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FINAL

APOLLO 9 FLIGHT PLAN

AS-504/CSM-104/LM-3

FEBRUARY 3, 1969

PREPARED BY

FLIGHT PLANNING BRANCH
FLIGHT CREW SUPPORT DIVISION

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HOUSTON, TEXAS

APOLLO 9

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(TO BE SUPPLIED)

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 AS504/CSM104/LM3 operations and crew activities to fulfill, when possible, the test objectives defined in the Mission Requirements, D Type Mission, LM Evaluation and Combined Operations, Rev. 1, Change A.

The trajectory parameters used in this Flight Plan are for a February 20, 1969 launch, with a 72° launch azimuth and were supplied by Mission Planning and Analysis Division as defined by the Apollo Mission D Spacecraft Operational Trajectory, Rev. 1.

The Apollo 9 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. W. Holloway will act as co-ordinator for all proposed changes to the Apollo 9 Flight Plan.

This Flight Plan is not to be reproduced without the written approval of the Chief, Flight Crew Support Division.

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,

ABBREVIATIONS

ACCEL	Accelerometer
ACN	Ascension
ACT	Activation
ACQ	Acquisition
AEA	Abort Electronics Assembly
AGS	Abort Guidance Sybsystem
AH	Ampere Hours
ALIGN	Alignment
ALT	Altitude
AMP or amp	Ampere
AMPL	Amplifier
ANG	Antigua
Ant	Antenna
AOS	Acquisition of Signal
AOT	Alignment Optical Telescope
APS	Ascent Propulsion Subsystem
ARS	Atmosphere Revitalization
ASCT	Ascent
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
B&W	Black & White
BRKT	Bracket
CAL	Pt. Arquillo, California
CAL *	Calibration Angle
CAM	Camera
CB	Circuit Breaker
CDH	Constant Delta Altitude
CDR	Commander
CDU	Control Data Unit
CIRC	Circularization
CK	Check
CM	Command Module
CMC	Command Module Computer
CONT	Continue
CMD	Command
CMP	Command Module Pilot
CNTL	Control
CNTLS	Controls
C.O.	Cut off
C/O	Check out
COAS	Crew Optical Alignment Sight
COMM	Communications
COMP	Computational
CONFIG	Configuration
CONT	Continue
CP	Control Point
CRO	Carnarvon, Australia
CRYO	Cryogenic
CSI	Coelliptic Sequence Initiation Maneuver
CSM	Command Service Module
C&WS	Caution and Warning System
CYI	Grand Canary Island
DAP	Digital Auto Pilot
D/B	Deadband
DCA	Digital Command Assembly
DEDA	Data Entry and Display Assembly
DEG	Degrees
DEPL	Depletion
DET	Determination or Digital Event Timer
DIFF	Difference

ABBREVIATIONS (Cont'd)

DK	Docked
DOI	Descent Orbit Insertion
DPS	Descent Propulsion Subsystem
DSE	Data Storage Equipment
DSKY	Display and Key Board
DTO	Detailed Test Objective
DUA	Digital Uplink Assembly
DWN	Down
E	Erasable
ECS	Environmental Control System
EFH	Earth Far Horizon
EI	Earth (atmosphere) Interface
ELDMK	Earth Landmark
EMS	Entry Monitor System
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	Feet per second
FQ	Flight Qualification
FT or ft	Feet
FTP	Full Throttle Position
GBM	Grand Bahama
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
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
ID	Identification
IGN	Ignition
IMU	Inertial Measurement Unit
INIT	Initialization
INT	Intervalometer
IP	Initial Point
IU	Instrumentation Unit
IVT	Intravehicular Transfer
JETT	Jettison
kwh	Kilowatt Hour

ABBREVIATIONS (Cont'd)

LAT	Latitude
LBR	Low Bit Rate (TLM)
LBS or lbs	Pounds
LCG	Liquid Cooled Garment
LDG	Landing
LDMK	Landmark
LEB	Lower Equipment Bay
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
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
LPO	Lunar Parking Orbit
LR	Landing Radar
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 or MCC	Mission Control Center - Houston
MDC	Main Display Console
MEAS	Measurement
MER	USNS Mercury
MET	Mission Event Timer
M/I	Minimum Impulse
MLA or MIL	Merrit Island, Florida
MIN	Minimum
MNVR	Maneuver
MON	Monitor
MSFN	Manned Space Flight Network
MTVC	Manual Thrust Vector Control
NAV	Navigation
NCC	Corrective Combination Maneuver
nm	Nautical Miles
NOM	Nominal
NSR	Nominal Slow Rate
NXX	Noun XX
OBS	Observation
O/F	Oxidizer to Fuel
OPER	Operate
ORB	Orbital
ORDEAL	Orbit Rate Display Earth and Lunar
ORIENT	Orientation
OVHD	Overhead
P	Pitch
PAD	Voice Update
PCM	Pulse Code Modulation
PC	Pericynthion
PGA	Pressure Garment Assembly

ABBREVIATIONS (Cont'd)

PGNCS	Primary Guidance Navigation Control Section
PIPA	Pulse Integrating Pendulous Accelerometer
PM	Phase Modulated
POL	Polarity or Polarizing
PRE	Pretoria, South Africa
PREF	Preferred
PREP	Preparation
PRESS	Pressure
PRIM	Primary
PT	Point
PRN	Pseudo-Random Noise
PROP	Proportional
PU	Propellant Utilization
PUGS	Propellant Utilization and Gaging System
PTC	Passive Thermal Control
PWR	Power
Pxx	Program XX
Qty	Quantity
R	Roll
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
RNDZ	Rendezvous
RR	Rendezvous Radar
RSI	Roll Stability Indicator
RT	Real Time
RTC	Real-Time Command
Rxx	Routine XX
S	Shaft
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
SEP	Separate
SEQ	Sequence
SLA	Service Module LM Adapter
SLOS	Star Line-of-Sight
SM	Service Module
SPOT	Spot Meter
SPS	Service Propulsion System
SR	Sunrise
SRX	S-Band Receiver Mode No. X
SS	Sunset
STX	S-Band Transmit Mode No. X
STBY	Standby
Sw	Switch
SXT	Sextant
SYNC	Synchronization
T	Trunnion
T_{EPHEM}	Time of Ephemeris Update
TA	Trunnion Angle
TAN	Tananarive, Madagascar
TCA	Time of Closest Approach
TBD	To Be Determined

ABBREVIATIONS (Cont'd)

TEC	Trans Earth Coast
TEI	Transearth Insertion
TEMP	Temperature
TERM	Terminate
TEX	Corpus Christi, Texas
T&D	Transposition and Docking
TGT	Target
TIG	Time of Ignition
TLC	Trans Lunar Coast
TLI	Translunar Insertion
TLM	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
UMB	Umbilical
UNDK	Undock
US	United States Pass
VAN	USNS Vanguard
VHF	Very High Frequency
VLV	Valve
Vxx	Verb xx
W/O	Without
WRT	With Respect to
XFER	Transfer
XMIT	Transmit or Transmitter
XPONDER	Transponder
Y	Yaw
ΔV	Velocity Change (Differential)
ΔVC	Velocity Change at Engine Cutoff
ΔR	Position Change (Differential)
8-balls	Flight Director Attitude Indicator (FDAI)
LBS or lbs	Pounds

SECTION 1 - GENERAL

FLIGHT PLAN DESCRIPTION

DAY 1

Launch

Day 1 begins with launch at 11:00 A.M. EST (1600 GMT) from Pad 39A with a launch azimuth of 72°. Insertion into a 103-nm circular orbit occurs at 10 minutes, 49 seconds after lift-off. At insertion, the CSM/LM/S-IVB combination will go into orbit rate with the S/C in heads down attitude.

CSM/S-IVB Orbital Operation

Immediately after insertion, the crew begins a series of CSM S-IVB orbital operations. This activity is to configure the CSM for orbital operations, prepare for transposition, docking and ejection and to evaluate the operations required to verify that the CSM and S-IVB would be ready for TLI on a lunar mission. The actual TLI burn will not be performed on this mission. The GO/NO GO for orbit is given at Carnarvon on the first pass. Following sunrise, the pre-TLI demonstration is concluded and the COAS and ORDEAL box are mounted.

Transposition, Docking and LM Ejection

GO/NO GO for T&D is given at 2:30 GET during the second pass over Carnarvon. At this time the S-IVB IU is enabled by ground command. At 02:34 GET, the S-IVB goes to inertial attitude hold for TD&E. The CSM separates from the LM/S-IVB after second sunrise and performs a visual inspection of the LM/S-IVB while formation flying. Docking occurs at 03:00 GET. LM pressurization begins immediately after docking. To pressurize the tunnel and LM, the three 1-pound repress bottles and the surge tank will be used. The 1-pound bottles are discharged until empty, and the surge tank is dumped to 500 psia. The surge tank is then recharged and the process repeated until tunnel and CM cabin pressures are equal. The tunnel bleed valve is left open to allow CM O_2 to flow continuously into the tunnel and LM. A state vector update is uplinked over the U.S. at 03:15 GET. As soon as the tunnel and LM pressure have been verified, the tunnel is configured for ejection. The GO/NO GO for ejection is given over Carnarvon at 04:00 GET. At third sunrise, the CSM/LM is ejected from the SLA.

Evasive Maneuver and S-IVB Restarts

Immediately following ejection, the SCS does a 3-second, 4-jet, -X RCS translation. At burn attitude, the CSM is 50° pitched down from the S-IVB +X axis. This evasive maneuver is performed to get the CSM/LM at least 500 feet away from the S-IVB when the first S-IVB restart occurs. The GO/NO GO for the S-IVB restart is given at Hawaii at 04:25 GET. The S-IVB returns to local horizontal attitude at 04:25 GET, and the first S-IVB restart occurs at 04:45:41 GET. The second S-IVB restart is at 06:07 GET. S-IVB LOX and LH_2 dumping is completed by 06:42 GET.

SPS Burn No. 1

Over Ascension at 05.00 GET the CSM, is sent a target load and a maneuver pad for the first SPS burn. The preferred IMU orientation for SPS No. 1 is calculated onboard, and the IMU is realigned to that orientation during the fourth night pass. The first SPS burn occurs at 06:01:40 GET over Hawaii. Burn time is 5.0 seconds and the ΔV is 36.8 fps. No ullage is required. The burn is posigrade, and apogee is raised to 131 nm.

Daylight Star Check and SXT Calibration

Over Texas at 06:20 GET, the CSM receives an update of the attitude required for the daylight star check. The daylight star check begins 15 minutes prior to the fifth sunrise and runs until 10 minutes after sunrise. This star identification exercise is done to determine if the optics are degraded by the light reflected from the surfaces of the LM. During the next night pass, a sextant calibration is performed using the Midcourse Navigation program. This calibration is done to determine any trunnion bias angle between the sextant lines of sight.

Rest

Rest period begins at 9:00 GET (8:00 P.M. EST) and lasts 9 1/2 hours.

DAY 2

Day 2 begins at 18:30 GET (5:30 A.M. EST).

SPS Burn No. 2

An IMU orientation determination is done during the first night pass of the day. A state vector, a target load and maneuver pad for the second SPS burn are given the CSM over the Eastern Test Range at 20:40 GET. The preferred IMU orientation is calculated onboard, and the following night pass the IMU is realigned to the preferred orientation. SPS Burn No. 2 occurs at 22:12:00 GET over the Cape. Burn time is 111.1 seconds and the ΔV is 850.1 fps. No ullage is required. The burn is out-of-plane and posigrade and raises apogee to 192 nm. During this burn the DAP stability test is run with 40% amplitude stroking.

SPS Burn No. 3

Over the U.S. at 23:55 GET the CSM receives a state vector, target load and a maneuver pad for the third SPS Burn. The preferred IMU orientation is calculated onboard, and the IMU is realigned during the next night pass. SPS Burn No. 3 occurs at 25:18:30 GET over the Cape. Burn time is 279.4 seconds and the ΔV is 2549.1 fps. No ullage is required. The burn is targeted mostly out-of-plane, and raises apogee to 271 nm. The DAP stability test is run again, this time with full amplitude stroking. Manual thrust vector control is used for the last 45 seconds of the burn.

SPS Burn No. 4

State vector, target load and maneuver pad for the fourth SPS burn are given to the CSM over Texas at 26:50 GET. The preferred IMU orientation is calculated onboard, and the IMU is realigned during the next night pass. SPS Burn No. 4 occurs at 28:28:20 GET over Texas. Burn time is 28.0 seconds and ΔV is 300.0 fps. Four-jet, 18-second ullage used. Targeting for the burn is out-of-plane. The orbit remains 271 nm by 115 nm.

Rest

Rest period begins at 30:00 GET (5:00 P.M. EST) and lasts for 9 1/2 hours.

DAY 3

Day 3 begins at 39:30 GET (2:30 A.M. EST). If required, tunnel and LM pressurization begins immediately. The surge tank and 1-lb bottles are used in the same manner as at T&D. State vector and desired IMU orientation for the Docked DPS Burn are uplinked to the CSM over the Huntsville at 41:05 GET.

IVT to LM & LM Activation

All crewmen don their PGA's. IVT GO/NO GO decision is at the Canaries at 41:55 GET. After clearing the tunnel hardware, the LMP transfers to the LM. The LMP activates the LM EPS, ECS, COMM, and INST systems.

During the first night pass after the LMP's IVT, the CMP performs P51, IMU Orientation Determination, with the CSM approximately out-of-plane. If time is available, P52, IMU Realign, is performed aligning the CSM platform to the Docked DPS Burn REFSMMAT.

The CDR transfers to the LM at 43:05. When the CDR completes his transfer, the tunnel hardware installation begins.

LM Systems Evaluation

A series of systems tests are performed to verify the operation of and gather data on the LM systems and system interactions. A daylight AOT star visibility check is performed at 43:55 GET. The S-Band steerable antenna check occurs over Carnarvon at 44:03.

The primary and secondary EVA COMM Modes are checked with the LMP connected to the PLSS COMM starting at 45:30. During the MILA pass at 46:27 GET, the TV COMM Mode is verifed using the TV inside the LM for the entire MILA pass. Interior shots of the LM are made with wide angle lens.

Docked LM IMU Alignment

The procedure for aligning the LM platform does not require star sightings, thus saves RCS propellant. It takes advantage of a known CSM inertial attitude and known CSM/LM geometry to coarse align the LM IMU to the inertial frame. The LM platform is coarse aligned by 47:38 and the CSM and LM gimbal angles are voiced to MCC. MCC calcualtes the fine align torquing angles.

After RCS pressurization and cold fire check, the LM DAP is set and the DPS gimbal drive is checked. While driving the gimbals, the DPS throttle check is performed. The RCS engines are then hot fired.

At 48:10 GET over Bermuda, the MCC updates the LM and CSM state vectors to the CSM and the LM state vector to the LM. The LM MNVR PAD is voiced to the crew for the Docked DPS Burn. REFSMMAT is uplinked to the LGC.

The fine align torquing angles are voiced to the crew, the gyros are torqued via the DSKY, and the REFSMMAT Flag is set.

The CSM & LM REFSMMATS are identical for the Docked DPS Burn. The REFSMMAT gives zero LM FDAI roll, pitch, and yaw angles at the burn attitude (ou-of-plane). CSM FDAI angles at the burn attitude are 300° roll, 180° pitch, and 0° yaw. With the platform aligned, the crew initializes the AGS. AGS zero time (or K-factor) is 40:00.

Landing & Rendezvous Radar Self Tests

At 48:16 GET the LR is self-tested in both the desent and hover positions. Since the RR was unstowed immediately prior to the Daylight AOT Star Observation, the standard RR self-test is performed.

Docked DPS Burn

The DPS is pressurized at 48:40. Beginning at sunset at 48:40, the CMP realigns the CSM platform the REFSMMAT. Again the CSM & LM gimbal angles are obtained for LM platform realignmnet. The gimbal angles are voiced to MCC. The crew torques the gyros after receiving the torquing angles at 49:10 GET. AGS update and alignment follows the LM IMU realignment.

The CSM trims the CSM/LM to the Docked DPS burn attitude while the CDR and LMP monitor the maneuver. The CMP targets P30, External ΔV and enters P40, SPS Thrust. P40 is used to monitor the LM DPS Burn. In the LM, the External ΔV program, P30, and the AGS External ΔV routine are targeted for the Docked DPS burn. The DPS Thrust Program, P40, is entered and the AGS is used in the follow-up mode. The LM assumes attitude control at TIG -6 min. The manual throttle profile is described in Section 4, DOCKED DPS BURN, page 4-42. Docked DPS Burn occurs over Texas at 49:42:00 GET. The throttle-down from fixed-throttle-point occurs on ΔV at 124 fps. The engine is manually shut down 3 sec before automatic engine shutdown. Total Burn time is 367 seconds.

After the burn the Landing Radar self test and AGS calibration are performed.

Sublimator Dry-Out

When the tunnel is clear, the CDR transfers to the CM. The LMP then connects to the transfer umbilical. He remains in the LM until the sublimator is dry. The LM is powered down leaving on only the necessary heaters on the translunar bus. Power is switched to the CM at 51:00 GET.

SPS Burn No. 5

MCC updates the CSM state vector, a target load, and voices up a maneuver pad over Texas at 52:50 GET. The preferred IMU orientation is calculated onboard, and the IMU is realigned during the next night pass.

SPS Burn No. 5 occurs at 54:26:16 GET over Texas. Burn time is 41.4 seconds and ΔV is 551.5 fps, 4 jet, 20 second ullage is used. The burn is targeted to circularize the orbit at 133 nm. Following the fifth SPS burn the crew doffs their PGA's.

Rest

Rest period begins at 57:00 GET (8:00 P.M. EST) and is 9 hours and 50 minutes in length.

DAY 4

Day 4 begins at ≈ 67:00 GET (6:00 A.M. EST); tunnel and LM pressurization begin immediately, if required.

IVT to LM

The crewmen don their PGA's and the tunnel is cleared by 69:22 GET. The LMP then transfers through the tunnel into the LM. CSM IMU orientation is determined during the next night pass. MCC uplinks the CSM state vector and desired orientation over Honeysuckle at 69:52 GET. The LMP activates the LM EPS, ECS, COMM, and INST. systems. The CDR transfers to the LM and connects to the LM ECS. The tunnel hardware is installed and the LM hatch is closed at 70:25 GET.

Attitude Control for EVA

The GNCS is used for the attitude control during EVA. The CMP realigns the CSM platform to the uplinked preferred orientation during the night pass starting at 71:00 GET. After the IMU is realigned, the CSM FDAI reads zero degrees roll, pitch, and yaw at the desired EVA attitude.

The attitude is determined by positioning the CSM -Z axis toward the sun, with the +X axis pointing south, then pitching the CSM 15° down and rolling left 80°. This attitude is held within the maximum deadband. The QUAD A & B SM RCS thrusters are disabled to avoid RCS jet impingement on the LMP during EVA.

Preparation for EVA

After the tunnel hardware installation, standard ECS, EPS and COMM checks are performed. The crew then prepare for EVA. All EVA prep procedures are described in the EVA Procedure Document.

Before the LMP dons the PLSS and OPS, the CDR and LMP reverse stations. The CDR holds the PLSS/OPS during the donning preparation. Over Honeysuckle Creek and the Mercury, the PLSS communication checks are performed. See the Communications Plan, Section 5 for details of the EVA comm.

All three crewmen don their helmets and gloves and verify the spacecraft cabins are prepared for depress. The LMP and CDR verify the pressure integrity of their PGA's and then depress the LM. While the LM depresses, the CMP checks the pressure integrity of his PGA. When the LM is fully depressurized, the LM hatch is opened and the LMP verifies proper suit cooling. The CSM is then depressurized and the CM side hatch opened.

EVA

Two sequence cameras record the EVA. One is attached to the inside of the CSM hatch. When the CMP opens the hatch, the camera "looks" down the transfer path. The other sequence camera is attached to the LM handrail. The LMP egresses the LM at 73:07 and attaches a sequence camera to the LM handrail.

Both cameras are operated by remote control by the CMP and the CDR at desired times during the EVA. After installing the camera, the LMP dons the "golden slippers" and rests.

Using the nominal transfer path, the LMP transfers to and partially ingresses the CSM, demonstrating extravehicular transfer. The transfer is timed and should require less than 15 minutes. During the EVA the CDR feeds out and keeps taut the EVA tether.

While at the CSM, the LMP retrieves thermal samples. After handing the samples to the CMP and resting, the LMP transfers back to the LM. The LMP dons the "golden slippers", rests, then passes the sequence camera to the CDR. Thermal samples on the LM are retrieved and handed to the CDR for stowage.

During the night pass and the remainder of the EVA, the LMP is restrained to the LM porch with tethers and "golden slippers". Exterior lighting is evaluated for illumination of the transfer path.

During the next daylight pass, the LMP photographs the LM and CSM. While both spacecraft are over Goldstone and MILA, the LMP will use the TV camera to photograph the exterior of the CSM and LM using the wide angle lens. At 75:23 GET the LMP ingresses the LM and the CDR closes the LM FWD hatch.

With the LM overhead hatch dump valve in DUMP, LM oxygen repressurizes the tunnel at the same time the LM is repressurized. CSM repressurization occurs immediately after LM repress. When the LM and CM pressures are 3.0 psia, the CSM pressure equalization valve is opened and LM O_2 pressurizes both spacecraft to 5.0 psia. Systems are then configured for post-EVA operations.

PLSS Recharge

The PLSS oxygen and water are recharged to 90% and the battery and LiOH cartridge are replaced. PLSS recharge is completed by 76:20 GET. The primary LiOH cartridge is then replaced.

Sublimator Dry-Out

Sublimator dry-out is accomplished in the same manner as Day 3. During the dry-out, the LMP is connected to the CSM transfer umbilical.

Rest Period

Rest Period begins at 79:00 GET (6:00 P.M. EST) and lasts approximately 7 1/2 hours.

DAY 5

Day 5 begins at 86:30 GET (1:30 A.M. EST). Tunnel and LM pressurization begin immediately, if required.

IVT to LM

The CSM IMU orientation is determined during the first night pass of the day. The crew then don their PGA's and clear the tunnel. At 89:00 GET, the LMP transfers through the tunnel to the LM.

Over the Mercury at 89:03, the MCC uplink the CSM and LM state vectors and the desired orientation for rendezvous to the CMC and voices the CSM DAP load. The CSM preferred orientation for the rendezvous is that of a nominal align for the time of alignment equal to TIG of TPI.

The CDR transfers to the LM after the LMP activates the LM. The Rendezvous Day LM checkout procedures where designed to simulate the lunar mission docked pre-DOI checkout as closely as possible. The DPS and RCS were pressurized on Day 3 thus cannot be done on Day 5. The criteria, however, was that all checks made where those that, if the checks failed, the lunar mission would be aborted.

Preparation for Undocking

The CSM realigns to the preferred option at 90:25 GET. After the CSM is aligned, the LM platform is coarse aligned as described on Day 3 and the gimbal angles are voiced to MCC over the Mercury at 90:42 GET. The MCC also uplinks the LM and CSM state vectors and REFSMMAT to the LGC at 91:07. The LM rendezvous REFSMMAT is that of a nominal alignment at TIG of TPI.

Over the U.S. at 91:10 GET, MCC voices the gyro torquing angles to the LM. The LM and CSM platforms are oriented so that the stable member axes are related as follows:

$$\overline{X}_{LM} = -\overline{Z}_{CM}$$

$$\overline{Y}_{LM} = \overline{Y}_{CM}$$

$$\overline{Z}_{LM} = \overline{X}_{CM}$$

The LM Rendezvous Radar is self-tested at 91:58 GET. Over Honeysuckle at 92:02 the maneuver pads for the phasing burn are voiced to the crew. The CSM then trims to the undocking attitude and at 92:39 GET the CSM extends the probe. The vehicles are then undocked.

SM RCS Separation and DPS Phasing

The detailed rendezvous procedures are documented in the CSM Rendezvous Procedures Document and the LM Rendezvous Procedures Document. After undocking, the LM rotates for the CMP's inspection of the LM landing gear. The CSM then targets for the separation burn. Using the RCS thrust Program, P41, the CSM separates with a radially down burn of 5 fps ΔV.

As the separation distance increases, the LM RR is turned on, locked onto the CSM transponder, checked and positioned for the IMU alignment. The LM platform is aligned to REFSMMAT using the AOT for the first time. The CSM also realigns to REFSMMAT. The RR is again turned on and locked on the CSM. At 93:50:03.6 GET over the Mercury the LM performs phasing with a DPS burn to achieve 85 fps ΔV. Phasing is an AGS controlled burn; the PGNCS residuals are nulled after the burn.

Insertion

When the residuals are nulled, the P20, Rendezvous Navigation program, is entered and, for the first time, RR data is used to update the LM state vector. The CMP also begins taking sextant marks to update the CMC's LM state vector.

By 94:10 the CSM and LM have a TPI_0 solution; these are reported to the MCC. After passing the maximum separation distance in the "football", the LM RR again locks on. The LM and CSM again take marks.

At 94:50 GET the CSM and LM both again have TPI_0 solutions. If the spacecraft are GO for the nominal rendezvous, they both begin to realign their platforms to REFSMMAT. If the decision is NO GO, TPI_0 is executed by the LM if it is capable and by the CSM if the LM is not capable of performing the burn.

Upon completing the alignment the RR locks onto the CSM transponder and the crew monitor the closest approach of the two vehicles. At 95:41:48.1 over GYM the LM executes a DPS posigrade burn with a ΔV of 39.9 fps to insert the LM into the coelliptic rendezvous sequence.

The CSM is targeted with the same burn one minute later. If during the burn it is decided to maintain the relative motion of the "football" the CSM can perform such a burn.

CSI, Staging

After the insertion burn, the LM again locks onto the CSM. Both spacecraft begin taking marks updating the LM state vector in each computer. About 8 minutes prior to CSI, the LM crew configure the LM for staging. At 96:22:00 GET, over Tananarive the LM executes CSI using 4 RCS jets and the APS interconnect to burn 37.8 fps retrograde. Immediately after the initiation of thrust the staging pyros are fired and the LM is staged.

For each of the LM rendezvous burns, the CSM targets for a "mirror image" burn. If for some reason the LM cannot perform the burn, the CSM is prepared to burn one minute after the nominal burn time.

CDH

During the rendezvous, the crew will eat as time permits. After CSI, the RR reacquires the CSM and marks are taken. The CMP also takes marks using the sextant. The CDR maintains the LM +Z axis pointed towards the CSM line-of-sight ±30°. Over the Redstone at 97:06:22.6 GET, the LM executes CDH using the APS for a 2.9 second burn. CDH is retrograde and ΔV = 37.9 fps. The LM is then coelliptic with the CSM.

TPI to Docking

For TPI both spacecraft take marks and calculate onboard solutions. The LM also updates the AGS LM state vector with RR data approximately every three minutes. The CDR maintains an attitude where the RR shaft and trunnion angles are zero for the AGS RR updates. When the final LM TPI solution (P34) is obtained the LM maneuvers to point the LM +Z at the CSM. At 98:00:15 GET over Tananarive the LM executes a line-of-sight burn of 21.8 fps.

Immediately after TPI, the LM pitches to point +Z at the CSM. Both spacecraft take marks and target for each midcourse. The first midcourse is at TPI + 10 minutes, the second at TPI + 22 minutes. After MCC_2, the LM maintains line-of-sight, nulls line-of-sight rates, and performs braking. The braking schedule is as follows:

30 fps - 6000 ft
20 fps - 3000 ft
10 fps - 1500 ft
Rendezvous, 0 fps - 100 ft

While formation flying with the CSM, the LM performs attitude control tests as described in Section 4. The CMP photographs the LM and the LMP photographs the CSM. At 99:05 the LM and CSM begin the maneuver for docking and the LM translates to capture latch. Upon capture the CMP retracts the probe and the LM docks with the CSM.

APS Burn to Depletion

The night pass after docking is used to perform a docked AOT P52 realign to REFSMMAT. To prepare for the APS burn to depletion the crew takes the probe and drogue out of the tunnel after the tunnel is pressurized and stows the probe and drogue on the LM floor. The PGNCS is targeted for the APS burn. At 100:45 the CDR transfers to CSM. The LMP prepares the LM systems for jettison and the CSM maneuvers to jettison attitude.

Just before transferring to the CSM, the LMP opens the APS interconnect and leaves the LGC in P00. At 101:05 the LMP closes the LM hatch.

To minimize helium ingestion into the RCS the crew waits until 101:33 to jettison the LM. Immediately after LM jettison the CSM maneuvers to behind the LM and performs a 3 fps RCS burn to separate the CSM from the LM. Over Texas MCC again sends commands to the LM and at 102:00 the APS ignites and burns to depletion.

REST

Rest period begins at 104:15 GET (7:15 P.M. EST) and is 9 1/2 hours long.

DAY 6

Day 6 begins at 113:30 GET (4:30 A.M. EST).

SPS Burn No. 6

The S/C is powered up and the IMU orientation is determined during the fourth night pass of the day. State vector, target load and maneuver pad for the sixth SPS burn are sent to the CSM over the Vanguard at 119:40 GET. The preferred IMU orientation is calculated onboard, and the IMU is realigned during the next night pass. Ignition for SPS Burn No. 6 is at 122.01 GET over Carnarvon. Burn time is 2.5 seconds and ΔV is 66.2 fps. Two-jet, 18-second ullage is used. The burn is retrograde and lowers perigee to 95 nm.

S065 Photography

During the night pass following the SPS burn, the s065 camera equipment is unstowed and mounted in the hatch window. This equipment consists of four electric Hassleblad cameras which are mounted together and are triggered simultaneously. Service Module RCS jet B-3 must be disabled to preclude the spraying of exhaust gas into the camera's field of view during a pass. The spacecraft is then maneuvered in-plane with the hatch window parallel to local horizontal and orbital rate is established. During each pass the cameras are triggered at a fixed time interval updated by MCC. Two S065 passes are made during the sixth day. The first pass occurs at the end of Rev 78 over the southwestern U.S., and the second is during the Rev 79 over Mexico. Following these passes the equipment is removed from the window and re-stowed. RCS jet B-3 in re-enabled.

Rest

Rest period begins at 129:00 GET (8:00 P.M. EST) and is 9 1/2 hours long.

DAY 7

Day 7 begins at 138:30 GET (5:30 A.M. EST).

Undocked Landmark Tracking

The spacecraft is powered up and the IMU orientation is determined during the second night pass of the day. State vector and nominal IMU orientation are uplinked to the spacecraft over the U.S. at 141:35 GET. The IMU is realigned to the nominal orientation during the next night pass. The update for the first set of landmarks is passed over Honeysuckle at 142:40 GET, and the first landmark tracking exercise is conducted over the U.S. and South Atlantic from 143:00 to 143:40 GET during Rev 91 The next three day passes are used for additional landmark tracking. The night pass between each rev of landmark tracking is used to realign the IMU. The yaw/roll method is used during all landmark tracking.

Rest

Rest period begins at 152:00 GET (7:00 P.M. EST) and is 10 hours in length.

DAY 8

Day 8 begins at 162:00 GET (5:00 A.M. EST).

SPS Burn No. 7

The spacecraft is powered up and the IMU orientation is determined during the fourth night pass of the day. State vector, target load and maneuver pad for the seventh SPS burn are passed to the spacecraft over the U.S. at 168:10 GET. The preferred IMU orientation is calculated onboard and the IMU is realigned during the next night pass. Ignition for SPS Burn No. 7 is at 169:49 GET over the Cape. Burn time is 6.8 seconds and ΔV is 174.0 fps. Two-jet, 18-second ullage is used. The burn is posigrade and raises apogee to 210 nm.

S065 Photography

Following the seventh SPS burn, two more passes of S065 photography are made. The procedure followed is the same as during Day 6. The areas photographed are again the southwest U.S. on Rev 108, and Mexico on Rev 109. In addition, a pass is made over Brazil early in Rev 110.

Rest

Rest period begins at 175:00 GET (6:00 P.M. EST) and is 9 1/2 hours in length.

DAY 9

Day 9 begins at 184:30 GET (3:30 A.M. EST).

S065 Photography

The spacecraft is powered up and a nominal IMU alignment for S065 is passed to the spacecraft over the Eastern Test Range at 187:30 GET. The IMU is oriented and realigned during the next night pass. S065 photography is done during Revs 120 and 121. The first pass is over northern Mexico and the southeastern U.S. Early in Rev 121 a pass over southwest and southern Africa is made. At the end of Rev 121 is the final pass, over the southern U.S.

Rest

Rest period begins at 198:00 GET (5:00 P.M. EST) and is 9 1/2 hours long.

DAY 10

Day 10 begins at 207:30 GET (2:30 A.M. EST).

S065 Photography

The spacecraft is powered up and a nominal IMU alignment is given the spacecraft over the U.S. at 211:30 GET. The IMU is oriented and realigned during the following night pass. S065 photography is performed during Revs 135 and 136. The same general areas in Mexico, the U.S. and Africa which were used on Day 9 are once again photographed.

Rest

Rest period begins at 222:00 GET (5:00 P.M. EST) and is 10 hours in length.

DAY 11

Day 11 begins at 232:00 GET (3:00 A.M. EST).

Entry Preparation

Initial entry preparation and stowage begins at 232:00 GET. The orientation of the IMU will be determined during the third night pass of the day. The pre-entry updates will be sent to the spacecraft over the U.S. at 235:15 GET. These updates will include a state vector, target load, desired IMU orientation, maneuver pad and entry pad. The next night pass, the IMU will be realigned to the preferred orientation. The preferred orientation will not be calculated onboard. Following realignment, entry preparations are completed.

SPS Deorbit Burn

The spacecraft will maneuver to deorbit attitude 45 minutes prior to deorbit. Deorbit attitude is heads up, pitched down 31.7° below the horizon, 180° yaw. Ignition occurs at 238:11:47 GET over the Redstone. Burn time is 9.6 seconds and ΔV is 253.5 fps. Four-jet, 15-second ullage is used. Perigee is lowered to 0 nm.

Entry

Approximately 5 minutes after deorbit CM/SM separation occurs. A GNCS auto entry is flown. The CM passes through 400K feet at 238:30 GET and chutes are deployed 11 minutes later. Splashdown is at 238:47 GET (9:47 A.M. EST).

FLIGHT PLAN NOTES

A. Crew

1. Crew designation is as follows:

Designation	Couch position at lift-off and entry	Prime	Backup
Commander (CDR)	Left	McDivitt	Conrad
Command Module Pilot (CMP)	Center	Scott	Gordon
Lunar Module Pilot (LMP)	Right	Schweikart	Bean

2. The mission is broken down into 11 activity days. Each day is one crew activity period and one rest period. Since crew activity periods vary in length according to mission phase, so do activity days. For this reason the activity days are not established on a 24-hour basis. All three crew members will sleep simultaneously. The CDR and CMP will sleep in the couches. Both the CDR and CMP will wear their COMM headsets and remain on alert duty.

3. The CMP will doff his helmet and gloves at approximately 00:15 GET. The CDR and LMP have the option to do so after the CRO orbital GO. All crewmen will doff their helmets and gloves after transposition, docking, and ejection.

4. The crew has the option to doff the pressure suits at the end of the first day's activity. If doffed, they will be donned for activities in the LM.

5. The crew will eat together when possible. One hour will be allocated for each eat period when possible. Other activities will be held to a minimum during the eat periods.

6. Two night passes are scheduled for IMU orientation determination, IMU realignment, and systems preparation prior to activities requiring the GNCS or PGNCS. If the IMU orientation is known but unacceptable, one full night pass is scheduled for realignment.

7. CSM spacecraft maneuver rates, unless required to support mission objectives or time critical events, will generally not exceed 0.5 deg/sec.

8. LM spacecraft maneuver rates, unless required to support mission objectives or time critical events, will generally not exceed 2.0 deg/sec.

B. Mission Control Center (MCC) Interface

1. During communications, the spacecraft will be referred to by name and the MCC will be referred to as "Houston".

2. General flight plan and consumables updates will be voiced to the crew at the start of each day's activity and will contain a schedule of that day's activities. Detailed updates to support each activity will be voiced to the crew as required throughout the day

3. Negative reporting will be used by the flight crew in reporting the completion of each checklist. The checklist will not be read by the flight crew or MCC over air/ground during the conduct of the checklist unless specifically requested by the MCC during abnormal conditions.

4. All onboard gage readings except RCS quantity reported to MCC by the crew will be read directly from the spacecraft gage and not corrected by the appropriate factors. RCS quantity will be temperature corrected.

C. Spacecraft Systems

1. The spacecraft lift-off and powerdown switch positions will be published in the applicable AOH, VOL. II.

2. Periodic spacecraft systems monitoring is a continuing task and is not scheduled in the flight plan timeline.

3. Each CSM CO_2 Filter will be replaced approximately every 24 hours. The primary LM LiOH cartridge will be changed after the EVA on Day 4.

4. Fuel cell O_2 purges will be performed approximately every 12 hours. H_2 purges will be performed approximately every 48 hours.

5. Potable water chlorination will be scheduled approximately every 24 hours starting at Day 2.

6. Tunnel hardware will be replaced after every crew transfer between the CSM and LM. The only exception to this will be prior to LM jettison, when the probe and drogue will be stowed inside the LM.

7. The CM/LM ΔP VLV valve will be left in the "LM" position for periods when the LM is not manned, allowing CM O_2 to bleed into the LM. For docked manned activity, the valve is in the "LM/CM Tunnel" position, allowing for onboard reading of tunnel pressure. During rendezvous the valve is off.

D. Procedures

1. Crew procedures for the accomplishment of the system and mission operations called out in the flight plan may be found in the following documents:

a. CSM Apollo Operations Handbook
b. LM Apollo Operations Handbook
c. Abort Summary Document
d. EVA Procedures Document
e. LM Rendezvous Procedures Document
f. CSM Rendezvous Procedures Document
g. Entry Summary Document
h. Crew Checklists

2. Particular procedures for the accomplishment of the specific DTO tests are found in Section 4 of this document. A reference to the applicable test procedure is also shown by the test in the timeline, Section 3.

E. Crew Status Reports

During the mission, two crew status reports via air-to-ground communications 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. The following information should be transmitted or logged as appropriate:

1. A daily report of each crewman's best estimate as to sleep quantity and quality.

2. A daily report of the integrated radiation dose each crewman receives.

3. An onboard record of water consumption, food not eaten, and exercise. No report is required.

4. Used fecal bags will be identified as to crewman and GET with the marker pens.

SECTION 2 - UPDATE PADS

INTRODUCTION

The following update pads are used for copying MSFN voice updates onboard the CSM and LM.

CSM BLOCK DATA

BLOCK DATA		
		AREA
		LAT
		LONG
		TIG
		ΔVc
		AREA
		LAT
		LONG
		TIG
		ΔVc
		AREA
		LAT
		LONG
		TIG
		ΔVc
		AREA
		LAT
		LONG
		TIG
		ΔVc
		AREA
		LAT
		LONG
		TIG
		ΔVc
REMARKS		

BLOCK DATA

AREA	XXX-XX	RECOVERY AREA FIRST 3 DIGITS - LANDING REVOLUTION LAST 2 DIGITS - RECOVERY AREA AND SUPPORT CAPABILITIES
LAT	±XX.X (DEG)	LATITUDE OF DESIRED LANDING AREA
LONG	±XXX.X (DEG)	LONGITUDE OFDESIRED LANDING AREA
TIG	XXX:XX:XX (HR:MIN:SEC)	DEORBIT IGNITION TIME FOR THE DESIRED LANDING AREA
ΔVc	XXX.X (fps)	ΔV SET INTO THE EMS ΔV COUNTER

CSM P27 UPDATE

P27 UPDATE

V	V	V	PURP
INDEX	INDEX	INDEX	01
			02
			03
			04
			05
			06
			07
			10
			11
			12
			13
			14
			15
			16
			17
			20
			21
			22
			23
			24
: :	: :	: :	T 34
			φ 43
			λ NAV CHECK
+	+	+	H

REMARKS

P27 UPDATE

V	XX	TYPE OF COMMAND LOAD (70 - 71 - 72 - 73)
PURP		TYPE OF DATA TO BE RECEIVED (SUCH AS: NAV, LIFT-OFF TIME)
01	XX	INDEX NO. OF COMMAND WORDS IN LOAD (OCTAL)
02-24	XXXXX	COMMAND WORDS (OCTAL)
NAV CHECK		SPACECRAFT POSITION RELATIVE TO THE EARTH AT A GIVEN TIME
T	XXX:XX:XX (HR:MIN:SEC)	GET OF NAV CHECK
ϕ	(DEG)	LATITUDE
λ	(DEG)	LONGITUDE
h	(nm)	ALTITUDE

CSM NAV CHECK

NAV CHECK			
+ 0 0	+ 0 0	HRS	N34
+ 0 0 0	+ 0 0 0	MIN	
+ 0 .	+ 0 .	SEC	
0 .	0 .	LAT (+N)	N34
.	.	LONG (+E)	
+ 0 .	+ 0 .	ALT	
+ 0 0	+ 0 0	HRS	N34
+ 0 0 0	+ 0 0 0	MIN	
+ 0 .	+ 0 .	SEC	
0 .	0 .	LAT	N43
.	0 .	LONG	
+ 0 .	+ .	ALT	
+ 0 0	+ 0 0	HRS	N34
+ 0 0 0	+ 0 0 0	MIN	
+ 0 .	+ 0 .	SEC	
0 .	0 .	LAT	N43
.	.	LONG	
+ 0 .	+ 0 .	ALT	
+ 0 0	+ 0 0	HRS	N34
+ 0 0 0	+ 0 0 0	MIN	
+ 0 .	+ 0 .	SEC	
0 .	0 .	LAT	N43
.	.	LONG	
+ 0 .	+ 0 .	ALT	
+ 0 0	+ 0 0	HRS	N34
+ 0 0 0	+ 0 0 0	MIN	
+ 0 .	+ 0 .	SEC	
0 .	0 .	LAT	N43
.	.	LONG	
+ 0 .	+ 0 .	ALT	

NAV CHECK

SPACECRAFT POSITION DEFINED RELATIVE TO THE EARTH FOR A GIVEN TIME

HRS	XXX	GET WHEN NAV CHECK IS VALID
MIN	XX	
SEC	XX.XX	
LAT	±XX.XX (DEG)	LATITUDE
LONG	±XXX.XX (DEG)	LONGITUDE
ALT	XXX.X (nm)	ALTITUDE

CSM MANUEVER UPDATE

MANEUVER UPDATE (P30)

		PURPOSE	
+ 0 0	+ 0 0	HR TIG	33
+ 0 0 0	+ 0 0 0	MIN	
+ 0 .	+ 0 .	SEC	
.	.	ΔVX	81
.	.	ΔVY	LOCAL VERT
.	.	ΔVZ	
+ .	+ .	ΔVR	42
+ .	+ .	ΔVC	
: : .	: : .	BT	
+	+	CSM WT	47
0 0 .	0 0 .	PTRM	48
0 0 .	0 0 .	YTRM	
		SXTS	
.	.	SFT	
.	.	TRUN	
0 .	0 .	ϕ(+N)	NAV CHECK (TIG−30) 43
.	.	λ(+E)	
+ 0 .	+ 0 .	h	

REMARKS R________ P________ Y________

RESIDUALS________ ________ ________ ΔVC________

MANEUVER UPDATE

PURPOSE		PURPOSE OF MANEUVER (SUCH AS: SPS NO. 1)
TIG		IGNITION TIME FOR THE MANEUVER
HR	XXX	
MIN	XX	
SEC	XX.XX	
ΔVX	±XXXX.X (fps)	LOCAL VERTICAL COMPONENTS OF THE MANEUVER
ΔVY	±XXXX.X (fps)	
ΔVZ	±XXXX.X (fps)	
ΔVR	XXXX.X (fps)	TOTAL ΔV REQUIRED FOR THE MANEUVER
ΔVC	XXXX.X (fps)	ΔV SET INTO THE EMS ΔV COUNTER
BT	X:XX.X (MIN:SEC)	DURATION OF THE MANEUVER
CSM WT	XXXXX. (LBS)	PREMANEUVER WEIGHT OF THE SPACECRAFT
PTRM	±X.XX (DEG)	SPS ENGINE PITCH GIMBAL TRIM
YTRM	±X.XX (DEG)	SPS ENGINE YAW GIMBAL TRIM
SXTS	XX	OCTAL IDENTIFIER FOR SEXTANT STAR USED TO VERIFY SPACECRAFT ATTITUDE
SFT	XXX.XX (DEG)	SEXTANT SHAFT ANGLE TO ACQUIRE STAR

MANEUVER UPDATE (cont'd)

TRUN	XX.XXX (DEG)	SEXTANT TRUNNION ANGLE TO ACQUIRE STAR
NAV CHECK		SPACECRAFT POSITION RELATIVE TO THE EARTH AT TIG -30 MIN
ϕ	±XX.XX (DEG)	LATITUDE
λ	±XXX.XX (DEG)	LONGITUDE
h	XXX.X (nm)	ALTITUDE
R		ROLL GIMBAL ANGLE AT TIG
P		PITCH GIMBAL ANGLE AT TIG
Y		YAW GIMBAL ANGLE AT TIG
RESIDUALS		ΔV COMPONENTS AND EMS COUNTER READING REMAINING AFTER THE MANEUVER

CSM ENTRY AND POSTBURN UPDATE

ENTRY UPDATE		
—	—	AREA
		P300K
O	O	LAT 61
		LONG
+	+	RTGO .05G
+	+	VIO .05G
		RET .05G
		RET .2G
		DRE 66
R L /	R L /	BANK AN
		RET RB
		RETBBO
		RETEBO
		RETDROG
		RET MAIN
		BBA(ΔV@90)CHART
		DRE(@90) UPDATE

POSTBURN UPDATE		
+	+	RTGO .05G 63
+	+	VIO .05G
		RET .05G
		RET .2G 66
		DRE
R L /	R L /	BANK AN
		RETRB
		RETBBO
		RETEBO
		RETDROG
		RET MAIN

ENTRY UPDATE AND POSTBURN UPDATE

AREA	XXX-X	RECOVERY AREA FIRST 3 DIGITS - LANDING REVOLUTION LAST DIGIT - RECOVERY AREA AND SUPPORT CAPABILITIES
P300K	XXX (DEG)	PITCH ENTRY GIMBAL ANGLE AT 300K FT
LAT	±XX.XX (DEG)	LATITUDE OF LANDING TARGET POINT
LONG	±XXX.XX (DEG)	LONGITUDE OF LANDING TARGET POINT
RTGO .05G	XXXX.X (nm)	RANGE TO GO FROM .05G TO TARGET
VIO .05G	XXXXX. (fps)	INERTIAL VELOCITY AT .05G
RET .05G	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO .05G
RET .2G	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO .2G
DRE	±XXXXX. (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
RETDROG	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO DROGUE CHUTE DEPLOYMENT

ENTRY UPDATE AND POSTBURN UPDATE (cont'd)

RET MAIN	XX:XX (MIN:SEC)	TIME FROM RETROFIRE TO MAIN CHUTE DEPLOYMENT

CHART UPDATE

BBA	±XX	VALUES USED TO RE-PLOT BACKUP ENTRY CHART -
DRE	±XXX	ΔV AND DRE @ 90° BANK ANGLE

STAR CHECK UPDATE

		HR	GET
		MIN	SR
		SEC	
		R	FDAI
		P	
		Y	
		HR	T ALIGN
		MIN	
		SEC	
		HR	GET
		MIN	SR
		SEC	
		R	FDAI
		P	
		Y	
		HR	T ALIGN
		MIN	
		SEC	
		HR	GET
		MIN	SR
		SEC	
		R	FDAI
		P	
		Y	
		HR	T ALIGN
		MIN	
		SEC	

STAR CHECK UPDATE (DAYLIGHT STAR CHECK, Pg 4-20)

GET SR			TIME OF SUNRISE AT START OF DAYLIGHT STAR CHECK
HR	XXX		
MIN	XX		
SEC	XX:XX		
R	±XXX.X	(DEG)	GIMBAL ANGLES REQUIRED TO PLACE SPACECRAFT AT PROPER INERTIAL ATTITUDE FOR DAYLIGHT STAR CHECK
P	±XXX.X		
Y	±XXX.X		
T ALIGN			ALIGN TIME FOR NOMINAL IMU ORIENTATION PRIOR TO DAYLIGHT STAR CHECK - IF REQUIRED
HR	XXX		
MIN	XX		
SEC	XX.XX		

CSM LANDMARK TRACKING UPDATE

LANDMARK TRACKING UPDATE

LANDMARK ID		
HR MIN SEC	GET	ACQ
R P Y		FDAI
SFT TRUN		

LANDMARK ID		
HR MIN SEC	GET	ACQ
R P Y		FDAI
SFT TRUN		

LANDMARK ID		
HR MIN SEC	GET	ACQ
R P Y		FDAI
SFT TRUN		

LANDMARK TRACKING UPDATE (CSM ORBITAL NAVIGATION, Pg 4-82

LANDMARK ID –	XXX	LANDMARK IDENTIFICATION NUMBER
GET ACQ		TIME WHEN LANDMARK IS FIRST VISIBLE
HR	XXX	
MIN	XX	
SEC	XX.XX	
R	±XXX.X (DEG)	GIMBAL ANGLES REQUIRED TO PLACE SPACECRAFT AT TRACKING ATTITUDE
P	±XXX.X (DEG)	
Y	±XXX.X (DEG)	
SFT	XXX.XX (DEG)	SHAFT AND TRUNNION ANGLES TO PLACE LANDMARK IN OPTICS FIELD-OF-VIEW
TRUN	XX.XXX (DEG)	

CSM S065 UPDATE

S065 UPDATE		
		SITE (OR AREA)
		R FDAI P Y
		HR GET START MIN (5 MIN PRIOR TO FIRST EXPOSURE) SEC
		HR T ALIGN MIN (IF REQ) SEC
		EXPOSURE INTER-SEC
		NUMBER OF EXPOSURES
ORB RATE INERTIAL	ORB RATE INERTIAL	ATTITUDE CONTROL
		SITE (OR AREA)
		R FDAI P Y
		HR GET START MIN (5 MIN PRIOR TO FIRST EXPOSURE) SEC
		HR T ALIGN MIN (IF REQ) SEC
		EXPOSURE INTER-SEC
		NUMBER OF EXPOSURES
ORB RATE INERTIAL	ORB RATE INERTIAL	ATTITUDE CONTROL

S065 UPDATE (S065 PHOTOGRAPHY, Pg 4-78)

SITE (OR AREA)		SITE NUMBER OR NAME OF AREA TO BE PHOTOGRAPHED
FDAI		FDAI ANGLES REQUIRED TO PLACE THE S/C AT PROPER ATTITUDE FOR THE PASS
R	XXX.XX(DEG)	
P	XXX.XX(DEG)	
Y	XXX.XX(DEG)	
GET START		TIME TO MANEUVER S/C TO PROPER ATTITUDE TO BEGIN PASS (5 MINUTES BEFORE THE FIRST EXPOSURE IS MADE)
HR	XXX	
MIN	XX	
SEC	XX	
T ALIGN		ALIGN TIME FOR NOMINAL IMU ORIENTATION PRIOR TO THE EXPERIMENT-IF REQUIRED
HR	XXX	
MIN	XX	
SEC	XX	
EXPOSURE INTERVAL	XX(SEC)	TIME INTERVAL BETWEEN EXPOSURES
NUMBER OF EXPOSURES	XXX	NUMBER OF EXPOSURES TO BE MADE OVER THE SITE OR AREA
ATTITUDE CONTROL		WHETHER THE PASS IS TO BE MADE IN ORBIT RATE (FOR LONG PASSES OVER LARGE AREAS) OR IN INERTIAL ATTITUDE HOLD (FOR SHORT PASSES OVER INDIVIDUAL SITES)

CSM & LM CONSUMABLES UPDATE

CONSUMABLES UPDATE					
				G.E.T.	
				WPU A	SM RCS %
				SM DAP RED	
				SM SCS RED	
				HYB DAP RED	
				WPU B	
				SM DAP RED	
				SM SCS RED	
				HYB DAP RED	
				WPU C	
				SM DAP RED	
				SM SCS RED	
				HYB DAP RED	
				WPU D	
				SM DAP RED	
				SM SCS RED	
				HYB DAP RED	
				lbs 02	
				lbs H2	
				BAT A	
				BAT B Amp-Hrs	
				BAT C	
LM					
				A % RCS	
				B	
				DESC lbs 02	
				DESC Amp-Hrs	
				ASC.	

CONSUMABLES UPDATE

GET	XXX(HR)	TIME WHEN THE UPDATE IS VALID
WPU	XX(%)	PERCENTAGE OF USEABLE PROPELLANT REMAINING IN THE QUAD
SM DAP REDLINE	XX(%)	PERCENTAGE OF USEABLE QUAD PROPELLANT REQUIRED FOR A G&N CONTROLLED SM RCS DEORBIT
SM SCS REDLINE	XX(%)	PERCENTAGE OF USEABLE QUAD PROPELLANT REQUIRED FOR A SCS CONTROLLED SM RCS DEORBIT
HYBRID DAP REDLINE	XX(%)	PERCENTAGE OF USEABLE QUAD PROPELLANT REQUIRED FOR A G&N CONTROLLED HYBRID DEORBIT
O2	XXX(LBS)	TOTAL AMOUNT OF O2 CRYOGENICS REMAINING
H2	XX (LBS)	TOTAL AMOUNT OF H2 CRYOGENICS REMAINING
BAT A,B&C	XX (Amp-Hrs)	NUMBER OF AMP-HRS REMAINING IN ENTRY & POSTLANDING BATTERIES A,B,&C

The above items are for the CSM only. The following items relate to the LM only.

RCS A&B	XX(%)	PERCENTAGE OF USEABLE RCS REMAINING IN SYSTEM A & B
DESCENT O2	XXX(LBS)	AMOUNT OF O2 REMAINING IN THE DESCENT STAGE
DESCENT AMP-HRS	XXXX(Amp-Hrs)	NUMBER OF AMP-HRS REMAINING IN THE DESCENT STAGE BATTERIES
ASCENT AMP-HRS	XXX(Amp-Hrs)	NUMBER OF AMP-HRS REMAINING IN THE ASCENT STAGE BATTERIES

LM AOT STAR OBSERVATION

This update data is copied directly in the onboard crew checklist and, as such, there is no pad format. The following data is required:

GET		GROUND ELAPSED TIME OF STAR OBSERVATION
HR	XXX	
MIN	XX	
SEC	XX	
AOT DETENT		AOT DETENT POSITION TO BE USED
NAV STAR	XX(OCTAL)	NAV STAR TO BE USED FOR TEST
R	XXX(DEG)	INERTIAL CSM ROLL ANGLE
P	XXX(DEG)	INERTIAL CSM PITCH ANGLE
Y	XXX(DEG)	INERTIAL CSM YAW ANGLE

LM S-BAND STEERABLE UPDATE

This update data is copied directly in the onboard crew checklist and, as such, there is no pad format. The following data is required:

GET ACQ			GROUND ELAPSED TIME WHEN STATION ACQUISITION SHOULD OCCUR
HR	XXX		
MIN	XXX		
SEC	XXX		
FDAI INER			
R	XXX	(DEG)	INERTIAL CSM FDAI ANGLES REQUIRED TO PLACE THE SPACECRAFT AT THE TRACKING ATTITUDE
P	XXX		
Y	XXX		
ANT @ T=0			
P	±XXX	(DEG)	ANTENNA GIMBAL ANGLES REQUIRED TO PLACE ANTENNA BEAM ON STATION AT GET ACQ
Y	±XX		
ANT @ T+2			
P	+XXX	(DEG)	ANTENNA GIMBAL ANGLES AT GET ACQ + 2 MIN
Y	±XX		
ANT @ T+4			
P	+XXX	(DEG)	ANTENNA GIMBLE ANGLES AT GET ACQ + 4 MIN
Y	±XX		
ANT @ T+6			
P	+XXX	(DEG)	ANTENNA GIMBLE ANGLES AT GET ACQ + 6 MIN
Y	±XX		

LM MANEUVER UPDATE

LM MANEUVER (P30)

		PURPOSE	
+ 0 0 + 0 0 0 + 0 .	+ 0 0 + 0 0 0 + 0 .	HR 33 MIN TIG SEC	+ 0 0 + 0 0 0 + 0 .
. . .	. . .	ΔVX 37 ΔVY LOCAL ΔVZ VERT	. . .
+ .	+ .	ΔVR 42	+ .
		R FDAI 18 P INER	
. . .	. . .	ΔVX 86 ΔVY AGS ΔVZ	. . .
		AOTS DETENT A1 LINE ID A2	
		COAS AZ EL	

REMARKS:

LM MANEUVER UPDATE

PURPOSE		PURPOSE OF MANEUVER (SUCH AS DOCKED DPS, PHASING, INSERTION)
TIG		IGNITION TIME FOR THE MANEUVER
HR	XXX	
MIN	XX	
SEC	XX.XX	
LOCAL VERT		
ΔVX	±XXXX.X(fps)	LOCAL VERTICAL ΔV COMPONENTS OF THE MANEUVER
ΔVY	±XXXX.X(fps)	
ΔVY	±XXXX.X(fps)	
ΔVR	XXXX.X(fps)	TOTAL ΔV REQUIRED FOR THE MANEUVER
FDAI INER		
R	XXX (DEG)	INERTIAL FDAI ANGLES AT THE BURN ATTITUDE
P	XXX (DEG)	
ΔVX AGS	±XXXX.X(fps)	LOCAL VERTICAL ΔV COMPONENTS OF THE MANEUVER USED TO TARGET THE AGS; ROTATED THROUGH THE HALF-ANGLE OF THE BURN
ΔVY AGS	±XXXX.X(fps)	
ΔVZ AGS	±XXXX.X(fps)	
AOTS	XX(OCTAL)	IDENTIFIER FOR AOT STAR USED TO VERIFY SPACECRAFT ATTITUDE AT THE BURN ATTITUDE
DETENT	X	AOT DETENT FOR STAR CHECK
A1	XXX(DEG)	ANGLE READOUT WHEN THE AOT RETICLE LINE IDENTIFIED BELOW IS PLACED ON THE AOTS
LINE ID	X	IDENTIFIER OF THE AOT RETICLE LINE TO BE USED WITH A1

LM MANEUVER UPDATE (cont'd)

A2	XXX(DEG)	ANGLE READOUT WHEN THE AOT RETICLE SPIRAL IS PLACED ON THE AOTS
COAS	XX(OCTAL)	IDENTIFIER FOR COAS STAR USED TO VERIFY SPACECRAFT ATTITUDE AT THE BURN ATTITUDE
AZ	XXX (DEG)	THE AZIMUTH AND ELEVATION ANGLES OF THE COAS STAR
EL	XXX (DEG)	

NOTE: THE P30 PAD FOR PHASING WILL CONTAIN A TPI_0 TIG IN THE REMARKS

CSI UPDATE (P32)

+ 0 0 + 0 0 0 + 0 .	+ 0 0 + 0 0 0 + 0 .	HR MIN TIG CSI SEC 30	+ 0 0 + 0 0 0 + 0 .
+ 0 0 + 0 0 0 + 0 .	+ 0 0 + 0 0 0 + 0 .	HR MIN TIG TPI SEC 37	+ 0 0 + 0 0 0 + 0 .

MSFN

0 0 . 0 0 .	0 0 . 0 0 .	ΔVX LOCAL VERT 81 ΔVY	0 0 . 0 0 .
		PLM FDAI 18	
0 0 . 0 0 .	0 0 . 0 0 .	ΔVX AGS 86 ΔVZ	0 0 . 0 0 .

PGNCS	CHARTS		
0 0 . 0 0 . 0 0 .	0 0 .	ΔVX LOCAL VERT 81 ΔVY ΔVZ	

BIAS: TIG (TPI) = TIG (MSFN) + 2:00

REMARKS:

_ _ _ : _ _ : _ _

2 : 0 0

_ _ _ : _ _ : _ _

<u>CSI UPDATE</u>

TIG CSI		IGNITION TIME FOR THE CSI MANEUVER
HR	XXX	
MIN	XX	
SEC	XX.XX	
TIG TPI		IGNITION TIME FOR THE TPI MANEUVER
HR	XXX	
MIN	XX	
SEC	XX.XX	
LOCAL VERT		
ΔVX	±XX.X (fps)	LOCAL VERTICAL ΔV COMPONENTS OF THE CSI MANEUVER
ΔVY	±XX.X (fps)	
PLM FDAI	XXX (DEG)	LM FDAI INERTIAL PITCH ANGLE AT CSI BURN ATTITUDE
ΔVX AGS	±XX.X (fps)	Local vertical ΔV COMPONENTS OF CSI USED TO TARGET AGS EXT ΔV; ROTATED THROUGH THE HALF-ANGLE OF THE BURN
ΔVZ AGS	±XX.X (fps)	

Below the double line is for onboard use only.

LM CDH MANEUVER UPDATE

CDH UPDATE (P33)

+ 0 0	+ 0 0	HR	+ 0 0
+ 0 0 0	+ 0 0 0	MIN TIG CDH 31	+ 0 0 0
+ 0 .	+ 0 .	SEC	+ 0 .

MSFN

0 0 .	0 0 .	ΔVX	0 0 .
0 0 .	0 0 .	ΔVY LOCAL VERT 81	0 0 .
0 0 .	0 0 .	ΔVZ	0 0 .
		PLM FDAI 18	
0 0 .	0 0 .	ΔVX AGS 86	0 0 .
0 0 .	0 0 .	ΔVZ	0 0 .

PGNCS	CHARTS		
0 0 .	0 0 .	ΔVX	
0 0 .		ΔVY	LOCAL VERT 81
0 0 .	0 0 .	ΔVZ	

BIAS: TIG (CDH) = TIG (PGNCS) + 1:50

REMARKS:

_ _ _ : _ _ : _ _

1 : 5 0

_ _ _ : _ _ : _ _

CDH UPDATE

TIG CDH		IGNITION TIME FOR THE CDH MANEUVER
HR	XXX	
MIN	XX	
SEC	XX.XX	
LOCAL VERT		
ΔVX	±XX.X (fps)	LOCAL VERTICAL ΔV COMPONENTS OF THE CDH MANEUVER
ΔVY	±XX.X (fps)	
ΔVZ	±XX.X (fps)	
PLM FDAI	XXX (DEG)	LM FDAI INERTIAL PITCH ANGLE AT CDH BURN ATTITUDE
ΔVX AGS	±XX.X (fps)	LOCAL VERTICAL ΔV COMPONENTS OF CDH USED TO TARGET AGS EXT ΔV; ROTATED THROUGH THE HALF-ANGLE OF THE BURN
ΔVZ AGS	±XX.X (fps)	

Below the double line for onboard use only.

LM TPI MANEUVER UPDATE

TPI UPDATE (P34)

+ 0 0 + 0 0 0 + 0 .	+ 0 0 + 0 0 0 + 0 .	HR MIN SEC	TIG TPI	37	+ 0 0 + 0 0 0 + 0 .
0 0 . 0 0 . 0 0 .	0 0 . 0 0 . 0 0 .	ΔVX ΔVY ΔVZ	LOCAL VERT	81	0 0 . 0 0 . 0 0 .
+ 0 0 .	+ 0 0 .	ΔVR		42	+ 0 0 .
		RLM PLM	FDAI INER	18	
+ 0 . 0 .	+ 0 . 0 .	R TPI Ṙ TPI		54	+ 0 . 0 .

MSFN

0 0 . 0 0 . 0 0 .	0 0 . 0 0 . 0 0 .	F/A (+/-) L/R (-/+) U/D (-/+)	ΔV LOS	59	0 0 . 0 0 . 0 0 .

PGNCS	CHARTS			
0 0 . 0 0 . 0 0 .	0 0 . 0 0 .	F/A L/R U/D	ΔV LOS	59

REMARKS:

TPI UPDATE

TIG TPI		IGNITION TIME FOR THE TPI MANEUVER
HR	XXX	
MIN	XX	
SEC	XX.XX	
LOCAL VERT		
ΔVX	±XX.X (fps)	LOCAL VERTICAL ΔV COMPONENTS OF THE TPI MANEUVER
ΔVY	±XX.X (fps)	
ΔVZ	±XX.X (fps)	
ΔAVR	XX.X (fps)	TOTAL ΔV REQUIRED FOR THE MANEUVER
FDAI INER		
R LM	XXX (DEG)	LM FDAI ROLL & PITCH ANGLE AT TPI BURN ATTITUDE
P LM	XXX (DEG)	
R TPI	XX.XX (ft)	RANGE AT TPI TIG -5 MIN
R TPI	±XXX.X (fps)	RANGE RATE AT TPI TIG -5 MIN
ΔV LOS		
F/A	F/AXX.X(fps)	LINE-OF-SIGHT ΔV COMPONENTS OF THE TPI MANEUVER
L/R	L/RXX.X(fps)	
U/D	U/DXX.X(fps)	

Below the double line is for onboard use only.

LM P-27 UPDATE

LM P27 UPDATE			
V	V	V	PURP
INDEX	INDEX	INDEX	01 306 02 307 03 310 04 311 05 312 06 313 07 314 10 315 11 316 12 317 13 320 14 321 15 322 16 323 17 324 20 325 21 326 22 327 23 330 24 331
+	+	+	T ϕ(+N) λ(+E) NAV H CHECK
REMARKS			

LM P27 UPDATE

V	XX	TYPE OF COMMAND LOAD (70 - 71 - 72 - 73)
PURP		TYPE OF DATA TO BE RECEIVED (SUCH AS: NAV. LIFT-OFF TIME)
01	XX	INDEX NO. OF COMMAND WORDS IN LOAD (OCTAL)
02-24	XXXXX	COMMAND WORDS (OCTAL)
NAV CHECK		SPACECRAFT POSITION RELATIVE TO THE EARTH AT A GIVEN TIME

(NOTE: 306 - 331 ARE THE UPBUFF REGISTERS)

T	XXX:XX:XX (HR:MIN:SEC)	GET OF NAV CHECK
Φ	±XXX.XX (DEG)	LATITUDE
λ	±XXX.XX (DEG)	LONGITUDE
h	XXXX.X	ALTITUDE

LM AGS STATEVECTOR UPDATE

	AGS STATE VECTOR UPDATE			
1	2 4 0		2 4 0	
2	2 4 1		2 4 1	
3	2 4 2		2 4 2	
4	2 6 0		2 6 0	
5	2 6 1		2 6 1	
6	2 6 2		2 6 2	
7	2 5 4	+	2 5 4	+
10	2 4 4		2 4 4	
11	2 4 5		2 4 5	
12	2 4 6		2 4 6	
13	2 6 4		2 6 4	
14	2 6 5		2 6 5	
15	2 6 6		2 6 6	
16	2 7 2	+	2 7 2	+

REMARKS

AGS STATE VECTOR UPDATE

PURP		PURPOSE FOR AGS STATE VECTOR UPDATE
1 - 16	XXXXX	OCTAL AGS STATE VECTOR COMPONENTS

CSM & LM GIMBAL ANGLE UPDATE

GIMBAL ANGLE UPDATE

		GET
		R
		P
		Y
		PURP
		GET
		R
		P
		Y
		PURP
		GET
		R
		P
		Y
		PURP

GIMBAL ANGLE UPDATE

G.E.T.	XXX:XX:XX	(HR-MIN-SEC)	TIME WHEN SPACECRAFT IS TO MANEUVER TO THE UPDATED GIMBAL ANGLES
R	XXX.X	(DEG)	ROLL ANGLE
P	XXX.X	(DEG)	PITCH ANGLE
Y	XXX.X	(DEG)	YAW ANGLE

SECTION 3 - DETAILED TIMELINE

SECTION 3

FOLDOUT FRAME 1

APOLLO 9 SUMMARY FLIGHT P

REVOLUTION NO.: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63

ACTIVITY DAY: 1, 2, 3, 4

GET: 0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96

LM

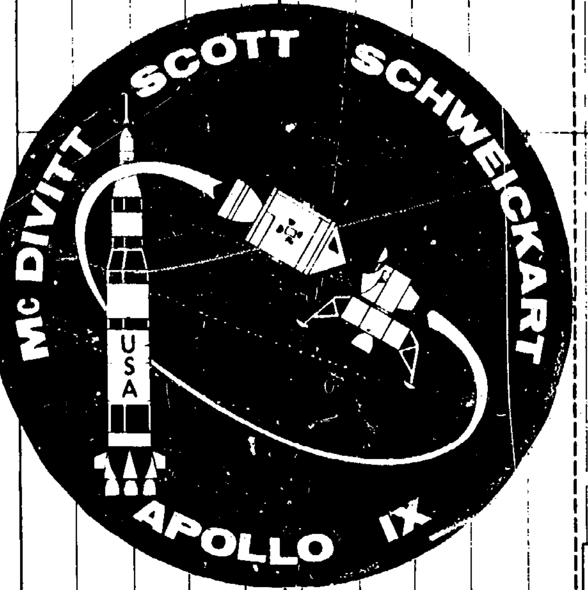
MNVR. DATA

DOCKED DPS
49:42 00
2/10 ULLAGE
BT 367.0 SEC
ΔV 1734.1 FPS
(TARGETED FOR
1723.2 FPS)
270/115

DPS
PHASING
93:50:03.6
2/7 ULLAGE"
BT 24.8 SEC
ΔV_R 85 FPS
145/119

DPS
INSERTION
95:41:48.1
2/7 ULLAGE
BT 24.4 SEC
ΔVR 39.9 FPS
144/142

RCS CSI
4 JET INTERCON
96 22:00
BT 29.6 SEC
ΔV 37.8 FPS
140/121



- LMP IVT TO LM, ECS CHECKOUT
- ENTRY CHECKS, EPS
- CDR IVT TO LM
- CLOSE TUNNEL
- GLYCOL, PGA, REGULATOR CHECK
- DAYLIGHT AOT VISIBILITY CHECK
- S-BAND STEERABLE ANT TEST
- COMMUNICATIONS TESTS
- PLSS COMMUNICATIONS CHECK AND TV
- DEPLOY LANDING GEAR
- PGNCS, AGS, LGC ACTIVATION
- IMU COARSE ALIGN
- RCS PRESS, COLD FIRE, HOT FIRE
- FINE ALIGN TORQUING
- LR, RR SELF TEST, AGS CALIBRATION
- DPS PRESSURIZATION
- FINE ALIGN TORQUING
- UPDATE, ALIGN, CALIBRATE AGS
- PREP FOR DPS BURN AND BURN
- AGS CALIBRATION AND LR SELF TEST
- CDR IVT TO CSM
- SUBLIMATOR DRYOUT
- LMP IVT TO CSM

TV PASS
46:27
TO
46:34

- LMP IVT TO LM
- INITIAL LM ACTIVATION
- CDR IVT TO LM
- ASSIST IN CLOSING TUNNEL
- COMPLETE LM ACTIVATION
- ASSEMBLE EMU FOR EVA
- PLSS COMMUNICATION CHECK
- PREP FOR DEPRESS AND DEPRESS
- LMP EVT TO CSM
- RETRIEVE CSM SAMPLES
- LMP EVT TO LM
- RETRIEVE LM SAMPLE
- LMP EVALUATE LIGHTING
- H BLAD PHOTO AND T.V.
- LMP INGRESS LM
- REPRESS LM
- PLSS DOFFING AND RECHARGE
- REMOVE, REPLACE LIOH CART
- CABIN CLEANUP
- CDR IVT TO CSM
- SUBLIMATOR DRYOUT
- LMP IVT TO CSM

TV PASS
75:00
TO
75:15

- LMP IVT TO LM
- INITIAL LM AC
- CDR IVT TO LM
- ASSIST CLOSI
- LM ACTIVAT
- IMU COARSE
- FINE ALIG
- UNDOC
- IMU REA
- PREP FO
- IMU R
- PRE
- PRE
- P

CSM

- LAUNCH, INSERTION CHECKLIST
- TRANSPOSITION, DOCKING AND EJECTION
- FIRST S-IVB RESTART
- IMU REALIGN AND ALIGNMENT CHECK
- PREP FOR SPS BURN 1 AND BURN
- SECOND S-IVB RESTART
- DAYLIGHT STAR CHECK
- SXT CALIBRATION (TRUNNION BIAS)
- DOFF PGAs
- IMU ORIENTATION
- IMU REALIGN AND ALIGNMENT CHECK
- PREP FOR SPS BURN 2 AND BURN
- IMU REALIGN
- PREP FOR SPS BURN 3 AND BURN
- IMU REALIGN
- PREP FOR SPS BURN 4 AND BURN
- DON PGAs
- CLEAR TUNNEL
- LMP IVT TO LM
- ORIENT, ALIGN IMU
- CDR IVT TO LM
- CLOSE TUNNEL
- MNVR FOR AOT STAR OBSERVATIONS
- MNVR FOR LM STEERABLE ANT TEST
- PLSS COMMUNICATIONS CHECK
- ASSIST LM IMU COARSE ALIGN
- IMU REALIGN
- PREP FOR DOCKED DPS BURN
- CLEAR TUNNEL
- CDR IVT TO CSM
- LMP IVT TO CSM
- CLOSE TUNNEL
- IMU REALIGN
- PREP FOR SPS BURN 5 AND BURN
- DOFF PGAs
- DON PGAs
- CLEAR TUNNEL
- LMP IVT TO LM
- IMU ORIENT
- CDR IVT TO LM
- CLOSE TUNNEL
- STOW CENTER COUCH
- IMU REALIGN
- PLSS COMMUNICATION CHECK
- PREP FOR DEPRESS
- CABIN DEPRESS
- EVA PHOTOGRAPHY
- LMP EVT CSM AND BACK TO LM
- LIGHTS CHECK AND EVA PHOTO
- REPRESS CSM
- CLEAR TUNNEL
- CDR IVT TO CSM
- LMP IVT TO CSM
- CLOSE TUNNEL
- DOFF PGAs
- IMU ORIENT
- DON PGAs AND
- LMP AND CDR
- CLOSE TUNNE
- ASSIST LM CO
- RR TRANSFO
- PREP FOR
- LM INSPE
- IMU REA
- IMU R
- PREP
- PRE

MNVR. DATA

SPS BURN 1
06:01:40
NO ULLAGE
BT 5.0 SEC
ΔV_R 36.8 FPS
128/113

SPS BURN 2
22:12:00
NO ULLAGE
BT 111.1 SEC
ΔV_R 850.1 FPS
192/113

SPS BURN 3
25:18:30
NO ULLAGE
BT 279.4 SEC
ΔV_R 2549.1 FPS
270/115

SPS BURN 4
28:28:00
4/18 ULLAGE
BT 28.0
ΔV_R 300.0
271/115

SPS BURN 5
54:25:16
4/18 ULLAGE
BT 41.4
ΔV_R 551.0 FPS
133/133

SM RCS SEP
93:05:45
4-X JETS
BT 10.5 SEC
ΔV 5.0 FPS
132/131

MAX COVERAGE REVS USA

CSM CANISTER CHANGE: 1, 2, 3, 4, 5, 6, 7, 8

SLEEP PERIODS

EAT PERIODS

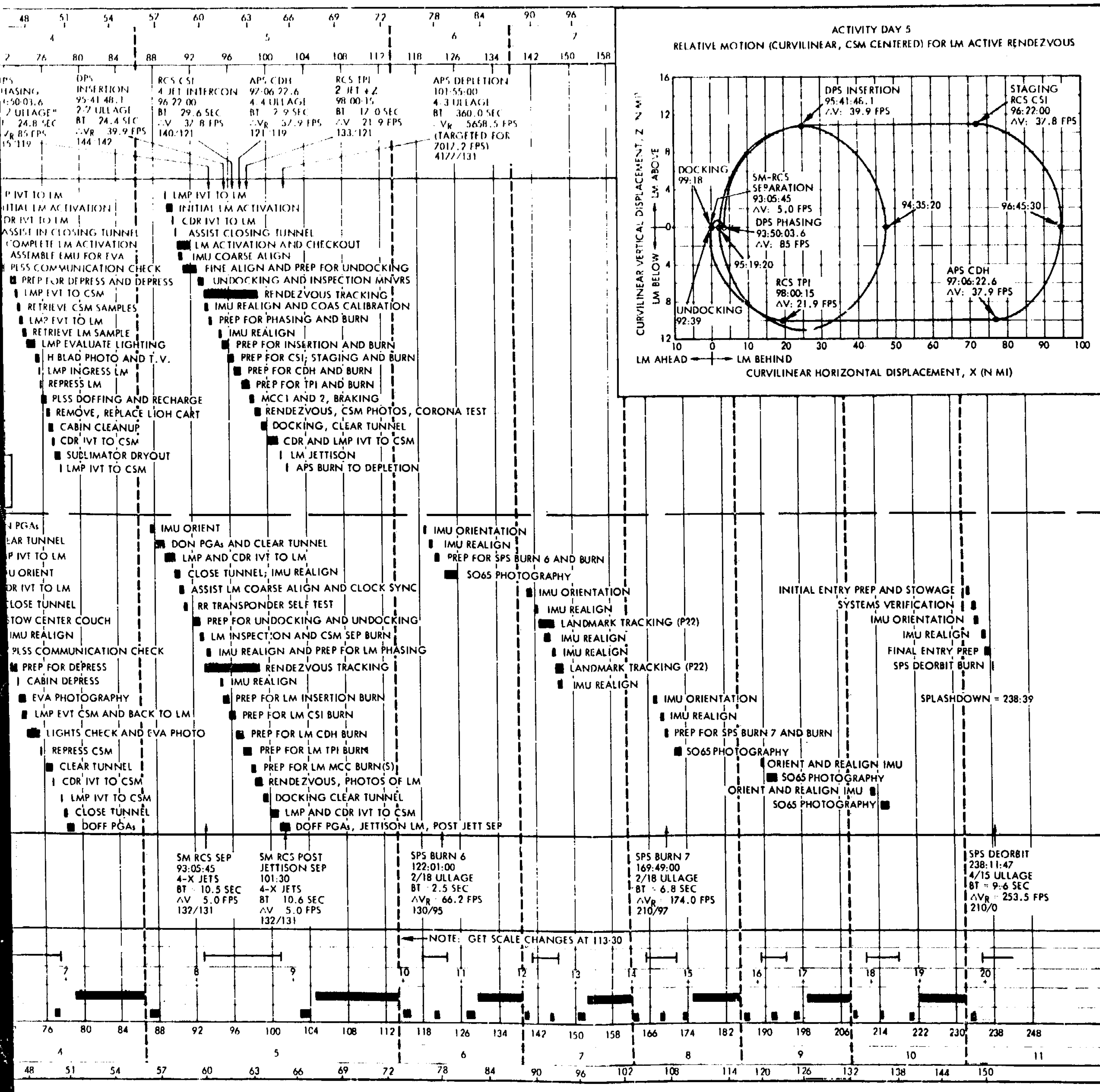
GET: 0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96

ACTIVITY DAY: 1, 2, 3, 4

REVOLUTION NO: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63

9 SUMMARY FLIGHT PLAN

FOLDOUT FRAME 2



BURN SCHEDULE

Burn	GETI Burn Time	LH Att wrt Orbit Plane	Head Position wrt Orb Plane Lighting	ΔV (LVLH) ΔV_R	Ullage ΔV	TVC Post Burn Orbit	Pilot (Left Position)	Vehicle Weight at GETI	Remarks
SM-RCS Evasive Mnvr	04:11:27.9 BT = 3.0		SR+4 min	ΔV = 0.4	.	112/106	CMP	CSM = 58,877 LM = 31,995 Total= 90,872	4 Jet Burn
CSM SPS Burn 1	06:01:40 BT = 5.0	R = 0.0 P = +1.0 Y = -0.7	Up SR+27 min	ΔVX = +36.8 ΔVY = 0.0 ΔVZ = 0.0 ΔV_R = 36.8	0	G&N 128/113	CDR	CSM = 58,856 LM = 31,995 Total= 90,851	
CSM SPS Burn 2	22:12:00 BT = 111.1	R = 0.0 P = +1.8 Y = -83.7	Up SR+20 min	ΔVX = +102.1 ΔVY = -843.8 ΔVZ = -14.4 ΔV_R = 850.1	0	G&N 192/113	CMP	CSM = 58,459 LM = 31,995 Total= 90,454	
CSM SPS Burn 3	25:18:30 BT = 279.4	R = 0.0 P = +1.4 Y = -90.3	Up SR+28 min	ΔVX = +13.9 ΔVY = -2549.0 ΔVZ = -16.7 ΔV_R = 2549.1	0	G&N with MTVC 270/115	CMP	CSM = 51,104 LM = 31,995 Total= 83,099	
CSM SPS Burn 4	28:28:00 BT = 28.0	R = 0.0 P = +0.7 Y = -90.2	Up SR+36 min	ΔVX = -0.7 ΔVY = -300.0 ΔVZ = +1.2 ΔV_R = 300.0	4 Jet 18 sec ΔV = 3.6	G&N 271/115	CMP	CSM = 32,467 LM = 31,995 Total= 64,462	
LM Docked DPS Burn	49:42:00 BT = 367.0	R = 0.0 P = 0.3 Y = -91.9	Face up SR+29 min	ΔVX = -57.2 ΔVY = -1722.3 ΔVZ = 9.2 ΔV_R = 1723.2	2 Jet 10 sec ΔV = 1.0	PGNCS with manual Ramp 270/115	CDR	CSM = 30,585 LM = 31,995 Total= 62,580	LM DOCKED DPS CSM Att wrt to Orbit Plane (LHLV); R = +120.0, P = -0.3 Y = +88.1.
CSM SPS Burn 5	54:25:16 BT = 41.4	R = 0.0 P = -37.5 Y = -120.3	Up SR+39 min	ΔVX = -208.4 ΔVY = -371.8 ΔVZ = 349.2 ΔV_R = 551.0	4 Jet 18 sec ΔV = 4.5	G&N 133/133	CDR	CSM = 30,476 LM = 21,878 Total= 52,354	LM targeted for 371 sec to allow for manual cutoff. Actual ΔV_R = 1714.1 fps
SM RCS Separation Burn	93:05:45 BT = 10.5	R = +17.3 P = +89.6 Y = +17.3	Face up SR+38 min	ΔV = 5.0		G&N 132/131	CMP	CSM = 27,282 LM = 22,302	4 Jet Burn
LM DPS Phasing	93:50:03.6 BT = 24.8	R = -6.5 P = +88.8 Y = -6.5	SR-7 min	ΔVX = +1.3 ΔVY = 0.0 ΔVZ = -85.0 ΔV_R = 85.0	2 Jet 7 sec ΔV = 2.0	AGS 145/119	CDR	LM = 22,121 CSM = 27,267	
LM DPS Insertion	95:41:48.1 BT = 24.4	R = 0.0 P = -0.7 Y = 0.0	Face up SR+15 min	ΔVX = +39.9 ΔVY = 0.0 ΔVZ = +0.5 ΔV_R = 39.9	2 Jet 7 sec ΔV = 2.1	PGNCS 10% 144/142	CDR	LM = 21,811 CSM = 27,267	

BURN SCHEDULE (CONT)

Burn	GETI Burn Time	LH Att wrt Orbit Plane	Head Position wrt Orb Plane Lighting	ΔV (LVLH) ΔV_R	Ullage ΔV	TVC Post Burn Orbit	Pilot (Left Position)	Vehicle Weight at GETI	Remarks
LM RCS CSI	96:22:00.0 BT 29.6	R : 0.0 P : +1.0 Y : +180.0	Face up SR+55 min	ΔVX : -37.8 ΔVY : 0.0 ΔVZ : 0.0 ΔV_R : 37.8		PGNCS 140/121	CDR	LM : 10,106 (staged) CSM : 22,267	LM weight unstaged : 21,676
LM APS CDH	97:06:22.6 BT 2.9	R : 0.0 P : +2.3 Y : +180.0	Face up SR+11 min	ΔVX : -37.8 ΔVY : 0.0 ΔVZ : -1.5 ΔV_R : 37.9	4 Jet 4 sec ΔV : 5.1	PGNCS Ext ΔV 121/119	CDR	LM : 10,040	
LM RCS TPI	98:00:15 BT : 17.0	R : 0.0 P : +26.4 Y : 0.0	Face up SR-10 min	ΔV = 21.9		PGNCS Lambert 133/121	CDR	LM = 9,971	
SM RCS Post Jettison Separation	101:30 BT : 10.6	R : 0.0 P : 0.0 Y : +90.0	SR+6 min	ΔVX : 0.0 ΔVY : 5.0 ΔVZ : 0.0 ΔV_R : 5.0			CMP	LM : 9,324 CSM : 27,711	4 Jet Burn
LM APS Depletion	101:55:00 BT : 360.0	R : 0.0 P : -14.1 Y : -46.7	SR+31 min	ΔVX : +4969.8 ΔVY : -4953.8 ΔVZ : +47.2 ΔV_R : 7017.2	4 Jet 3 sec ΔV : 4.1	PGNCS Ext ΔV 4177/131		LM : 9,319	LM Targeted for 422 sec to allow for propellant depletion. Actual ΔV_R = 5,658.5 fps
CSM SPS Burn 6	122:01:00 BT = 2.5	R : 0.0 P : +19.5 Y : +180.0	Up SR-11 min	ΔVX : -63.5 ΔVY : 0.0 ΔVZ : -18.8 ΔV_R : 66.2	2 Jet 18 sec ΔV : 4.3	G&N 130/95	CMP	CSM = 27,482	
CSM SPS Burn 7	169:49:00 BT : 6.8	R : 0.0 P : +27.5 Y : +0.6	Up SR+27 min	ΔVX : +157.8 ΔVY : -0.2 ΔVZ : -73.4 ΔV_R : 174.0	2 Jet 18 sec ΔV : 4.3	G&N 210/97	CDR	CSM = 27,157	
CSM SPS Deorbit	238:11:47 BT 9.6	R : 0.0 P : -47.0 Y : -180.0	Up SR-2 min	ΔVX : -162.4 ΔVY : +0.1 ΔVZ : +194.7 ΔV_R : 253.5	4 Jet 15 sec ΔV : 7.4	G&N 210/0	CDR	CSM = 26,512	

FLIGHT PLAN

TIME	EVENT	REMARKS
-00:09	LCC: REPORT IGNITION	NOMINAL LIFT-OFF 1600 GMT
00:00	LCC: REPORT LIFT-OFF	L/O LIGHT, ENGINE LIGHTS OFF UMBILICAL DISCONNECT, $T_1 = 0$
	CDR: REPORT CLOCK START	
00:02	YAW MANEUVER	
00:10	LCC: REPORT CLEAR OF TOWER	
00:12	CDR: REPORT ROLL & PITCH START	
00:31	ROLL COMPLETE	
00:42	MCC: REPORT MODE 1B	PRPLNT DUMP - RCS CMD
	CDR: REPORT MODE 1B	
01:21	MAX Q	
01:54	MCC: REPORT MODE 1C	h = 100,000 ft (16.5 nm)
	CDR: REPORT MODE 1C	
02:00	CMP: REPORT EDS AUTO - OFF	EDS ENG & RATES - OFF
	MCC: REPORT GO/NO GO FOR STAGING	
	CDR: REPORT GO/NO GO FOR STAGING	
02:14	CDR: REPORT INBOARD CUTOFF	
02:40	CDR: REPORT OUTBOARD CUTOFF	
	SIC/S-II STAGING	
02:44	S-II 65%	
03:10	CDR: REPORT S-II SEP LTS - OUT	
03:16	CMP: REPORT TOWER JETT & MODE II	
	MCC: REPORT MODE II	
03:20	CDR: REPORT GUIDANCE INITIATE	
04:00	MCC: REPORT TRAJECTORY GO/NO GO	

FLIGHT PLAN

TIME	EVENT	REMARKS
04:00	CDR: REPORT STATUS	
05:00	CDR: REPORT STATUS	
05:53	MCC: REPORT S-IVB TO ORBIT CAPABILITY	
06:00	CDR: REPORT STATUS	
06:30	MCC: REPORT TIME OF LEVEL SENSE ARM & S-II CUTOFF	
07:00	CDR: REPORT STATUS	
08:00	CDR: REPORT STATUS	
08:20	MCC: REPORT GO/NO GO FOR STAGING	
	CDR: REPORT GO/NO GO FOR STAGING	
08:54	S-II CUTOFF	
	S-II/S-IVB STAGING	
08:55	S-IVB IGNITION	
08:58	S-IVB 65%	
	CDR: REPORT STATUS	
09:45	MCC: REPORT MODE IV	
	CDR: REPORT MODE IV	
10:00	CDR: REPORT GO/NO GO FOR ORBIT	
10:49	CDR: REPORT S-IVB CUTOFF	$T_5 = 0$

FLIGHT PLAN

Time	Station	CDR	CMP	LMP
00:00	MIL	LAUNCH		
	BDA			
:10	VAN	INSERTION CHECKLIST ECS POST INSERTION CONFIGURATION		
			MAN LEB (DOFF & STOW HELMET, GLOVES & MAE WEST)	
:20	CYI	ECS RENDUNDANT COMPONENT CHECK 1. MAIN REGS 2. SEC RAD LEAK CHECK Sw TO SIMPLEX A 3. SEC GLYCOL LOOP		
		GDC ALIGN TO IMU		ECS MON CHECK
:30		EMS TEST	UNSTOW X-LIST & CAMERAS	EPS MON CHECK
		SM & CM RCS MON CHECK	INSTALL OPTICS	
:40			JETT DUST COVERS	
				PREPARE CAMERAS: HASS & SEQ
:50			P52 IMU REALIGN (REFSMMAT)	
	CRO	MCC-GO/NO GO FOR 6-4		BACKUP COMM CHECK
01:00				

2

Time	Station	CDR	CMP	LMP
01:00	HSK	DOFF & STOW HELMET, GLOVES & MAE WEST (OPTIONAL)	REPORT IMU TORQUE ∠'S & TIME	DOFF & STOW HELMET, GLOVES & MAE WEST (OPTIONAL)
:10		LAUNCH DEBRIEFING		
	MER			
:20		SCS CHECK	POSTINSERTION UNSTOWAGE	F/C PURGE CHECK
:30	GYM	PREPARE COAS		C&WS CHECK
	TEX			SPS MON CHECK
:40	MIL	MOUNT & INITIALIZE ORDEAL		
		EXTEND DOCKING PROBE		
:50	VAN			
	CYI	AT CREW CONVENIENCE: CDR MAN CENTER COUCH & CMP MAN LEFT-HAND COUCH		
02:00		TERMINATE CABIN PURGE		

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3. 1969	00:00 - 02:00	1/1-2	3-3

FLIGHT PLAN

02:00 DISABLE PRIMARY GLYCOL EVAPORATOR

:10 TAN

:20 LOGIC BUS ARM
MCC-GO/NO GO FOR PYRO ARM
MCC-GO/NO GO FOR T&D
ENABLE IU COMMAND
MCC-CMD IU SYSTEM ENABLE

CRO

:30 S-IVB MANEUVER TO T&D ATT
02:34:00, R=181, P=94, Y=15 (INERTIAL)

GDC ALIGN

PREPARE FOR T&D

:40 HTV

P47 THRUST MONITOR
SEPARATION (TO ≈50 FT)
PITCH 180° & NULL RELATIVE ΔV

:50 HAW

RFD

FORMATION FLYING (≈50 FT)
& VISUAL INSPECTION OF SLA (Pg 4-14)

03:00 TERMINATE P47

3

03:00 GDS

LOGIC BUS ARM
MCC-GO/NO GO FOR PYRO ARM
DOCK (HBR MSFN COVERAGE REQ)
R = 119, P = 274, Y = 345 (INERTIAL)
BEGIN LM PRESSURIZATION

TEX

:10 MIL

BDA

MCC UPDATE
STATE VECTOR

VAN

:20

:30 ACN

CONFIGURE FOR EJECTION
(1) TUNNEL PRESSURE INTEGRITY CK
(2) REMOVE & TEMP STOW FWD HATCH
(3) CHECK DOCKING LATCHES
(4) READ DOCKING ANGLE
(5) CONNECT UMBILICALS
(6) VERIFY PWR TO LM
(7) REINSTALL HATCH
(8) LM/CM ΔP VLV - LM

:40 PRE

TAN

:50

RESUME CABIN PURGE
LOGIC BUS ARM
MCC-GO/NO GO FOR PYRO ARM

04:00 CRO

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	02:00 - 04:00	1/2-3	3-4

FLIGHT PLAN

04:00

CRO

MCC-EJECTION GO/NO GO

EJECTION (@ SUNRISE)

(Pg 4-15)

P47 THRUST MONITOR

TIG = EJECTION + 2:30
4 -X JETS
BT = 3.0 SEC
ΔV = 0.4 fps
50° PITCH DOWN FROM S-IVB
ORBIT 112 x 109

:10

EVASIVE MNVR

V49: R=142.8, P=313.5, Y=3055

TERMINATE P47

HTV

S-IVB MANEUVER TO
R=0, P=0, Y=0
04:25:00

:20

HAW

MANEUVER TO MAINTAIN VISUAL CONTACT WITH S-IVB

REPORT ESTIMATED DISTANCE FROM S-IVB

MCC-GO/NO GO FOR S-IVB RESTART

ONBOARD GO/NO GO

:30

GDS

TEX

MCC UPDATE

SPS1 GIMBAL ANGLES

:40

MIL

FIRST S-IVB RESTART
TIG = 04:45:41

HGA BOOM LOCK CHECK

GBM

:50

ANG

MCC UPDATE

TGT LOAD

MNVR PAD

P30 EXTERNAL ΔV

P40 SPS THRUST

05:00

05:00

ACN

CYCLE O_2 & H_2 FANS

CMP - INGRESS LEB,
OPEN COOLANT CONTROL ATTENUATION PANEL,
CLOSE EVAP WATER CONTROL SEC VALVE,
CLOSE PANEL

:10

PRE

P52
IMU REALIGN
(PREFERRED)
(Pg 4-17)

TAN

EAT PERIOD (AS POSS.)

:20

ALIGNMENT CHECK (Pg 4-18)

LOAD DAP

P40 SPS THRUST

SXT STAR CHECK

:30

CRO

MCC-SPS GO/NO GO

POSS MCC UPDATE

SPS TIG

:40

CMP EXIT LEB

GWM

:50

AT CREW CONVENIENCE:
CMP MAN CENTER COUCH &
CDR MAN LEFT-HAND COUCH

06:00

HAW

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	04:00 - 06:00	1/3-4	3-5

FLIGHT PLAN

06:00

HAW

SPS NO. 1 (Pg 4-19)

TIG = 06:01:40
NO ULLAGE
BT = 5.0 SEC
ΔV = 36.8 fps
POSIGRADE
ORBIT 128 x 113

GDS

REPORT RESIDUALS & ΔV COUNTER

:10

GYM

SECOND S-IVB RESTART (S-IVB OVER GWM)
TIG = 06:07:04

5

TEX

MCC UPDATE
DAYLIGHT STAR CHECK

:20

BEGIN BATT B CHARGE

ANG

:30

CO_2 FILTER CHANGE NO. 1
3 TO A, 1 TO B5 (1 TO BE RE-USED)

:4

S-IVB LOX & LH_2 DUMPS COMPLETED
06:42:10

CMP MAN LEB

PRE

:50

TAN

DAYLIGHT STAR CHECK (Pg 4-20)

07:00

07:00

:10

:20

GWM

MCC-GO/NO GO FOR 19-1

MCC UPDATE
STATE VECTOR

:30

HAW

:40

GDS

TEX

:50

6

VENT BATTERIES

TERMINATE CABIN PURGE

08:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	06:00 - 08:00	1/4-6	3-6

FLIGHT PLAN

08:00
PRE
TAN
:10
:20
:30
:40
:50
09:00

SXT CALIBRATION
FOR TRUNNION BIAS
(P23 MIDCOURSE NAVIGATION)

H_2 PURGE HTRS ON

P52 IMU REALIGN
(REFSMMAT)
(FOR DRIFT CHECK)

MCC UPDATE
BLOCK DATA 2

DOFF PGA'S
(OPTIONAL)

F/C O_2 & H_2 PURGE

6-4 DEORBIT TIG

POWER DOWN S/C:
IMU, CMC (P06) AND SCS

GO TO DRIFTING FLIGHT

EAT
PERIOD

09:00
HAW
RED
:10
:20
7
:30
:40
:50
PRE
10:00

SET COMM FOR REST PERIOD
BEGIN REST PERIOD
2 IN COUCHES - 1 IN SLEEP STATION

REST
PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	08:00 - 10:00	1/6-7	3-7

FLIGHT PLAN

10:00

TAN

:10

:20

:30

REST PERIOD

:40

HAW

RED

:50

11:00

8

11:00

:10

:20

PRE

:30

REST PERIOD

:40

:50

12:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	10:00 - 12:00	1/7-8	3-8

FLIGHT PLAN

Time	Station	Activity
12:00		REST PERIOD
:10	HAW	
:20	RED	
:30		
9		
:40		
:50	ACN	
13:00		

Time	Station	Activity
13:00		REST PERIOD
:10		
:20		
:30		
:40	GYM	
:50	MER	
14:00		

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	12:00 - 14:00	1/8-9	3-9

FLIGHT PLAN

14:00

10

:10

:20

ACN

:30

:40

:50

15:00

REST PERIOD

15:00

:10

GWM

:20

HTV

MER

:30

:40

11

:50

16:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	14:00 - 16:00	1/9-11	3-10

FLIGHT PLAN

16:00

ACN

:10

:20

16:30

REST PERIOD

:40

GYM

:50

HTV

MER

17:00

12

17:00

MER

:10

:20

17:30

REST PERIOD

:40

CYI

:50

18:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	16:00 - 18:00	1/11-12	3-11

FLIGHT PLAN

18:00

:10

REST PERIOD

:20

:30

END REST PERIOD

TERMINATE BATT B CHARGE

MER

:40

DAY 2

POWER UP S/C:
IMU, CMC, AND SCS

EAT PERIOD

:50

13

19:00

19:00

ANG

:10

VAN

MCC-FLIGHT PLAN & CONSUMABLES UPDATE

MCC UPDATE
BLOCK DATA 3

CYI

:20

MAD

F/C O_2 PURGE

EAT PERIOD

:30

EAT PERIOD

:40

DAMP RATES

CMP MAN LEB

:50

CRO

P51
IMU ORIENTATION

HSK

20:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	18:00 - 20:00	1-2/12-13	3-12

FLIGHT PLAN

20:00

HSK

P51
IMU ORIENTATION

:10

MER

:20

CHLORINATE POTABLE WATER

CO_2 FILTER CHANGE NO. 2
4 TO B, 2 TO B5 (2 TO BE RE-USED)

:30

14

ANG

MCC UPDATE
STATE VECTOR
TGT LOAD
MNVR PAD

:40

CYI

:50

MAD

21:00

21:00

P30 EXTERNAL ΔV
P40 SPS THRUST

:10

CYCLE O_2 & H_2 FANS

:20

CRO

P52
IMU REALIGN
(PREFERRED)

ALIGNMENT CHECK (Pg 4-18)

:30

HSK

LOAD DAP
P40 SPS THRUST

:40

MER

SXT STAR CHECK

MCC-SPS GO/NO GO

:50

22:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	20:00 - 22:00	2/13-14	3-13

FLIGHT PLAN

15

22:00

TEX

CMP EXIT LEB

:10

TIG = 22:12:00	40% STROKING
NO ULLAGE BT = 111.1 SEC ΔV = 850.1 fps OUT-OF-PLANE	
ORBIT 192 x 113	

SPS NO. 2 (Pg 4-21)

:20

CYI

MAD

REPORT RESIDUALS & ΔV COUNTER
MCC UPDATE
SPS 3 GIMBAL ANGLES

:30

:40

:50

CRO

23:00

16

23:00

HSK

:10

MER

:20

:30

GYM

:40

MIL

EAT
PERIOD

:50

MCC UPDATE
STATE VECTOR
TGT LOAD
MNVR PAD

24:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	22:00 - 24:00	2/14-16	3-14

FLIGHT PLAN

24:00 CYI

P30 EXTERNAL ΔV
P40 SPS THRUST

:10

CMP MAN LEB

CYCLE O_2 & H_2 FANS

:20 TAN

P52
IMU REALIGN
(PREFERRED)

:30 CRO

LOAD DAP

P40 SPS THRUST

:40

SXT STAR CHECK

HSK

MCC-GO/NO GO FOR 33-1

HTV

:50

MCC-SPS GO/NO GO

25:00 RED

17

25:00 RED

CMP EXIT LEB

:10 GDS GYM TEX

SPS NO. 3 (Pg 4-22)	TIG = 25:18:30 NO ULLAGE BT = 279.4 SEC ΔV = 2549.1 fps OUT-OF-PLANE	FULL STROKING MTVC FOR LAST 45 SEC
	ORBIT 270 x 115	

:20 MIL BDA

REPORT RESIDUALS & ΔV COUNTER

:30 CYI

MCC UPDATE
SPS 4 GIMBAL ANGLES

:40

:50 PRE TAN

26:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	24:00 - 26:00	2/16-17	3-15

FLIGHT PLAN

26:00

CRO

:10

:20

HSK

HTV

:30

HAW

:40

RED

GDS

:50

TEX

MCC UPDATE
STATE VECTOR
TGT LOAD
MNVR PAD

MIL

27:00

GBM

27:00

P30 EXTERNAL ΔV
P40 SPS THRUST

:10

CMP MAN LEB

ACN

:20

P52
IMU REALIGN
(PREFERRED)

:30

PRE

TAN

CYCLE O_2 & H_2 FANS

:40

LOAD DAP

CRO

P40 SPS THRUST

:50

SXT STAR CHECK

28:00

HTV

18

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	26:00 - 28:00	2/17-18	3-16

FLIGHT PLAN

28:00
HTV
CMP EXIT LEB

:10
HAW
MCC-SPS GO/NO GO

:20
GDS

TEX

19 :30
SPS NO. 4

TIG = 28:28:20
4/18 ULLAGE
BT = 28.0 SEC
ΔV = 300.0 fps
OUT-OF-PLANE

ORBIT 271 x 115

BDA
REPORT RESIDUALS & ΔV COUNTER

:40
ANG
BEGIN BATT A CHARGE

:50
ACN
MCC UPDATE
STATE VECTOR
BLOCK DATA 4

PRE
POWER DOWN S/C:
IMU, CMC (P06) AND SCS
GO TO DRIFTING FLIGHT

29:00
PRE

:10
TAN

:20
CRO

:30
EAT PERIOD

GWM

:40
F/C O_2 PURGE

:50
HAW
SET COMM FOR REST PERIOD

GDS
CO_2 FILTER CHANGE NO. 3
5 TO A, 3 TO B5

30:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	28:00 - 30:00	2/18-19	3-17

FLIGHT PLAN

30:00
20
TEX
:10
MIL
ANG
:20
:30
ACN
PRE
:40
TAN
:50
CRO
31:00

BEGIN REST PERIOD
2 IN COUCHES - 1 IN SLEEP STATION

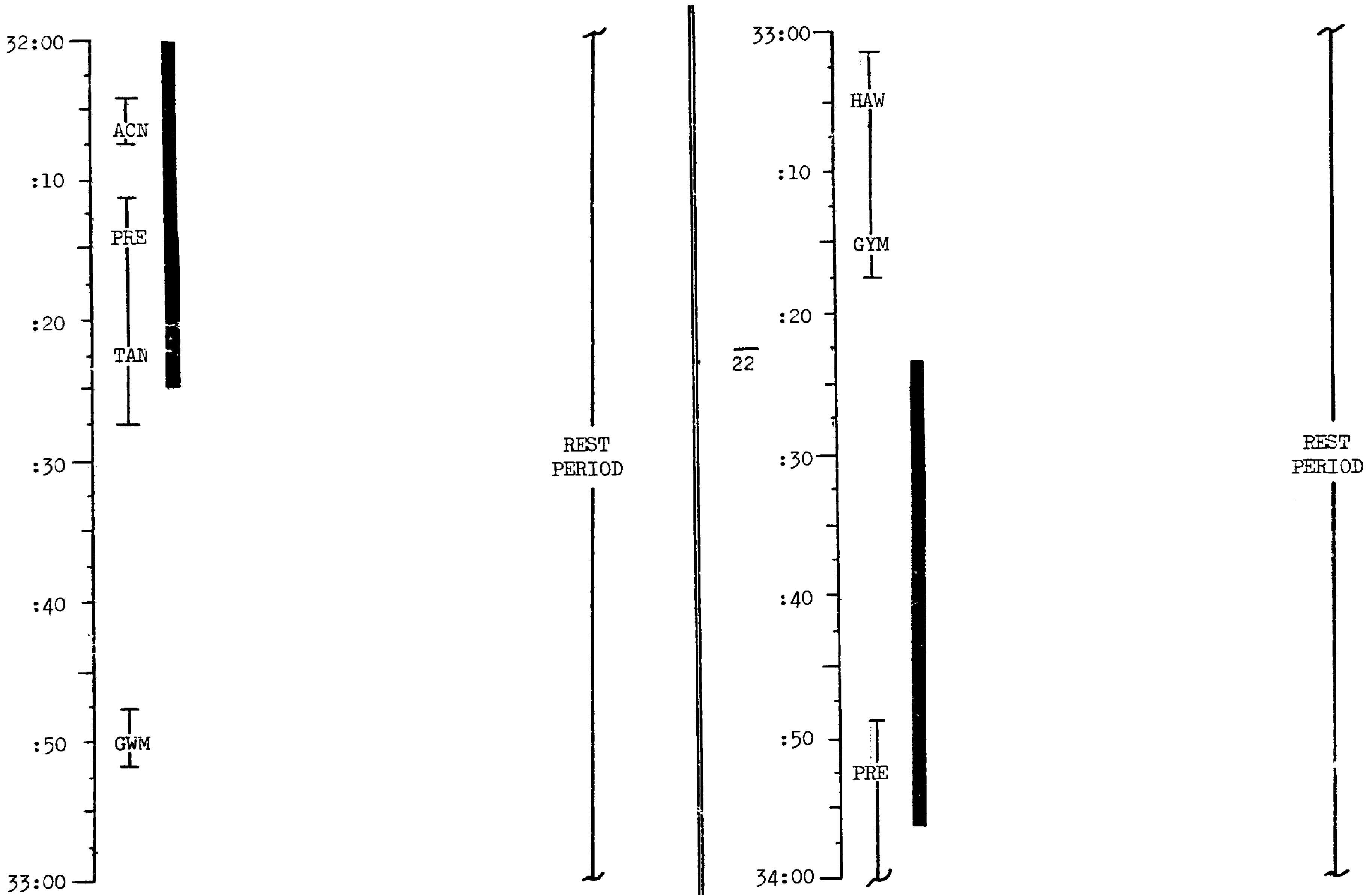
REST PERIOD

31:00
CRO
:10
GWM
:20
HAW
:30
GDS
:40
TEX
21
ANG
:50
32:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	30:00 - 32:00	2/19-21	3-18

FLIGH. PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	32:00 - 34:00	2/21-22	3-19

FLIGHT PLAN

34:00

TAN

:10

:20

:30

HAW

:40

RED

:50

23

35:00

REST PERIOD

35:00

:10

:20

PRE

:30

TAN

:40

:50

36:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	34:00 - 36:00	2/22-23	3-20

FLIGHT PLAN

36:00
:10
HAW
:20
RED
:30
24
:40
:50
ACN
37:00

REST PERIOD

37:00
ACN
:10
:20
:30
:40
GWM
:50
MER
38:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	36:00 - 38:00	2/23-24	3-21

FLIGHT PLAN

38:00
MER
:10
25
:20
REST PERIOD
:30
ACN
:40
:50
39:00

39:00
:10
:20 GWM
HTV
END REST PERIOD
:30
DAY 3
MER
MCC-FLIGHT PLAN & CONSUMABLES UPDATE
:40
START TUNNEL & LM PRESSURIZATION (IF REQUIRED)
:50
26
40:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	38:00 - 40:00	2-3/24-26	3-22

FLIGHT PLAN

40:00

:10

ACN

MCC UPDATE:
BLOCK DATA 5

:20

H_2 PURGE HEATERS - ON

:30

EAT PERIOD

27

:40

F/C O_2 & H_2 PURGE

:50

POWER UP S/C:
IMU, CMC, & SCS

GWM

41:00

27

CDR	CMP	LMP

41:00

MER

MCC UPDATE
STATE VECTOR
DESIRED ORIENT
LM AOT STAR OBS PAD
LM S-BD STEERABLE PAD

DON LCG & PGA (LMP)

:10

:20

DON PGA (CDR)

:30

:40

DON PGA (CMP)

:50

VERIFY TUNNEL PRESSURE

CYI

CLEAR & STOW TUNNEL HARDWARE:

42:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	40:00 - 42:00	3/26-27	3-23

FLIGHT PLAN

CSM

42:00

CDR

AID CMP

CMP

(1) HATCH
(2) PROBE
(3) DROGUE
(Pg 4-24)

LMP

AID CMP

IVT TO LM

:10

:20

:30

DAMP RATES

HSK

HTV

MER

TRANSFER LM TO LM POWER

P51
IMU ORIENTATION DETERMINATION

:40

:50

P52
IMU REALIGN (PREFERRED)

LM VHF B & A SIMPLEX CHECKS

43:00

LM

CDR

LMP

42:00

:10

OPEN LM HATCH

LMP IVT TO LM

:20

ENTRY STATUS CHECK

:30

EPS ACT. & C/O,
TRANSFER TO LM PWR (Pg 4-25)
ACTIVATE S-BAND FOR TM, DFI VHF B-ON
GLYCOL PUMP ACT

HSK

:40

CAUTION/WARNING CHECKOUT

DFI*

HTV

CIRCUIT BREAKER ACT.,
OPEN PRIM EVAP FLOW,
& TALKBACK VERIFICATION

MER

:50

ECS ACTIVATION
& CHECKOUT (Pg 4-26)

LBR RECORD

SUIT FAN/H_2O SEPARATOR CHECK

43:00

VHF ACT., B & A SIMPLEX CHECKS

*DFI PWR SW-ON

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	42:00 - 43:00	3/27	3-24

FLIGHT PLAN

CSM

CDR | CMP

43:00

LM VHF A & B SIMPLEX CHECKS

IVT TO LM

:10

REPORT TORQUE TIME

ANG

INSTALL TUNNEL HARDWARE:
(1) DROGUE
(2) PROBE
(3) HATCH
(pg. 4-27)

:20

VAN

LM/CM ΔP VLV - LM/CM TUNNEL

:30

CYI

DOFF HELMENTS & GLOVES
CONFIGURE FOR EVT
(1) REMOVE CENTER COUCH
(2) PREPARE UNBILICALS

MAD

:40

V49: R = 87.0°, P = 5.2°, Y = 301.8°

MNVR FOR LM
AOT STAR OBSERVATION

:50

DISABLE SM RCS THRUSTER B3
(UNTIL UNDOCKING)

INSTALL DOCKING TARGET
IN RH RNDZ WINDOW

44:00

LM

CDR | LMP

43:00

VHF ACT, B & A SIMPLEX CHECKS

LBR RECORD

LMP CONNECT TO LM ECS

:10

CDR TRANSFER
CONNECT TO LM ECS
CHECK COMM

ANG

DROGUE & PROBE INSTALLATION, OPS CHECK
& LM OVHD HATCH CLOSING

:20

VAN

(pg. 4-27)

DFI

:30

INSTALL WINDOW SHADES

CYI

GLYCOL PUMP CHECK

MAD

ARS/PGA PRESSURE INTEGRITY CHECK

:40

REGULATOR CHECK

LBR RECORD

ASCENT BATTERY ACT & CHECKOUT

:50

UNSTOW RR
DESIGNATE RR

DAYLIGHT AOT STAR VISIBILITY CHECK (pg. 4-28)
(SIRIUS)

44:00

28

FLIGHT PLAN

CSM

CMP

44:00

:10

:20

:30

:40

:50

45:00

CRO

HSK

MER

ANG

CO_2 FILTER CHANGE NO. 4
6 TO B, 4 TO B5

S-Band CONFERENCE
(MSFN RELAY) (pg 4-31)

LM

CDR | LMP

44:00

:10

:20

:30

:40

:50

45:00

LBR RECORD

CRO

HSK

MER

ANG

S-BAND STEERABLE
•ANTENNA CHECK
(pg. 4 - 30)

S-BAND BACKUP
VOICE & KEYING CHECK
(pg. 4 - 31)

S-BAND CONFERENCE
(MSFN RELAY)
(pg. 4 - 34)

EXT. LTG CHECKS
& COAS LTG

SECONDARY S-BAND
CHECK (pg 4 - 31)

29

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	44:00 - 45:00	3/23-29	3-26

CSM

CMP

45:00

YAN

CYI

:10

MAD

:20

:30

:40

CRO

CSM 1-WAY RELAY
WITH LM SIMULATING PLSS

:50

HSK

CSM 1-WAY RELAY
SIMULTANEOUS WITH
LM 1-WAY RELAY

MER

46:00

LM

CDR

LMP

45:00

DFI

VAN

LANDING GEAR DEPLOY (Pg 4-33)

CYI

PLSS PREP:
(1) INSTALL ISA
(2) UNSTOW TV
(3) UNSTOW PLSS BATT
(4) BLEED DOWN PLSS HOSES
(5) UNSTOW OPS
(6) VERIFY LIOH CARTRIDGE
(7) ATTACH OPS TO PLSS
(8) INSTLL PLSS BAT IN PLSS
(9) UNSTOW RCU
(10) CONNECT RCU TO PLSS
(11) PREP FOOD

:10

MAD

:20

LBR
RECORD

:30

PLSS COMM CHECK WITH LM
PLSS POS 1 & 4

:40

CRO

CSM 1-WAY RELAY
WITH LM SIMULATING PLSS
(PLSS IN POS 4)

:50

HSK

LM 1-WAY RELAY
USING PLSS SIMULTANEOUS
WITH CSM 1-WAY RELAY

MER

46:00

FLIGHT PLAN

CSM — CMP

46:00

MER (46:00 – :10)

:10

EAT (46:00 – :22)

:20

30

TEX

SUPPORT LM COMM CHECK AS REQUIRED (:17 – :42)

:30 MIL

BDA

:40 YAN

CYI

MAD

:50

CHLORINATE POTABLE WATER

47:00

LM — CDR / LMP

46:00

MER (46:00 – :10)

LMP: EAT (46:00 – :21)

LBR RECORD (:10 – :22)

:10

CONFIGURE FOR 2-WAY RELAY

CONFIGURE FOR TV MODE (10)

:20

CHECK LM 2-WAY RELAY COMM (Pg 4-36)

TEX

TV PASS 46:27-46:34

TV COMM MODE CHECK (Pg 4-36)

:30 MIL

LUNAR STAY RELAY COMM CHECK (MODE 7) (Pg 4-36)

BDA

:40 VAN

LUNAR STAY BACKUP RELAY COMM CHECK (MODE 8) (Pg 4-36)

CKI

MAD

:50

LBR RECORD (:50 – 47:00)

POST PLSS CHECK:
(1) STOW RCU
(2) REPLACE PLSS BATT

47:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEB 3, 1969	46:00 - 47:00	3/29-30	3-28

FLIGHT PLAN

CSM
CMP

47:00

:10

:20

:30

:40

:50

48:00

CRO

HSK

MER

GYM

MCC UPDATE:
BLOCK DATA 6

MNVR TO $Y \approx 0$
(MIDDLE GIMBAL ANGLE ZERO)
FOR LM IMU COARSE ALIGN

LGC/CMC CLOCK SYNC
VOICE TEPHEM TO LM

LM IMU COARSE ALIGN

ATT HOLD @ MIN DEADBAND
FOR LM RCS COLD FIRE

MCC-GO/NO GO FOR 48-1

LM
CDR LMP

47:00

:10

:20

:30

:40

:50

48:00

LBR RECORD

LBR RECORD

CRO

HSK

MER

GYM

(3) REMOVE OPS FROM PLSS
(4) STOW PLSS
(5) STOW OPS
(6) STOW TV

DPS/APS/RCS TEMP/PRESS CHECK

PGNCS TURN ON & SELF TEST

AGS ACT & SELF TEST & RATE GYRO TEST

LGC CLOCK INITIALIZATION
LOAD T_{EPHEM}
E-MEMORY DUMP (2)

IMU DOCKED
COARSE ALIGN

PASS GIMBAL ANGLES TO MCC

PIPA BIAS CHECK (Pg 4-38)

RCS PRESSURIZATION

RCS COLD FIRE

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	47:00 - 48:00	3/30	3-29

FLIGHT PLAN

CSM

CMP

31

48:00 GYM

MCC UPDATE:
LM STATE VECTOR
CSM STATE VECTOR
MNVR PAD FOR
LM DOCKED DPS

CMC-FREE

LM RCS HOT FIRE

:10

CMC-HOLD

VAN

:20 CYI

V49:R=322.5°,P=157.5°,Y=337.5°
MNVR TO AGS CAL
ATTITUDE

:30

CYCLE O_2 & H_2 FANS

:40 TAN

P52
IMU REALIGN
(REFSMMAT)

REPORT TORQUING ANGLES & TIME

:50

READ GIMBAL ANGLES TO LM

CRO

49:00

LM

CDR | LMP

31

48:00 GYM

DAP SET, GIMBAL
DRIVE CHECK & THROTTLE TEST

RCS HOT FIRE

:10

MCC UPDATE: LM STATE VECTOR | GYRO TORQUING
REFSMMAT | ANGLES
MNVR PAD FOR DOCKED DPS

VAN

IMU FINE ALIGN TORQUING

DFI

LR SELF TEST
(Pg 4-39)

:20 CYI

RR SELF TEST

AGS INITIALIZATION (Pg 4-40)

:30

AGS CALIBRATION
(Pg 4-41)

LBR
RECORD

REPORT AGS CAL RESULTS

:40 TAN

DPS PRESSURIZATION

:50

READ GIMBAL ANGLES & VOICE
TO MCC FOR IMU REALIGNMENT

CRO

49:00

FLIGHT PLAN

CSM
CMP

49:00

HSK

:10

V49: R= 300, P = 180, Y = 0
MNVR TO BURN
ATTITUDE

HTV

MER

DON HELMET & GLOVES
PGA PRESSURE INTEGRITY CHECK

:20

P30 EXTERNAL ΔV
P40 SPS THRUST

RED

:30

GDS

LM ASSUMES ATT CNTL (TIG- 06:00)

TIG = 49:42:00
BT = 367 SEC
ΔV = 1714.1
OUT-OF-PLANE
ORBIT 270 X 115

:40

DOCKED DPS

CSM ASSUME ATT CONT @ WIDE D/B

:50

V49: R=322.5°, P=157.5°, Y=337.5°
MNVR FOR LM AGS CALIBRATION

CLEAR & STOW TUNNEL HARDWARE
(1) HATCH
(2) PROBE
(3) DROGUE

CYI

50:00

LM
CDR | LMP

49:00

HSK

MCC UPDATE:
GYRO TORQUING ANGLES
FINE ALIGN TORQUING
UPDATE & ALIGN AGS

:10

VERIFY CSM
AT BURN ATT

HTV

MER

MOUNT
SEQ CAMERA
IN R.H. WINDOW

:20

P30 EXT ΔV
P40 DPS THRUST

RED

AGS EXT ΔV
AGS FOLLOW-UP

:30

GDS

ASSUME ATT CONT (TIG- 06:00)
START LR SPUR TEST
CONFIG SYS FOR BURN
DISABLED UV JETS

TIG = 49:42:00
2JET, 10.5 SEC ULLAGE
BT = 367 SEC
ΔV = 1714.1 fps
OUT-OF-PLANE
ORBIT 270 X 115

:40

DFI

DOCKED DPS
(Pg 4-42)

MANUAL SHUTDOWN
TERMINATE LR SPUR TEST

:50

CSM ASSUME ATT CONT

C-BAND

REPORT RESIDUAL
TO MCC

AGS CALIBRATION
(Pg 4-41)

CYI

50:00

32

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	49:00 TO 50:00	3/31-32	3-31

FLIGHT PLAN

CSM

CDR | CMP

50:00

PRE

TAN

CRO

HSK

HTV

HAW

51:00

CLEAR & STOW TUNNEL HARDWARE (Pg. 4-45)

SEQ PHOTOS OF CDR'S IVT

IVT TO CSM

INSTALL CENTER COUCH

LBR RECORD AND C-BAND

DFI AND LBR RECORD

DFI

LM

CDR | LMP

50:00

:10

PRE

TAN

:20

:30

CRO

:40

HSK

:50

HTV

51:00

HAW

LR SELF TEST (Pg 4-39)

DPS/APS/RCS TEMP/PRESS CHECK

CDR TRANSFER TO CSM

LMP TRANSFER TO CSM UMBILICAL

CLOSE PRIM EVAP FLOW

INITIAL POWER DOWN

SUBLIMATOR DRYOUT (30 MIN) (Pg 4-46)

DFI VHF B-OFF

FINAL DEACTIVATION

FLIGHT PLAN

CSM

CDR | CMP | LMP

51:00 HAW – RED

TRANSFER LM TO CSM POWER

:10 GDS

IVT TO CSM

33

:20

INSTALL TUNNEL HARDWARE:
(1) DROGUE
(2) PROBE
(3) HATCH

:30 VAN

LM/CM ΔP VLV - LM

:40 ACN

:50 PRE

F/C O_2 PURGE

52:00 TAN

LM

LMP

51:00 HAW – RED

TRANSFER TO CSM POWER

:10 GDS

IVT TO CSM

CLOSE LM OVHD HATCH

33

:20

:30 VAN

:40 ACN

:50 PRE

52:00 TAN

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	51:00 - 52:00	3/32-33	3-33

FLIGHT PLAN

52:00 – 53:00 (CDR / CMP / LMP)

52:00
:10
CRO
:20
HTV
:30
HAW
:40
GDS
:50
TEX
GBM
53:00

MCC UPDATE :
STATE VECTOR
TGT LOAD
MNVR PAD

34

53:00 – 54:00 (CDR / CMP / LMP)

53:00
ANG
P30 EXTERNAL ΔV
P40 SPS THRUST
:10
ACN
P52
IMU REALIGN
(PREFERRED)
:20
PRE
LOAD DAP
P40 SPS THRUST
:30
TAN
SXT STAR CHECK
:40
CYCLE O_2 & H_2 FANS
:50
CRO
MCC-SPS GO/NO GO
GWM
54:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	52:00 - 54:00	3/33-34	3-34

FLIGHT PLAN

	CDR	CMP	LMP
54:00 GWM		CMP EXIT LEB	
:10 HAW			
:20 GDS		SPS NO. 5	TIG=54:25:16 4/18 ULLAGE BT=41.4 SEC ΔV=551.0 fps ORBIT 133 x 133
TEX			
:30 GBM	REPORT RESIDUALS & ΔV COUNTER		
:40 ANG	CO_2 FILTER CHANGE NO. 5 7 TO A, 5 TO B6		
:50 ACN			
55:00			

	CDR	CMP	LMP
55:00 PRE			DOFF PGA & LCG
:10 TAN			
:20	DOFF PGA		
:30 GWM		MCC UPDATE : STATE VECTOR	
:40		DOFF PGA	
:50 HAW			
GDS	POWER DOWN S/C: IMU, CMC (P06) AND SCS GO TO DRIFTING FLIGHT		
56:00			

35

FLIGHT PLAN

56:00
TEX
36
:10
:20
56:30
PRE
TAN
:40
:50
57:00

MCC UPDATE:
BLOCK DATA 7

SET COMM FOR REST PERIOD

EAT PERIOD

37

57:00
GWM
:10
:20
HAW
RED
57:30
:40
:50
58:00

BEGIN REST PERIOD
2 IN COUCHES - 1 IN SLEEP STATION

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	56:00 - 58:00	3/35-37	3-36

FLIGh. PLAN

58:00

:10

PRE

TAN

:20

:30

:40

:50

HAW

59:00

REST PERIOD

38

59:00

RED

:10

:20

:30

:40

PRE

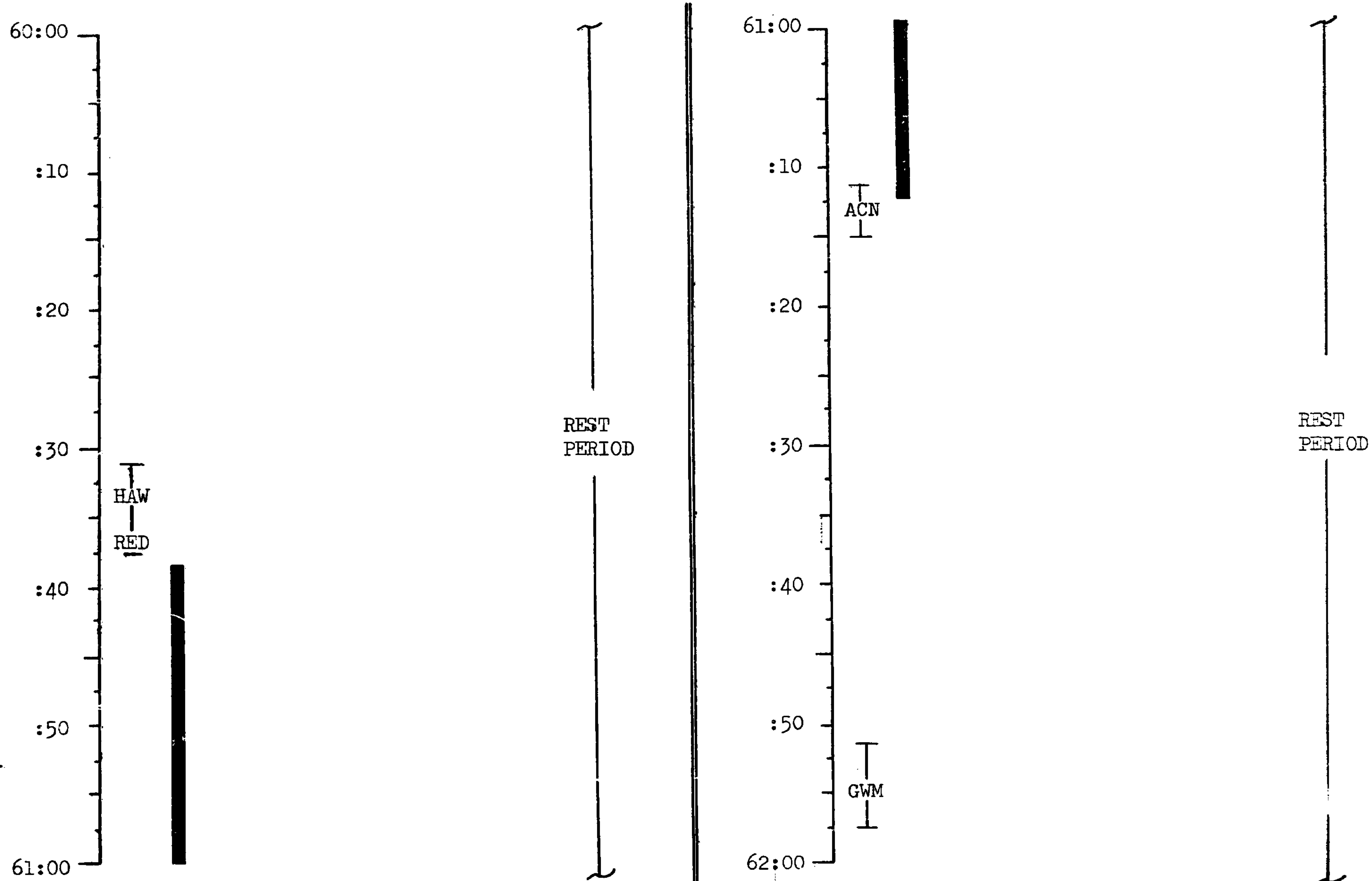
:50

60:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	58:00 - 60:00	3/37-38	3-37

FLIGHT PLAN



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MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	60:00 - 62:00	3 38-39	3-38

FLIGHT PLAN

62:00

:10 MER

:20

:30 REST PERIOD

:40

:50 ACN

63:00

63:00

:10

:20

:30 GWM REST PERIOD

:40 HTV

MER

:50

64:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	62:00 - 64:00	3/39-30	3-39

FLIGHT PLAN

64:00
41
:10
ACN
:20
:30
:40
:50
65:00

REST PERIOD

65:00
GWM
:10
HTV
MER
:20
:30
42
:40
:50
CYI
66:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	64:00 - 66:00	3/40-42	3-40

FLIGHT PLAN

66:00

MAD

:10

:20

:30

REST PERIOD

:40

:50

MER

END REST PERIOD

67:00

43

67:00

DAY 4

START TUNNEL & LM PRESSURIZATION (IF REQUIRED)

BEGIN BATT B CHARGE

:10

:20

ANG

VAN

:30

MCC UPDATE:
BLOCK DATA 8

EAT PERIOD

CYI

MCC-FLIGHT PLAN & CONSUMABLES UPDATE

MAD

:40

F/C O_2 PURGE

:50

CO_2 FILTER CHANGE NO. 6
8 TO B, 6 TO B6

CHLORINATE POTABLE WATER

68:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	66:00 - 68:00	3-4/42-43	3-41

FLIGHT PLAN

CSM

CDR | CMP | LMP

68:00 POWER UP S/C
IMU, CMC, & SCS

:10 CRO

:20 HSK

LMP: DON LCG & PGA

:30 MER

CDR: DON PGA

:40

:50 44

CMP: DON PGA (EXCEPT HELMET & GLOVES)

BDA

69:00 VERIFY TUNNEL PRESSURE

LM

68:00

:10 CRO

:20 HSK

NO LUNAR MODULE ACTIVITY

:30 MER

:40

:50 44

BDA

69:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	68:00 - 69:00	4/43-44	3-42

FLIG... PLAN

69:00 – :10 – :20 – :30 – :40 – :50 – 70:00

CYI
MAD
CRO
HSK

CDR
AID CMP

CMP
CLEAR & STOW TUNNEL HARDWARE:
(1) HATCH
(2) PROBE
(3) DROGUE

DAMP RATES

TRANSFER LM TO LM PWR

P51
IMU ORIENTATION DETERMINATION

MCC UPDATE:
STATE VECTOR
DESIRED ORIENT FOR EVA

LM VHF A & B CHECKOUT

LMP
AID CMP
IVT TO LM

69:00 – :10 – :20 – :30 – :40 – :50 – 70:00

CYL
MAD
CRO
HSK

LMP
OPEN LM HATCH
IVT TO LM
ENTRY STATUS CHECK
EPS ACT & C/O, TRANSFER TO LM PWR
ACTIVATE S-BD FOR TM, DFI VHF B-ON
GLYCOL PUMP ACTIVATION
C/W CHECKOUT
CIRCUIT BREAKER ACTIVATION
OPEN PRIM EVAP FLOW
ECS ACTIVATION & CHECKOUT
SUIT FAN/H2O SEP CHECK
VHF A & B ACTIVATION & CHECKOUT

FLIGHT PLAN

CSM

CDR | CMP | LMP

70:00
MER
LM VHF A CHECKOUT
IVT TO LM
:10
:20
INSTALL TUNNEL HARDWARE:
(1) DROGUE
(2) PROBE
(3) HATCH
MIL
:30
LM/CM ΔP VLV - LM/CM TUNNEL
CONFIGURE FOR EVT
(1) REMOVE CENTER COUCH
(2) PREPARE UMBILICALS
:40
CYI
MAD
:50
71:00

LBR RECORD
LBR RECORD

LM

CDR | LMP

70:00
MER
VHF A & B ACT. & CHECKOUT
CONNECT TO LM ECS
CDR TRANSFER TO LM
CONNECT TO LM ECS
CHECK COMM
:10
DROGUE & PROBE INSTALLATION & OPS CHECK
:20
MIL
:30
GLYCOL PUMP CHECK
ARS/PGA PRESSURE
INTEGRITY CHECK
:40
ASCENT BATTERY ACTIVATION & C/O
CYI
MAD
DESIGNATE
RR FOR EVA
EVA PREP:
(1) INSTALL ISA OVER
PANELS 1 & 2
(2) PREPARE:
(a) STD HASSELBLAD
(b) SWA HASSELBLAD
(c) 16 MM SEQ CAMERA
:50
71:00

45

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	70:00 - 71:00	4/44-45	3-44

FLIGHT PLAN

CSM

CMP

71:00

P52
IMU REALIGN
(PREFERRED)

CRO

:20

HSK

PLSS
COMM
CHECK

:30

MER

:40

EAT
PERIOD

:50

GYM

46

72:00

MCC-GO/NO GO FOR 63-1

LM

CDR LMP

71:00

LBR
RECORD

EVA PREP (CONT)
(3) CDR & LMP SWITCH POSITIONS
(4) ATTACH PLSS TO OPS
(5) PREPARE PLSS FOR DONNING
(6) DON PLSS/OPS
(7) CONNECT RCU

:10

CRO

:20

HSK

PLSS
COMM
CHECK

:30

(PRIME EVA MODE)

MER

:40

LBR
RECORD

EAT
PERIOD

:50

GYM

46

72:00

FLIGHT PLAN

CSM

CMP

72:00

CYI

MNVR TO EVA ATTITUDE
DEFINED BY:
(1) CSM -Z AXIS AT SUN
(2) +X AXIS SOUTH
(3) THEN PITCH DOWN 15°
(4) ROLL LEFT 80°
FDAI READS 0, 0, 0

EAT PERIOD

:10

DISABLE SM RCS QUADS A&B

ATT HOLD @ MAX DB
MCC GO/NO GO FOR DEPRESS

:20

:30

ECS PREP & CABIN PREP:
(1) MOUNT SEQ CAMERA ON HATCH
(2) VERIFY CAMERA OPERATION
(3) VERIFY REPRESS BOTTLES
(4) VERIFY SURGE TANK
(5) EXTERIOR LTS ON
(6) ANTI-FOG HELMETS
(7) DON HELMET & GLOVES

TAN

:40

:50

CRO

PGA PRESSURE INTEGRITY CHECK

HSK

73:00

LM

CDR | LMP

72:00

CYI

EAT PERIOD

:10

:20

LBR RECORD

MCC-GO/NO GO FOR DEPRESS
FINAL PREP:
(1) C/W CHECK
(2) CABIN FANS OFF
(3) ANTI-FOG HELMETS
(4) DON HELMETS, GLOVES, & VISORS
(5) ATTACH TETHER TO LMP
(6) LMP CONNECT TO PLSS ECS

:30

TAN

:40

CDR PRESSURE INTEGRITY CHECK

LMP PRESSURE INTEGRITY CHECK

:50

CRO

DEPRESS LM
OPEN FWD HATCH

HSK

OPEN PLSS FEEDWATER

73:00

FLIGHT PLAN

CSM

Time	Station	CMP	LMP
73:00	HSK		
		DEPRESS CM OPEN CM SIDE HATCH	
	HTV		
:10		INGRESS LH COUCH SEQ CAMERA-ON	RTC VOICE Bμ
	RED		
:20		SEQ CAMERA-OFF SEQ CAMERA-ON	RTC VOICE Bμ
		SEQ CAMERA-OFF	PARTIALLY INGRESS CM
:30	GDS		
47			REST & COMMENT
			RETRIEVE THERMAL SAMPLES
:40			REST & COMMENT
		SEQ CAMERA-ON	EGRESS CM
:50	CYI	SEQ CAMERA-OFF	
		SEQ CAMERA-ON	RTC VOICE Bμ
74:00			

LM

Time	Station	CDR	LMP
73:00	HSK		ALLOW FOR COOLING
	HTV		
:10			EGRESS (pg. 4-47)
		VERIFY SEQ CAMERA OPERATION-ON	MOUNT SEQ CAMERA
:20	RED	SEQ CAMERA-OFF SEQ CAMERA-ON	DON GOLDEN SLIPPERS REST & COMMENT
			EVT TO CM
:30	GDS	SEQ CAMERA-OFF	
47		SEQ CAMERA-ON	
:40			
			EVT TO LM DON GOLDEN SLIPPERS
:50	CYI	SEQ CAMERA-OFF	REST & COMMENT
			MOVE TO LADDER PASS SEQ CAMERA TO CDR DON GOLDEN SLIPPERS RETRIEVE THERMAL SAMPLES
74:00			

FLIGHT PLAN

CSM

CMP

74:00

SEQ CAMERA - OFF
CLOSE SIDE HATCH TO AJAR POSITION

PRE

:10

CM RUN/EVA LTS-ON
CM SPOT LT-ON

TAN

CM RUN/EVA LTS-OFF

:20

CM SPOT LIGHT-OFF

CRO

:30

CM RUN/EVA LTS-ON

HSK

RTC VOICE BU

OPEN SIDE HATCH
SEQ CAMERA-ON

:40

HTV

:50

HAW

RED
GDS

75:00

LM

CDR	LMP
74:00	REST & COMMENT
	DARK ADAPT
	RAISE EV VISOR
PRE	
:10 LM EXT LTG-DOCK	
TAN	
:20	EVALUATE LIGHTING
LM EXT LTG-OFF	
CRO	
:30	
HSK	STANDBY FOR SUNRISE
	LOWER EVA VISOR
	RECEIVE HASSELBLAD
	PHOTOGRAPH LM & CM
	EXTERIOR:
:40	(A) RCS QUADS
HTV	(B) CM/SM INTERFACE
	(C) CM RADIATORS
	(D) LM DESCENT STAGE
:50	PASS HASSELBAD TO CDR
HAW	
RED	RECEIVE TV CAMERA
GDS	
75:00	

FLIGHT PLAN

CSM

CMP

75:00 GDS TEX :10 MIL VAN :20 ACN :30 PRE :40 TAN :50 CRO 76:00

48

SEQ CAMERA-OFF

SEQ CAMERA-ON
SEQ CAMERA-OFF
CLOSE & LOCK SIDE HATCH

RTC
VOICE BU

REPRESS CM (3.0 PSIA)

OPEN PRESS EQUAL VALVE & MONITOR PRESS

POST EVA SYSTEMS CONFIGURATION:
(1) DOFF & STOW HELMET & GLOVES
(2) STOW THERMAL SAMPLES
(3) MOUNT SEQ CAMERA IN RH WINDOW

ENABLE ALL RCS JETS EXCEPT B3
MNVR FROM EVA ATT
(PITCH 180°) &
REMOVE ATT HOLD

LBR
RECORD

LM

CDR

75:00 GDS TEX :10 MIL VAN :20 ACN :30 PRE :40 TAN :50 CRO 76:00

CONNECT TV CAMERA

PASS CAMERA TO LMP

TV PASS
75:00 to 75:15

RECEIVE TV CAMERA
DISCONNECT & STOW TV

CLOSE & LOCK FWD HATCH
REPRESS LM (3.0 PSIA)

"GO" TO CMP FOR REPRESS

REPRESS CM/LM TO 4.8 PSIA

POST EVA SYSTEMS CONFIGURATION:
(1) DOFF HELMETS, GLOVES, VISORS
(2) LMP CONNECT TO LM ECS
(3) LMP CONNECT TO LM COMM

PLSS RECHARGE
(1) REMOVE & REPLACE SAME LiOH CART
(2) PLSS O_2 RECHARGE

LMP

OPERATE TV

CLOSE PLSS FEEDWATER
PASS TV CAMERA TO CDR
REST & COMMENT

INGRESS LM

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	75:00 - 76:00	4/47-48	3-49

FLIGHT PLAN

CSM

CDR | CMP

Time	CDR	CMP
76:00	CRO	
:05		CLEAR & STOW TUNNEL HARDWARE: (1) HATCH (2) PROBE (3) DROGUE
:10		
:15	HTV	
:20		
:25	HAW	
:30	GDS	
:40		
:46	IVT TO CSM	
:50	ANG; EAT PERIOD	EAT PERIOD
77:00		

LM

Time		CDR	LMP
76:00		CRO	PLSS RECHARGE
:05	LBR RECORD		PLSS/OPS DOFFING: (1) REMOVE & STOW RCU (2) DOFF PLSS/OPS (3) REPLACE PLSS BATTERY (4) REMOVE OPS FROM PLSS (5) STOW PLSS & OPS
:15	LBR RECORD	HTV	PLSS WATER RECHARGE
:20			REMOVE & REPLACE PRIM LiOH CART (Pg 4-50)
:20			POST EVA CABIN CLEANUP: (1) RESTOW SEQ CAMERA (2) RESTOW SWA HASSELBLAD (3) RESTOW STD HASSELBLAD (4) STOW FILM, EVA DATA & THERMAL SAMPLE IN ISA
:25		HAW	
:30		GDS	
:35		OPEN LM OVHD HATCH	
:40		CDR TRANSFER TO CSM	
:47	DFI		LMP CONNECT TO CSM ECS
:48			PRIM EVAP FLOW-CLOSE
:50		ANG	INITIAL POWER DOWN
:50			EAT PERIOD
:55			SUBLIMATOR DRYOUT (30 min)
77:00			

49

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	76:00 - 77:00	4/48-49	3-50

FLIGHT PLAN

CSM

CDR | CMP | LMP

77:00

ACN

EAT PERIOD (CDR)

EAT PERIOD (CMP)

:10

PRE TAN

:20

CO_2 FILTER CHANGE NO. 7
9 TO A, 7 TO B6

TRANSFER LM TO CSM POWER

:30

CRO

IVT TO CSM

:40

INSTALL TUNNEL HARDWARE:
(1) DROGUE
(2) PROBE
(3) HATCH

MCC UPDATE:
STATE VECTOR

GWM

AID CMP (CDR)

AID CMP (LMP)

:50

HAW

78:00

LM/CM ΔP VLV - LM

LM

CDR | LMP

77:00

DFI AND LBR RECORD

ACN

SUBLIMATOR DRYOUT

EAT PERIOD

:10

PRE TAN

:20

FINAL DEACTIVATION

DFI VHF B-OFF

TRANSFER TO CSM POWER

:30

CRO

IVT TO CSM

CLOSE LM HATCH

:40

GWM

:50

HAW

78:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	77:00 - 78:00	4/49	3-51

FLIGHT PLAN

78:00 – 79:00

Time	Station	CDR	CMP	LMP
78:00	HAW	POWER DOWN S/C: IMU, CMC (P06), AND SCS GO TO DRIFTING FLIGHT		
	GDS			DOFF PGA & LCG
:10		MCC UPDATE: BLOCK DATA 9		
	TEX			
:20	ANG	DOFF PGA		
:30				
:40			DOFF PGA	
	PRE			
:50			F/C O_2 PURGE	
	TAN			
79:00		SET COMM FOR REST PERIOD		

50

79:00 – 80:00

Time	Station	Crew
79:00		BEGIN REST PERIOD 2 IN COUCHES - 1 IN SLEEP STATION
:10		
:20	GWM	
:30	HAW	REST PERIOD
:40	GDS	
	TEX	
:50		
80:00		

51

FLIGHT PLAN

80:00

:10

:20 PRE

:30 TAN

:40

:50

81:00

REST PERIOD

52

81:00

:10 HAW RED

:20

:30

:40

:50

82:00 PRE

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	80:00 - 82:00	4/51-52	3-53

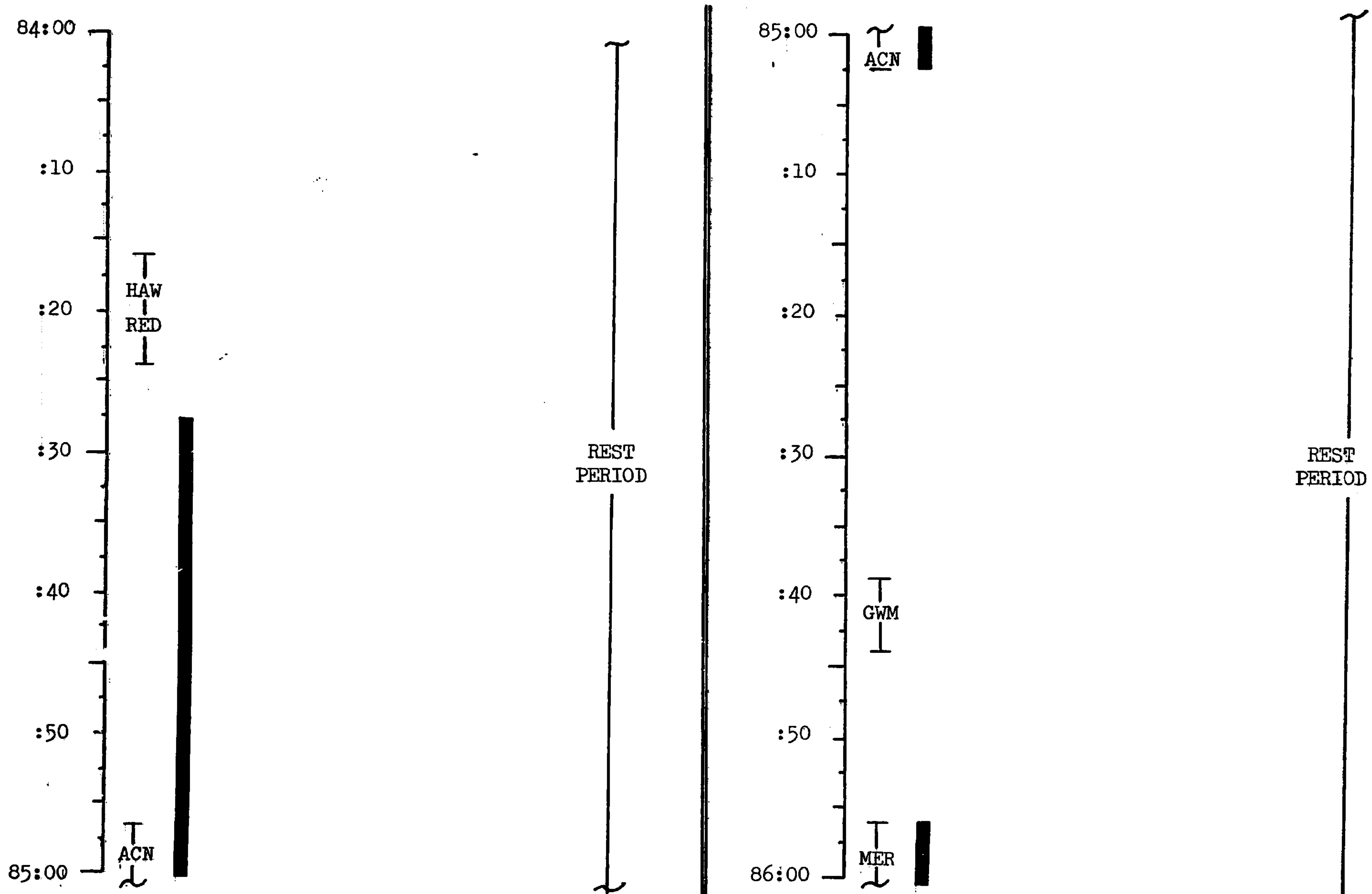
FLIGHT PLAN

82:00
TAN
:10
:20
REST PERIOD
:30
:40
HAW
RED
:50
53
83:00

83:00
:10
:20
:30
PRE
REST PERIOD
:40
:50
84:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	82:00 - 83:00	4/52-53	3-54

FLIGHT PLAN



54

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	84:00 - 86:00	4/53-54	3-55

FLIGHT PLAN

86:00 MER

:10

55

REST PERIOD

:20

:30 ACN

END REST PERIOD

:40

DAY 5

EAT PERIOD

:50

START TUNNEL & LM REPRESSURIZATION
(IF REQUIRED)

87:00

CDR | CMP | LMP

87:00

:10

POWER UP S/C
IMU, CMC, AND SCS
DAMP RATES

GWM

MCC UPDATE:
BLOCK DATA 10

EAT PERIOD

:20

H_2 PURGE HTRS - ON

HTV

MCC-FLIGHT PLAN & CONSUMABLES UPDATE

:30

MER

P51
IMU ORIENTATION
DETERMINATION

:40

F/C O_2 & H_2 PURGE
CHLORINATE POTABLE WATER

:50

56

DON LCG & PGA

88:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	86:00 - 88:00	4-5/55-56	3-56

FLIGHT PLAN

CSM

	CDR	CMP	LMP
88:00			
ACN (88:06–88:10)	DON PGA (88:10–88:25)		(–88:10)
:10			
:20			
:30		DON PGA (EXCEPT HELMET) (88:25–88:40)	
:40	VERIFY TUNNEL PRESSURE	VERIFY TUNNEL PRESSURE	
GWM (88:48–88:52)	AID CMP (88:40–89:00)	CLEAR & STOW TUNNEL HARDWARE (1) HATCH (2) PROBE (3) DROGUE (88:40–89:00)	AID CMP (88:40–89:00)
:50			
HTV (88:55–)			
89:00			

LM

88:00 – ACN (88:06–88:10)

NO LM ACTIVITIES

:50 – GWM (88:48–88:51)

HTV (88:55–)

89:00

57

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	88:00 - 89:00	5/56-57	3-57

FLIGHT PLAN

CSM

CDR | CMP | LMP

89:00

MER

IVT TO LM (LMP)

MCC UPDATE:
CSM STATE VECTOR
LM STATE VECTOR
DESIRED ORIENT

:10

:20

TRANSFER LM TO LM POWER

:30

:40

VHF A & B ACT & C/O

CYI

IVT TO LM

:50

MAD

INSTALL TUNNEL HARDWARE

90:00

LM

CDR | LMP

89:00

MER

OPEN LM HATCH

LMP IVT TO LM

:10

ENTRY STATUS CHECK

:20

EPS ACT & C/O, TRANSFER TO LM PWR
ACTIVATE S-BAND FOR TM
GLYCOL PUMP ACT

LBR RECORD

CAUTION/WARNING CHECKOUT

:30

CIRCUIT BREAKER ACT
& TALKBACK VERIFICATION
OPEN PRIM EVAP FLOW

ECS ACT & C/O

:40

SUIT FAN/H2O SEP CHECK

VHF A & B ACT & C/O

CYI

CDR TRANSFER &
CONNECT TO LM ECS
CHECK COMM

LMP CONNECT
TO LM ECS

:50

MAD

LBR RECORD

DROGUE & PROBE
INSTALLATION, HATCH
CLOSING & OPS CHECK

90:00

57

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	89:00 - 90:00	5/56-57	3-58

FLIGHT PLAN

CSM

CMP

90:00

(1) DROGUE
(2) PROBE
(3) DISCONNECT UMBILICALS
(4) FWD HATCH

LM/CM ΔV VLV - OFF

MOUNT DOCKING TARGET IN RH RNDZ WINDOW

:10

:20

P52 IMU REALIGN (PREFERRED)

:30 HSK

LM IMU COARSE ALIGN

:40 MER

REPORT G.E.T. TORQUED (FROM P52)

LM/CMC CLOCK SYNC & LM T_{EPHEM} CHECK

V83 GDC ALIGN & INITIALIZE ORDEAL

:50

EMS ACCEL TEST
EMS TEST

ATT HOLD @ MIN DEADBAND FOR LM RCS COLD FIRE

91:00

LM

CDR LMP

90:00 LBR RECORD

GLYCOL PUMP CHECK

:10

ARS/PGA PRESSURE INTEGRITY CHECK

ASCENT BATTERY ACT & C/O

:20

PGNCS TURN ON & SELF TEST

AGS ACT & SELF TEST

RATE GYRO CHECK

(WAIT FOR CSM ALIGNMENT)

:30 HSK

IMU COARSE ALIGN

:40 MER

PASS GIMBAL ANGLES TO MCC

LGC CLOCK INITIALIZATION & T_{EPHEM} CHECK

:50

DPS/RCS TEMP/PRESS CHECK & APS PRESSURIZATION

LBR RECORD

RCS COLD FIRE

91:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	90:00 - 91:00	5/57	3-59

FLIGHT PLAN

58

CSM

CMP

91:00

XPDR - ON
RR TRANSPONDER
SELF TEST
XPDR - OFF

ANG

:10

CMC - FREE

LM RCS HOT FIRE

:20 CYI

CMC - HOLD
DON HELMET &
PGA PRESSURE INTEGRITY CHECK

MAD

:30

CO_2 FILTER CHANGE NO. 8
10 TO B, 8 TO B6

UNSTOW & MOUNT
SEQUENCE CAMERA IN
L/H RNDZ WINDOW

:40

V49:R= , P=T , Y=

MNVR FOR &
MAINTAIN MIN DB ATT HOLD
FOR LM AGS CALIBRATION

:50

CRC

92:00

LM

CDR / **LMP**

91:00

RCS COLD FIRE
DFI VHF B - ON
E MEMORY DUMPS (2)

ANG

:10

IMU GIMBAL
ANGLES TO MCC

MCC UPDATE:
LM STATE VECTOR
CSM STATE VECTOR
REFSMMAT
NAV CHECK

DPS GIMBAL DRIVE
& THROTTLE CHECKS

COPY IMU
TORQUING
ANGLES

RCS HOT FIRE

:20 CYI

IMU FINE ALIGN

MAD

:30

REGULATOR CHECK

LBR
RECORD

:40

& PIPA BIAS CHECK (Pg 4-38)
AGS INITIALIZATION (Pg 4-40)

AGS CALIBRATION (Pg 4-41)

:50

LANDING RADAR SELF TEST (Pg 4-39)

CRO

REPORT:
AGS CAL DATA
& PIPA BIASES

92:00

FLIGHT PLAN

CSM

CMP

92:00

HSK

P52
IMU REALIGN
(REFSMMAT)

MCC UPDATE:
MNVR PAD 1
FOR PHASING
SEP TIME

LM EXTERIOR LTG
CHECK

:10

MER

MCC-GO/NO GO FOR 78-1
GO/NO GO FOR UNDOCKING

:20

TRIM MNVR TO UNDOCKING
ATTITUDE

:30

59

RR XPDR HTR - ON

CSM/LM UNDOCKING (Pg 4-52)

:40

ANG

ENABLE SM RCS JET B3
SEQUENCE PHOTOS
OF UNDOCKING

FORMATION FLYING
& LM INSPECTION
(Pg 4-52)

:50

CYI

MAD

RR XPDR - ON

MCC UPDATE:
MNVR PAD 2
FOR PHASING
SEP TIME
STATE VECTORS

P30 EXT ΔV
P41 RCS THRUST

93:00

LM

CDR

LMP

92:00

HSK

RR SELF TEST
(Pg 4-51)

MCC UPDATE:
MNVR PAD 1
FOR PHASING
SEP TIME

:10

LM LIGHTING CHECK

MER

MCC-GO/NO GO
FOR UNDOCKING

:20

:30

PREP FOR UNDOCKING

C-BAND

:40

ANG

CSM/LM UNDOCKING (Pg 4-62)

MNVR LM +Z TOWARD
CSM (Pg 4-55)
(AGS MIN DEADBAND AUTO ATT HOLD
& PROPORTIONAL RATE COMMAND)

:50

YAW 360° FOR INSPECTION
AGS PULSE
MODE
(Pg 4-55)

CYI

MAD

SET
ORDEAL

AGS FORMATION
FLYING

MCC UPDATE:
MNVR PAD 2
FOR PHASING
SEP TIME

93:00

PGNCS FORMATION FLYING

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	92:00 - 93:00	5/58-59	3-61

FLIGHT PLAN

CSM

CMP

93:00

SM RCS SEP BURN

TIG=93:05:45
4-X JETS
BT=10.5 SEC
ΔV=5.0 fps
RADIAL DOWN
ORBIT 132x131

:10

P20
RNDZ TRACK

:20

MNVR TO 0°, 70°, 0
CONFIRM SEP BURN WITH MCC

:30

CRO

V85 P52
IMU REALIGN (REFSMMAT)
& COAS CALIBRATION

REPORT TORQUE ANGLES & TIME
(FROM P52)
V83 P30 EXTERNAL ΔV
P40 SPS THRUST

HSK

:40

MER

MCC-GO/NO GO FOR PHASING

:50

LM PHASING
P76 TGT ΔV, P20 RNDZ TRACK

94:00

LM

CDR | LMP

93:00

FORMATION FLYING

TRACK CSM
CSM RCS SEP
V84, TARGET ΔV
UPDATE & ALIGN AGS

:10

RR-ON
DESIGNATE RR LOCK-ON
COMPARE LGC & RR RANGE, RANGE RATE
CHECK TAPE METERS

PREP FOR ALIGNMENT
RR-OFF
DESIGNATE RR
P30 - EXT ΔV

:20

C-BAND

P52 IMU REALIGN (Pg 4-56)
(REFSMMAT OPTION)
&
COAS CALIBRATION (Pg 4-57)

:30

CRO

REPORT IMU TORQUING ANGLES
& COAS CAL DATA

HSK

:40

RR-ON
UPDATE & ALIGN AGS
RR LOCK-ON

MCC - GO/NO GO FOR PHASING
P40 DPS THRUST
(BYPASS ENG ON)
LR SPURIOUS TEST
ULLAGE
(Pg 4-59)
AGS EXT ΔV
AGS BURN

MER

DFI :50

PHASING
(Pg 4-60)

TIG=93:50:03.6
2 JET, 8 SEC ULLAGE
BT=24.9 SEC
ΔV=85.0 fps
RADIAL UP
ORBIT 145 x 119

RR LOCK-ON & TARGET
P20 RNDZ NAV
TPI (P34)
(TIME OPTION)

V32 @ 5 MARKS

C-BAND

94:00

FLIGHT PLAN

CSM

CMP

94:00

TAKE MARKS

P34 TPI
V32

60

:10 TEX

REPORT P34 SOLUTION TO MCC

TAKE MARKS

:20

MCC-GO/NO GO
MCC UPDATE
TPI_0 PAD

:30 MAD

TAKE MARKS
(REINIT W MATRIX)
V32

TAKE MARKS

:40

P34 TPI
ONBOARD GO/NO GO

:50

P52
IMU REALIGN (REFSMMAT)

95:00 (TPI_0)

LM

CDR | LMP

94:00 C-BAND

MAINTAIN ATT FOR RR TRACKING

-FINAL COMP @ 12 MARKS

TARGET PGNCS (P34) & AGS FOR TPI

:10 TEX

CHECK TAPE METERS

LR SELF TEST (Pg 4-39)

:20

P20, RNDZ NAV
RR LOCK-ON

MCC GO/NO GO
MCC UPDATE
TPI_0 PAD

:30 MAD

V93, V32 @ 4 MARKS

-V32E @ 6 MARKS

MAINTAIN ATT FOR RR TRACKING

CONNECT ASC BATTS

TARGET PGNCS (P34) & AGS FOR TPI (TIME OPTION)

:40

-FINAL COMP @ TPI_0-14:00
ONBOARD GO/NO GO

:50

PREP FOR ALIGNMENT

UPDATE & ALIGN AGS
DESIGNATE RR

RR OFF

P52 IMU REALIGN (REFSMMAT OPTION)

(Pg 4-56)

95:00 (TPI_0)

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	94:00 - 95:00	5/59-60	3-63

FLIGHT PLAN

CSM

CMP

95:00 CRO HSK MER

P20 RNDZ TRACK

REPORT TORQUING ANGLES & TIME (FROM P52)

:10

MCC UPDATE
INSERTION PAD

:20

MCC-GO/NO GO FOR INSERTION

V83

:30

P30 EXTERNAL ΔV
P40 SPS THRUST

:40 GYM

LM INSERTION

P76 TGT ΔV
P20 RNDZ TRACK

TAKE MARKS
(REINIT W MATRIX)

:50

V85

MCC UPDATE
CSI PAD

96:00

C-BAND

DFI

C-BAND

LM

CDR	LMP
95:00 CRO	
RR-ON	P20 RNDZ NAV RR LOCK-ON
	UPDATE & ALIGN AGS
:10 HSK	MCC UPDATE: INSERTION PAD V95,R <19K FT
MAINTAIN RR TRACKING ATT	MONITOR CLOSEST APPROACH
:20 MER	V30,R >19K FT
	TARGET AGS EXT ΔV
	MCC-GO/NO GO FOR INSERTION
	POO @ 6 MARK
:30 ADJUST ORDEAL	UPDATE AND ALIGN AGS
P40 DPS THRUST	
	TARGET AGS EXT ΔV
:40 GYM	INSERTION (Pg 4-64)
	TIG = 95:41:48.1 2 JET, 9.5 SEC ULLAGE BT = 24.4 SEC ΔV = 39.9 fps POSIGRADE ORBIT 144 X 142
P20 RNDZ NAV RR LOCK-ON CHECK TAPE METERS	V93,V32 & 4 MARKS
:50	DESCENT BATTS 1 & 3 OFF
MAINTAIN RR TRACKING ATT	TARGET PGNCS (P32) & AGS FOR CSI
MCC UPDATE: CSI PAD	WHEN RANGE > 50.8 nm CHECK TAPE METERS VS. LGC
96:00	

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	95:00 - 96:00	5/60-61	3-64

FLIGHT PLAN

CSM

CMP

96:00
- CYI
- TAKE MARKS
- V85, V83
- P30 EXTERNAL ΔV
- TAKE MARKS

:10
- P40 SPS THRUST
- V85

:20
- TAN
- LM CSI
- P76 TGT ΔV
- P20 RNDZ TRACK

:30
- TAKE MARKS
- (REINIT W MATRIX)
- CRO
- V85
- P17 TPI SEARCH
- V83

:40
- TAKE MARKS
- HSK
- MCC UPDATE:
- CDH PAD
- V90, V85

:50
- TAKE MARKS
- HTV
- P30 EXTERNAL ΔV
- P40 SPS THRUST
- V85

97:00

C-BAND

LM

CDR | **LMP**

96:00
- CYI
- V32 @ 8 MARKS
- DES BATTS 2 & 4 OFF
- OBTAIN Y DOT

:10
- FINAL COMP @ CSI-14:00
- UPDATE & ALIGN AGS
- AGS EXT ΔV
- P41 RCS THRUST
- PREP FOR STAGING (Pg 4-67)

:20
- TAN
- CSI, STAGING

TIG = 96:22:00
4 JET, INTERCONNECT
BT = 29.6 SEC
ΔV = 37.8 fps
RETROGRADE
ORBIT: 140 x 121

- ONBOARD RCS READOUT
- PASS TIG CDH TO MCC
- P20 RNDZ NAV
- RR LOCK-ON (Pg 4-65)

:30
- V93, V32 @ 4 MARKS
- CRO

:40
- MAINTAIN RR TRACKING ATT
- TARGET PGNCS (P33) & AGS FOR CDH
- HSK
- MCC UPDATE:
- CDH PAD

:50
- FINAL COMP @ CDH-14:00
- OBTAIN Y DOT
- HTV
- ADJUST ORDEAL
- UPDATE & ALIGN AGS
- P42 APS THRUST
- TARGET AGS EXT ΔV

97:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	96:00 - 97:00	5/61	3-65

FLIGHT PLAN

CSM

CMP

Time	Stations	CMP
97:00	RED	LM CDH
		P76 TGT ΔV
:10	GDS	P20 RNDZ TRACK
		TAKE MARKS (REINIT W MATRIX)
:20		P34 TPI
		V32 REPORT P34 SOLUTION TO MCC
		MCC UPDATE TPI PAD 1
:30		TAKE MARKS
		MCC UPDATE TPI PAD 2
		V32 (P34)
	CYI	TAKE MARKS
:40		V83
:50	PRE-TAN	P34 TPI
		P40 SPS THRUST
98:00		LM TPI

LM

DFI / C-BAND

Time	Stations	CDR	LMP
97:00	RED	ATT MNVR (Pg 4-) P42	
		CDH (Pg 4-68)	TIG = 97:06:22.6 4 JET, 4 SEC ULLAGE BT = 2.9 SEC ΔV = 37.9 fps RETROGRADE ORBIT: 121 x 119
:10	GDS	P20 RNDZ NAV RR LOCK-ON	
		V93,V32 @ 4 MARKS	
:20		MAINTAIN RR TRACKING ATT	TARGET PGNCS (P34) & AGS FOR TPI
		MCC UPDATE: TPI PAD 1	UPDATE AGS WITH RR DATA EVERY THREE MINUTES
		V32 @ 10 MARKS	
:30		MCC UPDATE TPI PAD 2	
	CYI		
:40		V32 @ 16 MARKS	
		FINAL COMP @ TPI-14 MIN	
:50	PRE-TAN		UPDATE & ALIGN AGS
		P41 RCS THRUST	TARGET AGS EXT ΔV
98:00			

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	97:00 - 98:00	5/61-62	3-66

FLIGHT PLAN

CSM

CMP

Time	Station	CMP
98:00	TAN	P76 TGT ΔV; P35 MCC TGT
		TAKE MARKS
		P41 RCS THRUST
:10	CRO	P76 TGT ΔV — LM MCC_1 — P35 MCC TGT
		TAKE MARKS (REINIT W MATRIX)
		TAKE MARKS
:20		P41 RCS THRUST
		LM MCC_2
	HTV	P76 TGT ΔV, V77; P20 RNDZ TRACK, V83
		P47 THRUST MONITOR
:30		
	HAW	RENDEZVOUS (Pg 4-70)
:40	RED	PHOTOGRAPH LM
	GDS	
:50		FORMATION FLYING
99:00	ANG	

63

LM

Time	Station	CDR	LMP
98:00	TAN	TPI: TIG = 98:00:15, 2 JET, Z AXIS, BT = 17.0 SEC, ΔV = 21.8 fps, LINE OF SIGHT	(Pg 4-69)
		P20 RNDZ NAV	ORBIT:133x121
		MAINTAIN LINE OF SIGHT	V93 @ NO MARKS; FINAL COMP @TPI+7:00
			TARGET PGNCS (P35) FOR MCC_1
:10	CRO	P41 RCS THRUST — MCC_1	V93 @ NO MARKS
		MAINTAIN LINE OF SIGHT	TARGET PGNCS (P35) FOR MCC_2
		FINAL COMP @TPI+19:00	
:20		P41 RCS THRUST — MCC_2	
	HTV	MAINTAIN LINE OF SIGHT	P47 AVG G; COMPARE DSKY & TAPE METERS
:30		BRAKING	PREPARE CAMERAS
	HAW	RENDEZVOUS	
:40	RED	FORMATION FLYING	PHOTOGRAPH CSM (Pg 4-71)
	GDS	RR CORONA TEST (Pg 4-72)	
:50		LM PGNCS ATTITUDE CONTROL (Pg 4-73)	
99:00	ANG		

C-BAND

DFI

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 8, 1969	98:00 - 99:00	5/62-63	3-67

FLIGHT PLAN

CSM

Time	Station	Activity
99:00	VAN	LOGIC BUS ARM
		MCC-GO/NO GO FOR PYRO ARM
		MNVR TO DOCKING ATTITUDE
:10		SEQUENCE PHOTOS OF DOCKING
		DOCKING (Pg 4-75)
		XPDR-OFF
	ACN	PRESSURIZE TUNNEL
:20		MCC UPDATE
		GIMBAL ANGLES FOR LM RFALIGN
	PRE	
:30	TAN	SUPPORT LM P52 AS REQUIRED
:40		
	CRO	
:50		TUNNEL PRESSURE CHECK
		MCC UPDATE:
100:00	GWM	JETTISON ATTITUDE

LM

Time	Station	Activity
99:00	VAN	FORMATION FLYING
		MNVR TO DOCKING ATTITUDE & TRANSLATE TO CAPTURE LATCH
:10		DOCKING (Pg 4-75)
		RR-OFF
	ACN	PREP FOR ALIGNMENT
:20		P52
	PRE	IMU REALIGN
:30	TAN	TO REFSMMAT
:40		
	CRO	
:50		PREP FOR TRANSFER
		MCC UPDATE
		LM STATE VECTOR
100:00	GWM	MNVR PAD

DFI — C-BAND

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	99:00 - 100:00	5/63	3-68

FLIGHT PLAN

CSM

CDR | CMP | LMP

100:00
GWM
:10
HAW
:20
GDS
SUPPORT LM TUNNEL CLEARING AS REQUIRED
:30
ANG
MCC UPDATE
BLOCK DATA 11
:40
IVT TO CSM
:50
ACN
MNVR TO JETTISON ATT
R = ,P = ,Y=
ATT HOLD @ MIN DEADBAND
PRE
101:00

64

LM

CDR | LMP

100:00
GWM
P30 EXT ΔV
AGS EXT ΔV
PIPA BIAS CHECK
(Pg 4-38)
:10
HAW
C-BAND
:20
GDS
REMOVE TUNNEL HARDWARE FROM LM SIDE & STOW DROGUE, PROBE, AND OTHER EQUIPMENT FOR LM JETTISON
:30
ANG
CDR TRANSFER TO CSM
:40
LM CLOSEOUT
DFI
:50
ACN
CONNECT TO CSM ECS
P42 APS THRUST
MONITOR CSM MNVR TO BURN ATTITUDE
V77 MAX DEADBAND
ENTER P00
PRE
101:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	100:00 - 101:00	5/63-64	3-69

FLIGHT PLAN

CSM

CDR | CMP | LMP

101:00 — PRE — TAN — :10 — :20 — CRO — :30 — GWM — :40 — HAW — :50 — GDS — TEX — 102:00

IVT TO CSM

INSTALL FWD HATCH

POST RENDEZVOUS
EQUIPMENT
STOWAGE

LOGIC BUS ARM

MCC - GO/NO GO FOR PYRO ARM

LM JETTISON (Pg 4-76)

RETURN TO MAX DEADBAND
FLY FORMATION

FDAI ANGLES:
R=132.9°, P=105.8°,
Y=23.5°

POST JETT SEP MNVR

TIG = 101:38:14
4-X JETS
BT = 6.0 SEC
ΔV = 2.0 fps
45° OUT-OF-PLANE
LV PITCH DOWN -60°
FROM LM ATTITUDE
ORBIT: 130 x 130

APS BURN TO DEPLETION (Pg 4-77)

LM

101:00 — PRE — TAN — :10 — :20 — CRO — :30 — GWM — :40 — HAW — :50 — GDS — TEX — 102:00

DFI

LMP

OPEN APS INTERCONNECT
TRANSFER TO CSM

CLOSE LM HATCH

LM JETTISON (Pg 4-76)

MCC CMD:
ENTER P42
BYPASS AUTO MNVR
BYPASS TRIM

PROCEED FOR
ENG ON

APS BURN TO
DEPLETION
(Pg 4-77)

TIG = 102:00:00
4 JET, 4 SEC ULLAGE
BT = 360.0 SEC
ΔV = 5658.5 fps
45° OUT-OF-PLANE
POSIGRADE
ORBIT: 4177 x 131

FLIGHT PLAN

CDR	CMP	LMP

102:00

65

TEX

ANG

:10

DOFF PGA & LCG

CO_2 FILTER CHANGE NO. 9
11 TO A, 9 TO A3

:20

DOFF PGA

:30

PRE

F/C O_2 PURGE

:40

TAN

DOFF PGA

:50

103:00

103:00

GWM

MCC UPDATE:
STATE VECTOR

:10

POWER DOWN S/C:
IMU, CMC (P06) AND SCS

:20

HAW

GO TO DRIFTING FLIGHT

EAT PERIOD

GDS

:30

GYM

66

:40

:50

BEGIN BATT A CHARGE

SET COMM FOR REST PERIOD

104:00

FLIGHT PLAN

104:00

:10

PRE

TAN

MCC UPDATE
BLOCK DATA 12

:20

BEGIN REST PERIOD

2 IN COUCHES - 1 IN SLEEP STATION

REST
PERIOD

:30

:40

:50

HAW

105:00

105:00

RED

:10

67

:20

:30

REST
PERIOD

:40

PRE

TAN

:50

106:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	104:00 - 106:00	5/66-67	3-72

FLIGHT PLAN

106:00
:10
:20
:30 HAW
RED
:40
:50
107:00

68

REST
PERIOD

107:00
:10
:20
:30
:40
:50
108:00

REST
PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	106:00 - 108:00	5/67-68	3-73

FLIGHT PLAN

108:00
HAW
RED
:10
:20
69
:30
REST PERIOD
:40
ACN
:50
109:00

109:00
:10
:20
GWM
:30
HTV
REST PERIOD
:40
MER
:50
70
110:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	108:00-110:00	5/68-70	3-74

FLIGHT PLAN

110:00

:10

:20 ACN

:30 REST PERIOD

:40

:50

111:00 GWM

111:00 GWM

:10 HTV

:20 MER

:30 REST PERIOD

71

:40

:50

112:00 CYI

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	110:00 - 112:00	5/70-71	3-75

FLIGHT PLAN

112:00

:10

:20

:30

GWM

:40

HTV

:50

MER

113:00

REST PERIOD

113:00

:10

72

:20

:30

CYI

END REST PERIOD

DAY 6

:40

:50

114:00

REST PERIOD

FLIGHT PLAN

114:00

:10

HSK

F/C O_2 PURGE

:20

EAT PERIOD

MER

:30

:40

73

:50

ANG

MCC UPDATE
BLOCK DATA 13

115:00

CHLORINATE POTABLE WATER

115:00

MCC-FLIGHT PLAN & CONSUMABLES UPDATE

CYI

:10

MAD

:20

INSTALL CENTER COUCH

:30

:40

CRO

:50

HSK

116:00

MER

CO_2 FILTER CHANGE NO. 10
12 TO B, 10 TO A3

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	114:00 - 116:00	6/72-73	3-77

FLIGHT PLAN

116:00 MER
:10
:20
74
GBM
:30 BDA
:40 CYI
MAD
:50
117:00

117:00
:10
CRO
:20
HSK
:30
MER
:40
S/C POWER UP:
IMU, CMC, AND SCS
:50
TEX
75
MIL
118:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	116:00 - 118:00	6/73-75	3-78

FLIGHT PLAN

118:00 BDA

:10

MAD

:20

CMP ENTER LEB

:30

DAMP RATES

TAN

:40

P51
IMU ORIENTATION

:50 CRO

HSK

119:00

119:00 HSK

:10 MER

RED

:20

GYM

76 :30 TEX

MIL

MCC-GO/NO GO FOR 93-1

:40

MCC UPDATE
STATE VECTOR
TGT LOAD
MNVR PAD

:50 CYI

P30 EXTERNAL ΔV
P40 SPS THRUST

120:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	118:00 - 120:00	6/75-76	3-79

FLIGHT PLAN

120:00

TAN

:10

P52
IMU REALIGN
(PREFERRED)

:20

CRO

:30

EAT
PERIOD

HSK

:40

HTV

:50

HAW

RED

GDS

121:00

CYCLE O_2 & H_2 FANS

121:00

TEX

MIL

MCC-SPS GO/NO GO

77

:10

BDA

:20

VAN

CYI

LOAD DAP

P40 SPS THRUST

ACN

:30

PRE

:40

SXT STAR CHECK

TAN

CMP EXIT LEB

:50

CRO

122:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	120:00 - 122:00	6/76-77	3-80

FLIGHT PLAN

122:00

CRO

SPS NO. 6

TIG = 122:01:00
2/18 ULLAGE
BT = 2.5 SEC
ΔV = 66.2
RETROGRADE

ORBIT 130 x 95

REPORT RESIDUALS & ΔV COUNTER

:10

HTV

:20

HAW

RED

:30

GDS

TEX

78 :40

MIL

BDA

ANG

:50

123:00

ACN

:10

PRE

TAN

:20

UNSTOW &
INSTALL
S065 CAMERAS &
MAGAZINES

MCC UPDATE
S065

:30

CRO

:40

GWM

:50

V83, INITIALIZE ORDEAL

DISABLE RCS JET B3

HAW

MNVR TO S065 ATT
& BEGIN ORB RATE

124:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	122:00 - 124:00	6/77-78	3-81

FLIGHT PLAN

124:00
GDS
TEX
:10
79
MIL
:20
ANG
:30
ACN
:40
PRE
:50
TAN
125:00

S065
(Pg 4-78)

SOUTHWEST
U.S.

TERMINATE ORB RATE

125:00
CRO
MCC UPDATE
S065
:10
GWM
:20
:30
HAW
MNVR TO S065 ATT
& BEGIN ORB RATE
:40
GDS
TEX
S065
MEXICO
80 :50
TERMINATE ORB RATE
126:00
ENABLE JET B3

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	124:00 - 126:00	6/78-80	3-82

FLIGHT PLAN

126:00

CO_2 FILTER CHANGE NO. 11
13 TO A, 11 TO A3

F/C O_2 PURGE

:10

:20 PRE

TAN

STOW S065
MAGAZINES & CAMERAS

:30

:40

:50 GWM

MCC UPDATE
STATE VECTOR

POWER DOWN S/C:
IMU, CMC (P06), AND SCS

127:00

127:00

GO TO DRIFTING FLIGHT

HAW

:10

GDS
GYM

:20

81

:30

EAT
PERIOD

:40

:50

PRE

128:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	126:00 - 128:00	6/80-81	3-83

FLIGHT PLAN

128:00 TAN

:10

:20

:30

MCC UPDATE
BLOCK DATA 14

HAW

:40

RED

:50

82

129:00

SET COMM FOR REST PERIOD

129:00

BEGIN REST PERIOD
2 IN COUCHES - 1 IN SLEEP STATION

:10

:20

PRE

:30 TAN

REST
PERIOD

:40

:50

130:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	128:00 - 130:00	6/81-82	3-84

FLIGHT PLAN

130:00

:10

HAW

RED

:20

83 :30

:40

:50

131:00

REST PERIOD

131:00

:10

:20

:30

:40

:50

132:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	130:00 - 132:00	6/82-83	3-85

FLIGHT PLAN

132:00

84

:10

:20

ACN

:30

:40

:50

133:00

REST PERIOD

133:00

GWM

:10

HTV

:20

MER

:30

85

:40

:50

ACN

134:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	132:00 - 134:00	6/83-85	3-86

FLIGHT PLAN

134:00
ACN
:10
:20
:30
:40
GWM
HTV
:50
MER
135:00

REST PERIOD

135:00
MER
:10
86
:20
:30
CYI
:40
:50
136:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 8, 1969	134:00 - 136:00	6/85-86	3-87

FLIGHT PLAN

136:00

:10

:20

HTV

:30

MER

REST PERIOD

:40

87 :50

137:00

137:00

:10 CYI

MAD

:20

:30

REST PERIOD

:40

:50

HSK

138:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	136:00 - 138:00	6/86-87	3-88

FLIGHT PLAN

138:00

MER

:10

:20

88

:30 ANG — END REST PERIOD

DAY 7

:40

CYI

MAD — MCC-FLIGHT PLAN & CONSUMABLES UPDATE

:50

139:00

139:00

H_2 PURGE HEATERS ON

:10

CRO

:20

HSK — F/C O_2 & H_2 PURGE

:30 — EAT PERIOD

MER

:40

:50

POWER UP S/C:
IMU, CMC, AND SCS

89 — CO_2 FILTER CHANGE NO. 12
14 TO B, 12 TO A3

140:00 — CHLORINATE POTABLE WATER

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	138:00 - 140:00	6-7/87-89	3-89

FLIGHT PLAN

140:00
GBM
MCC UPDATE
BLOCK DATA 15
:10
CYI
:20
MAD
:30
DAMP RATES
:40
CMP MAN LEB
:50
CRO
P51
IMU ORIENTATION
HSK
141:00

90

141:00
HSK
:10
MER
:20
:30
TEX
MCC UPDATE
STATE VECTOR
T ALIGN
MIL
:40
BDA
:50
CYI
142:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	140:00 - 142:00	7/89-90	3-90

FLIGHT PLAN

142:00

:10

:20

CRO

P52
IMU REALIGN
(NOMINAL)

REPORT TORQUE TIME

:30

HSK

MCC-GO/NO GO FOR 108-1

MCC UPDATE
LANDMARK TRACKING

:40

MER

SET UP S/C ATT & RATES
FOR YAW/ROLL
LDMK TRACKING

:50

RED

GYM

143:00

91

143:00

GYM

TEX

MIL

P22 ORB NAV
LANDMARK TRACKING
(THREE LANDMARKS)
(Pg 4-82)

SOUTHEAST
U.S.

:10

BDA

MCC UPDATE
LANDMARK TRACKING

:20

CYI

:30

CENTRAL
AFRICA

:40

TAN

:50

P52
IMU REALIGN
(REFSMMAT)

CRO

144:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	142:00 - 144:00	7/90-91	3-91

FLIGHT PLAN

144:00

CRO

HSK

:10

HTV

:20

HAW

RED

:30

GDS

TEX

:40

MIL

BDA

:50

VAN

145:00

92

MCC UPDATE
STATE VECTOR

MCC UPDATE
LANDMARK TRACKING

P22 ORB NAV
LANDMARK TRACKING
(FOUR LANDMARKS)

SOUTHERN
U.S.

145:00

:10

PRE

TAN

:20

:30

CRO

:40

HTV

:50

HAW

RED

146:00

WESTERN &
SOUTHERN
AFRICA

P52
IMU REALIGN
(REFSMMAT)

EAT
PERIOD

REPORT TORQUE ANGLES AND TIME
MCC UPDATE
STATE VECTOR

P22 ORB NAV
LANDMARK TRACKING
(FOUR LANDMARKS)

HAWAII

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	144:00 - 146:00	7/91-92	3-92

FLIGHT PLAN

146:00
RED
GDS
:10 TEX
MIL
:20
ANG
:30
ACN
:40
PRE
:50 TAN
147:00

93

MCC UPDATE
LANDMARK TRACKING

P52
IMU REALIGN
(REFSMMAT)

SOUTHERN
U.S.

CARIBBEAN
ISLANDS

147:00
CRO
:10
GWM
:20
:30 HAW
GDS
:40 TEX
MIL
:50 GBI
ANG
148:00

94

MCC UPDATE
STATE VECTOR

P22 ORB NAV
LANDMARK TRACKING
(FOUR LANDMARKS)

SOUTHWEST
U.S.

CARIBBEAN
ISLANDS

NORTHEAST
SOUTH AMERIC

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	146:00 - 148:00	7/92-94	3-93

FLIGHT PLAN

148:00

ACN

:10

PRE

:20

TAN

:30

:40

GWM

:50

MCC UPDATE
STATE VECTOR

149:00

95

149:00

HAW

POWER DOWN S/C:
IMU, CMC (P06) AND SCS

GO TO DRIFTING FLIGHT

:10

GDS

TEX

:20

:30

:40

F/C O_2 PURGE

:50

PRE

CO_2 FILTER CHANGE NO. 13
15 TO A, 13 TO A4

TAN

150:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	148:00 - 150:00	7/94-95	3-94

FLIGHT PLAN

150:00 TAN
:10
:20 GWM
:30
:40 HAW
:50 GYM
96
151:00

EA PERIC

151:00
:10
:20 PRE
:30 TAN
:40
:50
152:00

MCC UPDATE
BLOCK DATA 16

SET COMM FOR REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	150:00 - 152:00	7/95-96	3-95

FLIGHT PLAN

152:00

BEGIN REST PERIOD
2 IN COUCHES - 1 IN SLEEP STATION

:10 HAW RED

:20

97 :30

REST PERIOD

:40

:50

PRE

153:00

153:00 TAN

:10

:20

:30

REST PERIOD

:40

HAW RED

:50

154:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	152:00 - 154:00	7/96-97	3-96

FLIGHT PLAN

Time	Rev	Activity
154:00	98	
:10		
:20		
:30		REST PERIOD
:40		
:50		
155:00		

Time	Rev	Station	Activity
155:00			
:10			
:20			
:30			REST PERIOD
:40	99		
:50			
156:00		ACN	

FLIGHT PLAN

156:00

ACN

:10

:20

:30

REST PERIOD

:40

GWM

:50

HTV

MER

157:00

157:00

MER

:10

100

:20

:30

ACN

:40

:50

158:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	156:00 - 158:00	7/99-100	3-98

FLIGHT PLAN

158:00
:10
GWM
:20
HTV
:30
MER
:40
101
:50
159:00

REST PERIOD

159:00
:10
CYI
:20
:30
:40
:50
160:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	158:00 - 160:00	7/100-101	3-99

FLIGHT PLAN

160:00

MER

:10

:20

102

:30

:40

GYI

MAD

:50

161:00

REST PERIOD

161:00

:10

:20

HSK

:30

MER

:40

:50

103

162:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	160:00 - 162:00	7/101-103	3-100

FLIGHT PLAN

162:00 ANG

DAY 8

MCC UPDATE
BLOCK DATA 17

:10 MCC-FLIGHT PLAN & CONSUMABLES UPDATE

CYI

F/C O_2 PURGE

MAD

:20

EAT PERIOD

:30

:40

:50 CRO

HSK

163:00

104

163:00 HSK

CHLORINATE POTABLE WATER

:10 MER

:20

:30

:40 ANG

CYI

:50 MAD

164:00

CO_2 FILTER CHANGE NO. 14
16 TO B, 14 TO A4

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	162:00 - 164:00	8/103-104	3-101

FLIGHT PLAN

164:00

:10

:20

CRO

:30

HSK

:40

MER

:50

165:00

105

165:00

TEX

:10

MIL

:20

CYI

:30

:40

:50

CRO

166:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	164:00 - 166:00	8/104-105	3-102

FLIGHT PLAN

166:00
CRO
HSK
:10
POWER UP S/C:
IMU, CMC, AND SCS
MER
:20
RED
:30
GYM
MCC-GO/NO GO FOR 122-1
106
:40
TEX
MIL
:50
CYI
CMP MAN LEB
167:00

167:00
DAMP RATES
:10
TAN
:20
:30
CRO
P51
IMU ORIENTATION
HSK
:40
HTV
:50
HAW
168:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	166:00 - 168:00	8/105-106	3-103

FLIGHT PLAN

168:00
RED
GDS
TEX
107
:10
MIL
:20
VAN
:30
:40
PRE
TAN
:50
169:00

MCC UPDATE
STATE VECTOR
TGT LOAD
MNVR PAD

P30 EXTERNAL ΔV
P40 SPS THRUST

CYCLE O_2 & H_2 FANS

P52
IMU REALIGN
(PREFERRED)

EAT
PERIOD

169:00
CRO
:10
HTV
:20
HAW
:30
RED
GDS
:40
TEX
108
MIL
:50
ANG
170:00

LOAD DAP
P40 SPS THRUST

SXT STAR CHECK

CMP EXIT LEB

MCC-SPS GO/NO GO

SPS NO. 7

TIG = 169:49:00
2/18 ULLAGE
BT = 6.8 SEC
ΔV = 174.0 fps
POSIGRADE
ORBIT 210 x 97

REPORT RESIDUALS & ΔV COUNTER

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	168:00 - 170:00	8/106-108	3-104

FLIGHT PLAN

170:00

ACN

:10

PRE

TAN

:20

UNSTOW & INSTALL
S065 CAMERAS
& MAGAZINES

:30

MCC UPDATE
S065

CRO

:40

GWM

:50

V83, INITIALIZE ORDEAL

DISABLE RCS JET B3

171:00

109

171:00

HAW

MNVR TO S065 ATT
& BEGIN ORB RATE

:10

GDS

TEX

S065

SOUTHWEST
U.S.

:20

MIL

GBI

ANG

:30

TERMINATE ORB RATE

:40

ACN

:50

PRE

TAN

172:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	170:00 - 172:00	8/108-109	3-105

FLIGHT PLAN

172:00
TAN
CRO
:10
:20
GWM
MCC UPDATE
S065
BLOCK DATA 18
:30
HAW
:40
MNVR TO S065 ATT
& BEGIN ORB RATE
GDS
:50
GYM
S065
MEXICO
110
TEX
173:00

173:00
S065
BRAZIL
TERMINATE ORB RATE
:10
ENABLE JET B3
:20
PRE
:30
F/C O_2 PURGE
EAT PERIOD
TAN
:40
:50
CO_2 FILTER CHANGE NO. 15
17 TO A, 15 TO A4
174:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	172:00 - 174:00	8/109-110	3-106

174:00
GWM
MCC UPDATE
STATE VECTOR

:10
HAW
POWER DOWN S/C:
IMU, CMC (P06), AND SCS

:20
GO TO DRIFTING FLIGHT

:30
111

STOW S065
MAGAZINES & CAMERAS

:40

:50
BEGIN BATT B CHARGE

175:00
SET COMM FOR REST PERIOD

175:00
PRE
TAN
BEGIN REST PERIOD
2 IN COUCHES - 1 IN SLEEP STATION

:10

:20

:30
REST
PERIOD

:40

HAW
:50
RED

176:00

FLIGHT PLAN

176:00

112

:10

:20

:30

PRE

:40

TAN

:50

177:00

REST PERIOD

177:00

:10

:20

HAW

RED

:30

113

:40

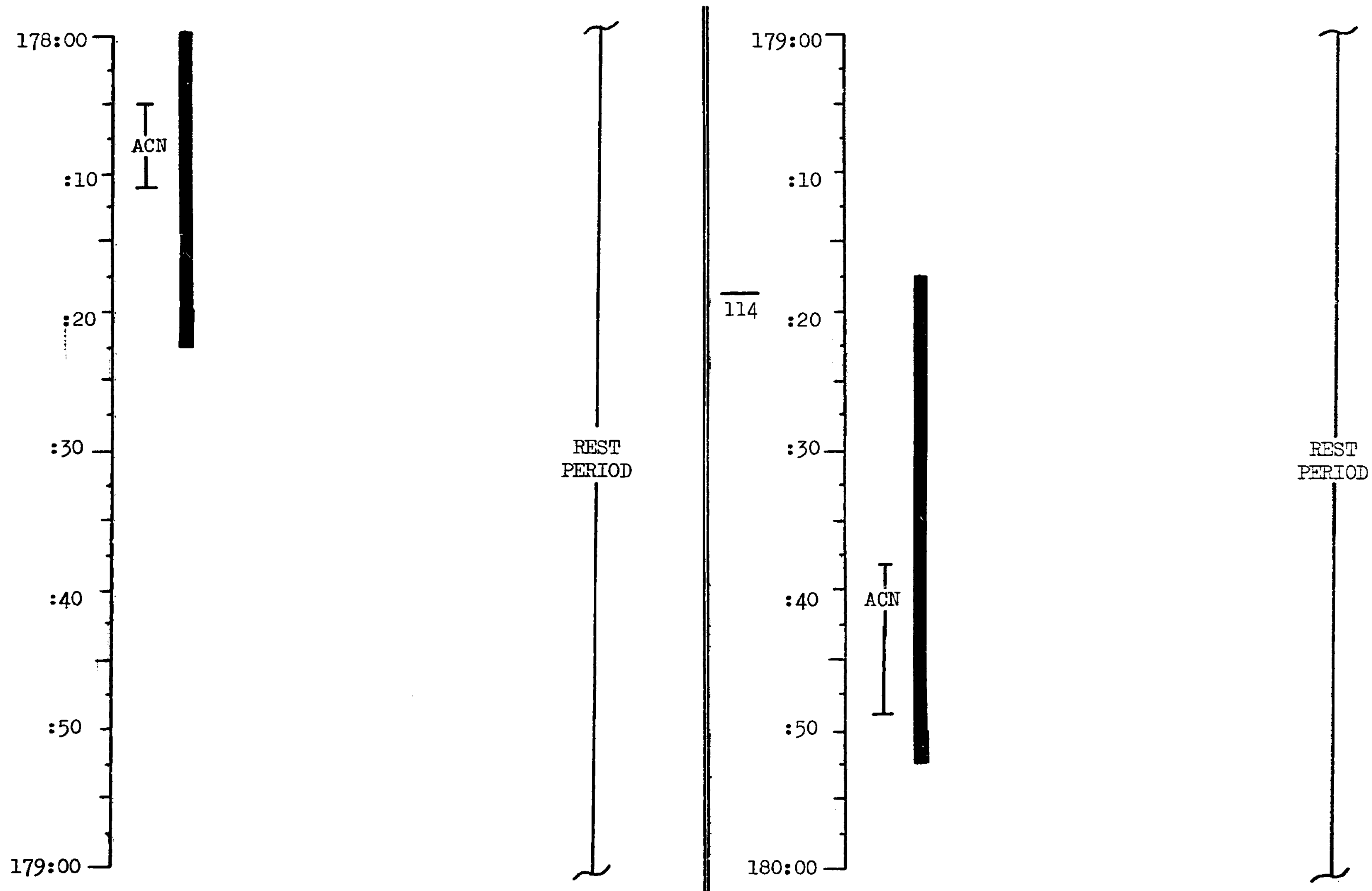
:50

178:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3,.1969	176:00 - 178:00	8/111-113	3-108

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	178:00 - 180:00	8/113-114	3-109

FLIGHT PLAN

180:00

:10

:20 GWM

:30 HTV

:40 MER

:50

115

181:00

REST PERIOD

181:00

:10 ACN

:20

:30

:40

:50

GWM

182:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	180:00 - 182:00	8/114-115	3-110

FLIGHT PLAN

182:00
GWM
HTV
:10
MER
:20
:30
116
:40
:50
CYI
183:00

REST PERIOD

183:00
CYI
:10
:20
:30
:40
HTV
:50
MER
184:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	182:00 - 184:00	8/115-116	3-111

FLIGHT PLAN

184:00

117

:10

ANG

REST PERIOD

:20

END REST PERIOD

:30

CYI

MAD

DAY 9

:40

:50

185:00

185:00

:10

HSK

MCC UPDATE
BLOCK DATA 19

:20

MER

EAT PERIOD

:30

:40

118

:50

BDA

MCC-FLIGHT PLAN & CONSUMABLES UPDATE

186:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	184:00 - 186:00	8-9/116-118	3-112

FLIGHT PLAN

186:00
C/I
MAD
CHLORINATE POTABLE WATER

:10
H_2 PURGE HEATERS ON

:20

:30
F/C O_2 & H_2 PURGE

:40
CRO

HSK

:50

MER
187:00

119

187:00
MER
POWER UP S/C:
IMU, CMC, AND SCS

:10

:20

MIL
BDA

:30
MCC UPDATE
NOMINAL IMU ORIENT (FOR S065)

:40

MAD

:50

CO_2 FILTER CHANGE NO. 16
18 TO B, 16 TO A4

188:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	186:00 - 188:00	9/118-119	3-113

FLIGHT PLAN

188:00

:10 DAMP RATES

CRO

:20

HSK

P51
IMU ORIENTATION

:30

MER

:40

P52
IMU REALIGN
(NOMINAL)

:50

GYM
TEX
MIL

120

MCC-GO/NO GO FOR 137-1

189:00

189:00 BDA

:10

CYI

UNSTOW & INSTALL
S065 CAMERAS &
MAGAZINES

:20

:30

TAN

:40

:50 CRO

MCC UPDATE
S065

HSK

190:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	188:00 - 190:00	9/119-120	3-114

FLIGHT PLAN

190:00

MER

:10 — V83, INITIALIZE ORDEAL

DISABLE RCS JET B3

:20 — RED

MNVR TO S065 ATT
& BEGIN ORB RATE

NORTHERN
MEXICO

:30

121

TEX

S065

MIL

:40 — SOUTHEAST
U.S.

VAN

:50

CYI

191:00

191:00 — S065 — AFRICA

PRE
TAN

:10

TERMINATE ORB RATE

:20

CRO

:30 — HSK — MCC UPDATE
S065

EAT
PERIOD

:40 — HTV

:50

HAW

RED — MNVR TO S065 ATT
& BEGIN ORB RATE

192:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	190:00 - 192:00	9/120-121	3-115

FLIGHT PLAN

192:00
GDS
TEX
122
MIL
:10
S065
SOUTHWEST
U.S.
BDA
VAN
:20
TERMINATE ORB RATE
ENABLE JET B3
:30
ACN
STOW S065
MAGAZINES & CAMERAS
:40
PRE
TAN
:50
CRO
193:00

193:00
CRO
MCC UPDATE
STATE VECTOR
:10
HTV
POWER DOWN S/C:
IMU, CMC (P06), AND SCS
:20
HAW
GO TO DRIFTING FLIGHT
:30
GDS
TEX
:40
123
MIL
:50
ANG
194:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	192:00 - 194:00	9/121-123	3-116

FLIGHT PLAN

194:00
ACN
:10
PRE
:20
TAN
:30
CRO
:40
GWM
:50
195:00

124

195:00
HAW
:10
GDS
TEX
:20
ANG
:30
:40
ACN
:50
PRE
TAN
196:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	194:00 - 196:00	9/123-124	3-117

FLIGHT PLAN

196:00

$\widetilde{TAN}$

:10

:20

GWM

EAT PERIOD

:30

:40

HAW

F/C O_2 PURGE

GDS

MCC UPDATE
BLOCK DATA 20

:50

TEX

125

197:00

197:00

:10

:20

PRE TAN

:30

:40

:50

CO_2 FILTER CHANGE NO. 17
19 TO A, 17 TO A6

SET COMM FOR REST PERIOD

198:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	196:00 - 198:00	9/124-125	3-118

FLIGHT PLAN

198:00
GWM
BEGIN REST PERIOD
2 IN COUCHES - 1 IN SLEEP STATION
:10
HAW
RED
:20
:30
REST
PERIOD
:40
:50
PRE
199:00

126

199:00
PRE
TAN
:10
:20
:30
REST
PERIOD
:40
:50
HAW
RED
200:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	198:00 - 200:00	9/125-126	3-119

FLIGHT PLAN

200:00
127
:10
:20
:30
PRE
:40
TAN
:50
201:00

REST PERIOD

201:00
:10
:20
HAW
RED
:30
:40
128
:50
202:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	200:00 - 202:00	9/126-128	3-120

FLIGHT PLAN

202:00		
	ACN	REST PERIOD
:10		
:20		
:30		
:40		
:50	GWM	
203:00		

129

203:00		
	MER	REST PERIOD
:10		
:20		
:30		
:40	ACN	
:50		
204:00		

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	202:00 - 204:00	9/128-129	3-121

FLIGHT PLAN

204:00
:10
:20 GWM
:30 HTV
MER
:40
:50
130
205:00

REST PERIOD

205:00
:10 ACN
:20
:30
:40
:50
GWM
206:00

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	204:00 - 206:00	9/129-130	3-122

FLIGHT PLAN

206:00 GWM

HTV

:10

MER

:20

:30

131

:40

:50

CYI

207:00

REST PERIOD

207:00 MAD

:10

:20

:30

:40 HSK

END REST PERIOD

MER

:50

DAY 10

208:00

BEGIN BATT A CHARGE

REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	206:00 - 208:00	9/130-131	3-123

FLIGHT PLAN

208:00

132

:10

ANG

:20

CYI

:30

MAD

:40

:50

209:00

EAT PERIOD

209:00

CRO

CHLORINATE POTABLE WATER

F/C O_2 PURGE

:10

HSK

:20

MER

:30

:40

133

:50

MIL

MCC UPDATE

BLOCK DATA 21

MCC-FLIGHT PLAN & CONSUMABLES UPDATE

210:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	208:00 - 210:00	10/132-133	3-124

FLIGHT PLAN

210:00
MAD
:10
:20
:30
:40 CRO
HSK
:50
MER
211:00

134

211:00
MER
POWER UP S/C:
IMU, CMC, AND SCS
:10
:20
TEX
MIL
MCC UPDATE
NOMINAL IMU ORIENT (FOR S065)
:30
BDA
CYI
:40
MAD
:50
CO_2 FILTER CHANGE NO. 18
20 TO B, 18 TO A6
212:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	210:00 - 212:00	10/133-134	3-125

FLIGHT PLAN

212:00

DAMP RATES

:10

CRO

:20

P51
IMU ORIENTATION

HSK

:30

MER

P52
IMU REALIGN
(NOMINAL)

:40

:50

135

GYM

TEX

MCC-GO/NO GO FOR 151-1 (EOM)

213:00

213:00

:10

CYI

UNSTOW & INSTALL
S065 CAMERAS &
MAGAZINES

:20

:30

TAN

:40

:50

CRO

MCC UPDATE
S065

214:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	212:00 - 214:00	10/134-135	3-126

FLIGHT PLAN

214:00

HTV

:10 V83, INITIALIZE ORDEAL

DISABLE RCS JET B3

HAW - RED

:20 MNVR TO S065 ATT & BEGIN ORB RATE

GDS

136 :30 NORTHERN MEXICO

TEX

MIL S065 EAT PERIOD

:40

VAN SOUTHERN U.S.

:50

CYI

215:00

215:00

PRE S065 SOUTHERN AFRICA

:10 TAN

TERMINATE ORB RATE

:20

CRO

MCC UPDATE S065

:30

HSK

:40

HTV

:50 HAW MNVR TO S065 ATT & BEGIN ORB RATE

RED

GDS

216:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	214:00 - 216:00	10/135-136	3-127

FLIGHT PLAN

216:00
137
TEX
MIL
:10
BDA
VAN
:20
:30
ACN
PRE
:40
TAN
:50
CRO
217:00

S065
SOUTHERN U.S.
TERMINATE ORB RATE
ENABLE JET B3
STOW S065 MAGAZINES & CAMERAS

217:00
CRO
:10
GWM
HTV
:20
HAW
:30
GDS
138
:40
TEX
MIL
:50
ANG
218:00

MCC UPDATE
STATE VECTOR

POWER DOWN S/C:
IMU, CMC (P06), AND SCS

GO TO DRIFTING FLIGHT

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	216:00 - 218:00	10/136-138	3-128

FLIGHT PLAN

218:00

ACN

:10

PRE

:20

TAN

:30

CRO

:40

F/C O_2 PURGE

GWM

:50

219:00

139

219:00

HAW

:10

GDS

TEX

:20

:30

:40

:50

PRE

TAN

220:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	218:00 - 220:00	10/138-139	3-129

FLIGHT PLAN

220:00

:10

:20 GWM

MCC UPDATE
BLOCK DATA 22

:30

EAT PERIOD

HAW

:40

GDS

GYM

140

:50

221:00

221:00

:10

:20

PRE

:30

TAN

:40

:50

222:00

CO_2 FILTER CHANGE NO. 19
1 TO A(RE-USE), 19 TO B5
SET COMM FOR REST PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	220:00 - 222:00	10/139-140	3-130

222:00

BEGIN REST PERIOD
2 IN COUCHES - 1 IN SLEEP STATION

:10

HAW

RED

:20

141

:30

REST
PERIOD

:40

:50

PRE

223:00

PRE

:10

TAN

:20

:30

REST
PERIOD

:40

HAW

:50

RED

224:00

FLIGHT PLAN

224:00
:10
:20
ACN
:30
PRE
:40
:50
225:00

REST PERIOD

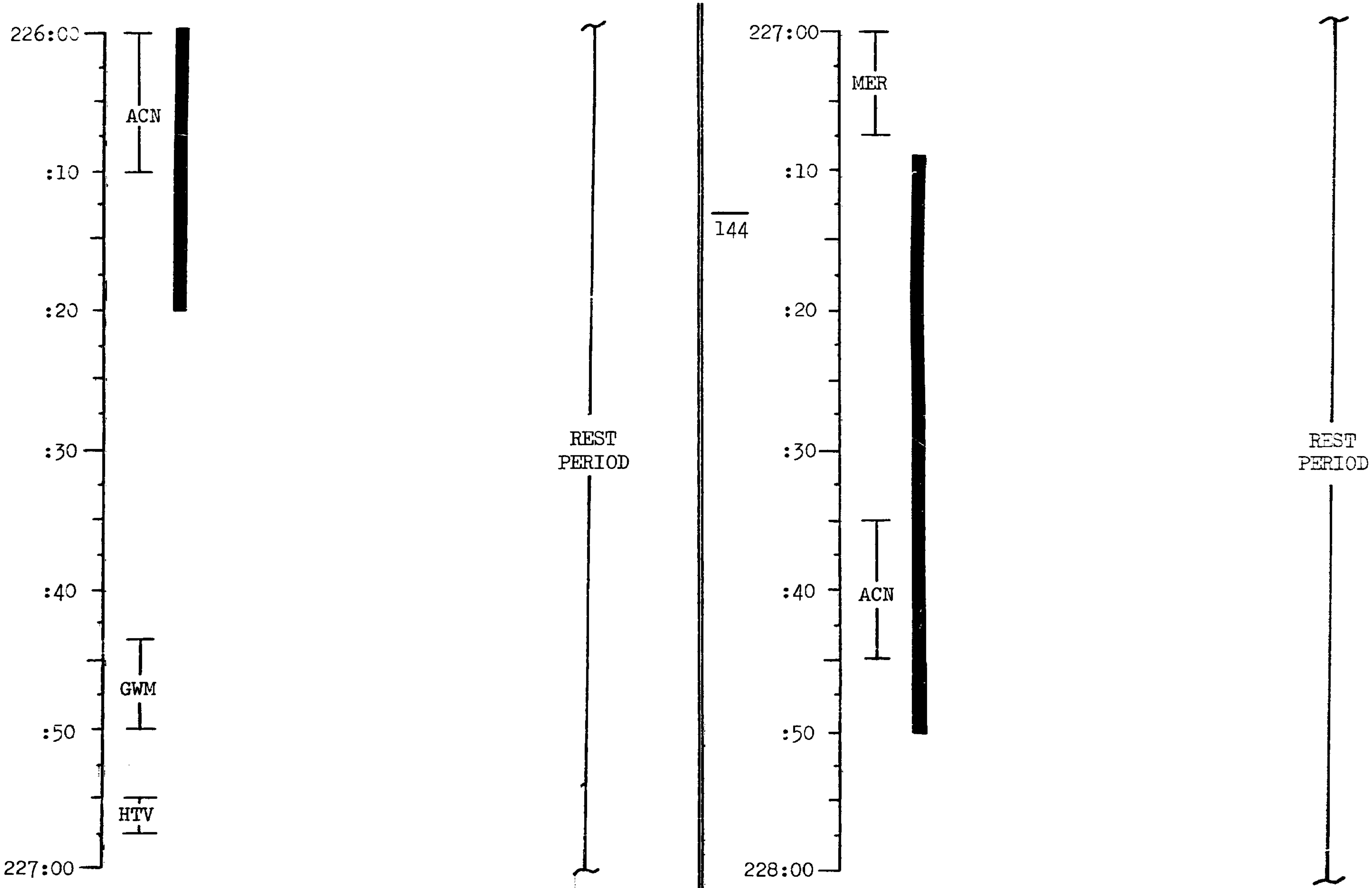
143

225:00
:10
:20
:30
:40
:50
226:00

REST PERIOD

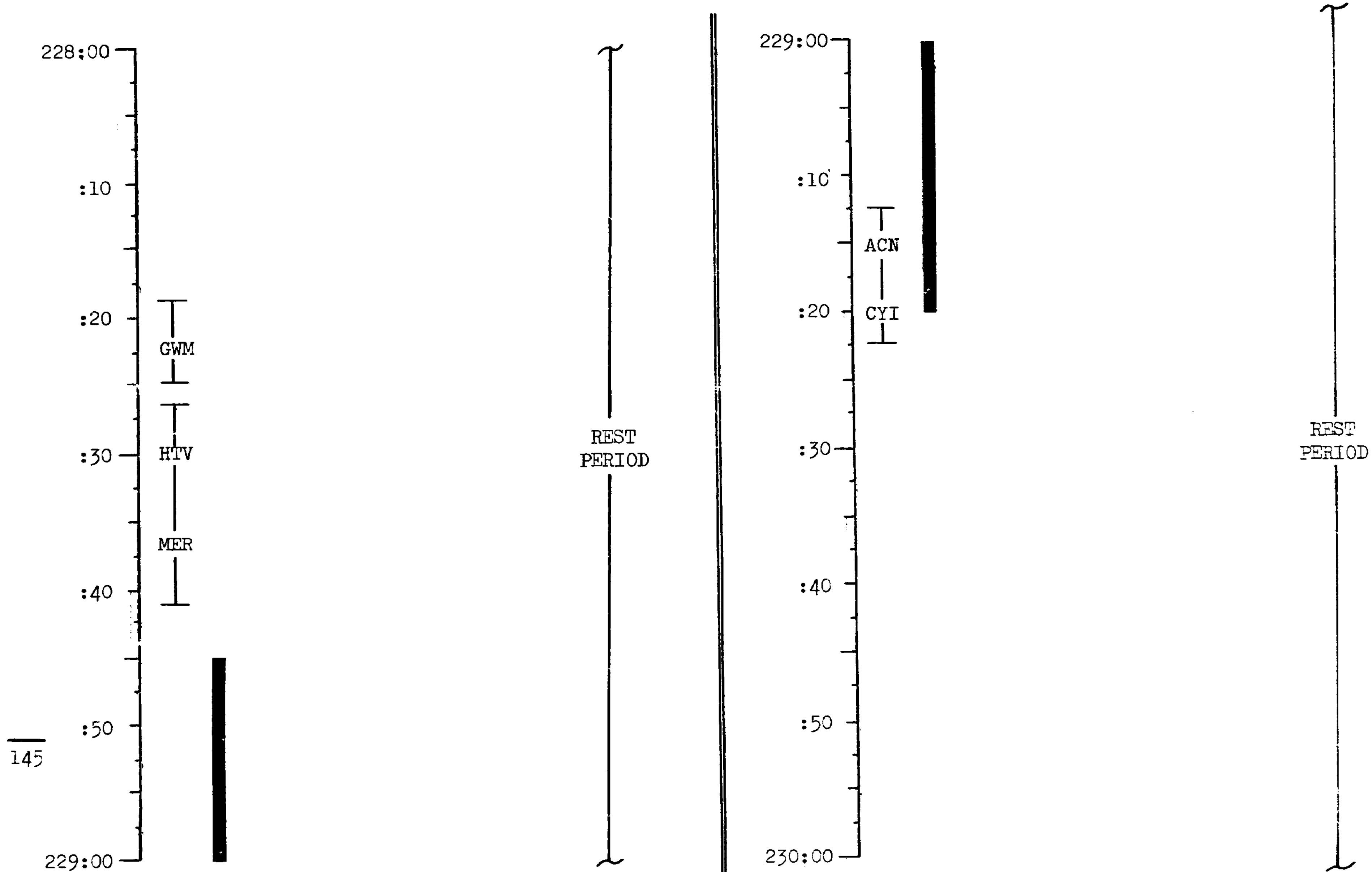
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	224:00 - 226:00	10/142-143	3-132

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	226:00 - 228:00	10/143-144	3-133

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	228:00 - 230:00	10/144-145	3-134

FLIGHT PLAN

230:00
HTV
:10
MER
:20
146
:30
REST PERIOD
:40
ANG
:50
CYI
MAD
231:00

231:00
:10
:20
:30
REST PERIOD
HSK
:40
MER
:50
232:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	230:00 - 232:00	10-11 145-146	3-135

FLIGHT PLAN

232:00

147

:10

:20

:30

:40

:50

233:00

ANG

CYI

MAD

DAY 11

MCC-FLIGHT PLAN & CONSUMABLES UPDATE

MCC UPDATE

BLOCK DATA 23

H_2 PURGE HTRS ON

INITIAL ENTRY PREPARATION AND STOWAGE

F/C O_2 & H_2 PURGE

POWER UP S/C:
IMU, CMC, AND SCS

233:00

:10

:20

:30

148

:40

:50

234:00

CRO

HSK

MER

MIL

GBM

SYSTEMS VERIFICATION AND TESTS

EAT PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	232:00 - 234:00	11/146-148	3-136

FLIGHT PLAN

234:00
BDA
CYI
MAD
CHLORINATE POTABLE WATER
:10
:20
:30
DAMP RATES
CRO
CMP MAN LEB
:40
HSK
P51
IMU ORIENTATION
:50
MER
235:00

149

235:00
MER
:10
GYM
MCC UPDATE
STATE VECTOR
TGT LOAD
DESIRED IMU ORIENT
MNVR PAD
ENTRY PAD
:20
MIL
BDA
:30
CYI
:40
SYSTEMS CHECKS
:50
236:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	234:00 - 236:00	11/148-149	3-137

FLIGHT PLAN

236:00

:10 — CRO — P52 IMU REALIGN (PREFERRED)

CO_2 FILTER CHANGE NO. 20
8 TO B (PRE-USE), 1 to A3
9 TO A (RE-USE), 1 TO A3

P52
IMU REALIGN
(PREFERRED)

:20 — HSK

EMS TEST

:30 — HAW — ENABLE PRIMARY GLYCOL EVAPORATOR

MER

:40 — RED

P30 EXTERNAL ΔV

:50 — GDS

TEX

MIL

FINAL ENTRY
PREPARATION

237:00

150

237:00

BDA

:10 — CYI — CYCLE O_2 & H_2 FANS

LOAD DAP
P40 SPS THRUST

:20

:30 — TAN

MNVR TO DEORBIT ATTITUDE
BEF, HEADS UP
PITCHED DOWN 31.7° BELOW HORIZON

:40

CRO

SXT STAR CHECK
LOGIC BUS ARM
MCC-GO/NO GO FOR PYRO ARM
MCC-GO NO GO FOR DEORBIT

:50

HSK

CMP EXIT LEB

238:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	236:00 - 238:00	11 [illegible]-151	3-138

FLIGHT PLAN

238:00

HTV

:10

SPS DEORBIT

TIG = 238:11:47
4/15 ULLAGE
BT = 9.6 SEC
ΔV = 235.5 fps
RETROGRADE

ORBIT 210 x 0

HAW

238:16:47 CM/SM SEP

RED

:20

MCC UPDATE
POSTBURN PAD

GDS

238:30:34 - 400K

151

:30

238:41:41 - CHUTES DEPLOYED

:40

:50

239:00

238:46:51 - SPLASHDOWN

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 9	FINAL	FEBRUARY 3, 1969	238:00 - 239:00	11/150-151	3-139

SECTION 4 - DETAILED TEST OBJECTIVE ACTIVITIES

SECTION 4

SECTION 4

DETAILED TEST OBJECTIVE ACTIVITIES

This section contains the activity summary sheets into which all the Detailed Test Objectives for Mission D have been incorporated. Revision 1, Change A of the Mission Requirements Document, D-Type Mission, LM Evaluation and Combined Operations is included. The activity summary sheets are presented in the same sequence as they will occur in the normal mission. Those mission activities which are repeated in the time-line are presented the first time they will occur only. DTO tasks and data requirements which are presently not scheduled in the flight plan are identified as "not implemented."

Each activity summary sheet contains the following data:

A. DTO Reference - identifies the detailed test objective(s) (all or part) that are included in the given activity.
B. Test Details - presents the special steps (other than standard procedures) which are required for performing the DTO. Constraints for performing the Activity are listed.
C. Procedural Reference - identifies existing documents which contain procedures for performing the DTO.
D. Data Requirements - lists the real time telemetry, developmental flight instrumentation and photography required to evaluate the DTO(s).
E. Crew Logging/Recording Requirements - identifies the test information to be supplied by the crewman either written or voice recorded/transmitted. This information is used to evaluate the DTO's.

A cross reference is shown on pages 4-2 through 4-12 and lists the DTO's in numerical order and by title. This index relates the following additional information.

- A subcategory breakdown of each DTO as was used in developing the Flight Plan.
- Association of the subcategory DTO to the activity that implements it.
- Identification of the activity summary sheet page number where the activity test data can be found.

The following ground rules will be used in implementing data requirements:

1. The collection of highly desirable (HD) data will not be allowed to constrain the timeline or crew procedures. It will be collected when doing so does not significantly constrain the timeline or crew procedures.
2. CSM data storage equipment (DSE) HBR recording will be done only when MSFN coverage is not available and when mandatory data is required.
3. Data collected by the crew that is required only for postflight analysis, will not be voiced to MSFN in real time.

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
P1.23	CSM Autopilot Stability Margin			
	o CSM Burn of 4 to 7 Second Duration	SPS Burn No. 1	4-19	
	o CSM Burn of 40 or More Second Duration	SPS Burn No. 2	4-21	
	o CSM Burn of 50 or More Second Duration	SPS Burn No. 3	4-22	
P1.24	CSM IMU Alignment Accuracy			
	o CSM IMU Alignments	Docked IMU Alignment	4-17	
	o Tracking Data for IMU Alignments	SPS Burn No. 2	4-21	
	o Tracking Data for IMU Alignments	SPS Burn No. 3	4-22	
	o CSM IMU Docked Alignment Check	Alignment Checks	4-18	
P1.25	IMU Orientation/Determination/Visibility	CSM Daylight Star Check	4-20	
S1.26	Orbital Navigation/Landmark Tracking	Orbital Navigation/Landmark Tracking	4-82	
P2.9	GNCS/MTVC Takeover	SPS Burn No. 3	4-22	
S7.29	Exhaust Effects/CSM			
	o LES Exhaust Impingement	Launch Monitoring	4-13	
	o RCS Exhaust Impingement	LM/CSM Ejection from SLA	4-15	
	o Retrieve CSM Samples and Photograph CSM Radiators	EVA	4-47	
	o Post Rendezvous Exhaust Impingement Photography	Post Rendezvous Inspection	4-71	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO	REMARKS
P11.5	LM IMU Inflight Alignment			
	o Data Collection for Determination of LM IMU Inflight Align Accuracy	Docked DPS Burn	4-42	
	o Data Collection for Determination of LM IMU Inflight Align Accuracy	Rendezvous Phasing Burn	4-60	
	o Data Collection for Determination of LM IMU Inflight Align Accuracy	Rendezvous Insertion Burn	4-64	
	o LM AOT Alignments	IMU Alignments	4-56	
	o LM Inflight IMU Align Accuracy	APS CDH Burn	4-68	
	o LM AOT Star Visibility Test	Daytime AOT Star Visibility Test	4-28	
	o LM AOT Star Occultation	Daytime AOT Star Occultation	4-29	
	o LM AOT Nighttime Star Observation - RR	LM AOT Nighttime Star Observation-RR	4-63	
	o LM AOT Nighttime Star Observation - S-Band Steerable	LM AOT Nighttime Star Observation-S-Band Steerable	4-62	
	o Obtain COAS Accuracy Data	LM COAS Calibration Check	4-57	
M11.6	LM PGNCS/DAP Performance & Thrust Performance			
	o DPS Burn Including Manual Throttling	Docked DPS Burn	4-42	
	o PGNCS Controlled Undocked DPS Burn with 10% throttle	Rendezvous Insertion Burn	4-64	
	o PGNCS Aligned Prior to First Undocked DPS Burn	Rendezvous Phasing Burn	4-60	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
P11.7	PGNCS Attitude/Translation Control			
	o PGNCS Attitude Control	LM PGNCS Attitude Control	4-73	
	o LM Manual Translation	LM PGNCS Manual Translation	4-69	
P11.10	PGNCS and GNCS IMU Performance			
	o GNCS IMU Performance	CSM PIPA Bias Test	4-16	
	o Data for LM IMU Performance	APS CDH Burn	4-68	
	o Data for IMU Performance	Launch Monitoring	4-13	
	o Data for IMU Performance	SPS Burn No. 1	4-19	
	o Data for IMU Performance	SPS Burn No. 2	4-21	
	o Data for IMU Performance	SPS Burn No. 3	4-22	
	o Data for CSM and LM IMU Performance	Docked DPS Burn	4-42	
	o PGNCS IMU Performance	LM PIPA Bias Test	4-38	
	o Data for LM IMU Performance	Rendezvous Phasing Burn	4-60	
	o Data for LM IMU Performance	Rendezvous Insertion Burn	4-64	
	o Data for LM IMU Performance	APS Burn to Depletion	4-77	
P11.14	PGNCS Controlled APS Burn	APS Burn to Depletion	4-77	
P12.2	AGS Inflight Calibration & Performance			
	o AGS Initialization	AGS Initialization	4-40	
	o Data for AGS Calibration and Performance	Docked DPS Burn	4-42	
	o AGS Gyro & Accelerometer Calibration	AGS Calibration	4-41	
	o Data for AGS Calibration	Rendezvous Phasing Burn	4-60	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
P12.3	AGS/CES Attitude/Translation Control			
	o AGS/CES Manual Translation	LM AGS Manual Translation	4-59	
	o AGS/CES Attitude Control	LM AGS Attitude Control	4-55	
P12.4	AGS ΔV Capability Using DPS	Rendezvous Phasing Burn	4-60	
S13.10	APS Burn to Depletion	APS Burn to Depletion	4-77	
M13.11	Long Duration APS Burn	APS Burn to Depletion	4-77	
M13.12	DPS Burn Duration Effects and Primary Propulsion/Vehicle Interactions			
	o DPS Burn of 200 seconds @ FTP	Docked DPS Burn	4-42	
	o Undocked DPS Burn at 10% Throttle	Rendezvous Insertion Burn	4-64	
	o Supercritical Helium Measurements	Crew Monitoring	4-83	
M14	LM ECS Performance			
	o LM ECS Activation	ECS Activation	4-26	
	o Sublimator Dryout	Sublimator Dryout	4-46	
	o Primary & Secondary Cartridge Removal	LiOH Cartridge Removal	4-50	
	o LM Depressurization, Repressurization, and PLSS Recharge	EVA	4-47	
	o ECS Event Times & Data Collection	Crew Monitoring	4-83	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
M15.3	LM EPS Performance Determination			
	o EPS Activation & Checkout	EPS Activation & Checkout	4-25	
	o EPS Preparation for DPS Burn	EPS Preparation for DPS Burn	4-58	
	o Prestaging Check	EPS Prestaging Check	4-67	
M16.4	Rendezvous Radar Tracking Performance			
	o Rendezvous Radar Self Test	Rendezvous Radar Self Test	4-51	
	o Rendezvous Radar Tracking Test	Rendezvous Radar Tracking Test	4-65	
	o Rendezvous Radar Tracking Performance during Burn	Rendezvous Phasing Burn	4-60	
P16.6	Landing Radar Self Test	Landing Radar Self Test	4-39	
M16.7	Landing Radar/Structure/Plume			
	o Operate Landing Radar in Position 1 During a DPS Burn	Docked DPS Burn	4-42	
	o Prerequisite to LR Spurious Test	Landing Radar Self Test	4-39	
	o Operate LR in Position 2	Rendezvous Phasing Burn	4-60	
P16.19	Rendezvous Radar/RCS Plume Impingement/ Corona Effects	RR Corona Test No. 1	4-72	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
M17.9	Landing Gear Deployment/Thermal			
	o Landing Gear Deployment	Landing Gear Deployment	4-33	
	o Landing Gear Temperature Data and Observed Exhaust Impingement	Docked DPS Burn	4-42	
	o Landing Gear Temperature Data On T/M	Rendezvous Insertion Burn	4-64	
	o Landing Gear Temperature Data On T/M	Rendezvous Phasing Burn	4-60	
	o Landing Gear Photography	LM/CSM Undocking & Inspection	4-52	
M17.17	LM Environmental and Propulsion Thermal Effects			
	o Long Duration APS Burn	APS Burn to Depletion	4-77	
	o Three Seconds of LM RCS Ullage Burn and a Long DPS Burn at FTP	Docked DPS Burn	4-42	
	o Retrieve Samples from the Exterior of the LM and Take Photographs	EVA	4-47	
	o Post Rendezvous Exhaust Inspection	Post Rendezvous Inspection	4-71	
M17.18	LM Structural Integrity			
	o LM Structural Integrity During Saturn V Launch	Launch Monitoring	4-13	
	o LM Structural Integrity During APS Burn	APS Burn to Depletion	4-77	
	o LM Structural Integrity During DPS Burn	Docked DPS Burn	4-42	
	o LM Dynamic Response During DPS Burn	Rendezvous Phasing Burn	4-60	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
M17.18 (Cont)	o LM Dynamic Response During DPS Burn	Rendezvous Insertion Burn	4-64	
	o DFI and Tracking Data for APS Burn	APS CDH Burn	4-68	
	o T & D Photography	CSM Transposition and Docking	4-14	
	o Undocking Photography	LM/CSM Undocking and Inspection	4-52	
	o Post Rendezvous Photography	Post Rendezvous Inspection	4-71	
P20.21	LM/MSFN S-Band Communication Performance			
	o Signal Combination Mode 2	Communications Tests-LM Activation	4-31	
	o Signal Combination Mode 4	Communications Tests-LM Activation	4-31	
	o Signal Combination Mode 6	Communications Tests-LM Activation	4-31	
	o Signal Combination Mode 7	PLSS Communication Checks	4-36	
	o Signal Combination Mode 8	PLSS Communication Checks	4-36	
	o Signal Combination Mode 10	PLSS Communication Checks	4-36	
	o LM Steerable Antenna Test	LM Steerable Antenna Test	4-30	
P20.22	LM/CSM/MSFN S-Band/VHF Compatibility			
	o Voice: EMU $\xrightarrow{\text{VHF}}$ LM	EVA Communications Test	4-49	
	o Voice: EMU $\xrightarrow{\text{VHF}}$ CSM	EVA Communications Test	4-49	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
P20.22 (Cont)	o Voice & EMU Biomed: VHF Relay S-Bd EMU ⟶ LM ⟶ MSFN & Return	PLSS Communication Checks	4-35	
	o Voice & EMU Biomed: VHF Relay S-Bd EVA ⟶ CSM ⟶ MSFN	EVA Communication Test	4-49	
	o Voice & T/M: CSM $\xrightarrow{\text{S-Bd}}$ MSFN & Voice Return	Rendezvous Communications Tests	4-66	
	o Voice & T/M: LM $\xrightarrow{\text{S-Bd}}$ MSFN & Voice Return	Rendezvous Communications Tests	4-66	
	o LBR Data LM $\xrightarrow{\text{VHF}}$ CSM $\xrightarrow{\text{S-Bd DUMP}}$ MSFN & LM $\xrightarrow{\text{S-Bd}}$ MSFN	Communications Tests - LM Activation	4-31	
	o Voice: S-Bd Relay S-Bd LM ⟶ MSFN ⟶ CSM & Return	Relay Tests	4-34	
	o Voice: VHF Relay S-Bd LM ⟶ CSM ⟶ MSFN & Return	Relay Test	4-34	
	o Voice: VHF Relay S-Bd CSM ⟶ LM ⟶ MSFN & Return	Relay Test	4-34	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
P20.22 (Cont)	o S-Band LBR for CSM DSE Recording and Playback	Communication Test - LM Activation	4-31	
M20.24	CSM Active Docking	CSM Transposition & Docking	4-14	
P20.25	LM Ejection from SLA			
	o LM Ejection from SLA	LM/CSM Ejection from SLA	4-15	
	o Still Photography of LM Exterior	LM/CSM Undocking & Inspection	4-52	
	o Still Photography of LM Exterior	EVA	4-47	
P20.26	LM-CSM Undocking	LM/CSM Undocking & Inspection	4-52	
P20.27	LM Evaluation Rendezvous	Rendezvous Data	4-70	
P20.28	LM Active Docking	LM Active Docking	4-75	
P20.29	LM Jettison	LM Jettison	4-76	
P20.31	Support Facilities Performance	Crew Monitoring	4-83	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION p NO.	REMARKS
S20.32	Crew Activities Evaluation CSM/LM			
	o Crew Activities & Evaluation (CSM-LM)	Crew Monitoring	4-84	
	o LM and CM Acoustical Environment During DPS Burn	Docked DPS Burn	4-42	
	o LM Accustics During DPS Burn	Rendezvous Insertion Burn	4-64	
	o LM Acoustics During DPS Burn	Rendezvous Phasing Burn	4-60	
	o Pressurized PGA in a Depressurized Cabin	EVA	4-47	
	o Subjective Comments on CM Acoustical Environment During Launch	Launch Monitoring	4-13	
	o Tunnel Clearing	Tunnel Clearing - Three Crewmen in CM	4-24	
	o Comments & Photography on Unfolding Couch	Crew Monitoring	4-84	
	o Comments & Photography on Folding CM Couch	Crew Monitoring	4-84	
	o Tunnel Clearing	Tunnel Clearing - Two Crewmen in LM	4-45	
	o Comments, Photography on Positioning within CM Couch Prior to Docking	CSM Transposition & Docking	4-14	
	o LM Crew Rendezvous Evaluation	Rendezvous Data	4-70	
	o Acoustical Environment During APS Burn	APS CDH Burn	4-68	

CSM 104/LM3
MISSION FLIGHT PLAN DTO
CROSS REFERENCE TABLE

DTO NO.	DTO TITLE AND SUBCATEGORY	MISSION ACTIVITY TITLE	SECTION NO.	REMARKS
P20.33	CSM Single Crewman Rendezvous Capability	Rendezvous Data	4-70	
P20.34	Intravehicular Crew Transfer			
	o Crew Transfer to LM	Tunnel Clearing - Three Crewmen in CM	4-45	
	o Installation of Tunnel Hardware	Tunnel Hardware Installation	4-27	
	o Crew Transfer to CM	Tunnel Clearing - Two Crewmen in LM	4-24	
M20.35	Extravehicular Activity	EVA	4-47	
S20.37	DPS Plume Effect			
	o Observe and Photograph DPS Plume	Docked DPS Burn	4-42	
	o Observe the DPS Plume	Rendezvous Insertion Burn	4-64	
S20.121	CSM/LM Electromagnetic Compatibility	Crew Monitoring	4-83	
Experiment	S065 Photography	S065 Photography	4-78	

LAUNCH MONITORING

A. DTO Reference

1. S7.29 - LES Exhaust Impingement
2. P11.10 - Data for IMU Performance
3. M17.18 - LM Structural Integrity During Saturn V Launch
4. S20.32 - Subjective Comments on CM Acoustical Environment During Launch

B. Test Details

There are no special test procedures.

C. Procedural Reference

NONE

D. Data Requirements

1. CSM HBR (M)
2. LM DFI (for five minutes) (M). [M17.18]
3. MSFN tracking (trajectory data) from liftoff through earth orbit insertion (M) [P11.10] (M17.18]
4. MSFN data as follows: (M) [M17.18]
   a. S-V acceleration
   b. S-1C thrust variations
   c. Wind data
   d. Dynamic pressure & angle of attack

E. Crew Logging/Recording Requirements

1. Subjective comments on CM acoustical enviroment (M) [S20.32]
2. Narrative describing vehicle dynamic response during the S-1C operation (M) [M17.18]
3. Comments on the observable effects of LES engine exhaust impingement on CM windows (M) [S7.29]

CSM TRANSPOSITION AND DOCKING (GET 02: 47 : 00)

A. DTO Reference

1. M17.18 - T&D Photography
2. M20.24 - CSM Active Docking
3. S20.32 - Comments, Photography on Positioning Within CM Couch Prior to Docking

B. Test Details

1. Perform docking in sunlight with the LM/S-IVB. [M20.24]
2. Take pictures of SLA/LM, LM upper outrigger strut, and relative motion with 16mm sequence camera from CM right window (from transposition to probe/drogue latching). [M20.24] [M17.18]
3. Take pictures of crewman positioning in couch prior to docking. [S20.32] (NOT IMPLEMENTED)

C. Procedural Reference

CSM/SLA Separation Through Captive Latch, Section 4.5.1.1
Docking with LM/S-IVB, Section 4.5.1.3
AOH SM2A-03-SC104 - (2)

D. Data Requirements

1. CSM HBR data (M) [M20.24]
2. MSFN coverage for S-IVB data (M) [M20.24]
   Note - All data are required from just prior to contact thru final latching.
3. Couch photography (HD) [S20.32]
4. T&D Photography
   - o Relative Motion (M) [M20.24]
   - o Probe and Drogue area, and upper outrigger strut (HD) [M17.18]

E. Crew Logging/Recording Requirements

1. GET when active docking was initiated (after transposition and after docking attitude is achieved) (M) [M20.24]
2. CSM handling characteristics during docking (M) [M20.24]
3. Adequacy of visual docking cues on the LM (M) [M20.24]
4. GET when docking complete (including connection of electrical umbilicals and hatch closing) (M) [M20.24]
5. Condition of relative rotational alignment between LM & CSM during docking (M) [M20.24]
6. Comment on crew capability to obtain the required couch position for docking (M) [S20.32]

LM/CSM EJECTION FROM SLA (GET 04 : 07 : 00)

A. DTO Reference

1. S7.29 - RCS Exhaust Impingement
2. P20.25 - LM Ejection From SLA

B. Test Details

1. LM/CSM is ejected from the SLA. [P20.25]
2. 16 mm photography is taken from CSM right hand rendezvous window to record the ejection maneuver [P20.25]

C. Procedure Reference

LM Withdrawal from the SLA, Section 4.5.1.4,
AOH SM2A-03-SC104 - (2)

D. Data Requirements

1. CSM HBR Data (M) [P20.25]
2. MSFN coverage for S-IVB data (M) [P20.25]
3. Photographic coverage from initiation of ejection through clearance from SLA (M) [P20.25]

E. Crew Logging/Recording Requirements

1. Dynamic characteristics of CSM/LM during ejection (M) [P20.25]
2. Stability characteristics and adequacy of attitude control of S-IVB/SLA prior to, during, and after ejection (M) [P20.25]
3. Adequacy of visibility from sunlight and CSM docking lights (HD) [P20.25]
4. Comments as to observable effects of exhaust from SM RCS engines (M) [S7.29]

CSM PIPA BIAS TEST

A. DTO Reference

P11.10 - GNCS IMU Performance

B. Test Details

1. CMC is powered up during test
2. Allow PIPA counts for 5 minutes during test (to telemetry)
3. Spacecraft in free drift
4. Astronaut motions minimal
5. The test is conducted at the following times:
   a. Following LM extraction from S-IVB/SLA
   b. Prior to first GNCS shutdown
   c. Following as many GNCS power ups as possible
   d. Prior to entry

C. Procedural Reference

Conducted by MSFN.

D. Data Requirements

1. CSM LBR data (M)
2. MSFN Coverage for S-IVB data (M)

E. Crew Logging/Recording Requirements

NONE

NOTE: PIPA BIAS Performed By MSFN Over Station

DOCKED IMU ALIGNMENT

A. DTO Reference

P1.24 - CSM IMU Alignments

B. Test Details

Perform as many alignments as practical while docked. There are no special test procedures.

C. Procedural Reference

IMU Realign (P52), Section 4.11.2, AOH SM2A-03-SC104-(2)

D. Data Requirements

CSM LBR (required at time star markings are performed) (M)

E. Crew Logging/Recording Requirements

1. Attitude control mode (M)
2. Star identification:
   1st (M)
   2nd (M)
3. Star angle difference (M)
4. Gyro torquing angles (M)
5. Comments on adequacy of controls, displays, visibility, etc. (M)

ALIGNMENT CHECKS

A. DTO Reference

P1.24 - CSM IMU Docked Alignment Checks

B. Test Details

1. At least three alignment checks will be performed following each of two alignments. (Alignments may be either P51 or P 52 (GET 05 : 20 : 00 , 21 : 30 : 00)
2. The checks shall consist of re-running the alignment program (P52) with deviation as follows:

   a. Perform a Program 52 to star selection routine (DSKY flashes requesting star acquisition).
   b. Bypass star selection routine and maneuver to select a new star. When DSKY flashes V01N70, Key V21E and load desired star code. Record star code.
   c. Monitor DSKY for inserted star code.
   d. Select automatic optics positioning and continue program with step 12 in procedures.
   e. In Step 13 of procedures, repeat (b) through (d) above for 2nd star, and select automatic optics positioning. Continue program with Step 17 in AOH P52 procedures.
   f. Complete Step 18 by reading gyro torquing angles. Do not torque the IMU. Key V32E and re-enter P52.
   g. Repeat steps (b) through (f) above for a second test.
   h. Repeat steps (b) through (f) above for a third test.
3. This test may be accomplished in daylight or at night.
4. Two different star pairs are desired for each alignment check.

C. Procedural Reference

IMU Realign (P52), Section 4.11.2
AOH SM2A-03-SC104 - (2)

D. Data Requirements

CSM LBR data (required during star markings) (M)

E. Crew Logging/Recording Requirements

1. Attitude control mode (M)
2. Star identification:
   1st (M)
   2nd (M)
3. Star angle difference (M)
4. Gyro torquing angles (M)
5. Comments on adequacy of controls, displays, visibility, etc. (M)

SPS BURN NO.1 (GET 06 : 01 : 40)

A. DTO Reference

1. P1.23 - CSM Burn of 4 to 7 Seconds Duration
2. P11.10 - Data for IMU Performance

B. Test Details [P1.23]

1. Perform normal GNCS SPS burn procedures
2. Burn Parameters
   Ullage: 0 sec
   SPS Burn Duration: 5 sec
   ΔV: 36.8 fps
   Guidance: G&N - EXT ΔV

C. Procedure Reference

G&N/SPS Orbit Change Thrusting (P40), Section 4.14.2
AOH SM2A-03-SC104 - (2)

D. Data Requirements

1. CSM HBR (M) [P1.23]
2. MSFN tracking data required prior to and after burn (M) (Tracking will occur as a normal mission function whenever a ground station is available.) [P1.23] [P11.10]

E. Crew Logging/Recording Requirements (HD) [P1.23]

Comments on vehicle vibrations

CSM DAYLIGHT STAR CHECK (GET 06: 30: 00)

A. DTO Reference

P1.25 - IMU Orientation Determination/Visibility

B. Test Details

1. IMU (P52) Alignment Precedes Test
2. Maneuver to attitude supplied by MSFN:

   The spacecraft will be oriented to an inertial attitude with the LM nearest the earth and the X-axis making an angle of 30° with the line of sight to the sun with the CSM tilted toward the sun. The spacecraft should then be rolled clockwise 40° (as viewed from inside the command module) away from the heads down attitude about the X-axis. This will give a 40° angle between the optics line of sight and the plane determined by the spacecraft X-axis and the line of sight to the sun. The optics shaft angle should be 180 and the trunnion angle should be 12° (i.e., away from the LM). This position will provide maximum shading of the LM S-band antennan and thus minimize reflected light from the antenna.
3. Power up optics
4. Observations begin (no recordings) 15 minutes prior to sunrise using SCT.
5. Identify dimmest star in the SCT at spacecraft sunrise - Record
6. Identify dimmest star in the SCT 5 min after sunrise - Record
7. Identify dimmest star in the SCT 10 min after sunrise - Record

C. Procedural Reference

Optics Power Control, Section 4.10.1.4
AOH SM2A-03-SC104 - (2)

D. MSFN Data Requirements

1. CSM LBR data (M)
2. MSFN best estimate of trajectory during star observations (M)

E. Crew Logging/Recording Requirements

1. Sunrise:
   a. Identify dimmest star (M)
   b. Visibility, earth cloud cover (HD)
   c. Comments on reflected light from LM and vented particles (HD)
2. Sunrise plus 5 minutes:
   a. Identify dimmest star (M)
   b. Visibility, earth cloud cover (HD)
   c. Comments on reflected light from LM and vented particles (HD)
3. Sunrise plus 10 minutes:
   a. Identify dimmest star (M)
   b. Visibility, earth cloud cover (HD)
   c. Comments on reflected light from LM and vented particles (HD)

SPS BURN NO. 2 (GET 22 : 12 : 00)

A. DTO Reference

1. P1.23 - CSM Burn of 40 or More Seconds Duration
2. P1.24 - Tracking Data for IMU Alignments
3. P11.10 - Data for IMU Performance

B. Test Details

1. Check ESTROKER, Key V06N02E, then key 03012E. (R100002) indicates 40% stroking for Colossus 237).
2. Initiate P40 Thrusting Program.
3. Source for angles displayed on FDAI to be CMC. [P1.23]
4. Select FDAI rate scale of 5/1 [P1.23]
5. FDAI select 1/2
6. Perform normal GNCS SPS burn procedures.
7. At 60 seconds after ignition Key V68E (initiates stroker program). Stroker test begins immediately after V68E. Test automatically terminates after 7.3 seconds or sooner if restart occurs.
8. If maximum value of FDAI rate indicator exceeds 0.8 degrees/second (peak to peak), then full amplitude test will not be performed on Burn No. 3. [P1.23]
9. Burn Parameters:
   Ullage: 0 sec
   SPS Burn Duration: 111.1 sec
   ΔV: 850.1 fps
   Guidance: G&N - Ext ΔV

C. Procedural Reference

G&N/SPS Orbit Change Thrusting (P40), Section 4.14.2, AOH, SM2A-03-SC104-(2)

D. Data Requirements

1. CSM HBR (M) [P1.23]
2. MSFN best estimate of trajectory required a minimum of 60 seconds prior to and 60 seconds after burn (HD) [P1.24];(M) [P11.10]

E. Crew Logging/Recording Requirements

Comments on vehicle vibrations (HD) [P1.23]

SPS BURN NO. 3 (GET 25 : 18 : 30)

A. DTO Reference

1. P1.23 - CSM Burn of 50 or More Seconds Duration
2. P1.24 - Tracking Data for IMU Alignments
3. P2.9 - GNCS/MTVC Takeover
4. P11.10 - Data for IMU Performance

B. Test Details

1. Perform normal G&N Prethrusting (P30) [P2.9]
2. If maximum value of FDAI rate indicator exceeds 0.8 degree/second (peak to peak) on Burn No. 2, then full amplitude test will not be performed. [P1.23]
3. Prior to starting the P40 SPS Thrusting Program the ESTROKER load parameter for amplitude is changed as follows: [P1.23]
   .Key V21N01E
   .Key 03012E (address)
   .Key 00005E (for full amplitude on Colossus 237)
4. To check existing load, key V06 N02 E, then key address.
5. Source for angles displayed on FDAI to be CMC [P1.23]
6. Select FDAI rate scale of 5/1. [P1.23]
7. Verify Pitch and Yaw SCS TVC is in Rate Command [P2.9]
8. Perform normal G&N SPS burn procedures. [P1.23]
9. At 60 sec after SPS ignition, key V68E (initiates stroker program - full amplitude).
10. Test automatically terminates after 7.3 seconds or sooner if restart occurs
11. Observe from FDAI and GPI that steady state burn conditions have been achieved prior to MTVC [P2.9]
12. At ≈234 sec after SPS ignition (shutdown minus 45 sec) initiate MTCV takeover (TC clockwise)
13. Engine shutdown will be by EMS ΔV counter [P2.9]
14. Burn Parameters
    Ullage: 0
    SPS Burn Duration: 279.4 sec
    ΔV 2549.1 fps
    Guidance: G&N - Ext ΔV

C. Procedure Reference
G&N SPS Orbit Change Thrusting (P40), Section 4.14.2
AOH SM2A-03-SC104 - (2)

D. Data Requirements

1. CSM HBR (M). [P1.23]
2. MSFN best estimate of trajectory required for a minimum of 60 seconds prior to and 60 seconds after burn (HD) [P1.24]; (M) for [P11.10]

E. Crew Logging/Recording Requirements

1. Comments on vehicle vibrations (HD) [P1.23]
2. Comments on handling characteristics during MTVC (M) [P2.6]
3. Visual cues used by crewman for altitude control during MTVC (M) [P2.6]

TUNNEL CLEARING - THREE CREWMEN IN CM (GET 41 : 55 : 00)

A. DTO Reference

1. S20.32 - Tunnel Clearing
2. P20.34 - Crew Transfer to LM

B. Test Details

1. Crew fully suited with PGAs unpressurized [P20.34]
2. Tunnel will be pressurized. [P20.34]
3. CM/LM hard docked [P20.34]
4. Three crewmen initially in CM [P20.34]
5. Photography of tunnel clearing activity will be made [S20.32]

C. Procedural Reference

1. Docking Probe Removal (CM Side) Section 4.5.4.1
   Docking Drogue Removal (CM Side) Section 4.5.4.4
   AOH SM2A-03-SC104 - (2)
2. Intravehicular Transfer, Sections 4.14.1 through 4.14.4
   AOH LMA 790-3-LM3

D. Data Requirements

Photography of tunnel clearing and hardware stowage from CM (HD) [S20.32]

E. Crew Logging/Recording Requirements

1. Time required for three crewmen to remove and stow tunnel components (Timing starts with the removal of the CSM forward pressure hatch.) (M) [P20.34]
2. Time required for the LMP to IVT to the LM from ingress to the CM tunnel to starting the entry status check (M) [P20.34]
3. Comments on tunnel clearing (M) [P20.34] [S20.32]
4. Comments on design of tunnel components (M) [P20.32]
5. Comments on a crewman IVT to LM (M) [P20.34]
6. Comments on attaching crew restraint system in the LM (M) [S20.32]

EPS ACTIVATION AND CHECKOUT (GET 42 : 35 : 00)

A. DTO Reference

M15.3 - EPS Activation and Checkout

B. Test Details

Crewman activation of the LM EPS will include the following:
1. Transfer LM electrical loads from CSM to LM.
2. Switch descent batteries from low taps to high taps.
3. Operate backup inverter.

C. Procedural Reference

EPS Activation and Checkout, Section 4.2.2, AOH LMA 790-3-LM3

D. Data Requirements

1. LM HBR (as permitted by MSFN acquisition)(M)

2. Battery temperature data (via DFI) will be collected over stations requiring DFI for other functions.

E. Crew Logging/Recording Requirements

None

ECS ACTIVATION (GET 42 : 50 : 00)

A. DTO Reference

M14 - LM ECS Activation

B. Test Details

No special test details

C. Procedural Reference

ECS Activation and Checkout, Section 4.2.12, AOH LMA 790-3-LM3

D. Data Requirements

1. LM HBR (HD)
2. LM LBR (M)
3. LM DFI (M)

Note: All telemetry data is required for 5 minutes including the end of ECS activation.

E. Crew Logging/Recording Requirements

None

TUNNEL HARDWARE INSTALLATION (GET 43: 15 : 00)

A. DTO Reference

P20.34 - Installation of Tunnel Hardware

B. Test Details

1. Crew fully suited with PGAs unpressurized [P20.34]
2. Tunnel will be pressurized. [P20.34]
3. CM/LM hard docked [P20.34]
4. Two crewmen in LM and one crewman in CM [P20.34]

C. Procedural Reference

1. Close Overhead Hatch (LM Side), Section 4.14.9, Install Drogue (LM Side), Section 4.14.11, AOH LMA 790-3-LM3
2. Docking Probe Installation (CM Side), Section 4.5.4.3, AOH SM2A-03-SC104-(2)

D. Data Requirements

None

E. Crew Logging/Recording Requirements

Time required to re-install tunnel components working from both the CM and the LM. (Timing starts with the acquisition of the first piece of hardware for installation.) (M) [P20.34]

DAYTIME AOT STAR VISIBILITY TEST (GET 43 : 55 : 00)

A. DTO Reference

P11.5 - LM AOT Star Visibility Test

B. Test Details

1. Perform at a normal missiton timeline attitude.
2. LM is undocked. (not implemented)
3. Window shades are installed.
4. Approximately 10 minutes of dark adaptation will precede test.
5. Place a nav star in the center of the field of view of the AOT
6. Identify dimmest star in the visible pattern around the nav star.

C. Procedural Reference

None

D. Data Requirements

MSFN best estimate of trajectory (M)

E. Crew Logging /Recording Requirements

1. AOT detent position (M)
2. GET at which dimmest star is observed (M)
3. IMU gimbal angles as read from the DSKY each time dimmest star is identified in a visibility test (M)

4. Identify dimmest star during count (M)

DAYTIME AOT STAR OCCULTATION
(not implemented)

A. DTO Reference

P11.5 - LM AOT Star Occultation

B. Test Details

1. Performed when sun is approaching AOT line of sight.
2. Identifiable stars are visible in the AOT.
3. Observe star field in AOT and record GET and gimbal angles when star washout occurs.

C. Procedural Reference

None

D. Data Requirements

MSFN Best estimate of trajectory (M)

E. Crew Logging/Recording Requirements

1. GET of star washout (M)
2. Gimbal angles at star washout (M)
3. AOT detent position (M)

LM STEERABLE ANTENNA TEST (GET 44:03:00)

A. DTO reference

P20 21 - LM Steerable Antenna Test

B. Test Details

1. Perform S-Band Steerable Antenna Check AOH procedure through step 6. Record GET of initial lock-on.
2. Manually adjust antenna for maximum signal strength. Record GET, signal strength, and antenna pitch and yaw angles.
3. Deliberately slew antenna in pitch and yaw such that a noticeable decrease in signal strength is detected. Record GET and signal strength. (Not implemented)
4. Continue with procedure step 7. Record GET of switch to Auto, record antenna pitch and yaw, and signal strength. (Not implemented)
5. Monitor for 1 minute and record pitch and yaw and signal strength.
6. LM tracking of MSFN station will use signal combination Mode 2.

C. Procedural Requirements

S-Band Steerable Antenna Check, Section 4.13.2.8
AOH LMA790-3-LM3

D. Data Requirements

1. LM HBR (M)
2. MSFN S-Band tracking data processor output (M)
3. MSFN recording of LM to MSFN voice (M)
4. MSFN records of acquisition times (HD)
5. MSFN recording of telemetry bit stream (M)
6. MSFN to use uplink modes 4, 5 and 6 during test (M)

E. Crew Logging/Recording Requirements

1. Comments on quality of MSFN voice (if not recorded on LM tape recorder) (M)
2. Crewman logs/records data as indicated under steps 1, 2, 3, 4 and 5 of Test Details (M)

Note: This test is secondary and is to be performed on a non-interference basis only.

COMMUNICATIONS TESTS - LM ACTIVATION

A. DTO Reference

P20.21 - Signal Combination Modes 2, 4, 6
P20.22 - S-Band LBR for CSM DSE Recording and Playback

B. Test Conditions

These tests will be demonstrated by normal communications procedures during LM manned activity periods with the constraint that each be performed at least once. Tests are listed in the order of desired priority as follows:

1. Signal Combination Mode 2 (LM Communications Basic) [P20.21] (GET 44 : 51 : 00)
   a. This mode will consist of primary and secondary S-band with PRN ranging, Voice, H.L. biomed, high-bit-rate PCM modulation, and primary S-band power amplifier.
   b. Five minutes of total data and two minutes of continuous data are required with the primary S-band transceiver.
   c. Two minutes of total data and one minute of continous data are required with the secondary S-band receiver.
2. LM LBR Transmission [P20.22] GET - See Note
   a. Test will be performed during rendezvous with a passive CSM. (not implemented)
   b. LM will transmit LBR PCM telemetry to the CSM for DSE recording and subsequent playback to MSFN via S-band.

   Note: This mode is implemented by normal LM/CSM communications during periods of MSFN LOS (recording) and AOS (playback) throughout the LM Systems Activation and EVA days.
3. Signal Combination Mode 4 (S-Band Backup Voice) [P20.21] (GET 44:12:00)
   a. This mode will consist of primary and secondary S-band with backup voice, LBR PCM telemetry, and low S-band amplifier power.
   b. Five minutes of total data and two minutes of continous data are required with the primary S-band transceiver. (not implemented)
   c. Two minutes of total data and one minute of continuous data are required with the secondary S-band transceiver. (not implemented)
4. Signal Combination Mode 6 (S-Band Key Check) [P20.21] (GET 44 : 12 : 00)
   a. This mode will consist of S-band carrier with keying modulation and low S-band amplifier power.
   b. Two minutes of total data are required. (not implemented)

   Note: This check must be performed over MIL or MSFN stations with 85' S-Band dish antennas.

C. Procedural Reference

"Subsystem Activation," Section 4.2 (4.2.14, 26, 27)
AOH LMA 790-3-LM3

D. Data Requirements

1. PCM HBR (M) [Test B.1.-P20.21]
2. MSFN recording of LM to MSFN Voice (M) [Test B.1.-P20.21]
3. PCM LBR (M) [Test B.2.-P20.21]
4. LM to CSM Voice and MSFN recording of CSM DSE playback (M) [Test B.2.-P20.22]
5. MSFN recording of keying communication (M) [Test B.4.-P20.21]
6. MSFN records of acquisition times (M) [P20.21]
7. Unified S-Band tracking data processor output (M) [P20.21]

E. Crew Logging/Recording Requirements

Astronaut comments on quality of MSFN Voice (M) [P20.21]

LANDING GEAR DEPLOYMENT (GET 45:00 :00)

A. DTO Reference

M17.9 - Landing Gear Deployment

B. Test Details

Landing gear deployed during daylight prior to the first DPS burn.

C. Procedural Reference

Landing Gear Deploy, Section 4.2.36, AOH LMA 790-3-LM3

D. Data Requirements

1. LM HBR (M)
2. LM DFI (HD)

E. Crew Logging/Recording Requirements

1. Landing gear deployment initiation time (GET $\pm$1.0 sec) (M)
2. Comments on landing gear deployment and downlock shock (M)

RELAY TESTS

A. DTO Reference

P20.22 - Communications Using LM, CSM and MSFN Relay Functions*

B. Test Details

1. Tests will be performed during rendezvous (not implemented).
2. CSM and LM communications configuration at the beginning of the tests are described on page 5-2 of the Communications Plan.
3. CSM Relay Details: (GET 45: 40: 00)

   $\text{LM} \xrightarrow{\text{VHF}} \overset{\text{Relay}}{\text{CSM}} \xrightarrow{\text{S-Bd}} \text{MSFN}$

   a. CMPs backup audio control is selected.
   b. The CMP will be on the CDR's umbilical.
   c. CMPs S-Band volume control is increased.
   d. CMPs relay is enabled.
   e. LM S-Band voice is disabled.
   f. MSFN transmits/receives voice via S-Band only.
   g. Voice communications between LM and MSFN ≈ one minute.
   h. CMPs S-Band volume control is fully decreased (CSM).
   i. LM S-Band voice is enabled.
4. LM Relay Details (GET 46: 23: 00)

   $\text{CSM} \xrightarrow{\text{VHF}} \overset{\text{Relay}}{\text{LM}} \xrightarrow{\text{S-Bd}} \text{MSFN}$ & return

   a. LMP relay is enabled (LM).
   b. CDR S-Band volume is increased (LM).
   c. S-Band voice is disabled (CSM).
   d. MSFN transmits/receives voice via S-Band only
   e. Voice communications between LM and MSFN ≈ one minute.
   f. CSM enables S-Band voice.
5. MSFN Relay Details (GET 44:22: 00)

   $\text{LM} \xrightarrow{\text{S-Bd}} \overset{\text{Relay}}{\text{MSFN}} \xrightarrow{\text{S-Bd}} \text{CSM}$

   a. CMPs S-Band volume is increased (CSM).
   b. CSM VHF A is disabled.
   c. LM VHF A receiver is disabled.
   d. LM tape recorder is enabled.
   e. Voice communication between LM and CSM ≈ one minute. (MSFN is relay.) Tape tb is gray.
   f. LM VHF A receiver is enabled.
   g. LM Recorder is set to off.
   h. LMPs audio is set to normal (LM).
   i. LM S-Band volume is fully decreased.
   j. CSM VHF A is set to simplex.
   k. CSM S-Band volume is fully decreased.

*Note: LM Activation and Checkout.

C. Procedural Reference

Procedures preceding this period are identified in the Communications Plan on page 5-2*.

D. Data Requirements

1. MSFN records CSM Relay voice (M)
2. MSFN records LM Relay voice (M)
3. LM records MSFN Relay voice (M)

E. Crew Logging/Recording Requirements

None

*Note: LM Activation and Checkout.

PLSS COMMUNICATION CHECKS

A. DTO Reference

1. P20.21 - LM/MSFN S-Band Performance
2. P20.22 - LM/CSM/MSFN Communication Compatibility

B. Test Details

1. Checkout of the EMU with LM 2-way relay. [P20.22] (GET 46:23:00)

   EMU Voice, Biomed $\xrightarrow{\text{VHF}}$ LM $\xrightarrow{\text{S-Band}}$ MSFN & return

   a. LM is configured to LM 2-way relay.
   b. PLSS Mode 5 is selected.
   c. CSM is configured for LM 2-way relay: DUPLEX A, RCV ONLY A

2. TV data (Signal Combination Mode 10) [P20.21]
   a. This mode will consist of S-Band with HBR data and voice on FM with high S-Band amplifier power.
   b. Five minutes of total data and two minutes of continuous data are required.
   c. Upon completion of TV operation the LM will reconfigure to the CSM 1-way down relay mode.

3. Signal Combination Mode 7 (Lunar Stay with Relay) [P20.21] (GET 46:33:00)
   a. This mode consists of LM S-Band voice, relay, H.L. biomed, EMU, LBR PCM, and low S-Band amplifier power.
   b. Two minutes total data are required.

4. Signal Combination Mode 8 (Lunar Stay with Relay Backup) [P20.21] (GET 46:38:00)
   a. This mode consists of S-Band backup voice, relay, EMU, H.L. biomed, LBR PCM and low S-Band amplifier power.
   b. Two minutes total data are required.

C. Procedural Reference

1. AOH LMA 790-3-LM-3, Section 4.13.2.2, "Relay Mode, EVA."
2. TV operation will be per the D-Mission Photo Operations Plan, Section IV, TV Plan, published by Flight Crew Support Division, MSC.
3. Communications configurations before and after these checks are identified in the Communications Plan, Section 5, of this document.

D. Data Requirements

1. MSFN recording of EMU to MSFN voice & biomed (via LM relay) (M) [P20.22]
2. EMU voice on LM tape recorder (M) P20.22
3. EMU voice on CSM DSE and MSFN playback (M) [P20.22]
4. EMU biomed data relayed to MSFN (M) [P20.21]
5. MSFN recording of video tape (M) [P20.21]
6. MSFN assessment of video quality. [P20.21]
7. MSFN records of acquisition times for omni antennas (M) [P20.21]
8. MSFN recording of LM to MSFN voice (M) [P20.21]
9. MSFN S-Band tracking data processor output (M) [P20.21]
10. MSFN recording of telemetry bit stream (M) [P20.21]

E. Crew Logging/Recording Requirements

Crewman's comments as to voice quality of MSFN up-voice via LM VHF, and via CSM VHF through S-Band (M) [P20.21] [P20.22]

LM PIPA BIAS TEST

A. DTO Reference

P11.10 - PGNCS IMU Performance

B. Test Details

1. LGC must be powered up during test.
2. Allow PIPA counts for minimum of 32 seconds during test (to telemetry).
3. Spacecraft in free drift.
4. Astronaut motions minimal.
5. The test is conducted at the following times:
   a. Prior to the docked DPS burn (GET 47: 40: 00)
   b. Prior to the rendezvous (GET 91: 40: 00)
   c. After the rendezvous (GET100: 05: 00)

C. Procedural Reference

PIPA Bias Measurement and Loading, Section 4.6.1.16,
AOH LMA 790-3-LM3

D. Data Requirements

LM HBR (M)

E. Crew Logging/Recording Requirements

None

LANDING RADAR SELF TEST

A. DTO Reference

1. P16.6 - Landing Radar Self Test
2. M16.7 - Prerequisite to LR Spurious Test

B. Test Details [P16.6]

1. Select HI MULT (panels 1 & 3) for the X-pointer scale.
2. Select LDG RDR/CMPTR on RATE/ERR MON sw's (panels 1 & 2).
3. Select LDG on RADAR TEST sw to perform self test.
4. Perform the self test before and after, but not during, DPS burns as follows:
   a. Prior to the Docked DPS Burn (GET 48 : 16 : 00)
   b. After the Docked DPS Burn (GET 50 : 00 : 00)
5. It is desired but not mandatory that the self-test be performed prior to and after each rendezvous DPS burn. (GET 91: 53: 00, 94: 15: 00)
6. Read the altimeter and velocity transmitters RF power output prior to and after each self-test. (Not implemented after self-test)

   Note - Test is performed in conjunction with the LR spurious test and is associated with the same burns. [M16.7]

C. Procedural Reference

Landing Radar Checkout, Section 4.6.3.4
AOH LMA -90-3-LM3

D. Data Requirements [P16.6]

1. LM HBR (M)
2. LM DFI (HD)

E. Crew Logging/Recording Requirements (M) [P16.6]

1. LR Vel and Alt transmitter RF power output from Sig Strength meter prior to each self-test.
2. LR X-axis velocity (or alt rate) from RANGE RATE/ALT RATE meter during each self-test.
3. LR Y-axis velocity from X-Pointers during each self-test.
4. LR Z-axis velocity from X-Pointers during each self-test.
5. LR altitude data from RANGE/ALT meter during each self-test.
6. LR Vel and Alt transmitter RF power output from Sig Strength meter after each self-test.

AGS INITIALIZATION

A. DTO Reference

P12.2 - AGS Initialization

B. Test Details

1. Perform AGS Initialization Routine via V47E each time AGS system is put in operate condition. (GET 48: 27: 00, 91: 42: 00)

2. There are no special procedures.

C. Procedural Reference

AGS Initialization Routine (R47), Section 4.6.1.18, AOH LMA 790-3-LM3

D. Data Requirements

None

E. Crew Logging/Recording Requirements

None

AGS CALIBRATION

A. DTO Reference

P12.2 - AGS Gyro and Accelerometer Calibration

B. Test Details

1. LM attitude rotation rates not to exceed:

   (a) 0.2 degree/second when unstaged
   (b) 0.6 degree/second when staged

2. Test is conducted at the following times:

   (a) Each time PGNCS and AGS are put in operate (GET 48:30:00, 91:45:00)
   (b) Before PGNCS controlled docked DPS burn (GET 48:30:00)
   (c) Within 30 minutes after PGNCS controlled docked DPS burn (GET 49:50:00)
   (d) Prior to LM separation from CSM (GET 91:45:00)
   (e) As operationally required during Rendezvous (none required)

   NOTE: AGS calibration automatically aligns AGS to PGNCS

C. Procedural Reference

AGS Calibration, Section 4.6.2.5, AOH LMA 790-3-LM3

D. Data Requirements

None

E. Crew Logging/Recording Requirements

1. Record DEDA X, Y, Z accelerometer bias after each AGS calibration (M unless HBR T/M available):
   (a) X_{accel}, Key DEDA C 540 R ______(octal)

   (b) Y_{accel}, Key DEDA C 541 R ______(octal)

   (c) Z_{accel}, Key DEDA C 542 R ______(octal)

2. Record DEDA X, Y, Z gyro drift after each AGS calibration (M unless HBR T/M available):

   (a) X_{drift}, Key DEDA C 544 R ______(0.01°/hr)

   (b) Y_{drift}, Key DEDA C 545 R ______(0.01°/hr)

   (c) Z_{drift}, Key DEDA C 546 R ______(0.01°/hr)

DOCKED DPS BURN (GET 49 : 42 : 00)

A. DTO Reference

1. P11.5 - Data Collection for Determination of LM IMU Inflight Align Accuracy
2. M11.6 - DPS Burn Including Manual Throttling
3. P11.10 - Data for CSM and LM IMU Performance
4. P12.2 - Data for AGS Calibration and performance
5. M13.12 - DPS Burn of 200 seconds at FTP
6. M16.7 - Operate Landing Radar in Position 1 during a DPS Burn
7. M17.9 - Landing Gear Temperature Data and Observed Exhaust Impingement.
8. M17.17 - 3 Sec of LM RCS Ullage Burn and a Long DPS Burn at FTP
9. M17.18 - LM Structural Integrity during DPS Burns
10. S20.32 - LM and CM Acoustical Environment During DPS Burn
11. S20.37 - Observe and Photograph DPS Plume

B. Test Details

1. LR Self Test is conducted prior to burn [M16.7]
2. PGNCS is aligned prior to burn. [M11.6] [P12.2]
3. GNCS is fine aligned using optics prior to burn. [M11.6]
4. AGS is aligned to PGNCS 5 minutes prior to burn. [M11.6] (Not implemented)
5. MODE SELECT sw (Pnl I) - Ldg Radar
6. LR antenna posisiton 1 is selected. [M16.7]
7. LM LR spurious test routine is selected. [M16.7]
8. DPS burn is performed using P40.
9. Burn Parameters
   Ullage: 10 sec
   DPS Burn duration: 367 sec
   1714.1
   Guidance: PGNCS - Ext ΔV
10. Burn profile is as follows: (covers requirements for M11.6, b thru o)
    NOTE: Throttle Control AUTO until VG = 124 fps
    a) TIG - 10 sec: Ullage, 2-jet, System B (M17.14 4-jet ullage not implemented)
    b) TIG = 0: Engine on (10%)
    c) TIG + 5 sec: Manual throttle to 40%
    d) TIG + 26 sec: Auto throttle to FTP (covers requirements for M13.12)
    e) VG = 124 fps (TIG + ≈ 306 sec): Throttle control to MANUAL (40% thrust)
    f) 2 sec: 40% thrust
    g) 5 sec: Ramp to 10% throttle
    h) 5 sec: 10% thrust
    i) 5 sec: Ramp to 40% throttle
    j) 5 sec: 40% thrust
    k) 2 sec: Ramp to 25% throttle

l) 5 sec: 25% thrust
m) 2 sec: Ramp to 40% throttle
n) ≈ 30 sec @ 40% thrust
o) Tgo = -3 sec: Manual engine shutdown

12. Take pictures using the sequence camera focusing through the DPS plume. [S20.37]

C. Procedural Reference

1. Landing Radar Spurious Test Routine, Section 4.6.3.10, AOH LMA 790-3-LM3
2. DPS Thrust Program (P40), Section 4.10.1, AOH LMA 790-3-LM3

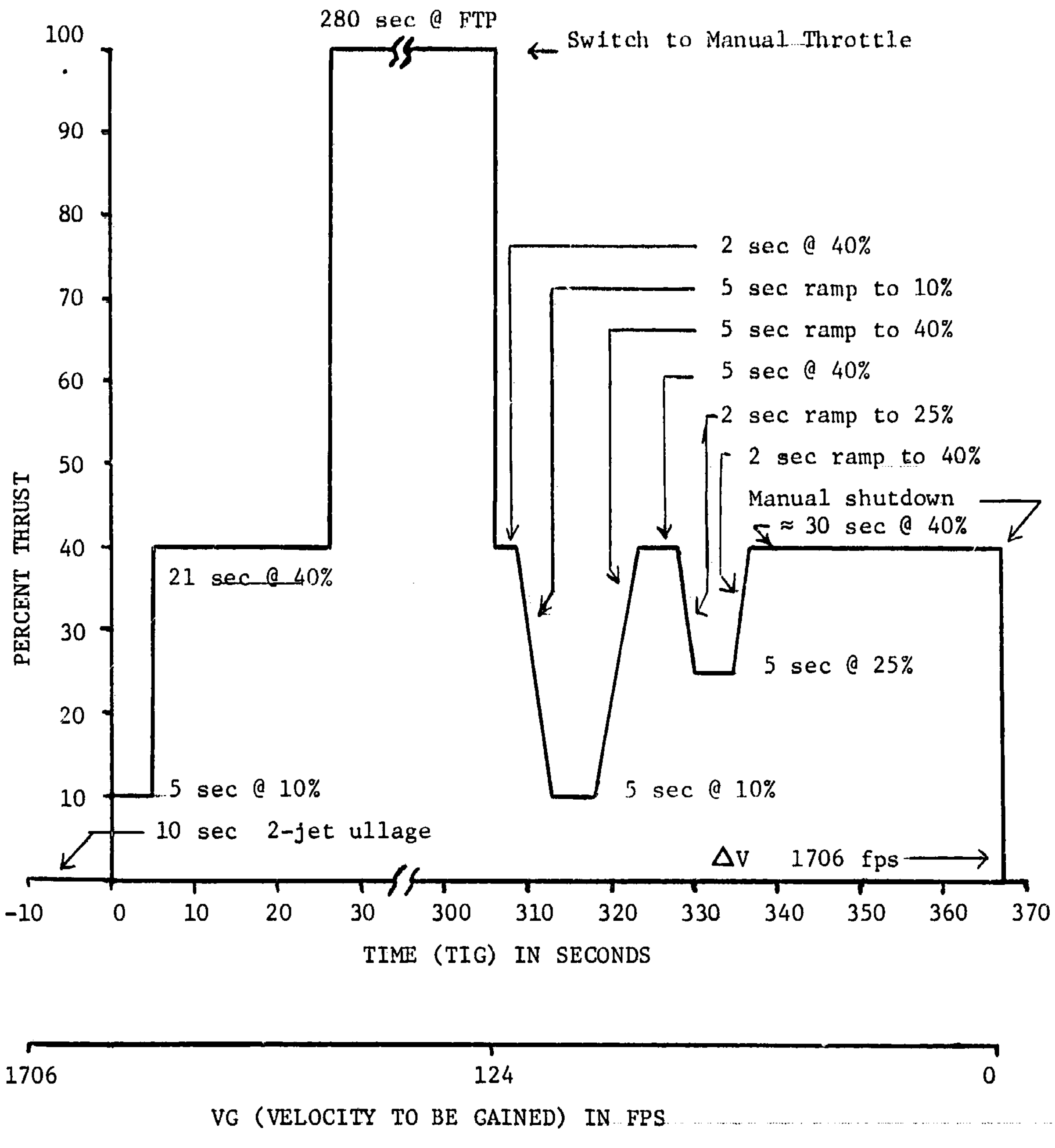
D. Data Requirements

1. CSM HBR (M) [M11.6]
2. LM HBR (M) [M11.6] [P12.2] [M13.12] [M16.7] [M17.9] [M17.17]
3. LM DFI (M) [M11.6] [M13.12[[M16.7] [M17.9] [M17.17]
4. Photography of the DPS plume (HD) [S20.37]
5. MSFN best estimate of trajectory during burn (M) [P11.5] [M11.6] [P11.10] [M17.17]
6. MSFN tracking data 60 seconds prior to and 60 seconds after the burn (HD) [P11.5]

E. Crew Logging/Recording Requirements

1. Comment on the visual effects of the DPS plume (M) [S20.37]

2. Record LR temperature at the end of the burn (HD) [M16.7]
3. Record LR temperature at the end of the burn +2 minutes. (HD) [M16.7]
4. Subjective comments on CSM and LM acoustical environment (M) [S20.32]
5. Observable effects of engine exhaust impingement on landing gear (M) [M17.9]
6. Narrative describing LM dynamic responses during DPS burn (M) [M17.17]



DPS BURN PROFILE FOR DOCKED DPS BURN

TUNNEL CLEARING - TWO CREWMEN IN LM (GET 49 : 55: 00)

A. DTO Reference

1. S20.32 - Tunnel Clearing
2. P20.34 - Crew Transfer to CM

B. Test Details

1. Crew fully suited with PGA unpressurized [P20.34]
2. Tunnel pressurized [P20.34]
3. CM/LM hard docked [P20.34]
4. Two crewmen in LM and one crewman in CM [P20.34]
5. Photograph a crewman transfer to CM [S20.32]

C. Procedural Reference

1. Open Overhead Hatch (LM Side) Section 4.14.7, and Remove Drogue (LM Side) Section 4.14.13
   AOH LMA 790-3-LM3
2. Remove Docking Probe (CSM Side) Section 4.5.4.1
   AOH SM2A-3-SC104 - (2)

D. Data Requirements

Photography of a crewman transfer (HD) [S20.32]

E. Crew Logging/Recording Requirements

1. Time required for crewmen to clear the tunnel working from both the CM and the LM (M) [P20.34]
2. Time required for one crewman to IVT to the CM from leaving the LM work station to ingress into the CM (M) [P20.34]
3. Comments on clearing the tunnel (M) [P20.34]
4. Comments on stowing tunnel equipment on the aft bulkhead (M) [S20.32]

SUBLIMATOR DRYOUT (GET 50: 24: 00)

A. DTO Reference

M14 - Sublimator Dryout

B. Test Details

No special test details

C. Procedural Reference

Sublimator Dryout, Section 4.3.1,
AOH LMA 790-3-LM3

D. Data Requirements

1. LM LBR (M)
2. LM HBR (HD)
3. LM DFI (M)

Notes: All telemetry data are required for 5 minutes at the start of sublimator dryout.
Telemetry coverage to verify complete shutdown will be collected over stations along with data from other functions.

E. Crew Logging/Recording Requirements

None

EVA (GET 73: 07: 00)

A. DTO Reference

1. S7.29 - Retrieve CSM Sample and Photograph CSM Radiators
2. M14 - LM Depressurization, Repressurization and PLSS Recharge
3. M17.17 - Retrieve Samples from the Exterior of the LM and Take Photographs
4. P20.25 - Still Photography of LM Exterior
5. S20.32 - Pressurized PGA in a Depressurized Cabin
6. P20.35 - Extravehicular Activity

B. Test Details

Total activity for the EVA period has been published in an EVA procedures document for both the LM and the CSM. The document has incorporated the requirements specified in the above referenced DTO's.

C. Procedural Reference

1. Final EVA Procedures Mission D, 20 Nov 1968.
2. Feedwater Reservoir Recharge, Section 4.15.15.4, AOH LMA 790-3-LM3

D. Data Requirements

1. LM HBR (HD) As station coverage permits [M14]
2. LM DFI (HD) As station coverage permits. [M14]
3. LM LBR (M) as follows: [M14]
   a. Five minutes, beginning at start of O_2 recharge (PLSS)
   b. Five minutes, beginning at start of H_2O recharge (PLSS)
   c. Five minutes, beginning at start of cabin depressurization
   d. Five minutes, beginning at start of cabin repressurization
4. EMU data to CSM is relayed to MSFN whenever ground coverage is available. (M) [P20.35]
5. Photography
   a. Sequence camera coverage of EVA transfer path from both the LM and CM (HD) [P20.35]
   b. Still photos taken by EVA crewman of +Y axis of CSM EPS and ECS radiators (3HD) [S7.29]
   c. Still photos of LM descent stage RCS impingement (1M, 2HD) [P20.25] [M17.17]
6. Obtain four thermal samples from CSM external locations. (HD) [S7.29]
7. Obtain one thermal sample from LM external location. (HD) [M17.17]

E. Crew Logging/Recording Requirements

1. Mark start and end of LM depressurization. (M) [P20.35]
2. Mark start and end of CM depressurization. (M[[P20.35]
3. Mark start and end of LM crewman to open LM forward hatch. (M) [P20.35]
4. Mark start and end of CMP's opening CM side hatch (M) [P20.35]
5. Mark start and end of EVA crewman's transfer from LM forward hatch to CM side hatch. (M) [P20.35]
6. Mark start and end of EVA crewman's closing CM side hatch from inside (M) [P20.35]
7. Crew comments on adequacy of EVT procedures and hardware provisions including illumination aids (M) [P20.35]
8. Comment on observable RCS exhaust impingements. (HD) [P20.35]
9. Mark start and end of LM crewman to close LM forward hatch. (M) [P20.35] (not implemented)
10. Mark start and end of CMP's closing CM side hatch. (M) [M20.35]
11. Mark start and end of LM repressurization. (HD) [P20.35]
12. Mark start and end of CM repressurization. (M) [P20.35]
13. GET at start and completion of O_2 recharge (HD) [M14]
14. GET at start and completion of H_2O recharge (HD) [M14]
15. Subjective comments on recharging PLSS (HD) [M14]
16. Narrative describing effects on crewman performance of wearing hard suit in depressurized cabin (M) [S20.32]

NOTE: All objectives required by DTO P20.35 are considered principle objectives except those concerned with EVT, which are considered secondary.

EVA COMMUNICATIONS TEST

A. DTO Requirements

P20.22 - Voice and EMU Biomed Data

B. Test Details

1. CSM 1-Way Down Relay [P20.22] (GET 71:23:00)

Voice, EMU Biomed $\xrightarrow{\text{VHF}}$ RELAY CSM $\xrightarrow{\text{S-BAND}}$ MSFN

2. Voice: EMU $\xrightarrow{\text{VHF}}$ LM and EMU $\xrightarrow{\text{VHF}}$ CSM [P20.22]

Note: This objective is satisfied by normal EVA communications.

C. Procedural Reference

CSM and LM communications modes during EVA are described on page 5-3 of the Communications Plan, Section 5. of this document.

D. Data Requirements

1. EMU biomed data relayed to MSFN (M) [P20.22] ____________
2. CSM HBR (HD) [P20.22]
3. LM DFI (HD) [P20.22] (not implemented)
4. LM HBR (HD) [P20.22]

E. Crew Logging/Recording Requirements

1. EVA crewman's comments on CSM to EVA voice (M) [P20.22]
2. EVA crewman's comments on LM to EVA voice (M) [P20.22]

LM LiOH CARTRIDGE REMOVAL (GET 76:17 : 00)

A. DTO Reference

M14 - Primary and Secondary Cartridge Removal

B. Test Details

There are no special test details.

C. Procedural Reference

1. Primary LiOH Cartridge Replacement, Section 4.13.1.6, AOH LMA 790-3-LM3,

2. Secondary LiOH Cartridge Replacement, Section 4.13.1.7, AOH LMA 790-3-LM3,

D. Data Requirements

1. LM HBR (HD)
2. LM LBR (M)
3. LM DFI (HD)

E. Crew Logging/Recording Requirements

1. GET at start and completion of primary cartridge replacement (HD)
2. GET at start and completion of secondary cartridge replacement (HD)
3. Subjective comments on removal procedures (HD)

RENDEZVOUS RADAR SELF TEST (GET 91:58:00)

A. DTO Reference

P16.4 - Rendezvous Radar Self Test

B. Test Details

1. LM configuration undocked and unstaged within station keeping distance of CSM (not implemented)

2. Self test to be performed prior to tracking performance test

C. Procedural Reference

Rendezvous Radar Checkout, Section 4.6.3.5, AOH LMA 790-3-LM3

D. MSFN Data Requirements

LM HBR (M)

E. Crew Logging/Recording Requirements

Record radar signal strength of the following (M)
a. AGC
b. Shaft ERR
c. XMTR PWR
d. TRUN ERR

LM/CSM UNDOCKING AND INSPECTION (GET 92:39 :00)

A. DTO Reference

1. M17.9 - Landing Gear Photography
2. M17.18 - Undocking Photography
3. P20.25 - Still Photography of LM Exterior
4. P20.26 - LM/CSM Undocking

B. Test Details

1. Vehicles will be undocked during daylight. [P20.26]
2. Sequence camera mounted in left hand rendezvous window of CSM [M17.18]
3. CSM sequence camera photography will record drogue condition immediately after undocking. [P20.26] Photograph one upper outrigger at ≈ 10 feet [M17.18]
4. LM will maneuver to allow the CSM to photograph the following LM surfaces at a distance of ≈ 45 feet using Hasselblad with 80mm lens and SO 121 film.
   a. Top view - normal to the LM tunnel, parallel to the +X axis [M17.18]
   b. Right side view - normal and parallel to the +Y axis [M17.18]
   c. Front view - normal to the forward hatch, parallel to the +Z axis [M17.18]
   d. Left side view - normal and parallel to the -Y axis [M17.18]
   e. Rear view - normal and parallel to the -Z axis [M17.18]
   f. Bottom view - normal to the DPS exhaust nozzle, parallel to the -X axis [M17.18]
   g. Additional pictures will be taken during LM maneuvers to show:
      - Four LM lunar surface sensing probe indicators [M17.9]
      - Eight LM landing gear downlock indicators [M17.9]

C. Procedural Reference

1. LM Separation from CSM, Section 4.5.1.5, AOH SM2A-03-SC104 (2)

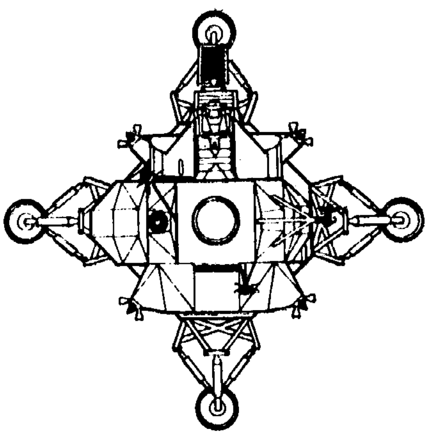
D. Data Requirements

1. LM HBR during undocking (M) [P20.26]
2. CSM HBR during undocking (M) [P20.26]
3. Photography of drogue condition immediately after undocking (HD) [P20.26]
4. Photography of upper outrigger. One is (M); two or more (HD) [M17.18]
5. Photography of each of six principal LM views as described in B.3. a through f. One photograph of each view is (M); two or more is (HD) [M17.18]
6. Photography of sensing probe indicators as described in B.3.g (M) [M17.9] [P20.25]
7. Photography of landing gear downlock indicators as described in B.3.g. (M) [M17.9] [P20.25]

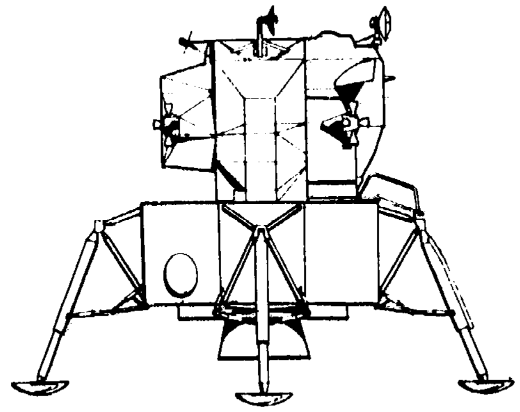
E. Crew Logging/Recording Requirements

1. Probe total travel time (initiation to full travel) as indicated by the flight annunciators (M) [P20.26]
2. Comments concerning vehicle dynamics and separation rates (M) [P20.26]

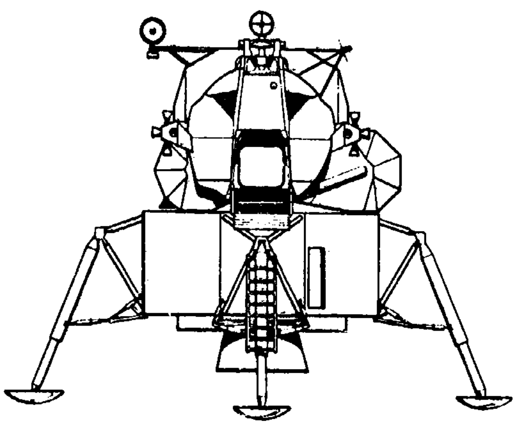
LM/CSM UNDOCKING AND INSPECTION PHOTOGRAPHY



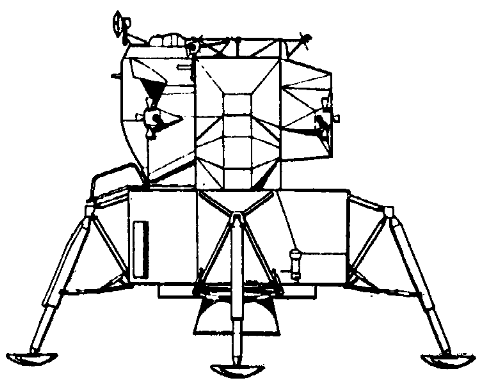
TOP VIEW +X AXIS



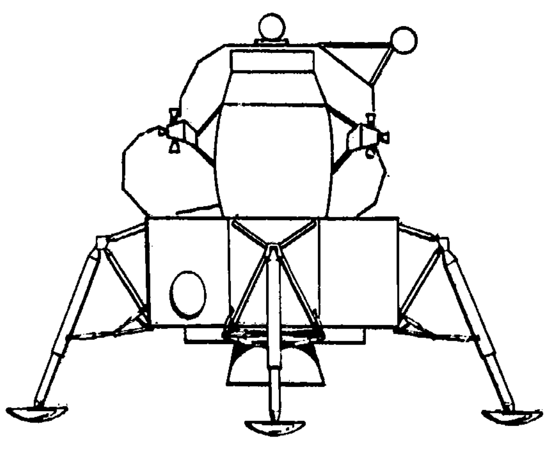
RIGHT SIDE VIEW +Y AXIS



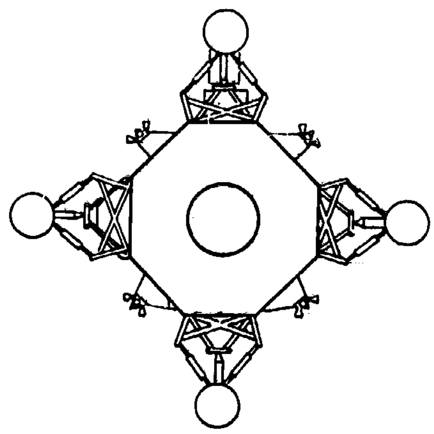
FRONT VIEW +Z AXIS



LEFT SIDE VIEW -Y AXIS



REAR VIEW -Z AXIS



BOTTOM VIEW -X AXIS

LM AGS ATTITUDE CONTROL

A. DTO Reference

P12.3 - AGS/CES Attitude Control

B. Test Details

1. LM configuration is undocked and unstaged.

2. Tests may be conducted as a normal exercise in performing the mission as follows:

   a. Minimum deadband auto attitude hold (GET 92:47:00) } >2/3 Main asc.&
   b. Maximum deadband auto attitude hold (GET 92:56:00) } des.eng.prplt.load
   c. Pulse mode attitude control (GET 92:53:00)
   d. Direct command attitude maneuver (Not implemented)
   e. Proportional rate command attitude control (GET 93:48:00)
   f. Auto attitude maneuver (not implemented)

   Note: Tests B.2.a. and b. Rates > 1°/sec in one axis (M), in all axes (HD) prior to start of hold. Hold will be maintained through one zero-error crossing cycle (±) in each axis. (1.5 minutes minimum deadband, 5.0 minutes maximum dead band).

C. Procedural Reference

1. AGS Attitude Hold/Rate Cmd., Section 4.5.1.6 (Tests B.2.a., B.2.b., B.2.e.),
2. AGS Pulse, Section 4.5.1.7 (Test c.),
3. AGS Direct, Section 4.5.1.8 (Test d.),
4. AGS Automatic, Section 4.5.1.5 (Test e.),

AOH LMA 790-3-LM3,

D. Data Requirements

1. LM HBR (M)
2. Continuous TM coverage for a minimum of 1.5 min (Test B.2.a.), and 5 min (Test B.2.b) (M)

E. Crew Logging/Recording Requirements

1. Initial body rates prior to attitude hold (M unless available on HBR TM) (Tests B.2.a, B.2.b.)
2. Time attitude hold demonstration periods being (M), and time interval of attitude error zero crossings in each axis (M unless available on HBR TM) (Tests B.2.a.B.2.b)
3. Describe success of manual attitude control modes. (M) (Tests B.2.c., B.2.d., B.2.e.)
4. FDAI inertial attitude prior to and at the conclusion of the automatic maneuver (M unless available on HBR TM) (Test B.2.f.)
5. Any information regarding unusual torques or venting (M)

LM IMU ALIGNMENTS

A. DTO Reference

P11.5 - LM AOT Alignments

B. Test Details

1. The following pertain to each test:
   a. Any of the four alignment options may be used.
   b. Prior to AOT aligns, perform coarse alignment using docking ring calibration marks.
   c. Obtain a minimum of three and a maximum of five sets of marks for each star sightings.
2. The following pertain to individual tests:
   a. Vehicle may be docked or undocked; a minimum of three AOT alignments are required. (GET 93: 19: 00, 94: 53: 00, third not implemented)
   b. It is desirable that all of the forward detent positions be used: FWD, Left and Right
   c. At least one alignment in daylight is desirable. (not implemented)
   d. Perform two AOT alignments ≥ one hour apart with no intervening ΔV maneuver to check gyro drift. (not implemented)
   e. LM IMU align precedes docked DPS burn. (GET 49: 10: 00)

C. Procedural Reference

Docked Manual IMU Coarse Alignment, Section 4.9.1.5;
IMU Realignment Program (P52), Section 4.9.1.2;
AOH LMA 790-3-LM3

D. Data Requirements

LM HBR during actual star marking (M)

E. Crew Logging/Recording Requirements

1. AOT detent position (M)
2. Align start time (M)
3. Star angle difference (M)
4. Gyro torquing angles (M)
5. Align end time (M)
6. Comments on displays, controls and procedures (M)

LM COAS CALIBRATION CHECK (GET 93 : 30 : 00)

A. DTO Reference

P11.5 - Obtain COAS Accuracy Data

B. Test Details

The recheck feature of the P52 program is used after an IMU alignment to perform the COAS calibration check as follows:

1. Select first alignment star and load 00000 azimuth and elevation in noun 87.
2. Perform an auto maneuver to the star selected and bypass trim.
3. Observe the star with the COAS and record azimuth and elevation angle errors. Note the position of the star when attitude error is zero.
4. Adjust noun 87
5. Restart selecting second star and using adjusted noun 87 azimuth and elevation.
6. Perform an auto maneuver, bypassing trim, to the second star and check azimuth and elevation angle errors with the COAS. Readjust noun 87 as required.
7. Repeat steps 1-6, if time permits, until errors are zero.
8. Bypass torquing and exit P52.

C. Procedural Reference

IMU Realign Program (P52), (using COAS option) Section 4.9.1.2, AOH LMA 790-3-LM3

D. Data Requirements

None

E. Crew Logging/Recording Requirements (M)

1. Stars selected for calibration check
2. Azimuth and elevation angle errors for each COAS sighting

EPS PREPARATION FOR A DPS BURN (GET 93 : 45 : 00)

A. DTO Reference

M15.3 - EPS Preparation for a DPS Burn

B. Test Details

Crewman EPS preparation for LM burns will include the following:

1. Operation of the backup inverter.
2. Operation of the ascent stage batteries as backup to the descent stage batteries. (Not implemented for docked DPS Burn).

C. Procedural Reference

EPS Preparation for DPS Burn, Section 4.13.4.3
AOH LMA 790-3-LM3

D. Data Requirements

LM HBR (M) as MSFN coverage allows

E. Crew Logging/Recording Requirements

None

LM AGS MANUAL TRANSLATION (GET 93: 49: 55)

A. DTO Reference

P12.3 - AGS/CES Manual Translation

B. Test Details

1. LM configuration is undocked and unstaged.
2. Test will be conducted as a normal exercise in performing the mission requiring LM manual translation in any axis (+ and -).

C. Procedural Reference

RCS Translation, Section 4.5.2.5, AOH LMA 790-3-LM3

D. Data Requirements

LM HBR (M)

E. Crew Logging/Recording Requirements

1. Describe success of manual translation control including observations of relative motion between the LM and optics target. (M)
2. Comments relevant to cross-coupling rotational effects as observed on FDAI(s) (M)
3. Any information regarding unusual torques or venting (HD)

RENDEZVOUS PHASING BURN (GET 93: 50: 03)

A. DTO Reference

1. P11.5 - Data Collection for Determination of LM IMU Inflight Align Accuracy
2. M11.6 - PGNCS Aligned Prior to First Undocked DPS Burn
3. P11.10 - Data for LM IMU Performance
4. P12.2 - Data for AGS Calibration
5. P12.4 - AGS ΔV Capability Using DPS
6. M16.4 - Rendezvous Radar Tracking Performance during Burn
7. M16.7 - Operate LR in Position 2
8. M17.9 - Landing Gear Temperature Data on T/M
9. M17.18 - LM Dynamic Response during DPS Burn
10. P20.32 - LM Acoustics during the DPS Burn

B. Test Details

1. Targeting parameters input via DSKY using prethrust program (P30) [P12.4]
2. PGNCS aligned prior to burn [M11.6]
3. Descent stage propellant loading > 65 percent of capacity is highly desirable [P12.4]
4. Rendezvous radar self test performed prior to operating RR [P16.4]
5. AGS aligned to PGNCS 5 minutes prior to burn [M11.6] (not implemented)
6. LR self test conducted prior to burn [M16.7]
7. LR antenna hover position is selected [M16.7]
8. LM spurious test routine is selected [M16.7]
9. DPS burn is AGS controlled with PGNCS monitoring in DPS thrusting program (P40) [P12.4]
10. RR lock-on is automatically maintained during the burn [P16.4]
11. Observe for false landing gear lock-on by monitoring the LDG RDR caution light, the LR altitude indicator remaining constant, and the alt. rate indicator remaining at zero [M16.17] (not implemented)
12. Burn Parameters
    Ullage: 7 sec (2 jet System B)
    Burn Duration: 24.9 sec
    ΔV: 85.0 fps
    Guidance: AGS - Ext ΔV (PGNCS/RCS trim)
    Profile: 10% thrust for 15 sec; 40% thrust for 10.2 sec

C. Procedural Reference

DPS Thrust Program (P40), Section 4.10.1, AOH LMA 790-3-LM3

D. Data Requirements

1. LM HBR (M) [M11.6] [P12.2] [P12.4]
2. LM DFI (M) [M11.6] [M17.18]
3. MSFN best estimate of trajectory for burn (M) [P11.5] [M11.6] [P11.10] [P12.4] [M17.18]

E. Crew Logging/Recording Requirements

1. V_g preburn (HD) [P12.4]
2. Ullage initiation time (HD) [P12.4]
3. Command thrust level at 10% (HD) [P12.4]
4. Engine thrust level at 10% (HD) [P12.4]
5. Command thrust level at 40% (HD) [P12.4]
6. Engine thrust level at 40% (HD) [P12.4]
7. DPS Shutdown time (HD) [P12.4]
8. V_g after shutdown (HD) [P12.4]
9. Narrative describing LM dynamic responses during DPS burn (M) [M17.18]
10. Subjective comments on LM acoustical environment during burn (M) [S20.32]
11. Crew comments on handling characteristics including any unusual att/rate transients (M) [P12.4]
12. Record LR temperature at the end of the burn and two minutes after the end of the burn.

LM AOT NIGHTTIME STAR OBSERVATION - S-BAND STEERABLE ANTENNA
(not implemented)

A. DTO Reference

P11.5 - LM AOT Nighttime Star Observation - S-Band Steerable

B. Test Details

1. Perform test during any night time pass.
2. LM is undocked.
3. Select AOT right rear detent position.
4. Position S-Band steerable antenna to a pitch angle of 90° and a yaw angle of 0°.
5. Observe star field with LM tracking light off.
6. Observe star field with LM tracking light on.
7. During observation with LM tracking light on, slew the S-Band antenna ± 10° in the spacecraft XZ plane.

C. Procedural Reference

None

D. Data Requirements

None

E. Crew Logging/Recording Requirements

1. Identify the dimmest star observed with the tracking light ON and OFF (M)
2. Comments on flashing light visibility in AOT (M)
3. Comments on flashing light degradation of star field observation (M)
4. Comments as to the portion of the observed star field that was degraded and direction of light that caused degradation. (M)

LM AOT NIGHTTIME STAR OBSERVATION - RR
(not implemented)

A. DTO Reference

P11.5 - LM AOT Nighttime Star Observation - RR

B. Test Details

1. LM is undocked.
2. Perform during any nighttime pass.
3. Select AOT forward detent position.
4. Select Rendezvous Radar Antenna shaft position of $35° \pm 5°$ (up).
5. Observe star field with LM tracking light off.
6. Observe star field with LM tracking light on.

C. Procedural Reference

None

D. Data Requirements

None

E. Crew Logging/Recording Requirements

1. Identify the dimmest star observed with the tracking light ON and OFF (M)
2. Comments on flashing light visibility in AOT (M)
3. Comments on flashing light degradation of star field observation (M)
4. Comments on whether the pulsating illumination was constant over the entire field of the AOT and, if not, from which direction the light emanated (M)

RENDEZVOUS INSERTION BURN (GET 95: 41: 48)

A. DTO Reference

1. P11.5 - Data Collection for Determination of LM IMU Inflight Align Accuracy
2. M11.6 - PGNCS Controlled Undocked DPS Burn with 10% Throttle
3. P11.10 - Data for LM IMU Performance
4. M13.12 - Undocked DPS Burn at 10% Throttle
5. M17.9 - Landing Gear Temperature Data on TM
6. M17.18 - LM Dynamic Response during DPS Burn
7. S20.32 - LM Acoustics during DPS Burn
8. S20.37 - Observe the DPS Plume

B. Test Details

1. AGS aligned to PGNCS 5 minutes prior to burn (not implemented) [M11.6]
2. DPS Propellant tank 1/3 to 2/3 full [M11.6]
3. DPS Burn is performed using P40.
4. Burn Parameters:
   Ullage: 7 sec (2 jet System B)
   DPS Burn Duration: 24.4 sec
   ΔV: 39.9 fps
   Guidance: PGNCS - Ext ΔV
   Profile: 10% thrust for 24.8 sec; [M11.6]

C. Procedural Reference

DPS Thrust Program (P40) with AGS followup, Section 4.10.1, AOH LMA 790-3-LM3

D. Data Requirements

1. LM HBR (M) [M11.6]
2. LM DFI (M) [M11.6] [M17.18]
3. MSFN Best estimate of trajectory for burn (M) [P11.5] [M11.6] [P11.10]

E. Crew Logging/Recording Requirements

1. Subjective comments on LM acoustical environment (M) [S20.32]
2. Comments on the visual effects of the DPS plume on viewed objects (M) [S20.37]
3. Narrative describing LM dynamic responses during DPS burn (M) [M17.18]

RENDEZVOUS RADAR TRACKING TEST (GET 97: 00: 00)

A. DTO Reference

P16.4 Rendezvous Radar Tracking Test

B. Test Details

1. Test will be preceded by a satisfactory rendezvous radar self test.
2. Test will be performed during LM/CSM separation and subsequent rendezvous.
3. Establish LM/MSFN communications. Activate rendezvous radar & acquire lock within station keeping distance. Break lock at any range >50.8 nm and verify dropout before RR search and reacquisition of lock.

C. Data Requirements

1. CSM LBR (M during radar reacquisition)
2. LM HBR (M) prior to 50.8 nm going out, after 50.8 nm, and the same coming back in
3. MSFN will provide trajectory tracking data during rendezvous for post-mission analysis. (M)

D. Procedural Reference

None

E. Crew Logging/Recording Requirements

1. Range data and GET twice/minute for five consecutive minutes when LM-CSM range is less than 50.8 nm, and once/minute for five consecutive minutes when LM-CSM range is greater than 50.8 nm for:

   a. LM Pos RR Range (Transponder Mode) (M)
   b. LM Vel RR Range Rate (PRF) (M)

2. GET $\pm$ 1 sec when RR NO TRACK lt turns ON and OFF (M)
3. GET when RR transponder AGC signal decreases to zero as RR lock is deliberately broken, and again as lock is subsequently obtained and signal increases perceptibly (M)
4. Crew narrative describing any change in the RR NO TRACK lt and in the range and range rate data (M)

RENDEZVOUS COMMUNICATIONS TESTS
(performed throughout rendezvous)

A. DTO Reference

P20.22 - CSM And LM Voice and Data Transmission via S-Band

B. Test Details

1. CSM and LM are undocked.
2. Voice and telemetry data transmission:

   CSM $\xrightarrow{\text{S-Bd}}$ MSFN & LM $\xrightarrow{\text{S-bd}}$ MSFN; voice return

3. CSM and LM communication configurations for the rendezvous are described on page 5-4 of the Communications Plan.

C. Procedural Reference

Procedures used during the period are identified in the Communications Plan on page 5-4.

D. Data Requirements

1. PCM LBR and HBR from LM to MSFN (M)
2. PCM LBR and HBR from CSM to MSFN (M)
3. MSFN recording of both CSM dump and LM direct PCM stream - LM LBR data (M)
4. S-Band voice to MSFN (HD)

E. Crew Logging/Recording Requirements

None

Note: CSM to LM voice recorded on LM tape recorder (M), and LM to CSM voice recorded on CSM DSE (M), will be obtained during the normal communications for the rendezvous period.

EPS PRESTAGING CHECK (GET 96 : 16 : 00)

A. DTO Reference

M15.3 - Prestaging Check

B. Test Details

Preparations for staging include the following:
1. Operation of the deadface relay without load
2. Operation of ascent stage batteries as backup to the descent stage batteries
3. Parallel operation of descent stage batteries with the ascent stage batteries

C. Procedural Reference

EPS Prestaging Check   Section 4.12.4
AOH LMA 790-3-LM3

D. Data Requirements

LM HBR (M)

E. Crew Logging/Recording Requirements

None

APS CDH BURN (GET 97: 06: 22)

A. DTO Reference

1. P11.5 - LM Inflight IMU Align Accuracy Data
2. P11.10 - Data for LM IMU Performance
3. M17.18 - DFI and Tracking Data for APS Burn
4. S20.32 - Acoustical Environment During APS Burn

B. Test Details

1. Perform APS Burn Program P42
2. Burn Profile:
   4 jet, 4 sec RCS ullage
   Burn duration: 2.9 sec
   ΔV: 37.9 fps
   Guidance: PGNCS

C. Procedural Reference

APS Thrust Program (P42) with AGS Followup, Section 4.10.2
AOH LMA 790-3-LM3

D. Data Requirements

1. LM DFI (M) [M17.18]
2. MSFN Best estimate of trajectory during the burn. (M)
   [M17.18] [P11.5] [P11.10]

E. Crew Logging/Recording Requirements

1. Subjective comments on LM acoustical environment during burn (M)
   [S20.32]
2. Narrative describing LM dynamic performance during the APS Burn (M)
   [M17.18]

LM PGNCS MANUAL TRANSLATION (GET 98 , 00:15)

A. DTO Reference

P11.7 - LM Manual Translation

B. Test Details

1. LM configuration is undocked, ascent stage only.
2. Test may be conducted as part of a normal mission activity requiring manual translation in any axis (+ and -).

C. Procedural Reference

RCS Translation, Section 4.5.2.5.
AOH LMA 790-3-LM3

D. Data Requirements

PCM HBR (M)

E. Crew Logging/Recording Requirements

1. Describe success of PGNCS manual translation control (M)
2. Comments relevant to cross coupling rotational effects as observed on FDAI(s) (M)
3. Any information regarding unusual torques or venting (HD)

RENDEZVOUS DATA
(THROUGHOUT RENDEZVOUS)

A. DTO Reference

1. P20.27 - LM Evaluation Rendezvous
2. S20.32 - LM Crew Rendezvous Evaluation
3. P20.33 - CSM Single Crewman Rendezvous Capability

B. Test Details

No Special test procedures

C. Procedural Reference

FCSD Rendezvous Procedures Document

D. Data Requirements

1. LM HBR during any MSFN coverage (M) [P20.33] [P20.27]
2. CSM LBR (M) [P20.33]
3. MSFN best estimate of trajectory for Rendezvous period (M) [P20.33] [P20.27]

E. Crew Logging/Recording Requirements

1. Comments on procedures and timelines by CSM and LM crewmen (M) [P20.33] [P20.27]
2. Comments on PGNCS and RR performance (M) [P20.27]
3. Comments on charts for backup solution (M) [P20.33]
4. Comments on SXT navigaion (M) [P20.33)
5. Comments on usefulness of CSM rendezvous beacon light (M) [P20.27]
6. Estimated differences in time between one and two man operation to: (M) [S20.32]
   a. Prepare for APS burn
   b. Perform APS burn
   c. Rendezvous and dock

POST RENDEZVOUS INSPECTION (GET 48: 40: 00)

A. DTO Reference

1. S7.29 - Post Rendezvous Exhaust Impingement Photography
2. M17.17 - Post Rendezvous Exhaust Inspection
3. M17.18 - Post Rendezvous Photography

B. Test Details

1. LM and CSM at station keeping distance prior to docking.
2. LM crewman photographs the CSM surfaces for exhaust impingement. [S7.29]
3. LM rotates slowly while CSM crewman photographs the LM
4. CSM crewman photographs the LM surfaces for SM and LM exhaust impingement using Hasselblad 80 mm lens, SO121 film. [M17.17]
5. CSM takes photographs of LM at $\approx$20 feet. [M17.18]

C. Procedual Reference

N/A

D. Data Requirements

1. Photos of CSM surfaces; one is (M); two are (HD) [S7.29]
2. Photos of LM surfaces; one is (M); two are (HD) [M17.17]; HD[M17.18]

E. Crew Logging/Recording Requirements

Comments by CSM & LM crewmen on observable effects of RCS exhaust impingement from CSM and from LM (HD) [M17.17]

<u>RR CORONA TEST</u> (GET 98: 48: 00)

A. DTO Reference

P16.19 - Rendezvous Radar/RCS Plume Impingement/Corona Effect

B. Test Details

1. Test performed prior to docking and after rendezvous
2. Rendezvous Radar is operating in MAN or LGC mode
3. RR Antenna is oriented as follows:
   Trunnion = 0 degrees (± 1 degree)
   Shaft = -60 degrees (± 1 degree)
4. Crewman (using TTCA) translates -X ≈ one second with jets IU and 4U.
5. Crew monitors RR transmitter RF on signal strength meter during firing

C. Procedural Reference

None

D. Data Requirements

LM HBR (M)

E. Crew Logging/Recording Requirements

RR RF power output changes will be recorded from the SIGNAL STRENGTH meter before, during, and after RCS engine firing. (M)

LM PGNCS ATTITUDE CONTROL

A. DTO Reference

P11.7 - PGNCS Attitude Control

B. Test Details

1. LM configuration is undocked, ascent stage only.
2. Tests may be conducted as a part of normal mission activities as follows:
   a. Proportional rate command attitude hold in all axes (+ and -). (GET 98: 47: 00)
   b. Minimum impulse attitude control. (Implemented throughout Rendezvous)
   c. 2°/sec auto attitude maneuver. (GET 97: 52: 00)
   d. 0.5°/sec auto attitude maneuver. (GET 99: 05: 00)
   e. Minimum deadband auto attitude hold. (GET 9[illegible]: 05: 00) >2/3 Main asc.
   f. Maximum deadband auto attitude hold. (GET 98: 55: 00) eng.prplnt.load

   Note - Tests B.2.e and B.2.f: Rates > 1°/sec in one axis (M), in all axes (HD), prior to start of hold. Hold will be maintained through one zero-error crossing cycle (±) in each axis. (0.5 minutes minimum deadband, 5.0 minutes maximum deadband)

C. Procedural Reference

1. PGNCS Attitude Hold/Rate Cmd., Section 4.5.1.3 (Tests B.2.a., B.2.e., B.2.f.)
2. PGNCS Minimum Impulse, Section 4.5.1.4 (Test B.2.b.)
3. PGNCS Automatic, Section 4.5.1.2 (Tests B.2.c., B.2.d.)
4. DAP Data Load Routine, Section 4.6.1.8
   AOH LMA 790-3-LM3

D. Data Requirements

1. LM HBR (M)
2. Continuous TM coverage for a minimum of 0.5 min (Test B.2.e.) and 5 min (Test B.2.f.) (M)

E. Crew Logging/Recording Requirements

1. Initial body rates prior to attitude hold (Tests B.2.e., B.2.f.) (M unless available on HBR TM)
2. Time attitude hold begins (M unless available on TM), and times of attitude error zero crossings in each axis (M unless available on HBR TM) (Tests B.2.e., B.2.f.)

3. Describe success of proportional rate command and minimum impulse control modes (M) (Tests B.2.a, B.2.b.)

4. Inertial attitudes prior to, and at the conclusion of, automatic maneuvers (M unless available on HBR TM) (Tests B.2.c., B.2.d.)

5. Value of the selected maneuver rate entered into the DSKY (M unless available on HBR TM) (Tests B.2.c., B.2.d.)

6. Any information regarding unusual torques or venting (HD)

LM ACTIVE DOCKING (GET 99: 13: 00)

A. DTO Reference

P20.28 LM Active Docking

B. Test Details

1. Active LM ascent stage will dock with the CSM during daylight.
2. Take photographs from the CM from the time of LM approach until initial probe and drogue capture latching occurs. Sequence camera mounted in CM left hand rendezvous window.

C. Procedural Reference

1. LM Active Docking, Section 4.11.2, AOH LMA 790-3-LM3
2. LM Active Docking with CSM, Section 4.5.1.7, AOH SM2A-3-SC104-(2)

D. Data Requirements

1. CSM LBR (M)
2. LM HBR (M)
3. CSM HBR (HD)
4. LM DFI (HD)
5. Photography using sequence camera (M)

E. Crew Logging/Recording Requirements

1. Comments on LM handling characteristics when docking (M)
2. Comments on the adequacy of visual cues on the CSM as used by the LM crew for a docking alignment target (M)
3. The included angle between the CM and LM Z-X planes, measured about the CM roll axis after docking (M)
4. Record GET when: (M)
   a. Preparation for LM active docking was initiated.
   b. LM active docking was completed.

LM JETTISON (GET 101: 30: 00)

A. DTO Reference

P20.29 LM Jettison

B. Test Details

1. LM jettison will occur in daylight.
2. The sequence camera will be used to photograph the top of the ascent stage and tunnel area during and after separation. Camera in left rendezvous window of CSM.

C. Procedural Reference

Final CSM Separation from LM, Section 4.5.1.9, AOH SM2A-03-SC104-(2)

D. Data Requirements

1. LM HBR Data (HD)
2. CSM HBR Data for approximately 10 seconds during separation (M)
3. Photography of LM (HD)

E. Crew Logging/Recording Requirements

Crewman comments on adequacy of separation maneuvers of LM and CSM and condition of docking ring (M)

APS BURN TO DEPLETION (GET:102: 00: 00)

A. DTO Reference

1. P11.10 - Data for LM IMU Performance
2. P11.14 - PGNCS Controlled APS Burns
3. S13.10 - APS Burn to Depletion
4. M13.11 - Long Duration APS Burn
5. M17.17 - Long Duration APS Burn
6. M17.18 - LM Structural Integrity during APS Burn

B. Test Details

1. Crew will set LM up for burn and return to CSM prior to LM jettison from CSM.
2. Burn is performed under PGNCS control [P11.14] (Control via MSFN to DCA command)
3. Burn is to propellant depletion [P13.10] (Propellant tanks will be nearly full at ignition and less than 1/4 full at ECO [P11.14].)
4. Burn Parameters
   a. Ullage: 3 sec
   b. APS Burn Duration: 360 sec
   c. ΔV: 5658.5 fps
   d. Guidance: PGNCS - Ext ΔV

C. Procedural Reference

APS Burn to Depletion, Section 4.10.6
AOH LMA 790-3-LM3

D. Data Requirements

1. LM HBR (M) [P11.14] [M13.11] [M17.17]
2. LM DFI (M) [S13.10] [M13.11] [M17.17] [M17.18]
3. MSFN T/M coverage is mandatory 60 seconds prior to and during the APS burn, highly desirable for 60 seconds after burn. [P11.14]
4. MSFN best estimate of trajectory (M) [P11.14] [P11.10] [M17.17]

E. Crew Logging/Recording Requirements

N/A

S065 PHOTOGRAPHY

A. DTO Reference

Experiment S065

B. Test Details

1. Mount S065 camera hardware in the side hatch window for photography
2. Spacecraft will be manevuered to attitude supplied by MSFN.

   Optical axes of cameras will be aligned to within five degrees of the local vertical when exposures are being made. For single site photography, spacecraft to be position so that the optical axes is concentric with the local vertical midway through the exposure sequence. For multi-site continuous photography, orbital rate to be established prior to starting the exposure sequence.

3. MSFN to provide crew (via update pad) site photography requirements:
   a. Time to begin e.g. first exposure
   b. Exposure interval
   c. Number of exposures

C. Procedural Reference

NONE

D. Data Requirements

1. Photography of sites as described on the following pages (M)
2. MSFN best estimate of trajectory during periods of exposures (M)

E. Crew Logging/Recording Requirements

Get, exposure interval, and number of exposures if different from pad update (M)

APOLLO MISSION D PHOTOGRAPHIC SITES

Site	No. of Exposures	Latitude	Longitude	Earth Resources Test Site	Priority
NORTH AMERICA					
Northern Baja California	(See Note 1)	31°00'N	115°30'W	---	M
Colorado River mouth	(See Note 1)	31°50'N	114°50'W	---	M
Twin Buttes, Arizonia	(See Note 1)	31°53'N	111°10'W	115	M
Willcox Lake	(See Note 1)	32°10'N	109°52'W	31	M
Deming, New Mexico	(See Note 1)	32°20'N	107°40'W	---	M
El Paso,Texas	(See Note 1)	31°45'N	106°30'W	---	M
Guadalupe Mountains	(See Note 1)	31°55'N	105°00'W	---	HD
Houston-Galveston area	6 (See Note 2)	29°40'N	95°10'W	175	M
Dallas-Fort Worth area	6	32°43'N	97°14'W	---	HD
Salton Sea, Borrego Springs, California	6	33°20'N	115°50'W	27	M
Weslaco, Texas	6	26°15'N	98°25'W	32	M
Corpus Christi, Texas	6	28°10'N	97°50'W	---	HD
Presidio, Texas	6	29°40'N	104°15'W	16	M
Mississippi River delta	6	29°10'N	89°20'W	128	M
Cape Kennedy, Florida	6	28°30'N	80°50'W	---	M
Valley of Toluca, Mexico	6 (See Note 3)	19°18'N	99°40'W	---	HD
Chapingo, Mexico	6 (See Note 3)	19°30'N	98°52'W	---	M
Veracruz, Mexico	6 (See Note 3)	19°12'N	96°12'W	---	HD
Mexicali	6	32°38'N	115°30'W	---	HD
Bajo Rio Bravo (Matamoras)	6	25°52'N	97°31'W	---	HD
Yucatan Coast	6	22°00'N	89°00'W	172	HD
ATLANTIC OCEAN					
Tongue of the Ocean	6	23°40'N	77°00'W	---	HD
Barbados	6	13°10'N	59°34'W	---	M
Bermuda	6	32°18'N	64°45'W	86	M
Puerto Rico	6	18°15'N	66°30'W	92	M

AFRICA					
Ethiopia	6	10°00'N	40°00'E	---	HD
Somali Republic	6	05°00'N	47°00'E	---	HD
Kenya	6	00°00'N	38°00'E	---	HD
Tansania	6	5°00'S	35°00'E	---	HD
Uganda	6	01°00'N	33°00"E	---	HD
Mauritania	6 (See Note 4)	17°00'N	15°37'W	---	HD
Mali	6 (See Note 4)	12°39'N	08°09'W	---	HD
Ghana, Togo, Dohomey	6 (See Note 4)	06°10'N	01°50'E	---	HD
Congo Republic	6 (See Note 4)	11°24'S	27°42'E	---	HD
Congo Republic	6 (See Note 4)	04°19'S	17°02'E	---	HD
Malawi (Blantyre)	6 (See Note 4)	15°45'S	34°58'E	---	HD
Mozambique	6 (See Note 4)	17°22'S	37°57'E	---	HD
Malagasay Republic	6 (See Note 4)	20°52'S	44°38'E	---	HD
PACIFIC OCEAN					
Hawaiian Islands	6	19°30'N	155°30'W	---	HD
New Guinea	6	06°00'S	142°00'E	---	HD
Australia					
Alice Springs	6	22°30'S	134°00'E	---	M
Lake Eyre	6	28°30'S	137°20'E	---	M
SOUTH AMERICA					
Brazil					
Campinas	6	22°54'S	47°06'W	---	M
Quadrilatero Ferrifero	6	19°49'S	43°22'W	---	M
		20°30'S	43°50'W	---	M
Rio De Janiero	6	22°40'S	43°00'W	---	M
	6	23°00'S	43°18'W		
Cape Frio	6	22°30'S	40°30'W	---	M
		23°30'S	42°00'W		

Note 1 - Sites from Baja, California to the Guadalupe Mountains should be covered with overlapping views, for stereo viewing, along the Apollo 6 flight path. If individual sites only are photographed, obtain six exposures per site. If taken continuously, a total of 18 exposures should be taken.

Note 2 - If photographs of the Houston-Galveston area (Test Site 175) cannot be obtained, photographs of the Dallas-Fort Worth area are second choice.

Note 3 - Continuous overlapping views from Cabo Corrientes to Veracruz, Mexico, centered on Valley of Toluca, are preferred. This coverage should include the Chapingo site. Fifteen exposures will cover this area coast-to-coast.

Note 4 - Sites from Mauritania to Malagasy Republic should be covered on one pass with overlapping views along the Apollo 6 flight path. If individual sites only are photographed, obtain six exposures per site.

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ORBITAL NAVIGATION/LANDMARK TRACKING (GET 142:30:00)

A. DTO Reference

1. S1.26 - Orbital Navigation/Landmark Tracking

B. Test Details

1. Perform P 22 (Landmark Tracking Program)
2. Track landmarks for three revolutions
3. The following pertain to each tracking revolution and sighting
   a. Track minimum of three landmarks per revolution
   b. Select landmark locations to a maximum of 45° off orbital track
   c. Use the Yaw/Roll technique
   d. IMU to be aligned during dark period in each revolution preceding sightings.
   e. Minimum of 4 marks per sighting
   f. Minimum of 15 seconds between two successive marks

C. Procedural Reference

Orbital Navigation (P22) Section 4.12.2,
AOH SM2A-03-SC104 - (2)

D. Data Requirements

1. CSM LBR data (M-required once during each landmark tracking) (HD)
2. MSFN best estimate of trajectory during sightings (M)

E. Crew Logging/Recording Requirements

1. Time required for each sighting (from initial recognition through final marking) (M)
2. Manual altitude control mode (M)
3. Adequacy of recognition maps (M)
4. Comments on coordinating optics and spacecraft motion (M)

CREW MONITORING

Note: The following reoccurring/monitoring tasks are performed by the crew on a continuing basis and include data collection via telemetry.

CREW LOGGING/RECORDING REQUIREMENTS	DTO REFERENCE
1. LM LBR (M) 2. LM DFI (M) (Data required 2 seconds every 12 hours from LM activation through the second DPS burn as a minimum) No Crew recording required	M13.12 Supercritical Helium Measurements
1. GET of the following as they occur: (M) a. Cabin warning light on b. ECS caution light on c. CO_2 component caution light on 2. Comments and GET of the following as they occur: (HD) a. Initial and final positions of the suit and cabin temperature control at each change b. Suit configuration when changed c. Noxious odors, if any d. Condensation in cabin, if any, and location e. Debris (lint) on intake screen, if any f. Estimation of amount of water consumed	M14 - ECS Event Times and Data Collection (LM only)
Comment on the existence, if any, of conducted or radiated EMI as related to crew safety or to CSM, LM, or PLSS performance.	S20.121 - CSM/LM Electromagnetic Compatibility
Comments on adequacy of MSFN support during the mission (M)	S20.31 - Support Facilities Performance

CREW LOGGING/RECORDING REQUIREMENTS	DTO REFERENCE
1. Comments on ability to distinguish individual RCS thruster firings (HD) 2. Data on undesirable noises (if heard) (HD) a. GET b. Origin of noise c. Description of noise 3. Comments on stowing and unstowing equipment on the aft bulkhead (M), photographic coverage is HD 4. Comments on replacing a LiOH cartridge (M), photographic coverage is HD	S20.32 - Crew Activities and Evaluations (CSM only)
1. Capability of one man to operate the LM (M) 2. Adequacy of the LM waste management system (M) 3. Comments on ability to distinguish individual RCS thruster firings (HD) 4. Data on undesirable noises (if heard) (HD) a. GET b. Origin of noise c. Description of noise 5. Comments on attaching crew restraint systems (M), photographic coverage is HD	S20.32 - Crew Activities and Evaluations (LM only)
During normal center couch folding and unfolding, photograph the crewman performing the activity (HD). Record comments on crew capability to perform couch folding and unfolding activities (M).	S20.32 - Unfolding Couch; Folding Couch

SECTION 5 - COMMUNICATIONS PLAN

SECTION 5

SECTION 5

COMMUNICATIONS PLAN

A plan for communications modes of operations during Mission D is described in this section. These modes are defined for each of the following phases of mission activities: Launch, Insertion to LM Activation, LM Activation and Checkout, Extravehicular Activity, Rendezvous, LM Jettison, and Post LM Jettison. Variations to this plan are required for satisfaction of Detailed Test Objectives and are described along with other DTO's, in order of implementation, in Section 4 of this document.

Lunar Module Developmental Flight Instrumentation (DFI) is available only on LM-3, and is used for C-Band ranging, transmitting real time data from the PCMTEA, and transmitting data from special instrumentation. A DFI duty cycle is presented on pages 5-7 through 5-12.

A table listing MSFN station capabilities is presented on page 5-13.

Throughout the mission the CSM telecommunications system will be configured for optimum ground control via RTC. The DSE will record continuously at low speed (for LBR) unless HBR is selected by the crew, or ground RTCs a data dump. During all but the EVA and Rendezvous portions of combined LM/CSM operations, the LM will transmit LBR PCM data via VHF B to the CSM for DSE recording except when LM HBR PCM is required by MSFN.

The RTC by MSFN for a typical station pass would include:

a. If there is a DSE data dump:

<u>STA AOS</u>:	DSE - Rewind PCM - HBR S-Band Tape Mode (FM on) DSE - Playback mode
At end of DSE: Rewind	 DSE - Forward
At end of DSE: Dump	 DSE - Rewind S-Band tape off (FM off) DSE - Record
<u>STA LOS</u>:	PCM - LBR DSE - FORWARD

b. If there is no DSE data dump:

<u>STA LOS</u>:	DSE - STOP PCM - HBR
<u>STA LOS</u>:	PCM - LBR DSE - Forward

There is no television scheduled for the CM.

A "CSM Communications Basic" configuration is established for the mission and, with exceptions noted under specific mission phases, will be maintained as follows:

Panel 4
TELCOM GRP 1 - AC1
TELCOM GRP 2 - AC2

Panels 9, 10, 6:
MODE (3) - INTERCOM/PTT
S BD (3) - T/R (S-Bd vol muted)
SUIT PWR (3) - ON (up)
AUDIO CONT (3) - NORM
PWR (3) - AUDIO/TONE
VHF AM (3)-T/R
INTERCOM (3) - T/R
PAD COMM (3) - OFF

Panel 3:
S BD XPNDR - PRIM
S BD PWR AMPL PRIM - PRIM
S BD PWR AMPL HI - HI
S BD MODE VOICE - VOICE

Panel 3
S BD MODE PCM - PCM
S BD MODE RNG - RNG
UP TLM DATA - DATA
UP TLM CMD - NORM
S BD ANT OMNI - B
S BD ANT OMNI - OMNI
VHF AM A - SIMPLEX
VHF AM B - OFF (ctr)
VHF AM RCV ONLY - OFF (ctr)
VHF BCN - OFF
TAPE RCDR PCM - PCM/ANLG
TAPE RCDR RCD - RCD
TAPE RCDR FWD - FWD
SCE PWR - NORM
PMP PWR - NORM
PCM BIT RATE - LOW
VHF ANT - SM LEFT

Panel 100:
RNDZ XPNDR - OFF

Launch: The launch phase covers the period from lift off to insertion.

1. The CM communications configuration employed during this period will vary from the CSM Communications Basic as follows:

   Panel 3
   VHF AM B-Duplex

   Panel 6
   Audio: S-BAND VOL - Increase
   VHF AM VOL - Increase

2. LM DFI will be commanded on one minute prior to liftoff and deactivated automatically four minutes after liftoff. (See DFI schedule on page 5-7.)

3. During all sleep periods, the communications power-down configuration will be CSM Communications Basic with exceptions as follows:

   Panels 9, 10, 6
   S BAND VOL - Full decrease

   Panel 3
   VHF AM A - Duplex
   VHF AM RCV ONLY - A

Insertion to LM Activation: The communications configuration for this period will be the CSM Communications Basic Configuration described above.

LM Activation and Checkout: The initial, inflight activation and checkout of LM communications systems performed during this period offer the first opportunity to implement DTOs pertaining to S-Band and VHF operational modes. These DTO activities are described on pages 4-30, 4-31, 4-34 and 4-36.

1. CSM communications will be configured to the CSM Communications Basic except:

Panel 3

VHF AM RCV ONLY - B DATA

2. LM communications during this period will be as follows:

   a. LM PCM transmission is enabled just after EPS Activation to allow maximum MSFN coverage.

   b. LM C-Band tracking and DFI will be activated upon MSFN command to the crew when required. (See DFI Schedule on pages 5-7 through 5-12.)

   c. A "LM Communications Basic" configuration will be established after VHF A Checkout and, with exceptions required for DTO implementation and noted during other mission phases described below, be maintained as follows:

S-BAND MODULATE - PM	VHF B XMTR - DATA
S-BAND XMTR/RCVR - PRIM	VHF B RCVR - OFF
S-BAND PWR AMPL - PRIM	AUDIO (BOTH): S-BAND- T/R
VOICE - VOICE	ICS - T/R
PCM - PCM	RELAY - OFF
RANGE - RANGE	AUDIO CONT - NORM
BIOMED - LEFT OR RIGHT	VOX - ICS
TLM - LO	VHF A - T/R
VHF A XMTR - ON	VHF B - OFF
VHF A RCVR - ON	CB(11) Comm: CDR Audio - Close
	CB(16) Comm: SE Audio - Close

   d. Biomed will be "Right" (LMP) for the first half of Activation Day and "Left" (CDR) for the second half.

Extravehicular Vehicular Activity (EVA): The normal communications mode for EVA uses the CSM as a relay to MSFN. The backup EVA communications mode uses LM relay to MSFN. The EVA communications configuration will be established during the LM PLSS COMM CHECK and will be maintained until LM POST EVA SYSTEM CONFIGURATION unless a real-time decision is made to change. Prior to station LOS MSFN will RTC (as desired) Down Voice Backup on the CSM to permit DSE recording of LM voice. After station AOS MSFN will RTC back to relay mode for MSFN comm. One communications DTO implemented in conjunction with the EVA period is described on page 4-49.

1. CSM One-Way Down Relay (EMU/LM/CSM/MSFN) Mode (normal):

   a. The CSM will be configured to the CSM Communications Basic with the exceptions as follow:

VHF AM A - DUPLEX A	S-BD NORMAL MODE - RELAY
VHF AM RCV ONLY - A	CMP AUDIO PWR - OFF

b. The LM will be configured to the LM Communications Basic with exception as follows: (PLSS Primary Mode)

VHF RCVR B - ON	VOX (CDR) - ICS/XMTR
VHF B XMTR - VOICE	BIOMED - LEFT
AUDIO: VHF B (CDR) - RCV	VHF ANT - 1/PLSS TEST
CB (16) Comm: SE AUDIO - OPEN	TLM - HI

2. LM one-way down relay (EMU/LM/CSM/MSFN) mode (backup):

a. The CSM will be configured to the CSM Communications Basic with exceptions as follow:

VHF AM A - DUPLEX A
VHF AM RCV ONLY - A

b. The LM will be configured to the LM Communications Basic with exceptions as follow:

AUDIO: VHF A (CDR) RCV (T/R only while CDR is transmitting PTT)

VHF B (CDR) - RCV	RELAY (LMP) - ON
VOX - (BOTH) ICS/XMTR	VHF ANT - 1/PLSS TEST
VHF A (LMP) - OFF	BIOMED - LEFT
VHF B (RCV) - ON	VHF B XMTR - VOICE

3. LM DFI and C-Band tracking will be activated upon MSFN command to the crew when required. (See DFI Schedule on pages 5-7 through 5-12.)

Rendezvous: Rendezvous communications will be established to permit VHF B backup voice between the LM and CSM while undocked. (This configuration will not allow LM transmission of data or voice to the CSM for DSE recording.) The Rendezvous communications configuration will be established during LM PREP FOR UNDOCKING and will be maintained until LM CLOSEOUT unless a real-time decision is made to change. One communications DTO implemented in conjunction with the Rendezvous period is described on page 4-66.

1. The CSM will be configured to the CSM Communications Basic with exceptions as follow:

VHF AM A - DUPLEX
VHF AM RCV ONLY - A

2. The LM will be configured to the LM Communications Basic with exceptions as follow:

AUDIO: VHF B (BOTH) - RCV	TLM - HI
VHF B RCVR - ON	VHF B XMTR - VOICE

3. LM DFI and C-Band tracking will be activated upon MSFN command to the crew when required. (See DFI Schedule on pages 5-7 through 5-12.)

4. LM Biomed will be "right" (LMP) for the first half of Rendezvous Day and "Left" (CDR) for the second half.

LM Jettison: Prior to pre-jettison closeout, the LM is configured to transmit data during the unmanned jettison and subsequent long duration APS burn to depletion. Subsequent to jettison, all LM activities are commanded by RTC via DCA uplink from MSFN.

1. The CSM will be configured to the CSM Communications Basic.

2. The LM will be configured to the LM Communications Basic.

3. LM DFI and C-Band tracking data will be transmitted to MSFN when Station coverage is available. (See DFI Schedule on pages 5-7 through 5-12.)

Post LM Jettison: The CSM will normally be configured to the CSM Communications Basic from LM Jettison to Splashdown.

LM DFI SCHEDULE

The developmental Flight Instrumentation (DFI) is composed of three main components:

1) C-Band for tracking.

2) DFI VHF B transmitter for real time PCM data.

3) DFI VHF A, D, E and F transmitters for developmental flight data with no real time monitoring.

The procedure for obtaining the data through DFI VHF A, D, E and F transmitters requires that the C-Band and DFI VHF B transmitter also be on. C-Band can be on separately as can DFI VHF B.

Table I shows the timeline for each DFI component. Certain MSFN stations (single and modified single) are not equipped to receive real time S-Band telemetry from both vehicles concurrently. LM DFI VHF B is used in lieu of S-Band so that data from both vehicles may be obtained and over all stations with DFI VHF B capability during the Rendezvous period.

A CSM DSE "Record" Schedule is included to indicate DSE recording of LM LBR PCM.

TABLE 1 - DFI (INSTRUMENTATION, VHF B, C-BAND) SCHEDULE

	GET (HR:MIN)	DFI VHF A, D, E, F	DFI VHF B	C-BAND	RECORD (CSM DSE)	REMARKS
DAY 1	-00:01	ON				LAUNCH
	00:04	OFF				
DAY 3	42:36	ON	ON →	ON		EPS ACTIVATION AND CHECKOUT
	42:55	OFF		OFF	ON	POWER UP
	43:17				OFF	
	43:30	ON		ON		GLYCOL PUMP CHECK
	43:36	OFF		OFF		
	43:38				ON	
	44:03				OFF	
	44:32				ON	
	44.52				OFF	
	45:00	ON		ON		LANDING GEAR DEPLOY
	45:05	OFF		OFF		
	45:14				ON	
	45:40				OFF	

TABLE 1 - DFI (INSTRUMENTATION, VHF B, C-BAND) SCHEDULE

	GET (HR:MIN)	DFI VHF A, D, E, F	DFI VHF B	C-BAND	RECORD (CSM DSE)	REMARKS
DAY 3	46:09		ON →		ON	
	46:23				OFF	
	46:50				ON	
	47:15				OFF	
	47:45				ON	
	47:58				OFF	
	48:15	ON		ON		LR SELF TEST
	48:20	OFF		OFF		
	48:26				ON	AGS INITIALIZATION & DPS PRESS.
	48:54				OFF	
	49:34	ON		ON →		DOCKED DPS & LR SPUR TEST
	49:50	OFF				
	50:02				ON →	
	50:22	ON				SUBLIMATOR DRYOUT
	50:31				OFF	

TABLE 1 - DFI (INSTRUMENTATION, VHF B, C-BAND) SCHEDULE

	GET (HR:MIN)	DFI VHF A, D, E, F	DFI VHF B	C-BAND	RECORD (CSM DSE)	REMARKS
DAY 3	50:55	OFF	OFF	OFF		POWER DOWN
DAY 4	69:41		ON			
	70:06				ON	
	70:24				OFF	
	70:48				ON	
	71:15				OFF	
	71:40				ON	
	71:53				OFF	
	72:21				ON	
	72:49				OFF	
	73:11				ON	VOICE RECORD ONLY
	73:17				OFF	
	73:22				ON	VOICE RECORD ONLY
	73;25				OFF	
	73:55				ON	VOICE RECORD ONLY

TABLE 1 - DFI (INSTRUMENTATION, VHF B, C-BAND) SCHEDULE

	GET (HR:MIN)	DFI VHF A, D, E, F	DFI VHF B	C-BAND	RECORD (CSM DSE)	REMARKS
DAY 4	74:06		ON		OFF	
	74:15				ON	VOICE RECORD ONLY
	74:25				OFF	
	74:35				ON	VOICE RECORD ONLY
	74:39				OFF	
	74:46				ON	VOICE RECORD ONLY
	74:50				OFF	
	75:21				ON	VOICE RECORD ONLY
	75:26				OFF	
	75:34				ON	
	75:58				OFF	
	76:06				ON	
	76:15				OFF	
	76:18				ON	
	76:25				OFF	

TABLE 1 - DFI (INSTRUMENTATION, VHF B, C-BAND) SCHEDULE

	GET (HR:MIN)	DFI VHF A, D, E, F	DFI VHF B	C-BAND	RECORD (CSM DSE)	REMARKS
DAY 4	76:47	ON	ON	ON		SUBLIMATOR DRYOUT
	77:08				ON	
	77:20	OFF	OFF	OFF	OFF	POWER DOWN
DAY 5	89:27				ON	
	89:42				OFF	
	89:52				ON	
	90:40				OFF	
	90:45				ON	
	91:07		ON		OFF	
	91:27				ON	
	91:54				OFF	
	92:41			ON		CSM/LM UNDOCKING
	93:45	ON				DPS PHASING BURN
	93:52	OFF				
	95:39	ON				DPS INSERTION BURN
	95:45	OFF				

TABLE 1 - DFI (INSTRUMENTATION, VHF B, C-BAND) SCHEDULE

	GET (HR:MIN)	DFI VHF A, D, E, F	DFI VHF B	C-BAND	RECORD (CSM DSE)	REMARKS
DAY 5	97:04	ON	ON	ON		APS CDH BURN
	97:09	OFF	↓	↓		
	98:45	ON	↓	↓		RR CORONA TEST THROUGH DOCKING
	99:20	OFF	↓	↓		
	100:40	ON	↓	↓		LM CLOSEOUT FOR APS BURN TO DEPLETION

PLANNED MSFN STATION CAPABILITIES FOR MISSION D

TABLE 3

STATION		UNIFIED S-BAND (USB) *STATION TYPE DUAL	MOD SINGLE	SINGLE	CMD	TLM	TRK	VOICE	BIO MED	DFI (LM) C-BAND TRK	VHF B PCM	VHF A D,E&F	VHF A&B VOICE	UHF CMD	RECORD	TV RECORD
MERRITT ISLAND	(MIL)	30'			X	X	X	X	X	X	X	X	X	X	X	X
GRAND BAHAMA	(GBM)			30'	X	X	X	X	X		X	X	X		X	
ANTIGUA	(ANG)		30'		X	X	X	X	X	X	X	X	X	X	X	X
ASCENSION	(ACN)	30'			X	X	X	X	X		X	X	X	X	X	X
BERMUDA	(BDA)		30'		X	X	X	X	X	X	X	X	X	X	X	X
CANARY ISLANDS	(CYI)			30'	X	X	X	X	X	X	X	X	X	X	X	X
CARNARVON	(CRO)	30'			X	X	X	X	X	X	X	X	X	X	X	X
GUAM	(GWM)	30'			X	X	X	X	X		X	X	X	X	X	X
HAWAII	(HAW)	30'			X	X	X	X	X	X	X	X	X	X	X	X
GUYMAS	(GYM)			30'	X	X	X	X	X		X	X	X		X	X
TEXAS	(TEX)			30'	X	X	X	X	X		X	X	X	X	X	X
GOLDSTONE	(GDS)	85'			X	X	X	X	X						X	X
MADRID	(MAD)	85'			X	X	X	X	X						X	X
HONEYSUCKLE	(HSK)	85'			X	X	X	X	X						X	X
VANGUARD	(VAN)	30'			X	X	X	X	X	X	X	X	X	X	X	X
REDSTONE	(RED)	30'			X	X	X	X	X	X	X	X	X	X	X	X
MERCURY	(MER)	30'			X	X	X	X	X	X	X	X	X	X	X	X
HUNTSVILLE	(HTV)			12'		X	X	X		X	X		X		X	
ARIA						X		X			X	X	X		X	
PATRICK	(PAFB)									X					X	
PRETORIA	(PRE)									X	X				X	
CALIFORNIA	(CAL)									X			X		X	
WHITE SANDS	(WHS)									X					X	
TANANARIVE	(TAN)									X	X		X		X	
CENT.INS.FACILITY	(CIF)					X					X				X	
MERRITT ISL-DOD	(MLA)					X				X	X				X	
CAPE KENNEDY	(CNV)									X			X	X	X	
GRAND BAHAMA-DOD	(GBI)													X	X	
ANTIGUA-DOD	(ANT)									X				X	X	
ASCENSION-DOD	(ASC)									X				X	X	

*Note: Station type definitions:
Single - 1 Uplink, 1 Downlink
Mod Single - 2 Uplinks, 1 Downlink
Dual - 2 Uplinks, 3 Downlinks

Ref: Flight Operations Plan, Mission D, 23 Aug. 68.
Memorandum - MSFN Capabilities for "D" and subsequent missions, 18 June 68.

SECTION 6 - CONSUMABLES ANALYSIS

SECTION 6