

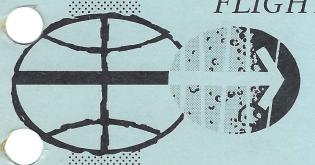
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FINAL FLIGHT MISSION RULES

APOLLO 13 (AS-508/109/LM-7)

FEBRUARY 12, 1970

PREPARED BY
FLIGHT CONTROL DIVISION



MANNED SPACECRAFT CENTER HOUSTON, TEXAS

FOR NASA/DOD INTERNAL USE ONLY INCLUDING APPROPRIATE CONTRACTORS

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SECTION 2 FLIGHT OPERATIONS RULES

PRELAUNCH A. LAUNCH AZIMUTH LIMITATIONS RESTRICT LAUNCHES TO OCCUR BETWEEN 72 DEG, AND % DEG. 9. THE FILENT DIRECTOR WILL EVALUATE WIND SIMULATIONS ALONG THE MODE 1 (TOWER) ABOUT TO PRIOR TO THE START OF CRITICAL COUNTDOWN ACTIVITIES AND WILL ADVISE THE LAUNCH DIRECTOR AND YPRODICTED PERIORS OF LAUNCH LANDING WILL BE ASSUMED AND THE SPECICAGET WIND CONSTRAINTS FOR LEAUNCHED OR REPRENAIN IN A TOWER ABOUT TO PROVIDE AND WILL BE ASSUMED AND THE SPECICAGET WIND CONSTRAINTS FOR LEAUNCHED OR REARIN IN A TOWER ABOUT MODE FOR THE AT THE PROVIDE TO A WILL ALONG WITH A HORIZOSTAL VELOCITY COMPONENT OF GREATER THAN 54 FEET PER SECOND AT IMPACT. IN CASES, THE LAUNCH SILL BE PRIME FOR CALLIER OURSE FOR LAUNCH LAUNCH DIRECTS WILL BE PRIME FOR CALLIER OURSE FOR THE WILL ADMIN LAUNCH SEN IN THE MAN PROVIDE TO AND THE SECOND TO THE WIND GROUND THE STRUMENTATION COUNTERED TO A CAPASILITY COMPONENTS. COUNTY OF THE LAUNCH WILL BE THE PROVIDED FOR LAND THE SECOND WITH THE WIND AND THE SECOND WITH THE WIND AND THE SECOND WITH THE WIND AND THE SECOND WITHOUT THE WIND WITHOUT THE W	REV	ITEM												
A. LAUNCH AZIMUTH LIMITATIONS RESTRICT LAUNCHES TO OCCUR BETWEEN 72 DEG. AND 96 DEG. B. THE FLIGHT DIRECTOR WILL EVALUATE AIRD SIMULATIONS ALONG THE MODE 1 TOWER! ABONT TR PRIOR TO THE START DE CRITICAL COUNTDON ACTIVITIES AND MILL ADD SET THE AUNCH DIRECTOR ANY PREDICTED PECIDOS OF LAND LANDING. IF THE FLIGHT DIRECTOR IS UMABLE TO PROVIDE T EVALUATION, A LAND LANDING WILL BE ASSURED AND THE SEARCHMENT WIND CONSTRUCTS FOR L LAUNCHED OR REMAIN IN A TOKER ABORT MODE IF A TOKER ABORT WOULD RESULT IN A LAND LAND WITH A MOREISTAN EVELOTITY COMPONENT OF GREATER THAN 54 FEET PER SECOND AT IMPACT CASES THE LAUNCH DIRECTOR WILL BE PRIME FOR CALLING HOLDS FOR LAND LANDING LAUNCH W VIDLATIONS. C. THE LAUNCH WILL NOT BE ATTEMPTED IF THE MINIMUM GROUND INSTRUMENTATION CAPABILITY COMPROMISED. (REFERENCE SECTION - GROUND INSTRUMENTATION REQUIREMENTS): CONTINUOUS VOI TELEMEIRY AND TRACKING COVERAGE FOR THE SPACECRAFT IS REQUIRED FROM LIFTOFF THRO THROUGH INSERTION PLUS 60 SEC. COMMAND IS HIGHLY DESIRABLE FOR BOTH VEHICLES. FOR THE PROPERTY OF THE SECTION - GROUND INSTRUMENTATION REQUIREMENTS: CONTINUOUS SOI TELEMEIRY AND TRACKING COVERAGE FOR THE SPACECRAFT IS REQUIRED FROM LIFTOFF THRO THROUGH INSERTION PLUS 60 SEC. COMMAND IS HIGHLY DESIRABLE FOR BOTH VEHICLES. FOR THE PROPERTY OF THE SECTION - GROUND INSTRUMENTS AS THE CREW CONDITION SATISFACTION, NO SCY OR SLY PROBLEMS ESTS THAN THE JOIN AS THE CREW CONDITION SATISFACTION, NO SCY OR SLY PROBLEMS ESTS THE MICH JEDORADIZE CREW SAFETT, AND SUFFICE CONSUMBBLES, CODIANT, AND ELECTRICAL ENERGY REMAIN FOR AT LEAST ONE REVOLUTION PLUS ENTRY.								' GENERAL '						
B. THE PLIGHT DIRECTOR WILL EVALUATE WIND SIMULATIONS ALONG THE MODE 1 (TOWER) ABONT TO PRICE TO THE STATE OF CRITICAL COUNTOWN ACTUTITIES AND WILL ADVISE THE LUNCH DIRECTOR EVALUATIONS A LAND LANDING WILL BE ASSUMED AND THE SPACECRAFT WIND CONSTRAINTS FOR LIPS WILL BE APPLIED. THESE CONSTRAINTS (MET LUNCH DO THE ATOWER ABORT WOULD RESULT IN A MUNICAL DRIVER OF MEMBERS AND THESE CONSTRAINTS (MET LUNCH DO THE ATOWER ABORT WOULD RESULT IN A MUNICAL DRIVER OF MEMBERS AND LAND LAND LAND LAND LAND LAND LAND		2 - 1	PREL	AUNCH										
PRIOR TO THE START OF CRITICAL COUNTOWN ACTIVITIES AND WILL ADVISE THE LAUNCH DIRECTOR ANY PRODICTED PERIOS OF LAND LANDING IN THE MET DIRECTOR IS UNABLE TO PROVIDE T EVALUATION, A LAND LANDING ESCAPE OF STANDING OF THE			Α•	LAUNCH	AZIMUTH L	IMITA	TIONS RE	STRICT LAUNCH	ES TO	OCCUR BET	WEEN 72 DE	G AND 96	DEG.	
COMPROMISED. REFERENCE SECTION 4 - GROUDD INSTRUMENTATION REQUIRED FROM LIFTOFF THRO TELEMETRY, AND TRACKING COVERAGE FOR THE SPACECRAFT IS REQUIRED FROM LIFTOFF THRO INSERTION PLUS GO SEC. CONTINUOUS TELEMETRY COVERAGE IS REQUIRED FROM THE SLV FROM LIFT THROUGH INSERTION PLUS GO SEC. COMMAND IS HIGHLY DESINABLE FOR BOTH VEHICLES. 2-2 LAUNCH IT IS PREFERABLE TO GO INTO URBIT AND REENTER INTO THE WEST ATLANTIC RATHER THAN PERFORM LAUNCH ABORT. THEREFORE THE LAUNCH WILL BE CONTINUED AS LONG AS THE CREW CONDITION SATISFACTORY, NO S/C OR SUY PROBLEME RISTS THICH JED/PARDIZE CREW SAFETT, AND SUFFICE CONSUMBBLES. COOLANT, AND ELECTRICAL ENERGY REMAIN FOR AT LEAST ONE REVOLUTION PLUS ENTRY. MISSION REV DATE SECTION GROUP PAGE			В•	PRIOR ANY PR EVALUA IP'S W LAUNCH WITH A CASES,	TO THE STA EDICTED PE TION; A LA FILL BE APP ED OR REMA HORIZONTA THE LAUNC	RT OF RIODS ND LA LIED. IN IN L VEL	CRITICA OF LAND NDING WI THESE C A TOWER OCITY CO	L COUNTDOWN A LANDING. IF LL BE ASSUMED ONSTRAINTS (R ABORT MODE I MPONENT OF GR	CTIVI THE F AND EF LM F A T EATER	TIES AND WILIGHT DIRECTHE SPACEORRD) REQUIRECTHAN 54 FE	ILL ADVISE CTOR IS L RAFT WIND RE THAT WOULD RES EET PER SE	THE LAUN UNABLE TO CONSTRA THE SPACEULT IN A	CH DIRECTOR PROVIDE INTS FOR L ECRAFT NOT LAND LAND MPACT IN	TH: LAI LAI II AI
IT IS PREFENABLE TO GO INTO ORBIT AND REENTER INTO THE WEST ATLANTIC RATHER THAN PERFORM LAUNCH ABORT. THEREFORE THE LAUNCH WILL BE CONTINUED AS LONG AS THE CREW CONDITION SATISFACTORY, NO S/C OR SLV PROBLEMS EXIST WHICH JEOPARDIZE CREW SAFETY. AND SUFFICE CONSUMABLES, COOLANT, AND ELECTRICAL ENERGY REMAIN FOR AT LEAST ONE REVOLUTION PLUS ENTRY.			с.	COMPRO TELEME INSERT	MISED. (RETRY, AND TO TON PLUS 6	FEREN RACKI O SEC	CE SECTI NG COVER . CONTIN	ON 4 - GROUND AGE FOR THE UOUS TELEMETR	INST SPAC Y COV	RUMENTATION ECRAFT IS ERAGE IS RE	REQUIREN REQUIRED EQUIRED FR	MENTS.) CC FROM L ROM THE SL	NTINUOUS VO: .IFTOFF THRO .V FROM LIFT	1 C I
LAUNCH ABORT. THEREFORE, THE LAUNCH WILL BE CONTINUED AS LONG AS THE CREW CONDITION SATISFACTORY, NO S/C OR SLV PROBLEMS EXIST WHICH JEOPARDIZE CREW SAFETY. AND SUFFICI CONSUMABLES, COOLANT, AND ELECTRICAL ENERGY REMAIN FOR AT LEAST ONE REVOLUTION PLUS ENTRY.	-	2-2	LAUN	СН										
			LAUN	CH ABOR	T. THEREFO	RE, T	HE LAUNC LV PROB	H WILL BE LEMS EXIST	CONTI WHICH	NUED AS I	LONG AS ZE CREW	THE CREW	CONDITION AND SUFFICE	
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MISSION RULES

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	8	
2-3	EARTH ORE	віт
	Α.	ENTRY WILL BE MADE AT THE NEXT BEST PTP WHEN ONE MORE CSM FAILURE WILL RESULT IN AN ASAP ENTRY OR UNCONTROLLABLE CONDITIONS.
	8•	ADEQUATE CONSUMABLES WILL BE MAINTAINED FOR ENTRY IN THE NEXT PTP. MAKING ALLOWANCES FOR SETUP AND ENTRY.
	c.	THE DEORBIT CAPABILITIES REQUIRED FOR EARTH ORBIT ARE
		1. TWO METHODS OF DEORBIT ARE REQUIRED.
		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 DELTA V WILL BE RESERVED FO THIS MANEUVER.
		4. SM-RCS (4 QUAD) AND SM-CM/RCS HYBRID WILL BE CONSIDERED AS .INDEPENDENT DEORBI METHODS AS LONG AS INDIVIDUAL SM-RCS QUAD AND GNCS INTEGRITY IS MAINTAINED AN SUFFICIENT RCS PROPELLANT IS AVAILABLE.
		5. THE LM PROPULSION SYSTEM (DPS OR RCS) MAY BE USED TO PLACE THE CSM IN AN ORBI (HP GREATER THAN OR EQUAL TO 80 NM) FROM WHICH A SM-RCS OR SM-CM/RCS HYBRI DEORBIT CAN BE CONDUCTED.
		6. UTILIZATION OF BACKUP DEORBIT METHODS WILL BE BASED ON THE FOLLOWING PRIORITIES
		(A) SM-RCS
Ì		(B) LM PROP PLUS SM-RCS
		(C) SM-CM/RCS HYBRID
		BERS 2=4 THROUGH RESERVED
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MISSION RULES SECTION 2 FLIGHT OPERATIONS RULES

					SE	ECTION 2	FLIGHT OPERATION	S RULES			
REV	ITEM										
	2-11	TRAI	ISLUNAR	INJECTION							
		1			IF T	THE S/C	AND L/V SATISFY T	HE FOLLOWING CR	ITERIA		
			1. T	HERE HAVE 8	EEN N	O FAILU	RES IN THE LAUNCH	VEHICLE WHICH	RESULTS	IN	
			- (A) A CATAS	TROPE	HIC HAZA	RD•				
			(DEFINIT SPECIFI S-IVB C	ELY F C MIS	PRECLUDII SSION RUI MABLES O	-IVB ENGINE BURN I NG AN ACCEPTABLE I LES, A NO GO RECOI R PROPULSION PERFO EVING A CUTOFF ORI	LUNAR MISSION. MMENDATION WILL DRMANCE IS AV.	IN APPLY BE REQU AILABLE	ING THIS TO ASSU	CRITERIA T INSUFFICIEN RE A FINIT
			V		15 5	SUBJECT	STEMS CAPABILIT TO THE NUMBER AND N EARTH ORBIT•		NDANCY. ANT COMP	REDUNDA	
	A	В•	CRITIC	AL SYSTEM (PRIME	OR BAC	YED UNTIL THE SEC (UP) (MANEUVER, S TIME FOR EVALUA	LIFE SUPPORT,			
		с.		I MANEUVER ENCE FAILURE		BE INIT	IATED AND CONTINU	ED UNDER MANUAL	CONTROL	. FOR A SA	TURN GUIDANG
	2-12	TRAI	NSPOSITI	ON, DOCKING	AND	EJECTIO	N (TD&E)				
		Α.					ING. ATTITUDES. R			NOMALIES,	THE FLIG
		в•	THE NO	DRMAL MINIMUNCES MAY BE	M CA	ABIN PR	ESSURE REDLINE (ING TOGE FOR E DEPRESSURIZED A	OF 4.0 PSIA TUNNEL OR LM	FOR TUN	WHICH PR	EVENT NORM
b		с.	IF NOR				SUCCESSFUL; NO AT	TEMPT WILL MADE	TO MAN	THE LM A	ND ''STAGE
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							OPERATIONS RULES		2-3		

MISSION RULES

SECTION 2 FLIGHT OPERATIONS RULES

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THE STATE OF THE S													
2=	-13		SLUNAR C		250014	- IE 10	I CAN BE TARGETE	WITHIN OPER	ATIONAL CON	STRAINTS			
							NATED IF ADEQU				FOR A		
		В»	CIRCUML	UNAR EARTH	RETU	RN + 12	HRS.						
		C.	CSM CON	W WILL USE MMUNICATION ORBIT MISSI	S ARE	LOST WI	TION TO MAN THE TH THE MSFN. IF E FLOWN.	LM FOR BACKUP CSM COMMUNICA	TIONS CANNO	T BE MAINTA	INED, A		
NAMES OF STREET		D.					E FLOWN UNLESS T						
		E.	I OT TAS	CONTENDO	CTOAT	ALT C WILLTI	ONS RESULTING IN LE RESERVING A LATE AS 2 HRS	CAPABILITY	O PERFORM	A KETUKN I	U EARTI		
2.	-14	LUNA	R ORBIT	INSERTION									
Unique de la constante de la c				INHIBITED		LUNAR F	LYBY PERFORMED I	F THE CSM	DOES NOT	SATISFY ANY	OF TH		
and constitution		Ae		RITICAL SYS					3.7				
		Во	B. ADEQUATE CONSUMABLES FOR MINIMUM LUNAR ORBIT OPERATIONS WITH CAPABILITY TO SUSTAIN A TANK LOSS AND RETURN TO EARTH WITH AN AVERAGE POWER LEVEL OF 40 AMPS.										
N-CENTRAL PROPERTY.		C.					ITY FOR TEI AND						
CONTRACTOR OF THE CONTRACTOR O		D.		OPELLANT RE			OMPLISH TEI CONTR	OL, TRANSEAR	TH MCC CONTR	ROL, PTC, AND	MINIMU		
		E.	A DPS	LOI WILL BE	PERF	ORMED IF	REQUIRED TO ACC	OMPLISH A LUI	NAR ORBIT MI	SSION.			
	•	5 LUNAR ORBIT											
2	-15												
000		Αø			00077	r HAC NO	T BEEN ACHIEVED.	A DPS 2 HOUR	ABORT WILL	BE EXECUTED			
			F	OLLOWED BY	A SUE	SEQUENT	DPS MANEUVER IF	REQUIRED.					
			2 • I	F A STABLE HE NEXT OPF	ORBIT ORTU	T HAS BE	EN ACHIEVED AN S AN ALTERNATE MIS	SPS OR DPS TE SION WILL BE	I WILL BE PE	ERFORMED AT			
		В.	LIFE S	SUPPORT .			MUST BE MAINTAIN						
A STATE OF THE STA		C.	SUSTAI	IENT CONSUM N A TANK LO OF 40 AMPS)55 A	S MUST R T ANY PO	EMAIN TO COMPLET INT DURING THE P	E THE NEXT MI HASE AND RETU	SSION PHASE RN TO EARTH	WITH CAPAB WITH AN AVER	ILITY TAGE POWE		
PANTES RELATED DO		De	MCC S				FUEL RESERVE CAP						
CHANDER SERVICE		E.	THE CS	M MUST MAI	NTAIN D MIN	RCS PRO IMAL TRA	PELLANT RESERVE NSEARTH OPERATIO	TO ACCOMPLIS	H TEI CON	TROL, TRANSE	ARTH M		
AMERICAN PROPERTY AND ADDRESS OF THE PERTY		Fo	IF NOF	RMAL MISSIO	N OPE HE DP	RATIONS S AND SP	ARE INHIBITED. T S.	HE DPS WILL B	E USED FOR	TEI WHEN THE	RE IS		
2=16 INTRAVEHICULAR TRANSFER ONE HARDSUIT IVT FROM THE CSM TO THE LM WILL BE ACCOMPLISHED IF A REASONABLE CHANCE EXISTS THE													
							STS TH						
		ONE	HARDSU RECTIVE	IT IVT FROM ACTION CAN	THE BE T	CSM TO T AKEN FOR	A LM/TUNNEL PRE	SSURIZATION F	PROBLEM.	LE CHANCE EN.	0,0 ,,,,		
NAMES OF TAXABLE PARTY OF TAXABLE PARTY.		COMMERCIAL PROPERTY OF THE PRO											
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MISSION RULES SECTION 2 FLIGHT OPERATIONS RULES

/ ITEN	
1	
2-17	DOCKED LM OPERATION
	FOR AN IMPENDING HAZARDOUS SITUATION RESULTING FROM A DESCENT STAGE PROBLEM, THE STAGE WILL JETTISONED AND ASCENT STAGE OPERATIONS WILL CONTINUE AFTER THE VEHICLE HAS MOVED TO A SADISTANCE.
	RULE NUMBERS 2-18 THROUGH 2-20 ARE RESERVED
2-21	CSM/LM UNDOCKING AND SEPARATION
D-4-Y-C-Manusconserved-Audit	A. A MANNED LM WILL NOT BE UNDOCKED FROM THE CSM WITHOUT INDEPENDENT MANEUVER CAPABILITY BOTH VEHICLES TO TERMINATE UNDOCKED ACTIVITIES AND TO ACCOMPLISH DOCKING. THE LM CAPABILI TO REDOCK MUST STILL EXIST IF THE LM IS REQUIRED TO STAGE.
NA COMPANY	B. EVT CAPABILITY IS REQUIRED FOR MANNED UNDOCKING.
Name of the last o	C. CREWMEN WILL BE SUITED DURING UNDOCKING AND DOCKING.
	D. VHF COMMUNICATIONS IS MANDATORY FOR SEPARATION.
2-22	CSM LUNAR ORBIT UNDOCKED
TO THE PERSON NAMED IN COLUMN TO THE	A. UNDOCKING TO PDI
	1. LOSS OF REDUNDANT CAPABILITY IN CRITICAL SYSTEMS WILL BE CAUSE TO TERMINATE THE MISSION AND PERFORM TEI ASAP.
	2. LOSS OF CSM RESCUE CAPABILITY WILL BE CAUSE FOR TERMINATING THE MISSION AND PERFORMING A LM ACTIVE RDZ ASAP.
	B. PDI TO LANDING
	NO CSM FAILURES WILL BE CAUSE FOR ABORT DURING POWERED DESCENT.
	C. LUNAR STAY
	FAILURE TO MAINTAIN REDUNDANT CAPABILITY IN SYSTEMS REQUIRED FOR TEI OR LIFE SUPPORT WISE CAUSE FOR TERMINATION OF LUNAR STAY.
2-23	RESERVED
	, fraiting
2-24	LM-PDI
	FOR PDI, THE LM MUST MEET THE LUNAR STAY WITH EVA CRITERIA, HAVE THE CAPABILITY TO LAND, ASCERENDEZVOUS AND DOCK WITHOUT VIOLATING ANY SPECIFIC MISSION RULES OR REDLINES.
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SECTION 2 FLIGHT OPERATIONS RULES

				50	ECTION 2	FLIGHT OPERATION:	NOLES			
V	ITEM									
	2-25	LM-POWERED	DESCENT							
		IF A SYSTEM	AS FAILURE C	OCCURS	S AND A C	HOICE IS AVAILAB	_E			
		A. EARLY TO ABO REQUIR VEHICL	IN POWERED ORT IN FLIGH RED TO CONTI	DESCE HT THA INUE F	ENT WHEN AN TO CON POWERED D SUMABLES	DPS-TO-ORBIT CAPA ITINUE DESCENT. RI	ABILITY IS AVAI EDUNDANT CAPABI IS PERIOD. HOWE ERATION WILL BE	VER, FO	IT IS MORE PREFERABLE CHITICAL LM SYSTEMS IS DR FAILURES EFFECTING TO CONTINUING POWERED	
		LUNAR LOSS (SURFACE THA	AN TO	ABORT - C	ONLY THOSE SYSTEM. O ASCEND AND ACH	S FAILURES OR T LEVE A SAFE ORB	RENDS TI	ND AND LAUNCH FROM THE HAT INDICATE IMPENDING THE LUNAR SURFACE, OF RING THIS PERIOD.	
	2-26	LM-LUNAR ST	ΓΑΥ							
		CAPAB:	THOSE TIME=C ILITY TO ASC FF) FROM THE	END A	AND ACHIE	VE A SAFE ORBIT	RENDS THAT INDI	CATE II	MPENDING LOSS OF THE MMEDIATE ABORT (ANYTIME	
B. LOSS OF REDUNDANT CAPABILITY IN CRITICAL LM SYSTEMS IS CAUSE FOR ABORT AT THE NEXT OPPORTUNITY.									RT AT THE NEXT BES	
	2-27	EVA								
-		A. FOR TH	HE NOMINAL O	TW0-1	MAN) EVA	TOTAL EMU LIFE CRITICAL INSTRUM	SUPPORT SYSTEMS	CAPABI	LITY, EVA TO EVA DUPLE ONAUTS ARE REQUIRED.	
		B. ALL PI	ANNED EVA'S	6 WILI	L INCLUDE	A 30-MINUTE POS	T-EVA RESERVE O	N EMU C	ONSUMABLES.	
		C. ALL EN	VA EXCURSION N TO THE LM	NS WII	LL BE LIN	MITED TO THAT VIC	INITY OF LM WHI	CH WILL	ALLOW A SAFE 32 MINUT	
		D. BOTH B	EVA CREWMEN	WILL	NOT REMA	IN OUTSIDE OF MS	FN COMM COVERAG	E FOR	A PERIOD EXCEEDING	
		INITIA	ATED AN OPS	PURGI	E. THIS	VILL ALWAYS EGRES WILL INSURE THAT OPPORTUNITY TO D	THE COR IS IN	RESS LA THE LEF	ST UNLESS THE CDR HA T PILOT POSITION SHOUL	
		F. THE LI	WILL NOT	BE PRI	ESSURIZED	WITH A CREWMAN	ON THE SURFACE.			
		G. A VACI	JUM TRANSFER	R WILI	L ONLY BE ATTEMPTED IN AN EMERGENCY.					
		INITI	ATED. ONE N	MAN FY	VAIS WILL	BE LIMITED TO A	N OPERATIONAL R	ADIUS O	, A ONE-MAN EVA WILL B F 1000 FEET FROM TH OBJECTIVES IDENTIFIE	
1		I. BOTH PLSS	PLSS'S AND (+ 1 OPS) HAV	OPS'S	WILL BE EN VERIFI	RETAINED UNTIL T	NO LIFE SUPPORT	UNITS ES TO S	(2 OPS, 2 PLSS, OR UPPORT CEVT.	
		J. THE AC	TIVATION OF	THE	OPS IN 1	THE MAKEUP MODE W RMED FOLLOWED BY	ILL REQUIRE EX IMMEDIATE RETUR	PEDITION TO TH	US COMPLETION OF THE LM.	
200000000000000000000000000000000000000		K. THE ALL	MOUNT OF SCI	IENTII	FIC EQUIF	PMENT & PAYLOAD T	AKEN INTO THE A	SCENT S	TAGE WILL BE LIMITED S TO ASCENT.	
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SECTION 2 FLIGHT OPERATIONS RULES

	SECTIO	N 2 FLIGHT OPERATION	IS RULES						
CENT									
ED FOR ASCENT OR FO	R RENDEZVO	OUS AND WHICH CAN BE	CORRECTED IN ONE	REV. IT IS BETTER TO DE					
NDEZVOUS									
SELECTION OF THE ACTIVE VEHICLE FOR RENDEZVOUS AND DOCKING WILL BE DETERMINED BY DIRECTOR AND THE FLIGHT CREW BASED UPON CONSUMABLES AND SYSTEMS PERFORMANCE. T CAPABILITY WILL BE DEDICATED TO ACCOMPLISHING THE RENDEZVOUS.									
ANSEARTH COAST									
RECOVERY ACCESS	VIOLATIONS								
IF THE FLIGHTPAT	H ANGLE IS	OUTSIDE THE ENTRY	CORRIDOR . AN MCC W	WILL BE EXECUTED AS SOON					
MCC'S WILL BE AC	COMPLISHED	BY THE SPS IF NECES	SSARY TO MAINTAIN	RCS REDLINES.					
TERNATE MISSION									
E.O.									
1. CSM ONLY - APPROXIMATE 100 NM E.O. PHOTOGRAPHY, SPS INCLINATION CHANGE, SPS MNVR TO LOWER APOGEE IF REQUIRED.									
			MS POWER UP, LO) PHOTOGRAPHY, PC.					
OPERATIONAL CONS	IDERATIONS	S SUCH AS CREW SAFE	Y AND SYSTEMS	LIFETIME, THE COMBINED					
1. LUNAR IMPAC	T.								
5. LONAR ORBIT									
SERVED									
•									
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	ED FOR ASCENT OR FOCENT FOR ONE REV AN OLDER TO THE ACTI RECTOR AND THE FLIG PABILITY WILL BE DE ANSEARTH COAST THE STEEP TARGET THAN 30,000 FPS MCC'S MAY BE USE RECOVERY ACCESS OPERATIONAL FOOT IF THE FLIGHTPAT PRACTICAL. MCC'S WILL BE ACTIONAL FOOT IF THE FLIGHTPAT PRACTICAL. MCC'S WILL BE ACTIONAL FOOT IF THE FLIGHTPAT PRACTICAL. MCC'S WILL BE ACTIONAL FOOT IF THE FLIGHTPAT PRACTICAL. MCC'S WILL BE ACTIONAL FOOT IF THE FLIGHTPAT PRACTICAL. IN CSM ONLY - MAY APPROXIMATE L.O. 1. CSM ONLY - CSM/LM (NO MANEUVER, L.O. IN ANY ALTERNAT OPERATIONAL CONS ASC/DES STAGES WILL BE ACTIONAL CONS ASC/	THE EVENT OF PROCEDURAL ERROR ED FOR ASCENT OR FOR RENDEZVO CENT FOR ONE REV AND CORRECT NDEZVOUS LECTION OF THE ACTIVE VEHICLE RECTOR AND THE FLIGHT CREW BAPABILITY WILL BE DEDICATED TO THE STEEP TARGET LINE WILL THAN 30,000 FPS AND THE GEMAND ACC'S MAY BE USED FOR LAND RECOVERY ACCESS VIOLATIONS OPERATIONAL FOOTPRINT. IF THE FLIGHTPATH ANGLE IS PRACTICAL. MCC'S WILL BE ACCOMPLISHED TERNATE MISSION E.O. 1. CSM ONLY - APPROXIMAT MNVR TO LOWER APOGEE 2. CSM/LM - LM SYSTEMS PAPPROXIMATE 100 NM E. L.O. 1. CSM ONLY - LUNAR ORBIT 2. CSM/LM (NO LANDING CAMANEUVER, LOW LUNAR COMENTAL CONSIDERATIONS ASC/DES STAGES WILL BE DISSION OPERATIONAL CONSIDERATIONS ASC/DES STAGES WILL BE DISSION COMENTAL COMENTAL CONSIDERATIONS ASC/DES STAGES WILL BE DISSION COMENTAL COME	THE EVENT OF PROCEDURAL ERRORS OR SYSTEMS PROBLE ED FOR ASCENT OR FOR RENDEZVOUS AND WHICH CAN BE CENT FOR ONE REV AND CORRECT THE SITUATION THAN I NDEZVOUS LECTION OF THE ACTIVE VEHICLE FOR RENDEZVOUS AND RECTOR AND THE FLIGHT CREW BASED UPON CONSUMBLE PABILITY WILL BE DEDICATED TO ACCOMPLISHING THE R ANSEARTH COAST THE STEEP TARGET LINE WILL BE USED FOR MCC'S L THAN 30,000 FPS AND THE GEN IS GO - THEN THE S MCC'S MAY BE USED FOR LANDING AREA CONTROL PRI RECOVERY ACCESS VIOLATIONS, UNACCEPTABLE WEATH OPERATIONAL FOOTPRINT. IF THE FLIGHTPATH ANGLE IS OUTSIDE THE ENTRY OF PRACTICAL. MCC'S WILL BE ACCOMPLISHED BY THE SPS IF NECES TERNATE MISSION E.O. 1. CSM ONLY - APPROXIMATE 100 NM E.O. PHOTOG MNVR TO LOWER APOGEE IF REQUIRED. 2. CSM/LM - LM SYSTEMS POWER UP AND DPS MNV APPROXIMATE 100 NM E.O. PHOTOGRAPHY MISSI L.O. 1. CSM ONLY - LUNAR ORBIT PHOTOGRAPHY, FREE 2. CSM/LM (NO LANDING CAPABILITY) - LM SYSTE MANEUVER, LOW LUNAR ORBIT. IN ANY ALTERNATE MISSION WITHIN THE CONSI OPERATIONAL CONSIDERATIONS SUCH AS CREW SAFET ASC/DES STAGES WILL BE DISPOSED OF IN THE FOLL 1. LUNAR IMPACT 2. OCEAN IMPACT 2. OCEAN IMPACT 3. LUNAR ORBIT	THE EVENT OF PROCEDURAL ERRORS OR SYSTEMS PROBLEMS WHICH RESULT IN ED FOR ASCENT OR FOR RENDEZVOUS AND WHICH CAN BE CORRECTED IN ONE CENT FOR ONE REV AND CORRECT THE SITUATION THAN IT IS TO LIFT OFF NOTES. NDEZVOUS LECTION OF THE ACTIVE VEHICLE FOR RENDEZVOUS AND DOCKING WILL BE RECTOR AND THE FLIGHT CREW BASED UPON CONSUMABLES AND SYSTEMS PABILITY WILL BE DEDICATED TO ACCOMPLISHING THE RENDEZVOUS. ANSEARTH COAST THE STEEP TARGET LINE WILL BE USED FOR MCC'S UNLESS THE VELOCITY OF THE STEEP TARGET LINE WILL BE USED FOR MCC'S UNLESS THE VELOCITY OF THE SHALLOW TARGET LINE MCC'S MAY BE USED FOR LANDING AREA CONTROL PRIOR TO ENTRY INTERECOVERY ACCESS VIOLATIONS, UNACCEPTABLE WEATHER, OR LAND MY OPERATIONAL FOOTPRINT. IF THE FLIGHTPATH ANGLE IS OUTSIDE THE ENTRY CORRIDOR, AN MCC WE PRACTICAL. MCC'S WILL BE ACCOMPLISHED BY THE SPS IF NECESSARY TO MAINTAIN TERNATE MISSION E.O. 1. CSM ONLY - APPROXIMATE 100 NM E.O. PHOTOGRAPHY. SPS INCLIF MONTH TO LOWER APORE IF REQUIRED. 2. CSM/LM - LM SYSTEMS POWER UP AND DPS MNVR TO LOWER APORT APPROXIMATE 100 NM E.O. PHOTOGRAPHY MISSION. INCLINATION OF APPROXIMATE 100 NM E.O. PHOTOGRAPHY MISSION. INCLINATION OF APPROXIMATE 100 NM E.O. PHOTOGRAPHY, FREE RETURN TRAJECTOR. 2. CSM/LM (NO LANDING CAPABILITY) - LM SYSTEMS POWER UP. LOWER APORT AND					

3 MISSION RULE SUMMARY

		SECTION 3 MISSION RULE SUMMARY
REV	ITEM	
	3-2	THE S-IVB EARLY STAGING WILL BE USED AFTER ''S-IVB TO COI'' CAPABILITY FOR THE FOLLOWING S-II GIMBAL ACTUATOR INBOARD HARDOVER S-II ENGINE FAILURES (TIME DEPENDENT) S-IVB COLD HE SHUTOFF VALVE(S) FAILS OPEN (AFTER TWR JETT)
	3-3	SWITCHOVER TO CSM GUIDANCE WILL BE PERFORMED FOR
		SATURN GUIDANCE REFERENCE FAILURE
		RULE NUMBERS 3-4 THROUGH 3-10 ARE RESERVED.
	CONTRACTOR OF THE CONTRACTOR O	
		MISSION REV DATE SECTION GROUP PAGE
		APOLLO 13 FNL 2/12/70 MISSION RULE LAUNCH PHASE 3-2

MISSION RULES

			SECTION 3 MISSION RULE SUMMARY							
	REV	ITEM								
1										
			THIS SECTION IS A SUMMARY OF THE DATA PRIORTY GUIDELINES BY MISSION PHASE, SLV RULES BY MISSION							
			PHASE, AND SYSTEMS GO/NO-GO CRITERIA ON CHARTS BY MISSION PHASE.							
			THE SUMMARY RULES PLUS THE CHART ARE REQUIRED TO ENCOMPASS EACH PHASE.							
			THE CAPABILITY LISTED IN THE CHARTS ARE THE REQUIREMENTS FOR INITIATION OR CONTINUATION OF A MISSION PHASE OR EVENT. MISSION EVENTS FROM UNDOCKING TO PDI IGNITION REQUIRE THAT THE VEHICLES							
			MEET THE LUNAR STAY WITH EVA CRITERIA AND HAVE THE CAPABILITY TO LAND, ASCEND, RENDEZVOUS, AND DOCK.							
			' LAUNCH PHASE '							
		3-1	THE LAUNCH WILL BE ABORTED FOR THE FOLLOWING REASONS							
			A• SLV							
- The second			S-II GIMBAL ACTUATOR HARDOVER INBOARD PRIOR TO S-IVB TO COI CAPABILITY							
			VIOLATION OF AUTO/MANUAL EDS LIMITS							
			S-II ENGINE FAILURES (TIME DEPENDENT)							
			FAILURE OF SECOND PLANE SEPARATION							
			S-IVB LOSS OF HYDRAULIC FLUID (PRIOR TO S-IVB IGNITION)							
			S-IVB LOSS OF THRUST (TIME DEPENDENT) (POSSIBLE COI CAPABILITY)							
			S-IVB LOX TANK PRESS GREATER THAN 50 PSI BEFORE TWR JETT							
			B. CSM							
-			1. ENVIRONMENTAL							
			LOSS OF CABIN AND SUIT PRESSURE							
			LOSS OF CABIN PRESSURE AND SUIT CIRCULATION							
			FIRE/SMOKE IN CM LOSS OF CABIN PRESSURE AND 02 MANIFOLD LEAK							
			2. ELECTRICAL							
Townstall Street			LOSS OF 3 FUEL CELLS AND 1 BATTERY							
			UNCONTROLLABLE SHORTED MAIN BUS							
			LOSS OF BOTH AC BUSES DURING MODE I OR MODE II							
			3. PROPULSION							
			SUSTAINED LEAK OR LOSS OF HE PRESSURE (SOURCE OR MANIFOLD) IN BOTH CM-RCS							
			RINGS (MODE I ONLY) C. VIOLATION OF TRAJECTORY LIMIT LINES							
			D. TEAM DISCRETION WILL BE USED FOR 1. SUIT/CABIN CONTAMINATION							
1			2. MEDICAL PROBLEMS							
Non-Consideration of the Constant of the Cons										
T			MISSION REV DATE SECTION GROUP PAGE							
-	- Chickenson	MINISTRAL STREET, STRE								

APOLLO 13 FNL 2/12/70 MISSION RULE SUMMARY

LAUNCH PHASE

MISSION RULES

SECTION 3 MISSION RULE SUMMARY

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	REV	ITEM									
NO. OF THE PERSONS ASSESSED.						1	EARTH ORBIT 1				
		3-11	CSM SEPARATION SLV CONDITION CORRECTED)	ON FROM THI	E S-I ERATI	VB (WITH	OUT LM EXTRACTION BE GIVEN TO EXTRA	I) WILL BE PERFO	RMED EA	RLY FOR THE F THE CONDITION	OLLOWING CAN BE
			*S-IVB RANGE SAFING	SAFETY PRO	OPELL	ANT DISP	ERSAL SYSTEM ARMS	INADVERTENTLY	AFTER I	NSERTION AND F	PRIOR TO
	*S-IVB LOX TANK PRESS IS GREATER THAN 50 PSI										
	LOSS OF ATTITUDE CONTROL DURING TB5										
	*S-IVB COMMON BULKHEAD DELTA PRESSURE EXCEEDS LIMITS										
			*START BOTTLE	E GREATER	THAN	1800 PSI	A				
			*PERFORM SPS	MANEUVER	TO A	SAFE DIS	TANCE				
		3-12	CSM SEPARATIO	ON FROM TH	E S-I	VB (WITH	LM EXTRACTION) W	ILL BE PERFORME	D FOR	a 000	
			A. S-IVB N	O-GO FOR T	LI						
			B. CSM NO-	GO FOR TLI	BUT	GO FOR E	ARTH ORBIT MISSIC	NO			
1		3-13	TLI WILL BE	INHIBITED	FOR						
			INSUFFICIENT	PROPELLAN	T REM	AINS FOR	ACHIEVING A 65.0	000 NM APOGEE EL	LIPSE		
			S-IVB ENGINE	MAIN LOX	VALVE	FAILS T	O CLOSE AT CUTOFF				
			LOSS OF ATTI	TUDE CONTR	OL						
			CONFIRMED AC	TUATOR HAR	DOVER	1					
			LOSS OF ENGI	NE HYDRAUL	IC FL	.UID					
			MISALIGNMENT	RATE BETW	EEN 1	HE IU AN	ID IMU IS OUTSIDE	LIMITS			
			UNACCEPTABLE INSERTION	DIFFERENC	ES BE	ETWEEN CM	C AND IU PLATFORM	M VELOCITY COMPO	NENTS (OR TOTAL VEL	OCITY AT
			UNACCEPTABLE	DIFFERENC	E BE1	WEEN MSF	N AND IU ORBITAL	DECISION PARAME	TERS		
\											
1											
	_			MISSION	REV .	DATE	SECTION	GROUP	PAGE		
				AND REAL PROPERTY OF LAND ASSESSED.	FNL		MISSION RULE	EARTH ORBIT			
				13			SUMMARY		3-3		

SECTION 3 MISSION RULE SUMMARY											
REV	ITEM										
	3-14	TLI WILL BE TERMINATED FOR A. PITCH OR YAW BODY RATES GREATER THAN 10 DEG./SEC B. ROLL BODY RATE GREATER THAN 20 DEG/SEC C. PITCH OR YAW ATTITUDE DIVIATIONS FROM NOMINAL PROFILES EXCEED 45 DEG. D. OVERBURN OF 6 SECS AND VI (PGNS) EQUALS VI (PAD)									
	3-15	CSM TAKEOVER WILL BE PERFORMED FOR SATURN GUIDANCE REFERENCE FAILURE OR SATURN LOSS OF ATTITUDE CONTROL IN EARTH ORBIT OR DURING TLI. RULES 3-16 THROUGH 3-20 ARE RESERVED.									
	Anti-importor of the Part Life	MISSION REV DATE SECTION GROUP PAGE									
		APOLLO 13 A 3/23/70 MISSION RULE EARTH ORBIT 3-4									

\	SECTION 3 MISSION RULE SUMMARY													
	REV	ITEM												
	3-21 TD&E WILL NOT BE PERFORMED FOR A. PILOTS EVALUATION OF RATES AND ATTITUDES, AND SLA CONFIGURATION NOT ACCEPTABLE B. THE SLV IS NO-GO FOR													
				1. VIOLATION OF S-IVB BULKHEAD DELTA P LIMITS										
			2. LOX TANK PRESSURE GREATER THAN 50 PSI											
		3-22	THE FOLLOWING ACTIONS	WILL BE TAKE	N FOR LOSS OF SA	ATURN ATTITUDE CO	ONTROL C	APABILITY						
			A. TLI CUTOFF TO S/C SEPARATION	'BSE ACTION		CREW ACTION	05 547	4404						
			FROM BOOSTER	GUIDANC		TAKEOVER CONTROL	. OF SAI	URN•						
				BEFORE	15 MINUTES . TOGE MANEUVER	FOR DOCKING A	NO LM F	IVER TO SEPARATION E. CREW DISCRETION XTRACTION. L BE ACCOMPLISHED BY						
				. MANEUVE	R OR EVASIVE (IMMEDIATELY. DOCKING AND L	CREW D	PARATE FROM BOOSTER DISCRETION FOR ION• EVASIVE OMPLISHED BY S/C•						
\				'4. COMMAND ' S-IVB S	NON-PROPULSIVE									
			B. S/C SEPARATION TO EVASIVE BURN INITIATE (TB8 INITIATE).			1. CREW DISCRETI	ON FOR	DOCKING AND LM						
					COMMAND EVASIVE B8 INITIATE) .		VER WIL	L BE ACCOMPLISHED BY						
				'3. COMMAND ' S-IVB S	NON-PROPULSIVE									
			C. AFTER EVASIVE BURN INITIATE (TB8 INITIATE).	FUNCTIO LOX DUM ENGINE CONTINU ONBOARD		NONE								
)			RULE NUMBERS 3-23 THRO 3-29 ARE RESERVED.	UGH										
)							generateur sweeten som senso							
			MISSION	REV DATE	SECTION	GROUP	PAGE	•						
			APOLLO 13	A 3/23/70	MISSION RULE SUMMARY	TD+E	3-5	Y .						

MISSION RULES SECTION 3 MISSION RULE SUMMARY

REV	ITEM	0									
		' TRANSLUNAR COAST '									
	3-30										
					LOI ABORT MODES						
		I II 1-	TIME 0=1+45 +45=2+50 +50=5+57	_	ELTA VM 0-750 750-1245 245-2815	DPS 2 EXECU	HR DIRECT ABORT -IMPULSE CIRCUMLUNAR ABORT TE TEI (SPS OR DPS) AT OPPORTUNITY OR ALTERNATE				
				ERS ARE MCC							
-		B. CONTROL									
		0-1+45 1+45-3+50 3+50-C/0	•	0-750 750-1700 1700-2815	TIGHT LOOSE						
					NOTE						
			I F	F ANY BALL PREMATURELY, IF THRU IF THRU	G THE TIGHT LIMITS VALVE FAILS TO OPER SHUTDOWN GOOD BANK STING CEASES—ABORT STING CONTINUES—REI NKS AND CONTINUE LO	C AND ENABLE	,				
		RULES 3-31 1 3-37 ARE RES									
PARTICIPATION OF THE PARTICIPA											
			MISSION	REV DATE	SECTION	GROUP	PAGE				
			APOLLO 13	B 4/9/70		TRANSLUNAR					

		SECTION 3 MISSION RULE SUMMARY								
REV	ITEM .									
		' LUNAR ORBIT '								
	3=38	PRIOR TO UNDOCKING, CSM MANEUVERS WILL BE SCHEDULED ASAP TO CORRECT THE FOLLOWING SITUATIONS								
		A. MISS DISTANCE OVER THE LLS GREATER THAN 0.5 DEG OUT OF PLANE.								
		B. DEVIATION IN APPROACH AZIMUTH GREATER THAN +/- 2 DEG. FROM THE NOMINAL.								
		C. CURRENT PERICYNTHION ALTITUDE LESS THAN 30,000 FT.								
		D. PREDICTED ALTITUDE AT PDI IGNITION LESS THAN 30,000 FT. OR GREATER THAN 70,000 FT. (PREDICTIONS WILL BE BIASED USING EXPECTED/CALCULATED WORST CASE PROPOGATION ERRORS).								
		NOTE								
		WHEN POSSIBLE ANY REQUIRED MANEUVERS(S) WOULD BE SCHEDULED SHORTLY AFTER CREW WAKE-UP ON PDI DAY.								
	3-39	DOI RESIDUALS								
		A. TRIM PGNS X-AXIS TO WITHIN +/- 1 FPS.								
		1. IF A DOI OVERBURN RESULTS IN A RESIDUAL GREATER THAN 2.2 FPS, BUT LESS THAN 10 FPS, PITCH 180 DEGREES AND TRIM TO 1 FPS USING +X SM-RCS THRUSTERS.								
		2. RESIDUALS GREATER THAN 10 FPS WILL BE TRIMMED USING SPS.								
		B. IF EITHER THE PNGS OR EMS HAS OBVIOUSLY MALFUNCTIONED, THE RESIDUALS INDICATED BY THE REMAINING SYSTEM WILL BE TRIMMED AND MCC WILL RELAY A STAY/NO STAY DECISION BASED ON MSIDATA ANALYSIS.								
	3-40	AT AOS AFTER DOI: THE REQUIREMENT FOR THE BAILOUT MANEUVER WILL BE DETERMINED BY EVALUATION THE THREE TRAJECTORY MONITORING SOURCES. THESE SOURCES - PGNS, EMS, AND MSFN - WILL BE EXAMIN WITH THE FOLLOWING CRITERIA A. IF MSFN RADAR DATA IS VALID AND REASONABLE, A STAY VOTE FROM MSFN IS REQUIRED TO REMAIN THE LOW OPPLIT.								
		THE LOW ORBIT. B. IF MSFN RADAR DATA IS INVALID OR UNAVAILABLE, THE FOLLOWING CRITERIA APPLIES								
		1. IF THE PGNS AND EMS ARE AVAILABLE, BOTH SOURCES MUST INDICATE STAY TO REMAIN IN THE LOW ORBIT.								
		2. IF ONLY THE PGNS IS AVAILABLE, IT MUST INDICATE STAY TO REMAIN IN THE LOW ORBIT.								
١		3. IF THE EMS RESIDUAL IS TRIMMED DUE TO CREW OBSERVATION OF A PGNS MALFUNCTION, THE BAIL OUT MANEUVER WILL BE EXECUTED AT THE NOMINAL TIME.								
		NOTE								
		1. THE EMS VOTE IS NO STAY IF THE EMS INDICATES A 6 FPS OVERSPEED AFTER TRIMMING THE PGNS.								
		2. THE MSFN VOTE IS NO STAY IF THE INCOMING RADAR DATA INDICATES A CLOSEST APPROACH ALTITUDE OF EQUAL TO OR LESS THAN 1.0 N. MI. ABOVE THE LUNAR TERRAIN. THIS ALTITUDE CORRESPONDS TO A PERICYNTHION ALTITUDE OF 3.6 N. MI. AND DOPPLER RESIDUALS AT AOS OF -32 CYCLES PER SECOND.								
		AND DOPPLER RESIDUALS AT AOS OF -32 CYCLES PER SECOND.								
		RULE NUMBERS 3-41 THROUGH 3-48 ARE RESERVED.								
		MISSION REV DATE SECTION GROUP PAGE								
	M. S. C.	APOLLO 13 B 4/9/70 MISSION RULE LUNAR ORBIT 3-7								

MISSION RULES SECTION 3 MISSION RULE SUMMARY

		SECTION 3 MISSION RULE SUMMARY
REV	ITEM	
		' POWERED DESCENT PHASE '
	3-49	PDI IGNITION
		THE FLIGHT CREW WILL NOT ATTEMPT TO BACK UP THE PDI ULLAGE MANEUVER. IF THE ULLAGE MANEUVER DOES OCCUR AUTOMATICALLY, THE FLIGHT CREW WILL ATTEMPT TO MANUALLY IGNITE THE DPS ENGINE IF IT DOES NOT IGNITE AUTOMATICALLY. THE MANUAL IGNITION MUST OCCUR BY LGC COMPUTED TIG + 7.5 SEC. PDI MAY BE ATTEMPTED 1 REV LATER, DEPENDING ON AN ANALYSIS OF THE PROBLEM.
	3-50	PDI TO LO GATE
		POWERED DESCENT WILL BE ABORTED FOR THE FOLLOWING
		A. LR DATA IS REQUIRED FOR LANDING - NO LR DATA BY 10 K FT - ABORT.
		1. LR CONVERGENCE (ALTITUDE ONLY) - DATA NOT BEING ACCEPTED OR CONVERGING FOLLOWING LOCKON FOR 60 SECONDS - ABORT.
		2. LR DATA ACCEPTED AND CONVERGED CONTINOUS TO P-64 - CONTINUE MISSION IF LOSS OF LOCK OCCURS IN P-64.
		3. LR DATA ACCEPTED AND CONVERGED WITH SUBSEQUENT DROPOUT - CONTINUE TO P-64.
		(A) LANDING RADAR REGAINED IN P-64.
		(1) DELTA H LESS THAN 1000 FT BETWEEN PGNS AND LR - CONTINUE MISSION.
		(2) DELTA H GREATER THAN 1000 FT BETWEEN PGNS AND LR - ATTEMPT MANUAL LANDING IN AGS.
		(B) LR NOT REGAINED AT P-64 - ABORT.
		4. LATE LR LOCKON WITH DATA BEING INCORPORATED AND CONVERGING - CONTINUE TO P-64.
		(A) DELTA H LESS THAN 1000 FT BETWEEN PGNS AND LR - CONTINUE MISSION.
1		(B) DELTA H GREATER THAN 1000 FT BETWEEN PGNS AND LR - ATTEMPT MANUAL LANDING IN AGS.
		B. PGNS ALTITUDE LESS THAN 22,000 FEET AND PNGS NAVIGATION ERRORS, CONFIRMED BY MSFN OR DOPPLER RESIDUALS, THAT CAUSE THE AGS-PGNS RADIAL VELOCITY DIFFERENCE TO- EXCEED MINUS 10 FPS, PRIOR TO LANDING RADAR ALTITUDE INCORPORATION AND CONVERGENCE (A MINUS VELOCITY DIFFERENCE INDICATES THAT THE AGS TRAJECTORY IS LOWER THAN THE PNGS TRAJECTORY).
		C. PNGS NAVIGATION ERRORS, CONFIRMED BY MSFN OR DOPPLER RESIDUALS, THAT RESULT IN THE FOLLOWING AGS-PNGS VELOCITY DIFFERENCES
		DELTA X DOT (DOWNRANGE) GREATER THAN +/- 30 FPS DELTA Y DOT (CROSSRANGE) GREATER THAN +/- 90 FPS DELTA Z DOT (RADIAL) GREATER THAN +/- 35 FPS
		D. PGNS ALTITUDE LESS THAN 18,000 FEET AND PNGS NAVIGATION ERRORS, CONFIRMED BY DOPPLER BUT NOT BY AGS, CAUSE THE MSFN-PGNS RADIAL VELOCITY DIFFERENCE TO EXCEED MINUS 20 FPS PRIOR TO LANDING RADAR ALTITUDE INCORPORATION AND CONVERGENCE.
		E. PNGS NAVIGATION ERRORS CONFIRMED BY DOPPLER RESIDUALS BUT NOT BY AGS, THAT RESULT IN THE FOLLOWING MSFN-PNGS VELOCITY DIFFERENCES
		DELTA Y DOT (CROSSRANGE) GREATER THAN +/- 200 FPS. DELTA Z DOT (RADIAL) GREATER THAN +/- 35 FPS.
		NOTERULES C AND E ARE INDEPENDENT OF ANY TYPE OF LANDING RADAR UPDATE. FOR RULES B AND C.
		SWITCHOVER TO AGS WILL BE PERFORMED.
		MISSION REV DATE SECTION GROUP PAGE
	November of Control of	APOLLO 13 B 4/9/70 MISSION RULE POWERED DESCENT
		SUMMARY 3-8

MISSION RULES

SECTION 3 MISSION RULE SUMMARY

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	REV	ITEM											
and the state of t		3-51	G. NO LAI H. NO THE I. FAILUE J. FAILUE K. THE FO (CONT: NOTETHE DESCEN LO GATE TO	NDING SITE ROTTLE RECO RE TO ACHIE RE TO ENTER DLLOWING PN INUING). CREW WILL NT IF THE T TD ILL NOT BE CONDITIONS RS 3-52 AND	VISIE VERY VE F1 P64 GS AL BE ACTIME E	BILITY BY BY P63/F FP BY NON WHEN TGG ARMS2 DVISED AN BIASED DF	PRIOR TO THROT P64 PLUS 60 : P64 PROGRAM SW MINAL TIG +31 : P6	SEC. ITCH PLUS 19 SEC. (ABORT CONDS. 20430,206076 DN WILL BE	SEC. AT GTC 21103.0 E GIVEN	DIVERGE 01107,	ENCE). 21204,2130 FERMINATION	OF POWE	ERED
			erno-messoo esta se esta esta esta esta esta esta e	MISSION	REV	DATE	SECTION BILLE	GROUP	DECCE	PAGE		en e	
L	-			APOLLO 13	A	3/23/10	MISSION RULE SUMMARY	POWERED	DESCEN	3-9			

MISSION RULES SECTION 3 MISSION RULE SUMMARY

EV	ITEM	
		' EVA PHASE '
,	3=54	GENERAL
		FOR ANY MALFUNCTION ON A SCIENTIFIC TASK, A MAXIMUM OF 10 MINUTES WILL BE SPENT ON TH CONTINGENCY PROCEDURE BEFORE THE TASK IS ABANDONED WITH THE FOLLOWING EXCEPTIONS
		A. RTG FUELING UP TO 20 MUNUTES WILL BE ALLOWED IN EXERCISING RTG FUELING CONTINGENCY PROCEDURES.
		B. ALSEP PACKAGE 1 TO PACKAGE 2 CABLE CONNECTION UP TO 20 MINUTES WILL BE ALLOWED FOR MAKIN- THE CABLE CONNECTION.
		C. ALSEP ANTENNA UP TO 30 MINUTES WILL BE ALLOWED FOR ANTENNA ERECTION AND ALIGNMENT.
		BEFORE ABANDONMENT OF ALSEP EXPERIMENT LEVELING TASKS, AN ESTIMATE OF THE OUT OF TOLERANCE CONDITION WILL BE RECORDED.
	3-55	ALSEP
		ALSEP DELPOYMENT SITE SELECTION THE ALSEP SHOULD BE DEPLOYED IN A LEVEL AREA AT LEAST 30' FEET WEST OF THE LM, OUT OF THE LM SHADOW AND IN THE LARGEST OPEN AREA AVAILABLE. THE FOLLOWING ARE ALTERNATE DIRECTIONS FOR SITE SELECTIONS IN ORDER OF PRIORITY
		A. EAST
		B. SOUTH
		C. NORTH
	3-56	FOR EVA TERMINATION OR OTHER INTERRUPTIONS
		DURING ALSEP DEPLOYMENT, THE FOLLOWING PREFERRED DEPLOYMENT INTERRUPTION POINTS WILL BE OBSERVED IF PERMITTED BY CREW SAFETY CONSIDERATIONS
		A. ANY POINT PRIOR TO DEFUELING THE FUEL CASK.
		B. AFTER FUELING THE RTG, THE ALSEP SHOULD BE CARRIED TO THE DEPLOYMENT SITE, PACKAGE NO. SHOULD BE EMPLACED, THE SUBPA-LET SHOULD BE REMOVED FROM PACKAGE NO. 2, AND THE RTG CABL SHOULD BE INTERCONNECTED.
		C. DEPLOYMENT MAY BE INTERRUPTED ANY POINT THEREAFTER.
oncidentespecialistical por contractions	3=57	IF ALSEP DEPLOYMENT IS NOT COMPLETED DURING EVA-1 AND THE TASK IS NOT ABANDONED. THE DEPLOYMEN WILL BE COMPLETED DURING EVA-2.
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A SERVICE STATE OF THE SERVICE		APOLLO 13 A · 3/23/70 MISSION RULE EVA PHASE SUMMARY 3-10

MISSION RULES

SECTION 3 MISSION RULE SUMMARY

ACTUATION, AND TRANSHITER '10N'II UNTIL THE CENTRAL STATION AND EXPERIMENTS HAVE BEEN JET-OVER OR ATTEMPTS TO DESILY AN EXPERIMENTS. 3-60 IF A MARD OBJECT IS ENCOUNTERED WHICH REDUCES DRILL RATE TO LESS THAN I SECTION IN 9 MINUTES THE FIRST HE PROBE HOLE OR I SECTION IN 10 MINUTES OR THE SECOND HOLE. THE FOLLOWING ACCOMPLISHED: 4. IF THER FIRST SECTION IS NOT ATTACHED, MITHORAN AND STATA I DIFFERENT LOCATION. 5. IF THIRD STEM IS ATTACHED. CONTINUE FOR 5 MINUTES IF ON FIRST HOLE OR AS LONG AS POSSIB ON SECOND HOLE, BUT NOT SO LONG AS TO PRECLUDE ATTEMPTING TO OBTAIN A CORE SAMPLE. 3-61 TRAVERSE SCIENCE A TOTAL OF 270 PAYLOAD POUNDS IS CONSIDERED AVAILABLE FOR METURN OF SCIENTIFIC SAMPLES AND CONTAINERS. 3-62 THE RELATIVE PRIORITIES OF RETURNABLE SCIENTIFIC SAMPLES AND THEIR PRIMARY AND SECONDARY PACKI CONTINGENCY SAMPLE SELECTED SAMPLE SAMPLE SELECTED SAMPLES (EVA-1) SELECTED SAMPLES (EVA-1) DUMA ENVIRONMENT SAMPLE SELECTED SAMPLES (EVA-1) SELECTED SAMPLES (EVA-1) SELECTED SAMPLES (EVA-1) SELECTED SAMPLES (EVEN-1)			SECTION 3 MISSION RULE SUMMARY								
RESIDENCE FIRST AND EPRORTS WILL BE TERMINATED SHOULD PROBLEMS ARISE. THE SOME HOLES MAY RESIDED AFTER THE CORE STEM NOLD HAS BEEN COMPLETED ALTHOUGH THIS IS A NUM-STANDARD OPERATION WITH LIMITED CHANCE OF SUCCESS. THE ALSEP WILL NOT BE ACTIVATED (RTG SHORTING SWITCH ACTUATION, ASTRONAUT SWITCH NO. ACTUATION, AND TRANSMITTER "TON") UNTIL THE CENTRAL STATEDH AND EMPERIMENTS HAVE SEEN CENTRAL GENERAL STATION AND OTHER EXPERIMENT PROBES WILL NOT BE A CONSTRAINT TO TURN ON THE ALS THE FIRST HEE PROBE HOLE OR I SECTION IN 10 MINUTES ON THE SECOND HOLE THE FIRST HEE PROBE HOLE OR I SECTION IN 10 MINUTES ON THE SECOND HOLE THE FIRST HEE PROBE HOLE OR I SECTION IN 10 MINUTES ON THE SECOND HOLE BUT NOT SO LONG AS TO PRECLUDE ATTEMPTING TO OBTAIN A CORE SAMPLE. 3-62 THE RELATIVE PRIORITIES OF RETURNABLE SCIENTIFIC SAMPLES AND THEIR PRIMARY AND SECONDARY PACKI CONTINENCE SAMPLE DRIVE ONE THESE STATES ATTRACHED. SECTION SECONDARY CONTINENCE SAMPLE DRIVE ONE THESE SAMPLE SCIENCE SAMPLE SECONDARY CONTINENCE SAMPLE SAMPLE SECONDARY CONTINENCE SAMPLE SCIENCE SAMPLE SECONDARY CONTINENCE SAMPLE SCIENCE SAMPLE SECONDARY CONTINENCE SAMPLE CO	REV	ITEM									
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			DRILL STEM SAMPLE SELECTED SAMPLES (EVA-1) DRIVE CORE TUBES (3) LUNAR ENVIRONMENT SAMPLE SRC-2 DOCUMENTED SAMPLES (2 WEIGH BAGS) GAS ANALYSIS SAMPLE MAGNETIC SHIELD SAMPLE SINGLE LARGE ROCK TOTE BAG 2 ETB-2 SINGLE LARGE ROCK TOTE BAG 2 ETB-2 SOIL SAMPLE (15 LBS) TOTE BAG 2 ETB-2 SIEB-2 SOIL SAMPLE (10 WEIGH BAG) SIEVE SAMPLE (IN WEIGH BAG) STB-2 X SOLAR WIND COMPOSITION FOIL ETB-2 X								
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SUMMARY 3-11		***************************************	APOLLO 13 A 3/23/70 MISSION RULE EVA PHASE								

MISSION RULES SECTION 3 MISSION RULE SUMMARY

-	Dichielar, and	Quidant many	SECTION	3 MISSION RULE S	JMMARY	ecocomical and the				
R	Eν	ITEM								
-										
-	1	3-63	FOR THE LUNAR SURFACE CLOSE—UP PHO	TOGRAPHY EXPERIME	NT, THE FOLLOW!	ING SPEC	IFIC TYPES OF FEATURES			
ARE OF INTEREST										
GLASSY FEATURES										
			ROCK-SOIL JUNCTION (UPHILL AND DOW							
	UNDISTURBED SURFACE (LEVEL AND SLOPING)									
Name of the last	SURFACE PATTERNS									
			ROCK SURFACE							
			SMALL CRATERS HOWEVER, NO FORMAL EFFORT WILL BE	MADE TO VERIEV CO	VERAGE OF EACH	OF THE	ABOVE TYPES OF FEATURES			
			BEFORE ABANDONMENT OF THE LUNAR SL			OF THE	ABOVE TIPES OF PERIORES			
		3-64	CAMERA FRAME COUNTS WILL BE OBT INTERVALS) TO ENABLE ACCURATE CORF							
		3=65	LUNAR SURFACE OPERATIONS							
			IN ESTABLISHING THE OPERATIONAL EV AS BASELINES AND MODIFIED AS NECES OPERATIONS AND TIMELINE CONSTRAINT	SARY TO ACCOMMOD	ATE THE ACTUA	L LAND	ING POINT , RADIUS OF			
	25	3-66	THE OPERATIONAL EVA PLAN WILL BE C RADIUS OF 1.75 KM. EXTENSIONS, DE CREW COMFORT, TO A MAXIMUM OF APPR POINTS WILL BE AFTER ALSEP DEPLOYM (EVA 2).	TERMINED DURING TOXIMATELY 5 HOURS	HE EVA BASED OF	CONSUM.	ABLES USAGE RATES AND PROBABLE EXTENSION			
T. Xramen Santon Co.		3-67	THE CREW WILL HAVE PRIME RESPONSIE	ILITY FOR						
			A. SELECTION OF SAMPLES TO BE CO	LLECTED.						
			B. DECISIONS TO DEPART FROM THE	OPERATIONAL EVA P	AN TO INVEST	TIGATE	UNEXPECTED OR UNUSUAL			
			FEATURES. C. ON THE SPOT DETERMINATION OF	DEST TRAVERSE DAT	TO PROVIDE MO	0011177	FASE.			
			D. ON THE SPOT DETERMINATION OF							
	Total second		E. SELECTION OF A SUITABLE LOCAT				EST.			
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-			MISSION REV DATE	SECTION	GROUP	PAGE	NECONOCIONALE PARTICIPATORI E REGISTA CARRESTE SE SECURIORISMONTO POR PRESENTA POR PROPERTO PARTICIPATO PARTICIPAT			
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DE:	175				32011011	3 MISSION RULE S		THE RESIDENCE OF THE PERSON NAMED IN COLUMN 1			
REV	ITEM										
	3-68					ERATIONAL EVA PLA OR GROUND INITIAT		ED. THE	FOLLOWING CONDITIONS		
		A. UNEXPE	CTED FEATU	RES O	F SIGNIF	ICANT SCIENTIFIC	INTEREST REPORT	ED BY T	HE CREW.		
		B. CONSUM EVA.	MABLES CONS	UMPTI	ON RATES	OR OTHER CONDITI	ONS NECESSITATE	CURTAI	LMENT OR TERMINATION OF		
	C. CONSUMABLES CONSUMPTION RATES PERMIT EXTENSION OF EVA.										
	3-69	ONE-MAN EV CONSTRAINTS				FOR COMPLETION	OF THE FULLO	WING A	CTIVITIES WITHIN TIME		
		A. ABORTE	D EVA TERM	INATI	ON TASKS	•					
		B. CONTIN	GENCY SAMP	LE CO	LLECTION	•					
		C. ALSEP	DEPLOYMENT	•							
		D. OBTAIN	ING DRILL	CORE	STEM SAM	PLE.					
		E. COLLEC	TING SELEC	TED S	AMPLES.						
1	3-70	FOR ONE-MAN	EVA'S THE	RADI	US OF OP	ERATIONS WILL BE	LIMITED TO 1000	FEET.			
	3-71	THE COLOR T	V CAMERA W	ILL N	OT BE PO	INTED WITHIN 45 D	EGREES OF THE S	UN WITH	OUT THE LENS CAP IN		
1	3=72	THE GROUND VIDICON TUB	WILL MONITO	OR TH	E TV PIC FLECTIVE	TURE AND RECOMMEN OBJECTS BASED ON	D CAMERA MOVEM THE FOLLOWING	ENT TO LIMITAT	PREVENT IRREVERSIBLE		
		A. HIGH R	EFLECTIVIT	Y/CON	TRAST	15 MINUTES					
		B. LOW RE	FLECTIVITY.	/CONT	RAST	30 MINUTES					
	3-73	BETWEEN EVA POSSIBILITY	'S THE TV (OF FREEZI	CAMER NG AN	A WILL B	E LOCATED IN THE EMPT TO CURE VIDI	SUN CAPPED AND CON BURNS.	OPERA	TING TO MINIMIZE THE		
•	3-74	THE TV OPER DIRECTION O	ATION DURI	NG TH VERS	E TRAVER ES SUN A	SE PORTION OF EVA NGLE IN ORDER TO	⇒2 WILL BE DETE AVOID SEVERE VI	RMINED DICON T	IN REAL TIME BASED UPON UBE BURN.		
	3-75	IF THE THER REQUEST THE				AMERA OPERATING T	IME IN THE MESA	ARE VI	OLATED, THE GROUND WILL		
	3-76	THE TV CAME	RA WILL NO	T BE	MOVED WI	THOUT THE LENS CA	P INSTALLED.				
Company	3-77	BE MADE TO	ELIMINATE	THE O	BJECT FI	RST BY REPOSITION	ING THE CAMERA	AND SE	F VIEW AN ATTEMPT WILL COND BY CHANGING THE BE LEFT IN THE PEAK		
		3-78 THROUG ARE RESERVED									
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					SECTION	3 MISSION RULE S	SUMMARY			
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						ASCENT 1				
						100 CD 400 CD 400 AN AN AN AN AND AND STO				
	3-80	ASCENT								
		A. GUIDAN	CE SWITCHO	VER T	O AGS WI	LL BE PERFORMED F	OR			
		1 e 2	THE FOL 1204,21302			ALARMS20105,0	00214, 20430	,20607,	21103,01	1107,
		2 • P	GNS NAVIGA ESULT IN A	TION NY OF	ERRORS, THE FOL	DURING ASCENT C	OR FOLLOWING	DESCENT	ABORT,	THAT
		(A) AGS PR	EDICT	ED HP AT	INSERTION LESS T	HAN 40,000 FT			
		(B) AGS PR	EDICT	ED HA AT	INSERTION GREATE	R THAN TARGET	VALUE PL	JS 40 NAL	TICAL MILES.
		(C) AGS PR	EDICT	ED INSER	TION WEDGE ANGLES	GREATER THAN	1.0 DEG.		
			ONFIRMED P ELOCITY DI			N ERRORS THAT RES	OLT IN THE	FOLLOWING	G MSFN	PNGS
				1.	DELTA VY	GREATER THAN +/= GREATER THAN +/= GREATER THAN +/=	90 FPS			
		B. THE GR	OUND WILL	NOT RI	EQUEST S	WITCHOVER AFTER A	GS TGO LESS T	HAN 30 SEC	CONDS.	
		C. DURING	ASCENT, T	HE AG	S WILL B	E DECLARED NO-GO	IF CONFIRMED	AGS NAV	GATION	ERRORS RESULT
		1. P	GNS PREDIC	TED I	NSERTION	HP LESS THAN 30	000 FT.			
		2. P	GNS PREDIC	TED I	NSERTION	HA GREATER THAN	TARGET VALUE	PLUS 40 NA	1 •	
		3. P	GNS PREDIC	TED I	NSERTION	WEDGE ANGLE GREA	TER THAN 1.0	DEGREE.		
		RULE NUMBER	S 3-81 THR	OUGH						
		3-83 ARE RE								
									Machine Machine Gale (New York)	
			MISSION	REV	DATE	SECTION	GROUP	PAGE	PULLSON ENGINEERING CONTRACTOR	
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\	para termenina		SECTION 3 MISSION RULE SUMMARY
	REV	ITEM	
		3-84	THE FOLLOWING GUIDELINES WILL APPLY TO LM MANEUVERS
			1. TRIMMING.
			A. DESCENT ABORTS/ASCENT - REAL TIME CALLOUT.
			B. ALL RENDEZVOUS MANEUVERS WILL BE NULLED.
			C. DOCKED DPS MANEUVERS WILL NOT BE TRIMMED.
			2. ALTERNATE MISSION DOCKED DPS MANEUVERS WILL BE COMPLETED VIA AGS TAKEOVER FOR VIOLATION OF THE FOLLOWING LIMITS
			A. ATTITUDE RATES - 10 DEG./SEC.
			B. ATTITUDE ERRORS - 10 DEG.
			C. ATTITUDE EXCURSIONS - 10 DEG.
		TO THE PROPERTY OF THE PROPERT	3. ALTERNATE MISSION DOCKED DPS MANEUVERS WILL BE TERMINATED AFTER VIOLATION OF THESE OVERBURN CRITERIA
			A. DPS LOI - 10 SEC AND DELTA V AGS GREATER THAN 10 FPS.
			B. DPS TEI - 10 SEC AND DELTA V AGS GREATER THAN 2 FPS.
			C. DPS LOI ABORTS - 10 SEC AND DELTA V AGS GREATER THAN 2 FPS.
			NOTE A CMC DELTA V OF 2 FPS (OVERSPEED) AND 10 SEC OVERBURN IS ALSO A VALID CUE FOR SHUTDOWN.
		3-85	THE FOLLOWING TABLE, INCLUDING NOTES AND REFERENCES, SUMMARIZES THE TAKEOVER, RESTART, SHUTDOWN, TRIMMING REQUIREMENTS, AND SPS ENGINE LIMITS FOR ALL SPS MANEUVERS. RULE NUMBERS 3-86 THROUGH 3-89 ARE RESERVED.
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MISSION RULES

SECTION 3 MISSION RULE SUMMARY

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	ENG	INE LIMITS		ERRORS FOR	MANUAL	OVERBURN	EARLY C/O	RCS
MANEUVER	INHI- BIT	TERMINATE	TAKE- OVER	ACTION	START	SHUTDOWN CRITERIA	RESTART CRITERIA	TRIM GUIDELINES
MODE III	NONE	ERRATIC ENG	5/5	COMPLETE	START	g	Hp > 40	N/A
MODE IV	NONE	ERRATIC ENG	5/5	COMPLETE	START	g	H_p < 100 IF G&N GO Δ VTG > 60 OR C/O > 6 SEC EARLY	N/A
APOGEE KICK	NONE	ERRATIC ENG	5/5	COMPLETE	START	g	$H_{\rm D}$ < 100 IF G&N GO Δ VTG > 60 OR C/O > 6 SEC EARLY	N/A
TLC MCC	TIGHT	TIGHT	10/10	TERMINATE	DELAY	1 SEC	NO	$X = 0.2^{a b}$
LOI	TIGHT				START			NO
a.MODE I		TIGHT	10/10	COMPLETE			YES	
b.MODE II		LOOSE	10/10	COMPLETE			YES	
c.MODE IIIA		LOOSE	10/10	COMPLETE			YES	
d.MODE IIIB		TIGHT	10/10	COMPLETE		10 SEC	VGO > 50 AND G&N GO	
DOI	TIGHT	TIGHT	10/10	TERMINATE	DELAY	1 SEC	NO ,	X = 1.0
CIRC	TIGHT	TIGHT	10/10	TERMINATE	DELAY	1 SEC	NO	X = 1.0 Y = 0.2
RESCUE	LOOSE	LOOSE	10/10	COMPLETE	START	1 SEC	ΔVTOGO > 12	ALL = 0.2
LOPC	TIGHT	TIGHT	10/10	TERMINATE	DELAY	1 SEC	NO	NO
TEI (G&N)	NONE	NONE	10/10	COMPLETE	DELAY	$_{\Delta V_{C}}^{2 \text{ SEC AND}} = -40^{\circ}$	$C/O > 3$ SEC EARLY AND $\Delta V_C > 50$ c	X AND Z = 0.2
TEI (SCS)	NONE	NONE	10/10	COMPLETE	START	2 SEC	ΔV _C > 50 OR C/O > 3 SEC EARLY	NO
TEC MCC								
a.CORRIDOR	LOOSE	LOOSE	10/10	COMPLETE	DELAY	1 SEC AND ΔV _C = 0	NO	X = 0.2
b.IP CONTRL	TIGHT	TIGHT	10/10	TERMINATE	DELAY	1 SEC AND $\Delta V_C = 0$	NO	X AND Z = 0.2
TLC ABORT	TIGHT	LOOSE	10/10	COMPLETE	START	10 SEC AND $\Delta V_C = -70$	C/O > 10 SEC EARLY AND ΔV _C > 70	NO
EARTH DEORB	LOOSE d	LOOSE	10/10	COMPLETE	START	1 SEC AND $\Delta V_{C} = 0$	ΔV TOGO > 30 AND C/O > 3 SEC EARLY	ALL = 0.2

TIGHT LIMITS: Fuel/Ox $\Delta P > 20$ and low P; either prop tank press < 160 psi and low P_c; any ball valve fails to open or closes prematurely; P < 80 or decays 10 psi: inhibit burn for any leak in He or prop tank. O GN₂A(B) 400 psi: certain burns may be allowed with He tank leak if blowdown ΔV exceeds remaining mission requirements. f

LOOSE LIMITS: $P_c < 70$ psi and other cues; either prop tank < 115 psi and low P_c ; erratic engine (popping, vibration, etc.)^f

NOTES: a. MCC4: Trim X to 1.0 fps

- b. Trim all MCC only if $X \le 2$ fps
- c. See Rule 5-131
- d. Both prop tank pressures > 140; one GN₂ tank press ≥ 400 if SM-RCS deorbit is available.
- e. See Rule 5-27
- Some limits may be downgraded if warranted by mission circumstance.
- g. See Rule 5-3

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NO REQUIREMENT

LEGEND:

REV B 4/9/70	NG ORBIT	RESTART/TLI TERMINATE			TLI TERM DURING BURN	04+											-26 OR + 36 PSID (ANY TIME) SEP TO 7000 FT MINIMUM			
	EARTH PARKING ORBIT	RESTART/TLI INHIBIT			DURING TB6 TO TB6 + 9 MIN 20 SEC							INHIBIT TLI DURING TB5 AND TB6		INHIBIT RESTART	INHIBIT RESTART		-26 0R + 36 PSID (ANY TI	SEP > 1800 PSIA	FOR LOX LEAD >20 SEC - INHIBIT	BEFORE TB6 + 9M 10S (AUX PUMP 0P)
SATURN LAUNCH VEHICLE GO/NO-GO CRITERIA	*	GUIDANCE TAKEOVER			ATTEMPT S/C CONTROL TB5 AND TB7 TO TB7 + 15 MIN	LAUNCH, EPO TLI														
SATURN LAUNCH VEH		S-II/S-IVB EARLY STAGE		NO	NO		FROM S-IVB TO COI TILL TB3 + 4 MIN 40 SEC	AFTER S-IVB TO COI	AFTER S-IVB TO COI AND BEFORE S-II C/O MINUS 30 SEC								SEP TO 7000 FT MINIMUM			
	LAUNCH	ABORT/SEPARATION		PRIOR TO TBI + 2:00 - ABORT	ABORT (LAUNCH)			ABORT	PRIOR TO S-IVB TO COI - ABORT	BEFORE TB3 + 66 SEC - ABORT	PRIOR TO EPO - SEPARATE	INHIBIT START	SEP FOR LOX PRESS OF 50 PSIA			SEP TO 7000 FT MINIMUM	-26 OR + 36 PSID (ANY TIME)	SEP > 1800 PSIA		NO START
FCD 12-69.25.11A	GO/NO-GO ITEM	CONDITION	TSHOULD SO I ST-S		U LOSS OF ATTITUDE CONTROL	INERTIAL ATTITUDE REFERENCE FAIL	S-II LOSS OF THRUST (2 ENG).	LOSS OF THRUST (3 OR MORE ENG) ABORT IF PRIOR TO S-IVB TO COI	ACTUATOR HARDOVER INBOARD	2ND PLANE SEPARATION FAIL	S-IVB LOSS OF THRUST	LOSS OF HYDRAULIC FLUID PRIOR TO START	COLD HE FAIL OPEN	INSUFFICIENT PROPELLANT	LOX VLV FAILS TO CLOSE AT 1ST C/0	DESTRUCT SYSTEM ARMS INADVERTANTLY	FU/OX BULKHEAD AP EXCEEDS LIMITS	START BOTTLE PRESS OUTSIDE RESTART LIMITS	LOX CHILLDOWN FAIL	S-IVB ACTUATOR HARDOVER

SATURN LAUNCH VEHICLE GO/NO-GO CRITERIA

CSM EECOM GO CRITERIA

FCD 5-69.25.4B

MANIF 02 LEAKS PRIMARY (1) CABIN INTEGRITY --NO FOR SIN CAB-4-6-ALL-6-PRIMARY LUNAR ORBIT (POST RNDZ) -SUIT CIRCUIT -BAT RELAY BUS. -NO GLY LEAK--ALL-6 10F2 1 OF 3 -NO HUMID -POT -1 OF 2 --20F3-—B0TH— -BOTH-- BOTH --BOTH-- BOTH -- BOTH-0F 2 (5) PAST T3 & SUBS 1 OF 2 (5) 9 LUNAR STAY 1 OF 2 PAST 1 OF 2 1 OF 3 PDI TO T/D POWERED (2) 9 (S) 100 PDI 0 \Diamond 62 -(1)-PRIMARY -(1). -- NO EXCESSIVE CABIN HUMIDITY -CIRC -PRIMARY --NO FIRE OR SMOKE IN CABIN-9 -CABIN INTEGRITY NO GLYCOL LEAK -SUIT CIRCUIT --6- ALL -6-2 OF 4 (8) AND (0)-Air-(0) -1 OF 2--BOTH -- BOTH --BOTH --NO 02 MANIFOLD LEAKS--2 OF 3-BOTH -BOTH--BOTH CONT L.O./DOI -BOTH ----1 OF 2-NFR/LOI -BOTH -9 OF 12 *(4)NOPACTA 191 RELAY + 1 OF → BOTH A-BAT CONT (a) TD & E <-(7)-CABIN INTEGRITY→ ↑(x)-1 OF 2 → BOTH ③ BOTH -NO LEAK - NO HUMID ★(7*) + SUIT CIRCUIT → ↑ 10F3 → BOTH ВОТН A4NOT ACT (4) ★(7*)-1,0F 2 → BOTH MH HDOTH → BOTH 1 -NO F OR S IN CABIN-ALL ALL RELAY BUS ←— B0TH — -BOTH--- BOTH --2 OF 3-←—B0TH— EARTH ORBIT OF 2 5 1 OF 25 CONT E.O. 1 OF 2 1 OF 2 2 OF 3 2 OF 3 POT 1 OF 2 CONT 0R +-1 OF 2 0F 2(9) OF 3(9) 1 OF 2 S NO FIRE OR SMOKE IN CABIN NO EXCESS CAB HUMIDITY NO 02 MANIFOLD LEAKS MAIN 02 REGULATORS SEQUENTIAL SYSTEMS ECS COOLANT LOOPS SMJC NOT ACTIVATED ECS GLYCOL EVAPS SUIT COMPRESSORS POTABLE H20 TANK ENTRY BATTERIES CABIN INTEGRITY NO GLYCOL LEAK WASTE H20 TANK BAT RELAY BUSES DOCKING LATCHES AC ФA (1 AND 2) ECS RADIATORS SUIT INTEGRITY BATTERY BUSES SUIT CIRCUIT GN2 BOTTLES OVBD DUMPS FUEL CELLS MAIN BUSES INVERTERS O2 TANKS H2 TANKS AC BUSES DOCKING CRYO EPS

1 BASED ON AMOUNT OF WATER AVAILABLE, CONSIDERATION WILL BE GIVEN TO CONTINUING THE MISSION WITH SECONDARY RADIATORS AND PRIMARY

LM DESCENT STAGE WILL BE RETAINED FOR TEI IF CONDITION NOT MET

IF ONE MAIN REG HAS FAILED OPEN AND THE OTHER IS FUNCTIONING NORMALLY, TLI WILL BE PERFORMED NO REQUIREMENT IF SOURCE OF ACTIVATION CAN BE ISOLATED MUST HAVE EITHER PRIMARY OR SECONDARY SYSTEM COMPOSED OF

FUNCTIONING LOOP AND CORRESPONDING RADIATORS

6 BASED ON FAILURE MODE, CONSIDERATION WILL BE GIVEN TO CONTINUING 7 MUST HAVE CABIN INTEGRITY OR VIABLE SUIT LOOP. ITEMS MARKED BY * ARE REQUIRED TO MAINTAIN VIABLE SUIT LOOP

8 BASED ON FAILURE MODE, CONSIDERATION WILL BE GIVEN TO UNDOCKING WITH ONE GN_2 BOTTLE REMAINING IN AN OPERABLE SYSTEM

9 MODE I AND II ONLY; 0 THEREAFTER

LEGEND:

NO REQUIREMENTS

Figure F	FCD 5-69.25.3C						CSM GNC G	CSM GNC GO CRITERIA								REV A 3/23/70
COM	09-0N/09	ij	ARTH ORBI	Т.				LUNAF (BEFORE U)	R ORBIT NDOCKING)	UNDOCK	CIRC	POWERED (ESCENT	LUNAR	STAY	LUNAR ORBIT (P RNDZ)
No. 64 All A	ITEM	CONT	CONT	TLI	TD&E		1	CONT	CONT L.0./DOI			PDI	PDI TO TD	PAST T1	PAST T3	CONT L. 0,
10 10 10 10 10 10 10 10	GNCS/SCS							4								
Color Colo	RBIT CAPABILITY		METHOD METHOD													
	O ATTITUDE CONTROL		\ \ \		-3-AXIS-		1		+	3-AX	-SI				2-AXIS	3-AXIS
	E DAMPING		*		-3-AXIS-		1		+	3-AX	SI	1			2-AXIS	3-AXIS
10F2	ECT RCS		1		-3-AXIS-		1		-	3-AX	IS -	1			2-AXIS	3-AXIS
10F2	iGS P, Y		1 0F	2			1 OF 2		Y	1 OF	2	A			←—10F	- 2-
CMC	Yes K			1 OF			1 OF 2	and the second								1 OF 2
10F2			104				1 OF 2			1 OF	2	1				1 OF 2
Cond			+	-THC	1					THC						
SS SS SS SS SS SS SS S			\ \ \	-10F2-	A		1 OF 2		+	1 OF	2	1				1 OF 2
10F2																
1 OF 2 BOTH BOTH PEFFR				CMC			CMC		+	CMC		1			WCW CM	0
10F2 BOTH REFR CO-DAC				ISS			ISS		1	SSIISS					186	
10F 2 BOTH REFER C				0.85			0.55			30	SS OR VHF	1				
10F2 BOTH REFR	ICS DAC			0-DAC			0-DAC		-	-0-DA	1 0				0-0	- CA
10F2 BOTH REPR	OLENOID DR GND							-								
10F2	SERVO LOOP		90	ВОТН			ВОТН	BEEED		BOTI		1			BOT	1
Color Colo	,			1 OF 2			1 OF 2	TO MR	1	1 0F	2		Ī		100	1
Color Colo	SPS							3-30								
Total Both	X TANK (W/O LEAK)		← FU/C	XC XC			FU/0X			FU OX T	ANK	1			/OX TNK >	160
10F2 B0TH	TANK (W/O LEAK)		₩ ₩ ₩	THE HE			ВОТН					Î			- ROI	
F	. VALVE BANK			ВОТН			ВОТН			B0TF	#	1			A BOT	
F	OLINE TEMP > 40° F		4<	00			>40。			>40		1			4<	00
F	IX AP < 20 PSI	1	<<	00			-			<20		1			*<2(TA I
STO WAR STO	VGE TEMP < 480° F		<480°	N/A						< 480						
HETNK	70 PSI		>70	N/A			>70			>70						
HETNK B 50F 4 ALL ALL ALL ALL ALL ALL ALL AL	AGE CAPABILITY			ВОТН			10F2		+	1 OF	2	1				
30F4 ALL	ANK (W/O LEAK)			HE TNK			ME TNK		1	↑ HE TI	NX — X					
3 0F 4 ALL ALL ALL 3 0F 4	SM RCS							-								
10F 2	ANK (W/O LEAK)		3 OF 4	ALL			ALL	-	3 OF 4	←——ALL		€3 OF 4>			3 OF	4
3 0F 4 ALL	EAK BELOW ISO VLV		3 OF 4	Г	1	4-4	ALL		3 OF 4	M-ALL		£3 0F 4≯			3 OF	4
ATTITUDE CONTROL AND ALL ROI 3 0F 4 P, T	TEMP > 55°		3 OF 4	ALL	4-3 OF	4-4	ALL		3 OF 4	ALL		-3 OF 4>			3 05	1
10F 2	STERS		1	3 OF 4 PY	0		3 OF 4P.Y	-11	4 0 HO 7	10	Р. У.	0 10		80	S OF 4 P, Y	E
# 10F 2	CM RCS		1	D 01			N 0 10 0		0 0	ALL		N O TO			6 0F 8 R	9
ATITIUDE CONTROL AND ATITUDE CONTROL AND ATITIUDE CONTROL AND ATITUDE CONTROL AND AT	ANK (W/O LEAK)	1 0F 2			- BOTH -					1 0F	2				1 05 2	ROTH
ATITIUDE CONTROL AND ATITIUDE CONTROL AND ATITIUDE CONTROL AND Description of the control and the control a	FOLD (W/O LEAK)	10F 2			-BOTH-		1			105	1				2 10 1	DOTE
S 3-AXIS ATTITUDE CONTROL AND ATTION SALS (ONE LATERAL AXIS DEGRADE).	ARMED			2	OT ARMED		1								7 10 7	NOT
LEGEND;								****								ARMED
LEGEND;								-\- →								T
	REQUIRES 3-AXIS ATTITUDE CO	NTROL AND									LEGEND		LI CHO ON	TINIANDA		
	TRANSLATION 3-AXIS (ONE LAT MAY BE DEGRADED)	ERAL AXIS									LEGENU		NO KEKO	REMENI		

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	ta	
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+	, a	
1		
)	

ITEM												02
	UNDOCKING	CIRC	PDI	PDI T0 PDI +5+30	PDI +5+30 TO HI GATE	HI GATE TO LO GATE	LO GATE TO TD	STAY W/0 EVA	2 MAN EVA	1 MAN EVA	LM ACT RNDZ CSI/CDH TPI/TPF	DOCKING
GNC												
1. GUID PGNS STEER AGS											PGNS	
2.3-AXIS PGNS RATE CMD ATT OR PGNS AUTO CONT						(O)	1				→ PGNS	
AGS RATE CMD (1)			B0 TH							1	W. J. S.	_
3. 3-AXIS TRANS	A AXIS		AUTO +X								←—1 AXIS ——	★3 AXIS→
4. FDAI-ATT/RATES/ERR				-CREW OPTION-			1					
6. VHF RNG/CSM OPTICS	ONE	ONE										
7. RR		1										
8. AUI												
10. DPS AUTO ON												
11. REDNT APS ON ⑤				1					100	1		
12. P&R GDA TRIM				NO IMPIN	-NO IMPINGEMENT CONSTRAINTS	USTRAINTS	1					
13. MAN THTL (1 TTAC)	Ţ				À	CREW OPT-	OPT -					
14. AUTO THTL				À								
DPS												
1. FU OR OX INLET/		>30/>30	\uparrow									
2. AP OX AND FU	1	NA FIL/OX < 50 L	1		>150/>160- <25	>160	1					
3, PROP TEMP > 50° < 90°			1									
4. PROP ∆T < 10° F			1									
5. PROP QTY >LOW LEVEL/2%												
SILITY	•		-<37% PQGS-		1							
7. FU/0X PQGS AQ < 13% (4)				V			1					
8. 30% EROSION EXCEEDED							1					
								150 \	← >150 LB 0X EACH TANK →	ANK		
APS												
1. NO PROP/HE LEAKS 1. AND REDUNDANT PRESS PATHS							 	IMMI —	- IMMEDIATE LIFTOFF	OFF -		
2. FU/OX INLET PRESS >62 & <220	\prod									^	TO TON SUP	Γ
3. FU/OX AP (EITHER HIGH) < 90											FOR RNDZ	3
4, PROP IEMP > 50° & < 90°										1		
9, PROP AT < 10° F									Ï	1		
RCS												
1. RCS LEAKS	NO HE	-NO HE/PROP LEAKS -	1	MARN-EABY 1851	5 WEENE			ON	-NO PROP LEAKS-	S		
2. FU/OX MANIF PRESS > 100	+				A AND B-	0 B					A OR B-	
3. PROP TEMP (>40°F <100°F)	*				——————————————————————————————————————	D B					A OR B-	1
4. 3-AXIS ATT CONTROL	¥	REDUNDANT-	1					-3-AXIS				
5. 3-AXIS TRANSLATION	3-AXIS-	IS S	×+								←— 1-AXIS ——	★3-AXIS
6. NO IMPINGEMENT LIMITS EXCEEDED				SECOND SE			1					
7. NO PAIR ISOLATED									100			10年 10日

NO REQUIREMENT

LEGEND:

FCD 5-69.25.5B

COMMUNICATIONS/INSTRUMENTATION GO CRITERIA

REV A

		FARTH	FARTH ORBIT		SE		LU LU	LUNAR ORBIT		IINDOGKING	CIRC		POWFRED DESCENT	TN		LINAR STAV	-		3/23/70 LUNAR
	09-0N/09				2		(BEF0)	(BEFORE UNDOCKING)	KING)									LM ACTIVE	PO
	ITEM	CONT	CONT E.O.	TLI	TD&E	CONT	107	CONT	CONT L.O./DOI	NOMINAL		PDI	PDI TO PDI+5 PDI +5 L0 GA1	TO LO GATE TE TO T/D	STAY W/0 EVA	2-MAN EVA	1-MAN EVA	PDI 10 PDI+5 TO LO GATE STAY 2-MAN 1-MAN CSI/CDH TPI/TPF PDI +5 LO GATE TO T/D W/O EVA EVA EVA	CONT L.O.
	USB 2-WAY VOICE COMM		•	CSM			CSM		OR LM	OR LM CSM & LM	CSM	CSM ANE	CSMAND (2)-LM-(2)	1	SSM NSSW NSSW	SW SSW SSW SW	SM 3		
	VHF COMM LM/CSM								i C	SIMPLEX OR DUPLEX		454							
	VHF COMM LM/EVA									•						SIMP DUPLEX	OUPLEX		
	VHF COMM EVA/EVA												-44.1.1			DUPLEX			-
	MSFN/EVA VOICE											- conce				EITHER CREWMAN	EWMAN		
	CRITICAL INSTRUMENTATION		SO —	— csw —			CSM		CSM	LM & CSM	CSM		LM-	Î	1 - LN	A AND CSM	1	← LM AND CSM → ← LM — →	-
3-22	LM TELEMETRY									LBR OR HBR		↑ LBR	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Å	▲LBR OR HBR	HBR-			
	CSM TELEMETRY		♣ HBR OF	HRR OR I BR		HRR O	HRR OR I BR		-	HBR OR I BR					H	HBR OR I BP	Í		

NO REQUIREMENT

LEGEND:

U VHF IS ACCEPTABLE
 CSM RELAY TO LM IS ACCEPTABLE
 LM RELAY TO CSM IS ACCEPTABLE
 ADEQUATE DATA TO MAKE FINAL GO/NO GO
 TO CONTINUE POWERED DESCENT

(5) CSM COMM IS REQUIRED FOR DOI

FCD 2-69.25.2A

EMU GO CRITERIA

1-MAN 2 0 2 EVA OF. 9F 1 OF OF. 0F 1 OF LUNAR STAY (2) -EMU-REV A 3/23/70 2-MAN EVA N CI 2 2 2 N 2 OF 2 OF 2 OF 2 OF 2 OF 2 OF _0 GATE STAY TO T/D W/0 EVA LO GATE PDI+5 +30 T0 L0 GATE POWERED DESCENT PDI T0 PDI+5 +30 PDI CIRC UNDOCKING CRITICAL INSTRUMENTATION PLSS 02 PRESSURE REG(S) EMU PRESSURE INTEGRITY PRIMARY 02 SUPPLY(S) GO/NO-GO LCG/LTL COOLING PLSS BATTERY(S) PLSS FAN(S)

NOMINALLY BOTH OPS'S SOURCE PRESSURES WILL BE CHECKED OUT PRIOR TO UNDOCKING - SHOULD ONE OPS SOURCE PRESSURE FAIL TO MEET THE OPS GO/NO-GO CRITERIA AS DEFINED IN RULE 3-103, A CHECK OF POS PRESSURE WILL BE MADE ON A PLSS TO FULFILL THE RQMT FOR TWO LIFE-SUPPORT UNITS

SUFFICIENT PLSS AND/OR OPS CONSUMABLES WILL BE RETAINED AT LM LIFTOFF TO SUPPORT A 30 MINUTE CEVA (7)

LEGEND:

NO REQUIREMENT

2

OF. OF.

p-1

90 N

N N

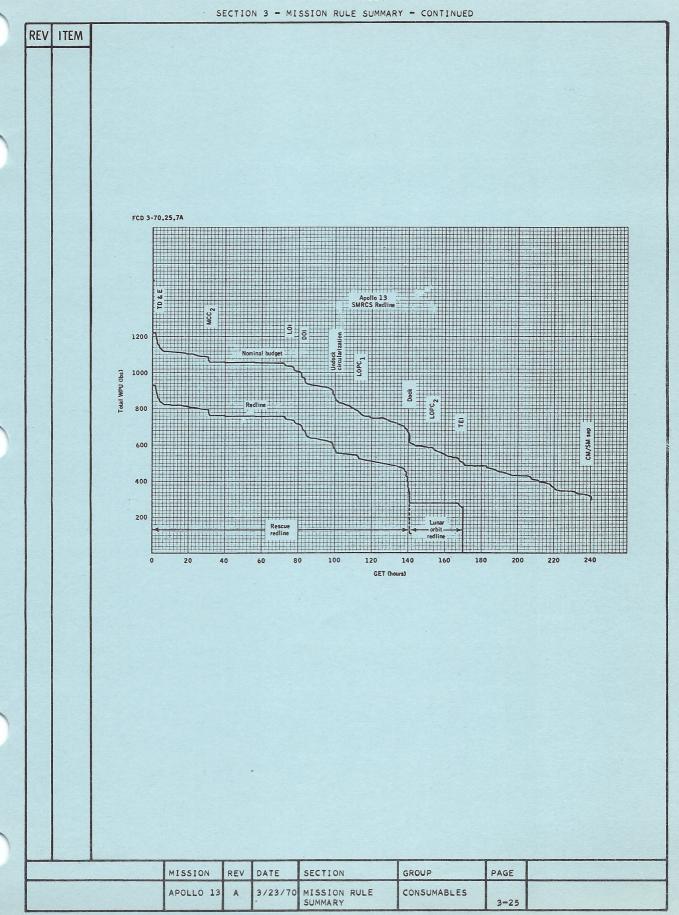
2 OF

OPS PRESSURE REG(S)

OPS 02 BOTTLE(S)

MISSION RULES

			SECTION 3 - MISSION RULE SUMMARY - CONTINUED
)	REV	ITEM	
			' CONSUMABLES '
		3-90	SPS
			A. AFTER TD&E AND THE FIRST DOCKED SPS MCC. THE DELTA V REQUIRED TO CONTINUE WITH A LUNAR MISSION IS 5500 FPS (CSM UNDOCKED CAPABILITY).
			B. THE DELTA V REQUIRED FOR LOI GO IS LOI (FUNCTION OF LAUNCH DAY AND LAUNCH AZ) +2960 FPS (TEI AND TEC MCC'S).
			C. THE DELTA V REQUIRED FOR GO FOR UNDOCKING IS 3825 FPS. THIS DELTA V INCLUDES
			700 FPS, LM RESCUE
			75 FPS, CIRC
			90 FPS, LOPCI
			2800 FPS, TEI (APPROXIMATELY 79 HR RETURN)
			160 FPS, 3 SIGMA MCC BASED ON SCS CONTROLLED TEI
			3825 FPS
		3-91	CM DCC
		3271	A. THE CSM RESCUE REDLINE INCLUDES
			(1) NOMINAL USAGE FROM LAUNCH TO CSM CIRCULARIZATION BURN.
			(2) ATTITUDE HOLD FROM CIRCULARIZATION BURN TO LM LIFTOFF (INCLUDED IN THIS
			PERIOD IS LOPC 1 ULLAGE AND DAMPING).
			(3) RESCUE ALLOWANCE INCLUDING NOMINAL RENDEZVOUS BUDGET, THREE 10-SECOND 4-JET ULLAGES, AND CSM ACTIVE BRAKING.
			(4) TWO REVS ATTITUDE HOLD PLUS TEI (ULLAGE AND DAMPING).
			(5) 7 FPS MCC (1 SIGMA G&N TEI CUTOFF).
			(6) PTC ALLOWANCE.
			(7) NOMINAL USAGE FROM MCC 7 TO CM/SM SEP. THE REDLINE DOES NOT INCLUDE CSM SOLO EXPERIMENTS, BOOTSTRAP PHOTOGRAPHY, OR P23'S IN TEC. THE
			CSM RESCUE REDLINE AT EARTH LAUNCH IS 930 LB.
			B. VIOLATION OF THE LUNAR ORBIT REDLINE WILL RESULT IN TERMINATION OF LUNAR ORBIT ACTIVITIES. THE LO REDLINE INCLUDES
			222 LB 2 REVS LO, TEI ULLAGE AND DAMPING, NOMINAL TEC BUDGET
			57 LB 20 FPS MCC (3 SIGMA G&N TEI CUTOFF)
			RULE NUMBERS 3-92
			AND 3-93 ARE RESERVED.
		<i>y</i> ,	MISSION REV DATE SECTION GROUP PAGE
			APOLLO 13 A 3/23/70 MISSION RULE CONSUMABLES SUMMARY 3-24
	The same of the same of	-	



MISSION RULES

	processor and the same of the		S	ECTION 3	- MISSION	RULE SUMMAR	Y - CONTINUED		
REV	ITEM								
	3-94	CSM BATTERY THE FOLLOWI PHASES.					T BE AVAILAB	LE TO	INITIATE THE SPECIFIC
		1	1	LAUNCH		UNDOCK	PC-1	PC-2	
		BATT AMP-HOUR	3 BATT	89.5 1		62.7 2	62.7 3	59.2	
			G! 2 BATT!		144.4	39.8	39.8	38.8	
			ENT TANK)		1		50.0	1 37.8	:
			ENT !	89.1	1 164 • 1	1 56.5	51.9	1 38	
		2 · A 3 · E (OT ALLOW POWER DOWN LLOWS NOMI NERGY REQU A) PRELAU ACCOMP B) THE TW TO PRO REDLIN BATTER TIME. C) IF RES POWERI D) CRYOGE CAPABI CRYO T.	RE-LOI G OF ECS R NAL LUNA IRED TO NCH BATT LISHING O BATTER VIDE CAP ES ARE B Y CHARGE CUE IS R NG DOWN NIC REDL LITY TO I ANK AT P	TO PERFORM IMBAL DRIV ADIATOR HE R STAY, BU PERFORM PC ERY REDLINES ABILITY FO ASED ON LO R WITH A T EQUIRED, TO A TWO-B INES ARE B RETURN TO C-2 (WORST	E CHECK OR B ATERS OVERLO T PRECLUDES -1 AND PC-2 ES ARE BASED NG. REFLECT THE R A SAFE RET SS OF THE HI WO-BATTERY E HE THREE-BAT ATTERY G&N E ASED ON CA	PC-1 AND PC-2 E ON FAILURE OF ENERGY REQUIRE URN FROM ANY GHEST BATTERY NTRY (WITH GGN) TERY ENERGY REC NTRY. PABILITY TO F 40 AMP AVERAGE	PREPS A BURNS. THE BA ED IN THE POINT SUBSEQUE AND 12 BUIREMENT PERFORM	REDLINE DOES AND REQUIRES THERY CHARGER BEFORE TWO LOWEST BATTERIES IN THE MISSION. THE HENT TO LOSS OF THE HOURS OF POSTLANDING S WILL BE RECOVERED BY NOMINAL MISSION WITH EVEL AFTER LOSS OF ONE
		RULES 3-95	AND 3-90 A	KE RESEK	VEDe				
			MISSION	REV DA			GROUP	PAGE	
,			APOLLO 13	A 3/2	23/70 MISS SUMM		CONSUMABLES	3-26	

MISSION RULES

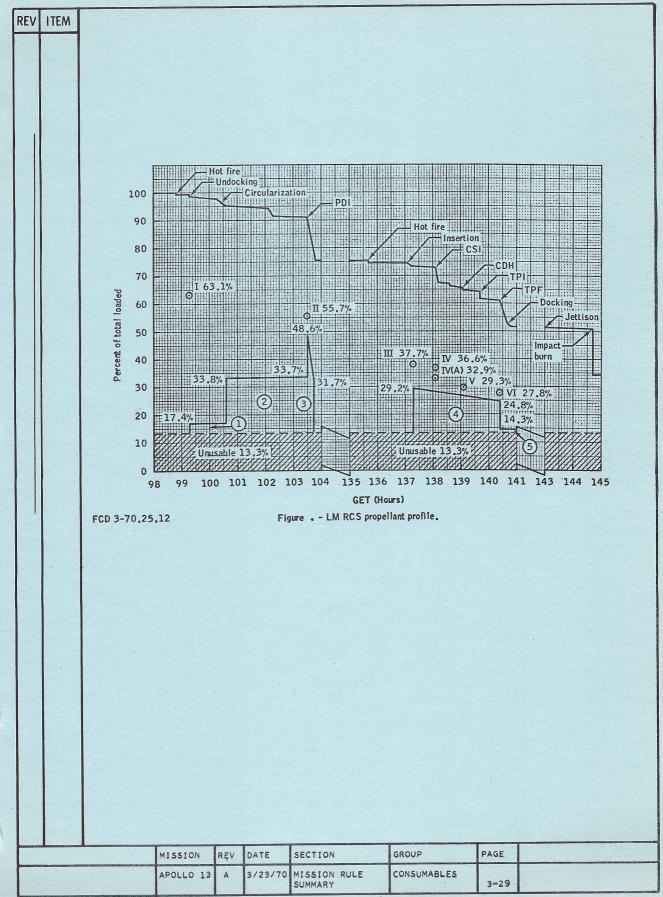
		SECTION 3 - MISSION RULE SUMMARY - CONTINUED
REV	ITEM	
	3=97	LM-RCS PROPELLANT GO/NO-GO'S AND REDLINES
	0-91	A. ASSUMPTIONS
		1. TOTAL LOADED 633 LBS EQUAL 100 PERCENT
		UNUSABLE
		TRAPPED PROPELLANT 7.3 PERCENT
		GROUND GAGING UNCERTAINTY 6.0 PERCENT
		TOTAL UNUSABLE 13.3 PERCENT 2. OPS RESERVE
		(A) PRIOR TO TPF - ONE REV LOS TRACKING OF CSM (STAGED) EQUAL 2.5 PERCENT
		(B) AFTER TPF - CSM ACTIVE DOCKING EQUAL 1.00 PERCENT
		B. GO/NO-GO'S
		1. UNDOCKING/SEPARATION
America		PROPELLANT REQUIRED FOR UNDOCKING, DESCENT, ASCENT AND RENDEZVOUS PLUS OPS RESERVE.
,		2. PDI
		PROPELLANT REQUIRED FOR DESCENT, ASCENT AND RENDEZVOUS PLUS OPS RESERVE.
		3. IMMEDIATELY AFTER ASCENT
		PROPELLANT REQUIRED FOR NOMINAL LM ACTIVE RNDZ PLUS OPS RESERVE.
		4. CSI
		PROPELLANT REQUIRED FOR REMAINDER OF RNDZ PLUS OPS RESERVE.
		5。 CDH
		PROPELLANT REQUIRED FOR REMAINDER OF RNDZ PLUS OPS RESERVE.
		6. TPI
		PROPELLANT REQUIRED FOR REMAINDER OF RENDZVOUS PLUS OPS RESERVE.
		MISSION REV DATE SECTION GROUP PAGE
		APOLLO 13 A 3/23/70 MISSION RULE CONSUMABLES
		SUMMARY 3-27

MISSION RULES

		-	een swaren een een een ee	SE	CTION	3 - MIS	SION RULE SUMMA	RY - CONTINUED	our de misse au seul de la company de la com	NATIONAL STREET, STREE	necessaries de designation de la constantion de
REV	ITEM										
	3-97										
	CONT.										
		C.	REDLIN	ES							
				NDOCKING TO							
						ED FOR N	NOMINAL DOCKING	PLUS OPS RESERVE			
				ROPELLANT R		ED FOR L	OS IN LONGEST A	BORT RNDZ WITH D	PS AT	TACHED UNTIL	
			J	UST BEFORE	TPF (P-20 MA	(IMUM DEADBAND),	STAGING, BRAKING	, DOCK	ING PLUS OPS	
			3. P	DI TO TOUCH	HOOWN						
			P (ROPELLANT R	REQUIR	RED FOR (DESCENT, NON ASC BRAKING, DOCKIN	ENT, LONGEST LO G PLUS OPS RESERV	S FOR	CSM RESCUE	
	J		4. I	NSERTION TO	TPF						
			P	ROPELLANT R	REQUIR	RED FOR I	OS TO TPF, BRAK	ING. DOCKING. PLUIL TPF.	JS OPS F	RESERVE. NOTE	
			5. T	PF TO DOCK	ING						
			F	ROPELLANT F	REQUIF	RED FOR	OPS RESERVE.				
			E NUMBER		.O., E.B.						
		THR	OUGH 3-1	01 ARE RESE	RVED						
,											
	Teach and the second se										
				MISSION	REV	DATE	SECTION	GROUP	PAGE	,	arramental
				APOLLO 13			MISSION RULE	CONSUMABLES		Control of	
							SUMMARY		3-28		-

MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED



		MISSION RULES
		SECTION 3 - MISSION RULE SUMMARY - CONTINUED
REV	ITEM	
	3-102	LM EPS, ECS
		THE LM EPS AND ECS MINIMUM CONSUMABLE REQUIREMENTS ARE DEFINED AS FOLLOWS
		A. FROM UNDOCKING TO TOUCHDOWN, THE MINIMUM REQUIREMENTS ARE BASED ON THE TIME TO COMPLETE A LANDING, A 24.5-HR STAY, WITH 1 EVA, ASCENT AND A NOMINAL RENDEZVOUS THROUGH CREW TRANSFER (4.5 HOURS), A TWO HOUR ORBITAL CONTINGENCY AND REDUNDANT ASCENT EPS SOURCES FOR THE RENDEZVOUS.
		THE TIME TO COMPLETE A LANDING AND THE 24.5-HR LUNAR STAY MAY BE SUPPORTED BY ANY
		TANK AND ONE ASCENT 02 TANK (THE LM CABIN IS CONSIDERED A REDUNDANT 02 SOURCE) MUST CONTAIN THE CONSUMABLES REQUIRED FOR LIFTOFF AND NOMINAL RENDEZVOUS THROUGH CREW TRANSFER. THE TWO-HOUR ORBITAL CONTINGENCY: INSOFAR AS ASCENT 02: AND ELECTRICAL POWER ARE CONCERNED: IS CONSIDERED TO BE SATISFIED BY THE REDUNDANCY REQUIREMENT: SHOULD TWO ASCENT H20 TANKS BE AVAILABLE: THE REQUIREMENT FOR LIFTOFF THROUGH CREW TRANSFER CAPABILITY IN EACH TANK WILL SATISFY THE TWO-HOUR ORBITAL CONTINGENCY: IF ONLY ONE TANK IS AVAILABLE: IT MUST ALSO INCLUDE THE TWO-HOUR CONTINGENCY:
		B. FOR THE REMAINDER OF THE LUNAR STAY; THE MINIMUM DESCENT STAGE REQUIREMENTS ARE BASED ON THOSE CONSUMABLES REQUIRED FOR THE SCHEDULED ACTIVITIES DURING EACH DEFINED PHASE; AN ASCENT PREPARATION AND A TWO-HOUR SURFACE RESERVE. THE LAST FOUR HOURS OF THIS REQUIREMENT FOR EPS MUST BE SPLIT-BUS OPERATION. ASCENT STAGE MINIMUM REQUIREMENTS ARE AS STATED ABOVE.
		C FOR THE PENDEZVOUS. THE MINIMUM REQUIREMENTS ARE THOSE CONSUMABLES NECESSARY TO SUPPORT A
		LM-ACTIVE RENDEZVOUS THROUGH CREW TRANSFER. SHOULD THESE MINIMUM REQUIREMENTS BE VIOLATED, THE LM WILL BE POWERED DOWN WHILE THE CSM BECOMES THE ACTIVE VEHICLE. HOWEVER, THE LM WILL BE POWERED UP TO PERFORM BRAKING SUFFICIENT CONSUMABLES BEING RETAINED FOR THIS PURPOSE.
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		MISSION REV DATE SECTION GROUP PAGE
	1	APOLLO 13 A 3/23/70 MISSION RULE CONSUMABLES 3-30
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	3-102 CONT.										
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MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED

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	3-103	EMU											
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MISSION RULES

SECTION 3 - MISSION RULE SUMMARY - CONTINUED

	REV	ITEM										
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MISSION RULES

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		and the second	LM VOIC	E REQUIRED	TILL T WIL	LO GATE	THERE ARE NO COMMINATED.	SM COMMUNICATION	NS SYSTEM	S FAILURES FO	OR WHI
		D.		TAY ADDITI							
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		AND AND SERVICE OF THE PERSON		TWEEN BOTH			OMM BETWEEN MSFN	AND LM OR EVA	PLUS DU	PLEX VOICE	
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	20-2	VUE	EVA COMM	iuni cations	DRIO	DITIES A) R F m m m				
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			1 a PR	IMFFVA-	1 AR/	EVA-2 AF	R (RELAY MODE-ALL	OWS DUPLEX VOIC	E BETWEEN	EVA'S PLUS	
		rincoraecasion.	TH	E TRANSMIS	SION	OF VOICE	E AND DATA FROM B	OTH EVA'S TO LM	, PLUS TH	E RECEPTION	
		- And Commission of the Commis	CC FR	MBINATION ROM BOTH TH	ALLOW	S DUPLE:	OR EVA-1 A/EVA-2 X VOICE BETWEEN E HE LM PLUS THE TR OF LM VOICE BY O	VA'S PLUS THE T ANSMISSION OF D	RANSMISSI	ON OF VOICE	
		в.	ONE-MAN								
	and sharp a management	STATE AND STATE	1. PF	RIMEEVA-	-1A OF	R EVA-2A DATA FROM	(ALLOW DUPLEX VO	ICE BETWEEN EVA	AND THE	LM PLUS THE	
	12 PC - 100						B (ALLOWS DUPLEX	VOICE BETWEEN E	VA AND LA	1)	
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			SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION
	REV	ITEM	
			' MANAGEMENT '
		20-7	VOICE CONFIGURATION
			A. LM/CSM/MSFN
			1. VHF DUPLEX B AND USB WILL BE TRANSMITTED/RECEIVED SIMULTANEOUSLY FOR LAUNCH THRUUGH CYI, REV 1. VHF SIMPLEX A AND USB WILL BE TRANSMITTED/RECEIVED SIMULTANEOUSLY FOR EARTH ORBIT AFTER CYI, REV 1 LOS.
			2. 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 SIMPLEX 296.8 MHZ.
			4. USB IS PRIME VOICE COMM BETWEEN MSFN AND CSM OR LM.
			5. USB/VHF RELAY IS VOICE COMM BACKUP TO USB BETWEEN MSFN AND MALFUNCTIONED S/C.
			6. 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. THE PRIME CSM/LM COMMUNICATIONS MODE DURING THE LUNAR ORBIT PHASE IS VHF. THE PRIME VHF MODE IS VHF A SIMPLEX UNLESS THIS MODE IS PRECLUDED BY THE USE OF VHF RANGING. DURING LUNAR STAY PHASE THE PRIME CSM/LM MODE IS MSFN RELAY WITH EACH S/C MONITORING THE VHF A FREQUENCY.
			8. THE CSM AND LM WILL TRANSMIT SIMULTANEOUSLY ON VHF AND USB DURING ALL LM POWERED UP PHASES IN LUNAR ORBIT.
			9. IN THE EVENT OF A COMPLETE LOSS OF CSM S-BAND COMMUNICATIONS WITH MSFN: THE LM WILL BE CONFIGURED FOR LM TWO-WAY RELAY AND RETAINED FOR TEI AND TEC.
			B. LM/CSM/EVA/MSFN
			1. LM TWO-WAY RELAY WITH TWO-MAN EVA IS THE PRIME MODE PLANNED FOR EVA OPERATION. CSMUSB TRANSMIT/RECEIVE ONLYLM TRANSMIT VHF A. RECEIVE VHF A AND B. MSFN CONFIGURED FOR USB RELAY.
		20-8	CSM VHF/USB MANAGEMENT
		20-8	A. FOR CREW REST PERIODS, CSM S-BAND ANTENNAS WILL BE SELECTED BY GROUND COMMANDS.
			B. NORMAL CUNTROL OF THE S-BAND MODES WILL BE BY GROUND COMMAND. CSM CUMMUNICATIONS SWITCH POSITION WILL REFLECT OUT-OF-SITE CONTACT CONFIGURATION.
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			COMM-MNG. 20-2

			SEC.	TION :	20 - COM	MUNICATIONS AND I	NSTRUMENTATION			
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	20-9					LE ANTENNA TEMPER	ATURE SHOULD BE	MAINTA	INED BETWEEN -6	5 DEG. F
	21-10	APOLLO COLO A. THE CO IN PLA B. THE G IKREVE LIMITA 1. H 2. L C. BLIWEE POSSIB D. THE TV DIRECT E. IF THE GROUND F. THE TV G. WHEN A ATTEMPA BY CHA	R TELEVISION OF THE MALL REQUIRED TO METERS OF THE METERS	ERA W L MODICON TIVITY E TV REEZII DURII VERSE ONSTR. EST TI LL NO JAADE ZOOM	NITOR T TUBE Y/CONTRAS CAMERA M NG, AND NG THE E VERSUS AINTS ON HE CAMER T BE MOV WITH A TO ELIMI SETTING.	AGEMENT BE POINTED WITHIN HE TV PICTURE BURNS FROM REFL ST 15 MINUTE T 30 MINUTE UST BE LOCATED IN TO ATTEMPT TO CUR VA-2 TRAVERSE WILL SUN ANGLE IN ORDE THE TV CAMERA OP A BE TURNED OFF. ED WITHOUT THE LE CONTRASTING DARK NATE THE OBJECT, IF THIS CAN NOT	AND RECOMMEND ECTIVE OBJECTS S THE SUN CAPPED E VIDICON BURNS L BE DETERMINE R TO AVOID SEVE ERATING TIME IN INS CAP INSTALLE BACKGROUND IS FIRST BY REPOSI	CAMERA BASED AND OP D IN RE VIDI THE ME IN TH	MOVEMENT TO ON THE FO	PREVENT DLLOWING MIZE THE ED UPON ED, THE IEW, AN SECOND
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MISSION RULES

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	20-13	LOSS OF TWO-WAY VHF	DOCKED		TINUE 30 FOR SEP MNVR		REF LM VOICE C			, LOSS	F VH
		SPACECRAFT	UNDOCKED	DOC							
	SA DETROCKED TO A SECOND		PRE-PDI	CON	TINUE MISSION		REF CSM OF VHF			COMM 5 -	- LOS
			POWERED DESCENT	CON	TINUE MISSION						
			LUNAR STAY	CON.	TINUE MISSION						
				0			NOTE	MSFN RE	LAY MAY	BE UTILI	ZED
	20-14	LOSS OF TWO-WAY	6 0 0	0			REF CSM CSM VOI			768 - 1	.oss 0
		A. CSM ONLY	LAUNCH	* A - 1	CONTINUE MISSION	N					
			'EARTH 'ORBIT	2	ENTER NEXT BLOCK	K DATA					
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		B. LM ONLY	DOCKED	Bel	CONTINUE MISSION			M MAL P	ROC COM	1==	
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			6 6	0	B.LO GATE TO TOU CONTINUE MISSI						
			LUNAR	5	• LM LIFTOFF NEXT OPPORTUNITY•	ASCENT					
	20-15	LOSS OF TWO CSM AUDIO CENTERS	EPO		TINUE MISSION GO FOR TLI	9 0					
			ALL	CON	TINUE MISSION-NO	GO !					
	20=16	LOSS OF VOICE FROM	DUAL	CON	TINUE MISSION	8	EVA-1 H	IAS EVC-	1 EVA-2	HAS EVC	-2
		EVA-2 TO EVA-1	EVA	EVA	-2 GO TO POSITION	118111					
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MISSION RULES

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	20-17	LOSS OF VOICEVA-1 TO EVA	CE FROM	DUAL	CON	TINUE MISSION EVA-2 GO TO POSIT	ION		
	20=18	LOSS OF DUPL BETWEEN EVA- EVA-2	-1 AND		0 0	MINATE EVA	0 0 0 0 0 0		
	20-19	LOSS OF TWO- VOICE BETWEE AND EVA	EN MSFN		110	EVA-2 GO TO POSITE EVA-1 GO TO POSITION ''B''	10N 0		
				9 0 0 0 0 0 0 0 0 0 0	† † † 3 o	IF UNABLE TO RE-ESTABLISH COMM EVA-2 RETURN TO U RECONFIGURE COMM IF ABLE TO RE-ESTABLISH COMM CONTINUE EVA.	M AND 6		
	20-20	VOICE BETWEE	EN MSFN AND EVA	EVA (ONE-MA	(N) 10 10 10 10 10 10	RMINATE EVA RECONFIGURE LM TO RE-ESTABLISH COMM IF ABLE TO RE-ESTABLISH COMM CONTINUE EVA.	1 a 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		
	20∞21	LOSS OF DUPI BETWEEN LM	AND EVA		*10 *10	RMINATE EVA RECONFIGURE LM AND EVA TO VHF BACKUP MODE。 IF ABLE TO RE—ESTABLISH DUPI COMM® CONTINUE EV			
		RULES 20-22 20-25 ARE R			8 8		8 6 9		
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MISSION RULES SECTION 20 - COMMUNICATIONS AND INSTRUMENTATION

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20=26	A٠	BASELI	NE REGUIRE	MENT	ALL PHA	SES EXCE	PT LAUNCH	r ·					
	Andrew Statement		RITICAL IN EQUIRED TO						IS T	HAT IN	ISTRUMEN'	TATION	
	В.	AUNCH											
		THERE TERMIN	ARE NO CSM ATED.	INST	RUMENTAT	ION FAIL	URES FOR	WHICH TH	E LAU	NCH/INS	ERTION	PHASE	WILL
	C.	POWERE	D DESCENT	ADDITI	ONAL RE	QUIREMEN	TS						
		THERE	ARE NO CSM	INST	SYS FA	ILURES F	OR WHICH	LM POWERE	D DESC	ENT WIL	L BE TER	RMINATE	De
	-												
20=27	THE M	ISSION	WILL BE C	ONTINU	ED WITH	THE LOS	S OF THE-	om a					
	A.	CSM UP	DATA LINK										
	В.	CSM CA	UTION AND	WARNIN	G SYSTE	М							
	C.	SM DS	E										
	Do 1	CSM HI	GH GAIN AN	TENNA									
	E.	CSM FM	DOWNLINK										
	F.	CSM US	B RANGING	(PRN)									
	G.	HF RA	NGING										
No.													
			MISSION	REV	DATE	SECTION		GROUP		PAGE			

MISSION RULES

TV ITEM	I I											
EV ITEN	VI .											
						** as in an an an an an an ** in a						
						MANAGEMENT						
20-3	30 DSE	MANAGEM	IENT									
	A •	GROUND	TELEMETRY	SITES	EXCEPT	DURING PERIO	RECORDED CONT: DDS OF VHF RANG ONCE PER REVOL	GING WH	EN NO LM	TM WIL	L BE REC	
	в.	CM HIG	H BIT RATE	DSE R	ECORDIN	GS WILL BE MA	DE DURING THE	FOLLOW	ING OPER	ATIONS-	e 400 400	
			AUNCH									
	all the same of th	2 · T	LI									
			-IVB/CSM S	EPARAT	ION							
			D&E									
				EUVERS	AND MI	DCOURSE CORRE	CTIONS					
			OCKING AND									
			M/SM SEPAR			RY						
			TO REQUIRE									
		9. L	M FINAL SE	P								
	l c.	DURING	SLEEP PER	IODS								
					NTFNNAC	. DSE BECORD	NG AND DUMPING	e Will	DE MANAG	EN DED		
			BOVE	en		, DOL KLOND	AND DOMESTIC		DE TIAMAG			
-												
	31 CTE MANAGEMENT											
20-3	31 CTE	MANAGEN	IENT									
20-3	31 CTE	CTE WI	LL BE CONF	IGURED	TO CLO	CK IN GET FOR	R FLIGHT, HOWEN	VER, IF	A HOLD	OCCUR	S AFTER	т-
20-3	Α.	CTE WI	LL BE CONF S, CTE WIL	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Τ-
20-3		CTE WI	LL BE CONF S, CTE WIL	L NOT	BE CORR	ECTED UNTIL (R FLIGHT, HOWE COMPLETION OF F ORE BEING UPDA	POWERED	FLIGHT.			Т-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			т-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			т-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Τ
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			т-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Т-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Т-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			τ-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			7-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			7-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Т-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Τ-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Τ-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			7-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Τ-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Т-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			τ-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			T-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED	FLIGHT.			Τ-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S, CTE WIL LL BE ALLO	L NOT	BE CORR	ECTED UNTIL (OMPLETION OF	POWERED TED AFT	FLIGHT.			7-
20-3	A. B. RULE	CTE WI MINUTE CTE WI S 20-32	LL BE CONF S. CTE WIL LL BE ALLO THROUGH ESERVED.	L NOT	BE CORR	SECTION	GROUP	POWERED TED AFT	FLIGHT.			1-

MISSION RULES

REV	ITEM	CONDITION/MALFUNCTION	PHASE	1 RULING	· CUES/NOTE		ito dan dan een dan ega ega een H
				†			
				' SPECIFIC '			
***************************************			1.	an em um no em lim (ib em 191 ins ma 184	I DEE CEM I	MAL PROCEDURE.	
	20-35	LOSS OF CSM IM	1	the CONTINUE MISSION	1	- MSFN REPORTS	1055 0
			1	A. CONTINUE MISSION	! REALTIME	PCM. DSE MAY BE F AVAILABLE.	
			1	B.1. CONTINUE MISSIO 2. ENTER NEXT BEST		VAVIENDEE	
			1	3. NO GO FOR LUNAR	!		
				OPERATIONS	1		
			POWERED DESCENT	4 . CONTINUE MISSIO			
			LUNAR STAY	5 . LM LIFTOFF AT T			
	20-36	LOSS OF CRITICAL	LAUNCH	CONTINUE MISSION			
			1				
			EO	'ENTER NEXT BEST PTP 'NO GO FOR TLI			
		•	TLC	CONTINUE MISSION			
	-			NO GO LOI			
			LO	NO GO FOR LUNAR OPER	ATIONS		
	20=37	LOSS OF ONE CSM PMP POWER SU P PLY	*ALL	CONTINUE MISSION			
	20-38	LOSS OF BOTH CSM POWER AMPLIFIERS	EPO	NO GO FOR TLI			
			ALL	CONTINUE MISSION IF			
			1	1			
	20-39	LOSS OF THE SCE	'EPO	'CONTINUE MISSION 'NO GO FOR TLI			
		·	TLC	CONTINUE MISSION NO GO FOR LOI	1		
			LUNAR ORBIT	CONTINUE MISSION			
			LUNAR STAY	CONTINUE MISSION	1		
		RULES 20-40 THROUGH	1	8	8		
		20-44 ARE RESERVED.		1	1		
			1	f	•		
	SCHOOL STATE OF STATE						
		MISSION	REV DA	ATE SECTION	GROUP F	AGE	CONCOUNT ON CONTRACTOR HANDING TO THE O
can gramov	OF THE PARTY CONTRACTOR	APOLLO 1		12/70 COMM & INSTR	CSM INST -		

MISSION RULES

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REV	ITEM !											
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	20-4	Ao	BASELIN	E REQUIR	EMENT							
CELLULATION CONTRACTOR			On	DUARD UR	1 141 - 1	UKING MS	ON (CRITICAL IN SFN AOS» OR ONB CRITERIA)	STRUMENTATION OARD ONLY DUR	I IS THAT	INSTRUM OS REQ	ENTATION, UIRED TO	
		В.					REQUIREMENTS					
				TELEMETR								
		C.	LUNAR S	TAY ADDI	TIONA	L REQUIF	REMENTS					
			LM LBR AND ATT	OR HBR T EMPT TO	M IS RE-ES	REQUIRED TABLISH	THE LOST COMMUN	A IS LOST DUR NICATIONS LIN	ING THE EV	A, ONE	CREWMAN W	ILL RETU
The Control of the Co	20-46	THE M	ISSION	WILL BE	CONTI	NUED WIT	H THE LOSS OF	[HE===				
				TA LINK								
The second		В• (M CAUT	ION AND	WARNI	NG SYSTE	M					
		Co L	M DSEA									
		D: 6	EVA TEL	EMETRY								
		E. L	M FM D	OWNLINK								
		F. L	M USB	RANGING	(PRN)							
		G. V	HF RANG	GING								
				SERVED.								
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	1											
-												

and the second second												
			М	ISSION	REV	DATE	SECTION	GROUP	PAGE			
		CONTRACTOR			FNL	2/12/70		LM INST -	1, 205			
								GENERAL	20-8			

MISSION RULES

and the same of		The state of the s		-		ONICATIONS AND			The second secon		Mary Constitute Chief
REV	ITEM										
						MANAGEMENT					
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	20-50	LM USB/TM MA	NAGEMENT								
,		USED. D	URING LUNA	R STA	YO IF TH	S» THE LM STEER E ERECTABLE ANT CIRCUIT MARGIN	ENNA IS USED	THE POW	WER AMPLIFIE	R WILL R MAY	BE BE
		B. DURING SWITCHE	PERIODS OF D FROM HBR	LM O	UT-OF-ST BR AND T	ATION CONTACT (LUNAR FAR SIDE), THE T	M BIT RATE	WILL F RANG	BE ING
		SYSTEM MONIT		ITICA	F ADICE	COMMUNICATIONS					
				ODS T	BD CREWM	EN WILL SLEEP V	ITH HEADSETS 1	O MONITOR	FOR MASTER	ALARMS	OR
		GROUND	COMMUNICAT	IONS.		an water out to					
		RULES 20-51 20-54 ARE RE									
											,
orpoins.											an contractions
DISKO:			MISSION	REV	DATE	SECTION	GROUP	PAGE			PRACTICAL
		•	APOLLO 13	FNL	2/12/70	COMM & INST	LM INST - MANAGEMENT	20-9			

MISSION RULES

REV	ITEM	CONDITION/MALFUNCTION			' CUES/NOTES/COMMENTS
			1		
				' SPECIFIC '	
	20-55	LOSS OF LM TM			1 255
	20-55	A. LOSS OF LBR ONLY	1	A. CONTINUE MISSION	REF LM MAL PROC COMM 6
		B. LOSS OF HBR ONLY	•	B.1. CONTINUE MISSION	MSFN REPORTS LOSS OF PCM
			1	1	ADEQUATE DATA TO MAKE FINAL GO/NO G
			;		TO CONTINUE POWERED DESCENT.
1		C. LOSS OF ALL TM	1	C.1. CONTINUE MISSION-	
			ALL	2. RETURN TO VICINITY	Y OF
			POWERED DESCENT	3.(A) PDI TO LO GATE ABORT-DOCK ASAF	
			i i	(B) LO GATE TO TD	
			1	CONTINUE MISSIC	
			LUNAR STAY	4. LM LIFTOFF NEXT LA	AUNCH!
	20=56	LOSS OF CRITICAL	1	1	
		INSTRUMENTION	1	1	
			r	DO NOT UNDOCK	
			UNDOCKED	DOCK ASAP	
		RULES 20-57 THROUGH 20-59 ARE RESERVED.			
			35		
		MISSION	REV DAT	E SECTION GR	ROUP PAGE
		APOLLO 1			I INST -
					PECIFIC 20-10

MISSION RULES

/ ITEM						
			UMENTATUON REC			
20-60	MEAS DESCRIPTION		PCM ONBOAF	RD TRANSDUCERS	CATEGORY	MISSION RULE RE
	UDL VALIDITY SIGNAL	СТО	262V -	-	HD	20-27A
	USB RECEIVER AGC	СТО	620E METER	COMMON	НД	20-27 • 20-7A (9) 20-8B
	USB RECEIVER AGC	ME.1	ER -	-	HD	
	USB RECEIVER ERROR	СТС	604F -	-	нр	
	DSE TAPE MOTION	cto	0012X TB	-	HD	20-27,20-30
	CTE TIME	СТС)145F -	-	НР	20-31
	SCE 10 VDC	СТО	0018V -	•	НО	
	SCE 5 VDC	СТ	0017V -	-	нр	
	SCE 20 VDC	сто	0015V -	-	HD	
	SCE -20 VDC	СТ	0016V -	-	но	
	PCM HI REF 85 PERCENT	CTO)125V -	_	но	
	PCM HI REF 15 PERCENT	CTO	0126V -	-	нD	
		I LM- INST	RUMENTATION RE	QUIREMENTS !		
20-61	MEAS DESCRIPTION		PCM ONBOA	RD TRANSDUCER	S CATEGORY	MISSION RULE RE
	PCM OSC FAIL 2	GL	0422V -	40	1 OF 2	
	PCM OSC FAIL 3	GL	0423V =	en	НД	
	CAL 85 PCT	GL	0401V -	400	НД	
	CAL 15 PCT	GL	0402V -	-	HD	
	MET	GL	0501W		HD	
	CEW PWR FAIL	GL	4054X CAUTI	ON -	НР	
	MASTER ALARM	GL	4069X MASTE	R ALARM -	HD	
	DUA STATUS	GT	0441X -		HD	20-46
	S-BND ST PH ERR	GT	0992B -	600	HD	
	S-BND RCVR SIG	GT	0994V METER	439	HD	20-46
	STEERABLE ANT TEMP	GT	0454 METER	60	HD	20-98:20-50
	XMTR PO	GT	0993	-	НД	20-46,20-55
				COLUMN TO THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER		
	MISSION	REV DATE	SECTION	GROUP	PAGE	
	APOLLO 13	CNI 2/12/70	COMMUNICATION	S PRELAUNCH		

REV	ITEM	M	er en manet kommune van men kan kan skriver van de skriver en ste forste de gregorie de deze bedekte betek
		GENERAL	
£	21-1	TO INITIATE MANNED LM MISSION PHASES, THE PYROTECHNIC SYSTEM MUST PROVIDE THE CAPABILITIES	FOLLOWING MINIMU
		A. DOCKED OPERATIONS	
		ONE OPERATIONAL PYRO SYSTEM	
		B. UNDOCKED/SEPARATION AND SUBSEQUENT PHASES SEE LM TELMU GO/NO GO CRITERIA	- PAGE 3-18.
	21-2		
		A. PYRO BATTERY OPEN CIRCUIT VOLTAGE LESS THAN 35 VDC	
		B. UNABLE TO ARM SYSTEM	
		ONABEL TO ANH STSTEM	
	21-3	A PYRO SYSTEM WILL BE DISABLED IF	
		A. ANY RELAY K2 THROUGH K6 INADVERTENTLY CLOSES (REF MR 21-13)	
		B. ANY RELAY K7 THROUGH K15 INADVERTENTLY CLOSES. SYSTEM WILL BE USED FOR DPS VENTING AND STAGING	APS PRESSURIZATIO
	-	A PYRO SYSTEM IS DISABLED BY OPENING THE APPROPRIATE ''LOGIC POWER'' CIRCUIT	BREAKER
	21-4	THE ASCENT AND DESCENT STAGES ARE CONSIDERED NON-RIGIDLY ATTACHED IF THE GL SEVER THE INTERSTAGE UMBILICALS AND ALL OTHER INTERSTAGE ATTACHMENT POINTS HA	ILLOTINE FAILS VE RELEASED.
			Y IN THE INTERPRETATION OF THE INTERPRETATIO
	21-5	ANY SPECIFIC PYRO MISSION RULE REQUIRING A NEXT BEST OPPORTUNITY LIFTOFF WE TERMINATION OF AN EVA. ADDITIONALLY, SHOULD A PYRO SYSTEM EXHIBIT A K1-K6 RELEVA, ONE CREWMAN WILL RETURN AND ATTEMPT TO CORRECT THE MALFUNCTION.	ILL BE CAUSE FO AY CLOSURE DURIN
		RULE NUMBERS 21-6 THROUGH 21-9 ARE RESERVED.	
Annual Participants			
			5
- 1			
		MISSION REV DATE SECTION GROUP PAGE	

MISSION RULES

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC

		SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC
EV I	TEM	
		MANAGEMENT
2	21-10	APS WILL NOMINALLY BE PRESSURIZED IMMEDIATELY PRIOR TO STAGING. APS WILL NOT NORMALLY PRESSURIZED MORE THAN 24 HOURS PRIOR TO THE LAST APS BURN HOWEVER. IN A CONTINGENCY CASE. TAPS MAY BE PRESSURIZED UP TO 3-1/2 DAYS PRIOR TO THE LAST APS BURN.
2	21-11	IF UNABLE TO DEPLOY ONE OR MORE LANDING GEAR. A LANDING WILL NOT BE ATTEMPTED. DESCENT ENGI BURNS WILL BE CONTINUED SINCE CONTROL PROBLEMS ARE NOT EXPECTED TO EXIST AND DAMAGE TO T LANDING GEAR FROM THE BURN WILL NOT AFFECT ALTERNATE MISSIONS.
2	21=12	UNDOCKED STAGING WITH ONE PYRO SYSTEM WILL BE PERFORMED ONLY IF ABSOLUTELY NECESSARY TO MAINTA
N	21-13	FOR A K1 THROUGH K6 FAILURE, THE GOOD SYSTEM WILL BE DISABLED AND A PYRO FUNCTION, OTHER TH STAGING, ATTEMPTED (WITH THE MASTER ARM SWITCH OFF) TO DETERMINE IF K1 HAS FAILED CLOSED. BOTH SYSTEMS ARE FAILED IN THIS MODE, THEY MUST BOTH BE TESTED FOR A K1 FAILURE INDEPENDENTL A PYRO SYSTEM CANNOT BE DISABLED FOR A K1 FAILURE.
2	21-14	AN ARMED PYRO SYSTEM(S) THAT CANNOT BE DEARMED IS CONSIDERED UNSAFE FOR THE VIBRATION/SHOENVIRONMENT ASSOCIATED WITH LUNAR TOUCHDOWN.
- Anna Carlotte Control of the Contr		RULE NUMBERS 21-15 THROUGH 21-19 ARE RESERVED.
	the second secon	
	and control of the co	
		MISSION REV DATE SECTION GROUP PAGE
entition de la comp		APOLLO 13 FNL 2/12/70 LM SEQUENTIAL AND PYROTECHNIC MANAGEMENT 21-2

MISSION RULES

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC

EV IT	rem !	CONDITION/MALFUNCTION			RULING	! CUES/N	OTES/COMMENTS
Ţ			8	1,		. 1	
No. of the last of					SPECIFIC		
21	1-20	LOSS OF	1	t t		REF	MALF PROC ED
		A. ONE PYRO SYSTEM			1. DELAY STAGING A	s 1 ED	
			IDOCKED		LONG AS POSSIBL 2. CONTINUE MISSION	i CSM	RESCUE MAY BE REQUIRED DUE
			UNDOCKE	1	NO-GO CIRC	i kes ke	DETRES
			PRE-PDI		3. DOCK ASAP NO-GO PDI	•	
			POWERED DESCENT	1	4.(A) PDI TO PDI 4 ABORT (B) PDI + 5+30 T CONTINUE MIS	O TD -	
			LUNAR STAY		5. LIFT OFF AT NEX BEST OPPORTUNIT		
H-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		B. TWO PYRO SYSTEMS	ALL	В.	1. DOCK ASAP	1	
			POWERED DESCENT		2. ABORT	8 8 8 8	
21	1-21	UNABLE TO DISARM PYRO SYSTEM(S)	ALL		TINUE MISSION GO PDI	REF	MALF PROC ED===
			* * * * * * * * * * * * * * * * * * *	PLA BAT THE SYS	UNSTAGED OPERATION CE ONE ASCENT TERY ON BUS POWER! ACTIVE GUIDANCE TEMS.	' RCS RE	RESCUE MAY BE REQUIRED DUE
				STA	GE AS REQUIRED IN	ORBIT	
			POWERED DESCENT	ABO	RT	0	
			LUNAR STAY	1 OPP	T OFF AT NEXT BEST ORTUNITY GO EVA		
The state of the s			1	1 1		9 9	
- PAGONETICAL PAGO			•	•		,	
COMMENS STORY	ON THE PERSON						
		a de la companya de					
	-	MISSION	REV D	ATE	SECTION	GROUP	PAGE
AND DESCRIPTION OF THE PARTY OF		APOLLO 1	3 ENL 2	/12/70	LM SEQUENTIAL	SPECIFIC	A CONTROL OF THE CONT

MISSION RULES SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC

REV	ITEM	CONDITION/MALFUNCTION		22 629 629 629 629 6	RULING		NOTES/COMMENTS
				1			
	21-22					RELAY	s
		MAD THUDAFILIFIE	8	8		K7 -	RCS PRES
			9	0		K8 -	LAND GEAR DEPLAY
			9	9		* K8A -	LAND GEAR DEPLOY
			8 8	9		1 K9 -	DPS CRYO HE PRESS
			1	0		' K10 -	ASC HE TANK 1
			1	•		, K11 -	ASC HE TANK 2
			0 0	† †			ASC FUEL AND OX COMP VALVE
			9 9	1			- ASC FUEL AND OX COMP LVES
			1	,		K13 -	DPS FUEL AND OX VENT
			1	8		* K14 -	DPS AMBIENT HE
			1	1		' K15 -	DPS FUEL AND OX COMP VALVES
			1	1		8	
		A. SYSTEM A	1	1 A .	CONTINUE MISSION	PRESS	B - PRIOR TO DPS CRYO HE THE FAILED SYSTEM WILL BE
			0 0 0	SHE DES	PRESSURIZATION. OPPOPULSION FUEL OXID VENTS THEN	R DPS SUBSE LOSE ACCOM	LED FOR ALL PYRO FUNCTIONS QUENT PYRO FUNCTIONS WILL BI PLISHED USING SYSTEMS A AND B.
			1	8	IC POWER "A" C/	3 6	
		B. SYSTEM B	1	* B »	CONTINUE MISSION	9	
			8 9 5 7	SHE DES FUE	N LOGIC POWER ' C/B UNTIL AFTER PRESSURIZATION OF PROPULSION L AND OXID VENTS N CLOSE LOGIC POWER ' C/B o	CLOSE	
		C. BOTH SYSTEMS	0	ic.	1. CONTINUE MISSI	ON .	
			1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	2. PRIOR TO POSITIONING MA ARM SW TO ''ON CLOSE DES HE R AND 2 AND DES PROPULSION FUE AND OXID VENTS ALSO, THE DESC PROPELLANT ISO SWITCH MUST BE IN THE FIRE PO WHEN THE MASTEL SWITCH IS POSI TO ''ON'' FOR FIRST TIME.	EG 1 ENT VLV HELD SITION R R ARM	
		e de sandre contracte de la co	8		3. OPEN DES HE RE	1 AT 1	
		2	•	1	TIG OF DPS 1 B		
				,			
	8						
		MISSION	REV DA	TC	SECTION	GROUP	PAGE

MISSION RULES

SECTION 21 - LM SEQUENTIAL AND PYROTECHNIC

REV	ITEAA	CONDITION/MALFUN	CTIONS	PHASE	1	9	RULING	9	CUES/NO	TES/COM	MENTS	
	ITEM	CONDITION/MALFUN	CIION.	cp cu (0" cu (00 cu fr		(COM AND					feet the sale sees take ago one sale on one	 Amay active 1987 Milest Active State Active Act
	21=23	UNABLE TO STAGE	0 0 8		9						APPLIES T	O ALTERNAT
		A. ASCENT AND DESCENT STAGES STILL RIGIDLY		NDZ	I A a	1. CONTI	INUE MISSI	ON °	A: CSM TO RCS	RESCUE		ITIATED DU
		TIED TOGETHER	6 6 8		0	MANEL		•			2504225	2524425
		B. INCOMPLETE STAGING, VEHICL NOT RIGID	E !		1		TE CSM RED DRIFTING		B. EVT INABILI	MAY BE TY TO D	OCK.	BECAUSE C
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		RULE NUMBERS 21 THROUGH 21-49 ARE RESERVED			0 0			. 0				
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		MI	SSION	REV D	ATE	SECTIO	N	GROUP		PAGE		

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				60 (in the till time till till	55 W CS 75 G1 TO				
					UNCH INSTRUMENT				
	21-50	MEAS DESCRIPTION	PCM	ON	BOARD		CATEGORY	MISSION F	RULE REFERENCE
		ED RLY A K1-K6	GY 02 01	X SYS A	STAGING LIGHT	COMMON	М	21-1, 2,	3, 13, 20, 21,
						CAUTION LIGHT	HD		
		ED RLY B K1-K6			STAGING LIGHT		M		3, 13, 20, 21,
		ED RLY A K7-K15		X			HD HD	21-1, 3,	
		ED RLY B K7-K15 SELECTED ED BAT		METER			м	21-1, 2,	
		VOLT		METER				/ -/	
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MISSION RULES

						SECTION	22 - LM ELECTRI	CAL POWER			
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							' GENERAL '				
	22-1	TO	INITIAT IMUM CA	E MANNED LM	MIS	SION PHAS	SES, THE ELECTRIC	CAL POWER SYS	TEM MUST	PROVIDE THE	FOLLOWIN
							NOTE				
				LM	ACTIV	VE RENDEZ	ZVOUS/CONTINGENCY	Y RETURN ASSU	MED		
		Α.	DOCKE	D WITH HATC	H OPE	EN AND TU	JNNEL CLEAR				
			1.	CDR OR LMP	BUS						
				TWO DESCENT ASSOCIATED			ITH ASSOCIATED F	EEDER OR ON	E ASCENT	BATTERY WIT	н
				SUFFICIENT PLANNED ACT			CENT OR DESCENT E	ELECTRICAL E	NERGY TO	COMPLETE TH	E
Washington		В٠	DOCKE	D WITH HATC	H CLO	DSED					
			1.	CDR AND LMP	BUSE	ES					
			2 •	TWO DESCENT	BATT	TERIES PL	US ONE ASCENT BA	ATTERY OR BOTH	ASCENT B	ATTERIES.	
				BOTH ASCENT							
			4 0	SUFFICIENT PLANNED ACT	AVAIL	LABLE ASC	CENT OR DESCENT E	ELECTRICAL EN	NERGY TO	COMPLETE TH	E
		c.	UNDOC	KED/SEPARAT	ION A	AND SUBSE	EQUENT PHASES SEE	E LM TELMU GO	NO GO CRI	TERIA - PAGE	3-18
		Constitution constitution described in the constitution of the con									
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	-			NAME AND ADDRESS OF THE OWNER, WHEN		1 22 - LM ELECTRI			CONTROL OF THE PROPERTY OF THE		
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	22=2	DEFINITIONS									
	22-2	LOSS OF CDR		ıc							
	and the same of th				TAITATAI D	HE VOLTAGE CREASE	- TUAN 04 5				
						US VOLTAGE GREAT		oc.			
		LOSS OF AN			KEAIER I	HAN OR EQUAL TO	O AMPS				
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	The same of the sa					N OR EQUAL TO 2 A					
		C	ONFIGURATION	(NO)	OR LESS	THAN NOMINAL (STA	GED CONFIGURA	TION), AN	DUAL (UNSTAGED ND CURRENT LESS		
		Ce I	NABILITY T	O ME	ET VOLTA	GE REGULATION AT	REQUIRED LOAD				
		D. I	NABILITÝ T	O BE	CONNECT	ED TO A FEEDER DU	E TO A MALFUNC	TIONED E	ECA		
		E. 8	ATTERY OPE	N CI	RCUIT VO	LTAGE BELOW 31.8	VDC STEADY STA	TE			
		LOSS OF A D	C BUS FEED	ER							
NO CONTRACTOR OF THE PERSON		J	HE OUTPUT	TERM	INALS OF	USE AS A POWER PA THE DESCENT ECA!	S TO THE DFR				
NAME OF TAXABLE PARTY.		T	SCENT - IN HE OUTPUT REAKERS	TERM.	ITY TO U	SE AS A POWER PAT THE ASCENT ECA	H THE ELECTRI	CAL CON	NECTIONS FROM TIE CIRCUIT		
200		LOSS OF OVE	RCURRENT P	ROTE	CTION						
		A. D	EFINITE LO	SS II	· us es-ess						
	on the second se	(1) BOTH CIRCUIT BREAKERS POWERING THE ECA'S FAIL OPEN (ALL DESCENT OR ALL A BATTERIES, DEPENDENT ON WHICH PAIR OF CIRCUIT BREAKERS FAILED)									
		()	2) FAILUR	E OF	AN ASCE	NT BATTERY NORMAL	FEED CONTACTO	R			
-		8 P	ROBABLE LO	SS IF	bits em em						
		()	1) UNABLE	TON	MEASURE A	A BATTERY CURRENT	BOTH ONBOARD	AND ON T	ELEMETRY		
	2000					BATTERY OFF LINE					
	900					ATED AC DISTRIBUT					
WHAT STATE S		V	AC			N OR EQUAL TO 110					
N. J. J. O. W. D. J. J. D. W. D. W. D. J. D. W. D. W. D. J. D. W.	er someone	HA	2			HAN OR EQUAL TO 3	90 OR GREATER	THAN OR	EQUAL TO 410		
			onen grinte	. 56	00116166	, 10 AN AC 503					
2	22-3	ANY SPECIFIC TERMINATION FOLLOWING-	OF AN EVA	ON R	RULE REQU DITIONALL	JIRING A NEXT BE Y A CREWMAN	ST OPPORTUNIT WILL RETURN	Y LIFTO FROM TH	FF WILL BE CAUSE F E EVA TO CORRECT T		
		A a A	DESCENT B	ATTER	Y MALFUN	ICTION REQUIRING	THE BATTERY TO	BE TAKE	N OFF LINE.		
		A. A DESCENT BATTERY MALFUNCTION REQUIRING THE BATTERY TO BE TAKEN OFF LINE. B. AN INVERTER MALFUNCTION IF THE STEERABLE ANTENNA IS AFFECTED (ASSUMES THE ERECTABLE ANTENNA IS NOT DEPLOYED).									
	A CONTRACTOR OF THE CONTRACTOR	RULE NUMBERS	5 22-4 THR	DUGH	22-9 ARE	RESERVED.					
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MISSION RULES

	D =:				****	SECTIO	N 22 - LM ELECT	RICAL POWER			
:	REV	ITEM									
							' MANAGEMENT	·			
		22-10	THE MISSION PROTECTION	ON WILL BE	CONT	INUED AFT	TER LIFTOFF WIT	H THE LOSS OF	OVERCURRE	NT PROTECTION	IF THIS
			A. IF O		PROTI	ECTION IS	LOST ON AN IN		NT BATTERY	THE BATTER	' WILL BE
			B. IF AL	LL DESCENT	OVER	CURRENT F	PROTECTION IS LOON LINE PERIODIO	OST + BOTH ASCE	NT BATTER OR CURRENT	IES WILL BE AND OBTAIN A	PARALLELED CONSUMABLE
			40.11	CONTR MILE	436	INI SIAGE	RY NORMAL FEED (: ONLY OPERATION ROSSTIES LEFT ON	IS ARE DECITION	L OPEN. T	THE SPACECRAFT HE BACKUP FEEDS	WILL BE ON BOTH
		22-11					ONDITIONED FOR-				
			FROM	THE BATTER	Y ON	THE CDR	T BATTERIES/SPL N THE LMP BUS (BUS (NORMALLY E	ATTERY 6) IMME	EDIATELY PR	A MINIMUM OF 5 FOR TO PDI.	AMP HOURS
100000000000000000000000000000000000000			DISCO	NNECTING T	HE LA	ST DESCE	COASTING FLIGHT AMP HOURS FRO NT BATTERY FROM	EACH BUS.	IT BATTERY	IMMEDIATELY	PRIOR TO
	**************************************						COASTING FLIGHT HOURS FROM THE NT BATTERY FROM		NT BATTERY NT BATTERY	/TWO BUS OPERA IMMEDIATELY	TION - BY PRIOR TO
		22=12		AD CROSSTIE OPERATE MOI NEVER BE CL			BE OPEN FOR MA ''AEA'' CIRCUIT	IN PROPULSION BREAKERS CLOS	BURNS, STA ED. THE BU	GING, AND WHE S CROSSTIES (10	NEVER AGS DOA) WILL
		22~13	ELECTRICAL UNLESS THE POSSIBLE SI		. NEVI	ER BE IN IGHT HAS	FAILED. A GOOD	LIED TO A SHOR BUS WILL NEVE	T TO HELP R BE CROSS	DETERMINE ITS FIED INTO A	LOCATION SHORT OR
		22-14	THE INVERTE GREATER THA	ERS WILL BE AN OR EQUAL	SWI'	TCHED FOR 402 OR LE	R A VOLTAGE LESS SS THAN OR EQUA	5 THAN OR EQU. AL TO 398 HZ.	AL TO 112	2 VAC OR A	FREQUENCY
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MISSION RULES

REV	ITEM	SECTION 22 - LM ELECTRICAL POWER
VEA	TICIVI	
	22-15	BATTERY MANAGEMENT WILL BE PERFORMED ONLY DURING LUNAR STAY PERIODS AND THEN ONLY IF IT CAN PREVENT VIOLATION OF CONSUMABLE REDLINES DUE TO LOSS OF A SINGLE DESCENT BATTERY.
	22-16	FOR A SHORTED DESCENT FEEDER, THE ASCENT BATTERIES WILL BE PLACED ON NORMAL FEED WITH THE SHORT ISOLATED VIA THE DEADFACE RELAY. OPERATIONALLY THIS RESULTS IN THE LOSS OF ALL REMAINING DESCENT ELECTRICAL ENERGY FOR CONSUMABLE CONSIDERATIONS. THE TWO DESCENT BATTERIES THAT STILL HAVE AN OPERABLE FEED PATH WILL BE USED ONLY IF NECESSARY TO MAINTAIN CREW SAFETY.
Camerical Communication	22-17	WITH THE LOSS OF ONE ASCENT BATTERY. THE REMAINING ASCENT BATTERY WILL BE PLACED ON BOTH NORMAL AND BACKUP FEEDS WITH THE CROSS-TIE CIRCUIT BREAKERS OPENED. ALSO PRIOR TO INITIATING AN ABORT STAGE THE DESCENT ECA C/B'S MUST BE OPENED TO PREVENT THE FAILED BATTERY FROM BEING AUTOMATICALLY PLACED ON LINE THRU ITS NORMAL FEEDPATH.
	22=18	FOR AN OPEN DESCENT FEEDER OR FOR THE LOSS OF TWO DESCENT BATTERIES ON THE SAME BUS THE CROSS TIE BAL LOAD CIRCUIT BREAKERS WILL BE CLOSED ON THE LUNAR SURFACE AND THE MISSION CONTINUED WITHIN THE CONSUMMABLES BUDGET.
	22-19	FOR A SHORTED ASCENT FEEDER ON THE LUNAR SURFACE, THE ASCENT BATTERIES WILL NOT BE CONNECTED UNTIL THE NOMINAL TIME TO MEET PRECONDITIONING REQUIREMENTS.
		MISSION REV DATE SECTION GROUP PAGE
		APOLLO 13 A 3/23/70 LM ELECTRICAL MANAGEMENT 22-4

MISSION RULES

REV	ITEM	CONDITION/MAL	*****			RULING		CUES/NO	TES/COMM	ENTS	W to in is is in in the to in in
			•		•		•				
						SPECIFIC '					
	22=20	LOSS OF EITH	HER DC		1			REF	MALF PR	OC EPS	
		BUS			1			1 UNS	TAGED DC	BUS	
			•	ALL	· A ·	DELAY STAGING AL		2 STAC	SED DC BU	s	
				DOCKED	'B.	CONTINUE MISSION	•				
					1	. DO NOT UNDOCK	6			•	
			0 0 0		† 2 † †	 CREWMEN OPERAT WITH CONNECTIN HATCHES OPEN A TUNNEL CLEAR 	G I		S OF DC B	US RESULTS	IN LOSS O
	,		1		3	. PERFORM LIMITE SYSTEMS EVALUA	D TION	DESCEN'	ENGINE	THER DC B BURNS RE 00 PERCENT. THE LMP B	SULTS I
			,		D C.	DOCK ASAP/ NO GO			TO SHUT		US CAUSE
					, D.	NO GO PDI/DOCK A	SAP	1			
				POWERED DESCENT		ABORT DOCK ASAP					
				LUNAR	*Fo	LIFTOFF AT NEXT BEST OPPORTUNITY					
							,				
	ALL CANADA										
	TOTAL STATE OF THE										
	District of the control of the contr										
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cours of though	Access to the second	(Company and the company of the comp	MISSION	REV D	ATÉ	SECTION	GROUP		PAGE		
			APOLLO 13		/12/70		SPECIF	IC			NAMES OF THE PARTY
									22-5		

MISSION RULES SECTION 22 - LM ELECTRICAL POWER

REV	ITEM	CONDITION/MA			RULING	' CUES/NOTES/COMMENTS
	22-21	SHORTED DC FEEDER	BUS		† † †	REF MALF PROC EPS
		PEGUEN			•	1 UNSTAGED DC BUS
		A. DESCENT		ALL	A.1. CONTINUE MISSION	2 STAGED DC BUS
					2. NO GO CIRC/DOCK	ASAP . SEE MANAGEMENT RULE 22-16
					3. DOCK ASAP	
				DESCENT	4 · ABORT DOCK ASAP	
					5. LIFTOFF AT NEXT E OPPORTUNITY	BEST !
		B. ASCENT	•		B.1. DELAY STAGING AL	AP . SEE MANAGEMENT RULE 22-19
					2. CONTINUE MISSION	1
					(A) DO NOT UNDOCK	
			9		(B) CREWMEN OPERA WITH CONNECTION HATCHES OPEN A TUNNEL CLEAR	NG '
	•		\$ \$ \$		(C) PERFORM LIMIT SYSTEMS EVALUATION	ED
			0		3. DOCK ASAP/NO GO	CIRC
				PRE-PDI	4. NO GO PDI DOCK ASAP	
				POWERED DESCENT	5. ABORT DOCK ASAP	
			0	LUNAR	6 . LIFTOFF AT NEXT BEST OPPORTUNITY	1
3						
			MISSION	REV DAT	TE SECTION	GROUP PAGE

MISSION RULES

22-25		10 40 40 00 00 00 00 00 00 00 00 00 00			' CUES/NOTES/COMMENTS	500 200 000 000 CIO SI
66-26	B. LOSS OF ASCENT E	CENT ONE BATTERY TWO BATTERIES	DOCKED UNDOCKED PRE-PDI POWERED DESCENT LUNAR STAY ALL	111.00	REF MALF PROC EPS 2 STAGED DC BUS 4 STAGED BATTERY S	

MISSION RULES

REV	ITEM	CON	DITION/M	ALFUNCTION	PHASE	1	RULING	¹ cu	ES/NOTES/COM	IMENTS	
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	22-23		SS OF DE	SCENT		•			REF MALF	PROC EPS	
	The state of the s		TTERY(S)					•	UNSTAGED D	BUS	
	DIA.	A	LOSS OF DESCENT	BATTERY	ALL	' A .	CONTINUE MISSION	. 5	UNSTAGED B	T TB ABNORMAL	
		в.	LOSS OF DESCENT	TWO BATTERIES	ALL	! !Be	CONTINUE MISSION	1 -00	NSUMABLES (ANAGEMENT RULE DICTATE GO/NO DION PHASES.	
	THE PROPERTY AND THE PR	c.	LOSS OF OR MORE BATTERII	THREE DESCENT ES	DOCKED	1 C .	1. DO NOT UNDOCK OPERATE WITH CONNECTING HATCH OPEN AND TUNNEL CLEAR				
		- AMELOGRAPHICA					2. DOCK ASAP, NO G	O CIRC!			
		ocenses passes					3. NO GO PDI DOCK ASAP				
					POWERED DESCENT		4.(A) PDI TO LO GA				
						8	(B) LO GATE TO T CONTINUE MIS				
					LUNAR STAY	•	5. LIFT OFF AT NEX BEST OPPORTUNIT	T ;			
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		beginningsprongen gan som acreamed for the gas in small by an particular, and a so a second and									
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MISSION RULES

EV	ITEM	CONDITION/MALF	ONCLION	PRASE	m em em em z	RULING	, "No case case 400 400 400 400 400 400 case case 400 400 400 400 400 400	UES/NOTES/COMMENTS
	:		1		8			
The state of the s	22-24	LOSS OF INVER	TER(S)		6		0	REF MALF PROC EPS
		A. LOSS OF ON INVERTER	E		† A	1. CONTINUE MISSI	ON 6	INVERTER
		B. LOSS OF BO INVERTERS	TH !	JNDOCKED		NO GO CIRC	* 0	LOSS OF AC POWER RESULTS IN L OF DPS GIMBALS, RR, S-BND STEERA NT (HBR TM), BOTH FDAI SPHERES,
					1	2. DO NOT PERFORM	PDI 'H	HBR TM IS AVAILABLE FROM AN OUNTENNA AND A 210 FT. MSFN SITE.
STATE OF THE PERSONS ASSESSED.				POWERED		3.(A) PDI TO LO G ABORT		
THE PERSON NAMED IN						(B) LO GATE TO CONTINUE MI		
	,			LUNAR STAY		4. CONTINUE MISSI	ON	
	22=25	LOSS OF AC BU	ISES		8 8			REF MALF PROC EPS
		A. LOSS OF BU	S A	DOCKED	! A.	1. CONTINUE MISSI	ON 9 6	INVERTER
			1		1	NO GO CIRC 2. CONTINUE MISSI		LOSS OF AC BUS A RESULTS IN L DF DPS GIMBAL CONTROL, RENDZ RAD ND INTEGRAL LIGHTING
			0	DESCENT/ LUNAR STAY			e C	LOSS OF AC BUS B RESULTS IN L DF S-BAND STEERABLE ANTENNA (HBR AND NUMERIC LIGHTING, HBR TM AVAILABLE FROM AN OMNI ANTENNA AN 210 FT MSFN SITE.
,		B. LOSS OF BL	IS B	ALL	1 B o	CONTINUE MISSION	0 9 0 7	LOSS OF BOTH AC BUSES RESULTS THE ABOVE PLUS LOSS OF BOTH F SPHERES AND THE AGT
		C. LOSS OF BO BUS A AND		UNDOCKED		• CONTINUE MISSIC NO GO €IRC	N= 8 8	
				_		DO NOT PERFORM	0	
				POWERED DESCENT	1 3	ABORT	TE 000	
			0		9 0 0	(B) LO GATE TO T CONTINUE MIS		
				LUNAR	0 4,	. CONTINUE MISSIC	N 8	
		RULE NUMBERS THROUGH 22-49 ARE RESERVED	9		8 8		0 0 0 0	
	demands and the second	Principle Company of the Company of						
		PROTESTIMENT STATEMENT STA						
	Security Commence of the Comme	THE REPORT OF THE PARTY OF THE						
			MISSION	REV DA	TE	SECTION	GROUP	PAGE
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MISSION RULES

	ITEM						
					NTATION REQUIRE		
	22-50	MEAS DESCRIPTION				CATEGORY	MISSION RULE REFERENCE
		AC BUS FREQ AC BUS VOLTS		METER + CAL		1 OF 2 M	22-2,5,24,25
		BAT 1 CUR BAT 2 CUR	GC1201C GC1202C			1 OF 2 M PCM	
		LMP BUS VOLTS BAT 1 VOLTS BAT 2 VOLTS BAT 5 VOLTS	GCU302V GCU201V GCU202V GCU205V	METER	}	2 OF 3 M	22-2,10,14,20,21,22,23
		BAT 3 CUR BAT 4 CUR	GC1203C GC1204C			1 OF 2 M PCM	
		CDR BUS VOLTS BAT 3 VOLTS BAT 4 VOLTS BAT 6 VOLTS	GC0301V GC0203V GC0204V GC0206V	METER J		2 OF 3 M	
		BAT 5 CUR BAT 6 CUR	GC1205C GC1206C			M PCM M PCM	
		BAT 1 MAL BAT 2 MAL BAT 3 MAL BAT 4 MAL BAT 5 MAL	GC9962U GC9963U GC9964U	CAUT , COMI CAUT , COMI CAUT , COMI CAUT , COMI CAUT , COMI		HD HD HD HD HD	22-2,10,14,20,21,23
		BAT 6 MAL BATTERY MAL	GC9966U GL4047X	CAUT . COMP		HD HD	22-2,10,20,21,22,23
		BAT 1 LOW TAP BAT 2 LOW TAP BAT 3 LOW TAP BAT 4 LOW TAP	GC4362X GC4364X GC4365X GC4368X	FLAG FLAG		HD HD HD HD	22-2,10,20,21,23
		BAT 5 B/U CDR BAT 6 NORM CDR BAT 5 NORM LMP BAT 6 B/U LMP	GC4369X GC4370X GC4371X GC4372X	FLAG FLAG		HD HD HD HD	22-2,10,17,20,21,22
-		NOTE LOSS OF	- A D A W 7 1 7 7 W				
		MONITORING	APADILITY				
			APADILITY				

MISSION RULES

oriometrical designation of the contract of th	n i	SECTION 23 - LM ENVIRONMENTAL CONTROL
EV	ITEM	
and distance of		
CORNEC TROOPER		* GENERAL *
CONCLUDENCE	23-1	TO INITIATE THE MANNED LM PHASES THE ENVIRONMENTAL CONTROL SYSTEM MUST PROVIDE THE FOLLOWIN MINIMUM CAPABILITIES
		NOTE LM ACTIVE RENDEZVOUS/CONTINGENCY RETURN IS ASSUMED
		A. DOCKED WITH HATCH OPEN AND TUNNEL CLEAR
		1. COMBINED VEHICLE PRESSURE INTEGRITY
	-	2. ONE LM COOLANT LOOP
		B. DOCKED WITH HATCH CLOSED
		1. CABIN PRESSURE INTEGRITY
		2. SUIT LOOP INTEGRITY
		3. ONE SUIT FAN
		4. ONE COOLANT LOOP
		5. SUFFICIENT 02, H20, AND LIOH CONSUMABLES TO COMPLETE THE PLANNED ACTIVITY PERIOD PLUS A RESERVE OF 1 HOUR
		C. UNDOCKED/SEPARATION AND SUBSEQUENT PHASES SEE LM TELMU GO/NO GO CRITERIA - PAGE 3-18.
	F-10-10-10-10-10-10-10-10-10-10-10-10-10-	
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	- International Control of Contro	
	1	MISSION REV DATE SECTION GROUP PAGE
THE REAL PROPERTY.		APOLLO 13 FNL 2/12/70 LM ENVIRONMENTAL GENERAL

MISSION RULES

EV	ITEM	CONDITION/MALFUNCTION	PHASE	RULING	' CUES/NOTES/COMMENTS
		*** *** *** *** *** *** *** *** *** **	4		e 1
			6		1
				SPECIFIC MISSION RULES	5 1
				ŧ	1
-	23-20		DOCKED	CONTINUE MISSION	REF MALF PROC ECS
		INTEGRITY	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	11. PERFORM SYSTEMS 1 EVALUATION WITHIN 2 CONSUMABLES LIFETIN 3 CONSTRAINTS WITH HAVE OPEN AND TUNNEL CLI	ME ! ATCH !
		-	1	'2. NO-GÓ FOR UNDOCKING	3
			UNDOCKED	DOCK ASAP	
			† †	DO NOT STAGE WHILE UNDOCKED	
			1	NO-GO FOR CIRC	
			PRE-PDI	DOCK ASAP ON NOT STAGE WHILE UNDOCKED	
			POWERED DESCENT	1. PDI TO PDI +5+30 -	ABORT
		i. 3	8	DOCK ASAP	1
			1	DO NOT STAGE WHILE	1
		ndecidential des	0	'2. PDI +5+30 TO TD =	ABORT !
			9	DOCK ASAP	1
				LIFTOFF AT NEXT BEST	1
			RNDZ	CONTINUE MISSION OCK ASAP	
			8	\$ \$	
		The state of the s	8	6	0.
	CONTRACTOR OF THE PROPERTY OF				
		Become of the Control			
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	RESERVATIONS.				
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MISSION RULES

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	23-21	LOSS OF CABIN	6 6 5	1.			MALF PROC ECS	
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			e 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9 9 0 0	PERFORM SYSTEMS EVALUATION WITHIN CONSUMABLES LIFETIME CONSTRAIN WITH ONE CREWMAN ON THE CSM UMBILICALS			
	,		0	120	NO-GO FOR UNDOCKI	IG *		
			UNDOCK		K ASAP NOT STAGE WHILE OCKED	0 6 8		
	MOUNT AND THE RESERVE AND THE	4	8		GO FOR CIRC	\$ *		
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MISSION RULES

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			9		0 0		, DEE	MALF PROC ECS	
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		B. TWO SUIT	1		8	TUNNEL CLEAR AND	* 9	MOVE HERRE! AND	959750
			1	1		ON TRANSFER UMBI OR CW GARMENT W/	SUIT . RE	F MALF PROC ECS-	0 600
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		TO CONTROL OF THE CON		0		DO NOT STAGE WHI	LE !		
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					0	(C) LO GATE TO TO CONTINUE MISS	ION "		
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		GENERAL STATE OF THE STATE OF T			6	DOCK ASAP	9		
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MISSION RULES

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	23-23							REF M	ALF PRO	C ECS	
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	al de la company		9		8		,				
		B. TWO REGUL	ATORS 10	JNDOCKED/	'B.1	DO NOT UNDOCK					
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			APOLLO 13	FNL	2/12/70	LM ENVIRONMENTAL	SPECIFIC		23-7		
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MISSION RULES

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	23-24	LOSS OF H20			8		· REF N	ALF PROC ECS	
000000		SEPARATOR(S)	1		0		' 7B ECS		
		A. ONE H20	* A	LL	A. C	ONTINUE MISSION	1 18 ECS		
		SEPARATOR			9		9		
		B. TWO H20 SEPARATORS			'B.1.	CONTINUE MISSION	1		
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			1 P		1 3 .	CONTINUE MISSION	•		
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MISSION RULES

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- 4	11111		10 eu eu e	50 CTG 953 CTG 953 FTG	CO 600 ALM		1				ब्लार व्हाउ ब्हाउ ब	***************************************	p 637 ftp 439 ftb 68.			1 /		nto eno eno eno ego e	en en es	2 (23) (23) (49) (23) (2			
	•						8									1							
	23-25	LO	SS	OF 02	TA	NK(S)	0									1							
		A٠	ON	E ASC	ENT	TANK	. 14			A. C	ONT	INUE	MISSIO	N		8 8 1							
	transport Condition	в.	TWO) ASC	ENT	TANK			, ,	B.1.	DO	NOT	JNDOCK			1							
							0 F	JNDOCK PRE-PD			NO NO	GO C	IRC	ALA	(P	1							
		N. Destruction of the Control of the					0 p	POWERE				ABOR	TO PDI T Y STAG										
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		And the first Administration					1	RNDZ	•	5 .	co	NTINU	E MISS	ION		1							
		c.	DE	SCENT	T A	NK		DOCKED) !	C • 1 •	, co	NTINU	E MISS	ION		0							
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MISSION RULES

Г	prvl	LTEAA	CONDITION/MALFUNCTION	PHASE	1	RULING		CUES/NOTES	/COMMEN	NTS	
-	REV	ITEM			!		!		, had _{\$100} and \$200 keV _{\$100} an		
		23-27		UNDOCKE) '		1	• REF MA	ALF PROC	ECS	
					NO GO	D FOR UNDOCKING D FOR CIRC		8 GLYCOL			
				PRE-PDI	RETUI	RN TO VICINITY OF	CSM !				
				POWERED DESCENT	11. P	DI TO PDI + 5+30 A	BORT !				
				1		DI + 5+30 TO TD - ONTINUE MISSION	1				
	1			LUNAR STAY		OFF NEXT BEST RTUNITY	1				
				RNDZ	CONT	INUE MISSION	1				
		23-28		1	1						
			A. ONE ASCENT TANK	1	1	ONTINUE MISSION	i				
			B. TWO ASCENT TANKS	'DOCKED 'UNDOCKE	'B.1.	NO GO CIRC					
				PRE-PDI	1	RETURN TO VICINI' CSM ASAP DO NOT STAGE NO GO PDI	TY OF				
				POWERED DESCENT	1	DO NOT STAGE (B) PDI + 5+30 TO LO-GATE ABORT (C) LO GATE TO	(
				LUNAR STAY	1	LIFTOFF NEXT BES					
				RNDZ	1 5	CONTINUE MISSION		CREW MAY	ELECT T	O REMOVE	PGA'S FOR
			C. DESCENT TANK	DOCKED	C.1	CONTINUE MISSION		1			
				PRE-PDI	D/1 2	NO GO CIRC NO GO PDI		# E			
				POWERED DESCENT LUNAR STAY	3 1 3 1	CONTINUE MISSION WITH ASCENT CONSUMABLES CAPA	BILITY	† † †			
)											
1											
			MISSION	REV	DATE	SECTION	GROUP	P	AGE	ALP WEST AND ADDRESS OF THE	Art - State -
			APOLLO	13 A	3/23/70	LM ENVIRONMENTAL CONTROL	SPECIF		3-11		

MISSION RULES

REV	ITEM	CONDITION/MALFUNCTIO	N° PHASE	_	RULING		CUES/NOTES/COM	MENTS	THE RES CO. CO. CO. CO. CO. CO. CO.
	23=29		ALL	I TROUI		9			
			8 8 8	ASSE: TRAN: NECE:	SS DAMAGE AND SFER TO CSM IF SSARY	•			
	23=30	CONTAMINATION IN CABIN	ALL	CREW DECO	MAY ELECT TO		IF UNABLE TO MISSION MAY BE		
				8		•			
	23-31	GLYCOL COOLANT LEAK	ALL		SFER TO CSM	9	REF MALF PROC	ECS	
			ALL	• D	URGE SUIT WITH	1	8 GLYCOL		
		B. SUIT	ALL	B. D	ISCONNECT FROM UIT LOOP	1			
		RULE NUMBERS 23-32 THROUGH 23-49 ARE RESERVED.	0 0 0 0 0	0 0 0		0 0 0			
		1 P							
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							
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		APOLLO	13 FNL	2/12/70	LM ENVIRONMENTAL	SPECIF	c		

MISSION RULES

		SECTION 24 - LM GUIDANCE AND CONTROL
EΥ	ITEM	
		GENERAL '
	24-1	RESERVED
	24=2	DEFINITIONS
		3-AXIS ATTITUDE CONTROL 3-AXIS ATTITUDE CONTROL IS DEFINED AS THE ABILITY TO CHANGE THE EXISTING
		VEHICLE ATTITUDE. TO HAVE THIS CAPABILITY THE LM REQUIRES AN OPERATIONAL MANUAL OR AUTOMATIC CONTROL SYSTEM.
		GUIDANCE STEERING
		GUIDANCE STEERING IS DEFINED AS THE ABILITY TO CALCULATE THE DESIRED LM THRUST VECTOR DURING A POWERED MANEUVER. AN OPERATIONAL PGNS OR AGS IS REQUIRED FOR GUIDANCE STEERING.
		OPERATIONAL PGNS
		AN OPERATIONAL PGNS IS DEFINED AS NO LGC FAILURE, NO ISS FAILURE, NO DSKY FAILURES, AND NO CES FAILURES PREVENTING ATTITUDE CONTROL.
	×	A. ANY FAILURE OF THE LGC HARDWARE AND/OR THE ASSOCIATED INPUT/OUTPUT INTERFA WHICH CANNOT BE REMEDIED BY CREW PROCEDURES IS CONSIDERED AN LGC FAILURE.
		B. ANY FAILURE WITHIN THE IMU, CDU, PTA, OR THE PSA WHICH WOULD CAUSE A PERMAN LOSS OF THE INERTIAL ATTITUDE AND VELOCITY MEASUREMENT, IS CONSIDERED AN FAILURE.
		C. ANY FAILURE OF THE DSKY HARDWARE AND/OR THE ASSOCIATED INPUT/OUTPUT INTERFA WHICH CANNOT BE REMEDIED BY CREW PROCEDURES IS CONSIDERED A DSKY FAILURE.
		D. ANY FAILURE OF THE CES HARDWARE THAT PREVENTS ATTITUDE CONTROL WHILE IN PGNS CONSIDERED A CES FAILURE.
		OPERATIONAL AGS
		AN OPERATIONAL AGS IS DEFINED AS NO AEA FAILURE, NO ASA FAILURE, NO DEDA FAILURE, AND NO CES FAILURE PREVENTING ATTITUDE CONTROL.
		A. ANY FAILURE OF THE AEA HARDWARE AND/OR THE ASSOCIATED INPUT/OUTPUT INTERFA WHICH CANNOT BE REMEDIED BY CREW PROCEDURES IS CONSIDERED AN AEA FAILURE.
		B. ANY FAILURE OF THE ASA HARDWARE AND/OR THE ASSOCIATED INPUT/OUTPUT INTERFA WHICH CAUSE LOSS OF THE VEHICLE ATTITUDE AND VELOCITY MEASUREMENTS IS CONSIDE AN ASA FAILURE.
		C. ANY FAILURE OF THE DEDA HARDWARE AND/OR THE ASSOCIATED INPUT/OUTPUT INTERFA WHICH CANNOT BE REMEDIED BY CREW PROCEDURES IS CONSIDERED A DEDA FAILURE.
		D. ANY FAILURE OF THE CES HARDWARE THAT PREVENTS ATTITUDE CONTROL WHILE IN AGS
		CONSIDERED A CES FAILURE. 3-AXIS TRANSLATION
		3-AXIS TRANSLATION IS DEFINED AS THE ABILITY TO CHANGE THE VEHICLE VELOCITY»
		PLUS OR MINUS. ALONG EACH BODY AXIS. TO HAVE THIS CAPABILITY THE LM REQUIRES ONE TICA AND AN OPERATIONAL PGNS OR OPERATIONAL CES CIRCUITRY.

2/12/70 LM GUIDANCE AND CONTROL

GENERAL

APOLLO 13 FNL

MISSION RULES

T					350	.11014 24	- LM GUIDANCE AND			AND
EV	ITEM									
-										
A Christian Christian							MANAGEMENT			
	24-3	IMU								
	24-5		IRIG BI	IAS UPDATES	WILL	. BE ACCO	MPLISHED AS FOLLO)WS		
		7.					IS GREATER THAN		/= •07	5 DEG/HR (5
100 to 10				ERU)						
			. (N LUNAR SUR 075 DEG/HR PTION AND A	(5 ME	ERU) AS C	ER THE GYRO DRIFT CALCULATED BETWEEN INIQUE.	IS GREATER THAI N TWO ALIGNMEN	N OR E	QUAL TO +/- NG THE SAME
		В.					D-GO WITH A GYRO (ABLE VALUE WITHIN			EQUAL TO +/-1.5 DEG/H G/HR (128 MERU).
		C.	PIPA BI	IAS UPDATES	WILL	BE ACCO	OMPLISHED AS FOLLS)WS		
			1. NO	BIAS UPDA	TES V	VILL BE	ACCOMPLISHED PRIOR	R TO 30 MIN OF	IMU OPE	RATION.
			GF	REATER THAN	OR E	EQUAL TO	WILL BE ACCOMPL: +/- 0.1 CM/SEC/SE 3 CM/SEC/SEC.	ISHED IF THE EC AND THE DELTA	ABSOLU A BIAS	TE VALUE IS IS GREATER
			Th	HE ABSOLUTE	BIAS	S IS GREA	BIAS UPDATE; U	_ TO +/- 0.1	CM/SEC/	SHED WHENEVER SEC AND THE
							DATED WHILE THE LI			ACE.
		D.	5.06 C	O-GO FOR PI M/SEC / SEC / SEC:	(• 1 e	1AS T: 66 FT/SE	HE PNGS WILL BE CO	ONSIDERED NO-GO KIMUM LOAD VALU	IF THE E WITHI	PIPA BIAS EXCEEDS +/ N THE LGC IS +/- 12.
	24-4	LGC								
		Α.		UPDATE IS BY MORE TH			THE DIFFERENCE B	ETWEEN THE GROU	ND CALC	ULATION AND LGC VALU
		В.	ALL +/	-(U=V) JETS	S WIL	L BE INH	IBITED VIA V65 DU	RING DOCKED DPS	BURNS .	
		C.	DURING THROTT	LE IN THE	NEUVE!	RS, ALL THROTTLE	DPS GIMBAL TRIMMI MODE. THE RECOMM	NG MUST BE DONE ENDED SETTING I	AT GRE S 40 PE	ATER THAN 35 PERCENT RCENT THROTTLE.
	24-5	REND	EZVOUS	RĀDAR						
		Α.	ANTENN	A TEMPERATI	JRE (HPM) IS	NTIL 2 1/2 HOURS GREATER THAN OR E OR EQUAL TO 15 DE	QUAL TO 10 DEG.	HEATE F AND	R ACTIVATION AND THE GYRO PACKAGE
		в.	THE RR AND/OR	SHOULD NO	T BE	OPERATED TEMP (E	AT AN ANTENNA TE STIMATED) OF GREA	MPERATURE GREAT TER THAN OR EQU	ER THAN AL TO 2	OR EQUAL TO 145 DEG 00 DEG F.
		c.	PRIOR	IS ESTIMATE TO COMPLET: D BRAKING.	ED TH	AT THE R F THE BR	R GYRO PACKAGE WI AKING PHASE; THE	LL EXCEED 200 D RR SHOULD BE TU	EG F (H	PM APPROX. 135 DEG F F UNTIL REQUIRED FO
		D.	IF THE	ESTIMATED THE BREAK	GYRO ING P	PACKAGE HASE, TH	TEMP SHOULD EXCE E AC POWER TO THE	ED 200 DEG F (H RR SHOULD NOT	PM APPR BE TURN	OX. 135 DEG F) ANYTIN
		E.		RR ANTENNA				AL TEMP PROFILE	BY 15	DEG F. THE RR SHOUL
		F	OPEN)	RR OVEN HI RR RANGE DI IAS DROPPED	ATA M	UST NOT	BE USED UNTIL 17	E PGNS RNDZ MIN AFTER RE-EN	RDR AND ERGIZIN	HEATERSRNDZ RDR OF
						1				
				MISSION	REV	DATE	SECTION	GROUP	PAGE	
				APOLLO 13	FNL	2/12/70	LM GUIDANCE AND CONTROL	MANAGEMENT	24-2	

MISSION RULES

EV	ITEM		
	24-6	LAND	DING RADAR
		A.	THE LR SHOULD NOT NORMALLY BE OPERATED AT AN ANTENNA TEMP LESS THAN \pm 50 DEG F. HOWEVER THE LUNAR LANDING MISSION WILL BE ATTEMPTED IF THE ANTENNA TEMP IS ABOVE THE CRITICAL LIMI OF \pm 15 DEG F (HARDWARE DAMAGE).
		8.	LR ACTIVATION WILL BE DELAYED TO PDI + 4 MIN IF THE LR TEMP IS GREATER THAN 125 DEG F. A NOMINAL TIG -10 MIN (LR ACTIVATION).
	24 *** 7	AGS	
		Α.	THE AGS IS DECLARED NO-GO WITH A TEMPERATURE OF LESS THAN + 40 DEG F OR GREATER THAN + 15 DEG F.
	-	В•	THE AGS IS DECLARED NO-GO DURING A GYRO AND ACCELEROMETER CALIBRATION IF THE GYRO DRIF CHANGE IS GREATER THAN 2.00 DEG/HR AND IF THE ACCELEROMETER BIAS CHANGE IS GREATER THA 0.039 FT/SEC/SEC FROM THE VALUE AT THE START OF THE CALIBRATION.
		c.	THE AGS MUST BE UPDATED WITHIN 7 MINUTES OF A BURN.
		D.	THE AGS CAN BE USED TO PERFORM DOCKED ATTITUDE HOLD CONTROL.
		E.	THE AGS IN PULSE MODE USING ONLY TTCA CONTROL CAN BE USED TO PERFORM A DOCKED BURN.
			NUMBERS 24-8 THROUGH
		24-1	19 ARE RESERVED.
			MISSION REV DATE SECTION GROUP PAGE
mountain			APOLLO 13 FNL 2/12/70 LM GUIDANCE MANAGEMENT 24-3

MISSION RULES

REV	ITEM	CONDITION/MALFUNCTION	PHASE		RULING		CUES/NOI	ES/COMMENIS
	1			1		*		
	· ·	1 2 2			* SPECIFIC *			
)					
	24=20	AND STEERING		9	5	8		
			1				255	MALE DROC AGENCE
		A. OPERATIONAL AGS	ALL	CONT	INUE MISSION	9		MALF PROC AGS
v			0 0	9		9		WARNING LIGHT
			9	0				A RESPONSE IS ABNORMAL
		B. OPERATIONAL	DOCKED/	18.1.	(A) RETURN TO CS!			MALF PROC PGNS===
		PGNS	UNDOCKED		(B) NO-GO FOR CI	RC ;	1 LGC	WARN
			PRE-PDI	1 2 0	(A) RETURN TO CS		2 155	WARN
			1	9	(B) NO-GO FOR PD		3 TEM	P CAUTION
			1	0		9		BAL LOCK
			POWERED DESCENT		(A) PRIOR TO HI	GATE :		
			1	9	(B) AFTER HI GAT	Ε '		
			1	0	(1) LAND MAN	UALLY !		
			1	0	(2) NO-GO FO			
	1		9	9	EXTENDED STAY	LUNAR '		
			LUNAR STAY	1 40	ASCEND AT THE N BEST OPPORTUNIT	EXT Y		
			RNDZ	. 5	(A) SWITCH TO AG	s		
			1	9	(B) CONTINUE MIS	SION		
			9					
	24-21	LOSS OF FDAI FUNCTIONS (ATT)	ALL		ONTINUE MISSION REW OPTION			
		RATES, ERRORS)						
	24-22	LOSS OF AOT	ALL		ONTINUE MISSION			
			BEV. 5	ATE	SECTION	GROUP		PAGE
		MISSION	REV D	ATE	SECTION	JANOUR		

MISSION RULES

EV	ITEM	CONDITION/MALFUN	CTION! P	HASE	RULIN		UES/NOTES/COM	
EV	112/11	LOSS OF RENDEZV RADAR AND/OR TRANSPONDER	OUS DOCI	KED/ OCKED ERS KED/ OCKED -PDI ERED CENT	2. NO=GO FOR CI CONTINUE MISSIO	M ASAP RC SM ASAP RC SM ASAP RC SM ASAP DI CQUATE DATING OF CTORS—— CR LANDING ATE DATING OF CTORS—— CTOR	REF MALF PRO TRACKER RNDZ RADAR NO TRACK REF MALF PR 1C RR TEMP AB	C PGNS CAUTION OC HTRS NORMAL DECIDE WHEN ADEQUAT M STATE VECTORS HARBED ROC PGNS
	24=25	VHF RANGING/OPT TRACKING A. LOSS OF EITH B. LOSS OF BOTH RULES 24-26 THF 24-27 ARE RESER	HER ALL	KED/ OCKED	A. CONTINUE MIS	SSION SSION SSION SSION STOCK SM ASAP STOCK STOC	CSM OPTICAL REQUIRES THE L	TRACKING CAPABILIT M TRACKING LIGHT AN D VISUALY TRACK.
and the same of	Land	T						
		∥ MI:	SSION RE	EV DAT	E SECTION	. GROUP	PAGE	

MISSION RULES

EV	ITEM	CONDITION/MALFUNCTION	PHASE	1	RULING		OTES/COMMENTS	nais aga aga saa saa ga aag nee naa naa naa naa naa naa naa naa naa
)- (B) - (B	†	1				
	24-28	LOSS OF REDUNDANT	DOCKED/	* A.1.	(A) RETURN TO CSM	1		
		CONTROL	UNDOCKED	9	ASAP (B) NO=GO FOR CIR			
		1 = -		\$	(A) RETURN TO CSM	•		
			8	1	ASAP			
			9		(B) NO-GO FOR PDI	1		
	1 - 1		DESCENT		ABORT	0		
	4.3		1	0	(B) AFTER HI GATE LANDING IS CREW OPTION	0 0 0		
					ASCEND AT NEXT B	EST		
			STAY	0	OPPORTUNITY	0		
			RNDZ	' 5.	CONTINUE MISSION			
		1						
	0400000					-		
		MISSION	REV C	ATE	SECTION .	GROUP	PAGE	
		APOLLO	13 FNL 2	/12/70	LM GUIDANCE AND CONTROL	SPECIFIC - PGNS/CES/AGS	24-6	

MISSION RULES

REV	ITEM	CONDITION/MALFUNCTION	PHASE		RULING	, Cr	JES/NOTES/COMMENTS		eso eso eso eso eso eso eso
			9	0					
	24-29	LOSS OF TRANSLATION	0 -	0					
		CAPABILITY		9		,		CT FAILURE	LINITI
		A. AUTOMATIC ULLAGE (+X)	'DOCKED/	A.1.	A) RETURN TO CSM	ASAP A	•1 • CAN NOT DETE GC COMMANDS ULLAG	E PAILURE	ONITE
			1	9 (B) NO-GO FOR CIR	9 0	REF MALF PROC CE	S	
			PRE-PDI	2 0 (A) RETURN TO CSM	ASAP 1	ABNORMAL VEHICL	E DYNAMICS	
			1	0 (B) NO-GO FOR PDI	1 6	TTCA CMDS ABNORM	AL	
			POWERED DESCENT	3 . (A) PRIOR TO PDI	9			
			i i	1	(1) RETURN TO CSM ASAP)			
				1	(2) PDI INHIE	BITED			
			8 8 8	1	(3) DO NOT BA UP ULLAGE MANUALLY				
			0 0	,	(4) NO-GO FOR	1			
	THE RESIDENCE OF THE PROPERTY		1 1	* (B) AFTER PDI CONTINUE MISS	SION			
	me and	B. ALL TTCA TRANSLATION	DOCKED/	*Colo(A) RETURN TO CS	M ASAP			
			1	0	(B) NO-GO FOR CI	RC !			
			PRE-PDIA POWERED DESCENTA LUNAR	0	CONTINUE MISSION	N 8			
			STAY	1					
			RNDZ	3 .	NO-GO FOR LM AC DOCKING	TIVE			
Name of Street									
		8							
		1 2							
		I I I I I I I I I I I I I I I I I I I	I DEV S	ATE .	SECTION	GROUP	PAGE		
_		MISSION		-		SPECIFIC			
1		APOLLO	TO LUF 5	/12/70	LM GUIDANCE AND CONTROL	PGNS/CES			

MISSION RULES

LOSS OF PITCH OR ROLL GOA ALL SMGINE GIMEAL - OFF CONTINUE MISSION UNLESS INCRIDENCE SIDE INPO ALL CONSTRAINTS ARE FUNCTION OF THE GOA POSITION AT THE OF FAILURES SODE INPO ALL CONSTRAINTS ARE FUNCTION OF THE GOA POSITION AT THE OF FAILURES SODE INPO ALL CONSTRAINTS ARE FUNCTION OF THE GOA POSITION AT THE OF FAILURES SODE INPO ALL CONSTRAINTS ARE FUNCTION OF THE GOA POSITION AT THE OF FAILURES SODE INPO ALL CONSTRAINTS ARE FUNCTION OF THE GOA POSITION AT THE OF FAILURES SODE INPO ALL CONSTRAINTS ARE FUNCTION. 24-31 LOSS OF REDUNDANT ASCEND. 25 NG-GO FOR CERC 21 NG-GO FOR FOR FOR FOR FOR FOR FOR FOR FOR FO	V ITEM	CONDITION/MA	LFUNCTION	PHASE		RULING		CUES/NO	TES/COMM	MENTS		a an (20 ga 10) (
ASC ENG ON CAPABILITY 2. NO-GO FOR CIRC CIRC 1. RETURN TO CSM ASAP 2. NO-GO FOR PDI POWERED 1. IF DPS INSERTION CAPABILITY CATION CAPABILITY CATION 2. AFTER OPS INSERTION CAPABILITY CONTINUE MISSION 3. NO-GO FOR EXTENDED LUNAR STAY LUNAR STAY LUNAR STAY CAPABILITY CONTINUE MISSION AREF MALF PROC CES CONTINUE MISSION IO MPS DOES NOT THRUST WHEN EVE POWERED 1. ENG START PUSH DESCENT 1. ENG START PUSH DESCENT 1. ENG START	24-30	LOSS OF PIT ROLL GDA	CH OR	ALL	CONS	STRAINTS ARE VIOL	ATED.	COMPLET	E DESCEN	SWINE CA	PABILITY	1
CIRC 11. RETURN TO CSM ASAP 22. NO=GO FOR PDI POWERED 11. IF DPS INSERTION CAPABILITY CONTINUE MISSION 22. AFTER DPS INSERTION WISSION 23. NO=GO FOR EXHANDED LUNAR STAY LUNAR STAY CONTINUE MISSION CAPABILITY CONTINUE MISSION CAPABILITY CONTINUE MISSION CAPABILITY CONTINUE MISSION TIMER IND 00-DD THRUST WHEN EVE POWERED POWERED 10. ENG START PUSH POWERED POWERED POWERED 12. DES ENG CMD OVRD ON RULE NUMBER 24-33 IS RESERVED. MISSION REV DATE SECTION GROUP PAGE	24=31	ASC ENG ON		UNDOCKE	D		P . 0					
POWERED 1. IF DPS INSERTION POSSENT 1. APPENDING TO THE SECTION CAPABILITY CAPABILITY EXISTS ABORT 1. AFTER DPS INSERTION CAPABILITY CONTINUE WISSION 1. ASCEND AT NEXT BEST OPPORTUNITY CAPABILITY OPPORTUNITY OPPORTUNITY 1. ENG START PUSH OPSECENT 1. ENG START PUSH				1	1		p I					
POWERED 12. IF DPS INSERTION CAPABILITY EXISTS ABORT 2. AFTER OPS INSERTION CAPABILITY CONTINUE MISSION 13. NO-GO FOR EXTENDED 1. LUNAR STAY 2. LUNAR STAY 3. NO-GO FOR EXTENDED 2. LUNAR STAY 2. LUNAR STAY 2. LUNAR STAY 3. LUNAR STAY 2. LUNAR STAY 3. LUNA				0	4		- 1					
# A PAGE 12		1		POWERED DESCENT	1 (ABORT					
24-92 LOSS OF DPS AUTO ON DOCKED/ CAPABILITY CONTINUE MISSION . REF MALF PROC CES UNDOCKED CIRC CONTINUE MISSION . REF MALF PROC CES POWERED 1. ENG START PUSH DESCENT 2. DES ENG CMD OVRD ON RULE NUMBER 24-33 1. RESERVED. MISSION REV DATE SECTION GROUP PAGE				1	12.	CAPABILITY CONTIN	ON I					
LUNAR STAY OPPORTUNITY 24-32 LOSS OF DPS AUTO ON DOCKED/ CONTINUE MISSION . REF MALF PROC CES (CAPABILITY ON DOCKED) (C				1	13. 1	NO-GO FOR EXTENDE	D .					
CAPABILITY UNDOCKED CITY CONTINUE MISSION 10 MPS DOES NOT THRUST WHEN EVE POWERED 1. ENG START PUSH DESCENT 12. DES ENG CMD OVRD ON 15 RESERVED.				LUNAR	1 ASC	END AT NEXT BEST						
POWERD 1.0 ENG START PUSH TIMER IND 00.00 THRUST WHEN EVE TIME	24-32			UNDOCKE	D '	TINUE MISSION	8	• REF M	ALF PROC	CES		
POWERED 12 ENG START PUSH DESCENT 22 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH POWERED 12 DES ENG CMD OVRD ON START PUSH PUSH PUSH PUSH PUSH PUSH PUSH PUSH				CIRC		TINUE MISSION					WHEN	EVEN
RULE NUMBER 24-33 IS RESERVED. MISSION REV DATE SECTION GROUP PAGE				POWERED		ENG START PUSH	0	TAPIGK A	ND OOSOG			
IS RESERVED.	17					DES ENG CMD OVRD	ON !					
IS RESERVED.				6	8		8					
				* *	1		0					
		*										
			MISSION	REV D	ATE	SECTION	GROUP		PAGE			
AND CONTROL PGNS/CES/AGS 24-8			APOLLO 1		/12/70	LM GUIDANCE	SPECIFIC					

MISSION RULES

REV	ITEM	CONDITION/MALFUNCT		E RULING	' CUES/NOTES/COMMENTS
	24-34	LOSS OF AUTO	0	1	• REF MALF PROC CES
		THRUST CONTROL	•		11 ENG THR AND CMD DO NOT AGREE/ O SCHEDULE.
	24-35	LOSS OF MANUAL THRUST CONTROL	DOCKED.	' 1. RETURN TO CSM AS ED '	ALLOWABLE TIME IN NON THROTTAB
-				1	
			PREPU	I 1. RETURN TO CSM AS	AP .
			1	2. NO-GO FOR PDI	• REF MALF PROC CES
				D '1. DO NOT SWITCH TO T ' MANUAL THROTTLE '2. SELECT OTHER TTC	<pre>! 11 ENG THR AND CMD THR DO NOT AGRE ! OFF SCHEDULE</pre>
			*	A MANUAL THROTT CONTROL REGAI	LE
			0 0	1. WITHIN ALL TIME - CON MISSION	
			0 0 0	2. NOT WITHIN ALLOWABLE BORT	
		7	•	BO NO MANUAL THR CONTROL	OTTLE
		e .		1. PRIOR TO H	I GATE -
			•	2. AFTER HI G	
	24-36	LOSS OF LUNAR CONTACT LIGHTS		D CONTINUE MISSION	
			1	1 9	
		RULE NUMBER 24-3 THROUGH 24-39 AR RESERVED	7 † E •	t t	
			1.02		
	1	MISS	ION REV	DATE SECTION	GROUP PAGE

MISSION RULES

SECTION 24 - M GUIDANCE AND CONTROL - CONTINUED

EV	ITEM							
					කා අතු රැක රැක රැක සහ පහ දැන සේ වේ රැක් පත රික විසි වකු පත පිරි විසි	10 GM (1) GM		
				PRELAU	NCH INSTRUMENTATIO	ON "		
	24-40	MEAS DESCRIPTION	PC	.M	` ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE
1		LGC DOWNLINK	GGOO		-	60	M HD	24-20 24-20
and the same of		PLS TORO REF	GG10 GG11			604	HD	24-20
TO STATE OF THE PERSON NAMED IN COLUMN 1		IMU 28 VAC 800	GG12	01V	602		HD HD	24-20 24-20
		IRIG SUSP 3.2 KC IMU STBY	GG13 GG15		es.	con .	HD	24-20
		LGC OPR	GG15		69	500 200	HD HD	24-20 24-20
		X PIPA OUT IN PHASE Y PIPA OUT IN PHASE	GG20		-	444	HD	24-20
		Z PIPA OUT IN PHASE	GG20			-	HD	24-20
		IG SVO ERR IN PHASE IG IX RSVR OUT SIN	GG21		FDAI	COMMON	HD	24-20
		IG IX RXVR OUT COS	GG2		FDAI	COMMON	HD	24-20 24-20
		MG SVO ERR IN PHASE MG IX RSVR OUT SIN		137V 142V	FDAI	COMMON	HD	24-20
		MG IX RSVR OUT COS	GG2	143V	FDAI	COMMON	HD HD	24-20
		OG SVO ERR IN PHASE OG RSVR OUT SIN		167V 172V	FDAI	COMMON	HD	24-20
		OG RSVR OUT COS	GG2	173V 219V	FDAI FDAI	COMMON	HD - PCM	24-20
		PITCH ATT ERR YAW ATT ERR	GG2	249V	FDAI	COMMON	HD - PCM	24-20
		ROLL ATT ERR PIPA TEMP		279V 300T	FDAI	COMMON SEPARATE	HD - PCM HD - PCM	24-20 24-20
		RR SHFT SIN	GG3	304V	FDAI	COMMON	HD - PCM	24-23 24-23
		RR SHFT COS RR TRUN SIN		305V 324V	FDAI FDAI	COMMON	HD - PCM	24-23
		RR TRUN COS	GG3	325V	FDAI C&W	COMMON	HD - PCM	24-23 24-20
		LGC WARNING ISS WARNING		001X 002X	C&W	COMMON	HD - PCM	24-20
		LR ANT TEMP		563T	TEMP MONITOR	COMMON	HD - PCM HD - PCM	24-23
		RR NO TRACK RR ANT TEMP		621X 723T	TEMP MONITOR	COMMON	HD - PCM	24-23
		YAW ERR CMD PITCH ERR CMD		247V 248V	-	em.	M	24-28 24-28
		ROLL ERR CMD		249V 419V	èss	en .	M HD	24-28 24-27
		JD A4D OUTPUT RCS TCP A4D	GR 5	032X	=		HD	24=27 24=27
		JD B3D OUTPUT RCS TCP B3D		423V 036X	-	400	HD HD	24-27
		JD A2D OUTPUT	GH1	427V	600	-	HD HD	24-27 24-27
		JD B1D OUTPUT		040X 431V	-		HD	24-27
		RCS TCP B1D	GR 5	044X			HD HD	24-27 24-27
	The state of the s	JD B4U OUTPUT JD B4F OUTPUT	GH1	418V 420V		-	HD	24-27
	The second	JD A4R OUTPUT JD A3U OUTPUT		421V 422V		es es	HD	24-27 24-27
	The state of the s	JD B3A OUTPUT	GH1	424V	600		HD HD	24-27 24-27
		JD A3R OUTPUT JD B2U OUTPUT		.425V .426V	en.	653	HD	24-27
		JD AZA OUTPUT	GH2	428V	•	÷	HD HD	24-27 24-27
		JD B2L OUTPUT JD A1U OUTPUT		429V 430V	400	-	HD	24-27
		JD A1F OUTPUT		432V 433V		-	HD HD	24-27 24-27
		JD B1L OUTPUT RCS TCP B4U	GR S	031X	•	***	HD	24-27
		RCS TCP B4F RCS TCO A4R		033X 5034X	en.	-	HD HD	24-27 24-27
		RCS TCD A4R	GR :	5035X	es	an	HD	24-27
		RCS TCP B3A RCS TCP A3R		5037X 5038X	= -	cos cos	HD HD	24-27 24-27
		RCS TCP B2U	GR S	5039X	-		HD HD	24-27 24-27
		RCS TCP A2A RCS TCP B2L		5041X 5042X	en	-	HD	24-27
		RCS TCP A1U	GR:	5043X	-		HD HD	24-27 24-27
		RCS TCP A1F RCS TCP B1L		5045X 5046X			HD	24-27
		YAW ATT ERR	GH:	1455V	FDAI	COMMON	HD	24-28 24-28
		PITCH ATT ERR	GH	1456V	FDAI	Common	1107	
				-				
		MISSIO		DATE 2/12/70	SECTION LM GUIDANCE AND	GROUP PRELAUNCH	PAGE	

MISSION RULES SECTION 24 - M GUIDANCE AND CONTROL - CONTINUED

EV	ITEM								
	24=40	MEAS DESCRIPT	TION	PCM		ONBOARD	TRANSDUCERS	CATEGORY	MISSION RULE REFERENCE
	CONT	ROLL ATT ERR RGA YAW RATE RGA PITCH RAI RGA ROLL RATE AGS SEL PITCH PLSD/DI PITCH PLSD/DI AUTO ON APS ARM ENG FIRE OVRI MAN THRUST CI PITCH GDA POS P TRM FAIL AUTO THRUST DPS ARM VAP: INJ ACT CES AC PWR F AGS DOWNLINK ASA TEMP	E R IR D MD S CMD POS AIL AIL	GH1457' GH1462' GH1462' GH1629 GH1629 GH1630 GH1214 GH1286 GH12313 GH1313 GH1313 GH13314 GH1330 GH1230 GH1230	V V V X X X X X X X X X X X X X X X X X	FDAI FDAI FDAI FDAI 	COMMON COMMON COMMON COMMON SEPARATE COMMON COMMON COMMON COMMON COMMON COMMON COMMON COMMON	M O O O O O O O O O O O O O O O O O O O	24-28 24-28 24-28 24-33 24-33 24-33 24-33 24-31 24-31 24-31 24-31 24-31 24-31 24-31 24-31 24-31 24-31 24-30 24-30 24-30 24-30 24-30 24-30 24-30 24-30 24-30 24-31 24-32 24-33 24-33 24-33 24-33 24-33 24-33
		ASA PWR/AEA AUTO OFF AGS AUTO AGS ATT HOLD PGNS AUTO PGNS ATT HOL LR RNG DATA LR VEL DATA	D NO GOOD	GL4028 GH1217 GH1641 GH1642 GH1643 GH1644 GN7521 GN7557	X X X X X	C&W - - - - C&W C&W	COMMON COMMON	H D H D D D H D D D H D	24-33 24-32,24-31 24-27 24-27 24-27 24-27
		-							
	,								
			MISSION	REV DA	TE SEC	TION	GROUP	PAGE	
							1		

25 LM DPS

MISSION RULES

REV	ITEM								
						' GENERAL '			
						45 45 45 45 45 45 45 45 45 45			
	25-1	RESERVED							
	23.1	REGERVES							
		v a							
	25-2	DEFINITION	S						
		A. AN OP	ERATIONAL DE	s Is	DEFINED	AS FOLLOWS			
		1.	FUEL AND/OR	DIXO	ENGINE :	INLET PRESSURE GR	EATER THAN 30 F	PSIA AT INITIATION.	
		10	PRESSURES GR PERCENT OR C	REATER	R THAN 1: ER THAN :	23 PSIA.) DURING	A BURN WITH THE	N 120 PSIA (ULLAGE ROTTLE LESS THAN 65 FER THAN 160 PSIA•)	
		3 •	TO INITIATE THAN 50 DEG	A BUF	RN. THE C	DXIDIZER AND FUEL HAN 90 DEG F.	BULK TEMPERATU	JRES MUST BE GREATER	
			DELTA TEMP E 400 SEC, AND INITIATE A	LESS	EN FUEL A	AND OXID LESS TO DEG F FOR BURNS	HAN 25 DEG F FO GREATER THAN	OR BURNS LESS THAN N 400 SEC ONLY TO	
		5 •	(A) DELTA PE PSID PRIOR T	RESSUR	RE BETWE	EN FUEL AND OXID	ENGINE INLET PR	RESSURES LESS THAN 25	
			(B) DELTA PE	RESSU	RE (FUEL	HIGH) LESS THAN	50 PSID AT STAF	RT OF ANY BURN.	
						QUATE TO COMPLETE			
		B. THE L ASSUM	E WITH MINI	POINT	T IS DEF	INED AS THE MINIM ROTTLE COMMAND VO	NUM POSITION THA DLTAGE:	AT THE THROTTLE ACTUATOR	WILL
		READS	37 PERCENT	•				ALLY OCCURS WHEN THE DPS	
		D. DPS I CAPAB	NSERTION CAR	PABIL:	TTY IS TO	HE ABILITY TO OBT	AIN A SAFE INSE	ERTION WITH ONLY THE DPS.	THIS
		П							
		RULES 25-3	THROUGH 25	-10 Af	RE RESER	VED.			
	1								
	6								
			MISSION	REV	DATE	SECTION	GROUP	PAGE	
				-			GENERAL - DPS		

MISSION RULES

SECTION 25 - LM PROPULSION - DPS

					SEC	CTION 25	- LM PROPULSION	- DPS		
REV	V	ITEM								
	2	5-11	THE DPS ENGIN AT LTP AND A	E WILL NOT 30 MINUTE	NORM/ COAST	ALLY BE BEFORE	OPERATED FOR LESS RESTARTS GREATER	THAN 3.5 SEC. THAN LTP IS REQ	A 2 SEC	: COAST BEFORE RESTART
	2	5-12	RESERVED							
	2	?5 - 13	87 SECONDS IN COMPLETION OF	THE NON T	HROTT AL MI	ABLE REG SSION DU	GION (65 PERCENT T JTY CYCLE•	O FTP) IS AN A	ALLOWABL	E EVENT AND ALLOWS
	2	25=14	FROM A SAFETY ALLOWABLE EVE	∕ STANDPÖIN ENT•	IT SUP	ERCRITIO	CAL HELIUM BURST (DISC RUPTUR⊑ DUF	RING MAI	NNED OPERATION IS AN
	2	25-15		ETHOD PO			ARD) (1.3 PERCENT ALCULATION (3 PER)	
		25-16								ED DPS CONTINGENCY IS DING OF 37 PERCENT TO NICS LIMITS FROM HEAT
			RULE NUMBERS	25-17 THR	ough 2	25 -2 9 AR	E RESERVED.			
	THE OTHER DESIGNATION OF THE OTHER DESIGNATION									
				MISSION	REV	DATE	SECTION	GROUP	PAGE	

LM PROPULSION -DPS

APOLLO 13 B

GENERAL - DPS

MISSION RULES

REV	ITEM	CONDITION/MALFUNCTION	PHASE	1	RULING	0 000 000 000 000 000 000 000 000 000 0	CUES/NO	TES/COMMENTS
			1		IFIC MISSION RULE			
	25-30	DPS (PRIOR TO LOW	UNDOCKED	! A		0	REF MAL	PROC DPS
		FOR DEFINITION. AFTER LOW GATE ONLY LOW INLET PRESSURES LESS THAN 150 PSIA)	PRE-PDI	0		0 0 0		UEL/OXID PRESS ABNORMAL
			•	0	1. INHIBIT PDI 2. RNDZ WITH APS	8 9 0	3 HE	PRESS ABNORMAL
			POWERED DESCENT		ABORT STAGE	9 8 8		
	25-31	PRIOR TO	9	•	, "			. PROC DPS
		PRESSURIZATION A. FUEL AND/OR OXID ENGINE INLET P GREATER THAN 30 PSIA.	ALL	* A • •	CONTINUE MISSION INHIBIT FIRING DPS START TANK SQUIB		2 (16 C)	ASSO ASSOCIATE
		B. FUEL AND/OR OXID ENGINE INLET P LESS THAN 30 PSIA.	1 1 1 1 1 1 1	1	CONTINUE MISSION 1. FIRE SQUIB TO START TANK	8 0 0	TO STAR	RIZATION SYSTEM MAY BE OPENE RT TANK LEAK。 CLOSE PRIMARY H / AFTER EACH BURN AND REOPE IATION OF EACH BURN。
	25-32	RESERVED	1 2 1 8	0 0 0		1		
	25-33	LOSS OF SUPERCRITICAL PRESSURE (DPS IN BLOWDOWN MODE)	0 0 0 0 0	0 0 0 0		.v 0 0 0		_ PROC DPS E PRESS ABNORMAL
		A. WITHOUT FTP BLOWDOWN CAPABILITY	POWERED	0				
			1	0 0	ABORT STAGE PRIOR INLET PRESSURES LESS THAN OR EQUAL 150 PSIA (ULLAGE PRESSURE LESS THAN PSIA)	L TO :	a 	
		B. WITH FTP BLOWDOWN CAPABILITY		18.	CONTINUE MISSION	1	REF RUI	LE 25-2.
		, .						
		MISSION	REV D	ATE	SECTION	GROUP		PAGE
		APOLLO			LM PROPULSION	SPECIFI	C-DPS	25-3

MISSION RULES

REV	ITEM	CONDITION/MALF			400 day 400 con 600 con 600 co			10 with core stall state stall state state				ar ma cas ma ma on on on on on on on
	25-34	LEAK BETWEEN SQUIB AND QUA CHECK VALVES DETECTED	SHE !	ALL	4	1. INHIE	BIT DPS B LEAK RATE TER THAN	BURNS				
			0 0 0 0 0 0		0 0 0 0 0	(A) (CLOSE HE OPEN DES OR 2 IMME	REG 1	' TO OPEN	· MSFN W	ILL EVALU	ATE WHICH R
		RULE NUMBER 25-35 RESERVE	ED.		† †				0 0 0			
	# 55											
	1											
		M	IISSION	REV	DATE	SECTION	,	GROUP	3	PAGE		
		A	POLLO 13	FNL	2/12/70	LM PROP	ULSION	SPECIFI		25-4		

MISSION RULES

REV	ITEM	CONDITION/MALFUNCT	TION! PHAS	E ' RULING		NOTES/COMMENTS	
	25 - 36	93 SEC AFTER LO LEVEL SENSE	POWERE DESCEN		5 20 THRO	SEC CAPABILITY AT FTP D SEC CAPABILITY AT 25 PER DITLE	RCEN
	25 - 37	INSUFFICIENT	DESCEN	D 'A. ABORT T 'B. ABORT STAGE A DEPLETION	•	MAL PROC DPS	
	25-38	PUGS READING 2 PERCENT (EITHER FUEL OR OXID) AND NO VALID TIME ESTIMATE FROM LOW LEVEL			DPS I NOTE	GROUND CALC DPS QUANTITY WIN	
	25 - 39	USAGE (PREDICTED	OWN !	D 'A. PRIOR TO P64 T CONTINUE MISS 'B. AFTER P64 BU' LO GATE. 1. ABORT 2. ABORT STAC	SION SECTIONS	ETHROTTLEDOWN TIME; THEL, AND SYSTEM PRESSURES ONDARY CUES WHICH INDICATE NAL DPS PERFORMANCE:	AF
	1						-
		MISSI	ON REV	DATE SECTION	GROUP	PAGE	

MISSION RULES SECTION 25 - LM PROPULSION - DPS

REV I	TEM	CONDITION/MALFUNCTION			ING	CUES/NOTES/COMME	NTS
2	25-40	UNABLE TO VENT DPS AFTER LANDING.	0				
		A. UNABLE TO VENT DPS FUEL TANKS	LUNAR STAY	A. CONTINUE M	ISSION	•	
		B. UNABLE TO VENT OXIDIZER TANKS AND GREATER THAN	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B. CONTINUE M	ISSION		
		OXIDIZER IN EACH	1	C. STAY UNTIL			IME DEPENDS UPO NG IN EACH TANK AN ED REAL TIME.
2	25-41	30 PERCENT THROAT AREA INCREASE EXCEEDED	ALL	ABORT STAGE		LEVEL, AND SYS	DOWN TIME, THRUS TEM PRESSURES AR WHICH INDICATE OF ORMANCE
		RULES 25-42 THROUGH 25-49 ARE RESERVED•		0 0 0		9 8 8	
	•						
		•					
		MISSION	REV	DATE SECTION	GROUP	PAGE	
		APOLLO	13 FNL	2/12/70 LM PROPUL	SION SPECIF	IC-DPS 25-6	

MISSION RULES

SECTION 25 - LM DPS - CONCLUDED

r. T	TEM				.611011 22	- LM DPS - CO			
REV	ITEM								
				· DF	S - PREL	AUNCH INSTRUME	NTATION '		
								MISSION RULE	
	25=50	MEAS DESCRIPTION	PC		ONBOARD HE MON	TRANSDUCER	CATEGORY	REFERENCE 25-31 • 32 • 35	
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		OX PRESS	GQ41	1119			Μ .	25-30:31:32:33: 35	
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		APOL	LO 13	FNL	2/12/70	LM DPS	PRELAUNCH INSTR	25-7	

26 LM APS

MISSION RULES

		SECTION 26 - LM PROPULSION - APS
REV	ITEM	APOLLO 13 A 3/23/70 LM PROPULSION GENERAL
	26-1	' GENERAL '
1	26-2	DEFINITIONS A. AN OPERATIONAL APS (PREPRESSURIZATION) IS DEFINED AS FOLLOWS 1. DELTA PRESS BETWEEN APS FUEL AND OXID ENGINE INLET PRESSURES LESS THAN 90 PSID. 2. DELTA TEMP BETWEEN APS FUEL AND OXID LESS THAN 10 DEG F. 3. APS FUEL AND/OR OXID TEMP GREATER THAN 50 DEG F AND LESS THAN 90 DEG F. 4. APS FUEL OR OXID INLET PRESSURE GREATER THAN 62 PSIA AND LESS THAN 220 PSIA. 5. REDUNDANT PRESSURIZATION PATHS AND NO HELIUM TANK OR HELIUM LINE LEAKS. B. AN OPERATIONAL APS (POST-PRESSURIZATION) IS DEFINED AS FOLLOWS 1. ADEQUATE SOURCE PRESSURE FOR DELTA V REQUIRED AND REDUNTANT PRESSURIZATION PATHS. 2. DELTA TEMP BETWEEN APS FUEL AND OXID LESS THAN 60 DEG F FOR BURNS LESS THAN 100 SECONDS AND 10 DEG F FOR BURNS GREATER THAN 100 SECONDS. 3. APS FUEL AND/OR OXID TEMP GREATER THAN 50 DEG F AND LESS THAN 90 DEG F FOR BURNS LESS THAN 100 SECONDS. 4. APS FUEL AND/OR OXID INLET PRESSURES GREATER THAN 115 PSIA. (ULLAGE PRESSURE GREATER THAN 125 PSIA) 5. DELTA PRESSURE BETWEEN FUEL AND OXID INLET PRESSURES LESS THAN OR EQUAL TO
		5. DELTA PRESSURE BETWEEN FUEL AND OXID INCEI PRESSURES LESS THAN ON EGGAL TO 15 PSID. RULES 26-3 THROUGH 26-12 ARE RESERVED
	Acres and the second	MISSION REV DATE SECTION GROUP PAGE
		APOLLO 13 A 3/23/70 LM INSTR 26-1
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MISSION RULES

	_	SECTION 26 - LM PROPULSION - APS
REV	ITEM	
		' SYSTEMS MANAGEMENT '
	26-13	THE MINIMUM IMPULSE OF THE APS ENGINE IS 1257 PLUS OR MINUS 104 LBS - SEC, WHICH CORRESPONDS TO AN ELECTRICAL ON/OFF TIME OF 0.5 SEC.
	26=14	ONLY PREMISSION APPROVED APS MULTIBURN PROFILES WILL BE EXECUTED, SINCE NO DATA EXISTS TO ALLOW REALTIME SUPPORT FOR EXAMINING APS FREEZING, CHARRING, BACKWALL TEMPERATURE CONSTRAINTS FOR MULTIBURN PROFILES.
	26-15	PROPELLANT GAGING (NO ONBOARD READOUT) A. PRIME METHOD APS QTY FROM LGC MASS CALCULATION (THREE PERCENT) B. BACKUP METHOD FLOW RATE X TIME (5 PERCENT)
		RULES 26-16 THROUGH 26-19 ARE RESERVED.
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		APOLLO 12 A 3/23/70 LM PROPULSION MANAGEMENT 26-2

MISSION RULES

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2000000	26=20	OPERATIONAL APS	1	9	O-GO FOR CIRC	1 ASC PRESS
		4 2	1		ETURN TO CSM ASAP	t.
			*	9	0=G0 FOR PD1	2A FUEL OR OXID PRESS ABNORMAL
			POWERED	0		3 HE PRESS ABNORMAL OR DECR.
			DESCENT	, ,	SE DPS AS LONG AS OSSIBLE	
			LUNAR	* D. A	SCEND NEXT BEST	1
	26-21	APS HE SOURCE PRESSURE	1	0 0		REF MAL PROC APS
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				1 2	RETURN TO CSM NO-GO FOR PDI	NOTE :
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	And the state of t		0 0 2	0 0 0	AS POSSIBLE (B) SELECT ALTE	
	000000000000000000000000000000000000000		1	0	APS HELIUM	
			6 0 0 0 0	0 0 0 0 0 0 0	(C) AFTER APS G IN BLOWDOWN CONFIRMED B ULLAGE PRES THAN OR EQL 160 PSIA, S LEAKING TAN PRESS GREAT THAN OR EQL GOOD TANK F	S LESS' AL TO ' ELECT ' K IF ' ER ' IAL TO '
			LUNAR	0 d	OPPORTUNITY (A) SELECT ALTE APS HELIUM	RNATE
			1		(B) DO NOT ASC	FEED
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		B. LEAK AFTER	LUNAR	*B.1	.(A) ASCEND IMMED	TATELY
		PRESSURIZATION	STAY	9	(B) DO NOT ASC F	EED
			RNDZ	8	2. CONTINUE MISSI	ис
		MISSIC	N REV	DATE	SECTION	GROUP PAGE
		APOLLO	13 FNL	2/12/70	LM PROPULSION	SPECIFIC 26-3

MISSION RULES SECTION 26 - LM PROPULSION - APS

APS HE LEAK BETWEEN 'DOCKED' JA. RETURN TO CSM REF MAL PROC APS UNDOCKED AND ASC HE REG 1 AND ASS HE REG 1 A	26-22 APS HE LEAK BETWEEN LOCKED/ UNDO CHECK VALVES AND ASCHE RESG LAND AS POSSIBLE 12) PRESSURIZE WITH ONE BOTTLE IMMEDIATELY PRESS GREATER THAN AND ASCEND REST BEST OPPORTUNITY 10. ASCEND REST BEST OPPORTUNITY 11. PRESSURIZE WITH ONE BOTTLE IMMEDIATELY PRESSURIZE WITH ONE BOTTLE IMMEDIATELY PRESS GREATER THAN OF EUGLA BOTTLE IMMEDIATELY ASCEND REST BEST OPPORTUNITY 12. PRESSURIZE WITH ONE BOTTLE IMMEDIATELY ASCEND REST BOTTLE HERMAL PROC APS APS PROPELLANT/VAPOR LEAK DOWNSTREAM OF UNDOCKED ASCEND RESSONS CLOSE ME SOV'S APS PROPELLANT/VAPOR LEAK DOWNSTREAM OF UNDOCKED ASCEND RESSONS CLOSE ME SOV'S REF MAL PROC APS 1 ASC PRESS 2A FUEL OR UNID PRESS ABNORMAL OR DECR. PRE-PPI 'B. DOCK ASAP 2A FUEL OR UNID PRESS ABNORMAL OR DESCRIT 1. USE DPS AS LONG AS POSSIBLE LUNAR PRE-PPI 'B. DOCK ASAP 3 HE PRESS ABNORMAL OR DECR. CLOSE ME SOV'S 1. ASC PRESS 2A FUEL OR UNID PRESS ABNORMAL OR DESCRIT 1. USE DPS AS LONG AS POSSIBLE LUNAR PRE-PPI 'B. DOCK ASAP 3 HE PRESS ABNORMAL OR DECR.	REV	ITEM	'CONDITION/MALFUNCTION		RULING	' CUES/NOTES/COMMENTS
PRE-PDI B. RETURN TO CSM SHORT APS BURNS MIGHT BE POSSIB POWERED C. ABORT 10 SP DESCRIT 110 OR BOTTLE MEDIATELY PRIOR TO IGNITION (3) USE SECOND HE BOTTLE PRIOR TO 125 PSIA OR AFTER 330 SEC INTO THE ASCENT BURN LUNAR D. ASCEND MET BEST OPPORTUNITY 1. PRESURIZE WITH ONE BOTTLE WHEN APS ULLAGE PRESS GREATER THAN OR EDUAL TO 125 PSIA OR AFTER 330 SEC INTO THE ASCENT BURN LUNAR D. ASCEND MET BEST OPPORTUNITY 1. PRESURIZE WITH ONE BOTTLE WHEN APS ULLAGE PRESS OF THE MEDIATELY PRIOR TO IGNITION 2. DO NOT ASC FEED 3. USE SECOND HE BOTTLE WHEN APS ULLAGE PRESS OF THE ASCENT BURN CO 125 PSIA OR AFTER 330 SEC INTO THE ASCENT BURN RNDZ E. CONTINUE MISSION CLOSE HE SOVY'S 26-23 APS PROPELLANT/VAPOD' CREE HE SOVY'S VANDOCKED A. DOCK ASAP 27 POWERD C. ABORT PRE-PDI G. DOCK ASAP 28 FUEL OR GXID PRESS ABNORMAL OR DECRIPORTED 1. USE DPS AS LONG AS POSSIBLE AS P	PRE-PDI B. RETURN TO CSM NO-GO FOR PDI POWERED C. ABORT POSSIBLE (1) USE DPS AS LONG AS POSSIBLE (2) PRESSUALZE WITH ONE BOTTLE IMMEDIATELY PRIOR TO IGNITION (3) USE SECOND HE BOTTLE WHEN APS OLLAGE PRESS OREATER THAN OR EQUAL TO 125 PSIA OR AFTER 330 SEC INTO THE ASCENT BURN LUNAR D. ASCEND NEXT BEST OPPORTUNITY 1. PRESSURIZE WITH ONE BOTTLE IMMEDIATELY PRIOR TO IGNITION 2. DO NOT ASC FEED 3. USE SECOND HE BOTTLE WHEN APS ULLAGE PRESS GREATER THAN OR EQUAL TO 125 PSIA OR AFTER 330 SEC INTO THE ASCENT BURN RNDZ E. CONTINUE MISSION CLOSE HE SOV'S APS PROPELLANT/VAPOR' CEAK DOWNSTREAM OF BUAD CHECK VALVES UNDOCKED A. DOCK ASAP 2A FUEL OR UXID PRESS ABNORMAL OR DECN. 1. USE DPS AS LONG AS POSSIBLE 1. UNAR 1. LIFTOFF IMMEDIATELY DO NOT ASC FEED		26=22	APS HE LEAK BETWEEN QUAD CHECK VALVES	'DOCKED/	A. RETURN TO CSM	! REF MAL PROC APS
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PRE-PDI 'B. DOCK ASAP 3 HE PRESS ABNORMAL OR DECR POWERED 'C. ABORT DESCENT ' 1. USE DPS AS LONG AS POSSIBLE LUNAR 'D.1. LIFTOFF IMMEDIATELY STAY DO NOT ASC FEED	PRE-PDI 'B. DOCK ASAP 3 HE PRESS ABNORMAL OR DECR. POWERED 'C. ABORT DESCENT ' 1. USE DPS AS LONG AS POSSIBLE LUNAR 'D.1. LIFTOFF IMMEDIATELY STAY DO NOT ASC FEED						1 ASC PRESS
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MISSION REV DATE SECTION GROUP PAGE	MISSION REV DATE SECTION GROUP PAGE			MISSION	REV DAT	F SECTION GROUP	PAGF

MISSION RULES

REV	ITEM	CONDITION/MAL				RULING		JES/NOTES/COMMENTS
	26=24	APS PROP VAL MISMATCH (DELTA POS)	9	ALL	LEA INH	TINUE MISSION BURNING OR HAVE H ST ONE APS BURN, IBIT SUBSEQUENT BURNS	AD AT F	HIS INDICATION PRIOR TO FIRST AP NGINE ON WILL BE CONSIDERED A T AILURE
	2 6=25	APS FU AND/O		ASCENT	8	CONTINUE MISSION 1. OPEN RCS MAINS 2. CLOSE ASC FEED		PS MAL PROC APS 4 ASC QTY
		RULES 26-26 THROUGH 26-2 ARE RESERVED	9 1		0 0 0 0		0 0 0 0 0	
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MISSION RULES

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	26-30	MEAS DESCRIPTION	PCM	ONB	DARD TRANSDUC	ER CATEGORY	MISSION RULE REFERENCE	
		APS HE 1 PRESS APS HE 2 PRESS APS HE REG PRESS APS HE REG PRESS APS HE 1 TEMP APS HE 1 TEMP APS FUEL TEMP APS FUEL LOW APS OXID TEMP APS FUEL PRESS		2P HEL MC 8P 5P C6W 1T HEL MC 2T HEL MC 8T TEMP 8X C6W 8T TEMP 8X C6W	COMMON COMMON COMMON	M = PCM HD 1 0F 2 HD M = PC HD = PCM HD = PCM H = PCM HD M = PCM HD HD HD		
		APS OXID PRESS	GP150	3P C&W	COMMON	M - PCM	26-20,21,22,23	
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27 LM REACTION CONTROL SYSTEM

MISSION RULES

EV	ITEM	
		' GENERAL '
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-	27-1	RESERVED
	27≃2	DEFINITIONS
		A. OPERATIONAL RCS SYSTEM
-		1. AN RCS SYSTEM CONTAINS EIGHT OPERATIONAL THRUSTERS SUPPLIED BY ITS OWN PRESSURIZATION AND PROPELLANT FEED SYSTEM INDEPENDENT OF ASCENT FEED AND CROSSFEED.*
		2. FUEL AND/OR OXID MANIFOLD PRESSURES GREATER THAN OR EQUAL TO 100 PSI.
The second second		3. FUEL TEMP GREATER THAN OR EQUAL TO 40 DEG F AND LESS THAN OR EQUAL TO 100 DEG F.
		4. QUAD TEMP GREATER THAN 119 DEG F.
		*INDIVIDUAL THRUSTERS REQUIRED FOR DIFFERENT MISSION PHASES WILL BE COVERED SEPARATELY.
		RULE NUMBERS 27-3 THROUGH 27-9 ARE RESERVED.
9		
		MISSION REV DATE SECTION GROUP PAGE
		APOLLO 13 FNL 2/12/70 LM REACTION GENERAL - RCS

MISSION RULES

SECTION 27 - LM REACTION CONTROL SYSTEM

REV	ITEM	A STATE OF THE STA		Annua addition of Call			,	
						YSTEMS MANAGEMENT		
	27=10	RESERVED						
	27-11	USABLE RCS PROP	ELLANT	IS 5	48.9 LBS	OR 86.7 PERCENT	OF TOTAL LOAD	ED
		TOTAL LOADED		633.	O LBS	100.0 PERCENT		
		TRAPPED AND LOA ERROR			2 LBS	- 7.3 PERCENT		
		TM ERROR*			9 LBS	- 6.0 PERCENT		
		USABLE		548.	9 LBS	86.7 PERCENT		
		*BASED ON A GRO	OUND COM	PUTA	TIONAL A	CCURACY OF 6 PERC	ENT.	
	27-12	PROPELLANT GAGI						
		A. PRIME METH						
		GROUND RCS		M (6	.O PERCE	NT)		
		B. BACKUP MET				DEFUT COOLING DEA	2015 10 0 050	on (m.k.) on h
		POMD TONBO	ARD REA	10001	13.0 PE	RCENT, GROUND REA	D001 10.0 PER	CENT
	27-13	CROSSFEED		1				
	21-15		SHOULD	BF	CROSSEED	WHEN NECESSARY T	O INSURE THAT	NEITHER SYSTEM EXCEEDS ITS R
		CONSUMABLE REDL		0.2	31,000, 22	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
		RULE NUMBERS 27	'-14 THR	OUGH	27-19 A	RE RESERVED.		
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		MIS	SION	REV	DATE	SECTION	GROUP	PAGE
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MISSION RULES
SECTION 27 - LM REACTION CONTROL SYSTEM

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27=20	LOSS OF OPERATIONAL RCS SYSTEM A OR B	ALL	A. CLOSE MAINS OF AFFECTED	REF MAL PROC RCS
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-			FROM ANYTHING OTHER THAN ISOLATION OF JETS	1A HE PRESS LOW OR DECR.
AND DESCRIPTION OF THE PERSON		6	B. CROSSFEED FROM GOOD	1B PQMD ABNORMAL
		DOCKED	DO NOT UNDOCK	2 RCS PRESS OR TEMP ABNORMAL
ale de la constante de la cons		1	DOCK ASAP	3 RCS A(B) REG
-		•	'NO-GO FOR CIRC	•
SCIENCE STATE		PRE-PDI	RETURN TO CSM ASAP	
		6	NO-GO FOR PDI	
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27-21	RCS THRUSTER PAIR	6	6	REF MAL PROC RCS
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CONTRACTOR		4	2. DOCK ASAP	1
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- 1000 -		9	NO-GO FOR PDI	9
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MISSION RULES

SECTION 27 - LM REACTION CONTROL SYSTEM

REV	ITEM	CONDITION/MALFUNCTION	PHASE	RULING	* CUES/NOTES/COMMENTS
	27-22	DECREASING OR LOSS OF RCS HE PRESSURE	1	SYSTEMS UNTIL	SYSTEM 1 RCS 100 PSI,0 INS 1 A HE PRESS LOW OR DECR. 1B PQMD ABNORMAL
			UNDOCKED	AND DOCK ASAP NO GO FOR CIRC	
			PRE-PDI	CO RETURN TO CSM AN DOCK ASAP	D
			6 0 8	NO-GO FOR PDI	
			POWERED DESCENT/ LUNAR STAY		OWN OF TOTAL LOADED IN ONE SYSTEM). D.2. RCS TROUBLESHOOTING WILL NOT IN PERFORMED AFTER HI GATE D.5.
			PDI	IF THIS CAPABILITY NOT EXISTS	DOES
			LUNAR STAY	ASCEND NEXT BEST	
	STATE OF THE PERSON OF THE PER		RNDZ	E. CONTINUE MISSION	
	27=23		DOCKED UNDOCKED	Aolo RETURN TO CSM	
			PRE-PDI	Bo RETURN TO CSM AS.	0
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-			LUNAR STAY	D. ASCEND NEXT BEST	9
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MISSION RULES SECTION 27 - LM REACTION CONTROL SYSTEM

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	Gyman and a second			NO GO FOR CIRC	1	MD ADMONNAE		
				B. DOCK ASAP	*			
				NO GO FOR PDI				
			POWERED DESCENT	'C.1. ABORT	8 8			
	TO COMPANY AND	0 0		2. ABORT STAGE AS SO AS POSSIBLE	oon !			
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MISSION RULES SECTION 27 = LM REACTION CONTROL - CONCLUDED

REV	ITEM								
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	AND				AUNCH INSTRUMEN				
	27-30	MEAS DESCRI	PTION	PCM	ONBOARD	T	RANSDUCER	CATEGORY	MISSION RULE REFERENCE
		RCS ''A'' PRO RCS ''A'' HE RCS ''A'' REG RCS ''B'' REG RCS ''B'' PRO RCS ''B'' FUE RCS ''B'' FUE RCS MAIN ''A' RCS MAIN ''A' RCS MAIN ''A' RCS MAIN ''B' RCS ''A'' OX I RCS ''B'' FUE RCS ''A'' OX I RCS ''B'' OX I RCS	PRESS PRESD CLSD LAFLD PRESS MFLD PRESS LAFLD PRESS MFLD PRESS M	GR2202 GR3201 GR3202 GR3202 GR3613 LV GR9661 LV GR9665 LV GR9666 LV GR9666 LV GR9666 LV GR9666 LV GR9666 LV GR9664	PRESS MON PRESS MON PRESS MON PRESS MON QP PRESS MON QP PRESS MON TEMP MON TEMP MON PRESS MON PRESS MON PRESS MON PRESS MON PRESS MON QP PRESS MON Q	C&W C&W C&W C&W C&W C&W C&W C&W C&W C&W	COMMON CO	10F2 M CM	27-23,20 27-20,22,23 27-20,22,23
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41									
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		1.							
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