



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MSC FLIGHT READINESS REVIEW
APOLLO 14

PART I

MISSION SUMMARY
MISSION RULES
LUNAR MODULE



MANNED SPACECRAFT CENTER HOUSTON, TEXAS
DECEMBER 11, 1970

INDEXING DATA

DATE	OPR	#	T	PGM	SUBJECT	SIGNATOR	LOC
12-11-70	MSC		V	APD	(title)	MSC	073-15

MISSION SUMMARY

MISSION SUMMARY

- MISSION EVENTS
- LAUNCH OPPORTUNITIES
- EXPERIMENTS AND OBJECTIVES
- MAJOR NEW ACTIVITIES

MISSION EVENTS
FIRST LAUNCH MONTH

FRA MAURO

LAUNCH DATE	JANUARY 31, 1971
LAUNCH TIME, E. S. T.	15:23
TRANSLUNAR COAST TIME	80 HOURS
LANDING REV	14
APPROACH AZIMUTH	-76.3°
SUN ELEVATION AT LANDING	10.3°
BOOTSTRAP PHOTOGRAPHY	DESCARTES
REV NUMBER	4 & 26 - 29
SUN ELEVATION	31° & 55°
TEI REV	END OF 34
TRANSEARTH FLIGHT TIME	67 HOURS
MISSION DURATION	9 ^d 0 ^h 41 ^m
3 σ LOW SPS RESERVE	300 FPS

LAUNCH OPPORTUNITIES

	<u>T-24</u>	<u>T=0</u>	<u>T+24</u>
FIRST MONTH		✓	
SECOND MONTH	✓	✓	*
THIRD MONTH	✓	✓	*

* HEADQUARTERS APPROVAL PENDING.
PLANNING PROCEEDING.

EXPERIMENTS AND OBJECTIVES

- CONTINGENCY SAMPLE COLLECTION
- ALSEP
 - PSE, ASE, SIDE/CCIG, CPLEE, DUST DETECTOR
- LUNAR GEOLOGY
- BOOTSTRAP PHOTOGRAPHY
- CSM O₂ FLOW RATE
- LASER RANGING RETRO-REFLECTOR
- SOIL MECHANICS
- PORTABLE MAGNETOMETER
- VISIBILITY AT HIGH SUN ANGLES
- MET EVALUATION
- SELENODETIC REFERENCE POINT UPDATE
- DOWNLINK BISTATIC RADAR OBSERVATIONS
- CSM ORBITAL SCIENCE PHOTOGRAPHY

EXPERIMENTS AND OBJECTIVES (CONT)

CDR	EXPERIMENT	OBJECTIVE	1+0	2+0	3+0	4+0	5+0	6+0	7+0	8+0	9+0	10+0
LMP	EXPERIMENT	OBJECTIVE	1+0	2+0	3+0	4+0	5+0	6+0	7+0	8+0	9+0	10+0
CDR	EXPERIMENT	OBJECTIVE	1+0	2+0	3+0	4+0	5+0	6+0	7+0	8+0	9+0	10+0
LMP	EXPERIMENT	OBJECTIVE	1+0	2+0	3+0	4+0	5+0	6+0	7+0	8+0	9+0	10+0
CDR	EXPERIMENT	OBJECTIVE	1+0	2+0	3+0	4+0	5+0	6+0	7+0	8+0	9+0	10+0
LMP	EXPERIMENT	OBJECTIVE	1+0	2+0	3+0	4+0	5+0	6+0	7+0	8+0	9+0	10+0

- EVA OPERATION LIMITS
- TRANSEARTH LUNAR PHOTOGRAPHY
- SOLAR WIND COMPOSITION
- THERMAL COATING DEGRADATION
- EVA COMMUNICATIONS
- GEGENSCHN FROM LUNAR ORBIT
- DIM LIGHT PHOTOGRAPHY
- S-BAND TRANSPONDER (CSM/LM)

LUNAR SURFACE EXPERIMENTS AND OBJECTIVES

EVA NO. 1

	0	10	20	30	40	50	60	1+10	1+20	1+30		
CDR	DEPRESS	EGRESS	FAM	MET OFF LOAD MESA ADJ TV DEPLOY	S-BAND		ETB TRANSFERS	FIAG DEPLOY	LM & SITE INSPECT/PHOTG	MET DEPLOY	AISEP	
LMP	ASSIST CDR WITH EGRESS		EGRESS & FAM	MESA ACT	CSC	SWC	LR ³ OFFLOAD ASSIST W/S-BAND	INGRESS SW S-BAND EGRESS	FIAG DEPLOY	TV PAN & SITE SURVEY	MET DEPLOY	AISEP
	1+30	1+40	1+50	2+0	2+10	2+20	2+30	2+40	2+50	3+0		
CDR	OFF-LOAD + FUEL	TRAVERSE	SITE SURVEY	AISEP SYSTEM INTERCONNECT	PSE OFF LOAD	SUNSHIELD DEPLOYMENT	AISEP ANT INSTALL	PSE DEPLOY	LR ³ DEPLOY	AISEP PHOTOS		
LMP	OFF-LOAD + FUEL	TRAVERSE	SITE SURVEY	AISEP SYSTEM INTERCONNECT	THOM. GEOP. OFF LOAD	MORTAR PACK DEPLOY	CPLEF DEPLOY	SIDE/CCIG DEPLOY	GEOPHONE DEPLOY			
	3+00	3+10	3+20	3+30	3+40	3+50	4+00	4+10	4+15			
CDR	COMPREHENSIVE SAMPLE FOOTBALL	SAMPLING			RET TRAV.	EVA CLOSE-OUT	ETB TRANS	EVA TERM				
LMP	THUMPER ACTIVITY	SAMPLING			MORT PKG ACT	RET TRAV.	EVA CLOSE-OUT	EVA TERM	ETB TRANS			
					8							

ORBITAL EXPERIMENTS AND OBJECTIVES
LUNAR SURFACE EXPERIMENTS AND OBJECTIVES
EVA NO. 2

	10	20	30	40	50	1+0	1+10	1+20	1+30	
CDR	DEPRESS	EGRESS TRANSFER	MET LOAD	TRAV	STATION A THERM DEGRAD SAMP	PAN SAMP	DOUBLE CORE	TR	STATION B D,S	TRAVERSE TO CONE
LMP	DEPRESS	ETB	EGRESS ASST. MET LOAD	TRAV	LPM POINT MEAS		DOUBLE CORE	TR	D,S	TRAVERSE TO CONE

	1+30	1+40	1+50	2+0	2+10	2+20	2+30	2+40	2+50	3+00
CDR		CONE CRATER RIM D, 2 PANS, SAMPLES EVA COMM EVAL POLARIMETRIC (HD)			TRA- VERSE	STATION D D,S	TRAVERSE		STATION E TRENCH, SAMPLES D,P SINGLE CORE (HD)	
LMP		D, 2 PANS, SAMPLES EVA COMM EVAL ROLL BOULDERS			TRA- VERSE	D,S	TRAVERSE	LPM	D,P SAMPLES	

	3+00	3+10	3+20	3+30	3+40	3+50	4+00	4+10
CDR	TR	STATION F D,P TRIPLE CORE	TR	STATION G D,P GAS, MAG (HD)	TR	CONT SAMP	EVA CLOSEOUT TRANSFERS	EVA TERM
LMP	TR	RADIAL/DIAMETRID(HD) TRIPLE CORE D,P	TR	D,P LPM(HD) GAS, MAG (HD)	TR	CONT SAMP	EVA CLOSEOUT SWC STOW	INGRESS TRANSFERS

ORBITAL EXPERIMENTS AND OBJECTIVES

	<u>OBJECTIVE</u>		<u>JANUARY 31 (LAUNCH)</u>
CDR	SELENODETTIC LANDMARK TRACKING		11
LMP	BOOTSTRAP PHOTOGRAPHY		
	DESCARTES		REVS 4 AND 26 - 29
	ORBITAL SCIENCE PHOTOS		
CDR	TOPO TARGETS		6
	HANDHELD HASSELBLAD		8
LMP	DI M LIGHT PHOTOS		
	GALACTIC LIGHT		2
	ZODIACAL LIGHT		1
	LUNAR LIBRATION		1
	EARTHSHINE		1
	GEGENSCHIEIN		1
CDR	S-170 DOWNLINK BISTATIC RADAR		VHF AND S-BAND OMNI
LMP	VISIBILITY AT HIGH SUN ANGLES		4

MAJOR NEW ACTIVITIES

- ACTIVE SEISMIC EXPERIMENT
- MOBILE EQUIPMENT TRANSPORTER (MET)
- SPS DOI
- LONGER EVA's
 - 4-1/4 HOURS NOMINAL WITH POSSIBLE EXTENSION TO 5 HOURS VERSUS 3-3/4 HOURS ON APOLLO 12
- INFLIGHT DEMONSTRATIONS
- SHORT RENDEZVOUS

MISSION RULES

MISSION RULE CHANGES

- LAUNCH/EARTH PARKING ORBIT
 - ATTITUDE DEVIATIONS DURING LAUNCH
 - IU NAVIGATION UPDATE CRITERIA
 - SM BATTERY EQUATED TO ONE FUEL CELL
- TRANSLUNAR INJECTION
 - S-IVB PROPELLANT REQUIREMENTS
 - OVERBURN SHUTDOWN CRITERIA
- LUNAR ORBIT INSERTION
 - SPS REQUIREMENTS RELAXED FOR CONTINUATION
 - OSS NOT REQUIRED
- DESCENT ORBIT INSERTION
 - OVERBURN SHUTDOWN CRITERIA
- DESCENT/LANDING
 - SPS PROPELLANT LEAKS
 - EITHER AUTO ULLAGE OR AUTO DPS IGNITION REQUIRED
 - EITHER AUTO OR MANUAL DPS THROTTLE REQUIRED
 - T_1 AND T_2 NO-STAY CRITERIA DEFINED

MISSION RULE CHANGES (CONT)

- LUNAR STAY/EVA
 - EITHER PGNS OR AGS GUIDANCE REQUIRED
 - BOTH CM RCS RINGS
 - EVA'S PLANNED FOR 4.25 HOURS (EXTENDABLE TO 5.0 HOURS MAXIMUM)
 - MAXIMUM DISTANCE
 - WITH BSLSS, APPROXIMATELY 3 KM
 - WITHOUT BSLSS, APPROXIMATELY 1 KM
 - RESTRICTED OPERATIONS AFTER GRENADE LAUNCHER ASSEMBLY IS ENABLED
- ASCENT/RENDEZVOUS
 - SHORT RENDEZVOUS REQUIRES REDUNDANT NAVIGATION CAPABILITY
 - APS USED FOR TPI
- EFFECTS OF CSM LIFEBOAT ENHANCEMENT MODIFICATIONS
 - CONTINUE MISSION WITH LOSS OF 1 CRYO O₂ TANK
 - SM BATTERY WILL NOT BE USED
 - CM WATER STOWAGE BAGS WILL NOT BE FILLED
 - LM ASCENT STAGE WILL NOT BE RETAINED FOR SM BATTERY OR THIRD O₂ TANK FAILURES

APOLLO 14 TRAINING SCHEDULE
ALTERNATE MISSIONS

TOTAL	REMAINING		ACCOMPLISHED		MISSION PHASE
	MCC ALONE	MCC CREW	MCC ALONE	MCC CREW	
					FLIGHT
					LAUNCH
					TLI
					TLC
					LOI-DOI
					LM ASCENT/DESCENT
					DESCENT
					LUNAR SURFACE EVA
					ASCENT
					TEI
					ENTRY
					ALSEP
					SIM OPTIONAL
46-115	1	1	8	8	TOTAL
	10		24-115		

● **EARTH ORBIT**

- ONLY NEAR-CIRCULAR, LOW ALTITUDE ORBITS WILL BE USED

● **LUNAR ORBIT**

- PHOTOGRAPHY MISSION OBJECTIVES WILL BE COMPLETED
- FOLLOW NOMINAL MISSION TIMELINE AS MUCH AS PRACTICAL
- WILL NOT DO TLI IF LUNAR LANDING MISSION CANNOT BE FLOWN
- WILL DO LOI IN ORDER TO PERFORM LUNAR ORBIT MISSION
- CSM SOLO IS ACCEPTABLE

*** REMAINING ALSEP EXERCISES WILL BE RUN CONCURRENT WITH OTHER SIMULATIONS
 ** TWO DAYS WITH THE 15 CREW
 * ONE DAY WITH THE 15 CREW

APOLLO 14 TRAINING SCHEDULE
(AS OF 12/18/70)

<u>MISSION PHASE</u>	<u>ACCOMPLISHED</u>		<u>REMAINING</u>		<u>TOTAL</u>
	<u>MCC ALONE</u>	<u>MCC CREW</u>	<u>MCC ALONE</u>	<u>MCC CREW</u>	
FIDO/BSE	3		1		4
LAUNCH		2-1/2*		1	3-1/2
TLI	1	3-1/2**		1	5-1/2
TLC		2			2
LOI-DOI		2		1	3
LM ASCENT/DESCENT		3*		1	4
DESCENT		4-1/2**		2	6-1/2
LUNAR SURFACE/EVA	2	1		1	4
ASCENT		4*		1	5
TEI		1			1
ENTRY		1		1	2
ALSEP	2		3***		5
SIM OPTIONAL				1	1
TOTAL	<u>8</u>	<u>24-1/2</u>	<u>4</u>	<u>10</u>	<u>46-1/2</u>

* ONE DAY WITH THE 15 CREW.

** TWO DAYS WITH THE 15 CREW.

*** REMAINING ALSEP EXERCISES WILL BE RUN CONCURRENT WITH OTHER SIMULATIONS.

LUNAR MODULE

CARR SUMMARY

LM-8 CARR SUMMARY

- A TOTAL OF 14 RFA'S WERE GENERATED
- ALL HAVE BEEN CLOSED

FRR PRE-BOARD SUMMARY

FRR PRE-BOARD SUMMARY

● 12 RFA's SUBMITTED BY SUBSYSTEM WORKING GROUPS

ACTION REQUIRED 4

RFA's CLOSED 4

RFA's TO BOARD 4

—
12

● 6 GSE RFA's SUBMITTED

ACTION REQUIRED 0

RFA's CLOSED 6

RFA's TO BOARD 0

—
6

SNEAK CIRCUIT ANALYSIS OF LM-8

- LM-8 IS THE SIXTH LUNAR MODULE FORMALLY ANALYZED FOR SNEAK CONDITIONS
- MANUAL AND COMPUTER ASSISTED ANALYSIS OF DESIGNED CONFIGURATION AND CHANGES
- MAIN EMPHASIS ON COMPUTER-LOCATED PATHS IN ALL SWITCH AND RELAY CIRCUITRY, EXPLOSIVE DEVICES, CONTROL ELECTRONICS, DISPLAYS/CONTROLS AND INSTRUMENTATION/COMMUNICATION SUBSYSTEMS
- ALL FLIGHT PHASES, ABORT STAGING, AND LANDING WERE TREATED
- FORM OF REPORT
 - DOCUMENTED RESULTS - D2-118356-1

SNEAK CIRCUIT ANALYSIS OF LM-8 FINDINGS AND READINESS STATUS

- 95 PERCENT ANALYSIS COMPLETED. THIS IS A 13 PERCENT INCREASE OVER LM-7

- TWO NEW SNEAK CIRCUIT BULLETINS RELEASED AND DISPOSITIONED BY ASCB REVIEW BOARD:
 - LM-8-001 CRITICAL CIRCUITS DIODED TO GROUND NO CHANGE NEEDED, DESIGN ADEQUATE

 - LM-8-002 LOSS OF S-BAND TRANSCEIVERS REMOVE REDUNDANT CIRCUIT TO AVOID SNEAK ACTUATION

- NO FLIGHT CONSTRAINTS KNOWN IN THE SYSTEM PORTION ANALYZED

NONMETALLIC MATERIALS SUMMARY

NONMETALLIC MATERIALS SUMMARY

LM-8

- ALL NONMETALLIC MATERIALS USED IN THE LM ARE CONTROLLED BY COMAT (CHARACTERISTIC OF MATERIALS) DATA SYSTEM

- CFE

- A REVIEW OF COMAT RESULTED IN 27 CCB APPROVED DEVIATIONS

- GFE

- A REVIEW OF COMAT RESULTED IN 25 CCB APPROVED DEVIATIONS

- SELECTION REQUIREMENT EXCEPTIONS

- ALL MATERIALS WHICH FAIL STANDARD SELECTION REQUIREMENTS MUST BE APPROVED BY MATERIALS DEVIATIONS FOR CFE OR GFE PRIOR TO USE AS EXCEPTIONS

- FLAMMABILITY TESTING

- NO FLAMMABILITY TESTING REMAINS UNRESOLVED IN SUPPORT OF LM-8

LM-8	LM-7	LM-6	LM-5	
25	28	28	28	GFE
25	25	25	25	TOTAL
18.40	18.40	18.40	18.40	WEIGHT, LB
10,008	6,386	3,676		AREA, IN ²

SUMMARY OF NONMETALLIC MATERIALS (NMM) DEVIATIONS

● DEVIATIONS APPROVED BY MSC CONFIGURATION CONTROL BOARD (CCB)

	LM-5	LM-6	LM-7	LM-8
CFE	26	27	26	27
GFE	26	26	26	25
TOTAL	52	53	52	52

● TOTAL WEIGHT AND SURFACE AREA OF DEVIATED NMM

	LM-5	LM-6	LM-7	LM-8
WEIGHT, LB	18.40	18.48	16.17	14.16
SURFACE AREA, IN ²	9,515	10,008	6,396	3,676

SUMMARY OF NONMETALLIC MATERIALS (NMM) DEVIATIONS (CONT)

- TYPICAL EXAMPLES OF DEVIATED NMM IN LM-8
 - SOLDER AND CRIMPED SPLICES AND ID SLEEVES (KYNAR)
 - APPROXIMATELY 1.1 POUNDS
 - ALL CASES OF 6 OR MORE SPLICES IN CLOSE PROXIMITY ARE WRAPPED WITH NON-FLAMMABLE TAPE
 - ONBOARD DATA BOOKS (PAPER)
 - 4 POUNDS PLUS STOWED DURING LAUNCH, RESTOWED AFTER USE

LM CATEGORY D

- 63 MATERIALS REQUIRE TESTS
- 62 MATERIALS RECEIVED AT MSC THE WEEK OF DECEMBER 7, 1970
- ONE REMAINING MATERIAL WILL BE SHIPPED BY DECEMBER 15, 1970
- ALL TESTING SCHEDULED FOR COMPLETION JANUARY 20, 1971

LM CATEGORY J

- GAC REVIEW INCOMPLETE - ESTIMATE 60 MATERIALS THAT REQUIRE TESTING
- ESTIMATE SHIPMENT DECEMBER 21, 1970 OF ALL CATEGORY J MATERIALS FROM GAC
- 12 MATERIALS WERE TESTED FOR APOLLO 13, PANEL 6
- ESTIMATE COMPLETION OF TESTING JANUARY 20, 1971

GFE CATEGORY D

- 32 PLSS MATERIALS REQUIRE TESTING. SCHEDULE WILL BE AVAILABLE DECEMBER 11, 1970

