NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FINAL EXPERIMENTS MISSION RULES

APOLLO 15
ALSEP A2
P&FS NO. 1

JUNE 17, 1971

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A ACRONYMS AND SYMBOLS

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PREPARED BY

FLIGHT CONTROL DIVISION

MANNED SPACECRAFT CENTER
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FINAL EXPERIMENTS MISSION RULES

APOLLO 15
ALSEP A2
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PREFACE

THIS DOCUMENT CONTAINS THE EXPERIMENTS MISSION RULES FOR ALSEP A2 AND P&FS NO. 1 AS OF JUNE 17, 1971. ALL 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. JOHN H. TEMPLE FLIGHT CONTROL OPERATIONS BRANCH, BUILDING 30, ROOM 2064A, PHONE 483-3838.

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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INTRODUCTION AND PURPOSE

MISSION RULES ARE PROCEDURAL STATEMENTS WHICH PROVIDE FLIGHT CONTROL 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 EXPERIMENT MISSION RULES FOR ALSEP AND P&FS.

THE ALSEP AND P&FS MISSION RULES ARE PUBLISHED UNDER SEPARATE COVER FROM THE FLIGHT MISSION RULES BECAUSE OF THE DIFFERENCE IN LIFETIME OF THESE EXPERIMENT OPERATIONS AND SPECIFIC MISSION ORIENTATED ACTIVITIES. THE EXPERIMENT MISSION RULES DOCUMENT WILL CONTAIN ALL ALSEP AND P&FS MISSION RULES INCLUDING:

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

B. ALL MISSION RULES AFFECTING MCC INTERFACE WITH THE ALSEP AND P&FS, THROUGH SYSTEMS LIFETIME.

THE FLIGHT MISSION RULES ALSO WILL CONTAIN ALL ALSEP AND P&FS RULES INVOLVING FLIGHT CREW INTERFACE. EXPERIMENT RULES IN THE FLIGHT MISSION RULE AND THE EXPERIMENT MISSION RULE DOCUMENTS WILL BE ASSIGNED THE SAME NUMBERS FOR EASE OF CROSSREFERENCE. 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 EXPERIMENT 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 THE EXPERIMENT PACKAGES FOR EACH MISSION.

R	ITEM	
		GENERAL
	2-1	THE EXPERIMENT MISSION RULES OUTLINE PREPLANNED DECISIONS DESIGNED TO MINIMIZE THE AMOUNT OF REAL-TIME RATIONALIZATION REQUIRED WHEN NON-NOMINAL SITUATIONS OCCUR AFTER CREW ACTIVATION OF THE ALSEP OR DEPLOYMENT OF THE P&FS.
	2-2	WHEN A CONFLICT OF PLANNED ACTIVITIES OCCURS AMONG EXPERIMENT PACKAGES, THE LUNAR EXPERIMENTS OFFICER WILL DETERMINE THE PRIORITY OF ACTIVITIES WITH CONCURRENCE OF THE SCIENCE TEAM LEADER.
	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 FUIDELINES WILL BE NOTED.
	2-4	THE ALSEP SENIOR ENGINEER OR SATELLITE COMMUNICATIONS ENGINEER MAY, AFTER ANALYSIS OF THE OPERATION, CHOOSE TO TAKE ANY NECESSARY ACTION REQUIRED FOR SUCCESSFUL COMPLETION OF EXPERIMENT 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 EXPERIMENT AND MSFN DATA/DISPLAY SYSTEMS.

ALSEP OPERATIONAL GUIDELINES

32-1 GENERAL

A. THESE ALSEP GENERAL OPERATIONAL GUIDELINES ARE BASED ON OBJECTIVES IN THE FOLLOWING PRIORITIES:

1. HFE
2. LSM
3. PSE
4. CCGE
5. SWS
6. SIDE
7. DTREM
8. ENGINEERING

NOTE - RIPPLE-OFF SEQUENCE: 1) SIDE/CCGE 2) SWS, 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. NORMAL BIT RATE WILL BE USED UNLESS SELECTION OF LOW BIT RATE IS REQUIRED FOR THE COLLECTION OF ALSEP DATA.

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 OFF WHILE THE TIMER IS INHIBITED. DURING NORMAL OPERATION THE TIMER WILL NOT BE INHIBITED AND THE TRANSMITTER WILL NOT BE COMMANDED OFF.

H. THE RESETTABLE TIMER WILL NORMALLY BE RESET TO ZERO DURING SUNRISE TERMINATOR SUPPORT PERIODS.

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 11.8 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. ASTRONAUT ACTIVATES ASTRO SWITCH NO. 1 ASAP AFTER ACTIVATING SHORTING PLUG SWITCH.

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 DURING EVA NO. 1 WHEN REQUESTED FROM THE GROUND.

N. THE CENTRAL STATION HEATERS AND PDR WILL BE UTILIZED TO MAINTAIN AN AVERAGE INTERNAL THERMAL PLATE TEMPERATURE GREATER THAN 20 DEG F AND LESS THAN 125 DEG F UNLESS THERE IS AN ANOMALY REQUIRING THE C/S HEATERS TO BE OFF AND/OR THE POWER IS REQUIRED TO MAINTAIN EXPERIMENT INTEGRITY.

O. IF ALSEP DEPLOYMENT TIME BECOMES CONSTRAINED AND THE CREW MUST RETURN TO THE LM, THE RTG SHORTING SWITCH AND ASTRONAUT SWITCH NO. 1 SHALL BE ACTUATED BY THE CREW IF THE ANTENNA IS EMPLACED. IF THE ANTENNA IS NOT EMPLACED, THESE SWITCHES SHALL NOT BE ACTUATED. (PICK UP HERE ON EVA NO. 2).

P. 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 ADDITIONAL PROTECTION AGAINST THE GENERATION OF SPURIOUS COMMANDS.

Q. THE HFE BORE HOLES WILL HAVE PRIORITY OVER THE DRILL CORE STEM. THE HFE BORE HOLES WILL BE DRILLED FIRST. IF PROBLEMS ARE ENCOUNTERED, EFFORTS ON BORE HOLES WILL BE TERMINATED AFTER A TOTAL OF 20 MINUTES ACCUMULATED DRILL ON TIME.

R. IF A HARD OBJECT IS ENCOUNTERED WHICH REDUCES DRILL RATE TO LESS THAN 5 INCHES PER MINUTE ON EITHER HFE PROBE HOLE, THE FOLLOWING WILL BE ACCOMPLISHED:

1. IF THE THIRD STEM SECTION IS NOT ATTACHED, WITHDRAW AND START AT A NEW LOCATION FOR A MAXIMUM OF TWO WITHDRAWALS.

2. IF LESS THAN THREE STEM SECTIONS ARE ATTACHED TO THE POWER HEAD, CONTINUE UNTIL 10 MINUTES OF POWER ON TIME FOR DRILL STRING HAS ELAPSED.

S. HFE CONDUCTIVITY MEASUREMENTS IN MODE II AND MODE III WILL BE COMPLETED PRIOR TO TERMINATION OF CONTINUOUS REAL-TIME SUPPORT.

32-2 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.

D. AFTER PSE INITIAL LEVELING OF THE HORIZONTAL COMPONENTS (LPX AND LPY) HAS BEEN COMPLETED, THE COARSE LEVEL SENSORS WILL BE GROUND COMMANDED OUT (VIA CMD 102).

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

F. THE X-AXIS AND Y-AXIS MASSES OF THE PSE SHOULD BE LEVEL BEFORE LEVELING THE Z-AXIS MASS.

G. THE PSE WILL BE RELEVELED 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.

32-3 LSM

A. A SITE SURVEY WILL NOT BE PERFORMED UNTIL THE FUNCTIONAL VERIFICATION OF EXACTLY FOUR FLIP/CALS IS COMPLETE. NO FLIP/CAL WILL BE ALLOWED BETWEEN THE X, Y, AND Z SITE SURVEYS. TIMER INITIATED FLIP/CALS SHALL BE INHIBITED (BY LSM FLIP/CAL INHIBIT) UNTIL COMPLETION OF THE SITE SURVEY.

B. OPERATIONAL POWER WILL NOT BE REMOVED FROM THE LSM DURING THE LUNAR NIGHT PERIODS, EXCEPT AS NOTED IN RULE 32-62.

C. SITE SURVEY WILL NOT BE PLANNED UNTIL AFTER LM ASCENT AND FOUR FLIP/CALS HAVE BEEN SENT.

D. ONE FLIP/CAL WILL BE PLANNED PRIOR TO LM ASCENT.

32-4 SWS

HIGH GAIN (COMMAND 122) WILL BE SENT THREE TIMES WITHIN 10 SECONDS WHEN LEVEL 14 READS GREATER THAN 40 PCM COUNTS WHILE IN OPERATE MODE.

32-5 SIDE/CCGE

A. THE SIDE/CCGE WILL BE TURNED ON ASAP AFTER DEPLOYMENT.

B. THE SIDE DUST COVER WILL BE REMOVED BY GROUND COMMAND AFTER LM ASCENT.

C. THE CCGE SEAL WILL BE REMOVED BY GROUND COMMAND 10 MINUTES AFTER TURN-ON.

32-6 HFE

A. SEQUENTIAL COMMAND UPLINKED TO THE HFE WILL BE SEPARATED BY AT LEAST 54 SECONDS IN NORMAL BIT RATE AND 108 SECONDS IN LOW BIT RATE.

B. A CONDUCTIVITY MEASUREMENT WILL NOT BE INITIATED UNLESS THERE WILL BE SUFFICIENT POWER TO COMPLETE THE MEASUREMENT WITHOUT INTERRUPTION. ONCE A PROBE HEATER IS TURNED ON FOR AN EXPERIMENT IT WILL NOT BE TURNED OFF UNLESS THE CONDUCTIVITY MEASUREMENT IS TERMINATED.

32-7 INSUFFICIENT POWER FOR SIMULTANEOUS SUPPORT OF ALL EXPERIMENTS

IN GENERAL, MANUAL THERMAL CONTROL OF THE CENTRAL STATION AND, AUTO THERMAL CONTROL OF 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.

32-8 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 REMOVED FROM ITS DESIRED OPERATIONAL CONFIGURATION FOR MORE THAN 80 PERCENT OF ANY LUNAR DAY (29.5 EARTH DAYS).

RULES 31-9 AND 32-10 ARE RESERVED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
		RULES 32-11 THROUGH 32-20 ARE RESERVED.			

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-21	FAILURE OF AUTO SWITCHOVER TO PCU 2		SELECT PCU 2	PCU 2 SEL---CMD 062 AUTO SWITCHOVER TO PCU 2 SHOULD OCCUR AT +12 VDC OUT OF LIMITS (LESS THAN 11 VDC/GREATER THAN 13 VDC) CUE--- THE FOLLOWING TM WILL BE OUT-OF-LIMITS: TM NOMINAL HI LO AE-9 +12 +13.0 +11.0 AE-7 +29 +31.3 +25.7 AE-8 +15 +16.2 +13.8 AE-10 +5 + 5.4 + 4.6 AE-11 -12 -11.0 -13.0 AE-12 - 6 - 5.5 - 6.5 VERIFY AE-02 CAL VOLTAGES ARE WITHIN LIMITS.
	32-22	RESERVE POWER LESS THAN 2.0W		COMMAND EXPERIMENTS TO LOWER POWER MODES, BEGINNING WITH THE LOWEST PRIORITY EXPERIMENT.	CUE--- CS2 FOR PCU 1 CS4 FOR PCU 2
		RULES 32-23 THRU 32-30 ARE RESERVED.			

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-31	ALSEP FAILS TO RESPOND TO A COMMAND		A. REINITIATE THE COMMAND B. IF UNSUCCESSFUL, SELECT OTHER DECODER (ALSEP 2A OR 2B) AND REINITIATE THE COMMAND.	CUE--- NO FUNCTIONAL VERIFICATION AND NO CMD VERIFICATION WORD (CVW)
	32-32	FAILURE OF 18 HOUR TIMER		A.1. INITIAL CONTINUOUS SUPPORT--- IF ANY TWO OF THE FOLLOWING TEMPS ARE BETWEEN -20 DEG F AND +155 DEG F, CONTINUE REAL-TIME SUPPORT THRU 45 DAYS--- AT31, CMD DEC BASE T AT32, CMD DEC INT T AT33, CMD DEC VCO T 2. AFTER THE INITIAL CONTINUOUS SUPPORT, THE TRANSMITTER WILL BE LEFT ON PROVIDING THE ALSEP IS: (A) RETURNING VALID SCIENTIFIC DATA AND (B) THERE IS NO INDICATION OF FAILURE OR IMMINENT FAILURE IN THE COMMAND SYSTEM	THE TIMER WILL BE DEEMED FAILED AFTER NOT RECEIVING 10 CONSECUTIVE 18 HOUR PULSES (SEE AZ-1). THE FOLLOWING WILL BE GIVEN CONSIDERATION IN PREDICTING THE IMMINENT FAILURE OF THE COMMAND SYSTEM: 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 2. IS THE ALSEP RESPONDING NORMALLY TO ALL COMMANDS 3. IS A CVW BEING RECEIVED AFTER A MINIMUM OF 90 PERCENT OF THE COMMANDS TRANSMITTED
		RULES 32-33 AND 32-34 ARE RESERVED.			

SECTION 4 - ALSEP SPECIFIC RULES - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-35	WEAK TM SIGNAL		A. SELECT REDUNDANT XMTR	A. XMTR A SEL---CMD 012 B. XMTR B SEL---CMD 015
				B. SELECT LOW BIT RATE	B. LOW BIT RATE SEL---CMD 007
	32-36	LOSS OF SYNC OR BAD DECOMMED DATA		A. SELECT REDUNDANT PROCESSOR	A. PROC "X" SEL---CMD 034 PROC "Y" SEL---CMD 035 AB-6---D/P X ON/OFF STATUS
				B. SELECT LOW BIT RATE	B. LOW BIT RATE SELECT---CMD 007
	32-37	LOSS OF TM SIGNAL		A. VERIFY LOSS OF TM SIGNAL NOT DUE TO PCU FAILURE.	
				B. SELECT REDUNDANT XMTR	B. XMTR A SEL---CMD 012 XMTR B SEL---CMD 015
				C. SEND TM ON.	C. TM ON---CMD 013
				D. AFTER NEXT 18 HR PULSE--- REPEAT B AND C.	D. IF RCVR CB (CB-01) OPEN, NEXT 18 HR PULSE WILL RESET IT. AE-13, AT-21, AT-22, AND AB-1 WILL GO TO ZERO. NOTE--- IF PSE LEVELING IS IN PROGRESS, SEND PSE STBY SEL---CMD 037
	32-38	DATA DEMAND SIGNAL FROM DATA PROCESSOR FAILS HIGH		SELECT REDUNDANT PROCESSOR USING THE OTHER DECODER. DO NOT RETURN TO FAILED PROCESSOR.	CUE--- 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 PROCESSOR. PROC "X" SEL---CMD 034 PROC "Y" SEL---CMD 035
		RULES 31-39 THRU 31-40 ARE RESERVED.			

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-41	FAILURE OF AUTOMATIC LEVELING MODE		PERFORM FORCED LEVELING BY GROUND COMMANDS	PSE ACTIVATION PRESETS LEVELING MODE TO AUTOMATIC. CMD 103 WILL SWITCH TO FORCED MODE. CMD 103 IS A TWO-STATE CMD, PSE LEVELING MODE AUTO/FORCED.
	32-42	PSE LEVELING MOTOR FAILS ON		GND CMD PSE TO STANDBY SELECT AND THEN TO OPERATE SELECT	CUE--- LEVELING MOTOR WILL DRAW 3 WATTS FROM RESERVE POWER. PSE STBY SEL--CMD 037 PSE OPER. SEL--CMD 036
	32-43	PSE LEVELING MOTOR FAILS OFF		NO ACTION TO BE TAKEN	CUE--- NO DROP IN RESERVE POWER (NORMALLY 3 WATTS) WHEN REPEATED EFFORTS ARE MADE TO TURN MOTOR ON, AND NO ACTIVITY ON SHORT PERIOD Z-DATA CHANNEL.
	32-44	FAILURE OF MECHANICAL LEVEL DRIVE		SELECT LOW SPEED AND HIGH SPEED AND DIRECTION REVERSALS ALTERNATELY.	CUE--- NO MOTION OF THE PLATFORM CAN BE DETECTED ON THE LP HORIZONTAL OR LP-Z COMPONENT TIDAL OUTPUT. X-MTR ON/OFF--CMD 070 Y-MTR ON/OFF--CMD 071 Z-MTR ON/OFF--CMD 072 DIRECTION PLUS/MINUS--CMD 074 SPEED LOW/HIGH--CMD 075
	32-45	MISALIGNED COARSE SENSOR		A. COMMAND COARSE SENSOR OUT WHEN CORRESPONDING MOTOR IS IN LEVELING OPERATION. B. PERFORM FORCED LEVELING OF THE PSE BY GND CMD.	WHILE IN FINAL LEVELING PHASE (LOW STEPPING RATE), THE MOTOR REVERTS TO A HIGH STEPPING RATE REPEATEDLY WITHOUT ACHIEVING CENTERING. COARSE LEVEL SENSOR AND GIMBAL WILL NEVER ALIGN, AND THE MOTOR WILL CONTINUE TO DRIVE BEYOND LEVEL. COARSE SENSOR OUT-CMD 102.
	32-46	FAILURE OF COARSE LEVEL SENSOR		A. SELECT FORCED PSE LEVELING MODE. B. GROUND COMMAND COARSE LEVEL SENSOR OUT. 1. PROCEED WITH INITIAL FORCED LEVELING FOR COARSE LEVELING. 2. USE AUTO MODE FOR FINE LEVELING.	CUE--- NO HIGH SPEED MOTOR OPERATION IS NOTICED DURING INITIAL LEVELING PHASE AND COMPONENT DOES NOT CENTER WITHIN EXPECTED TIME (35 MINUTES MAXIMUM IN AUTO MODE). USE HIGH SPEED LEVELING FOR COARSE LEVELING. CMD 103--PSE LEVELING MODE AUTO/FORCED. CMD 102--COARSE LEVEL SENSOR OUT

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-47	LONG PERIOD COMPONENT STICKS		A. USE HIGH SPEED, FORCED LEVELING IN DIRECTION WHICH PULLS MASS AWAY FROM STOP. B. IF UNSUCCESSFUL, SELECT LOW SPEED AND HIGH SPEED AND DIRECTION REVERSALS ALTERNATELY.	CUE--- FAILURE TO CENTER WITHIN EXPECTED TIME (35 MINUTES MAXIMUM IN AUTO MODE). IF STEPS A AND B FAIL, LP COMPONENT IS DEFECTIVE. NOTE--- DO NOT EXCEED 5 MIN 30 SEC IN HIGH SPEED. X-MTR ON/OFF--CMD 070 Y-MTR ON/OFF--CMD 071 Z-MTR ON/OFF--CMD 072 DIRECTION PLUS/MINUS--CMD 074 SPEED HIGH/LOW--CMD 075
	32-48	ELECTRICAL FAILURE OF LONG PERIOD COMPONENT		TERMINATE LEVELING OF THE AFFECTED AXIS AFTER COARSE SENSOR PHASE IS COMPLETED	CUE--- TIDAL OUTPUT IS WITHIN RANGE, BUT IS NOT AFFECTED BY LEVELING OR CENTERING DRIVE.
	32-49	AUTOMATIC SWITCHOVER OF PSE TO STANDBY		CMD PSE TO OPERATE SELECT	CHECK RESERVE POWER IF CIRCUIT BREAKER CB-06 HAS OPENED FROM OVERCURRENT (500 MA ± 10 PERCENT), STANDBY MODE WILL BE SELECTED AND THE CB WILL BE RESET AUTOMATICALLY. PSE OPER SEL--CMD 036
	32-50	FAILURE OF PSE UNCAGE SEQUENCE		A. TO UNCAGE ARM--- 1. SEND UNCAGE ARM/FIRE. 2. IF UNSUCCESSFUL, FIRST 18 HR TIMER PULSE WILL ARM ACTUATOR. 3. IF UNSUCCESSFUL, 144 HR +2 MIN PULSE FROM DELAYED CMD SEQUENCER WILL ARM ACTUATOR. B. TO UNCAGE FIRE (AFTER ACTUATOR HAS BEEN ARMED). 1. SEND UNCAGE ARM/FIRE 2. IF UNSUCCESSFUL, SEND CMD 037 PSE STANDBY SEL, THEN CMD 036 PSE OPERATE SEL. 3. IF UNSUCCESSFUL, NEXT 12 HOUR TIMER PULSE MAY FIRE THE ACTUATOR.	NORMAL UNCAGING IS ACCOMPLISHED BY SENDING CMD 073-- UNCAGE ARM/FIRE--TWICE, ONCE TO ARM AND ONCE TO FIRE THE ACTUATOR. NOTE--- UNCAGING MAY NOT BE POSSIBLE UNLESS AT05 THERMAL PLATE 3 TEMP IS ABOVE +25 DEG F. NOTE--- SELECTING PSE STANDBY MAY FIRE ACTUATOR IF IT HAS BEEN ARMED AND NOT FIRED. NOTE--- 30 SEC IS REQUIRED BETWEEN ARM AND FIRE TO CHARGE CAPACITOR.
	32-51	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 (500MA), CAPABILITY TO SELECT PSE STBY MODE IS LOST. CMD 037--PSE STBY SEL

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-52	PSE TEMP LOW AND AUTO THERMAL CONTROL FAILS		A. COMMAND HEATER TO FORCED ON B. CMD Z DRIVE MOTOR TO ON IN AUTO MODE.	ASSUME AUTOMATIC THERMOSTAT CONTROL FAILED. CMD 076 IS A 4-STATE CMD, WHICH CAN SEQUENTIALLY STEP THRU THE FOLLOWING MODES TO CONTROL THE PSE SENSOR HEATER. 1. AUTO OFF 2. FORCED HTR ON 3. FORCED OFF 4. AUTO ON DL-07 PSE INSTRUMENT TEMP LOW LIMIT IS 125 DEG F. MINIMUM OF 8 WATTS RESERVE POWER IS REQUIRED.
	32-53	PSE TEMP HIGH AND AUTO THERMAL CONTROL FAILS.		A. COMMAND HEATER TO FORCED OR AUTO OFF B. IF UNSUCCESSFUL, CMD PSE TO STBY, THEN TO OPERATE.	A. CMD 076 IS 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. SELECTING PSE TO STBY WILL REINITIALIZE TO AUTOMATIC THERMOSTAT CONTROL.
	32-54	LOSS OF DOWNLINK DURING LEVELING MOTOR OPERATION RULES 32-55 THROUGH 32-60 ARE RESERVED.		SEND PSE STBY SEL	NOTE--- PSE STBY SEL WILL STOP MOTORS.

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-61	MAINTAIN LSM SENSOR TEMP 40 ± 10 DEG C.		A. SELECT Y SENSOR THERMOSTAT. B. IF TEMP CONTINUES HIGH, TURN HTRS OFF.	CMD 134 IS 3-STATE CMD--- 1. X SENSOR THERMOSTAT SEL (PRESET). 2. Y SENSOR THERMOSTAT SEL. 3. ALL HTRS OFF. CUE--- DM-1 FOR X-AXIS DM-2 FOR Y-AXIS
	32-62	FAILURE OF FLIP/CAL TO STOP		CMD THE FOLLOWING SEQUENCE--- LSM STBY--043 LSM OPER--042	NOTE--- NORMAL FLIP/CAL SEQUENCE IS 350 SEC. DURING LUNAR NIGHT, RETURN TO OPER WITHIN 1 MIN AFTER STBY. SEND STBY CMD ONLY AT THE END OF A FLIP CAL SEQUENCE.
	32-63	FLIP/CAL SEQUENCE NOT INITIATED BY TIMER AT 18-HR INTERVALS.		A. VERIFY FLIP/CAL INHIBIT OFF. B. CMD FLIP/CAL GO. C. IF UNSUCCESSFUL, SEND FOLLOWING CMD SEQUENCE. 1. 043-STBY SEL 2. 042-OPER ON 3. 127-FLIP/CAL INHIBIT OFF 4. 131-FLIP/CAL GO	A. CUE--- DM-23 IS A "0." CMD 127 B. CMD 131. C. REINITIALIZE LOGIC.
		RULES 32-64 THROUGH 32-70 RESERVED.			

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-71	UNABLE TO BREAK SEAL AND/OR UNABLE TO REMOVE DUST COVERS.		WAIT FOR DELAYED TIMER TO INITIATE CMDS. EXP MUST BE IN OPERATE SELECT AT TIME OF PULSE.	8 18-HOUR PULSES + 2 MIN - BREAK SEAL 8 18-HOUR PULSES + 3 MIN - EXECUTE 8 18-HOUR PULSES + 4 MIN - REMOVE DUST COVERS 8 18-HOUR PULSES + 5 MIN EXECUTE NOTE--- CONSIDERATION MAY BE GIVEN TO ADVANCING THE TIMER BY TIMER INHIBIT AND ACCEPT COMMANDS.
	32-72	CMD REGISTER DOES NOT AGREE WITH UPLINK CMD.		CLEAR LOAD REGISTER--- ALSEP CMDS 104, 105, 106, 107, 110	CUE--- DI-64. CLEAR REGISTER BY UPLINKING CMDS 104, 105, 106, AND 107--THEN EXECUTE WITH 110 UNLESS SIDE DUST COVER AND CCIG SEAL HAVE NOT BEEN REMOVED, CLEAR REGISTER BY CMD 053.
	32-73	UNEXPLAINED CHANGE IN SIDE MODE OR SEQUENCE		CMD HIGH VOLTAGE OFF-- ALSEP CMDS 105, 106, 107, 110	CUE--- D1-1 (FRAME COUNTER) ERRATIC. NOTE - SPURIOUS CVW CMDS ARE CONSIDERED EXPLAINED.
	32-74	SIDE DUST COVER COMES OFF DURING DEPLOYMENT.		DO NOT REINSTALL. INSURE DUST COVER IS COMPLETELY OFF.	CONTINUE DEPLOYMENT
		RULES 32-75 THROUGH 32-80 ARE RESERVED.			

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-81	CCGE DUST COVER COMES OFF DURING DEPLOYMENT.		DO NOT TRY TO REINSTALL.	DUST FROM ASTRONAUT GLOVES DOES MORE HARM THAN HAVING COVER OFF.
	32-82	UNABLE TO BREAK CCGE SEAL.		WAIT FOR DELAYED TIMER TO INITIATE COMMANDS.	8 18-HOUR PULSES + 2 MIN SET SEAL BREAK 8 18-HOUR PULSES + 4 MIN EXECUTE SEAL BREAK CCGE MUST BE IN OPERATE SELECT AT THE TIME OF THE 144 HOUR PULSES.
	32-83	UNEXPECTED CHANGE IN CCGE MODE OR RANGE		CMD HIGH VOLTAGE OFF---ALSEP CMDS 104, 106, 107, 110 A. IF SIDE TEMP IS DECREASING WAIT FOR A DELTA TEMP OF 1 DEG AND RESET THE EXP. B. IF SIDE TEMP IS INCREASING WAIT UNTIL IT HAS DECREASED TO 1 DEG BELOW TEMP AT WHICH ARCING OCCURRED, AND RESET THE EXPERIMENT.	USE DI-05 AS TEMP REFERENCE.
		RULES 32-84 THROUGH 32-90 ARE RESERVED.			

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-91	UNEXPECTED CHANGE IN SWS MODE OR RANGE		CMD TO STBY----046	CUE--- DW-1 AND/OR DW-2 (SEQUENCE COUNTER) ERRATIC
		RULES 32-92 THROUGH 32-100 ARE RESERVED.			

SECTION 4 - ALSEP SPECIFIC RULES - CONTINUED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-101	UNABLE TO DRILL NOMINAL HFE EMPLACEMENT HOLES			
		A. NEITHER HOLE DEEP ENOUGH TO EMPLACE HFE PROBES		A. LAY PROBES ON HORIZONTAL LUNAR SURFACE AND COVER PROBES AND FIRST 6 FEET OF CABLE WITH SOIL AS MUCH AS POSSIBLE.	A. HOLE IS NOT DEEP ENOUGH TO EMPLACE A HFE PROBE IF THE DRILL STRING SECTIONS WILL NOT STAND UNATTENDED.
		B. HOLES NOT NOMINAL		B. IF TWO OR MORE BORE SECTIONS ARE BELOW THE SURFACE, USE EMPLACEMENT TOOL TO DETERMINE DEPTH TO BOTTOM OF CASING AND INSERT PROBE. MOVE RADIATION SHIELD TO PLUG TOP OF CASING.	
	32-102	HAVE CHOICE OF DRILLING 2ND HFE HOLE OR CORE SAMPLE HOLE.		DRILL 2ND HFE PROBE EMPLACEMENT HOLE.	HFE HAS PRIORITY OVER CORE SAMPLE.
	32-103	DRILL RATE REDUCED TO LESS THAN 5 INCHES PER MINUTE		A. IF LESS THAN THREE STEM SECTIONS ARE ATTACHED TO THE POWER HEAD, WITHDRAW AND START AT NEW LOCATION FOR MAXIMUM OF TWO WITHDRAWALS.	
				B. IF THREE OR MORE STEM SECTIONS ARE ATTACHED TO THE POWER HEAD, CONTINUE UNTIL 10 MINUTES OF POWER ON TIME FOR THE DRILL STRING HAS ELAPSED.	
	32-104	HFE INTERRUPTED DURING CONDUCTIVITY MEASUREMENT (HEATER ON)			
		A. DURING MODE II			
		1. HEATER GOES OFF		A.1. GO TO NEXT CONDUCTIVITY MEASUREMENT.	
		2. GOES TO MODE III		2. TURN HEATER OFF AND RETURN TO MODE II AND GO TO NEXT HFE CONDUCTIVITY MEASUREMENT.	HFE HTR---CMD 152
		B. DURING MODE III		B. IF ON TIME IS GREATER THAN 6 HOURS, GO TO DECAY MODE. IF ON TIME IS LESS THAN 6 HOURS, GO TO NEXT CONDUCTIVITY MEASUREMENT.	
	32-105	DOWNLINK DATA LOSES SYNC		A. SWITCH DATA PROCESSOR IF RULE 32-38 HAS NOT BEEN INVOKED, AND CONDUCTIVITY MEASUREMENT IS IN PROGRESS.	HFE STBY---CMD 056 HFE ON ---CMD 055
				B. IF BETWEEN HEATER ON MODE, SEND HFE STBY THEN HFE ON CMDS.	

SECTION 4 - ALSEP SPECIFIC RULES - CONCLUDED

R	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	32-106	HFE ELECTRONICS REFERENCE TEMP GREATER THAN 60° C		GO TO STBY OFF FOR 12 HOURS	HFE STBY---CMD 056 HFE OFF ---CMD 057 CUE--- DH13 T_1 REF DH15 T_2 REF
		RULES 32-107 THROUGH 32-110 ARE RESERVED			

P&FS OPERATIONAL GUIDELINES

33-1 THROUGH 33-8 (N/A FOR SUBSATELLITE, REF APOLLO 15 FLT MR)

33-9 WATER AND URINE DUMPS WILL BE INHIBITED FROM 1 HOUR BEFORE UNTIL IMMEDIATELY AFTER P&FS LAUNCH.

33-10 THROUGH 33-12 (N/A FOR SUBSATELLITE, REF APOLLO 15 FLT MR)

33-13 FAILURE OF THE SUBSATELLITE TO CLAR THE LAUNCHER FOLLOWING A VALID ONBOARD LAUNCH INDICATION WILL PRECLUDE THE NOMINAL CMP EVA FOR FILM RETRIEVAL.

33-14 THROUGH 33-17 (N/A FOR SUBSATELLITE, REF APOLLO 15 FLT MR)

33-18 IF SUBSATELLITE JETTISON IS REQUIRED DURING TLC OR TEC, THE DESIRED TRAJECTORIES ARE LISTED BELOW IN THEIR ORDER OF PRIORITY:

1. ELLIPTICAL (LUNAR)
2. ELLIPTICAL (EARTH)
3. SOLAR ORBIT
4. EARTH IMPACT
5. LUNAR IMPACT

33-19 THE P&FS OPERATIONAL GUIDELINES ARE BASED ON THE FOLLOWING OBJECTIVES WHICH ARE LISTED IN THEIR ORDER OF PRIORITY.

A. PARTICLES EXP S-173

B. FIELD EXP S-174

C. S-BAND TRACK S-164

33-20 HARDWARE REDLINES WILL NOT BE VIOLATED IN THE PURSUIT OF SCIENCE DATA UNLESS THE DATA BEING COLLECTED IS JUDGED TO BE MORE IMPORTANT THAN ALL SUBSEQUENT DATA.

33-21 THE GATHERING OF SCIENTIFIC DATA WILL NOT BE COMPROMISED FOR ENGINEERING/TEST PURPOSE UNLESS SPECIFICALLY DIRECTED BY THE WORK SCHEDULE.

33-22 NO MISSION RULE BASED UPON A P&FS MALFUNCTION WILL BE IMPLEMENTED UNTIL IT HAS BEEN ASCERTAINED THAT NO PROBLEM EXISTS WITH SUPPORTING GROUND EQUIPMENT.

P&FS MANAGEMENT

33-23 THE INITIAL P&FS ACTIVATION WILL BE PERFORMED IN SUNLIGHT.

33-24 THE P&FS HIGH VOLTAGE WILL NOT BE ACTIVATED UNTIL P&FS LAUNCH + 24 HR.

33-25 THE EXPERIMENT/DATA OFF COMMAND WILL NOT BE TRANSMITTED UNLESS THE ACTION IS REQUIRED TO ENHANCE P&FS OPERATIONS OR IS JUSTIFIED BY AN ANOMALY AFFECTING THE ACCOMPLISHMENT OF THE MISSION.

33-26 THE P&FS BATTERY WILL NOT NORMALLY BE DEPLETED BELOW 8.0 AMPERE-HOURS.

33-27 THE UNDERVOLTAGE PROTECTION CIRCUIT (UVP) WILL BE DISABLED IF THE BATTERY VOLTAGE IS LESS THAN 11 VDC AND THE REMAINING LIFE OF THE SATELLITE IS PREDICTABLY LIMITED OR BELIEVED TO BE IN JEOPARDY, OR A UVP MALFUNCTION IS SUSPECTED TO HAVE OCCURRED.

33-28 THE P&FS WILL NOT BE ACTIVATED PRIOR TO LM IMPACT BUT WILL BE ACTIVATED PRIOR TO THE AUGUST 6, 1971, 3.5 HOUR ECLIPSE. IN NO INSTANCE WILL P&FS OPERATION BE PERMITTED TO INTERFERE WITH THE LM OPERATION.

33-29 TRANSPONDER "ON"--FUNCTION WILL NOT BE ENABLED EXCEPT DURING MOC ACTIVE SUPPORT PERIODS.

33-29A THE "AUTO KILL" CIRCUIT WILL BE ALLOWED TO DEACTIVATE THE SATELLITE PRIOR TO APOLLO LAUNCHES. IF THE "AUTO KILL" CIRCUIT FAILS TO FUNCTION THE SATELLITE WILL BE COMMANDED OFF.

RULES 33-30 THROUGH 33-94 (N/A FOR SUBSATELLITE, REF APOLLO 15 FLT MR)

33-95 THE P&FS WILL BE LAUNCHED NORTHWARD PERPENDICULAR TO THE ECLIPTIC PLANE.

33-96 THE P&FS WILL BE LAUNCHED INTO AN ORBIT WITH A REV PERIOD OF 7134 ± 30 SEC.

33-97 SUBSATELLITE LAUNCH WILL NOT BE ATTEMPTED WITH THE GRS BOOM EXTENDED.

33-98 SUBSATELLITE LAUNCH WILL NOT BE CONSTRAINED BY THE FAILURE OF EXPERIMENT COVERS.

33-99 ALL RCS JETTS WILL BE INHIBITED FROM THE START OF THE P&FS LAUNCH SEQUENCE UNTIL AFTER P&FS LAUNCH.

RULES 33-100 THROUGH 33-104 ARE RESERVED

RULES 33-105 THROUGH 33-199 (N/A FOR SUBSATELLITE, REF APOLLO 15 FLT MR)

RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
			COMM/INST	
33-200	TRANSPONDER "ON" LOGIC FAILURE	LO	CONTINUE MISSION	TRACKING LIMITED TO RT & MRO OPERATIONAL MODES
33-201	REDUCED TRANSMITTER OUTPUT	LO		
	A. IF UPLINK ON		TURN OFF UPLINK	SELECTS TX 95.1 MHZ L.O.
	B. IF UPLINK OFF		TURN ON UPLINK	SELECTS RX 95.1 MHZ L.O.
				REF MAL PROCEDURE
33-202	DOWNLINK CARRIER FREQUENCY DEVIATION	LO		
	A. IF UPLINK ON		TURN OFF UPLINK	SELECTS TX 95.1 MHZ L.O.
	B. IF UPLINK OFF		TURN ON UPLINK	SELECTS RX 95.1 MHZ L.O.
				REF MAL PROCEDURE
33-203	LOSS OF DOWNLINK CARRIER	LO		
	A. IF UPLINK ON		TURN OFF UPLINK	SELECTS TX 95.1 MHZ L.O.
	B. IF UPLINK OFF		TURN ON UPLINK	SELECTS RX 95.1 MHZ L.O.
				REF MAL PROCEDURE
33-204	LOSS OF MESSAGE ACCEPTANCE PULSE	LO	CONTINUE MISSION USING MAP OVERRIDE FUNCTION	SATELLITE LIFE MAY BE LIMITED DUE TO POSSIBLE FAILURE TO RESET AUTO KILL CIRCUIT.
	33-205 THROUGH 33-210 ARE RESERVED.			

RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
			EPS	
33-211	BATTERY TEMPERATURE >90°F OR <10°F	LO	MANAGE POWER TO MINIMIZE THERMAL PROBLEM	
33-212	EXCESSIVE BATTERY CURRENT DUE TO TRANSMITTER MALFUNCTION	LO	REDUCE USE OF TRANSMITTER	
33-213	EXCESSIVE BATTERY CURRENT DUE TO ELECTROSTATIC ANALYZERS (EA) HV MALFUNCTION	LO	TURN OFF HVPS	
33-214	EXCESSIVE CURRENT DUE TO OTHER THAN THE ABOVE (RULES 212 & 213)	LO	CONTINUE MISSION WITH POSSIBLE RESCHEDULING	
33-215	BATTERY VOLTAGE BELOW 13.0 VOLTS WHILE DISCHARGING	LO	CONTINUE MISSION WITH POSSIBLE RESCHEDULING	MAY EFFECT MISSION CAPABILITIES, DEPENDING UPON DEGREE OF FAILURE.
33-216	LOSS OF OUTPUT FROM A SOLAR CELL STRING	LO	CONTINUE MISSION WITH POSSIBLE RESCHEDULING	POWER AVAILABLE FROM SOLAR CELLS REDUCED BY 2.5%
33-217	BATTERY SHUNT FAILS OPEN	LO	CONTINUE MISSION	BATTERY CELL OVERCHARGE PROTECTION CIRCUITS WILL PROTECT BATTERY
33-218	BATTERY CHARGE CONTROL (BCC) REGULATOR SWITCH LOGIC FAILURE	LO		
	A. FAILS IN 15.5V REGULATOR POSITION		CONTINUE MISSION WITH RESCHEDULING	CHARGE RATE WILL BE REDUCED DUE TO LOW CHARGE VOLTAGE
	B. FAILS IN 16.9V REGULATOR		CONTINUE MISSION	BATTERY WILL TEND TO OVERCHARGE, BUT IS PROTECTED BY CELL OVERCHARGE CIRCUITS
33-219	BCC 15.5V REGULATOR FAILS TO REGULATE	LO	CONTINUE MISSION	BATTERY VOLTAGE WILL BE REGULATED TO HIGHER VOLTAGE LEVEL DEPENDENT UPON LOAD
33-220	BCC 16.9V REGULATOR FAILS TO REGULATE	LO	CONTINUE MISSION	BATTERY VOLTAGE WILL BE REGULATED TO HIGHER VOLTAGE LEVEL DEPENDENT UPON LOAD
33-221	INVALID DETECTION OF UNDERVOLTAGE CONDITION	LO	CONTINUE MISSION	REESTABLISH NORMAL OPERATION DEPENDENT UPON FREQUENCY OF OCCURRENCE
	RULES 33-222 THROUGH 33-225 ARE RESERVED			

RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
			DATA	
33-226	ANALOG-TO-DIGITAL CONVERTER 2.5V REFERENCE ERROR	LO	CONTINUE MISSION	ANALOG DATA WILL REQUIRE CORRECTION
33-227	FAILURE OF SUN SENSOR	LO	CONTINUE MISSION WITH POSSIBLE RESCHEDULING	SECTORING GATES AND B-FIELD CALCULATIONS WILL BE INACCURATE
33-228	FAILURE OF BIT RATE INDICATOR	LO	CONTINUE MISSION	TSN (8 BPS) OR TSF (16 BPS) MUST BE MANUALLY SPECIFIED TO THE ALCS
33-229	FAILURE OF FORMAT ID INDICATOR	LO	CONTINUE MISSION	RT OR MRO FORMAT MUST BE MANUALLY SPECIFIED TO THE ALCS
33-230	DATA STORAGE JNIT FAILURE	LO	CONTINUE MISSION	LOSS OF TELEMETRY STORAGE CAPABILITY. DATA MAY BE OBTAINED IN REAL-TIME MODE ONLY.
33-231	LOSS OF TELEMETRY STOARGE MODE	LO	CONTINUE MISSION USING NON-FAILED TS MODE AND RT MODE	THIS MAY PRECLUDE USE OF AUTO MODE IF TSN MODE FAILED
33-232	LOSS OF RT MODE	LO	CONTINUE MISSION USING TS, MRO, AND AUTO MODES	SOME LOSS OF MRO DATA WILL OCCUR DUE TO MSFN SITE LOCK-UP DELAYS
33-233	FAILURE TO ACHIEVE 12 ± 2 RPM SPIN RATE	LO	CONTINUE MISSION WITH POSSIBLE RESCHEDULING	
	RULES 33-234 THROUGH 33-240 ARE RESERVED			

RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
			PARTICLE DETECTORS	
33-241	CORONA	LO		
	A. EA		A. ATTEMPT TO REDUCE BY OUTGASSING B. IF "A" UNSUCCESSFUL, 1. RESCHEDULE TO OPTIMIZE DATA BEING OBTAINED 2. TURN OFF HVPS IF NO VALID SCIENTIFIC DATA IS BEING OBTAINED	
	B. TRANSPONDER		A. ATTEMPT TO REDUCE BY OUTGASSING B. IF "A" UNSUCCESSFUL, RESCHEDULE TO OPTIMIZE DATA BEING OBTAINED	
33-242	ELECTROSTATIC ANALYZER HV INCORRECT	LO	CONTINUE MISSION	ENERGY RANGE OF EA'S WILL CHANGE
33-243	EXCESSIVE EA VETO ACTION	LO	CONTINUE MISSION	INCREASE FREQUENCY OF CALIBRATION
33-244	FAILURE OF TELESCOPE A/B SELECT LOGIC	LO	CONTINUE MISSION	LOSS OF DATA FROM UNSELECTED TELESCOPES
	RULES 33-245 THROUGH 33-250 ARE RESERVED			

	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
				MAGNETOMETER	
	33-251	EXPERIMENT CALIBRATION CMD FAILS IN "ON" STATE	LO	CONTINUE MISSION	SOME DATA LOSS PRIMARILY IN MAGNETOMETER AND TELESCOPES
	33-252	MAGNETOMETER 2.5V REFERENCE ERROR	LO	CONTINUE MISSION	MAGNETOMETER DATA WILL REQUIRE CORRECTION
	33-253	MAGNETOMETER TEMPERATURE TOO HIGH OR LOW	LO	CONTINUE MISSION	DATA MAY REQUIRE CORRECTION
	33-254	LOSS OF MAGNETIC ZERO CROSSING	LO	CONTINUE MISSION	THE MAGNETIC PHASE COUNTER AND SECTOR GENERATORS WILL BE INOPERATIVE INHIBITING DATA FROM EA A-4 WHILE IN TS MODES

R	ITEM	
		AC — ALTERNATING CURRENT
		A/DC — 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
		BCC — BATTERY CHARGE CONTROL
		BL — BOTTOM LOCATION OF STRUCTURE TEMPERATURE
		BAS — 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 3)
		CCGE/A, CCGE/D — ANALOG AND DIGITAL ID READOUT FROM CCGE
		CCIG — COLD CATHODE ION 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/H1 CHANNELTRON VOLTAGE INCREASES OFF CHAN/LO CHANNELTRON VOLTAGE INCREASES OFF
		CMD — COMMAND
		CNT — COUNT
		CNTR — COUNTER
		CONV — CONVERTER
		CPLEE OR CPE — CHARGED-PARTICLE EXPERIMENT (FULL NAME IS CHARGED-PARTICLE LUNAR ENVIRONMENT EXPERIMENT)
		CPS — CYCLES PER SECOND
		CS — CENTRAL STATION
		CTL — 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)
		DISSIP — DISSIPATION
		DLAY — DELAY
		D/P — DATA PROCESSOR
		DPLY — DEPLOY
		DRT — DOME REMOVAL TOOL
		DSS — DATA SUBSYSTEM--COMPONENTS INCLUDE DSS/A ANALOG DATA PROCESSOR DSS/D DIGITAL DATA PROCESSOR DSS/PROC COMPLETE DATA PROCESSOR (REDUNDANT)
		EA — ELECTROSTATIC ANALYZER
		EPS — ELECTRICAL POWER SYSTEM
		EXP — EXPERIMENT
		F — FAHRENHEIT
		FET — FIELD EFFECT TRANSISTOR
		FLD — FIELD
		FREQ — FREQUENCY
		FTT — FUEL TRANSFER TOOL
		GDT — GRADIENT SENSOR DELTA TEMPERATURE (HFE)
		GEO — GEOPHONE
		GMBL — GIMBAL
		GND — GROUND
		GT — GRADIENT SENSOR AMBIENT TEMPERATURES (HFE)

R	ITEM	
		HBR — HIGH BIT RATE
		HFE — HEAT FLOW EXPERIMENT
		HTR — HEATER---ON HFE THERE ARE TWO CASES--- HTR/HK HIGH CONDUCTIVITY HEATER; HTR/LK LOW CONDUCTIVITY HEATER
		HT/S — HEAT SINK
		HV — HIGH VOLTAGE
		HZ — HERTZ
		INST — INSTRUMENT
		INSUL — INSULATION
		INT — INTERNAL
		K — KELVIN
		KC — KILOCYCLES
		KHZ — KILOHERTZ
		KV — KILOVOLTS
		LAT — LATITUDE
		LBR — LOW BIT RATE
		LEO — LUNAR EXPERIMENTS OFFICER
		LM — LUNAR MODULE
		LONG — LONGITUDE
		L/O — LOCAL OSCILLATOR
		LOS — LOSS OF SIGNAL
		LP — LONG PERIOD (PSE SENSORS)
		LSB — LEAST SIGNIFICANT BIT
		LSD — LEAST SIGNIFICANT DATA
		LSM — LUNAR SURFACE MAGNETOMETER
		LVL — LEVEL
		MA — MILLIAMPERE
		MDAC — MILLAMPERES DC
		MAP — MESSAGE ACCEPTABLE PULSE
		MC — MEGACYCLE
		MCC — MISSION CONTROL CENTER
		MDE — MODE
		MEV — MILLION ELECTRON VOLTS
		MHZ — MEGAHERTZ
		MOCR — MISSION OPERATIONS CONTROL ROOM
		MOD — MODULE
		MODE — OPERATING MODES ARE DEFINED AS FOLLOWS--- FOR HFE: MODE/G GRADIENT MODE; MODE/HK HIGH CONDUCTIVITY MODE; MODE/LK LOW CONDUCTIVITY MODE
		MRO — MEMORY READOUT MODE
		MS — MILLISECOND
		MSB — MOST SIGNIFICANT BIT
		MSD — MOST SIGNIFICANT DATA
		MSFN — MANNED SPACE FLIGHT NETWORK
		MTR — MOTOR--ON PSE, THE THREE MOTORS ARE MTRX, MTRY, AND MTRX
		MUX — MULTIPLEX
		MV — MILLIVOLTS
		MW/CM2 — MILLIWATTS PER SQUARE CENTIMETER
		NA — NANOAMPERES
		OSC — OSCILLATOR
		PA — POWER AMPLIFIER
		PA — PICOAMPERES
		PCM — PULSE CODE MODULATION
		PCU — POWER CONDITIONING UNIT
		PDR — POWER DISSIPATION RESISTOR
		PDU — POWER DISTRIBUTION UNIT
		PET — PACKAGE ELAPSED TIME
		P&FS — PARTICLES AND FIELD SUBSATELLITE
		PHYS — PHYSICAL--ON CPE USED AS FOLLOWS--- PHYS/AN PHYSICAL ANALYZER (SENSOR ASSEMBLY)
		PLT — PLATE
		PM — PHASE MODULATION
		PRE/LIM — PRE-LIMITING
		P/S — PASSIVE SEISMIC EXPERIMENT--ALSO -- PSE/LP LONG PERIOD SENSORS; PSE/SP SHORT PERIOD SENSORS; PSE/LP/SP LONG AND SHORT PERIOD SENSORS; LONG PERIOD SENSORS ARE FURTHER DEFINED AS PSE/X, PSE/Y, AND PSE/Z, WHILE PSE XY DENOTES THE TWO HORIZONTAL LONG PERIOD SENSORS

R	ITEM	
		R — RESISTOR (USED AS R1 AND R2) RCVR — RECEIVER RDT — RING SENSOR DELTA TEMPERATURE (HFE) RF — RADIO FREQUENCY RST — RESET RT — RING SENSOR AMBIENT TEMPERATURE (HFE) RTC — REAL-TIME COMMAND RTG — RADIOISOTOPE THERMOELECTRIC GENERATOR SCI — SCIENTIFIC SEQ — SEQUENCE, SEQUENTIAL--USED ON HFE AS-- SEQ/FUL FULL SEQUENCE SEQ/P1 PROBE 1 SEQUENCE SEQ/P2 PROBE 2 SEQUENCE USED ON ASE AS--- SEQ/S SEQUENTIAL SINGLE SEQ — SCIENTIFIC EQUIPMENT SIDE — SUPRATHERMAL ION DETECTOR EXPERIMENT SNSR — SENSOR SP — SHORT PERIOD (PSE SENSOR) SPST — SINGLE POLE SINGLE THROW S/S — SAMPLES PER SECOND, SIGNAL STRENGTH SWS — SOLAR WIND SPECTROMETER SYNC — SYNCHRONIZATION TC — THERMOCOUPLE (ON HFE, FOUR CABLE AMBIENT TEMPERATURES ARE READ ON EACH PROBE) TM — TELEMETRY TSF — TELEMETRY STORE FAST TSN — TELEMETRY STORE NORMAL USB — UNIFIED S-BAND V — VELOCITY (USED TO INDICATE "SPEED" ON PSE IN "LVL DIR/V") VCO — VOLTAGE CONTROLLED OSCILLATOR V/FILT — VELOCITY FILTER, A COMPONENT OF SIDE W — WATTS W1, W2, W3 — WALL LOCATIONS OF STRUCTURE TEMPERATURE SENSORS XMTR — TRANSMITTER XTAL — CRYSTAL XYZ — AXES OF LSM, WHERE SYO INDICATES XYO — X, OR Y, OR NEITHER

R	ITEM

DEPUTY DIRECTOR
AB/KRAFT, JR., C. C.

DIRECTOR OF FLIGHT OPERATIONS
FA/SJOBERG, S. A.

FLIGHT CONTROL DIVISION
FC/KRANZ, E. F.
FC/ROACH. J. W.
FC2/HARLAN, C. S. (6), PLUS SEND ALL EXTRAS TO HARLAN/FC2
FC6/HOOVER, R. A. (2)
FC9/SAULTZ, J. E.
FC9/BRADFORD, R. (BDX) (4)

FLIGHT SUPPORT DIVISION
FS2/SATTERFIELD, J. M.
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FS5/ROUNDTREE, J. R.

MISSION PLANNING AND ANALYSIS DIVISION
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FM/HUSS, C. R.
FM4/WOLLENHAUPT, W. R.

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CB/ASTRONAUT OFFICE
CA/SLAYTON, D. K.

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CD/ALLEN, L. D. (2)
CD3/RICHARD, L. G.
CG5/O'NEILL, J. W.
CEK/THOMPSON, L. E. (4)

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PA/MORRIS, O.
PA/KUBICKI, R.
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PD7/KOHRS, R. H. (2)
PD9/CRAIG, J. W.
PE (2)
PG
PG/COULTAS, G. A.
PA231/TASH, H. (3)
PT/ARABIAN, D.
PT3/DATA LIBRARY (8)

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EE/JOHNSTON, J. H.
EF/JONES, E. M.
EH/WISEMAN, D. (4)

SAFETY OFFICE
SA/FRENCH, J. C.

DIRECTOR OF SCIENCE AND APPLICATIONS
TD/SCIENCE MISSION SUPPORT DIVISION
TD5/BATES, J. R. (27)

OFFICE MANNED SPACEFLIGHT
MAO/LAND, E. W. (20)

R	ITEM

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

JUNE 17, 1971

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), FCD.

2.1.1 FORMAT

PERSONS DESIRING TO SUBMIT A PROPOSED CHANGE WILL REDLINE A PAGE FROM THIS DOCUMENT OR REWRITE THE RULE, 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, LUNAR EARTH/EXPERIMENTS 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 CONTRACTOR(S).

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.