG. C, AS-2 (MORTAR BOX TEMP.) IS ABOVE -30 DEG. C, AND AS-3 (GRENADE LAUNCHER ASSEMBLY TEMP.) IS ABOVE -30 DEG. C.

B. OPERATION OF THE ASE IN THE MORTAR MODE WILL BE PERFORMED ONLY WHEN AS-2 (MORTAR BOX TEMP.) AND AS-3 (GRENADE LAUNCHER ASSEMBLY TEMP.) ARE ABOVE -20 DEG. C.

C. FOR OPERATION OF THE ASE IN THE THUMPER OR MORTAR MODES, EIGHT MINUTES TIME WILL BE ALLOWED AFTER ASE ACTIVATION TO PERMIT GEOPHONE AMPLIFIER TEMPERATURES TO STABILIZE.

D. A MINIMUM WAITING PERIOD OF 60 SECONDS WILL BE ALLOWED BETWEEN ARMING AND FIRING OF THE MORTARS (FOR CHARGING OF CAPACITORS).

E. THE INDIVIDUAL FIRE COMMANDS WILL BE THE NOMINAL MODE OF FIRING THE ASE MORTARS.

F. ONCE MORTAR FIRING HAS COMMENCED, ALL MORTARS WILL BE FIRED WITHIN THAT LUNATION (BECAUSE OF THE LOSS OF THERMAL INTEGRITY CAUSED BY THE FIRING OF THE FIRST MORTAR).

G. IF THE CHEK DOES NOT HAVE TIME TO COMPLETE THE THUMPER ACTIVITY AND ARM THE GLA, THUMPER ACTIVITY TIME WILL BE REDUCED SO AS TO ALLOW 5 MINUTES FOR GLA ARMING.

H. THE ASE WILL BE FIRED 3 MONTHS AFTER ALSEP 4 DEPLOYMENT AFTER THE FOLLOWING CONDITIONS HAVE BEEN MET:

1. LUNAR SCIENCE ACTIVITY IS NEAR A MINIMUM.
2. TWO 85 FOOT SITES ARE SCHEDULED FOR NOT LESS THAN 3 Hours OF SIMULTANEOUS ALSEP SUPPORT.
3. THE ALSEP EXPERIMENTS ARE NOT PICKING UP TERMINATION CROSSING ACTIVITY WITHIN 2 DAYS OF TERMINATION.
4. THE GLA AND MORTAR BOX TEMPERATURES ARE BETWEEN 15.5 DEG. C AND 26.6 DEG. C.

THE ASE MORTARS MAY BE FIRED WITHOUT THESE CONDITIONS IF ANY OF THE FOLLOWING OCCUR:

1. THE ALSEP IS IN DANGER OF AN IMMINENT TOTAL FAILURE.
2. THE ASE OPERATION INDICATES THAT THE EXPERIMENT WILL PROBABLY LOSE ITS CAPABILITY TO OPERATE IN THE MORTAR MODE.
3. THE COMMAND SYSTEM IS OPERATING IN A DEGRADED MODE (SEE MISSION RULE 31-102).
4. ONE OF THE TWO ALSEP TRANSMITTERS HAS FAILED.
5. THE ASE WILL BE OPERATED IN THE LISTENING MODE FOR 30 MINUTES EACH WEEK.
6. THE ASE WILL BE TURNED TO STANDBY OFF EXCEPT DURING LISTENING MODES AFTER ASE MORTARS HAVE BEEN FIRED.

<table>
<thead>
<tr>
<th>MISSION</th>
<th>REV</th>
<th>DATE</th>
<th>SECTION</th>
<th>GROUP</th>
<th>PAGE</th>
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</thead>
<tbody>
<tr>
<td>ALSEP 4</td>
<td>FNL</td>
<td>16/18/73</td>
<td>ALSEP OPS GUIDELINES</td>
<td>GENERAL</td>
<td>3-4</td>
</tr>
</tbody>
</table>
31-74 SIDE/CCIG

A. THE SIDE/CCIG WILL BE TURNED ON ASAP AFTER DEPLOYMENT.
B. THE SIDE DUST COVER WILL BE REMOVED BY GROUND COMMAND AFTER LM ASCENT.
C. THE CCIG SEAL WILL BE REMOVED BY GROUND COMMAND 10 MINUTES AFTER TURN ON.
D. THE SIDE/CCIG WILL BE CYCLED ON AND OFF TO KEEP TEMP. 2 BILLS 40 DEG. C. UNTIL LM IMPACT.
E. THE SIDE/CCIG WILL REMAIN IN OPERATE DURING LM ASCENT.
F. THE SIDE/CCIG WILL BE COMMANDED TO STBY DURING ABE MORTAR FIRINGS. COMMAND WILL BE SENT PRIOR TO HIGH BIT RATE.

31-75 CPLEE

A. THE CPLEE WILL BE GROUND COMMANDED TO OPERATE FOR A BRIEF FUNCTIONAL CHECK ASAP AFTER DEPLOYMENT.
B. THE CPLEE DUST COVER WILL BE REMOVED AFTER LM ASCENT.
C. THE CPLEE WILL BE TURNED TO STANDBY 10 MINUTES PRIOR TO LM ASCENT. CABIN VENTING, MORTAR FIRING, EVA AND ENGINE FIRING, IT WILL BE TURNED TO ON 10 MINUTES AFTER THE INTERRUPTING ACTIVITY IS COMPLETE.
D. THE CPLEE WILL BE COMMANDED TO STBY DURING ABE MORTAR FIRINGS. COMMAND WILL BE SENT PRIOR TO HIGH BIT RATE.
E. THE CPLEE CHECKOUT WILL BE PERFORMED AFTER EVA 1 AND WILL BE COMPLETED PRIOR TO INITIATION OF CABIN DEPRESSURIZATION FOR EVA 2.
31-76 INSUFFICIENT POWER FOR SIMULTANEOUS SUPPORT OF ALL EXPERIMENTS

IN GENERAL, AUTO THERMAL CONTROL OF THE CENTRAL STATION AND THE EXPERIMENTS WILL BE INHIBITED IF ADEQUATE POWER IS NOT AVAILABLE; THERMAL CONTROL WILL BE MANUALLY MANAGED TO PRECLUDE RIPPLE OFF OF EXPERIMENTS. CENTRAL STATION AVERAGE TEMPERATURES WILL BE ALLOWED TO GO AS LOW AS -20 DEG F. IF THE HEATER POWER IS REQUIRED FOR OPERATION OF AN EXPERIMENT, EXPERIMENT COMMANDS, REQUIRING CENTRAL STATION HEATER POWER, THAT WOULD CAUSE THE CENTRAL STATION AVERAGE TEMPERATURE TO GO BELOW 0 DEG F, WILL BE HELD TO A MINIMUM.

31-77 EXPERIMENT INTERFERES WITH ANOTHER EXPERIMENT OR THE CENTRAL STATION

IF ANY EXPERIMENT IS DETERMINED TO BE A STEADY SOURCE OF INTERFERENCE TO ANOTHER EXPERIMENT, OPERATION OF THE INTERFERING EXPERIMENT WILL BE CURTAILED (BUT NOT TERMINATED) FOR AS LONG AS THE INTERFERING EXPERIMENT IS STILL RETURNING DATA. IN NO CASE WILL ANY EXPERIMENT BE ALLOWED FROM ITS DESIRED OPERATIONAL CONFIGURATION FOR MORE THAN 90 PERCENT OF ANY LUNAR DAY (29.5 EARTH DAYS).
<table>
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<tr>
<th>RULE</th>
<th>CONDITION/MALFUNCTION</th>
<th>PHASE</th>
<th>RULING</th>
<th>CUES/NOTES/COMMENTS</th>
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<tr>
<td>31-81</td>
<td>A+ ST-01 FAILED</td>
<td>CLOSED</td>
<td>A+ DSS 3 HTR (10W) OFF</td>
<td>A+ DSS 3 HTR OFF -- CMD Q25</td>
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<td>31-82</td>
<td>THROUGH</td>
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<td>31-90</td>
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<td>RESERVED</td>
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**Notes:**
- **UNEXPLAINED 10W DROP IN RESERVE POWER AND AN UNEXPLAINED RISE IN TEMPERATURE.**
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<tr>
<th>RULE</th>
<th>CONDITION/MALFUNCTION</th>
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<th>RULING</th>
<th>CUES/NOTES/COMMENTS</th>
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<tbody>
<tr>
<td>31-91</td>
<td>FAILURE OF AUTO</td>
<td>1</td>
<td>SELECT PCU 2</td>
<td>PCU 2 LEL --- CMD 062 AUTO SWITCHOVER TO PCU 2 SHOULD OCCUR AT +12 VDC OUT OF LIMITS (LESS THAN 11 VDC/GREATER THAN 13 VDC)</td>
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<td></td>
<td>SWITCHOVER TO PCU 2</td>
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<td>CUE --- THE FOLLOWING TM WILL BE OUT-OF-LIMITS ---</td>
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<td>TM NOMINAL HI LO</td>
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<td>AE-9   +12  +13.0  +11.0</td>
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<td>AE-7   +29  +31.3  +25.7</td>
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<td>AE-8   +15  +16.2  +13.8</td>
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<td>AE-10  +5   +5.4   +4.6</td>
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<td>AE-11  -12  -11.0  -13.0</td>
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<td>AE-12  -6   -5.5   -6.5</td>
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<td></td>
<td>VERIFY AE-02 CAL VOLTAGES ARE WITHIN LIMITS.</td>
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<td>31-92</td>
<td>RESERVE POWER LESS</td>
<td>1</td>
<td>COMMAND EXPERIMENTS TO STOP</td>
<td>CUE ---</td>
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<tr>
<td></td>
<td>THAN 2.0W</td>
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<td>LOWER POWER MODES</td>
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<td>BEGINNING WITH THE</td>
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<td>LAST PRIORITY EXPERIMENT</td>
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<td>31-93</td>
<td>TMHU</td>
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<td>31-100</td>
<td>RESERVED</td>
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<td>12/18/74</td>
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<tr>
<td>A. REINITIATE THE COMMAND</td>
<td>ALSEP FAILS TO RESPOND TO A COMMAND</td>
<td>31-10</td>
<td>CUE---</td>
<td></td>
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</tr>
<tr>
<td>B. IF UNSUCCESSFUL, SELECT OTHER DECODER (ALSEP 4A OR 4B) AND REINITIATE THE COMMAND</td>
<td></td>
<td></td>
<td>NO FUNCTIONAL VERIFICATION AND NO CMD VERIFICATION WORD (CVW)</td>
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</tr>
<tr>
<td>A. INITIAL CONTINUOUS SUPPORT</td>
<td>FAILURE OF 12 HOUR TIMER</td>
<td>31-10</td>
<td>THE TIMER WILL BE DEEMED FAILED</td>
<td></td>
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<tr>
<td>B. IF ANY TWO OF THE FOLLOWING TEMPS ARE BETWEEN -20 DEG F AND +155 DEG F, CONTINUE REAL TIME SUPPORT</td>
<td></td>
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<td>AS A FUNCTION OF ATU7, THERMAL PLATE TEMPS.</td>
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<td>NUMBER OF CONSECUTIVE MISSED PULSES</td>
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<td>12 HR</td>
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<td>OR LESS THAN +155 DEG F</td>
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<td>GREATERTHAN+155 DEG F</td>
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<td>ONE</td>
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<td>2. AFTER THE INITIAL CONTINUOUS SUPPORT, THE TRANSMITTER WILL BE LEFT ON PROVIDING THE ALSEP IS---</td>
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<td></td>
<td>THE FOLLOWING WILL BE GIVEN CONSIDERATION IN PREDICTING THE IMMINENT FAILURE OF THE COMMAND SYSTEM---</td>
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<tr>
<td>A. RETURNING VALID SCIENTIFIC DATA AND</td>
<td></td>
<td></td>
<td>1. ARE THE COMMAND SYSTEM TEMPS, AT-31, AT-32, AT-33, CONSISTENT WITHIN +/-5 DEG F OF THEIR VALUES AT THE SAME SUN ANGLE DURING THE PREVIOUS LUNAR DAY</td>
<td></td>
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</tr>
<tr>
<td>2. THERE IS NO INDICATION OF FAILURE OR IMMINENT FAILURE IN THE COMMAND SYSTEM</td>
<td></td>
<td></td>
<td>2. IS THE ALSEP RESPONDING NORMALLY TO ALL COMMANDS</td>
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<tr>
<td>3. IS A CVW BEING RECEIVED AFTER A MINIMUM OF 90 PERCENT OF THE COMMANDS TRANSMITTED</td>
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<td></td>
<td>3. IS A CVW BEING RECEIVED AFTER A MINIMUM OF 90 PERCENT OF THE COMMANDS TRANSMITTED</td>
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31-103 TO 31-104 RESERVED
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<th>PHASE</th>
<th>RULING</th>
<th>CUES/NOTES/COMMENTS</th>
</tr>
</thead>
</table>
| 31-105 | WEAK TM SIGNAL | A. SELECT REDUNDANT XMTR | A. XMTK A SEL—CMD 012  
| | | | B. XMTK B SEL—CMD 015 |
| 31-106 | LOSS OF SYNC OR BAD DECOMMED DATA | A. SELECT REDUNDANT PROCESSOR | A. PROC '11X' SEL—CMD 034  
| | | | B. LOW BIT RATE SELECT—CMD 007 |
| | | B. SELECT LOW BIT RATE | B. LOW BIT RATE SELECT—CMD 007 |
| 31-107 | LOSS OF TM SIGNAL | A. IF IN HIGH BIT RATE, COMMAND TO NORMAL BIT RATE. | A. ASY BIT OFF—CMD 005  
| | | | B. TM OFF—CMD 013 |
| | | B. SEND TM UN | C. XMTK A SEL—CMD 012  
| | | | XMTK B SEL—CMD 013 |
| | | | D. IF CRV CR (CB=01) OPEN, NEXT 12 HR PULSE WILL RESET IT. |
| | | | | NOTE— |
| | | C. SELECT REDUNDANT XMTR | | |
| | | D. AFTER NEXT 12 HR PULSE— | | |
| | | | | REPEAT B AND C |
| | | | | | IF PSE LEVELING IS IN PROGRESS, SEND PSE STBY SEL—CMD 037 |
| 31-108 | DATA DEMAND SIGNAL FROM DATA PROCESSOR FAILS HIGH | SELECT REDUNDANT PROCESSOR USING THE OTHER DECODER, DO NOT RETURN TO FAILED PROCESSOR. | | |
| | | | | CVW IS STEADILY INDICATING AN ERRONEOUS PATTERN OTHER THAN ALL ZEROS (CVW LIGHT ON EVERY 0.6 SECONDS) AFTER A CMD HAS BEEN SENT; DISABLE CMD TO FAILED PROCESSORS |
| | | | | PROC '11X' SEL—CMD 034  
| | | | | PROC '11Y' SEL—CMD 035 |
| 31-109 | LOSS OF ANY TM PARAMETER IN FIRST 15 CHANNELS OF 90 CHANNEL MULTIPLEXER | SELECT REDUNDANT PROCESSOR | | |
| | | | | DO NOT APPLY IF MISSION RULE 31-108 HAS BEEN INVOKED |
| 31-110 | GROUND UNABLE TO COMMAND HIGH BIT RATE OFF | | | |
| | | A. SEE RULE 31-101 | | |
| | | B. CMD 48 005 (BIT OFF) | | |
| | | C. CMD 4A 011 (BIT RESET) | | |
| | | D. CMD 4B 011 (BIT RESET) | | |
| | | E. CMD 4A 035  
| | | | (ON 4A 034) |
| | | F. CMD 4B 035  
| | | | (ON 4B 034) |
| | | G. IF CREW IS AVAILABLE  
| | | | HAVE SW NO 9 TURNED CW |
| | | | | SW NO 5 WILL BE TURNED CCW PRIOR TO CREW LEAVING THE ALSEP AREA FOR THE FINAL TIME |
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<td>CUE—&lt;br&gt;FAILURE TO CENTER WITHIN EXPECTED TIME (30 MINUTES MAXIMUM IN AUTO MODE). IF STEPS 1 AND 5 FAIL, LP COMPONENT IS DEFECTIVE.</td>
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<td></td>
<td>B. IF UNSUCCESSFUL, SELECT LOW SPEED AND HIGH SPEED AND DIRECTION REVERSALS ALTERNATELY.</td>
<td>NOTE—&lt;br&gt;DO NOT EXCEED 5 MIN 30 SEC IN HIGH SPEED.</td>
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<td>NOTE—&lt;br&gt;UNCAGING MAY NOT BE POSSIBLE UNLESS ATOP THERMAL PLATE TEMP IS ABOVE 229 DEG F.)</td>
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<td>1. SEND UNCAGE ARM/FIRE*</td>
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<td>2. IF UNSUCCESSFUL: FIRST 12 HR TIMER PULSE WILL ARM ACTUATOR.</td>
<td>NOTE—&lt;br&gt;SELECTION MAY BE POSSIBLE UNLESS ATOP THERMAL PLATE TEMP IS ABOVE 229 DEG F.)</td>
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<td>3. IF UNSUCCESSFUL: 96 HR + 2 MIN PULSE FROM DELETED CMD SEQUENCER WILL ARM ACTUATOR.</td>
<td>NOTE—&lt;br&gt;SELECTION MAY BE POSSIBLE UNLESS ATOP THERMAL PLATE TEMP IS ABOVE 229 DEG F.)</td>
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<td></td>
<td>SELECTING PSE STANDBY MAY FIRE ACTUATOR IF IT HAS BEEN ARMED AND NOT FIRED.</td>
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<td>NOTE—&lt;br&gt;30 SEC IS REQUIRED BETWEEN ARM AND FIRE TO CHARGE CAPACITOR.</td>
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<td></td>
<td>1. SEND UNCAGE ARM/FIRE</td>
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<td></td>
<td>2. IF UNSUCCESSFUL: SEND CMD 037 HSL STANDBY SEL, THEN CMD 036 PSE OPER SEL.</td>
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| 31-121 | PSE GOES OFF WHILE IN STANDBY MODE | **DURING NORMAL OPERATIONS** | CMD PSE TO STBY SEL | CUE--- 
EXP 1 STBY DISCRETE EXTINGUISHED, AND RESERVE POWER INCREASES SINCE POWER IS REMOVED FROM THE HEATERS. IF FUSE (F-03) HAS BEEN BLOWN BY OVERCURRENT (1500MA)Capability to SELECT PSE STBY MODE IS LOST. CMD 037--PSE STBY SEL |
| 31-122 | PSE TEMP LOW AND AUTO THERMAL CONTROL FAILS | **A. COMMAND HEATER TO FORCED ON** | CMD 076 IS A 4-STATE CMD WHICH CAN SEQUENTIALLY STEP THRU THE FOLLOWING MODES TO CONTROL THE PSE SENSOR HEATER. |
| | | **B. CMD 2 DRIVE MOTOR TO ON IN AUTO MODE** | 1. AUTO OFF  
2. FORCED HTR ON  
3. FORCED OFF  
4. AUTO ON | DL-07 PSE INSTRUMENT TEMP LOW LIMIT IS +25 DEG F. MINIMUM OF 9 WATTS RESERVE POWER IS REQUIRED. |
| 31-123 | PSE TEMP HIGH AND AUTO THERMAL CONTROL FAILS | **A. COMMAND HEATER TO FORCED OR AUTO OFF** | CMD 076 IS A 4-STATE CMD.  
1. AUTO OFF  
2. FORCED HTR ON  
3. FORCED OFF  
4. AUTO ON | DL-07 PSE INSTRUMENT TEMP HIGH LIMIT IS +127 DEG F. |
| | | **B. IF UNSUCCESSFUL, CMD PSE TO STBY, THEN TO OPERATE** | | B. SELECTING PSE TO STBY WILL REINITIALIZE TO AUTOMATIC THERMOSTAT CONTROL. |
| 31-124 | LOSS OF DOWNLINK DURING LEVELING MOTOR OPERATION | **SEND PSE STBY SEL** | | NOTE---  
PSE STBY SEL WILL STOP MOTORS. |

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<td>31-131</td>
<td>IT IS NECESSARY TO DISARM A GRENADE</td>
<td>TRANSIT CMD 043 TO TURN ASE TO STBY.</td>
<td>LEAVE IN STBY FOR AT LEAST 3 MIN.</td>
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<td>GRENADE FIRE COMMAND FAILS TO FIRE A GRENADE.</td>
<td>A. SEE RULE 31-101 B. USE CMD 162 (ASE SEQ FIRE)</td>
<td>WHEN USING CMD 162 TO FIRE GRENADE THE SEQUENCE IS ---</td>
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<td>DURING DEPLOYMENT GROUND IS UNABLE TO COMMAND TO HIGH BIT RATE. (MIN)</td>
<td>A. SEE RULE 31-101 B. (1) HAVE THE CREW ACTIVATE SWITCH NO. 4 AND COMPLETE THUMPER ACTIVITY (2) AT COMPLETION OF THUMPER ACTIVITY COMMAND MUR OFF (CMD 003) PRIOR TO CREW TURNING SWITCH NO. 5 CMD, COMPLETE NORMAL GLA DEVELOPMENT.</td>
<td>SWITCH NO. 4 WILL TURN THE ASE TO &quot;ON&quot; AND SELECT MUR.</td>
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<td>NOTE---THERE ARE 3 CMD ROUTES TO RETURN TO NORMAL BIT RATE, 005, 011 AND 034/035.</td>
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<td>(4) CONDUCT MORTAR EXPERIMENT AFTER LIFT OFF AND PRIOR TO LM ASCENT STAGE IMPACT.</td>
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<td>GROUND IS UNABLE</td>
<td>COMMAN</td>
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<td></td>
<td>FROM MBR TO NBR.</td>
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A. SEE RULE 31-101
B. (1) IF DURING THUMPER ACTIVITIES, FIRST COMPLETE THE THUMPER MODE IN NBR.
(2) AT COMPLETION OF THUMPER MODE HAVE CREW STAND BY PHDR TO TURNING SWITCH NO 5 CM WHILE ALTERNATE CMD ARE CHECKED.
(3) CMD NORMAL BIT RATE HESET CMD 017
(4) IF (3) IS UNSUCCESSFUL CMD Y PROCESSOR SELECT CMD 0357.
(5) IF EITHER 3 OR 4 ABOVE IS SUCCESSFUL CONTINUE NORMAL MISSION.
(6) IF (4) IS UNSUCCESSFUL HAVE CREW TURN SWITCH NO 5 CM AND CONTINUE NORMAL EVA.
(7) DO NOT COMMAND MBR ON.

A. SEE RULE 31-101
B. PRIOR TO THUMPER MODE
(1) HAVE CREW ACTIVATE SWITCH 4 AND CONTINUE WITH GEOPHONE DEPLOYMENT.
(2) DURING GEOPHONE DEPLOYMENT ATTEMPT TO CMD TO NBR CMD 005 MBR UPP AND THEN RETURN TO NBR CMD 003 MBR ON IF SUCCESSFUL COMPLETE THUMPER ACTIVITY IF UNSUCCESSFUL SEE RULE 31-132 AND 31-134.
(3) CMD TO NBR CMD 005 MBR UPP AT COMPLETION OF THUMPER ACTIVITY.
(4) HAVE CREW TURN SWITCH NO 5 CM AS IN NORMAL DEPLOYMENT SEQUENCE.
(5) AFTER GHA AXING AND SAFING PEN RECVY AS TURN SWITCH LOW CCR AND ACTIVATE SWITCH NO 5.
(6) CMD TO NBR CMD 005 MBR UPP.

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<td>AFTER THE FIRING OF ANY ONE OF COMBINATION OF MOUNTAINS IF D-D7 CASE KEEPS ON MOUNT CASE KEEPS</td>
<td>DISCONTINUE MOUNTING NO MOUNTING FURTHER MOUNTING</td>
<td>FLYING WILL BE DONE ONLY WITH THREAT OF IMMEDIATE MULTIFIT TOTAL FAILURE OR COMPLETION OF ALL OTHER SCIENTIFIC OBJECTIVES</td>
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<td>PRIOR TO MOUNTING FIRING D-D7 CASE KEEPS ON DEPLOY CASE KEEPS HEAD OFF SCALE</td>
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<td>5 14-HOUR PULSES + 4 MIN-EXECUTE DUST</td>
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<td>(1) IF INTERNAL TEMPERATURE IS LESS THAN -10 DEG C*</td>
<td>CMD HTN CV IN FONCED COOL (CM 111)</td>
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<td>CMD HTN OFF (CM 112)</td>
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<td>31-15</td>
<td>UNEXPLAINED CHANGE IN CPLLEE MIDE OR SEQUENCE</td>
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<td>C)O HIGH VOLTAGE OFF WHEN COMMANDED BACK TO OPERATE IF CPLLEE WILL COME UP IN 2000 V- DECREASING WAIT FOR A PERIOD SUFFICIENT TO PERMIT A DELTA TEMP TO USE AC-0 AS TEMP REFERENCE</td>
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<td>11) IF CPLLEE TEMP IS DECREASING WAIT FOR A PERIOD SUFFICIENT TO PERMIT A DELTA TEMP OR USED Cвели EXECUTED AND CONSIDERED EXPLAINED</td>
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<td>12) IF CPLLEE TEMP IS INCREASING WAIT UNTIL IT HAS DECREASED TO A DEG BELOW THE TEMP AT WHICH THE UNEXPLAINED CHANGES OCCURRED AND RESET THE EXP</td>
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<td>USE AC-0 AS TEMPERATURE REFERENCE</td>
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<td>CPLLEE INTERNAL TEMPERATURE GREATER THAN + 66 DEG C</td>
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<td>CV TO STAY SEL</td>
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<td></td>
<td>31-157 THRU 31-160 RESERVED</td>
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AC  ALTERNATING CURRENT
A/D  ANALOG-TO-DIGITAL CONVERTER
ADC  AMPERES DC
ADD  ADDRESS
ALIGN  ALIGNMENT
ALSEP  APOLLO LUNAR SURFACE EXPERIMENTS PACKAGE
A/F  AUTOMATIC/FORCED
AMPS  AMPERES
ANT  ANTENNA
ASE  ACTIVE SEISMIC EXPERIMENT
AUTO  AUTOMATIC
AZ  AZIMUTH

BL  BUTTON LOCATION OF STRUCTURE TEMPERATURE
BASE  BASE
BER  BIT ERROR RATE
BPS  BITS PER SECOND
CAL  CALIBRATE
CB  CIRCUIT BREAKER
CCGE  COLD CATHODE GAGE EXPERIMENT (PART OF SIDE ON ALSEP 1 AND 4 SEPARATE MSC EXPERIMENT ON ALSEP 31
CCGE/A  ANALOG AND DIGITAL READOUT FROM CCGE
CCGE/D  CCGE COLD CATHODE GAGE (INSTRUMENT PORTION OF CCGE)
CCW  COUNTERCLOCKWISE
CH  CHANNEL
CHAN  CHANNELTRON--USED IN CPE AS--
CHAN/1  CHANNELTRON P/S NO. 1
CHAN/2  CHANNELTRON P/S NO. 2
CHAN/3  CHANNELTRON VOLTAGE INCREASES OFF
CHAN/4  CHANNELTRON VOLTAGE INCREASES OFF
CMU  COMMAND
CNT  COUNT
CNTR  COUNTER
CONV  CONVERTER
CPLEE ON  CHARGED-PARTICLE EXPERIMENT (FULL NAME IS CHARGED-PARTICLE LUNAR ENVIRONMENT EXPERIMENT)
CP  CYCLES PER SECOND
CS  CENTRAL STATION
CTR  CONTROL
CVR  COVER
CVW  COMMAND VERIFICATION WORD
DB  DECIBELS
DBM  DECIBELS WITH RESPECT TO ONE MILLIWATT
DC  DIRECT CURRENT
DEC  DECODER
DET  DETECTOR
DIG  DIGITAL
DIR/V  DIRECTION AND SPEED (USED ON PSE)
DSSIP  DISSIPATION
DLY  DELAY
D/P  DATA PROCESSOR
DEPLOY  DEPLOY
DMT  DOME REMOVAL TOOL
DSS  DATA SUBSYSTEM--COMPONENTS INCLUDE
DSS/A  ANALOG DATA PROCESSOR
DSS/D  DIGITAL DATA PROCESSOR
DSS/PROC COMPLETE DATA PROCESSOR (REDUNDANT)
EPS  ELECTRICAL POWER SYSTEM
EXP  EXPERIMENT
F  FAHRENHEIT
FET  FIELD EFFECT TRANSISTOR
FLD  FIELD
FREQ  FREQUENCY
FTT  FUEL TRANSFER TOOL
GAT  GRADIENT SENSORS DELTA TEMPERATURE (HFE)
GGU  GEOPHONE
GMBL  GIMBAL
GND  GROUND
GT  GRADIENT SENSORS AMBIENT TEMPERATURES (HFE)
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<td>SEQ</td>
<td>Sequence, Sequential if used on HFE as SCW/FU or SCW/PU Full SCW Sequence (SCW/FU or SCW/PU Probe 1 Sequence) SCW/P2 Probe 2 Sequence (SCW/P2 Probe 2 Sequence) Sequence Sequential Single</td>
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<td>Samples Per Second Signal Strength</td>
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<td>Solar Wind Spectrometer</td>
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<td>Synchronization</td>
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<td>TC</td>
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<td>Unified S-Band</td>
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<td>Velocity (used to indicate &quot;speed&quot; on PSE in &quot;LVL DIR/V&quot;)</td>
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<td>XY2</td>
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<td>XYD</td>
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**MISSION RULES**

**APPENDIX A - ACRONYMS AND SYMBOLS**

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MISSION RULES

APPENDIX B - DISTRIBUTION LIST

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# APPENDIX C - CHANGE CONTROL

## 1.0 INTRODUCTION

**1.1 PURPOSE**

The purpose of this Appendix is to delineate change control procedures for the ALSEP Mission Rules. This will insure the proper coordination of changes, provide a record of proposed changes (including the rationale for making them), and will provide a means for promulgating individual rule updates between revisions (interim changes).

## 1.2 EFFECTIVITY


## 2.0 CHANGE PROCEDURES

### 2.1 SUBMISSION OF CHANGES

Proposed changes are solicited from any individual or organization having a valid input. All changes will be submitted directly to the Chief Flight Control Operations Branch (FCOB). FCOB

#### 2.1.1 FORMAT

Persons desiring to submit a proposed change will rewrite a page of the document using the standard mission rule format. All proposed changes will be supported by rationale. Two copies will then be forwarded to FCOB.

### 2.2 APPROVAL

#### 2.2.1 COORDINATION

The originator of the change may obtain preliminary concurrences. FCOB will obtain formal concurrences from the Chief Experiments Systems Branch, Chief Flight Control Division.

#### 2.2.3 DISAPPROVED CHANGES

If a change is disapproved, FCOB will return the copy to the originator. A copy of the requested change will be retained for future reference.

### 2.3 PUBLICATION AND DISTRIBUTION OF INTERIM CHANGES

Interim changes will be distributed via an abbreviated distribution list consisting of the mission control team, pertinent NASA organizations, and the appropriate contractors.

## 3.0 REVISIONS

### 3.1 DEVELOPMENT

FCOB will compile the effective interim changes and corrections of minor typographical errors into complete page changes to the basic document. "Pen and ink" changes may be used to correct typographical errors if there are no other changes on the page concerned.

### 3.2 APPROVAL

All revisions will be approved by the Director of Flight Operations and the Manager, Apollo Spacecraft Program.

### 3.3 PUBLICATION

#### 3.3.1 SCHEDULE

Revisions will be made on an "AS REQUIRED" basis.

#### 3.3.2 DISTRIBUTION

Revisions will be printed and distributed according to Appendix B.

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