

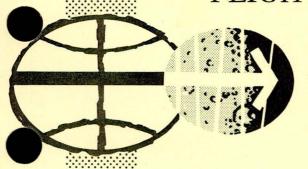
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FINAL FLIGHT MISSION RULES

APOLLO 10 (AS-505/106/LM-4)

APRIL 15, 1969

PREPARED BY FLIGHT CONTROL DIVISION



MANNED SPACECRAFT CENTER HOUSTON, TEXAS

> FOR NASA/DOD INTERNAL USE ONLY INCLUDING APPROPRIATE CONTRACTORS

FINAL FLIGHT MISSION RULES

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REVISION A

PREFACE

THIS DOCUMENT CONTAINS REVISION A TO THE FLIGHT MISSION RULES FOR APOLLO 10 AS OF APRIL 23, 1969. REVISION A IS A PAGE CHANGE REVISION AND THE PAGES SHOULD BE INSERTED IN ACCORDANCE WITH THE REVISION INSTRUCTION SHEET WHICH FOLLOWS THIS PAGE. THIS AND ALL SUBSEQUENT REVISIONS TO THIS DOCUMENT WILL BE PRINTED ON DIFFERENT COLORED PAGES FOR EASY RECOGNITION.

IT IS REQUESTED THAT ANY ORGANIZATION HAVING COMMENTS, QUESTIONS, OR SUGGESTIONS CONCERNING THESE MISSION RULES CONTACT MR. JOHN H. TEMPLE, FLIGHT CONTROL OPERATIONS BRANCH, BUILDING 45, ROOM 635, PHONE HU3-2267.

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, JK.

DIRECTOR OF FLIGHT OPERATIONS

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CSM APOLLO 10 FINAL MISSION PULES	ABORT LAI NGI FO R LOSS OF:	INHUBITATLE FOR LOSS OF:	CONSTINER TIC ABORT FOR LOSS OF:	INHIBIT LOT FOR LOSS OF: *(See foot note)	DO EARLY TEL FOR LOSS OF: *(See foot note)	INDOCK OR RNDZ FOR LOSS OF:	SAVE DPS/APS FOR LOSS OF:
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о ₂ н ₂		X X	X		X	X	X
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INVERTERS BTRY CHROER		X (2 of 3)	X (2 of 3)	X (2 of 3) X (+ SUM OF 2 BATTS)	X (2 of 3) X (+SUM OF 2 BATTS)	X (2 of 3) X (+SUM OF 2 BATTS)	X (2 of 3)
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TRANSLATION CAP BMAGS	ļ	X (BOTH) IN ANY	- 7	X (ULLAGE)	X (P + Y) X (ULLAGE) X(BOTH IN ANY AXIS)	X (ANY AXIS) X (ANY AXIS) X (BOTH, IN ANY	
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SOURCE HELIUM		X X		X X	X + X	& •	\$
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PRĒVIOUS PERF			v (3 - 3 - 1	; X	Х	Х	
SOURCE HELIUM QUADS THRUSTERS		X (1 of 4) X (1P,1Y or 2R)	X (1 of 4)	X (1 of 4) X (2P or 2Y, 1P or 1Y +	X (1 of 4) 1P + 1Y, 2R, 3Ri	X (1 of 4) X (ANY 1)	X (2 of 4)
DOCKING LATCHES DOCKING MECH N ₂ BOTTLES				X (4 of 12)		X (9 of 12) Ø (BOTH) X (3 SQUIBS)	X (2 of 4)
SOURCE HELIUM MFLD PRESS ARMED	X BOTH RINGS X WHILE MODE 1	X (1 of 2) X (1 of 2) X	X (1 of 2) X (1 of 2) X	X (1 of 2) X (1 of 2) X	X (1 of 2) • X (1 of 2) • X •	X (1 of 2) • X (1 of 2) • X •	**************************************
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O - STILL UNDER DISCUSSION

- * DEPENDS UPON REALTIME UNDERSTANDING OF FAILURE MODE
- FOR THESE ITEMS, EARLY TEL WILL BE DELAYED A REASONABLE TIME PENDING COMPLETION OF VARIOUS L/O ACTIVITY.

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	, ;	SUIT INTEGRITY	х	Х	:	X			х		
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		EXPED CONFIG THE D	ITE THE DECI: GURATION, SY: IRECTOR OF FI	PROCEDURAL STATEMENTS WHICH PROVIDE FLIGHT SION-MAKING PROCESS. THE RULES ARE BASED STEMS OPERATIONS AND CONSTRAINTS, FLIGHT (LIGHT OPERATIONS, MANNED SPACECRAFT CENTER R THE PREPARATION, CONTENTS, AND CONTROL (ON AN ANALYSIS OF MISSION EQUIPM CREW PROCEDURES, AND MISSION OBJU R, HOUSTON, TEXAS, HAS THE OVERAL	MENT ECTIVES.
		PHILO:	SOPHIES USED	BE CATEGORIZED AS GENERAL AND SPECIFIC. IN THE DEVELOPMENT OF THE FLIGHT MISSION A FROM WHICH REAL-TIME DECISIONS ARE MADE	RULES. SPECIFIC MISSION RULES !	PROVIDE
		A. T	HE CONDITION,	MALFUNCTION COLUMN DEFINES THE FAILURE.		
		в. т	HE PHASE COL	UMN IDENTIFIES THE TIME INTERVAL IN WHICH	THE CONDITION/MALFUNCTION OCCUR	s .
				LUMN DEFINES FLIGHT CONTROLLER ACTION AND, HE CONDITION.	OR PROCEDURES THAT MUST BE ACCOM	MPLISHED AS
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		OMSF GENERAL RULES
	I-1	MISSION RULES ARE EFFECTIVE DURING THE LAUNCH COUNTDOWN, FLIGHT AND RECOVERY OPERATIONS, AND DURING PRELAUNCH TESTS WHEN APPLICABLE. THEY ARE BASED ON PRIMARY OBJECTIVES AS STATED IN THE APOLLO FLIGHT MISSION ASSIGNMENTS DOCUMENT M-D MA 500-11. PROPOSED CHANGES TO THE PRIMARY OBJECTIVES STATED IN THE MISSION ASSIGNMENTS DOCUMENT SHALL REQUIRE AA/MSF APPROVAL.
	I-2	THE DIRECTOR OF FLIGHT OPERATIONS AND THE DIRECTOR OF LAUNCH OPERATIONS OR THEIR DESIGNATED REPRESENTATIVE WILL INSURE COORDINATION OF THEIR RESPECTIVE MISSION RULE CHANGES WITH THE MISSION DIRECTOR AND OTHER APPROPRIATE ORGANIZATIONS.
	1-3	FOLLOWING THE CDDT OR FRT, WHICHEVER OCCURS FIRST, MISSION DIRECTOR APPROVAL AND CONCURRENCE WILL BE REQUIRED ON ALL RULES CHANGES AFFECTING SAFETY, ACCOMPLISHMENT OF TEST OBJECTIVES, DEVIATIONS FROM THE NOMINAL MISSION AND PRELAUNCH CONSTRAINTS. CONCURRENCE MAY BE OBTAINED VERBALLY IF TIME CONSIDERATIONS SO DICTATE.
	1-4	DURING THE CONDUCT OF THE MISSION, THE MISSION DIRECTOR WILL BE ADVISED OF ALL RECOMMENDATIONS THAT INVOLVE CHANGES TO: MISSION OBJECTIVES, MISSION RULES, FLIGHT PLAN CONTENT, OR LAUNCH/FLIGHT SAFETY.
	I-5	WITHIN THEIR RESPECTIVE AREAS OF RESPONSIBILITY, THE COMMAND PILOT, THE LAUNCH DIRECTOR, FLIGHT DIRECTOR, DOD MANAGER FOR MSF SUPPORT OPERATIONS, AND THE MISSION DIRECTOR MAY TAKE OR RECOMMEND ANY ACTION REQUIRED FOR OPTIMUM CONDUCT OF THE MISSION.
	1-6	THE COMMAND PILOT, SPACECRAFT TEST CONDUCTOR, LAUNCH VEHICLE TEST CONDUCTOR, SPACE VEHICLE TEST SUPER-VISOR, LAUNCH OPERATIONS MANAGER, LAUNCH DIRECTOR, FLIGHT DIRECTOR, DOD MANAGER FOR MANNED SPACE FLIGHT SUPPORT OPERATIONS, OR THE MISSION DIRECTOR MAY REQUEST A HOLD FOR CONDITIONS WITHIN THEIR RESPECTIVE AREAS OF RESPONSIBILITY.
	1-7	DURING THE COUNTDOWN, THE LAUNCH VEHICLE AND SPACECRAFT PROGRAM MANAGERS AND RESPECTIVE CENTER OPERATIONS MANAGERS SHALL PROVIDE TECHNICAL ADVICE AND SUPPORT DIRECTLY TO THE LAUNCH OPERATIONS MANAGER AND LAUNCH DIRECTOR. THE LATTER TWO WILL KEEP THE MISSION DIRECTOR FULLY INFORMED OF PROBLEMS AND PROPOSED SOLUTIONS. DURING THE FLIGHT PHASE OF OPERATIONS, SIMILAR SUPPORT AS REQUIRED WILL BE PROVIDED TO THE FLIGHT DIRECTOR AND THE MSC DIRECTOR OF FLIGHT OPERATIONS. THE MISSION DIRECTOR WILL BE KEPT FULLY INFORMED BY THESE INDIVIDUALS OF PROBLEMS AND PROPOSED SOLUTIONS DURING THE APPLICABLE PHASES OF THE MISSION.
	1-8	WHEN TIME PERMITS, THE FAILURE OF A MANDATORY OR HIGHLY DESIRABLE ITEM WILL BE REPORTED TO THE MISSION DIRECTOR BY THE LAUNCH DIRECTOR OR THE FLIGHT DIRECTOR. THE INITIAL REPORT WILL INCLUDE THE POSITION OR FACILITY THAT DETECTED THE MALFUNCTION. SUBSEQUENTLY, THE MISSION DIRECTOR WILL BE INFORMED OF ESTIMATED TIME TO REPAIR AND RECOMMENDED PROCEED, HOLD, RECYCLE, OR SCRUB ACTION AS IT DEVELOPS.
MI	SSION	REV DATE SECTION GROUP PAGE
APO	LLO 10	FINAL 4/15/69 GENERAL GUIDELINES OMSF GENERAL RULES I-1
		FINAL 1/15/09 GENERAL GUIDELINES OF GENERAL ROLES 1-1 292 (AUG 68)

RΕV	1TEM						
	1-9	IF A MANDATORY ITEM FAILS DURING THE COUNTDOWN, IT WILL BE CORRECTED PRIOR TO LAUNCH, HOLDING OR RECYCLING THE COUNTDOWN AS NECESSARY. IF A MANDATORY ITEM CANNOT BE CORRECTED TO PERMIT LIFTOFF WITHIN THE LAUNCH WINDOW, THE MISSION DIRECTOR MAY PROCEED WITH THE LAUNCH AFTER APPROPRIATE COORDINATION WITH THE APPROPRIATE OPERATIONS AND PROGRAM MANAGERS. GENERALLY THE LOSS OF A MANDATORY ITEM WILL RESULT IN A SCRUB.					
	I-10	AS THE DESIGNATED REPRESENTATIVE OF THE PROGRAM DIRECTOR, ONLY THE MISSION DIRECTOR MAY SCRUB THE MISSION. FURTHER, THE MISSION DIRECTOR RETAINS THE PRIMARY AUTHORITY TO DOWNGRADE A MANDATORY ITEM. THIS AUTHORITY SHALL BE EXERCISED AS CIRCUMSTANCES DICTATE AND AFTER APPROPRIATE RECOMMENDATIONS FROM THE PROGRAM MANAGERS, LAUNCH DIRECTOR, AND FLIGHT DIRECTOR.					
	1-11	CONSIDERATION WILL BE GIVEN TO THE REPAIR OF ANY HIGHLY DESIRABLE ITEM, BUT IN NO CASE WILL THE LAUNCH BE SCRUBBED FOR ANY SINGLE HIGHLY DESIRABLE ITEM. IF TWO OR MORE HIGHLY DESIRABLE ITEMS FAIL AND/OR OTHER AGGRAVATING CIRCUMSTANCES OCCUR, THE MISSION DIRECTOR MAY SCRUB THE MISSION AFTER COORDINATION WITH THE APPROPRIATE OPERATIONS AND PROGRAM MANAGERS.					
	I-12	THE COUNTDOWN WILL NOT BE HELD NOR THE LAUNCH SCRUBBED FOR FAILURE OF DESIRABLE ITEMS.					
	I-13	WHENEVER POSSIBLE, THE LAUNCH SITE AND MCC WILL VERIFY TELEMETRY READOUT DISCREPANCIES OCCURRING PRIOR TO LIFTOFF. IF THE MCC LOSES A PARAMETER BUT THE LAUNCH SITE HAS A VALID READOUT, THE MCC WILL CONTINUE ON THE LAUNCH SITE READOUT. THIS IS TRUE EXCEPT FOR THOSE MANDATORY PARAMETERS (LISTED IN THE FLIGHT MISSION RULES) UPON WHICH MISSION RULES ACTION IS TAKEN. IN THIS CASE, A HOLD MAY BE CALLED TO EVALUATE THE PROBLEM.					
	I-14	THE COUNTDOWN WILL CONTINUE WHERE POSSIBLE CONCURRENTLY WITH CORRECTION OF AN EXISTING PROBLEM.					
	I~15	WHERE POSSIBLE, ALL MANUAL ABORT REQUESTS FROM THE GROUND DURING FLIGHT WILL BE BASED ON TWO INDEPENDENT INDICATIONS OF THE FAILURE. CREW ABORT ACTION WILL NORMALLY BE BASED UPON TWO CUES.					
	1–16	PRIOR TO LIFTOFF, THE DIRECTOR OF LAUNCH OPERATIONS WILL BE RESPONSIBLE FOR ALL ACTIONS IN THE EVENT OF LAUNCH SITE EMERGENCIES, EXCEPT FOR RECOVERY OPERATIONS OF SPACECRAFT AND CREW RESULTING FROM A PAD ABORT.					
	I-17	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. THE CRITERIA FOR SENDING AN ABORT REQUEST WILL BE ESTABLISHED IN THE LAUNCH RULES.					
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REV	ITEM						
	1-18	FROM LIFTOFF TO TOWER CLEAR, THE LAUNCH DIRECTOR AND FLIGHT DIRECTOR WILL HAVE CONCURRENT RESPONSIBILITY FOR SENDING AN ABORT REQUEST. THE CRITERIA FOR SENDING AN ABORT REQUEST DURING THIS PERIOD WILL BE ESTABLISHED IN THE LAUNCH AND FLIGHT RULES RESPECTIVELY.					
	1-19	THE LAUNCH OPERATIONS MANAGER WILL INFORM MCC WHEN THE SPACE VEHICLE CLEARS THE UMBILICAL TOWER BY SAYING "CLEAR TOWER" OVER ONE OF THE LOOPS FROM KSC TO MCC.					
	1-20	IN THE EVENT OF NON-CATASTROPHIC SPACE VEHICLE COLLISION WITH THE UMBILICAL TOWER OR OTHER CONTINGENCIES WHICH DO NOT REQUIRE IMMEDIATE ACTION, THE LAUNCH OPERATIONS MANAGER WILL CONTINUE TO EVALUATE THE EXTENT OF THE DAMAGE AND PROVIDE INFORMATION TO THE FLIGHT DIRECTOR FOR ANY ACTION NECESSARY AFTER UMBILICAL TOWER CLEARANCE.					
	I-21	COMPLETE GROUND CONTROL OF THE SPACE VEHICLE PASSES TO THE FLIGHT DIRECTOR WHEN THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER.					
	1-22	IN THE MCC, THE FLIGHT DIRECTOR, FLIGHT DYNAMICS OFFICER AND BOOSTER SYSTEMS ENGINEER WILL HAVE THE CAPABILITY TO SEND AN ABORT REQUEST SIGNAL. THE CRITERIA FOR SENDING AN ABORT REQUEST WILL BE ESTABLISHED IN THE FLIGHT RULES.					
	1-23	THE COMMAND PILOT MAY INITIATE SUCH INFLIGHT ACTION AS HE DEEMS ESSENTIAL FOR CREW SAFETY.					
	1-24	FLIGHT CREW SAFETY SHALL TAKE PRECEDENCE OVER THE ACCOMPLISHMENT OF MISSION OBJECTIVES.					
	1-25	IN THE EVENT OF COMMUNICATIONS LOSS BETWEEN THE MANNED SPACE FLIGHT NETWORK AND THE SPACECRAFT, THE COMMAND PILOT WILL ASSUME RESPONSIBILITY FOR MISSION CONDUCT AS DESCRIBED WITHIN THE FLIGHT RULES.					
:	1-26	THE FLIGHT DIRECTOR, THROUGH THE RECOVERY COORDINATOR, WILL PROVIDE THE DOD MANAGER FOR MANNED SPACE FLIGHT SUPPORT OPERATIONS THE PREDICTED LOCATION AND TIME OF SPLASHDOWN.					
	I-27	THE DOD MANAGER FOR MANNED SPACEFLIGHT SUPPORT OPERATIONS IS RESPONSIBLE FOR RECOVERY AND COMMAND AND CONTROL OF DOD RECOVERY FORCES. RECOMMENDATIONS, GUIDELINES AND REQUIREMENTS, AS SET FORTH BY NASA, WILL BE CONSIDERED TO EFFECT SAFE AND EXPEDITIOUS RECOVERY OF THE FLIGHT CREW AND SPACECRAFT.					
		RULE NUMBERS 1-28 THROUGH 1-35 ARE RESERVED					
MI	SSION	REV DATE SECTION GROUP PAGE					
		FINAL 4/15/69 GENERAL GUIDELINES OMSF CENERAL RULES I~3					
-	SG Form	111V4L 1/25/05					

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REV ITEM	-		DEFINIT	IONS		
1-36	IDENT SUCH	IFY VEHICLE,	NE VALUE IS A MAXIMUM AND/OR MI SYSTEM, AND COMPONENT PERFORMA DEGRADATIONS OF THE SYSTEM OR	NIMUM LIMITANCE AND OPE	ERATION. REDLINE VALUES W	ILL BE ESTABLISHED
I-37	OF A	UNIT TO INSU	A REDLINE FUNCTION IS A PARAM RE THE OPERATIONAL PERFORMANCE ARE MANDATORY.			
I-38	DOCUM	ENTATION THE	: A STATEMENT OF THE PRIMARY F PRIMARY OBJECTIVE MAY BE AMPLI AND AMPLIFIED TO FULFILL EACH	FIED BUT NO	OT MODIFIED. DETAILED. TES	
1-39	LUNAR	LANDING MIS	D TEST OBJECTIVE: A DETAILED T SION. ANY PRINCIPAL DETAILED T CAN BE ATTEMPTED ON A SUBSEQUEN	TEST OBJECT:	IVE NOT SATISFACTORILY COM	
I-40	COMPL	ETED ON THE	<u>D TEST OBJECTIVE</u> : A PRINCIPAL ASSIGNED MISSION. FAILURE TO C REQUIRE SUBSEQUENT SPACE VEHICL	OO SO WOULD	UNDULY COMPROMISE SUBSEQU	
I-41			ED TEST OBJECTIVE: A DETAILED TO THE			IGNIFICANT DATA OR
I-42	FOR A	CCOMPLISHMEN	MANDATORY ITEM IS A SPACE VEH NT OF THE PRIMARY MISSION, WHICA SAFETY AND EFFECTIVE OPERATION JECTIVES.	H INCLUDES	PRELAUNCH, FLIGHT, AND REC	COVERY OPERATIONS
I-43 _.	SUPPO	RTS AND ENHA	(HD): A HIGHLY DESIRABLE ITEM NICES THE ACCOMPLISHMENT OF THE DETAILED TEST OBJECTIVES.			
I-44			A DESIRABLE ITEM IS A SPACE VEH E ACCOMPLISHMENT OF THE PRIMARY		T OR OPERATIONAL SUPPORT E	ELEMENT THAT IS NOT
I-45	PROCE	ED: CONTINU	JE IN ACCORDANCE WITH PRESCRIBE	D COUNTDOWN	PROCEDURES.	
1-46			ION OF THE COUNTDOWN FOR UNFAVOI ISFACTORY FOR LAUNCH OR FLIGHT.	rable weath	ER, REPAIR OF HARDWARE, OF	R CORRECTION OF
MISSION	REV	DATE .	SECTION		GROUP	PAGE
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		MISSION RULES							
REV	ITEM								
	I-47	COUNTDOWN: THE PERIOD OF TIME STARTING WITH LAUNCH VEHICLE POWER UP FOR THE LAUNCH (OR SIMULATED AUNCH) WHICH INCLUDES SERVICE STRUCTURE REMOVAL, LAUNCH VEHICLE CRYOGENIC TANKING, SPACECRAFT CLOSEOUT, AND THE TERMINAL COUNT.							
	1-48	HOLD-POINT: A PREDETERMINED POINT WHERE THE COUNTDOWN MAY BE CONVENIENTLY INTERRUPTED.							
	I-49	RECYCLE: THE COUNTDOWN IS STOPPED AND RETURNED TO A DESIGNATED POINT OR AS SPECIFIED IN THE LAUNCH MISSION RULES.							
	I-50	SCRUB: THE LAUNCH IS POSTPONED.							
	I-51	CUTOFF: THE AUTOMATIC OR MANUAL COMMAND TO STOP THE LAUNCH SEQUENCE AFTER INITIATION OF THE 'AUTOMATIC LAUNCH SEQUENCE START."							
	I-52	<u>IFTOFF:</u> THE EVENT DETERMINED BY THE INSTRUMENTATION UNIT UMBILICAL DISCONNECT SIGNAL AND IS THE OINT IN TIME WHEN PLUS TIME COMMENCES.							
	I-53	ABORT: MISSION TERMINATION BY UNSCHEDULED INTENTIONAL SEPARATION OF THE SPACECRAFT FROM THE LAUNCH WEHICLE PRIOR TO ORBITAL INSERTION.							
	1-54	EARLY MISSION TERMINATION: UNSCHEDULED INTENTIONAL MISSION TERMINATION AT OR AFTER ORBITAL INSERTION.							
	I - 55	MEASUREMENT: A MEASUREMENT IS A SPECIFIC DATA CHANNEL OF INSTRUMENTATION MONITORING A SINGLE FUNCTION.							
	I-56	INSTRUMENTATION: INSTRUMENTATION IS THE EQUIPMENT THAT ACQUIRES, TRANSMITS AND MONITORS DATA FOR PERFORMANCE EVALUATION OF SPACE VEHICLE AND OPERATIONAL SUPPORT ITEMS.							
A	I-57	SEMI-SYNCHRONOUS: AN ORBIT WITH A PERIOD OF 12 HOURS. THE PERIGEE POSITIONS ARE FIXED RELATIVE TO EARTH AND 180° APART IN LONGITUDE.							
MI	SSION	REV DATE SECTION GROUP PAGE							
	LO 10	A 4/23/69 GENERAL GUIDELINES OMSF GENERAL RULES I-5							
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PART II 1 GENERAL RULES AND SOP'S

1	-1 -2	RATIONALIZATION PHASE, AND RECOV	GENERAL ON RULES OUTLINE PREPLANNED DECISIONS I REQUIRED WHEN NON-NOMINAL SITUATIONS OF REY OPERATIONS.		
		RATIONALIZATION PHASE, AND RECOV	ON RULES OUTLINE PREPLANNED DECISIONS I		
		RATIONALIZATION PHASE, AND RECOV	REQUIRED WHEN NON-NOMINAL SITUATIONS OF		
1	-2				
		BETWEEN SPACECRA	E, THE CREW AND GROUND WILL VERIFY ALL FT AND GROUND TELEMETRY READOUTS, THE S DEQUATE INSTRUMENTATION AND THAT APPLIC	PACECRAFT READOUTS ARE PRIME (ASSU	MING THE
1-	-3	PRIORITY OF OBJE	MISSION IS REQUIRED, MISSION OBJECTIVE: CTIVES STATED IN THE FLIGHT OPERATIONS DOING SO MAY COMPROMISE THE ACCOMPLISH	RULES. LOWER ORDER OBJECTIVES WIL	L NOT
1-	4	SPACECRAFT LAUNC MISSION DURATION WILL BE COMPROMI	H WILL NOT BE ATTEMPTED IF KNOWN SPACE SUCH THAT ACCOMPLISHMENT OF THE PRINC SED.	CRAFT SYSTEMS MALFUNCTIONS WILL LIM PAL OR MANDATORY DETAILED TEST OB	NIT THE PECTIVES
1-	WHEN A CONFLICT OF FLIGHT PLAN ACTIVITIES OCCURS, THE FLIGHT DIRECTOR WILL DETERMINE THE OF ACTIVITIES.			PRIORITY	
1-	-6	IN SOME INSTANCES, THE SPECIFIC MISSION RULES MAY DEVIATE FROM THE GENERAL GUIDELINES CONTAINED PART I OR FROM THESE GENERAL RULES. THE SPECIFIC MISSION RULE WILL APPLY IN ALL CASES, AND THE DEVIATIONS FROM THE GENERAL GUIDELINES WILL BE NOTED.			
1-	-7	THE FLIGHT DIRECTOR MAY, AFTER ANALYSIS OF THE FLIGHT, CHOOSE TO TAKE ANY NECESSARY ACTION REQUIRED FOR THE SUCCESSFUL COMPLETION OF THE MISSION.			
1-	-8	MISSION RULE LIMITS THAT ARE CONSIDERED TO BE INTERIM OR UNCONFIRMED NUMBERS WILL BE UNDERLINED IN THIS PUBLICATION AND ALL SUBSEQUENT REVISIONS UNTIL THE NUMBERS ARE CONFIRMED BY THE RESPONSIBLE NASA AGENCY.			
1-	-9	THE SYSTEMS LIMITS LISTED IN THESE RULES ARE THE ACTUAL VEHICLE LIMITS AS WELL AS THEY ARE KNOWN AND UNDERSTOOD AND ARE NOT BIASED TO COMPENSATE FOR TIME DELAYS OR INSTRUMENTATION ERRORS WITHIN THE SPACECRAFT AND MSFN DATA/DISPLAY SYSTEMS.			
MISS	NOIS	REV DATE	SECTION	GROUP	PAGE
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251.1					
REV	I TEM				
	1-10		HERWISE, MANDATORY AND HIGHLY DESTRABL D OR PCM CAPABILITY.	LE INSTRUMENTATION REQUIREMENTS A	RE SATISFIED
	1-11	A. REQUIRED TO B. REQUIRED TO C. REQUIRED TO D. REQUIRED TO THE MANDATORY IN	VEHICLE INSTRUMENTATION FOR THE PURPOSING CRITERIA: CREFERENCE OMSF GENERAL INSURE FLIGHT CREW SAFETY. IMPLEMENT RULES RESULTING IN LAUNCH AS IMPLEMENT RULES RESULTING IN EARLY MISSINGMAKE DECISION TO CONTINUE TO THE NEXT ISTRUMENTATION LISTINGS IN THIS DOCUMENTATION THE ABOVE CRITERIA.	RULE I-42). BORTS. SSION TERMINATION. MISSION PHASE.	
	1-12	THE CRITERION FO	OR CATEGORIZING INSTRUMENTATION AS HIG TON REQUIRED FOR NORMAL SYSTEMS MANAGI		
	1-13		. NOT BE TRANSMITTED TO THE SPACECRAFT N RULES ARE INVOKED WHICH REQUIRE COMM		UNCH PHASE UNLESS
	1-14		NTIONS MANAGER WILL INFORM THE FLIGHT I BY STATING "CLEAR TOWER" OVER CHANNEL		HAS CLEARED THE
	1~15	THE COMMAND PILC	OT MAY INITIATE SUCH INFLIGHT ACTION A	S HE DEEMS ESSENTIAL FOR CREW SAF	гетү.
	1-16	IN THE EVENT OF RESPONSIBILITY C	LOSS OF COMMUNICATIONS BETWEEN THE MS OF MISSION DIRECTION WITHIN THE FRAME !	FN AND THE S/C, THE COMMAND PILO WORK OF THE MISSION RULES.	Γ WILL ASSUME
		RULE NUMBERS 1-1			
		1-23 ARE RESERVE	ED.		
MIS	SSION	1-23 ARE RESERVE	SECTION	GROUP	PAGE

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D=: 1		MISSION RULES
REV	ITEM	DEFINITIONS
	1-24	ASAP: AS SOON AS PRACTICABLE (I.E., AS SOON AS POSSIBLE AND REASONABLE).
	1–25	PTP: A PREFERRED TARGET POINT IS A STRATEGICALLY LOCATED SET OF COORDINATES FOR WHICH THE SPACECRAFT SHOULD BE TARGETED IF IT BECOMES NECESSARY TO LAND ON THAT REVOLUTION.
	1-26	ATP: AN "ALTERNATE TARGET POINT" IS A STRATEGICALLY LOCATED SET OF COORDINATES CHOSEN TO PROVIDE A SPACECRAFT TARGET POINT MIDWAY BETWEEN PTP'S.
	1-27	NEXT BEST PTP: A PREFERRED TARGET POINT WHICH CAN BE REACHED BY THE SPACECRAFT WITHIN THE CONSTRAINTS IMPOSED BY THE SPACECRAFT PROBLEM CAUSING AN EARLY MISSION TERMINATION AND ALLOWING THE BEST POSSIBLE REENTRY AND LANDING AREA CONDITIONS. THE MISSION WILL NOT PROCEED TO THE NEXT PHASE UNLESS SPECIFICALLY NOTED.
	1–28	REENTER AS SOON AS PRACTICABLE (I.E., AS SOON AS POSSIBLE AND REASONABLE).
	1–29	TERMINATE ASAP: REENTER WITH THE MINIMUM TRIP TIME TO AN UNSPECIFIED LANDING AREA.
	1-30	CRITICAL MANEUVERS: FOR THE PURPOSE OF MISSION RULE ACTION, CRITICAL MANEUVERS ARE DEFINED AS THOSE MANEUVERS REQUIRED TO INSURE CREW SAFETY. THE VIOLATION OF PROPULSION SYSTEM LIMITS WILL BE ACCEPTED AS NECESSARY FOR SUCH BURNS. ALL MANEUVERS ARE CONSIDERED CRITICAL EXCEPT LOI AND MCC'S NOT REQUIRED FOR ENTRY CORRIDOR CONTROL.
	1-31	NON-CRITICAL BURN: A BURN WHICH NEED NOT BE ACCOMPLISHED TO MAINTAIN AN ACCEPTABLE LEVEL OF CREW SAFETY.
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		MISSION RULES					
REV	ITEM	4					
	1-32	EARLY STAGING: UNSCHEDULED INTENTIONAL SEPARATION OF THE S-IVB STAGE FROM THE S-II STAGE.					
	1-33	CONTINGENCY ORBIT INSERTION (COI): AN SPS PROPULSIVE MANEUVER WHICH WILL PROVIDE CSM INSERTION INTO A SAFE ORBIT (Hp \geq 75MM) IN THE EVENT OF AN SLV FAILURE OCCURRING IMMEDIATELY PRIOR TO INSERTION, OR IN THE EVENT OF DEGRADED SLV PERFORMANCE.					
	1-34	S-IVB DESTRUCT PACKAGE SAFING: THE EMERGENCY DESTRUCT PACKAGE IS SAFED BY THE RSO TRANSMITTING A COMMAND WHICH PERMANENTLY REMOVES POWER FROM THE RANGE SAFETY RECEIVERS.					
	1-35	S-IVB SAFING: A PASSIVATION SEQUENCE IN WHICH S-IVB LOX, LH ₂ , AND HIGH PRESSURE SPHERES ARE DEPLETED.					
	1-36 PRELAUNCH PHASE (PRELN): THE TIME INTERVAL FROM THE COMPLETION OF THE FLIGHT READINESS RETORY.						
A 	1-37	PHASE IS FURTHER SUBDIVIDED AS SHOWN BELOW: A. LAUNCH PHASE: FROM LIFTOFF THROUGH INSERTION (TB1 THROUGH TB4). B. EARTH ORBIT PHASE: FROM INSERTION THROUGH S-IVB CUTOFF FOR TRANSLUNAR INJECTION (TLI). C. TOSE PHASE: FROM CSM/S-IVB SEPARATION THROUGH LM EJECTION FROM SLA. D. TRANSLUNAR COAST PHASE: FROM S-IVB CUTOFF FOR TLI THROUGH LOI1 CUTOFF.					
		E. DOCKED PHASE: THE TIME INTERVALS DURING WHICH THE LM AND CSM ARE DOCKED.					
		F. <u>LUNAR ORBIT PHASE</u> : FROM LOI ₁ CUTOFF TO UNDOCKING AND FROM FINAL LM ACTIVITIES TO TEI CUTOFF. G. <u>UNDOCKED PHASE</u> : THE TIME INTERVAL DURING WHICH A MANNED LM IS SEPARATED FROM THE CSM FOR					
İ		STATION KEEPING (MAXIMUM SEPARATION DISTANCE OF≈500FT.). H. RENDEZVOUS PHASE: FROM THE CSM PRE-DOI SEPARATION MANEUVER THROUGH CSM/LM DOCKING AT END OF					
		RENDEZVOUS. I. <u>UNMANNED PHASE</u> : FROM FINAL CSM/LM SEPARATION TO COMPLETION OF LM ACTIVITIES (INCLUDING LM APS BURN TO DEPLETION).					
		J. TRANSEARTH COAST PHASE: FROM TEI CUTOFF TO CM/SM SEPARATION.					
[K. ENTRY PHASE: FROM CM/SM SEPARATION TO SPLASHDOWN.					
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		MISSION RULES				
REV	1 TEM					
	1-38	ECOVERY PHASE: THE TIME INTERVAL FROM SPLASHDOWN TO DELIVERY OF THE FLIGHT CREW AN ESIGNATED LANDBASED INSTALLATIONS.	D SPACECRAFT TO			
	1-39	EENTRY DEFINITIONS: AUTOMATIC - REENTRY CONTROLLED BY CMC WHICH OUTPUTS BANK ANGLE COMMAND TO THE RC CLOSED LOOP - REENTRY CONTROLLED BY THE CREW MANUALLY FLYING BANK ANGLE MODULATI ENTRY PROGRAM OUTPUTS. OPEN LOOP REENTRY - REENTRY CONTROLLED BY THE CREW USING SPACECRAFT DISPLAYS AND 1. BANK ANGLE (RR 0-90) AND RETRB (RL 0-90). 2. CONSTANT BANK ANGLE - CREW ESTABLISHES AND MAINTAINS A CONSTANT BANK ANGLE. ANGLES >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 RANGING - CONSTANT BANK ANGLE IS HELD TO 1G; THEN THE RANGE TO GO DISPLA POTENTIAL LINES ARE COMPARED TO MODULATE THE BANK ANGLE. AT RETRB THE PRESE IS RESERVED. CONSTANT G ENTRY: CREW CONTROLS THE BANK ANGLE TO MAINTAIN A SPECIFIED G LEVEL. EMS REENTRY: CREW CONTROLS THE BANK ANGLE TO MAINTAIN A CONSTANT G UNTIL VELOCI THE EMS IS THEN USED TO CONTROL RANGE BY NULLING THE DIFFERENCE BETWEEN THE RANGE AND THE RANGE POTENTIAL GUIDELINES. ALL MANEUVERS ARE OVERRIDDEN AS NECESSARY TONSET OR OFFSET VIOLATION.	ON USING CMC FLYING: (CONSTANT BANK AY AND THE RANGE ENT BANK ANGLE TY <25,500 FPS. SE TO GO COUNTER			
	1-40	<u>LTERNATE MISSION</u> : ANY DEVIATION FROM THE NOMINAL MISSION TIMELINE WHERE FURTHER M RE CONSIDERED BEFORE THE END OF THE MISSION.	MISSION OBJECTIVES			
	1-41	ONTINUE MISSION: THE CONTINUE MISSION RULING FOR MALFUNCTIONS INDICATES THAT THE MINUED IN ACCORDANCE WITH PRESENT PLANS UNLESS OVERRIDING FACTORS ARE PRESENT WHICH ELECTION OF AN ALTERNATE CHOICE.	MISSION WILL BE CON- WOULD CAUSE			
	1-42	SLINGSHOT MANEUVER: USE OF RESIDUAL S-IVB PROPELLANTS TO PLACE THE SPENT STAGE IN A SOLAR OR NON-LUNAR IMPACTING TRAJECTORY.				
	LUNAR ABORT MODES AFTER DISPERSED LOI1 A. SPS ABORT 15 MIN ABORT - SPS RESTART FOR DIRECT RETURN. (DOCKED SPS ABORT MAY BE EXECUTED IN MODES I OR I B. DPS ABORT 1. MODE I - DIRECT RETURN USING DPS, BURN AT APPROXIMATELY LOI + 2 HRS. 2. MODE II - TWO IMPULSE DPS ABORT FOR EARTH RETURN, FIRST BURN AT APPROXIMATELY LOI + 2 HRS, SECOND BURN AT NEXT PERICYNTHION. 3. MODE III - DPS TEI, BURN AT APPROXIMATELY LOI + 15 HRS. NOTE: HANDOVER BETWEEN MODES I, II, AND III IS FUNCTION OF ACCUMULATED LOI1 AV (REF RULE 5-III) RULE NUMBERS 1-44 THROUGH 1-47 ARE RESERVED.					
	CCION	EV DATE SECTION GROUP	I DAGE			
	SSION OLLO 10	CENTRAL DIVISION AND CORTO	PAGE 1 - F			
		NAL 4/15/69 GENERAL RULES AND SOP'S DEFINITIONS	1-5			

			MISSION KOLES	
REV	ITEM		CRITERIA FOR TARGET POINT SELECTION	
Α	1-48		ED BELOW WILL BE USED WHEN CHOOSING BETWEEN TW E MISSION SITUATION WILL AFFECT THE APPLICATIO	O OR MORE TARGET POINTS. THE
		ACCEPTABLE LAND M	ASS CLEARANCE	1
		ACCEPTABLE WEATHE STRUCTURAL INTE	R CONDITIONS FOR RECOVERY OPERATIONS AND CM	2
		CAPABILITY OF REC		3
			TH THE SPACECRAFT FROM A GROUND STATION AT LEASON TO DEORBIT BURN	ST 4
			HT FOR RECOVERY OPERATIONS	5
		A GROUND STATION	FOR POST-DEORBIT BURN% TRACKING	6
11		VOICE CONTACT PRI	OR TO AND DURING DEORBIT BURN	7
		POST-BLACKOUT TRA	ACKING DATA AVAILABLE FOR REENTRY (ASSUMES QUISITION)	8
	i	GROUND STATIONS A	AVAILABLE TO OBTAIN DELTA V _C READOUTS AND TO UP GUIDANCE QUANTITIES	9
		*OR FINAL MCC MAN	NEUVER	
	1-49	IS AS FOLLOWS: A. 1200 - 1400 N B. 1400 - 1800 N	Y RANGE PRIORITY: THE RELATIVE ENTRY RANGE (4 M (NOMINAL) M (USED TO AVOID WEATHER VIOLATIONS IN PRIORIT M (USED TO AVOID EXTREME WEATHER VIOLATIONS IN	Y A.)
		RULE NUMBERS 1-! 1-55 ARE RESERVI		
MI	SSION	REV DATE	SECTION GRO	UP PAGE

			MISSION RULES		
REV	ITEM		PRELAUNCH RU	IFS	
A	1-56	IN CASE OF A BE CONFIRMED MANDATORY ITE ITEMS WILL RE	HE COGNIZANT FLIGHT CONTROLLER WILL REQU LOSS OR FAILURE OF A MANDATORY ITEM. PR PRIOR TO REQUESTING A HOLD OR A CUTOFF. MS WITHOUT VERIFICATION DUE TO THE LIMIT VERT TO HIGHLY DESIRABLE UNLESS SPECIFIC N RULES DOCUMENT FOR SPECIFIC PROCEDURES	EST A HOLD OR A CUTOFF FROM THE FLI IOR TO T-1 MIN, FAILURES OF MANDATO AFTER T-1 MIN, CUTOFF WILL BE REQU ED TIME REMAINING. AT T-20 SEC, AL	PRY ITEMS WILL JESTED FOR I MANDATORY
	1-57	THIS ITEM(S)	BLE - THE COGNIZANT FLIGHT CONTROLLER WI OF A HIGHLY DESIRABLE ITEM(S). A HOLD M HEN IT IS CONVENIENT AND IF THE ESTIMAT ALL HIGHLY DESIRABLE ITEMS REVERT TO DES	AY BE CALLED BY THE FLIGHT DIRECTOR FD TIME TO REPAIR OR REPLACE THE IT	TO DEDATE
	1-58	<u>DESIRABLE</u> - FI IN THIS CATEGO	LIGHT CONTROLLERS WILL NOT CALL HOLDS FO DRY BECAUSE THEY ARE ITEMS OF SUPPORT WH	R THE LOSS OF DESIRABLE ITEMS AS TH	EY ARE PLACED HT OPERATIONS.
	1-59	MANUAL CUTOFF	WILL NOT BE ATTEMPTED FROM T-11 SECONDS	(ENGINE IGNITION) TO T-0.	
				·	
	!				
				,	
		RULE NUMBERS 1-65 ARE RES	1-60 THROUGH ERVED.		
MI	SSION	REV DATE	SECTION	GROUP	PAGE
APOL	LO 10	A 4/23/6	g GENERAL RULES AND SOP'S	PRELAUNCH RULES	1-7
		292 (AUT 66)		1	

EΥ	1TEM				· · · · · · · · · · · · · · · · · · ·	
			LAUNCH AB	ORTS		
	1-66	LIGHT ON THE CO	COMMANDS ARE COMMANDS TRANSMITTED F MMAND PILOT'S PANEL. THE "ABORT L ES FOR THE CREW TO TAKE THE NECESSA CUES PRIOR TO TRANSMITTING "ABORT IDICATIONS.	IGHT" AND A VOICE REPORT "ABORT" RY ACTION TO ABORT THE MISSION.	OVER A/G ARE CON- THE GROUND WILL USE	
	1-67	ABORT ACTION CA	N BE INITIATED ONLY BY THE CREW OR	THE EDS.		
į	1-68	WHENEVER POSSIE	BLE, ALL ABORTS AND EARLY MISSION T	ERMINATIONS WILL BE TIMED FOR A W	NATER LANDING.	
	1-69	THE FLIGHT DIRE	CTOR WILL INITIATE THE ABORT REQUE	ST FOR SPACECRAFT SYSTEM MALFUNCT	TONS.	
	1-70		MICS OFFICER WILL INITIATE THE ABO EXCEEDS THE FLIGHT DYNAMICS ENVELOR		GHT PHASE IF THE	
	1-71		STEMS ENGINEER WILL INITIATE THE AS AS MALFUNCTIONS THAT WOULD NOT ALLO			
A	1-72	LAUNCH OPERATIO UNTIL THE SPACE TO TRANSFER OF REQUEST COMMAND	OSITION THAT WILL HAVE ABORT REQUES ONS MANAGER MAY SEND AN ABORT REQUE E VEHICLE REACHES SUFFICIENT ALTITU CONTROL TO THE FLIGHT DIRECTOR, TO OFROM KSC BASED ON THE CRITERIA DE	EST FROM THE TIME THE LAUNCH ESCAF DDE TO CLEAR THE TOP OF THE UMBIL! HE LAUNCH OPERATIONS MANAGER WILL	PE SYSTEM IS ARMED ICAL TOWER. PRIOR INITIATE THE ABORT	
		A. UNCONTROLL B. SLV EXPLOS C. SLV STRUCT D. SLV TIPOVE E. SLV FALLBA	ION URAL FAILURE R			
	1-73	LIGHT IN THE SI THE MFCO COMMAI IF TRANSMITTED	UTDOWN THE SLV BY TRANSMITTING THE PACECRAFT. THE MFCO WILL INITIATE ND INITIATES A 4.1 SEC TIMER ON THIS. THE RSO DESTRUCT COMMAND CAN THE TING MFCO UPON VERIFICATION OF CUTO	AN AUTO-ABORT IF TRANSMITTED PRICE GROUND WHICH IN TURN ENABLES DESTROY THE SLV. THE RSO WILL	OR TO EDS DISABLE. STRUCT CAPABILITY ALWAYS SAFE THE S-IV	
	1–74	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 VERIFICATION OF S-IVB CUTOFF.				
мт	SSION	REV DATE	SECTION	GROUP	PAGE	
(11	001014	DEY DATE	GENERAL RULES AND SOP'S	LAUNCH ABORTS		
	LLO 10	A 4/23/69			1-8	

Α	1-77	ABORT MODES: MODE I 1A 1B 1C	BOUNDARY OF APPLICATION LES ABORT ENABLE (≈T-45 MINERAL ENABLE (≈	MIN) TO ALTITUDE WER JETTISON ATION 16) UNTIL 3200 NM	PROCEDURES A. MCC PROVII 1. GET OI 2. P1TCH 3. GET DI	DES F 400K AT .05G
		MODE I 1A 1B 1C	LES ABORT ENABLE (≈T-45 GET 42 SEC. (10 K FEET) GET 42 SEC TO 100K FEET (GET ≈1 + 50) 100K FEET ALTITUDE TO TO (GET ≈1 + 16) BOUNDARY OF APPLIC TOWER JETTISON (GET ≈1 + FULL LIFT SPLASHPOINT IS	MIN) TO ALTITUDE WER JETTISON ATION 16) UNTIL 3200 NM		
		MODE I 1A 1B 1C	LES ABORT ENABLE (≈T-45 GET 42 SEC. (10 K FEET) GET 42 SEC TO 100K FEET (GET ≈1 + 50) 100K FEET ALTITUDE TO TO (GET ≈ 1 + 16) BOUNDARY OF APPLIC	MIN) TO ALTITUDE WER JETTISON ATION	<u>PROCEDURES</u>	
		MODE I 1A 1B 1C	LES ABORT ENABLE (≈T-45 GET 42 SEC. (10 K FEET) GET 42 SEC TO 100K FEET (GET ≈1 + 50) 100K FEET ALTITUDE TO TO (GET≈1 + 16)	MIN) TO ALTITUDE WER JETTISON		
	1-77	MODE I 1A 1B	LES ABORT ENABLE (≈T-45 GET 42 SEC. (10 K FEET) GET 42 SEC TO 100K FEET (GET ≈1 + 50) 100K FEET ALTITUDE TO TO	MIN) TO ALTITUDE		
A	1-77	MODE I	LES ABORT ENABLE (≈T-45 GET 42 SEC. (10 K FEET) GET 42 SEC TO 100K FEET	OT (NIM		
A	1-77	MODE I	LES ABORT ENABLE (≈T-45			
۱	1-77		BOUNDARY OF APPLIC	<u>ATION</u>		
	1-77	ABORT MODES:				
	•	The bos on row		MINI STITEMENT		
			ITCH WILL BE TURNED OFF WHEN CONFIRMED LOSS OF ANY CSM E		RY BATTERIES A	ARE TIED TO THE SAME
,	1-76		DS (TWO ENGINE OUT AND OVERRING LAUNCH, MALFUNCTIONS EFF			
						SEC; HOWEVER, S-IC ENGINES WILL NOT BE SHUTDOWN
		EDS	VOTÍNG LÓGIC	3-10		AUTO OFF AT T + 2:00 MIN NOTE: EDS WILL INITIATE ABORT FROM T-0 TO T + 30
			(MFCO) 2 OF 3	S-IC		T + 30 SEC TO EDS
		RSO	RF CMD	S-IC, S-II, S-	IVB	T-0 TO S-IVB CUTOFF
		ASTRONAUT	S-II/S-IVB L/V STAGE SWITCH	S-II, S-IV	В	T + 2:33 TO S-IVB CUTOFF
		ASTRONAUT	CCW ON THC	S-IC, S-II, S-	IVB	T + 30 SEC TO S-IVB CUTOR
		INITIATOR	METHOD	STAGE		TIME FRAME

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			MISSION RULES		
REV	1TEM				
Α	1-79	MODE III	BOUNDARY OF APPLICATION		PROCEDURES
l			BETWEEN FULL LIFT SPLASH POINT =3200 NM	Α.	REFERENCE AOH TBD
ļ			AND INSERTION.	В.	MCC PROVIDES:
1					1. GETI AT S-IVB CUTOFF PLUS 2:05 2. DELTA V FOR 3350 NM SPLASH-POINT 3. BURN DURATION 4. GET OF 400K 5. PITCH AT .05G 6. GET DROGUE
				С.	MANEUVER IS SCS AUTO.
1				D.	ENTRY IS ROLL LEFT 55 DEGREES.
			NOTE MODE III "NO BURN" WILL E CALLED IF THE ROLL LEFT ! ENTRY RANGE IS <3350 NM.		
A	1-80	MODE IV	BOUNDARY OF APPLICATION CONTINGENCY ORBIT INSERTION CAPABILITY		<u>PROCEDURES</u>
			TO INSERTION (BASED ON COI LINE ON Y VS V PLOT FOR NEAR NOMINAL ALTITUDE	Α,	MCC PROVIDES:
					1. GETI AT S-IVB CUTOFF PLUS 2:05 2. DELTA V REQUIRED TO ACHIEVE PERIGEE ≥75 NM 3. BURN DURATION 4. PITCH AT GETI
				В.	MANEUVER IS SCS AUTO
A	1-81	MODE	BOUNDARY OF APPLICATION		<u>PROCEDURES</u>
		APOGEE KICK	PRE-APOGEE CUTOFFS, OUTSIDE THE COI BOUNDARY, CORRECTABLE TO SAFE ORBITAL		
			CONDITIONS BY A MANEUVER AT APOGEE.	Α.	MCC PROVIDES:
					 GETI FOR BURN AT APOGEE DELTA V REQUIRED TO ACHIEVE PERIG >75 NM BURN DURATION PITCH ATTITUDE
				в.	MANEUVER IS SCS AUTO
		RULES 1-82 THROUG 1-86 ARE RESERVED			
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	LO 10	A 4/23/69	GENERAL RULES AND SOP'S	LAUN	CH ABORTS 1-10

1-8	88 <u>R</u> A	AX Q REGION . (00:50 TO 02:00) AOA >100 PCT AND ROLL ERROR >5 DEGREES NOTE: NOT APPLICABLE ENGINE OUT PRI ATES AND ATTITUDE . PITCH AND YAW 1. L/O TO S-IC/S-II 4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° . ROLL 1. L/O TO S-IVB CUTO	E FOR ANY OR TO 50 SEC. STAGING - TO S-IVB CUTOFF	PROCEDURES ABORT MODE I (ACTION ONLY AFTER BOTH HAVE REACHED THRESHOLD.) PROCEDURES ABORT MODE I ABORT MODE I, MODE II, MODE III, OR MODE IV ABORT MODE I, MODE II, MODE III, OR MODE IV	
A 1-8	88 <u>R</u> A	. (00:50 TO 02:00) AOA >100 PCT AND ROLL ERROR >5 DEGREES NOTE: NOT APPLICABLE ENGINE OUT PRI ATES AND ATTITUDE . PITCH AND YAW 1. L/O TO S-IC/S-II 4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° . ROLL 1. L/O TO S-IVB CUTO	E FOR ANY OR TO 50 SEC. STAGING - TO S-IVB CUTOFF	ABORT MODE I (ACTION ONLY AFTER BOTH HAVE REACHED THRESHOLD.) PROCEDURES ABORT MODE I ABORT MODE I, MODE II, MODE III, OR MODE IV ABORT MODE I, MODE II, MODE III, OR MODE IV	
A 1-8	88 <u>R</u> A	. (00:50 TO 02:00) AOA >100 PCT AND ROLL ERROR >5 DEGREES NOTE: NOT APPLICABLE ENGINE OUT PRI ATES AND ATTITUDE . PITCH AND YAW 1. L/O TO S-IC/S-II 4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° . ROLL 1. L/O TO S-IVB CUTO	E FOR ANY OR TO 50 SEC. STAGING - TO S-IVB CUTOFF	ABORT MODE I (ACTION ONLY AFTER BOTH HAVE REACHED THRESHOLD.) PROCEDURES ABORT MODE I ABORT MODE I, MODE II, MODE III, OR MODE IV ABORT MODE I, MODE II, MODE III, OR MODE IV	
A	88 <u>R</u> A	AOA >100 PCT AND ROLL ERROR >5 DEGREES NOTE: NOT APPLICABLE ENGINE OUT PRI ATES AND ATTITUDE PITCH AND YAW 1. L/O TO S-IC/S-II 4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° ROLL 1. L/O TO S-IVB CUTO	E FOR ANY OR TO 50 SEC. STAGING - TO S-IVB CUTOFF	PROCEDURES ABORT MODE I ABORT MODE I, MODE II, MODE III, OR MODE IV ABORT MODE I, MODE II, MODE III, OR MODE IV	
A	A	ENGINE OUT PRI ATES AND ATTITUDE PITCH AND YAW 1. L/O TO S-IC/S-II 4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° ROLL 1. L/O TO S-IVB CUTO	STAGING -	ABORT MODE I, MODE II, MODE III, OR MODE IV ABORT MODE I, MODE II, MODE III, OR MODE IV	
A	A	PITCH AND YAW 1. L/O TO S-IC/S-II 4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° ROLL 1. L/O TO S-IVB CUTO	TO S-IVB CUTOFF	ABORT MODE I, MODE II, MODE III, OR MODE IV ABORT MODE I, MODE II, MODE III, OR MODE IV	
A	A	PITCH AND YAW 1. L/O TO S-IC/S-II 4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° ROLL 1. L/O TO S-IVB CUTO	TO S-IVB CUTOFF	ABORT MODE I, MODE II, MODE III, OR MODE IV ABORT MODE I, MODE II, MODE III, OR MODE IV	
A	В	1. L/O TO S-IC/S-II 4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° ROLL 1. L/O TO S-IVB CUTO	TO S-IVB CUTOFF	ABORT MODE I, MODE II, MODE III, OR MODE IV ABORT MODE I, MODE II, MODE III, OR MODE IV	
A		4 DEG/SEC 2. S-IC/S-II STAGING 9 DEG/SEC 3. YAW ERROR >45° ROLL 1. L/O TO S-IVB CUTO	TO S-IVB CUTOFF	ABORT MODE I, MODE II, MODE III, OR MODE IV	
		. ROLL 1. L/O TO S-IVB CUTO		MODE IV	
		1. L/O TO S-IVB CUTO		MODE IV	
	89 <u>E</u> I		FF - 20 DEG/SEC	MODE IV	
	89 <u>E</u> I	DC AUTOMATIC ADODT LIMIT			
	89 <u>E</u>	DC AUTOMATIC ADODT LIMITOR			
	89 <u>E</u> l				
	1	DS AUTOMATIC ABORT LIMIT	S (UNTIL MANUAL DEACTIN	VATION OF TWO ENGINES OUT AUTO AND LV RATES AT 2:00	CNIM
			BOUNDARY OF APPLICATION	<u>0N</u>	
	A	• RATES			
! [PITCH AND YAW ROLL	4.0 ± .5 DEG/SEC 20.0 ± .5 DEG/SEC		
	В	. ANY TWO ENGINES OUT			
	c	. CM TO IU BREAKUP			
				•	
1-9	90 <u>s</u>	-IVB TANK PRESSURE LIMIT	<u>S</u> (S-II/S-IVB SEP TO C	SM/LV SEP)	
	A	. BULKHEAD ΔP FUEL > OXID = 26 PSID OXID > FUEL = 36 PSID			
	В	LOX TANK PRESS >50 PS			
1-9	91 <u>E</u>	NGINE FAILURES		PROCEDURES	
		OSS OF 3 OR MORE S-II EN	GINES	ABORT MODE I, MODE II	
		RIOR TO S-IVB TO ORBIT			
			·		
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APOLLO 1	N I	55.1.2	AL RULES AND SOP'S	CREW ABORT LIMITS 1-11	

SECTION 2 - FLIGHT OPERATIONS RULES

			MISSION RULES
REV	ITEM		FLIGHT OPERATIONS RULES
A			A. GO/NO-GO DECISIONS WILL BE MADE BY THE FLIGHT CREW AND THE MCC PRIOR TO PROCEEDING BEYOND THE NEXT BEST DEORBIT OR DIRECT ABORT OPPORTUNITY, PRIOR TO ENTERING ANY CRITICAL MISSION SEQUENCE, AND PRIOR TO EXECUTING ANY PROPULSIVE MANEUVER. FORMAL GO/NO-GO POINTS ARE SUMMARIZED IN SECTION 3.
	2-1	MISSION GO/NO-GO	B. FAILURE TO SATISFY THE GO/NO-GO CRITERIA IS SUFFICIENT CAUSE TO ALTER THE NOMINAL MISSION ACTIVITIES. THE COURSE OF ACTION REQUIRED WILL BE BASED UPON THE SPECIFIC CRITERIA NOT SATISFIED AND ASSOCIATED SPECIFIC MISSION RULES.
			C. THE LIFETIME REQUIREMENTS AND CONSUMABLES ESTABLISHED FOR THE GO/NO-GO CRITERIA MUST ACCOUNT FOR THE NOMINAL ACTIVITIES PLANNED FOR COMPLETION, SUFFICIENT TIME AND CONSUMABLES TO PREPARE AND CONDUCT A CSM LM RESCUE, TEI, AND ENTRY FROM ANY POINT IN THE NOMINAL ACTIVITIES PLUS 12 HRS.
А			A. LAUNCH AZIMUTH LIMITATIONS RESTRICT LAUNCHES TO OCCUR BETWEEN 72° AND 107°.
	2-2	PRELAUNCH	B. THE FLIGHT DIRECTOR WILL EVALUATE WIND SIMULATIONS ALONG THE MODE I (TOWER) ABORT TRACK PRIOR TO THE START OF CRITICAL COUNTDOWN ACTIVITIES AND WILL ADVISE THE LAUNCH DIRECTOR OF ANY PREDICTED PERIODS OF LAND LANDING. IF THE FLIGHT DIRECTOR IS UNABLE TO PROVIDE THIS EVALUATION, A LAND LANDING WILL BE ASSUMED AND THE SPACECRAFT WIND CONSTRAINTS FOR LAND IP'S WILL BE APPLIED. THESE CONSTRAINTS (REF LMRD) REQUIRE THAT THE SPACECRAFT NOT BE LAUNCHED OR REMAIN IN A TOWER ABORT MODE IF A TOWER ABORT WOULD RESULT IN A LAND LANDING WITH A HORIZONTAL VELOCITY COMPONENT OF GREATER THAN 54 FEET PER SECOND AT IMPACT. IN ALL CASES, THE LAUNCH DIRECTOR WILL BE PRIME FOR CALLING HOLDS FOR LAND LANDING LAUNCH WIND VIOLATIONS.
			C. THE LAUNCH WILL NOT BE ATTEMPTED IF THE MINIMUM GROUND INSTRUMENTATION CAPABILITY IS COMPROMISED. (REFERENCE SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS.) CONTINUOUS VOICE, TELEMETRY, AND TRACKING COVERAGE FOR THE SPACECRAFT IS REQUIRED FROM LIFTOFF THROUGH INSERTION PLUS 60 SEC. CONTINUOUS TM AND TRACKING COVERAGE IS REQUIRED FROM THE SLV FROM LIFTOFF THROUGH INSERTION PLUS 60 SEC. COMMAND IS HIGHLY DESIRABLE.
	2-3	LAUNCH	IT IS PREFERABLE TO GO INTO ORBIT AND REENTER INTO THE WEST ATLANTIC RATHER THAN PERFORM A LAUNCH ABORT. THEREFORE, THE LAUNCH WILL BE CONTINUED AS LONG AS THE CREW CONDITION IS SATISFACTORY, NO S/C OR SLV PROBLEMS EXIST WHICH JEOPARDIZE CREW SAFETY, AND SUFFICIENT CONSUMABLES, COOLANT, AND ELECTRICAL ENERGY REMAIN FOR AT LEAST ONE REVOLUTION PLUS ENTRY.
1		(·	
	2-4	EARLY STAGING	IF REQUIRED, EARLY S-IVB STAGING MAY BE INITIATED BY THE FLIGHT CREW ONLY AFTER S-IVB-TO-ORBIT CAPABILITY IS OBTAINED OR S-IVB LOX TANK PRESS LIMITS EXCEEDED AFTER TOWER JETTISON.
М	ISSION	REV DATE SECTION	GROUP PAGE
<u> </u>	OLLO 10		OPERATIONS RULES GENERAL 2-1
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_				MISSION RULES
R	ŒV	ITEM		
۱	A			A. ENTRY WILL BE MADE WHEN ONE MORE CSM FAILURE WILL RESULT IN AN ASAP ENTRY OR UNCONTROLLABLE CONDITIONS.
				B. ADEQUATE CONSUMABLES WILL BE MAINTAINED FOR ENTRY IN THE NEXT PTP, MAKING ALLOWANCES FOR SETUP AND ENTRY PLUS 12 HRS.
				C. THE DEORBIT CAPABILITIES REQUIREMENTS FOR EARTH ORBIT ARE:
	,			1. TWO METHODS OF DEORBIT ARE REQUIRED (SPS PLUS ONE OTHER).
				2. IF A SUBSEQUENT SINGLE FAILURE WOULD PRECLUDE DEORBIT BY EITHER METHOD REMAINING, THE CSM WILL DEORBIT.
				3. SPS IS THE PRIME METHOD OF DEORBIT AND SUFFICIENT ΔV WILL BE RESERVED FOR THIS MANEUVER.
		2-5	EARTH ORBIT	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 INTEGRITY 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 ($\rm h_p > 80~NM$) FROM WHICH A SM-RCS OR SM-CM/RCS HYBRID DEORBIT 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
	A	2-6	EARLY CSM/S-IVB 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 A SEPARATION MANEUVER ASAP. MINIMUM SAFE DISTANCE IS CONSIDERED TO BE 7,000 FT. B. LOSS OF ATTITUDE CONTROL DURING TB5.
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L.		LLO 10	A 4/23/69 FLIGHT	OPERATIONS RULES GENERAL 2-2
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			MISSION RULES		
REV	ITEM				
А		•		HE S/C AND L/V SATISFY THE FO S-IVB CONSUMABLES TO PROVIDE IDED CUTOFF.	
,	2-7		RESULT IN A CATASTRO		
		TRANSLUNAR INJECTION	PEFINITELY NOT BE A	ALFUNCTION IN THE LAUNCH VEH: ITION FOR WHICH A GUIDED CUTO CHIEVED. YSTEMS CAPABILITY WITH REDUNI	OFF WILL
			REDUNDANCY VERIFICA	TION IS SUBJECT TO THE NUMBER CHECKS WHICH CAN BE PERFORM	R AND TYPE OF
			SUSPECTED FAILURE OF A	E DELAYED UNTIL THE SECOND OF CRITICAL SYSTEMS (PRIME OR B POWER, SEQUENTIAL, COMMUNICA ATION.	ACKUP) (MANEUVER,
_					
A				LIGHTING, ATTITUDES, RATES, REW WILL MAKE THE FINAL DECI:	
	2-8	TRANSPOSITION, DOCKING, AND EJECTION (TOSE)	PRESSURIZATION SEQUENCE LM LEAKS WHICH PREVENT	N PRESSURE REDLINE OF 4.0 PS S WILL BE WAIVED DURING TOSE NORMAL PRESSURIZATION, THE C ED FOR HATCH REMOVAL AND UMB	. FOR TUNNEL OR M WILL BE
				S NOT SUCCESSFUL, NO ATTEMPT E" TO RECOVER THE ASCENT STA	
			D. THREE LATCHES LOCATED 1	20° APART ARE REQUIRED TO PE	REORM TOSE.
					,
Α				ATELY 20 FPS IS PLANNED AFTE ROM THE S-IVB AND TO ESTABLI:	
	2-9	TRANSLUNAR COAST	B. NO MCC WILL BE PERFORME CONSTRAINTS.	D IF LOI CAN BE TARGETED WITH	HIN OPERATIONAL
			C. TRANSLUNAR COAST WILL B EXIST FOR A FREE RETURN	E TERMINATED IF ADEQUATE CON +12 HRS.	SUMABLES DO NOT
1				DISCRETION TO MAN THE LM FO ATIONS ARE LOST WITH THE MSFI	
				Y CANNOT BE CONSIDERED AS AC IVT AND LM SYSTEMS CHECKOUT	
		·			
<u>'</u>					
M)	ISSION	REV DATE SECTION		GROUP	PAGE
APO	LLO 10	A 4/23/69 FLIG	GHT OPERATIONS RULES	GENERAL	2-3
		202 (415 65)			

			MISSION RULES		
REV	ITEM				
1	2-10	LUNAR ORBIT INSERTION	SATISFY ANY OF THE FOLLOWING A. FULL CRITICAL SYSTEMS RED B. ADEQUATE CONSUMABLES FOR I C. SPS PROPELLANT RESERVE CA	UNDANCY. MINIMUM LUNAR ORBIT OPERATIONS F PABILITY FOR TEI AND TRANSEARTH ACCOMPLISH TEI CONTROL, TRANSEA LUNAR ORBIT OPERATIONS.	PLUS 12 HOURS.
	2-11	<u>LUNAR ORBIT</u>	WILL BE EXECUTED. 2. IF A STABLE ORBIT HAS PERFORMED AT THE NEXT BE FLOWN. B. DESIGNED REDUNDANT CAPABI SYSTEMS. C. SUFFICIENT CONSUMABLES MU AND EARTH RETURN +12 HRS D. THE CSM MUST MAINTAIN AN MANEUVERS AND TRANSEARTH E. THE CSM MUST MAINTAIN RCS TRANSEARTH MCC CONTROL, P F. IF NORMAL RENDEZVOUS OPER	BEEN ACHIEVED, AN SPS OR DESTE PERICYNTHIAN OR AN ALTERNATE MILLITY MUST BE MAINTAINED IN ALL CONTINUATION TO THE NEXT METERS FUEL RESERVE CAPABILITY FOR MCC'S. PROPELLANT RESERVE TO ACCOMPLISTIC, AND MINIMAL TRANSEARTH OPERATIONS ARE INHIBITED, THE DPS WITHOUTCE BETWEEN THE DPS AND SPS.	EI WILL BE ISSION WILL CRITICAL CSM MISSION PHASE ISSION PHASE. THE TEI SH TEI CONTROL, ATIONS.
	2-12	INTRAVEHICULAR TRANSFER	REASONABLE CHANCE EXISTS THAT TUNNEL PRESSURIZATION PROBLEM IF THE PROBLEM CANNOT BE CORR	TO THE LM WILL BE ACCOMPLISHED CORRECTIVE ACTION CAN BE TAKEN. ECTED, THE LM SYSTEMS WILL BE ACTUPE FOR THE UNMANNED OPERATION.	FOR A LM/
	2-13 DOCKED LM OPERATION		MAN, WILL CONTINUE AS LON SUITED CREWMEN AND AS LON AND NO HAZARDOUS, CREW SA B. FOR AN IMPENDING HAZARDOU PROBLEM, THE STAGE WILL B CONTINUE AFTER THE VEHICL	SYSTEMS PERFORMANCE, UTILIZING (G AS LIFE SUPPORT CAN BE PROVIDE IG AS LM/CSM VOICE COMMUNICATIONS IFETY SITUATIONS EXIST. IS SITUATION RESULTING FROM A DES IE JETTISONED AND ASC STAGE OPER IE HAS MOVED TO A SAFE DISTANCE (LIFE SUPPORT CAPABILITY FOR CONT	D TO THREE ARE AVAILABLE CENT STAGE ATIONS WILL FT).
MI	N0122	REV DATE SECTION	1	GROUP	PAGE
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				WISSION KOLES		
REV	ITEM					
					DOCKED FROM THE CSM WITHOUT IN H VEHICLES TO TERMINATE UNDOCKE	
:				3. VHF VOICE COMMUNICATIONS B	ETWEEN THE LM AND CSM ARE MANDA	ATORY FOR UN-
	2-14	CSM/LM UNDOCKING SEPARATION		C. CM AND LM SUIT LOOP INTEGR	RITY IS REQUIRED FOR MANNED UND	OCKING.
					LE IN THE UNDOCKED CONFIGURATION D AFTER RENDEZVOUS AND DOCKING	
					ITH THE ASCENT STAGE ONLY MUST	
				BELOICE OF BOOKING WILL BE I	EN SNED.	
	2-15	RENDEZVOUS		TERMINATION, THE TOTAL LM NO VIOLATION OF DETAILED S OF THE RENDEZVOUS IN PROSE CONTROL OF AN APS/DPS TRAN THE DPS FOR EASE OF CONTRO B. BOTH VEHICLES MUST HAVE IN AND DOCKING. C. LM STAGING MAY BE DELAYED, TO MAINTAIN SUFFICIENT ELE CAPABILITY FOR COMPLETION D. FITH STAGING FROM EITHER A PERFORMED, EXCEPT FOR IMPE STAGE.	THER SPACECRAFT THAT WOULD RESULT CAPABILITY (WITHIN ESTABLISHED DYSTEMS RULES) WILL BE DEDICATED WILL BE DEDICATED WILL BE DEDICATED WILL BE DEDICATED WILL BE DEDICATED WILL SPEED WILL BE DEDICATED WILL AND STAGE CONSUMABLES. **IDEPENDENT CAPABILITY TO COMPLE OF THE RENDEZVOUS IN PROGRESS OF THE RENDEZV	REDLINES AND D TO COMPLETION ING MANUAL RRED TO RETAIN TE RENDEZVOUS IF NECESSARY D/OR PROPULSION AND DOCKING. S WILL NOT BE THE DESCENT
	2-16	unmanned Phase		CONTROL OR TLM. IF IGNIT: ORBIT, THE MANEUVER WILL!	WILL BE ACCOMPLISHED UNLESS LO ION WOULD RESULT IN STAGE DESTR BE INHIBITED. TH THE DPS AND TEH ASCENT STAGE UNMANNED BURN TO DEPLETION WIL	UCTION IN LUNAR IS NOT REQUIRED
				DURING THE TEC PHASE.	ON PARTIES BONY TO BE ELIZON WIL	
		TRANSEARTH COAST		A. THE STEEP TARGET LINE WILL BE USED FOR MCC'S UNLESS THE VELOCITY AT ENTRY INTERFACE IS LESS THAN 30,000 FPS AND THE G&N IS GO; THEN THE SHALLOW TARGET LINE WILL BE USED. B. MCC'S MAY BE USED FOR LANDING AREA CONTROL PRIOR TO ENTRY INTERFACE		
	2-17			MINUS 24 HOURS FOR RECOVERY ACCESS VIOLATIONS, UNACCEPTABLE WEATHER, OR LAND MASSES IN ANY PART OF THE OPERATIONAL FOOTPRINT.		
				C. IF THE FLIGHT PATH ANGLE IS OUTSIDE THE ENTRY CORRIDOR, AN MCC WILL BE EXECUTED AS SOON AS PRACTICAL.		
				D. MCC'S WILL BE ACCOMPLISHED BY THE SPS IF NECESSARY TO MAINTAIN RCS REDLINES.		
MI	SSION		SECTION		GROUP	PAGE
Ĺ	LO 10		FLIGHT OPE	RATIONS RULES	GENERAL	2-5
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REV	ITEM						
1							
Α	2-18	ALTER	NATE MISSION	<u>15</u> A	. ALTERNATE MISSION GUIDELIN	ES	
					AND TLI WILL BE INHIBI	HAVE FIRST PRIORITY IN ALTERNATED IF A FAILURE SHOULD OCCUR WAS EVALUATION WILL HAVE SECOND	HICH WOULD
					2. THE LM WILL BE UNDOCKED ONLY.	D IN LUNAR OR LOW EARTH ORBIT (H _a <400 NM)
					(H _a <400 NM) FROM DISPI	SPS WILL BE USED TO RETURN TO ERSED TLI CUTOFFS, WHEN THIS I CED IN A SEMI-SYNCHRONOUS ORBIT NDUCTED,	S NOT POSSIBLE
			•		4. SHOULD SPS PROBLEMS OC BE GIVEN TO USING THE I	CUR IN ANY MISSION PHASE, CONSI DPS ENGINE.	DERATION WILL
					5. SHOULD CSM FAILURES OCC BE GIVEN TO USING THE	CUR IN ANY MISSION PHASE, CONSI LM SYSTEMS.	DERATION WILL
					6. THE DPS WILL BE USED TO	D EXECUTE TEI WHENEVER AVAILABL	E.
1				В	. ALTERNATE MISSION DESCRIPT	IONS	
	:				THE FOLLOWING CLASSES OF A LISTED IN ORDER OF PRIORI MISSION GUIDELINES.	LTERNATE MISSIONS ARE AVAILABLE TY. SEE REFERENCE 2-18A FOR AL	, AND ARE NOT TERNATE
				· (RI	JLE 2-18 CONTINUED ON FOLLOWIN	NG PAGE.)	
				j			
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				r			
MIS	SSION	REV	DATE	SECTION		GROUP	PAGE

REV ITEM	}						
A 2-18		NATE MISSION	s B	.1. EARTH ORBIT MISSIC	NS		
(CONT'D)	[l	CONTINGENCY/FAILUR	<u>E</u> .	ACTION/MISS	ION
				(A) NO LM EXTRACT (H _a < 25,000	ION AFTER PARTIAL TL NM) OR SPS COI	1 1. SPS PHA 2. SPS "XC 400 X 1 3. SPS "MC 240 X 1	
				(B) NO LM EXTRACT (H _a > 25,000	ION AFTER PARTIAL TL NM)	2. SPS "LC SEMI-SY (PARTIA 3. SPS PHA	SING BURN I'' TO ACHIEVE NCHRONOUS ORBIT LLY OUT OF PLANE SING TO ACHIEVE DE _D = 165 W
				'(C)' LM EXTRACTION TLI'(H _a < 400	AFTER NO TLI OR PAR 0 NM)	TIAL 1. SPS FOR (IF NEC 2. SPS "LC APOGEE (PARTIA PLANE) 3. DPS "DC 4. DPS PON (DOCKEE 5. SPS CIR 140 NM 6. LM ACTI 7. APS BTD	APOGEE RAISE ESSARY) I'' TO ACHIEVE = 400 NM LLY OUT OF I'' (DOCKED) ERED DESCENT) CULARIZATION AT VE RENDEZVOUS - AGS (UNMANNEE ACHIEVE 240 X 90
				(D) LM EXTRACTION (4000 < H _{B.} <	AFTER PARTIAL TLI 10,000 NM)	1. SPS PHA 2. DPS "IDC 3. DPS "IPC ACHIEVE NM (PA PLANE) 4. SPS PHA 5. SPS "LC APOGEE 6. SPS CIR 150 NM 7. LM ACTI 8. APS BTD	SING I" (DOCKED) " (DOCKED) TO APOGEE = 4000 RTIALLY OUT OF SING I" TO ACHIEVE = 400 NM CULARIZATION AT VE RENDEZVOUS - AGS (UNMANNED 240 X 90 ORBIT
				(E) LM EXTRACTION (10,000 < Ha <	: 50,000 NM)	(PARTIA 3. SPS PHA 4. DPS "DO 5. DPS "PD 6. SPS PHA 7. SPS BUR	I" TO SEMI-SYNC LLY OUT OF PLANE SING I" (DOCKED) " (DOCKED) SING N TO ACHIEVE DED = 165 W
				т	<u>NOTE</u> HE LM ACTIVE RENDEZVO	OUS FOR THESE ALTE	RNATES
				W 1 2 3 4 5	ILL BE: . SEP - CSM ACTIVE - . PHASING - LM ACTIV . CSI - ΔV = 0 FPS . CDH - ΔV = 103 FPS . TPI - ΔV = 24 FPS . TPF - ΔV = 32 FPS	- ΔV = 5 FPS /E - ΔV = 178 FPS	NYAILJ
			(R	ULE 2-18 CONTINUED ON F	OLLOWING PAGE)		
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MISSION							PAGE

REV	1 TEM										
Ą	2-18	ALTERN	IATE MISSIONS	<u> </u>	В.2.	LUNAR M	ISSIONS ,				
	(CONT'D) 				CONTING	ENCY/FAI LURE		ACT	ION/MISSIO	<u>N</u>
						·(A)(1)·	LM EXTRACTION AFTER WHERE EOMFR AFTER BALOI2, AND TEI <500 F (NOTE: SPS DOCKED ATORY)	AP MCC, LOI ₁ , PS	2.	APOCYNTHI SPS LOI 2	DOCKED) WHERE ON = 2000 NM
						.(2).	LM EXTRACTION AFTER WHERE (1) IS NOT PER		2.		
						.(3)	LM EXTRACTION AFTER WHERE (1) AND (2) AF	NON-NOMINAL TLI RE NOT PERFORMED	2. 3.	LM CHECKO DPS FLYBY APS BTD (SPS FOR F (IF DESIR	MCC UNMANNED) ASTER RETURN
				•		AF	LM EXTRACTION AFTER TER NON-NOMINAL TLI W S BAP MCC, LOI1, LOI2 S	HERE EOMFR AFTER	1.	WITH SPS	LUNAR MISSION DOI AND SUB- IRCULARIZATION
						(N LU	OTE: FAILURE OF THIS NAR FLYBY MCC WITH PO STER RETURN POST-PERI	SSIBLE SPS FOR			
						·(Ø(1) <u>;</u>	ANY SITUATION WHICH TEI (REFERENCE MISSI		2.	DPS TEI APS BTD ((IF POSSI SPS FOR F (IF DESIR	BLE) ASTER RETURN
						.(2).	LM NO-GO FOR RENDEZV	OUS AND TEI		EXTENDED APS BTD (LM CHECKOUT
							Y SITUATION WHICH WAR NTION OF THE ASCENT S		1.	SPS TEI W STAGE RET	ITH THE ASCENT AINED
					3.	RENDEZV	OUS ALTERNATES			•	
						CONTING	ENCY/FAILURE		ACT	ION/MISSIO	Ň
						(A) AN STA	Y SITUATION WHICH DIC AGING (REFERENCE MISS	TATES NO LM ION RULES)	ĺ	OUT STAGING (NOTE: DISTAGED 7 I	
	!	:				(B) APS	S ONLY PROFILE (DPS N	OT AVAILABLE FOR		APS DOI PDI ABORT	PROFILE
					<u> </u>						
			MBERS 2-19 RE RESERVED.	THROUGH				-			
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REV	ITEM	<u></u>						
		LAUNCH PHASE						
	ן ו							
А	3-1	THE LAUNCH WILL BE ABORTED FOR THE FOLLOWING REASONS:						
		CONDITION						
		A. SLV						
1		S-II GIMBAL ACTUATOR HARDOVER INBOARD (TIME DEPENDENT) 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), POSSIBLE COI CONDITION S-IVB LOSS OF THRUST (TIME DEPENDENT), POSSIBLE COI CONDITION S-IVB LOX TANK PRESSURE >50 PSI (THROUGH TWR JETT) B. CSM						
		1. ENVIRONMENTAL						
		LOSS OF CABIN PRESSURE AND SUIT PRESSURE LOSS OF CABIN PRESSURE AND SUIT CIRCULATION FIRE/SMOKE IN CM LOSS OF CABIN PRESSURE AND O ₂ MANIFOLD LEAK						
		2. ELECTRICAL						
		LOSS OF 3 FUEL CELLS AND 1 BATTERY UNCONTROLLABLE SHORTED MAIN BUS LOSS OF BOTH AC BUSES DURING MODE 1 OR MODE 11						
		3. PROPULSION						
	÷	SUSTAINED LEAK OR LOSS OF He PRESSURE 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						
	3-2	THE S-IVB EARLY STAGING WILL BE USED AFTER "S-IVB TO-ORBIT" CAPABILITY FOR THE FOLLOWING REASONS:						
		CONDITIONS						
		S-II GIMBAL ACTUATOR INBOARD HARDOVER						
		S-II ENGINE FAILURES (TIME DEPENDENT) S-IVB LOX TANK PRESS >50 PSI (L'PSTAGE AFTER TWR JETT)						
A	3-3	SWITCHOVER TO CSM GUIDANCE WILL BE PERFORMED FOR:						
		SATURN GUIDANCE REFERENCE FAILURE						
		RULE NUMBERS 3-4 THROUGH 3-9 ARE RESERVED.						
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	LLO 10	A 4/23/69 MISSION RULE SUMMARY LAUNCH PHASE . 3-1						
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l nov	LITCH		MISSION RULES					
REV	ITEM		EARTH ORBIT					
1		: 	LAKTII OKBIT					
А	3-10	THE CSM	WILL BE NO-GO FOR CONTINUING THE MISSION IF ANY OF THE FOLLOWING CONDITIONS EXIST:					
		A. ECS						
		LOSS	S OF CABIN INTEGRITY	ULES				
		LOSS	S OF SUIT CIRCUIT S OF O2 MANIFOLD					
İ		LOSS	S OF SURGE TANK AND REPRESS PACK					
1		POTA	S OF CYCLIC ACCUMULATOR OPERATION ABLE WATER TANK QUANTITY PLUS FUEL CELL PRODUCTION TO THE NEXT	;				
		LOSS	TP WILL TOTAL 20 LB S OF URINE DUMP CAPABILITY FOR PTP'S SUBSEQUENT TO LM JETTISON					
		LOSS	S OF PRIMARY COOLING FIRMED LEAK OF GLYCOL IN EITHER COMMAND MODULE OR SUIT CIRCUIT					
		B. CRYC						
		INSU	UFFICIENT O2 AND H2 TO SUPPLY FUEL CELL AND ECS DEMANDS TO THE NEXT					
		GC	O/NO-GO PTP PLUS THREE HOURS (DRIFTING FLIGHT PLUS GUIDED ENTRY MANEUVER)					
		C. EPS						
1			S OF TWO FUEL CELLS S OF TWO ENTRY BATTERIES					
		LOSS	S OF ONE MAIN BUS, ONE AC BUS, OR THE BATTERY RELAY BUS					
		LOSS	S OF TWO INVERTERS S OF BATT CHARGER AND TOTAL BATT AMP-HRS <73 (REF. RULE 12-42)					
		D. COMM	M/INSTRUMENTATION					
Ì		LOSS	S OF INSTRUMENTATION (TM OR ONBOARD) SUCH THAT IT IS NOT POSSIBLE TO					
		LOSS	ERIFY GO/NO-GO CRITERIA EITHER IN S/C OR ON GROUND S OF TWO-WAY VOICE COMMUNICATION AFTER LM JETTISON (CSM/MSFN)					
		E. SEQU	JENTIAL .					
		LOSS	5 OF ONE SEQUENTIAL SYSTEM					
		F. G&C						
		LOSS	S OF DIRECT RCS (ANY AXIS) S OF RATE DAMPING (ANY AXIS) S OF TWO DEORBIT METHODS					
		G. SPS						
\mathbf{I}_{1}		LOSS	OF CAPABILITY TO PERFORM CRITICAL MANEUVERS					
		∆V RI	REMAINING LESS THAN SPS DEORBIT REQUIREMENTS					
1		H. SM-R						
		· LOSS PROPI ANI	G OF TWO QUADS GOF ATTITUDE CONTROL IN ONE OR MORE AXES PELLANT REMAINING LESS THAN HYBRID DEORBIT REQUIREMENT, IF HYBRID HO SPS DEORBIT AVAILABLE. OTHERWISE PROPELLANT REMAINING LESS THAN HO DEORBIT REQUIREMENT.					
		I. CM-R	·					
		LOSS	OF SOURCE PRESSURE - ONE RING					
			OF MANIFOLD PRESSURE - ONE RING CCS ARMED					
1		J. UNSATISFACTORY CREW CONDITION						
		K. Two s	SATISFACTORY METHODS OF DEORBIT ARE NOT AVAILABLE (SPS AND ONE ALTERNATE)					
		L. A SUBSEQUENT SINGLE FAILURE WOULD REQUIRE ENTRY IN ONE REV OR LESS						
		1						
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			MISSION R	OLEJ	
REV	ITEM	-			
	3-11	FOLLOWING SLV C		CTION) WILL BE PERFORMED EARLY FOR THE GIVEN TO EXTRACTING THE LM LATER IF	
ŀ	·		<u>NOTE</u>		
			THOSE CONDITIONS MARI REQUIRE AN SPS SEPARA		
- {		CONDITION	:		RULES
	The second secon	"S-IVB RANGE SAFI PRIOR TO SAFII "S-IVB LOX TANK I LOSS OF ATTITUD	NG PRESS >50 PSI E CONTROL DURING TB5 LKHEAD DELTA PRESSURE EXCEEDS LIM	ARMS INADVERTENTLY AFTER INSERTION AND	
	3-12	CSM SEPARATION	FROM THE S-IVB (WITH LM EXTRACTIO	; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	
1			WOW THE SELEND CATTLE THE EVIKACITE	NY) MILL DE PERFORMED EARLT FUK;	
		CONDITION			RULES
		A. S-IVB NO-GO			
		B. CSM NO-GO FO	OR TLI BUT GO FOR EARTH ORBIT MIS	SSION	
A	3-13	TLI WILL BE INH	IBITED FOR:		
		CONDITION			DIII EC
		A. SLV			RULES
	•	S-IVB ENGINI LOSS OF ATT	T PROPELLANT FOR TLI GUIDANCE CU E MAIN LOX VALVE FAILS TO CLOSE / ITUDE CONTROL VENT SYSTEM REGULATOR FAILS		
		CONFIRMED AC LOSS OF ENG	INE CONTROL BOTTLE PRESSURE CTUATOR HARDOVER INE HYDRAULIC FLUID ERE PRESS LOW PRESS LOW PRESS LOW		
		UNACCEPTABLE OR TOTAL \ UNACCEPTABLE	T RATE BETWEEN THE IU AND IMU IS E DIFFERENCES BETWEEN CMC AND IU VELOCITY AT INSERTION E DIFFERENCE BETWEEN MSFN AND IU ACCELEROMETER FAILURE	PLATFORM VELOCITY COMPONENTS	
İ		B. CSM			
		1. ECS			
		LOSS OF FIRE OR O ₂ MANIF LOSS OF	CABIN INTEGRITY SUIT CIRCULATION SMOKE IN THE CABIN FOLD LEAK ONE MAIN 02 REGULATOR		
		LOSS OF	ONE SUIT COMPRESSOR PRIMARY RADIATOR PRIMARY COOLANT LOOP	·	
\bot		DEL. 3			
	SSION .LO 10	REV DATE	SECTION	GROUP	PAGE
		A 4/23/69	MISSION RULE SUMMARY	EARTH ORBIT	3-3

				MISSION RULES		
REV	ITEM					
A	3-13 (CONT'D)	LOSS OF LEAK OF FAILURE LOSS OF LOSS OF	SECONDARY RADIATOR SECONDARY LOOP GLYCOL COOLANT OF BOTH H20 ACCUMULATORS POTABLE OR WASTE H20 TANK BOTH H20 EVAPORATORS (BECAUSE NO-GO F ALL OVERBOARD DUMP CAPABILITY	FOR LUNAR RNDZ)	RULES
			2. CRYO			
			LOSS OF	ANY CRYO TANK		
			3. EPS			
			LOSS OF LOSS OF LOSS OF LOSS OF LOSS OF	ONE FUEL CELL ONE ENTRY BATTERY ONE BATTERY, MAIN OR BATTERY RELAY BU TWO INVERTERS ONE A/C BUS AC1 PHASE A AC2 PHASE A	us .	
			4. COMM/IN	STRUMENTATION		
			LOSS OF	BOTH POWER AMPLIFIERS THE SCE TWO AUDIO CENTERS CRITICAL INSTRUMENTATION (REQUIRED FO	R GO/NO-GO DECISION)	
			5. SEQUENT	IAL		
			SMJC AC LOSS OF	TIVATED ONE SEQUENTIAL SYSTEM		
			6. G&C			
			LOSS OF GROUND / LOSS OF LOSS OF LOSS OF LOSS OF LOSS OF LOSS OF	NAV DSKY (CMC WARNING RELAY) BOTH DSKY'S		
			7. SPS			
1			LOSS OF FUEL FEI FUEL/OX	ED PRESSURE DECAY IN SPS FUEL OR OX TA BOTH GN2 TANK PRESSURES EDLINE AND/OR OXID FEEDLINE TEMP 40°F IDIZER AP GREATER THAN 20 PSI He SOURCE PRESSURE		
		:	8. SM RCS			
			LEAK DON PACKAGE LOSS OF 2P OR 1P ANI 1P OR			
		٥	. CM RCS		•	
	ŕ		CM-RCS A	HELIUM SOURCE PRESS - ONE RING ARMED He MANIFOLD PRESS ONE RING		
MI	SSION	REV	DATE	SECT ION	GROUP	PAGE
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2511	LIEN				MISSION RULES			
₹EV	ITEM							
	3-13	1	0. INTERFA	CE CONDITIONS				
	(CONT'D)	LOSS OF	TWO-WAY S-BAND VOICE				
			LOSS OF	ALL TM				
	3-14			MINATED FOR:				RUL
				W BODY RATES GREATER THA				
				W ATTITUDE DEVIATIONS FR		S EXCEED 45°		
		С.	ROLL BODY RA	ATE GREATER THAN 20°/SEC				
A	3-15	CUIT	CHOVED TO C	CM CUIDANCE QUIDING THE T	, , , , , , , , , , , , , , , , , , , ,			
)-1)			SM GUIDANCE DURING THE T REFERENCE FAILURE	LI BURN WILL BE PER	RFORMED FOR:		
							•	
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i								
	}							
A I		RULE	NUMBERS 3-1	16 THROUGH				
		3-20	ARE RESERVE	D.				
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		MISSION RULES	
REV	ITEM	TD & E	
A	3-21	TD&E WILL BE PERFORMED IF NO IMMEDIATE ABORT RETURNS (CSM CONDITIONS) EXIST. RETURNS (CSM CONDITIONS) EXIST.	ULES
		A. PILOT'S EVALUATION OF RATES AND ATTITUDES, AND SLA CONFIGURATION NOT ACCEPTABLE.	
		B. LESS THAN THREE GOOD DOCKING RING LATCHES LESS THAN 120° APART.	
		C. THE SLV WILL BE NO-GO FOR:	
		1. VIOLATION OF S-IVB BULKHEAD ΔP LIMITS	
		2. LOX TANK OVERPRESSURE >50 PSI	
		3. TB7 FAILS TO INITIATE	
		D. THE CSM WILL BE NO-GO FOR:	
		1. LOSS OF SUIT INTEGRITY	
	·	2. LOSS OF TRANSLATION HAND CONTROLLER	
. (
	j		
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	,		
		PILLE NUMBERS 7-22 TURQUISU	
		RULE NUMBERS 3-22 THROUGH 3-27 ARE RESERVED.	
]			
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	LLO 10	A 4/23/69 MISSION RULE SUMMARY TD&E 3-6	

A. ECS LOSS OF CABIN INTEGRITY FIRE OR SMOKE IN THE CABIN OR MANIFOLD LEAK LOSS OF OR MAIN OR REGULATOR LOSS OF PRIMARY RADIATOR LOSS OF PRIMARY RADIATOR LOSS OF SECONDARY RADIATOR LOSS OF SECONDARY RADIATOR LOSS OF SECONDARY RADIATOR LOSS OF SECONDARY RADIATOR LOSS OF FORMAL OR WASTE MAY COLON TO THE RECESSIVE CABIN MANIDITY LOSS OF FORMAL OR WASTE MAY CAPABILITY B. CRYO LOSS OF ALL OVERBOARD DUMP CAPABILITY B. CRYO LOSS OF ANY CRYO TANK C. EPS LOSS OF TWO FUEL CELLS LOSS OF TWO FUEL CELLS LOSS OF TWO FUEL CELLS LOSS OF TWO ENTRY BATTERIES D. COMPY INSTRUMENTATION LOSS OF TWO ENTRY BATTERIES D. COMPY INSTRUMENTATION LOSS OF SCE E. SEQUENTIAL LOSS OF ONE SEQUENTIAL SYSTEM SMIC ACTIVATED FREMATURELY F. GBC LOSS OF DIRECT RCS CONTROL, BOTH RHC'S (CHECK ONCE POST TILI) G. SPS NONE H. SM-RCS LOSS OF ONE QUAD LEAK DOWNSTREAM OF HELIUM ISOLATION VALVE I. OM-RCS LOSS OF HELIUM MONIFOLD PRESSURE – ONE RING OM-RCS ARMED UCOSS OF HELIUM MANIFOLD PRESSURE – ONE RING OM-RCS ARMED UCOSS OF HELIUM MANIFOLD PRESSURE – ONE RING OM-RCS ARMED UCOSS OF HELIUM MANIFOLD PRESSURE – ONE RING		1754			· · · · · · · · · · · · · · · · · · ·	MISSION RULES				
SM FALLURES. THE MET BEST PIP COLOR INCLIDE A CIRCUMLINAR FLIGHT DEPENDENT ON INFLIGHT ANALYSIS AND EVALUATION OF THE FOLIORING TRADEUPS: A. FLIGHT TIME REPAINING B. ABORT MANELYER REQUIRED C. SYSTEMS REDUIDANCY REMINING (NOTE: FOR CSM PROBLEMS, CONSIDERATION WILL BE GIVEN TO EARLY TRANSFER TO THE LM TO ALLEVIATE THE CONTITION.) CSM CONDITION A. ECS LOSS OF CARM INTEGRITY FIPE OR SHOW IN THE CABIN OZ MANIFOLD LEAK LOSS OF OR MAIN OZ REGULATOR LOSS OF FRIMARY RADIATOR LOSS OF FRIMARY RADIATOR LOSS OF FRIMARY COLLANT LOOP LEAK OF GICTOL COLLANT EXCESSIVE CABIN IMMIDITY LOSS OF FRIMARY COLLANT LOOP LEAK OF GICTOL COLLANT EXCESSIVE CABIN MINDITY LOSS OF THE DIEL CELLS LOSS OF THE DIEL CELLS LOSS OF THE DIEL CELLS LOSS OF THE DIEL CELLS LOSS OF THE DIEL CELLS LOSS OF THE DIEL CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIET CELLS LOSS OF THE DIETE CELLS LOSS OF THE D	EV	ITEM				TRANSLUNAR COAST				
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CM-RCS ARMED LOSS OF HELIUM MANIFOLD PRESSURE - ONE RING MISSION REV DATE SECTION GROUP PAGE			I.	CM-RCS						
Inde		-		CM-RCS ARMED						
Inde	MI	CCION	DEV	DATE	LECTION		Tenous	Taxas		
APOLLO 10 FINAL 4/15/69 MISSION RULE SUMMARY TRANSLUNAR COAST 3-7						MADV		 		

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		WISSION KOLES							
REV	ITEM								
Α	3-28 (CONT'D)	J. INTERFACE CONDITION							
	CONT	LOSS OF ALL TWO-WAY VOICE CSM OR LM/MSFN (CREW NOT UPDATED WITH FLYBY PAD)							
Α	3-29	OI WILL BE INHIBITED AND A CIRCUMLUNAR FLIGHT ACCOMPLISHED FOR ANY CONSUMABLE PROBLEM PREVEN	TING						
		MINIMUM LUNAR ORBIT OPERATIONS OR ANY CONDITION REQUIRING TERMINATION OF TLC. THE FOLLOWING CONDITIONS WILL ALSO CAUSE LOI TO BE INHIBITED:	CSM						
		A. CSM CONDITION							
			RULES						
		1. ECS							
		LOSS OF PRIMARY AND SECONDARY EVAPORATORS							
		2. EPS							
		LOSS OF ONE ENTRY BATTERY (BASED ON FAILURE MODE, CONSIDERATION WILL BE GIVEN TO CONTINUING WITH LOI)							
		LOSS OF ONE FUEL CELL (BASED ON FAILURE MODE, CONSIDERATION WILL BE GIVEN							
		TO CONTINUING WITH LOI) LOSS OF AC 1 PHASE A							
1		LOSS OF AC 2 PHASE A LOSS OF BATT CHARGER (IF SUM OF TWO LOWEST ENTRY BATT <56 AMP HRS)							
'		3. COMM/INSTRUMENTATION							
		LOSS OF CRITICAL INSTRUMENTATION (REQUIRED FOR GO/NO-GO DECISION)							
	[]	4. G&C							
		LOSS OF BOTH BMAGS IN ROLL							
	j	LOSS OF BOTH BMAGS IN PITCH OR YAW AXIS							
		LOSS OF BOTH FDAI'S LOSS OF CMC							
		LOSS OF NAV DSKY (CMC WARNING RELAY) LOSS OF ISS							
		LOSS OF OPTICS SUBSYSTEM							
		LOSS OF OPTICS CDU D/A (CHECK PRE-SPS BURN) GROUND AT EITHER SPS SOL DRIVER OUTPUT AND UNABLE TO REMOVE							
		LOSS OF EITHER TVC SERVO LOOP DURING A PREVIOUS BURN							
		5. SPS							
١.		SUSTAINED PRESSURE DECAY IN SPS FUEL OR OX TANK LOSS OF ONE BANK OF BALL VALVES							
		FUEL FEEDLINE TEMP 40°F AND UNABLE TO INCREASE ENGINE FLANGE OVERTEMP DURING A PREVIOUS BURN							
		THRUST CHAMBER PRESSURE BELOW 70 PSI DURING A PREVIOUS BURN							
		FUEL/OXIDIZER ΔP GREATER THAN 20 PSI LOSS OF HELIUM SOURCE PRESSURE (SPS)							
		LOSS OF BOTH GN ₂ TANKS							
		6. SM-RCS							
		LOSS OF ULLAGE CAPABILITY LOSS OF FOLLOWING THRUSTER COMBINATIONS:							
		2P OR 2Y							
		IP AND IY							
		1P OR 1Y AND 2 ROLL IN SAME DIRECTION 3 ROLL IN SAME DIRECTION							
		7. CM-RCS							
		LOSS OF HELIUM SOURCE PRESSURE - ONE RING							
		CM-RCS ARMED LOSS OF HELIUM MANIFOLD PRESSURE - ONE RING							
		THE TOTAL OLD TRESSORE - ONE KING							
М	ISSION	DATE SECTION GROUP PAGE							
APO	LLO 10	A 4/23/69 MISSION RULE SUMMARY TRANSLUNAR COAST 3-8							
erc/	C ~ Farm	2 (AU) (C)							

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	MISSION RULES
REV ITEM	
3-29	B. INTERFACE CONDITION:
(CONT'D	. 1. DOCKING
	LOSS OF 4 DOCKING LATCHES
	2. COMMUNICATIONS
	LOSS OF ALL TM
	LOSS OF ALL TWO-WAY VOICE CSM/MSFN
A 3-30	DURING THE LOI BURN, THE FLIGHT CREW WILL TAKE THE FOLLOWING ACTION:
	A. TERMINATE LOI FOR THE FOLLOWING SPS PROBLEMS (PERFORM THE 15 MINUTE ABORT IF THE BURN IS TERMINATED IN THE MODE I OR MODE II REGION):
,] [*SEE MALFUNCTION PROCEDURE #1
	 LOSS ONE GN₂ BOTTLE (<400 PSI) AND DECAY IN OTHER (TERMINATE ONLY WHILE IN THE MODE I OR MODE II REGION)
	2. PRESSURE DECAY IN EITHER SPS PROPELLANT TANK TO 140 PSI (AFTER MANUAL REPRESS ATTEMPT)
	*3. FUEL - OXIDIZER ΔP>20 PSI
	344. CHAMBER PRESSURE <80 PSI OR DECAY OF 10 PSI DURING BURN
	5. ANY BALL VALVE(S) FAILS TO OPEN AFTER ITS RESPECTIVE BANK IS COMMANDED ON OR FAILS CLOSED
' .	(TERMINATE ONLY WHILE IN THE MODE I OR MODE II REGION) 6. FLANGE TEMPERATURE LIGHT
	B. PERFORM MTVC TAKEOVER AND COMPLETE THE BURN FOR THE FOLLOWING CONTROL PROBLEMS:
	1. GEN NO-GO
	2. ATTITUDE EXCURSION >10°
	3. RATES >10°/SEC
	C. RESTART THE BURN AND COMPLETE UNDER SCS CONTROL FOR AN SPS SHUTDOWN.
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	RULE NUMBERS 3-31 THROUGH 3-36 ARE RESERVED.
MISSION	REV DATE SECTION GROUP PAGE
APOLLO 10	A 4/23/69 MISSION RULE SUMMARY TRANSLUNAR COAST 3-9
EC/TSG Form	292 (AUG 68)

		· · · · · · · · · · · · · · · · · · ·	MISSION RULES			
REV	ITEM		LUNAR ORBIT			
	3-37	A. UNLESS A STA CIRCUMLUNAR B. IF STABLE OR	ANALYSIS OF A NON-NOMINAL LOI BURN, THE BLE ORBIT HAS BEEN ACHIEVED, DIRECT (SPS ABORTS WILL BE EXECUTED. BIT HAS BEEN ACHIEVED, TEI (DPS OR SPS) WATE MISSION WILL BE INITIATED.	OR DPS) ABORTS OR DPS TWO IMPULS	E :	
Α	3–38	TEI WILL BE PERF	ORMED AT THE NEXT BEST OPPORTUNITY FOR TH NOTE 1 FOR CSM PROBLEMS, CONSIDERATION TO RETAINING THE LM FOR THE TRAN TO ALLEVIATE THE CONDITION AND/O BACKUP CAPABILITY.	WILL BE GIVEN SEARTH PHASE		
			BACKOF CAFABILITY.			
			NOTE 2 FOR THOSE CONDITIONS MARKED BY A EARLY TEI WILL BE EXECUTED ONLY CRITICAL LUNAR ORBIT OPERATIONS COMPLETED (I.E., LM CHECKOUT, RN TRACKING).	AFTER MISSION HAVE BEEN	·	
		CONDITION			RULES	
		A, ECS			10000	
		CONFIRMED LE LOSS OF POTA EXCESSIVE CA LOSS OF CABII LOSS OF SUIT LOSS OF BOTH LOSS OF SECO LOSS OF BOTH *LOSS OF SECO *LOSS OF SECO *LOSS OF ALL *LOSS OF ONE	ARY RADIATOR ARY COOLANT LOOP AK OF GLYCOL COOLANT BLE OR WASTE H ₂ O TANK BIN HUMIDITY N INTEGRITY CIRCULATION EVAPORATORS			
		B. CRYO				
		LOSS OF ANY	CRYO TANK			
		C. EPS				
*LOSS OF BATT CHARGER AND SUM OF TWO LOWEST ENTRY BATT =52 AMP-HR LOSS OF TWO INVERTERS LOSS OF AC 1, PHASE A LOSS OF AC 2, PHASE A LOSS OF ONE MAIN OR BATTERY BUS LOSS OF ONE MAIN OR BATTERY BUS LOSS OF 1 AC BUS *LOSS OF 1 AC BUS *LOSS OF ONE BATTERY (BASED ON FAILURE MODE, CONSIDERATION WILL BE GIVEN TO CONTINUING WITH THE NOMINAL MISSION) *LOSS OF ONE FUEL CELL (BASED ON FAILURE MODE, CONSIDERATION WILL BE GIVEN TO CONTINUING WITH THE NOMINAL MISSION) D. COMM/INSTRUMENTATION *LOSS OF SCE						
		LOSS OF CRIT	CAL INSTRUMENTATION (REQUIRED FOR GO/NO-C	O DECISION)		
IM	SSION	REV DATE	SECTION	GROUP	PAGE	
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L		A 4/23/69	MISSION RULE SUMMARY	LUNAR ORBIT	3-10	

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	,	MISSION RULES		
REV	ITEM	·		
А	3-38	E. SEQUENTIAL		
	(CONT'D)		
,	ļ	FG&C		
		LOSS OF BOTH BMAGS IN PITCH OR YAW *LOSS OF BOTH ROLL BMAGS LOSS OF EITHER TVC LOOP IN EITHER PITCH OR YAW (C	HECKED PRE-SPS BURNS)	
1		LOSS OF DIRECT RCS CONTROL BOTH RHC COMPLETE LOSS OF AUTO ATTITUDE CONTROL IN PITCH A LOSS OF BOTH FDAI'S GROUND AT EITHER SPS SOL DRIVER OUTPUT AND ENABLE	ND YAW	
		*LOSS OF CMC *LOSS OF NAV DSKY (CMC WARNING RELAY) *LOSS OF INERTIAL SUBSYSTEM *LOSS OF OPTICS CDU D/A (CHECKED PRE-SPS BURNS)		
		G. SPS		
		SUSTAINED PRESSURE DECAY IN SPS FUEL OR OX TANK LOSS OF ONE BANK OF BALL VALVES LEAK OR LOSS OF SPS HE SUPPLY PRESSURE (DEPENDENT FUEL FEEDLINE AND/OR OXIDIZER FEEDLINE TEMP 40°F FUEL-OXIDIZER $\Delta P > 20$ PSI CHAMBER PRESSURE <70 PSI FLANGE TEMPERATURE LIGHT LOSS OF BOTH GN2 TANK PRESS UNABLE TO IGNITE THE SPS LOSS OF ULLAGE CAPABILITY	ON ULLAGE BLOWDOWN CAPABILITY) AND UNABLE TO INCREASE	
		H. SM-RCS		
		LOSS OF ONE SM-RCS QUAD SM-RCS PACKAGE TEMP LOW AND UNABLE TO INCREASE LOSS OF FOLLOWING THRUSTER COMBINATIONS:		
		2P OR 2Y 1P AND 1Y 1P OR 1Y AND 2 ROLL IN SAME DIRECTION 3 ROLL IN SAME DIRECTION		
		I. CM-RCS		
	•	*LEAK IN OR LOSS OF SOURCE PRESS IN ONE CM-RCS RIN *ARMING OF CM-RCS *LOSS OF He MANIFOLD PRESS ONE RING	G	
		J. INTERFACE CONDITIONS		
		1. COMMUNICATIONS		
		LOSS OF TWO-WAY VOICE CSM/MSFN LOSS OF ALL TM		
А	3-39	IVT (CSM TO LM) WILL BE INHIBITED FOR ANY OF THE FOLLO	OWING:\	
		A. DOCKING SYSTEM		
		LESS THAN THREE GOOD DOCKING RING LATCHES LESS THA	AN <u>120</u> ° APART	·
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inci /a	O. C.	292 (All 7 66)	1	

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3-40 THE LM WILL BE JETTISONED EARLY FOR:	
· · · · · · · · · · · · · · · · · · ·	
A. APS PROPELLANT LEAKS	
B. RCS PROPELLANT LEAKS	
	-
3-41 THE ASCENT STAGE WILL BE RETAINED FOR TEC FOR THE	FOLLOWING CSM CONDITIONS:
A. ECS	
LOSS OF SUIT CIRCULATION UNCONTROLLABLE HIGH HUMIDITY	
B. SM-RCS	
LOSS OF 2 QUADS	
C. INTERFACE CONDITIONS	4
LOSS OF TWO-WAY VOICE WITH MSFN	
A 3-42 A DPS TEI WILL BE PERFORMED FOR:	
A. BEFORE UNDOCKING	
ALL CONDITIONS INHIBITING UNDOCKING OR REASON TO EMU REQUIREMENTS)	S FOR EARLY TEI (REF. RULE 3-49/3-38; DELETE REFERENCE
B. AFTER DOCKING	
ALL CSM CONDITIONS WHERE STAGING IS INHIBITED	IN ORDER TO RETAIN THE DESCENT STAGE
FOR TEI AND/OR TEC (REF. RULE 3-59)	
	· .
RULE NUMBERS 3-43 THROUGH	
3-48 ARE RESERVED.	
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				MISSION RULES	·	
REV	ITEM					
А	3-49	UNDOC	KING OF THE	LM WILL BE INHIBITED FOR:		
		A. CS	SM CONDITION	S		
		l Di	PEND ON THE	S CAUSING A DECISION TO PERFORM AN EARL LM SYSTEMS. UNDOCKING ALSO REQUIRES F ERS OPERATIONAL, AND TWO-WAY VOICE COMM	III SHIT CIDCUIT INTECDITY A THE	ONS ALL
		B. LA	1 CONDITIONS	:		
				<u>NOTE</u>		
.				THE CAPABILITY IS MAINTAINED TO STAGE	THE LM IF REQUIRED.	
	:	1.	SEQUENTIA	L AND PYROTECHNICS	·	
		 	LOSS OF BO	OTH PYRO SYSTEMS		
		2.	EPS			
			LOSS OF E	NE ASCENT AND AT LEAST TWO DESCENT BATT ITHER ASCENT FEEDER ITHER CDR OR LMP BUS ENT ELECTRICAL ENERGY TO COMPLETE THE UN NO DESCENT FEEDERS	NDOCKED OPERATIONS PLUS 2 HRS	
		7	ECS	TO DESCRIPTEDENS		
		۶.		APIN DESCUE INTERNITY		
			LOSS OF SU LOSS OF BO LOSS OF BO LOSS OF AL LOSS OF TV	ABIN PRESSURE INTEGRITY JIT CIRCUIT INTEGRITY DITH SUIT FANS DITH DEMAND REGULATORS DITH PRIMARY AND SECONDARY COOLANT LOOP LL H ₂ O TANKS WO OR MORE O ₂ TANKS ENT CONSUMABLES (O ₂ , H ₂ O, OR LIOH) TO CO	MPLETE THE UNDOCKED OPERATIONS	
		4.	COMM/INSTR			
				NBOARÒ CRITICAL DISPLAYS		
ļ		5.	G&C			
	-		LOSS OF RE	EDUNDANT 3-AXIS ATTITUDE CONTROL -AXIS TRANSLATION CAPABILITY		
		6.	DPS			
				LEAK (JETTISON DPS AT BEST OPPORTUNITY	BEFORE CONCIDENTAIC UNIDOCKANO	
ļ		7	APS	CLAR COETTISON DES AT BEST OPPORTUNITS	BEFORE CONSIDERING UNDUCKING)	
		, ·		TIEN CITTURE IN AT DESCRIPTION		
				LEAK (JETTISON LM AT BEST OPPORTUNITY)	•	•
		8.	RCS			
			PROPELLANT	S SYS A OR B - LEAK (JETTISON LM AT BEST OPPORTUNITY) RUSTER PAIR ISOLATED		
		C. IN	TERFACE COND	DITIONS		
		1.	DOCKING SY	STEM		
			FAILURE TO	ING RETRACT SQUIBS HAVE FIRED OR MISFIF REINSTALL OR CLOSE DOCKING PROBE, DROG CSM FORWARD HATCH PRIMARY AND SECONDAR	UE, OR LM UPPER HATCH	
'		2.	COMMUNICAT	TIONS		
				O-WAY VHF VOICE BETWEEN CSM AND LM		
		D. EM				
MI	SSION	LO: REV		(2 OPS, 1 PLSS)	Longue	1
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		MISSION RULES
EV	ITEM	RENDEZVOUS PHASE
A	3-50	INITIATION OF NOMINAL RENDEZVOUS (TRAJECTORY PROFILE) WILL BE INHIBITED FOR:
		<u>NOTE</u>
		THE SEP MANEUVER AND MINI-FOOTBALL WILL BE PERFORMED FOR ALL CONDITIONS ALLOWING UNDOCKING. REFERENCE RULE 3-49.
		A. CSM CONDITIONS REQUIRING TEI AT THE NEXT BEST OPPORTUNITY (3-38). RENDEZVOUS ALSO REQUIRES FULL SUIT CIRCUIT INTEGRITY, THC, SEXTANT TRACKING CAPABILITY, RR TRANSPONDER, AND TM.
		B. LM CONDITIONS
		1. SEQUENTIAL AND PYROTECHNICS
		LOSS OF BOTH PYRO SYSTEMS
		2. EPS
		NEED TWO ASCENT AND TWO DESCENT OR FOUR DESCENT AND ONE ASCENT BATT LOSS OF EITHER CDR OR LMP BUS LOSS OF BOTH INVERTERS LOSS OF EITHER AC BUS A OR B LOSS OF EITHER ASCENT FEEDER INSUFFICIENT ELECTRICAL ENERGY TO COMPLETE THE NOMINAL RNDZ PLUS 2 HRS LOSS OF BOTH DESCENT FEEDERS OR LOSS OF ONE DESCENT FEEDER DUE TO HARD SHORT
		3. ECS
		LOSS OF CABIN PRESSURE INTEGRITY LOSS OF SUIT LOOP INTEGRITY LOSS OF BOTH SUIT FANS LOSS OF BOTH H ₂ O SEPARATORS LOSS OF BOTH DEMAND REGULATORS LOSS OF EITHER COOLANT LOOP LOSS OF FIMER COOLANT LOOP LOSS OF PRIMARY H ₂ O FEEDPATH CAPABILITY INSUFFICIENT CONSUMABLES (O ₂ , H ₂ O, OR LiOH) TO PERFORM NOMINAL RNDZ PLUS 2 HRS LOSS OF TWO O ₂ TANKS LOSS OF TWO H ₂ O TANKS
		4. COMM/INSTRUMENTATION
ł		LOSS OF CRITICAL ONBOARD DISPLAYS
		5. G&C
		LOSS OF REDUNDANT 3-AXIS ATTITUDE CONTROL CAPABILITY LOSS OF PCNS LOSS OF 3-AXIS TRANSLATION CAPABILITY LOSS OF RR LOSS OF BOTH FDAI'S LOSS OF DSKY LOSS OF DPS ENG ON/OFF CAPABILITY LOSS OF AOT AND COAS
1		LOSS OF GDA WHERE RCS IMPINGEMENT CONSTRAINTS WILL BE VIOLATED LOSS OF BOTH TTCA LOSS OF BOTH HAND CONTROLLERS
		6. DPS
		PROPELLANT LEAKS LOSS OF OPERATIONAL DPS
		7. APS
		PROPELLANT LEAKS LOSS OF OPERATIONAL APS
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A 3-50 8. RCS SERBINDANT 3-AXIS ATTITUDE CONTROL 3-AXIS TRANSLATION CONTROL 3-AXIS TRANSLATION CONTROL 3-AXIS TRANSLATION CONTROL 3-AXIS TRANSLATION CONTROL 3-AXIS TRANSLATION CONTROL 3-AXIS TRANSLATION CONTROL 1. LOSS OF SYSTEMS A OR 8 ONE TRUSTER PAIR ISCALAYED PROPELLANT LEAK C. THE BERGEZOUS WILL BE NO-EQD IF ANY OF THE FOLLOWING INTERFACE CONDITIONS EXIST: 1. COMMANICATION S LOSS OF TWO-MAY VOICE COMMANICATION BETWEEN VEHICLES LOSS OF TWO-MAY VOICE COMMANICATION BETWEEN VEHICLES LOSS OF ALL TELEMETRY (NEED BLOCK OF HER FOR E-MEMORY DUMP BEFORE GO) A 3-51 THE FLIGHT CREW WILL TERMINATE DOL FOR: ATTITUDE DEVIATIONS 3-9 SATES 5-5/SCC UPS TANK PRESS 1/20 PSI OYMEROUS A 3-52 THE PLIGHT GREW WILL PERFORM THE DIRECT RETURN TO THE CSM FOR THE FOLLOWING REASONS (CAMPABILITY REMAINS TITL APPROXIMATELY DOL + 10 MIND): A ECS LOSS OF BOTH CODUNIT LODGS FIRE ON SWIKE IN CARIN LOSS OF CABIN PRESSURE B. GGC PONS FAIL ACQUIRACY TEST (COMPARISON WITH AGS AND RR) LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCEEDED 2. DES NALT PRESSURE STONERS PRESSURE BILL TRUSTS WERE DITTINED FOR THE FOULDWING IN CONTROL THROTTLE DELTA PRESSURE STONERS IN VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCEEDED MISSION BY VATE SCELLON MISSION BY VATE SCELLON A 4-V23/65 MISSION RULE SUMMARY BENGEZOUS 3-15	REV	ITEM	MISSION RULES
REDURANT 3-AXIS ATTITUDE CONTROL SANIS TRANSLATION CONTROL SANIS TRANSLATION CONTROL SANIS TRANSLATION CONTROL SANIS TRANSLATION CONTROL ONE TRANSPECT PAIR ISOLATED PROPELLANT LEAR C. THE REDOEXNOUS WILL BE NO-50 IF ANY OF THE FOLLOWING INTERFACE CONDITIONS EXIST: 1. COMMUNICATIONS LOSS OF TRO-MAY VOICE COMMUNICATION BETWEEN VEHICLES LOSS OF TRO-MAY VOICE COMMUNICATION BETWEEN VEHICLES LOSS OF TRO-MAY VOICE COMMUNICATION BETWEEN WISH AND IN LOSS OF TRO-MAY VOICE COMMUNICATION BETWEEN VEHICLES ATTITUDE DEVITATIONS >50 SANIS SANISE ANTE SANISES 420 PSI OVERNIAN IN USE LOCE FAIL DELTA PRESSURE BETWEEN FUEL AND OXIDIZER >TEO PSI (AFTER STEADY STATE ACHIEVED) A 3-51 THE FLIGHT CREA WILL PERFORM THE DIRECT STURM TO THE CSM FOR THE FOLLOWING REASONS (CAPABILITY REMAINS TILL APPROXIMATELY DOI + 10 MIND: LA CONDITIONS A. ECS LOSS OF BOTH COOLANT LOOPS FIRE OR SHOKE IN CASIN LOSS OF CABIN PRESSURE B. GBC C. TRANSFECTORY DOI OVERBURN >12 FPS A 3-53 DPS PHASING BURN OPERATION A. THE DPS PHASING BURN WILL BE TERMINATED FOR THE FOLLOWING LM CONDITIONS: 1. GBC LOSS OF ALL ATTITUDE CONTROL, ATTITUDE EXCURSION >50 RATE EXCURSION >50 FSEE LOSS OF ALL THRUST VECTOR CONTROL AND RCS PILME IMPROPENT CONSTRAINT EXCEEDED 2. DPS NELT PRESSURE SETMENT VECTOR CONTROL AND RCS PILME IMPROPENT CONSTRAINT EXCEEDED MESSION REV PATE SECTION MESSION REV PATE SECTION MESSION REV PATE SECTION MESSION RULE SUMMARY BEDDEZVOUS 3-15	KE.V	11674	
REQUADANT 3-AXIS ATTITUDE CONTROL 3-AXIS TOWNSLATION CONTROL 3-AXIS TOWNSLATION CONTROL 3-AXIS TOWNSLATION CONTROL 3-AXIS TOWNSLATION CONTROL 4. ON THE TENDEZYOUS WILL BE MO-60 IF ANY OF THE FOLLOWING INTERFACE CONDITIONS EXIST: 1. COMMUNICATIONS LOSS OF TRO-MAY VOICE COMMUNICATION BETWEEN WEIN MAD IN 1.055 OF TRO-MAY VOICE COMMUNICATION BETWEEN WEIN MAD IN 1.055 OF TRO-MAY VOICE COMMUNICATION BETWEEN WEIN MAD IN 1.055 OF TRO-MAY VOICE COMMUNICATION BETWEEN WEIN MAD IN 1.055 OF ALL TELEMETRY (MEED BLOCK OF HER FOR E-MEMORY LUMP BEFORE GO) A 3-51 THE FLIGHT CREW WILL TERMINATE DO) FOR: ATTITUDE DEVIATIONS >5° MATES X-5/S-EC OVERBURN 1-10-10-10-10-10-10-10-10-10-10-10-10-10	А	3-50	8. RCS
3-XXIS TRANSLATION CONTROL LOSS OF SYSTEMS AND RES REPORTANT LEAR CO. THE RENDEZPOUS WILL BE NO-SO IF ARY OF THE FOLLOWING INTERFACE CONDITIONS EXIST: 1. COMMINICATIONS LOSS OF TWO-MAY VOICE COMMINICATION DETWERN VEHICLES LOSS OF TWO-MAY VOICE COMMINICATION DETWERN VEHICLES LOSS OF TWO-MAY VOICE COMMINICATION DETWERN VEHICLES LOSS OF TWO-MAY VOICE COMMINICATION DETWERN VEHICLES LOSS OF THE FLIGHT CREW WILL TERMINATE DOI FOR: AYTHING DIVIATIONS >5º PATES >/SEC PATES >/SEC DOS TAMP PRESS PATES >/SEC DOS TAMP PRESS PATES >/SEC COMPARIENT INDIOR LOG FAIL CRELIAN INDIOR LOG FAIL CREATER INDIOR LOG FAIL CREATER INDIOR LOG FAIL CREATER THE AND OXIDIZER >TRO PSI CAFTER STEADY STATE ACHIEVED) A 3-52 THE FLIGHT CREW WILL PERFORM THE DIRECT RETURN TO THE CSM FOR THE FOLLOWING REASONS (CAPABILITY REMAINS TILL APPROXIMATELY DOI + 10 MIN): A. ECS LOSS OF BOTH COOLANT LOOPS FIRE OS SMOKE IN CABIN LOSS OF CABIN PRESSURE B. GCC PONS FAIL ACCURACY TEST (COMPARISON WITH AGS AND RR) LOSS OF LOG C. TRAJECTORY DOI OVERBURN >12 FPS A 3-53 LOSS OF ALL THRUST CONTROL, ATTITUDE EXCURSION >5º RATE EXCURSION >> PERFORM LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED AMISSION REV PATE SECULO PSI MARIN 455 PERCENT THROTTLE PROSECUOUS DE ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINEDMENT CONSTRAINT EXCREDED APPOLLO TO A 4 9/23/69 PISSION RUSE SUMMAY REDECVOUS 3-15			
ONE THISITED PAIR ISOLATED PROPERLAY LEAK C. THE RENDEZVOUS WILL BE NO-SO IF ANY OF THE FOLLOWING INTERFACE CONDITIONS EXIST: 1. COMMUNICATIONS LOSS OF TWO-MAY VOICE COMMUNICATION BETWEEN MEIN AND UM LOSS OF ALL TREMPETRY ONCE DELOCK OF HER FOR E-MEMORY DUMP BEFORE GO) A 3-51 THE FLIGHT CREW WILL TERMINATE DOI FOR: PATITIONE DELTA PRESSURE BETWEEN FUEL AND OXIDIZER >TEO PSI (AFTER STEADY STATE ACHIEVED) A 3-52 THE FLIGHT CREW WILL PERFORM THE DIRECT RETURN TO THE CSM FOR THE FOLLOWING REASONS COMPARITITY REMAINS TILL APPROXIMATELY DOI + 10 MIN); A. ECS LOSS OF FOR LOCALITY EMAINS TILL APPROXIMATELY DOI + 10 MIN); A. ECS LOSS OF GRID COLANT LOOPS FIRE OR SMOKE IN CABIN LOSS OF CABIN PRESSURE B. GGC POSS OF FAIL ACCURACY TEST (COMPARISON WITH AGS AND RR) LOSS OF FUE LOSS OF FUE LOSS OF FUE LOSS OF FUE LOSS OF FUE LOSS OF ALL THITUSE CONTROL, ATTITUDE EXCURSION >5°, RATE ENCURSION >5° PSEC LOSS OF ALL THITUSE CONTROL, ATTITUDE EXCURSION >5°, RATE ENCURSION >5° PSEC LOSS OF ALL THITUSE CONTROL, ATTITUDE EXCURSION >5°, RATE ENCURSION >5° PSEC LOSS OF ALL THITUSE CONTROL, ATTITUDE EXCURSION >5°, RATE ENCURSION SET PSEC LOSS OF ALL THITUSE CONTROL, ATTITUDE EXCURSION >5°, RATE ENCURSION SET PSEC LOSS OF ALL THITUSE CONTROL, ATTITUDE EXCURSION >5°, RATE ENCURSION SET PSEC LOSS OF ALL THEORY VECTOR CONTROL AND RCS PILLIPS IMPINIBATELY CONSTRAINT EXCEEDED PROSSURE ENTRE ENTREM FUEL AND OXIDIZER -TED PSI (AFTER STEADY STATE ACHIEVED) MISSION REV DATE SECTION A 9/23/69 MISSION RULE SUMMARY RENDEZVOUS 3-15		{	3-AXIS TRANSLATION CONTROL
C. THE RENDEZVOUS WILL BE NO-GO IF ANY OF THE FOLLOWING INTERFACE CONDITIONS EXIST: 1. COMMUNICATIONS LOSS OF TWO-MAY VOICE COMMUNICATION BETWEEN VEHICLES LOSS OF TWO-MAY VOICE COMMUNICATION BETWEEN VEHICLES LOSS OF TWO-MAY VOICE COMMUNICATION BETWEEN VEHICLES LOSS OF TWO-MAY VOICE COMMUNICATION BETWEEN VEHICLES LOSS OF ALL TELEMETRY (NEED BLOCK OF HER FOR E-MEMORY DUMP BEFORE GO) A 3-51 THE FLIGHT CREW WILL TERMINATE DOLFOR: ATTITIZES DEVIATIONS >5° THAT PRESSURE BETWEEN FUEL AND OXIDIZER >18D PSI (AFTER STEADY STATE ACHIEVED) A 3-52 THE PLIGHT CREW WILL PERFORM THE DIRECT RETURN TO THE CSM FOR THE FOLLOWING REASONS (CAMPABILITY REMAINS TILL APPROXIMATELY DOLF) 10 MIN): LM CONDITIONS A. ECS LOSS OF BOTH COLLANT LOOPS FIRE OR SMOKE IN CARIN LOSS OF LUC C. TRAJECTORY DOLFORDERN >12 FPS A 3-53 DPS PHASING BURN OPERATION A. THE DPS PHASING BURN WILL BE TERMINATED FOR THE FOLLOWING IM CONDITIONS: 1. GCC LOSS OF LUC LOSS OF ALL ATTITUDE CONTROL, ATTITUDE EXCURSION >5°, RATE EXCURSION >5° /5°C. LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLIME IMPINEDMENT CONSTRAINT EXCEEDED 2. DPS INLET PRESSURE SETWEEN FUEL AND OXIDIZER >15D PSI (AFTER STEADY STATE ACHIEVED) MISSION. REV INTER SECTION APOLLO 10 A 4/23/69 MISSION RULE SUMMARY RENDEZVOUS 3-15			ONE THRUSTER PAIR ISOLATED
1. COMMUNICATIONS LOSS OF TWO-MAY VOICE COMMUNICATION BETWEEN METH AND LY LOSS OF ALL TELEMETRY (NEED BLOCK OF HBR FOR E-MEMORY DAMP BEFORE GO) A 3-51 THE FLIGHT CREW WILL TERMINATE DOI FOR: ATTITUDE CONTAINED SET SET SET SECTION ATTITUDE CONTAINED SET SET SET SET SET SET SET SET SET SET	1		
LOSS OF TWO-WAY VOICE COMMINICATION BETWEEN VEHICLES LOSS OF TWO-WAY VOICE COMMINICATION BETWEEN MERN AND UM LOSS OF ALL TELEMETRY (OMED BLOCK OF HER FOR E-MEMORY DUMP BEFORE GO) A 3-51 THE FLIGHT CREW WILL TERMINATE DOI FOR: PATTITUDE DEVIATIONS >5° RATES >5/SEC DOST TANK PRESS <120 PS1 OVERBURN DELTA PRESSURE BETWEEN FUEL AND OXIDIZER >150 PS1 (AFTER STEADY STATE ACHIEVED) A 3-52 THE FLIGHT CREW WILL PERFORM THE DIRECT RETURN TO THE CSM FOR THE FOLLOWING REASONS (CAPABILITY REMAINS TILL APPROXIMATELY DOI + 10 MIN): LOS COF BOTH COOLANT LOOPS FIRE OR SMOKE IN CASIN LOSS OF FAIL ACCURACY TEST (COMPARISON WITH AGS AND RR) LOSS OF GAIL ACCURACY TEST (COMPARISON WITH AGS AND RR) LOSS OF GLO C. TRAJECTORY DOI OVERBURN >12 FPS A 3-53 DPS PHASING BURN OPERATION A. THE DPS PHASING BURN OPERATION A. THE DPS PHASING BURN WILL BE TERMINATED FOR THE FOLLOWING UM CONDITIONS: 1. GBC LOSS OF ALL ATTITUDE CONTROL, ATTITUDE EXCURSION >5°, RATE EXCUSSION >5° FEC LOSS OF ALL ATTITUDE CONTROL, ATTITUDE EXCURSION >5°, RATE EXCUSSION >5° FEC LOSS OF ALL ATTITUDE CONTROL AND RCS PLUME IMPINISHMENT CONSTRAINT EXCEEDED 2. DPS INLET PRESSURE STIMES FUREN FULL AND OXIDIZER >150 PSI (AFTER STEADY STATE ACHIEVED) MISSION REY DATE SECTION REV DATE SECTION A 4/23/69 MISSION RULE SUMMARY RENDEZVOUS 3-15			C. THE RENDEZVOUS WILL BE NO-GO IF ANY OF THE FOLLOWING INTERFACE CONDITIONS EXIST:
LOSS OF TAIL—ATTITUDE CONTROL. ATTITUDE COMPARISON WITH AGS AND RR) LOSS OF ALL TELEPETRY (NEED BLOCK OF HBR FOR E-MEMORY DUMP BEFORE GO) A 3-51 THE FLIGHT CREW WILL TERMINATE DOI FOR: ATTITUDE DEVIATIONS >5º RATES >5/SEC DPS TAIK PRESSURE BETWEEN FUEL AND OXIDIZER >TBD PSI (AFTER STEADY STATE ACHIEVED) A 3-52 THE FLIGHT CREW WILL PERFORM THE DIRECT RETURN TO THE CSM FOR THE FOLLOWING REASONS (CAPABILITY REMAINS TILL APPROXIMATELY DOI + 10 MIN): LM CONDITIONS A, ECS LOSS OF BOTH COOLANT LOOPS FIRE OR SHOKE IN CABIN LOSS OF CABIN PRESSURE B. G&C PENS FAIL ACCURACY TEST (COMPARISON WITH AGS AND RR) LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF IND LOSS OF ALL ATTITUDE CONTROL, ATTITUDE EXCURSION >5º, RATE EXCURSION >5º/SEC LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINGEMENT CONSTRAINT EXCEEDED 2. DPS INLET PRESSURE =120 PSI WHEN <65 PERCENT THROTTLE, <150 PSI WHEN >65 PERCENT THROTTLE DELTA PRESSURE BETWEEN FUEL AND OXIDIZER >100 PSI (AFTER STEADY STATE ACHIEVED) MISSION REV DATE SECTION PAGE PPOLLO 10 A 4/23/69 MISSION RULE SUMMARY RENDEZVOUS 3-15			1. COMMUNICATIONS
ATTITUDE DEVIATIONS >5° RATES >5/5EC DPS TANK PRESS <120 PSI OVERRURN INU OR LOC FAIL DELTA PRESSURE BETWEEN FUEL AND OXIDIZER >TBD PSI (AFTER STEADY STATE ACHIEVED) A 3-52 THE FLIGHT CREW WILL PERFORM THE DIRECT RETURN TO THE CSM FOR THE FOLLOWING REASONS (CAPABILITY REMAINS TILL APPROXIMATELY DOI + 10 MIN): LM CONDITIONS A. ECS LOSS OF BOTH COOLANT LOOPS FIRE OR SHOKE IN CABIN LOSS OF CABIN PRESSURE B. G&C PONS FAIL ACCURACY TEST (COMPARISON WITH AGS AND RR) LOSS OF INU LOSS OF UGC C. TRAJECTORY DOI OVERBURN >12 FPS A 3-53 DPS PHASING BURN OPERATION A. THE DPS PHASING BURN WILL BE TERMINATED FOR THE FOLLOWING LM CONDITIONS: 1. G&C LOSS OF ALL ATTITUDE CONTROL, ATTITUDE EXCURSION >5°, RATE EXCURSION >5°/SEC LOSS OF ALL THRUST VECTOR CONTROL AND RCS PLUME IMPINGEMENT CONSTRAINT EXCEEDED 2. DPS INLET PRESSURE <120 PSI MHEN <6S PERCENT THROTTLE, <150 PSI WHEN >65 PERCENT THROTTLE, DELTA PRESSURE BETWEEN FUEL AND OXIDIZER >120 PSI (AFTER STEADY STATE ACHIEVED) MISSION REV DATE SECTION PAGE APOLLO 10 A 4/23/69 MISSION RULE SUMMARY RENDEZVOUS 3-15	l		LOSS OF TWO-WAY VOICE COMMUNICATION BETWEEN MSFN AND LM
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APOLLO 10 A 4/23/69 MISSION RULE SUMMARY RENDEZVOUS 3-15	347	ISSION	DEV DATE CECTION
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	· · · · · · · · · · · · · · · · · · ·			, MISSION RULES		·			
REV	ITEM								
Α	3-53	В.	AFTER PREMAT	URE DPS CUTOFF, THE FOLLOWING ACTION WILL	BE TAKEN:				
	CONT'D)	_,		RESTART WITH "START" BUTTON	DE TANEIX				
				RESTART WITH "DES ENG CMD OVRD" SWITCH					
1									
			(B) 5 < V	5 FPS - TRIM WITH +X 'G < 25 FPS - STAGE AND COMPLETE BURN VIA 25 FPS - STAGE AND COMPLETE BURN VIA APS	RCS WITH AGS CONTROL				
			4. ACHIEVE REV LATE	$\Delta V_{\mbox{\scriptsize M}} \geq 40$ FPS VIA RCS IF DPS AND APS FAIL R THAN NOMINAL	TO ALLOW RNDZ PHASING ONE				
А	3-54	APS	INSERTION BU	JRN OPERATION					
		Α.	THE APS INSE	RTION BURN WILL BE TERMINATED FOR:					
			1. G&C						
			LOSS OF RATE E	ALL ATTITUDE CONTROL, ATTITUDE EXCURSION XCURSION >10°/SEC	>10°,				
			2. APS						
				RESSURE <115 PSI OR >250 PSI RESSURE BETWEEN FUEL AND OXIDIZER >12 PSI					
		В.	AFTER PREMAT	URE CUTOFF, THE FOLLOWING ACTION WILL BE	TAKEN:				
			1. ATTEMPT	RESTART AND COMPLETE BURN IF:					
			(A) 10 (B) 10	SEC > COAST TIME > 200 SEC, PROP TEMP < 6 SEC > COAST TIME > 90 SEC, PROP TEMP > 65	5°F °F				
		2. IF V_M < 45 FPS, TRIM BACK TO ZERO WITH RCS MINUS X 3. IF V_G < 80 FPS, COMPLETE MANEUVER WITH RCS PLUS X							
		NOTE							
				FOR ALL CASES BETWEEN VM > 45 F A CSM RESCUE WILL BE PERFORMED. OCCUR TWO HOURS LATER THAN NOMIN	DOCKING WILL				
Α	3-55	AGS	TAKE-OVER WI	LL BE PERFORMED FOR THE FOLLOWING LM COND	ITIONS EXCEPT DOI:				
			G&C						
			LOSS OF						
			LOSS OF LOSS OF	ATTITUDE CONTROL, ATTITUDE EXCURSION >10°	FOR STAGED VEHICLE, >5°/SEC FOR	R UNSTAGED			
•			VEHICL	E RATE CONTROL, RATE EXCURSION >10°/SEC FOR					
					·				
Â	3-56	AS	5 MIN BEFORE	LM ACTIVE RNDZ (WITH DOCKING 2 HOURS EAR THE PC AFTER DOI. FAILURE TO MEET THE FO SE FOR PERFORMING THE FIVE-IMPULSE RNDZ.	LIER THAN NOMINAL) CAN BE SELECT LLOWING CRITERIA IN RULE 3-50 FC	TED AS LATE OR THE NOMINAL			
				S (IF THE PROBLEM OCCURS PRIOR TO DOI):					
			1. EPS						
			INSUFFIC	EITHER DESCENT FEEDER DUE TO A HARD SHORT IENT ELECTRICAL ENERGY TO COMPLETE THE NOT	MINAL PLUS 2 HRS BUT				
			SUFFIC	IENT TO COMPLETE THE FIVE-IMPULSE PLUS 2 }	HRS				
MI	SSION	REV	DATE	SECTION	GROUP	DACE			
	LLO 10	A	4/23/69	MISSION RULE SUMMARY	RENDEZVOUS	PAGE 3-16			
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			 	MISSION R	ULES		
REV	ITEM					 -	
A	3-56	 	2. ECS				
	CONT D)		INSUFFI	CIENT CONSUMABLES (02, H20, LiOH CIENT TO COMPLETE FIVE-IMPULSE P) TO PERFORM LUS 2 HRS	I NOMINAL RNDZ PLUS 2 HRS BUT	
			3. G&C				
١, ١	1		LOSS OF	AOT AND COAS (IF A FINE ALIGN H	AS BEEN ACCO	MPLISHED BEFORE THE FAILURE)	
			LOSS OF	GDA WHERE RCS IMPINGEMENT CONST	RAINTS WILL	BE VIOLATED	
			4. DPS				
			PROPELLA	OPERATIONAL DPS ANT LEAKS DPS ENG ON/OFF CAPABILITY			
		В.	LM CONDITION	NS (IF FAILURE IS RECOGNIZED AFT	ER DOI) FOR	FIVE-IMPULSE:	
			1. EPS				
			LOSS OF LOSS OF	ANY TWO BAT EITHER DC BUS EITHER ASCENT FEEDER CIENT ELECTRICAL ENERGY TO COMPL	ETE THE NOMI	NAL TIMELINE PLUS 2 HRS	
			2. ECS				
			LOSS OF LOSS OF LOSS OF LOSS OF LOSS OF LOSS OF LOSS OF	CABIN PRESSURE INTEGRITY SUIT LOOP INTEGRITY BOTH SUIT FANS BOTH H20 SEPARATORS BOTH DEMAND REGULATORS PRIMARY COOLANT LOOP TWO 02 TANKS TWO H20 TANKS CIENT CONSUMABLES (02, H20, LiOH) TO PERFORM	NOMINAL TIMELINE	
			3. COMM/INS	STRUMENTATION			
			LOSS OF	CRITICAL DISPLAYS			
			4. G&C				
			LOSS OF				
			5. RCS				
			LOSS OF	SYSTEM A OR B			
		с.	TRAJECTORY				
			DOI UNDERBÜF	RN >5 FPS	٠		
Α	3-57	LM S	TAGING WILL	BE PERFORMED EARLY FOR THE FOLLO	OWING LM CON	DITIONS:	
		Α. (
				WHERE RCS PLUME IMPINGEMENT CON	STRAINT WILL	. BE VIOLATED	
		В, І		DATIONAL DOG			
			LOSS OF OPER PROPELLANT I	RATIONAL DPS LEAK			:
MI	SSION	REV	DATE	SECTION	G	ROUP	PAGE
	LLO 10	Α	4/23/69	MISSION RULE SUMMARY	R	ENDEZVOUS	3-17
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		MISSION RULES									
REV	ITEM										
A	3-58	LM STAGING WILL BE DELAYED FOR ANY CSM RESCUE (REFERENCE RULE 3-60) AND THE FOLLOWING LM CONDITIONS:									
		NOTE									
		DELAYED STAGING WILL OCCUR AT TPI AT									
		THE EARLIEST. IT IS PREFERABLE TO INHIBIT STAGING IF CIRCUMSTANCES WILL									
١		PERMIT.									
		A. SEQUENTIAL AND PYRO									
		LOSS OF EITHER PYRO SYSTEM									
		B. EPS									
		LOSS OF EITHER BUS LOSS OF EITHER ASCENT BATTERY INSUFFICIENT ASCENT ELECTRICAL ENERGY TO COMPLETE NOMINAL OPERATIONS PLUS 2 HRS CONFIRMED LOSS OF ASCENT BATTERY OVERCURRENT PROTECTION									
۱.		c. ECS									
		LOSS OF CABIN PRESS INTEGRITY									
		LOSS OF SUIT LOOP INTEGRITY LOSS OF BOTH SUIT FANS									
1		LOSS OF EITHER SUIT FANS LOSS OF BOTH DEMAND REGULATORS									
.		LOSS OF EITHER ASCENT O2 TANK									
1		LOSS OF EITHER ASCENT H ₂ O TANKS INSUFFICIENT ASCENT O ₂ , H ₂ O, OR LiOH TO COMPLETE NOMINAL OPERATIONS PLUS 2 HRS LOSS OF BOTH COOLANT LOOPS									
		D. APS									
		NON OPERATIONAL DELTA V < TBD									
		E. RCS									
1		LOSS OF SYSTEM A OR B									
	3-59	LM STAGING WILL BE INHIBITED WHILE IN THE UNDOCKED CONFIGURATION FOR THE FOLLOWING CONDITIONS:									
		<u>NOTE</u>									
		FOR THESE CONDITIONS, THE CSM WILL PERFORM THE MCC AND BRAKING MANEUVERS.									
		A. CSM CONDITIONS									
		1. ECS									
		LOSS OF CABIN INTEGRITY FIRE OR SOURCE									
		LOSS OF O ₂ MANIFOLD									
-		2. CRYO									
		LOSS OF ANY CRYO TANK									
		3. EPS									
		LOSS OF TWO FUEL CELLS LOSS OF TWO INVERTERS LOSS OF ONE AC BUS LOSS OF AC 1 \$A OR AC 2 \$A									
		4. GEC									
		LOSS OF EITHER TVC LOOP									
		-									
IM	SSION	REV DATE SECTION GROUP PAGE									
	.LO 10	A 4/23/69 MISSION RULE SUMMARY RENDEZVOUS 3-18									

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	T					N RULES		
RE:V	1TEM							
A	3~59 (CONT'D)		5.	SPS				
}	CONTRO				PRESSURE DECAY IN FUEL OR O	· ·		
				FUEL /OX E	BOTH GN2 TANK PRESSURES FEEDLINE <40°F AND UNABLE TO	INCREASE		ļ
				DELTA PRE	SSURE BETWEEN FUEL/OX >20 PS LOSS OF SPS He SUPPLY PRESSUR			
		_						l
	' l	В.		CONDITIONS	 "			
			1.	,	AL AND PYRO BOTH PYRO SYSTEMS		•	
					DOTH FIRO SISTEMS			
			2.	EPS				
				LOSS OF 8	BOTH ASCENT BATTERIES BOTH ASCENT FEEDERS IENT ASCENT ELECTRICAL ENERGY	TO COMPLETE	TERMINAL PHASE PLUS 2 HRS	
			3.	ECS				
			•				BUACE BUIE A UBA	
				INSUFFICI	IENT ASCENT 02 OR H20 TO COMP	LETE TERMINAL	. PHASE PLUS 2 MKS	
	·		4.	G&C				
					RCS TRANSLATION CAPABILITY ATTITUDE CONTROL			
			5.	APS				
	-			PROPELLAN	NT LEAK			
			6	RCS				
			•					
				PROPELLAN	NT LEAK			
	3-60	EOD	TET	OD THE F	ING MANEUVERS WILL BE PERFORM DESCENT STAGE CONSUMABLES ARE SM RESCUE (MULTIPLE BURN COND	PECHIPED FOR	TEC (REFEDENCE CSM CONDI	TIONS IN
	3-61	AN E	EVT 1	WILL BE PE	ERFORMED FOR THE FOLLOWING CO	NDITIONS:		
		INA	3ILI	TY TO DOCK	<			
					FORM TUNNEL TRANSFER			
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		Din.	- KD -	ABEDS 3 CA	THROUGH			
				MBERS 3-62 E RESERVED				·
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APOL	-LO 10	A		4/23/69	MISSION RULE SUMMARY		RENDEZVOUS	3-19
	37 Form				L			

REV	ITEM	MISSION RULES	
		UNMANNED PHASE	
А	3-67	THE UNMANNED APS BURN WILL BE INHIBITED FOR CONDITIONS REQUIRING ASCENT STAGE SYSTEMS FOR LIFE SUPPORT OR COMMUNICATIONS AS A RESULT OF CSM PROBLEMS (REFERENCE RULE 3-41) AND THE FOLLOWING LM CONDITIONS:	<u>LES</u>
		A, EPS	
	:	LOSS OF EITHER BUS LOSS OF BOTH ASCENT BATTERIES	
	1	B. GUIDANCE AND CONTROL	
		LOSS OF PGNCS AND AGS LOSS OF APS ARM-DEARM/ON-OFF CONTROL LOSS OF 3-AXIS ATTITUDE CONTROL	
			!
		C. INTERFACE CONDITIONS	
		1. COMMUNICATIONS	
		LOSS OF ALL TM LOSS OF CMD UPLINK	
			:
			ı
			•;
	!		
	,		
Ŷ		DIRE NUMBERS 7 CO THROUGH	
'		RULE NUMBERS 3-68 THROUGH 3-75 ARE RESERVED.	
MI	SSION	REV DATE SECTION GROUP PAGE	
APO	LLO 10	A 4/23/69 MISSION RULE SUMMARY UNMANNED PHASE 3-20	
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REV	ITEM	ALL MANEUVERS	
	3-76	A CRITICAL SPS MANEUVER WILL BE INHIBITED FOR THE FOLLOWING CSM PROBLEMS (OTHER RIPOPULSION SYSTEMS WILL BE USED IF AVAILABLE):	ULES
		A. G&C	
		LOSS OF TWO TVC SERVO LOOPS LOSS OF THREE TVC CONTROL MODES (G&N, SCS AUTO, AND MTVC)	
		B. SPS	
		PRESSURE IN EITHER FUEL OR OXIDIZER TANK <115 PSI LOSS OF BOTH GN ₂ BOTTLES (<400 PSI) FUEL OR OXIDIZER FEEDLINE TEMP <27°F FLANGE TEMP >480°F ON PREVIOUS BURN CHAMBER PRESSURE <70 PSI ON PREVIOUS BURN FUEL/OXIDIZER P >20 PSI FIRST BURN SUBSEQUENT TO DOCKED DPS WAS <40 SEC, CONTINUOUS	
ļ		C. DOCKING SYSTEM	
		FOR DOCKED BURNS LESS THAN NINE GOOD DOCKING RING LATCHES	
	~ ~~		
Α	3-77	A DPS MANEUVER WILL BE INHIBITED FOR THE FOLLOWING LM PROBLEMS:	
		A. EPS	
	-	LOSS OF EITHER BUS	
		B. G&C	
ļ		LOSS OF ULLAGE NO GDA CONTROL AND GIMBAL FAILED HARDOVER	
		C. DPS	
		PROPELLANT TEMP NOT WITHIN 40 TO 75°F LIMITS DELTA PRESS BETWEEN FUEL AND OXIDIZER >TBD PSID AT FTP FUEL INLET PRESS <120 PSI FOR <65 PERCENT! THROTTLE AND <150 PSI FOR >65 PERCENT THROTTLE LOSS OF SUPERCRITICAL HE OR INSUFFICIENT HE PRESS TO GAIN 310 FPS AV PROPELLANT LEAKS MORE THAN 100 SEC WILL BE ACCUMULATED IN DPS NON-THROTTABLE RANGE	
		D. DOCKING SYSTEM	
		FOR DOCKED BURNS LESS THAN NINE GOOD DOCKING RING LATCHES	
-			
Α	3-78	AN APS MANEUVER WILL BE INHIBITED FOR THE FOLLOWING LM PROBLEMS:	
		A. G&C	
		LOSS OF ULLAGE LOSS OF 3-AXIS ATTITUDE CONTROL LOSS OF PGNS AND AGS	
		B. APS	
		DELTA PRESS BETWEEN FUEL AND OXIDIZER >20 PSIA DELTA TEMP BETWEEN FUEL AND OXIDIZER >10°F PROPELLANT TEMP NOT WITHIN 40 TO 100°F LIMITS INLET PRESS <115 PSI PROPELLANT LEAKS	
ΜI	SSION	REV DATE SECTION GROUP PAGE	
	LLO 10	A 4/23/69 MISSION RULE SUMMARY ALL MANEUVERS 3-21	
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				MISSION RULES		
REV	ITEM				-	
	3-79	LM	RCS MANEUVER	S WILL BE INHIBITED FOR THE FOLLOWING	IM PROBLEMS:	בווי בכ
		ł	G&C	The second of th	THROUGHS.	RULES
1			LOSS OF PGN	IS AND AGS		
			LOSS OF BOT	IXIS ATTITUDE CONTROL TH ACA'S IXIS TRANSLATION		
		В.	RCS	WIS TRANSLATION		
			PROPELLANT	TEMP NOT WITHIN 40 TO 100°F LIMITS		
			DELTA PRESS	BETWEEN FUEL AND OXIDIZER >80 PSID ESSURE <100 PSI LEAKS		
		c.	DOCKING SYS			
	ı		THREE GOOD	DOCKING RING LATCHES 120° APART ARE RI	EQUIRED	
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	LO 10	FINAL		MISSION RULE SUMMARY	GROUP ALL MANEUVERS	PAGE
	3G Form				ALL PARLOYERS	3-22

4 GROUND INSTRUMENTATION REQUIREMENTS

,					MISSION	KOTE2			
EV	ITEM								·
Α	4-1	GENE	RAL						
		A.	THE FOLLOWING	PRELAUNCH REQU EN FOR LAUNCH.	IREMENTS DEFINE	THE MCC/MS	FN REQUIREMENTS	WHICH MUST	BE MET BEFORE
			HARDWARE AND/	IC HARDWARE ITE OR SOFTWARE INT TIONAL CAPABILI	ERFACE REOUTRED	TO PROVIDE	THE MANDATORY	FUNCTIONS OF	ITEM, THE THAT HARDWARE
				NCY EXISTS FOR I					GHLY DESIRABLE.
					· <u>M</u>	<u>OTE</u>			
				SE ONI MI	E VARIOUS EQUIPM CTION ARE TO BE LY, IT IS MAND, TTING THE MISSIM LE TO:	UTILIZED A ATORY, PRIO	S A GUIDE R TO COM-		
				В.	RECEIVE AND D TRACKING DATA MAINTAIN VOICE THE CREW. COMMAND TO TH	E COMMUNICA	TIONS WITH		
					MANDATORY FROM CUTOFF + 60 S SEPARATION.	M S-IVB CUT	OFF TO S-IVB		
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		1							
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	SSION	REV		SECTION			GROUP		PAGE
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SECTION 4 - GROUND INSTRUMENTATION REQUIREMENTS - CONTINUED

					MISSION RULES			
REV	RULE	CONDITION/MAL	FUNCTION .	PHASE	RULING		CUES/NOTES/CON	MENTS
					,			
	4-2	TELEMETRY						
		A. CONSOLE DI EVENTS, AN	ISPLAY (D/TV,	PRELAUNCH .	MANDATORY	A.	FOR DISPLAY OF S/V PARAMETERS	
		B. PCM GROUNE		PRELAUNCH	1 OF 4 MANDATORY , 1 HIGHL	. Y В.	FOR DISPLAY OF	
		(4) C. RECORDING	WID BY VABVEA		DESIRABLE	•	S/V EVENTS AND	ANALOGS.
			AND PEATBACK			İ		
		ALDS		PRELAUNCH	BOTH DESIRABLE			
		MSFN	}					
		D. FM - GROUN	ND STATION	PRELAUNCH	1 OF 2 MANDATORY) D.	TO PROVIDE MANU DISPLAY DATA FO SURGEON.	
4	4-3	COMMAND						
		A. MOCR TOGGL	F SWITCHES					
		(BOTH A AN						
		1. BSE AE	BORT REQUEST	PRELAUNCH	HIGHLY DESIRABLE	Α.	FOR LAUNCH PHAS REQUEST	E ABORT
		2. FIDO A	ABORT REQUEST	PRELAUNCH	HIGHLY DESIRABLE		1,44,4-21	
		3. FD ABO	ORT REQUEST	PRELAUNCH	HIGHLY DESIRABLE			
		B. COMMAND PA	ANELS:			ı		
		EECOM, GUI TELCOM, CO	IDO, BSE, ONTROL, CCATS	PRELAUNCH	1 OF 6 MANDATORY	В.	FOR BULKHEAD AF	
		C. MOCR CONSC SELECT CAR						
		1. RTC CC CCCATS		DDEL AUNGU	1 OF 2 MANDATORY			
		2. CCATS MED	CMD CONSOLE	PREDMONON	I OF 2 MANDATORY	c.	FOR BULKHEAD ΔF INSERTION AND S	
		D. FC/M&O SWI						
		1. FLIGH	T DIRECTOR					
	ļ I	2. CCATS	CMD MED	PRELAUNCH	1 OF 2 MANDATORY	D.	FOR BULKHEAD AF INSERTION AND S	
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			Į					
	1		}			}		
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			_	MISSION RULES	
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	4-4	TRAJECTORY			
	1 1	A. TRAJECTORY DATA PRO- CESSING			A. THE TRAJECTORY DATA SOURCE ARE UTILIZED AS FOLLOWS:
		1. AVAILABILITY OF ONE INDIPENDENT TRACKING SOURCE (IP, USB) FROM LIFTOFF TO T + 10	PRELAUNCH	1 MANDATORY	1.(A) INDEPENDENT VERI- FICATION OF L/V NAVIGATION. (B) PROTECTION AGAINST
		MINUTES.			VIOLATION OF LAUNCH ENVELOPE.
		2. IU AND CMC TM VECTORS FROM LIFTOFF TO INSER- TION PLUS 60 SECONDS.	PRELAUNCH	BOTH MANDATORY	A.2. REQUIRED FOR ORBIT GO/NO-GO
		B. RTCC - DATA SELECT CAPABILITY	PRELAUNCH	MANDATORY	B. TO SELECT BEST AVAILABLE DATA SOURCE.
	4-5	COMMUNICATIONS			
		A. MOCR:			
		FD LOOP AFD CONF LOOP MOCR SYS 1 & 2	PRELAUNCH	I OF 2 MANDATORY	FOR MISSION CONTROL
		MOCR DYN A/G 1 LOOP A/G 2 LOOP	PRELAUNCH	ALL HIGHLY DESTRABLE	
		B. MCC/LAUNCH COMPLEX:	סטבו עוויוירח	1 OF 3 MANDATORY	FOR TERMINAL COUNT COORDINA-
		111 CVTS 212 MSTC C. MCC/RSO:	PRELAUNCH	1 OF 3 MANUATORY	TION OF MCC-PAD ACTIVITIES
		FD LINE TO RSO RSO PRIVATE LINE CAPE 111 RSO LOOP	PRELAUNCH	1 OF 3 MANDATORY	FOR TRAJECTORY VERIFICATION AND BOOSTER SAFING
		D. MISCELLANEOUS:			·
		BSE TM MONITOR LOOP CIF/USB LOOP	PRELAUNCH	DESTRABLE	USED FOR MONITORING SPACE VEHICLES SUBSYSTEM CHECKOUT
		E. MCC/REMOTED SITES:			
	:	ONE A/G PATH VIA GSFC	PRELAUNCH	MANDATORY .	USED FOR COMMUNICATION WITH CREW
	-				
				·	
	,			·	
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				MISSION RULES	· _	
REV	RULE	CONDITION/MALFUNCTION	ON PHASE	RULING	С	JES/NOTES/COMMENTS
	4-6	COMPUTER				•
		A. MOC (IBM 360/75)	PRELAUNCH	MANDATORY		CESS MANDATORY S/V
					PARAME DATA.	TERS AND TRAJECTORY
		B. DSC (IBM 360/75)	DDEL ALMICH	LIXCULV OFOXDADI F		(
	İ	D. DSC (18M)00//5/	PRELAUNCH	HIGHLY DESIRABLE		(IBM 360/75) IS AVAIL- S BACKUP TO THE MOC OR
i 1			į .		DSC.	
		C. CCATS (UNIVAC 49	4) - }			
		ONLINE	PRELAUNCH	1 MANDATORY AND 1 HIGHLY	TO THR	OUGH PROCESS TO MOC
		D. CCATS (UNIVAC 49	4) - [DESIRABLE	MANDAT	ORY S/V PARAMETERS
		STANDBY	· /			
		E. RTACF - 2	PRELAUNCH	1 HIGHLY DESIRABLE		NCH IP PREDICTIONS FOR
					MODE 1	ABORTS.
\	,					
	4-7	TIMING				·
			BOEL MINOL			
		MITE (2)	PRELAUNCH	1 MANDATORY		MING STANDARD TO SUPPORT ORY RTCC/CCATS COMPUTERS
	*			•		·
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			· · · · · · · · · · · · · · · · · · ·			
	4-8	MCC POWER				
		A. BUS A ₁	PRELAUNCH	MANDATORY	UNINTE	RRUPTABLE POWER FOR
li		1				AND CROSS BAR SWITCH
		B. BUS A ₂	PRELAUNCH	MANDATORY	UNINTE	RRUPTABLE POWER FOR
					D/TV D	ATA DISTRIBUTORS
]]		C. BUS B _l	PRELAUNCH	MANDATORY		ONDS INTERRUPTABLE POWER
			·		FOR PL	OTBOARDS (POWER)
		D. BUS B ₂	PRELAUNCH	MANDATORY	20 SEC FOR VS	ONDS INTERRUPTABLE POWER
					100 43	М
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			GUOCIAD TIASTROMEN	TITLION NEQUINERING	MCC	4-4
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DEV.	RULE	CONDITION/MALFUNCTION	PHASE	MISSION RULES RULING		CUES/NOTES/COM	MENTS
REV	KULE	CONDITION/PALFUNCTION	FUASE	KULING		COLS/NOTES/COM	1,1410
	4-9	DISPLAY	ane to see				
		A. MOCR D/TV CHANNELS	PRELAUNCH	10 OF 36 MANDATORY			
		NO. OF CHANNELS					
		RETRO 1 FIDO 1		,		<u> </u>	
		GUIDO 1 EECOM 1					
		GNC 1 RTCC 1		ı			
		BOOSTER 4					
		B. TRAJECTORY DISPLAY					
		1. FDO LAUNCH DIGITAL]			FOR CONTINGENCY ORB MANEUVER DATA AND T	
		2. γ VS V	PRELAUNCH	MANDATORY ON 1 OF 4: (A) 10 X 20 SCRIBER PLOT	TER	FROM SELECTED TRACK	INC DATA
				(B) D/TV (C) RTCC PLOTBOARD (D) SSR PLOTBOARD		SOURCE.	ING DATA
		3. RFO LAUNCH DIGITAL	PRELAUNCH	MANDATORY ON D/TV		MONITOR FOR MODES I MANEUVER DATA.	II AND IB
		4. YEI VS VEI	PRELAUNCH	MANDATORY ON 1 OF 2:		MONITOR FOR G-LIMIT	VIOLATION.
				(A) D/TV (B) SSR PLOTBOARD			
		5. φ VS λ	PRELAUNCH	H/D ON 1 OF 2:		MONITOR FOR CROSS-R	ANGE LIMITS
				(A) RTCC PLOTBOARD (B) SSR PLOTBOARD			
		6. T _{FF} VS R _{IP}	PRELAUNCH	HIGHLY DESIRABLE ON 1 OF	2:	MONITOR FOR ABORT M	ODES II,
		•		(A) D/TV (B) SSR PLOTBOARD		·	
		7. h VS d	PRELAUNCH	H/D ON 10 X 20 SCRIBER PLOTTER			
		8. Yi VS Vi (CMC DYNAMIC STATUS)	PRELAUNCH	HIGHLY DESIRABLE ON 10 X SCRIBER PLOTTER	10	MONITOR FOR L/V AND GATION PERFORMANCE SYSTEM ANALYSIS - CO WITH TRACKING).	(GUI DANCE
		9. WEDGE ANGLE MONITOR	PRELAUNCH	HIGHLY DESIRABLE ON D/TV		MONITOR FOR L/V AND GATION PERFORMANCE	S/C NAVI-
		10. GUIDO ANALOG CHART RECORDERS ONE AND TWO	PRELAUNCH	HIGHLY DESIRABLE ON TV			
		11. INSERTION/ INJECTION DIGITALS	PRELAUNCH	MANDATORY ON D/TV		FOR GEN GO/NO-GO	•
		C. ADEG CHANNELS 90-93	PRELAUNCH	HIGHLY DESIRABLE		FOR DSC DISPLAYS	
		D. <u>VSM</u>	PRELAUNCH	MANDATORY		FOR D/TV	
		E. AUX VSM	PRELAUNCH	HIGHLY DESIRABLE			
		F. <u>EIDOPHORS (3)</u>	ļ	2 HIGHLY DESIRABLE			
		NOTE: INDIVIDUAL FLIGHT C MANDATORY PARAMETER			PORTING LOS	S OF DISPLAY CAPABIL	ITY OF
	CC LON	DEV		0000000			
—	SSION	REV DATE		SECTION	 	GROUP	PAGE
		FINAL 4/15/69 GROU	ND INSTRUMEN	NTATION REQUIREMENTS	MCC		4-5

REV	RULE	CONDITION/MALFUNCTION	PHASE	MISSION RULES RULING		CUES/NOTES/COMMENTS
A	4-10	GSFC A. GSFC UNIVAC - 494 (2)	PRELAUNCH	1 MANDATORY	A	. ONE UNIVAC - 494 CAN PER
		COMMUNICATIONS PROCESSOR	111221011011			FORM ALL NECESSARY FUNC- TIONS, THE SECOND ONE IS BACKUP.
		B. WBD (50.0 KBPS) LINES (2) BETWEEN MCC AND GSFC	PRELAUNCH	1 MANDATORY	В	EITHER LINE CAN BE SWITCHED TO EITHER UNIVAC - 494.
		C. TTY CIRCUITS BETWEEN MCC AND GSFC	PRELAUNCH		c.	ONE CIRCUIT IS (M) TO REC LOW SPEED RADAR DATA. ONE CIRCUIT IS (HD) TO
		1. VOICE FREQUENCY TTY GROUP LINES (2)		1 OF 4 MANDATORY		SEND ACQ MESSAGES.
		2. LOW-SPEED TTY CIRCUITS (2)		,		
	4-11	KSC				
		TELEMETRY:				
	;	A. VHF TM FROM THE FOLLOWING FOR S-II, S-IVB, AND IU:			A	 THESE ANTENNAS CAN BE SWITCHED TO MILA OR CIF FACILITIES.
		1. CIF ANTENNA	PRELAUNCH	1 MANDATORY		•
		2. MILA VHF ANTENNA	1			
		B. USB TM FROM THE FOLLOWING:	DDE! ALMIC!	1 MANDATODY	. В	. USB IS THE CSM'S ONLY SOURCE OF DATA.
		1. MILA USB 2. CIF USB	PRELAUNCH	1 MANDATORY		
		COMMAND:				
			D UNDER GSFC	KSC/MSFN COMMAND RULE 4-1	2 FOR LAUNCH	COVERAGE.
		TRACKING:			ļ	
		THAT CAPABILITY REQUIRED	TO SATISFY R	ULE 4-4 (TRAJECTORY) IS MA	NDATORY.	
		VOICE COMMUNICATIONS:				
		THIS KSC CAPABILITY IS DE	FINED UNDER	NCC RULE 4-5 (COMMUNICATIO	NS).	
				·		
1						
	CCAC		1			
	SSION LLO 10	REV DATE		SECTION DECLIDEMENTS	GSFC/KSC	GROUP PAGE MSFN 4-6
AF 01		A 4/23/69 GI	COND INSTRUM	MENTATION REQUIREMENTS	9350/830	ALCOLM 4-0

REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
Α	4-12	LAUNCH COVERAGE					
		KSC/MSFN SITES (SITES NOT	ISTED DUE T	O VARIABLE LAUNCH AZIMUTH)	MUST PROV	IDE THE FOLLOWING CA	PABILITIES
		FROM LIFTOFF THROUGH S-IVE THROUGH 4-5) TO DETERMINE		00 SECONDS. REFER TO DEC	11210W MAIS	IN CRULE 4-16 AND FI	GUKES 4-1
		A. <u>CMD</u>	ļ				
		CCS	PRELAUNCH	MANDATORY FROM S-IVB C/C	TO S-IVB	·	
		USE CSM	PRELAUNCH	C/O + 60 SECS. HIGHLY DESIRABLE			
'		B. TELEMETRY					
		S-IC (VHF)	PRELAUNCH	HIGHLY DESIRABLE		S-IC DATA IS ONLY H DESIRABLE SINCE THE NOT PRIME FOR REQUE	MCC IS STING AN
						ABORT FOR S-IC MALF	UNCTIONS.
		S-II (VHF)	PRELAUNCH	HIGHLY DESIRABLE FROM LI S-II CUTOFF (APPROX. 8 +		FOR ABORT CUES FROM	MCC
		S-IVB VHF (CP-1)	PRELAUNCH	HIGHLY DESIRABLE			
		IU CCS (DP-1B) } IU VHF (DP-1)	PRELAUNCH	1 OF 2 MANDATORY FROM LI S-IVB CUTOFF PLUS 60 SEC		FOR ABORT CUES FROM	MCC
'		CSM (USB)	PRELAUNCH	MANDATORY FROM LIFTOFF 1 S-IVB CUTOFF PLUS 60 SEC		FOR ABORT CUES FROM	MCC
		C. TRACKING					
		THAT CAPABILITY REOUIR	ED TO SATISH	Y RULE 4-4 (TRAJECTORY) IS	MANDATOR	,	
		D. A/G COMMUNICATIONS 1. MILA					
		VHF	PRELAUNCH	HIGHLY DESIRABLE			
		USB	PRELAUNCH	MANDATORY			
		2. MSFN VHF)	1				
		USB }	PRELAUNCH	1 OF 2 MANDATORY			
A	4-13	GENERAL ORBITAL COVERAGE (FROM S-IVB (/O + 60 SEC TO TLI C/O)			
·				ILITY OF PROVIDING THE MCC		NUM MISSION CONTROL S	UPPORT
	ĺ	LISTED BELOW OF TWO MSFN (SB SITES PER	REVOLUTION THROUGH REVOLU	JTION 3.		
		A. CMD					
l		CCS	PRELAUNCH	HIGHLY DESIRABLE			
Ì		CSM USB	PRELAUNCH	HIGHLY DESTRABLE			
		B. TELEMETRY					
			DDEL MINICIE	LITCH VERGIDADES			
.	į	S-IVB VHF (CP-1)	PRELAUNCH	HIGHLY DESIRABLE			
		<pre>IU CCS (DP-1B) IU VHF (DP-1) }</pre>	PRELAUNCH	1 OF 2 MANDATORY		DOWNLINKS REQUIRED S-IVB DATA.	TO RECOVER
		CSM USB	PRELAUNCH	MANDATORY			
		C. TRACK			į		
		C-BAND	PRELAUNCH	HIGHLY DESIRABLE			
		USB	PRELAUNCH	MANDATORY .			
.]		D. A/G COMMUNICATIONS					
		VHF .	PRELAUNCH	HIGHLY DESIRABLE			
		USB	PRELAUNCH	MANDATOR.Y			
IM	MOIZZ	REV DATE		SECTION		COOLID	2105
 	LLO 10		<u>-</u>		CCEC IVO	GROUP	PAGE
Щ.		A 4/23/69 GROUN	IND I KUMEN	TATION REQUIREMENTS	GSFC/KS	C/MSFIN	4-7

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REV	RULE	CONDITION/MALFUNCTI	ON PHASE	RULING		CUES/NOTES/COM	MENTS
A .	4-14	POST S/C SEPARATION IT IS MANDATORY THAT A. TLM - CCS B. CMD - CCS	T 1 SITE PROVIDE T	HE FOLLOWING CAPABILITIES: MANDATORY MANDATORY		TO PROVIDE TM F MINING S-IVB ST BEYOND VHF RANG TO PROVIDE CORR COMMAND CAPABIL S-IVB BULKHEAD	ATUS E. ECTIVE ITY FOR
					с.	PROBLEMS. BOTH OF THE ABO REQUIRED TO INS SAFETY AND LM E	URE CREW
À	4-15	HSK, GDS, MAD IT IS MANDATORY 2 OF A. TM USB B. TRACK USB C. VOICE USB D. CMD USB	PRELAUNCH PRELAUNCH PRELAUNCH	PROVIDE THE FOLLOWING CAPABILIT MANDATORY MANDATORY MANDATORY HIGHLY DESIRABLE	1	TO COVER TRANSL COAST AND LPO.	UNAR
A	4-16	RIOMETER NETWORK SI A. LIMA B. CRO CYI	TES PRELAUNCH	HIGHLY DESIRABLE 1 OF 2 HIGHLY DESIRABLE			
1	SSION	REV DATE A 4/23/69		SECTION GS	GR FC/KSC/MS	OUP FN	PAGE 4-8

		MISSION RULES									
REV	ITEM		····								
	4–16	INTRODUCTION TO SITE EXTILIDE DESIGNAMATRICES CETSURE	S h.1 THROUGH h.EN								
	7-10	INTRODUCTION TO SITE FAILURE DECISION MATRICES (FIGURE THESE DECISION MATRICES APPLY THE GROUND INSTRUMENTATI									
		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	****								
Ì		A. LOOK FOR AN X UNDER THE COLUMN FOR THE SITE WHERE B. GO ACROSS TO THE COLUMN FOR THE CAPABILITY THAT WA									
		C. THE COVERAGE THAT WAS LOST IS IN THE COLUMN LABELE									
		D. MORE THAN ONE X IN A ROW SPECIFIES A FAILURE OF TH									
		·	•								
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	SSION	REV DATE SECTION	GROUP PAGE								
	DLLO 10	FINAL 4/15/69 GROUND INSTRUMENTATION REQUIREMENTS 292 (AUG 68)	GSFC/KSC/MSFN 4-9								

REV	LTEM

Α

	I	SITES	FAILED				[CAP	ABILITY LOS	Ť	7
	ALDS TM 0:00 8:49	MIL/CAPE 0:08 8:49	GBM 1:07 9:13	BDA 4:11 12:42	VAN 9:30 15:32	MANDATORY COVERAGE LOST	TELEMETRY USB OR VHF	CMD	TRACK BOTH S AND C BAND	A/G USB	A/G USB AND VHF
S I N	Х					NONE SEE NOTE 4	GO	N/A	N/A	N/A	N/A
G L E		Х				00:00 TO 01:07	GO	GO	NO-GO	NO-GO	NO-GO
F A I			Х			S-IC/S-II SEP SEE NOTE 1	GO	GO	GO	GO	GO
L				Х		NONE	GO	GO	GO	GO	GO
R					Х	NONE	GO	GO	GO	GO	GO
	х	Х				00:00 TO 01:07	NO-GO	GO	NO-GO	NO-GO	NO-GO
MU		Х	Х			00:00	GO	GO	NO-GO	NO-GO	NO-GO
L	Х	Х	Х	,		04:11	NO-GO	GO	NO-GO	NO-GO	NO-G0
I		х		Х		00:00 TO 01:07	GO	GO	NO-GO	NO-GO	NO-GO
L E	х	х		Х		9:13 TO 9:30	NO-GO	GO	NO-GO	NO-GO	NO- GO
F		X			X	00:00 TO	GO	GO	NO-GO	NO-GO	NO-GO
A	X	X				01:07	NO-GO	GO	NO-GO	NO-GO	NO-GO
I L U R E			X	X		08:49 TO 9:30 SEE NOTES 1 AND 3	GO	GO	GO	GO	GO
S			Х		х	S-IC/S-II SEP	GO	GO	GO	GO	GO
				Х	Х	9:13 TO INSR + 60	NO-GO	NO-GO	NO-GO	GO	NO-GO

NOTES:

- 1. FLAME ATTENUATION WILL CAUSE LOSS OF USB LOCK AT MIL DURING S-IC/S-II SEPARATION.
- 2. INSR + 60 SECONDS IS APPROXIMATELY 12:21.
- 3. LOSS OF COVERAGE IS NOT SEVERE ENOUGH FOR A NO-GO CONDITION.
- 4. LOSS OF ALDS RESULTS IN LOSS OF S-IC TM; HOWEVER, IT IS NOT MANDATORY FOR LAUNCH.

FIGURE 4-1.- 72° LAUNCH AZIMUTH SITE FAILURE DECISION MATRIX.

<u> </u>					
MISSION	REV	DATE	SECTION	GROUP	PAGE
APOLLO 10	A	4/23/69	GROUND INSTRUMENTATION REQUIREMENTS	GSFC/KSC/MSFN	4~10

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REV	ITEM	

		SITE	S FAILED				CAPABILITY LOST				
	ALDS TM 0:00 8:49	MIL/CAPE 0:00 8:49	GBM 1:07 9:20	BDA 4:12 12:33	VAN 9:11 16:12	MANDATORY COVERAGE LOST	TELEMETRY USB OR VHF	CMD	TRACK BOTH S AND C BAND	A/G USB	A/G USB AND VHF
SHZGLE FAHJCM MACTHYE FAHJEN	Х					NONE SEE NOTE 4	GO	N/A	N/A	N/A	N/A
		х				00:00 TO 01:07	GO	GO	NO-GO	NO-G0	NO-GO
			Х			S-IC/S-II SEP SEE NOTE 2	GO	GO	GO	GO	GO
				х		NONE ·	GO	GO	GO	GO	GO
					х	NONE	GO	GO	GO	GO	GO
	Х	х				00:00 TO 01:07	NO-GO	GO	NO-GO	NO-GO	NO-GO
		X	X			00:00 TO	GO	GO	NO-G0	NO-GO	NO-GO
	Х	X	Х			4:12	NO-GO	GO	NO-GO	NO-GO	NO-GO
		_ X		X		00:00 TO	GO	GO	NO-GO	NO-GO	NO-GO
	X	Х		X	ļ	01:07	NO-GO	GO	NO-GO	NO-GO	NO-GO
		х х		<u> </u>	X	00:00 TO	GO	GO	NO-GO	NO-GO	NO-GO_
	Х	X			X	01:07	NO-GO	GO	NO-GO	NO-GO	N0-G0
			X	×		S-IC/S-II SEP	GO	GO	GÓ	GO	GO
			X		X	S-IC/S-II SEP	GO	GO	GO	GO	GO
				Х	х	09:20 TO INSR + 60	NO-GO	NO-GO	NO-GO	GO.	N0-G0

NOTES:

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- 1. ANG HAS ACQUISITION FROM 07:48 TO 11:20; HOWEVER, MAXIMUM ELEVATION IS 1.6 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.

FIGURE 4-2.- 81° LAUNCH AZIMUTH SITE FAILURE DECISION MATRIX.

MISSION	REV	DATE	SECTION	GROUP	PAGE				
APOLLO 10	Α	4/23/69	GROUND INSTRUMENTATION REQUIREMENTS	GSFC/KSC/MSFN	4-11				
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REV	IΤ	ΈM												
Α				S	ITES FA	ALLED			Г			LITY LOST		
			ALDS TM 0:00 8:48	MIL/CAPE 0:00 8:48	GBM 1:06 9:26	BDA 4:15 12:13	ANG 7:23 12:48	VAN 9:07 16:19	MANDATORY COVERAGE LOST	TELEMETRY USB OR VHF	CMD	TRACK BOTH S AND C BAND	A/G USB	A/G USB AND VHF
		S	×						NONE SEE NOTE 4	GO	N/A	N/A	N/A	N/A
ı		Z G L		х					00:00 TO 01:06	GO	GO	NO-GO	NO-G0	NO-GO
		FA			Х				S-IC/S-II SEP SEE NOTE 2	GO	, GO	GO .	GO	GO
		L				Х			NONE	GO	GO	GO	GO	GO
		U R E					Х		NONE	GO	GO	GO GO	GO	GO
								Х	NONE	GO	GO	GO	GO	GO
Ì		M U	х	х					00:00 TO 01:06	NO-GO	GO	NO-GO	NO-GO	NO-GO
		L T	X	X	X X				00:00 TO 04:15	GO NO-GO	GO GO	NO-GO NO-GO		NO-GO NO-GO
İ		P L E	Х	X		X			00:00 TO 01:06	GO MO-GO	GO GC	NO-GO NO-GO	NO-GO NO-GO	NO-GO NO-GO
		FA	X	X X				X	00:00 TO 01:06	GO NO-GO	GO GO	NO-GO NO-GO		NO-GO NO-GO
•		I L U			Х	Х			S-IC/S-II SEP	GO	GO	GO	GO	GO GO
		R E S			х			х	S-IC/S-II SEP	GO	GO	GO ,	GO	GO
					,	Х		Х	NONE	GO	GO	GO	GO	GO
							Х	×	12:13 TO	NO-GO	NO-GO	NO-GO	GO	NO-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 5-IC TM; HOWEVER, IT IS NOT MANDATORY FOR LAUNCH.

FIGURE 4-3.- 90° LAUNCH AZIMUTH SITE FAILURE DECISION MATRIX.

<u> </u>				,		· · · · · · · · · · · · · · · · · · ·
1.	MISSION	REV	DATE	SECT10N	GROUP	PAGE
Al	POLLO 10	Α	4/23/69	GROUND INSTRUMENTATION REQUIREMENTS	GSFC/KSC/MSFN	4-12

RE.V	ITEM		

-			SITES F	AILED				1	CAPABI	LITY LOST		
	ALDS TM 0:00 8:48	MIL/CAPE 0:00 8:48	GBM 1:06	BDA 4:21	ANG 7:00	VAN 9:16	MANDATORY COVERAGE LOST	TELEMETRY USB OR VHF	CMD	TRACK BOTH C AND S	A/G USB	A/G USB AND
S I	X X	8.46	9:31	11:43	13:40	15:57	NONE SEE NOTE 3	GO	N/A	BAND N/A	N/A	VHF N/A
N G L		Х					00:00 TO 01:06	GO	GO	NO-GO	NO-G0	NO-G
F A			х				S-IC/S-II SEP SEE NOTE 1	GO	GO	GO	GO	GO
L				Х			NONE	GO	GO	GO	GO	GO
U R					Х		NONE	GO	GO	GO	GO	GO
Ε						Х	NONE	GO	GO	GO	GO	GO
	х	х					00:00 TO 01:06	NO-GO	GO	NO-GO	NO-GO	NO-G
		X	X				00:00 TO	GO	GO	NO-GO	NO-GO	NO-G
M U	X	X	Х				04:21	NO-GO	GO	NO-GO	NO-GO	
L T	x	X		X			00:00 TO 01:06	GO NO-GO	GO GO	NO-GO NO-GO	NO-GO NO-GO	
I P		Х				. X	00:00 TO	GO	GO	NO-GO	NO-GO	NO-G
L	Х	Х				Х	01:06	NO-GO	GO	NO-GO	NO-G0	NÖ-G
F			Х	х			S-IC/S-II SEP	GO	GO	GO	GO	GO
A I L			Х			х	S-IC/S-II SEP	GO	GO	GO	GO	GO
R				х		Х	NONE	GO	GO	GO GO	GO	GO
E S				х	Х		NONE	GO	GO	GO	GO	GO
					х	Х	11:43 TO INSR + 60	NO-GO	NO-GO	GO	GO	NO-G
		X			X		00:00 TO	GO	GO	NO-GO	NO-GO	
	X	^	.	1	X		01:06	NO-GO	GO	NO-GO	NO-GO	INO⊸G

NOTES:

- 1. FLAME ATTENUATION WILL CAUSE LOSS OF USB LOCK AT MIL DURING S-IC/S-II SEPARATION.
- 2. INSR + 60 SECONDS IS APPROXIMATELY 12:21.
- 3. LOSS OF ALDS RESULTS IN LOSS OF S-IC TM; HOWEVER, IT IS NOT MANDATORY FOR LAUNCH.

FIGURE 4-4.- 99° LAUNCH AZIMUTH SITE FAILURE DECISION MATRIX.

					
NOTSSIM	REV	DATE	SECTION	GROUP	PAGE
APOLLO 10	Α	4/23/69	GROUND INSTRUMENTATION REQUIREMENTS	GSFC/KSC/MSFN	4-13
1000	نصوب وينجيا		. —————————————————————————————————————		

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REV ITEM

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		Ç	ITES FA	ILED			1			ILITY LOST		
	ALDS TM 0:00 8:48	MIL/CAPE 0:00 8:48	GBM 1:06 9:35	BDA 4:29 11:03	ANG 6:48 14:10	VAN 9:42 14:59	MANDATORY COVERAGE LOST	TELEMETRY USB OR VHF	CMD	TRACK BOTH C AND S BAND	A/G USB	A/G USB AND VHF
S	×						NOTE SEE NOTE 3	GO	N/A	N/A	N/A	N/A
N G L		Х					00:00 TO 01:02	GO	GO	NO-GO	NO-G0	NO-GC
Ē F A			Х				S-IC/S-II SEP SEE NOTE 1	GO	GO	GO	GO	GO
I				Х			NONE	GO	GO	GO	GO	GO
U R		_			X		NONE	GO	GO	GO	GO	GO
E						Х	NONE	GO	GO	GO	GO	GO
	×	х					00:00 TO 01:02	NO-GO	GO	NO-GO	NO-GO	NO-GC
M U		X	X				00:00 TO	GO	GO	NO-GO	NO-GO	NO-G0
L	X	\ <u>`</u>	Х	ļ		<u> </u>	04:11	NO-GO	GO	NO-GO	NO-GO	NO-GC
1		Х			x		00:00 TO	GO	GO	NO-GO	NO-GO	NO-GO
P	X	Х			Х		01:02	NO-GO	GO _	NO-GO	NO-GO	NO-GO
L		Х				X	00:00 TO	GO	GO	NO-GO	NO-GO	NO-GO
1	X	X				X	01:02	NO-GO	GO	NO-GO	NO-GO	NO-G
F A I			Х		х		S-IC/S-II SEP	GO	GO	GO	GO	GO.
UR			X			X 	S-IC/S-II SEP	GO	GO	GO	GO	GO.
S					Х	х	11:01 TO INSR + 60	NO-GO	NO- GO	GO	GO	NO-G
		i		Х	Х		NONE	GO	GO	GO	GO	GO

NOTES:

- 1. FLAME ATTENUATION WILL CAUSE LOSS OF USB LOCK AT MIL DURING S-IC/S-II SEPARATION.
- 2. INSR + 60 SECONDS IS APPROXIMATELY 12:21.
- 3. LOSS OF ALDS RESULTS IN LOSS OF S-IC TM; HOWEVER, IT IS NOT MANDATORY FOR LAUNCH.

FIGURE 4-5.- 108° LAUNCH AZIMUTH SITE FAILURE DECISION MATRIX.

MISSION	REV	DATE	SECTION	GROUP	PAGE
APOLLO 10	i	4/15/69	GROUND INSTRUMENTATION REQUIREMENTS	GSFC/KSC/MSFN	4-14

5 TRAJECTORY AND GUIDANCE

REV	ITEM										
	5-1	THE LA	INCH PHASE "	ILL BE TERMINATED FOR ANY OF THE FOL	FOWING CONDITIONS.						
Ì	J. 1	ĺ		THE VEHICLE BREAKUP LINE,	LEONING CONDITIONS.						
1		1									
		1		D DECREASING AFTER TOWER JETTISON.		·					
		ł		NTRY "G" LIMIT.							
-			INCREASING.								
				DITIONS AT INSERTION.							
		F. VIC	LATION OF E	XIT HEATING LINE.							
	5-2	THE LES	WILL NOT B	E JETTISONED UNTIL MODE II CAPABILIT	TY IS ESTABLISHED BY T _{FF} ≥1 + 20 /	AND INCREASING.					
	5-3	MODE II	I, III, IV,	AND APOGEE KICK.							
		A. THE	GROUND IS	PRIME FOR ABORT MODE DETERMINATION A	ND MODE III MANEUVER COMPUTATION:	S.					
		B. MAN	EUVERS WILL	BE INTERRUPTED WHEN T _{EE} = 1 + 40 AN	ID DECREASING.						
		B. MANEUVERS WILL BE INTERRUPTED WHEN T _{FF} = 1 + 40 AND DECREASING. C. MODE IV MANEUVERS WILL BE INTERRUPTED IF THE CURRENT ALTITUDE IS 75 NM, DECREASING AND									
		h _p <300K FT.									
		E. MAXIMUM NUMBER OF SPS START ATTEMPTS IS TWO.									
		F. IF NO SLA SEP OR IF SPS FAILS:									
		1. $h_D < 40 - EXECUTE CM/SM SEP BY T_{FF} = 1 + 40.$									
		2. 40 < $h_{_{\rm D}}$ <75 - GROUND WILL DECIDE TO USE SM RCS ASAP OR AT APOGEE TO REDUCE $h_{_{\rm D}}$ TO 40 NM.									
			40 × 11 p	S - GROWN WILL PROTOL TO COLL 3M NOS	p ASAF OR AT A COLL TO REDUCE IIp	TO TO INFI.					
A	5-4	MODE II	I ABORTS.								
.		A. PRE	DICTED T _{EF}	AFTER SPS C/O <1 + 40.							
				IP ON WATER - DO NOT BURN.							
		2.	GEN GO AND	FULL LIFT IP ON LAND - BURN TO TEE	= 1 + 40, RL 90 DEG.						
1		3.		AND FULL LIFT IP ON LAND - BURN A RE		O AND RL 90 DEG.					
,		1		, DO NOT BURN.	, FF						
<u> </u>		1		CURS AFTER GETI +10 SEC, BURN UNTIL	GEN AR = 0 RL 55 DEG. (TE INARI	F TO BURN					
-			= 0, RL 90		out at wo, the year of the order	EE 10 BONY					
	t										
	i										
	t										
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FEC/TSG Form 292 (AUG 66)

				MISSION RULES		
REV 1	ITEM					
5	;-5	A. C B. F C. C	CMC PROGRAM F RTCC AND CMC CONFIRMED ERF	BE NO-GO FOR ABORT MANEUVER DETERMINATION FAILURE. T _{FF} DIFFERENCE OF >40 SEC. ROR IN S/C PLATFORM VELOCITY COMPONENTS OF SOURCE INDICATES "GO' OR "NO-GO" INCOME.	DF > <u>50</u> FPS IN X OR <u>100</u> FPS IN Z.	
A 5	5-6	THE (ORBIT IS "GO"	' IF $h_p \geq 75$ NM.		
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		RULES	S 5-7 THROUGI	d 5-19		
		ARE I	RESERVED.			
MISS	SION	REV	DATE	SECTION	GROUP	PAGE
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		MISSION RULES
REV	ITEM	
	5-20	EARTH ORBITAL ALTITUDE CONSTRAINTS:
		A. REAL-TIME MISSION PLANNING
	1	PERIGEE - 85 NM MINIMUM. MAXIMUM, h IS DETERMINED BY SM RCS AVAILABLE FOR HYBRID DEORBIT.
		B. CONTINGENCY
		PERIGEE - 75 NM MINIMUM (VIOLATIONS WILL BE CORRECTED ASAP)
	Ì	IF h <75 NM AND MANEUVER TO RAISE h IS NOT POSSIBLE:
		1. 40 < h < 75 - EXECUTE SPS RETROGRADE ASAP UNTIL h < 40. IF NO SPS, USE SM-RCS.
		2. h <40 - CM/SM SEP - RETRO WILL RECOMMEND ENTRY PROFILE.
A 5	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 REQUIRED IN
		200 SEC).
	}	B. S-IVB ATTITUDE RATES >5 DEG/SEC - 5 FPS RCS ASAP.
		C. S-IVB YAW ATTITUDE >45 DEG - 5 FPS RCS ASAP.
		D. CSM RETROFIRE REQUIRED WHILE ATTACHED TO THE S-IVB OR LM - SEPARATION 20 MINUTES PRIOR TO RETRO, 5 FPS RCS RETROGRADE WITH LINE ON HORIZON.
A 5	5-22	S/C COMPUTER TIMING UPDATES ARE REQUIRED FOR SET ERRORS AS FOLLOWS:
		A. CMC OR LGC >.5 SEC.
	1	B. AGS >2 SEC.
		C. S/C L/O TIME (GRR) WILL BE UPDATED WITH SRO L/O TIME IF THE TWO ARE DIFFERENT BY 10 SEC.
A	5-23	TIME BETWEEN EPO RETROFIRE CETI AND 400K MUST BE >9 MIN. IF NOT, RETARGET FOR NEXT PTP.
A 1 1	5-24	IF SPS RETROFIRE ΔT _B <7 SEC, USE SCS AUTO TVC.
	5-25	PLANNED G&N AND SCS RETROFIRE MANEUVERS WILL BE UPDATED IF:
- }	1	A. THE COMPUTED RETROFIRE POSITION CHANGES BY >0.5 DEG LONGITUDE PRIOR TO GETI ~30 MIN.
		B. THE COMPUTED RETROFIRE POSITION CHANGES BY >2 DEG LONGITUDE AFTER GETI -30 MIN.
	İ	
}		
		IF A G&N FAILURE IS DETECTED PRIOR TO RETROFIRE, CREW USES SCS AV MODE WITH AN EMS ENTRY.
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		MISSION ROLES
RE.V	1 TEM	
А	5-27	IF SPS FAILS AFTER EPO RETROFIRE IGNITION OR NO SLA SEP:
		A. $\rm h_{_{ m D}}$ >75 NM - RETARGET FOR NEXT BEST PTP USING RCS.
		B. 40 < ${ m h}_{_{ m D}}$ <75 - PITCH UP TO LOCAL HORIZONTAL ATTITUDE AND BURN SM RCS USING FOLLOWING PRIORITIES:
		1. BURN h TO PAD VALUE
		P 2. BURN MAXIMUM SM RCS ΔV AVAILABLE
1		3. BURN CM RCS TO h_p = 40 NM IF SM RCS ΔV NOT SUFFICIENT TO OBTAIN h_p = 40 NM IF $h_p \le 40$ NM TERMINATE ALL THRUSTING AT T_{FF} = 7 MIN.
		C. $h_{ m p}$ <40 NM - REMAIN IN RETRO ATTITUDE AND BURN SM RCS USING THE FOLLOWING PRIORITY:
		1. BURN ΔV RESIDUALS.
		2. BURN MAXIMUM SM AV AVAILABLE.
		<u>NOTE</u>
		THE S-IVB LOX DUMP CAPABILITY MAY BE USED TO SHAPE THE ORBIT FOR RETROFIRE MANEUVER OR TO REDUCE THE S-IVB WEIGHT TO OBTAIN MORE SM RCS AV.
	5-28	THE G&N IS NO-GO FOR ENTRY IF:
		A. THE CMC VALUE OF DOWNRANGE ERROR ($R_{ m p}$ - $R_{ m T}$) AT .2G DIFFERS >±100 NM FROM GROUND VALUE OR >±130 NM FROM BACKUP CHART VALUE. CREW FAILOVER TO EMS ENTRY AS FIRST PRIORITY OR GROUND BANK ANGLE AND RETRB AS SECOND PRIORITY.
		B. V AND Y AT 400K ARE OUTSIDE THE CORRIDOR. GROUND WILL PROVIDE ENTRY PROFILE.
A	5-29	IU TARGET AND NAVIGATION UPDATES:
		A. THERE WILL BE NO IU TARGET UPDATE FOR EITHER TLI OPPORTUNITY.
		B. AN IU NAVIGATION UPDATE WILL BE PERFORMED FOR TLI OPPORTUNITIES WHEN S-IVB GUIDANCE REFERENCE
		FAILURE OCCURRED PRIOR TO EARTH ORBIT INSERTION.
	5-30	THE CMC STATE VECTOR WILL BE UPDATED PRIOR TO TLI WITH THE BEST MSFN VECTOR.
A	5-31	A PROPERLY OPERATING G&N (CMC + ISS + OSS) IS MANDATORY FOR TLI.
	5-32	THE MAXIMUM ALLOWABLE MISALIGNMENT RATES BETWEEN THE IU AND IMU ARE <u>0.6</u> DEG/HR (IU) AND <u>1.5</u> DEG/HR (IMU).
	5-33	THE S/C L/O RESFMMAT WILL BE USED FOR BOTH TLI OPPORTUNITIES.
MI	SSION	REV DATE SECTION GROUP PAGE
APO	LLO 10	A 4/23/69 TRAJECTORY AND GUIDANCE EARTH ORBIT AND TLI 5-4
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		MISSION RULES									
REV	ITEM	DIAGEDRED THE ALCOHOL									
A	5-34	DISPERSED TLI C/O:									
		A. PREDICTED END OF MISSION FUEL RESERVES (EOMFR) >500 FPS - CONTINUE MISSION AND EXECUTE MCC CONSISTENT WITH LUNAR ORBIT MISSION. (EOMFR INCLUDES T&D, BAP MCC ₁ , LOI ₂ , RENDEZVOUS RESCUE, AND TEI.)									
1		B. PREDICTED EOMFR <500 FPS AND:									
		 PREDICTED FUEL RESERVES AFTER T&D, BAP MCC₁, LOI₁, LOI₂, AND TEI (NO RENDEZVOUS RESCUE) >500 FPS - CONTINUE MISSION, EXEUCTE MCC CONSISTENT WITH LUNAR ORBIT MISSION. (DPS LOI MAY BE CONSIDERED TO IMPROVE SPS AV CAPABILITY.) 									
		 PREDICTED FUEL RESERVES AFTER T&D, BAP MCC₁, LOI₁ (DPS), LOI₂, AND TEI (NO RENDEZVOUS RESCUE) <500 FPS, AND: 									
1		(A) EOMFR AFTER LUNAR FLYBY (CSM AND LM) >5500 FPS (CSM ONLY), EXECUTE MCC FOR FLYBY MISSION.									
		(B) EOMFR AFTER LUNAR FLYBY <5500 FPS, EXECUTE ALTERNATE MISSION CONSISTENT WITH FINAL MISSION PLANNING.									
ļ											
	5-35	DIFFERENCE IN CMC AND IU PLATFORM VELOCITY COMPONENTS OR TOTAL VELOCITY AT INSERTION:									
		A. VIOLATION OF ANY OF THE FOLLOWING MEANS THI IS NO-GO:									
		ΔVX > <u>35</u> FPS									
		$\Delta V\dot{Y} > 66$ FPS									
		ΔVZ > <u>87</u> FPS									
İ		ΔV _T > <u>33</u> FPS									
		B. VIOLATION OF ANY OF THE FOLLOWING MEANS TLI IS TEMPORARILY NO-GO:									
		<u>7.4</u> <ΔX < <u>35</u> FPS									
	ŀ	45 < 66 FPS TLI IS NO-GO UNTIL PARTS C AND 5-36 ARE DETERMINED									
		(ORBITAL PARAMETER DECISIONS). 27 <ΔZ <87 FPS									
		<u>13</u> <∆ _T < <u>33</u> FPS									
	ĺ	C. VIOLATION OF ANY OF THE FOLLOWING ORBITAL DECISION PARAMETERS AT GET = 1 HR 45 MIN MEANS TLI IS NO-GO. PARAMETERS ARE IU VERSUS MSFN.									
	:	Δα > <u>19,300</u> FT									
		Δω _{MAX} > <u>32</u> FPS									
↑	5-36	DIFFERENCE IN MSFN AND IU DOWNRANGE POSITION (ΔR _V) >105,000 FT AT GET = 56 MIN MEANS TLI IS NO-GO.									
ļ											
		RULES 5-37 THROUGH 5-45									
		ARE RESERVED.									
MI	SSION	REV DATE SECTION GROUP PAGE									
	LO 10	A 4/23/69 TRAJECTORY AND GUIDANCE EARTH ORBIT AND TLI 5-5									
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			Mission Rules		
REV	ITEM				
	5-46	THE CMC OR LGC	WILL BE TEMPORARILY NO-GO FOR MANEUVER CON	TROL FOR ANY OF THE FOLLOWING:	
		A. COMPUTER P	ROGRAM FAILURE.		
		B. CMC/IMU AL	IGNMENT DISCREPANCY (FOR MANEUVER EXECUTION,	MONITORING, AND ORBIT DETERMIN	ATION).
		1. SEXTAN' OF SXT	T STAR CHECK: AUTO OPTICS POSITIONING DOES	NOT PLACE SELECTED STAR IN FIEL	D OF VISION
	<u> </u>	2. HORIZO	CHECK ERROR >4 DEG FOR RETROFIRE FROM EPO.		
		C. LGC/IMU AL	IGNMENT DISCREPANCY INDICATE BY >2 DEG FROM	PREDICTED COAS COORDINATES.	
		D. DIFFERENCE	BETWEEN CMC/LGC GROUND NAV CHECK AFTER A NA	AV UPDATE FROM GROUND IS:	
		1. \$\phi > \dot \dot \dot \dot \dot \dot \dot \dot	DEG.		
		2. λ >. <u>02</u>	DEG.	•	
		3. h >. <u>2</u> !	w.	•	
					*
Α					
î	5-47	MODE III, APOGE OF >5 DEG.	EE KICK OR EPO RETROFIRE WILL BE COMPLETED E	Y MANUAL TAKEOVER FOR ATTITUDE (EXCURS I ONS
			·		
A	5-48	CRITICAL MANEU	/ERS WILL BE COMPLETED BY SCS (MTVC OR AUTO)	OR ACS TAKEOVED FOR ANY OF THE	FOLLOWING:
		A. CSM OR STAG		ON AGS TAKEOVER FOR ANT OF THE	FOLLOWING:
			DE EXCURSION > 10 DEGREES		·
			DE RATES > 10°/SEC		
			DE ERRORS > 10 DEGREES		
		B. UNSTAGED LN	_		
		1. ATTITUD	E EXCURSIONS > 5 DEGREES		
		2. ATTITUE	DE RATES > 5°/SEC		
		3. ATTITUE	E ERRORS ≥ 5 DEGREES		
1					
	5-49	NON-CRITICAL MA	NEUVERS WILL BE TERMINATED AFTER MANUAL TAK	EOVER FOR:	
			CURSIONS > 10 DEG.		
		B. ATTITUDE RA	TES > 10 DEG/SEC.		
		C. ATTITUDE ER	RORS > 10 DEG.		
		•			
А	5-50	GENERALLY, THE	FOLLOWING MANEUVER RESIDUAL TRIMMING CRITER	IA WILL APPLY:	
			- TRIMMED TO $\underline{1}$ FPS IN X-AXIS ONLY (MCC $_1$, MC	•	
			WILL NOT BE TRIMMED.	- •	
		C. ALL UNDOCKE Y AND Z-AXI	D MANEUVERS (BY EITHER VEHICLE) WILL BE TRI S RESIDUALS WILL NOT BE TRIMMED.	MMED TO WITHIN 0.2 FPS IN X-AXIS	S.
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	LLO 10	A 4/23/69	SECTION TRAJECTORY AND CUIDANCE	GROUP	PAGE
	10	7/22/09	TRAJECTORY AND GUIDANCE	MANEUVERS	[5-6]

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·					MISSIO	N RULES			
REV	ITEM								
А	5-51	THE I	FOLLOWING MA	NEUVERS WILL BE	MANUALLY TER	MINATED AFTER	VIOLATION OF	THESE OVERBURN	CRITERIA:
			TLI - <u>6</u> SEC					•	
		в.1.	LOI - 10	SEC (SPS)					
			LOI 1 - TBD						
		C. 1	LOI ₂ - 1 SEC	:				•	
		D. [OI - 2 SEC .	AND ΔV _{AGS} = 2 F	PS				
		E.1.	TEI - 2 SE	C AND ΔV_C > 40	FPS OVERBURN	(SPS)			
		2.	TEI - 10 S	EC AND AV _{AGS} >	10 FPS OVERBU	RN (DPS)			-
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	OLLO 10	REV A	DATE 4/23/69	SECTION TRAJECTORY AN	D CHIDANCE		GROUP MANIEL MEDS		PAGE
1.	33 Form			I HOLCTORT AN	D GOIDANCE		MANEUVERS		5-7

S-56 MIDCOURSE CORRECTION NOMINAL EXECUTION POINTS WILL BE A. TLI C/O +9 HRS (EARLIEST PLANNED MCC AT TLI C/O + B. TLI C/O +25 HRS. C. LOI -22 HRS. D. LOI ₁ -5 HRS. S-57 TRANSLUNAR MCC EXECUTION CRITERIA A. MCC ₁ AND MCC ₂ WILL NOT BE EXECUTED AS LONG AS MCC NOTE: MCC ₃ AV >3 EPS ENABLES UTILIZATION OF SPS. B. MCC ₃ WILL BE EXECUTED ONLY IF LOI, CANNOT BE TARGE CONSTRAINTS) TO CORRECT THE TLC DISPERSIONS. C. MCC ₆ LILL BE EXECUTED ONLY IF LOI, CANNOT BE TARGE CONSTRAINTS) TO CORRECT TLI DISPERSIONS. S-58 THE GEN WILL BE THE PRIMARY MODE OF EXECUTING TRANSLUCE ON THE RESIDUAL WILL BE TRIPMED TO WITHIN 1.0 FPS. A 60 > h _p >50 (LUNAR PARKING ORBIT). B. THE PERICYNTHION OF THE APPROACH HYPERBOLA WILL BE TRIPMED TO MITHIN THE APPROACH HYBETWEEN 50 AND 75 NM. A 1960" FOR LOI REQUIRES THE FOLLOWING: A . COMMITMENT TO AT LEAST 4 HRS IN LPO - (PROVIDES OF TEI). B. ADEQUATE FUEL REMAINING FOR SUBSEQUENT LUNAR ORBIC IN h _p >50 NM. A 4 M _M <735 FPS (100 SEC) - EXECUTE AN SPS 15 MIN DISPERSION). A 5-62 PREMATURE LOI SHUTDOWN A 4 M _M <735 FPS (100 SEC) - EXECUTE AN SPS 15 MIN DISPERSION).		
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A. TLI C/O +9 HRS (EARLIEST PLANNED MCC AT TLI C/O + B. TLI C/O +25 HRS. C. LOI -22 HRS. D. LOI ₁ -5 HRS. 5-57 TRANSLUNAR MCC EXECUTION CRITERIA A. MCC ₁ AND MCC ₂ WILL NOT BE EXECUTED AS LONG AS MCC NOTE: MCC ₃ AV >3 EPS ENABLES UTILIZATION OF SPS. B. MCC ₃ WILL BE EXECUTED ONLY IF LOI, CANNOT BE TARGICONSTRAINTS) TO CORRECT THE TLC DISPERSIONS. C. MCC ₄ WILL BE EXECUTED ONLY IF LOI, CANNOT BE TARGICONSTRAINTS) TO CORRECT TLI DISPERSIONS. 5-58 THE G&N WILL BE THE PRIMARY MODE OF EXECUTING TRANSLU 5-59 THE RESIDUALS OF MCC ₃ WILL BE TRIMMED TO 0.5 FPS IN A RESIDUAL WILL BE TRIMMED TO WITHIN 1.0 FPS. A 60 > h _p >50 (LUNAR PARKING ORBIT). B. THE PERICYNTHION OF THE APPROACH HYPERBOLA WILL BE CONSTRAINTS: A. 60 > h _p >50 (LUNAR PARKING ORBIT). C. THE ALTITUDE OF THE NODE (BETWEEN THE APPROACH HY BETWEEN 50 AND 75 NM. A 5-61 A "GO" FOR LOI REQUIRES THE FOLLOWING: A. COMMITMENT TO AT LEAST 4 HRS IN LPO - (PROVIDES OF TEI). B. ADEQUATE FUEL REMAINING FOR SUBSEQUENT LUNAR ORBIC. A b _p >50 NM. 5-62 PREMATURE LOI SHUTDOWN A. ΔV _M <735 FPS (100 SEC) - EXECUTE AN SPS 15 MIN DII B. 735 <4V _M <1280 (100 TO 170 SEC) - EXECUTE AN SPS	AT THE FOLLOWING:	
C. LOI -22 HRS. D. LOI ₁ -5 HRS. TRANSLUNAR MCC EXECUTION CRITERIA A. MCC ₁ AND MCC ₂ WILL NOT BE EXECUTED AS LONG AS MCC NOTE: MCC ₃ AV >3 EPS ENABLES UTILIZATION OF SPS. B. MCC ₃ WILL BE EXECUTED ONLY IF LOI, CANNOT BE TARGE CONSTRAINTS) TO CORRECT THE TLC DISPERSIONS. C. MCC ₄ WILL BE EXECUTED ONLY IF LOI ₁ CANNOT BE TARGE CONSTRAINTS) TO CORRECT TLI DISPERSIONS. 5-58 THE G@N WILL BE THE PRIMARY MODE OF EXECUTING TRANSLUMAN AND AND AND AND AND AND AND AND AND A		
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5-57 TRANSLUNAR MCC EXECUTION CRITERIA A. MCC1 AND MCC2 WILL NOT BE EXECUTED AS LONG AS MCC NOTE: MCC3 &V >3 EPS ENABLES UTILIZATION OF SPS. B. MCC3 WILL BE EXECUTED ONLY IF LOI, CANNOT BE TARGI CONSTRAINTS) TO CORRECT THE TLC. DISPERSIONS. C. MCC4 WILL BE EXECUTED ONLY IF LOI1 CANNOT BE TARGI CONSTRAINTS) TO CORRECT TLI DISPERSIONS. 5-58 THE GEN WILL BE THE PRIMARY MODE OF EXECUTING TRANSLU 5-59 THE RESIDUALS OF MCC3 WILL BE TRIMMED TO 0.5 FPS IN A RESIDUAL WILL BE TRIMMED TO WITHIN 1.0 FPS. A. 60 > hp >50 (LUNAR PARKING ORBIT). B. THE PERICYNTHION OF THE APPROACH HYPERBOLA WILL BE C. THE ALTITUDE OF THE NODE (BETWEEN THE APPROACH HY) BETWEEN 50 AND 75 NM. A 'GO'' FOR LOI REQUIRES THE FOLLOWING: A. COMMITMENT TO AT LEAST 4 HRS IN LPO - (PROVIDES OF TEI). B. ADEQUATE FUEL REMAINING FOR SUBSEQUENT LUNAR ORBI C. hp >50 NM. A 5-62 PREMATURE LOI SHUTDOWN A. 4VM <735 FPS (100 SEC) - EXECUTE AN SPS 15 MIN DII B. 735 <avm (100="" -="" 170="" <1280="" an="" execute="" sec)="" sps<="" td="" to=""><td></td><td></td></avm>		
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B. 735 < \$\Delta V_M < 1280 (100 TO 170 SEC) - EXECUTE AN SPS LUNAR ABORT.		
LUNAR ABORT.	,	
C. ΔV _M >1280 FPS (>170 SEC TO END OF BURN) - EXECUTE INITIATE AN ALTERNATE MISSION.	TEI (SPS OR DPS) AT NEXT PERICY	NTHION OR
MISSION REV DATE SECTION	GROUP	PAGE
APOLLO 10 A 4/23/69 TRAJECTORY AND GUIDANCE	TRANSLUNAR COAST	5-8

NASA — Manned Spacecraft Center Mission Rules

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؛ ا	5-63	THE MA	X ALLOWABLE	E MISS DISTANCE OVER THE LLS IS .5 OUT	T-OF-PLANE AND .5 DEG IN AZIMUT	н.
		(NOTE:	THE ALLO	WABLE MISS DISTANCE IS AZIMUTH IS A FU	UNCTION OF THE LLS AND LAUNCH D	AY.)
			ű			
1.	5-64	TC TUE	CDC TAILS	AT ICANTION.		
	7-07			AT IGNITION:		
		A. MC	CC - RESCHE	DULE MCC FOR FLYBY TRAJECTORY WITH DPS	S/SM-RCS EXECUTION.	
- {	1	B. LC	OI1 - EXECU	TE MCC5 ABORT MANEUVER WITH DPS/SM-RCS	S	
-		C. LO	DJ2 - EXECU	TE GROUND COMPUTED TEI WITH DPS AS SOC	ON AS PRACTICAL.	
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APOL	LO 10	Α	4/23/69	TRAJECTORY AND GUIDANCE	TRANSLUNAR COAST	5-9

THE LOI2 WHELVER WILL BE TARGETED TO MINIMIZE THE LLS MISS DISTANCE. 5-77 A "GO" FOR LOI2 REQUIRES COMMITMENT TO AT LEAST 4 MRS IN LUMAR ORBIT. CNOTE: THIS PROVIDES ONE FULL REV OF TRACK AFTER LOI2 FOR CALCULATION OF TEI.) A 1 5-78 ALL LUMAR CRBIT OPERATIONS WILL PRESERVE By, NO LESS THAN 8 MM. VIOLATIONS WILL BE CORRECTED ASAP. RULES 5-79 THOCKEN 5-95 ARE RESERVED. MISSION REV DATE SECTION GUILDANCE GROUP PAGE APOLLO 10 A 4/4723/59 TRAJECTORY AND GUIDANCE LUMBR 0891T 5-10			MISSION RULES	
S-77 A "GOV" FOR LOI2 REQUIRES COMMITMENT TO AT LEAST 4 HRS IN LUNAR ORBIT, (NOTE: THIS PROVIDES ONE FULL REV OF TRACK AFTER LOI2 FOR CALCULATION OF TEL.) A 1 5-78 ALL LUNAR ORBIT OPERATIONS WILL PRESERVE by NO LESS THAN 8 NM. VIOLATIONS WILL BE CORRECTED ASAP. RULES 5-79 THROUGH 5-85 ARE RESERVED. NISSION REV DATE SECTION GROUP PAGE APOLLO 10 A 1/23/69 TRALECTORY AND GUIDANCE LUNAR ORBIT 5-10	REV	ITEM		
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RULES 5-79 THROUGH 5-85 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE APOLLO 10 A 4/23/69 TRAJECTORY AND GUIDANCE LUNAR ORBIT 5-10		5-78	ALL LUNAR ORBIT OPERATIONS WILL PRESERVE hp NO LESS THAN 8 NM. VIOLATIONS WILL BE CORRECTED A	SAP.
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FEC/TSG Form 292 (AUG 68)

					MISSION RULES				
EV	ITEM								
A	5-86	THE	PGNCS I IZING T	S PRIME HE ACCE	FOR CSI, CDH, AND TPI MANEUVER COM PTED SOLUTION (EXCEPTION: CDH IS A	PUTATION/EXECUTION WITH THE AGS GS CONTROLLED):	S AS BAC	KUP	
		Α.	THE AVA	ILABLE	SOLUTIONS FOR CSI ARE: PGNCS, CHAR	TS, AND GROUND. THE ORDER OF F	PRIORITY	WILL BE:	
	}		1. USE	LARGES	T SOLUTION (ΔV) IF NO GREATER THAN	2 FPS DIFFERENT FROM MIDDLE SOL	LUTION.		
			2. IF	"I" ABC	VE IS VIOLATED, USE MIDDLE SOLUTION	+2 FPS.	•		
$\ \cdot\ $					SOLUTIONS FOR CDH ARE: PGNCS, CHAR				
	İ				NCS AND CMC. IF NO DIFFERENT THAN	•			
			USE	PGNCS	VE IS VIOLATED, COMPARE PGNCS AND C SOLUTION.				
					"2" ABOVE ARE VIOLATED, COMPARE CH PASSES, USE CHART SOLUTION.	ARTS AND CMC USING THE SAME CRI	ITERIA.	IF	
11			4. IF	"1", "2	", AND "3" ABOVE ARE VIOLATED, USE	THE CMC SOLUTION.			
		с.	THE AVA	ILABLE	SOLUTIONS FOR TPI ARE: PGNCS, CHAR	TS, AND CMC. THE ORDER OF PRICE	ORITY WI	LL BE:	
				PARE PO ICS SOLU	NCS AND CMC. IF NO DIFFERENT THAN TION.	2 FPS IN X, 5 FPS IN Y, OR 6 FF	PS IN Ż,	USE THE	
			2. IF PGN	"1" FAI	LS, COMPARE THE PGNCS AND CHARTS, WITTON.	ITH SAME CRITERIA. IF COMPARIS	SON PASS	SES, USE THE	
					"2" FAIL, COMPARE THE CHARTS AND T PASSES, USE THE CHART SOLUTION.	HE CMC SOLUTIONS, USING THE SAM	ME CRITE	RIA. IF	
1			4. IF	"1", "2	", AND "3" FAIL, USE THE CMC SOLUTI	DN			
		•							
	5-87			OF PRIORITY FOR THE TPI SOLUTION IS PGNCS, LM ONBOARD CHARTS, CSM, AND GROUND. THE OLUTION WILL NOT BE USED IF DIFFERENT FROM THE CSM BY:					
		A. $\Delta V_{GX} > 2$ FPS C. $\Delta V_{GZ} > 6$ FPS							
		в.	ΔV _{GY} >	5 FPS	D. ΔTIG TPI >	2 MIN			
	5-88	RENC	EZVOUS	PLANS S	HALL, WHERE POSSIBLE, SATISFY THE F	OLLOWING CONSTRAINTS:			
İ		Α.	RENDEZV	OUS MAN	EUVERS MUST BE AT LEAST <u>25</u> MIN APAR	т.			
ŀ		B. THE ALLOWABLE SLIP TIME FOR TPI IS ±15 MIN FROM MPD.							
		c.	THE AH	FOR TPI	WILL BE 15 ±5 NM.				
-								,	
	5-89	l			RESPONSIBLE FOR ALL MANEUVERS PRIC			_	
		TOM	E: GRC	DUND WIL	L COMPUTE CSI, CDH, AND TPI BUT WIL	L NOT PASS THESE MANEUVERS UNLI	ESS REQL	JESTED.)	
	5-90	PHAS	ING AND) INSERT	ION WILL BE TARGETED TO PRESERVE TH	E NOMINAL RENDEZVOUS.			
	5-91				BE TRIMMED TO <u>0.2</u> FPS IN THE X-AXI		L NOT BE	E TRIMMED.	
MI	SSION	REV	 -		SECTION	GROUP		PAGE	
		A		769	TRAJECTORY AND GUIDANCE	RENDEZVOUS		5-11	

THE FOLLOWING RENDEZVOUS OPTIONS AND RESCUE MODES WILL BE UTILIZED AS NECESSARY FOR FAILURES REQUIRING TERRITMATION OF THE IMMINUM ARROGENOUS: A. DOL FAILURES 1. UNDERBURN (A) ATTEMPT TO COMPLETE (C) DISC FAILURE - DIRECT RETURN (C) OFFICE FAILURE - DIRECT RETURN (A) OVERSIAND 12 FPS, PMLI RESTORMS (C) PENCS FAILURE - DIRECT RETURN (A) OVERSIAND 12 FPS, DIRECT RETURN (C) PENCS FAILURE - DIRECT RETURN (A) OVERSIAND 12 FPS, DIRECT RETURN (C) PENCS FAILURE - DIRECT RETURN (A) OVERSIAND 12 FPS, DIRECT RETURN (A) OVERSIAND 12 FPS, DIRECT RETURN (C) PENCS FAILURES FROM DOL 12 DIRECT RETURN (A) OVERSIAND 13 FPS, PMLI RESTORMS (C) PENCS FAILURES FROM DOL 14 DIRECT RETURN (A) OVERSIAND 14 FPS, DIRECT RETURN (C) PENCS FAILURES FROM DOL 15 DIRECT RETURN (C) PENCS FAILURES FROM DOL 15 DIRECT RETURN (C) PENCS FAILURES FROM DOL 15 DIRECT RETURN (C) PENCS FAILURES FROM DOL 15 DIRECT RETURN (C) PENCS FAILURES FROM DOL 15 DIRECT RETURN (C) PENCS FAILURES FROM DOL 15 DIRECT RETURN (C) PENCS FAILURES FROM DOL 15 DIRECT RETURN THE RESTORMS FROM THE NOWING PROMING PRO			MISSION RULES
TERMINATION OF THE NOMINAL RENCEZVOUS: A. DOI FAILURES 1. UNDERBURN (A) ATTEMPT TO COMPLETE (B) DEPARTMENT OF DIRECT RETURN (C) PORCE FAILURE - DIRECT RETURN (C) PORCE FAILURE - DIRECT RETURN (C) PORCE FAILURE - DIRECT RETURN (C) PORCE FAILURE - DIRECT RETURN (C) PORCE FAILURE - DIRECT RETURN (C) PORCE FAILURE - DIRECT RETURN (C) PORCE FAILURE - DIRECT RETURN (C) PORCE FAILURE - DIRECT RETURN AGE FAIL - CONTINUE MISSION B. FOR FAILURES FROM DOI +1 ID MIN TO PRICTORMING MISSION B. FOR FAILURES FROM DOI +1 ID MIN TO PRICTORMING MISSION C. FOR DES FAILURES FROM DOI - 1 ID MIN TO PRICTORMING MISSION AGE FAIL - CONTINUE MISSION D. FOR DES FAILURES FROM DOI - 1 ID MIN TO PRICTORMING MISSION AND COMPLETE THE BURN WITH THE ARS. IF YO, OF THE PASIAL MARRIMER IS 25 FRS, THE UN WILL STAKE AND OWNERS. THE BURN WITH THE ARS. IF YO, OF THE PASIAL MARRIMER IS 25 FRS, THE UN WILL STAKE AND OWNERS FAIL TO PRICTORMING MISSION D. FOR DES FAILURES FROM DOI - 1 IF YO, OF SFRS, UN WILL COMPLETE BURN VIA ARS - NO STAGNAS.) D. FOR DES FAILURES FOLUMED BY ARE FAILURED SUBGINE PHONING THE WITH LINE ARD MINE AND AND AND AND AND AND AND AND AND AND	RE.V	1TEM	
1. INDERBURN (A) ATTEMPT TO COMPLETE (B) DOS FAILURE - POI ABORT AT FC (APS ONLY PROFILE) (C) PARCS FAILURE - POI ABORT AT FC (APS ONLY PROFILE) (C) PARCS FAILURE - DIRECT RETURN (A) OVERBURN 2 12 FPS, DIRECT RETURN (C) PARCS FAILURE - DIRECT RETURN (C) PARCS FAILURE - DIRECT RETURN (C) PARCS FAILURE - DIRECT RETURN (C) PARCS FAILURE - DIRECT RETURN ABORT FAILURES SOURCES IS WITHIN 2 FPS. FINANS FAILL - DIRECT RETURN ABS FAILL - CONTINUE MISSION 8. FOR FAILURES FROW DOI 1 IO MIN TO PERICIVITHION THAT REQUIRE DEVIATION FROM THE MOMINAL, THE FIVE-IMPULSE PDI ABORT SEQUENCE WILL BE INITIATED. DOOKING WILL OCCUR 2 HOURS BARLIER THAN MOMINAL. (C) FOR DPS FAILURES FROW DOI C/O WITHIL THE V ₁ O OF THE FHASING PAREVURE IS 25 FPS, THE UM WILL STAKE AND COMPLETE THE BURN WITH THE ROS. IF V ₁ O OS PPS, LM WILL COMPLETE BURN VIA RCS - NO STOMEOUT THE BURN WITH THE APS. IF V ₂ O OS PPS, LM WILL COMPLETE BURN VIA RCS - NO STOMEOUT THE BURN WITH THE ROS. TO HOTEL THE V ₂ O OS THE MILL COMPLETE BURN VIA RCS - NO STOMEOUT COMPLE	A	5-92	
(A) ATTEMPT TO COMPLETE (B) DIS PALLIAR - POLACICA AT PC. CAPS ONLY PROFILE) (C) PROSEPATION - POLACIT AT PC. CAPS ONLY PROFILE) (C) PROSEDIAL 12 FPS, MAIL RESIDALS (G) OFERSON'S 12 FPS, MAIL RESIDALS (G) OFERSON'S 12 FPS, MAIL RESIDALS (G) OFERSON'S 12 FPS, MAIL RESIDALS (G) OFERSON'S 12 FPS, MAIL RESIDALS (G) OFERSON'S 12 FPS, MAIL RESIDALS (G) OFERSON'S 13 FPS, MAIL RESIDALS (G) OFERSON'S 14 FPS, MAIL RESIDALS (G) OFERSON'S 14 FPS, MAIL RESIDALS (G) OFERSON'S 15 WITHIN 2 FPS. PROSE STAIL - DIRECT RETURN AGS FAIL - CONTINUE MISSION REAL - CONTINUE MISSION B. FOR PAILURES PROMIDED H 10 MIN TO PERICONPHION THAT REQUIRE DEVIATION FROM THE MOMINAL, THE FIVE-INFLUSE FPOL ABORT SEQUENCE MILL BE INITIATED. DOCKING WILL COUR 2 MORE BRAILER THAN INVENTMENT (C) FOR DPS FAILURES PROMIDED OF MASS FAILURES DURING PHASING, THE LIMITUAL TAKES POS THAN AND COMPLETE THE BURN WITH THE APS. IF VOO IS LESS THAN 25 FPS, THE UM MILL STAGE AND COMPLETE THE BURN WITH THE APS. IF VOO IS LESS THAN 25 FPS, THE UM MILL STAGE AND COMPLETE THE BURN WITH THE CRS. ONDITE IF VOO STEP, JU MILL COMPLETE BURN IN ARE SON STAND S			A, DOI FAILURES
(D) POS FAILURE - POI ABORT AT PC CAPS ONLY PROFILE) (C) PRINCE FAILURE - DIRECT RETURN (C) PRINCE FAILURE - DIRECT RETURN (C) PRINCE FAILURE - DIRECT RETURN (C) PRINCE FAILURE - DIRECT RETURN (C) PRINCE FAILURE - DIRECT RETURN (C) PRINCE FAILURE - DIRECT RETURN (C) PRINCE FAILURE - DIRECT RETURN AGREEPONT WITH EITHER OF THE OTHER SOURCES IS WITHIN EITHER OF THE OTHER SOURCES IS WITHIN EITHER OF THE OTHER AGREEPONT WITH EITHER OF THE OTHER AGREEPONT WITH EITHER OF THE OTHER AGREEPONT WITH EITHER OF THE OTHER AGREEPONT WITH EITHER OTHER OTHER OTHER AGREEPONT WITH EITHER OTHER OTHER OTHER AGREEPONT WITH EITHER OTHER OTHER OTHER AGREEPONT WITH EITHER OTHER OTHER AGREEPONT WITH EITHER OTHER OTHER AGREEPONT WITH EITHER OTHER OTHER AGREEPONT WITH EITHER OTHER AGREEPONT WITH EITHER OTHER AGREEPONT WITH EITHER OTHER AGREEPONT WITH EITHER OTHER AGREEPONT WITH EITHER OTHER EITHER WITH THE ROS. THE WAS INTERED OTHER OTHER OTHER ACTION UNLESS WAS UP A PASSING "AGREEPE THE BURN WITH THE AGREE," TO GOOD THE HEAVING PASSING "AGREEPE THE BURN WITH THE AGREE," IF WE IS LESS THAN 40, THE WITH WILL TAKE AND OTHER EITHER ACTION UNLESS WAS UP A PASSING "AGREEPE THE BURN WITH THE AGREE OTHER OTHER ACTION UNLESS WAS UP A PASSING "AGREEPE THE BURN WITH THE AGREE OTHER ACTION UNLESS WAS UP A PASSING "AGREEPE THE BURN WITH THE AGREE OTHER ACTION UNLESS OTHER AGREED WITH A THE AGREEM THE AGREEPE OTHER ACTION UNLESS OTHER AGREED WITH A THE AGREED WAS AGREED WITH A THE AGREED WAS AGREED			1. UNDERBURN
(A) OVERBURN < 12 FPS, NULL RESIDUALS (B) OVERBURN < 12 FPS, DIRECT RETURN (C) PONCS FAILURE - DIRECT RETURN (C) PONCS FAILURE - DIRECT RETURN NOTE THE PONCS, AGS, OR RIS "GO" IF AGREEMENT WITH THE OF THE OTHER SOURCES IS WITHIN 2 FPS. PONCS FAIL - DIRECT RETURN AGS FAIL - CONTINUE MISSION B. FOR FAILURES FROM DOI + 10 MIN TO DESICTIVITION THAT REQUISE DEVIATION FROM THE MOMINAL. THE FIVE- IMPRUSE PDI ABORT SEQUENCE WILL BE INITIATED. DOOKING WILL COCUR 2 HOURS EARLIER THAM MOMINAL. C. FOR DPS FAILURES FROM DOI C/O LIMIT THE YEO OF THE PHASING MANEUVER IS 25 FPS, THE UM WILL STAGE AND COMPLETE THE BURN WITH THE RES. ON THE PLAY OF THE PHASING MANEUVER IS 25 FPS, THE UM WILL STAGE AND COMPLETE THE BURN WITH THE RES. ON THE PLAY OF THE PHASING THE WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN WITH THE RES. ON THE PLAY OF THE BURN OF THE PLAY OF THE BURN OF THE PLAY OF THE BURN OF THE PLAY OF THE BURN OF THE PLAY OF THE BURN OF THE PLAY OF THE BURN OF THE PLAY OF THE BURN OF THE PLAY OF THE BURN OF			(B) DPS FAILURE - PDI ABORT AT PC (APS ONLY PROFILE)
(B) OVERBURN 3 12 FPS, DIRECT RETURN (C) PGNCS FAILURE - DIRECT RETURN (C) PGNCS FAILURE - DIRECT RETURN THE PONCS, AGS, OR OR IS "ISO" IF AGREEMENT WITH EITHER OF THE OTHER SOURCES IS WITHIN 2 FPS. PRICES FAIL - DIRECT RETURN AGS FAIL - CONTINUE MISSION B. FOR FAILURES FROM DOI + 10 MIN TO PERICYITHION THAT REQUIRE DEVIATION FROM THE NOMINAL, THE FIVE- IMPULSE POI ABORT SEQUENCE WILL BE INITIATED. DOCKING WILL OCCUR 2 YOURS BALLER THAN NOMINAL C. FOR OPS FAILURES FROM DOI + 10 MIN TO PERICYITHION THAT REQUIRE DEVIATION FROM THE NOMINAL, THE FIVE- AND COMPLETE THE BURN WITH THE ARS. IF VGO IS LESS THAN 25 FPS, THE UM WILL STAGE AND COMPLETE THE BURN WITH THE RCS. OUTCOME: IF VGO OF SPS, LM WILL COMPLETE BURN VIA RCS - NO STORIGH. D. FOR DPS FAILURES PROLLOGED BY APS FAILURES DURING PHASING, THE LM WILL TAKE NO FURTHER ACTION UNLESS WIN OF PHASING -40 FPS. IF VM, IS LESS THAN 25 MPS, THE LM WILL TAKE NO FURTHER ACTION UNLESS WIN OF PHASING -40 FPS. IF VM, IS LESS THAN 25 MPS, THE LM WILL TAKE NO FURTHER ACTION UNLESS WIN OF PHASING -40 FPS. IF VM, IS LESS THAN 25 MPS, THE LM WILL TAKE NO FURTHER ACTION UNLESS WIN OF PHASING -40 FPS. IF VM, IS LESS THAN 25 MPS, THE LM WILL TAKE NO FURTHER ACTION UNLESS WIN OF PHASING -40 FPS. IF VM, IS LESS THAN 25 MPS, THE LM WILL LITTIATE A FIVE-IMPULSE RESCUE WITH DOCKING OCCURRING AT THE NOMINAL TIME. E. FOR COMPLETE UM FAILURES POLLOWING DOI BUT PRIOR TO PHASING JENITION. THE CSM WILL INITIATE THE FIVE-IMPULSE, THE CSM WILL EXCENT THE "SERO! INSERTION" BACUE MANALURE. THE CSM WILL ALSO EXCUTE CSI AND COM HILL ETHER VEHICLE FAY EXECUTE TENHAL PHASE. (IF THE ARS FAILS WITH VM, 4 SF FPS, THE UM WILL UTILIZE THE RCS TO TRIM THE MANALURE. BACK TO ZERO.) DOCKING OCCURS AT THE NOMINAL TIME. 6. FOR APS FAILURES DURING. INSERTION, HERE WE THE ETHER VEHICLE EXECUTION TERMINAL PHASE. (IF YG. 4 SO FPS, THE UM WILL OFFICIAL THE THE ROW OF THE MANALURE. 6. FOR APS FAILURES DURING. INSERTION, THE CSM WILL EXECUTE ANY OR ALL OF THE CFP SEQUENCE UTILIZING THE MISSION THE WILL OF			2. OVERBURN
THE PROKS, AGS, OR DR IS "GO" IF AGGENERAT WITH LETTER OF THE OTHER SOURCES IS WITHIN 2 FPS. PRINCS FAIL — DIRECT RETURN AGS FAIL — DOITHOUR MISSION RE FAIL — CONTINUE MISSION RE FAILURES FROM DOI + 10 MIN TO PRECIDENTHION THAT REQUIRE DEVIATION FROM THE NOMINAL, THE FIVE-IMPULSE POI ABORT SEQUENCE WILL BE INITIATED. DOCKING WILL OCCUR 2 MOURS EARLIER THAN NOMINAL. C. FOR DPS FAILURES FROM DOI C/O LINTIL THE VGO OF THE PHASING MANEUVER IS 25 FPS, THE UM VILL STACE AND COMPLETE THE BURN WITH THE RAS. (NOTE: IF VGO IS LESS THAN 40, THE UM VILL STACE OF OMER THE BURN WITH THE RAS. (NOTE: IF VGO IS LESS THAN 40, THE UM VILL STACE OWN FOR SHARE ACTION VALUES VALOE PHASING "40 FPS. IF VM, IS LESS THAN 40, THE UM VILL STACE ACTION VALUES VALOE PHASING "40 FPS. IF VM, IS LESS THAN 40, THE UM VILL STACE ACTION VALUES VALOE PHASING "40 FPS. IF VM, IS LESS THAN 40, THE UM VILL STACE ACTION VALUES VALOE PHASING "40 FPS. IF VM, IS LESS THAN 40, THE UM VILL VALID THE ACTION VALUES VALOE PHASING "40 FPS. IF VM, IS LESS THAN 40, THE UM VILL VILL TAKE NO THAN THE ACTION VALUES VALOE PHASING "40 FPS. IF VM, IS LESS THAN 40, THE UM VILL VILL TAKE NO THAN THE ACTION VALUES VALOE PHASING THE MONITOR. THE MONITOR THE PHASE ACTION VALUES VALOE PHASING THE MONITOR. THE COMMITTED THE FIVE-IMPULSE (R2) RESCUE SEQUENCE WITH DOCKING OCCURRING AT THE MONITOR. THE MONITOR. THE COMMITTED THE FIVE-IMPULSE (R2) RESCUE SEQUENCE WITH DOCKING OCCURRING THE MONITOR. THE SERVICE WAS VALUED TO THE COMMITTED THE COMMITTED THE PHASE OF THE MONITOR. THE COMMITTED THE PHASE OF THE MONITOR. THE COMMITTED THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF THE MONITOR. THE PHASE OF T	1		(B) OVERBURN ≥ 12 FPS, DIRECT RETURN
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IMPUSE PDI ABORT SEQUENCE WILL BE INITIATED. DOCKING WILL OCCUR 2 HOURS EARLIER THAN NOMINAL. C. FOR DPS FAILURES FROM DOI C/O UNTIL THE VGO OF THE PHASING MANEUVER IS 25 FPS, THE UM WILL STAGE AND COMPLETE THE BURN WITH THE RS. IF VGO IS LESS THAN 25 FPS, THE UM WILL STAGE AND COMPLETE THE BURN WITH THE RS. IF VGO IS FPS, LM WILL COMPLETE BURN VIA RCS - NO STAGING.) D. FOR DPS FAILURES POLLOWED BY APS FAILURES DURING PHASING, THE LM WILL TAKE NO FURTHER ACTION UNLESS W, OF PHASING 440 FPS. IF V4, IS LESS THAN 40, THE LM WILL UTILIZE RS TO ACHIEVE 40 FPS. THE CSM WILL INITIATE A FIVE-IMPULSE RESCUE WITH DOCKING OCCURRING AT THE NOMINAL TIME. E. FOR COMPLETE LM FAILURES FOLLOWING DOI BUT PRIOR TO PHASING IGNITION, THE CSM WILL INITIATE THE FIVE-IMPULSE (R2) RESCUE SEQUENCE WITH DOCKING OCCURRING 2 HOURS LATE. F. FOR CASES WHICH MAKE THE UN MO-GO FOR INSERTION, FOR NO APS IGNITION AT INSERTION, OR FOR V4, < 45 FPS, THE UM WILL WILLIZE THE "EXEND INSERTION" BACKUP MANEURED. THE CSM WILL ALSO EXECUTE CSI AND COH WHILE EITHER VEHICLE THE "EXEND INSERTION" BACKUP MANEURED. THE CSM WILL ALSO EXECUTE CSI AND COH WILL WILLIZE THE RCS TO TRIM THE MANEUVER BACK TO SERO,) DOCKING OCCURS AT THE NOMINAL TIME. G. FOR APS FAILURES DURING INSERTION WHERE V4 > 45 AND VGO > 80, THE CSM WILL INITIATE A FIVE-IMPULSE RESCUE. DOCKING WILL OCCUR 2 HOURS LATE WITH EITHER VEHICLE EXECUTING TERMINAL PHASE. (IF VG < 80 FPS, THE UM WILL OCCUR 2 HOURS LATE WITH EITHER VEHICLE EXECUTING TERMINAL PHASE. (IF VG < 80 FPS, THE UM WILL OCCUR 2 HOURS LATE WITH EITHER VEHICLE EXECUTING TERMINAL PHASE. (IF VG < 80 FPS, THE UM WILL OCCUR 2 HOURS LATE WITH EITHER VEHICLE EXECUTING TERMINAL PHASE. (IF VG < 80 FPS, THE UM WILL OCCUR 2 HOURS LATE WITH EITHER VEHICLE EXECUTING TERMINAL PHASE. (IF VG < 80 FPS, THE UM WILL OCCUR 2 HOURS LATE WITH EITHER VEHICLE EXECUTING TERMINAL PHASE. (IF VG < 80 FPS, THE UM WILL DOCK STAND THE COMPLETE THE WAS TORDED.) RULES 5-93 THROUGH 5-99 ARE RESCUE. DOCK STAND THE COMPLETE THE COMPLETE THE WAS THE WAS THE WAS	1		AGS FAIL - CONTINUE MISSION
AND COMPLETE THE BURN WITH THE ROS. IF YGO 15 LESS THAN 25 FPS, THE LM WILL STACE AND COMPLETE THE BURN WITH THE ROS. (NOTE: 1F YGO 15 FPS, LM WILL COMPLETE BURN VIA ROS - NO STAGING.) D. FOR DPS FAILURES FOLLOWED BY APS FAILURES DURING PHASING, THE LM WILL TAKE NO FURTHER ACTION UNLESS YM OF PHASING 40 FPS. IF My IS LESS THAN 40, THE LM WILL UTILIZE RCS TO ACHIEVE 40 FPS. THE CSM WILL INITIATE A FIVE-IMPULSE RESCUE WITH DOCKING OCCURRING AT THE NOMINAL TIME. E. FOR COMPLETE LM FAILURES FOLLOWING DOI BUT PRIOR TO PHASING IGNITION, THE CSM WILL INITIATE THE FIVE-IMPULSE (R2) RESCUE SEQUENCE WITH DOCKING OCCURRING 2 HOURS LATE. F. FOR CASES WHICH MAKE THE LM NO-GO FOR INSERTION, FOR NO APS IGNITION AT INSERTION, OR FOR YM 45 AND APS FAILURE, THE CSM WILL EXCED THE TWO EXECUTE THE "YEAR DOCKING WILL ALSO EXECUTE CSI AND COM HILLE ETHER VEHICLE MAY EXECUTE TERMINAL PHASE. (IF THE APS FAILUR THE CSM WILL LITE THE RCS TO TRIM THE MANEUVER BACK TO ZERO.) DOCKING OCCURS AT THE NOMINAL TIME. G. FOR APS FAILURES DURING INSERTION WHERE YM > 45 AND YGO > 80, THE CSM WILL INITIATE A FIVE-IMPULSE RESCUE. DOCKING WILL OCCUR 2 HOURS LATE WITH EITHER VEHICLE EXECUTING TERMINAL PHASE. (IF VG < 80 FPS, THE LM WILL UTILIZE THE RCS TO COMPLETE THE MANEUVER.) H. FOR LM FAILURES FOLLOWING INSERTION, THE CSM WILL EXECUTE ANY OR ALL OF THE CFP SEQUENCE UTILIZING THE MIRROR IMAGE TARGETING. MISSION REV DATE SECTION GROUP PAGE MISSION REV DATE SECTION FROM GROUP PAGE APOLLO 10 A 4/23/69 TRAJECTORY AND GUIDANCE REDUCEDED REDUCES. 5-12			
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APOLLO 10 A 4/23/69 TRAJECTORY AND GUIDANCE RENDEZVOUS 5-12			
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ITEM								
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5-100	TRANSEARTH MCC WILL BE TARGETED TO ACHIEVE ENTRY CONDITIONS AS FOLLOWS:							
	A. IF V _{EI} >30000 FPS USE STEEP TARGET LINE.							
	B. IF V _{EI <30000} FPS AND G&N GO, USE SHALLOW TARGET LINE.							
5-101	1 TRANSEARTH MCC PHILOSOPHY.							
	A. TEC MCC WILL NOT USE LANDING POINT CONTROL UNLESS THE LANDING POINT IS UNACCEPTABLE.	•						
	B. IF γ_{EI} IS OUTSIDE THE ENTRY CORRIDOR, EXECUTE MCC ASAP (EXCEPTION: MCC, ONLY).							
	C. THE LAST MCC WILL BE SCHEDULED NO LATER THAN EI-3 HOURS.							
	D. THE GEN WILL BE THE PRIMARY MODE OF EXECUTION FOR ALL TEC MCC.							
	E. MCC > 10 FPS WILL USE THE SPS IF PRACTICAL.							
	F. THE RESIDUALS FOR MCC'S WILL BE TRIMMED TO WITHIN 0.2 FPS IN EACH AXIS.							
5-102	2 TEC MCC FOR LANDING AREA CONTROL:							
	A. PRIOR TO EI-24 HRS: WILL BE EXECUTED FOR RECOVERY ACCESS VIOLATIONS, UNACCEPTABLE WEA	ATHER						
	AT IP, OR IF ANY PART OF THE OPERATIONAL FOOTPRINT IS ON LAND.							
	B. ATER EI-24 HRS: WILL NOT BE EXECUTED							
5-103	3 ENTRY CONDITIONS WILL BE CONTROLLED TO AVOID HEAT SHIELD LIMITATIONS.							
5 106	(DACKUR THITDY AS CONSTRAINED AS FOLLOWS							
5-104	4 BACKUP ENTRY IS CONSTRAINED AS FOLLOWS: A. THE CONSTANT G ENTRY MUST FALL BETWEEN 3 AND 5 G'S.							
	B. EMS RANGING WILL NOT BE ATTEMPTED UNTIL V <25500 FPS							
5-105	WEATHER AVOIDANCE WITH AERODYNAMIC LIFT WILL NOT BE ATTEMPTED UNLESS THE G&N IS OPERATION/ EMS_INDICATED VELOCITY <25500 FPS.	AL, OR						
5-106	PREDICTED ENTRY CORRIDOR VIOLATION AFTER THE LAST MCC OPPORTUNITY:							
	A. UNDERSHOOT LINE EXCEEDED: GROUND ADVISE CREW TO FLY FULL LIFT UNTIL PEAK G IS PASSED,	, THEN						
I.								
	FLY GEN. B. OVERSHOOT LINE EXCEEDED: GROUND ADVISE CREW TO FLY NEGATIVE LIFT TO 2 G'S FOLLOWED B'							
	FLY GEN.							
	FLY GEN. B. OVERSHOOT LINE EXCEEDED: GROUND ADVISE CREW TO FLY NEGATIVE LIFT TO 2 G'S FOLLOWED B'							
	FLY GEN. B. OVERSHOOT LINE EXCEEDED: GROUND ADVISE CREW TO FLY NEGATIVE LIFT TO 2 G'S FOLLOWED B' CONSTANT ENTRY.							
	FLY GEN. B. OVERSHOOT LINE EXCEEDED: GROUND ADVISE CREW TO FLY NEGATIVE LIFT TO 2 G'S FOLLOWED B' CONSTANT ENTRY.							
II SSION	FLY GEN. B. OVERSHOOT LINE EXCEEDED: GROUND ADVISE CREW TO FLY NEGATIVE LIFT TO 2 G'S FOLLOWED B' CONSTANT ENTRY.							

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	- 10-					
	5-107	IF T	HE EMS INDIC CROSS CHECK	CATES A SKIP CONDITION, NEGATIV KS.	E LIFT SHOULD BE ACHIEVED PRIOR TO	VERIFYING THE EMS
1				· ·		
	j					
1	5-108	ie ti	HE EMS INDIC	CATES AN UNDERCHOOT CONDITION S	MICTO FILL LIFE CHOILE	
-	3-100	THE	EMS WITH CRO	SS CHECKS.	XISTS, FULL LIFT SHOULD BE ACHIEVED	PRIOR TO VERIFYING
	5-109	THE (G&N IS NO-GO	DURING ENTRY IF:		
ĺ					ERANCE SPECIFIED BY GROUND DERIVED N	/ALLIEC
╽	İ			CTORY TO VIOLATE THE OFFSET LI		ALUES.
				CTORY TO VIOLATE THE ONSET LIM		
					FER FROM THE HORIZON MONITOR ATTITUD	DE BY >5 DEG.
					FROM THE GROUND VALUES BY >5 DEG.	
		F. :	IF THE CMC F	AILS TO SEQUENCE FROM P63 TO P	64 AT RET .05 G ±5 SEC.	
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			NUMBERS 5-1: ARE RESERVE			
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ΔPΛ	LLO 10	Α	4/23/69	TRAJECTORY AND GUIDANCE	TRANSEARTH & ENTRY	5-14

5-12 5-12	21	THE RS OFF AR RESPONWILL (THIS F	SAFETY POLI DLLOWING MIS SO WILL ACCO FTER IGNITIC NSE TO A COL CALL THE RSC	SION RULES CON OMPLISH THE PAC ON AND NASA IS DED VERBAL REQU	CERNING SPECIF EMERGENCY RAN UNABLE TO ACCO EST FROM THE N SO DIRECT LINE	FIC ETR/NASA I NGE CUTOFF PRO MPLISH CUTOFF NASA LAUNCH VE E TO TRANSMIT	MANUAL (AFETRM) 127-1 I NTERFACE SUPPLEMENT AFE DEEDURE IF THE SPACE VEI THE RSO WILL SEND " HICLE TEST CONDUCTOR (THIS REQUEST. THE RSO	ETRM 127-1. HICLE WILL NOT LI ARM/MFCO'' ONLY IN CLTC). THE CLTC	FT
5-12	22	RANGE THE FO	SAFETY POLI DLLOWING MIS SO WILL ACCO FTER IGNITIC NSE TO A COL CALL THE RSC	SION RULES CON OMPLISH THE PAC ON AND NASA IS DED VERBAL REQU O ON THE CLTC-F	CERNING SPECIF EMERGENCY RAN UNABLE TO ACCO EST FROM THE N SO DIRECT LINE	FIC ETR/NASA I NGE CUTOFF PRO MPLISH CUTOFF NASA LAUNCH VE E TO TRANSMIT	NTERFACE SUPPLEMENT AFF OCCURE IF THE SPACE VEI THE RSO WILL SEND " HICLE TEST CONDUCTOR (ETRM 127-1. HICLE WILL NOT LI ARM/MFCO'' ONLY IN CLTC). THE CLTC	FT
		OFF AF RESPON WILL O THIS F	FTER IGNITIONS TO A COL CALL THE RSC	ON AND NASA IS DED VERBAL REQU O ON THE CLTC-F	UNABLE TO ACCO EST FROM THE N SO DIRECT LINE	OMPLISH CUTOFF NASA LAUNCH VE TO TRANSMIT	THE RSO WILL SEND "A	ARM/MFCO" ONLY IN CLTC). THE CLTC	
5-12	23	THE FL					,	WILL NOT EXECUTE	:
		EFFOR1	PROCEDURE WI IS TO TERMIN	LL BE EXECUTED	IF RANGE SAFE E FAILED. THE	ETY FLIGHT TER E REQUEST FROM	O A CODED VERBAL REQUE: MINATION CRITERIA HAVE I RSO TO FD WILL BE TRAI	BEEN VIOLATED AN	ID RSO :1DO-
4.									
5-12	24	OR THE	E FLIGHT DYN DED AND ABOR	IAMICS OFFICER RT ACTION HAS E	(FIDO). THIS EEN UNSUCCESS	PROCEDURE WIL FUL. THE REQU	REQUEST FROM THE FLIGH LE BE EXECUTED IF ABORT JEST FROM FD/FIDO TO THE ATE LINE AS BACKUP.	LIMITS HAVE BEEN	ı ·
5-12	25	THE FE	O WILL INFOR + OUT)" AND/	M THE RSO WHEN	THE NO. 3 OR E ENGINE OUT !	NO, 4 ENGINE LIGHT ON THE R	HAS SHUT DOWN BY STATIN SO CONSOLE.	NG "RSO, NO. 3 OL	ΙΤ
5-12	26			ESTRUCT LINES WILL BE INITIA			SEND "ARM/MFCO" AND NO FETY ACTION.	TIFY THE FD/FIDO.	
5-12	27	IF AN WILL E	ESTABLISHED BE TRANSMITT) IMPACT PREDIC	NIOP (PI) NOIT	NT IS ON THE C	APE KENNEDY LAND AREA,	"DESTRUCT/PD"	
5-12	28	IF AN LAND A	ATTEMPT TO AREA, "DESTR	TERMINATE THRU CUCT/PD" WILL B	ST BY "ARM/MF(E SENT.	co" IS UNSUCCE	SSFUL WHILE THE IP IS (ON THE CAPE KENNE	DY
5-12	29	INITIA	ATED ABORT.	THE "DESTRUCT	/PD" FUNCTION	WILL BE SENT	ION WILL BE LIMITED TO ONLY AFTER FD/FIDO CONI I IS NECESSARY.	''ARM/MFCO'' OR CR FIRMATION OF SATI	EW S-
	-								
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APOLLO	10	FINAL	4/15/69	TRAJECTORY	AND GUIDANCE		RANGE SAFETY	5-1	.5

REV	ITEM	
	5-130	IF AN IP POINT IS ESTABLISHED AND "DESTRUCT/PD" IS DEEMED UNNECESSARY, THE RSO WILL NOTIFY FD/FIDO AND SEND "SAFE" UPON FD/FIDO'S REQUEST.
	5-131	FD/FIDO WILL DECLARE TO THE RSO WHEN THERE IS NO POSSIBILITY OF INSERTING THE SPACECRAFT INTO AN ORBIT, AND THE RSO WILL NOT ALLOW THE AFRICAN GATE TO BE OVERFLOWN.
	5-132	AN ETR RANGE SAFETY OFFICER (BRSO) IS REQUIRED AT BERMUDA TO MONITOR PRESENT POSITION AND IMPACT PREDICTION CHARTS, TO OBSERVE TELEMETRY DISPLAYS, AND TO TRANSMIT THE RANGE SAFETY FUNCTIONS WHEN COMMANDED TO DO SO BY THE RSO. FOR FLIGHT AZIMUTHS LESS THAN 90 DEGREES, THE BRSO WILL ASSUME RANGE SAFETY RESPONSIBILITY IN THE EVENT OF LOSS OF COMMUNICATIONS BETWEEN THE BRSO AND THE RSO.
	5–133	SAFING BY THE RSO WILL BE TRANSMITTED AFTER GATE PENETRATION IF THE RSO HAS VERIFICATION OF S-IVB C/O OR THE FD/FIDO REQUESTS "SAFE." WHEN SAFING IS CONFIRMED, THE RSO WILL STATE TO THE FD/FIDO "SAFING CONFIRMED."
	5-134	IF SAFING CANNOT BE CONFIRMED BY THE RSO, ANOTHER SAFING ATTEMPT WILL BE MADE BY THE RSO ON THE FIRST ORBITAL PASS OVER THE CAPE. COORDINATION WILL BE EFFECTED WITH THE SUPERINTENDENT OF RANGE OPERATIONS (SRO) AND FIDO TO ENSURE COMMAND COVERAGE, NON-INTERFERENCE WITH OTHER COMMAND FUNCTIONS, AND TELEMETRY DISPLAY AVAILABILITY. AT THE AGREED TIME, FIDO WILL STATE, "COMMAND CLEAR, RSO SEND SAFE." UPON CONFIRMATION, THE RSO WILL STATE, "SAFING CONFIRMED."
	5-135	TRACKING SOURCES: AT LEAST TWO VEHICLE POSITION DATA SOURCES ARE MANDATORY BEFORE LAUNCH FOR EACH PHASE OF POWERED FLIGHT TO ENABLE THE RANGE SAFETY OFFICER TO DETERMINE IF THE SPACE VEHICLE IS NORMAL OR VIOLATES ESTABLISHED INFLIGHT SAFETY CRITERIA.
	5-136	DATA FROM TWO OF THE FOLLOWING THREE RADARS ARE MANDATORY BEFORE LAUNCH (OTHER HIGHLY DESIRABLE): BERMUDA FPS-16, BERMUDA FPQ-6, AND GRAND TURK TPQ-18.
	5-137	XY, XZ, AND IP PLOTS AT BERMUDA (BDA) USING INPUTS FROM EITHER THE BDA FPS-16 OR BDA FPQ-6 RADAR ARE HIGHLY DESIRABLE FOR LAUNCH.
	5-138	DOP DATA TO THE CAPE KENNEDY REAL-TIME COMPUTER SYSTEM (RTCS) FOR IP COMPUTATION AND RSO DISPLAY DURING FIRST STAGE BURN ARE HIGHLY DESIRABLE.
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ITEM	1			
	AIRBORNE SYSTEMS:			
5-139	ARE MANDATORY FOR		EACH LAUNCH VEHICLE STAGE (S-IC, VISOR (CRSS) AT THE LAUNCH CONTROI FOR LAUNCH.	
5-140			NCH FOR FLIGHT AZIMUTHS 72 TO 90 I LAUNCH FOR FLIGHT AZIMUTHS GREATI	
	COMMAND/CONTROL:			
5-141	WHEN BERMUDA COMM FOR LAUNCH.	AND COVERAGE IS REQUIRED, THE NA	SA BERMUDA DRS COMMAND/CONTROL SYS	STEM IS <u>MANDATORY</u>
5-142			D") WILL HAVE <u>MANDATORY</u> PRECEDENCI OND TIME DELAY BETWEEN "ARM/MFCO"	
	COMMUNICATIONS:			
5-143		PENDENT, GEOGRAPHICALLY DIVERSIF TWO COMM LINKS IS <u>MANDATORY</u> .	TED COMMUNICATIONS LINKS BETWEEN	THE RSO AND BRSO ARE
5-144	TWO OF THE FOLLOW A. RSO LOOP (CAPI		RE <u>MANDATORY</u> BETWEEN THE RSO AND I	FD/FIDO:
	B. RSO PRIVATE L	INE		
	C. FLIGHT DIRECTO	DR LOOP		
5-145	A COMMUNICATIONS CENTER IS MANDATO		GE SAFETY SUPERVISOR (CRSS) AT THE	E LAUNCH CONTROL
5-146	A DIRECT LINE COM HIGHLY DESIRABLE.	MUNICATIONS LINK BETWEEN THE RSC	AND THE LAUNCH VEHICLE TEST CONDI	UCTOR (CLTC) IS
	TELEMETRY:			
5-147	IU TELEMETRY DATA	(ONBOARD GUIDANCE PARAMETERS) T PUTATION AND RSO DISPLAY.	O THE RTCS ARE HIGHLY DESIRABLE) I	FROM T+0 UNTIL S-IVB
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REV	ITEM	<u> </u>			MISSIO	N RULES						
KE V	11⊆M	{										
		TELEMET.	RY:									
	5-148	TELEMET	RY REQUIRE	MENTS TO BE D	ISPLAYED FOR THE	RSO AND THE	BRSO ARE HIGHLY	DESIRABLE.				
		A. FOR	RSO DISPL	AY: SEE ATCH	NO. 1							
- {		B. FOR BRSO DISPLAY: SEE ATCH NO. 2										
Ì												
		RANGE S.	AFFTY WEAT	HER RESTRICTION	ONIC +			•				
]	5-149		STRICTIONS		<u> </u>							
	213				TION OF 1 25 STG	MA (11%) ከ፤፤	_ BE IN EFFECT FO	D THE LAUNCH AD	EΛ			
			12 1 101 112	MIND NEDTHIO		W (110) WILL	- BE IN EITEGI FOR	K THE EMONOT AR	EA.			
			-						•			
	5-150	CEILING	AND VISIB	ILITY RESTRICT	TIONS:							
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		292 (AUG		I MAJECTORY	AND GUIDANCE		RANGE SAFETY		5-18			

6 SLV - TB1 THROUGH TB4/TB4A (LAUNCH)

REV	ITEM										
		SE GENERAL RULES (THESE RULES SUPPLEMENT ALL BSE RULES)									
		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.									
		BSE MANEUVER UPDATE AND INHIBIT CAPABILITY FOR TB7 MANEUVERS ONLY.									
		. BSE HAS NAVIGATION UPDATE CAPABILITY.									
		. BSE HAS NO COMMAND CAPABILITY DURING POWERED BURN PHASES.									
		. A SAFE DISTANCE BETWEEN THE SPACECRAFT AND S-IVB/IU IS DEFINED AS 7000 FT.									
		E WILL RECOMMEND NO S-IVB RESTART FOR ANY CONFIRMED MALFUNCTION IN THE LAUNCH VEHICLE									
		1. A CATASTROPHIC HAZARD									
		2. INSUFFICIENT CONSUMABLES TO ASSURE A 1 SIGMA PROBABILITY OF GUIDANCE CUTOFF, OR									
		3. ANY CONDITION/MALFUNCTION(S) FOR WHICH A GUIDANCE CUTOFF WILL DEFINITELY NOT BE ACHIEVED. CONDITIONS LEADING ONLY TO A FAILURE TO RESTART WILL NOT BE CONSIDERED.									
		IN THE EVENT OF NO S-IVB IGNITION AT RESTART OR AN EARLY S-IVB SECOND BURN CUTOFF, THE SPACECRAFT SHOULD REMAIN ATTACHED TO THE S-IVB/IU AND MONITOR LH2 AND LOX ULLAGE PRESSURES UNTIL THE STAGE STATUS CAN BE ASSESSED BY GROUND. IF EMERGENCY SEPARATION IS REQUIRED IMMEDIATELY AFTER S-IVB CUTOFF, THE SPACECRAFT SHOULD IMMEDIATELY GO TO A SAFE DISTANCE (7000 FT) FROM THE S-IVB/IU.									
		· ABORT DURING LAUNCH PHASE WILL BE RECOMMENDED FOR THE FOLLOWING:									
		6-1 S-IC LOSS OF THRUST									
		6-7 S-II LOSS OF THRUST 6-8 S-II GIMBAL SYSTEM FAILURE - ACTUATOR HARDOVER INBOARD 6-9 S-II SECOND PLANE SEPARATION FAILS TO OCCUR AT TB3 + 31 SEC 6-10 S-IVB LOSS OF HYDRAULIC FLUID 6-11 S-IVB LOSS OF THRUST									
		. SPACECRAFT GUIDANCE TAKEOVER WILL BE RECOMMENDED FOR THE FOLLOWING:									
		6-4 LAUNCH VEHICLE INERTIAL PLATFORM FAILURE-ATTITUDE REFERENCE 7-8 LOSS OF ATTITUDE CONTROL									
		. S-II/S-IVB EARLY STAGING WILL BE RECOMMENDED FOR THE FOLLOWING:									
		6-7 S-II LOSS OF THRUST (AFTER S-IVB TO ORBIT CAPABILITY)									
		. SPACECRAFT SEPARATION OR TLI INHIBIT PRIOR TO RESTART WILL BE RECOMMENDED FOR THE FOLLOWING:									
		7-1 INSUFFICIENT PROPELLANTS REMAIN FOR TLI GUIDANCE CUTOFF *7-11 TIME BASE 5 OR TIME BASE 7 FAILS TO INITIATE AT S-IVB CUTOFF 7-8 LOSS OF ATTITUDE CONTROL 7-16 J-2 ENGINE CONTROL BOTTLE PRESSURE LESS THAN 400 PSIA 8-1 INERTIAL PLATFORM FAILURE - ACCELEROMETER 8-6 S-IVB ACTUATOR CONFIRMED HARDOVER PRIOR TO RESTART 7-22 S-IVB LOSS OF ENGINE HYDRAULIC FLUID 8-8 LOSS OF ATTITUDE CONTROL DURING SECOND BURN 8-5 S-IVB LHZ TANK ULLAGE PRESSURE LESS THAN 25 PSIA PRIOR TO SECOND BURN									
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		MISSION RULES	,						
V ITEM	-	,	· · · · · · · · · · · · · · · · · · ·						
		EPARATION OR TLI INHIBIT PRIOR TO RI L FOR THE FOLLOWING;	ESTART WILL BE RECOMMENDED UNLESS C	OMMAND ACTION					
	7-5 FAILURI %7-6 S-IVB 7-9 S-IVB %7-14 S-IVB 7-18 S-IVB 7-20 J-2 EN 8-7 S-IVB	GINE MAIN OXIDIZER VALVE FAILS TO CLE E OF THE RANGE SAFETY SYSTEM AFTER I COLD HELIUM SHUTOFF VALVES FAIL TO CONTINUOUS VENT SYSTEM (CVS) REGULA' STAGE COMMON BULKHEAD DELTA PRESSURE COLD HELIUM SPHERE PRESSURE LOW GINE START BOTTLE PRESSURE OUTSIDE F CONTINUOUS VENT SYSTEM (CVS) REGULAT X TANK ULLAGE PRESSURE	NSERTION CLOSE FOR FAILS TO OPEN IN TB5 EREACHES OR EXCEEDS +36 OR -26 PSI						
	M. FOR EARLY SPA GROUND COMMAN POSSIBLE.	ACECRAFT SEPARATION THE CREW SHOULD ND TO LOCK OPEN THE IU COMMAND SYSTE	ENABLE THE IU COMMAND SYSTEM AND T EM, PRIOR TO SPACECRAFT SEPARATION	HE BSE SHOULD IF AT ALL					
	"EMERGENCY SEPARATION REQUIRED.								
MICCIO	DEV JOSE	Teceston	enoug.	Insec					
MISSION	REV DATE	SECTION	GROUP	PAGE 6-2					

	I				MISSION RULES		·	
REV	ITEM			. <u>S</u>	UMMARY OF LAUNCH PH	ASE RULES		
								
		6-1		OF THRUST				
		6-2		TTITUDE CONTROL				
		6-3			- ACCELEROMETER			
		6-4		IAL PLATFORM FAI	LURE			
		6-7		OF THRUST				
		6-8			E - ACTUATOR INBOARI)		
		6 - 9		ND PLANE SEPARAT				
				S OF HYDRAULIC F	LUID			
		6-11	S-IVB LOS	S OF THRUST				
		THE F	OLLOWING MI	SSION RULES ALSO	APPLY TO THIS SECT	ION:		
		NONE						
	:							
}								
						,		
MI	ISSION	REV	DATE	SECTION		GROUP		PAGE
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	SG Form	1 1		L				

REV RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COM	MENTS
6–1	S-IC STAGE LOSS OF THRUST		·	A&B. <u>CUES</u> :	
	A. ANY SINGLE ENGINE PRIOR TO TB3	LAUNCH	A. <u>CONTINUE MISSION</u> BSE INFORM FLIGHT AND FIDO.		, K34-115, K36-115,
	B. ANY TWO OR MORE ENGINES 1. PRIOR TO DEACTI- VATICAL OF TWO ENGL. 35 AUTO ABORT	LAUNCH	B. CONTINUE MISSION BSE INFORM FLIGHT. 1. ABORT BSE INFORM FLIGHT AND	K39-115,	K40-115, K42-115, K44-115, K46-115,
	2. AFTER DEACTIVATION OF TWO ENGINES AUTO ABORT		TRANSMIT ABORT REQUEST. 2. CONTINUE MISSION BSE INFORM FLIGHT AND FIDO. CAPCOM ADVISE CREW OF POTENTIAL OVERRATE CONDITION.	2. THRUST CH PRESSURE (D8-101) D8-105).	<500 PSIA
				3. LONGITUD RATION - (A2-603)	ZERO
				4. FINAL THE CUTOFF - (K52-115 K56-115)	ON THROUGH
				A&B. <u>NOTE</u> :	
				CREW MAY DEAG AUTOMATIC ABO TB1 + 120 SEG	ORT AFTER
	C. LOSS OF THRUST -	LAUNCH	C. CONTINUE MISSION	C. <u>CUES</u> :	
	ENGINE 3 OR 4 (THIS RULE APPLIES ONLY FOR THE UNIQUE CASE OF ENGINE 3 OR 4 THRUST LOSS BETWEEN 0 TO		BSE INFORM FLIGHT AND FIDO. FLIGHT INFORM RSO.	1. THRUST CHAN SURE LESS T PSIA (D8-10	THAN 500
	45 SEC) 1. VOICE COMM WITH RSO	·	1.(A) FLIGHT CONFIRM ENGINE 3 OR 4 OUT VIA RSO PRIVATE LINE.	2. ENGINE 3 TH SWITCHES OF K40-115, K4 K42-115, K4 K44-115).	F (K39-115 +1-115,
			(B) FLIGHT CONFIRM NO OTHER KNOWN ANOMALIES BY LITE ACTIVATION AND VOICE REPORT.	3. ENGINE 3 OR THRUST OK C (K54-115, k	UTOFF
	2. NO VOICE COMM WITH		2. FLIGHT CONFIRM ENGINE 3	C. <u>NOTES</u> :	
	RSO		OR 4 OUT AND NO OTHER KNOWN ANOMALIES BY LITE ACTIVATION.	1. RSO LOOP 11 LOOP BACKUP	
				2. CONFIRMATIO OTHER KNOWN WILL BE BAS	ANOMALIES
				PRESSU	
	\				
}		} .			
MISSION	REV DATE		SECTION	GROUP	PAGE
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	I PHASE	RULING		CUES/NOTES/COM	MENTS
	6+2	LOSS OF ATTITUDE CONTR	ROL LAUNCH		A.	CUES:	
		A. S-IC BURN		A. LAUNCH VEHICLE ABORT BSE INFORM FLIGHT AND CAPCOM INFORM CREW OF OF ATTITUDE CONTROL. CREW WILL ABORT ON LI (NOTE A.1.).	FIDO.	1. ANGULAR RATE (R4-602, R1: YAW (R5-602) GREATER THAM SEC AND NOT ING. ROLL (R12-602) GRE 5 DEG/SEC AND DECREASING.	3-602) OR R8-602) V 2 DEG/ DECREAS- [R6-602, EATER THAN
						2. PLATFORM GIN ANGLES - PI OR ROLL (H60 CHANGING AT GIVEN IN CUE	TCH, YAW, 0-603) THE RATES
		·				TROL ALERT (A.2)	
				•	Α.	NOTES:	
	ļ					1. CREW ABORT I	IMITS:
	:					(A) PITCH A RATE ± (B) ROLL RA DEG/SEC (C) PITCH, ROLL EF	ND YAW DEG/SEC TE ±20 YAW, OR ROR ±5
						2. LOSS OF ATTI TROL ALERT V GIVEN FOR TH FOLLOWING CO	TUDE CON- VILL BE ME ONDITIONS:
						(A) LVDC/LV PUTATIO FAILURE (B) ATTITUE	NAL E
						(C) FAILURE INITIAT GUIDANC (D) S-IC EN	: TO :E PROPER :E SEQUENCE :GINE :R HARDOVER
	·						
MI	SSION	REV DATE		SECTION	G	ROUP	PAGE
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTI	ON PHASE	RULING		CUES/NOTES/COM	1ENTS
	RULE 6-2 (CONT'D)	B. S-II BURN	ON PHASE		D FIDO. F LOSS	CUES: 1. ANGULAR RAT (R4-602, R1 YAW (R5-602) GR ROLL (R6 R12-602) GF THAN 5 DEG/NOT DECREAS 2. PLATFORM GANGLES - POR ROLL (H6	TES - PITCH 13-602); 2-602); 2-602, REATER SEC AND SING. (MBAL ITCH, YAW 50-603) THE RATES JE B.1.
					_		
					В.	NOTES: 1. CREW ABORT	LIMITS:
						(A) PITCH	AND YAW ±10 DEG/SEC RATE ±20
						2. LOSS OF AT TROL ALERT GIVEN FOR ING CONDIT	WILL BE THE FOLLOW-
						(C) FAILU	IONAL RE JDE ERROR LS >±5 DEG
						3. LOSS OF AT TROL ALERT GIVEN DURIN BURN FOR S- ACTUATOR HU	WILL BE NG S-II -IVB ENGINE
	į						
				<u> </u>			
MI:	SSION	REV DATE		SECTION	GF	ROUP	PAGE
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REV	RULE	CONDITION/MALFUNCT	ION PHASE	RULING		CUES/NOTES/COMMENTS
	6-2 (CONT'D)	C. S-IVB BURN	LAUNCH	C. LAUNCH VEHICLE ABORT BSE INFORM FLIGHT AND CAPCOM INFORM CREW OF OF ATTITUDE CONTROL. CREW WILL ABORT ON LI (NOTE C.1);	FIDO. LOSS	CUES: 1. ANGULAR RATES - PITCH (R4-602, R13-602); YAW (R5-602, R8-602); OR ROLL (R6-602, R12-602) GREATER THAN 5 DEG/SEC AND NOT DECREASING.
						2. PLATFORM GIMBAL ANGLES - PITCH, YAW, OR ROLL (H60-603) CHANGING AT THE RATES GIVEN IN CUE C.1.
						 LOSS OF ATTITUDE CONTROL ALERT (SEE NOTE C.2).
					c.	NOTES:
						1. CREW ABORT LIMITS:
						·(A)· PITCH AND YAW RATE ±10 DEG/SEC ·(B)· ROLL RATE ±20 DEG/SEC
,						2. LOSS OF ATTITUDE CONTROL ALERT WILL BE GIVEN FOR THE FOLLOWING CONDITIONS:
						(A) LVDC/LVDA COM- PUTATIONAL FAILURE (B) ATTITUDE ERROR SIGNALS: ROLL
						>±3.5 DEG, PITCH >±3.5 DEG, PITCH AND YAW >±5 DEG. (C) FAILURE TO INI- TIATE PROPER GUIDANCE SEQUENCE
					.	
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	6-3	INERTIAL PLATFORM FAILURE - ACCELEROMETER	LAUNCH	CONTINUE MISSION BSE INFORM FLIGHT AND FIDO. CAPCOM ADVISE CREW OF PROBABL DEGRADED ORBIT.		ES: GUIDANCE STATUS CODE 24) (H60-6	
						BITS D26 AND D2 ACCEL SET TO "O	5 FOR Z
						BITS D24 AND D2 ACCEL SET TO "O	
						BITS D22 AND D2 ACCEL SET TO "O	
					2.	ACCELEROMETER P (X, Y, OR Z) IN EXCESS OF 3 DEG NOT DECREASING (H10-603, H11-6 H12-603)	DICATE IN AND
			į		NO.	TES:	
					1.	NO EFFECT ON VE JECTORY DURING BURN.	
		,			2.	LVDC SWITCHES T MODE AND UTILIZ COMPUTED F/M PR FAILED AXIS DUR S-IC, S-II, AND BURNS.	ES A PRE- OFILE FOR ING THE
		-					
	6-4	LAUNCH VEHICLE INERTIAL PLATFORM FAILURE – ATTITUDE REFERENCE .	LAUNCH	CONTINUE MISSION BSE INFORM FLIGHT AND RECOMME SPACECRAFT GUIDANCE TAKEOVER.	END	GUIDANCE REFERE (D04 OR D06) MOI BIT D8 SET TO TO 603).	DE CODE 26
				·	2.	GUIDANCE STATUS (MODE CODE 24) BITS D20 AND D1 GIMBAL SET TO "	(H60-603) · 9 FOR Z
						BITS D18 AND D1 GIMBAL SET TO "	ONE"
					- 3.	BITS D16 AND D1 GIMBAL SET TO " LADDER OUTPUTS	ONE" CONSTANT
					4.	FOR FAILED AXES H55-603, H56-60 ATTITUDE ERROR	3):
						FOR FAILED AXES H70-602, H71-60	(H69-602,
		RULE NUMBERS 6-5 THROUGH 6-6 ARE RESERVED.				TES: CUE 1 AND ANY C ARE NECESSARY T PLATFORM FAILUR	O CALL
MI	SSION	REV DATE		SECTION		ROUP	PAGE
ΔΡΩ	LLO 10	FINA 4/15/69 SLV	- TB1 THROUGH				
		201 (AUC 68)	- IDI IMKUUGE	I IDT/ IDTA	<u> </u>		6-8

REV. BULLE. CONDITION/MAINTENETION A. AMY SINGLE ENGINE. A. AMY SINGLE ENGINE. A. AMY SINGLE ENGINE. BEAUTION TO ATTAIN THRUST OR ATTAIN THRUST FIRED TO MINISTER FIRED TO		, , ,	F	<u> </u>	MISSION RULES			
A. ANY SINGLE ENDING- PATLIAR TO ATTAIN THRUST PER TO ATTAIN THRUST PER TO THRUST CASTAIN THRUST OR SKITCHES OF CX285-201 THRUST CO CX285-201 THRUST CO THRUST CASTAIN THRUST THRUST CASTAIN THRUST CASTAIN THRUST CASTAIN THRUST CASTAIN THRUST CASTAIN THRUST THRUST CASTAIN THRUST THRUST CASTAIN THRUS	REV	RULE	CONDITION/MALFUNCTI	ON PHASE	RULING		CUES/NOTES/COM	MENTS
B. ANY THO ENGINES-FAIL- LIRE TO ATTAIN THRUST OR LOSS OF THRUST: 1. VEHICLE CONFROLLING 1. VEHICLE CONFROLLING 2. IF ANDIJAR PATES EXCED 9.5 DEC/SEC OR THE DIFFRENCE IN COMMANDED ANGLES AND GIRBAL ANGLES EXCEED 9.0 DES IN PITOL OR OR RECORD FOLIA OR IN PICCOMPTON AND THREE OR FOLIA OR IN PICCOMPTON AND TRANSITION ORD IT PROVIDE IN PICCOMPTON AND TRANSITION OR IN PICCOMPTON AND TRANSITION OR IT PROVIDE IN PICCOMPTON AND TRANSITION OR IT PROVIDE IN PICCOMPTON AND TRANSITION OR IT PICCOMPTON AND TRANSITION OR IT PICCOMPTON AND TRANSITION OR IT PICCOMPTON AND TRANSITION OR IT PICCOMPTON AND TRANSITION OR IT PICCOMPTON AND TRANSITION OR PICCOMPTON AND TRANSITION OR IT PICCOMPTON AND TRANSITION OR PAGE OF AN OR OR OR PARTY OR OR OR OR OR OR OR OR OR OR OR OR OR O		6-7	A. ANY SINGLE ENGIN FAILURE TO ATTAI THRUST OR LOSS O THRUST PRIOR TO NOMINAL S-II	E- N		A.1.	THRUST OK SWI (K285-201 THRO K286-201 THRO THRUST CHAMBEI ZERO (D13-201 205):	OUGH 205, UGH 205): R PRESSURE THROUGH
OR LOSS OF THEUST: 1. VEHICLE CONTROLLING 2. IF ANGULAR RATES EXCEED 9. SEG/SEC OR THE DIFFERENCE IN COMMANDED ANGLES AND GIMBAL ANGLES EXCEEDS 40 DEG IN PITCH OR YAM C. THREE OR MORE ENGINES OUT 1. PRIOR TO S-IVB TO ORBIT CAPABILITY BUT PRIOR TO LOW LEVEL SENSE ARM 3. AFTER S-IVB TO ORSIT CAPABILITY BUT PRIOR TO LOW LEVEL SENSE ARM 3. AFTER LOW LEVEL SENSE ARM 3. AFTER LOW LEVEL SENSE ARM 3. AFTER SOUT (A) THREE OR FOUR ENGINES OUT (A) THREE OR FOUR ENGINES OUT (B) CONTINUE MISSION 2. ARROY STAGE SEE INFORM FLIGHT AND TRANSMIT ABORT REQUEST. 2. ARROY STAGE (CN-6-02), R8-602, R8						ļ	TION (A2-603) TWO ENGINES O	; UT·(CUES
2. IF ANGULAR PATES EXCECT 9. 5. DEG/SEC OR THE DIFFERENCE IN COMMANDED ANGLES AND GHINGL ANGLES AND GHINGL ANGLES AND GHINGL ANGLES AND GHINGL ANGLES AND GHINGL ANGLES AND GHINGL ANGLES AND GHINGL ANGLES AND GHINGL ANGLES EXCEEDS 40 DEG IN PITCH OR YAW C. THREE OR MORE ENGINES OUT 1. PRIOR TO S-IVB TO ORBIT CAPABILITY BUT PRIOR TO LOW LEVEL SENSE ARM 3. AFTER LOW LEVEL SENSE ARM 4. APTICE TO M LEVEL SENSE ARM 4. APTICE TO M LEVEL SENSE ARM 5. AFTER LOW LEVEL SENSE ARM 6. APTICE TO M LEVEL SENSE ARM 6. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 7. APTICE TO M LEVEL SENSE ARM 8. BE INFORM FLIGHT AND RECOMMEND EARLY STAGE BESE RECOMMEND EARLY STAGE BESE RECOMMEND EARLY STAGE 7. COMMANDED ANGLES AND GHINGLINA HE ARE CULT. THREE OR MORE ENGINES OUT. CLIES A.1, A.2, A.3): 8. BESE INFORM FLIGHT AND RECOMMEND EARLY STAGE 7. COMMANDED ANGLES AND GHINGLINA HE ARE CULT. THREE OR MORE ENGINES OUT. CLIES A.1, A.2, A.3): 8. BESE INFORM FLIGHT AND RECOMMEND EARLY STAGE 7. BESCINON STAGE ST			OR LOSS OF THRUS	T:	B.1. <u>CONTINUE MISSION</u> BSE INFORM FLIGHT A		ANGULAR RATES YAW EXCEED 9. (R4-602, R13-	PITCH OR 5 DEG/SEC 602,
OUT 1. PRIOR TO S-IVB TO ORBIT CAPABILITY 2. ATTER S-IVB TO ORBIT CAPABILITY BUT PRIOR TO LOW LEVEL SENSE ARM 3. AFTER LOW LEVEL SENSE ARM 3. AFTER LOW LEVEL SENSE ARM (A) THREE OR FOUR ENGINES OUT (B) ALL ENGINES (B) ALL ENGINES MISSION MISSION 1. ABORT SEST INFORM FLIGHT AND RESE INFORM FLIGHT AND RECOMMEND EARLY STAGING. (A) EARLY STAGE BESE RECOMMEND EARLY STAGE. (B) CONTINUE MISSION MISSION OUT (CUES A.1, A.2, A.3): 1. ABORT SEST INFORM FLIGHT AND RESE INFORM FLIGHT AND RECOMMEND EARLY STAGING. (A) EARLY STAGE BESE RECOMMEND EARLY STAGE. (B) CONTINUE MISSION MISSION REV DATE SECTION GROUP PAGE			EXCEED 9,5 D OR THE DIFFE IN COMMANDED ANGLES AND G ANGLES EXCEE DEG IN PITCH	EG/SEC RENCE IMBAL DS 40	BSE INFORM FLIGHT A		COMMANDED ANG GIMBAL ANGLES CHANGING AT TH	LES AND (H60-603) HE RATES
1. PRIOR TO S-IVB TO ORBIT CAPABILITY 2. AFTER S-IVB TO ORBIT CAPABILITY BUT PRIOR TO LOW LEVEL SENSE ARM 3. AFTER LOW LEVEL SENSE ARM 4. THREE OR FOUR ENGINES OUT (A) THREE OR FOUR ENGINES OUT (B) ALL ENGINES (B) ALL ENGINES (C) ALL ENGINES (B) GONTINUE MISSION MISSION REV DATE ANDER LOW BEST INFORM FLIGHT AND RECOMMEND EARLY STAGE (B) GONTINUE MISSION MISSION REV DATE ANDER LOW BEST INFORM FLIGHT AND RECOMMEND EARLY STAGE. (B) GONTINUE MISSION				GINES		TINUE C.1.	OUT (CUES A.1	
ORBIT CAPABILITY BUT PRIOR TO LOW LEVEL SENSE ARM 3. AFTER LOW LEVEL SENSE ARM 3. AFTER CON LEVEL SENSE ARM 3. BSE INFORM FLIGHT AND FIDO. (A) THREE OR FOUR ENGINES OUT (A) EARLY STAGE BSE RECOMMEND EARLY STAGE. (B) ALL ENGINES OUT MISSION REV DATE SECTION GROUP PAGE					BSE INFORM FLIGHT		A.37.	
SENSE ARM (A) THREE OR FOUR ENGINES OUT (B) ALL ENGINES OUT (B) CONTINUE MISSION MISSION REV DATE SECTION GROUP PAGE			ORBIT CAPABI BUT PRIOR TO	LITY LOW	BSE INFORM FLIGHT			
ENGINES OUT BSE RECOMMEND EARLY STAGE. (B) CONTINUE MISSION MISSION REV DATE SECTION GROUP PAGE				VEL		AND		
MISSION REV DATE SECTION GROUP PAGE					BSE	DI Y		
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APOLLO 10 TANAN MARKON CIV. TOL TROUBLE TOLETA								
APOLLO 10 TANAN MARKON CIV. TOL TROUBLE TOLETA			·					
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	68	S-II STAGE GIMBAL SYSTEM FAILURE ANY SINGLE ACTUATOR HARDOVER (INBOARD)	LAUNCH	ABORT BSE INFORM FLIGHT AND TRAI ABORT REQUEST.	NSMIT	CUES: 1. YAW ACTUATOR POS CEEDS + 6 DEG (G THROUGH 204) (G3 THROUGH 204).	8-201 0-201
						2. PITCH ACTUATOR F EXCEEDS + 6 DEG THROUGH 204) (G3 THROUGH 204). 3. ADJACENT CONTROL ACTUATOR IN SAME	(G9-201 :1-201 . ENGINE E PLANE
						MOVES 4-1/2 DEG (SAME MEASUREMEN 1 AND 2).	
						NOTE:	
						CREW SHOULD ABORT AS POSSIBLE AFTER MALFU OCCURS TO PRECLUDE E THERMAL PROBLEMS IN INTERSTAGE.	NCTION XCESSIVE
\vdash							
	69	S-II SECOND PLANE SEPARATION FAILS TO OCCUR AT TB3 + 31	LAUNCH	ABORT BSE INFORM FLIGHT AND TRA	TIMZ	<u>CUES</u> :	
		SEC		ABORT REQUEST. CREW ABOR TO TB3 + 52 SEC.		1. SECOND PLANE SEF INDICATION SHOWS RATION (M86-206,	NO SEPA-
					į	2. GUIDANCE MODE WO CODE 25 BIT D15 ZERQ (H60~603).	
						3. IGNITION BUS VOI MAINS AT APPROXI VOLTS (M125-207)	MATELY 28
						4. RECIRCULATION BU REMAINS AT APPRO 56 VOLTS (M111-2	XIMATELY
						NOTES:	
	:		i			1. MANUAL ABORT BY ONBOARD INDICATE	
						2. PROBABLE SUBSEQUE OF VEHICLE DUE TEMPERATURE.	JENT LOSS TO EXCESSIV
						·	
					İ		
MI	SSION	REV DATE		SECTION		GROUP	PAGE
APO	LLO 10	FINAL 4/15/69 SLV -	TB1 THROUGH	I TB4/TB4A			6-10

					MISSION RULES			
REV	RULE	CONDITION/MALFUN	NCT I ON	PHASE	RULING		CUES/NOTES/COM	MENTS
	6-10	S-IVB LOSS OF ENG DRAULIC FLUID PRIO S-IVB BURN		LAUNCH	SPACECRAFT SEPARATION BSE INFORM FLIGHT AND FID RECOMMEND NO S-IVB START. FIDO WILL ADVISE FLT OF CO	O AND	CUES: 1. HYDRAULIC RESERV LEVEL APPROX ZER (L7-403). 2. HYDRAULIC SYSTEM LESS THAN 1700 F 403).	O PERCENT
					<i>‡</i>	3	3. HYDRAULIC RESERV SURE APPROX ZERO (D42-403).	
						1	NOTE:	
						1	L7-403 (CUE 1) P THE OTHER CUES A FOR IMPLEMENTATI RULE.	RE REQUIRED
							2. COI CAPABILITY N EXISTS AT S-II C	
	6–11	S-IVB STAGE LOSS	OF THRUST			2	CUES:	
		A. FAILS TO ATTA OR PREMATURE S PRIOR TO OBTA	SHUTDOWN	LAUNCH	A. SPACECRAFT SEPARATION BSE INFORM FLIGHT AND		1. THRUST CHAMBER F ZERO (D0001-401)	
		PARKING ORBIT			FIDO WILL ADVISE FLT CAPABILITY.	OF COI	2. THRUST OK SWITHO (K0014-401, K015	
						3	 LONGITUDINAL ACC ZERO (A2~603). 	ELERATION -
	<u>.</u>			· ·			CODE 25, BIT D2 (H60-603).	
						!	5. TB7 IS INITIATED CODE 26, BIT D20 (H60-603).	
		B. FAILS TO ATTA OR PREMATURE PRIOR TO VELO OFF FOR SECON	SHUTDOWN CITY CUT-	EARTH	B. CONTINUE MISSION BSE INFORM FLIGHT AND THE SPACECRAFT SHOULD ATTACHED TO THE S-IVB MONITOR LH2 AND LOX T LAGE PRESSURES. IF S IS REQUIRED, THE SPAC SHOULD IMMEDIATELY GO SAFE DISTANCE (7000 F THE S-IVB/IU.	FIDO. REMAIN /IU AND ANK UL- EPARATION ECRAFT TO A	NOTE: SEPARATION WILL BE R VIOLATION OF FMR 7-6 7-14.	
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-			CLV	TB1 THROUGH		 	JACOI	6-11
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7 SLV - TB5 AND TB7 (COAST)

REV ITEM	7-1 7-2 7-3 7-4 7-5 7-6 7-7 7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15 7-16	SUMMARY OF COAST P INSUFFICIENT PROPELLANT RESERVED MAIN FUEL VALVE FAILS TO CLOSE MAIN OXIDIZER VALVE FAILS TO CLOSE RANGE SAFETY SYSTEM NOT SAFED AFTER INS COLD HELIUM SHUTOFF VALVE FAILS OPEN AUXILIARY HYDRAULIC PUMP FAILS LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP	SERTION	
	7-2 7-3 7-4 7-5 7-6 7-7 7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15	INSUFFICIENT PROPELLANT RESERVED MAIN FUEL VALVE FAILS TO CLOSE MAIN OXIDIZER VALVE FAILS TO CLOSE RANGE SAFETY SYSTEM NOT SAFED AFTER INS COLD HELIUM SHUTOFF VALVE FAILS OPEN AUXILIARY HYDRAULIC PUMP FAILS LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP	SERTION	
	7-2 7-3 7-4 7-5 7-6 7-7 7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15	RESERVED MAIN FUEL VALVE FAILS TO CLOSE MAIN OXIDIZER VALVE FAILS TO CLOSE RANGE SAFETY SYSTEM NOT SAFED AFTER INS COLD HELIUM SHUTOFF VALVE FAILS OPEN AUXILIARY HYDRAULIC PUMP FAILS LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP		
	7-3 7-4 7-5 7-6 7-7 7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15	MAIN FUEL VALVE FAILS TO CLOSE MAIN OXIDIZER VALVE FAILS TO CLOSE RANGE SAFETY SYSTEM NOT SAFED AFTER INS COLD HELIUM SHUTOFF VALVE FAILS OPEN AUXILIARY HYDRAULIC PUMP FAILS LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP		
	7-4 7-5 7-6 7-7 7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15	MAIN OXIDIZER VALVE FAILS TO CLOSE RANGE SAFETY SYSTEM NOT SAFED AFTER INS COLD HELIUM SHUTOFF VALVE FAILS OPEN AUXILIARY HYDRAULIC PUMP FAILS LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP		
	7-5 7-6 7-7 7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15	RANGE SAFETY SYSTEM NOT SAFED AFTER INSCOLD HELIUM SHUTOFF VALVE FAILS OPEN AUXILIARY HYDRAULIC PUMP FAILS LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP		
	7-6 7-7 7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15	COLD HELIUM SHUTOFF VALVE FAILS OPEN AUXILIARY HYDRAULIC PUMP FAILS LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP		
	7-7 7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15	AUXILIARY HYDRAULIC PUMP FAILS LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP	ı	
	7-8 7-9 7-10 7-11 7-12 7-13 7-14 7-15	LOSS OF ATTITUDE CONTROL CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP	ı	
	7-9 7-10 7-11 7-12 7-13 7-14 7-15	CONTINUOUS VENT REGULATOR FAILS TO OPEN APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP	1	
	7-10 7-11 7-12 7-13 7-14 7-15	APS ULLAGE ENGINE FAILS ON TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP	ı	
	7-11 7-12 7-13 7-14 7-15	TB5 OR TB7 FAILS TO INITIATE RESERVED IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD AP		
	7-12 7-13 7-14 7-15	RESERVED $ \begin{tabular}{llll} IU & ENVIRONMENTAL & CONTROL & SYSTEM & FAILS \\ COMMON & BULKHEAD & ΔP \\ \end{tabular} $		
	7-13 7-14 7-15	IU ENVIRONMENTAL CONTROL SYSTEM FAILS COMMON BULKHEAD ΔP		
	7-14 7-15	COMMON BULKHEAD AP		
	7-15	_		
	7-16	LOSS OF S-IVB STAGE PNEUMATICS		
		LOSS OF ENGINE CONTROL BOTTLE PRESSURE		
	7-17	LH2 TANK VENT FAILURE OR LEAK		
	7-18	LOW COLD HELIUM SUPPLY		
	7–19	LOX TANK ULLAGE PRESSURE < 31 PSIA		
	7-20	J-2 ENGINE START BOTTLE PRESSURE OUTSID	DE RESTART LIMITS	
	7-21	PU VALVE FAILURE		
	7-22	S-IVB LOSS OF HYDRAULIC FLUID		
	7-23	RESERVED		
	7-24	RESERVED		
	7-25	LOX NON-PROPULSIVE VENT FAILS TO OPEN		
	7-26	\ensuremath{LH}_2 LATCHING VENT VALVE FAILS TO OPEN		
	7-27	${ m GH}_2$ START BOTTLE DUMP FAILS TO OCCUR		
	7-28	COLD HELIUM DUMP FAILS TO OCCUR		
	7-29	RESERVED		
	7-30	RESERVED		
	THE FOL	_OWING MISSION RULES ALSO APPLY TO THIS SE	ECTION	
	NONE		••••	
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DEV	RULE	CONDITION/MALFUNCTIO	N PHASE	RULING		CUES/NOTES/COM	MENTS
REV	NULE			KOLING		COLOTIOTES/COM	
	7–1	PRIOR TO RESTART, INS	UFFI- COAST	NO S-IVB RESTART		<u>CUE</u> :	
		FOR ACHIEVEMENT OF TL GUIDANCE CUTOFF	I CNI	BSE INFORM FLIGHT AND RE NO S-IVB RESTART.	COMMEND	PROPELLANT REMAININ TAINED DURING REAL-	TIME
		•				MONITORING EVALUATI	ONS.
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		RULE NUMBER 7-2 IS RESERVED.			,		
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REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	7-3	J-2 ENGINE MAIN FUEL VALVE (MFV) FAILS TO CLOSE AT:				CUES:	. 500171011
	i	A. FIRST S-IVB CUTOFF	COAST	A. <u>CONTINUE MISSION</u>	:	1. MAIN FUEL VALVE (G004-401).	POSITION
				BS E INFORM FLIGHT AN (ASAP):	D COMMAND	2. MAIN FUEL VALVE (K118-401).	OPEN
				1. PRÉVALVES AND RE SHUTOFF VALVES C (SEE NOTE 1)	LOSED	3. FUEL RECIRC FLO (F5-401).	
			ŀ	2. ATTEMPT TO CLOSE		4. FUEL FLOWMETER (F2-401).	FLOWRATE
				IF SUCCESSFUL, BSE C	OMMAND:	NOTES:	·
				3. ENGINE MFV CLOSE		1. IF THE MFV IS C LH ₂ PUMP INLET	PRESSURE
				4. PREVALVE AND REC OFF VALVES OPEN	IRC SHUT-	WILL GO TO ZERO AFTER COMMAND A (A.1).	
		B. SECOND S-IVB CUTOFF	COAST SLINGSHOT	B. <u>CONTINUE MISSION</u>		2. THIS FAILURE WI	
				BSE INFORM FLIGHT AN		EVALUATION OF L	IÑE
				1. PREVALVES AND RE SHUTOFF VALVES G	LOSE	ADEQUACY FOR TL CUTOFF (REF FMR	
				2. ATTEMPT TO CLOSE	ì		
	i			WHEN S-IVB IS AT PRO ATTITUDE, BSE COMMAN	D:		
		•	,	3. PREVALVES AND RE SHUTOFF VALVES O			
			1.0				
	7-4	J-2 ENGINE MAIN OXIDIZER VALVE (MOV) FAILS TO CLOSE				CUES:	
		AT:				1. MAIN OXIDIZER V TION (G3-401).	ALVE POSI-
		A. FIRST S-IVB CUTOFF	COAST	A. CONTINUE MISSION/NO RESTART		2. MAIN OXIDIZER V (K120-401)	ALVE OPEN
	!	}		BSE INFORM FLIGHT AN (ASAP):		3. LOX FLOWMETER F (F1-401):	LOWRATE
				1. PREVALVES AND RE SHUTOFF VALVES C		NOTES:	
				2. ATTEMPT TO CLOSE	MOV	1. MANNED RESTART ATTEMPTED IF TH	
				IF SUCCESSFUL, BSE C	OMMAND:	CAN BE CLOSED.	L MOV
				3. ENGINE MOV CLOSE	į	2. THIS FAILURE WI EVALUATION OF L	OX RESI-
				4. PREVALVE AND REC SHUTOFF VALVES O		DUALS TO DETERM ADEQUACY FOR TL CUTOFF (REF FMR	I VELOCITY
				IF MOV CANNOT BE CLO RECOMMEND NO S-IVB R			
		B. SECOND BURN CUTOFF	COAST SLINGSHOT	B. CONTINUE MISSION	D. COMMAND.		
				BSE INFORM FLIGHT AN 1. PREVALVES AND RE SHUTOFF VALVES C	CIRC		
				2. ATTEMPT TO CLOSE	l l		
				AT INITIATION OF LOX BSE COMMAND:	DUMP,		
				3. PREVALVES AND RE SHUTOFF VALVES O			
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	7-5	RANGE SAFETY SYSTEM NOT SAFED AFTER INSERTION	COAST		cu	<u>ES</u> :	
		A. PROPELLANT DISPERSION SYSTEM NOT ARMED		A. CONTINUE MISSION	1.	FIRING UNIT 1 F >1.6 VOLTS (M30	
				BSE INFORM FLIGHT AN MEND RSO SEND SAFE C		FIRING UNIT 2 F >1.6 VOLTS (M31	
		B. PROPELLANT DISPERSION SYSTEM ARMED AND RSO HAS NOT SENT MFCO		B. <u>SPACECRAFT SEPARATIO</u> BSE INFORM FLIGHT AN	⁻ }	RANGE SAFETY RE ENABLE (N057-4) 2.4 AND 4.5 VOL	1) BETWEEN
				1. RECOMMEND SPACEC SEPARATION TO A DISTANCE (7000 F	SAFE	RANGE SAFETY RE ENABLE (N062-41 2.4 AND 4.5 VOL	1) BETWEEN
				2. WHEN SPACECRAFT I REACHED A SAFE D RECOMMEND RSO SEI	ISTANCE, ND SAFE	RSO DISPLAY AND SYSTEM STATUS.	COMMAND
				COMMAND.	NO	<u>TES</u> :	
					1.	RSO SHOULD NOT SAFE THE RANGE RECEIVERS ON RE UNTIL MCC.CONFI PROPELLANT DISP SYSTEM IS NOT A DITION A ONLY).	SAFETY SVS 2 AND 3 RMS THE SERSION RMED (CON-
					2.	EITHER CUE 1 OR SUFFICIENT FOR ING THIS RULE.	
		,					
	7–6	S-IVB STAGE COLD HELIUM SHUTOFF VALVES FAIL TO CLOSE AT:	COAST			<u>ES</u> :	
		A. TB5 + 1.4 SEC		A. CONTINUE MISSION/SPACESEPARATION		COLD HELIUM REG DISCHARGE PRESS THAN 200 PSIA (URE GREATER
				BSE INFORM FLIGHT AND 1. LOX NPV VALVE OPE	COMMAND:	COLD HELIUM BOT SURE DECAYING (D0263-403).	
	•			2. ATTEMPT TO CLOSE COLD HELIUM SHUTCH	STAGE 3.	LOX TANK ULLAGE (D0179-406, D01	
				IF 2 SUCCESSFUL, BSE		TES:	
				IMMEDIATELY: 3. LOX NPV VALVE CLO	1.	FAILURE TO CLOS OFF VALVES WILL THE DEPLETION O	RESULT IN
				IF 3 IS UNSUCCESSFUL FORM FLIGHT AND RECO	MEND 2.	HELIUM. ACTION REQUIRED	
		B. TB7 + 1.1 SEC		SPACECRAFT SEP IF LOX PRESSURE AT 50 PSIA (B. CONTINUE MISSION		PRESSURE OR BUL POSITIVE DELTA	KHEAD PRESSURE
				AFTER TB7 + 2 MIN 30 INFORM FLIGHT AND COM		LIMITS (FMR 7-1 SEE FMR 7-18 FO CRITERIA FOR OF	R RESTART
))	·			1. LOX NPV VALVE OPT	1	COLD HELIUM PRE	SSURE.
				AT TB7 + 15 MIN BSE S			
			1	2. LOX NPV VALVE CLO	JSE		
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						SION RULES					
REV	RULE	CONDI	TION/MALFUNCTION	PHASE		RULING			CUE	S/NOTES/COM	MENTS
	7-7	S-IVB A	UXILIARY HYDRAUL	-IC				А.	CUE	<u>s</u> :	
			TURN OFF AS	COAST	Α.	CONTINUE MISSION			1.	SYSTEM PRES 1700 PSIA (
		·				BSE INFORM FLIGHT AN TO TURN OFF AUXILIAN LIC PUMP AS SOON AS	RY HYDRAU-		2.	RESERVOIR L 50 PERCENT	
)	LIC FUMP AS SOUN AS	POSSIBLE		3.	AFT BUS NO ABOVE 20 AN (M22-404).	
										HYDRAULIC FOR OIL PRESSUR THAN 137 PS (D42-403).	RE GREATER
								Α.	NOT	<u>ES</u> :	
									HYD AFT APP OVE	LURE TO TURN RAULIC PUMP NO. 2 BATTE ROXIMATELY S RHEATS HYDRA IN APPROXIM	DEPLETES ERY IN 00 MIN AND JULIC SYS-
	1	в, то	TURN ON		в.	CONTINUE MISSION		в.	CUE	<u>s</u> :	
		1.	AS SEQUENCED AN THE HYDRAULIC F TEMP IS BELOW O	LUID		1. BSE INFORM FLIGH ATTEMPT TO TURN AUXILIARY HYDRAU	ON		1.	SYSTEM PRES 1700 PSIA (
			PREDICTED TO DR BELOW 10°F BEFO NEXT STATION AC	ROP RE		2. BSE INFORM FLIGH ATTEMPT TO TURN AUXILIARY HYDRAU	IT AND OFF		2.	RESERVOIR C ABOVE 50 PE (L7-403).	
		2.	AT TB6 + 3 MIN 39 SEC	RESTART		TOXI ET IN THORSE	210 10/11		3.	AFTER BUS N RENT AT ZER (M22-404).	
									4.	RESERVOIR F LESS THAN 8 (D42-403).	
									5.	HYDRAULIC F	
									6.	RESERVOIR C	OIL TEMP
					<u> </u>						
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REV	RULE	CONDITION/MALFUNCTION	PHASE	┼	RULING			COLO/NOTES/COM	ILIVI O
	78	LOSS OF ATTITUDE CONTROL DURING A. TB5 AND TB7 TO TB7 + 15 MIN	COAST	Α.	SPACECRAFT GUIDANCE TAKE BSE INFORM FLIGHT AND RE MEND SPACECRAFT GUIDANCE TAKEOVER	ECOM-	CUES:	ANGULAR RATES 602; R13-602) 602; R8-602) THAN 0.3 DEG/S DECREASING, AN 602; R12-602)	OR YAW (R5- GREATER EC AND NOT D ROLL (R6- GREATER
-					IF UNSUCCESSFUL, BSE REC SPACECRAFT SEPARATION	OMMEND		THAN 0.5 DEG/S DECREASING PLATFORM GIMBA PITCH, YAW, OR 603) CHANGING CORRESPONDING IN CUE 1	L ANGLES - ROLL (H60- AT RATES TO THOSE
		B. TB6 TO TB6 + 9 MIN 20 SEC) RESTART	В.	TLI INHIBIT BSE INFORM FLIGHT AND RE MEND TLI INHIBIT			LOSS OF ATTITU ALERT (SEE NOT ANGULAR RATES (R4-602; R13-6 (R5-602; R8-60 THAN 0.5 DEG/S DECREASING, AN (R6-602, R12-6 THAN 0.5 DEG/SI DECREASING	E 2) - PITCH 02) OR YAW 2) GREATER EC AND NOT D ROLL 02) GREATER
							3.	SAME AS CUE A.	3
		C. AFTER TB7 + 15 MIN	SLINGSHOT	c.	CREW DISCRETION BSE INFORM FLIGHT AND FI			ANGULAR RATES 602; R13-602), 602; R8-602), / (R6-602; R12-6) THAN 1.0 DEG/SI DECREASING	YAW (R5- AND ROLL 02) GREATER EC AND NOT
								SAME AS CUE A.	
		D. AFTER TB8 INITIATE	SLINGSHOT	D.	CONTINUE MISSION BSE INFORM FLIGHT AND FI	IDO ODI	С.	AME AS CUES C.1	, C.2, AND
					AND TERMINATE: 1. PROPELLANT DUMP 2. ULLAGE ENGINE BURNS		11 AB	: FTER S-IVB CUTO NG PROGRAMED MAI BOVE RATE LIMIT: PPLICABLE	NEUVERS THE
							A l F0	DSS OF ATTITUDE LERT WILL BE GI' DLLOWING CONDIT A) LVDC/LVDA CO	VEN FOR THE IONS;
							((AL FAILURE 3) ABNORMAL AT SIGNALS C) FAILURE TO PROPER GUID. SEQUENCE D) ATTITUDE REI FAILURE	INITIATE ANCE
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				WISSION KOLES				
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING			CUES/NOTES/COM	MENTS
	7-9	CONTINUOUS VENT SYSTEM	COAST	CONTINUE MISSION/NO S-IVB	RESTART	CUES	•	
	<i>,</i> ~ 5	(CVS) REGULATOR FAILS TO OPEN IN TB5 (TB5 + 59 SE	ŀ	BSE INFORM FLIGHT AND	ŀ	1.	LH, ULLAGE PRESS	SURE
				1. ATTEMPT TO OPEN CVS RI OVERRIDE SHUTOFF VALVE	ELIEF E	2.	(DÍ77-410, D178- CVS NOZZLE PRESS	JURE
	:			IF UNSUCCESSFUL, BSE:			(D181-409, D182- CVS REGULATOR CL	
				2. VENT THE LH, TANK PRICE	OR TO	'	(K154-411).	.0325
				PRESSURE REQUIRED FOR INITIATE		NOTE:	<u>s:</u> IF THE CVS REGUL	ATOR FAILS
				IF THE LH ₂ BLOWDOWN IS CON WITHIN 30 MINUTES PRIOR TO INITIATE, COMMAND:		•	TO OPEN, THE LHO TION TEMPERATURE INCREASE ABOVE R	WILL
	ŀ			3. ULLAGE ENGINES ON			LIMITS.	
				AFTER 90 SEC OF ULLAGING		(COMMAND ACTION W QUIRE EVALUATION RESIDUALS TO DET	OF LH2
				4. ULLAGE ENGINES OFF			ADEQUACY FOR TLI CUTOFF. APPROXI	VELOCITY
				ULLAGING SHOULD BE COMPLE TO THE AMBIENT REPRESSURI			150 POUNDS OF LH LOST FOR EACH PS TANK IS VENTED E	NILL BE
			RESTART	IF NEITHER COMMAND ACTION IS SUCCESSFUL PRIOR TO TB 40 SEC, BSE RECOMMEND NO S RESTART	6 + 8 MIN		PSIA	SEEOW 13.7
	-							
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	7-10	APS ULLAGE ENGINE(S) THRUST FAILS TO TERMINATE AT SEQUENCED TIMES	COAST	CONTINUE MISSION BSE INFORM FLIGHT AND ATTEMPT TO TERMINATE ULLAGE ENGINE THRUST. IF UNSUCCESSFUL, BSE INFORM F OF IMPENDING LOSS OF ATTITUDE CONTROL.	LIGHT	ULLAGE ENGINE CHAMBER PRESSUITHAN 90 PSIA (ID221-415). APS HELIUM SPHISURE DECREASING D36-415, D250-251-415).	RE GREATER 0220-414, ERE PRES- 5 (D35-414,
	7-11	TIME BASE 5 OR TIME BASE 7 FAILS TO INITIATE AT S-IVB CUTOFF	COAST	SPACECRAFT SEPARATION BSE INFORM FLIGHT AND RECOMME IMMEDIATE SEPARATION TO A SAF DISTANCE	TH LO	E: DC FAILURE TE: IS CONDITION WILE SS OF SEQUENCING D YAW ATTITUDE CO	AND PITCH
		RULE NUMBER 7-12 IS RESERVED.					
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REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COM	MENTS
	7~13	IU ECS WATER VALVE FAILS TO CYCLE OPEN AND CLOSED	ALL	CONTINUE MISSION	CUES:	
		A. WATER VALVE CLOSED AND COOLANT INLET CONTROL		A. BSE INFORM FLIGHT AND SEND:	1. WATER VALVE CL (G5~601, G6-60	
		TEMPERATURE IS 64°F OR HIGHER, AND		1. ECS LOGIC INHIBIT COMMAND	2. ME/H ₂ 0 TEMP (C	15-601).
		THE INERTIAL GIMBAL TEMPERATURE IS PRE- DICTED TO BE EQUAL TO		2. WATER VALVE OPEN	3. OMW MODE CODE SET TO "O" (H6 4. ST-124 INERTIA	0-603).
		OR GREATER THAN 115°F BEFORE : NEXT SITE AOS OR,			TEMP (C34-603) 5. SUBLIMATOR INL	
		THE LVDC MEMORY TEMPER- ATURE IS PREDICTED TO			(C11-601).	
		BE EQUAL TO OR GREATER THAN 124°F BEFORE THE			6. LVDC MEMORY TE 7. LVDA TEMP #1 (
		NEXT SITE AOS.			8. LVDA TEMP #2 (
		B. WATER VALVE OPEN AND COOLANT INLET CONTROL		B. BSE INFORM FLIGHT AND SEND:	00 21311 1211 112 (0,0 00,,,
		TEMP IS 55°F OR LESS, AND THE INERTIAL GIM-		1. ECS LOGIC INHIBIT COMMAND		
		BAL TEMPERATURE IS PREDICTED TO BE 104°F OR LESS BEFORE THE NEXT SITE AOS OR,		2. WATER VALVE CLOSED		
		THE LVDC MEMORY TEMPER- ATURE IS PREDICTED TO BE 32°F OR LESS BEFORE THE NEXT SITE AOS.				
ļ	7-14	S-IVB STAGE COMMON BULK- HEAD DELTA PRESSURE REACHES	COAST RESTART		CUES:	
1		OR EXCEEDS:		4	1. LH ₂ TANK ULLAGI (D0177-410, D0	E PRESSURE 178-410).
		A. MINUS 20 PSID OR PLUS 30 PSID		A. <u>CONTINUE MISSION</u> BSE INFORM FLIGHT AND COMMAND:	2. LH ₂ PUMP INLET (D0002-403).	PRESSURE
				LH ₂ AND/OR LOX VENT VALVES OPEN OR CLOSED TO PRECLUDE	3. LOX TANK ULLAGI (D0180-406, D0	
		B. MINUS 26 PSID OR	:	REACHING SEPARATION LIMITS B. SPACECRAFT SEPARATION	4. LOX PUMP INLET (D0003-403).	PRESSURE
ļ		PLUS 36 PSID		BSE INFORM FLIGHT AND FIDO AND RECOMMEND SPACECRAFT	NOTES:	
				SEPARATION TO A SAFE DISTANCE	1. MINUS DELTA PRI DEFINED AS A FI ULLAGE PRESSURI THAN THE LOX TA PRESSURE.	JEL TANK E GREATER
					2. PLUS DELTA PRE DEFINED AS A LO ULLAGE PRESSURI THAN THE FUEL PRESSURE.	OX TANK E GREATER
			·		3. THE MINIMUM REC DISTANCE BETWEN AND THE SPACECE 7,000 FT.	EN THE S-IVE
				,	4. THE BULKHEAD W RALLY FAIL AT LIMITS OF MINUS OR PLUS 42.0 P	THE ULTIMATE 3 32.5 PSID
MI	SSION	REV DATE		SECTION	GROUP	PAGE
		FINAL 4/15/69 SL'	V - TB5 AND	TB7		7-9

				WISSION KOLES	
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	7-15	LOSS OR IMPENDING LOSS OF S-IVB STAGE PNEUMATICS PRESSURE A. ENGINE PUMP PURGE FAILS (TB5 + 10 MIN 3 SEC) B. STAGE PNEUMATIC PRESSURE LEAKING AT GREATER THAN 6 PSI/MIN IN TB5 OR EXCESSIVE LEAKAGE DURING TB7		A. CONTINUE MISSION BSE INFORM FLIGHT AND 1. ATTEMPT TO TERMINATE PURGE IF UNSUCCESSFUL, COMMAND: 2. AMBIENT HELIUM SUPPLY SHUTOFF VALVE CLOSED 3. REOPEN AMBIENT HELIUM SUPPLY SHUTOFF VALVE AS REQUIRED B. CONTINUE MISSION BSE INFORM FLIGHT AND COMMAN 1. AMBIENT HELIUM SHUTOFF VALVE CLOSED 2. REOPEN AMBIENT HELIUM SHUTOFF VALVE AS REQUIRE	
	7–16	S-IVB ENGINE CONTROL BOTTLE PRESSURE LESS THAN 400 PSIA		NO S-IVB RESTART (TB5)/TLI INHIBIT (TB6) BSE INFORM FLIGHT AND RECOMMEND NO S-IVB RESTART	CUES: 1. ENGINE CONTROL BOTTLE PRESSURE (D019-401, D242-401). 2. REPRESSURIZATION BOTTLE PRESSURE (D20-403, D88-403, D249-403, D254-403).
	7-17	LH ₂ TANK VENT FAILURE OR LEAK DURING ORBITAL COAST	COAST	CONTINUE MISSION IF LH2 ULLAGE PRESSURE DROPS BELOW 17 PSIA, BSE COMMAND: 1. BOOST LH2 VENT VALVES CLOSED AND CVS REGULATOR CLOSED (ORIFICE OPEN) IF THE SITUATION CANNOT BE CORRECTED, AFTER INITIATION OF BURNER REPRESS, BSE COMMAND: 2. SECOND BURN RELAY OFF	CUES: 1. LH ₂ ULLAGE PRESSURE (D177-410, D178-410). 2. LH ₂ PUMP INLET PRESSURE (D002-403). 3. LH ₂ VENT CLOSED DISCRETES (K001-424, K210-410). NOTES: 1. IF THE ULLAGE PRESSURE RISES ABOVE 21 PSIA AFTER THE REGULATOR HAS BEEN CLOSED, THE REGULATOR SHOULD BE CYCLED TO MAINTAIN A 17 TO 21 PSIA ULLAGE PRESSURE IN LH ₂ TANK. 2. EXISTENCE OF A SERIOUS LEAK WILL BE VERIFIED BY LITTLE OR NO PRESSURE RISE DURING BURNER REPRESS.
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	OLLO 10			SECTION TR7	GROUP PAGE
Ь.		FIÑAL 4/15/69 SL 201 (AUG 68)	V - TB5 AND	/ ID/	7-10

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				MISSION RULES	
REV	RULE	CONDITION/MALFUNCTION	PHASE	RUL ING	CUES/NOTES/COMMENTS
	7-17 (CONT'D		COAST RESTART		3. REPRESS REQUIREMENTS AKE BASED ON LH2 TANK ULLAGE PRESSURE OF 21 PSIA AT INITIATION OF RESTART SEQUENCE. 4. IF LH2 TANK ULLAGE PRESSURE DROPS BELOW 19.5 PSIA DURING TB5, RESULTING PROPELLANT LOSSES SHOULD BE INCLUDED IN THE EVALUATION OF CAPABILITY TO ACHIEVE TLI GUIDANCE CUTOFF PER FMR 7-1.
	7-18	LOW COLD HELIUM SUPPLY PRESSURE			CUE: COLD HELIUM SPHERE PRESSURE
İ		A. LESS THAN 1000 PSIA DURING TB5	COAST	A. CONTINUE MISSION BSE INFORM FLIGHT AND FROM LAST STATION PR BURNER LOX SHUTDOWN N CLOSE ON	(D0016-425, D0263-403). D COMMAND IOR TO TB6
	·	B. LESS THAN 450 PSIA DURING BURNER REPRES- SURIZATION	RESTART	B. CONTINUE MISSION BSE INFORM FLIGHT AND 1. BURNER LOX SHUTDO CLOSE ON 2. BURNER LOX SHUTDO CLOSE OFF	OWN VALVE
	·	C. LESS THAN 350 PSIA PRIOR TO RESTART	COAST RESTART	C. NO S-IVB RESTART (TB: INHIBIT (TB6) BSE INFORM FLIGHT AND MEND NO S-IVB RESTART	D RECOM-
	7-19	LOW LOX TANK ULLAGE PRESSU A. LOX ULLAGE PRESSURE <31 PSIA IN TB5	IRE COAST	A. CONTINUE MISSION BSE INFORM FLIGHT AND 1. BURNER LOX SHUTDO CLOSE 2. LOX VENT VALVES E CLOSE	2. LOX PUMP INLET PRESSURE (D0003-403).
		B. E AMBIENT REPRESS SYSTEM DOES NOT INCREATE ULLAGE PRESSURE TO AT LEAST 20 PSIA FOR FIRST OPPORTUNITY RESTART OR 23 PSIA FOR SECOND OPPORTUNITY RESTART BY TB6 + 9 MIN 10 SEC)	AS CLOSE AS POSSIBLE 7 MIN 30 SEC, BSE COM 3. LOX REPRESS ON B. TLI INHIBIT BSE INFORM FLIGHT AND MEND TLI INHIBIT	B. LOX ULLAGE PRESSURE (D0179, 406, D0180-406).
MI	SSION	REV DATE		SECTION	GROUP PAGE
AROL	LO 10	FINAL 4/15/69	SLV - TB5 AND	ТВ7	7–11

REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COM	MENTS
KE.V	NOLL.	CONDITION/PACIFORCITON	THASE	KOLING	COL3/1401L3/CO	LINIO
	7–20	J-2 ENGINE START BOTTLE PRESSURE OUTSIDE RESTART LIMITS A. ABOVE 1400 PSIA DURING ORBITAL COAST FOR FIRST OPPORTUNITY RESTART OR ABOVE 1500 PSIA FOR SECOND OPPORTUNITY RESTART	COAST	A. CONTINUE MISSION BSE INFORM FLIGHT AND SEND: 1. START BOTTLE VENT OPEN F 3 SEC 2. REPEAT COMMAND AS NECESS TO ENSURE A PRESSURE OF LESS THAN 1400 PSIA FOR FIRST OPPORTUNITY RESTAR OR 1500 PSIA FOR SECOND OPPORTUNITY RESTART	CUES: 1. START BOTTLE PRE (D17-401; D241-4) OR ARY	SSURE
		B. ABOVE 1800 PSIA PRIOR TO RESTART		B. <u>SPACECRAFT SEPARATION</u> BSE INFORM FLIGHT AND FIDO A RECOMMEND SPACECRAFT SEPARAT		
						·
MI	NOIZZ	REV DATE		SECTION	GROUP	PAGE
APOL	LO 10	FINAL 4/15/69 SLV -	TB5 AND TB7	,		
		291 (Alig 68)				7-12

				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	7-21	PU VALVE FAILURE FAILS TO A HIGH MIXTURE RATIO GREATER THAN 5.0 TO 1 AND ANY TIME PRIOR TO RESTART	COAST	CONTINUE MISSION BSE INFORM FLIGHT AND CO 1. PU VALVE HARDOVER POON (LOW EMR 4.5 TO 1 NOTE 1) IF 1 IS UNSUCCESSFUL, BSE FLIGHT AND: 2. VENT START BOTTLE TO ABLE LIMITS	OSITION) (SEE SE INFORM	CUES: 1. PU VALVE POSIT (G010-401) 2. PU FEEDBACK VO (M061-411) NOTES: 1. THIS FAILURE WEYALUATION OF TO DETERMINE AFOR TLI VELOCI (REF FMR 7-1). 2. PU FEEDBACK VO IS ONLY VALID SYSTEM POWER I	LTAGE ILL REQUIRE RESIDUALS DEQUACY TY CUTOFF LTAGE M061, WHEN PU
	7-22	S-1VB LOSS OF ENGINE HYDRAULIC FLUID RULE NUMBERS 7-23 AND 7-24 ARE RESERVED.	COAST RESTART	NO S-IVB RESTART (TB5)/T INHIBIT (TB6) BSE INFORM FLIGHT AND RE NO S-IVB RESTART		CUES: 1. HYDRAULIC RESELEVEL APPROX Z (L7-403). 2. HYDRAULIC SYSTLESS THAN 1700 (D41-403). 3. HYDRAULIC RESESURE APPROXIMAPSIA (D42-403) NOTES: 1. L7-403 PLUS ON OTHER CUES AREFOR IMPLEMENTATHIS RULE. 2. IF ALL THREE CFUNCTIONING PRITHEY ARE REQUITED IMPLEMENTATION RULE.	ERO PERCENT EM PRESSURE PSIA RVOIR PRES- TELY ZERO E OF THE REQUIRED TION OF UES ARE OPERLY, RED FOR
MI	SSION	REV DATE	<u> </u>	SECTION		GROUP	PAGE
\vdash	LLO 10					GROOF	PAGE
		291 (AUG 68)	- TB5 AND T				7-13

PASE COLUTION/PARTICATION PASE RULING CLESS					MISSION RULES			
PROPULSIVE YEAT CHEVY FALS TO OPEN AT: A. T87 + 0.7 SEC COAST A. CONTINUE MISSION BSE INFORM FLIGHT AND 1. ATTERPT TO OPEN THE LOX NEW YOUNG DISCRETE (C0198-02%). 1. ATTERPT TO OPEN THE LOX NEW YOUNG DISCRETE C0198-02%). 1. ATTERPT TO OPEN THE LOX NEW YOUNG DISCRETE C0198-02%). 1. ATTERPT TO OPEN THE LOX NEW YOUNG DISCRETE C0198-02%). 1. ATTERPT TO OPEN THE LOX NEW YOUNG DISCRETE C0198-02%). 1. ATTERPT TO OPEN THE LOX ON PAY CLOSE DISCRETE C0198-02%). 1. ATTERPT TO OPEN THE LOX NEW YOUNG DISCRETE C0198-02%). 1. ATTERPT TO OPEN THE LOX NEW YOUNG DISCRETE C0198-02%). 1. ATTERPT TO OPEN THE LOX NEW YOUNG 1. ATTERPT TO OPEN THE LOX LOX NEW YOUNG 2. LOX NEW YOUNG 1. ATTERPT TO OPEN THE LH, LATCHING VEHT VALVE DISCRESSFUL, BSE COMMOD: 2. LOX NEW YOPEN 1. ATTERPT TO OPEN THE LH, LATCHING VEHT VALVE DISCRETESSUE C0198-02%). 1. LH, UNIVERSURES C0183-02%. 1. LH, UNIVERSURES C0183-02%. 1. LH, UNIVER PRESSURE C0179-040, D188-06%. 1. LH, UNIVERSURES C0183-02%. 2. LH, ULLAGE PRESSURE C0179-040. 2. LH, LATCHING VEHT VALVE C0177-040, D189-040%. 2. LH, LATCHING VEHT VALVE C0177-040, D189-040%. 3. LH, VEHT VALVE CLOSE 1. LH, UNIVER PRESSURE C0179-046, D188-046%. 3. LL, VEHT VALVE C0179-040, D189-040%. 3. LOX NEW YOPEN AT TO OPEN THE LH, LATCHING VEHT VALVE C0177-040, D189-040%. 3. LH, VEHT VALVE C0177-040, D189-040%. 3. LH, VEHT VALVE C0177-040, D189-040%. 3. LH, VEHT VALVE C0177-040, D291-041%. 3. LH, VEHT VALVE C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-041%. 3. LOX NEW YORD C0177-040, D291-0	REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
2. VENT THE LOX TANK FOR 2 MIN 13 SEC THROUGH THE NOV IF UNSUCCESSFUL, BSE COMMAND: 3. LOX NOV VALVE CLOSE 4. LOX VENT VALVE OPEN FOR 40 SEC 4. LOX VENT VALVE OPEN FOR 40 SEC 4. LOX VENT VALVE OPEN FOR 40 SEC 4. LOX VENT VALVE OPEN FOR 40 SEC 4. LOX VENT VALVE OPEN HE 17 MIN 3 SEC BS. TO LATCH OPEN AT TIB8 + SLINGSHOT D. 1. ATTEMPT TO LATCH OPEN THE LOX LATCHING VENT VALVE IF UNSUCCESSFUL, BSE COMMAND: 2. LOX NOV OPEN IF B2 UNSUCCESSFUL, BSE COMMAND: 3. LOX VENT OPEN 1. ATTEMPT TO OPEN THE LH2 LATCHING VENT VALVE (D13-4-09, D134-4-09). 2. LH2 LATCHING VENT VALVE CLOSE 1. LH3 PATCHING VENT VALVE (D17-4-10, D178-4-10). 3. LH2 VENT VALVE CLOSE 7-27 ENSINE START BOTTLE DUMP FAILS TO INITIATE COAST SET INFORM FLIGHT AND ATTEMPT TO OPEN THE START BOTTLE PRESSURE COATTINUE MISSION BSE INFORM FLIGHT AND ATTEMPT TO OPEN THE START BOTTLE VENT CONTROL 1. G6H2 START BOTTLE PRESSURE CO017-4-10, D281-4-10). COAST SET INFORM FLIGHT AND ATTEMPT TO OPEN THE START BOTTLE VENT CONTROL 1. GROUP PAGE MISSION REV DATE MISSION REV DATE SECTION SECTION SECTION SECTION GROUP PAGE		7-25	PROPULSIVE VENT (NPV) FAILS TO OPEN AT:	COAST	BSE INFORM FLIGHT AND 1. ATTEMPT TO OPEN T NPV VALVE	!	1. LOX NPV NOZZLE I (D0243-404, D024) 2. LOX NPV OPEN DIS (K0198-424). 3. LOX NPV CLOSE D (K0199-424).	44-404). SCRETE
BSE INFORM FLIGHT AND 1. ATTEMPT TO LATCH OPEN THE LOX LATCHING VENT VALVE IF UNSUCCESSFUL, BSE COMMAND: 2. LOX NPV OPEN IF B2 UNSUCCESSFUL, BSE COMMAND: 3. LOX VENT OPEN COAST PAILS TO LATCH OPEN AS PROGRAMED 1. ATTEMPT TO OPEN THE LH2 LATCHING VENT VALVE IF UNSUCCESSFUL, BSE COMMAND: 1. ATTEMPT TO OPEN THE LH2 LATCHING VENT VALVE IF UNSUCCESSFUL, BSE COMMAND: 2. LH2 LATCHING VENT VALVE OPEN AT T67 + 15 MIN OR VENT VALVE CLOSED 3. LH2 VENT VALVE OPEN AT T67 + 15 MIN OR WENDOR: 4. LH2 VENT VALVE CLOSE 7-27 ENGINE START BOTTLE DUMP FAILS TO INITIATE COAST OPEN THE START BOTTLE PUMP FAILS TO INITIATE COAST OPEN THE START BOTTLE VENT CONTROL COUNTINUE MISSION BSE INFORM FLIGHT AND COMMAND: COAST OPEN THE START BOTTLE VENT CONTROL COAST OPEN THE COAST O					MIN 30 SEC THROUG IF UNSUCCESSFUL, BSE 3. LOX NPV VALVE CLC 4. LOX VENT VALVE OP	H THE NPV COMMAND:	(D0179-406, D01	30-406).
FATLS TO LATCH OPEN AS PROGRAMED BSE INFORM FLIGHT AND 1. ATTEMPT TO OPEN THE LH2 LATCHING VENT VALVE 1. ATTEMPT TO OPEN THE LH2 LATCHING VENT VALVE 2. LH2 LATCHING VENT VALVE CLOSED 3. LH2 LATCHING VENT VALVE CLOSED AT TB7 + 15 MIN OR TB7 + 1 HR 15 MIN COMMAND: 4. LH2 VENT VALVE CLOSE 7-27 ENGINE START BOTTLE DUMP FAILS TO INITIATE COAST BSE INFORM FLIGHT AND ATTEMPT TO OPEN THE START BOTTLE VENT CONTROL VALVE COBSTANT BOTTLE PRESSURE (D183-409). 1. LH2 NPV NOZZLE PRESSURE (D183-409). 2. LH3 ULLAGE PRESSURE (D177-410, D178-410). 3. LH4 LATCHING VENT VALVE CLOSE 3. LH2 LATCHING VENT VALVE DISCRETES (K210-410), K211-410). 4. LH2 VENT VALVE CLOSE COES: 1. GH2 START BOTTLE PRESSURE (D177-401, D24-1-410). COES: 1. GH2 START BOTTLE PRESSURE (D177-401, D24-1-410). MISSION REV DATE SECTION GROUP PAGE		,		SLINGSHOT	BSE INFORM FLIGHT AND 1. ATTEMPT TO LATCH LOX LATCHING VENT IF UNSUCCESSFUL, BSE 2. LOX NPV OPEN IF B2 UNSUCCESSFUL, B MAND:	OPEN THE VALVE COMMAND:		
FAILS TO INITIATE BSE INFORM FLIGHT AND ATTEMPT TO OPEN THE START BOTTLE VENT CONTROL VALVE 1. GH ₂ START BOTTLE PRESSURE (D017-401, D241-410). MISSION REV DATE SECTION GROUP PAGE		7-26	FAILS TO LATCH OPEN AS		BSE INFORM FLIGHT AND 1. ATTEMPT TO OPEN THE L LATCHING VENT VALVE IF UNSUCCESSFUL, BSE COMM 2. LH ₂ LATCHING VENT VAL 3. LH ₂ VENT VALVE OPEN AT TB7 + 15 MIN OR TB7 + 15 MIN COMMAND:	IAND: VE CLOSED	1. LH ₂ NPV NOZZLE (D183-409, D184- 2. LH ₂ ULLAGE PRESS (D177-410, D178- 3. LH ₃ LATCHING VEIDISCRETES (K210-	-409). SURE -410). NT VALVE
APOLLO 10 CLV - TRS AND TR7		7-27		COAST	BSE INFORM FLIGHT AND ATT OPEN THE START BOTTLE VEN		1. GH2 START BOTTLE	E PRESSURE 410).
APOLLO 10 SLV - TRS AND TR7	MI	SSION	REV DATE		SECTION		GROUP	PAGE
	APO	LLO 10	FINA 4/15/69 SLV	- TB5 AND	ТВ7			7-14

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REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COM	IEN15
	7-28	S-IVB STAGE COLD HELI DUMP FAILS TO INITIAT	UM COAST E SLINGSHOT	BSE INFORM FLIGHT AND	CUES: 1. COLD HELIUM BOT SURE (D0016-425	TLE PRES- , D0263-
				1. ATTEMPT TO OPEN THE LH, CRYOGENIC REPRESSURIZATION SUPPLY VALVES IF UNSUCCESSFUL, BSE INFORM FLIGHT	403).	
				AND AT TB8 + 17 MIN 30 SEC SEND: 2. LOX PRESSURIZATION SHUTOFF VALVES OPEN		
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		RULE NUMBERS 7-29 AND TARE RESERVED.	7-30			
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APOL	LO 10	INAL 4/15/69 291 (ANG 68)	SLV - TB5 AND T	В7		7-15

8 SLV - TB6 (RESTART)

т.				Mission	I RULES	
ÆV.	1TEM					
				SUMMARY OF REST	ART PHASE RULES	
		8-1	ACCELEROM	ETER FAILURE		
		8-2	O2/H2 BUR	NER LH ₂ VALVE FAILS		
		8-3	LH ₂ CHILL	DOWN SYSTEM FAILS		
		8-4	LOX CHILL	DOWN SYSTEM FAILS		
		8-5	LH ₂ TANK	ULLAGE PRESSURE LOW		
		8-6	S-IVB ACT	UATOR HARDOVER		
		8–7	CONTINUOU	S VENT REGULATOR FAILS TO CLO	SE	
		8-8	LOSS OF A	TTITUDE CONTROL DURING SECOND	BURN	
				,		
	1	THE FO	LLOWING MIS	SION RULES ALSO APPLY TO THIS	SECTION:	
	•	6-11	S-IVB STA	GE LOSS OF THRUST		
		7-7	S-IVB AUX	ILIARY HYDRAULIC PUMP FAILS		
	!	7-8	LOSS OF A	TTITUDE CONTROL DURING TB5 AN	TB7 TO SPACECRAFT SEPARATION, TB6	TO TB6 + 9 MIN 20 SEC
1		7-9	CONTINUOU	S VENT SYSTEM (CVS) REGULATOR	FAILS TO OPEN IN TB5 (TB5 + 59 SEC	:)
		7-13	IU ECS WA	TER VALVE FAILS TO CYCLE OPEN	AND CLOSED	
		7-14	S-IVB STAG	GE COMMON BULKHEAD DELTA PRES: PSID OR PLUS 36 PSID	SURE REACHES OR EXCEEDS MINUS 20 PS	ID OR PLUS 30 PSID,
ŀ	-	7–16	S-IVB ENG	INE CONTROL BOTTLE PRESSURE LI	ESS THAN 400 PSIA	
		7-17	LH ₂ TANK	VENT FAILURE OR LEAK DURING O	RBITAL COAST	
		7-18	LOW COLD	HELIUM SUPPLY PRESSURE		
		7-19	LOX TANK	ULLAGE PRESSURE LESS THAN 31 (PSIA IN TB5	
		7-22	S-IVB LOS	S OF ENGINE HYDRAULIC FLUID	·	
	 	7-21	PU VALVE	FAILS TO A MIXTURE RATIO GREA	TER THAN 5.0 TO 1 ANY TIME AFTER RE	START
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	!					
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SECTION 8 - SLV - TB6 - CONTINUED

NASA — Manned Spacecraft Center MISSION RULES

				WISSION KOLES		
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COM	AMENTS
	8-1	INERTIAL PLATFORM FAILURE—ACCELEROMETER A. AFTER TB6 INITIATED BUT PRIOR TO TB6 + 9 MIN 10 SEC B. AFTER TB6 + 9 MIN 10 SEC	RESTART	A. TLI INHIBIT BSE INFORM FLIGHT AND RECOMMEND TLI IN PRIOR TO TB6 + 9 MIN B. CONTINUE MISSION BSE INFORM FLIGHT AND	HIBIT ACCEL SET TO " 10 SEC. BITS D24 AND D ACCEL SET TO "	(H60-603) 25 FOR Z ONE" 23 FOR X ONE" 21 FOR Y ONE" PICKOFFS NDEG AND NOT 0-603, H11- TO A BACKUP ZES A PRE- ROFILE FOR RING S-IVB FAILURE NG TB5 WILL
	8-2	S-IVB STAGE O2/H2 BURNER FUEL PROPELLANT VALVE FAILS CLOSED	RESTART	CONTINUE MISSION BSE INFORM FLIGHT AND COM A. BURNER SHUTDOWN B. CONTINUOUS VENT SYSTE ORIFICE OPEN C. CRYOGENIC REPRESSURIZ OFF	PERATURE INDIC OR LESS (C0382- EM 2. BURNER NOZZLE (C0380-403) OF	ATES 460°R -403). TEMPERATURE F SCALE LOW. ECTOR TEM- 3-403). SURIZATION 0195-404). ANT VALVE 80-404, ER VOTING DIT DETECT BURNER TO ER FLAME-OUT HE FUEL
MI	SSION	REV DATE	L	SECTION		
				JLC (TUN	GROUP	PAGE
		FINAL 4/15/69 SLV 291 (ANG 68)	- TB6			8-2

				MISSION RULES	
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	8-3	LH ₂ CHILLDOWN SYSTEM FAIL: DURING RESTART PREPARATION	RESTART	CONTINUE MISSION	CUES:
				A. BSE INFORM FLIGHT AND ATT TO CORRECT SITUATION SPEC IN NOTE 1(A), 1(B), 1(D)	TEMPT 1. LH ₂ PREVALVE OPEN (KI11-404).
				B. IF UNSUCCESSFUL, BSE INFO	2. LH ₂ PREVALVE CLOSE ORM (K112-404).
				FLIGHT AND AT TB6 + 8 MIN 45 SEC COMMAND, FUEL LEAD	3. LH ₂ BLEED VALVE CLOSE (K127-401).
					4. LH ₂ RECIRC VALVE CLOSE (K136-409).
					5. LH ₂ RECIRC FLOW (F005-404)
					6. LH ₂ PUMP INLET PRESS (D002-403).
					7. LH ₂ ULLAGE PRESS (D177-409 D178-409).
					8. LH ₂ PUMP INLET TEMP (C003-403).
			1		NOTES:
					1. LH ₂ CHILLDOWN WILL NOT BE SATISFACTORY IF:
					(A) PREVALVE IS OPEN (B) RECIRCULATION VALVE
					IS CLOSED (C) BLEED VALVE IS CLOSED (D) CHILLDOWN PUMP IS NOT ON
					2. THIS FAILURE AND THE FUEL LEAD WILL REQUIRE EVALUATION OF RESIDUALS TO DETERMINE ADEQUACY FOR TLI VELOCITY CUTOFF (REF FMR 7-1).
MI	SSION	REV DATE		SECTION	GROUP PAGE
	LLO 10	FINAL 4/15/69 SL	V - TB6		

				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
				LOCUMENT MEDICAL CARD		CUEC.	
	8-4	S-IVB STAGE LOX CHILLDOWN SYSTEM FAILS DURING RESTART	RESTART	CONTINUE MISSION		CUES:	
		PREPARATIONS		BSE INFORM FLIGHT AND ATT		 LOX PUMP INLET P (D0003-403) AND 	
				IN NOTE 1(A), 1(B), 1(D)	11 120	ULLAGE PRESSURE	
						D0180-406).	
						2. LOX CHILLDOWN FL	OWRATE
İ						(F0004-424).	
					I	3. LOX PUMP INLET TO (C0004-403).	EMPERATURE
						4. LOX PREVALVE OPE (K0109-403),	N POSITION
						5. LOX PREVALVE CLO POSITION (K0110-	
						6. LOX BLEED VALVE (K0126-401).	POSITION
					j	7. LOX RECIRCULATIO POSITION (K0139-	
						NOTES:	167/♦
						1. LOX CHILLDOWN WI SATISFACTORY IF:	
						(A) PREVALVE IS (B) RECIRCULATI	
						CLOSED (C) BLEED VALVE	
			,	·		(D) CHILLDOWN P	
	!						
			· · · · · · · · · · · · · · · · · · ·				
	8-5	LOW LH2 TANK ULLAGE PRESSURE AT TB6 + 9 MIN	RESTART	TLI INHIBIT		<u>cues</u> :	
		10 SEC (SEE NOTES 1 AND 2)		BSE INFORM FLIGHT AND REC	OMMEND	1. LH ₂ TANK ULLAGE (D177-410, D178-	
						2. LH ₂ PUMP INLET P (D002-403).	RESSURE
						NOTES:	
	•					1. THIS RULE IS NOT	WALTE WITH
			ļ		i	ANY INDICATION O VENT VALVE PROBL LEAKAGE OR FAILU	F AN LH ₂ EM (I.E., RE TO
			•			CLOSE). (SEE FM 8-7.)	k 7-17 AND
				·		2. AT TB6 + 9 MIN 1	SEC, THE
						LH ₂ TANK ULLAGE SHOULD BE 4 PSIA	PRESSURE
					1	THAN ULLAGE PRES	SURE
						DURING ORBITAL C MEET RESTART REQ	
						MENTS.	
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					WISSION KOTES			
REV	RULE	CONDITION/MALFUNC	TION F	PHASE	RULING		CUES/NOTES/COM	MENTS
	8-6	S-IVB ACTUATOR CONF		START	TLI INHIBIT		CUES:	
		HARDOVER PRIOR TO T MIN 10 SEC	DU + 9		BSE INFORM FLIGHT AND RECO TLI INHIBIT	MMEND .	OR GREATER (G1-40 G2-400, G2-403).	IS <u>+ 5</u> DEG 0, G1-403
						.	NOTE:	
							BOTH INDIVIDUAL ACTUA POSITIONS MUST CONFIF MALFUNCTION PRIOR TO MENUNCHION S/C SEPARATION	M REÇOM-
	·						TLI INHIBIT.	
	8-7	S-IVB STAGE CONTINU	JOUS VENT RES	START	CONTINUE MISSION/TLI INHIE	BIT	CUES:	
	!	SYSTEM (CVS) REGULA FAILS TO CLOSE DURI RESTART SEQUENCE	ING		BSE INFORM FLIGHT AND COM	i	1. CVS REGULATOR CLC (K154-411).	SED
					SECOND BURN RELAY OFF ATTEMPT TO CLOSE THE OREGULATOR	- 1	2. CVS NOZZLE PRESSU GREATER THAN 3 PS (D181-409, D182-	SIA
					IF NEITHER 1 NOR 2 IS SUCC BSE INFORM FLIGHT AND RECO TLI INHIBIT.	CESSFUL, OMMEND		PRESSURE
							· -	
							· · · · · · · · · · · · · · · · · · ·	
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SECTION D - SEA - IDD - CONCEDED

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REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	ļ	CUES/NOTES/COM	MENTS
	8-8	LOSS OF ATTITUDE CONTROL) DECEMBE	SPACECRAFT SEPARATION	CUES:		
	8-8	LOSS OF ATTITUDE CONTRO DURING S-IVB SECOND BUR		BSE INFORM FLIGHT AND FIDO. CAPCOM INFORM CREW OF LOSS OF ATTITUDE CONTROL. CREW WILL ABORT ON LIMITS.	11. AN (R (R (R TH	GULAR RATES - 1 44-602, R13-602 5-602, R8-602) 6-602, R12-602 AN 5 DEG/SEC AN), YAW , OR ROLL) GREATER
					2. PL PI (H	ATFORM GIMBAL . TCH, YAW, OR R 160-603), CHANG ITES GIVEN IN C	OLL ING AT
						SS OF ATTITUDE ERT (SEE NOTE	
1				1	NOTES:		
						IE SLV YAW GIMB. CRITICAL BEYO	
					AL	OSS OF ATTITUDE LERT WILL BE GIVE FOLLOWING CO	VEN FOR
					(A) LVDC/LVDA O	
				•	(8	ATIONAL FAI ATTITUDE ER SIGNALS ROL DEG, PITCH >±5 DEG	ROR L >+3.5
					(0	PROPER GUID SEQUENCE.	
					(0) FAILURE OF ENGINE HYDR	
					(E	E) ATTITUDE RE FAILURE.	FERENCE
					ļ		
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9 SLV - TB8 (SAFING AND SLINGSHOT)

	7			Mission	·	
REV	ITEM					
				SUMMARY OF SAFING	AND SLINGSHOT RULES	
		9-1	STAGE PNEUM	MATIC DUMP FAILS		
		9-2	LOX DUMP FA	AILS		
		9-3	ENGINE CONT	ROL BOTTLE DUMP FAILS		
		9-4	RESERVED			
		9~5	LOSS OF APS	FOR DUMP		
		THE F	OLLOWING REF	ERENCED FLIGHT MISSION RULES A	RE ALSO APPLICABLE DURING TIME BAS	SE EIGHT (TB8)
		7-3	J-2 ENGINE	MAIN FUEL VALVE (MFV) FAILS TO	CLOSE AT FIRST S-IVB CUTOFF, SECO	OND S-IVB CUTOFF
		7-4	J-2 ENGINE	MAIN OXIDIZER VALVE FAILS TO C	LOSE AT FIRST S-IVB CUTOFF, SECOND	BURN CUTOFF
		7-8	LOSS OF ATT AFTER SPACE	TTUDE CONTROL DURING TB5 AND TO CRAFT SEPARATION, AFTER TB8 IN	37 TO SPACECRAFT SEPARATION, TB6 TITIATE	TO TB6 + 9 MIN 20 SEC
		7-13	IU ECS VALV	E FAILS TO CYCLE OPEN AND CLOSE	ED	
		7-14		: COMMON BULKHEAD DELTA PRESSURI ID OR PLUS 36 PSID	E REACHES OR EXCEEDS MINUS 20 PSI	O OR PLUS 30 PSID,
		7-25	S-IVB STAGE TB8 + 17 MI		FAILS TO OPEN AT TB7 + 0.7 SEC,	TO LATCH OPFN AT
		7-26	LH ₂ LATCHIN	IG VENT VALVE FAILS TO LATCH OP	EN AS PROGRAMED	
		7-28	S-IVB STAGE	COLD HELIUM DUMP FAILS TO INI	TIATE	
		•				
		1				
				,		
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SECTION 9 - SLV - TB8 - CONTINUED

				MISSION RULES		
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMME	NTS
	9-1	S-IVB STAGE PNEUMATIC DUMP FAILS TO INITIATE	SLINGSHOT	CONTINUE MISSION	CUES:	
		THE TO THE TABLE		BSE INFORM FLIGHT AND ATTEMPT TO OPEN THE ENGINE PUMP PURGE CONTROL VALVE	1. ENGINE PUMP PURGE (D050-403).	PRESSURE
	-				2. AMBIENT HELIUM SUF PRESSURE (D236-403 D256-403).	
	9–2	S-IVB LOX DUMP FAILS TO INITIATE AT TB8 + 12 MIN	SLINGSHOT	CONTINUE MISSION	CUES:	
		2.8 SEC		BSE INFORM FLIGHT AND ATTEMPT TO INITIATE LOX DUMP BY OPENING THE MAIN OXIDIZER VALVE	1. MAIN OXIDIZER VALV POSITION (G0003-40	
				TOTAL TALE	2. MAIN OXIDIZER VALV DISCRETE (K0120-40	
					3. LOX PUMP INLET TEN TURE (C0004-403).	MPERA~
					4. LOX RECIRCULATION RATE (F0004-424).	FLOW
				·		
	0.7	Charles and Tool	GI TNGS: IS-	CONTENTE MISCION	CUE.	
	9–3	ENGINE CONTROL BOTTLE DUMP FAILS TO INITIATE	SLINGSHOT	CONTINUE MISSION BSE INFORM FLIGHT AND ATTEMPT TO	CUE: ENGINE CONTROL HELIUM	SPHERE
				OPEN THE ENGINE HELIUM CONTROL VALVE	PRESSURE (D019-401, D2	
	9-4	RESER V ED				
				,		
					OUEC 4	
	9-5	LOSS OF EITHER OR BOTH APS MODULES PRIOR TO OR DURING	SLINGSHOT	CONTINUE MISSION BSE INFORM FLIGHT AND COMMAND	CUES: 1. MANIFOLD PRESSURE	MOD 1
		PROPELLANT DUMP		S-IVB BURN MODE ON	LESS THAN 160 PSIA FUEL) (D70-414, D7	-dixo) A
				`	2. MANIFOLD PRESSURE LESS THAN 160 PSIA	
			:		FUEL) (D72-415, D7	73-415).
					3. ATTITUDE CONTROL F CONTROL PRESSURE T APPROXIMATELY 1100 (D35-414, D250-414	TANK 1 PSIA
		· •			4. ATTITUDE CONTROL H CONTROL PRESSURE 1	
	ļ				APPROXIMATELY 1100 (D36-415, D251-415	PSIA
	}					
		·				
		RULE NUMBERS 9-6 THROUGH 9-9 ARE RESERVED.				
					·	
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EV	ITEM	1		PR	ELAUNCH I	NSTRUMI	NTATIO	N			
	9-10	MEASUR	EMENT DESCRI	PTION	MEAS NUMBER	UNBUVDV	TRANS-		EFFEC-	MICETAL NO	e December
	J			NS SYSTEMS AND					TIVITY	MISSION RUL	E REFERENCE
		1 .	COMMUNICATIO		/ LIGHT CON	TRUL MEAS	OKEMENT	CATEGURIZ	ATTON		
l				113 3131E/15							
			FAGE NONE								
			TAGE-NONE								
1		S-IVB S									
		MUX DP:	B0 (VIA IU)					М			
		INSTRUM	MENT UNIT								
ļ		LINK DE EMERGEN COMMAND	NCY DETECTIO	N SYSTEM (EDS) IONS SYSTEM (C	CS) UPLINK			M M M			
ļ		FLIGHT	CONTROL MEA	SUREMENTS							
- [S-IC ST	AGE-NONE				•				
		<u>S-11 S7</u>	AGE								•
		POSITIO POSITIO POSITIO POSITIO POSITIO POSITIO E1 YAW E2 YAW E3 YAW E4 YAW E1 PITO E2 PITO E3 PITO	NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW ACTUA NYAW NYAW ACTUA NYAW NYAW ACTUA NYAW NYAW ACTUA NYAW NYAW NYAW NYAW NYAW NYAW NYAW NYA	TOR TOR TOR TOR JATOR JATOR JATOR JATOR JATOR ST POS ST POS ST POS PIST POS PIST POS PIST POS PIST POS	G8-201 G8-202 G8-203 G8-204 G9-201 G9-202 G9-204 G30-201 G30-202 G30-204 G31-201 G31-202 G31-203 G31-204			유 근 문 문 문 문 문 문 문 문 모 모 모 모 모 모		6-8, 8-6 6-8 6-8, 8-6 6-8, 8-6 6-8, 8-6 6-8 6-8 6-8 6-8 6-8 6-8 6-8 6-8 6-8	
		VOLT, I	GNITION DC	BUS	M125-207			HD		6-9	
		S-IVB S	TAGE								
		PRESS, PRESS, PRESS, PRESS, PRESS, PRESS, PRESS, PRESS, PRESS, PRESS, PRESS,	FUEL PUMP INFUEL TANK UNIFUEL T	LAGE EDS 1 LAGE EDS 2 ILET LAGE EDS 1 LAGE EDS 2 SPHERE OTTLE HE SPHERE STEM L	D178-410 D3-403 D179-406 D180-406 D16-425 D17-401 D19-401 D41-403 D42-403 D236-403	METER* METER* METER* METER*	COMMON COMMON	M 2 OF 3		7-14 7-14 7-14/19, 7-14/19, 8-1 7-14/19, 8-1 7-18 7-20 6-10, 7-22 6-10, 7-22 7-15 7-20	5
		PRESS, (FLOWMETE POSITION POSITION POSITION POSITION VOLT, FA	'U 1 EBW RAN 'U 2 EBW RAN	RE UATOR TOR IZER VALVE RATIO VALVE GE SAFETY	D242-401 D256-403 D263-403 F1-401 G1-403 G2-403 G3-401 G10-401 M30-411 M31-411 M61-411		ı			7-16 7-15 7-18 7-4 8-6 8-6 7-4 7-21 7-5 7-5 7-21	
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SECTION 9 - SLV - TB8 - CONCLUDED

			MISSI	ON RULES					
V ITEM									
9-10 (CONT'D)	MEASUREMENT DESCRI	PTION	MEAS <u>NUMBER</u>	ONBOARD	TRANS- DUCERS		EFFEC- TIVITY	MISSION RU	JLE REFERENCE
	MISC, SEC R/S RCVR MISC, SEC R/S RCVR LEVEL, RESERVOIR O	2 L/L SIG STR	N57-411 N62-411 L7-403			HD HD HD		7-5 7-5 6-10, 7-22	!
	INSTRUMENT UNIT								
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	ANG VEL PITCH CONT ANG VEL YAW CONTRO ANG VEL ROLL CONTR ANG VEL YAW EDS GR ANG VEL ROLL EDS G ANG VEL PITCH EDS	L OL OUP 1 (REF) ROUP 2 (REF)	R4-602 R5-602 R6-602 R8-602 R12-602 R13-602			HD HD HD HD HD		6-1/7, 7-8 6-1/7, 7-8 6-1/7, 7-8 6-1/7, 7-8 6-1/7, 7-8 6-1/7, 7-8	8, 8-8 8, 8-8 8, 8-8 8, 8-8
				ONBOARD DISPLAY					
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10 CSM ENVIRONMENTAL CONTROL

NASA — Manned Spacecraft Center

			MISSION RULES					
REV	ITEM		GENERAL					
	10-1	LAUNCH						
		LAUNCH WILL BE CONTINUED AS LONG AS THE SUIT CIRCUIT AND O ₂ SUPPLY WILL SUPPORT FLIGHT CREW DEMANDS FOR AT LEAST ONE REV AND ENTRY INTO 2-1. THERE ARE NO COOLANT FAILURES FOR WHICH LAUNCH/INSERTION PHASE WILL BE TERMINATED.						
		TLC & TEC						
ļ		WATER EVAPORATION WILL BE LIMITED	TO COMPONENT TESTING.					
	,	ALL PHASES						
		A. BACKUP SYSTEMS AND BACKUP CON NOT FOR MISSION CONTINUTATION		THE MOST RAPID PRACTICAL RETURN	TO EARTH,			
į		B. LM SYSTEMS WILL BE USED AS REQUIRED FOR CSM SYSTEMS BACKUP. 1F CSM SYSTEMS REQUIRE LM BACKUP THE DESCENT STAGE WILL BE RETAINED WHERE POSSIBLE.						
		C. TO CONTINUE, WATER QUANTITY F REQUIREMENTS.	PREDICTIONS MUST REFLECT A	ADEQUATE QUANTITIES TO MEET NORM	AL MISSION			
İ	10-2	DEFINITIONS						
		LOSS OF CABIN INTEGRITY:		AGE SUCH THAT CABIN PRESSURE CAN CABIN PRESSURE REGULATORS (1.2				
		LOSS OF SUIT INTEGRITY:	TOTAL PGA AND SUIT LOOP PGA SUIT LOOP PRESSURE O	LEAKAGE >0.5 PSI/MIN (1.5 LB/HR HECK.) DURING			
		LOSS OF SUIT CIRCUIT:	INABILITY OF THE SUIT CAND/OF CO2 REMOVAL WITHOU	RCUIT TO MAINTAIN ADEQUATE CREW DUT USING DIRECT O ₂ .	COMFORT			
	,	LOSS OF O2 MANIFOLD:	AN O ₂ MAINFOLD OR REGULA DEMANDS CANNOT BE SUPPLI	ATOR FAILURE WITH WHICH THE SUIT ED FOR ENTRY.	CIRCUIT 02			
		LOSS OF PRIMARY LOOP COOLING:		WHICH CANNOT BE ISOLATED, OR CATORS AND EVAPORATOR PROVIDE NO				
		LOSS OF SECONDARY LOOP COOLING:		K WHICH CANNOT BE ISOLATED, OR C ATORS AND EVAPORATOR PROVIDE NO				
		LOSS OF COOLANT LOOP RADIATORS:		OF ALL FLOW THROUGH RADIATORS, TAL LONG TERM USAGE OF WATER IS				
		LOSS OF ALL COOLING:	LOSS OF PRIMARY AND SECO	ONDARY LOOP COOLING.				
		LOSS OF SURGE TANK AND/OR REPRESS PACK:	SURGE TANK, REPRESS PACE FAILURES WHICH REQUIRE D PACK.	K, OR ASSOCIATED ISOLATABLE PLUM ISOLATION OF THE SURGE TANK AND/	BING OR REPRESS			
		•						
		RULE NUMBERS 10-3 THROUGH 10-9 ARE RESERVED.						
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		COM FAINT DONINGAT	AL CONTROL SYSTEM	GENERAL	PAGE			
	LO 10	FINAL 4/15/69 CSM ENVIRONMENT	TO SOUTH OF STATE !!		10-1			

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		MISSION RULES				
REV	ITEM	SYSTEMS MANAGEMENT				
A	10-10	O ₂ SYSTEM				
		A. SUIT FLOW RELIEF VALVE WILL REMAIN CLOSED FOR DURATION OF FLIGHT.				
		B. NORMAL CM REPRESSURIZATION WITH LM MANNED WILL UTILIZE THE REPRESS PACK.				
		C. SURGE TANK WILL BE ON LINE EXCEPT DURING LM PRESSURIZATION OR CM PRESSURIZATION WITH THE LM MANNED, WHEN IT WILL BE ISOLATED TO MAINTAIN QUANTITY >500 PSIA.				
		D. THE PLSS VALVE WILL BE IN OFF POSITION FOR ALL PHASES EXCEPT LAUNCH AND TUNNEL/LM PRESSURIZATION AND RECHARGE.				
	'	E. THE SUIT CIRCUIT MUST BE PURGED OF ACCUMULATED H ₂ ONCE EVERY 6 HOURS FOR ONE MINUTE WHEN ALL CREWMEN ARE SUITED AND THE SUIT CIRCUIT IS ISOLATED.				
		F. THE SURGE TANK AND REPRESS PACK WILL NORMALLY BE RECHARGED SIMULTANEOUSLY.				
		G. CM CABIN PRESSURE WILL NOT BE ALLOWED TO DROP BELOW <u>4.0</u> PSIA DURING NORMAL LM PRESSURIZATION EXCEPT DURING TOSE.				
		H. THE CM ECS WILL NORMALLY SUPPLY ALL O_2 FOR CONSUMPTION AND LEAKAGE DURING IVT PHASES.				
		I. LIOH CANISTER WILL BE REPLACED EVERY 12 HOURS OR 7.6 MM HG OF PCO2 WHICHEVER COMES FIRST.				
		J. THE FLIGHT CREW WILL DON SUITS FOR THE FOLLOWING:				
		1. INABILITY TO MAINTAIN CABIN PRESSURE ABOVE 4.5 PSIA				
		2. ALL UNDOCKED OPERATIONS				
		3. TD&E				
		4. GLYCOL LEAKS IN COMMAND MODULE				
	1	5. FIRE, SMOKE, CONTAMINATION IN CABIN				
		K. THE FLIGHT CREW WILL DOFF SUITS (TIME AND CONDITIONS PERMITTING) FOR THE FOLLOWING:				
		1. LOSS OF SUIT CIRCUIT				
		2. CONFIRMED LEAK OF GLYCOL IN SUIT CIRCUIT				
		L. CABIN FANS WILL NORMALLY BE OFF FOR MISSION DURATION.				
,		COOLANT MANAGEMENT				
		A. FOR SIMULTANEOUS PRIMARY AND SECONDARY LOOP OPERATION, NORMALLY EITHER THE PRIMARY OR SECONDARY LOOP RADIATOR WILL BE ISOLATED.				
		B. GLYCOL RESERVOIR WILL BE ON LINE AND RADIATORS WILL BE BYPASSED FOR LAUNCH.				
		C. INDICATED GLYCOL ACCUMULATOR QUANTITY WILL BE MAINTAINED BETWEEN 30 AND 65 PERCENT.				
		D. SECONDARY COOLANT WILL BE OFF FOR LAUNCH.				
		E. ADDITIONAL POWER LOADS WILL BE ADDED AS REQUIRED IN AN ATTEMPT TO MAINTAIN PRIMARY RADIATOR OUTLET TEMPERATURE >-20 DEG.				
MI	SSION	REV DATE SECTION GROUP PAGE				
	LLO 10	A 4/23/69 CSM ENVIRONMENTAL CONTROL SYSTEM MANAGEMENT 10-2				
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Locul							
REV	ITEM						
		WATER	R SYSTEM				
		1	WASTE WATER	WILL NORMALLY BE DUMPED TO 2	5 PERCENT; HOW	INTAIN INDICATED QUANTI TY <85- BEVER, IF WASTE WATER QUANTITY ABLE WATER QUANTITY (CF0010) B	INSTRUMENTATION
				WILL BE MANAGED SO THAT:			
		:	1. AT LO1,	THE WASTE TANK WILL CONTAIN	>75 PERCENT.		
						. AND THE WASTE TANK WILL BE 90	PERCENT FULL.
				PING CONSIDERATIONS TO REDUCE			
				LL BE PERFORMED (IF REQUIRED			
		:	2. IF DUMPS PERIODS	ARE REQUIRED IN LUNAR ORBIT	THE OPTIMUM D	DUMP TIME IS IMMEDIATELY PRECED	ING SLEEP
		SYST	EM BACKUP				
				BE USED AS REQUIRED FOR CSM	SYSTEMS BACKUP	P. DESCENT STAGE WILL BE RETAI	NED IF POSSIBLE
				·			
} }	ļ						
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			NUMBERS 10- 9 ARE RESERY				
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	<u>.</u>		,	MISSION RULES		
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTE	S/COMMENTS
	10-20	CABIN PRESSURE CANNOT BE RELIEVED	SPEC LAUNCH	CONTINUE MISSION	NORMAL RELIEF SECONDS	STARTS AT <u>50</u>
	10-21	CABIN PRESSURE DECREASING AND/OR <4.5 PSIA AND:				N TO USE LM T FOR EARTH LIEU OF SUITED
		A. SUIT PRESSURE >3.5 PSIA	LAUNCH	A.1. CONTINUE MISSION		
			ALL	2. ENTER NEXT BEST PTP IF CABIN PRESS NOT F >4.5 PSIA.	RESTORED	
		B. SUIT PRESSURE <3.5 PSIA	LAUNCH ALL	B.1. ABORT ASAP 2. ENTER ASAP		
		C. LOSS OF SUIT CIRCU- LATION	LAUNCH	C.1. ABORT ASAP OPEN DIRECT 02 45 DE LAUNCH SETTING.		DNDS TO 12.6 LB/ ROX 3 CFM/
			ALL	2. ENTER ASAP		·
Α	10-22	LOSS OF SUIT CIRCULATION CABIN STABLE, AND >4.5 PSIA				(IF AVAILABLE) ED FOR CO ₂ AND
			LAUNCH	A. <u>CONTINUE MISSION</u> OPEN DIRECT O ₂ VALVE ¹ FROM LAUNCH SETTING.	A. CORRESPON	DS TO 12.6 LB/HR CFM/CREWMAN)
		,	EO	B. ENTER NEXT BEST PTP W 4 HOURS	ITHIN	
		,		 DOFF SUITS. OPEN WASTE OVERBOA 	ARD B.2. WASTE O	VERBOARD BLEED =
1				DRAIN VALVE TO OB- CABIN BLEED FLOW.	TAIN 1.00 LB	O ₂ /HR
				3. DON FACE MASKS AF HOUR	CO ₂ PAR INCREAS 1 CREWM	QUIRED FOR CM TIAL PRESSURE TO E TO 7.6 MM HG AN: 4 HR. AN: 80 MIN.
			ALL	C. <u>ENTER NEXT BEST PTP</u>		
·	10-23	LOSS OF SURGE TANK OR REPRESS PACK			FOR LEAK IN S LATE SURGE TA PLSS VALVE TO	
			LAUNCH	A. CONTINUE MISSION		
			ALL	B. <u>CONTINUE MISSION</u>		
L	J	· · · · · · · · · · · · · · · · · · ·				
_ M.	SSION	REV DATE		SECTION	GROUP	PAGE
	LLO 10	A 4/23/69 CSM	ENVIRONMENT	AL CONTROL SYSTEM	SUIT/CABIN	10-4

REV	RULE	CONDITION/MALFUNCTION	I PHASE	RULING		CUES/NOTES/COM	MENTS
	10-24	LOSS OF SURGE TANK AND REPRESS PACK					
ı			LAUNCH	A. CONTINUE MISSION			
			ALL	B. CONTINUE MISSION PLAN TO RESTORE ENTR STORING OPS IN CM AT LM EGRESS.		B. OPS O ₂ QTY 2 TANKS -2 LB/TA	ANK
			TEC	C. CONTINUE MISSION DOFF SUITS FOR ENTRY			
	·			,			
	10-25	FIRE OR SMOKE IN COMMA	ND LAUNCH	A. ABORT 1. DECOMPRESS CABIN	1		
				 TROUBLESHOOT ELE SYSTEM PER FLIGH CHECKLIST BOOST PROCEDURES. 	IT CREW		
			ALL	B.1. TROUBLESHOOT/COMBA PER FLIGHT CREW CH EMERGENCY PROCEDUR	ECKLIST		
				2. ASSESS DAMAGE AND POWER FROM AFFECTE	D SYSTEMS.		
				3. ENTER NEXT BEST PT	<u>'P</u>		
	10-26	CONTAMINATION IN CABIN	N ALL	CREW MAY ELECT TO DECOMP	RESS	IF UNABLE TO CLEAR (NATION, MISSION MAY NATED EARLY.	
	10-27	LOSS OF SUIT INTEGRITY	,		· · · · · · · · · · · · · · · · · · ·	CONTINUE MISSION EX	
						MAJOR CSM PRESSURE N CONFIGURATION CHANGE	
			LAUNCH	A. CONTINUE MISSION			
	į		EO	B. CONTINUE MISSION			
			TEC	C. INHIBIT TOSE			
			TDSE	D. TERMINATE PHASE CONTINUE LM EJECTION PRESSURIZED AND TUNN IS COMPLETE. NO-GO FOR UNDOCK			
			ALL.	E. CONTINUE MISSION NO-GO FOR UNDOCK			
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	LO 10	FINAL 4/15/69	CSM ENVIRONMENTA	L CONTROL SYSTEM	SUIT	T/CABIN	10~5

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REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	10-28	LOSS OF O ₂ MANIFOLD					
		A. O2 MANIFOLD LEAKS >4 LB/HR AND CABIN PRES-	LAUNCH	A.1. CONTINUE MISSION			
		SURE >4.5 PSIA	ALL	2. ENTER NEXT BEST PTP	A.2.	APPROXIMATELY ARE REQUIRED CABIN O ₂ FROM 3.5 PSIA, WIT HR USAGE RATE CABIN LEAK + BLEED)	TO DEPLETE 4.8 TO H 0.456 LB/ (CREW +
				(A) VERIFY SURGE TANK REPRESS PACK ISOL UNTIL ENTRY.			
		·		(B) RETRIEVE OPS FROM	LM. A.2.	(B) CREW OPTIO LM ENVIRON EARTH RETU OF MANUAL PRESSURE R	MENT FOR RN IN LIEU CABIN
		B. O ₂ MANIFOLD LEAKS >4 LB/HR AND CABIN	LAUNCH	B.1. ABORT ASAP			
		PRESSURE <4.5	ALL	2. ENTER ASAP USE OPS IN SUITED MODE ENTRY		2 (IF AVAILABLE TO SUPPLEMENT LY.	
	10-29	LOSS OF ONE MAIN REGULA-	LAUNCH	Ä. CONTINUE MISSION		 	· · · · · · · · · · · · · · · · · ·
	10-29	TOR	LAUNCH	A. CONTINUE PIESTON			•
			EO	B. NO-GO FOR TLI			
[.			TLC	C. ENTER NEXT BEST PTP	<u>.</u>		
			ALL	D. CONTINUE MISSION CONSIDER TEI AT NEXT BES OPPORTUNITY AFTER RNDZ	iT		
	10-30	BOTH MAIN REGULATORS FAILED CLOSED				YSTEMS (IF AVAI SED IN LIEU OF	
			LAUNCH	A. CONTINUE MISSION			
			ALL	B. ENTER NEXT BEST PTP			
	10-31	LOSS OF ONE SUIT COMPRES-	LAUNCH	A. CONTINUE MISSION			
		SOR	EO	B. NO-GO FOR TLI			
			ALL	C. CONTINUE MISSION CONSIDER RETAINING LM AS STAGE AND DOING EARLY TE NEXT OPPORTUNITY AFTER R	I AT		
		RULE NUMBERS 10-32					
		10-39 ARE RESERVED.					
MI	SSION	REV DATE	L	SECTION	GRO	UP -	PAGE
APO	LLO 10	FINAL 4/15/69 CSM E	NVIRONMENTA	AL CONTROL SYSTEM	SUIT/CABIN		10-6
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				MISSI	ON RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE		RULING		CUES/NOTES/COM	MENTS
	10-40	PRIMARY COOLANT LOOP MALFUNCTIONS					•	
		A. LOSS OF EVAPORATOR	LAUNCH	A.1.	CONTINUE MISSION		A.1. REF MALF PROC	
			ALL	2.	CONTINUE MISSION ACTIVATE SECONDARY LOOP WITH RADIATORS PASS AS REQUIRED TO TAIN PRIMARY EVAPOR OUT TEMP <80°F OR A QUIRED FOR CREW COM	S IN BY- O MAIN- RATOR AS RE-	2.(A) MAINTAIN PI OUT TEMP > (B) WATER MANA MAY DICTAT TION AND TION OF SE LOOP TO MA PRI RAD OU BETWEEN 45	-20°F. GEMENT E ACTIVA- EACTIVA- CONDARY INTAIN T TEMP
		B. LOSS OF RADIATORS	LAUNCH	В.1.	CONTINUE MISSION		B.1. REF MALF PROC	
			EO	2.	NO-GO FOR TLI			
					(A) ACTIVATE SECON	NDARY		
					(B) USE PRIMARY LO ADDITION TO SE LOOP FOR GEN O TIONS.	ECONDARY		
			ALL	3.	ENTER NEXT BEST PT	_		
		C. TOTAL LOSS OF LOOP	LAUNCH	C.1.	CONTINUE MISSION ACTIVATE SECONDARY	LOOP	•	
			EO	2.	NO-GO FOR TLI ACTIVATE SECONDARY	LOOP	C.2. ALTERNATE MIS BE PERFORMED.	
			ALL	3.	ENTER NEXT BEST PTI ACTIVATE SECONDARY	LOOP		
	10-41	SECONDARY LOOP MALFUNCTIONS						
		A. LOSS OF EVAPORATOR	ALL	Α. <u>(</u>	CONTINUE MISSION		A. MALF ECS	
		B. LOSS OF RADIATORS	EO		NO-GO FOR TLI LOOP IS STILL OPER IN EVAPORATIVE MOD		B.1. MALF ECS	-
			ALL	2.	ENTER NEXT BEST PT	<u> </u>		
		C. TOTAL LOSS OF LOOP	EO	c.1.	NO-GO FOR TLI		C.1. MALF ECS	
			ALL	2.	ENTER NEXT BEST PT	<u>P</u>		
	`.							
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MI	SSION	REV DATE		SECTION	N	<u> </u>	GROUP	PAGE
	LO 10		SM ENVIRONMENT			COOLANT	GNOO!	10~7
L	GC Varm	COT (AUG 62)				COULANT		10~/

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				MISSION RULES		
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/C	OMMENTS
	10-42	LOSS OF PRIMARY AND SECONDARY EVAPORATORS	EO	A. CONTINUE MISSION NO-GO FOR TLI		
			TLC	B. CONTINUE MISSION NO-GO FOR LOI		
			ALL	C. ENTER NEXT BEST PTP		
	10-43	LOSS OF ALL COOLING, PRIMARY AND SECONDARY			LM SYSTEMS (IF AV BE USED TO SUPPLE OPERATIONS.	
			LAUNCH	A. CONTINUE MISSION		
			EO	B. ENTER NEXT BEST ATP MAXIMUM ORBIT TIME: 4 HOURS EMERGENCY PO' FOLLOWED BY 1.5 HOUR POWER UP FOR ENTRY.	WER DOWN	
			ALL	C. <u>ENTER ASAP</u>		
	10-44	CONFIRMED LEAK OF GLYCOL			LM ENVIRONMENT (MAY BE USED FOR I IN LIEU OF CSM.	
		A. IN COMMAND MODULE	LAUNCH	A.1. CONTINUE MISSION		
			EO	2. ENTER NEXT BEST PT DON SUITS. PURGE WITH DIRECT 02.	P SUIT LOOP	
			ALL	3. ENTER NEXT BEST PT	<u>P</u>	
ĺ		B. IN SUIT CIRCUIT	I AUNCH	B.1. CONTINUE MISSION		
			EO	2. ENTER NEXT BEST PT DOFF SUITS AND USE MASKS IF REQUIRED.	FACE	
			ALL	3. ENTER NEXT BEST PT	P	
				į		
			-			
		RULE NUMBERS 10-45 THRO 10-49 ARE RESERVED.	JGH			
MI	SSION	REV DATE		SECTION	GROUP	PAGE
APO	LLO 10	FINAL 4/15/69 CS	1 ENVIRONMENT	AL CONTROL SYSTEM	COOLANT	10-8
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				MISSION RULES	
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
	10-50	LOSS OF OVERBOARD DUMPS A. NORMAL OVERBOARD DUMPS FROZEN OR BLOCKED	ALL	A. CONTINUE MISSION	A.1. UTILIZE AUXILIARY DUMP FOR URINE AND WASTE WATER DISPOSAL.
					2. BLEED O ₂ FROM WATER TANK THROUGH WASTE MANAGEMENT OVERBOARD DRAIN VALVE INTO CABIN.
		B. LOSS OF ALL OVERBOARD DUMP CAPABILITY	ALL	B. <u>ENTER NEXT BEST PTP</u>	B.1. IF POTABLE AND WASTE TANKS (OR WASTE TANKS ALONE) BECOME FULL, FORCED WATER BOILING WILL BE NECESSARY TO ALLOW FUEL CELL AND/OR CYCLIC ACCUMULATOR OPERATION.
					2. LM URINE STORAGE BAGS (IF AVAILABLE) WILL BE USED.
	·				
	10-51	FAILURE OF BOTH WATER ACCUMULATORS OR UNCONTROL- LABLE HIGH HUMIDITY			LM SYSTEMS MAY BE USED FOR HUMIDITY CONTROL.
			LAUNCH	A. CONTINUE MISSION	
			ALL.	B. <u>ENTER NEXT BEST PTP</u>	
	10-52	WASTE WATER TANK LEAK OR LOSS OF WASTE WATER STORAGE CAPABILITY			LM SYSTEMS (IF AVAILABLE) MA BE USED TO SUPPLEMENT CSM.
					WHEN POTABLE WATER TANK BECOMES FULL, FUEL CELL WATE WILL BE DUMPED THROUGH OVER- BOARD PRESSURE RELIEF VALVES
			LAUNCH	A. CONTINUE MISSION	
			EO	B. <u>CONTINUE MISSION</u> NO-GO FOR TLI	
	,		ALL	C. ENTER NEXT BEST PTP	
					,
		·			
MI	SSION	REV DATE		L SECTION	GROUP PAGE
APO	LLO 10	FINAL 4/15/69 CSM	ENVIRONMEN'	TAL CONTROL SYSTEM	WATER AND WASTE MANAGEMENT 10-9
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			· · · · · · · · · · · · · · · · · · ·	MISSION RULES		
ÆΛ	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMM	ENTS
	10-53	CONFIRMED LEAK IN POTABLE WATER TANK OR UNABLE TO TRANSFER FUEL CELL WATER TO POTABLE TANK			LM SYSTEMS (IF AVAII MAY BE USED TO SUPPI CSM.	
			LAUNCH	A. CONTINUE MISSION		
			EO	B. <u>CONTINUE MISSION</u> NO-GO FOR TLI ENTER NEXT BEST PTP AF TANK DEPLETED.	TER	
			ALL	C. ENTER NEXT BEST PTP		
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		RULE NUMBERS 10-54				
		THROUGH 10-59 ARE RESERVED	}			
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c., I	1TEM			MISSION RUI			
EV	1 TEM		INSTRI	JMENTATION I	REQUIREMENTS		
A	10-60	MEAS DESCRIPTION	ON PCM	ONBOARD	TRANSDUCER	CATEGORY	REFERENCE
		CABIN PRESS SUIT PRESS TANK BLADDER P	CF0001P CF0012P RESS CF0120P	METER METER	COMMON }	1 OF 3 M	10-20
		SUIT PRESS (CUFF GAGES)			 .	MANDATORY (EACH CREWMAN)	10-21
		SURGE TANK PRE OXYGEN REPRESS		METER METER	COMMON	1 OF 2 M	10-28
		PRIM ACCUM QTY PRIM PUMP OUT		METER METER	COMMON COMMON	1 OF 2 M	10-40, 10-44
		POTABLE H2O QT WASTE H2O QTY	Y CF0010Q CF0009Q	METER METER	COMMON COMMON	1 OF 2 M	10-53, 10-52
		SEC STEAM PRES SEC EVAP OUT T		METER METER	COMMON COMMON	1 OF 2 M	10-41
		SEC ACCUM QTY	CF0072P	METER	COMMON	HD	
		SEC PUMP OUT P	RESS CF0070P	METER	COMMON	HD	
		PRIM EVAP OUT	TEMP CF0018T	METER	COMMON	HD	
		PRIM STEAM PRE	SS CF0034	METER	COMMON	HD	
		ECS O2 FLOW	CF0035R	METER	COMMON	HD	
		O2 MANIFOLD PR	RESS CF0036P			HD	
		SUIT COMP PRES	S CF0015P	METER	COMMON	HD	,
		PRIM RAD OUT T	TEMP CF0020T	METER	COMMON	HD `	
		PRIM EVAP INLE	T TEMP CF0181T			HD	
		STEAM DUCT TEM	IP SF0263T			HD	
		SEC RAD OUT TE	MP SF0236T	METER		HD	
							,
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11 CSM CRY OGENICS

SECTION 11 - CSM CRYOGENICS

	1.75		MISSION RULES		
REV	ITEM		GENERAL		
			<u> </u>		
	11-1	LAUNCH			
		THERE ARE NO CRYO FAILU	RES FOR WHICH THE LAUNCH/INSERTION	PHASE WILL BE TERMINATED. FOR (COMPLETE LOSS
		OF THE SYSTEM RESULTING	IN THREE FUEL CELL FAILURES, ENTRY	WILL BE PLANNED INTO PTP 2-1.	THREE ENTRY
		BATTERIES ARE CAPABLE OF	F SUPPORTING THE LAUNCH, ONE REV OF	- POWER DOWN AND SCS ENTRY.	
	i				
	11-2	ALL PHASES			
			S REQUIRED UNTIL CM/SM SEP SO THAT		
	·	INTO WITH FULL CONSUMABLE THIS CAPABILITY IS POTE	LES POTENTIAL, THAT IS, FULLY CHARC NTIALLY JEOPARDIZED BY CRYO SYSTEMS	GED ENTRY BATTERIES AND ENTRY O2 S DEPLETION OR MALFUNCTION. MISSI	TANKS. IF ION TERMINATION
		PROCEDURES WILL BE ENACT	TED IN WHATEVER TIME FRAME IS APPROSS OF RECHARGE CAPABILITY FROM THE	OPRIATE OR AVAILABLE. ANY ENTRY	BATTERY OR
		FOR ENTRY, LANDING, AND	POSTLANDING.	CK (O STSTEP WILL REDUCE SOFFET A	ANT DADEE
A	11-3	LOSS OF CRYOCENIC TANK	IS DEFINED AS: PRESSURE CANNOT BE	MAINTAINED ABOVE 150 PSIA FOR O	AND 100
'	11-5	PSIA FOR H2.	13 DEL TRED AS. TRESSURE CANNOT DE	PARTITION OF	<u> </u>
Α	11-4	TUNAD MISSION WILL DE C	ONTINUED AS LONG AS ENGLISH COVO (O	- H-) IC MAINTAINED IN LOWEST TA	NNK TO BED
	11-4	FORM AN EARTH RETURN FR	ONTINUED AS LONG AS ENOUGH CRYO (O OM ANY POINT WITH AT LEAST A POWER	LEVEL OF 50 AMPS AVERAGE. EARTH	1 ORBIT
		MISSION WILL BE CONTINUE THE NEXT DAILY GO/NO-GO	ED AS LONG AS ENOUGH TOTAL CRYO (O, AREA.	₂ , H ₂) is available to perform An	N ENTRY INTO
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		DILLE MINOROG AS E THESE			
		RULE NUMBERS 11-5 THROU 11-9 ARE RESERVED.	у н		
	·				•
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ΔΡΛ	OLLO 10	A 4/23/69 CSM C	RYOGENICS	CENEDAL	<u> </u>
		292 (AUG 68)	VIONITO	GENERAL	11-1

					MISSION	RULES			
EV	ITEM				SYSTEMS MAI	NAGEMENT			
А	11-10	CRYO	MANAGEMENT						
	:	A. M	ANUAL PRESSI	URE CONTROL WILL	BE USED AS REQ	UIRED TO MAINTA	AIN:		
		1	. TANK PRES	SSURES GREATER T	HAN <u>750</u> PSIA O ₂	AND 200 PSIA	FOR H ₂		
		2	. QUANTITY	BALANCE WITHIN	4 PERCENT 02 AN	D 3 PERCENT FO	R H ₂		
ı		В. І	T IS PREFERA	ABLE TO EITHER P	URGE F/C OR POW	ER UP TO PRECLI	UDE VENTING.		
				AND H2 TANK FAN	S WILL NOT BE O	PERATED IN THE	AUTO MODE.		
	i			CYCLE CRITERIA:	ED BOTH DDE AND	DOCT CLEED			
		`	2 110 12 17	ANS WILL BE CYCLE	ED BOTT THE AND	7001 322.			
	11-11	CRYO	<u>GAGING</u>						
		A. 0	NBOARD CRYO 1 ₂) PER TANK	GENIC QUANTITY G	AGING IS PRIME.	ACCURACY IS	±2.65 PERCENT (±8.	48 LB O ₂ ,	±0.72 LB
ı		в. м	CC CALCULATE	ED QUANTITY USIN	G PRESSURE VERS	US TEMPERATURE	IS BACKUP.		
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		B		10 THE CHOICE					
l			NUMBERS 11- ARE RESERV						
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MI	SSION.	11/4	DATE	SECTION		GR	OUP		PAGE

REV	pilit # 1	CONDITION/MALFUNG	CTION PHASE	RULING	CUES/NOTES/CO	MMENTS
1 1	RULE	COMPTITON/PACEON		ECIFIC MISSION RULES	COE3/NOTE3/CO	7 - 10-11 V
	11-20	LOSS OF ONE O. AND	i	A. CONTINUE MISSION	IM DICC AND ODE). WYLL
	11-20	LOSS OF ONE O2 AND CRYO TANK (TANK PR		1	BE USED AS REQUIRED	O TO
		<150 0 ₂ , <100 H ₂ , RESPECTIVELY).	EO	B. CONTINUE MISSION NO-GO FOR TLI	SUPPLEMENT CSM O2.	
			TOSE	C. CONTINUE MISSION		
			ALL	D. <u>ENTER NEXT BEST</u>	<u>PTP</u>	
		,				
	11-21	LOSS OF BOTH O, AN	ID/OR H ₂ LAUNCH	A. CONTINUE MISSION		
		<150 O ₂ , <100 H ₂ , RESPECTIVELY)		ISOLATE SURGE TA 800 PSIA.	NK PRIOR TO	
			EO	B. ENTER NEXT BEST	ATP OR PTP B. IF THREE FUEL	
				MAXIMUM ORBIT TI HOURS FOR LOSS O FUEL CELLS.	ME IS 4.75 LOST PRIOR TO C SMJC 'S WILL BE INOPERATIVE.	JM/SM SEP,
		,				
		-				
		RULE NUMBERS 11-22 11-49 ARE RESERVE	2 THROUGH			
MI	SS10N	REV DATE		SECTION	GROUP	PAGE
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NASA — Manned Spacecraft Center

MISSION RULES

EΥ	ITEM			INSTRUM	ENTATION REQUIR	EMENTS	1		
	11-50	MEAS DESCRIP	TION	PCM	<u>ONBOARD</u>	TRANSDUC	ERS	CATEGORY	MISSION RUI REFERENCI
		O ₂ TANK 1 QT O ₂ TANK 2 QT	Y S	C0032Q C0033Q	METER METER	COMMON COMMON	}	1 OF 2 MANDATORY	11-20
		O ₂ TANK 1 TE O ₂ TANK 2 TE	MP S	00041T 00042T	77 C TO TO TO TO TO TO TO TO TO TO TO TO TO			HIGHLY DESIRAB HIGHLY DESIRAB	
		${ m H_2}$ TANK 1 QT ${ m H_2}$ TANK 2 QT	Y S	C0030Q C0031Q	METER METER	COMMON COMMON	}	1 OF 2 MANDATORY	11-20
	,	${ m H_2}$ TANK 1 TE ${ m H_2}$ TANK 2 TE	MP S	00043T 00044T				HIGHLY DESIRABI	
		O ₂ TANK 1 PR O ₂ TANK 2 PR		C0037P C0038P	METER METER	COMMON	}	1 OF 2 MANDATORY	11-20
		H ₂ TANK 1 PR H ₂ TANK 2 PR	ESS S	C0039P C0040P	METER METER	COMMON	}	1 OF 2 MANDATORY	11-20
	.								-
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12 CSM ELECTRICAL POWER SYSTEM

			Mission Rules	ر الماري الماري الماري الماري الماري الماري الماري الماري والماري الماري الماري الماري الماري والماري والماري و ولا الماري الماري الماري والماري والماري والماري والماري والماري والماري والماري والماري والماري والماري والم				
REV	ITEM		GENERAL					
	12-1	LÄUNCH	***************************************					
		LAUNCH WILL BE CO PTP 2-1. THERE M	NTINUED AS LONG AS SUFFICIENT ENERGY UST BE AT LEAST ONE MAIN BUS AND ONE	IS AVAILABLE TO PERFORM AN ENTRY IN AC BUS OPERATIONAL TO CONTINUE.	NTO AT LEAST			
	12-2		CELL FAILURES FOR WHICH THE LAUNCH AINING TO SUPPLY MAIN BUS LOADS.	PHASE WILL BE TERMINATED AS LONG AS	THREE ENTRY			
	12-3	ALL PHASES						
		CAPABLE OF SUPPOR	BE CONTINUED AS LONG AS THE REQUIRED TING MISSION REQUIREMENTS OF 75 TO 9 EE GOOD ENTRY BATTERIES REMAIN.	NUMBER OF FUEL CELLS ARE AVAILABLE) AMPS (WITHOUT BATTERY SUPPLEMENT I	AND ARE EXCEPT DURING			
	12-4	BATTERY IS CONSID	ERED FAILED IF:	•				
			S WHEN CONNECTED TO A MAIN BUS DURIN	S SPS MANEUVERS (NOMINAL TOTAL BATTI	ERY CURRENT			
		B. SUSTAINED BAT	TERY CHARGER OUTPUT >2.0 AMPS AND AL	_ LOADS REMOVED.	,			
	12-5	AN AC BUS IS CONS	IDERED FAILED IF ANY TWO PHASES CANN	DT BE MAINTAINED >95 VOLTS.				
	12-6	AN INVERTER IS CO	NSIDERED FAILED IF:					
		A. OUTPUT VOLTAGE ON ANY PHASE >130 VAC.						
		B. OUTPUT VOLTAG	E ON ANY TWO PHASES <95 VAC.					
	12-7	FUEL CELL IS CONS	IDERED FAILED FOR MISSION PLANNING I	F:				
		A. FUEL CELL CAN POWER AS REQU	NOT SUPPLY SUFFICIENT POWER TO MEET	ITS OWN PARASITIC LOADS (5 AMPS PLU:	S INLINE HEATER			
		B. FUEL CELL H ₂	LOOP IS CONTAMINATED WITH KOH.					
	<u>.</u>	C. REGULATED H ₂ OPERATION; LO	PRESSURE <36.7 PSIA (CORRESPONDS TO I WER N ₂ PRESSURE CAN BE MANAGED BY TU	$ m N_2$ PRESSURE SHIFT DOWN TO 28.2 PSIA RNING OFF $ m H_2O$ TANK PRESSURE).	FOR CRITICAL			
	12-8	TLI MINIMUM PURGE OTHER FUEL CELL.	CAPABILITY IS BOTH OXYGEN AND HYDRO	GEN ON ONE FUEL CELL AND AT LEAST OX	XYGEN ON ANY			
]						
		DITE MIMPERS 10 0	THEO: I'CLI					
		RULE NUMBERS 12-9 12-19 ARE RESERVE						
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	Α.	ONE AND ONLY (ONE FUEL CELL WILL BE TIED	TO BOTH MAIN BUSES.						
	В.	INVERTERS WILL AC BUS 2.	BE CONFIGURED SUCH THAT M	AIN BUS A WILL SUPPLY AC BUS 1 AND MAIN BUS B WILL SUPPL						
	с.	C. MAIN BUS VOLTAGE WILL BE MAINTAINED >26.5 VDC AND <31 VDC. ONE FUEL CELL MAY BE OPEN CIRCUITED FOR OPTIMUM VOLTAGE AND POWER MANAGEMENT.								
	D.		HARGER WILL BE USED TO CHEC POWER SOURCES HAVE BEEN RE	K OUT A SUSPECTED SHORTED BUS (EXCEPT MAIN BUSES) AFTER MOVED FROM BUS.						
	E.	MINIMUM MAIN E	BUS VOLTAGE WILL BE MAINTAI	NED TO BE COMPATABLE WITH ONLINE OPERATION EQUIPMENT.						
		1. SPS	24.5							
-		2. PGNS	25.0							
		3. AUTO SM-RO	os <u>22.0</u>							
		4. AUTO CM-RO	CS <u>21.0</u>							
		5. DIRECT SM-	-RC5 <u>21.0</u>							
		6. DIRECT CM-	-RCS <u>17.0</u>							
		7. INVERTERS	<u>19.0</u>							
10.01		TERV MANAGEMENT	· •							
12-21		TERY MANAGEMEN	_	MENT MAIN BUC LOADS SOOM T.75 SECONDS TO INSERTION						
	ĺ			MENT MAIN BUS LOADS FROM T-75 SECONDS TO INSERTION.						
		ROTATED IN THE	E EVENT THE BATTERY CHARGER	MENT MAIN BUS LOADS FOR SPS MANEUVERS. BATTERY C WILL I FAILS TO MAINTAIN BATTERY BALANCE.						
	C. BATTERY CHARGING WILL BE TERMINATED FOR ONE OF THE FOLLOWING, WHICHEVER OCCURS FIRST: 1. INTEGRATED AMP-HOURS INTO BATTERY BY CHARGER EQUALS INTEGRATED AMP-HOURS OUT OF ELOADS.									
		2. WHEN BATTE	ERY CHARGER CURRENT DROPS T	0 0.4 AMPS.						
	D.	THREE BATTERIES WILL BE TIED TO THE MAIN BUSES FOR DEORBIT MANEUVER AND ENTRY.								
	E.	BATTERIES ARE CONSIDERED TO HAVE 40 AMP-HR CAPABILITY INFLIGHT AND 45 AMP-HR CAPABILITY FOR POSTLANDING.								
	F.	. A SINGLE BATTERY THAT CANNOT BE RECHARGED WILL NOT BE USED EXCEPT DURING DEORBIT, ENTRY, AND POSTLANDING.								
	G.		VALVE WILL REMAIN CLOSED UN L BE ALLOWED TO TROUBLESHOO	ILESS MANIFOLD PRESSURE 1S GREATER THAN 6 PSIA. VENTING OT A SUSPECTED FROZEN DUMP.						
12-22	FUE	L CELL MANAGEM	ENT							
	Α.	FUEL CELL WIL	L BE "SHUTDOWN" FOR THE FOL	LOWING:						
		1. SUSTAINED	CURRENT OUTPUT LESS THAN !	AMPS.						
		2. FUEL CELL	H2 LOOP IS CONTAMINATED W	тн кон.						
		3. REACTANT	LEAKAGE JEOPARDIZING MISSIC	N DURATION.						
	ī		•							
ISSION	RE	V DATE	SECTION	GROUP PAGE						

				MISSION RULES		
REV	ITEM					
	12-22	в.	FUEL CELL MAY	BE "OPEN CIRCUITED" FOR THE FOLLOWI	NG:	
{	(CONT)		1. SKIN TEMP			
	į		2. TCE TEMP >	215°F.		
			3. FAILURE OF	H, PUMP OR GLYCOL PUMP.		
			4. VOLTAGE MA	-		••
					GREATER THAN PREDICTED FUEL CELL LIFE	TIMF.
					VALS. FUEL CELL H, PURGES WILL BE DO	
		-•	HOUR INTERVALS	•	7 2 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	ne /// 10
\	į	D.	ADDITIONAL PUR	GES WILL BE INITIATED AS OPERATIONA	L CONDITIONS DICTATE.	
		Ε.	FUEL CELLS WIL	L NOT BE PURGED FOR CONFIRMED HIGH	PH INDICATION.	
		F.	EACH H ₂ PURGE	WILL NORMALLY BE PRECEDED BY 20 MIM	JTES OF H ₂ VENT HEATER OPERATION.	
		G.	FC INLINE HEAT	ERS WILL NORMALLY OPERATE IN "AUTO"	CONTINUOUSLY.	
		н.	REACTANT VALVE	S MUST REMAIN OPEN AT ALL TIMES UNL	ESS THE FUEL CELL IS DECLARED FAILED.	
			ADDITIONAL POW CRYO BUDGET JE EMERGENCY BYPA	OPARDIZED OR RAD OUT TEMPS NOT MAIN	TO MAINTAIN FC RAD OUT TEMP > -40 DEG TAINED > -40 DEGREES, FC RAD WILL BE	REES. IF PLACED IN
		J.	FUEL CELLS MAY	BE PURGED TO PRECLUDE VENTING OF C	RYO TANKS.	
	'					·
А	12-23	INVE	RTER MANAGEMEN	<u>T</u>		
		INVE	RTERS MAY BE F	EMOVED FROM LINE FOR ANY OF THE FOL	LOWING REASONS:	
,		Α.	INVERTER TEMP	>190°F		
		в.	SPACECRAFT LOA	D MANAGEMENT		,
	i					
					•	
					·	
			: NUMBERS 12-24 19 ARE RESERVED			
MI	SSION	RE\	/ DATE	SECTION	GROUP	PAGE
L	LO 10	Α	4/23/69	CSM ELECTRICAL POWER SYSTEM	MANAGEMENT	12-3
upa la	A 11		(AUC. KE)			

FEC/TS3 Form 292 (AUG 68)

12-30 LOSS OF ONE PUREL CELL COUTPUT 45 APPS) LANNOH A. CONTINUE MISSION CELLS TO ONE FUEL CELL					MISSION RULES		
LOSS OF ONE FURL CELL OUTPUT -5 AMPS) LOSS OF TWO FUEL CELLS (OUTPUT -5 AMPS EACH) LAINCH C. BASED ON THE FAILURE MODE, CONSIDERATION WITH EGY CANNOT BE RESTORED, PREMES MULT DOWN. TLC C. BASED ON THE FAILURE MODE, CONSIDERATION WITH EGY CONSIDERATION WITH EGY CONTINUE MITS ION. ALL D. CONTINUE MISSION ATTER 2 - 60 GET PERFORM: 1. EUS ANTO/OFT TO OFF, 2. IF LOSS OF FOL AMD 2, THE BAT C TO MAIN M. 3. IF LOSS OF FOL AMD 3, THE BAT C TO MAIN M. 3. IF LOSS OF FOL AMD 3, THE BAT C TO MAIN M. 4. IF LOSS OF FOL AMD 3, THE BAT C TO MAIN M. 3. IF LOSS OF FOL AMD 3, THE BAT C TO MAIN M. 4. IF LOSS OF FOL AMD 3, THE BAT C TO MAIN M. 5. ENTER NEXT BEST PTP 1. CONNECT REWINING FUEL CELL TO BOTH MAIN BUSSES. 2. PERFORM "LOSS OF TWO FC POWER DOAN." D. ONE ENTRY BATTERY MAY BE USED TO SUPPLIED THE PROPERTY OF TWO FC POWER DOAN." D. ONE ENTRY BATTERY MAY BE USED TO SUPPLIED THE PROPERTY OF TWO FC OF TWO FC POWER ALIGNMENT REMAIL INSIDER. BISSION BEV DATE SECTION FOR CONTROL FOR CONT	REV	RULE:	CONDITION/MALFUNCTION			ÇUES/NOTE	S/COMMENTS
COUTPUT <s 1="" 1.="" 2,="" 2.="" 3,="" 3.="" a.="" alignment="" all="" amps)="" and="" b.="" bay="" be="" best="" both="" bus="" buscn="" buscn.="" buscs.="" busgn="" busgn.="" busgs.="" busson="" c="" c.="" cell="" cell.="" cells="" circuit="" con-="" connect="" continue="" enter="" eo="" failine="" fc="" for="" fuel="" gased="" ggm="" given="" if="" launch="" loss="" main="" mext="" mill="" mission="" mode,="" no-go="" of="" on="" one="" only.="" open="" perform="" pleel="" ptp="" reconfigure="" remaining="" s.="" sideration="" sto="" supplimen<="" suppliment="" td="" the="" tlc="" tll="" to="" two=""><td></td><td></td><td></td><td>SPECI</td><td>FIC MISSION RULES</td><td></td><td>.*</td></s>				SPECI	FIC MISSION RULES		.*
BO B. NO-SO FOR TLL 1. OPEN CIRCUIT PUEL CELL., 2. RECOMPTIONER REMAINING TWO FLUEL CELLS TO ONE FUEL. CHANGT PER RESTORED, PERFORM SHAPT-DOWN. THE RESTORED, PERFORM SHAPT-DOWN. THE C. BREEN ON THE FAILURE MODE, CONSIDERATION WILL BE GIVEN TO CONTIDUING WITH LOS. ALL D. CONTINUE MISSION APPER 2 + 00 GET PERFORM: 1. EUS AUTO/OFF TO OFF. 2. IF LOSS OF FC 1 AND 2, THE BAT C TO MAIN A. 3. IF LOSS OF FC 1 AND 3, THE BAT C TO MAIN B. 4. IF LOSS OF FC 1 AND 3, THE BAT C TO MAIN B. 4. IF LOSS OF FC 1 AND 3, THE BAT C TO MAIN B. 5. ONE ENTRY BATTERY MAY BE USED TO SUPPLEMENT REMAIL INS FC FOR GAN ALIGNMENT PRIOR TO DEGREE! ALL B. ENTER NEXT BEST PTP 1. CONNECT BENAINING FUEL CELLS USED TO SUPPLEMENT REMAIL INS FC FOR GAN ALIGNMENT PRIOR TO DEGREE! 2. PERFORM "LOSS OF TWO FC POWER DOWN." MISSION. REV DATE SECTION GROUP PAGE POULD 10 A 4 1/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4		12-30		LAUNCH	A. CONTINUE MISSION		
2. RECONFIGURE REMAINING TWO FREE CELLS TO ONE YEAR CELL CANNOT BE RESTORDED, PERRORM HUT- DOWN. TLC C. BASED ON THE FAILURE MODE, CON- SIDERATION WITL BE GIVEN TO CONTINUE MISSION ALL D. CONTINUE MISSION ALL A. CENTINUE MISSION AFTER 2 + 00 GET PERFORM: 1. EDS AUTO/OFF TO OFF. 2. IF LOSS OF FC 1 AND 2, THE BAT C TO MAIN A. 3. IF LOSS OF FC 2 AND 3, THE BAT C TO TO NAM B. 4. IF LOSS OF FC 1 AND 3, THE BAT C TO TO MAIN B. 4. IF LOSS OF FC 1 AND 3, THE BAT C TO TO MAIN B. 5. INTER NEXT BEST PTP 1. CONNECT REMAINING FUEL CONNECT REMAINING FUE	1		(OUTPOT <5 AMPS)	EO	B. NO-GO FOR TLI		
FILE CELLS TO ONE PICE. CELL PER MAIN BIS ONLY. 3. IF PIEL CELL CANNOT DE RESONDE, PERFORM SHUTDOWN. TLC C. BASED ON THE FAILURE MODE, CONSIDERATION WILL BE GIVEN TO CONTINUE MISSION ALL D. CONTINUE MISSION APPER 2 + DI GET PERFORM: 1. EBS AUTO/OFF TO OFF. 2. IF LOSS OF FLO AND 3, TIE BAT C TO MAIN A. 3. IF LOSS OF FLO AND 3, TIE BAT C TO MAIN B. 4. IF LOSS OF FLO AND 3, TIE BAT C TO MAIN B. 4. IF LOSS OF FLO AND 3, TIE BAT C TO MAIN B. 5. ONE ENTRY BATTERY MAY BE USED TO CONSERVE CELL TO DOTH HAIN BUSES. 2. PERFORM "LOSS OF TVO FC POWER DOWN." 5. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 5. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 5. ONE ENTRY BATTERY MAY BE USED TO TO PERFORM THE PICE OF POWER DOWN." 5. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 6. ONE ENTRY BATTERY MAY BE USED TO OFF POWER DOWN." 7. IF POWER DOWN." 7. IF POWER DOWN." 7. IF POWER DOWN." 7. IF POWER DOWN." 7. IF POWER DOWN." 7. IF POWER DOWN." 7. IM SYSTEM TO OFF POWER. 7. IM SYSTEM TO OFF POWER. 8. ENTRY BATTERY MAY BE USED TO OFF POWER. 8. ENTRY BATTERY MAY BE USED TO OFF POWER. 8. ENTRY BATTERY MAY BE USED TO OFF POWER. 8. ENTRY BATTERY MAY BE USED TO OFF POWER. 8. ENTRY BATTERY MAY BE USED					1. OPEN CIRCUIT FUEL	CELL. B.1. REF MALE	PROC EPS 5.
RESTORED, PERFORM SHUT- DOM: C. BASED ON THE FAILURE MODE, CON- SIRBRATION WILL BE SIVEN TO ALL D. CONTINUE MISSION 12-31 LOSS OF TWO FUEL CELLS (OUTPUT <5 AMPS EACH) LAUNCH A. CONTINUE MISSION AFTER 2 + 00 GET PERFORM: 1. EDS AUTO/OFF TO OFF. 2. IF LOSS OF FC 1 AND 2, THE BAT C TO MAIN B. 3. IF LOSS OF FC 1 AND 3, THE BAT C TO BOTH MAIN BUSSES. ALL B. ENTER MEXT BEST PTP 1. CONNECT REMAINING FUEL CELL TO BOTH MAIN BUSSES. 2. PERFORM "LOSS OF TWO FC POMER DOWN." MISSION REV DATE SECTION GROUP PAGE POLLO 10 A 4/23769 CSM ELECTRICAL POMER SYSTEM FUEL CELLS 12-4					FUEL CELLS TO ONE	FUEL	
SIGNATION WILL BE GIVEN TO CONTINUE MISSION 12-31 LOSS OF TWO FUEL CELLS COUTPUT <5 AMPS EACH) LAINCH A. CONTINUE MISSION AFTER 2 + 00 GET PERFORM: 1. EDS ANTO/OPF TO OPF. 2. IF LOSS OF FC 1 AND 2, TIE BAT C TO MAIN A. 3. IF LOSS OF FC 1 AND 3, TIE BAT C TO MAIN B. 4. IF LOSS OF FC 1 AND 3, TIE BAT C TO MAIN B. 4. IF LOSS OF FC 1 AND 3, TIE BAT C TO MAIN B. 5. ENTER NEXT BEST PTP. 1. CONNECT REMAINING FUEL CELL TO SOTH MAIN BUSES. 2. PERFORM "LOSS OF TWO FC POWER DOWN." MISSION REV DATE SECTION GROUP PAGE POULD TO A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4					RESTORED, PERFORM		
LAUNCH A. CONTINUE MISSION AFTER 2 + 00 GET PERFORM: 1. EDS AUTO/OFF TO OFF. 2. IF LOSS OF FC 1 AND 2, TITE BAT C TO MAIN A. 3. IF LOSS OF FC 1 AND 3, TITE BAT C TO BOTH MAIN BUSES. ALL B. ENTER NEXT BEST PTP 1. CONNECT REMAINING FUEL CELL TO BOTH MAIN BUSES. 2. PERFORM "LOSS OF TWO FC POWER DOWN." B. ONE ENTRY BATTERY MAY BUSE TO FOR GAN ALL GOMENT." B. ONE ENTRY BATTERY MAY BUSE TO FOR GAN ALL GOMENT. B. ONE E				TLC	SIDERATION WILL BE GI		
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2. IF LOSS OF FC 1 AND 2, TIE BAT C TO MAIN A. 3. IF LOSS OF FC 2 AND 3, TIE BAT C TO MAIN B. 4. IF LOSS OF FC 1 AND 3, TIE BAT C TO BOTH MAIN BUSES. ALL B. ENTER NEXT BEST PTP 1. CONNECT REMAINING FUEL CELL TO BOTH MAIN BUSES. 2. PERFORM "LOSS OF TWO FC POWER DOWN," MISSION REV DATE SECTION GROUP PAGE POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4						1	
3. IF LOSS OF FC 2 AND 3, THE BAT C TO MAIN B. 4. IF LOSS OF FC 1 AND 3, THE BAT C TO BOTH MAIN BUSES. ALL B. ENTER NEXT BEST PTP 1. CONNECT REMAINING FUEL CELL TO BOTH MAIN BUSES. 2. PERFORM "LOSS OF TWO FC POWER DOWN," MISSION REV DATE SECTION SECTION GROUP PAGE POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 1. AND 3, THE BAT C TO MAIN B. B. ONE ENTRY BATTERY MAY BE SECTION B. ONE ENTRY BATTERY MAY BE SECTION GROUP PAGE PAGE 1. CONNECT REMAINING FUEL CONNECT REMAINING F					2. IF LOSS OF FC 1 A	ND 2,	
MISSION REV DATE SECTION GROUP PAGE 4. IF LOSS OF FC 1 AND 3, TIE BAT C TO BOTH MAIN BUSES. B. ENTER NEXT BEST PTP 1. CONNECT REMAINING FUEL CELL TO BOTH MAIN BUSES. 2. PERFORM "LOSS OF TWO FC POWER DOWN." MISSION REV DATE SECTION GROUP PAGE POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4					3. IF LOSS OF FC 2 A	ND 3,	
1. CONNECT REMAINING FUEL CELL TO BOTH MAIN BUSES. 2. PERFORM "LOSS OF TWO FC POWER DOWN." MISSION REV DATE SECTION GROUP PAGE POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4		!			4. IF LOSS OF FC 1 A TIE BAT C TO BOTH	ND 3,	
1. CONNECT REMAINING FUEL CELL TO BOTH MAIN BUSES. 2. PERFORM "LOSS OF TWO FC POWER DOWN." MISSION REV DATE SECTION GROUP PAGE POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4				ALL	B. ENTER NEXT BEST PTP		
POWER DOWN." POWER DOWN." MISSION REV DATE SECTION GROUP PAGE POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4						FUEL ING FC FO	R GEN ALIGNMENT
POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4						TWO FC	
POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4							
POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4							
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POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4							
POLLO 10 A 4/23/69 CSM ELECTRICAL POWER SYSTEM FUEL CELLS 12-4		65161	logu I				
TOTAL TOTAL TOTAL STOTEM					SECT10N	GROUP	PAGE
	APO		A 4/23/69	CSM ELECTRICAL F	POWER SYSTEM	FUEL CELLS	12-4

<u></u>				MISSION RULES		
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	c	UES/NOTES/COMMENTS
A	12-32	LOSS OF THREE FUEL CELLS			BE USE	TEMS (IF AVAILABLE) MAY D IN LIEU OF CSM SYSTEMS ISERVE CSM POWER.
]]		A. OUTPUT <10 AMPS EACH	LAUNCH	A.1. CONTINUE MISSION		
	·			(A) AFTER 2 + 00 E OFF TO OFF.	DS AUTO/ A.1.(A	CAPABILITY LESS THAN 8 AMPS AT 22 VDC, SMJC WILL BE INOPERATIVE FOR CM/ SM SEP.
		·		(B) TIE BAT C TO E BUSES.	NIAM HTO	
				(C) POWER DOWN AT ENTER 2-1 IF F CANNOT BE REST	UEL CELLS) 4.75 HOURS LEFT IN ORBIT BEFORE DEORBIT MANEUVER.
			ALL	2. ENTER NEXT BEST PTF	:	
	i	B. TOTAL OUTPUT CAPABILITY INSUFFICIENT TO SUPPORT DRIFTING FLIGHT LOADS	ALL	B.1. ENTER NEXT BEST PTF MANIPULATION OF CYC LOADS WILL BE ATTEM MAINTAIN VM >26.5 \	LIC PYED TO	95 AMPS REPRESENTS MAXIMUM DRIFTING FLIGHT REQUIREMENTS (66 AMPS AVERAGE).
			LAUNCH	2. NOT APPLICABLE		
		C. TOTAL OUTPUT CAPA- BILITY <36 AMPS AT MAIN BUS VOLTAGE OF 26.5 VDC	ALL	C.1. ENTER NEXT BEST ATE		36 AMPS REPRESENTS MINI- MUM POWER TO SUPPORT S/C SYSTEMS IN ORBIT.
			LAUNCH	2. NOT APPLICABLE		
	12-33	LOSS OF THREE FUEL CELLS PLUS ONE BATTERY CURRENT <50 PERCENT OF LOAD ON EITHER REMAINING BATTERY			USE LM RESERV ENTRY.	N SYSTEMS (IF AVAILABLE). WE ENTRY BATTERIES FOR
			LAUNCH	A. <u>ABORT</u>	CE 8A	SUMES ALL THREE FUEL ELL CURRENTS <5 AMPS AND ATTERY C TIED TO BOTH AINS.
		,	EO	B. ENTER NEXT BEST ATP (PERFORM EMERGENCY PO		4 HOURS LEFT IN ORBIT FORE SPS IGNITION
		1	ALL	C. <u>ENTER NEXT BEST PTP</u> PERFORM EMERGENCY PO	VER DOWN	i
		RULE NUMBERS 12-34 THROUGH 12-39 ARE RESERVED				
MI	SSION	REV DATE	<u> </u>	SECTION SECTION	GROUP	PAGE
ABO	10.10	A 4/23/69 CSM F	I FCTRICAL D	OWER SYSTEM	FUEL CELLS	
	LO 10	291 (A ¹¹ 2 63)	LECTRICAL P	OUEV 2121FL		12-5

12-40 LOSS OF ONE ENTRY BATTERY (QUIPUT <3 AMPS WHEN TIED TO MAIN BUS) 1. EDS AUTO/OFF TO OFF. 2. IF LOSS OF BAT A, TIE BAT C TO MAIN A. 3. IF LOSS OF BAT B, TIE BAT C TO MAIN B. B. NO-GO FOR TLI ALL C. BASED ON FAILURE MODE, CONSIDERATION WILL BE GIVEN TO CONTINUE ON REMAINING BATTERY. ALL 12-41 LOSS OF TWO ENTRY BATTERIES (QUIPUT <3 AMPS EACH WHEN CONNECTED TO NAIN BUS) LAUNCH A. CONTINUE MISSION 1. EDS AUTO/OFF TO OFF. 2. ENTER 2-1 POWERED DOWN. ALL B. ENTER NEXT BEST PTP USE ONE BATTERY ENTRY PROCEDURE. B. 1F LOSS DURING SPS MANEUVER, ATTEMPT TO TIE BATTERY C TO BOTH MAINS.				WISSION KULES		
TO MAIN BUS) 1. EDS AUTO/OFF TO OFF. 2. IF LOSS OF BAT A, THE BAT C TO MAIN B. 3. IF LOSS OF BAT B, THE BAT C TO MAIN B. 4. C. BASED ON FAILURE MODE, CONSIDERATION MILL DE GLEWAN TO CONSIDERATION MILL BE GIVEN TO CONSIDERATION MILL DE GIVEN TO CONSIDERATION MILL DE GIVEN TO CONSIDERATION MILL DE GIVEN TO CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION MILL DE GIVEN TO CANADA AND RECUEUR PORCES ON CONSIDERATION M	REV RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/CO	OMMENTS
ALL C. BASED ON FAILURE MODE, CONSIDERATION MILE CONTINUE MISSION 12-41 LOSS OF TWO ENTRY BAT- TERIES (CUITUT 3 APPS EACH MERS CONTECTED TO MAIN 983) LAUNCH A. CONTINUE MISSION 1. EDS AUTO/OFF TO OFF. 2. ENTER 2-1 POWERED DOWN. ALL BATTERY CHARGER MILL NOT DE CHECKED PRICE TO TIL. ROTATE BATT C AS REQUIRED TO MAIN- TAIN BALANCED BATTERY. BATTERY CHARGER WILL NOT DE CHECKED PRICE TO TIL. ROTATE BATT C AS REQUIRED TO MAIN- TAIN BALANCED BATTERY. ED CATER T.I. FREQUIRED DEDGRIT CAPABILITY IS SOOD BATTS 2 GOOD BATTS HYBRID 68 AH 73 AH SH-RCS 32 AH 37 AH SH-RCS 34 AH 37 A	12-40	(OUTPUT <3 AMPS WHEN TIE		1. EDS AUTO/OFF TO C 2. IF LOSS OF BAT A, C TO MAIN A. 3. IF LOSS OF BAT B,	, TIE BAT	
A 12-42 LOSS OF TWO ENTRY BATTERIES COUTPUT 3 AMPS EACH WE'N CONNECTED TO MAIN BUS) A 12-42 LOSS OF BATTERY CHARGER BATTERY CHARGER WILL NOT BE CHECKED PRIOR TO TILL ROTATE BATT CAR SEQUIRED TO MAIN BUS) BATTERY CHARGER WILL NOT BE CHECKED PRIOR TO TILL ROTATE BATT CAR SEQUIRED TO MAIN MAINS. BATTERY CHARGER WILL NOT BE CHECKED PRIOR TO TILL ROTATE BATT CAR SEQUIRED TO MAIN TILL BATTERY C TO BOTH MAINS. BATTERY CHARGER WILL NOT BE CHECKED PRIOR TO TILL ROTATE BATT CAR SEQUIRED TO MAIN TAIN BALANCED BATTERIES. A. ENTER NEXT BEST PTP LIF REQUIRED DECRBIT CAPABILITY IS LOST AS FOLLOWS: 3 GOOD BATTS GOOD BATTS 15 LOST AS FOLLOWS: 3 GOOD BATTS GOOD BATTS 15 LOST AS FOLLOWS: 4 FARRED BATTS COOD			EO	B. <u>NO-GO FOR TLI</u>	MANEUVER, CON	ITINUE ON
TERIES COUTPUT -3 AMPS EACH MHEN CONNECTED TO MAIN BUS) 1. EDS AUTO/OFF TO OFF. 2. ENTER 2-1 POWERED DOWN. ALL B. ENTER NEXT BEST PTP USE ONE BATTERY ENTRY PROCEDURE. BATTERY CHARGER WILL NOT BE CHECKED PRIOR TO TILI. ROTATE BATT C AS REQUIRED TO MAIN- TAIN BALL-MACED BATTERIES. A. ENTER NEXT BEST PTP IF REQUIRED DEORBIT CAPABILITY IS LOSS OF BATTERY CHARGER CAFTER TLI IS LOSS OF BATTERY CHARGER ED CAFTER TLI IS LOSS OF BATTERY CHARGER LOSS OF BATTERY CHARGER BATTERY CHARGER WILL NOT BE CHECKED PRIOR TO TILI. ROTATE BATT C AS REQUIRED TO MAIN- TAIN BALL-MACED BATTERIES. A. ENTER NEXT BEST PTP IF REQUIRED DEORBIT CAPABILITY IS LOSS OF BATTS 2 COOD BATTS THOSE AND THE MET BATTS THOSE AND THE SECOND BATTS TO CAPTER THE SALLOM FOR UP- RIGHTING AND 18 HRS OF POST- LANDING. B. ENERGY LEVEL REFLECTS NO CSM RESCUE, NO PRE CM SM SEP BATT CONDITIONING AN ARD REDUCED POWER GSN ENTRY WITH TWO BATTS. CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS TO CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER TO CONTROL TO THE CONTROL TO CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTROL TO THE CONTR			ALL	CONSIDERATION WILL BE GIVEN TO CONTINUING NOMINAL	Ξ ,	
BATTERY CHARGER LOSS OF BATTERY CHARGER BATTERY CHARGER WILL NOT BE CHECKED PRIOR TO TLI. ROTATE BATT C AS REQUIRED TO MAINTAIN BALANCED BATTERIES. A. ENTER NEXT BEST PT. IF REQUIRED DEORBIT CAPABILITY IS LOST AS FOLLOWS: 3 GOOD BATTS 2 GOOD BATTS HYBBID 68 AH 73 AH SM-RCS 52 AH 57 AH TLC B. NO-GO LOI IF SUM OF TWO LOWEST BATTS S SEP BATT CONDITIONING AN AREDUCED POWER GREEN ENTRY WITH TWO BATTS. LO C. NO-GO FOR UNDOCK/RNDZ IF SUM OF TWO LOWEST BATTS S AH. CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS A REDUCED POWER CANS BETT POWERED DOWN GRN ENTRY WITH TWO BATTS. CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS S AP AH TULE NUMBERS 12-43 THROUGH 12-49 ARE RESERVED MISSION REV DATE SECTION BATTERY LEVEL SALLOW AN AT SPLASH. AL REPOLICES ALLOW AN AT SPLASH. AL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICES ALLOW AND AT SPLASH. ALL REPOLICE AND AND ATTENDED AT SPLASH. ALL REPOLICE AND AND ATTENDED AT SPLASH. ALL REPOLICE AND AND ATTENDED AT SPLASH. ALL REPOLICE AND AND ATTENDED AT SPLASH. ALL REPOLICE AND AND ATTENDED AT SPLASH. ALL REPOLICE AND AND ATTENDED AT SPLASH ALLOW AND ATTENDED AT SPLASH ALLOW AND ATTENDED AT SPLASH ALLOW AND ATTENDED AT SPLASH ALLOW AND ATTENDED AT SPLASH ALLOW AND ATTENDED AT SPLASH ALLOW AND ATTENDED AT SPLASH AND ATTENDED AT SPLASH	12-4)	TERIES (OUTPUT <3 AMPS EACH WHEN CONNECTED TO		1. EDS AUTO/OFF TO 0 2. ENTER 2-1 POWEREI B. ENTER NEXT BEST PTP USE ONE BATTERY ENTR	B. IF LOSS DURIN MANEUVER, ATT TIE BATTERY	EMPT TO
TLC B. NO-GO LOI IF SUM OF TWO LOWEST BATTS <56 AH. LO C. NO-GO FOR UNDOCK/RNDZ IF SUM OF TWO LOWEST BATTS <1F SUM OF TWO LOWEST BATTS <52 AH. CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS. CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS CONSIDERATION WILL BE GIVEN TO EARLY TOWN EARL	A 12-42	LOSS OF BATTERY CHARGER	EO (AFTER TLI	CHECKED PRIOR TO TLI. ROTATE BATT C AS REQUIRE TAIN BALANCED BATTERIES. A. ENTER NEXT BEST PTP IF REQUIRED DEORBIT IS LOST AS FOLLOWS: 3 GOOD BATTS	ADDITIONAL 5 AMP- AT SPLASH. ALL REDLINES ALLO RIGHTING AND 18 H LANDING. CAPABILITY 2 GOOD BATTS	-HRS GAINED DW FOR UP-
C. NO-GO FOR UNDOCK/RNDZ IF SUM OF TWO LOWEST BATTS SEP BATT CONDITIONING AN A REDUCED POWER SCS ENTR WITH TWO BATTS. CONSIDERATION WILL BE GIVEN TO EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS CONSIDERATION WILL BE GIVEN TO BATT POWERED DOWN GEN ENTRY WITHOUT PRE CM/SM SFP BATT CONDITIONING. RULE NUMBERS 12-43 THROUGH MISSION REV DATE SECTION C. ENERGY LEVEL REFLECTS CS RESCUE WITH NO PRE CM/SM SEP BATT CONDITIONING AN A REDUCED POWER SCS ENTR WITH TWO BATTS. 49 AH WILL ALLOW A TWO BATT POWERED DOWN GEN ENTRY WITHOUT PRE CM/SM SFP BATT CONDITIONING.			TLC	B. <u>NO-GO LOI</u> IF SUM OF TWO LOWEST	B. ENERGY LEVEL NO CSM RESCUE SM SEP BATT (AND REDUCED F	E, NO PRE CM/ CONDITIONING, POWER G&N
EARLY TEI AFTER RNDZ IF SUM OF TWO LOWEST ENTRY BATTS CH9 AH, RULE NUMBERS 12-43 THROUGH 12-49 ARE RESERVED MISSION REV DATE SECTION BATT POWERED DOWN G&N ENTRY WITHOUT PRE CM/SM SFP BATT CONDITIONING. BATT POWERED DOWN G&N ENTRY WITHOUT PRE CM/SM SFP BATT CONDITIONING.			ro	IF SUM OF TWO LOWEST	Z C. ENERGY LEVEL RESCUE WITH N SEP BATT COND A REDUCED PON	REFLECTS C6M NO PRE CM/SM DITIONING AND WER SCS ENTRY
RULE NUMBERS 12-43 THROUGH 12-49 ARE RESERVED MISSION REV DATE SECTION GROUP PAGE AND A MARKET SECTION BOTTER SYSTEM BATTERIES (CHARGER				EARLY TEI AFTER RNDZ OF TWO LOWEST ENTRY	IF SUM BATT POWERED BATTS ENTRY WITHOUT	DOWN G&N T PRE CM/SM
ACCUSE TO A MARKET COME OF THE CONTROL OF THE CONTR			DUGH	-		
ACCUSE OF THE CONTRACT OF THE	MICCION	REV DATE		SECTION	GROUP	PAGE
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REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	12-50	MAIN BUS TIE MOTOR SWITCH FAILURES A. ONE MOTOR SWITCH FAILS OPEN	LAUNCH ALL	A.1. CONTINUE MISSION (A) IF MOTOR SW AA BAT C TO MAIN (B) IF MOTOR SW BABAT C TO MAIN 2. CONTINUE MISSION CLOSE ALTERNATE MOTOR SWITCHES.	BUS A. /C, TIE BUS B. FOR SW	A.2. BATTERIES MUS CHARGED THROU MOTOR SW. LE RLY CB CLOSED CHARGING.	GH OPEN AVE BAT
		B. ONE OR BOTH MOTOR SW FAILED CLOSED	ALL	B. <u>CONTINUE MISSION</u> USE CB'S AS MOTOR SWI	TCHES.	B. IF BOTH MOTOR S FAIL CLOSED, BA CANNOT BE CHARG	TTERIES
	12-51	MAIN BUS SHORTED CAUSING FUEL CELL REVERSE CURRENT DISCONNECT					
		A. FUEL CELL 2 DISCON- NECTS FROM MAIN A	LAUNCH	A.1. CONTINUE MISSION (A) PLACE EDS AUTOOFF. (B) F/C 2 TO BUS A		A.1. >85 AMPS SHOR B WILL CAUSE DISCONNECT DU MALF EPS-3.	REVERSE
				(C) TIE BAT C TO N (D) INVERTER 3 TO 2, MAIN A. (E) POWER DOWN MA	AAIN A. AC BUS		
			ALL	A.2. ENTER NEXT BEST PTF NOT RESTORED POWER DOWN MAIN BUS		A.2. REF MALF PROC	EPS <u>5SR-1</u>
		B. FUEL CELL 2 DISCONNECTS FROM MAIN B	LAUNCH	B.1. CONTINUE MISSION (A) PLACE EDS AUTOOFF. (B) FC 2 TO BUS B (C) TIE BAT C TO N B. (D) INVERTER 3 TO 1, MAIN B.	ONLY. MAIN BUS	B.1. >79 AMPS SHOR A WILL CAUSE DISCONNECT DU	REVERSE
				(E) POWER DOWN MAY (F) TVC GIMBAL DRI -2. (G) GIMBAL MOTOR ((YAW 2, PITCH B OPEN FOLLOW) MOTOR TURN ON	IVE (P,Y) CONTROL 2) BAT ING GIMBAL		
			ALL	B.2. ENTER NEXT BEST PTF NOT RESTORED. POWER DOWN MAIN BUS			
MI	SSION	REV DATE		SECTION	·	GROUP	PAGE
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				MISSION RULES				
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUE	S/NOTES/COM	MENTS
	12-51 (CONT)	C. MAIN BUS SHORTED >25 AMPS AND FUEL CELLS CANNOT BE DISCONNECTED FROM SHORTED BUS.	LAUNCH	C.1. ABORT		TO SH BY	AILURE OF MOD DISCONNECT HORTED BUS IN FC SHORTED BUS IN FC SHORTED BUSY.	FROM NDICATED
			ALL	2. ENTER NEXT BEST PTI BUS NOT RESTORED.	P IF MAIN	cu	FUEL CELL I DITRY SHORTEI REACTANT V	D, CLOSE
	12-52	A. BATTERY BUS SHORTED >5 AMPS	LAUNCH	A.1. CONTINUE MISSION (A) PLACE EDS AUTOOFF.	D/OFF TO	BA	22 AMPS WILL ATTERY BUS VO E < MAIN BUS	OLTAGE TO
				(B) OPEN ASSOCIATE BUS TO BAT BUS				
				(C) TIE BAT C TO A	ASSOCIATED			
			ALL	2. <u>ENTER NEXT BEST PTI</u> IF BUS NOT RESTORE	2	IF PO TO	MOVE POWER IS SHORTED < WER BUS JUS OF ENTRY TO MICES REDUNDANCES	10 AMPS. T PRIOR AINTAIN
		B. BATTERY BUS SHORTED <5 AMPS	ALL	8. <u>CONTINUE MISSION</u> REMOVE POWER FROM BUS FOR MANEUVERS AND EN				
								
	12-53	BATTERY RELAY BUS SHORTED A. SHORT >2.0 AMPS	LAUNCH	A.1. <u>CONTINUE MISSION</u>				l l
		71. 51.0.17 72.0 741 5	ALL	2. ENTER NEXT BEST PTI OPEN BATTERY BUS TO RELAY BUS CB'S.	D BATTERY	A.2. RE	F MALF PROC	EPS-SSR-2
		B. SHORT <2.0 AMPS	ALL	B. <u>CONTINUE MISSION</u>		BAT BAT BAT POST CONS LOST	RELAY BUS AI B CONTINUOUS B POWER ENTE LANDING CB SIDER BATTER FOR MISSION EPS SSR-2	ND CHARGE SLY WITH RY AND OPEN. Y CHARGER
	12-54	LOSS OF ONE BATTERY BUS, MAIN BUS, OR BATTERY RELAY BUS. (UNABLE TO POWER BUS)	LAUNCH ALL	A. CONTINUE MISSION B. ENTER NEXT BEST PTP				
	:	RULE NUMBERS 12-54 THROUGH						
		12-59 ARE RESERVED						
 	SSION	REV DATE		SECTION		GROUP		PAGE
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				MISSION RULES	
REV	RULE.	CONDITION/MALFUNCTIO	N PHASE	RULING	CUES/NOTES/COMMENTS
	12-60	LOSS OF TWO INVERTERS	LAUNCH	A. <u>CONTINUE MISSION</u>	A. REF MALF PROC PLACE REMAINING INVERTER ON BOTH AC BUSES.
			ALL	B. ENTER NEXT BEST PTP	B. CONSIDERATION WILL BE GIVE TO RETAINING LM FOR SYSTEM BACKUP.
	12+61	LOSS OF ONE AC BUS (T PHASES CANNOT BE MAIN >95 VAC)		A. CONTINUE MISSION	
			ALL	B. ENTER NEXT BEST PTP	B. REF MALF PROC <u>EPS-1</u>
	12-62	RULE NUMBERS 12-63 T 12-69 ARE RESERVED	ALL	A. ABORT MODE I OR MODE 1. OPEN DIRECT O2 FOR VENTILATION. 2. IF AFTER MODE II 2-1 PTP. B. ENTER NEXT BEST PTP IF SUITED, REMOVE HE GLOVES. IF TIME PER MOVE SUITS. IF CABIS SURIZED, USE DIRECT CABIN IS REPRESSURIZED. CABIN IS REPRESSURIZED.	DR SUIT A.2. INITIATE CONTINUOUS FC H ₂ PURGE FOR COOLING. B.1. USE LM SYSTEMS (IF AVAILABLE) FOR AC POWER FUNCTIONS TO ENTRY. DEPRES- O, UNTIL OR ATP LMET AND MITS, RE- N DEPRES- O, UNTIL OR SUITAL A.2. INITIATE CONTINUOUS FC H ₂ PURGE FOR CONTINUOUS FC H ₂ POR CSM ONLY, ENTER WITHIN 1-1/2 HOURS.
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V ITEM		INST	RUMENTATION RE	QUIREMENTS		
12-70	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE
	AC BUS 1 ¢A VAC AC BUS 1 ¢B VAC AC BUS 1 ¢C VAC	CC0200V	METER METER METER COMMON	SEPARATE	HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	12-5,6,61
	AC BUS 2 ¢A VAC AC BUS 2 ¢B VAC AC BUS 2 ¢C VAC	CC0203V	METER METER METER METER	SEPARATE	HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	12-5,6,61
	MAIN BUS A VDC MAIN BUS B VDC BAT BUS A VDC BAT BUS B VDC BAT RELAY BUS VDC	CC0206V CC0207V CC0210V CC0211V CC0232V	METER METER METER METER METER	SEPARATE SEPARATE SEPARATE SEPARATE SEPARATE	1 OF 2 MANDATORY HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	12-32,52,20C 12-22
	BAT A CURRENT BAT B CURRENT BAT C CURRENT	CC0222C CC0223C CC0224C	METER METER METER	COMMON COMMON	2 OF 3 MANDATORY	12-4,33,40,41
	FC 1 CURRENT FC 1 O ₂ FLO FC 1 H ₂ FLO	SC2113C SC2141R SC2139R	METER METER METER	COMMON }	1 OF 3 MANDATORY	12-7,31,32,33, 22A
	FC 2 CURRENT FC 2 O ₂ FLO FC 2 O ₂ FLO	SC2114C SC2142R SC2140R	METER METER METER	COMMON }	1 OF 3 MANDATORY	12-7,31,32,33, 22A
	FC 3 CURRENT FC 3 O ₂ FLO FC 3 H ₂ FLO	SC2115C SC2144R SC2141R	METER METER METER	COMMON }	1 OF 3 MANDATORY	12-7,31,32,33, 22A
	BAT CHARGER CURRENT	SC0215C	METER	COMMON	HIGHLY DESIRABLE	
	FC 1 SKIN TEMP FC 2 SKIN TEMP FC 3 SKIN TEMP	SC2084T SC2085T SC2086T	METER METER METER	COMMON COMMON	HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	12 - 22B
	FC 1 COND TEMP FC 2 COND TEMP FC 3 COND TEMP	SC2081T SC2082T SC2083T	METER METER METER	COMMON COMMON COMMON	HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	12 - 228
	FC 1 RAD OUT TEMP FC 2 RAD OUT TEMP FC 3 RAD OUT TEMP	SC2087T SC2088T SC2089T	METER METER METER	COMMON COMMON	HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	12-221
	BAT MANIFOLD PRESS		METER	an	HIGHLY DESIRABLE	~*=== <u></u>
	INV 1 TEMP INV 2 TEMP INV 3 TEMP	CC0175T CC0176T CC0177T	MCWS MCWS MCWS	COMMON COMMON COMMON	HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	g All Performance and compact and compact bearing and compact and compact and compact and compact
	FC 1 PH FC 2 PH FC 3 PH	SC2160X SC2161X SC2162X	TALKBACK TALKBACK TALKBACK	COMMON COMMON COMMON	HIGHLY DESIRABLE HIGHLY DESIRABLE HIGHLY DESIRABLE	12-22E
	NOTE: USE BAT C IN	LIEU OF BATT	FRY WITH LOST TAKET			
MISSION		CTION	- MINI COST 1/431	GROUP		BACE
	JOHN DE	×1 (VI)		I GKOUP		PAGE

13 CSM COMM/ INSTRUMENTATION (SEE SECTION 32)

REV	ITEM		· · · · · · · · · · · · · · · · · · ·				
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14 CSM SEQUENTIAL

		MISSION RULES								
REV	ITEM		GENERAL							
	14-1	LAUNCH								
		THERE ARE NO SEQUENTIAL MALFU	UNCTIONS FOR WHICH LAUNCH WILL BE TERMINATED.							
į	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	H PYRO BUSES AND BOTH LOGIC BUSES ARE REQUIRED.							
	14-4	SEQUENTIAL LOGIC BUS IS CONST A. VOLTAGE <22 VDC AND UNABI SYSTEM A, CD0171X AND/OR B. LOGIC BUS SHORTED >10 AME	LE TO ACTIVATE RCS ENABLE AND/OR SLA SEP RELAYS (CD0170X AND/OR CD0123X CD0124X SYSTEM B)							
	14-5	PYRO BUS IS CONSIDERED FAILED A. SHORTED >10 AMPS B. FAILURE TO PERFORM ANY SE	O IF: EQUENTIAL FUNCTION WITH SUSPECTED FAILED PYRO SYSTEM							
		RULE NUMBERS 14-6 THROUGH 14-9 ARE RESERVED								
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FEC/TSG Form 292 (AUG 68)

REV	ITEM			MANAGEMEN			
	14-10	ARMIN FLIGH THE P	G OF THE SEC T CREW WILL YRO BUSES.	UENTIAL SYSTEM WILL BE PERFORMED WHARM THE LOGIC BUSES AND STAND BY FO	HLE IN OR A GO	CONTACT WITH A GROUND TELEMETRY FROM THE GROUND TO PROCEED WITH	SITE. THE ARMING
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		RULE 14-19	NUMBERS 14-1 ARE RESERVE	1 THROUGH D			
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FEC/TSG Form 292 (AUG 68)

					MISSION RULES			
R	EΥ	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
_		14-20	SEQUENTIAL LOGIC BUS A OR B ≤22 VDC AND UNABLE TO ACTIVATE RCS ENABLE AND/OR SLA SEP RELAYS	SPE	CIFIC MISSION RULES	-	CD0170X AND/OR CD01 A, CD0171X AND/OR C SYSTEM B	23X SYSTEM D0124X
				LAUNCH	A. CONTINUE MISSION ENTER 3-1 IF BUS NOT RESTORED			
				ALL	B. TERMINATE OPERATIONS ENTER NEXT BEST PTP IF NOT RESTORED	∓ βUS		
		14-21	PYRO BUS A OR B <35 VDC A. SHORTED >10 AMPS	LAUNCH	A.1. CONTINUE MISSION		 SHORTS CAN ONLY E USING ENTRY BATTE 	
			7. C. C. C. C. C. C. C. C. C. C. C. C. C.	ALL	2. TERMINATE OPERATIONS ENTER NEXT BEST PTP	<u>5</u>	A.2. USE BATTERY TO PYRO POWER TO BUS	
			B: SHORTED <10 AMPS	ALL	B. <u>CONTINUE MISSION</u>		B. USE BATTERY TIE POWER TO AFFECT	
			C. PYRO BUS NOT SHORTED	LAUNCH	C.1. CONTINUE MISSION	_		
					2. ATTEMPT FUNCTION USI SUSPECTED FAILED BUS	ONLY:		
					(A) IF FUNCTION NOR <u>CONTINUE MISSIC</u>	Σ N		
		1			(B) IF FUNCTION DOE WORK NORMALLY, NEXT BEST PTP			
		14-22	TELEMETRY INDICATES AN EDS VOTE INPUT 1, 2, OR 3	LAUNCH	CONTINUE MISSION		PARAMETERS ARE CD01 CD0133X, AND CD013 ^L TIVELY.	
					A. IF ANY ENTRY BATTERY < EDS AUTO/OFF SWITCH TO	<22 VDC,	A. BAT C VOLTAGE O MONITORED ONBOA	
					B. ALL ENTRY BATTERIES >2 CHECK CORRESPONDING ED CB'S 1, 2, OR 3 CLOSED	os I		
		14-23	LET JETTISON MOTOR DOES NOT FIRE	LAUNCH	CONTINUE MISSION ATTEMPT JETTISON PER CREW LIST EMERGENCY PROCEDURE	CHECK-		
	MIS	SSION	REV DATE	* *************************************	SECT10N		GROUP	PAGE
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REV	RULE	COND	TION/MALFUNCTI	ON	PHASE	RULING		CUES/NOTES/COM	MENTS	
	14-24	SMJC	ACTIVATES PREMA	TURELY	ALL .	ENTER NEXT BEST PTP A. TERMINATE OPERATIONS DOWN AFFECTED MAIN BU NOT ARM AFFECTED PYRO	IS. DO	A. USE GOOD SEQUENTEM. IF IN CONMSFN, ARMING OF BUSES WILL INDIGMAIN BUS MUST BUDOWN. MAIN AIL CM/SM SEP. MAIL SYSTEM B CM/SM IS ACTIVATED.	FACT WITH LOGIC CATE WHICH E POWERED F SYSTEM A N B IF	
						B. IF UNDOCKED, RETURN 1 AND PERFORM CSM/LM F) SEP C. REPOWER AFFECTED MAIN AFTER CM/SM SEP	NAL	B. USE GOOD SEQUEN	TIAL SYSTEM	
	14-25	ACTIVATED CM RCS PRESS LOGIC RELAYS.			ALL	CONTINUE MISSION A. PRIOR TO CM RCS PRESS NOT ARM RESPECTIVE PY (FOR BOTH INDICATIONS SLA SEP WITH SECS ARN OPEN.) B. AT CM RCS PRESS: ARN RESPECTIVE PYRO BUS	RO BUS PERFORM CB'S	CD0173X AND/OR CD0174X		
	14-26		/ATED SLA DEPLOY CRELAYS		ALL	CONTINUE MISSION A. PRIOR TO SLA SEP: DO NOT ARM RESPECTIVE PYRO BUS B. FOR SLA SEP: ARM RESPECTIVE PYRO BUS FIRST		CD0123X AND/OR CD01	24X	
	14-27		E TO PERFORM SL	A	TLC	ENTER NEXT BEST PTP		REF MR		
A	14-28	NETWORK FOR LOGIC OR PYRO BUS 'VOLTS MEASUREMENTS RULE NUMBERS 14-29 THROUGH 14-39 ARE RESERVED		PYRO	ALL	CONTINUE MISSION DO NOT ARM AFFECTED SYSTEM UNTIL SEQ GO/NO-GO PRIOR TO ENTRY UNLESS OTHER SYSTEM FAILS.		ARMING SYSTEM WITH VOLTAG >18 VDC WILL RESULT IN PERMANENT LOSS OF ALL ANA TELEMETRY PARAMETERS.		
MI	SSION	REV	DATE			SECTION		GROUP	PAGE	
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
	14~40	ACTIVATED APEX JETTISON LOGIC RELAYS	ALL	ENTER NEXT BEST PTP DO NOT ARM PYRO BUSES UNI MALFUNCTION HAS BEEN ISOL		DETECTED AT SECS POL (CD0230X AND CD023X)	
	14-41	ACTIVATED DROGUE CHUTE DEPLOY LOGIC RELAYS	ALL	ENTER NEXT BEST PTP DO NOT ARM PYRO BUSES UNI MALFUNCTION HAS BEEN ISOL		MAY BE DETECTED AT / (CE0001X AND/OR CE0	
	14-42	ACTIVATED PILOT CHUTE DEPLOY LOGIC RELAYS	TEC	ENTER NEXT BEST PTP DO NOT ARM PYRO BUSES UNI MALFUNCTION HAS BEEN ISOL		DETECTED AT SECS POPERIOR TO ENTRY (CEOCEO004X) WITH ELS BUCB CLOSED	003X AND/OR
					,		-
		RULE NUMBERS 14-43 THROUGH					
	<u> </u>	14-49 ARE RESERVED					
IM	NOTES	REV DATE		SECTION		GROUP	PAGE
			SEQUENTIAL		SPECIFIC	-	14-5
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				INS	KUMENTAL	ION REQUIREME	N15]	MISSION RULE	<u> </u>
A	1450	MEAS DE	SCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	REFERENCE	.
			JS A VOLTS JS B VOLTS	CD0005V CD0006V		}	1 OF 2 M	14-21 14-21	
			GIC BUS A VO				HD HD	14-20 14-20	
		APEX JE APEX JE		CD0230X CD0231X			HD HD	14-40 14-40	
			DEPLOY A DEPLOY B	CE0001X CE0002X			HD HD	14-41 14-41	
			CHUTE DEPLOY CHUTE DEPLOY				HD HD	14-42 14-42	
1			P RELAY A S ACTIVATE A	CD0123X CD0170X			HD HD	14-26 	
			P RELAY B S ACTIVATE B	CD0124X CD0171X			HD HD	14-26 	
			PRESS SIG A		-		HD HD	14-25 14-25	
			SEP RELAY A SEP RELAY B	CD0023X CD0024X			HD HD		
		CREW AI		CD0130X CD0131X			HD HD		
		EDS AB	ORT VOTE 1 ORT VOTE 2 ORT VOTE 3	CD0132X CD0133X CD0134X			HD HD HD	14-22 14-22 14-22	
		EDS AB		CD0135X CD0136X			HD HD		
ì			HUTE DISC A HUTE DISC B	CE0321X CE0322X		J	HD HD		
			ORT REQ A ORT REQ B	BS0080X BS0081X			HD HD		
		DOCKIN	G PROBE TEMP	CS0220T		- -	HD		
	1		LOCK RING	CD1154X			HD	19-23	
		SEP RE CSM-LM SEP RE	LOÇK RING	CD1155X		Julius 1	HD	19-23	
		LM CUR	RENT	SC2962C	METER	COMMON	HD	-	
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15 CSM GUIDANCE AND CONTROL

		MISSION RULES
REV	ITEM	GENERAL
	15-1	LAUNCH
		THERE ARE NO FAILURES OF THE CSM GUIDANCE AND CONTROL SYSTEM WHICH ARE CAUSE FOR ABORT.
}		
	15-2	EARTH ORBIT PHASE
		A. IN ORDER TO CONTINUE THE MISSION PAST THE NEXT BEST PTP, THE GUIDANCE AND CONTROL SYSTEMS MUST PROVIDE SPS CRITICAL BURN CAPABILITY AND ONE BACKUP DEORBIT METHOD (SM OR HYBRID). THE FOLLOWING MINIMUM CAPABILITIES MUST BE AVAILABLE:
}		1. ATTITUDE CONTROL: DIRECT RCS AND RATE DAMPING IN EACH AXIS.
		2. TVC (CRITICAL BURNS): ONE TVC SERVO LOOP IN EACH AXIS AND ONE TVC CONTROL MODE (ACCEL CMD EXCLUDED).
		3. BACKUP DEORBIT: AS LONG AS ENOUGH PROPELLANT IS AVAILABLE FOR AN SM DEORBIT, THE G&C SYSTEMS MUST PROVIDE THAT CAPABILITY. IF SM DEORBIT IS NOT POSSIBLE DUE TO LACK OF PROPELLANT OR A SYSTEMS FAILURE, THE G&C SYSTEMS MUST PROVIDE CAPABILITY FOR A HYBRID DEORBIT.
		(A) SM DEORBIT REQUIREMENTS:
		- TRANSLATION CAPABILITY - ONE OPERATIONAL FDAI - RATE DAMPING IN ALL THREE AXES (DAP OR SCS)
		(B) HYBRID DEORBIT REQUIREMENTS:
		- ALL SM DEORBIT REQUIREMENTS (RATE DAMPING MUST BE SCS) - OPERATIONAL, IMU, CMC, AND MAIN DSKY - TWO OPERATIONAL RHC'S
		B. IN ORDER TO PERFORM A NON-CRITICAL BURN AFTER THE STORAGE TANKS ARE EMPTY, THE G&C SYSTEMS MUST PROVIDE THE CAPABILITY TO EXECUTE AN ULLAGE MANEUVER BY EITHER CMC AUTO (RCS DAP), SCS AUTO, OR DIRECT ULLAGE.
		C. IN ORDER TO COMMIT TO THE TRANSLUNAR COAST PHASE, THE GUIDANCE AND CONTROL SYSTEMS MUST PROVIDE SPS NON-CRITICAL BURN CAPABILITY. THE FOLLOWING MINIMUM CAPABILITIES MUST ALSO BE AVAILABLE TO BE GO FOR TLI:
		1. ATTITUDE CONTROL: DIRECT RCS AND RATE DAMPING IN EACH AXIS.
		2. TVC: TWO SERVO LOOPS AND BOTH GEN AND ONE SCS TVC CONTROL MODES (ACCEL CMD EXCLUDED)
		3. GEN: CMC, IMU, AND MDC DSKY FULLY OPERATIONAL AND OPTICS CAPABLE OF ALIGNING PLATFORM.
		4. <u>DISPLAYS</u> : ONE OPERATIONAL FDAI.
		5. ATTITUDE REFERENCE: REDUNDANT ATTITUDE SOURCES ARE REQUIRED FOR ENTRY.
	15-3	TRANSLUNAR COAST
	:	IN ORDER TO CONTINUE THE MISSION PAST THE NEXT BEST PTP, THE GUIDANCE AND CONTROL SYSTEMS MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITIES:
		A. ATTITUDE CONTROL: DIRECT RCS AND RATE DAMPING IN EACH AXIS.
		B. RCS TRANSLATION: X-AXIS VIA AUTO COILS OR DIRECT ULLAGE PUSHBUTTON.
		c. ATTITUDE REFERENCE: REDUNDANT ATTITUDE REFERENCE SOURCES ARE REQUIRED FOR ENTRY.
MI	SSION	REV DATE SECTION GROUP PAGE
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[c=	7.700	MISSION RULES						
REV	ITEM							
	15-4	LOI, LUNAR ORBIT 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 FOLLOWING MINIMUM CAPABILITIES MUST BE AVAILABLE BEFORE COMMITTING TO OR CONTINUING LUNAR ORBIT.						
		1. ATTITUDE CONTROL: DIRECT RCS AND RATE DAMPING IN EACH AXIS.						
		2. TVC: BOTH SERVO LOOPS AND TWO TVC CONTROL MODES (ACCEL CMD EXCLUDED).						
		3. <u>G&N</u> : THE G&N MUST BE FULLY OPERATIONAL WITH THE EXCEPTION OF OPTICS AND NAV DSKY. OPTICS MUST BE CAPABLE OF ALIGNING PLATFORM.						
		4. RCS TRANSLATION: X-AXIS VIA AUTO COILS OR DIRECT ULLAGE PUSHBUTTON.						
		B. IN ORDER TO PERFORM A NON-CRITICAL BURN THE G&C SYSTEMS MUST PROVIDE THE CAPABILITY TO EXECUTE AN ULLAGE MANEUVER BY EITHER CMC AUTO (RCS DAP), SCS AUTO, OR DIRECT ULLAGE.						
	15-5	DOCKED SPS MANEUVERS						
	19-9	THE GUIDANCE AND CONTROL SYSTEM MUST PROVIDE A MINIMUM OF ONE TVC SERVO LOOP IN EACH AXIS AND ONE TVC CONTROL MODE TO ALLOW DOCKED SPS MANEUVERS.						
	15.6	INIDOCKED						
	15-6	UNDOCKED THE UNDOCKED PHASE WILL BE DELETED OR TERMINATED IF THE G&C SYSTEMS CANNOT PROVIDE REDOCKING CAPABILITY						
		THE GREE SYSTEMS MUST PROVIDE DIRECT RCS, RATE DAMPING AND TRANSLATION CAPABILITY IN EACH AXIS FOR DOCKING/UNDOCKING CONTROL.						
	15-7	RENDEZVOUS						
		THE RENDEZVOUS PHASE WILL BE DELETED IF THE G&C SYSTEM CANNOT PROVIDE AN SPS CRITICAL BURN CAPABILITY. IN ADDITION, THE GUIDANCE AND CONTROL SYSTEMS MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITIES FOR LM RESCUE:						
		OPERATIONAL OPTICS SUBSYSTEM						
		ONE DSKY TRANSLATION CAPABILITY RATE DAMPING IN ALL THREE AXES OPERATIONAL IMU AND CMC						
		ONE OPERATIONAL RHC ONE OPERATIONAL FDAI DIRECT RCS						
	,							
	,	RULES 15-8 THROUGH 15-9 ARE RESERVED.						
MI	SSION	REV DATE SECTION GROUP PAGE						
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		MISSION RULES
REV	ITEM	SYSTEMS MANAGEMENT
]	
1	15-10	ATTITUDE CONTROL: CSM IN ACTIVE RCS CONTROL; LM WILL NOT BE IN ACTIVE ATTITUDE HOLD.
		LM IN ACTIVE RCS CONTROL; CSM WILL NOT BE IN ACTIVE ATTITUDE HOLD.
		FOR DOCKED ACTIVITIES AFTER OPENING THE APS INTERCONNECT (BOTH VEHICLES IN
		ACTIVE RCS CONTROL), THE CSM MUST BE IN A TIGHTER DEADBAND THAN THE LM.
	15-11	PIPA AND IRIG BIAS WILL BE UPDATED WHEN ACTUAL BIASES DIFFER FROM VALUES IN CMC ERASABLE BY 0.007 FT/SEC
		AND 0.075 DEG/HR RESPECTIVELY.
	15-12	AV COUNTER DRIFT
A .	1,5-12	
		SHOULD THE ΔV COUNTER DRIFT BE >0.01 FT/SEC 2 FOR AN RCS MANEUVER, THE V_c SETTING WILL BE APPROPRIATELY BIASED. SHOULD THE DRIFT BE >0.1 FT/SEC 2 , THE EMS WILL BE CONSIDERED FAILED.
		and the state of t
	15-13	DAP INITIALIZATION
		MANEUVER AS MONITORED ON TELEMETRY. IF THE PREVIOUS MANEUVER WAS SCS CONTROLLED, IF
		THE PREVIOUS MANEUVER WAS GEN CONTROLLED, THE CMC STORED VALUES WILL BE USED. TRIMS WILL BE REINITIALIZED FROM THE GROUND AFTER EACH VEHICLE CONFIGURATION CHANGE AND AFTER
		EACH WEIGHT UPDATE. TRIMS MUST BE UPDATED WHEN GROUND COMPUTED VALUES DIFFER FROM CMC
		STORED VALUES BY 0.5 DEGREE.
		CSM, LM WEIGHT: WILL BE UPDATED WHEN GROUND COMPUTED VALUES DIFFER FROM CMC STORED VALUES BY 1.0
i i		PERCENT. WEIGHTS MUST BE UPDATED WHEN GROUND VALUES DIFFER FROM CMC VALUES BY 10.0 PERCENT.
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		RULE NUMBERS 15-14 THROUGH
		15–19 RESERVED.
MI	SSION	REV DATE SECTION GROUP PAGE
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		A 4/23/69 MANAGEMENT 15-3

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SECTION 15 - GUIDANCE AND CONTROL - CONTINUED

		00/01/7/01/01/01		MISSION RULES	
REV	RULE	CONDITION/MALFUNCTION	PHASE.	RULING	CUES/NOTES/COMMENTS
			SPECI	FIC MISSION RULES]
	15-20	LOSS OF EITHER BMAG 1 OR 2 IN EITHER PITCH OR YAW CHANNEL		CONTINUE MISSION	A. REF MALF PROC B. NO SCS AUTO TVC C. IF IN YAW CHANNEL, AFTER .05G, RSI IS USABLE IF REMAINING GYRO IS SELECT FOR RATE. RSI MUST BE REALIGNED IN ADDITION TO THE ABOVE, FOR YAW FAILU AFTER .05G.
	15-21	LOSS OF BOTH BMAG 1 AND 2 IN EITHER PITCH OR YAW CHANNEL	LAUNCH	A. CONTINUE MISSION	A. MTVC ACCEL CMD IS ONLY MODE III OR MODE IV SPS CONTROL MODE.
			TLC	B. <u>NO-GO FOR LOI</u>	
			RNDZ	C. CONTINUE MISSION	
			ALL OTHERS	D. TERMINATE PHASE AND ENTER NEXT BEST PTP	
	i.		ENTRY	E. <u>CONTINUE MISSION</u>	E. RSI AND SCS FDAI ROLL UNUSABLE WITH YAW CHANNE FAILURES.
	15-22	LOSS OF ROLL BMAG			
	17-22	A. NUMBER ONE	ALL	A. <u>CONTINUE MISSION</u>	A.1. MANUAL ROLL ATTITUDE CONTROL REQUIRED IN AL SCS MODES.
		B. NUMBER TWO	ALL	B. CONTINUE MISSION	2. NO SCS FDA1 ROLL. RS1 VALID. B.1. USE OF ATT 1/RATE 2 AN LIM CYCLE MAY PROVIDE RATE DAMPED ATTITUDE HOLD WHEN RCS DAP IS N USED. GYRO PACKAGE 2 MUST BE POWERED DOWN T EFFECT ATTITUDE HOLD I FAILURE IS HARDOVER.
					2. SELECTION OF RATE 1 WI PROVIDE BOTH RSI AND S FDAI ROLL FOR ENTRY. RSI MUST BE REALIGNED FOR ROLL FAILURE AFTER .05G.
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				WHZ	231OM KOTE2			
REV	RULE	CONDITION/MALFUNCTION	PHASE		RULING		CUES/NOTES/CO	MMENTS
	15-23	LOSS OF BOTH ROLL BMAG'S	LAUNCH	Α.	CONTINUE MISSION			
			TLC	в.	NO-GO FOR LOI			
			LO/UN- DOCKED	c.	CONTINUE MISSION			
			RNDZ	D.	CONTINUE MISSION			
}			ALL OTHERS	E.	TERMINATE PHASE AND E	NTER NEXT		
			ENTRY	F.	CONTINUE MISSION		F. NO SCS FDAI RO AVAILABLE	LL OR RSI
	15-24	LOSS OF EITHER TVC SERVC LOOP IN EITHER PITCH OR YAW AXIS					MAINTAIN 20 LBS// FOR HARDOVER RECUNDOCKED AND AXIS FOR HARDOVE FOR DOCKED SPS M	OVERY FOR _LBS/QUAD/ R RECOVERY
			LAUNCH/ EO	Α.	CONTINUE ALTERNATE EO MISSION SELECT 1 OR 2 ON TVC DRIVE SWITCH IN APPRO AXIS	GIMBAL		
			TLC	В.	NO-GO FOR LOI			
			RNDZ	c.	CONTINUE MISSION		C. DO NOT STAGE L	м .
			ALL OTHERS	D.	TERMINATE PHASE AND E NEXT BEST PTP	NTER		
	15-25	LOSS OF BOTH TVC SERVO LOOPS	LAUNCH	Α.	CONTINUE MISSION		A.1. REF MALF PRO 2. NO MODE III BILITY. LIM POINT CONTRO III OR IV WI	OR IV CAPA- IITED LANDING
	,		EO	в.	ENTER NEXT BEST PTP RCS DEORBIT			
	l		TLC	c.	NO-GO FOR LOI			
			RNDZ	D.	CONTINUE MISSION		D. DO NOT STAGE L	м
			ALL OTHERS	Ε.	TERMINATE PHASE AND E NEXT BEST PTP	NTER		
	15-26	LOSS OF PROPORTIONAL CO	V-				,	
		A. EITHER RHC	ALL	Α.	CONTINUE MISSION USE REMAINING RHC			
		B. BOTH RHC'S	ALL	в.	CONTINUE MISSION USE DIRECT RCS OR ACC FOR MANUAL MANEUVERS	CEL CMD ,	B. NO MTVC RATE C CMD CAPABILITY	
MI	SSION	REV DATE		SECT	ION	······································	GROUP	PAGE
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	MISSION RULES							
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS	
	15-27	LOSS OF DIRECT RCS CONTROFROM:	oL			REF MALF PROC SC	:s	
		A. EITHER RHC	ALL	A. CONTINUE MISSION	ļ			
		B. BOTH RHC'S	LAUNCH	B.1. CONTINUE MISSION	ĺ			
		B. DOTH RIC 3	RNDZ	2. CONTINUE MISSION				
				1		D 7 FATURE WOLA	TEC DIDECT	
			ALL OTHERS	3. TERMINATE PHASE AND NEXT BEST PTP) ENIER	B.3. FAILURE VIOLA RCS REQUIREME		
	15-28	COMPLETE LOSS OF AUTO ATTITUDE CONTROL IN PITCH AND YAW CHANNELS.	1			REF MALF PROC SC SUSPECTED FAILUR BE AUTO INHIBIT	E WOULD	
		A. CONTROL IS REGAINED BY OPENING EMS CB'S.	ALL	A. CONTINUE MISSION AFTER SM JETTISON EMS REENABLED WITHOUT LOS AUTO RCS.				
	' '	B. CONTROL IS REGAINED BY PLACING S/C CONTROL SWITCH TO CM	ALL	B. CONTINUE MISSION		B. NO SCS ATTITUDE CONTROL	OR TVC	
		C. CONTROL IS NOT	RNDZ	C.1. CONTINUE MISSION				
		REGAINED	ALL OTHERS	2. TERMINATE PHASE AND NEXT BEST PTP USE DIRECT ULLAGE ADDIRECT CS.		C.2. FAILURE VIOLA DAMPING REQUI		
		-				and which was a supplied to the supplied to th	·	
	15-29	LOSS OF FLIGHT DIRECTOR ATTITUDE INDICATORS				REF MALF PROC SC	:s	
		A. ONE	ALL	A. CONTINUE MISSION				
		в. вотн	LAUNCH	B.1. CONTINUE MISSION				
			TLC	2. <u>NO-GO FOR LOI</u>				
			RNDZ	3. CONTINUE MISSION				
	į		ALL OTHERS	4. TERMINATE PHASE AND NEXT BEST PTP	<u>ENTER</u>	4. USE WINDOW REF.		
		·				·		
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		FINAL 4/15/69 G					L <u>. </u>	

	MISSION RULES								
REV	RULE	CONDITION/MALFUNCT	ION PHASE	RULING	CUES/NOTES/COM	MENTS			
	15-30	LOSS OF AC1 ¢A			LOSS OF AC1 \$\phi A F THE LOSS OF: A. REDUNDANT SE POWER, BOTH LOOPS MUST E BY THE SAME	RVO LOOP I SERVO BE POWERED			
					B. PROPORTIONAL CONTROL FROM RHC'S. ALL TIONAL CONTR RHC #1. C. FDAI #1 D. GYRO ASSEMBI E. SCS TOTAL AT ERROR F. SCS TOTAL AT G. SCS AUTO TVO H. SCS MINIMUM CAPABILITY I. SCS ATTITUDE RATE DAMPING J. GPI P&Y DRIV	ATTITUDE A BOTH PROPOR- ROL FROM Y #1 TTITUDE C CAPABILITY IMPULSE E CONTROL			
					• IN EARTH ORBIT, AC1 PRECLUDES HY DEORBIT AND SUB. REMAINING DEORB! TO A SINGLE FAIL \$\phiA).	/BRID JECTS BOTH IT METHODS			
			LAUNCH	A. CONTINUE MISSION					
			TLC	B. NO-GO FOR LOI					
			RNDZ	C. CONTINUE MISSION	C. DO NOT STAGE LA	1.			
			ALL OTHERS	D. TERMINATE PHASE AND ENTER NEXT BEST PTP					
	15-31	LOSS OF AC2 ¢A			• LOSS OF AC2 ¢A F	RESULTS IN			
	·				A. REDUNDANT SE POWER B. ALL PROPORT CONTROL C. FDAI #2 D. GYRO ASSEMBLE. SCS PITCH AFTOTAL ATTITUTE. ALL SCS TVC (AUTO, RATE CMD)	IONAL _Y #2 ND YAW JDE CAPABILITY			
					G. RSI H. GPI P&Y DRIV				
					AC2 RESULTS IN / DEORBIT METHODS SUBJECTED TO A S FAILURE (AC1 \$A)	ALL THREE BEING SINGLE			
			LAUNCH	A. CONTINUE MISSION					
			TLC	B. NO-GO FOR LOI					
			RNDZ	C. CONTINUE MISSION	C. DO NOT STAGE LA	1.			
			ALL OTHERS	D. TERMINATE PHASE AND ENTER NEXT BEST PTP					
	SSION	REV DATE		SECTION	GROUP	PAGE			
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	MISSION RULES							
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS	
	15-32	LOSS OF ORBIT RATE DISPLAY (ORDEAL) EARTH AND LUNAR	ALL	CONTINUE MISSION		REF MALF PROC SCS		
	15-33	LOSS OF ENTRY MONITOR SYSTEM	ALL	CONTINUE MISSION		REF MALF PROC SCS	·····	
	15-34	GROUND AT EITHER SPS SOL DRIVER OUTPUT AND UNABLE TO REMOVE.				● REF MALF PROC SC	CS	
			LAUNCH	A. CONTINUE MISSION				
	:		EARTH ORBIT	B. CONTINUE ALTERNATE E MISSION. USE OTHER BANK FOR ENGINE OPER	SPS			
			TLC	C. NO-GO FOR LOI				
			RNDZ	D. CONTINUE MISSION				
		·	ALL OTHERS	E. TERMINATE PHASE AND NEXT BEST PTP	ENTER			
	15-35	LOSS OF TRANSLATION HAND CONTROLLER	LAUNCH EARTH	A. CONTINUE MISSION B. ENTER NEXT BEST PTP		B. VIOLATES BOTH S		
			ORBIT	D. HALL REST TH		BRID DEORBIT MI REQUIREMENTS.		
1			TLC	C. CONTINUE MISSION				
			LO	D. NO-GO FOR UNDOCKING PERFORM ALTERNATE LO	MISSION	D. VIOLATES LM RES MINIMUM REQUIRE	SCUE MENTS.	
			UNDOCKED	E. <u>DOCK</u>		•		
			RNDZ	F. CONTINUE MISSION				
		RULE NUMBERS 15-36 THROUGH 15-49 ARE RESERVED.						
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		291 (AUG 68)	-					

LAUNCH A. CONTINUE MISSION EO B. CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE TLC C. NO-GO FOR LOI LO D. NO-GO FOR UNDOCKING P. REF • REF	CUES/NOTES/COMMENTS MALF PROC G&C COLATES HYBRID DEORBIT INIMUM REQUIREMENTS.
COMPUTER LAUNCH A. CONTINUE MISSION EO B. CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE TLC C. NO-GO FOR LOI LO D. NO-GO FOR UNDOCKING PERFORM ALTERNATE LO MISSION UNDOCKED E. DOCK RNDZ F. CONTINUE MISSION	OLATES HYBRID DEORBIT NIMUM REQUIREMENTS.
B. CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE TLC C. NO-GO FOR LOI LO D. NO-GO FOR UNDOCKING PERFORM ALTERNATE LO MISSION UNDOCKED E. DOCK RNDZ F. CONTINUE MISSION	NIMUM REQUIREMENTS.
IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE TLC C. NO-GO FOR LOI LO D. NO-GO FOR UNDOCKING PERFORM ALTERNATE LO MISSION UNDOCKED E. DOCK RNDZ F. CONTINUE MISSION	NIMUM REQUIREMENTS.
LO D. NO-GO FOR UNDOCKING PERFORM ALTERNATE LO MISSION MI UNDOCKED E. DOCK RNDZ F. CONTINUE MISSION	
PERFORM ALTERNATE LO MISSION MI UNDOCKED E. <u>DOCK</u> RNDZ F. <u>CONTINUE MISSION</u>	
RNDZ F. CONTINUE MISSION	
ENTRY G. PERFORM BACKUP ENTRY	
15-51 LOSS OF DSKY • REF	MALF PROC G&C
A. EITHER MDC OR LEB ALL A. CONTINUE MISSION DSKY	
	VIOLATES HYBRID DEORBIT MINIMUM REQUIREMENTS
TLC 2. NO-GO FOR LOI	
	VIOLATES LM RESCUE MINIMUM REQUIREMENTS
UNDOCKED 4. DOCK	
RNDZ 5. CONTINUE MISSION	
ENTRY 6. PERFORM BACKUP ENTRY	
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	MISSION RULES									
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS					
	15–52	CSM WARNING RELAY IN NA DSKY CLOSED	V		• CONSTITUTES LOSS OF PIPA'S GEN TVC, ENTRY GUIDANCE AND FINE ALIGN.					
			LAUNCH	A. CONTINUE MISSION						
			EO	B. CONTINUE ALTERNATE EC IF BOTH SPS AND SM DE CAPABILITY AVAILABLE	MISSION B. PIPA'S ARE REQUIRED FOR AV SENSING IN HYPRID DEORBIT.					
			TLC	C. NO-GO FOR LOI	•					
			LO	D. <u>NO-GO FOR UNDOCKING</u> PERFORM ALTERANATE LO	D. VIOLATES LM RESCUE MISSION MINIMUM REQUIREMENTS					
			UNDOCKED	E. DOCK						
		·	RNDZ	F. CONTINUE MISSION						
- 1			ENTRY	G. PERFORM BACKUP ENTRY						
	15-53	LOSS OF INERTIAL SUB- SYSTEM			• REF MALF PROC G&C					
			LAUNCH	A. CONTINUE MISSION						
			EO	B. CONTINUE ALTERNATE EC	ORBIT B. VIOLATES HYBRID DEORBIT MINIMUM REQUIREMENTS					
			TLC	C. NO-GO FOR LOI						
			LO	D. <u>NO-GO FOR UNDOCKING</u> PERFORM ALTERNATE LO	D. VIOLATES LM RESCUE MISSION MINIMUM REQUIREMENTS					
-			UNDOCKED	E. <u>DOCK</u>						
)			RNDZ	F. CONTINUE MISSION						
ŀ			ENTRY	G. PERFORM BACKUP ENTRY						
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LAMOY D. CONTINUE MISSION O. CONTINUE ALGEBRATE DO MISSION OR MALE ALGEBRATE DO MISSION OR MISSION OR MALE ALGEBRATE DO MISSION OR MALE ALGEBRATE DO MISSION OR MALE ALGEBRATE DO MISSION OR MALE ALGEBRATE DO MISSION OR M					771	ISSION RULES			<u> </u>
LAUNCH EO B. CONTINUE MISSION CONTINUE ALIERANTE EO MISSION USE COULD ALIGNMENT PROCEDURE (COAS) TLC LINAR OBIT 19-55 LOSS OF OPTICS SUBSYSTEM COUPLING DAYA UNIT DIGITAL TO ANALOG CONTRITER LAUNCH EO B. CONTINUE MISSION EO CONTINUE MISSION FOR THE MISS	REV	RULE	CONDITION/MALFUNCTION	PHASE	<u> </u>	RULING		CUES/NOTES/CON	MENTS
LAINGY ED B. CONTINUE MISSION ED CONTINUE ALTERNATE ED MISSION LUNAR COACH ALIGNMENT PROCEDURE (COAS) TLC C. NO-60 FOR LOI LUNAR COACH ALIGNMENT PROCEDURE (COAS) TLC LUNAR COACH ALIGNMENT PROCEDURE (COAS) TLC LUNAR COACH ALIGNMENT PROCEDURE ED MO-60 FOR LOI LUNDOCKED RNDZ F. CONTINUE MISSION PREF MALE PROC GAC CONTINUE MISSION A. CONTINUE MISSION LAUNCH ED A. CONTINUE MISSION FOR THIS SEARCH SECRET TO MISSION LAUNCH ED D. NO-60 FOR LOID LO D. NO-60 FOR LOID LO D. NO-60 FOR LOID LO D. NO-60 FOR LOID RNDZ F. CONTINUE MISSION WADDOCKED RNDZ F. CONTINUE MISSION RNDZ F. CONTINUE MISSION RNDZ F. CONTINUE MISSION RNDZ F. CONTINUE MISSION RNDZ R		15-54	LOSS OF OPTICS SUBSYSTEM					• REF MALF PROC G&C	
EO B. CONTINUE ALTERNITE EO MISSION UNDOCCED E. DOCC RNDZ F. CONTINUE MISSION UNDOCCED B. CONTINUE MISSION UNDOCCED B. CONTINUE MISSION UNDOCCED B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE MISSION E. DOCC DAP RNDZ F. CONTINUE MISSION RND				LAUNCH	l _A ,	CONTINUE MISSION			
USE BACKUP ALIGNMENT PROCEDURE (COAS) TLC C, NO-GO FOR LOI LIANR OBBIT UNDOCKED E, DOOK RNDZ F, CONTINUE MISSION I S-55 LOSS OF OPTICS SUBSYSTEM COUPLING DATA UNIT DIGITAL TO ANALOG CONVERTER LAUNCH ED B, CONTINUE MISSION EO CONTINUE MISSION FOR CONTINUE MISSION I CONTINUE MISSION I REF MALF PROC GGC C CONSTITUTES LOSS OF TVC A. CONTINUE MISSION I CONTINU							MISSION		
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OBBIT UNDOCKED E. DOCK RNDZ F. CONTINUE MISSION 15-55 LOSS OF OPTICS SUBSYSTEM COMPLINE DATA UNIT DIGITAL TO ANALOG CONVENTER LANCH EO B. CONTINUE MISSION EO B. CONTINUE MISSION F. CONTINUE MISSION F. CONTINUE MISSION F. CONTINUE MISSION F. CONTINUE MISSION F. CONTINUE MISSION F. CONTINUE MISSION F. CONTINUE MISSION F. CONTINUE MISSION RNDZ F	ļ		1:	TLC	c.	NO-GO FOR LOI			
RNDZ F. CONTINUE MISSION 15-55 LOSS OF OPTICS SUBSYSTEM COUPLINS DATA UNIT DIGITAL TO ANALOG CONVERTER LAUNCH EO B. CONTINUE MISSION EO B. CONTINUE MISSION IT BOTH SPS AND SM DEORSIT CPARELITY AVAILABLE LO D. NO-GO FOR LOU LO D. NO-GO FOR LOU LO D. NO-GO FOR LOU RNDZ F. CONTINUE MISSION RNDZ F. CONTINUE MISSION RNDZ F. CONTINUE MISSION RULE NUMBERS 15-56 THROUGH 15-59 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE					D.	NO-GO FOR UNDOCKING PERFORM ALTERNATE LO	MISSION		
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CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE ALTERNATE EO MISSION FOR UNDOCKED CONSTITUTES LOSS OF TVC DAP CONSTITUTES LOSS OF TVC DAP CONSTITUTES LOSS OF TVC CONDENS CONTINUE MISSION CON			·	RNDZ	F.	CONTINUE MISSION			
CONTINUE MISSION EO B. CONTINUE MISSION EO B. CONTINUE ALTERNATE EO MISSION FOR UNDOCKED CONSTITUTES LOSS OF TVC DAP CONSTITUTES LOSS OF TVC DAP CONSTITUTES LOSS OF TVC CONDENS CONTINUE MISSION CON									
LAUNCH A. CONTINUE MISSION EO B. CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE TLC C. NO-GO FOR LOT LO D. NO-GO FOR UNDOCKINS PERFORM ALTERNATE LO MISSION UNDOCKED E. DOCK RNDZ F. CONTINUE MISSION RULE NUMBERS 15-56 THROUGH 15-59 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE		15-55	COUPLING DATA UNIT DIGITA						
B. CONTINUE ALTERNATE EO MISSION IF BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE TLC C. NO-GO FOR LOI LO D. NO-GO FOR UNDOCKING PERFORM ALTERNATE LO MISSION UNDOCKED E. DOCK RNDZ F. CONTINUE MISSION RULE NUMBERS 15-56 THROUGH 15-59 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE	1		TO ANALOG CONVERTER						OF TVC
TIE BOTH SPS AND SM DEORBIT CAPABILITY AVAILABLE TLC C. NO-GO FOR LOI LO D. NO-GO FOR UNDOCKING PERFORM ALTERNATE LO MISSION UNDOCKED E. DOOK RNDZ F. CONTINUE MISSION RULE NUMBERS 15-56 THROUGH 15-59 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE				LAUNCH	Α.	CONTINUE MISSION			
RULE NUMBERS 15–56 THROUGH 15–59 ARE RESERVED. D. NO-GO FOR UNDOCKING PERFORM ALTERNATE LO MISSION UNDOCKED E. DOCK F. CONTINUE MISSION RULE NUMBERS 15–56 THROUGH 15–59 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE				EO	В.	IF BOTH SPS AND SM DE		·	
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		INSTRUME	NTATION RE	QUIREMENTS	<u> </u>	
15-60	MEAS DESCRIPTI	ON PCM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE
	CMC DIGITAL DATA	CG0001V	-	-	MANDATORY	15~50
	SPS SOL DRIVER 1 SPS SOL DRIVER 2		EMS-SPS-ON EMS-SPS-ON	SEPARATE SEPARATE	HIGHLY DESIRABLE HIGHLY DESIRABLE	15-34 15-34
	PITCH GIMBAL POS YAW GIMBAL POS 1		GPI GPI	COMMON	1 OF 2 MANDATORY-OB/HD-PCM 1 OF 2 MANDATORY-OB/HD-PCM	
	TM BIAS 2.5 VDC	CG1110V CG2300T	-	- -	HIGHLY DESIRABLE HIGHLY DESIRABLE	15-53/54/55 15-53
	IMU HTR +28 VDC	CH1513X	-	-	HIGHLY DESIRABLE	15-53
	CMC OPERATE +28 V OPTX OPERATE 28 V			- -	HIGHLY DESIRABLE HIGHLY DESIRABLE	15-50 15 - 55
	IG 1X RSVR OUT SI		FDAI	COMMON	HIGHLY DESIRABLE	15-53
	IG 1X RSVR OUT CO MG 1X RSVR OUT SI		FDAI FDAI	COMMON COMMON	HIGHLY DESIRABLE HIGHLY DESIRABLE	15-53 15- 53
}	MG 1X RSVR OUT CO		FDAI	COMMON	HIGHLY DESTRABLE	15-53
	OG 1X RSVR OUT SI		FDAI	COMMON	HIGHLY DESIRABLE	15-53
	OG 1X RSVR OUT CO			COMMON	HIGHLY DESIRABLE	15-53
	SHAFT CDU DAC OUT TRUNNION CDU DAC			-	HIGHLY DESIRABLE HIGHLY DESIRABLE	15-55 15-55
	CMC WARNING	CG5040X	C&M	COMMON	HIGHLY DESIRABLE	15-52
j	PITCH ATT ERROR	CH3500H	FDAI	COMMON		5-20/21/22/2
	YAW ATT ERROR ROLL ATT ERROR	CH3501H CH3502H		COMMON		15-20/21/22/23 15-20/21/22/23
	SCS PITCH BODY RATE SCS YAW BODY RATE SCS ROLL BODY RAT	CH3504R	FDAI FDAI FDAI	COMMON COMMON COMMON	HIGHLY DESIRABLE	15-20/21/22/2 15-20/21/22/2
				COMMON		15-20/21/22/2
	SCS TVC PITCH AUT			-	HIGHLY DESIRABLE HIGHLY DESIRABLE	15-24/25 15 - 24/25
	MTVC PITCH CMD MTVC YAW CMD	CH3585H CH3586H	-	- -	HIGHLY DESIRABLE HIGHLY DESIRABLE	15-24/25 15-24/25 15-24/25
	FDAI ERROR 5, RAT	E 5 CH3592X RATE 50/10 CH3593X		-		15-20/21/22/2
	PITCH DIFF CLUTCH	CH3666C	_		HIGHLY DESIRABLE	15-20/21/22/2 15-24/25
	YAW DIFF CLUTCH (CUR CH3667C	-	_	HIGHLY DESIRABLE	15-24/25
1						
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16 CSM SERVICE PROPULSION SYSTEM

	MISSION RULES									
REV	ITEM	SYSTEMS MANAGEMENT								
	16.10									
	16-10	PROPELLANT GAGING								
		A. PRIME METHOD: ONBOARD GAGING SYSTEM (1%).								
		B. BACKUP METHOD: FLOW RATE x BURN TIME (3%).								
	16-11	PROPELLANT UTILIZATION VALVE								
		THE PU VALVE WILL BE USED TO CONTROL THE O/F MIXTURE RATIO TO MAINTAIN OXIDIZER IMBALANCE WITHIN								
		±100 POUNDS.								
Α	16-12	DUAL BANK vs SINGLE BANK OPERATION								
		THE SPS WILL ALWAYS BE STARTED USING A SINGLE BANK. HOWEVER, THE OTHER BANK WILL BE OPEN 2 TO 5 SECONDS AFTER IGNITION FOR BURNS GREATER THAN 6 SEC. BANK A WILL BE USED FOR THE FIRST ENGINE IGNITION.								
'										
A	16-13	PROPELLANT MANAGEMENT								
,	10 17	A. THE SPS PROPELLANT REDLINE TO PROVIDE A GO CAPABILITY FOR LOI IS 92.6 PERCENT INDICATED PROPELLANT								
		REMAINING AND INCLUDES LOI, TEI, AND TRANSEARTH MCC'S.								
		B. THE SPS PROPELLANT REDLINE TO PROVIDE A GO CAPABILITY FOR RENDEZVOUS IS 32.2 PERCENT INDICATED								
		PROPELLANT REMAINING AND INCLUDES CSM RESCUE, TEI, AND TRANSEARTH MCC'S.								
, ,										
А	16-14	PROPELLANT FEEDLINE TEMPERATURE MANAGEMENT								
		SPS LINE HEATERS WILL BE MANUALLY CYCLED TO MAINTAIN FEEDLINE TEMPERATURES BETWEEN 45°F AND 75°F AND ENGINE VALVE TEMPERATURE ABOVE 40°F.								
		·								
	16-15	ULLAGE MANAGEMENT								
	10 17	IN GENERAL, DOCKED SPS BURNS REQUIRING ULLAGE WILL BE PRECEDED BY A FOUR-JET ULLAGE - UNDOCKED SPS								
		BURNS BY A TWO-JET ULLAGE. TWO-JET ULLAGE WILL BE USED WHENEVER NECESSARY TO IMPROVE SM RCS PROPELLANT CAPABILITY.								
		FROFELDANI CAFADILITI								
]	RULE NUMBERS 16-16 THROUGH 16-19 ARE RESERVED.								
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SECTION 16 - CSM SPS - CONTINUED

NASA — Manned Spacecraft Center MISSION RULES

				WISSION KOLES	
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
			SPEC	IFIC MISSION RULES	
	16-20	SUSTAINED PRESSURE DECAY IN EITHER THE FUEL OR			MALF PROC: SPS
		OXIDIZER TANK (COULD BE HELIUM OR FUEL OR OXIDIZER	LAUNCH	CONTINUE MISSION	MANUAL PRESSURIZATION OF THE TANKS SHOULD BE SOME
				PLAN RCS DEORBIT AT NEXT BEST PTP	THE TANKS SHOULD BE CON- SIDERED PRIOR TO ANY REQUIRED SPS BURN.
				IF LAND IMPACT IS IMMINENT AFTER ABORTING, REPRESS MANUALLY AND PERFORM BURN TO AVOID LAND.	
			EO .	ENTER NEXT BEST PTP RCS DEORBIT	
			TLC	NO-GO FOR LOI INHIBIT NON-CRITICAL SPS BURNS	
			ro	PLAN TEI ASAP USE LM DPS IF CAPABILITY EXISTS	
			UNDOCKED	DOCK ASAP	
		·	RNDZ	RETURN TO CSM OR ATTEMPT CSM RESCUE	DO NOT STAGE LM
			TEC	CONTINUE MISSION INHIBIT NON-CRITICAL BURNS	
		A. DURING NON-CRITICAL BURN	ALL	A. <u>TERMINATE BURN</u>	
		B. DURING CRITICAL BURN	ALL	B. CONTINUE BURN	`
:	16-21	LOSS OF ONE GN ₂ TANK PRESSURE (<400 PSIA)	UNDOCKED	A. NO-GO FOR RNDZ	MALF PROC: SPS
		, , , , , , , , , , , , , , , , , , ,	ALL OTHERS	B. <u>CONTINUE MISSION</u>	TRANSDUCER INDICATION CANNOT BE VERIFIED WITHOUT ENGINE OPERATION.
	16-22	LOSS OF BOTH GN ₂ TANK PRESSURES (<400 PSIA)	LAUNCH	A. <u>CONTINUE MISSION</u>	MALF PROC: SPS
		FNESSONES (\400 FS1A)	EO	B. ENTER NEXT BEST PTP RCS DEORBIT	TRANSDUCER INDICATION CANNOT BE VERIFIED WITHOUT ENGINE OPERATION.
			TLC	C. NO-GO FOR <u>LOI</u>	
			LO	D. PLAN TEI ASAP WITH LM DPS	
			UNDOCKED	E. DOCK ASAP	
	}		RNDZ	F. CONTINUE MISSION	F. DO NOT STAGE LM
			TEC	G. <u>CONTINUE MISSION</u>	
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				SECTION	GROUP PAGE
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SECTION 16 - CSM SPS - CONTINUED

NASA — Manned Spacecraft Center MISSION RULES

	MISSION RULES									
REV	RULE	CONDITION/MALFUNCTION	N PHASE	RULING	CUES/NOTE	S/COMMENTS				
A	16-23	FUEL FEEDLINE AND/OR OXIDIZER FEEDLINE TEMP <40°F AND UNABLE TO INCREASE.	LAUNCH EO	A. CONTINUE MISSION B. CONTINUE ALTERNATE ECINHIBIT NON-CRITICAL	IS 27°F.	SPS				
			TLC LO	C. NO-GO FOR LOI D. PLAN TEI ASAP	·					
			RNDZ	F. CONTINUE MISSION G. CONTINUE MISSION						
	16-24	ENGINE FLANGE TEMP GO HIGHER THAN 480°F DUR AN SPS BURN.	ES ING LAUNCH EO	NOT APPLICABLE ENTER NEXT BEST PTP RCS DEORBIT	• MALF PROC:	SPS				
		A. DURING NON-CRITIC BURN B. DURING CRITICAL B	† 	A. TERMINATE BURN INHIBIT FURTHER NON-C BURNS B. CONTINUE BURN INHIBIT FURTHER NON-C BURNS						
	16-25	UNABLE TO IGNITE SPS	LAUNCH EO	A. NOT APPLICABLE B. ENTER NEXT BEST PTP RCS DEORBIT						
			TLC LO UNDOCKED RNDZ	C. NO-GO FOR LOI D. PLAN TEI ASAP WITH LM DPS E. N/A F. RETURN TO CSM ASAP CONSERVING DPS IF PO	SSIBLE					
			TEC	G. <u>CONTINUE MISSION</u>						
-	LECTON	DEV. DATE		CECTION						
├ [™]	ISSION	REV DATE		SECTION	GROUP	PAGE				
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				IMISSION ROLES		
REV	RULE	CONDITION/MALFUNCT	ION PHASE	RUL, ING	CUES/NOTES/COM	MENTS
A	16-26	THRUST CHAMBER PRESS <70 PSI CONFIRMED B INSTRUMENTATION A. DURING NON-CRIT BURN B. DURING CRITICAL	Y OTHER LAUNCH EO	NO APPLICABLE ENTER NEXT BEST PTP A. TERMINATE BURN INHIBIT FURTHER NON-CRITI BURNS B. CONTINUE BURN INHIBIT FURTHER NON-CRITI BURNS		MENTATION P. METER, RÜST, FU PRESSURES, NS, FU
	16-27	LACK OF ULLAGE CAPA	BILITY LAUNCH E0 TLC L0 UNDOCKED RNDZ	A. NOT APPLICABLE B. NO-GO FOR TLI CONTINUE MISSION IN EO WI SUITABLE ALTERNATE C. NO-GO FOR LOI D. PLAN TEI ASAP E. DOCK ASAP F. CONTINUE MISSION	MALF PROC: SM RCS	
A	16-28.	FIRST BURN SUBSEQUE DOCKED DPS BURN WAS <40 SEC		INHIBIT ALL BURNS	IF BURN IS TERMINAT REASON: 1. BEFORE 4 SECOND ENTIRE 40 SECON ULLAGE. NO CON ON REIGNITION T 2. AFTER 4 SECONDS BEFORE 40 SECON IF REQUIRED TO A CRITICAL MANE REIGNITE ASAP WULLAGE.	DS - REPEAT ID BURN WITH ISTRAINT IME. J. BUT IDS - COMPLETE
	SSION PLLO 10	REV DATE A 4/23/69	CSM SPS	SECTION	GROUP	PAGE

				MISSION RULES		
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COM	1ENTS
	16-29	ΔP BETWEEN FUEL AND TANK PRESSURES >20 PSI AND UNABLE TO DECREASE	LAUNCH EO	CONTINUE MISSION ENTER NEXT BEST PTP	MALF PROC: SPS	-
			TLC	RCS DEORBIT NO-GO FOR LOI		
			LO	PLAN TEI ASAP	<u>.</u>	
	l		UNDOCKED	WITH LM DPS DOCK ASAP		
			RNDZ	RETURN TO CSM OR ATTEMPT	CSM DO NOT STAGE LM	
				RESCUE		
		A DUDYNG NON COLTICAL	TEC	CONTINUE MISSION	·	
		A. DURING NON-CRITICAL BURN		A. TERMINATE BURN INHIBIT FURTHER NON- BURNS	CRITICAL	
		B. DURING CRITICAL BURN		B. <u>CONTINUE BURN</u> INHIBIT FURTHER NON- BURNS	CRITICAL	
A	16-30	LEAK OR COMPLETE LOSS OF HELIUM SUPPLY PRESSURE OR BOTH HELIUM VALVES FAIL			■ BLOWDOWN ∆V CAPABI A FUNCTION OF ULLA VOLUME AT TIME OF	GE
		CLOSED.	LAUNCH	A. CONTINUE MISSION		
		,	EO	B. NO-GO FOR TLI CONTINUE MISSION IN SUFFICIENT ULLAGE BL ΔV CAPABILITY EXISTS	OWDOWN	
			TLC	C. NO-GO FOR LOI		
			LO	D. <u>CONTINUE MISSION</u> IF SUFFICIENT ULLAGE DOWN AV CAPABILITY E		
			UNDOCKED	E. CONTINUE MISSION IF SUFFICIENT ULLAGE DOWN AV CAPABILITY E	The state of the s	
		·	RNDZ	F. CONTINUE MISSION	F. DO NOT STAGE LM	
			TEC	G. CONTINUE MISSION	j	
		·				
	:	RULE NUMBERS 16-31 THROUGH 16-49 ARE RESERVED.				
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16-50	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFEREN
	OX TK PRESS OX SM/ENG INTERFACE	SP0003P P SP0931P	METER/C&W	COMMON -	M O/B HD	16-20, 29 16-20, 29
	FU TK PRESS FU SM/ENG INTERFACE	SP0006P P SP0939P	METER/C&W	COMMON -	M O/B HD	16-20, 29 16-20, 29
	SPS VLV ACT PRESS-P SPS VLV ACT PRESS-S		METER METER	COMMON	-1 OF 2 M O/B	16-21, 22 16-21, 22
	SPS FU FEEDLINE TEM SPS OX FEEDLINE TEM		METER SYS TEST	COMMON COMMON	-1 OF 2 M	16-23
	SPS INJ FLANGE TEMP SPS INJ FLANGE TEMP		C&M C&M	COMMON COMMON	-1 OF 2 M O/B	16-24
	ENG CHAMBER PRESS	SP0661P	METER	COMMON	, м о/в	16-26
	He TK PRESS	SP0001P	METER	SEPARATE	HD	16-30
	FU/OX VLV 1 POS FU/OX VLV 2 POS FU/OX VLV 3 POS FU/OX VLV 4 POS	SP0022H SP0023H SP0024H SP0025H	DISPLAY DISPLAY DISPLAY DISPLAY	SEPARATE SEPARATE SEPARATE SEPARATE	M 1 OF 2 O/B M 1 OF 2 O/B	16-25, 26 16-25, 26 16-25, 26 16-25, 26
	OX TK 1 QTY - TOTAL OX TK 2 QTY FU TK 1 QTY - TOTAL FU TK 2 QTY	AUX SP0655Q SP0656Q	DISPLAY DISPLAY DISPLAY DISPLAY	COMMON COMMON COMMON COMMON	HD HD HD HD	16-10, 11, 13 16-10, 11, 13 16-10, 11, 13 16-10, 11, 13
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		MISSION RULES										
REV	ITEM	GENERAL										
		MENERAL										
	,											
	17-1	LAUNCH										
		THE LOSS OF ONE QUAD 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.										
1 1												
} \												
	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 QUAD WILL REQUIRE TLI BE INHIBITED 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.										
		 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, DEPENDING ON										
		LM RCS CAPABILITY, THE TRANSLUNAR COAST PHASE MAY BE TERMINATED BY ENTRY INTO THE NEXT BEST										
1		PTP.										
1 1												
1	17-4	<u>LOI</u>										
		LOSS OF ONE QUAD IS CAUSE FOR INHIBITING LOI1, BECAUSE SUBSEQUENT FAILURE OF QUADS OR JETS IMPAIR										
} }		ATTITUDE CONTROL OR ULLAGE.										
	175	LUNAR ORBIT										
1	'' /											
\ \		LOSS OF ONE QUAD IS CAUSE FOR <u>EARLY TERMINATION</u> OF <u>LUNAR ORBIT PHASE</u> AND FOR <u>INHIBITING LOI</u> AND RENDEZVOUS, BECAUSE SUBSEQUENT FAILURE OF QUADS OR JETS IMPAIR ATTITUDE CONTROL OR ULLAGE,										
		CONSIDERATION MAY BE GIVEN TO A MANEUVER TO DECREASE THE REMAINING TIME OF FLIGHT.										
}												
1 1												
) '												
[]		RULE NUMBERS 17-6 THROUGH										
	NOTE NOMBERS 17-6 THROUGH 17-14 ARE RESERVED.											
MI	SSION	REV DATE SECTION GROUP PAGE										
		FINAL 4/15/69 CSM SM-RCS GENERAL 17-1										
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		,			MISSION RULES			
REV	ITEM			SYSTE	MS MANAGEMENT			
	17-15	D⊅UDE1	LLANT GAGING					
	1/-15]		RTCC EQUATION (6%)				
		B, BA	ACKUP METHOD	: HELIUM PRESSURE/TEN	PERATURE (11%)			
		. (0)NBOARD)					
	17-16	OUAD F	PROPELLANT B	ALANCE				
		PROP I	SOLATION VA	LVES WILL NOT BE USFD	FOR QUAD PROPELLANT	BALANCE. PROPELLANT BALANCE W	ILL BE	
		ACCOMP CHOOSI	LISHED BY S	ELECTING TWO-JET +X AN JETS FOR ATTITUDE CON	ID −X TRANSLATIONS W	ITH EITHER THE PITCH OR YAW QUA IFFERENCES BETWEEN QUADS WILL B	D AND BY	
		411111	, ->v 100ND3	•				
	17-17	SECOND	ARY PROPELL	ANT FUEL PRESSURE VALV	<u>E</u>	•		
		THE RC REACHE	S SECONDARY ES 150 PSIA.	FUEL PRESSURIZATION V	ALVE WILL BE OPENED	WHEN THE PRIMARY FUEL MANIFOLD	PRESSURE	
]		•				
		<u> </u>						
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	!							
RULE NUMBERS 17-18 THROUGH 17-19 ARE RESERVED.								
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MIS	SSION	REV	DATE	SECTION		GROUP	PAGE	
L	LO 10	FINAL	4/15/69	CSM SM-RCS		MANAGEMENT	17-2	
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REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMME	ENTS
	NOLL	25.12.1.1.51,		CIFIC MISSION RULES		
	17-20	SUSTAINED LEAK IN HELIUM TANK	SPE	CIFIC WISSION RULES	• MALF PROC: RCS	
	i	A. ONE OR MORE QUADS	LAUNCH	A. CONTINUE MISSION	• QUAD WILL REMAIN US HE MANIFOLD PRESSU	
l		B. ONE QUAD (ALL OTHER QUADS NORMAL)	EO	B.1. NO-GO FOR TLI	75 PSI	
		(0.12)	TLC	2. ENTER NEXT BEST PTF		
			LO	3. PLAN TEI FOR NEXT C TUNITY	PPOR-	
		1	UNDOCKED	4. DOCK ASAP		
			RNDZ	5. CONTINUE MISSION		
		C. MORE THAN ONE QUAD	EO	C.1. <u>CONTINUE MISSION</u> ENTER PRIOR TO LOSS HYBRID DEORBIT CAPA		
		1	ALL OTHER	2. REF RULING B	C.2. RETAIN LM ASCEN FOR TEI	IT STAGE
					WALE FROM POR	-
	17-21	SUSTAINED LEAK BELOW He ISOLATION VALVE (COULD BE			• MALF PROF: RCS	
		HELIUM OR FUEL OR OXIDIZER)	LALINICIL	a continue MICCION	• QUAD WILL REMAIN U UNTIL He MANIFOLD ! REACHES 75 PSI.	
		A, ONE OR MORE QUADS B. ONE QUAD (ALL OTHER	LAUNCH EO	A. CONTINUE MISSION B.1. NO-GO FOR TLI	REACTES / 9 F 31 :	
		QUADS NORMAL)	TLC	2. ENTER NEXT BEST PTF	, ·	
			LO	3. PLAN TEL FOR NEXT (1	
			UNDOCKED	4. DOCK ASAP		
			RNDZ	5. CONTINUE MISSION		
		C. MORE THAN ONE QUAD	EO	C.1. ENTER NEXT BEST PT	,	
			ALL OTHER	2. REF RULING B	C.2. RETAIN LM ASCEN	IT STAGE
	17-22	PACKAGE TEMP <55 ⁰ F AND UNABLE TO INCREASE	LAUNCH	NOT APPLICABLE	• MALF PROC: RCS	
		A. ONE QUAD (ALL OTHER QUADS NORMAL	EO	A.1. NO-GO FOR TLI		
' <i> </i>		, , , , , , , , , , , , , , , , , , ,	TLC	2. ENTER NEXT BEST PT	<u>P</u>	
		r	LO	3. PLAN_TEI_FOR_NEXT TUNITY	OPPOR-	
			UNDOCKED	4. <u>DOCK ASAP</u>		
			RNDZ	5. CONTINUE MISSION		
		B. MORE THAN ONE QUAD	EO	B.1. ENTER NEXT BEST PT		
			ALL OTHER	2. <u>REF RULING A</u>	B.2. RETAIN LM ASCE FOR TEI	ENT STAGE
			{			
MI	SSION	REV DATE		SECTION	GROUP	PAGE
APO	LO 10	FINAL 4/15/69 CSM S	M-RCS		SPECIFIC	17-3

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				MISSION RULES	
REV	RULE	CONDITION/MALFUNCTI	ON PHASE	RULING	CUES/NOTES/COMMENTS
A	17-23	LOSS OF INDIVIDUAL TO ERS OR THRUSTER COMB TIONS AS A RESULT OF CLOGGING, FREEZING, I OUT, OR CONTROL SYSTI MALFUNCTION	INA- BURN-	NOT APPLICABLE	CONTROL SYSTEM MALFUNCTION WILL CAUSE LOSS AUTO COILS OF THRUSTER ALTHO DIRECT COILS ARE STILL AVAIL ABLE.
		A. LOSS OF ANY ROLL	LO	A.1. NO-GO FOR UNDOCKING	
		THRUSTER	UNDOCKED	2. DOCK ASAP	
ļ			ALL OTHERS	3. CONTINUE MISSION	
		B. LOSS OF FOLLOWING THRUSTER COMBINA 2 PITCH OR 2 YAW 1 PITCH AND 1 YAW	TIONS:	B.1. CONTINUE ALTERNATE EO M IF BOTH SPS AND SM RCS DEORBIT CAPABILITY AND AXIS ATTITUDE CONTROL A ABLE	ALL
		1 PITCH AND 2 RO IN SAME DIRECT	ION TLC	2. NO-GO FOR LOI	
1	}	1 YAW AND 2 ROLL IN SAME DIRECT	ION LO	3. PLAN TEI FOR NEXT OPPOR	אַדַ אַעַדַ (צְּדִּוַאְעַדַ
		3 ROLL IN SAME D	IRECTION UNDOCKED	4. DOCK ASAP	
			RNDZ	5. CONTINUE MISSION	B.5. RETAIN LM ASCENT STAGE
}			TEC	6. <u>CONSIDER MANEUVER TO DE</u> FLIGHT TIME	FOR TEI IF LOSS OF ALL THRUSTERS IN ONE DIRECTION IN SAME AXIS
		C. LOSS OF +X THRUS ON ADJACENT QUAD		C. INHIBIT NON-CRITICAL SPS	BURNS C. REF SPS RULE 16-27, LACK OF ULLAGE CAPABILITY
\vdash	ISSION	REV DATE		SECTION	GROUP PAGE
	OLLO 10	A 4/23/69	CSM SM-RCS	SP	ECIFIC 17-4

ITEM		INST	RUMENTATIO	N REQUIREM	ENTS	- Alba
17-50	MEAS DESCRIPTION	PCM	ONBOARD	TRANSDUCERS		MISSION RULE REFERENC
"	SM He TK A PRESS	SR5001P	METER	COMMON	`	17-20, 21
	QTY SM-RCS PROP SYS	`	METER	COMMON	} -1 OF 2 M	17-20, 21
	SM He TK B PRESS QTY SM-RCS PROP SYS	SR5002P B SR5026Q	METER METER	COWWON	} -1 OF 2 M	17-20, 21 17-20, 21
	SM He TK C PRESS QTY SM-RCS PROP SYS	SR5003P C SR5027Q	METER METER	COMMON COMMON	} -1 OF 2 M	17-20, 21 17-20, 21
	SM He TK D PRESS QTY SM-RCS PROP SYS	SR5004P D SR5028Q	METER METER	COMMON COMMON	} -1 OF 2 M	17-20, 21 17-20, 21
	SM ENG PKG A TEMP	SR5065T	METER/C&W	COMMON	HD	17-22
	SM ENG PKG B TEMP SM ENG PKG C TEMP SM ENG PKG D TEMP	SR5066T SR5067T SR5068T	METER/C&W METER/C&W METER/C&W	COMMON COMMON	HD HD HD	17-22 17-22 17-22
	SM He TK A TEMP	SR5013T	METER	COMMON	HD	17-20, 21
	SM He TK B TEMP	SR5014T	METER	COMMON	HD	17-20, 21
	SM He TK C TEMP	SR5015T	METER	COMMON	HD	17-20, 21
	SM He TK D TEMP	SR5016T	METER	COMMON	HD	17-20, 21
	SM He MAN A PRESS	SR5729P			HD	17-20, 21
	SM He MAN B PRESS SM He MAN C PRESS	SR5776P			HD	17-20, 21
	SM He MAN D PRESS	SR5817P SR5830P			HD HD	17-20, 21 17-20, 21
	SM FU MAN A PRESS	SR5737P	METER/C&W	COMMON	HD	17-12, 21
	SM FU MAN B PRESS	SR5784P	METER/CSW	COMMON	HD	17-12, 21
	SM FU MAN C PRESS SM FU MAN D PRESS	SR5822P SR5823P	METER/C&W METER/C&W	COMMON	HD HD	17-12, 21 17'-12, 21
	SM OX MAN A PRESS	SR5733P			HD	17-21, 21
1	SM OX MAN B PRESS SM OX MAN C PRESS	SR5780P SR5820P			HD HD	17-21, 21
l	SM OX MAN D PRESS	SR5821P			HD	17-21, 21 17-21, 21
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LLO 10	FINAL 4/15/69 C	SM SM-RCS		I	NSTRUMENTATION REQU	IREMENTS 17-5

					MISSION RULES		
REV	!TEM				GENERAL		
	10.7	1 41 520	ī				
A	18-1	RC	SUSTAINED L S RING IS N	NOT CAUSE FOR ABORT S	INCE THE REMAINING	ESSURE OR HELIUM MANIFOLI RING IS CAPABLE OF ABOR 6-4 SINCE SYSTEMS ARE NO	T OR ENTRY ATTITUDE
,		B. A CM IT OF ME PC	SUSTAINED LINES RINGS IS NOT CAU THE FIRST THOD OF ENTITENTIAL HAZ DE II AND N	LEAK IN OR THE LOSS O PRIOR TO TOWER JETT JSE FOR ABORT SINCE T REV STILL EXISTS BY TRY IS CONSIDERED OPE ZARD TO CREW RECOVERY	F HELIUM SUPPLY PRI ISON IS JUSTIFICAT HE ABILITY TO PERFC USING THE CONTINGEI RATIONALLY PREFERAL FURTHERMORE, CM TO ABORT THE LAUNG	ESSURE OR HELIUM MANIFOLI ION FOR A MODE I ABORT. DRM A SAFE ENTRY INTO THI NCY SM RCS SPIN UP PRIOR BLE TO PERFORMING AN ABOU RCS CONTROL IS REQUIRED CH IN THESE REGIONS FOR	O PRESSURE IN <u>BOTH</u> AFTER TOWER JETTISON, E ATLANTIC AT THE END TO CM/SM SEP. THIS RT AND PRESENTS LESS FOR ABORTS IN THE
	18-2	ALL OT	HER PHASES	,			
		FU AN FO CO	EL OR OXIDI D REDUCES T LD PRESSURE NTINGENCY S	IZER) IN ONE CM RCS R THE ΔV AVAILABLE FOR I E IN BOTH CM RCS RING:	ING DELETES THE REC HYBRID DEORBIT, LO S DELETES ALL ENTRY TO CM/SM SEP, THE	OR HELIUM MANIFOLD PRESS DUNDANCY OF THE ENTRY AT DSS OF HELIUM SUPPLY PRESS ATTITUDE CONTROL CAPAB LOSS OF ONE OR BOTH CM F THE NEXT BEST PTP.	FITUDE CONTROL SYSTEM SSURE OR HELIUM MANI- ILITY REQUIRING
		B. AR FO	MING OF THE R-TERMINATI	E CM RCS RINGS, WHETHI ING THE PHASE AND MIS	ER THE PROPELLANT I SION INTO THE NEXT	ISOLATION VALVES ARE OPEN BEST PTP.	NED OR CLOSED, IS CAUSE
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			JMBERS 18-3 RE RESERVED				
	SSION	REV	DATE	SECTION		GROUP	PAGE
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REV	ITEM				SYSTEMS MANAGEMENT		
1	'			ı		1	
А	18-10	THRUSTE	R TEMP CONT	ROI.			
						,	
١.		CM RCS	THRUSTERS W . WHICHEVER	MILL BE HEATED COMES FIRST.	PRIOR TO ENTRY FOR 20 MINU	TES OR UNTIL THE LOWEST INDICATES	D TEMPERATURE
		OPERATIO	ONAL PENDIN	G RESULTS OF	CM RCS CHECKOUT PRIOR TO EN	TRY. MALF PROC RCS	SIDERED
						·· ····	
{	{ {						
ĺ						•	
	18-11	HELIUM	INTERCONNEC	<u>:T</u>			
(ĺ	Δς Δ 1Δ9	ST DESORT	TE THE HELLIN	IN ONE DING IS DEDICTED DU	E TO A LEAK AND THE PROPELLANT I	C DEBLETED IN
1		THE OTH	ER RING, TH	IE SYSTEMS MAY	BE INTERCONNECTED IF THE RE	EMAINING PROPELLANT IS REQUIRED	FOR CONTROL.
		ONCE IN	TERCONNECTE	D, THE RINGS	CANNOT BE ISOLATED. MALF PE	ROC RCS	
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	1		MBERS 18-12 RE RESERVED				
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AP	OLLO 10	Α	4/23/69	CSM CM-RCS		MANAGEMENT	18-2

SECTION 18 - CSM CM-RCS - CONTINUED

[new]	Di II C	CONDITION (MALEUMOTIC)	BUACE	MISSION RULES		OUEC MOTES (CO)	MENTS
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	TYICIN 1 5
А	18-20	SUSTAINED LEAK IN OR COMPLETE LOSS OF HELIUM - SUPPLY PRESSURE		FIC MISSION RULES			
		A. ONE RING	LAUNCH	A.1. CONTINUE MISSION AND PTP 6-4	O ENTER		
		· 1	RNDZ	2. CONTINUE MISSION			
		_	ALL OTHERS	3. TERMINATE PHASE AND NEXT BEST PTP	ENTER A.	3. NORMAL ENTRY	
		B. BOTH RINGS	LAUNCH	B.1. CONTINUE MISSION AND PTP 2-1. UNLESS PRIOR TO TOWN JETTISON. IF PRIOR JETTISON, ABORT	≅R		
			RNDZ	2. CONTINUE MISSION			
			ALL OTHERS	3. TERMINATE PHASE AND NEXT BEST PTP	ENTER B.	3. CONTINGENCY S UP PRIOR TO (
					ر به در د		
Α	18-21	SUSTAINED LEAK IN OR COMPLETE LOSS OF HELIUM MANIFOLD PRESSURE (COULD BE EITHER FUEL OR OXIDIZER)					
		A. ONE RING	LAUNCH	A.1. CONTINUE MISSION AND PTP 6-4	D ENTER		
	·		RNDZ	2. CONTINUE MISSION			
			ALL OTHERS	3. TERMINATE PHASE AND NEXT BEST PTP	ENTER		
		B. BOTH RINGS	LAUNCH	B.1. CONTINUE MISSION AND PTP 2-1 UNLESS PRIOR TO TOWN JETTISON. IF PRIOR TOWNER JETTISON, ABOUT	ER TO		
			RNDZ	2. CONTINUE MISSION			
			ALL OTHERS	3. TERMINATE PHASE AND NEXT BEST PTP	ENTER 8.3	3. CONTINGENCY S UP PRIOR TO (
						·	
	18-22	CM RCS IS ARMED FOR ANY REASON	RNDZ	CONTINUE MISSION			
			ALL OTHERS	TERMINATE PHASE AND ENTER BEST PTP	NEXT		
		RULE NUMBERS 18-23 THROU 18-49 ARE RESERVED.	JGH				
MI	SSION	REV DATE		SECTION	G	ROUP	PAGE
	DLLO 10	1	1 CM-RCS		SPECIFIC		18-3
FEC/T	S : Form	291 (A*1) 63)					

REV	ITEM				MISSION			
			v	INS	STRUMENTATIO	N REQUIREMENTS	_	
	18-50	CM HE CM TH CM TH	DESCRIPTION TK A PRESS TK B PRESS A TEMP (B TEMP MNFLD A PR MNFLD B PR	CR0001 CR0002 CR0003 CR0004 ESS CR0035	1P METER 2P METER 3P METER 4P METER 5P METER/C&W		CATEGORY M M M M M M M M (BOTH) M (BOTH)	MISSION RULE REFEREN 18-20 18-20 18-20 18-20 18-21 18-21
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MIS	NOIZZ	REV	DATE	SECTION		GROU	P	PAGE
		FINAL	4/15/69	CSM CM-RCS			TRUMENTATION REQUI	

		MISSION RULES
REV	ITEM	GENERAL
		WEINTING.
А	19-1	THREE GOOD DOCKING RING LATCHES 120 DEGREES APART ARE REQUIRED FOR AN IVT.
А	19-2	THREE GOOD DOCKING RING LATCHES 120 DEGREES APART ARE REQUIRED FOR A DOCKED RCS MANEUVER.
	19-3	DOCKED SPS OR DPS BURNS REQUIRE AT LEAST NINE DOCKING RING LATCHES.
	19-4	MANNED UNDOCKING OPERATIONS WILL BE TERMINATED FOR ANY FAILURE OF A DOCKING RING LATCH TO RELEASE, NO ATTEMPT WILL BE MADE TO DISASSEMBLE A DOCKING RING LATCH.
	19-5	THE SECONDARY FORWARD HATCH MECHANISM MAY BE USED AS THE SOLE METHOD OF LOCKING OR UNLOCKING THE FORWARD HATCH.
	19-6	LOSS OF VISUAL DOCKING AIDS (COAS AND TARGETS) WILL NOT INHIBIT DOCKING AND UNDOCKING.
	19-7	TDSE WILL BE ATTEMPTED WITH A NON-EXTENDED DOCKING PROBE.
		NOTE: THE ONLY DOCKING PROBE INSTRUMENTATION CONSISTS OF TWO TALK BACK INDICATORS IN THE CSM.
А	19-8	LOW PROBE TEMPERATURE WILL NOT INHIBIT DOCKING ATTEMPTS.
А		RULE NUMBERS 19-9 AND 19-10 ARE RESERVED.
MI	SSION	REV DATE SECTION GROUP PAGE
ΔΡΛ	LLO 10	A 4/23/69 DOCKING AND UMBILICAL GENERAL 19-1
		292 (AUG 6E)

REV	ITEM					CACAT)				
					MANAG	EMENT				
	19-11	TWO NI IN THE	ITROGEN BO E SAME SYS	OTTLES ARE REQUIRES STEM BEFORE UTILIZ	D FOR UNDOCKIN ING BOTTLES IN	G. FOR SYSTEM THE REDUNDAN	M RETRACT T SYSTEM.	FAILURE, USE 7	THE SECOND BOT	TLE
	19-12	THE C	4 FORWARD	AND LM UPPER HATCH	H NORMALLY WIL	L BE INSTALLE	D FOR ANY	TYPE OF MANEU	ER OR DOCKING	
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		i								
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		RULE 1	NUMBERS 1 ARE RESE	9-13 THROUGH						
		19-19	ARE KESE	(VED.		,				
MI	SSION	REV	DATE	SECTION			GROUP		PAGE	
	LO 10			DOCKING AND UM	BILICAL		MANAGEMEN	ĮT	19-2	
	SO Form		4/15/69 JG 68)	DUCKTING AND UM	ID 1 F I CAF			· ·	13-2	

REV	RULE	CON	NDITION/MALFUNCT	ION	PHASE	RULING		CUES/NOTES/	COMMENTS
A	19-20 FAILURE TO ACHIEVE OR MAINTAIN POWER TO X-LUNAR BUS LOADS FROM CSM				SPE	CIFIC MISSION RULES CONTINUE MISSION 1. INSURE LM DESCENT BA VOLTAGE TAPS ON 2. OPEN CB (11) AND CB DES ECA CB WITHIN 6 TDSE 3. CLOSE CB (11) AND CB DES ECA CB'S AT FIRST MANNING	(16) EPS: HRS OF (16) EPS:	• NOMINAL MISSIO FORMED BECAUSE CONSTRAINTS WI VIOLATED WITH CB OPEN. OVER TECTION, HOWEV UNTIL THESE CB	ECA THERMAL LL NOT BE DESCENT ECA CURRENT PRO- ER, IS LOST
	19-21	LM SE	JRE TO ACHIEVE S PARATION OR FAI ATE LM UMBILICALS AND P24)	LURE	TD&E	PERFORM CSM/LM FINAL SEP		S-IVB/LM SEP CANN WITHOUT MATING AT UMBILICAL. POWER CAN BE SWIT TAINED WITH EITHE	LEAST ONE CHED AND MAIN
	19-22 FAILURE TO ACHIEVE CSM/LM FINAL SEPARATION			DOCKED	MUST PERFORM NORMAL UNDO A. RETRIEVE PROBE AND D AND INSTALL. B. AFTER UNDOCKING, DEP AND JETTISON PROBE O	ROGUE RESS CSM	LM MASS MAY HAVE MODIFIED FOR APS		
	19-23	FAILURE TO INDICATE DOCKING PROBE EXTEND OR BOTH TALK BACK INDICATORS ARE BARBER POLE.			TD&E	A. CONTINUE MISSION ATTEMPT TOSE B. CONTINUE MISSION ATTEMPT DOCKING		DOCKING RING/TUNN DAMAGE MAY OCCUR THAT TUNNEL PRESS BE MAINTAINED.	TO THE EXTEN
<u> </u>	19-24	CANNI HATCI	NOT REMOVE CSM FORWARD TD&E CH DOCKED			A. PERFORM CSM/LM FINAL B. PERFORM CSM/LM FINAL IF LM MANNED, PERFOR TO CSM.	. SEP		
	19-25	19-25 CANNOT REMOVE DOCKING PROBE LM DROGUE, AND/OR LM UPPER HATCH.			, DOCKED	CONTINUE MISSION PERFORM EVT IF LM MANNED)	SPS AND SM RCS MANEUVERS MAN BE PERFORMED	
	19-26	FAIL LATC	URE TO RELEASE C	APTURE	DOCKED	REDOCK PERFORM RETRACTION			
						L		1	
MI	SSION	REV	DATE			SECTION		GROUP	PAGE

REV	RULE	CONDITION/MALFUNCTION	PHASE.	RULING		CUES/NOTES/COM	MENTS
	19-27	PRIMARY FORWARD HATCH LOCK/UNLOCK MECHANISM INOPERATIVE	ALL	CONTINUE MISSION			
	19-28	FAILURE TO REINSTALL CSM FORWARD HATCH	ALL	CONTINUE MISSION		REF BACKUP PROCEDURI	ΞS
	19-29	FAILURE TO REINSTALL PROBE AND/OR DROGUE OR FAILURE TO CLOSE LM UPPER HATCH	DOCKED	NO NUDOCKING	;	RETAIN DESCENT STAG	E FOR TBI
	19-30	LOSS OF PRIMARY OR SECONDARY DOCKING SYSTEM	ALL	CONTINUE MISSION TWO RETRACT BOTTLES ARE FIN REMAINING SYSTEM.	REQUIRED	TUNNEL INGRESS MAY I PERFORMED TO INTERCI UMBILICALS.	HAVE TO BE
MI	SSION	REV DATE		SECTION		GROUP	PAGE
	LLO 10 F	FINAL 4/15/69 DOCKING 291 (4%) 63)	AND UMBIL	ICAL	SPECIFIC		19-4

	,	MISSION RULES
REV	ITEM	GENERAL
	20-1	TO INITIATE AND CONTINUE THE FOLLOWING MISSION PHASES, THE EXTRAVEHICULAR MOBILITY UNIT (EMU) MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITIES: A. DOCKED (TUNNEL HARDWARE INSTALLED) TWO LIFE SUPPORT UNITS (PLSS AND OPS OR 2 OPS) PROVIDING SUFFICIENT CONSUMABLES TO SUPPORT A 30 MINUTE CONTINGENCY TRANSFER. B. UNDOCKED/RNDZ TWO LIFE SUPPORT UNITS (PLSS AND OPS OR 2 OPS) PROVIDING SUFFICIENT CONSUMABLES TO SUPPORT A CONTINGENCY TRANSFER.
		MANAGEMENT
A	20-2	THE PLSS BATTERY IS CONSIDERED TO HAVE A MINIMUM OF 14.3 AMP-HR CAPABILITY. THIS CONSUMABLE IS GAGED BY MONITORING GT8140C AND PROCESSING IN THE RTCC TO OBTAIN AMP-HRS.
A	20-3	THE PLSS PRIMARY OXYGEN SUBSYSTEM (POS) IS CONSIDERED TO HAVE A NOMINAL SOURCE PRESSURE OF 850 PSIA. THIS CONSUMABLE IS GAGED BY MONITORING GT8182P AND PROCESSING IN THE RTCC TO OBTAIN LBS MASS.
A	20-4	THE PLSS FEEDWATER RESERVOIR IS CONSIDERED TO HAVE A NOMINAL LOADING OF 8.3 LBS. THIS CONSUMABLE IS GAGED BY MONITORING GT8154T, GT8196T, GT8182P, GT8110P AND PROCESSING IN THE RTACF TO OBTAIN LBS REMAINING.
	20-5	THE OPS IS CONSIDERED TO HAVE A MINIMUM SOURCE PRESSURE OF 5380 PSIA. THIS CONSUMABLE IS MONITORED BY A PRESSURE GAGE LOCATED ON THE OPS.
		RULE NUMBERS 20-6 THROUGH 20-19 ARE RESERVED.
М	ISSION	REV DATE SECTION GROUP PAGE
	LLO 10	A 4/23/69 CEVT GENERAL/MANAGEMENT 20-1
		m 200 (ACC MC)

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RULING CLES/MOTES/COMPCINTS A 20-20 LOSS OF PRESSURE INTEGRITY A. PEA PRESS 43,75 PSIA CITIO AND DECREASING OR PSIA PRESS CAND CERRISHING B. PAGE PRESS 43,75 PSIA CITIO AND DECREASING OR PSIA PRESS CAND CERRISHING B. CONTINUE ACTIVATE OPS 1. ACTIVATE OPS 1. ACTIVATE OPS 2. CORE POS SMJOFF VALVE B. MOXIOUS COOR CEVT B. CONTINUE 1. ACTIVATE OPS 2. OPEN PSA PURGE VALVE B. CONTINUE 1. ACTIVATE OPS 2. OPEN PSA PURGE VALVE B. CREW SENSIBLE DETECTION LOW VENT PLOW TONE CEVT B. CONTINUE 1. ACTIVATE OPS 2. OPEN PSA PURGE VALVE CEVT B. CONTINUE 1. ACTIVATE OPS 2. OPEN PSA PURGE VALVE CEVT CEVT CEVT CEVT CEVT CEVT CEVT C			+ **		Mission Rules			
A 20-20 LOSS OF PRESSURE INTEGRITY A. PCA PRESS 45,75 PSIA OF CORPORATION OF CONTINUE TOP DATE DECRESSION OF 67,7 PSIA AND DECRESSION OF PCA PRESS GAGE COUNTRIES FOR PRESS TOUR COUNTRIES FOR PRESS GAGE COUNTRIES FOR PRESS	REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
A. FAN FAILURE CEYT A. CONTINUE 1. ACTIVATE OPS 2. OPEN PGA PURGE VALVE B. NOXIOUS ODOR CEYT B. CONTINUE 1. ACTIVATE OPS 2. OPEN PGA PURGE VALVE B. CREW SENSIBLE DETECTIVE CONTINUE 1. ACTIVATE OPS 2. OPEN PGA PURGE VALVE CEYT CONTINUE 1. ACTIVATE OPS 2. OPEN PGA PURGE VALVE CONTINUE 1. ACTIVATE OPS 3. OPEN PGA PURGE VALVE CREW SENSIBLE DETECTIVE CONTINUE 1. POPULATION IS REQUIRED, ACTIVATE OPS IN PURGE MODE CREW SENSIBLE DETECTION OF 1110P FEED HQD PRESS 1 CONTINUE	A .	20-20	A. PGA PRESS <3.75 PSIA (TM) AND DECREASING PGA PRESS GAGE OF <3 PSIA AND DECREASING B. PGA PRESS >4.05 PSIA (TM) AND INCREASING PGA PRESS GAGE OF >4.0 PSIA AND	OR	A. CONTINUE ACTIVATE OPS B. CONTINUE 1. ACTIVATE OPS	В.	PGA PRESS GAGE LOW PGA PRESS 1 (3.0 KHZ) GT8168P PGA PRE PGA PRESS GAGE	ONE
ACTIVATE OPS IN PURGE MODE RULES 20-23 THROUGH 20-29 ARE RESERVED.	A	20-21	A. FAN FAILURE	CEVT	1. ACTIVATE OPS 2. OPEN PGA PURGE VAL B. CONTINUE 1. ACTIVATE OPS	VE 8.	GT8141V PLSS BA LOW VENT FLOW T (3.0 KHZ)	T VOLT ONE
20-29 ARE RESERVED.		20-22	MALFUNCTION TOTAL LOSS OF WATER	CEVT	IF DEHUMIDIFICATION IS REQ	G1 G1 L0	REW SENSIBLE DETEC T8110P FEED H ₂ O PR T8140C PLSS BAT CL CG H ₂ O AT LOW FEED	ESS R GT8196T
MISSION DEV DATE								
1 1/10	MI	SSION			SECTION		GROUP	PAGE
APOLLO 10 A 4/23/69 CEVT SPECIFIC 20-2	APOI	LLO 10	A 4/23/69 CI	EVT				

				MISSION RULES		
REV	RULE	CONDITION/MALFUNCT	TON PHASE	RULING	CUES/NOTES/COM	MENTS
	20-30	LOSS OF LIQUID TRAN: LOOP THERMAL CONTROL	SPORT L CEVT	CONTINUE		
				IF ADDITIONAL COOLING IS REQUACTIVATE OPS IN PURGE MODE	JIRED, GT8154T LCG H ₂ O TEMF GT8196T LCG H ₂ O ΔT GT8140C PLSS BAT CUF CREW SENSIBLE DETECT LOW FEED H ₂ O PRESS T	rion :
	20-31	FAILURE OF OPS TO CO	HECK CEVT			
		A. OPS SOURCE PRESS		A. CHECK OUT PLSS USE DEGRADED OPS WITH THE	A. PRESSURE GAGE OF	N OPS
		B. OPS REG PRESSURI PSID OR <3.4 PS		B. CHECK OUT PLSS USE DEGRADED OPS WITH THE FOR CEVT	B. PRESSURE GAGE OF FIXTURE	N CHECKOUT
		C. LOSS OF BOTH GR HEATER STATUS L		C. <u>CHECK OUT PLSS</u> USE DEGRADED OPS WITH THE FOR CEVT	C. CREW DETECTION	
	20-32	DEPLETION OF POS POS PRESS <130 PSIA	CEVT	ACTIVATE OPS	GT8182P PLSS O2 PRES GT8168P PGA PRESS PGA PRESS GAUGE LOW PGA PRESS TONE PLSS O2 QTY IND	
	20-33	LOSS OF MAIN POWER	SUPPLY CEVT	CONTINUE ACTIVATE OPS IN A PURGE MODE		
	20-34 DEGRADED POWER PROFILE CUR <2.0 AMP OR CUR >3.0 AMP			CONTINUE VERIFY PERFORMANCE OF FAN, PLAND SSC	LOW VENT FLOW TONE	
	SSION	REV DATE		SECTION	CDOUD	5005
MI	331011	5/1/2			GROUP	PAGE

SECTION 20 - CEVT - CONTINUED

APOLLO 10 FINAL 4/15/69 CEVT SPECIFIC 20-4	MISSION RULES									
20-36 LOSS OF ANY CRITICAL INSTRUMENTATION RULES 20-37 THROUGH 20-40 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE APOLIO 10 PINA 9/13/69 CEVT SECTION SPECIFIC 20-42	REV RUL	E CONDITION/MALFUNCTI	ON PHASE	RULING		CUES/NOTES/COM	MENTS			
28-36 LOSS OF ANY CRITICAL INSTRUMENTATION RULES 20-37 THROUGH 20-40 ARE RESERVED. MISSION SEV OATE SECTION SPECIFIC 20-47 APOLLO 10 FINA 4/13/69 CEVT SPECIFIC 20-49 REF MR 20-42 ACTIVATE OPS	20-3	5 LOSS OF TM	CEVT	CONTINUE						
RULES 20-37 THROUGH 20-40 ARE RESERVED. NISSION REV DATE SECTION GROUP PAGE APOLLO 10 FINE 4/13/69 CEVT SPECIFIC 20-4	-						······································			
RULES 20-37 THROUGH 20-40 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE APOLLO 10 FINA 4/15/69 CEVT SPECIFIC 20-4	20-3	6 LOSS OF ANY CRITICAL INSTRUMENTATION	CEVT	3071121101.		REF MR 20-42				
RULES 20-57 THROUGH 20-40 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE APOLLO 10 FINA 4/15/69 CEVT SPECIFIC 20-4										
RULES 20-37 THROUGH 20-40 ARE RESERVED. MISSIGN REV DATE SECTION GROUP PAGE APOLLO 10 FINAL 4/15/69 CEVT SPECIFIC 20-4										
20-40 ARE RESERVED.										
20-40 ARE RESERVED.										
MISSION REV DATE SECTION GROUP PAGE APOLLO 10 FINAL 4/15/69 CEVT SPECIFIC 20-4										
MISSION REV DATE SECTION GROUP PAGE APOLLO 10 FINAL 4/15/69 CEVT SPECIFIC 20-4										
MISSION REV DATE SECTION GROUP PAGE APOLLO 10 FINAL 4/15/69 CEVT SPECIFIC 20-4										
20-40 ARE RESERVED.										
20-40 ARE RESERVED.										
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20-40 ARE RESERVED.										
20-40 ARE RESERVED.										
APOLLO 10 FINAL 4/15/69 CEVT SPECIFIC 20-4		RULES 20-37 THROUGH 20-40 ARE RESERVED.								
APOLLO 10 FINAL 4/15/69 CEVT SPECIFIC 20-4	MISSIO	N REV DATE		SECT10N		GROUP	PAGE			
FC/TS: Form 201 (AUC 63)			CEVT		SPECIFIC					

REV	ITEM			MISSION RULES					
7		INSTRUMENTATION REQUIREMENTS							
	20-41	MEAS DESCRIPTION	FM/FM	ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE		
		·	GT81244 GT81400 GT8141V GT8154T GT8168P GT8182P GT8196T	WARNING TONE (1.5 KHZ) METER WARNING TONE (3.0 KHZ) METER WARNING TONE (3.0 KHZ) METER METER METER GREEN LIGHTS	соммон	HD M HD HD HD M HD M M M M M 1 OF			
	20-42	CRITICAL INSTRUME	NTATION						
ļ	- · -	MEAS DESCRIPTION	FM/FM	ONBOARD	TRANSDUCER				
			S O ₂ QTY IND GT8182P		COMMON				
				w.					
						, ·			
MI	SSION	REV DATE	SECTION		GROUP		PAGE		
	LO 10	FINAL 4/15/69	CEVT				1		

00	177611	MISSION RULES								
REV	ITEM	GENERAL MISSION RULES								
Α	21-1	TO INITIATE THE FOLLOWING MISSION EVENTS, THE PYROTECHNIC SYSTEM MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITIES:								
		A. DOCKED, UNDOCK RNDZ								
	į	ONE OPERATIONAL PYRO SYSTEM								
		B. NORMAL STAGING								
		TWO OPERATIONAL PYRO SYSTEMS								
1										
	21-2	A PYRO SYSTEM IS CONSIDERED LOST IF:								
,		A. PYRO BATTERY OPEN CIRCUIT VOLTAGE <35 VDC								
		B. UNABLE TO ARM SYSTEM								
A	21-3	A PYRO SYSTEM WILL BE DISABLED IF:								
		A. ANY RELAY K2 THROUGH K6 INADVERTANTLY CLOSES (REF MR 21-13)								
		B. ANY RELAY K7 THROUGH K15 INADVERTANTLY CLOSES								
		A PYRO SYSTEM IS DISABLED BY OPENING THE APPROPRIATE "LOGIC POWER" CIRCUIT BREAKER. SYSTEM WILL BE USED FOR APS PRESSURIZATION AND STAGING.								
	21-4	THE ASCENT AND DESCENT STAGES ARE CONSIDERED RIGIDLY ATTACHED WITH TWO DIAGONALLY OPPOSITE BOLT/NUT PAIRS INTACT.								
Ā	21-5	THE ASCENT AND DESCENT STAGES ARE CONSIDERED NON-RIDIGLY ATTACHED IF ALL STAGING FUNCTIONS OCCUR EXCEPT THE GUILLOTINE FAILS TO SEVER THE INTERSTAGE UMBILICALS.								
		RULE NUMBERS 21-6 THROUGH 21-9 ARE RESERVED.								
	MANAGEMENT MISSION RULES									
	21-10	APS WILL BE PRESSURIZED PRIOR TO STAGING. APS WILL NOT NORMALLY BE PRESSURIZED MORE THAN 24 HOURS PRIOR TO THE LAST APS BURN; HOWEVER, IN A CONTINGENCY CASE, THE APS MAY BE PRESSURIZED UP TO 3-1/2 DAYS PRIOR TO THE LAST APS BURN.								
	21-11	IF UNABLE TO DEPLOY ONE OR MORE LANDING GEAR, DESCENT ENGINE BURNS WILL BE CONTINUED SINCE CONTROL PROBLEMS ARE NOT EXPECTED TO EXIST AND DAMAGE TO THE LANDING GEAR FROM THE BURN WILL NOT AFFECT THE MISSION.								
	21-12	UNDOCKED STAGING WITH ONE PYRO SYSTEM WILL BE PERFORMED ONLY IF ABSOLUTELY NECESSARY TO MAINTAIN CREW SAFETY.								
	21-13	FOR A K1 THROUGH K6 FAILURE, THE GOOD SYSTEM WILL BE DISABLED AND A PYRO FUNCTION, OTHER THAN STAGING, ATTEMPTED TO DETERMINE IF K1 HAS FAILED CLOSED. IF BOTH SYSTEMS ARE FAILED IN THIS MODE, THEY MUST BOTH BE TESTED FOR A K1 FAILURE INDEPENDENTLY. A PYRO SYSTEM CANNOT BE DISABLED FOR A K1 FAILURE.								
	RULE NUMBERS 21-14 THROUGH 21-19 ARE RESERVED.									
MI	SSION	REV DATE SECTION GROUP PAGE								
	LO 10	A 4/23/69 LM SEQUENTIAL AND PYROTECHNIC GENERAL/MANAGEMENT 21-1								
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SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC - CONTINUED

NASA — Manned Spacecraft Center MISSION RULES

	MISSION RULES										
REV	RULE	CON	DITION/MALFUNCTI	ON	PHASE		RULING		CI	UES/NOTES/COM	MENTS
SPECIFIC MISSION RULES											
A	21-20	PYRO <35	BATTERY VOLTAGE VDC			· ·			• REf	F MR 21-12, 3	3-58
		Α.	ONE SYSTEM	ŀ	ALL	A. <u>C</u>	ONTINUE MISSION ELAY STAGING				
	B. TWO SYSTEMS			ALL	В.1.	DO NOT STAGE					
				DOCKED	2.	CONTINUE MISSION DO NOT UNDOCK					
					UNDOCKED	3.	DOCK ASAP DO NOT PERFORM SER	PARATION			
					RNDZ	4.	DOI - CONTINUE MIS	K ASAP - DO NOT PERFORM DOI - CONTINUE MISSION SING - CONTINUE MISSION			
A 	21-21		LE TO ARM PYRO EM(S)						• REF	F MR 21-12, 3	3–58
		Α.	ONE SYSTEM		ALL		ONTINUE MISSION ELAY STAGING				•
		в.	BOTH SYSTEMS PRI	OR TO:							
			1. UNDOCKING		DOCKED	В.1.	CONTINUE MISSION DO NOT UNDOCK		В.1.	STAGING CANN ACCOMPLISHED	
			2. DPS SHE PRES IZATION	SSUR-	RNDZ	2.	DOCK ASAP SEPARATION - DO NO DOI	OT PERFORM			
			3. APS PRESSURI STAGING	ZATION	RNDZ	3.	DOCK ASAP		3.	CSM RESCUE N REQUIRED DUE REDLINES	
								į			
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МІ	SSION	REV	DATE			SECTION		<u> </u>	GROUP		PAGE
┢	OLLO 10	A	4/23/69	IM SE				SPECIFIC			21-2
APOLLO 10 A 4/23/69			SEQUENTIAL AND PYROTECHNIC			5, 2011 10	11 10				

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			,	MISSION RULES	
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
А	21-22	UNABLE TO DISARM PYRO SYSTEM(S)	DOCKED UNDOCKED	A. <u>CONTINUE MISSION</u>	REF MALF PROC <u>ED 1</u> K1 = MASTER ARM RELAY
			RNDZ	B. <u>CONTINUE MISSION</u> STAGE NORMALLY	EPS WILL BE CONFIGURED TINSURE ASCENT POWER.
		,			
	21-23	RELAY K2 THROUGH K6 (OR K1 THROUGH K6 AFTER APS PRESS) INADVERTANTLY CLOSED AND CANNOT BE RESET	DOCKED	CONTINUE MISSION	RELAYS K2 = STAGE K3 = STAGE SEQUENCE K4 = 1 GUILLOTINE K5 = 2 BOLTS (SYS A) AND 2 NUTS (SYS B) K5A = 2 BOLTS (SYS A) AND 2 NUTS (SYS B) K6 = 2 ELECTRICAL CIRCUIT INTERRUPTERS
		A. SYSTEM A (DESCENT STAGE)	ALL	A. CONTINUE MISSION OPEN LOGIC POWER A CB UNTIL TIME TO PRESSURIZE APS, THEN: 1. ASC He SEL SW - BOTH 2. MSTR ARM SW - ON 3. ASC He PRESS SW - FIRE 4. MSTR ARM SW - OFF 5. LOGIC PWR A CB - CLOSE 6. ASC He PRESS SW - FIRE (HO 7. STAGE SW - FIRE 8. MSTR ARM SW - ON 9. ASC He PRESS SW - SAFE	A. ALL PYRO FUNCTIONS EXCE APS PRESSURIZATION AND STAGING WILL BE PERFORM ON SYSTEM B.
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		B. SYSTEM B (ASCENT STAGE)	ALL	B. CONTINUE MISSION OPEN LOGIC PWR B CB UNTIL TIME TO PRESSURIZE APS, THEN: 1. ASC He SEL SW - BOTH 2. MSTR ARM SW - ON 3. ASC He PRESS SW - FIRE 4. STAGE SW - FIRE 5. LOGIC PWR B CB - CLOSE 6. ASC He PRESS SW - FIRE	B. ALL PYRO FUNCTIONS EXCE APS PRESSURIZATION AND STAGING WILL BE PERFORM ON SYSTEM A.
		C. BOTH SYSTEMS	ALL	C. CONTINUE MISSION OPEN BOTH LOGIC POWER A AND B CB'S UNTIL TIME TO PRESSURIZE APS, THEN: 1. ASC He SEL SW - BOTH 2. LOGIC PWR A CB - CLOSE 3. ASC HE PRESS SW - FIRE (HON 4. STAGE SW - FIRE 5. MSTR ARM SW - ON 6. ASC HE PRESS SW - SAFE 7. LOGIC PWR B CB - CLOSE 8. ASC HE PRESS SW - FIRF	C. NO PYRO FUNCTION CAN BE PERFORMED EXCEPT APS PRESSURIZATION/STAGING. FOR THIS EVENT SYSTEM B WILL BE BACKUP TO SYSTEM A.
		,	ŀ	8. ASC He PRESS SW - FIRE	
MI	SSION	REV DATE		SECTION	GROUP PAGE

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC - CONTINUED

·		MISSION RULES	
REV RULE CONDITION/MALFUNCTIO	N PHASE	RULING	CUES/NOTES/COMMENTS
A 21-24 A RELAY K7 THROUGH K INADVERTANTLY CLOSES			RELAYS K7 = RCS PRESS K8 = LAND GEAR DEPLOY K8A = LAND GEAR DEPLOY K9 = DPS CRYO He PRESS K10 = ASC He TANK 1 K11 = ASC He TANK 2 K12 = ASC FUEL & OX COMP VALVE K12A = ASC FUEL & OX COMP VALVES (SYSTEM A ONLY) K13 = DPS FU & OX VENT K14 = DPS AMBIENT HE K15 = DPS FU & OX COMP VALVES
A. SYSTEM A		A. CONTINUE MISSION OPEN LOGIC POWER A C/B UNTIL DPS CRYO HE PRESSURIZATION ACCOMPLI	A. ALL PYRO FUNCTIONS EXCEP STAGING WILL BE PERFORME ON SYSTEM B
B. SYSTEM B		B. CONTINUE MISSION OPEN LOGIC POWER B C/B UNTIL DPS CRYO HE PRESS ZATION ACCOMPLISHED	B. ALL PYRO FUNCTIONS EXCEP STAGING WILL BE PERFORME ON SYSTEM A
C. BOTH SYSTEMS		C.1. CONTINUE MISSION 2. OPEN LOGIC POWER A&B UNTIL NEXT PYRO FUNCT	
		3. CLOSE LOGIC POWER A&B	
		4. CLOSE DES He REG 1 AN VERIFY DES He REG 2 C	
		5. MASTER ARM SW ON	
		6. PERFORM PYRO FUNCTION	
		7. MASTER ARM SW OFF	
		8. OPEN DES HE REG 1 AFT SUCCESSFUL DPS AMBIEN HE PRESS.	
21-25 UNABLE TO STAGE			
A. ASCENT AND DESCEN STAGE STILL RIGII TIED TOGETHER		A.1. <u>CONTINUE MISSION</u> 2. USE RCS FOR MANEUVERS	A. CSM RESCUE MAY BE INITIATED DUE TO RCS REDLINES
B. INCOMPLETE STAGIN VEHICLE NOT RIGIN		B.1. EXECUTE CSM RESCUE 2. GO TO DRIFTING FLIGHT	B. EVT MAY BE REQUIRED
RULE NUMBERS 21-26 1 21-49 ARE RESERVED.	THROUGH		
MISSION REV DATE		SECTION	GROUP PAGE
APOLLO 10 A 4/23/69	IN CEOUENTAL	AND PYROTECHNIC S	PECIFIC 21-4

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC - CONCLUDED

	1				MISSION	RULES			**************************************	
REV	ITEM				INSTRUMENTATIO	N REQUI	REMENTS			
										
	21-50	MEAS I	DESCRIPTION	PCM	ONBOARD			CATEGORY	MISSION RULE	REFERENCE
		ED RL	Y A K1-K6	GY0201X	SYS A STAGING L	IGHT)	COMMON CAUTION LIGHT	M HD	21-1, 2, 3, 1	13, 21, 22, 23
		ED RL	Y B K1-K6	GY0202X	SYS B STAGING LI	існт)		M HD	21-1, 2, 3, 1	13, 21, 22, 23
		ED RLY	Y A K7-K15	GY0231X	·			М	21-1, 3, 24	
		ED RLY	Y B K7-K15	GY0232X			٠	М	21-1, 3, 24	į
		SELECT VOLT	TED ED.BAT		METER			М	21-1, 2, 20	
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MI	SSION	REV	DATE	SECTION			GROUP			PAGE
	OLLO 10	FINAL	4/15/69	LM SEQUENT:	AL & PYROTECHNIC		PRELAUN	CH INSTRUM	MENTATION	21-5
FEC/T	33 Form	292 (AL	ια 6 6)				· · · · · · · · · · · · · · · · · · ·			

REV	ITEM	MISSION RULES
		GENERAL
А	22-1	TO INITIATE THE FOLLOWING MISSION EVENTS, THE ELECTRICAL POWER SYSTEM MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITIES:
Ì		A. DOCKED WITH HATCH CLOSED
l		1. CDR AND LMP BUSES
ľ		2. TWO DESCENT BATTERIES PLUS ONE ASCENT BATTERY
		3. BOTH ASCENT FEEDERS PLUS ONE DESCENT FEEDER
		4. SUFFICIENT AVAILABLE ELECTRICAL ENERGY TO POWER THE LM FOR 2 HRS BEYOND THE PLANNED LM TO CSM CREW TRANSFER
		B. DOCKED WITH HATCH OPEN AND TUNNEL CLEAR (NOTE: DOCKED DPS BURN FOR TEI IS NO-GO FOR ITEM 1)
ļ		1. CDR OR LMP BUS
l		2. TWO DESCENT BATTERIES WITH ASSOCIATED FEEDER OR ONE ASCENT BATTERY WITH ASSOCIATED FEEDER
		C. UNDOCKING, SEPARATION
		1. CDR AND LMP BUSES
]		2. TWO DESCENT BATTERIES PLUS ONE ASCENT BATTERY
		3. BOTH ASCENT FEEDERS PLUS ONE DESCENT FEEDER
1		4. SUFFICIENT AVAILABLE ELECTRICAL ENERGY TO POWER THE LM FOR 2 HOURS BEYOND THE PLANNED LM TO CSM CREW TRANSFER
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APO	LLO 10	A 4/23/69 LM ELECTRICAL POWER GENERAL 22-1
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<u></u>				MISSION RULES								
REV	ITEM											
А	22-1	D.	DOI									
	CONT'D			ND LMP BUSES								
		•	2. TWO DESCENT BATTERIES PLUS TWO ASCENT BATTERIES OR FOUR DESCENT BATTERIES PLUS ONE BATTERY									
				ASCENT FEEDERS PLUS ONE DESCENT FEEDER.								
l i			4. ONE I	NVERTER AND BOTH AC BUSES								
				CIENT AVAILABLE ELECTRICAL ENERGY TO POR	WER THE LM FOR 2 HOURS BEYOND	THE PLANNED LM TO						
		ε.		FIVE IMPULSE RNDZ WILL BE SELECTED IF T	HESE CONDITIONS ARE VIOLATED)							
			1. CDR A	ND LMP BUSES								
			2. TWO D	ESCENT BATTERIES PLUS TWO ASCENT BATTER	IES OR FOUR DESCENT BATTERIES	PLUS ONE ASCENT						
				ASCENT FEEDERS PLUS ONE DESCENT FEEDER	JNLESS DESCENT FEEDER LOST DU	E TO HARD SHORT						
				CIENT AVAILABLE ELECTRICAL ENERGY TO POR	WER THE LM FOR 2 HOURS BEYOND	THE PLANNED LM TO						
		F.	STAGING (NORMAL)		·						
			1. CDR A	ND LMP BUSES		•						
				ASCENT BATTERIES OR ONE ASCENT BATTERY	IF NO DESCENT ENERGY REMAINS	AND DESCENT O2						
1			3. EITHE	R ASCENT FEEDER								
			4. ASCEN	T BATTERY OVERCURRENT PROTECTION								
				CIENT AVAILABLE ASCENT ELECTRICAL ENERG' CSM CREW TRANSFER	TO POWER THE LM FOR 2 HOURS	BEYOND THE PLANNED						
		G.	STAGING (OCKED, HATCH OPEN AND TUNNEL CLEAR, OR	DELAYED)							
] } '			1. CDR O									
			2. ONE A	SCENT BATTERY								
1			3. ONE A	SCENT FEEDER								
				CIENT AVAILABLE ASCENT ELECTRICAL ENERG' CSM CREW TRANSFER	TO POWER THE LM FOR 2 HOURS	BEYOND THE PLANNED						
	·	н.	UNMANNED	APS BURN								
			1. CDR A	ND LMP BUSES								
			2. ONE A	SCENT BATTERY								
			3. ONE A	SCENT FEEDER								
	22-2	THE	CDR OR LM	P BUS IS CONSIDERED LOST IF:								
		Α.	BUS VOLTA	GE CANNOT BE MAINTAINED ABOVE 26.5 VDC								
		В.	BUS CURRE	VT ≥90 AMPS								
M	ISSION	REV	DATE	SECTION	GROUP	PAGE						
<u> </u>	OLLO 10	Α	4/23/69	LM ELECTRICAL POWER	GENERAL	22-2						
												

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		MISSION RULES										
REV	ITEM											
	22-3	A BATTERY IS CONSIDERED LOST IF:										
		A. OUTPUT <2 AMPS WHEN CONNECTED TO THE BUS										
		B. TEMPERATURE IS ≥145°F										
		C. CANNOT MEET VOLTAGE REGULATION AT REQUIRED LOAD										
		D. CANNOT BE CONNECTED TO A FEEDER DUE TO A MALFUNCTIONING ECA										
		E. BATTERY OPEN CIRCUIT VOLTAGE BELOW 31.8 VDC STEADY STATE										
	22-4	A DC BUS FEEDER IS CONSIDERED LOST IF:										
		CANNOT BE USED AS A POWER PATH										
		GARROL DE OSEPTO TO CONER TAIL										
.												
	22-5	AN INVERTER AND/OR ASSOCIATED AC DISTRIBUTION SYSTEM IS CONSIDERED LOST IF:										
		A. AC BUS VOLTAGE <110.5 OR >120 VAC										
		B. AC BUS FREQUENCY <390 OR >410 HZ										
		C. POWER CANNOT BE SUPPLIED TO AN AC BUS										
	22-6	A FOA OVERCURRENT PROTECTION TO DESINITE VIOCTIES										
.	22-0	A. ECA OVERCURRENT PROTECTION IS <u>DEFINITELY</u> LOST IF:										
		 BOTH CIRCUIT BREAKERS POWERING THE ECA'S FAIL OPEN (ALL DESCENT OR ALL ASCENT ECA'S, WHICHEVER IS APPLICABLE) 										
		2. ASCENT BATTERY BACKUP FEED IS USED B. ECA OVERCURRENT PROTECTION IS <u>PROBABLY</u> LOST IF:										
		1. UNABLE TO MEASURE A BATTERY CURRENT BOTH ONBOARD AND ON TELEMETRY										
		2. UNABLE TO TAKE THE BATTERY OFF LINE										
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ļ												
		RULE NUMBERS 22-7 THROUGH										
]		22-9 ARE RESERVED.										
MI	SSION	REV DATE SECTION GROUP PAGE										
APO	LLO 10	FINAL 4/15/69 LM ELECTRICAL POWER GENERAL 22-3										
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REV	ITEM			r~~~~			
	[[MANAC	GEMENT		
	22-10	THE MIS IS LOST PROTECT	PRIOR TO	BE CONTINUED WITH THE PROBAR LIFTOFF, A HOLD WILL BE CALL	BLE LOSS OF OV LED. (REF MR	VERCURRENT PROTECTION. IF TO 22-22 FOR DEFINITE LOSS OF	HIS PROTECTION OVERCURRENT
	22-11	FOR NOM BY REMO	INAL STAG VING 20 AM	ING, THE ASCENT BATTERIES WIL MP-HRS FROM EACH BATTERY IMME	LL BE PRECONDI EDIATELY PRIOR	TIONED FOR ONE ASCENT BATTE TO THE EVENT.	RY OPERATION
A	22-12	BE ACCO	DVING 5 AM XMP∟ISHED	STAGING, THE ASCENT BATTERIE: P-HRS FROM EACH BATTERY IMME: ONLY FOR THE PHASING MANEUVE: LE BUS OPERATION WILL BE CON BATTERY.	DIATELY PRIOR R. IN THE EVE	TO THE EVENT. THIS IS PRES	ENTLY PLANNED TO
	22-13	DELETED)				
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			MBERS 22-1 RE RESERVE	4 THROUGH ED.			
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	SSION		ATE	SECTION		GROUP	PAGE
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r		CONDITIONAL	N. 51::2=	MISSION RULES		OUEC MOTES ASSISTED TO
REV	RULE	CONDITION/MALFUNCTIC	N PHASE	RULING		CUES/NOTES/COMMENTS
Α	22-20	LOSS OF EITHER DC BUS		A. CONTINUE MISSION 1. DO NOT UNDOCK 2. CREWMAN OPERATE CONNECTING HATCH AND TUNNEL CLEAF 3. PERFORM LIMITED EVALUATION B. DOCK ASAP DELAY STAGING	HES OPEN	1. UNSTAGED DC BUS 2. STAGED DC BUS 3. UNSTAGED CEW PWR 4. STAGED CEW PWR • LOSS OF DC BUS RESULTS IN LOSS OF ONE PYRO SYSTEM
A	22-21	SHORTED DC BUS FEEDER A. DESCENT	DOCKED UNDOCKED RNDZ	A. CONTINUE MISSION 1. PUT BOTH ASCENT ON NORMAL FEED V ISOLATED VIA DE/ RELAY 2. CONTINUE MISSION 3. SEP - CONTINUE I DOI - PERFORM F RNDZ PHASING - CONTIN	NITH SHORT ADFACE MISSION IVE IMPULSE	1. UNSTAGED DC BUS 2. STAGED DC BUS 3. UNSTAGED CSW PWR 4. STAGED CSW PWR
		B. ASCENT	ALL DOCKED UNDOCKED RND2	B.1. SET UP FOR UNMANN 2. CONTINUE MISSION (A) DO NOT UNDOCI (B) POWER AFFECTI OTHER BUS VI. CROSSTIE C/B (C) CREWMEN OPER CONNECTING H OPEN AND TUNI (D) PERFORM SYSTI ATION 3. DOCK ASAP	K ED BUS FROM A 100 AMP 'S ATE W1TH ATCHES NEL CLEAR	
-	SSION LLO 10	REV DATE A 4/23/69 L	M ELECTRICAL POWE	SECTION FR	SPECIFIC	GROUP PAGE 22-5
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	_			MISSION RULES		
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COM	MMENTS
A	22-22	DEFINITE LOSS OF OVER-CURRENT PROTECTION A. DESCENT BATTERIES B. ASCENT BATTERIES	ALL ALL	A. CONTINUE MISSION B. CONTINUE MISSION DELAY STAGING	• NO APPLICABLE M REF MR 22-6, 21	
A	22-23	LOSS OF ASCENT BATTERIES: A. LOSS OF ONE ASCENT BATTERY	ALL	A.1. CONTINUE MISSION DO NOT STAGE UNLES BATTERIES ARE DEPL DESCENT 02 TANK DE	ETED AND 4 STAGED C&W	RUS
		B. LOSS OF TWO ASCENT BATTERIES	ALL	B.1. DO NOT STAGE 2. CONTINUE MISSION (A) DO NOT UNDOCK (B) CREWMEN OPERA CONNECTING HA OPEN AND TUNN (C) PERFORM SYSTE TION	TE WITH TCHES EL CLEAR	
			UNDOCKED RNDZ	3. <u>DOCK ASAP</u>		
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
A	22-24	LOSS OF DESCENT BATTERIES A. LOSS OF ONE OR TWO DESCENT BATTERIES B. LOSS OF THREE DESCENT BATTERIES C. LOSS OF FOUR DES BATTERIES	: ALL DOCKED UNDOCKED RNDZ ALL DOCKED	A. CONTINUE MISSION B.1. CONTINUE MISSION 2. CONTINUE MISSION 3. SEP - DO NOT PERFORM 4. DOI - PERFORM FIVE RNDZ 5. PHASING - CONTINUE C.1. SET UP FOR UNMANNED 2. CONTINUE MISSION (A) DO NOT UNDOCK (B) CREWMAN OPERATON CONNECTING HATON TUNNEL CLE (C) PERFORM SYSTEN EVALUATION	IMPULSE MISSION APS BURN TE WITH TCHES OPEN	• REF MALF PROC EP 1 UNSTAGED DC B 3 UNSTAGED CSW 5 BATTERY	<u>US</u>
A	22-25	LOSS OF INVERTERS A. LOSS OF ONE INVERTERS B. LOSS OF BOTH INVERTERS	ALL DOCKED UNDOCKED RNDZ	A. CONTINUE MISSION B.1. CONTINUE MISSION 2. SEP - DO NOT PERFOR 3. DOI - CONTINUE MISS 4. PHASING - CONTINUE	ION	REF MALF PROC EPT TINVERTER LOSS OF AC BUS A LOSS OF DPS GIMB AND RR. LOSS OF AC BUS B LOSS OF S-BAND S ANTENNA (HBR TM) LOSS OF BOTH AC RESULTS IN THE A LOSS OF BOTH FDA	RESULTS IN AL CONTROL RESULTS IN TEERABLE BUSES BOVE PLUS
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	KULL	CON	NDITION/MALFUNCT	ION	PHASE	 	RULING		CUES/NOTES/COMM	IENTS
A	22-26	LOSS	OF AC BUSES LOSS OF BUS A, BUSES DR BOTH BUSES	US Β,	DOCKED UNDOCKED RNDZ	3.	CONTINUE MISSION SEPARATION - CONTINUMISSION DO NOT PERFORM DOI DOI - CONTINUE MISSI PHASING - CONTINUE M	<u>on</u> nission	CUES/NOTES/COMM REF MALF PROC EPS: 7 INVERTER LOSS OF AC BUS A FLOSS OF DPS GIMBAL AND RR. LOSS OF AC BUS B FLOSS OF S-BAND STEANTENNA (HBR TM): LOSS OF BOTH AC BURESULTS IN THE ABCUSS OF BOTH FDAI	RESULTS IN CONTROL RESULTS IN ERABLE SSES
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T CET		INSTR	UMENTATION REQUIRE	MENTS		
22-50	MEAS DESCRIPTIO	<u>N PCM</u>	ONBOARD	CATEGOR		MISSION RULE REFERENCE
	AC BUS FREQ AC BUS VOLTS BAT 1 VOLTS BAT 2 VOLTS BAT 3 VOLTS BAT 4 VOLTS BAT 5 VOLTS BAT 6 VOLTS CDR BUS VOLTS LMP BUS VOLTS	GC0155F GC0071V GC0201V GC0202V GC0203V GC0204V GC0205V GC0206V GC0301V GC0302V	CAUTION COMM METER/CAUTION LIGH METER METER METER METER METER METER METER METER METER METER/WARNING COMM METER/WARNING LIGH	T M HD HD HD NN HD M M M M ON 1 OF 2	$\begin{cases} 22-1\\ 20, 2 \end{cases}$ $\begin{cases} 22-1\\ 20, 2 \end{cases}$,5,25,26 ,2,3,10, 1,22,24 ,2,3,10, 1,22,23 ,2,3,20, 2,23,24
	BAT 1 CUR BAT 2 CUR BAT 3 CUR BAT 4 CUR BAT 5 CUR BAT 6 CUR	GC1201C GC1202C GC1203C GC1204C GC1205C GC1206C	METER METER METER METER METER METER METER		∫ ^{20,2} ,22-1	,2,3,10 1,22,24 ,2,3,10 1,22,23
	BAT 1 MAL BAT 2 MAL BAT 3 MAL BAT 4 MAL BAT 5 MAL BAT 6 MAL BATTERY MAL	GC9961U GC9962U GC9963U GC9964U GC9965U GC9966U GC4047X	CAUTION/COMP CAUTION/COMP CAUTION/COMP CAUTION/COMP CAUTION/COMP		RD 22-1 RD 10,2 RD 22-1 RD 22-1	,2,3, 2,24 ,2,3,10,22,23 ,2,3,10,22,23,
	BAT 1 LOW TAP BAT 2 LOW TAP BAT 3 LOW TAP BAT 4 LOW TAP	GC4362X GC4364X GC4366X GC4368X	FLAG FLAG FLAG FLAG	HD HD HD HD	22-1	,2,3,10,20,22,
·	BAT 5 B/U CDR BAT 6 NORM CDR BAT 5 NORM LMP BAT 6 B/U LMP	GC4369X GC4370X GC4371X GC4372X	FLAG FLAG FLAG FLAG	HD HD HD HD	} 22-1 21,2	,2,3,10,20, 2,23
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GENERAL A 23-1 TO INITIATE AND CONTINUE THE FOLLOWING MISSION EVENTS, THE ENVIRONMENTAL CONTROL SYSTEM MUST THE FOLLOWING MINIMUM CAPABILITIES: A. DOCKED WITH HATCH OPEN 1. COMBINED VEHICLE PRESSURE INTEGRITY 2. ONE LIM 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 LOOP 6. SUFFICIENT 02, H20, AND LIGH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD C. UNDOCKING 1. CABIN PRESSURE INTEGRITY 2. SUIT CIRCUIT INTEGRITY 3. ONE SUIT FAN 4. ONE DEMAND REGULATOR 5. ONE COOLANT LOOP 6. SUFFICIENT 02, H20, AND LIGH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD PLUS 2 HOURS 7. SUFFICIENT 02, H20, AND LIGH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD PLUS 2 HOURS 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROW POINT PLUS 2 HOURS 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROW POINT PLUS 2 HOURS 1. CABIN PRESSURE INTEGRITY 2. SUIT CIRCUIT INTEGRITY 2. SUIT CIRCUIT INTEGRITY 2. SUIT CIRCUIT INTEGRITY 2. SUIT CIRCUIT INTEGRITY	T PROVIDE
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3. ONE SUIT FAN 4. ONE DEMAND REGULATOR 5. ONE COOLANT LOOP 6. SUFFICIENT O ₂ , H ₂ O, AND Lioh Consumables to complete the specified activity period C. <u>UNDOCKING</u> 1. CABIN PRESSURE INTEGRITY 2. SUIT CIRCUIT INTEGRITY 3. ONE SUIT FAN 4. ONE DEMAND REGULATOR 5. ONE COOLANT LOOP 6. SUFFICIENT O ₂ , H ₂ O, AND Lioh Consumables to complete the specified activity period plus 2 hours 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROM POINT PLUS 2 HOURS D. <u>SEPARATION</u> 1. CABIN PRESSURE INTEGRITY	
4. ONE DEMAND REGULATOR 5. ONE COOLANT LOOP 6. SUFFICIENT O ₂ , H ₂ O, AND LiOH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD C. UNDOCKING 1. CABIN PRESSURE INTEGRITY 2. SUIT CIRCUIT INTEGRITY 3. ONE SUIT FAN 4. ONE DEMAND REGULATOR 5. ONE COOLANT LOOP 6. SUFFICIENT O ₂ , H ₂ O, AND LiOH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD PLUS 2 HOURS 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROM POINT PLUS 2 HOURS D. SEPARATION 1. CABIN PRESSURE INTEGRITY	
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3. ONE SUIT FAN 4. ONE DEMAND REGULATOR 5. ONE COOLANT LOOP 6. SUFFICIENT O ₂ , H ₂ O, AND LiOH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD PLUS 2 HOURS 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROM POINT PLUS 2 HOURS D. SEPARATION 1. CABIN PRESSURE INTEGRITY	ļ
4. ONE DEMAND REGULATOR 5. ONE COOLANT LOOP 6. SUFFICIENT O ₂ , H ₂ O, AND LiOH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD PLUS 2 HOURS 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROM POINT PLUS 2 HOURS D. SEPARATION 1. CABIN PRESSURE INTEGRITY	
5. ONE COOLANT LOOP 6. SUFFICIENT O ₂ , H ₂ O, AND LiOH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD PLUS 2 HOURS 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROM POINT PLUS 2 HOURS D. SEPARATION 1. CABIN PRESSURE INTEGRITY	
6. SUFFICIENT O ₂ , H ₂ O, AND LiOH CONSUMABLES TO COMPLETE THE SPECIFIED ACTIVITY PERIOD PLUS 2 HOURS 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROM POINT PLUS 2 HOURS D. <u>SEPARATION</u> 1. CABIN PRESSURE INTEGRITY	
PLUS 2 HOURS 7. SUFFICIENT ASCENT CONSUMABLES TO EFFECT A CONTINGENCY RETURN AND TRANSFER TO CSM FROM POINT PLUS 2 HOURS D. SEPARATION 1. CABIN PRESSURE INTEGRITY	
D. SEPARATION 1. CABIN PRESSURE INTEGRITY	
1. CABIN PRESSURE INTEGRITY	M ANY
2. SUIT CIRCUIT INTEGRITY	
3. ONE SUIT FAN	
4. ONE DEMAND REGULATOR	
5. ONE COOLANT LOOP	
6. SUFFICIENT O ₂ , H ₂ O, AND LiOH CONSUMABLES TO COMPLETE START OF EVENT THROUGH DOCKING A CONTINGENCY TRANSFER TO CSM PLUS 2 HOURS	AND
7. THE ${\bf 0}_2$ AND ${\bf H}_2$ O CONSUMABLES ARE TO BE CONTAINED IN AT LEAST TWO ASCENT ${\bf 0}_2$ TANKS AND OF ${\bf H}_2$ O TANK	NE ASCENT
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REV	ITEM							
А		E.	<u>DOI</u>					
	(CONT'D))	1.	CABIN PRESSURE INTEGRITY				
			2.	SUIT CIRCUIT INTEGRITY				
			3.	NE SUIT FAN				
			4.	NE DEMAND REGULATOR			ĺ	
			5.	NE H ₂ O SEPARATOR				
		6. BOTH COOLANT LOOPS 7. PRIMARY H ₂ O FEEDPATH CAPABILITY						
			8.	SUFFICIENT 0 ₂ , H ₂ O, AND LiOH CONSUMABLE PHASING IS NOT PERFORMED PLUS 2 HOURS	S TO COMPLE	TE A CONTINGENCY RETURN AND TRAN	ISFER IF	
			9.	THE O_2 AND $\mathrm{H}_2\mathrm{O}$ CONSUMABLES ARE TO BE COWO OF THREE $\mathrm{H}_2\mathrm{O}$ TANKS.	NTAINED IN A	AT LEAST TWO OF THREE O2 TANKS A	ND IN	
		F.	PHAS	<u>NG</u>				
			1.	ABIN PRESSURE INTEGRITY				
			2.	UIT LOOP INTEGRITY				
			3.	ONE SUIT FAN				
			4.	NE DEMAND REGULATOR				
			5.	NE H ₂ O SEPARATOR				
			6.	OTH COOLANT LOOPS				
			8.	UFFICIENT 0, ASCENT H,O, AND LIOH CON HROUGH DOCKING PLUS 2 HOURS HE 02 AND H20 CONSUMABLES REQUIRED ARE ND TWO OF THREE H20 TANKS.				
		G.	IIMON	AL STAGING				
				ABIN PRESSURE INTEGRITY				
	 		2. :	UIT LOOP INTEGRITY				
1			3.	WO SUIT FANS				
			4. (NE DEMAND REGULATOR				
			5. (NE H ₂ O SEPARATOR				
			6. (NE COOLANT LOOP				
			7.	SUFFICIENT O, ASCENT H ₂ O, AND LiOH CONS HROUGH DOCKING PLUS 2"HOURS	SUMABLES TO	COMPLETE THE SPECIFIED ACTIVITY	PERIOD	
			8.	HE O2 AND H $_2$ O CONSUMABLES REQUIRED THR ND TWO ASCENT H $_2$ O TANKS.	OUGH DOCKING	ARE TO BE IN AT LEAST TWO ASCE	NT O2 TANKS	
		н.	<u> 1-11011</u>	OMINAL STAGING (DELAYED)				
			1. (ABIN PRESSURE INTEGRITY				
		1	2. 9	UIT LOOP INTEGRITY				
			3. (NE SUIT FAN				
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	SG Form	L				GENERAL	23-2	

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			MISSION RULES					
REV	ITEM							
	23-1 (CONTD)	 ONE COOLANT LOOP SUFFICIENT ASCENT CO H₂O TANK 	NSUMABLES TO COMPLETE DOCKING	IN TWO ASCENT O $_2$ TANKS AND ONE A	SCENT			
А	23-2	DEFINITIONS:						
		LOSS OF CABIN INTEGRITY LM PRESSURE VESSEL LEAKAGE SUCH THAT CABIN PRESSURE CANNOT BE MAINTAINED 24.6 PSIA WITH AN O ₂ FLOW RATE OF .68 LBS/HR. FOR DOCKED ACTIVITIES, TH WILL BE RELAXED TO A FLOW RATE OF 6 LBS/HR.						
			TOTAL PGA/SUIT LOOP LEAKAGE <u>>0</u> PRESSURE CHECK OR A VISIBLE TE	.2 PSI/MIN (0.6 LB/HR) DURING SU AR IN THE PGA.	IT LOOP			
			LOOP STARTUP AND DRYOUT (SUBLI)	50°F AND RISING EXCEPT DURING COMMATOR LOST) OR GLYCOL PUMP $\Delta P \le 6$ SS OF H_2O FEED CAPABILITY TO THE	PSID			
			OBSERVED FLUID IN CABIN CONFIRM INDICATION CONFIRMED BY STATIC	MED BY TASTE OR PRESENCE OF GLYC PRESSURE DROP.	OL LOW			
		LOSS OF DESCENT O2 TANK	INABILITY TO TRANSFER O_2 FROM ITANK PRESSURE WITH O_2 MANIFOLD	DESCENT TANK OR MSFN CONFIRMATIO PRESSURE (WITHIN LIMITS).	N OF DESCENT			
			PRESSURE; OR (2) IF UNSTAGED AN	OF ASCENT TANK PRESSURE WITH O2ND DESCNET TANK >35 PERCENT, CREINST THE OTHER; OR (3) IF STAGED ONBOARD AND MSFN READOUT.	W CONFIRM			
		LOSS OF DESCENT HO TANK	INABILITY TO SUPPLY H2O TO W/B TEMPERATURE (CREW AND MSFN) AND	RESULTING IN RISING GLYCOL AND DROP IN H ₂ O ΔP (MSFN ONLY).	SUIT LOOP			
				ING TANK FEEDING AT TWICE NORMAL AND NO CHANGE IN MEASUREMENT ON				
	23-3 23-4	MEMBER ON THE CSM TRANSFER U	R SUIT LOOP INTEGRITY, THE LM M MBILICAL BEFORE STAGING IS ATTE TO BREAKTHROUGH, NO RESTART ATT		CREW			
Α	23–5	DELETED						
	23-6	OXYGEN PURGE SYSTEM AND PLSS FOR NOMINAL REDLINE USAGE.	CONSUMABLES WILL BE RESERVED F	FOR POSSIBLE EVT AND WILL NOT BE	CONSIDERED			
		RULE NUMBERS 23-7 THROUGH 23-9 ARE RESERVED						
. MI	SSION	REV DATE SECTION		GROUP	PAGE			
	LLO 10	1 107 150	I RONMENTAL CONTROL					
L		202 (Alic 66)	INONHERIAL CONTROL	GENERAL	23-3			

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INL V	1120		SYSTEMS MAN	AGEMENT	
	23-10	PRIMARY GLYCOL LOO FOLLOWING SEC LOO	OP CIRCULATION WILL BE DISCONTING P STABILIZATION IF DEEMED NECESSA	JED AT START OF THE SECONDARY LOOP BUT MA	Y BE INITIATED
	23-11	IF EITHER ASCENT (TANK QUANTITY <u>></u> 35	D, TANK IS ≤95 PERCENT, IT WILL E PERCENT AND AS CLOSE TO STAGING	BE REPLENISHED FROM THE DESCENT O ₂ WHEN T AS POSSIBLE.	HE DESCENT
	23-12	PLSS FILL VALVE W OF 0 ₂ MANIFOLD PRI	ILL BE CLOSED, EXCEPT FOR REPRESSESSURE.	SURIZING THE PLSS AND FOR MSFN REQUESTED	READOUTS
	23-13	CREW WILL GO TO E REQUIRED TIME. AI ANTICIPATED.	GRESS MODE IF INSUFFICIENT O_2 IS DDITIONALLY, A MISSION PHASE WILL	AVAILABLE TO MAINTAIN CABIN PRESSURE FOR NOT BE INITIATED IF THIS CONDITION CAN	THE BE
					•
				4	
		RULE NUMBERS 23-14	: THROUGH		
		23-19 ARE RESERVED			
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
			SPEC	IFIC MISSION RULES			
	23-20	LOSS OF CABIN PRESSURE INTEGRITY	<u> </u>				
			ALL	A. SET UP FOR UNMANNED A	APS BURN	A. REF MALF PROC E	<u>CS</u> CABIN
			DOCKED	B.1. PERFORM SYSTEMS EVA WITHIN CONSUMABLES TIME CONSTRAINTS WI CREWMAN ON BOTH THE AND LM UMBILICALS.	LIFE- ITH ONE		
				2. NO-GO FOR UNDOCKING	}		
			UNDOCKED	C.1. DOCK ASAP			
	·			2. DO NOT STAGE WHILE	UNDOCKED		
				3. NO-GO FOR RNDZ			
			RNDZ	D.1. DOCK ASAP		•	
				2. DO NOT STAGE WHILE	UNDOCKED		
							
	23-21	LOSS OF SUIT LOOP INTEGRITY	ALL	A. SET UP FOR UNMANNED A	APS BURN		
			DOCKED	B.1. PERFORM SYSTEMS EVA			
				2. NO-GO FOR UNDOCKING	3		
			UNDOCKED	C.1. DOCK ASAP			
				2. DO NOT STAGE WHILE	UNDOCKED		
				3. NO-GO FOR RNDZ		•	
	<u>;</u>		RNDZ	D.1. DOCK ASAP			
				2. DO NOT STAGE WHILE	UNDOCKED		
	23-22	SUIT FAN(S) FAILURE				REF MALF PROC <u>ECS</u> SI	JIT/FAN
		A. ONE SUIT FAN	ALL	A. CONTINUE MISSION			
:		B. TWO SUIT FANS	DOCKED	B.1. CONTINUE MISSION ON TRANSFER UMBILICAL	N CSM	B.1.(A) OTHER CREWI RETURN TO	
				NO-GO FOR UNDOCKING	;	(B) REMOVE HELI	MET.
			UNDOCKED	2. <u>DOCK ASAP</u>		AND GLOVES	
				NO-GO FOR RNDZ			
				DO NOT STAGE WHILE	DOCKING		
			RNDZ	3. DOCK ASAP			
				DO NOT STAGE WHILE	UNDOCKED		
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	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMMENTS
2	23-23	LOSS OF H ₂ O SEPARATOR(S) A. ONE SEPARATOR B. TWO SEPARATORS	ALL DOCKED UNDOCKED	A. CONTINUE MISSION B.1. CONTINUE MISSION 2.(A) CONTINUE MISSION AT CREW OPTION (B) NO-GO FOR RNDZ (C) DELAY STAGING 3. DOCK ASAP	REF MALF PROC <u>ECS</u> ECS
				DELAY STAGING	
	23-24	DEMAND REGULATOR(S) FAIL OPEN OR CLOSED A. ONE REGULATOR B. TWO REGULATORS	ALL DOCKED UNDOCKED RNDZ	A. CONTINUE MISSION B.1.(A) SET UP FOR UNMANNED APS BURN (B) PERFORM SYSTEMS EVALUATION WITHIN CONSUMABLES LIFETIME CONSTRAINTS WITH ONE CREWMAN ON BOTH THE CSM AND LM UMBILICALS (C) NO-GO FOR UNDOCKING B.2.(A) DOCK ASAP (B) NO-GO FOR SEP, DOI, PHASING (C) DELAY STAGING	
	23-25	LOSS OF COOLANT LOOP(S) A. PRIMARY LOOP	DOCKED UNDOCKED	A.1. <u>CONTINUE MISSION</u> ON SECONDARY LOOP	REF MALF PROC <u>ECS</u> ECS
		B. BOTH LOOPS (ANY COMBINATION OF LOSS OF CIRCULATION, SUBLIMATION CAPABILITY, OR H ₂ O FEED FOR BOTH LOOPS)	RNDZ DOCKED UNDOCKED RNDZ	NO-GO FOR DOI 2. RETURN TO CSM VICINITY ASAP ON SECONDARY LOOP B.1. INGRESS CSM ASAP NO-GO FOR UNDOCKING 2. DOCK ASAP NO-GO FOR SEPARATION 3. DOCK ASAP (A) CONTINUE GLYCOL CIRCULATION IF POSSIBLE (B) POWER DOWN S/C FOR LIFE SUPPORT ONLY	Ī
MIS	SSION	(ANY COMBINATION OF LOSS OF CIRCULATION, SUBLIMATION CAPABILITY, OR H ₂ O FEED FOR BOTH	DOCKED UNDOCKED RNDZ	2. RETURN TO CSM VICINITY ASAP ON SECONDARY LOOP B.1. INGRESS CSM ASAP NO-GO FOR UNDOCKING 2. DOCK ASAP NO-GO FOR SEPARATION 3. DOCK ASAP (A) CONTINUE GLYCOL CIRCULATION IF POSSIBLE (B) POWER DOWN S/C FOR LIFE	Ī

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	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COMME	VTS
23-26	LOSS OF PRIMARY H ₂ O FEEDPATH	DOCKED UNDOCKED RNDZ	A. CONTINUE MISSION NO-GO FOR DOI B. RETURN TO VICINITY OF CSM ASA	REF MALF PROC ECS GLY	COL.
23-27	FIRE OR SMOKE IN CABIN OR SUIT	ALL	A. TROUBLESHOOT/COMBAT FIRE B. ASSESS DAMAGE AND TRANSFER TO CSM IF NECESSARY	REF AOH PROC 5.3.2	
2328	CONTAMINATION IN CABIN	ALL	CREW MAY ELECT TO DECOMPRESS	IF UNABLE TO CLEAR CO TION, MISSION MAY BE ATED EARLY.	NTAMINA TERMIN-
23-29	GLYCOL COOLANT LEAK A. CABIN B. SUIT	ALL ALL	TRANSFER TO CSM SET UP FOR UNMANNED APS BURN A. PURGE SUIT WITH DIRECT O ₂ B. DISCONNECT FROM SUIT LOOP		
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REV ITEM		INSTRUMENT	ATION REQUIREMENTS]	
A 23-50	MEAS DESCRIPTIO	<u>N</u> <u>PCM</u>	ONBOARD	CATEGORY	
	SUIT PRESS	GF1301P	METER	MANDATORY	
	CABIN PRESS REPR ELEC OPEN CO ₂ PART PRESS	GF3571P GF3572X GF1521P	WARNING METER WARNING METER, CAUTION COMP	MANDATORY MANDATORY HIGHLY DESIRABLE HIGHLY DESIRABLE	
	H ₂ O SEP RATE DES O ₂ PRESS ASC 1 O ₂ PRESS ASC 2 O ₂ PRESS O ₂ MANIFOLD PRE	GF9999U GF3584P GF3582P GF3583P SS GF3589P	CAUTION, COMP METER, CAUTION METER, CAUTION METER, CAUTION	HIGHLY DESIRABLE MANDATORY 1 OF 2 MANDATORY MANDATORY	
	GLYCOL PUMP AP GLYCOL PUMP SW/ GLYCOL PUMP P GLYCOL LEVEL LO GLYCOL TEMP	GF9997U	COMP METER CAUTION METER, CAUTION	MANDATORY HIGHLY DESIRABLE MANDATORY MANDATORY MANDATORY PCM	
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) 7.55 £ 1120 Q11	GF4582Q 1 OF	METER	MANDATORY BOTH	1
	PRI H20 REG AP	GF4583Q) 2 GF4582Q GF4583Q GF4101P		MANDATORY BOTH MANDATORY	OF 2
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- 24 LM/COMM INSTRUMENTATION (SEE SECTION 32)
- 25 LM GUIDANCE AND CONTROL
- 26 LM DPS
- 27 LM APS
- 28 LM REACTION CONTROL SYSTEM
- 29 SPACE ENVIRONMENT
- 30 RECOVERY
- 31 AEROMEDICAL
- 32 COMMUNICATIONS/ INSTRUMENTATION

APPENDICES

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

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25 LM GUIDANCE AND CONTROL

GENERAL 25-1 DOCKED NO MINIMUM GSC SYSTEM CAPABILITIES ARE REQUIRED TO CONTINUE THE DOCKED PHASE. 25-2 UNDOCKED IN ORDER TO INITIATE AND CONTINUE THE UNDOCKED PHASE, THE GSC SYSTEMS MIST PROVIDE THE FOLLOWING MINIMUM CAPABILITYS: A. REDURBANT 3-AXIS ATTITUDE CONTROL, INCLUDING ONE MANUAL CAPABILITY AND ONE AUTO ATT HOLD CAPABILITY. S. 3-AXIS TRANSLATION CAPABILITY, DEFINED AS HAVING A MINIMUM OF: 1. ONE TICA. 2. PORS OR ASS TRANSLATION CAPABILITY A. SEPARATION 1. REDURBANT 3-AXIS ATTITUDE CONTROL CAPABILITY 2. 3-AXIS TRANSLATION CAPABILITY 2. 3-AXIS TRANSLATION CAPABILITY 3. REDURBANT 3-AXIS ATTITUDE CONTROL CAPABILITY 4. SEPARATION 1. REDURBANT 3-AXIS ATTITUDE CONTROL CAPABILITY 2. 3-AXIS TRANSLATION CAPABILITY 3. NO FORE THAN 100 SECONDS MAXIMUM DES OPERATION ARE REQUIRED TO INITIATE DOT PLUS THE POLLOWING MINIMUM CAPABILITY 3. NO FORE THAN 100 SECONDS MAXIMUM DES OPERATION IN NON-THROTTLEABLE RANGE 4. EITHER AN OPERATIONAL BOT COAS 3. ONE OPERATIONAL FROM EXPLORER COMES TRANSPONDER COMBINATION, DEFINED AS: A VALID LOC-ON DURING THE SEPARATION PRISE MISSION SEX VARE SECTION PRISE SECTION RANGE AND ONTROL CAPABILITY APOLLO ID A 9/23/69 UM GUIDANCE AND CONTROL CAPABILITY APOLLO ID A 9/23/69 UM GUIDANCE AND CONTROL CAPABILITY APOLLO ID A 9/23/69 UM GUIDANCE AND CONTROL CAPABILITY APOLLO ID A 9/23/69 UM GUIDANCE AND CONTROL CAPABILITY APOLLO ID A 9/23/69 UM GUIDANCE AND CONTROL CAPABILITY APOLLO ID A 9/23/69 UM GUIDANCE AND CONTROL CAPABILITY APOLLO ID A 9/23/69 UM GUIDANCE AND CONTROL CAPABILITY 25-1		MISSION RULES							
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6. OPERATIONAL RENDEZVOUS RADAR AND RR TRANSPONDER COMBINATION, DEFINED AS: A VALID LOCK-ON DURING THE SEPARATION PHASE MISSION REV DATE SECTION GROUP PAGE APOLLO 10 A 4/23/69 LM GUIDANCE AND CONTROL GENERAL 25-1			4. EITHER AN OPERATIONAL ACT OR COAS						
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	25-3	c. :	STAGING			
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			IN ORDER TO	STAGE THE LM, THE G&C SYSTEMS MUS	ST PROVIDE THE FOLLOWING MINIMUM CA	APABILITIES:
ļ		;	l. 3-AXIS A	TTITUDE CONTROL		
-			2. +X TRANS	LATION CAPABILITY		
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	25-4	UNMAI	<u>INED</u>			
		IN OF	RDER TO INIT	IATE AND CONTINUE THE UNMANNED PINIMUM CAPABILITIES FOR THE UNMAN	HASE OF THE MISSION, THE G&C SYSTEMED APS BURN:	AS MUST PROVIDE
İ		A. /	NPS ENG ARM-	DEARM/ON-OFF CONTROL		
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1		25-9	ARE RESERVED)		
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	·	ļ	4/15/69	LM GUIDANCE AND CONTROL	GROUP	PAGE
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D=: .1	7.7		MISSION RULES					
REV	ITEM		SYSTEMS MANAGEMENT]				
А	25-10	IWN .						
		A. THE IRIG BIASE	$S \ge \pm .225^{\circ}/HR \ (15 MERU)$					
			BE CONSIDERED NO-GO WITH A GYRO DRIFT > THE MAXIMUM ALLOWABLE VALUE WITHIN THE		BIAS <u>></u> ±1.93°/			
		C. THE PIPA BIAS SEC ² (.0066 FT	WILL BE UPDATED WHENEVER THE Δ BIAS (LG/SEC 2).	C VALUE OF BIAS - MEASURED BIAS) IS <u>></u> ±. <u>200</u> CM/			
		D. THE PGNS WILL BE CONSIDERED NO-GO IF THE PIPA BIAS EXCEEDS ±3.125 CM/SEC ² , THE MAXI VALUE WITHIN THE LGC.						
		•						
А	25-11	<u>LGC</u>						
		A. A MASS UPDATE EXISTS WHEN IN	IS REQUIRED IF A MASS Δ OF $\pm 10\%$ (DIFFER THE DPS CONFIGURATION OR $\pm 5\%$ IN APS CO	ENCE BETWEEN GROUND CALCULATION NFIGURATION.	AND LGC VALUE)			
		B. ALL DESCENT EN SYSTEM "B" JET	GINE STARTS MUST NOMINALLY BE PRECEDED S OR TWO SYSTEM "A" JETS IN CASE OF A C	BY A PROPELLANT SETTLING MANEUVE CONTINGENCY.	R USING TWO			
		C. ULLAGE FOR ALL	APS BURNS MAY BE FOUR JET OR TWO JET S	YSTEM "A" OR "B".				
		D. ALL ± (U-V) JE	TS WILL BE INHIBITED VIA V65 DURING DOC	KED DPS BURNS.				
		E. DURING DOCKED SETTING IS 40%	MANEUVERS, ALL DPS GIMBAL TRIMMING MUST THROTTLE.	BE DONE AT >35% THROTTLE. THE	RECOMMENDED			
	05.10							
A	25-12	RENDEZVOUS RADAR	T DE ODERATED LAITAL THE ANTEANIA TEMPERA	TUDE CUDAN TO LIGHT AND THE CARD	DAGUAGE TO			
		ESTIMATED TO B	_					
		(ESTIMATED) OF						
		OFF IF IT IS N			į			
		RENDEZVOUS PHA	ED GYRO PACKAGE TEMP SHOULD EXCEED 200° SE, THE AC POWER TO THE RR SHOULD NOT B	F (HPM≈125°F) ANYTIME DURING TH E TURNED OFF.	E			
			ATED THAT THE RR GYRO PACKAGE WILL EXCE PHASE, THE RR SHOULD BE TURNED OFF UNT					
A	25-13	<u>AGS</u>						
			LARED NO-GO WITH AN ASA TEMPERATURE OF	< +90°F OR > +150°F.				
		IS GREATER THAI	LARED NO-GO DURING A GYRO AND ACCELEROM N 2.50°/HR AND IF THE ACCELEROMETER BIA HE START OF THE CALIBRATION.					
$\{\ \}\ $			BE UPDATED WITHIN 7 MINUTES OF A BURN.					
			USED TO PERFORM DOCKED ATTITUDE HOLD C	ONTROL.				
			SED MODE, USING ONLY TTCA CONTROL, CAN		BURN.			
MI	SSION	REV DATE S	ECTION	GROUP	PAGE			
	OLLO 10		M GUIDANCE AND CONTROL	MANAGEMENT	25-3			
<u> </u>								

				MISSION RULES	······································	
REV	ITEM					
Α						
	25-14	LAND	ING RADAR			
		Α.	THE LR SHOUL	D NOT BE OPERATED AT AN ANTENNA TEMP OF	<50°F.	
		в.	THE LR SHOUL	D NOT BE OPERATED AT AN ANTENNA TEMP OF	>145°F.	
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		RULES	24-15 THROU	JGH		
		25-19	ARE RESERVE	D.		
MI	SSION	REV	DATE	SECTION	GROUP	PAGE
	DLLO 10	Α	4/23/69	LM GUIDANCE AND CONTROL	MANAGEMENT	25-3A
l.	33 Form	ليب	1	· · · · · · · · · · · · · · · · · · ·		<u> </u>

		r		WISSION RULES			
REV	RULE	CONDITION/MALFUNCTION		RULING		CUES/NOTES/CO	MENTS
			SPE	CIFIC MISSION RULES			
A	25-20	LOSS OF AN OPERATIONA		A.1. CONTINUE THRU SEPA	RATION		
		PGNS	UNDOCKED	2. SELECT AGS			
			1	3. DOI NO-GO			
				4. START APS UNMANNED IN AGS	BURN		
!			RNDZ	B.1. PRIOR TO DOI:			
				(A) SELECT AGS (B) DOI NO-GO			
				2. <u>WITHIN 10 MIN AFTER</u> PERFORM DIRECT RETU	REF	MR 3-52	
				3. AFTER DOI +10 MIN			
1				(A) SELECT AGS (B) PERFORM 5-IMPU	JLSE		
			UNMANNED	C. CONTINUE BURN IN AGS			
	25-21	LOSS OF FDAI]	<u> </u>		
		A. ONE	ALL	A. CONTINUE MISSION			
		в. вотн	DOCKED	B.1. CONTINUE MISSION			
			UNDOCKED	2. <u>CONTINUE MISSION</u> DOI NO-GO			
			RNDZ	3.(A) <u>PRIOR TO DOI</u> DOI NO-GO			
				(B) <u>AFTER DOI</u> <u>CONTINUE MISSIO</u>	4		
		,	UNMANNED	4. <u>CONTINUE MISSION</u>	·		
	25-22	LOSS OF AOT AND/OR CO					
		A. EITHER	1	A. <u>CONTINUE MISSION</u>			
ĺ		B. BOTH	DOCKED/ UNDOCKED	8.1. CONTINUE MISSION DOI NO-GO			
			RNDZ	2.(A) PRIOR TO DOI DOI NO-GO			
				(B) <u>AFTER DOI</u> <u>CONTINUE MISSION</u>	<u>1</u>		
			UNMANNED	3. CONTINUE MISSION			
	25-23	LOSS OF RENDEZVOUS RADAR AND/OR TRANSPON	DOCKED/ DER UNDOCKED	A. <u>CONTINUE MISSION</u>			
			RNDZ	8.1. PRIOR TO DOI			
				2. AFTER DOI CONTINUE MISSION			
MI	SSION	REV DATE	UNMANNED	C. CONTINUE MISSION			
	OLLO 10	 	LM GUIDANCE	SECTION AND CONTROL		OUP	PAGE
		A 4/23/69	Z, GOLDARCE	THE CONTROL	SPECIFIC - PO	5NO/ CE3/AG3	25-4

		,		MISSION RULES		
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING	CUES/NOTES/COM	MENTS
А	25-24	LOSS OF REDUNDANT 3-AXIS ATTITUDE CONTROL				
		A. ONLY AUTO ATT HOLD CAPABILITY REMAINING	DOCKED	A.1.(A) DO NOT UNDOCK (B) PERFORM APS UNMAI BURN IN PGNS	NNED	
			UNDOCKED	2. RETURN TO CSM AND D	OCK ASAP	
		•	RNDZ	3.(A) PRIOR TO DOI		
				DOI NO-GO (B) AFTER DOI CONTINUE MISSION		
			UNMANNED	4. CONTINUE MISSION		
		B. ONLY MANUAL CAPABILITY REMAINING	DOCKED	B.1.(A) DO NOT UNDOCK (B) APS UNMANNED BURI	N NO-GO	
			UNDOCKED	2. RETURN TO CSM AND D	OCK ASAP	
·			RNDZ	3.(A) PRIOR TO DOI DOI NO-GO RETURN TO CSM ANI ASAP	D DOCK	
				(B) <u>AFTER DOI</u> CSM RESCUE		
			UNMANNED	4. STOP BURN ASAP		
	25-25	LOSS OF TRANSLATION				At .
		CAPABILITY				
		A. ULLAGE (+X)	DOCKED	A.1.(A) DO NOT UNDOCK (B) PERFORM APS UNMAI BURN WITHOUT ULL		٠
			UNDOCKED	2. <u>RETURN TO CSM AND EX</u> CSM ACTIVE DOCKING	OCK ASAP	
		·	RNDZ	3.(A) PRIOR TO DOI RETURN TO CSM ANI ASAP	D DOCK	
			ļ.	CSM ACTIVE DOCKIN	NG	
;		•		(B) AFTER DOI CSM RESCUE LM STAGING NO-GO		
			UNMANNED	4. CONTINUE MISSION		
	,	B. EITHER ±Y, ±Z, -X TRANSLATION	DOCKED	B.1. DO NOT UNDOCK		
			UNDOCK/ RNDZ	2. RETURN TO CSM AND DO CSM PERFORM BRAKING AND DOCKING		
			UNMANNED	3. CONTINUE MISSION		
			1			
	SSION	REV DATE		SECTION	GROUP	PAGE
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REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COMM	ENTS
	25-26	LOSS OF THRUST VECTOR CONTROL A. RCS IMPINGEMENT CON- STRAINTS WILL NOT BE VIOLATED B. RCS IMPINGEMENT CON- STRAINTS WILL BE VIOLATED	Ē ,	A. CONTINUE MISSION B.1. INHIBIT DPS BURNS 2. STAGE LM 3. CONTINUE MISSION US	•	B. RCS IMPINGEMENT C MAY BE VIOLATED B OF RCS OPPOSING T VECTOR OFFSET.	ECAUSE
	25–27	LOSS OF AUTO ENG ON/OFF CAPABILITY	RNDZ	A.1. DEPRESS START PB IMM 2. CONTINUE MISSION USING MANUAL ON/OFF B. APS UNMANNED BURN NO-C	CONTROL	B. NO FURTHER APS ST CAPABILITY EXISTS	
	25-28	ENG DOES NOT IGNITE AFTE START PB DEPRESSION	ER RNDZ	A.1. DOI (A) SET STOP PB (B) DEARM DPS (C) MSFN EVALUATE FOR ON/OFF CONTROL 2. PHASING: (A) START DPS VIA FOR OVERD SW (B) STOP BURN VIA SOME STOP BURN VIA SOME STOP BURN VIA SOME STOP PB (A) SET STOP PB (B) DEARM APS (C) CSM PERFORM IN (D) APS UNMANNED BURN APS (E) CSM PERFORM IN (D) APS UNMANNED BURN APS (E) CSM PERFORM IN (E) APS UNMANNED BURN APS (E) CSM PERFORM IN (E) APS UNMANNED BURN APS (E) CSM PERFORM IN (E) APS UNMANNED BURN APS (E) CSM PERFORM IN (E) APS UNMANNED BURN APS (E) CSM PERFORM IN (E) APS UNMANNED BURN APS (E	FOR APS DES ENG STOP PB SERTION	A.1. STOP PB MUST BE RESET THE LATCH RELAYS ENERGIZE START PB DEPRES 3. NO FURTHER APS CAPABILITY EXIS	ING D BY SION START
MI	SSION	REV DATE		SECTION	[GROUP	PAGE.
APOI	LO 10	FINAL 4/15/69 LM	GUIDANCE AND C	ONTROL	SPECIFIC	- PGNS/CES/AGS	25-6
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTIO	N PHASE	RULING		CUES/NOTES/COM	MENTS
	25-29	LOSS OF OPERATIONAL A	GS ALIL	A.1. CONTINUE MISSION IN 2. PERFORM UNMANNED AF IN PGNS			
			UNMANNED	B. <u>CONTINUE BURN</u> SWITCH TO PGNS			
2	25-30	DPS BURN IN NON- THROTTLEABLE RANGE	RNDZ	CONTINUE BURN CONTINUE MISSION	N	IO LONGER THAN 100 S ION-THROTTLEABLE RAN BE ACCUMULATED	
A 2	25-31	LOSS OF MANUAL THRUST CONTROL A. ZERO OUTPUT	RNDZ	A. <u>CONTINUE MISSION</u> USE LOW STOP POINT FO		A.1. THE THROTTLE WAPPROXIMATELY ZERO MANUAL IN VARIABLE THROTACTUATOR ELECTICONTROLS. 2. DURING PHASING AUTO THROTTLE WILL CAUSE THE INCREASE TO THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THE THROTTLEABLE FOR THROTT	10% WITH IPUT TO TLE RONIC BURN, TO MAX UST TO IE NON- HANGE,
		B. MAXIMUM OUTPUT	RNDZ	B.1. PRIOR TO DOI (A) CONTINUE MISSI (B) START AT MAX TO CONTINUE MISSI USING APS 2. DURING DOI (A) CONTINUE BURNI COMMAND SHUTDO (B) CONTINUE MISSI 3. PRIOR TO PHASING (A) CONTINUE MISSI (B) START AT MAX TO COMMAND SHUTDO (COMMAND SHUTDO (COMMAND SHUTDO (B) CONTINUE BURNI COMMAND SHUTDO (B) CONTINUE MISSI	IHRUST ON ING UNITIL OWN ON HRUST	BUT FOR AN ACC DURATION.	EPTABLE
MISS	SION	REV DATE A 4/23/69	LM GUI DANCE	SECTION AND CONTROL		GROUP	PAGE
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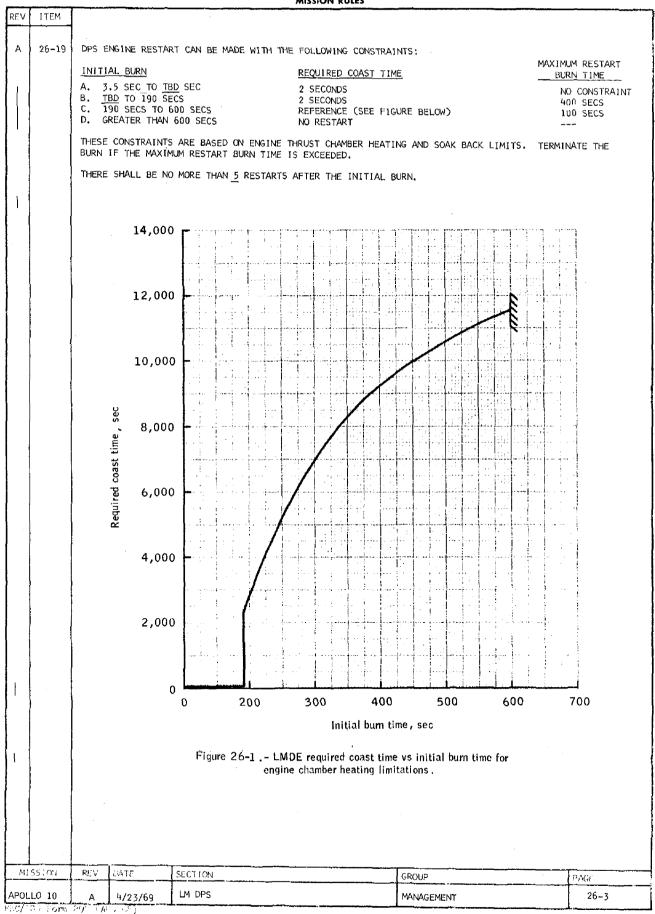
					MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	DN PHA	\SE	RULING		CUES/NOTES/COM	MENTS
			.					
	25-32	LOSS OF ACA						
	Į	A. ONE	ALL		A. CONTINUE MISSION			
		в. вотн	DOCK	EÐ	B.1. DO NOT UNDOCK			
			UNDOC	KED	2. RETURN TO CSM ASAP CSM ACTIVE DOCKING			
			RNDZ		3.(A) <u>PRIOR TO DOI</u> DOI NO-GO CSM ACTIVE DOCKI	NG		
					(B) <u>AFTER DOI</u> CONTINUE LM ACTI TERMINAL PHASE CSM ACTIVE DOCKI	VE UNTIL		
			UNMAI	NNED	4. <u>CONTINUE MISSION</u>			
	!							
	25-33	LOSS OF TTCA						
		A. ONE	ALL		A. CONTINUE MISSION			
		В. ВОТН	DOCK	ED	B.1. DO NOT UNDOCK			
			UNDO	CKED	2. <u>RETURN TO CSM ASAP</u> CSM ACTIVE DOCKING			
			RNDZ	ļ	3.(A) PRIOR TO DOI DOI NO-GO			
					CSM ACTIVE DOCK	ING		
					(B) <u>AFTER DOI</u> CONTINUE LM ACT: TERMINAL PHASI CSM ACTIVE DOCK	Ξ		
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L		FINAL 4/15/69	nu GOIDAN		CONTROL	orculfic	- PGNS/CES/AGS	25-6

	 	Post	ONBOARD	7041001000	CATECORY	MISSION RUL
25-40	MEAS DESCRIPTION	<u>PCM</u>	<u>ONBOARD</u>	TRANSDUCERS	CATEGORY	REFERENCE
	LGC DOWNLINK	GG0001U	-	· –	M	25-20
	PLS TORO REF	GG1040V	-	-	HD HD	25-20 25-20
	2.5 VDC TM BIAS IMU 28 VAC 800	GG1110V GG1201V	_	_	HD	25-20
	IRIG SUSP 3.2 KC	GG1331V	-	_	HD	25-20
	IMU STBY	GG1513X	- '	-	HD	25-20
	LGC OPR	GG1523X		-	HD	25-20
	X PIPA OUT IN ¢	GG2001V	-	-	HD	25-20
	Y PIPA OUT IN φ Z PIPA OUT IN φ	GG2021V GG2041V	_	<u>-</u>	HD HD	25-20 25-20
	IG SVO ERR IN 6	GG2107V		_	HD	25-20
	IG IX RSVR OUT SIN	GG2112V	FDAI	COMMON	M-PCM	2520
	IG IX RXVR OUT COS	GG2113V	FDAI	COMMON	M-PCM	25-20
	MG SVO ERR IN ¢	GG2137V	-	-	HD M. DCM	25 - 20 25 - 20
	MG IX RSVR OUT SIN MG IX RSVR OUT COS	GG2142V GG2143V	FDAI FDAI	COMMON COMMON	M-PCM M-PCM	25-20 25-20
	OG SVO ERR IN 6	GG2167V	-	-	HD	25-20
	OG RSVR OUT SIN	GG2172V	FDAI	COMMON	M-PCM	25-20
	OG RSVR OUT COS	GG2173V	FDAI	COMMON	M-PCM	25-20
	PITCH ATT ERR	GG2219V	FDAI	COMMON	HD - PCM HD - PCM	25-20 25-20
i	YAW ATT ERR ROLL ATT ERR	GG2249V GG2279V	FDAI FDAI	COMMON COMMON	HD - PCM	25-20 25-20
	PIPA TEMP	GG2300T	C&W	SEPARATE	M-PCM	25-20
	RR SHFT SIN	GG3304V	FDAI	COMMON	HD - PCM	25-23
	RR SHFT COS	GG3305V	FDAI	COMMON	HD - PCM	25-23
	RR TRUN SIN	GG3324V	FDAI	COMMON	HD - PCM HD - PCM	25-23 25-23
	RR TRUN COS LGC WARNING	GG3325V GG9001X	FDAI C&W	COMMON	HD - PCM	25-20
	ISS WARNING	GG9002X	C&M	COMMON	HD - PCM	25-20
	LR ANT TEMP	GN7563T	TEMP MONITOR	COMMON	HD - PCM	
	RR NO TRACK RR ANT TEMP	GN7621X GN7723T	C&W TEMP MONITOR	COMMON	HD — PCM M-PCM	25-23 25-23
	YAW ERR CMD	GH1247V	_	_	M	25-24
	PITCH ERR CMD	GH1248V	-	-	M	25-24
	ROLL ERR CMD	GH1249V	-		M	25-24
	JD A4D OUTPUT RCS TCP A4D	GH1419V GR5032X	_		HD HD	25-24,25-2 25-24,25-2
	JD B3D OUTPUT	GH1423V	_	-	HD	25-24,25-2
	RCS TCP B3D	GR5036X	-	-	HD	25-24, 25-2
	JD A2D OUTPUT	GH1427V	-	-	HD	25-24,25-2
	RCS TCP A2D	GR5040X	-	-	HD HD	25-24,25-2 25-24,25-2
	JD B1D OUTPUT RCS TCP B1D	GH1431V GR5044X		-	HD	25-24,25-2
1	JD B4U OUTPUT	GH1418V	-	_	HD	25-24,25-2
	JD B4F OUTPUT	GH1420V	-	-	HD	25-24,25-2
	JD A4R OUTPUT	GH1421V	-		HD	25-24,25-2
	JD A3U OUTPUT JD B3A OUTPUT	GH1422V GH1424V	_	_	HD HD	25-24,25-2 25-24,25-2
	JD A3R OUTPUT	GH1425V	_	-	HD	25-24,25-2
	JD B2U OUTPUT	GH1426V	_	=	HD	25-24,25-2
]	JD A2A OUTPUT	GH1428V	-	-	HD	25-24, 25-2
	JD B2L OUTPUT JD A1U OUTPUT	GH1429V	-	_	HD HD	25-24,25-2 25-24,25-2
	JD AIG OUTPUT	GH1430V GH1432V	_ _	_ _	HD .	25-24, 25-2
	JD B1L OUTPUT	GH1433V	-	-	HD	25-24, 25-2
	RCS TCP B4U	GR5031X	-	-	HD	25-24, 25-2
	RCS TCP B4F	GR5033X	-	-	HD HD	25-24, 25-2
	RCS TCO A4R RCS TCP A3U	GR5034X GR5035X	_ 	-	HD HD	25-24,25-2 25-24,25-2
	RCS TCP B3A	GR5037X	-	_	HD	25-24,25-2
	RCS TCP A3R	GR5038X	-	-	HD	25-24,25-2
	RCS TCP B2U	GR5039X	-	-	HD	25-24, 25-2
	RCS TCP A2A RCS TCP B2L	GR5041X	-	-	HD	25-24,25-2
	RCS TCP B2L RCS TCP A1U	GR5042X GR5043X	_		HD HD	25-24,25 - 2 25-24,25-2
j	RCS TCP A1F	GR5045X	<u>-</u>	_	HD	25-24,25-2
1	RCS TCP B1L	GR5046X	-	_	HD	25-24,25-2
	YAW ATT ERR PITCH ATT ERR	GH1455V GH1456V	FDA I	COMMON	HD	25-24 25-24
	I I I OH ALL ERK	9014700	FDAI	COMMON	HD .	2J - 24
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FEC/TSG Form 292 (AUG 68)

MINIMUM CONDITION: NO DPS PROPELLANT LEAK A 26-3 DOI/RENDEZVOUS			MISSION RULES
IN ORDER TO INITIATE AND CONTINUE THE DOCKED PHASE, THE DPS SUBSYSTEM MUST PROVIDE THE FOLLOWING CONDITION: NO DPS PROPELLANT LEAK 26-2 LINDOCKED/SEPARATION IN ORDER TO INITIATE AND CONTINUE THE UNDOCKED PHASE, THE DPS SUBSYSTEM MUST PROVIDE THE FOLLOWING MINIMUM CONDITION: NO DPS PROPELLANT LEAK A 26-3 DOT/RENDEZVOUS IN ORDER TO INITIATE AND CONTINUE THE RENDEZVOUS PHASE, THE DPS SUBSYSTEM MUST PROVIDE A SAFE BURN CAPABILITY, DEFINED AS FOLLOWS: A. NO DPS PROPELLANT LEAK B. AN OFER PROPELLANT LEAK B. AN OFER PROPELLANT LEAK 1. FUEL AND CXID ENGINE INLET PRESSURE 1100 PSI AT BURN INITIATION. 2. DURING BURN, DUID AND PUBL ENGINE INLET PRESS 1220 PSI (THROTTLE SETTING 465%) OR 150 PSI (THROTTLE SETTING 465%). 3. DPS PROPELLANT TEMPS 475°F OR 150°P CALLY TO INITIATE A BURN. 4. AT BETWEEN FUEL AND CXID TEMP 425°F CALLY TO INITIATE A BURN. 5. AP BETWEEN FUEL AND CXID TEMP 425°F CALLY TO INITIATE A BURN. 5. AP BETWEEN FUEL AND CXID TEMP 425°F CALLY TO INITIATE A BURN. 6. SUFFICIENT AN CAPABILITY TO ACCOMPLISH DOI AND PHASING. RULES 26-4 THROUGH 46-10 ARE RESERVED.	RE.V	ITEM	GENERAL
IN ORDER TO INITIATE AND CONTINUE THE DOCKED PHASE, THE DPS SUBSYSTEM MUST PROVIDE THE FOLLOWING CONTINUE NO DPS PROPELLANT LEAK 26-2 LINDOCKED/SEPABATION IN ORDER TO INITIATE AND CONTINUE THE UNDOCKED PHASE, THE DPS SUBSYSTEM MUST PROVIDE THE FOLLOWING INITIATION: NO DPS PROPELLANT LEAK A 26-3 DOL/PEDEZYOUS IN ORDER TO INITIATE AND CONTINUE THE RENDEZYOUS PHASE, THE DPS SUBSYSTEM MUST PROVIDE A SAFE BURN CAPABILITY, DEFINED AS FOLLOWS: A, NO DPS PROPELLANT LEAK B, NO DPS PROPELLANT LEAK B, NO OPERATIONAL DPS DEFINED AS FOLLOWS: 1. FUEL AND OXID ENGINE INLET PRESSURE \$\frac{100}{200}\$ PSI AT BURN INITIATION. 2. DURING BURN, OXID AND FUEL ENGINE INLET PRESS \$\frac{120}{200}\$ PSI (THROTTLE SETTING \$\frac{455}{200}\$) OR \$\frac{150}{200}\$ PSI OXID TEMP \$\frac{120}{200}\$ FORLY TO INITIATE A BURN. 4. AT BETWEEN FUEL AND OXID TEMP \$\frac{120}{200}\$ FORLY TO INITIATE A BURN. 5. AP BETWEEN FUEL AND OXID TEMP \$\frac{120}{200}\$ FORLY TO INITIATE A BURN. 5. AP BETWEEN FUEL AND OXID TEMP \$\frac{120}{200}\$ FORLY TO INITIATE A BURN. 6. SUFFICIENT OX CAPABILITY TO ACCUPPLISH DOI AND PHASING. RULES \$25-4 THROUGH \$26-10 ARE RESERVED.		26-1	<u>DOCKED</u>
IN ORDER TO INITIATE AND CONTINUE THE UNDOCKED PHASE, THE DPS SUBSYSTEM MUST PROVIDE THE FOLLOWING MINIMUM CONDITION: NO DPS PROPELLANT LEAK A 26-3 DOJ/RENDEZVOUS IN ORDER TO INITIATE AND CONTINUE THE RENDEZVOUS PHASE, THE DPS SUBSYSTEM MUST PROVIDE A SAFE BURN CAPABILITY, DEFINED AS FOLLOWS: A. NO DPS PROPELLANT LEAKS B. AN OPERATIONAL DPS DEFINED AS FOLLOWS: 1. FUEL AND OXID ENGINE INLET PRESSURE >100 PSI AT BURN INITIATION. 2. DURING BURN, OXID AND FILE LEAGINE INLET PRESS >120 PSI (THROTTLE SETTING <65%) OR >150 PSI (THROTTLE SETTING <65%). 3. DPS PROPELLANT TEMPS <75°F OR >50°F ONLY TO INITIATE A BURN. 4. AT BETWEEN FUEL AND OXID TEMP <25°F ONLY TO INITIATE A BURN. 5. AP BETWEEN FUEL AND OXID TEMP <25°F ONLY TO INITIATE A BURN. 6. SIEP PSID AT 465% THROTTLE FOR BURNS <180 PSID AT <65% THROTTLE, C. SUFFICIENT AV CAPABILITY TO ACCOMPLISH DOI AND PHASING.			IN ORDER TO INITIATE AND CONTINUE THE DOCKED PHASE, THE DPS SUBSYSTEM MUST PROVIDE THE FOLLOWING CONDITION:
IN ORDER TO INITIATE AND CONTINUE THE RENDEZVOUS PHASE, THE DPS SUBSYSTEM MUST PROVIDE A SAFE BURN CAPABILITY, DEFINED AS FOLLOWS: A. NO DPS PROPELLANT LEAKS B. AN OPERATIONAL DPS DEFINED AS FOLLOWS: 1. FUEL AND OXID ENGINE INLET PRESSURE >100 PSI AT BURN INITIATION. 2. DURING BURN, OXID AND FUEL ENGINE INLET PRESS >120 PSI (THROTTLE SETTING <65%) OR >150 PSI (THROTTLE SETTING >65%). 3. DPS PROPELLANT TEMPS <75°F OR >50°F ONLY TO INITIATE A BURN. 4. AT BETWEEN FUEL AND OXID TEMP <25°F ONLY TO INITIATE A BURN. 5. AP BETWEEN FUEL AND OXIDIZER ENGINE INLET PRESSURE <180 PSID AT <65% THROTTLE, OR <180 PSID AT >65% THROTTLE FOR BURNS <180 PSIC. C. SUFFICIENT AV CAPABILITY TO ACCOMPLISH DOI AND PHASING.		26-2	IN ORDER TO INITIATE AND CONTINUE THE UNDOCKED PHASE, THE DPS SUBSYSTEM MUST PROVIDE THE FOLLOWING MINIMUM CONDITION:
	A	26-5	IN ORDER TO INITIATE AND CONTINUE THE RENDEZVOUS PHASE, THE DPS SUBSYSTEM MUST PROVIDE A SAFE BURN CAPABILITY, DEFINED AS FOLLOWS: A. NO DPS PROPELLANT LEAKS B. AN OPERATIONAL DPS DEFINED AS FOLLOWS: 1. FUEL AND OXID ENGINE INLET PRESSURE ≥100 PSI AT BURN INITIATION. 2. DURING BURN, OXID AND FUEL ENGINE INLET PRESS ≥120 PSI (THROTTLE SETTING <55%) OR >150 PSI (THROTTLE SETTING >55%): 3. DPS PROPELLANT TEMPS <75°F OR >50°F ONLY TO INITIATE A BURN. 4. △T BETWEEN FUEL AND OXID TEMP <25°F ONLY TO INITIATE A BURN. 5. △P BETWEEN FUEL AND OXID TEMP SURNS INLET PRESSURE <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <18D PSID AT <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE, OR <65% THROTTLE
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APOLLO 10 A 4/23/69 LM PROPULSION - DPS GENERAL 26-1			

THE COTAL CONTINUOUS BRIEF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION THE TOTAL CONTINUOUS BRIEF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION THE TOTAL CONTINUOUS BRIEF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION THE TOTAL CONTINUOUS BRIEF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION THE TOTAL CONTINUOUS BRIEF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION THE TOTAL CONTINUOUS BRIEF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION THE DESCRIPTION OF THROST LEVEL. 26-13 THE DESCRIPTION MUST BE ENGINE THE IS 3.5 SECONDS. THE MINIMUM COAST TIME DETWEEN 26-15 ALL DES STARTS MUST BE INMITIVALLY PLANTED AT THE LOW THROTTLE POINT. 26-16 THE DES ENGINE MUST NOT BE OPERATED IN THE NON-THROTTLING RANGE (65% TO TTP) FOR MORE THAN 100 SEC. 26-17 SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWABLE EVENT. A 1 26-18 AND DESCENT ENGINE STARTS MUST INMITIVALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER. PROPERTY OF THE DESCENTE OF THE DESCENCE OF THE DESCENCE OF THE DESCENCE OF THE DESCRIPTION O	DEM	1 TEM	
MINIORM MANUAL THROTTLE CONVINCE (12.48 FOR LM-4) 26-12 CPS LEABLE PROPELLANT IS 17627.0 LBS. TOTAL LONDED 18229.5 LBS TRAPPED 507.5 LBS TRAPPED 507.5 LBS TRAPPED 197.7.1 LBS 26-13 THE TOTAL CONTINUOUS BRAIN TIME OF THE DESCENT ENGINE SMALL NOT EXCEED 910 SECONDS OF OPERATION INDEPENDENT OF THRUST LEVEL. 26-14 THE DESCENT RUNNING BURN TIME IS 3.5 SECONDS. THE MINIMUM COAST TIME BETMEEN PES ENGINE BURNS IS 2 SECONDS. THE MINIMUM COAST TIME BETMEEN 26-15 ALL DES STARTS MUST BE INDIVIDUALLY PLANATED AT THE LOW TRAPPETTLE POINT. 26-16 THE DES ENGINE MUST NOT BE OPERATED IN THE NON-THROTTLING RANCE (65% TO FTP) FOR MORE THAN 100 SEC. 36-17 SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWAGUE EVENT. ALL DESCENT ENGINE STARTS MUST NONINALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER. PROPERTY OF THE PROPERTY OF T	REV	I I EM	SYSTEMS MANAGEMENT
TOTAL LOADED 18229.5 LBS THE PROR 156.5 LBS THE ERROR 255.0 LBS THE FORAL CONTINUOUS BURN TIME OF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION 26-13 THE TOTAL CONTINUOUS BURN TIME OF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION 100FPRIDENT OF THRUST LEVEL. THE DPS ENGINE MINIMUM BURN TIME IS 3.5 SECONDS. THE MINIMUM COAST TIME BETWEEN 26-15 ALL DPS STARTS MUST BE NOMINALLY PLANAED AT THE LOW THROTTLE POINT. 26-16 THE DPS ENGINE MUST NOT BE OPERATED IN THE NON-THROTTLING RANGE (65% TO FTP) FOR MORE THAN 100 SEC. 26-17 SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWABLE EVENT. A 26-18 ALL DESCENT ENGINE STARTS MUST NOMINALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER. PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE MINIMUM COAST TIME BETWEEN A RULE 26-19 IS RESERVED.	A	26-11	THE LOW THROTTLE POINT IS THE MINIMUM THROTTLE POSITION THAT THE THROTTLE ACTUATOR WILL ASSUME WITH MINIMUM MANUAL THROTTLE COMMAND VOLTAGE (12.4% FOR LM-4)
TOTAL LOADED 18229.5 LBS THE PROR 156.5 LBS THE ERROR 255.0 LBS THE FORAL CONTINUOUS BURN TIME OF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION 26-13 THE TOTAL CONTINUOUS BURN TIME OF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION 100FPRIDENT OF THRUST LEVEL. THE DPS ENGINE MINIMUM BURN TIME IS 3.5 SECONDS. THE MINIMUM COAST TIME BETWEEN 26-15 ALL DPS STARTS MUST BE NOMINALLY PLANAED AT THE LOW THROTTLE POINT. 26-16 THE DPS ENGINE MUST NOT BE OPERATED IN THE NON-THROTTLING RANGE (65% TO FTP) FOR MORE THAN 100 SEC. 26-17 SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWABLE EVENT. A 26-18 ALL DESCENT ENGINE STARTS MUST NOMINALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER. PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE MINIMUM COAST TIME BETWEEN A RULE 26-19 IS RESERVED.	ĺ	06.10	DOC WARRIE DEODELLANT IC 17627 O LOC
THE DPS ENGINE MINIMUM BURN TIME IS 3.5 SECONDS. THE MINIMUM COAST TIME BETWEEN 26-15 ALL DPS STARTS MUST BE NOMINALLY PLANNED AT THE LOW TWROTTLE POINT. 26-16 THE DPS ENGINE MUST NOT BE OPERATED IN THE NON-THROTTLING RANGE (65% TO FTP) FOR MORE THAN 100 SEC. 26-17 SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWABLE EVENT. A 26-18 ALL DESCENT ENGINE STARTS MUST NOMINALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER. PULE 26-19 IS RESERVED.		26-12	TOTAL LOADED 18229.5 LBS TRAPPED 367.5 LBS TM ERROR 235.0 LBS
THE DPS ENGINE MINIMUM BURN TIME IS 3.5 SECONDS. THE MINIMUM COAST TIME BETWEEN 26-15 ALL DPS STARTS MUST BE HOMINALLY PLANNED AT THE LOW THROTTLE POINT. 26-16 THE DPS ENGINE MUST NOT BE OPERATED IN THE NON-THROTTLING RANGE (65% TO FTP) FOR MORE THAN 100 SEC. 26-17 SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWABLE EVENT. 4 26-18 ALL DESCENT ENGINE STARTS MUST NOMINALLY BE PRECEDED BY A PROPELLANT SETTLING MANNEUVER. RULE 26-19 IS RESERVED. MISSION REV DATE SECTION GROUP PAGE	:	26-13	THE TOTAL CONTINUOUS BURN TIME OF THE DESCENT ENGINE SHALL NOT EXCEED 910 SECONDS OF OPERATION INDEPENDENT OF THRUST LEVEL.
THE DPS ENGINE MUST NOT BE OPERATED IN THE NON-THROTTLING RANGE (65% TO FTP) FOR MORE THAN 100 SEC. 26-17 SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWABLE EVENT. ALL DESCENT ENGINE STARTS MUST NOMINALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER. RULE 26-19 IS RESERVED. MISSION. REV. DATE. SECTION. GROUP. PAGE	7	26-14	THE DPS ENGINE MINIMUM BURN TIME IS 3.5 SECONDS. THE MINIMUM COAST TIME BETWEEN DPS ENGINE BURNS IS 2 SECONDS.
26-17 SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWABLE EVENT. A 26-18 ALL DESCENT ENGINE STARTS MUST NOMINALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER. RULE 26-19 IS RESERVED. MISSION REV DATE SECTION GROUP PAGE		26-15	ALL DPS STARTS MUST BE NOMINALLY PLANNED AT THE LOW THROTTLE POINT.
A 26-18 ALL DESCENT ENGINE STARTS MUST NOMINALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER. RULE 26-19 IS RESERVED. MISSION REV DATE SECTION GROUP PAGE	1	26-16	THE DPS ENGINE MUST NOT BE OPERATED IN THE NON-THROTTLING RANGE (65% TO FTP) FOR MORE THAN 100 SEC.
RULE 26-19 IS RESERVED. REV DATE SECTION GROUP PAGE		.26~17	SUPERCRITICAL HELIUM BURST DISC RUPTURE DURING MANNED OPERATION IS AN ALLOWABLE EVENT.
RULE 26-19 IS RESERVED. MISSION REV DATE SECTION GROUP PAGE		26-18	ALL DESCENT ENGINE STARTS MUST NOMINALLY BE PRECEDED BY A PROPELLANT SETTLING MANEUVER.
RULE 26-19 IS RESERVED. MISSION REV DATE SECTION GROUP PAGE			
RULE 26-19 IS RESERVED. MISSION REV DATE SECTION GROUP PAGE			
1700	1		RULE 26-19 IS RESERVED.
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	APO	LLO 10	17700



			MISSION RULES		
REV	ITEM				
	26-20	ONLY PREMISSION . TO ALLOW REAL-TI FOR MULTIBURN PR	APPROVED ALTERNATE DPS/MULTIBURN PROFILES ME SUPPORT FOR EXAMINING DPS FREEZING, CH DFILES.	WILL BE EXECUTED, SINCE NO DATA ARRING, BACKWALL TEMPERATURE CON	EXISTS ISTRAINTS
A	26-21	PROPELLANT GAGIN	S GROUND MASS CALCULATION (1.5%)		
			o: PQGS (TM, ONBOARD) (1.3%)		
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		RULE NUMBERS 26-			
		26-29 ARE RESERVI	:U.		
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APO	LLO 10	A 4/23/69	LM PROPULSION - DPS	MANAGEMENT	26-4

26-31	CONDITION/MALFUNCT	SF	ECIFIC MISSION RULES A. CONTINUE MISSION 1. DOI NO-GO 2. FOR FURTHER MAIN BURNS USE APS B. PRIOR TO PHASING 1. INHIBIT BURN 2. STAGE AND USE AF FURTHER MAIN ENG C. DURING PHASING 1. STOP BURN 2. COMPLETE BURN PE	PS FOR GINE BURNS	
26-30	START TANK LEAK PRIC	-	A. CONTINUE MISSION 1. DOI NO-GO 2. FOR FURTHER MAIN BURNS USE APS B. PRIOR TO PHASING 1. INHIBIT BURN 2. STAGE AND USE AFFURTHER MAIN ENG C. DURING PHASING 1. STOP BURN	REQUIRED REQUIRED REGINE REQUIRED	APS AND RCS IS
26-30 L	START TANK LEAK PRIC	NAL DPS ALL	1. DOI NO-GO 2. FOR FURTHER MAIN BURNS USE APS B. PRIOR TO PHASING 1. INHIBIT BURN 2. STAGE AND USE AFFURTHER MAIN ENG C. DURING PHASING 1. STOP BURN	REQUIRED REQUIRED REGINE REQUIRED	APS AND RCS IS
			FURTHER MAIN ENG C. <u>DURING PHASING</u> 1. STOP BURN	GINE BURNS	
		ı		CC-C NM N:	
1 1	PRESS A. FU AND OXID ENGI INLET PRESS ≥100 AT IGNITION	NE ALL	A. <u>CONTINUE MISSION</u> INHIBIT FIRING DPS S SQUIB	REF MAL PROC DPS	S #1
	B. FU AND/OR OXID E INLET <100 PSIA	NG I NE	B. <u>CONTINUE MISSION</u> FIRE SQUIB TO START	NOTE: PRESSURI: MAY BE OPENED TO LEAK; CLOSE PRIN AFTER EACH BURN INITIATION OF E. BURN.	O START TANK MARY HE REG S I AND REOPEN A
	DPS FAILS TO PRESSUR A. VIA START TANK 1. INLET PRESS PSIA 2. INLET PRESS PSIA B. VIA SUPERCRITICA HELIUM	<100 >100	A.1. INHIBIT ALL DPS BUREF ALT MISSION	AND APS ET PRESS	
	OFF NOMINAL SUPERCRI He PRESS <500 PSI	TICAL RNDZ	A. <u>CONTINUE MISSION</u> REMAIN AT 10% UNTIL >500 PSIA	REF MAL PROC DP	'S #1
MISSION	REV DATE		SECTION	GROUP	PAGE
	A 4/23/69	LM PROPULSIO		SPECIFIC	

			MISSION RULES	
REV RULE	CONDITION/MALFUNCT	ION PHASE	RULING	CUES/NOTES/COMMENTS
'26-34	LEAK BETWEEN HE REG AND QUAD CHECK VALVE	SHUTOFF ALL	CONTINUE MISSION A. CLOSE He REG SHUTOFF B. OPEN He SHUTOFF VALVE PRIOR TO EACH BURN	
A 26-35	DPS PROPELLANT LEAD	K ALL	STAGE ASAP	REF MAL PROC DPS
	·			
Moore				
MISSION APOLLO 10	REV DATE A 4/23/69	LM PROPULSION -	SECTION	GROUP PAGE SPECIFIC 26-6

			Mis	SION RULES					
REV	ITEM								
- {	27-1	DOCKED, UNDOCKING	, SEPARATION						
		IN ORDER TO INITI	ATE THE ABOVE PHASES, TH	HE APS MUST EXHIBIT THE	E FOLLOWING CAPABILITY:				
l		NO PROPELLANT LEA	К						
	.]								
А	27-2	DOI/RENDEZVOUS							
}		IN ORDER TO INITI BURN CAPABILITY D	ATE THE RENDEZVOUS PHASE EFINED AS FOLLOWS:	OF THE MISSION, THE	APS SUBSYSTEM MUST PROVIDE	A SAFE			
		A. NO APS PROPEL	LANT LEAKS						
1		B. AN OPERATIONA	L APS, DEFINED AS FOLLOW	'S:					
		MANNED	<u>ST</u> AR	T BURN	CONTINUE BURN				
11		1. APS BULK	TEMP >30°	F < 120°F	N/A				
		2. OX-FUEL A	T <60°	Fχ	N/A				
		3. INLET PRE	SS >115	< 250 PSI ³⁴	>115 < 250 PSI, NO PRE	SS OSCILLATION			
		4. INLET PRE	SS ΔP <u>20</u> F	SID¤	< <u>12</u> PSID**				
		5. TCP	N/A		> <u>80</u> < 150 PSI ^X , NO PRE	SS OSCILLATION			
-		6. PROPELLAN	T LEAK NONE		NONE				
		UNMANNED							
		1. APS BULK	TEMP N/A		N/A				
		2. OXID-FUEL	ΔT N/A		N/A				
		3. INLET PRE	SS <250	PSI	<250 PSI, NO PRESS OSC	ILLATIONS			
	Ì	4. INLET PRE	SS ΔP < <u>90</u>	PSID	< <u>20</u> PSID				
		5. TCP	N/A		<150, NO PRESS OSCILLA	TIONS			
		6. PROPELLAN	T LEAK N/A		NONE				
1		*VALUES SHOWN	ARE FOR BURNS <100 SEC	LONG.					
	;	C. SUFFICIENT ΔV	CAPABILITY TO DO INSERT	ION BURN.					
- 1	27-3	STAGING/INSERTION		•					
ļ		IN ORDER TO STAGE THE LM PRIOR TO THE INSERTION BURN, THE APS SUBSYSTEM MUST PROVIDE A SAFE BURN CAPABILITY FOR THE INSERTION BURN							
		0. 11 / 10 / 11 / 10 / 11 / 11 / 11 / 11							
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l									
ľ									
		RULES 27-4 THROUG							
		27-9 ARE RESERVED	•						
MI	SSION	REV DATE	SECTION	GROUE		PAGE			
APO	LLO 10	A 4/23/69	M PROPULSION - APS	GENER	AL	27-1			

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SECTION 26 - LM DPS - CONCLUDED

	T			W1221	ON RULES		
REV	ITEM		[DPS - PRELAU	JNCH INSTRUME	NTATION	
	26-40	MEAS DESCRIPTION START TNK PRESS HE REG PRESS HE REG PRESS	N <u>PCM</u> GQ3015P GQ3018P GQ3025P	ONBOARD HE MON C&W	TRANSDUCER COMMON COMMON	CATEGORY M HD	MISSION RULE <u>REFERENCE</u> 26-31,32 26-34,30 26-34,30
		HE REG PRESS HE PRESS FU TNK 1 QTY FU TNK 2 QTY OX TNK 1 QTY OX TNK 2 QTY OX TNK 2 QTY FU 1 TEMP FU 2 TEMP OX 1 TEMP OX 2 TEMP FU PRESS OX PRESS TCP	GQ3425P GQ3436P GQ34603Q GQ3604Q GQ4103Q GQ4104Q GQ3718T GQ3719T GQ4218T GQ4219T GQ3611P GQ4111P GQ6510P	PRESS QTY QTY QTY QTY QTY TEMP MON TEMP MON TEMP MON TEMP MON TEMP MON	COMMON COMMON COMMON COMMON COMMON COMMON COMMON	HD 1 OF 2 HD M HD 1 OF 2 HD M HD 1 OF 2 HD M HD 1 OF 2 HD M HD 1 OF 2 HD M M HD 1 OF 2 HD M M M M M M M M M M M M M M M M M M M	26-30 26-30 26-30 26-30 26-30 26-30,35 26-30,35
	SSION	REV DATE	SECTION		Т	CDOUD	Ipace
						GROUP	PAGE
B .	LO 10	FINAL 4/15/69 292 (AUG 68)	LM DPS			PRELAUNCH INSTRUMENTATION	26-7

27 LM APS

REV	ITEM	CENEDAL
		GENERAL
	27-1	DOCKED, UNDOCKING, SEPARATION
		IN ORDER TO INITIATE THE ABOVE PHASES, THE APS MUST EXHIBIT THE FOLLOWING CAPABILITY:
	İ	NO PROPELLANT LEAK
	27-2	DOI/RENDEZVOUS
		IN ORDER TO INITIATE THE RENDEZVOUS PHASE OF THE MISSION, THE APS SUBSYSTEM MUST PROVIDE A SAFE BURN CAPABILITY DEFINED AS FOLLOWS:
		A. NO APS PROPELLANT LEAKS
		B. AN OPERATIONAL APS, DEFINED AS FOLLOWS:
1		1. ΔP BETWEEN APS FUEL AND OXIDIZER ENGINE INLET PRESSURE < TBD PSID.
		2. At between APS fuel and oxidizer temp $< \underline{10}^{\circ}$ f. Only to initiate A burn.
		3. APS FUEL AND/OR OXIDIZER TEMP $>40^{\circ}$ F AND $<85^{\circ}$ F. ONLY TO INITIATE A BURN.
		4. APS FUEL AND/OR OXIDIZER INLET PRESSURE >115 PSI AND <220 PSI
		C. SUFFICIENT AV CAPABILITY TO DO INSERTION BURN.
	27-3	STAGING/INSERTION
		IN ORDER TO STAGE THE LM PRIOR TO THE INSERTION BURN, THE APS SUBSYSTEM MUST PROVIDE A SAFE BURN CAPABILITY FOR THE INSERTION BURN
		CAPABLETT FOR THE INSERTION BONN
		RULES 27-4 THROUGH .
		27–9 ARE RESERVED.
MI	SSION	REV DATE SECTION GROUP PAGE
APO FEC/T	LLO 10 SG Form	FINAL 4/15/69 LM PROPULSION - APS GENERAL 27-1

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REV	ITEM	SYSTEMS MANAGEMENT		
A	27-10	APS MANNED ENGINE STARTS WILL BE PRECEDED BY A PROPELLANT	SETTLING MANEUVER.	
	2711	APS PROPULSION SYSTEM CANNOT REMAIN ACTIVATED (COMPATABILI BEFORE ITS USAGE IS COMPLETED NOMINALLY. IN CASE OF A CON DAYS.		
	27-12	THE USABLE PROPELLANT FOR APS IS 2465.6 LBS. TOTAL LOADED 2631.7 LBS TRAPPED 53.1 LBS TM ERROR 113.0 LBS USABLE 2465.6 LBS		
Α	27-13	THE MINIMUM IMPULSE OF THE APS ENGINE IS 1200 LBS/SEC, WHI	CH CORRESPONDS TO A BURN TIME OF	0.5 SEC.
	27-14	ONLY PREMISSION APPROVED APS MULTIBURN PROFILES WILL BE EXREAL-TIME SUPPORT FOR EXAMINING APS FREEZING, CHARRING, BAMULTIBURN PROFILES.		
	27-15	PROPELLANT GAGING (NO ONBOARD READOUT): A. PRIME METHOD: FLOWRATE X TIME (5%) B. BACKUP METHOD: GROUND MASS CALCULATION (5%)		
Α	27-16	THE APS ENGINE MAY BE RESTARTED WITH COAST TIMES A. <10 SEC OR >200 SEC, WITH PROPELLANT TEMP <65°F B. <10 SEC OR >90 SEC, WITH PROPELLANT TEMP >65°F		
A		RULES 27-17 THROUGH 27-19 ARE RESERVED.		
IM	SSION	REV DATE SECTION	GROUP	PAGE
APOL	LLO 10	A 4/23/69 LM PROPULSION - APS	MANAGEMENT	27-2
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
A			SPEC	FIC MISSION RULES			
	27~20	LOSS OF AN OPERATIONAL APS	RNDZ	A.1. PRIOR TO STAGING (A) DO NOT STAGE			
				(B) PERFORM INSERT	TIÓN		
				2. AFTER STAGING			
				(A) INHIBIT APS BI (B) INSERTION NO-((C) CSM PERFORM IN	30 l		
				3. INSERTION			
				(A) STOP BURN IF :	IN		
				PROGRESS (B) COMPLETE AV RE MENTS IN ACCOF WITH MR 3-54			
			UNMANNED	B.1. STOP BURN IF IN PRO	OGRESS		
			Ĭ	2. INHIBIT FURTHER APS	S BURNS		
					l		
Î	27-21	DELETED					
	27-22	APS He SOURCE PRESSURE				REF MAL PROC APS #	<u>_</u>
		A. LEAK PRIOR TO PRESSURIZATION	ALL	A. CONTINUE MISSION INHIBIT USE OF EFFECT	ED TANK		-
		B. PRESS ≥3500 PSI PRIOR TO PRESSURIZATION	ALL	B. PRESSURIZE APS			
		C. SOURCE PRESSURE LESS THAN ENGINE INLET PRESSURE	ALL	C.1. <u>CONTINUE MISSION</u> CLOSE He REG SHUTOF	FF: VALVES		
			RNDZ	2. <u>CONTINUE MISSION</u>			
				'(A)' CLOSE He REG S VALVES '(B)' OPERATE IN BLO MODE			
	27-23	APS He LEAK BETWEEN QUAD CHECK VALVES AND He	ALL	CONTINUE MISSION		REF MAL PROC APS #2	<u> </u>
		SHUTOFF VALVES		A. CLOSE He REG SHUTOFF	VALVES		
				B. OPEN He REG SHUTOFF V PRIOR TO EACH BURN	/ALVES		
]		
MI	SSION	REV DATE	1	SECTION	l	GROUP	PAGE
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L_APC	OLLO 10 3 Form	A 4/23/69 LM PRO 291. (APG 63)	PULSION - A	P\$	SPECIFI	<u>C</u>	27-3

				WISSION RULES			
REV	RULE	CONDITION/MALFUNC	TION PHASE	RULING		CUES/NOTES/COM	MENTS
Α]			
1	27-24	APS PROPELLANT LEAK	DOCKED	A. EGRESS TO CSM ASAP		REF MAL PROC APS #1	<u> </u>
1				1. JETTISON LM			
				2. APS UNMANNED BURN	N NO-CO		
					4 140-GO		
			UNDOCKED	B.1. DOCK ASAP			
				2. CSM ACTIVE DOCKING			
			RNDZ	C. <u>CSM RESCUE</u>			
			UNMANNED	D. CONTINUE BURN			
	27-25	APS PROP VALVE MISH	MATCH RNDZ	A. CONTINUE BURN IN PRO	GRESS	THIS INDICATION PR	OR TO FIRST
	2/-25	(APOS)	VATCH NND2	INHIBIT FURTHER MANN	ED APS	APS ENGINE ON WILL CONSIDERED A TM FAI	BE
			UNMANNED	B. CONTINUE MISSION			
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	OLLO 10	 	LM PROPULSION - A		SPECIFIC		27-4
		201 (400 53)			3, 201, 10		[~/- '

т					MISSION	RULES		
REV	ITEM			APS - P	RELAUNCH INST	RUMENTATION		
	27-30	MEAS D	<u>ESCRIPTION</u>	РСМ	ONBOARD	TRANSDUCER	CATEGORY	MISSION RULE REFERENCE
		APS HE APS HE APS HE APS HE APS FU APS FU APS OX APS OX	1 PRESS 2 PRESS REG PRESS 1 TEMP 2 TEMP EL TEMP EL LOW ID TEMP ID LOW EL PRESS	GP0001P GP0002P GP0018P GP0025P GP0201T GP0202T GP0718T GP0908X GP1218T GP1408X GP1501P	HEL MON C&W HEL MON C&W HEL MON HEL MON TEMP C&W TEMP C&W C&W	COMMON COMMON COMMON COMMON COMMON COMMON COMMON COMMON COMMON COMMON	M - PCM M - PCM HD 1 OF 2 HD 1 M - PCM M - PCM M - PCM HD M - PCM HD M - PCM HD M - PCM	27-22,20 27-22,20 27-20,23 27-20,23 27-21,22 27-21,22 27-20 27-20
		APS OX	ID PRESS	GP1503P	C&W.	COMMON	M - PCM	27-20,21,24
		VLVS A VLVS B APS TC	ΔPOS	GP2997U GP2998U GP2010P			M M M	27-25 27-25 27-20
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P∩LI	LO 10	FINAL	4/15/69	LM APS		PRE	LAUNCH INSTRUMEN	TATION 27-5

28 LM REACTION CONTROL SYSTEM

		MISSION RULES
REV	ITEM	
	28-1	DOCKED
		IN ORDER TO INITIATE AND CONTINUE THE DOCKED PHASE OF THE MISSION, THE RCS SUBSYSTEM MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITY:
		NO PROPELLANT LEAKS
Α		
	28-2	A. <u>UNDOCKED</u>
		IN ORDER TO INITIATE AND CONTINUE THE UNDOCKED MISSION PHASE, 3-AXIS TRANSLATION CONTROL AND REDUNDANT 3-AXIS RCS ATTITUDE CONTROL CAPABILITY IS REQUIRED. TO ASSURE THAT NO SINGLE FAILURE CAN DISABLE ATTITUDE CONTROL, THE FOLLOWING MINIMUM CAPABILITIES ARE REQUIRED:
		 REDUNDANT CAPABILITY TO SUPPLY PROPELLANT FOR MAINTAINING RCS 3-AXIS ATTITUDE CONTROL VIA ONE OF THE FOLLOWING:
		(A) OPERATIONAL SYSTEM A AND B
		(B) OPERATIONAL SYSTEM A OR B, PLUS CROSSFEED CAPABILITY AND ASC FEED CAPABILITY
		2. NO THRUSTER PAIRS ISOLATED OR ANY SINGLE VERTICAL JET FAILED
		3. NO PROPELLANT LEAKS
		B. <u>SEPARATION/DOI/PHASING</u>
		IN ORDER TO INITIATE AND CONTINUE THIS MISSION PHASE, 3-AXIS TRANSLATION CONTROL AND REDUNDANT 3-AXIS RCS ATTITUDE CONTROL CAPABILITY IS REQUIRED. TO ASSURE THAT NO SINGLE FAILURE CAN DISABLE ATTITUDE CONTROL, THE FOLLOWING MINIMUM CAPABILITIES ARE REQUIRED:
		1. RCS SYSTEM A AND B OPERATIONAL
		2. NO THRUSTER PAIRS ISOLATED OR ANY SINGLE VERTICAL JET FAILED
		3. NO LEAKS
		C. <u>STAGING</u>
		IN ORDER TO INITIATE STAGING, THE FOLLOWING MINIMUM CAPABILITIES ARE REQUIRED:
		1. 3-AXIS RCS ATTITUDE CONTROL
		2. 3-AXIS RCS TRANSLATION
		D. INSERTION
		IN ORDER TO INITIATE AND CONTINUE THE INSERTION, +X-AXIS TRANSLATION CONTROL AND REDUNDANT 3-AXIS RCS ATTITUDE CONTROL IS REQUIRED. THE FOLLOWING MINIMUM CAPABILITIES ARE REQUIRED.
		1. SAME AS SEPARATION/PHASING
A	28-3	DELETED
	284	UNMANNED
		IN ORDER TO INITIATE AND CONTINUE THE UNMANNED PHASE OF THE MISSION, THE RCS SUBSYSTEM MUST PROVIDE THIS MINIMUM CAPABILITY:
		3-AXIS ATTITUDE CONTROL
		RULE NUMBERS 28-5 THROUGH 28-8 ARE RESERVED.
ΜI	ISSION	REV DATE SECTION GROUP PAGE.
APO	LLO 10	A 4/23/69 LM REACTION CONTROL SYSTEM GENERAL 28-1
		292 (AUG 0E)

		MISSION RULES
REV	ITEM	SYSTEMS MANAGEMENT
î	28-9	AN OPERATIONAL RCS SYSTEM IS DEFINED AS MAINTAINING:
		A. PROPELLANT TEMPERATURE >40°F AND <100°F
		B. AP BETWEEN OXID AND FUEL <80 PSI
		C. PROPELLANT MANIFOLD PRESSURE >100 PSI
		D. CAPABILITY TO EXPEL REQUIRED RCS PROPELLANT FROM TANKS TO SUPPORT PLANNED GO/NO-GO'S
А	28-10	THRUSTER TEMP
1		THE RCS QUAD TEMP MUST BE BROUGHT UP TO OPERATING TEMP VIA THE RCS HEATERS PRIOR TO ANY RCS FIRINGS. THRUSTER QUAD TEMP MUST BE ABOVE 119°F AND LESS THEN 190°F, EXCEPT DURING PERIODS OF HEAVY DUTY CYCLE WITH EXPECTED TEMP RISES SUCH AS DOCKING.
	28-11	USABLE RCS PROPELLANT IS 530 LBS. TOTAL LOADED 630 LBS TRAPPED 40 LBS TM ERROR* 63 LBS
		USABLE 530 LBS
		**TO BE UPDATED TO REFLECT GROUND COMPUTATIONAL ACCURACY
A	28-12	PROPELLANT GAGING
		A. PRIME METHOD: RCS GROUND PROGRAM (6%)
		B. BACKUP METHOD: POMD
		TM (10%) · ONBOARD (13%) ·
	28-13	PRIOR TO UNDOCKING, THE LM SHOULD BE IN WIDE DEADBAND ATTITUDE HOLD AND THE CSM IN NARROW DEADBAND ATTITUDE HOLD.
	28-14	ASCENT FEED OPERATION IS NOMINALLY PLANNED FOR THE UNMANNED APS DEPLETION BURN. HOWEVER, IF ONE RCS SYSTEM HAS >30 PERCENT TOTAL PROPELLANT REMAINING PRIOR TO THE UNMANNED APS BURN, THAT SYSTEM WILL REMAIN WITH THE MAINS OPEN AND ASCENT FEED VALVES CLOSED. IF BOTH SYSTEMS HAVE >30 PERCENT TOTAL PROPELLANT REMAINING, THEN THE SYSTEM WITH THE GREATER AMOUNT OF PROPELLANT WILL REMAIN IN THE ABOVE CONFIGURATION WHILE THE OTHER USES ASCENT FEED OPERATION AND THE SYSTEM WITH ASCENT FEED WILL BE USED FOR ULLAGE.
MI	NOTES	REV DATE SECTION GROUP PAGE
	LO 10	A 4/23/69 LM REACTION CONTROL SYSTEM MANAGEMENT 28-2
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				MISSION RULES	<u> </u>	
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		1			•	
١ ١	28-15	RCS	PLUME IMPINGE	MENT ON THE LM		
	-0 -5	l				
		1		CONTINUOUS FIRING OF RCS JETS:		
		٦	PROPELLANT LI	FIRING ENGINE): <u>15</u> SEC UNSTAGED EXCEEDI NE FREEZING AND LARGE TEMPERATURE DIFFER DESCENT STAGE THERMAL INSULATION.	NG +X IMPINGEMENT TIME COULD RESU ENCES BETWEEN PROPELLANT TANK DUE	ILT IN TO DAMAGE
		B. 1	M, +X (DOWN	FIRING ENGINE): 55 SEC STAGED.		
]]	MPINGEMENT T	-X'(UP FIRING ENGINE): 30 SEC'(-X THRUS IME COULD RESULT IN DAMAGE TO S-BAND AND DUE TO PLUME.	TERS OF QUAD 1, 3, AND 4): EXCEE /OR RR ANTENNA BECAUSE OF OVERHEA	DING -X TING OR
		D. [OCKED LM, -X	: 15 SEC FIRING EXCEEDING -X IMPINGEMEN	T TIME COULD RESULT IN DAMAGE TO	CSM THERMAL
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		KULE 28-19	NUMBERS 28-16 ARE RESERVE	HROUGH D.		
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
			SPECIFI	C MISSION RULES			
	28-20	LOSS OF RCS SYSTEM A OR I		A.1. ISOLATE EFFECTED SY	STEM	REF MAL PROC RCS #1	AND MB
A	20-20	LOSS OF RCS STSTEM A OK	B ALL			28-2	AND MK
				2. UTILIZE GOOD SYSTEM			
			DOCKED	B. <u>DO NOT UNDOCK</u> REFER TO ALT MISSION			
			UNDOCKED/ RNDZ	C. <u>CSM RESCUE</u> LM IN FREE DRIFT UNTI	L DOCKING		
			UNMANNED	D. CONTINUE MISSION			
				· · · · · · · · · · · · · · · · · · ·	·		
\Box							
	28-21	RCS THRUSTER PAIR	Ì			REF MAL PROC RCS #3	
		A. ONE PAIR ISOLATED	DOCKED	A.1. <u>DO NOT UNDOCK</u> REFER TO ALT MISSIO	N.		
			UNDOCKED/ RNDZ	2. <u>RETURN TO CSM AND D</u>	OCK ASAP		
			UNMANNED	3. CONTINUE MISSION			
		B. COMBINATION ISOLATED		B.1. DO NOT UNDOCK	•		
		RESULTING IN LOSS OF	ויייייייייייייייייייייייייייייייייייייי	UNMANNED APS BURN N	10-G0		
		ATTITUDE CONTROL					
			UNDOCK	2. CSM ACTIVE DOCK ASA	₽.		
			RNDZ	3. CSM RESCUE			
			UNMANNED	4. STOP UNMANNED APS B	SURN		
	-0.00						****
	28-22	DECREASING OR LOSS OF RCS He PRESSURE	·		İ	REF MAL PROC RCS #1	AND 2
			ALL	A. CONTINUE MISSION			
				1. CONTINUE USING BO	, _{TU}		
		1		SYSTEMS UNTIL MFL	D PRESS		
				IN BAD SYSTEM <10 THEN ISOLATE BAD			
				2. CROSSFEED FROM GO			
			חספעדה		3.5161	LAJENI MELO DOGGO COO	De Berov
			DOCKED	B. DO NOT UNDOCK	ļ	WHEN MFLD PRESS DRO 100 PSI, THE SYSTEM	IS CON-
			UNDOCKED	C. <u>DOCK ASAP</u>		SIDERED NON-OPERATI REF 28-20	ONAL
			RNDZ	D. RETURN TO CSM AND DOC	K ASAP		
			UNMANNED	E. CONTINUE MISSION	į		
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MI	SSION	REV DATE		SECTION		GROUP .	PAGE
APO	LLO 10	A 4/23/69 L	M REACTION CONT	ROL SYSTEM	SPECIFIC		28-3
VV/2 /2		<u> </u>			· · · · · · · · · · · · · · · · · · ·		L

RISES, SUCH AS DOCKING COMBUSTION, WHICH COULD CAU HARD STARTS AND POSSIBLE EXPLOSIONS. QUAD TEMPS > 190° F INDICATE PREMATURE OXID VAPORIZATION	A			RULING	CUES/NOTES/COMMENTS
A 28-23 RCS PROPELLANT LEAK DOCKED A. CREM EVACUATE SPACECRAFT 1. UNDOCK 2. CSM SEPARATE FROM LM 3. INHIBIT FURTHER MANNING OF LM B. BETURN TO CSM ASAP ROX MESCUE REQUIRED C. CONTINUE MISSION REF MAL PROC RCS #3 QUAD TEMP <119°F OR 190°F EXCEPT DURING PRISES, SUCH AS DOCKING I SOLATE BOTH THRUSTER PAIRS IN EFFECTED QUAD REF 28-21 REF MAL PROC RCS #3 QUAD TEMP <119°F INDICATE THE POSSIBILITY OF MALE REF MAL PROC RCS #3 QUAD TEMP <119°F INDICATE THE POSSIBILITY OF WALE EXPLOSIONS. QUAD TEMP <119°F INDICATE THE POSSIBILITY OF WALE SEAT DAMAGE. RULE NUMBERS 28-26 THROUGH 28-29 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE		3 RCS PROPELLANT LEAK			
A 28-23 RCS PROPELLANT LEAK DOCKED A. CREM EVACUATE SPACECRAFT 1. UNDOCK 2. CSM SEPARATE FROM LM 3. INHIBIT FURTHER MANNING OF LM B. BETURN TO CSM ASAP ROX MESCUE REQUIRED C. CONTINUE MISSION REF MAL PROC RCS #3 QUAD TEMP <119°F OR 190°F EXCEPT DURING PRISES, SUCH AS DOCKING I SOLATE BOTH THRUSTER PAIRS IN EFFECTED QUAD REF 28-21 REF MAL PROC RCS #3 QUAD TEMP <119°F INDICATE THE POSSIBILITY OF MALE REF MAL PROC RCS #3 QUAD TEMP <119°F INDICATE THE POSSIBILITY OF WALE EXPLOSIONS. QUAD TEMP <119°F INDICATE THE POSSIBILITY OF WALE SEAT DAMAGE. RULE NUMBERS 28-26 THROUGH 28-29 ARE RESERVED. MISSION REV DATE SECTION GROUP PAGE		RCS PROPELLANT LEAK	2001/25		
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29 SPACE ENVIRONMENT

SECTION 29 - SPACE ENVIRONMENT

REV	1TEM	GENERAL	
	29-1	ALL DECISIONS WILL BE BASED ON CONFIRMED MEASUREMENTS AND/OR EVENTS AND PROJECTIONS BASED ON CONFIRMED EVENTS.)
	29-2	DEFINITIONS:	
		A. THE MAXIMUM OPERATIONAL DOSE (MOD) IS THE MAXIMUM RADIATION DOSE TO WHICH THE CREW WOULD BE SUBJECTED BASED ON A SKIN DOSE OF 400 RAD AN/OR A DEPTH (GASTROINTESTINAL) DOSE OF 50 RAD.	
		B. THE PLANNING OPERATIONAL DOSE (POD) IS THE MAXIMUM RADIATION DOSE TO THE CREW WHICH ANY MISSION WOULD BE DESIGNED DURING THE PLANNING PERIOD BASED ON A SKIN DOSE OF 250 RAD AND/OR A DEPTH DOSE OF 25 RADS.	OF
		C. THESE DOSES REPRESENT THE CUTOFF POINT WHERE A DECISION MUST BE MADE WHETHER TO CONTINUE OR TERMINATE THE MISSION.	
		D. THE RADIATION ABSORBED DOSE (RAD) IS A UNIT OF ABSORBED DOSE WHICH IS EQUAL TO AN ENERGY DEPOSITION OF 100 ERGS/GRAM.	
		E. THE RELATIVE BIOLOGICAL EFFECTIVENESS (RBE) EXPRESSES THE EFFECTIVENESS OF PARTICULAR TYPES OF RADIATION IN PRODUCING THE SAME BIOLOGICAL RESPONSE.	
		THE AVERAGE RBE THAT WILL BE USED FOR SOLAR PARTICLE EVENT RADIATION FROM PROTONS IS 1.2.	
		F. THE ROENTGEN EQUIVALENT MAN (REM) IS THE PRODUCT OF THE RAD AND THE RBE (REM = RAD X RBE).	
		G. A CONFIRMED EVENT IS DEFINED AS AN EVENT THAT HAS BEEN MEASURED BY TWO OR MORE RELIABLE SOURCES.	
		H. A SIGNIFICANT INCREASE OF THE MOD IS DEFINED AS A PARTICLE EVENT THAT WILL PRODUCE A FLUX OF 10^{10} AND A SKIN DOSE OF 575 RADS AND/OR A DEPTH DOSE OF 140 RADS.	
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		PROTON	COUNT RATE	CHAN 2	ST0821K	-	-	HD	29-14
		PROTON	COUNT RATE	CHAN 3	ST0822K	-	-	HD	29-14
		PROTON	COUNT RATE	CHAN 4	ST0823K	-	-	HD	29-14
		ALPHA	COUNT RATE		ST0830K	-	-	HD	29-14
		ALPHA	COUNT RATE		NPDS ST0831K	-	-	HD	29-14
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		PERSON	WAL RADIATION	N DOSIMETER	(PRD) -	3 - ONBOARD		MANDATORY TO BE ONBOARD	29-14
1		RATE S	SURVEY METER	(RSM)		1 - ONBOARD		MANDATORY TO BE ONBOARD	29–14
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30 RECOVERY

SECTION 30 - RECOVERY

NASA — Manned Spacecraft Center MISSION RULES

A 30-1 ACCEPTABLE WEATHER CONDITIONS AND RECOVERY CAPABILITY" IN THE LAUNCH SITE AREA A 30-2 ACCEPTABLE WEATHER CONDITIONS AND RECOVERY CAPABILITY" IN THE LAUNCH ABORT AREA TO 1000 NM DOWNRANGE AND IN THE MID-PACIFIC RECOVERY ZONE A 30-3 MINIMUM OF 65 AMP-HOURS OF HIGHLY DESIRABLE TO PROVIDE	NOTES/COMMENTS E FOR 40 HOURS OF NDING POWER PLUS
A 30-1 ACCEPTABLE WEATHER CONDITIONS AND RECOVERY CAPABILITY. IN THE LAUNCH SITE AREA A 30-2 ACCEPTABLE WEATHER CONDITIONS AND RECOVERY CAPABILITY. IN THE LAUNCH ABORT AREA TO 1000 MM DOWNRANGE AND IN THE MID-PACIFIC RECOVERY ZONE A 30-3 MINIMUM OF 65 AMP-HOURS OF CM POSTLANDING POWER AVAILABLE AT LANDING. HIGHLY DESIRABLE TO PROVIDE CM POSTLANDING POWER AVAILABLE AT LANDING.	
CONDITIONS AND RECOVERY CAPABILITY* IN THE LAUNCH SITE AREA A 30-2 ACCEPTABLE WEATHER CONDITIONS AND RECOVERY CAPABILITY* IN THE LAUNCH ABORT AREA TO 1000 NM DOWNRANGE AND IN THE MID-PACIFIC RECOVERY ZONE A 30-3 MINIMUM OF 65 AMP-HOURS OF CM POSTLANDING POWER AVAILABLE AT LANDING HIGHLY DESIRABLE TO PROVIDE CM POSTLANDING ONE UPRIGHT	
A 30-3 MINIMUM OF 65 AMP-HOURS OF CM POSTLANDING POWER AVAILABLE AT LANDING A 1 30-3 ACCEPTABLE WEATHER CONDITIONS AND RECOVERY CAPABILITY* IN THE LAUNCH ABORT AREA TO 1000 NM DOWNRANGE AND IN THE MID-PACIFIC RECOVERY ZONE A 30-3 MINIMUM OF 65 AMP-HOURS OF CM POSTLANDING POWER AVAILABLE AT LANDING HIGHLY DESIRABLE TO PROVIDE CM POSTLANDING ONE UPRIGH	
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	HTING
	E WEATHER AVOIDANCE Y
A FRECOVERY CAPABILITY WILL BE BASED PRIMARILY UPON THE LOCAL RECOVERY UNIT COMMANDER'S HIS CAPABILITY TO PERFORM THE RECOVERY OPERATION. WEATHER CONDITIONS AT THE TIME OF AFFECT BOTH RECOVERY CAPABILITY AND STRUCTURAL INTEGRITY OF THE CM. THE USED TO INDICATE WHEN IT MAY BE NECESSARY TO RE-EVALUATE: SURFACE WINDS 25 KNOTS CEILING 1500 F VISIBILITY 3 NM WAVE HEIGHT 8 FT	THE CM LANDING
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APOLLO 10 A 4/23/69 RECOVERY SPECIFIC	30-1

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A 30-5 TARRET POINTS WILL BE LOCATED SUCH THAT THE POLICE OF ALL PIESE 155 NV DEBLEMENT LESS THE STATE OF THE	DSV.	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CHEC /NOTEC /COM	MENITS
29-5 TARGET POINTS WILL BE LOCATIVE SUCH THAT THE POLICY SUCH THAT THE	REV	RULE	CONDITION/MACFONCTION	FUMBL	RUE ING		CUES/NOTES/CUM	MENTS
A 30-7 TARGET POINTS WILL BE CATE AND LINES ELAND MERCE AND LINES ELAND MERCE AND LINES ELAND MERCE AND CONNERS ELAND MERCE AND CONNERS ELAND MERCE AND CONNERS ELAND MERCE AND CONNERS ELAND MERCE AND CONNERS ELAND MERCE AND CONNERS ELAND MERCE AND CONNERS ELAND MERCE AND CONNERS ELAND MERCE AND CONNERS ELAND	Α	30-5	LOCATED SUCH THAT THE FOLLOWING AREAS WILL BE CLEAR OF ALL LAND: A. AN ELLIPSE 163 NM UPRANGE, 152 NM DOWN- RANGE, AND 50 NM EITHER SIDE OF 55°/55° TARGET POINT. B. AN ELLIPSE 105 NM UPRANGE, 105 NM DOWN- RANGE, AND 40 NM EITHER SIDE OF ROLL RIGHT 90° (DELAYED)		MANDATORY			
MISSION REV DATE SCOVERY BECOVERY SPECIFIC 30-2 APOLLO 10 A 4/23/69 RECOVERY MANDATORY	A	30-6	LOCATED SUCH THAT THE FOLLOWING AREAS WILL BE CLEAR OF LARGE LAND MASSES: A. AN ELLIPSE 109 NM UPRANGE, 109 NM DOWN- RANGE, AND 40 NM EITHER SIDE OF 90°/90° LANDING POINT. B. AN ELLIPSE 105 NM UPRANGE AND DOWNRANGE AND 40 NM EITHER SIDE OF ROLL RIGHT 90° LAND-	ORBITAL	HIGHLY DESIRABLE			
APOLLO 10 A 4/23/69 RECOVERY SPECIFIC 30-2	A	30-7	LOCATED SUCH THAT THE FOLLOWING AREAS WILL BE CLEAR OF ALL LAND: A. AN ELLIPSE 5 NM UPRANGE 5 NM DOWNRANGE, AND 3 NM TO EITHER SIDE OF THE GNCS TARGET POINT. B. AN ELLIPSE 18 NM UPRANGE, 18 NM DOWN- RANGE, AND 45 NM TO EITHER SIDE OF EMS		MANDATORY			
APOLLO 10 A 4/23/69 RECOVERY SPECIFIC 30-2		00100						
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SECTION 30 - RECOVERY - CONTINUED

REV RU	LE (CONDITION/MALFUNCTI	ON PHASE	RULING		CUES/NOTES/COMM	ENTS
A 30-	Li Fi	ARGET POINTS WILL E DCATED SUCH THAT TH DLLOWING AREAS WILE LEAR OF LARGE LAND	HE BE	HIGHLY DESIRABLE			
	i	REMAINDER OF OPERATIONAL FOOT					
	В	AN ELLIPSE 130 N UPRANGE, 270 NM RANGE, AND 35 NN	DOWN- 1 TO	t t			
		EITHER SIDE OF T CONSTANT "G" LAN POINT.	THE NDING		·	. ···	
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31 AEROMEDICAL

				WISSION KOTES		
	REV	ITEM		GENERAL		
		31-1	PRELAUNCH			·
				NG TO LAUNCH, THE FOLLOWING CONDITIONS	MUST BE MET:	
			A. SATISFACTORY	FLIGHT CREW PHYSIOLOGICAL STATUS.		
$C \supset$			B. THE MINIMUM (CABIN OXYGEN CONCENTRATION FOR LAUNCH I	S 60 PERCENT.	
	1		C. THE MINIMUM S	SUIT OXYGEN CONCENTRATION FOR LAUNCH IS	95 PERCENT.	ł
		31-2		MUST BE MAINTAINED AT LEAST 2 IN. WATE		
			LOOP PURGE IS REC	QUIRED IF THE SUIT-TO-CABIN DELTA PRESS	SURE REMAINS AT ZERO FOR A	PERIOD OF 5 MINUTES.
		31-3	THE POTABLE WATER	R PH MUST BE WITHIN 6.0 TO 8.0 AT SERVI	CING AND FINAL SAMPLING.	
			.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	· · · · · · · · · · · · · · · · · · ·		
		31-4	THE MAXIMUM ALLOW	MABLE CONCENTRATION OF PCO, IS 5 MM HG.	,	
				2		
			•			
\bigcap	.	31-5	LAUNCH			
I ===	1	}		ICAL REASONS FOR ABORTING DURING THE LA	AUNCH PHASE OTHER THAN THOS	SE CONDITIONS
	1	:	INTOLERABLE TO TH	IE CREW.		
		31-6	<u>ORBIT</u>			
				RMINATION FOR MEDICAL FALL INTO TWO CA	ΓEGORIES:	
			A. ONSET OF CONE	DITIONS WHICH ADVERSELY AFFECT CREW SAM	FETY, HEALTH, OR FUNCTION A	WD PERFORMANCE.
			B. FAILURE OF SE	PACECRAFT SYSTEMS TO MAINTAIN A PHYSIO	LOGICALLY SATISFACTORY ENVI	RONMENT.
		31-7	WATER PALATABILIT	<u>'Y</u>		
			CREW EVALUATION (OF THE DRINKING WATER TASTE WILL BE TH	E BASIS FOR DETERMINING WAT	TER PALATABILITY,
	,					
_			RULE NUMBERS 31-8 31-14 ARE RESERVE			
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CREW MAY ELECT TO ABORT IF CONDITIONS PERMIT CORN TO SEPTION CONDITIONS PERMIT CORN FOR THE SURFICE TO ORGANIZE. (A) ALL THERE SUITS CONNECTED TO SUIT CIRCUMSTONES OF SURFICE SUITS CONNECTED TO SUIT CIRCUMSTONES. (A) ALL THERE SUITS CONNECTED TO SUIT DEPAND OR THE SUIT OF SURFICE SUITS CONNECTED TO SUIT CIRCUMSTONES. (B) SUIT DEPAND REST TO PERSON FOR THE SUIT OF SURFICE SUIT OF SURFICE SUIT OF SURFICE SUIT OF SURFICE SUIT OF SURFICE SUIT OF SURFICE SUITS CONNECTED TO SURFICE SUIT OF SURFICE SUIT OF SURFICE SUIT OF SURFICE SUITS CONNECTED TO SURFICE SUITS CONNECTED TO SUIT OF SURFICE SUIT OF SURFICE SUITS CONNECTED TO SUIT OF SURFICE SUITS CONNECTED AND ANY RECOMMEND EAST MAN A	REV	RULE	CONDITION/MALFUNCTIO	N	PHASE	RULING		CUES/NOTES/COMMEN	ITS
CONDITION IS INFOLERABLE CREM MAY ELECT TO OVER- PRESSURIZE. (A) ALL THREE SUITS CON- NECTED TO SUIT CIR- COUTT. (C) MOUNT OR SUIT CIR- COUTT. (C) MOUNT OR SUIT FREE CHARGE SUITS CANNOT THE CONTROL THE MANY THE MANY THE MANY THE MANY THE MANY THE MANY THE MANY THE MANY THE MANY THE MANY THE MANY THE MANY THE MANY THE M		31-19	DYSBARISM IN ANY CREW	MAN L	AUNCH	A. CONTINUE MISSION	,	A.1. CHECK SUIT INTEG	RITY.
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NASA — Manned Spacecraft Center

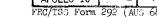
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32 COMMUNICATIONS/ INSTRUMENTATION

		MISSION RULES									
REV	1TEM	GENERAL									
	32-1	TO INITIATE AND CONTINUE THE FOLLOWING MISSION PHASES, THE CSM AND LM COMMUNICATIONS AND INSTRUMENTATION SYSTEMS MUST PROVIDE THE FOLLOWING MINIMUM CAPABILITIES:									
		A. <u>LAUNCH</u>									
		THERE ARE NO COMMUNICATIONS/INSTRUMENTATION FAILURES FOR WHICH THE LAUNCH/INSERTION PHASE WILL BE TERMINATED.									
		B. ALL PHASES EXCEPT LAUNCH AND RNDZ									
		 CRITICAL INSTRUMENTATION (CRITICAL INSTRUMENTATION IS THAT INSTRUMENTATION, ONBOARD OR TM, REQUIRED TO VERIFY GO/NO-GO CRITERIA) 									
		2. TWO-WAY VOICE COMM BETWEEN SPACECRAFT. NOTE: THIS MAY BE SATISFIED BY UMBILICAL INTERCOM DURING DOCKED PHASES.									
		 TWO-WAY VOICE COMM BETWEEN CSM OR LM AND MSFN DURING ALL DOCKED ACTIVITIES AND BETWEEN BOTH SPACECRAFT AND MSFN DURING UNDOCKED ACTIVITIES. 									
		C. RENDEZVOUS									
		1. CRITICAL ONBOARD DISPLAYS									
		2. TWO-WAY VOICE COMM BETWEEN CSM AND LM									
		3. LM LBR AND CSM OPERATIONAL TELEMETRY									
		4. DIRECT TWO-WAY VOICE COMM BETWEEN CSM/LM AND MSFN									
	32-2	THE MISSION WILL BE CONTINUED WITH THE LOSS OF: A. EITHER OR BOTH THE CSM AND THE LM UPDATA LINK									
		B. EITHER OR BOTH THE CSM AND THE LM CAUTION AND WARNING SYSTEM									
		C. THE CSM DATA STORAGE EQUIPMENT									
		D. THE CSM OR LM HIGH GAIN ANTENNA									
А	32~3	VOICE CONFIGURATION									
		A. LM/CSM/MSFN									
		 VHF DUPLEX B AND USB WILL BE TRANSMITTED/RECEIVED SIMULTANEOUSLY FOR LAUNCH. VHF SIMPLEX A AND USB WILL BE TRANSMITTED/RECEIVED SIMULTANEOUSLY FOR EARTH ORBIT. 									
		(THE BEST QUALITY DOWNLINK WILL BE REMOTED TO HOUSTON.)									
		 VHF A SIMPLEX 296.8 MHZ IS PRIME VOICE COMM BETWEEN VEHICLES EXCEPT DURING RANGING WHEN DUPLEX B (CSM) AND DUPLEX A (LM) WILL BE USED. 									
		3. VHF B SIMPLEX 259.7 MHZ IS BACKUP TO VHF A, BUT WILL BE USED ONLY IF REQUIRED.									
		4. USB IS PRIME VOICE COMM BETWEEN MSFN AND CSM/LM.									
		5. USB/VHF RELAY IS VOICE COMM BACKUP TO USB BETWEEN MSFN AND MALFUNCTIONED S/C.									
		NORMAL VOICE COMM WILL USE SIMULTANEOUS MSFN UPLINK TO BOTH VEHICLES. HOWEVER, IF REQUIREMENT SHOULD EXIST, SIMULTANEOUS INDEPENDENT MSFN/CSM AND MSFN/LM COMM MODES WILL BE INITIATED.									
		7. CSM AND LM WILL TRANSMIT SIMULTANEOUSLY ON VHF AND USB.									
		RULE NUMBERS 32-4 THROUGH 32-9 ARE RESERVED.									
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REV	I TEM	MISSION RULES						
KE V	1 I CM	MANAGEMENT						
	32-10	CSM VHF/USB MANAGEMENT						
		A. FOR CREW REST PERIODS, CSM S-BAND ANTENNAS WILL BE SELECTED BY GROUND COMMANDS.						
		B. NORMAL CONTROL OF THE S-BAND MODES WILL BE BY GROUND COMMAND. CSM COMMUNICATIONS SWITCH POSITION WILL REFLECT OUT-OF-SITE CONTACT CONFIGURATION.						
	32-11	DSE MANAGEMENT A. LM AND CSM LOW BIT RATE TELEMETRY WILL BE RECORDED CONTINUOUSLY WHEN NOT IN CONTACT WITH GROUND						
		TELEMETRY SITES AND WILL BE PLAYED BACK AT LEAST ONCE PER REVOLUTION IN LUNAR ORBIT.						
		B. CM HIGH BIT RATE DSE RECORDINGS WILL BE MADE DURING THE FOLLOWING OPERATIONS: 1. LAUNCH						
		2. S-IVB/CSM SEPARATION						
		3. ALL SPS MANEUVERS						
		4. CM/LM SEPARATION AND ENTRY						
	i	5. DTO REQUIREMENTS (TBD)						
		C. DATA DUMP LOGS WILL BE MAINTAINED AND MSFN DATA RECORDING STORAGE WILL BE MANAGED IN ORDER TO ALLOW IMMEDIATE REPLAY OF ANY DATA RECORDED WITHIN THE PREVIOUS 24 HOURS.						
		D. DURING SLEEP PERIODS						
		1. USING HIGH GAIN ANTENNAS, DSE RECORDING AND DUMPING WILL BE MANAGED PER (A) ABOVE.						
		 USING OMNI'S, LM AND CSM LOW BIT RATE TELEMETRY WILL BE RECORDED CONTINUOUSLY WHEN NOT IN CONTACT WITH GROUND TELEMETRY SITES. DATA WILL NOT BE DUMPED UNLESS A MALFUNCTION SO DICTATES. IN THIS CASE THE HGA WILL BE ACTIVATED FOR THE DUMP. 						
	32-12	CTE AND MISSION TIMER MANAGEMENT						
l		A. CTE AND THE MISSION TIMER WILL BE CONFIGURED TO CLOCK IN GET FOR FLIGHT; HOWEVER, IF A HOLD OCCURS AFTER T-20 MINUTES, CTE WILL NOT BE CORRECTED UNTIL COMPLETION OF POWERED FLIGHT.						
		B. CTE AND THE MISSION TIMER WILL BE ALLOWED TO DRIFT ±5 SEC BEFORE BEING UPDATED AFTER ORBIT INSERTION.						
	32-13	LM USB/TM MANAGEMENT						
		A. FOR NORMAL LM POWERED UP PHASES, THE LM STEERABLE ANTENNA WILL BE USED.						
		B. DURING PERIODS OF LM OUT-OF-STATION CONTACT (LUNAR FAR SIDE), THE TM BIT RATE WILL BE SWITCHED FROM HBR TO LBR AND TRANSMITTED TO THE CSM OVER VHF B EXCEPT DURING VHF RANGING.						
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SECTION 32 - COMMUNICATIONS AND INSTRUMENTATION - CONTINUED

NASA — Manned Spacecraft Center Mission Rules

			MISSION RULES								
REV	ITEM										
	32-14	SYSTEMS MONITOR	ING								
		DURING SLEEP PERIODS TBD CREWMEN WILL SLEEP WITH HEADSETS TO MONITOR FOR MC&W AND/OR GROUND ALER SIGNAL.									
A	32-15	LM STEERABLE ANT	TENNA MANAGEMENT								
		A. CSM THRUSTERS B3 AND C4 MUST BE DISABLED WHEN THE LM STEERABLE ANTENNA IS UNSTOWED DURING DOCKED PHASES.									
		B. DURING ALL F AND 185°F.	PHASES, THE STEERABLE ANTENNA TEMPERATURE	SHOULD BE MAINTAINED BETWEEN -65°F							
					•						
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	}										
		RULE NUMBERS 32-16 THROUGH 32-19 ARE RESERVED.									
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SECTION 32 - COMMUNICATIONS AND INSTRUMENTATIONS - CONTINUED

NASA — Manned Spacecraft Center MISSION RULES

				MISSION KULES			
₩EV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTES/COM	MENTS
			SPEC	IFIC MISSION RULES			
	32-20	LOSS OF TWO-WAY DIRECT	DOCKED	A. CONTINUE MISSION	į	REF MALF PROC	
		VOICE COMM BETWEEN CSM AND LM		DO NOT UNDOCK			
		אוט טיו					
] '		UNDOCKED	B. DOCK WITH TWO VEHICLE COVERAGE	E MSFN		
				NO-GO FOR RNDZ			
			RNDZ	C. CONTINUE MISSION	ľ		
) '						
	32-21	LOSS OF TWO-WAY VOICE				CONFIGURE FOR CSM C	IR IM
	72-21	COMM WITH MSFN				VOICE RELAY AS REQU	
		A. LM ONLY	DOCKED	A.1. CONTINUE MISSION			
				UNDOCKING OK			
			INDOCKED	2. NO-GO FOR RNDZ			
			UNDOCKED .				
			RNDZ	3. CONTINUE MISSION			
		B. CSM ONLY	LAUNCH	B.1. CONTINUE MISSION			
			ORBIT	2. ENTER NEXT BLOCK D	ATA		
				POINT			
			ALL	C. ENTER NEXT BEST PTP			
	}						
<u> </u>							· · · · · · · · · · · · · · · · · · ·
	32-22	LOSS OF CSM TM					
		A. HBR OR LBR	ALL	A. CONTINUE MISSION			
-	}	B. ALL'TM	LAUNCH	B.1. CONTINUE MISSION			
		o. ALL III					
			ALL	2. ENTER NEXT BEST PT	<u> </u>		
			1				
	32-23	LOSS OF LM TM			·		
		A. LBR	ALL	A. CONTINUE MISSION			
		B. ALL TM	DOCKED	B.1. CONTINUE MISSION			
-			UNDOCKED	2. NO-GO FOR RNDZ			
			RNDZ	3. CONTINUE MISSION			
ľ			KINDZ	5. <u>CONTINUE PRISOTON</u>			
-			 				
	32-24	LOSS OF USB RANGING (CSM OR LM)	ALL	CONTINUE MISSION			
		OK MID					
			}		ļ		
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				MISSION RULES			
REV	RULE	CONDITION/MALFUNCTION	PHASE	RULING		CUES/NOTE	S/COMMENTS
	32-25	LOSS OF ONE CSM PMP POWER SUPPLY	ALL	CONTINUE MISSION			
	32-26	LOSS OF FM DOWNLINK (CSM OR LM)	ALL	CONTINUE MISSION			
	32-27	LOSS OF THE UPDATA LINK (CSM AND/OR LM)	ALL	CONTINUE MISSION			
	32-28	LOSS OF BOTH CSM POWER AMPLIFIERS	EPO	NO-GO FOR TLI			
	32-29	LOSS OF THE SCE	EPO TLC	A. NO-GO FOR TLI B. ENTER NEXT BEST PTP NO-GO FOR LOI			111-12-11-1-1-1-1-1
	32-30	LOSS OF TWO CSM AUDIO CENTERS	EPO	NO-GO FOR TLI			
	32-31	LOSS OF CRITICAL INSTRUMEN- TATION					·
		A. ONBOARD	LAUNCH EO	CONTINUE MISSSION NO-GO FOR TLI	İ		
			TLC ALL	CONTINUE MISSION NO-GO FOR LOI NO-GO FOR RNDZ			
		B. ONBOARD AND TM	ALL	ENTER NEXT BEST PTP			
		:		·			
Â		RULE NUMBERS 32-32 THROUGH 32-39 ARE RESERVED.					. *
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POM OSC FAIL 3 CAL 85 PCT GL0401V HIGHLY DESTRABL CAL 15 PCT GL0402V HIGHLY DESTRABL MET GL0501W CAUTION HIGHLY DESTRABL MASTER ALARM GL4069X MASTER ALARM HIGHLY DESTRABL MASTER ALARM GL4069X MASTER ALARM HIGHLY DESTRABL DUA STATUS GT0441X HIGHLY DESTRABL S-BND ST PH ERR GT0992B HIGHLY DESTRABL S-BND ROWR PO GT0993E HIGHLY DESTRABL DSE TAPE MOTION MONITOR CT0012X HIGHLY DESTRABL SIG COMD POS SUPPLY VOLTS CT0015V HIGHLY DESTRABL SIG COMD POS SUPPLY VOLTS CT0016V SIG COMD NGG SUPPLY VOLTS CT0016V SENSOR EXCITATION 10 VOLTS CT0018V SENSOR EXCITATION 10 VOLTS CT0018V CTE TIME FROM LAUNCH CT01145F HIGHLY DESTRABL USB REC GS VOLTS CT0620E HIGHLY DESTRABL USB REC GS VOLTS CT0620E HIGHLY DESTRABL USB REC GS VOLTS CT0640F HIGHLY DESTRABL USB REC STATIC PH ERR CT0640F		CATEGORY	ONBOARD	<u>00</u>	PCM		DESCRIPTION	MEAS		
CAL 15 PCT GL0402V HIGHLY DESTRABL METER GL9501W CRW FAIL GL4069X CAUTION HIGHLY DESTRABL CRW PWR FAIL GL4069X MASTER ALARM HIGHLY DESTRABL DUA STATUS GT0441X HIGHLY DESTRABL S-BND XMTR PO GT0932B HIGHLY DESTRABL S-BND XMTR PO GT0939E METER HIGHLY DESTRABL DEST TAME MOTION MONITOR CT0012X SIG COND POS SUPPLY VOLTS CT0016V HIGHLY DESTRABL SIG COND NEG SUPPLY VOLTS CT0016V HIGHLY DESTRABL SENSOR EXCITATION 10 VOLTS CT0017V HIGHLY DESTRABL CTE TIME FROM LAUNCH CT0114F HIGHLY DESTRABL UNL STS VALIDITY SIG CT026V HIGHLY DESTRABL CTE TIME FROM LAUNCH CT0114F HIGHLY DESTRABL UNS REC STATIC PH ERR CT0640F HIGHLY DESTRABL USB REC STATIC PH ERR CT0640F HIGHLY DESTRABL	BLE	1 OF 2 HIGHLY DESIRABLE	HIG				SC FAIL 2	PCM 0 PCM 0		
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APPENDICES

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C CHANGE CONTROL

MISSION RULES REV ITEM										
REV	ITEM			CHANGE CONTROL						
		1.0	INTRODUCT	TION						
		1.1	PURPOSE							
THE PURPOSE OF THIS APPENDIX IS TO DELINEATE CHANGE CONTROL PROCEDURES FOR THE AS-505/106 MISSION RULES. THIS WILL INSURE THE PROPER COORDINATION OF CHANGES, PROVIDE A RECORD OF POSED CHANGES (INCLUDING THE RATIONALE FOR MAKING THEM), AND WILL PROVIDE A MEANS FOR PRO GATING INDIVIDUAL RULE UPDATES BETWEEN REVISIONS (INTERIM CHANGES).										
	•	1.2	EFFECTIVI	TY						
			FEBRUARY	24, 1969						
		2.0	CHANGE PR	COCEDURES						
		2.1	SUBMISSIO	ON OF CHANGES						
		PROPOSED CHANGES ARE SOLICITED FROM ANY INDIVIDUAL OR ORGANIZATION HAVING A VALID INPUT. CHAN ORIGINATING OUTSIDE THE FLIGHT CONTROL TEAM WILL BE SUBMITTED DIRECTLY TO THE ASSISTANT FLIGHT DIRECTOR (AFD). CHANGES ORIGINATING WITHIN THE FLIGHT CONTROL TEAM WILL BE SUBMITTED TO THE AFD VIA THE PRIME MISSION OPERATIONS CONTROL ROOM (MOCR) POSITION CONCERNED.								
		2.1.1	FORMAT			,				
PERSONS DESIRING TO SUBMIT A PROPOSED CHANGE WILL COMPLETE ALL ITEMS ON THE FORM SHOWN FIGURE C-1 (FORM MUST BE TYPED). ADDITIONAL PAGES MAY BE USED IF THE SPACE PROVIDED IS ADEQUATE. THE COMPLETED ORIGINAL FORM AND ONE COPY WILL THEN BE FORWARDED TO THE AFD.										
			THE AFD W	VILL REVIEW THE FORM FOR COMPLETENESS AND NOS AS REQUIRED. THE ORIGINATOR WILL BE V	PROPER MISSION RULE FORMAT, AND ADVISED OF ANY SUCH CHANGES.	MAKE				
		2.2	APPROVAL							
2.2.1 COORDINATION										
	THE ORIGINATOR OF THE CHANGE MAY OBTAIN PRELIMINARY CONCURRENCES. THE AFD WILL, HOWEVER OBTAIN FORMAL CONCURRENCES OR DISAPPROVALS (VERBALLY OR BY INITIATING) FROM THE NECESSAR PERSONNEL. VERBAL CONCURRENCES WILL BE INDICATED IN THE APPROPRIATE SIGNATURE BOX.									
		2.2.2	SIGNOFF/D	DISAPPROVAL	• •					
	UPON OBTAINING THE REQUIRED CONCURRENCES OR NEGATIVE COMMENTS, THE AFD WILL PRESENT THE PR CHANGE TO THE FLIGHT DIRECTOR FOR FINAL APPROVAL OR DISAPPROVAL. THE AFD MAY SIGN OFF OR DISAPPROVE PROPOSED CHANGES IN THE ABSENCE OF THE FLIGHT DIRECTOR.									
		2.2.3	DISAPPROV	/ED CHANGES						
			IF A CHAN REQUESTED	NGE IS DISAPPROVED THE AFD WILL RET⊎BN TH O CHANGE WILL BE RETAINED FOR FUTURE REFE	E COPY TO THE ORIGINATOR. A COP RENCE.	Y OF THE				
		2.3	<u>PUBLICATI</u>	ON AND DISTRIBUTION OF INTERIM CHANGES						
			INTERIM C	CHANGES WILL BE DISTRIBUTED VIA AN ABBREV CONTROL TEAM, PERTINENT NASA ORGANIZATION	IATED DISTRIBUTION LIST CONSISTI S, AND THE APPROPRIATE VEHICLE C	NG OF THE ONTRACTOR(S).				
		3.0	REVISIONS	5						
		3.1.	DEVELOPME	ENT						
	THE AFD WILL COMPILE THE EFFECTIVE INTERIM CHANGES AND CORRECTIONS OF MINOR TYPOGRAPHICA ERRORS INTO COMPLETE PAGE CHANGES TO THE BASIC DOCUMENT. ("PEN AND INK" CHANGES MAY BE TO CORRECT TYPOGRAPHICAL ERRORS IF THERE ARE NO OTHER CHANGES IN THE PAGE CONCERNED.)									
3.2 APPROVAL										
			SINCE ALL DIRECTOR	L INTERIM CHANGES WILL HAVE RECEIVED PRIC (OR THE AFD IN THE FLIGHT DIRECTOR'S ABS	R CONCURRENCES AND APPROVAL, ONL ENCE) WILL BE REQUIRED TO APPROV	Y THE FLIGHT E REVISIONS.				
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APOLLO

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FINAL FLIGHT MISSION RULES

APOLLO 10 (AS-505/106/LM-4)



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