

A high-contrast, black and white photograph of an astronaut's boot print on the lunar surface. The boot print is in the foreground, showing the tread pattern. The background is a grainy, textured surface of the moon. The text is overlaid on the lower part of the image.

# Apollo 11

## Flight Plan

Final – July 1, 1969

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

A large, faint, circular mission patch for Apollo 11 is visible in the background of the lower section. It features an eagle with wings spread, a globe, and the text "APOLLO 11".

**MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS**



# APOLLO 11 - FLIGHT PLAN

315 pages



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FINAL

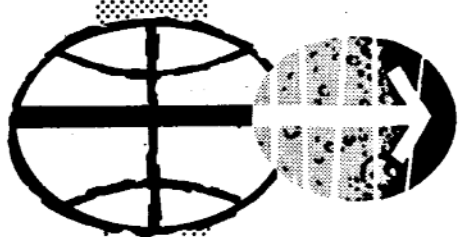
# APOLLO 11 FLIGHT PLAN

AS-506/CSM-107/LM-5

*Neil Armstrong* *Michael Collins*  
JULY 1, 1969

*Buzz Aldrin*

PREPARED BY  
FLIGHT PLANNING BRANCH  
FLIGHT CREW SUPPORT DIVISION



MANNED SPACECRAFT CENTER  
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SECTION I  
SECTION II  
SECTION III  
SECTION IV  
SECTION V  
SECTION VI

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

# **Apollo 11 Flight Plan**

## **Final – July 1, 1969**

MANNED SPACECRAFT CENTER

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APOLLO 11  
APOLLO AS-506/CSM-107/LM-5  
FINAL FLIGHT PLAN

JULY 1, 1969

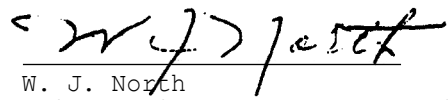
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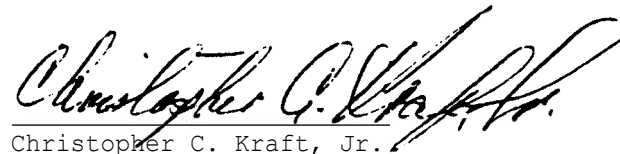
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Views of the earth and the P52 stars shown in the Flight Plan were taken from the document, "Views from the CM and LM During the Flight of Apollo 11" (Mission G).

The CSM and LM attitude information was taken from the document, "Lunar Orbit Attitude Sequence for Mission G".



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## ABBREVIATIONS

ACCEL	Accelerometer
ACN	Ascension
ACT	Activation
ACQ	Acquisition
AEA	Abort Electronics Assembly
AGS	Abort Guidance Subsystem
AH	Ampere Hours
ALSCC	Apollo Lunar Surface Close-up Camera
ALT	Altitude
AMP or amp	Ampere
ANG	Antigua
ANT	Antenna
AOH	Apollo Operations Handbook
AOS	Acquisition of Signal or Acquisition of Site
AOT	Alignment Optical Telescope
APS	Ascent Propulsion Subsystem
ARS	Atmosphere Revitalization System
ATT	Attitude
AUX	Auxiliary
AZ	Azimuth
BAT	Battery
BDA	Bermuda
Bio	Bio-Medical Data on Voice Downlink
BP	Barber Pole
BT	Burn Time
BU	Backup
BW	Black & White
BRKT	Bracket
CAP COM	Capsule Communicator
CAL	Calibration Angle
CAM	Camera
CB	Circuit Breaker
CDH	Constant Delta Altitude
CDR	Commander
CDU	Coupling Data Unit
CEX	Color External
CIN	Color Internal
CIRC	Circularization
CK	Check
CM	Command Module
CMC	Command Module Computer
CMD	Command
CMP	Command Module Pilot
CNTL	Control
C/O	Check out
COAS	Crew Optical Alignment Sight
COMM	Communications
CONFIG	Configuration
CONT	Continue
CP	Control Point
CRO	Carnarvon, Australia
CRYO	Cryogenic
CSC	Contingency Sample Collection
CSI	Coelliptic Sequence Initiation
CSM	Command Service Module
C&WS	Caution and Warning System
CYI	Grand Canary Island
DAP	Digital Auto Pilot
DB	Deadband
DCA	Digital Command Assembly
DEDA	Data Entry and Display Assembly
DEGS	Degrees
DEPL	Depletion
DET	Digital Event Timer
DIFF	Difference

DOI	Descent Orbit Insertion
DPS	Descent Propulsion System
DS	Documented Sample
DSE	Data Storage Equipment
DSKY	Display and Keyboard
DTO	Detailed Test Objective
DUA	Digital Uplink Assembly
DWN	Down
E	Erasable or Enter
EASEP	Early Apollo Scientific Experiment Package
ECS	Environmental Control System
ED	Explosive Device
EDT	Eastern Daylight Time
EFH	Earth Far Horizon
EI	Earth (atmosphere) Interface
EL	Elevation or Electric
EMS	Entry Monitor System
EMU	Extravehicular Mobility Unit
ENH	Earth Near Horizon
EPO	Earth Parking Orbit
EPS	Electrical Power Subsystem
EQUIP	Equipment
EST	Eastern Standard Time
EVA	Extravehicular Activity
EVAP	Evaporator
EVT	Extravehicular Transfer
EXT	External
f	F Stop
FC	Fuel Cell
FDAI	Flight Director Attitude Indicator
FLT	Flight
FM	Frequency Modulated
FOV	Field of View
fps or FPS	Feet per second
FT or ft	Feet
FTO	Flight Test Objective
FTP	Full Throttle Position
GBI	Grand Bahama Islands
GBM	Grand Bahama (MSFN)
GDC	Gyro Display Coupler
GDS	Goldstone, California
GET	Ground Elapsed Time
GETI	Ground Elapsed Time of Ignition
GLY	Glycol
GMT	Greenwich Mean Time
G&N	Guidance and Navigation
GNCS	Guidance Navigation Control System
GWM	Guam
GYM	Guaymas, Mexico
H2	Hydrogen
HA	Apogee Altitude
HAW	Hawaii
HBR	High Bit Rate (TLM)
HD	Highly Desirable
HGA	High Gain Antenna
HI	High
Hp	Perigee Altitude
HSK	Honeysuckle (Canberra, Australia)
HTR	Heater
HTV	USNS Huntsville
ICDU	Inertial Coupling Data Unit
ID	Identification
IGA	Inner Gimbal Angle
IGN	Ignition
IMU	Inertial Measurement Unit

INIT	Initialization
INT	Intervalometer
IP	Initial Point
ISA	Interim Storage Assembly
IU	Instrumentation Unit
IVC	Intervehicular Communications
IVT	Intravehicular Transfer
JETT	Jettison
KM	Kilometer
kwh	Kilowatt Hour
LA	Launch Azimuth
LAT	Latitude
LBR	Low Bit Rate (TLM)
LBS or lbs	Pounds
LCG	Liquid Cooled Garment
LDG	Landing
LDMK	Landmark
LEB	Lower Equipment Bay
LEC	Lunar Equipment Conveyor
LFH	Lunar Far Horizon
LGC	LM Guidance Computer
LH	Left-hand
L/H	Local Horizontal
LHEB	Left-hand Equipment Bay
LHFEB	Left-hand Forward Equipment Bay
LHSSC	Left Hand Side Storage Container
LiOH	Lithium Hydroxide
LLM	Lunar Landing Mission
LLOS	Landmark Line of Sight
LM	Lunar Module
LMP	Lunar Module Pilot
LNH	Lunar Near Horizon
LOI	Lunar Orbit Insertion
LONG	Longitude
LOS	Loss of Signal or Loss of Site
LPO	Lunar Parking Orbit
LR	Landing Radar
LRRR or LR3	Laser Ranging Retro-Reflector
LS	Landing Site
LT	Light
LTG	Lighting
LV	Launch Vehicle
L/V	Local Vertical
LVPD	Launch Vehicle Pressure Display
M	Mandatory
MAD	Madrid, Spain
MAN	Manual
MAX	Maximum
MAX Q	Maximum Dynamic Pressure
MCC	Midcourse Correction
MCC-H	Mission Control Center - Houston
MCC	Mission Control Center
MDC	Main Display Console
MEAS	Measurement
MER	USNS Mercury
MESA	Modularized Equipment Stowage Assembly
MET	Mission Event Timer
MGA	Middle Gimbal Angle
M/I	Minimum Impulse
MIN	Minimum
MLA	Merrit Island, Florida
MNVR	Maneuver
MPS	Main Propulsion System
MSFN	Manned Space Flight Network
MTVC	Manual Thrust Vector Control

N2	Nitrogen
NAV	Navigation
NM	Nautical Miles
NOM	Nominal
NXX	Noun XX
O2	Oxygen
OBS	Observation
O/F	Oxidizer to Fuel Ratio
OGA	Outer Gimbal Angle
OMNI	Omnidirectional Antenna
OPS	Oxygen Purge System
ORB	Orbital
ORDEAL	Orbit Rate Display Earth and Lunar
ORIENT	Orientation
OVHD	Overhead
P	Pitch or Program
PAD	Voice Update
PCM	Pulse Code Modulation
PC	Plane Change
PDI	Powered Descent Initiation
PGA	Pressure Garment Assembly
PGNCS	Primary Guidance Navigation Control Section
PIPA	Pulse Integrating Pendulous Accelerometer
PLSS	Personal Life Support Systems
PM	Phase Modulated
POL	Polarity or Polarizing
PRE	Pretoria, South Africa
PREF	Preferred
PREP	Preparation
PRESS	Pressure
PRIM	Primary
PROP	Proportional
PSE	Passive Seismic Experiment
PT	Point
PU	Propellant Utilization
PUGS	Propellant Utilization and Gaging System
PTC	Passive Thermal Control
PWR	Power
PXX	Program XX
Qty	Quantity
R	Roll or Range
R&B	Red & Blue
RAD	Radiator
RCDR	Recorder
RCS	Reaction Control System
RCU	Remote Control Unit
RCV	Receiver
RED	USNS Redstone
REFSMMAT	Reference Stable Member Matrix
REG	Regulator
REQD	Required
RH	Right-hand
RING	Ringsite
RLS	Radius of Landing Site
RNDZ	Rendezvous
RR	Rendezvous Radar
RSI	Roll Stability Indicator
RT	Real Time
RTC	Real Time Command
RXX	Routine XX
SA	Shaft Angle
S/C	Spacecraft
SCE	Signal Conditioning Equipment
SCS	Stabilization Control System
SCT	Scanning Telescope



SEC	Secondary
SECO	S-IVB Engine Cut-off
SECS	Sequential Events Control System
SEP	Separate
SEQ	Sequence
S-IVB	Saturn IV B(Third Stage)
SLA	Service Module LM Adapter
SLOS	Star Line-of-Sight
SM	Service Module
SPOT	Spot Meter
SPS	Service Propulsion System
SR	Sunrise
SRC	Sample Return Container
SRX	S-Band Receiver Mode No. X
SS	Sunset
STX	S-Band Transmit Mode No. X
S.V.	State Vector
SWC	Solar Wind Composition
Sw	Switch
SXT	Sextant
T EPHEM	Time of Ephemeris Update
TA	Trunnion Angle
TAN	Tananarive, Madagascar
TB	Time Base
TCA	Time of Closest Approach
TD&E	Transposition Docking & LM Ejection
TEC	Trans Earth Coast
TEI	Transearth Insertion
TEMP	Temperature
TERM	Terminate
TEX	Corpus Christi, Texas
TGT	Target
TIG	Time of Ignition
TLC	Trans Lunar Coast
TLI	Translunar Insertion
TLM or TM	Telemetry
TPF	Terminal Phase Final
TPI	Terminal Phase Initiation
TPM	Terminal Phase Midcourse
T/R	Transmitter/Receiver
TRANS	Translation
TV	Television
TVC	Thrust Vector Control
TWR	Tower
US	United States
V	Velocity
VAN	USNS Vanguard
VHF	Very High Frequency
VLV	Valve
VI	Inertial Velocity
VOX	Voice Keying
VXX	Verb XX
W/O	Without
WRT	With Respect to
WTN	USNS Watertown
XFER	Transfer
XMIT	Transmit or Transmitter
XPONDER	Transponder
Y	Yaw

$\Delta V$     Velocity Change (Differential)  
 $\Delta VC$     Velocity Change at Engine Cutoff  
 $\Delta R$     Position Change (Differential)

8-balls        Flight Director Attitude Indicator (FDAI)

#### CAMERA NOMENCLATURE

EL/250/BW-BRKT

Electric Hasselblad/250mm Lens/Black & White film-Camera Bracket

INT (f5.6,250,INF)

Intervalometer (f-stop 5.6, shutter speed=1/250 sec, Infinity)

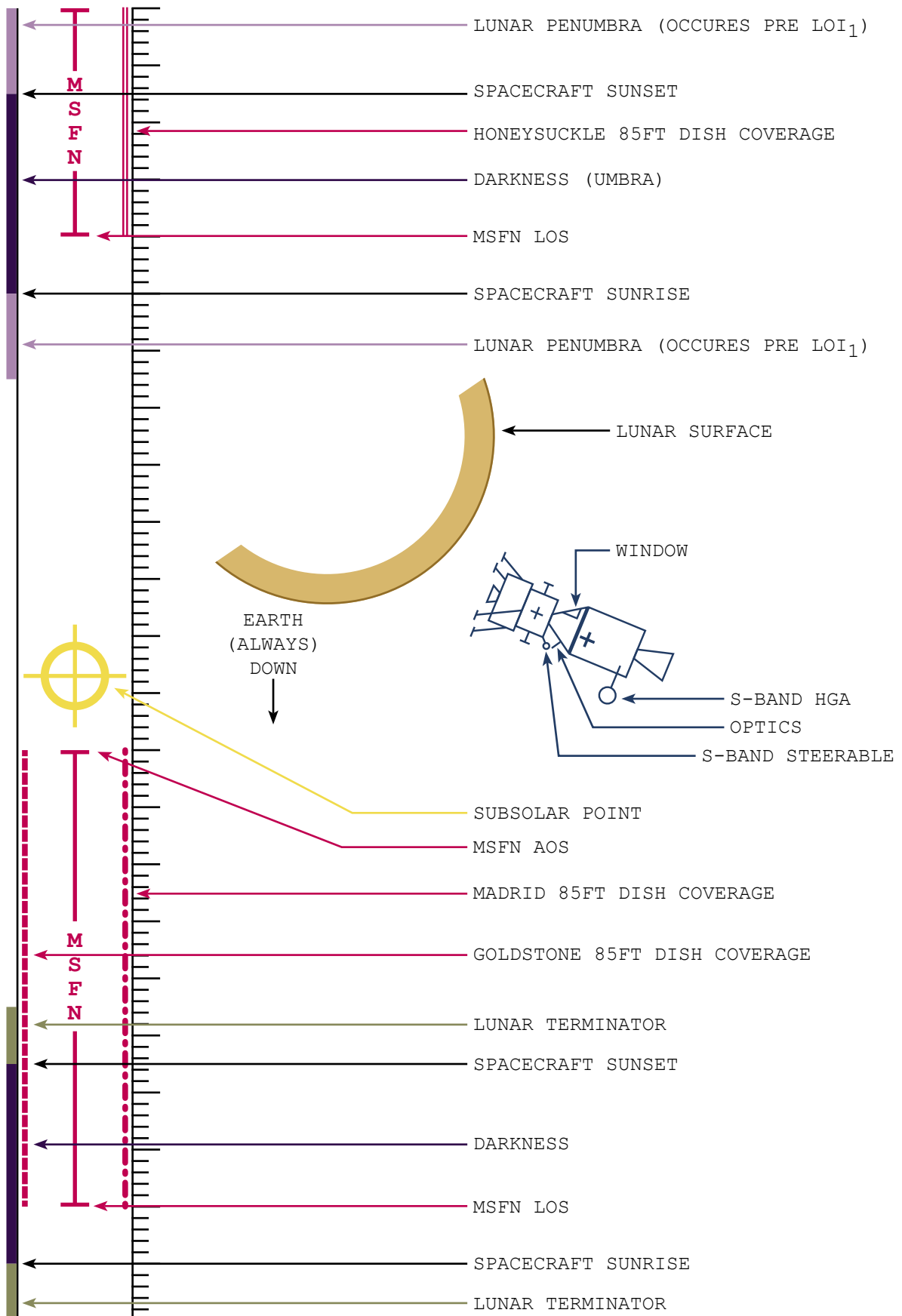
16mm/18/CEX-BRKT

16mm Camera/18mm Lens/Color Film External-Camera Bracket

MIR (f8,250,INF) 6fps

Mirror(f-stop 8, shutter speed=1/250 sec,Infinity) 6 frames per sec

# SYMBOL NOMENCLATURE



## INTRODUCTION

This Flight Plan has been prepared by the Flight Planning Branch, Flight Crew Support Division, with technical support by TRW Systems.

This document schedules the AS-506/CSM-107/LM-5 operations and crew activities to fulfill, when possible, the test objectives defined in the Mission Requirements, G Type Mission Lunar Landing.

The trajectory parameters used in this Flight Plan are for July 16, 1969 launch, with a 72° launch azimuth and were supplied by Mission Planning and Analysis Division as defined by the Apollo Mission G Spacecraft Operational Trajectory.

The Apollo 11 Flight Plan is under the configuration control of the Crew Procedures Control Board (CPCB). All proposed changes to this document that fall in the following categories should be submitted to the CPCB via a Crew Procedures Change Request:

1. Items that impose additional crew training or impact crew procedures.
2. Items that impact the accomplishment of detailed test objectives.
3. Items that result in a significant RCS or EPS budget change.
4. Items that result in moving major activities to a different activity day in the Flight Plan.
5. Items that require a change to the flight data file.

The Chief, Flight Planning Branch (FCSD) will determine what proposed changes fall in the above categories.

Mr. T. A. Guillory will act as co-ordinator for all proposed changes to the Apollo 11 Flight Plan.

Any requests for additional copies or changes to the distribution lists of this document must be made in writing to Mr. W. J. North, Chief, Flight Crew Support Division, MSC, Houston, Texas.

SECTION I

**GENERAL**



## MISSION DESCRIPTION

### 1. Launch and EPO (Duration 2:44) LIFT OFF - 2:44 GET

- (a) Nominal launch time is 9:32 EDT, July 16, 1969, with a launch window duration of 4 hrs. 24 min,
- (b) Earth orbit insertion into a 100 nm, circular orbit at 11 min. 43 sec. after lift-off
- (c) CSM systems C/O in earth orbit
- (d) Optional IMU realign (P52) to the pad REFSMMAT during the first night period
- (e) TLI occurs at 2:44:26 GET over the Pacific Ocean during the second revolution. (See Table 1-1 for burn data).

### 2. Translunar Coast (Duration 73:10) 2:44 - 75:54 GET

After TLI, which places the spacecraft in a free lunar return trajectory, the following major events occur prior to LOI:

- (a) Transposition, docking and LM ejection, including SIVB photography
- (b) Separation from SIVB and a CSM evasive maneuver
- (c) SIVB propulsive venting of propellants (slingshot)
- (d) Two series of P23 cislunar navigation sightings, star/earth horizon, consisting of five sets at 06:00 GET and five sets at 24:30 GET
- (e) Four midcourse corrections which take place at TLI +9, TLI +24, LOI -22 and LOI -5 hours with DV nominally zero (See Table 1-1).
- (f) Passive thermal control (PTC) will be conducted during all periods when other activities do not require different attitudes.
- (g) LM inspection and housekeeping
- (h) LOI<sub>1</sub>, performed at 75:54:28 GET, ends the TLC phase.

3. Lunar Orbit (Duration 59:30) 75:54 - 135:24 GET

LOI Day (Duration 25:00) 69:00 - 94:00

- (a) LOI<sub>1</sub>
- (b) Photos of targets of opportunity
- (c) LOI<sub>2</sub>
- (d) Post LOI<sub>2</sub> LM entry and inspection. S-Band/UHF B Voice tests will be conducted.
- (e) Post LOI<sub>2</sub> Pseudo landmark tracking (one set of sightings)  
(See Table 1-4)
- (f) Rest period of 9 hours

DOI and EVA Day (Duration 28:00) 94:00 - 122:00 GET

- (a) Docked LM activation and checkout
- (b) Docked landing site landmark sighting (one set of sightings)  
(See Table 1-3)
- (c) Undocking and separation
- (d) DOI thru landing (See Figure 1-3 Powered Descent)
- (e) LM post touchdown and simulated liftoff
- (f) Rest period (LM) of 4 hours
- (g) CSM plane change
- (h) Rest period (CSM) of 4 hours
- (i) EVA prep
- (j) EVA for 2 hours 40 minutes
- (k) Post EVA
- (l) Rest period (LM) 4 hours 40 minutes
- (m) Rest period (CSM) 4 hours 50 minutes

Ascent and TEI Day (Duration 25:00) 122:00 - 147:00 GET

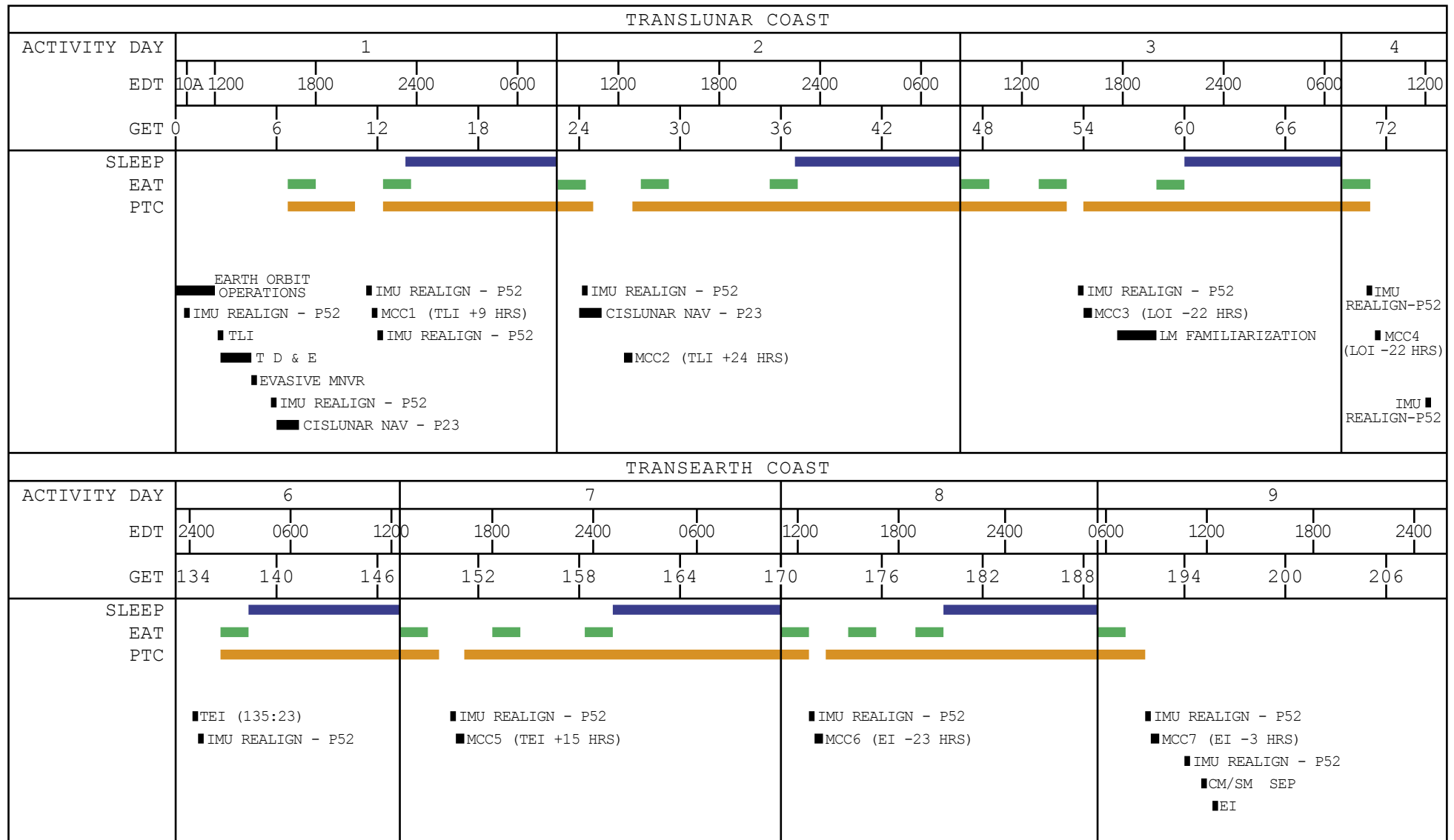
- (a) LM Lift-Off and Insertion
- (b) LM active rendezvous
  - CSI
  - PC
  - CDH
  - TPI
  - Braking



- (c) Docking
  - (d) LM jettison
  - (e) TEI
  - (f) Rest Period
4. Lunar Orbit Particulars (Average Values for a 60 x 60 nm orbit)
- (a) Revolutions start at 180° longitude
  - (b) Revolution duration - 1 hr. 58.2 min.
  - (c) S/C night period duration - 47 min.
  - (d) MSFN coverage per rev. - 72 min.
  - (e) Orbit inclination - 1.25° for July 16, 1969 launch
  - (f) S/C orbital rate - 3°/min. (.05°/sec)
  - (g) Lighting change at fixed ground point - 1°West/Rev.
  - (h) Horizon visibility ± 20° selenocentric angle on the lunar surface
  - (i) One lunar degree on lunar surface is 16.35 nm
  - (j) Site 2 will be visible (3° sun angle) at REV. 7
  - (k) S/C subvehicle point to horizon 327 nm.
5. Transearth Coast and Entry (Duration 59:39) 131:52 - 195:03 GET
- Transearth coast begins with TEI at 135:24:34 GET and consists of the following major events:
- (a) Three midcourse corrections are scheduled at TEI +15, EI -23 and EI -3 hours with DV nominally zero.
  - (b) CM/SM separation takes place at 194:51 GET and Entry Interface occurs at 195:03 GET.
  - (c) Splashdown will occur in the Pacific Ocean at a longitude of about 172.4° West at 195:17 GET. This will occur approximately 25 minutes prior to sunrise local time.

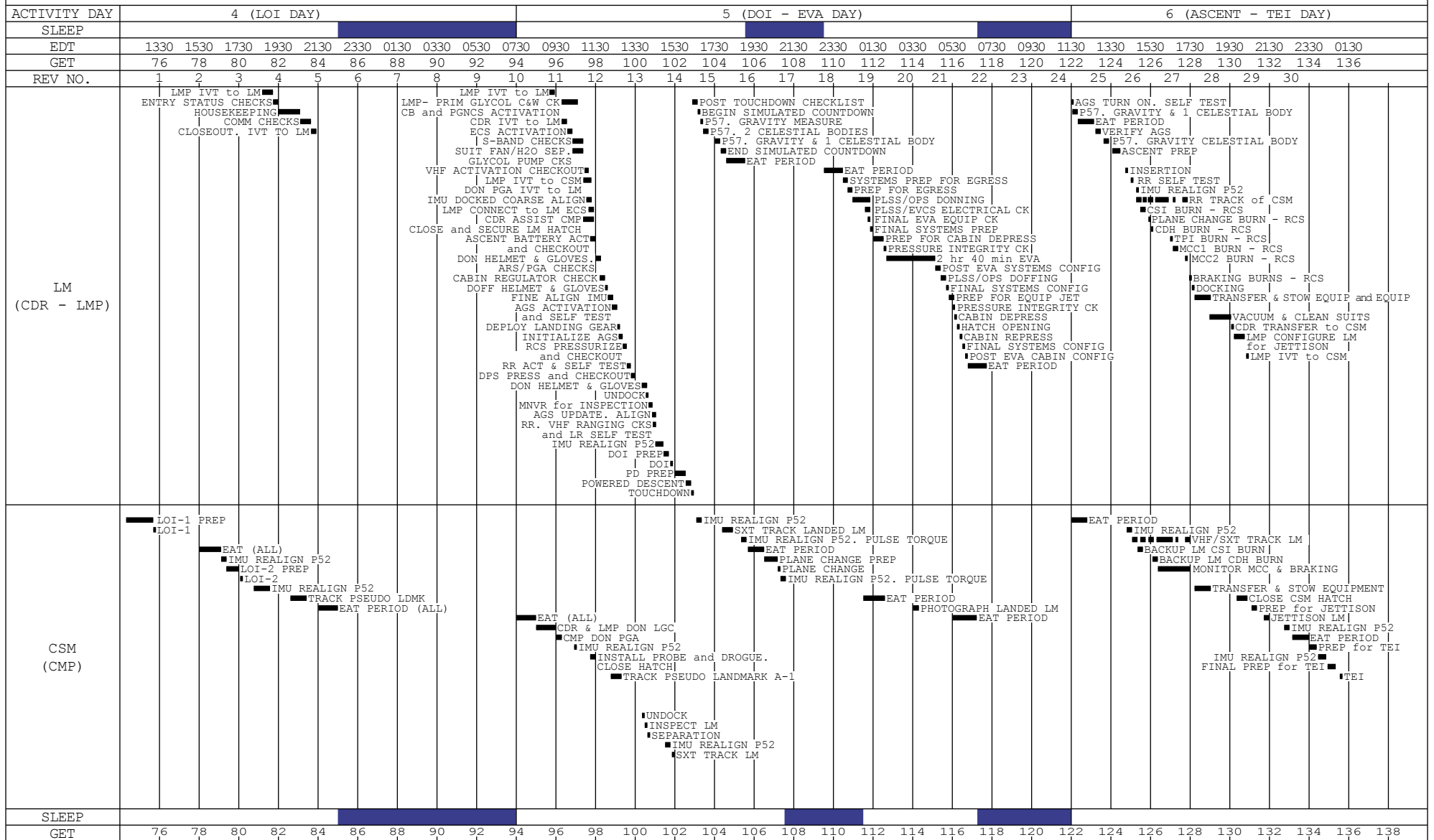


FIGURE 1-1  
MISSION SUMMARY FLIGHT PLAN

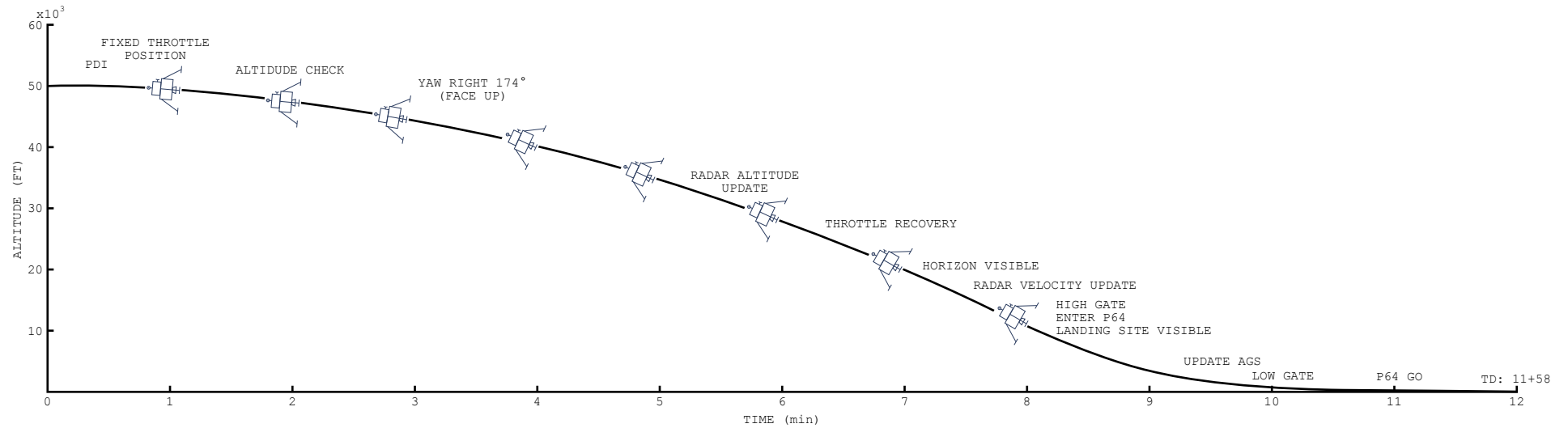


# LUNAR ORBIT SUMMARY FLIGHT PLAN

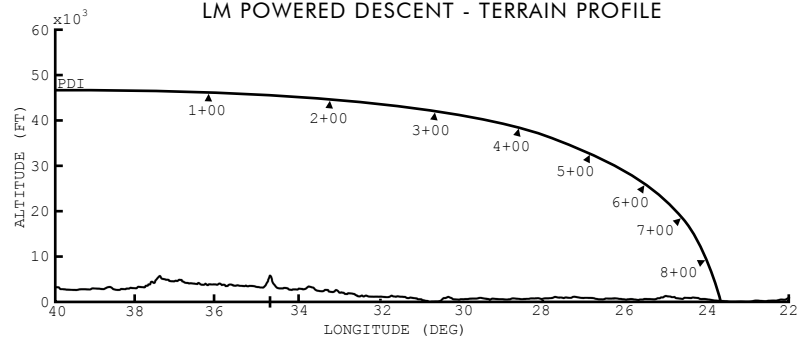
FIG 1 - 2



## LM POWERED DESCENT



## LM POWERED DESCENT - TERRAIN PROFILE



## LM POWERED DESCENT - HIGH GATE TO TD

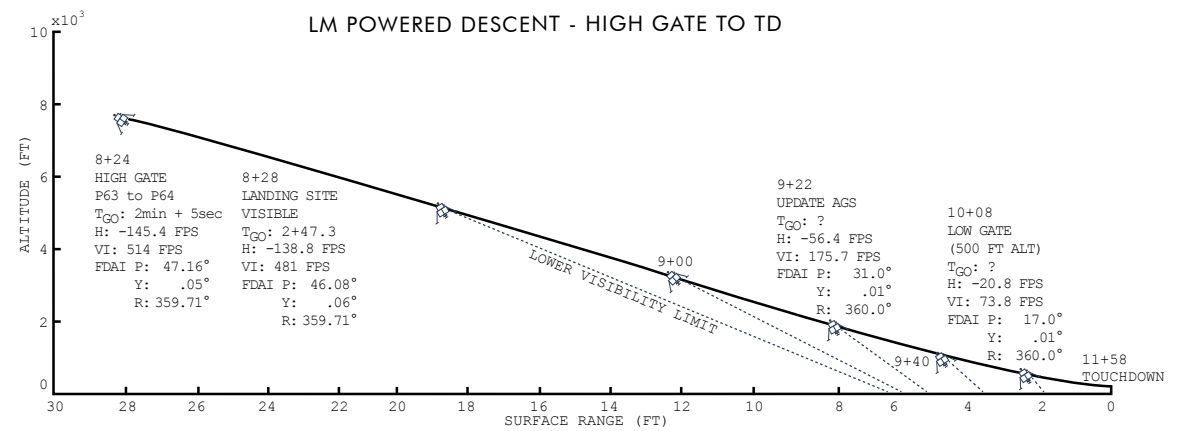


TABLE 1-1 CSM BURN SCHEDULE

BURN / MANEUVER	GETI BURN TIME ΔVC	ATTITUDE (DEG)		LIGHTING	ΔV (FPS)	ULLAGE	TVC MODE	REFSMAT	S/C WT. RESULTANT HA, HP	REMARKES
		LH/LV	INERTIAL							
S-IVB TLI	02:44:26 5 MIN 20 SEC			BURNOUT AT SUNRISE	ΔVX: -- ΔVY: -- ΔVZ: -- ΔV REQ: 10,451.2	----	----	PAD	WT: -- HP: -- HA: --	S-IVB BURN
CSM/LM S-IVB EVASIVE MNVR	04:39:44.9 2.8 SEC 15.6 FPS			DAYLIGHT	ΔVX: 5.1 ΔVY: 0.0 ΔVZ: 19.0 ΔV REQ: 19.7	NOT REQUIRED	G&N AUTO	PAD	WT: 96662.3 HP: 123.8 HA: 281953.9	SPS BURN
MIDCOURSE CORRECTIONS MCC <sub>1</sub> TO MCC <sub>4</sub>	11:45 26:45 53:55 70:55			----	ΔVX: NOMINALLY ΔVY: ZERO ΔVZ: -- ΔV REQ:	NOT REQUIRED	G&N AUTO	PAD PTC PTC LDG SITE	----	TLI +9 TLI +24 LOI -22 LOI -5
LOI <sub>1</sub>	75:54:28.4 5 MIN 58.9 SEC 2914.8 FPS			DAYLIGHT (SS -1 HR 7 MIN)	ΔVX: -2891.8 ΔVY: -433.1 ΔVZ: 20.4 ΔV REQ: 2924.1	NOT REQUIRED	G&N AUTO	LDG SITE	WT: 95207.4 HP: 59.2 HA: 169.8	SPS BURN
LOI <sub>2</sub>	80:09:29.7 16.4 SEC			DAYLIGHT (SR +9 MIN)	ΔVX: 138.3 ΔVY: 0.0 ΔVZ: 75.9 ΔV REQ: 157.8	2 JET 20 SEC	G&N AUTO	LDG SITE	WT: 71320.81bs HP: 53.6 HA: 65.6	SPS BURN
CSM/LM SEP	100:39:50.4 8 SEC			SUNLIGHT (SS -14 MIN)	ΔVX: 0.0 ΔVY: 0.0 ΔVZ: 2.5 ΔV REQ: 2.5	----	G&N AUTO	LDG SITE	WT: 36407.9 HP: 55.6 HA: 63.1	RCS BURN
*CSM PLANE CHANGE	107:05:33.4 0.8 SEC 5.7 FPS			DARKNESS (SS +17 MIN)	ΔVX: 0.0 ΔVY: 16.6 ΔVZ: 0.0 ΔV REQ: 16.6	2 JET 20 SEC	G&N AUTO	PLANE CHANGE	WT: 36325.4 HP: NO CHANGE HA: NO CHANGE	SPS BURN
LM JETTISON	131:53:04.7 3.1 SEC 0.8 FPS			DAYLIGHT (SR +36 MIN)	ΔVX: -1.0 ΔVY: -- ΔVZ: -- ΔV REQ: 1.0	----	G&N AUTO	LIFT OFF	WT: 36154.7 HP: 58.5 HA: 59.4	RCS BURN
TEI	135:24:33.8 2 MIN 29.4 SEC NOT AVAILABLE			DAYLIGHT (SR +10 MIN)	ΔVX: 3213.3 ΔVY: 705.0 ΔVZ: -138.8 ΔV REQ: 3292.7	2 JET 16 SEC	G&N AUTO	LIFT OFF	WT: 36111.4 HP: -- HA: --	SPS BURN
MIDCOURSE CORRECTIONS MCC <sub>5</sub> TO MCC <sub>7</sub>	150:24 172:00 192:06			----	ΔVX: -- ΔVY: NOMINALLY ΔVZ: ZERO ΔV REQ:	----	G&N AUTO	PTC PTC ENTRY	----	TEI +15 EI -23 EI -3

TABLE 1-2 LM BURN SCHEDULE

BURN / MANEUVER	GETI BURN TIME ΔVC	ATTITUDE (DEG)		LIGHTING	ΔV (FPS)	ULLAGE	TVC MODE	REFSMAT	S/C WT. RESULTANT HA, HP	REMARKS
		LH/LV	INERTIAL							
DOI	101:38:48 28:5 SEC			DARKNESS (SR -4 MIN)	ΔVX: 67.46 ΔVY: -28.68 ΔVZ: -12.51 ΔV REQ: 70	2 JET 7.5 SEC 1.3 FPS	PGNCS AUTO	LDG SITE	WT: 33,404 HP: 8.97 HA: 57.87 nM	DPS BURN
PDI	102:35:13 11 MIN 58 SEC			DAYLIGHT	ΔVX: - ΔVY: - ΔVZ: - ΔV REQ: 6766	2 JET 7.5 SEC 1.3 FPS	PGNCS AUTO	LDG SITE	WT: 16,569 HP: 0 HA: 0	DPS BURN
ASCENT	124:23:26 7 MIN 18 SEC			DAYLIGHT	ΔVX: - ΔVY: - ΔVZ: - ΔV REQ: 6060	----	PGNCS AUTO	LIFT OFF	WT: 5,894 AT INS HP: 60,000 ft HA: 45 nM	APS BURN
CSI	125:21:19.1 45:0 SEC			DARKNESS (SR -1 MIN)	ΔVX: 49.5 ΔVY: 0.0 ΔVZ: 0.0 ΔV REQ: 49.5	----	PGNCS AUTO	LIFT OFF	WT: 5875.0 HP: 44.9 HA: 45.0	RCS BURN
PLANE CHANGE	125:50:28 0			DAYLIGHT (SR +25 MIN)	ΔVX: 0.0 ΔVY: 0.0 ΔVZ: 0.0 ΔV REQ: 0.0	----	PGNCS AUTO	LIFT OFF	WT: - HP: - HA: -	RCS +Y 2 JET BURN NOMINALLY ZERO
CDH	126:19:37.0 1.9			DAYLIGHT (SS -19 MIN)	ΔVX: -1.1 ΔVY: 0.0 ΔVZ: 4.1 ΔV REQ: 4.3	----	PGNCS AUTO	LIFT OFF	WT: 5842.9 TIG HP: 43.8 HA: 45.3	RCS BURN
TPI	126:58:08.4 22.4 SEC			DARKNESS (SR -23 MIN)	ΔVX: 22.0 ΔVY: 0.0 ΔVZ: -11.1 ΔV REQ: 24.8	----	PGNCS AUTO	LIFT OFF	WT: 5840.1 HP: 43.3 HA: 61.7	RCS BURN
MCC <sub>1</sub>	127:13:08 0			DARKNESS (SR -8 MIN)	ΔVX: 0.0 ΔVY: 0.0 ΔVZ: 0.0 ΔV REQ: 0.0	----	PGNCS AUTO	LIFT OFF	WT: - HP: - HA: -	RCS +Z 2 JET BURN NOMINALLY ZERO
MCC <sub>2</sub>	127:28:08 0			DAYLIGHT (SR +7 MIN)	ΔVX: 0.0 ΔVY: 0.0 ΔVZ: 0.0 ΔV REQ: 0.0	----	PGNCS AUTO	LIFT OFF	WT: - HP: - HA: -	RCS +Z 2 JET BURN NOMINALLY ZERO
1st BRAKING MNVR	127:36:57 0			DAYLIGHT (SR +15 MIN)	ΔVX: 0.0 ΔVY: 0.0 ΔVZ: 0.0 ΔV REQ: 0.0	----		LIFT OFF	WT: - HP: - HA: -	RCS -Z 2 JET BURN NOMINALLY ZERO
2nd BRAKING MNVR	127:39:24.5 10.8 SEC			DAYLIGHT (SR +18 MIN)	ΔVX: - ΔVY: - ΔVZ: - ΔV REQ: 12.0	----	PGNCS AUTO	LIFT OFF	WT: 5824.1 HP: 49.0 HA: 60.7	RCS -Z 2 JET
3rd BRAKING MNVR	127:40:32.8 8.8 SEC			DAYLIGHT (SR +20 MIN)	ΔVX: - ΔVY: - ΔVZ: - ΔV REQ: 9.8	----	PGNCS AUTO	LIFT OFF	WT: 5816.4 HP: 53.7 HA: 60.3	RCS -Z 2 JET
4th BRAKING MNVR	127:42:16.1 4.3 SEC			DAYLIGHT (SR +21 MIN)	ΔVX: - ΔVY: - ΔVZ: - ΔV REQ: 4.6	----	PGNCS AUTO	LIFT OFF	WT: 5810.1 HP: 56.2 HA: 60.1	RCS -Z 2 JET
5th BRAKING MNVR	127:43:35.7 4.2 SEC			DAYLIGHT (SR +23 MIN)	ΔVX: - ΔVY: - ΔVZ: - ΔV REQ: 4.7	----	PGNCS AUTO	LIFT OFF	WT: 5807.0 HP: 69.9 HA: 58.9	RCS -Z 2 JET

TABLE 1-3 LUNAR LANDING SITE DATA

DAY	SITE DESIG	LATITUDE	LONGITUDE	<sup>1</sup> LAUNCH AZIMUTH/ SUN ELEVATION	<sup>2</sup> LAUNCH AZIMUTN/ SUN ELEVATION
JULY 16 0932 EDT	2 (IIP6)	00°42'50"N 00.71388889°N (00.6914°N)	23°42'28"E 23.70777778°E (23.7169°E) <sup>3</sup>	72°/10.5°	108°/13.5°
JULY 18 1132 EDT	3 (IIP8)	00°21'10"N 00.35277778°N	01°17'57"W 01.29916667°W	89.295°/11°	108°/13°
JULY 21 1209 EDT	5 (IIP13)	01°40'41"N 01.67805556°N	41°53'57"W 41.89916667°W	94.6775°/9.7°	108°/11.7°

Data From TJ memo, Accuracy Estimates, Landing Site Landmarks,  
May 12, 1969, TJ-69-499.

<sup>1</sup>Sun Elevation Angles Are For Approximately 27 Hours After LOI, 1st Opportunity TLI.

<sup>2</sup>Includes 2nd Opportunity TLI.

<sup>3</sup>Data From MPAD memo, landing site coordinates for G,  
June 12, 1969, 69-FM41-181.

TABLE 1-4 LANDMARK TRACKING DATA  
July 16 Launch

LANDMARK DESIG.	LATITUDE	LONGITUDE	DELTA ALTITUDE (nm)	SUN EL
Al (Pseudo)	2°N 2.000°N	65° 30'E 60.500°E	000.00	43°
IP (130)	1°53'N 1.885°N	28°42'E 28.726°E	000.00	--
130 (Prime LDG SITE 2)	01°15'56"N 01.26555556°N (01.24307°N)	23°40'44"E 23.67888889°E (23.6880°E) <sup>1</sup>	-001.68	8.5°
123 (Alternate LDG SITE 2)	00°30'19"N 00.50527778°N	24°53'20"E 24.88888889°E	-001.71	--
129 (Alternate LDG SITE 2)	01°17'06"N 01.28500000°N	23°44'37"E 23.74361111°E	-001.76	--
133 (Alternate LDG SITE 2)	00°47'14'°N 00.78722222°N	23°30'55"E 23.51527778°E	-001.68	--

<sup>1</sup>Data from MPAD memo, landing site 2 position,  
June 20, 1969, 69-FM41-199.



TABLE 1-4 LANDMARK TRACKING DATA (CONT'D)  
July 18 Launch

LANDMARK DESIG.	LATITUDE	LONGITUDE	DELTA ALTITUDE (nm)	SUN EL
IP(G1)	0°16'N 0.267°N	32°19'E 32.317°E	--	--
G1(129)	01°17'06"N 01.28500000°N	23°44'37"E 23.74361111°E	-001.97	26°
IP(143)	00°18'N 00.300°N	3°23'E 3.383°E	--	--
143(Prime LDG SITE 3)	00°36'51"N 00.61416667°N	01°04'39"W 01.07750000°W	-001.01	9°
150(Alternate LDG SITE 3)	00°16'59"N 00.28305556°N	01°25'43"W 01.42861111°W	-001.01	--
147(Alternate LDG SITE 3)	00°03'42"N 00.06166667°N	01°16'36"W 01.27666667°W	-000.99	--

TABLE 1-4 LANDMARK TRACKING DATA (CONT'D)  
July 21 Launch

LANDMARK DESIG.	LATITUDE	LONGITUDE	DELTA ALTITUDE (nm)	SUN EL
IP(G1)	0°30'S 0.500°S	26°33'W 26.550°W	--	--
G1	1°42'N 1.696°N	32°10'W 32.162°W	-001.77	8°
IP(180)	0°36'N 0.608°N	36°34'W 36.567°W	--	--
180(PRIME LDG SITE 5)	01°30'37"N 01.51027778°N	41°49'05"W 41.81805556°W	-001.25	8.9°
171(Alternate LDG SITE 5)	01°20'04"N 01.33444444°N	40°47'34"W 40.79271778°W	-001.29	--
178(Alternate LDG SITE 5)	01°45'33"N 01.75916667°N	41°34'12"W 41.57000000°W	-001.22	--
184(Alternate LDG SITE 5)	02°03'10"N 02.05277778°N	42°13'41"W 42.22805556°W	-001.23	--



## FLIGHT PLAN NOTES

### A. Crew

1. Crew designations are as follows:

<u>Designation</u>	<u>Prime</u>	<u>Backup</u>
Commander (CDR)	Armstrong	Lovell
Command Module Pilot (CMP)	Collins	Anders
Lunar Module Pilot (LMP)	Aldrin	Haise

2. Crew positions during the mission are as follows:

	<u>CSM</u>			<u>LM</u>	
	<u>Left</u>	<u>Center</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Launch thru TLI	CDR	LMP	CMP		
T&D thru Entry	CMP	CDR	LMP		
Manned LM	CMP			CDR	LMP

3. The crew will eat and sleep simultaneously throughout the mission. Eat periods will be normally 1-hour duration, with additional activities held to a minimum during this time frame. Sleep periods will normally be 8 to 10 hour duration with two 4 to 5 hour sleep periods while the LM is on the lunar surface.

### 4. Activity

### PGA Configuration

Launch to insertion	PGA's with helmet & gloves (H&G)
Insertion to TLI	PGA's without H&G
TLI to evasive mnvr	PGA's with H&G
TLC & LOI 1&2	Constant wear garments
LM activation & checkout	PGA without H&G (CMP H&G donned for latch cocking & CDR/LMP H&G donned for pressure integrity check and cabin reg check)
Undocking through touchdown	PGA's with H&G except CMP without H&G after DOI
Touchdown through pre lift-off	PGA's without H&G except for CDR/LMP simulated count- down & EVA
Liftoff through LM jettison	PGA's with H&G (except H&G off after docking)
LM jettison through splashdown	Constant wear garmets

5. Two crew status reports via air-to-ground commmunications will be made by the flight crew during each activity day. The first report will be given after the first meal of the day and will concern the sleep obtained during the previous sleep period. The second report will be given following the final meal of the day and will concern the radiation dose received during the previous 24 hours and medication taken if any. The following information should be logged:

- Food Consumption
- Exercise
- Used fecal bags marked as to crewman and GET

6. Negative reporting will be used in reporting completion of each checklist.

7. Continuous CSM biomedical data are automatically transmitted to the ground.

8. LM biomedical switching is performed manually by the LMP from undocking to docking as scheduled in the timeline.

9. All onboard gage readings will be read directly from the gages.  
and will not be corrected by the appropriate calibration factors.

## B. Photography

Photographic requirements were derived from the following:

- a. Lunar Surface Operations Plan
- b. Photographic Operations Plan

## C. Procedures

### 1. CSM

Crew procedures called out in the flight plan may be found in the following documents:

- a. Apollo Operations Handbook - CSM-107 (AOH), Volume 1/2
- b. Crew Checklist
- c. CSM Rendezvous Procedure
- d. Abort Summary Document
- e. Apollo Entry Summary Document
- f. Photographic Operations Plan
- g. Descent Procedures Document
- h. Ascent Procedures Document
- i. Lunar Landmark Tracking Attitude Studies
- j. Lunar Orbit Attitude Sequence for Mission G
- k. Data Priority Documents

### 2. LM

Crew procedures called out in the flight plan may be found in the following documents:

- a. Apollo Operations Handbook LM-5 Volume 1/2
- b. Crew Checklist
- c. LM Rendezvous Procedures
- d. LM Descent/Ascent Summary Document
- e. Lunar Landing Phase Photographic Operations Plan
- f. Data Priority Documents
- g. EVA Procedures
- h. Apollo Lunar Surface Operations Plan

## D. Communications

### 1. General

- a. CSM and LM HBR data transmissions in lunar orbit will normally require the use of the high gain or steerable antennas
- b. During communications, the spacecraft will be referred to by name (Apollo 11) and MCC-H will be referred to as Houston.
- c. The preferred S-Band communications are:
  - (1) CSM
    - (a) Uplink Mode 6 (Voice, PRN, and Updata)
    - (b) Downlink Mode 2 (Voice, PRN, TLM-HBR)
  - (2) LM
    - (a) Uplink Mode 7 (Voice, Updata)
    - (b) Downlink Mode 1 (Voice, TLM-HBR)
- d. LM voice recorder has a maximum utilization of 10 hours. This recorder will be used during LM operations to record all LM voice data during undocked operations (27 hours 42 minutes). This recorder will be operated in the VOX mode.
- e. A small portable voice recorder will be carried in the CM to be used at the discretion of the crew as a voice recorder back-up. This recorder will not be transferred to the LM for use during undocked operations.
- f. The S-band "squellch" will be on during the sleep periods in order to prevent MSFN fade-out noise from disturbing the crew.

## 2. DSE Operation

- a. The DSE will normally be operated via ground command except for special cases where the operation is time limited. In these cases the crew may be asked to rewind the tape.
- b. During the earth orbit period when the CSM is not over a MSFN station, CSM TLM-LBR data will be recorded on the DSE and will be dumped during the pass over the US and over CRO prior to TLI if possible.
- c. DSE will be used for CSM HBR and voice recording during all CSM engine burns.
- d. DSE data and voice recordings will be made in CSM LBR mode whenever possible in order to minimize the DSE dump time.
- e. During PTC using the HGA REACQ communications mode the DSE will be used to record LBR data when the HGA is not in the MSFN field of view.
- f. During lunar orbit LM operations, the DSE will be used to record LM-TLM-LBR data during all docked LM activities that occur on the lunar farside. For undocked LM activities only DOI will be recorded as VHF ranging is required.
- g. DSE will be used to record all HBR entry data during the blackout region.

## 3. Launch - Earth Orbit Phase

- a. OMNI B and VHF LEFT will be selected for lift off. OMNI D will be selected by the crew during boost phase if the launch azimuth is less than 96° or OMNI C if the launch azimuth is greater than 96°. OMNI D will probably be the best antenna for earth orbit.
- b. VHF Duplex B will be used for launch, and Simplex A for earth orbit operations.
- c. VHF Simplex A will be used for entry to be compatible with recovery forces communications.

## 4. Translunar and Transearth Coast Phase

The translunar and transearth sleep communications mode will be as follows. The CSM x-axis will be placed normal to the ecliptic plane. The CSM will be rolled at a rate of approximately three revolution per hour. During the near earth sleep periods prior to 30 hours GET (range less than 120Knm) omni antennas B and D will be used. During the other sleep periods (beyond 120Knm) the high gain antenna may be required (in the REACQ mode). The REACQ configuration will provide approximately 210 degrees of HGA coverage per CSM/LM revolution or 35 minutes of MSFN coverage per hour. The REACQ configuration will also allow MCC-H to use real time control to select TLM HBR or LBR and to dump the DSE during each spacecraft revolution.

## 5. Lunar Exploration Phase

- a. Normal CSM communications between MSFN/LM will be by S-Band during the lunar exploration period.
- b. If additional communications capability is required the S-Band erectable antenna will be deployed by the EVA crewman and will be utilized for all LM/MSFN/CSM communications.
- c. During periods when both crewmen are EVA, the „AR“ position (Relay Mode) will be the normal communication mode on each of the Extravehicular Communication System (EVCS). The CDR will relay the LMP VHF voice and data to the LM which in turn will relay to MCC-H via S-Band.

## E. CSM Notes

### 1. Electrical Power System and Water Management

- a. Spacecraft lift-off switch positions are listed in the Apollo Operations Handbook (Volume 2) for CSM 107.
- b. The CSM will remain fully powered up throughout the mission (CMC, IMU and SCS in the „operate“ configuration and optics power-up as required).
- c. Fuel cell H<sub>2</sub> and O<sub>2</sub> purging is scheduled as follows H<sub>2</sub> approximately every 48 hours and O<sub>2</sub> approximately every 12 hours.

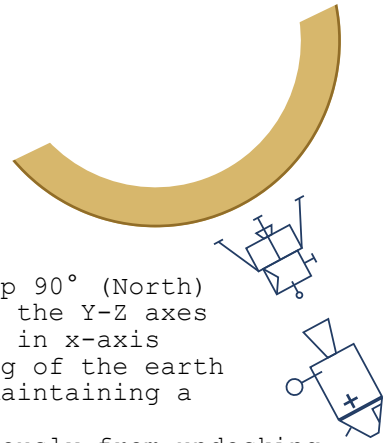
- d. The hydrogen and oxygen VAC ION pumps will be inactive throughout the mission.
- e. Potable water will be chlorinated once a day before each sleep period, starting with the First sleep period (GET 13:30).  
The POT H<sub>2</sub>O inlet valve will be opened prelaunch.
- f. FC purges and waste water dumps will not be scheduled within one hour prior to optical sightings.
- g. Waste H<sub>2</sub>O dumping will be managed to allow:
  - (1) Maximum QTY: 85-90%
  - (2) Minimum QTY: 25%
  - (3) At LOI: QTY = 75%
  - (4) At CM-SM SEP: QTY = 90% to 100%
  - (5) No dumping after MCC3 until after LOI
  - (6) Dumps will be performed (if required) within 2 hours preceding MCC maneuvers
  - (7) In lunar orbit if dumping is required, dumps will be performed immediately prior to sleep periods
  - (8) The water dump will not be operated in the automatic mode at anytime during the mission
- h. The cryogenic heaters will be in AUTO during the mission and the fans will be operated manually. The fans will be cycled for one minute before and after each sleep cycle.
- i. The batteries will be charged according to the following schedule:

<u>Time</u>	<u>Battery</u>
5:20:00	B
12:20:00	A
48:10:00	B
80:25:00	A
103:30:00	B
148:00:00	A
154:00:00	B

- 2. Environmental Control System and Cabin Pressurization
  - a. One CO<sub>2</sub> odor absorber filter (LiOH canister) is changed approximately every 12 hours or if CO<sub>2</sub> partial pressure is greater than 7.6mm Hg. There are 20 filters (2 in the canisters onboard and 18 stowed).
  - b. A Pre TLI/LOI ECS redundant component check including the secondary evaporator operation, is performed prior to TLI and LOI. The secondary evaporator water control valves will be turned „OFF“ after the check.
  - c. The evaporator operation will be as follows:
    - (1) Launch - primary loop operation
    - (2) Earth Orbit - primary loop operation and secondary loop test plus redundant operation test prior to TLI.
    - (3) Post TLI - deactivate both evaporators
    - (4) Pre LOI-ECS pre TLI/LOI redundant component check and primary evaporator activation
    - (5) Post TEI - deactivate primary evaporator
    - (6) Entry interface minus 1 hour - activate primary and secondary evaporator.

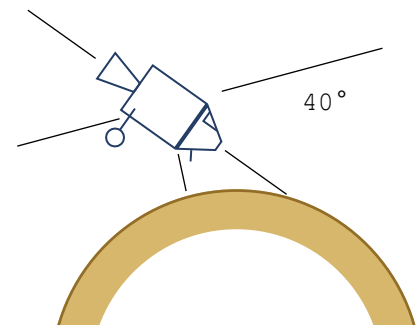
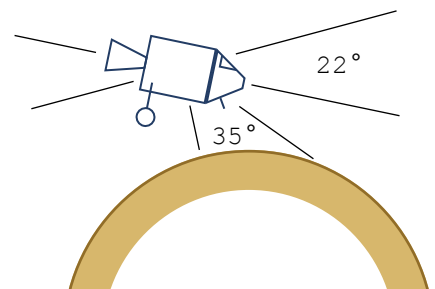
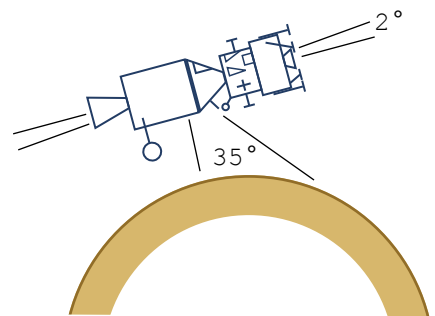
### 3. Guidance and Navigation

- a. During lunar orbit, the CSM and LM will utilize the same landing site REFSMMAT such that the gimbal angles would be 0,0,0 at landing with the LM sitting face forward on landing site number two and the CSM over the landing site pitched up  $90^\circ$  from local horizontal „heads up“.
- b. During PTC the CSM/LM x-axis is pitched up  $90^\circ$  (North) for TLC and down  $90^\circ$  (South) for TEC with the Y-Z axes in the plane of the ecliptic. This change in x-axis pointing is to enable simultaneous viewing of the earth and moon through the side windows while maintaining a favorable high gain antenna position.
- c. The CSM tracking light will be on continuously from undocking to landing and from LM lift-off to docking.



### 4. Landmark Tracking

- The following ground rules were used for landmark tracking.
- a. IMU to be realigned on the dark side preceding each tracking period.
  - b. MSFN is reacquired after each tracking period. The tracking data will be acquired by MSFN after all the marks have been made and while N49 ( $\Delta R, \Delta V$ ) is displayed. MSFN will give a GO when data acquisition has been verified.
  - c. The pseudo landmark tracking (A1) will be used to determine the altitude of an area in which the LM will be making altitude checks after DOI. The data will be processed during the sleep period after the trackings and relayed to the LM prior to undocking.
  - d. In the docked configuration the CSM/LM approaches the landmark in an inertial hold attitude. This inertial attitude places the spacecraft  $2^\circ$  below the local horizontal at the  $35^\circ$  elevation angle point. At  $35^\circ$  elevation angle a pitch down of  $0.3^\circ/\text{sec}$  is initiated. Five marks are then taken with the time between marks a minimum of 25 seconds. (See tracking profile)
  - e. In the undocked configuration the CSM approaches the landmark in ORB RATE and pitched down  $22^\circ$  from the local horizontal. At  $35^\circ$  elevation angle five marks are taken with the time between marks a minimum of 25 seconds. ORB RATE is continued throughout the marking period.
  - f. In the undocked COAS tracking the CSM will approach the LM in ORB RATE heads up and pitched down  $40^\circ$  from the local horizontal. When the LM is centered in the COAS the CSM will initiate a  $40^\circ$  variable pitch rate to keep the LM centered in the COAS.



5. CSM/LM and CSM attitude maneuvers will normally be at a rate of  $0.2^{\circ}/\text{sec}$  or  $0.5^{\circ}/\text{sec}$ . Unless other rates are required.  
NOTE: At  $0.2^{\circ}/\text{sec}$ , 15 minutes is required to maneuver  $180^{\circ}$ .  
At  $0.5^{\circ}/\text{sec}$ , 6 minutes is required to maneuver  $180^{\circ}$ .
6. Passive thermal control mode will be initiated after MCC1 or as soon as MCC1 is scrubbed and maintained throughout the mission (except in lunar orbit) until at least three hours before entry except for interruptions for midcourse corrections, communications orientation (maximum interruption of three hours). PTC will not be initiated before approximately 7:00 GET.
7. Service Propulsion System All SPS burns will be initiated on Bank A except LOI1 which will be initiated on Bank B.

#### F. LM Notes

1. Entries into the LM
  - a. Three entries into the LM are scheduled in the timeline at 56:30, 81:30 and 95:52 GET respectively.
  - b. The first entry (56:30 GET) will be for LM familiarization and will be performed by the CDR and LMP in the constant wear garments. During this period there will be approximately 5 minutes of VHF-B LBR data which will be recorded by the DSE in the CSM. The LM will remain on CSM power during the crew familiarization period.
  - c. The second entry (81:30 GET) will be for LM housekeeping and will be performed by the LMP in constant wear garments. During this period the LM will go to internal power for the S-Band/VHF B voice activation.
  - d. The third entry into the LM (95:52 GET) will be performed by the LMP in LCG's to prepare the LM for undocking and descent to the lunar surface. During this period the LMP and CDR initially transfer to the LM in LCG's then return to the CSM for PGA donning.
2. Environmental Control System and Cabin Pressurization
  - a. The LM cabin will contain ambient air at lift off and will bleed down to zero pressure psi during the launch.
  - b. The LM will be pressurized for transposition and docking after which it will be isolated and the pressure periodically monitored.
  - c. The LM will be pressurized prior to the first entry (LM familiarization) after which it will be isolated again for the remainder of the TLC period.
  - d. Prior to the second entry (LM housekeeping) it will be pressurized again and will remain pressurized.
3. Guidance and Navigation
  - a. Two LGC erasable memory dumps and MCC-H verifications will be accomplished prior to DOI. If a significant number of errors are found, memory correction and re-verification will be performed before DOI.
  - b. The LM IMU will be manually aligned to the CSM IMU during the DOI Day LM activation and checkout. P52/AOT alignments will be performed as close to DOI as possible.
  - c. All translations during the undocked manned LM operations will be under PGNCs control.
  - d. The capability for MCC-H to update the LGC via uplink will normally be blocked by the LMP UP-DATA LINK switch (panel 12).
4. RCS Operation and Interface Constraints
  - a. During CSM/LM docked checkout operations, the LM steerable and/or RR antennas will not be powered down once they have been activated. The SM B3 and C4 thrusters will be deactivated before the LM steerable and/or RR antennas have been unstowed in order to prevent SM-RCS impingement on these antennas.



- b. The CSM roll jets and LM yaw jets will be disabled when the probe is preloaded (docking latches are cocked) and the tunnel is pressurized prior to undocking. The jets will be activated after tunnel venting.
  - c. LM RCS two jet ullage (System B) will be used for unstaged ullage maneuvers in order to prevent asymmetrical RCS thrust caused by impingement on the descent stage.
  - d. The RCS interconnect will be used during the APS lift-off and ascent, but will not be used during the rendezvous maneuvers.
5. Rendezvous
- a. The rendezvous radar will be pointed away from the sun and will be turned off when no functional use is required to prevent overheating of the antenna.
  - b. The LM tracking light will be on continuously between separation and touchdown and between launch and docking except during PGNCs/AOT alignments. During PGNCs/AOT alignments (LM P52), the tracking light would interfere with the alignments. (dark adaption)

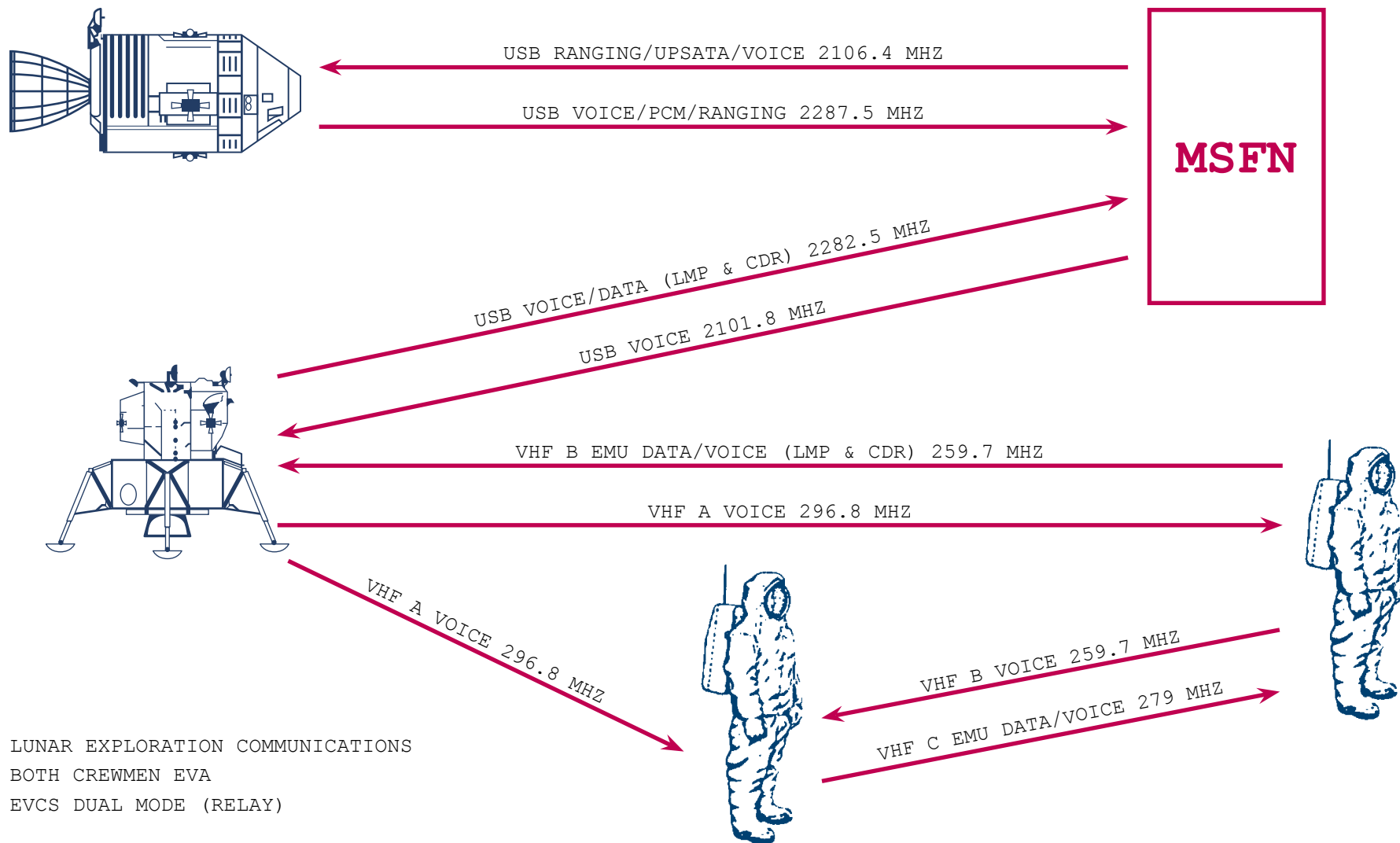
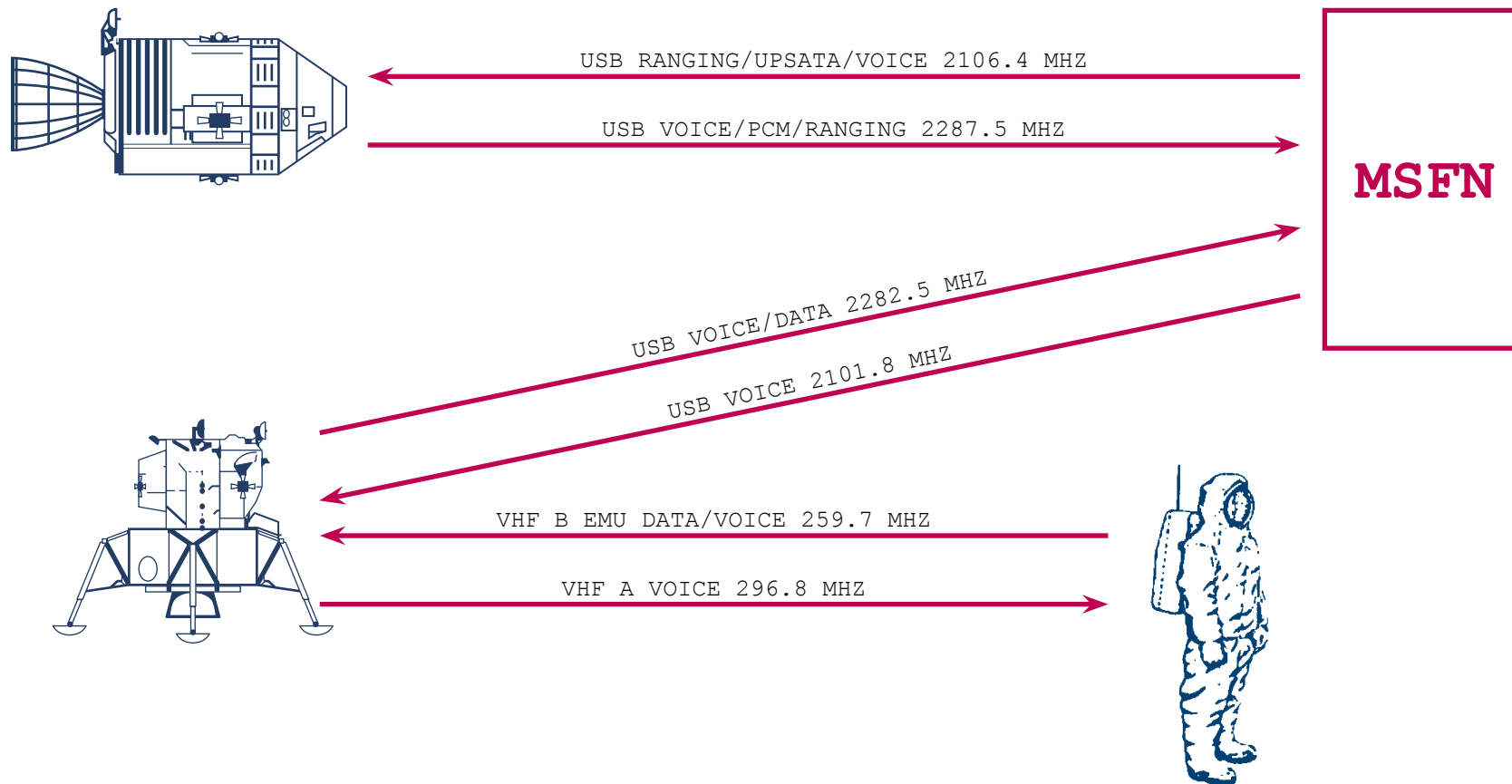


FIGURE 1-4



LUNAR EXPLORATION COMMUNICATIONS  
ONE CREWMEN EVA  
PRIMARY MODE

FIGURE 1-5



SECTION II

**UPDATE FORMS**



## UPDATE FORMS

This section contains the update pads which are in the Flight Data File onboard the spacecraft.

The CSM forms are as follows:

1. TLI Maneuver
2. P37 Block Data
3. P27 Update
4. P30 Maneuver (External  $\Delta V$ )
5. P76
6. CSM Rendezvous Rescue
7. Lunar Entry
8. Earth Orbit Entry
9. Earth Orbit Block Data

The LM forms are:

1. P27 Update
2. AGS State Vector Update
3. Phasing P30 LM Maneuver
4. P30 LM Maneuver
5. DOI Data
6. PDI Data
7. Lunar Surface
8. LM Ascent
9. CSI Data
10. CDH Data
11. TPI Data

TLI	TLI												TLI
	X	•		•		X	•		•		TB6p		
APRIL 1, 1969	X	X	X			X	X	X			R P Y TLI		
	X	X	X			X	X	X					
	X	X	X			X	X	X					
	X	X	X	•		X	X	X	•		BT		
					•					•	$\Delta VC'$ VI		
	X	X	X			X	X	X			R P Y SEP		
	X	X	X			X	X	X					
	X	X	X			X	X	X					
	X					X	X	X			R P Y EXTRACTION		
	X					X	X	X					
	X					X	X	X					



TLI PAD

TB 6p	X:XX:XX (HR:MIN:SEC)	PREDICTED TIME OF BEGINNING OF S-IVB RESTART PREPARATION FOR TLI (TB6 = TLI IGN -578.6 SEC)
R	XXX (DEG)	PREDICTED SPACECRAFT IMU GIMBAL
P	XXX (DEG)	ANGLES AT TLI IGNITION
Y	XXX (DEG)	
BT	X:XX (MIN:SEC)	DURATION OF TLI BURN
ΔVC	XXXX.X (FPS)	NOMINAL TLI ΔV SET INTO EMS ΔV COUNTER
VI	+XXXXXX (FPS)	NOMINAL INERTIAL VELOCITY DISPLAYED ON DSKY AT TLI CUTOFF
R SEP	XXX (DEG)	PREDICTED SPACECRAFT IMU GIMBAL
P SEP	XXX (DEG)	ANGLES AT COMPLETION OF S-IVB
Y SEP	XXX (DEG)	MNVR TO CSM/S-IVB SEP ATTITUDE
R EXT	XXX (DEG)	PREDICTED SPACECRAFT IMU
P EXT	XXX (DEG)	GIMBAL ANGLES AT TIME OF CSM
Y EXT	XXX (DEG)	EXTRACTION OF LM FROM S-IVB

	P37 BLOCK DATA										
			•				•		GETI		
	X				X				ΔVT		
	X				X				LONG		
			•				•		GET <sub>400K</sub>		
			•				•		GETI		
			•				•		ΔVT		
	X				X				LONG		
	X				X				GET <sub>400K</sub>		
			•				•		GETI		
			•				•		ΔVT		
			•				•		LONG		
P37			•				•		GET <sub>400K</sub>		
			•				•		GETI		
			•				•		ΔVT		
	X				X				LONG		
	X				X				GET <sub>400K</sub>		
			•				•		GETI		
			•				•		ΔVT		
	X				X				LONG		
	X				X				GET <sub>400K</sub>		
			•				•		GETI		
			•				•		ΔVT		
			•				•		LONG		
APRIL 1, 1969			•				•		GET <sub>400K</sub>		
			•				•		GETI		
			•				•		ΔVT		
	X				X				LONG		
	X				X				GET <sub>400K</sub>		
			•				•		GETI		
			•				•		ΔVT		
	X				X				LONG		
	X				X				GET <sub>400K</sub>		
			•				•		GETI		
			•				•		ΔVT		
			•				•		LONG		

P37 BLOCK DATA

GETI	XXX:XX (HR:MIN)	DESIRED TIME OF IGNITION
$\Delta$ VT	XXXX (FPS)	TOTAL VELOCITY OF MNVR
LONG	$\pm$ XXX (DEG)	LONGITUDE OF THE LANDING POINT FOR ENTRY GUIDANCE
GET 400K	XXX:XX (HR:MIN)	TIME OF ENTRY INTERFACE

	P27 UPDATE															
	PURP	V			V			V								
	GET	:			:			:			:					
P27	304 01	INDEX			INDEX			INDEX								
	02															
	03															
	04															
	05															
	06															
	07															
	10															
	11															
	12															
	13															
	14															
	15															
	16															
	17															
	20															
	21															
	22															
	23															
	24															
	APRIL 1, 1969	N34	HRS	X	X	X				X	X	X				
			MIN	X	X	X	X			X	X	X	X			
		NAV	CHECK	X	X				X	X						
			SEC													
		N43	LAT		0					0						
			LONG													
			ALT	+	0				+	0						

P27 UPDATE - CSM

PURP	XXX	TYPE OF DATA TO BE RECEIVED (SUCH AS: CMC TIME)
V	XX (VERB)	TYPE OF COMMAND LOAD (70-71-72-73)
GET	XXX:XX:XX (HR:MIN:SEC)	TIME DATA RECORDED
304 01	XX (OCTAL)	INDEX NO. OF COMMAND WORDS IN LOAD
02-24	XX (OCTAL)	CORRECTION IDENTIFIERS
N34 NAV CHECK	XXX:XX:XX.XX (HR:MIN:SEC)	TIME FOR CONFIRMATION OF GROUNDTRACK
N43		
LAT	XX.XX (DEG)	LATITUDE FOR GROUND TRACK CONFIRMATION
LONG	XXX.XX (DEG)	LONGITUDE FOR GROUND TRACK CONFIRMATION
ALT	XXX.X (DEG)	ALTITUDE FOR GROUND TRACK CONFIRMATION

		P30 MANEUVER													
		SET STARS										PURPOSE			
						/						PROP/GUID			
			+									WT		N47	
P30		RALIGN		0	0							P <sub>TRIM</sub>	N48	P30	
		PALIGN		0	0							Y <sub>TRIM</sub>			
		YALIGN	+	0	0							HRS	GETI		
			+	0	0	0						MIN	N33		
APRIL 5, 1969			+	0									SEC		
		ULLAGE												$\Delta V_X$	N81
														$\Delta V_Y$	
														$\Delta V_Z$	
			X	X	X									R	
			X	X	X									P	
			X	X	X									Y	
			+											H <sub>A</sub>	N42
														H <sub>P</sub>	
			+											$\Delta VT$	
		HORIZON/WINDOW	X	X	X									BT	
			X											$\Delta VC$	
			X	X	X	X								SXTS	
			+										0	SFT	
			+									0	0	TRN	
			X	X	X									BSS	
			X	X										SPA	
			X	X	X									SXP	
		OTHER		0										LAT	N61
														LONG	
	+											RTGO	EMS		
	+											VIO			
												GET	0.05G		

### P30 MANEUVER

PURPOSE	XXXXX	TYPE OF MNVR TO BE PERFORMED
PROP/GUID	XXX/XXX	PROPULSION SYSTEM (SPS/RCS) GUIDANCE (SCS/G&N)
WT	+XXXXX (lbs)	PREMANEUVER VEHICLE WEIGHT
P TRIM	±X.XX (DEG)	SPS PITCH GIMBAL OFFSET TO PLACE THRUST THROUGH THE CG
Y TRIM	±X.XX (DEG)	SPS YAW GIMBAL OFFSET TO PLACE THRUST THROUGH THE CG
GETI	XX:XX:XX.XX (HRS:MIN:SEC)	TIME OF MNVR IGNITION
ΔVX	±XXXX.X (FPS)	P30 VELOCITY TO BE GAINED COMPONENTS IN LOCAL VERTICAL COORDINATES
ΔVY	±XXXX.X (FPS)	
ΔVZ	±XXXX.X (FPS)	
R	XXX (DEG)	IMU GIMBAL ANGLES OF MANEUVER ATTITUDE
P	XXX (DEG)	
Y	XXX (DEG)	
HA	XXXX.X (NM)	PREDICTED APOGEE ALTITUDE AFTER MANEUVER
HP	±XXXX.X (NM)	PREDICTED PERIGEE ALTITUDE AFTER MANEUVER
ΔVT	+XXXX.X (FPS)	TOTAL VELOCITY OF MANEUVER
BT	X:XX (MIN:SEC)	MANEUVER DURATION
ΔVC	XXXX.X (FPS)	PREMANEUVER ΔV SETTING IN EMS ΔV COUNTER
SXTS	XX (OCTAL)	SEXTANT STAR FOR MANEUVER ATTITUDE CK
SFT	+XXX.X (DEG)	SEXTANT SHAFT SETTING FOR MANEUVER ATTITUDE CK
TRN	+XX.X (DEG)	SEXTANT TRUNNION SETTING FOR MANEUVER ATTITUDE CK
BSS	XX (OCTAL)	BORESIGHT STAR FOR MANEUVER ATTITUDE CK USING THE COAS
SPA	±XX.X (DEG)	BSS PITCH ANGLE ON COAS FOR MANEUVER ATTITUDE CK

SXP	±X.X (DEG)	BSS X POSITION ON COAS FOR MANEUVER ATTITUDE CK
LAT	±XX.XX (DEG)	LATITUDE AND LONGITUDE OF THE
LONG	±XXX.XX (DEG)	LANDING POINT FOR ENTRY GUIDANCE
RTGO	+XXXX.X (NM)	RANGE TO GO FOR EMS INITIALIZATION
VI0	+XXXXX (FPS)	INERTIAL VELOCITY AT .05G FOR EMS INITIALIZATION
GET (.05G)	XXX:XX:XX.XX (HRS:MIN:SEC)	TIME OF .05G
SET STARS	XX (OCTAL) XX (OCTAL)	STARS FOR BACKUP GDC ALIGN
R, P, Y (ALIGN)	XXX (DEG) XXX (DEG) XXX (DEG)	ATTITUDE TO BE SET IN ATTITUDE SET TW FOR BACKUP GDC ALIGN
ULLAGE	X (JETS) XX.X (SEC)	NO. OF SM RCS JETS USED AND LENGTH OF TIME OF ULLAGE
HORIZON/WINDOW	XX.X (DEG)	WINDOW MARKING AT WHICH HORIZON IS PLACED AT A SPECIFIED TIG (ATT CK)
OTHER		ADDITIONAL REMARKS VOICED UP BY MCC-H



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	P76 UPDATE PAD												
	+	0	0				+	0	0				
	+	0	0	0			+	0	0	0			
	+	0			•		+	0			•		
						•						•	
						•						•	
						•						•	
P76													P76
APRIL 5, 1969													

P76 UPDATE PAD

PURPOSE  
N33 TIG

XXXXX  
XX:XX:XX.XX  
(HR:MIN:SEC)

PURPOSE OF MANEUVER  
TIME OF IGNITION

N84  
 $\Delta V_X$   
 $\Delta V_Y$   
 $\Delta V_Z$

XXXX.X (FPS)  
XXXX.X (FPS)  
XXXX.X (FPS)

COMPONENTS OF  $\Delta V$  APPLIED ALONG  
LOCAL VERTICAL AXIS AT TIG (LM)

CSM SEP PAD

31	00	•	000	•	0	.
81	+	0000.0	+	0000.0	-	0002.5
22	XXX		XXX		XXX	

DOI PAD

84	•		•		•	
33	•		•		•	

PDI<sub>1</sub> +12 ABORT PAD

84	•		•		•	
33	•		•		•	

„CSM RESCUE“ PAD

PHAS	33	00	•	000	•	0	.
TPI (PDI < 10)	37	00	•	000	•	0	.
TPI (PDI > 10)	37	00	•	000	•	0	.

„CSM RESCUE UPDATE“ PAD

PHAS	33	00	•	000	•	0	.
TPI (PDI < 14.5)	37	00	•	000	•	0	.
TPI (T <sub>2</sub> )	37	00	•	000	•	0	.

RESCUE TWO PAD

47	+	•	+	0000.0		
48		•		•		
33	00	•	000	•	0	.
81		•		•		•
22	XXX		XXX		XXX	
$\Delta V_C$	X	•				
11	00	•	000	•	0	.
37	00	•	000	•	0	.
N						

CSI ONE

11		•	000	•	0	.
81		•		•		•
N						

P22 PAD

T1	•	•					(HOR)
T2	•	•					(LMK)
			NM (N OR S)				
89	•		•		•		
	LAT		LONG/2		ALT		

NOMINAL LM IGNITION TIMES

CSI	11	00	•	000	•	0	.
PC	33	00	•	000	•	0	.
TPI	37	00	•	000	•	0	.

CSI TWO

11	00	•	000	•	0	.
81		•		•		•
N						

CSI THREE

11	00	•	000	•	0	.
81		•		•		•
N						

CSI FOUR

11	00	•	000	•	0	.
81		•		•		•
N						

CDH

13	00	•	000	•	0	.
81		•		•		•

TPI

13	00	•	000	•	0	.
81		•		•		•
59		•		•		•
LOS BT	XX	•	XX	•	XX	•

CSM SEP PAD

33	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF CSM/LM SEPARATION BURN
81	DELTA VX DELTA VY DELTA VZ	+XXXX.X (FPS) +XXXX.X (FPS) +XXXX.X (FPS)	LOCAL VERTICAL VELOCITY COMPONENTS OF SEP BURN
22	R P Y	XXX (DEG) XXX (DEG) XXX (DEG)	SEPARATION BURN INERTIAL GIMBAL ANGLES

DOI PAD

84	DELTA VX DELTA VY DELTA VZ	XXXX.X (FPS) XXXX.X (FPS) XXXX.X (FPS)	LM LOCAL VERTICAL VELOCITY COMPONENTS FOR DOI BURN
33	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF DOI BURN

PDI +12 ABORT PAD

84	DELTA VX DELTA VY DELTA VZ	XXXX.X (FPS) XXXX.X (FPS) XXXX.X (FPS)	LM LOCAL VERTICAL VELOCITY COMPONENTS FOR FIRST OPPORTUNITY PDI PLUS 12 MIN ABORT
33	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF PDI +12 MIN ABORT BURN

„CSM RESCUE“ PAD

PHAS	33	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF CSM ABORT PHASING BURN
TPI (PDI 10)	37	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF TPI FOR LM ABORTS BETWEEN PDI AND PDI +10 MIN
TPI (PDI 10)	37	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF TPI FOR LM ABORTS AFTER PDI +10 MIN

„CSM RESCUE UPDATE“ PAD

PHAS	33	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF CSM ABORT PHASING BURN FOR 2ND OPPORTUNITY (1 REV DELAY)
TPI (PDI 14.5)	37	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF TPI FOR LM ABORTS BETWEEN PDI AND PDI +14.5 MIN FOR 2ND OPPORTUNITY
TPI (T2)	37	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF PREFERRED LM LIFTOFF TIME

RESCUE TWO PAD

47	WT	XXXX.X (lbs)	PREMANEUVER CSM WEIGHT
48	P TRIM Y TRIM	X.XX (DEG) X.XX (DEG)	SPS PITCH & YAW GIMBAL OFFSET TO PLACE THRUST THROUGH THE CG
33	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF RESCUE BURN
81	DELTA VX DELTA VY DELTA VZ	XXXX.X (FPS) XXXX.X (FPS) XXXX.X (FPS)	LOCAL VERTICAL VELOCITY COMPONENTS OF RESCUE BURN
22	R P Y	XXX (DEG) XXX (DEG) XXX (DEG)	RESCUE BURN GIMBAL ANGLES
$\Delta V_c$	$\Delta V_c$	XX.X (FPS)	VELOCITY TO BE SET IN EMS COUNTER FOR RESCUE BURN
11	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF CSI BURN BASED ON RESCUE BURN
37	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF TPI BURN BASED ON RESCUE BURN
N		X	THE FUTURE APSIDAL CROSSING (APOLUNE OR PERILUNE) OF THE ACTIVE VEHICLE AT WHICH CDH SHOULD OCCUR

CSI ONE

11	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF CSI ONE BURN
81	DELTA VX DELTA VY DELTA VZ	XXXX.X (FPS) XXXX.X (FPS) XXXX.X (FPS)	LOCAL VERTICAL VELOCITY COMPONENTS OF CSI ONE BURN
N		X	THE FUTURE APSIDAL CROSSING (APOLUNE OR PERILUNE) OF THE ACTIVE VEHICLE AT WHICH CDH SHOULD OCCUR

CSI TWO, THREE, FOUR

SAME AS ABOVE EXCEPT CSI TWO, THREE, FOUR

CDH

13	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF CDH BURN
81	DELTA VX DELTA VY DELTA VZ	XXXX.X (FPS) XXXX.X (FPS) XXXX.X (FPS)	LOCAL VERTICAL VELOCITY COMPONENTS OF CDH BURN

TPI

37	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	GET OF LM TPI BURN
81	DELTA VX DELTA VY DELTA VZ	XXXX (FPS) XXXX (FPS) XXXX (FPS)	LOCAL VERTICAL VELOCITY COMPONENTS OF TPI BURN
59	$\Delta V$ (LOS)	XXXX (FPS)	VELOCITY COMPONENTS ALONG THE LINE OF SIGHT TO TARGET
LOS BT		X:XX MIN:SEC	BURN DURATION ALONG THE LINE OF SIGHT

P22 PAD

T1		XXX:XX:XX.XX (HRS:MIN:SEC)	GET AT WHICH LANDMARK APPEARS ON HORIZON
T2		XXX:XX:XX.XX (HRS:MIN:SEC)	GET AT WHICH LANDMARK LOS IS 35° ABOVE LOCAL HORIZONTAL
NM (N OR S)		XX.X (NM)	DISTANCE OF LANDMARK NORTH OR SOUTH OF ORBITAL TRACK
89	LAT LONG ALT	±XX.X (DEG) ±XX (DEG)	LATITUDE OF LANDMARK LONGITUDE OF LANDMARK ALTITUDE OF LANDMARK ABOVE OR BELOW MEAN LUNAR RADIUS

NOMINAL LM IGNITION TIMES

CSI 11	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	NOMINAL GET OF LM CSI BURN
PC 33	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	NOMINAL GET OF LM PLANE CHANGE BURN
TPI 37	GETI	XXX:XX:XX.XX (HRS:MIN:SEC)	NOMINAL GET OF LM TPI BURN



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LUNAR ENTRY PAD

AREA	XXXXX	SPLASHDOWN AREA DEFINED BY TARGET LINE
R .05G	XXX (DEG)	SPACECRAFT IMU GIMBAL ANGLES
P .05G	XXX (DEG)	REQUIRED FOR AERODYNAMIC TRIM
Y .05G	XXX (DEG)	AT .05G
GET (HOR CK)	XXX:XX:XX (HRS:MIN:SEC)	TIME OF ENTRY ATTITUDE HORIZ CHECK AT EI -17 MIN.
P (HOR CK)	XXX (DEG)	PITCH ATTITUDE FOR HORIZON CHECK AT EI -17 MIN.
LAT	±XX.XX (DEG)	LATITUDE OF TARGET POINT
LONG	±XXX.XX (DEG)	LONGITUDE OF TARGET POINT
MAX G	XX.X (G's)	PREDICTED MAXIMUM REENTRY ACCELERATION
V400K	+XXXXXX (FPS)	INERTIAL VELOCITY AT ENTRY INTERFACE
γ400K	-X.XX (DEG)	INERTIAL FLIGHT PATH ANGLE AT ENTRY INTERFACE
RTGO	+XXXXX.X (NM)	RANGE TO GO FROM .05G TO TARGET FOR EMS INITIALIZATION
VI0	+XXXXXX (fps)	INERTIAL VELOCITY AT .05G FOR EMS INITIALIZATION
RRT	XXX:XX:XX (HRS:MIN:SEC)	REENTRY REFERENCE TIME BASED ON GET OF PREDICTED 400K (GET START)
RET .05G	XX:XX (MIN:SEC)	TIME OF .05G FROM 400K (RRT)
DL MAX	+X.XX (G's)	MAXIMUM ACCEPTABLE VALUE OF PREDICTED DRAG LEVEL (FROM CMC)
DL MIN	+X.XX (G's)	MINIMUM ACCEPTABLE VALUE OF PREDICTED DRAG LEVEL (FROM CMC)
VL MAX	+XXXXXX (FPS)	MAXIMUM ACCEPTABLE VALUE OF EXIT VELOCITY (FROM CMC)
VL MIN	+XXXXXX (FPS)	MINIMUM ACCEPTABLE VALUE OF EXIT VELOCITY (FROM CMC)
DO	X.XX (G's)	PLANNED DRAG LEVEL DURING CONSTANT G
RET VCIRC	XX:XX (MIN:SEC)	TIME FROM EI THAT S/C VELOCITY BECOMES CIRCULAR
RETBBO	XX:XX (MIN:SEC)	TIME FROM EI TO THE BEGINNING OF BLACKOUT
RETEBO	XX:XX (MIN:SEC)	TIME FROM EI TO THE END OF BLACKOUT

RETDRO	XX:XX (MIN:SEC)	TIME FROM EI TO DROGUE DEPLOY
SXTS	XX (OCTAL)	SEXTANT STAR FOR ENTRY ATTITUDE CHECK
SFT	+XXX. X (DEG)	SEXTANT SHAFT SETTING FOR ENTRY ATTITUDE CHECK
TRN	+XX. X (DEG)	SEXTANT TRUNNION SETTING FOR ENTRY ATTITUDE CHECK
BSS	XXX (OCTAL)	BORESIGHT STAR FOR ENTRY ATTITUDE CHECK USING THE COAS
SPA	±XX.X (DEG)	BSS PITCH ANGLE ON COAS FOR ENTRY ATTITUDE CHECK
SXP	±X.X (DEG)	BSS X POSITION ON COAS FOR ENTRY ATTITUDE CHECK
LIFT VECTOR	XX (UP/DN)	LIFT VECTOR DESIRED AT .05G's BASED ON ENTRY CORRIDOR

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APRIL 16, 1969	EARTH ORBIT ENTRY UPDATE												
	X			-		X			-		AREA		
	X	X	-		•	X	X	-		•	$\Delta V$ TO		
	X	X	X			X	X	X			R 0.05G EMS		
	X	X	X			X	X	X			P 0.05G		
	X	X	X			X	X	X			Y 0.05G		
	+				•	+				•	RTGO EMS		
	+					+					VIO		
	X	X			•	X	X			•	RET 0.05G		
		0			•		0			•	LAT N61		
					•					•	LONG		
	X	X			•	X	X			•	RET 0.2G		
					•					•	DRE (55°) N66		
	R	R			/	R	R			/	BANK AN		
	X	X			•	X	X			•	RET RB		
	X	X			•	X	X			•	RETBBO		
	X	X			•	X	X			•	RETEBO		
	X	X			•	X	X			•	RETDROG		
	X	X	X			X	X	X			(90°/fps) CHART		
	X	X				X	X				DRE (90°) UPDATE		
	POST BURN												
	X	X	X			X	X	X			P 0.05G		
	+				•	+				•	RTGO EMS		
	+					+					VIO		
	X	X			•	X	X			•	RET 0.05G		
E.O. ENTRY	X	X			•	X	X			•	RET 0.2G		
					•					•	DRE $\pm 100$ nm N66		
	R	R			/	R	R			/	BANK AN		
	X	X			•	X	X			•	RETRB		
	X	X			•	X	X			•	RETBBO		
	X	X			•	X	X			•	RETEBO		
	X	X			•	X	X			•	RETDROG TO MAIN		
	X	X			•	X	X			•			
	X	X			•	X	X			•			

# EARTH ORBIT ENTRY UPDATE

AREA	XXX-X	RECOVERY AREA - FIRST 3 DIGITS DENOTES REV IN WHICH LANDING OCCURS. LAST DIGIT DENOTES RECOVERY AREA AND SUPPORT CAPABILITIES.
$\Delta V$ TO	XX.X (FPS)	$\Delta V$ DUE TO ENGINE TAILOFF
EMS		
R 0.05G	XXX (DEG)	SPACECRAFT IMU GIMBAL ANGLES
P 0.05G	XXX (DEG)	REQUIRED FOR AERODYNAMIC TRIM
Y 0.05G	XXX (DEG)	AT 0.05G.
EMS		
RTGO	XXXX.X (NM)	RANGE TO GO FROM .05G TO TARGET
VI0	XXXXX (FPS)	INERTIALVELOCITY AT .05G FOR EMS INITIALIZATION
RET 0.05G	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO .05G
N61		
LAT	$\pm$ XX.XX (DEG)	LATITUDE OF IMPACT LANDING POINT
LONG	$\pm$ XXX.XX (DEG)	LONGITUDE OF IMPACT LANDING POINT
N66		
RET .2G	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO .2G
DRE (55°)	$\pm$ XXXX.X (NM)	DOWNRANGE ERROR AT .2G
BANK AN	XX/XX (DEG/DEG)	BACKUP BANK ANGLE FOR SCS ENTRY: ROLL RIGHT/ROLL LEFT
RETRB	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO REVERSE BACKUP BANK ANGLE
RETBBO	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO BEGINNING OF COMMUNICATIONS BLACKOUT
RETEBO	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO END OF COMMUNICATIONS BLACKOUT
RETDRG	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO DROGUE CHUTE DEPLOYMENT
CHART UPDATE		
90°/FPS	$\pm$ XX	VALUES USED TO RE-PLOT BACKUP
DRE (90°)	$\pm$ XXX	ENTRY CHART - $\Delta V$ AND DOWNRANGE ERROR (DRE) @ 90° BANK ANGLE

POST BURN

P 0.05G	XXX (DEG)	PITCH ANGLE @ ENTRY INTERFACE
EMS		
RTGO	+XXXX.X (NM)	RANGE TO GO FROM 0.05G TO TARGET FOR EMS COUNTER
VIO	+XXXXX (FPS)	INERTIAL VELOCITY @ 0.05G
RET 0.05G	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO 0.05G
RET 0.2G	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO 0.2G
DRE	±XXXX.X (NM)	DOWN RANGE ERROR
BANK AN	XX/XX (DEG/DEG)	BACKUP BANK ANGLE FOR SCS ENTRY: ROLL RIGHT/ROLL LEFT
RETRB	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO REVERSE BACKUP BANK ANGLE
RETBBO	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO BEGINNING OF COMMUNICATIONS BLACKOUT
RETEBO	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO END OF COMMUNICATIONS BLACKOUT
RETDROG	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO DROGUE CHUTE DEPLOYMENT





		EARTH ORBIT BLOCK DATA													
APRIL 1, 1969	E.O. BLOCK	X	X			-		X	X			-		AREA	E.O. BLOCK
		X	X	X			•	X	X	X			•	LAT	
		X	X				•	X	X				•	LONG	
				•		•				•		•		GETI	
		X	X	X			•	X	X	X			•	$\Delta V_C$	
		X	X			-		X	X			-		AREA	
		X	X	X			•	X	X	X			•	LAT	
		X	X				•	X	X				•	LONG	
				•		•				•		•		GETI	
		X	X	X			•	X	X	X			•	$\Delta V_C$	
		X	X			-		X	X			-		AREA	
		X	X	X			•	X	X	X			•	LAT	
		X	X				•	X	X				•	LONG	
				•		•				•		•		GETI	
		X	X	X			•	X	X	X			•	$\Delta V_C$	
		X	X			-		X	X			-		AREA	
X	X	X			•	X	X	X			•	LAT			
X	X				•	X	X				•	LONG			
		•		•				•		•		GETI			
X	X	X			•	X	X	X			•	$\Delta V_C$			
X	X			-		X	X			-		AREA			
X	X	X			•	X	X	X			•	LAT			
X	X				•	X	X				•	LONG			
		•		•				•		•		GETI			
X	X	X			•	X	X	X			•	$\Delta V_C$			
REMARKS:															

EARTH ORBIT BLOCK DATA

AREA	XXX-X	RECOVERY AREA FIRST 3 DIGITS - LANDING REVOLUTION LAST DIGIT - RECOVERY AREA AND SUPPORT CAPABILITIES
LAT	±XX.XX (DEG)	COORDINATES OF THE DESIRED
LONG	±XXX.XX (DEG)	LANDING AREA
GETI	XXX:XX:XX.XX (HR:MIN:SEC)	DEORBIT IGNITION TIME FOR THE DESIRED LANDING AREA
ΔVC	XXX. X (FPS)	DEORBIT MANEUVER ΔV TO BE LOADED INTO THE EMS COUNTER.

	LM P27 UPDATE													
	PURP	V			V			V						
	GET	:			:			:			:			
P27	1174 01	INDEX			INDEX			INDEX						P27
	02													
APRIL 16, 1969	03													
	04													
	05													
	06													
	07													
	10													
	11													
	12													
	13													
	14													
	15													
	16													
	17													
	20													
	21													
	22													
	23													
	24													
		N34	HRS	X	X	X				X	X	X		
			MIN	X	X	X	X			X	X	X	X	
	NAV	CHECK	X	X					X	X				
		SEC												
	N43	LAT		0						0				
		LONG												
		ALT	+	0					+	0				

P27 UPDATE-LM

PURP	XXX	TYPE OF DATA TO BE RECEIVED (SUCH AS: LDG TIME)
V	XX (VERB)	TYPE OF COMMAND LOAD (70-71-72-73)
GET	XXX:XX:XX (HR:MIN:SEC)	TIME DATA RECORDED
1174 01	XX (OCTAL)	INDEX NO. OF COMMAND WORDS IN LOAD
02-24	XX (OCTAL)	CORRECTION WORD IDENTIFIERS
N34 NAV CHECK TIME	XXX:XX:XX.XX (HR:MIN:SEC)	TIME FOR CONFIRMATION OF GROUNDTRACK
N43		
LAT	XX.XX (DEG)	LATITUDE FOR GROUND TRACK CONFIRMATION
LONG	XXX.XX (DEG)	LONGITUDE FOR GROUND TRACK CONFIRMATION
ALT	XXX.X (NM)	ALTITUDE FOR GROUND TRACK CONFIRMATION

APRIL 5, 1969	AGS STATE VECTOR UPDATE														
														PURP	
														240	
														241	
														242	
														260	
														261	
														262	
														254	
	+													244	
														245	
														246	
														264	
														265	
														266	
														272	
	+													REMARKS:	
AGS SV															AGS SV

AGS STATE VECTOR UPDATE

PURP		PURPOSE FOR AGS STATE VECTOR UPDATE
240	±XXXXXX (100 FT)	LM STATE VECTOR-POSITION COMPONENTS
241	±XXXXXX (100 FT)	
242	±XXXXXX (100 FT)	
260	±XXXX.X (FPS)	LM STATE VECTOR-VELOCITY COMPONENTS
261	±XXXX.X (FPS)	
262	±XXXX.X (FPS)	
254	+XXXX.X (MIN)	LM TIME FOR WHICH THE STATE VECTOR IS ACCURATE
244	±XXXXXX (100 FT)	CSM STATE VECTOR-POSITION COMPONENTS
245	±XXXXXX (100 FT)	
246	±XXXXXX (100 FT)	
264	±XXXX.X (FPS)	CSM STATE VECTOR-VELOCITY COMPONENTS
265	±XXXX.X (FPS)	
266	±XXXX.X (FPS)	
272	+XXXX.X (MIN)	CSM TIME FOR WHICH THE STATE VECTOR IS ACCURATE

JUNE 18, 1969

		PHASING						P30 LM MANEUVER					
HR	N33	+	0	0				+	0	0			
MIN	TIG	+	0	0	0			+	0	0	0		
SEC		+	0					+	0				
$\Delta V_X$	N81												
$\Delta V_Y$	LOCAL												
$\Delta V_Z$	VERT												
H <sub>A</sub>	N42	+						+					
H <sub>p</sub>													
$\Delta V_R$		+						+					
BT		X	X	X				X	X	X			
R	FDAI	X	X	X				X	X	X			
P	INER	X	X	X				X	X	X			
$\Delta V_X$	AGS N86												
$\Delta V_Y$	AGS												
$\Delta V_Z$	AGS												
BSS		X	X	X				X	X	X			
SPA		X	X					X	X				
SXP		X	X	X				X	X	X			



PHASING

N33 PHASING TIG	XXX:XX:XX.XX (HR:MIN:SEC)	IGNITION TIME OF LM MANEUVER
-----------------	------------------------------	------------------------------

N81 LOCAL VERTICAL  $\Delta V$

$\Delta V_X$	$\pm XXXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE MANEUVER
$\Delta V_Y$	$\pm XXXX.X$ (FPS)	
$\Delta V_Z$	$\pm XXXX.X$ (FPS)	

N42 ORBITAL PARAMETERS

HA	+XXXX.X (NM)	PREDICTED APOGEE RESULTING FROM MANEUVER
HP	$\pm XXXX.X$ (NM)	PREDICTED PERIGEE RESULTING FROM MANEUVER
$\Delta V_R$	+XXXX.X (FPS)	TOTAL $\Delta V$ REQUIRED FOR THE MANEUVER
BT	X:XX (MIN:SEC)	DURATION OF THE MANEUVER

FDAI

R	XXX (DEG)	INERTIAL FDAI ANGLES AT THE BURN ATTITUDE
P	XXX (DEG)	

AGS  $\Delta V$

$\Delta V_X$ AGS	$\pm XXXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE MANEUVER TO TARGET THE AGS
$\Delta V_Y$ AGS	$\pm XXXX.X$ (FPS)	
$\Delta V_Z$ AGS	$\pm XXXX.X$ (FPS)	
BSS	XX (OCTAL)	BSS STAR FOR MANEUVER ATTITUDE CHECK
SPA	$\pm XX.X$ (DEG)	BSS PITCH ANGLE ON COAS, & BSS X POSITION ON COAS FOR MANEUVER ATTITUDE CHECK
SXP	$\pm XX.X$ (DEG)	

P30	P30 LM Maneuver												P30	
														PURPOSE
	+	0	0				+	0	0				HR	N33
	+	0	0	0			+	0	0	0			MIN	TIG
	+	0			•		+	0			•		SEC	
						•						•	$\Delta V_X$	N81
						•						•	$\Delta V_Y$	LOCAL
						•						•	$\Delta V_Z$	VERT
	+					•	+					•	H $\alpha$	N42
						•						•	H $\rho$	
	+					•	+					•	$\Delta V_R$	
	X	X	X		•		X	X	X		•		BT	
	X	X	X				X	X	X				R	FDAI
	X	X	X				X	X	X				P	INER
						•						•	$\Delta V_X$ AGS	N86
						•						•	$\Delta V_Y$ AGS	
						•						•	$\Delta V_Z$ AGS	
	X	X	X				X	X	X				BSS	
	X	X				•	X	X				•	SPA	
	X	X	X			•	X	X	X			•	SXP	
	REMARKS:													

P30 LM MANEUVER

PURPOSE	XXXXX	PURPOSE OF MANEUVER (SUCH AS DOI TARGETING)
N33 TIG OF MANEUVER	XXX:XX:XX.XX (HR:MIN:SEC)	IGNITION TIME FOR THE MANEUVER
N81 LOCAL VERTICAL $\Delta V$		
$\Delta V_X$	$\pm XXXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE MANEUVER
$\Delta V_Y$	$\pm XXXX.X$ (FPS)	
$\Delta V_Z$	$\pm XXXX.X$ (FPS)	
N42 ORBITAL PARAMETERS		
HA	+XXXX.X (NM)	PREDICTED APOGEE AND PERIGEE RESULTING FROM MANEUVER
HP	$\pm XXXX.X$ (NM)	
$\Delta V_R$	+XXXX.X (FPS)	TOTAL $\Delta V$ REQUIRED FOR THE MANEUVER
BT	X:XX (MIN:SEC)	DURATION OF THE MANEUVER
FDAI		
R	XXX (DEG)	INERTIAL FDAI ANGLES AT THE
P	XXX (DEG)	BURN ATTITUDE
N86 AGS $\Delta V$		
$\Delta V_X$ AGS	$\pm XXXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE MANEUVER USED TO TARGET
$\Delta V_Y$ AGS	$\pm XXXX.X$ (FPS)	THE AGS
$\Delta V_Z$ AGS	$\pm XXXX.X$ (FPS)	
BSS	XX (OCTAL)	BSS STAR FOR BURN ATTITUDE CHECK
SPA	$\pm XX.X$ (DEG)	BSS PITCH ANGLE ON COAS, &
SXP	$\pm XX.X$ (DEG)	BSS X POSITION ON COAS FOR MANEUVER ATTITUDE CHECK

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DOI DATA CARD

		P30											
HR	N33	+	0	0				+	0	0			
MIN	TIG	+	0	0	0			+	0	0	0		
SEC		+	0					+	0				
$\Delta V_X$	N81												
$\Delta V_Y$	LOCAL												
$\Delta V_Z$	VERT												
H <sub>A</sub>	N42	+						+					
H <sub>p</sub>													
$\Delta VR$		+						+					
BT		X	X	X				X	X	X			
R	FDAI	X	X	X				X	X	X			
P	INER	X	X	X				X	X	X			
$\Delta V_X$ AGS	N86												
$\Delta V_Y$ AGS													
$\Delta V_Z$ AGS													
BSS		X	X	X				X	X	X			
SPA		X	X					X	X				
SXP		X	X	X				X	X	X			

OR

MANUAL SHUT-DOWN  
A.  $\Delta VG$  NEGATIVE (PGNS)  
B. VT: 2 SECONDS OVER BURN  
- AND -  
AGS VGX 2 FPS OVER

MANUAL TAKEOVER  
ATT  $\pm 5^\circ$  RATE  $\pm 5^\circ/\text{sec}$

LR SELF TEST

H TM (+7994 $\pm$ 30) \_\_\_\_\_  
H TM (-480 $\pm$ 6) \_\_\_\_\_  
N66 SLANTRNG (+08275. $\pm$ 5.0) \_\_\_\_\_  
N67 VX (-00494.  $\pm$ 2.0) \_\_\_\_\_  
VY (+01858.  $\pm$ 2.0) \_\_\_\_\_  
VZ (+01329.  $\pm$ 2.0) \_\_\_\_\_

RR / TM / VHF

R1 R2 R

N73 \_\_\_\_\_  
TM \_\_\_\_\_  
CMC \_\_\_\_\_  
VHF \_\_\_\_\_

P52 STAR 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_  
N05 (STAR  $\neq$  DIFF) \_\_\_\_\_  
N93 (TORQUING  $\neq$ ) X \_\_\_\_\_  
Y \_\_\_\_\_  
GET : : Z \_\_\_\_\_

RESIDUALS

		PGNS				AGS			
$\Delta V_X$						500			
$\Delta V_Y$	N85					501			
$\Delta V_Z$						502			

DOI DATA CARD

N33 DOI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	IGNITION TIME OF LM MANEUVER
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N81 LOCAL VERTICAL  $\Delta V$

$\Delta V_X$	$\pm XXXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE MANEUVER
$\Delta V_Y$	$\pm XXXX.X$ (FPS)	
$\Delta V_Z$	$\pm XXXX.X$ (FPS)	

N42 ORBITAL PARAMETERS

HA	+XXXX.X (NM)	PREDICTED APOGEE RESULTING FROM MANEUVER
HP	$\pm XXXX.X$ (NM)	PREDICTED PERIGEE RESULTING FROM MANEUVER
$\Delta VR$	+XXXX.X (FPS)	TOTAL $\Delta V$ REQUIRED FOR THE MANEUVER
BT	X:XX (MIN:SEC)	DURATION OF THE MANEUVER

FDAI

R	XXX (DEG)	INERTIAL FDAI ANGLES AT THE BURN ATTITUDE
P	XXX (DEG)	

N86 AGS  $\Delta V$

$\Delta V_X$ AGS	$\pm XXXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE MANEUVER TO TARGET THE AGS
$\Delta V_Y$ AGS	$\pm XXXX.X$ (FPS)	
$\Delta V_Z$ AGS	$\pm XXXX.X$ (FPS)	
BSS	XXX (OCTAL)	BSS STAR FOR MANEUVER ATTITUDE CHECK
SPA	$\pm XX.X$ (DEG)	BSS PITCH ANGLE ON COAS, & BSS X POSITION ON COAS FOR MANEUVER ATTITUDE CHECK
SXP	$\pm XX.X$ (DEG)	

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PDI DATA CARD

PDI PAD													
HRS	TIG	+	0	0				+	0	0			
MIN	PDI	+	0	0	0			+	0	0	0		
SEC		+	0					+	0				
TGO	N61	X	X					X	X				
CROSSRANGE													
R	FDAI	X	X	X				X	X	X			
P	AT TIG	X	X	X				X	X	X			
Y		X	X	X				X	X	X			
DEDA 231 IF RQD													

PDI ABORT <10 MIN													
LOG INSERTION GET = ____:____:____													
+                      5 0:0 0													
CSI TIG = ____:____:____													
HRS	N37	+	0	0				+	0	0			
MIN	TPI	+	0	0	0			+	0	0	0		
SEC		+	0					+	0				

PDI ABORT >10 MIN													
HRS		+	0	0				+	0	0			
MIN		+	0	0	0			+	0	0	0		
SEC	PHASING TIG	+	0					+	0				
HRS	N37	+	0	0				+	0	0			
MIN	TPI	+	0	0	0			+	0	0	0		
SEC		+	0					+	0				

NO PDI +12 ABORT													
HR	N33	+	0	0				+	0	0			
MIN	TIG	+	0	0	0			+	0	0	0		
SEC		+	0					+	0				
ΔVX	N81												
ΔVY	LOCAL												
ΔVZ	VERT												
H <sub>A</sub>	N42	+						+					
H <sub>p</sub>													
ΔVR		+						+					
BT		X	X	X				X	X	X			
R	FDAI	X	X	X				X	X	X			
P	INER	X	X	X				X	X	X			
ΔVX AGS	N86												
ΔVY AGS													
ΔVZ AGS													
HRS	N11	+	0	0				+	0	0			
MIN	CSI	+	0	0	0			+	0	0	0		
SEC		+	0					+	0				
HRS	N37	+	0	0				+	0	0			
MIN	TPI	+	0	0	0			+	0	0	0		
SEC		+	0					+	0				

R2 SUN CHECK

N22 \_\_\_\_\_ N20 \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

PDI DATA CARD

PDI PAD

TIG PDI	XXX:XX:XX.XX (HR:MIN:SEC)	PDI IGNITION TIME
TGO	XX:XX (MIN:SEC)	TIME TO HIGH GATE
CROSSRANGE	±XXXX.X (NM)	OUT-OF-PLANE DISTANCE BETWEEN THE INITIAL LM ORBITAL PLANE AND THE LANDING SITE (POSITIVE INDICATES LANDING SITE IS NORTH OF ORBITAL PLANE)
FDAI AT TIG		
R	XXX (DEG)	INERTIAL FDAI ANGLES AT IGNITION
P	XXX (DEG)	
Y	XXX (DEG)	
DEDA 231 (IF REQ'D)	XXXXX (100 FT)	LUNAR RADIUS AT THE LANDING SITE

PDI ABORT <10 MIN

TPI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TPI IGNITION TIME
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PDI ABORT >10 MIN

PHASING TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF IGNITION OF LM PHASING MANEUVER
TPI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TPI IGNITION TIME

NO PDI +12 ABORT

N33 ABORT TIG	XXX:XX:XX.XX (HR:MIN:SEC)	IGNITION TIME OF FOR ABORT BURN
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N81 LOCAL VERTICAL  $\Delta V$

$\Delta V_X$	$\pm XXXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE PHASING MANEUVER
$\Delta V_Y$	$\pm XXXX.X$ (FPS)	
$\Delta V_Z$	$\pm XXXX.X$ (FPS)	

N42 ORBITAL PARAMETERS

HA	+XXXX.X (NM)	PREDICTED APOGEE RESULTING FROM MANEUVER
HP	$\pm XXXX.X$ (NM)	PREDICTED PERIGEE RESULTING FROM MANEUVER
$\Delta VR$	XXXX.X (FPS)	TOTAL $\Delta V$ REQUIRED FOR THE MANEUVER
BT	X:XX (MIN:SEC)	DURATION OF THE MANEUVER

FDAI

R	XXX (DEG)	INERTIAL FDAI ANGLES AT THE BURN ATTITUDE
P	XXX (DEG)	

N86 AGS  $\Delta V$

$\Delta V_X$ AGS	$\pm XXXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE MANEUVER TO TARGET THE AGS
$\Delta V_Y$ AGS	$\pm XXXX.X$ (FPS)	
$\Delta V_Z$ AGS	$\pm XXXX.X$ (FPS)	

N11 CSI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF IGNITION FOR CSI BURN
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N37 TPI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF IGNITION FOR TPI BURN
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LUNAR SURFACE DATA CARD

T 2 ABORT											
HRS	T2	+	0	0				+	0	0	
MIN	TIG	+	0	0	0			+	0	0	0
SEC		+	0		.			+	0		.
HRS	N33	+	0	0				+	0	0	
MIN	PHASING	+	0	0	0			+	0	0	0
SEC	TIG	+	0		.			+	0		.
HRS	N11	+	0	0				+	0	0	
MIN	CSI <sub>1</sub>	+	0	0	0			+	0	0	0
SEC		+	0		.			+	0		.
HRS	N37	+	0	0				+	0	0	
MIN	TPI	+	0	0	0			+	0	0	0
SEC		+	0		.			+	0		.

P68

N43 \_\_\_\_\_ . LAT  
 \_\_\_\_\_ . LONG  
 \_\_\_\_\_ . ALT

P12

N76 \_\_\_\_\_ . V (HOR) (5515.2)  
 \_\_\_\_\_ . V (VERT) ( 19.6)  
 \_\_\_\_\_ . CROSSRANGE ( 0.0)

NOTE: IF CROSSRANGE >8 N.M., LOAD 8 N.M.

N74 \_\_\_\_\_ . YAW  
 \_\_\_\_\_ . PITCH

T 3 ABORT											
HRS	T3	+	0	0				+	0	0	
MIN	TIG	+	0	0	0			+	0	0	0
SEC		+	0		.			+	0		.
HRS	CSM	+	0	0				+	0	0	
MIN	PERIOD	+	0	0	0			+	0	0	0
SEC		+	0		.			+	0		.
HRS		+	0	0				+	0	0	
MIN	P+ΔT	+	0	0	0			+	0	0	0
SEC		+	0		.			+	0		.
HRS	N11	+	0	0				+	0	0	
MIN	CSI TIG	+	0	0	0			+	0	0	0
SEC		+	0		.			+	0		.
HRS	N37	+	0	0				+	0	0	
MIN	TPI	+	0	0	0			+	0	0	0
SEC		+	0		.			+	0		.

P12

N76 \_\_\_\_\_ . V (HOR) (5535.6)  
 \_\_\_\_\_ . V (VERT) ( 32.0)  
 \_\_\_\_\_ . CROSSRANGE ( 0.0)

NOTE: IF CROSSRANGE >8 N.M., LOAD 8 N.M.

N74 \_\_\_\_\_ . YAW  
 \_\_\_\_\_ . PITCH

LUNAR SURFACE DATA CARD

T2 ABORT

T2 TIG	XXX:XX:XX.XX (HR:MIN:SEC)	LIFTOFF TIME - SECOND PREFERRED TIME AFTER TOUCHDOWN (~T.D. +12 MIN.)
N33 PHASING TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF IGNITION FOR PHASING BURN
N11 CSI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF IGNITION FOR CSI BURN
N37 TPI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF IGNITION FOR TPI BURN

T3 ABORT

T3 TIG	XXX:XX:XX.XX (HR:MIN:SEC)	LIFT OFF TIME AFTER FIRST CSM REVOLUTION
CSM PERIOD	XXX:XX:XX.XX (HR:MIN:SEC)	CSM ORBITAL PERIOD
P + $\Delta T$	XXX:XX:XX.XX (HR:MIN:SEC)	CSM PERIOD PLUS THE TIME INTERVAL BETWEEN CLOSEST APPROACH AND LIFTOFF TIMES
N11 CSI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF IGNITION FOR CSI BURN
N37 TPI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF IGNITION FOR TPI BURN

# LM ASCENT PAD

+	0	0				+	0	0				HR	
+	0	0	0			+	0	0	0			MIN	TIG
+	0			•		+	0			•		SEC	
+					•	+					•	V (HOR)	
+					•	+					•	V (VERT)	N76
	0				•		0				•	*CROSSRANGE	
												DEDA	047
												DEDA	053
												DEDA	225/226
												DEDA	231

\*NOTE: LOAD 8 NM IF CROSSRANGE IS GREATER THAN 8 NM  
COMMENTS:

LM ASCENT PAD

ASCENT TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TIME OF APS IGNITION FOR LM ASCENT
N76 INSERTION TARGET		
V (HOR)	XXXX.X (FPS)	HORIZONTAL VELOCITY AT ORBIT INSERTION
V (VERT)	XXXX.X (FPS)	VERTICAL VELOCITY AT ORBIT INSERTION
CROSSRANGE	±XXXX.X (NM)	CROSSRANGE DISTANCE AT ORBITAL INSERTION
DEDA 047	XXXXXX (OCTAL)	SINE OF LANDING AZIMUTH ANGLE
DEDA 053	XXXXXX (OCTAL)	COSINE OF LANDING AZIMUTH ANGLE
DEDA 225	XXXXXX (100 FT)	LOWER LIMIT OF $\alpha$ AT ORBIT INSERTION
DEDA 226	XXXXXX (100 FT)	UPPER LIMIT OF $\alpha$ AT ORBIT INSERTION
DEDA 231	XXXXXX (100 FT)	RADIAL DISTANCE OF LAUNCH SITE FROM CENTER OF MOON

2 - 44

CSI DATA CARD (P32 LM MANEUVER)

N11 CSI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	CSI IGNITION TIME
N37 TPI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	TPI IGNITION TIME
N81		
ΔVX	XXX.X (FPS)	LOCAL VERTICAL ΔV COMPONENTS OF THE CSI MANEUVER
ΔVY	XXX.X (FPS)	
FDAI PITCH	XXX (DEG)	FDAI INERTIAL PITCH ANGLE AT THE CSI BURN ATTITUDE
DEDA 373	XXXX.X (MIN)	AGS IGNITION TIME OF NEXT MANEUVER
DEDA 275	XXXX.X (MIN)	DESIRED TPI TIG (FOR CSI CALCULATION ONLY)
N86 AGS ΔV		
ΔVX AGS	XX.XX (FPS)	LOCAL VERTICAL ΔV COMPONENTS OF CSI USED TO TARGET AGS EXT ΔV
ΔVY AGS	XX.XX (FPS)	
ΔVZ AGS	XX.XX (FPS)	

[illegible]



CDH DATA CARD

N13 CDH TIG	XXX:XX:XX.XX (HR:MIN:SEC)	IGNITION TIME FOR CDH MANEUVER
-------------	------------------------------	--------------------------------

N81 LOCAL VERTICAL  $\Delta V$

$\Delta V_X$	$\pm XXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS
$\Delta V_Y$	$\pm XXX.X$ (FPS)	OF CDH MANEUVER
$\Delta V_Z$	$\pm XXX.X$ (FPS)	

PLM FDAI	XXX (DEG)	FDAI INERTIAL PITCH ANGLE AT CDH BURN ATTITUDE
----------	-----------	---

DEDA 373	XXXX.X (MIN)	AGS IGNITION TIME OF NEXT MANEUVER
----------	--------------	---------------------------------------

N86 AGS  $\Delta V$

$\Delta V_X$ AGS	$\pm XXX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF
$\Delta V_Y$ AGS	$\pm XXX.X$ (FPS)	CDH USED TO TARGET AGS EXT $\Delta V$
$\Delta V_Z$ AGS	$\pm XXX.X$ (FPS)	

HRS	N37	+	0	0				+	0	0			
MIN	TIG	+	0	0	0			+	0	0	0		
SEC	TPI	+	0					+	0				
N55		(BLANK)		( +026.60)		( +130.00)							
ΔVX	N81		0						0				
ΔVY			0						0				
ΔVZ			0						0				
ΔVR	N42	+	0	0				+	0	0			
RLM		X	X	X				X	X	X			
PLM		X	X	X				X	X	X			
R TPI	N54	+	0					+	0				
R TPI	TIG -5		0						0				
F/A	(+/-) N59		0	0					0	0			
R/L	(+/-) ΔV		0	0					0	0			
D/U	(+/-) LOS		0	0					0	0			
BT		X	X					X	X				
307+043.00, 314+0													

RESIDUALS

	PGNS				AGS				
ΔVX	N85					500			
ΔVY						501			
ΔVZ						502			

P G N C S	N58			N81						P G N C S	
	HP	ΔV TPI	ΔV TPF	ΔVX	ΔVY	ΔVZ	ΔV F/A-	ΔV R/L-	ΔV D/U-		
	( )	( )	( )	( )	( )	( )	( )	( )	( )		
	_____	_____	_____	_____	_____	_____	_____	_____	_____		
	_____	_____	_____	_____	_____	_____	_____	_____	_____		
A G S	267 ΔV TPI			371 ΔV TPI+TPF			CSM SOLUTION			A G S	
				ΔVX	ΔVY	ΔVZ					
				_____	_____	_____					
				N86 (AGS)							
			ΔVX	ΔVY	ΔVZ						
						_____	_____	_____			

TPI DATA CARD

N37 TPI TIG	XXX:XX:XX.XX (HR:MIN:SEC)	IGNITION TIME FOR THE TPI MANEUVER
N81 LOCAL VERTICAL $\Delta V$		
$\Delta V_X$	$\pm XX.X$ (FPS)	LOCAL VERTICAL $\Delta V$ COMPONENTS OF THE TPI MANEUVER
$\Delta V_Y$	$\pm XX.X$ (FPS)	
$\Delta V_Z$	$\pm XX.X$ (FPS)	
N42 $\Delta V_R$	$+XX.X$ (FPS)	TOTAL $\Delta V$ REQUIRED FOR THE MANEUVER
RLM	XXX (DEG)	ROLL AND PITCH FDAI ANGLES AT TPI BURN ATTITUDE
PLM	XXX (DEG)	
N54 TIG -5		
R TPI	XX.XX (FT)	RANGE AT TPI TIG -5 MIN
R TPI	$\pm XXX.X$ (FPS)	RANGE RATE AT TPI TIG -5 MIN
N59 $\Delta V$ LOS		
F/A	$\pm XX.X$ (FPS)	LINE-OF-SIGHT $\Delta V$ COMPONENTS OF THE TPI MANEUVER
R/L	$\pm XX.X$ (FPS)	
D/U	$\pm XX.X$ (FPS)	
BT	XX:XX (MIN:SEC)	DURATION OF THE MANEUVER



SECTION III

**DETAILED TIMELINE**



TIME	EVENT	REMARKS
-00:09	LCC: <u>REPORT</u> IGNITION	FIRST OPPORTUNITY LIFT-OFF JULY 16, 0932 EDT, 72° LA, TARGETED FOR LANDING SITE 2. LIFT-OFF: 1332 GMT  PROP DUMP TO RCS CMD  ALTITUDE 14,000 ft  ALTITUDE 100,000 ft
00:00	LCC: CDR: <u>REPORT</u> LIFT-OFF	
00:02	CDR: <u>REPORT</u> YAW MNVR	
00:10	LCC: <u>REPORT</u> CLEAR OF TOWER	
00:15	CDR: <u>REPORT</u> ROLL AND PITCH PROGRAM INITIATE	
00:32	CDR: <u>REPORT</u> ROLL COMPLETE	
00:42	MCC: <u>REPORT</u> MARK MODE IB	
00:51	LMP: <u>REPORT</u> CABIN PRESS DECREASING	
01:21	MAX Q	
01:56	MCC: <u>REPORT</u> MARK MODE IC	
02:00	MCC: CDR: <u>REPORT</u> GO/NO GO FOR STAGING	
02:15	CDR: <u>REPORT</u> INBOARD OUT	
02:41	CDR: <u>REPORT</u> OUTBOARD OUT	
02:42	CDR: <u>REPORT</u> STAGING / S-II IGNITION	
03:12	CDR: S-II SEP LIGHT OUT	
03:17	CDR: <u>REPORT</u> TWR JETT AND MODE II	
03:21	CDR: <u>REPORT</u> GUIDANCE	
MISSION G		DATE JULY 1, 1969
EDITION FINAL		PAGE 3-i

TIME	EVENT	REMARKS
04:00	MCC: <u>REPORT</u> TRAJECTORY AND GUIDANCE GO/NO GO	
04:00	CDR: <u>REPORT</u> S/C GO/NO GO	
05:00	CDR: <u>REPORT</u> S/C GO/NO GO	
05:25	MCC: <u>REPORT</u> S-IVB TO ORBIT CAPABILITY	
06:00	CDR: <u>REPORT</u> S/C GO/NO GO	
07:00	CDR: <u>REPORT</u> S/C GO/NO GO	
08:00	CDR: <u>REPORT</u> S/C GO/NO GO	
08:30	MCC: CDR: <u>REPORT</u> GO/NO GO FOR STAGING	
08:57	MCC: <u>REPORT</u> MODE IV	
	CDR: <u>REPORT</u> S/C GO/NO GO	
	MCC: <u>REPORT</u> TRAJECTORY AND GUIDANCE GO/NO GO	
09:11	CDR: <u>REPORT</u> S-II CUTOFF	
09:15	CDR: <u>REPORT</u> S-IVB IGNITION	
10:00	MCC: CDR: <u>REPORT</u> GO/NO GO FOR ORBIT	
	MCC: <u>REPORT</u> PREDICTED SECO	
11:40	CDR: <u>REPORT</u> SECO TB <sub>5</sub> = 0	IMU GIMBAL ANGELS @INSERTION R 180° P 340° Y 0°
	S-IVB MAINTAINS COMMANDED CUTOFF INTERTIAL ATTITUDE	H pad 103.3 NM
MISSION G		EDITION FINAL
		DATE JULY 1, 1969
		PAGE 3-ii

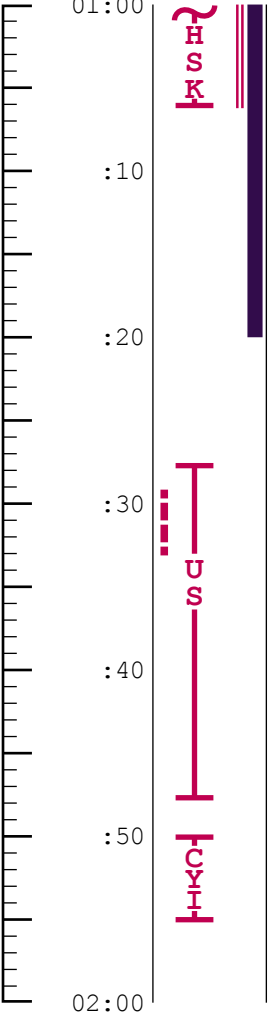




MCC-H

1030 EDT

01:00



UPLINK CMC

CSM STATE VECTOR

UPDATE

PAD DATA

GO/NO GO

# FLIGHT PLAN

P52 - CONT'D

GDC ALIGN TO IMU  
STOW OPTICS

SCS ATT REF COMPARISON CK  
EXTEND DOCKING PROBE

V66 - TRANS CSM STATE VECTOR TO LM SLOT  
RECORD PAD DATA  
(TLI, TLI +90 MIN ABORT, AND P37 - TLI +4 HR ABORT)  
SM RCS HOT FIRE  
(MIN IMPULSE - ALL JETS)

GO/NO GO FOR PYRO ARM  
BEGIN TLI PREPARATION (CHECKLIST PG L-2-19)  
DON HELMETS & GLOVES - ALL

EMS ΔV TEST

NOTES

AS A GENERAL RULE MSFN WILL ALWAYS UPLINK THE STATE VECTOR TO THE CSM SLOT AND THE CREW WILL TRANSFER IT VIA V66 TO THE LM SLOT

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	01:00 - 02:00	1 / 1	3-2

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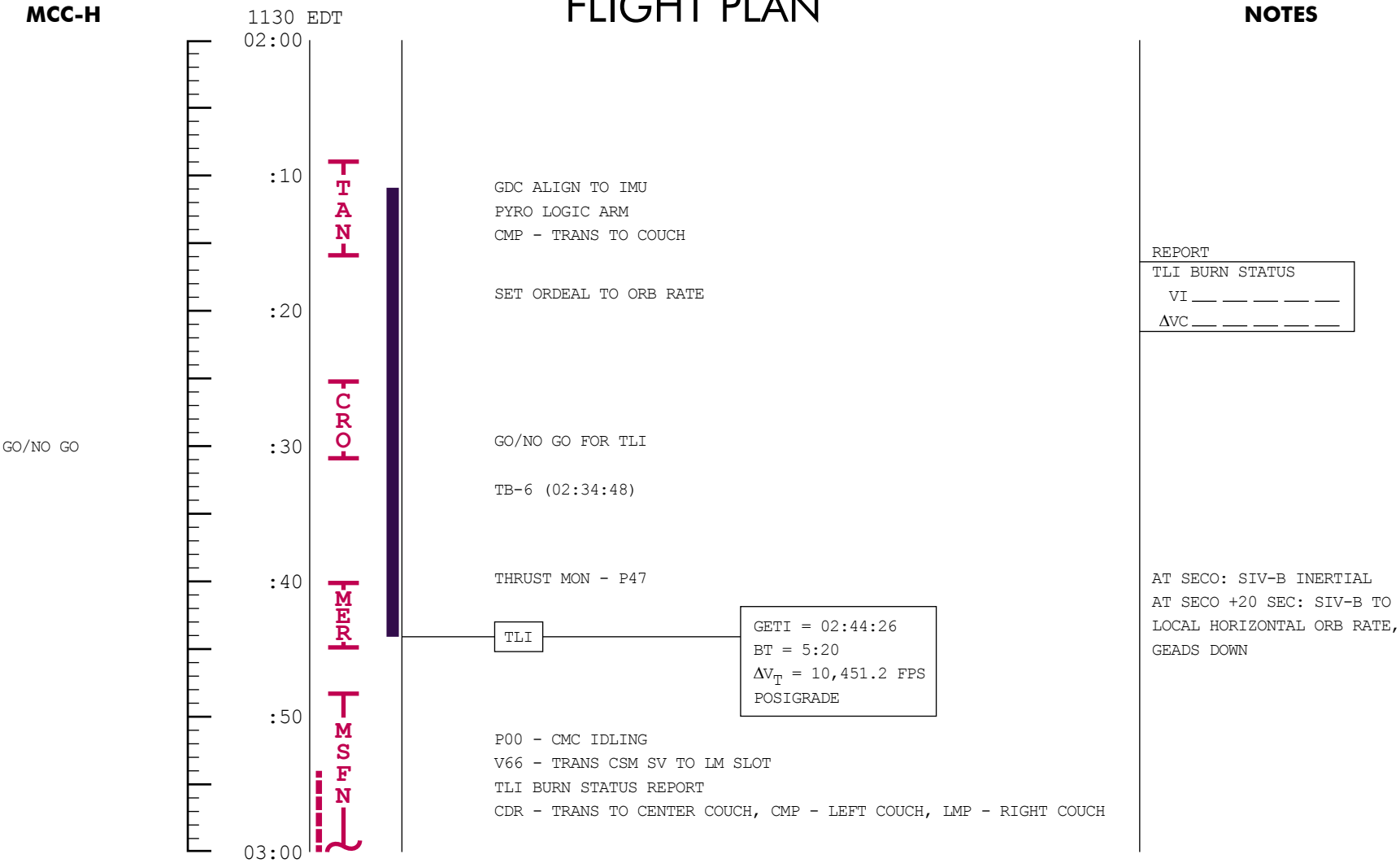
TLI  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
TLI	10°/SEC SHUTDOWN	±45° SHUTDOWN	BT +6 SEC & VI = PAD VALUE	DO NOT TRIM

MCC-H

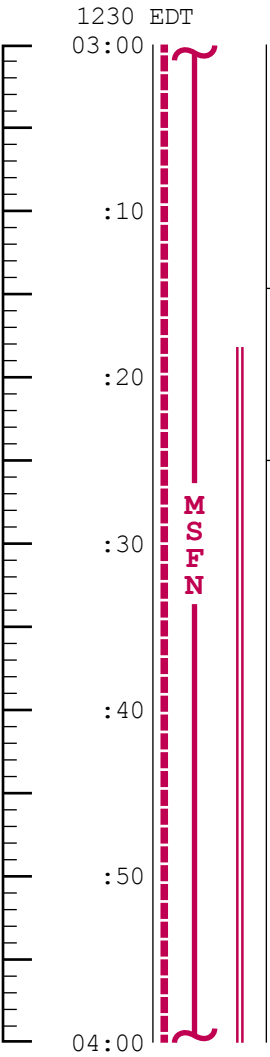
FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	02:00 - 03:00	1 / 2	3-3

MCC-H



# FLIGHT PLAN

NOTES

WASTE STOWAGE VENT VLV - CLOSED  
PRESS CABIN TO 5.7 PSIA  
GDC ALIGN TO IMU  
VERIFY AND ACTIVATE RCS DAP  
R1=11103, R2=01111  
CSM SEP PREPARATION  
LOAD DOCKING GIMBAL ANGLES  
START 16mm CAMERA  

CSM/SIV-B SEP  
GET = 03:15  
DOCKING PHOTOGRAPHY  
T&D MNVR  
+X 0.8 FPS  
AFTER 15 SEC, -X 0.3 FPS  
AUTO MNVR TO DOCKING ATT  
NULL TRANSLATION & RATES  
+X TO CLOST AT .25 TO .5 FPS  
STOP 16mm CAMERA

DOCK GET = 03:25  
POST DOCKING  
S-BAND HGA ANGLES = P\_\_\_\_Y\_\_\_\_  
CMP - INITIATE CM/LM PRESS EQUALIZATION  
CONFIGURE FOR EXTRACTION  
CHECK LM PRESS STABILIZATION  
REMOVE AND TEMP STOW TUNNEL HATCH  
CHECK DOCKING LATCHES  
VENT DOCKING PROBE  
CONNECT UMBILICALS - VERIFY PWR TO LM  
REINSTALL HATCH  
LM/CM ΔP VALVE - LM/CM ΔP  
VERIFY TUNNEL EQUALIZATION - CLOSED  
WASTE STOWAGE VENT VALVE - OPEN (FOR 8 HOURS)

DAP LOAD FOR SEPARATION CSM,  
0.5°DB, 2.0°/SEC, B/D ROLL,  
4 JETS  
  
EL PHOTOS AS CONVENIENT  
  
  
  
  
DECISION TO END CM CABIN  
PURGE WILL BE MADE REAL TIME  
BASED ON LM LEAK RATE

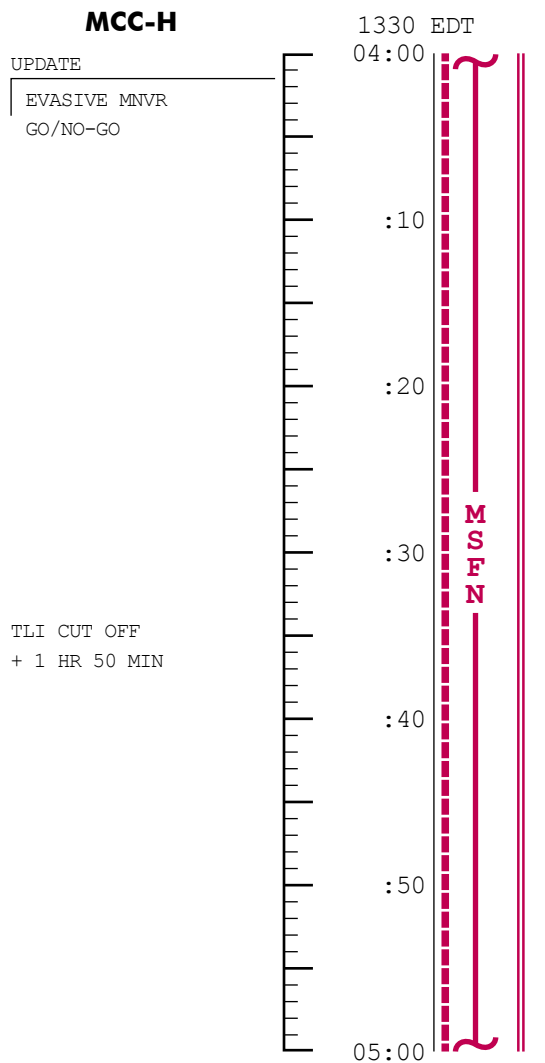
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	03:00 - 04:00	1 / TLC	3-4

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EVASIVE MANEUVER  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
EVASIVE MNVR	10°/SEC TAKEOVER	±10° TAKEOVER	BT +1 SEC	DO NOT TRIM





FLIGHT PLAN

RECORD EVASIVE MNVR PAD

GO/NO-GO FOR PYRO ARM & LM EJECTION

DAP - R1 = 21101, R2 = 11111

PYRO LOGIC ARM

THRUST MONITOR - P47

LM EJECTION

EXT  $\Delta v$  = P30

DAP - R1 = 21111, R2 = 11111

DAP CONFIGURATION AFTER

LM EJECTION SAME AS ABOVE

EXCEPT CHANGE TO 5° DB

SPS THRUST - P40

PITCH DOWN 75° WRT LOCAL HORIZONTAL

ROLL TO VISUALLY ACQ SIV-B

SM RCS MON CK

GDC ALIGN TO IMU

EVASIVE MNVR

SM RCS MON CK

SPS MON CK

BURN STATUS REPORT

V66 - TRANS CSM STATE VECTOR TO LM SLOT

MANEUVER TO OBSERVE SLINGSHOT

GETI = 04:09:45

BT = 3 SEC

$\Delta v_T$  =

GETI = 04:39:45

NO ULLAGE

BT = 2.8 SEC

$\Delta v_T$  = 19.7

IN PLANE

DAP CONFIGURATION FOR

LM EJECTION: CSM & LM

0.5° DB, .5°/SEC, A/C

ROLL, 4 JETS

NOTE:

WITH RT TLM, ONLY

ITEMS NORMALLY

REQUIRED IN BURN

STATUS REPORT ARE

%VC, FUEL, OX, AND

UNBAL

NOTES

FOR LM EJECTION

RELATIVE  $\Delta v$  FROM

SPRINGS = 1 FPS

BURN STATUS REPORT

X X :  $\Delta TIG$

X X : BT

•  $v_{gx}$

TRIM

X X X R

X X X P

X X X Y

•  $v_{gx}$

•  $v_{gy}$

•  $v_{gz}$

•  $\Delta v_c$

X X X FUEL

X X X OX

X X X UNBAL

FIRST SPS BURN WILL ALWAYS

START ON BANK A AND

BANK B WILL BE ACTIVATED IF

THE BURN >5 SEC

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	04:00 - 05:00	1 / TLC	3-5

MCC-H

1430 EDT

05:00

:10

:20

:30

:40

:50

06:00

MSFN

UPDATE

BLOCK DATA

FLIGHT PLAN

SIV-B SLINGSHOT

REPORT LM/CM ΔP

DOFF & STOW  
HELMET, GLOVES  
AND PGA'S

BATTERY CHARGE, BATTERY B

IMU REALIGN - P52  
OPTION 3 - REFSMMAT

GDC ALIGN TO IMU  
RECORD BLOCK DATA  
(P37 - TLI +11 HRS ABORT)  
MNVR TO SIGHTING ATT

NOTES

REPORT

P52 - (PAD REFSMMAT)

N71:   — —, — —

N05:   — — —. — —

N93:

X   — —. — — —

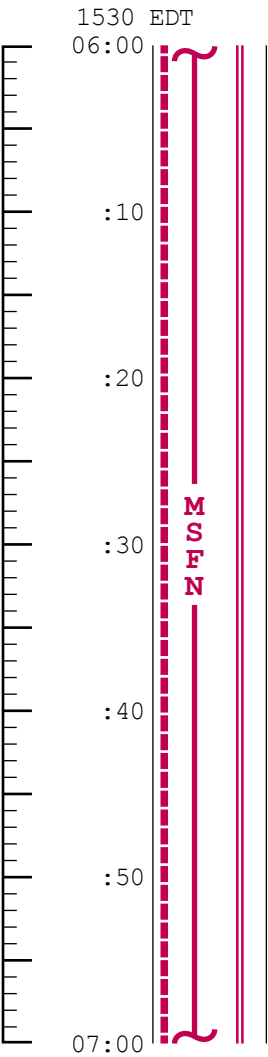
Y   — —. — — —

Z   — —. — — —

GET   — — —. — —. — —

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	05:00 - 06:00	1 / TLC	3-6

MCC-H



# FLIGHT PLAN

CISLUNAR NAVIGATION - P23

OPTICS CALIBRATION

- 1. STAR 02 ENH (R3=00110)
- 2. STAR 40 ENH (R3=00120)
- 3. STAR 44 ENH (R3=00110)
- 4. STAR 44 ENH (R3=00110)
- 5. STAR 45 ENH (R3=00110)

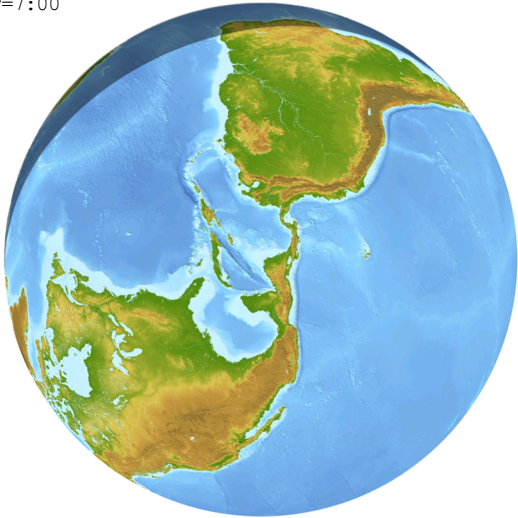
## NOTES

3 MARKS ON EACH STAR

INCORPORATE P23 MARK  
DATA AND UPDATE  
ONBOARD STATE VECTOR

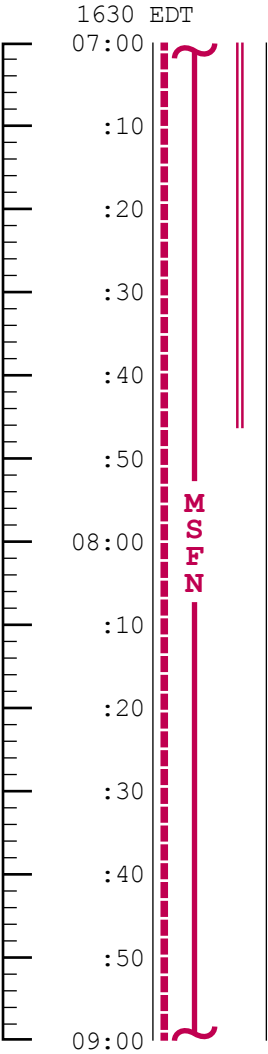
TRN BIAS CALIBRATION  
REPEATED UNTIL 2 CKS  
AGREE TO WITHIN 0.003°  
REPEAT CKS EVERY 30 MIN  
DURING P23

FOV=12°  
GET=7:00



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	06:00 - 07:00	1 / TLC	3-7

MCC-H



# FLIGHT PLAN

DEACTIVATE PRIMARY & SECONDARY EVAPORATORS  
MNVR TO PTS ATT P 90 Y 0 (SEE NOTES)  
SELECT NORMAL LUNAR COMM CONFIGURATION  
EXCEPT: S-BD AUX TAPE - OFF (CTR)  
TAPE RCDR FWD - OFF (CTR)  
POWER DOWN VHF

EAT PERIOD - ALL



## NOTES

PTC WILL BE INITIATED  
AFTER MCC1, OR AFTER  
MCC1 IS SCRUBBED

PHOTOS OF EARTH AS  
CONVENIENT  
EL/250/CEX-RING  
(f11, 250)

LUNAR  
EL/250/CEX-RING  
(f5.6, 250, INF)

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	07:00 - 09:00	1 / TLC	3-8

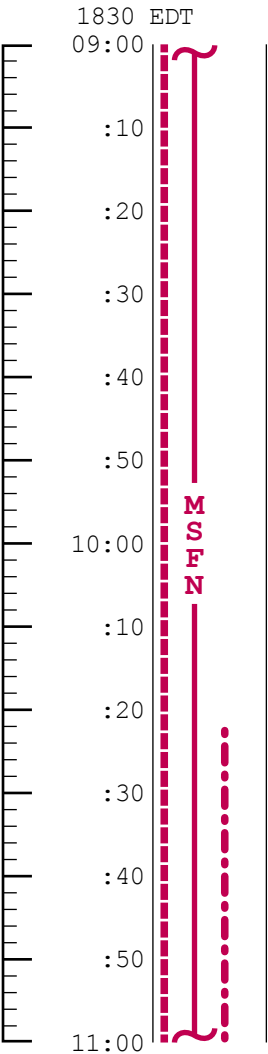
MCC-H

UPLINK CMC

EARTH HORIZON  
BIAS ( $\Delta H$ )  
(IF REQUIRED)  
CSM STATE VECTOR  
MCC1 TGT LOAD

UPDATE

MCC1 MNVR PAD



FLIGHT PLAN

CO<sub>2</sub> FILTER CHANGE NO.1  
(3 INTO A, STORE 1 IN B5)

V66 - TRANS CSM STATE VECTOR TO LM SLOT

O2 FUEL CELL PURGE

RECORD MCC1 MNVR PAD

CONTINUE PTC IF MCC1 IS SCRUBBED

IMU REALIGN - P52  
OPTION 3 - REFSMMAT  
(OPTIONAL)

PTC

NOTES

THE EARTH HORIZON BIAS  
( $\Delta H$ ) WILL BE UPDATED  
TO THE CMC IF  
THE DIFFERENCE BETWEEN  
THE SIGHTING  $\Delta H$  & THE  
E-MEMORY  $\Delta H$  IS  $\geq 8.3$ KM

REPORT

P52 - (PAD REFSMMAT)

N71: \_ \_ \_ , \_ \_ \_

N05: \_ \_ \_ . \_ \_ \_

N93:

X \_ \_ . \_ \_ \_ \_

Y \_ \_ . \_ \_ \_ \_

Z \_ \_ . \_ \_ \_ \_

GET \_ \_ \_ : \_ \_ : \_ \_

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	09:00 - 11:00	1 / TLC	3-9

MCC  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
MCC1	10°/SEC TAKEOVER	±10° TAKEOVER	BT +1 SEC	TRIM X AXIS ONLY (UNLESS X > 2 FPS)

MCC-H

2030 EDT

11:00

:10

:20

:30

:40

TLI  
+9 HRS

:50

12:00

UPLINK CMC

DESIRED ORIEN-  
TATION (PTC)  
UPDATE

BLOCK DATA

M  
S  
F  
N

FLIGHT PLAN

EXT ΔV

SPS/RCS THRUST - P40/41

MNVR TO BURN ATT

SXT STAR CK

EMS ΔV TEST

SM RCS MON CK

GDC ALIGN TO IMU

MCC1 ΔV = NOMINALLY ZERO

SM RCS MON CK

SPS MON CK

MCC1 BURN STATUS REPORT

V66 - TRANS CSM STATE VECTOR TO LM SLOT

RECORD BLOCK DATA

(P37 - TLI +25, +35, +44, AND +53 HR ABORTS)

NOTES

BURN STATUS REPORT

X	X	<input type="checkbox"/>	:	ΔTIG
X	X		:	BT
<input type="checkbox"/>			.	V <sub>gx</sub>
TRIM				
X	X	X		R
X	X	X		P
X	X	X		Y
<input type="checkbox"/>			.	V <sub>gx</sub>
<input type="checkbox"/>			.	V <sub>gy</sub>
<input type="checkbox"/>			.	V <sub>gz</sub>
<input type="checkbox"/>			.	ΔV <sub>C</sub>
X	X	X		FUEL
X	X	X		OX
X	X	X		UNBAL

MCC1 WILL BE PERFORMED  
IF ΔV WOULD EXCEED  
25 FPS IF DELAYED TO  
MCC3 (LOI -22 HRS)

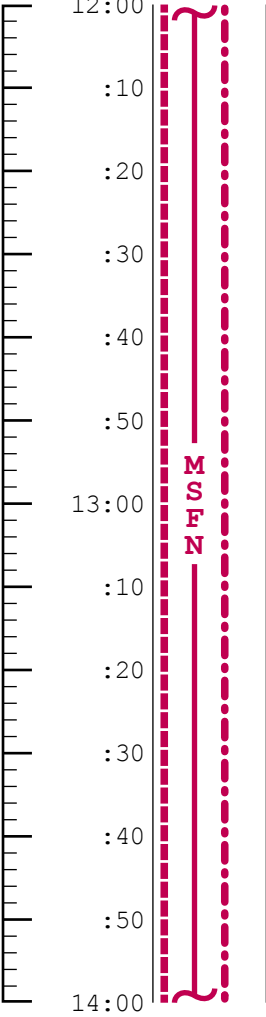
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	11:00 - 12:00	1 / TLC	3-10

MCC-H

2130 EDT

FLIGHT PLAN

NOTES



IMU REALIGN - P52  
(OPTION 1 - PREFERRED)  
& STAR CHECK  
(IF MCC1 WAS PERFORMED)

REPORT LM/CM ΔP  
BATTERY CHARGE, BATTERY A

EAT PERIOD - ALL

REST PERIOD  
(9 HOURS)

WASTE STOWAGE VENT VLV - CLOSED

VENT BATTS UNTIL SYSTEM TEST  
METER (4A) = 0

START PTC  
P 90° Y 0°

PRE SLEEP CHECKLIST  
CREW STATUS REPORT (RADIATION, MEDICATION)  
CYCLE O<sub>2</sub> & H<sub>2</sub> FANS  
CHLORINATE POTABLE WATER  
SELECT NORMAL LUNAR CONFIGURATION  
EXCEPT:  
S-BD NORMAL MODE VOICE - OFF  
S-BD SQUELCH - ENABLE  
S-BD AUX TAPE - OFF  
S-BD ANT - OMNI  
S-BD ANT OMNI - B  
TAPE RCDR FWD - OFF  
VERIFY:  
WASTE MNGT OVBD DRAIN - OFF  
WASTE STOW VENT VLV - CLOSED  
EMERG CABIN PRESS VLV - BOTH  
SURGE TK O<sub>2</sub> VLV - ON  
REPRESS PACK O<sub>2</sub> VLV - ON  
LM TUNNEL VENT VLV - LM/CM ΔP  
POT H<sub>2</sub>O HTR - OFF  
AUTO RCS JET SELECT (16) - OFF

P52 - PULSE TORQUE  
TO PTC REFSMMAT.  
ALIGNMENT CHECKED  
WITH OPTICS  
PTC ESTABLISHED IN  
G&N P, Y ±30°DB,  
R RATE OF 0.3°/SEC

ONBOARD READOUT

BAT C \_\_\_\_\_

PYRO BAT A \_\_\_\_\_

PYRO BAT B \_\_\_\_\_

RCS A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

D \_\_\_\_\_

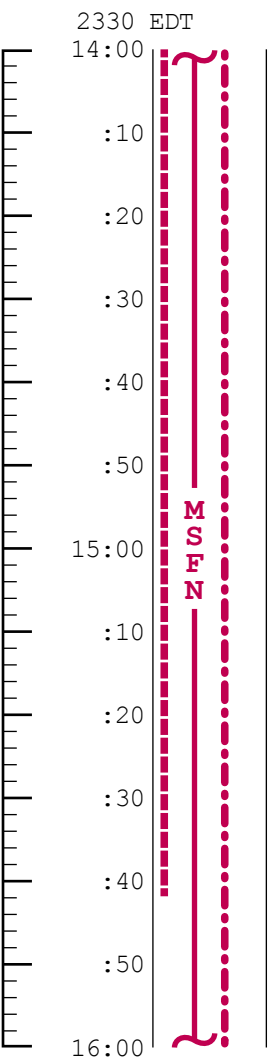
DC IND SEL TO MNA OR MNB

DURING REST PERIOD,  
2 CREWMEN IN REST  
STATION, 1 IN LEFT  
COUCH

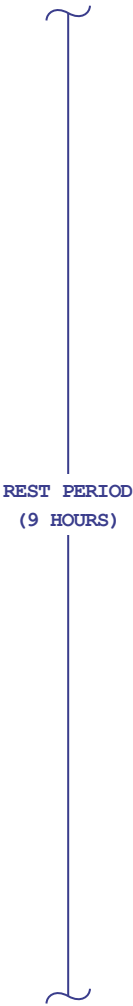
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	12:00 - 14:00	1 / TLC	3-11



MCC-H



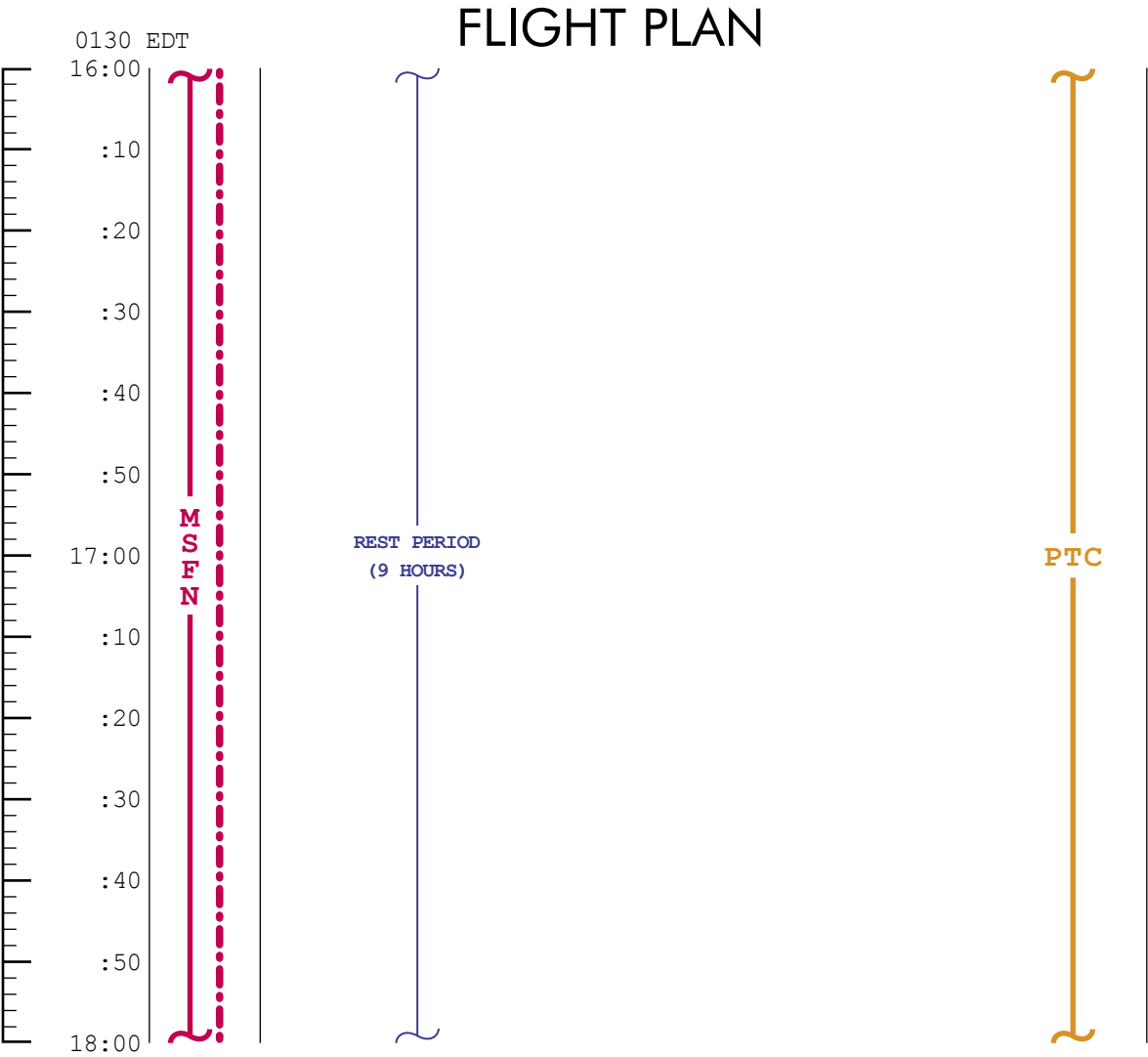
# FLIGHT PLAN



NOTES

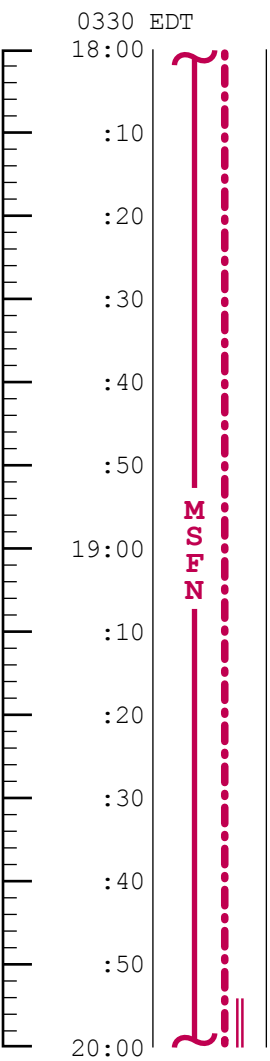
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	14:00 - 16:00	1 / TLC	3-12

MCC-H

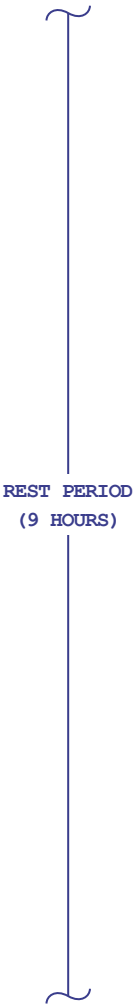


MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	16:00 - 18:00	1 / TLC	3-13

MCC-H



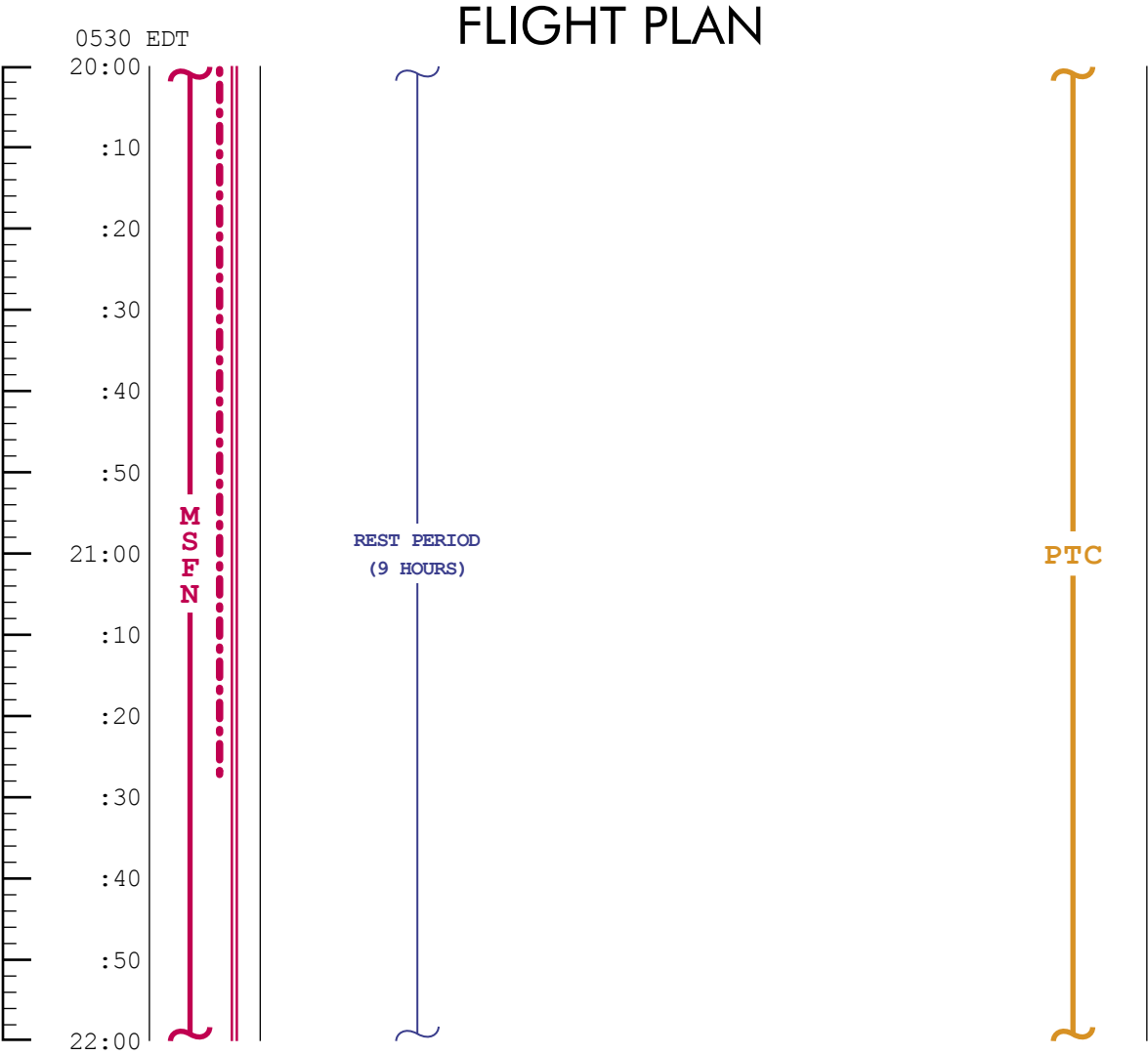
# FLIGHT PLAN



NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	18:00 - 20:00	1 / TLC	3-14

MCC-H



NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	20:00 - 22:00	1 / TLC	3-15

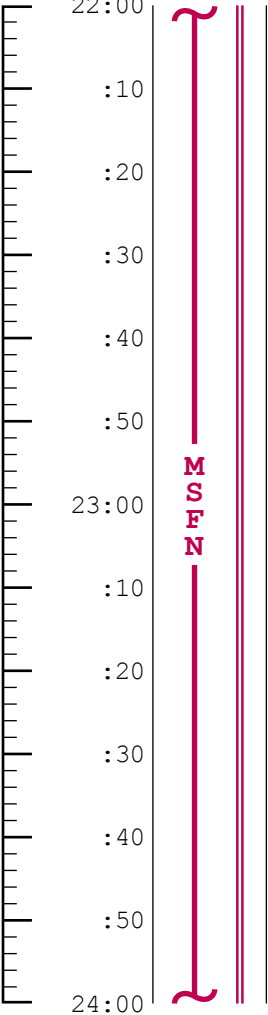
MCC-H

0730 EDT

FLIGHT PLAN

NOTES

UPDATE  
CONSUMABLES



REST PERIOD  
(9 HOURS)

CO<sub>2</sub> FILTER CHANGE NO.2  
(4 INTO B, STORE 2 IN B5)

EAT PERIOD

POST SLEEP CHECKLIST  
CREW STATUS REPORT (SLEEP)  
CYCLE O<sub>2</sub> & H<sub>2</sub> FANS  
GDC ALIGN TO IMU  
REPORT LM/CM ΔP  
CONSUMABLES UPDATE  
SELECT NORMAL LUNAR CONFIGURATION  
EXCEPT:  
S-BD AUX TAPE - OFF  
TAPE RCDR FWD - OFF  
POT H<sub>2</sub>O HTR - ON  
AUTO RCS JET SELECT (16) - ON

CONSUMABLE UPDATE  
(Δ FROM NOMINAL)  
GET: \_\_\_\_\_  
RCS TOT \_\_\_\_\_  
A \_\_\_\_\_  
B \_\_\_\_\_  
C \_\_\_\_\_  
D \_\_\_\_\_  
H<sub>2</sub> TOT \_\_\_\_\_  
O<sub>2</sub> TOT \_\_\_\_\_

PTC

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	22:00 - 24:00	2 / TLC	3-16

MCC-H

0930 EDT

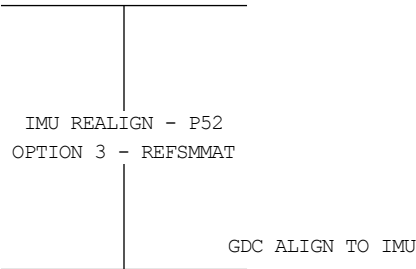
24:00



M  
S  
F  
N

FLIGHT PLAN

O<sub>2</sub> FUEL CELL PURGE



MNVR TO SIGHTING ATT  
CISLUNAR NAVIGATION P23  
OPTICS CALIBRATION

- 1. STAR 01 ENH (R3=00110)
- 2. STAR 02 ENH (R3=00110)

NOTES

PTC

REPORT

P52 - (PAD REFSMMAT)

N71:    \_ \_ \_ / \_ \_ \_

N05:    \_ \_ \_ . \_ \_ \_

N93:

      X   \_ \_ \_ . \_ \_ \_

      Y   \_ \_ \_ . \_ \_ \_

      Z   \_ \_ \_ . \_ \_ \_

GET    \_ \_ \_ : \_ \_ : \_ \_ \_

3 MARKS ON EACH STAR  
INCORPORATE P23 MARK  
DATA AND UPDATE  
ONBOARD STATE VECTOR  
TRN BIAS CALIBRATION  
REPEATED UNTIL 2 CKS  
AGREE TO WITHIN 0.003°  
REPEAT CKS EVERY 30 MIN  
DURING P23 's

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	24:00 - 25:00	2 / TLC	3-17

MCC-H

1030 EDT

25:00

:10

:20

:30

:40

:50

26:00

UPLINK CMC

CSM STATE VECTOR  
MCC2 TGT LOAD

UPDATE

MCC2 PAD DATA

M  
S  
F  
N

FLIGHT PLAN

3. STAR 44 EFH (R3=00120)

4. STAR 44 EFH (R3=00120)

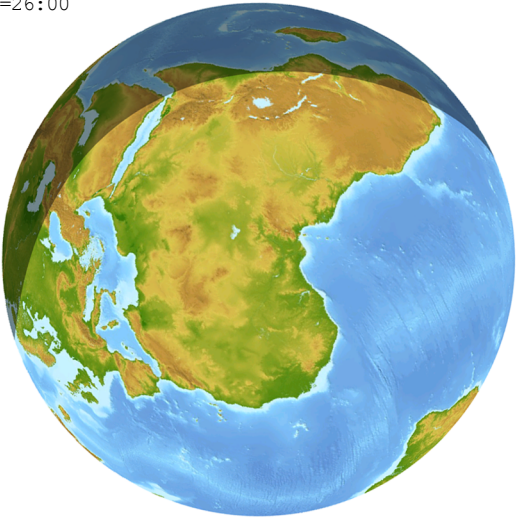
5. STAR 45 EFH (R3=00120)

V66 - TRANS CSM STATE VECTOR TO LM SLOT

RECORD MCC2 MNVR PAD

NOTES

FOV=4°  
GET=26:00



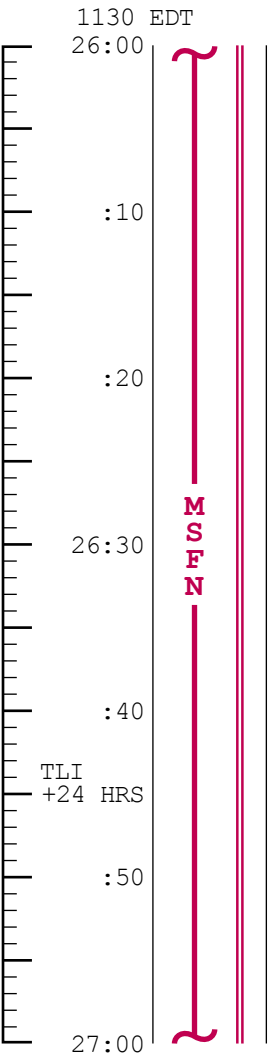
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	25:00 - 26:00	2 / TLC	3-18

MCC  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
MCC2	10°/SEC TAKEOVER	±10° TAKEOVER	BT +1 SEC	TRIM X AXIS ONLY (UNLESS X > 2 FPS)



MCC-H



# FLIGHT PLAN

EXT ΔV - P30

SPS/RCS THRUST - P40/41

MNVR TO BURN ATT

SXT STAR CK

EMS ΔV TEST

SM RCS MON CK

GDC ALIGN TO IMU

MCC2 ΔV=NOMINALLY ZERO

SM RCS MON

SPS MON CK

MCC2 BURN STATUS REPORT

V66 - TRANS CSM STATE VECTOR TO LM SLOT

## NOTES

BURN STATUS REPORT					
X	X	<input type="checkbox"/>	:		ATIG
X	X		:		BT
<input type="checkbox"/>				.	V <sub>gx</sub>
TRIM					
X	X	X			R
X	X	X			P
X	X	X			Y
<input type="checkbox"/>				.	V <sub>gx</sub>
<input type="checkbox"/>				.	V <sub>gy</sub>
<input type="checkbox"/>				.	V <sub>gz</sub>
<input type="checkbox"/>				.	ΔV <sub>C</sub>
X	X	X			FUEL
X	X	X			OX
X	X	X			UNBAL

MCC2 WILL BE PERFORMED  
IF 5V WOULD EXCEED  
25 FPS IF DELAYED TO  
MCC3 (LOI -22 HRS)

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	26:00 - 27:00	2 / TLC	3-19

MCC-H

UPLINK

EARTH HORIZON

BIAS (ΔH)

(IF REQUIRED)

1230 EDT

27:00

:10

:20

:30

:40

:50

28:00

:10

:20

:30

:40

:50

29:00

MSFN

FLIGHT PLAN

EAT PERIOD

START PTC

P 90° Y 0°

PTC

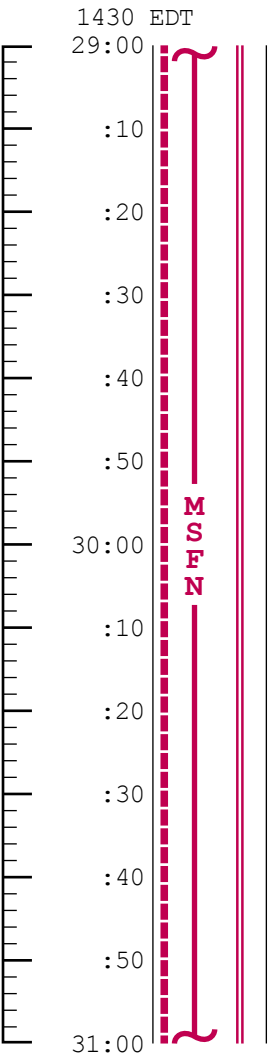
NOTES

THE EARTH HORIZON  
BIAS WILL BE UPDATED  
TO THE CMC IF THE  
DIFFERENCE BETWEEN  
THE SIGHTING ΔH  
IS ≥8.3 KM

PTC ESTABLISHED  
IN G&N P, Y  
±30° DB, R RATE  
OF 0.3°/SEC

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	27:00 - 29:00	2 / TLC	3-20

MCC-H



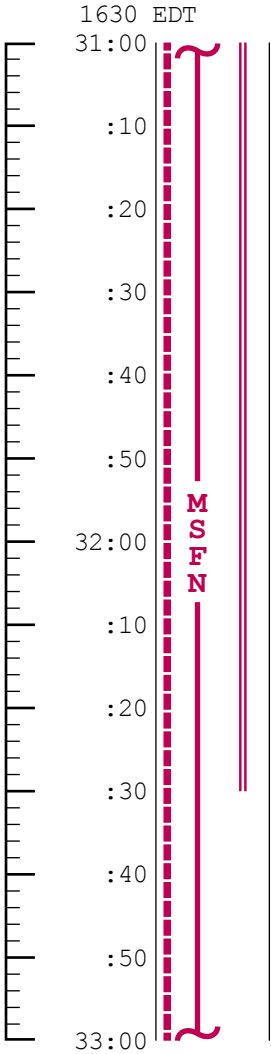
# FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	29:00 - 31:00	2 / TLC	3-21

MCC-H



# FLIGHT PLAN

NOTES

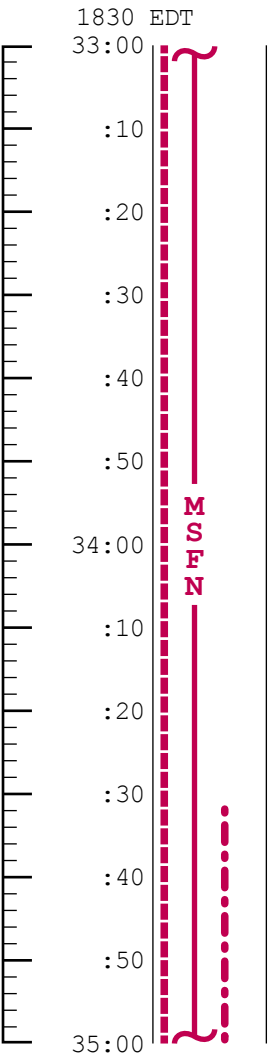


MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	31:00 - 33:00	2 / TLC	3-22

MCC-H

FLIGHT PLAN

NOTES



O<sub>2</sub> FUEL CELL PURGE

CO<sub>2</sub> FILTER CHANGE NO.3  
(5 INTO A, STORE 3 IN B5)



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	33:00 - 35:00	2 / TLC	3-23

MCC-H

UPDATE

BLOCK DATA

2030 EDT

35:00

:10

:20

:30

:40

:50

36:00

:10

:20

:30

:40

:50

37:00

MSFN

FLIGHT PLAN

RECORD BLOCK DATA-  
LOI -5 FLYBY TO  
PRIME CLA

EAT PERIOD - ALL

REPORT LM/CM ΔP  
REINITIATE CSM PURGE  
(IF REQUIRED)

NOTE:  
THE LENGTH OF THE SECOND CSM CABIN PURGE  
WILL BE DETERMINED REAL TIME BASED ON THE  
LM LEAK RATE ENSURING LM O<sub>2</sub> PURITY  
REQUIREMENTS ON THE LUNAR SURFACE

PRE SLEEP CHECKLIST

CREW STATUS REPORT (RADIATION, MEDICATION)  
CYCLES O<sub>2</sub> & H<sub>2</sub> FANS  
CHLORINATE POTABLE WATER  
SELECT NORMAL LUNAR CONFIGURATION  
EXCEPT:  
S-BD NORMAL MODE VOICE - OFF  
S-BD AUX TAPE - OFF  
TAPE RCDR FWD - OFF  
GO TO HGA OR CONTINUE OMNI  
OPS PER MSFN  
OMNI OPS  
S-BD ANT OMNI - OMNI  
S-BD ANT OMNI - B  
HI GAIN OPS  
HI GAIN ANT BEAM - NARROW  
HI GAIN ANT TRACK - REACQ  
S-BD ANT - HI GAIN  
VERIFY:  
WASTE MNGT OVBD DRAIN - OFF  
WASTE STOW VENT VLV - CLOSED  
EMERG CABIN PRESS VLV - BOTH  
SURGE TK O<sub>2</sub> VLV - ON  
REPRESS PACK O<sub>2</sub> VLV - ON  
LM TUNNEL VENT VLV - LM/CM ΔP  
POT H<sub>2</sub>O HTR - OFF  
AUTO RCS JET SELECT (16) - OFF

NOTES

ONBOARD READOUT

BAT C

PYRO BAT A

PYRO BAT B

RCS A

B

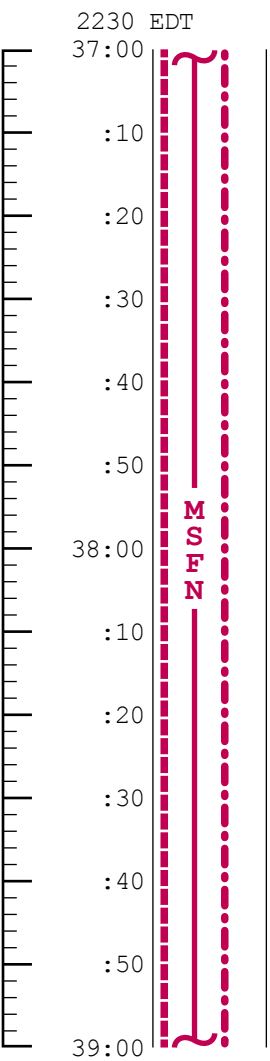
C

D

DC IND SEL TO MNA OR MNB

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	35:00 - 37:00	2 / TLC	3-24

MCC-H



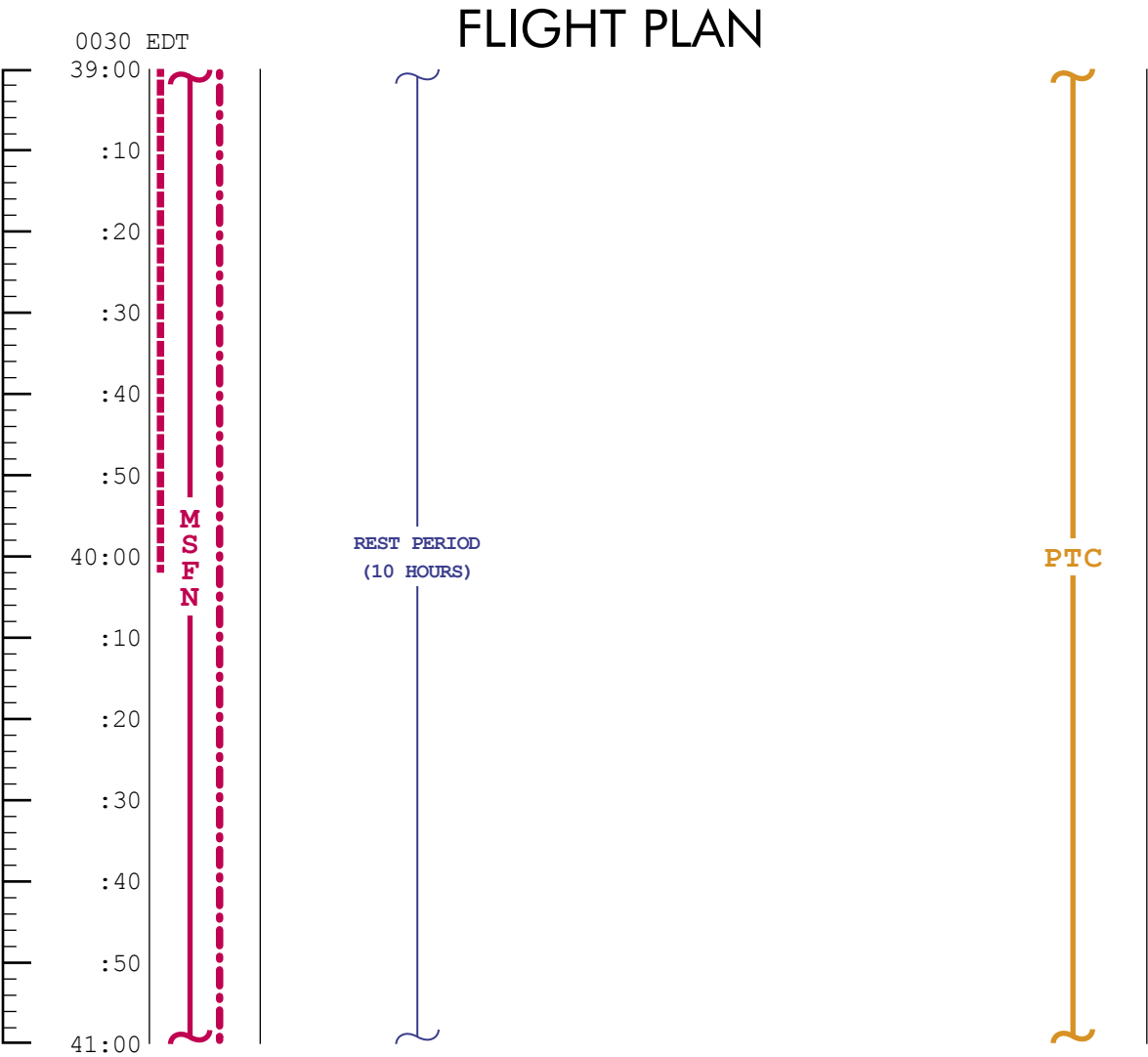
# FLIGHT PLAN

NOTES

DURING REST PERIOD  
2 CREWMEN IN REST  
STATION, 1 IN LEFT  
COUCH

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	37:00 - 39:00	2 / TLC	3-25

MCC-H

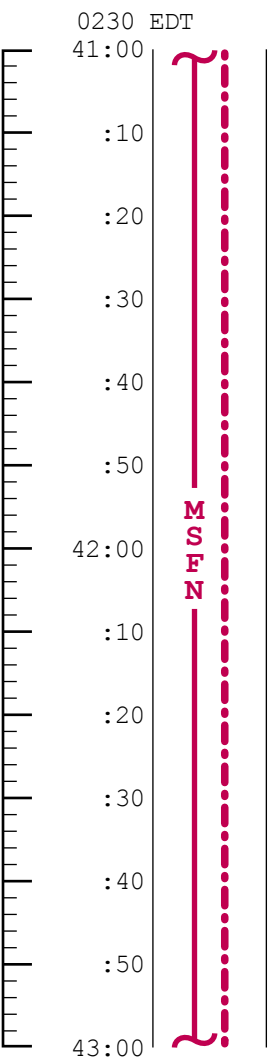


NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	39:00 - 41:00	2 / TLC	3-26

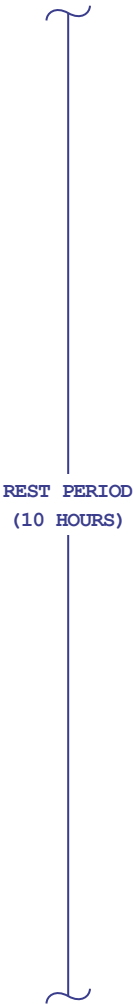


MCC-H



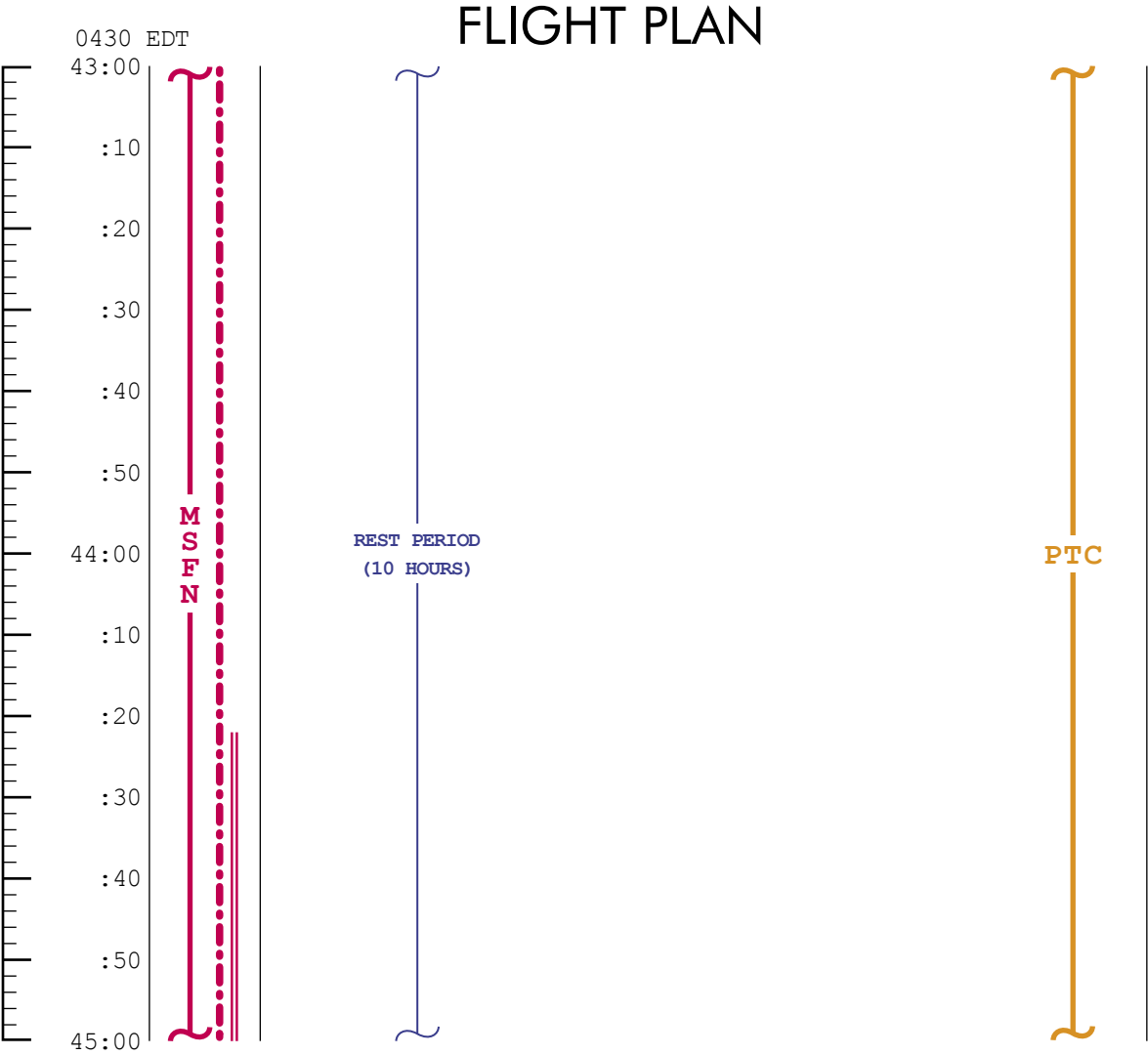
# FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	41:00 - 43:00	2 / TLC	3-27

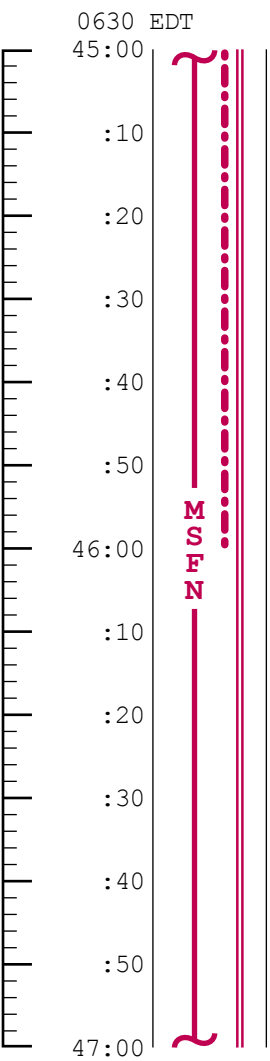
MCC-H



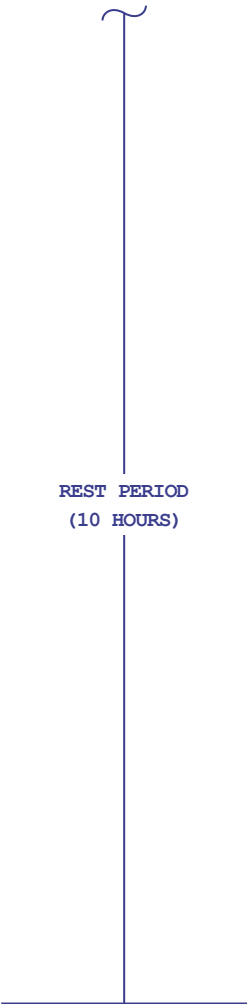
NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	43:00 - 45:00	2 / TLC	3-28

MCC-H



# FLIGHT PLAN



NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	45:00 - 47:00	2 / TLC	3-29

**MCC-H**

0830 EDT

47:00

:10

:20

:30

:40

:50

48:00

:10

:20

:30

:40

:50

49:00

# FLIGHT PLAN

CO2 FILTER CHANGE NO.4  
(6 INTO B, STORE 4 IN B5)

## POST SLEEP CHECKLIST

CREW STATUS REPORT (SLEEP)	
NAME	STATUS
1. [REDACTED]	[REDACTED]
2. [REDACTED]	[REDACTED]
3. [REDACTED]	[REDACTED]
4. [REDACTED]	[REDACTED]
5. [REDACTED]	[REDACTED]
6. [REDACTED]	[REDACTED]
7. [REDACTED]	[REDACTED]
8. [REDACTED]	[REDACTED]
9. [REDACTED]	[REDACTED]
10. [REDACTED]	[REDACTED]
11. [REDACTED]	[REDACTED]
12. [REDACTED]	[REDACTED]
13. [REDACTED]	[REDACTED]
14. [REDACTED]	[REDACTED]
15. [REDACTED]	[REDACTED]
16. [REDACTED]	[REDACTED]
17. [REDACTED]	[REDACTED]
18. [REDACTED]	[REDACTED]
19. [REDACTED]	[REDACTED]
20. [REDACTED]	[REDACTED]
21. [REDACTED]	[REDACTED]
22. [REDACTED]	[REDACTED]
23. [REDACTED]	[REDACTED]
24. [REDACTED]	[REDACTED]
25. [REDACTED]	[REDACTED]
26. [REDACTED]	[REDACTED]
27. [REDACTED]	[REDACTED]
28. [REDACTED]	[REDACTED]
29. [REDACTED]	[REDACTED]
30. [REDACTED]	[REDACTED]
31. [REDACTED]	[REDACTED]
32. [REDACTED]	[REDACTED]
33. [REDACTED]	[REDACTED]
34. [REDACTED]	[REDACTED]
35. [REDACTED]	[REDACTED]
36. [REDACTED]	[REDACTED]
37. [REDACTED]	[REDACTED]
38. [REDACTED]	[REDACTED]
39. [REDACTED]	[REDACTED]
40. [REDACTED]	[REDACTED]
41. [REDACTED]	[REDACTED]
42. [REDACTED]	[REDACTED]
43. [REDACTED]	[REDACTED]
44. [REDACTED]	[REDACTED]
45. [REDACTED]	[REDACTED]
46. [REDACTED]	[REDACTED]
47. [REDACTED]	[REDACTED]
48. [REDACTED]	[REDACTED]
49. [REDACTED]	[REDACTED]
50. [REDACTED]	[REDACTED]
51. [REDACTED]	[REDACTED]
52. [REDACTED]	[REDACTED]
53. [REDACTED]	[REDACTED]
54. [REDACTED]	[REDACTED]
55. [REDACTED]	[REDACTED]
56. [REDACTED]	[REDACTED]
57. [REDACTED]	[REDACTED]
58. [REDACTED]	[REDACTED]
59. [REDACTED]	[REDACTED]
60. [REDACTED]	[REDACTED]
61. [REDACTED]	[REDACTED]
62. [REDACTED]	[REDACTED]
63. [REDACTED]	[REDACTED]
64. [REDACTED]	[REDACTED]
65. [REDACTED]	[REDACTED]
66. [REDACTED]	[REDACTED]
67. [REDACTED]	[REDACTED]
68. [REDACTED]	[REDACTED]
69. [REDACTED]	[REDACTED]
70. [REDACTED]	[REDACTED]
71. [REDACTED]	[REDACTED]
72. [REDACTED]	[REDACTED]
73. [REDACTED]	[REDACTED]
74. [REDACTED]	[REDACTED]
75. [REDACTED]	[REDACTED]
76. [REDACTED]	[REDACTED]
77. [REDACTED]	[REDACTED]
78. [REDACTED]	[REDACTED]
79. [REDACTED]	[REDACTED]
80. [REDACTED]	[REDACTED]
81. [REDACTED]	[REDACTED]
82. [REDACTED]	[REDACTED]
83. [REDACTED]	[REDACTED]
84. [REDACTED]	[REDACTED]
85. [REDACTED]	[REDACTED]
86. [REDACTED]	[REDACTED]
87. [REDACTED]	[REDACTED]
88. [REDACTED]	[REDACTED]
89. [REDACTED]	[REDACTED]
90. [REDACTED]	[REDACTED]
91. [REDACTED]	[REDACTED]
92. [REDACTED]	[REDACTED]
93. [REDACTED]	[REDACTED]
94. [REDACTED]	[REDACTED]
95. [REDACTED]	[REDACTED]
96. [REDACTED]	[REDACTED]
97. [REDACTED]	[REDACTED]
98. [REDACTED]	[REDACTED]
99. [REDACTED]	[REDACTED]
100. [REDACTED]	[REDACTED]

CYCLE O<sub>2</sub> & H<sub>2</sub> FANS

GDC ALIGN TO IMU

## CONSUMABLES UPDATE

SELECT NORMAL LUNAR CONFIGURATION

EXCEPT:

S-BD AUX TAPE - OFF

TAPE RCDR FWD - OFF

POT H<sub>2</sub>O HTR - ON

AUTO RCS JET SELECT (16) - ON

EAT PERIOD - ALL

BATTERY CHARGE, BATTERY B

PTC

## NOTES

CONSUMABLE UPDATE (Δ FROM NOMINAL)
---------------------------------------

GET: \_\_\_\_\_

RCS TOT \_\_\_\_\_

A \_\_\_\_\_

B \_\_\_\_\_

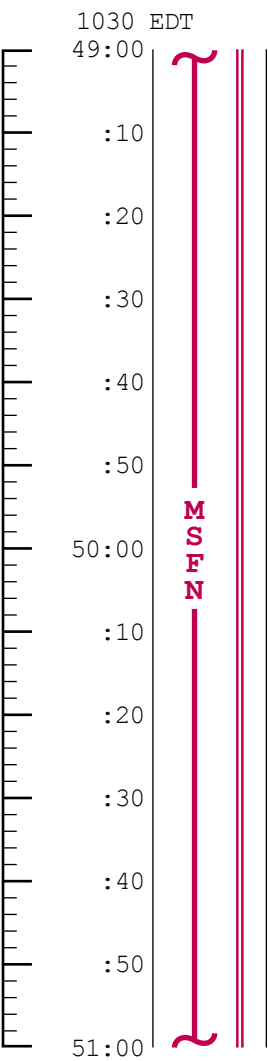
C \_\_\_\_\_

D \_\_\_\_\_

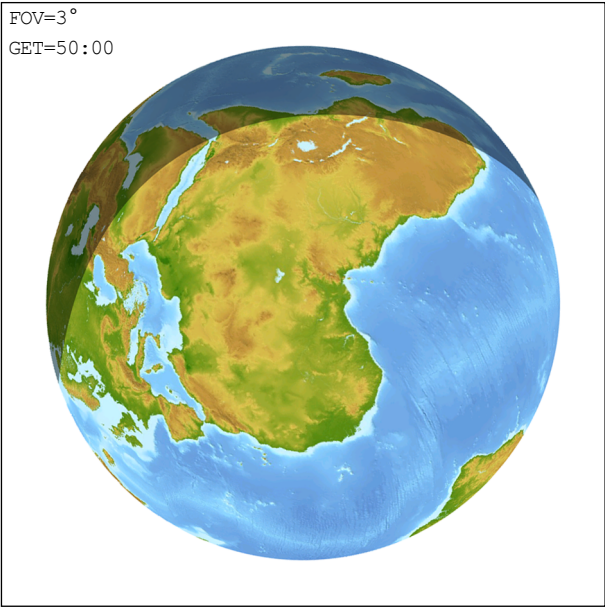
H<sub>2</sub> TOT \_\_\_\_\_O<sub>2</sub> TOT \_\_\_\_\_

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	47:00 - 49:00	3 / TLC	3-30

MCC-H



# FLIGHT PLAN



NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	49:00 - 51:00	3 / TLC	3-31

MCC-H

1230 EDT

FLIGHT PLAN

NOTES

UPLINK

CSM STATE VECTOR  
MCC3 TGT LOAD

UPDATE

MCC3 MNVR PAD

51:00  
:10  
:20  
:30  
:40  
:50  
52:00  
:10  
:20  
:30  
:40  
:50  
53:00

M  
S  
F  
N

V66 - TRANSFER CSM STATE VECTOR TO LM SLOT

RECORD MCC3 MNVR PAD  
H<sub>2</sub> PURGE LINE HTRS-ON

O<sub>2</sub> & H<sub>2</sub> FUEL CELL PURGE

EAT PERIOD - ALL

PTC

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	51:00 - 53:00	3 / TLC	3-32

THIS PAGE INTENTIONALLY LEFT BLANK.

MCC  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
MCC3	10°/SEC TAKEOVER	±10° TAKEOVER	BT +1 SEC	TRIM X AXIS ONLY (UNLESS X > 2 FPS)



MCC-H

1430 EDT

53:00

:10

:20

53:30

:40

:50

LOI  
-22 HRS

54:00

MSFN

FLIGHT PLAN

IMU REALIGN - P52

OPTION 3 - REFSMMAT

EXT ΔV - P30

SPS/RCS THRUST - P40/41

MNVR TO BURN ATT

SXT STAR CK (STOW OPTICS)

EMS ΔV TEST

SM RCS MON CK

GDC ALIGN TO IMU

MCC3 ΔV=NOMINALLY ZERO

SM RCS MON

SPS MON CK

BURN STATUS REPORT

X X ☐

X X

☐

TRIM

X X X

X X X

X X X

☐

☐

☐

☐

X X X

X X X

X X X

ΔTIG

BT

V<sub>gx</sub>

R

P

Y

V<sub>gx</sub>

V<sub>gy</sub>

V<sub>gz</sub>

ΔV<sub>c</sub>

FUEL

OX

UNBAL

NOTES

P52 - (PAD REFSMMAT)

N71:    \_ \_ \_ / \_ \_ \_

N05:    \_ \_ \_ . \_ \_ \_

N93:

X    \_ \_ \_ . \_ \_ \_

Y    \_ \_ \_ . \_ \_ \_

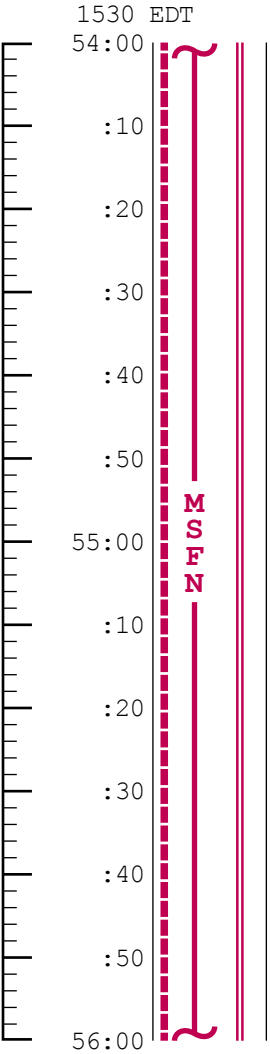
Z    \_ \_ \_ . \_ \_ \_

GET    \_ \_ \_ : \_ \_ : \_ \_ \_

MCC3 WILL BE EXECUTED  
IF ΔV >3 FPS  
AND IF LOI1 CANNOT BE  
TARGETED TO CORRECT  
THE TLC DISPERSIONS

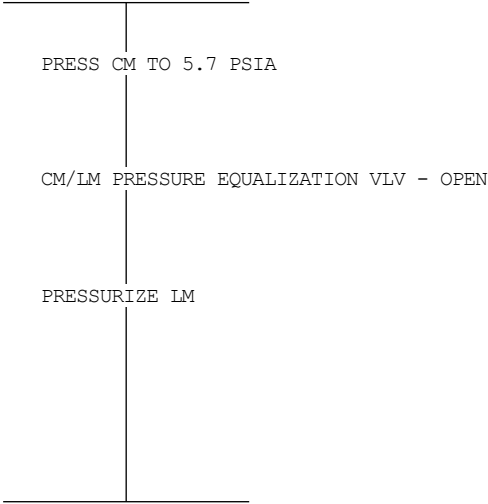
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	53:00 - 54:00	3 / TLC	3-33

MCC-H



# FLIGHT PLAN

MCC3 BURN STATUS REPORT  
V66 - TRANS CSM STATE VECTOR TO LM SLOT



NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	54:00 - 56:00	3 / TLC	3-34

**CSM**  
**CMP**

DUMP DSE (LM DATA)

**CDR**

LM

**LMP**

MCC-H

ASSIST CDR

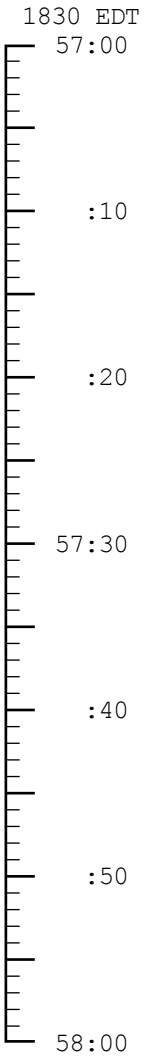
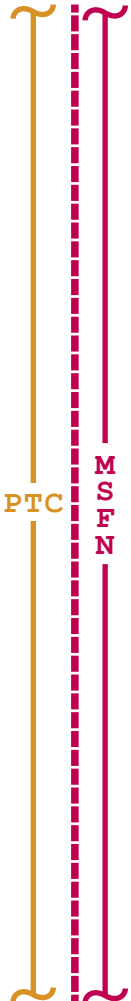
LM FAMILIARIZATION

LM FAMILIARIZATION

VERIFY OPERATION  
OF LM 16mm CAMERA

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	56:00 - 57:00	3 / TLC	3-35

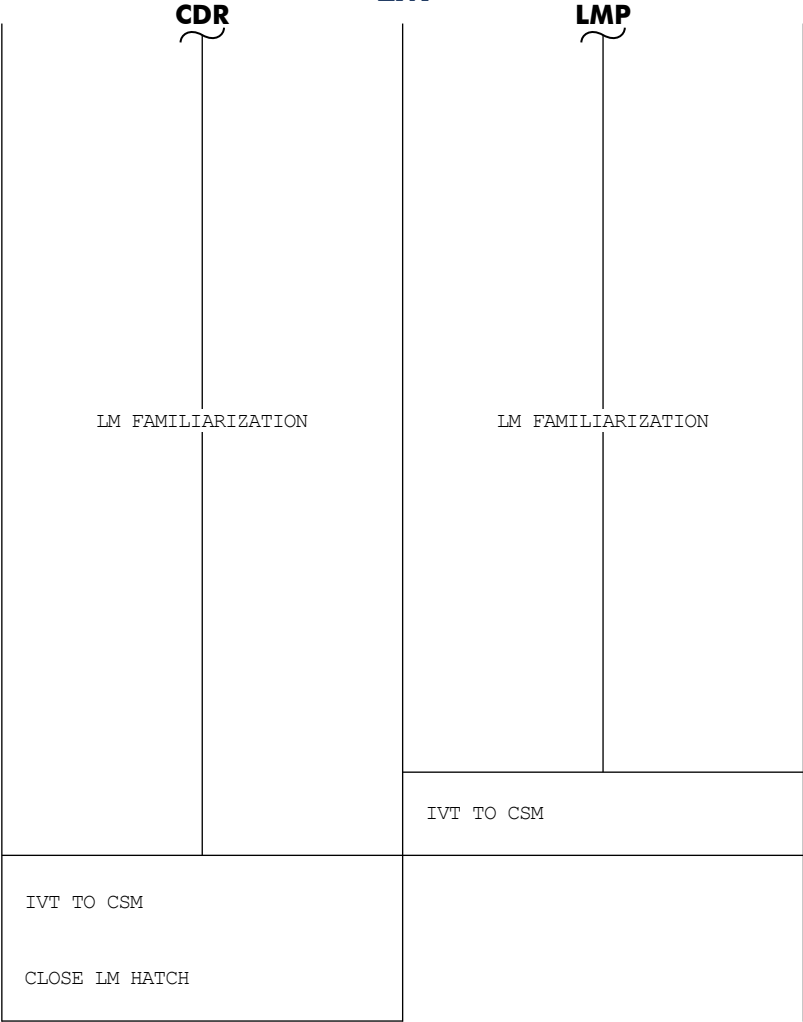
CSM  
CMP



# FLIGHT PLAN

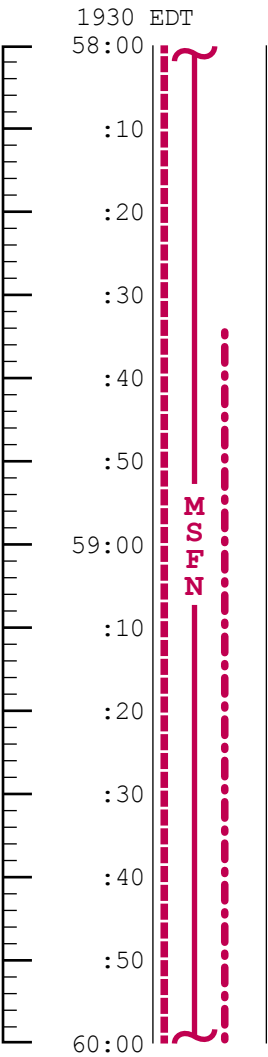
LM

MCC-H



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	57:00 - 58:00	3 / TLC	3-36

MCC-H



M  
S  
F  
N

INSTALL PROBE AND DROGUE  
INSTALL CM HATCH  
LM TUNNEL VENT VALVE - LM/CM ΔP

CO<sub>2</sub> FILTER CHANGE NO.5  
(7 INTO A, STORE 5 IN B6)

EAT PERIOD - ALL

# FLIGHT PLAN



## NOTES

180,000 NM from EARTH

ONBOARD READOUT

BAT C

PYRO BAT A

PYRO BAT B

RCS A

B

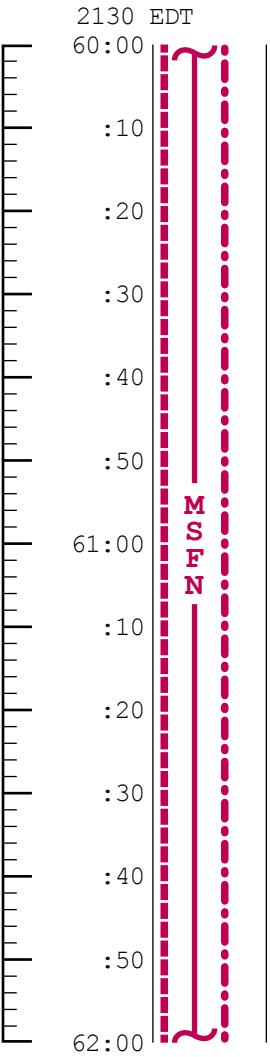
C

D

DC IND SEL TO MNA OR MNB

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	58:00 - 60:00	3 / TLC	3-37

MCC-H



# FLIGHT PLAN

NOTES

PRE SLEEP CHECKLIST

CREW STATUS REPORT (RADIATION, MEDICATION)

CYCLES O<sub>2</sub> & H<sub>2</sub> FANS

CHLORINATE POTABLE WATER

SELECT NORMAL LUNAR CONFIGURATION

EXCEPT:

- S-BD NORMAL MODE VOICE - OFF
- S-BD SQUELCH - ENABLE
- S-BD AUX TAPE - OFF
- TAPE RCDR FWD - OFF
- GO TO HGA OR CONTINUE OMNI
- OPS PER MSFN

OMNI OPS

- S-BD ANT OMNI - OMNI
- S-BD ANT OMNI - B

HI GAIN OPS

- HI GAIN ANT BEAM - NARROW
- HI GAIN ANT TRACK - REACQ
- S-BD ANT - HI GAIN

VERIFY:

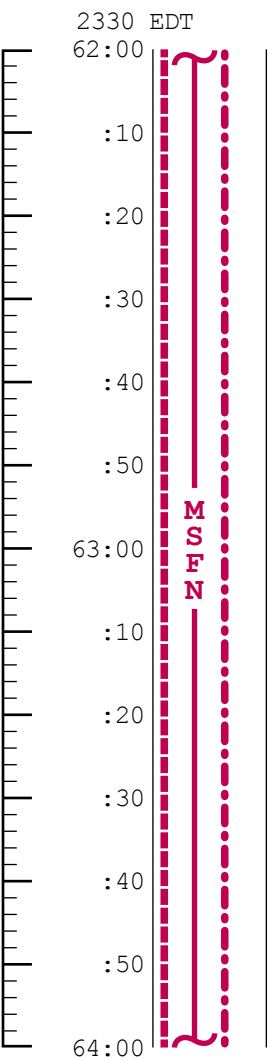
- WASTE MNGT OVBD DRAIN - OFF
- WASTE STOW VENT VLV - CLOSED
- EMERG CABIN PRESS VLV - ON
- REPRESS PACK O<sub>2</sub> VLV - ON
- LM TUNNEL VENT VLV - LM/CM ΔP
- POT H<sub>2</sub>O HTR - OFF
- AUTO RCS JET SELECT (16) - OFF

DURING REST PERIOD  
2 CREWMEN IN REST  
STATION, 1 IN LEFT  
COUCH

REST PERIOD  
(9 HOURS)

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	60:00 - 62:00	3 / TLC	3-38

MCC-H

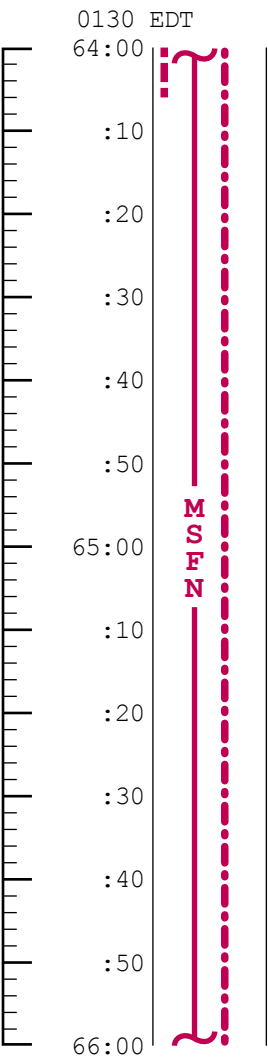


# FLIGHT PLAN

NOTES

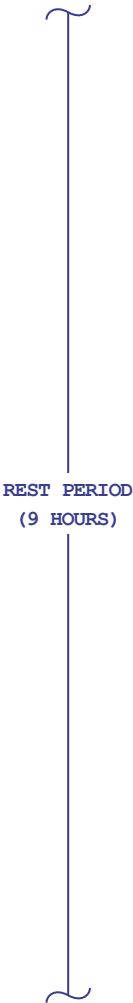
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	62:00 - 64:00	3 / TLC	3-39

MCC-H



# FLIGHT PLAN

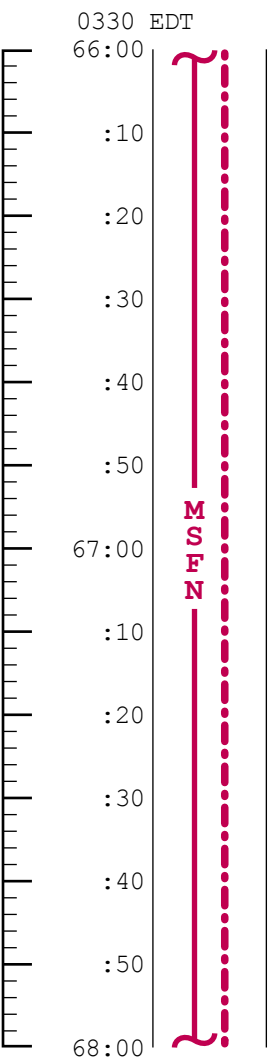
NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	64:00 - 66:00	3 / TLC	3-40



MCC-H



# FLIGHT PLAN



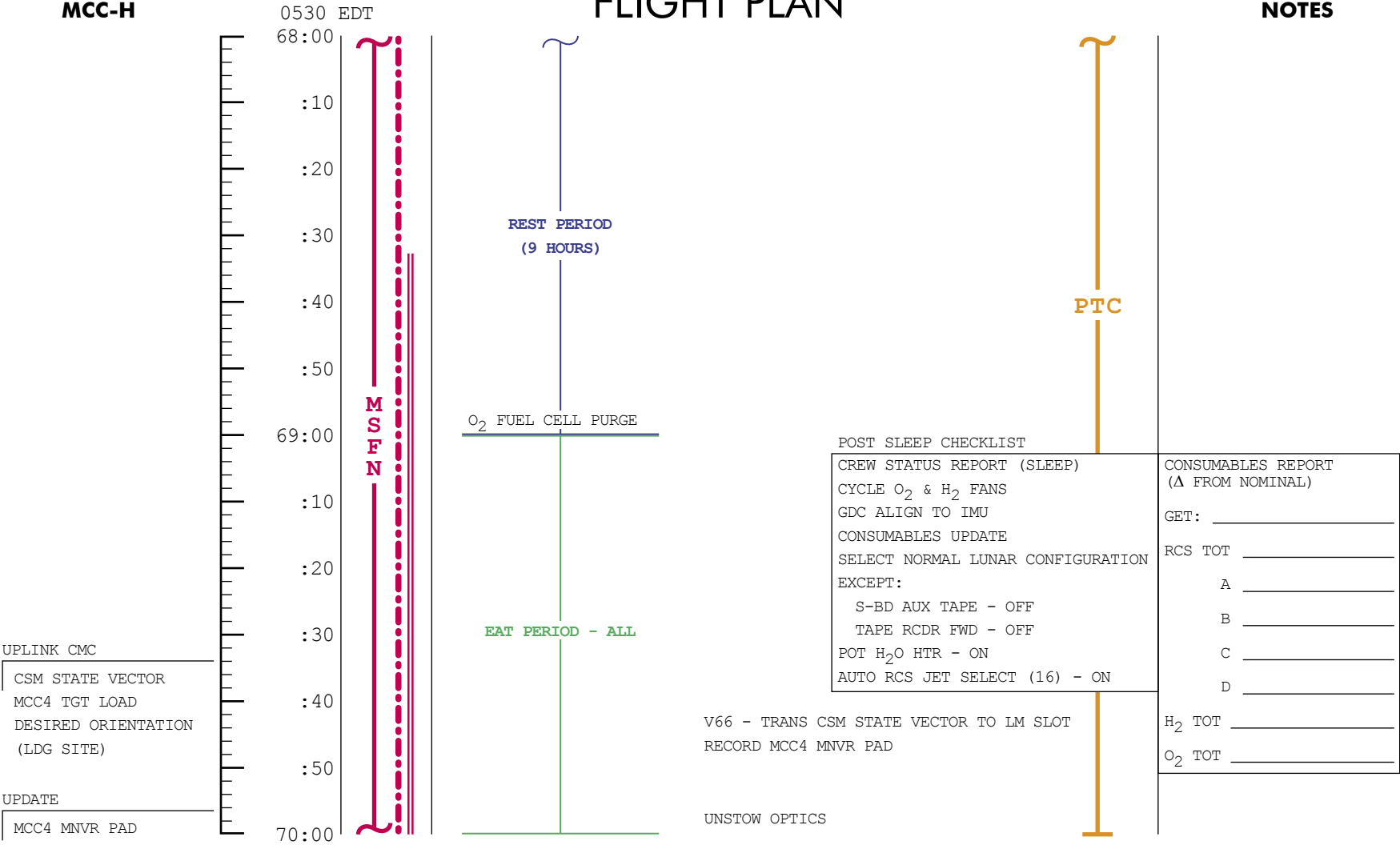
NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	66:00 - 68:00	3 / TLC	3-41

MCC-H

FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	68:00 - 70:00	3 / TLC	3-42

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MCC  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
MCC4	10°/SEC TAKEOVER	±10° TAKEOVER	BT +1 SEC	TRIM X AXIS ONLY (UNLESS X > 2 FPS)

MCC-H

UPDATE

BLOCK DATA

0730 EDT

70:00

:10

:20

70:30

:40

:50

LOI

-5 HRS

70:55

71:00

MSFN

# FLIGHT PLAN

IMU REALIGN - P52

OPTION 1 - PREFERRED

EXT ΔV - P30

SPS/RCS THRUST - P40/41

MNVR TO BURN ATT

SXT STAR CK

EMS ΔV TEST

SM RCS MON CK

GDC ALIGN TO IMU

MCC4 ΔV=NOMINALLY ZERO

SM RCS MON CK

RECORD BLOCK DATA-

PC +2 HRS FAST

RETURN TO ANY CLA

BURN STATUS REPORT

X X ☐

X X

☐

X X X

X X X

X X X

☐

☐

☐

☐

X X X

X X X

X X X

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ΔTIG

BT

V<sub>gx</sub>

R

P

Y

V<sub>gx</sub>

V<sub>gy</sub>

V<sub>gz</sub>

ΔV<sub>C</sub>

FUEL

OX

UNBAL

NOTES

REPORT

P52 - (LDG SITE REFSMMAT)

N71: \_ \_ / \_ \_

N05: \_ \_ . \_ \_

N93:

X \_ \_ . \_ \_

Y \_ \_ . \_ \_

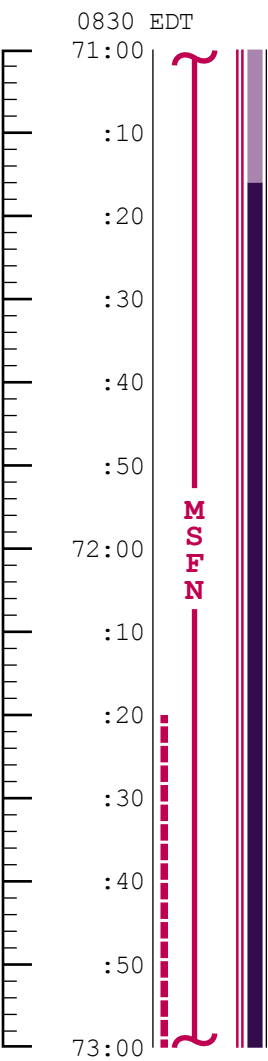
Z \_ \_ . \_ \_

GET \_ \_ . \_ : \_ \_ : \_ \_

MCC4 WILL BE EXECUTED  
ONLY IF LOI<sub>1</sub> CANNOT BE  
TARGETED TO CORRECT  
THE MCC3 DISPERSIONS

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	70:00 - 71:00	3 / TLC	3-43

MCC-H

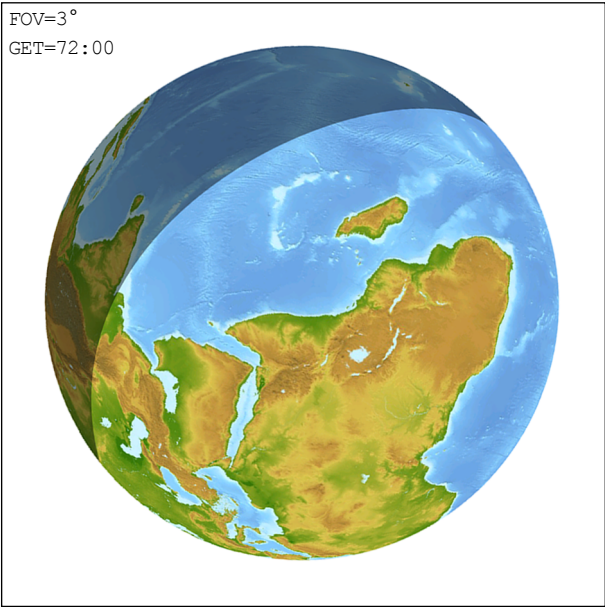


# FLIGHT PLAN

SPS MON CK  
MCC4 BURN STATUS REPORT  
V66 - TRANS CSM STATE VECTOR TO LM SLOT

CO<sub>2</sub> FILTER CHANGE NO.6  
(8 INTO B, STORE 6 IN B6)

PRE-LOI ECS REDUNDANT COMPONENT CK  
ACTIVATE PRIMARY EVAPORATOR



NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	71:00 - 73:00	4 / TLC	3-44

MCC-H

UPLINK CMC

CSM STATE VECTOR

LOI<sub>1</sub> TGT LOAD

UPDATE CSM

LOI<sub>1</sub> MNVR PAD

UPDATE CSM

BLOCK DATA

1030 EDT

73:00

73:30

73:52

74:00

MSFN

FLIGHT PLAN

V66 - TRANSFER CSM STATE VECTOR TO LM SLOT

COPY LOI<sub>1</sub> P30 MANEUVER PAD

IMU REALIGN - P52

AND DRIFT CK

OPTION 3 - REFSMMAT

COPY BLOCK DATA (TEI<sub>1</sub> & TEI<sub>4</sub>)

NOTES

TEI<sub>1</sub> BLOCK DATA ASSUM LOI<sub>1</sub> ACCOMPLISHED

TEI<sub>4</sub> ASSUMES LOI<sub>1</sub> ACCOMPLISHED BUT NO LOI<sub>2</sub>

REPORT

P52 - (LDG SITE REFSMMAT)

N71:    \_ \_ \_ , \_ \_ \_

N05:    \_ \_ \_ . \_ \_ \_

N93:

X   \_ \_ \_ . \_ \_ \_ \_ \_

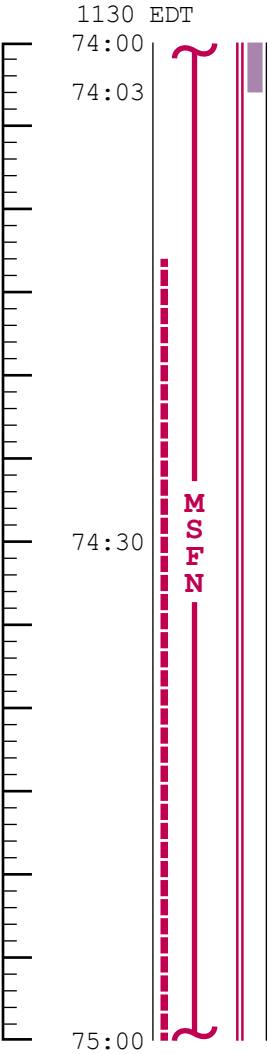
Y   \_ \_ \_ . \_ \_ \_ \_ \_

Z   \_ \_ \_ . \_ \_ \_ \_ \_

GET   \_ \_ \_ . \_ \_ \_ : \_ \_ \_ : \_ \_ \_

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	73:00 - 74:00	4 / TLC	3-45

MCC-H



# FLIGHT PLAN

NOTES

P30 EXTERNAL %V  
EXT ΔV - P30  
P00. V49  
MANEUVER TO BURN ATTITUDE R 357.9, P 225.4, Y 346.2  
SEXTANT STAR CHECK

ROLL TO ACQUIRE MSFN  
SPS PRETHRUST - P40 (TVC TEST)  
ROLL TO BURN ATTITUDE

S-BAND SQUELCH - OFF

PITCH UP 360° AT 0.2°/SEC  
TO OBSERVE LUNAR SURFACE

GO INERTIAL  
V64 REACQUIRE MSFN

EMS ΔV TEST

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	74:00 - 75:00	4 / TLC	3-46



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LOI<sub>1</sub>  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
LOI <sub>1</sub>	10°/SEC TAKEOVER	±10° TAKEOVER	BT +10 SEC	DO NOT TRIM

LOI <sub>1</sub> V <sub>GO</sub>	BT	TRAJECTORY	ABORT MODE	
2924.0 - 2129.0	0 - 110	HYPERBOLIC	MODE I -	COAST 2 HR - DPS - P37 (P37 BEYOND SPHERE FOR VGO >2279 AND BT <90)
2129.0 - 1589.0	110 - 180	UNSTABLE	MODE II -	COAST 2 HR - 2 DPS BURNS FOR STABILI- ZATION AND WATER OR CLA LANDING
1589.0 - 0	180 - 365	LUNAR ORBIT	MODE III -	DPS BURN AFTER ONE REV

MCC-H

1230 EDT

75:00

UPLINK CSM

LOS AND AOS  
(WITH & WITHOUT  
LOI<sub>1</sub>)

GO/NO GO

75:30

75:46

76:00

MSFN

# FLIGHT PLAN

CMP - PRE LOI<sub>1</sub> SYSTEMS CKS

C&W CK

CM RCS CK

SM RCS CK

SPS PERIODIC MON

EPS PERIODIC MON

ECS PERIODIC MON

COPY UPDATE: LOS \_\_\_\_:\_\_\_\_:\_\_\_\_

AOS WITH LOI<sub>1</sub> \_\_\_\_:\_\_\_\_:\_\_\_\_

AOS W/O LOI<sub>1</sub> \_\_\_\_:\_\_\_\_:\_\_\_\_

EXT ΔV - P30 (RELOAD N81 WITH PAD VALUES)

SPS THRUST - P40

MNVR TO BURN ATTITUDE

R 357.9, P 225.4, Y 346.2

SEXTANT STAR CHECK

GO/NO GO FOR LOI<sub>1</sub>

PCM-LO

S-BAND AUX-DOWN VOICE BACKUP

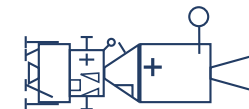
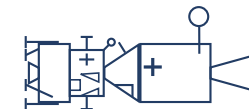
GDC ALIGN TO IMU

LOI<sub>1</sub>

GETI: 75:54:28  
NO ULLAGE  
BT: 5 MIN 59.9 SEC  
ΔV<sub>T</sub>: 2924.1 FPS  
ORBIT: 59.2 x 169.8  
RETROGRADE  
DO NOT TRIM

NOTE: INITIATE LOI<sub>1</sub>  
WITH BANK B BALL VALVES

NOTES



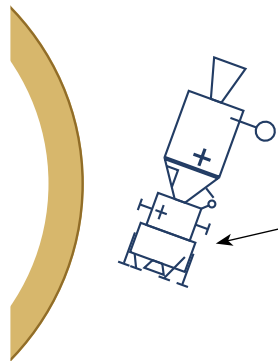
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	75:00 - 76:00	4 / 1	3-47

MCC-H

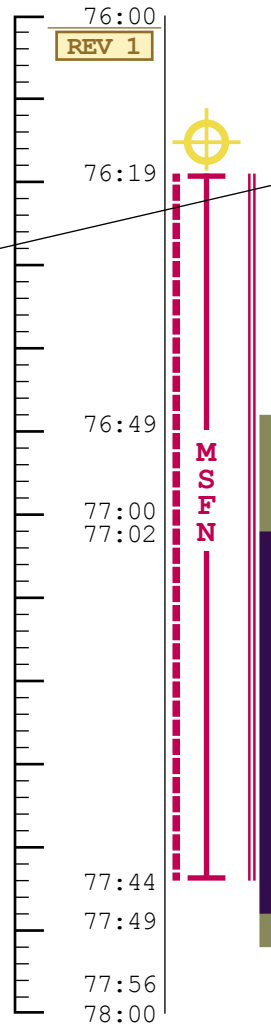
1330 EDT

# FLIGHT PLAN

NOTES



R180, P315/295, Y0  
HGA P-20, Y355  
DUMP DSE



V66 - TRANSFER CSM STATE VECTOR  
TO LM SLOT

SM RCS AND SPS MON CK  
ROLL 180°, PITCH DOWN 70°,  
YAW LEFT 14°  
V64 REACQUIRE MSFN  
ORB RATE

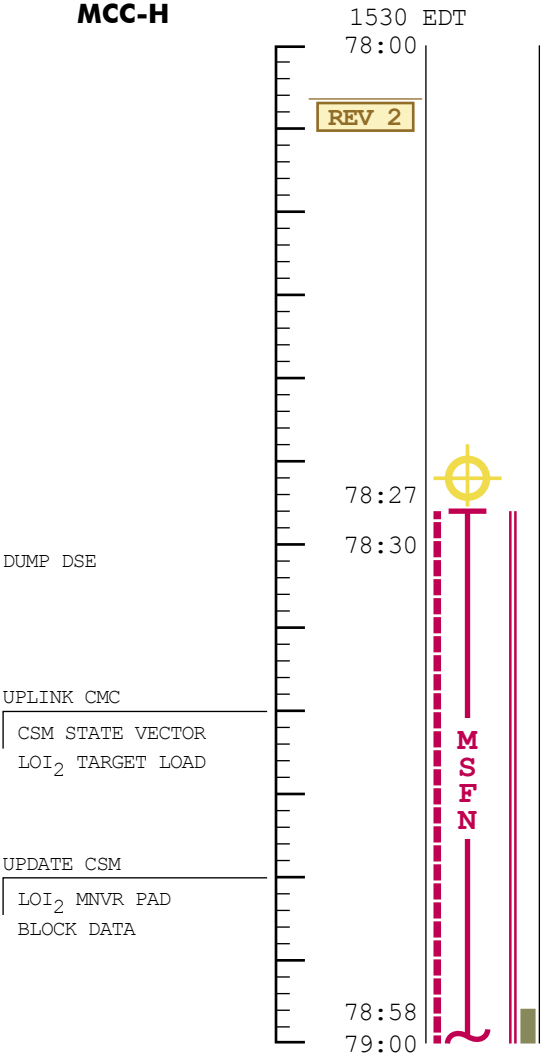
LOI<sub>1</sub> BURN STATUS REPORT

BURN STATUS REPORT			
X	X		:
X	X		:
			.
TRIM			
X	X	X	
X	X	X	
X	X	X	
			.
			.
			.
			.
X	X	X	
X	X	X	
X	X	X	

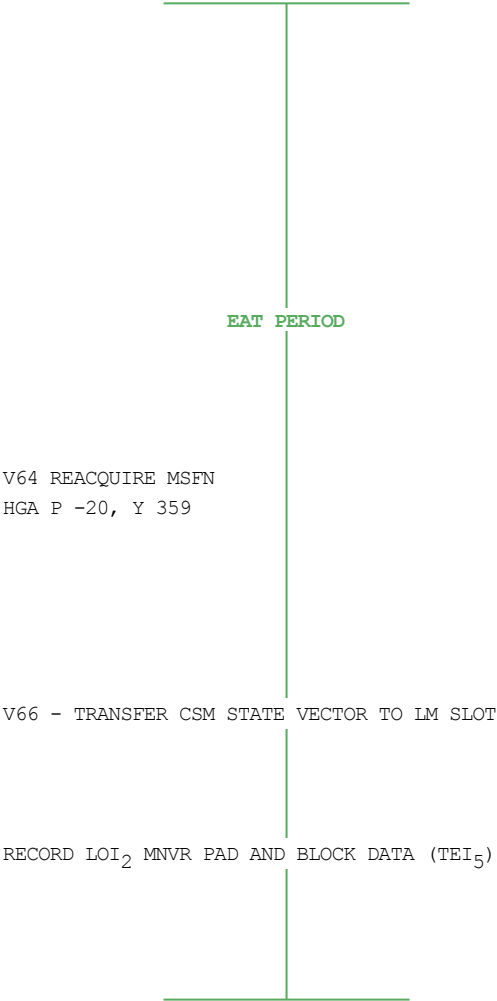
ΔTIG  
BT  
V<sub>gx</sub>  
R  
P  
Y  
V<sub>gx</sub>  
V<sub>gy</sub>  
V<sub>gz</sub>  
ΔV<sub>C</sub>  
FUEL  
OX  
UNBAL

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	76:00 - 78:00	4 / 1	3-48

MCC-H



FLIGHT PLAN



NOTES

TEI<sub>5</sub> BLOCK DATA  
ASSUMES LOI<sub>1</sub> & LOI<sub>2</sub>  
ACCOMPLISHED

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	78:00 - 79:00	4 / 2	3-49

MCC-H

1630 EDT

79:00

79:10

79:30

79:52

79:57

80:00

MSFN

PIPA BIAS CHECK

## FLIGHT PLAN

CMP - PRE LOI<sub>2</sub> SYSTEMS MONITOR

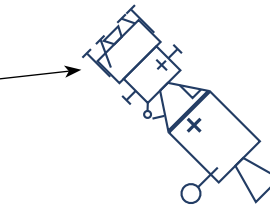
GO INERTIAL

IMU REALIGN - P52  
OPTION 3 - REFSMMAT  
DRIFT CHECK

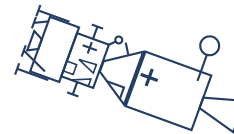
P30 EXTERNAL ΔV  
MANEUVER TO LOI<sub>2</sub> BURN ATTITUDE

P40 SPS THRUST  
GO INERTIAL

SEXTANT STAR CHECK  
EMS ΔV TEST  
SM RCS CHECK  
LOAD DAP FOR 2 JET ULLAGE  
R1 = 20111  
R2 = 11111



R 180, P 315/182, Y 0  
HGA P -45, Y 180



R 0, P 50.1/212.3, Y 359.6

## NOTES

### REPORT

P52 - (LDG SITE REFSMMAT)

N71: \_ \_ , \_ \_

N05: \_ \_ . \_ \_

N93:

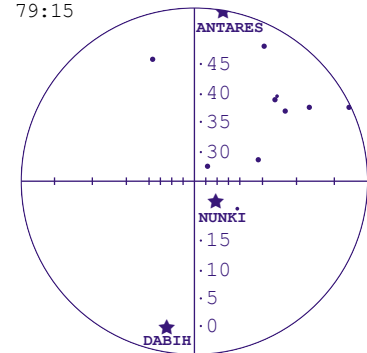
X \_ \_ . \_ \_

Y \_ \_ . \_ \_

Z \_ \_ . \_ \_

GET \_ \_ : \_ \_ : \_ \_

79:15



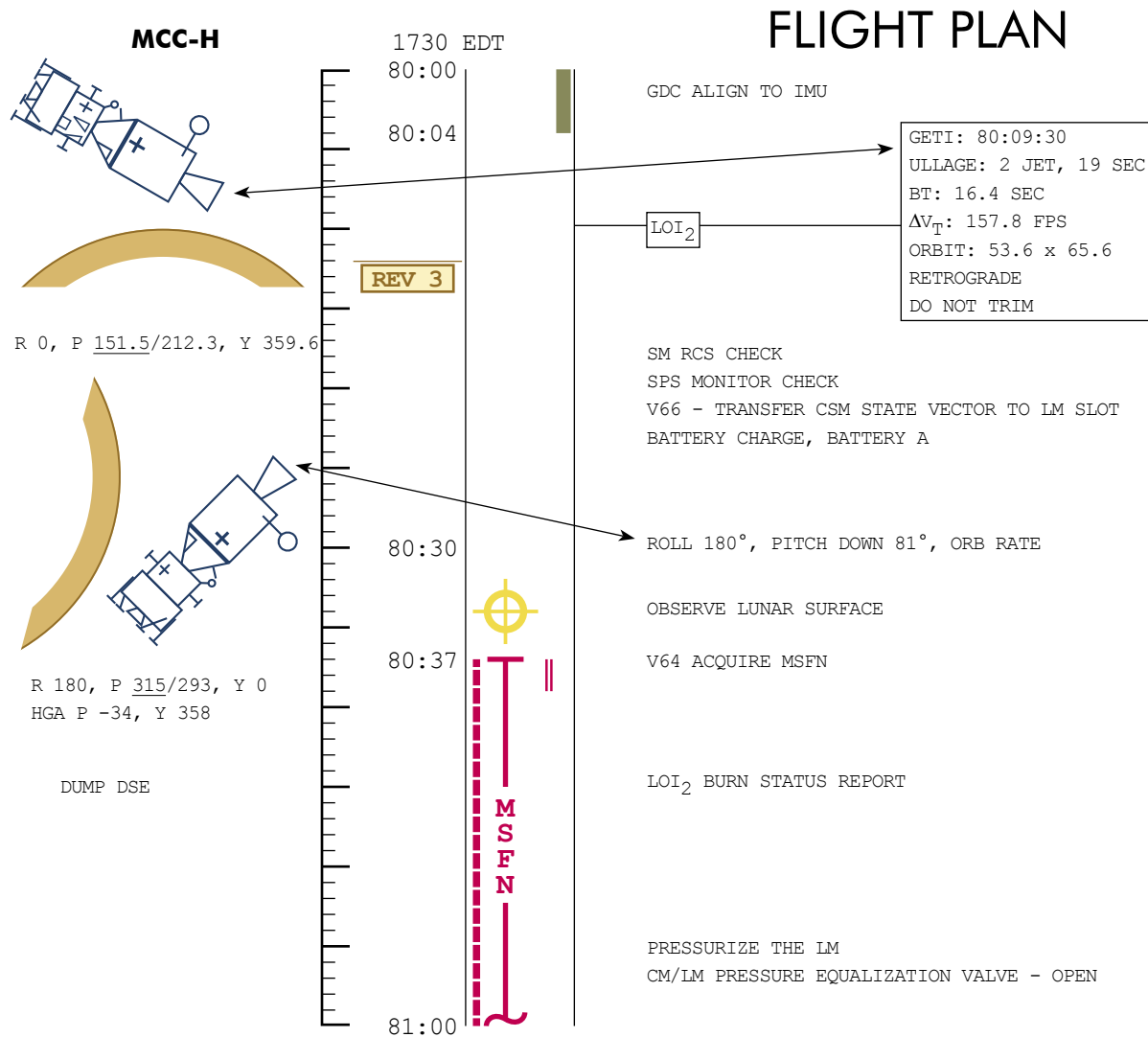
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	79:00 - 80:00	4 / 2	3-50

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LOI<sub>2</sub>  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
LOI <sub>2</sub>	10°/SEC TAKEOVER	±10° TAKEOVER	BT +1 SEC	TRIM X AXIS TO 1 FPS





**NOTES**

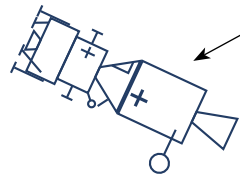
BURN STATUS REPORT				
X	X	<input type="checkbox"/>	:	$\Delta TIG$
X	X	<input type="checkbox"/>	:	BT
<input type="checkbox"/>			.	$V_{gx}$
TRIM				
X	X	X		R
X	X	X		P
X	X	X		Y
<input type="checkbox"/>			.	$V_{gx}$
<input type="checkbox"/>			.	$V_{gy}$
<input type="checkbox"/>			.	$V_{gz}$
<input type="checkbox"/>			.	$\Delta V_C$
X	X	X		FUEL
X	X	X		OX
X	X	X		UNBAL

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	80:00 - 81:00	4 / 3	3-51

# MCC-H

## UPDATE CSM

P22 AUTO OPTICS  
ALT LMK (A-1)  
TRACKING  
(SEE GET 82:35)



R 180, P 318/196, Y 0  
HGA P -60, Y 182

1830 EDT

81:00

81:04

81:10

81:30

81:49

81:56

82:00

M  
S  
F  
N

# FLIGHT PLAN

RECORD UPDATE (SEE GET 82:40)

GO INERTIAL

IMU REALIGN - P52  
OPTION 3 - REFSMMAT

STOW OPTICS

TUNNEL VENT VALVE - LM/CM ΔP  
VERIFY LM/CM ΔP <0.2

PREPARE FOR LM INGRESS

CMP - CLEAR TUNNEL OF CM HATCH  
INSPECT TUNNEL & DOCKING LATCHES  
REMOVE PROBE & DROGUE  
STOW CM HATCH, PROBE & DROGUE  
LMP - OPEN LM HATCH  
VERIFY DOCKING TUNNEL INDEX ANGLE  
IVT TO LM

LMP - LM ENTRY STATUS CHECKS

# NOTES

## REPORT

P52 - (LDG SITE REFSMMAT)

N71: \_ \_ \_ , \_ \_ \_

N05: \_ \_ \_ . \_ \_ \_

N93:

X \_ \_ . \_ \_ \_

Y \_ \_ . \_ \_ \_

Z \_ \_ . \_ \_ \_

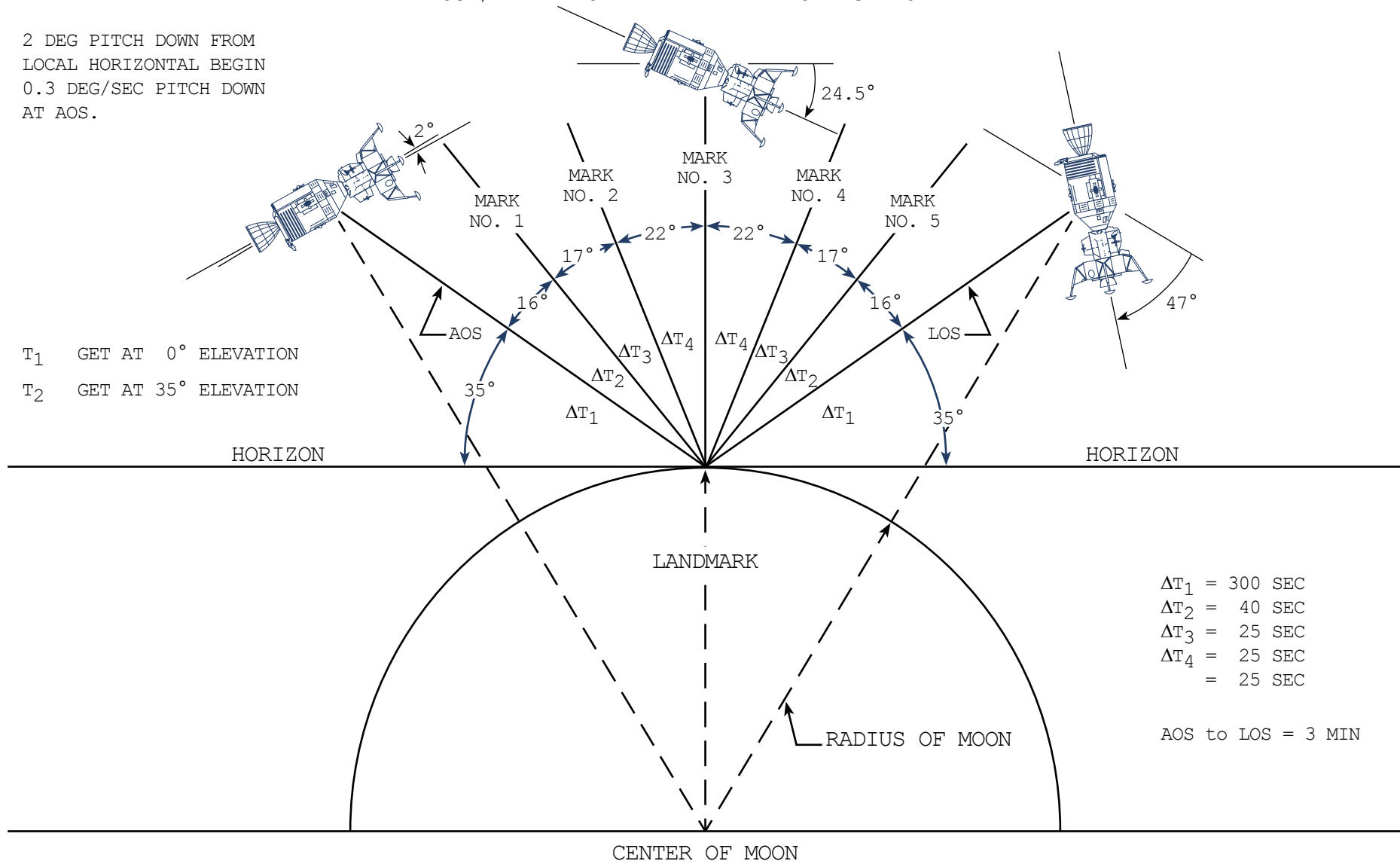
GET \_ \_ \_ : \_ \_ \_ : \_ \_ \_

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	81:00 - 82:00	4 / 3	3-52

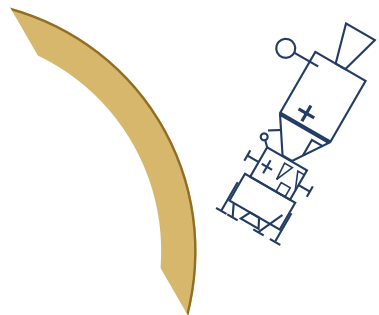
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# CSM/LM TYPICAL LANDMARK TRACKING PROFILE

2 DEG PITCH DOWN FROM  
LOCAL HORIZONTAL BEGIN  
0.3 DEG/SEC PITCH DOWN  
AT AOS.



CSM  
CMP



R 0, P 257/297, Y 0

MANEUVER TO LANDMARK  
TRACK ATTITUDE  
GO INERTIAL  
SELECT OMNI B

P22 ORBITAL NAVIGATION  
UNSTOW OPTICS

TRACK LANDMARK ALT LMK (A-1)  
(5 MARKS ON LMK)  
PITCH DOWN 0.3°/SEC  
DO NOT INCORPORATE MARKS

STOW OPTICS



1930 EDT

82:00

82:02

REV 4

82:30

82:35

83:00

# FLIGHT PLAN

CDR

LM

LMP

MCC-H

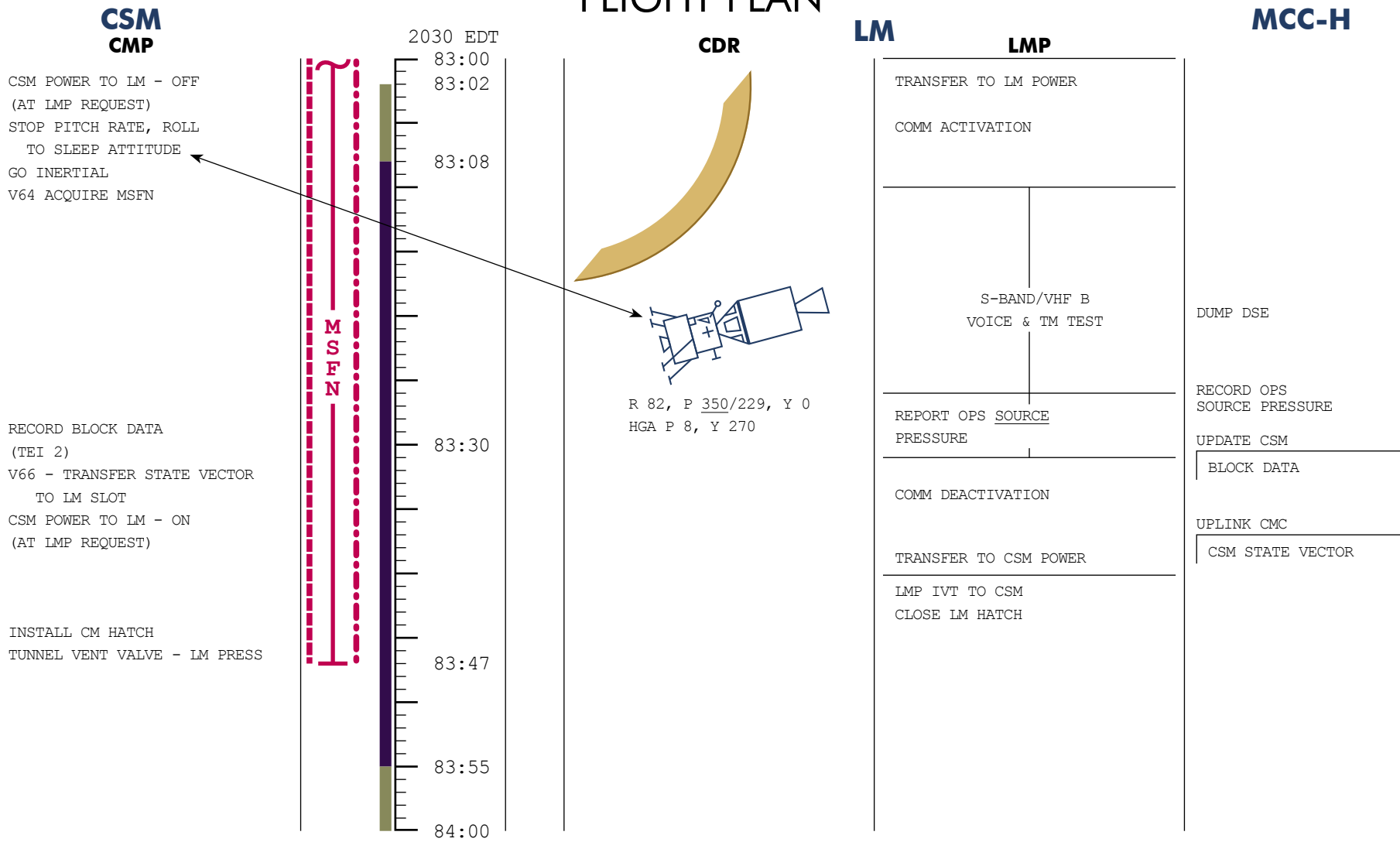
AID LMP AS REQUIRED

PERFORM HOUSEKEEPING CHORES

- 1 STOW HELMET STOWAGE BAGS
- 2 UNSTOW MIRROR, CHECKLIST AND DISPOSAL ASSEMBLY
- 3 STOW INTERIM STOWAGE ASSEMBLY
- 4 UNSTOW AND CONFIGURE FOR USE: 16mm/HCEX (f4, 500, INF) 6 fps

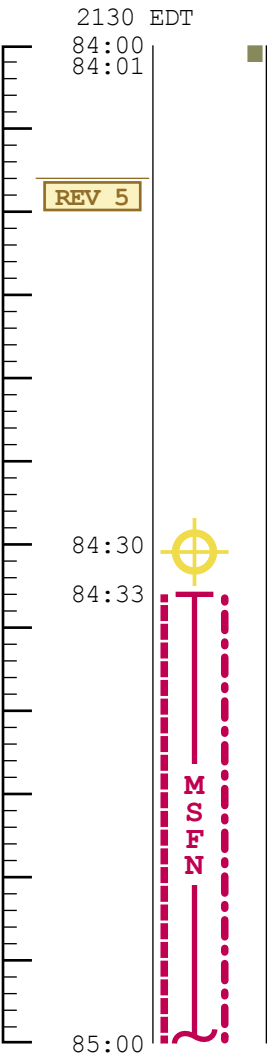
P22 AUTO OPTICS  
LMK ID A-1  
T<sub>1</sub>   8  2  :  4  1  :  0  6   (HOR)  
T<sub>2</sub>   8  2  :  4  6  :  1  7   (35°)  
  1  4   NM (N)  
N 89  
LAT   0  2  .  0  0  0    
LONG/2   3  2  .  7  5  0    
ALTITUDE-   0  0  0  .  0  0   NM

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	82:00 - 83:00	4 / 4	3-53



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	83:00 - 84:00	4 / 4	3-54

MCC-H



# FLIGHT PLAN

O<sub>2</sub> FUEL CELL PURGE

EAT PERIOD

CO<sub>2</sub> FILTER CHANGE NO. 7  
(9 INTO A, STORE 7 IN B6)

## NOTES

CSM PRESLEEP CHECKLIST

CREW STATUS REPORT (RADIATION, MEDICATION)

CYCLE O<sub>2</sub> & H<sub>2</sub> FANS

CHLORINATE POTABLE WATER

SELECT NORMAL LUNAR COMM CONFIGURATION

EXCEPT:

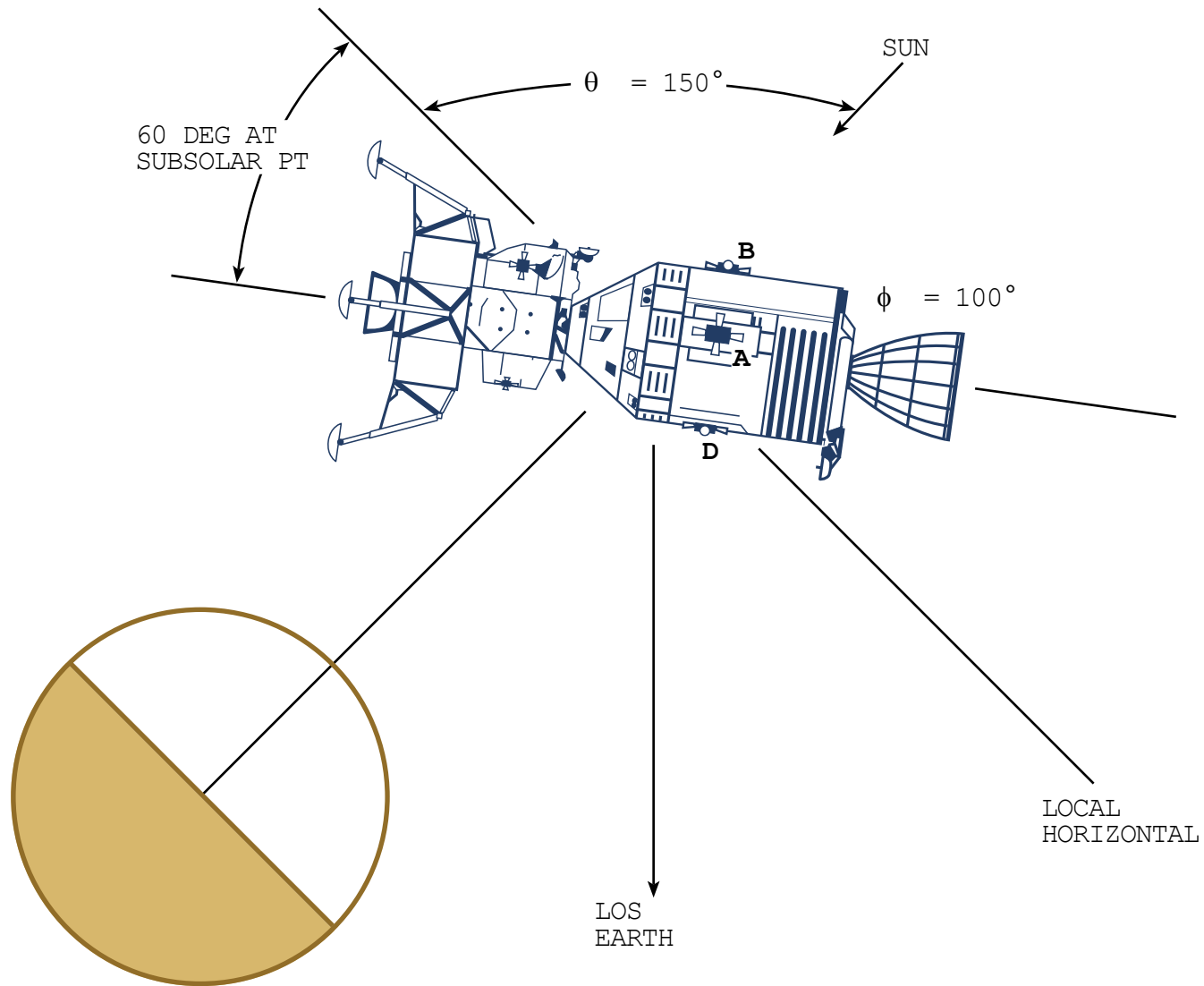
- S-BD SQUELCH - ENABLE
- HGA TRACK - REACQ
- HGA BEAM - NARROW

VERIFY:

- WASTE MNGT OVBD DRAIN - OFF
- WASTE STOW VENT VLV - CLOSED
- EMERGENCY CABIN PRESS VLV - BOTH
- SURGE TANK O<sub>2</sub> VLV - ON
- REPRESS PACK O<sub>2</sub> VALVE - OFF
- LM TUNNEL VENT VLV - LM PRESS
- POT H<sub>2</sub>O HTR - OFF

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	84:00 - 85:00	4 / 5	3-55

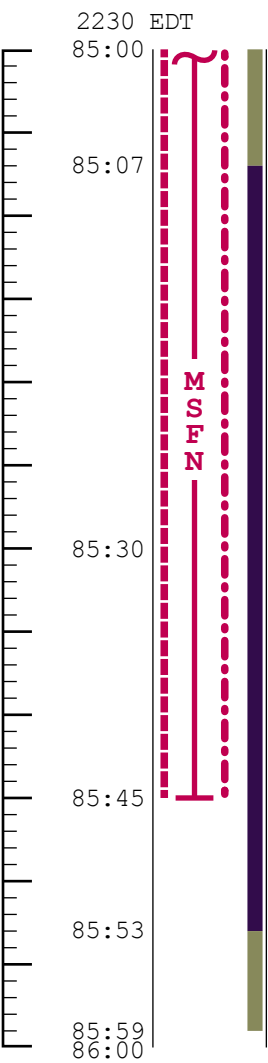
# LUNAR ORBIT REST PERIOD ATTITUDE





MCC-H

DUMP DSE



# FLIGHT PLAN

NOTES

REST PERIOD  
(9 HOURS)

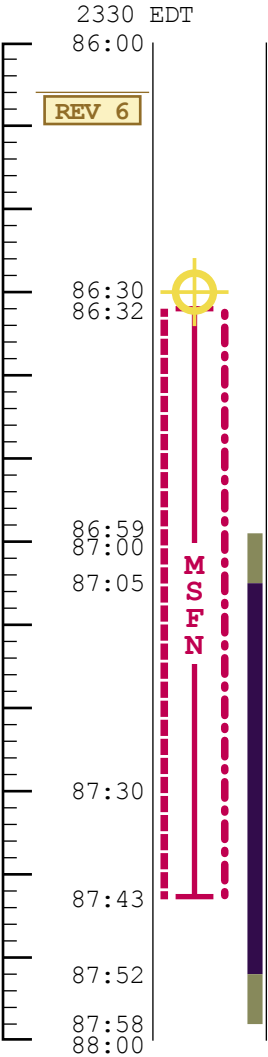
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	85:00 - 86:00	4 / 5	3-56

MCC-H

FLIGHT PLAN

NOTES

DUMP DSE

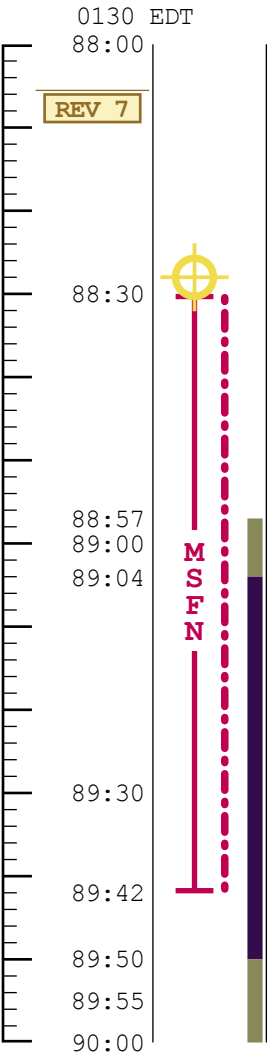


REST PERIOD  
(9 HOURS)

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	86:00 - 88:00	4 / 6	3-57

MCC-H

DUMP DSE



# FLIGHT PLAN

NOTES

REST PERIOD  
(9 HOURS)

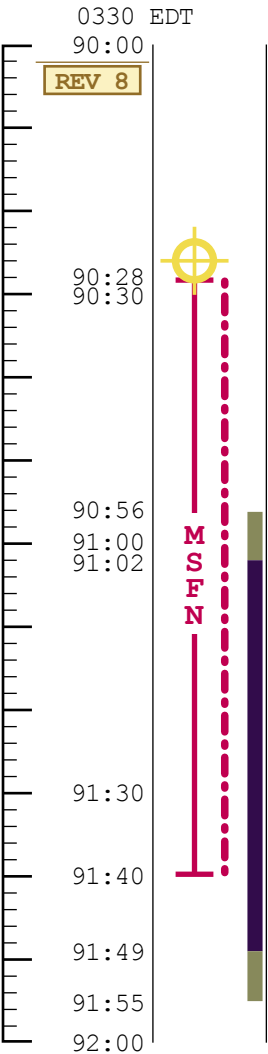
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	88:00 - 90:00	4 / 7	3-58

MCC-H

FLIGHT PLAN

NOTES

DUMP DSE



REST PERIOD  
(9 HOURS)

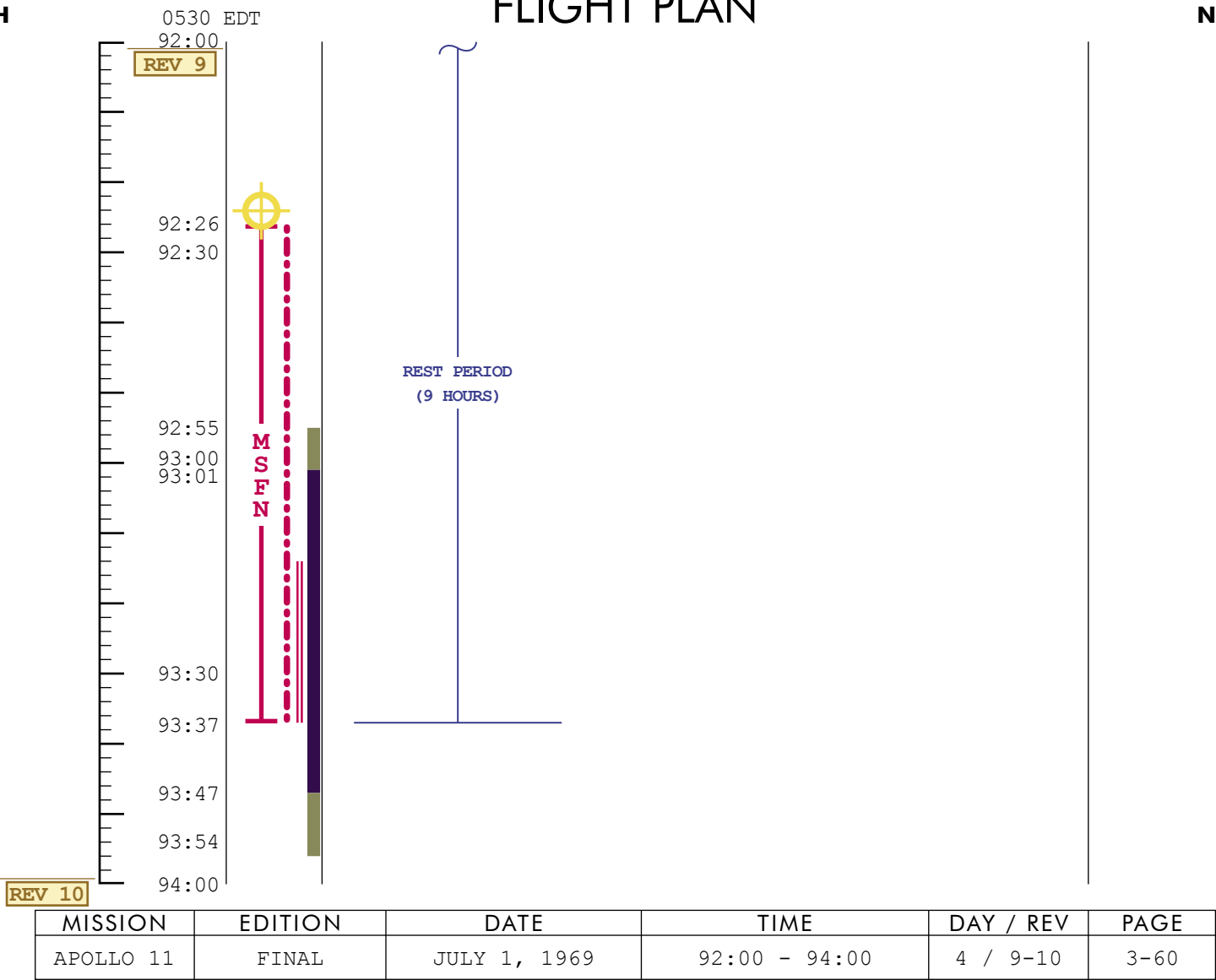
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	90:00 - 92:00	4 / 8	3-59

MCC-H

# FLIGHT PLAN

NOTES

DUMP DSE



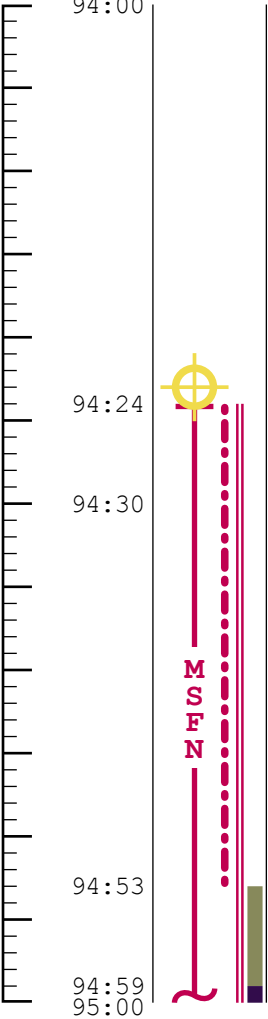
MCC-H

0730 EDT

FLIGHT PLAN

NOTES

DUMP DSE



EAT PERIOD

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	94:00 - 95:00	5 / 10	3-61

MCC-H

UPDATE

BLOCK DATA

UPDATE

BASELINE ALTITUDE  
FOR DESCENT ALTITUDE  
SIGHTINGS

0830 EDT

95:00

MSFN

95:30

95:36

95:46

95:52

96:00

REV 11

SDR & LMP DON LCG'S  
CMP - RECORD BLOCK DATA - TEI<sub>30</sub>

LMP - COPY BASELINE ALTITUDE

CO<sub>2</sub> FILTER CHANGE NO. 8  
(10 INTO B, STORE 8 IN B6)

CMP: DON PGA W/O HELMET AND GLOVES  
H2 - PURGE LINE HTRS - ON  
LM TUNNEL VENT VALVE - LM/CM ΔP  
VERIFY LM/CM ΔP <0.2  
OPEN AND STOW CM HATCH  
LMP: VERIFY DOCKING TUNNEL INDEX ANGLE  
IVT TO LM

POST SLEEP CHECKLIST  
CREW STATUS REPORT (SLEEP)  
CYCLE O<sub>2</sub> & H<sub>2</sub> FANS  
GDC ALIGN TO IMU  
CONSUMABLES UPDATE  
SELECT NORMAL LUNAR CONFIGURATION

NOTES

CONSUMABLE UPDATE  
(Δ FROM NOMINAL)

GET: \_\_\_\_\_

RCS TOT \_\_\_\_\_

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

D \_\_\_\_\_

H<sub>2</sub> TOT \_\_\_\_\_

O<sub>2</sub> TOT \_\_\_\_\_

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	95:00 - 96:00	5 / 10-11	3-62

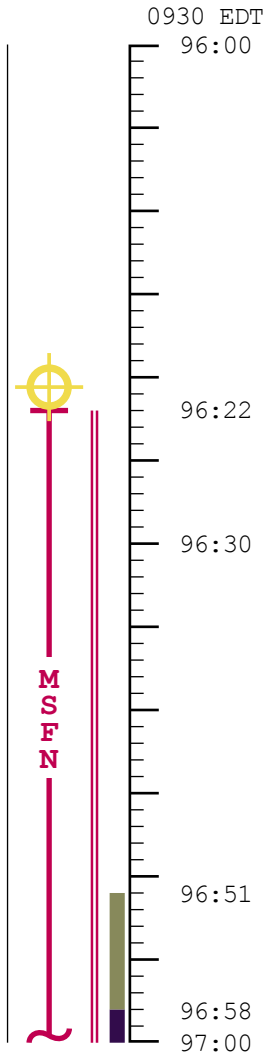
CSM  
CMP

UNDocking PHOTO  
16mm/18/CEX-BRKT-MIR  
(f8, 250, 7) 6 fps  
O<sub>2</sub> & H<sub>2</sub> FUEL CELL PURGE

V64 ACQUIRE MSFN  
CREW STATUS REPORT  
REPORT DOCKING TUNNEL INDEX  
ANGLE TO MSFN  
DEACTIVATE B3 & C4 JETS  
CONFIGURE DAP 21112  
WIDE DB 11001  
(FOR LM STEERABLE  
ANTENNA ACTIVATION)

RECORD LMK 130 PAD DATA  
(SEE GET 98:35)  
AND CSM DAP DATA  
AND LOAD

UNSTOW OPTICS  
P52 - IMU REALIGN  
OPTION 1 PREFERRED



# FLIGHT PLAN

CDR

LM

LMP

MCC-H

DON PGA W/O HELMET AND GLOVES	LM FAMILIARIZATION
CSM POWER TO LM - OFF (AT LMP REQUEST)	LM POWER - ON
DISCONNECT AND STOW LM POWER UMBILICAL	EPS ACTIVATION MISSION TIMER ACTIVATION PRIMARY GLYCOL LOOP ACT
IVT TO LM TRANSFER HELMET & GLOVES	CAUTION/WARNING CHECKOUT CB ACTIVATION TB VERIFICATION
ECS ACTIVATION AND C/O CONNECT TO LM ECS	PGNCS TURN - ON AND SELF TEST
	BIO MED SWITCH - LEFT

DUMP DSE

UPLINK CMC

CSM STATE VECTOR  
DESIRED ORIENT  
(LS REFSMMAT)

UPDATE CSM

LMK 130 PAD  
BLOCK DATA  
CSM DAP DATA

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	96:00 - 97:00	5 / 11	3-63



CSM  
CMP

REPORT

P52 - (LDG SITE REFSMMAT)

N71: \_ \_ \_ , \_ \_ \_

N05: \_ \_ \_ . \_ \_ \_

N93:

X \_ \_ \_ . \_ \_ \_

Y \_ \_ \_ . \_ \_ \_

Z \_ \_ \_ . \_ \_ \_

GET \_ \_ \_ : \_ \_ \_ : \_ \_ \_

VHF CHECKOUT

CSM TIME MARK TO LM

STOW OPTICS

V06N20E

(ON MARK FROM CDR)

RECORD LM PCM DATA

DON HELMET AND GLOVES

PGA PRESSURE INTEGRITY CHECK

INSTALL DROGUE & PROBE,

PRELOAD PROBE

INHIBIT ROLL COMMANDS UNTIL

LM/CM ΔP >3.5 PSIA

COCK LATCHES (12)

INSTALL HATCH

VENT TUNNEL

HATCH INTEGRITY CHECK

INSTALL AND ALIGN DOCKING

TARGET

1030 EDT

97:00



MSFN

97:30

97:34

97:44

97:49

REV 12

98:00

FLIGHT PLAN

CDR

SUIT FAN/H<sub>2</sub>O SEP CHECK

GLYCOL PUMP CHECK

VHF-B ACTIVATION

E MEMORY DUMP

VHF CHECKOUT  
(COMM CHECK WITH CSM)

LGC/CMC CLOCK SYNC  
T EPHEM UPDATE

DOCKED IMU COARSE ALIGN  
REPORT GIMBAL ANGLES AND TIME  
TO MSFN

AFT OMNI - LBR  
SLEW STEERABLE ANTENNA  
P 187, Y 70

VERIFY DROGUE AND PROBE  
INSTALLATION CLOSE AND  
SECURE HATCH

LM

LMP

SEC S-BAND T/R AND POWER  
AMPLIFIER CHECK

S-BAND STEERABLE  
ANTENNA ACTIVATION  
P 152, Y -9

IVT TO CSM

DON PGA

IVT TO LM  
TRANSFER HELMET & GLOVES

CONNECT TO LM ECS AND COMM

ASCENT BATTERY ACTIVATION  
AND CHECKOUT  
RECORD ED BAT VOLTS

MCC-H

UPDATE LM

STEERABLE ANTENNA  
ANGLES  
(GET: 97:10)

UPDATE LM

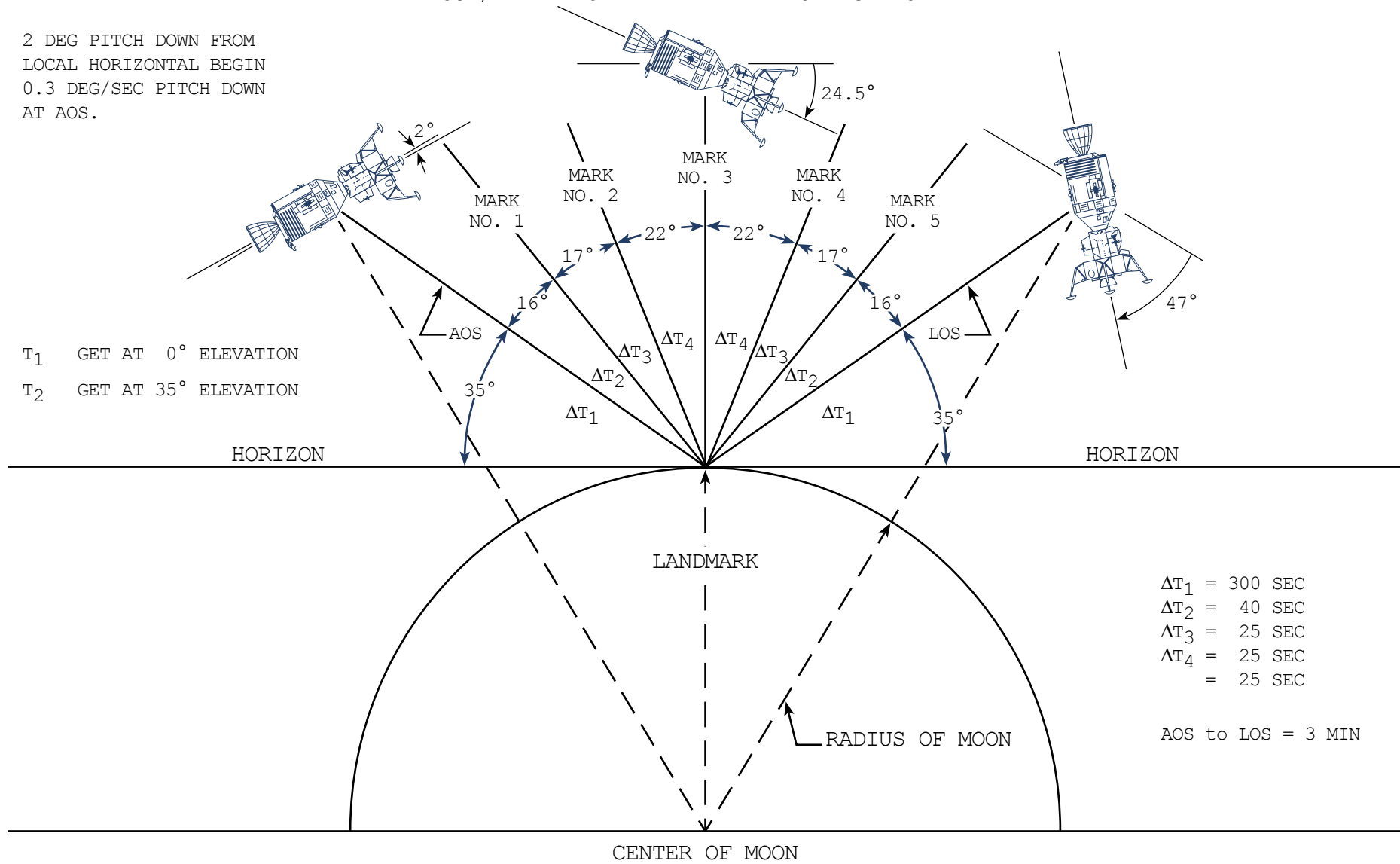
STEERABLE ANTENNA  
ANGLES P 187, Y 70  
(GET: 98:55)

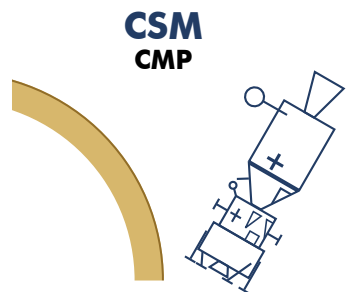
COPY GIMBAL ANGLES  
AND TIME

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	97:00 - 98:00	5 / 11-12	3-64

# CSM/LM TYPICAL LANDMARK TRACKING PROFILE

2 DEG PITCH DOWN FROM  
LOCAL HORIZONTAL BEGIN  
0.3 DEG/SEC PITCH DOWN  
AT AOS.





MANEUVER TO TRACKING ATTITUDE  
R 0, P 278/290, Y 0  
DOFF HELMET & GLOVES

SELECT OMNI C

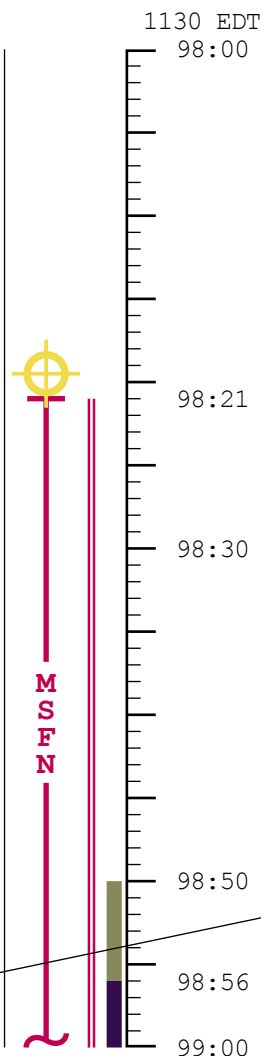
GO INERTIAL  
UNSTOW OPTICS  
P22 ORBITAL NAVIGATION

TRACK LDG SITE LANDMARK  
(5 MARKS ON LDMK 130)  
PITCH DOWN 0.3°/SEC AT T<sub>2</sub>  
DO NOT INCORPORATE MARKS

PITCH DOWN, 0.5°/SEC

STOP PITCH AND GO INERTIAL

V64 ACQUIRE MSFN



# FLIGHT PLAN

CDR

LM

LMP

MCC-H

DON HELMET & GLOVES
ARS/PGA PRESSURE INTEGRITY CHECK
CABIN REGULATOR CHECK
DOFF HELMET & GLOVES
COPY DAP DATA COPY GYRO TORQUE ANGLES AND FINE ALIGN IMU X __, Y __, Z __
RATE GYRO CHECK
<p>R 0, P 135/14, Y 0 HGA P -45, Y 3</p>

DON HELMET & GLOVES
ARS/PGA PRESSURE INTEGRITY CHECK
CABIN REGULATOR CHECK
DOFF HELMET & GLOVES
SELECT OMNI <u>FWD</u> BIO MED SWITCH - RIGHT
AGS ACT & SELF TEST
V64 ACQUIRE MSFN ANT P 187, Y 70

UPDATE LM

DAP DATA  
GYRO TORQUE ANGLES

P22 AUTO OPTICS  
LMK ID 130  
T<sub>1</sub> - 9 8 : 4 0 : 0 2 (HOR)  
T<sub>2</sub> - 9 8 : 4 5 : 0 8 (35°)  
9 6 NM (N) OR S)  
N 89  
LAT + 0 1 . 2 4 3  
LONG/2 + 1 1 . 8 4 4  
ALTITUDE- 0 0 1 . 4 6 NM

DUMP DSE

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	98:00 - 99:00	5 / 12	3-65

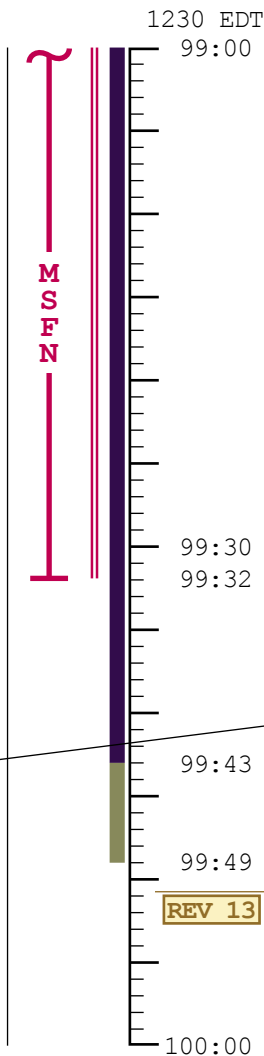
# CSM CMP

STOW FLIGHT PLAN  
UNSTOW SOLO BOOK  
COPY PADS

DON HELMET & GLOVES  
SC CONT - SCS  
MIN/MAX DB, LOW/HIGH RATE  
(AT REQUEST OF CDR)  
GO/NO-GO FOR UNDOCKING  
DISABLE ROLL JETS FOR  
RCS HOT FIRE  
VERIFY TUNNEL VENT VALVE - OFF  
RECORD LM PCM DATA

MANEUVER TO  
AGS CALIBRATION ATTITUDE

RATES <0.1°/SEC  
DISABLE THRUSTERS FOR 32 SEC  
(AT REQUEST OF LMP)  
MANEUVER TO UNDOCKING ATTITUDE  
R 0, P 320/14, Y 0



# FLIGHT PLAN

## CDR

DRIFT CHECK - REPORT GIMBAL  
ANGLES & TIME TO MSFN  
DEPLOY LANDING GEAR

ORDEAL INITIALIZATION

LOAD DAP DATA - 32012

CSM WT \_\_\_\_\_

P TRIM \_\_\_\_\_

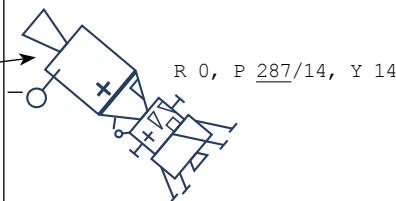
Y TRIM \_\_\_\_\_

DPS GIMBAL DRIVE AND  
THROTTLE TEST

RCS PRESSURIZATION

RCS CHECKOUT

RR ACT & SELF TEST



DPS PRESS & CHECKOUT

## LM

## LMP

V47 INITIALIZE AGS

COPY AGS ABORT CONSTANT  
AND K FACTOR

RCS PRESSURIZATION

GO/NO-GO FOR UNDOCKING  
RCS CHECKOUT

AFT OMNI - LBR

SLEW STEERABLE ANTENNA  
ANT P 123, Y -37

AGS ACCEL & GYRO CALIBRATION

## MCC-H

UPLINK LGC

LS REFSMMAT  
LM & CSM STATE VECTORS  
LGC/CMC CLOCK SYNC  
PIPA BIAS  
LGC ABORT CONSTANT

UPDATE LM

AGS ABORT CONSTANT  
AGS K FACTOR

UPLINK CMC

LM & CSM STATE VECTORS

UPDATE CSM

P30 MNVR PAD  
(SEPATATION)  
GO/NO-GO

UPDATE LM

STEERABLE ANTENNA  
ANGLES (GET: 100:25)

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	99:00 - 100:00	5 / 12-13	3-66

**CSM  
CMP**

RR TRANSPONDER ACT & SELF TEST  
CONFIGURE DAP  
FOR UNDOCKING, CSM ONLY  
R1 = 11102  
R2 = 11111  
SC CONT - SCS  
START 16mm CAMERA

**UNDOCK**

ENABLE B3 & C4 RCS JETS  
V64 ACQUIRE MSFN  
LM INSPECTION, CAMERA OFF

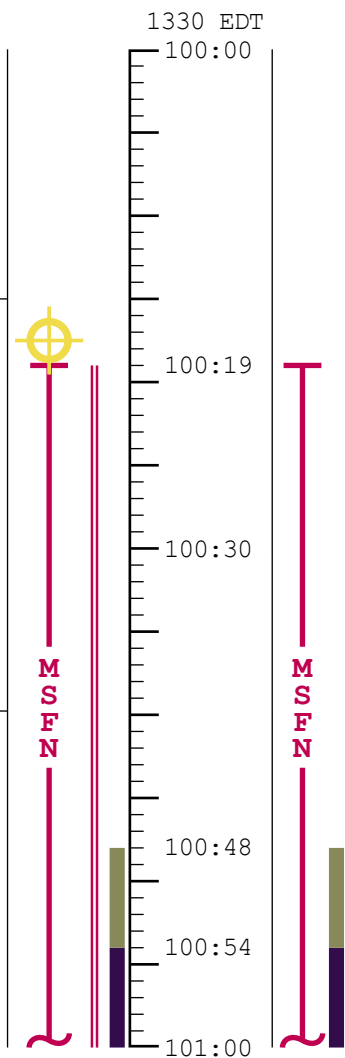
COPY PADS  
SC CONT - CMC  
P30 EXT ΔV  
P41 RCS THRUST

CSM SEPARATION

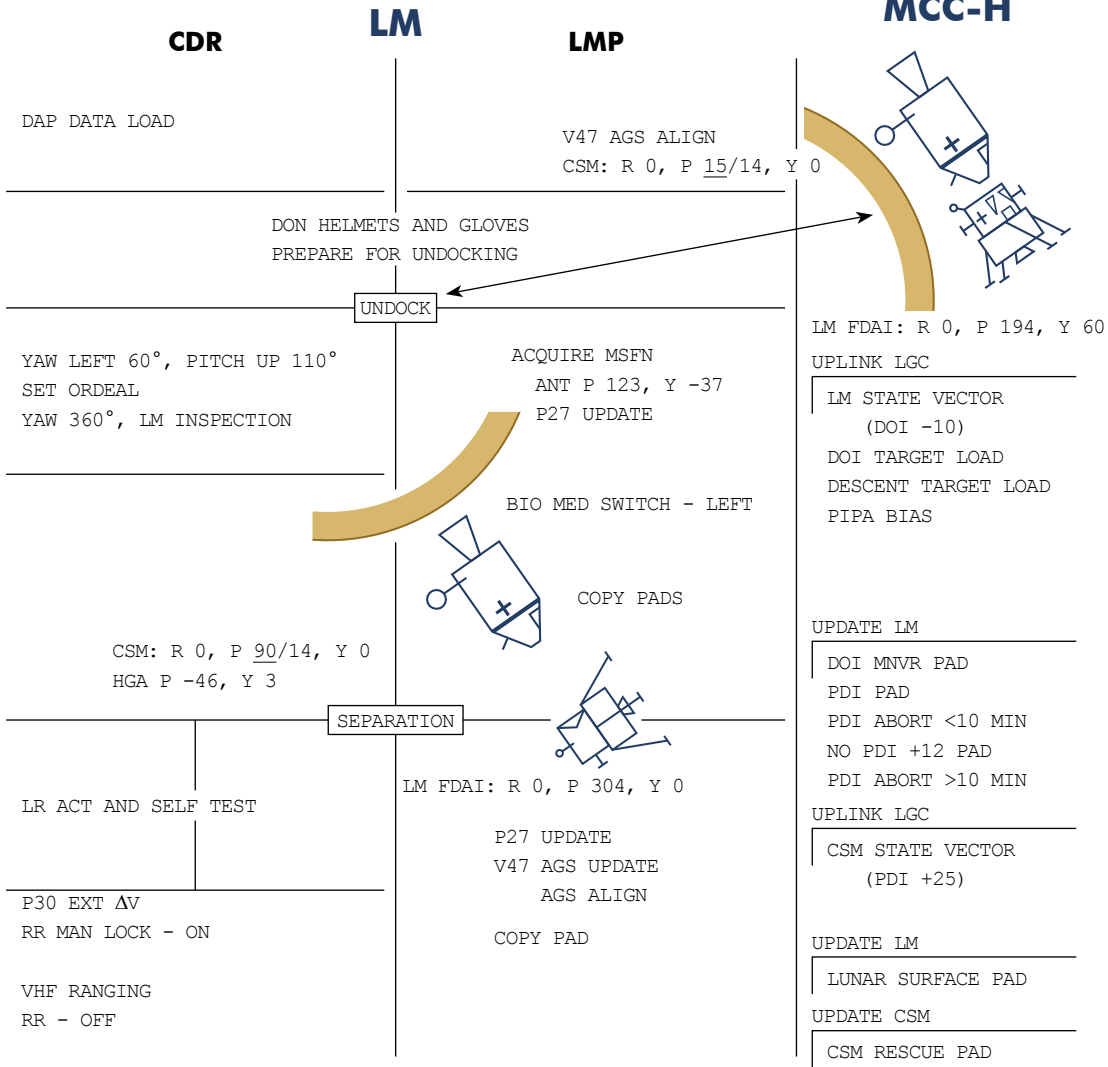
GET: 100:39:50  
BT: 8.0 SEC  
ΔV<sub>T</sub>: 2.5 FPS  
-X THRUSTERS  
ORBIT: 55.6 x 63.1

P20 AUTO MANEUVER  
SXT & VHF RANGING

COPY PAD



# FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	100:00 - 101:00	5 / 13	3-67

# CSM CMP

P27 UPDATE  
P52 IMU REALIGN  
OPTION 3 REFSMMAT

## REPORT

P52 - (LDG SITE REFSMMAT)

N71: \_ \_ \_ / \_ \_ \_

N05: \_ \_ \_ . \_ \_ \_

N93:

X \_ \_ \_ . \_ \_ \_

Y \_ \_ \_ . \_ \_ \_

Z \_ \_ \_ . \_ \_ \_

GET \_ \_ \_ : \_ \_ \_ : \_ \_ \_

GDC ALIGN TO IMU  
VHF B - DATA  
P20 AUTO MANEUVER TO SEXTANT  
TRACK LM

CONFIRM DOI - VHF RANGING  
INCORPORATE P76  
P20 AUTO MANEUVER TO SEXTANT  
TRACK LM  
SEXTANT TRACK ONLY  
DOFF HELMET & GLOVES

# FLIGHT PLAN

## CDR

### REPORT

P52 - (LDG SITE REFSMMAT)

N71: \_ \_ \_ / \_ \_ \_

N05: \_ \_ \_ . \_ \_ \_

N93:

X \_ \_ \_ . \_ \_ \_

Y \_ \_ \_ . \_ \_ \_

Z \_ \_ \_ . \_ \_ \_

GET \_ \_ \_ : \_ \_ \_ : \_ \_ \_

P40 DPS THRUST  
MNVN TO DOI ATTITUDE

## LM

## LMP

SYSTEMS CHECKS

V47 AGS ALIGN

OMNI AFT, PCM LBR  
VHF A-VOICE, B-DATA

SLEW STEERABLE ANTENNA  
ANT P 220, Y 28

N20 AGS ALIGN  
LOADS AGS EXT ΔV

DPS, DOI

GETI: 101:38:48  
ULLAGE: 2 JET, 7.5 SEC  
BT: 28.5 SEC  
ΔV: 70 FPS  
RETROGRADE  
ORBIT 8.97 x 57.87

VHF A-VOICE/RNG  
VHF B - XMTR - OFF  
SET CAMERA  
16mm/HCEX (4,5000, INF) 6 fps  
COAS OVERHEAD

# MCC-H

## UPLINK CMC

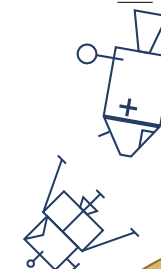
CSM STATE VECTOR  
(PDI +25)  
LM STATE VECTOR  
(DOI -10)  
PIPA BIAS  
DUMP DSE

GO/NO-GO FOR DOI

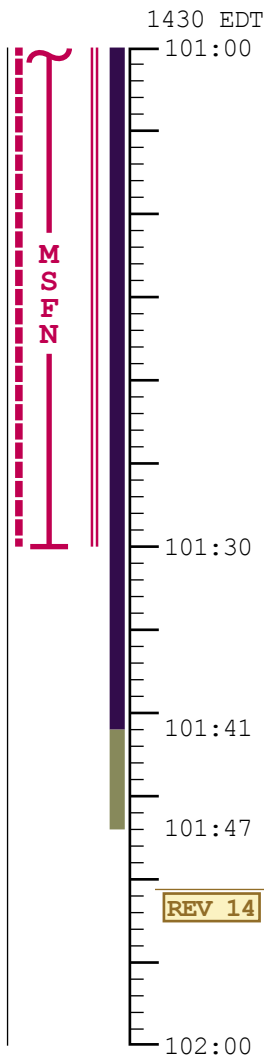
## UPDATE LM

STEERABLE ANTENNA  
ANGLES (GET: 102:19)

CSM: R 0, P 215/319, Y 0



LM FDAI: R 0, P 294.9, Y 0



M  
S  
F  
N

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	101:00 - 102:00	5 / 13-14	3-68

FLIGHT PLAN

CSM  
CMP

LM

MCC-H

SEXTANT AND VHF  
TRACKING OF LM

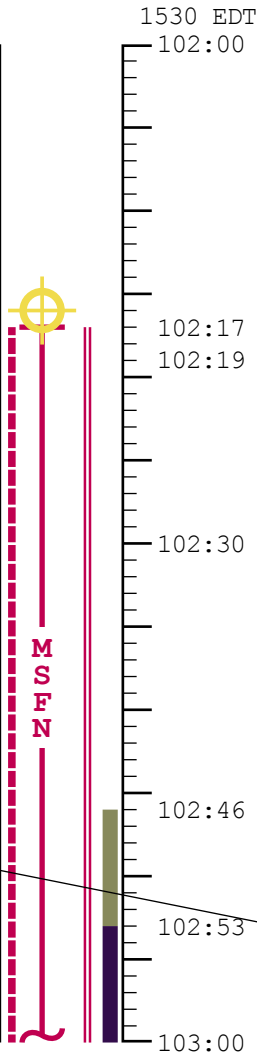
TERMINATE P20 TRACK

P20 AUTO MANEUVER  
TO SEXTANT TRACK LM

P00, MANUAL ATTITUDE  
PITCH RATE DOWN 0.2°/SEC

STOP PITCH AT  
R 0, P 282/179, Y 0  
GO INERTIAL  
CONFIRM STAY/NO-STAY  
V44 SET LS FLAG  
CONFIRM STAY/NO-STAY

RR TRANSPONDER - OFF



CDR

LMP

P52 PITCH ALIGNMENT CHECK

PITCH TO 285°

RR - ON  
P20 MODE II LOCK - ON

P63

LPD ALTITUDE, ATTITUDE  
POSITION CHECK  
GO/NO-GO FOR PDI

LR - ON

LPD ALTITUDE, ATTITUDE  
POSITION CHECK,  
ULLAGE 7.5 SEC

LPD ALT CK  
YAW RIGHT 174° THEN 6°

EVALUATE MANUAL CONTROL  
PITCH OVER AT P64  
MANUAL ATTITUDE CONTROL

INITIATE DPS VENTING  
V76 RCS MIN IMPULSE

V06N20, ENTER ON MARK  
RECORD PITCH CDU  
N22, RECORD PITCH CDU

BATTERIES 5 & 6 ON

SYSTEMS CHECK  
DPS, OPS, RCS, EPS, CWEA

ANT P 220, Y 28  
ACQUIRE MSFN  
DOI POST BURN REPORT

CSM: R 0, P 348/337, Y 0

N20 AGS ALIGN  
CONFIGURE AGS

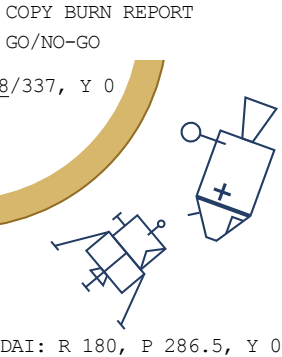
START 16mm CAMERA  
GETI: 102:35:13  
ULLAGE: 2 JET, 7.5 SEC  
BT = 11 MIN 58 SEC  
ΔV<sub>T</sub> = 6766 FPS

SYSTEMS MONITOR

TOUCHDOWN 102:47:11

PERFORM LUNAR CONTACT CHECKLIST  
STAY/NO-STAY  
STAY/NO-STAY

STOP 16mm CAMERA  
ASCENT BATTERIES OFF  
REPORT 047, 053



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	102:00 - 103:00	5 / 14	3-69

CSM  
CMP

REPORT

P52 - (LDG SITE REFSMMAT)  
OPTION 3

N71: \_ \_ \_ / \_ \_ \_

N05: \_ \_ \_ . \_ \_ \_

N93:

X \_ \_ \_ . \_ \_ \_

Y \_ \_ \_ . \_ \_ \_

Z \_ \_ \_ . \_ \_ \_

GET \_ \_ \_ : \_ \_ : \_ \_

ALIGN GDC, VERIFY ORDEAL

COPY LM TRACKING PAD  
(SEE GET - 104:35)

P22 AUTO MNVR TO  
TRACKING ATTITUDE  
ORB RATE

R 0, P 338/76, Y 0

# FLIGHT PLAN

CDR

LM

LMP

MCC-H

1630 EDT

103:00

MSFN

MSFN

RR TO STANDBY  
REPORT ESTIMATE OF  
LANDED LOCATION  
CLOSE SHADES, DOFF HELMET  
AND GLOVES

BEGIN SIMULATED COUNTDOWN

80mm/BW/CHECKLIST  
60mm/HCEX/CHECKLIST

6 FRAMES FAR FIELD (FOCUS 50`)  
6 FRAMES NEAR FIELD (FOCUS 20`)  
WITH EACH CAMERA  
REMOVE MAGS AND STOW  
INSTALL PROTECTIVE COVER AND  
STOW CAMERAS

PHOTOGRAPH LUNAR SURFACE  
DON HELMET AND GLOVES

AGS LUNAR SURFACE GYRO  
CALIBRATION  
LOAD AGS ASCENT TARGET  
H=60,000 FT, H DOT=32 FPS  
CLOSE SHADES, DOFF  
HELMET AND GLOVES

P57 - IMU ALIGN (REFSMMAT)  
GRAVITY MEASUREMENT  
N04: \_ \_ \_ . \_ \_ \_

AGS LUNAR ALIGNMENT

P57 - IMU ALIGN (REFSMMAT)  
2 CELESTIAL BODIES

N04: \_ \_ \_ . \_ \_ \_

N05: \_ \_ \_ . \_ \_ \_

N71: \_ \_ \_ / \_ \_ \_

N93:

X \_ \_ \_ . \_ \_ \_

Y \_ \_ \_ . \_ \_ \_

Z \_ \_ \_ . \_ \_ \_

N89:

LAT \_ \_ \_ . \_ \_ \_

LONG/2 \_ \_ \_ . \_ \_ \_

ALT \_ \_ \_ . \_ \_ \_

GET \_ \_ \_ : \_ \_ : \_ \_

INITIALIZE AGS  
COPY AND LOAD ASCENT PAD DATA  
DON HELMET AND GLOVES

VERIFY AGS ASCENT PROGRAM

COPY AGS AZIMUTH

COPY LANDED LOCATION,  
GRAVITY MEASURE

UPDATE CSM

LM TRACKING PAD

COPY P57 DATA

COPY AGS AZIMUTH

UPLINK LGC

RLS

CSM STATE VECTOR  
(TD +1:40)

UPDATE LM

ASCENT PAD

103:29  
103:30

103:39

103:45

REV 15

104:00

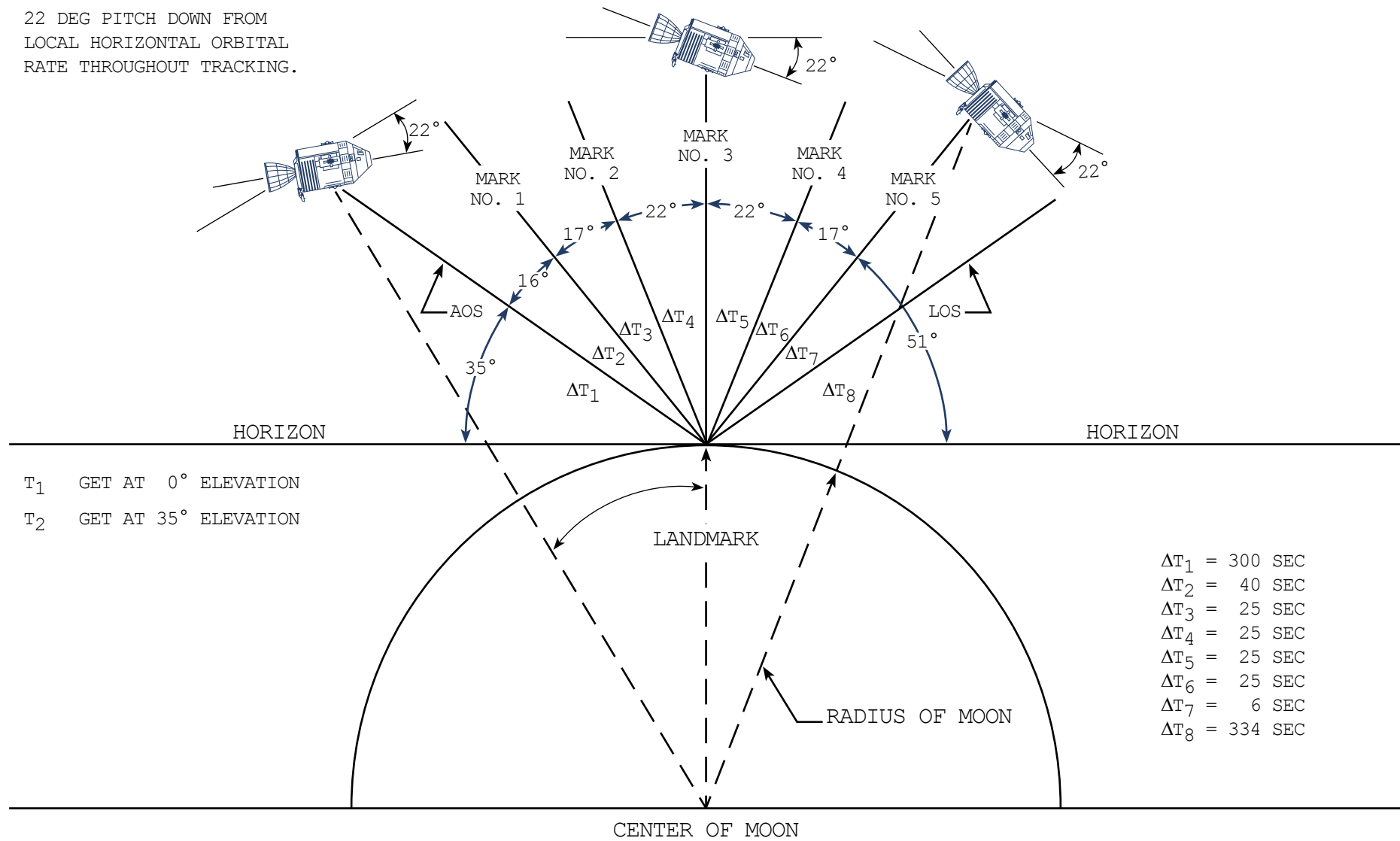
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	103:00 - 104:00	5 / 14-15	3-70



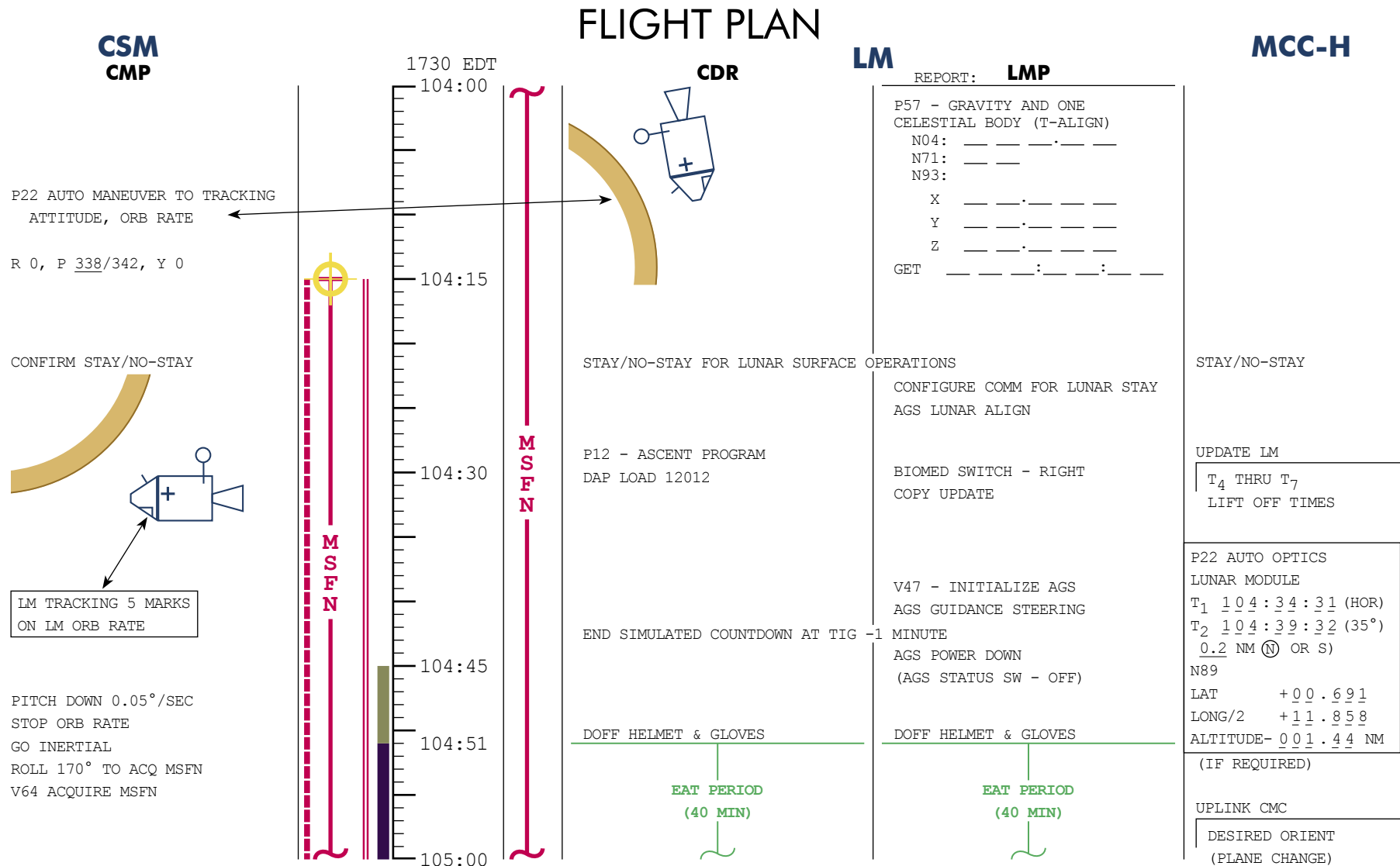
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# CSM TYPICAL LANDMARK TRACKING PROFILE

22 DEG PITCH DOWN FROM  
LOCAL HORIZONTAL ORBITAL  
RATE THROUGHOUT TRACKING.



T<sub>1</sub> GET AT 0° ELEVATION  
T<sub>2</sub> GET AT 35° ELEVATION



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	104:00 - 105:00	5 / 15	3-71

FLIGHT PLAN

CSM  
CMP

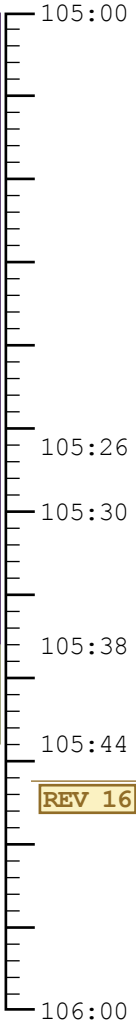
P52 (OPT 1 - PREFERRED)  
GYRO TORQUE TO DESIRED  
ORIENTATION FOR PLANE CHANGE  
(IF PLANE CHANGE IS REQUIRED)

GDC ALIGN TO IMU

EAT PERIOD  
(1 HOUR)

MSFN

1830 EDT



MSFN

CDR

EAT PERIOD  
(40 MIN)

CREW STATUS REPORT (RADIATION, MEDICATION)

CONFIGURE SLEEP STATION  
STOW PLSS IN DONNING STATION

REST PERIOD  
(4 HOURS)

LM

LMP

EAT PERIOD  
(40 MIN)

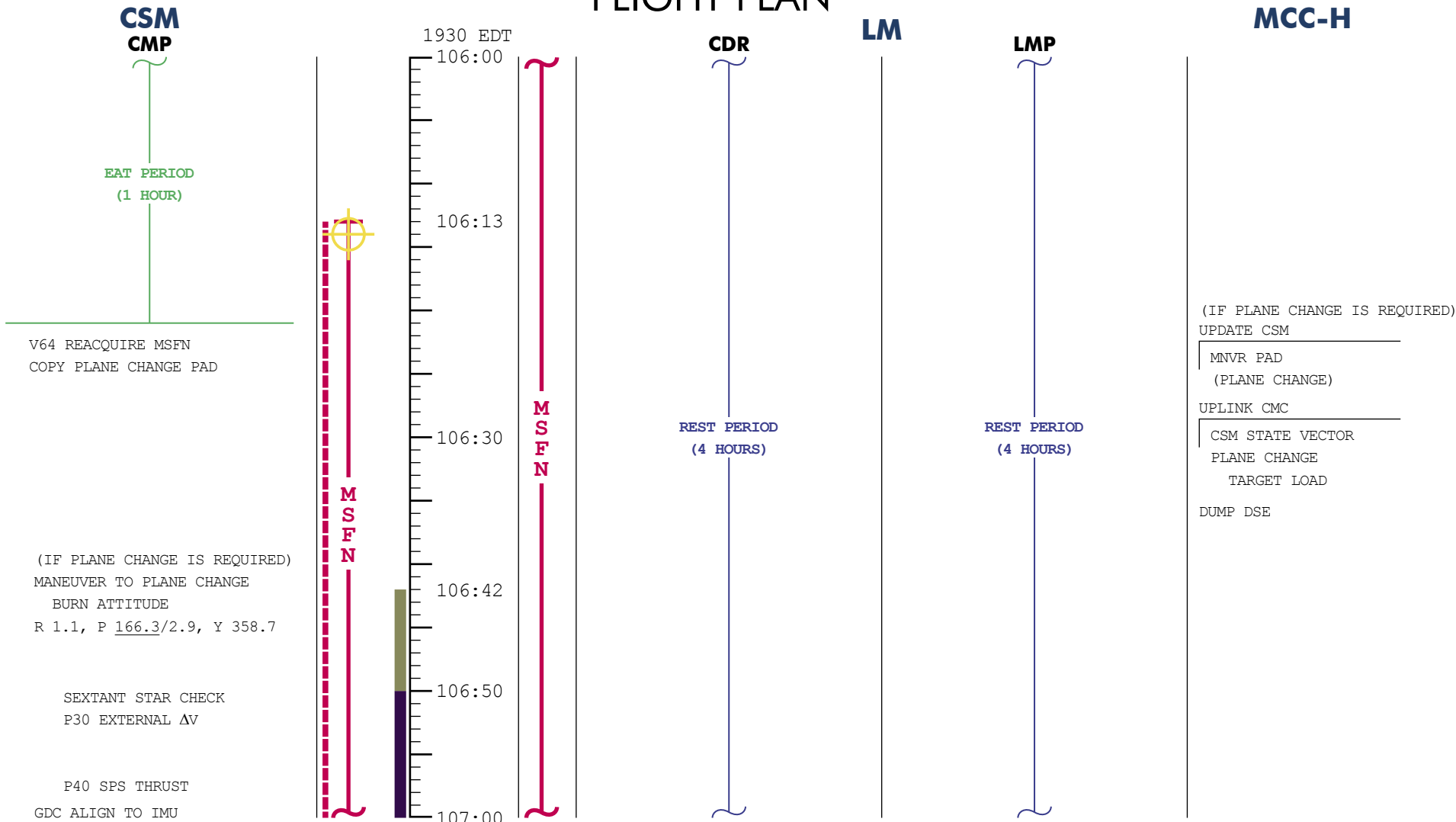
REST PERIOD  
(4 HOURS)

MCC-H

DUMP DSE

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	105:00 - 106:00	5 / 15-16	3-72

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	106:00 - 107:00	5 / 16	3-73

FLIGHT PLAN

CSM  
CMP

SPS, PLANE CHANGE  
GETI = 107:05:33  
ΔV=NOMINALLY ZERO

R 1.1, P 244.2/2.9, Y 358.7

BATTERY CHARGE, BATTERY B

P52 IMU REALIGN  
OPTION 1 PREFERRED  
PULSE TORQUE TO  
LIFT OFF REFSMMAT

PRESLEEP CHECKLIST

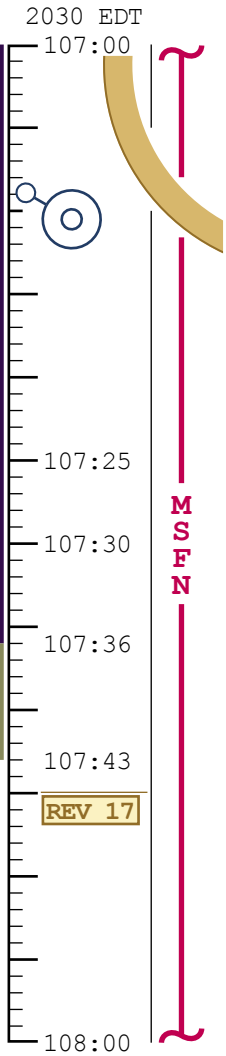
MANEUVER TO SLEEP ATTITUDE



REST PERIOD  
(4 HOURS)

R 82, P 128/218, Y 0  
HGA P -10, Y 258

MSFN



CDR

REST PERIOD  
(4 HOURS)

LM

LMP

REST PERIOD  
(4 HOURS)

MCC-H

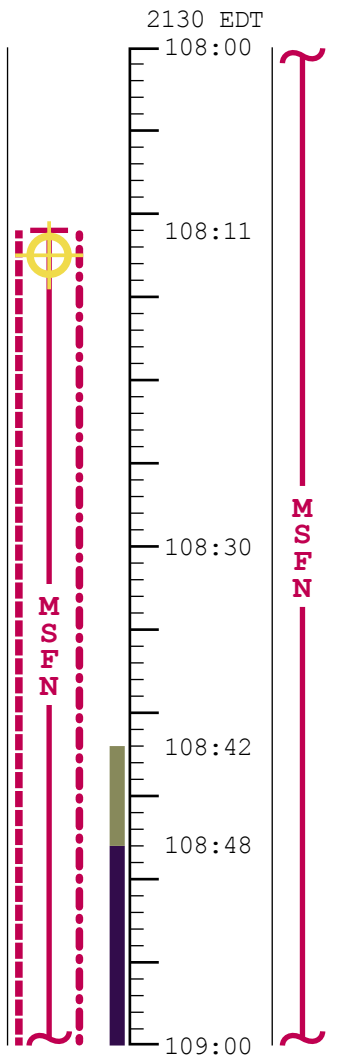
UPLINK CMC  
DESIRED ORIENT  
(LIFT OFF)

CSM  
PRE SLEEP CHECKLIST  
CREW STATUS REPORT (RADIATION, MEDICATION)  
CYCLES O<sub>2</sub> & H<sub>2</sub> FANS  
CHLORINATE POTABLE WATER  
VERIFY:  
WASTE MNGT OVBD DRAIN VLV - OFF  
WASTE STOW VENT VLV - CLOSED  
EMERG CABIN PRESS VLV - BOTH  
SURGE TANK O<sub>2</sub> VLV - ON  
REPRESS PACK O<sub>2</sub> VLV - OFF  
POTABLE H<sub>2</sub>O HTR - OFF  
LM TUNNEL VENT VLV - OFF  
SELECT COMM NORMAL LUNAR CONFIGURATION  
EXCEPT:  
S-BD SQUELCH - ENABLE  
HGA TRACK - REACQ  
HGA BEAM - NARROW  
HGA P -10, Y 258

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	107:00 - 108:00	5 / 16-17	3-74

CSM  
CMP

REST PERIOD  
(4 HOURS)



# FLIGHT PLAN

CDR

REST PERIOD  
(4 HOURS)

LM

LMP

REST PERIOD  
(4 HOURS)

MCC-H

DUMP DSE

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	108:00 - 109:00	5 / 17	3-75

CSM  
CMP

REST PERIOD  
(4 HOURS)

M  
S  
F  
N

2230 EDT

109:00

109:23

109:30

109:35

109:41

REV 18

110:00

M  
S  
F  
N

# FLIGHT PLAN

CDR

REST PERIOD  
(4 HOURS)

EAT PERIOD  
(1 HOUR)

LM

LMP

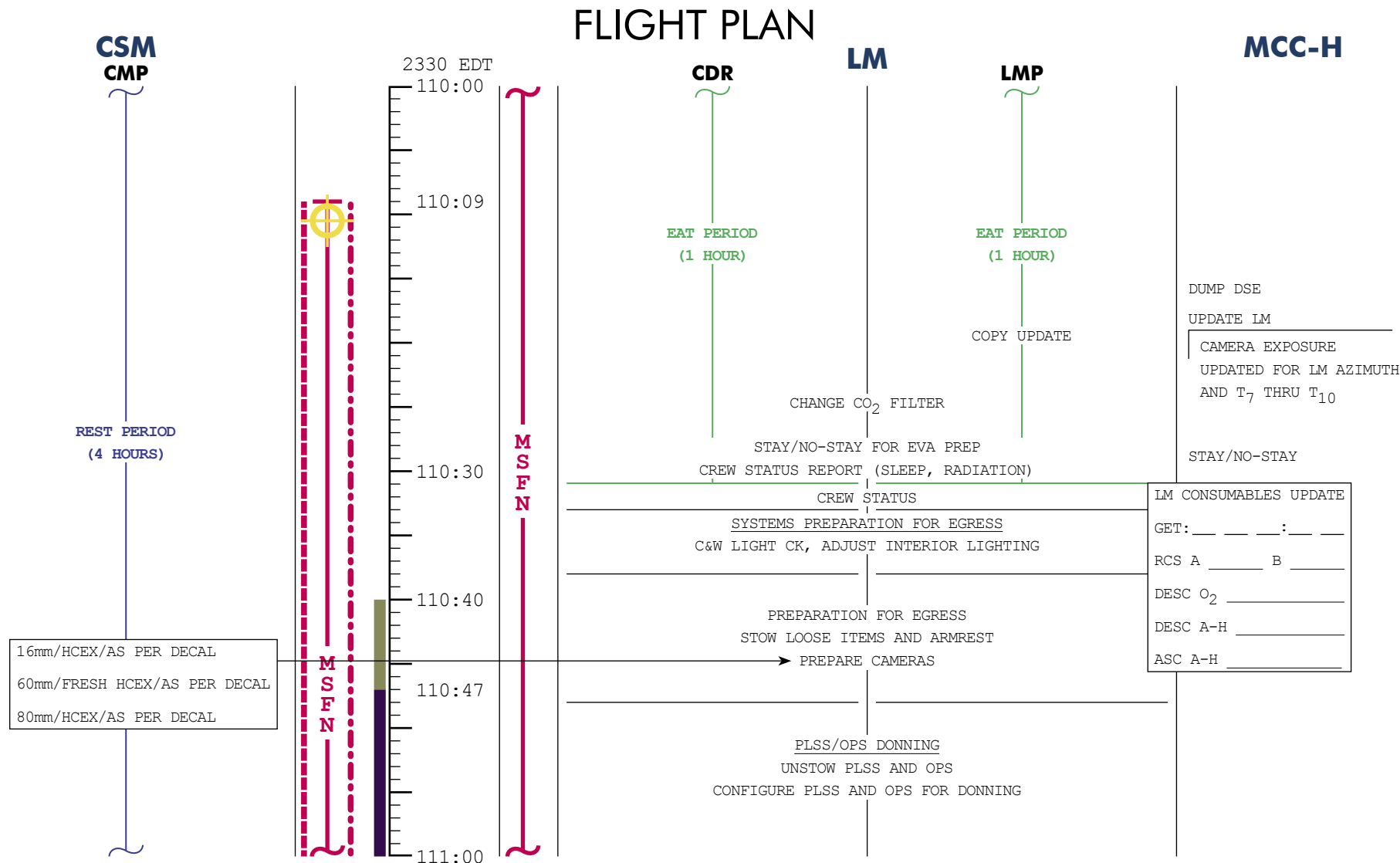
REST PERIOD  
(4 HOURS)

EAT PERIOD  
(1 HOUR)

MCC-H

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	109:00 - 110:00	5 / 17-18	3-76





MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	110:00 - 111:00	5 / 18	3-77

# FLIGHT PLAN

**MCC-H**

**CSM**  
**CMP**

REST PERIOD  
(4 HOURS)

```
CO2 FILTER CHANGE NO. 9
(11 INTO A, STORE 9 IN A3)
```

O<sub>2</sub> FUEL CELL PURGE

EAT PERIOD  
(1 HOUR)

0030 EDT

- 111:00

MSFN

111:21

- 111:30

111:33

111:39

REV 19

MSFN

- 112:00

**CDR**

LM

**LMP**

LMP UNSTOW AND DON OVERSHOES  
ATTACH OPS TO PLSS

CDR UNSTOW AND DON OVERSHOES  
ATTACH OPS TO PLSS

LMP DON PLSS  
UNSTOW AND CONNECT RCU  
VERIFY PLSS SWITCH AND VALVE POSITIONS

PREPARE CDR PLSS FOR DONNING

CDR DON PLSS  
UNSTOW AND CONNECT RCU  
VERIFY PLSS SWITCH AND VALVE POSITIONS

### PLSS/EXTRA VEHICULAR COMM SYSTEM ELECTRICAL CHECKOUT

## AUDIO SWITCHES CHECK

ACTIVATE PLSS COMM SYSTEMS

FINAL EVA EQUIPMENT PREP FOR EGRESS

UNSTOW AND CONNECT OPS O<sub>2</sub> HOSE AND ACTUATOR

FINAL SYSTEMS PREP FOR EGRESS  
CONFIRM "GO" FOR CABIN DEPRESS  
VERIFY C/B, VALVES AND O<sub>2</sub>/H<sub>2</sub>O QUAN

GO/NO-GO

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	111:00 - 112:00	5 / 18-19	3-78

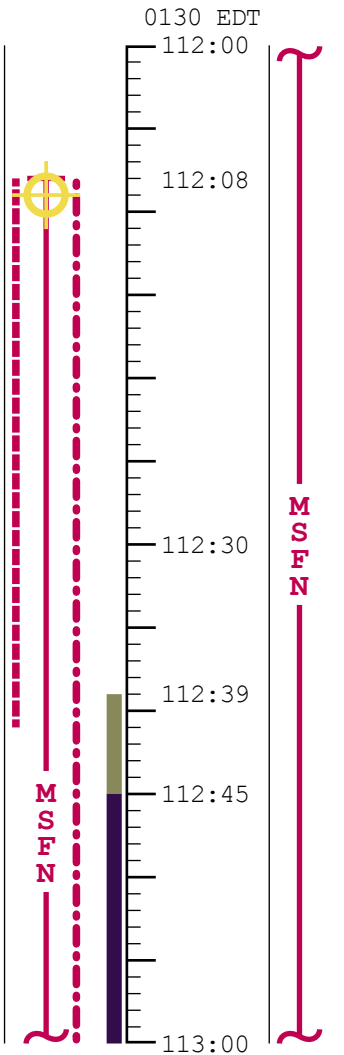
FLIGHT PLAN

CSM  
CMP

EAT PERIOD  
(1 HOUR)

CREW STATUS REPORT (SLEEP)  
SELECT COMM NORMAL  
LUNAR CONFIGURATION

COPY PAD  
(SEE GET 114:20)



CDR LM LMP

PREP FOR CABIN DEPRESS

CONNECT OPS O<sub>2</sub> HOSES

LMP DON HELMET

CDR DON HELMET

CONNECT PLSS H<sub>2</sub>O HOSES

DON GLOVES

PRESSURE INTEGRITY CHECK

PLSS O<sub>2</sub> ON  
SET CHRONOMETER

FINAL PRE-EVA OPERATIONS  
DEPRESS CABIN  
FINAL SYSTEMS CHECKS

OPEN FWD HATCH

PLSS H<sub>2</sub>O ON

INITIAL EVA  
EGRESS TO PLATFORM  
RELEASE MESA  
DESCEND LADDER  
REST/CHECK EMU SYSTEM

ASSIST AND MONITOR CDR

TURN TV ON  
ACT 16mm CAMERA

ENVIRONMENTAL FAMILIARIZATION  
CHECK STABIL, MOBIL, EMU

MONITOR CDR  
OPERATE 16mm CAMERA

CONT SAMPLE COLLECTION  
COLLECT AND STOW SAMPLE

MCC-H

DUMP DSE

START EVA  
0+00

0+10

UPDATE CSM  
LM ACQUISITION TIME

0+20

0+30

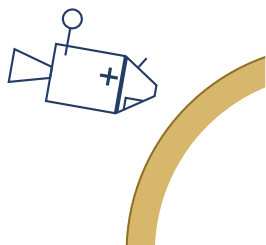
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	112:00 - 113:00	5 / 19	3-79

CSM  
CMP

SET UP CAMERA FOR TRACKING

EL/250/BW-BRKT  
INT (f5.6, 250, INF)

PITCH DOWN 172° TO HEADS DOWN  
FOR LUNAR SURFACE OBSERVATION,  
ORB RATE



R 180, P 282/44, Y 0

# FLIGHT PLAN

LM

MCC-H

CDR

LMP

0230 EDT

113:00

MSFN

113:19

113:30

113:32

113:38

REV 20

114:00

MSFN

PRELIMINARY CHECKS  
CK LM STATUS  
CK LIGHTING VISIBILITY

REST  
MONITOR AND PHOTOGRAPH  
LMP EGRESS

TV DEPLOYMENT  
CAMERA EQPT FROM MESA  
CARRY TV TO SITE  
MOUNT TRIPOD, PANORAMA,  
POSITION FOR EVA  
PHOTOGRAPH SWC  
PHOTO BULK SAMPLE AREA

BULK SAMPLE COLLECTION  
CAMERA ON MESA  
PREPARE SRC  
COLLECT ROCK FRAGMENTS AND  
LOOSE MATERIAL  
WEIGH SAMPLE  
PACK AND SEAL SRC,  
CONNECT TO LEC  
REST

LM INSPECTION  
INSPECT QUAD IV, +Y GEAR  
EVAL TERRAIN, VISIBILITY  
INSPECT QUAD III, -Z GEAR  
PHOTO QUAD II, EASEP  
OFF LOADING  
INSPECT, PHOTO -Y GEAR  
PHOTO PANORAMA  
TAKE CLOSEUP PHOTOS  
EASEP DEPLOYMENT

STILL-CAMERA TO SURFACE  
FINAL LM CK  
EVA GO

INITIAL EVA  
EGRESS  
DESCEND TO SURFACE

ENVIRONMENT FAMILIARIZATION  
CK BALANCE, STABILITY, REACH,  
WALKING, EMU

SWC DEPLOYMENT  
DEPLOY SWC IN SUN

EVA AND ENIRON EVAL  
EVAL EVA CAPABILITY AND  
EFFECTS  
EVAL LIGHTING/VISIBILITY  
AND SURFACE CHARACTERISTICS  
PHOTO PANORAMA

LM INSPECTION  
PHOTO QUAD I, +Z GEAR  
PHOTO BULK SAMPLE AREA  
DEPLOY ALSCC  
PHOTO QUAD IV, +Y GEAR  
PHOTO PANORAMA  
PHOTO QUAD III, -Z GEAR  
CAMERA TO CDR

EASEP DEPLOYMENTS  
REMOVE EXPERIMENTS

0+30

EVA GO

0+40

0+50

1+00

1+10

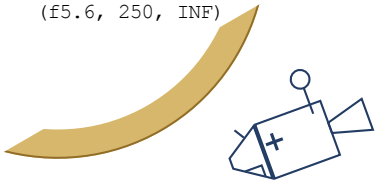
1+20

1+30

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	113:00 - 114:00	5 / 19-20	3-80

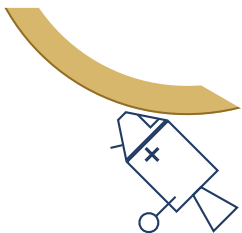
CSM  
CMP

EL/250/BW-BRKT, INT  
(f5.6, 250, INF)



IF CONVENIENT CHANGE  
SHUTTER TO 1/125  
PITCH UP 38°  
ROLL 180° TO HEADS UP  
R 0, P 320/260, Y 0  
PITCH DOWN, PHOTOGRAPH LM  
WHILE TRACKING THROUGH COAS

STOP PITCH AND ROLL 180° TO  
HEADS DOWN ATTITUDE FOR  
SURFACE OBSERVATIONS  
STOP CAMERA



R 180, P 282/185, Y 0  
HGA P -7, Y 183

# FLIGHT PLAN

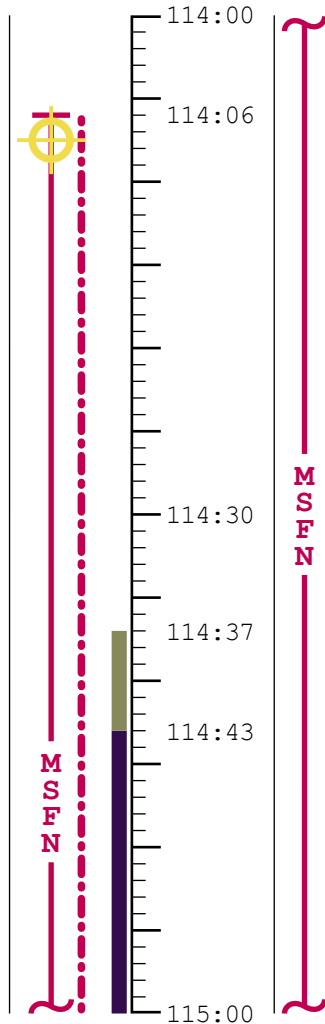
CDR

LM

LMP

MCC-H

0330 EDT



SELECT DEPLOY SITE  
CARRY CAMERAS  
DEPLOY LR<sup>3</sup> EXPERIMENT  
PHOTO EXPERIMENTS

## DOCUMENTED SAMPLE COLLECTION

REST/PHOTO LMP  
CLOSE-UP PHOTOS  
TETHER SAMPLE BAG TO LMP  
PHOTO SAMPLING  
UNSTOW GNOMON  
PHOTO DS AREA  
PHOTO SAMPLE COLLECTION  
STOW ALSCC FILM  
COLLECT ENVIRONMENTAL SAMPLES  
RETRIEVE AND STOW SWC  
PACK SRC  
CLOSE AND SEAL SRC  
REST/PHOTO LMP

## SRC TRANSFER

TRANSFER BULK SRC AND STILL  
CAMERA MAGAZINE  
PHOTO LMP  
REST  
TRANSFER DS SRC

SELECT DEPLOY SITE  
CARRY EXPERIMENTS  
DEPLOY PSE  
TAKE CLOSEUP PHOTOS

## DOCUMENTED SAMPLE COLLECTION

MOVE BULK SRC TO STRUTS OR  
FOOT PAD  
PREPARE DS SRC  
  
COLLECT CORE TUBE SAMPLE  
UNSTOW TOOLS  
COLLECT SAMPLES  
STOW ALSCC FILM  
COLLECT ENVIRONMENTAL SAMPLES  
COLLECT LOOSE MATERIAL  
CORE TUBE SAMPLE

## EVA TERMINATION

WIPE SUIT AND EMU  
WIPE FEET ON LANDING PAD  
AND LADDER  
ASCEND LADDER  
INGRESS CABIN  
CHECK LM  
OPERATE SEQ CAMERA  
RECEIVE AND STOW SRC  
AND MAGAZINE  
RECEIVE AND STOW SRC

1+30

1+40

DUMP DSE

1+50

LM ACQUISITION GET:  
\_ \_ \_ : \_ \_ \_ : \_ \_ \_

2+00

2+10

2+20

2+30

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	114:00 - 115:00	5 / 20	3-81

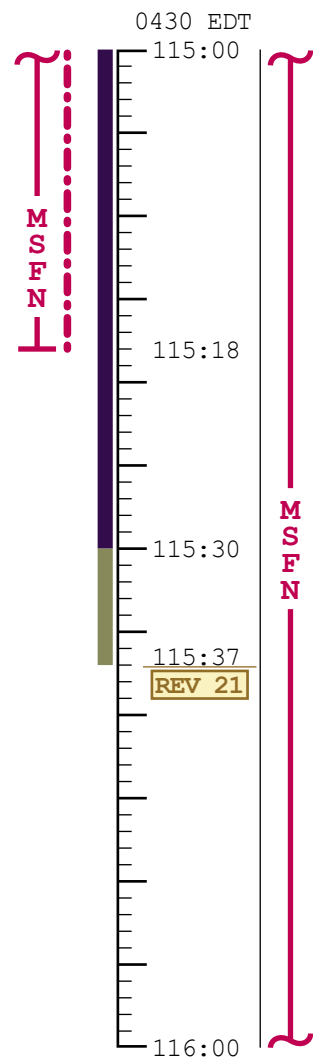
**CSM  
CMP**

PRE SLEEP CHECKLIST  
 CREW STATUS REPORT  
 (RADIATION, MEDICATION)  
 CYCLES O<sub>2</sub> & H<sub>2</sub> FANS  
 CHLORINATE WATER  
 VERIFY:  
   WASTE MNGMT OVBD DRAIN  
     VLV - OFF  
   WASTE STOW VENT VLV - CLOSED  
   EMERG CABIN PRESS VLV - BOTH  
   SURGE TANK O<sub>2</sub> VLV - ON  
   REPRESS PACK O<sub>2</sub> VLV - OFF  
   POTABLE H<sub>2</sub>O HTR - OFF  
 SELECT COMM NORMAL LUNAR  
 CONFIGURATION - EXCEPT:  
   S-BD SQUELCH - ENABLE  
   HGA TRACK - REACQ  
   HAG BEAM - NARROW  
   HGA P -59, Y 355

EAT PERIOD  
(1 HOUR)

# FLIGHT PLAN

**MCC-H**



**CDR**

**LM**

**LMP**

<u>TERMINATE EVA</u> WIPE FEET ON LANDING PAD AND LADDER ASCEND LADDER CABIN REPRESS	CLOSE FWD HATCH
<u>PPOST EVA SYSTEMS CONFIGURATION</u> VERIFY CAUTION LIGHTS OFF DISCONNECT RCU DISCONNECT OPS O <sub>2</sub> HOSES CONNECT LM O <sub>2</sub> HOSES (TV-OFF) CONFIGURE VALVES AND CIRCUIT BREAKERS DISCONNECT PLSS H <sub>2</sub> O HOSES SWITCH TO LM COMM SYSTEM	
<u>PLSS/OPS DOFFING</u> REMOVE LMP RCU OPS CHECK STOW PLSS/OPS ON CABIN FLOOR REMOVE CDR RCU STOW PLSS/OPS ON CABIN FLOOR	
<u>FINAL SYSTEMS CONFIGURATION</u> <u>PREP FOR EQUIPMENT JETTISON</u> REPORT PLSS FEEDWATER REMOVE OPS FROM PLSS	

2+30

2+40  
END EVA

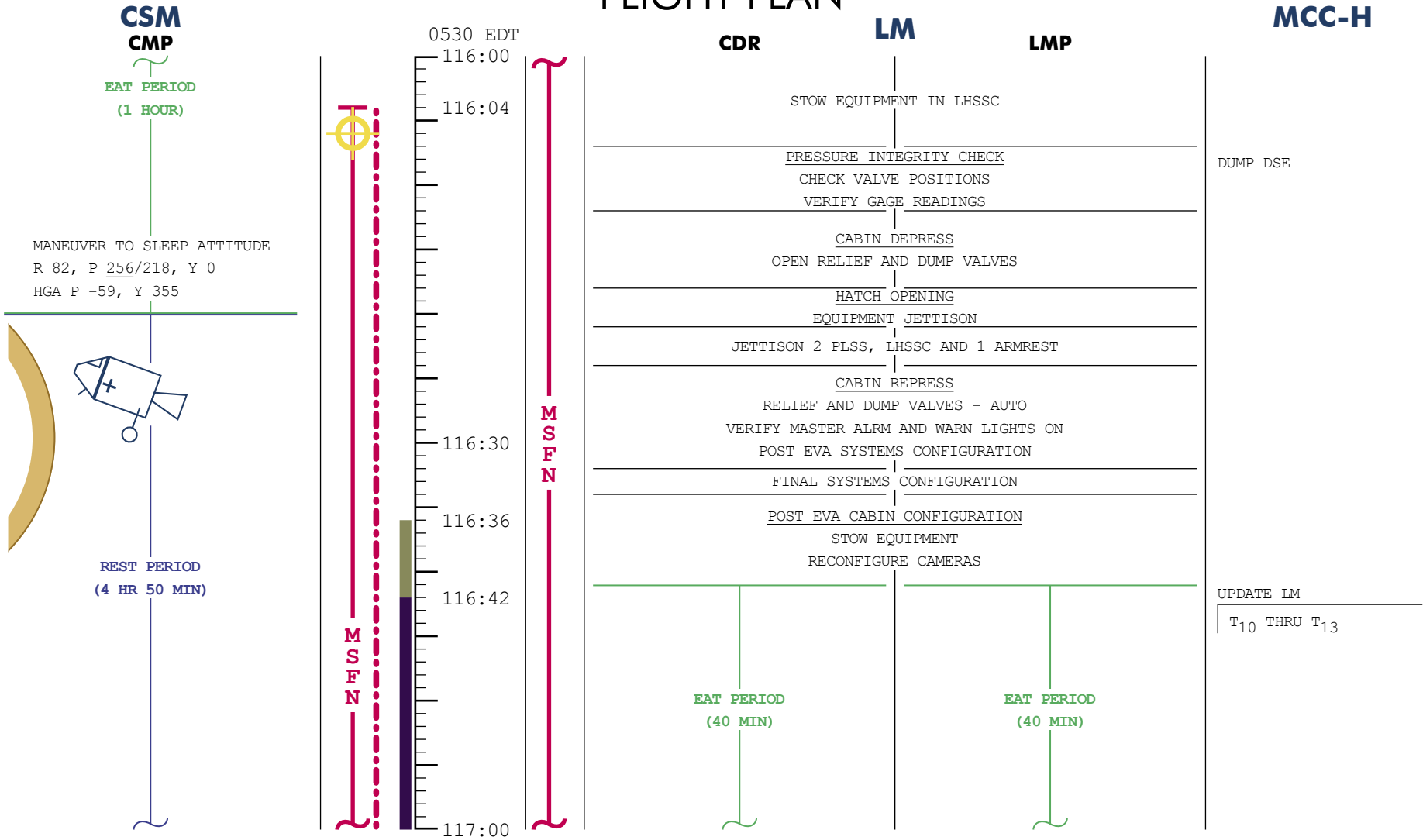
80mm/HCEX/EVA CARD #1  
 3 FRAMES EACH, FAR & NEAR  
 FIELD (FOCUS 50')  
 AND  
 80mm/BW/EVA CARD #1  
 3 FRAMES EACH, FAR & NEAR  
 FIELD (FOCUS 20')

COPY REPORT

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	115:00 - 116:00	5 / 20-21	3-82

FLIGHT PLAN

MCC-H



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	116:00 - 117:00	5 / 21	3-83

CSM  
CMP

REST PERIOD  
(4 HR 50 MIN)

MSFN

0630 EDT

117:00

117:16

117:28

117:30

117:35

REV 22

118:00

MSFN

# FLIGHT PLAN

CDR

EAT PERIOD  
(40 MIN)

CREW STATUS REPORT (RADIATION, MEDICATION)

REST PERIOD  
(4 HR 40 MIN)

LM

LMP

EAT PERIOD  
(40 MIN)

BIO MED SW - LEFT

REST PERIOD  
(4 HR 40 MIN)

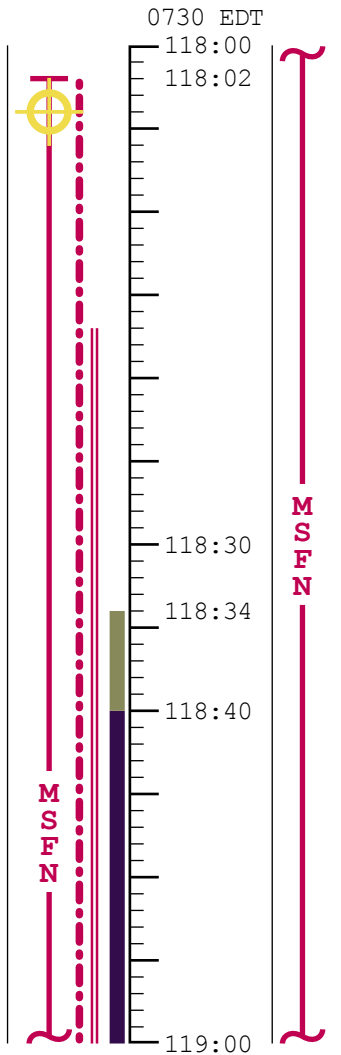
MCC-H

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	117:00 - 118:00	5 / 21-22	3-84



CSM  
CMP

REST PERIOD  
(4 HR 50 MIN)



# FLIGHT PLAN

CDR

REST PERIOD  
(4 HR 40 MIN)

LM

LMP

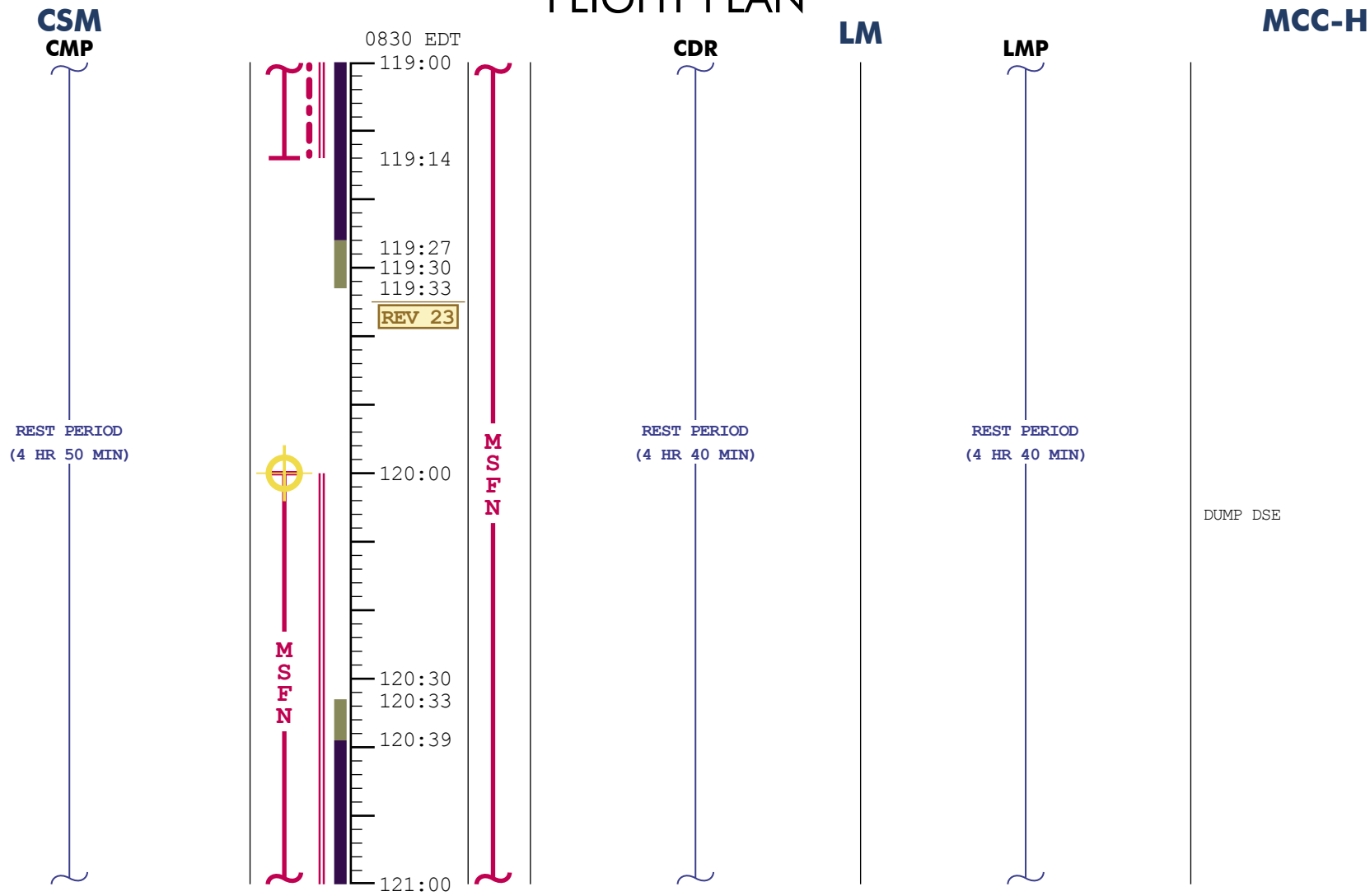
REST PERIOD  
(4 HR 40 MIN)

MCC-H

DUMP DSE

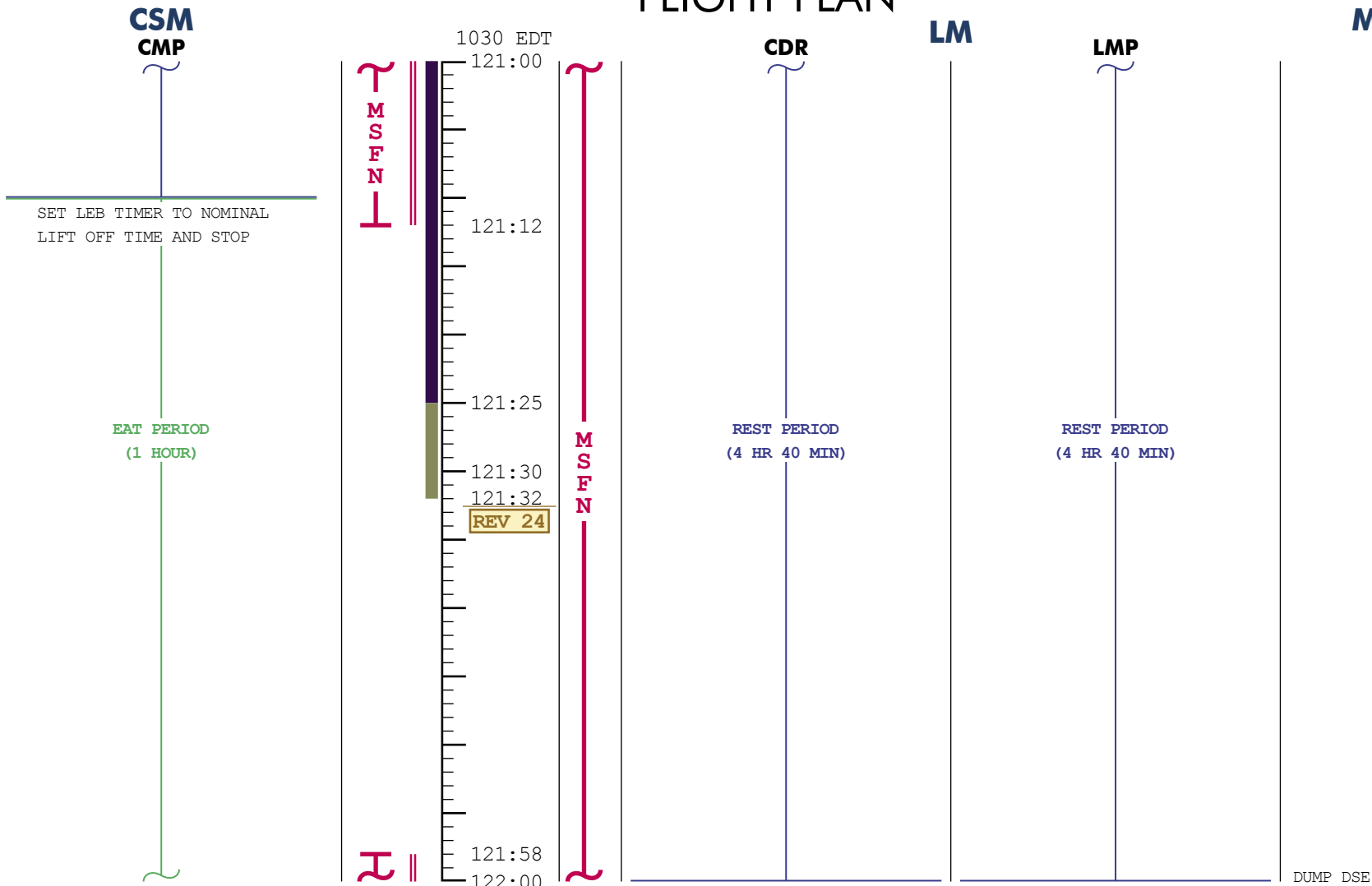
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	118:00 - 119:00	5 / 22	3-85

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	119:00 - 121:00	5 / 22-23	3-86

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	121:00 - 122:00	5 / 23-24	3-87

FLIGHT PLAN

CSM  
CMP

LM

MCC-H

SELECT COMM: NORMAL LUNAR  
CONFIGURATION  
CREW STATUS REPORT (SLEEP)

V45 RESET LUNAR SURFACE FLAG

1130 EDT  
122:00

MSFN

122:30  
122:31

122:37

123:00

CDR  
CREW STATUS REPORT (SLEEP)  
RR - ON, SELF TEST

EAT PERIOD  
(35 MIN)

LMP  
AGS TURN ON, SELF TEST  
AND SYSTEM TESTS  
INITIALIZE AGS TIME  
REPORT BIAS TO MCC-H  
REPORT:  
P57 - GRAVITY AND ONE  
CELESTIAL BODY (REFSMMAT)  
N04:    \_  \_  \_  .  
N71:    \_  \_    
N93:    \_  \_    
X    \_  \_  .  
Y    \_  \_  .  
Z    \_  \_  .  
GET    \_  \_  \_  :  \_  \_  :  \_  \_

EAT PERIOD  
(35 MIN)

MCC-H  
COPY TIME BIAS

UPLINK LGC  
CSM STATE VECTOR  
(INSERTION +18 MIN)  
PGNCS GYRO COMP  
(IF REQUIRED)

UPLINK CMC  
CSM STATE VECTOR  
(INSERTION +18 MIN)  
NOMINAL LM S. V.  
(INSERTION +18 MIN)

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	122:00 - 123:00	6 / 24	3-88

CSM  
CMP

COPY CONSUMABLES UPDATE

O<sub>2</sub> FUEL CELL PURGE

SET UP CAMERA FOR DOCKING  
16mm/18/CEX-BRKT  
MIR (f8, 250, INF) 6 fps

RR TRANSPONDER - PWR

FLIGHT PLAN

CDR

COPY CONSUMABLES UPDATE

RCS HOT FIRE

LM

LMP

COPY ASCENT PAD  
LOAD PAD DATA

VERIFY AGS:  
AZIMUTH CORRECTION = 0  
H = 60,000 FT  
H DOT = 32 FPS  
NO S-BAND YAW MNVR  
ORBIT INSERTION MODE  
SET CAMERA FOR ASCENT  
16mm/HCEX/OVERHEAD  
MIR (f4, 500, INF) 12 fps

REPORT:

P57 - GRAVITY AND ONE  
CELESTIAL BODY (T-ALIGN)

N04:    .    .    .    .    .

N71:    .    .    .    .    .

N93:    .    .    .    .    .

X    .    .    .    .    .

Y    .    .    .    .    .

Z    .    .    .    .    .

GET    .    .    .    .    .

ENTER AGS LUNAR ALIGN

MCC-H

UPDATE LM

ASCENT PAD

CONSUMABLE UPDATE  
(Δ FROM NOMINAL)

GET:    .    .    .    .    .

RCS TOT    .    .    .    .    .

A    .    .    .    .    .

B    .    .    .    .    .

C    .    .    .    .    .

D    .    .    .    .    .

H<sub>2</sub> TOT    .    .    .    .    .

O<sub>2</sub> TOT    .    .    .    .    .

LM CONSUMABLES UPDATE

GET:    .    .    .    .    .

RCS A    .    .    .    .    .    .    .    .    .    .    .    .    .

DESC O<sub>2</sub>    .    .    .    .    .

DESC A-H    .    .    .    .    .

ASC A-H    .    .    .    .    .

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	123:00 - 124:00	6 / 24-25	3-89

CSM  
CMP

V64 ACQUIRE MSFN

VHF RANGING  
MNVR TO SUPPORT LIFT OFF  
R 0, P 250/207, Y 0

PITCH DOWN, 0.2°/SEC

CONFIRM INSERTION

VHF RANGING

REPORT:

P52 - (LIFT OFF REFSMMAT)  
OPTION 3  
N71: \_ \_ \_ , \_ \_ \_  
N05: \_ \_ \_ . \_ \_ \_  
N93:  
X \_ \_ \_ . \_ \_ \_  
Y \_ \_ \_ . \_ \_ \_  
Z \_ \_ \_ . \_ \_ \_  
GET \_ \_ \_ : \_ \_ \_ : \_ \_ \_

1330 EDT

124:00

MSFN

124:30  
124:31

124:36  
124:37

125:00

MSFN

# FLIGHT PLAN

CDR

LOAD DAP - 12012  
DON HELMET AND GLOVES  
P12 ASCENT PROGRAM  
RR - ON

PRELAUNCH SWITCH CK  
VERIFY RESTRAINTS

TIG -5 SEC, ABORT STAGE

APS, LIFT OFF

RR LOCK ON, MODE II

ORBIT INSERTION

RR - OFF  
VERIFY INSERTION VEL

P52 - (LIFT OFF REFSMMAT)  
OPTION 3  
N71: \_ \_ \_ , \_ \_ \_  
N05: \_ \_ \_ . \_ \_ \_  
N93:  
X \_ \_ \_ . \_ \_ \_  
Y \_ \_ \_ . \_ \_ \_  
Z \_ \_ \_ . \_ \_ \_  
GET \_ \_ \_ : \_ \_ \_ : \_ \_ \_

RR - ON

LM

LMP

DON HELMET AND GLOVES

GO/NO-GO FOR PGNC  
ASCENT GUIDANCE AND  
LIFT OFF THIS REV  
PRELAUNCH SWITCH CK  
VERIFY RESTRAINTS

LIFT OFF COMM  
START 16mm CAMERA  
V47 INITIALIZE AGS  
AGS GUIDANCE STEERING

TIG: 124:23:26  
BT: 7 MIN 18 SEC  
ΔV: 6060 FPS  
ORBIT: 60 KFT x 45 NM

P00 - DOWNLINK LM S. V.  
STOP 16mm CAMERA  
ECS CHECK  
V48 LOAD DAP N46, 12002  
V56, V41 - RR - OFF  
TURN ON TRACK LIGHT

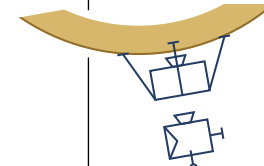
V93 (BEFORE FIRST MARK)  
V80, V47 INITIALIZE AGS  
P32 CSI PRETHRUST

MCC-H

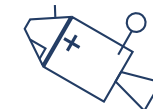
UPDATE LM

GO/NO-GO

LIFT OFF -6 MIN  
DISABLE S-BAND RELAY



LM FDAI: R 0, P 0, Y 0



CSM: R 0, P 320/207, Y 0

UPLINK CMC

LM STATE VECTOR



LM FDAI: R 0, P 257.3, Y 0



CSM: R 0, P 235/119, Y 0

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	124:00 - 125:00	6 / 25	3-90

**CSM**  
**CMP**

VHF RANGING

P40

SPS CHECKLIST

CSI, BACKUP

P76 TARGET ΔV

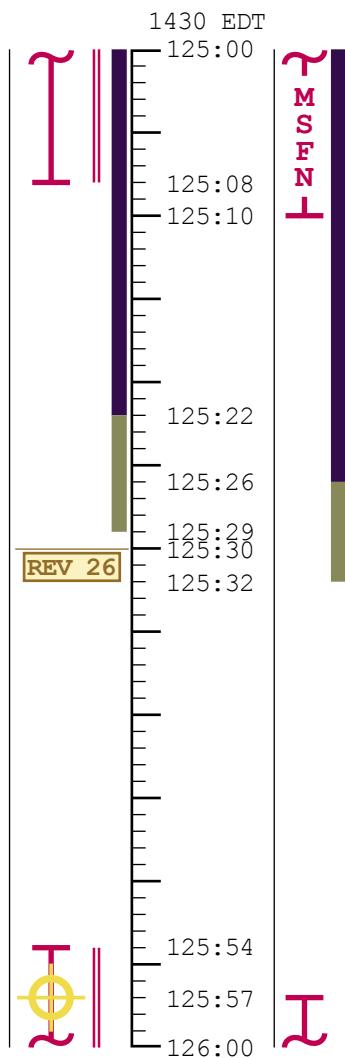
P20 AUTO MANEUVER  
TO SEXTANT TRACK

VHF RANGING

P76 TARGET ΔV  
(LM PC BURN DATA)

SEXTANT TRACKING

VHF RANGING



# FLIGHT PLAN

**CDR**

**LM**

**LMP**

P20 RENDEZVOUS NAVIGATION  
ACQUIRE AND TRACK CSM  
MAINTAIN RR  
TRACKING ATTITUDE  
SLEW STEERABLE ANT  
ANT P 58, Y -38

V83 SET ORDEAL

P41 RCS THRUSTING

RCS, CSI

VERIFY RESIDUALS

Z AXIS BORESIGHT

MAINTAIN RR AND  
VHF TRACKING ATTITUDE

P41 RCS THRUSTING

RCS, PLANE CHANGE

V32 - MARKS = 5

V32 - MARKS = 10

RCS TEMP/PRESS/QTY CK

AFT OMNI, PCM LBR

FINAL CSI COMPUTATION

V90 OUT OF PLANE

V47 INITIALIZE AGS (PCM-HI)

CSI DATA TO CSM (PCM-LO)

LOAD AGS ΔV

TIG: 125:21:19

BT: 45 SEC

ΔV: 49.5 FPS

V76, V67, VHF RANGING

P33 CDH PRETHRUST

V93 MARKS = 4

V32 MARKS = 3

V90 OUT OF PLANE

V32 MARKS = 10

P30 EXTERNAL ΔV

V90 OUT OF PLANE

LOAD AGS ΔV

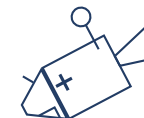
TIG: 125:50:28

ΔV=NOMINALLY ZERO

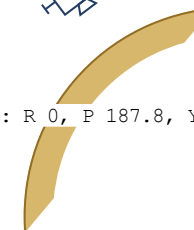
V76, P33 CDH PRETHRUST

**MCC-H**

CSM: R 0, P 180/271, Y 0



LM FDAI: R 0, P 187.8, Y 0



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	125:00 - 126:00	6 / 25-26	3-91

CSM  
CMP

V90 YDOT  
TRANSMIT YDOT TO LM  
P33 FINAL COMPUTATION

P41  
CDH BACKUP

P76 TARGET ΔV

P20 AUTO MANEUVER  
TO SEXTANT TRACK  
VHF RANGING

SEXTANT TRACKING  
VHF RANGING

P34 TPI

SET EVENT TIMER  
P40 ΔV THRUST  
SPS CHECKLIST

P76 TARGET ΔV

1530 EDT

126:00

126:28

126:30

126:34

127:00

# FLIGHT PLAN

CDR

MAINTAIN RR AND  
VHF TRACKING ATTITUDE

V83 SET ORDEAL  
P41 RCS THRUSTING

MAINTAIN RR AND  
VHF TRACKING ATTITUDE

P41 RCS THRUSTING  
COUNTDOWN TO CSM

VERIFY RESIDUALS

LM

LMP

V93 MARKS = 4  
ACQUIRE MSFN S-BAND  
STEERABLE ANTENNA  
P -58 Y -38  
V32 MARKS = 5  
RCS TEMP/PRESS/QTY CK  
ECS CHECK  
FINAL COMPUTATION  
V90 OUT OF PLANE  
COPY CSM YDOT, LOAD NEG  
V47 INITIALIZE AGS

TIG: 126:19:37  
BT: 1.9 SEC  
ΔV: 4.3 FPS

V76, P34 TPI PRETHRUST  
V93 MARKS = 4  
V32 MARKS = 3

V32 MARKS = 10

RCS TEMP/PRESS/QTY CK  
ECS CHECK

FINAL COMPUTATION  
COPY CSM YDOT, LOAD NEG  
V47 INITIALIZE AGS  
COPY CSM TPI SOLUTION  
LOAD AGS ΔV

TIG: 126:58:08  
BT: 22.4 SEC  
ΔV: 24.8 FPS

MCC-H

LM FDAI: R 0, P 352.8, Y 0

CSM: R 180, P 264/177, Y 0

CSM: R 0, P 208/9, Y 0

LM FDAI: R 0, P 274.6, Y 0

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	126:00 - 127:00	6 / 26	3-92



CSM  
CMP

P20 AUTO MNVR  
P35 TPM PRETHRUST  
SXT AND VHF TRACKING

P41  
MCC1 BACKUP  
P76 TARGET ΔV

SXT AND VHF TRACKING

P35 TPM PRETHRUST  
P41  
MCC2 BACKUP  
P76 TARGET ΔV  
V89 MANEUVER TO COAS  
TRACKING ATTITUDE  
DON HELMET & GLOVES

START 16mm CAMERA  
DOCK CHECKLIST  
LOAD DAP R1 = 61112  
R2 = 11111  
FOR LM ASCENT STAGE DOCKING  
CMC - AUTO

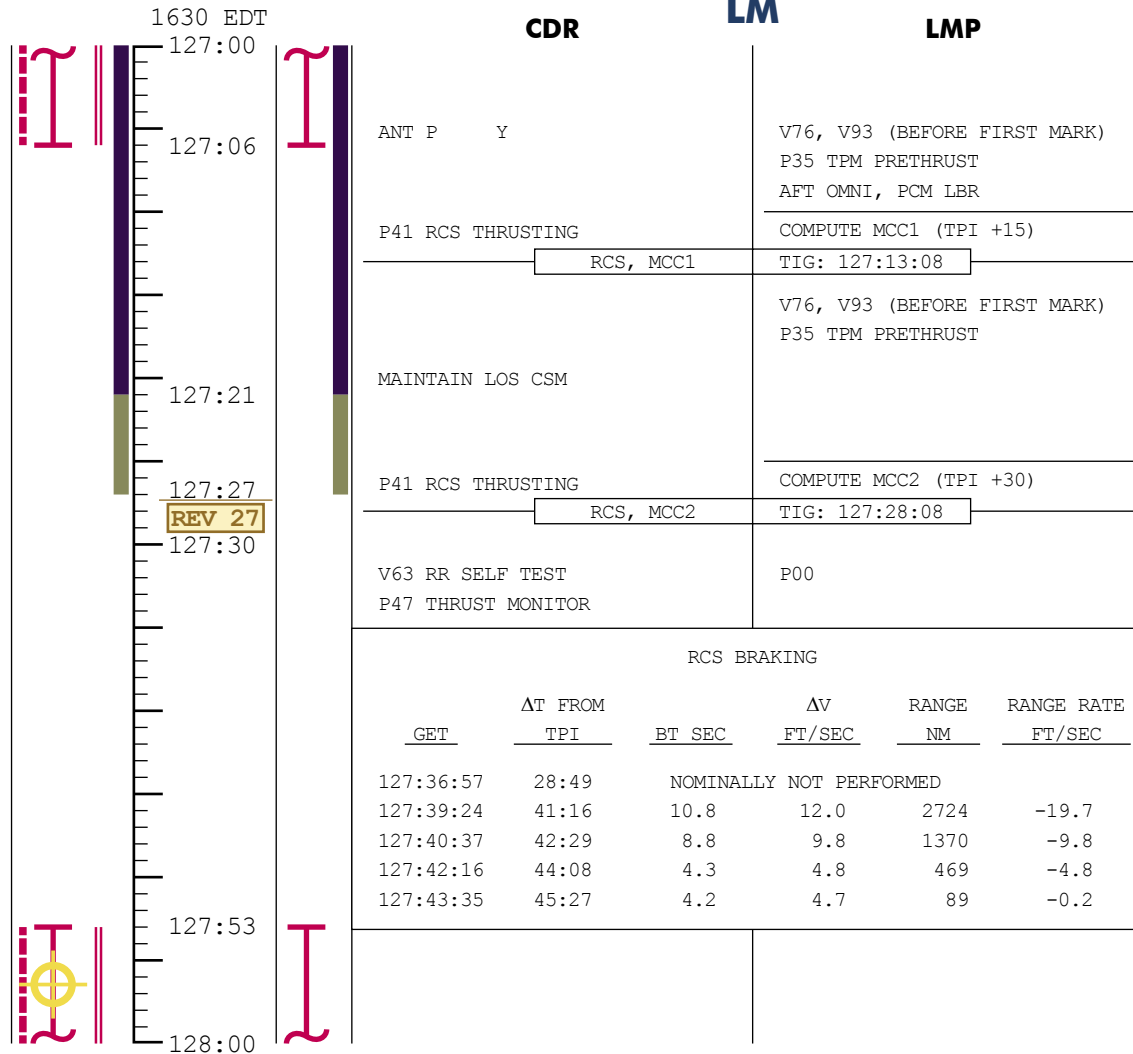
# FLIGHT PLAN

CDR

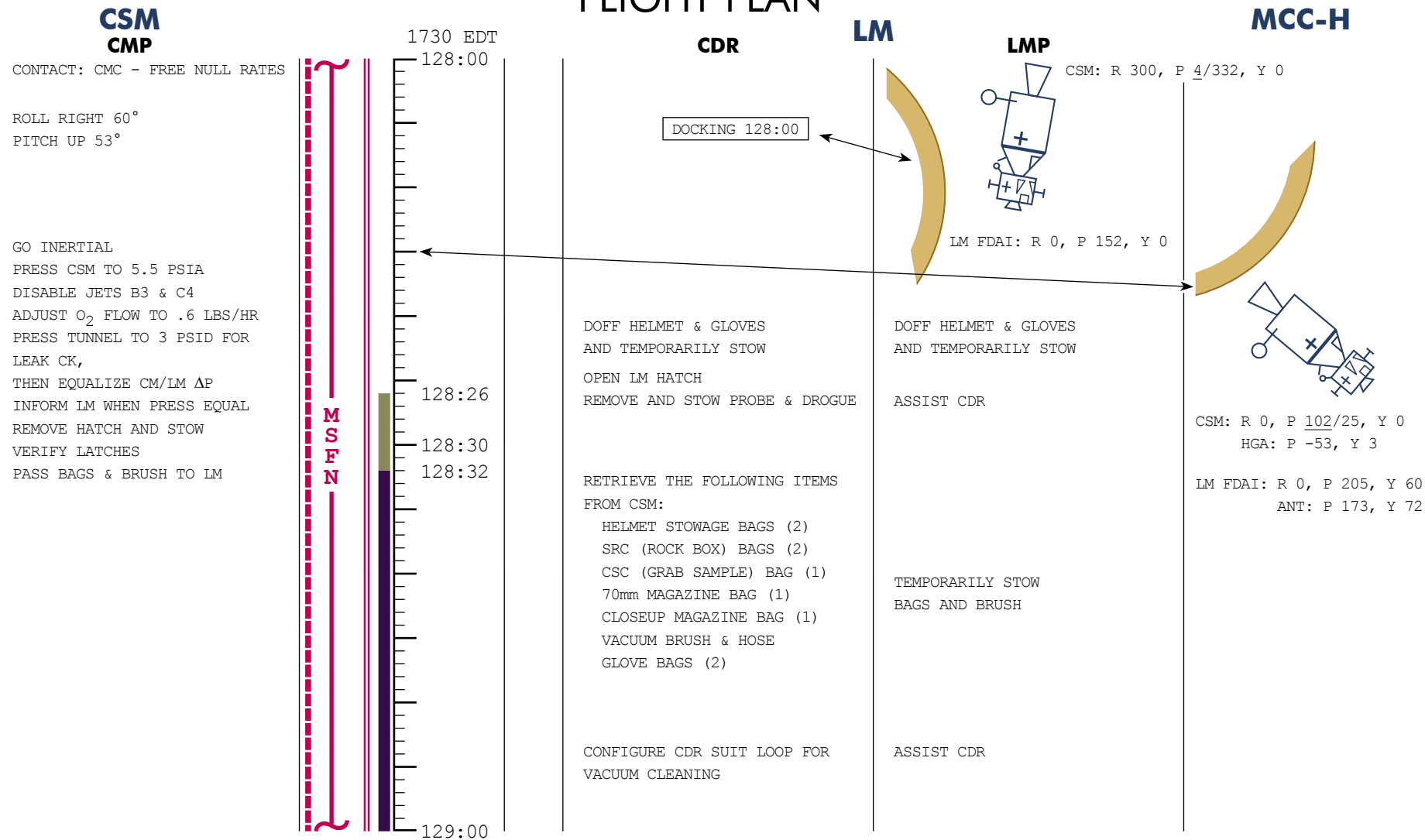
LM

LMP

MCC-H



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	127:00 - 128:00	6 / 26-27	3-93



CSM  
CMP

V66 - TRANS CSM STATE VECTOR  
TO LM SLOT

RETRIEVE SRC's FROM LM AND  
STOW IN B5 AND B6

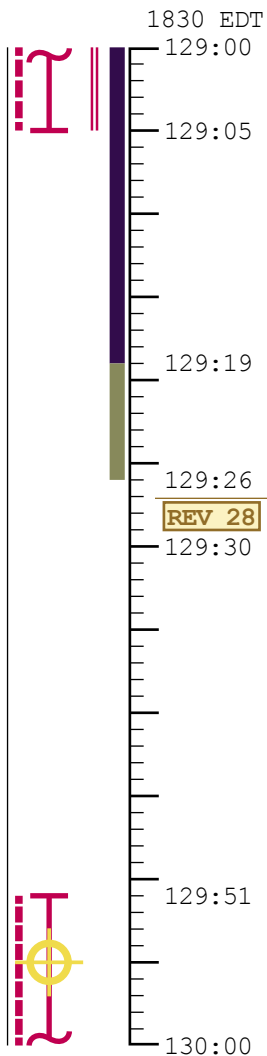
RETRIEVE BAGGED ITEMS FROM LM  
AND STOW:

CSC - A5

CLOSEUP MAGAZINE - A5

70mm MAGAZINES - R13

HELMETS - FOOD CONTAINERS



# FLIGHT PLAN

CDR

VACUUM BRUSH FWD  
DUMP VALVE FILTER

VACUUM SRC's

VACUUM:

CSC

70mm MAGAZINE

CLOSEUP MAGAZINE

HELMETS

GLOVES

VACUUM BRUSH LMP's PGA

VACUUM THE BRUSH  
AND STOW IN ISA

LM

LMP

UNSTOW AND HOLD SRC's  
FOR CLEANING

BAG SRC's AND TRANSFER TO CM

HOLD EQUIPMENT FOR CLEANING

BAG ITEMS AND TRANSFER TO CSM  
(GLOVES IN HELMETS)

VACUUM BRUSH CDR's PGA

MCC-H

UPLINK

CSM STATE VECTOR

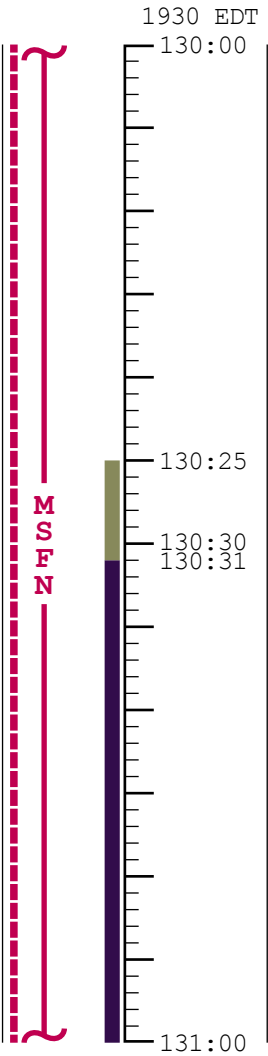
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	129:00 - 130:00	6 / 27-28	3-95

CSM  
CMP

REMOVE ISA CONTENTS AND  
STOW. PLACE CM JETTISONABLE  
ITEMS INTO ISA AND  
TRANSFER ISA TO LM.

UNSTOW AND INSTALL CSM HATCH

HATCH INTEGRITY CHECK  
DEPRESSURIZE TUNNEL



FLIGHT PLAN

CDR

DISCONNECT FROM LM AND  
TRANSFER TO CM WITH ISA

LM

LMP

RETRIEVE ISA AND INSTALL ON  
PANELS 1 & 2

CONFIGURE LM SYSTEMS  
FOR JETTISON

DISCONNECT FROM LM HOSES  
CLOSE LM HATCH

IVT TO CSM

MCC-H

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	130:00 - 131:00	6 / 28	3-96

MCC-H

# FLIGHT PLAN

NOTES

2030 EDT

131:00

131:03

131:18

131:25

REV 29

131:30

131:50

132:00

EQUIPMENT STOWAGE

VACUUM PGA's

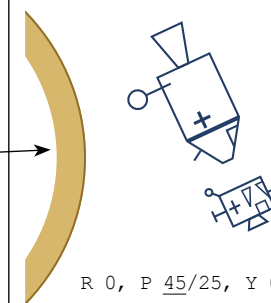
SET UP CAMERA FOR LM JETTISON  
16mm/18/CEX-BRKT, MIR  
(f8, 250, 7) 12 fps

SM RCS CHECK  
ENABLE JETS B-3 AND C-4  
CONFIGURE DAP - R1=11102, R2=11111

GO/NO-GO FOR PYRO ARM  
PYRO LOGIC ARM  
THRUST MONITOR - P47  
START CAMERA  
LM JETTISON  
SM RCS CHECK

GETI = 131:53:05  
BT = 3.1 SEC  
 $\Delta V$  = 1 FPS  
RETROGRADE  
ORBIT: 58.5 x 59.4

DAP CONFIGURATION  
FOR LM JETTISON  
CSM, 0.5° DB, 0.5°/SEC  
A/C ROLL, 4 JET



R 0, P 45/25, Y 0  
HGA P -53, Y 3

GO/NO-GO

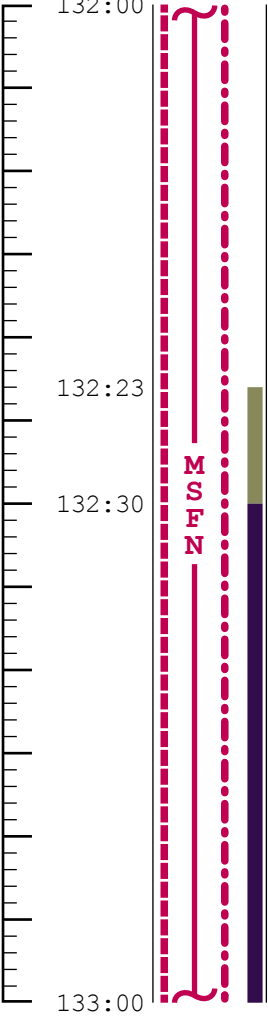
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	131:00 - 132:00	5 / 29	3-97

MCC-H

2130 EDT

UPDATE

TEI<sub>30</sub> MNVR PAD



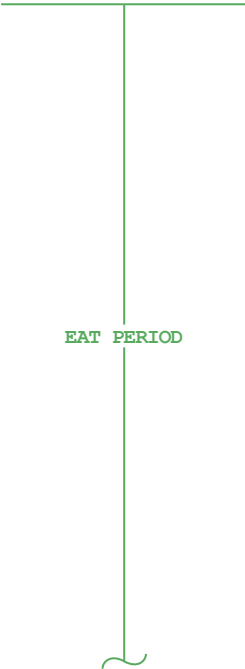
# FLIGHT PLAN

MNVR TO TEI BURN ATTITUDE

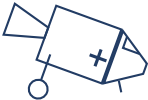
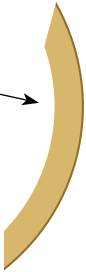
V66 - TRANS CSM STATE VECTOR TO LM SLOT  
BURN STATUS REPORT  
RECORD PRELIMINARY TEI<sub>30</sub> MNVR PAD

GO INERTIAL

DOFF AND BAG PGA's, HELMETS AND GLOVES



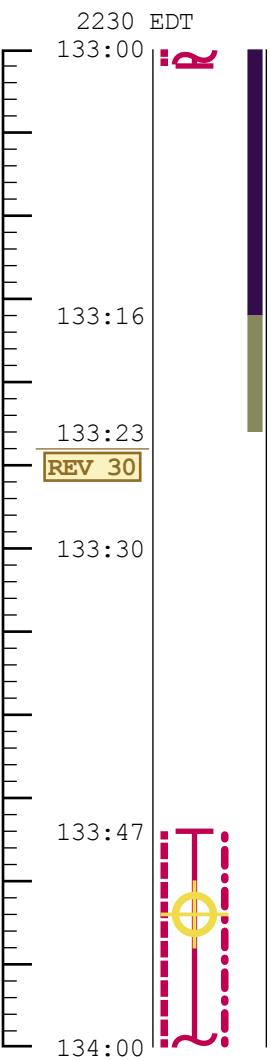
NOTES



R 1.1, P 93.2/52.6, Y 13.8  
HGA P -79, Y 10

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	132:00 - 133:00	6 / 29	3-98

MCC-H



# FLIGHT PLAN

CO<sub>2</sub> FILTER CHANGE NO. 10  
(12 INTO B, STORE 10 IN A3)

EAT PERIOD

O<sub>2</sub> FUEL CELL PURGE

NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	133:00 - 134:00	6 / 30	3-99

MCC-H

2330 EDT

FLIGHT PLAN

NOTES

UPDATE

TEI<sub>30</sub> MNVR PAD  
BLOCK DATA  
(TEI<sub>31</sub>)

UPLINK CMC

CSM STATE VECTOR  
TEI TGT LOAD

134:00

134:22

134:29

134:30

134:58

135:00

MISSION

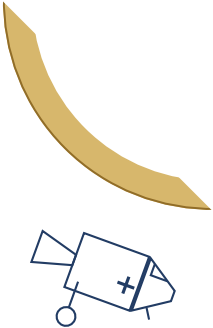
PRI TEI SYSTEMS CKS:  
C&W CK  
CM RCS MON CK  
SM RCS MON CK  
EPS MONITOR CK  
ECS REDUNDANT COMPONENTS CK

RECORD FINAL TEI<sub>30</sub> MNVR PAD AND  
BLOCK DATA  
GO/NO-GO FOR TEI<sub>31</sub>  
THIS REV

V66 - TRANS CSM STATE VECTOR TO LM SLOT

IMU REALIGN - P52  
OPTION 3 - REFSMMAT  
AND DRIFT CHECK

P30 EXTERNAL ΔV



R 1.1, P 201.4/52.6, Y 13.8  
HGA P -78, Y 5

REPORT

P52 - (LIFT OFF REFSMMAT)

N71: \_ \_ , \_ \_

N05: \_ \_ . \_ \_

N93:

X \_ \_ . \_ \_

Y \_ \_ . \_ \_

Z \_ \_ . \_ \_

GET \_ \_ \_ : \_ \_ : \_ \_

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	134:00 - 135:00	6 / 30	3-100



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TEI  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
TEI	10°/SEC TAKEOVER	±10° TAKEOVER	BT +2 SEC & $\Delta V_C = -40$ FPS	TRIM X AND Z AXIS TO 0.2 FPS

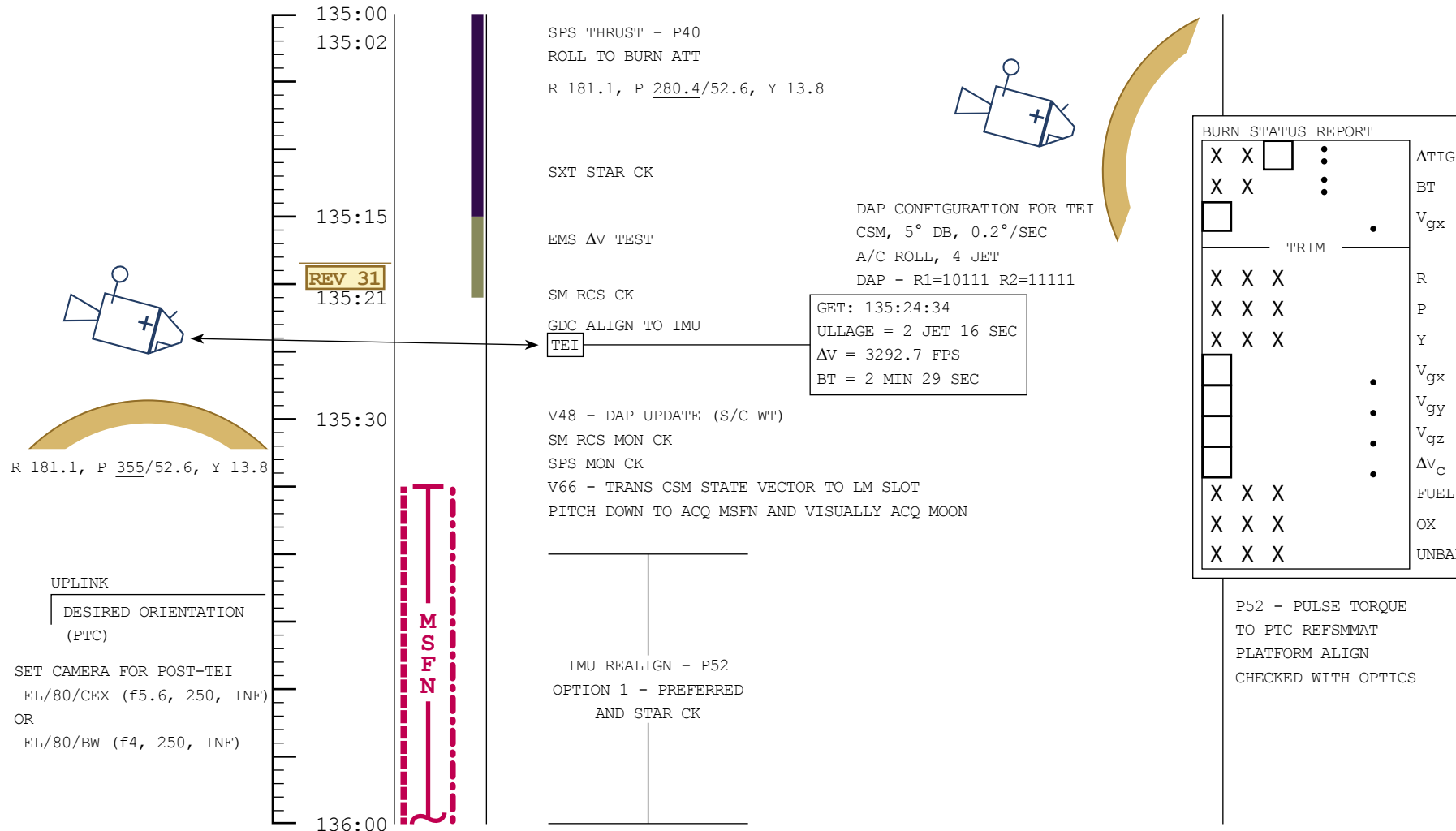
LOI <sub>1</sub> V <sub>GO</sub>	BT	TRAJECTORY	ABORT MODE	
3292.7 - 1436.0	0 - 90	LUNAR ORBIT	MODE III - AFTER 1 REV	
1436.0 - 1207.0	90 - 100	UNSTABLE	MODE II - 2 SPS BURNS FOR ORBIT STABILIZATION AND WATER OR CLA LANDING.	
1207.0 - 0	100 - 149	UNSTABLE/ HYPERBOLIC	MODE I - 1 BURN AT TEI +2HRS P37 AT SPHERE OF INFLUENCE HYPERBOLIC ( $\Delta V$ 580 TO 0, BT 125-149)	

MCC-H

0030 EDT

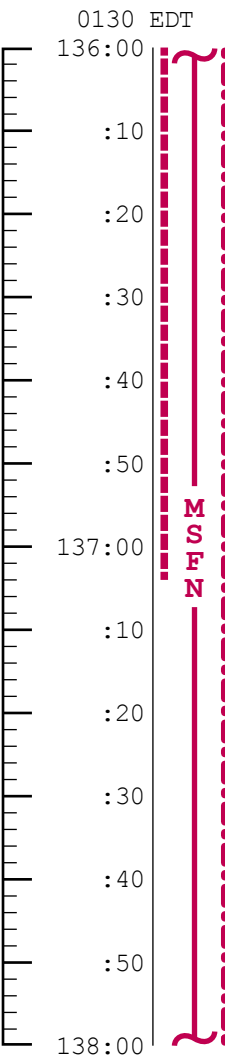
# FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	135:00 - 136:00	6 / TEC	3-101

MCC-H



# FLIGHT PLAN

WIPE EXCESSIVE MOISTURE  
FROM TUNNEL HATCH AREA

START PTC  
P 270° Y 0°

EAT PERIOD - ALL

REST PERIOD  
(10 HOURS)

PRE SLEEP CHECKLIST

CREW STATUS REPORT (RADIATION, MEDICATION)

CYCLES O<sub>2</sub> & H<sub>2</sub> FANS

CHLORINATE POTABLE WATER

SELECT NORMAL LUNAR CONFIGURATION

EXCEPT: (FOR COAST ASLEEP)

S-BD NORMAL MODE VOICE - OFF

S-BD AUX TAPE - OFF

TAPE RCDR FWD - OFF

GO TO HGA OR CONTINUE OMNI

OPS PER MSFN

OMNI OPS

S-BD ANT OMNI - OMNI

S-BD ANT OMNI - B

HI GAIN OPS

HI GAIN ANT BEAM - NARROW

HI GAIN ANT TRACK - REACQ

S-BD ANT - HI GAIN

VERIFY:

WASTE MNGT OVBD DRAIN - OFF

WASTE STOW VENT VLV - CLOSED

EMERG CABIN PRESS VLV - BOTH

SURGE TK O<sub>2</sub> VLV - OFF

LM TUNNEL VENT VLV - OFF

POT H<sub>2</sub>O HTR - OFF

AUTO RCS JET SELECT (16) - OFF

## NOTES

PTC ESTABLISHED IN G&N P,  
Y ±30° DB, R RATE OF 0.3°/SEC

P23 - NO COMM, (5 SETS)

TEI +30 MIN (136:00)

MENKENT (30), LNH

MENKENT (30), LNH

ATRIA (34), LNH

NUNKI (37), LFH

NUNKI (37), LFH

ONBOARD READOUT

BAT C \_\_\_\_\_

PYRO BAT A \_\_\_\_\_

PYRO BAT B \_\_\_\_\_

RCS A \_\_\_\_\_

B \_\_\_\_\_

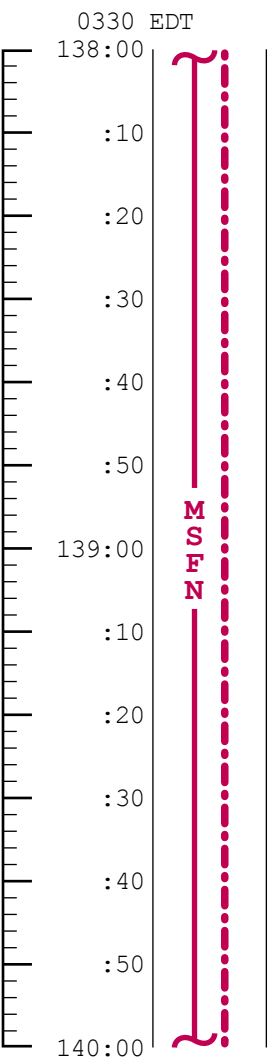
C \_\_\_\_\_

D \_\_\_\_\_

DC IND SEL TO MNA OR MNB

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	136:00 - 138:00	6 / TEC	3-102

MCC-H



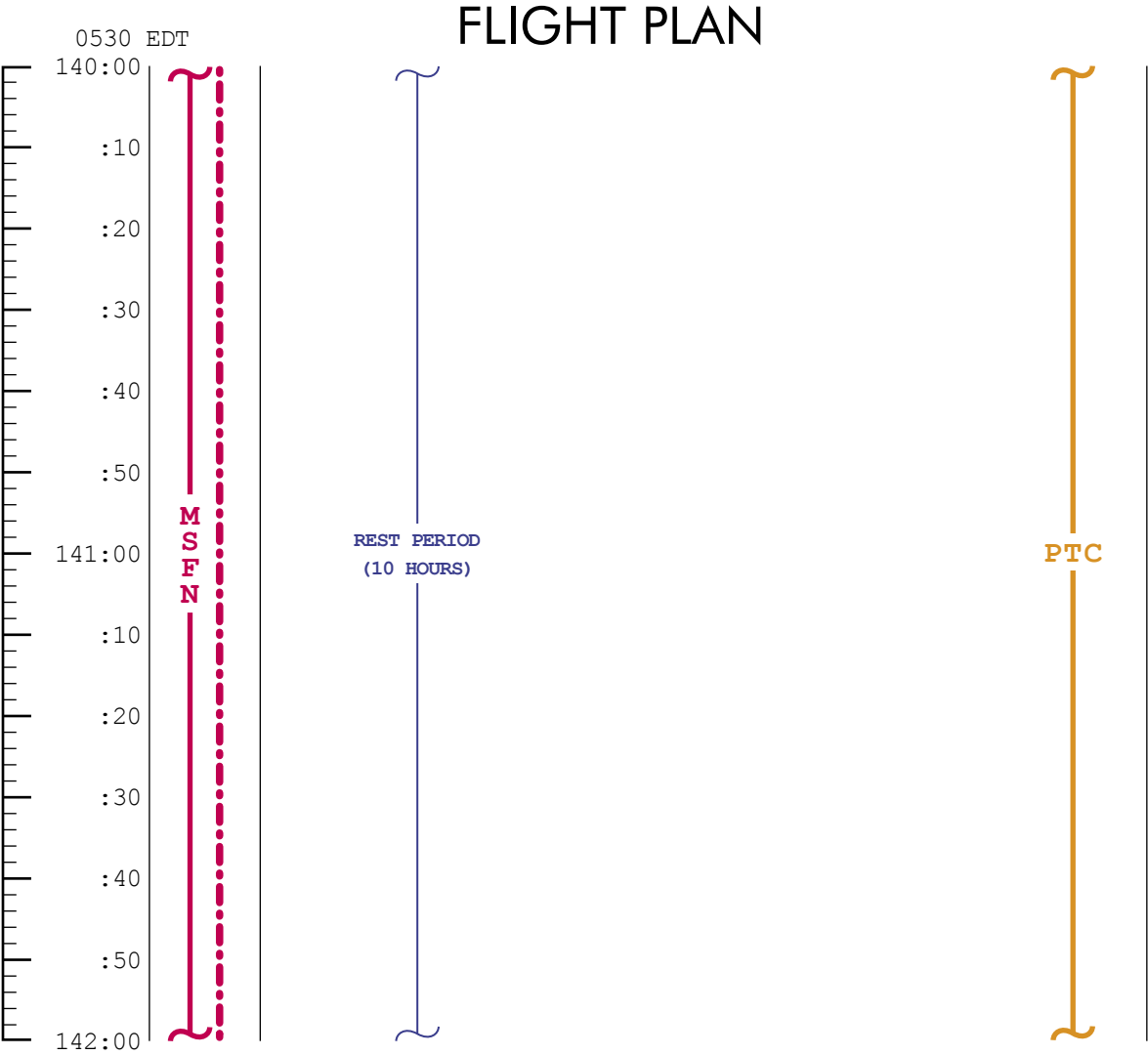
# FLIGHT PLAN



NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	138:00 - 140:00	6 / TEC	3-103

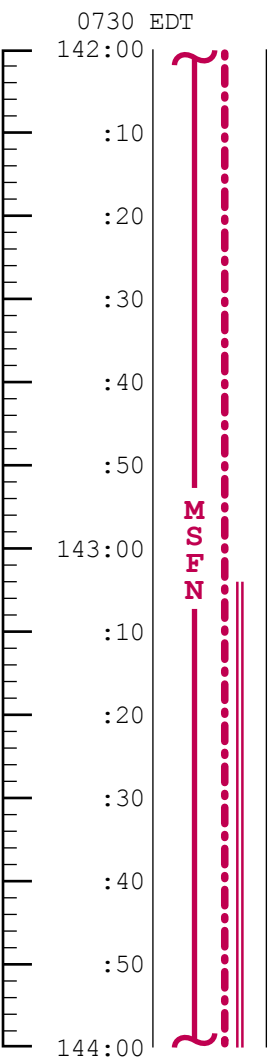
MCC-H



NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	140:00 - 142:00	6 / TEC	3-104

MCC-H

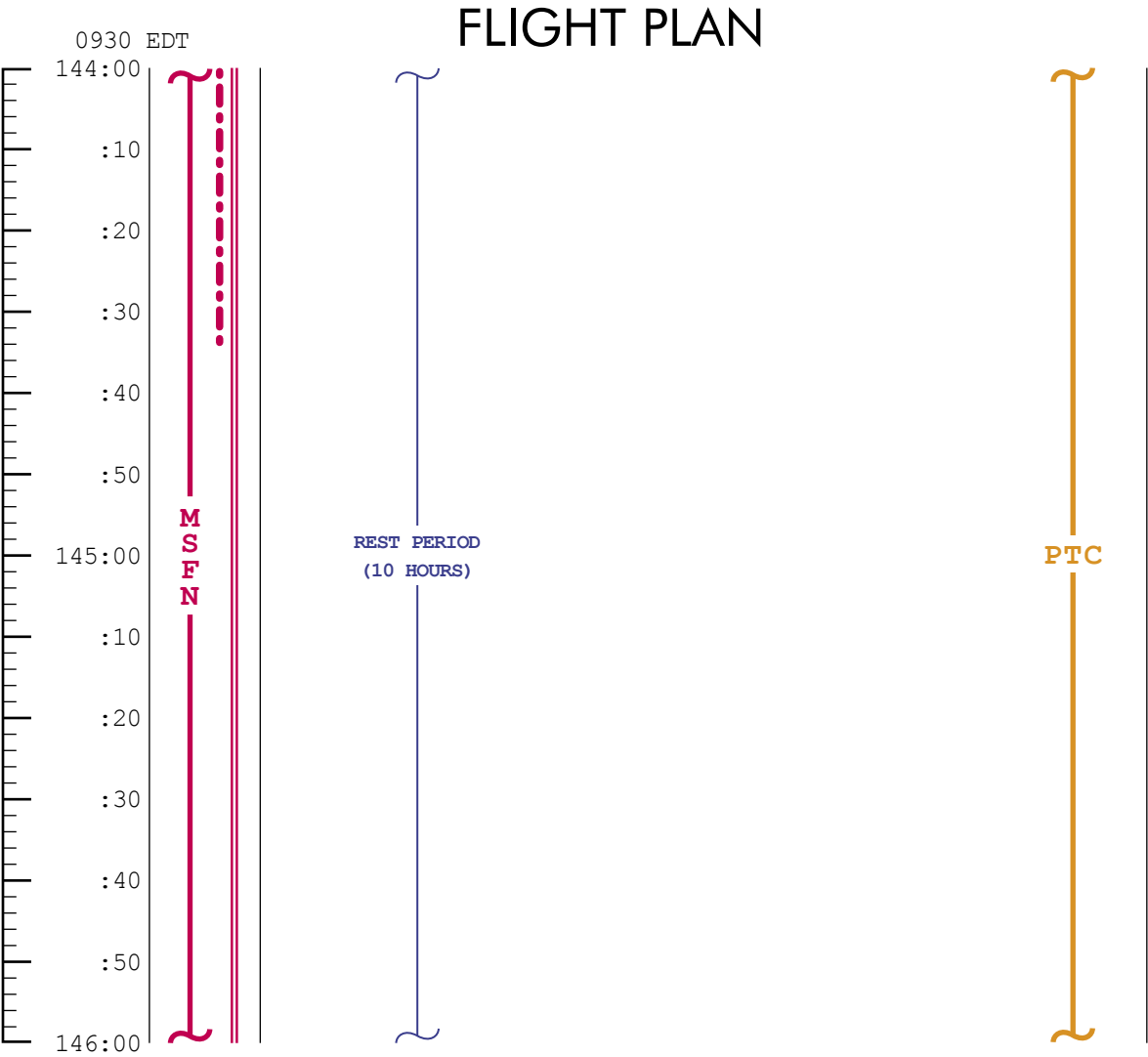


# FLIGHT PLAN

NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	142:00 - 144:00	6 / TEC	3-105

MCC-H



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	144:00 - 146:00	6 / TEC	3-106

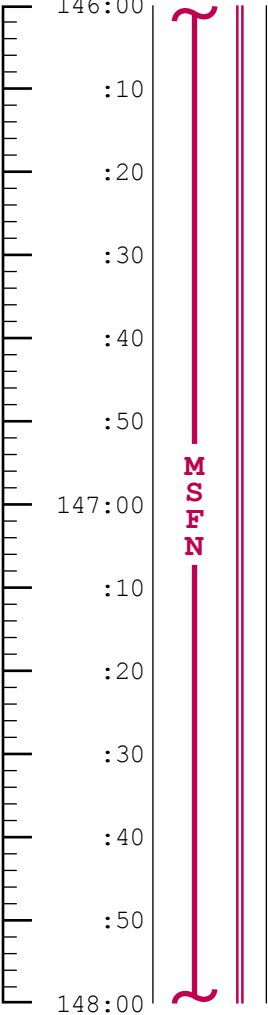


MCC-H

1130 EDT

FLIGHT PLAN

NOTES



M  
S  
F  
N

REST PERIOD  
(10 HOURS)

CO<sub>2</sub> FILTER CHANGE NO. 11  
(13 INTO A, STORE 11 IN A3)

EAT PERIOD - ALL

H<sub>2</sub> PURGE LINE HTR - ON

O<sub>2</sub> & H<sub>2</sub> FUEL CELL PURGE

POST SLEEP CHECKLIST  
CREW STATUS REPORT (SLEEP)  
CYCLE O<sub>2</sub> & H<sub>2</sub> FANS  
GDC ALIGN TO IMU  
CONSUMABLES UPDATE  
SELECT NORMAL LUNAR CONFIGURATION  
EXCEPT:  
S-BD AUX TAPE - OFF  
TAPE RCDR FWD - OFF  
POT H<sub>2</sub>O HTR - ON

PTC

P23 - NO COMM, (5 SETS)  
TEI +11:30 (147:00)  
SPICA (26), LNH  
SPICA (26), LNH  
MENKENT (30), LNH  
NUNKI (37), LFH  
NUNKI (37), LFH

CONSUMABLE UPDATE  
(Δ FROM NOMINAL)

GET: \_\_\_\_\_  
RCS TOT \_\_\_\_\_  
A \_\_\_\_\_  
B \_\_\_\_\_  
C \_\_\_\_\_  
D \_\_\_\_\_  
H<sub>2</sub> TOT \_\_\_\_\_  
O<sub>2</sub> TOT \_\_\_\_\_

PHOTO AS CONVENIENT

EARTH:  
EL/250/CEX-RING  
(11, 250, INF)

MOON:  
EL/250/BW-RING  
(5.6, 250, INF)

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	146:00 - 148:00	7 / TEC	3-107

MCC-H

1330 EDT

148:00

:10

:20

:30

:40

:50

149:00

:10

:20

:30

:40

:50

150:00

UPLINK

CSM STATE VECTOR  
MCC5 TGT LOAD

UPDATE

MCC5 MNVR PAD

M  
S  
F  
N

FLIGHT PLAN

WIPE EXCESSIVE MOISTURE FROM TUNNEL HATCH AREA

V66 - TRANS CSM STATE VECTOR TO LM SLOT

RECORD MCC5 MNVR PAD

IMU REALIGN - P52  
OPTION 3 - REFSMMAT

EXT ΔV - P30

SPS/RCS THRUST - P40/41

PTC

NOTES

P23 - NO COMM, (5 SETS)  
TEI +13:00 (148:30)  
ALPHERATZ (01), EFH  
DIPHDA (02), EFH  
MIRFAK (10), ENH  
MIRFAK (10), ENH  
ALDEBARAN (11), ENH

P52 - (PTC REFSMMAT)  
N71: \_ \_ , \_ \_  
N05: \_ \_ . \_ \_  
N93:  
X \_ \_ . \_ \_  
Y \_ \_ . \_ \_  
Z \_ \_ . \_ \_  
GET \_ \_ . \_ \_ : \_ \_ : \_ \_

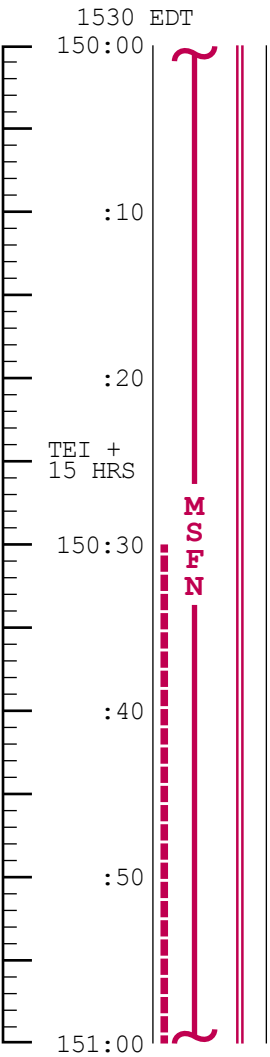
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	148:00 - 150:00	7 / TEC	3-108

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MCC  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
MCC5	10°/SEC TAKEOVER	10° TAKEOVER	BT +1 SEC	TRIM X AXIS ONLY

MCC-H



# FLIGHT PLAN

MNVR TO BURN ATT

SXT STAR CK

EMS ΔV TEST

SM RCS MON CK

GDC ALIGN TO IMU

MCC5 ΔV=NOMINALLY ZERO

SM RCS MON CK

SPS MON CK

V66 - TRANS CSM STATE VECTOR TO LM SLOT

BURN STATUS REPORT

BATTERY CHARGE, BATTERY A

START PTC  
P 270° Y 0°

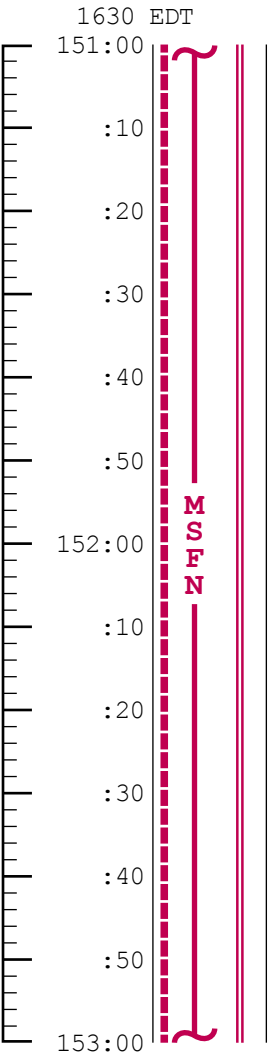
## NOTES

PTC ESTABLISHED IN G&N P,  
Y ±30° DB, R RATE OF 0.3°/SEC

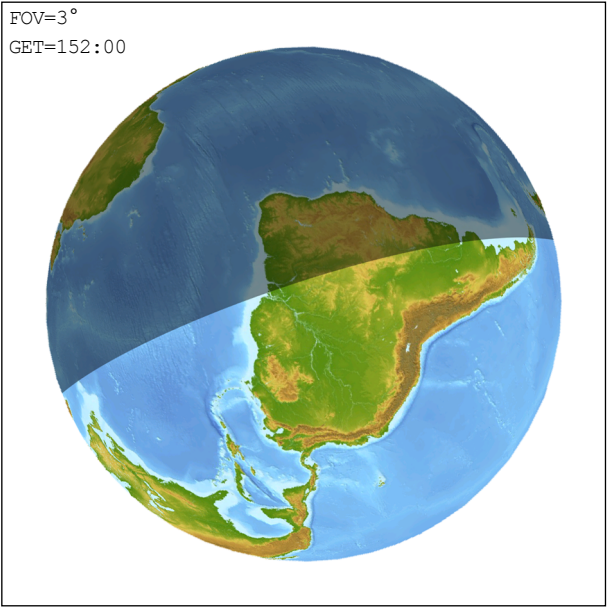
BURN STATUS REPORT			
X	X	<input type="checkbox"/>	:
X	X		:
<input type="checkbox"/>			.
TRIM			
X	X	X	R
X	X	X	P
X	X	X	Y
<input type="checkbox"/>			V <sub>gx</sub>
<input type="checkbox"/>			V <sub>gy</sub>
<input type="checkbox"/>			V <sub>gz</sub>
<input type="checkbox"/>			ΔV <sub>C</sub>
X	X	X	FUEL
X	X	X	OX
X	X	X	UNBAL

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	150:00 - 151:00	7 / TEC	3-109

MCC-H



# FLIGHT PLAN



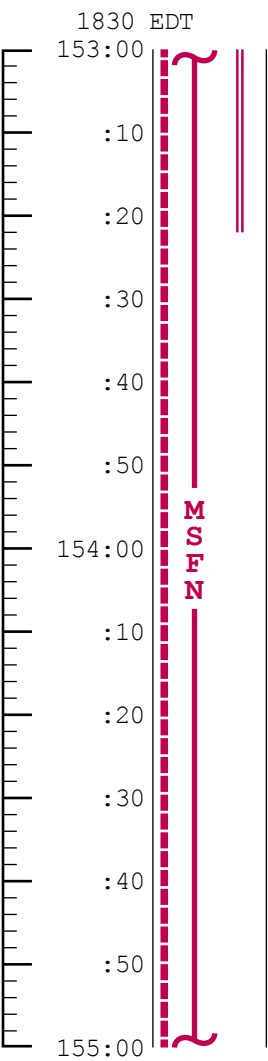
NOTES

PTC

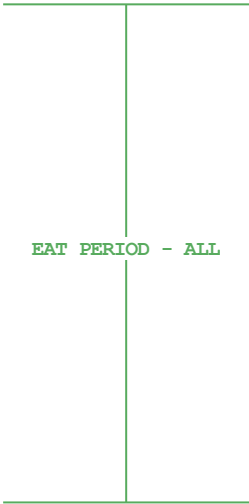
P23 - NO COMM, (5 SETS)  
TEI +15:30 (152:00)  
DIPHDA (02), EFH  
DIPHDA (02), EFH  
NAVI (03), ENH  
MIRFAK (10), ENH  
ALDEBARAN (11), ENH

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	151:00 - 153:00	7 / TEC	3-110

MCC-H



# FLIGHT PLAN

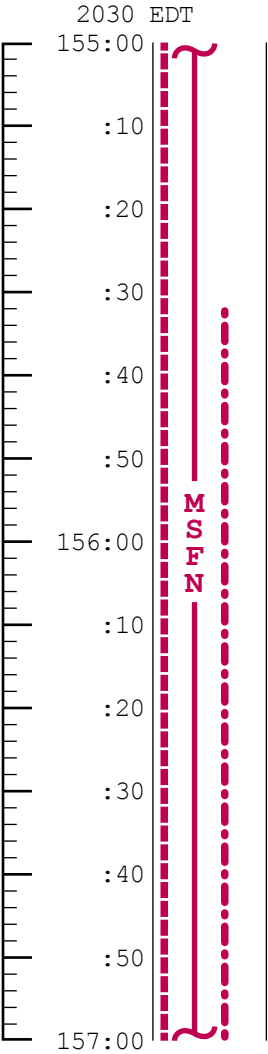


NOTES

P23 - NO COMM, (3 SETS)  
TEI +19:00 (154:30)  
SPICA (26), ENH  
ANTARES (33), EFH  
NUNKI (37), EFH

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	153:00 - 155:00	7 / TEC	3-111

MCC-H



# FLIGHT PLAN

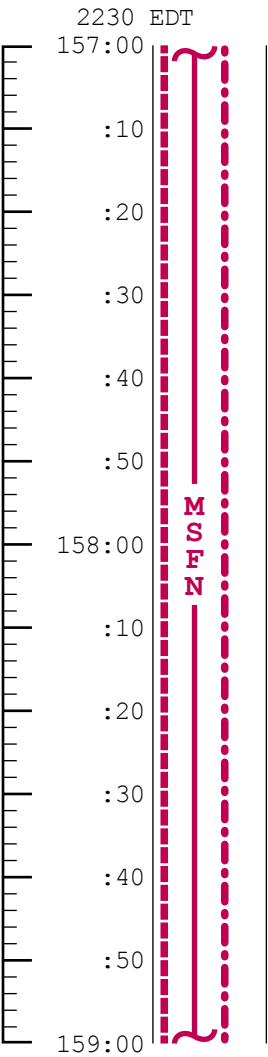
NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	155:00 - 157:00	7 / TEC	3-112



MCC-H



# FLIGHT PLAN

NOTES



P23 - NO COMM, (5 SETS)  
TEI +22:30 (158:00)  
DIPHDA (02), EFH  
DIPHDA (02), EFH  
MENKAR (07), ENH  
MIRFAK (10), ENH  
ALDEBARAN (11), ENH

WIPE EXCESSIVE MOISTURE FROM TUNNEL HATCH AREA

O<sub>2</sub> FUEL CELL PURGE

CO<sub>2</sub> FILTER CHANGE NO. 12  
(14 INTO B, STORE 12 IN A3)

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	157:00 - 159:00	7 / TEC	3-113

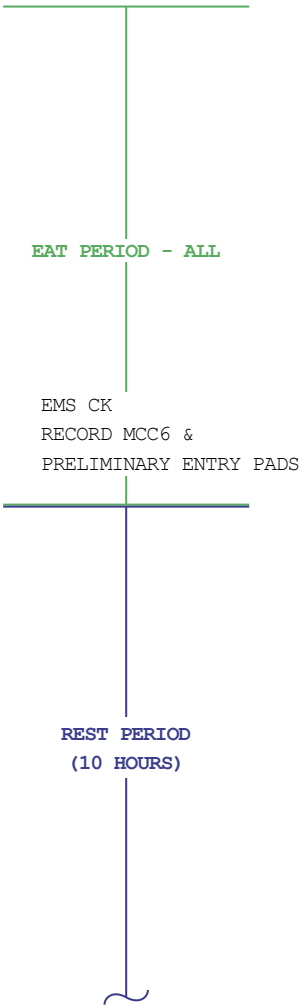
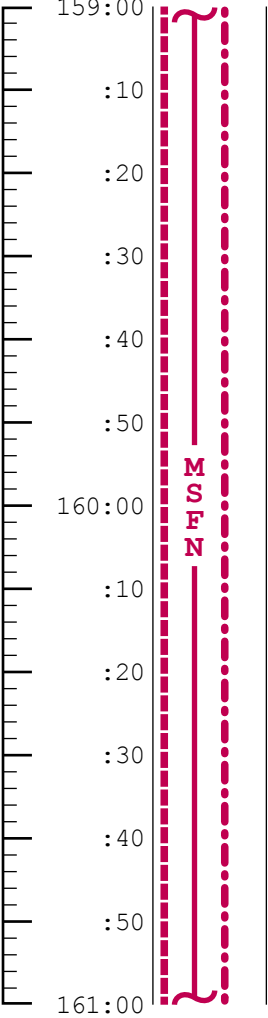
MCC-H

0030 EDT

FLIGHT PLAN

NOTES

UPDATE  
PRELIMINARY MCC6  
MNVF PAD & ENTRY PAD  
(ASSUMES MCC6)



PRE SLEEP CHECKLIST

CREW STATUS REPORT (RADIATION, MEDICATION)

CYCLES O<sub>2</sub> & H<sub>2</sub> FANS

CHLORINATE POTABLE WATER

SELECT NORMAL LUNAR CONFIGURATION

EXCEPT: (FOR COAST ASLEEP)

S-BD NORMAL MODE VOICE - OFF

S-BD AUX TAPE - OFF

TAPE RCDR FWD - OFF

GO TO HGA OR CONTINUE OMNI

OPS PER MSFN

OMNI OPS

S-BD ANT OMNI - OMNI

S-BD ANT OMNI - B

HI GAIN OPS

HI GAIN ANT BEAM - NARROW

HI GAIN ANT TRACK - REACQ

S-BD ANT - HI GAIN

VERIFY:

WASTE MNGT OVBD DRAIN - OFF

WASTE STOW VENT VLV - CLOSED

EMERG CABIN PRESS VLV - BOTH

SURGE TK O<sub>2</sub> VLV - OFF

REPRESS PACK O<sub>2</sub> VLV - OFF

LM TUNNEL VENT VLV - OFF

POT H<sub>2</sub>O HTR - OFF

AUTO RCS JET SELECT (16) - OFF

ONBOARD READOUT

BAT C \_\_\_\_\_

PYRO BAT A \_\_\_\_\_

PYRO BAT B \_\_\_\_\_

RCS A \_\_\_\_\_

B \_\_\_\_\_

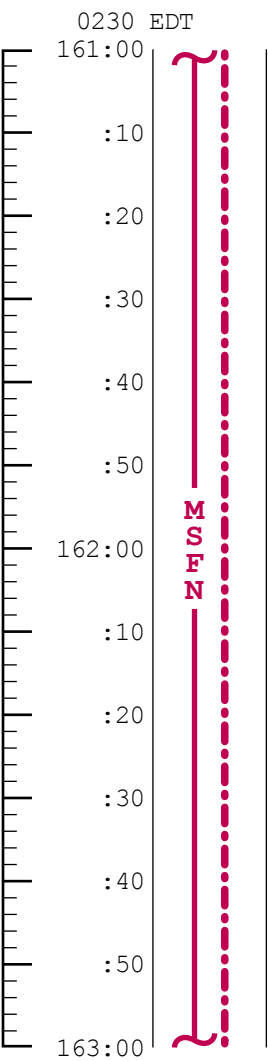
C \_\_\_\_\_

D \_\_\_\_\_

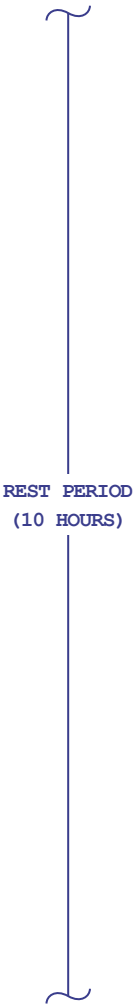
DC IND SEL TO MNA OR MNB

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	159:00 - 161:00	7 / TEC	3-114

MCC-H



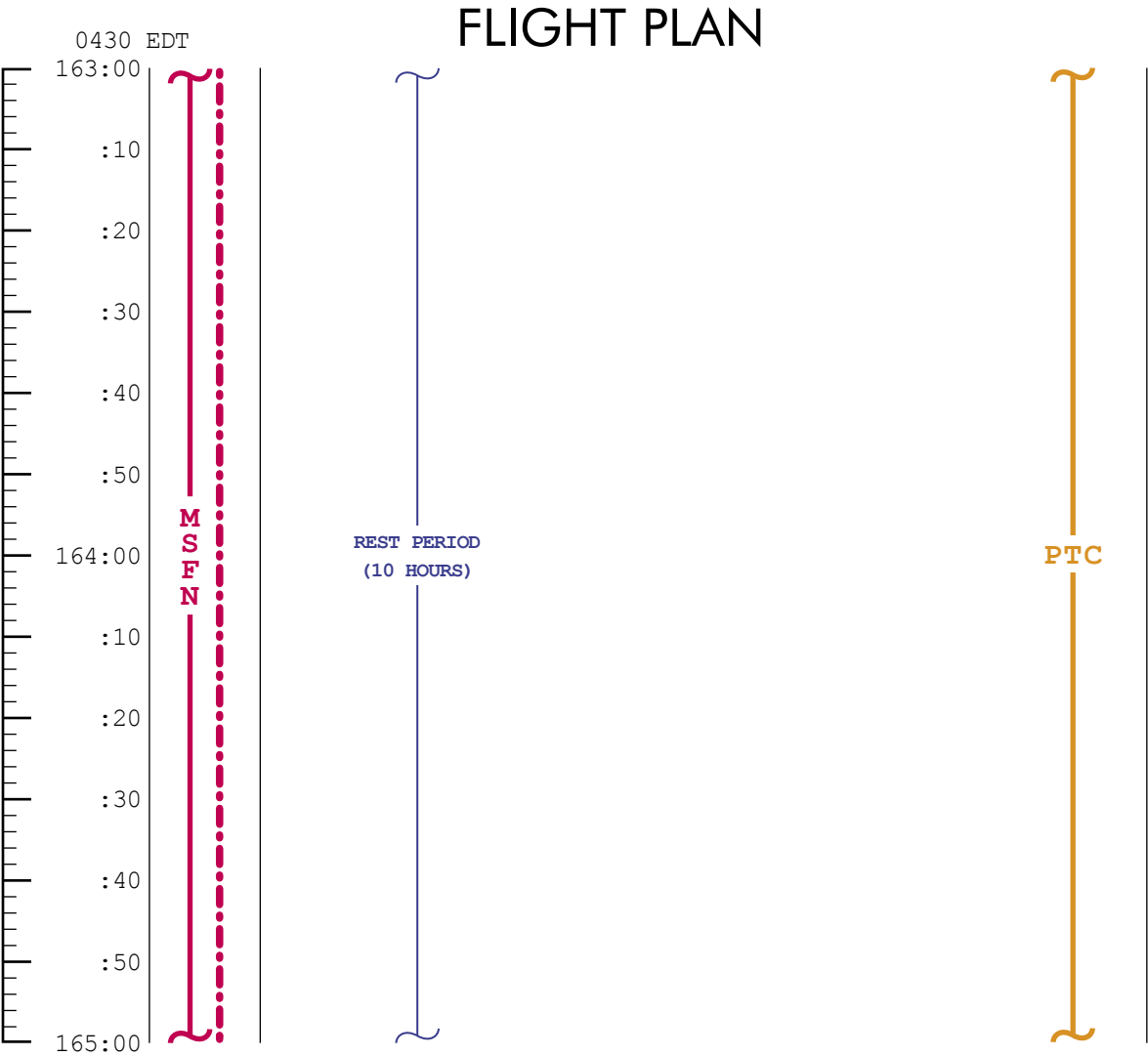
# FLIGHT PLAN



NOTES

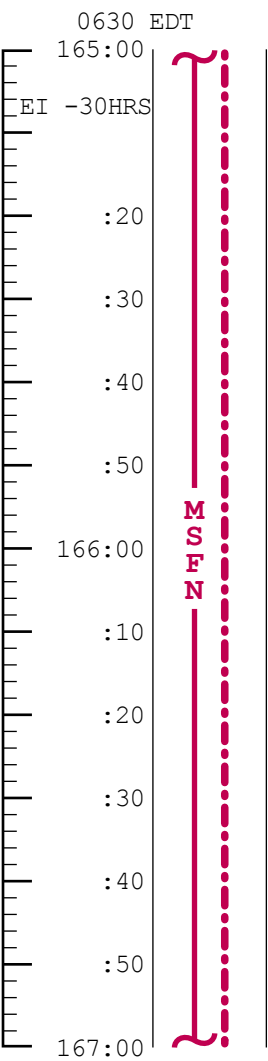
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	161:00 - 163:00	7 / TEC	3-115

MCC-H

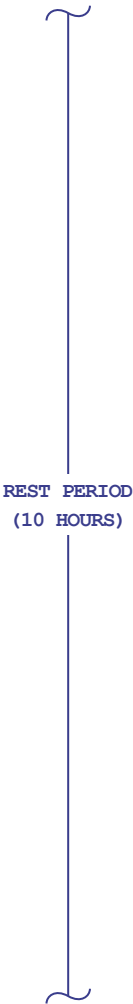


MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	163:00 - 165:00	7 / TEC	3-116

MCC-H



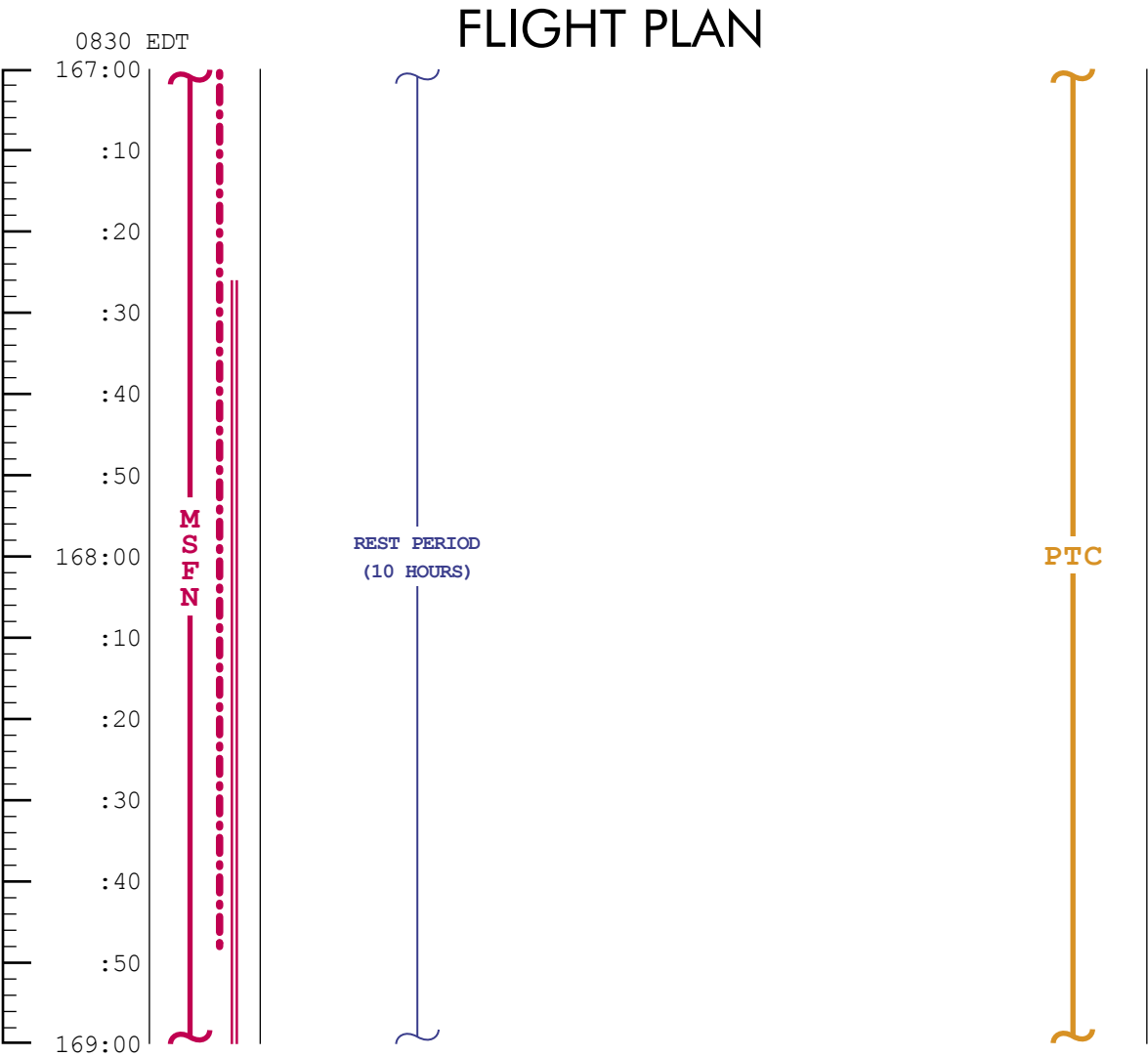
# FLIGHT PLAN



NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	165:00 - 167:00	7 / TEC	3-117

MCC-H

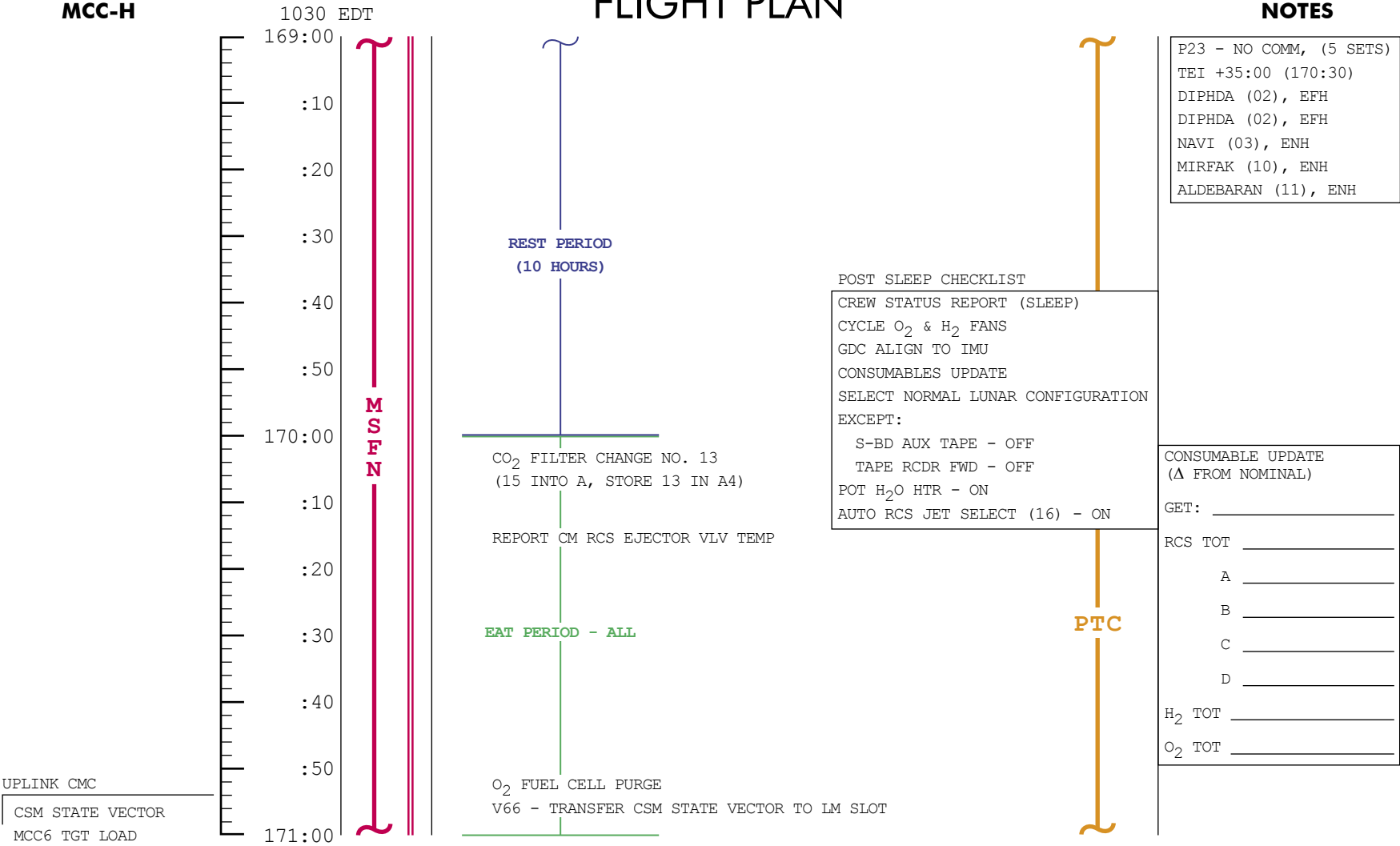


MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	167:00 - 169:00	7 / TEC	3-118

MCC-H

FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	169:00 - 171:00	8 / TEC	3-119

MCC  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
MCC6	10°/SEC TAKEOVER	10° TAKEOVER	BT +1 SEC	TRIM X AXIS ONLY



**MCC-H**

1230 EDT

171:00

UPDATE

MCC6 PAD DATA  
ENTRY PAD  
(ASSUMES MCC6)

:10

:20

:30

171:30

:40

:50

EI  
-23 HRS  
172:00

**M S F N**

WIPE EXCESSIVE MOISTURE FROM TUNNEL HATCH AREA

RECORD MCC6 AND PRELIMINARY ENTRY PAD DATA

IMU REALIGN - P52  
(OPTION 3 - REFSMMAT)

EXT  $\Delta V$  - P30

SPS/RCS THRUST - P40/41

MNVR TO BURN ATT

SXT STAR CK

### EMS $\Delta V$ TEST

SM RCS MON CK

## GDC ALIGN TO IMU

MCC6  $\Delta V$ =NOMINALLY ZERO

P52 - (PTC REFSMMAT)

N71:    — —, — —

N05:    \_   \_   \_ . \_   \_

N93:

X \_\_\_\_\_.

Y \_\_\_\_\_ . \_\_\_\_\_

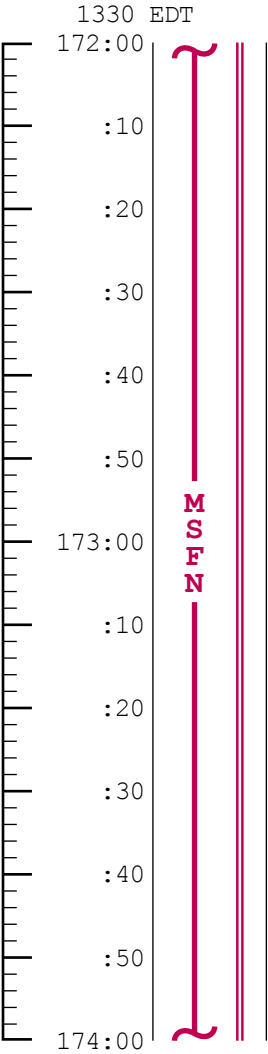
Z \_\_\_\_\_.

GET    \_ \_ \_ : \_ \_ : \_ \_ \_

BURN STATUS REPORT				
X	X	<input type="checkbox"/>	•	ΔTIG
X	X		•	BT
<input type="checkbox"/>			•	V <sub>gx</sub>
TRIM				
X	X	X		R
X	X	X		P
X	X	X		Y
<input type="checkbox"/>			•	V <sub>gx</sub>
<input type="checkbox"/>			•	V <sub>gy</sub>
<input type="checkbox"/>			•	V <sub>gz</sub>
<input type="checkbox"/>			•	ΔV <sub>C</sub>
X	X	X		FUEL
X	X	X		OX
X	X	X		UNBAL

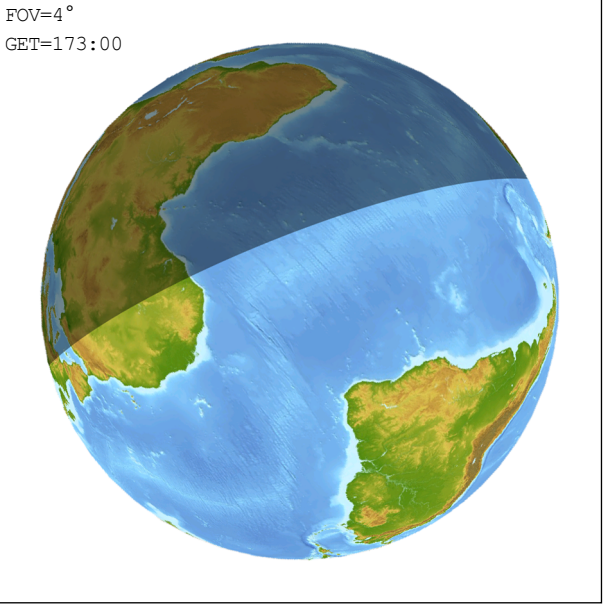
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	171:00 - 172:00	8 / TEC	3-120

MCC-H



# FLIGHT PLAN

SM RCS MON CK  
SPS MON CK  
V66 - TRANS CSM STATE VECTOR TO LM SLOT  
BURN STATUS REPORT  
BATTERY CHARGE, BATTERY B



START PTC  
P 270° Y 0°

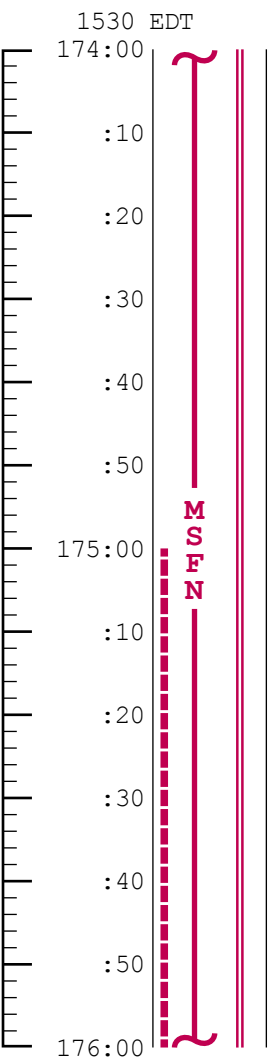
## NOTES

PTC ESTABLISHED IN G&N P,  
Y ±30° DB, R RATE OF 0.3°/SEC

P23 - NO COMM, (3 SETS)  
TEI +37:00 (172:30)  
SPICA (26), LNH  
ANTARES (33), LFH  
NUNKI (37), LFH

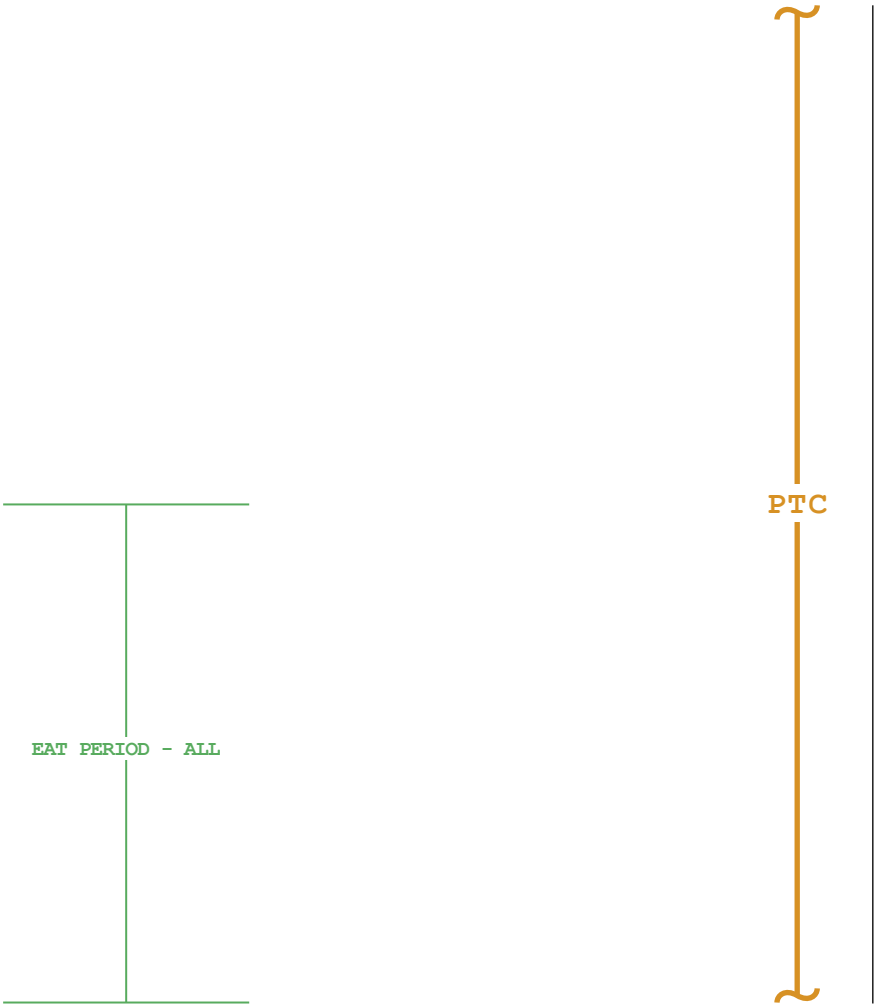
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	172:00 - 174:00	8 / TEC	3-121

MCC-H



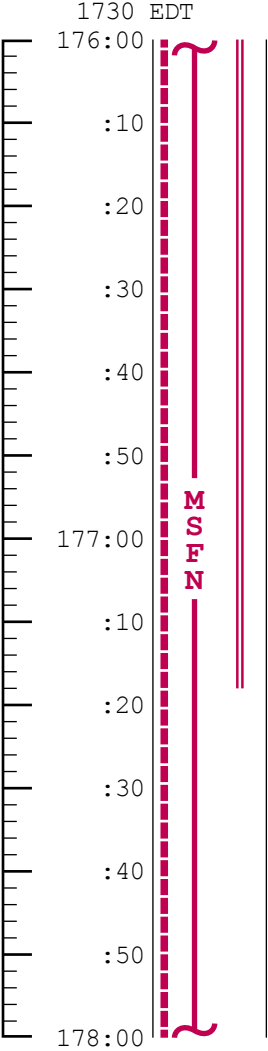
# FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	174:00 - 176:00	8 / TEC	3-122

MCC-H



FLIGHT PLAN

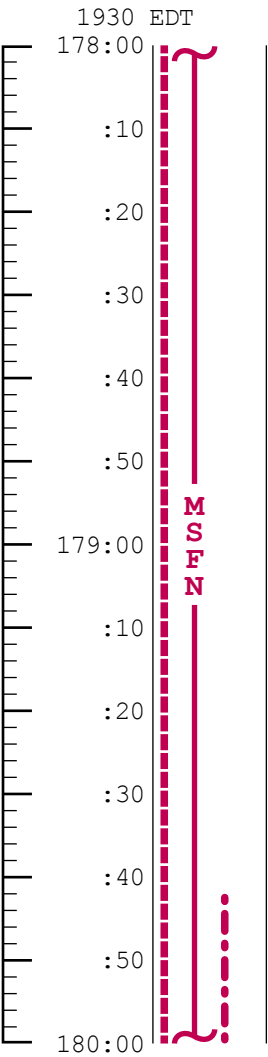
NOTES



P23 - NO COMM, (5 SETS)  
TEI +41:00 (176:30)  
DIPHDA (02), EFH  
MIRFAK (10), ENH  
ALDEBARAN (11), ENH  
CAPELLA (13), ENH  
CAPELLA (13), ENH

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	176:00 - 178:00	8 / TEC	3-123

MCC-H



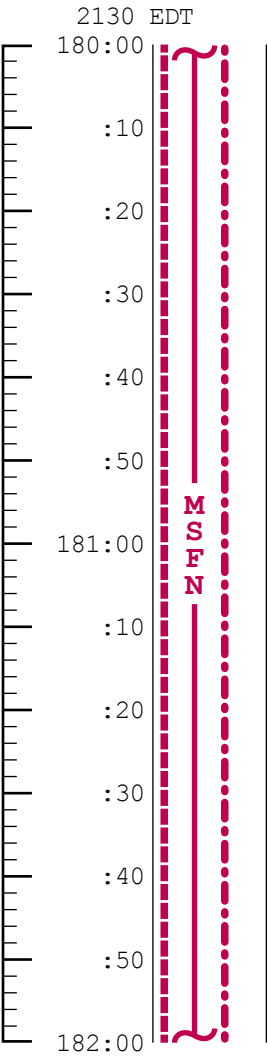
# FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	178:00 - 180:00	8 / TEC	3-124

MCC-H



# FLIGHT PLAN

WIPE EXCESSIVE MOISTURE FROM TUNNEL HATCH AREA

O<sub>2</sub> FUEL CELL PURGE

CO<sub>2</sub> FILTER CHANGE NO. 14  
(16 INTO B, STORE 14 IN A4)

EAT PERIOD - ALL



## NOTES

P23 - NO COMM, (5 SETS)  
TEI +44:30 (180:00)  
DIPHDA (02), EFH  
DIPHDA (02), EFH  
MIRFAK (10), ENH  
CAPELLA (13), ENH  
CAPELLA (13), ENH

### ONBOARD READOUT

BAT C \_\_\_\_\_

PYRO BAT A \_\_\_\_\_

PYRO BAT B \_\_\_\_\_

RCS A \_\_\_\_\_

B \_\_\_\_\_

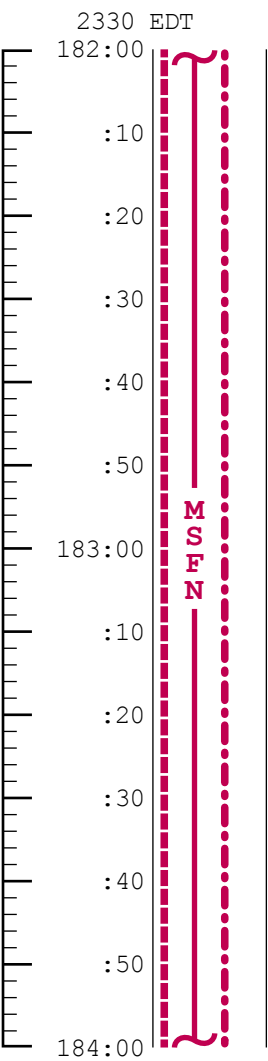
C \_\_\_\_\_

D \_\_\_\_\_

DC IND SEL TO MNA OR MNB

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	180:00 - 182:00	8 / TEC	3-125

MCC-H



# FLIGHT PLAN

NOTES

REST PERIOD  
(7 HOURS)

PRE SLEEP CHECKLIST

CREW STATUS REPORT (RADIATION, MEDICATION)

CYCLE O<sub>2</sub> & H<sub>2</sub> FANS

CHLORINATE POTABLE WATER

SELECT COMM NORMAL CONFIGURATION

EXCEPT:

S-BD NORMAL MODE VOICE SW - OFF

S-BD SQUELCH - ENABLE

S-BD AUX TAPE - OFF

S-BD ANT - OMNI

S-BD ANT OMNI - B

TAPE RCDR FWD - OFF

VERIFY:

WASTE MNGT OVBD DRAIN - OFF

WASTE STOW VENT VLV - CLOSED

EMERG CABIN PRESS VLV - BOTH

SURGE TK O<sub>2</sub> VLV - ON

REPRESS PACK O<sub>2</sub> VLV - OFF

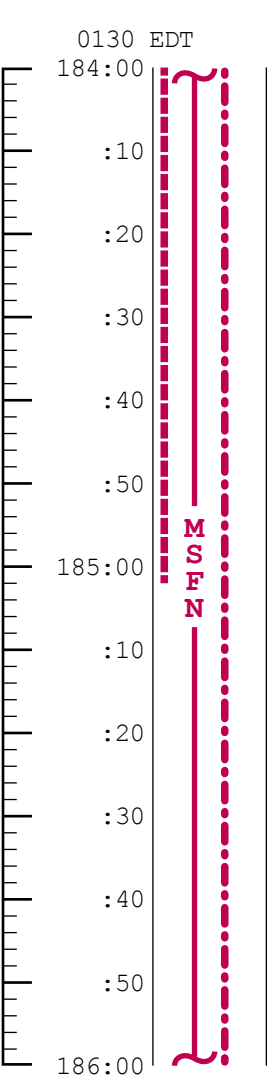
POT H<sub>2</sub>O HTR - OFF

AUTO RCS JET SELECT (16) - OFF

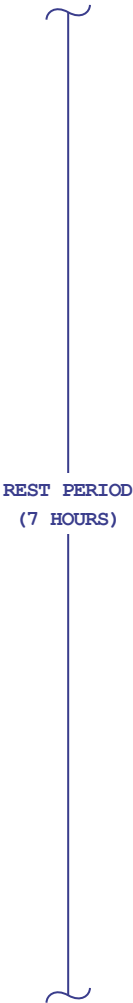
PTC

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	182:00 - 184:00	8 / TEC	3-126

MCC-H



# FLIGHT PLAN



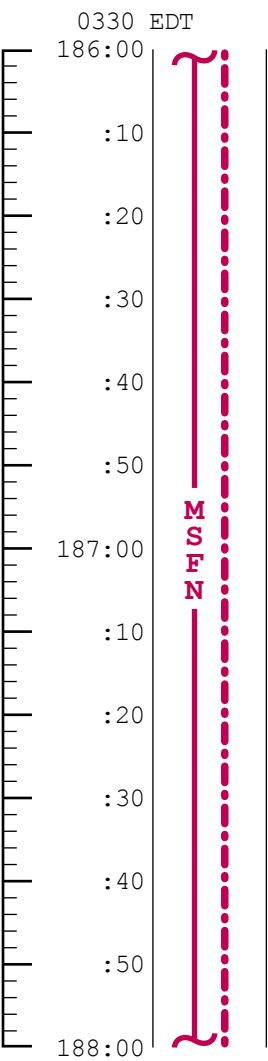
NOTES

P23 - NO COMM, (5 SETS)  
TEI +50:00 (185:30)  
ALPHERATZ (01), EFH  
MIRFAK (10), ENH  
ALDEBARAN (11), ENH  
CAPELLA (13), ENH  
CAPELLA (13), ENH

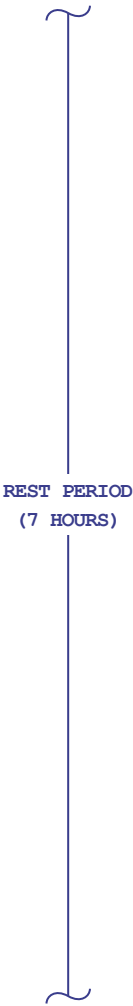
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	184:00 - 186:00	8 / TEC	3-127



MCC-H



# FLIGHT PLAN



NOTES

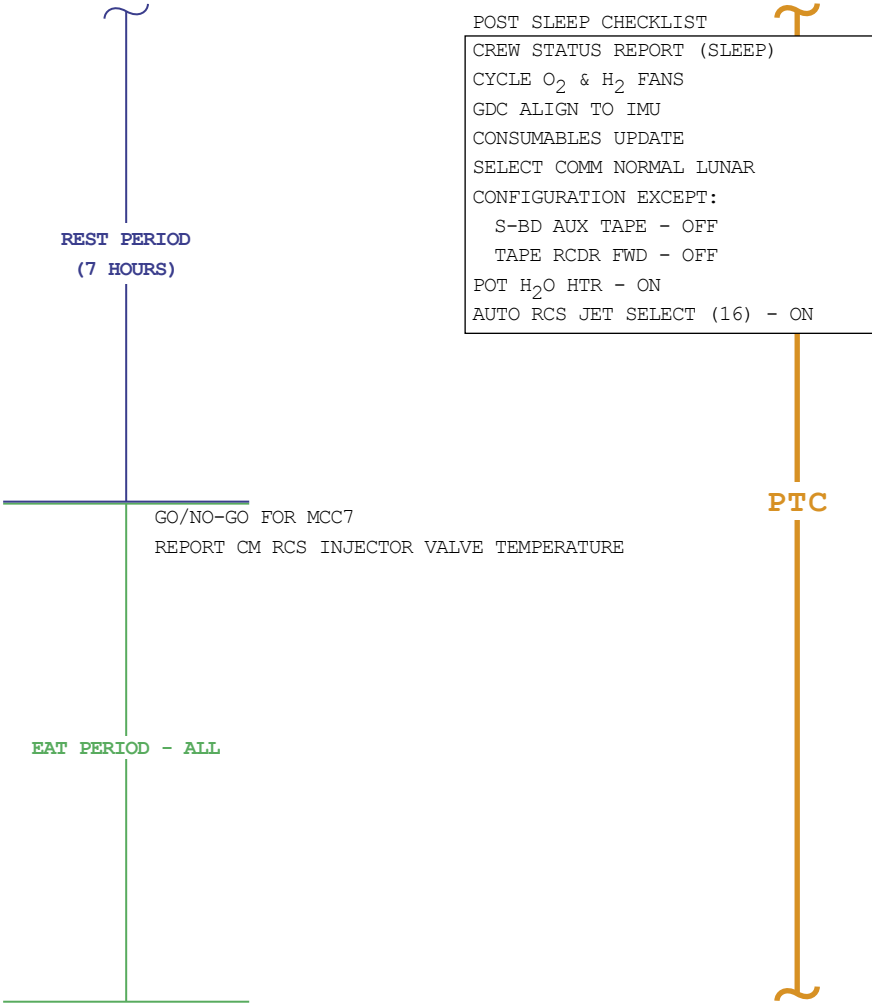
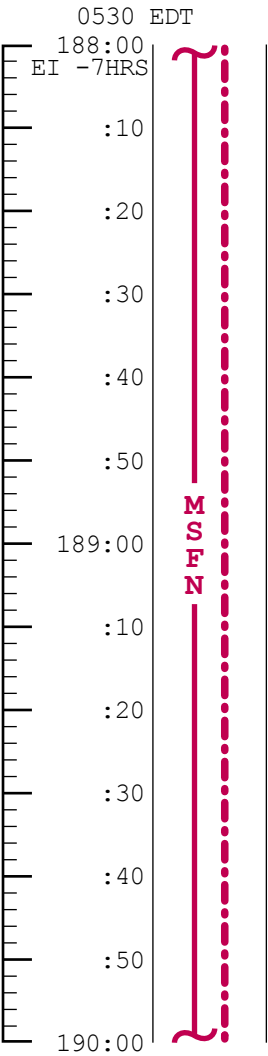
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	186:00 - 188:00	8 / TEC	3-128

MCC-H

FLIGHT PLAN

NOTES

GO/NO-GO



CONSUMABLE UPDATE  
(Δ FROM NOMINAL)

GET: \_\_\_\_\_

RCS TOT \_\_\_\_\_

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

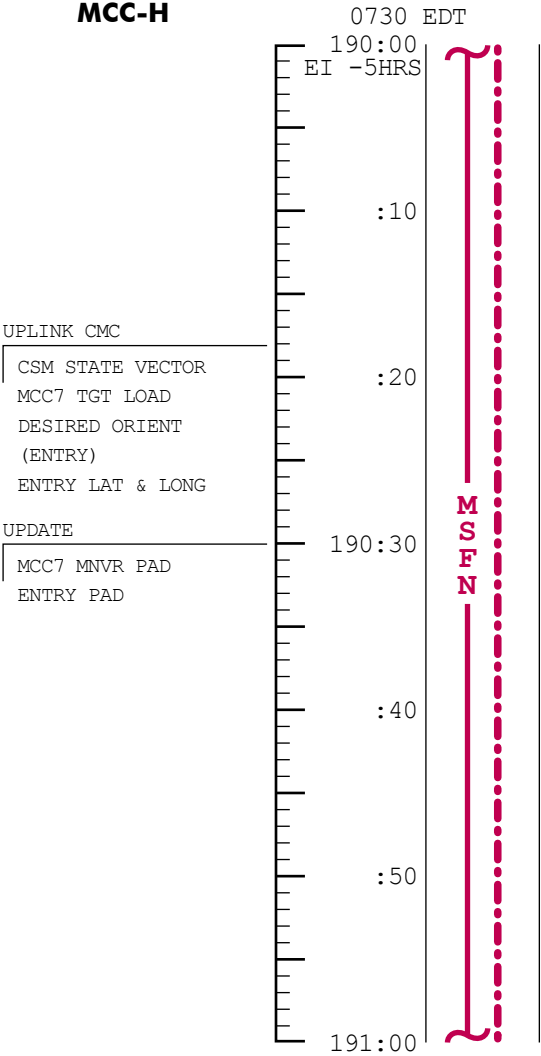
D \_\_\_\_\_

H<sub>2</sub> TOT \_\_\_\_\_

O<sub>2</sub> TOT \_\_\_\_\_

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	188:00 - 190:00	8 / TEC	3-129

MCC-H



FLIGHT PLAN

DON MAE WEST & FOOT RESTRAINTS

V66 - TRANS CSM STATE VECTOR TO LM SLOT

RECORD MCC7 MNVR PAD & ENTRY PAD

EPS CHECK

SPS CHECK  
CM RCS MON CK

SM RCS MON CK

C&W SYS CK

CMC SELF TEST

DSKY COND LT TEST

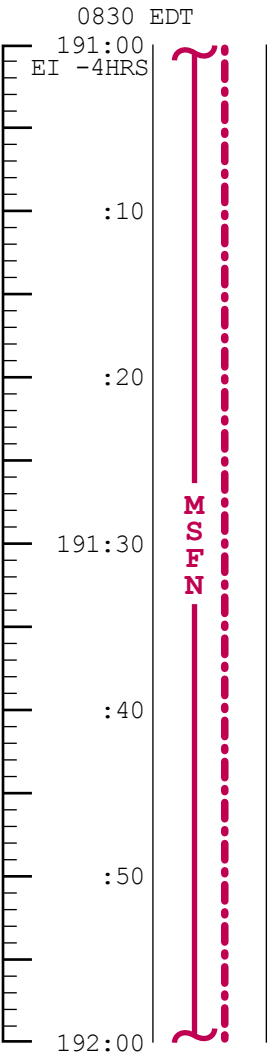
NOTES

P23 - NO COMM, (5 SETS)  
TEI +54:30 (190:00)  
ALPHERATZ (01), EFH  
MIRFAK (10), ENH  
ALDEBARAN (11), ENH  
CAPELLA (13), ENH  
CAPELLA (13), ENH



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	190:00 - 191:00	9 / TEC	3-130

MCC-H



FLIGHT PLAN

IMU REALIGN - P52  
OPTION 1 - PREFERRED

EXT ΔV - P30

SPS/RCS THRUST - P40/41

MNVR TO BURN ATT

SXT STAR CK

EMS ΔV TEST

SM RCS MON CK

GDC ALIGN TO IMU

NOTES

P52 - (ENTRY REFSMMAT)

N71: \_ \_ \_ / \_ \_ \_

N05: \_ \_ \_ . \_ \_ \_

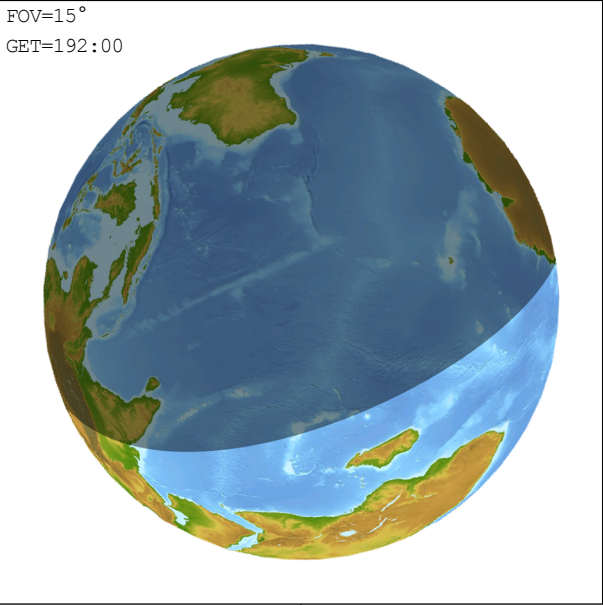
N93:

X \_ \_ \_ . \_ \_ \_ \_

Y \_ \_ \_ . \_ \_ \_ \_

Z \_ \_ \_ . \_ \_ \_ \_

GET \_ \_ \_ \_ : \_ \_ \_ : \_ \_ \_



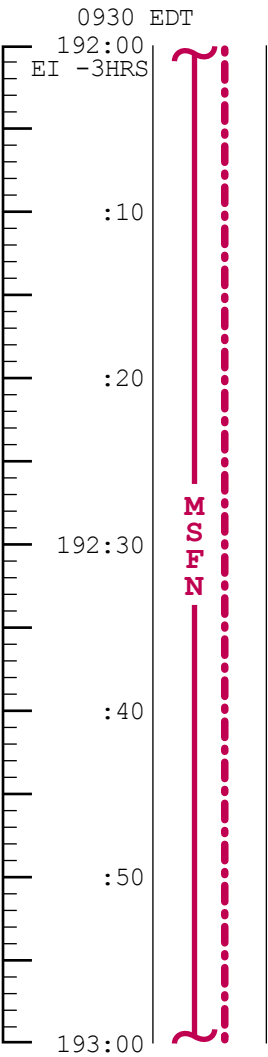
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	191:00 - 192:00	9 / TEC	3-131

THIS PAGE INTENTIONALLY LEFT BLANK.

MCC  
BURN CHART

	P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
MCC7	10°/SEC TAKEOVER	10° TAKEOVER	BT +1 SEC	TRIM X AXIS ONLY

MCC-H



FLIGHT PLAN

MCC7 ΔV=NOMINALLY ZERO

SM RCS MON CK  
SPS MON CK  
BURN STATUS REPORT  
V66 - TRANS CSM STATE VECTOR TO LM SLOT

P23 - NO COMM, (5 SETS)  
TEI +57:00 (192:30)  
MENKAR (07), ENH  
CAPELLA (13), ENH  
CAPELLA (13), ENH

GO/NO-GO FOR PYRO ARM SEQUENCE  
VHF ACTIVATION

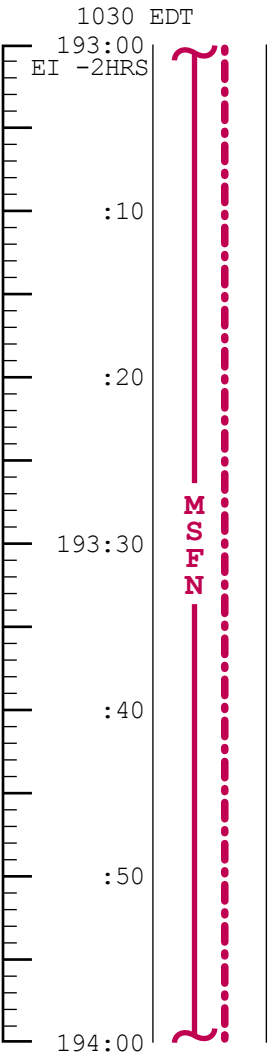
NOTES

BURN STATUS REPORT		
X	X	<input type="checkbox"/>
X	X	<input type="checkbox"/>
<input type="checkbox"/>		
TRIM		
X	X	X
X	X	X
X	X	X
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>		
X	X	X
X	X	X
X	X	X

ΔTIG  
BT  
V<sub>gx</sub>  
R  
P  
Y  
V<sub>gx</sub>  
V<sub>gy</sub>  
V<sub>gz</sub>  
ΔV<sub>C</sub>  
FUEL  
OX  
UNBAL

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	192:00 - 193:00	9 / TEC	3-132

MCC-H



# FLIGHT PLAN

NOTES

LOGIC SEQUENCE CHECK

MNVR TO ENTRY ATTITUDE

COAS STAR CHECK

SXT STAR CHECK

IMU REALIGN - P52  
(OPTION 3 - REFSMMAT)

GDC ALIGN TO IMU  
CM RCS PREHEAT

P52 - (ENTRY REFSMMAT)

N71: \_ \_ / \_ \_

N05: \_ \_ . \_ \_

N93:

X \_ \_ . \_ \_

Y \_ \_ . \_ \_

Z \_ \_ . \_ \_

GET \_ \_ . : \_ \_ : \_ \_

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	193:00 - 194:00	9 / TEC	3-133

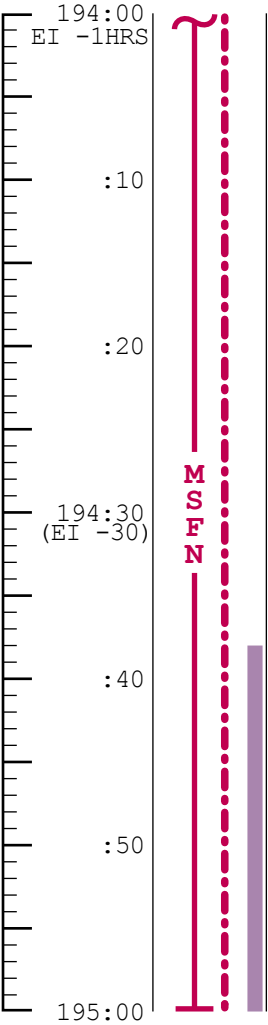


MCC-H

1130 EDT

FLIGHT PLAN

NOTES



PRIMARY EVAPORATOR ACTIVATION

FINAL GDC DRIFT CHECK  
TERM CM RCS PREHEAT

SECONDARY EVAPORATOR ACTIVATION  
PYRO BATTERY CHECK  
RECORD ENTRY PAD AND RECOVERY DATA

P27 UPDATE - V66 - TRANS CSM STATE VECTOR TO LM SLOT

SET DET TO RRT  
EMS INITIALIZATION  
RSI ALIGN TO GDC

CM RCS CK  
ENTRY BATTS - ON

SEPARATION CHECKLIST  
GO FOR PYRO ARM

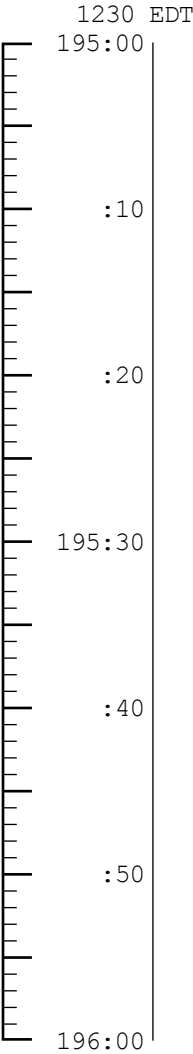
P61 ENTRY PREP  
MNVR TO CM/SM SEP ATT

CM/SM SEP

P62 - ENTRY ATTITUDE  
MNVR TO ENTRY ATT

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	194:00 - 195:00	9 / TEC	3-134

MCC-H



# FLIGHT PLAN

NOTES

P63 - ENTRY INITIATE

EI - GET = 195:03:27

P64 - ENTRY POST .05G

TRAJECTORY EVENT	TIME FROM
	ENTRY INTERFACE MIN:SEC
400,000 FEET (GET 195:03:27)	00:00
ENTER S-BAND BLACKOUT	00:18
0.05G	00:28
KA - INITIATE CONSTANT DRAG	00:52
RDOT = -700 FPS	01:18
PEAK G (6.6)	01:22
SUBCIRCULAR VELOCITY	02:08
P64 TO P67	02:08
EXIT S-BAND BLACKOUT	03:24
GUIDANCE TERMINATION	07:14
DROGUE DEPLOYMENT	08:12
MAIN DEPLOYMENT	09:00
SPLASHDOWN	13:55

$\gamma = -6.52^\circ$ ,  $L/D = 0.295$ ,  $V = 36,309$  &  $R = 1285$

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	195:00 - 196:00	9 / TEC	3-135

SECTION IV

**DETAILED TEST OBJECTIVES**



## SECTION 4

### DETAILED OBJECTIVE ACTIVITIES

This section contains the activity summaries which reflect the test objectives for Mission G as described in „Mission Requirements G Type Mission“, SPD9-R-038, Change A dated May 1, 1969. These activity summaries are presented in the approximate sequence in which they are planned to occur during the mission.

Each activity summary provides the following information:

- A. TEST OBJECTIVES. This is the listing of the Functional Test Objectives (complete or partial) which relate to the particular activity;
- B. TEST REQUIREMENTS. Here the special test prerequisites (and mission phase if necessary) are presented in addition to brief statements of the requirements for performing the activity;
- C. TEST PROCEDURES/CHECKLISTS. These are the procedural references for the performance of the activity as far as the test objectives are concerned; and
- D. DATA REQUIREMENTS. This part of the summary identifies the gross data which are needed for evaluation of test results in terms of flight crew and ground support requirements.

Cross references for relating Detailed and Functional Test Objectives with the activity summaries and relating activities to Functional Test Objectives, are provided as the initial part of this section.

The following ground rules are to be used in implementing data requirements:

- A. The collection of highly desirable (HD) data should not constrain the timeline of the crew procedures.
- B. Post-flight debriefing requirements which are fulfilled by real time transmission of data per the DATA REQUIREMENTS sections may be deleted from the post-flight debriefing.

All of the Test Requirements have not been totally implemented into the mission timeline. These items are identified in this section as „Not Implemented“ or with the conditions by which they will be implemented.

TABLE 4-1  
MISSION ACTIVITY AND  
TEST OBJECTIVE CROSS REFERENCE

<u>ACTIVITY</u>	<u>FTO</u>
LM Descent	D-1, G-1, G-3, H-1, M-1
Lunar Surface Navigation	G-1, G-2, G-3, L-4, M-2
EVA Preparation and Egress	B-1, B-2, C-1, C-2, C-3, L-1
Surface Sample Collection	A-1, E-1, F-1, F-2, I-3, J-2, J-3, J-4, M-3
External LM Observations and Photography	D-1, D-2, D-3, D-4, L-2, M-3
Lunar Surface Observations and Photography	E-1, E-2, E-3, H-2, J-5, L-3, L-4, M-3
Experiment Deployment/Conduct	S-031, S-078, S-080
Post EVA Operations	B-1, C-1, C-2
Contamination Prevention	I-1, I-2

TABLE 4-2  
TEST OBJECTIVE/MISSION ACTIVITY  
CROSS REFERENCE

DTO/FTO NUMBER	TEST OBJECTIVE	MISSION ACTIVITY	SECTION PAGE NO.
A A-1	Contingency Sample Collection Provide a Contingency Lunar Surface Sample	Surface Sample Collection	4 - 13
B B-1	Lunar Surface EVA Operations Demonstrate Egress-To/Ingress-From the Lunar Surface	EVA Preparation and Egress Post EVA Operations	4 - 10 4 - 21
B-2	Evaluate Crew Lunar Surface EVA Capability	EVA Preparation and Egress	4 - 10
C C-1	EMU Lunar Surface Operations EMU Capability to Provide a Habitable Environment	EVA Preparation and Egress	4 - 10
C-2	EMU Effects on Crew Mobility, Dexterity & Comfort	EVA Preparation and Egress	4 - 10
C-3	Demonstrate EVA Data/Voice Communications	EVA Preparation and Egress	4 - 10
D D-1	Landing Effects on LM LM Landing Gear Performance Under Landing Conditions	LM Descent External LM Observ/Photo	4 - 6 4 - 15
D-2	Effects of Landing on LM Structure and Components	External LM Observ/Photo	4 - 15
D-3	Descent Engine Skirt Damage/Clearance After Landing	External LM Observ/Photo	4 - 15
D-4	Effects of RCS Plume Impingement on LM Structure & Components	External LM Observ/Photo	4 - 15
E E-1	Lunar Surface Characteristics Data on Behavior/Characteristics of the Lunar Surface	Surface Sample Collection Lunar Surface Observ/Photo	4 - 13 4 - 17
E-2	Lunar Soil Erosion from DPS Plume Impingement	Lunar Surface Observ/Photo	4 - 17
E-3	Effect of DPS Venting on the Lunar Surface	Lunar Surface Observ/Photo	4 - 17
F F-1	Bulk Sample Collection Collect Rock Samples and Fine Grained Material	Surface Sample Collection	4 - 13
F-2	Photograph Collection Area of Samples	Surface Sample Collection	4 - 13

TABLE 4-2  
TEST OBJECTIVE/MISSION ACTIVITY  
CROSS REFERENCE

DTO/FTO NUMBER	TEST OBJECTIVE	MISSION ACTIVITY	SECTION PAGE NO.
G	Landed LM Location		
G-1	Determine Location of Landed LM from LM Data	LM Descent	4 - 6
		Lunar Surface Navigation	4 - 8
G-2	Determine Location of Landed LM from CSM Data	Lunar Surface Navigation	4 - 8
G-3	Capability of Locating Landed LM in Real Time	LM Descent	4 - 6
		Lunar Surface Navigation	4 - 8
H	Lunar Environment Visibility		
H-1	Data on Landing Aids & Final Approach Visibility	LM Descent	4 - 6
H-2	Crew Performance of Visual Tasks on Lunar Surface	Lunar Surface Observ/Photo	4 - 17
I	Assessment of Contamination by Lunar Material		
I-1	Prevent Earth Contamination by Lunar Exposed Materials	Contamination Prevention	4 - 22
I-2	Minimize Crew/CM Contamination by Lunar Exposed Materials	Contamination Prevention	4 - 22
I-3	Lunar Sample for Quarantine Testing	Surface Sample Collection	4 - 13
J	Documented Sample Collection		
J-1	Obtain an Aseptic Sample of the Lunar Surface	Deleted	
J-2	Obtain a Core Sample of the Lunar Surface	Surface Sample Collection	4 - 13
J-3	Collect Lunar Geologic Samples	Surface Sample Collection	4 - 13
J-4	Collect a Lunar Environment Sample	Surface Sample Collection	4 - 13
J-5	Study and Describe Lunar Topography Features	Lunar Surface Observ/Photo	4 - 17
K	Lunar Surface Structure Photograph (Objective Deleted)	Deleted	



TABLE 4-2  
TEST OBJECTIVE/MISSION ACTIVITY  
CROSS REFERENCE

DTO/FTO NUMBER	TEST OBJECTIVE	MISSION ACTIVITY	SECTION PAGE NO.
L	Television Coverage		
L-1	TV Coverage of Astronaut Descending to the Lunar Surface	EVA Preparation and Egress	4 - 10
L-2	TV Coverage of External Landed LM	External LM Observ/Photo	4 - 15
L-3	TV Coverage of Lunar Surface Near LM	Lunar Surface Observ/Photo	4 - 17
L-4	TV Panoramic Coverage of Distant Terrain Features	Lunar Surface Navigation	4 - 8
		Lunar Surface Observ/Photo	4 - 17
L-5	TV Coverage of Astronaut Activities on the Lunar Surface	Lunar Surface Observ/Photo	4 - 17
M	Photographic Coverage		
M-1	Photograph Lunar Surface During LM Descent	LM Descent	4 - 6
M-2	Photograph Lunar Surface Post Touchdown/Pre EVA	Lunar Surface Navigation	4 - 8
M-3	Obtain Photographs During EVA	Surface Sample Collections	4 - 13
		External LM Observ/Photo	4 - 15
		Lunar Surface Observ/Photo	4 - 17
S-031	Lunar Passive Seismology	Experiment Deployment/Conduct	4 - 20
S-078	Laser Ranging Retro-Reflector	Experiment Deployment/Conduct	4 - 20
S-080	Solar Wind Composition	Experiment Deployment/Conduct	4 - 20

## LM DESCENT

### A. Test Objective

- D-1 LM Landing Gear Performance Under Landing Conditions
- G-1 Location of the Landed LM from LM Data
- G-3 Capability of Locating the Landed LM in Real Time from LM/CSM/MSFN Data
- H-1 Data on Landing Aids and Final Approach Visibility
- M-1 Photograph Lunar Surface During LM Descent

### B. Test Requirements

1. Determine landing site visibility, extent of washout and visibility of landing site landmarks. [H]
2. Photograph the landing site during the approach through the LM pilot's window with the data acquisition camera. [G, H, M]
3. Evaluate landing aids, i.e., Landing Point Designator, maps, photographs. [G, H]
4. Assess visual phenomena during LM landing which are significantly different from expected. [H]
5. Voice anotate location and identity of features during final descent. [G]
6. Determine landing location in real time by description of terrain features during descent. [G]
7. Assess LM landing conditions on the lunar surface. [D]

### C. Procedures/Checklist

1. Photographic and Television Operations Plan.
2. Descent Procedures Document.

### D. Data Requirements

1. Flight Crew Reports/Logs/Photographs
  - a. LM crew comments on landing site visibility during final approach and landing phases and on effectiveness of the Landing Point Designator and landing site recognition aids. [H] (M)
  - b. GET at start of data acquisition camera photographs during LM final approach. [H] (M)
  - c. Voice track regarding observations of surface features during the descent phase. [G] (M)
  - d. Photographs of the landing site and surrounding lunar surface features taken through a LM window during descent. [G, M] (M)
  - e. Data Acquisition Camera photographs of the landing site from high gate to touchdown. [H, M] (M)
  - f. Photographs of the landing site and surrounding lunar surface features taken through a LM window during descent. [G, M] (N)
  - g. Comments on any lunar dust observed during the final approach, the severity of the landing and vehicle stability after touchdown. [D] (M)
2. Ground Support
  - a. LM TM HBR. [D, G, H] (M)
  - b. LM TM LBR. [D, G] (M)

c. LM BET from DOI through touchdown. [G, H] (M)

d. MSFN tracking data of LM from acquisition of signal through touchdown.  
[G] (F4)

## LUNAR SURFACE NAVIGATION

### A. Test Objectives

- G-1 Determine the Location of the Landed LM from LM Data
- G-2 Determine the Location of the Landed LM from CSM Data
- G-3 Determine Capability of Locating the Landed LM in Real Time  
from LM/CSM/MSFN Data
- L-4 Panoramic Coverage of Distant Terrain Features
- M-2 Photograph Lunar Surface Post Touchdown/Pre EVA

### B. Test Requirements

1. Correlate lunar surface features surrounding the landing site with photomaps and mark the LM location. [G, L, M]
2. Photograph terrain features thru the LM window to correlate LM location. [G, M]
3. Obtain two sets of LM IMU alignments after landing [G]
4. Provide TV coverage of prominent terrain features. [G, L]
5. Track the landed LM from the CSM during two orbital passes. Mark on a landmark near the landed LM. [G] - (Only one pass is implemented.)
6. Track the CSM with LM RR during one pass. [G] - (Not Implemented.)
7. Obtain 70 MM photographs of the landed LM or its shadow and the surrounding lunar features. [G]
8. Assist MCCH in determining the landing LM location in real time. [G, L]

### C. Procedures/Checklist

1. Photographic and Television Operations Plan.
2. LM AOH, „PGNCS Lunar Surface Align Program (P57)“.
3. LM AOH, „Lunar Surface Navigation Program (P22)“
4. CSM AOH, „Orbital Navigation (P22)“.

### D. Data Requirements

1. Flight Crew Reports/Logs/Photographs
  - a. Estimate of the landed LM location on lunar photomaps. [G] (M)
  - b. Comments by LM crew regarding any difficulties encountered in estimating the location of the LM with respect to lunar surface features. [G] (HD)
  - c. Comments by LM crewman on location of landed LM with respect to prominent terrain features. [G] (M)
  - d. Obtain high resolution photographs of the landing area from the CSM. [G] (M)
  - e. Photographs of the landing site and surrounding lunar surface features taken through a LM window after landing. [G, M] (M)
  - f. Provide TV coverage of the lunar surface as viewed from the LM. [G, L] (M)
2. Ground Support
  - a. LM TLM HBR. [G] (M)
  - b. LM TLM LBR. [G] (M)

- c. BET of CSM during the lunar surface phase. [G] (M)
- d. BET of LM from DOI through touchdown. [G] (M)
- e. Photographs of the landing area obtained during previous lunar missions. [G] (M)
- f. Post-scan conversion video tape of all TV coverage. [L] (M)
- g. Estimate solar illumination established by mission geometry. [L] (M)
- h. Reflectivity and geometry of surfaces contributing to indirect illumination. [L] (HD)

## EVA PREPARATION AND EGRESS

### A. Test Objectives

- B-1 Demonstrate Egress-to/Ingress-from the Lunar Surface
- B-2 Evaluate Crew Lunar Surface EVA Capability
- C-1 EMU Capability to Provide a Habitable Environment
- C-2 EMU Effects on Crew Mobility/Dexterity/Comfort
- C-3 Data/Voice Communications Capability During EVA
- L-1 TV Coverage of an Astronaut Descending to the Lunar Surface

### B. Test Requirements

1. Perform EVA preparations. [C]
2. Release the MESA pallet with pre-mounted TV camera and turn camera power on prior to descent to the lunar surface. [L]
3. Egress to the lunar surface. [B, C]
4. Deploy and set the TV camera to provide TV coverage of the lunar surface EVA. [L]
5. During EVA, communicate with MSFN via the EVA-LM-MSFN two way voice relay. [C]
6. Two-way voice communications to be performed between two EVA crewmen. [C]
7. EMU and biomedical data from two EVA crewmen will be simultaneously transmitted to MSFN via EVA-LM-MSFN one-way relay. [C]

### C. Procedures/Checklist

1. EVA Procedures Document.
2. Lunar Surface Operations Plan.

### D. Data Requirements

1. Flight Crew Reports/Logs/Photographs
  - a. Notify MSFN of the initial and final positions of the PLSS water diverter valve, primary oxygen shutoff valve and water shutoff/relief valve each time they are changed. [C] (M)
  - b. Notify MSFN when PLSS; High O2 flowrate, low vent flow, low feed water pressure or PGA pressure low remote control unit status indicators and audible warning tone come on. [C] (M)
  - c. Record EMU radiation dosimeter readings just prior to the EVA. [C] (M)
  - d. Notify MSFN if noxious odors occur or any condensation on the visor assembly. [C] (HD)
  - e. Comment on the adequacy of procedures and difficulties encountered during donning of EMU equipment. [C] (HD)
  - f. Comment on time required and adequacy of the EMU checkout procedures. [C] (MD)
  - g. Comment on the adequacy of EMU thermal environment when walking from a sunlit area to shadow and vice versa. [C] (M)
  - h. Comment on estimated energy expenditure and comfort as compared to simulation experience. [C] (HD)
  - i. Provide data on the adequacy of hardware and procedures, and the time required to perform the egress from the LM. [B] (M)

j. Comment on voice quality for EVA-EVA and EVA-LM-MSFN communications.  
[C] (M)

k. Provide sequence camera coverage and TV camera coverage of: [B, M] (M)

1) A crew member descending to the lunar surface.

2) A crew member walking on the lunar surface.

3) A crew member performing lunar surface EVA operations.

## 2. Ground Support

a. LM TM FM. [B, C] (M)

b. Ground recorded TV signals. [B] (HD)

c. LM TM LBR. [L] (HD)

d. Post-scan conversion video tape of all TV coverage. [L] (M)

e. Record of S-band signal strength during video transmission. [L] (HD)

f. GET at beginning and end of TV transmission. [L]

g. Time period, if any, when LBR TM (in lieu of HBR TM) transmitted  
simultaneously with TV data. [L] (M)

h. Identity of ground station(s) used to record video transmission from  
LM. [L] (M)

i. Time period, if any, when erectable antenna used to transmit TV data.  
[L] (M)

j. Estimate of incident illumination. [L] (M)

k. LM position on lunar surface. [H] (HD)

l. MSFN recording of EVA-LM-MSFN voice. [C] (M)

## SURFACE SAMPLE COLLECTION

### A. Test Objectives

A-1 Provide a Contingency Lunar Surface Sample  
E-1 Behavior and Characteristics of the Lunar Surface  
F-1 Collect Rock Samples and Fine Grained Material  
F-2 Photograph Collection Area of Samples  
I-3 Obtain a Lunar Sample for Quarantine Testing  
J-2 Obtain a Core Sample of the Lunar Surface  
J-3 Collect Lunar Geologic Samples  
J-4 Collect a Lunar Environment Sample  
M-3 Obtain Photographs of Geologic Inspection & Sampling

### B. Test Requirements

1. Contingency Sample - Obtain upon first descending to the lunar surface. [A]
2. Bulk Material - Obtain 30 pounds consisting of 1/3 fragmentary and 2/3 loose samples. [F]
3. Core Sample - Obtain with the drive tube. [I, J]
4. Geologic Samples - Obtain using tools stowed in the MESA. Photograph sample areas. [J, M]
5. Lunar Environment Sample - Seal in gas analysis container. [J]

### C. Procedures/Checklist

1. Lunar Landing Mission Flight Plan.
2. Lunar Surface Operations Plan.
3. Photographic and Television Operations Plan.

### D. Data Requirements

1. Flight Crew Reports/Logs/Photographs
  - a. Record areas in relation to LM where samples were collected. [A, F, J] (M)
  - b. Record unusual lunar surface observations. [A, F, J] (M)
  - c. Comment on soil behavior during collection of Bulk Sample. [E] (M)
  - d. Comment on soil behavior during collection of Documented Sample. [E] (HD)
  - e. Estimates of volume of fine grained material collected in one bag of the Documented Sample. [E] (HD)
  - f. Take photographs during sample collection. [A, F] (HD)
  - g. Photograph the lunar surface sample areas and of the samples as defined in the Photographic Operations Plan. [J] (M)
2. Ground Support
  - a. LM position on lunar surface. [J] (M)
  - b. MSFN recordings of all MSFN/EVA voice conferences. [J] (M)



## EXTERNAL LM OBSERVATIONS AND PHOTOGRAPHY

### A. Test Objectives

- D-1 Effects of Landing on LM Landing Gear
- D-2 Effects of Landing on LM Structure and Components
- D-3 Descent Engine Skirt Damage and Clearance After Landing
- D-4 Effects of RCS Plume Impingement on LM Structure and Components
- L-2 TV Coverage of External Landed LM
- M-3 Obtain Photographs of Landed LM

### B. Test Requirements

1. Operate the TV camera to provide an external view of the LM. [L]
2. Photograph any observed LM external structural damage. [D, M]
3. Determine descent engine skirt ground clearance. [D, M]
4. Photograph any effects of RCS plume impingement observed. [D, M]
5. Obtain photographs of any lunar material collected on the LM. [D, M]

### C. Procedures/Checklist

1. Mission G Photographic and Television Operations Plan.

### D. Data Requirements

#### 1. Flight Crew Reports/Logs/Photographs

- a. Comment on any LM component damage to include any visible discoloration or lunar soil accumulation. [D] (M)
- b. Comments describing any descent engine skirt damage and estimate of any skirt ground clearance. [D] (M)
- c. If the landing gear strut assembly photographs cannot be obtained, estimate the amount of stroking of each primary and secondary strut assembly. [D] (M)
- d. Photograph the landing gear to show the stroking of the primary and secondary strut assemblies. [D, M] (M)
- e. Photograph the LM exterior showing any structural damage. [D, M] (M)
- f. Photograph each landing gear assembly along the Z axis and the Y axis. [D, M] (HD)
- g. Photograph the descent engine skirt. [D, M] (HD)
- h. Photograph the LM base heat shield. [D, M] (HD)
- i. Photograph the LM exterior, i.e., structure antenna, RCS jets, windows and foot pads. [D, M] (HD)
- j. Photograph soil accumulation on the LM. [D, M] (HD)
- k. Photographs by the close up stereo camera of lunar material adhering to LM surfaces. [M] (HD)

#### 2. Ground Support

- a. LM TM HBR. [D] (M), [L] (HD)
- b. LM Mass, center of gravity and mass moment of inertia calculations. [E] (M)
- c. Video tape of all TV coverage. [L] (M)

- d. Record of S-band signal strength during TV coverage. [L] (HD)
- e. GET at beginning and end of TV operations.
- f. Time period of simultaneous LBR TM and TV transmission. [L] (M)
- g. Identification of ground station(s) used to record video transmission.  
[L] (M)
- h. Time period when erectable antenna was used to transmit from lunar  
surface. [L] (M)

## LUNAR SURFACE OBSERVATIONS AND PHOTOGRAPHY

### A. Test Objectives

- E-1 Behavior and Characteristics of the Lunar Surface
- E-2 Erosion of Lunar Surface by DPS Plume Impingement
- E-3 Effect of Any DPS Venting on the Lunar Surface
- H-2 Crew Performance of Visual Tasks on the Lunar Surface
- J-5 Study and Description of Lunar Topography Features
- L-3 TV Coverage of Lunar Surface Near LM
- L-4 TV Panoramic Coverage of Distant Terrain Features
- L-5 Coverage of Astronaut Activities on the Lunar Surface
- M-3 Obtain Photographs During EVA

### B. Test Requirements

1. Provide TV coverage of the lunar surface in the vicinity of the LM and panoramic scenes of distant terrain features. [L]
2. Photograph the lunar terrain at various azimuths with respect to the sun including 9, 90 and 180 degrees. Comment on ability to see terrain features in these areas. [H, M]
3. Estimate the distance to prominent terrain features within the field of view of photographs taken. [H]
4. Observe lunar surface characteristics including texture, consistency, compressibility, cohesiveness, adhesiveness, density and color. [E]
5. Study and photograph the mechanical behavior of the lunar surface from interactions of astronauts boots and equipment with the lunar soil, erosion by DPS plume impingement and DPS venting. [E, M]
6. Describe and photograph field relationships such as shape, size, range, pattern of alignment or distribution of all accessible types of lunar topographic features. [J,M]
7. Photograph the structure of lunar surface material in its natural state. [M]

### C. Procedures/Checklist

1. Mission G Photographic and Television Operations Plan.

### D. Data Requirements

1. Flight Crew Report/Logs/Photographs
  - a. Report condition of the temperature indicator viewing ports on the TV camera at the beginning and the end of the TV operations. [L] (M)
  - b. Position of the TV camera scan rate switch at start of TV operation. [L] (M)
  - c. Comments describing the interaction between astronaut boots and lunar surface while walking. [E] (M)
  - d. Comments on slope and roughness characteristics of the landing terrain to include descriptions of craters, depressions, embankments or other obstacles. [E] (M)
  - e. Comments on the color and texture of both undisturbed and mechanically disturbed areas of the lunar surface. [E] (M)
  - f. Comments on lunar soil conditions adjacent to DPS vents to include any discoloration. [E] (M)
  - g. Comments describing the lunar surface penetration by the Solar Wind Composition Staff and core sample tool under their own weight and the

estimated force. [E] (Mandatory for either the staff or the core sample tool: highly desirable for the other.)

- h. Comments on lunar soil erosion as caused by the DPS plume impingement during landing. [E] (M)
- i. Record vent valves opened. [E] (M)
- j. Photograph the lunar surface showing DPS plume impingement erosive effects. [E, M] (M)
- k. Photograph the lunar surface adjacent to DPS vents if soil discoloration is observed. [E, M] (M)
- l. Photograph an astronaut footprint showing interaction between astronaut boots and lunar surface. [E, M] (M)
- m. Photograph the Solar Wind Composition Experiment Staff and core sampling tool after being inserted to their maximum depth as penetrometers. [E, M] (HD)
- n. Photograph the natural slopes, crater walls and embankments in the vicinity of the landing site. [E, M] (M)
- o. Photograph from the CSM of the lunar surface surrounding the LM. [E, M] (HD)
- p. Comments on the visibility of the lunar terrain as a function of the sun/viewing angle and on their ability to perform visual tasks while on the lunar surface. [H] (M)
- q. Comments on color/contrast perception. [H] (M)
- r. Comments on and significant unexpected visual phenomena. [H] (M)
- s. Estimate of distance to at least one prominent terrain feature within the field of view of the photographs in item »t« below. [H] (M)
- t. Photograph the lunar terrain at various sun azimuths to include 0 degrees, 90 degrees and 180 degrees. [H, M] (M)
- u. Photograph any unexpected visual phenomena. [H, M] (HD)
- v. Photograph a representative depression caused by use of the scoop in collecting fine grained fragmental material. [E, M] (M)
- w. Photograph one scoop of fine grained fragmental material placed in one of the pre-numbered bags. [E, M] (HD)
- x. Photograph of each LM foot pad and surrounding lunar soil exhibiting evidence of LM foot pad - lunar soil interaction. [M] (HD)

## 2. Ground Support

- a. LM TM HBR. [E, L] (HD)
- b. Estimate of incident illumination. [D] (M)
- c. Video tape of all TV coverage. [L] (M)
- d. Record of S-band signal strength during TV transmission. [L] (M)
- e. GET at beginning and end of TV transmission. [L] (M)
- f. Time period when LBR TM was transmitted simultaneously with TV. [L] (M)
- g. Identity of ground station(s) used to record LM video transmission. [L] (M)
- h. Time period when erectable antenna was used to transmit from the lunar surface. [L] (M)

## EXPERIMENT DEPLOYMENT/CONDUCT

### A. Test Objectives

S-031      Deploy the Passive Seismic Experiment Package  
S-078      Deploy the Laser Ranging Retro-Reflector Experiment  
S-080      Conduct the Solar Wind Composition Experiment

### B. Test Requirements

1. Emplace, level and orient the Passive Seismic Experiment Package (PSEP).  
Deploy the solar panels and aim the antenna at the earth. [S-031 ]
2. Photograph the deployed PSEP and deployment area. [S-031]
3. Remove the Laser Ranging Retro-Reflector (LRRR) from the descent stage and  
carry it to the deployment site. [S-078]
4. Emplace, level and orient the LRRR to the alignment marks corresponding  
to the landing site. [S-078]
5. Remove the Solar Wind Composition Experiment from the LM MESA and deploy  
it on the lunar surface. [S-080]
6. After one hour operation, disassemble the Solar Wind Composition  
Experiment, place the reel and foil in a teflon bag and store in a sample  
return container. [S-080]

### C. Procedures/Checklist

None

### D. Data Requirements

1. Flight Crew Reports/Logs/Photographs
  - a. Comment on deployment of experiment. [S-031] (M)
  - b. Photograph deployment area. [S-031, S-078, S-080] (HD)
  - c. Comment on location of deployed experiment with respect to the LM,  
attitude of deployed foil with respect to the sun and total time foil  
was deployed. [S-080] (M)
  - d. Retrieve reel and foil from the Solar Wind Composition Experiment.  
[S-080] (M)
  - e. Comments on orientation and elevation setting used for deployment.  
[S-078] (HD)
2. Ground Support
  - a. Experiment TLM Data [S-031] (M)

## POST EVA OPERATIONS

### A. Test Objectives

B-1 Demonstrate Egress-to/Ingress-from the Lunar Surface  
C-1 EMU Capability to Provide a Habitable Environment  
C-2 EMU Effects on Crew Mobility, Dexterity/Comfort

### B. Test Requirements

1. Perform post EVA preparations and ingress. [B]
2. Perform PLSS shutdown. [C]

### C. Procedures/Checklist

1. EVA Procedures Document.

### D. Data Requirements

#### 1. Flight Crew Reports/Logs/Photographs

- a. Notify MSFN of the initial and final positions of the PLSS water diverter valve, primary oxygen shutoff valve and water shutoff/ relief valve each time they are changed. [C] (M)
- b. Notify MSFN when PLSS; High O2 flowrate, low vent flow, low feed water pressure or PGA pressure low remote control unit status indicators and audible warning tone come on. [C] (M)
- c. Provide data on the adequacy of hardware and procedures, and the time required to perform the ingress to the LM. [B] (M)
- d. Comment on the adequacy of procedures and difficulties encountered during doffing of EMU equipment. [C] (HD)
- e. Record quantity of water drained from PLSS at end of EVA period. [C] (M)
- f. Record EMU radiation dosimeter readings after completion of the EVA. [C] (M)
- g. Provide sequence camera coverage and TV camera coverage of a crew member ascending the LM ladder. [B] (M)

## CONTAMINATION PREVENTION

### A. Test Objectives

- I-1 Prevent Earth Contamination by Lunar Exposed Materials
- I-2 Minimize Crew/CM Contamination by Lunar Exposed Materials

### B. Test Requirements

- 1. All contamination related operations from the initial astronaut egress to the lunar surface until postflight crew/cm quarantine will be completed per procedures contained in the documents listed below. [I]

### C. Procedures/Checklist

- 1. Lunar Surface Operations Plan
- 2. EVA Procedures Document
- 3. Quarantine Procedures

### D. Data Requirements

- 1. Flight Crew Reports/Logs/Photographs
  - a. Crew comments on the adequacy of Biological Isolation Garment, sample return containers, Mobile Quarantine Facility and related equipment and procedures used to prevent back contamination. [I] (M)
  - b. Photograph boots, clothing and equipment showing adhesion of particles. [I, M] (HD)
- 2. Ground Support
  - a. Deliver samples, CM and Mobile Quarantine Facility to the Lunar Receiving Laboratory. [I] (M)
  - b. Comment on ground procedures and hardware used for retrieval, biological isolation and CM transfer to the Lunar Receiving Laboratory. [I] (M)
  - c. Report on the existence of contamination of the crew on CM. [I] (M)





SECTION V

**CONSUMABLES ANALYSIS**



#### NOTE

Acknowledgement is made to the Consumables Analysis Section (CAS) of the Mission Planning and Analysis Division (MPAD) for their work in the preparation of the consumable analysis presented herein and to the Crew Systems Division for the PLSS Consumables.



## CSM-107/LM5 PROPELLANT BUDGET

The results of the Propellant Budget Analysis are summarized in the following Tables and Figures:

TABLE 5-1	SM RCS Propellant Loading And Usage Summary
TABLE 5-2	SM RCS Budget
TABLE 5-3	CM RCS Propellant Summary
TABLE 5-4	SPS Propellant Summary
TABLE 5-5	SPS Assumptions
TABLE 5-6	LM RCS Propellant Loading And Usage Summary
TABLE 5-7	LM RCS Budget
TABLE 5-8	DPS Propellant Summary
TABLE 5-9	DPS Assumptions
TABLE 5-10	APS Propellant Summary
TABLE 5-11	APS Assumptions
FIGURE 5-1	Total SM RCS Propellant Profile
FIGURE 5-2	Quad A SM RCS Propellant Profile
FIGURE 5-3	Quad B SM RCS Propellant Profile
FIGURE 5-4	Quad C SM RCS Propellant Profile
FIGURE 5-5	Quad D SM RCS Propellant Profile
FIGURE 5-6	Total LM RCS Propellant Profile

SM-RCS BUDGET  
GROUND RULES and ASSUMPTIONS

1. The transposition and docking phase of the mission includes an SPS evasive maneuver.
2. The first and third midcourse corrections (translunar) are executed as SPS burns with the third MCC followed by an RCS trim.
3. No SM RCS propellant is required during PTC or lunar orbit coast.
4. The sixth midcourse correction (transearth) is executed as an RCS burn of 5 fps.
5. The individual quad plots are included for reference only as quad management is determined by the flight controllers during the mission.

TABLE 5-1  
SM RCS PROPELLANT LOADING AND USAGE SUMMARY

Nominal loaded	1342.4 lb
Initial outage due to loaded mixture ratio	15.6
Total trapped	26.4
Gauging inaccuracy	<u>80.4</u>
Deliverable SM-RCS propellant	1220.0
Nominal usage	590
Translunar phase (through LOI-2)	204
Lunar orbit phase	311
Transearth phase (includes TEI)	75
Nominal remaining	630 lb

TABLE 5-2

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	(a)		(b)	
		S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
.0	MISSION G	63457.	.0	1220.0	100.
.0	INITIALIZE PROP LOADING	63457.	.0	1220.0	100.
1.7	SM RCS CHECKOUT	63451.	5.8	1214.2	100.
3.2	TRANSPOSITION AND DOCKING +X 0.8 FPS	63445.	6.1	1208.1	99.
3.2	-X 0.3 FPS	63443.	2.4	1205.7	99.
3.2	PITCH TO ACQUIRE S-IVB PITCH 180 DEG AT 1.5 DEG/SEC	63440.	2.3	1203.4	99.
3.2	ROLL CSM 60 DEG 2 DEG/SEC	63439.	1.3	1202.1	99.
3.2	NULL RELATIVE DEL V 0.5 FPS	63435.	4.0	1198.1	98.
3.5	INDEX AND DOCK	63409.	26.0	1172.1	96.
4.2	LM EJECTION -X 5 SEC 4 JET	96717.	7.4	1164.6	95.
4.5	SPS BURN TO EVADE S-IVB ORIENT AT 0.2 DEG/SEC	96712.	4.4	1160.2	95.
4.5	ATTITUDE HOLD 0.5 DEG DB PGCS	96712.	.8	1159.4	95.
4.5	START TRANSIENT CONTROL	96710.	1.3	1158.1	95.
4.5	SPS BURN BUILD UP	96707.	.0	1158.1	95.
4.5	STEADY STATE BURN	96508.	.3	1157.8	95.
4.5	TAILOFF	96467.	.7	1157.2	95.
4.5	DAMP SHUTDOWN TRANSIENT	96466.	1.1	1156.1	95.
5.5	P52 IMU ALIGN	96466.	.2	1155.9	95.
5.9	NAVIGATION SIGHTINGS ORIENT AT 0.2 DEG/SEC	96461.	4.4	1151.5	94.

(a) Spacecraft weights are approximate and are included for reference only.  
(b) Note: These refer to usable SM RCS propellant.

TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
6.1	NAVIGATION SIGHTINGS ORIENT AT 0.2 DEG/SEC	96457.	4.4	1147.1	94.
7.0	ORIENT FOR PTC 3-AXIS 0.2 DEG/SEC	96453.	4.1	1143.0	94.
7.0	ATTITUDE HOLD 0.5 DEG DB PGNC	96452.	.8	1142.2	94.
7.0	ROLL 0.3 DEG/SEC	96451.	.4	1141.8	94.
10.6	TERMINATE PTC DAMP RATES	96447.	4.4	1137.4	93.
10.7	P52 IMU ALIGN	96447.	.2	1137.1	93.
11.5	MIDCOURSE CORRECTION NO 1 3-AXIS ORIENT PGNC	96442.	4.4	1132.7	93.
11.5	ATTITUDE HOLD 0.5 DEG DB PGNC	96442.	.8	1131.9	93.
11.5	START TRANSIENT CONTROL	96440.	1.3	1130.6	93.
11.5	SPS BURN BUILD UP	96437.	.0	1130.6	93.
11.5	STEADY STATE BURN 3 FPS PGNC	96402.	.1	1130.5	93.
11.5	TAILOFF	96361.	.8	1129.7	93.
11.5	DAMP SHUTDOWN TRANSIENT	96359.	1.1	1128.6	93.
12.0	P52 IMU ALIGN	96359.	.2	1128.4	92.
12.5	ORIENT FOR PTC 3-AXIS 0.2 DEG/SEC	96355.	4.1	1124.3	92.
12.5	ATTITUDE HOLD 0.5 DEG DB PGNC	96354.	.8	1123.5	92.
12.5	ROLL 0.3 DEG/SEC	96354.	.4	1123.1	92.
24.2	TERMINATE PTC DAMP RATES	96349.	4.4	1118.7	92.
24.3	P52 IMU ALIGN	96349.	.2	1118.5	92.



TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
24.5	CISLUNAR NAVIGATION STAR/EARTH HORIZON ORIENT	96345.	4.4	1114.2	91.
24.7	NAVIGATION SIGHTINGS ORIENT AT 0.2 DEG/SEC	96341.	4.4	1109.8	91.
26.6	MIDCOURSE CORRECTION NO 2 MNVR TO BURN ATT	96336.	4.4	1105.4	91.
26.6	ATTITUDE HOLD 0.5 DEG DB PGCS	96335.	.8	1104.7	91.
26.7	DELTA VEL = NOMINALLY ZERO	96335.	.0	1104.7	91.
27.0	ORIENT FOR PTC 3-AXIS 0.2 DEG/SEC	96331.	4.2	1100.5	90.
27.0	ATTITUDE HOLD 0.5 DEG DB PGCS	96330.	.8	1099.7	90.
27.0	ROLL 0.3 DEG/SEC	96330.	.4	1099.3	90.
52.8	TERMINATE PTC DAMP RATES	96326.	4.4	1094.9	90.
53.0	P52 IMU ALIGN	96325.	.2	1094.7	90.
53.6	MIDCOURSE CORRECTION NO 3 MNVR TO BURN ATT	96321.	4.4	1090.3	89.
53.6	ATTITUDE HOLD 0.5 DEG DB PGCS	96320.	.8	1089.5	89.
53.6	START TRANSIENT CONTROL	96319.	1.3	1088.2	89.
53.6	SPS BURN BUILD UP	96318.	.0	1088.2	89.
53.6	STEADY STATE BURN 3 FPS	96281.	.1	1088.1	89.
53.6	TAILOFF	96239.	.8	1087.3	89.
53.6	DAMP SHUTDOWN TRANSIENT	96238.	1.1	1086.2	89.
53.6	RCS TRIM 1 FPS	96227.	11.2	1075.0	88.
54.0	ORIENT FOR PTC 3-AXIS 0.2 DEG/SEC	96223.	4.1	1070.9	88.

TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
54.0	ATTITUDE HOLD 0.5 DEG DB PGNC	96222.	.8	1070.1	88.
54.0	ROLL 0.3 DEG/SEC	96222.	.4	1069.8	88.
69.5	TERMINATE PTC DAMP RATES	96217.	4.4	1065.3	87.
70.0	P52 IMU ALIGN	96217.	.2	1065.1	87.
70.5	MIDCOURSE CORRECTION NO 4 MNVR TO BURN ATT	96213.	4.4	1060.7	87.
70.5	ATTITUDE HOLD 0.5 DEG DB PGNC	96212.	.8	1059.9	87.
70.5	DELTA VEL = NOMINALLY ZERO	96212.	.0	1059.9	87.
72.7	P52 IMU ALIGN	96212.	.2	1059.7	87.
74.0	ORIENT AND SXT STAR CHECK	96207.	4.4	1055.2	86.
74.5	ORIENT AND OBSERVE LUNAR SURFACE	96203.	4.4	1050.8	86.
75.5	LUNAR ORBIT INSERTION BURN 1 3-AXIS ORIENT PGNC	96198.	4.4	1046.5	86.
75.5	ATTITUDE HOLD 0.5 DEG DB PGNC	96198.	.8	1045.7	86.
75.5	START TRANSIENT CONTROL	96196.	1.3	1044.4	86.
75.9	LOI BURN BUILD UP	96193.	.0	1044.4	86.
75.9	STEADY STATE BURN	72357.	.5	1043.9	86.
75.9	TAILOFF	72316.	.0	1043.9	86.
75.9	DAMP SHUTDOWN TRANSIENT	72315.	1.1	1042.8	85.
76.2	REV 1 ATTITUDE HOLD WIDE DEADBAND	72312.	3.0	1039.8	85.
77.5	P52 IMU ALIGN	72312.	.1	1039.6	85.

TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
78.2	REV 2 ATTITUDE HOLD	72309.	3.0	1036.6	85.
79.2	P52 IMU ALIGN	72309.	.1	1036.5	85.
80.0	LOI 2 LPO CIRC MNVR TO BURN ATT	72306.	3.5	1033.0	85.
80.0	ATTITUDE HOLD 0.5 DEG DB PGCS	72305.	.8	1032.2	85.
80.0	B-D ULLAGE	72290.	15.1	1017.1	83.
80.1	SPS BURN BUILD UP	72287.	.0	1017.1	83.
80.1	STEADY STATE BURN	71316.	.2	1017.0	83.
80.1	TAILOFF	71276.	.0	1017.0	83.
80.1	DAMP SHUTDOWN TRANSIENT	71275.	1.1	1015.9	83.
80.2	REV 3 ATTITUDE HOLD	71272.	3.0	1012.9	83.
80.4	REACQUIRE MSFN ROLL 0.2 DEG/SEC	71272.	.1	1012.8	83.
82.2	REV 4 ATTITUDE HOLD	71269.	3.0	1009.8	83.
82.3	MNVR TO LDG SITE OBS ATT	71265.	3.5	1006.3	82.
82.3	LDG SITE OBSERVATION	71265.	.4	1005.8	82.
82.3	REORIENT	71261.	3.5	1002.3	82.
82.3	REACQUIRE MSFN	71261.	.2	1002.1	82.
84.2	MANEUVER TO SLEEP ATTITUDE 3 AXIS 0.2 DEG/SEC	71258.	3.5	998.6	82.
94.4	DAMP RATES	71254.	3.5	995.0	82.
94.5	REACQUIRE MSFN	71254.	.1	994.9	82.

TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
95.1	MNVR TO ALIGN ATT	71250.	3.5	991.4	81.
96.2	REV 11 ATTITUDE HOLD	71247.	3.0	988.4	81.
98.2	REV 12 ATTITUDE HOLD	71244.	3.0	985.4	81.
98.5	MNVR TO LDG SITE OBS ATT	71241.	3.5	981.8	80.
98.5	LDG SITE OBSERVATION	71240.	.4	981.4	80.
98.9	REACQUIRE MSFN ROLL 0.2 DEG/SEC	71240.	.2	981.3	80.
99.8	MANEUVER TO AGS CAL ATTITUDE	71237.	3.5	977.7	80.
100.0	PRE UNDOCKING ALLOCATION	71213.	24.0	953.7	78.
100.0	ORIENT TO UNDOCKING ATTITUDE ROLL 0.2 DEG/SEC	71212.	.2	953.6	78.
100.2	CSM ACTIVE UNDOCK SEP AND NULL VEL 0.5 FPS	37893.	4.5	949.0	78.
100.2	FORMATION FLYING	37883.	10.0	939.0	77.
100.2	REACQUIRE MSFN	37883.	.1	938.9	77.
100.6	ORIENT FOR SEP BURN	37880.	3.1	935.8	77.
100.7	RCS SEPARATION BURN 2.5 FPS	37868.	11.2	924.6	76.
100.7	REV 13 ATTITUDE HOLD	37865.	3.0	921.6	76.
101.5	MANEUVER TO SXT TRACKING	37862.	3.1	918.6	75.
102.6	MANEUVER TO SXT TRACKING	37859.	3.1	915.5	75.
104.4	REACQUIRE MSFN ROLL 0.5 DEG/SEC	37859.	.3	915.5	75.
104.5	MANEUVER TO SXT TRACKING	37856.	3.1	912.2	75.

TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
104.6	REV 14 ATTITUDE HOLD	37853.	3.0	909.2	75.
104.6	MNVR TO LDG SITE OBS ATT	37850.	3.1	906.1	74.
104.6	SDG SITE OBS	37850.	.4	905.7	74.
104.7	TRACK LM	37846.	3.1	902.6	74.
104.9	REACQUIRE MSFN ROLL 0.5 DEG/SEC	37846.	.3	902.3	74.
105.0	REV 15 ATTITUDE HOLD	37843.	3.0	899.3	74.
105.0	REACQUIRE MSFN ROLL 0.5 DEG/SEC	37843.	.3	899.1	74.
107.0	PLANE CHANGE MNVR TO BURN ATT	37840.	3.1	896.0	73.
107.0	ATTITUDE HOLD 0.5 DEG DB PGCS	37839.	.8	895.2	73.
107.0	ULLAGE	37825.	14.3	880.9	72.
107.0	SPS BURN BUILD UP	37822.	.0	880.9	72.
107.0	STEADY STATE	37754.	.1	880.8	72.
107.0	TAILOFF	37713.	1.0	879.8	72.
107.0	DAMP SHUTDOWN TRANSIENT	37712.	1.1	878.7	72.
107.2	P52 IMU ALIGN	37712.	.1	878.6	72.
107.2	MANEUVER TO SLEEP ATTITUDE	37710.	1.7	876.9	72.
111.5	DAMP RATES	37707.	3.1	873.9	72.
112.2	REV 19 ATTITUDE HOLD	37704.	3.0	870.9	71.
114.2	REV 20 ATTITUDE HOLD	37701.	3.0	867.9	71.

TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
114.3	ORIENT FOR SEXTANT TRACKING	37698.	3.1	864.8	71.
115.0	MANEUVER TO SLEEP ATT	37697.	.7	864.1	71.
120.0	DAMP RATES	37697.	.7	863.5	71.
120.0	SEXTANT TRACKING	37695.	1.3	862.2	71.
120.0	REACQUIRE MSFN	37695.	.1	862.1	71.
120.2	REV 23 ATTITUDE HOLD	37692.	3.0	859.1	70.
122.2	REV 24 ATTITUDE HOLD NARROW DEADBAND	37687.	5.2	853.9	70.
124.5	SUPPORT LM LIFT OFF	37669.	18.0	835.9	69.
124.6	MANEUVER TO TRACK LM POST LIFTOFF	37666.	3.1	832.8	68.
125.5	MANEUVER TO SUPPORT LM CSI BURN	37663.	3.1	829.7	68.
125.6	MANEUVER TO TRACK LM POLST CSI	37660.	3.1	826.6	68.
125.6	REV 25 ATTITUDE HOLD NARROW DEADBAND	37654.	5.2	821.4	67.
126.5	MANEUVER TO SUPPORT LM CDH BURN	37651.	3.0	818.4	67.
126.6	MANEUVER TO TRACK LM POST CDH	37648.	3.1	815.3	67.
126.6	RNDZ NAV	37645.	3.1	812.2	67.
126.6	REINITIATE RNDZ NAV	37642.	3.1	809.1	66.
127.0	MANEUVER TO SUPPORT LM TPI BURN	37639.	3.1	806.1	66.
127.1	MANEUVER TO TRACK LM POST TPI	37636.	3.1	803.0	66.
127.1	MANEUVER TO COAS TRACK	37633.	3.1	799.9	66.

TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
127.1	MANEUVER TO SXT TRACKING	37630.	3.1	796.9	65.
127.2	MANEUVER TO SUPPORT LM MCC1 BURN	37627.	3.1	793.8	65.
127.2	MANEUVER TO SXT TRACKING	37624.	3.1	790.8	65.
127.5	MANEUVER TO SUPPORT LM MCC2 BURN	37621.	3.1	787.7	65.
127.5	MANEUVER TO SUPPORT LM TPF BURN	37618.	3.0	784.7	64.
127.5	MANEUVER TO SXT TRACKING	37615.	3.1	781.6	64.
127.8	ORIENT TO DOCKING ATTITUDE	37612.	3.1	778.5	64.
127.8	ALLOCATION FOR TERMINAL RDZ USAGE FROM POSTFLIGHT	37577.	35.0	743.5	61.
127.9	MAINTAIN BORESIGHT	37574.	3.1	740.5	61.
128.0	DOCKING	43212.	26.0	714.5	59.
131.5	MNVR TO JETTISON ATT	43210.	1.1	713.3	58.
132.0	JETTISON LM 1 FPS	37542.	4.7	708.6	58.
132.0	ORIENT TO TRACKING ATT	37540.	1.6	707.0	58.
132.0	TRACK LM	37540.	.4	706.6	58.
132.6	HOLD INERTIAL ATT	37539.	.4	706.1	58.
132.6	P52 IMU ALIGN	37539.	.7	705.5	58.
134.5	P52 IMU ALIGN	37538.	.7	704.8	58.
134.5	SXT STAR CHECK	37537.	.4	704.4	58.
135.0	TRANS-EARTH INJECTION MNVR TO BURN ATT	37536.	1.6	702.7	58.

TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
135.0	ATTITUDE HOLD 0.5 DEG DB PGNC	37535.	.8	702.0	58.
135.0	ULLAGE	37521.	14.3	687.6	56.
135.5	SPS BURN BUILD UP	37518.	.0	687.6	56.
135.5	STEADY STATE SPS BURN	27478.	.2	687.4	56.
135.5	TAILOFF	27437.	.0	687.4	56.
135.5	DAMP SHUTDOWN TRANSIENT	27436.	1.1	686.3	56.
136.0	P52 IMU ALIGN	27436.	.6	685.7	56.
136.0	ORIENT FOR PTC	27435.	1.1	684.6	56.
136.0	ATTITUDE HOLD 0.5 DEG DB PGNC	27434.	.8	683.8	56.
136.0	ROLL 0.3 DEG/SEC	27434.	.1	683.7	56.
147.5	TERMINATE PTC DAMP RATES	27432.	1.3	682.3	56.
147.6	P52 IMU ALIGN	27432.	.6	681.8	56.
150.0	MIDCOURSE CORRECTION NO 5 MANVR TO BURN ATT	27430.	1.3	680.5	56.
150.0	ATTITUDE HOLD 0.5 DEG DB PGNC	27430.	.8	679.7	56.
150.0	DEL VEL = NOM ZERO	27430.	.0	679.7	56.
150.5	ORIENT FOR PTC	27428.	1.1	678.5	56.
150.5	ATTITUDE HOLD 0.5 DEG DB PGNC	27428.	.8	677.8	56.
150.5	ROLL 0.3 DEG/SEC	27428.	.1	677.6	56.
171.0	TERMINATE PTC	27426.	1.3	676.3	55.



TABLE 5-2 (CONT'D)

SM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
172.0	P52 IMU ALIGN	27426.	.6	675.8	55.
172.5	MIDCOURSE CORRECTION NO & MANVR TO BURN ATT	27424.	1.3	674.5	55.
172.5	ATTITUDE HOLD 0.5 DEG DB PGCS	27424.	.8	673.7	55.
172.5	RCS -X TRANS 5 FPS	27408.	15.9	657.8	54.
173.0	ORIENT FOR PTC	27407.	1.1	656.6	54.
173.0	ATTITUDE HOLD 0.5 DEG DB PGCS	27406.	.8	655.8	54.
173.0	ROLL 0.3 DEG/SEC	27406.	.1	655.7	54.
190.0	TERMINATE PTC	27404.	1.3	654.4	54.
191.2	P52 IMU ALIGN	27404.	.6	653.8	54.
192.0	MIDCOURSE CORRECTION NO 7 MNVR TO BURN ATT	27402.	1.3	652.5	53.
192.0	ATTITUDE HOLD 0.5 DEG DB PGCS	27402.	.8	651.7	53.
192.0	DEL VEL = NOM ZERO	27402.	.0	651.7	53.
192.0	STAR CHECK MIN IMPULSE	27401.	.4	651.3	53.
193.0	MANEUVER TO REENTRY ATTITUDE	27399.	2.6	648.7	53.
193.0	ATTITUDE HOLD 0.5 DEG DB PGCS	27390.	8.6	640.1	52.
194.8	MANEUVER TO SEP ATTITUDE	27387.	2.6	637.4	52.
194.8	CM/SM SEPARATION DELTA VEL = 3 FPS	15001.	7.9	629.6	52.

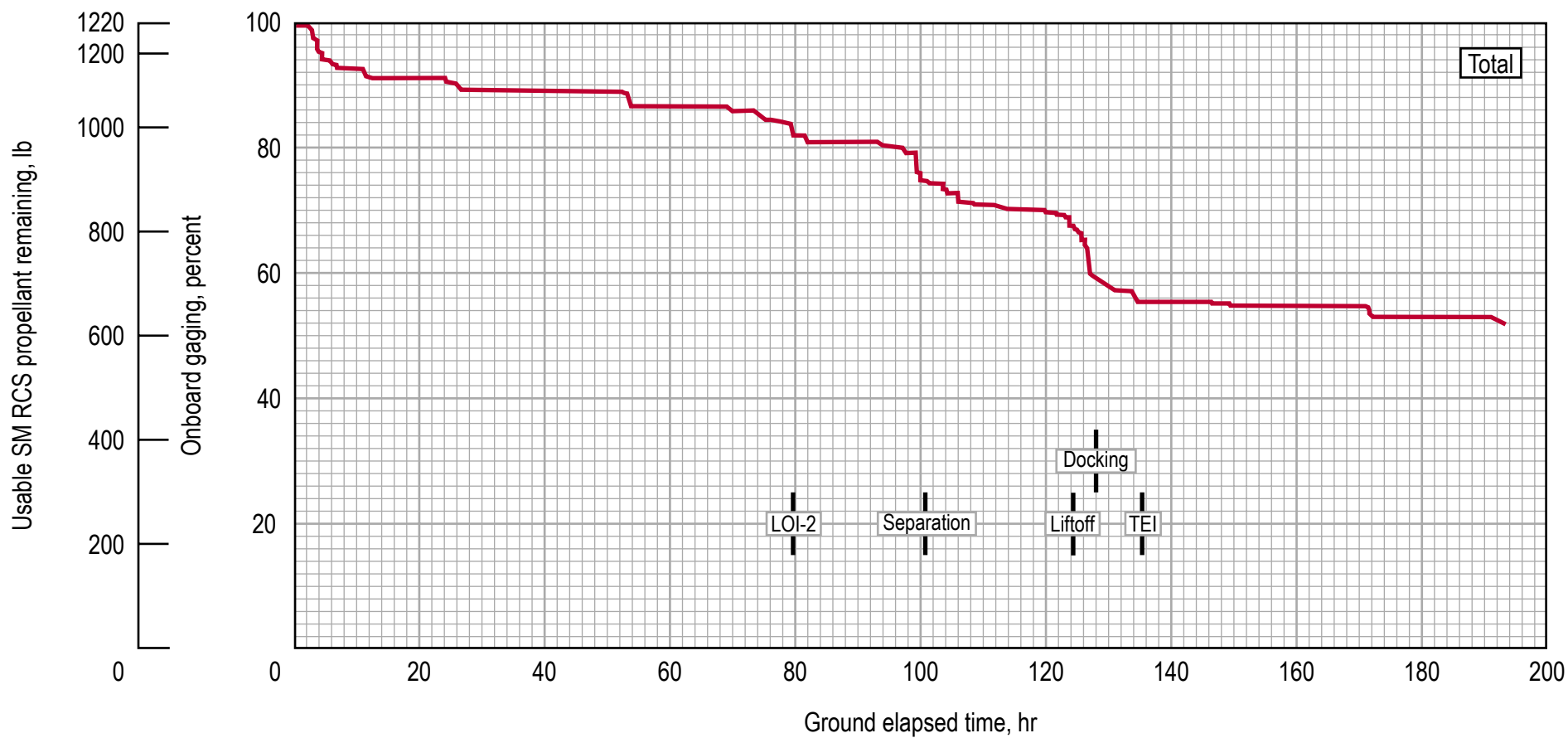


Figure 5-1  
SM RCS propellant profile - total

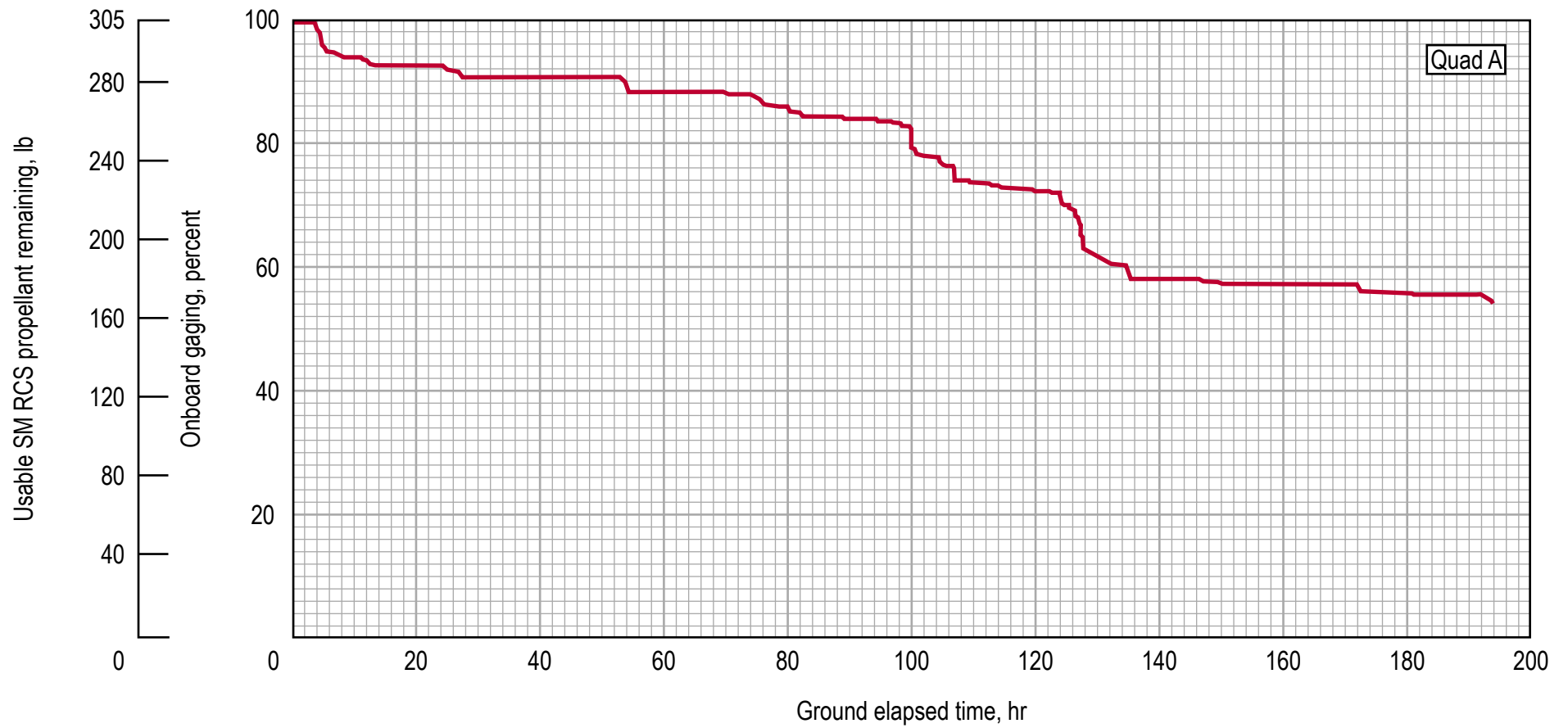


Figure 5-2  
SM RCS propellant profile - quad A

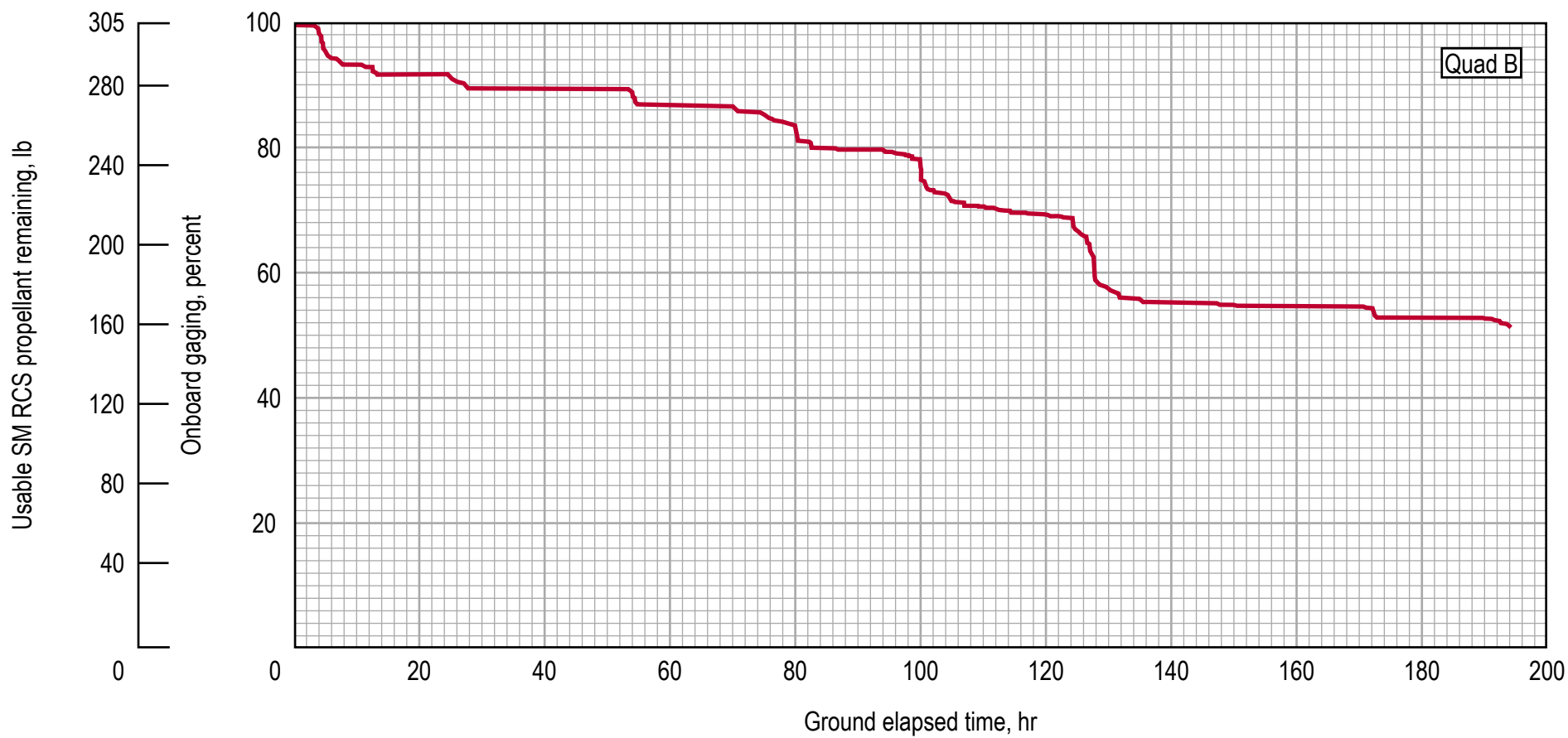


Figure 5-3  
SM RCS propellant profile - quad B

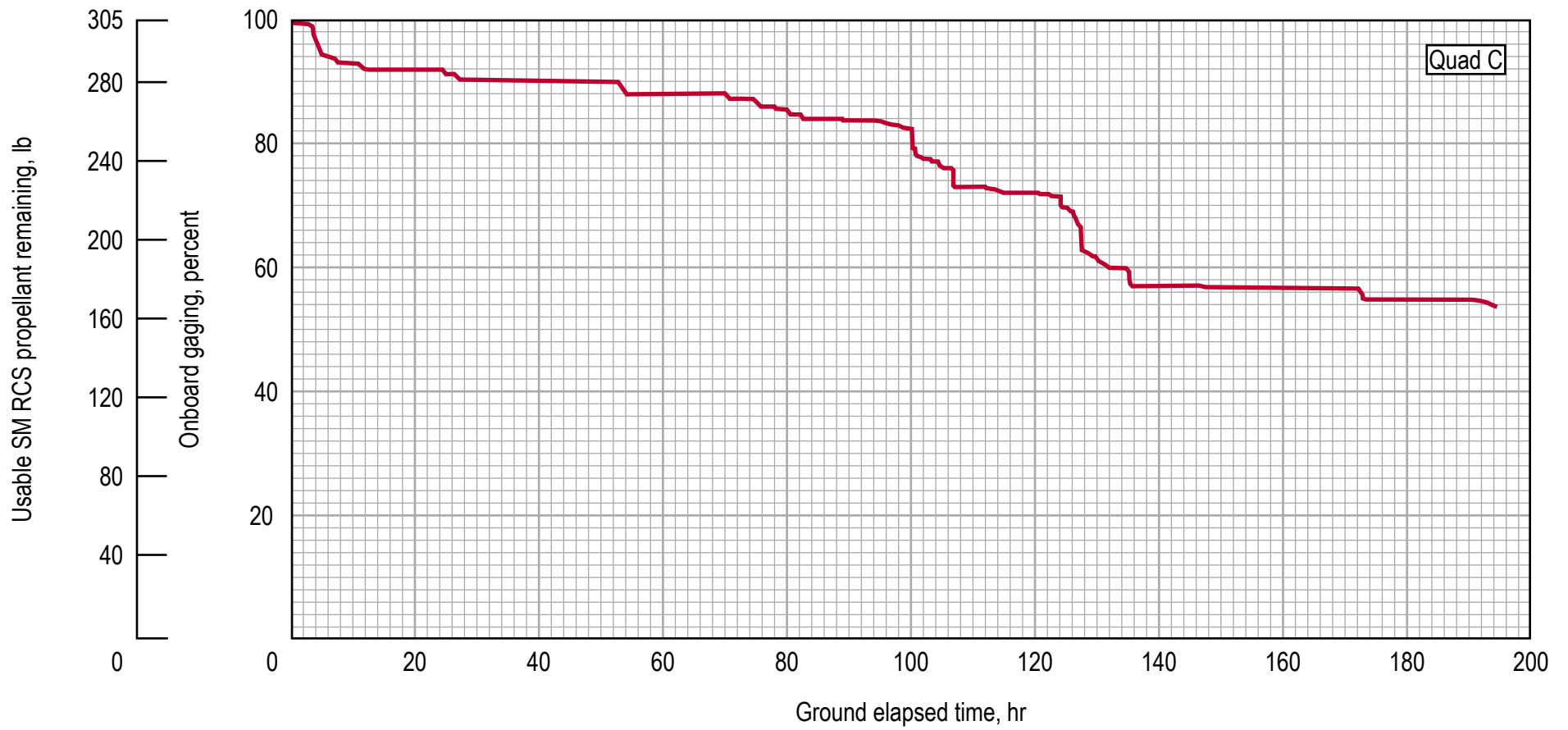


Figure 5-4  
SM RCS propellant profile - quad C

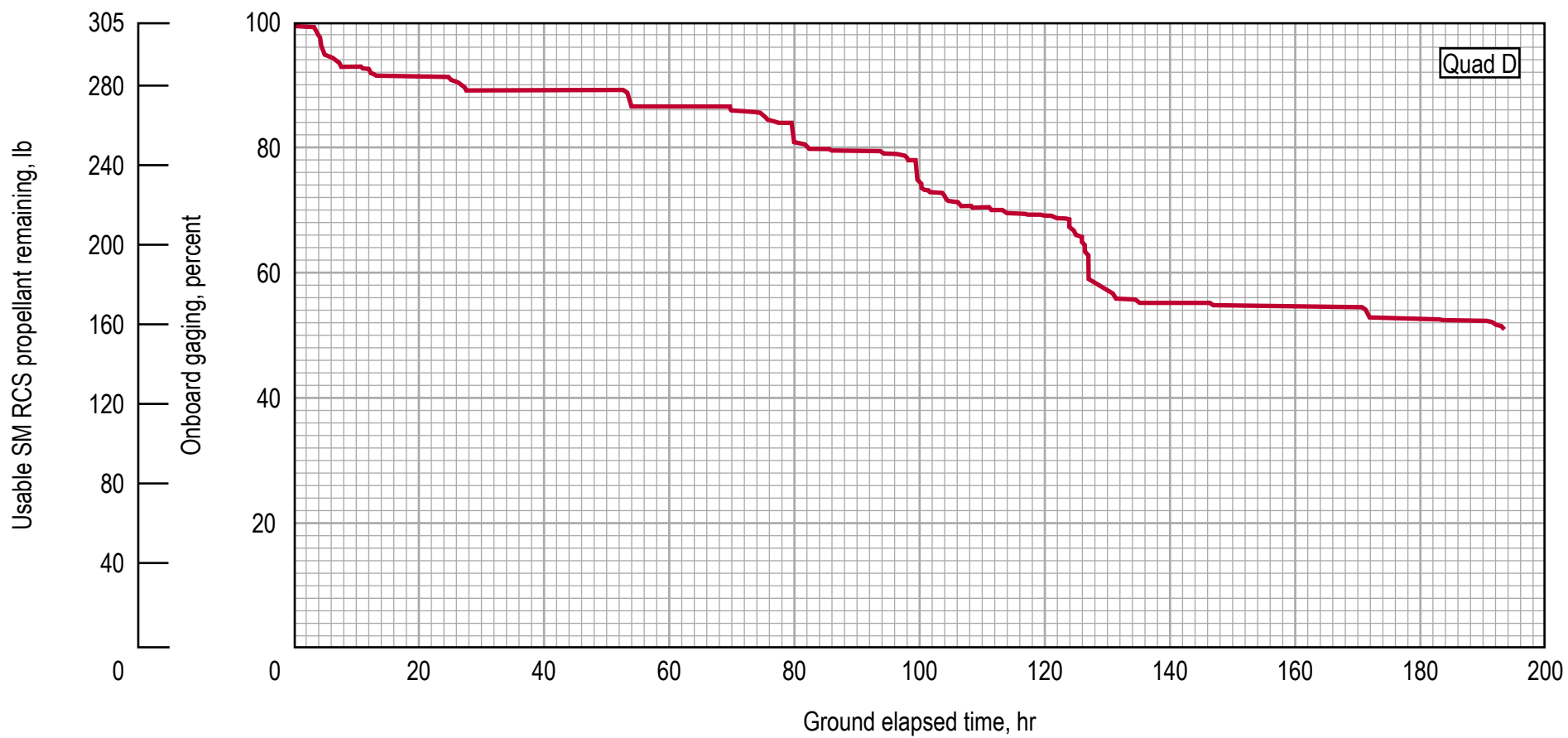


Figure 5-5  
SM RCS propellant profile - quad D

TABLE 5-3  
CM RCS Propellant Summary

<u>Item</u>	<u>Propellant required, lb.</u>	<u>Propellant remaining, lb.</u>
Loaded	--	245.0
Trapped	36.4	208.6
Available for mission planning	--	208.6
Nominal usage	39.3	169.3
Nominal remaining	--	169.3

## SERVICE PROPULSION SYSTEM

SERVICE PROPULSION SYSTEM (SPS). - The budget presented in table 5-4 is for a July 16 launch, 72 degree launch azimuth, first opportunity injection, 59.5 hour lunar parking orbit, and fast earth return. The assumptions used in preparing this budget are presented in table 5-5.  $\Delta V$  requirements were coordinated with LMAB in MPAD.

It should be noted that the mission flexibility allowance of 900 fps has been used in addition to the fast return. In real time however, it is highly likely that a slower earth return would be performed in the mission flexibility  $\Delta V$  had already been used (e.g., for LM rescue). Table 5-4 shows 3906 lbs of propellant remaining nominally and a total propellant margin (accounting both for the flexibility  $\Delta V$  and the fast return) of 1268 lb.

Table 5-4 - APOLLO 11 SPS PROPELLANT SUMMARY

<u>ITEM</u>	<u>PROPELLANT REQUIRED, LB</u>	<u>PROPELLANT REMAINING, LB</u>
Loaded <sup>a</sup>	--	40803.0
Trapped and unavailable	441.4	40361.6
Outage	59.5	40302.1
Unbalance meter	100.0	40202.1
Available for $\Delta V$	--	40202.1
Required for $\Delta V$		
TLMC (120 fps) <sup>b</sup>	1166.4	39035.7
LOI-1 (2924 fps, 5 min. 59 sec.)	23862.4	15173.3
LOI-2 (157.8 fps, 16.4 sec.)	1115.4	14057.9
LOPC (16.6 fps, .9 sec.)	73.8	13984.1
TEI (3292.7 fps, 149 sec.)	10077.8	3906.3
Nominal remaining	--	3906.3
Mission flexibility (900 fps)	2212.4	1693.9
Dispersions (-3 $\sigma$ )	426.0	1267.9
Propellant margin	--	1267.9

<sup>a</sup> 15712.0 lb of fuel and 25091.0 lb of oxidizer; this is loaded on CSM-107.

<sup>b</sup> Includes 19.7 fps for evasive maneuver.



TABLE 5-5 - ASSUMPTIONS FOR THE APOLLO 11 SPS PROPELLANT BUDGET

1. There is a non-propulsive propellant loss of 14.4 lb for each engine start. LM rescue assumed three engine starts.
2. A mission flexibility  $\Delta V$  of 900 fps has been included in the SPS budget to provide the capability to perform a worst case LM rescue, or to handle several other contingencies (such as loss of PGNCs), or to perform a quicker earth return.
3. Spacecraft weight:

CM	12 280.0 lb
SM	10 551.3 lb
SLA Ring	98.0 lb
Tanked SPS	40 600.7 lb
LM (unmanned)	33 278.3 lb
Total	96 808.3 lb

4. Lunar Orbit Activity
  - Total weight transfer (CSM to LM) = 436.7 lb
  - Total weight transfer (LM to CSM) = 284.0 lb

5. SM RCS, EPS and ECS weight losses:

<u>Mission Period</u>	<u>Incremental Weight Loss, lb</u>
EL to TLMC	151.8
TLMC to LOI-1	327.1
LOI-1 to LOI-2	32.0
LOI-2 to LOPC	146.5
LOPC to TEI	216.1

6. SM RCS usage (above nominal rendezvous requirement) for LM rescue was 216 lb.

## LM RCS BUDGET

### Ground Rules and Assumptions

1. Data for the LM RCS engine performance and propellant requirements were obtained from the Spacecraft Operational Data Book and postflight analysis from Apollo 9 and Apollo 10.
2. All orientation maneuvers were assumed to be made at  $2.0^\circ/\text{sec}$ .
3. All orientation maneuvers were assumed to be three-axis maneuvers.

TABLE 5-6

### LM RCS Propellant Loading and Usage Summary

Loaded	633.0
Trapped	40.6
Nominal deliverable	592.4
Gaging inaccuracy and loading tolerance	39.5
Mixture ratio uncertainty	17.0
Usable	535.9
Nominal mission requirement	252.7
Nominal remaining	283.2

TABLE 5-7

LM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	(a)		(b)	(b)
		S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
0 00	OUTPUT PROPELLANT LOADINGS	33714.	.0	633.0	100.
99 25	RCS HOT FIRE	33709.	5.0	628.0	99.2
100 15	UNDOCKING	33709.	.0	628.0	99.2
100 15	NULL UNDOCKING VELOCITY	33707.	1.9	626.1	98.9
100 20	LM MNVR FOR INSPECTION YAW	33705.	1.7	624.4	98.6
100 20	LM MNVR FOR INSPECTION PITCH	33703.	2.0	622.4	98.3
100 25	LM MNVR FOR INSPECTION YAW	33702.	.8	621.6	98.2
100 25	FORMATION FLYING	33690.	2.0	619.6	97.9
100 50	RR LOCK ON MNVR	33687.	3.6	616.0	97.3
101 00	IMU REALIGN STAR 1	33683.	3.6	612.4	96.7
101 00	IMU REALIGN STAR 2	33680.	3.6	608.8	96.2
101 00	IMU REALIGN STAR 3	33676.	3.6	605.2	95.6
101 32	MNVR TO DOI BURN ATTITUDE	33672.	3.6	601.6	95.0
101 32	ATTITUDE HOLD	33672.	.1	601.5	95.0
101 38	2 JET ULLAGE	33667.	5.9	595.6	94.1
101 38	DOI BURN	33419.	.0	595.6	94.1
101 38	MOMENT CONTROL DOI BURN	33414.	5.0	590.6	93.3
101 38	TRIM HORIZONTAL RESIDUAL	33407.	7.6	583.0	92.1
101 38	ATTITUDE HOLD	33407.	.3	582.8	92.1
101 38	PITCH DOWN	33406.	1.0	581.8	91.9
101 42	RR LOCK ON MNVR	33402.	3.6	578.2	91.3
101 55	PITCH DOWN	33401.	.6	577.6	91.3
101 55	YAW LEFT	33401.	.6	577.0	91.2
102 00	ALIGNMENT CHECK	33400.	1.2	575.8	91.0
102 10	RR LOCK ON MNVR	33396.	3.6	572.2	90.4
102 14	MNVR TO PDI ATTITUDE	33392.	3.6	568.6	89.8
102 14	MAINTAIN LOS	33391.	1.0	567.6	89.7
102 29	ATTITUDE HOLD	33391.	.1	567.5	89.7
102 35	2 JET ULLAGE	33385.	5.9	561.7	88.7
102 35	PDI BURN	16753.	.0	561.7	88.7
102 35	POWERED DESCENT	16710.	34.1	527.5	83.3
102 47	TOUCHDOWN	16710.	.0	527.5	83.3

<sup>a</sup> These weights were used for analysis only and do not reflect the actual weight after consumables loading.

<sup>b</sup> RCS propellant remaining of total loaded.

TABLE 5-7 (CONT'D)

LM-RCS PROPELLANT BUDGET					
TIME (HR)	EVENT	(a)		(b)	
		S/C WT (LBS)	S/C RCS USED (LBS)	S/C RCS LEFT (LBS)	S/C RCS LEFT (%)
112 40	ADD LUNAR SAMPLES	16580.	.0	527.5	83.3
124 23	LUNAR LIFT OFF	10840.	.0	527.5	83.3
124 23	POWERED ASCENT PHASE WITH RCS/APS INTERCONNECT	6087.	.0	527.5	83.3
124 23	POWERED ASCENT PHASE WITHOUT RCS/APS INTERCONNECT	5969.	.9	526.7	83.2
124 25	RR LOCK ON MNVR	5969.	.4	526.2	83.1
124 30	INSERTION BURN CONTROL	5967.	1.8	524.4	82.8
124 30	TRIM OUT OF PLANE ERROR	5964.	3.3	521.2	82.3
124 30	ATTITUDE HOLD	5962.	1.3	519.9	82.1
124 37	IMU REALIHN STAR 1	5962.	.4	519.5	82.1
124 37	IMU REALIHN STAR 2	5961.	.4	519.0	82.0
124 37	IMU REALIHN STAR 3	5961.	.4	518.6	81.9
124 55	RR LOCK ON MNVR	5961.	.4	518.1	81.9
124 55	MAINTAIN LOS	5958.	2.7	515.5	81.4
125 15	ATTITUDE HOLD	5957.	1.3	514.2	81.2
125 21	CSI BURN RCS +2	5923.	33.6	480.6	75.9
125 26	MAINTAIN LOS	5920.	3.3	477.2	75.4
125 44	MNVR TO PLANE CHANGE ATTITUDE	5919.	.4	476.8	75.3
125 45	ATTITUDE HOLD	5918.	1.3	475.5	75.1
125 50	RCS PLANE CHANGE BURN	5914.	4.1	471.4	74.5
126 00	RR LOCK ON MNVR	5913.	.4	471.0	74.4
126 00	MAINTAIN LOS	5911.	2.0	469.0	74.1
126 15	ATTITUDE HOLD	5910.	1.3	467.7	73.9
126 19	CDH RCS BURN	5906.	4.0	463.7	73.3
126 19	MAINTAIN LOS	5902.	4.0	459.7	72.6
126 53	ATTITUDE HOLD	5901.	1.3	458.4	72.4
126 58	RCS TPI BURN	5884.	17.0	441.4	69.7
126 58	MAINTIN LOS	5883.	1.3	440.1	69.5
127 36	MCC AND BRAKING	5849.	33.9	406.3	64.2
127 36	ATTITUDE AND LOS CONTROL	5833.	16.0	390.3	61.7
128 00	LM CONTROL CSM ACTIVE DOCKING	5823.	10.0	380.3	60.1

<sup>a</sup> These weights were used for analysis only and do not reflect the actual weight after consumables loading.

<sup>b</sup> RCS propellant remaining of total loaded.

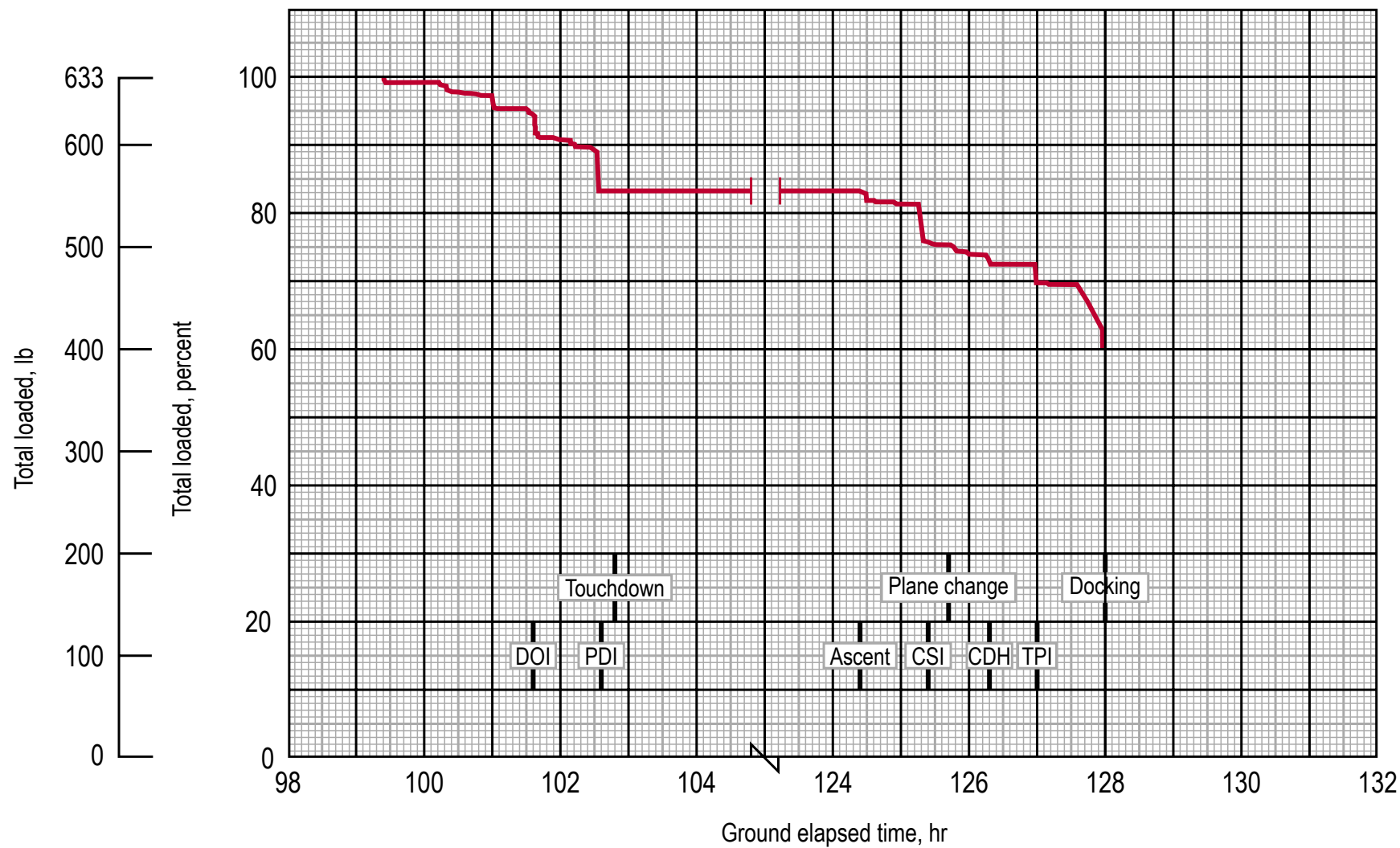


Figure 5-6  
LM RCS propellant profile

#### DESCENT PROPULSION SYSTEM PROPELLANT BUDGET

DESCENT PROPULSION SUBSYSTEM (DPS) - The DPS budget is shown in table 5-8 and the ground rules and assumptions in table 5-9.

Previously, the uncertainty in the low-level sensor (68.7 lb) has been shown as a contingency allowance. This is now included as part of the unusables. Also, there has previously been a contingency allowance for manual hover to allow for 2 minutes of burn time from 500 feet to touchdown. The present budget shows a nominal  $\Delta V$  which includes a manual allowance of 477 fps (90 sec) from 500 feet to touchdown. Any additional hover time will be used from the propellant margin (unassigned capability). The rate of use for hover is approximately 9.1 lb/sec.

Propellant loads are those actually loaded on LM-5, and trapped and residual propellants are from Volume III, SODB. Engine performance data and  $\Delta V$  requirements have been coordinated with LAB in MPAD.

Three sigma dispersions represent total propellant cost due to 3 s uncertainties in propellant loading, trapped,  $I_{sp}$ ,  $\Delta V$ , separation weight, non- $\Delta V$  consumables weight, and mixture ratio. There is a total propellant margin of 669 lb or approximately 73 seconds of hover time.

Table 5-8 - APOLLO 11 DPS PROPELLANT SUMMARY

<u>ITEM</u>	<u>PROPELLANT REQUIRED, LB</u>	<u>PROPELLANT REMAINING, LB</u>
Loaded <sup>a</sup>	--	18184.2
Trapped and unavailable	223.5	17960.7
Outage	14.0	17946.7
Low-Level Sensor Uncertainty	68.7	17878.0
Available for $\Delta V$	--	17878.0
Nominal Required for $\Delta V$ of 6728.6 fps	16799.7	1078.3
Dispersions (-3 $\sigma$ )	224.7	853.6
Contingencies		
Engine Valve-Pair Malfunction ( $\Delta MR = \pm 0.016$ )	81.1	772.5
Redesignation (60 fps)	104.0	668.5
Margin (73 sec. hover)	--	668.5

<sup>a</sup> 6974.8 lb of fuel and 11209.4 lb of oxidizer; this is loaded on the LM-5 spacecraft.

Table 5-9 - ASSUMPTIONS FOR THE APOLLO 11 DPS PROPELLANT BUDGET

1. Integrated average  $I_{sp} = 301.9 \pm 3.54$  seconds
2. LM separation weight = 33746. lb
3. Mixture ratio =  $1.596 \pm 0.0108$
4. Nominal  $\Delta V = 6728.6 \pm 96$  fps
5. Non- $\Delta V$  consumables of 47.4 lb from separation to DOI and 106.1 lb from DOI to touchdown.

ASCENT PROPULSION SYSTEM PROPELLANT BUDGET

ASCENT PROPULSION SUBSYSTEM (APS) - Tables 5-10 and 5-11 present the ascent propellant budget for the current mission. Propellant loads are those actually on LM-5. Mission  $\Delta V$  was coordinated with LAB in MPAD. The budget shown in table 5-10 accounts for an engine valve-pair malfunction, a PGNCs to AGS switchover, and a touchdown abort. There is a total propellant margin of 68 lb or about 6 seconds of burn time.

Table 5-10 - APOLLO 11 APS PROPELLANT SUMMARY

<u>ITEM</u>	<u>PROPELLANT REQUIRED, LB</u>	<u>PROPELLANT REMAINING, LB</u>
Loaded <sup>a</sup>	--	5238.4
Trapped and unavailable	48.9	5189.5
Outage	17.5	5172.0
Available for $\Delta V$	--	5172.0
Nominal Required for $\Delta V$ of 6072.5 fps	4965.8	206.2
Dispersions ( $-3 \sigma$ )	57.8	148.4
Contingencies		
Engine Valve-Pair Malfunction ( $\Delta MR = \pm 0.016$ )	19.6	128.8
PGNCs to AGS Switchover (40 fps)	23.8	105.0
Touchdown Abort ( $\Delta W = +99.9$ lb, $\Delta \Delta V = -15$ fps)	36.8	68.2
Margin (6 seconds)	--	68.2

<sup>a</sup> Includes 2019.9 lb fuel and 3218.5 lb oxidizer; this is loaded on the LM-5 spacecraft.

Table 5-11 - ASSUMPTIONS FOR THE APOLLO 11 APS PROPELLANT BUDGET

1.  $I_{sp} = 308.97 \pm 3.553$  seconds
2. Mixture ratio =  $1.602 \pm 0.0225$
3. Nominal  $\Delta V = 6072.5 \pm 33.5$  fps
4. Ascent stage lift-off weight = 10873.6 lb

#### CSM-107/LM5 CRYOGENIC/EPS AND ECS BUDGET

The results of the Cryogenic, EPS, and ECS analysis are summarized in the following tables and figures:

TABLE 5-11	CSM Cryogenic Loading And Usage Summary
TABLE 5-13	LM EPS Summary
TABLE 5-14	LM ECS Summary
FIGURE 5-7	CSM O2 PROFILE
FIGURE 5-8	CSM H2 PROFILE
FIGURE 5-9	CSM POWER PROFILE
FIGURE 5-10	CSM BUS VOLTAGE VS TIME
FIGURE 5-11	LM DESCENT POWER PROFILE
FIGURE 5-12	LM ASCENT POWER PROFILE
FIGURE 5-13	LM TOTAL CURRENT PROFILE
FIGURE 5-14	LM DESCENT O2 PROFILE
FIGURE 5-15	LM ASCENT O2 PROFILE
FIGURE 5-16	LM DESCENT H2O PROFILE
FIGURE 5-17	LM ASCENT H2O PROFILE

#### CSM EPS BUDGET

##### ASSUMPTIONS AND GROUND RULES

1. The system was assumed to operate with three fuel cells and two inverters.
2. Fuel cell purging is included in the EPS requirements.
3. 100% fill for both H<sub>2</sub> and O<sub>2</sub>.
4. Three entry and postlanding batteries were considered available to supply the total spacecraft power required for entry, parachute descent, and postlanding time. Each battery was assumed to have a 40 A-h capacity until splashdown, at which time the capacity was uprated to 45 A-h.
5. Two batteries were considered to be in parallel with the fuel cells during ascent and for each SPS maneuver.
6. No cryogenic venting was assumed in flight.
7. The EPS hydrogen consumption rate (lb/hr) =  $0.00257 \times I_{fc}$
8. The EPS oxygen consumption rate (lb/hr) =  $7.936 \times \dot{H}_2$
9. Six battery charges were assumed: three on battery A and three on battery B.



TABLE 5-12  
APOLLO 11 CRYOGENIC SUMMARY

I.	Planning Allowance	H <sub>2</sub> , lb	O <sub>2</sub> , lb
	A. Total Loaded	58.60	660.20
	B. Less Residual	2.32	13.00
	C. Less Instrumentation Error	1.50	17.50
	Available for Mission Planning	54.78	629.70
II.	Predicted Usages		
	A. Prelaunch <sup>1</sup>		
	1. Inline HTR + Pressure Relief (T-28 to T-3 (Incl 12.5 hr hold ))	1.61	18.60
	2. Power Production (plus ECS O <sub>2</sub> ) (T-3 to liftoff)	.57	6.96
	Total Prelaunch requirements	2.18	25.50
	B. Flight		
	1. EPS Requirements (Incl FC Purge)	36.60	288.33
	2. CM ECS (Incl Cabin Purge)	-	72.40
	3. LM Pressurizations	-	10.35
	Total Flight Requirements	36.60	371.08
III.	Nominal Reserves (RSS)		
	EPS Uncertainty (5 percent)	1.83	14.42
	ECS Uncertainty (.08 lb/hr)	-	15.60
	Tank Unbalance (AOH)	.80	12.90
	Launch Window	.86	10.20
	RSS Subtotal	2.17	26.87
IV.	Operational Reserves		
	A. Available for Mission Planning	54.78	629.70
	B. Less Nominal Predicted Usage	38.78	396.58
	C. Less Nominal Reserves	2.17	26.87
	Operational Reserve	13.83	206.25

<sup>1</sup> KSC Supplied Data

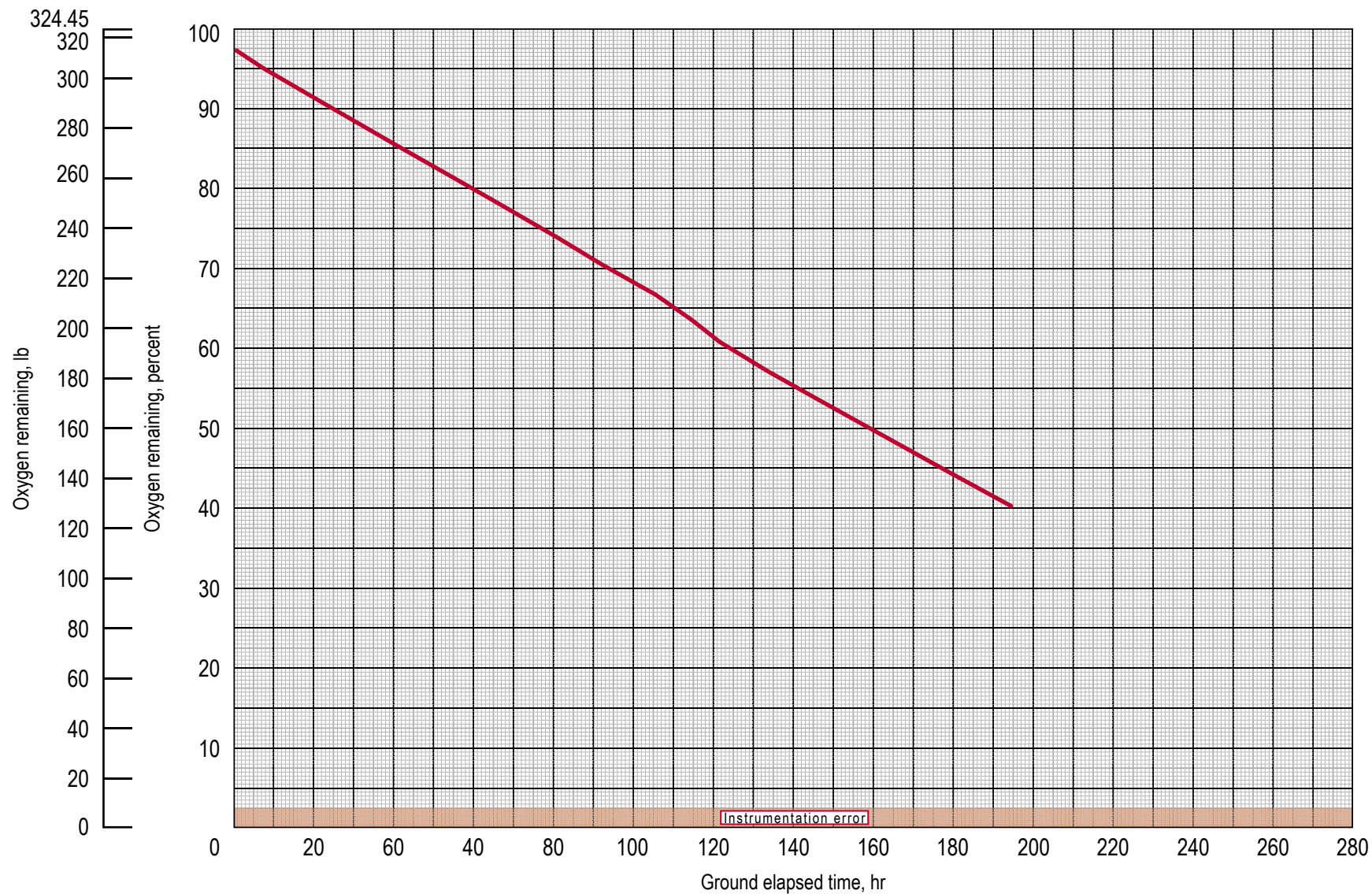


Figure 5-7  
Oxygen remaining for mission for one tank versus time

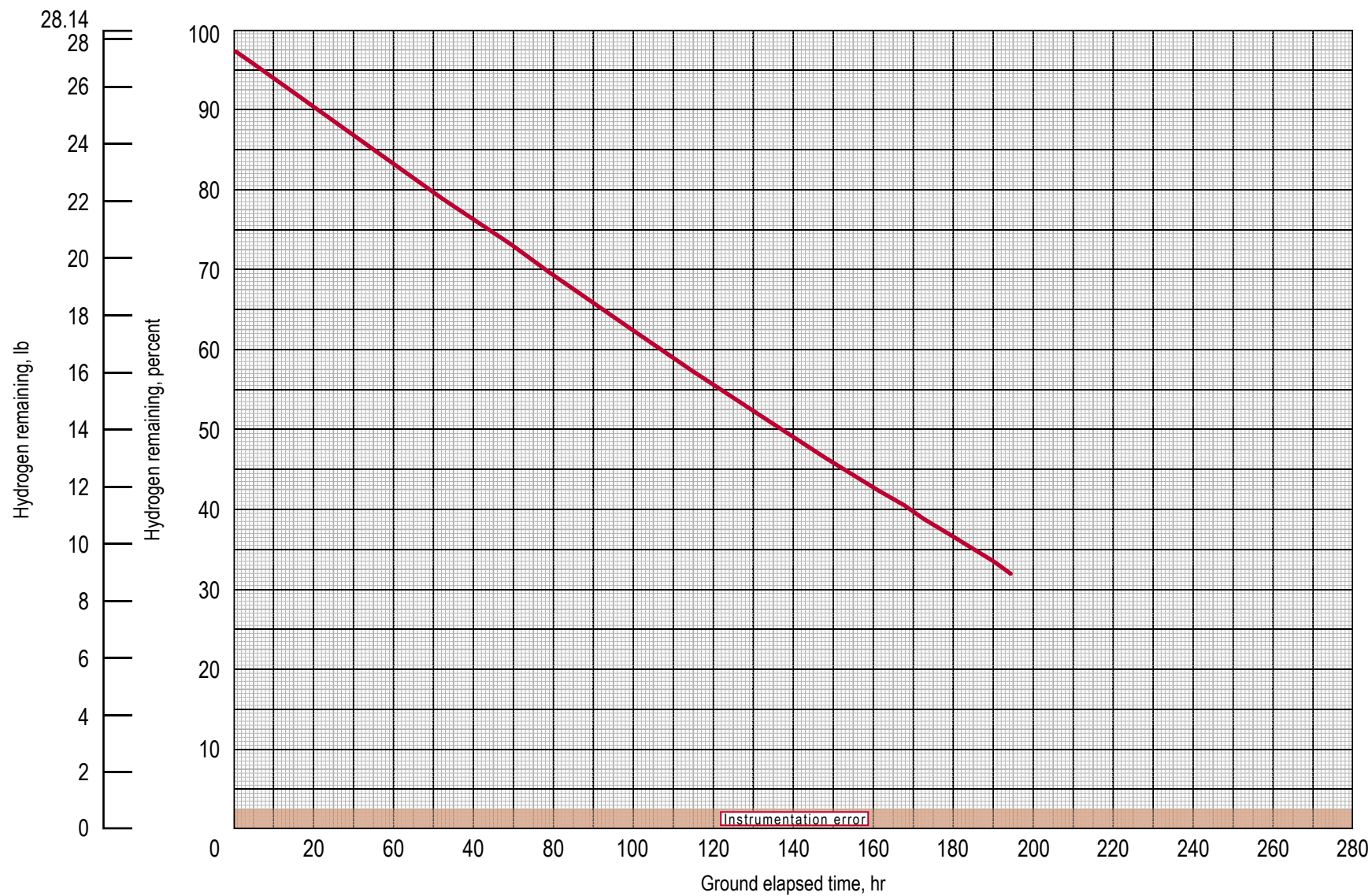


Figure 5-8  
Hydrogen remaining for mission for one tank versus time

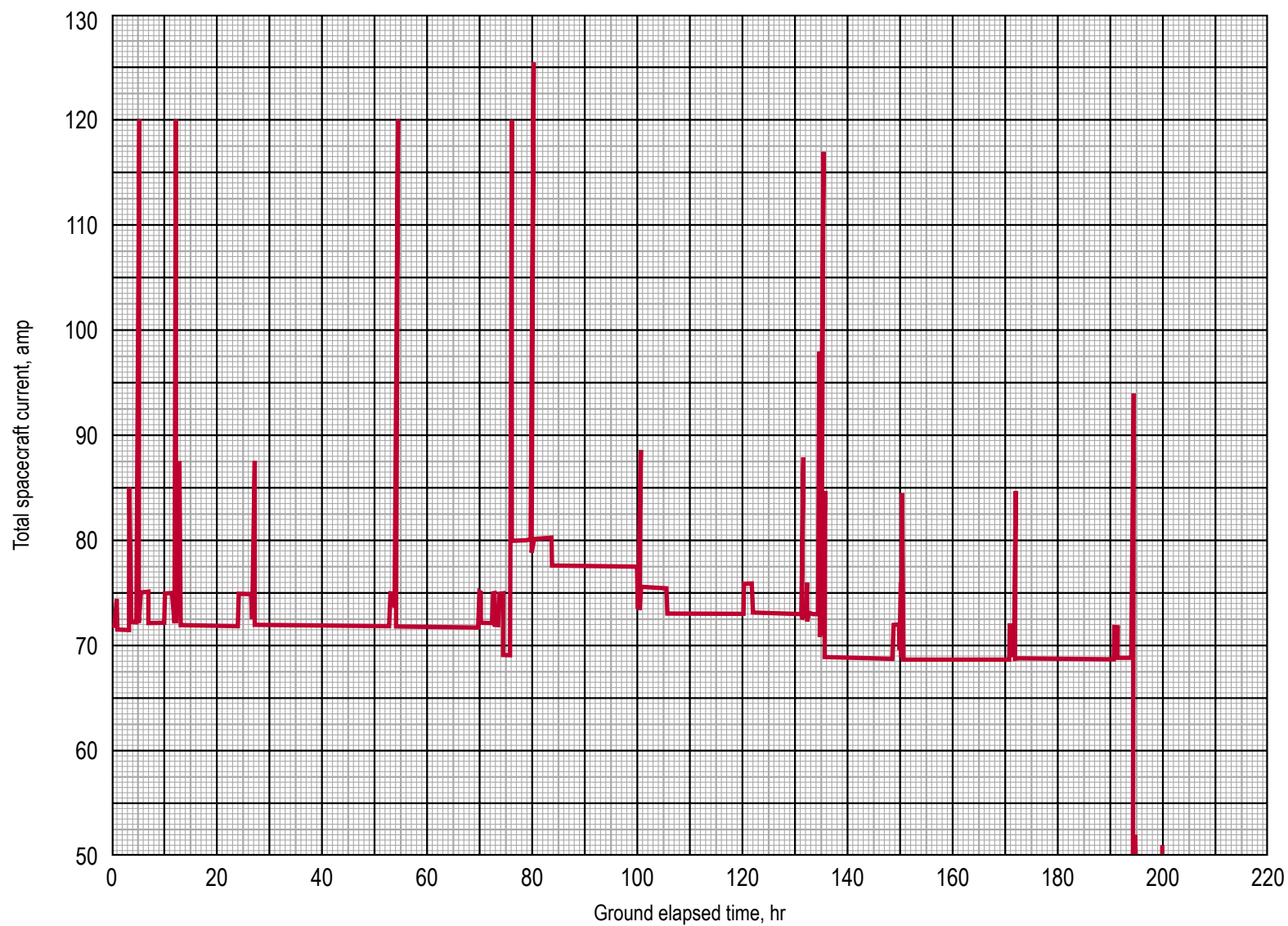


Figure 5-9  
CSM total spacecraft current profile

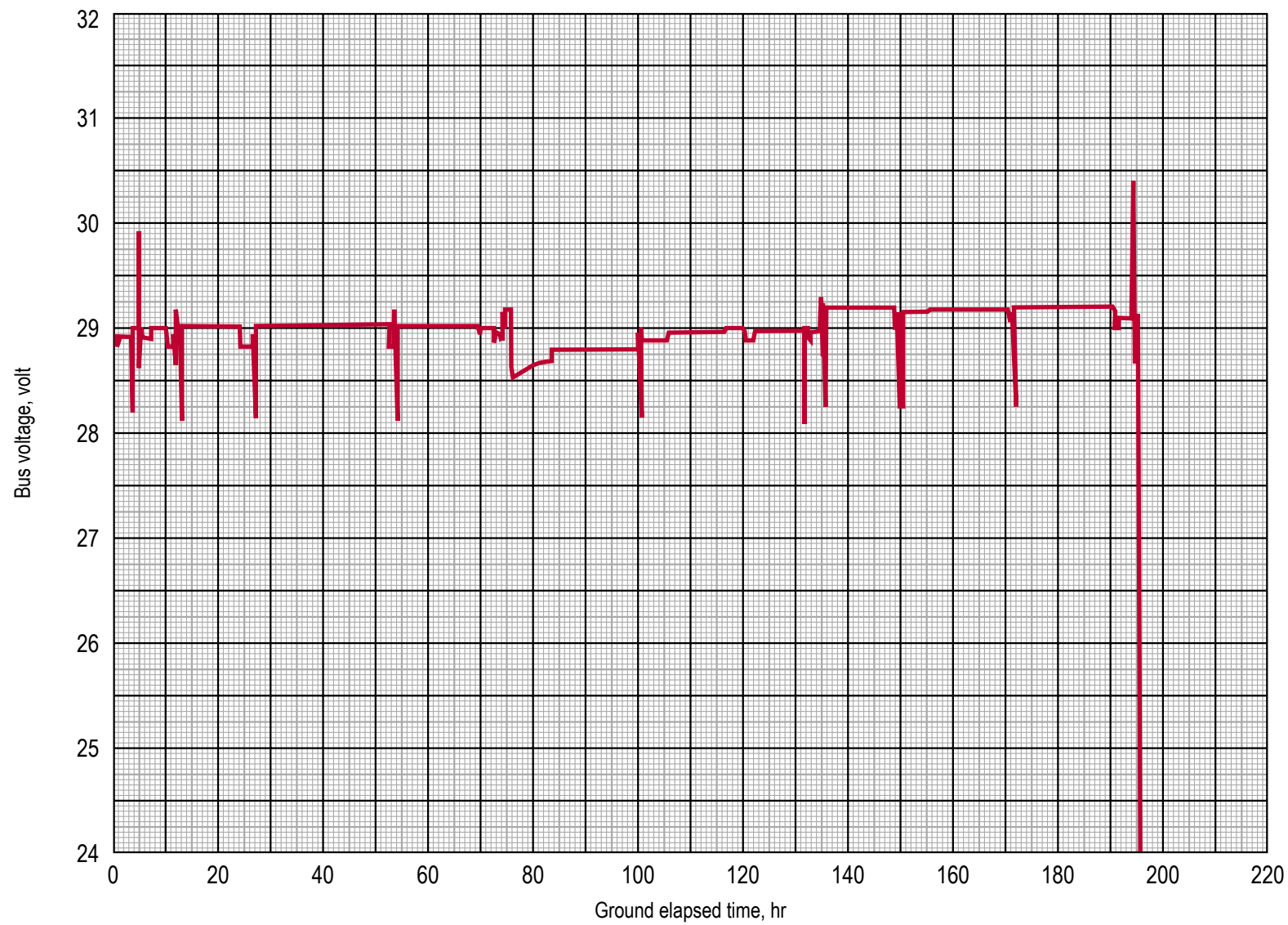


Figure 5-10  
CSM bus voltage versus time

## LM EPS ANALYSIS

### GROUND RULES AND ASSUMPTIONS

1. The descent stage batteries go on the line 30 minutes prior to earth liftoff.
2. A 3.8 hour checkout was assumed for lunar orbit.
3. Ascent and descent batteries were paralleled for the powered descent burn and prior to liftoff from the lunar surface.
4. The S-band equipment was assumed on 100 percent from initial activation in lunar orbit until completion of the mission.
5. The rendezvous radar electronics was assumed to be operational for the period of time dictated by the current G Mission flight plan.
6. The primary navigation and guidance subsystem (PGNCS) was left in the operate mode for the entire lunar stay.
7. The forward window heaters were left off for the entire mission.

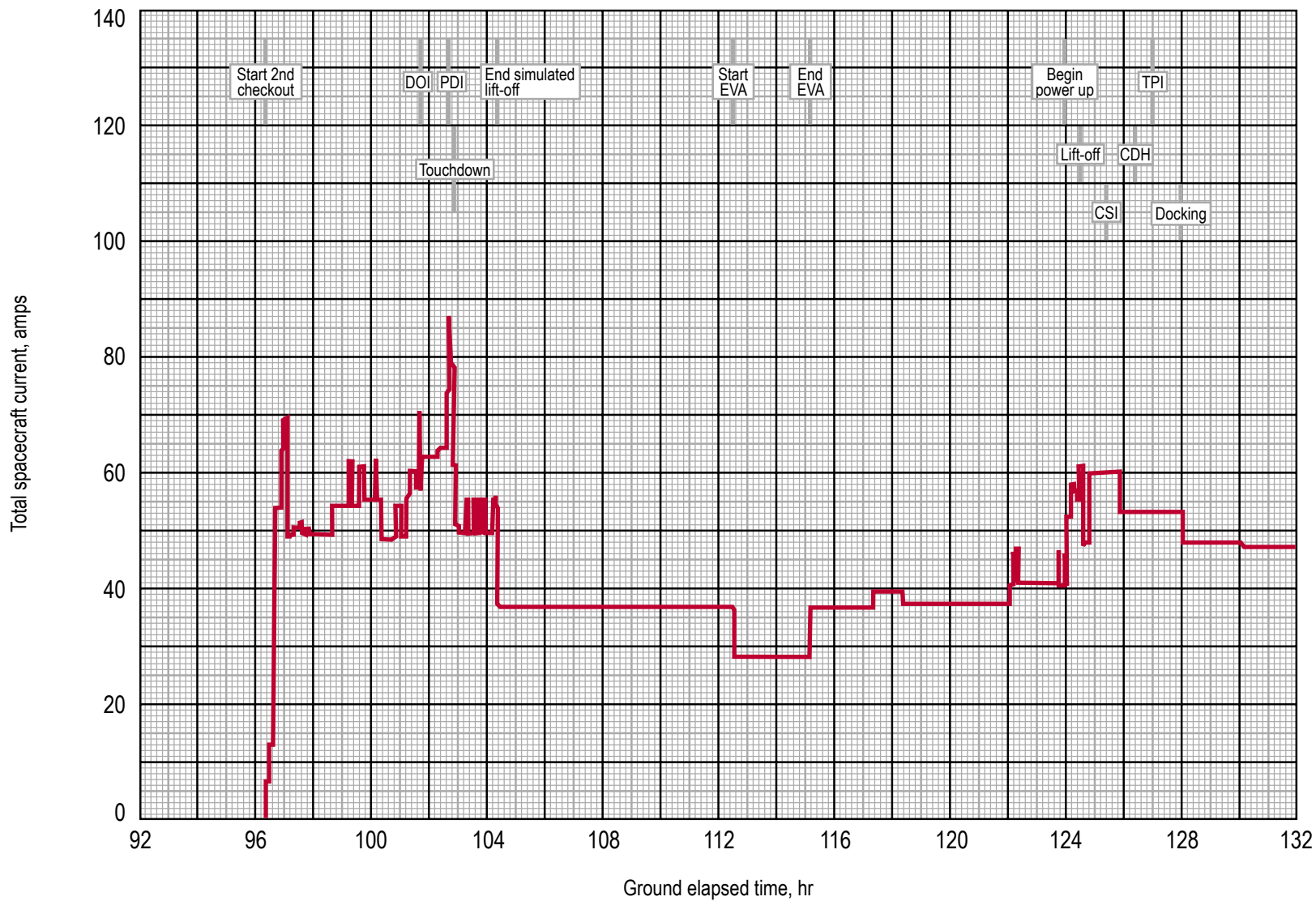


Figure 5-11  
LM-5 total spacecraft current

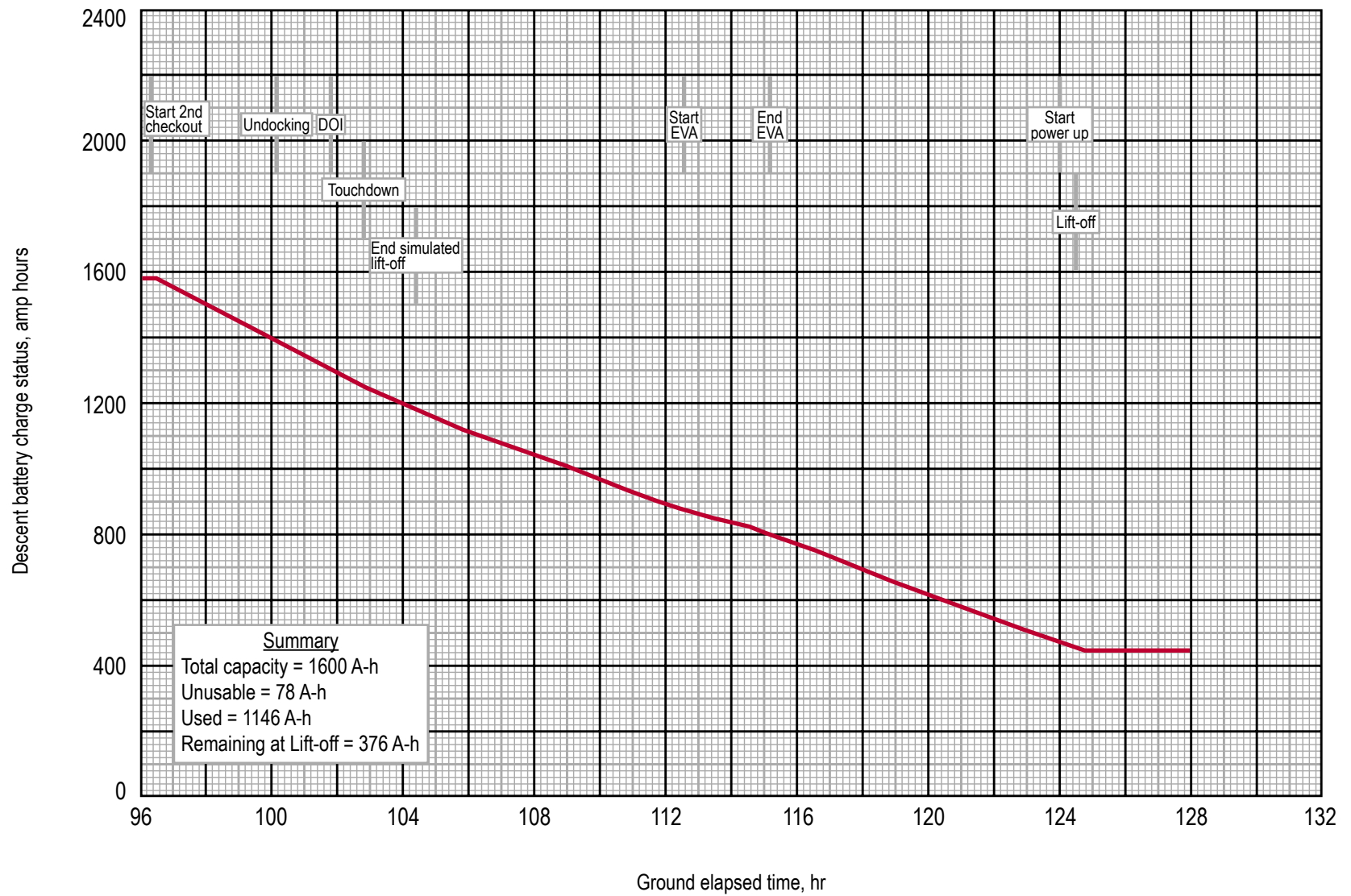


Figure 5-12  
Descent stage amp hours remaining



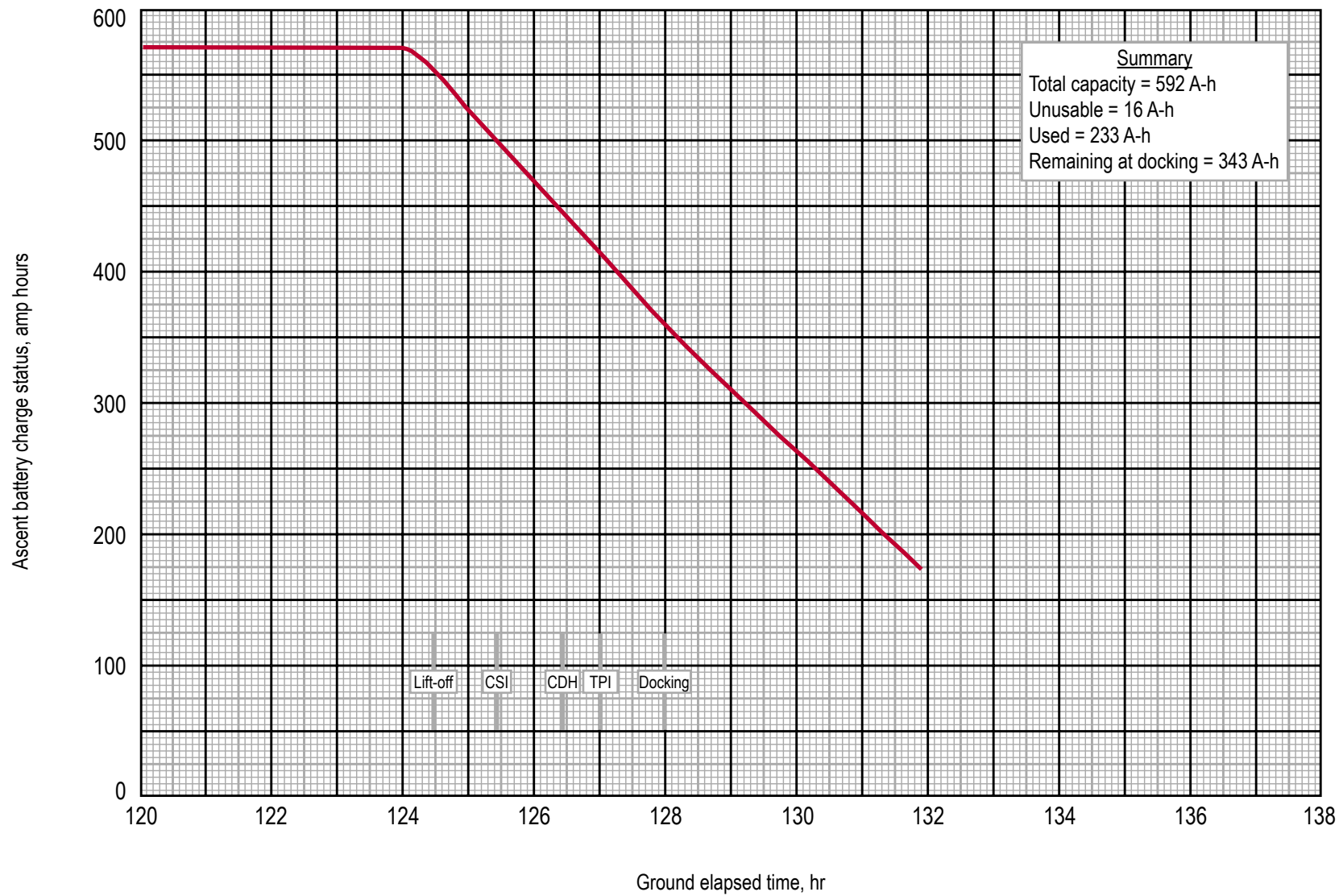


Figure 5-13  
 Ascent stage amp hours remaining

# LM ECS BUDGET

## GROUND RULES AND ASSUMPTIONS

1. Cabin O<sub>2</sub> leakage rate was 0.2 lb/hr while pressurized
2. Metabolic rates were varied according to Volume 2 of the Spacecraft Operational Data Book
3. Metabolic O<sub>2</sub> consumed was  $(1.643 \times 10^{-4}) \times (\text{metabolic rate})$
4. LM pressurization requires 6.62 lb of O<sub>2</sub>
5. Cabin pressure regulator check requires 2.65 lb of O<sub>2</sub>
6. H<sub>2</sub>O consumed because of sublimator cooling was total heat removed divided by 1040 (btu per lb) of H<sub>2</sub>O
7. H<sub>2</sub>O lost due to urination was 0.11 lb/hr per man
8. Cabin temperature control was set to 72° F
9. Average glycol flow rate was 250 lb/hr
10. Budget was performed on the operational trajectory and may change when the revision 1 is analyzed.

TABLE 5-13  
LM ECS Summary

### (a) Descent Stage

<u>Description</u>	<u>O<sub>2</sub>, lb</u>	<u>H<sub>2</sub>O, lb</u>
Loaded	48.00	210.6
Unusable	3.40	16.4
Available for mission	44.60	194.2
Required for mission	26.17	142.4
Usable remaining in tanks	18.43	51.8

### (b) Ascent Stage

Loaded	4.86	85.00
Unusable	.74	4.20
Available for mission	4.12	80.80
Required for mission	1.95	45.48
Usable remaining in tanks	2.17	35.32

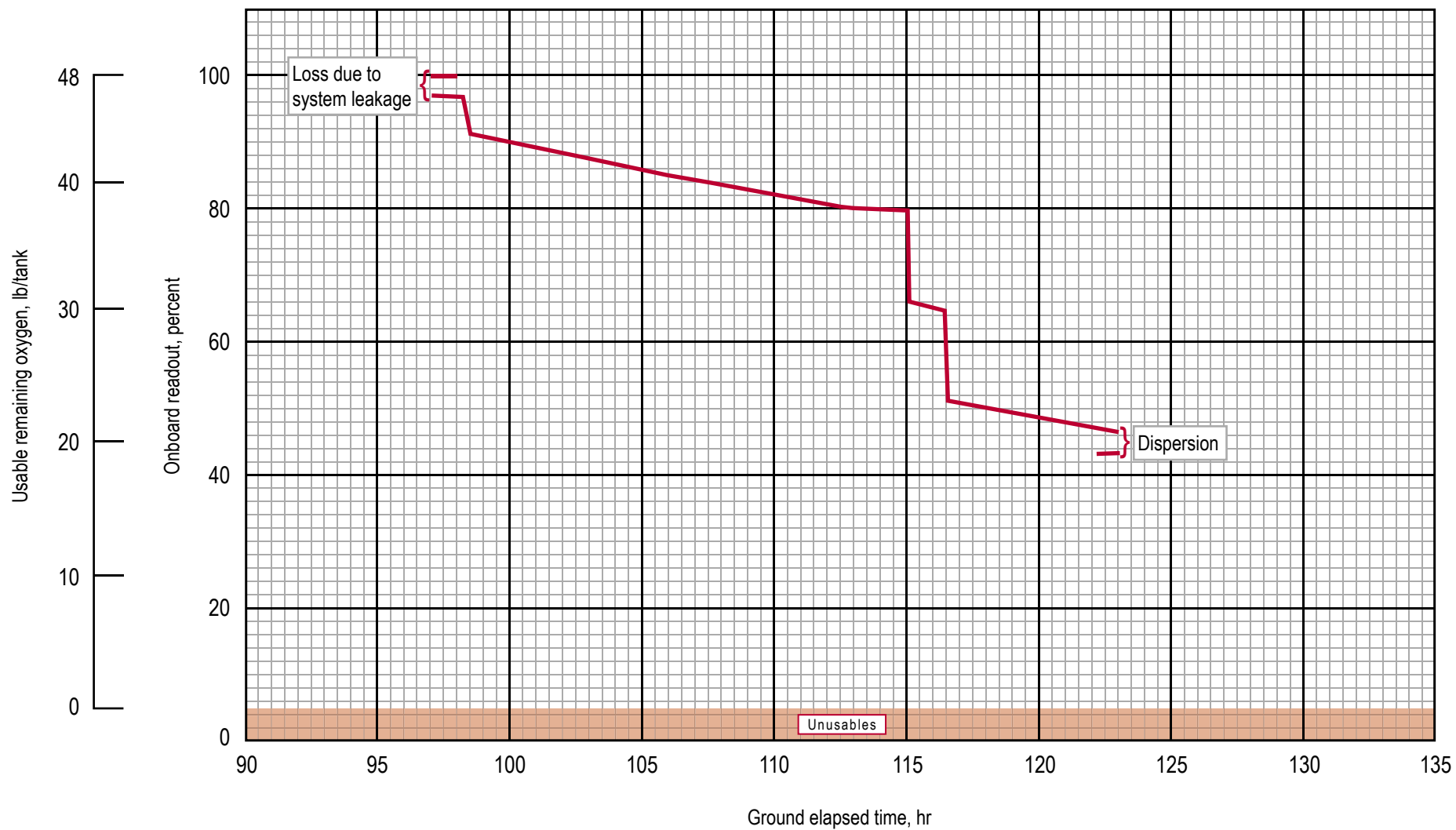


Figure 5-14  
Descent oxygen tank quantities as a function of mission time

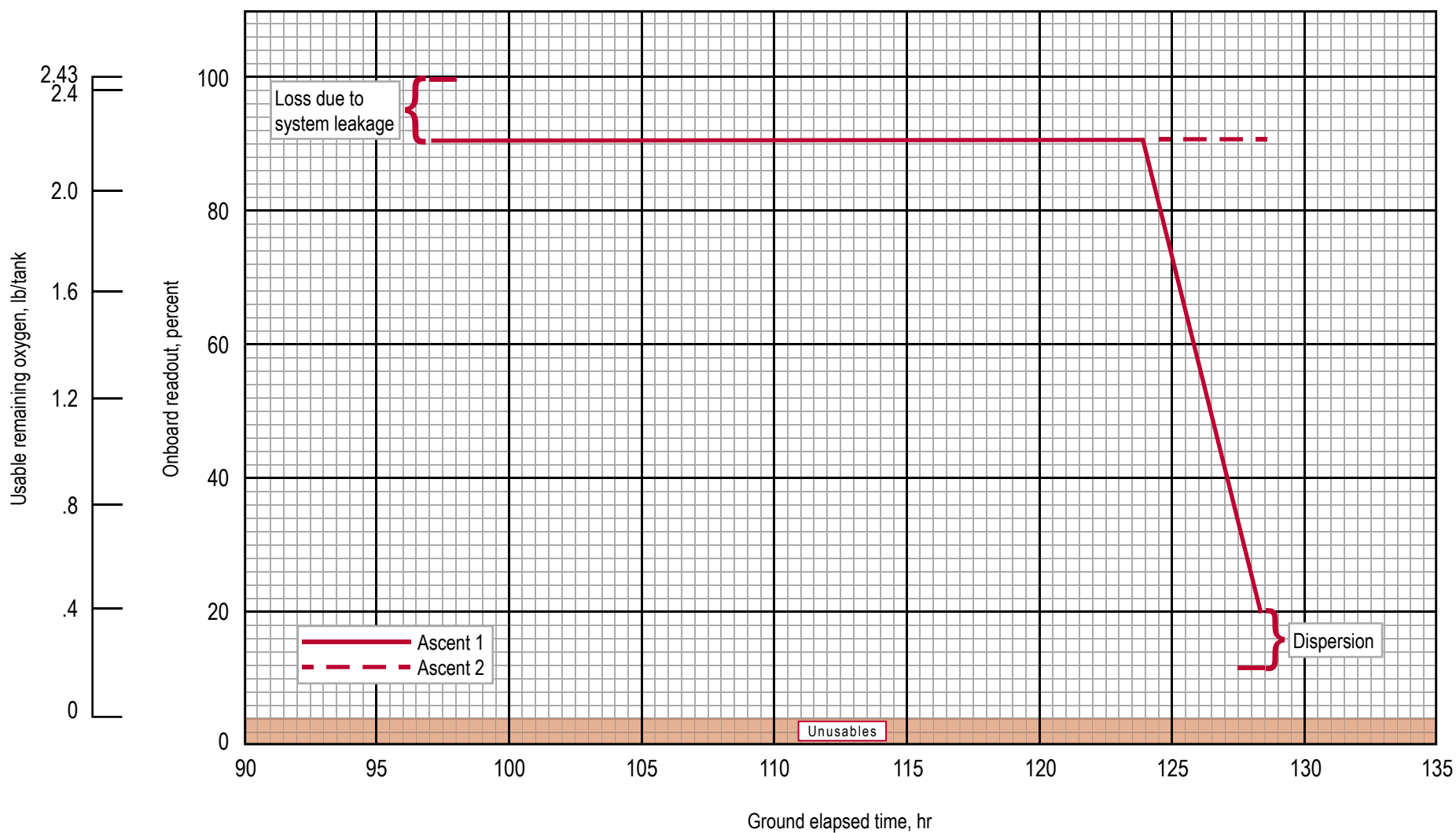


Figure 5-15  
Ascent oxygen tank quantities as a function of mission time

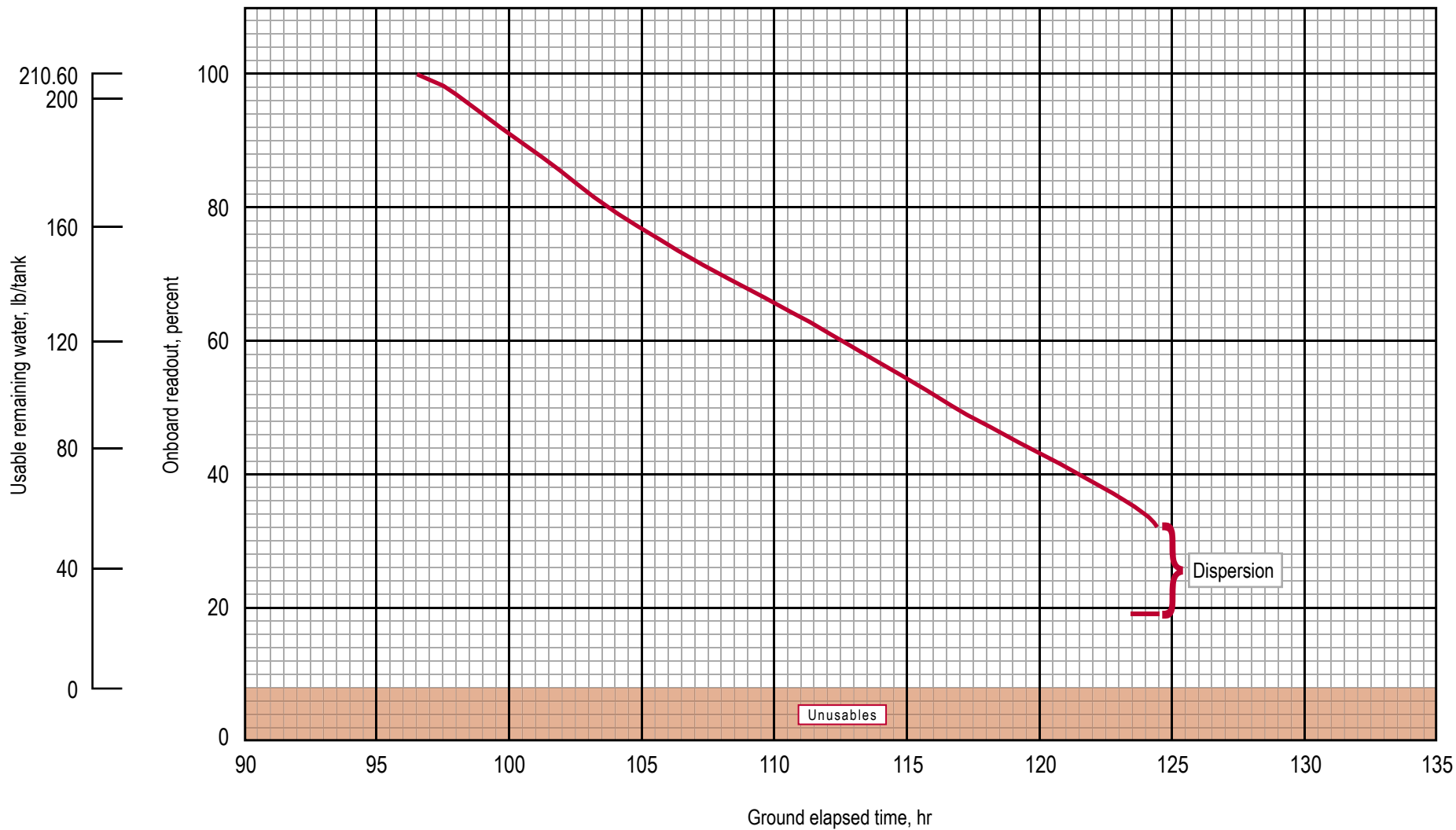


Figure 5-16  
Descent water tank quantities as a function of mission time

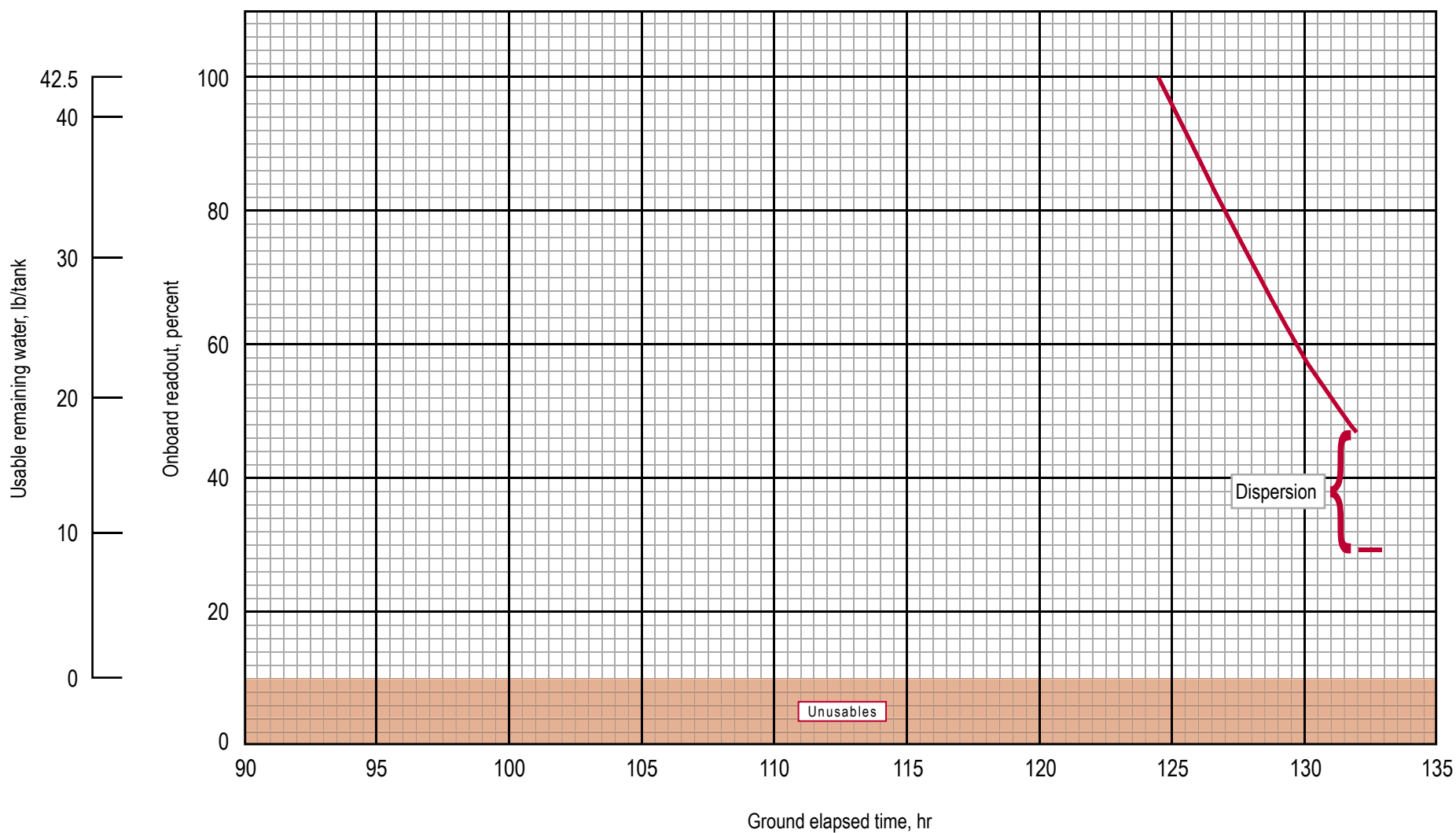


Figure 5-17  
Ascent water tank quantities as a function of mission time

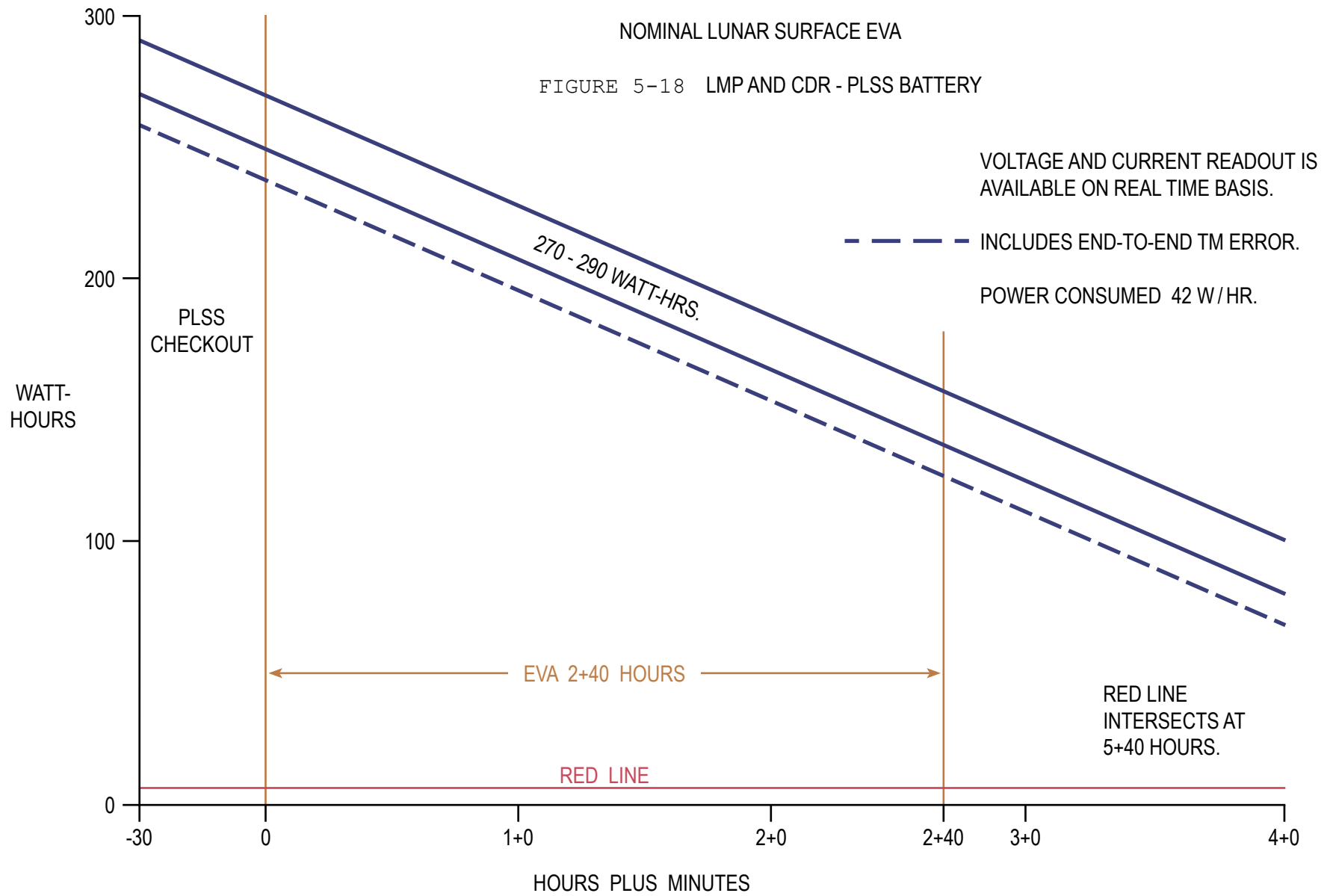
## MISSION G PLSS CONSUMABLE ANALYSIS

THE RESULTS OF THE PLSS BATTERY, OXYGEN, WATER AND LiOH CONSUMABLE ANALYSIS ARE SUMMARIZED IN THE FOLLOWING FIGURES:

FIGURE5-18	LMP AND CDR PLSS BATTERY PROFILE
FIGURE5-19	CDR OXYGEN PROFILE
FIGURE5-20	LMP OXYGEN PROFILE
FIGURE5-21	CDR H2O PROFILE
FIGURE5-22	LMP H2O PROFILE
FIGURE5-23	LMP AND CDR LiOH CO2 PROFILE

# NOMINAL LUNAR SURFACE EVA

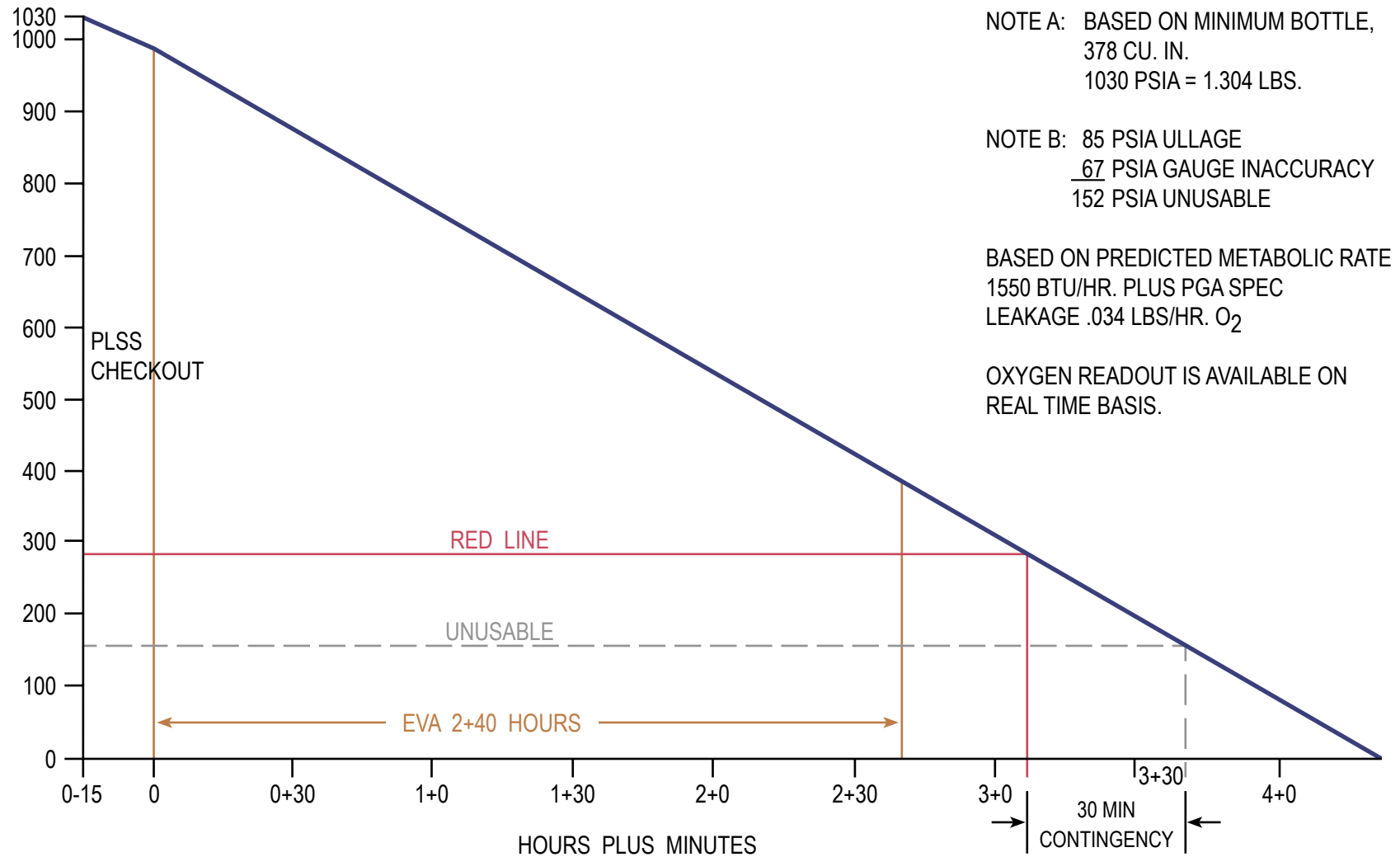
FIGURE 5-18 LMP AND CDR - PLSS BATTERY





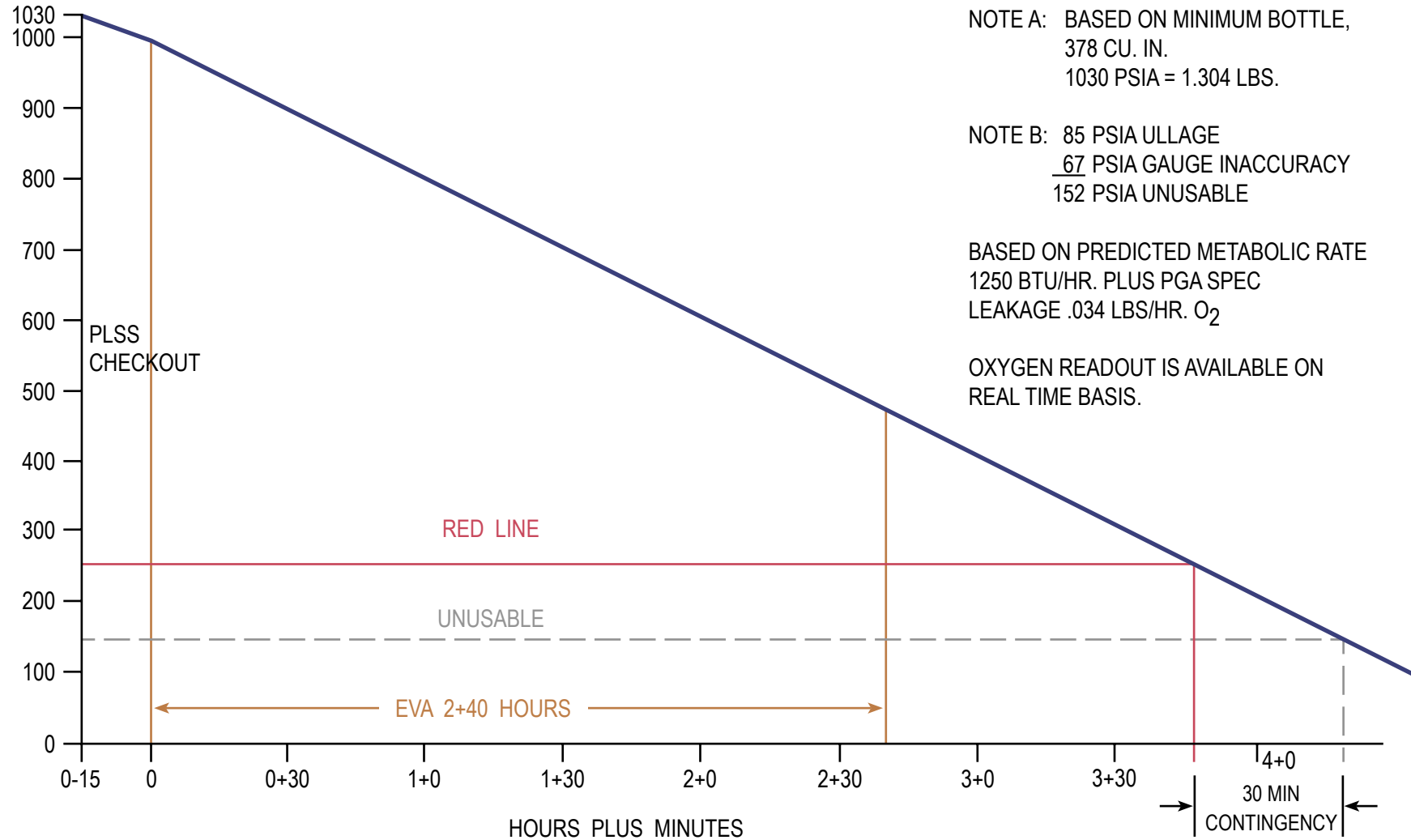
# NOMINAL LUNAR SURFACE EVA

FIGURE 5-19 CDR - OXYGEN



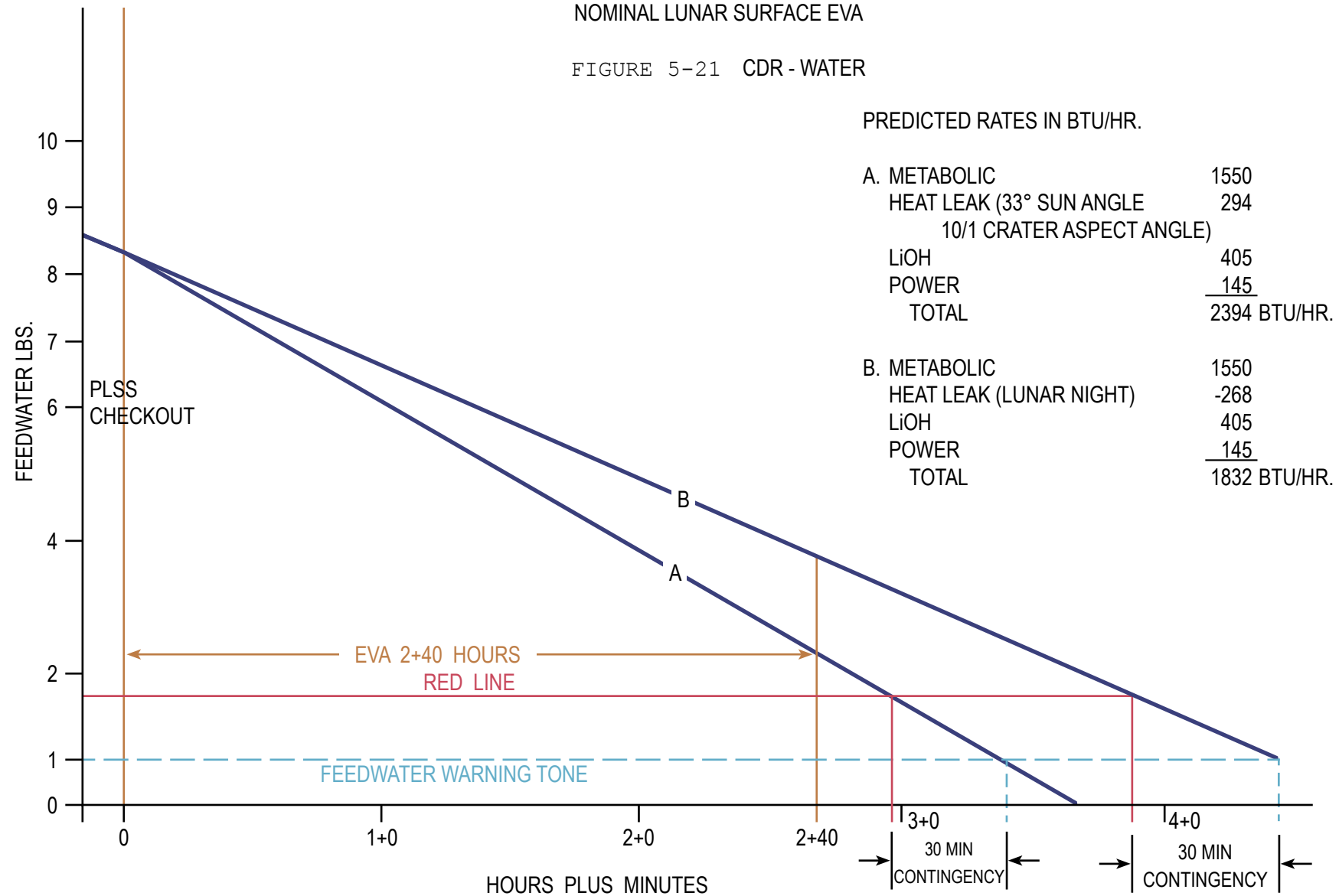
# NOMINAL LUNAR SURFACE EVA

FIGURE 5-20 LMP - OXYGEN



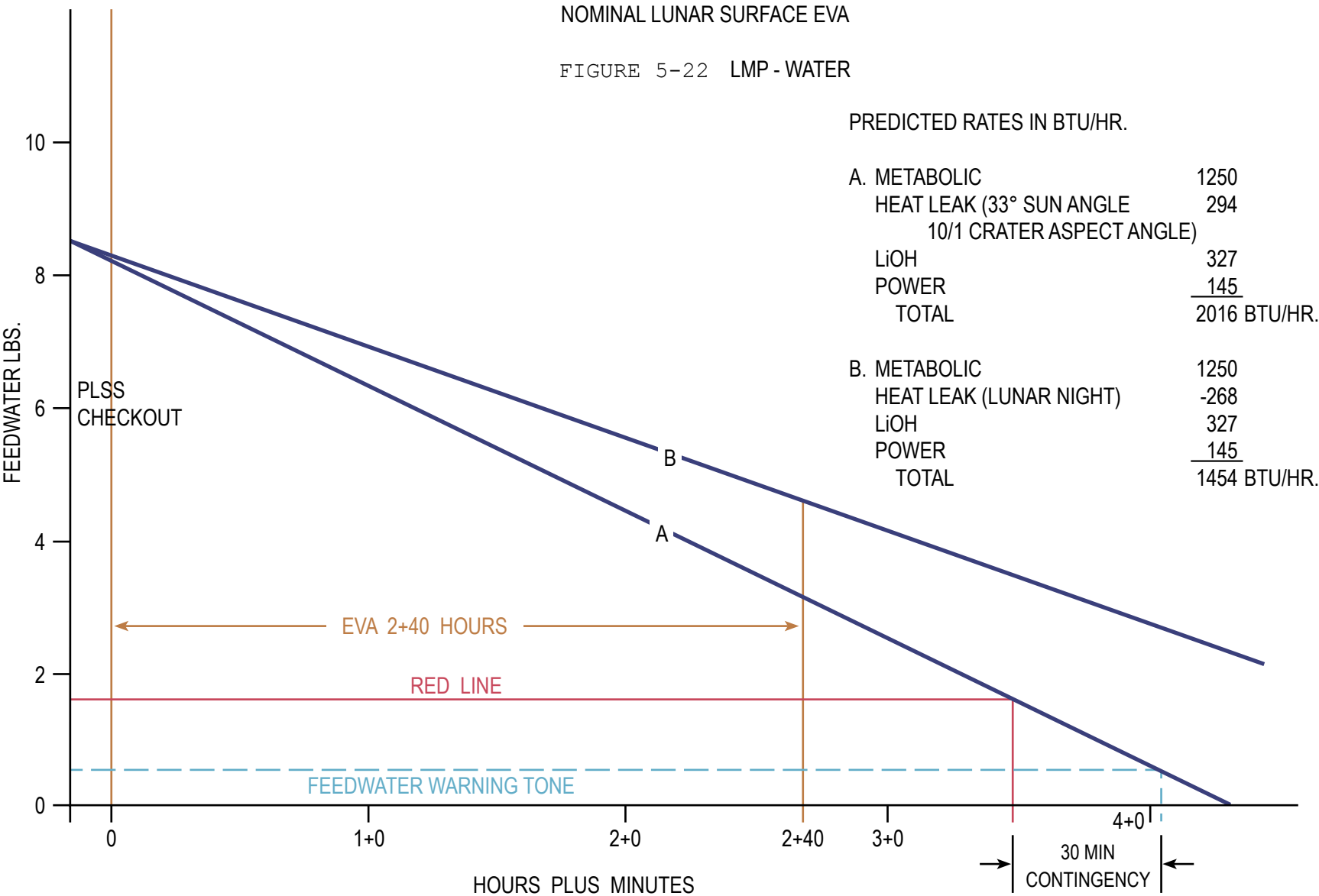
# NOMINAL LUNAR SURFACE EVA

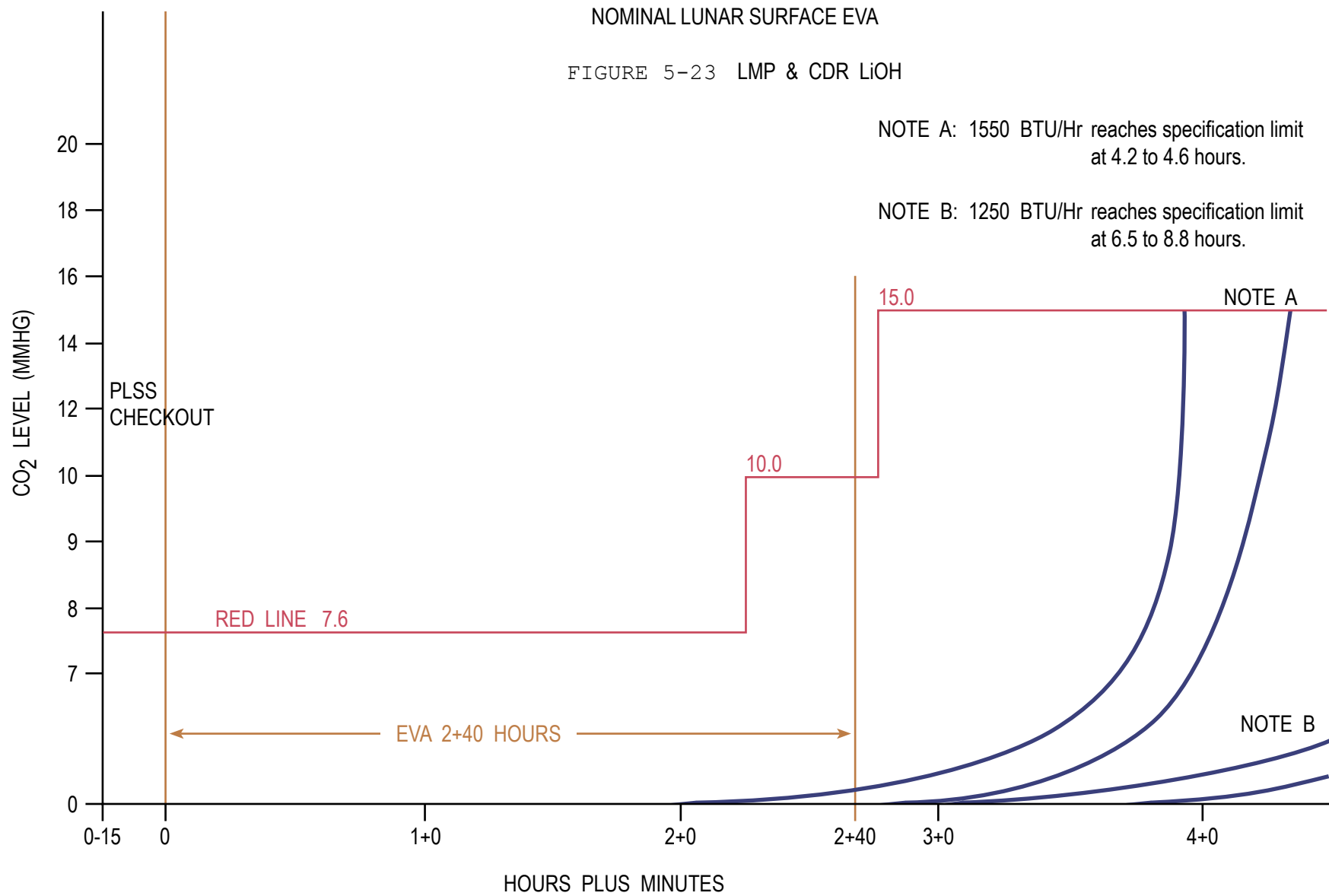
FIGURE 5-21 CDR - WATER



NOMINAL LUNAR SURFACE EVA

FIGURE 5-22 LMP - WATER





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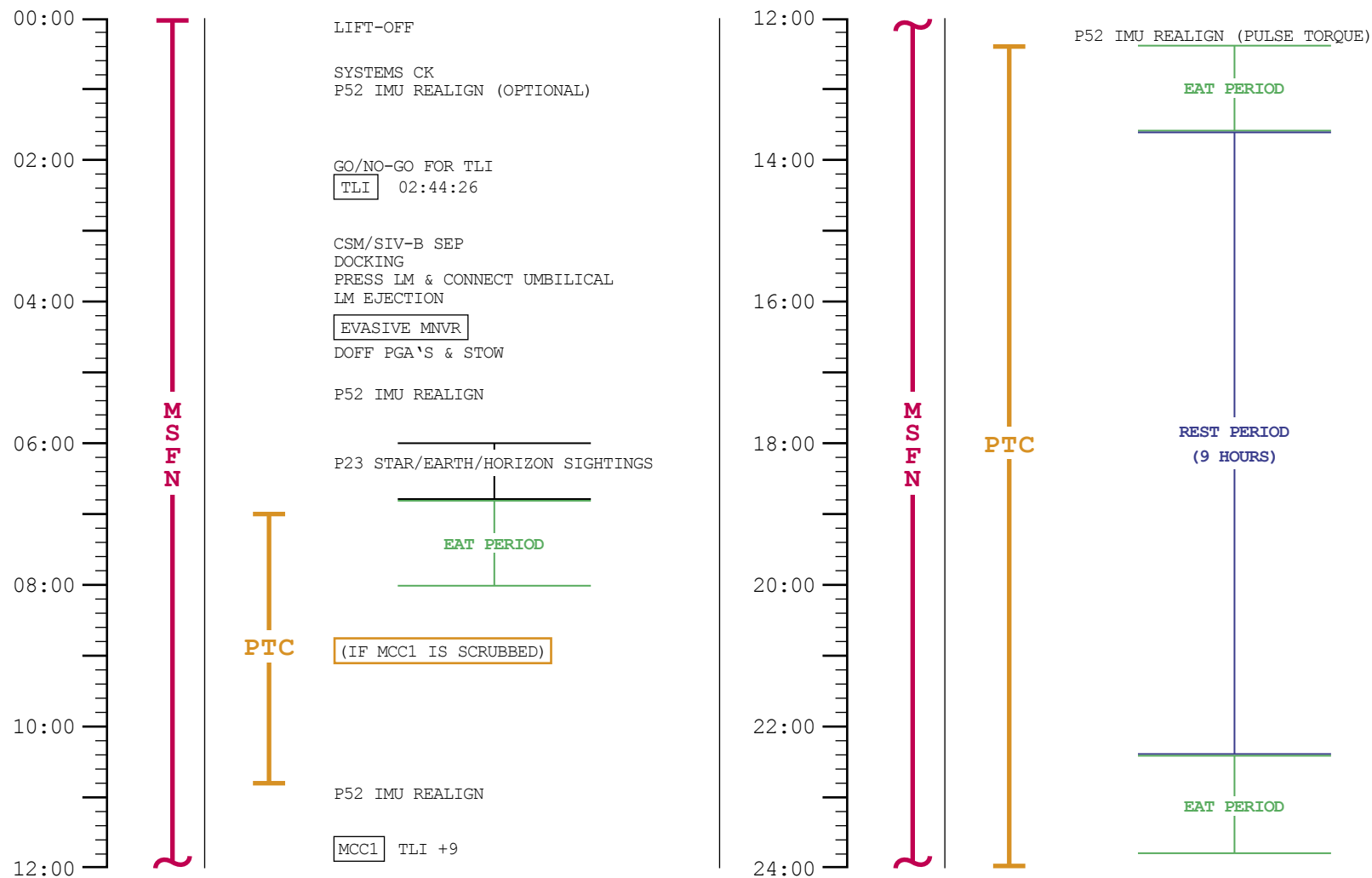
SECTION VI

**SUMMARY FLIGHT PLAN**



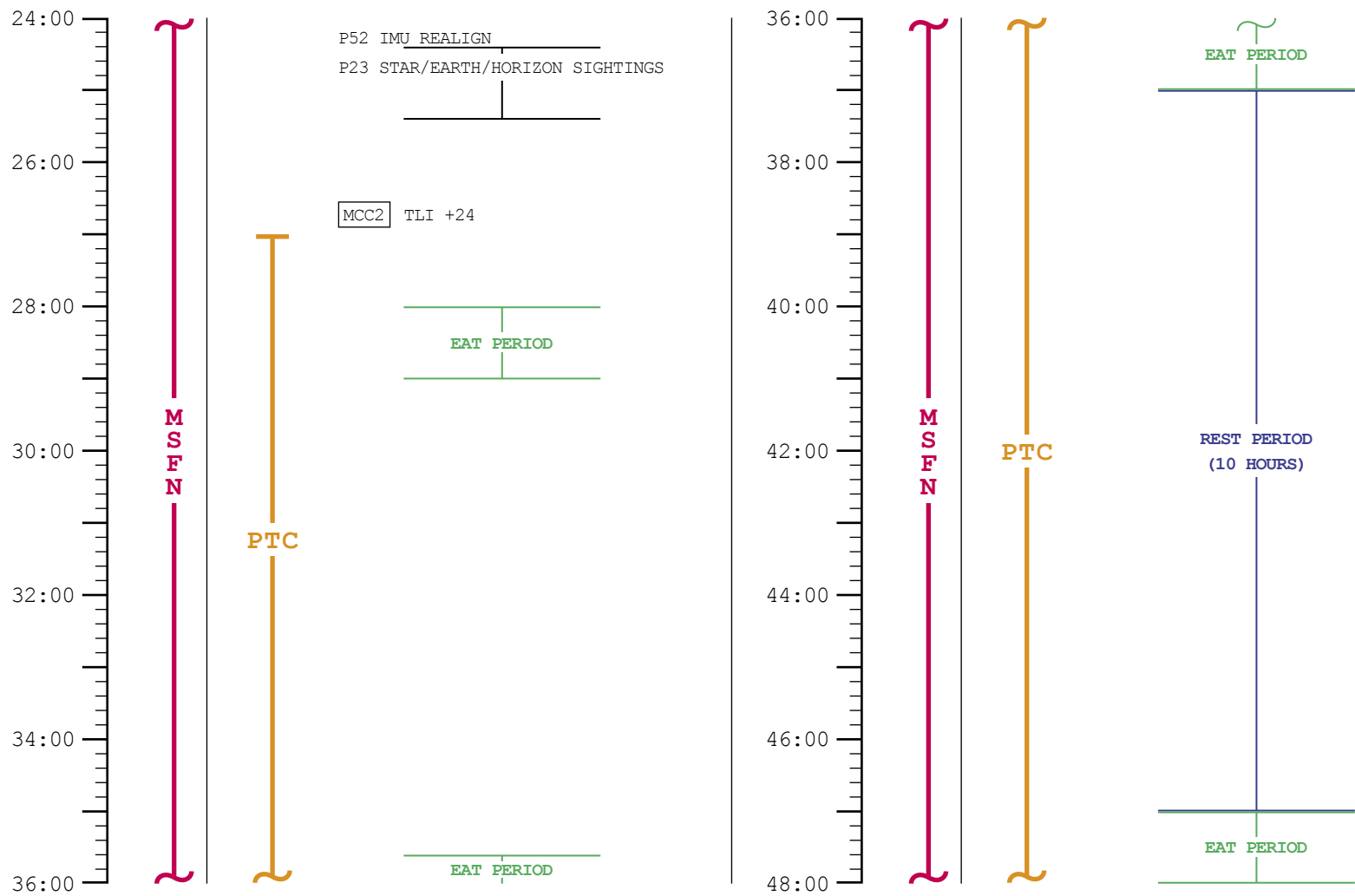


# FLIGHT PLAN



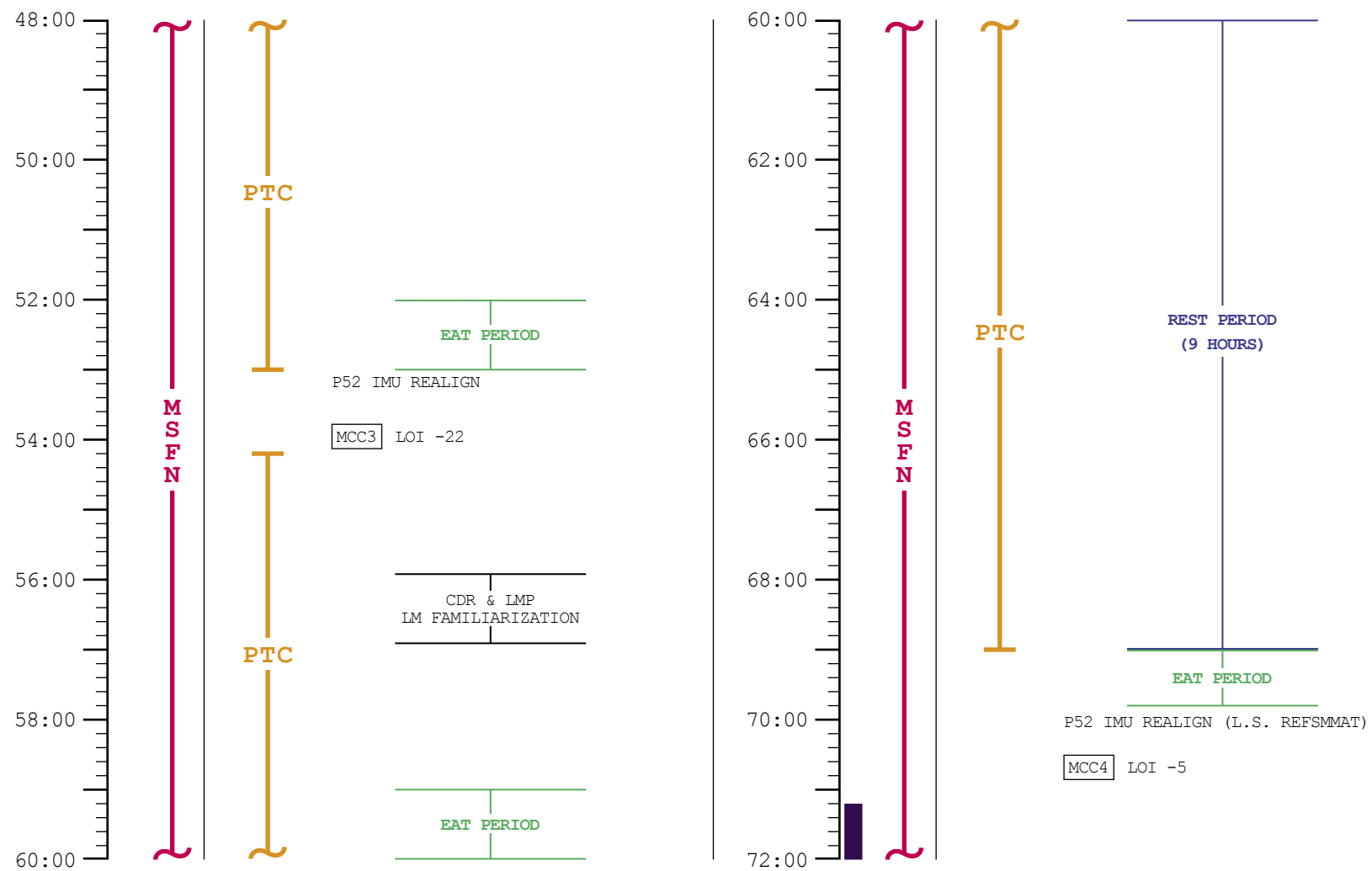
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# FLIGHT PLAN



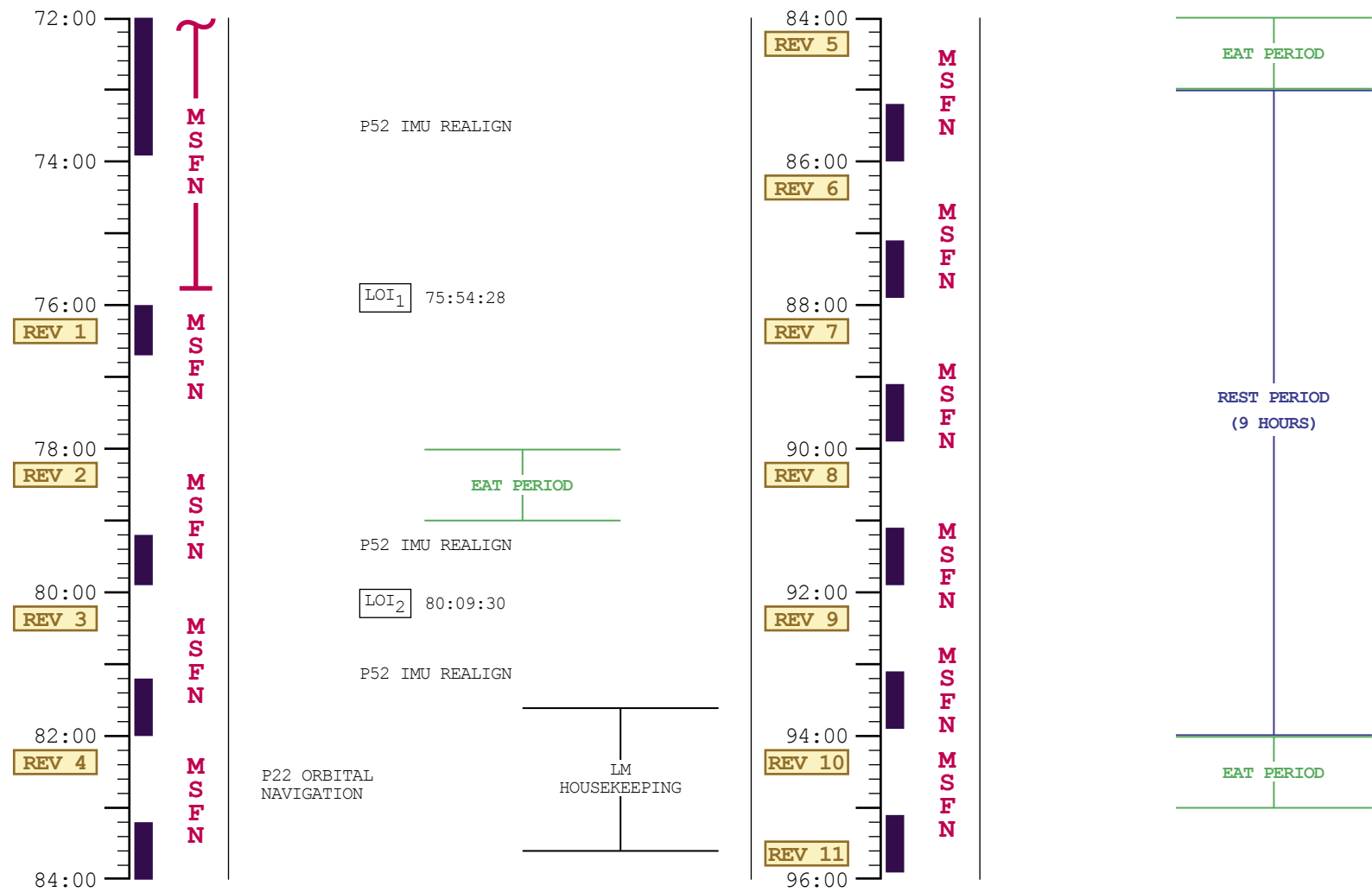
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# FLIGHT PLAN



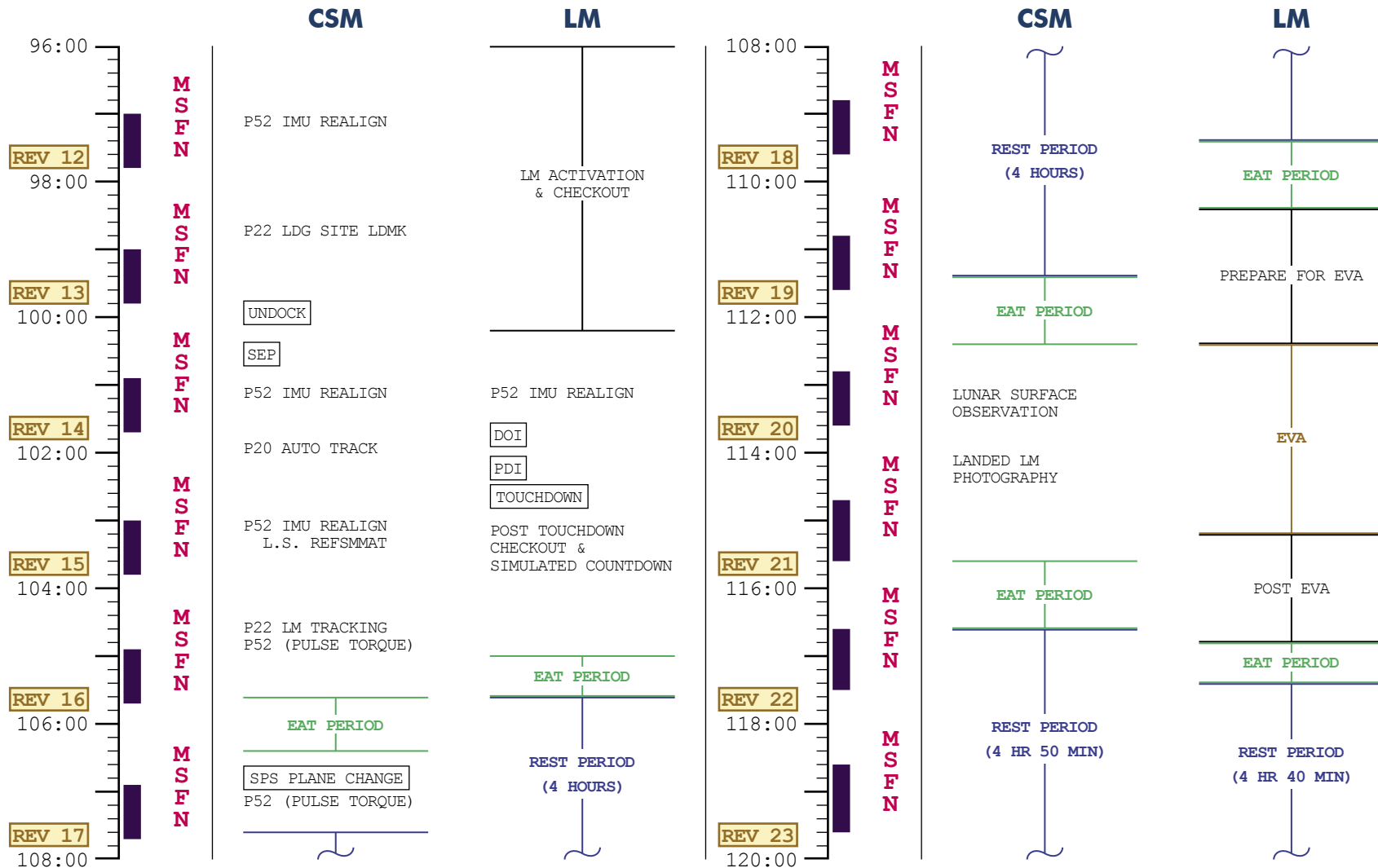
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# FLIGHT PLAN



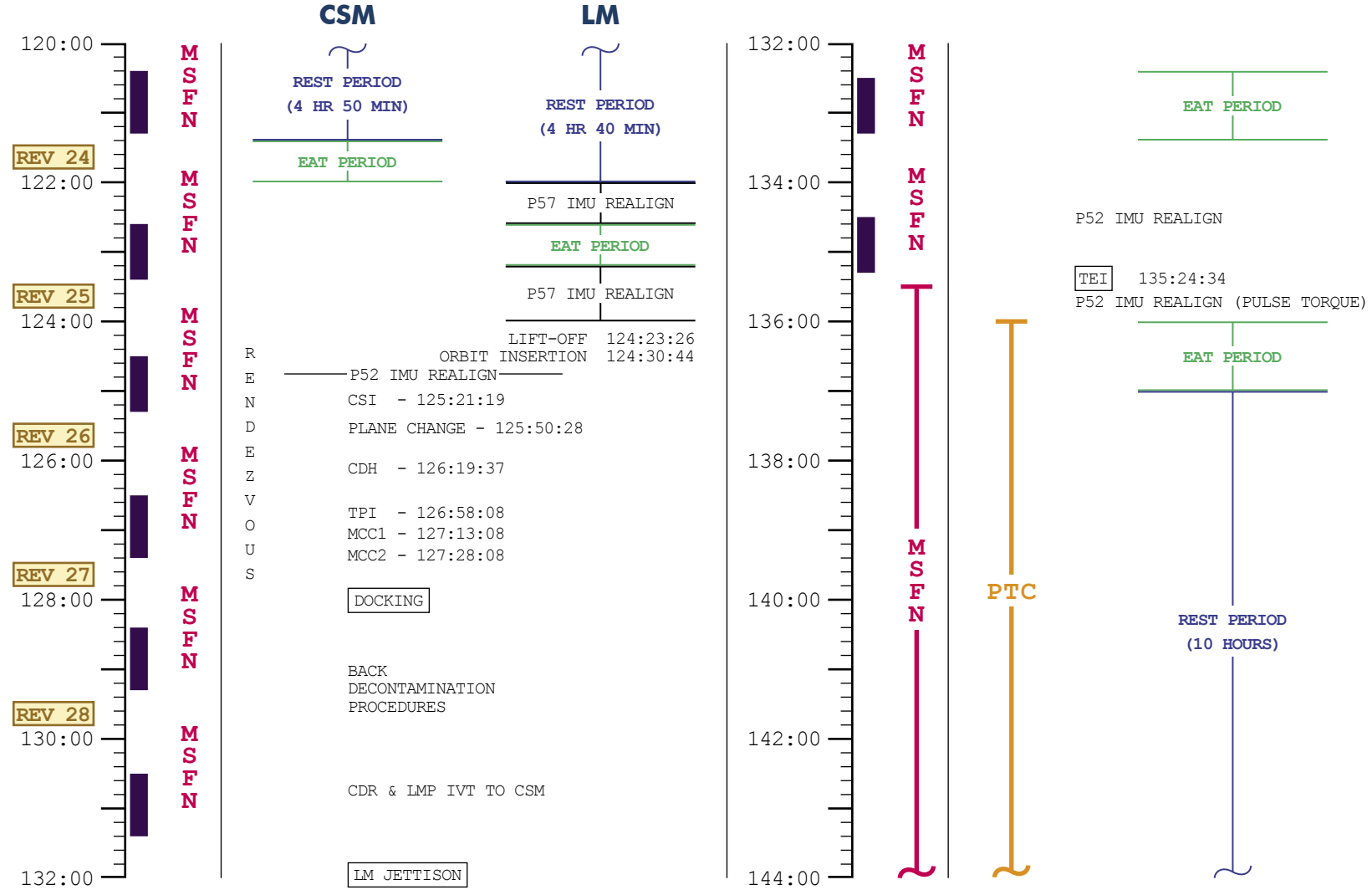
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# FLIGHT PLAN



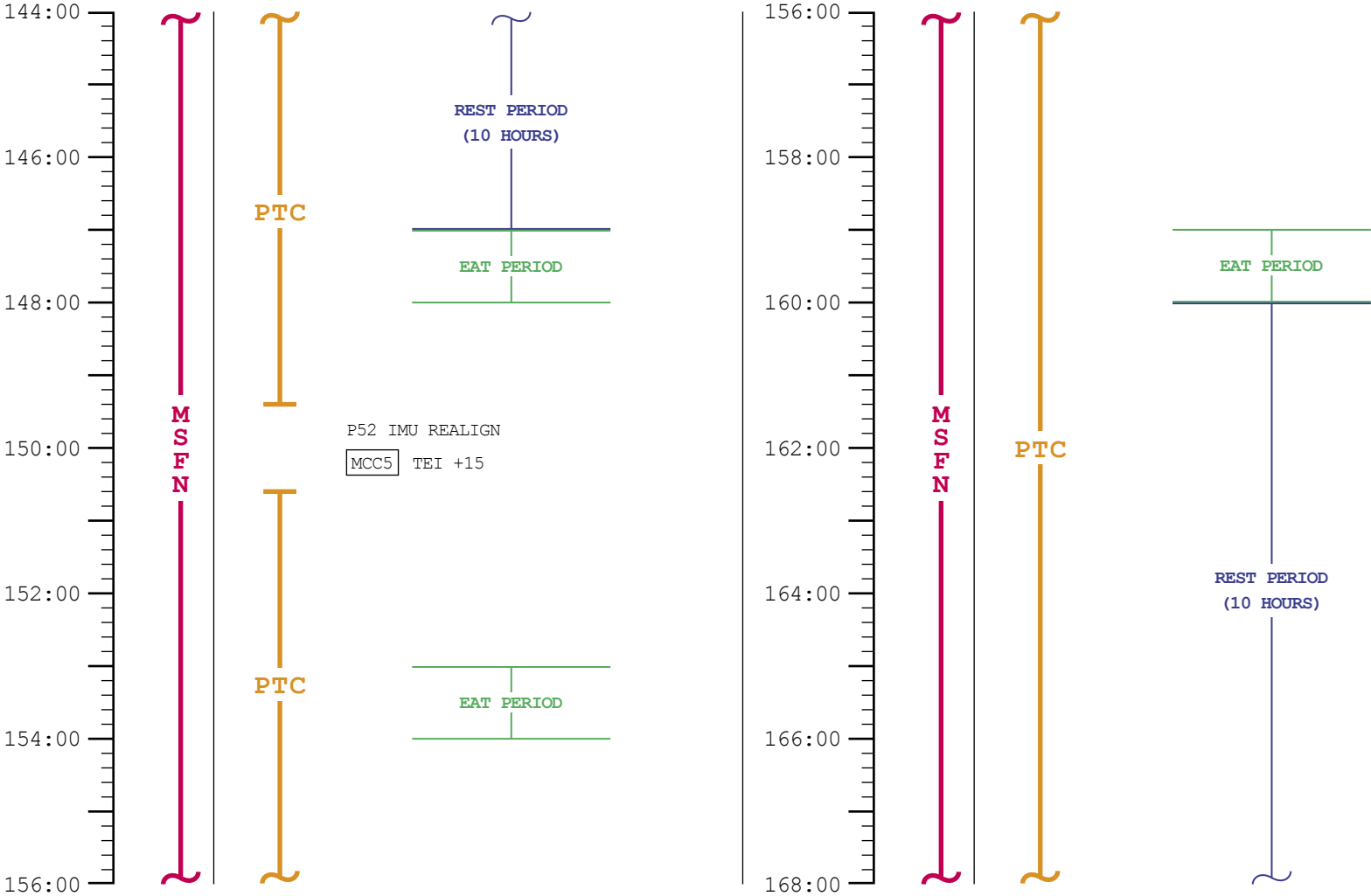
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FLIGHT PLAN



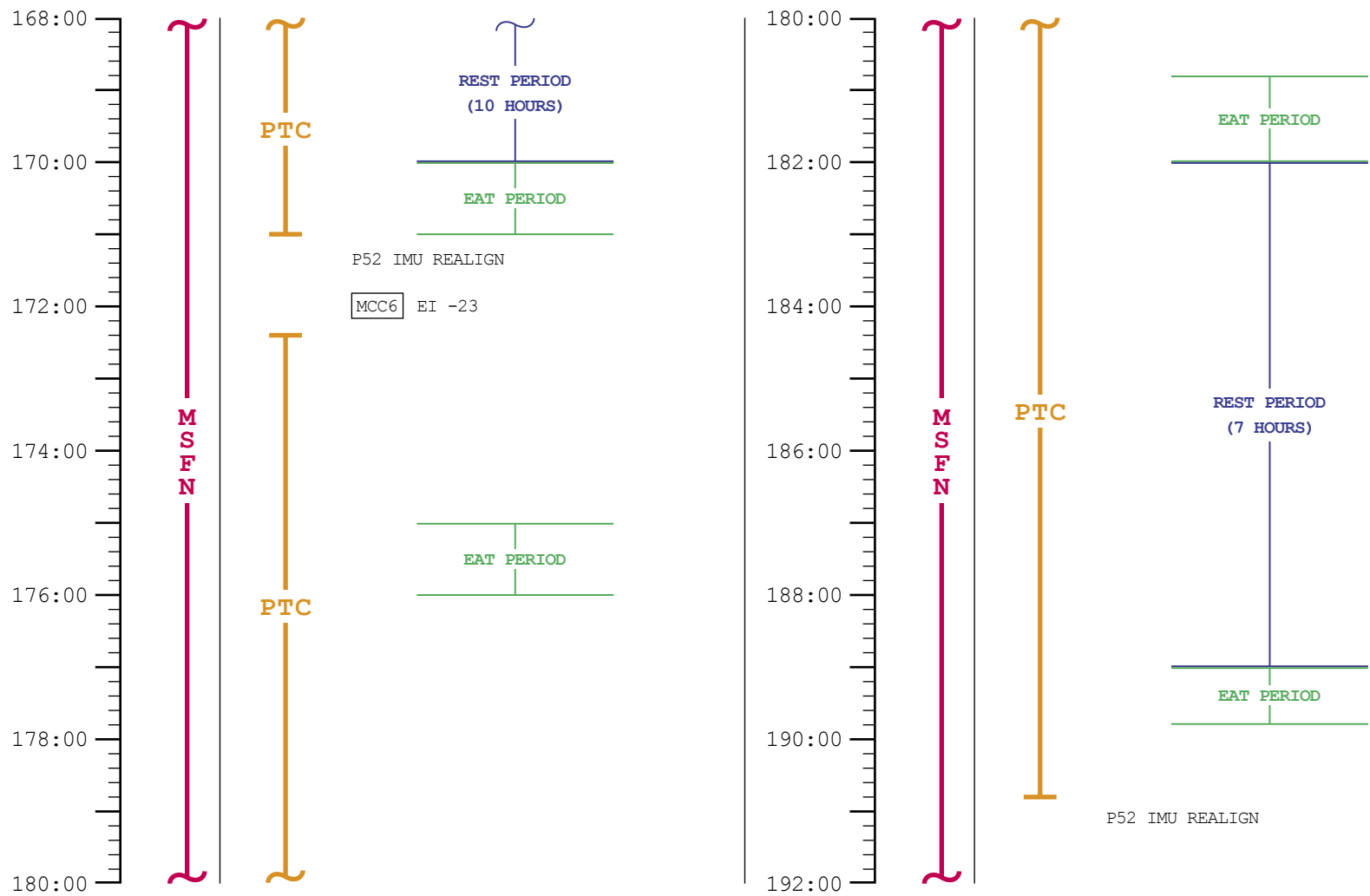
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# FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
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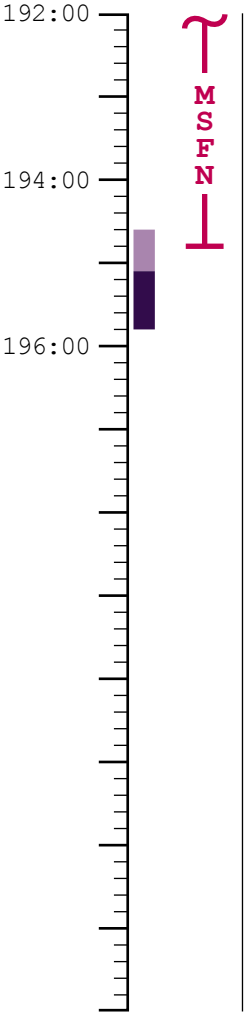
# FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	168:00 - 192:00	8 / TEC	6-8



# FLIGHT PLAN



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LANDING

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	192:00 - 196:00	9	6-9