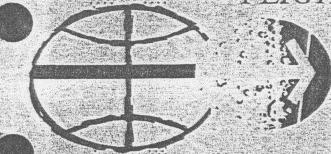
IELEGETE MISSION RULES

APOLLO 11 (AS-506/107/LM-5)

APRIL 16, 1969

PREPARED BY

FLIGHT CONTROL DIVISION



MANNED SPACECRAFT CENTER
HOUSTON TEXAS

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APOLLO

FLIGHT MISSION RULES

AS-506/107/LM-5

APOLLO 11

PREFACE

THIS DOCUMENT CONTAINS THE FLIGHT MISSION RULES FOR APOLLO 11. THESE RULES WILL RECEIVE AN EXTENSIVE EVALUATION DURING THE SIMULATIONS PRIOR TO THE APOLLO 11 MISSION. SUBSEQUENT REVISIONS TO THIS DOCUMENT WILL BE PRINTED ON COLORED PAGES FOR EASY RECOGNITION. INFORMATION CONTAINED WITHIN THIS DOCUMENT REPRESENTS THE FLIGHT MISSION RULES FOR THE APOLLO 11 MISSION AS OF APRIL 16, 1969.

IT IS REQUESTED THAT ANY ORGANIZATION HAVING COMMENTS, QUESTIONS, OR SUGGESTIONS CONCERNING THESE MISSION RULES CONTACT MR. LARRY W. KEYSER, FLIGHT CONTROL OPERATIONS BRANCH, BUILDING 45, ROOM 638, 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. CHRISTOPHER C. KRAFT, JR., DIRECTOR OF FLIGHT OPERATIONS, MANNED SPACECRAFT CENTER, HOUSTON, TEXAS.

THIS IS A CONTROL DOCUMENT AND ANY CHANGES ARE SUBJECT TO THE CHANGE CONTROL PROCEDURES DELINEATED IN APPENDIX C. THIS DOCUMENT IS NOT TO BE REPRODUCED WITHOUT THE WRITTEN APPROVAL OF THE CHIEF, FLIGHT CONTROL DIVISION, MANNED SPACECRAFT CENTER, HOUSTON, TEXAS.

APPROVED BY:

CHRISTOPHER C. KRAFT, JR.

DIRECTOR OF FLIGHT OPERATIONS

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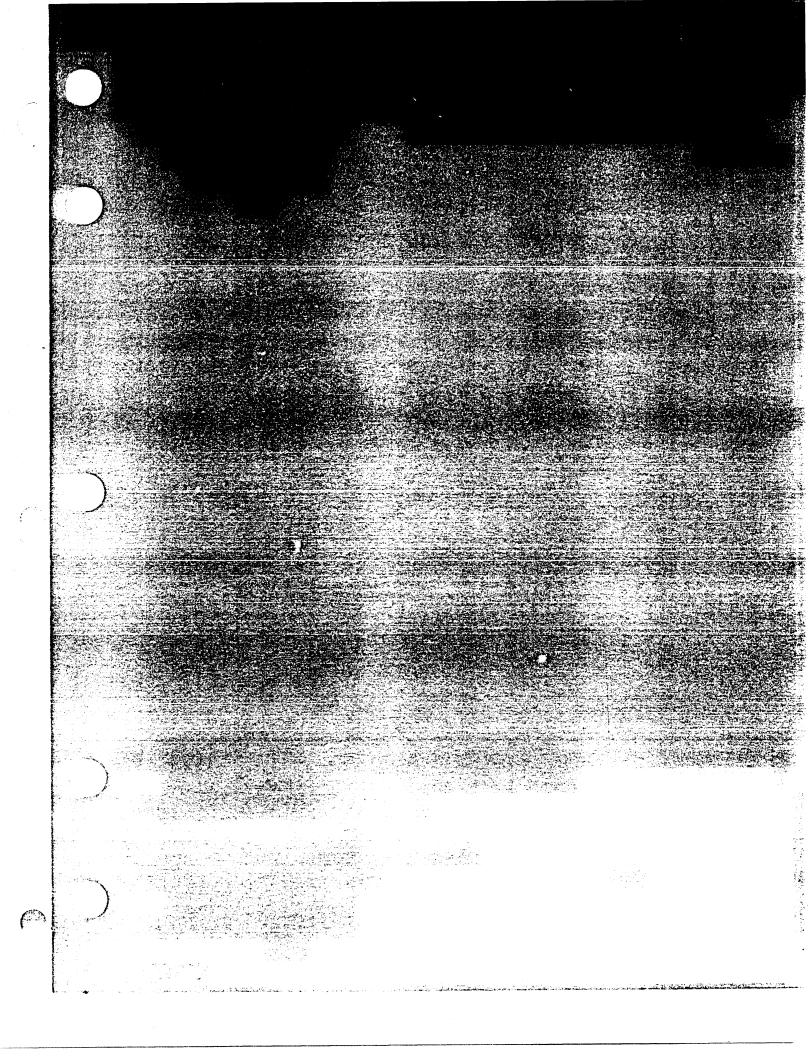
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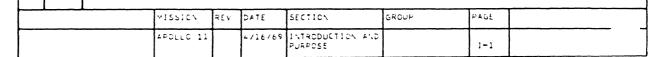
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	MISSION RULES ARE PROCEDURAL STATEMENTS WHICH PROVIDE FLIGHT CONTROL PERSONNEL WITH GUIDS TO EXPEDITE THE DECISION-MAKING PROCESS. THE RULES ARE BASED ON AN ANALYSIS OF MISSION: EDUC CONFIGURATION. SYSTEMS OPERATIONS AND CONSTRAINTS, FLIGHT CREW PROCEDURES. AND DEJECTIVES. THE DIRECTOR OF FLIGHT OPERATIONS, MANNED SPACECKAFT CENTER, HOUSTON, TEXAS, HAD OVERALL RESPONSIBILITY FOR THE PREPARATION, CONTENTS, AND CONTROL OF THE FLIGHT MISSION HOLD	IPMEN'
	MISSION RULES CAN BE CATEGORIZED AS GENERAL AND SPECIFIC. GENERAL MISSION RULES CONTAIN BASIC PHILOSOPHIES USED IN THE DEVELOPMENT OF THE FLIGHT MISSION RULES. SPECIFIC MISSION PROVIDE THE BASIC CRITERIA FROM WHICH REAL-TIME DECISIONS ARE MADE AND WILL BE FURNATTE FOLLOWS	
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	1-1	APOLLO FLIC	CAUNCH TEST SHT MISSION	ASS1	ON APPLIC	ABLE. THEY ARE A	ASED ON PRIMARY	OBJECT	COVERY OPERATIONS, AN IVES AS STATED IN THE MANGES TO THE PRIMAR APPROVAL.
	1-2	I KEPKESENIA:	TIVE WILL I	NSUKE	COURDIN	AND THE DIRECTOR ATION OF THEIR LATE ORGANIZATIO	RESPECTIVE MT	ERATIONS SSION F	OR THEIR DESIGNATE: RULE CHANGES WITH TH
	1-3	I WILL BE REC	FROM THE N	LL RU Omina	ILES CHAN L MISSIO	IGES AFFECTING IN AND PRELAUNCH	SAFFTY. ACCOMD	I T CHMENT	ROVAL AND CONCURRENCE OF TEST OBJECTIVES ENCE MAY BE OBTAINED
	1-4	DURING THE THAT INVOL LAUNCH/FLIG	LVE CHANGE:	s to	MISSION:	THE MISSION DIR ON OBJECTIVES+	ECTOR WILL BE A MISSION RULES	DVISED O	F ALL RECOMMENDATIONS T PLAN CONTENT, CH
	1-5	DIRECTOR. D	DOD MANAGER	FOR	MSF SUPP	ESPONSIBILITY: TO ORT OPERATIONS: . NDUCT OF THE MIS.	AND THE MISSION	T. THE L DIRECTO	AUNCH DIRECTOR: FLIGH R MAY TAKE OR MECOMMEN.
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	1-7	OPERATIONS MANAGER AND PROBLEMS AN REQUIRED WI MISSION DIR	MANAGERS SH D LAUNCH DIF D PROPOSED LL BE PROVI ECTOR WILL	RECTO SOLU IDED BE K	PROVIDE R. THE L TIONS. D TO THE F EPT FULL	TECHNICAL ADVICE ATTER TWO WILL KI URING THE FLIGHT LIGHT DIRECTOR A	AND SUPPORT DISEP THE MISSION PHASE OF UPPORT OF THE MSC DIRECT OF	RECTLY T DIRECT ERATIONS CTOK OF	AND RESPECTIVE CENTER OF THE LAUNCH OPERATIONS OR FULLY INFORMED CH + SIMILAR SUPPLET A FLIGHT OPERATIONS. THE PROBLEMS AND PROPERSEL
	1-6	MISSION DIR THE POSITIO	ECTOR BY THON OR FACILIES OF ESTIMAT	TE LA	UNCH DIR HAT DETE	ECTOR OR THE FLIC CTED THE MALFUNT:	SHT DIRECTUR. THIS	E INITI	LL BE REPORTED TO THE AL REPORT WILL INCLUDE MISSION DIRECTOR WILL CYCLE, OR SCRUE WCTIVE
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	1-9	WITHIN THE COORDINATIO	LAUNCH WIN	WN AS DOW, APPR	NECESSA THE MISS OPRIATE	RY. IF A MADATOR ION DIRECTOR MAY OPERATIONS AND P	Y ITEM CANNOT B	E CORREC	OR TO LAUNCH, HOLDING TED TO PERMIT LIFTOFF INCH AFTER APPROPRIATE RALLY THE LUSS OF A
	1-10	MANDATORY	TEM. THIS	IHE AUTHO	RITY SHA	DIRECTOR RETA	INS THE PRIMA	RY AUTH	ON DIRECTOR MAY SCRUB MORITY TO DOWNGRADE A E AND AFTER APPROPRIATE RECTOR:
	I-11	FAIL AND/OR	CTHER AGE	R ANT AVATI	NG CIRCU	HIGHLY DESIRABLE	ITEM. IF TWO DI	R MORE H	OUT IN NO CASE WILL THE IGHLY DESIRABLE ITEMS AY SCRUE THE MISSION
	1-12	THE COUNTDO	OWN WILL NO	T BE	HELD NOR	THE LAUNCH SCRUE	BEED FOR FAILUR	E OF DES	IRABLE ITEMS.
	I-13	PRIOR TO LI	FICEF. IF NUE ON THE : THE FLIGHT	THE M LAUNC MISS	CC LOSES H SITE R ION RULE	A PARAMETER BUT FADOUT: THIS IS T S) UPON #HICH MIS	THE LAUNCH SITE	E HAS A	DISCHEPANCIES UCCUPRING VALID READOUT: THE MCC MANDATORY PARAMETERS AKEN. IN THIS CASE: A
	1-14	THE COUNTED	WN WILL CO	NT I NU	E *HERE	PUSSIBLE CUNCURRE	CNTLY WITH COMES	CTION C	F AN EXISTING PROBLEM.
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	1-16	PRIOR TO LI EVENT OF LA RESULTING F	UNCH SITE	EMER	GENCIES.	LAUNCH OPERATIONS EXCEPT FOR RE	NILL BE RESPO COVERY OPERATI	SIBLE F ONS OF	CH ALL ACTIONS IN THE SPACECRAFT AND CHEA
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THE FROM LITTORY TO TOMER CLEAR, THE LAUNCH DIRECTOR AND FLIGHT DIRECTOR WILL MANE CONCURRENT RESPONSIBILITY FOR SCHOOL AN ABORT REQUEST. THE CRITERIA FOR SENDING AN ABORT REQUEST DURING THIS PERIOD WILL BE LETABLISHED IN THE LAUNCH AND FLIGHT MULES RESPECTIVELY. L-19 THE LAUNCH OPPRATIONS WANNERS WILL INFORM MCC WHEN THE SWACE VEHICLE CLEARS THE UMBLICAL TOWER BY SAYING "TCLEAR TOMER" DUES THE OPEN FROM ASC TO MCC. L-20 THE LAUNCH OPPRATIONS WANNERS WILL INFORM MCC WHEN THE SWACE VEHICLE CLEARS THE UMBLICAL TOWER BY SAYING "TCLEAR TOWER" DUES TO BE LODGE FROM ASC TO MCC. L-20 THE LAUNCH OPPRATIONS WANNERS WILL SAYONE VEHICLE CREASES TO THE SWACE VEHICLE CLEARS THE UMBLICAL TOWER ACTION AND THE MICHAELS AND FOLIAGE TOWERS AND FOLIAGE TOWERS AND THE LODGE CONTINUENCES WAS ACTED TO THE FLIGHT DIRECTOR FOR ANY ACTION ANCESSARY AFTER UMBLICAL TOWER CLEARANCE. L-21 COMPLETE SROUND CONTROL OF THE SPACE VEHICLE FRASES TO THE SIGNT DIRECTOR WHEN THE SWACE VEHICLE PRACEDS SUFFICIENT ANTITUDE TO CLEAR THE TOP OF THE UMBLICAL TOWER. L-22 THE COMMAND PRIOT MAY INITIALS SUCH INFLIGHT DYNAMICS OFFICER AND EQUATES SYSTEMS INJURIES ALL MAY ACTED BY SECRETARY ACT OR ASSET FRANCE. L-23 THE COMMAND PRIOT MAY INITIALS SUCH INFLIGHT ACTION AS HE DEEMS ESSENTIAL ACT OR ASSET FRANCE THE ACCOMPLISHMENT OF VIDSIUS DELICITIES. L-24 FLIGHT CREA SAFETY SMALL TAKE PRECEDENCE OVER THE ACCOMPLISHMENT OF VIDSIUS DELICITIES. L-25 THE FLIGHT DIRECTOR. THANDON THE RECOVERY COUNDINATERS WILL PROVIDE THE OUT MANAGES THE VALUE AND SHARP OF MANAGES FOR MANAGES FOR MANAGES FROM SECOND OF SAFE AND EARTED AND ACCOMPLANT AND COMMAND PROVIDED AND ACCOMPLANT FOR MANAGES AND FROM SECOND OF SAFE AND EARTED AND ACCOMPLANT AND COMMAND AND ACCOMPLANT AND ACCOMPLANT AND COMMAND AND ACCOMPLANT AND COMMAND AN	R	ITEM								
BY SAYING "ICLEAR TOKER" OVER ONE OF THE LDOPS FROM KSC TO MCC. 1-20 IN THE EVENT OF NON-CATASTROPHIC SPACE VEHICLE COLLISION WITH THE UNBILLCA. TOKER OF OTHER CONTINGENCIES WHICH DO NOT REQUIRE IMPEDIATE ACTION, THE LAUNCH OPERATIONS MARKEER KILL CONTINUE TO EVALUATE THE EXPECT OF THE DANAGE AND PROVIDE INFORMATION TO THE FLIGHT DIRECTOR FOR ANY ACTION MICESSARY AFTER OWELLICAL TOKER CLEARANCE. 1-21 COMPLETE ORDUND CONTROL OF THE SPACE VEHICLE PASSES TO THE FLIGHT DIRECTOR WHEN THE SERICL VEHICLE PRACES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UNSILICAL TOKER. 1-22 IN THE MCC. THE FLIGHT DIRECTOR, FLIGHT DYNAMICS OFFICER AND BOUSTER SYSTEMS ENJIRED ALL HAVE THE CAPABILITY TO SEND AN ABORT REDUEST SIGNAL. THE CRITERIA FOR SENDING AN ABORT PROJECT WILL HAVE THE COMMAND PILOT THAT INITIATE SUCH INFLIGHT ACTION AS HE DEEMS ESSENTIAL FUNCER, SAFETY. 1-23 THE COMMAND PILOT THAT INITIATE SUCH INFLIGHT ACTION AS HE DEEMS ESSENTIAL FUNCER, SAFETY. 1-24 1-25 IN THE SYSTEM OF COMMUNICATIONS LUSS BETWEEN THE MANNED SPACE FLIGHT KETADAK AND THE SHALECHAFT, THE COMMAND PILOT THAT ASSUME RESPONSIBILITY FOR MISSION CONDUCT AS DESCRIBED ALTHON THE SHALECHAFT, THE COMMAND PILOT THAN OFFICE AND SHALES AND SPACE TRIBED ALTHON THE SHALECHAFT, THE COMMAND PILOT THAN OFFI THE SECOND CONDUCTIONS OF SHALES AND THE FILE THAN THE AND SHALES AND SHALES AND SHALES AND SHALES AND SHALES AND SHALES AND THE FILE THAN THE ADDRESS AND SHALES AND S		1-18	RESPONSIBIL	ITY FOR SEN	IDING	AN ABOR	T REQUEST. THE CR	ITERIA FOR SEND	ING AN	ABORT REQUEST DURING
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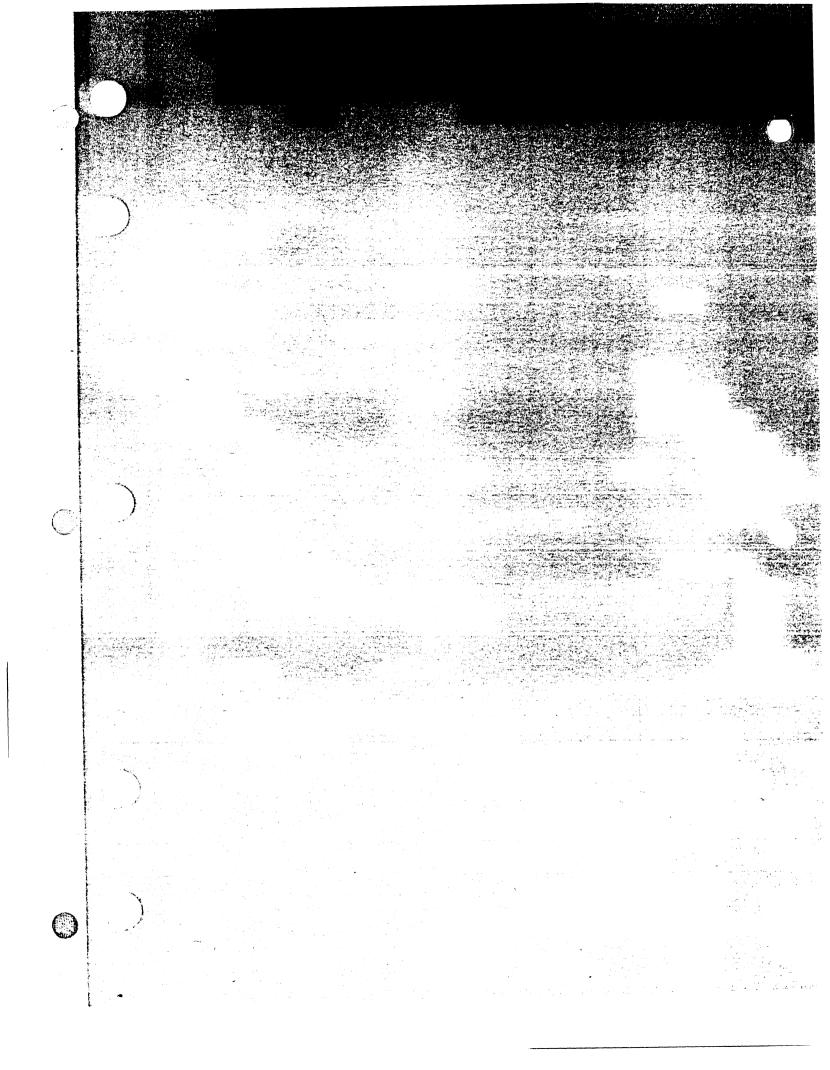
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1-52	LIFTOFFT THE POINT I	HE EVENT DI N TIME #HE!	ETERMINE N PLUS T	D BY T	ME INSTRUMENTA MMENCES:	TION UNIT UMBIL	ICAL DISC	UNNECT SIGNAL A	15
1-53	ABORTYIS LAUNCH VEHI	SION TERM! CLE PRIOR	NATION 6 TO URBIT	Y UNSC AL INS	HEDULED INTENT ERTION:	ICHAL SEPARATIO	OF THE	SPACECHAFT FRU	Y THE
1-54	EARLY MISSI INSERTION.	UN TERMINA	TICK (UNSCHE	Duled Intentic	NAL MISSION TER	HINATION	AT UR AFTER U-	-BITAL
1-55	MEASUPEMENT FUNCTION:	A VEASU	REMENT I	S A SP	ECIFIC DATA CH	ANNEL OF INSTRU	MENTATION	MONITORING A :	SINGLE
:-56						T THAT ACULIRES PERATIONAL SUPP(TRANSMI	TS AND MONITCHS	JATH
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		MISSION	REV DA	T E	SECTION	GROUP	PAGE		
		AFCLLO 11	473		GENERAL GUIDELINES	OMSF GENERAL RULES	1-6		



MISSION RULES

DEV ITEM

ŀ		' GENERAL '
	1-1	THE FLIGHT MISSION RULES OUTLINE PREPLANNED DECISIONS DESIGNED TO MINIMIZE THE AMOUNT OF REAL-TIME RATIONALIZATION REUDIRED WHEN NON-NOMINAL SITUATIONS OCCUR DURING THE TERMINAL COUNTDOWN, THE FLIGHT PHASE, AND RECOVERY OPERATIONS.
	1-2	WHENEVER POSSIBLE: THE CREW AND GROUND WILL VERIFY ALL MALFUNCTIONS: WHENEVER THERE IS A CONFLICT BETWEEN SPACECRAFT AND GROUND TELEMETRY READOUTS: THE SPACECRAFT READOUTS ARE PRIME (ASSUMING THE SPACECRAFT HAS ADEQUATE INSTRUMENTATION AND THAT APPLICABLE SPACECRAFT COCKPIT READOUTS ARE OPERATIONAL).
	1-3	SPACECRAFT LAUNCH WILL NOT BE ATTEMPTED IF KNOWN SPACECRAFT SYSTEMS MALFUNCTIONS WILL LIMIT THE MISSION DURATION SUCH THAT ACCOMPLISHMENT OF THE PRINCIPAL OR MANDATORY DETAILED TEST OBJECTIVES WILL BE COMPROMISED.
	1-4	WHEN A CONFLICT OF FLIGHT PLAN ACTIVITIES OCCURS. THE FLIGHT DIRECTOR WILL DETERMINE THE PRIORITY OF ACTIVITIES.
	1-5	IN SOME INSTANCES. THE SPECIFIC MISSION RULES MAY DEVIATE FROM THE GENERAL GUIDELINES. CUNTAINED IN PART I OR FROM THISE GENERAL RULES. THE SPECIFIC MISSION RULE ALL APPLY IN ALL CASES. AND THE DEVIATIONS FROM THE GENERAL GUIDELINES WILL BE NOTED.
	1-6	THE FLIGHT LIRECTOR MAY: AFTER ANALYSIS OF THE FLIGHT: CHOOSE TO TAKE ANY NECESSARY ACTIO. REQUIPED FOR THE SUCCESSFUL COMPLETION OF THE MISSION:
	1-7	MISSION RULE LIMITS THAT ARE CONSIDERED TO BE INTERIM OR UNCONFIRMED NUMBERS WILL BE UNDERLINED IN THIS PUBLICATION AND ALL SUBSECUENT REVISIONS UNTIL THE NUMBERS ARE CONFIRMED BY THE RESPONSIBLE NASA AGENCY.
	1-ē	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 ERRORD WITHIN THE SPACECRAFT AND MSFW LATARDISPLAY SYSTEMS.
	1-9	UILESS STATED CTHERWISE: MANDATORY AND HIGHLY DESIRABLE INSTRUMENTATION REGUlherents are SATISFIED BY EITHER UNSCARD OF MOY CAPABILITY:
-	1	MISSION REV DATE SECTION GROUP PAGE
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REV	' ITEM	MISSION RULES SECTION 1 GENERAL RULES AND SOP'S
	1-10	MANDATORY SPACE VEHICLE INSTRUMENTATION FOR THE PURPOSES OF FLIGHT MISSION RULES MUST B CONSONANCE WITH THE FOLLOWING CRITERIA (REFERENCE OMSF GENERAL RULE 1-42).
		A. REQUIRED TO INSURE FLIGHT CREW SAFETY.
		B. REQUIRED TO IMPLEMENT RULES RESULTING IN LAUNCH ABORTS.
		C. REQUIRED TO IMPLEMENT RULES RESULTING IN EARLY MISSION TERMINATION.
1		D. REQUIRED TO MAKE DECISION TO CONTINUE TO THE NEXT MISSION PHASE.
		THE MANDATORY INSTRUMENTATION LISTINGS IN THIS DOCUMENT WILL BE CROSS-REFERENCED TO THE APPROPRIATE MISSION RULE MEETING THE ABOVE CRITERIA.
	1-11	THE CRITERION FOR CATEGORIZING INSTRUMENTATION AS HIGHLY DESIRABLE IN THE FLIGHT MISSION RULES IS ANY INSTRUMENTATION REQUIRED FOR NORMAL SYSTEMS MANAGEMENT OR REQUIRED FOR FLIGHT CONTROL DECISIONS NOT IN THE MANDATORY CATEGORY.
	1-12	RE COMMANDS WILL NOT BE TRANSMITTED TO THE SPACECRAFT OR LAUNCH VEHICLE DURING THE LAUNCH PHASE UNLESS SPECIFIC MISSION RULES ARE INVOKED WHICH REDUIRE COMMAND ACTIVITY.
	1-13	THE LAUNCH OPERATIONS MANAGER WILL INFORM THE FLIGHT DIRECTOR WHEN THE SPACE VEHICLE HAS CLEARED THE UMBILICAL TOWER BY STATING "ICLEAR TOWER" OVER CHANNEL 111.
ž -	1-14	THE CONVAND PILOT MAY INITIATE SUCH INFLIGHT ACTION AS HE DEEMS ESSENTIAL FOR CREW SAFLTY.
	1-15	IN THE EVENT OF LOSS OF COMMUNICATIONS BETWEEN THE MSFN AND THE SZC+ THE COMMAND PILOT AILL ASSUME RESPONSIBILITY OF MISSION DIRECTION AITHIN THE FRAME WORK OF THE MISSION RULES.
		PULE NUMBERS 1-16 THROUGH 1-23 ARE RESERVED.
		MISSION REV DATE SECTION GROUP PAGE
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1		

MISSION RULES

REV ITEM

+-	\dashv					' DEFINITIONS '			
1-2	١ ا	ASAPAS S	CON AS PRA	CTICA	BLE (1.E	. AS SOON AS POS	SIBLE AND REAS	ONABLE).	
				• .					
1-2	5	PTPA PRE SPACECRAFT	FERRED TAR SHOULD BE	GET P	OINT IS TED IF I	A STRATEGICALLY L T HECOMES NECESSA	DCATED SET DI RY TO LAND ON	F COORD THAT REV	INATES FOR #HICH TH OLUTION.
	İ								
1-2	6	ATP AN ' PROVIDE A 5	'ALTERNATE PACECRAFT	TARGE	ET POINT	'' IS A STRATEGIC MIDWAY BETWEEN PT	ALLY LOCATED SI	ET OF	COORDINATES CHUSEN T
	Ì								
1-2	7	NEXT BEST P	TPA PRE	FERRE	D TARGET	POINT WHICH CAN	BE REACHED BY	r THE	SHACECRAFT WITHIN TH
		THE BEST PO. PHASE UNLES	SSIBLE KEL	NTEY .	AND LAND	AFT PROBLEM CAUSI ING AREA CONDITIO	NG AN EARLY MIS NS. THE MISSION	SSICN TE N WILL N	RMINATION AND ALLOWING OF PRODEED TO THE NEX
1-2	е	REENTER ASA	PREENTL	R AS :	SUCH AS	PRACTICABLE (1•E•	. AS SOUN AS PO	DSSIBLE	AND REASONABLE).
1-2	9	TERMINATE A	5APREEN	TER W	ITH THE	VINIMUM TRIP TIME	TO AN UNSPECTE	FIED LAN	DING AREA.
1-3	c	THOSE MANEU	VERS REGULI	PED T	D INSURE	CREW SAFETY. THE	VIOLATION OF F	PROPULSI	EUVERS ARE DEFINED AS ON SYSTEM LIMITS WILL
		LDI2. PLANE	CHANGE + D	481 F; Ul, A'	DR SULM I	BURKS. ALL MANEUV HOT REQUIRED FOR	ERS ARE CONSI ENTRY CORRIDUR	DERED CONTRU	CHITICAL EXCEPT LOIL
1-3	1	NON-CRITICAL CREW SAFETY		BURN	WHICH N	EED NOT HE ACCUMP	LISHED TO MAINT	TAIN AN	ACCEPTABLE LEVEL OF
1-3	2	EARLY STAGI	NGUNSCH	EDULE	SEPARA	TION OF THE S-IVB	STAGE FRUM THE	5-11 S	TAGE .
			•						
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MISSION RULES SECTION 1 GENERAL RULES AND SOP'S

EV ITEM	SECTION 1 GENERAL RULES AND SOP'S
1-33	CONTINGENCY ORBIT INSERTION (COI) AN SPS PROPULSIVE MANEUVER WHICH WILL PROVIDE CSM INSERTION INTO A SAFE ORBIT (HP GREATER THAN OR EQUAL TO 75 NM) IN THE EVENT OF AN SLV FAILURE OCCURTION IMMEDIATELY PRIOR TO INSERTION. OR IN THE EVENT OF DEGRADED SLV PERFORMANCE.
1-34	S-IVB DESTRUCT PACKAGE SAFINGTHE EMERGENCY DESTRUCT PACKAGE IS SAFED BY THE RSD. TRANSMITTING A COMMAND WHICH PERMANENTLY KEMOVES POWER FROM THE RANGE SAFETY RECEIVERS.
1-35	S-1VB SAFINGA PASSIVATION SEQUENCE IN WHICH S-1VB LOX; LHZ; AND HIGH PRESSURE SPHERES ARE DEPLETED:
1-36	PRELAUNCH PHASE (PRELN)THE TIME INTERVAL FROM THE COMPLETION OF THE FLIGHT READINESS REVIEW TO LIFTOFF.
1-37	FLIGHT PHASETHE INTERVAL FROM LIFTOFF THROUGH SPLASHDOWN. FOR MISSION RULE PURPOSES THE FLIGHT PHASE IS FURTHER SUBDIVIDED AS SHOWN BELOW
	A. LAUNCH PHASE FROM LIFTOFF THROUGH INSERTION (TB1 THROUTH TB4).
	B. EARTH ORBIT PHASEFROM INSERTION THROUGH S-IVB CUTUFF FOR TRANSLUNAR INJECTION (TL1):
	C. TDGE PHASEFRUM CSM/S-IVB SEPARATION THROUGH LM EJECTION FROM SLA (TB5).
	D. TRANSLUNAR COAST PHASEFROM S-IVB CUTOFF FOR TLI THROUGH LCI1 CUTOFF.
	E. DOCKED PHASETHE TIME INTERVALS DURING WHICH THE LM AND CSM ARE DOCKED.
	F. LUNAR ORBIT PHASEFROM LOTE CUTCER TO UNDOCKING AND FROM PEDOCKING TO TEL CUTCER.
	G. UNDUCKED PHASE——THE TIME INTERVAL DURING WHICH A MANNED LY IS SEPARATED. FROM THE CSM T STATION REEPING LYAXIMUM SEPARATION DISTANCE OF APPROX. 500FT).
	H. DOI PHASETHE TIME INTERVAL FROM THE DOI MANEUVER TO THE INITIATION OF THE PDI MANEUVER.
	I. POWERED DESCENTTHE TIME INTERVAL FROM THE INITIATION OF THE PDI MANEUVER TO TOUCH DOWN.
	1. PDI TO PDI +f+++DURING THIS TIME PERIOD THE EM CAN ABORT THE POWERED DESCENT AND GET INTO ORBIT USING THE DPS ONLY AND RETAIN. THE DESCENT STAGE AFTER INSERTION.
	2. PDI +5 TO LO GATELO GATE IS THE POINT AT WHICH THE CREW TAKES OVER AND MANUALLY FLIES THE DESCENT.
	3. LO GATE TO TOUCH DOWNTHE TIME INTERVAL FROM CREW TAKEOVER (APPROXIMATELY 500 FT ALTITUDE) TO LANDING.
	U, LUNAR STAY PHASE——THE TIME INTERVAL FROM TOUCHDOWN UNTIL LIFTOFF.
	EVATHE TIME INTERVAL FROM LY DEPRESSURIZATION UNTIL LM REPRESSURIZATION.
	K. RENDEZVOUSTHE TIME INTERVAL FROM INSERTION INTO LUNAR CROIT AFTER ASCENT OR AFTER AN ABOPTED DESCENT UNTIL COMMENDE FOR AN ALTERNATE MISSION WHICH DOES NOT INCLUDE A LUNAW LANDING IT IS THE TIME FROM THE CSM PREHDDI SEPARATION MANEUVER THROUGH CSMMEN DOCKING.
	L. TRANSEARTH COAST HEASEFROM TEL CUTOFF TO CM/SM SEPARATION.
	M. ENTRY PHASEFACK CM/SM SEPARATION TO SPHASHDOWN.
	MISSION REV DATE SECTION GROUP PAGE
	

4/16/69 GENERAL RULES AND SOP'S

APOLLO 11

DEFINITIONS

MISSION RULES SECTION 1 GENERAL RULES AND SOP'S

REV	ITEM			S	ECTION 1	GENERAL RULES AN	D SOP'S		
	1-33	I INTO A SAFE	ORBIT THP	GREA	TER THAN	- AN SPS PROPULS OR EQUAL TO 75 N IN THE EVENT OF	(M) IN THE EVENS	DF AN	L PROVIDE CSM INSERTION SLV FAILURE OCCURRING NCE.
	1-34	S-IVB DESTRI	UCT PACKAG	E SAF	1NGTH	E EMERGENCY DESTR	RUCT PACKAGE 15	SAFED E	BY THE RSD TRANSMITTING
		A COMMAND W	HICH PERMA	NENTL	Y REMOVE	S POWER FROM THE	RANGE SAFETY RE	CEIVER	•
	1-35	STIVE SAFING	GA PASS	ITAVI	ON SEQUE	NCE IN WHICH S-1V	B LOX+ LH2+ AND	HIGH	PRESSURE SPHEKES ARE
	1-24	D35: 4100CH D			* .				
	1-36	TO LIFTOFF.	HASE (PRELI	,,	IME IIME	INTERVAL FROM TH	HE COMPLETION OF	THE FL	IGHT READINESS REVIEW
									•
	1-37	FLIGHT PHASE FLIGHT PHASE	E===THE IN E IS FURTH	TERVA ER SU	L FROM L BDIVIDED	IFTOFF THROUGH SP AS SHOWN BELOW	LASHDOWN. FOR	MISS1	ON RULE PURPUSES THE
		A. LAUNCH PI	HASE FR	DM L1	FIOFF TH	ROUGH INSERTION (TB1 THROUTH TB4	.) .	
		B. EARTH ORE	BIT PHASE-	FRO	M INSERT	ION THROUGH S-IVE	CUTUFF FOR TRE	NSLUNAR	INJECTION (TLI).
		C. TOGE PHAS	SEFRUM (SM/S	-IVB SEP	ARATION THROUGH L	M EJECTION FROM	SLA (T	B51.
		D. TRANSLUN	AR COAST P	-ASE-	FROM S	-IVB CUTOFF FOR T	LI THROUGH LOI1	CUTOFF	•
		E. DOCKED P	HASETHE	TIME	INTERVA	LS DURING WHICH T	HE LM AND CSM A	RE DOCK	ED.
		F. LUNAR OR	BIT PHASET	FRC	™ L011 C	UTUFF TO UNDOCKIN	G AND FROM PEDE	CKING T	O TEL CUTOFF.
						VAL DURING WHICH RATION DISTANCE O			ED FROM THE CSM FOR
		H. DCI PHAS:	:THE TI	7E IN	TERVAL F	-OM THE DOI MANEE	VER TO THE INIT	IATION	OF THE PDI MANEUVER.
		:. POWERED :	DE SCE*.T	T-E 7	17E 17TE	RVAL FROM THE INT	TIATION OF THE	PDI YAN	EUVER TO TOUCH DOWN.
		Α,				S TIME PERIOD THE THE DPS DNEY AND			
			+5 TO LC (Anually Fl			E IS THE PUINT AT	WHICH THE CR	EW TAK	ES OVER AND
			GATE TO TU. UO ET ALTI			E TIME INTERVAL F Ing.	HOM CHEN TAKE	OVER (APPROXIMATELY
		L. LUNAR ST	AY F-ASE	-T+1	TIME INT	ERVAL FROM TOUCHD	OWN UNTIL LIFTO	FF.	
		EVA	THE TIME I	NTERV	AL FROM	LM DEPRESSURIZATI	ON UNTIL LM REP	RESSURI	ZATION.
		ABOPTE	D DESCENT (ATIL	CEVILY	DUCKING. FOR AN A	LTERNATE MISSIC	N WHICH	ASCENT OR AFTER AND DOES NOT INCLUDE A NEUVER THADUGH CSY/LY
		L. TRANSEART	TH COAST H	-45E-	FRUM T	ET CUTOFF TO CM/S	M. SEPARATION.		
						TION TO SPEASHDOW			
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<u></u>			MISSION	REV	DATÈ	SECTION	GROUP	PAGE	
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MISSION RULES

REV ITEM SECTION 1 GENERAL RULES AND SOP'S

RECOVERY PHASE --- THE TIME INTERVAL FROM SPLASHDOWN TO DELIVERY OF THE FLIGHT CREW AND SPACE 1-38 TO DESIGNATED LAND BASED INSTALLATIONS. 1-39 REENTRY DEFINITIONS---A. AUTOMATIC --- REENTRY CONTROLLED BY CMC WHICH OUTPUTS BANK ANGLE COMMAND TO THE RCS. B. CLOSED LOOP---REENTRY CONTROLLED BY THE CREW MANUALLY FLYING BANK ANGLE MODULATION USING CMC ENTRY PROGRAM OUTPUTS. C. OPEN LOOP REENTRY---REENTRY CONTROLLED BY THE CREW USING SPACECRAFT DISPLAYS AND FLYING---1. BANK ANGLE (RR 0-90) AND RETRB (RL 0-90). 2. CONSTANT BANK ANGLE---CREW ESTABLISHES AND MAINTAINS A CONSTANT BANK ANGLE. (CONSTANT BANK ANGLES GREATER THAN 90 DEGREES WILL NOT BE FLOWN EXCEPT WHEN SKIPOUT RULE IS VIOLATED.) 3. ROLLING REENTRY---MAINTAIN CONSTANT 18 DEGREES PER SECOND ROLL RATE. 4. EMS RANGINGT--CONSTANT BANK ANGLE IS HELD TO 16. THEN THE RANGE TO GO DISPLAY AND THE RANGE POTENTIAL LINES ARE COMPARED TO MODULATE THE BANK ANGLE. AT RETRE THE PRESENT BANK ANGLE IS REVERSED. D. CONSTANT S ENTRY---CREW CONTROLS THE BANK ANGLE TO MAINTAIN A SPECIFIED & LEVEL. E. EMS REENTRY---CHF4 CONTROLS THE BANK ANGLE TO MAINTAIN A CONSTANT G UNTIL VELUCITY LESS THAN 25:500 FPS. THE EMS IS THEN USED TO CONTROL RANGE BY NULLING THE DIFFERENCE BETWEEN THE RANGE TO GO COUNTER AND THE RANGE PUTENTIAL GUIDELINES. ALL MANEUVERS ARE OVERRIDDEN AS NECESSARY TO PREVENT AN CASET OR OFFSET VICLATION. ALTERNATE MISSION---ANY DEVIATION FROM THE NOMINAL MISSION TIMELINE WHERE FURTHER MISSION 1-40 OBJECTIVES ARE CONSIDERED HEFORE THE END OF THE MISSION. CONTINUE MISSION——THE CONTINUE MISSION RULING FOR MALFUNCTIONS INDICATES THAT THE MISSION WILL BE CONTINUED IN ACCORDANCE WITH PRESENT PLANS UNLESS OVERRIDING FACTORS ARE PRESENT WHICH WOULD 1-41 CAUSE SELECTION OF AN ALTERNATE CHOICE. SLINGSHOT MANEUVER—+USE OF RESIDUAL SHIVB PROPELLANTS TO PLACE THE SPENT STAGE IN A SCLAR OR NON-LUNAR IMPACTING TRAJECTORY. 1-42 DATE SECTION GROUP PAGE REV 415510N APOLLO 11 4/16/69 GENERAL DEFINITIONS

RULES AND SOPIS

1-5

MISSION RULES

REV ITEM

ITEM	-,			;	SECTION	I GENERAL RULES A	ND SOP'S			
1-43	LU	NAR A	BORT MODES AF	TER E	ARLY LO	11 SHUTOFF				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	۸.	DPS								
		1.	MODE-1 5	HUTOF	FF OCCUR	S FROM LOI1 + 0 S!	C TO LOI1 +	104 SEC.		
						PPROXIMATELY LOTI				
		2•				RS FROM <u>LOI1 + 10</u>		+ 170 KFC		
						BURN AT APPROXIMA				N AT
			PERICY	NTHIC	ON.		2011 4 2	. NRS AND	SECOND BUR	N AI NE
		3.	MODE-111	SHUT	TOFF OCCU	JRS FROM LOI1 + 1	TO SEC TO NOM	INAL LOIL	SHUTOFF.	
			TEL AT APPH	CXIMA	ATELY LO	11 + 15 HRS INEXT	PERICYNTHION	i) •		
						NOTE				
			7.	بة ديا	ITSEE TIL					
			υF	10 5	SHUTOFF.	MES ARE BASED ON A HANDOVER BETWEEN ON OF ACCUMULATED	MODES 1. 11.	4 ND		
	5.	SPS	(DOCKED) S	HUTCE	F OCCURS	S FROM LOIL + D SE	C TO LO11 +	170 SEC.		
						FOR A DIRECT RET	-			
			BERS 1-44 THM RESERVED.	SUGH						
	l									
	1									
	L		W15510N	REV	DATE	SECTION	GROUP	PAGE		
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			Theorem 11		1	RULES AND SOP'S	22	1-6		

MISSION RULES

REV ITEM

			' CRITER	IA FOR TARGET	POINT 5	ELECTION .					
1-48	THE CRITER CRITICALIT	IA LISTED E Y OF THE MI	BELOW WILL	BE USED WHEN	CHODSIN	G RETWEEN TWO	OR MO	RE TARGET E CRITERIA.	POINTS.		
	ACCEPTABLE	LAND MASS	CLEARANCE			PK	IORITY				
	ACCEPTABLE	WEATHER CO	ONDITIONS	FOR RECOVERY	OPERATIO	NS	2				
	1	OF RECOVER					3				
	COMMUNICAT	ION WITH TH	HE SPACECR	AFT FROM A GR	OUND STA	TION AT LEAST	-				
	40 MINUTES SUFFICIENT			RN* RY OPERATIONS			4				
	1			BIT BURN* TRA			5				
	1			ING DEORBIT B			7				
	POST-BLACK	OUT TRACKIN UT ACQUISIT	NG DATA AV	AILABLE FOR R	EENTRY (ASSUMES	8				
		TIONS AVAIL	ABLE TO O	BTAIN DELTA VI	C READOU	IS AND TO	9				
			THE BOAN	*OR FINAL *C	C MANEUVE	- R					
1-49	LUNAR RETUR	RN ENTRY RA DWS	NGE PRIUR	ITY THE REL	LATIVE EN	NTRY RANGE (4)	00.000 FE	EET TO SPLAS	SHI PRICRI		
	A. 1200 -	- 1400 NM (NOMINAL)								
	B. 1400 - 1600 NM (USED TO AVOID WEATHER VICLATIONS IN PRICHITY A.)										
	C. 1800 - 2500 NM (USED TO AVOID EXTREME MEATHER VIOLATIONS IN PRIORITY A AND 5.)										
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									·		
	RULE NUMBER 1-55 ARE RE		OUGH								
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MISSION RULES

R	EV ITEM	· ·	·	SI	ECTION 1	GENERAL RULE	S AND	SOP'S			
Ŀ	-	1				PRELAUNCH RUL	ES '				
	1-56	DIRECTOR IN MANDATORY I WILL BE REG T-20 SEC+ A	I CASE OF A TEMS WILL E DUESTED FOR ALL MANDATOR	LOSS BE COM MANDA RÝ 1TE	OR FAILE NFIRMED E ATORY ITE EMS WILL	URE OF A MAN PRIOR TO REQU EMS WITHOUT V REVERT TO HI	DATOR ESTIF ERIF!	RY ITEM. PRID NG A HOLD OR A LCATION DUF TO	R TO CUTOFF, THE LIM	TOFF FROM THE I-1 MIN: FAILUR AFTER I-1 MIN: ITED TIME REMAINI IFICALLY DESIGNAT C PROCEDURES.	RES OF CUTOFF
	1-57	REPAIR THIS	'AILURE OF A ITEM(S) WH	L HIGH HEN IT	HLY DESI	RABLE ITEM(S) ZENIENT AND I	· A F	HOLD MAY BE CALI ESTIMATED TIME	ED BY	DIRECTOR IN CASE THE FLIGHT DIRECT EPAIR OR KEPLAC ER AUTO SEUUENCE	OR TU
	1-58	DESIRABLE - PLACED IN T FLIGHT OPER	HIS CATEGOR	TROLL	LERS WILI CAUSE TH	L NOT CALL HO EY ARE ITEMS	LDS F OF SU	OR THE LOSS OF PPORT WHICH A	DESIRAI ARE OF	BLE ITEMS AS THE MINOR IMPORTAN	Y ARE CE TO
	1-59	MANUAL CUTO	FF WILL NOT	BE #	ATTEMPTE!) FROM T-11 S	ECONE	S (ENGINE IGNI	IION) TO	D T-D.	
		RULE NUMBER 1-65 ARE RE		DUGH							
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MISSION RULES SECTION 1 GENERAL RULES AND SOP'S ITEM RFV LAUNCH ABORTS 1 ABORT REDUEST COMMANDS ARE COMMANDS TRANSMITTED FROM THE MCC OR LCC WHICH ILLUMINATE THE REDUEST LIGHT ON THE COMMAND PILOT'S PANEL. THE "ABORT LIGHT" AND A VOICE REPORT "ABORT LIGHT" AND A VOICE REPORT "ABORT LIGHT" ABORT ' ABORT' OVER A/G ARE CONSIDERED TWO CUES FOR THE CREW TO TAKE THE NECESSARY ACTION TO ABORT THE MISSION.
THE GROUND WILL USE TWO INDEPENDENT CUES PRIOR TO TRANSMITTING * ABORT REQUEST. ADDITIONAL CUES FOR THE CREW WILL COME FROM ONBOARD INDICATIONS. ABORT ACTION CAN BE INITIATED ONLY BY THE CREW OR THE EDS. 1-67 WHENEVER POSSIBLE. ALL ABORTS AND EARLY MISSION TERMINATIONS WILL BE TIMED FOR A WATER LANDING. 1-68 THE FLIGHT DIRECTOR WILL INITIATE THE ABORT REQUEST FOR SPACECRAFT SYSTEM MALFUNCTIONS. 1-69 1-70 THE FLIGHT DYNAMICS OFFICER WILL INITIATE THE ABORT REQUEST COMMAND DURING THE FLIGHT PHASE IF THE SPACE VEHICLE EXCEEDS THE FLIGHT DYNAMICS ENVELOPE. 1-71 THE BOOSTER SYSTEMS ENGINEER WILL INITIATE THE ABORT REQUEST COMMAND BASED UPON LAUNCH VEHICLE TIME-CRITICAL SYSTEMS MALFUNCTIONS THAT WOULD NOT ALLOW A SAFE INSERTION OR CONTINUATION TO A FLIGHT DYNAMICS LIMIT LINE. THE ONLY KSC POSITION THAT WILL HAVE ABORT REQUEST CAPABILITY IS THE LAUNCH OPERATIONS MANAGER. THE LAUNCH OPERATIONS MANAGER MAY SEND AN ABORT REQUEST FROM THE TIME THE LAUNCH ESCAPE SYSTEM IS ARMED UNTIL THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER. PRIOR TO TRANSFER OF CONTROL TO THE FLIGHT DIRECTOR. THE LAUNCH OPERATIONS MANAGER WILL 1-72 INITIATE THE ABORT REQUEST COMMAND FROM KSC BASED ON THE CRITERIA DEFINED IN THE LMRD. THESE INCLUDE--A. MAJOR STRUCTURAL FAILURE OR EXPLOSION. B. NEGATIVE VERTICAL MOTION. C. UNCONTROLLABLE VEHICLE TILTING. D. CATASTROPHIC FIRES PRIOR TO LIFTOFF. THE RSO CAN SHUTDOWN THE SLV BY TRANSMITTING THE MFCO COMMAND WHICH ALSO LIGHTS THE ABORT REQUEST LIGHT IN THE SPACECRAFT. THE MFCO WILL INITIATE AN AUTO-ABORT IF TRANSMITTED PRIOR TO EDS DISABLE. THE MFCO COMMAND INITIATES A 4.1 SEC TIMER ON THE GROUND WHICH IN TURN ENABLES DESTRUCT CAPABILITY IF TRANSMITTED. THE RSO DESTRUCT COMMAND CAN THEN DESTROY THE SLV. THE RSO WILL ALWAYS SAFE THE S-IVB AFTER TRANSMITTING MFCO UPON VERIFICATION OF CUTOFF IF THE DESTRUCT 1-73 COMMAND IS NOT TO BE TRANSMITTED. THE RSO WILL SAFE THE S-IVB DESTRUCT SYSTEM AFTER CONFIRMATION OF S-IVB C/O FROM THE FLIGHT DYNAMICS OFFICER. IF COMMUNICATIONS ARE LOST WITH THE FIDO. THE S-IVB DESTRUCT SYSTEM WILL BE SAFED BASED ON THE RSO'S VERIFICATION OF S-IVB CUTOFF. ONCE SAFED. THE S-IVB DESTRUCT SYSTEM CANNOT BE REINITIATED. IF THE RSO INITIATES MFCO. THE RSO WILL INITIATE SAFING AFTER 1-74 CANNOT BE REINITIATED. IF VERIFICATION OF S-IVB CUTOFF.

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MISSION RULES

REV ITEM

	EMERGENCY E	NGINE SHUT	DOWN METHO	D5.			
		•		METHOD		TIME FRAME	
		•	ASTRONAUT	' THC	S-IC, S-II, S-IVB	T + 30 SEC.TO SE	i
			ASTRONAUT	' 5-1VB	S-IVB	T + 2-33 TO SECO	
		, , ,	RSO	•	• s-IC•		! ! !
			EDS		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	T + 30 SEC TO ED AUTO OFF AT T+ 2 MIN NOTEEDS WILL INITIATE ABORT F T-0 TO T + 30 SE HCWEVER, 5-1C ENGINES WILL NOT BE SHUTDOWN	-00 PROM PROM PROM PROM PROM PROM PROM PROM
1-76	THE AUTOMAT	T + <u>02-00</u>	O ENGINE O	IVO DNA TUC IAM •HJ/NUA.	ERRATE AUT LFUNCTIONS	O-ABORT CAPABILITI AFFECTING EDS OPE	ES) WILL BE FLOWN CL RATION WILL BE MANAGED
1-76	FOLLOWS	T + <u>02-00</u>	DURING L	RNED OFF W	_FUNCTIONS HENEVER AN	AFFECTING EDS OPE Y TWO CSM ENTRY BA	ES) WILL BE FLOWN CL RATION WILL BE MANAGED TTERIES ARE TIED TO THE
1-76	LOOP UNTIL FOLLOWS	T + <u>02-00</u>	DURING L	RNED OFF W	_FUNCTIONS HENEVER AN	AFFECTING EDS OPE Y TWO CSM ENTRY BA	RATION WILL BE MANAGED
1-76	LOOP UNTIL FOLLOWS	T + <u>02-00</u>	DURING L	RNED OFF W	_FUNCTIONS HENEVER AN	AFFECTING EDS OPE Y TWO CSM ENTRY BA	RATION WILL BE MANAGED

MISSION RULES SECTION 1 GENERAL RULES AND SOP'S

REV ITE		ABORT MODES-		· · · · · · · · · · · · · · · · · · ·	1 GENERAL		-				
\dashv		MODE I	BOUNDA	RY OF AP	PLICATION			PROCED	URES		
		1A	LES ABORT !	ENABLE (APPROX. T~	45 FT)	RE	FERENCE			
		18	GET 42 SEC	TO 100K	FEET ALTI		RE	REFERENCE AOM TBD			
		10	100K FEET A	ALTITUDE GET APPR	TO TOWER DX - 3 + 07)	RE	FERENCE	AOH <u>IBD</u>		
1-	78	MODE II	BOUNDA	RY OF API	PLICATION			PROCED	URES		
			TOWER JETT UNTIL FULL	ISON (GE	T APPROX.	3 + 07) 15 3200	Α.	REFEREN	CE AOH TBI	D	
			NM DOWNRANG	SE (GET	APPROX.			MCC PRO			
	l							1. GET 2. PITC 3. GET	H AT .05G	·	
							С.	ENTRY 1	S FULL LIF	FT	
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			MISSION REV	DATE	SECTION		GROUP	, a	PAGE		
			APOLLO 11	4/16/69	GENERAL		LAUNCH	ABORTS	1-11		

MISSION RULES

REV ITEM

BETHERN FULL LIFT SPLASH POINT -3200 MM AND INSERTION. 6. MCC PROVIDES 1. 0ET) AT SEVER CUTOFF PLUS 2-09 2. DELTA FOR 2325 MM SPLASH POI 3. DELTA FOR 2325 MM SPLASH POI 4. OCT INSERTION CONTINUE THE MOLE LEFT 35 DEGNELS. NOTE MODE IV BOUNDARY OF APPLICATION CONTINUENCY ORBEIT INSERTION CONTINUE TO SPLASH POI 4. REFERENCE AOM IBD 5. MCC PROVIDES 5. DELTA FOR 251 AT SHIPE CUTOFF PLUS 2-05 2. DELTA FOR 251 AT SHIPE CUTOFF PLUS 2-05 3. DELY DURATION 4. REFERENCE AOM IBD 6. MCC PROVIDES 5. DELTA FOR 251 AT ADDRESS MODE SOUNDARY OF APPLICATION 5. DELTA FOR 251 AT ADDRESS MCC PROVIDES 6. MCC PROVIDES 6. MCC PROVIDES 6. MCC PROVIDES 6. MCC PROVIDES 6. MCC PROVIDES 7. DELTA FOR 251 AT ADDRESS 7.	1-79	MODE III	BOUNDARY OF AP			ROCEDURES	
B. MCC PROVIDES 1. GETI AT S-198 CUTOFF PLUS 2-05 2. DELTA V FOR 2305 NP SPLASH PDI 3. BURN DURATION 5. PITCH AT 1.036 6. GET DROOM C. MANEUVER IS SCS AUTO. D. ENTRY IS ROLL LEFT 59 DEGREES. NOTE MODE IV BOUNDARY OF APPLICATION CONTINGENCY ORBIT INSERTION CAPABILITY TO INSERTION (BASED ON COI LINE ON DAMMA US V PLOT FOR NEAR NOMINAL ALTITUDE) A. REFERENCE AON 180 B. MCC PROVIDES 1. GETI AT S-198 CUTOFF PLUS 2-05 2. DETTA V REQUIRED TO ACRIEVE PER GREATER THAN OR LUMAL TO 73 MM 4. PITCH AT GETI C. MANEUVER IS SCS AUTO 1-61 MODE BOUNDARY OF APPLICATION PROCEDURES A. REFERENCE AON 180 B. MCC PROVIDES 1. GETI AT S-198 CUTOFF PLUS 2-05 2. DETTA V REQUIRED TO ACRIEVE PER GREATER THAN OR LUMAL TO 73 MM 4. PITCH AT GETI C. MANEUVER IS SCS AUTO 1-61 APOGEE KICK PRE-APOGEE CUTOFF, OUTSIDE THE COI BOUNDARY: CORRECTABLE TO SAFE CREATER THAN OR LUMAL TO 75 MM 3. BURN DURATION 4. PITCH ATTITUDE C. MANEUVER IS SCS AUTO RULES 1-62 THROUGH 1-86 ARE RESERVED					A. RE	FERENCE AOH I	שפ
D. ENTRY IS ROLL LEFT 55 DEGREES. NOTE MODE 111 "NO BURN" WILL BE CALLED IF THE ROLL LEFT 55 DEG. ENTRY RANGE IS LESS THAN 3350 NM. 1-80 MODE IV BOUNDARY OF APPLICATION CAPABILITY TO INSERTION (BASED ON COI LINE ON GAMMA VS V PLOT FOR MEAR NOMINAL ALTITUDE) B. MCC PROVIDES 1. GETI AT 5-IVE CUTOFF PLUS 2-OS 2. DELTA V REQUIRED TO ACHIEVE PER 3. GENEROPATION CR. EJUAL TO 75 NM 4. PITCH AT GETI C. MANEUVER IS SCS AUTO PROCEDURES APOGEE KICK PRE-APOGEE CUTOFF, OUTSIDE THE COI BOUNDARY, CORRECTABLE TO SAFE ORBITAL CONDITIONS BY A MANEUVER AT APOGEE APOGEE TAND UR COUNTY OF APPLICATION PROCEDURES 1. GETI FOR BURN AT APOGEE CREATER THAN UR EQUAL TO 75 NM 4. PITCH ATTITUDE C. MANEUVER IS SCS AUTO RULES 1-82 THROUGH 1-86 ARE RESERVED			=3200 NM AND INSEK	1100.	1	GETI AT S-IV DELTA V FOR BURN DURATIO GET OF 400K PITCH AT .05	B CUTOFF PLUS 2-05 3350 NM SPLASH POINT N
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1-81 MCDE BOUNDARY OF APPLICATION APOSEE KICK PRE-APOSEE CUTOFF, OUTSIDE THE COI BOUNDARY, CORRECTABLE TO SAFE ORBITAL CONDITIONS BY A MANEUVER AT APOSEE APOSEE. APOSEE KICK PRE-APOSEE APOSEE APOSEE BOUNDARY OF APPLICATION PROCEDURES A. REFERENCE ADH TBD B. MCC PROVIDES—— 1. GETI FOR BURN AT APOSEE 2. DELTA V REQUIRED TO ACHIEVE PER GREATER THAN UR EQUAL TO 75 NM 3. BURN DURATION 4. PITCH ATTITUDE C. MANEUVER IS SCS AUTO RULES 1-82 THROUGH 1-86 ARE RESERVED			CAPABILITY TO INSE ON COI LINE ON GAM	RTION (BASED MA VS V PLOT		_	-
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APOGEE KICK PRE-APOGEE CUTOFF, OUTSIDE THE COI BOUNDARY, CORRECTABLE TO SAFE ORBITAL CONDITIONS BY A MANEUVER AT APOGEE. 1. GET1 FOR BURN AT APOGEE 2. DELTA V REQUIRED TO ACHIEVE PER GREATER THAN UR EQUAL TO 75 NM 3. BURN DURATION 4. PITCH ATTITUDE C. MANEUVER IS SCS AUTO RULES 1-82 THROUGH 1-86 ARE RESERVED					2.	DFLTA V REQU GREATER THAN BURN DURATIO	IRED TO ACHIEVE PERIGE OR EQUAL TO 75 NM N
APOGEE KICK PRE-APOGEE CUTOFF, OUTSIDE THE COI BOUNDARY, CORRECTABLE TO SAFE ORBITAL CONDITIONS BY A MANEUVER AT APOGEE. 1. GETI FOR BURN AT APOGEE 2. DELTA V REQUIRED TO ACHIEVE PE GREATER THAN UR EQUAL TO 75 NM 3. BURN DURATION 4. PITCH ATTITUDE C. MANEUVER IS SCS AUTO RULES 1-82 THROUGH 1-86 ARE RESERVED					C. MA	NEUVER IS SCS	AUTO
BOUNDARY, CORRECTABLE TO SAFE ORBITAL CONDITIONS BY A MANEUVER AT APOGEE. 1. GETI FOR BURN AT APOGEE 2. DELTA V REQUIRED TO ACHIEVE PER GREATER THAN UR EQUAL TO 75 NM 3. BURN DURATION 4. PITCH ATTITUDE C. MANEUVER IS SCS AUTO RULES 1-82 THROUGH 1-86 ARE RESERVED	1-81	MODE	BOUNDARY OF AP	PLICATION			
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RULES 1-82 THROUGH 1-86 ARE RESERVED					2.	DELTA V REQU GREATER THAN BURN DURATIO	IRED TO ACHIEVE PERIGE OR EQUAL TO 75 NM N
1-86 ARE RESERVED					C. MA	NEUVER IS SCS	AUTO
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REV ITEM

MISSION RULES SECTION 1 GENERAL RULES AND SOP'S

ļ	CREW ABORT LIMITS '										
1-87	MAX Q REGION			PROCEDU	RES						
	A. (00-50 TO D2-00) ADA GREATER THAN O PITCH, DR YAW ERROR GREATER THAN	R EDUAL TO 10	•	ABORT MODE REACHED TH	I (ACTION ONLY AFTER BOTH RESHOLD.)						
1-88	RATES AND ATTITUDE			PROCEDU	RES						
	A. PITCH AND YAW 1. L/O TO 5-IC/5-I DEG/5EC 2. S-IC/5-II STAGI 3. YAW ERROR GREAT	NG TO SECO -	9 DEG/SEC	ABORT MODE ABORT MODE MODE IV	I 1. MODE 11. MODE 111. OR						
	B. ROLL 1. L/O TO SECO - 2	O DEG/SEC		ABORT MODE MODE IV	I. MODE II. MODE III. OR						
1-89	EDS AUTOMATIC ABORT L 2-00 MIN)	IMITS (UNTIL	MANUAL DEACTIVATI	ON OF TWO ENGIN	NES OUT AUTO AND LV RATE						
	A. RATES PITCH AND YAW ROLL	4.0 +/: 20.0 +/-									
	B. ANY TWO ENGINES OF	Т									
	C. CM TO 1U BREAKUP										
1-90	S-IVB TANK PRESSURE LI	MITS (S-II/S	-:VB SEP TO CSM/L	V SEP)	•						
	A. BULKHEAD DELTA P FUEL GREATER THAN O OXID GREATER THAN F										
	B. LOX TANK PRESS GREA	TER THAN OR	EQUAL TO 50 PSIA								
1-91	ENGINE FAILURES			PROCEDUR	ES						
	LOSS OF 3 OR MORE S-1: PRIOR TO S-1VB TO ORB			ABORT MODE	I. OR MODE II						

	1										
L	MISSION	REV DATE	SECTION	GROUP	PAGE						

FLIGHT OPERATIO

MISSION RULES

	1					' GENERAL '			
2-1	PREL	.AUNCH							
	Α.	LAUNCH	H AZIMUTH L	IMITA	TIONS RE	STRICT LAUNCHES	TO OCCUR BETW	LEN 72 DEG. A	ND 107 DEG.
	В•	PRIOR ANY PR EVALUA IP'S W LAUNCH WITH A	TO THE STA REDICTED PE RTION: A LA FILL BE APP HED OR REMA HORIZONTA THE LAUNC	RT OF RIODS ND LA LIED. IN IN L VEL	CRITICA OF LAND NDING WI THESE C A TOWER OCITY CO	L CCUNTDOWN ACTIVE LANDING IF THE LL BE ASSUMED AND ONSTRAINTS (REF LABORT MODE IF A MPONENT OF GREATE	/ITIES AND WI FLIGHT DIKEC O THE SPACECR MRD) REQUIR TOWER ABORT	LL ADVISE THE TOR IS UNABL AFT WIND CO E THAT THE WOULD RESULT ET PER SECOND	TOWER) ABORT TRACK LAUNCH DIRECTOR OF E TO PROVIDE THIS INSTRAINTS FUR LAND SPACECRAFT NOT BE IN A LAND LANDING AT IMPACT. IN ALL ANDING LAUNCH WIND
	С.	TELEME INSERT	DMISED. (RE (TRY: AND T TION PLUS <u>1</u> (F. THROUGH	FEREN RACKI MIN	CE SECTI NG COVER + 30 SEC	ON 4 - GROUND INS AGE FOR THE SPA CONTINUOUS TELFN	TRUMENTATION CECRAFT IS METRY COVERAGE	REQUIREMENTS REQUIRED FR F IS REQUIRED	TION CAPABILITY 15 1 CONTINUOUS VOICE; OM LIFTOFF THROUGH FROM THE SLV FROM DESIRABLE FOR BOTH
2 - 2	LAUN	Сн							
	LAUN	CH ABOR	T. THEREFO	RE. T. OR S	HE LAUNC LV PROB	H WILL BE CONT	INUED AS LI	ONG AS THE E CREW SAFF	ER THAN PERFORM A CREW CONDITION 15 TY: AND SUFFICIENT ON PLUS ENTRY:
2-3		Y STAGI		tun e	TAGING M	AV 95 INITIATED	BY THE EL	TOUT COMM A	FTER S-IVB-TO-ORBIT
						WER JETTISON IF L			FIER SHIVE-TO-ORBIT
			٠.						
						.*			
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MISSION RULES

REV ITEM

2-4	EARTH ORBIT
	A. ENTRY WILL BE MADE AT THE NEXT BEST PIP WHEN ONE MORE CSM FAILURE WILL RESULT IN AN AS ENTRY OR UNCONTROLLABLE CONDITIONS.
	B. ADEQUATE CONSUMABLES WILL BE MAINTAINED FOR ENTRY IN THE NEXT PTP. MAKING ALLOWANCES F SETUP AND ENTRY.
	C. THE DEORBIT CAPABILITIES REQUIREMENTS FOR EARTH ORBIT ARE
	1. TWO METHODS OF DECRBIT ARE REQUIRED.
	2. If A SUBSECUENT SINGLE FAILURE WOULD PRECLUDE DEORBIT BY EITHER METHOD REMAINING, THE CSM WILL DEORBIT.
	3. SPS 1S THE PRIME METHOD OF DEORBIT AND SUFFICIENT DELTA V WILL BE RESERVED FUR THIS MANEUVER.
	4. SM-RCS (4 QUAD) AND SM-CM/RCS HYBRID WILL BE CONSIDERED AS INDEPENDENT DEORBIT METHODS AS LONG AS INDIVIDUAL SM-RCS QUAD AND GNCS INTERGRITY IS MAINTAINED AND SUFFICIENT RCS PROPELLANT IS AVAILABLE.
	5. THE LM PROPULSION SYSTEM (DPS OR RCS) MAY BE USED TO PLACE THE CSM IN AN ORBIT (HP GREATER THAN OR EQUAL TO BO NM) FROM WHICH A SM-RCS OR SM-CM/RCS HYBRID DECRBIT CAN BE CONDUCTED.
	6. UTILIZATION OF BACKUP DEORBIT METHODS WILL BE BASED ON THE FOLLOWING PRIORITIES
	(A) SM-RCS
	(B) LM PROP PLUS SM-RCS
	(C) SM-CM/RCS HYBRID
	(D) LM PROP PLUS SM-CM/RCS HYBRID
2-5	EARLY CSM/S-1VB SEPARATION (NO LM EXTRACTION), EARTH ORBIT
	A. AN S-IVB FAILURE OR SYSTEMS TREND THAT WILL RESULT IN A HAZARDOUS SITUATION FOR THE FLIGHT CREW IS CAUSE FOR AN IMMEDIATE CSM/S-IVB SEPARATION. THE FLIGHT CREW WILL PERFORM SEPARATION MANEUVER ASAP. MINIMUM SAFE DISTANCE IS CONSIDERED TO BE 7.000-FT.
	E. LOSS OF ATTITUDE CONTROL DURING TB5.
	RULE NUMBERS 2-6 THROUGH 2-10 ARE RESERVED
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	OPERATIONS RULES 2-2

MISSION RULES

REV ITEM

ΕV	ITEM	SECTION 2 FLIGHT OPERATIONS RULES
\perp	2-11	TRANSLUNAR INJECTION
		A. THE TLI WILL BE GO IF THE S/C AND L/V SATISFY THE FOLLOWING CRITERIA
		1. THERE ARE ADEQUATE S-IVB CONSUMABLES TO PROVIDE A <u>ONE SIGMA</u> PROBABILITY OF A GUIDED CUTOFF.
		2. THERE HAVE BEEN NO FAILURES IN THE S-IVB THAT WOULD MAKE IT UNSAFE TO RESTART.
		3. THERE HAVE BEEN NO FAILURES IN THE S-IVB THAT WOULD LEAD TO AN EARLY SHUTDOWN. OR THERE HAVE BEEN NO FAILURES DETECTED IN THE IU THAT WOULD PRECLUDE A NOMINAL TLI.
		4. THE CSM HAS TOTAL SYSTEMS CAPABILITY WITH REDUNDANCY. REDUNDANCY VERIFICATION IS SUBJECT TO THE NUMBER AND TYPE OF REDUNDANT COMPONENT CHECKS WHICH CAN BE PERFORMED IN EARTH ORBIT.
		### THE TLI MANEUVER WILL BE DELAYED UNTIL THE SECOND OPPORTUNITY FOR SUSPECTED FAILURE OF A CRITICAL SYSTEM (PRIME OR BACKUP) (MANEUVER, LIFE SUPPORT, COOLING, POWER, SEQUENTIAL COMMUNICATIONS) WHICH REQUIRES TIME FOR EVALUATION.
	2-12	TRANSPOSITION, DOCKING AND EJECTION (TDGE)
		A. IN THE EVENT OF ADVERSE LIGHTING, ATTITUDES, RATES, OR MECHANICAL ANOMALIES. THE FLIGHT CREW WILL MAKE THE FINAL DECISION TO ATTEMPT DOCKING AND EJECTION.
		B. THE NORMAL MINIMUM CABIN PRESSURE REDLINE OF 4.0 PSIA FOR TUNNEL/LM PRESSURIZATION SEQUENCES WILL BE WAIVED DURING TOGE. FOR TUNNEL OR LM LEAKS WHICH PREVENT NORMAL PRESSURIZATION. THE CM WILL BE DEPRESSURIZED AS REQUIRED FOR HATCH REMOVAL AND UMBILICAL HOOKUP.
		C. THREE LATCHED LATCHES LOCATED 120 DEGREES APART ARE REQUIRED TO PERFORM EJECTION.
		D. IF NORMAL LM EJECTION IS NOT SUCCESSFUL. NO ATTEMPT WILL MADE TO MAN THE LM. AND. ''STAGE'' TO RECOVER THE ASCENT STAGE.
l		
L		MISSION REV DATE SECTION GROUP PAGE
		APOLLO 11 4/16/69 FLIGHT GENERAL
-		OPERATIONS RULES 2-3

MISSION RULES

REV ITEM

2-13									
	TRANSLUNAR COAST								
	A. AN SPS BURN OF APPROXIMATELY 20 FPS IS PLANNED AFTER TLI TO PROVIDE A SEPARATION DE FROM THE S-IVB.	STANC							
	B. NO MCC WILL BE PERFORMED IF LOI CAN BE TARGETED WITHIN OPERATIONAL CONSTRAINTS.								
	C. TRANSLUMAR COAST WILL BE TERMINATED IF ADEQUATE CONSUMABLES ARE NOT AVAILABLE FOR RETURN + 12 HRS.	A FRE							
	D. THE CREW WILL USE THEIR DISCRETION TO MAN THE LM FOR BACKUP COMMUNICATIONS AND CSM COMMUNICATIONS ARE LOST WITH THE MSFN.								
	E. LM PROPULSION CAPABILITY CANNOT BE CONSIDERED AS ACCEPTABLE BACKUP TO CSM SYSTEMS AFTER IVT AND LM SYSTEMS CHECKOUT.	UNTI							
2-14	LUNAR ORBIT INSERTION								
	L)I WILL BE INHIBITED AND A LUNAR FLYBY PERFORMED IF THE CSM DOES NOT SATISFY ANY FOLLOWING CONDITIONS	OF TH							
	A. FULL CRITICAL SYSTEMS REDUNDANCY.								
	B. ADEQUATE CONSUMABLES FOR MINIMUM LUNAR ORBIT OPERATIONS AND RETURN TO EARTH + 12 HOU	RS.							
	C. SPS PROPELLANT RESERVE CAPABILITY FOR TEI AND TRANSEARTH MCC'S.								
	D. RCS PROPELLANT RESERVE TO ACCOMPLISH TEI CONTROL. TRANSEARTH MCC CONTROL. PTC. AND LUNAR ORBIT OPERATIONS.	MINIMUM							
	E. LOSS OF ANY 4 DOCKING RING LATCHES WILL BE CAUSE FOR CSM ONLY LOI.								
2-15	LUNAR CRBIT								
	A. LOI DISPERSIONS								
	 IF A STABLE ORBIT HAS NOT BEEN ACHIEVED. AN SPS OR DPS ABORT WILL BE EXECUTED. 								
	2. IF A STABLE ORBIT HAS BEEN ACHIEVED. AN SPS OR DPS TEI WILL BE PERFORMED AT THE NEXT PERICYNTHION OR AN ALTERNATE MISSION WILL BE FLOWN.								
	B. DESIGNED CAPABILITY MUST BE MAINTAINED IN ALL CSM SYSTEMS CRITICAL FOR TEI AND LIFE SUPPORT.								
	C. SUFFICIENT CONSUMABLES MUST REMAIN TO COMPLETE THE NEXT MISSION PHASE AND EARTH RETURN PLUS 12 HRS FOR CONTINUATION TO THE NEXT MISSION PHASE.								
	D. THE CSM MUST MAINTAIN AN SPS FUEL RESERVE CAPABILITY FOR THE TEL MANEUVERS AND TRANSEARTH MCC'S.								
	E: THE CSM MUST MAINTAIN RCS PROPELLANT RESERVE TO ACCOMPLISH TEI CONTROL: TRANSEARTH MCC CONTROL: PTC: AND MINIMAL TRANSEARTH OPERATIONS:								
	F. IF NORMAL MISSION OPERATIONS ARE INHIBITED. THE DPS WILL BE USED FOR TEI WHEN THERE IS A CHOICE BETWEEN THE DPS AND SPS.								
2-16	INTRAVEHICULAR TRANSFER								
	ONE HARDSUIT IVT FROM THE CSM TO THE LM WILL BE ACCOMPLISHED IF A REASONABLE CHANCE EXISTS. THAT								
	CORRECTIVE ACTION CAN BE TAKEN FOR A LM/TUNNEL PRESSURIZATION PROBLEM.								
_	MISSION REV DATE SECTION GROUP PAGE								

MISSION RULES

REV ITEM

ITEM	T		SEC	CTION 2	FLIGHT OPERAT	IONS RULES		
2-17	4	M OPERATION						
	FOR AN IMPENDING MAZARDOUS SITUATION RESULTING FROM A DESCENT STAGE PROBLEM. THE STAGE WILL JETTISONED AND ASC STAGE OPERATIONS WILL CONTINUE AFTER THE VEHICLE HAS MOVED TO A SAFE DI							
	RULE NUMBERS 2-18 THROUGH 2-20 ARE RESERVED							
					- · - ·			
2-21	CSM/LM UN	DOCKING AND	SEPERAT	ION				
	A. A MA	ANNED LM WILL VEHICLES TO	NOT BE	UNDOC	KED FROM THE CO DOCKED ACTIVIT THE LM IS REU	IFS AND TO AC	COMBITED DOCK!	EUVER CAPABILITY NG. THE LM CAPABILI
	į.				EEN THE LM AND			CKING.
	C. EVT	CAPABILITY	IS REQU	IRED F	OR MANNED UNDO	IKING.		•
	D. CREW	VMEN WILL BE BLISHED AFTE	SUITED ER RENDE	WHILE ZVOUS	IN THE UNDOCKED AND DOCKING.) CONFIGURAT	ITNU DNA NOI	L CM INTERGRITY
2-22	CSM LUNAR	: ORBIT UNDOC	KED					
	A. UNDO	CKING TO PDI	1					
	LOSS OF REDUNDANT CAPABILITY IN CRITICAL SYSTEMS WILL BE CAUSE TO TERMINATE THE MISSION AND PERFORM TEL ASAP. BETWEEN UNDOCKING AND DOL! THE VEHICLES WILL BE REDOCKED FOR LOSS OF CSM ACTIVE DOCKING OR LM RESCUE CAPABILITY.							
	B. PD1	TO LANDING						
	NO C	SM FAILURES:	EXCEPT	FOR T	IME-CRITICAL SE	S FAILURES.	WILL BE CAUS	E FOR ABORT DURI
		R STAY						
	FAIL BE C	URE TO MAINT	AIN RED	UNDANT N OF LI	CAPABILITY IN	SYSTEMS REQU	IRED FOR TEI O	R LIFE SUPPORT WI
2-23	LM-DOI							
2-23		THE LM MUST	HAVE TH	E CAPA	BILITY TO RENDE	ZVOUS AND DO	CK WITHOUT VIO	LATING ANY SPECIF
	MISSION R	ULES OR REDL	INES.					
2-24	LM-PDI							
	FOR PDI+ THE LM MUST HAVE THE CAPABILITY TO LAND+ COMPLETE ONE REV+ ASCENT+ RENDEZVOUS AND DOCK							
	WITHOUT VIOLATING ANY SPECIFIC MISSION RULES OR REDLINES.							
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	E .							
		MISSION	REV DA	ATE	SECTION	GROUP	PAGE	

MISSION RULES

, REV ITEM

SECTION 2 FLIGHT OPERATIONS RULES

2-25	LM-	POWERED	DESCENT			TEIGHT OFERATIO		· · · · · · · · · · · · · · · · · · ·	
	1F	A SYSTEM	S FAILURE	occur	RS AND A	CHOICE IS AVAILA	BLE		
	Α•					DPS-TO-DRBIT CAN NUE DESCENT. RED DESCENT DURING TO		VAILABLE + LITY OF CE	IT IS PREFERABLE RITICAL LM SYSTEMS
	8•	OF THE	CAPABILIT	Y TO	LAND AS	CEND AND ACHIEVE	URES OR TREN	US THAT IN	LAUNCH FROM THE LUNDICATE IMPENDING LIHE LUNAR SURFACE, JRING THIS PERIOD.
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2 - 2£	۲۷-	LUNAR ST	AY						
	۸.	CALABI	HOSE TIME- LITY TO AS F) FROM TH	CEND	AND ACHI	EVE A SAFE DREIT	RENDS THAT II WILL BE CAUSE	NDICATE I E FOR AN I	MPENDING LOSS OF MMEDIATE ABORT (ANYT
	9•	LOSS O	F REDUNDAN UNITY.	T CAP	ABILITY	IN CRITICAL LM SY	STEMS IS CAUS	SE FOR ABO	ORT AT THE NEXT B
					1				
2-27	EVA								
	۰ ۸	NOMINA	L EVA						
		TO EVA	E NOMINAL VOICE, EV AUTS ARE K	A TO	MSFN VDI	, TOTAL EMU LIFE CE, AND "CRITICA	SUPPORT SYSTE L INSTRUMENTA	MS CAPABI	LITY IS REQUIRED. EE RULE 19-42) FOR B
	5∙	ALTERN	ATE EVA						
		FAILUR INSTRU	E OF ONE MENTATION	PLSS,	ONE O	PS+ EVA TO EVA FOR A ONE-MAN AL	DUPLEX VOI TERNATE EVA.	CE. OR	THE LOSS OF CRITIS
	۲.	EARLY	TERMINATIO	N OF	EVA INOM	INAL OR ALTERNATE)		
		- WITH E	ACH OTHERA	THE	CAPABILI	EVA WILL BE BASED TY TO MONITOR T CATE WITH THE EVA	HE EMU CRIT	DNAUTS! CA	PABILITY TO COMMUNIC TRUMENTATION: AND
	٥٠	ALL EV RETURN	A EXCURSIO TO THE LM	NS w1 ECS	EL BE LI WHILE OP	MITED TO THAT VIC ERATING ON THE OP	INITY OF THE	LM WHIC	H WILL ALLOW A SA
2-28	ASC	ENT							
	USEL	FOR AS	LENT FOR D	R REN	DEZVOUS	DR SYSTEMS PROBLE AND WHICH CAN BE SITUATION THAN I	CORRECTED IN	ONE REV.	S OF SOME CAPABIL: IT IS BETTER TO DEL ME.
2-29	REND	EZVOUS							
	AND	THE FLIC	GHT CREW B	ASED	UPON CON	R RENDEZVOUS AND SUMABLES AND SYST RENDEZVOUS•	DOCKING WILL EMS PERFORMAN	BE DETERM ICE. THE T	INED BY FLIGHT CONTR OTAL LM CAPABILITY WI
					•				
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
			APOLLO 11	1	4/16/69	FLIGHT OPERATIONS RULES	GENERAL	2-6	

MISSION RULES

REV	ITEM
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SECTION 2 FLIGHT OPERATIONS RULES

		APOLLO 11		4/16/69	FLIGHT OPERATIONS RUL	GENERAL		2-7		
		MISSION	REV	DATE	SECTION	GROUP	Р	AGE		
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	TO BE DETER									
2-31	ALTERNATE N									
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	PRACTI	ICAL.			THE SPS IF NEC					
	C. IF THE	E FLIGHTPAT			TSIDE THE ENTRY	CORRIDOR,	AN MCC W	ILL BE EXE	CUTED AS	500N
	RECOVE	MAY BE USE ERY ACCESS TIONAL FOOT	VIDLA	TIONS, U	AREA CONTROL P	RIOR TO EN THER, OR	TRY INTE	RFACE MIN SSES IN	SUS 24 HO	OURS OF
	A. THE ST	TEEP TARGET 30,000 FPS	LINE AND T	WILL BE HE G&N I	USED FOR MCC'S S GO - THEN THE	UNLESS TH SHALLOW T	ARGET LIN	Y AT ENTRY E WILL BE	'INTERFAC	1.5
		**** * · · · · ·					,			

SECTION 3 MISSION RULE SUMMARY REV ITEM " LAUNCH PHASE ! 3-1 THE LAUNCH WILL BE ABORTED FOR THE FOLLOWING REASONS---CONDITION A. SLV S-II GIMEAL ACTUATOR HARDOVER INBOARD PRIOR TO S-IVB TO ORBIT CAPABILITY VIOLATION OF AUTO/MANUAL EDS LIMITS S-II ENGINE FAILURES (TIME DEPENDENT) FAILURE OF SECOND PLANE SEPARATION S-IVB LOSS OF HYDRAULIC FLUID (PRIOR TO S-IVB IGNITION) S-IVB LOSS OF THRUST (TIME DEPENDENT) S-IVE LOX TANK PRESS GREATER THAN 50 PSI BEFORE TWR JETT. AFTER TWR JETT. PERFORM EARLY STAGING B. CSM 1. ENVIRONMENTAL LCSS OF CABIN AND SUIT PRESSURE LOSS OF CABIN PRESSURE AND SUIT CIRCULATION FIRE/SMOKE IN CM LCSS OF CABIN PRESSURE AND 02 MANIFOLD LEAK 2. ELECTRICAL LOSS OF 3 FUEL CELLS AND 1 BATTERY UNCONTROLLABLE SHORTED MAIN BUS LOSS OF BOTH AC BUSES DURING MODE I OR MODE II 3. PROPULSION SUSTAINED LEAK OR LOSS OF HE PRESSURE (SOURCE OR MANIFOLD) IN BOTH CM-RCS RINGS [MODE I ONLY) C. VIOLATION OF TRAJECTORY LIMIT LINES D. TEAM DISCRETION WILL BE USED FOR---1. SUIT/CABIN CONTAMINATION 2. MEDICAL PROBLEMS THE SHIVE EARLY STAGING WILL BE USED AFTER "'SHIVE TO-ORBIT" CAPABILITY FOR THE FOLLOWING ---3-2 CONDITION S-II GIMBAL ACTUATOR INBOARD HARDOVER S-II ENGINE FAILURE (TIME DEPENDENT) SWITCHOVER TO CSM GUIDANCE WILL BE PERFORMED FOR-3-3 IU PLAT FAIL RULE NUMBERS 3-4 THROUGH 3-10 ARE RESERVED.

MISSION	REV	DATE	SECTION	GROUP	PAGE	
APOLLO 11		4/16/69	MISSION RULE SUMMARY	LAUNCH PHASE	3-1	

3-11	* EARTH ORBIT * CSM SEPARATION FROM THE S-IVB (WITHOUT LM EXTRACTION) WILL BE PERFORMED EARLY FOR THE FOLLOWILL SLY CONDITIONS (CONSIDERATION WILL BE GIVEN TO EXTRACTING THE LM LATER IF THE CONDITION CAN EXPRECTED) CONDITION TIME BASE 5 FAILS TO INITIATE AT CUTOFF *S-IVB RANGE SAFETY PROPELLANT DISPERSAL SYSTEM ARMS INADVERTENTLY AFTER INSERTION AND PRIOR SAFING *S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI LOSS OF ATTITUDE CONTROL DURING TB5 *S-IVE COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR—— CONDITION
	CSM SEPARATION FROM THE S-IVB (WITHOUT LM EXTRACTION) WILL BE PERFORMED EARLY FOR THE FOLLOWING SEVEN CONDITIONS (CONSIDERATION WILL BE GIVEN TO EXTRACTING THE LM LATER IF THE CONDITION CAN INCOMPLETED) CONDITION TIME BASE 5 FAILS TO INITIATE AT CUTOFF *S-IVB RANGE SAFETY PROPELLANT DISPERSAL SYSTEM ARMS INADVERTENTLY AFTER INSERTION AND PRIOR SAFING *S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI LOSS OF ATTITUDE CONTROL DURING TB5 *S-IVB COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
	CSM SEPARATION FROM THE S-IVB (WITHOUT LM EXTRACTION) WILL BE PERFORMED EARLY FOR THE FOLLOWING SEVEN CONDITIONS (CONSIDERATION WILL BE GIVEN TO EXTRACTING THE LM LATER IF THE CONDITION CAN INCOMPLETED) CONDITION TIME BASE 5 FAILS TO INITIATE AT CUTOFF *S-IVB RANGE SAFETY PROPELLANT DISPERSAL SYSTEM ARMS INADVERTENTLY AFTER INSERTION AND PRIOR SAFING *S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI LOSS OF ATTITUDE CONTROL DURING TB5 *S-IVB COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
	CONDITIONS (CONSIDERATION WILL BE GIVEN TO EXTRACTING THE LM LATER IF THE CONDITION CAN INCORRECTED) CONDITION TIME BASE 5 FAILS TO INITIATE AT CUTOFF *S-IVB RANGE SAFETY PROPELLANT DISPERSAL SYSTEM ARMS INADVERTENTLY AFTER INSERTION AND PRIOR SAFING *S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI LOSS OF ATTITUDE CUNTHOL DURING TB5 *S-IVB COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	TIME BASE 5 FAILS TO INITIATE AT CUTOFF *S-IVB RANGE SAFETY PROPELLANT DISPERSAL SYSTEM ARMS INADVERTENTLY AFTER INSERTION AND PRIOR SAFING *S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI LOSS OF ATTITUDE CONTROL DURING TB5 *S-IVB COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	*S-IVB RANGE SAFETY PROPELLANT DISPERSAL SYSTEM ARMS INADVERTENTLY AFTER INSERTION AND PRIOR *S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI LOSS OF ATTITUDE CONTROL DURING TB5 *S-IVE COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	*S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI LOSS OF ATTITUDE CONTROL DURING TB5 *S-IVB COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	LOSS OF ATTITUDE CONTROL DURING TB5 *S-IVE COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	*S-IVE COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS *START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	*START BOTTLE GREATER THAN 1800 PSIA *PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	*PERFORM SPS MANEUVER TO A SAFE DISTANCE CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	CSM SEPARATION FROM THE S-IVB (WITH LM EXTRACTION) WILL BE PERFORMED FOR
3-12	
3-12	
	A. S-IVB NO-GO FOR TLI
	B. CSM NO-GO FOR TELL BUT GO FOR EARTH ORBIT MISSION
3-13	TLI WILL BE INHIBITED FOR
	CONDITION
	SLV
	INSUFFICIENT PROPELLANT REMAINS FOR A GUIDED THI CUTOFF.
	S-IVE ENGINE MAIN LOX VALVE FAILS TO CLOSE AT CUTOFF
	LOSS OF ATTITUDE CONTROL
	CONTINUOUS VENT SYSTEM REGULATOR FAILS.
	LCSS OF ENGINE CONTROL BOTTLE PRESSURE
	CONFIRMED ACTUATOR HARDOVER
	LOSS OF ENGINE HYDRAULIC FLUID
	COLD HE SPHERE PRESS LOW
	LH2 ULLAGE PRESS LOW
	LOX ULLAGE PRESS LOW
	SATURN INERTIAL GUIDANCE SYSTEM IS NO-GO
1 1	MISALIGNMENT, RATE BETWEEN THE IU AND IMU IS OUTSIDE LIMITS
	UNACCEPTABLE DIFFERENCES BETWEEN CMC AND 1U PLATFORM VELOCITY COMPONENTS OR TOTAL VELOCITY A INSERTION
	UNACCEPTABLE DIFFERENCE BETWEEN MSFN AND 10 ORBITAL DECISION PARAMETERS
	MISSION REV DATE SECTION GROUP PAGE
	APOLLO 11 4/16/69 MISSION RULE EARTH ORBIT 3-2

MISSION RULES
SECTION 3 MISSION RULE SUMMARY REV. ITEM 3-14 TLI WILL BE TERMINATED FOR---A. PITCH OR YAW BODY RATES GREATER THAN 10 DEG./SEC B. ROLL BODY RATE GREATER THAN 20 DEG/SEC C. PITCH OR YAW ATTITUDE DEVIATIONS FROM NOMINAL PROFILES EXCEED 45 DEG. RULES 3-15 THROUGH 3-20 ARE RESERVED. GROUP PAGE MISSION DATE SECTION 4/16/69 MISSION RULE SUMMARY EARTH ORBIT APOLLO 11

MISSION RULES SECTION 3 MISSION RULE SUMMARY

REV ITEM ' TDGE ' 3-21 TDGE WILL NOT BE PERFORMED FOR---PILOTS EVALUATION OF RATES AND ATTITUDES, AND SLA CONFIGURATION NOT ACCEPTABLE. THE SLV IS NO-GO FOR---VIOLATION OF S-IVB BULKHEAD DELTA P LIMITS 2. LCX TANK OVERPRESSURE GREATER THAN 50 PSI 3. TB7 FAILS TO INITIATE RULE NUMBERS 3-22 THROUGH 3-29 AKE RESERVED. MISSION DATE SECTION GROUP PAGE 4/16/69 MISSION RULE SUMMARY APOLLO 11 TD+E

MISSION RULES SECTION 3 MISSION RULE SUMMARY REV ITEM ' TRANSLUNAR COAST ' 3-30 DURING THE LOT BURN. THE FLIGHT CREW WILL TAKE THE FOLLOWING ACTION---TERMINATE LOI FOR THE FOLLOWING SPS PROBLEMS (PERFORM THE 15 MINUTE ABORT IF THE BURN IS TERMINATED IN THE MCDE I OR MODE II REGION)---LOSS OF ONE GN2 BOTTLE (LESS THAN 400 PSI) AND DECAY IN OTHER 2. PRESSURE DECAY IN EITHER SPS PROPELLANT TANK TO 140 PSI * 3. FUEL - OXIDIZER DELTA P GREATER THAN 20 PSI * 4. CHAMBER PRESSURE LESS THAN 80 PSI OR DECAY OF 10 PSI DURING BURN 5. FLANGE TEMPERATURE LIGHT 6. ANY BALL VALVE FAILS TO OPEN AFTER ITS RESPECTIVE BANK IS COMMANDED ON OR FAILS CLOSED (TERMINATE LOI ONLY IN MODE I REGION) * REFERENCE MALF. PROCEDURE--- SPS-1. PERFORM MTVC TAKEOVER AND COMPLETE THE BURN FOR THE FOLLOWING CONTROL PROBLEMS ---₿. 1. GEN NO-GO 2. ATTITUDE EXCURSION GREATER THAN 10 DEG EXCLUDING START TRANSIENTS 3. RATES GREATER THAN 10 DEG./SEC RESTART THE BURN AND COMPLETE UNDER SCS CONTROL FOR AN SPS SHUTDOWN. C • RULES NUMBER 3-31 THROUGH 3-36 ARE RESERVED.

GROUP

COAST

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SUMMARY

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MISSION RULES

REV ITEM SECTION 3 MISSION RULE SUMMARY ' LUNAR ORBIT ' DEPENDING ON THE ANALYSIS OF A NON-NOMINAL LOI BURN. THE FOLLOWING COURSES OF ACTION ARE 3-37 AVAILABLE ---UNLESS A STABLE ORBIT HAS BEEN ACHIEVED. DIRECT (SPS OR DPS) ABORTS OR DPS TWO IMPULSE CIRCUMLUNAR ABORTS WILL BE EXECUTED. Α. IF STABLE ORBIT HAS BEEN ACHIEVED, TEI (DPS OR SPS) WIL BE EXECUTED AT NEXT OPPORTUNITY OR AN ALTERNATE MISSION WILL BE INITIATED. PRIOR TO UNDOCKING THE FOLLOWING TRAJECTORY CONDITIONS MUST BE SATISFIED---3-38 THE MISS DISTANCE OVER THE LLS IS LESS THAN 0.5 DEG. OUT OF PLANE AND +/-2 DEG. IN AZIMUTH NOTE ADDITIONAL MANEUVERS WILL BE SCHEDULED, AS NEEDED, BETWEEN LO12 AND UNDOCKING TO CORRECT DISPERSIONS. ONE SET OF 5 SATISFACTORY LANDMARK SITHTINGS ON THE LANDING SITE HAS BEEN OBTAINED. NOTE UNDOCKING WILL BE SLIPPED NO MORE THAN ONE REV IF THE SIGHTINGS ARE NOT SATISFACTORY. RULE NUMBERS 3-39 THROUGH 3-44 ARE RESERVED PAGE GROUP SECTION MISSION REV DATE LUNAR ORBIT APOLLO 11 4/16/69 MISSION RULE SUMMARY

MISSION RULES

SECTION 3 MISSION RULE SUMMARY REV ITEM 1 DOI PHASE 1 3-45 DOI IGNITION THE FLIGHT CREW WILL NOT ATTEMPT TO BACKUP THE DOI ULLAGE MANEUVER OR THE DPS IGNITION SHOULD EITHER FAIL TO OCCUR AUTOMATICALLY. 3-46 DOI TERMINATION THE FLIGHT CREW WILL TERMINATE DOI FOR THE FOLLOWING---A. ATTITUDE DEVIATIONS GREATER THAN 10 DEG. B. RATES GREATER THAN 10 DEG./SEC. C. DPS TANK PRESSURE LESS THAN 120 PSI D. OVERBURN OF 2 SECONDS AND 2 FPS E. NO MANUAL THROTTLE CAPABILITY F. PGNS FAIL 3-47 DOI TO PDI A. DOI RESIDUALS WILL BE NULLED ALONG THE X BODY AXIS B. THE FLIGHT CREW WILL PERFORM THE DIRECT RETURN TO THE CSM FOR THE FOLLOWING REASONS---NOTE 1--- CAPABILITY REMAINS TILL APPROXIMATELY DOI =10 MINUTES NOTE 2---RR IS MANDATORY FOR THIS MANEUVER 1. LM CONDITIONS---(A) ECS (1) LOSS OF BOTH COOLANT LOOPS (2) FIRE, SMOKE, OR FREE GLYCOL IN CABIN OR SUIT (B) G&C (1) PGNS FAIL OR AGS FAIL (2) PGNS, AGS POST-DOI REDIGUALS DIFFER BY GREATER THAN 2 FPS (3) AT DOI CUTOFF, PRIOR TO TRIMMING, PGNS RESIDUALS ARE GREATER THAN $\frac{2}{2}$ FPS. IN ANY AXIS (C) CREW TERMINATES THE DOI MANEUVER RULE 3-48 IS RESERVED SECTION GROUP PAGE MISSION DATE APOLLO 11 MISSION RULE DOI PHASE 4/16/69

SUMMARY

MISSION RULES

	POWERED DESCENT PHASE
3-49	PDI IGNITION
J-4,	THE FLIGHT CREW WILL NOT ATTEMPT TO BACK UP THE PDI ULLAGE MANEUVER. IF THE ULLAGE MANEUVER OCCUR AUTOMATICALLY. THE FLIGHT CREW WILL ATTEMPT TO MANUALLY IGNITE THE DPS ENGINE IF IT NOT IGNITE AUTOMATICALLY. THE MANUAL IGNITION MUST OCCUR BY LGC COMPUTED TIG = 7.5 SEC.
3-50	PDI TO LO GATE
	POWERED DESCENT WILL BE ABORTED FOR THE FOLLOWING
	A. LR DATA NOT INCORPORATED BY H LESS THAN OR EQUAL TO 13,000 FT.
	B. LR FAILURE AFTER INCORPORATION AND PRIOR TO CONVERGENCE.
	C. VIOLATION OF THE APS ABORT BOUNDARY
	C. FAILURE TO ENTER P64 WHEN TG EQUALS 60 SEC.
	D. PGNS NAVIGATION ERRORS WHICH RESULT IN AGS-PGNS VELOCITY DIFFERENCES THAT VIOLATE THE F
	FAILURE LIMITS.
	E. PGNS NAVIGATION ERRORS WHICH RESULT IN MSFN-PGNS VELOCITY DIFFERENCES THAT VIOLATE THE FAILURE LIMITS.
	NOTE
	ITEMS E AND F ARE VALID ONLY PRIOR TO LR INCORPORATION. FOR ITEM E. SWITCHOVER TO AGS WILL BE PERFORMED.
3-51	LO GATE TO TD
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKED
3-51	
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKED
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKED
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
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3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
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3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH
3-51	THERE ARE NO TRAJECTORY OR GUIDANCE CONSIDERATIONS WHICH ARE CAUSE FOR ABORT AFTER CREW TAKES OF POWERED DESCENT RULE NUMBERS 3-52 THROUGH

MISSION RULES

REV ITEM SECTION 3 MISSION RULE SUMMARY ' ASCENT ' ASCENT 3-61 A. GUIDANCE SWITCHOVER TO AGS WILL BE PERFORMED FOR ---1. ONBOARD RECOGNIZED PGNS FAILURES (SEE RULES (HARDWARE) AND (SOFTWARE)). 2. PGMS NAVIGATION ERRORS. DURING ASCENT OR FOLLOWING DESCENT ABORT, THAT RESULT 1N ANY OF THE FOLLOWING CONDITIONS—— (A) AGS PREDICTED HP AT INSERTION LESS THAN 37000 FT (B) AGS PREDICTED HA AT INSERTION GREATER THAN TBD NM (C) AGS PREDICTED WEDGE ANGLE AT INSERTION GREATER THAN 1.7 DEG. B. THE GROUND WILL NOT REQUEST SWITCHOVER AFTER TGO LESS THAN 30 SECONDS. RULE 3-62 THROUGH 3-69 ARE RESERVED. GROUP PAGE SECTION MISSION REV DATE ASCENT APOLLO 11 4/16/69 MISSION RULE

SUMMARY

MISSION RULES SECTION 3 MISSION RULE SUMMARY

REV ITEM

7. SPS (A) LOSS OF BOTH GN2 BOTTLES (LESS THAN 400 PSI) (B) FUEL OR OXIDIZER FEEDLINE TEMP LESS THAN 27 DEG. F. (C) FLANGE TEMP GREATER THAN 480 DEG. F. ON PREVIOUS BURN (D) CHAMBER PRESSURE LESS THAN 70 PSI ON PREVIOUS BURN (E) FUEL/OXIDIZER DELTA P GREATER THAN 20 PSI (F) LOSS OF ULLAGE CAPABILITY FOR FIRST BURN SUBSEQUENT TO DOCKED DPS BURN. OR AFTER STORAGE TANKS EMPTY (G) FIRST BURN SUBSEQUENT TO DOCKED DPS WAS LESS THAN 40 SEC. CONTINUOUS (H) PRESSURE IN EITHER FUEL OR OXIDIZER TANK LESS THAN 140 PSI (I) DELTA V REMAINING LESS THAN MANEUVER PLUS DEORBIT REQUIREMENT B. THE NON-CRITICAL DOCKED SPS BURNS WILL BE NO-GO IF THE FOLLOWING INTERFACE CONDITION EXISTS---1. DOCKING SYSTEM (A) LESS THAN (TBD) GOOD DOCKING RING LATCHES GROUP PAGE SECTION MISSION REV DATE 4/16/69 MISSION RULE SUMMARY APOLLO 11 ALL PHASES 3-11

MISSION RULES

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SECTION 3 MISSION RULE SUMMARY

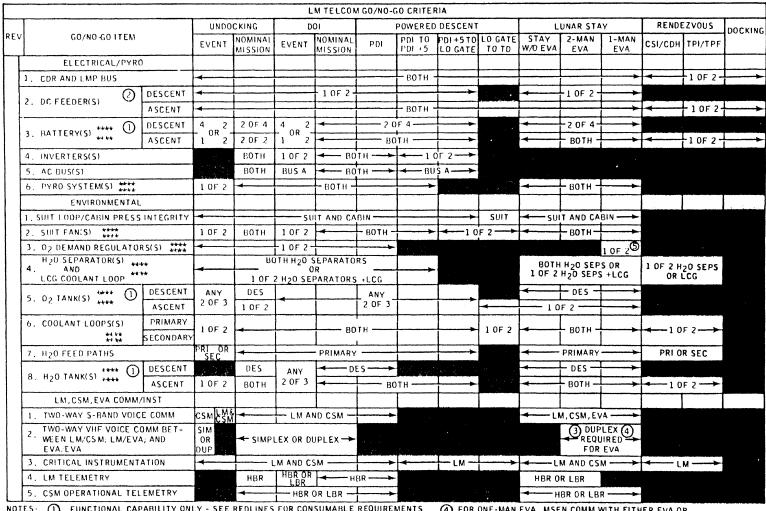
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	A NON-CRITICAL ERE N	ANGUNE					
3-70	A NON-CRITICAL SPS MA. THE CSM WILL BE						
	1. ECS		21 801 6	or the following t	TOWN THIONS EXTS		
	(A) LOSS C	E CART	N 1NTEC				
	(B) LCSS C						
	(C) LOSS 0			WD 055054- 5.5.			
				ND REPRESS PACK			
				ULATOR OPERATION			
				TY (FOR DOCKED SE	S BURNS)		
	(G) LOSS O						
		MED LE	AK OF GL	YCOL IN EITHER CO	MMAND MUDULE OR	SUIT (IRCUIT
1 1	2. CRYO						
	(A) INSUFF PTP P	LUS	02 AND	H2 TO SUPPLY FUEL	. CELL AND ECS D	EMANDS	TO THE NEXT GOING
	3. EPS						
	(A) LOSS O	F TWO	FUEL CEL	LS			
	(B) LOSS O	F TWO	ENTRY BA	TTERIES			
	(C) LOSS O	F ONE	MAIN BUS	ON BATTERY BUS	ONE AC BUS+ OR	THE BA	TTERY KELAY BUS
	(D) LOSS O	FTWO	INVERTER	S			
	4. COMM/INSTRUM	ENTATI	ON				
	(A) LOSS O	F INST	RUMENTAT	ION (TM OR CNBOAR	D) SUCH THAT IT	IS NO	T POSSIBLE TO VER
				ITHER IN S/C OR O		•	
1 1		F TWO-	MAY VOIC	E COMMUNICATION (CSM/MSFN)		
	5. SEQUENTIAL	_					
				OGIC BUS A OR B			
1 1	(B) LOSS O	PYRO	BUS A D	R B			
	6. G&C	_					
1 1	(A) LOSS OF						
							RATE CMD IF UNDOCKED
	(C) LOSS OF	THRE	E TVC CO	NTROL MODES (G&N,	SCS AUTO, AND	MTVC -	ACCEL CMD IF DOCKED)
	•						
		*					
LL	MISSION	REV	DATE	SECTION	GROUP	PAGE	
		+	 		 		

SECTION 3 MISSION RULE SUMMARY

	T					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				
	1									
3-71	A C	RITICAL	SPS MANEUN	VER W	ILL BE I	NHIBITED FOR THE	FOLLOWING CSM P	ROBLEMS		
	1	G& C								
		1. LO	55 OF TWO 1	rvc se	ERVO LOO	PS				
		2. LO	SS OF THREE	TVC	CONTROL	MODES (GGN+ SCS	AUTO, AND MTVC	- RATE	CMD)	
	в.	SPS								
:		1. PRE	ESSURE IN E	ITHER	R FUEL O	R OXIDIZER TANK LI	ESS THAN 115 PS	1		
		2. LOS	SS OF BOTH	GN2 E	OTTLES	LESS THAN 400 PS	1)			
		3. FUE	EL OR OXIDI	ZER F	EEDLINE	TEMP LESS THAN 2	7 DEG. F.			
		4. FL	ANGE TEMP G	REATE	R THAN	480 DEG. F. ON PRE	EVIOUS BURN			
		5. CHA	AMBER PRESS	URE L	ESS THAI	N 70 PSI ON PREVIO	DUS BURN			
		6. FUE	EL/OXIDIZER	DELT	A P GREA	ATER THAN 20 PSI				
		7. FIR	RST BURN SU	BSEQU	ENT TO	DOCKED DPS WAS LES	SS THAN 40 SEC+	CONTING	UOUS	
3-72	A D	PS MANEU	JVER WILL B	E INH	IBITED F	FOR THE FOLLOWING	LM PROBLEMS			
		G& C			'					
		TBD								
	в.	DPS								
		THROTT	LE STUCK A	BOVE	60 PER.	IDPS NO START CON	(DITION)			
) TO 75 DEG. F. L!				
		DELTA	PRESS BETn	EEN F	UEL AND	OXIDIZER GREATER	THAN 5 PSI			
			NLET PRESS							
		LOSS O	F SUPERCRI	TICAL	HE AND	DELTA V REQUIRED	GREATER THAN 31	O FPS		
			LANT LEAKS							
l	с.	DOCKING	SYSTEM							
		FOR DO	CKED BURNS	LESS	THAN (T	BD1 GOOD DOCKING	RING LATCHES			
l										
3-73	AN A	PS MANE	UVER. OTHE	R THAI	N ASCENT	. WILL BE INHIBIT	ED FOR THE FOLL	CWING L	M PROBLEMS	
	A .	G& C								
		TBD								
1	₿•	AP5								
l		DELTA	PRESS BETWE	EEN FL	JEL AND	OXIDIZER TBD				
l		DELTA	TEMP BETWEE	EN FU	EL AND O	XIDIZER GREATER T	HAN 10 DEG. F			
		PROPEL	LANT TEMP	VOT W	ITHING 4	0 TO 85 DEG. F. L	IMITS			
		INLET	PRESS LESS	THAN	115 PSI					
l		PROPELI	LANT LEAKS							
			1		Γ	T	T	Т	Т	
			MISSION	REV	DATE	SECTION	GROUP	PAGE		
			APOLLO 11		4/16/69	MISSION RULE SUMMARY	ALL PHASES	3-12		
			1		<u> </u>		L		<u> </u>	

MISSION RULES

EV ITEM				SECTION	3 MISSION RULE	SUMMARY		
3-74	LM RCS MA	NEUVERS WILL	BE I	NHIBITED	FOR THE FOLLOWS	NG LM PROBLEMS-		
	A. G&C							•
	TBD							
	B. RCS							
	PROP	ELLANT TEMP	NOT W	ITHIN 40	TO 100 DEG. F.	LIMITS		
	DELT	A PRESS BETW	EEN F	UEL AND	OXIDIZER GREATER	THAN 80 PSID		
	MANI	FOLD PRESSUR	E LES	S THAN 1	00 PSI			
	PROP	ELLANT LEAKS						
	QUAD	TEMPS LESS	THAN	119 DEG.	F•			
	_							
							•	
				•				
				•				
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		MISSION	 	ļ	MISSION RULE SUMMARY	ALL PHASES	1,735	
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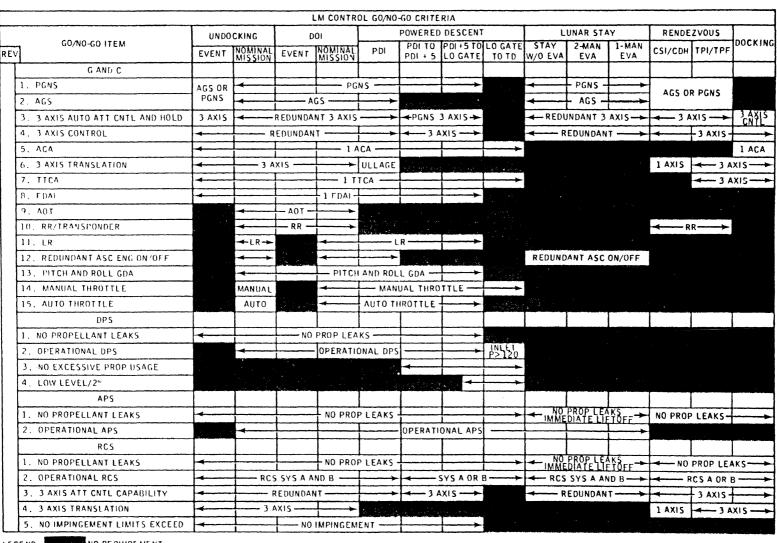
NOTES: (1) FUNCTIONAL CAPABILITY ONLY - SEE REDLINES FOR CONSUMABLE REQUIREMENTS

DURING POWERED DESCENT A SHORT ON EITHER AN ASCENT OR DESCENT FEEDER WILL BE CONSIDERED LOSS OF A BUS AND THUS REQUIRE AN ABORT. AN OPEN WILL PROBABLY NOT BE DETECTED AND REGARDLESS NO ACTION WILL BE TAKEN

FOR TWO - MAN EVA, MSFN COMM WITH EVA REQUIRED FOR LM/EVA COMM DUPLEX OR SIMPLEX IS ACCEPTABLE

- 4 FOR ONE-MAN EVA, MSFN COMM WITH EITHER EVA OR THE CREWMAN IN THE LM IS REQUIRED
- (5) ASSUMES CREWMAN IN LM OPERATING ON LM ECS

LEGEND: RETAIN DESCENT STAGE ALAP NO REQUIREMENT



LEGEND: NO REQUIREMENT

CSMEECOMGO/NO-GO CRITERIA

							MEECOM	00/110-00	CATTERIA	` 					,			
GO/NO-GO	E A R O R E			TLC		LUNAR	ORBIT	UNDO	CKING	D	01		POWERED	DESCENT		L	UNAR STA	ΑY
ITEM	CONT BOOST	CONT E.O.	TLI	TD&E	CONT TLC	LOI	CONT L.D.	EVENT	NOMINAL MISSION	EVENT	NOMINAL MISSION	PDI	PDI TO PDI+5	PDI+5 TO LO GATE	LO GATE TO T/D	STAY W/O EVA	2-MAN EVA	1-MAN EVA
ECS																		
CARIN INTEGRITY	- 10									CABIN IN	TEGRITY.					← CAB	IN INTEG	RITY-
NO FIRE OR SMOKE IN CABIN	-								NO F	IRE OR S	MOKE IN C	ABIN				→NO FIR	E/SMOKE	IN CAB
NO 02 MANIFOLD LEAKS	(10)							NO	02 MANI	FOLD LEA	KS				← NO 02	MANIF L	EAKS-
MAIN 02 REGULATORS	→ (10+)1	0F 2 	-	- во	ТН		-		1 0	F 2	I	-				4	-1 OF 2-	
ECS COOLANT LOOPS		1 0F 2 ⁽⁵⁾	-	80	TH	-	4		PRIM	ARY-		-	1 0	F 2		-	PRIMARY	
ECS RADIATORS		1 OF 2(5)	-	В0	TH		-		PRIM	ARY						- 0-	PRIMARY	<u>-(1)</u>
ECS GLYCOL EVAPS		← (5)·1 (14.5 S	O. Ed. Ver	4			1 0	F 2-		-				4	1 OF 2-	-
SUIT INTEGRITY	51(10+	1111	recession de	ŞΙ		- 1		SUIT IN	EGRITY	144	*							
NO GLYCOL LEAK		4	-							NO GLY	OL LEAK-					→	GLYCOL I	EAK-
NO EXCESSIVE CABIN HUMID	ITY	-							NO EX	CESSIVE	CABIN HUI	MIDITY-				→ NO	EXC CAB	ним
POTABLE H20 TANK		-	 	POTABLE	H20 TANI	-	-	Sept Garage	-	POTABLE	H20 TANK	(POTA	BLE H20	TANK (2)
WASTE HOO TANK		22 (2)	-	 						WASTE	20 TANK	-					TE H ₂ O T	
SUIT COMPRESSORS	(10.)1	0F 2 →	BOTIS	-	-1 OF 2-	-	-		1 0	F 2		-				-	-1 OF 2-	—
SUIT CIRCUIT	(10)						<u> </u>		- SUIT (IRCUIT -					← S	UIT CIRCU	IT-
OVERBOARD DUMPS	19010	1	 	1 OF 3-				1.24.26	-	1 (F 3-	-				100		
CRYO																		
O2 TANKS		1 OF 2	-				-			ВС	ТН ——		10	F 2		-	вотн-	-
H2 TANKS		1 OF 2	-			İ				— вс	ТН	>	1 0	F 2		-	вотн-	-
EPS																		
FUEL CELLS	2 0	2 OF 3	ALL	2 0	F 3	4 -(6)− A	LL-6)-	2 OF 3	4 −®−	-6-	ALL-6	<u>_6</u>	← 10	F 3		- 6)-	ALL-(6)	<u>(6)</u>
ENTRY BATTERIES	OR	2 OF 3	ALL	2.0	F 3 →	4 -6)- A	LL-(6)->	2 OF 3	4-6)-	-6-	-ALL-6	<u>_6</u>				4 -©-	-ALL-(6)	<u></u>
MAIN BUSES	1 OF 20	-				 	ļ	 		— вс	Тн	-				<u> </u>	-вотн-	<u> </u>
BATTERY BUSES	1 OF 20	-	 	 	<u> </u>		 			—— ВС	TH					-	-вотн-	
AC BUSES	1 OF 29		+	 			 	<u> </u>		В(TH					-	-вотн-	
BATT RELAY BUS	1.6.5	-	ВА	TT RELAY	BUS -	-	1 1 1 1 1 1 1 1 1	14.0 Tale.				The same						
INVERTERS	1 OF 3	-	 	 	 			a da familia da sena	- 2 OF 3-			-				_	-2 OF 3-	
AC & A (1 AND 2)	1 0F 2	-	+	 	<u> </u>	<u> </u>	ļ	 		B0	TH					-	-вотн-	-
INSTRUMENTATION	1	1	1	1			1	 		 								
SCE		1		SCE-		 				1. y 1 44.	and district		ليوسا					
CRITICAL INSTR		→ CR	TICAL IN	STR-	September	-		T	ITICAL INS							→ CR.	TICAL INS	TR
SEQ			1	1		1				 	İ							
SMJC NOT ACTIVATED		-	1	 	<u> </u>	MJC NOT	ACTIVATE	D	 			—				+SMJC	NOT ACTIV	VATED→
SEQUENTIAL SYSTEMS		-	 	BC	TH	 					100							
DOCKING	- CONTRACT TO		1	†	 			A STREET, SQUARE,	14 (0.00	and the said trail								
DOCKING LATCHES	a respective		3 feet 1 1 2 2	→ ⑦ 3 0	F 12(D)►	9.0	F 12	रामा संग्रह		1000	1000000	a Beglati a tani i	ا نسور والادار					-

- BASED ON H₂O AVAILABLE FOR EVAPORATIVE COOLING WILL CONSIDER CONTINUING IF SECONDARY LOOP STILL AVAILABLE
- 2. BASED ON WASTE $\ensuremath{\text{H}_2\text{O}}$ available for evaporative cooling will consider continuing
- 5. MUST BE IN SAME COOLANT LOOP

- 6. BASED ON FAILURE MODE, CONSIDERATION WILL BE GIVEN TO CONTINUING
- LEGEND: NO REQUIREMENT

- 7. 3 LATCHED LATCHES MUST BE 120° APART; IF DOCKED SPS BURNS ARE REQUIRED 9 ARE NECESSARY
- 9. MODE I AND IT ONLY; O THEREAFTER
- 10. MUST HAVE CABIN INTEGRITY OR VIABLE SUIT LOOP. ITEMS MARKED BY * ARE REQUIRED TO MAINTAIN VIABLE SUIT LOOP.

1) FOR LEAKS AFTER
PDI + 10, WILL ASCEND
FIRST REV OPPORTUNITY

(2) REQUIRES 3 AXIS ATTITUDE CONTROL AND TRANSLATION IN THREE AXES (ONE LATERAL AXIS MAY BE DEGRADED)

LEGEND: NO REQUIREMENTS

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4 GROUND
ANSTRUMENTATION
REQUIREMENTS

MISSION RULES

ITEM	·	5	ECTIO	N 4 GROUP	ND INSTRUMENTATIO	N REQUIREMENTS			
ITEM	1								
								•	
1	GENE			NEW BEOUT	DEMENTE DEFINE T	us week or			
	 ^··	BEFORE A ''GO''	IS G	IVEN FOR	LAUNCH.	HE MCC/MSFN REG	DUIREMENT	S WHICH MUST BE	1
	в.	HARDWARE AND/OR	SOFT	WARE INTE	OR OPERATIONAL REFACE REQUIRED T CAPABILITY ARE T	O PROVIDE THE	MANDATO	S A MANDATORY ITEM RY FUNCTIONS OF ATUS ALSO.	• T
	c.	WHERE REDUNDANC DESIRABLE.	Y EXIS	STS FOR M	MANDATORY ITEMS.	A BACKUP CAP	ABILITY	15 CONSIDERED H	1 G
					NOTE				
			SE C	CTION ARE	EQUIPMENT LISTI TO BE UTILIZED S MANDATORY, PRI TO LAUNCH, TO B	AS A GUIDE OR TO COMMITTIN	ıG		
				RECEIVE	AND DISPLAY TEL				
			8∙		N VOICE COMMUNIC	ATIONS WITH			
1									
l									
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MISSION RULES

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4-2	TELEMETRY A. CONSOLE DISPLAY (D/TV. EVENTS. ANALOGS) B. PCM GROUND STATIONS (4)			,
4-2	A. CONSOLE DISPLAY (D/TV, EVENTS, ANALOGS) B. PCM GROUND STATIONS		1	•
	EVENTS + ANALOGS) . B. PCM GROUND STATIONS			1
	B. PCM GROUND STATIONS		MANDATORY	A. FOR DISPLAY OF MANDATORY PARAMETERS.
	1	PRELAUNCH	1 1 OF 4 MANDAT 1 HIGHLY DESIRABLE	TORY, B. FOR DISPLAY OF MANDATORY . EVENTS AND ANALOGS.
	C. RECORDING AND PLAYBACK	! !	•	1
	ALD5	† †	•	•
	MSFN	PRELAUNCH	BOTH DESIRABL	.E
	D. FM - GROUND STATION	PRELAUNCH	1 OF 2 MANDAT	TORY D. TO PROVIDE MANDATORY DISPI DATA FOR THE MCC SURGEON.
		! !	•	
) 	t t	
4-3	COMMAND		•	:
	A. MOCR TOGGLE SWITCHES (BCTH A AND B)	! !		A. FOR LAUNCH PHASE ABORT REQUE
	1. BSE ABORT REQUEST	PRELAUNCH	HIGHLY DESIRA	BLE !
	2. FIDO ABORT REQUEST	PRELAUNCH	HIGHLY DESIRA	BLE !
	3. FD ABORT REQUEST	PRELAUNCH	HIGHLY DESIRA	BLE
	B. COMMAND PANELS	, ,		
	EECOM: GUIDO: BSE: TELCOM: CONTROL: CCATS		HIGHLY DESIRA	BLE !
	C. MOCR CONSOLE/SITE SELECT CAPABILITY) 	1	
	1. RTC CONSOLE (CCATS)	PRFLAUACH	HIGHLY DESIRA	e e e e e e e e e e e e e e e e e e e
	2. CCATS CMD CONSOLE MED	, weendach	+	1
	D. FC/MGO SWITCHING CAPABILITY		•	1. 1.
	1. FLIGHT DIRECTOR (DDF: ALINCH	HIGHLY DESIRA	, BLE !
	2. CCATS CMD MED	. REERORCH	I DESIRA	!
	,			
	•			
	MISSION REV	DATE SE	CTION G	ROUP PAGE
		4/16/69 GR		cc

MISSION RULES

REV ITEM

RULE '	CONDITION/MALFUNCTION'	PHASE	RULING	,	CUES/NOTES/CO	MMENTS
		•	1	1		
4-4	TRAJECTORY	1	1	•		
	A. TRAJECTORY DATA PROCESSING	•	•	!		AJECTORY DATA SOURC AS FOLLOWS
	1. AVAILABILITY OF ONE INDIPENDENT TRACKING SOURCE	PRELAUNCH	1 MANDATOR		1. (A) IN OF L/V NAVIGA	DEPENDENT VERIFICATI
	(IPR, USB) FROM LIFTOFF TO T + 10 MINUTES.	•	1	1	(B) PROTEC OF LAUNCH ENV	TION AGAINST VIOLATI ELOPE•
	2. IU AND CMC TM VECTORS FROM LIFTOFF TO INSERTION PLUS 60 SECONDS.	1	BOTH MANDAT	ORY	A•2• REQU	IRED FOR CRBIT GO/NO-
	B. RTCC - DATA SELECT CAPABILITY	PRELAUNCH	MANDATORY		B. TO SEL SOURCE.	ECT BEST AVAILABLE DA
4-5	COMMUNICATIONS	•				
	A. MOCR	1	1	•		
	FD LOOP AFD CONF LOOP	PRELAUNCH	1 OF 2 MAND	ATORY !	FOR MISSION	N CONTRUL
	MOCR SYS 1 & Z MOCR DYN A/G 1 LOOP A/G 2 LOOP	PRELAUNCH	ALL HIGHLY DESIRABLE	! ! !		
	B. MCC/LAUNCH COMPLEX	•	1	•		
	121 CLTC 111 CVTS 212 MSTC	PRELAUNCH	1 1 OF 3 MAND	ATORY !	FOR TERMINA OF MCC-PAD ACT	AL COUNT COORDINATION
	C. MCC/RSO	1	1	1		
	FD LINE TO RSO RSO PRIVATE LINE CAPE 111 RSO LOUP	PRELAUNCH	1 1 OF 3 MAND	ATORY !	FOR TRAJECT BOOSTER SAFING	ORY VERIFICATION AND
	D. MISCELLANEOUS	1	1	•		
	BSE TM MONITOR LCOP } CIF/USB LOOP	PRELAUNCH	DESIRABLE			MONITORING SPACE
	E. MCC/REMOTED SITES					
	ONE A/G PATH VIA GSFC	PRELAUNCH	MANDATORY	1	USED FOR CO	MMUNICATION WITH CREW
	•					
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MISSION RULES

REV ITEM	

RULE	CONDITION/M	ALFUNCTION		PHASE	RULING	, ,	CUES/NOTES/CO	MMENTS	
1.	500000750			! !	1	•			
4-6	A. MOC (IB)	M 360/75)		PRELAU	NCH ! MANDATORY		TO BROCE	EC MANDATORY	* 4
	B. DSC (16)			i	•	Ţ	PARAMETERS AN	D TRAJECTORY D	ATA
				i	NCH ! HIGHLY DE	SIRABLE !	AN SSC (IB AS BACKUP TO	M 360/75) IS THE MOC OR DSC	AVAILABL •
	C. CCATS II	UNIVAC 494)	1	1		:			
	D. CCATS IL		- 1	PRELAU	NCH ' 1 MANDATO ! HIGHLY DE !	SIRABLE !	TO THROUGH PARAMETERS TO	PROCESS MANDA MOC	TORY S/
	E. RTACF -	2		PRELAU	NCH ! 1 HIGHLY ! DESIRABLE	;	PRELAUNCH	IP PREDICTIONS	FOR MOD
				•		1	- ADORTS		
				i		:			
4-7	TIMING			t	1 ?	:			
	MITE (2)			PRELAU!	NCH ! 1 MANDATO		MCC TIMING	STANDARD TO C/CCATS COMPUTE	SUPPOR RS
				•					
				•	•				
4-8	MCC POWER			: ! PRELAU!	NCH ! MANDATORY	•	UNINTERRUP	TABLE POWER F	OR DAT
	5. BUS A2			1	CH ! MANDATORY	,	CONVERTERS .		
				· PRELAUR	I		DATA DISTRIBU	TABLE POWER F TORS	OR DZE
	C. BUS E1			PRELAUM	NCH MANDATORY		20 SECONDS FOR MOCR AND	S INTERRUPTABL SSR CONSOLES	E POWE
	D. BUS B2			PRELAUNC	H MANDATORY		20 SECONDS FOR VSM	S INTERRUPTABL	E POWE
				•		'			
		•							
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MISSION RULES

REV ITEM

KULE	CONDITION/MA	ALFUNCTION		PHASE		RULING		CUES/	NOTES/C	OMMENTS 	
4-9				•		•		† 			
	DISPLAY			1		1		•			
	A. MOCR D/T	V CHANNELS		PRELAU		10 OF 36 MANDATORY		! !			
		NO. OF		•		1					
	POSITION	CHANNEL		•		•					
	RETRO FIDO	1				•					
	GUIDO EECOM	1		1		1					
1	GNC	1		•		· •					
	RTCC BOOSTER	1 4		:			;	•			
	B. TRAJECTO	RY DISPLAY		:		•	;	•			
	1. FDO L	AUNCH DIGI	TALS	PRELAU		MANDATORY (FOR MANEUV	CONTIN	GENCY ORBIT INSERT	
	2. GAMMA	vs v		PRELAUM		MANDATORY C		FRC SOURCE		ECTED TRACKING D	
				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		! (A) 10 X 20 ! SCRIBER PLO ! (B) D/TV ! (C) RTCC ! PLOTBOARD ! (D) SSR					
	3∙ RFO L	AUNCH DIGI	TALS	PRELAUN	ich :	PLOTBOARD MANDATORY C D/TV		MON MANEUV	ITOR F	OR MODES III AND	
	4. GAMMA	(E1) VS V(EI)	PRELAUN	iCH	MANDATORY C	,			R G-LIMIT VIOLATION.	
				1		(A) D/TV (B) SSR PLOTBCARD	•				
	5. PHI V	S LAMEDA		PRELAUN		HIGHLY DESI ON 1 OF 2		MON	ITOR FO	R CROSS-RANGE LIMITS	
				! !	• ((A) RTCC PLOTBOARD (E) SSR PLOTBOARD	,				
	6. T(FF)	VS R(IP)		PRELAUN		HIGHLY DESI		MON AND IB		R ABORT MODES II. II	
				! !	•	(A) D/TV (B) SRR PLOTBCARD					
	7. H VS 0			PRELAUN	CH I	HIGHLY DESI ON 10 X 20 SCRIBER PLO	1				
		II) VS VII DYNAMIC 5)		*PRELAUN * !	,	ON 10 X 10	TTER '	NAVIGA SYSTEM	TION	FOR L/V AND S/C PERFORMANCE (GUIDAN IS — COMPARES CMC WI	
	9. WEDGE	ANGLE MON		PRELAUN		HIGHLY DESI		! TRACKING). ! MONITOR FOR L/V AND S/C ! NAVIGATION PERFORMANCE			
	10. GUIDO ANALOG CHART PRECORDERS ONE AND TWO			'PRELAUN '	•	,		•			
L		MISSION	REV	DATE	SECT	ION	GROUP		PAGE		
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MISSION RULES

REV ITEM

- MULE	CONDITION/MALFUNCTION!	PHASE	RULING	' CUES/	NOTES/COMMENTS	
		•	• •	t t		
	11. INSERTION/INJECTION	PRELAUNCH	MANDATORY ON	, , , FO	R G&N GO/NO-GO	
	DIGITALS C. ADEG CHANNELS 90-93	PRELAUNCH	' D/TV ' HIGHLY DESIR	ABLE ! FOR D	SC DISPLAYS	
	D. VSM	PRELAUNCH	MANDATORY	'	R D/TV	
	E. AUX VSM	PRELAUNCH	' ' HIGHLY DESIR	ABLE '		
	F. EIDOPHORS (3)	PRELAUNCH	2 HIGHLY	•		
		•	DESTRABLE	•		
	NOTE INDIVIDUAL FLIGHT RESPONSIBLE FOR REPORTING	CONTROLLERS I	WILL BE			
	CAPABILITY OF MANDATORY PA	ARAMETERS TO	THE FLIGHT			
					•	
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MISSION RULES

REV ITEM

RULE	CONDITION/MALFUNCTION'	PHASE	RULING	
		•	•	
4-10	GSFC	1	· •	1
	A. GSFC UNIVAC - 494 (2) COMMUNICATIONS PROCESSOR	PRELAUNCH	1 MANDATOR	A. ONE UNIVAC - 494 CAN PERFO ALL NECESSARY FUNCTIONS, THE SECO ONE IS BACKUP.
	B. WED (50.0 KBPS) LINES (2) BETWEEN MCC AND GSFC	PRELAUNCH	1 MANDATOR	B. EITHER LINE CAN BE SWITCHED EITHER UNIVAC - 494.
	C. TTY CIRCUITS BETWEEN MCC AND GSFC			C. VFTG PROVIDES TWO REDUNDA 16 CIRCUIT TTY CHANNELS.
	1. OUTGOING	PRELAUNCH	1 OF 32 CIF	CUITS 1. FOR ACQ MSG, LS CMD RABLE
	2. INCOMING (LL)	PRELAUNCH	1 OF 32 CIF	CUITS 2. FOR RECEPTION OF LOWSPE RADAR DATA.
		1	*	! !
4-11	KSC	•	† , , , , , , , , , , , , , , , , , , ,	:
	TELEMETRY	•	•	† !
	A. VHF TM FROM THE FOLLOWING FOR S-II. S-IV8. AND IU	!		A. THESE ANTENNAS CAN BE SWITCH TO MILA OR CIF FACILITIES
	1. CIF ANTENNA	PRELAUNCH	1 MANDATORY	
	2. MILA VHF ANTENNA	1		
	B. USB TM FROM THE FOLLOWING	6 6 1	1	B. USB IS THE CSM'S ONLY SOUR OF DATA.
	1. MILA USB	PRELAUNCH	1 MANDATORY	!
	2. CIF USB	!	1	
	COMMAND	•		•
	THIS CAPABILITY IS DEFINED COMMAND RULE 4-12 FOR LAUN			
	TRACKING			
	THAT CAPABILITY REQUIRED T (TRAJECTORY) IS MANDATORY.		RULE 4-4	
	VOICE COMMUNICATIONS			•
	THIS KSC CAPABILITY IS DEF (COMMUNICATIONS).	INED UNDER	MCC RULE 4-5	
	•			
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R RULE	'CONDITION/MALFUNCTION'	PHASE			CUES/NOTES/COMMENTS
			1	!	
4-12	LAUNCH COVERAGE	•	•	•	
	KSC/MSFN SITES (SITES N LAUNCH AZIMUTH) MUST PR CAPABILITIES FROM LIFTO PLUS 60 SECONDS. REFER TO DECISION MATRI	OVIDE THE FO FF THROUGH S X (RULE 4-16	DLLOWING S-IVB CUTOFF S AND FIGURES		
- 1	4-1 THROUGH 4-51 TO DET	ERMINE CAPAE	BILITY.	•	
	A. CMD			;	
	USB CCS	PRELAUNC	H HIGHLY DEST	RABLE	
	B. TELEMETRY S-1C (VMF)	1005: 4:45			
	2-1C (VFF)	PRELAUNC	H HIGHLY DEST		S-IC DATA IS ONLY HIGHLY DESIRABLE SINCE THE MCC IS NOT PRIM FOR REQUESTING AN ABORT FOR S-I MALFUNCTIONS.
,	S-II (VHF)	PRELAUNC	H IHIGHLY DESI FROM LIFTOFF TO CUTOFF (APP B + 36 SEC)	S-II	FOR ABORT CUES FROM MCC
-	S-IVB VHF (CP-1)	! !PRELAUNC	H HIGHLY DESI	•	
	IU CCS (DP-18) IU VHF (DP-1)	1	H MANDATORY	•	FOR BULKHEAD DELTA P AFTER S/1 SEP
	CSM (USB)	PRELAUNC	H ' MANDATORY F ' LIFTOFF THR ' S-IVB CUTOF ' PLUS 60 SEC	OUGH !	FOR ABORT CUES FROM MCC
	C. TRACKING	;	:	•	
	THAT CAPABILITY REQUIRED (TRAJECTORY) IS MANDATOR		RULE 4-4		
	D. A/G COMMUNICATIONS 1. MILA VHF	! ! !PRELAUNC!	H ' HIGHLY DESI	RABLE '	
	USB		H MANDATORY	;	
	2. MSFN VHF	PRELAUNC	H	ATORY	
	USB				
4-13	GENERAL ORBITAL COVERAGE	.			
	IT IS REQUIRED THE MSFN PROVIDING THE MCC MINIMULISTED BELOW OF TWO MSFN THROUGH REVOLUTION 3.	M MISSION C	ONTROL SUPPORT		
			,	1	
	A. CMD	100511		1	
	CCS	1	H HIGHLY DESI	•	
	CSM USB	PRELAUNCE	H ! HIGHLY DESI	TADLE '	
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	7. 3620		REQUIREMENTS		4-8

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1	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
		,	•	
	B. TELEMETRY	•		•
	S-IVB VHF (CP-1)	PRELAUNCH	HIGHLY DESIRABLE	
	10 CCS (DP-18)	1005		DOWNLINKS REQUIRED TO REC
	IU VHF (DP-1)	PRELAUNCH	1 OF 2 MANDATORY	S-IVB DATA.
	CSM USB	PRELAUNCH	' MANDATORY	1
	C. TRACK	•	•	1
	C-BAND	PRELAUNCH	HIGHLY DESIRABLE	. 1
	USB	! !PRELAUNCH	MANDATORY	•
	D. A/G COMMUNICATIONS	•	•	•
	VHF	•	' HIGHLY DESIRABLE	,
	USB	1	MANDATORY	
	033	1	· MANDATOR!	
			•	1
		•		•
4-14	HSK. GDS. MAD	•	t	
ĺ	IT IS MANDATORY 2 OF FOLLOWING CAPABILITIE		PROVIDE THE	
	A. TM USB	1	! MANDATORY	1 10 50055 754050000 50457
	7. (· ·	PANDATORT	A. TO COVER TRANSLUNAR COAST
	9. TRACK USB	PRELAUNCH	MANDATORY	
	i	1		
	C. VOICE USE	PRELAUNCH	MANDATORY	•
	C. VOICE USB	•	MANDATORY HIGHLY DESIRABLE	· · · · · · · · · · · · · · · · · · ·
		•	•	1 1 1 1 1
		•	•	
		•	•	
		•	•	
4-15		PRELAUNCH	HIGHLY DESIRABLE	
4-15	D. CMD USB	PRELAUNCH	HIGHLY DESIRABLE	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA	PRELAUNCH	HIGHLY DESIRABLE	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	
4-15	D. CMD USB RICMETER NETWORK SITE A. LIMA B. CRO	PRELAUNCH S PRELAUNCH	HIGHLY DESIRABLE HIGHLY DESIRABLE 1 OF 2 HIGHLY	

MISSION RULES

REV ITEM	SECTION 4 GROUND INSTRUMENTATION REQUIREMENTS												
R ' ITEM													
4-16	INTRODUCTION TO SITE FAILURE DECISION MATRICES (FIGURES 4-1 THROUGH 4-5)												
	THESE DECISION MATRICES APPLY THE GROUND INSTRUMENTATION REQUIREMENTS TO THE POSSIBLE FATLURES												
	OF SITE CAPABILITIES DURING LAUNCH PHASE.												
	THESE MATRICES POINT OUT TIMES DURING LAUNCH WHEN A FAILURE WILL CAUSE A LOSS OF CONTINUOUS COVERAGE BETWEEN LIFTOFF AND INSERTION PLUS 60 SECONDS.												
	TO USE THE MATRIX												
	A. LOOK FOR AN X UNDER THE COLUMN FOR SITE WHERE THE FAILURE OCCURRED. B. GO ACROSS TO THE COLUMN FOR THE CAPABILITY THAT WAS LOST AND READ THE DECISION.												
	C. THE COVERAGE THAT WAS LOST IS IN THE COLUMN LABELED "MANDATORY COVERAGE LOST."												
	D. MORE THAN ONE X IN A ROW SPECIFIES A FAILURE OF THE SAME CAPABILITY AT MORE THAN ONE SITE.												
1													
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	1	. !	SITES F	AILED			' '	' CAPABILITY LOST					
	1	00-00	M'MIL/CAPE 00-00 08-49	' GBM	' BDA '	VAN 09-30	MANDATORY COVERAGE LOST	TELEMETRY USB	CMD !	BOTH S AND C	1		
	!	- !	-	!	!		' '		!-				
	' S	, x	1	, , , ,	1 1		NONE SEE NOTE 4	•	_		N/A		
	1 G	1	' X	•		'	00-00 TO		GO •		! NO-GO		
	1 F		•			' '	S-IC/S-II SEP SEE NOTE 1	1	60	60	GO !		
			, ,						GO !	GO	. GO .		
	. 6	1				χ (GO '	GO	. GO		
	!	1 X		' '	11	'	GG-00 TO 01-02	1 NO-GU	GO !	NU-GO	NO-GO !		
,	1 1 M	!	' x	'	!!		00-00	GO !	GO '	NO-GO	' NO-GO		
	' U		' x	' ' x			03-56				<u></u> '		
	' T	1	' X	•	' x '	'	00-C0 TO	60	GO	NO-GC	NO-GO		
	! E							1 NO-GO	GQ '	NU-GO	NO-GU		
	,			•	, , , , , , , , , , , , , , , , , , ,	х '	00-00 TO		GC '		NO-GO		
	! F	' x	, X			X f	01-02	' NO-GO			NO-GC		
	 (HL) QC	;	•) } -	1 1	•	08-51 TO	. GO	60 !		GO !		
	, E			X			S-IC/S-II SEP	GO .		GO	GO		
	:	1	1				9-14 TO INSR + 60			NO-GO	' GO * '		
	NOTE 2. 3. 4.	INSR + LOSS OF	60 SECONDS F COVERAGE F ALDS RESU USB NO	15 NO 15 NO JLTS I GO FO	PPROXIM T SEVER N LOSS R USB A	E ENOLOGE S-I	IGH FOR A NO-	GO CONDITION.	MANDAT O				
1													
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MISSION RULES

,													
	.							·					
	;	, ,_ 1		SITES F	AILED				' CAPABILITY LOST				
	1	,	ALDS TE			I BDA	· VAN	MANDATORY COVERAGE	TELEMETRY!	CMD !	TRACK	A/G	
	, ,	•	00-00	00-00	101-07	1.04-12	09-11	LOST	USB CR VHF		BOTH S AND C BAND	!	
				· · · · · · · · · · · · · · · · · · ·	_	!		SEE NOTE 4	GO :	(N/A	N/A	
				• x	! !	•	' '	00-00 TO 01-02	GO !	CO 1		NO-GO	
					' X	•	' '	SEP SEE NOTE 2			1	60	
				!		' x		NONE	. GO	GO		GO	
				!	, ,	1 1	X		GO	GO	GO	GO	
			x		•		, ,	00-00 TO 01-02	NO-GO	GO '	NU-GO	NO-GO	
	, 1	, • : :			' X	•		00-00 TO		GO !	NO-GO	NO-GO	
			x		' X	•	, ,	03-57		GO !	NO-GO	NO-G0	
	1 1				•	' X	' '	00-00 TG		GO !	NO-GO	NO-GU	
	,		x		1	' X '	' '	01-02	NO-GO	GO '	NO-GC	NO-GC	
	,			1 X	•		י א י	00-00 TC		GO !	NO-GO	! NO-GU	
	,		X					01-02				NO-GO	
	• 1			1	' X	! X		S-IC/S-II SEP	!	GO !		' GO	
	, ,					•	' x '	S-IC/S-II SEP		GO ,	GO	, GO	
				!	1	¦ x	' x		1 NO-GO 1			GO *	
	NO1 1. 2. 3.		FLAME A INSR + LOSS OF	ATTENUATIO 60 SECOND ALDS RES USB NO	N WILL S IS A ULTS I GO FO	CAUSE PPROXIM N LOSS OR USB A	LOSS C MATELY OF S-1	F USB LOCK A 12-21. C TM HOWEVE	R, MAXIMUM E IT MIL DURING R. IT IS NOT	S-IC/S	5-11 SEPAR	ATION.	
						y exceller (o. o. o. o. o. o. o. o. o. o. o. o. o. o							
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REV ITEM

R	ITEM!								TATION REQUIR					
				CITES FALLEN										
		!	SITES FAILED						. HANDATORY	' CAPABILITY LOST '				
		١.	'ALDS TM	MIL/CAPE	' GBM '01-06 '09-26	' BDA '	' ANG.	' VAN '	COVERAGE LOST	1	! !	' TRACK ' BOTH ' S AND C ' BAND	1	
		S	' ' X	!	! ! !				NONE SEE NOTE 4	GO	N/A	-!	! N/A	
			'	, x	•	''			00-00 TO 01-02		G0	NO-GC	NO-GO	
-			: :	1	×				SIC/SII SEP SEE NOTE 2		GO	GO.	GO	
			!		! !	' X '			NONE	GO	60	. GO	GO !	
		' R			,,	, ,	X		NONE		' GO	, GO	GC	
			 	1		1 1		x	NONE	60	60	GO	60	
		• M	X								•	NO-GO	•	
		1 T	,	* x	×		•	•	00-00 TO	GO	. GO	! NU-GU	' NO-GC !	
١		! P	χ		X	1 1		•	03-59	NO-GO	' 60	NO-GO	' NO-GC '	
		' E	1)	! x !	!	•	00-00 TO	GO	GO	NO-GO	' NO-GC '	
			X			' x '			01-02			NO-GO		
١		; ; E ; A	1			1		х !	00-00 TO	GO	<u> 6</u> 0	NO-GO	NO-GO	
				' x		,			01-02	NO-GO	. GO	NO-GC	NO-GC	
						. ' '			S-IC/S-II SEP		GO	. GO	GO	
		1 S			x	1 1			S-IC/S-II SEP		GO	GO	GO	
l				1		1 X 1	!	_ X !	NONE	GO	' GO	' GO	GC	
		1 1		1	 	1 1	× ¦	x :	12-11 TO INSR + 60	NO GO	GO	! NO-GO	GO *	
	NOTES 1. ANG HAS MAXIMUM ELEVATION OF 5 DEGREES. 2. FLAME ATTENUATION WILL CAUSE LOSS OF USB LOCK AT MIL DURING S-IC/S-II SEPARATION. 3. INSR + 60 SECONDS IS APPROXIMATELY 12-21. 4. LOSS OF ALDS RESULTS IN LOSS OF S-IC TM HOWEVER. IT IS NOT MANDATORY FOR LAUNCH. * GO FOR USB NO GO FOR USE AND VHF FIGURE 4-3 9C DEG. LAUNCH AZIMUTH SITE FAILURE DECISION MATRIX.													
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			1				1							
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;						'	; , (CAPABILITY LOST				
;								TELEMETR	Y' CMD	TRACK	! A/G	
		00-00						USB OR VHF		BOTH S AND C BAND	1	
' S	' ' x '	!	' !	'		·	NONE SEE NOTE 3	GO	N/A	N/A	N/A	
	·	X		1			00-00 TO 01-02	GO	GO	NO-GC	NO-GO	
F	1	1	X	1 1		•	S-IC/S-II SEP SEE NOTE 1	GO.	GO	G0	GO	
! I	! !	!	' !	! x		!	NONE	GO	-!	'	' 60	
' R	' ! !	1		† · · · · · · · · · · · · · · · · · · ·	X	·	NONE	GO	GO	GO	GO	
l :	·			1		' x	NONE	GO	60	<u> 6</u> 0	GO	
;	' х	. x	· · · · · · · · · · · · · · · · · · ·	•		·	00-00 TO 01-02	NO-GO	GO	NO-GC	NO-GO	
;	· •	' x	x	1		, , ,	00-00 TO	GO	GO	NO-GO	NO-GO	
1 M	' X	' X		1 1			04-04	NO-GO	GO	NO-GO	NO-GO	
L	·	' x	· ·	' x '			00-00 TO	GO	GO	NO-GO	NO-GO	
	' ×	' x		! x !			•	NO-GO	GO	NO-GO	, MO-GO	
	·	' x	,			' x	00-00 TO	' GO	' GO	! NO-GO	' NO-GO	
	' ×	. x				' x	01-02	NO-GO	GO	NO-GO	NO-G0	
F	' ! !	1	X	' X		, , , , , , , , , , , , , , , , , , ,	S-IC/S-II SEP	GO	. GO	GO	GO	
' I	! ! !	! !	x 	! ! !		, x	S-1C/S-11 SEP	GO	, GO	GO	GO	
1 R	! !	t		1 X	! !!	' X '	NONE	' GO	, GO	1 GO	, GO	
! S		1				!	NONE	' GO	' GO	' GO	' GO	
,	; ; ;	!		• (, ,	11-41 TO INSR + 60	1	•	GC	, 60 +	
;	! !			!			00 - 00 TO	' GO		1 NO-GO	' NO-GO	
'	' x	ı X	, 		' X	, ,	01-02	' NO-GO	' GO	' NO-GO	' GO *	
NOTES												
1		TTENUATION	Y WILL	CAUSE	LOSS	OF USB	LOCK AT MIL I	DURING 5-1	C/S-11 S	EPARATION.		
		60 SECONDS										
							HOWEVER: IT	IS NOT MAN	DATORY F	OR LAUNCH.		
3. LOSS OF ALDS RESULTS IN LOSS OF S-IC TM HOWEVER: IT IS NOT MANDATORY FOR LAUNCH. * GO FOR USB NO GO FOR USB AND VMF												

4/16/69 GROUND INSTR. REQUIREMENTS

APOLLO 11

GSFC/KSC/MSFN

5 TRAJECTORY AND GUIDANCE

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MISSION RULES SECTION 5 TRAJECTORY AND GUIDANCE

FIV THM

FIV	1754	SECTION 5 TRAJECTORY AND GUIDANCE
٦	(TEM+	
	5.0	THE LAUNCH PHASE WILL BE TERMINATED FOR ANY OF THE FOLLOWING CONDITIONS
	5-1	A. VIOLATION OF THE VEHICLE BREAKUP LINE.
		9. IFF IS LESS THAN OR EQUAL TO 1 + 40 AND DECREASING AFTER TOWER JETTISON.
		C. VICLATION OF ENTRY ''G'' LIMIT.
		D. VS INCREASING.
		E. CYERSPEED CONDITIONS AT INSERTION.
		F. VIOLATION OF EXIT HEATING LINE.
	5 - 2	THE LES WILL NOT BE JETTISONED UNTIL MODE II CAPABILITY IS ESTABLISHED BY TFF IS GREATER THAN OR EQUAL TO 1 + 20 AND INCREASING.
	5-3	MODE II. III. IV. AND APOGEE KICK.
		4. THE GROUND IS PRIME FOR ABORT MODE DETERMINATION AND MODE III MANEUVER COMPUTATION.
		9. MANEUVERS WILL BE INTERRUPTED WHEN TFF = 1 + 40 AND DECREASING.
		C. YOUR IV MANEUVERS WILL BE INTERRUPTED IF THE CURRENT ALTITUDE IS 75 NM. DECREASING AND HP IS LESS THAN 300K FT.
		Do IF ENTERINGO UTILIZE LIFT OF AVOID LANDO UNAVOIDABLE LAND LANDING USE AL 90 DEGO
		E. MAXIMUM NUMBER OF SPS START ATTEMPTS IS TWO.
		F. IF NO SLA SEP OR IF SPS FAILS
		1. HP IS LESS THAN 40 - EXECUTE CM/SM SEP BY TFF = 1 + 40.
		2. 40 IS LESS THAN HP IS LESS THAN 75 - GROUND WILL DECIDE TO USE SM RCS ASAP
		OR AT APUGLE TO REDUCE HP TO 40 NM.
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	l	
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		GUIDANCE 5-1

MISSION RULES

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! ITEM									
	W005 ***								
5-4	MODE III AS			s c.o **	LESS THAN 1 + 40				
		L LIFT IP (1.			
			•		LAND - BURN TO T	FF - 1 - 60	31 00 055		
					CN LAND - BURN A			AIN TEE	
	A	FTER C/O A	ND RL	90 DEG.	ON EXITO - GOVIN	REDUCED DEL	IN V TO MAIN	AIN IFF	
	B. IF DELT	TA TB IS LES	55 TH	AN OR EU	UAL TO 2 SEC. DO	NOT BURN.		•	
	C. IF IGNI BURN D	TION OCCURS	AFT RL	ER GETI 90 DEG.)	+10 SEC. BURN UNT	IL GGN DELTA	A R = 0. RL 55 (EG. (IF UNABL	Ε 7
5=5	THE S/C CMC	WILL BE NO	o - GO	FOR ABOR	T MANEUVER DETE	RMINATION A	AND MONITORING	FOR ANY OF	ŢΗ
	A. CMC PRO	GRAM FAILUR	₹.						
	B. RTCC AN	O CMC TFF	IFFE	RENCE OF	GREATER THAN 40	SEC.			
	C. CONFIRM IN Z.	ED ERROH IN	N S/C	PLATFOR	M VELOCITY COMPON	ENTS OF GREA	TER THAN 50 FPS	IN X OR 130	. FP
	D. CMC TRA	JECTORY SOL	IRCE	INDICATE	S ''GO'' OR ''	NO-GO'' INC	ONSISTENT WITH	BEST TRAJE	CTOR
	•								
5-6	THE ORBIT I	S ''GO'' IF	- нР	IS GREAT	ER THAN OR EQUAL	TO 75 NM.			
	RULES 5-7 T		•						
	ARE RESERVE	.D.							
	e e								
	144								
	1.1	•							
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MISSION RULES

SECTION 5 TRAJECTORY AND GUIDANCE

REV LIEM

Q ITE	4 1
5-20	EARTH ORBITAL ALTITUDE CONSTRAINTS
	A. REAL-TIME MISSION PLANNING
1	PERIGEE - 85 NM MINIUM. MAXIMUM. HP IS DETERMINED BY SM RCS AVAILABLE FOR HYBRID DECKBIT.
Į	B. CONTINGENCY
	PERIGEE - 75 NM MINIMUM (VIOLATIONS WILL BE CORRECTED ASAP) IF HP LESS THAN 75 NM AND MANEUVER TO RAISE HP IS NOT POSSIBLE
	1. 40 IS LESS THAN HP IS LESS THAN 75 - EXECUTE SPS RETROGRADE ASAP UNTIL HP IS LESS THAN 40. IF NO SPS, USE SM-RCS.
	2. HP IS LESS THAN 40 - CM/SM SEP - RETRO WILL RECOMMEND ENTRY PROFILE.
5-21	THE CONTINGENCY SEPARATION MANEUVERS FOR THE CSM ARE
	A. IMPENDING S-IVB OR UNMANNED LM EXPLOSION - 55 FPS SPS ASAP (7000 FT SEPARATION REGULRED 200 SEC.)
	8. S-IVB ATTITUDE RATES IS GREATER THAN OR EQUAL TO 5 DEG/SEC - 5 FPS RCS ASAP.
	C. S-IVB YAW ATTITUDE GREATER THAN 45 DEG - 5 FPS RCS ASAP.
	0. CSM RETROFIRE REQUIRED WHILE ATTACHED TO THE S-IVB OR LM - SEPARATION 20 MINUTES PRICE RETRO, 5 FPS RCS RETROGRADE WITH LINE ON HORIZON.
į.	
5-22	S/C COMPUTER TIMING UPDATES ARE REQUIRED FOR SET ERRORS AS FOLLOWS
1	A. CMC OR LGC IS GREATER THAN .1 SEC.
l	8. AGS IS GREATER THAN .3 SEC.
I	C. S/C L/G TIME (GRR) WILL BE UPDATED WITH SRO L/G TIME IF THE TWO ARE DIFFERENT BY 10 SEC.
1	
5-23	TIME BETWEEN EPO RETROFIRE GETI AND 400K MUST BE GREATER THAN 9 MIN. IF NOT. RETARGET FOR NEPTP.
l	
5-24	IF SPS RETROFIRE DELTA TB IS LESS THAN 7 SEC. USE SCS AUTO TVC.
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	MISSION REV DATE SECTION GROUP PAGE APOLLO 11 4/16/69 TRAJECTORY EARTH ORBIT

MISSION RULES SECTION & TRAJECTORY AND GUIDANCE

PLANNED ORN AND SCS RETROFTITE MANEUVERS WILL DE JODATED 19 A. "ME COMMUTED RETROFTITE DOSITION CHANGES BY GREATER THAN 1.3 DEC LONGITUDE PRIOR TO GET! -3. 3. THE COMMUTED RETROFTITE DOSITION CHANGES BY GREATER FHAN 2 DEC LONGITUDE AFTER CET! -33 NI). 2-20 IF A 36N FAILURE IS DETECTED PRIOR TO RETROFTIRE, CREW USES SCS DELTA V MODE WITH AN EMS ENTRY. 2-21 2-22 2-23 2-24 3-20 IS 345-148N MP 15 LESS THAN 18 NO SELA SEP 3-20 IS 345-148N MP 15 LESS THAN 18 NO SEPTEMBET PTP JSING RCS. 3-20 IS 1455 THAN 18 NO SELETA V AVAILABLE 2-20 SURN MAINUM SM RCS DELTA V AVAILABLE 3-30 NO RESEARCH PROMITIES— 1-30 NO	· ITEM	·		35	C11011 3 1	RAJECIORY AND GO	J. JANCE		<u> </u>
A. THE COMMUTED RETROPTER POSITION CHANGES BY GREATER THAN 2.385 LONGITUDE PRIOR TO GET3. 3. THE COMMUTED RETROPTER POSITION CHANGES BY GREATER THAN 2.385 LONGITUDE AFTER GET! -30 MIN. 3. THE COMMUTED RETROPTER POSITION CHANGES BY GREATER THAN 2.385 LONGITUDE AFTER GET! -30 MIN. 3. THE COMMUTED RETROPTER POSITION CHANGES BY GREATER THAN 2.385 LONGITUDE AFTER GET! -30 MIN. 5. THE COMMUTED RETROPTER POSITION CHANGES BY GREATER THAN 2.385 LONGITUDE AFTER GET! -30 MIN. 5. THE COMMUTED RETROPTER POSITION CHANGES BY GREATER THAN 2.385 LONGITUDE AFTER GET! -30 MIN. 5. THE SHALLS AFTER EPO RETROPTER ISMITTION CHANGES BY FIRE MIN. 5. THE SHALLS AFTER EPO RETROPTER ISMITTION CHANGES BY FIRE MIN. 5. THE SHALLS THAN 10 SECOND OF THE SHALL TO TO MIN SEMINATE ALL THRUSTING AT THE TOWN OF THE SHALL TO TO MIN TERMINATE ALL THRUSTING AT THE TOWN OF THE SHALL SHALL THRUSTING AT THE TOWN OF THE SHALL	ITEM!								
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9, THE COMMUTED REPORTED POSITION CHANGES BY SHEATER THAN 2 DEG LONGITUDE AFTER GET1 -30 MIN. 5-26 IF A 36N FAILURE IS DETECTED PRIOR TO RETROPIRE, CREW USES SCS DELTA V MODE WITH AN EMS ENTRY. 5-27 IF SPS FAILS AFTER PRO RETROPIRE (SNITION OR NO SLA SEPH A. DO IS SPEATER THAN TO NM - RETARGET FOR NEXT SEST PTP USING RCS. 3. WO IS LESS THAN TO IS LESS THAN TO - PITCH UP TO LOCAL MORIZONTAL ATTITUDE AND BURN SM NO. 1. SURN MAXIMUM SM RCS DELTA V AVAILABLE 2. BURN WAXIMUM SM RCS DELTA V AVAILABLE 2. BURN WAXIMUM SM DELTA V REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLDRIN 1. SURN DELTA V RISIDUALS. 2. BURN WAXIMUM SM DELTA V AVAILABLE. NOTE THE STIME DOS DUMP CAPABILITY WAY 3E USED TO SHAPE THE ORBIT SECRETORY MAXIMUM SM DELTA V AVAILABLE. NOTE THE STIME DOS DUMP CAPABILITY WAY 3E USED TO SHAPE THE ORBIT SECRETORY MAXIMUM SM DELTA V AVAILABLE. MISSION REV DATE MISSION REV DATE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE MISSION REV DATE SECTION GROUP PAGE	5-25								
IF A JENN FAILURE IS DETECTED PRIOR TO RETROPIRE, CREW USES SCS DELTA V MODE WITH AN EMS ENTRY, 1. 30 IS 34EATER THAN 75 NM - RETARGET FOR NEXT BEST PTP USING RCS. 3. 40 IS 1625 THAN NP IS LESS THAN 79 - PITCH UP TO LOCAL HORIZONTAL ATTITUDE AND BURN SM NC LISTNO FOLLOWING PRIORITIES— 1. 9187 NP TO TO AD VALUE 2. 9187 MAXIMUM SM RCS DELTA V AVAILABLE 3. 9188 CM RCS TO HE * 40 NN F 9M RCS DELTA V NOT SUFFICIENT TO OBTAIN MP * * * * * * * * * * * * * * * * * *			שובם אבוייט	- I AE I	POSITION	CHANGES ST SHEAT	TER THAN U.5 DEG	LONGITU	DE ERIOR 10 GE11 #3
S-27 (F SPS FAILS AFTER EPO RETROFIRE IGNITION OR NO SLA SEPT— A. =0 IS JREATER THAN 13 NM - RETARGET FOR NEXT BEST PTP JSING RCS. 3. =0 IS JREATER THAN 16 IS LESS THAN 17 - PITCH UP TO LOCAL HORIZONTAL ATTITUDE AND BURN SM NO USING POLICY TO ADVANCE 2. BURN MAXIMUM SM RCS DELTA V AVAILABLE 3. BURN CM RCS TO MB - 40 NM (F SM RCS DELTA V NOT SUFFICIENT TO OBTAIN MP - 40 NM IF SM RCS DELTA V REMINATE ALL THRUSTING AT TFF - 7 NOT NOT SUFFICIENT TO OBTAIN MP - 40 NM IF SM RCS DELTA V REMINATE ALL THRUSTING AT TFF - 7 NOT SM RCS DELTA V REMINATE ALL THRUSTING AT TFF - 7 NOT SM RCS DELTA V REMINATE ALL THRUSTING AT TFF - 7 NOT SM RCS DELTA V REMINATE ALL THRUSTING AT TFF - 7 NOT SM RCS DELTA V RCS RETERMINATE ALL THRUSTING AT TFF - 7 NOT SM RCS DELTA V RCS RETERMINATE ALL THRUSTING REMINATE ALL		B. THE COMPL	UTED RETRO	FIRE	POSITION	CHANGES BY GREAT	TER THAN 2 DEG L	ONG I TUDE	AFTER GETI -30 MIN.
D-27 IF SPS FAILS AFTER EPO RETROFIRE IGNITION OR NO SLA SEPT— AD IS SPEATER THAN 73 NM - RETARGET FOR NEXT BEST PTP USING RCS. 3D IS SESS THAN HD IS LESS THAN 75 - PITCH UP TO LOCAL HORIZONTAL ATTITUDE AND BURN SM NO ISSUE TO SERVE AND SURFICIENT TO DETAIN HD = -D IN SEPT OF AN ANXIOUM SM RCS DELTA V AVAILABLE 2. BURN MAXIMUM SM RCS DELTA V AVAILABLE 3. SURN CM RCS TO HD = -AD NALE CHO IS LESS THAN HD NM - REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLDHIN BRITCH STREET AND SERVE AND SURFICIENT TO DETAIN HD = -D IN SEPT OF ANXION SM RCS USING THE FULLDHIN BRITCH SERVE AND SERVE AND SERVE AND SERVE SERVE									
Description of the section of the se									
AD IS JAESTER THAN 15 NW - RETARGET FOR NEXT BEST DIP JSING RCS. 3. 40 IS LESS THAN HO IS LESS THAN 75 - PITCH UP TO LOCAL HORIZONTAL ATTITUDE AND BURN SW RC USING FOLLOWING PRIORITIES 1. 9URN -D TO PAD VALUE 2. 8URN MARIMUM SM RCS DELTA V AVAILABLE 3. 8URN MARIMUM SM RCS DELTA V AVAILABLE 3. 8URN CM RCS TO JM = 40 NM IF SM RCS DELTA V NOT SUFFICIENT TO OBTAIN AP - 40 NM IF IS LESS THAN BE EQUAL TO 40 NM TERMINATE ALL THRUSTING AT TEF - 7 NT. C. HO IS LESS THAN 40 NM - REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLOWIN DELOPITY 1. 9URN DELTA V RISIOUALS. 2. 8URN MARIMUM SM DELTA V AVAILABLE. NOTE THE S-IVE USED TO SHAPE THE CRBIT FOR RETTORY BE USED TO SHAPE THE CRBIT FOR RETTORITE MAREUMEN OR TO TEDUCE THE STAN WARDEN ROT ON THE MAREUMEN ROT OF THE MAREUMEN ROT OF THE MAREUMEN ROT OF THE MAREUMEN ROTE SM RCS DELTA V.	ē-26	IF A GEN FAIL	LURE IS DE	TECTE	O PRIOR 1	O RETROFIRE, CRE	EW USES SCS DELT	A V MODE	WITH AN EMS ENTRY.
A. HD IS INTERTED THAN 75 NW - RETARGET FOR NEXT BEST DIP -SING RCS. 3. 40 IS 465 THAN HD IS LESS THAN 75 - PITCH UP TO LOCAL HORIZONTAL ATTITUDE AND BURN SM RC USING FOLLDWING PRIORITIES 1. 9URN HD TO SAD VALUE 2. 8URN MARIMUM SM RCS DELTA V AVAILABLE 3. 9URN CM RCS TO HD = 40 NM IF SM RCS DELTA V NOT SUFFICIENT TO OBTAIN HD = 40 NV IF HD IS LESS THAN DR EQUAL TO HD NM TERMINATE ALL THRUSTING AT TEF = 7 NVIN. C. HD IS LESS THAN 40 NM - REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLDAIN DRIDGHTY 1. 9URN DELTA V RISIOUALS. 2. 8URN MARIMUM SM DELTA V AVAILABLE. NOTE THE S-IVB USED TO SHAPE THE CRBIT FOR RETORY RANEUVER OR TO REDUCE THE SHOPLY WITH ALL WAS ALBERT TO SECURE WAREVER OR TO RETORY REPORTED TO SHAPE THE ORBIT FOR RETORY RE WAREVER OR TO RETORY REPORTED TO SHAPE THE ORBIT TO SECURE THE SHAPE WAREVER OR TO RETORY REPORTED TO SHAPE THE ORBIT TO SHAPE AND WERE SM RCS DELTA V.									
A IS SHEATER THAN 75 NW - RETARGET FOR NEXT BEST PTP -SING RCS. 3									
B. 40 IS LESS THAN HP IS LESS THAN 75 = PITCH UP TO LOCAL HORIZONTAL ATTITUDE AND BURN SM HC USING FOLLOWING PRIORITIES— 1. SURN HP TO PAD VALUE 2. BURN HAIMUM SM RCS DELTA V AVAILABLE 3. BURN CM ICS TO HP = 40 NM IF SM RCS DELTA V NOT SUFFICIENT TO OBTAIN HP - 40 NM IF JM RCS DELTA V NOT SUFFICIENT TO OBTAIN HP - 40 NM IF JM RCS DELTA V NOT SUFFICIENT TO OBTAIN HP - 40 NM IF JM PIS LESS THAN NO MET REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLOWIN ORIGINATING AT THE SUBJECT OF STANDARD THE CABLITY WAY 3E USED TO SHAPE THE CABLITY WAY 3E USED TO SHAPE THE CABLITY ROR RETROTRE WANELVER ON TO REDUCE THE SHVB MEIGHT TO DETAIN MORE SM RCS DELTA V. MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE APOLLO 11 4/16/69 TRAJECTORY EARTH ORBIT	5-27	IF SPS FAILS	AFTER EPO	RETR	OFIRE IGN	NITION OR NO SLA	SEP		
USING FOLLOWING PRIGRITIES 1. BURN HO TO PAD VALUE 2. BURN VARIMUM SM RCS DELTA V AVAILABLE 3. BURN CM RCS TO HP * 40 NM IF SM RCS DELTA V NOT SUFFICIENT TO OBTAIN HP * * 10 NV IF HP IS LESS THAN OR EQUAL TO 40 NM TERMINATE ALL THRUSTING AT IFF * * 7 NV IV. C. **PO IS LESS THAN 10 NM - REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLDAIN POPULOTIVE** 1. BURN DELTA V RISIDUALS. 2. BURN MAXIMUM SM DELTA V AVAILABLE. NOTE THE S-IVE LOS DUMP CAPABILITY WAY 3E USED TO SHABE THE CABIT FOR RETROTRE WANELVER OR TO DETAIN MORE SM RCS DELTA V. MISSION REV DATE SECTION GROUP APOLLO 11 4/18/69 TRAJECTORY EARTH ORBIT APOLLO 11 4/18/69 TRAJECTORY EARTH ORBIT		A IS 346	EATER THAN	75 N	M - RETAR	RGET FOR NEXT BE	ST PTP USING RCS	i •	
2. BURN CH RCS TO HP = 10 NM IF SM RCS DELTA V NOT SUFFICIENT TO OBTAIN HP = 40 "V F HP IS LESS THAN OR EQUAL TO 40 NM TERMINATE ALL THRUSTING AT TEFF = 7 CH HD IS LESS THAN 0 NM = REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLDAIN PROJECTION OF THE SHORT OF THE SHO		3. 40 IS LES USING FO	SS THAN HP OLLOWING P	IS L RIORI	ESS THAN Ties 	75 - PITCH UP TO	O LOCAL HORIZONT	TITTM JA	UDE AND BURN SM RC
2. SURN CH RCS TO HP = 40 NM IF 3M RCS DELTA V NOT SUFFICIENT TO OBTAIN HP = 40 VIN. C. HE IS LESS THAN 40 NM - REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLDAIN POPULATED AND BURN SM RCS USING THE FULLDAIN SHOULD BURN SM RCS USING THE FULLDAIN POPULATION OF THE S-IVB LOX DUMP CAPABILITY WAY 3E USED TO SHAPE THE OBST OF THE S-IVB LOX DUMP CAPABILITY WAY 3E USED TO SHAPE THE OBST OF THE S-IVB LOX DUMP CAPABILITY WAY 3E USED TO SHAPE THE OBST OF THE S-IVB LOX DELTA V. MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE APOLLO 11 L-VIB/99 TRAJECTORY EARTH ORBIT		1. BURN	HP TO PAD	VALU	ε				
WISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE MASSION REV DATE SECTION GROUP PAGE		2. BURN	MAX:MUM S	M RCS	DELTA V	AVAILABLE			•
C. HD IS LESS THAN WO NM - REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FULLOWING ORIGITY—— 1. BURN DELTA V RISIDUALS. 2. BURN MAXIMUM SM DELTA V AVAILABLE. NOTE THE S-IVB ON DUMP CAPABILITY WAY 22 USED TO SHAPE THE ORBIT CONTROL THE S-IVB WEIGHT TO THE S-		*\ *	IF AP IS	HP = LESS	40 NM II THAN OR	F SM RCS DELTA V Equal to 40 nm to	NOT SUFFICIENT ERMINATE ALL THE	TO OBTAI RUSTING A	N HP = 40 T TFF = <u>7</u>
MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION GROUP PAGE		C. HP IS LES	SS THAN 40	NM -	REMAIN	IN RETRO ATTITU	DE AND BURN S	M RCS	USING THE FOLLOWIN
THE S-IVB LOX DUMP CAPABILITY MAY 3E USED TO SHAPE THE ORBIT FOR RETYDETE MARBUER OR TO REDUCE THE S-IVB WEIGHT TO DETAIN MORE SM RCS DELTA V. MISSION REV DATE SECTION GROUP PAGE APOLLO 11 4/16/69 TRAJECTORY EARTH ORBIT		1. BURN DE	LTA V RISI	DUALS	•				
THE S-IVB LOX DUMP CAPABILITY MAY 3E USED TO SHAME THE ORBIT FOR RETROFTRE WAREVER OR TO REDUCE THE S-IVB WEIGHT TO DBTAIN MORE SM RCS DELTA V. MISSION REV DATE SECTION GROUP PAGE APOLLO 11 4/16/99 TRAJECTORY EARTH ORBIT		2. BURN MA	XIMUM SM D	ELTA	V AVAILA	BLE.			
THE S-IVB _OX DUMP CAPABILITY MAY 3E USED TO SHAME THE ORBIT FOR RETROFTRE WAREVER OR TO PEDUCE THE S-IVB WEIGHT TO DBTAIN MORE SM RCS DELTA V. MISSION REV DATE SECTION GROUP PAGE APOLLO 11 4/16/69 TRAJECTORY EARTH ORBIT									
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APOLLO 11 4/16/69 TRAJECTORY EARTH ORBIT									
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IV LTEM	SECTION 5 TRAJECTORY AND GUIDANCE
9 ! !!!	
5-28	THE GGN IS NO-GO FOR ENTRY IF
	A. THE CMC VALUE OF DOWNRANGE ERROR (RP = RT) AT *2G DIFFERS GREATER THAN +/= 100 NM FR GROUND VALUE OR IS GRATER THAN +/= 130 NM FROM BACKUP CHART VALUE. CREW FAILOVER TO S ENTRY AS FIRST PRIORITY OR GROUND BANK ANGLE AND RETRE AS SECOND PRIORITY.
l	3. V AND GAMMA AT 40CK ARE DUTSIDE THE CORRIDOR. GROUND WILL PROVIDE ENTRY PROFILE.
	ST V AND GAMMA AT 400% ARE SOCIALISE THE CORRESPOND WILL PROVIDE ENTRY PROFILE.
Ì	
5-29	BOOSTER NAVIGATION AND TARGET UPDATES FOR TLI
ĺ	A. THERE WILL BE NO IN TARGET UPDATES FOR EITHER THE OPPORTUNITY.
	3. AN IU NAVIGATION UPDATE WILL BE PERFORMED FOR EITHER TLI OPPORTUNITY WHERE AN S-IVE GUID R FAIL OCCURRED PRIOR TO EARTH-ORBIT INSERTION.
5-30	THE CMC STATE VECTOR WILL BE UPDATED PRIOR TO THE WITH THE BEST MSFN VECTOR.
ŀ	
5-31	A PROPERLY OPERATING SPACECRAFT GGN (CMC, IMU AND OSS) SYSTEM IS MANDATORY FOR THE.
5-32	THE MAXIMUM ALLOWABLE MISALIGNMENT RATES BETWEEN THE IU AND IMU ARE 0.6 DEG/HR (IU) AND 1 DEG/HR (IMU).
5-33	THE S/C L/C RESEMMAT WILL BE USED FOR BOTH TLI OPPORTUNITIES.
l	
5-34	DISPERSED TLI C/O
	A. PREDICTED END OF MISSION FUEL RESERVES (EOMFN) GREATER THAN 500 FPS - CONTINUE MISSION A EXECUTE MCC 20%SISTENT WITH LUNAR ORBIT MISSION. (EOMER INCLUDES TGO. BAP MCC), LD12, PENDEZVOUS RESCUE, AND TEL.)
	B. PREDICTED EDMFR LESS THAN 500 FPS AND
	1. PREDICTED FUEL RESERVES AFTER TGD. BAP MCC1. LOI1. LOI2. AND TEI (NO
	RENDEZVOUS RESCUE) GREATER THAN 300 FPS - CONTINUE MISSION. EXECUTE MCC CONSISTENT WITH LUNAR ORBIT MISSION. (DPS LOI MAY BE CONSIDERED TO IMPROVE SPS DELTA V CAPABILITY.)
	2. PREDICTED FUEL RESERVES AFTER TGD, BAP MCC1, LGI1 (DPS), LGI2, AND TELL (NG RENDEZVOUS RESCUE LESS) LESS THAN 500 FPS, AND——
	(A) EOMFR AFTER LUNAR FLYBY (CSM AND LM) GREATER THAN <u>5500</u> FPS (CSM ONLY). EXECUTE M FOR FLYBY MISSION.
	(8) EOMFR AFTER LUNAR FLYBY LESS THAN <u>5500</u> FPS. EXECUTE ALTERNATE MISSION CONSISTE WITH FINAL MISSION PLANNING.
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MISSION

APOLLO 11

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SECTION

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GROUP

EARTH ORBIT

PAGE

5-5

MISSION RULES

	ITEM	SECTION 5 TRAJECTORY AND GUIDANCE
3	ITEM!	
	5-35	DIFFERENCE IN CMC AND IN PLATFORM VELOCITY COMPONENTS OR TOTAL VELOCITY AT INSERTION
		A. VICLATION OF ANY OF THE FOLLOWING MEANS TLI IS NO-GO
		DELTA XOOT IS GREATER THAN 35 FPS
		DELTA YOUT IS GREATER THAN 66 FPS
		DELTA ZDOT IS GREATER THAN 87 FPS
		DELTA VT IS GREATER THAN 33 FPS
		9. VIOLATION OF ANY OF THE FOLLOWING MEANS THE IS TEMPORARILY NO-GO
		7.4 IS LESS THAN DELTA XDOT LESS THAN 35 FPS
		45 IS LESS THAN DELTA YDOT LESS THAN 66 FPS
		27 LESS THAN DELTA ZOCT LESS THAN 87 FPS
		13 IS LESS THAN DELTA VT IS LESS THAN 33 FPS
		NOTE
		TLI IS NO-GO UNTIL PARTS C AND 5-36 ARE DETERMINED (CRBITAL PARAMETER DECISIONS).
		C. VICLATION OF ANY OF THE FOLLOWING ORBITAL DECISION PARAMETERS AT GET = 1 HR 45 MIN MEANS THE IS NO-GO. PARAMETERS ARE IN VERSUS MSFN.
		DELTA ALPHA IS GREATER THAN 19.300 FT
		DELTA OMEGA MAX IS GREATER THAN 32 FPS
	5-36	DIFFERENCE IN MSFN AND IN DOWNRANGE POSITION (DELTA RV) IS GREATER THAN 105+000 FT AT GET # 5.
		MIN MEANS THE IS NO-GO.
		RULES 5-37 THROUGH 5-45 ARE RESERVED.
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		MISSION REV DATE SECTION GROUP PAGE
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REV ITEM

P	ITEM!										
	5-46					NO-GO FOR MANEL	JVER CONTROL FO	R ANY OF	THE FOLLO	·ING	
		A. COMPUTER P									
						FOR MANEUVER EXE					•
		1. SEXTAN	NT STAR COLOR OF VIS	-ECK-	F SXT.	OPTICS POSITION	ING DOES NOT PL	ACE SELEC	TED STAR	IN .	
		Z. HORIZO	ON CHECK I	ERROH	IS GREA	TER THAN 4 DEG F	FOR RETROFIRE F	ROM EPO.			
		C. LGC/IMU COORDINAT	ALIGNMEN	7 01	SCREPANC	Y INDICATE BY	GREATER THAN	2 DEG	FROM PRE	EDICTED COA	ıs
		0. DIFFERENCE	E BETWEEN	CMC/	LGC GROU	IND NAV CHECK AFT	TER A NAV UPDAT	E FROM GR	OUND IS		
		l. PHI IS GR	REATER TH	4N .	2 DEG.						
		2. LAMBDA IS	S GREATER	THAN	.02 DEG	i•					
		3. H IS GREA	ATER THAN	• <u>2</u> ^	IM .						
	5-47	MODE III. MODE Aftitude excur	E IV. APO	GEE K Grea	LICK. OR LICK THAN	EPO RETROFIRE V	WILL BE COMPL DEG.	ETED BY	MANUAL	TAKEOVER FO	la l
	5-48	CRITICAL MANE FOLLOWING	EUVERS WI	LL BE	COMPLET	ED BY SCS (MTVC	OR AUTO) OR A	GS TAKEC	VER FOR	ANY OF TH	•E
		A. ATTITUDE E	EXCURSION	s GRE	ATER THA	N OR EQUAL TO 10	DEG.				1
		B. ATTITUDE R	RATES GRE	ATER	THAN OR	EQUAL TO 10 DEG	SEC.				
		C. ATTITUDE E	ERRORS GR	EATER	THAN OR	EQUAL TO 10 DEC	3.				
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		 ^F	POLLO 10	r NL	4/14/69	TRAJECTORY AND GUIDANCE	MANEUVERS	5-7			

REV ITEM

AND Z-AXIS RESIDUALS WILL NOT BE TRIMMED.			APOLLO 10	FNL	4/14/69	TRAJECTORY	MANEU	VERS	5-8	-	
A. ATTITUDE EXCURSIONS IS GREATER THAN OR EQUAL TO 10 DEG. 8. ATTITUDE RATES IS GREATER THAN OR EQUAL TO 10 DEG/SEC. C. ATTITUDE ERRORS IS GREATER THAN OR EQUAL 10 DEG. 5-90 3-			MISSION	REV	DATE	SECTION	GROUP		PAGE		
A. ATTITUDE EXCURSIONS IS GREATER THAN OR EQUAL TO 10 DEG. B. ATTITUDE RATES IS GREATER THAN OR EQUAL TO 10 DEG/SEC. C. ATTITUDE ERRORS IS GREATER THAN OR EQUAL 10 DEG. 5-50 JENERALLY, THE POLLOWING MANEUVER RESIDUAL TRIMMING CRITERIA WILL APPLY—— A. DOCKED SPS - TRIMMED TO 1 FPS IN X-AXIS ONLY (MCC, MCC1, MCC2, AND LO11 ARE NOT TRIMMED). B. DOCKED DPS WILL NOT BE TRIMMED. C. ALL UNDOCKED MANEUVERS (BY EITHER VEHICLE) WILL BE TRIMMED TO WITHIN 0.2 FPS IN A-AXIS. AND Z-AXIS RESIDUALS WILL NOT BE TRIMMED. 5-51 THE FOLLOWING MANEUVERS WILL BE MANUALLY TERMINATED AFTER VIOLATION OF THESE CVERBURCHITERIA—— A. TLI - 6 SEC 3. LO11 - 10 SEC 1. SPS - 10 SEC 2. DPS 190 SEC C. LO12 - 1 SEC D. DOI-2 SEC AND DELTA V GREATER THAN 2 FPS E. TEI 1. SPS - 2 SEC AND DELTA V GREATER THAN 40 FPS 2. DPS - 10 SEC AND DELTA V GREATER THAN 2 FPS PULES 5-52 THROUGH 5-55											
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5-56	MIDCOURSE CORRECTION NOMINAL EXECUTION POINTS WILL BE AT THE FOLLOWING
	A. TLI C/O +9 HRS (EARLIEST PLANNED MCC AT TLI C/O +4 HRS).
	8. TLI C/O +25 HRS.
	C. LOI -22 HRS.
	0. LOI1 -5 HRS.
5=57	TRANSLUNAR MCC EXECUTION CRITERIA
	A. VCC1 AND MCC2 WILL NOT BE EXECUTED AS LONG AS MCC3 REMAINS LESS THAN 25 EPS.
	NOTE MCC3 DELTA V IS GREATER THAN 3 EPS ENABLES UTILIZATION OF SPS.
	8. MCC3 WILL BE EXECUTED ONLY IF LOI: CANNOT BE TARGETED (WITHIN ALTITUDE AND APSIDAL SHIF CONSTRAINTS) TO CORRECT THE TLC DISPERSIONS.
	C. MCC4 WILL BE EXECUTED ONLY IF LOIT CANNOT BE TANGETED (WITHIN ALTITUDE CONSTRAINTS) TO CORRECT MCC3 DISPERSIONS.
5-58	THE GGN WILL BE THE PRIMARY MODE OF EXECUTING TRANSLUNAR MCC.
5-59	THE RESIDUALS OF MCC3 WILL BE TRIMMED TO 0.5 FPS IN ALL AXES. IF MCC4 IS EXECUTED. THE X-AXII RESIDUAL WILL BE TRIMMED TO WITHIN 1.0 FPS.
5=60	LOI SHALL BE TARGETED WITHIN THESE CONSTRAINTS
	A. 50 LESS THAN HP LESS THAN 60 (LUNAR PARKING ORBIT).
	B. THE PERICYNTHION OF THE APPROACH HYPERBOLA WILL BE MAINTAINED WITHIN 50 AND 70 N.M.
	C. THE ALTITUDE OF THE NODE (BETWEEN THE APPROACH HYPERBULA AND THE DESIMED LPG) WILL BE MAINTAINED BETWEEN 50 AND 75 N.M.
5-61	A ''GO'' FOR LOI REGUIRES THE FOLLOWING
	A. COMMITMENT TO LEAST 4 HRS IN LPO - (PROVIDES ONE REV OF TRACK AFTER LOI1 FOR CALCULATION O TEI).
	B. ADEQUATE FUEL REMAINING FOR SUBSEQUENT LUNAR ORBIT OPERATIONS (MINIMUM WOULD BE LC12 AN TEI).
	C. HP IS GREATER THAN 50 NM.
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REY ITEM SECTION 5 TRAJECTORY AND GUIDANCE

3	' ITEM									
	5-62		LCI SHUTDO							
		A. DELTA DIRECT	VM LESS TH	AN 73	5 FPS (1	00 SEC) - EXECUT	E AN SPS 15 MIN	DIRECT ABOR	RT OR A JE	5 2
		8 • 735 LE CR A D	SS THAN DE	LTA V ULSE	M LESS T CIRCUMLU	HAN 1280 (130 TO NAR ABORT.	: 170 SEC) - EXE	CUTE AN SPS	15 MIN DIRE	CT Ağukt
		C. DELTA DPS) A	VM GREATER T NEXT PER	THAN ICYNT	1280 FP HIAN CR	S (GREATER THAN INITIATE AN ALTE	170 SEC TO END	OF BURN) - S	XECUTE TEL	(595 JA
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	5-63		PS FAILS A							
		A. MCC - R	ESCHEDULE	MCC F	OR FLYBY	TRAJECTORY WITH	DPS/SM-RCS EXE	CUTION.		İ
		8. LOI1 -	EXECUTE MC	C5 AB	ORT MANE	UVER WITH DPS/SM	-RCS.			
		C. LOIZ -	EXECUTE GR	פויטס	COMPUTED	TEL WITH OPS AS	SOON AS PRACTI	CAL.		
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UNDOCKING TO CORRECT DISPERSIONS.										
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5-81 00100 to whose transfer	5-81					LOWABLE MISS DIS MANEUVERS WILL A	TANCE OVER T	HE LLS IS O	.5 DEG OUT OF	ا يونون

MISSION RULES

SECTION 5 TRAJECTORY AND GUIDANCE 1754 ' ITEM POWERED DESCENT WILL BE TERMINATED FOR VIOLATION OF THE FOLLOWING LR CONSTRAINTS---5-89 A. FAILURE TO INCORPORATE LANDING RADAR ALTITUDE DATA BEFORE LM ALTITUDE EQUALS 13.000 FT. NOTE NOTE

LA WILL NOT BE INCORPORATED IF THE PGNS/LA

ALTITUDE DIFFERENCE IS GREATER THAN THE

PREMISSION SPECIFIED LIMIT (LIMIT IS A

FUNCTION OF ALTITUDE CARRIED AS CREW CHART.) B. LR FAILURE AFTER INCORPORATION AND PRIOR TO CONVERGENCE. 5-90 POWERED DESCENT WILL BE TERMINATED FOR---4. VIOLATION OF APS ABORT BOUNDARY. B. FAILURE TO ENTER A64 AMEN TO EQUALS 60 SEC. C. PSNS NAVIGATION ERRORS WHICH MESULT IN AGS-PGNS VELOCITY DIFFERENCES THAT VIOLATE THE PGNS FAILURE LIMITS. D. PSNS NAVIGATION ERPORS WHICH RESULT IN MSEM-PONS VELOCITY DIFFERENCES THAT VIOLATE THE MISNS FAILURE LIMITS. NOTE
RULES C AND D ARE VALID DNLY PRIOR TO
LANDING RADAR VELOCITY INCORPORATIONS.
FOR RULE C: SWITCHOVER TO AGS WILL BE PERFORMED. THERE ARE NO TRAJECTURY OR GUIDANCE CONSTRAINTS AMICH ARE CAUSE FOR ABORT AFTER CHEM TAKEUVER OF POMERED DESCENT. 5-41 MISSION REV DATE SECTION GROUP PAGE TRAJECTORY AND APOLLO 11 /16/69 DESCENT

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MISSION RULES

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		VARIA	BLE TAR	GET3.	. 3 E	SEZVOUS	ER TOUCHOOWN) WIN WILL BE ACCUMPL /4 HOURS FROM INS	T INSEK! INIC				
	٥.	ABORTS	DURING	3 -0 m F	FRED :	DESCENT	FROM BOT -10 WT		4€ F[RST L⊔	NAR SURFA	ACE GOZN	O=-
							FROM POI TO POI GG. THE LM WILL : 74 HOURS FROM IN		#ILL INSERT Endezvous us	INTO LUNAR	R CABIT J Fa Jesué	S:
	!	-5.7.	JUCK!	13 1.1	*800	1 3-1/4	HOURS.					
	8.	FOR FA	ILURES	FROM	001	+ <u>13</u> TO F	PDI EXECUTE THE	OOI ABORT SEW	UENCE IROWER	*I) DE:C:	A.T	
						RR FAIL	L - FIVE IMPULSE	RENDEZVOUS.				
						AGS FAI	IL - DIRECT RETU	RN.				
							AIL - DIRECT RET					
						CCMPARE	ING DOI: THE PGN ED: IN CASE OF D E USED FOR SYSTE	ISAGREEMENT. 1	THE DD			
							NOTE					
							O BE INHIBITED. FOR THESE ABORT		S CAN BE PER	RECKMED UN	TIL DUI	•
	۵.	001 FA	ILURES.	01	RECT	RETURN	ABORTS WILL HE P	ERFORMED WHEN	EVER POSSIBL	E FOR F	AILURÉ A	an i i
5-9	2 TH	FOLLO	ING REI	NDEZV ATION	OUS C	PTIONS/	RESCUE MODES W	ILL BE OTIL	IZED AS NE	ECESSARY	FOR FAIL	_UA:

NASA - Manned Spacecraft Center MISSION RULES

								SLIP IN NOMINAL LIFTUFF TIME
				•				
5-:								D AGS WILL BE PERFORMED FOR -
	1					S (SEE RULES 5-4	6A AND TBD).	
	э.		VIGATION ER					
						ON LESS THAN 370		
						ON GREATER THAN T INSERTION GREA		
					-11000	THE THE SERVICE SEE	12K 1HAN 1107 DE	.G∙
5-1	103 THE	GROUND	WILL NOT RE	QUEST	SWITCHO	VER AFTER TGO LE	SS THAN 30 SECO	ONDS•
RULES	5-104 T	HROUGH						
5-110	ARE RES	ERVED.						
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MISSION RULES

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	ARE RESERVED.								
	RULES 5-116 TH	ROUGH 5-	120						
					THIS INCLUDES	NOMINAL MANEUVERS.			
					NOTE				
5-115	ALL MANEUVERS	all 8t	NULL	ED ALONG	THE X-AXIS. Y	AND Z RESIDUALS	WILL NOT	DE THIMMED.	
				UNL	ESS REQUESTED.				
				CDH PAS	AND TPI BUT W S THESE MANEUVE	ILL NOT			
				GRO	NOTE UND WILL COMPUT.	F CSI.			
3-114	THE GROUND WIT	LL BE RES	SPONS	IBLE FOR	ANY MANEUVERS	PRIOR TO CSI.			
5-11/	THE COOLING								
	C. THE DELTA								
					I IS +/ - <u>15</u> MIN	FROM MOD.			
- •••	A. PENDEZYOU					HE FOLLOWING CO	NSTRAINTS-		
5-113	95N057V0+6 B	AA.C. CA.							
								100 F-3.	
5-112	THE ORDER OF	PRIORITY ION WILL	FOR	THE TPI	SOLUTION IS PGN	CS. LM ONBOARD OM THE CSM BY G	CHARTS. (ISM. AND GRO	unD.
							•		
	THAN 2 F	PS. THE	CSM S	SOLUTION	WILL BE USED IN	STEAD.		302011011 31	un : A
	B. THE ONBOA	RD SOLUT	ION C	OF COM WI	LL NOT BE HEED	TE DIESEBENT SO			
	A. THE ONBOA	RD SOLUT	ION C	F CSI WI	LL NOT BE USED BE USED INSTEAD	IF DIFFERENT FR	OM THE CS	Y SOLUTION GRE	ATER '
	THE ACCEPTED	SOLUTION			MANEUVER COMPL		M MILIT AG	S AS BACKUP	

RIV ITEM

ITEN								
1	1 .							
5-123	TRANSEARTH	MCC WILL BE	E TAR	GETED TO	ACHIEVE ENTRY CO	NDITIONS AS FO	LLO#S	
	1				USE STEEP TARGET			
	8. IF VEI	LESS THAN	30000	FP5 4ND	GEN GO. USE SHAL	LOW TARGET LINE	E.	
5-122	TRANSEART	TH MCC PHILE	OSCPH	Υ.				
	A. TEC	MCC WILL NO	USE	LANDING	POINT CONTROL UN	LESS THE LANDIN	NG POINT IS UN	ACCEPTABLE.
	1				NTRY CORRIDOR. EX			
	C. THE L	LAST MCC WIL	L 8E	SCHEDUL	ED NO LATER THAN	E:-3 HOURS.		
	D. THE G	SON WILL BE	THE 9	PRIMARY	MODE OF EXECUTION	FUR ALL TEC MO	:c.	
					USE THE SPS IF P			
	F. THE 9	RESIDUALS FO	OR MC	C'S WILL	BE TRIMMED TO WI	THIN 0.2 FPS IN	EACH AXIS.	
								•
5-123	1	FOR LANDING						
	A. PRIOR AT IP.	TO EI-24 HR	PART	FILL BE	EXECUTED FUR RECO	VERY ACCESS VIO	DLATIONS . UNAC	SEPTABLE ASATHS
	1	R EI-24 HRS-						
					•		•	
5-124	ENTRY CON	OITIONS wil	a E	CONTROL	LED TO AVOID HEAT	SHIELD LIMITAT	'IONS.	
						•		
İ								
5-125	BACKUP EN	ITRY IS CONS	MIART	NED AS FO	OLLOWS			• . 1
	A. THE C	CONSTANT G E	NTRY	MUST FAL	L BETAEEN 3 AND	5 G'S.		
	9. EMS R	ANGING WILL	. NOT	BE ATTE	PTED UNTIL V IS	LESS THAN 25500	FPS.	
							r 1	
5-126	WEATHER A	ANDIDANCE MI	TH AE	ESS THAN	C LIFT WILL NOT . N 25500 FPS.	BE ATTEMPTED UN	LESS THE GGN	S OPERATINAL. O
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MISSION RULES

SECTION 5 TRAJECTORY AND GUIDANCE

5-127	PREDICTE	O ENTRY COM	91009	VICLATI	ON AETER TO	E LAST MCC OPPO	0.5		
						E LAST MCC OPPO SE CREW TO FLY			
	THEN	FLY GGN.	- * *	560	GROUND ADVI	SE CREW TO FLY	FULL LIFT UNTI	- PEAK G	IS PASSED.
	B. OVER CONST	SHOOT LINE ANT ENTRY.	EXCEED	EDGR	OUND ADVISE	CREW TO FLY NE	GATIVE LIFT TO	2 G'S FOL	rowed av # 3
5-128	IF THE E	MS INDICATE ROSS CHECKS	S A SK	IP COND	ITION. NEGA	TIVE LIFT SHOUL	D BE ACHIEVED F	PRIOR TO V	EMIFYING THE
5-129	IF THE E VERIFYING	MS INDICATE	S AN U	NDERSHO S CHECK	OT CONDITIO	N EXISTS. FULL	LIFT SHOULD BE	ACHIEVE	OT ROINE C
5-13C	THE GEN	is No+GC DU£	RING E	VTRY IF					
	A. P65	VALUE OF VL	DIFFE	RS FROM	THE GROUND	VALUE BY GREATE	ER THAN +/- 800	FPS.	
	8. P65	VALUE OF DE	DIFFE	RS FROM	THE GROUND	BY GREATER THAT	+/- <u>C.6</u> G'S.		
·	C. CAUSE	ES TRAJECTOR	RY TO	VIOLATE	THE OFFSET	LIMITS (SKIP)	ON EMS SCRULL.		
	D. CAUSE	ES TRAJECTOR	י פד א	VIOLATE	THE ONSET	LIMITS (G) ON E	45 SCROLL.		₩ #
	E. IF THAN	HE GGN TRIM	ATTITE	JDES AT	CM/SM SEP	DIFFER FROM THE	HURIZON MONITO	CUTITTA R	E BY GREATER
	F. IF T	HE GGN TRIM	ATTIT	UDES AT	.05 G DIFF	ERS FROM THE GRO	DUND VALUES BY	GREATER T	HAN 5 DEG.
	G. IF T	HE CYC FAILS	to s	EGUENCE	FRCM 963 T	0 964 AT RET .05	G +/- 5 SEC.		
							• •	<i>*</i>	
1 1									

TRAJECTORY AND

APOLLO 11

TRANSEARTH ENTRY

5 SLV - TB1 THROUG TB4/TB4A (LAUNG)

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	e version de la company

MISSION RULES SECTION 6 - SLV - TBI THROUGH TB4/TB4A

PLV ITEM

ITEM			_	
		SUMMARY OF LAUNCH PHASE RULES		
	6-1	S-IC LOSS OF THRUST		
	6-2	LOSS OF ATTITUDE CONTROL		
	6-3	INERTIAL PLATFORM FAILURE - ACCELEROMETERR		
	6-4	SLV INERTIAL PLATFORM FAILURE		
	6-7	S-II LOSS OF THRUST		
	6-8	S-II GIMBAL SYSTEM FAILURE - ACTUATOR INBOARD		
		S-II SECOND PLANE SEPERATION FAILS		
		S-IVB LOSS OF HYDRAULIC FLUID		
	6-11	S-IV9 LOSS OF THRUST		
	•ue ea	N. OVING MISSION ON TO A SOLIDAY TO THE SOLIDAY TON		
	NONE	DELOWING MISSION RULES ALSO APPLY TO THIS SECTION		
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SECTION 5 - SLV - TBI THROUGH TB4/TB4A ITEM ' BSE GENERAL RULES ' A. BSE GENERALIZED SWITCH SELECTOR COMMAND CAPABILITY EXISTS---1. WHEN CREW ENABLES IU COMMAND SYSTEM (EXCEPT AS NOTED BELOW IN ITEM D) 2. AFTER TB7 + 20 MIN. B. BSE MANEUVER UPDATE AND INHIBIT CAPABILITY FOR TB7 MANEUVERS ONLY. C. BSE HAS NAVIGATION UPDATE CAPABILITY. D. BSE HAS NO COMMAND CAPABILITY DURING POWERED BURN PHASES. E. A SAFE DISTANCE BETWEEN THE SPACECRAFT AND S-IVB/IU IS DEFINED AS 7000 FT. F. BSE WILL RECOMMEND NO SHIVE RESTART FOR ANY CONFIRMED MALFUNCTION IN THE LAUNCH VEHICLE AHICH RESULTS IN---1. A CATASTROPHIC HAZARD 2. INSUFFICIENT CONSUMABLES TO ASSURE A 1 SIGMA PROBABILITY OF GUIDANCE CUTOFF. 3. ANY CONDITION/MALFUNCTION(S) FOR WHICH A NOMIMAL THE CUTOFF WILL DEFINITELY NOT BE ACHIEVED. CONDITIONS LEADING ONLY TO A FAILURE TO RESTART WILL NOT BE CONSIDERED. G. IN THE EVENT OF NO SHIVB IGNITION AT RESTART OR AN EARLY SHIVB SECOND BURN CUTUME, THE SPACECRAFT SHOULD REMAIN ATTACHED TO THE SHIVB/IU AND MONITOR THE AND LOX JULIAGE MASSURES UNTIL THE STAGE STATUS CAN BE ASSESSED BY GROUND. IF EMERGENCY SEMARATION IS KEDURED IMMEDIATELY AFTER SHIVB CUTOFF, THE SPACECRAFT SHOULD IMMEDIATELY GO TO A SAFE DISTANCE (7000 FT) FROM THE S-IVB/IU. H. ABORT DURING LAUNCH PHASE WILL BE RECOMMENDED FOR THE FULLWING---6-1 SHIC LOSS OF THRUST 6-7 S-I: LOSS OF THRUST 6-8 S-11 GIMBAL SYSTEM FAILURE ANY SINGLE ACTUATOR HARDOVER (INBOARD) 6-9 S-II SECOND PLANE SEPARATION FAILS TO OCCUR AT 183 + 31 SEC 6-10 S-IVB LOSS OF ENGINE HYDRAULIC FLUID PRIOR TO FIRST S-IVB BURN 6-11 S-IVB STAGE LOSS OF THRUST I. SPACECRAFT GUIDANCE TAKEOVER WILL BE RECOMMENDED FOR THE FOLLOWING---6-4 LAUNCH VEHICLE INERTIAL PLATFORM FAILURE-ATTITUDE REFERENCE 7-8 LOSS OF ATTITUDE CONTROL (DURING COAST PERIOD) 185. 187 J. S-II/S-IVB EARLY STAGING WILL BE RECOMMENDED FOR THE FULLOWING---6-7 S-II LOSS OF THRUST

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SECTION 6 - SLV - TBI THROUGH T84/T84A

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5-1	S-IC STAGE LOSS OF	LAUNCH	'A. CONTINUE MISSION	AGB. CUES
	THRUST A. ANY SINGLE	•		1. THRUST OK SWITCHES - S
	ENGINE PRIOR TO TB3		THE THEORY FLICHT AND	(K33-115 THROUGH K47-115)
		•	BSE INFORM FLIGHT AND	
	B. ANY TWO OR MORE	•	B. CONTINUE MISSION	2. THRUST CHAMBER PRESSURE LE
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	·	-	THE INFORM FLIGHT.	08-105).
	1. PRIOR TO DEACTIVATION	•	1. ABORT 95E INFORM FLIGHT AND TRANSMIT ABORT REQUEST.	3. LONGITUDINAL ACCELERATION ZERO (A2=603).
	OF TWO ENGINES	5 (AND TRANSMIT ABORT	
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	2. AFTER DEACTIVATION	i	' Z. CONTINUE MISSION ' BSE INFORM FLIGHT '	4. FINAL THRUST OX CUTOFF - (K52-115 THROUGH K56-115). AGB. NGTE
	OF TWO ENGINES	5 <u>1</u>	AND FIDO. CAPCOM !	AAR. ACTE
		1	OF POTENTIAL OVERRATE CONDITIONAL	
		1		CREW MAY DEACTIVATE AUTOMAT ABORT AFTER TBL + 120 SEC.
	ENGINE 3 OF L	t	C. CONTINUE MISSION	** ****
	ENGINE 3 OR 4	•	BSE INFORM FLIGHT AND FIDO. FLIGHT INFORM RSO.	1. THRUST CHAMBER PRESSURE LE
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	OF ENGINE 3 OR 4	•	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2. ENGINE 3 OR ENGINE 4 THRO OK SWITCHES OFF (X39-115. THRO
	BETWEEN O TO 45	•	•	K44-1151.
		•		3. ENGINE 3 OR 4 FINAL THRUST CUTOFF (K54-115. K55-115).
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SECTION 6 - SLV - TBI THROUGH T84/T84A

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		•				SEE NOTE A.2/.
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	A. S-IC BURN		'A• L	AUNCH VEHICLE ABO	RT ' (R4-602	R13-602) OR YAW (R5-60) GREATER THAN 2 DEG/ SEC A: SECREASING. ROLL (26-602)
	CONTROL	1	1		1.	ANGULAR RATES - 3:11
		' L AUNIC ₩	,		1 A.	CUES
6-2	LOSS OF ATTITUDE					

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SECTION 6 - SLV - TB1 THROUGH T84/T84A

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B. S-II BURN LAUNCH BSE INFORM FUIGHT AND FIDD. CAPCEM INFORM REBW OF LOSS OF ATTITUDE CONTROL. CREW WILL ABORT ON LIVITS LIVIDE B.11. B. CUES 1. ANGULAR RATES - DITC (14-002, RIS-902), YAW WEST-SUE REATER THAN 3 DEW/SEC AND NO DECREASING. 2. PLATFORM GIMBAL ANCES PITCH, YAW OR RELW (-50-0-02 CARADING THE RATES SIZEN IN CONTROL ALERT ISEE NOTE B.21. B. NUTES 1. CREW ABORT LIMITS 1A3 DITCH AND YAW ARTS - LOSS WINLS ID DEG/SEC 2. LOSS OF ATTITUDE CONTROL ALERT FILL BE SIZEN CREW FREE CONTROL ALERT FILL BE SIZEN CREW FREE CONTROL ALERT FILL BE SIZEN CREW FREE CONTROL ALERT FILL BE SIZEN CREW FREE CONTROL ALERT FILL BE SIZEN CREW FREE CONTROL ALERT FILL BE SIZEN CREW FREE CONTROL ALERT FILL BE SIZEN CREW FREE CONTROL ALERT FILL BE SIZEN CREW FREE CONTROL C. S-IVB BURN LAUNCH C. LAUNCH VEHICLE ABORT AND FIDO CAPCOM INFORM FILIGHT AND FIDO CAPCOM INFORM FILIGHT AND FIDO CAPCOM INFORM CREW CREW FREE THAN 3 DEG.SEC AND NO DECREASING RACES AND NO DECREASING RACES AND NO DECREASING RACES AND NO DECREASING RACES AND NO DECREASING RACES AND NO DECREASING RACES FREE THAN 5 DEG.SEC AND NO DECREASING RA			•			LIMITS	, , ,	PITCH+ YAW+ OR ROLL (H60-6) Changing at the rates given in
B. S-II BURN LAUNCH B. LAUNCH VEHICLE ABORT AND FIDO. CAPCOM INFORM CREW OF LOSS OF ATTITUDE CONTROL. CREW WILL ABORT ON LIMITS (NOTE B-1). CREW AGLIA BORT IN LIMITS COST OF ATTITUDE CONTROL. CREW AGLIA BORT ON LIMITS COST OF ATTITUDE CONTROL B. LOSS OF ATTITUDE CONTROL ALBERT THAN 9 DEUTSEC IND NO DECREASING. 2. PLATFORM GIMBAL ANCIES PITCH, VAM OR RCLL 1-50-602 CHANGING AT THE RATES SIVEN IN CO B-11 3. LOSS OF ATTITUDE CONTRO ALERT ISSE NOTE B-21. B. NOTES—— 1. CREW ABORT LIMITS—— 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE C. CUES—— 3. LOSS OF ATTITUDE CONTRO ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 2. LOSS OF ATTITUDE CONTROL 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 2. LOSS OF ATTITUDE CONTROL 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 2. LOSS OF ATTITUDE CONTROL 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 2. LOSS OF ATTITUDE CONTROL 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 2. LOSS OF ATTITUDE CONTROL 1. AMGULAR RATES — 2:17 ABOUTE SEGUENCE 2. LOSS OF ATTITUDE CONTROL 3. COST OF AMGULAR PACES 3. COST OF AMGULAR PACES 3. COST OF AMGULAR PACES 4. COST OF			· · · · · · · · · · · · · · · · · · ·		1	CONTROL.	•	SHEATER THAN 5 DEGISEC AND
B. S-II BURN LAUNCH B. LAUNCH VEHICLE ABORT BSE INFORM FIGHT AND FIDD. CAPCOM INDOM CREW GA-DOD. CAPCOM INDOM CREW GA-DOD. CAPCOM INDOM CREW GA-DOD. CAPCOM INDOM CREW GA-DOD. GA-DOD. CAPCOM GARDON GAEATER THAN 3 DEUTSCE AND NO DECREASING. GAEATER THAN 3 DEUTSCE AND NO DECREASING. GARGING AT THE RATES GIVEN IN CO. GARGING AT THE RATES GIVEN IN CO. GARGING AT THE RATES GIVEN IN CO. GARGING AT THE RATES GIVEN IN CO. GARGING AT THE RATE GIVEN IN CO. GARGING AT THE RATE GIVEN IN CO. GARGING AT THE RATE GIVEN IN CO. GARGING AT THE RATE GIVEN IN CO. GARGING AT THE RATE GIVEN IN CO. GARGING AT THE RATE GIVEN IN CO. GARGING AT THE RATE GIVEN IN CO. GARGING AND CO. GARGING AT THE RATE GIVEN IN CO. GARGING AND					;	AND FIDO. CAPCOM INFORM C	REW !	1. ANGULAR RATES - 2: (R4-602, R13-602), YAW (95-6
B. S-II BURN CAUNCH '9. LAUNCH VEHICLE ABORT S. CUCS SSE INFORM FLIGHT 1. ANGULAR RATES SITE OF TOOL OF IDO. (RA-502, R13-502), "AW (RS-502) OF LOSS OF ATTITUDE (RA-502, R13-502), "AW (RS-502) OF LOSS OF ATTITUDE (RS-502), DR ROLL (RS-602, R13-502), R13-502, AND DECREASING. CAREW HILL ABORT ON LIMITS PROPER THAN 3 DECREASING. PITCH ANGULAR THE RATES GIVEN IN COMMING AT THE RATES GIVEN IN COMMING AT THE RATES GIVEN IN COMMING AT THE RATES GIVEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE RATE SIZEN IN COMMING AT THE SIZEN IN COMMING A		C. S-IVB BUR	N 1	.AUNCH	.; •c. L		RT !	5 DEG
B. S-II BURN LAUNCH SE LAUNCH VEHICLE ABORT SE INFORM FLIGHT AND FIDO. CAPCOM INFORM CREW OF LOSS OF ATTITUDE CONTROL CREW WILL ABORT ON LIMITS (NOTE 8-1). 3. LOSS OF ATTITUDE CONTROL REAL SE NOTE SELL. 3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE 8-2). 3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE 8-2). 3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE 8-2). 3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE 8-2). 3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE 8-2). 4. DITCH AND YALL MATE FLUS CONTROL ALERT (SEE NOTE 8-2). 4. LOSS OF ATTITUDE CONTROL ALERT HILL BE GIVEN FUR THE FULLOR ALERT WILL			•		1		•	(D): SHIVB ENGINE ACTUA
B. S-II BURN LAUNCH B. LAUNCH VEHICLE ABORT BEE INFORM FLIGHT AND FIDO. CAPCOM INFORM CREW OF LOSS OF ATTITUDE BROWN OF LOSS OF ATTITUDE GONTROL. CONTROL. CREW WILL ABORT ON LIMITS (NOTE B.1). 1. ANGULAR RATES - DITTOR (RA-602, Rij=02), VAW (RS-602) GREATER THAN DEGISER AND NO DECREASING. 2. PLATFORM GIMBAL ANGLES PITCH, VAM OR ROLL (-60-603) CHANGING AT THE RATES GIVEN IN CUB. B.1. 3. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE B.2). B. NUTES 1. GREA ABORT LIMITS 1. GREA ABORT LIMITS 1. GREA ABORT LIMITS (A) DITCH AND VAW MATE -LUB VINUS 10 DEGISEC 2. LOSS OF ATTITUDE CONTROL ALERT WILL BE SIVEN FOR THE FULLOR ING CONDITIONS (A) LYDG/LVDA COMPUTATIONA FAILURE 1. ANGULAR RATES - DITTOR RA-602, Rij=02), VAW (RS-60-1) RA-602, RIJ=02), VAW (RS-60-1) RA-602, RIJ=02), VAW (RS-60-1) RA-602, RIJ=02), VAW (RS-60-1) RA-602, RIJ=02), VAW (RS-60-1) RA-602, RIJ=02), VAW (RS-60-1) RA-602, RIJ=02), VAW (RS-60-1) RA-602, RIJ=02), VAW (RS-60-1) RA-602, RIJ=02), VAW (RS-60-1) RA-602, RIJ=02), VA			• • • • • • • • • • • • • • • • • • •		1 1		,	(C) FAILURE TO INITIATE PRO
B. S-II BURN LAUNCH B. LAUNCH VEHICLE ABORT BSE INFORM FLIGHT AND FIDO. CAPCOM INFORM CREW OF LOSS OF ATTITUDE CONTROL. CONTROL. CREW WILL ABORT ON LIMITS (NOTE 8-1). 2. PLATFORM GIMBAL ANCLES PITCH, YAM, OR ROLL (-60-603 CHANGING AT THE RATES GIVEN IN CO B.: 3. LOSS OF ATTITUDE CONTRO ALERT (SEE NOTE 8-2). B. NUTES 1. GREW ABORT LIMITS (A) PITCH AND YAW MATE HOUS A WINGS 10 DEG/SEC (3) ROLL RATE PLUS OR MINGS 2 JEG/SEC 2. LOSS OF ATTITUDE LINITS ALERT WILL BE GIVEN, FUR THE FULLOW ING CONDITIONS (A) LVOC/LVDA COMPONANTIONS					4 ,			(9) ATTITUDE ERROR SIGN
B. S-II BURN B. LAUNCH VEHICLE ABORT BSE INFORM FLIGHT AND FIDO. CAPCOM INFORM CREW CAL-502, VAW (RS-502) CAPCOM INFORM CREW CAL-502, RIJ-602, VAW (RS-502) CONTROL. CREW WILL ABORT ON LIMITS COMBAN OR ROLL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATES GIVEN IN CABEL (A60-603 CHANGING AT THE RATE FLUS CAR MINUS ABORT LIMITS			•		1 1 1		1	(A) LVOCZEVDA COMPUTATIO
B. S-II BURN LAUNCH BSE INFORM FLIGHT AND FIDO. CAPCOM INFORM CREW OF LOSS OF ATTITUDE CONTROL. CREW WILL ABORT ON LIMITS (NOTE 8:1). B. CUES 1. ANGULAR RATES - DITO (R4-502, R13-502). VAW VR3-5UZ (R4-502). OR ROLL (R6-602, R12-502) GREATER THAN 5 DEG/SEC -NO NO DECREASING. 2. PLATFORM GIMBAL ANGUES PITCH: YAW OR ROLL (-60-603) CHANGING AT THE RATES GIVEN IN CO B:1 3. LOSS OF ATTITUDE CONTRO ALERT (SEE NOTE 8:2). B. NOTES 1. GREW ABORT LIMITS (A) DITCH AND YAW MATE HOUS IN MINUS 10 DEG/SEC		e de la companya de l	1 1		1		1	2. LOSS OF ATTITUDE CONT ALERT WILL BE GIVEN FOR THE FOLL
B. S-II BURN LAUNCH B. LAUNCH VEHICLE ABORT BSE INFORM FLIGHT AND FIDO. ANGULAR RATES = DITO RAPCOM INFORM CREW (RA-602, R13-902). VAW (R5-902) OF ROLL (R6-602, R12-602) CONTROL. GREATER THAN 5 DEGYSEC AND NO DECREASING. CREW WILL ABORT ON LIMITS PITCH, YAW OR ROLL (R60-603) CHANGING AT THE RATES SIVEN IN COMPANION ALERT (SEE NOTE 5-2). 3. LOSS OF ATTITUDE CONTROL B. NOTES 1. GREW ABORT LIMITS					1		1	(B) ROLL RATE PLUS OR WINUS
B. S-II BURN LAUNCH B. LAUNCH VEHICLE ABORT B. CUES BSE INFORM FLIGHT I. ANGULAR RATES - DITC CAPCOM INFORM CREW (R4-602, R13-902), VAW (R5-902) CONTROL GREATER THAN 5 DEGYSEC AND NO DECREASING. CREW WILL ABORT ON LIMITS 2. PLATFORM GIMBAL ANGLES CHANGING AT THE RATES GIVEN IN COMB. B. LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE 5-2).								(A) PITCH AND YAR HATE HELS
B. S-II BURN LAUNCH BSE INFORM FLIGHT AND FIDO. CAPCOM INFORM CREW CAPCOM INFORM CREW CONTROL. CONTROL. CREW WILL ABORT ON LIMITS (NOTE B.1). LAUNCH B. LAUNCH VEHICLE ABORT 1. ANGULAR RATES - DITO (R4-602, R13-602), VAW (R3-602) CAPCOM INFORM CREW (R4-602, R13-602), VAW (R3-602) CAPCOM INFORM CREW CAPCOM IN			1					· · · · · · · · · · · · · · · · · · ·
B. S-II BURN LAUNCH 'B. LAUNCH VEHICLE ABORT B. CUES BSE INFORM FLIGHT I. ANGULAR RATES - PITC AND FIDO. I. ANGULAR RATES - PITC CAPCOM INFORM CREW (R4-602, R13-602), VAW (R5-612) OF LOSS OF ATTITUDE MB-021), OR ROLL (R6-602, R12-602) CONTROL. GREATER THAN 5 DEG/SEC AND NO DECREASING. CREW WILL ABORT ON LIMITS 2. PLATFORM GIMBAL ANGUES PITCH, YAW OR POLL (-60-603) CHANGING AT THE RATES SIZEN IN CO			1				:	3. LOSS OF ATTITUDE CONT
B. S-II BURN LAUNCH 'B. LAUNCH VEHICLE ABORT B. CUES BSE INFORM FLIGHT I. ANGULAR RATES - DITC AND FIDO. I. ANGULAR RATES - DITC CAPCOM INFORM CREW (R4-602, R13-602), YAW (R3-502) OF LOSS OF ATTITUDE R8-602), OR ROLL (R6-602, R12-602) CONTROL. GREATER THAN 5 DEG/SEC AND NO CREW WILL ABORT ON							• (PITCH: YAW OR ROLL (H60H6 Changing at the rates given in
B. S-II BURN LAUNCH 'B. LAUNCH VEHICLE ABORT 5. CUES BSE INFORM FLIGHT AND FIDO. 1. ANGULAR RATES - DITTE CAPCOM INFORM CREW (RA-502, R13-502), MAN (RS-502)			1		1	CONTROL. CREW WILL ABORT	• ;	GREATER THAN 5 DEG/SEC AND
B. S-II BURN 'LAUNCH 'B. LAUNCH VEHICLE ABORT ' B. CUES			1 1 1		† 1	AND FIDO. CAPCOM INFORM C	REW '	(R4-602, R13-602), YAW (R4-4
5-2 (CONT)		8. S-II BURN		AUNCH				3. (655
	1	1 (00.11)	•		•			

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SECTION 6 - SLV - TBI THROUGH TB4/TB4A

	CONDITION/MALFUNCTI	UN! PHASE	RULING	' CUES/NOTES/COMMENTS
			1	
				(A) EVDC/LVDA COMPUTATIONAL FAILURE
		1 1 1		(8) ATTITUDE ERROR SIGNALS ROLL GREATER THAN PLUS OR MINUS 3.5 DELL PITCH AND YAW GREATER THAN PLUS D- MINUS 5 DEG.
				(C) FAILURE TO INITIATE PROPE-
		•		
		• • • • • • • • • • • • • • • • • • •		
6-3	INERTIAL PLATFORM FAILURE - ACCELEROMETER	LAUNCH	'CONTINUE MISSION 'BSE INFORM FLIGHT AN	
			'CAPCOM ADVISE CREW O	RBIT. 1
		• • • • • • • • • • • • • • • • • • •	1	BITS 026 AND 025 FOR Z ACCEL 381
				BITS 024 AND 023 FOR A ACCEL SET TO "CNE"
		•		BITS DZZ AND DZ% FOR Y ACCEL SET
		1		. 2. ACCELEROMETER PICKOFFS (X, Y) INDICATE IN EXCESS OF 3 DEC AND NOT DECREASING. (MID-603, H11-603, H12-603)
		1	1	NOTES
		• • • • • • • • • • • • • • • • • • •		1. NO EFFECT ON VEHICLE TRAJECTORY DURING SHIC STAGE BURN.
		1		. Z. LVDC SWITCHES TO A BACKU. MODE AND UTILIZES A PRECOMPUTED F., PROFILE FOR FAILED AXIS JURING THE SHICK SHIP, AND SHIVE BURNIS.
		•		
6-4	LAUNCH VEHICLE	11 ALINCH	CONTINUE MISSION	C-ES
S - 2	INERTIAL PLATFORM FAILURE - ATTITUDE REFERENCE	•	'SSE INFORM FLIGHT AN 'RECOMMEND SPACECRAFT GUIDANCE TAKEOVER.	١٥ '
		•		' 2. GUIDANCE STATUS MORÚ - (MUD: ' CODE 24) (M60-003) 5175 020 AND 03:
		1 1 1	1	FOR 2 GIMBAL SET TO "TONE" BITS 31. AND 017 FOR X GIMBAL SET TO "TONE" BITS 31. BITS 016 AND 010 FOR Y GIMBAL SET TO "TONE"
	1		• • • • • • • • • • • • • • • • • • •	•
	• · · · · · · · · · · · · · · · · · · ·	•		3. LADDER OUTPUTS CONSTANT FO FAILED AXES (H54-603, H55-603)
	•	1		' M56-603) ' 4. ATTITUDE ERROR CONSTANT FO
				' H56-603) ' 4. ATTITUDE ERROR CONSTANT FG' ' FAILED AXES (H69-602, H70-602
				H56-603) 4. ATTITUDE ERROR CONSTANT FO: FAILED AXES (H69-602. H70-602) H71-602) NOTES 1. CUE 1 AND ANY OTHER CUE AR
				H56-603) 4. ATTITUDE ERROR CONSTANT FO FAILED AXES (H69-602. H70-602 H71-602) NOTES 1. CUE 1 AND ANY OTHER CUE AR
				H56-603) 4. ATTITUDE ERROR CONSTANT FO: FAILED AXES (H69-602. H70-602) H71-602) NOTES 1. CUE 1 AND ANY OTHER CUE AR
	MISSIO	on Rev DA	ATE SECTION	# 4. ATTITUDE ERROR CONSTANT FOR FAILED AXES (H69-602, H70-602)

MISSION RULES. SECTION 6 - SLV - TBI THROUGH TB4/TB4A

PULE	CONDITION/MALFUNCTION	PHASE		RULING	' CUES	/NOTES/COMMENTS	
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1	35		•		•		
	RULE NUMBERS 6-5 THROUGH 5-6 ARE						
	RESERVED.	i de la composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della composición della comp	•		•		
1			•		•		
6-7	S-II LOSS OF THRUST	LAUNCH	i			· CUES	
	A. ANY SINGLE ENGINE	1	'A. CONTIN	UE MISSION	1	THRUST OK	SWI TOWE CAN
	FAILURE TO ATTAINS THRUST ON LOSS OF STRUST PRICE TO	• •	BSE IN	FORM FLIGHT	(X 2 8 1 THRC:	5-201 THROUGH 205 JGH 2051.	• K286-
	NOMINAL S-II CUTOFF				(013	. THRUST CHAMBER PRI -201 THROUGH 205).	ESSURE- Z
					(A2-	LONGITUDINAL ,	ACCELERAT
	B. ANY TWO ENGINES-		'B. CONTIN	UE MISSION	BORT' B.	• CUES	
	FAILURE TO ATTAIN THRUST OR LOSS OF THRUST——		†		1		
			1			. THO ENGINES OUT	د دعدی
	1. VEHICLE CONTROLLING		' BSE	TINUE MISSIC : INFORM FLIC : FIDC.		A.3)	
	2. IF THE		1 2. ABOR		1 2.	. COMMANDED ANGLES	AND SIM
	DIFFERENCE '		1 BSE		HT ! ANGLE	S (m60-603)	- -
	IN COMMANDED ' ANGLES AND ' BOTH ANGLES ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '		' TRA	NSMIT ABORT	•		
	EXCEEDS 40 DEG .		REC	IUE31	•		
	IN PITCH OR YAW		,		•		
	C. THREE OR MORE ! ENGINES OUT !			EARLY STAGE		CUES	
1	1. PRIOR TO S-IVB		1		1 1	THREE OR MORE	ENGINES
	TO CRBIT		' AND	RT INFORM FLIC TRANSMIT AB UEST+	int !	5 A.1. A.2. A.3)	
1	2. AFTER S-IVB TO		1 . 2. EAR	LY STAGE	•		
	CABIT CAPABILITY BUT			INFORM FLIC			
	PRICE TO LOW '		7/10	GING.	ARG T		
	LEVEL SEMSE				,		
			1 3. CON	TINUÉ MISSI	i i		
1	3. AFTER LOW LEVEL SENSE		' 3 S E	INFORM FLIC			
	ARM SENSE		AND	F100			
	(A) 3 CR 4		· (A)	EARLY STAGE			
	ENGINES OUT	·	1	BSE INFORM	•		
1			•	RECOMMEND :	ARLY!		
	(B) ALL .	i	· ·	STAGE.	ssion'		
	ENGINES CUT	! !	1	BSE INFORM	•		
	33.1		•	FLIGHT	•		
		·	•		• • • • • • • • • • • • • • • • • • •		
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						(x,y) = (x,y) + (x,y)	
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SECTION 6 - SLV - TBI THROUGH TB4/TB4A

' QULE	CONDITION/MA			SE '	RULING		CUES/NOTES/COMMENTS	
;				;				
6-8	S-II STAGE SYSTEM FAIL				RT - INFORM FLIGHT A	, O	CUES	
	SINGLE ACTU HAROGVER (I	ATCR	! ! ! .		NSMIT ABORT REQU		1. TAW ACTUATOR POSITION CEEDS + 6 DEG (G8-201 THROUGH 20	£,6 • (4)
							2. PITCH ACTUATOR POST EXCEEDS + 6 DEG (G9-201 THR 204).	7:J 1 0:J S
				† † †			3. ADJACENT CONTROL EN ACTUATOR IN SAME PLANE MOVES 4 DEG INBOARD (SAME MEASUREMENTS CUES 1 AND 2)	-17
							VOTE	
			i				CREW SHOULD ABORT AS SOUN POSSIBLE AFTER MALFUNCTION USCUP PRECLUDE EXCESSIVE THERMAL PROBUNTHE AFT INTERSTAGE.	S 7
	* * .	•		•				
1				1				
				•		,		
	-			•		•		
5 - 9	S-II SECOND						CUES	
	SEPARATION OCCUR AT TB SEC			'TRA	INFORM FLIGHT A NSMIT ABORT REQU W ABORT PRIOR TO 2 SEC.	EST. '	1. SECOND PLANE SEPARA INDICATION SHOWS NO SEPARA (M86-206: M87-206)	
						1 1	2. GUIDANCE MODE WORD 1 CODE 25 BIT D15 REMAINS	400 ZER
	e e e e e e e e e e e e e e e e e e e	, , , , , , , , , , , , , , , , , , ,		1 1 1		1 1 1	3. IGNITION BUS VOLTAGE MAINS AT APPROXIMATELY 28 VO. (M125-207).	45 GL 1
				, t	•	,	NUTES THE CREW SHOULD ABOR'SCON AS POSSIBLE AFTER MALFUNC'OCCURS TO PRECLUDE EXCESSIVE THE PROBLEMS IN AFT INTERSTAGE.	7:0
				•				
		į		•		i	f	
6-10					CECRAFT SEPARATIO		CUES	
	PRIOR TO S-			'FID	INFORM FLIGHT AS D AND RECOMMEND VB START:	10 '	1. HYDRAULIC RESERVOIR DIL LE APPHOX ZERO PERCENT (L7-403).	ĒVΕ
		•			D WILL ADVISE CR	Ew	2. HYDRAULIC SYSTEM PRESS LESS THAN 1700 PSIA (041- 403).	SUR
		1		•		1	3. HYDRAULIC RESERVEIM DE SURE APPROX ZERO PSIA (D42-403).	
						•	NOTE	
	1.5.					•	1. L7-403 PLUS ONE OF THE O'CUES ARE REQUIRED FOR IMPLEMENTATION THIS RULE.	
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1	1							
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SECTION 6 - SLV - TBI THROUGH TB4/TB4A

- 40FE	CONDITION/ MALFUNCTION	PHASE '	RULING	CUES/NOTES/COMMENTS
6-11	A. FAILS TO ATTAIN THRUST OR PREMATURE SHUTDOWN PRIOR TO OBTAINING PARKING ORBIT 8. FAILS TO ATTAIN THRUST OR	LAUNCH A	FIDO. FIDO WILL ADVICE CREW OF COI CAPABILITY B. CONTINUE MISSION BSE INFORM FLIGHT AND FIDO. THE SPACECRAFT SHOULD REMAIN ATTACHED TO THE	3. LONGITUDINAL ACCELERATION ZERO (A2-603). 4. TB5 IS INITIATED. MODE COD 25. BIT D2 SET TO ONE (A60-603). NOTE
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7 SLV - TB5 AND TB7 (COAST)

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SECTION 7 - SLV - TB5 AND TB7

REV ITEM	,				SECTION	7 - SLV - TB5 A	ND TBT		
R ITEM	1								
					SUMMAR	Y OF COAST PHASE	RULES		
	7-1	INSU	FFICIENT P	ROPEL	LANT				
	7-2	RESE	RVED	•					
	7-3	MAIN	FUEL VALVE	E FAI	LS TO CL	OSE			
	7-4	MAIN	OXIDIZER	VALVE	FAILS T	O CLOSE			
	7-5	RANG	E SAFETY S	YSTEM	NOT SAF	ED AFTER INSERTI	ON		
	7-6	COLD	HELIUM SH	JTOFF	VALVE F	AILS OPEN			
	7-7	IXUA	LIARY HYDRA	MULIC	PUMP FA	ILS			
	7-8	LOSS	OF ATTITUE	DE CO	NTROL				
	7-9	CONT	INUOUS VENT	REG	ULATOR F	AILS TO OPEN			
	7-10	APS	ULLAGE ENG	INE F	AILS ON				
	7-11	T85	OR TB7 FAIL	-s TO	INITIAT	•			
.	7-12	RESE	RVED						
	7-13	IU E	NV I RONMENTA	AL CO	NTROL SY	STEM FAILS			
	7-14	COMM	ON BULKHEAD	DEL	TA P				
	7-15	LOSS	OF S-IVB	STAGE	PNEUMAT	ICS			
-	7-16	LOSS	OF ENGINE	CONT	ROL BOTTI	LE PRESSURE			
	7-17	LH2	TANK VENT	FAILU	RE OR LE	AK			
	7-18	LOW	COLD HELIUM	4 SUP	PLY				
	7-19	LOX	TANK ULLAGE	E PRE	SSURE IS	LESS THAN 31 PS	IA		
	7-20	J-2	ENGINE STAF	RT 80	TTLE PRES	SSURE OUTSIDE RE	START LIMITS		
	7-21	PU V	ALVE FAILUS	35					
	7-22	S=1V	B LOSS OF P	TORA	ULIC FLU	ID			
	7-23	RESE	RVED						
	7-24	RESE	RVED						
	7-25	LOX	NON-PROPULS	SIVE	VENT FALL	S TO OPEN			
	7-26	LH2	LATCHING VE	ENT V	ALVE FAIL	S TO OPEN			
į	7-27	GHZ :	START BOTTL	E DU	MP FAILS	TO OCCUR			
l	7-28		HELIUM DUA						
	7-29	RESE	RVED						
	7-30	RESE	RVED						
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l									
1			•						
	THE P	OFFORI	NG MISSION	RULE	S ALSO AI	PPLY TO THIS SEC	TION NONE		
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+	NULZ	CONDITION/MALFUNCTION	PHASE		RULING	' CUES/I	NOTES/COMMENTS
	Ì		•				
1	7-1		'EARTH	NO .	S-IVB RESTART	CUI	
		PROPELLANT REMAINS		185E	INFORM FLIGHT AN		PELLANT REMAINING AS
	l	TLI GUIDANCE		RES	OMMEND NO S-IVB		TAINED DURING REAL-TIME DRING EVALUATIONS.
	- 1	CUTOFF		i		•	
						:	
1	1	RULE NUMBER 7-2 IS		;		•	
	ı	RESERVED.					
	_			;		•	
7	7-3	J-2 ENGINE MAIN FUEL VALVE (MFV)	1			CUES-	-
-	·	FAILS TO CLOSE AT-	1			1 (64-40	
ı			EARTH	'A+ (CONTINUE MISSION	2.	
					BSE INFORM FLIGHT COMMAND (ASAP)		
					PREVALVES AND RECIRC SHUTOFF		
					VALVES CLOSED (SEE NOTE1)	3. (F2=40	
				;	ATTEMPT TO CLOS	1 4. SE ! (F5-40	FUEL RECIRC FLOWRAT
				;	MFV		E\$
					IF SUCCE SS FUL, BSI	E '	IF THE MEV IS OPEN. THE
-				' 1	. PREVALVE AND RE	' PUMP I	MLET PRESSURE WILL GO TO ZE FTER COMMAND ACTION (A.1).
				:	SHUTOFF VALVES	•	THIS FAILURE WILL REQUI
1						' EVALUA	TION OF LHZ RESIDUALS THE ADEQUACY FOR THE VELOCI
		8. SECOND S-IVB	TLC	18. 0	CONTINUE MISSION		(REF FMR 7-1).
		CUTOFF		!	SE INFORM FLIGHT	AND !	
		•			OMMAND		
				1	PREVALVES AND RECIRC SHUTOFF	•	
				•	VALVES CLOSE	1	
-				; 2	ATTEMPT TO CLOS	SE !	
				•	MEN S-IVB IS AT	•	
					PROPER DUMP ATTITU	JOE . !	
				3	PREVALVES AND RECIRC SHUTOFF	;	
				•	VALVES OPEN	• 1	
		•					
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TRULE	CONDITION/M	ALFUNCTION'	PHASE		RULING	CUES/NOTES/COMM	INTS
7-4	J-2 ENGINE OXIDIZER V	MAIN SALVE (MOV)		•		CUES	
	FAILS TO CI					1. MAIN OXIE	DIZER VALVE POSITIO
	A. FIRST S-		EARTH	Α.	CONTINUE MISSION/	' (G3-401). G	XIDIZER VALVE OPE
					BSE INFORM FLIGHT COMMAND (ASAP)	AND ' 3. LOX	FLOWMETER FLOWRAT
					1. PREVALVES AND RECIRC SMUTOFF VALVES CLOSED	NOTES	
		1		•			WILL BE ATTEMPTED !
				•	IF SUCCESSFUL . BSE	' EVALUATION OF	ILURE WILL REGULA LOX RESIDUALS T CY FOR TLI VELOCIT
		1 1 1		•	3. PREVALVE AND RECIRC SHUTOFF VALVES OPEN	CUTOFF (REF FMR	7-1).
				•	IF MOV CANNOT BE CLOSED. RECOMMEND S-IVB RESTART	NO :	
	B. SECOND B CUTOFF	BURN !	TLC	•	CONTINUE MISSION BSE INFORM FLIGHT COMMAND-	ANO	
					1. PREVALVES AND RECIRC SHUTOFF VALVES CLOSED		
		• •			2. ATTEMPT TO CLOS	E	
		•			AT INITIATION OF LOX DUMP: BSE COMMAND		
					3. PREVALVES AND RECIRC SHUTOFF VALVES OPEN	1 0	
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 'RULE	CONDITION/MALFUNCTION'	PHASE	ı 	RULING	' CUES/NOTES/COMMENTS
•			•		1
7-5	RANGE SAFETY SYSTEM				CUES
	NOT SAFED AFTER 'INSERTION '		1		1. FIRING UNIT 1 RS EBW GREAT
	A. PROPELLANT	•	14.	ONTINUE MISSION	THAN OR EQUAL TO 1.6 VOL
	DISPERSION ' SYSTEM NOT ARMED '		;		1 2. FIRING UNIT 2 RS EBW GREAT
			' 8	SSE INFORM FLIGHT ECOMMEND RSO SEND SAFE COMMAND	AND THAN OR EQUAL TO 1.6 VOL
	B. PROPELLANT		8. 1	PACECRAFT SEPARAT	
	DISPERSION SYSTEM ARMED AND				* ENABLE (N57-411) BETWEEN 2.4 AND 4 VOLTS.
	RSO HAS NOT SENT !		; •	SE INFORM FLIGHT	4. RANGE SAFETY DECEIVED NO.
			1	 RECOMMEND SPACECRAFT SEPARATION TO A 	ENABLE (N62-411) BETWEEN 2.4 AND 4 VOLTS.
				SAFE DISTANCE (7000 FT).	5. RSO DISPLAY AND COMMA SYSTEM STATUS.
			. 2	WHEN SPACECRAFT	HAS NOTES
1				REACHED A SAFE	. I. RSO SMOULD NOT ATTEMPT
				RECOMMEND RSO S SAFE COMMAND.	END ' SAFE THE RANGE SAFETY RECEIVERS REVS 2 AND 3 UNTIL MCC CONFIRMS TO PROPELLANT DISPERSION SYSTEM IS NOT ARMED (CONDITION A ONLY).
			1		2. EITHER CUE 1 OR CUE 2 SUFFICIENT FOR IMPLEMENTING TH RULE.
			•		•
			•		
			;		
7-6		EARTH ORBIT	1	en en en en en en en en en en en en en e	CUES
	VALVES FAIL TO CLOSE!		•		1 COLD MELIUM REGULAT DISCHARGE PRESSURE GREATER THAN 2 PSIA (D0105-403)
İ	A. 185 + 1.4 SEC			CONTINUE MISSION NO S-IVB RESTART	2. LOX TANK ULLAGE PRESSUR
				SE INFORM FLIGHT	
			•	COMMAND	DECAYING (DOO16-425: DO263-403).
			•	1. LOX NPV VALVE (2. ATTEMPT TO CLO	•
1			'	STAGE COLD HELIUM	•
			•	IF 2 SUCCESSFUL.	SSE 1. FAILURE TO CLOSE THE SHUTCH STATE OF THE SHUTCH SHU
			•		' OF THE COLD HELIUM.
			•	S. LOX NPV VALVE	2. ACTION REQUIRED TO AVO
			• (IF 2 IS UNSUCCESSI BSE INFORM FLIGHT	AND ! BULKHEAD POSITIVE DELTA PRESSU
			• ;	RECOMMEND SPACECR SEP IF LOX ULLAGE PRESSURE AT 50 PS	' FOR RESTART CRITERIA FOR OFF-NOMIN
	. 797		;	SATURATED.	
	B. TB7 + 1.1 SEC		•	CONTINUE MISSION	
			•	AFTER TB7 + 2 MIN SEC, BSE INFORM F AND COMMAND	
		•		1. LOX NPV VALVE AT TB7 + 15 MIN B	
			•	SEND	
1			•	2. LOX NPV VALVE	cLose'
 	MISSIAN	REV DA	ATE	SECTION	GROUP PAGE
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R 'RULE	'CONDITION/MALFUNCTION	' PHASE	•	RULING	CUES/NOTES/COMME	INTS
:		·	1		† †	
7-7	S-IVB AUXILIARY HYDRAULIC PUMP FAILS	:	•		CUES	
	A. TO TURN OFF AS	'EARTH	!A•	CONTINUE MISSION	' A.1. SYSTEM P ' PSIA (D41-403).	RESSURE ABOVE 1
	SEQUENCED	ORBIT		BSE INFORM FLIGHT AND	1 2. RESERVO	IR LEVEL BELOW
			11.	ATTEMPT TO TURN O		. O. 2 CURRENT ABO
		•	•	AUXILIARY HYDRAUL PUMP AS SOON AS POSSIBLE	C 20 AMPS (MZZ-404	1.
		•			PRESSURE GREATE	IC RESERVOIR C R THAN <u>137</u> PS
		•			NOTES	
			•		I FATLURS TO	7110M 055
		9 0 1			PUMP DEPLETES AF APPROXIMATELY 90	TURN OFF HYDRAUL T NO. 2 BATTERY MIN AND OVERHEA IN APPROXIMATELY
	.8. TO TURN ON	.		CONTINUE MISSION	CUES	
	1. AS SEQUENCED AND THE HYDRAULIC	• •	•	1. SSE INFORM FLI AND ATTEMPT TO TU AUXILIARY HYDRAUL	(N UN' PSIA (D41-403).	RESSURE BELOW 17
	FLUID TEMP IS BELOW OR PREDICTED	! !		PUMP		OIL LEVEL ABOVE
	TO DROP BELOW 10 DEG F	! !	•		3. AFTER BUS ZERO AMPS (M22-4)	NO. 2 CURRENT
	STATION AOS	•			89 PSI (D42-403)	PRESSURE LESS TH
	MIN 39 SEC	TLC		2. BSE INFORM FLIG AND ATTEMPT TO OFF AUXILIARY	HT ' TURN' 5. HYDRAULIC	PUMP INLET OIL TE
		•	1	HYDRAULIC PUMP	1	OIL TEMP (C51-402
1						•
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REV ITEM

	HISSION	REV	ATE	SECTION	GROUP	PAGE
	L	[T	T	
	• • • •	•	•		•	CE SEQUENCE ATTITUDE REFERENCE FAILURE
		•				FAILURE TO INITIATE PROPE CE SEQUENCE
		• •	:		(B)	
		; ;	•		FAILUR	E LVDC/LVDA COMPUTATIONAL
		•	•		CONDIT	IONS
			•			LOSS OF ATTITUDE CONTROL ALER BE GIVEN FOR THE FOLLOWIN
		•			PROGRA	MMED MANEUVERS THE ABOVE RAT ARE NOT APPLICABLE
		1	• •		NOTES-	 AFTER S-IVB CUTOFF AND DURIN
				2. ULLAGE ENGINE I	•	
		:	•	1. PROPELLANT DUM	•	
				BSE INFORM FLIGHT FIDO AND TERMINATI		
	O- AFTER TBB INITIATE	'TLC	•	CONTINUE MISSION	•	SAME AS CUES C+1+ C+2+ AND C
		! !			1	SAME AS CUE A-1
		1			2.	SAME AS CUE A+2
		1		FIDO). AND ROLL (R6-602. R12-60 R Than 1.0 Deg/Sec and N Sing
	C. AFTER 187 + 15	TLC	•	CREW DISCRETION BSE INFORM FLIGHT	' (R4-60	1. ANGULAR RATES PIT 2. R13-602): YAW (R5-50
		•			3.	SAME AS CUE A.3
		t t			2.	SAME AS CUE A.2
		• : : : : : : : : : : : : : : : : : : :			1 812-60	CREASING. AND ROLL (R6-50 2) Greater Than 0.3 Deg/s T Decreasing
	MIN 20 SEC			BSE INFORM FLIGHT RECOMMEND TLI INH	AND ! R8-602	Z> R13-602) OR YAW (R5- 60 D GREATER THAN 0.5 DEG/SEC A
	B. 786 TO 786 + 9	TLI	18.	TLI INHIBIT	, 8.	1. ANGULAR RATES - PIT
			· •	SEPARATION	3.	LOSS OF ATTITUDE CONTROL ALE
			•	IF UNSUCCESSFUL, RECOMMEND SPACECR	BSE ' CHANGI	YAW OR ROLL (M60-60 NG AT RATES CORRESPONDING IN CUE 1
				RECOMMEND SPACECR Guidance Takeover	AFT ! 2.	PLATFORM GIMBAL ANGLES
				BSE INFORM FLIGHT	(R6-60	NOT DECREASING, AND RO D2> R12=602)> GREATER THAN G EC AND NOT DECREASING
	TB7 + 15 MIN	'QRBIT/		SPACECRAFT GUIDAN TAKEOVER	CE ' (R4-60	D2: R13-602) OR YAW (R5- 60 R1: GREATER THAN 0:3 DEG/S NOT DECREASING: AND RO
	CONTROL DURING	! !EARTH	•	***************************************	; A.	1. ANGULAR RATES - DIT
7-8	LOSS OF ATTITUDE	•	•		CUES-	
10			, .		;	

RITRULE	*CONDITION/MA	LFUNCTION'	PHA	5€ ' 	RULING	' CUES/	OTES/CO	MMENTS
7-9	CONTINUOUS	VENT	EARTH	! ! ! CON	TINUE MISSION/NO	•	:5	
	SYSTEM ICVS REGULATOR F OPEN IN 185	AILS TO	ORBIT	' 5 -I	VB RESTART INFORM FLIGHT AN	1.	CV	S NOZZLE PRESSURE 82-409).
	59 SEC)			REL	ATTEMPT TO OPEN C IEF OVERRIDE SHUT VALVE		-¢11).	S REGULATOR CLOSE
				•	UNSUCCESSFUL, BSE	10177-		2 ULLAGE PRESSURE 78-408).
		1 1 1		;	VENT THE LH2 TANK PRIOR TO TB6 TO A VALUE BELOW THE PRESSURE REQUIRED	•	E\$	
		1			THE LH2 BLOWDOWN	OPEN.	THE LHZ	CVS REGULATOR FAILS SATURATION TEMPERATU ABOVE RESTART LIMITS
				'COM	PLETED WITHIN 30 UTES PRIOR TO TB6 TIATE: COMMAND	2. EVALUA	COMMAN:	D ACTION WILL REQUIF LM2 RESIDULAS
				•	ULLAGE ENGINES ON	CUTOFF	. APPRI	QUACY FOR TLI VELOCI OXIMATELY 150 POUNDS OST FOR EACH PSI T
				SEN	ER 90 SEC OF ULLAS	iE ! LHZ TA	NK IS VI	ENTED BELOW 19.5 PSIA
				ULL	ullage engines off Aging should be Pleted prior to to) 		
			EARTH ORBIT	IF IACT ISUC	IENT REPRESSURIZAT NEITHER COMMAND ION(S) 1 NOR 2 IS CESSFUL: BSE RECON S-IVB RESTART:	•		
							142 (142) 142 (142)	
7-10	APS ULLAGE 1	 	FARFU	1				
	THRUST FAILS TERMINATE AS	5 TO 11	DRBIT/	.c ' 'BSE 'ATTI	TINUE MISSION INFORM FLIGHT AND EMPT TO TERMINATE	1. PRESSU	RE GREA	ENGINE THRUST CHAMB ATER THAN 90 PS 21-415).
				'IF ('INF('IMP(AGE ENGINETHRUST. JINSUCCESSFUL, BSE DRM FLIGHT OF ENDING LOSS OF	' DECREA	APS HE SING (• D251-	ELIUM SPHERE PRESSU (D35-414, D36-415, -415).
				ATT	ITUDE CONTROL.			
7-11	TIME BASE 9 BASE 7 PAILS INITIATE AT CUTOPP	TO 'C	EARTH DRBIT	'BSE	CECRAFT SEPARATION INFORM FLIGHT AND DMMEND IMMEDIATE	•	S C FAILUI	NE
				'SEP	ARATION TO A SAFE	THI	E	ITION WILL RESULT
	RULE NUMBER	7-12 **				LOSS O	F SEQUEN DE CONTR	CING AND PITCH AND Y
	RESERVED.			•				
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RIRU	LE CO	NDITION/MALFUNCTION	PHASE	1 RULING	CUES/NOTES/COMMENTS
1	-			1)
7-	F	U ECS WATER VALVE 'ALLS TO CYCLE OPEN '	ALL	'A. CONTINUE MISSION	CUES
				' 'BSE INFORM FLIGHT AND	l. WATER VALVE CLOSED/OF (G5-601, G6-601).
		CLOSED AND COOLANT INLET CONTROL		SENO	2. ME/M20 TEMP (C15-601). 3. GMW MODE CODE 27 BIT DB 3
		TEMPERATURE IS		1. ECS LOGIC INHIBIT	TO ZERO (H60-603).
		THE INERTIAL		2. WATER VALVE OPEN	4. ST-124 INERTIAL GIMBAL TE C34-603).
		GIMBAL TEMPERATURE IS PREDICTED TO BE) 		5. SUBLIMATOR INLET TE (C11-601).
		EQUAL TO OR STREAMER THAN			6. LVDC MEMORY TEMP (C54-603)
		115 DEG.F BEFORE THE NEXT SITE AOST)		7. LVDA TEMP NO. 1 (C55-603). 8. LVDA TEMP NO. 2 (C56-603).
		THE LVDC MEMORY TEMPERATURE IS			,
		PREDICTED TO BE			
		GREATER THAN 124 DEG.F BEFORE THE NEXT SITE AOST		1	
	- 1	• WATER VALVE OPEN ND COOLANT)	'B. CONTINUE MISSION	
				'BSE INFORM FLIGHT AND 'SEND	
		INLET CONTROL TEMP IS 55 DEG.F OR LESS. AND	1	1. ECS LOGIC INMIBIT	
		THE INERTIAL GIMB TEMPERATURE IS PREDICTED TO BE 194 BEGOP OR LESS BEFORE THE NEXT SITE AGS OR:	! !	2. WATER VALVE CLOSED	
		THE LVDC MEMORY TEMPERATURE IS PREDICTED TO BE 32 DEGSF OR LESS BEFORE THE NEXT SITE AGS.	' '		
1					

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R 'RUL	CONDITION/MALFUN	NCTION' PH	ASE '	RULING	' CUES	NOTES/COMMENTS	
;	1.		•		!		
7-1	BULKHEAD DELTA	'ORBI			•	JES 	
	OR EXCEEDS	t. 1			(K177	H2 TANK ULLAG 7-408: 0178-408):	E PRESSU
	A. MINUS 20 PSI OR PLUS 30 PSIC	1	A	CONTINUE MISSION BSE INFORM FLIGH	* (D180	, LOX TANK ULLAG 1-406:	E PRESS.
			:	COMMAND) 3. (D2=4	LH2 PUMP INLET	PRESS
			•	LHZ AND/OR LOX VALVES OPEN OR OF TO PRECLUDE REAL SEPARATION LIMIT	CLOSED ' 4.	LOX PUMP INLET	PRESS
	8. MINUS 26 PSI	D !	8.	SPACECRAFT SEPA	RATION ! NOTES		
	PLUS 36 PSID)	•	BSE INFORM FLIG FIDO AND RECOMM SPACECRAFT SEPA TO A SAFE DISTAI	T AND ' END ' 1. RATION ' DEFIN NCE ' PRESS	MINUS DELTA PRI IED AS À FUEL TAN IURE GREATER THAN THE IE PRESSURE	NK ULL.
			1		DEFIN	PLUS CELTA PRI IED AS A LOX TAI GURE GREATER THAN THE IE PRESSURE.	WK ULL
		•	1		DISTA	THE MINIMUM PACE BETWEEN THE S-IVEN CRAFT IS 7:000 FT.	RECOMMEN B AND
			1 1		STRUC	THE BULKHEAD TURALLY FAIL AT THE S OF MINUS 32.5 PSIC PSID.	E ULTIM
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MISSION RULES

NI NULE	'CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
1		!		!
7-15	LOSS OR IMPENDING			CUES
	PNEUMATICS PRESSURE			A+1. ENGINE PUMP PURGE REGULAT
	A. ENGINE PUMP PURGE FAILS ON (TB5 + 1		A. CONTINUE MISSION	PRESSURE (D50-403) FAILS TO DECREA FROM ABOUT 100 PSIA TO ABOUT PSIA
	MIN 3 SEC)		BSE INFORM FLIGHT AN	i
	4	•	1 1. ATTEMPT TO	SPHERE PRESSURE (0235-403, 0255-40
		*	TERMINATE PURGE	
		•	COMMAND	
		•	2. AMBIENT HELIUM SUPPLY SHUTOFF VALVE CLOSED	
			3 REOPEN AMBIENT	
		• • • • •	HELIUM SUPPLY SHUTOR	
		† †	• • • • • • • • • • • • • • • • • • •	LOX REPRESS 3UPPLY GRESSU ! (D88-403, D254-403)
	PRESSURE LEAKING	'ORBIT/		• • • • • • • • • • • • • • • • • • •
	AT GREATER THAN 6 PSI/MIN IN TOS OR EXCESSIVE LEAKAGE	•	BSE INFORM FLIGHT AN COMMAND	10
	CURING TB7		1 1. AMBIENT HELIUM 1 SHUTOFF VALVE 1 CLOSED	8:1: STAGE PNEUMATIC 3020 PRESSURE (02367403: 02567403)
		1 1	2 REOPEN AMBIENT HELIUM SHUTOFF	2. LOX REPRESS SUPPLY PRE (D88-403, 0254-403)
		•	VALVE AS REQUIRED	
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MISSION RULES

-		CONDITION/MALFUNCTION					S/NOTES/COMMENTS	
	7-16	S-IVB ENGINE CONTROL BOTTLE PRESSURE LESS THAN 400 PSIA	' 'EARTH 'ORBIT	' 'NO / '(TB	S-IVB RESTART	,		
		THAN 400 PSIA	TLI	INH	IBIT (TB6) INFORM FLIGHT AND	PRE:	1. ENGINE CONTROL BOS	TTL
				'REC	OMMEND NO S-IVB	PRE	2. REPRESSURIZATION BOT SSURE (D20-403, D88-403, 9-403, D254-403).	TT.
				1.				
						•		
) -	. 1				
	7-17	LH2 TANK VENT FAILURE OR LEAK DURING ORBITAL COAST	ORBIT	;	TINUE MISSION	:	CUES	
			! ! ;	5.0	LMZ ULLAGE PRESSUF PS BELOW 17 PSIA. MAND	BSE '	1. LM2 ULLAGE PRESSUR 77-408. D178-408).	
) 	114	BOOST LH2 VENT VAL	ves '	2. LH2 PUMP INLET PRESS	
				, ,	CLOSED AND CVS REGULATOR CLOSED (ORIFICE OPEN)	(K1=	3. LM2VENT CLOSED DISCRE -410, D210-410).	LT E
	-		N 1 + 1 1	BE 'INI	THE SITUATION CANN CORRECTED, AFTER TIATION OF BURNER RESS, BSE COMMAND-	, ,	NOTES	
			, , , , , , , , , , , , , , , , , , , ,	2.	SECOND BURN RELAY	OFF ABOV	1. IF THE ULLAGE PRESSURE RI VE 21 PSIA AFTER THE REGULA	SE
				1		SHOU	BEEN CLOSED. THE REGULA ULD BE CYCLED TO MAINTAIN A 17 PSIA ULLAGE PRESSURE IN LH2 TA	T (
				1		" WILL	2. EXISTENCE OF A SERIOUS L L BE VEXIFIED BY LITTLE OR SSURE RISE DURING BURNER REPRE	٨
						' BASE	3. REPRESS REQUIREMENTS ED ON LH2 TANK ULLAGE PRESSURE PSIA AT INITIATION, OF REST	: 0
				•		SEQU	UENCE. 4. IF LM2 TANK ULLAGE PRESS	
				, , ,		DROP	PS BELOW 19-5 PSIA DURING T ULTING PROPELLANT LOSSES SHO INCLUDED IN THE EVALUATION ABILITY TO ACHIEVE TLI GUIDA OFF PER FMR 7-1.	BS
				! !		•		
				•				
						*		
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R	'RULE	CONDITION/MALFUNCTION	PHASE	•	RULING	· C	JES/NOTES/COMMENTS
-	,	l .	,	,			
	7-18	LOW COLD HELIUM	•	•		•	
	•••	SUPPLY PRESSURE	•	:			
			EARTH		CONTINUE MISSION	•	
		PSIA DURING TB5	ORBIT	. !	BSE INFORM FLIGHT	AND !	
			1 1		COMMAND FROM LAST Station prior to 1	861	
			•	•		•	
					BURNER LOX SHUTDON VALVE CLOSE ON	•	
			• •	÷		C	;E
			•	;		• (0	COLD HELIUM SPHERE PRESS 261-403. D263-403).
		B. LESS THAN 450 PSIA DURING	TLI	18.	CONTINUE MISSION		
		BURNER	•				
		REPRESSURIZATION			BSE INFORM FLIGHT	AND	
			•		1. BURNER LOX SHUT	DOWN!	
			•		VALVE CLOSE ON		
				•	2. BURNER LOX SHUT		
				į	VALVE CLOSE OFF		
			'EARTH 'ORBIT/		NO S-IVB RESTART (TB5)/TLI		
		RESTART	TLI	1	INHIBIT (TB6)	•	
			:	: :	BSE INFORM FLIGHT	AND !	
			•		RECOMMEND NO S-IVE RESTART.		
			•			:	
	7-19	LOW LOX TANK ULLAGE	! !FARTH	180	CONTINUE MISSION	•	CUES
	'-•'	PRESSURE	ORBIT	18SE	INFORM FLIGHT AND	•	
				, COMI	ONAM		1. LOX ULLAGE PRESSURES 0179-406. 0180-406).
		A. LOX ULLAGE PRESSURE LESS	† †		BURNER LOX SHUTDON VALVE CLOSE		2. LOX PUMP INLET PRESS
		THAN 31 PSIA IN TB5	•	- <u> </u>			3-403).
			1	12.	LOX VENT VALVES BO	NOST I	
					CLOSE		
			•		CLOSE AS POSSIBLE		
			:	1 TB6	+ 7 MIN 30 SEC, 8 M and	ISE !	
			1 1	13.	LOX REPRESS ON	•	
			•	1		•	
		B. THE AMBIENT	•		TLI INHIBIT BSE INFORM FLIGHT	AMO 1	
		REPRESS SYSTEM DOES NOT INCREASE	•		BSE INPORM PLIGHT RECOMMEND TLI INHI		
	1	THE ULLAGE PRESSURE TO AT		÷		•	
	}	LEAST 20 PSIA FOR		;		1 · · · · · · · · · · · · · · · · · · ·	
		RESTART OR 23 PSIA FOR SECOND	• . •			•	
		OPPORTUNITY	•				
		RESTART BY TB6 + 9 MIN 10 SEC	•	- 1			
	1						
			REV	ATE	SECTION	GROUP	PAGE
		MISSION				JNU47	1533
		APOLLO 1	-1 1		SLV - TB5 AND TB7	l	7-12

MISSION RULES

SECTION 7 - SLV - TB5 AND TB7

100 May 180

-	CONDITION/MALFUNCTI	1			,	ES/NOTES/COMMENTS	
7-20	J-2 ENGINE START BOTTLE PRESSURE OUTSIDE RESTART	ORBIT	•			ES 1. START BO	OTTLE PRESSUA
	LIMITS A. ABOVE 1400 PSIA DURING ORBITAL		'A. CONT	INUE MISSION	(0)	17-401, D241-401)	
	DURING ORBITAL COAST FOR FIRST OPPORTUNITY RESTART OR ABOV	• •	BSE SEND	INFORM FLIGH	T AND		
	1500 PSIA FOR SECOND OPPORTUNITY		1. 5	TART BOTTLE PEN FOR 3 SE	VENT		
	RESTART		' NI	EPEAT COMMAN ECESSARY TO PRESSURE OF	INSURE!		•
			' F	HAN <u>1400</u> PSI IRST OPPORTU ESTART OR <u>15</u> SIA FOR SECO	1 Y 1 00		
		1	01	PORTUNITY ESTART	1		
	B. ABOVE 1800 PSIA	, , , , , , , , , , , , , , , , , , ,	B. SPACE	ECRAFT SEPAR	ATION		
	The second	• •	' FIDO	INFORM FLIGH AND RECOMME ECRAFT SEPAR	NO '		
7-21	PU VALVE FAILS TO	'EARTH 'ORBIT/		E MISSION	:	CUES	
	GREATER THAN 5.0 TO 1 ANY TIME PRIOR TO	'TLI	1	ORM FLIGHT A	' ON	1. PU VALVE POSIT	
	RESTART	1	1			NOTES	AUE (M81-41)
		•	POSI 4+5	ALVE HARDOVE TION ON {LOW TO 1} (SEE N	EMR ! HOTE 1)! EVA	l. THIS FAILURI ALUATION OF RESIDU EQUACY FOR TLI	LS TO DETERMIN
		1.		UNSUCCESSFU FLIGHT AND	L. BSE! (RE	EF FMR 7-1).	
				START BOTTL	E TO ! ONE	2. PU FEEDBACK VO LY VALID WHEN PU S	STEM POWER
			•		•		
		•	•		•		
	1						
	MISSI	ON REV	DATE SEC	TION	GROUP	PAGE	

MISSION RULES

R PRINT	CONDITION (MA) SUNCESCO		ECTION 7 - SLV - TB5	
A PROLE	CONDITION/MALFUNCTION			' CUES/NOTES/COMMENTS
ŀ		:	,	
7-22	S-IVB LOSS OF ENGINE	E'EARTH	'NO S-IVB RESTART	CUES
	HYDRAULIC FLUID	'ORBIT/	'(T85)/TLI 'INHIBIT (T86)	1. HYDRAULIC RESERVOIR OIL LEVE
			BSE INFORM FLIGHT A	* APPROX 7FRO BERCENT (17-403)
		. i	RECOMMEND NO S-IVE	. 2. HYDRAULIC SYSTEM PRESSUE
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	LESS THAN 1700 PSIA (D41-403).
		1	•	3. HYDRAULIC RESERVOIR PRESSUI APPROXIMATELY ZERO PSIA (D42-403).
		•		NOTES
		•		L7-403 PLUS ONE OF THE OTHER CUE
			1	ARE REQUIRED FOR IMPLEMENTATION OF
				•
	RULE NUMBERS 7-23 AND 7-24 ARE	•		
	RESERVED.			
ŀ				
1				
- [
	MISSION	REV D	ATE SECTION	GROUP PAGE
	APOLLO 1		/16/69 SLV - TB5 AND TB7	
		1 1	AND TB7	7-14

MISSION RULES

R	RULE	CONDITION/MALFUNCTIO	N' PHAS	Ε '	RULING		CUES/NOTES/COMMENTS
	;	•	:			•	
	7-25	S-IVB STAGE LOX		i		•	CUES
		NONPROPULSIVE VENT (NPV) FAILS TO OPEN AT				•	1. LOX NPV NOZZLE PRESSU (D243-404).
		A. TB7 + 0.7 SEC	TLC		CONTINUE MISSION	•	2. LOX TANK ULLAGE PRESS
					SE INFORM FLIGHT	AND	(D179-406, D180-406). 3. LOX NPV OPEN DISCRE
			•	. ! 1	LOX NPV VALVE	N THE!	3. LOX NPV OPEN DISCRE (K198-424. K199-424).
					F SUCCESSFUL		
					FOR 2 MIN 30 SE		
			•		THROUGH THE NP	, ,	
			:		F UNSUCCESSFUL, E	ese !	
			•	,	B. LOX NPV VALVE (CLOSE'	
					LOX VENT VALVE	OPEN	
		B. TO LATCH OPEN AT TBB + 17 MIN 3	TLC	8. (CONTINUE MISSION	•	
		SEC			SSE INFORM FLIGHT	AND !	
					L. ATTEMPT TO LATE DPEN THE LOX LATER VENT VALVE		
			•		F UNSUCCESSFUL.	BSE	
		s freeze f	1 i •	•	. LOX NPV OPEN	•	
					IF BZ UNSUCCESSFU	٠. ;	
			1		. LOX VENT OPEN		
			• · · · · · · · · · · · · · · · · · · ·				
	7-26	LHZ LATCHING VENT	TLC	CON	TINUE MISSION	•	CUES
		VALVE FAILS TO LATCH OPEN AS PROGRAMMED		•	INFORM FLIGHT AND	в <u>;</u>	1. LM2 NPV NOZZLE PRESS (D183-409: D184-409).
			† •		ATTEMPT TO LATCH	OPEN	2. LH2 ULLAGE PRESSUR (D177-408: D178-408).
			1	'IF	UNSUCCESSFUL + BSE	•	3. LH2 LATCHING VENT VA DISCRETES (K210-410, K211-410).
			•	12.	LHZ LATCHING VENT	:	51340E/23 10235-4181 0212-41816
	1			•	VALVE CLOSED LH2 VENT VALVE OP	EN '	
			•	IAT	TB7 + 15 MIN OR T	B7 + 1	
				•	R 15 MIN COMMAND- LH2 VENT VALVE CL		
			· · · · · ·				
	1	MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO			SLV - T85 AND T87		7-15

MISSION RULES

24 V 1 T	1.11
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RIRULE	ONDITION/MALFUNCTIO	N' PHAS	E !	RULING	CUES/NOTES/COMMENTS
1 1	ENGINE START BOTTLE DUMP FAILS TO INITIATE	TLC	CONTINUE M	ISSION	CUES 1. GH2 START BOTT PRESSURE (D17-401, D241-401).
		1	'BSE INFORM 'ATTEMPT TO 'BOTTLE VEN	FLIGHT AND OPEN THE ST T VALVE	ART
			• • • • • • • • • • • • • • • • • • •		
			• • • • • • • • • • • • • • • • • • •		
1 1	S-IVB STAGE COLD HELIUM DUMP FAILS TO	01	CONTINUE M	ISSION	CUES
	INITIATE		BSE INFORM	FLIGHT AND	1. COLD HELIUM BOTTLE PRESSUR (0261-403. D263-403).
		•	' THE COL	TO INITIATE D HELIUM DUM THE BURNER.	p 1
		1	'IF UNSUCCE	SSFUL. BSE GHT AND AT TI O SEC SEND-	88 -
		•	'2. LOX PRE	SSURIZATION VALVES OPEN	
		•			
	•		•		
	•				
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	APOLLO :	11	/16/69 SLV - AND TB	789 7	7-16

8 SLV - TB6 (RESTART)

MISSION RULES

REV. LTD

SECTION 8 - SLV - TB6

	9	[TEM!		. •	CLIES/	NOTES/CO	MMENTS				
							-				
			•			SUMMARY	OF RESTART PHAS	E RULES			•
			8-1 ACCE	ELEROMETER	FAIL	URE					
-				12 BURNER			LS				
				CHILLDOWN							
				CHILLDOWN							
				TANK ULLA							
١			8-6 S-IV	B ACTUATO	R HAR	DOVER					
I			9-7 CONT	TINUOUS VE	NT RE	GULATOR	FAILS TO CLOSE				
ı			8-8 LOSS	OF ATTIT	UDE C	CNTROL D	URING SECOND BUI	RN			
l											
١											
١			THE FOLLOWING	MISSION	RULES	ALSO AP	PLY TO THIS SEC	110N			
			6-11 S-IV	P STAGE L	oss o	F THRUST					
١			7-7 S-1V	AUXILIA	RY HY	DRAULIC	PUMP FAILS				
				S GF ATTIT 20 SEC	UDE C	ONTROL D	URING TB5 AND T	B7 TO SPACECRA	AFT SEPARATIO	N. TB6 TO T	86 + 9
			7-9 CON1	TINUCUS VE	NT SY	STEM (CV	S) REGULATOR FA	ILS TO OPEN I	N T85 (T85 +	59 SEC)	
1			7-13 IU E	ECS WATER	VALVE	FAILS T	G CYCLE OPEN AN	D CLOSED			
							D DELTA PRESSUR IS 26 PSID OR PL		EXCEEDS MINUS	20	
			7-16 S-IV	VB ENGINE	CONTR	01 80771	E PRESSURE LESS	THAN 400 PSI	A		
			7-17 LH2	TANK VENT	FAIL	URE OR L	EAK DURING ORBI	TAL COAST			
			7-18 LOW	נטנט הבנו	UM SU	IPPLY PRE	SSURE				
			7-19 LOX	TANK ULLA	GE 29	RESSURE L	ESS THAN 31 PSI	A IN TB5			
			7-21 PU V	VALVE FAIL	s TO	A MIXTUR	E RATIO GREATER	THAN 5.0 TO	1 ANY TIME AF	TER RESTART	
			7-22 S-IV	VE LOSS OF	ENG I	NE HYDRA	OLIC FLUID				
									•		
			4								
									1		•
	一	Δ		MISSION	REV	DATE	SECTION	GROUP	PAGE		
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	<u></u>						_		8-1		

MISSION RULES SECTION 8 - SLV - 186

SIV ITEM

	APOLLO 11			SLV - 186	
L	MISSION	REV	DATE	SECTION	GROUP PAGE
			:		
			• •		IN THE EVENT THE FUEL FROMEN - LAYER VALVE FAILS CLUSED.
			, , • , • ,		THE 02/H2 BURNER VOTING CIRC HILL NOT DETECT FAILURE OF HOURNER TO IGNITE OR BURNER FLAME-
					NOTE
			9. 9	REPRESSURIZATION C	FF SELECT (K.y5-40+).
				IONTINUOUS VENT SY DRIFICE OPEA	STEY! POSITIONS (K180-404, K192-403).
			1. a	BURNER SHUTDOWN	LESS (C2034-403).
	PROPELLANT VALVE !		'55E	INFORM FLIGHT AND	TEMPERATURE INDICATES 450 Jag.
9-2	SHIVE STAGE 02/H2 !		•		CUES
				•	
			• .		
			:		IGNITION.
					' 2. ACCELEROMETER FAILUR ' OCCURRING DURING TH5 MAY NUT ' RECUGNIZED UNTIL SECONU HUR
			•		PROFILE FUR FAILED AXIS DURING S- BURN.
			•		1. LVDC SWITCHES TO A BAC MODE AND UTILIZES A PRECOMPUTED
	:				NOTES
			•		AND NOT DECREASING (H10-603 H11-603 H12-603)
			, ,	SSE INFORM FLIGHT	AND ' ' 2. ACCELEROMETER PICKOFFS (A) ' UR ZI INDICATE IN EXCESS OF 0.5
	B. AFTER TB6 + 9 MIN' 10 SEC		•	CONTINUE MISSION	' TC ''CNE''
			•	9 MIN 10 SEC.	TO !!ONE!!
	PRIOR TO 186 + 9 MIN 10 SEC		' 8	BSE INFORM FLIGHT FIDO AND RECOMMEND INHIBIT PRIOR TO T	AND ! TO !!ONE!!
	INITIATED BUT		1	LI INHIBIT	9175 026 AND 025 FOR 2 ACCE.
-	TAILURE+ ACCELERCMETER				1. GUIDANCE STATUS WURD (
1					
a-1	INERTIAL PLATFORM	TLI	•		CUES

MISSION RULES

PEV ITEM

SECTION 8 - SLV - TB6

RULE	CONDITION/MALFU	MCHION'	PHAS	iE '	RULING	' CUES/NOTES/COMMENTS
8-3	LH2 CHILLDOWN		TL I	•	INUE MISSION	Cues
	SYSTEM FAILS D			•	SE INFORM FLIGHT	1
	PREPARATIONS			' A	NO ATTEMPT TO COR	1
			•		SITUATION SPEC	IFIED!
		•			IN NCTE 1.A. 1	1
					IF UNSUCCESSFU	
					BSE INFORM FLI AND AT TB 6 +	8 MIN' (K127-401)
				. 2	+5 SEC COMMAND	
						7. LH2 ULLAGE PRESS (0177-40
						NOTES
		•				1. LM2 CHILLDOWN WILL NOT SATISFACTORY IF
		•				(A) PREVALVE IS OPEN
		i				(B) RECIRCULATION VALVE CLOSED
						(C) BEEED VALVE IS CLOSE.
				•		(D) CHILLDOWN PUMP IS NOT ON
-		:		;		1 2. THIS FAILURE AND THE FO
						LEAD WILL REQUIRE EVALUATION OF C RESIDUALS TO DETERMINE ADEQUACY F TLI VELOCITY CUTOFF (REF FMR 7-1)
-					•	
				•		
				. •		
						$(x_1, \dots, x_n) = \sum_{i=1}^n (x_i - x_i)^{-1} \sum_{$
	1					
		•				
	# 15 mg					
	1					
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MISSION RULES SECTION 8 - SLV - TB6

		0 11	L	SLV - 186	+	
	MISS	ON REV	DATE	SECTION	GROUP	PAGE
		• • • • • • • • • • • • • • • • • • • •	•		•	
		•			•	
						PRIOR TO RECOMMENDING TELL LAMIST
	·	•			•	BOTH INDIVIDUAL ACTUATOR POSITIONS MUST CONFIRM WALLUNG
	10 350	. • • • • • • • • • • • • • • • • • • •			•	NOTE
1	EQUAL TO +/- 5 DE PRIOR TO TB6 + 9 10 SEC	MIN'	!REC	OMMEND TLI INHIB:	IT !	OR GREATER (G1=400: G1-403: G2- G2=403):
	CONFIRMED HARDOVE (GREATER THAN OR	R !	'85E	INFORM FLIGHT AN	, o	1. ACTUATOR POSITIONS +/- 5
8-6	S-IVB ACTUATOR	TLI	• • TLI	INHIBIT	•	CuE
			•			
1			• • •			REQUIREMENTS.
		•	•		•	TANK ULLAGE PRESSURE SHOULD B PSIA HIGHER THAN ULLAGE FRES DURING ORBITAL COAST TO MEET RES
		•			•	AT T86 + 9 MIN 10 SEC. THE
		t	* • • • • • • • • • • • • • • • • • • •		•	NOTE
		•	•		1	2. LM2 PUMP INLET PRES
	TB6 + 9 MIN 10 SEC		'85E	INFORM FLIGHT AN OMMEND TLI INHIBI	10	1. LHZ TANK ULLAGE MRES (D177-408. 0178-408).
8-5	LOW LHZ TANK ULLAGE PRESSURE A	T •	TLI	INHIBITIT	1 1	CUES
			•		•	(D) CHILLDOWN PUMP IS NOT CA
			1		•	(C) BLEED VALVE IS CLOSED
						(B) RECIRCULATION VALVE IS CL
			•			(A) PREVALVE IS ONEN
		•	. · ·		1	1. LOX CHILLDOWN WILL NOT SATISFACTORY IF
			1			NOTES
		•	•		•	6. LOX RECIRCULATION V. CLOSED (K139-424)
					;	5. LUX BLEED VALVE CL (K126-401)
		•	•		. t	(K109-403, K110-403)
			•		1	PRESSURE (0179-406: 0180-406) 4. LOX PREVALVE DISCR
			•		1	3. LOX PUMP INLET PRES
				IN 1.0		2. LUX CHILLUUNN FLOW (F4-424).
	PREPARATIONS		' 5	ATTEMPT TO CORRECTIVE STRUCTURE TO CORRECT T	ED '	· · · · · · · · · · · · · · · · · · ·
	CHILLDOWN SYSTEM FAILS DURING RESTART			INFORM FLIGHT AN		1. LOX PUMP INLET TEMPERA
1 1						
9-4	S-IVB STAGE LOX		'CON'	TINUE MISSION		CUES

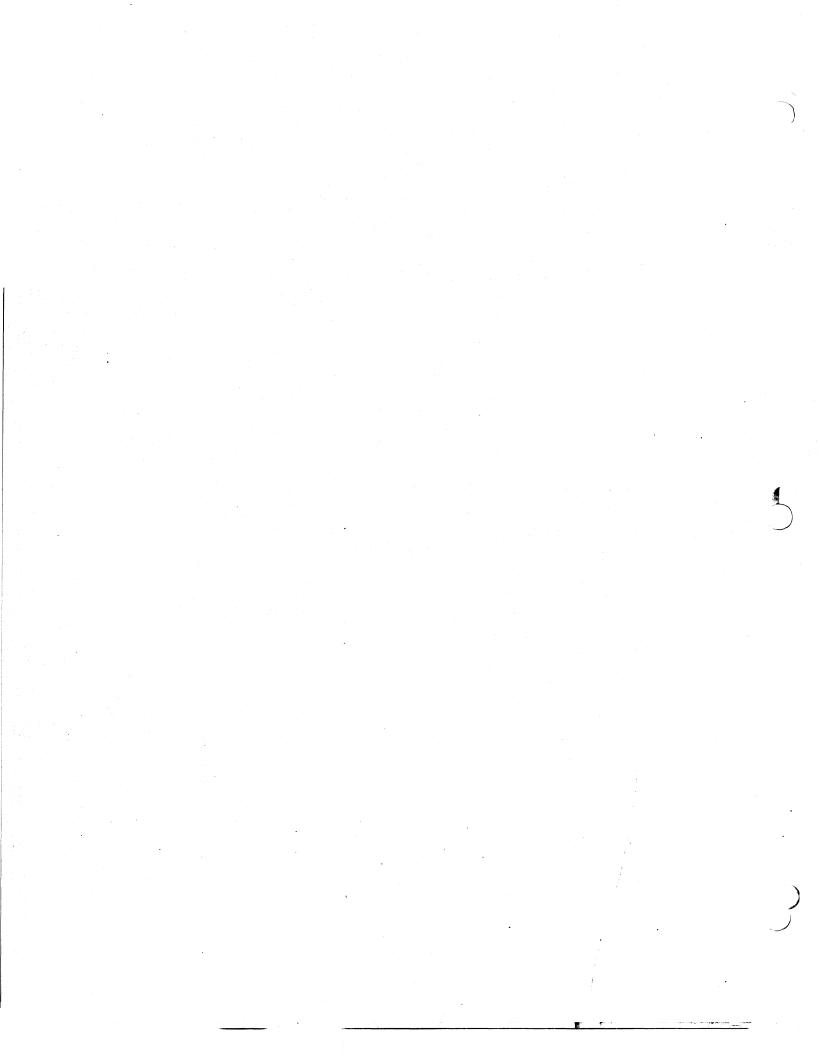
MISSION RULES

REV ITEM

SECTION 8 - SLV - TB6

1,022	CONDITION/MALFUNCTION			RULING	' CUES/N	DIES/COMMENTS
;		•	;		•	
8-7	S-IVB STAGE CONTINUOUS VENT SYSTEM (CVS)		,		. ,	616 1022 6 1052
	REGULATOR FAILS TO CLOSE DURING RESTART SEQUENCE	1	COMM	SSE INFORM FLIGHT	AND GREATER	CVS NOZZLE PRESSURE REMAI R THAN 3 PSIA (U181-40 09).
	ALSTART SEGUENCE	•		SECOND BURN RE	LAY 2. (K154-4	CVS REGULATOR CLUSS
		•	; 2	ATTEMPT TO CLO. THE CVS REGULA	SE 3.	LHZ TANK ULLAGE PRESSU +08+ 0178-408).
		! !	' 9	F NEITHER 1 NOR SUCCESSFUL, BSE NFORM FLIGHT AND RECOMMEND TLI INH	•	
9-8	LOSS OF ATTITUDE CONTROL DURING	TLI	SPAC	ECRAFT SEPARATION	N CUES	j
	S-IVB SECOND BURN	† † †	CONT	ROL.	GREATER DECREAS	ANGULAR RATES - PIT 2. R13-602), YAW (R5-60 1. OR ROLL (R6-602, F12-60 R THAN 5 DEG/SEC AND SING.
		1 1 1	'CREW	WILL ABORT ON L	1 Z.	PLATFORM GIMBAL ANGLES PITC R ROLL (M6C-603) CHANGING SIVEN IN CUE 1.
		•	•		3.	LOSS OF ATTITUDE CONTRISE NOTE2).
		•	:		NOTE	\$
		•				THE SLV YAW GIMHAL (Z-AXI FICAL BEYOND +/- 45 DEG.
		•			ALERT	LOSS OF ATTITUDE CUNTR WILL BE GIVEN FOR T ING CONDITIONS——
					(A) FAILURE	EVDC/LVDA COMPUTATION
		! !				ATTITUDE ERROR SIGNA REATER THAN +/= 3.5 Jeg. Pit M GREATER THAN +/= 5 Deg.
		•			(C)	FAILURE TO INITIATE PROP CE SEQUENCE.
		•	•		(D)	FAILURE OF S-IVE ENGI LICS.
		•			† (É)	ATTITUDE REFERENCE FAILURE
			• .			
				and 🛊 and the second		
					•	
	1				<u> </u>	
ــــــــــــــــــــــــــــــــــــــ	MISSION	REV	DATE	SECTION	GROUP	PAGE

9 SLV - TOB (SAFING AND SLINGSHOT)



REV ITEM

SECTION 9 - SLV TB8

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							•
	7-28	S-IVB STAGE CO	DLD HELIUM	DUMP FAILS TO IN	ITIATE		
	7-26			FAILS TO LATCH U	PEN AS PRUGHAM!	YE D	
	7-25	S-IVB STAGE LO	X NON-PROP	ULSIVE VENT (NHV) FAILS TO OPE	N AT TB7 + U+7	' SEC, FO LATCH CP
	7-14	S-IVB STAGE CO PSID. MINUS 26	MMON BULKH S PSID OR P	EAD DELTA PRESSU LUS 36 PSID+	RE REACHES OR	EXCEEDS MINUS	20 PSID OR PLUS
	7-13			CLE OPEN AND CLO	-	•	
	7-9	MIN 20 SEC AF	TER SPACECR	AFT SEPARATION	AFTER TEB INIT	AFT SEPARATION LATE	(• TB6 TQ Tc6 + 9
	7-4						SECOND BURN CUTO
	7-3	J-2 ENGINE MA	IN FUEL VAL	VE (MFV) FAILS T	O CLUSE AT FIR	ST S-IVB CUTOF	F. SECOND S-IVE
	THE FOLL	OWING REFERENCE	ED FLIGHT M	ISSION RULES ARE	ALSO APPLICABI	LE DURING TIME	E BASE EIGHT (TBB)
	9=5	LOSS OF APS FO	DR DUMP				
	9-4	LHZ DUMP FAILS	.				
	9-3	ENGINE CONTROL	. BOTTLE DU	MP FAILS			
	9-2	LOX DUMP FAILS					
, ,	9-1	STAGE PNEUMAT	C 01140 EA	ı c			
1 1			SUMMARY OF	SAFING AND SLIN	GSHOT RULES		

MISSION RULES

REV, ITEM

SECTION 9 - SLV TB8

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<u> </u>	MISSION	REV	DATE	SECTION	GROUP	PAGE
					· · · · · · · · · · · · · · · · · · ·	
a 514 1		•			•	4. HELIUM SUPPLY PRESSURE MOD APPROXIMATELY 1100 PSIA (036-4 D251-415).
		•	•		•	3. HELIUM SUPPLY PRESSURE MCC APPROXIMATELY 1100 PSIA (035-6 D250-414).
		! !	•			THAN 160 PSIA (OXID-FUEL) (072-4 073-415).
		; ; ;		S-IVB BURN MODE	G14 #	2. MANIFOLD PRESSURE MOD 2 L
, -,	LOSS OF EITHER OR BOTH APS MODULES PRIOR TO OR DURING PROPELLANT DUMP	,	1852	INFORM FLIGHT	AND '	1. MANIFOLD PRESSURE MOD 1 L THAN 160 PSIA (OXID FUEL) : 070-4
9-5	1055 OF 517450 OR	1	100	TINUE MISSION	•	C115 C
					, , , , , , , , , , , , , , , , , , ,	3. FUEL FLOW RATE (F2-401)
		•		LH2 DUMP BY GPE THE MAIN FUEL V	ALVE '	2. MAIN FUEL VALVE UPEN DISCR
	INITIATE AT THE + 17 MIN 9.4 SEC	1 1 1	12.	INFORM FLIGHT . ATTEMPT TO INIT	IATE '	1. MAIN FUEL VALVE POSIT (G4-401)
9-4	LHZ DUMP FAILS TO			TINUE MISSION		CJES
		•	'VAL		1 1 1	PRESSURE (D19-401, D242-401).
		• • • • • • • • • • • • • • • • • • • •	11.	ATTEMPT TO OPEN INE HELIUM CONT	THE '	(018-401). 2. ENGINE CONTROL HELIUM SPH
9-3	ENGINE CONTROL BOTTLE DUMP FAILS TO INITIATE		•	TINUE MISSION INFORM FLIGHT		CUE 1. ENGINE CONTROL REC. PRI
		• • • • • • • • • • • • • • • • • • •	•		1	
		1 1	• • •		· · · · · · · · · · · · · · · · · · ·	4. LOX FLOW RATE (F1-401).
		• •	•	is an every model of the fi	• • •	3. LOX PUMP INLET TEMPERATE (C4-403).
		! !	'LOX	ATTEMPT TO INIT DUMP BY OPENING N OXIDIZER VALV	IATE ' 5 THE '	(G3-401). 2. MAIN OXIDIZER VALVE D. DISCRETE (K120-401).
,	S-IVB LOX DUMP FAILS TO INITIATE AT TB8 + 12 MIN 0.2 SEC	•	•	TINUE MISSION INFORM FLIGHT .	AND '	1. MAIN OXICIZER VALVE POSIT
9-2	S-IVE LOV DUMO SALLS	1		-15 wissian		
		•	VAL			PRESSURE (0236-403) .
		1	11.	ATTEMPT TO OPEN	THE 1	(D50-403). 2. AMBIENT HELIUM SUP
9-1	S-IVB STAGE PNEUMATIC DUMP FAILS TO INITIATE	'TLC	,'CON 'BSE	TINUE MISSION INFORM FLIGHT	1	CUES 1. ENGINE PUMP PURGE PRESS
ŀ		,	,			

SECTION 9 - SLV - TB8 - CONTINUED

			PRELA	UNCH INSTRUM	ENTATI	ON				
MEASUREME!	NT DESCRIPT	ION		MEAS NUMBER ONBOA	RD TR	ANSDUCERS	CATEGO	EF RY TI	FEC-	MISSION RULE
				IGHT CONTROL						
STAGE COMMU	NICATIONS S	YSTE	ч							
S-IVB STAGE										
NC XUP	P180 (VIA I	U)					M			
INSTRUMENT (TINC									
٠.	INK DP18						м			
EMERGENCY DE	ETECTION SY	STEM	(EDS)				M			
COMMAND COM	MUNICATIONS	SYS	TEM (CCS) UPLINK			M			
FLIGHT CONTR	ROL MEASURE	MENT	S							
S-II STAGE										
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S-IV8 STAGE										
PRESS. FUEL PRESS. FUEL PRESS. FUEL PRESS. OXID PRESS. OXID PRESS. OXID PRESS. GND PRESS. ENG PRESS. ENG PRESS. ENG PRESS. RESE PRESS. AMB PRESS. ENG PRES	TANK ULLAG TANK ULLAG PUMP INLET TANK ULLAG TANK ULLAG TENK ULLAG START BOTTE CONTROL HE EVOIR OIL ENT HE POEL CONT HE SPH HE SPHERE DXIDIZER ITCH ACTUAT AW ACTUAT AW ACTUAT BW RANGE EBW RANGE	EE EE H HKU! EE EE H SEEE N SEEE R VALUE OR IAFE	S 2 S 1 S 2 RE ERE LIP MEAS SKUP MEA	0178-410 03-403 0179-406 0180-406 016-425 017-401 019-401 041-403 042-403 0236-403	METER METER	COMMON COMMON COMMON	2	OF OFFICE		7-14 7-14 7-14 7-14 7-14 7-14 7-14 7-19 7-14 7-19 7-16 7-10 7-16 7-15 7-20 7-16 7-15 7-20 7-16 7-15 7-21 7-6 8-6 8-6 8-6 7-4 7-21 7-5 7-21
	•	•		ONBOARD DI	-					
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MISSION RULES

SECTION 9 - SLV - TBB - CONTINUED

3EV 9	I ITEM				(3.11.11.02.5		
		MEASUREMENT DESCRIPTION		MEAS NUMBER	ONBOARD TRANSDUC	EFFEC ERS CATEGORY	TIVITY RE
		MISC: SEC R/S RCVR 1 L/L MISC: SEC R/S RCVR 2 L/L LEVEL: RESERVOIR OIL	SIG STR	N57-411 N62-411 L7-403		000	7-5 7-5 6-10:7-22
		INSTRUMENT UNIT GUIDANCE COMPUTER OPERAT	ION	H60-603			6-1/4/7/9. 7-8/11.8-1/8
		COMPUTER RESET PULSE NO. DECODER	1-GUIDANC	E J71-603			REGUIRED TO
		COMPUTER RESET PULSE NO. DECODER	2-GUIDANCI	E J72-603		1 OF 2	MULTIPLE WORK GROUND COMMANOS
		ANG VEL PITCH CONTROL		R4-602		но	6-1/7.7-9.8-
		ANG VEL YAW CONTROL		R5-6C2		HD	6-1/7:7-8:8-9
		ANG VEL ROLL CONTROL		R6-602		HO	6-1/7.7-8.8-6
		ANG VEL YAW EDS GROUP 1	(REF)	R8-6C2		~ 0	5-1/7:7-5:8-6
		ANG VEL ROLL EDS GROUP 2	(REF)	R12-602		но	6-1/7.7-8.8-6
		ANG VEL PITCH EDS GROUP	3 (REF)	R13-6C2		HO	5-1/7:7-8:8-6
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		APOLLO 11	4/16/69		PRELAUNCH		
			·		INSTR	9-4	

10 CSM ENVIRONMENTA

MISSION RULES

SECTION	10	•	CSM	ENVIRONMENTAL	CONTROL	SYSTEM
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\$67	1755		SECTION 1	o - c	SM ENVIR	ONMENTAL CONTROL	SYSTEM			
R	ITEM									
						' GENERAL '				
	10-1	LAUNCH WILL	BE CONTIN	JED A	S LONG A	S THE SUIT CIRCUI	T AND OZ SUPI	PLY WILL	SUPPORT FLIGHT CREW	
		LAUNCH/INSE					THERE ARE NO	o coolan	T PAILURES FOR WHICH	
		TLC & TEC	BATTON WILL			TO COMPONENT TEST	tua.			
		ALL PHASES	MAILON WILL	. 56	CIMITED	TO COMPONENT TEST	ING.			
		A. BACKUP S	YSTEMS AND	BACK	UP COMPO	NENTS WILL NORMAL ION CONTINUATION.	LY BE USED I	FOR THE	MOST RAPID PRACTICAL	
		8. LM SYSTE THE DE	MS WILL BE SCENT STAGE	USED E WIL	AS REQU L BE RET.	IRED FOR CSM SYST AINED WHERE POSSI	EMS BACKUP. II	CSM SYS	TEMS REQUIRE LM BACKUP	
		C. TO CONTI	NUE: WATER N REGUIREM	QUAN ENTS.	TITY PRE	DICTIONS MUST RE	FLECT ADEQUAT	TE QUANT	ITIES TO MEET NORMAL	
	10-2	CEFINITIONS								
		LOSS OF CAB	IN INTEGRI	TY						
						LEAKAGE SUCH THAT •5 PSIA BY CABIN			BE MAINTAINED GREATER: +2 LB/HR TOTAL) +	
		LOSS OF SUI	T INTEGRIT	Y						
		TOTAL PGA AND SUIT LOOP LEAKAGE IS GREATER THAN 0.5 PSI/MIN (1.5 LB/HR) BURING PGA SUIT LOOP PRESSURE CHECT.								
		LOSS OF SUI								
			AND/OR	C02		IT CIRCUIT TO MAN WITHOUT USING DIR		CREM C	OMFORT AND/OR COMFORT	
		LOSS OF OZ			o. D. o.e. d	FC: 4 TO FA	J. P		BELLIF AS DELLANDS CHARAS	
					FOR ENT		MILL MATCH IN	2 3011 C1	RCUIT OZ DEMANOS CANNOT	
		LOSS OF PRI	MARY LOOP	COOLI	NG					
						LEAK WHICH CANNO RATOR PROVIDE NO		OR COME	INED FAILURES SUCH THAT	
		LOSS OF SEC		•	-•					
						LEAK WHICH CANNO RATOR PROVIDE NO		OR COME	INED FAILURES SUCH THAT	
		LOSS OF COO	LANT LOOP	RADIA	TORS					
						XAGE OF ALL FLOW G TERM USAGE OF W			RADIATOR DEGRADATION EING PRODUCED.	
		LOSS OF ALL	COCLING	-						
						SECONDARY LOOP C	OOLING.			
		LOSS OF SUR							! !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	
						PACK, OR ASSO F THE SURGE TANK			UMBING FAILURES WHICH	
		RULE NUMBER	IS 10-3 THR	OUGH	10-9 ARE	RESERVED.				
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		y to the								
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			APOLLO 11		4/10/69	CSM ENVIRONMENT		10-1		

MISSION RULES

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	н.	THE CM		AMRON	LLY SUPP	LY ALL OZ FOR COM			
	I• J•					D EVERY 12 HOURS S FOR THE FOLLOW.		F PCO2 WHICE	HEVER COMES FIRST:
		1. 1	NABILITY TO	IAM D	NTAIN CA	BIN PRESSURE ABOV	E 4.5 PSIA.		
		2 . A	LL UNDOCKE	OPE	RATIONS.				
			D&E.						
	!		LYCOL LEAK						•
			_			ON IN CABIN.			
	×.					TS (TIME AND CON	ITTIONS PERMITT	ING) FOR TH	E FOLLOWING
			OSS OF SUL						
				EAK O	F GLYCOL	IN SUIT CIRCUIT			
		NAM THA.		2014				,. 	ės tus satuvoji a
	۸.	SECOND	ARY LOOP R	ADIAT	OR WILL	BE ISOLATED.			ER THE PRIMARY O
	9.		_		-	INE AND RADIATORS			
	٠.					SOR LAUNGH	MATHIATHED BEI	WEEN JU AND	55 PERCENT.
	D•					FOR LAUNCH.		OT TO MAINT	AIN PRIMARY RADIATO
						AN -20 DEG.	TED IN AN ATTEM	PI IO MAINI	AIR PRIMARY RADIATO
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SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM

				,							10-3			
				APOLLO 1	+	4/16/61	CSM ENVI	RONMENT	MANAGEN	MENT	,	· · · ·		
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				S 10-11 THESERVED.	1ROUGH				•					
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			TEMS V		ED AS	REQUIRE	D FOR CSM	SYSTEMS	BACKUP.	DESCENT	STAGE	dit 8	E RETAIN	ED IF
		SYSTEM	BACK	JP .										
		2. IF	ERIODS	S ARE REQL S.	IRED	IN LUNAR	ORBIT THE	E OPTIMUM	M DUMP T	IME IS	IMMEDIA	TELY P	RECEDING	SLEEP
							QUIRED! WI							
		C. GE	NERAL	DUMPING C	ONSID	ERATIONS	TO REDUCE	E TRAJECT	TORY CAL	CULATION	PERTUR	BATIONS		
		2. AT	CM-SM	SEPARATI	ON . T	HE POTAB	LE TANK WI	ILL BE FO	JLL AND	THE WAST	E TANK	AILL	BE 90 P	ERCENT
							NTAIN GREA							
l		B. WA	TER DL	IMPS WILL	BE MA	NAGED SO	THAT							
		8	15-90 P	PERCENT. W	IASTE IENTAT	WATER WII	RBOARD AS LL NORMALL 009) IS LO ECREASE.	Y BE QUI	MPED TO :	25 PFRCE	NT. HOW	EVER. 1	E WASTE	WATER
		WATER												
	ITEM													

MISSION RULES

SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM

, ,	CONDITION/MALFUNCTION			HULING		CUES/NOTES/COMMENTS
;	, . ,		•		•	
	RULE NUMBERS 7-29		'		•	
				' SPECIFIC '		
10-20	AND 7-30 ARE RESERVED.	•	' ,		1 1	NO. 100 100 100 100 100 100 100 100 100 10
	CABIN PRESSURE	LAUNCH	CON	TINUE MISSION	•	NORMAL RELIEF STARTS AT SECONDS
10-21	CANNOT BE RELIEVED CABIN PRESSURE	•			•	3.5 PSIA CREW OPTION TO USE
	DECREASING AND/OR LESS THAN 4.5 PSIA		;			ENVIRONMENT FOR EARTH RETURN IN CO
	AND	1				
		•	•		•	
	A. SUIT PRESSURE GREATER THAN	LAUNCH	A+1	. CONTINUE MISSIO	N :	
		ALL	2	. ENTER NEXT BEST		
		;		IF CABIN PRESS RESTORED GREATE		
		1	•	THAN 4.5 PSIA.	1	
	9. SUIT PRESSURE LESS THAN 3.5 PSIA	LAUNCH	8.1	. ABORT ASAP	:	
		ALL	¦ 2	. ENTER ASAP		
	C. LOSS OF SUIT	LAUNCH	C+1	. ABORT ASAP		C.1. CORRESPONDS TO 12.6 _B/ (APPROX 3 CFM/CREWMAH)
	CIRCULATION	1	,	DEG FROM LAUNCH	45	LAPPROX 3 CFM/CREWMAH)
		; ;		SETTING.		
		'ALL		. ENTER ASAP		
			•	- EITEN NOME	-	
10-22	LOSS OF SUIT	Ĺ	•		•	LM SYSTEMS (IF AVAILABLE) WILL
	CIRCULATION CABIN STABLES AND GREATER		÷			USED FOR CO2 AND H20 REMOVAL.
	THAN 4.5 PSIA	1	,		•	
		LAUNCH	'A•	CONTINUE MISSION OPEN DIRECT 02 VA	LVE	A. CORRESPONDS TO 12.6 LEZ (APPROX 3 CFM/CREWMAN)
		•	•	45 DEG FROM LAUNC SETTING.	я <u> </u>	The second secon
		' EG	1			
			•	ENTER NEXT BEST P		
		1	,	1. DOFF SUITS.	;	
		•	•	2 · OPEN WASTE OVERBOARD DRAI	N '	8.2. WASTE OVERBOARD BLEED = 0.0
				VALVE TO OBTAI	N '	
		•		3. DON FACE MASK	•	3. TIME REQUIRED FOR CM COZ PART
		1		AFTER 1 HOUR		PRESSURE TO INCREASE TO 7.6 MM MG
					•	1 CREWMAN- 4 AR.
	•	•			;	3 CREWMAN 80 MIN.
		ALL	·c•	ENTER NEXT BEST P	TP	
		1	;			
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MISSION RULES

V	ITEM	SECTION 10 - CSM ENVIRONMENTAL CONTROL S	SYSTEM

R	RULE	CONDITION/MALFUNCTION	PHASE		RULING	,	CUES/NOTES/COMMENTS
				,		•	
	10-22	LOSE OF CHOCE TANK	, *	•			Soo . Sty to sugar
	10-23	LOSS OF SURGE TANK OR REPRESS PACK	!				FOR LEAK IN SURGE TANK, ISOLA SURGE TANK AND PLACE RLSS VALVE
				•			FILL.
			•	•	CONTINUE MISSION	·	
			ALL	18.	CONTINUE MISSION		
		. .					
	10-24	LOSS OF SURGE) 	•		1	
		TANK AND REPRESS	1 · · · · · · · · · · · · · · · · · · ·	1		;	
			! !! *!!*!*	1	CONTINUE MISSION	•	
			•	•			
			ALL	' 5	CONTINUE MISSION Plan to restore ei	NTRY '	B. OPS 02 GTY 2 TANKS -2 LB/TANK
			•	' (DZ BY STORING OPS IM AT FINAL LM EGR	IN ' RESS•'	
			TEC	· · · · ·	CONTINUE MISSION	1	
			•		OFF SUITS FOR EN	TRY.	
			•	;		;	
			•	•		:	
			•				
	10-25		LAUNCH		ABORT L. DECOMPRESS CAB	IN	
	1		;	;	. TROUBLESHOOT	;	
			1 1	1	ELECTRICAL SYSTEM PER FLIC	GHT '	
			•	;	CREW CHECKLIST		
			•		PROCEDURES.		
			ALL		TROUBLESHOOT/CO		
				;	FIRE PER FLIGHT CHECKLIST EMERG		
			•	· ;	PROCEDURES.	;	
			1	2	. ASSESS DAMAGE AN REMOVE POWER FRO		
			•	•	AFFECTED SYSTEM	5 ;	
			•	; 3	. ENTER NEXT BEST	PTP !	
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MISSION RULES

10-26 CONTAMINATION IN ALL CREW MAY ELECT TO IF UNABLE TO CLEAR CONTAMINAT MISSION MAY BE TERMINATED EARLY. 10-27 LOSS OF SUIT INTEGRITY LAUNCH 'A. CONTINUE MISSION CSM PRESSURE VESSEL CONFIGURA CHANGES LOSS OF OZ MANIFOLD CEARS CAUNCH CONTINUE MISSION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION COMPLICATION NO-GO FOR UNDOCK ALL 'E. CONTINUE	. KULE		PHASE	RULING	CUES/NOTES/COMMENTS
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LOSS OF SUIT INTEGRITY LAUNCH SO SO SO CONTINUE MISSION COMPRESSURE VESSEL CONFIGURA COMPRESSURE COMPRESSURE VESSEL CONFIGURA COMPRESSURE	10-26	CONTAMINATION IN	ALL	CREW MAY ELECT TO	IF UNABLE TO CLEAR CONTAMINAT
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LAUNCH 'A. CONTINUE MISSION CHANGES O 'B. CONTINUE MISSION TICC 'C. INNIGIT TOBE O 'B. CONTINUE MISSION OF LAUNCH 'L. PRESSURIZED AND TUNNEL WORK IS COMPLETE. ALL 'E. CONTINUE MISSION NO-GO FOR UNDOCK A. 02 MANIFOLD LEAKS LAUNCH A. BAYMR AND CABIN PRESSURE GREATER THAN A.9 PSIA ALL '2. ENTER NEXT BEST PTP A.2. APPROXIMATELY 3 MOURS REQUIRED TO DEPLETE CABIN 02 A.0 TO THE CABIN O2 A.2 APPROXIMATELY A.2. APPROXIMATELY A.2. APPROXIMATELY A.2. APPROXIMATELY A.2. APPROXIMATELY A.2. APPROXIMATELY A.2. A	10-27				CONTINUE MISSION EXCEPT FOR ME CSM PRESSURE VESSEL CONFIGURA
TIC 'C. INNIBIT TOSE 'D. ITMMINATE PHASE CONTINUE ME EJECTION IF IM IS PRESSURIZED AND TUNNEL WORK IS COMPLETE. ALL 'E. CONTINUE MISSION NO-GO FOR UNDOCK A. 0.2 MANIFOLD LEAKS'LAUNCH GREATER THAN A. LB/MR AND CABIN PRESSURE GREATER THAN A.5 PSIA ALL 2. ENTER NEXT BEST PTP A.2. APPROXIMATELY 5 MOURS REQUIRED TO DEPLETE CABIN 02 A.4 TANK AND REPRESS PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS PACK ISOLATED UNTIL ENTRY. A.2. (APPROXIMATELY 5 MOURS REQUIRED TO DEPLETE CABIN 02 A.4 TANK AND REPRESS PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS PACK ISOLATED UNTIL ENTRY. (C) ENTER ASAP USE OPS IN SUITED MODE FOR ENTRY LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. 10-29 LOSS OF ONE MAIN REGULATOR 150 19-0 (SONTINUE MISSION CONSIDER TEI AT NEXT BEST OPPORTUNITY			LAUNCH	'A. CONTINUE MISSION 'B. CONTINUE MISSION	
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AND TUNNEL WORK IS COMPLETE. ALL 'E. CONTINUE MISSION NO-GO FOR UNDOCK ALL 'E. CONTINUE MISSION NO-GO FOR UNDOCK ALL 'A.1. CONTINUE MISSION ALL 'A.1. CONTINUE MISSION ALL 'A.1. CONTINUE MISSION ALL 'A.2. APPROXIMATELY 5 HOURS REATER THAN ALS PSIA ALL '2. ENTER NEXT BEST PTP ALL 'A.2. APPROXIMATELY 5 HOURS REQUIRED TO DEPLETE CABIN 02 ALC 10 1.9 PSIA. WITH 056 L USAGE RATE (CREW + CABIN LEAK + PRESS BLEED) ALL 'A. VERIFY SURGE TANK AND REPRESS, PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS UNTIL ENTRY. (B) RETRIEVE OPS FROM LM. ENVIRONMENT FOR TARTH RETURN IN OF MANUAL CABIN PRESSURE REGULAT B. 02 MANIFOLD LEAKS LAUNCH GREATER THAN A. B. 1. ABORT ASAP USE OPS IN SUITED MODE FOR ENTRY 10-29 LOSS OF ONE MAIN REGULATOR 'EO '3. NO-GO FOR TLI 'TLC 'C. ENTER NEXT BEST PTP ALL 'D. CONTINUE MISSION CONSIDER TEI AT NEXT BEST OPPORTUNITY BEST OPPORTUNITY BEST OPPORTUNITY BEST OPPORTUNITY BEST OPPORTUNITY			1	' CONTINUE LM EJECTION	• • • • • • • • • • • • • • • • • • •
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10-28 LOSS OF OZ MANIFOLD LEAKS LAUNCH A*1. CONTINUE MISSION GREATER THAN A*5 PSIA ALL 2. ENTER NEXT BEST PTP A*2. APPROXIMATELY 5 HOURS REQUIRED TO DEPLETE CABIN OZ 4.8 TO 3.5 PSIA. WITH 0.*50 LUSAGE RATE (CREW + CABIN LEAK + PRESS BLEED) (A) VERIFY SURGE TANK AND REPRESS PACK ISQUATED UNITL ENTRY. (B) RETRIEVE OPS PACK ISQUATED UNITL ENTRY. (B) RETRIEVE OPS PACK ISQUATED UNITL ENTRY. (B) RETRIEVE OPS PACK ISQUATED UNITL ENTRY. (B) RETRIEVE OPS PACK ISQUATED UNITL ENTRY. LB/MR AND CABIN PRESSURE REGULATED USE OPS IN SUITED MODE FOR ENTRY 10-29 LOSS OF ONE MAIN LAUNCH A*6. CONTINUE MISSION REGULATOR 10-29 LOSS OF ONE MAIN LAUNCH A*6. CONTINUE MISSION CONSIDER TEI AT NEXT BEST PTP ALL OCCUMENT MISSION CONSIDER TEI AT NEXT BEST PTP ABEST OPPORTUNITY			l Láirí	•	• 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
A. 02 MANIFOLD LEAKS LAUNCH A.1. CONTINUE MISSION GREATER THAN LB/HR AND CABIN PRESSURE GREATER THAN A.5 PSIA ALL 2. ENTER NEXT BEST PTP A.2. APPROXIMATELY 5 HOURS REQUIRED TO DEPLETE CABIN 02 4.8 TO 3.5 PSIA, WITH 056 LOSAGE RATE (CREW + CABIN LEAK + PRESS BLEED) CABIN LEAK + PRESS BLEED) CABIN LEAK + PRESS BLEED) CABIN LEAK + PRESS BLEED	l		-		
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GREATER THAN A CABIN PRESSURE GREATER THAN A-5 PSIA ALL 2. ENTER NEXT BEST PTP A-2. APPROXIMATELY 5 HOURS REQUIRED TO DEPLETE CABIN 0.02 A-68 TO 3.5 PSIA. WITH 0.056 USAGE RATE (CREW + CABIN LEAK + PRESS BLEED) (A) VERIFY SURGE TANK AND REPRESS PACK ISOLATED UNITL ENTRY. (B) RETRIEVE OPS FROM LMA LB/MR AND CABIN PRESSURE LESS THAN A-5 PSIA ALL 2. ENTER ASAP USE OPS IN SUITED MODE FOR ENTRY LOSS OF ONE MAIN REGULATOR (EO '8. NO-GO FOR TLI TIC 'C. ENTER NEXT BEST PTP A-2. APPROXIMATELY 5 HOURS REGULATOR A-2. APPROXIMATELY 5 HOURS REGURED TO DEPLETE CABIN 0.00 A-68 TO 3.5 PSIA WITH 0.00 A-68 TO 3.5 PSIA WITH 0.00 A-68 TO 3.5 PSIA WITH 0.00 A-68 TO 3.5 PSIA WITH 0.00 A-68 TO 3.5 PSIA A-2. (3) CREW OPTION TO USE ENVIRONMENT FOR EARTH RETURN IN OF MANUAL CABIN PRESSURE REGULAT TO SUPPLEMENT CSM SUPPLY. 10-29 LOSS OF ONE MAIN REGULATOR CONTINUE MISSION CONSIDER TEI AT NEXT BEST OPPORTUNITY	10-28				
PRESSURE GREATER THAN 4-5 PSIA ALL 2. ENTER NEXT BEST PTP REQUIRED TO DEPLETE CABIN 02 4.8 TO 3-5 PSIA, WITH 056 L USAGE RATE (CREW + CABIN LEAK + PRESS BLEED) (A) VERIFY SURGE TANK AND REPRESS PACK ISOLATED UNTIL ENTER: (B) RETRIEVE OPS PROM LM. FROM LM. B. 02 MANIFOLD LEAKS LAUNCH GREATER THAN 4 LB/HR AND CABIN PRESSURE LESS THAN 4-5 PSIA ALL 2. ENTER ASAP USE OPS IN SUITED MODE FOR ENTRY 10-29 LOSS OF ONE MAIN REGULATOR ED TANK AND REPRESS THAN 4-5 PSIA ALL 2. ENTER ASAP USE OPS IN SUITED MODE FOR ENTRY 10-29 LOSS OF ONE MAIN REGULATOR ED TIC (C. ENTER NEXT BEST PTP ALL OD. CONTINUE MISSION CONSIDER TEI AT NEXT BEST OPPORTUNITY 10-25 ENTER NEXT BEST PTP ALL OD. CONTINUE MISSION CONSIDER TEI AT NEXT BEST OPPORTUNITY		GREATER THAN	1	A-1- CONTINUE MISSION	
ALL 2. ENTER NEXT BEST PTP REQUIRED TO DEPLETE CABIN 02 4.8 TO 3.5 PSIA. WITH 096 L USAGE RATE (CREW + CABIN LEAK + PRESS BLEED) (A) VERIFY SURGE TANK AND REPRESS PACK ISOLATED UNTIL ENTR. (B) RETRIEVE OPS PROM LM. (B) RETRIEVE OPS A.2.(9) CREW OPTION TO USE ENVIRONMENT FOR EARTH RETURN IN OF MANUAL CABIN PRESSURE REQUIAT B. 02 MANIFOLD LEAKS LAUNCH GREATER THAN 4 LB/HR AND CABIN PRESSURE LESS THAN 4.5 PSIA ALL 2. ENTER ASAP USE OPS IN SUITED MODE FOR ENTRY 10-29 LOSS OF ONE MAIN REGULATOR 10-29 LOSS OF ONE MAIN CONSTIDER TEIL TIC CO. ENTER NEXT BEST PTP ALL D. CONTINUE MISSION CONSTIDER TEIL TO CONSTIDER TEIL TO CONSTIDER TEIL TO CONSTIDER TEIL TO CONSTIDER TEIL TO SUPPLEMENT CSM SUPPLY.		PRESSURE GREATER	•	•	
## Cabin Leak + Ca		INAM SOJ FORM		2. ENTER NEXT BEST PTP	
USAGE RATE (CREW + CABIN LEAK + PRESS BLEED) (A) VERIFY SURGE TANK AND REPRESS PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS FROM LM. (B) PRESSURE LESS THAN 4.5 PSIA ALL 2. ENTER ASAP USE OPS IN SUITED MODE FOR ENTRY LOSS OF ONE MAIN REGULATOR (B) NO-GO FOR TLI (TLC 'C. ENTER NEXT BEST PTP ALL 10-29 LOSS OF ONE MAIN REGULATOR (B) NO-GO FOR TLI (TLC 'C. ENTER NEXT BEST PTP ALL 10-CONTINUE MISSION CONSIDER TEIA TNEXT BEST OPPORTUNITY				t y y	1 4.8 TO 3.5 PSIA, WITH 0.456 L
TANK AND REPRESS' PACK ISOLATED UNTIL ENTRY. (B) RETRIEVE OPS FROM LM. (B) RETRIEVE OPS FROM LM. (B) RETRIEVE OPS FROM LM. (C) MANUAL CABIN PRESSURE REGULATED (D) MANUAL CABIN PRESSURE PROMETOR (D) MANUAL CABIN PRESSURE PROMETOR (D) MANUAL CABIN PRESSURE PROMETOR (D) MANUAL CABIN PRESSURE PROMETOR (D) MANUAL CABIN PRESSURE PROMETOR			,	1 1	
B. 02 MANIFOLD LEAKS LAUNCH B.1. ABORT ASAP GREATER THAN 4 LAUNCH S. ENTER ASAP LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. MODE FOR ENTRY					† †
B. OZ MANIFOLD LEAKS LAUNCH B.1. ABORT ASAP GREATER THAN 4 LB/HR AND CABIN PRESSURE REGULAT A.2.(9) CREW OPTION TO USE ENVIRONMENT FOR EARTH RETURN IN OF MANUAL CABIN PRESSURE REGULAT B. OZ MANIFOLD LEAKS LAUNCH B.1. ABORT ASAP GREATER THAN 4 LB/HR AND CABIN PRESSURE REGULAT LM OZ (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LOSS OF ONE MAIN LAUNCH A. CONTINUE MISSION PREGULATOR LOSS OF ONE MAIN LAUNCH A. CONTINUE MISSION CONTINUE			•	PACK ISOLATED	
B. OZ MANIFOLD LEAKS LAUNCH B.1. ABORT ASAP GREATER THAN 4 L8/HR AND CABIN PRESSURE LESS LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E TO SUPPLEMENT CSM SUPPLY. LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE) MAY 3E LM 02 (IF AVAILABLE			• , • .	' (B) RETRIEVE OPS	! A-2-(9) CREW OPTION TO USE
GREATER THAN 4			•	FROM LM.	ENVIRONMENT FOR EARTH RETURN IN OF MANUAL CABIN PRESSURE REGULAT
LB/HR AND CABIN				B.1. ABORT ASAP	
THAN 4.5 PSIA THAN 4.5 PSIA ALL 2. ENTER ASAP USE OPS IN SUITED MODE FOR ENTRY TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY. TO SUPPLEMENT CSM SUPPLY.		LB/HR AND CABIN	•	•	
LOSS OF ONE MAIN 'LAUNCH 'A. CONTINUE MISSION 'REGULATOR 'EO 'B. NO-GO FOR TLI 'TLC 'C. ENTER NEXT BEST PTP 'ALL 'D. CONTINUE MISSION 'CONSIDER TEI AT NEXT 'BEST OPPORTUNITY 'BEST OPPORTUNITY		THAN 4.5 PSIA	•		LM 02 (IF AVAILABLE) MAY 3E
10-29 LOSS OF ONE MAIN 'LAUNCH 'A. CONTINUE MISSION 'EO 'B. NO-GO FOR TLI 'TLC 'C. ENTER NEXT BEST PTP 'ALL 'D. CONTINUE MISSION 'CONSIDER TEI AT NEXT 'BEST OPPORTUNITY 'BEST OPPORTUNITY			ALL	USE OPS IN SUITED	
REGULATOR 'EO '8. NO-GO FOR TLI 'TLC 'C. ENTER NEXT BEST PTP 'ALL 'D. CONTINUE MISSION ' 'CONSIDER TEI AT NEXT ' BEST OPPORTUNITY			•	MODE FOR ENTRY	1
REGULATOR 'EO '8. NO-GO FOR TLI 'TLC 'C. ENTER NEXT BEST PTP 'ALL 'D. CONTINUE MISSION ' 'CONSIDER TEI AT NEXT ' BEST OPPORTUNITY					
REGULATOR 'EO '8. NO-GO FOR TLI 'TLC 'C. ENTER NEXT BEST PTP 'ALL 'D. CONTINUE MISSION ' 'CONSIDER TEI AT NEXT ' BEST OPPORTUNITY			•	•	
TLC 'C. ENTER NEXT BEST PTP ' 'ALL 'D. CONTINUE MISSION ' ' CONSIDER TEI AT NEXT ' ' BEST OPPORTUNITY '	10-29		•	•	
CONSIDER TEL AT NEXT '			TLC	'C. ENTER NEXT BEST PTP	
			ALL	CONSIDER TEL AT NEXT	
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4/16/6 CSM ENVIRONMENT CONTROL SYSTEM

APOLLO 1

SUIT/CABIN

MISSION RULES

	CONDITION/MALFUNCTION	I' PHASE	! RULING	CUES/NO	TES/COMMENTS	
1. 1		•	•			
10-30	BOTH MAIN REGULATORS	31	•	LM S	SYSTEMS (IF AVAILABLE) MAY
1	FAILED CLOSED	1 Acres	1	' USED IN	LIEU OF CSM SYSTEMS	•
1		* A t. L.	'A. CONTINUE MISSION 'B. ENTER NEXT BEST	PTP .		
- 1		1	•	ı		
10-31	LOSS OF ONE SUIT	LAUNCH	A. CONTINUE MISSION	•		
- 1	COMPRESSOR	' EO	B. NO-GO FOR TLI	•		
		ALL	1			
1		T.	'C. CONTINUE MISSION ' PERFORM ASCENT AT	NEXT		
1		1	. BEST OPPORTUNITY	AFTER '		
- 1		i ,	EVA.	•		
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l	RULE NUMBERS 10-32	•		•		
İ	THROUGH 10-39 ARE					
- 1	RESERVED.			•		
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	MISSION	REV D	ATE SECTION	GROUP	PAGE	

MISSION RULES

RIRULE	CONDITION/MALFUNCTION			' CUES/NOTES/COMMENTS
!	***************			1
		· · · · · · · · · · · · · · · · · · ·	•	
10-40	PRIMARY COOLANT) 		• • • • • • • • • • • • • • • • • • •
		LAUNCH	! A.1. CONTINUE MISSION	A-1- REF MALF PROC
	EVAPORATOR	ALL	2. CONTINUE MISSION	•
		 !	ACTIVATE SECONDAI	RY ' GREATER THAN-20 DEG. F.
		r F	RADIATORS IN BYP	ASS ! (B) WATER MANAGEMENT MAY DICT
			MAINTAIN PRIMARY EVAPORATOR OUT TO	SECONDARY LOOP TO MAINTAIN PRI
) 	LESS THAN 80 DEG	
			FOR CREW COMFORT	1
	B. LOSS OF RADIATORS	LAUNCH	18.1. CONTINUE MISSION	8.1. REF MALF PROC
		EO	2. NO-GO FOR TLI	1 2. ALTERNATE MISSION MAY 1 PERFORMED
		, ,	' (A) ACTIVATE ' SECONDARY L	
		· •	(8) USE PRIMARY	• • • • • • • • • • • • • • • • • • •
		! !	LOOP IN ADDI	
		! !	LOOP FOR GEN	•
		'TLC	3. ENTER NEXT BEST	, PTP 1
		•	NO-GO FOR LOI	
		LUNAR 'ORBIT/	4. BASED ON WATER AVAILABLE FOR	•
		LUNAR STAY	EVAPORATIVE COOF	
		;	BE GIVEN TO CONTINUING MISS	ION !
	LOOP	LAUNCH	'C.1. CONTINUE MISSION ACTIVATE SECONDAR	
	•) 	LOOP	
		EO	2. NO-GO FOR TLI CTIVATE SECONDAR	1 C.2. ALTERNATE MISSION MAY RY 1 PERFORMED.
		1 •	LOOP	1
		ALL	3. ENTER NEXT BEST	
			LOOP	
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	MISSION			GROUP PAGE
	APOLLO 1	ዛ •′	16/69 CSM ENVIRONMENT CONTROL SYSTEM	COOLANT 10-8

REV ITEM

R	RULE	CONDITION/MALF	UNCTION'	PHAS	E '	RULING	' CUES/N	TES/COMMENTS
	;		<u>.</u>		:		•	
	10-41	SECONDARY LOOP MALFUNCTIONS	•				•	
		A. LOSS OF EVAPORATOR		NLL .	A. (CONTINUE MISSION	A. MALI	F ECS
		B. LOSS OF RADIATORS	•	EO	8.1	NO-GO FOR TLI LOOP IS STILL OPERATIONAL IN EVAPORATIVE MODE	;	MALF ECS
			1	TLC	2.	ENTER NEXT BEST	PTP	
				UNAR	3 .	CONTINUE MISSION		
				LUNAR	4.	CONTINUE MISSION PERFORM ASCENT NEXT BEST		
			•		•	OPPORTUNITY AFT	'ER !	
		C. TOTAL LOSS	OF !	E 0	c.1.	NO-GO FOR TLI	C.1.	MALF ECS
				ruc	2.	ENTER NEXT BEST	PTP	
			16	LUMAR TIERC	3.	CONTINUE MISSION		
				LUNAR	4.	CONTINUE MISSION PERFORM ASCENT NEXT BEST	AT :	
						OPPORTUNITY AFT	ER	
							1	
	10-42	LOSS OF PRIMAR SECONDARY EVAPORATORS	RY AND			CONTINUE MISSION HO-60 FOR TLI		
			17	ruc		CONTINUE MISSION NO-GO FOR LOI		
			;	ALL	'C• 6	ENTER NEXT BEST PI	P	
					•		1	
	10-43	PRIMARY AND	DOLING.		1			SYSTEMS (IF AVAILABLE) WILL SE DESCRIPTIONS.
		SECONDARY		4111464				
			1	LAUNCH EO	•	CONTINUE MISSION ENTER NEXT BEST AT	P OR	
l					• ,	PTP MAXIMUM ORBIT TIME	•	
					, ,	HOURS EMERGENCY POWER DOWN FOLLOWE LOS HOURS OF POWER FOR ENTRY.		
				ALL	•	ENTER ASAP	•	
							•	
					•		•	
		**						
\vdash	1	M	ISSION	REV	DATE	SECTION	GROUP	PAGE
			POLLO 11		4/16/69	CSM ENVIRONMENT CONTROL SYSTEM	COOLANT	10-9
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MISSION RULES

REV LTEM

R	RULE	CONDITION/MALFUNCTION			RULING	' CUES	NOTES/COMMEN	rs .	-
			•	•		• •			
	10-44	CONFIRMED LEAK OF GYLCOL COOLANT	•			ae us	SENVIRONMENT	(IF AVAILABLE RETURN IN LIE) H
		A. IN COMMAND	LAUNCH	!A•1•	CONTINUE MISSIO				
		MODULE	ΕO	2.	ENTER NEXT BEST				
			•	•	SUIT LOOP WITH DIRECT OZ.				
			ALL	3.	ENTER NEXT BEST	PTP I			
		8. IN SUIT CIRCUIT	LAUNCH	8-1-	CONTINUE MISSION	N .			
			'EO	2.	ENTER NEXT BEST DOFF SUITS AND I FACE MASKS IF				
			1		REQUIRED.				
			ALL	3.	ENTER NEXT BEST	PTP !			
			•			•			
		RULE NUMBERS 10-45 THROUGH 10-49 ARE	i .						
		RESERVED.	•						
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MISSION RULES

REV ITEM

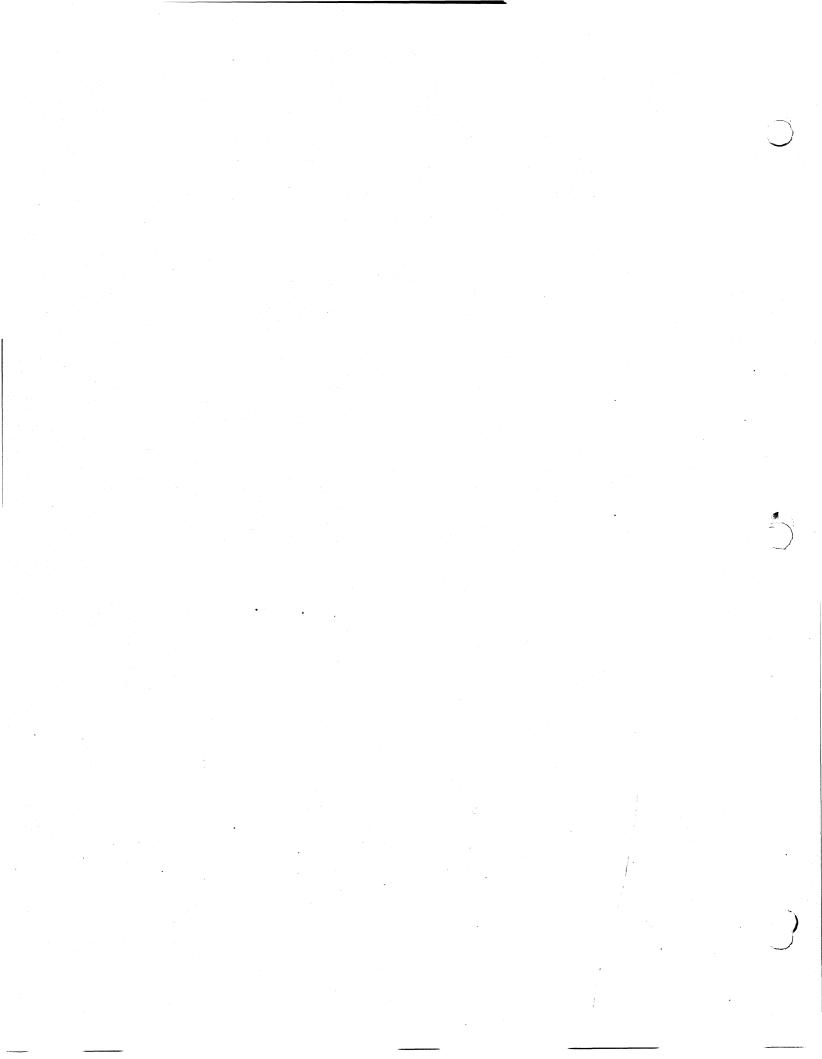
1. 1	************	PHASE		CUES/NOTES/COMMENTS
1 1				
10-50	LOSS OF OVERBOARD DUMPS		•	
	A. NORMAL OVERBOARD DUMPS FROZEN OR BLOCKED		A. CONTINUE MISSION	PALL UTILIZE AUXILIARY DUMP
				2. BLEED 02 FROM WATER T THROUGH WASTE MANAGEMENT GVERBO DRAIN VALVE INTO CABIN.
	OVERBOARD DUMP CAPABILITY	'TLC 'LUNAR 'ORBIT	B.1. ENTER NEXT BEST	PTP B.1. IF POTABLE AND HASTE TA (OR WASTE TANKS ALONE) BECOME FU FORCED WATER BOILING WILL NECESSARY TO ALLOW FUEL CELL AND CYCLIC ACCUMULATOR OPERATION.
		LUNAR STAY		AT ' AVAILABLE) WILL BE USED.
		• · · · · · · · · · · · · · · · · · · ·		• • • • • • • • • • • • • • • • • • •
		•		1
10-51	FAILURE OF BOTH WATER ACCUMULATORS OR UNCONTROLLABLE HIGH HUMIDITY	•		LM SYSTEMS MAY BE USED HUMIDITY CONTROL.
		LAUNCH	A. CONTINUE MISSION	• • • • • • • • • • • • • • • • • • •
		ALL	8. ENTER NEXT BEST P	TP .
1 1		1	•	
10-52	WASTE WATER TANK	•		I CHESTERS (IF IVAL AS 5) IN I
1.0-72	LEAK OR LOSS OF WASTE WATER STORAGE	1 ·	•	LM SYSTEMS (IF AVAILABLE) MAY USED TO SUPPLEMENT CSM
	CAPABILITY	•	1	MMEN POTABLE WATER TANK SECO FULL» FUEL CELL WATER WILL BE DUM THROUGH OVERBOARD PRESSURE REL VALVES
		'LAUNCH	A. CONTINUE MISSION	
		, , EO	8. CONTINUE MISSION NO-GO FOR TLI	
		ALL	C. ENTER NEXT BEST P	TP .
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	MISSION	REV DA	TE SECTION	GROUP PAGE

R PRULE	CONDITION/MALFUNCTION			M ENVIRONMENTAL C			-
	TOUR TITON MALFUNCTION			RULING		MOTES/COMMENTS	
ļ.		1 1	,				
10-53	CONFIRMED LEAK IN	•	•			SYSTEMS (IF AVAILABLE) MA	u.
	POTABLE WATER TANK	•	*. •		USED	O SUPPLEMENT CSM.	Ť
	TRANSFER FUEL CELL	•	;				
l	WATER TO POTABLE	1	•		•		
		1	1		•		
-		LAUNCH	'A• (CONTINUE MISSION	;		
		'EO	18.	CONTINUE MISSION NO-GO FOR TLI	*		
		•	• (ENTER NEXT BEST P	TP		
			;	AFTER TANK DEPLET	ED.		
		TLC	'c. 1	ENTER NEXT BEST P	TP		
		LUNAR		BASED ON WASTE HZ	•		
-		'ORBIT 'LUNAR	' '	AVAILABLE FOR EVAPORATIVE COOLI:	NG.		
		STAY	' '	CONSIDERATION WIL	L BE '		
		•		GIVEN TO CONTINUI: THE LUNAR STAY.	NG .		
		•	;		•		
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	RULE NUMBERS 10-54			•			
1	THROUGH 10-59 ARE RESERVED.		:		•		
	RESERVED.	•	· ;				
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SECTION 10 - CSM ENVIRONMENTAL CONTROL SYSTEM - CONCLUDED

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10-60 MEAS DESCRIPTION PCM ONBOARD TRANSDUCER CATEGORY REFERENCE		ECS 02 FLOW	CF0035R	METER	COMMON	но	
10-60 MEAS DESCRIPTION PCM ONBOARD TRANSDUCER CATEGORY REFERENCE		PRIM STEAM PRESS	CF0034	METER	COMMON	но	
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10-60 MEAS DESCRIPTION PCM ONBOARD TRANSDUCER CATEGORY REFERENCE		SUIT PRES	CF0012P	METER			10-20
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11 CSM CRYOGENICS

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MISSION RULES

SECTION 11 - CSM CRYOGENICS

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	RULE NUMBER 11-9 ARE RE		DUGH					
11-4	MINIMUM REQ SUPPLY FUEL HOURS AT FU	CELL AND E	CS DE	IINUE BEY EMANDS TO	TOND A GO/NO-GO D COMPLETE EITHE	POINT IS SUFF R A LUNAR FLY	ICIENT OXYGEN BY OR NOMINAL	AND HYDROGEN Mission Plus
-	100 PSIA FO	R #2.					THE HOUVE I	<u>,,</u> -3.4 -04 02 4
11-3	LCSS OF CRY	OGENIC TANK	. IS	DEFINED A	Asama PRESSUBE A	ANNOT RE MAIN	TAINED ABOVE 1	50 PSIA FOR 02 A
	. Non the CK	e eratem 1		TEDUCE SC	Jeer: AVAILABLE	FOR ENIRTS LA	HUING AND POS	TLANDING.
	MALFUNCTION APPROPRIATE	MISSION OR AVAILAGE	TER	MINATION ANY ENTRY	PROCEDURES WE	JEOPARDIZED LL BE ENACT RY OZ HSAGE A	ED IN WHATEVE	TEMS DEPLETION R TIME FRAME
	ENTERED INT	O WITH PULL	CONS	SUMABLES	POTENTIAL DIMAT	' ISO FULLY CH	ARGED ENTOV AL	NG PHASES WILL TTERIES AND ENT
11-2	ALL PHASES						, 	
						ic chancily one	. NEV OF POWER	DOWN AND SCS ENT
	LOSS OF THE	SYSTEM RES	U_T I I	NG IN THE	REE FUEL CELL FA	IILHRES. ENTRY	WILL BE DIAMA	NATED. FOR COMPLED INTO PTP 2-
11-1	LAUNCH							
					' GENERAL '			

REV ITEM

SECTION 11 - CSM CRYOGENICS

	' SYSTEMS MANAGEMENT '	
11-10	CRYO MANAGEMENT	
	A. MANUAL PRESSURE CONTROL WILL NORMALLY BE USED AS REQUIRED TO MAINTAIN-	
	1. TANK PRESSURES GREATER THAN 750 PSIA OZ AND 200 PSIA FOR HZ.	
	2. QUANTITY BALANCE WITHIN 4 PERCENT OF AND 3 PERCENT FOR H2.	
	B. CRYO TANKS WILL BE ALLOWED TO VENT NORMALLY THROUGH TANK RELIEF VALVES.	
	C. OZ TANK FANS AND HZ TANK FANS WILL NOT BE OPERATED IN THE AUTO MODE.	
11-11	CRYO GAGING	
	A. ONBOARD CRYOGENIC QUANTITY GAGING IS PRIME. ACCURACY IS +/-2.65 PERCENT (+/-8.48 +/-0.72 LB HZ) PER TANK.	L8
	B. MCC CALCULATED QUANTITY USING PRESSURE VERSUS TEMPERATURE IS BACKUP.	
	RULE NUMBERS 11-12 THROUGH	
	11-19 ARE RESERVED.	
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MISSION RULES

SECTION 11 - CSM CRYOGENICS

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				IFIC MISSION RULE		
	IND/OR HZ CRYO TANK	LAUNCH		ONTINUE MISSION	! AS	LM. PLSS. AND OPS O2 WILL BE US REGUIRED TO SUPPLEMENT CSM O2.
	LESS THAN 150 02. LESS THAN 100 H2. RESPECTIVELY).	' EO	B. C	ONTINUE MISSION O-GO FOR TLI		
		TD&E	, , c	ONTINUE MISSION	1	
		ALL	D. E	NTER NEXT BEST P	, i	
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		1 . .			ga ar e	
11-21	OSS OF BOTH 02 AND/OR H2 CRYO TANK	LAUNCH	'A• C	ONTINUE MISSION	1	
	AND/OR H2 CRYO TANK TANK PRESSURE LESS THAN 150 02. LESS THAN 100 H2.	:	' I	SOLATE SURGE TANK RIOR TO 800 PSIA		
	RESPECTIVELYD					
		EO		NTER NEXT BEST A' R PTP	' PRI	IF THREE FUEL CELLS ARE LO OR TO CM/SM SEP. SMUC'S WILL PERATIVE.
		†	,	AXIMUM ORBIT TIME	IS '	- with 1 4 7 % T
		•	,	F THREE FUEL CEL	.s.	
,	RULE NUMBERS 11-22	•	•		•	
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NASA - Manned Spacecraft Center MISSION RULES

SECTION 11 - CSM CRYOGENICS - CONCLUDED

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				INSTRU		N REQUIR	EMENTS			
11-50	MEAS DESCRI	PTION	,	 РСМ		NBOARD	TRANSDUCER	s	CATEGORY	MISSION RUL Reference
	02 TANK 1 Q 02 TANK 2 Q			0032Q 0033Q		METER METER	COMMON	}	1 OF Z MANDATORY	11-20
	02 TANK 1 T	EMP EMP	sco	0041T					HIGHLY DESIRABLE	11-20
	H2 TANK 1 Q H2 TANK 2 Q		sco	0300		METER METER	COMMON	}	1 OF 2 MANDATORY	11-20
	H2 TANK 1 T	Емр	sco	1043T					HIGHLY	11-20
	OZ TANK 1 P	RESS	sco	1037P		METER METER	COMMON	}	DESIRABLE	11-20
	H2 TANK 1 P	RESS	sco	1039P		METER METER	COMMON	ì	MANDATORY	11-20
	HE TANK 2 P		300	10 40 F		MEIEM	COMMON	ſ	MANDATORY	
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12 CSM ELECTRICAL POWER SYSTEM

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y ITE:	7	SECT	ION 12 -	CSM ELECTRICAL PO	OWER SYSTEM		
ITEM							
				' GENERAL '			
12-1	LAUNCH						
	LAUNCH WILL BE CONT	INUED A	S LONG AS	SUFFICIENT ENERG	Y IS AVAILABL	E TO PERFO	DRM AN ENTRY INTO A
	LEAST PTP 2-1. THER	E MUST	BE AT LEA	ST ONE MAIN BUS	IND ONE AC BUS	OPERATION	NAL TO CONTINUE.
	THERE ARE NO SUEL C	E1					
12-2	ENTRY BATTERIES ARE	REMAIN	ING TO SU	IPPLY MAIN BUS LOA	DS.	SE TERMINA	TED AS LONG AS THRE
12-3	ALL PHASES						
		CONTIN	UFD AS LC	ING AS THE REQUIRE	O NUMBER OF 6	FUEL CELLS	ARE AVAILABLE AND AR
	CAPABLE OF SUPPORTE	NG MISS	ION REGUI	REMENTS OF 75 TO	90 AMPS (WITH	HOUT BATTER	RY SUPPLEMENT EXCEP
12-4	BATTERY IS CONSIDER	ED FAIL	ED [F				
				EN CONNECTED TO A PERS IS 20 +/- 2 /		ING SPS MAI	NEUVERS (NOMINAL TOTA
	B. SUSTAINED BATT	ERY CHA	RGER OUTF	PUT IS GREATER THA	N 2.0 AMPS AF	ND ALL LOAG	S REMOVED.
12-5	AN AC BUS IS CONSID	ENED FA	ILED IF A	INT THE PHASES CAN	INO! BE MAIN!	TINED GREAT	IER THAN 95 VOLTS.
	i i i i i i i i i i i i i i i i i i i						
12-6	AN INVERTER IS CONS	IDERED	FAILED IF				
	A. OUTPUT VOLTAGE	ON ANY	PHASE IS	GREATER THAN 130	VAC.		
	B. OUTPUT VOLTAGE	YNA NC	TWO PHAS	ES IS LESS THAN	95 VAC.		
12-7	FUEL CELL IS CONSID	ERED FA	ILED FOR	MISSION PLANNING	[F		
	A. FUEL CELL CANNINLINE HEATER			IENT POWER TO ME	ET ITS OWN F	PARASITIC	LOADS 15 AMPS PLL
	8. FUEL CELL HZ L	.00P IS	CONTAMINA	ATED WITH KOH.			
							JRE SHIFT DOWN TO 28
	PRESSURE).	CAL OPE	RATION- I	LOWER NZ PRESSURE	CAN BE MANA	ו מפני	JRNING OFF H2O TAN
12-6	TLI MINIMUM PURGE (TY IS 80	TH OXYGEN AND HYD	ROGEN ON ONE	FUEL CELL	AND AT LEAST OXYGEN (
	ONE OTHER FOLL CLE						
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SECTION 12 - CSM ELECTRICAL POWER SYSTEM

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ITEM!		*							
						STEMS MANAGEMENT			
İ						SICHS MANAGEMENT	•		
12-20	BUS	MANAGEM	ENT						
	Α•	ONE AND	ONLY ONE	FUEL	CELL WIL	L BE TIED TO BOT	H MAIN BUSES.		
	8.	INVERTER SUPPLY	S WILL BE O	CONFI	GURED SU	CH THAT MAIN BUS	A WILL SUPPLY	AC BUS 1 AND	MAIN BUS B
	c.	MAIN BU	S VOLTAGE	WILL CIRCU	BE MAINT	AINED GREATER THE OPTIMUM VOLTAGE	AN 26.5 VDC AN AND POWER MAN	ID LESS THAN 3	1 VDC. ONE
	٥.	THE BAT AFTER A	TERY CHARGE	E WIL	L BE USE D POWER	D TO CHECK OUT A SOURCES HAVE BEE	SUSPECTED SHO N REMOVED FROM	RTED BUS (EX I BUS.	CEPT MAIN BU
	ε.	MINIMUM EQUIPME	MAIN BUS	VOLTA	GE WILL	BE MAINTAINED	TO BE COMP	ATABLE WITH	ONLINE OPERA
		1. SP	5	2	4.5				
		2 • PG	NS	2	5.0				
	1	3. AU	TO SM-RCS		22.0				
		4. AU	TO CM-RCS	2	1.0				
		5. 01	RECT SM-RC	s <u>2</u>	1.0				
		6. 01	RECT CM-RC	s <u>1</u>	7.0				
		7. IN	VERTERS	1	9.0				
12-21	BAT	TTERY MAN							
	A •	BATTERI	ES A AND B	WILL	BE USED	TO SUPPLEMENT M	AIN BUS LOADS	FROM T-75 SEC	ONDS TO INSERT
	8.					TO SUPPLEMENT ME THE BATTERY CHARG			
	c.	BATTERY	CHARGING	WILL	BE TERMI	NATED FOR ONE OF	THE FOLLOWING	. WHICHEVER	CCURS FIRST
			TEGRATED A			BATTERY BY CHAR	GER EQUALS IN1	EGRATED AMP-	OURS OUT
		2 . WH	EN BATTERY	CHAR	GER CURR	ENT DROPS TO 0.4	AMPS.		
	٥.	THREE B	ATTERIES W	144 8	E TIED 1	O THE MAIN BUSES	FOR DEGREET N	MANEUVER AND E	INTRY .
	٤٠	BATTERI POSTLAN		SIDER	ED TO HA	NVE 40 AMPTHR CAP	ABILITY INFLIC	SHT AND 45 AME	-HR CAPABILITY
	F.	A SINGL		THAT	CANNOT E	BE RECHARGED WILL	NOT BE USED E	EXCEPT DURING	DEORBIT . ENTRY
	G.	BATTERY	VENT VALV	MILL E WIL	L REMAIN	CLOSED UNLESS M DWED TO TROUBLESH	ANIFOLD PRESSU OOT A SUSPECTE	JRE IS GREAT ED FROZEN DUMF	TER THAN 6 P
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			APOLLO 11		4/16/69	CSM ELECTRICAL POWER SYSTEM	MANAGEMENT	12-2	

REV LIES

12-22	FUE	EL CELL	MANAGEMENT							
	A.	FUEL C	ELL WILL BE	. ''SH	UTDOWN	FOR THE FOLLOW!	NG			
		1. S	USTAINED CU	RRENT	OUTPUT	LESS THAN 5 AMPS	•			
		2. F	UEL CELL HZ	LOOP	IS CONT	AMINATED WITH KO	н•			
		3 • R	EACTANT LEA	KAGE	JEOPARD I	ZING MISSION DUR	ATION.			
	8.	FUEL C	ELL MAY BE	' 'OPE	N CIRCUI	TED' FOR THE FO	LLOWING			
		1. 5	KIN TEMP GR	EATER	THAN 47	75 DEG. F.				
		2 • T	CE TEMP GRE	ATER	THAN 200	DEG. F.				
		3• F	AILURE OF H	2 PUM	IP OR GLY	COL PUMP.				
		*• ∨	OLTAGE MANA	GEMEN	IT.					
		5. F	UEL CELL CA ELL LIFETIM	NNOT	BE PURGE	ED AND TIME TO GO	IS GREATER	THAN PREDIC	CTED FUEL	
	c.	FUEL C	ELL OZ PURG R INTERVALS	ES WI	LL BE DO	ONE AT 12 HOUR IN	TERVALS. FUEL	CELL H2 PUR	SES WILL BE	DONE
	٥.	ADDITI	ONAL PURGES	WILL	BE INIT	TIATED AS OPERATI	ONAL CONDITION	S DICTATE.		
	Ε.	FUEL C	ELLS WILL N	OT BE	PURGED	FOR CONFIRMED HI	GH PH INDICATI	ON.		
	F.	EACH H	2 PURGE WIL	L NOR	MALLY BE	PRECEDED BY 20	MINUTES OF H2	VENT HEATER	OPERATION.	
	3.	FC INL	INE HEATERS	WILL	NORMALL	Y OPERATE IN " A	UTO'' CONTINUO	USLY.		
ŀ	н•	REACTA	NT VALVES M	UST R	EMAIN OF	PEN AT ALL TIMES	UNLESS THE FUE	L CELL IS D	ECLARED FAIL	ED.
	1.	-40 DE	G. IF CRYO	BUDGE	T JEOPAR	E ADDED AS REQUIR RDIZED OR RAD OUT GENCY BYPASS.				
	J.	FUEL C	ELLS MAY BE	PURG	ED TO PE	RECLUDE VENTING O	_			
							F CRYO TANKS O	R FOR CRYO	PRESSURE MAN	IAGEN
							F CRYO TANKS O	R FOR CRYO	AKESSOKE WAL	IAGEN
			•				F CRYO TANKS O	R FOR CRYO	PRESSURE MAR	IAGEM
12-23	IN	VERTER M	ANAGEMENT				F CRYO TANKS O	R FOR CRYO	PRESSURE MAN	IAGEN
12-23				'ED FR	OM LINE				PRESSURE MAR	IAGEN
12-23	INV	ERTERS M	AY BE REMOV			FOR ANY OF THE F			TRESSURE MAR	HAGEN
12-23	INVE	ERTERS M	AY BE REMOVER TEMP GRE	ATER	THAN 190	FOR ANY OF THE F			TRESSURE MAR	IAGEN
12-23	INV	ERTERS M	AY BE REMOV	ATER	THAN 190	FOR ANY OF THE F			TESSURE MAR	iage M
12-23	INVE	ERTERS M	AY BE REMOVER TEMP GRE	ATER	THAN 190	FOR ANY OF THE F			TESSURE MAR	iage »
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TRESSURE MAR	i AGE №
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TESSURE MAR	i AGE №
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TESSURE MAR	AGEN
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TESSURE MAR	AGEN
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TESSURE MAR	AGEN
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TESSURE MAR	AGEM
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TRESSURE MAR	AGEM
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TRESSURE MAR	AGEM
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TESSUKE MAR	AGEM
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TESSUKE MAR	AGEM
12-23	INVE	ERTERS M INVERT SPACEC	AY BE REMOVER TEMP GREET LOAD M	ATER	THAN 190	FOR ANY OF THE F			TRESSURE MAR	AGEM

MISSION RULES

		MISSION	REV	DATE	SECTION	GROUP	PAGE
			,				
						,•	
		•		•			
-					2. PERFORM ''LOSS Two FC POWER DOWN.		
					1. CONNECT REMAINI FUEL CELL TO BOTH MAIN BUSES.		ALIGNMENT PRIOR TO DEORBIT.
			ALL	•	ENTER NEXT BEST PT	•	TO SUPPLEMENT REMAINING FC FOR
		:		' 1	6. IF LOSS OF FC 1 3. TIE BAT C TO BO MAIN BUSES.		
		•	·	; ;	B. TIE BAT C TO MA	IN !	
		• • • • • • • • • • • • • • • • • • •			2. TIE BAT C TO MA A. 3. IF LOSS OF FC 2	IN	
				' '	DFF. 2. IF LOSS OF FC 1		
				, ,	PERFORM===	, , ,	
	CACHI	i	LAUNCH		CONTINUE MISSION AFTER 2 + 00 GET	•	
12-31	LOSS OF TWO CELLS (OUTPU LESS THAN 5 EACH)	T '					. LM SYSTEMS MAY BE USED SUPPLEMENT CSM POWER.
						•	
2		1 1	ALL	10.	CONTINUE MISSION	1	
		• •	LUNAR ORBIT LUNAR STAY	! N	MADE ON THE FALLS MODE CONSIDERATIO WILL BE GIVEN TO CONTINUING WITH MOMINAL MISSION		
	*	•	TLC		3. IF FUEL CELL CA BE RESTORED. PERFO SHUTDOWN. BASED ON THE FAILU	RM !	
		•		, 8	RECONFIGURE REMAINING TWO FUEL ELLS TO ONE FUEL PER MAIN BUS ONLY	CELL	
				;	L. OPEN CIRCUIT #U	EL !	B.1. REF MALF PROC EPS 5.
	LESS THAN 5		EO		10-GO FOR TLI	i	
12-30	CELL COUTPUT	•			CONTINUE MISSION	1	
				' SPEC	IFIC MISSION RULE		
				•		•	

PLY LIEN

RULE '	CONDITION/MALFUNCTION	PHASE	RULING	' CUES/NOTES/COMMENTS
:	LOSS OF THREE FUEL			LM SYSTEMS (IF AVAILABLE) MAY USED TO SUPPLEMENT FUEL CELL POWE
	A. OUTPUT LESS THAN 10 AMPS EACH	LAUNCH	A.1. CONTINUE MISSIC	•
		1 1 1 1	(A) AFTER 2 + EDS AUTO/OFF 1 OFF.	OO ' A.l.(A) IF TOTAL OUTPUT CAPABILITY LESS THAN 8 AMPS AT VOC. SMJC WILL BE INOPERATIVE CM/SM SEP.
		•	(B) TIE BAT C	TO .
		1 1 1 1	(C) POWER DOWN INSERTION ENTE	A AT A.1.(C) 4.75 HOURS LEFT IN OR ER 2-1 BEFORE DEORBIT MANEUVER.
	5.74	• ,	CANNOT BE REST	
	8. TOTAL OUTPUT CAPABILITY INSUFFICIENT TO SUPPORT DRIFTING FLIGHT LOADS	! !ALL !	Bolo ENTER NEXT BEST MANIPULATION C CYCLIC LOADS Y BE ATTEMPTED T MAINTAIN VM GREATER THAN 2	Bolo 95 AMPS REPRESENTS MAXII DRIFTING FLIGHT REQUIREMENTS AMPS AVERAGE).
		•	2. NOT APPLICABLE	•
	AT MAIN BUS	•	C.1. ENTER NEXT BEST	C.1. 36 AMPS REPRESENTS MINI. POWER TO SUPPORT S/C SYSTEMS ORBIT.
	VOLTAGE OF 26.5 VDC	•		1
		LAUNCH	2. NOT APPLICABLE	
		•		
12-33	LOSS OF THREE FUEL CELLS PLUS ONE BATTERY CURRENT LESS THAN 30 PERCENT	1	• • • • • • • • • • • • • • • • • • •	USE LM SYSTEMS (IF AVAILABLE RESERVE ENTRY BATTERIES FOR ENTRY
	OF LOAD ON EITHER REMAINING BATTERY	1		
		LAUNCH	A. ABORT	A. ASSUMES ALL THREE FUEL C CURRENTS LESS THAN OR EQUAL TO AMPS AND BATTERY C TIED TO B MAINS.
		EO	'B. ENTER NEXT BEST / 'OR PTP 'PERFORM EMERGENC' 'POWER DOWN	STP B. 2.4 HOURS LEFT IN OR BEFORE SPS IGNITION
		ALL	C. ENTER NEXT BEST F	
1		•	POWER DOWN	
	RULE NUMBERS 12-34 THROUGH 12-39 ARE	•		
	RESERVED.	•		
	MISSION	REV D	ATE SECTION	GROUP PAGE
	APOLLO 1	1 4	/16/69 CSM ELECTRICAL	FUEL CELLS 12-5

MISSION RULES

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		MISSION	REV	DATE	SECTION	GROUP	PAGE
			•				
		•			•		
		•				• .	
	THROUGH 12-4 RESERVED.			;		1	
	RULE NUMBERS	12-43				•	
		1		•		i • , • ,	
					LESS THANAMPS .	•	
			STAY	•	BEST OPPORTUNITY IF SUM OF TWO LOW ENTRY BATTERIES	EST	
			LUNAR		PERFORM ASCENT AT	NEXT	
		•			ENTRY BATTERIES LESS THANAMP-HI		
			LO	•	NO-GO FOR UNDOCK IF SUM OF TWO LOW		
		1 2 2 1			LESS THANAMP-H	le , ¦	
			-	•	IF SUM OF TWO LOW!	ST !	
		•		•	NO-GO FOR LOI		
1	CHARGER			•	ROTATE BATTERY C ! BURNS TO MAINTAIN BALANCED BATTERIE:	• ′	
12-42	LOSS OF BATT		EO		CONTINUE MISSION		EF MALF PROC EPS-5
		•					
				•			
		;			USE ONE BATTERY EN		
		•	ALL		ENTER NEXT BEST P	' ATTE	. IF LOSS DURING SPS MANEUV MPT TO TIE BATTERY C TO B
					DOWN.	:	
	TO MAIN BUS)	,			OFF. 2. ENTER 2-1 POWE	; IFO	
	LESS THAN 3 EACH WHEN CO	NNECTED !			1. EDS AUTO/OFF TO		
12-41	LOSS OF TWO	UTPUT !		;A•	CONTINUE MISSION		
		:		•		•	
				•			
					NOMINAL MISSION.	•	
					CONSIDERATION WILL GIVEN TO CONTINUI	. 8E '	
			ALL	10.	BASED ON FAILURE !	10DE • 1	
					NO-GO FOR TLI	CONT	IF LOST DURING SPS MANEUV INUE ON REMAINING BATTERY.
			EO	•	TIE BAT C TO MAIN	1	10 100° 50°
		1			3. IF LOSS OF BAT		
		•		1	TIE BAT C TO MA		
		•		•	2. IF LOSS OF BAT		
	BUS)			•	1. EDS AUTO/OFF TO		
	LESS THAN 3 WHEN TIED TO	AMPS !		1		•	
12-40	BATTERY (OUT	PUT '		, ! A •	CONTINUE MISSION	•	
l '		:		•		•	

REV TEM

R	RULE	CONDITION/MALFUNCTION	PHAS	E '	RULING	' CUES/	NOTES/COMMENTS
	•		, ,	;			
	12-50	MAIN BUS TIE MOTOR SWITCH FAILURES) 	•			
		A. ONE MOTOR SWITCH	LAUNCH	A+1	CONTINUE MISSION	1	
) 		(A) IF MOTOR SI A/C TIE HA		
) 	, 1	C TO MAIN BUS A.		
					(B) IF MOTOR SI		
) 	į	TIE BAT C		
			ALL	. 2	CONTINUE MISSION CLOSE ALTERNATI MOTOR SW AND US MAIN BUS TIE CO AS MOTOR SWITCH	E ' THROU SE ' RLY C B'S '	2. BATTERIES MUST BE CHARGED GM OPEN MOTOR SW. LEAVE BAT B CLOSED FOR CHARGING.
		3. ONE OR BOTH				:	
		MOTOR SW FAILED		1 (CONTINUE MISSION USE CB'S AS MOTOR SWITCHES.	8.	IF BOTH MOTOR SWITCHES FAIL
						CLOSE	D. BATTERIES CANNOT BE CHARGED
	-						
					•		
						*3	
	<u></u>	<u> </u>	1				Table
		MISSION	+	DATE 4/16/69	SECTION CSM ELECTRICAL	GROUP	PAGE
		APOLLO 1	۱ ا	-/10/07	POWER SYSTEM	DISTRIBUTION	12-7

RULE	CONDITION/MA	LFUNCTION'	PHASE	<u> </u>	RULING	CUE	S/NOTES/CO	MMENTS
12-5	1 MAIN BUS SH CAUSING FUE REVERSE CUR DISCONNECT	L CELL '		1				
	A. FUEL CEL DISCONNE MAIN A	L Z CTS FROM		;	. CONTINUE MISSIC	1 ON	MAIN B	ER THAN <u>85</u> AMPS SHO WILL CAUSE REVER RING LAUNCH MALF EPS-
		•		:	AUTO/OFF TO OFF	•		
					ONLY.	1		
					(C) TIE BAT C T	. • • • • • • • • • • • • • • • • • • •		
		•		÷	(D) INVERTER 3 BUS 2+ MAIN A.	TO AC!		
				:	(E) POWER DOWN BUS B.	MAIN		
		1	ALL	'A•2	ENTER NEXT BEST	PTP !	4.2. REF	MALF PROC EPS 5SR-1
		•			POWER DOWN MAIN	BUS		
	B. FUEL CEL	L 2 '	LAUNCH	9.1	. CONTINUE MISSIO		3.1. GREATE	ER THAN 79 AMPS SHO
	MAIN B	1			(A) PLACE EDS AUTO/OFF TO OFF	' 015		WILL CAUSE REVER
					(B) FC 2 TO BUS	В		
					(C) TIE BAT C T	•		
					(D) INVERTER 3 BUS 1. MAIN B.	TO AC		
		•		:	(E) POWER DOWN	MAIN .		
					BUS A. (F) TVC GIMBAL	DRIVE		
					(P+Y)-2. (G) GIMBAL MOTO	,		• • • • • • • • • • • • • • • • • • •
				•	CONTROL (YAW 2.0 PITCH 2) BAT B FOLLOWING GIMBA MOTOR TURN ON.	OPEN !		
			ALL .	8.2	ENTER NEXT BEST IF BUS NOT REST POWER DOWN MAIN A	ORED.'		
	C. MAIN BUS GREATER THA AND FUEL CE CANNOT BE DISCONNECTE	N 25 AMPS'		C.1.	. ASORT	. DIS	CONNECT (URE OF MOTOR SWITCH FROM SHORTED BUS FC SHORTED BUS T
	SHORTED BUS	• ;	ALL	2	ENTER NEXT BEST IF MAIN BUS NOT RESTORED.		2. IF FUE RTED. CLOS	L CELL FEED CIRCUIT E FC REACTANT VALVES.
			· .	*1			#	
		MISSION	REV C	DATE	SECTION	GROUP	PAGE	
		APOLLO 11	1 1	16/69	CSM ELECTRICAL POWER SYSTEM	DC DISTRIBUTIO	N 12-8	

MISSION RULES

PLV ITES

SHORTED IS GREATER THAN 3 AMPS (A) PLACE EDS AUTO/OFF TO OFF. (B) OPEN ASSOCIATED MAIN BUS TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN BUS. ALL 2. ENTER NEXT BEST PTP IF BUS NOT RESTORED SHORTED LESS THAN OR EQUAL TO ASSOCIATED MAIN BUS. A.2. REMOVE POWER FROM BUS. SHORTED LESS THAN OR EQUAL TO AMPS. B. BATTERY BUS SHORTED LESS THAN AEMOVE POWER FROM BUS. EXCEPT FOR MANEUVERS AND ENTRY AND ENTRY LUNAR ORBIT LUNAR ORBIT LUNAR ORBIT LUNAR STAY B. SHORT LESS THAN ALL B. CONTINUE MISSION ORBIT LUNAR ORBIT LUNAR STAY B. SHORT LESS THAN ALL B. CONTINUE MISSION ORBIT LUNAR ORBIT LUNAR STAY AFTER EVA B. SHORT LESS THAN ALL B. CONTINUE MISSION ORBIT ORBIT CONTINUE MISSION ORBIT ORBIT CONTINUE MISSION ORBIT ORBIT CONTINUE MISSION ORBIT ORBIT ORBIT CONTINUE MISSION ORBIT ORBIT ORBIT CONTINUE MISSION ORBIT OR	THAM 3 AMPS (A) PLACE EDS AUTO/OFF TO OFF, (B) DOEN ASSOCIATED MAIN SUS TO BAT SUS (C) TIE BAT C TO ASSOCIATED MAIN ALL 2. ENTER NEXT BEST PTP IF BUS NOT RESTORED SHORTED LESS THAN OR EQUAL TO AMPS. POWER BUS JUST PRION TO ENT TO MAINTAIN SECS REDUNDANCY. B. BATTERY BUS SHORTED LESS THAN A ENTER PEAR BUS TO BATTERY BUS TO BATTER		MISSION	+	DATE	SECTION CSM ELECTRICAL	GROUP	PAGE
THAN 3 AMPS (A) PLACE SOS AUTO/OFF TO OFF. (B) OPEN ASSOCIATED MAIN MUS TO BAT BUS TO ASSOCIATED MAIN MUS TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN MUS TO BAT BUS CB. (ALL (C) FIE BAT C TO ASSOCIATED MAIN MUS TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN MUS TO BAT BUS SMORTED LESS THAN OR EQUAL TO MAIN TO MAINTAIN SECS REDUNDANCY. (B) SHORT CREATER THAN 2.0 AMPS (C) TIE BAT C TO ASSOCIATED MAIN MENOVE POWER FROM BUS EXCEPT FOR MANEUVERS AND ENTRY BUS SMORTED LESS THAN CREATER THAN 2.0 AMPS (C) TIE BAT C TO ASSOCIATED ASSOCIATED MAIN MENOVE POWER FROM BUS EXCEPT FOR MANEUVERS AND ENTRY BUS TO BATTERY ADD TO CONTINUE MISSION THE BAT BOOK BUS BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS TO BATTERY A CONTINUE MISSION BATTERY BUS MAND CHARGE BUS BATTERY BUS MAIN BUS TO BATTERY	THAN 3 AMPS (A) PLACE SOS AUTO/OFF TO OFF. (B) OPEN ASSOCIATED MAIN MUS TO BAT BUS TO ASSOCIATED MAIN MUS TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN MUS TO BAT BUS CB. (ALL (C) FIE BAT C TO ASSOCIATED MAIN MUS TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN MUS TO BAT BUS SMORTED LESS THAN OR EQUAL TO MAIN TO MAINTAIN SECS REDUNDANCY. (B) SHORT CREATER THAN 2.0 AMPS (C) TIE BAT C TO ASSOCIATED MAIN MENOVE POWER FROM BUS EXCEPT FOR MANEUVERS AND ENTRY BUS SMORTED LESS THAN CREATER THAN 2.0 AMPS (C) TIE BAT C TO ASSOCIATED ASSOCIATED MAIN MENOVE POWER FROM BUS EXCEPT FOR MANEUVERS AND ENTRY BUS TO BATTERY ADD TO CONTINUE MISSION THE BAT BOOK BUS BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS MAIN BUS (MABLE TO ALL BATTERY BUS TO BATTERY A CONTINUE MISSION BATTERY BUS MAND CHARGE BUS BATTERY BUS MAIN BUS TO BATTERY							
THAM 3 AMPS (A) PLACE EDS AUTO/OFF TO OFF. (B) OPEN ASSOCIATED MAIN 9US TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN 9US TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN 9US TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED ASSOCIATED MAIN 9US TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED ASSOCIATED ASSOCIATED ASSOCIATED AND ENTRE LESS THAN OR EQUAL TO MAIN 10 AMPS POWER BUS JUST PRIOM BUS EXCEPT FOR MANEUVERS AND ENTRY AND ENTRY BATTERY RELAY BUS SMORTED ASSOCIATION ASSOCIATED ASSOCIATION ASSOCIATION ASSOCIATED ASSOCIATION ASSOCIATED ASSOCIATION ASSOCIATION ASSOCIATED ASSOCIATION ASSOCIATION ASSOCIATION ASSOCIATED ASSOCIATED ASSO	THAM 3 AMPS (A) PLACE EDS AUTO/OFF TO OFF. (B) OPEN ASSOCIATED MAIN 9US TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN 9US TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED MAIN 9US TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED ASSOCIATED MAIN 9US TO BAT BUS CB. (C) TIE BAT C TO ASSOCIATED ASSOCIATED ASSOCIATED ASSOCIATED AND ENTRE LESS THAN OR EQUAL TO MAIN 10 AMPS POWER BUS JUST PRIOM BUS EXCEPT FOR MANEUVERS AND ENTRY AND ENTRY BATTERY RELAY BUS SMORTED ASSOCIATION ASSOCIATED ASSOCIATION ASSOCIATION ASSOCIATED ASSOCIATION ASSOCIATED ASSOCIATION ASSOCIATION ASSOCIATED ASSOCIATION ASSOCIATION ASSOCIATION ASSOCIATED ASSOCIATED ASSO		RESERVED.		•		•	
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							' CAUSE' GREATE	BATTERY BUS VOLTAGE TO IR Than OR Equal TO MAIN

ALL 'B. ENTER NEXT BEST PTP B. CONSIDERATION WILL BE TO RETAINING LM FOR SYSTEM BA 12-61 LOSS OF ONE AC BUS (TWO PHASES CANNOT BE MAINTAINED GREATER THAN 95 VAC) ALL 'B. ENTER NEXT BEST PTP B. REF MALF PROC EPS-1 12-62 LOSS OF BOTH AC LAUNCH 'A. ABORT MODE I OR MODE A. REF MR—— 12-62 LOSS OF BOTH AC SUSCESS 10-0PEN DIRECT OZ FOR SUIT VENTILATION. 20-IF AFTER MODE II. PURGE FOR COOLING. AA2. INITIATE CONTINUOUS PURGE FOR COOLING. AA2. INITIATE CONTINUOUS PURGE FOR COOLING. AA2. INITIATE CONTINUOUS PURGE FOR COOLING. AA2. INITIATE CONTINUOUS PURGE FOR COOLING. AA2. INITIATE CONTINUOUS PURGE FOR COOLING. AA2. INITIATE CONTINUOUS PURGE FOR COOLING. ATP AVAILABLE) FOR AC POWERED FURTH TO ENTRY.	RULE '	CONDITION/MALFUNCTION				CUES/NOTES/COMMENTS
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BUSES II 1 • OPEN DIRECT O2 FOR SUIT VENTILATION. 2 • IF AFTER MODE II • PURGE FOR COOLING. A•2 • INITIATE CONTINUOUS PURGE FOR COOLING. B• ENTER NEXT BEST PTP OR AVAILABLE) FOR AC POWERED FU TO ENTRY. IF SUITED • REMOVE IF SUITED • REMOVE IF TIME PERMITS • IF CABIN H2 PURGE FOR COOLING. DEPRESSURIZED • USE DIRECT O2 UNTIL CABIN IS REPRESSURIZED. RULE NUMBERS 12-63 THROUGH 12-69 ARE			•	! !		1
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				•	INSTRUM	ENTATION REC	UIREMENTS '			
12-	70	MEAS DESCRIPT	ION	PCM	ON	BOARD	TRANSDUCERS	CATEGOR	,	MISSION RULE REFERENCE
		AC BUS 1 PHAS AC BUS 1 PHAS AC BUS 1 PHAS	E B VAC			ER	SEPARATE	HIGHLY DE: HIGHLY DE: HIGHLY DE:	IRABLE	12-5 +6 +61
						COMMON				
		AC BUS 2 PHAS AC BUS 2 PHAS AC BUS 2 PHAS	E B VAC		METI	ER	SEPARATE	HIGHLY DES HIGHLY DES HIGHLY DES	IRABLE }	12-5.6.61
		MAIN BUS A VO MAIN BUS B VO BAT BUS B VO BAT BUS B VO BAT RELAY BUS	C	CC0206 CC0216 CC0211	7V METI DV METI LV METI	ER Er Er	SEPARATE SEPARATE SEPARATE SEPARATE SEPARATE	1 OF 2 MAN HIGHLY DES HIGHLY DES HIGHLY DES	IRABLE	12-32.52.20C 12-22
		BAT A CURRENT BAT B CURRENT BAT C CURRENT	•	CC0222	C MET	ER ER	COMMON COMMON COMMON			12-4-33-40-41
		FC 1 CURRENT FC 1 02 FLO FC 1 H2 FLO			C MET	ER Er	COMMON COMMON	1 OF 3 MAR	IDATORY	12=7.31.32.33. 22A:
		FC 2 CURRENT FC 2 02 FLO FC 2 H2 FLO			C METI R METI DR METI	ER	COMMON COMMON	1 OF 3 MAR	DATORY	12-7:31:32:33: 22A
		FC 3 CURRENT FC 3 02 FLO FC 3 H2 FLO		SCZ115 SCZ144 SCZ141		ER	COMMON COMMON COMMON	1 OF 3 MAR	DATORY	12-7+31+32+33+ 22A
		BAT CHARGER C	URRENT	50021	C MET	ER	COMMON	HIGHLY DES	IRABLE	
		FC 1 SKIN TEM FC 2 SKIN TEM FC 3 SKIN TEM	P	SC2084 SC2085 SC2086	T MET	ER	COMMON COMMON COMMON	HIGHLY DES HIGHLY DES HIGHLY DES	IRABLE	12-228
		FC 1 COND TEM FC 2 COND TEM FC 3 COND TEM	IP .	SC2081 SC2081 SC2081		ER	COMMON COMMON COMMON	HIGHLY DES HIGHLY DES HIGHLY DES	IRABLE	12-228
		FC 1 RAD OUT FC 2 RAD OUT FC 3 RAD OUT	TEMP	SC2081 SC2081		ER	COMMON COMMON COMMON	HIGHLY DES HIGHLY DES HIGHLY DES	IRABLE !	12-221
		BAT MANIFOLD	PRESS		MET	ER		HIGHLY DE	IRABLE	
		INV 1 TEMP INV 2 TEMP INV 3 TEMP FC 1 PH FC 2 PH FC 3 PH		SC216		S S KBACK KBACK	COMMON COMMON COMMON COMMON COMMON COMMON	HIGHLY DE: HIGHLY DE: HIGHLY DE: HIGHLY DE: HIGHLY DE:	SIRABLE SIRABLE SIRABLE SIRABLE	12-22E
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13 DOCKING AND UMBILICAL

MISSION RULES

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R	ITEM									
			•			' GENERAL '				
	13-1	THREE GOOD	DOCKING RIP	NG LAT	CHES 12	D DEG. APART ARE	REQUIRED FOR A	N IVT.		
	13-2	THREE GOOD	DOCKING RIP	NG LAT	'CHES 120	D DEG. APART ARE	REQUIRED FOR A	DOCKED R	CS MANEUVER.	
	13-3	DOCKED SPS	OR DPS BURN	NS REG	UIRE AT	LEAST NINE DOCKI	NG RING LATCHE	5. 5.		
	13-4	MANNED UNDO	CKING OPERA	ATIONS	WILL BE	E TERMINATED FOR D DISASSEMBLE A D	ANY FAILURE	OF A DO	CKING RING L	ATCH TO
	13-5	WITH FAILUR	E OF THE CS	M FOW	ARD HAT	CH PRIMARY LOCK/U	NLOCKED MECHAN		NOMINAL MISSI	ON WILL
	13-6	LOSS OF VIS	UAL DOCKING	S AIDS	(COAS	AND TARGETS) WILL	NOT INHIBIT D	OCKING AN	O UNDOCKING.	
	13-7	IF THE DOCK	ING PROBE F	FAILS	TO INDIC	CATE EXTENSION OR	IF BOTH TALK	BACK IN	DICATORS* ARE	BARBER
		POLE: TD&E	WILL BE AT1	EMPTE	D•					
		*NOTETHE	ONLY DOCK	ING PR	OBE INST	TRUMENTATION CONS	ISTS OF TWO TA	LK BACK I	NDICATORS IN 1	HE CSM.
		RULE NUMBER	S 13mm TWP/	حون د						
		13-10 ARE R	ESERVED							
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					·	UMBILICAL		13-1		

SECTION 13 - DOCKING AND UMBILICAL

	1.										
	e e e				' MANAGEMEN	T '					
13-11	TWO NITROGE	N BOTTLES	ARE RE	EQUIRED (FOR UNDOCKIN	G. FOR S	STEM RET	RACT FAI	LURFA US	. THE	c e c on
	BOTTLE IN T	HE SAME SY	STEM E	BEFORE U	TILIZING BOT	TLES IN	THE REDUND	ANT SYSTE	M OS	i int	SECON
13-12	THE CM FORW	ARD AND LM	UPPF	R HATCH	NORMALLY WÎL:		STALLED	F08 AUG	7405 00		
	DOCKING.		G / · L ·	· HAIGH	NONHALL WIS	- 05 1	13 1 7 5 5 5 0	FOR ANY	TYPE OF	MANEUV	ER C
1	RULE NUMBER	S 13-13 TH	ROUGH				•				
	13-19 ARE R										
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MISSION RULES

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SECTION 13 - DOCKING AND UMBILICAL

	NUMBER OF THE PROPERTY OF THE			' CUES/NOTES/COMMENTS
;		1		
			SPECIFIC MISSION R	ULES '
13-20	FAILURE TO MAINTAIN POWER TO X-LUNAR BU OR TO MAINTAIN X-LUNAR BUS LOADS FROM CSM	s'	CONTINUE MISSION RETURN LM TO DESCE	MAXIMUM LIFETIME OF DESCENT TO
13-21	FAILURE TO ACHIEVE S-IVB/LM SEPARATION OR FAILURE TO MATE LM UMBILICALS (P23	:	PERFORM CSM/LM FIN	AL SEP S-IVB/LM SEP CANNOT BE ACHIEV WITHOUT MATING AT LEAST ON UMBILICAL
	AND P24)	1	1	POWER CAN BE SWITCHED AN MAINTAINED WITH EITHER PLUG.
13-22	FAILURE TO ACHIEVE CSM/LM FINAL SEPARATION	DOCKED	MUST PERFORM NORMA	L LM MASS MAY HAVE TO BE MODIFI
			A. RETRIEVE PROBE DROGUE AND INST	
		•	B. AFTER UNDOCKING DEPRESS CSM AND JETTISON PROBE OVERBOARD.	
			1 1	
13-23	INDICATORS ARE		A. CONTINUE MISSIO ATTEMPT TOSE	TUNNEL PRESSURE CAN NOT BE
	BARBER POLE.	I	D '8. CONTINUE MISSIO ATTEMPT DOCKING	
13-24	CANNOT REMOVE CSM FORWARD HATCH	TD&E	'A. PERFORM CSM/LM :	FINAL
	FUNNANU HATER	DOCKED	•	FINAL
			IF LM MANNED. P	ERFORM
			• • • • • • • • • • • • • • • • • • •	
13-25	CANNOT REMOVE	DOCKED	CONTINUE MISSION	SPS AND SM RCS MANEUVERS MAY PERFORMED
	PROBE: LM DROGUE: AND/OR LM UPPER HATCH:		PERFORM EVT IF LM	MANNED
		•	1	
	MISSION	REV	ATE SECTION	GROUP PAGE

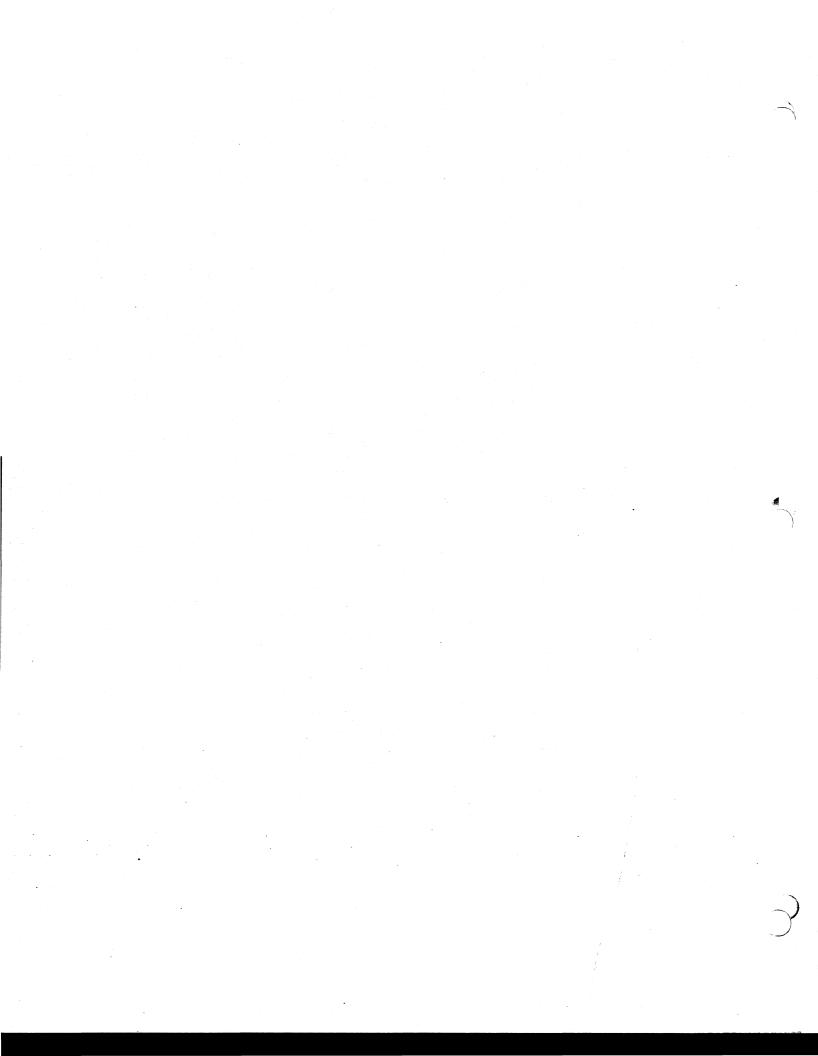
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SECTION 13 - DOCKING AND UMBILICAL

	LUNDI I TUN/MALFUNCTIO	I PHAS	E ' RULING	CUES/	IOTES/COMMENTS
		!	•		
13-26	FAILURE TO RELEASE CAPTURE LATCHES	•	REDOCK	•	
		•	PERFORM RETRACTION	•	
		•	I TENTONE RETRACTION		
		;		•	
13-27	PRIMARY FORWARD HATCH LOCK/UNLOCK	ALL	CONTINUE MISSION		
	MECHANISM INOPERATIVE	•	1		
	INOPERATIVE	•			
		•			
		:	•	•	
13-28	FAILURE TO REINSTAL	'TDEE	CONTINUE MISSION 10 ATTEMPT TO SEAL	•	
	CSM FORWARD HATCH	ייייייייייייייייייייייייייייייייייייייי	" HATCH WITH		
		•	' 4 PSID. '2. Just Prior to	•	
		•	' ENTRY. PRESS ' CABIN TO 15	t 1	
		1	PSI. AT DROGUE	•	
		1	RAPID REPRESS.	:	
			'3. ENTER IN SUITS	•	
		1	1		
		1	• • • • • • • • • • • • • • • • • • •		
13-29	FAILURE TO REINSTALE PROBE AND/OR DROGUE	'DOCKED	NO DOCKING	RET	AIN DESCENT STAGE FOR TEI
	OR FAILURE TO CLOSE		•	•	
-	LM UPPER HATCH				
		•			
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14 CSM SEQUENTIAL



REV ITEM

SECTION 14 - CSM SEQUENTIAL

' ITEM	
	GENERAL '
14-1	LAUNCH
	THERE ARE NO SEQUENTIAL MALFUNCTIONS FOR WHICH LAUNCH WILL BE TERMINATED.
1	
14-2	IF AN ENTRY BATTERY IS LOST, THE EDS WILL BE FLOWN OPEN LOOP.
14-3	ALL MISSION PHASES
	TO CONTINUE THE MISSION, BOTH PYRO BUSES AND BOTH LOGIC BUSES ARE REQUIRED.
14-4	SEQUENTIAL LOGIC BUS IS CONSIDERED FAILED IF
	A. VOLTAGE IS LESS THAN 22 VDC AND UNABLE TO ACTIVATE RCS ENABLE AND/OR SLA SEP RELA' (CD0170x AND/OR CD0123x SYSTEM A. CD0171x AND/OR CD0124x SYSTEM B).
	B. LOGIC BUS SHOURTED GREATER THAN 10 AMPS.
14-5	PYRO BUS IS CONSIDERED FAILED IF
	A. SHORTED GREATER THAN 10 AMPS.
	B. FAILURE TO PERFORM ANY SEQUENTIAL FUNCTION WITH SUSPECTED FAILED PYRO SYSTEM.
	RULE NUMBERS 14-6 THROUGH
	14-9 ARE RESERVED
	MISSION REV DATE SECTION GROUP PAGE

REV ITEM

SECTION 14 - CSM SEQUENTIAL

-	110,11							
			1 - 1 4					
					' MANAGEMENT '			
	14-10	ARMING OF SITE THE FI	PION: CVEN	ATPP NUM INC	LL BE PERFORMED LOGIC BUSES AND	WHILE IN CO	ONTACT WITH A	GROUND TELEMETRY GROUND TO PROCEED
							. •	
		1.0						
		11.0						
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		RULE NUMBERS		OUGH				
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MISSION RULES

REV TITEM SECTION 14 - CSM SEQUENTIAL

RULE	CONDITION/MALFUNCTION	PHAS	E '	RULING	' CUES	
}		1 , , ,				
1 .				IFIC MISSION RUL		
14-20	SEQUENTIAL LOGIC BUS				' CD01	170X AND/OR CD0123X SYSTEM
	A OR B LESS THAN OR EQUAL TO 22 VDC AND	•	į.		, CD01	TIX AND/OR CD0124X SYSTEM B
	UNABLE TO ACTIVATE RCS ENABLE AND/OR	•	i			
	SLA SEP RELAYS	LAUNCH		ONTINUE MISSION		
				ENTER 3-1 IF BUS RESTORED	NOT	
		EO TLC	₿.	ERMINATE OPERATI	ONS	
		1		ENTER NEXT BEST P BUS NOT RESTORED	TP IF'	
		LUNAR	ic. (ONTINUE MISSION	į	
		'LUNAR 'STAY				
		, ,				
	BYBO BUE A OB B 1556	•				
14-21	THAN OR EQUAL TO 35		į			
	VDC	1				
	A. SHORTED GREATER THAN 10 AMPS	LAUNCH	Ael	CONTINUE MISSIC	N :	
		1E0	2.	TERMINATE OPERA	TIONS! A	
		LUNAR	•	CONTINUE MISSION	•	. USE BATTERY TIE FOR PYR
		'ORBIT/				R TO AFFECTED BUS
		STAY	•		•	•
	B. SHORTED LESS THAN	ALL	B. (CONTINUE MISSION		
	10 AMPS	•				
	C. PYRO BUS TM READS O VDC AND PYRO			CONTINUE MISSIC	N :	
	BAT ONBOARD GREATER THAN 35 VDC					
	VBC	ALL	2	ATTEMPT FUNCTION	N 1 C-2-	ASSUME PYRO BAT VERIFIE
		•	;		D BUS' IF E	INTRY BAT USED IN LIEU OF PYR VOLTAGE SHOULD BE APPROXIMATE
		1 · · · · · · · · · · · · · · · · · · ·		(A) IF FUNCTION	' = TC	BAT BUS VOLTAGE.
	•	1	•	NORMAL: CON MISSION		
		•		(B) IF FUNCTION	DOES	
		•	•	NOT WORK Normally De	NTER '	
		•		NEXT BEST	TP !	
		•	;			
		•				
						•
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SECTION 14 - CSM SEQUENTIAL

	CONDITION/MALFUNCTI			RULING	' CUES/NOTES/COMMENTS
14-22	TELEMETRY INDICATE AN EDS VOTE INPUT 2. OR 3		- CON	TINUE MISSION	PARAMETERS ARE CD0132X+ CD013 AND CD0134X RESPECTIVELY+
			•	IF ANY ENTRY BATT LESS THAN 22 VDC+ AUTO/OFF SWITCH T	EDS '
			•	ALL ENTRY BATTERI GREATER THAN 22 V CHECK CORRESPONDI EDS	Comp
				CB'S 1, 2, OR 3 C	OSED
14-23	LET JETTISON MOTOR DOES NOT FIRE	LAUNCH	'ATT	TINUE MISSION EMPT JETTISON PER CKLIST EMERGENCY CEDURE	CREW
14-24	SMJC ACTIVATES PREMATURELY	ALL	•	ER NEXT BEST PTP	1
			: ;	TERMINATE OPERATION AND POWER DOWN AFFECTED MAIN BUS NOT ARM AFFECTED BUS	
			•	IF UNDOCKED: RETUI CSM AND PERFORM C FINAL SEP	IN TO B. USE GOOD SEQUENTIAL SYSTEM
				REPOWER AFFECTED BUS AFTER CM/SM S	
14-25	ACTIVATED CM RCS PRESS LOGIC RELAYS			TINUE MISSION PRIOR TO CM RCS PRESS===DO NOT AR RESPECTIVE PYRO B	
			1 • 1	(FOR BOTH INDICAT PERFORM SLA SEP W SECS ARM CB'S OPE	TH !
				AT CM RCS PRESS RESPECTIVE PYRO B	
14-26		;			CD0123X AND/OR CD0124X
	ACTIVATED SLA DEPL LOGIC RELAYS	OY ALL		TINUE MISSION PRIOR TO SLA SEP- NOT ARM RESPECTIV PYRO BUS	
			• "	FOR SLA SEP arm Respective Pyro B First	ıs .
		•	•		
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			DATE	SECTION	GROUP PAGE

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SECTION 14 - CSM SEQUENTIAL

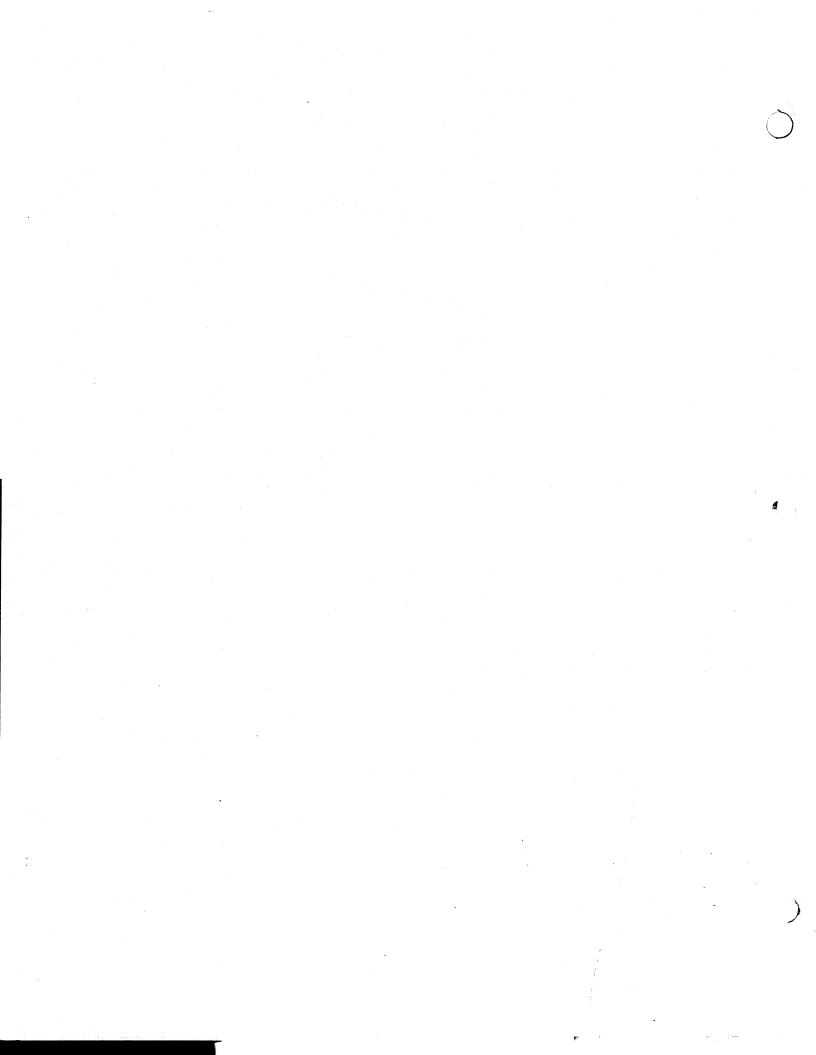
RULE	CONDITION/MALF	UNCTION!	PHASE	·	RULING	' CUES/NO	DTES/COMMENTS
				1		,	
		•		•			
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		•		•		•	
			•			1	
14-27	UNABLE TO PER		TLC	'ENTE	R NEXT BEST PTP	REF	MR
	SLA SEPARATIO	N		- ;			
				•		•	
	1.0	į					
						• •	· · · · · · · · · · · · · · · · · · ·
14-28	LOST GROUND T	ORK '			TINUE MISSION NOT ARM AFFECTED		ING SYSTEM WITH VOLTA R THAN 18 VDC MAY RESULT
	FOR LOGIC OR	- 1.10	ALL		TEM UNTIL SEQ GO/ ENTER NEXT BEST P	NO-GO' PERMANE	ENT LOSS OF THAT PAM TRAIN.
	BUS VOLTS			'PRIC	OR TO ENTRY UNLES:	s '	
	MEASUREMENTS	;		OTHE	ER PYRO SYSTEM FA	ils.	
				•		•	
	RULE NUMBERS	14-29					
	THROUGH 14-39			•		·	
	RESERVED.					• • • • • • • • • • • • • • • • • • •	
	į.						
14-40	ACTIVATED APE		LUNAR Orbit		ONTINUE MISSION OT ARM PYRO BUSSI		ECTED AT SECS POWER OX AND CD023X)
	RELAYS		LUNAR	'UNT	L MALFUNCTION HAS		
			STAY	BEE	SISOLATED	•	
			ALL		NTER NEXT BEST P		
		· .			NOT ARM PYRO BUSE: LL malfuntion	5	
		· · · · ;		HAS	BEEN ISOLATED.	•	
		•				•	
				•		•	_
14-41	CHUTE DEPLOY		LUNAR Orbit/		ONTINUE MISSION NOT ARM PYRO BUSE:		BE DETECTED AT ANY T .x and/or ceogozx)
	RELAYS	• 1	LUNAR	'UNT	L MALFUNCTION HAS		
			31 41	BEEF	1 ISOLATED	i	and the second of the second
					NOT ARM PYRO BUSE: IL MALFUNCTION	\$!	
l		•			BEEN ISOLATED.	•	
				÷		1	
				•		•	
		;		;		•	
14-42			LUNAR		ONTINUE MISSION		CTED AT SECS POWER UP PR
	CHUTE DEPLOY		ORBIT/ Lunar		NOT ARM PYRO BUSE: LL malfunction ha:		RY (CEOOO3X AND/OR CEOOO LS BAT A(B) CB CLOSED
			STAY	BEE	ISOLATED		
			ALL		NTER NEXT BEST P		
		;			NOT ARM PYRO BUSE: LL MALFUNCTION HA		
					ISOLATED	'	
				;		1	
	1	•		•		•	
	RULE NUMBERS	14-63		•		•	
l	THROUGH 14-49					•	
	RESERVED.	•		•		•	
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					e de la companya de la companya de la companya de la companya de la companya de la companya de la companya de		
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MISSION RULES

SECTION 14 - CSM SEQUENTIAL - CONCLUDED

			MENTATION REQUIRE	MENTS		•
14-50	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RUL REFERENCE
	PYRO BUS A VOLTS PYRO BUS B VOLTS	CD0005V CD0006V	****		1 OF 2 M	14-21 14-21
	SEQ LOGIC BUS A VOLTS	CD0200V CD0201V	****	*****	HD HD	14-20
	APEX JET A APEX JET B	CD0230X CD0231X	*****	*****	HO HO	14-40
	DROGUE DEPLOY A DROGUE DEPLOY B	CE0001X	****		HD	14-41
	PILOT CHUTE DEPLOY A PILOT CHUTE DEPLOY B	CE0003X CE0004X	****	70000	HD HD	14-42 14-42
	SLA SEP RELAY A RCS/SCS ACTIVATE A	CD0123X CD0170X	****		HD HD	14-26
	SLA SEP RELAY B RCS/SCS ACTIVATE B	CD0124X CD0171X			HO	14-26
	CM RCS PRESS SIG A CM RCS PRESS SIG B	CD0173X CD0174X	****		HO	14-25 14-25
	CM-SM SEP RELAY A CM-SM SEP RELAY B	CD0023X CD0024X	****		HD HD	
	CREW ABORT A CREW ABORT B	CD0130x CD0131x	*****		HO	
	EDS ABORT VOTE 1 EDS ABORT VOTE 2 EDS ABORT VOTE 3	CD0132X CD0133X CD0134X	*****	*****	1000	14=22 14=22 14=22
	EDS ABORT A EDS ABORT B	CD0135X CD0136X	****		HD HO	
	MAIN CHUTE DISC A MAIN CHUTE DISC B	CE0321X CD0322X	****	*****	HD HO	
	EDS ABORT REQ A	850080x 850081x	*****		HD HD	*****
	DOCKING PROBE TEMP	C50220T	****	****	нО	
	CSM-LM LOCK RING SEP RELAY A	CD1154X			но	19-23
	SEP RELAY B CSM-LM LOCK RING LM CURRENT	CD115X 5C2962C	METER	COMMON	HD HD	19-23
		, a 4	•			
						
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15 CSM GUIDANCE AND CONTROL



MISSION RULES

F : '.	1 T : 11					5 - GUIDANCE AND	CONTROL		
R	ITEM!								
			: 1						
						' GENERAL '			
	,,								
	15-1	LAUNCH		*					
		THERE ARE N	O FAILURES	OF T	HE CSM G	LIDANCE AND CONTR	ROL SYSTEM WHI	CH ARE CA	USE FOR ABORT.
	15-2	EARTH ORBIT	PHASE						
		A. IN ORD	ER TO CONT	Ni E	THE M100				
		MUST P	ROVIDE SPS	CRIT	ICAL BUR!	N CAPABILITY AND S MUST BE AVAILAB	ONE BACKUP DE	ORBIT MET	E AND CONTROL SYSTEMS HOD (SM OR HYBRID) . THE
		. 1. A	TTITUDE CON	NTROL	DIREC	T RCS AND RATE DA	AMPING IN EACH	AXIS.	
		2. T	VC (CRITICA	L BUI	RNS) (ONE TVC SERVO LOC	P IN EACH AXI	S AND ONE	TVC CONTROL
		м	ODE (ACCEL	CMD	EXCLUDED) •			- CONTINUE
		3. B	ACKUP DEORE	3 I T	- AS LONG	S AS ENOUGH PRO	PELLANT IS	AVAILABLE	FOR AN SM
		D ¢	EORBIT: THE OSSIBLE DUE	: G&C : TO :	SYSTEMS LACK OF 8	MUST PROVIDE THA PROPELLANT OR A	AT CAPABILITY.	IF SM DE	ORBIT IS NOT
	,	M.	UST PROVIDE	CAP	ABILITY F	FOR A HYBRID DEOF	BIT.		3/3/Em3
	i		AT SM DEORE	IT R	EQUIREME				
						- TRANSLATION CA			
		, and a second				- RATE DAMPING !	N ALL THREE		
	;						3637		
		٠ (B) HYBRID (EORB	IT REQUI	REMENTS - All SM Deorbii	REQUIREMENTS		
-		•				TRATE DAMPING	MUST BE SCS)		
		*				- OPERATIONAL . I			
	}					- TWO OPERATION	AL RHC'S		
		MUST P	ER TO PERFO ROVIDE THE TO: OR DIRE	THE	CAPABILI'	TICAL BURN AFTER TY. TO EXECUTE AN	THE STORAGE TA	ANKS ARE	EMPTY: THE G&C SYSTEMS HER CMC AUTO (RCS DAP);
		PROVID	E SPS NON-C	RITI	CAL GUIDA		L SYSTEMS BU	JRN CAPA	CONTROL SYSTEMS MUST BILITY. THE FOLLOWING
	į					T RCS AND RATE DA			
		2. T	VCTWO SE			BOTH GEN AND ON			S (ACCEL CMD
		3. G				DSKY FULLY OF	PERATIONAL AND	OPTICS	CAPABLE OF
		A	LIGNING PLA	TFOR	M⊕				
		4. D	ISPLAYS	ONE O	PERATION	AL FDAI.			
	(5 . A	TTITUDE REF	EREN	CE-RED	UNDANT ATTITUDE S	OURCES ARE RE	QUIRED FO	R ENTRY.
	15-3	TRANSLUNAR	COAST						
						AST THE NEXT BEST	PTP+ THE GUI	DANCE AND	CONTROL SYSTEMS MUST
						AND RATE DAMPING	IN EACH AXIC		
			-						
		B. RCS TR	ANSLATION-	x-A	XIS VIA	AUTO COILS OR DIS	RECT ULLAGE PU	SHBUTTON.	
						•			
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			APOLLO 11	+	 	GUIDANCE AND	GENERAL		
			APOLLO II	1	77.4789	CONTROL	arurur.	15-1	<u>'</u>
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4	ITEM	
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- 1	15-4	LOI. LUNAR ORBIT, LUNAR STAY PHASES
		A. LOI WILL BE INHIBITED OR LUNAR ORBIT TERMINATED EARLY IF EITHER REDUNDANT ATTITUDE CONTROL REDUNDANT SPS CONTROL OR NON-CRITICAL SPS CAPABILITY IS LOST. IN ADDITION: THE FOLLOWIN MINIMUM CAPABILITIES MUST BE AVAILABLE BEFORE COMMITTING TO OR CONTINUING LUNAR ORBIT.
		1. ATTITUDE CONTROL DIRECT RCS AND RATE DAMPING IN EACH AXIS.
		2. TVCBOTH SERVO LOOPS AND TWO TVC CONTROL MODES (ACCEL CMD EXCLUDED).
Ì		
		3. GGNTHE GGN MUST BE FULLY OPERATIONAL WITH THE EXCEPTION OF OPTICS AND NAV DSKY. OPTICS MUST BE CAPABLE OF ALIGNING PLATFORM.
		4. RCS TRANSLATIONX-AXIS VIA AUTO COILS OR DIRECT ULLAGE PUSHBUTTON.
		B. IN ORDER TO PERFORM A NON-CRITICAL BURN THE GEC SYSTEMS MUST PROVIDE THE CARABILITY
ĺ		EXECUTE AN ULLAGE MANEUVER BY EITHER CMC AUTO (RCS DAP). SCS AUTO, OR DIRECT ULLAGE.
1		
	15-5	UNDOCKED
		THE UNDOCKED PHASE WILL BE DELETED OR TERMINATED IF THE GGC SYSTEMS CANNOT PROVIDE REDOCKING OF THE RESCUE CAPABILITY. THE GGC SYSTEMS MUST PROVIDE DIRECT RCS, RATE DAMPING AND TRANSLATIC CAPABILITY IN EACH AXIS FOR DOCKING/UNDOCKING CONTROL. IN ADDITION. THE FOLLOWING MINIMAL CAPABILITIES FOR LM RESCUE MUST BE AVAILABLE——
•		- OPERATIONAL OPTICS SUBSYSTEM
į		- ONE DSKY
į	Ì	- TRANSLATION CAPABILITY IN EACH AXIS
1		
		- RATE DAMPING IN ALL THREE AXES
		- OPERATIONAL IMU AND CMC
1		- ONE OPERATIONAL RMC
		- ONE OPERATIONAL FDAI
i		- DIRECT RCS
		- NON CRITICAL SPS BURN CAPABILITY
į	j	
į		
	15-6	ASCENT. DESCENTTHERE ARE NO GUIDANCE AND CONTROL SYSTEM FAILURES THAT AFFECT. THE ASCENT OF DESCENT PHASES.
	15-6	
Control of the contro	15-6	DESCENT PHASES. RULES 19-7 THROUGH
	15-6	DESCENT PHASES.
	15-6	RULES 19-7 THROUGH
A STANDARD AND THE PARTY OF THE	19-6	RULES 19-7 THROUGH
to extended minutes and or so the second desired to be a second desired.	15-6	DESCENT PHASES. RULES 19-7 THROUGH
the september of the section of the	15-6	RULES 19-7 THROUGH
e de company de la company de la company de la company de la company de la company de la company de la company	19-6	RULES 19-7 THROUGH
e de de la la la la la la la la la la la la la	15-6	DESCENT PHASES. RULES 19-7 THROUGH
ES PARAMENTATION DE LA COMPANIA DE LA COMPANIA COMPANIA COMPANIA COMPANIA DE LA COMPANIA COMPANIA COMPANIA COM	15-6	DESCENT PHASES. RULES 19-7 THROUGH
E) plantinistical mercuse over the company distribution of the same (s.), is for the first the same	19-6	DESCENT PHASES. RULES 19-7 THROUGH
Es plantingues anno estado en estadores está indicadades estados en está como está en el como estados de estados de	19-6	RULES 19-7 THROUGH
E. p. Landing and Landing and the Control of Control of the Contro	19-6	RULES 19-7 THROUGH
S. plantinistica, mercane en er can error (difficult). Access e can er en er en en en en en en en en en en en	15-6	RULES 19-7 THROUGH 19-9 ARE RESERVED.

REV ITEM:

	ITEM									
					' 51	STEMS MANAGEMEN	 T '			
15	5-10	ACIIVE RCS	CONTROL - CS ERCONNECT (M WIL	L NOT BE	S CONTROL- LM W IN ACTIVE ATTI IN ACTIVE RCS	TUDE HOLD, FOR	DOCKIN AC	TIVITIES AFTER	OBENING
1!	5-11	PIPA AND IRI	G BIAS WIL	L BE	UPDATED	WHEN ACTUAL BIA	SES DIFFER FROM	M VALUES	IN CMC ERAS	SABLE BY
15	5-12	DELTA V COUN	NTER DRIFT							
		SHOULD THE D SETTING WILL BE CONSIDERS	. BE APPROP	INTER PRIATE	DRIFT BE	GREATER THAN O	•01 FT/SEC2 RIFT BE GREATE	FOR AN R R THAN 0.1	CS MANEUVER: FT/SEC2: THE	THE VC EMS WILL
1!	5-13	DAP INITIALI	ZATION							
and the second of the second o		PREVIOUS MAN PREVIOUS MAN REINITIALIZE	NEUVER AS M NEUVER WAS ED FROM THE	ONITO GEN C GROU	RED ON 1 CONTROLLE JND AFTER	EVERY SPS MANEUT ELEMETRY: IF THE D: THE CMC STO EACH VEHICLE CO GROUND COMPUTED	E PREVIOUS MANI DRED VALUES (ONFIGURATION (EUVER WAS WILL BE Change an	SCS CONTROLLED USED: TRIMS D AFTER EACH	WILL BE
						HEN GROUND COMPI D WHEN GROUND V				
					,	is which discours to	THE PARTY OF THE P		-023 0 1000 ,	ENCENT
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		RULE NUMBERS		ROUGH						
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MISSION RULES

REV' ITEM

RULE	CONDITION/MALFUNCTION	PHA:		RULING	•	CUES/NO	TES/CO	MMENTS
:		,	,		;			
				CIFIC MISSION RUL	Es '			
15-20	LOSS OF EITHER	'ALL	, CON	TINUE MISSION		A •	REF MA	LF PROC
	BMAG 1 OR 2 IN EITHER PITCH OR YAW CHANNEL) !	:				1,3,4+	
	OR TAN CHARREL					SCS-	1 • 3 • 3A	1+6
) 	•			8•	NO SCS	AUTO TVC
					•	GYRO IS BE REA	SI IS SELEC LIGNED	N YAW CHANNEL, AFTE USABLE IF REMAININ TED FOR RATE. RSI MUS IN ADDITION TO TH W FAILURE AFTER .05G.
) ' 	•					
15-21	LOSS OF BOTH BMAG 1 AND 2 IN EITHER PITCH OR YAW CHANNEL	r	4 A.	CONTINUE MISSION		III OR	MTVC A	CCEL CMD IS ONLY MOD V SPS CONTROL MODE.
		TLC	5.	NO-GO FOR LOI	•			
		DESCEN	17 .c.	CONTINUE MISSION				
		ALL		TERMINATE PHASE A		D.1. IN	LUNAR	ORBIT DO DPS TEI.
		OTHERS		ENTER NEXT BEST P	•	2. II	F STAG	ED» RETAIN LM ASCEN
			1		•	CHANNEL	RESUL	H ORBIT. LOSS OF PITC TS IN ALL THREE DEORBI SUBJECTED TO SINGL
					1 1	FAILURE: LOSS PRI SUBJECT:	S IN TI ECLUDE: S BOTI TO SII	HE GAN SYSTEM. THE YAS HYBRID DEORBIT AN REMAINING DEORBI
		ENTRY	Ε.	CONTINUE MISSION	! !			AND SCS FDAI ROL YAW CHANNEL FAILURES.
			•		† †			
14-22	LOSS OF ROLL BMAG							
19-22		ALL	! ! A • · !	CONTINUE MISSION	1			ROLL ATTITUDE CONTRO LL SCS MODES.
			•			2. 1	o scs	FDAI ROLL. RSI VALID
	B. NUMBER TWO	ALL	· B.	CONTINUE MISSION	:	CYCLE	4AY F	OF ATT 1/RATE 2 AND LI PROVIDE RATE DAMPE
						USED. POWERED	GYRO DOWN	WHEN RCS: DAP IS NO PACKAGE: 2 MUST B TO EFFECT ATTITUDE HOLI
			1		•	2.	SELEC	HARDOVER. Tion of Rate 1 wil RSI and SCS FDAI ROL
			•		;	FOR ENTI	RY. RS	RSI AND SES FDAI ROW I must be realigned for After .05g.
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	APOLLO 11	+ -		GUIDANCE AND	scs			

MISSION RULES

REV ITEM

	CONDITION/MA	1			RULING		CUES/NOTES/COMMENTS
15-23	LOSS OF BOT		LAUNCH	'A• (CONTINUE MISSION		
	BMAG'S	1	E 0	18. 5	ENTER NEXT BEST P	, TP '	
				· B • 1 •	NO GO FOR TLI	•	
				2 .	ENTER NEXT BEST PTP IF SM DEORB NOT AVAILABLE		
			TLC		NO-GO FOR LOI		. NO SCS FDAI ROLL OR R
			ALL OTHERS	D• 0	CONTINUE MISSION	•	AVAILABLE FOR ENTRY.
						. ! !	
15-24	LOSS OF EITI	HER TVC !		1			- MAINTAIN ZO LBS/QUAD/AXIS F
	SERVO LOOP EITHER PITCH AXIS						HARDOVER RECOVERY FOR UNDOCKED A
			AUNCH/		CONTINUE ALTERNAT MISSION SELECT 1 OR 2 ON	E EO	
					SIMBAL DRIVE SWITE IN APPROPRIATE AX		
		11	LC	18. A	NO-GO FOR LOI		
		; :	DESCENT	, c. c	CONTINUE MISSION	•	
			THERS		TERMINATE PHASE ALENTER NEXT BEST P		D. IN LUNAR ORBIT DC DPS TEI.
15-25	LOSS OF BOTE		-AUNCH	A. (CONTINUE MISSION	; ; ; ;	A.1. REF MALF PROC GEC-1, GGN- SCS-A1
		† † !				' '	2. NO MODE III OR IV CAP BILITY. LIMITED LANDING POI CONTROL IN MODE III OR IV WI 5M-RCS.
		10	EO	₿. 6	ENTER NEXT BEST P	TP	
		1		, t	RCS DEORBIT	•	
		*1	LC	!C. N	NO-GC FOR LOI	•	
			DESCENT	D. 0	CONTINUE MISSION		
			ALL OTHERS		TERMINATE PHASE AS ENTER NEXT BEST P		. IN LUNAR ORBIT DO DPS TEI.
				į		•	
						•	
15-26	LOSS OF PRO	M ana ' 1		, ;		. •	
	A. EITHER R	•	ALL		CONTINUE MISSION USE REMAINING RMC	•	
	B. BOTH RHC	's	ALL	•	CONTINUE MISSION USE DIRECT RCS OR ACCEL CMD FOR MAN	• (B. NO MTVC RATE OR MTVC ACCEL C CAPABILITY
		•			MANEUVERS	- '-	
•							
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MISSION RULES

REV. ITEM

RULE	CONDITION/MALFUNCTIO	ON' PHASI	E '	RULING	· · ·	UES/NOTES/CO	MENTS
			•		;		
15-27	LOSS OF DIRECT RCS CONTROL FROM	- :	•		•	. REF MALI	PROC SCS 5
	A. EITHER RHC	ALL	ļA. C	ONTINUE MISSION	•		
	B. BOTH RHC'S	LAUNCH	' 'B.1	CONTINUE MISSI) ON '		•
		DESCEN	, T	CONTINUE MISSI	ON !		
		ALL OTHERS	3.	TERMINATE PHASE		.3. FAILURE EQUIREMENT.	VIOLATES DIRECT RC
15-28	COMPLETE LOSS OF					· REF MALI	PROC SCS 1 SUSPECTE
	AUTO ATTITUDE CONTROL IN PITCH AND YAW CHANNELS.					AILURE WOULD	D BE AUTO INHIBI
	A. CONTROL IS	ALL		ONTINUE MISSION			1 -
i	REGAINED BY OPENING EMS CB':		, h	FTER SM JETTISO! AY BE REENABLED	•		
				ITHOUT LOSS OF A	AUTO !		
	B. CONTROL IS REGAINED BY	ALL	В. С	ONTINUE MISSION	, ! B	NO SES ATT	TITUDE CONTROL
	PLACING S/C CONTROL SWITCH	то:	:				
	CMC. C. CONTROL IS NOT REGAINED	; DESCENT	T C.1.	CONTINUE MISSI	ON .		
	REGATIVED	ALL OTHERS	! EN	TERMINATE PHASE TER NEXT BEST PORTER TERMINATE PHASE TERMINATE PHASE TERMINATE PHASE	TP ' R	.2. FAILURE EQUIREMENTS.	VIOLATES RATE DAMPIN
				IRECT RCS.		•	
			į				
15-29	LOSS OF FLIGHT DIRECTOR ATTITUDE INDICATORS	1				. REF MALE	PROC G6C-1+2+3+4+5+6
	A. ONE	'ALL	14.	ONTINUE MISSION	t , .		
	B. BCTH	LAUNCH	•	CONTINUE MISSI	י אכ		
		TLC	. 2	NO-GO FOR LOI	1 · · · · · · · · · · · · · · · · · · ·		
		DESCHT	, 3,	CONTINUE MISSI	י אכ		
1		•	•				
			•		1 1		
		OTHERS		TERMINATE PHASE		OD NOT STA	ORBIT. DO DPS TEI.
		•				IF STAGED.	16 5 F
	**	•	•		•		ASCENT STAGE FOR TEI
			•			USE WINDOW	
		6	1		•		
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LOSS OF ACI PHASE A	R RULE	CONDITION/MA	LFUNCTION'	PHASE		RULING		S/NOTES/COMMENTS
THE LOSS OF A REQUIREMENT SERVO LODE POWER BOTH SERVO LODE POWERED B THE SAME BUY. BOTH SERVO LODES MUST BE POWERED B THE SAME BUY. B. PRODRESTIONAL THITUDE CONTROL FROM BROWN PRICES. ALL PROPORTIONAL CONTROL FROM BRC NO. 1. C. PAGE NO. 1 E. SCS TOTAL ATTITUDE ERROR F. SCS TOTAL ATTITUDE CONTROL RATIONS SCS ATTITUDE CONTROL	•							
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MISSION RULES

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RULE	CONDITION/MALFUNCTION	PHASE	RULING	' CUES/NOTES/COMMENTS
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15-31	LOSS OF AC2 PHASE A		• • • • • • • • • • • • • • • • • • •	- LOSS OF AC2 PHASE A RESULTS IN
				A. REDUNDANT SERVO LOOP POWER
) 		B. ALL PROPORTIONAL CONTROL
		ra di di di di di di di di di di di di di	•	C. FDAI NO. 2
		1	•	D. GYRO ASSEMBLY NO. 2
			1	E. SCS PITCH AND YAW TOTAL ATTITUDE
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				G. RSI
		t in the second		H. GPI PEY DRIVE NO. 2
			1	• IN EARTH ORBIT • LOSS OF AC RESULTS IN ALL THREE DEORBIT METHOD BEING SUBJECTED TO A SINGLE FAILUR (AC1 PHASE A).
		LAUNCH	A. CONTINUE MISSION	•
		TLC	B. NO-GO FOR LOI	
		DESCENT	C. CONTINUE MISSION	
		ALL OTHERS	D. TERMINATE PHASE A	DO IN LUNAR ORBIT DO DPS TEIO
15-32	LOSS OF ORBIT RATE DISPLAY (ORDEAL)	ALL	CONTINUE MISSION	REF MALF PROC G6C-++5
	EARTH AND LUNAR	! !	• •	
		l Landaria Landaria		
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15-33	LOSS OF ENTRY MONITOR SYSTEM	ALL	CONTINUE MISSION	-EF MALF PROC EMS-1
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LAUNCH A. CONTINUE MISSION EARTH S. CONTINUE ALTERNATE CO PRINTED MISSION REV DATE SECTION B. CONTINUE MISSION TLC C. NO-GO FOR LOI ALL OTHERS B. VIOLATES BOTH SM AND HYGRI OCHTROLLER B. WIOLATES BOTH SM AND HYGRI OCHTROLLER D. NO-GO FOR UNDOCKING UNDOCKED C. CONTINUE MISSION UNDOCKED C. CONTINUE MISSION D. NO-GO FOR UNDOCKING UNDOCKED THE DOCK ALL OTHERS THEOLOM STATE MISSION REV DATE MISSION REV DATE SECTION GROUP PAGE	15-34	EITHER SPS S DRIVER OUTPL	SOL !					REF MALF PROC GGC	-1
PARTY ORBIT INISSION REV DATE SECTION GROUP PAGE			1	,	! !A•	CONTINUE MISSION	• •		
TIC C. NO-GO FOR LOI ALL OTHERS 19-35 LOSS OF TRANSLATION LAUNCH A. CONTINUE MISSION MAND CONTROLLER EARTH B. ENTER NEXT BEST PTP ORBIT TIC C. CONTINUE MISSION D. OPENBER LIN RESCUE MINIMUM UNDOCKED B. DOCK ALL OTHERS RULE NUMBERS 13-34 THROUGH 13-39 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE			! !!	EARTH ORBIT	8.	CONTINUE ALTERNATI Mission. USE Other Bank for Engine	E EO !		
THERS OTHERS LOSS OF TRANSLATION LAUNCH As CONTINUE MISSION EARTH S. ENTER NEXT BEST PTP DEORBIT MINIMUM REQUIREMENTS. LO D. NO-GO FOR UNDOCKING D. VIOLATES LM RESCUE MINIMUM REQUIREMENTS. ALL OTHERS RULE NUMBERS 19-36 THROUGH 13-49 ARE RESERVED.				TLC	•		1		
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15-50	LOSS OF COMMAND MODULE COMPUTER	• • • • •				REF MALF PROC GEN-5
		LAUNCH		CONTINUE MISSION	1	
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·	1000 05 000				•	
15-51	LOSS OF DSKY				•	REF MALF PROC G&C 5
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	B. BOTH MDC AND LEB	•	8.1	CONTINUE ALTERNATED MISSION IF BOTH SPS AND DEORBIT CAPABIL	SM !	 VIQLATES MYBRID DEORBI M REQUIREMENTS
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15-52	LOSS OF INERT	TIAL				•	REF MALF F	ROC GEN-6	
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15-53	LOSS OF OPTIC SUBSYSTEM	:5		;		•	REF MALF P	ROC GGN-5	
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	15-54	LOSS OF OPTICS	•	. i			REF MALF PROC G&C=1
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MISSION RULES

REV ITEM

SECTION 15 - GUIDANCE AND CONTROL - CONCLUDED

REFERENCE CMC DIGITAL DATA CG0001V - MANDATORY 19-50 SPS SOL DRIVER 1 CH3604X EMS-SPS-ON SEPARATE HIGHLY DESIRABLE 19-34 PITCH GIMBAL POS 1 6 2 CH3518H GPI COMMON 1 OF 2 MANDATORY - OB/HO-PCM 19-24/2 - OB/HO-PCM TM BIAS 2.5 VDC CG1110V - HIGHLY DESIRABLE 19-52/2 PIPA TEMP IMU HTR +28 VDC CG2300T - HIGHLY DESIRABLE 19-52/2 IMU HTR +28 VDC CG1513X - HIGHLY DESIRABLE 19-52/2 IG 1X RSVR OUT SIN CG2112V FDAI COMMON HIGHLY DESIRABLE 19-52 IG 1X RSVR OUT SIN CG2113V FDAI COMMON HIGHLY DESIRABLE 19-52 MG 1X RSVR OUT COS CG2143V FDAI COMMON HIGHLY DESIRABLE 19-52 MG 1X RSVR OUT SIN CG2112V FDAI COMMON HIGHLY DESIRABLE 19-52 MG 1X RSVR OUT COS CG2143V FDAI COMMON HIGHLY DESIRABLE 19-52 OG 1X RSVR OUT COS CG2143V FDAI COMMON HIGHLY DESIRABLE 19-52 OG 1X RSVR OUT COS CG2143V FDAI COMMON HIGHLY DESIRABLE 19-52 OG 1X RSVR OUT COS CG2143V FDAI COMMON HIGHLY DESIRABLE 19-52 OG 1X RSVR OUT COS CG2143V FDAI COMMON HIGHLY DESIRABLE 19-52 OG 1X RSVR OUT COS CG2172V FDAI COMMON HIGHLY DESIRABLE 19-52 OG 1X RSVR OUT COS CG2172V FDAI COMMON HIGHLY DESIRABLE 19-52 SHAFT CDU DAC OUT CG3722V - HIGHLY DESIRABLE 19-52 SHAFT CDU DAC OUT CG3722V - HIGHLY DESIRABLE 19-52 CMC WARNING CG9040X C6W COMMON HIGHLY DESIRABLE 19-52 CMC WARNING CG9040X C6W COMMON HIGHLY DESIRABLE 19-52 SCS PITCH BODY RATE CH3503R FDAI COMMON HIGHLY DESIRABLE 19-52 SCS PITCH BODY RATE CH3503R FDAI COMMON HIGHLY DESIRABLE 19-20/21 ROLL ATT ERROR CH3503R FDAI COMMON HIGHLY DESIRABLE 19-20/21 ROLL ATT ERROR CH3503R FDAI COMMON HIGHLY DESIRABLE 19-20/21 ROLL ATT ERROR CH3503R FDAI COMMON HIGHLY DESIRABLE 19-20/21 ROLL ATT ERROR CH3503R FDAI COMMON HIGHLY DESIRABLE 19-20/21 ROLL ATT ERROR CH3503R FDAI COMMON HIGHLY DESIRABLE 19-20/21 ROLL ATT ERROR CH3503R FDAI COMMON HIGHLY DESIRABLE 19-20/21 ROLL ATT ERROR CH3503R FDAI COMMON HIGHLY DESIRABLE 19-20/21 ROLL ATT ERROR CH3503R FDAI COMMON HIGHLY DESIRAB			INSTRUM	MENTATION REQUI	REMENTS		
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SCS TVC PITCH AUTO CMD							
SCS TVC YAW AUTO CMD				FDAI			
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16 CSM SERVICE PROPULSION SYSTEM



MISSION RULES

SEV ITEM

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			•			' GENERAL				
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16-1		NCH PHAS								
	THE	RE ARE N	O SPS FAIL	URES	THAT ARE	CONSIDERED	CAUSE FOR	ABORT DU	RING THE	LAUNCH PHASE.
16-2	-		MISSION PHA		5 6B6 5		
	1 ^•					LL INTO ONE		LATEGORIE	5	
								C RF TERM	INATED BY	ENTRY INTO
			THE NEXT BE					32 (2.0)		ENTAL PAGE
		2 • F	FAILURES WH	ICH C	AUSE THE	SPS TO BE 1	INOPERABLE	OR UNSAF	E TO OPER	ATE.
			THAT SUBSEU	UENT	SPS MANE	UVERS ARE NO	DT NECESSA	44.		ALTERED SUCH
		,	THAT ALL PL	ANED	BURNS EX	CEPT CRITICA	AL BURNS B	E INHIBIT	ED•	HAT REQUIRES
		S	SUBSEQUENT	SPS M	ANEUVERS	ARE NOT NEC	ESSARY, I	F POSSIBL	£.•	SUCH THAT
	₿.	ALL NO	STORAGE TANI DN-CRITICAL NHIBITING A	BURN	S. LACK	OF CAPABILIT	ET OR FOUR TY TO PERF	-UET UELA ORM AN UL	GE MANEUVI LAGE MANE:	EM IS REQUIRED HAIDAN UVER WILL NOT BE CAU
	c.	BURNS	NOMALIES OR WILL BE TEN E CONDITION	RMINA	ADATIONS	ARE NOT CAU SPS ANOMALIS	USE FOR TE ES OR DEGR	RMINATING 4DATIONS	A CRITIC WHICH CAU	AL BURN. NON-CRITIC SE OR CUULD LEAD
16-3	EAR	TH ORBIT	PHASE							
	A.	OF PER		ITICA	L BURNS	THE MISSION				F THE SPS IS JINCAPAB Y INTO THE NEXT: BE
	8.	IF THE SUITAE ONLY.	E SPS IS IN BLE EARTH O	CAPAE KBIT	LE OF PE	REGRMING NOM	N=CRITICAL ILL BE IMP	BURNS. LEMENTED.	TLI WILL THE SPS	BE INHIBITED AND MAY BE USED FOR DECRE
	c•					CAPABILITY OR CRBIT SHAP		T FROM AN	Y POINT I	N THIS PHASE: THE
	1									
16-4			COAST PHAS			.12 2,				.,
	^•	TO AVE	DID LUNAR G	R LAN	D IMPACT	. HOWEVER.	ONCE INIT	IATED WI	TH THE	RE FREE RETURN OR BUR SPS+ THESE BURNS A ANALYSIS AND POSSIB
	a.		E SPS IS IN OI WILL BE			ERFORMING NU	N-CRITICAL	MANEUVER	S• FURTH	ER NON-CRITICAL BUR
	с.		IN ABORT BU HE LM DPS A			ASSURE FRE	E RETURN C	R BURNS T	o Avoid L	UNAR OR LAND IMPACT M
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			APOLLO 11		4/16/6	CSM SPS	GEN	ERAL	1	
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MISSION RULES

SECTION 16 - CSM SPS

REV ITEM

' ITEM LUNAR ORBIT PHASE 16-5 TEL IS THE ONLY CRITICAL BURN IN THIS PHASE. IF THE SPS IS INCAPABLE OF PERFORMING NON-CRITICAL BURNS, FURTHER NON-CRITICAL BURNS WILL BE INHIBITED. LM DPS MAY BE USED FOR TEL IF THE CAPABILITY EXISTS. DESCENT PHASE 16-6 THE LM POWERED DESCENT WILL BE ABORTED FOR SPS PROPELLANT LEAKS BECAUSE THE CAPABILITY TO PERFORM TELL IS DECREASING WITH TIME. 16-7 UNDOCKED AND LUNAR STAY PHASES A. THE LUNAR ORBIT PLANE CHANGE IS A CRITICAL BURN IF OUTSIDE TOTAL LM CAPABILITY. B. THESE PHASES WILL BE TERMINATED FOR CONFIRMED LOSS OF SPS REDUNDANCY. LUNAR STAY PHASE WILL BE TERMINATED FOR LOSS OF LM RESCUE CAPABILITY. IN ADDITION, THE 16-8 ASCENT PHASE LM RESCUE IS THE ONLY BURN REQUIRED IN THIS PHASE AND ARE CRITICAL. 16-9 TRANSEARTH COAST PHASE CRITICAL BURNS IN THIS PHASE ARE MIDCOURSE CORRECTIONS TO ATTAIN THE PROPER ENTRY CORRIDOR WHICH ARE OUTSIDE SM-RCS CAPABILITY. HOWEVER, ONCE INITIATED, THESE BURNS ARE CONSIDERED NON-CRITICAL BECAUSE SUFFICIENT TIME IS THEN AVAILABLE FOR ANALYSIS AND POSSIBLE CORRECTIVE ACTION. MISSION REV DATE SECTION GROUP PAGE 4/16/69 CSM SPS GENERAL APOLLO 11

MISSION RULES

REV ITEM

२	' ITEM								
						YSTEMS MANAGEMENT			
	16-10	PROPELLANT	GAGING						
		A. PRIME	METHODON	BOAR	GAGING	SYSTEM(1 PERCENT	1.		
		B. BACKUP	METHODF	LOW F	RATE X B	JRN TIME (3 PERCE	NT) •		
	16-11	PROPELLANT							
		+= 100 POUN	IDS.	SED	TO CONTRO	OL THE O/F MIXTUR	E RATIO TO MAIN	TAIN OX	IDIZER IMBALANCE WITHIN
	16-12	DUAL BANK V	S SINGLE BA	NK OF	PERATION				
		THE SPS WIL 5 SECONDS A	L ALWAYS BE AFTER IGNITI	STAF	RTED USII DR LOI AI	NG A SINGLE BANK. ND TEI. BANK A WI	HOWEVER. THE O	THER BAI	NK WILL BE CLOSED 2 TO ST ENGINE IGNITION.
		. *							
	16-13	PROPELLANT	MANAGEMENT						
						PRE LOI TO PROVID			CIRCULARIZATION. LOPC
						EUNDOCKING TO PRO PERCENT INDICAT			RESCUE: TEL AND TEMC
		, 5					as Therese Andrews		
		14 1							
	16-14	PROPELLANT	FEEDLINE TE	MPERA	ATURE MAI	NAGEMENT			
								ERATURE	S BETWEEN 45 DEG. F AND
		75 DEG. F.	AND ENGINE	VALV	E TEMPER	A URE ABOVE 45 DE	G. F.		
1.	16-15	ULLAGE MANA	AGEMENT						
1	1.0			BURI	NS REQUI	RING ULLAGE WILL	BE PRECEDED BY	A FOUR-	JET ULLAGE - UNDOCKED
}		SPS BURNS E		ULL					SARY TO IMPROVE SM RCS
1									
		16-19 ARE R	RS 16-16 THE RESERVED.	KOUGH					
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						J		16-3	,

MISSION RULES

REV ITEM

RIRULE	CONDITION/MALFUNCTION		·	RULING	' CUES/N	OTES/COMMENTS
:		!			1	
				IFIC MISSION RULE	1 5 1	
16-2	DECAY IN EITHER THE FUEL OR OXIDIZER	•			•	MALF PROC SPS 18
	TANK (COULD BE HELIUM OR FUEL OR OXIDIZER)	LAUNCH	CONT	TINUE MISSION	TANKS	MANUAL PRESSURIZATION OF SHOULD BE CONSIDERED PHIOR
				RCS DEORBIT AT	ANY RE	QUIRED SPS BURN.
		• • • • • • • • • • • • • • • • • • •	' IA	AND IMPACT IS MMINENT AFTER ABOR EPRESS MANUALLY AN ERFORM BURN TO AVO AND.	ID I	
		EO	ENTE	ER NEXT BEST PTP		
		TLC	1 NO-0	O FOR LOI BIT NON-CRITICAL S	SPS !	
		Lo	PLAN	TEL ASAP LM DPS IF CAPABIL STS	.ITY	
		UNDOCKED	DOCK	CASAP		NOT STAGE LM
		DESCENT	ABOR	T+ RETURN TO CSM		• • • • • •
		LUNAR	RETU	IRN TO CSM ASAP		
		TEC		TINUE MISSION BIT NON-CRITICAL IS	1	
	A. DURING NON-CRITICAL BURN	ALL		ERMINATE BURN		
	8. DURING CRITICAL BURN	ALL	. B • C	ONTINUE BURN	• • • • • • • • • • • • • • • • • • •	
		1 · · · · · · · · · · · · · · · · · · ·				
16-2	PRESSURE (LESS THAN	UNDOCKED LUNAR STAY	1 2.	REDOCK PERFORM MANEUVER SUSPECTED SYSTEM REF FMR 16-22	ON !	MALF PROC SPS 9 TRANSDUCER INDICATION CAN
		•	B• C	ONTINUE MISSION	' BE V	ERIFIED WITHOUT ENGINE
					•	
				•		
	MISSION	REV DA	TE	SECTION	GROUP	PAGE
	APOLLO 1	1 4/	16/69	CSM SPS	SPECIFIC	16-4

REV ITEM

R	RULE	CONDITION/MALFUN	CTION'	PHASE		RULING		OTES/COMMENTS
	16-22	LOSS OF ONE BAN	K OF		;		! MALF P	ROC SPS-9
		BALL VALVES			1.	N/A		
			'EC		,	NO-50 FOR LOT		
			16		•	NO-GO FOR LOI ENTER NEXT BEST P	TP.	
					•	USE LM DPS IF AVAILABLE		
				NDOCKE ESCENT	D/ D.	N/A		
			1 L	ESCENT UNAR TAY		ENTER NEXT BEST P	TP	
	16-23		2 L	AUNCH	14.	CONTINUE MISSION	• MAL	F PROC SPS 9
		TANK PRESSURES (LESS THAN 400		^	;			
			EC		•	ENTER NEXT BEST PT	BE VI	TRANSDUCER INDICATION CANNOT ERIFIED WITHOUT ENGINE IONA
			171	LC	,	NO-GO FOR LOI	1	
			, , ,		10.	PLAN TEI ASAP WITH	1 LM !	
			1	MUUC	,	DPS DOCK ASAP		
				ESCENT	•	CONTINUE MISSION	Ε.	DO NOT STAGE LM
			1	UNAR	•	RETURN TO CSM ASAF		
				EC	н.	CONTINUE MISSION		
					1		• •	
	,,_,,	51151 55501 TAIS A	, ,					
^	16-24	FUEL FEEDLINE A OXIDIZER FEEDLI TEMP LESS THAN	NE 1					MALF PROC SPS 11
		DEG F. AND UNAB			•		1	
				AUNCH	Α•	CONTINUE MISSION		
			E	0	В.	ENTER NEXT BEST P	TP	
			•		•	RCS DEORBIT		
			· Ti		•	NO-GO FOR LOI		
				•		PLAN TEI ASAP With LM DPS		
			יט י	NDOCKE	D 'E.	DOCK ASAP	. E. DO	NOT STAGE LM
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	•					
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				i.				
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MISSION RULES

PEV ITEM

R	ULE "	CONDITION/MAL				RULING		CUES/NO		
1	6-25		• • • (DESCEN LUNAR STAY	' '' 'F• (CONTINUE MISSIO RETURN TO CSM A	N ;			0C SPS 5
l				TEC	'н. (CONTINUE MISSIO	N !			
			•		1		. 1			
	1						•			
		GOES HIGHER 480 DEG F DU SPS BURN.	THAN !				! !			
				LAUNCH	NOT	APPLICABLE	·		• • •	
	İ			EO	ENTE	ER NEXT BEST PT				
					RCS	DEORBIT	:			
ļ	ļ			-0	'ENTE	ER NEXT BEST PT	P. USE			
		A. DURING NON-CRITICAL		ALL	' 1	FERMINATE BURN INHIBIT FURTHER HON-CRITICAL BUR	RNS			
		B. DURING CR BURN		NLL	'INH	ONTINUE BURN BIT FURTHER ON-CRITICAL BU	RNS			
	1		į							
ĺ										
1	6-26	THRUST CHAMB PRESSURE LES 70 PSI CONFI OTHER INSTRUMENTAT	S THAN !		• • • • • • • • • • • • • • • • • • • •			• M	ALF PRO	DC SPS 6
	1			LAUNCH	NOT	APPLICABLE	•			RMING INSTRUMENTATIO
					'ENTE	R NEXT BEST PTE	P RCS	DEGRADE PRESSUR	D THRUS	DARD PC METER: CRES ST: FU AND OX INTERFAC D VALVE POSITIONS: F
				-0		R NEXT BEST PTE		XC QNA	TANK PR	RESSURES
		A. DURING NON-CRITICAL			. 1	ERMINATE BURN NHIBIT FURTHER ION-CRITICAL BUR				
		B. DURING CR BURN	ITICAL		• 1	CONTINUE BURN INMIBIT FURTHER ION-CRITICAL BUR	RNS			
1	6-27	LACK OF ULLA	GE !	.AUNCH	A. N	NOT APPLICABLE		MALF	PROC-	SM RCS
					' '	HO-GO FOR TLI CONTINUE MISSION WITH SUITABLE ALTERNATE	N IN EO			
				ruc	•	O-GO FOR LOI	ļ			i.
				.0	D+ E	ENTER NEXT BEST	PTP	PRELUDE	S LM RE	ESCUE
				JNDOCK	ED E. F	REDOCK				
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						SEEF TIME				

REV ITEM

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OTHERS INHIBIT NON-CRITICAL	16-28			LAUNCH	CON	TINUE MISSION	. • • • • • • • • • • • • • • • • • • •	MALF PROC	SPS 1C
OTHERS INHIBIT NON-CRITICAL							•		
				OTHERS	. •	INHIBIT NON-CRITI			

MISSION RULES

SECTION 16 - CSM SPS - CONCLUDED

		INSTRUMENTATION REQUIREMENTS .						
16-50	MEAS DESCRIPTION	PCM	ONBGARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE		
	OX TK PRESS OX SM/ENG INTERFACE P	5P0003P 5P0931P	METER/CLW	COMMON _	M C/B	16-20: 28 16-20:29		
		SP0006P SP0930P	METER/CGW	COMMON	M O/B HD	16-20. 28 16-20. 28		
	SPS VLV ACT PRESS-PRI SPS VLV ACT PRESS-SEC	SP0600P SP0601P	METER METER	COMMON (COMMON (-1	. OF 2 M G/B	16-21, 22 16-21, 22		
	SPS FU FEEDLINE TEMP	5P0048T 5P0049T	METER Sys Test	COMMON -1	OF 2 M	16-24		
	SPS INJ FLANGE TEMP 1 SPS INJ FLANGE TEMP 2	SP0061T SP0062T	CEM	COMMON 1 -1	OF 2 M O/B	16-25		
	ENG CHAMBER PRESS	SP0661P	METER	COMMON	M 0/B	16-26		
	HE TK PRESS FU/OX VLV 1 POS FU/OX VLV 2 POS	SP0001P SP0022H SP0023H	METER DISPLAY	SEPARATE M	HC	16-29 16-21: 26		
	FU/OX VLV 3 POS FU/OX VLV 4 POS OX TK 1 QTY - TOTAL AUX OX TK 2 GTY	SP0023H SP0025H SP0025G SP0655G SP0657G SP0657G	DISPLAY DISPLAY DISPLAY DISPLAY DISPLAY DISPLAY DISPLAY	SEPARATE M (1 SEPARATE M) 1 SEPARATE M) COMMON COMMON COMMON COMMON	OF 2 0/B OF 2 0/B HD HD HD	16-21, 26 16-21, 26 16-21, 26 16-10, 11, 13 16-10, 11, 13 16-10, 11, 13		
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17 CSM SM-RCS

SECTION 17 - CSM SM-RCS

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R	' ITEM	
		' GENERAL '
	17-1	LAUNCH
		THE LOSS OF ONE GUAD IS NOT CAUSE FOR ABORT AND THERE ARE NO SINGLE FAILURES NOR ANY REASONABLE
		REALISTIC COMBINATION OF FAILURES WHICH LEAD ONLY TO LOSS OF MULTIPLE QUADS. THERE ARE,
		THEREFORE, NO SM-RCS FAILURES WHICH ARE CONSIDERED CAUSE FOR ABORT.
	_	
	17-2	EARTH ORBIT PHASE
		A. LOSS OF ONE QUAD. IN ITSELF, IS NOT NECESSARILY CAUSE FOR EARLY TERMINATION OF THE MISSION. THE GUIDELINE IS THAT AS LONG AS THE SPACECRAFT ATTITUDE CAN BE CONTROLLED AND THE SPS. CAN
		BE BURNED THE MISSION NEED NOT BE TERMINATED EARLY. HOWEVER: LOSS OF ONE GUAD WILL REQUIRE TLE BE INMIBITED AND MAY LEAD TO EARLY MISSION TERMINATION SINCE THE CAPABILITY TO PERFORM
		SM OR HYBRID DEORBIT WILL BE AFFECTED.
		B. LOSS OF TWO OR MORE QUADS IS CAUSE FOR ENTRY INTO THE NEXT BEST PTP.
		1. LOSS OF TWO ADJACENT QUADS WILL DESTROY THE CAPABILITY TO PERFORM ULLAGE
		MANEUVERS AND WILL REQUIRE DELETION OF NON-CRITICAL SPS MANEUVERS. LOSS OF TWO ADJACENT QUADS PRECLUDES SM OR HYBRID DEORBIT.
		2. LOSS OF TWO OPPOSITE QUADS WILL DESTROY THE CAPABILITY TO PERFORM PRECISE
		3-AXIS ATTITUDE CONTROL AND PRECLUDES SM OR HYBRID DEORBIT.
) [
	17-3	TRANSLUNAR COAST
		LOSS OF ONE QUAD IS NOT . IN ITSELF . CAUSE FOR TERMINATION OF THE MISSION . HOWEVER . CONSIDERING
	į l	THE EFFECTS OF POSSIBLE SUBSEQUENT QUAD OR JET FAILURES AND LM RCS CAPABILITY, THE TRANSLUNAR COAST PHASE MAY BE TERMINATED BY ENTRY INTO THE NEXT BEST PTP. LOSS OF ONE QUAD IS CAUSE FOR
		INMIBITING LOI» BECAUSE SUBSEQUENT FAILURE OF QUADS OR JETS IMPAIR ATTITUDE CONTROL OR ULLAGE.
	17-4	LUNAR ORBIT
		LOSS OF ONE QUAD IS CAUSE FOR EARLY TERMINATION OF LUNAR ORBIT AND LUNAR STAY PHASES. AND FOR INHIBITING LOIZ AND UNDOCKING. BECAUSE SUBSEQUENT FAILURE OF QUADS OR JETS IMPAIR ATTITUDE
		CONTROL OR ULLAGE. UNDOCKING WILL BE NO-GO BECAUSE LOSS OF ONE QUAD PRECLUDES CSM ACTIVE DOCKING. LOSS OF TWO QUADS IS CAUSE FOR RETAINING THE LM ASCENT STAGE THROUGH TE: FOR TEMC AND
Ì		PTC.
		RULE NUMBERS 17-5 THROUGH
		17-14 ARE RESERVED.
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		17-1

MISSION RULES

REV ITEM

SECTION 17 - CSM SM-RCS

R	ITEM									
						STEMS MANAGE	EMENT !			
				•						
	17-15	PROPELLANT	GAGING							
						6 PERCENT).				
		B. BACKUP	METHOD	ELIU	4 PRESSUR	RE/TEMPERATUR	RE (11 PERCENT)	(ONBOARD)		
	17-16	QUAD PROPELI								
		ACCOMPLISHE	D BY SELECT Suitable J	ING 1	TWO-JET 4 FOR ATTI1	X AND -X TRA	D PROPELLANT BA Anslations with Propellant di	FITHER THE	PITCH OR YAW	OUAD AND
	17-17	SECONDARY PI	ROPELLANT F	UEL F	PRESSURE	VALVE				
		THE RCS SEC	ONDARY FUEL	PRES	SSURIZATI	ON VALVE WIL	L BE OPENED	WHEN THE	PRIMARY FUEL	MANIFOLD
		PRESSURE REA	ACHES 190 H	SIA						
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		RULE NUMBER:		OUGH						*
		17-19 ARE R	ESERVED							
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REV ITEM

R	RULE	CONDITION/MA	LFUNCTION	PHASE	E '	RULING	·	CUES/NO	TES/CO	MMENTS	
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					SPE	CIFIC MISSION RU	LES '				
	17-20	SUSTAINED L					•		ALF PR	OC RCS	
		A. ONE OR M	ORE QUADS	LAUNCH		CONTINUE MISSION			IW DAU	LL REMAIN USABLE U	JNT.
		B. ONE QUAD OTHER QUADS		EO	8.1	NO-GO FOR TLI	į	HE MANI	FOLD P	RESSURE REACHES 75	PS
		THE TORSE		TLC	1 2	(A) NO-GO FOR L	01				
)) 	(B) CONTINUE MI IF SUFFICIE BLOWDOWN CAPABILITY	NT !				
				LO	3	PLAN TEI FOR N	EXT				
				UNDOCKE	ED 4	DOCK ASAP	•				
ĺ				DESCENT	, ,	. CONTINUE MISSI	ON '			•	
***************************************				LUNAR STAY	6	CONTINUE MISSI WITHIN BLOWDOW CAPABILITY					
Ballet (B. 1 1 1 1 1 1 1 1.		C. MORE THAT	N ONE	EO	C.1	CONTINUE MISSI ENTER PRIOR TO OF HYBRID DEOR	LOSS '				
	,			ALL OTHER	2	CAPABILITY REF RULING B		TEI DE	PENDIN	N LM ASCENT STAGE G UPON LM APS/	F(
			•				1	PROPELA	NI REM	AINING.	
	17-21	SUSTAINED LE BELOW HE ISO VALVE (COULT HELIUM OR FO OXIDIZER)	DLATION '							CC RCS	IN T
		A. ONE OR ME	ORE !	LAUNCH	A• (CONTINUE MISSION				RESSURE REACHES 75	
		B. ONE GUAD OTHER GUADS NORMAL)	•	EO	8.1	NO-GO FOR TLI	•				
Ì		NORMAL /		TLC	. 2	ENTER NEXT BES	T PTP				
				LO	•	PLAN TEI FOR NEX	T :				
ļ					D . 4	DOCK ASAP	:				
						CONTINUE MISSI	ON :				
		- 10 miles		LUNAR Stay	6. (ENTER NEXT BEST	PTP				
		C. MORE THAP	N ONE	EO	C.1	ENTER NEXT BES	T PTP :			e e e e e e e e e e e e e e e e e e e	
		-	•	ALL OTHER		2 REF RULING B		TEI DE	PENDING	LM ASCENT STAGE UPON LM APS/	
								FRUPELL	ANI KEP	AIÑING.	
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MISSION RULES

REV ITEM

R	RULE	CONDITION/MAL	FUNCTION'	PHAS	SE !	RULING	' C	UES/NOTES/COM	MENTS		
	17-22	PACKAGE TEMP THAN <u>55</u> DEG UNABLE TO IN	F. AND 'CREASE '		NOT	APPLICABLE		• MALF PRO	C RCS _		
		A. ONE QUAD	(ALL 'S	E O	1A+1	NO-GO FOR TLI	•				
		OTHER GUADS	• 1	TLC .	. 2	ENTER NEXT BES	T PTP :				
				-0	3.	PLAN TEI FOR N	EXT				
					; ED ! 4:	DOCK ASAP					
					•	CONTINUE MISSI	on !				
				LUNAR	6	ENTER NEXT BES	T PTP				
		B. MORE THAN	•		'B.1	ENTER NEXT BES	; T PTP !				
		QUAD			;						•
<u> </u>				ALL OTHER	. 2	REF RULING A	, , , P	B.2. RETAIN EI DEPENDING ROPELLÄNT.	LM ASCENT UPON LM	STAGE APS/	FOR
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1		1	APULLU II	I	1-110/09	1-3- 3	3-501-10	17-4			

REV, ITEM;

R RULE	CONDITION/MALFUNCTION	PHASE	' RULING	CUES/NOTES/COMMENTS
17-23	LOSS OF INDIVIDUAL THRUSTERS OR THRUSTER COMBINATIONS AS A RESULT OF CLOGGING.	1 1	NOT APPLICABLE	CONTROL SYSTEM MALFUNCTION WILL CAUSE LOSS OF AUTO COILS OF THRUSTE ALTHOUGH DIRECT COILS ARE STILL AVAILABLE.
	FREEZING. BURNOUT. OR CONTROL SYSTEM MALFUNCTION	1		
	A. LOSS OF ANY ROLL THRUSTER	•	1A-1. NO-GO FOR UNDOCK	NG !
		'ALL	3. CONTINUE MISSION	
	B. LOSS OF FOLLOWING THRUSTER COMBINATIONS——	EO	B-1- CONTINUE ALTERNATED MISSION	PE !
	TWO PITCH OR TWO	! !	IF BOTH SPS AND S RCS DEORBIT CAPABILITY AND AL	
	ONE PITCH AND ONE YAW;	1 1 1	AXIS ATTITUDE CONTROL AVAILABLE	
	PITCH AND TWO ROLL IN SAME DIRECTION:	· · ·		
	ONE YAW AND TWO ROLL IN SAME	TLC	2. NO-GO FOR LOI	
	THREE ROLL IN SAME DIRECTION	UNDOCKE	OPPORTUNITY 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
		•	5. CONTINUE MISSION	B.5. RETAIN LM ASCENT STAGE FOR TE
		LUNAR	6. ENTER NEXT BEST PT	•
	C. LOSS OF +X Thrusters on Adjacent quads.	ALL	C. INMIBIT NON-CRITICA SPS BURNS	' C. REF SPS RULE 16-27. LACK C L ! ULLAGE CAPABILITY !
	et kir Maria da yan	• ,		
	RULE 17-24 THROUGH 17-49 ARE RESERVED.			
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V ITEM		SECTION 17	- CSM SM-RCS -	CONCLUDED		
ITEM!						
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		' INSTRU	MENTATION REQUI	REMENTS '		
17-50	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE
	SM HE TK A PRESS GTY SM-RCS PROP SYS A	SR5001P SR5025Q	METER METER	COMMON COMMON	} -1 OF 2 M	17-20, 21 17-20, 21
	SM HE TK B PRESS QTY SM-RCS PROP SYS B	SR5002P SR5026Q	METER METER	COMMON	} -1 OF 2 M	17-20, 21 17-20, 21
	SM HE TK C PRESS GTY SM-RCS PROP SYS C	SR5003P SR5027Q	METER METER	COMMON	} -1 OF 2 M	17-20. 21 17-20. 21
	SM HE TK D PRESS QTY SM-RCS PROP SYS D	SR5004P SR5028Q	METER METER	COMMON	-1 OF 2 M	17-20, 21 17-20, 21
	SM ENG PKG A TEMP SM ENG PKG B TEMP SM ENG PKG C TEMP SM ENG PKG D TEMP	SR5065T SR5066T SR5067T SR5068T	METER/CSW METER/CSW METER/CSW	COMMON COMMON COMMON	HO HO HO	17-22 17-22 17-22 17-22
	SM HE TK A TEMP SM HE TK B TEMP SM HE TK C TEMP SM HE TK D TEMP	SR5013T SR5014T SR5015T SR5016T	METER METER METER METER	COMMON COMMON COMMON	HD HD HO	17-20: 21 17-20: 21 17-20: 21 17-20: 21
	SM HE MAN A PRESS SM HE MAN B PRESS SM HE MAN C PRESS SM HE MAN D PRESS	SR5729P SR5776P SR5817P SR5830P			HO HO HO	17-20, 21 17-20, 21 17-20, 21 17-20, 21
	SM FU MAN A PRESS SM FU MAN B PRESS SM FU MAN C PRESS SM FU MAN D PRESS	SR5737P SR5784P SR5822P SR5823P	METER/CSW METER/CSW METER/CSW METER/CSW	COMMON COMMON COMMON COMMON	HD HD HD	17-12, 21 17-12, 21 17-12, 21 17-12, 21
	SM OX MAN A PRESS SM OX MAN B PRESS SM OX MAN C PRESS SM OX MAN D PRESS	SR5733P SR5780P SR5820P SR5821P			H D D H D D H D D D H D D D D D D D D D	17-21 17-21 17-21 17-21
	MISSION	REV DATE	SECTION	GROUP	PAGE	

18 CSM CM-RCS

R	ITEM		
		' GENERAL '	
		WENTERAL WENTERAL WAR AND A STATE OF THE STA	
	18-1	LAUNCH	
		A. A SUSTAINED LEAK IN OR THE LOSS OF HELIUM SUPPLY PRESSURE OR HELIUM MANIFOLD PRES ONE CM RCS RING IS NOT CAUSE FOR ABORT SINCE THE REMAINING RING IS CAPABLE OF A ENTRY ATTITUDE CONTROL. THIS FAILURE WILL REQUIRE ENTRY INTO PTP 6-4 SINCE SYSTEMS LONGER REDUNDANT.	ener ne
		B. A SUSTAINED LEAK IN OR THE LOSS OF HELIUM SUPPLY PRESSURE OR HELIUM MANIFOLD PRES BOTH CM RCS RINGS PRIOR TO TOWER JETTISON IS JUSTIFICATION FOR A MODE I ABORT. AFTE JETTISON. IT IS NOT CAUSE FOR ABORT SINCE THE ABILLTY TO PERFORM A SAFE ENTRY I ATLANTIC AT THE END OF THE FIRST REV STILL EXISTS BY USING THE CONTINGENCY SM RCS PRIOR TO CM/SM SEP. THIS METHOD OF ENTRY IS CONSIDERED OPERATIONALLY PREFER PERFORMING AN ABORT AND PRESENTS LESS POTENTIAL MAZARD TO CREW RECOVERY. FURTHERM RCS CONTROL IS REQUIRED FOR ABORTS IN THE MODE II AND MODE III REGIONS, AND TO ABLAUNCH IN THESE REGIONS FOR LOSS OF CM RCS CAPABILITY WOULD PUT THE SPACECRAFT A INTO AN UNSAFE ENVIRONMENT.	R TOWER NTO THE SPIN UP ABLE TO OBT THE
			-
	18-2	LUNAR ORBIT: LUNAR STAY PHASES	
		A. LUNAR ORBIT ACTIVITIES WILL BE CONTINUED FOR LOSS OR IMPENDING LOSS OF ONE CM RCS SY	STEM.
		B. THESE PHASES WILL ALSO BE CONTINUED IF THE CM-RCS IS ARMED.	
		C. LOSS OF ONE SYSTEM AND ANY DEGRADATION IN THE REMAINING SYSTEM IS CAUSE FOR ENTRY I NEXT BEST PTP.	NTO THE
	18-3	LM DESCENT PHASE	ĺ
	10-3		
		THERE ARE NO CSM RCS FAILURES THAT ARE CAUSE FOR TERMINATING THE DESCENT PHASE.	
	18-4	ALL OTHER PHASES	
		A. SUSTAINED LEAK IN OR LOSS OF HELIUM SUPPLY PRESSURE OR HELIUM MANIFOLD PRESSURE (C	Ou 2 85
		EITHER FUEL OR OXIDIZER) IN ONE CM RCS RING DELETES THE REDUNDANCY OF THE ENTRY CONTROL SYSTEM AND REDUCES THE DELTA V AVAILABLE FOR HYBRID DEORBIT. LOSS OF HELIUM PRESSURE OR HELIUM MANIFOLD PRESSURE IN BOTH CM RCS RINGS DELETES ALL ENTRY CONTROL CAPABILITY REQUIRING CONTINGENCY SM RCS SPIN UP PRIOR TO CM/SM SEP. THE LOSS OR BOTH CM RCS RINGS IS CAUSE FOR TERMINATING THE PHASE AND MISSION BY ENTRY INTO THE BEST PTP.	ATTITUDE SUPPLY ATTITUDE S OF ONE
		B. ARMING OF THE CM RCS RINGS: WHETHER THE PROPELLANT ISOLATION VALVES ARE OPENED OR IS CAUSE FOR TERMINATING THE PHASE AND MISSION INTO THE NEXT BEST PTP:	CLOSED.
		RULE NUMBERS 18-5 THROUGH	
		10-9 ARE RESERVED.	
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MISSION RULES

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R	ITEM											
					' S'	YSTEMS MANAG	EMENT !					
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l	18-10	THRUSTER TEM										
		CM RCS THRUS TEMPERATURE IS STILL CON	15 /8 056		WHICHEVE	FR COMES FIR	CT. IE THE	ictebiel w	PATER P	INCTION C		RCS
		MALF PROC RC										
	18-11	HELIUM INTER	CONNECT									
		AS A LAST RE DEPLETED IN REGUIRED FOR	SORT. IF THE OTHER CONTROL.	THE HI RING ONCE	ELIUM IN THE SYS INTERCOM	ONE RING IS STEMS MAY BE NNECTED+ THE	DEPLETED D INTERCONNE RINGS CANN	DUE TO A COTED IF	LEAK AI THE REI LATED. I	ND THE MAINING MALF PROC	PROPELLANT PROPELLANT RCS	15
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MISSION RULES

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RULE	CONDITION/MAN		PHASI		RULING	' CUES/	NOTES/CO	MMENTS
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		▼		1		1		
1				' SPEC	IFIC MISSION RUL			
18-20	SUSTAINED LE	EAK IN '	•			•		
	OR COMPLETE	LOSS OF '		•		ta in the second		
1	PRESSURE	JPPLY .				•		
	A. ONE RING	•	LAUNCH	A.1.	CONTINUE MISSIC	DN AND		
		1 1	LO/ DESCENT LUNAR STAY	7/ 2.	CONTINUE MISSIC	DN .		
		t 			TERMINATE PHASE		3. NORM	AL ENTRY
	B. BOTH RING	,	LAUNCH	•	CONTINUE MISSIC	+		
				,	ENTER PTP 2-1.	1		
					TOWER JETTISON.	IF '		
		•			PRIOR TO TOWER JETTISON. ABORT			
		;	DESCENT	' 2.	CONTINUE MISSIC	n i		
						•		
			ALL OTHERS		TERMINATE PHASE ENTER NEXT BEST	PRIOR	TO CM/S	IGENCY SM RCS SPINI 1 SEP FOR DEDHBIT AI RETURN ENTRY.
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	•			. .		• • • • • • • • • • • • • • • • • • •		
18-21	SUSTAINED LE	I EAK IN OR!		•		•		
	COMPLETE LOS	SS OF '		•		•		
	PRESSURE (CO BE EITHER FL OXIDIZER)	onro .		† †				
	A. ONE RING	1 1 1	LAUNCH	A.1.	CONTINUE MISSIC	ON AND		
			LO/		CONTINUE MISSIC	on !		
		•	DESCENT LUNAR	7/ ;		•		
		**************************************	STAY	•		•		
			ALL OTHERS		TERMINATE PHASE ENTER NEXT BEST			
	B. BOTH RING	ss ;	LAUNCH	18.1	CONTINUE MISSIC	ON AND!		
		,		•	UNLESS PRIOR TO			
					PRIOR TO TOWER	•	2	
	241 24				JETTISON. ABORT	1		
	0.00		DESCENT	20	CONTINUE MISSIC	JN '		
			ALL		TERMINATE PHASE			NGENCY SM RCS SPIN
			OTHERS	;	ENTER NEXT BEST			M SEP FOR DEORBIT AN RETURN ENTRY+
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MISSION RULES

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RULE CONDITIO				RULING	1	CUES/NOTE	S/COMMENTS		
18-22 CM RCS ANY REA	S ARMED FOR SON	'LO/	CONTI		 				
		ALL	TERMI	NATE PHASE AND NEXT BEST PTR					
	4BERS 18-23 ' 18-49 ARE '								
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MISSION RULES

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R	ITEM								
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				INSTRU	MENTATION REQUI				•
	18-50	MEAS DESCRIPTI	ON	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE	
		CM HE TK A PRE		CR0001P CR0002P	METER	COMMON	м	REFERENCE 18-20	
		CM TK A TEMP	. 33	CR0003P	METER METER	COMMON	M HD	18-20 18-20)
		CM HE MNFLD A		CROOO4P CROO35P	METER/CSW	COMMON SEPARATE	HD M	18-20 18-21	•
		CM HE MNFLD B	PRESS	CR0036P	METER/CSW	SEPARATE	M	18-21	,
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19 EMU/EVA

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REV ITEM

19-1	TO INITIATE AND CONTINUE THE FOLLOWING MISSION PHASES, THE EXTRAVEHICULAR MOBILITY UNIT (EMI MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITIES
	A. DOCKED (TUNNEL HARDWARE INSTALLED)/UNDOCKED/RNDZ
	TWO LIFE SUPPORT UNITS (PLSS AND OPS OR TWO OPS) PROVIDING SUFFICIENT CONSUMABLES
	SUPPORT A 30-MINUTE CONTINGENCY TRANSFER. B. EVA
	1. NOMINAL (TWO MAN)
	TWO EXTRAVEHICULAR MOBILITY UNITS (EMU) WITH SUFFICIENT CONSUMABLES TO
	SUPPORT CHECKOUT AND THE PLANNED EVA. 2. ALTERNATE
	AN EXTRAVEMICULAR MOBILITY UNIT (EMU) WITH SUFFICIENT CONSUMABLES TO SUPPORT CHECKOUT AND THE ALTERNATE EVA.
	MANAGEMENT
19-2	THE PLSS BATTERY IS CONSIDERED TO MAVE A MINIMUM OF 14.3 AMP-HR CAPABILITY. THIS CONSUMABLE SAGED BY MONITORING GT8140C/GT8240C AND PROCESSING IN THE RTCC TO OBTAIN AMP-HRS.
19-3	THE PLSS PRIMARY DXYGEN SUBSYSTEM (POS) IS CONSIDERED TO HAVE A MINIMUM SOURCE PRESSURE OF 101 PSIA TO SATISFY THE PLANNED EVA. THIS CONSUMABLE IS GAGED BY MONITORING GT8182P/GT8282P AI
	PROCESSING IN THE RICC TO OBTAIN LBS MASS.
19-4	THE PLSS FEEDWATER RESERVOIR IS CONSIDERED TO HAVE A NOMINAL LOADING OF 8.5 LBS. THE
	CONSUMABLE IS GAGED BY MONITORING GT8154T/GT8254T. GT8196T/GT8296T. GT8182P/GT8282F GT8110P/GT8210P AND PROCESSING IN THE RTCC AND MAND CALCULATIONS TO OBTAIN LBS REMAINING.
1	
19-5	THE CONTAMINANT CONTROL ASSEMBLY IS CONSIDERED TO HAVE A 4800 BTU TOTAL METABOLIC CAPABILITY THIS CONSUMABLE (LICH) IS GAGED BY MONITORING POS CONSUMPTION.
19-5	
	THIS CONSUMABLE (LIOH) IS GAGED BY MONITORING POS CONSUMPTION.
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ULES 19-	THIS CONSUMABLE (LIOH) IS GAGED BY MONITORING POS CONSUMPTION. 5 THROUGH
ULES 19-	THIS CONSUMABLE (LIOH) IS GAGED BY MONITORING POS CONSUMPTION. 5 THROUGH
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ULES 19-	THIS CONSUMABLE (LIOH) IS GAGED BY MONITORING POS CONSUMPTION. 5 THROUGH
ULES 19-	THIS CONSUMABLE (LIOH) IS GAGED BY MONITORING POS CONSUMPTION. 5 THROUGH

MISSION RULES

RULE	CONDITION/MALFUNCTION	PHASE	•	RULING	' CUES	/NOTES/COMMENTS
•						NOTES COMMENTS
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19-20		EVA			. R	EF MALF EMU
	INTEGRITY		ï			• GT8168P/GT8268P PGA PRÉSS PO
	A. PGA PRESS LESS THAN 3.75 PSIA) 	'A. '	TERMINATE EVA	PRES	S GAGE
	(TM) AND	1 ,	. !		<u>.</u>	OW PGA PRESS FLAG ANNUNCIATOR
	AND DECREASING OR PGA PRESS GAGE OF	•	•	L. ACTIVATE OPS	•	IGH 02 FLOW FLAG ANNUNCIATOR
	LESS THAN 3.7 PSIA AND	, ,				
	DECREASING				<u>.</u>	
				2 INGRESS LM	REF	MALF EMU
	B. PGA PRESS GREATER			TERMINATE EVA	• •	
	THAN 4.05 PSIA			CEMMINAIS EVA	PRES.	ST8168P/GT8268P PGA PRESS PC 5 GAGE CREW SENSIBLE DETECTIO
	(TM) AND INCREASING OR	•			HIGH	OZ FLOW FLAG ANNUNCIATOR
	PGA PRESS GAGE OF GREATER THAN 4.0		1 :	L. ACTIVATE OPS	•	
	PSIA AND				1	
	INCREASING			. CLOSE POS SHU	TOFF	
			'	VALVE	,	
	with the second second		! :	. INGRESS LM	•	
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MISSION RULES

J ,		N' PHAS	E ' RULING	CUES/NOTES/COMMENTS
19-21	LOSS OF OXYGEN VENTILATION	1 1 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		REF MALF EMU
	A. FAN FAILURE	EVA	A. TERMINATE EVA	A. GT8140C/GT8240C PLSS BAT CU
		• · · · · · · · · · · · · · · · · · · ·	1. ACTIVATE OPS	GT8141V/GT8241V PLSS BAT VOLT
		•	2. OPEN PGA PURGE VALVE	GT8170T/GT8270T SUBL 02 OUT TE
		•	3. INGRESS LM ASAP	LOW VENT FLOW FLAG ANNUNCIATOR
	B. NOXIOUS ODOR	'EVA	B. TERMINATE EVA	B. CREW SENSIBLE DETECTION
		1	1 1. ACTIVATE OPS	GT8175P/GT8275P PLSS CO2 PP
		•	. Z. OPEN PGA PURGE	HIGH CO2 PP FLAG ANNUNCIATOR
		•	VALVE	
			3. INGRESS LM ASAP	• • • • • • • • • • • • • • • • • • •
		1		
19=22	HUMIDITY CONTROL MALFUNCTION	1		REF MALF EMU
	A. DEGRADED OPERATION OF WATER SEPARATOR	EVA	'A. CONTINUE MISSION ' REDUCE WORK PROFILE ' TO COMPENSATE ' FOR INCREASED ' HUMIDITY	A. CREW SENSIBLE DETECTION
	B. FOTAL LOSS OF	'EVA	B. TERMINATE EVA	B. CREW SENSIBLE DETECTION
	WATER SEPARATOR		' 1. IF DEHUMIDIFICATION	GT8110P/GT8210P FEED H2C PRESS
			' IS REQUIRED; ' ACTIVATE OPS IN	GT8140C/GT8240C PLSS BAT CUR
		1	PURGE MODE 1 2. INGRESS LM ASAP	LOW FEED H20 PRESS FLAT ANNUNCIATOR
	9.41.55 19-22 THO			F
	RULES 19-23 THRU 19-29 ARE RESERVED.	•		
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	MISSION	REV	DATE SECTION GROU	JP PAGE

MISSION RULES

REV ITEM

19-30 TARAPPORT LOOP THERMAL CONTROL A. DEGRADED CIRCULATION LESS TWAN 3-9 B. LOSS OF CIRCULATION CIRCULATION CIRCULATION CIRCULATION CIRCULATION CIRCULATION B. LOSS OF CIRCULATION CIRCULATION CIRCULATION CIRCULATION CIRCULATION B. LOSS OF CIRCULATION CIRCULATION CIRCULAT		MISSION	REV	DATE	SECTION	GROUP PAGE
TRANSPORT LOOP TREMANAL CONTROL A. DEGRADED CIRCULATION (LESS TYAN 3.9 B. LOSS OF CIRCULATION CIRCULATION CIRCULATION B. LOSS OF CIRCULATION CIRCULATION CIRCULATION CIRCULATION CIRCULATION B. TERMINATE EVA CIRCULATION 1. IF ADDITIONAL COOPERATE FOR DEGRADED SUBLINATOR LOOP MEAT RESULTION C. DEGRADED SUBLINATOR LOOP MEAT RESULTION C. CONTINUE MISSION C. CONTINUE MISSION C. CONTINUE MISSION C. CONTINUE MISSION C. CRESS-SENSIBLE DETECTION REF MALF EMU C. GRESS-TYGRES-AT LCG H20 TEMP GT8190F/GT8294T LCG H20 TEMP GT8190F/GT8294T LCG H20 DELTA COOPERATE FOR DEGRADED SUBLINATOR LOOP MEAT RESULTION C. GRESS-TYGRES-AT LCG H20 TEMP GT8190F/GT8294T LCG H20 TEMP GT8190F/GT8294T LCG H20 DELTA COOPERATE FOR DEGRADED COOPERA					r	. · · · · · · · · · · · · · · · · · · ·
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SECTION 19 - EMU/EVA - CONCLUDED

REV ITEM

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19-41	MEAS DESCRIPTION	PAM FM/F		BOARD	TRANSDUCERS	CATAGORY	MISSION RUL REFERENCE
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	PLSS BAT VOLT LCG H2O TEMP PGA PRESS PGA PRESS GAGE	GT8141V/G GT8154T/G GT8168P/G	T8241V T8254T T8266P	ETER		HD HD HD	
	LOW PGA PRESS SUBL 02 OUT TEMP PLSS CO2 PP	GT8170T/G GT8175P/G	T8270T T8275P	NNUNCIATOR		M HD HD	
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	* AEROMEDICAL PARAMETER **1 OF 2 OPS REG PRESS						
19-42	CRITICAL INSTRUMENTATIO	N PAM					
	MEAS DESCRIPTION PLSS 02 PRESS/PLSS02 QT	FM/F	M ON	BOARD ETER	TRANSDUCER		
	PGA PRESS GAGE/LOW PGA FLAG ANNUNCIATOR/PGA PR		SP/ METE	R/TONE-			
	PLSS CO2 PP/HIGH CO2 PP FLAG ANNUNCIATOR	GT817 GT827		R/TONE- }	COMMON		
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		6. ONE-	MAN EVA							
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ĺ		A. LM.	CSM/MSFN							
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USED, DURING LUNAR STAY, IF THE ERECTABLE ANTENNA IS USED, THE POWER AMPLIFIER MAY E TURNED OFF IF HBR TM AND MOITCE CIRCUIT MARGINS ARE ADEQUATE. B. DURING PERIODS OF LM OUT-OF-STATION CONTACT (LUNAR FAR SIDE). THE TM DIT RATE WILL IS SWITCHED FROM HBR TO LBR AND TRANSMITTED TO THE CSM OVER MHF BEXCEPT DURING MHF RANGE AND PERIODS OF CRITICAL MOICE COMMUNICATIONS. C. FOR ALL LUNAR STAY OPERATIONS, HBR TM WILL BE USED. 20-14 SYSTEM MONITORING DURING SLEEP PERIODS TBD CREWMEN WILL SLEEP WITH HEADSETS TO MONITOR FOR MCGAL AND/OR GROUP ALERT SIGNAL. RULE NUMBERS 20-15 THROUGH 20-19 ARE RESERVED.		20-13	LM USB/TM MA	ANAGEMENT						
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C. FOR ALL LUNAR STAY OPERATIONS: HBR TM WILL BE USED: 20-14 SYSTEM MONITORING DURING SLEEP PERIODS TBD CREWMEN WILL SLEEP WITH HEADSETS TO MONITOR FOR MCG-, AND/OR GROUP RULE NUMBERS 20-15 THROUGH 20-19 ARE RESERVED MISSION REV DATE SECTION GROUP PAGE			SWITCH	ED FRC™ ⊨8R	to t	SR AND	FRANSMITTED TO TH			
20-14 SYSTEM MONITORING DURING SLEEP PERIODS TBD CREWMEN WILL SLEEP WITH HEADSETS TO MONITOR FOR MCG-1 AND/OR GROUNALERT SIGNAL. RULE NUMBERS 20-15 THROUGH 20-19 ARE RESERVED MISSION REV DATE SECTION GROUP PAGE								uSED•		
DURING SLEEP PERIODS TBD CREWMEN WILL SLEEP WITH HEADSETS TO MONITOR FOR MCG- AND/OR GROUP RULE NUMBERS 20-15 THROUGH 20-19 ARE RESERVED MISSION REV DATE SECTION GROUP PAGE			CT FOR ALI		., 0-6					
DURING SLEEP PERIODS TBD CREWMEN WILL SLEEP WITH HEADSETS TO MONITOR FOR MCG- AND/OR GROUP RULE NUMBERS 20-15 THROUGH 20-19 ARE RESERVED MISSION REV DATE SECTION GROUP PAGE		,,_,	CYCTEN HOUT	TORING						
ALERT SIGNAL. RULE NUMBERS 20-15 THROUGH 20-19 ARE RESERVED MISSION REV DATE SECTION GROUP PAGE		23-14				: : widen	TIL ELEED WITH HE	ADSETS TO MOST	*****	B MCG. AND 200 400
20-19 ARE RESERVED MISSION REV DATE SECTION GROUP PAGE					<u> </u>	tewmen W	THE SPEEK MILL HE	-DSEIS IO MON	. IUR - FOI	. <i>च्राज्यः सम्प्राच्य</i> छ्रेष्ट्रा
20-19 ARE RESERVED MISSION REV DATE SECTION GROUP PAGE		<u> </u>								
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MISSION RULES

RULE	CONDITION/MALFUNCT	TION' PHASE		RULING	' CUE	ES/NOTES/COMMENTS	5
; ;		•	!		,		
			· SPECIF	IC MISSION RUL			
20-20	LOSS OF TWO-WAY V		CONTIN	UE MISSION	†	. REF MAL PROC	
	SPACECRAFT	UNDOCKE		UE MISSION FOR DOI	• • •	3 LOSS OF VMF VO	SICE COMM WITH :
		DESCENT	CONTIN	UE MISSION	•		
		POWERED		UE MISSION			
		LUNAR STAY	CONTIN	UE MISSION	•		
			OR SIM	FOR EVA IF DUPI PLEX VOICE BET NOT AVAILABLE	WEEN !		
		•	•		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		
20-21	LOSS OF TWO-WAY	SFN'	•			• REF MAL PROC C	
	A. LM ONLY	DOCKED	A. CON	TINUE MISSION	•	4 LOSS OF S-BAND	
!		•	, NC	SO FOR DOI		5 S-BAND RECOVER ASE LOCK.	CANNOT ACGUI
	B. CSM ONLY	LAUNCH	•	ONTINUE MISSION	•		
	and the second s	'EARTH 'ORBIT		NTER NEXT BLCC! ATA POINT			
		TLC	3 · C	ONTINUE MISSION		. ENTER LM EARLY VOICE COMM WITH	
		1	•	O GO FOR LOI	, <u>1</u>	3.55	-
i		ALL	1	NTER NEXT BEST	•		
	C. LM OR CSM	DESCENT	•	ONTINUE MISSION	1		
		1	•	O GO FOR PDI	•		
		POWERED DESCENT		ONTINUE MISSION	¥		
		LUNAR STAY	3. 1	M LIFTOFF ASAP	:		
				• 1	•		
		•	•		1 1		
20-22	LOSS OF CSM TM	1	1		•		
	A. HBR OR LBR	ALL	A. CON	TINUE MISSION	•		
ĺ	B. ALL TM	LAUNCH	18.1. C	ONTINUE MISSION			
1		ORBIT	2 • E	NTER NEXT BEST	PTP :		
		POWERED DESCENT	3. 0	ONTINUE MISSION	1		
		LUNAR STAY	1 4. LI	M LIFTOFF ASAP	* *		
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MISSION RULES

RULE	CONDITION/MALF		PHAS		RULING	' CUE	S/NOTES/COMMENTS
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						•	
20-23	LOSS OF LM TM			t t .		1	. REF MAL PROC COMM
	A. LOSS OF LB	R '	ALL	! A (CONTINUE MISSION		6 MSFN REPORTS LOSS OF PCM
	B. LOSS OF HB	R ',	ALL	B.1	· CONTINUE MISSIO	N !	
			DESCEN' DRBIT	T ! 2	RETURN TO VICIN OF CSM ASAP	ITY	
				į	NO GO FOR PDI		
	C. LOSS OF AL		JNDOCK		CONTINUE MISSIO RETURN TO VICIN OF CSM ASAP		
				1	NO GO FOR DOI	# 1	
			DESCEN'	T ! 3.	RETURN TO VICIN	ITY	
				•	NO GO FOR POI	1	
			POWERE		. CONTINUE MISSIO	, N ,	
į			DESCEN		NO GO FOR LUNAR		
			LUNAR	, 5,	LM LIFTOFF ASAP		
		,		,			
20-21							
20-24	LOSS OF CRITI	ON !	LAUNCH		TINUE MISSION		
			E0	•	O FOR TLI	•	
ļ [r L C	•	TINUE MISSION		
•				•	30 LOI	•	
Ì		10	LUNAR DRBIT	'ACT	O FOR UNDOCKED	•	one de la companya de la companya de la companya de la companya de la companya de la companya de la companya d La companya de la companya de la companya de la companya de la companya de la companya de la companya de la co
			OCKED	, , 00 v	NOT UNDOCK	•	
			JNDOCK	ED 'DOC*	CASAP		
	1			•		1	
İ		1		,		•	
20-25	LOSS OF ONE C		N LL	! !::0N1	TINUE MISSION	•	
	POWER SUPPLY					1	
				•			
!		•	٠	1		•	
20-26	LCSS OF BOTH		EPO .	'NO 6	O FOR TLI	;	
	POWER AMPLIFI		ALL	CONT	TINUE MISSION	1	
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1							
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MISSION RULES

RULE '	CONDITION/MALFUNCTION			RULING	' CUES/	NOTES/COMMENTS
,		! !	1 1			
20-27	LOSS OF THE SCE	'EPO	NO :	SO FOR TLI	**************************************	
		TLC		TINUE MISSION	•	
			•	O FOR LOI	•	
		'LUNAR 'ORBIT	CON	TINUE MISSION		
		LUNAR STAY	CON	TINUE MISSION		
		:	•		* :	
		1	1		•	
20-28		EPO	! NO (SO FOR TLI	•	
		'ALL	CON	TINUE MISSION	t :	
		• •			1	
		1 1		*		
20-29	LOSS OF VOICE FROM EVA-2 TO EVA-1	DUAL 'EVA	•	TINU MISSION	1	A-1 HAS EVC-1 EVA-2 HAS EVC
		1	EVA	-2 GO POSITION ''E		
		i			•	
20-55	LOSS OF WOLGE TEEN	10	,		•	
20-30		'EVA	•	TINUE MISSION		
				EVA-2 GO TO POSITION ''A''		
		!	12.	EVA-1 GO TO POSITION "B"		
		•	. ; '	-OSTATEN S	•	
	e e e e e e e e e e e e e e e e e e e	•	· . •		•	
20-31	LOSS OF DUPLEX	'DUAL	'TER	INATE EVA	• • • • • • • • • • • • • • • • • • •	
		EVA	•			
20-32		DUAL	CON	TINUE MISSION		
		'EVA		VA-2 GO TO		
		•	•	POSITION ''A''		
)		POSITION ''B''	•	
		•		F UNABLE TO	•	
		• · · · · · · · · · · · · · · · · · · ·		EVA-2 MAY ELECT TO RETURN TO LM AT	10	• • • • • • • • • • • • • • • • • • •
) 	!	RECONFIGURE COMM	•	
		•	٠,	IF UNABLE TO RE-ESTABLISH COMM	,	
		•		TERMINATE EVA.	•	
		•			•	
					, , *	
1	MISSION	REV D	ATE	SECTION	GROUP	PAGE
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MISSION RULES

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RULE	FONDITION/MALFUNCTIO	N' PHASE	RULING	' CUES/NOTES/COMMENTS
:				
20-33	LOSS OF TWO-WAY	ALT	CONTINUE MISSION	
	VOICE BETWEEN MSFN AND BOTH LM AND EVA	(ONE-MAN	11. RECONFIGURE LM TO	
			RE-ESTABLISH COMM	
			2. IF UNABLE TO RE-ESTABLISH COMM.	
			TERMINATE EVA.	•
20-34			CONTINUE MISSION	
	VOICE BETWEEN LM	(ONE-MAN	'1. RECONFIGURE LM AND EV.	
			TO VHE BACKUP MODE	
		•	'2. IF UNABLE TO ' RE-ESTABLISH COMM,	
		1	TERMINATE EVA	
			1	
			• 1	
	RULES 20-35 THROUGH 20-39 ARE		1 1	
	RESERVED.			
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NASA - Manned Spacecraft Center MISSION RULES

R ! ITEM!				RUMENTATION CONC		
		1 CSM+ INSTR	RUMENTATUON REQU	JIREMENTS !		
20-40	MEAS DESCRIPTION		PCM ONBOARD	TRANSDUCERS	CATEGURY M	: :51:0% #445 95
	UDL VALIDITY SIGNAL	CTC	026 2 V -		HS.	13-102,102,1
	USB RECEIVER AGC	CT:	GAZGE METER	COMMON	HE	15-108
	USB RECEIVER AGC	MET	ER -	-	-0	. 3-1.8
	USB RECEIVER ERROR	cto	0604F -	-	но	
	DSE TAPE MOTION	CTC	0012x TE	-	HC	. := : :
Ì	CTE TIME	cro	145F -	-	# 3	. : = . :
	SCE 10 VDC	cto	0018v -	-	HE	
	SCE 5 VDC	CTC	0017V -	•	ac ac	
	SCE 20 VDC	CTC	0015v -	-	٦٥	
	SCE -20 VDC	CTC	0016V -	•	#2	
	PCM HI REF 85 PERCENT	cto	1125v -	, -	- 5	
	PCM HI REF 15 PERCENT	<u>c</u> TS	0125v -	-	-0	
			RUMENTATION REGU			
20-41	MEAS DESCRIPTION		PCM ONBOARD	TRANSDUCERS	CATEUURY Y	18810. Auge Ag
į į	PCM OSC FAIL 2	GLO	3422v -	-	1 0= 4	
	PCM CSC FAIL 3	GL	1423V -	-	~ ⊃	
	CAL SE PCT	<u>ق</u> ر 5	0401v -	-		
1	CAL 15 PCT	GL:	0402v -	- -	-5	
	₩ Ę ™	GL C)501× -		•	
	COW DWR FAIL	GL 4	1354X CAUTION	.	40	22-
	MASTER ALARM	GL4	O69X MASTER	ALARY -	48	22-
	DUA STATUS	GTS)441x -	•	42	
	S-BND ST PH ERR	GT ()492B -	_	HD	
1	S-BND RCVR SIG	GT	1994V YETER	•	- 3	20-11
1						
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21 LM SEQUENTIAL AND PYROTECHNIC

MISSION RULES

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SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC

	or V	TITM	SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC
	R	ITEM	
			GENERAL
1		21-1	TO INITIATE THE FOLLOWING MISSION PHASES, THE PYROTECHNIC SYSTEM MUST PROVIDE THE FOLLOWING
١			MINIMUM CAPABILITIES NOTE
			LM-ACTIVE RENDEZVOUS/CONTINGENCY RETURN ASSUMED
			A. DOCKED OPERATIONS, UNDOCKING
l			ONE OPERATIONAL PYRO SYSTEM
- 1			
ı			
.			TWO OPERATIONAL PYRO SYSTEMS
- 1			
		21-2	DEFINITIONS
ı			LOSS OF PYRO SYSTEM
1			A. PYRO BATTERY OPEN CIRCUIT VOLTAGE LESS THAN 35 VDC
- 1			B. UNABLE TO ARM SYSTEM
ı			
I		21-3	A PYRO SYSTEM WILL BE DISABLED IF
			A. ANY RELAY K2 THROUGH K6 INADVERTENTLY CLOSES (REF MR 21-13)
			B. ANY RELAY K7 THROUGH K15 INADVERTENTLY CLOSES. SYSTEM WILL BE USED FOR APS PRESSURIZATION.
			DPS VENTING AND STAGING
			A PYRO SYSTEM IS DISABLED BY OPENING THE APPROPRIATE ''LOGIC POWER'' CIRCUIT EREAKER
ı			
		21-4	THE ASCENT AND DESCENT STAGES ARE CONSIDERED NON-RIGIDLY ATTACHED IF THE GUILLOTINE FAILS TO SEVER THE INTERSTAGE UMBILICALS AND ALL OTHER INTERSTAGE ATTACHMENT POINTS HAVE RELEASED.
ı			SEVER THE INTERSTAGE UMBILICALS AND ALL OTHER INTERSTAGE ATTACHMENT POINTS HAVE RELEASED.
			RULE NUMBERS 21-5 THROUGH 21-9 ARE RESERVED.
		<u> </u>	MISSION REV DATE SECTION GROUP PAGE
	 _		
			APOLLO 11 4/16/69 LM SEQUENTIAL GENERAL MANAGEMENT 21-1

MISSION RULES

	ITEM			SECTI	ON 21 -	LM SEQUENTIAL AND	PYROTECHNIC			
R	ITEM	·								
						MANAGEMENT				
	21-10	PRESSURIZED	MORE THAN	24 H	JURS PRIC	IMMEDIATELY PRIOR OR TO THE LAST AP	S BURN HOW	EVED. IN A	ILL NOT NO	RMALLY TO
		APS MAY BE	PRESSURIZED	UP.	70 3-1/2	DAYS PRIOR TO TH	E LAST APS BU	RN.		
	21-11	IF UNABLE T	TO DERLOY OF	.E 08	MORE LA	NDING GEAR. A LAN		05 4755	***	
		DUKNS WILL	BE CONTINUE	:D 511	NCE CONTR	ROL PROBLEMS ARE T AFFECT ALTERNAT	NOT EXPECTED	TO EXIST	AND DAMAG	E TO T
						A TECHNOLOGIC	C 11133101131			
	21-12	UNDOCKED ST	AGING WITH	ONE I	PYRO SYS	TEM WILL BE PERFO	RMED ONLY IF	ABSOLUTELY	NECESSARY 1	G MAINTA
-		CREW SAFETY	(•							
	21-13	508 A V1 Th	1901/GH KA E4		5. TUE C	000 exercis	F 014101 F0			
	21-13	ISTAGING: AT	TEMPTED TO	DETER	RMINE IF	DOD SYSTEM WILL B K1 has failed cl A K1 failure ind	USED. IE BOT	- CYCTEME	ARE EATLED	TAL TO
		FOR A K1 FA	ILURE.	, ,	SIED FOR	A RI FAILURE IND	EPENDENILY.	A PYNO SYS	IEM CANNOT E	E DISABLE
	21-14	AN ARMED PY ENVIRONMENT	RO SYSTEMIS	THI (T CANNOT	BE DEARMED IS	CONSIDERED U	NSAFE FOR	THE VIBRA	TION/SHO
		2					• a - 2			
		RULE NUMBER 21-19 ARE R		COUGH						
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			1	l	1	AND PYROTECHNIC	MANAGEMENT	21-2		

MISSION RULES

REV ITEM

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC

R RULE	CONDITION/MALFUNCTION			RULING	' CUES	/NOTES/COMMEN	'S
:		:					
		•			•		
				SPECIFIC			
İ			•		•		
21-20	LOSS OF	•	•		R	EF MALF PROC	D
1	A. ONE PYRO SYSTEM	ALL	A. 1	. DELAY STAGING	\s	ED RELAY	
		:	•	LONG AS POSSIBL	.E '		BE REQUIRED DUE
		DOCKED!	' ' 2 D 'NO-G	. CONTINUE MISSICO DOI	N RCS	REDLINES	or wedowed boe
		DESCENT		DOCK ASAP			
		POWERED) 1 4	(A) PDI TO PDI	LUS 5		
		DESCENT		ABORT (8) PDI PLUS 5 CONTINUE MIS			
		LUNAR		. LIFT OFF AT NE	•		
		STAY		BEST OPPORTUNI	ry !		
	B. TWO PYRO SYSTEMS	•	•	. DOCK ASAP	•		•
		POWERED)	. ABORT			
		DESCENT					
		•	•				
		•					
		•					
21-21	UNABLE TO DISARM PYRO SYSTEM(S)	'ALL	I COMT	INUE MISSION		EF MALF PROC	
1	PINO SISTEMIS	,^		O PDI	•		
		,	·		1	ED RELAY	
		•	PLAC	UNSTAGED OPERATION	' RCS	SM RESCUE MAY	BE REQUIRED DUE
		,		ERY ON BUS POWER: ACTIVE GUIDANCE EMS.			
		1 · , 1 · . · · · · · · ·	•	E AS REQUIRED IN	ORBIT '		
		POWERED		iT			
		•	•				
		LUNAR	'OPPC	'OFF AT NEXT BES' RTUNITY O EVA	•		
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REV ITEM

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC

KOLE	CONDITION/MA	LFUNCTION'			RULING	' CUES/NOTES/COMMENTS	
•	. *						
21-22	A RELAY KT					RELAYS	
	CLOSES	I				K7 EQUALS RCS PRESS	
			•			KE EQUALS LAND GEAR DEPLOY	
						KBA EQUALS LAND GEAR DEPLOY	
		į				K9 EQUALS DPS CRYO HE PRESS	
						KIO EQUALS ASC HE TANK 1	
1						K11 EQUALS ASC HE TANK 2	
				1		K12 EQUALS ASC FUEL AND OX C	: OM
						K12A EQUALS ASC FUEL AND OX (VALVES (SYSTEM A ONLY)	ON
				•		K13 EQUALS DPS FUEL AND OX VEN	u T
1						K14 EQUALS DPS AMBIENT HE	••
				1		K15 EQUALS DPS FUEL AND OX	- OM
				1		VALVES	,,,
	A. SYSTEM A			1 'A• (CONTINUE MISSION	A AND B - PRIOR TO DPS CRYO	
1				OPE	LOGIC POWER	PRESS THE FAILED SYSTEM WILL DISABLED FOR ALL PYRO FUNCTION	9 2 N S
				'A C.	B UNTIL DPS CRYO PRESSURIZATION OMPLISHED	'SUBSEQUENTLY: REMAINING PYRO	
	B. SYSTEM B	•		!B. (CONTINUE MISSION		
					LOGIC POWER		
		!		PRES	B UNTIL DPS CRYO SSURIZATION OMPLISHED.	HE !	
	C. BOTH SYS	TEMS		c. :	. CONTINUE MISSI	ON	
1		i tali			PRIOR TO		
			•	•	POSITIONING MA	- · · · · · · · · · · · · · · · · · · ·	
					CLOSE DES HE R AND 2	EG 1	
					OPEN DES HE RE		
1					TIG OF DPS 1 B	URN	
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		•					
ł						$E_{m{k}}$	
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MISSION RULES

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC

KULE '	CONDITION/MALFUNC	110N, b		RULING	' CUES/	NOTES/COMMENTS	
} :		•					
21-23	UNABLE TO STAGE				тн	IS RULE ONLY	APPLIES
			_		ALTER	NATE MISSIONS	
	A. ASCENT AND DESCENT STAGES	•	Z	L. CONTINUE MISSI	ON ' A. CS	M RESCUE MAY BE S REDLINES	INITIATED D
	STILL RIGIDLY TIED TOGETHER	,	•	2. USE RCS FOR			
		•	;	MANEUVERS			
	E. INCOMPLETE STAGING. VEHICLE	,	•		INABI	T MAY BE REQUIRED	D BECAUSE
	NOT RIGID			2. GO TO DRIFTING	FLIGHT!		
					• • • • • • • • • • • • • • • • • • • •		
		5 to	:		•		
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	RULE NUMBERS 21- THROUGH 21-49	24 ;	1		•		
	ARE RESERVED	•	•		•		
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MISSION RULES

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC - CONCLUDED

			-							
			-	PRELAC	JNCH INSTRUMEN	TATION	•			
21-50	MEAS DESCRI	PTION	PCM	ONE	BOARD		CATEGORY	MISSION	RULE REFER	ÊNCE
	ED RLY A KI	-K5 GY	0201x	SYS A	STAGING LIGHT	COMMON	M	21-1 - 2	3. 13. 20	٠2.
						CAUTION LIGHT	HO			
	ED RLY B K1		0202X	SYS B S	STAGING LIGHT)		M	21-1. 2.	3 • 13 • 20	:
	ED RLY A K7-						· · · •	21-1. 3.	22	
	ED RLY B K7						, · · M	21-1, 3		
	SELECTED ED	BAT		METER			. M	21-1 • 2 •	20	
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22 LM ELECTRICAL POWER

MISSION RULES

SECTION 22 - LM ELECTRICAL POWER

ITEM REV R ITEM ' GENERAL ' 22-1 TO INITIATE THE FOLLOWING MISSION PHASES, THE ELECTRICAL POWER SYSTEM MUST PROVIDE THE FULLOWING MINIMUM CAPABILITIES---LM ACTIVE RENDEZVOUS/CONTINGENCY RETURN ASSUMED DOCKED WITH HATCH OPEN AND ONE CREWMAN IN LM ON TRANSFER UMBILICAL CDR OR LMP BUS TWO DESCENT BATTERIES WITH ASSOCIATED FEEDER OR GNE ASCENT BATTERY WITH ASSOCIATED FEEDER. SUFFICIENT AVAILABLE ASCENT OR DESCENT ELECTRICAL ENERGY TO COMPLETE THE PLANNED ACTIVITY PERIOD. 8. DOCKED WITH HATCH CLOSED COR AND LMP BUSES TWO DESCENT BATTERIES PLUS ONE ASCENT BATTERY ON BOTH ASCENT BATTERIES. BOTH ASCENT FEEDERS 3. SUFFICIENT AVAILABLE ASCENT OR DESCENT ELECTRICAL ENERGY TO CUMPLETS THE PLANNED ACTIVITY PERIOD PLUS A RESERVE OF 1 HOUR. UNDOCKED/SEPARATION COR AND LMP BUSES 1. TWO DESCENT BATTERIES PLUS TWO ASCENT BATTERIES OR FOUR DESCENT BATTERIES PLUS ONE ASCENT BATTERY. BOTH ASCENT FEEDERS PLUS ONE DESCENT FEEDER. RESULTS IN LOSS OF ALL DESCENT BATTERIES. 3. A SHORTED DESCENT FEEDER SUFFICIENT AVAILABLE ELECTRICAL POWER---(A) IN BOTH ASCENT AND DESCENT BATTERIES TO COMPLETE THE PLANNED ACTIVITY PLUS A RESERVE OF 2 HOURS. (B) IN EACH ASCENT BATTERY TO PROVIDE A 2-HOUR CONTINGENCY RETURN CAPABILITY. NOTE TO CONTINUE LANDING MISSION. SEE POWERED DESCENT CONSUMABLE REQUIREMENTS. DESCENT ORBIT 0. CDR AND LMP BUSES 1. TWO DESCENT BATTERIES PLUS BOTH ASCENT BATTERIES ON FOUR DESCENT BATTERIES PLUS ONE ASCENT BATTERY BOTH ASCENT FEEDERS PLUS ONE DESCENT FEEDER. ONE INVERTER AND AC BUS A SUFFICIENT AVAILABLE ELECTRICAL POWER---5. IN BOTH ASCENT AND DESCENT BATTERIES TO COMPLETE THE PLANNED ACTIVITY PLUS A RESERVE OF 2 HOURS. (8) IN EACH ASCENT BATTERY TO PROVIDE A 5-HOUR CONTINGENCY RETURN CAPABILITY NOTE TO CONTINUE LANDING MISSION. SEE POWERED DESCENT CONSUMABLE REQUIREMENTS. MISSION REV DATE SECTION GROUP PAGE APOLLO 11 4/14/69 LM ELECTRICAL POWER GENERAL 22-1

MISSION RULES SECTION 22 - LM ELECTRICAL POWER ITEM ITEM Ε. POWERED DESCENT CDR AND LMP BUSES TWO DESCENT BATTERIES PLUS BOTH ASCENT BATTERIES BOTH ASCENT FEEDERS PLUS ONE DESCENT FEEDER BOTH INVERTERS AND BOTH AC BUSES SUFFICIENT AVAILABLE ELECTRICAL POWER---IN ALL DESCENT BATTERIES TO COMPLETE A NOMINAL LUNAR LANDING. A 4-HOUR LUNAR STAY, PLUS A LUNAR STAY RESERVE OF 2 HOURS. (8) IN EACH ASCENT BATTERY TO ACCOMPLISH RENDEZVOUS/DOCKING/CREW TRANSFER. (C) IN BOTH ASCENT BATTERIES TO ACCOMPLISH A 2-HOUR LUNAN STAY (IN-PHASE LIFTOFF). RENDEZVOUS/DOCKING/CREW TRANSFER, PLUS AN ORBITAL RESERVE OF 2 HOURS. LUNAR STAY CDR AND LMP BUSES TWO DESCENT BATTERIES PLUS BOTH ASCENT BATTERIES BOTH ASCENT FEEDERS AND ONE DESCENT FEEDER SUFFICIENT AVAILABLE ELECTRICAL POWER (A) IN ALL DESCENT BATTERIES FOR A NOMINAL 22-HOUR LUNAR STAY PLUS RESERVE OF 2 HOURS. (B) IN ONE ASCENT BATTERY TO ACCOMPLISH RENDEZVOUS/DOCKING/CREW TRANSFER. (C) IN BOTH ASCENT BATTERIES TO ACCOMPLISH A 2-HOUR LUNAR STAY (IN-PHASE LIFTOFF? RENDEZVOUS/DOCKING/CREW TRANSFER PLUS AN ORBITAL RESERVE OF 2 HOURS. LM ACTIVE RENDEZVOUS G. EITHER COR OR LMP BUS ONE ASCENT BATTERY WITH ASSOCIATED FEEDER 2. SUFFICIENT AVAILABLE CONSUMABLES TO COMPLETE RENDEZVOUS/DOCKING/CREW TRANSFER PLUS A RESERVE OF 2 HOURS#

MISSION

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LM ELECTRICAL POWER GROUP

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RULE NUMBERS	22-3 THRO	UGH 2	2-9 ARE	KLSERVED.			
HZ				3 24072 10 33.	. Jo Grenier if	mit on Leone 10 410	
VA 5. AC	-	ENCY	: FEC THA	IN OR FOLIAL TO 39	0 00 GDEATED T	HAN OR EQUAL TO 410	,
		GE LĒ	SS THAN	OR EQUAL TO 110.	5 OR GREATER TH	HAN OR EJUAL TO 120	•
LOSS OF AN I	NVERTER AN	D/OR	ASSCCIAT	ED AC DISTRIBUTE	ON		
				ATTERY OFF LINE	· · ·	· · -	
				BATTERY CURRENT !	BOTH ONBOARD AN	ND ON TELEMETRY	
	OBABLE LOS			BATTERY NORMAL I	FEED PAIN		
				ON WHICH PAIR OF		CERS FAILED)	
	.) BOTH CI	RCUIT	BREAKER	S POWERING THE E	CA'S FAIL OPEN	CALL DESCENT OR A	LL ASCE
	FINITE LOS						
LOSS OF OVER							
	NNOT BE US		A POWER	PATH			
E. BA			UII VULT	AGE BELOW 31.8 V	SC STEADY STATE		
				TO A FEEDER DUE			
				REGULATION AT R			
				OR EQUAL TO 145			
				2 AMPS WHEN CONNI			
LOSS OF AN E	PS BATTERY						
8∙ ▲	BUS CURREN	T GRE	ATER THA	N OR EQUAL TO 90	AMPS		
A. IN	ABILITY TO	MAIN	TAIN BUS	VOLTAGE GREATER	THAN 26.5 VDC		
LOSS OF CDR	OR LMP BUS						

MISSION RULES

R ! ITEM									
					' MANAGEMENT '				
22-10	THE MISSION	will be c	ONTIN	UED WITH	THE LOSS OF OVE	FROMBBENT DBUTE	C110N 15	Tule page	
	LOSI PRIOR	10 LIFTUFF	• A H	OLD WILL	BE CALLED.				
	LEFT	IN LINE .F	KEGUI	KEU.	OTECTION IS LOST				
	with i	HE DESCENT	BAIT	ERIES ON	LINE.				
, and the second	C 31/12 1 3	SURED WHEN	ASCEN	I STAGE	ONLY OPERATIONS SSTIES LEFT OPEN	ARE REQUIRED.	USING THE	BACKUP FEEDS	WILL SE
22-11	FOR NIMINAL OPERATION B	STAGING.	THĒ	ASCENT	BATTERIES WILL ROM EACH BATTERY	BE PRECONDIT	IONED FOR	ONE ASCEN	EATTER'
22-12	FOR CONTING	ENCY STAGE	NG + TI	ME ASCEN	T BATTERIES WILL	BE PRECONDIT	IONED FOR	TWO ASCEN	T BATTERY
	PRESENTLY P IN THE EVEN	Y REMOVING PLANNED TO E IT THAT A B	5 AMI BE ACI ATTER	P-HRS FRI COMPLISHI Y IS LOS	OM EACH BATTERY ED ONLY FOR PUWE T AT: OR SUBSEQL	IMMEDIATELY PR ERED DESCENT OR JENT TU: STAGIN	IOR TO T IMMEDIAT G. SINGLE	MÉ EVENT. E LIFTOFF A BUS OPFRATION	THIS IS
	CONTINUED U	NTIL 20 AM	P-HOU	RS HAVE	BEEN REMOVED FRO	OM THE REMAININ	G ASCENT B	ATTERY.	
22-12	THE BALL OA	0 600001151			25. 005. 5 00			<u>.</u>	
22-13	IS IN THE O	PERATE MODI	E . T	HE BUS C	BE OPEN FOR MAIN ROSSTIES (100A)	WILL NOMINALLY	NEVER BE	NG. AND WHEN CLOSED.	EVER AGS
22-14	THE SHORT.	ENT/DESCEN' IF TIME PE	T FEE: Ermit:	DER), PRO S, STAND	A REQUIREMENT E DCEDURES WILL AL ARD MALFUNCTION	LOW TAKING THE PROCEDURES WIL	RISK OF	INTENTIONALLY	FEEDING
	MEVER BE CR	OSSTIED TO	DETE	CT THE L:	DCATION OF A SHO	ORT.			
		54 41 45							
22-15					A VOLTAGE LESS OR EQUAL TO 398		TO 112 VAC	OR A FREGU	ENCY 402
	·								
22-16	BATTERIES W WITHIN TBD	ILL BE MANA	AGED (DURING LE EN ALL B	JNAR STAY TO MAI ATTERIES ON LINE	NTAIN EGUAL DI	SSIPATION	OF AVAILABL	E ENERGY
	RULE NUMBER	S 22-17 THE	ROUGH	22-19 A	RE RESERVED.				
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MISSION RULES

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		•	•		
			e of the second	•	
				y . • •	
		ALL	2. DOCK ASAP	+ 1 1 - +	
		,	ACTIVITIES		
	B. ASCENT	, DOCKED	'B. 1. TERMINATE LM		
		•	THE SHORT ISOLATED THE DEADFACE RELAY	' AIV	
			BOTH ASCENT BATTER		
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	CONFIGURE WITH	, , , , ,	
	A. DESCENT	ALL	A. RETURN TO VICINITY	' A. I	RESULTS IN LOSS OF ALL DESC
			• • • • • • • • • • • • • • • • • • •	8	STAGED C AND W PWR
		* * !		7	INSTAGED C AND W PWR
			•	· · · · · · · · · · · · · · · · · · ·	STAGED DC BUS W/BAT FAULT
			•	•	JNSTAGED DC BUS W/BAT FAULT
22-21	SHORTED DC BUS FEEDER				HALF PROC EPS
,,_,	SHORTED DC DIS		•		000c co-
		•		JNE PY	RO SYSTEM
		•		LOS	S OF DC BUS RESULTS IN LOSS
				9	BATTERY
			• • • • • • • • • • • • • • • • • • •	8	STAGED C AND W PWR
		•		•	UNSTAGED C AND # PWR
					STAGED DC BUS W/BAT FAULT
				•	JNSTAGED DC BUS W/BAT FAULT
				• • • • • • • • • • • • • • • • • • •	STAGED DC BUS W/BUS FAULT
			. .	•	UNSTAGED DC BUS W/BUS FAULT
		•		•	
		, , , , ,	1		STAGED DC BUS
	B∪S	IALL	ACTIVITIES	•	UNSTAGED DC BUS
22-20	LOSS OF EITHER DC	DOCKED	'A. TERMINATE LM	1 955	HALF PROC EPS
			' SPECIFIC		
	(A) IN BOTH ASCE	NT 'ND DESCE	EN' BATTERIES TO COMPLE	TE THE '	

MISSION RULES

RULE	CONDITION/MALFUNCTION	PHASE		PULING		OTES/COMMENTS
		•	:		• • • • • • • • • • • • • • • • • • •	
22-22		•			REF	MALF PROC EPS
	BATTERY(S)	1			, 2	STAGED DC BUS
	A. LOSS OF ONE ASCENT BATTERY	'DOCKED		1. CONTINUE MISSI		STAGED DC BUS W/BUS FAULT
		DESCENT	• ;	2. RETURN TO VICIN	ITY 6	STAGED DC BUS W/BAT FAULT
		ORBIT	•	OF CSM ASAP.		STAGED C AND W POWER
		•	:	NO GO POI		BATTERY
		POWERED DESCENT		3.(A) PDI TO LO GA - ABORT	TE	
		<u>:</u> .	. 01	ELAY STAGING ALAP		
		•		(B) LO GATE TO TD - CONTINU MISSION	JE	
		LUNAR STAY		4. LIFTOFF AT NEXT BEST OPPORTUNIT		
		ALL	B	1. DO NOT STAGE -	DOCK	
		DOCKED		ASAP 2. DO NOT UNDOCK		
		POWERED	: :	3. ABORT		
		DESCENT				
		•				
		•			1	
22-23	LOSS OF DESCENT	f.,			REF	MALE PROC EPS
		i 'ALL	1	CONTINUE MISSION	1	UNSTAGED DC BUS
	TWO DESCENT BATTERIES	1	, ~ `	10411HUE M1331UN		UNSTAGED DC BUS W/BUS FAULT
		inockes i	1	1. DO NOT UNDOCK	5	UNSTAGED DC BUS W/BAT FAULT
	OR MORE DESCENT BATTERIES	,		I. DO NOT UNDUCK	. 7	UNSTAGED C AND W POWER
		'UNDOCKED 'DESCENT 'ORBIT		2. RETURN TO VICIN OF CSM ASAP	ITY 9	BATTERY
		POWERED DESCENT		3.(A) PDI TO LO GA RETURN TO	TE -	
		t .		VICINITY OF	CSM !	
		1	•	(B) LO GATE TO 1	'D = 1	
		•		CONTINUE MIS	SION	
		LUNAR		4. LIFT OFF AT NEX BEST OPPORTUNIT		
		•	•		•	
1		•				
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PULE	CONDITION/MAL	FUNCTION!	PHAS	E '	RULING		CUES/NOTES/COMMENTS
-				,			
22-24	LOSS OF ONE	;		•			
	INVERTER	1		1			REF HALF PROC EPS
	A. LOSS OF C	NE !	ALL	A •	1. CONTINUE MISS	NOI	10 INVERTER
	- 11 <u>- 11 - 11 - 11 - 11 - 11 - 11 - 1</u>	•	05555			! !	
			DESCEN ORBIT	'	2. DO NCT PERFOR	RM PDI	
	9. LOSS OF B	отн	DOCKED	/ B.	1. CONTINUE MISS	ion '	
	INVERTERS		UNDOCK	Eù '	NO GO DOI	,	
			DESCEN	T ' :	2. DO NOT PERFOR	RM PDI '	
		•	ORBIT	,		•	
			POWERE DESCEN		3.(A) PDI TO LO ABORT	GATE -	
				•	(B) LO GATE TO	ct	
		•			CONTINUE M	1155100	•
			LUNAR Stay	;	++ CONTINUE MISS	ION	
		. 1		•			
				1			
22-25	LOSS OF AC B	uses !		1			DEE WALE DOOR TO
** 23	A. LOSS OF B	,	nncrea		I CONTINUE MITT	100	REF HALF PROC EPS
	A. 2055 UP B		UNDOCK DOCKED		I. CONTINUE MISS NO GO DOI	100	10 INVERTER
			DESCEN	• :	2. DO NOT PERFOR		LOSS OF AC BUS A RESULTS IN LOFE DPS GIMBAL CONTROL AND THE RE
i			CRBIT				RADAR
	al de la companya de la companya de la companya de la companya de la companya de la companya de la companya de La companya de la companya de		POWERE		CA CT IDQ (A).E		LOSS OF AC BUS B RESULTS IN LOSF S-BAND STEENABLE ANTENNA (HBR
					(B) LO GATE TO		1033 0. 30 . XC 803E3 KE30E13
						•	THE ABOVE PLUS LOSS OF SCTH F SPHERES.
			LUNAR		CONTINUÉ MISS	107.	
	B. LOSS OF B	us B	ALL	В• :	L. CONTINUE MISS	.10n ·	
			DESCEN	r ! :	2. DO NOT PERFOR	M PDI	
		•	CRBIT			;	
	C. LOSS OF B BUSES	•	DOCKED	,	L. CONTINUE MISS	•	
		•	UNDOCK	•	2. DO NUT PERFOR	•	
			DESCEN' URBIT	T ! :	. DO NOT PERFOR	M PDI	
			POWERE		(A) PDI TO LO	GATE - '	
		; (DESCEN'		ABORT	;	
	- S	•		,	(B) LO GATE TO CONTINUE M		
		•	LUNAR	•	. CONTINUE MISS	. •	
			STAY			•	
				•		•	
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		•		•		•	
	RULE NUMBERS	22=26		•		•	
	THROUGH 22-4	9 1					
	THE MESERVED	• '		•		•	
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MISSION RULES

	7					WER - CONCLUDE	
+	ITEM	4.4 1.4 1.4					
				! INSTRUMENTA	TION REGUI	REMENTS '	
	22-50	MEAS DESCRIPTION	26:	01100.00		CATECAR	MICCION O -
	22-30	AC BUS FREQ	PCM GC0155F	ONBOARD	COMMON	CATEGORY	MISSION RULE REFERENCE 122-2.5.24.25
		AC BUS VOLTS		METER/CAUTIO		M HD	(22-213)24123
		BAT 2 VOLTS BAT 3 VOLTS	GC0202V GC0203V	METER	COMMON	H C	22-2.10.14
		BAT 4 VOLTS BAT 5 VOLTS	GC0204V GC0205V	METER	METER	HD M	22-2.10.14
		BAT 6 VOLTS CDR BUS VOLTS	GC0206V GC0301V	METER/WARNING	3),COMMON	M M	(20 · 21 · 22 ,22-2 · 10 · 14
		LMP BUS VOLTS		METER/WARNING	SILIGHT	M	21.22.23
1		BAT 1 CUR BAT 2 CUR	GC1201C GC1202C	METER	COMMON	M PCM M PCM	22-2.10.14
		BAT 3 CUR BAT 4 CUR BAT 5 CUR	GC1203C GC1204C GC1205C	METER	COMMON	M PCM M PCM M PCM	20.21.22.23
		BAT 6 CUR	GC1206C)	M PCM	/22-2.10.14 /20.21.22.23
		BAT 1 MAL BAT 2 MAL BAT 3 MAL	GC9962U	CAUTION/COMPI CAUTION/COMP CAUTION/COMP	ļ	M ONBOARD M ONBOARD M ONBOARD	22-2.10.14.20.21.23
		BAT 4 MAL BAT 5 MAL	GC9964U GC9965U	CAUTION/COMP	LIGHTS	M UNBOARD	122-2.10.20.21.22
		BAT 6 MAL BATTERY MAL	GC9966U GC4047X	CAUTION/COMP	!	M ONBOARD HD	22-2,10,20,21,22,23
		BAT 1 LOW TAP BAT 2 LOW TAP BAT 3 LOW TAP BAT 4 LOW TAP	GC4362X GC4364X GC4366X GC4368X	FLAG FLAG		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	22-2+10+20+21+23
		BAT 5 B/J CDR BAT 6 NORM CDR BAT 5 NORM LMP BAT 6 B/U LMP	GC4369X GC4370X GC4371X GC4372X	FLAG FLAG		11111	22-2.10.17.20
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RIV ITEM

SIV	r	SECTION 23 - LM ENVIRONMENTAL CONTROL
R	' ITEM	
		I CENEDAL I
		' GENERAL '
	23-1	TO INITIATE THE FOLLOWING MISSION PHASES THE ENVIRONMENTAL CONTROL SYSTEM MUST PROVIDE TH FOLLOWING MINIMUM CAPABILITIES
		NOTE LM ACTIVE RENDEZVOUS/CONTINGENCY RETURN IS ASSUMED
		A. DOCKED WITH HATCH OPEN AND TUNNEL CLEAR
		1. COMBINED VEHICLE PRESSURE INTEGRITY
		2. ONE LM COOLANT LOOP
		B. DOCKED WITH HATCH CLOSED
		1. CABIN PRESSURE INTEGRITY
		2. SUIT CIRCUIT INTEGRITY
		3. ONE SUIT FAN
		4. ONE DEMAND REGULATOR
		5. ONE COOLANT LOUP
		6. SUFFICIENT 02, H20, AND LIGH CONSUMABLES TO COMPLETE THE PLANNED ACTIVITY PERIOD PLUS A RESERVE OF 1 HOUR
		C. UNDOCKED/SEPARATION
		1. CABIN PRESSURE INTEGRITY
		2. SUIT CIRCUIT INTEGRITY
		3. ONE SUIT FAN
		4. ONE DEMAND REGULATOR
		5. ONE COOLANT LOOP
		6. BOTH H20 SEPARATORS OR 1 OF 2 H20 SEPARATORS PLUS THE LCG LOOP
		7. SUFFICIENT 02. H20 AND LIGH
		(A) TO COMPLETE THE PLANNED ACTIVITY PLUS A RESERVE OF 2 HOURS
		(B) IN EACH ASCENT H20 TANK TO PROVIDE A 2-HOUR CONTINGENCY RETURN CAPABILITY
		.(C) IN BOTH ASCENT OZ TANKS TO PROVIDE A 2-HOUR CONTINGENCY RETURN CAPABILITY
		NOTE
		TO CONTINUE LANDING MISSION: SEE POWERED DESCENT CONSUMABLES REQUIREMENTS:
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	1 4 1 21						- LM ENVIRONMENTA			
R	! ITEM									
		D•		NT ORBIT						
			1.	CABIN PRESSU						
			2•	SUIT LOOP IN		ITY				
			3.	ONE SUIT FAN						
			4.	ONE DEMAND F						
			5.	BOTH COOLANT						
				PRIMARY H20 F						
							OF 2 H2O SEPARATO	RS PLUS THE LC	LCOP	
			8.	SUFFICIENT 02						
							NNED ACTIVITY PLU			
							ANK TO PROVIDE A			
				(C) IN BOTH	ASCE!	NT OZ TAM	NKS TO PROVIDE A	5-hour Continge	NCY RET	URN CAPABILITY
							NOTE			
				TO CONTIN POWERED D REQUIREME	ESCE					
		٤.	POWE	RED DESCENT						
			1.	CABIN PRESSU	RE I	NTEGRITY				
			2.	SUIT LOCP IN	TEGR:	ITY				
			3•	BOTH SUIT FA	NS					
			4.	ONE DEMAND R	REGULA	ATOR				
			5•	BOTH COOLANT	_ L00F	PS				
			6•	PRIMARY HZO	FEED	PATH CAP	ABILITY			
			7.	BOTH H20 SER	ARATO	ORS OR 1	OF 2 H2O SEPARATO	ORS PLUS THE LO	C LOOP	
			5.	SUFFICIENT C	2 - на	20. AND L	_:0			
						TO COMPLE E OF 2 HO		AR LANDING. A 4	-HOUR L	UNAR STAY. PLUS A LUNAR
				AND COM	BINES	D IN BOTH	ANK TO ACCUMPLISH H TANKS TO ACCOMP: CREW TRANSFER: PI	.ISH A 2-HOJR :	UNAR ST	OCKING /CREW TRANSFER AY (IN-PHASE LIFTOFF): OF 2 HOURS
				OPERATI 2-HCUR	ON IN	N AN OPER R Stay ()	N SUIT LOOP MUDE A IN-PHASE LIFTOFF)	AND IN ECTH ASO RENDEZVOUS/DO	ENT 02 CKING/C	/DOCKING/CREW TRANSFER TANKS TO ACCOMPLISH A REW TRANSFER* PLUS AR
				ORBITAL	. RESE	ERVE OF	2 HOURS OPERATING	IN A CLOSED SU	IIT LOOP	MODE
										1
								•		
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- Լ	4 TäM				SEC	TION 23 -	- LM ENVIRONMENTA	- CONTROL		
R	ITEM									
		F.	LUNAR S	STAY						
			1. 0	ABIN PRESSU	JRE I	NTEGRITY				
			2 • St	JIT LOOP IN	ITEGR	ITY				
			3. 93	OTH SUIT FA	NS					
			4. 80	OTH COOLANT	LCO	PS				
			5. PF	RIMARY H20	FEEDI	PATH				
			6. 50	OTH HZO SEP	ARAT	ORS OR 1	OF 2 H20 SEPARATO	ORS PLUS THE	LCG LOOP	
				JFFICIENT A					. 100 100	
								MINAL 22-MA	NIE LINAS STAV	PLUS A LUNAR STA
				RESERVE	OF :	2 HOURS				
			()	AND IN	BOTH	H TANKS	INK TO ACCOMPLISH TO ACCOMPLISH TREW TRANSFER PLUS	A 2-HCUR	LUNAR STAY	CKING/CREW TRANSFE (IN-PHASE LIFTOFF) HOURS
			((AN OPEN STAY (;	N-PH	T LOUP MO ASE LIFTÜ	DE AND IN BOTH AS	CENT OF TAN OCKING/CRE#	KS TO ACCOMPL	NSFER OPERATING 1/ ISH A 2 MOURS LUNA/ S AN ORBITAL RESERV!
			8. Su	JFFICIENT L RANSFER. PL	.10H /	FOR A 22- RESERVE	HOUR LUNAR STAY, OF 4 HOURS	LIFTOFF/ RE	INDEZVOUS/ DO	CKING/CRE#
		G.	LM-ACT	IVE RENDEZV	ous / :	DOCKING				
			1. 0	NE COOLANT	LOOP					
			2. 01	NE H20 FEED	PATH					
				NE HZO SEPA	RATO	R OR THE	LCG LOOP			
				NE ASCENT H						
							.ISH RENDEZVOUS/DO	CKING		
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લંપ	ETEM			SECT	TION 23	- LM ENVIRONMENTA	L CONTROL			
R	ITEM									
	23-2	DEFINITIONS								
		LOSS OF CAB	IN INTEGRI	TY						
		G	REATER THAI	N OR 5	EQUAL TO	GE SUCH THAT CABI 4.6 PSIA WITH AN WILL BE RELAXED	02 FLOW RATE O	F 0.6	LBS/HR. FOR	
		LOSS OF SUI	OTAL PGA/SE	UIT LO	OP LEAK	AGE GREATER THAN PRESSURE CHECK O	OR EUUAL TO R A VISIBLE TEA	0.3 R IN TH	PSI/MIN (0.6 E PGA.	
		LOSS OF COO								
			SUSTAINE EXCEPT	ED GLY	COL TEM	PERATURE GREATER	THAN OR EQUAL NO DRYOUT (SUBL	TO 50 IMATOR	DEGREE F AND	RISING
		8	• GLYCOL S OF HZO	PUMP D	CAPABIL	LESS THAN OR EQUALITY TO THE SUBLIM	L TO 6 PSID (CI	RCULATI	ON LOST) OR KNOWN	L 0\$ 5
		GLYCOL COOL	ANT LEAK							
		0	BSERVED FLO	JID IN CONFIR	CABIN	CONFIRMED BY THE STATIC PRESSURE DE	ASTE OR PRESE	NCE OF	GEACOF FOM	
		LOSS OF DES	CENT 02 TA	4K						
		I	NABILITY 1	TO TR	ANSFER	OZ FROM DESCEN Pressure with OZ P	T TANK OR MS Manifold Pressu	FN CON	FIRMATION OF	
		LOSS OF ASC	ENT OZ TANI	<						
			MSFN CO	NF I RMA	TION OF	LOSS OF ASCENT TO	ANK PRESSURE WI	TH 02 M	ANIFOLD PRESSURE-	- 0R
		В	BALANCI	AGED A	ND DESC	ENT TANK GREATER AGAINST THE OTHER	THAN 35 PER	CENT.	CREW CONFIRM LO	\$\$ 5°
		C	. IF STAGE	ED OR	IF DESC	ENT 02 LESS THAN	35 PERCENT LOSS	OF ONB	GARD AND MSEN REA	ocut.
		LOSS OF DES	CENT HZO TA	NK						
						TO W/B RESULTING : FN) AND DROP IN H				
		LOSS OF ASC	ENT HZO TAP	NK						
			. LOSS OF	MEASU	REMENT	AND REMAINING TANK	FEEDING AT TW	ICE NOR	MAL RATE	
		В	ONE TANK	(FEED	ING TWI	CE NORMAL RATE AND	NO CHANGE IN	MEASURE	MENT ON OTHER TAN	K •
	23-3	IF A SUBLIM	ATOR IS LOS	ST DUE	TO BREA	AKTHROUGH . NO RES	TART ATTEMPT WI	LL BE M	ADE.	
	23-4						SERVED FOR POS	SIBLE	EVT AND WILL N	OT BE
		CONSIDERED	FOR NOMINAL	REDL	INE USA	GE.				
			•						•	
	23-5	CONSUMABLE	G0/N0-G015	OR RE	DLINES.	THE CABIN CAN	SE CONSIDERED.	WHEN	A USE IN CALCU DISCUSSING FUNC	LATING TIONAL
		PRESSURE VE	SSEL REQUIF	REMENT	S. AS A	THIRD ORDER BACK	JP TO THE ASCEN	T C2 TA	NKS.	
		RULE NUMBER 23-9 ARE RE		DUGH						
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			MISSION	REV	DATE	SECTION	GROUP	PAGE		
			APOLLO 11		4/16/69	LM ENVIRONMENTAL	GENERAL			
						CONTROL	<u></u>	23-4		

MISSION RULES

ITEM!	:								
					STEMS MANAGEMENT	•			
23-10	PRIMARY GLYC	OL LOOP CI	RCULA	TION WIL	L BE DISCONTINUED OP STABILIZATION	DURING STARTU	P OF THE S	ECONDARY LO	OP BUT
23-11	IF EITHER AS	CENT OZ TA	NK IS	LESS TH	AN OR EQUAL TO 95 ANTITY IS GREATER	PERCENT. IT W	ITLL RE REP	LENISHED FR Ent and as c	OM THE
23-12		L VALVE WI	LL BE	CLOSED.	EXCEPT FOR REPRE	SSURIZING THE	PLSS AND F	OR MSFN RE	QUESTED
23-13	CREW WILL GO	TO EGRESS	MODE	IF INSU	FFICIENT 02 IS AV ION PHASE WILL NO	VAILABLE TO MAI OT BE INITIATED	NTAIN CABIN IF THIS	PRESSURE F	OR THE
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	RULE NUMBERS 23-19 ARE RE		OUGH						
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		APOLLO 11		4/16/69	LM ENVIRONMENTAL	MANAGEMENT	23-5		

MISSION RULES

RULE	CONDITION/MALFUNCTIO		' RULING	CUE	S/NOTES/COMMENTS	
•		•				
			SPECIFIC MISSION R	ULES '		
23-20	LOSS OF CABIN	•	1		REF MALF PROC ECS	
	PRESSURE INTEGRITY	•	- 1 - 1	•	L CABIN	
		DOCKED	CONTINUE MISSION			
	• •		11. PERFORM SYSTEMS PEVALUATION	•		
		1	WITHIN CONSUMAB			
		•	WITH ONE CREWMA			
			UMBILICALS			
			'2. NO-GO FOR UNDOC	KING		
		UNDOCKED	DOCK ASAP DO NOT STAGE WHILE UNDOCKED			
		•	'NO-GC FOR DOI			
		DESCENT	DOCK ASAP	•		
		ORBIT	'DO NOT STAGE WHILE 'UNDOCKED	1 1		
		POWERED	11. PDI TO PDI +5 -	ABORT		
		DESCENT	DOCK ASAP			
İ		1	DO NOT STAGE WHILE	•		
		•	UNDOCKED			
		•	'2. PDI +5 TO LO GA	1 - 1		
		. i	DOCK ASAP	•		
			CONTINUE MISSION			
		LUNAR	LIFTOFF AT NEXT BE	sT		
		RNDZ	CONTINUE MISSION OOCK ASAP	•		
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REV ITEM

•] 		RULING	' CUES/NOTES/COMMENTS
		•	1	
23-21	LOSS OF SUIT LOOP	DOCKED	CONTINUE MISSION	• REF MALF ECS
		1	11. PERFORM SYSTEMS	3A SUIT FAN
			CONSUMABLES LIFETIME	•
	•	•	CONSTRAINTS WITH ONE CREWMAN ON BOTH THE	•
1		•	CSM AND LM UMBILICALS	
		1	2. NO-GO FOR UNDOCKING	
		UNDOCKED	DOCK ASAP	•
		:	DO NOT STAGE WHILE	
		•	UNDOCKED	
		1 1	NO-GO FOR DOI	
		DESCENT	DOCK ASAP	
		1	DO NOT STAGE WHILE	
			UNDOCKED	
		'POWERED 'DESCENT	'l. PDI TO PDI +5 - ' ABORT	
		1	DOCK ASAP	$\frac{1}{2} \left(\frac{1}{2} \right)^{-1} = \frac{1}{2} \left(1$
		•	•	
		•	DO NOT STAGE WHILE UNDOCKED	
			12. PDI +5 TO TD - ABORT	
		•	DOCK ASAP	
1		LUNAR	LIFTOFF AT NEXT BEST	•
		STAY	OPPORTUNIGY	
		RNOZ	CONTINUE MISSION	•
		:	JUCK ASAP	
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MISSION RULES

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23-2	2 SUIT FAN(S) A. ONE SUIT	FAN	DOCKED	2. RETU OF C DELA	AY STAGING ALL	177	• REF MALF	PROC ECS	•
		FAN	DOCKED UNDOCKED DESCENT ORBIT	2. RETU OF C DELA	JRN TO VICINI ISM AY STAGING AL	177		PROC ECS	
	A. ONE SUIT		'UNDOCKED 'DESCENT 'ORBIT 'POWERED	2. RETU OF C DELA	JRN TO VICINI ISM AY STAGING AL	177	7A ECS		
			'ORBIT ' 'POWERED	OF C DELA	SM AY STAGING AL I TO PDI +5	•			
			POWERED	3.(A) PDI	TO PDI +5	LAP !			
				, ,					
			! !		BORT DELAY				
				; s	STAGING ALAP				
			•		PDI +5 TO TD CONTINUE MISS	SION !			
			LUNAR STAY		OFF AT NEXT				
			'RNDZ	•	TINUE MISSION				
	1				C ASAP			•	
	B. TWO SUIT	FANS	, 'DOCKED	Bala CONT	TINUE MISSION	1 1 NON 1	Bala(A) OT	ER CREWMAN	RETURN T
			•	' CSM	TRANSFER		CSM	- CNEWNAN	KE (OKIV)
			•	1 NO-6	O FOR UNDOCK	KING !	(B) REMOVE	MELMET AND	GLOVES
			'UNDOCKED	1 2. DOCK	ASAP		· REFMALF P	ROC ECS	
			!	' NO-6	O FOR DOI	•	3 SUIT FAN		
			•		OT STAGE WHI	ILE .			
			DESCENT	•	CKED				
1			ORBIT	3. DOCK					
1			•		NOT STAGE WHI DCKED	ILE ;			
			POWERED DESCENT		PDI TO PDI +5	5			
			•		OCK ASAP	1			
1				C	O NOT STAGE			•	
					PDI +5 TO TD	i			
				•	OCK ASAP				
			LUNAR		OFF AT NEXT	BEST			
		2	STAY	•	PRTUNITY			•	
1			'RNDZ	' 6. DOCK	. ASAP				
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MISSION RULES

REV ITEM

23-23 ADE NOT HO SEPARATOR SI ADDRESS OF HOLE COMPANDED SEPARATOR SI ADDRESS OF HOLE COMPONENTIAL SPECIFIC PROCESS OF HOLE COMPONENTIAL SPECIFIC P	RULE	CONDITION/MALFUNCTION	N' PHASE	, RL	ILING	' CUE:				
SEPARTOR LIGG LOOP A. ONE 120 SEPARATOR LICG LOOP DEPARAGE 3. TWO MZO OPERABLE 3. TWO MZO OPERABLE 3. TWO MZO OPERABLE 3. TWO MZO OPERABLE 3. TWO MZO OPERABLE 3. TWO MZO OPERABLE 4. LETTOR MZO OPERABLE 4. LETTOR MZO OPERABLE 5. STAY OPERABLE 5. STAY OPERABLE 4. LETTOR MZO OPERABLE 5. STAY OPERABLE 5. CONTINUE MISSION OPERABLE 5. CONTINUE MISSION OPERABLE 5. CONTINUE MISSION OPERABLE 6. LUMAR 5. CONTINUE MISSION OPERABLE 6. STAY OPERABLE 7. OPERABLE		,		1		!				-
AND/OR LCS LOOP A ONE HAD SEPARATOR (LCC LOOP OPERABLE) B. TWO HAD SEPARATOR (LCC LOOP OPERABLE) B. TWO HAD SEPARATOR AND LCG LOOP WUNDOCKED POWERED ASIAN ON NOT STAGE WHILE UNDOCKED OSSENT ON NOT STAGE WHILE UNDOCKED ASIAN ASSET OPPOWERED ASSET OPPOWERED SELAY STAGING ALAP (B) PO! +3 TO TO CONTINUE MISSION LUMAR A. LIFTOFF MEXT BEST OPPOWERED SEPARATORS AND LCG LOOP WINDOCKED C. TWO HAD SEPARATORS AND LCG LOOP DESCENT ODE SEPARATORS AND LCG LOOP WINDOCKED ORSE OF SEPARATORS AND LCG LOOP DESCENT ORSE OPPOWERED ORSE OP	23-23		•			' • R	EF MALF PRO	C ECS		
A. ONE HIDD SEPARATOR LICC LOOP OPERABLE) S. TWO HID SEPARATORS LICC LOOP OPERABLE) S. TWO HID SEPARATORS LICC LOOP HID SEPARATORS LICC LOOP HID SEPARATORS AND LICG LOOP POWERED POWERED POWERED 10 NOT STAGE WHILE HISSION LUNAR ALAP STAY OPPORTUNITY PHOD CONTINUE MISSION CONTINUE MISSION LUNAR ALIFITOR MEST BEST OPPORTUNITY PHOD CONTINUE MISSION LUNAR STAY OPPORTUNITY PHOD CONTINUE MISSION LUNAR STAY OPPORTUNITY PHOD CONTINUE MISSION LUNAR STAY OPPORTUNITY PHOD CONTINUE MISSION LUNAR STAY OPPORTUNITY PHOD CONTINUE MISSION LUNDOCKED AND LCG LOOP POWERED AND LCG LOOP POWERED ALAP LETTOR MASION ALAP LOOK ASAP CONTINUE MISSION CONTINUE MISSION LUNDOCKED ALAP ALAP LUNDOCKED ALAP LUNDOCKED ALAP ALAP LUNDOCKED ALAP ALAP LUNDOCKED ALAP ALAP LUNDOCKED ALAP ALAP LUNDOCKED ALAP			;	•			78 ECS			
SEPARATOR LICC LODP OPERABLE 9. TWO HZD SEPARATORS LICC LODS BIG SEPARATORS LICC LODS BIG SEPARATORS AND LEG LODY OPESCENT OPESCENT OPESCENT OPESCENT OPESCENT STAY OPESCENT		A. ONE HZD		A. CONTINUE	MISSION	•	= - ·			
DEFABLE! 9. TWO HID STPARATORS (LCG LOOP OPERABLE) OR ONE HID SEPARATORS AND LCG LOOP OPERABLE OR ONE HID SEPARATOR OPERATOR OPERABLE POWERED OPERABLE POWERED OPERABLE POWERED OPERABLE POWERED OPERABLE POWERED OPERABLE POWERED OPERABLE POWERED OPERABLE AND LCG LOOP ROUNDOKED OPERABLE POWERED OPERABLE LUMAR ALIFTOFF MEXT BEST OPPORTUNITY OPERABLE OPERABLE POWERED OPERABLE POWERED OPERABLE POWERED OPERABLE POWERED OPERABLE STAY OPERABLE POWERED OPERABLE POWERED OPERABLE VALUE OPERABLE	1	SEPARATOR		1		, t .,				
SEPARATORS LICE LOOP OF THE TRANSPORT O			•	·						
OPERABLE) OR ONE HIZO SEPARTOR AND LCG LOOP POWERED OESCENT POWERED OESCENT DELAY STAGING ALAP (B) PDI =9 TO TO CONTINUE MISSION LUMAR STAY PROZ CATTINUE MISSION AND LCG LOOP UNDOCKED CATTINUE MISSION AND LCG LOOP UNDOCKED CATTINUE MISSION CONTINUE MISSION AND LCG LOOP UNDOCKED OESCENT OR SIT DO NOT STAGE WHILE UNDOCKED CONTINUE MISSION SEPARATORS AND LCG LOOP UNDOCKED OESCENT OR SIT DO NOT STAGE WHILE UNDOCKED CONTINUE MISSION SEPARATORS AND LCG LOOP UNDOCKED OESCENT OR SIT DO NOT STAGE WHILE UNDOCKED OF LOOP OF L		SEPARATORS	1	B.1. CONTINU	E MISSION	•				
UNDOCKED 2. DOCK ASAP DESCENT ON STAGE WHILE UNDOCKED 1 ASABR DESCENT ASABR 181 PDI +5 TO TD CONTINUE MISSION AND DOCK ASAP 181 PDI +5 TO TD CONTINUE MISSION AND DOCK ASAP 181 PDI +5 TO TD CONTINUE MISSION AND DOCK ASAP DESCENT DONOCKED ASAP DESCENT DONOCKED BEARTORS AND LCG LOOP UNDOCKED DOCK ASAP DESCENT ORBIT DONOCKED DOCKED POWERED ASABR ASABR 181 PDI +5 TO TD CONTINUE MISSION ASABR ASABR 181 PDI +5 TO TD CONTINUE MISSION ASABR ASA		OPERABLE) OR ONE	•	1						
DESCENT ORBIT DO NOT STAGE WHILE UNDOCKED POWERED 3-(AL) PDI TO PDI +9 ABORT DELAY STAGING ALAP (B) PDI +9 TO TD CONTINUE MISSION LUMAR		AND LCG LOOP	UNDOCKED	1 Za DOCK AS	AP	•				
POWERED 3*(A) PDI TO PDI *5 ASORT DELAY STAGING ALAP (8) PDI *5 TO TD CONTINUE MISSION LUNAR ** LITTOFF NEXT BEST OPPORTUNITY RNDZ 5. CONTINUE MISSION AND DOCK ASAP DOCK ASAP ** UNDOCKED ** ONCY STAGE WHILE UNDOCKED ** ON NOT STAGE WHILE UNDOCKED ** ON NOT STAGE WHILE UNDOCKED ** OPPORTUNITY DELAY STAGING ALAP ** OPPORTUNITY (8) PDI *5 TO TD CONTINUE MISSION LUNAR ** LITTOFF NEXT BEST OPPORTUNITY ** OPPORTUNI			DESCENT	DO NOT	STAGE WHIL	Ε .				
DELAY STAGING ALAP (8) PDI +5 TO TD CONTINUE MISSION LUNAR STAY OPPORTUNITY RNDZ 5. CONTINUE MISSION AND DOCK ASAP DOCK ASAP OSEPARATORS AND LCG LOOP OSEPARATORS ON DOCKED ON ONT STAGE WHILE UNDOCKED OBSCENT OPPORTUNITY ORDIT UNDOCKED 10. ASAP OSECANT			POWERED	3.(A) PDI	TO PDI +5					
(B) POI +5 TO TO CONTINUE MISSION LUMAR 4. LIFTOFF MEXT BEST OPPORTUNITY AND 2. S. CONTINUE MISSION AND DOCK ASAP DOCK ASAP OPESCENT ON NOT STAGE WHILE UNDOCKED POWERED OBLAY STAGING ALAP (B) POI +5 TO TO CONTINUE MISSION SEPARATORS AND LCG LOOP OPESCENT ON NOT STAGE WHILE UNDOCKED POWERED OBLAY STAGING ALAP (B) POI +5 TO TO CONTINUE MISSION LUMAR LIFTOFF MEXT BEST OPPORTUNITY ANDZ S. INITIATE CSM RESCUE			DESCENT	DELA	Y STAGING	•				
CONTINUE MISSION LUNAR STAY A. LIFTOFF NEXT BEST OPPORTUNITY RNDZ S. CONTINUE MISSION AND DOCK ASAP ODCKED LUNDOCKED ODCK ASAP ODSSENT ORBIT ON NOT STAGE WHILE UNDOCKED ODSSENT OD NOT STAGE WHILE UNDOCKED ODSSENT OD NOT STAGE WHILE UNDOCKED OD NOT STAGE UNDOCKED OD NOT STAGE UN			•	ALAP		•				
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C. TWO M20 SEPARATORS AND LCG LOOP DOCKED C.1. CONTINUE MISSION SEPARATORS AND LCG LOOP DESCENT DO NOT STAGE WHILE UNDOCKED POWERED DESCENT DELAY STAGING ALAP (B) PDI +5 TO TD (CONTINUE MISSION LUNAR LUNAR 4. LIFTOFF NEXT BEST STAY OPPORTUNITY RNDZ S. INITIATE CSM RESCUE MISSION MISSION REV DATE SECTION GROUP PAGE			'STAY			•				
C. TWO H2D SEPARATORS AND LCG LOOP UNDOCKED DESCENT ORBIT DO NOT STAGE WHILE UNDOCKED POWERED ABORT DELAY STAGING ALAP (B) PDI +9 TO TD CONTINUE MISSION LUNAR LUNAR LUNAR LUNAR STAY OPPORTUNITY RNDZ MISSION REV DATE SECTION GROUP PAGE			RNDZ	5. CONTINU	E MISSION	AND	•			
AND LCG LOOP UNDOCKED DESCENT DO NOT STAGE WHILE UNDOCKED POWERED 3-(A) PDI TO PDI +5 ABORT DELAY STAGING ALAP (B) PDI +5 TO TD CONTINUE MISSION LUNAR 4. LIFTOFF NEXT BEST 'STAY 'OPPORTUNITY 'RNDZ ' 5. INITIATE CSM RESCUE			DOCKED	C.1. CONTINU	E MISSION					
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MISSION RULES

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23-24	DEMAND REGULATOR(S) FAIL OPEN OR CLOSED		•		*· *,	• REF MALF PROC ECS	
	A. ONE REGULATOR	TALL	A. C	ONTINUE MISSICK	*	2 CABIN PRESS IND HI 6 02 OTY	
	B. TWO REGULATORS	DOCKED	5.1.	סס אכן שאנסכא .		5 02 011	
		!UNDOCKED	2.	DOCK 4547	1		
		'ORBIT	1	DELAY STAGING A			
		POWERED DESCENT	3.	CONTINUE WISSIC			
		'LUNAR	·	continua missic	•		
		PNDZ	5.	CONT. NUE	N		
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		•	. 1				
	LOSS OF COCLANT	.*				REF MALF PROC ECS	
	FLOOF(S) Ea. Primary of Esecondary loof	Tugaked Tundaaked		- 10471402 51351 - 3831524-5 2002	ak uk 🤺	7E ECS	٠
•	SECONDARY COUP	, U NDUCK 9D		nostrijaya 2004 Nostrija		3 GLYCOL	
		DESCENT FORBIT	, ,	• ARTU-A TO VICE	NIT- !		
		•	. 3	./4 - 401 TU LC 6 460RT - 1	ATE - :		
		• · · · · · · · · · · · · · · · · · · ·		(A) LC SATE TO CONTINUE MI			
		LUNAR STAY		UIFTURE NEXT B			
		TRNDZ		5 CONTINUE MISS.	o		
	B. BOTH LOOPS LANY	DOCKED	S - 1	· INGRESS CSM AS	AP !		
	LOSS OF CIRCULATION .	•	.,	%3-30 FOR UNDO	CKING !		
	CAPABILITY, OF H2O FEED FOR BOTH LOOPS!	TUNDOCKED TDESCENT		. DOLK ASAP			
	1 80 14 COOPS 1	DRB1		Du Nit stade			
		POWERED DESCENT	· ·	(*(4) POL TO ADI 5-AEDRT* DO ABAP			
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		LUNAR		ABORT, JOCK Liftoff Asap	MSAP !		
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RÉV ITEM

				CUES/NOTES/COMMENTS
23-26	LOSS OF PRIMARY H20	•	CONTINUE MISSION	. REF MALF PROC ECS
		UNDOCKED		8 GLYCOL
		DESCENT	RETURN TO VICINITY OF	• • • • • • • • • • • • • • • • • • •
		ORBIT	*CSM	
		POWERED	1. PDI TO LO GATE - ABORT	
		DESCENT	2. LO GATE TO TD - CONTINUE MISSION	1
		LUNAR STAY	LIFTOFF NEXT BEST	
		RNDZ	CONTINUE MISSION	
	• •	1		1 1 1
23-27	CABIN OR SUIT	ALL	TROUBLESHOOT/COMBAT FIRE	REF AOM PROC 5.3.2
		1 1	ASSESS DAMAGE AND TRANSFER TO CSM IF	t t
23-28	CONTAMINATION IN	'ALL	'NECESSARY	' IF UNABLE TO CLEAR CONTAMINAT' MISSION MAY BE TERMINATED EARLY
23-29	GLYCOL COOLANT LEAK	'ALL	TRANSFER TO CSM	REF HALF PROC ECS
	A. CABIN	' 'ALL	'A. PURGE SUIT WITH	8 GLYCOL
		'ALL	DIRECT 02 B. DISCONNECT FROM	. The second sec
	RULE NUMBERS 23-40	•	SUIT LOOP	•
	THROUGH 23-49 ARE	•		
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MISSION RULES

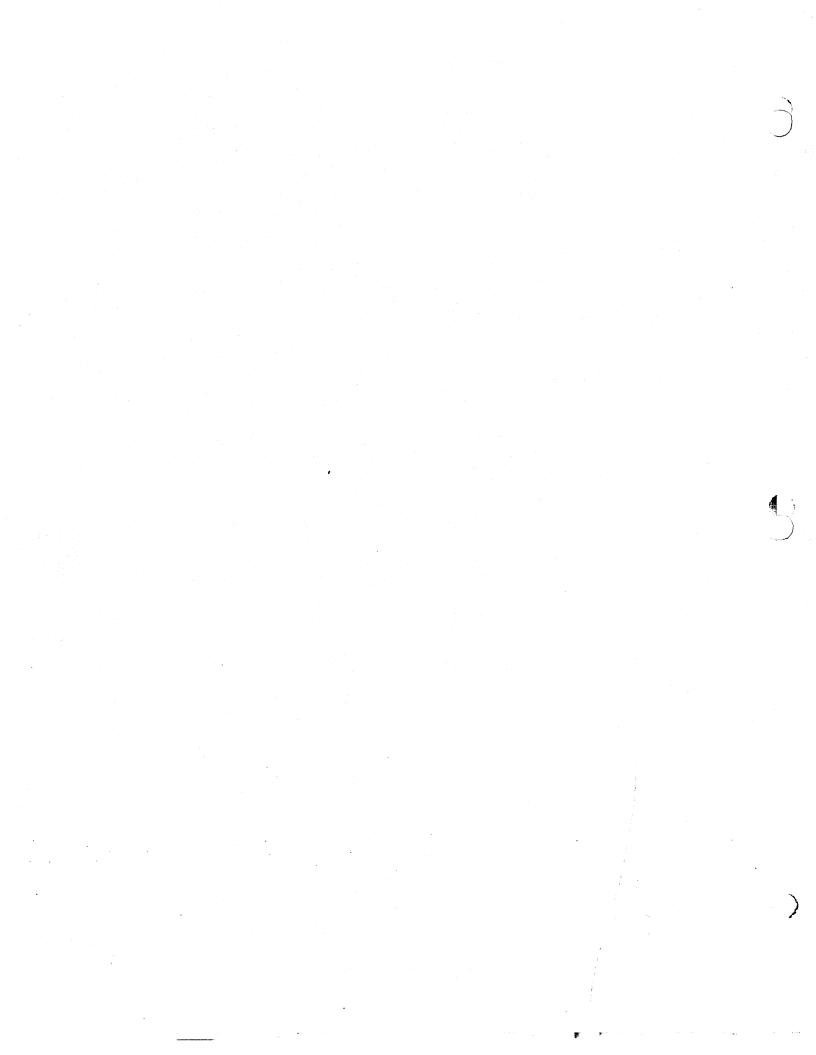
SECTION 23 - LM ENVIRONMENTAL CONTROL - CONCLUDED

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5E 5- 5E 45 45	L. GLY LVL L YCOL TEMP S H20 GTY C 1 H20 GTY C 2 H20 GTY I H20 REG DE IT DIV EGRES	OW	GF9986 GF9998 GF4581 GF4582 GF4583 GF4101 GF1221 GF1231	U U U U U U U U U U U U U U U U U U U	METER. METER. METER.	CAUTION CAUTION CAUTION 1 OF 2 M	PCM UNE TA	MANDAT MANDAT MANDAT INK AND M CAUTION MANDAT HIGHLY DE	ORY SETER DIHE ORY SUTH TANK SUTH TANK SIRABLE SIRABLE	
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- 24 LM GUIDANCE AND CONTROL
- 25 LM DPS
- 26 LM APS
- 27 LM REACTION CONTROL SYSTEM
- 28 SPACE ENVIRONMENT
- 29 RECOVERY
- 30 AEROMEDICAL
- 31 EASEP

APPENDICES

- A ACRONYMS AND SYMBOLS
- B DISTRIBUTION LIST
- C CHANGE CONTROL



24 LM GUIDANCE AND CONTROL

MISSION RULES

' ITEM					-			
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	·				' GENERAL '			
24-1	TO INITIAT	TE THE FOLLOW	LING	PHASES.	THE LM GUIDANCE	SYSTEMS MUST F	ROVIDE	THE FOLLOWING MINIME
	A. DOCKE	ED/UNDOCKED.	DESC	ENT ORBI	7			
	1.	OPERATIONAL	PGNS	. WHICH	REQUIRES LGC. ISS	AND DSKY.		
	2•	REDUNDANT 3- BCTH PGNS AN	AXIS	AUTO AT	TITUDE CONTROL AN	ID HOLD CAPABILID CONTROL CAPA	.ITY, WH BILITY.	ICH REGUIRES
	3•	REDUNDANT 3-	AXIS	CONTROL	•			
	4.	ONE HAND COM	ITROL	LER (ACA)•			
	5 •	3-AXIS TRANS	LATI	ON CAPAB	ILITY, WHICH REQU	IRES		
		(A) ONE TTCA	١					
		(B) PGNS OR	AGS :	3-AXIS T	RANSLATION CAPABI	LITY		
	6.	ONE THRUST 1	RANS	LATION C	ONTROLLER ASSEMBL	Y (TTCA)		
	7.	ONE FDAI INC	LUDII	NG				
		(A) ATTITUDE	REF	ERENCE				
		(B) RATE NEE	DLES					
		(C) ERROR NE	EDLE	s				
	8•	AN OPERATION	IAL A	ОТ				
		NO AOT FAILL	RE TI	HAT WOULS	PREVENT ITS USE	IN REALIGNING	THE LM	PLATFORM.
					NOTE			
		AFTER SUCCESS					•	
	9.	OPERATIONAL	RENDI	EZVOUS RA	ADAR (RR) AND RR	TRANSPONDER		
		(A) PRIOR TO WITHIN			DENTIFIED BY ABIL	TTY TO ACTIV	ATE+ ANI	D ANTENNA TEMPERATUI
					IRES ABILITY TO L WITHIN LIMITS.	OCK ON THE TRA	NSPONDER	LGC INTERFACE. A
	15.	OPERATIONAL	LAND	ING RADA	R (LR)	·		
	:	DURING THIS			CONFIRMED ONLY E	Y THE ABILITY	TO ACTIV	ATE AND THE
	11.	REDUNDANT AS	C EN	GINE ON/	OFF CAPABILITY			
		BOTH AUTO AN	D MAI	NUAL ASC	ENGINE ON/OFF CA	PABILITY.		
	12•	OPEATIONAL F	ITCH	AND ROLE	GDA+ WHICH REQL	IRES		
		(A) NO GDA F	AILU	RE				
		(B) NO CES D	C PO	WER FAIL	JRE			
		(C) AC BUS A	POW	ER				
	13•				TLE CAPABILITY+ RES WHICH WOULD :			
	14•				E CAPABILITY, WH.		CES/DE	SCENT ENGINE
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MISSION RULES

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R ITEM						
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	B. PO	ERED DESCENT				
	1.	REQUIREMENTS TO INITATE PDI	ARE IDENTICAL 1	O DESCENT ORBIT	EXCEPT DELETE ACT	
		AND RR WHICH ARE NOT REQUIR	ED.	o block onb.	THE PERCENT	
	2.	PDI TO LOW GATE				
]		(A) OPERATIONAL PGNS				
		(8) PGNS 3-AXIS AUTO ATTITU	DE CONTROL AND	HOLD CAPABILITY		
		(C) 3-AXIS CONTROL				
		(D) ONE ACA				
		(E) ONE TTCA				
		(F) ONE FDAI				
		(G) OPERATIONAL LANDING RAD	AR			
İ		(1) NOT REQUIRED AFTER	ADEQUATE ALTITU	DE UPDATING OF	LM STATE VECTORS.	
1		(2) OPERATIONAL LR REQ	UIRES			
	1 1	VALID ALTITUDE LOCK ON				
		VALID ALTITUDE READOUT				
		ANTENNA TEMPERATURE WI	THIN LIMITS			
		(H) OPERATIONAL PITCH AND R	OLL GDA			
		(I) OPERATIONAL AUTO AND MA	NUAL THROTTLE			
	3.	LOW GATE TO TOUCHDOWN (TD)				
		(A) ONE ACA				
	2	(B) ONE TTCA				
		(C) OPERATIONAL MANUAL THRO	TTLE			
	c. Lu	AR STAY				
	1.	THE ASCENT MANEUVER TO OPPORTUNITY WILL BE PERFORM ARE LOST				
		(A) OPERATIONAL AGS				
		(B) REDUNDANT 3-AXIS AUTO A	TTITUDE CONTROL	AND HOLD CAPABI	LITY	
		(C) REDUNDANT 3- AXIS CONTR				
1		(D) REDUNDANT ASC ENGINE ON	OFF CAPABILITY			
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MISSION RULES

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		D•	RENDE	ZVOUS						
				CSI AND CDH						
				IN ORDER FOR RENDEZVOUS M CAPABILITIES	IANEUN	E LM TO /ERS+ THE	D BE ACTIVE VE G&C SYSTEMS MU	EHICLE IN PER	RFORMING TH HE FOLLOWIN	E INITIAL G MINIMUM
				(A) OPERATIO	NAL F	PGNS OR	AGS	· · · · · · · · · · · · · · · · · · ·		
				(B) 3-AXIS A	.uto 4	ATTITUDE	CONTROL AND HOL	D CAPABILITY		
				(C) 3-AXIS C	ONTRO	OL .				
				(D) 1-AXIS T	RANSL	ATION CA	APABILITY			
				(E) AN OPERA	TION	AL RR AND	RR TRANSPONDER	!		
			2•	TPI AND TPF						
				IN ORDER FOR MANEUVERS. CAPABILITIES	THE	LM TO BE	E THE ACTIVE VEH	ICLE FOR THE PROVIDE THE	TERMINAL FOLLOWING	RENDEZVOUS MINIMUM
ı				(A) OPERATIO	NAL F	PGNS OR A	AGS			
				(8) 3-AXIS A	UTO A	ATTITUDE	CONTROL AND HOL	D CAPABILITY		
				(C) 3-AXIS C						
l				(D) 3-AXIS T		-	APARILITY			
							O RR TRANSPONDER			
				(F) ONE TICA			- AN INHIGEURDER	•		
				DOCKING	•					
			•	IN ORDER FOR			E THE ACTIVE VEH		ING THE GE	C SYSTEMS
				(A) 3-AXIS C					•	
				(B) ONE ACA		-				
				(C) 3-AXIS T	RANSI	ATION C	APARII ITY			
				(D) ONE TTCA						
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							AND CONTROL		24-3	

MISSION RULES

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R	ITEM		
	24-2	DEFINITIONS .	
		3-AXIS AUTO ATTITUDE CONTROL AND HOLD CAPABILITY	
		3-AXIS AUTO ATTITUDE CONTROL AND HOLD CAPABILITY IS DEFINED AS THE ABILITY TO AUTOMATICALLY HOLD AND CONTROL ATTITUDE. IN ORDER TO HAVE CAPABILITY THE LM REGUIRES EITHER AN OPERATIONAL PRIS OR AN OPERATIONAL	THIS
		3-AXIS CONTROL	
		3-AXIS CONTROL IS DEFINE AS THE ABILITY TO CHANGE THE EXISTING VE ATTITUDE. TO HAVE THIS CAPABILITY THE LM REGUIRES AN OPERATIONAL MANUAUTOMATIC CONTROL SYSTEM.	HICLE AL OR
		OPERATIONAL PGMS	
		AN OPERATIONAL PGNS IS DEFINED AS NO LGC FAILURE. NO ISS FAILURE. AND DSKY FAILURES.	ID NO
		A. ANY FAILURE OF THE LGC HARDWARE AND/OR THE ASSOCIATED INPUT/OUTPUT CANNOT BE REMEDIED BY CREW PROCEDURES IS CONSIDERED AN LGC FAILURE	INTERFACES WHICH
		B. ANY FAILURE WITHIN THE IMU. CDU. PTA. OR THE PSA WHICH WOULD CAUSE A OF THE INERTIAL ATTITUDE AND VELOCITY MEASUREMENT. IS CONSIDERED A	N PERMANENT LOSS NN ISS FAILURE.
		C. ANY FAILURE OF THE DSKY HARDWARE AND/OR THE ASSOCIATED INPUT/OU WHICH CANNOT BE REMEDIED BY CREW PROCEDURES IS CONSIDERED A DSKY (PUT INTERFACES
		OPERATIONAL AGS	
		AN OPERATIONAL AGS IS DEFINED AS NO AEA FAILURE, NO ASA FAILURE, NO FAILURE, AND NO CES FAILURE PREVENTING ATTITUDE CONTROL.	DEDA
		A. ANY FAILURE OF THE AEA HARDWARE AN/OR THE ASSOCIATED INPUT/OUTPUT I CANNOT BE REMEDIED BY CREW PROCEDURES IS CONSIDERED AN AEA FAILURE	
		B. ANY FAILURE OF THE ASA MARDWARE AND/OR THE ASSOCIATED INPUT/OUTPUT CAUSE LOSS OF THE VEHICLE ATTITUDE AND VELOCITY MEASUREMENTS IS CONFAILURE.	INTERFACES WHICH INSIDERED AV ASA
		C. ANY FAILURE OF THE DEDA HARDWARE AND/OR THE ASSOCIATED 'INPUT/OU' WHICH CANNOT BE REMEDIED BY CREW PROCEDURES IS CONSIDERED A DEDA F	
		D. ANY FAILURE OF THE CES HARDWARE THAT PREVENTS ATTITUDE CONTROL WHITE CONSIDERED A CES FAILURE.	ILE IN AGS IS
		3-AXIS TRANSLATION	
		3-AXIS THANSLATION IS DEFINED AS THE ABILITY TO CHANGE THE VEHICLE VELO PLUS OR MINUS. ALONG EACH BODY AXIS. TO HAVE THIS CAPABILITY THE LM REC ONE TICA AND AN OPERATIONAL PGNS OR OPERATIONAL CES CIRCUITY.	
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		AND CONTROL 24-4	

MISSION RULES

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								MANAGEMENT				
		24-3	IMU									
1			A.	THE IRI	IG BIAS WIL	L BE	UPDATED	WHENEVER THE GYR	DRIFT IS GREA	TER THAN	OR EQUAL TO	+/=0.09
				DEG/4R	16 MERUT							
			8∙	(100 ME	ERU). THE M	CONS I	M ALLOWA	D-GC WITH A GYRO DABLE VALUE WITHIN	PRIFT GREATER THE THE LGC IS +/=:	AN OR E	EGUAL TO +/-1.5 5/HR (128 MERU)	DEG/HR
			c.	THE PIF	PA BIAS WIL R THAN CR E	L BE	UPDATED TO +/=.2	WHENEVER THE DELT	A BIAS (LGC VAI FT/SEC2).	LUE OF E	BIAS - MEASURE	BIAS) IS
			D•	THE PGN	NS WILL BE BLE VALUE W	CONSI	DERED NO	D-GC IF THE PIPA E	IAS EXCEEDS +/-	3 • 125	CM/SEC2+ THE	MAXIYUM
l		24-4	LGC									
		-	A.	A MASS	UPDATE IS	REQUI	RED IF	MASS DELTA OF	+/=10 PERCENT	(DIFFE	KENCE BETWEEN	GROUNE
				CALCULA	ATION AND L JRATION.	GC VA	ALUE) EXI	STS WHEN IN THE D	PS CONFIGURATIO	ON OR	+/=5 PERCENT	IN APS
			8•					NOMINALLY BE PRESE OF A CONTINGENCE		PROPELLA	ANT SETTLING	MANEUVER
			c.	ULLAGE	FOR ALL AP	S BUR	RNS MAY E	BE 4 JET OR 2 JET	SYSTEM A OR B.			
l			٥.					BITED VIA V65 DUR				
l			E.	DURING	DOCKED MAN E IN THE A	EUVER UTO 1	RS. ALL DIHROTTLE	PS GIMBAL TRIMMIN MODE. THE RECOMME	IG MUST BE DONE INDED SETTING IS	AT GREA	TER THAN 35	PERCENT
۱		24-5	REND	EZVOUS F	RADAR							
			۸.	THE RR	MUST NOT B	E OPE	ERATED UN	ITIL THE ANTENNA TE IS ESTIMATED TO	EMPERATURE (HPM BE GREATER THAN	A) IS GE	REATER THAN OR JAL TO 15 DEG F	EQUAL TC
			в.	THE RR	SHOULD NOT	BE C	PERATED	AT AN ANTENNA TEM STIMATED) OF GREAT	PERATURE GREATS	ER THAN	OR EQUAL TO 14	5 DEG F
			с.	PRIOR 1				R GYRO PACKAGE WIL MKING PHASE: THE R				
			D•					EMP SHOULD EXCEED THE AC POWER TO TH				ANYTIME
			ε.	IF THE	RR ANTENNA	TEMP	HPM) E	EXCEEDS THE NOMINA	L TEMP PROFILE	8Y <u>130</u>	DEG F. THE RR	SHOULJ
			F.					OFF (BOTH THE PGNS 7 MIN AFTER RE-ENS		ND OPR	PEN) FOR TBD	MIN» RK
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MISSION RULES

SECTION 24 - LM GUIDANCE AND CONTROL

ITEM

R ITEM LANDING RADAR 24-6 THE LR SHOULD NOT BE OPERATED AT AN ANTENNA TEMP LESS THAN +50 DEG F. THE LR TEMP SHOULD NOT BE GREATER THAN 100 DEG F AT PDI. 8. 24-7 AGS THE AGS IS DECLARED NO-GO WITH AN ASA TEMPERATURE OF LESS THAN \pm 90 DEG F OR GREATER THAN \pm 150 DEG F. THE AGS IS DECLARED NO-GO DURING A GYRO AND ACCELEROMETER CALIBRATION IF THE GYRO DRIFT CHANGE IS GREATER THAN 2.50 DEG/HR AND IF THE ACCELEROMETER BIAS CHANGE IS GREATER THAN 0.049 FT/SEC2 FROM THE VALUE AT THE START OF THE CALIBRATION. С. THE AGS MUST BE UPDATED WITHIN 7 MINUTES OF A BURN. THE AGS CAN BE USED TO PERFORM DOCKED ATTITUDE HOLD CONTROL. ٥. THE AGS USING ONLY TICA CONTROL CAN BE USED TO PERFORM A DOCKED DPS BURN. RULE NUMBERS 24-8 THROUGH 24-19 ARE RESERVED. GROUP PAGE DATE SECTION MISSION REV LM GUIDANCE AND CONTROL APOLLO 11 MANAGEMENT

MISSION RULES

MIV ITEM

RULE	CONDITION/MAL		PHAS	E '	RULING	' CUES/N	OTES/COMMENTS
;						•	
					' SPECIFIC '		
24-20	LOSS OF OPER		DOCKED UNDOCK	ED '	RETURN TO CSM ASA	•	EF MALF PROC PGNS
				•	NO-GO FOR DOI		ISS WARN
	(A) (A) (A) (A) (A) (A) (A) (A) (A) (A)		DESCEN ORBIT	•	RETURN TO CSM ASA	•	LGC WARN
				•	NO-GO FOR PDI	'	TEMP CAUTION
			POWERE DESCEN	D '1. 1	PRIOR TO LOW GATE	•	ABNORMAL DSKY RESPONSE
					(A) NO-GC FOR LAN	DING '	MISSING NUMERICS ON DSKY
					(B) ABORT	RESPON	ABNORMAL DSKY PUSHBUTT SE
				2.	AFTER LOW GATE	:	
					(A) LAND MANUALLY		
					(B) NO-GO FOR Extended Lunai Stay	R	
			LUNAR STAY		ENT AT NEXT BEST	! !	
			RNDZ	•	SWITCH TO AGS	•	
		;			CONTINUE MISSION	•	
				•			
24-21	LOSS OF FDA			•			EF MALF PROC DISPLAY
	A. ONE	•	ALL	•	CONTINUE MISSION	•	FDAI ATT ERROR ABNORMAL
	B. BOTH		DOCKED UNDOCK		.(A) RETURN TO CSI ASAP	•	FDAI TOTAL ATT ABNORMAL
				•	(B) NO-GC FOR DO	1	FDAI RATE DISPLAY ABNORMAL
			DESCEN OR b it	T 2	.(A) RETURN TO CS	4 1 1	
					(B) NO-GC FOR PD	ı	
			POWERE DESCEN		(A) PRIOR TO LOW GATE		
		•			(1) NO-GC FO	R	
		•		•	(2) ABORT	•	
				•	(B) AFTER LOW GA	•	
		. :		•	CONTINUE MIS	•	
			LUNAR Stay/R		. CONTINUE MISSIO	N !	
				•		en en en e	
				•			
			2.5	• .			
1		MISSION	REV	DATE	SECTION	GROUP	PAGE
		APOLLO 11	 	4/16/69	 	SPECIFIC -	
			1 1		AND CONTROL	PGNS/CES/AGS	24-7

MISSION RULES

REV ITEM

24-22		DOCKED/ UNDOCKED		MENT	
				MENT	
				• •	
		1.1	11. RETURN TO CSM AS	AP :	
		1	2. NO-GO FOR DOI		
		•	AFTER FINE ALIGNMEN	т !	
		•	CONTINUE MISSION		
		;	·	•	
		•		•	
24-23	LOSS OF RENDEZVOUS	DOCKED/	11. RETURN TO CSM AS.	AP ! • I	REF MALF PROC PGNS
		,	1	5	HEATER CAUTION
			2. NO-GC FOR DOI	66.	7 RNDZ RADAR CAUTION
		DESCENT	1. CONTINUE MISSION	' 9	NO TRACK
		'LUNAR 'STAY	12. NO-GC FOR LM ACT	IVE	
1 1		I RNDZ	CSM ACTIVE FOR RNDZ	BUASE I	
			TOR NOT	i i	
1		!			
24-24	LOSS OF LANDING	DOCKED/	11. RETURN TO CSM AS	AP !	REF MALF PROC PGNS
1 1	RADAR	UNDOCKED	12. NO-GC FOR DOI	•	LDG RADAR CAUTION
		DESCENT	11. RETURN TO CSM ASA	•	
1		ORBIT	1	1	TRACKER CAUTION
1 1		POWERED	12. NO-GC FOR PDI 11. PRIOR TO ADEQUATE	E 'UPDATI	GUIDO TO DECIDE WHEN ADEQUA
		DESCENT	'ALTITUDE UPDATING OF	F 'BEEN A	ACCOMPLISHED.
1 1		! !	1 (A) NO-GO FOR LAN	•	
		•	•	1	
1 1			(B) ABORT	•	
			'2. AFTER ADEQUATE ' ALTITUDE UPDATING	G OF	
1 1) 	LM STATE VECTORS	!	
) 	CONTINUE MISSION	,	
			1		
				•	
24-25	LOSS OF VHF RANGING	! !	TBD		
1 1))	•		•
24-26	LOSS OF TRACKING	, ·	• 'TBD	•	
	LIGHT)	•		
1 1	•				
1 1					
1 1					
1 1		•			
1					
	MISSION	REV DAT	E SECTION	GROUP	PAGE
	APOLLO 1	++	6/69 LM GUIDANCE	SPECIFIC -	1,755

MISSION RULES

REV ITEM

RULE	CONDITION/MALFUNCTI	UNT PHA	SE !	RULING	' CUES/	NOTES/COMMENTS
24-27	LOSS OF REDUNDANT	•			1	MALF PROC CES
221	AUTOMATIC 3-AXIS	NO!			•	
	HOLD CAPABILITY				•	ABNORMAL VEHICLE DYNAMICS
	A. LOSS OF AGS	ALL	CON	TINUE MISSION	11	LM DRIFTS
	B. LOSS OF PGNS	DOCKE	D/ B•1	.(A) RETURN TO C	sm	
	CAPABILITY	UNDOC	KED	(B) NO-GC FOR DO	21	
		DESCE		.(2) STOP BURN.	IF	
		i,	;	(B) NO-GO FOR PE	, ;	
				(C) RETURN TO C	SM	
		POWER	ED 3	•(A) PRIOR TO LOV ABORT	W GATE	
			•	(B) AFTER LOW G	ATE	
				(1) LAND MAI	NUALLY	
				(2) NO-GC FO Extended Lunar S	١ .	
		LUNAR		ASCENT AT THE ! BEST OPPORTUNI	NEXT '	
		1	•		•	
		•	,	•		
24-28	LOSS OF 3-AXIS	•	;		•	
	A. REDUNDANT	DOCKE!		ASAP	5M	
			1	(B) NO-GO FOR DO	01	
		'DESCE		.(A) RETURN TO C	SM I	
				(B) NO-GO FOR PE	;	
		POWER		. CONTINUE MISSI	on !	
		DESCEI LUNAR STAY	1 4	· ASCENT AT NEXT OPPORTUNITY	BEST	
		RNDZ	5	. CONTINUE MISSIC	ON .	
	B. ANY AXIS	POWER	ED B-1	.(A) PDI TO LOW (SATE	
				ABORT		
		i		(B) AFTER LOW GA	•	
		•		CONTINUE MIS	2210N	
	•			NO-GO FOR Extended Lunar Stay		
		RNDZ	2	NO-GO FOR LM AC	TIVE	
		•				
					•	
				ı		T T
	MISSIO		DATE	SECTION	GROUP	PAGE
	APOLLO	11	4/16/69	LM GUIDANCE AND CONTROL	SPECIFIC - PGNS/CES/AGS	24-9

MISSION RULES

REV	ITEM
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R	PULE	CONDITION/MALFUNCTIO	N' PHA			RULING	•	CUES/NO	TES/CO	MMENTS		
	:		;	;								
	24-29	LOSS OF TRANSLATION	•	1			•	A+1	CAN N	OT DETEC	T FAILUR	E UNTIL
		A. AUTOMATIC ULLAGE (+x)	'DOCKE	D/ 'A.1 KED '	. NOT	APPLICABLE	•			PROC CE	S	
			DESCE ORBIT	NT ' 2		RETURN TO CSI	•	14 /			AL RESPO	NSE VI
				;	(B) (OOI INHIBITE	, ;	TTCA				
						DO NOT BACK I		1 /	BNORMA	L VEHICL	E DYNAMI	CS
				•	(D) N	NO-GO FOR PD	;					
			POWER DESCE		(A) C	PRIOR TO PDI	1					
						1) RETURN TO						
					, (2) PDI INHIE	SITED '					
					(3) DO NOT BA	•					
				1		MANUALLY	•					
			1		((4) NO-GO FOR LANDING	•					
			1 1	1	(B) A	FTER PDI						
			•	t, t .		ONTINUE MISS	SION					
		B. EITHER +/-Y. +/-Z. +/-X Translation	DOCKE			RETURN TO CSA SAP	1 :					
			;		(8) /	10-G0 FOR DO	' '					
			'DESCE		.(A) P	RIOR TO DOI	;					
			1	•	(1) RETURN TO ASAP	CSM !					
			1, 2, 2			2) DCI INHIE	SITED :					
			1		. (3) NC-GO FOR	R PDI					
			1	•	(B) A	FTER DOI						
			•	•	(1) CONTINUE MISSION	•					
			•		(2) NO-GO FOR LM ACTIVE TPI AND 1	· •					
			POWER		•(A) C	ONTINUE MISS	SION					
			DESCE	NT !	A	HO-GO FOR LM						
		*	i IRNDZ			PI AND TPF		B		MINITALIA	OF ONE	
		**************************************	1	1		:1) CONTINUE	į				TED DURIN	
			1	1	•	MISSION		· IIIGE				
					(2) NO-GO FOR						
					(B) T	PI-TPF					· .	
				1	. (1) CSM ACTIV					1	
			• 1	•		DOCKING	•					
		I		2422	T		CROUS	<u> </u>	BAGE			
		MISSION		DATE	SECTI		GROUP		PAGE	,		
		APOLLO	11	4/16/69		JI DANCE CONTROL	SPECIFIC PGNS/CE		24-10			

MISSION RULES

REV ITEM

RULE	CONDITION/MALFUNCTION	PHASE		RULING		CUES/NOTES/COMMENTS	
24-30	ROLL GDA	'UNDOCKED/	D '	RETURN TO CSM ASA	•	RCS IMPINGEMENT CON VIOLATED BECAUSE THRUST VECTOR OFFSE	OF RCS OPPOSIN
		' 'DESCENT 'ORBIT	1.	RETURN TO CSM ASAI	•		
		' 'POWERED 'DESCENT	, .CON	NO-GO FOR PDI Tinue mission unli Impingement	ESS :	REF MALE PROC	CES
		DESCENT 1		STRAINTS ARE VIOL	ATED.	5 GDA CAUTION LI	GHT ON
24-31		i 'DOCKED/ 'UNDOCKE		RETURN TO CSM ASA	P !	• REF MALF PROC	CES
		1. 1	!2.	NO-GO FOR DOI	! !	7 MPS DOES NOT T	HRUST WHEN EVEN
		ORBIT	12.	DOI INHIBITED			
		POWERED	11.	NO-GO FOR PDI BACKUP PDI WITH M	ANUAL		
		· DESCENT !	1	START PB CONTINUE MISSION			
		1 1	•	NO-GO FOR EXTENDED LUNAR STAY IF FAIT AFFECTS ASCENT EN	LURE '		
		LUNAR	'OPP	ENT AT NEXT BEST ORTUNITY MANUAL START ABILITY			
		! !	•		•		
24-32		' POWERED DESCENT		INHIBIT POI		STOP PB MUST BE LATCHING RELAYS ENE PB DEPRESSION.	
	PB DEPRESSION	1 1 1		RETURN TO CSM ASA	P .	REF MALF PROC NOT THRUST WHEN	
		• •	•			00.00	
24-33	LOSS OF OPERATIONAL	ALL	CON	TINUE MISSION		• REF MALF PROC	AGS
			•		1	1 AGS WARNING L 11 DEDA RESPONSE	
		, , ,					
		•	•				
						gradien de la company de la company de la company de la company de la company de la company de la company de l La company de la company de la company de la company de la company de la company de la company de la company d	•
	MISSION	REV D	ATE	SECTION	GROUP	PAGE	
	APOLLO 1	1 4	/16/69	LM GUIDANCE AND CONTROL	SPECIFIC PGNS/CES		

MISSION RULES

RIV ITEM

_~	RULE	CONDITION/MALFUNCTION	PHASE	•	RULING	' CUES/N	OTES/COMMENTS
			1	;		1	
	24-34		DOCKED/	'	RETURN TO CSM ASAF	•	MALF PROC CES
				1	NO-GO FOR DOI	DURING	ENG THR AND CMD DO NOT AGREE DPS BURN
			DESCENT ORBIT	•	RETURN TO CSM ASAF	' 20	CMD THR DOES NOT RESPOND TO
				'2. I	IF BURNING, CONTIN BURN	IUE ! TTCA C	R DOES NOT FOLLOW TIMELINE
				3. 1	NO-GO FOR PDI		
			POWERED		PRIOR TO LOW GATE		
			1	: ;	ABORT USING DPS. ABORT STAGE 20 SEC AFTER LOW LEVEL		
) 	12.	AFTER LOW GATE	•	
				•	(A) SHITCH TO MANL	IAL	
) }		THROTTLE		
	1 1				(B) CONTINUE MISS	ION	
	24-35		DOCKED/	, 1	RETURN TO CSM ASAF		LONGER THAN 100 SEC IN ROTTLEABLE RANGE CAN BE LATED.
				11. 6	RETURN TO CSM ASAF	•	
			ORBIT	12.	IF BURNING. CONTIN		
				•	BURN	• R	EF MALF PROC CES
			' '	•	NO-GO FOR PDI		ENG THR AND CMD THR DO NOT DURING DPS BURN
			POWERED	•	DO NOT SWITCH TO		CMD THR DOES NOT RESPOND TO
			· DESCENT	1	MANUAL THROTTLE	•	R DOES NOT FOLLOW TIMELINE
			! !	' 9	ABORT USING DPS. A Stage 20 SEC After Level		
	24-36	LOSS OF ACA	•	•			EF MALF PROC CES
		A. ONE	ALL	!A. (CONTINUE MISSION	ACA	ABNORMAL VEHICLE DYNAMICS 10 JAMMED OUT OF DETENT.
		B. BOTH	DOCKED/	8.1	(A) RETURN TO CSM ASAP		TIONAL SIGNALS ALWAYS PRESENT
					(B) NO-GO FOR DOI		
			DESCENT	2.	(A) RETURN TO CS	•	
			ORBIT		ASAP IF BURNING CONTINUE BURN		
			•		(B) NO=GO FOR PD	•	
		artini. Parining	· ' POWERED	1 3.	(A) ABORT USING	•	
			DESCENT		ABORT STAGE 2 SEC AFTER LOW LEVEL	10	
			LUNAR	4.	.(A) CONTINUE MISS	SION !	
			'STAY 'RNDZ	. !	(B) CSM ACTIVE		\hat{J}
			i	Ī.,	VEHICLE FOR DOCKING	•	
<u>_</u>			, , ,				T
-		MISSION	++	ATE	SECTION	GROUP	PAGE
1		APOLLO 1	1 4	/16/69	LM GUIDANCE	SPECIFIC - PGNS/CES/AGS	24-12

MISSION RULES

REV ITEM

	CONDITION/MALFUNCTIC	N' PHASE	' RULING	' CUES/NOTES/COMMENTS
1		•	•	
24-37	LOSS OF TTCA	1		REF MALF PROC CES
1.1	A. ONE	ALL	'A. CONTINUE MISSION	1 ABNORMAL VEHICLE DYNAMICS
	B. BOTH	'DOCKED/	'B.1.(A) RETURN TO CSM	14 ABSENCE OF NORMAL RESPONSE V
		į	(B) NO-GO FOR DOI	
		DESCENT	2.(A) RETURN TO CSM	
			(B) NO-GO FOR PDI. CDM. CSI. DOCKIA	ig '
		POWERED DESCENT	1 3.(A) DO NOT SWITCH TO MANUAL THROTTLE	
			(B) ABORT USING DPS. ABORT STAGE 20 SEC AFTER LOW LEVEL	
			4. CONTINUE MISSION	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
		STAY RNDZ	5. THE CSM MUST BE THE ACTIVE VEHICLE FOR TPI. TPF. AND	
			DOCKING	
	e e	1. 1		
24-38	LOSS OF LUNAR CONTACT LIGHTS	POWERED	CONTINUE MISSION	
		•	• ** ** ** ** ** ** ** ** ** ** ** ** **	
	RULE NUMBER 24-39			
	IS RESERVED.	1 t	• • • • • • • • • • • • • • • • • • •	
		•	• • • • • • • • • • • • • • • • • • •	$p_{\rm eff} = \frac{1}{2} (1 + \frac{1}$
				$\begin{array}{cccccccccccccccccccccccccccccccccccc$
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	MISSIO	N REV DA	TE SECTION GR	DUP PAGE

MISSION RULES

IT	EM						
]							
1		' PRELA	UNCH INSTRUMENTATI	ON '			
l							
24-	MEAS DESCRIPTION	PCM	CAUROAGO	784448		MISSION RULE	
*		PCM	ONBOARD	TRANSDUCERS	CATEGORY	REFERENCE	
l	LGC DOWNLINK PLS TORO REF	GG0001U GG1040V	-	•	M	24-20	
	2.5 VDC TM BIAS	GG1110V		•	HD }	24=20 24=20	
1	IMU 28 VAC 800	GG1201V	•	• .	HD)	24-20	
l	IRIG SUSP 3.2 KC	GG1331V GG1513X	<u> </u>	-	HD	24-20	
1	LGC OPR	GG1523X		-	HD HD	24-20 34-30	
1	X PIPA OUT IN PHASE	GG2001V	•	-	HD	24-20 24-20	
1	Y PIPA OUT IN PHASE	GG2021V	•	•	HD	24-20	
l	Z PIPA OUT IN PHASE IG SVO ERR IN PHASE	GG2041V GG2107V	-	-	HD	24-20	
	IG IX RSVR OUT SIN	GG2112V	FDAI	COMMON	HD M-PCM	24-20 24-20	
1	IG IX RXVR OUT COS	GG2113V	FDAI	COMMON	M-PCM	24-20	
]	MG SVO ERR IN PHASE	GG2137V	•	- COMMC::	HD	24-20	
	MG IX RSVR OUT SIN	GG2142V GG2143V	FDAI FDAI	COMMON COMMON	M-PCM M-PCM	24-20	
]	OG SVO ERR IN PHASE	GG2167V	-	COMMON	HD	24-20 24-20	
1	OG RSVR OUT SIN	GG2172V	FDAI	COMMON	M-PCM	24-20	
1	OG RSVR OUT COS	GG2173V GG2219V	FDAI	COMMON	M-PCM	24-20	
l	YAW ATT ERR	GG2249V	FDAI FDAI	COMMON	HD - PCM HD - PCM	24-20 24-20	
1	ROLL ATT ERR	GG2279V	FDAI	COMMON	HD - PCM	24-20	
1	PIPA TEMP	GG2300T	CEW	SEPARATE	M-PCM	24-20	
l	RR SHFT SIN	GG3304V GG3305V	FDAI FDAI	COMMON COMMON	HD - PCM	24-23	
l	RR TRUN SIN	GG3324V	FDAI	COMMON	HD - PCM HD - PCM	24-23 24-23	
1	RR TRUN COS	GG3325V	FDAI	COMMON	HC - PCM	24-23	
1	LGC WARNING	GG9001X	CSW	COMMON	HD - PCM	24-20	
l	ISS WARNING LR ANT TEMP	GG9002X GN7563T	CGW TEMP MONITOR	COMMON	HD - PCM	24-20	
ļ	RR NO TRACK	GN7621X	C&W	COMMON	HD - PCM	24-23	
l	RR ANT TEMP	GN7723T	TEMP MONITOR	COMMUN	M-PCM	24-23	
İ	YAW ERR CMD	GH1247V	•	-	M	24-33	
	PITCH ERR CMD	GH1248V GH1249V		-	M	24-33 24-33	
	JD A4D OUTPUT	GH1419V	-	-	HD	24-27	
	RCS TCP A4D	GR5032X	•	•	HD	24-27	
	RCS TCP 83D	GH1423V GR5036X			HD	24-27	
I	JD AZD OUTPUT	GH1427V	•	-	HD	24=27 24=27	
	RCS TCP A2D	GR5040X	•	-	HD	24-27	
1	JD B1D OUTPUT	GH1431V	•	•	HD	24-27	
1	RCS TCP B1D JD B4U OUTPUT	GR5044X GH1418V	-	-	HD HD	24-27 24-27	
1	JD BAF OUTPUT	GH1420V	• 1 · · · ·	-	HD .	24-27	
1	JD A4R OUTPUT	GH1421V	•	, -	HD	24-27	
1	JD A3U OUTPUT	GH1422V GH1424V		•	HD	24-27	
1	JD ASR OUTPUT	GH1425V	· · · · · · · · · · · · · · · · · · ·		HD	24-27 24-27	
	JD B2U OUTPUT	GH1426V		• •	HD	24-27	
1	JD AZA OUTPUT	GH1 428V		-	HD	24-27	
1	JD B2L CUTPUT	GH1429V GH1430V		_	HD HD	24 - 27 24 - 27	
1	JD A1F OUTPUT	GH1432V	• 🔨	-	HD	24-27	
	JD B1L OUTPUT	GH1433V	•	-	HD	24-27	
	RCS TCP 84U	GR5031X		-	HD	24-27	
1	RCS TCP B4F	GR5033X GR5034X	• 📜	-	HD HD	24 - 27 24 - 27	
1	RCS TCP A3U	GR5035X	•	•	HD	24-27	
1	RCS TCP B3A	GR5037X	•	•	HD	24-27	
1	RCS TCP A3R RCS TCP B2U	GR 5038X		<u> </u>	HD	24-27	
	RCS TCP BZU	GR5039X GR5041X	•	· .	HD HD	24 - 27 24 - 27	
1	RCS TCP BZL	GR 5042X		•	HD	24-27	
1	RCS TCP Alu	GR5043X	•	• .	HD.	24-27	
1	RCS TCP AlF	GR5045X	-		HD HD	24-27	
1	YAW ATT ERR	GR 5046X GH1455V	FDAI	COMMON	HD	24-27 24-3 3	
1	PITCH ATT ERR	GH1456V	FDAI	COMMON	HD	24-33	
1	i						

MISSION

APOLLO 11

REV DATE

SECTION

4/16/69 LM GUIDANCE AND CONTROL

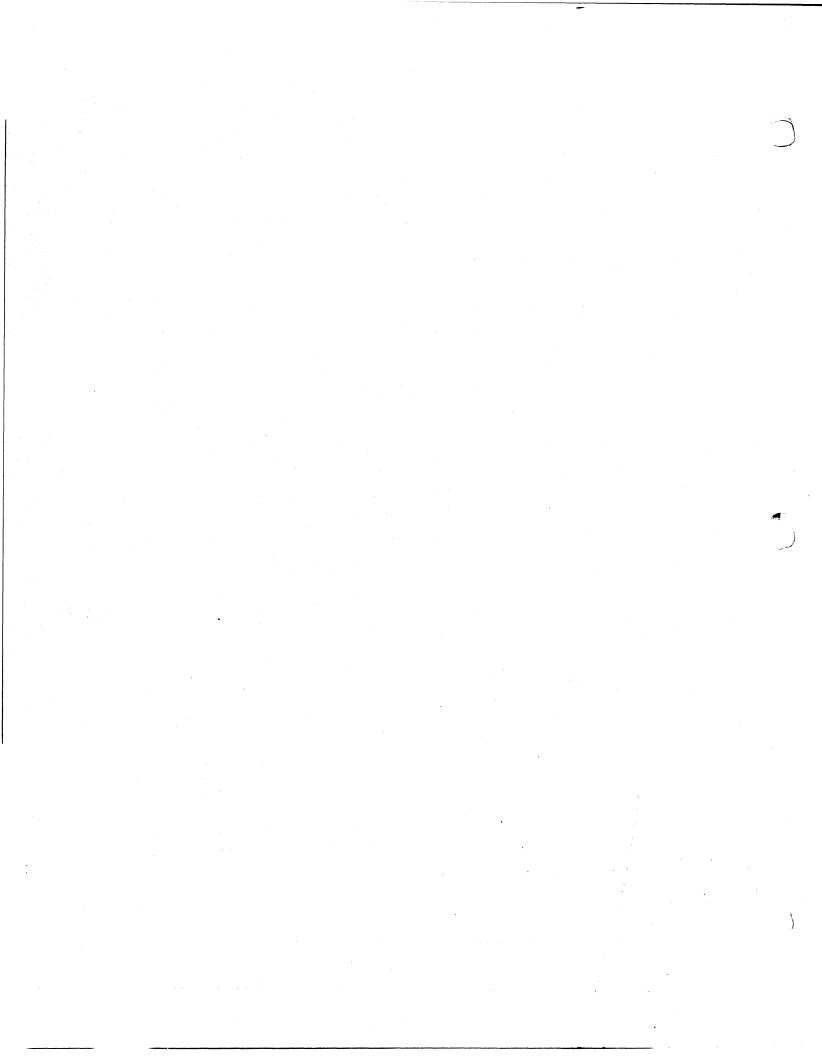
GROUP

PRELAUNCH INSTR PAGE

MISSION RULES

REV ITEM SECTION 24 - M GUIDANCE AND CONTROL - CONTINUED

24-40	MEAS DESCRIPTION	F	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE
	ROLL ATT ERR		1457V	FDAI	COMMON	HD	24-28
	RGA YAW RATE RGA PITCH RATE	GH1	1461V 1462V	FDAI FDAI	COMMON COMMON	M ON BOAR	24 -3 3 24 -3 3
	RGA ROLL RATE	GH1	1463V	FDAI	COMMON	M	24-33
	AGS SEL ROLL PLSD/DIR		L621X L628X			HD HD	24 -33 24 -33
	PITCH PLSD/DIR	GHI	1629X	-	•	HD	24-33
	YAW PLSD/DIR AUTO ON		1630X 1214X	=	-	HD M	24 -33 24 - 31
	APS ARM	GH1	1230X	_	•	M	24-31
	ENG FIRE OVRD		1286X 1311V	METER	SEPARATE	M M	24-31 24-34,24-35
	PITCH GDA POS	GH	1313V	•	-	M ·	24-30
	ROLL GDA POS P TRM FAIL		1314V 1323X	CEW	COMMON	M M	24-30 24-30
	R TRM FAIL	GH	1330X	CEW	COMMON	M	24-30
	AUTO THRUST CMD		1331V 1348X	METER -	SEPARATE	MD M	24-34 24-32•24-31
1	VAR INJ ACT POS	GO	5806H	-	-	M	24-34,24-35
1	CES AC PWR FAIL CES DC PWR FAIL		4026X 4027X	C&W C&W	COMMON	M M	24-30 24-30
	AGS DOWNLINK DATA	GIO	0001X	-	-	M	24-33
	ASA TEMP ASA PWR/AEA FAIL		3301T 6028X	CEW	COMMON	HO HD	24-33 24-33
	AUTO OFF		1217X	-	- ·	HD	24-32+24-31
	AGS AUTO		1641X 1642X	:	<u>-</u> ,	HD	24=27 24=27
	PGNS AUTO		1643X	-	-	HD	24-27
1	PGNS ATT HOLD LR RNG DATA NO GO		1644X 7521X	CEW	COMMON	HD HD	24-27
	LR VEL DATA NO GO		7557X	CEW	COMMON	HD	
		•					
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25 LM DPS

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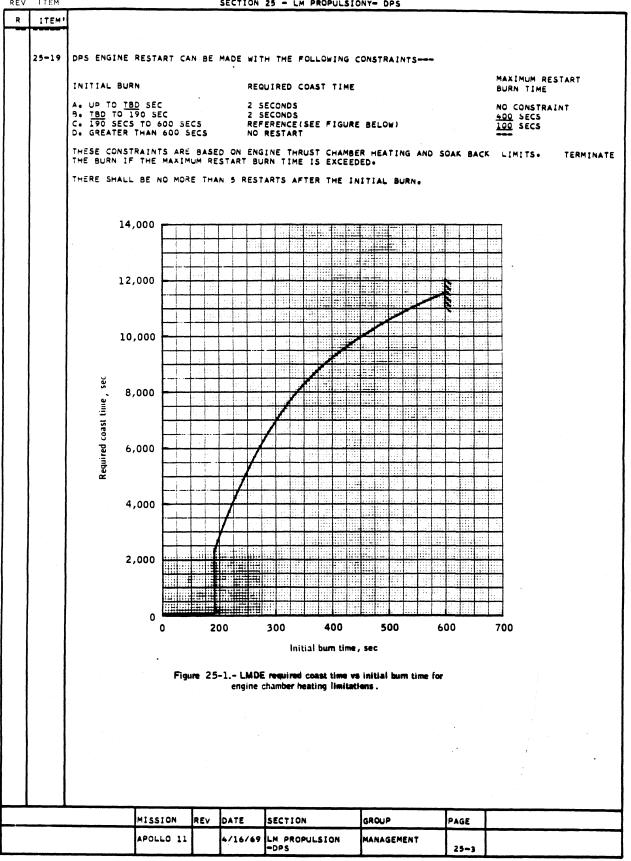
MISSION RULES

REV ITEM

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MISSION RULES

ITEM			SECTION	25 - LM PROPULSIO	DNY- DPS		
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25-11	DPS USABLE	PROPELLANT	.IS <u>17.701.1</u>	LBS.			
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	USABLE		,701.1 LBS				
1 1	*BASED ON 1	-3 PERCENT	POGS ERROR				
25-12	THE TOTAL C	ONTINUOUS DOF THRUST	BURN TIME OF LEVEL.	THE DESCENT ENGIN	E SHALL NOT EXC	EED 910	SECONDS OF OPERAT
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1 1	COAS! BEIWE	EN NON-CRI	TICAL BURNS A	ND A Z SEC COAST	BETWEEN CRITICA	L BURNS	L PROVIDE A 10 MIN
25-14	ALL DPS STAF	RTS WILL B	E NOMINALLY P	LANNED AT THE LOW	THROTTLE POINT	•	
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MISSION RULES

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25-20	ONLY PREMIS	SION APPROV	ED A	LTERNATE	DPS/MULTIBURN P	ROFILES WILL	BE EXECUTE	D. SINCE NO	DATA EXIS
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MISSION RULES

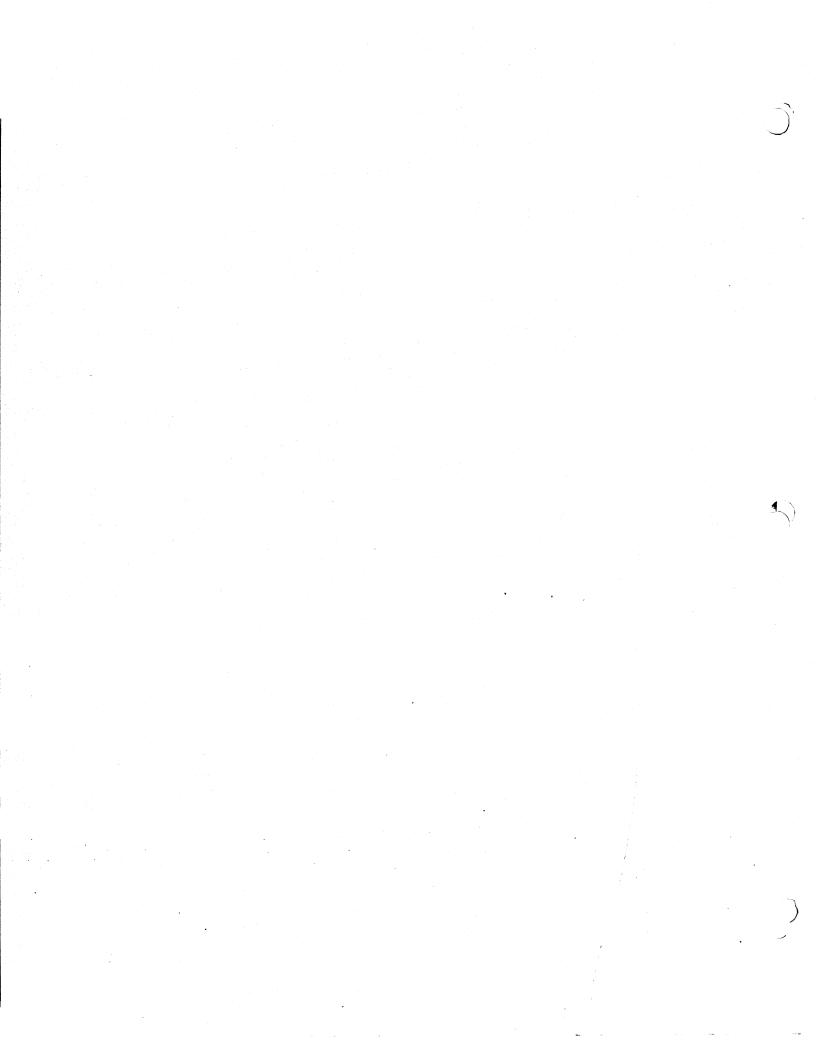
REV ITEM

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MISSION RULES

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26 LM APS



MISSION RULES

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		2.	AN OPERATION	IAL AF	PS					
		C. RENDE	ZVOUS							
		1.	NO PROPELLAN	T LEA	KS					
		2.	OPERATIONAL	APS I	F APS RE	EQUIRED				
	26-2	DEFINITION	S							
		A. AN OP	ERATIONAL AP	S (PF	REPRESSUR	RIZATION) IS DEFI	NED AS FOLLOWS-			
			DELTA PRESS PSID.	BETWE	EN APS F	FUEL AND OXID ENG	INE INLET PRESSU	UR ES LESS	THAN 90	
		2•	DELTA TEMP B	ETWE	N APS FU	JEL AND OXID LESS	THAN 10 DEG F.			
		3•	APS FUEL AND	OR C	XID TEMP	GREATER THAN 50	DEG F AND LESS	THAN 90 DE	EG F.	
			APS FUEL AND PSIA.	/OR C	XID INLE	ET PRESSURE GREAT	ER THAN 62 PSIA	AND LESS	THAN 205	
		5.	NO HELIUM TA	NK OF	HELIUM	LINE LEAKS.				
		B. AN OP	PERATIONAL AF	S IP	ST-PRES	SURIZATION) IS DE	FINED AS FOLLOWS	5		
		1.	ADEQUATE SOL	RCE F	PRESSURE	FOR DELTA V REQU	IRED.			
						JEL AND OXID LESS FOR BURNS GREATE			LESS THAN	
		ł		00 SE	CONDS AF	P GREATER THAN <u>TB</u> ND GREATER THAN 5 ECONDS•				
		4.	APS FUEL AND	/OR C	XID INLE	T PRESSURES GREA	TER THAN 115 PS	IA.		
		5.				IEL AND OXID INLE				
			20 PSID FOR FOR BURNS GR			AN 100 SECONDS A DO SECONDS	NU LESS THAN OR	EGUAL TO	12 PSIA	
		B 55	THROUGH 26-			-n				
		MULES 20-1	nauuga 20°	y AKI	. RESERVE					
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			MISSION	REV	DATE	SECTION	GROUP	PAGE		
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L				<u> </u>	1	- APS		26-1		

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MISSION RULES

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26-	-10	APS MANNED JET ULLAGE OF ASCENT F	WITH THE E	XCEPT	ION THAT	NALLY BE PRECEDED NO ULLAGE IS REG	BY A PROPELLAN BUIRED FOR AN AB	IT SETTLING ORT STAGE O	MANEUVER USING R FROM INITIAT
26-	-11	THE APS CAN ITS USAGE IN DAYS.	NOT REMAIN S COMPLETE	ACTI D NOM	VATED (C INALLY.	OMPATIBILITY SUUI IN CASE OF A CON	B VALVES FIRED)	LONGER THA IME CAN BE	N 24 MOURS BEF Extended to 3-
26-	-12	THE USABLE	PROPELLANT	FOR	APS IS 5	•180•7 LRS•			
"		TOTAL LOADER		227.1				•	
	- 1	TRAPPED AND		46.4					
		USABLE		180.7					
		1							
	1								
26-	-13	THE MINIMUM TO A BURN T	IMPULSE OF	F THE SEC.	APS ENG	INE IS 1235 PLUS	OR MINUS -NC 89	LBS - SEC.	WHICH CORRESPO
26-	-14	ONLY PREMISS REALTIME SUI MULTIBURN PI	PPORT FOR	VED AF	PS MULTI NING APS	BURN PROFILES WIL FREEZING+ CHARR	L BE EXECUTED. ING. BACKWALL	SINCE NO DA TEMPERATUR	TA EXISTS TO AL E CONSTRAINTS
26-	-15	PROPELLANT	GAGING (NO	ONBO	ARD READ	OUT)			
		A. PRIME	METHOD	APS Q	TY FROM	LGC MASS CALCULAT	ION (2.5 PERCEN	π)	
		E. BACKUP	METHOD	FLOW	RATE X	TIME (5 PERCENT)			
								•	
	- 1	RULES 26-16	**************************************	4-10	ARE RESE	0.455			
		ROLLS 20-10	I HOUGH E	u-1,					
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			APOLLO 11	i	4/16/69	LM PROPULSION	MANAGEMENT		

MISSION RULES

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	PRESSURIZATIO		INDZ	;	2. CONTINUE MISSIO	N i		
	B. LEAK AFTER		UNAR	8.	1. ASCEND IMMEDIAT	ELY		
					TANK IF PRE GREATER THA 200 PSIA.			
				•	IN BLOWDOWN SELECT LEAK	ING		
				į	APS HELIUM (B) AFTER APS G	•		
			TAY	:	(A) SELECT ALTE			
		•	UNAR	;	4. ASCEND ASAP			
					TANK IF PRE GREATER THA 200 PSIA			
				:	IN BLOWDOWN SELECT LEAK	ING		
					APS HELIUM	• "	•	
				:	(B) SELECT ALTE	RNATE !		
			ESCENT	:	(A) USE DPS AS AS POSSIBLE			
	1.441	1	OWERED	•	3. ABORT	•		
			ESCENT	:	2. RETURN TO CSM		FICIENT APS DELTA	V CAPABILTY F
	A. LEAK PRIOF		OCKED/		1. RETURN TO CSM NO-GO FOR DOI		NOTE ONE HELIUM BOTT	LE CAN SUPP
26-21	APS HE SOURCE PRESSURE	E :		•		•	REF MAL PROC APS	NO
							•	
		' S	STAY	:				
			UNAR	•	POSSIBLE ASCEND ASAP			
			ESCENT	•	USE DPS AS LONG AS	•		
		1 9	OWERED	•	NO-GC FOR PDI ABORT	i		
			RBIT	•	RETURN TO CSM ASAP			
	OPERATIONAL ,		INDOCKED		NO-GO FOR DOI	•		
26-20	LOSS OF AN		OCKED/	A•	RETURN TO CSM		REF MAL PROC APS	NO •
					SPECIFIC			
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MISSION RULES

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26-22	APS HE LEAK BE	TWEEN 'C	OCKED/	IA. R	ETURN TO CSM	RE	F MAL PE	ROC AP	s no		
	QUAD CHECK VAL			D ;		• •	NOTE			-	
	2 SHUTOFF VALV	ES !		! N	O-GO FOR DOI	•	_				
		10	ESCENT		ETURN TO CSM		SHORT SSIBLE.	APS	BURNS	MIGHT	8
			ORBIT	' N	O-GO FOR PDI						
l			POWERED		BORT						
				ا ر	SE DPS AS LONG	•					
			LUNAR		CONTINUE MISSION	•					
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					BOTTLE IMMEDIA PRIOR TO IGNIT						
		•		,	. USE SECOND BOT	•					
		:		: -	WHEN APS GOES	:					
		•		•	IN BLOWDOWN	į.					
		, ,	RNDZ		ONTINUE MISSION	- 1					
				. ;							
26-23							REF MAL	PROC	APS NO.		
	PROPELLANT VAP-			'A• E	GRESS TO CSM ASA	Ρ !					
	QUAD CHECK VAL	VES ;		JETT	ISON LM	,					
		10	NDOCKE	D 'B. C	OCK ASAP						
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			POWERED DESCENT		BORT	,					
		1		' 1	USE DPS AS LON AS POSSIBLE	G					
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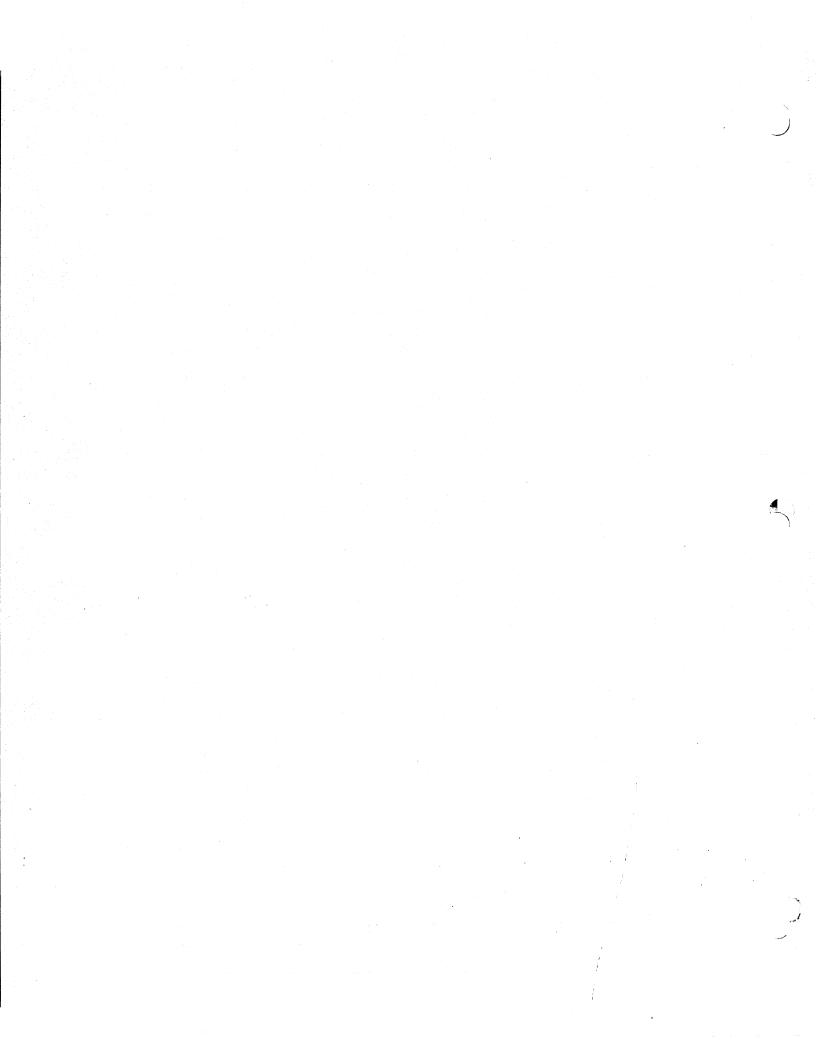
MISSION RULES

REV ITEM

-			E ' RULING	' CUES/NOTES/COMMENTS
26-24	APS PROP VALVE MISMATCH (DELTA POS)	ALL	CONTINUE MISSION IF BURNING OR HAVE HAD A	THIS INDICATION PRIOR TO FIRST APS ENGINE ON WILL BE CONSIDERED A
			LEAST ONE APS BURN, INHIBIT SUBSEQUENT APS BURNS	THE FAILURE
26-25	APS FU AND/OR OXID	•	A. CONTINUE MISSION	
			1. OPEN RCS MAINS	
	RULES 26-26 Through 26-29			
	ARE RESERVED.			
	MISSIO	N REV	DATE SECTION GRO	DUP PAGE

MISSION RULES

ITEM	*:					
	INSTR 26					
		' A	PS - PRELAUM	NCH INSTRUME		
26-30	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCER	CATEGORY	MISSION RULE REFERENCE
	APS HE 1 PRESS APS HE 2 PRESS APS HE REG PRESS APS HE 1 TEMP APS HE 2 TEMP APS FUEL TEMP APS FUEL LOW APS OXID TEMP APS OXID LOW APS FUEL PRESS	GP0001P GP0002P GP0018P GP0025P GP0201T GP0202T GP0718T GP078X GP1218T GP1408X GP1501P	HEL MON CE HEL MON CE HEL MON HEL MON TEMP C&W TEMP C&W C&W		M - PCM M - PCM HD	26-20.21.22 26-20.21.22 26-20.22 26-20.22 26-21 26-21 26-20 26-25 26-25 26-20 26-25 26-20.21.22.23
	APS OXID PRESS	GP1503P	C&W	COMMON	M - PCM	26-20+21+22+23
	VLVS A DELTA POS VLVS B DELTA POS APS TCP	GP2997U GP2998U GP2010P			HO HO	26-24 26-25
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27 LM REACTION CONTROL SYSTEM

MISSION RULES

SECTION 27 - LM REACTION CONTROL SYSTEM

PLV ITEM

GENERAL '		ITEM			•			EN REACTION CON				
IN ORDER TO INITIATE AND CONTINUE THE FOLLOWING MISSION PMASES, THE RCS SUBSYSTEM MUST PROVIDE THE FOLLOWING MISSION PMASES, THE RCS SUBSYSTEM MUST PROVIDE THE FOLLOWING MISSION PMASES, THE RCS SUBSYSTEM MUST PROVIDE THE FOLLOWING MISSION PMASES, THE RCS SUBSYSTEM MUST PROVIDE AND DECEMBER OF SECRET ORBIT. 4. DOPERATIONAL RCS SYSTEMS A AND B 2. NO PROPELLANT LEAKS 2. TO CONTINUE POWERED DESCENT 1A) DEPRATIONAL RCS SYSTEMS A AND B 2. NO PROPELLANT LEAKS 2. TO CONTINUE POWERED DESCENT 1A) DEPRATIONAL RCS SYSTEMS A AND B 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 3. NO PROPELLANT LEAKS 4. RCS SYSTEM AND SHALLS TRANSLATION CAPABILITY FROM TO! THROUGH DECAING. 2. NO PROPELLANT LEAKS 4. RCS SYSTEM AND SHALLS TRANSLATION CAPABILITY FROM TO! THROUGH DECAING. 2. NO PROPELLANT LEAKS 4. RCS SYSTEM CONTAINS SIGHT OPERATIONAL THRUSTERS SUPPLIED BY ITS OWN PRESSURIZATION AND PROPELLANT FEED SYSTEM INDEPREDENT OF ASCENT FEED AND CROSSFEED. **NOISIOUNL THRUSTERS REQUIRED FOR DIFFERENT MISSION PHASES WILL BE COVERED SEPARATELY. 5. OPERATIONAL RCS SYSTEM 1. FUEL AND/ORD RICH MANIFOLD PRESSURES GREATER THAN OR EQUAL TO 100 PSI. 2. DELTA PRESSURE SETWEEN FUEL AND DXID MANIFOLD LESS THAN OR EQUAL TO 80 PSID. 3. FUEL TEMP GREATER THAN OR EQUAL TO 40 DEG F AND LESS THAN OR EQUAL TO 100 DEG F. RULE NUMBERS 27-3 THROUGH 27-9 ARE RESERVED.	+-											
IN ORDER TO INITIATE AND CONTINUE THE FOLLOWING MISSION PMASES, THE RCS SUBSYSTEM MUST PROVIDE THE FOLLOWING MISSION PMASES, THE RCS SUBSYSTEM MUST PROVIDE THE FOLLOWING MISSION PMASES, THE RCS SUBSYSTEM MUST PROVIDE THE FOLLOWING MISSION PMASES, THE RCS SUBSYSTEM MUST PROVIDE AND DECEMBER OF SECRET ORBIT. 4. DOPERATIONAL RCS SYSTEMS A AND B 2. NO PROPELLANT LEAKS 2. TO CONTINUE POWERED DESCENT 1A) DEPRATIONAL RCS SYSTEMS A AND B 2. NO PROPELLANT LEAKS 2. TO CONTINUE POWERED DESCENT 1A) DEPRATIONAL RCS SYSTEMS A AND B 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 2. NO PROPELLANT LEAKS 3. NO PROPELLANT LEAKS 4. RCS SYSTEM AND SHALLS TRANSLATION CAPABILITY FROM TO! THROUGH DECAING. 2. NO PROPELLANT LEAKS 4. RCS SYSTEM AND SHALLS TRANSLATION CAPABILITY FROM TO! THROUGH DECAING. 2. NO PROPELLANT LEAKS 4. RCS SYSTEM CONTAINS SIGHT OPERATIONAL THRUSTERS SUPPLIED BY ITS OWN PRESSURIZATION AND PROPELLANT FEED SYSTEM INDEPREDENT OF ASCENT FEED AND CROSSFEED. **NOISIOUNL THRUSTERS REQUIRED FOR DIFFERENT MISSION PHASES WILL BE COVERED SEPARATELY. 5. OPERATIONAL RCS SYSTEM 1. FUEL AND/ORD RICH MANIFOLD PRESSURES GREATER THAN OR EQUAL TO 100 PSI. 2. DELTA PRESSURE SETWEEN FUEL AND DXID MANIFOLD LESS THAN OR EQUAL TO 80 PSID. 3. FUEL TEMP GREATER THAN OR EQUAL TO 40 DEG F AND LESS THAN OR EQUAL TO 100 DEG F. RULE NUMBERS 27-3 THROUGH 27-9 ARE RESERVED.												
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NASA - Manned Spacecraft Center MISSION RULES

REV ITEM

SECTION 27 - LM REACTION CONTROL SYSTEM

		APOLLO 11	H	4/16/69	LM REACTION	MANAGEMENT					
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	RULE NUMBERS	27-12 THE	OUGH	27-19 AR	RE RESERVED.						
	*BASED ON A	GROUND COM	PUTAT	TIONAL AC	CURACY OF 6 PERCE	ENT .					
	TM ERROR*			LBS	- 6.0 PERCENT 87.6 PERCENT						
	TRAPPED AND		-40.	LBS	- 6.4 PERCENT						
	TOTAL LOADED)		L8S	100.0 PERCENT	OF TOTAL LUAD	-				
27-11	USABLE RCS	PRODELLANT	15 #	53.5 I PC	OR 87.6 PERCENT	OF TOTAL : 0:0					
						The Name of the State of the St	AS DOCKING.				
	THE RCS QUAD TEMP MUST BE BROUGHT UP TO OPERATING TEMPERATURE VIA THE RCS HEATERS PRIOR TO AN RCS FIRINGS. THRUSTER QUAD TEMPERATURES MUST BE ABOVE 119 DEG F AND LESS THAN 190 DEG F. EXCEPTION PERIODS OF HEAVY DUTY CYCLE WITH EXPECTED TEMP RISES SUCH AS DOCKING.										
27-10	THRUSTER TEN										
1 1					STEMS MANAGEMENT						

MISSION RULES

R RULE	CONDITION/MALE	FUNCT ION	PHASE		RULING		S/NOTES/COMME	INTS	
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27-20	LOSS OF RCS S	SYSTEM !A	AL I	1	LOSE MAINS OF AF	FECTER	REF MAL PROC	BC5 No.	
	A OR B			• :	SYSTEM IF LOSS OF	•	KEP MAL PROC	RCS NO	
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MISSION RULES

REV ITEM

SECTION 27 - LM REACTION CONTROL SYSTEM

RULE '	CONDITION/MALFUNCTION	N' PHAS		RULING	' CUES/NOTES/COMM	ENTS
:	·		•		!	
27-21	RCS THRUSTER PAIR	•			REF MAL PROC	RCS NO
	A. ONE PAIR	DOCKED	A - 1	L. DO NOT UNDOCK		
	ISOLATED	UNDOCK	ED 2	DOCK ASAP		
		;	;	NO-GO FOR DOI		
		DESCEN	' '' ''	. RETURN TO CSM A	SAP '	
1		ORBIT		NO-GO FOR PDI	•	
		•	•	CONTINUE MISSI	N I	
		'DESCEN'			1	
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	B. COMBINATION ISOLATED	DOCKED	180 1	L. DO NOT UNDOCK		
	RESULTING IN LOSS OF	: 1	•		1	
	ATTITUDE CONTROL	UNDOCK	בט :	2. CSM ACTIVE DOC	ING	•
1				NO-GO FOR DOI		
		• .	•	B. CSM RESCUE		
		ORBIT	•	NO-GO FOR PDI. ACTIVE DOCKING	CSM !	
		POWERE		OPEN WHATEVER		
1		DESCEN	Т ;	ISOLATION PAIRS REQUIRED TO MAI		
1		•		ATTITUDE CONTRO		
		•	•	(A) PRIOR TO LO	W *	
		:	•			
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SECTION 27 - LM REACTION CONTROL SYSTEM

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SECTION 27 - LM REACTION CONTROL SYSTEM

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28 SPACE ENVIRONMENT

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	# + -									
28-2	DEFINI	TIONS-								
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	Т	THE AVE	RAGE RBE T	HAT W	ILL BE U	SED FOR SOLAR PA	RTICLE EVENT	RADIATION	FROM PROTONS	IS 1.2.
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	28-4	PRIORITY C	F DATA										
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			(C) PIONEER	RADI	ATION SA	TELLITE							
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		2•	(A) S/C I	HASES NSTRU	MENTATIO	N.							
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			(2) PE	RSONAL	RADIAT	ION DOSIMETE	R (PRD)						
			(3) NU	CLEAR	PARTICL	E DETECTION	SYSTEM (N	PDS)					
			(B) SOLAR P	ARTIC	LE ALERT	NETWORK (SP	AN I						
			(C) VELA NA	TURAL	RADIATI	ON SATELLITE							
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4/16/69 SPACE ENVIRONMENT MANAGEMENT

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	CNBOARD TM AND	'AND	•			
28-12			NOT APPLICABLE			
		ALL OTHER	C. CONTINUE MISSION	1		
		•	BASED ON ACTUAL CONDITIONS.	1		
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		1	' THROUGH TLI WILL ' EXCEED THE MOD BY A	1		
		1	UNLESS DATA ANALYSIS INDICATES THAT THE	DOSIMET	ER READOUTS P	ER SOP 2-8
		! ! FBO	TRAJECTORY.		ABEN FURNIS	pretu pro-
	REPORTING SOURCES	I	INDICATES A SEVERE INCREASE IN RADIATION	•		
28-11			A. HOLD IF INFORMATION			
20-20			VERIFICATION FROM ALL			
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		1 1	SPECIFIC MISSION RULES '			
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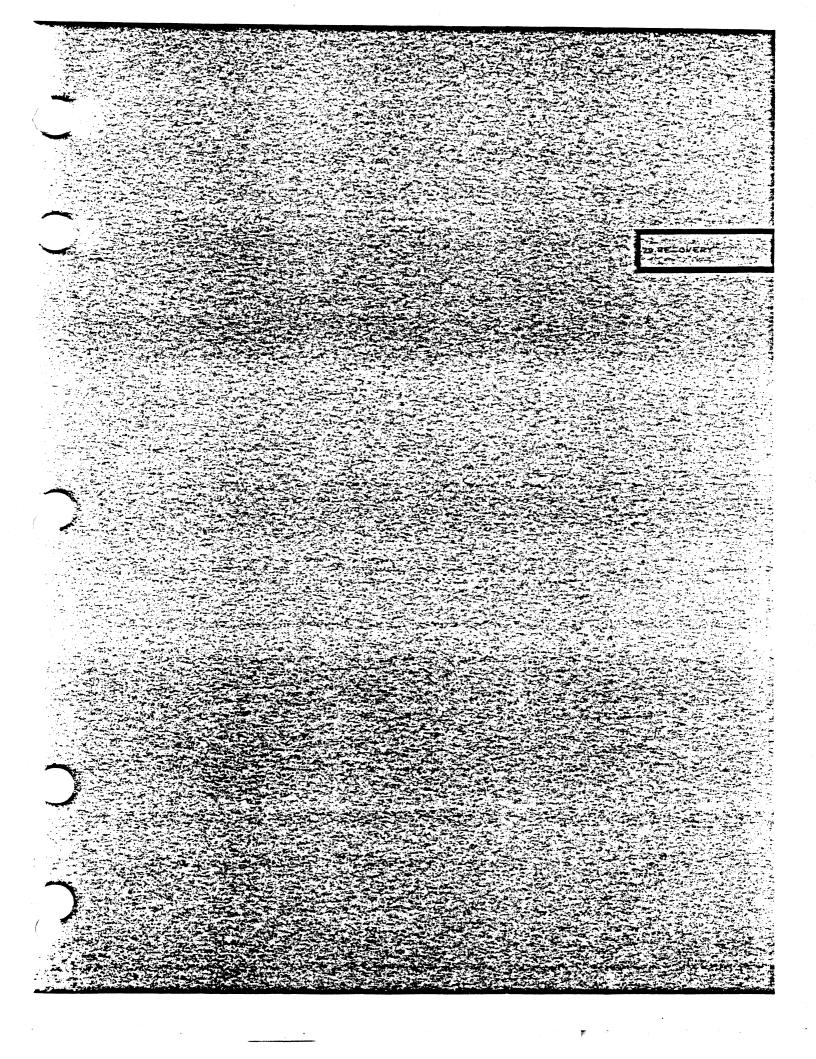
NASA - Manned Spacecraft Center MISSION RULES

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MISSION RULES

REV ITEM

SECTION 29 - RECOVERY

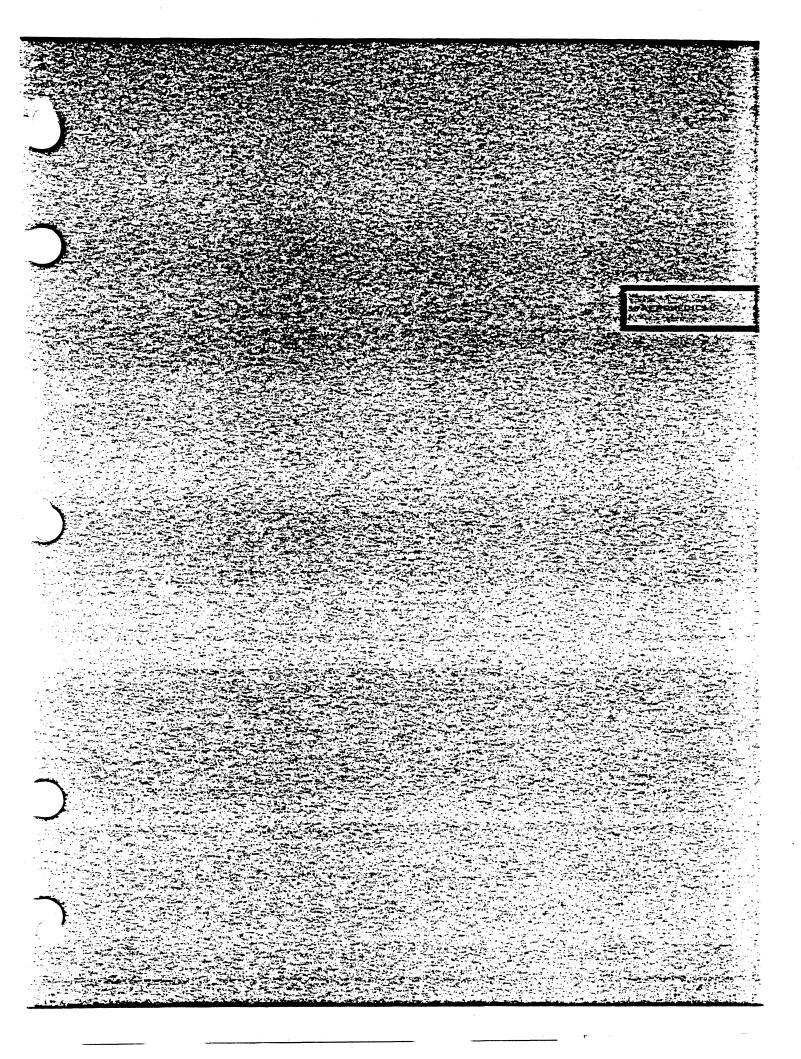
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					- 1		1	·		
						' SPECIFIC '				
	29-1	ACCEPTABLE WE CONDITIONS AND RECOVERY	EATHE !F	RELAUN	ICH MANE	DATORY	•			
		CAPABILITY+ IN THE LAUNCH			,		į			
		SITE AREA.	•							
	29-2	CONDITIONS AND RECOVERY	•	PRELAUN	CH!HIGH	HLY DESIRABLE	 			
		CAPABILITY+ IN THE LAUNCH AREA TO 1000 DOWNRANGE AND	NM !							
		THE MIDPACIFI			:					
			•		. 1		•			
	29-3	MINIMUM OF 65 HOURS OF CM POSTLANDING F AVAILABLE AT	OWER !		HIGH	HLY DESIRABLE	POS	PROVIDE TLANDING IGHTING.	40 HOURS POWER PLUS	
		LANDING.	•		1 1		•			
			1		1		1			
	29-4	MINIMUM OF 35 HOURS OF CM POSTLANDING F AVAILABLE	•		MANE	DATORY	POS	TO PROVIDE TLANDING IGHTING.	E 18 HOURS POWER PLUS	
		AT LANDING.	1		1		•			
					1		• • • • • • • • • • • • • • • • • • •			
	29-5	UNTIL ENTRY - HOURS. RETAIN V CAPABILITY MOVE ENTRY PO	TO I		HIGH	HLY DESIRABLE		TO PROVIDE	E WEATHER	AVGIDANCE
		+/-500 NM			•		• . •			
		F F S	RECOVERY UPERFORM THE TIME OF CM STRUCTURAL	INIT CO HE RECO H LANDI H INTEG O INDI	MMANDER VERY OF NG AFFE BRITY OF	ILL BE BASED PRI R'S EVALUATION O PERATION • WEATHE ECT BOTH RECOVER F THE CM• THE FO HEN IT MAY BE NE	OF HIS CAPABILER CONDITIONS BY CAPABILITY CLOWING GUIDE	ITY TO AT THE AND		
			SURFACE WI	,	1 5	5 KNCTS 500 FT NM				
			WAVE HEIGH		•	FT			i i i i i i i i i i i i i i i i i i i	
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			APOLLO 11	4	/16/69	RECOVERY	SPECIFIC	29-1		
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MISSION RULES

RLV ITEM

SECTION 29 - RECOVERY

+	CONDITION/MALFUNCTION	PHASE	' RULING	' CUES/NO	TES/COMMENTS	
		1	1			
29-6	AN ELLIPSE 163 NM	'EARTH	MANDATORY	•		
	UPRANGE + 152 NM	'ORBITAL	1	<u>.</u>		
1	DOWNRANGE AND 50 NM TO EITHER SIDE OF		•			
1	55 DEG/55DEG	• .		•		
1	TARGET POINT- AND			•		
	AN ELLIPSE 105 NM UPRANGE AND	1				
	DOWNRANGE AND 40 NM	•		. •		
1	TO EITHER SIDE OF THE ROLL RIGHT 90	1		1		
	DEG (DELAYED)	•		•		
	TARGET POINT WILL	•		1		
	BE CLEAR OF ALL	1	•	i i		
1		1		•		
		•				
1		•	•	•		
29-7	REMAINDER OF MANEUVER FOOTPRINT	EARTH	HIGHLY DESIRABLE	•		
l	AND AN ELLIPSE 109			i		
-	NM UPRANGE AND	1		•		
	DOWNRANGE AND 40 NM TO EITHER SIDE					
1	OF 90 DEG/90DEG	1 -		•		
	TARGET POINT	•		19 (19) (19		
	AND ELIPSE 105		1			
	DOWNRANGE AND 40 NM	•		•		
1	TO EITHER SIDE OF ROLL RIGHT 90 DEG	1	•	•		
	TARGET POINT WILL	•		i		
	BE CLEAR OF LARGE	•				
1	LAND MASSES.	•				
1		•		•		
1		1.		•		•
29-8	AN ELLIPSE TBD NM		MANDATORY	ing of the second		
	UPRANGE. IED NM	1	1	•	•	
	DOWNRANGE AND IBD NM TO EITER SIDE	•	•	• • • • • • • • • • • • • • • • • • •		
	OF THE GNCS TARGET		•	•		
	POINTAND AN ELLIPSE TBD NM	•				
	UPRANGE TBD NM	•	•			
	DOWNRANGE AND TBD	1	1			
	NM TO EITHER SIDE OF THE EMS TARGET	•		.		
	POINT WILL BE CLEAR	1		•		
	OF ALL LAND	1	1 1			
	1	•	•	•		
1	1	•				
29-9			HIGHLY DESIRABLE	•		
	OPERATIONAL		1	•		
	FOOTPRINT AND AN ELLIPSE TBD NM	i	i	•		
	UPRANGE. IBD NM	•	•	•		
	DOWNRANGE + AND TBD NM TO EITHER SIDE	•	1	•		
	OF THE CONSTANT	•	•			
	''G'' TARGET POINT	•				
i	WILL BE CLEAR OF LARGE LAND MASSES	•	•	•	<u> </u>	
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MISSION RULES

REV ITEM

1 TEM				SECT	ION 30 - AEROME	DICAL			
ITEM									
1					' GENERAL '				
120-1	DOE! ALINCH								
30-1	PRELAUNCH								
					FOLLOWING CONDI		MET		
1	A. SATISF	ACTORY FLIC	SHT C	REW PHYS	IOLOGICAL STATU	S •			
	B. THE MI	NIMUM CABIN	V OXY	GEN CONC	ENTRATION FOR L	AUNCH IS 60 P	ERCENT .		
1	C. THE MI	NIMUM SUIT	OXYG	EN CONCE	NTRATION FOR LA	UNCH IS 95 PE	RCENT.		
30-2	THE SUIT CI SUIT LOOP P 5 MINUTES.	RCUIT MUST URGE IS REG	BE MA	AINTAINE(D IF THE	D AT LEAST 2 IN SUIT-TO-CABIN	. WATER PRES Delta Pressur	SURE ABOVE E REMAINS A	THE CABIN T ZERO FOR A P	PRESSURE Ekiob d
l									
30-3	THE POTABLE	WATER PH N	1UST (BE WITHIR	N 6.0 TO 8.0 AT	SERVICING AND	O FINAL SAM	PLING.	
30-4	THE MAXIMUM	ALLOWABLE	CONC	ENTRATIO	N OF PCO2 IS 5M	M OF HG.			
							•		
	LANGE								
30-5	LAUNCH							_	
İ	INTOLERABLE			NS FOR A	BORTING DURING	THE LAUNCH PH	ASE OTHER	THAN THOSE C	ONDITICA
	•								
								•	
30-6	ORBIT								
		ON TERMINAT	TION I	FOR MEDI	CAL FALL INTO T	WO CATEGORIES			
					ADVERSELY AF			LTHE OR FUNC	TION AN
1		MANCE.	. ,		ADVENUE -				, , , , , , , , , , , , , , , , , , , ,
	B. FAILUR	E OF SPACE	CRAFT	SYSTEMS	TO MAINTAIN A	PHYSIOLOGICAL	LY SATISFAC	TORY ENVIRONME	NT.
30-7	WATER PALAT	ABILITY							
	CREW EVALU	ATION OF	THE	DRINKIN	G WATER TASTE	WILL BE T	HE BASIS	FOR DETERMINI	NG WATE
	PALATABILIT	Y. EVEN FOR	R KOH	CONTAMI	•NOITAN				
								:	
	RULE NUMBER	5 30-8 THE	OUGH						
	30-14 ARE R								
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MISSION RULES

REV ITEM

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		:		
		TEC	'E. ENTER NEXT BEST	PTP
		10	D. ENTER NEXT BEST	
		TLC	C. ENTER NEXT BEST	
		'EPO	'B. ENTER NEXT BEST	' EFFECTIVE.
30-18	ONSET OF SERIOUS MEDICAL PROBLEM	LAUNCH	'A. CONTINUE MISSION ' CREW MAY ELECT TO ABORT IF INTOLER	RECOMMEND EARLY MISSION TERMINAT
		•	• • • • • • • • • • • • • • • • • • •	
		•	•	• • • • • • • • • • • • • • • • • • •
		TEC	E. ENTER NEXT BEST	PTP (
		LO	D. ENTER NEXT BEST	PTP ,
		TLC	C. NO-GC FOR LOI	RECOMMENDED IF CORRECTIVE ACTION NOT EFFECTIVE.
	RATE	EPO	B. NO-GC FOR TLI	EVALUATED BY THE MCC SURGEON EARLY MISSION TERMINATION MAY
30-17	ABNORMAL RESPIRATORY	LAUNCH	A. CONTINUE MISSION	
		TEC	E. ENTER NEXT BEST	
			D. ENTER NEXT BEST	PTP
		TLC	C. NO-GO FOR LOI	ACTION IS NOT EFFECTIVE.
	RATE: RHYTHM OR EKG		B. NO-GO FOR TLI	PROBLEM AND MAY RECOMMEND EAR MISSION TERMINATION IF CORRECT
30-16	ABNORMAL HEART	LAUNCH	'A. CONTINUE MISSION	
		•		
			•	ACTION IS NOT EFFECTIVE.
			•	PROBLEM AND MAY RECOMMEND EA MISSION TERMINATION IF CORRECT
	UNREADABLE ERG	I I	•	C SURGEON WILL EVALUATE
30-15	LOSS OR Unreadable Ekg	'ALL 'PHASES	CONTINUE MISSION	' ARTIFACTS ANTICIPATED DURI ' LAUNCH
			' SPECIFIC MISSION RU	
1		•	*	
RULE	CONDITION/MALFUNCTION			CUES/NOTES/COMMENTS

TAULE !					RULING		OTES/COMMENTS
30-19	DYSBARISM IN A	; Ny 'L	AUNCH	14.	CONTINUE MISSION	A.l.	CHECK SUIT INTEGRITY.
	CREWMAN			; ,	REW MAY ELECT TO	2.	IF CONDITIONS PERMIT CREW M TO OVER- PRESSURIZE.
			•		NTOLERABLE	(A)	ALL THREE SUITS CONNECTED
						•	IRCUIT. SUIT DEMAND REG TO PRE
						POSITIO	ON '
						REACH	MONITOR SUIT PRESS (SHOUP PSIA IN 75 SEC).
						' SEL VAL	SELECT SUIT DEMAND REG INL LVE TO OFF WHEN SUIT PRE S 9.0 PSIA.
							MAINTAIN SUIT OVERPRESSUNING INLET SELECTOR VALVE
						DEMAND	E RELIEF FUNCTION REGULATOR IS ISOLATED WHITH THIS PROCEDURE.
		· ·	LL	B• T	ERMINATE PHASE		MCC SURGEON WILL EVALUATE A
					ENTER NEXT BEST PI	P TERMIN	RECOMMEND EARLY MISSION ATION IF CORRECTIVE ACTION FECTIVE.
				:		•	
30-20	ORAL TEMP EXCE 101 DEG F. DES CORECTIVE ACTI	PITE '				MISSIO	SURGEON MAY RECOMMEND EAR N TERMINATION IF TREATMENT ESSFUL.
	A. IF DUE TO I	LLNESS	AUNCH	A.1	NOT APPLICABLE	• • • • • • • • • • • • • • • • • • •	
			LL	2.	TERMINATE PHASE		
		1		•	ENTER NEXT BEST	PTP ;	
	B. IF RESULTAN THERMAL OVERLO	AD '		•	NOT APPLICABLE	. • • • • • • • • • • • • • • • • • • •	
		;^	LL	, 2	TERMINATE PHASE	:	
				1	ENTER NEXT BEST	PTP	
		:		;		•	
	RULE NUMBERS 3 Through 30-24 Reserved.			! !		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
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MISSION RULES

REV ITEM

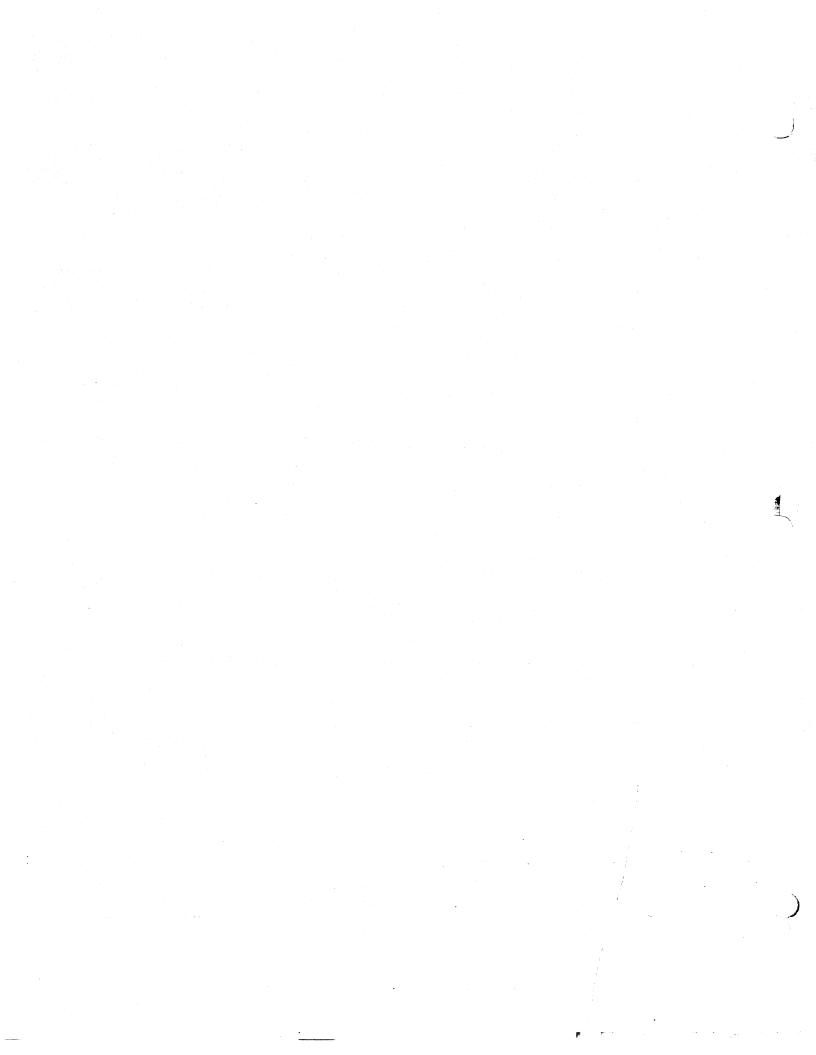
R RULE	CONDITION/MALFUNCT		E '	RULING	' CUES	/NOTES/COMMENTS
30-25	INCREASE IN PCO2 A. IS GREATER THAN OR EQUAL TO 7.6 MM HG		A.1.	. CONTINUE MISSI	ON HG W	PCO2 SHOULD DECREASE BELOW 2 M
1	7.66 MM HG	ALL	2	. CONTINUE MISSI	ON	
		•		CHANGE LIGH CAN	NISTER!	
1	B. GREATER THAN OF EQUAL TO	R LAUNCH	8.1	. CONTINUE MISSI	ON !	
	7.6 MM HG AND UNABLE TO DECREASE	:				
	DECREASE	ALL	. 2	. CONTINUE MISSI		LIOM CANISTERS WILL NOT B GED IN AN UNPRESSURIZED CABIN.
		•		(A) OPEN SUITS BREATHE FRO CABIN	AND '	or in the control of the capture
		•	•	(B) CHANGE SECOLUTION CANIS		
				(C) TEST PCO2	SENSOR! B.2.	(C) PCO2 SENSOR TEST
					' DISC	ISOLATE SUIT CIRCUIT B ONNECTING SUIT HOSES FROM TH ECRAFT
		•				SUIT CIR RET AIR VALVE CLOSED
		1 . 1 .			OPEN	CRACK 02 METERING VALVE T
			•			PURGE FOR 30 SECONDS
		•				CLOSED 02 METERING VALVE
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	•		1 A PC	IF ABOVE PROCEDURE RESULTS I O READING NEAR ZERO, THE PCO OR IS OPERATING PROPERLY
			•			
	C. GREATER THAN OF EQUAL TO 10 MMHG			CONTINUE MISSIC		
				ENTER NEXT BEST	T PTP	
	the state of the state of	:				
30-26	PCO2 INSTRUMENTATION	ALL	CONT	TINUE MISSION		
	FAILURE	•	USE	ONBOARD COZ TAPE	ES !	
			•			
	RULE NUMBER 30-27 Through 30-34 Are Reserved.	•				
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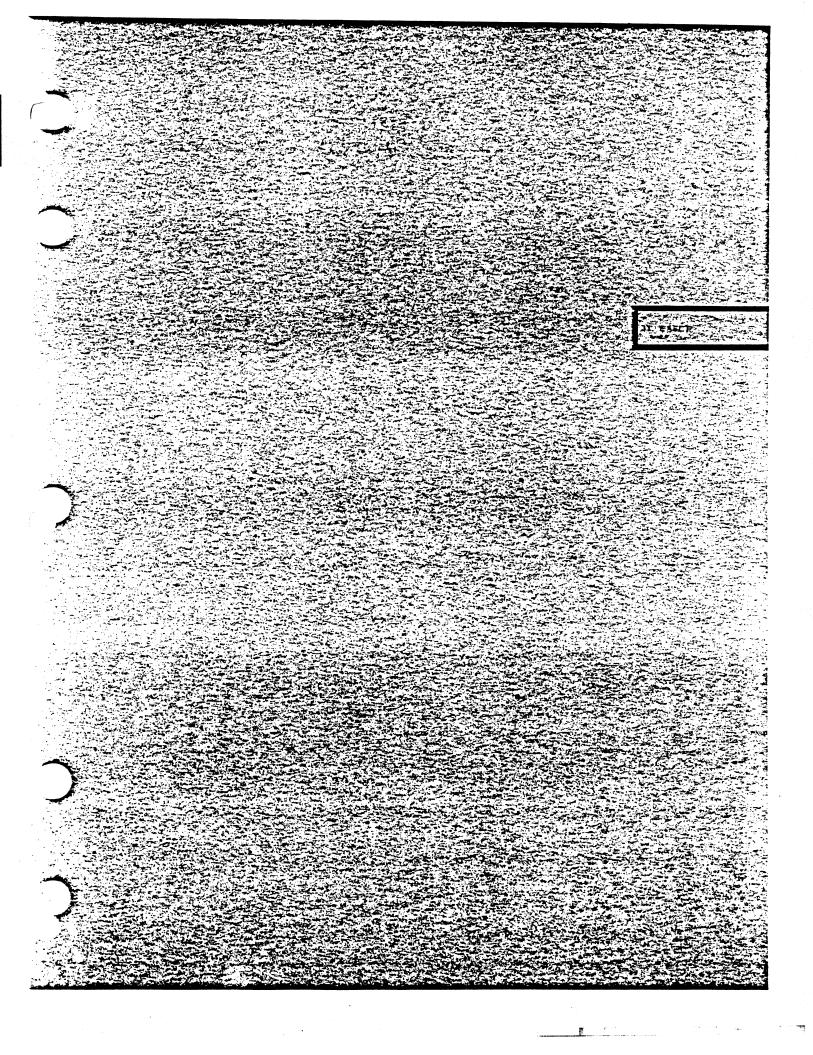
MISSION RULES

REV ITEM SECTION 30 - AEROMEDICAL - CONCLUDED

		' INSTRU	MENTATION REQUIREME	ENTS '		
	CSM	***************************************				
30-35	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE
	ELECTROCARDIOGRAM	C700607	NOT DISPLAYED		Me	30-15/16
	ELECTROCARDIOGRAM	CJ0061J	NOT DISPLAYED		Me	30-15/16
	ELECTROCARDIOGRAM	CJ0062J	NOT DISPLAYED		M®	30-15/16
	CO2 PARTIAL PRESSURE	CF0005P	METER	COMMON	нр	30-2/27/28
	SUIT CABIN DELTA PRESS	CF0003P	NOT DISPLAYED		HD	30-3/19
	ORAL TEMPERATURE		CLINICAL THERMOMETER		M+	30-20
	PNEUMOGRAM	CJOZOOR	NOT DISPLAYED		но	30-17
	PNEUMOGRAM	CJ0201R	NOT DISPLAYED		HD	30-17
	PNEUMOGRAM	CJ0202R	NOT DISPLAYED		HD	30-17
	LM					
	COZ PARTIAL PRESSURE	GF1521P	METER		HD	
	ELECTROCARDIOGRAM	GT9999	NOT DISPLAYED		HD	30-15/16
	PNEUMOGRAM		NOT DISPLAYED		HD	30-17
	PLSS				•	
	PLSS ELECTROCARDIOGRAM	GT8124J			M	30-15/16
	+MANDATORY TO CABIN CLO	SEOUT				
	EVA RULES NOT INCLUDED					
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REV ITEM

GENERAL 31-1 A. GENERAL 1. "THE SATURENUM OF SCIENTIFIC DATA WILL NOT BE COMPROMISED FOR ENGINEERING OR TEST THE THE THE THE STATE OF THE THE THE THE STATE OF THE THE THE STATE OF THE THE STATE OF THE THE STATE OF THE STATE	_	,	T									
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MISSION RULES

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		• FOR P	ROPER C	PERAT	ION OF	THE PSE	• THE	FEEDBACK FI	LTER MUS	T BE IN	THE
l		LOOP	BY CMD	101 P	SE FILTE	R IN/OUT	OUND COM	MANDED IN AN	D OUT OF	THE FEED	DBACK
		٨.	LEVELIA	NG MOT	OR MODE	OF ANY K	IND - FI	LTER OUT			
		8.	LONG PE	ERIOD	CALIBRAT	ION - FI	LTER IN				
						ODE - FIL					
	5	. THE X	-AXIS A	AND Y-	AXIS MAS	SES OF TH	HE PSE M	UST BE LEVEL	ED BEFOR	E THE Z-	-AXIS
	6	• REFER	TO STA	NDARD	OPERATI	NG PROCES	DURE	FOR PSE LEV	ELING PRO	CEDURES.	
	7	. THE P	SE SENS	SOR HE	ATERS MU	IST BE OF	F DURING	OPERATION	OF THE	PSE LEVE	ELING
		• PS APPRO	E WILL	BE Y ONE	PLACED (1) HOU	IN STB	Y-SELECT	CONDITION.	BY GRO	JND COMM	AAND.
	l										
	RULES	31-2 THRU	j								
	31-9 A	RE RESERV	ED								
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REV ITEM

4	RULE '	CONDITION/MALFUNCTION			RUL I NG	, cr	ES/NOTES/COMMENTS
-	•					;	
	31-10	FAILURE OF PCU	 	A	F PCU 1 IS ACTIVELECT PCU 2.	/E. 'OF	CUE PCU QUTPUT VOLTAGES AR F NOMINAL AND SCIENTIFIC DATA I ING LOST.
						TO	AUTOMATIC SWITCHOVER FROM PCU PCU 2 SHOULD OCCUR WHEN THE +1 C BUS VARIES +1 VDC.
1				B• 1	F PCU 2 IS ACTIV	/E	CMD 062+ PCU 2 SELECT.
					• VERIFY THAT SCIENTIFIC DAY BEING LOST•	•	CMD 060. PCU 1 SELECT.
					• VERIFY THAT TO FAILURE OF POL INEVITABLE•		
				1	F ABOVE COND: ARE MET. SELECTION OF THE PCU 1.	TIONS	
						1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
		RULES 31-11 THRU))				
1		31-19 ARE RESERVED		•			
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MISSION RULES

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RULE '	CONDITION/MALFUNCTION'	PHAS	SE !	RULING	• C	JES/NOTES/COMME	
31-20	ANY THERMAL PLATE TEMPO EXCEEDS DEG F.		STAT	SIPATION VS. SHUN RENT TO DETERMINE	ER	EDUCES HEAT GE EDUCING INTERNA NO MINIMIZES TH LU HIGH AND LOW MUNT CURRENT HI RAPH OF INTERNA S. PCU LOAD VAILABLE. TH ASSUREMENTS ARE T-6. AND AT-7.	ADJUSTMENT WHICH NERATION (E.G B L POWER DISSIPATION E RISK OF EXCEEDING LOAD LIMITS (ALSO GM AND LOW LIMITS) L POWER DISSIPATION COULD BE USED [1] ERMAL PLATE TEMP AT-3. AT-4. AT-5 PDR NO. 1 DISSIPATE . 2 DISSIPATES [1]
			•	• TRANSMITTER OF	•		
	RULES 31-21 THRU 131-29 ARE RESERVED.		•				• • • • • • • • • • • • • • • • • • •
	•						
						·•	$\frac{1}{2} \left(\frac{1}{2} \int_{\mathbb{R}^{n}} dx dx dx \right) = \frac{1}{2} \left(\frac{1}{2} \int_{\mathbb{R}^{n}} dx dx dx \right)$
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RULE '					RULING		DTES/COMMENTS
1 :		•		•		•	
31-30	EASEP FAILS RESPOND TO A	TO !		1	REINITIATE THE CM	' AND NO	NO FUNCTIONAL VERIFICATION CMD VERIFICATION WORD (CVW)
				' 0	THER DECODER (ALS	SELECT ' SEP 2A ' VER!	FY THAT THE RECEIVER CB H
		1	•		R 28) AND REINIT! HE CMD.		
				c. ;	F UNSECCESSFUL. S	SEND I NO FUNC	RE' CMD SHOULD YIELD CVW b TION. CMD 150, 153, 154, A SPARE CMDS.
1				D. 1	F UNSECCESSFUL. S	SWITCH ' CMD	034 PROCESSOR 'X' SELECT.
		• • • • • • • • • • • • • • • • • • •		•	S STILL SATA FROM		035 PROCESSOR 'Y' SELECT.
		•		•			
	RULES 31-31 31-39 ARE RE			,			
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MISSION RULES

PLV ITEM

R ·	RULE	CONDITION/MALFUNCTION'	PHASE	,	RULING	' CUES/NOTES/COMMENTS
-	1			;		,
	31-40	LOSS OF DOWNLINK CARRIER.		۸.	SELECT OTHER TLM TRANSMITTER.	GROUND STATION VERIFIES THAT LOSS OF TLM CARRIER IS NOT FAILURE IS GROUND SYSTEMS. SELECTION OF
			•	'B.	IF NO EFFECT SEITRANSMITTER ON CMD	ND 'ALTERNATE TRANSMITTER WILL RESET
						CMD 012 TRANSMITTER'A' SELECT.
l				•		CMD 015 TRANSMITTER 'B' SELECT.
		1				CMD 013 TRANSMITTER ON.
				1		
	31-41	LOSS OF DOWNLINK MODULATION.			SELECT OTHER DATA PROCESSOR.	GROUND STATION VERIFIES LOSS OF MODULATION ON THE CARRIER.
1		1			IF NO EFFECT SEL	
1				•	OTHER TEM TRANSMIT	CMD 035, PROCESSOR 'Y' SELECT.
1				•		CMD 012. TRANSMITTER 'A' SELECT.
						CMD 015. TRANSMITTER 'B' SELECT.
	31-42	UNABLE TO RETAIN 'NORMAL BIT RATE. '			SEND NORMAL BIT RAT	E LSM DATA IS MEANINGLESS IN LO
					IF UNSUCCESSFUL. SE	
١					NORMAL BIT RATE RES CMD.	CMD 011. NORMAL BIT RATE RESET
					IF UNSUCCESSFUL, SI	ELECT ' DR. ' CMD 034. PROCESSOR 'X' SELECT
					IF UNSUCCESSFUL, RI	
	-					
	31-43	LOSSES EVERY TEN			SWITCH TO REDUNDANT	BIT ERROR RATE. INDICATION OF
		(10) SECONDS.		в.	IF UNSUCCESSFUL SWITCH TO REDUNDAN	' MALFUNCTION WILL BE EVENT LIGHT. ' THIS ACTION ASSUMES NO GROUN ' STATION MALFUNCTION.
1		•		- ;	DATA PROCESSOR.	
					IF UNSUCCESSFUL SELECT LOW BIT RATE	LOW BIT RATE IS 530 BPS RATE NOTE THAT LSM DATA WILL BECOM MEANINGLESS.
l						CMD 012+ TRANSMITTER 'A' SELECT
						CMD 015. TRANSMITTER 'B' SELECT
						CMD 034. PROCESSOR 'X' SELECT
1						CMD 035. PROCESSOR 'Y' SELECT
-				i		CMD 007+ LOW BIT RATE SELECT
-						
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REV ITEM

RULE	CONDITION/MA	LFUNCTION	PHASE	! RUL	Ing '	CUES/NOTES/COMME	NTS
31-44	DATA DEMAND FROM DATA P FAILS—HIGH	SIGNAL ROCESSOR		SWITCH TO RED PROCESSOR. US OTHER DECODER		PATTERN OTHER TH	ICATION WORD (CV CATING AN ERRONEO AN ALL ZEROS (C •6 SECONDS) AFTER
						OPERATION FROM L	PROCESSOR WAS OG DATA (NO TM POI
		•				DISPLAYED).	ESSOR 'X' SELECT
				•	•		ESSOR 'Y' SELECT
				• • • • • • • • • • • • • • • • • • •			
	RULES 31-45	THRU !		•			
	31-49 ARE R			•	•		
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MISSION RULES

REV ITEM

R	RULE	CONDITION/MALFUNCTI	ON' P	HASE '	RULING	,	CUES/NOTES/COM		
	:		• •			:			
	31-50	FAILURE OF AUTOMAT PSE LEVELING MODE	ıc	· · · · · · · · · · · · · · · · · · ·	UAL LEVELING OF	THE PSE	SWITCH TO THE IS A 2-STATE C	ION PRESETS LEVELING TIC. CMD 103 WILL MANUAL MODE. CMD 103 MD. PSE LEVELING MODE	
							AUTO/MANUAL.		
	31-51	PSE LEVELING MOTOR FAILS ON		'STA	ERNATELY GND CMD NDBY SELECT AND T RATE SELECT.	PSE TO		COMMAND PSE LEVELING	
			•				CUES LEVI	ELING MOTOR WILL DRAW ESERVE POWER.	
			. t				CMD 037.	EXP 1 (PSE) STANDBY	
							CMD 036. SELECT.	EXP 1 (PSE) OPERATE	
	31-52	FAILURE OF PSE LEVELING MOTOR - OF	· F	, NO	ACTION CAN BE TAK	KEN•	MADE TO TURN	DROP IN RESERVE POWER (TS) WHEN ATTEMPT IS MOTOR ON, AND NO	
		•					ACTIVITY ON S	SHORT PERIOD Z-DATA	
	31-53	FAILURE OF	•	! ! !SEL	ECT LOW SPEED AND	i i HIGH I	CUESTO NO I	OTION OF THE PLATFORM	
		FAILURE OF MECHANICAL LEVEL DRIVE		'SPE	ED AND DIRECTION ERSALS ALTERNATED	•	CAN BE DETECT	D ON THE OTHER LP	
			:				X-MOTOR ON/	DFF - CMD 070	
							Y-MOTOR ON/	DFF - CMD 071	
				•			Z-MOTOR ON/	OFF - CMD 072	
			1, 1	9			DIRECTION P	US/MINUS - CMD 074	
						1	SPEED LOW/H	GH - CMD 075	
	31-54	MISALIGNED COARSE SENSOR	•	•	MOTOR IS IN LEVELING OPERATION.		WHILE IN FINAL LEVELING PHASE (LOW STEPPING RATE). THE MOTOR REVERTS TO A HIGH STEPPING RATE REPEATEDLY WITHOUT ACHIEVING CENTERING.		
			•		REFERENCE PROCEDU FOR MANUAL LEVEL! THE PSE BY GROUND COMMANDS.	NG OF	WILL NEVER ALIC	SENSOR AND GIMBAL SNO AND THE MOTOR WILL WE BEYOND LEVELO	
			i			•	CMD 102, CO	ARSE SENSOR OUT.	
		•							
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REV ITEM

		PHASE	' RULING '	CUES/NOTES/COMMENTS
31-54			! !	CUES NO HIGH SPEED MOTOR
	LEVEL SENSOR		' LEVELING MODE	OPERATION IS MOTICED DURING INITIAL LEVELING PHASE AND COMPONENT DOE
		•	'B. GROUND COMMAND COARSE ' LEVEL SENSOR OUT.	' NOT CENTER WITHIN EXPECTED TIME. (4 ' MINUTES MAXIMUM IN AUTO MODE.)
			'C. PROCEED WITH MANUAL ' LEVELING FOR COARSE ' LEVELING. PROCEDURE	USE HIGH SPEED MANUAL LEVELING FOR COARSE LEVELING.
			D. USE AUTO MODE FOR FINE	' CMD 103. PSE LEVELING MOD ' AUTO/MANUAL.
			LEVELING. PROCEDURE .	CMD 102. COARSE LEVEL SENSOR OUT
31-56	LONG PERIOD COMPONENTS STICK		A. USE HIGH SPEED. MANUAL LEVELING IN DIRECTION WHICH PULLS MASS AWAY FROM STOP.	CUE FAILURE TO CENTER WITHIN EXPECTED TIME (40 MINUTES MAXIMUM IN AUTO MODE).
			LOW SPEED AND HIGH SPEE	' IF STEPS A AND B FAIL. L D' COMPONENT IS DEFECTIVE.
			AND DIRECTION REVERSALS ALTERNATELY.	NOTE DO NOT EXCEED LEVELIN
				X-MOTOR ON/OFF - CMD 070
				Y-MOTOR ON/OFF - CMD 071
				Z-MOTOR ON/OFF - CMD 072
				DIRECTION PLUS/MINUS - CMD 074
			• • • • • • • • • • • • • • • • • • •	SPEED LOW/HIGH - CMD 075
1				
31-57	ELECTRICAL FAILURE OF LONG PERIOD COMPONENT		'AFFECTED AXIS AFTER COARSE	CUE TIDAL OUTPUT IS WITHING RANGE. BUT IS NOT AFFECTED BUT LEVELING OR CENTERING DRIVE.
31-57	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-51	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-57	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-57	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-57	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-57	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-51	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-51	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-51	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-51	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-57	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-51	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
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31-51	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-57	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	'RANGE. BUT IS NOT AFFECTED B
31-57	OF LONG PERIOD '		'AFFECTED AXIS AFTER COARSE	

MISSION RULES

RIV ITEM

R	RULE	CONDITION/MA	LFUNCTION'	PHASE	,	RULING	' CUI	ES/NOTES/COMMENTS	
	31-58	FAILURE TO	1		•	TO UNCAGE ARM	i NOI	RMAL UNCAGING OF PSE ACCOMPLISM	
		PSE			•		BY M/FIRE. TWI	SENDING CMD 073 UNCAGE ARM/FII ICE, ONCE TO ARM AND ONCE TO FII E ACTUATOR CIRCUIT WHICH UNCAG	RE
			•	• .	•	2. IF UNSUCCESSFU FIRST 12-HOUR PULSE WILL ARM ACTUATOR.	TIMER	. SPRING MASSES. NOTE AT05 THERMAL PLATE	3
					1		' STA L. 96 ' BEF ES '	IP. PSE ELECTRONICS IN CENTRI ITION MUST BE ABOVE +25 DEG ORE UNCAGING IS POSSIBLE.	AL F
					•	CMD SEQUENCER ARM ACTUATOR.	WILL		
					•	TO UNCAGE FIRE (A) THE ACTUATOR HAS (ARMED)			
						1. SEND UNCAGE AR	M/FIRE.		
					•	<pre>2. IF UNSUCCESSFU! 12-HOUR TIMER (WILL FIRE THE ACTUATOR.</pre>			
						3. IF UNSUCCESSFU			
	31-59	AUTOMATIC SY OF PSE TO ST			OFF	CMD 037 EXPER STANDBY SELECT PSE HAS NOT BEEN (COMMAND EXPER.) COMMAND EXPER.	RIPPLED' IF L (PSE)' FRO ' PER ' SEL	CIRCUIT BREAKER CB-06 HAS OPENE M OVERCURRENT (500 MA +/- : CENT): STANDBY MODE WILL E ECTED AND THE CIRCUIT BREAKE L BE RESET AUTOMATICALLY:	10 Be
		* .			•		• •	CMD 036. EXPER. 1 OPERATE SELECT	T.
					1				•
					•				
	31-60	PSE GOES OFF IN STANDBY M			COMI	MAND EXPER• 1 (PSI RATE SELECT•	'EXT'INC	CUE EXP. 1 STDBY DISCRETINGUISHES. AND RESERVE POWER IS REMOVE MITTHE HEATERS. FUSE (F-03) MADABLY BEEN BLOWN BY OVERCURREN O MA). CAPABILITY TO SELECT PUNDBY MODE IS LOST.	ER ED AS NT
					• ;			CMD 036. EXPER. 1 OPERATE SELECT	۲.
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		100							
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			1			L	<u> </u>	31-10	

MISSION RULES

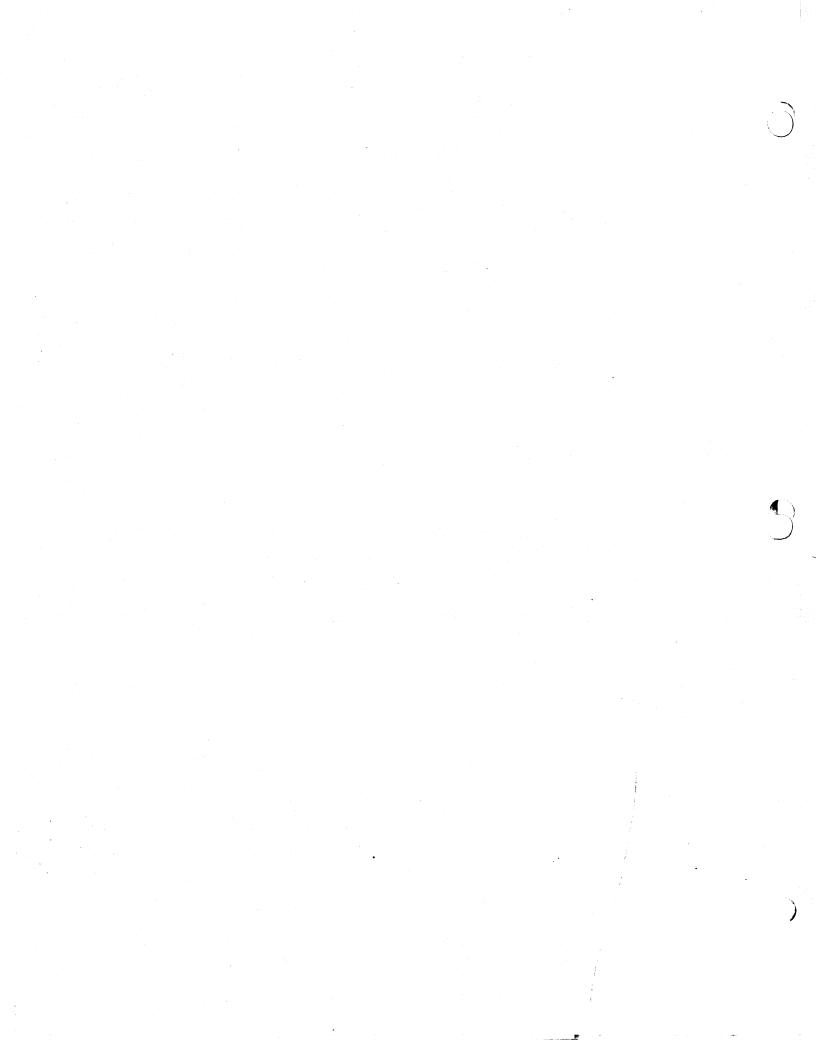
REV ITEM

SECTION 31 - EASEP

					' RULING '	CUES/NOTES/COMMENTS
	31 - 61	PSE INSTRUMEN HELOW 123 DEG			COMMAND HEATER TO MANUAL	ASSUME AUTOMATIC THERMOSTAT CONTROL FAILED. CMD 076 IS A 4-STATE CMD WHICH CAN SEQUENTIALLY STEP THROUGH THE FOLLOWING MODES TO CONTROL THE
						PSE SENSOR MEATER
						2. MANUAL HEATER ON
						3. OFF
						4. AUTOMATIC THERMOSTAT CONTROL
-						DL-07 PSE INSTRUMENT TEMP.
	31-62	PSE INSTRUMEN Exceeds 127 D			A. COMMAND HEATER OFF.	A CMD 076 IS A 4-STATE CMD WHICH CAN SEQUENTIALLY STEP THROUGH THE FOLLOWING MODES TO CONTROL THE PSE SENSOR HEATER
						1. OFF
						2. MANUAL HEATER ON
	-					3. OFF
	·					4. AUTOMATIC THERMOSTAT CONTROL ENABLED.
			•		1	DL-07 PSE INSTRUMENT TEMP.
					' PSE TO STANDBY . THEN	B. SELECTING PSE TO STANDBY WILL PREINITIALIZE TO AUTOMATIC THERMOSTA CONTROL.
			4ISSION	REV D	ATE SECTION GROUP	PAGE

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ACRONYMS AND



APPENDIX A - ACRONYMS AND SYMBOLS

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APPENDIX A - ACRONYMS AND SYMBOLS

	LIOH	LITHIUM HYDRO				-	SYSTEM LA			
	LET LGC LH2	LAUNCH ESCAPE LM GUIDANCE (LIQUID HYDRO)	E TOWI	ER	PGNCS PRIMARY GUIDANCE AND NAVIGATION CONTROL SYSTEM CSM PGNS PRIMARY GUIDANCE AND NAVIGATION					
	LBR LCG LES	LOW-BIT-RATE LIQUID COOLIN LAUNCH ESCAPI				PDS/DD PLOTTING DISPLAY SUBCHANNEL/DA' DISTRIBUTION PGA PRESSURE GARMENT ASSEMBLY				
1	LB	POUND				PCO2	STATION PARTIAL PRES	SSURE CARBON DIOXIDE		
	KSC	KENNEDY SPACE				PC PCM PCMGS	PERICYNTHION PULSE CODE			
	КОН	POTASSIUM HYC)ROX II	DE		PAFB PAM PB	PATRICK AIR PULSE AMPLIT PUSH-BUTTON	FORCE BASE TUDE MODULATION		
	۵۲	JET DRIVER				0.65		505-5		
						OXID	APOLLO LM OXIDIZER			
	IU	INSTRUMENTAT: INTRAVEHICULA				OPS ORDEAL	ORBITAL RATE	E SYSTEM E DRIVE ELECTRONICS		
	155	INERTIAL SUBS				OMSF		NNED SPACE FLIGHT		
	IRIG ISOL	INERTIAL RATE				ODOP OGA		ER AND POSITION		
	INV	INVERTER IMPACT POINT	OR II	MPACT PRE	DICTION	02 0/B	OXYGEN ONBOARD			
	LNI	INJECTOR INSTRUMENTATI	lon							
	IGA IMU	INERTIAL MEAS				124	CUELLIPHICAL	- MANEUVER		
	IC IGA	INTERCOMMUNIC			IENT	NPV NSR	NON-PROPULSIVE VENT COELLIPTICAL MANEUVER			
	ļ					NCC COMBINED CORRECTIVE MANEUVER NM NAUTICAL MILES				
	HZ	HERTZ				RONAUTICS AND SPACE				
	HS	HIGH-SPEED	- I GEE			NASA		ANALYIEE 112		
	HF	HIGH FREQUENCE HEIGHT OF PER	ZY.			=				
	HAW HBR	HAWAII HIGH—BIT—RATE	:			MTVC MUX		ST VECTOR CONTROL		
	H2O HA	HEIGHT OF APO	GEE			MSK MSTC		AFT TEST CONDUCTOR		
	H2 H20	HYDROGEN WATER				MSFN	MANNED SPACE	FLIGHT NETWORK		
	1.1					M&O MOC		AND OPERATION RATIONS COMPUTER		
		COLUMNIE OFF.	- 			MNFLD	MANIFOLD	AND OBSOLUTION		
	GTS GUIDO	GIMBAL TRIM S	SYSTEM			MITE		RUMENTATION TIMING		
	GRR GSFC	GUIDANCE REFE GODDARD SPACE				MGA . MIL	MIDDLE GIMBA MERRITT ISLA			
	GND	GROUND				MFV	MANUAL FUEL MAIN FUEL VA	LVE		
	GNC GNCS	GUIDANCE NAVI	GATIC		CONTROL SYSTEM	MESC	MASTER EVENT	'S SEQUENCE CONTROLLE		
	GSN GN2	GASEOUS NITRO	DGEN		•	MDAS MED	MEDICAL DATA MANUAL ENTRY	ACQUISITION SYSTEM POPULOE		
	GMTLO	GREENWICH MEA	AN TIP	ME OF LIF	TOFF	MC&W	MASTER CAUTI	ON AND WARNING		
	GETI GMT	GROUND ELAPSE GREENWICH MEA	AN TIN	ME		MCC MCC	MISSION CONT			
1	GET	GROUND ELAPSE	ED TIM	ME	. 1	MALF	MALFUNCTION			
	GDA GDC	GIMBAL DRIVE GYRO DISPLAY	ASSE	MBLY						
	GBI	ASSEMBLY Grand Bahama						Jan Jigh		
1	GASTA	GIMBAL ANGLE			SLATION	LVDA		LE DATA ADAPTER LE DIGITAL COMPUTER		
	G&C	GRAVITY GUIDANCE AND	CONT	ş0ı		L/V	LAUNCH VEHIC			
	1					L/R LV	LEFT/RIGHT LOW-VOLTAGE			
						LOX	LIQUID OXYGE			
	FQR FTP	FLIGHT QUALIF			DER	LOI	LUNAR ORBIT			
	FPS	FEET PER SECO	DND		nen.	L/0	LIFTOFF			
	FL FM	FULL LIFT FREQUENCY MOD	ULAT	ION		LMDE LMP	LM DESCENT E			

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APPENDIX A - ACRONYMS AND SYMBOLS

ITEM								
	PIPA	PULSE INTEGRATING PENDULOUS	SODB	SPACECRAFT OPERATIONAL DATA BOOK				
1 1		ACCELEROMETER	SOL	SOLENOID				
1 1	PLSS	PORTABLE LIFE SUPPORT SYSTEM	SOP	STANDARD OPERATING PROCEDURE				
1 1	PO	POWER OUT	SOV	SHUT-OFF VALVE				
1 1	POZ	PARTIAL PRESSURE OXYGEN	SPAN	SPACECRAFT PLANNING AND ANALYSIS				
	POS	POSITION	SPS	SERVICE PROPULSION SYSTEM				
	POS	PRIMARY OXYGEN SYSTEM	SRO	SUPERINTENDENT RANGE OPERATIONS				
	PPM	PARTS PER MILLION	SSC	SPACE SUIT COMMUNICATOR				
} !	POGS	PROPELLANT QUANTITY GAGING SYSTEM	STBY	STANDBY				
1 1	PRELN	PRELAUNCH	SW	SWITCH				
1 1	PRESS PRI	PRESSURE PRIMARY	SXT	SEXTANT				
1 1	PROC	PROCEDURE						
1 1	PROP	PROPELLANT						
1 1	PSA	POWER SERVO AMPLIFIER	TB	TIME BASE				
1 1	PSI	POUNDS PER SQUARE INCH	TBD TC	TO BE DETERMINED				
1 1	PSID	POUNDS PER SQUARE INCH DIFFERENCE	T/C	TEST CONDUCTOR				
1 1	PSS	PAD SAFETY SUPERVISOR	TCE	TELEMETRY AND COMMUNICATIONS				
1 1	PTA	PULSE TORQUE ASSEMBLY	TCP	CONDENSER EXHAUST TEMPERATURE				
	PTP	PREFERRED TARGET POINT	TDSE	THRUST CHAMBER PRESSURE				
1 1		The second secon	. 500	TRANSPORTATION, DOCKING AND EJECTION				
	PTV	PITCH THRUST VECTOR	TDP	TELEMETRY DATA PROCESSOR				
1 1	PU	PROPELLANT UTILIZATION	TELCOM	LM EECOM				
1 1	PUGS	PROPELLANT UTILIZATION AND GAGING SYSTEM	TEMP	TEMPERATURE				
	PVT	PRESSURE-VOLUME-TEMPERATURE	TEE	TIME OF FREE FALL				
	PYRO	PYROTECHNICS	THC	THRUST AND CONTROLLER				
			TIG	TIME OF IGNITION				
1			TLI	TRANSLUNAR INJECTION				
	QTY	QUANTITY	TM	TELEMETRY				
			TMG	THERMAL METEROID GARMENT				
			TNK	TANK				
			TOK	THRUST OKAY				
1 1			TPF	TERMINAL PHASE FINALIZATION				
] }	RAD	RADIATOR	TPI	TERMINAL PHASE INITIATE				
1 1	RET	RETRACT	TRNS	TRANSFER				
	RCS	REACTION CONTROL SYSTEM	TRUN	TRUNNION				
	RCU	REMOTE CONTROL UNIT	TTC	TRANSLATION THRUST CONTROLLER				
	RCVR	RECEIVER	TTY	TELETYPE				
	REF	REFERENCE	TVC	THRUST VECTOR CONTROL				
		REFERENCE STABLE MEMBER MATRIX						
	REGD RETRB	REGUIRED RETRO ELAPSED TIME TO REVERSE B	11.40	118 / 5 OWN				
	RETRO	RETROFIRE OFFICER	UZD	UP/DOWN				
1 1	REV	REVOLUTION	UDL	UPDATA LINK				
(1	RF	RADIO FREQUENCY	UMF	ultra High Frequency undocked				
1	RFO	RETROFIRE OFFICER	USB	UNIFIED S-BAND				
	RGA	RATE GYRO ASSEMBLY						
	RHC	ROTATION HAND CONTROLLER	VC	VELOCITY COUNTER				
1 1	RIP	RANGE OF IMPACT POINT	VEI	INERTIAL VELOCITY AT ENTRY				
1 1	RL	ROLL LEFT	VGX	VELOCITY TO BE GAINED X-AXIS				
1	RNDZ	RENDEZVOUS	VGY	VELOCITY TO BE GAINED Y-AXIS				
1 1	RP-RT	DOWNRANGE ERROR	VGY	VELOCITY TO BE GAINED 2-AXIS				
1 1	RR	RENDEZVOUS RADAR	VHF	VERY HIGH FREQUENCY				
	RR	ROLL RIGHT	VLV	VALUE				
, 1	RSI	ROLL STABILITY INDICATOR	VSM	VIDEO SWITCHING MATRIX				
	RSO	RANGE SAFETY OFFICER	-	· · · · -				
	RSVR	RESOLVER						
1	RTACE	REAL-TIME AUXILIARY COMPUTING FACILITY	WBD	WICE-BAND DATA				
1 1	RTC	REAL-TIME COMMAND	WMS	WASTE MANAGEMENT SYSTEM				
1	RTCC	REAL-TIME COMPUTER COMPLEX	WT	WEIGHT				
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. 1	5/C	SPACECRAFT	XFEED	CROSSFEED				
	SCE	SIGNAL CONDITIONING EQUIPMENT	XMIT	TRANSMIT				
	SCS	STABILIZATION AND CONTROL SYSTEM	XMTR	TRANSMITTER				
1 1	SEC	SECONDARY						
1 1	SEC	SECOND		;				
1 1	SEC0	SUSTAINER ENGINE CUTOFF S-IVBCUTOFF	Y	YAW OR Y-AXIS				
	SECS	SEQUENTAL EVENTS CONTROL SYSTEM	YTV	YAW THRUST VECTOR				
1 1	SHE	SUPER-CRITICAL HELIUM						
	SIG	SIGNAL	,	7-4716				
	SLA	SPACECRAFT LM ADAPTER	2	Z-AXIS				
		SATURN LAUNCH VEHICLE						
	SLV	SERVICE MODULE						
	SLV SM	SERVICE MODILIE IETTICON CONTROL ER						
	SLV	SERVICE MODULE JETTISON CONTROLER						
	SLV SM	SERVICE MODULE JETTISON CONTROLER	•					
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	RELIABILITY AND CERTIFICATE	HAGE,						
	KSC/HY VAUGHN, N.B.							
	MSC/SA FRENCH, J.C. SF/GREENWELL, D.							
		OFFICE	OFFICE MANNED SPACEFLIGHT					
	FLIGHT SAFETY OFFICE	MSFC/I	-MO-MGR, MISSION OPERATIONS OFF	ICE (30)				
	EX2/REDD, B.			•				
- A	PAVLOSKY, J.E. EX/SILVERIA, M.	МДРСНД	LL SPACE FLIGHT CENTER					
	WEISS, S.P.		OPRESTI, R. (10), R1047 MSOB					
	ES12/GLYNN, P.C.		RSE, A.E. SSION DIRECTOR'S OFFICE, R3121 I	NSO BLDG				
1	ES3/STROUHAL, G. ES127/SMITH, J.		BEASON, W.P.					
	ES/CHAUVEN, L.		MAN, R. (3) 2/CLARK, B.					
1	OWENS, S. TROUT, B.	IN/SEN	DLER, K. (5)					
	EP5/BELL, D.		/MOORE, A.H. (6)					
1	LAMBERT, C.H. EP4/KARAKULKO, W.		N1/GROVIER, P.M. (2) RK, R.L. (5)					
	HAMMOCK, W.R.	MDC, 2	7B12/SHAFFER, J.R. (2)					
	HUMPHRIES, C.E.		M16/WEAVER, R.A. (2)					
	EP/MCSHEEHY, R. EP2/TOWNSEND, N.A.	TPC 7	MARS, C.B. (4) L15/PARK, J.E. (2)					
1	SHELTON, D.H.		-1/GASKINS,.R.B. (4)					
	KURTEN, P.M.		/FANNIN, L.E. LIAMS, J.J.					
	EG42/RICE, G. (2) EG43/LEWIS, R.E.		/EDWARDS, M.D.					
- 1	WASSON, C.	LV-GDC	/LEALMAN, R.E.					
	EG23/COX, K.J., DR. EG25/HANAWAY, J.		-1/HART, J.J. -4/YOUMANS, R.E.					
-	EG/KAYTON, M.	LV-ENG	/RIGELL, I.A.	. •				
	EDMISTON, C.R.	LV/GRU	ENE, H.					
ĺ	EE12/LUSE, M.B. EE13/TREMONT, R.		/DONNELLY, P. -2/KNIGHT, G.W. (2)					
- 1	GIESECKE, R.L.	KAP	YRAN, W.J.					
1	WALTER, R.T.		/BLACKWOOD, H. (2) RONE, R.A.					
-	DIETZ, R.H. FENNER, R.G.		/BEDDINGFIELD, S.					
	COMPOS, A.B.	AS-SAT	/BARNETT, V. (2)					
	ROTRAMEL, F.		BUS, K., DR.					
	JOHNSON, G. MUFORD, R.E.		Y SPACE CENTER, FLORIDA HO/ASTRO OFF (6)					
	EE4/RIEGERT, D.	VELACE	V CDACE CENTED TO A CO.					
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	ED14/LAUTEN, W.	REOUTR	EMENTS SECTION					
	TUCKER, E.M. EC9/STUTESMAN, H.L.		FLIGHT OPERATIONS DIVISION,					
ĺ	EC3/GILLEN, R.J.	CODE 8	21.1					
	DEVELOPMENT (CONTINUED)	KNOX.	C.B. (9)					
	DEVELOPMENT (CONTINUED)	GODDAR						

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CHANGE CONTROL

Francis Co.

MISSION RULES

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APPENDIX C - CHANGE CONTROL

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		•					CHANGE CONTROL					
		1.0	INTRODU	ICTION	•							
		1.1	PURPOSE	•								
		THE PURPOSE OF THIS APPENDIX IS TO DELINEATE CHANGE CONTROL PROCEDURES FOR THE AS-505/106/LM-4										
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MISSION RULES

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