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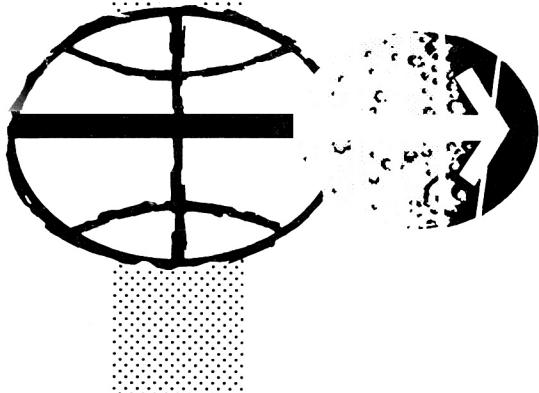
FINAL

Apollo 13 Flight Plan

AS-508/CSM-109/LM-7

MARCH 16, 1970

FLIGHT PLANNING BRANCH
FLIGHT CREW SUPPORT DIVISION



MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

SECTION IV

SECTION V

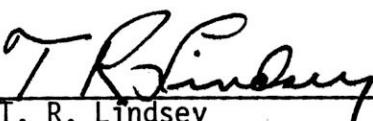
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SECTION II

SECTION I

APOLLO 13
APOLLO AS-508/CSM-109/LM-7
FINAL FLIGHT PLAN
MARCH 16, 1970

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INTRODUCTION

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

This document schedules the AS-508/CSM-109/LM-7 operations and crew activities to fulfill, when possible, the test objectives defined in the Mission Requirements, H-2 Type Mission Lunar Landing, Revision B dated February 19, 1970.

The trajectory parameters used in this Flight Plan are for April 11, 1970 launch, with 72° launch azimuth and were supplied by Mission Planning and Analysis Division as defined by the Apollo Mission H-2 Spacecraft Operational Trajectory to be published.

The Apollo 13 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 Mission 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.

Lt. Col. T. R. Lindsey will act as co-ordinator for all proposed changes to the Apollo 13 Flight Plan.

This Flight Plan is not to be reproduced without the written aproval 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.

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Views of the earth shown in the Flight Plan were taken from the document, "Views from the CM and LM during the Flight of Apollo 13 (Mission H-2)."

The CSM and LM attitude information was taken from the document, "Operational Lunar Orbit Attitude Sequence for Apollo 13 (Mission H-2)" to be published.

Consumable analysis data was prepared by the Consumables Analysis Section of the Mission Planning and Analysis Division.

ABBREVIATIONS

ACCEL	Accelerometer
ACN	Ascension
ACT	Activation
ACQ	Acquisition or Acquire
AEA	Abort Electronics Assembly
AGS	Abort Guidance Subsystem
AH	Ampere Hours
ALSCC	Apollo Lunar Surface Close-up Camera
ALSD	Apollo Lunar Surface Drill
ALSEP	Apollo Lunar Surface Experiment Package
ALT	Altitude
AM	Amplitude Modulation
AMP or amp	Ampere
AMPL	Amplifier
ANG	Antigua
ANT	Antenna
AOH	Apollo Operations Handbook
AOS	Acquisition of Signal or Acquisition of Site
AOT	Alignment Optical Telescope
APS	Ascent Propulsion Subsystem/Auxillary Propulsion System (S-IVB)
ARS	Atmosphere Revitalization System
ASC	Ascent
A/T	Alignment Technique
ATT	Attitude
AUX	Auxiliary
AZ	Azimuth
BAT	Battery
BEF	Blunt End Forward
BD	Band
BDA	Bermuda
Bio	Bio-Medical Data on Voice Downlink
BP	Barber Pole
BRKT	Bracket
BT	Burn Time
BU	Backup
BW	Black & White (Film 3400)
BW1	Black & White (Film 3401)
CAP COM	Capsule Communicator
CAM	Camera
CAN	CANISTER
CB	Circuit Breaker
CCGE	Cold Cathode Gage Experiment
CCIG	Cold Cathode Ion Gage
CDH	Constant Delta Altitude

ABBREVIATIONS (CONT'D)

CDR	Commander
CDU	Coupling Data Unit
CEX	Color External (S0368)
CIN	Color Internal (S0168)
CIRC	Circularization
CK	Check
C/L	Centerline or Checklist
CM	Command Module
CMC	Command Module Computer
CMD	Command
CMP	Command Module Pilot
CNTL	Control
C/O	Check out
COAS	Crew Optical Alignment Sight
COMM	Communications
CONFIG	Configuration
COMP	Compare
CONT	Continue and Contingency
CP	Control Point
CPLLEE	Charged Particle Lunar Environment Experiment
CRO	Carnarvon, Australia
CRYO	Cryogenic
CSC	Contingency Sample Collection
CSC	Close-up Stereo Camera
CSI	Coelliptic Sequence Initiation
CSM	Command Service Module
C&WS	Caution and Warning System
CWEA	Caution and Warning Electronic Assembly
CYI	Grand Canary Island
DAC	Data Acquisition Camera
DAP	Digital Auto Pilot
DB	Deadband
DC	Data Camera (RESEAU)
DCA	Digital Command Assembly
DEDA	Data Entry and Display Assembly
DEGS	Degrees
DEPL	Depletion
DES	Descent
DET	Digital Event Timer
DIFF	Difference
DIR	Direct
DK	Docked
DO	Detailed Objective
DOI	Descent Orbit Insertion
DPS	Descent Propulsion System

ABBREVIATIONS (CONT'D)

DS	Documented Sample
DSE	Data Storage Equipment(CSM)
DSEA	Data Storage Equipment Assembly (LM)
DSKY	Display and Keyboard
DTO	Detailed Test Objective
DUA	Digital Uplink Assembly
DWN	Down
E	Erasable or Enter
ECS	Environmental Control System
ED	Explosive Device
EDT	Eastern Daylight Time
EFH	Earth Far Horizon
EI	Earth (atmosphere) Interface and Entry Interface
EL	Electric Hasselblad Camera
ELEV	Elevation
EMER	Emergency
EMS	Entry Monitor System
EMU	Extravehicular Mobility Unit
ENH	Earth Near Horizon
EPO	Earth Parking Orbit
EPHEM	EPHEMERIS
EPS	Electrical Power Subsystem
EQUIP	Equipment
EST	Eastern Standard Time
ETB	Equipment Transfer Bag
EVA	Extravehicular Activity
EVAP	Evaporator
EVCS	Extravehicular Communications System
EVT	Extravehicular Transfer
EXT	External
f	F Stop
FC	Fuel Cell
FDAI	Flight Director Attitude Indicator
FLT	Flight
FM	Frequency Modulated
FOV	Field of View
FPS or fps	Feet per second
FT or ft	Feet
FTO	Flight Test Objective
FTP	Full Throttle Position
FWD	Forward
G.A.	Gas Analysis
GA	Gimbal Angle
GBI	Grand Bahama Islands
GBM	Grand Bahama (MSFN)

ABBREVIATIONS (CONT'D)

GDC	Gyro Display Coupler
GDS	Goldstone, California
GET	Ground Elapsed Time
GETI	Ground Elapsed Time of Ignition
GLY	Glycol
GMT	Greenwich Mean Time
G&N	Guidance and Navigation
GNCS	Guidance Navigation Control System
GWM	Guam
GYM	Guaymas, Mexico
H2	Hydrogen
HA	Apogee Altitude
HAW	Hawaii
HBR	High Bit Rate (TLM)
HD	Highly Desirable or Heads Down
HFE	Heat Flow Experiment
HGA	High Gain Antenna
HI	High
H2O	Water
HP	Perigee Altitude
HSK	Honeysuckle (Canberra, Australia)
HTC	Hand Tool Carrier
HTR	Heater
HTV	USNS Huntsville
HU	Heads Up
ICDU	Inertial Coupling Data Unit
IGA	Inner Gimbal Angle
IGN	Ignition
IMU	Inertial Measurement Unit
IND	Indicator
INIT	Initialization
INT	Intervalometer
IP	Initial Point
ISA	Interim Stowage Assembly
IU	Instrumentation Unit
IVC	Intervehicular Communications
IVT	Intravehicular Transfer
JETT	Jettison
KM	Kilometer
kwh	Kilowatt Hour

ABBREVIATIONS (CONT'D)

LA	Launch Azimuth
LAT	Latitude
LBR	Low Bit Rate (TLM)
LBS or lbs	Pounds
LCG	Liquid Cooled Garment
L/D	Lift/Drag
LD	Lunar Day (TV Lens)
LDG	Landing
LDMK	Landmark
LEB	Lower Equipment Bay
LEC	Lunar Equipment Conveyor
LEL	Lunar Surface Electric Hasselblad Camera
LFH	Lunar Far Horizon
LGC	LM Guidance Computer
LH	Left-hand
L/H	Local Horizontal
LHEB	Left-hand Equipment Bay
LHFEB	Left-hand Forward Equipment Bay
LHSSC	Left Hand Side Storage Container
LiOH	Lithium Hydroxide
LLM	Lunar Landing Mission
LLOS	Landmark Line of Sight
LM	Lunar Module
LMP	Lunar Module Pilot
LNH	Lunar Near Horizon
L/O	LIFT OFF
LOI	Lunar Orbit Insertion
LONG	Longitude
LOS	Loss of Signal or Loss of Site
LPO	Lunar Parking Orbit
LR	Landing Radar
LRRR or LR3	Laser Ranging Retro-Reflector
LS	Landing Site or Lunar Surface
LSM	Lunar Surface Magnetometer
LT	Light
LTC	Lunar Topographic Camera
LTG	Lighting
LV	Launch Vehicle
L/V	Local Vertical
LVPD	Launch Vehicle Pressure Display
M	Mandatory
MAD	Madrid, Spain
MAG	Magazine (Camera)
MAN	Manual
MAX	Maximum

ABBREVIATIONS (CONT'D)

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
MESA	Modular Experiment Stowage Assembly
MET	Mission Event Timer
MGA	Middle Gimbal Angle
M/I	Minimum Impulse
MIN	Minimum
MIR	Mirror
MLA	Merrit Island, Florida
mm	Millimeter
MNVR	Maneuver
MON	Monitor
MPL	Mid Pacific Landing
MPS	Main Propulsion System
MSFN	Manned Space Flight Network
MTVC	Manual Thrust Vector Control
N2	Nitrogen
NAV	Navigation
NM	Nautical Miles
NOM	Nominal
NXX	Noun XX
O2	Oxygen
OBS	Observation
O/F	Oxidizer to Fuel Ratio
OGA	Outer Gimbal Angle
OMNI	Omnidirectional Antenna
OPR	Operate
OPS	Oxygen Purge System
OPT	Option
ORB	Orbital
ORDEAL	Orbit Rate Display Earth and Lunar
ORIENT	Orientation
OVBD	Overboard
OVHD	Overhead
P	Pitch or Program
PAD	Voice Update
PCM	Pulse Code Modulation
PC	Plane Change or Chamber Pressure

ABBREVIATIONS (CONT'D)

PDI	Powered Descent Initiation
PER	Pericynthian
PGA	Pressure Garment Assembly
PGNCS	Primary Guidance Navigation Control Section
PGNS	Primary Guidance Navigation Section
PHOTO	PHOTOGRAPH
PIPA	Pulse Integrating Pendulous Accelerometer
PKG	Package
PLSS	Portable Life Support Systems
PM	Phase Modulated
POL	Polarity or Polarizing
PRE	Pretoria, South Africa
PREF	Preferred
PREP	Preparation
PRESS	Pressure
PRIM	Primary
PROP	Proportional
PRN	Pseudo Random Noise
PRPLNT	Propellant
PSE	Passive Seismic Experiment
PSIA	Pounds per Square Inch Absolute
PSID	Pounds per Square Inch Differential
PSIG	Pounds per Square Inch Gage
PT	Point
PTC	Passive Thermal Control
PU	Propellant Utilization
PUGS	Propellant Utilization and Gaging System
PWR	Power
PXX	Program XX
PYRO	Pyrotechnic
Qty	Quantity
QUAD	Quadrant
R	Roll or Range
R&B	Red & Blue
RAD	Radiator, or Radial, or Radiation
RCDR	Recorder
RCS	Reaction Control System
RCU	Remote Control Unit
RCV	Receiver
REACQ	Reacquire
RED	USNS Redstone
REFSMMAT	Reference Stable Member Matrix
REG	Regulator
REQD	Required

ABBREVIATIONS (CONT'D)

REV	Revolution
RH	Right-hand
RING	Ringsite
RLS	Radius of Landing Site
RNDZ	Rendezvous
RNG	Range/Ranging
RR	Rendezvous Radar
RSI	Roll Stability Indicator
RT	Real Time
RTC	Real Time Command
RTE	Return To Earth
RTG	Radioisotope Thermoelectric Generator
RXX	Routine XX
SA	Shaft Angle
S/C	Spacecraft
SCE	Signal Conditioning Equipment
SCS	Stabilization Control System
SCT	Scanning Telescope
SEC	Secondary
SECO	S-IVB Engine Cut-off
SECS	Sequential Events Control System
SEF	Sharp End Forward
SEL	Select
SEP	Separate
SEQ	Sequence
SIDE	Suprathermal Ion Detector Experiment
S-IVB	Saturn IV B(Third Stage)
SLA	Service Module LM Adapter
SLOS	Star Line-of-Sight
SM	Service Module
SPOT	Spotmeter
SPS	Service Propulsion System
SR	Sunrise
SRC	Sample Return Container
SS	Sunset
S.V.	State Vector
Sw	Switch
SWC	Solar Wind Composition
SWE	Solar Wind Experiment
SXT	Sextant
SYS	System
T EPHEM	Time of Ephemeris
TA	Trunnion Angle
TAN	Tanarive, Madagascar
TB	Time Base

ABBREVIATIONS (CONT'D)

TCA	Time of Closest Approach
TD	Touchdown
TD&E	Transposition Docking & LM Ejection
TEC	Trans Earth Coast
TECH	Technique
TEI	Transearth Insertion
TEMP	Temperature
TERM	Terminate
TEX	Corpus Christi, Texas
TGT	Target
TIG	Time of Ignition
TLC	Trans Lunar Coast
TLI	Translunar Insertion
TLM or TM	Telemetry
TOPO	Lunar Topographic Camera
TPF	Terminal Phase Final
TPI	Terminal Phase Initiation
TPM	Terminal Phase Midcourse
T/R	Transmitter/Receiver
TRANS	Translation
TRN	Trunion
TV	Television
TVC	Thrust Vector Control
TWR	Tower
UHT	Universal Hand Tool
ULL	Ullage
UMB	Umbilical
UNDK	Undock
US	United States
V	Velocity
VR	Resultant Velocity
VX	Velocity along the X-axis
VY	Velocity along the Y-axis
VZ	Velocity along the Z-axis
VAN	USNS Vanguard
UHBW	Very High Speed Black and White Film
VHF	Very High Frequency
VLV	Valve
VOX	Voice Keying
VXX	Verb XX
W/O	Without
WRT	With Respect to
WTN	USNS Watertown

ABBREVIATIONS (CONT'D)

X	Time of Closest Approach (Symbol)
X-DOT	Rate of Change along the X axis
XFER	Transfer
XMIT	Transmit or Transmitter
XPONDER	Transponder
Y	Yaw
YDOT	Rate of Change along the Y axis
ZDOT	Rate of Change along the Z axis
ΔA_z	Azimuth Change (Difference)
ΔH	Altitude Change (Difference)
ΔP	Pressure Change (Difference)
ΔR	Position Change (Difference)
ΔV	Velocity Change (Difference)
ΔV_C	Velocity Change at Engine Cutoff

PHOTOGRAPHIC NOMENCLATURE

AAA/BBB/CCC/DDD - EEE, EEE, (GGG, HHH, III) JJJ

AAA - Location from which photography is to be accomplished

BBB - Camera

CCC - Lens

DDD - Film Type

EEE - Photography aids (i.e., brackets, intervalometer, mirror etc.)

GGG - Lens Aperture Setting

HHH - Shutter Speed

III - Focus distance in feet

JJJ - Number of frames for DC, LTC, EL & LEL cameras

Frame Rate

Magazine percent

Time (minutes)

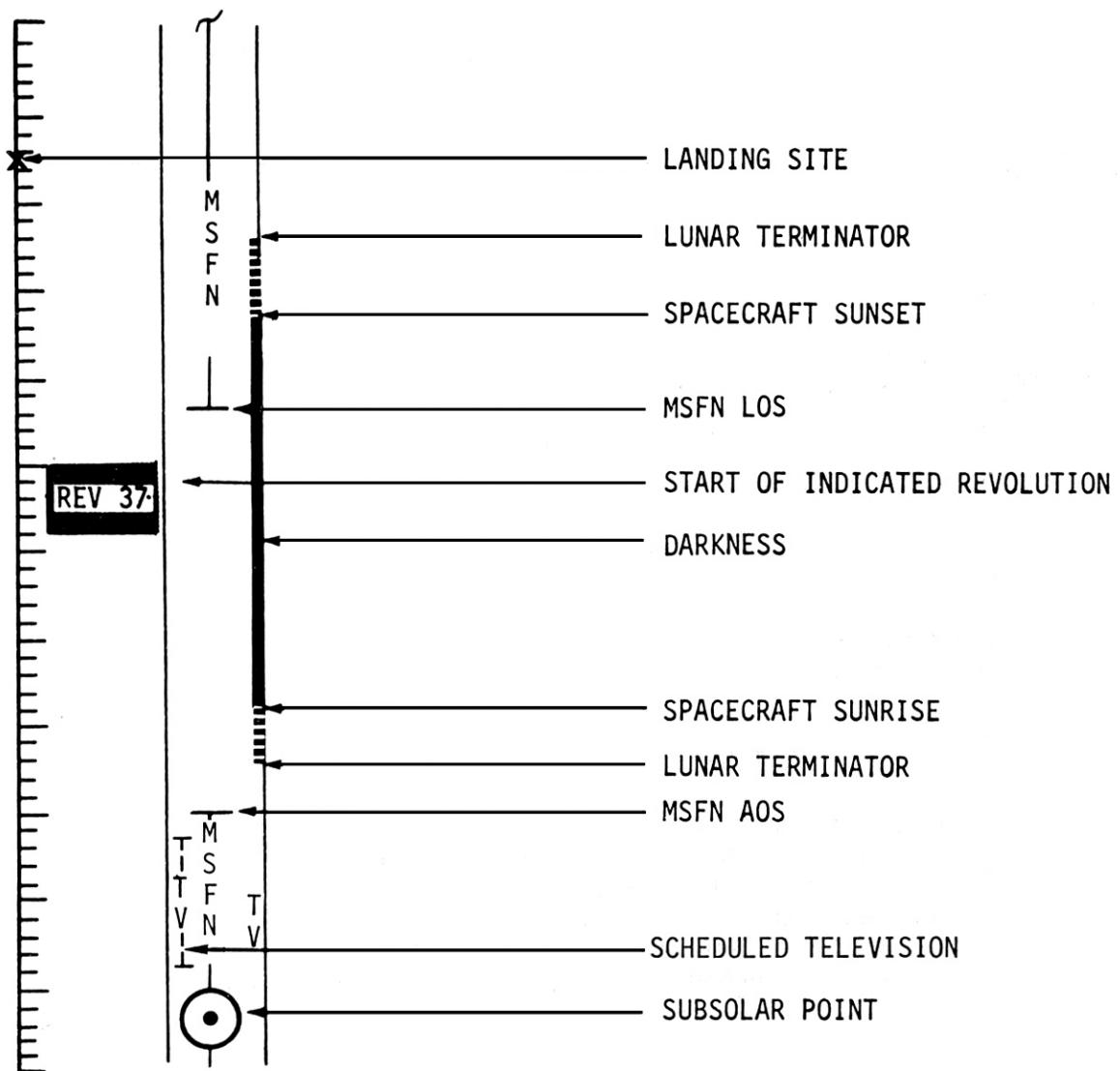
Operating time (minutes) for TV

CODE EXAMPLE:

CM4/DAC/18/CEX-BRKT,SPOT (S,250, ∞) 12 fbs, .5 mag (4 min)

Meaning: Photos taken from CM right hand rendezvous window using the DAC with 18mm lens and S0368 film. The camera will be bracket mounted with the following camera settings: f-stop from spotmeter reading, shutter speed 1/250 of a second, focus at infinity, 12 frames per second, .5 mag or 4 min to be used.

SYMBOL NOMENCLATURE



SECTION I - GENERAL

FLIGHT PLAN NOTES

A. Crew

T. Crew designations are as follows:

<u>Designation</u>	<u>Prime</u>	<u>Backup</u>
Commander (CDR)	Lovell	Young
Command Module Pilot (CMP)	Mattingly	Swigert
Lunar Module Pilot (LMP)	Haise	Duke

2. The nominal CM couch positions are:

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

3. The PGA's will be worn as follows:

<u>ACTIVITY</u>	<u>PRESSURIZED HARD SUIT</u>	<u>SUITED (SOFT SUIT)</u>	<u>PARTIAL SUIT W/O HELMET & GLOVES</u>	<u>SHIRT SLEEVES</u>
LAUNCH		ALL		
EARTH ORBIT			ALL	
TLI THROUGH S-IVB			ALL	
EVASIVE MNVR				
TLC & TEC				ALL
LM ACTIVATION			ALL	
UNDOCKING		CDR & LMP	CMP	
SEPARATION		CDR & LMP	CMP	
PDI & TD		CDR & LMP	CMP	
LUNAR STAY EXCEPT EVA	VARIES ACCORDING TO CHECKLIST FOR CDR & LMP. CMP WILL BE IN SHIRT SLEEVES			
SURFACE EVA	CDR & LMP			CMP
LIFTOFF		CDR & LMP	CMP	
THRU DOCKING				
POST JETTISON				ALL
THRU TEI ENTRY				ALL

4. Crew status reports will be voiced to MCC-H before and after crew sleep periods. After waking the crew will report sleep obtained and radiation doses received during the last 24 hours and before going to sleep the crew will report medication used and any other pertinent information on activities performed.
5. Negative reporting will be used in reporting completion of each checklist.
6. All onboard gauge readings will be read directly from the gauges with no calibration bias applied.

B. CSM Systems

1. Communications

- (a) The preferred S-Band communication modes are:
 - (1) Uplink Mode 6 (Voice, PRN, and Updata)
 - (2) Downlink Mode 2 (Voice, PRN, TLM-HBR)
 - (b) OMNI B and VHF LEFT will be selected for liftoff. OMNI D will be selected by the crew during boost if the launch azimuth is less than 96° or OMNI C if the launch azimuth is greater than 96°. OMNI D will normally be the best antenna during earth orbit.
 - (c) VHF Duplex B will be used for launch, and Simplex A for earth orbit operations.
 - (d) During TLC and TEC, OMNI antennas will normally be used. The CSM X-axis will be pitched up 90° (North) for TLC and pitched down 90° (South) for TEC with the Y-Z axis in the plane of the ecliptic. These attitudes permit high gain antenna coverage and simultaneous viewing of the earth and moon through side windows for TV coverage.
 - (e) For nominal conditions, the CSM communications with the LM while the LM is on the lunar surface is VHF only.
 - (f) Table 1-1 is a summary of the MSFN coverage available for the CSM.
 - (g) Table 1-2 contains a summary of the scheduled TV transmissions.
 - (h) During PTC the OMNI antennas will be switched via ground command. During periods of attitude control other than PTC the crew will manage antenna operations.
2. DSE
- (a) The DSE will be normally operated via ground command except for special cases where the operation is time limited. In these cases the crew may be asked to re-wind the tape.
 - (b) During the earth orbit phase, the CSM LBR data will be recorded when the CSM is not within MSFN coverage. The DSE will be dumped during the pass over the US and over CRO prior to TLI if possible.
 - (c) During the lunar orbit phase, CSM HBR data is required for the first and last five minutes of all photographic strips. When the HGA is not available, this data will be recorded on the DSE.

- (d) During lunar orbit phase, the CSM LBR data will be recorded when the CSM is not within MSFN coverage. The DSE will normally be dumped at AOS.
 - (e) CSM LBR data will be recorded during all P22 landmark tracking and dumped at completion of tracking.
 - (f) CSM HBR and voice will be recorded during all CSM engine burns.
 - (g) All Entry data will be recorded in HBR during the blackout.
3. Electrical Power
- (a) The CSM will normally remain powered up throughout the mission.
 - (b) Table 1-3 lists the fuel cell purges and waste water dumps.
 - (c) Based on cryo purity and performance, the time between fuel cell O2 purges will be increased to coincide with water dump times. The O2 purge at 11 hours will allow a judgement to be made on the defined purge schedule.
 - (d) The cryogenic heaters will be in AUTO during the mission and the fans will be operated manually. The O2 & H2 fans will be cycled for one minute before and after each sleep cycle and before each SPS burn. The O2 & H2 fans will also be cycled prior to CSM-LM Ejection from the SIVB.
 - (e) Table 1-9 contains the battery charge schedule.
4. ECS and Water Management
- (a) Potable water will be chlorinated once a day after the eat period prior to each sleep period.
 - (b) Waste Water dumps and fuel cell purge criteria:
 1. During TLC and TEC water dumps and fuel cell purges will be scheduled after the sextant star check and prior to each midcourse maneuver.
 2. Waste water dumps and fuel cell purges will not be scheduled during the following periods:
 - a. Between MCC-3 and LOI plus two hours.
 - b. Within three revolutions of undocking.

- c. Between TEI and sextant star check prior to MCC-5.
 - d. Within one hour prior to optical navigation sightings.
 - e. Between MCC-6 and EI.
3. During lunar orbit, waste water dumps and fuel cell purges should be scheduled as close to the LOS midpoint as possible.
4. All waste water dumps will be manual.
- (c) Only one CO₂ absorber filter (LIOH canister) is changed at a time. Table 1-4 lists the LIOH canister change schedule. There are 20 filters onboard with 18 stowed at launch.
- (d) At lift-off the cabin will contain 60% O₂ and 40% N₂. The CM will be purged after launch. The purge is terminated prior to LM pressurization after TLI. After the LM is configured for ejection, it will be isolated and the CM will be purged for eight more hours.
5. Guidance and Navigation
- (a) REFSMMAT Definitions
- 1. The "Launch Pad" REFSMMAT will be used for launch, TLI and TD&E. This REFSMMAT places the IMU X-axis along the launch azimuth at the pad and the Z-axis along the negative radius vector. The FDAO, at launch, will display roll 162° (launch azimuth +90°), pitch 90° and yaw 0°.
 - 2. The "PTC" REFSMMAT will be used for all midcourse maneuvers (except MCC-7) and other operations during TLC and TEC. This REFSMMAT places the IMU X-axis in the ecliptic plane and perpendicular to the earth-moon line projection in the ecliptic plane at the average time of transearth injection for the monthly launch window and azimuth range. The Z-axis is then perpendicular to the ecliptic and directed south. At the beginning of the PTC Mode, during TLC, the spacecraft will maneuver to an FDAO display of roll X, pitch 90° and yaw 0°. During TEC the pitch attitude will be 270°.
 - 3. The "Landing Site" REFSMMAT will be used for LOI, DOI, PDI, landing and CSM lunar orbit activities up to the first plane change. This REFSMMAT places the CSM IMU X-axis along the positive lunar radius vector at the

landing site at the predicted landing time and the Z-axis in the direction of flight parallel to the CSM orbital plane. At nominal touchdown the LM FDAI will display roll 0°, pitch 0° and yaw 0°.

4. A "Preferred" REFSMMAT will be used by the CSM for all lunar orbit plane changes and TEI. The CSM IMU X-axis will normally be aligned with the spacecraft X-body axis at the vehicle attitude for ignition with the thrust directed through the center of gravity. In the case of large plane change maneuvers, the IMU X-axis may be aligned 45° from the spacecraft body axis at ignition attitude. The Z-axis will be in the plane formed by the X-axis and position vector and directed up away from the moon for plane changes and towards the moon for TEI. Nominally, at burn ignition, the FDAI will display roll 0°, pitch 0° and yaw 0°. TEI will be heads down with an FDAI roll of 180°.
 5. The "Lift Off" REFSMMAT will be used for all lunar activities between plane change 1 and 2 including rendezvous and docking. This REFSMMAT places the CSM IMU X-axis along the positive lunar radius vector at the landing site at predicted lift-off time, with the Z-axis parallel to the CSM orbital plane. At nominal lift-off time the LM FDAI will display roll 0°, pitch 0° and yaw 0° with slight differences reflecting actual touchdown yaw and slop tilt angles.
 6. A "Photography" REFSMMAT will be used for the "Bootstrap" phase between plane change 2 and TEI. This REFSMMAT is a pseudo landing site REFSMMAT in that it is referenced to the time of crossing the longitude of the landing site on revolution 41. The FDAI will display roll 0°, pitch 0°, and yaw 0°, with the X-axis pitched up 20° from the local horizontal and the Z-axis in the direction of flight parallel to the CSM orbital plane.
 7. The "Entry" REFSMMAT aligns the IMU X-axis in the local horizontal plane in the direction of flight at entry interface. The entry REFSMMAT is used for MCC-7 and all remaining activities. The Z-axis is down along the negative radius at entry interface. At entry interface; with wings level, local horizontal, heat shield forward, lift up, heads down, the FDAI will display roll 0°, pitch 180°, and yaw 0°.
- (b) The CSM external lighting will be operated during the rendezvous from lift-off to docking. The running lights only will be on from CSM/LM separation to PDI.

- (c) After each landmark tracking period, the CSM will hold on N89 for 30 seconds so that these values are displayed on TLM for data retrieval.
- (d) The time tags on maneuvers in Section 3 indicate the completion time of the maneuvers unless otherwise stated. All maneuver angles are the FDAO angles after the completed maneuver. "By" precedes the time tag when the completion time is critical, otherwise the time is in parentheses.
- (e) CSM/LM and CSM attitude maneuvers will normally be at the rate of 0.2°/sec (0.5°/sec after rendezvous and docking) unless other rates are required.
- (f) Undocking will be done radially, CSM below, using the soft-undocking procedure. The probe will be extended its full length with the LM held on by the capture latches. When the rates are nulled, the CSM will then release the LM. The separation maneuver will then be performed immediately.

6. Propulsion Systems

- (a) In order to conserve SM RCS the SPS engine will be used to "back-up" all LM rendezvous burns except CDH. The nominal CDH burn magnitude is zero and it is backed up by the SM RCS. The SPS gimbal motors will not be turned on during the normal maneuver preparation, except for CSI.
- (b) The SPS will always be started using a single bank; however, the other bank will be opened 2 to 5 seconds after ignition for burns longer than 6 seconds. Bank A will be used for the first engine ignition.
- (c) Table 1-5 lists the CSM propulsion burns.

C. LM Systems

1. Communications

- (a) The preferred S-Band communications are:
 - (1) Uplink Mode 7 (Voice, Updata)
 - (2) Downlink Mode 1 (Voice, TLM-HBR)
- (b) The LM voice recorder (DSEA) will be used to record LM voice. Table 1-8 is a schedule of LM voice recorder usage.
- (c) Figure 1-1 shows the communications mode for the first part of the EVA (CDR EVA only) and the one man contingency EVA. Figure 1-2 shows the nominal two-man EVA comm configuration.

2. ECS

- (a) The LM will contain ambient air at lift-off. During launch the pressure will bleed to zero. CSM 02 will be used to pressurize the LM after T&D.

After T&D, the LM will be isolated and allowed to bleed down via leakage. For each entry into the LM before undocking the CSM 02 will be used to equalize LM pressure. After each LM egress, the LM will be isolated and allowed to leak down. This procedure insures a pure oxygen environment in the LM at the first EVA.

- (b) There are a total of six LM repressurizations, three docked and three on the lunar surface.
- 3. Guidance Systems
 - (a) The LGC and CMC will use the same landing site and lift-off REFSMMATS.
 - (b) The AGS will be placed in standby after the "GO" is given for lunar stay.
 - (c) The RR and IMU will be powered down and the LGC placed in standby after TD plus two hours until lift-off preparation.
 - (d) The rendezvous radar will be pointed away from the sun and will be turned off when no functional use is required to prevent overheating of the antenna. The LM tracking light will be turned off during the rendezvous while the LM is in sunlight.
- 4. Propulsion Systems
 - (a) The APS/RCS interconnect will be used during the lunar lift-off and ascent only.
 - (b) Table 1-6 lists the LM propulsion burns.

D. Procedures

- 1. CSM
Crew procedures called out in the flight plan may be found in the following documents:
 - (a) Apollo Operations Handbook - CSM 109 (AOH), Volume 2
 - (b) Crew Checklists
 - (c) CSM Rendezvous Procedures
 - (d) Photographic Operations Plan
 - (e) Lunar Landmark Tracking Attitude Studies
 - (f) Lunar Orbit Attitude Sequence for Mission H
- 2. LM
Crew procedures called out in the flight plan may be found in the following documents:
 - (a) Apollo Operations Handbook LM-7 Volume 2

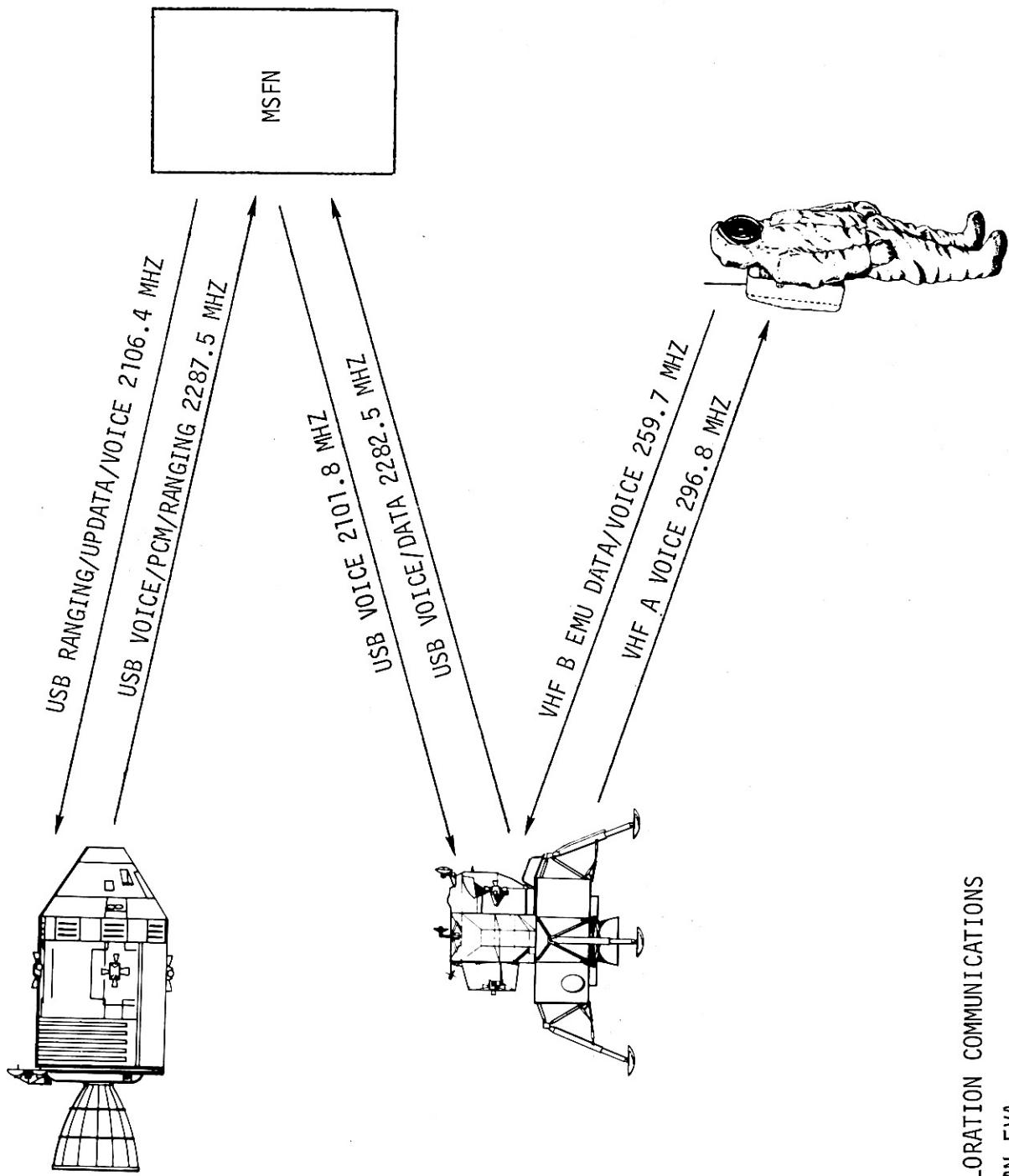
- (b) Crew Checklists
- (c) LM Rendezvous Procedures
- (d) LM Descent/Ascent Procedures
- (e) Photographic and T.V. Procedures
- (f) Orbital EVA Procedures
- (g) Lunar Surface Procedures

E. Medical Data During Sleep Periods

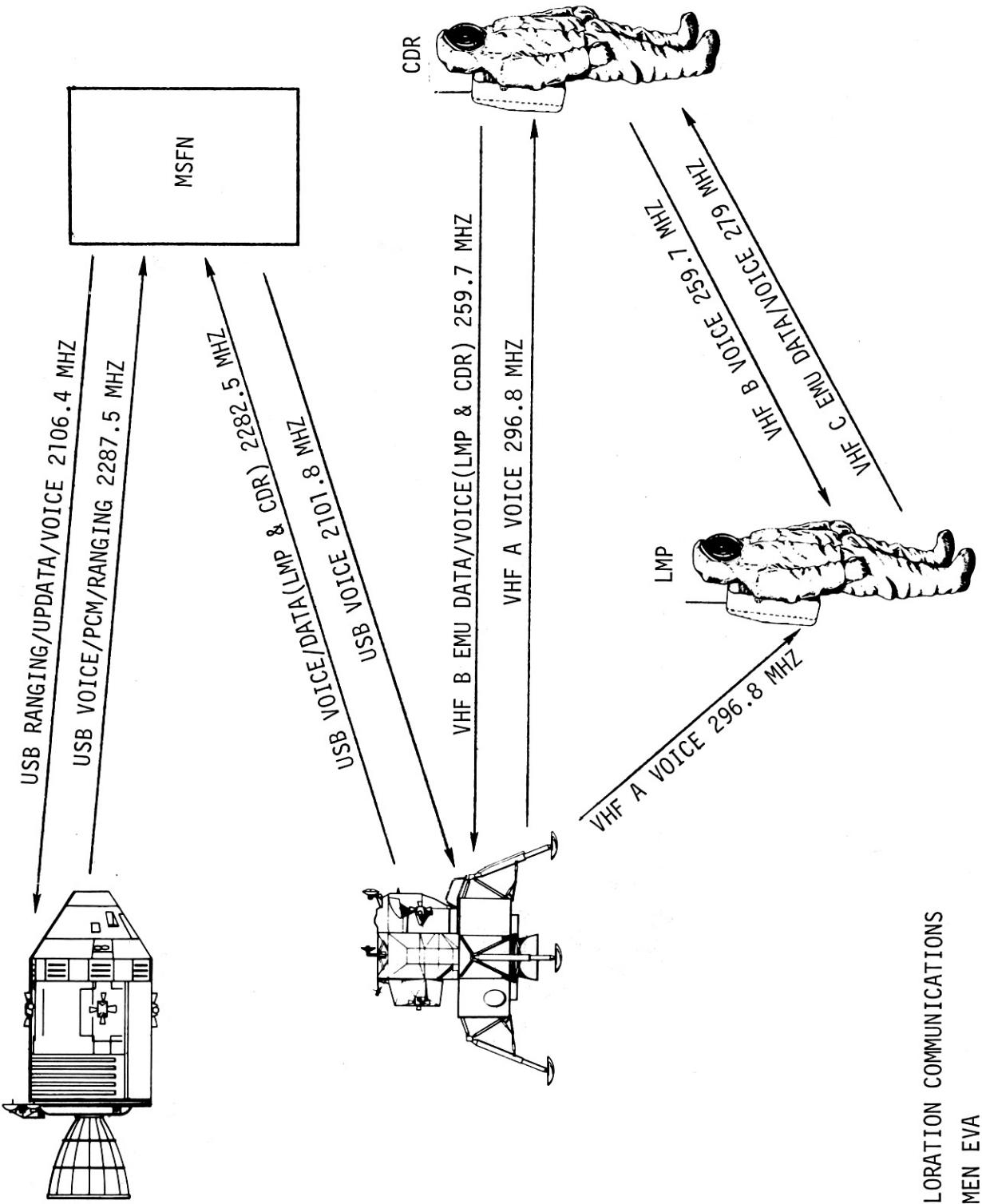
1. During translunar and transearth coast phases, and in lunar orbit when all three crewmembers are in the CSM, an EKG and ZPN will be transmitted continuously from at least one crewman.
2. During lunar orbit, when the CMP is the sole occupant of the CSM, the CMP's EKG and ZPG will be transmitted to MCC.
3. While on the lunar surface, an EKG and ZPN will be transmitted continuously from at least one crewman.

F. Miscellaneous

1. Table 1-7 contains a summary of the expected block data update times.
2. Table 1-10 is the Landmark Tracking Table.
3. Table 1-11 is the Mission Activity Summary.



LUNAR EXPLORATION COMMUNICATIONS
ONE CREWMAN EVA



LUNAR EXPLORATION COMMUNICATIONS
BOTH CREWMEN EVA

FIGURE 1-2

TABLE 1-1
S/C COVERAGE BY MSFN STATIONS USING 85-FT/210-FT DISH/ANTENNA

	GOLDSTONE (GDS)		PARKS		HONEYSUCKLE (HSK)		MADRID (MAD)	
	AOS	LOS	AOS	LOS	AOS	LOS	AOS	LOS
EARTH ORBIT			WILL NOT BE AVAILABLE FOR AN APOLLO 13 LAUNCH	1:00	1:06			
	1:29	1:34						
	2:51	14:16						
					8:55	18:09		
							16:30	30:41
COST TRANSLUNAR	24:32	38:46			35:17	42:52	41:05	55:34
	48:54	62:53			57:21	67:06	65:17	77:16
	73:02	77:15						
							167:42	176:52
COST TRANSEARTH	172:25	184:21			178:48	190:36		
							188:59	200:48
	196:34	208:20						
	221:04	232:21			202:50	214:53	213:21	224:45
							227:01	240:46

NOTE: AOS AND LOS TIMES SHOWN ASSUME TRACKING TO 0° ELEVATION.

TABLE 1-1 (Cont'd)
S/C COVERAGE BY MSFN STATIONS USING 85-FT/210-FT DISH/ANTENNA

REV	GET AT END OF REV	HONEYSUCKLE (HSK)	PARKS AUSTRALIA		GOLDSTONE (GDS)		MADRID (MAD)	
			AOS	LOS	AOS	LOS	AOS	LOS
1	79:35				77:49	79:14	77:49	79:14
2	81:43				79:57	81:22		
3	83:37	82:08	83:14		82:08	83:12		
4	85:31	84:03	85:06		84:02	85:06		
5	87:24	85:57	87:00		85:56	87:00		
6	89:18	87:49	88:55					
7	91:11	89:43	90:47					
8	93:05							
9	94:58							
10	96:52							
11	98:56							
12	100:39							
13	102:37							
14	104:35							
15	106:33	105:51	106:10					
16	108:31	106:57	108:08					
17	110:29	108:55	110:06					
18	112:27	110:53	112:05					
19	114:25	112:51	114:03					
20	116:23	114:49	116:01					
							114:49	116:00

TABLE 1-1 (Cont'd)
S/C COVERAGE BY MSFN STATIONS USING 85-FT/210-FT DISH/ANTENNA

REV	GET AT END OF REV	HONEYBUCKLE (HSK)	PARKS AUSTRALIA			GOLDSTONE (GDS)			MADRID (MAD)		
			AOS	LOS	AOS	LOS	AOS	LOS	AOS	LOS	
21	118:21								116:47	117:58	
22	120:19								118:45	119:56	
23	122:17								120:43	121:54	
24	124:15								122:43	123:52	
25	126:13								124:39	125:50	125:51
26	128:11								126:37	127:48	126:37
27	130:09								128:35	129:47	127:49
28	132:07	130:33	131:45						130:33	131:45	
29	134:05	132:31	133:43						132:31	133:43	
30	136:03	134:29	135:41						134:30	135:41	
31	138:01	136:27	137:39								
32	139:59	138:26	139:37								
33	141:57	140:23	141:35								
34	143:55										
35	145:53										
36	147:50										
37	149:48										
38	151:46										
39	153:44										
40	155:42	154:38	155:20								
41	157:40	156:07	157:18								
42	159:38	158:05	159:16								
43	161:36	160:03	161:14								
44	163:34	162:01	163:12								
45	165:31	163:59	165:10								
46	167:29	165:57	166:33								

TABLE 1 - 2

APOLLO 13 TV SCHEDULE

DAY	DATE	CST	GET	DURATION	ACTIVITY/SUBJECT	VEH	STA
SATURDAY	APR 11	4:28 PM	03:15	1 HR 08 MIN	TRANSPOSITION & DOCKING	CSM	GDS
SUNDAY	APR 12	7:28 PM	30:15	30 MIN	SPACECRAFT INTERIOR (MCC-2)	CSM	GDS
MONDAY	APR 13	11:13 PM	58:00	30 MIN	INTERIOR & IVT TO LM	CSM	GDS
WEDNESDAY	APR 15	1:03 PM	95:50	15 MIN	FRA MAURO LANDING SITE	CSM	MAD**
THURSDAY	APR 16	1:23 AM	108:10	3 HR 52 MIN	LUNAR SURFACE (EVA-1)	LM	GDS/HSK
THURSDAY	APR 16	9:03 PM	127:50	6 HR 35 MIN	LUNAR SURFACE (EVA-2)	LM	GDS
FRIDAY	APR 17	9:36 AM	140:23	12 MIN	DOCKING	CSM	MAD
SATURDAY	APR 18	11:23 AM	166:10	40 MIN	LUNAR SURFACE	CSM	MAD*
SATURDAY	APR 18	1:13 PM	168:00	25 MIN	LUNAR SURFACE (POST TEI)	CSM	MAD*
MONDAY	APR 20	6:58 PM	221:45	15 MIN	EARTH & SPACECRAFT INTERIOR	CSM	GDS

* Recorded only

**Approval pending for satellite time

TABLE 1-3
FUEL CELL PURGE AND WATER DUMP SCHEDULE

O2 FUEL CELL PURGE AND WATER DUMP			H2 FUEL CELL PURGE			REMARKS
GET	NUMBER	ΔTIME	NUMBER	ΔTIME		
06:55	1	06:55				IF NO MCC-1
11:20	1	11:20				IF MCC-1 PERFORMED
30:20	2	23:25 / 19:00	1	30:20		MCC-2
55:10	3	24:50				MCC-3
79:35	4	24:25	2	49:15		LOI + 2 HRS
108:30	5	28:55				LOS MIDPOINT/ EAT PERIOD
135:50	6	27:20	3	56:15		PREP FOR LANDMARK TRACK
155:30	7	19:40				PLANE CHANGE 2
182:00	8	26:30	4	46:10		MCC-5
218:25	9	36:25				MCC-6

TABLE 1-4
LIOH CANISTER CHANGE SCHEDULE

CHG. NO.	APPROX. GET HRS	APPROX. ΔT	INSTALL		REMOVE & STOW	
			CAN	POSITION	CAN NO.	STOWAGE LOCATION
1	9:00		3	A	1	B5
2	23:00	14	4	B	2	B5
3	35:00	12	5	A	3	B5
4	47:45	13	6	B	4	B5
5	60:00	12	7	A	5	B6
6	71:00	11	8	B	6	B6
7	85:15	14	9	A	7	B6
8	98:30	13	10	B	8	B6
9	112:40	14	11	A	9	A3
10	141:20	29	12	B	10	A3
11	154:30	13	13	A	11	A3
12	166:35	12	14	B	12	A3
13	181:15	15	15	A	13	A4
14	192:20	11	16	B	14	A4
15	207:30	15	17	A	15	A4
16	216:30	9	18	B	16	A4
17	231:50	15	19	A	17	A6

TABLE 1-5
CSM BURN SCHEDULE

BURN/ MNVR	GETI/ BURN TIME	ΔV_R (FPS)	ULLAGE / ΔV (FPS)	REFSMMAT	RESULTANT HA & HP	REMARKS
TLI	2:35:27.65 5 MIN 55.7 SEC	10,437.1	-----	-----	-----	S-IVB BURN
CSM/LM EJECTION	04:01 3.0 SEC	0.4	NOT REQ'D	PAD	-----	RCS BURN
MCC-1	11:41:25	-----	-----	PTC	-----	NOM. ZERO
MCC-2	30:40:49 2.2 SEC	15.1	NOT REQ'D	PTC	-----	SPS BURN
MCC-3	55:24:53	-----	-----	PTC	-----	NOM. ZERO
MCC-4	72:24:53	-----	-----	LDG SITE	-----	NOM. ZERO
LOI	77:24:53 5 MIN 56.5 SEC	2815.3	NOT REQ'D	LDG SITE	HA 168.3 HP 57.0	SPS BURN
DOI	81:45:20 23.1 SEC	212.9	2 JET 19 SEC	LDG SITE	HA 57.4 HP 7.1	SPS BURN
UNDOCK & SEP	99:16:21	1.0	-----	-----	-----	RCS BURN
CIRC. BURN	100:35:05 3.9 SEC	70.4	2 JET 15 SEC	LDG SITE	HA 61.7 HP 52.5	SPS BURN
PC-1	113:42:03 10.0 SEC	183.6	2 JET 15 SEC	PLANE CHANGE	HA 59.9 HP 53.8	SPS BURN
CSM SEP MNVR	143:09 6.12 SEC	1.0	N/A	LIFTOFF	HA 57.7 HP 55.3	RCS BURN
PC-2	154:13:11 43 SEC	824.6	2 JET 15 SEC	PLANE CHANGE	HA 58.4 HP 53.6	SPS BURN
TEI	167:28:48 2 MIN 14.9 SEC	3147.7	2 JET 17 SEC	TEI	-----	SPS BURN
MCC-5	182:28:48	-----	-----	PTC	-----	NOM. ZERO
MCC-6	218:49:37.6	-----	-----	PTC	-----	NOM. ZERO
MCC-7	237:49:37.6	-----	-----	ENTRY	-----	NOM. ZERO
EI	240:49:37.6	-----	-----	-----	-----	-----

NOTE: HA&HP ARE HEIGHTS ABOVE MEAN LUNAR RADIUS (938.49 nm.)

TABLE 1-6
LM BURN SCHEDULE

BURN/ MNVR	GETI/ BURN TIME	ΔV_R (FPS)	ULLAGE/ ΔV (FPS)	REFSMMAT	RESULTANT HA & HP	REMARKS
PDI	103:30:27.8 11 MIN 0.2 SEC	6592.5	2 JET 7.5	LDG SITE		
ASCENT	137:09:16.0 7 MIN 7.3 SEC	6044.4	NONE	LIFT-OFF	HA 43.9 HP 8.7	APS BURN
CSI	138:06:01 44.4 SEC	49.6	-----	LIFT-OFF	HA 44.9 HP 43.4	RCS BURN
PLANE CHANGE	138:35:08	-----	-----	LIFT-OFF	HA 44.8 HP 43.3	RCS BURN NOM. ZERO
CDH	139:04:14	-----	-----	LIFT-OFF	HA 44.8 HP 43.3	RCS BURN NOM. ZERO
TPI	139:45:41 22.1 SEC	24.7	-----	LIFT-OFF	HA 60.7 HP 43.7	RCS BURN
MCC-1	140:00:41	-----	-----	LIFT-OFF	HA 60.6 HP 43.6	RCS BURN NOM. ZERO
MCC-2	140:15:41	-----	-----	LIFT-OFF	HA 60.6 HP 43.6	RCS BURN NOM. ZERO
LM DEORBIT	144:32:20.2 75.2 SEC	185.5	-----	LIFT-OFF	-----	RCS BURN

NOTE: HA & HP ARE HEIGHTS ABOVE MEAN LANDING SITE RADIUS

TABLE 1-7
APOLLO 13 RTE BLOCK DATA SCHEDULE

BLOCK DATA	PASSED UP (GET)	~GETI	~ΔV	~GETLC	IR	TYPE OF DATA
TLI + 90 MIN	1:40	4:11	6617	14:00	31.9	COMPLETE MANEUVER
LIFT-OFF + 8H	1:40	8:00	7833	23:00	31.9	P-37
LIFT-OFF + 15H	6:00	15:00	5617	47:00	31.9	P-37
LIFT-OFF + 25H	12:30	25:00	5117	71:00	32.0	P-37
LIFT-OFF + 35H	12:30	35:00	7716	71:00	32.1	P-37
LIFT-OFF + 45H	12:30	45:00	6188	95:00	32.2	P-37
LIFT-OFF + 60H	12:30	60:00	5996	119:00	32.9	P-37
LOI - 5 FLYBY	35:00	72:25	335	167:00	40°D	COMPLETE MANEUVER (DOCKED)
PERICYNTHION + 2	71:10	79:28	4648	118:00	40°A	ABB. MANEUVER (DOCKED)
TEI 1	74:30	79:41	3189	142:51	40°A	ABB. MANEUVER
TEI 4	74:30	86:08	3512	142:56	40°A	ABB. MANEUVER
TEI 5	80:55	87:33	3793	142:57	40°A	ABB. MANEUVER
TEI 11	84:10	98:48	3175	167:29	40°A	ABB. MANEUVER
TEI 35	95:45	145:54	3013	216:50	40°A	ABB. MANEUVER
TEI 40	144:20	155:49	3338	217:01	40°A	ABB. MANEUVER
TEI 42	153:10	159:35	2993	241:18	40°A	ABB. MANEUVER
TEI 44	158:10	163:33	3055	241:23	40°A	ABB. MANEUVER
TEI 46	161:05	167:30	3129	241:28	40°A	ABB. MANEUVER
NOM TEI 46 PRELIM	164:50	167:30	3142	240:58	40°A	COMPLETE MANEUVER
NOM TEI 46 FINAL	166:10	167:30	3142	240:58	40°A	COMPLETE MANEUVER
TEI 47	166:10	169:28	3172	241:30	40°A	ABB. MANEUVER

Notes:

1. The TLI + 90 min abort is to the AOL all other block data maneuvers are to the MPL line [Nominal TEI (TEI 46) is to EOM ϕ , λ].
2. Lift-off + 15h abort assumes no MCC-1.
3. Lift-off + 35h abort assumes MCC-2.
4. Pass flyby early if pericynthion is not clear of moon.
5. Pericynthion + 2 hours fast return to MPL assumes MCC-4.
6. TEI-1 assumes LOI.
7. TEI-4 assumes LOI and no DOI.
8. TEI-5 assumes DOI.
9. TEI-35 assumes circularization and PC-1, and CSM SEP.
10. TEI-42 assumes PC-2.
11. All TEI's are $i=40^{\circ}$ ascending returns

APOLLO 13/LM - 7 DSEA SCHEDULE
TABLE 1-8

ACTIVITY	GET MODE	OPERATE TIME x (%) DUTY CYCLE = TAPE TIME USED	TOTAL TAPE TIME USED
UNDOCK PREP	99:13 ICS/PTT	00:13 x 100% = 00:13	00:13
POST UNDOCKING	99:26		
PDI PREP	103:11 VOX	00:39 x 63% = 00:25	00:25
POST TD (PDI+20)	103:50		
EVA 1 PLSS COMM	107:25 VOX	4:45 x 63% = 3:00	3:00
POST EVA 1	112:10		
EVA 2 PLSS COMM	127:10 VOX	4:45 x 63% = 3:00	3:00
POST EVA 2	131:55		
ASCENT COMM	136:53 ICS/PTT	00:14 x 100% = 00:14	00:14
LIFT-OFF (-) 2	137:07		
LIFT-OFF (-) 2	137:07 VOX	00:11 x 63% = 00:07	00:07
INSERTION	137:18		
INSERTION	137:18 ICS/PTT	1:10 x 100% = 1:10	1:10
ANS AFTER CSI	138:28		
LOS BEFORE TPI	139:37 ICS/PTT	1:13 x 100% = 1:13	1:13
POST DOCKING	140:50		

*REMAINING TAPE WILL BE REQUIRED IF EVA'S ARE EXTENDED

TABLE 1-9
BATTERY CHARGE SCHEDULE

GET HR:MIN	BATTERY
04:20	B
23:00	A
55:30	B
72:35	A
101:05	B
127:30	A
154:40	B
189:00	A
209:10	B

LANDMARK, LANDING SITE AND TARGET DATA

<u>Site</u>	<u>Rev</u>	<u>Latitude</u>	<u>Longitude</u>	* <u>Altitude (NM)</u>
Pickering B	2	2.097°S	7.354°E	---
H - 2	3	3.033°S	4.767°W	---
13 - 1	12,13,15 & 30	4.043°S	15.599°W	-00.179
13 - 2	----	3.606°S	15.315°W	-00.001
13 - 3	---	3.189°S	15.478°W	-00.756
13 - 4	---	3.707°S	14.012°W	-00.733
13 - 5	---	3.226°S	14.114°W	-00.853
Fra Mauro	---	3.669°S	17.484°W	-00.759
Landing Site				
Theon SR B	15	0.171°N	14.057°E	---
Taruntius O	17	2.333°N	54.317°E	---
Ldmk 130	17	1.266°N	23.679°E	---
Secchi B	18	3.833°N	41.483°E	---
Mosting A	18	3.250°S	5.283°W	---
Reamur X	29	2.917°S	0.673°W	---
Euclides F	29	6.377°S	33.707°W	---
Moltke	30	0.586°S	24.128°E	---
CP 1	44,45	6.850°N	107.150°E	---
CP 2	44,45	0.550°N	68.100°E	---
Davy Rille (DR)	44	11.163°S	7.179°W	---
CP 5	44	10.900°S	44.200°W	---
CP 3	45	8.800°S	12.517°E	---
CP 4	45	11.633°S	20.133°W	---

BOOTSTRAP PHOTO TARGETS

Censorinus	4,26,27,28	0.311°S	32.481°E	---
Descartes	41,42,43	8.858°S	15.517°E	---
Davy Rille	41,42,43	10.950°S	6.100°W	---

*Difference between landmark radius vector and mean lunar radius

Mean Lunar Radius = 1736.685 km
or 938.4935 nm

TABLE 1-11

TABLE 1-12
P23 CISLUNAR NAVIGATION

GET	SET NUMBER	STAR/HORIZON	COMMON NAME
06:00	TLC-1	33/EFH 221/ENH 76/EFH 40/ENH 42/ENH	ANTARES DELTA CAPRICORNI THETA SCORPII ALTAIR PEACOCK
31:00	TLC-2	37/EFH 221/ENH 42/EFH 45/ENH 77/EFH	NUNKI DELTA CAPRICORNI PEACOCK FOMALHAUT KAUS AUST
170:20	TEC-1	26/LFH 37/LNH 33/LNH 34/LNH	SPICA NUNKI ANTARES ATRIA
183:00	TEC-2	221/EFH 102/ENH 45/EFH 01/ENH 126/ENH * 02/ENH * 44/EFH	DELTA CAPRICORNI MIRACH FOMALHAUT ALPHERATZ GAMMA PEGASI DIPHDA ENIF
187:00	TEC-3	33/LNH 26/LFH 24/LFH 31/LFH 25/LNH * 32/LFH * 30/LNH	ANTARES SPICA GIENAH ARCTURUS ACRUX ALPHECCA MENKENT
191:00	TEC-4	221/EFH 102/ENH 45/EFH 02/ENH 126/ENH * 44/EFH * 01/ENH	DELTA CAPRICORNI MIRACH FOMALHAUT DIPHDA GAMMA PEGASI ENIF ALPHERATZ

* Alternates

TABLE 1-12 (Cont'd)

P23 CISLUNAR NAVIGATION

GET	SET NUMBER	STAR/HORIZON	COMMON NAME
195:00	TEC-5	33/LNH 26/LFH 24/LFH 31/LFH 25/LNH * 32/LFH * 30/LNH	ANTARES SPICA GIENAH ARCTURUS ACRUX ALPHECCA MENKENT
208:00	TEC-6	221/EFH 45/EFH 102/ENH 224/EFH 126/ENH * 44/EFH * 01/ENH	DELTA CAPRICORNI FOMALHAUT MIRACH MARKAF GAMMA PEGASI ENIF ALPHERATZ
212:00	TEC-7	221/EFH 102/ENH 45/EFH 01/ENH 224/EFH * 126/ENH * 44/EFH	DELTA CAPRICORNI MIRACH FOMALHAUT ALPHERATZ MARKAF GAMMA PEGASI ENIF
217:00	TEC-8	221/EFH 45/EFH 102/ENH 224/EFH 44/EFH * 126/ENH	DELTA CAPRICORNI FOMALHAUT MIRACH MARKAF ENIF GAMMA PEGASI
220:00	TEC-9	221/EFH 45/EFH 102/ENH 126/ENH 224/EFH * 44/EFH	DELTA CAPRICORNI FOMALHAUT MIRACH GAMMA PEGASI MARKAF ENIF
232:00	TEC-10	227/ENH 44/EFH 224/EFH VENUS/ENH 103/ENH * 223/EFH	BETA PERSEI ENIF MARKAF VENUS ALMACH BETA PEGASI
236:00	TEC-11	1/EFH 10/ENH VENUS/ENH * 133/ENH * 233/EFH	ALPHERATZ MIRFAK VENUS ZETA PERSEI BETA PEGASI

* Alternates

SECTION 2 - MISSION OBJECTIVES

SECTION 2

MISSION OBJECTIVES

This section contains an activity summary, reflecting the objectives for Apollo 13 as described in "Mission Requirements H-2 Type Mission". Table 2-1 provides a functional breakdown of the objectives and indicates the page in the timeline where the activity occurs. The alphanumeric listing presented in Table 2-1 is not intended to represent a priority or a sequential listing.

Details of the implemented test requirements are adequately covered in the Mission Requirements Document, the Lunar Surface Operation Plan and the Photographic and TV Operations Plan.

TABLE 2-1
MISSION OBJECTIVE/ACTIVITY
REFERENCE

NUMBER	OBJECTIVE	ACTIVITY	PAGE NO.
ALSEP	Apollo Lunar Surface Experiments Package.		
ALSEP-1	Deploy the Passive Seismic Experiment (S-031)	EVA-1	3-83
ALSEP-2	Deploy the Heat Flow Experiment (S-037)	EVA-1	3-84
ALSEP-3	Deploy the Charged Particle Lunar Environment Experiment (S-038)	EVA-1	3-84
ALSEP-4	Deploy the Cold Cathode Gauge Experiment (S-058)	EVA-1	3-84
ALSEP-5	Deploy the Lunar Dust Detector Experiment (M-515)	EVA-1	3-84
S-059	Lunar Field Geology		
S-059-1	Collect lunar surface drill stem samples.	EVA-1	3-84/85
S-059-2	Obtain three core tube samples of lunar material.	EVA-2	3-99
S-059-3	Collect a lunar environment sample of lunar surface material.	EVA-2	3-99
S-059-4	Collect a gas analysis sample of lunar surface material.	EVA-2	3-99
S-059-5	Collect a sample of lunar surface material for study of residual magnetism.	EVA-2	3-99
S-059-6	Examine, describe, photograph and collect lunar geologic samples for return to earth.	EVA-2	3-98-101
S-059-7	Study and describe field relationships (such as shape, size, range, patterns of alignment or distribution) of all accessible types of lunar topographic features.	EVA-2	3-98-101
S-080	Solar Wind Composition		
S-080-1	Conduct the Solar Wind Composition Experiment (S-080).	EVA-1/2	3-85/101
S-184	Lunar Surface Closeup Photography	EVA-2	3-98-101
B	Television Coverage		
B-1	Provide TV camera coverage of an astronaut descending to the lunar surface.	EVA-1/2 EVA-1/2	3-82/97 3-82/98
B-2	Provide TV camera coverage of an external view of the landed LM.		
B-3	Provide TV camera coverage of the lunar surface in the general vicinity of the LM.	EVA-1/2 EVA-1	3-82/98 3-83
B-4	Provide TV camera panoramic coverage of distant terrain features.	EVA-1/2	3-82/98
B-5	Provide TV camera coverage of an astronaut during lunar surface activities.	EVA-1/2	3-82/98

TABLE 2-1
MISSION OBJECTIVE/ACTIVITY
REFERENCE

NUMBER	OBJECTIVE	ACTIVITY	PAGE NO.
C	Contingency Sample Collection Provide a contingency sample for postflight scientific investigations.	EVA-1	3-82
D	Selected Sample Collection Collect rock samples and fine grained fragmental material. Collect one large rock.	EVA-1 EVA-1	3-85 3-85
E	Evaluation of Landing Accuracy Techniques Obtain data to allow a determination of the ability to land within one kilometer of a preselected lunar feature.	TOUCHDOWN	3-77
F	Photographs of Candidate Exploration Sites Obtain photographs of a selected lunar site from low altitude. Obtain stereoscopic and sequence photographs of selected Lunar sites. Obtain high resolution photographs of selected lunar sites.	REV-4 CSM SOLO BOOTSTRAP CSM SOLO BOOTSTRAP	3-62 3-96 3-122 3-98/100 3-124
G	EVA Communications System Performance Determine the effects upon communication of obstructing lunar surface features between EVC-1 and the LM.	EVA-2	3-99
H	Lunar Soil Mechanics Obtain data on lunar soil mechanical behavior. Obtain data on lunar surface characteristics relative to the mobility of men and roving vehicles. Obtain data on the lunar sub-surface characteristics relative to construction either on or within the lunar surface.	EVA-2 EVA-1/2 EVA-2	3-99 3-82/97 3-99

TABLE 2-1
MISSION OBJECTIVE/ACTIVITY
REFERENCE

NUMBER	OBJECTIVE	ACTIVITY	PAGE NO.
I-1	Dim Light Photography Obtain photographs of the solar corona using the moon as an occulting disc.	CSM SOLO	3-81/88
I-2	Obtain photographs of the zodiacal light using the moon's horizon as an occulting edge.	CSM SOLO	3-101/102
I-3	Obtain photographs of the gegenschein from lunar orbit.	CSM SOLO	3-103
I-4	Obtain photographs indicating the presence and seriousness of the contamination cloud surrounding the spacecraft.	CSM SOLO BOOTSTRAP	3/78/80 3-125
I-5	Obtain photographs of the ice particles resulting from a water dump.	TEC	3-143
I-6	Obtain photographs of the lunar limb brightening just after lunar sunset.	CSM SOLO	3-88
J-1	Selenodetic Reference Point Update Obtain lunar landmark tracking data to permit an update of the selenodetic coordinates of selected lunar reference points.	PRE DOI CSM SOLO	3-58 3-79/83/85/103/104
K-1	CSM Orbital Science Photography Obtain photographs from the CSM using the Lunar Topographic camera of lunar surface areas of prime scientific interest.	CSM SOLO BOOTSTRAP	3-81/98/99 3-124-126
K-2	Obtain photographs from the CSM using the Hasselblad reseau camera with the 80 mm lens from terminator to terminator and of lunar surface areas of prime scientific interest.	CSM SOLO BOOTSTRAP	3-96/97 3-122
K-3	Obtain photographs from the CSM using the Hasselblad camera with the 250 mm lens of lunar surface areas of prime scientific interest.	CSM SOLO BOOTSTRAP	3-79 through 104 3-122/124/126
K-4	Obtain photographs from the CSM using the 16 mm sequence camera and the T-1 (f.95) lens in earthshine of specific segments of the lunar surface.	CSM SOLO	3-83
L-1	Transearth Lunar Photography Obtain lunar photographs after TEI to permit extension of selenodetic control and mapping.	TEC	3-134-135/143

SECTION 3 - DETAILED TIMELINE

FLIGHT PLAN

TIME	EVENT	REMARKS
-00:09	LCC: <u>REPORT IGNITION</u>	CREW POSITIONS @ L/O CDR - LH COUCH CMP - CENTER COUCH LMP - RH COUCH
00:00	LCC: CDR: <u>REPORT LIFT-OFF</u>	LIFT-OFF 1313 CST APRIL 11, 1970, 72° L.A.
00:02	CDR: <u>REPORT YAW MNVR</u>	TARGETED FOR FRA MAURO
00:13	CDR: <u>REPORT ROLL AND PITCH PROGRAM</u>	
00:31	CDR: <u>REPORT ROLL COMPLETE</u>	
00:42	MCC: <u>REPORT MARK MODE IB</u>	
00:50	LMP: <u>REPORT CABIN PRESS DECREASING</u>	ALTITUDE 14,000 ft
01:25	MCC: <u>REPORT MAX Q</u>	ALTITUDE 100,000 ft
01:58	MCC: <u>REPORT MARK MODE IC</u>	
02:00	MCC: CDR: <u>REPORT GO/NO-GO FOR STAGING</u>	
02:15	CDR: <u>EDS AUTO-OFF</u> <u>REPORT INBOARD ENGINE CUTOFF</u>	
02:44	CDR: <u>REPORT OUTBOARD ENGINES CUTOFF</u>	
02:45	CDR: <u>REPORT STAGING</u>	
02:46	CDR: <u>REPORT S-II IGNITION</u>	
03:15	CDR: <u>REPORT S-II SEP LT OUT</u>	
03:21	CMP: <u>REPORT TOWER JETT</u>	
	MCC: <u>REPORT MODE II</u> CDR: <u>REPORT S/C GO/NO-GO</u>	
MISSION	APOLLO 13	EDITION FINAL (APRIL) DATE MARCH 16, 1970 PAGE 3-1

FLIGHT PLAN

TIME	EVENT	REMARKS
03:25	CDR: <u>REPORT</u> GUIDANCE INITIATE	
03:53	MCC: <u>REPORT</u> TRAJECTORY GO/NO-GO	
04:00	CMP: <u>REPORT</u> S/C GO/NO-GO	
05:00	LMP: <u>REPORT</u> S/C GO/NO-GO	
05:25	MCC: <u>REPORT</u> S-IWB TO COI CAPABILITY	
06:00	CDR: <u>REPORT</u> S/C GO/NO-GO	
06:25	MCC: <u>REPORT</u> TIME OF LEVEL SENSE ARM AND S-II CUTOFF	
07:00	CDR: <u>REPORT</u> S/C GO/NO-GO	
07:44	CDR: <u>REPORT</u> INBOARD ENGINE CUTOFF	
08:00	CDR: <u>REPORT</u> S/C GO/NO-GO	
08:30	MCC & CDR: <u>REPORT</u> S/C GO/NO-GO FOR STAGING	
09:00	MCC: <u>REPORT</u> MARK MODE IV	
09:18	CDR: <u>REPORT</u> S-II CUTOFF	
09:19	CDR: <u>REPORT</u> S-II S-IVB STAGING	
09:22	CDR: <u>REPORT</u> S-IVB IGNITION	
10:00	MCC & CDR: <u>REPORT</u> GO/NO-GO FOR ORBIT	
	MCC: <u>REPORT</u> PREDICTED SECO	
MISSION	EDITION FINAL (APRIL)	DATE MARCH 16, 1970
Apollo 13		PAGE 3-i

FLIGHT PLAN

TIME	EVENT	REMARKS
11:00	CDR: <u>REPORT</u> S/C GO/NO-GO	
11:46	CDR: <u>REPORT</u> SECO	TBS = 0
	S-IVB MAINTAINS COMMANDED CUTOFF	
	INERTIAL ATTITUDE	
SECO	MCC: <u>REPORT</u> ORBITAL GO/NO GO	INSERTION
+10 SEC		
SECO	-----	S-IVB MANEUVERS TO LH AND INITIATES
+20 SEC	-----	ORB RATE (HEADS DOWN)
SECO	-----	S-IVB INITIATES CONTINUOUS LH2
+59 SEC	VENTING (TERMINATES AT TB6 + 42.2 SEC)	
	V66-TRANSFER CSM STATE VECTOR TO LM SLOT	
	V45-RESET LUNAR SURFACE FLAG	
12:46	BDA LOS	
	INSERTION AND SYSTEMS CHECKS	
16:00	VAN LOS	
16:34	CYI AOS	
19:05	MCC UPDATE: Z TORQUING ANGLE	SYSTEM MONITORING & CHECKING POST INSERTION ECS CONFIGURATION
22:59	EARTH UMBRA	
23:40	CYI LOS	
MISSION APOLLO 13	EDITION FINAL (APRIL)	DATE MARCH 16, 1970
		PAGE 3-iii

FLIGHT PLAN

TIME	EVENT	REMARKS
	P52 IMU REALIGN OPTION 3-REFSMMAT (LAUNCH ORIENT)	CONFIGURE CAMERA FOR T&D AND S-IVB PHOTO CM2/DAC/18/CEX-BRKT, MIR (f8,250,7) 12 fps MAG A CM/EL/80/CEX-SPOT (f8,250,focus) 10 MAG L
	GDC ALIGN	UNSTOW TV CAMERA CDR INSTALL COAS CMP JETTISON OPTICS COVERS
52:17	CRO AOS DUMP DSE REPORT GYRO TORQUING ANGLES	LMP HOLDS CAMERA P52 N71: _____, _____ N05: _____ • _____ N93: X _____ ; _____ Y _____ ; _____ Z _____ ; _____ GET: _____ : _____ ; _____
58:07	CRO LOS	MARCH 16, 1970
MISSION	APOLLO 13	PAGE 3-iV
EDITION	FINAL (APRIL)	DATE

FLIGHT PLAN

LIFT-OFF CREAMER POSITIONS
 LEFT COUCH - CDR
 CENTER COUCH - CMP
 RIGHT COUCH - LMP
 AT SEC0+20 SEC, S-IVB
 MNVRs TO LH AND
 INITIATES ORB RATE
 (HEADS DOWN)

NOTES

LIFT-OFF APRIL 11, 1970 LAUNCH OPERATIONS CHECKLIST

MCC-H 1313 CST

00:00

M S F N C Y I

:10

Z TORQUING ANGLE

:20

00:30

P52 - IMU REALIGN
 OPTION 3 - REFSMMAT
 (LAUNCH ORIENT)
GDC ALIGN

:40

SET UP CAMERA EQUIPMENT

:50

REPORT GYRO TORQUING ANGLES

C R O X

01:00

DUMP DSE

P52 IMU REALIGN

N71: _____, _____
 N05: _____, _____
 N93: _____

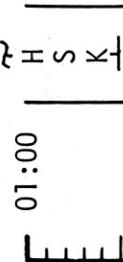
X _____, _____
 Y _____, _____
 Z _____, _____
 GET _____; _____

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	00:00 - 01:00	1/E.O.	3-1

FLIGHT PLAN

MCC-H

1413 CST



:10

:20

DUMP DSE

SCS ATT REF COMPARISON CK
EXTEND DOCKING PROBE

01:30

UPLINK TO CM
CSM S.V. & V66
UPDATE TO CSM
TLI PAD
TLI +90 MIN
ABORT PAD
P37 (L/0+8) PAD
GO/NO-GO FOR PYRO
ARM

:40

M
S
F
N

01:00 - 02:00

GO/NO-GO FOR PYRO ARM (CUE MSFN)
LOGIC ON

TLI PREPARATION CHECKLIST
GDC ALIGN
PYRO ARM

:50

02:00

AS A GENERAL RULE,
EXCEPT DURING TEC,
UPLINK THE STATE
VECTOR TO THE CSM
SLOT AND TRANSFER
IT VIA V66 TO THE
LM SLOT IN ORDER TO
HAVE REDUNDANT STATE
VECTORS ONBOARD

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	01:00 - 02:00	1/E.O.	3-2

MSC Form 29 (May 69)

FLIGHT PLANNING BRANCH

FLIGHT PLAN

TL1
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC SHUTDOWN	+45° SHUTDOWN	BT + 6 SEC & $V_i = \text{PAD VALUE}$	NO TRIM

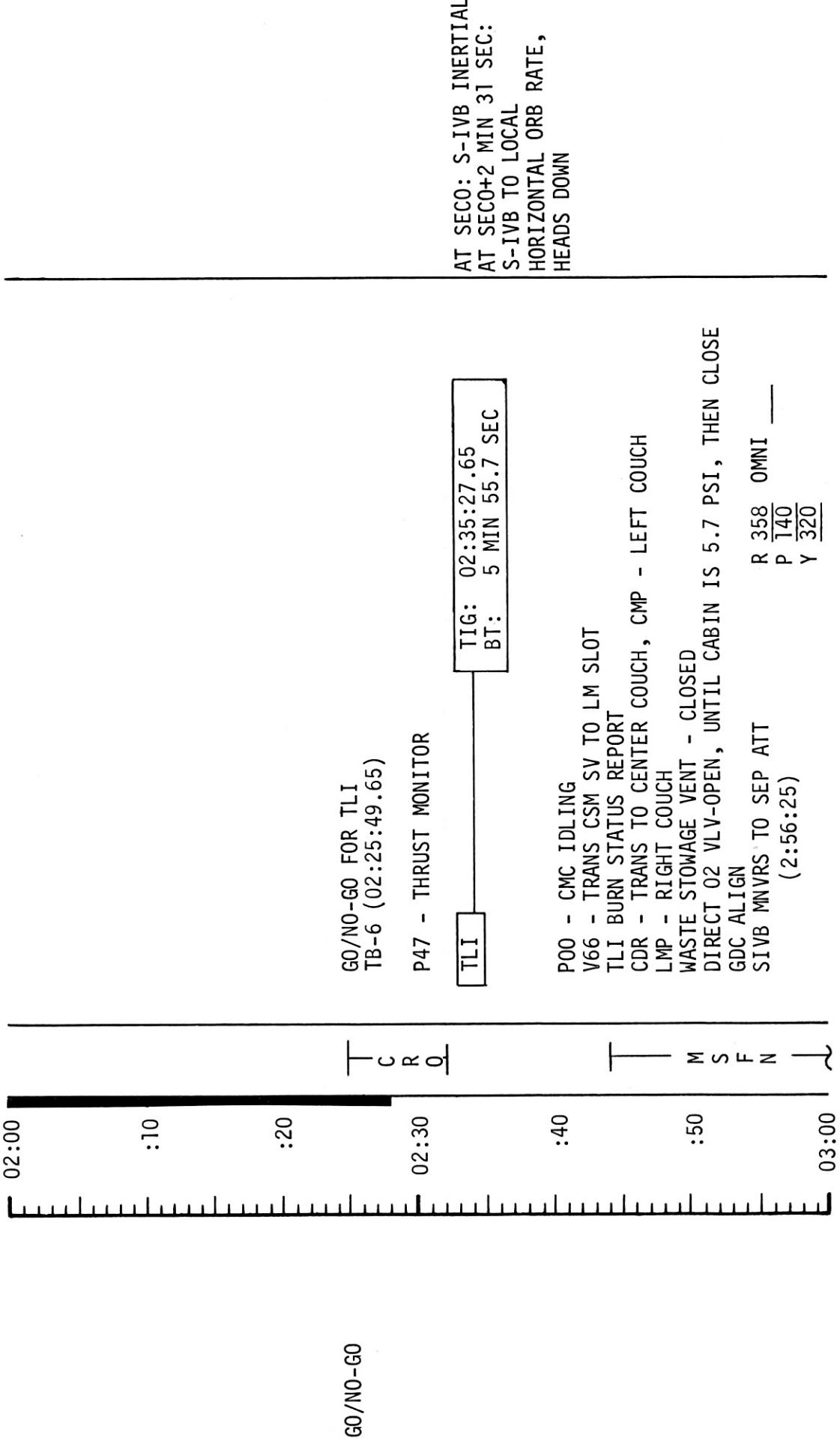
TABLE 3-1
3-2A

FLIGHT PLAN

1513 CST

MCC-H

NOTES



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	02:00 - 03:00	1/TLC	3-3

MCC-H

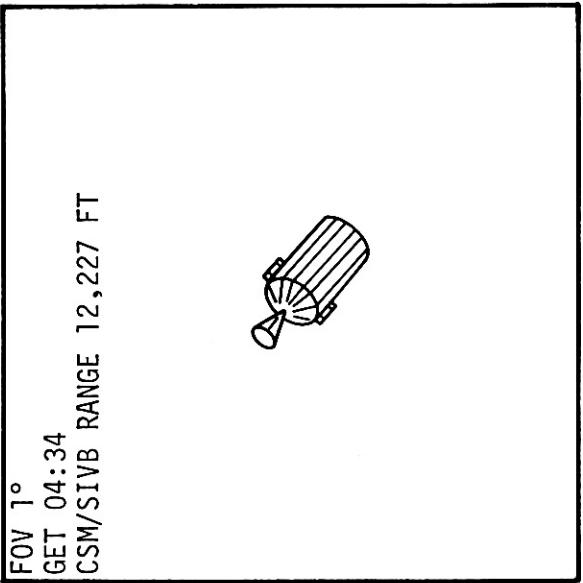
FLIGHT PLAN

1613 CST

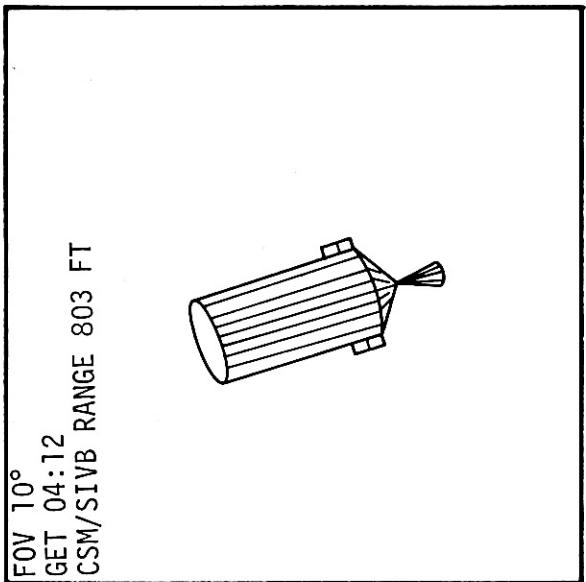
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	03:00 - 04:00	1/TLC	3-4

NOTES

GO/NO GO FOR T & D		03:00	ACTIVATE AND LOAD DAP N46 (11103, 01111) LOAD DOCKING GIMBAL ANGLES CSM SEP PREPARATION	T&D MNVR +X FOR 3 SEC ($\Delta V \sim 0.5$ FPS), AFTER 15 SEC PITCH UP AT 2.0°/SEC. V49 AUTO MNVR TO DOCKING ATT. NULL TRANSLATION AND RATES, +X FOR 4 SEC ($\Delta V \sim 0.7$ FPS)	
CSM/SIVB SEP GET:03:06)				CAMERA SETTINGS FOR TRANSPOSITION/DOCKING: CM2/DAC/18/CEX-BRKT, MIR(f8,250,7)12fps, 0.7 MAG (5 MIN) MAG A CM/EL/80 CEX - SPOT (f8,250,FOCUS)10,MAG L	
CSM MNVR TO DOCK ATT (03:10) HGA TRACK - REACQ HGA BEAM - WIDE DAP 11102 TV (GDS) 03:15 TO 04:23 CM4/TV - PEAK, BRKT (f 22) VISUALLY INSPECT AND PHOTOGRAPH SIVB AND LM				CAMERA SETTINGS FOR LM EJECTION: CM 2/DAC/18/CEX - BRKT, MIR (f8,250,7) 6 fps, 0.3 MAG (5 MIN) MAG A	
DOCK GET: 03:16				TIG: 04:01 BT: 3 SEC AVR: 0.4 FPS ULLAGE: N/A ORBIT: N/A	
BEGIN CSM/LM CABIN PRESSURE EQUALIZATION				CSM/LM EJECTION	
CDR:CONFIGURE FOR LM EJECTION				SPRING ACTUATOR $\Delta V \sim 0.8$ FPS. 5 SEC AFTER EJECTION THERE IS A 4 JET RCS -X TRANSLATION FOR 3 SEC ($\Delta V \sim 0.4$ FPS). TOTAL $\Delta V \sim 1.2$ FPS.	
TUNNEL PRESSURE INTEGRITY CHECK					
REMOVE AND TEMPORARILY STOW TUNNEL HATCH					
CHECK DOCKING LATCHES					
VENT DOCKING PROBE					
LM UMBILICAL CONNECTION					
REINSTALL TUNNEL HATCH					
LM TUNNEL VENT VL LM/CM AP					
LEAVE TUNNEL EQUALIZATION VALVE CLOSED					
CYCLE O ₂ & H ₂ FANS					
S-IVB NON PROPULSIVE VENT START (GET: 03:41)					
GO/NO-GO PYRO ARM (CUE MSFN)					
LOGIC ON					
LOAD DAP N46 (21101, 11111)					
PYRO ARM					
P47 - THRUST MONITOR					
PHOTOGRAPH LM EJECTION					
S-IVB VENT COMPLETE (GET: 03:56)					
CSM/LM EJECTION					

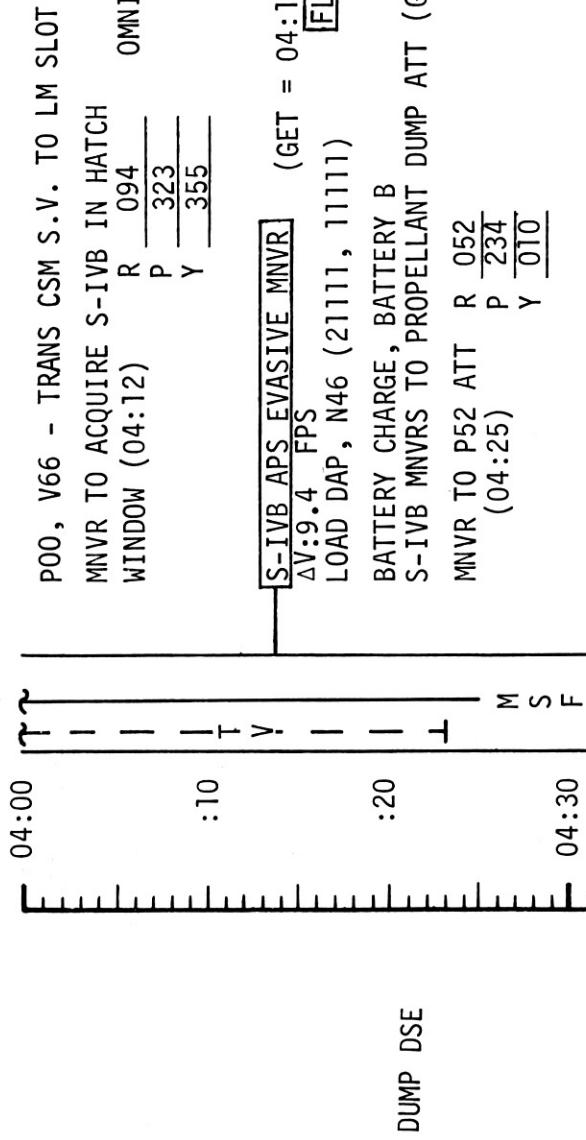


3-4A



MCC-H**FLIGHT PLAN**

1713 CST

**NOTES**

THE S-IVB 80° YAW MNVR IS PLANNED FOR LM EJECTION +3 MIN. THE MNVR WILL NOT BE STARTED UNTIL CREW REPORTS GOOD EJECTION. THE S-IVB EVASIVE MNVR WILL NOT BE STARTED UNTIL THE CREW HAS THE S-IVB IN SIGHT.

NOTE: DURING TLC

LOX DUMP ΔV
= 28.1 FPS

S/C INTERIOR PHOTOGRAPHY AT CREW OPTION

CM/DAC/5/CIN-
SPOT (f2.8, 60, fixed)
6 fps, 1 mag MAG J

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	04:00 - 05:00	1/TLC	3-5

FLIGHT PLAN

MCC-H

1813 CST
05:00

:10

UPLINK TO CSM
DESIRED ORIENTATION
(PTC)
ZERO TRUNION BIAS

:20

05:30

P52 - IMU REALIGN
OPTION 1 - PREFERRED
(PTC ORIENT)
GYRO TORQUE

STARS _____,
SA _____,
TA _____,

REPORT GYRO TORQUING ANGLES

GDC ALIGN

:50

UPDATE TO CSM
P37 PAD (L70+15)

VHF A SIMPLEX - OFF
VERIFY WASTE STOWAGE VENT VALVE - VENT

06:00

PREPARE FOR LAUNCH VEHICLE
SYSTEMS PERFORMANCE
DEBRIEFING AT 25 HRS.
SEE QUESTIONS ON PAGE 3-21

P52 IMU REALIGN
N71: _____, _____
NO5: _____, _____
N93: X _____.
Y _____.
Z _____.
GET _____; _____; _____

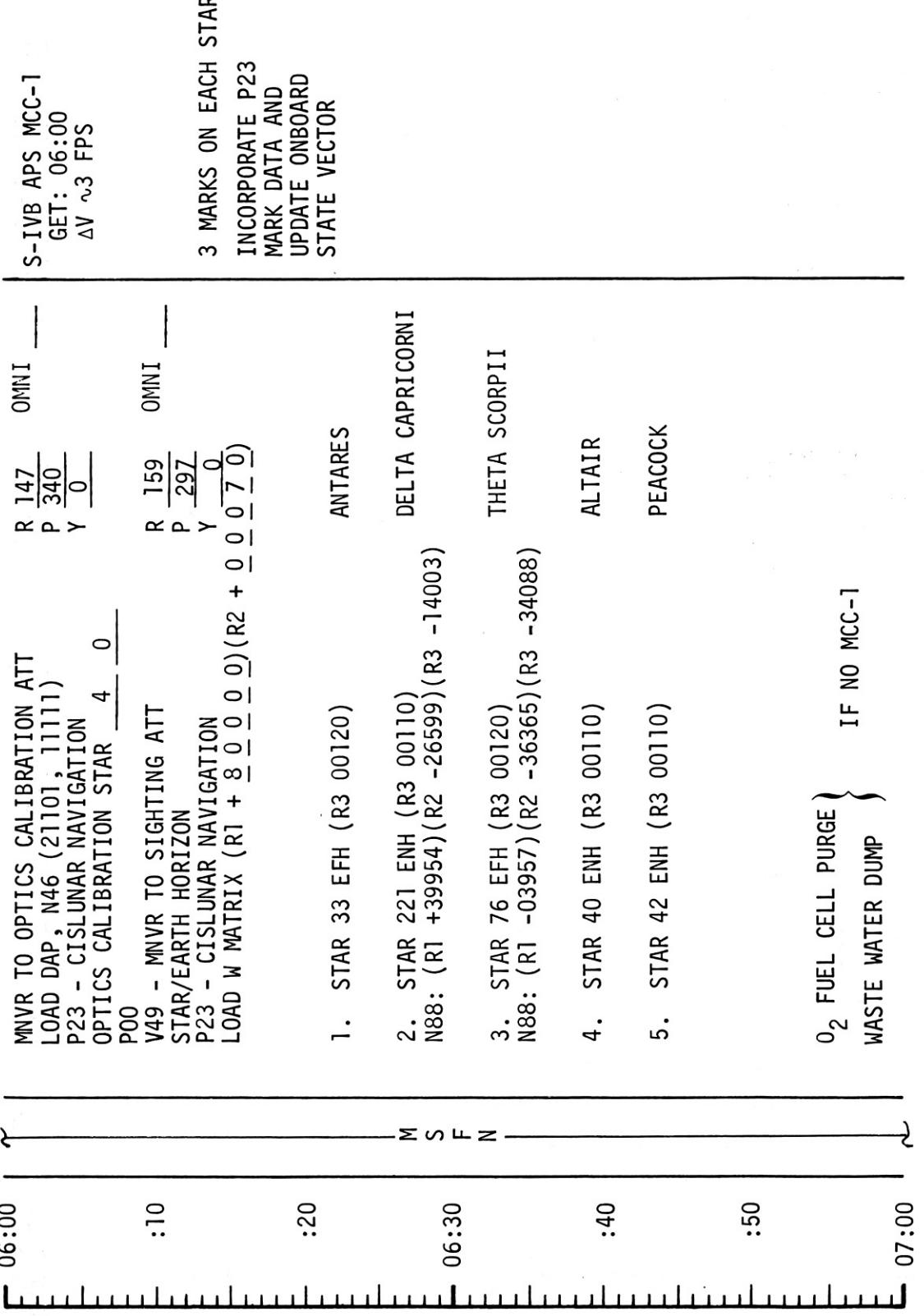
P 37 PAD ASSUMES
NO MCC-1

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	05:00 - 06:00	1/TLC	3-6

MCC-H

1913 CST

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	06:00 - 07:00	1 / TLC	3-7

FLIGHT PLAN

MCC-H

2013 CST

:07:00 UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

:10 RECORD PHOTO
TIMES ON CREW
MARK.

MINVR TO PTC ATTITUDE
PREPARE FOR EARTH WEATHER
CM /EL/250/CEX - RING
($\frac{fTT}{250}, \infty$) 10

MAG L
FRAME

P 90
Y 0

EAT PERIOD

:07:30

:40

08:00

PTC

P 90, Y 0

M S F N

EARTH
WEATHER
PHOTOGRAPHY

GO TO PTC ATTITUDE
AND NULL RATES TO
+ 0.5° DB. DISABLE
TWO ADJACENT QUADS.
MONITOR FOR 20 MIN-
UTES THEN SELECT
+ 30° DB AND 0.3° /SEC
RATE, THEN DISABLE
THE REMAINING QUADS
AFTER SPIN UP.

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	07:00 - 08:00	1/TLC	3-8

2113 CST

FLIGHT PLAN

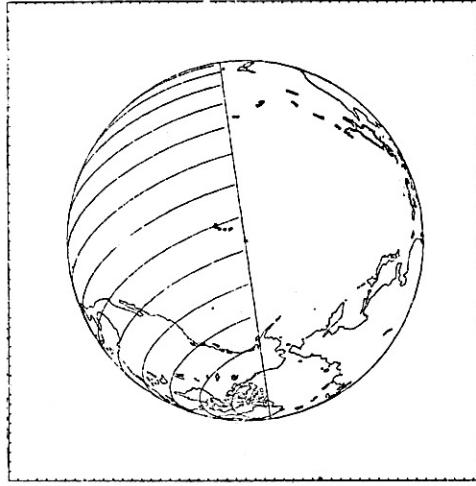
MCC-H

NOTES

DEACTIVATE PRIMARY EVAPORATOR
GLY EVAP H2O FLOW - OFF (CTR)
GLY EVAP STM PRESS AUTO - MAN
GLY EVAP STM PRESS INCR - INCR FOR 1 MIN

:10 SELECT NORMAL LUNAR COMM EXCEPT:
S-BD AUX TAPE - OFF
TAPE RCDR FWD - OFF

GET 8 HRS F.O.V. 11°



08:00

T

08:30

M

:20

S

:40

F

:50

N

09:00

PTC
P 90, Y 0
EARTH WEATHER PHOTOGRAPHY

LiOH CANISTER CHANGE
(3 INTO A, STOW 1 IN B5)

S-IVB MCC-2 APPROX
09:00 GET, ΔV IS
NOMINALLY ZERO

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	08:00 - 09:00	1/TLC	3-9

MCC-H

FLIGHT PLAN

2213 CST

09:00

:10

:20

09:30

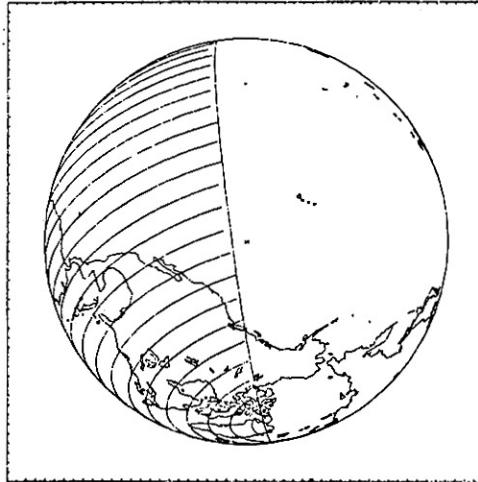
W S F N

:40

:50

10:00

GET 10 HRS F.O.V. 10°



PTC
P 90, Y 0
EARTH
WEATHER
PHOTOGRAPHY

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	09:00 - 10:00	1/TLC	3-10

FLIGHT PLAN

2313 CST

MCC-H

10:00 EMS ACCEL NULL BIAS TEST (REPORT)

UPLINK TO CSM
CSM S.V. & V66
MCC-1 TGT LOAD

:10

:20

10:30

CONTINUE EARTH WEATHER
PHOTOGRAPHY TO 11:30 IF MCC-1
IS NOT PERFORMED

M S F N

UPDATE TO CSM
MCC-1 MNVR PAD

:40

:50

11:00

P52 - IMU REALIGN
OPTION 3 REFSMMAT
(PTC ORIENT)

REPORT GYRO TORQUING ANGLES
CONTINUE PTC IF MCC-1 IS NOT PERFORMED

NOTES

EARTH
WEATHER
PHOTOGRAPHY

PTC
P 90, Y 0

P52 IMU REALIGN

N7: —,—,—
NO5: —,—,—
N93:
X —,—,—
Y —,—,—
Z —,—,—
GET —,—,—;

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	10:00 - 11:00	1/TLC	3-11

FLIGHT PLAN

MCC-1
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	±10° TAKEOVER	BT + 1 SEC	IF<2FPS, TRIM X AXIS TO 0.2FPS IF>2FPS, NO TRIM

TABLE 3-2
3-11A

FLIGHT PLAN

NOTES

BURN STATUS REPORT									
X	X								ΔTIG
X	X								BT
									V gx
									R
									P
									Y
									Y gx
									Y gy
									Y gz
									ΔY^C
									FUEL *
									OX *
									UNBAL

MCC-1

11:00

P30 - EXTERNAL ΔV

:10

V49 - MNVR TO BURN ATT
P40/41 - SPS/RCS THRUST
SXT STAR CHECK

:20

O_2 FUEL CELL PURGE } IF NOT PERFORMED
WASTE WATER DUMP } AT 06:55

GDC ALIGN

11:30

M S F N

TIG:	11:41:25
BT:	NOM. ZERO
ΔVR :	NOM ZERO
ULLAGE:	NONE
ORBIT:	N/A

MCC-1

V66 - TRANSFER CSM SV TO LM SLOT
MCC-1 BURN STATUS REPORT

:50

REPORT: $LM/CM \Delta P$
WASTE STOWAGE VENT VLV - CLOSE ($\Delta 8$ HRS FROM VENT)
VENT BATTS UNTIL SYSTEM TEST METER ($4A$) = 0

12:00

*ITEMS TO BE
REPORTED TO MSFN
MCC-1 WILL BE
DELAYED TO MCC-2
IF PROPELLANT COST
IS NOT PROHIBITIVE

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	11:00 - 12:00	1/TLC	3-12

FLIGHT PLAN

0113 CST

MCC-H

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

12:00 MNVR TO PTC ATT P 90
Y 0

START PTC

:10

:20

12:30

UPDATE TO CSM
P37 PADS (L/0 +
25, 35, 45 & 60)

:40

:50

13:00

PRESLEEP CHECKLIST

NOTES

ONBOARD READOUT	
BAT C	
PYRO BAT A	
PYRO BAT B	
RCS A	
B	
C	
D	
DC IND SEL - MNA OR B	

PTC
P 90, Y 0

EAT PERIOD

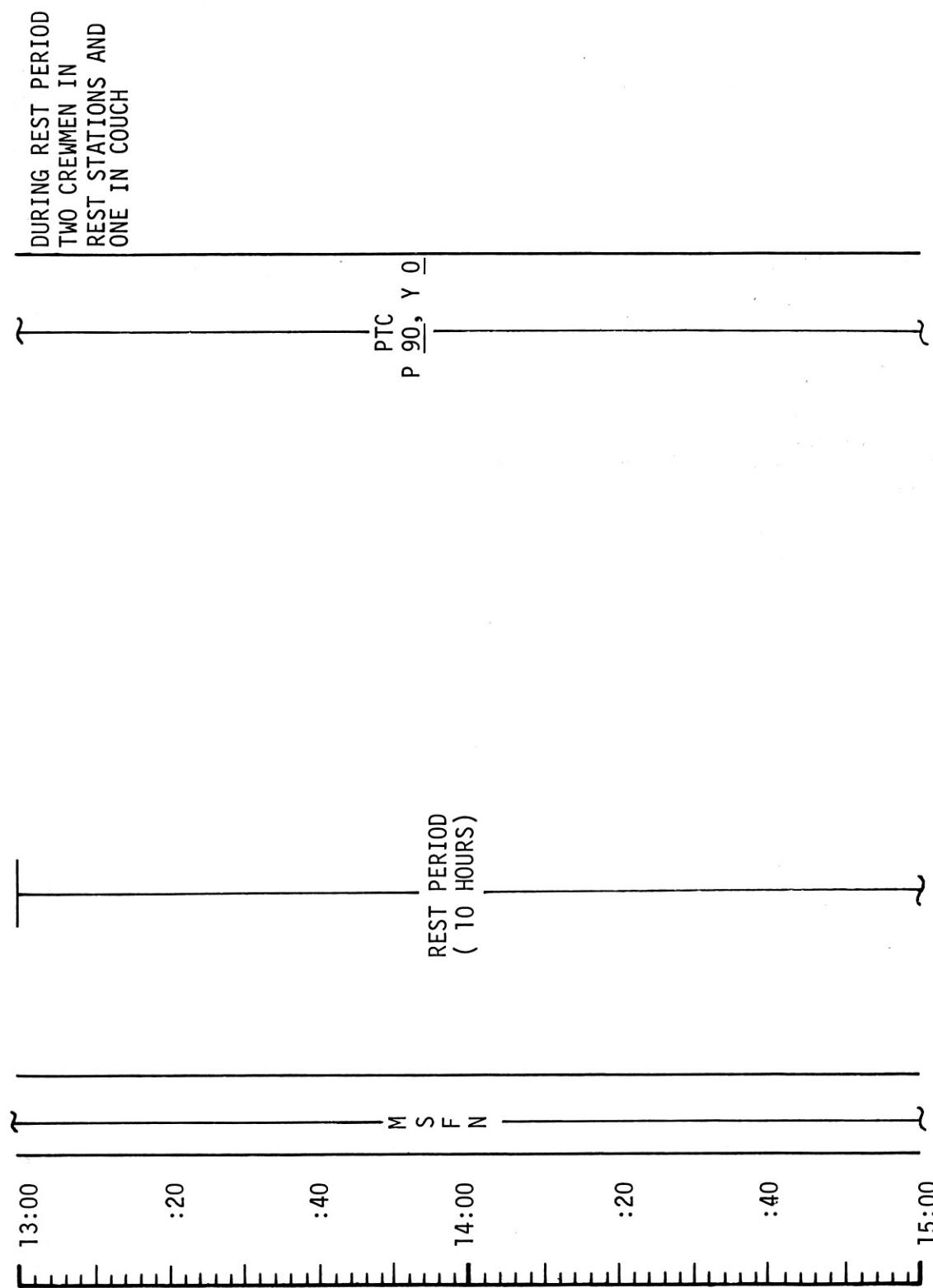
N S F N

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	12:00 - 13:00	1/TLC	3-13

MCC-H

FLIGHT PLAN

0213 CST



NOTES

DURING REST PERIOD
TWO CREWMEN IN
REST STATIONS AND
ONE IN COUCH

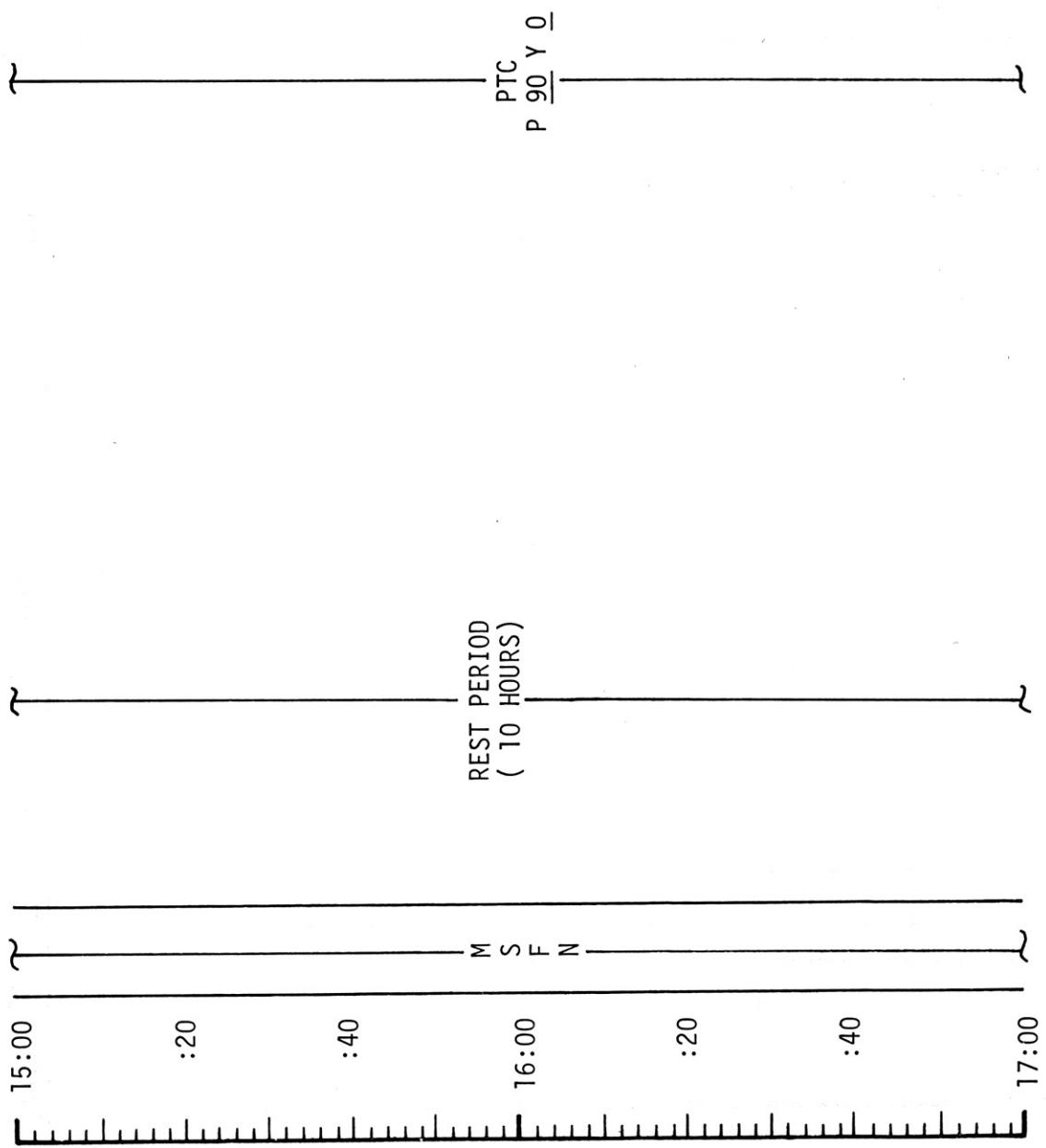
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	13:00 - 15:00	1/TLC	3-14

FLIGHT PLAN

0413 CST

MCC-H

NOTES



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	15:00 - 17:00	1/TLC	3-15

MCC-H

FLIGHT PLAN

0613 CST

17:00

:40

:40

18:00

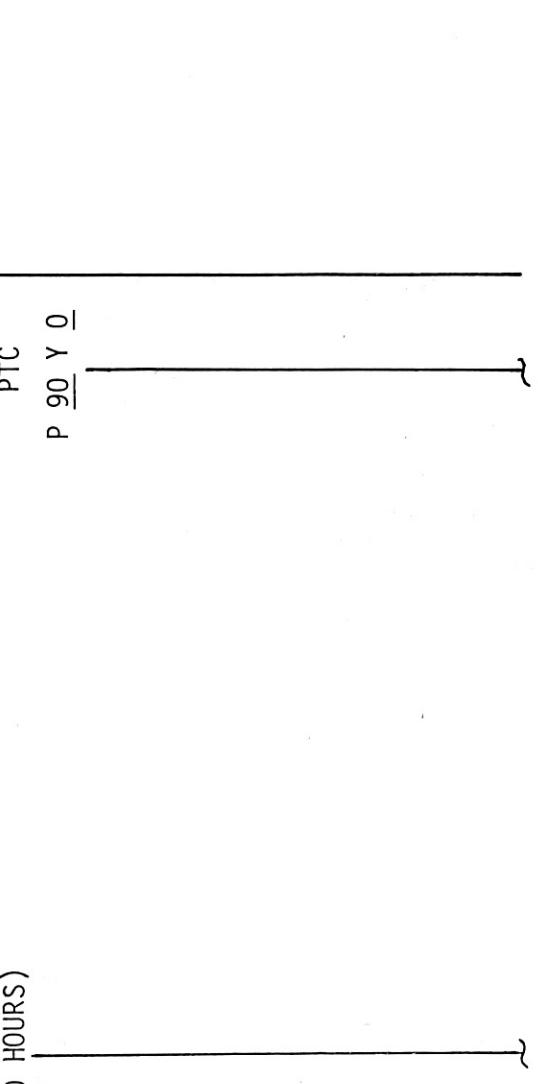
REST PERIOD
(10 HOURS)

:20

:40

19:00

M S F N



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	17:00 - 19:00	1/TLC	3-16

MCC-H

FLIGHT PLAN

0813 CST

19:00

:20

:40

20:00

:20

:40

21:00

19:00

M S F N

REST PERIOD
(10 HOURS)

PTC
P 90 Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	19:00 - 21:00	1/TLC	3-17

MCC-H

FLIGHT PLAN

1013 CST

21:00

:20

:40

22:00

REST PERIOD
(10 HOURS)

:20

:40

23:00

M S F N

PTC
P 90 Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	21:00 -23:00	1/TLC	3-18

1213 CST

FLIGHT PLAN

MCC-H

UPDATE TO CSM
CONSUMABLES
FLIGHT PLAN

23:00

POSTSLEEP CHECKLIST

LIOH CANISTER CHANGE
(4 INTO B, STOW 2 IN B5)

:10

BATTERY CHARGE, BATTERY A

:20

23:30

:40

:50

24:00

EAT PERIOD

M
S
F
N

REPORT LM/CM ΔP

NOTES

CSM CONSUMABLES UPDATE
GET: _____ : _____
RCS TOTAL _____
QUAD A _____ B _____
C _____ D _____
H₂ TOTAL _____
O₂ TOTAL _____

PTC

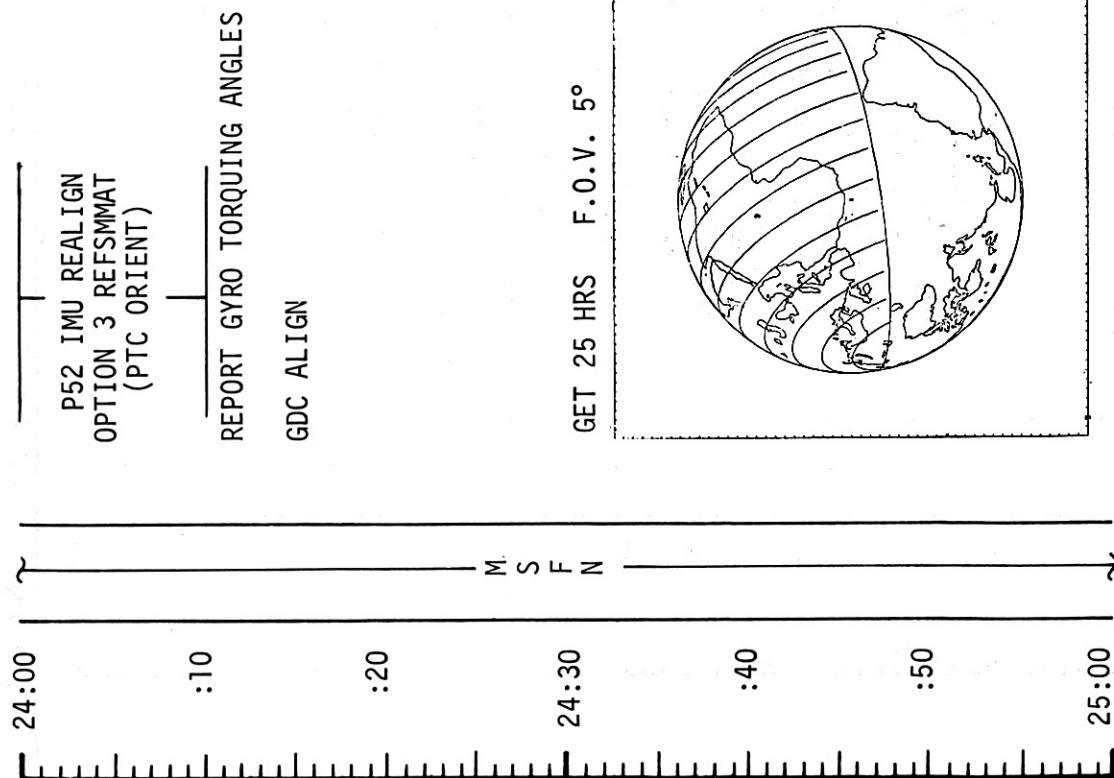
P 90, Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	23:00 - 24:00	2/TLC	3-19

MCC-H

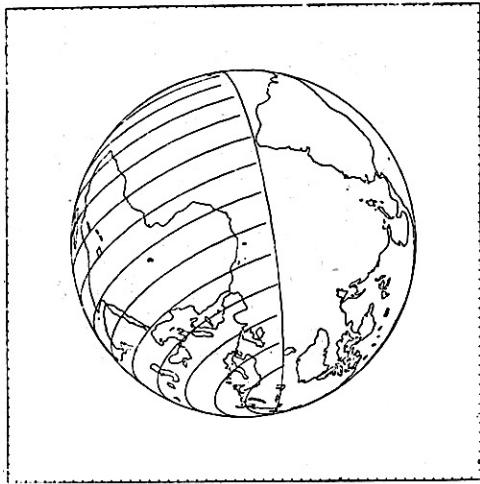
FLIGHT PLAN

1313 CST



NOTES

P52 IMU REALIGN
N71: _____, _____
N05: _____, _____.
N93: _____
X _____.
Y _____.
Z _____.
GET _____; _____;



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	24:00 - 25:00	2/TLG	3-20

FLIGHT PLAN

1413 CST

LAUNCH VEHICLE DEBRIEFING

LAUNCH VEHICLE SYSTEMS PERFORMANCE DEBRIEFING

25:00

1. Were there any significant changes in noise level between stages of powered flight?

2. Were there any significant changes in noise/vibration level during a single stage of powered flight?

3. Were there any unexpected acceleration transients experienced at initiation of IGN, SII CEZO, MAX Q or M/R shift for both SII and S-IVB?

4. After SC separation, describe the conditions of the IU thermal shroud. Was there any looseness? P PTC
P 90, Y 0

5. How was ground/SC comm at ignition/liftoff time region relative to vibration and acoustic environments?

6. Describe any visible venting or suspected leak after separation.

7. When, and at what distance, was the S-IVB seen for the last time?

8. Are there any comments relative to S-IVB/IU TLI guidance cutoff conditions (predicted vs actual SC display)?

:10

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25:30

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26:00

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MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	25:00 - 26:00	2/TLG	3-21

MCC-H

FLIGHT PLAN

1513 CST

26:00

:20

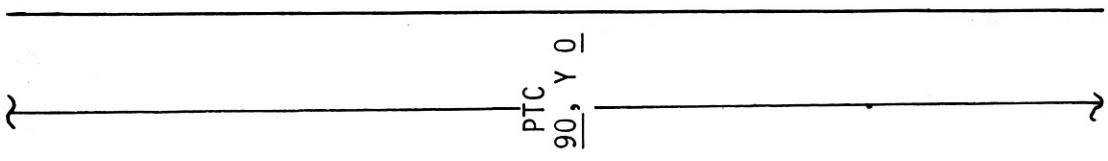
:40

27:00

:20

:40

28:00



FLIGHT PLAN

NOTES

M S F N

PTC
P 90, Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	26:00 - 28:00	2/TLC	3-22

FLIGHT PLAN

1713 CST

MCC-H

NOTES

:20

:40

29:00

:40

30:00

UPLINK TO CSM
CSM S.V. & V66
MCC-2 TGT LOAD

UPDATE TO CSM
GO/NO-GO MCC-2
MCC-2 MNVR PAD

EAT PERIOD

P52 - IMU REALIGN
OPTION 3 - REFSMMAT
(PTC ORIENT)

REPORT GYRO TORQUING ANGLES
STOP PTC
EMS ACCEL NULL BIAS TEST (REPORT)
 H_2 PURGE LINE HTRS ON
P30 EXTERNAL ΔV

V49 - MNVR TO BURN ATT

R _____
P _____
Y _____

HGA
P
Y

PTC
P90,

P52 IMU REALIGN

N71: _____, _____
N05: _____.
N93:
X _____.
Y _____.
Z _____.
GET _____: _____;

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	28:00 - 30:00	2/TLC	3-23

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FLIGHT PLAN

MCC-2
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+10° TAKEOVER	BT + 1 SEC	IF < 2FPS, TRIM X AXIS TO 0.2FPS IF > 2FPS, NO TRIM

TABLE 3-3
3-23 A

MCC-H

FLIGHT PLAN

1913 CST

30:00

P40 - SPS THRUST
SXT STAR CHECK

:10

TV (GDS) 30:15 T0 30:45
CM4/TV-AVG (f5.6)

H₂ & O₂ FUEL CELL PURGE

WASTE WATER DUMP

H₂ PURGE LINE HEATERS - OFF

:20

30:30

GDC ALIGN

TLI CUTOFF
+ 28 HRS

:40

MCC-2

V66 - TRANSFER CSM SV TO LM SLOT

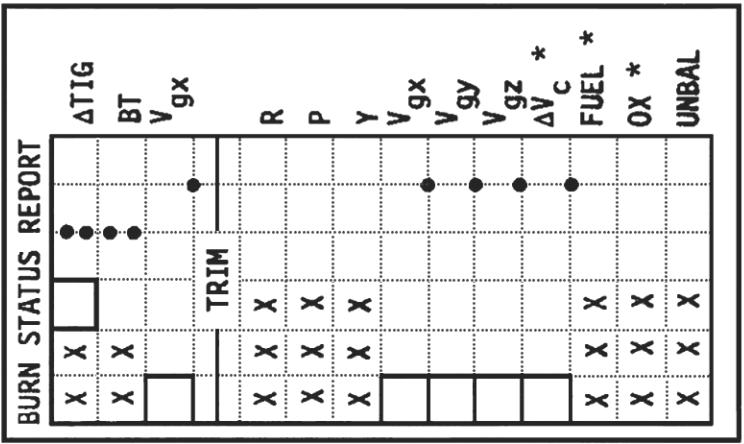
MCC-2 BURN STATUS REPORT

:50

ATTITUDE FOR MCC-2
BURN IS CONSTRAINED
IN ROLL FOR HGA
ACQUISITION FOR TV
AND BY SXT STAR CHECK

*ITEMS TO BE
REPORTED TO MSFN

TIG: 30:40:49
BT: 2.2 SEC
△VR: 15.1 FPS
ULLAGE: - NONE
ORBIT: N/A



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	30:00 - 31:00	2/TLC	3-24

MCC-H**FLIGHT PLAN**

2013 CST

MNVR TO OPTICS CALIBRATION ATT R 147
 P23-CISLUNAR NAVIGATION P 340
 OPTICS CALIBRATION Y 0
 STAR 4 0

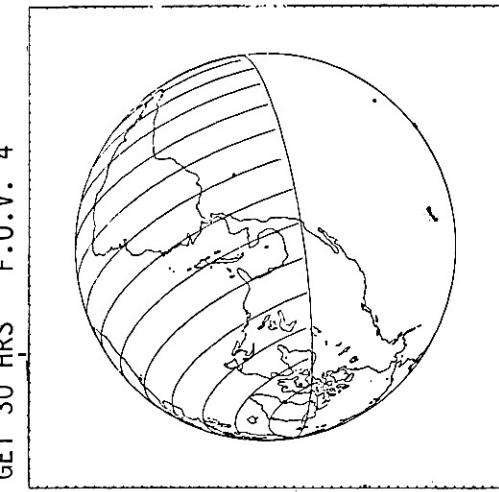
P00
 :10
 V49 - MNVR TO SIGHTING ATT R 136
 STAR/EARTH HORIZON P 307
 P23 - CISLUNAR NAVIGATION Y 0
 LOAD W MATRIX (R1 + 4 5 0 0) (R2 + 0 0 0 6)
 1. STAR 37 EFH (R3 00120) NUNKI

2. STAR 221 ENH (R3 00110) DELTA CAPRICORNI
 N88: (R1 +39954)(R2 -26599)(R3 -14003)

3. STAR 42 EFH (R3 00120) PEACOCK

4. STAR 45 ENH (R3 00110) FOMALHAUT

5. STAR 77 EFH (R3 00120) KAUS AUST
 N88: (R1 +03986)(R2 -41062)(R3 -28249)



GET 30 HRS F.O.V. 4°

31:00

M

S

F

N

-

:10

:20

31:30

:40

:50

32:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	31:00 - 32:00	2/TLC	3-25

MCC-H
UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

FLIGHT PLAN

2113 CST

32:00

MANEUVER TO PTC ATTITUDE
START PTC

S-BAND ANT - OMNI B ON MCC CUE

SECURE HGA

HGA TRACK - MAN

HGA PITCH -52°

HGA YAW $\frac{270^\circ}{}$

CHECK BAT VENT (TEST METER 4A)

:10

:20

M

S

F

N

32:30

:40

:50

33:00

PTC
P 90 Y 0

NOTES

UPDATES TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

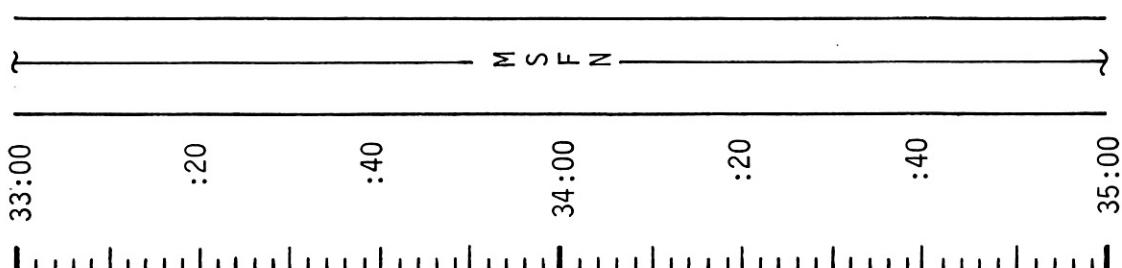
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	32:00 - 33:00	2/TLC	3-26

MCC-H

2213 CST

FLIGHT PLAN

NOTES



UPDATE TO CSM
LOI MINUS 5 HR
FLYBY

LOI MINUS 5 HR
FLYBY IS A
CIRCUMLUNAR
TRAJECTORY TO THE
PRI MPL AND
WITH A PERILUNE
BETWEEN 60 AND
1500 NM.

PTC
P 90 Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	33:00 - 35:00	2/TLC	3-27

MCC-H

FLIGHT PLAN

0013 CST

35:00

LiOH CANISTER CHANGE
(5 INTO A, STOW 3 IN B5)

:20

:40

M S F N

36:00

:20

:40

37:00

UPLINK TO CSM
CSM S.V. & V66

REPORT LM/CM ΔP

PTC
P 90 Y 0

EAT PERIOD

PRESLEEP CHECKLIST

NOTES

ONBOARD READOUT	
BAT C	_____
PYRO BAT A	_____
PYRO BAT B	_____
RCS A	_____
B	_____
C	_____
D	_____
DC IND SEL	- MNA OR B

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	35:00 - 37:00	2/TLC	3-28

MCC-H

FLIGHT PLAN

0213 CST

37:00

:20

:40

38:00

:20

:40

39:00

REST PERIOD
(10 HOURS)

PTC
P 90 Y 0

DURING REST PERIOD
TWO CREWMEN IN
REST STATIONS AND
ONE IN COUCH

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	37:00 - 39:00	2/TLC	3-29

MCC-H

FLIGHT PLAN

0413 CST

39:00

:20

:40

40:00

REST PERIOD
(10 HOURS)

M S F N

:20

:40

41:00

PTC
P 90 Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	39:00 - 41:00	2/TLC	3-30

MCC-H

FLIGHT PLAN

0613 CST

41:00 :20

:40

42:00

:20

:40

43:00

REST PERIOD
(10 HOURS)

PTC
P 90 Y 0

M S F N

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	41:00 - 43:00	2/TLC	3-31

MCC-H

0813 CST

FLIGHT PLAN

NOTES

43:00

:20

:40

44:00
M S F N

:20

:40

45:00

REST PERIOD
(10 HOURS)

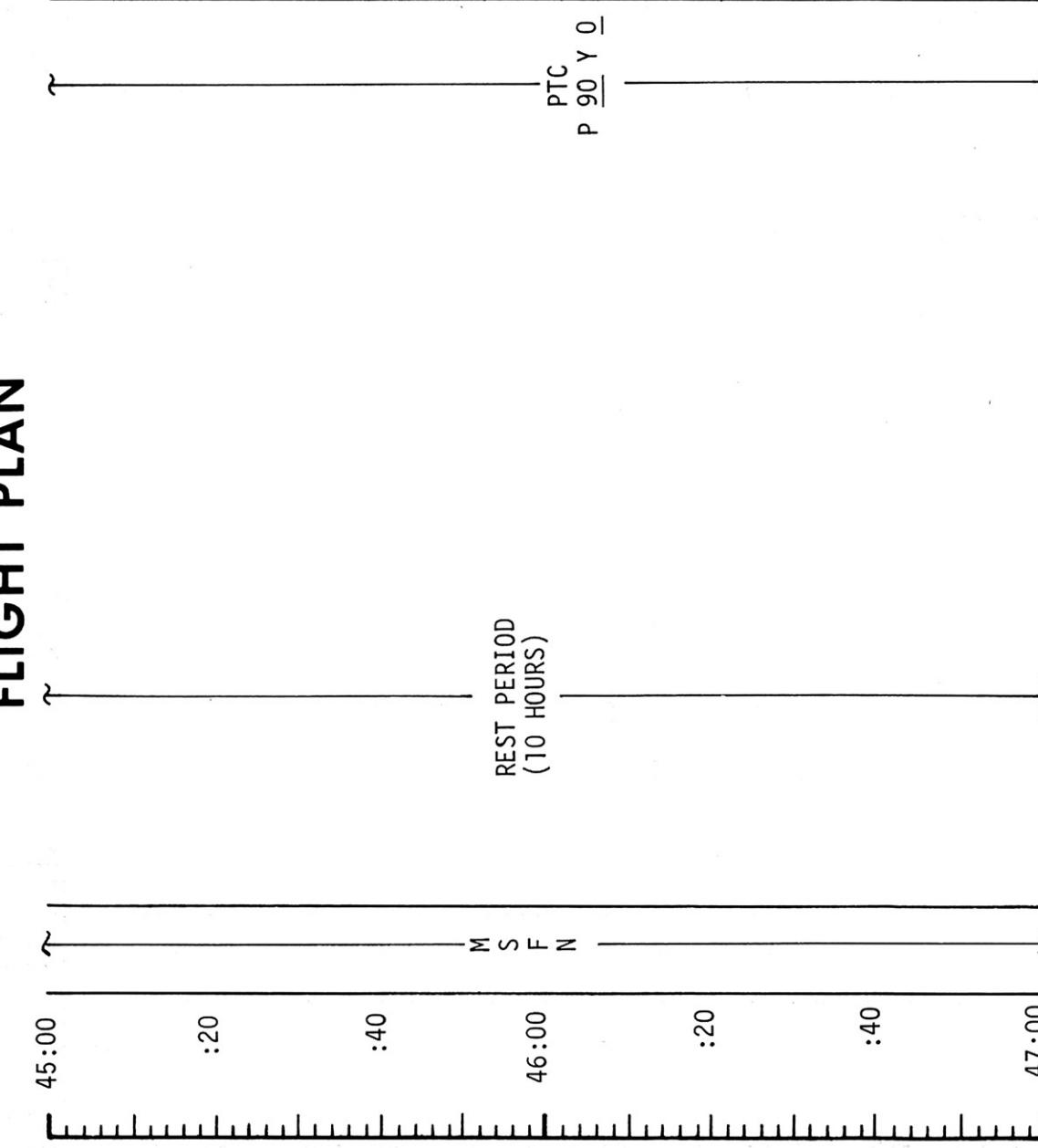
PTC
P 90 Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	43:00 - 45:00	2/TLG	3-32

MCC-H

FLIGHT PLAN

1013 CST



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	45:00 - 47:00	2/TLC	3-33

MCC-H

1213 CST

FLIGHT PLAN

NOTES

UPDATE TO CSM
CONSUMABLES
FLIGHT PLAN

CSM CONSUMABLES UPDATE	
GET:	_____ ; _____
RCS TOTAL	_____
QUAD A	_____ B _____
C	_____ D _____
H ₂ TOTAL	_____
O ₂ TOTAL	_____

POST SLEEP CHECKLIST

47:00

:20

EAT PERIOD

:40

LiOH CANISTER CHANGE
(6 INTO B, STOW 4 IN B5)

REPORT LM/CM ΔP

48:00

M S F N

:20

:40

49:00

PTC
P 90 Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	47:00 - 49:00	3/TLC	3-34

MCC-H

FLIGHT PLAN

1413 CST

49:00 T
P52 - IMU REALIGN
OPTION 3 - REFSMMAT
(PTC ORIENT)

:20 REPORT GYRO TORQUING ANGLES

GET 50 HRS F.O.V. 3°



:40

50:00 M S F N

:20

:40

51:00 ~

P52 IMU REALIGN

N71: _____, _____

N05: _____, _____

N93: _____, _____

X _____, _____

Y _____, _____

Z _____, _____

GET _____; _____

PTC
P 90 Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	49:00 - 51:00	3/TLC	3-35

MCC-H

FLIGHT PLAN

1613 CST

51:00

:20

:40

M S F N

52:00

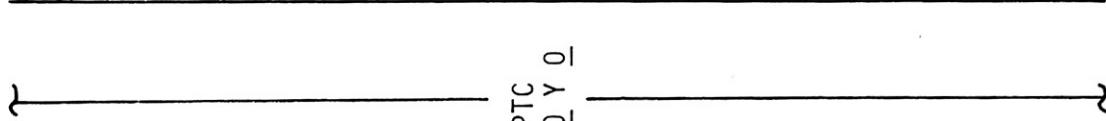
:20

EAT PERIOD

:40

53:00

PTC
P 90 Y 0

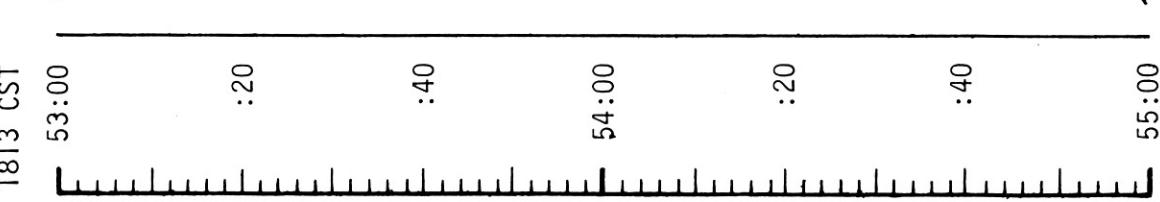


NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	51:00 - 53:00	3/TLC	3-36

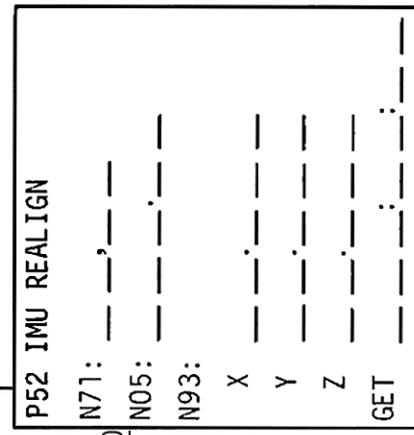
FLIGHT PLAN

1813 CST



NOTES

FUEL CELL PURGE AND
WASTE WATER DUMP
SCHEDULED AT 55:08
WILL BE DELAYED
TO 57:50 IF MCC-3
IS NOT PERFORMED.



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	53:00 - 55:00	3/TLC	3-37

MCC-H**FLIGHT PLAN**

2013 CST

55:00

V49 - MNVR TO BURN ATT
 P40/P41 - SPS/RCS THRUST
 SXT STAR CHECK
 02 FUEL CELL PURGE
 WASTE WATER DUMP

:10

:20
 (LOI - 22 HRS)

GDC ALIGN

MCC-3

V66 - TRANSFER CSM SV TO LM SLOT
 MCC-3 BURN STATUS REPORT

55:30

BATTERY CHARGE, BATTERY B

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

:40

LM TUNL VENT VALVE - LM/CM ΔP
 IF LM/CM $\Delta P < 1.7$ psid - VENT
 UNTIL $\Delta P \geq 1.7$

:50

PTC
 P 90, Y 0

MCC-3 WILL BE
 DELAYED TO MCC-4
 IF PROPELLANT
 COST IS NOT
 PROHIBITIVE

BURN STATUS REPORT			
X	X	X	ΔTIG
X	X	X	BT
			y_{gx}
X	X	X	R
X	X	X	P
X	X	X	Y
			y_{gy}
			y_{gz}
			Δy^C
X	X	X	*FUEL
X	X	X	*OX
X	X	X	UNBAL

*ITEMS TO BE
 REPORTED TO MSFN

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	55:00 - 56:00	3/TLC	3-38

FLIGHT PLAN

2113 CST

56:00

:10

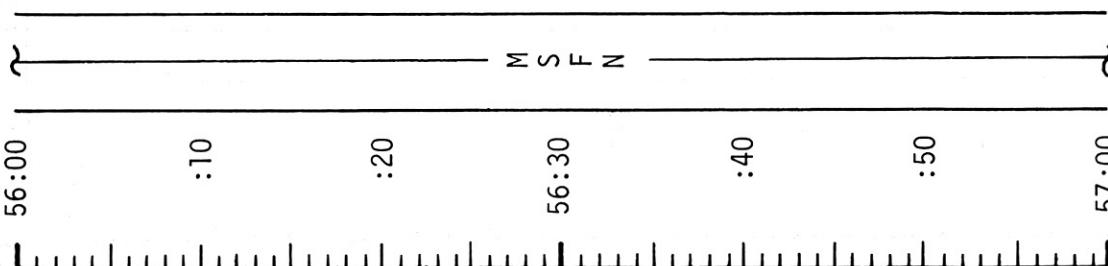
:20

56:30

:40

57:00

M S F N



NOTES

LUNAR PHOTOGRAPHY
AT CREW OPTION
CM /EL/80 or 250/BW-
RING(f5.6,250, ∞)10
MAG P
CM /EL/80 or 250/CEX-
RING(f5.6,250, ∞)10
MAG L

PTC
P 90, Y 0

LUNAR PHOTOGRAPHY
AT CREW OPTION
CM /EL/80 or 250/BW-
RING(f5.6,250, ∞)10
MAG P
CM /EL/80 or 250/CEX-
RING(f5.6,250, ∞)10
MAG L

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	56:00 - 57:00	3/TLC	3-39

FLIGHT PLAN

NOTES

UPLINK TO CSM
 ΔH (IF REQUIRED)

2213 CST

PRESSURIZE CSM TO 5.7 PSIA
 PRESSURIZE LM

ΔH DETERMINED
 FROM STAR/EARTH
 HORIZON SIGHTINGS
 WILL BE UPLINKED
 IF IT DIFFERS FROM
 ΔH IN E-MEMORY
 BY MORE THAN 5.0 KM

57:00

:20

T EPHEM: V05N01 1706E
 COPY IN LM ACTIVATION CHECKLIST (ACT 33)

M S F N

57:30

CLEAR TUNNEL OF
 CM HATCH
 INSPECT TUNNEL &
 DOCKING LATCHES
 REMOVE PROBE & DROGUE

:40

TV (GDS) 58:00 TO 58:30
 CM / TV-AVG (f5.6)

:50

LOAD DAP, N46 (21111, 11111)

O_2 FUEL CELL PURGE
 & WASTE WATER DUMP
 @ 57:50 IF NOT
 PERFORMED AT 55:08

58:00

STOP PTC ROLL AT _____,

HGA P _____ Y _____

PTC
 P 90, Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	57:00 - 58:00	3/TLC	3-40

FLIGHT PLAN

CSM

CMP

2313 CST

TEMPORARILY STOW
PROBE & DROGUE

:10

:20

58:30

M
S
F
N

:40

:50

59:00

LM

CDR

ACTIVATION CHECKLIST

OPEN LM HATCH
RECORD AND REPORT DOCKING
TUNNEL INDEX ANGLE
IVT TO LM

ASSIST CDR

LM

OPEN LM HATCH
RECORD AND REPORT DOCKING
TUNNEL INDEX ANGLE
IVT TO LM

FAMILIARIZATION

FAMILIARIZATION

MCC-H

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	58:00 - 59:00	3/TI	3-41

FLIGHT PLAN

CSM

CMP

MNVR TO PTC ATTITUDE
START PTC
S-BAND ANT-OMNI B
(ON MCC CUE)
SECURE HGA

0013 CST

59:00

P 90
Y 0
F 0

:10

:20

PTC
P 90
Y 0
F N

59:30
:40

60:00

MCC-H

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

LM

CMP

59:00

P 90
Y 0
F N

FAMILIARIZATION

FAMILIARIZATION

FAMILIARIZATION

IVT TO CSM

CLOSE LM HATCH

MCC-H

LM

CDR

MP

FAMILIARIZATION

FAMILIARIZATION

FAMILIARIZATION

IVT TO CSM

MCC-H

CMP :
INSTALL PROBE AND DROGUE
INSTALL CM HATCH
LM TUNNEL VENT VALVE - LM/CM Δ P

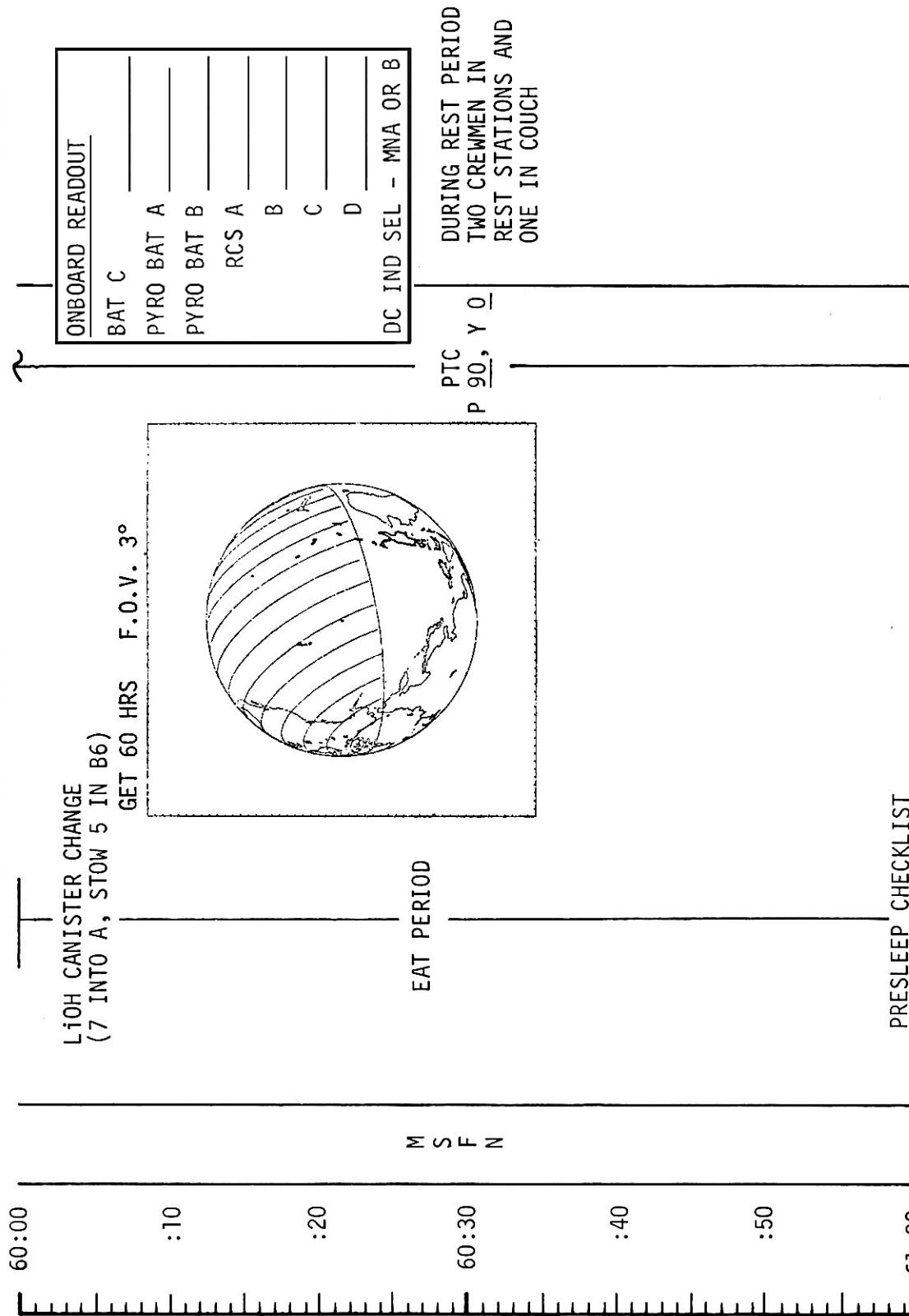
FLIGHT PLAN

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	59:00 - 60:00	3/TLC	3-42

MCC-H

FLIGHT PLAN

0113 CST



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	60:00 - 61:00	3/TLC	3-43

MCC-H

FLIGHT PLAN

0213 CST

61:00

~

:20

:40

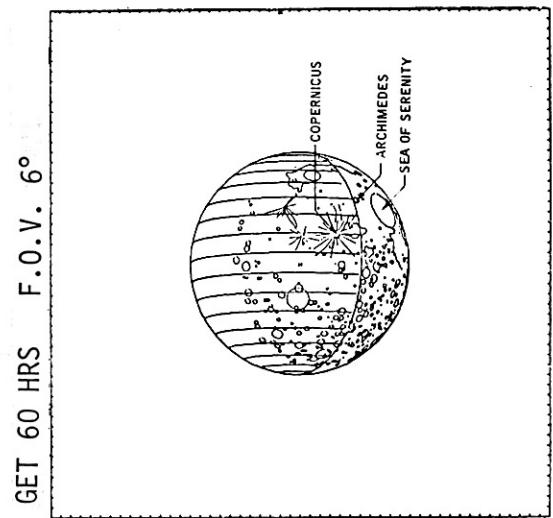
M S F N

62:00

:20

:40

63:00



GET 60 HRS F.O.V. 6°

REST PERIOD
(9 HOURS)

PTC
P 90, Y 0

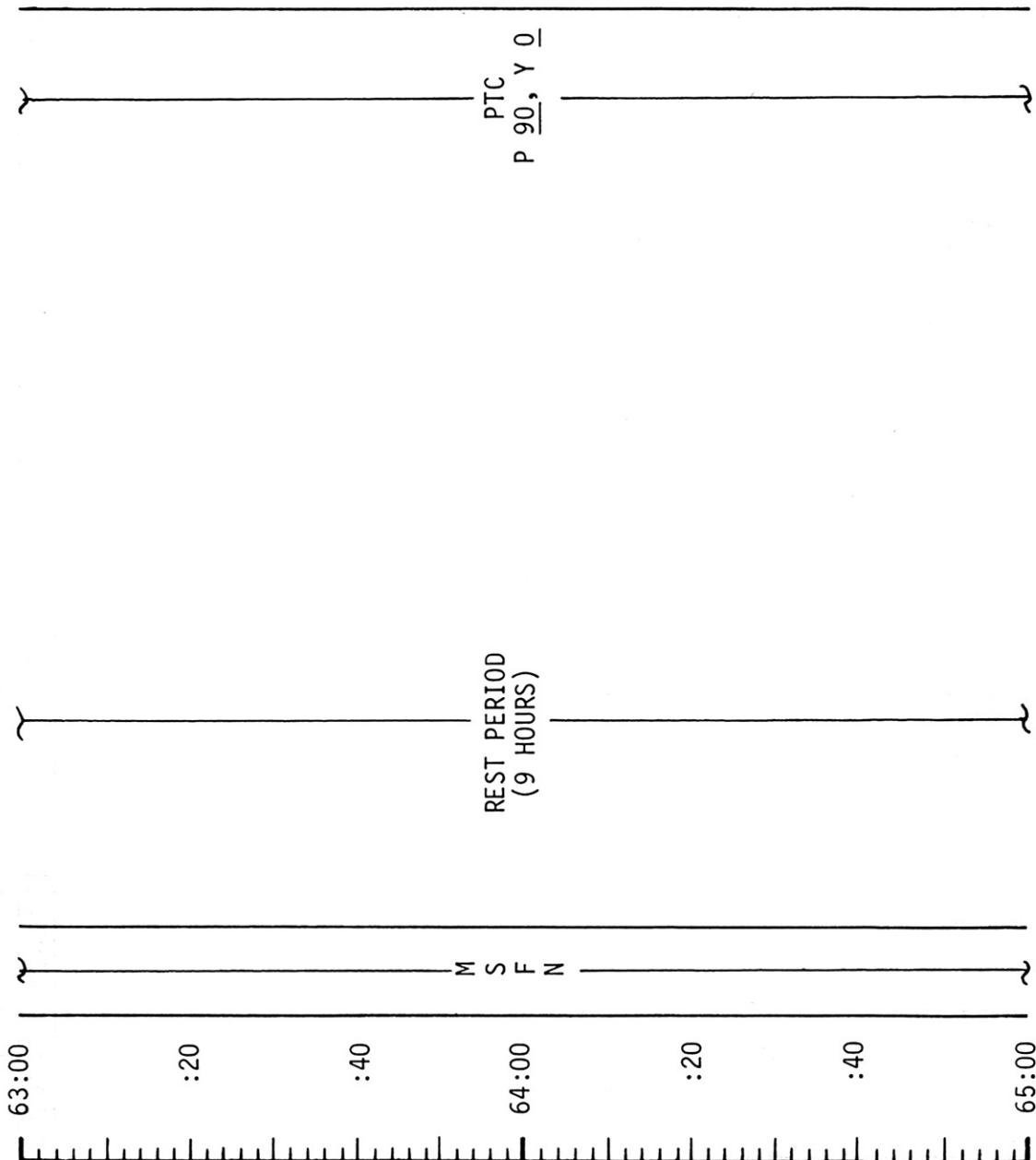
NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	61:00 - 63:00	3/TLC	3-44

MCC-H

FLIGHT PLAN

0413 CST



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	63:00 - 65:00	3/TLC	3-45

MCC-H

FLIGHT PLAN

0613 CST

65:00

:20

:40

66:00

REST PERIOD
(9 HOURS)

M S F N

:20

:40

67:00

PTC
P 90, Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	65:00 - 67:00	3/TLC	3-46

MCC-H

FLIGHT PLAN

0813 CST

67:00

:20

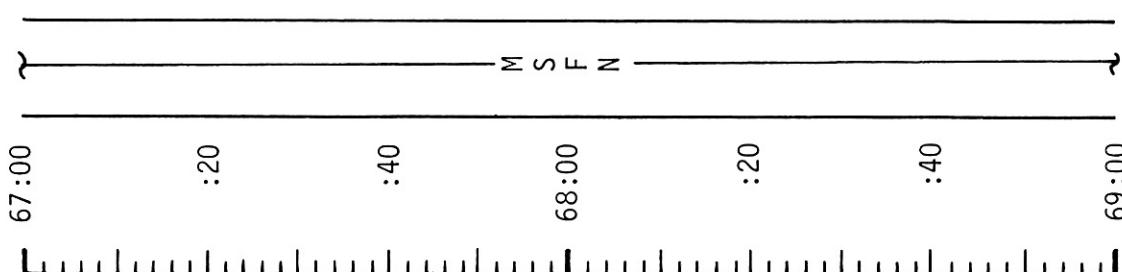
:40

68:00

:20

:40

69:00



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
Apollo 13	FINAL (APRIL)	MARCH 16, 1970	67:00 - 69:00	3/TLC	3-47

MCC-H

FLIGHT PLAN

1013 CST

NOTES



REST PERIOD
(9 HOURS)

:20

:40

M S F N
70:00

POST SLEEP CHECKLIST

:20

EAT PERIOD

:40

LiOH CANISTER CHANGE
(8 INTO B, STOW 6 IN B6)

71:00

IF MCC4 IS NOT
PERFORMED, CREW
AWAKE TIME IS
73 HRS.

PTC
P 90, Y 0

CSM CONSUMABLES UPDATE
GET: _____ : _____
RCS TOTAL _____
QUAD A _____ B _____
C _____ D _____
H₂ TOTAL _____
O₂ TOTAL _____

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	69:00 - 71:00	3-4 / TLC	3-48

FLIGHT PLAN

MCC-H

1213 CST

UPLINK TO CSM
 CSM S.V. & V66
 MCC-4 TGT LOAD
 MCC-4 MNVR PAD
 CONSUMABLES
 FLIGHT PLAN
 PERICYNTHION +2HR
 ABORT PAD

:10

:20

71:30

:40

:50

72:00

P52 IMU REALIGN
 OPTION 3-REFSMMAT
 (PTC ORIENT)

REPORT GYRO TORQUING ANGLES

STOP PTC AT

BURN ROLL ATT

P30 EXT. ΔV

LOAD DAP, N46 (20101,01111)

V49 MNVR TO BURN ATT

NOTES

PERICYNTHION +2 HR
 ABORT PAD TARGETED
 FOR A FAST RETURN
 TO MPL.

P52 IMU REALIGN

N71:

— — , — —

N05:

— — . — —

N93:

X — — . — —

Y — — . — —

Z — — . — —

GET — — . — —

; — — ; — —

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	71:00 - 72:00	4/TLC	3-49

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FLIGHT PLAN

MCC-4 BURN CHART

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	±10° TAKEOVER	BT + 1 SEC	TRIM X AXIS ONLY TO 1.0 FPS

TABLE 3-5
3-49A

MCC-M

FLIGHT PLAN

1313 CST

T :10 P40/41 - SPS/RCS THRUST
SXT STAR CHECK

72:00

LOI - 5 HRS

:20

GDC ALIGN

MCC-4

72:30

V66-TRANSFER CSM SV TO LM SLOT
MCC 4 BURN STATUS REPORT
REPORT LM/CM ΔP

N :40 LOAD DAP , N46 (20111, 01111)
BATTERY CHARGE, BATTERY A

73:00

BURN STATUS REPORT									
X	X								ΔTIG
X	X								BT
									V gx
									R
									P
									Y
									V gx
									V gy
									V gz
									ΔV ^C
									FUEL *
									OX *
									UNBAL

*ITEMS TO BE
REPORTED TO MSFN

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	72:00 - 73:00	4/TLC	3-50

MCC-H

FLIGHT PLAN

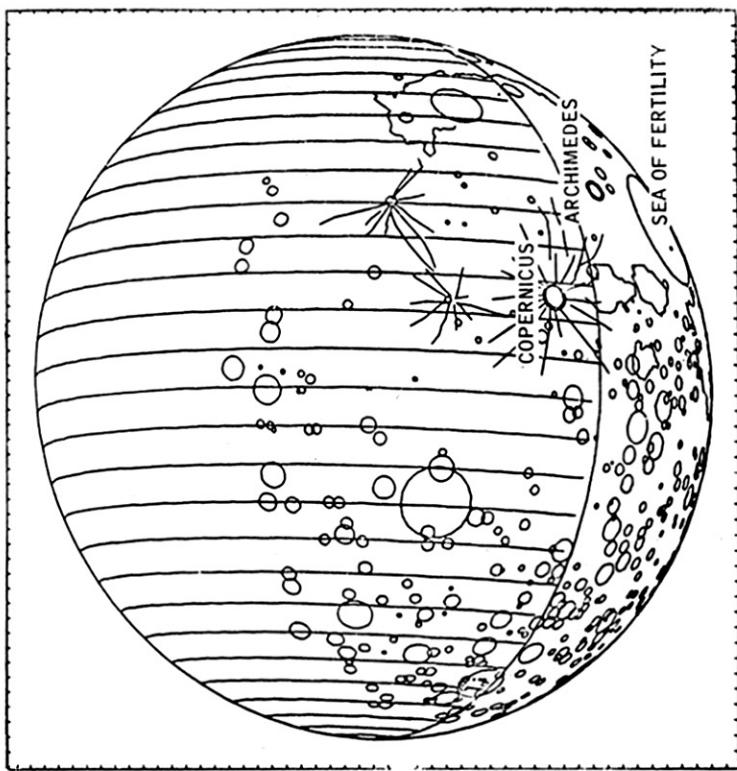
1413 CST

PRE LOI SEC GLY LOOP CHECK
 ECS IND SW - SEC
 SEC GLY TO RAD VLV - NORM
 SEC COOL LOOP PUMP - AC1
 GLY DISCHARGE SEC PRESS-39-51 PSIA
 ACCUM SEC QTY IND-30-55%
 SEC EVAP TEMP OUT - DECREASE
 (VERIFY FLOW)
 SEC COOL LOOP PUMP - OFF (CTR)
 SEC GLY TO RAD VLV - BYPASS
 ECS IND SW - PRIMARY

:10
 :20
 73:00
 73:30
 :40
 :50
 74:00

GET 72 HRS F.O.V. 6°

IF NO MCC-4, CREW WILL BE AWAKENED AT 73:00. THE CREW WILL PICK UP THE P52 AND BAT CHARGE NOMINALLY SCHEDULED AT 71:20 AND 72:37 RESPECTIVELY AND PROCEED WITH SCHEDULED ACTIVITIES AT 73:00.



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	73:00 - 74:00	4/TLC	3-51

MCC-H

FLIGHT PLAN

1513 CST

74:00

PRESSURIZE LM
(IN CASE OF LOI ABORT)
LM TUNNEL VENT VALVE - CM/LM ΔP

:10

CHECK MISSION TIMER AGAINST CMC CLOCK

UPLINK TO CSM
CSM S.V. & V66
(PRELIMINARY)
LOI TGT LOAD
(PRELIMINARY)
DESIRED ORIENTATION
(LDG SITE)

UPDATE TO CSM
LOI MNVR PAD
(PRELIMINARY)
TEI 1 & 4 PAD

MNVR TO MOON VIEW ATT (74:25)
(HATCH WINDOW)

R 0 HGA
P 073 P -69
Y 0 Y 0

TEI 1 & 4 PADS
ASSUMES NO DOI

M S F N

:20

74:30

:40

:50

75:00

P52 IMU REALIGN	
N71:	_____, ____
N05:	_____, ____
N93:	_____, ____
STARS	_____, ____
SA	_____, ____
TA	_____, ____
X	_____, ____
Y	_____, ____
Z	_____, ____
GET	_____, ____

P52 IMU REALIGN
OPTION 1 - PREFERRED
(LDG SITE ORIENT)
GYRO TORQUE

REPORT GYRO TORQUING ANGLES

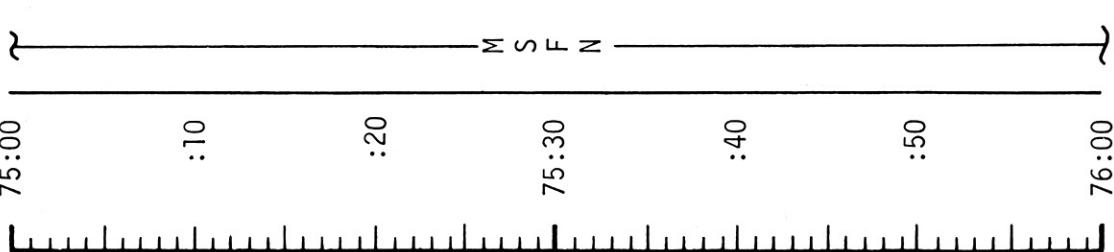
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	74:00 - 75:00	2/TLC	3-52

MCC-H

FLIGHT PLAN

1613 CST

75:00



LUNAR PHOTOGRAPHY
AT CREW OPTION
CM-/EL/80 or 250/BW-
RING(f5.6,250, ∞)10
MAG P

CM-/EL/80 or 250/CEX-
RING(f5.6,250, ∞)10
MAG L

MAP UPDATE REV 1	
LOS	:
180°	:
AOS	:

R 180 HGA
P 272 P -88
Y 357 Y 172

:50

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	75:00 - 76:00	4/TLCL	3-53

NOTES

MCC-H**FLIGHT PLAN**

1713 CST

UPDATE TO CSM
SUBSOLAR POINT
REV 1
LOI MNVR PAD
UPLINK TO CSM
CSM S.V. & V66
LOI TGT LOAD

76:00

SUBEARTH POINT
REV 1
3.215W
0.868N

PRE LOI SYSTEMS CHECKS:
C&W CHECK
CM RCS CHECK
SM RCS CHECK
SPS PERIODIC MONITOR
ECS PERIODIC MONITOR
EMS ΔV AND ACCEL NULL BIAS TEST (REPORT)
VERIFY PUGS - INCREASE

:10

:20

M S F N

76:30

P30-EXT ΔV

P40-SPS THRUST

LOAD DAP N46 (20101) (01111)

ROLL TO BURN ATT
(76:40) R 0
OMNI D P $\frac{272}{357}$ UPDATE TO CSMGO/NO GO LOI

:50

SXT STAR CHECK

77:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	76:00 - 77:00	4/TLC	3-54

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<u>LOI INHIBIT CRITERIA</u>	
<u>CSM GNC GO CRITERIA</u>	<u>GNCS/SCS</u>
<u>SPS</u>	
0 FU/OX TANK (W/O LEAK) -FU/OX GN ₂ TANK (W/O LEAK) - 1 OF 2 (CANT CONFIRM)	0 FULL CRITICAL SYSTEMS REDUNDANCY 0 ADEQUATE CONSUMABLES FOR MIN LO OPS, CAPABILITY TO SUSTAIN TANK LOSS AND RETURN TO EARTH WITH AVG POWER LEVEL OF 40 AMPS
0 BALL VALVE BANK - BOTH FEEDLINE TEMP >40° F FU/OX ΔP<20 PSI PC>70 PSI ULLAGE CAPABILITY - 1 OF 2 0 HE TANK (W/O LEAK)	0 SPS PRPLNT RESERVE FOR TEI AND TEC MCC'S 0 RCS PRPLNT RESERVE FOR TEI AND TEC MCC CONTROL, PTC, AND MIN LUNAR ORBIT OPERATIONS 0 DPS LOI IF REQUIRED TO ACCOMPLISH A LUNAR ORBIT OPERATION
<u>SM RCS</u>	<u>CSM GNC GO CRITERIA</u>
	<u>GNCS/SCS</u>
0 HE TANK (W/O LEAK) - ALL 0 NO LEAK BELOW ISO VLV - ALL PKG TEMP > 55° - ALL 0 THRUSTERS - 3 OF 4 P & Y, 6 OF 8 R	0 3 - AXIS AUTO ATTITUDE CONTROL 0 3 - AXIS RATE DAMPING 0 3 - AXIS DIRECT RCS 0 BMAGS P, Y -- 1 OF 2 0 BMAGS R -- 1 OF 2 0 FDAO -- 1 OF 2 0 CMC, ISS, OSS, OPTICS DAC 0 TVC SERVO LOOP -- BOTH 0 DSKY -- 1 OF 2
<u>SYSTEMS MANAGEMENT</u>	
0 START BURN ON BANK B 0 OPEN BANK A TIG + 2-5 SECONDS	

FLIGHT PLAN

LOI
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+10° TAKEDOWN	BT + 10 SEC	DO NOT TRIM

TABLE 3-6
LOI ABORT TABLE

MODE I (DPS ONLY)	MODE II (DPS ONLY)	MODE III (DPS ONLY)	LOOSE SPS LIMITS
0-1 MIN 45 SEC ΔV_m 0-750 (TIGHT)	1 MIN 45 SEC TO 2 MIN 50 SEC ΔV_m 750-1245 (LOOSE)	2 MIN 50 SEC TO 3 MIN 50 SEC ΔV_m 1245-1700 (LOOSE)	NOTE: IF THE FIRST BANK SELECTED FAILS TO OPERATE UNDER G & N CONTROL, ATTEMPT TO START THAT BANK UNDER SCS CONTROL. IF THE BANK STARTS UNDER SCS CONTROL, CONTINUE THE BURN AND EVALUATE G & N STEERING. IF THE BANK FAILS TO START UNDER SCS CONTROL, INHIBIT LOI.

LOI + 2 HR. MCC-H TARGET OR CREW CHART (NO COMM)	DPS ₁ @ LOI + 2 HR DPS ₂ @ LOI + 1 REV MCC-H TARGET	DPS @ LOI + 1 REV DPS @ LOI + 1 REV MCC-H TARGET	TIGHT SPS LIMITS FUEL - OXID DELTA P GREATER THAN 20 PSI CONFIRMED BY LOW PC PROP TANK PRESS LESS THAN 160 PSI CONFIRMED BY LOW PC PC LESS THAN 80 PSI OR DECAYS 10 PSI DURING THE BURN ANY BALL VALVE FAILS TO OPERATE, OR CLOSES PREMATURELY, AND THE OTHER BANK GN2 TANK PRESSURE HAS DECAYED TO 1500 PSI (SHUT DOWN DECAYING BANK FIRST, IF STILL BURNING, CONTINUE)
			PHYSIOLOGICAL INDICATIONS OF ERRATIC ENGINE PERFORMANCE (VIBRATION, POPPING, ETC.)

TABLE 3-7

MCC-H

FLIGHT PLAN

1813 CST

77:00

:10

77:20

:20

77:30

:40

78:00

VERIFY DSE MOTION AT LOS

GDC ALIGN

REV 1

77:30

40

DUMP DSE

NOTE: LOI will be started on BANK B.
BANK A will be turned on 2 to 5 sec after ignition

TIG: 77:24:53
BT: 5 MIN 56.5 SEC
AVR: 2815.3
ULLAGE: NONE
ORBIT: 168.3 x 57.0

V66 TRANSFER CSM SV TO LM SLOTT

MNVR TO COMM ATT (77:45)

R 0 HGA
P 160 P -24
Y 0 Y 180

LOI BURN STATUS REPORT

BURN STATUS REPORT			
X	X	ΔTIG **	
X	X	BT **	
		V _{gx}	
			TRIM
X	X	X	R
X	X	X	P
X	X	Y	Y
X	X	V _{gx} ***	V _{gy} ***
		V _{gz} ***	ΔV _C *
		FUEL *	OX *
		X	UNBAL

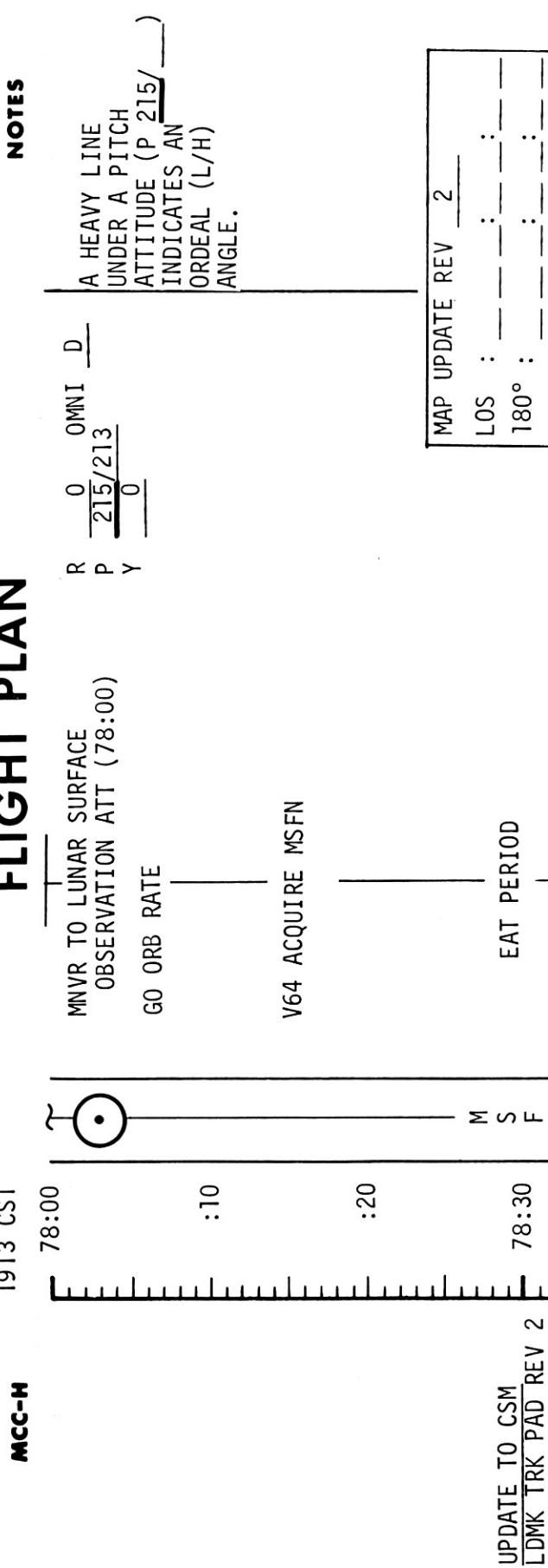
* ITEMS TO BE REPORTED TO MSFN
** REPORT IF OFF MORE THAN ONE SECOND
*** REPORT IF >0.2 FPS
S-IVB LUNAR IMPACT (GET 77:49) LAT 2.6°S, LONG 27.7°W

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	77:00 - 78:00	4/1	3-55

MCC-H

FLIGHT PLAN

1913 CST



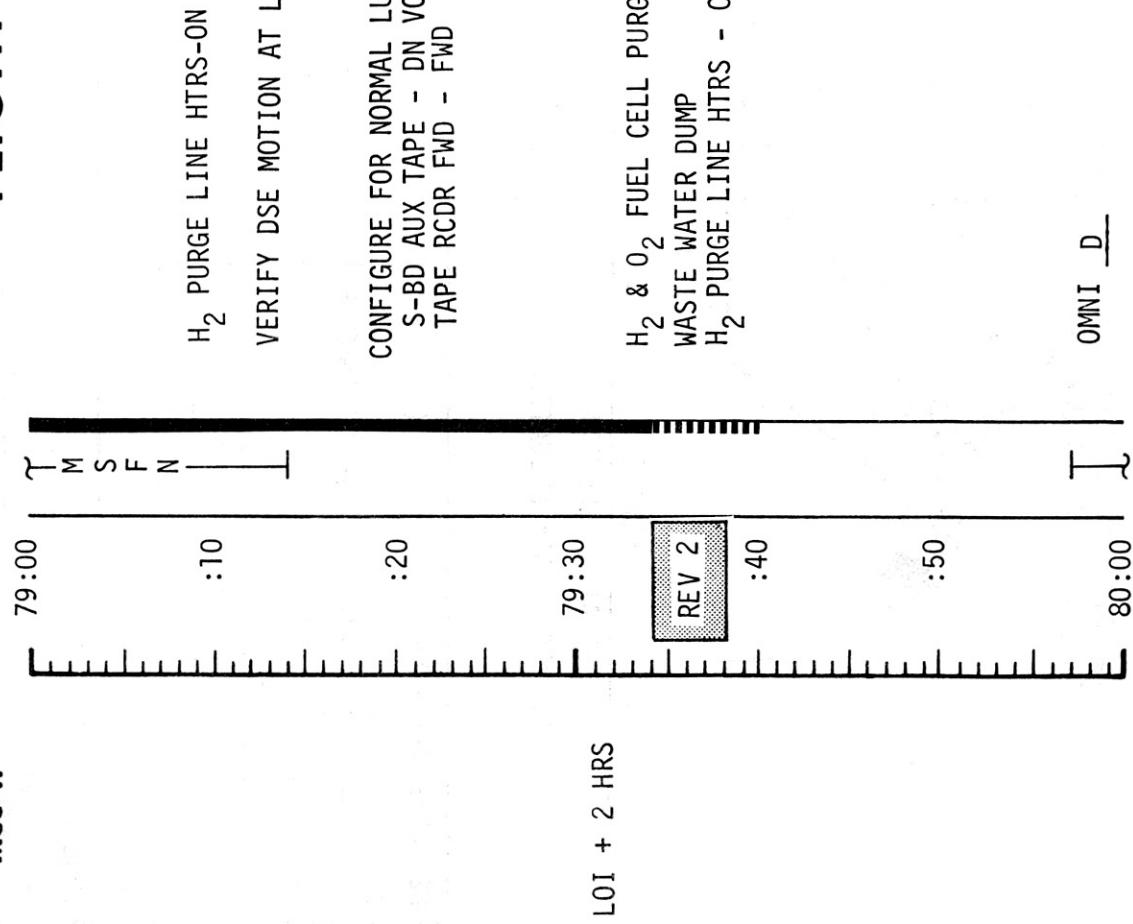
NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	78:00 - 79:00	4/1	3-56

FLIGHT PLAN

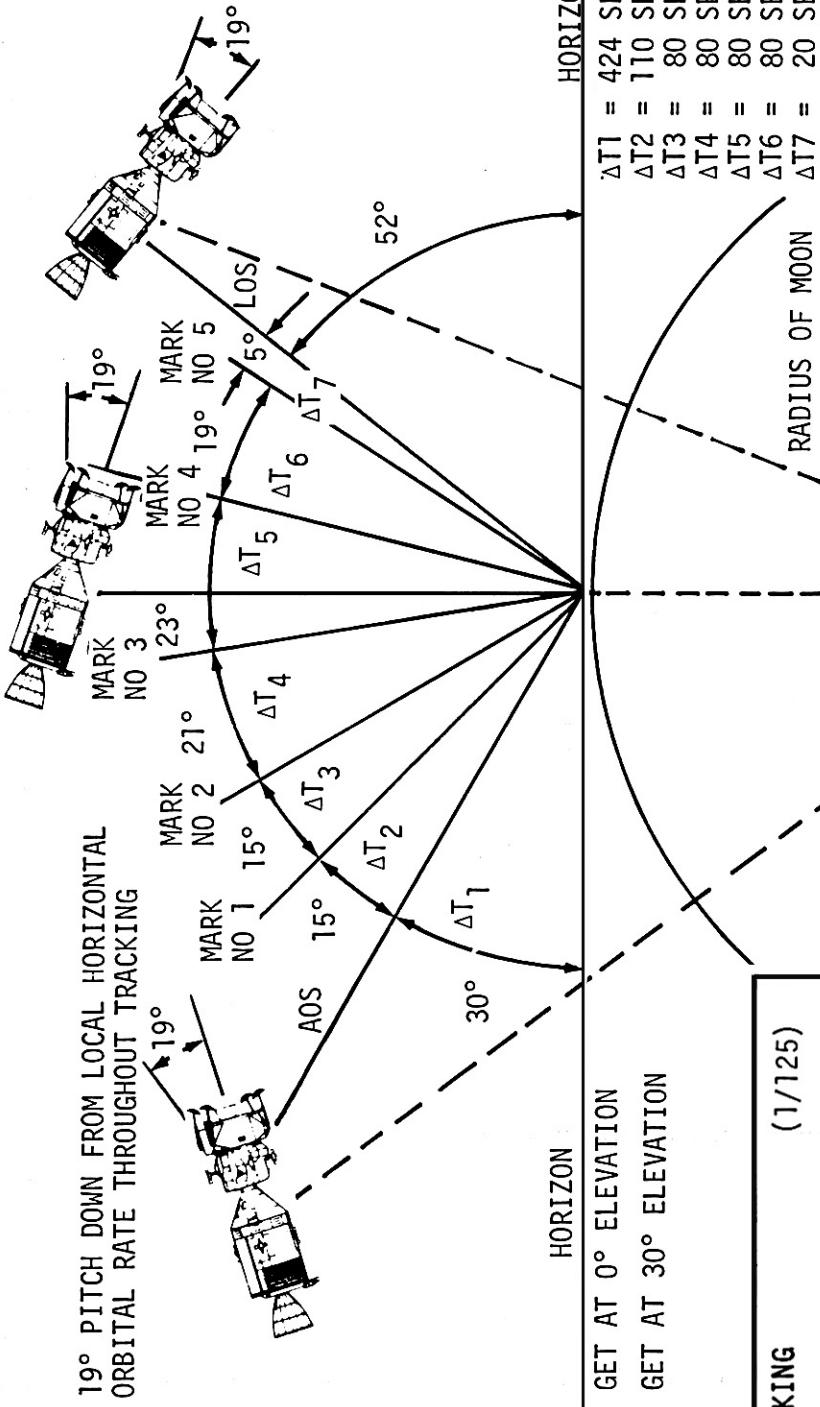
2013 CST

NOTES



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	79:00 - 80:00	4/2	3-57

CSM LANDMARK TRACKING PROFILE
(60 x 170NM ORBIT)



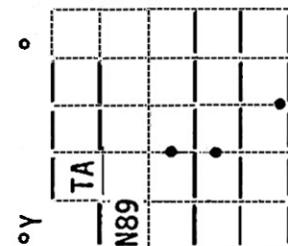
MARK 1 = $T_2 + 1 \text{ MIN } 50 \text{ SEC}$
MARK 2 = $T_2 + 3 \text{ MIN } 10 \text{ SEC}$
MARK 3 = $T_2 + 4 \text{ MIN } 30 \text{ SEC}$
MARK 4 = $T_2 + 5 \text{ MIN } 50 \text{ SEC}$
MARK 5 = $T_2 + 7 \text{ MIN } 10 \text{ SEC}$

AOS TO LOS 450 SEC
AOS TO FINAL MARK - 430 SEC

CENTER OF MOON
FIGURE 3-1
3-57A

T₁ GET AT 0° ELEVATION
T₂ GET AT 30° ELEVATION

P22 LDMK TRACKING
T₁ : : : : : : :
T₂ : : : : : : :
R : : : : : : : °P
N or S NM : : : : : : : SA
N89 : : : : : : : TA



MCC-H

FLIGHT PLAN

2113 CST

80:00

~

:10

MNVR TO LDMK TRK ATT (80:22)
GO ORB RATE

R 0
P 341/302
Y 0

:20

CM/DAC/SXT/CEX - (FIXED, 125, FIXED) 1 fps
MAG C % FILM

MAP UPDATE REV 3
LOS : _____
180° : _____
AOS : _____

MSFN
RECORD PCM LBR ON
DSE DURING P22

START DAC @ T2-1 MIN
STOP DAC AFTER MARK 1
LDMK IS AT 23°
SUN ANGLE
START DAC AFTER MARK 4
STOP DAC AFTER MARK 5

M S F N

TRACK LDMK PICKERING B
80 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

:40

MNVR TO BURN ATT
EXCEPT FOR ROLL
BY 80:45

R 180
P 283
Y 0 2

LOAD DAP FOR TWO JET ULLAGE
(2011) (1111)
CMP - PRE DOI SYSTEMS CHECKS

C&W CHECK
CM RCS CHECK
SPS PERIODIC MONITOR CHECK
ECS PERIODIC MONITOR CHECK

EMS ΔV AND ACCEL NULL
BIAS TEST (REPORT)

TEI 5 PAD
ASSUMES NOMINAL
DOI ACCOMPLISHED

MISSION

EDITION

DATE

TIME

DAY/REV

PAGE

APOLLO 13 FINAL (APRIL)

MARCH 16, 1970

80:00 - 81:00

4/2

3-58

NOTES

FLIGHT PLAN

DOI
BURN TABLE

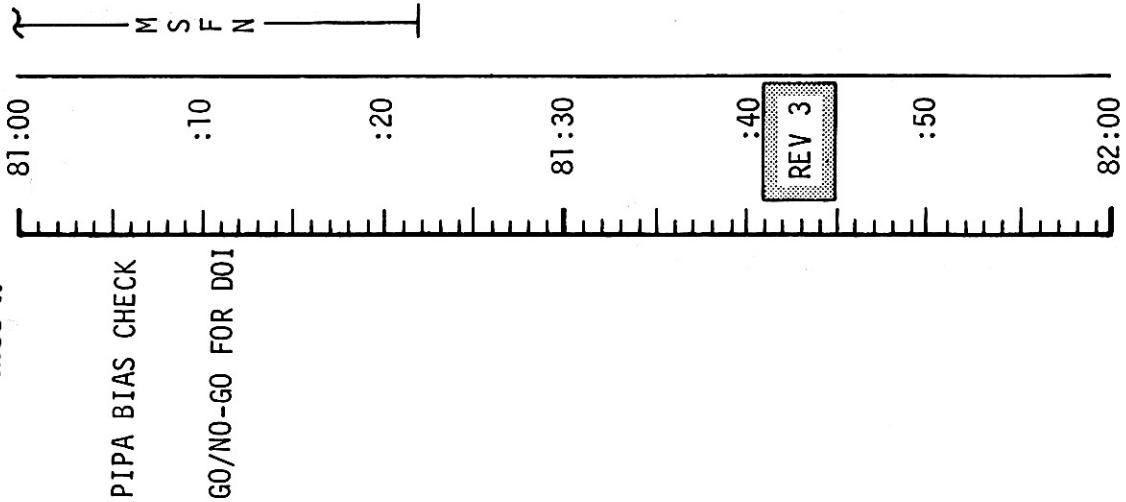
P OR Y RATES	ATT DEVIATIONS	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+ 10° TAKEOVER	BT + 1 SEC	TRIM X TO WITHIN 1 FPS DO NOT TRIM Y & Z

TABLE 3-8
3-58A

FLIGHT PLAN

MCC-H

2213 CST

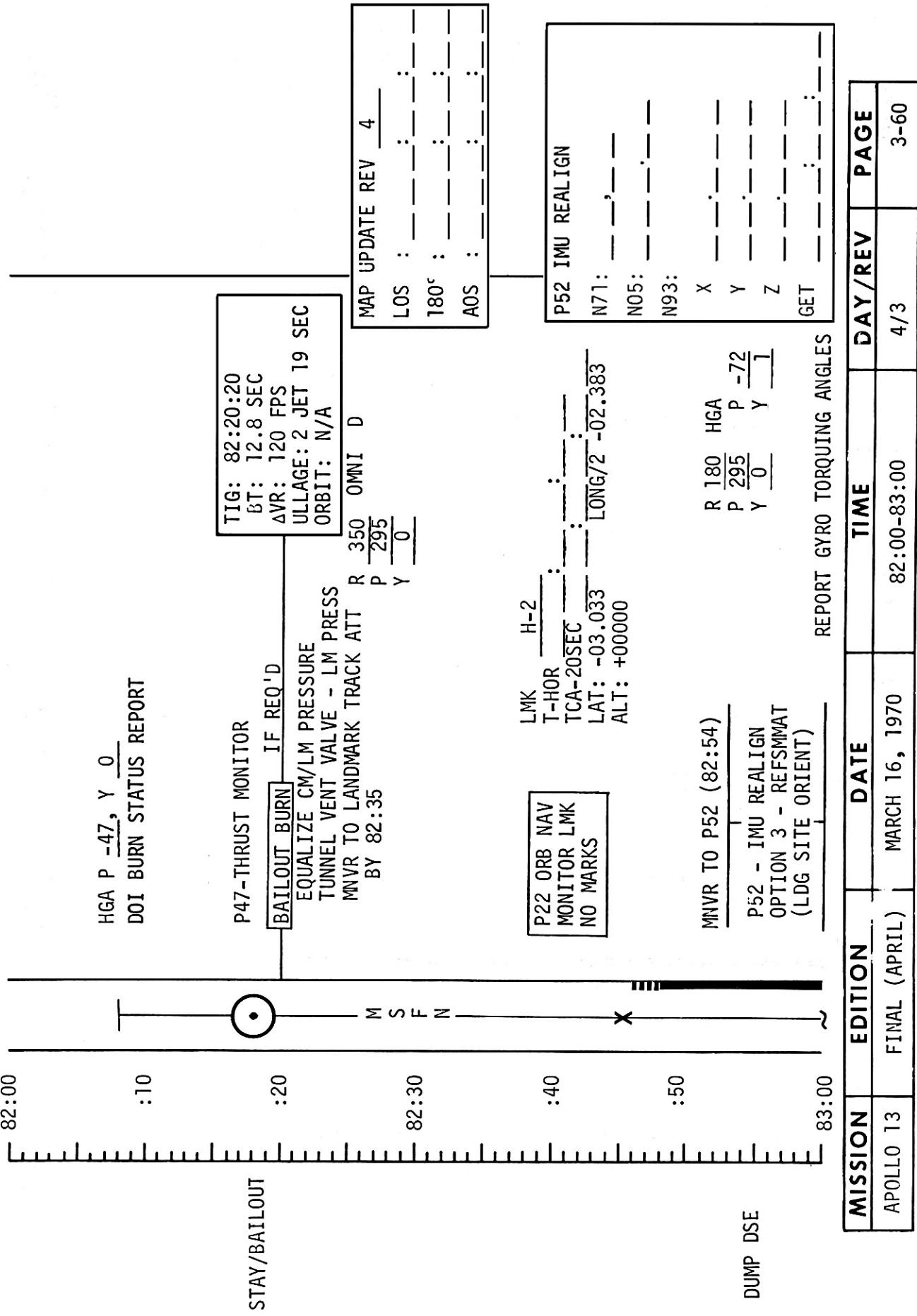


NOTES

BURN STATUS REPORT			
X	X		ΔTIG **
X	X		BT **
			V _{gx}
			TRIM
X	X	X	R
X	X	X	P
X	X	X	Y
			V _{gx} ***
			V _{gy} ***
			V _{gz} ***
			ΔV_c *
			FUEL *
			OX *
			UNBAL

*ITEMS TO BE REPORTED
TO MSFN
**REPORT IF OFF MORE
THAN 1 SEC
***REPORT IF >0.2 FPS

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	81:00 - 82:00	4/3	3-59



FLIGHT PLAN

MCC-H

CSM

CMP

GDC ALIGN
PREPARE FOR LM INGRESS
VERIFY TUNNEL PRESS
REMOVE HATCH & STOW
INSPECT DOCKING LATCHES
REMOVE & STOW PROBE AND
DROGUE
VERIFY DOCKING ANGLE
VERIFY DSE MOTION AT LOS

0013 CST

83:00

M
S
F
N

:10

MOUNT TOPO CAM ON HATCH
SHUTTER 1/100
RANGE 64.5
INTERVAL .42
MAG U, START FR NO. —
RECORD LTC
CLOCK TIME —
@ GET — : — : —

MNVR TO TOPO ATT (83:45)
R 0
P T63
Y 0

:40

:50

84:00

CDR

LMP

LM ACTIVATION CHECKLIST

OPEN LM HATCH
IVT TO LM

LM ENTRY STATUS
CHECKS

PERFORM HOUSEKEEPING CHORES

AID CMP OR
LMP AS REQUIRED

REV 4

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	83:00 - 84:00	4/3-4	3-61

MCC-H

LM

CDR

0113 CST

84:00

PHOTO CENSORINUS

:10

HGA: P -25
Y 180

CSM PWR TO LM-OFF
(AT LMP REQUEST)

84:00

AID CMP OR LMP
AS REQUIRED

84:30

VHF SIMPLEX VOICE
CHECK WITH LM

84:30

STOW TOPO CAMERA
MNVR TO REST ATT

85:00

R 94, P 289, Y 0
HGA: P -4, Y 281
CSM POWER TO LM-ON
(AT LMP REQUEST)

85:00

LOAD DAP R1(20101)
R2(11111)
V79: 10° DB
ZERO RATE

85:00

LMP

DUMP DSE
UPDATE TO CSM
TOPO PHOTO PAD
(CENSORINUS)
TEI 11 PAD
TRAJECTORY STATUS
UPLINK TO CSM
CSM S.V. & V66

TRANSFER TO LM PWR

COMM ACTIVATION

TOPO PHOTO PAD

R _____ P _____ Y _____

T START: _____ : _____ ; _____

T STOP: _____ : _____ ; _____

RNG _____

RNG _____ GET _____ ; _____

RNG _____ GET _____ ; _____

RNG _____ GET _____ ; _____

S-BAND/VHF
SIMPLEX VOICE
AND TM TEST

REPORT OPS SOURCE
PRESSURE

COMM DEACTIVATION
TRANSFER TO CSM POWER

[FLIGHT PLAN]

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	84:00 - 85:00	4/4	3-62

MCC-H

0213 CST

85:00

LMP: IVT TO CSM
CLOSE LM HATCH

CMP: VERIFY DSE MOTION AT LOS
INSTALL DROGUE & PROBE

INSTALL CM HATCH
TUNNEL VENT VALVE - LM PRESS
LiOH CANISTER CHANGE: 9 INTO A, STOW 7 IN B6

:10

:20

85:30

REV 5

:40

:50

DUMP DSE
UPDATE TO CSM
TRAJECTORY
STATUS

86:00

FLIGHT PLAN

NOTES

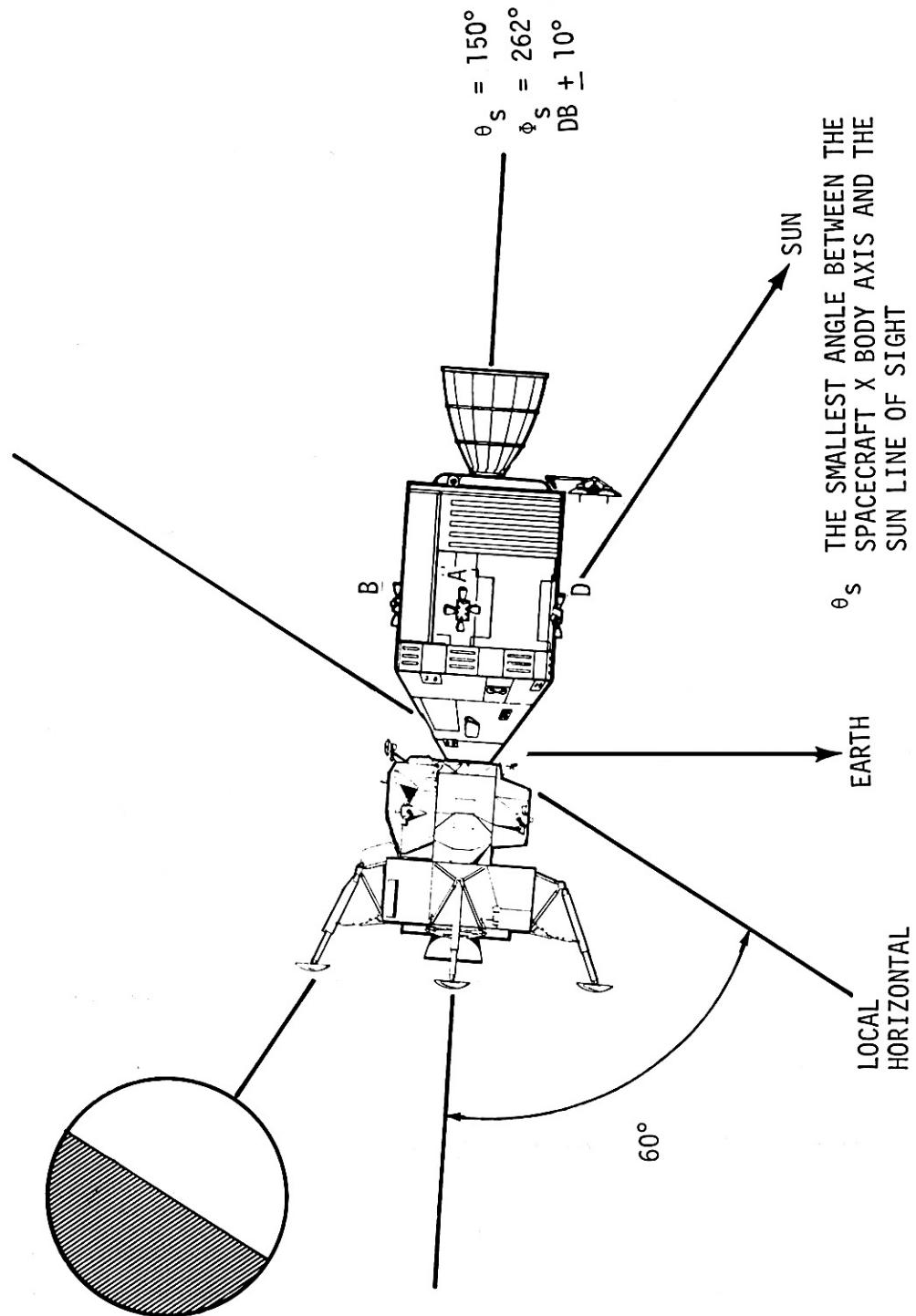
MAP UPDATE REV 10	
LOS	:
180°	:
AOS	:

ONBOARD READOUT	
BAT C	
PYRO BAT A	
PYRO BAT B	
RCS A	
B	
C	
D	
DC IND SEL - MNA OR B	

PRESLEEP CHECKLIST

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	85:00 - 86:00	4/4-5	3-63

LUNAR ORBIT REST PERIOD ATTITUDE



θ_s THE SMALLEST ANGLE BETWEEN THE
 SPACECRAFT X BODY AXIS AND THE
 SUN LINE OF SIGHT
 ϕ_s THE ANGLE WHICH IS MEASURED FROM
 THE MINUS Z SPACECRAFT BODY AXIS
 POSITIVELY ABOUT THE X BODY AXIS
 TO THE SUN LINE OF SIGHT VECTOR
 PROJECTION IN THE Y - Z AXIS PLANE

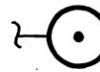
FIGURE 3-2
3-63A

MCC-H

FLIGHT PLAN

0313 CST

86:00



N

S

F

N

:20

:40

87:00

:20

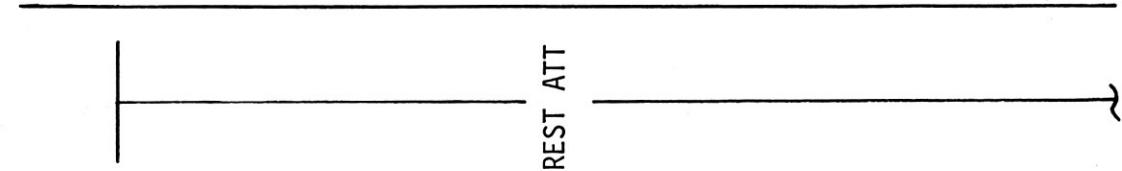
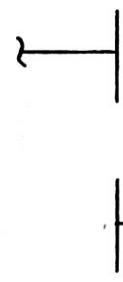
:40

88:00



REST PERIOD
(8.5 HOURS)

REST ATT



NOTES

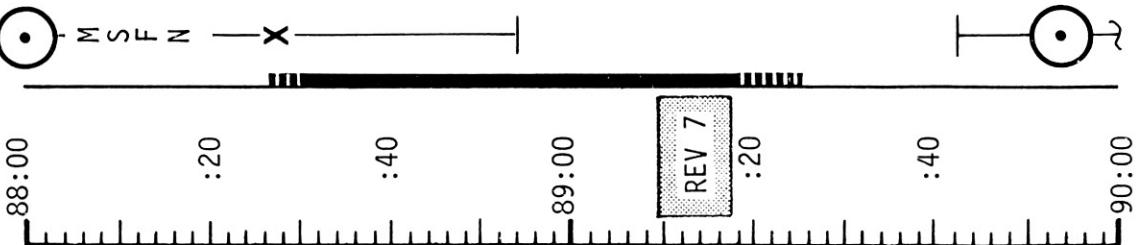
DUMP DSE

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	86:00 - 88:00	4/5-6	3-64

FLIGHT PLAN

0513 CST

MCC-H



DUMP DSE

REST PERIOD
(8.5 HOURS)

REST ATT

NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	88:00 - 90:00	4/6-7	3-65

MCC-H**FLIGHT PLAN**

0713 CST

90:00

:20

:40

91:00

:20

92:00

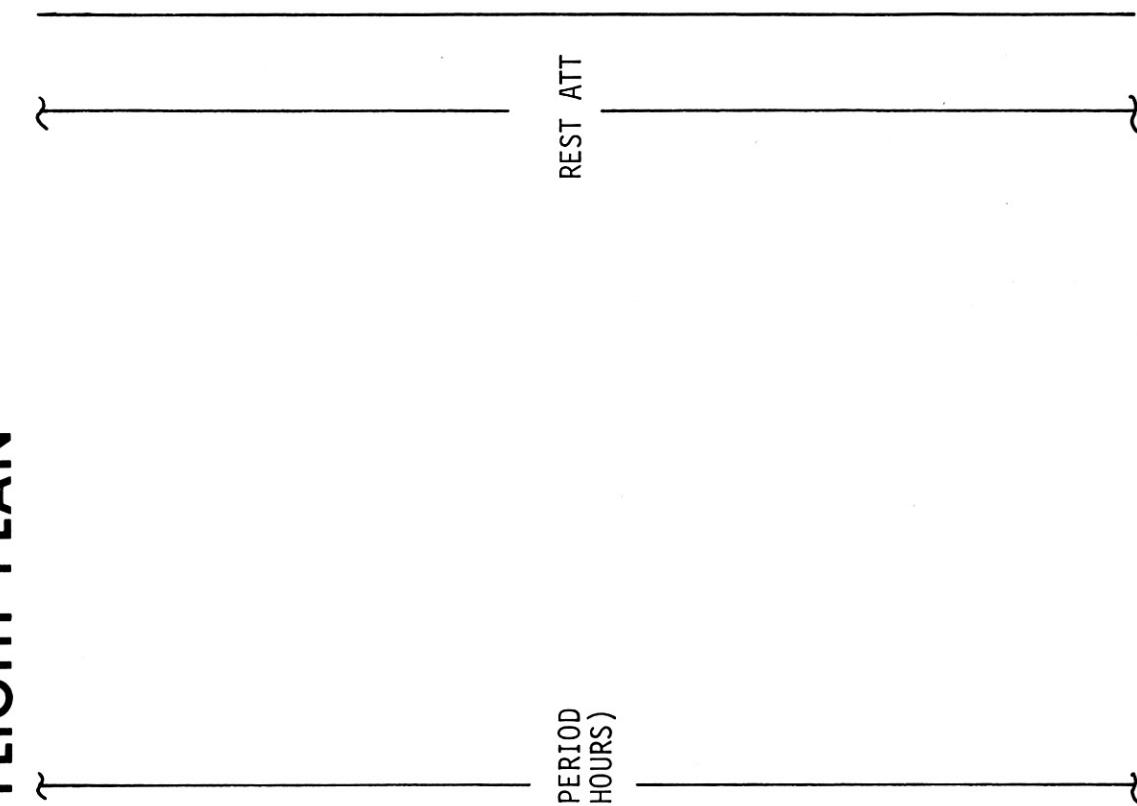
X M S F N**REV 8**

:40

DUMP DSE

REST PERIOD
(8.5 HOURS)

REST ATT

**NOTES**

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	90:00 - 92:00	4/7-8	3-66

FLIGHT PLAN

NOTES

0913 CST

92:00

:20

:40

MCC-H

X M S F N

93:00

REV 9

:20

:40

94:00

DUMP DSE

REST PERIOD
(8.5 HOURS)

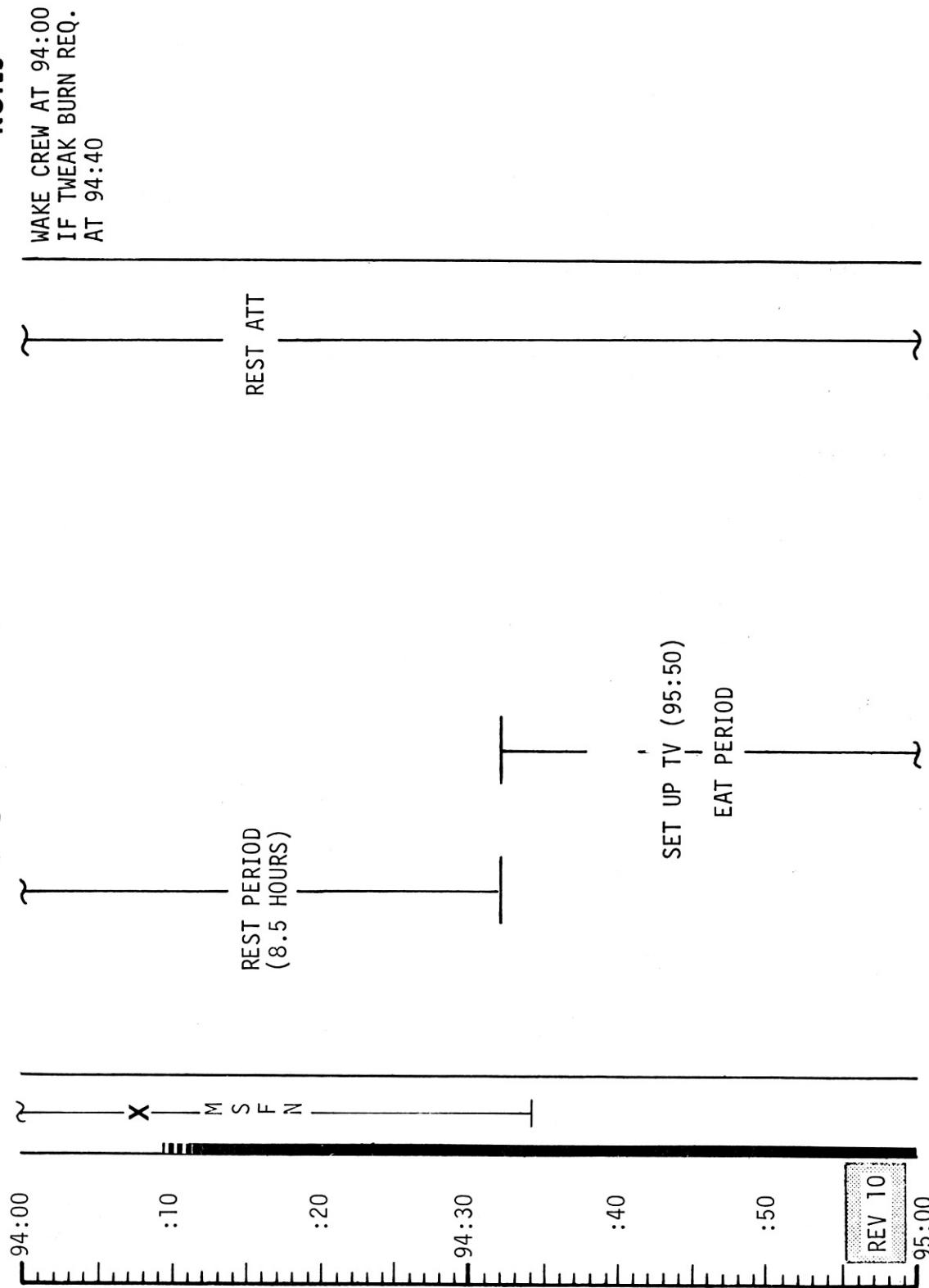
REST ATT

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	92:00 - 94:00	4/8-9	3-67

MCC-H

FLIGHT PLAN

1113 CST



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	94:00 - 95:00	5/9-10	3-68

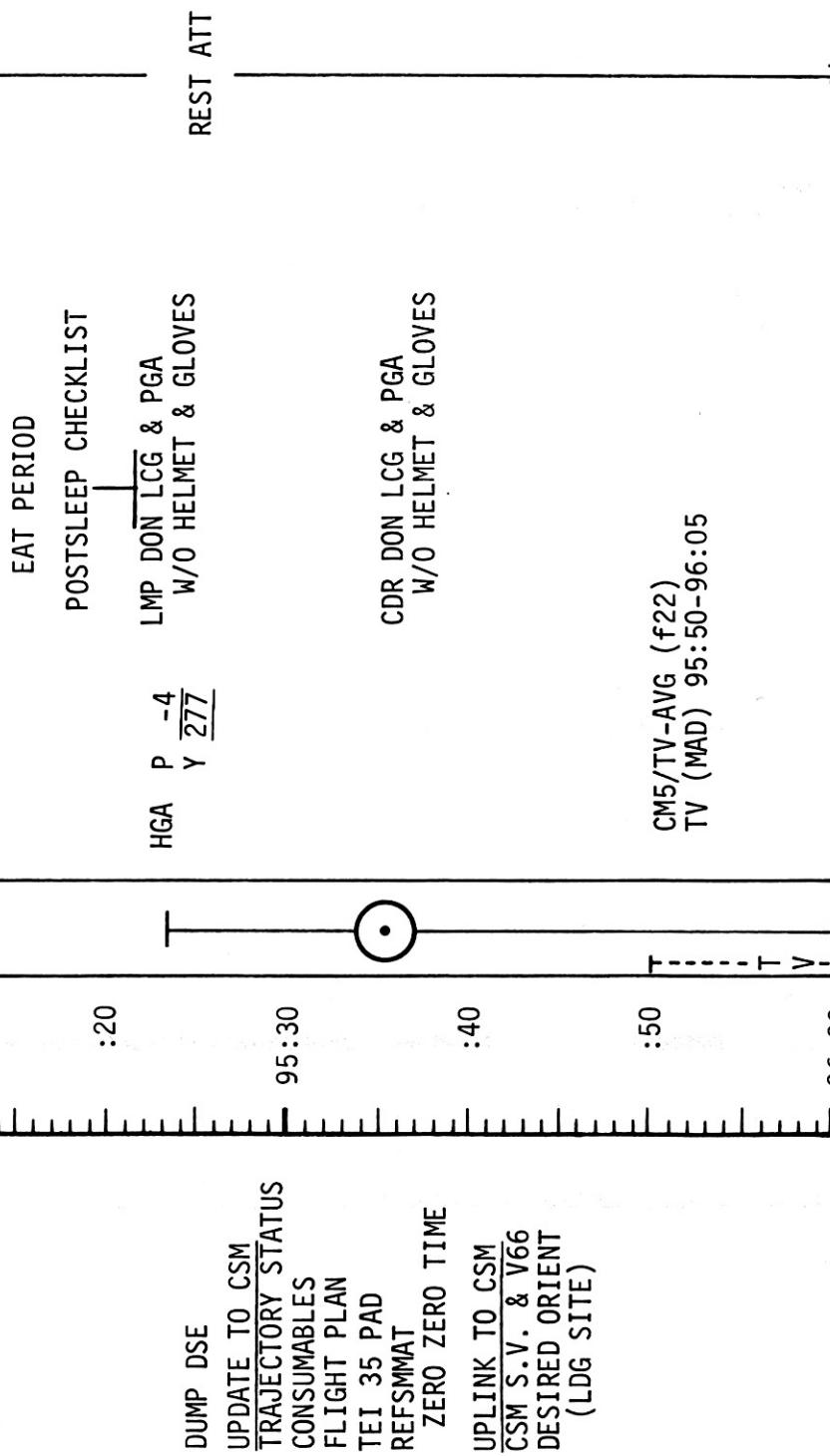
FLIGHT PLAN

1213 CST

MCC-H

95:00

CSM CONSUMABLES UPDATE			
GET:	:	:	
RCS TOTAL			
QUAD A		B	
C		D	
H ₂ TOTAL			
O ₂ TOTAL			



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	95:00 - 96:00	5/10	3-69

FLIGHT PLAN

1313 CST		CMP	CDR	LMP	MCC-H
96:00		CMP SOLO BOOK	OBSERVE LDG SITE THROUGH CM 5	P52 IMU REALIGN N71: _____, _____ N05: _____, _____ N93: X _____. Y _____. Z _____. GET _____; _____;	
:10	M S F N	P52 - IMU REALIGN OPTION 3 - REFSMMAT (LDG SITE ORIENT)			
		P52 - IMU REALIGN OPTION 1 - PREFERRED (LDG SITE ORIENT)			
:20			MNVR TO AGS CAL ATT (y6:35) R 007.5, P 112.5, Y 022.5 HGA: P -76, Y 127	VERIFY DSE MOTION AT LOS	
96:30		DON PGA	LOAD DAP R1=21111 R2=11111	LM ACTIVATION CHECKLIST	
				VERIFY DOCKING TUNNEL INDEX ANGLE OPEN LM HATCH IVT TO LM	
:40		W/O HELMET & GLOVES			TRANSFER TO LM POWER LM FAMILIARIZATION & HOUSEKEEPING (IF NECESSARY)
:50		PRESSURIZE LM CM/LM PRESS EQUALIZATION VALVE - Close OPEN & STOW CM HATCH REMOVE & STOW PROBE & DROGUE CHECK LATCHES CSM POWER TO LM OFF AT LMP's REQUEST	DISCONNECT AND STOW LM POWER UMBILICAL IVT TO LM TRANSFER CDR & LMP HELMET & GLOVES	EPS ACTIVATION CONFIGURE S-BAND	
97:00		REV 11			

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	96:00 - 97:00	5/10-11	3-70

MCC-H

LM

CSM

1413 CST

CDR

LMP

CONFIGURE CAMERAS FOR
UNDOCKING

97:00

CONNECT TO LM COMM

REACQUIRE MSFN
HGA: P - 76, Y 127
REPORT DOCKING TUNNEL
INDEX ANGLE
COPY UPDATE

:10

S/C CONT - SCS, MIN DB
VO6N20E FOR LM COARSE
ALIGN ON CDR'S MARK
VO6N20E & VOICE ANGLES
TO LM

:20

S/C CONT-CMC
LM CLOCK SYNC: V16N65E
DON HELMET & GLOVES

97:30

:40

SUIT LOOP INTEGRITY
CHECK

CMC WIDE DB, ATT HOLD
FOR LM COLD FIRE
CMC FREE FOR LM
RCS HOT FIRE

98:00

MISSION TIMER ACTIVATION
PRIMARY GLYCOL LOOP ACT

CAUTION/WARNING C/O

CB ACTIVATION
TB VERIFICATION

PGNCS TURN-ON & SELF TEST

DUMP DSE
UPDATE TO LM
STEERABLE ANT
SEC S-BD VOICE CHECK
PRIM S-BAND T/R &
POWER AMPL CHECK
S-BAND STEERABLE ANTENNA
ACT: P 112, Y 34
CONNECT TO LM ECS

P22 TRK PAD

SUIT FAN/H2O SEP CHECK
GLYCOL PUMP CHECK
BIOMED SW-RT
VHF CHECKOUT

REV 12

UNDOCK & SEP
TIME & IMU PITCH
UPLINK TO CSM
CSM S.V. & V66

DOCKED IMU COARSE ALIGN
REPORT GIMBAL ANGLES
& TIME TO MSFN

LGC/CMC CLOCK SYNC
T EPHEM UPDATE
E MEMORY DUMP
SET DAP R1=32022
DEPLOY LANDING GEAR

RCS PRESSURIZATION

RCS CHECKOUT

RCS CHECKOUT

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	97:00 - 98:00	5/11	3-71

CSM**MCC-H**

1513 CST

CMP

INHIBIT ROLL COMMANDS
UNTIL LM/CM $\Delta P > 3.5$ PSID
REMOVE & STOW
CSM/LM UMBILICAL
INSTALL DROGUE & PROBE
PRELOAD PROBE
COCK LATCHES (12)
INSTALL HATCH
VENT TUNNEL
HATCH INTEGRITY
CHECK
CMC - FREE/AUTO
VERIFY DSE MOTION AT LOS
RECORD LM PCM DATA
DOFF HELMET & GLOVES
LiOH CANISTER CHANGE
10 INTO B, STOW 8 IN B6
RR TRANSPONDER ACT
& SELF TEST

LOAD DAP
R=21101, R2=11111

V06N20E
INHIBIT B3
THRUSTER FOR
RR ACT & SELF TEST
CMC FREE FOR AGS CAL
P30/P41 TO MANEUVER
TO UNDOCKING ATT
(99:10)
R 0, P 102, Y 0

CDR

DOCKED IMU FINE ALIGN
VERIFY DROGUE
& PROBE
INSTALLATION
CLOSE AND SECURE
HATCH
DON HELMET & GLOVES

98:00
:10
:20
98:30
:40
REV 12
:50
E 99:00

UPDATE TO LM
GYRO TORQUING Y'S
AGS ABORT CONSTANTS
DAP DATA
COPY UPDATES
AGS ACTIVATION & SELF
TEST
AGS TIME INITIALIZATION
LOAD AGS PAD
STEERABLE ANT
P 131, Y 41
VHF B XMTR - DATA
DON HELMET & GLOVES

LM

AGS ACTIVATION & SELF
TEST
AGS TIME INITIALIZATION
LOAD AGS PAD
STEERABLE ANT
P 131, Y 41
VHF B XMTR - DATA
DON HELMET & GLOVES

UPDATE TO LM
AGS K FACTOR

MAP UPDATE REV 12
LOS : _____
180° : _____
AOS : _____

DOFF HELMETS & GLOVES (CREW OPTION)

DRAFT CHECK
V06 N20E ON MARK

RATE GYRO
TEST

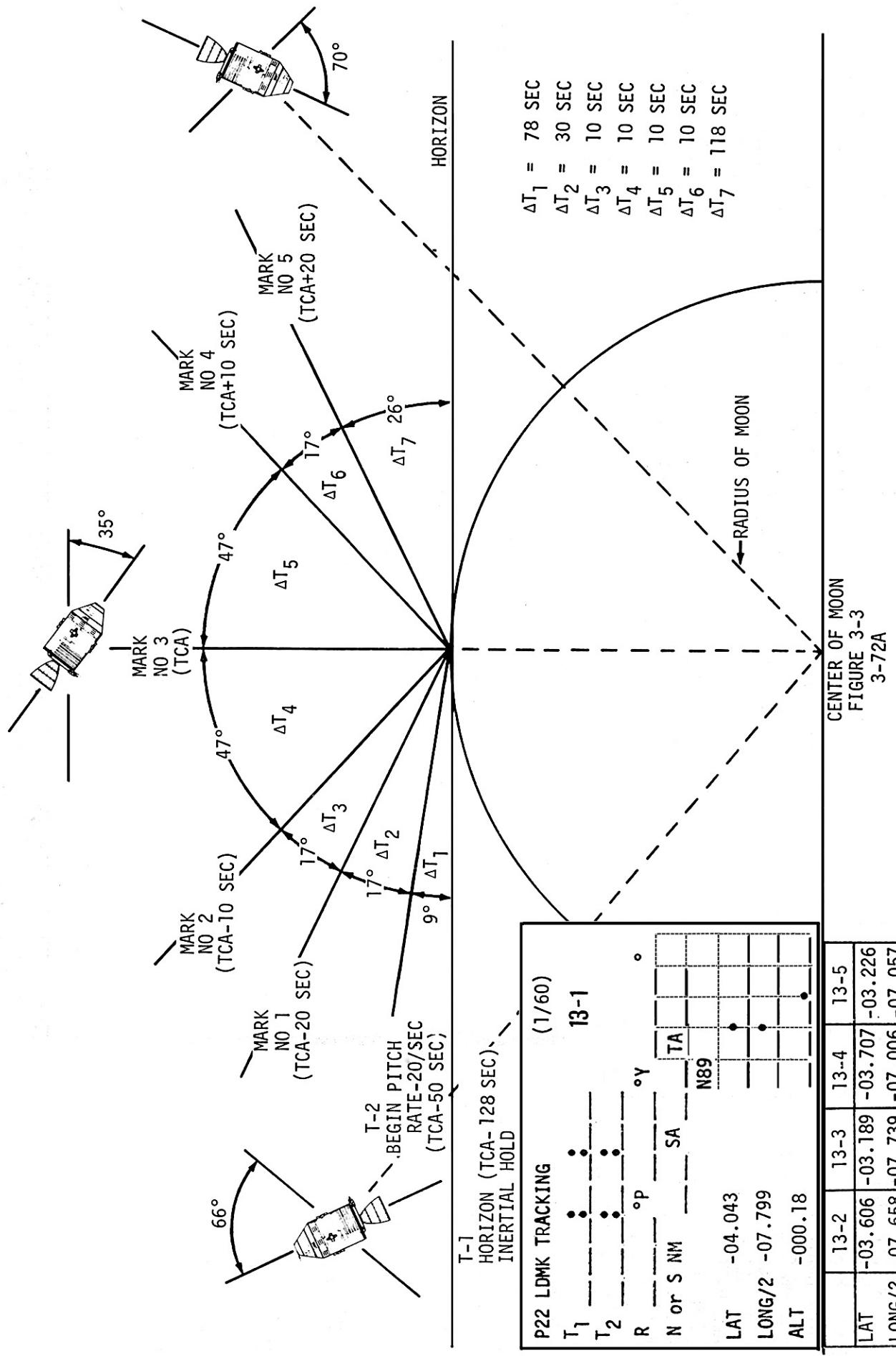
V47-AGS UPDATE & ALIGN

DOCKED AGS
CALIBRATION

UPDATE TO LM
LS REFSMMAT
LM S.V. & V66
LGC/CMC CLOCK SYNC
LGC ABORT CONSTANTS
E MEMORY UPDATE
(IF REQ'D)

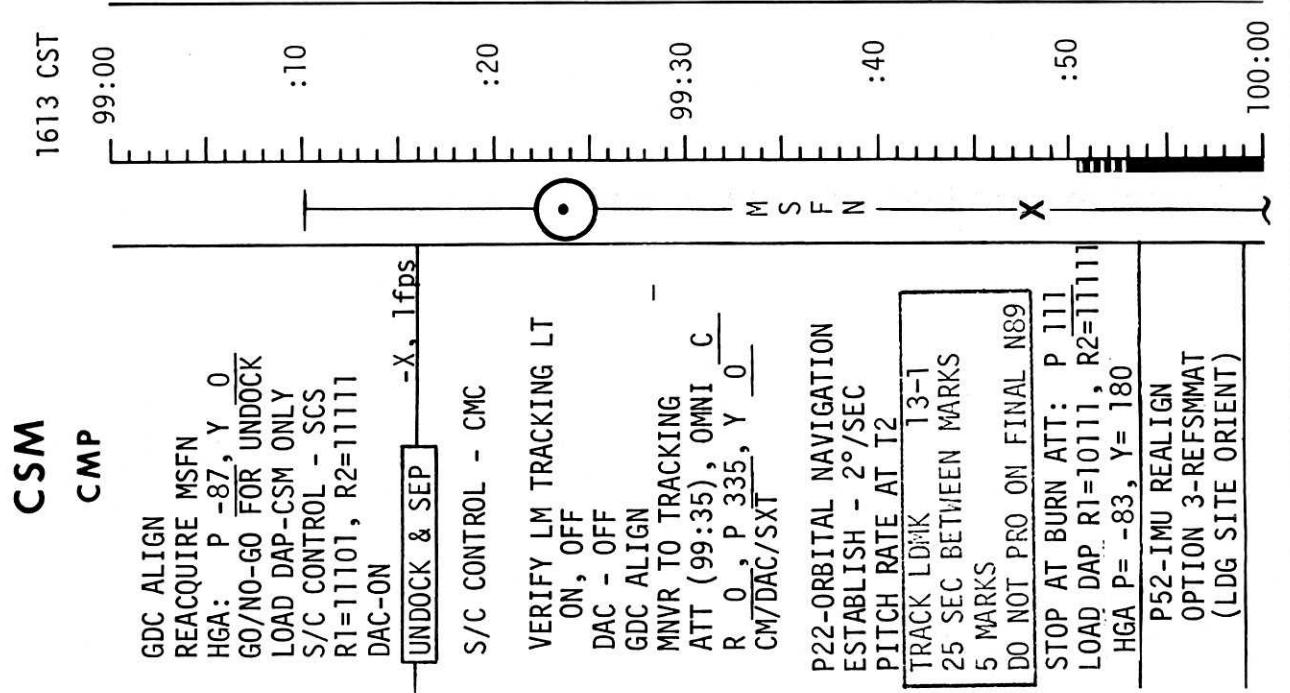
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	98:00 - 99:00	5/11-12	3-72

CSM LOW ALTITUDE LANDMARK TRACKING PROFILE



FLIGHT PLAN

MCCC-H



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	99:00 - 100:00	5/12	3-73

MCC-H

LM

1713 CST

CSM

CMP

V49-TRIM TO CIRC BURN
ATT
P30-EXT ΔV
P40-SPS THRUST
SXT STAR CHECK
GO/NO-GO FOR CIRC

100:00

M
S
F
N

:10

VERIFY DSE MOTION AT LOS
RECORD LM PCM DATA
GDC ALIGN
VERIFY ORDEAL

100:00

CIRCULARIZATION	
TIG:	100:35:05
BT:	3.9 SEC
ΔV_R	70.4 FPS
ULLAGE:	2 JET 15 SEC
ORBIT:	61.7 x 52.5 NM

P20 - AUTO MNVR
SXT & VHF TRACKING
OF LM

:40

REV 13

101:00

MNVR TO COMM
ATT (100:58)
R 60, P 282, Y 0

100:00

CDR

P52-OBSERVE THRU AOT

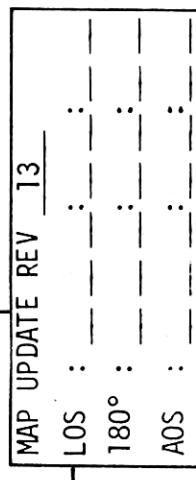
LPD CALIBRATION

SLEW STEERABLE
ANT: P 15, Y -14

MNVR TO AGS CAL ATT
R 024, P 239, Y 021

UNDOCKED AGS CALIBRATION

AGS ALIGN



MNVR TO OBSERVE CSM CIRC BURN
R 0, P 234, Y 0

100:35:05

CSM CIRCULARIZATION

MAP UPDATE REV 13
LOS : ----- ; -----
180° : ----- ; -----
AOS : ----- ; -----

P76 - TARGET ΔV
(UPDATE CSM S.V.)

V83 - SET ORDEAL
GO ORB RATE (100:40)
R 0, P 325/160, Y 0

RESET DET TO COUNT UP
TO PDI₀

:50

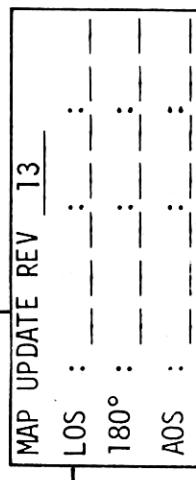
100:00

LM

P52-1IMU ALIGN
OPTION 3 - REFSMMAT
(LDG SITE ORIENT)

SLEW STEERABLE
ANT: P 15, Y -14

AGS ALIGN



MAP UPDATE REV 13
LOS : ----- ; -----
180° : ----- ; -----
AOS : ----- ; -----

V47 - AGS INITIALIZATION
& ALIGNMENT

100:00

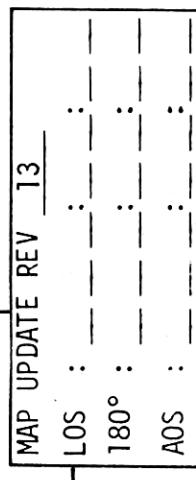
100:00

LM

P52-1IMU ALIGN
OPTION 3 - REFSMMAT
(LDG SITE ORIENT)

SLEW STEERABLE
ANT: P 15, Y -14

AGS ALIGN



MAP UPDATE REV 13
LOS : ----- ; -----
180° : ----- ; -----
AOS : ----- ; -----

V49 MNVR TO COMM
ATT (100:58)
R 60, P 282, Y 0

100:00

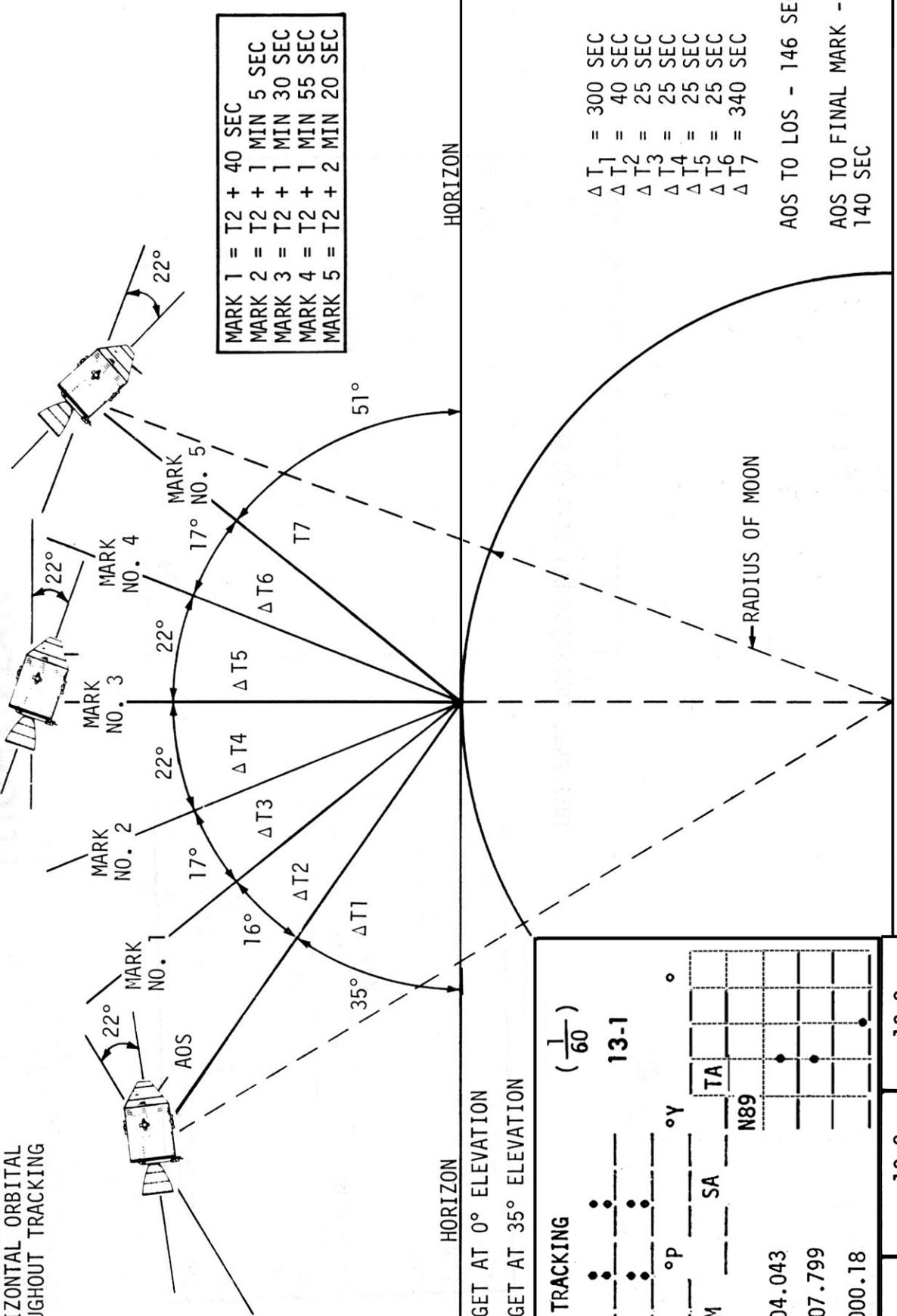
100:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	100:00 - 101:00	5/12-13	3-74

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22 DEG PITCH DOWN FROM
LOCAL HORIZONTAL ORBITAL
RATE THROUGHOUT TRACKING

CSM LANDMARK TRACKING PROFILE

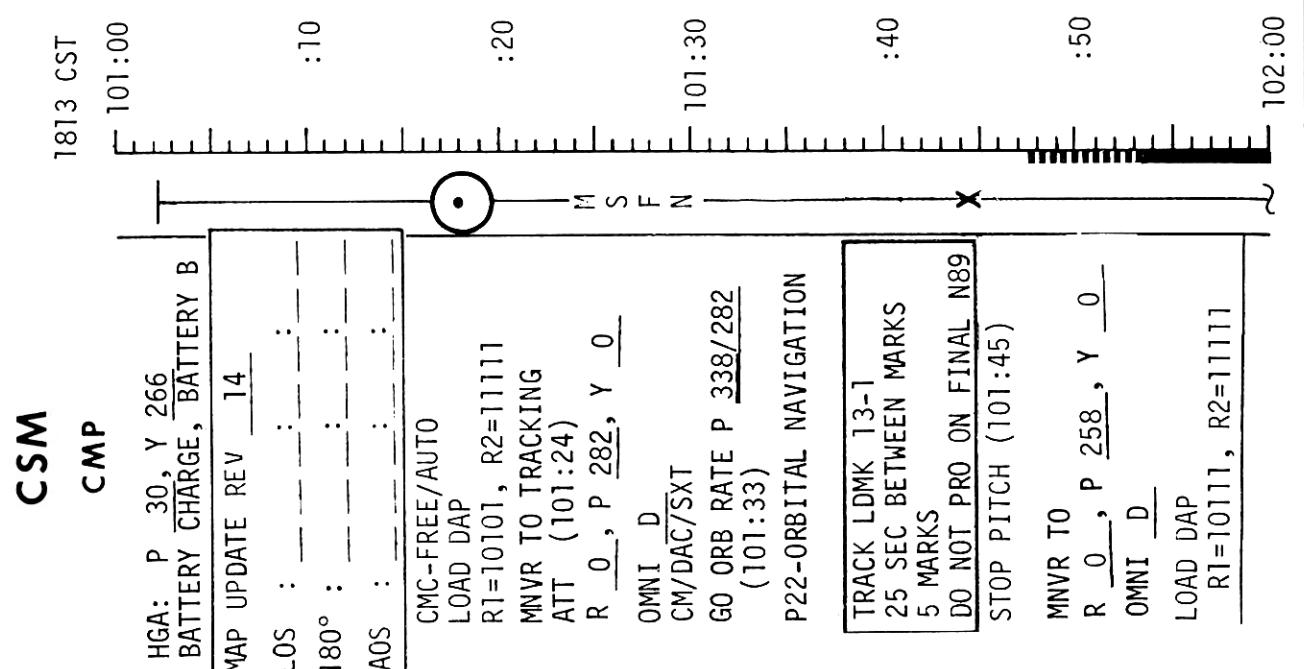


T₁ GET AT 0° ELEVATION
T₂ GET AT 35° ELEVATION

P22 LDMK TRACKING		($\frac{1}{60}$)
T ₁	•	13-1
T ₂	•	
R	°P	°Y
N or S NM	SA	TA
N89		
LAT	-04.043	13-3
LONG/2	-07.799	
ALT	-000.18	
LAT	-03.606	-03.189
LONG/2	-07.658	-07.739
ALT	+000.00	-000.76

FLIGHT PLAN

MCC-H



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	101:00-102:00	5/13	3-75

MCC-C-H

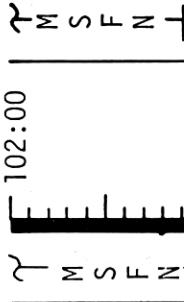
LM

CDR

CSM
CMM

1913 CST

102:00



P52 - IMU REALIGN
OPT 3 - REFSMMAT
(LDG SITE ORIENT)
COAS CALIBRATION (SPICA)

VERIFY DSE MOTION

AT LOS

GDC ALIGN

CMC - FREE/AUTO

LOAD DAP

R1=10101

R2=11111

P20 - AUTO MNVR

SXT & VHF

TRACKING OF LM

LOAD DAP

R1=10111

R2=11111

REV 14

INSTALL TOPO

CAMERA

CM3/LTC/BW (fixed,50, fixed)

:40

:50

103:00

STEERABLE ANT
P -2, Y 2ENABLE MSFN
S-BD
RELAY

P52 - IMU ALIGN
OPTION 3 - REFSMMAT
(LDG SITE ORIENT)

P52 - OBSERVE THRU AOT

START MNVR TO PDI ATT
P30-EXT Δ V
LOAD NO PDI +12 ABORT
VERIFY DAP - 21112
P63-COMPLETE MNVR TO PDI ATT (102:50)
P00; R 0, P 110, Y 0
COAS TO OWD WINDOW

DON HELMETS & GLOVES

CONFIGURE EGRESS MODE
CHECK SYS CONFIGURATION

BATTS 5&6 NORM FEED-ON
REACQUIRE MSFN
STEERABLE ANTENNA
P -2, Y 2
3IOMED SW - LEFT

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	102:00 - 103:00	5 / 13-14	3-76

CSM

2013 CST

CDR

LMP

LM

MCC-H

MAP UPDATE REV	<u>15</u>
LOS :	-----:
180° :	-----:
AOS :	-----:

SET DET COUNTING UP

TO PDI R1=10101
LOAD DAP R2=11111MNVR TO TOPO PHOTO ATT
R₀, P153, Y₀ (103:34)
HGA P-43, Y180
GO/NO-GO

:20

M
S
F
N

103:30

M
S
F
N

:40

M
S
F
N

104:00

M
S
F
N

MAP UPDATE REV

15

LOS

180°

AOS

TO PDI

LOAD DAP

R1=10101

R2=11111

MNVR TO TOPO PHOTO ATT

R₀, P153, Y₀

(103:34)

HGA P-43, Y180

GO/NO-GO

LR-ON
P63
FINAL TRIM
GO/NO-GO FOR PDI

ULL: 2 JET, 7.5 SEC

103:30:28

M
S
F
N

103:30:28

MAP UPDATE REV

15

LOS

180°

AOS

TO PDI

LOAD DAP

R1=10101

R2=11111

MNVR TO TOPO PHOTO ATT

R₀, P153, Y₀

(103:34)

HGA P-43, Y180

GO/NO-GO

V47-INITIALIZE AGS

TARGET AGS FOR ABORT

ALIGN AGS TO PGNS

GO/NO-GO

DUMP DSE

UPLINK TO LM

LM S.V.

RLS

GYRO COMPENSATION

UPDATE TO LM

AGS RLS (23T)

UPDATE TO LM

ΔRLS

UPDATE LM ΔRLS

DAC-ON

SYSTEMS MONITOR

UPDATE AGS ALT @ 6000'

PITCH OVER AT P64

P66

TOUCHDOWN 103:42:02

STEERABLE: P 112, Y -43

PERFORM LUNAR CONTACT CHECKLIST

STAY/NO-STAY FOR T1

P68-LDG CONFIRMATION

P12-POWERED ASCENT GUID

LOAD AGS ASCENT TARGET

STAY/NO-STAY FOR T2

BIOMED SW-RT

ASCENT BATTERIES OFF

REPORT DEDA 047,053

DISABLE S-BD RELAY

COPY AGS AZIMUTH

GDC ALIGN

MISSION EDITION

DATE

TIME

PAGE

APOLLO 13 FINAL (APRIL)

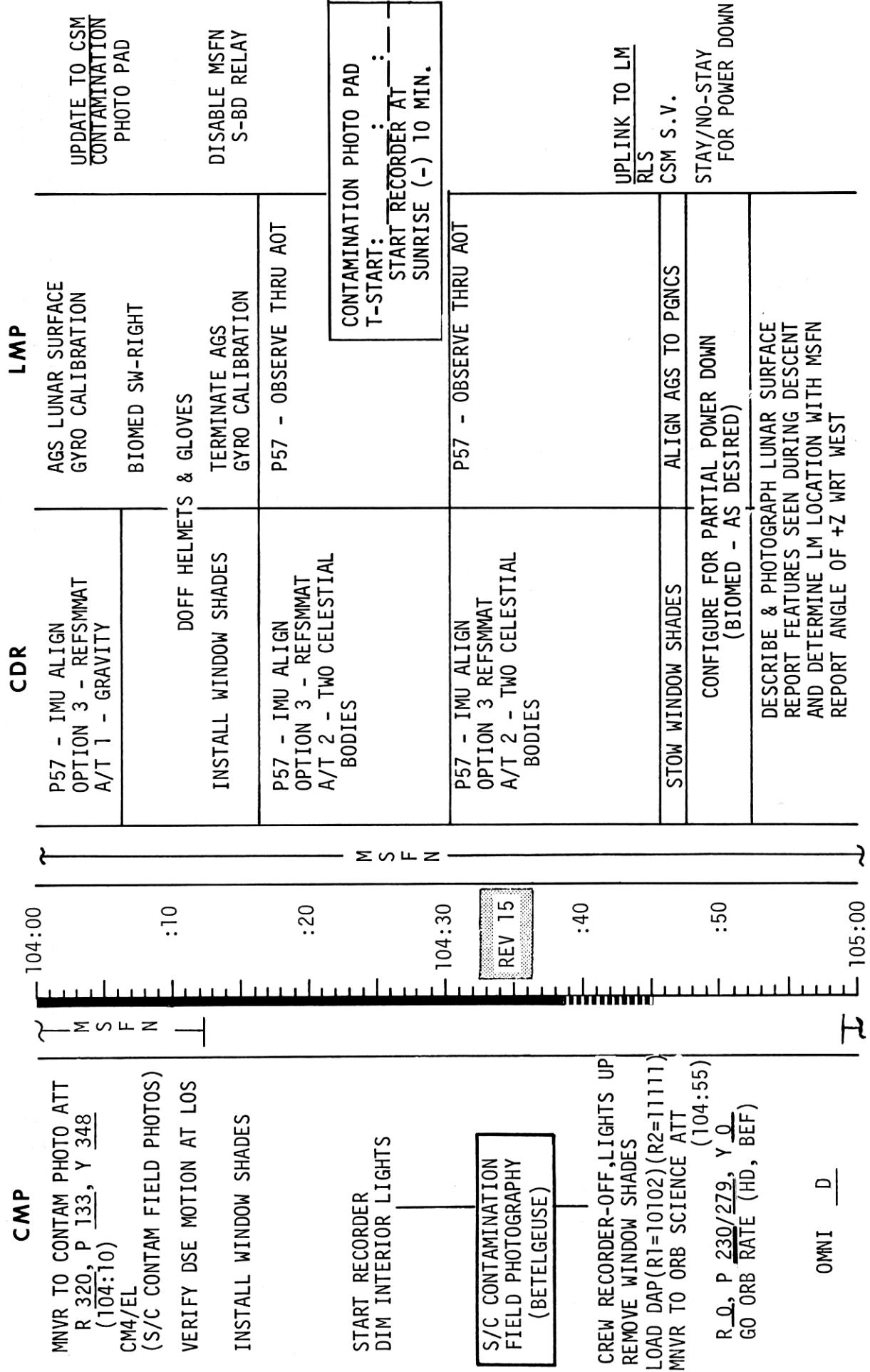
MARCH 16, 1970

103:00-104:00

3-77

MCCC-H

LM



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	104:00-105:00	5/14-15	3-78

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FLIGHT PLAN

P22 LDMK TRACKING (1/60)		THEON SR B	
T ₁	•	T ₂	•
R	°P	N or S NM	SA
LAT	+00.171		
LONG/2	+07.028		
ALT	+000.00		

N89

P22 LDMK TRACKING (1/60)		THEON SR B	
T ₁	•	T ₂	•
R	°P	N or S NM	SA
LAT	-04.043		
LONG/2	-07.799		
ALT	-000.18		

N89

		13-2	13-3
LAT	-03.606	-03.189	
LONG/2	-07.658	-07.739	
ALT	+000.00	-000.76	

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970			3-78A

FLIGHT PLAN

CSM

CMP

2213 CST
105:00

ORBITAL SCIENCE
PHOTO TGT 14
DAP LOAD (10101)(11111)
MNVR TO TRK ATT (105:18)
R 0, P 306, Y 0
OMNT D

CM-/DAC/SXT

P22 ORBITAL NAV
GO ORB RATE (105:22)
P 338/306

START DAC @ T2 -1 MIN
TRACK LDMK THEON SR.B
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

STOP DAC AFTER MARK 5
REMOVE DAC FROM SXT
TRACK LDMK 13-1
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

RNDZ XPNDR-OFF
INSTALL WINDOW SHADES
CM4/EL (S/C CONTAM)

D OFF PGA
STOP ORB RATE (105:59)
P 192

MCC-H

LM

CDR

(DESCRIPTION CONT)

EAT PERIOD

RR-ON
P22 LUNAR SURFACE NAV
M S F N

:20

:40

:50

106:00

TERMINATE P22 LUNAR SURFACE NAVIGATION
DESIGNATE THEN PWR DOWN RR
E MEMORY DUMP

POWER DOWN IMU, LGC TO STANDBY
CREW STATUS REPORT (DOSSIMETER, MEDICATION)

UPDATE TO LM
LM CONSUMABLES
P22 ACQ TIME 28° EL
MSFN
RECORD PCM LBR ON
DSE DURING P22'S

UPDATE TO LM
DAP LOAD
LIFT OFF TIME FOR
REV 16 THRU 19

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	105:00 - 106:00	5/15	3-79

**CSM
CMP**

2313 CST

106:00

M
S
F
N
T
VERIFY DSE MOTION @ LOS

106:11

:10

LOAD DAP (10101)(11111)

:20

START CREW RECORDER
DIM INTERIOR LIGHTING

S/C CONTAM FIELD PHOTOS
(REGULUS)

CREW RECORDER-OFF, LIGHTS
MN VR TO ORB SCIENCE ATT

(106:48)

R 0 P 286, Y 0
CM/ EL (ORB SCIENCE)
GO ORB RATE (106:51)

P 230/286

VISUAL TGT-3

ORBITAL SCIENCE
OMNI D

MISSION EDITION

DATE

TIME

DAY/REV

PAGE

APOLLO 13 FINAL (APRIL)

MARCH 16, 1970

106:00 - 107:00

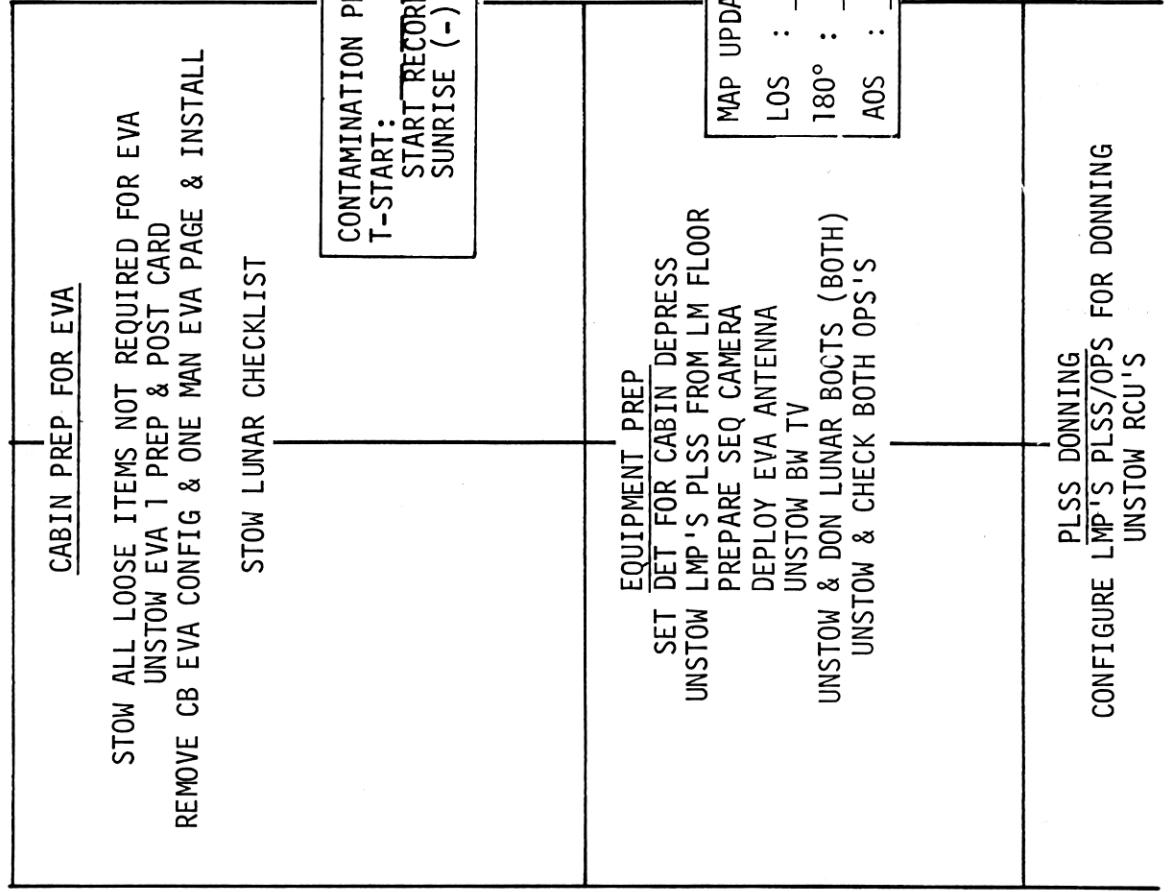
5/15 - 16

3-80

LM

LMP

MCC-H



MAP UPDATE REV 16
LOS : ----- : ----- ;
180° : ----- : ----- ;
AOS : ----- : ----- ;

-1:00

CONTAMINATION PHOTO PAD
T-START:
START RECORDER AT
SUNRISE (-) 10 MIN.

PLSS DONNING
UNSTOW RCU'S

-1:10

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	106:00 - 107:00	5/15 - 16	3-80

SOLAR CORONA PHOTOGRAPHY

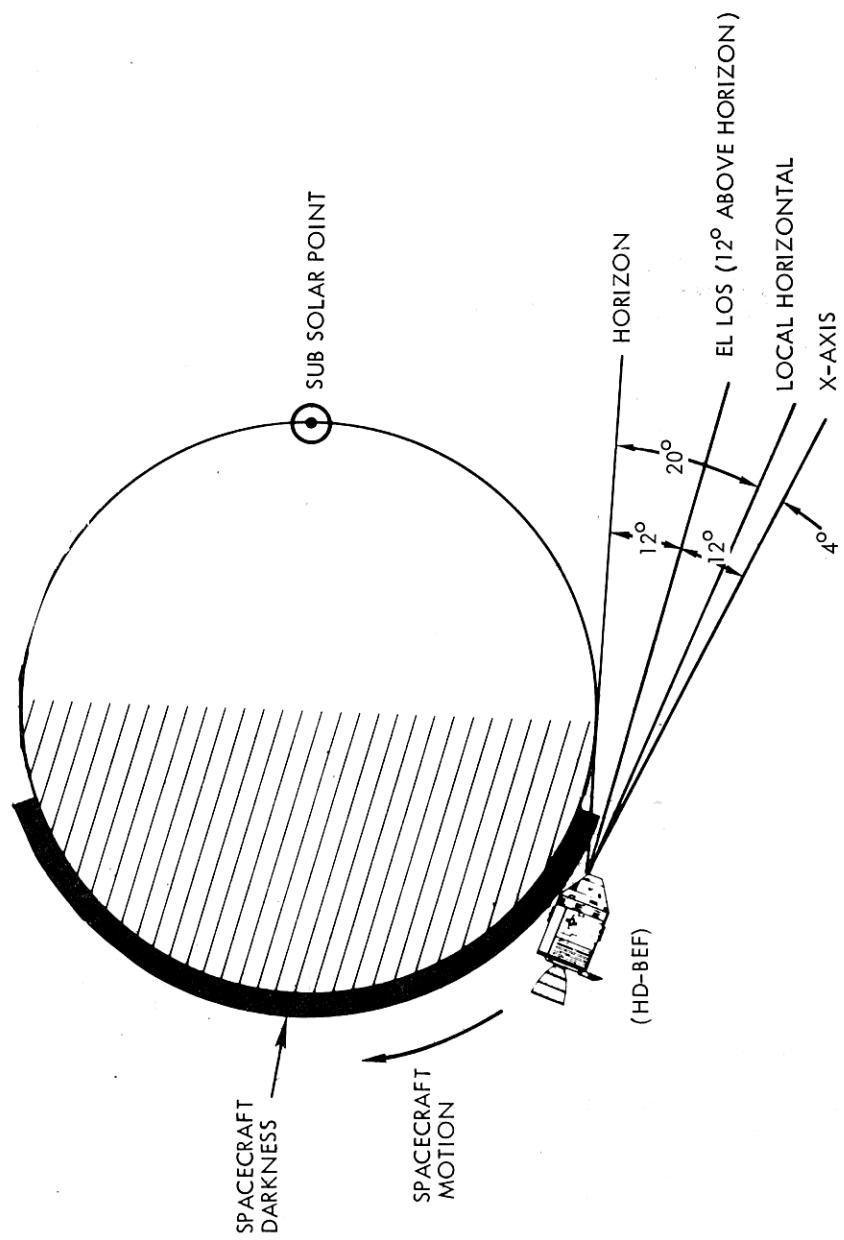


FIGURE 3-5
3-80A

FLIGHT PLAN

MAP UPDATE REV	17
LOS :	----- : -----
180° :	----- : -----
AOS :	----- : -----

SOLAR CORONA PHOTO PAD
T-START : ----- : -----
START RECORDER at
SUNSET (-)5 MIN

TOPO PHOTO PAD (LM)
R ----- P ----- Y -----
T START : ----- : -----
T STOP : ----- : -----
RNG ----- NM.

EARTHSHINE PHOTO PAD
T-START ----- : -----
START RECORDER
AT SUNSET

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970			3-80B

FLIGHT PLAN

CSM

0013 CST
107:00

CMP

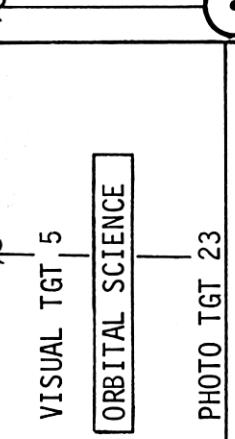
VISUAL TGT 5

ORBITAL SCIENCE

PHOTO TGT 23

LM

CDR



- :100

- 1:00

- :10

- :50

- :40

- :30

- :20

- :10

- :00

- :00

- :00

- :00

- :00

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- :00

LMP

LOAD DAP (10101)(11111)
MNVR TO TOPO ATT(107:35)
R 002, P 123, Y 001
HGA P -75, Y 188
INSTALL TOPO CAMERA
IN HATCH WINDOW
CM4/EL (SOLAR CORONA)

AUDIO SWITCHES CK, ACTIVATE PLSS COMM SYSTEMS &C/0
(TV CB - CLOSE THEN OPEN)

FINAL SYSTEMS PREP

CONNECT OPS O₂ HOSES
DON HELMETS
CONNECT PLSS H₂O HOSES
LCG PUMP CB-OPEN
DON GLOVES

VERIFY CB & VALVE CONFIGURATION

PRESSURE INTEGRITY CHECK
PLSS O₂ ON
DEPRESS CABIN TO 3.5 PSIA
DEPRESS CUPBOARD
EARTHSHINE PHOTO PAD
0:00 START EVA

UPLINK TO CSM
CSM S_v
UPDATE TO CSM
EARTHSHINE PHOTO PAD
0:00 START EVA

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	107:00 - 108:00	5/16	3-81

CMP

STOP ORB RATE (108:01)
P 018
LOAD DAP (10101)(11111)
STOW TOPO CAMERA
VERIFY DSE MOTION @ LOS

CDR

FWD DUMP VALVE - OPEN, OPEN FWD HATCH
PLSS H₂O ON, FINAL SYSTEMS CHECK
TURN TV ON, VERIFY CB CONFIGURATION

LMP

FWD DUMP VALVE - OPEN, OPEN FWD HATCH
FINAL PREP FOR EGRESS
TRANSFER 70MM CAMERA ON LEC

GO ORB RATE (108:19)
P 230/018
CM-/DAC/SXT
WASTE WATER DUMP
O₂ FUEL CELL PURGE
ORBITAL SCIENCE
VISUAL TGT 1

EQUIP JETT, DEPLOY LEC & MESA, DESCEND TO SURFACE
ENVIRONMENTAL FAM & TRANSFER DC CAMERA
CONT. SAMPLE COLLECTION

MVR TO TRK ATT (109:00)
R 0, P 353, Y 0
OMNI-D
CM4/EL (EARTHSHINE)

ASSIST & MONITOR CDR HAND JETT BAG TO CDR
MONITOR & PHOTO CDR
TRANSFER 70MM CAMERA ON LEC

ANT SW & TRANSFERS
S-BD ANT-LUNAR STAY
AID CDR WITH ETB TRANSFER
OFFLOAD PLSS CONSUMABLES
AND STOW
AID CDR WITH ETB TRANSFER

CHECK S-BAND
TRANSFER ETB TO LMP
TRANSFER ETB TO SURFACE
PHOTOS
CONTINGENCY SAMPLE AREA
LMP EGRESS

MISSION**EDITION****DATE****TIME****DAY / REV****PAGE**

APOLLO 13

FINAL (APRIL)

MARCH 16, 1970

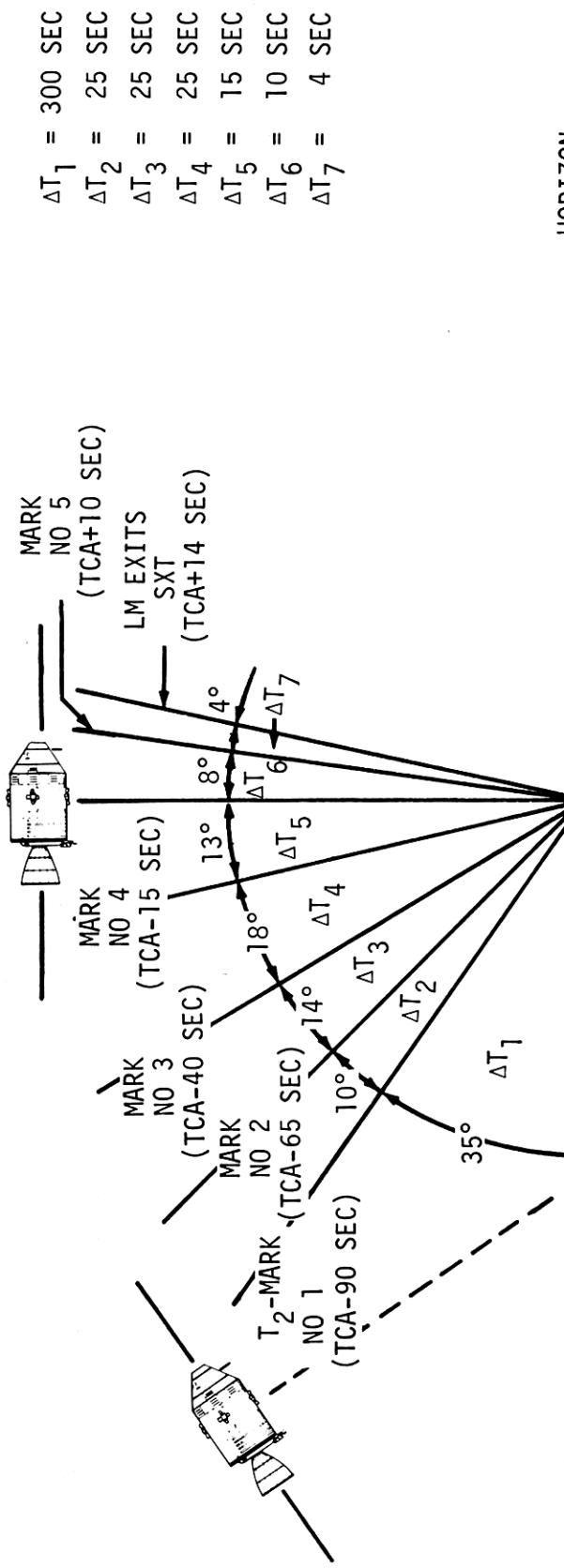
108:00 - 109:00

5/16 - 17

3-82

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	108:00 - 109:00	5/16 - 17	3-82

CSM LM TRACKING PROFILE



T_1 -HORIZON
 LM ENTERS SXT
 (TCA-390 SEC)
 ORB RATE

CENTER OF MOON
FIGURE 3-5
3-82A

P22 LDMK TRACKING (1/125)			
T ₁	•	•	•
T ₂	•	•	•
R	°P	°Y	°Y
N or S NM	SA	SA	TA
N89			
LAT	+01.266		
LONG/2	+11.839		
ALT	+000.00		

P22 LDMK TRACKING (1/250)			
TARUNTIUS			
O	•	•	•
T ₁	•	•	•
T ₂	•	•	•
R	°P	°Y	°Y
N or S NM	SA	SA	TA
N89			
LAT	+02.333		
LONG/2	+27.158		
ALT	+000.00		

P22 LDMK TRACKING			
LM	•	•	•
T ₁	•	•	•
T ₂	•	•	•
R	°P	°Y	°Y
N or S NM	SA	SA	TA
N89			
LAT			
LONG/2			
ALT			

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970			3-82B

FLIGHT PLAN

CSM

CMP

0213 CST
109:00

P22 ORBITAL NAV
GO ORB RATE (109:03)
P 338/353

START DAC @ T2 - 1 MIN
TRACK LDMK TARUNTIUS O
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

STOP DAC AFTER MARK 5
LOAD DAP (10102)(11111)
START DAC @ T2-1 MIN
TRACK LDMK 130

25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

STOP DAC AFTER MARK 5
& REMOVE DAC FROM SXT
MNVR TO LM TRK ATT
R 0, P 0 / 296, Y 0
GO ORB RATE (109:29)-

TRACK LM
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

MNVR TO EARTHSHINE ATT
R 0, P 270/157, Y 0
HGA P -43, Y 180
GO ORB RATE (109:45)

CM4/DAC(EARTHSHINE)
EARTHSHINE PHOTOS
& VISUAL TGT 17

110:00

CDR

FLAG DEPLOY

TV RELOCATION

1:00
MSFN
RECORD PCM LBR ON
DSE DURING P22'S

:10

1:10

ALSEP PREP

OPEN SEQ BAY DOORS
OFFLOAD PKG 1
RTG FUEL SUPPORT
CLOSE SEQ BAY & CONNECT PKGS

TV & PHOTO PAN

WALK TO SEQ BAY (CW)
+Y STRUT PHOTOS&LM INSPECT
LOCATE TV FOR SEQ BAY

WALK TO SEQ BAY (CCW)
-Y STRUT PHOTOS&LM INSPECT

1:10

ALSEP PREP

OFFLOAD PKG 2 DEPLOY HTC
OFFLOAD ALSD & PLACE ON PAD
DEPLOY FUEL CASK
EXTRACT FUEL ELEMENT
FUEL RTG

TAKE HTC & ALSD TO MESA
REMOVE CSC & PLACE DOWN
SUN NW
UNLOAD SRC 1 CONTENTS
INTO HTC

1:20

ASSEMBLE ALSD

UPLINK TO CSM
CSM S.V.

2:00

LM

TV RELOCATION

1:00

:20

1:20

ALSEP DEPLOY

OPEN SEQ BAY DOORS
OFFLOAD PKG 1
RTG FUEL SUPPORT
CLOSE SEQ BAY & CONNECT PKGS

TV & PHOTO PAN

POSITION TV TO COVER
TRAVERSE & CHECK
TRAVERSE > 300 FT WITH
ALSEP

1:30

ALSEP DEPLOY

LOCATE PKG 2 10FT WEST
EMPLACE PKG 2
DEPLOY RTG CABLE & CONNECT
TO CENTRAL STATION
ALIGN PKG 1
AID LMP WITH HFE REMOVAL
DEPLOY PSE STOOL & REMOVE
SUBPALLET
DEPLOY PSE

REMOVE HFE & LOCATE
DEPLOY HFE CABLES & LOCATE
HOLES

1:50

ASSEMBLE ALSD

DEPLOY CCGE

2:00

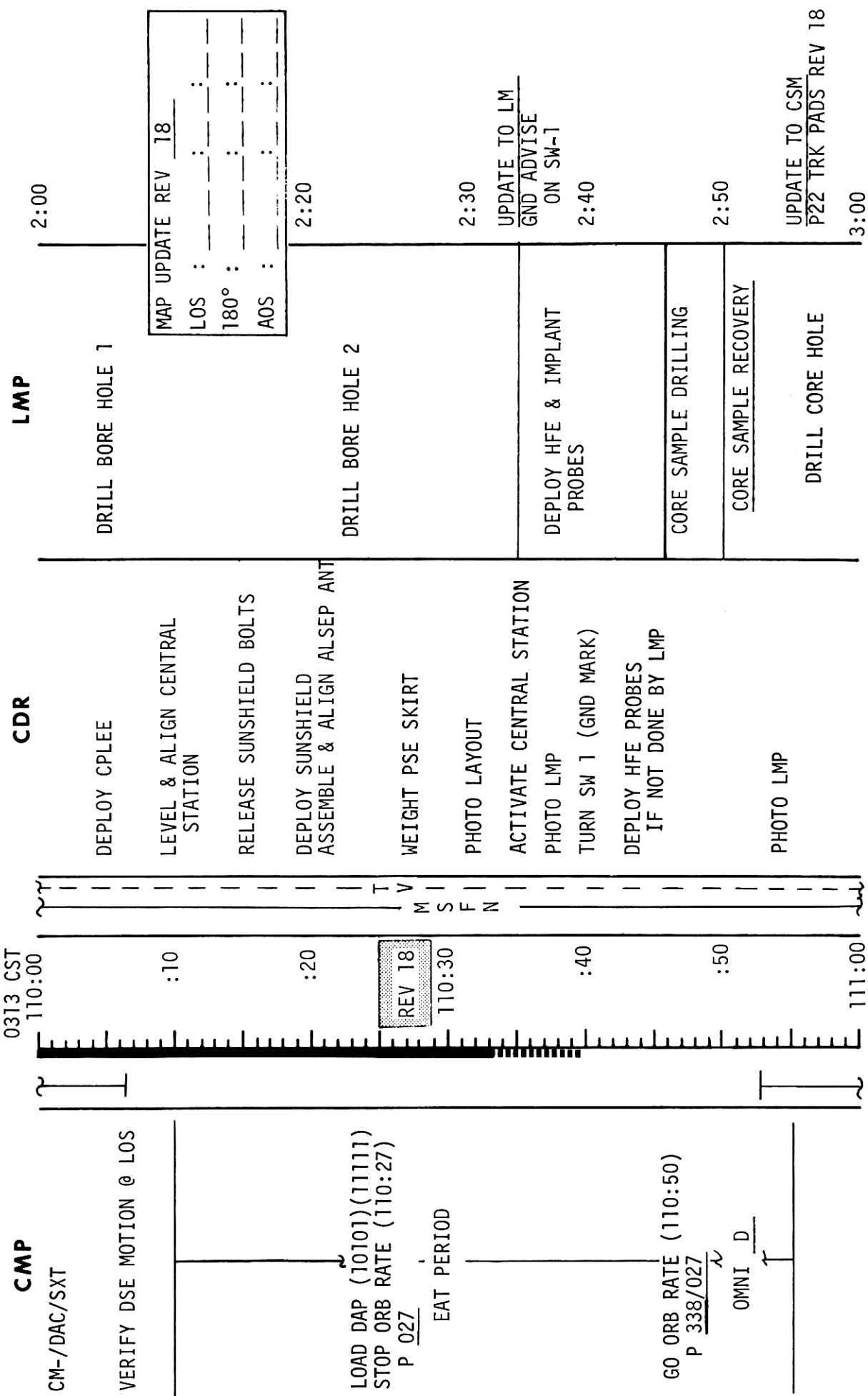
MCC-H

PAGE

3-83

MISSION **EDITION** **DATE** **TIME** **DAY/REV** **PAGE**

APOLLO 13 FINAL (APRIL) MARCH 16, 1970 109:00 - 110:00 5/17 3-83

CSM**MCC-H**

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	110:00 - 111:00	5/17 - 18	3-84

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FLIGHT PLAN

P22 LDMK TRACKING (1/250)		
SECCHI		
T ₁	•	•
T ₂	•	•
R	°P	°Y
N or S NM	SA	TA
N89		
LAT	+03.833	
LONG/2	+20.742	
ALT	+000.00	

P22 LDMK TRACKING (1/60)		
MO STING		
T ₁	•	•
T ₂	•	•
R	°P	°Y
N or S NM	SA	TA
N89		
LAT	-03.250	
LONG/2	-02.642	
ALT	+000.00	

P52 IMU REALIGN		
N71:	—, —, —	
N05:	—, —, —	
N93:		
X	—, —, —	
Y	—, —, —	
Z	—, —, —	;
GET	—, —, —	;

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970			3-84A

FLIGHT PLAN

MCC-H

LM

CSM

CDR

LMP

0413 CST
0411:00

P22 ORBITAL NAV
DAC-ON @ T2 - 1 MIN
TRACK LDMK SECCHI B
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

DAC-OFF AFTER MARK 5
TRACK LDMK MOSTING A
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

DAC-OFF AFTER MARK 5
MNVR TO P52 ATT (111:41)
R 0, P 115, Y 045
HGA -86, Y 130

:20

111:30

:40

112:00

ASSIST LMP WITH CORE STEM REMOVAL
CLEAN UP DEBRIS
CHECK EMU

RETURN TRAVERSE
COLLECT SELECTED SAMPLES
PHOTO SAMPLE AREA

REMOVE CORE STEMS CAP AND STOW CORE STEMS
CLEANUP DEBRIS
CHECK EMU

RETURN TRAVERSE
COLLECT SELECTED SAMPLES

REPOSITION TV OFF +Y
TRANSFER LMP TOTE BAG CONTENTS INTO WEIGH BAG
ON SCALE
TRANSFER HTC SELECTED SAMPLES INTO WEIGH BAG
STOW WEIGH BAG IN SRC
COLLECT LM AREA & LOOSE MATERIAL & PLACE IN WEIGH BAG

EVA TERMINATION
ASCEND, STOW LEC & INGRESS
REPRESS CABIN

MISSION

EDITION

DATE

TIME

DAY/REV

PAGE

APOLLO 13

FINAL (APRIL)

MARCH 16, 1970

111:00 - 112:00

5/18

3-85

4:00

3:00
MSFN RECORD PCM LBR ON DSE DURING P22'S
EMU CONSUMABLES GO/NO-GO FOR EVA 3:10 EXTENSION

DUMP DSE
UPLINK TO CSM
CSM S.V.

PLANE CHANGE TGT LOAD
DESIRED ORIENT (PLANE CHANGE)

CSM
CWP

P30 EXT ΔV
V49-MNVR TO BURN ATT
R 0, P 0, Y 0
VERIFY DSE MOTION @ LOS
SEXTANT STAR CHECK

0513 CST

LiOH CANISTER CHANGE
11 INTO A, STOW 9 IN A3

:20

0:00

POST EVA SYSTEMS CONFIGURATION
CONFIGURE VALVES AND CIRCUIT BREAKERS, TV-OFF
DOFF HELMETS & GLOVES
DISCONNECT OPS 02 & PLSS H2O HOSES & CONNECT LM 02 &
H2O HOSES, LCG PUMP CB-CLOSE
SWITCH TO LM COMM SYSTEM, BIO MED-LEFT

:10

0:10

112:00

0:00

PLSS/OPS DOFFING

REMOVE RCU'S, DOFF PLSS/OPS
REPLACE CDR'S PLSS BATT & LiOH CARTRIDGE
REMOVE OPS & STOW ON ENG COVER
STOW PLSS (RECHARGE STATION)
REPLACE LMP'S PLSS BATT & LiOH CARTRIDGE
REMOVE OPS & STOW PLSS (FLOOR)
CHECK OPS PRESSURE (BOTH)
STOW LMP OPS ON FLOOR

0:20

0:20

112:30

0:30

0:30

0:30

113:00

0:50

0:50

MAP UPDATE REV 19
LOS : _____
180° : _____
AOS : _____

0:50

0:50

113:00

0:50

0:50

DUMP DSE
MSFN
RECORD TOTE BAG #1
WEIGHT
REPORT TOTE BAG #1 WEIGHT
1:00

POST EVA CABIN CONFIGURATION

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	112:00 - 113:00	5/18-19	3-86

FLIGHT PLAN

CSM PLANE CHANGE #1 BURN TABLE			
P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+10° TAKEOVER	BT + 1 SEC	NO TRIM

TABLE 3-9
3-86A

MCC-C

LM

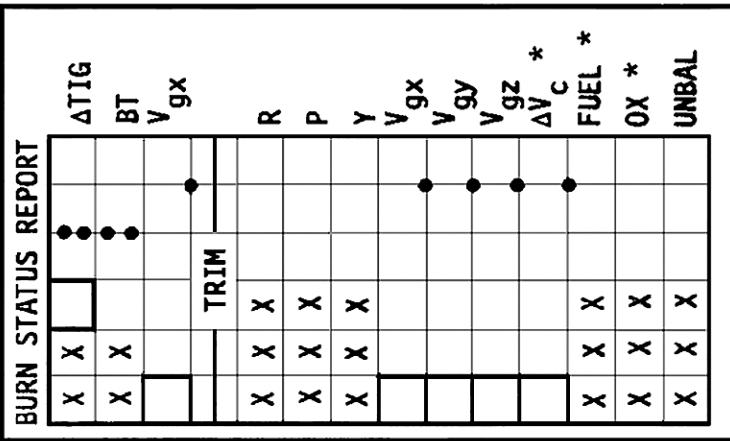
CSM CWP

GO/NO-GO FOR PC 1

LM P

0613 CST :10

CONFIGURE SEQ CAMER
VERIFY CB CONFIGURATION
LCG PUMP CB - OPEN
UNSTOW LUNAR SURFACE CHECKLIST
STOW EVA 1 PREP & POST CARD



* ITEMS TO BE
REPORTED TO MSFN
DUMP DSE
UPLINK TO CSM
DESIRE ORIENT
(LIFTOFF)
RLS UPDATE (IF REQ)
2:00 UPDATE TO CSM
REFSMAT 00 TIME

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	113:00 - 114:00	5/19	3-87

P52 IMU REALIGN

N71: ____
N05: ____
N93: ____
X ____
Y ____
Z ____
GET ____

SOLAR CORONA PHOTO PAD(SR)
T-START : ____
START RECORDER at ____
SUNRISE(-) 7MIN

MAP UPDATE REV 20
LOS : ____
180° : ____
AOS : ____

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970			3-87A

CSM

CMP

0713 CST

OPTION 1 - PREFERRED
(LIFTOFF ORIENT)
GYRO TORQUE
STARS _____,

MNVR TO SOLAR CORONA/LIMB
BRIGHTENING ATT (114:17)

R 0, P 092, Y 0
VERIFY DSE MOTION @ LOS

CM4/EL (SOLAR CORONA)

CM4/DAC (LIMB BRIGHT)

GO ORB RATE (114:20)

P 340/092

CREW RECORDER-ON
DIM INTERIOR LIGHTS

**SOLAR CORONA & LIMB
BRIGHTENING PHOTOS**

CREW RECORDER-OFF, LIGHTS UP
LOAD DAP (10101)(11111)

MNVR TO REST ATT (114:48)

R 098, P 272, Y 0
HGA P -6, Y 268

PERFORM PRESLEEP
CHECKLIST

SC CONT-CMC/FREE(VERIFY)
V79 (-0.0000)
(+010.00)
(+11111)

SC CONT-CMC/AUTO

114:00

:10

REV 20

114:30

:40

:50

115:00

LM

CDR

114:00

:20

REV 20

114:30

:40

:50

115:00

LMP

114:00

:20

REV 20

114:30

:40

:50

115:00

MCC-H

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	114:00 - 115:00	5/19 - 20	3-88

FLIGHT PLAN

MCC-H

LM

CSM
CMP

0813 CST

:10

:20

115:30

:40

116:00

REST PERIOD
(10 HOURS)

REST PERIOD
(9 1/2 HOURS)

REST PERIOD
(9 1/2 HOURS)

LMP

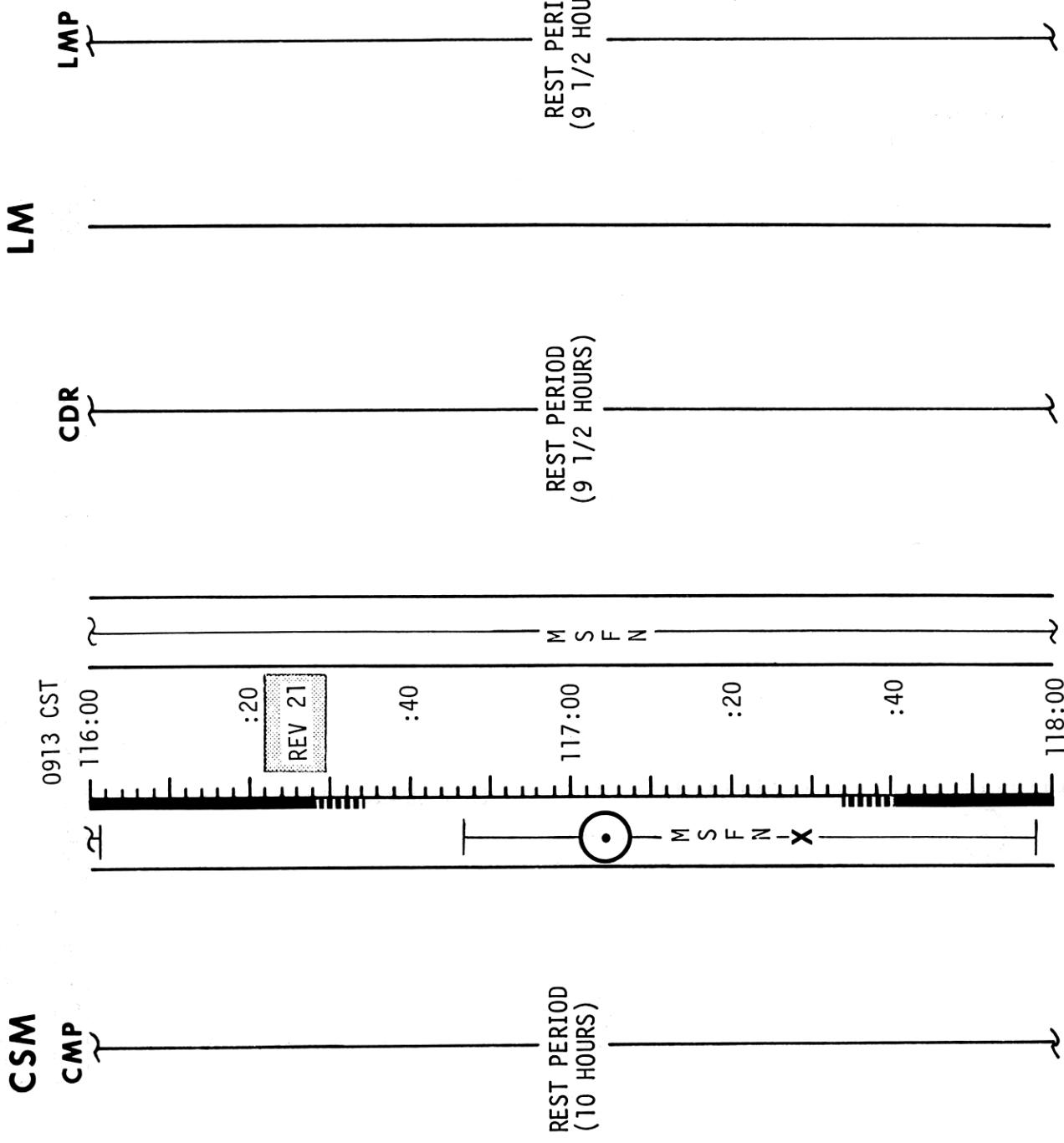
CDR

M S F N

M S F N X

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	115:00 - 116:00	5/20	3-89

MCCC-H



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	116:00 - 118:00	5/20-21	3-90

FLIGHT PLAN

MCC-H

CSM
CMP

1103 CST
118:00

:20
REV 22

:40

REST PERIOD
(10 HOURS)

REST PERIOD
(9 1/2 HOURS)

REST PERIOD
(9 1/2 HOURS)

DUMP DSE

LMP

CDR

M S F N

:20

:40

120:00

119:00

•

M S F N

MISSION

EDITION

DATE

TIME

DAY/REV

PAGE

APOLLO 13 FINAL (APRIL)

3-91

5/21-22

3-91

MISSION

EDITION

DATE

TIME

DAY/REV

PAGE

LM

LMP

CDR

1313 CST

CSM
CMP

REV 23

:20

:40

REST PERIOD
(10 HOURS)

121:00

:20

:40

122:00

M S F N

REST PERIOD
(9 1/2 HOURS)

DUMP DSE

M

S

F

N

X

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	120:00 - 122:00	5/22 - 23	3-92

FLIGHT PLAN

MCC-H

LM

CDR

LMP

CSM
CMP

1513 CST
122:00

REV 24

:20

:40

DUMP DSE

REST PERIOD
(9 1/2 HOURS)

REST PERIOD
(9 1/2 HOURS)

REST PERIOD
(10 HOURS)

123:00

:20

:40

124:00

M S F N

M S F N

M S F N

M S F N

•

X

MISSION EDITION DATE TIME

APOLLO 13 FINAL (APRIL) MARCH 16, 1970

DAY/REV

122:00 - 124:00

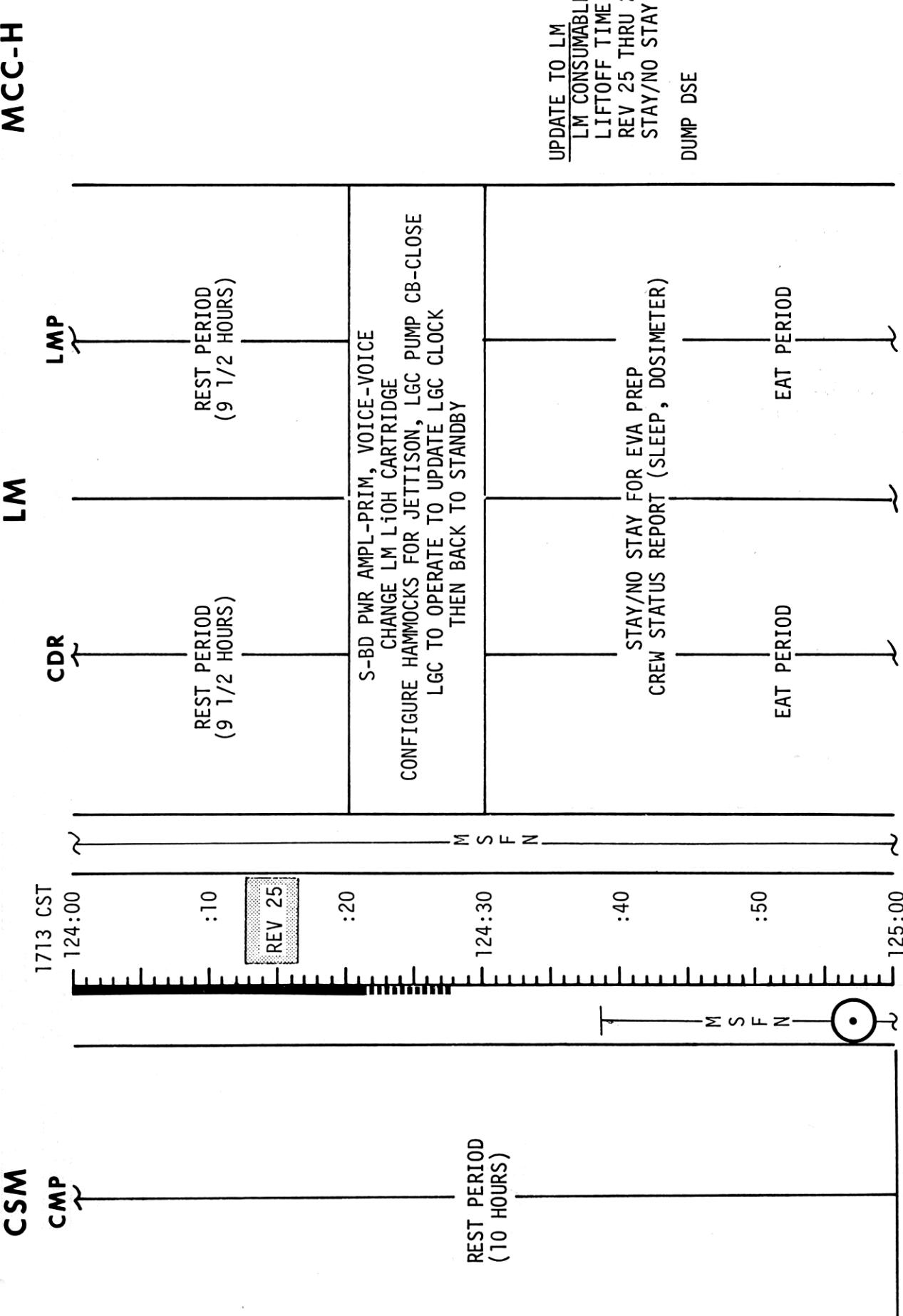
PAGE

3-93

3

MCC-H

LM



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	124:00 - 125:00	5-6/24 - 25	3-94

FLIGHT PLAN

CSM

1813 CST
125:00

WAKE UP
PERFORM POSTSLEEP
CHECKLIST

CSM CONSUMABLES UPDATE

GET:	_____	_____	:	_____
RCS TOTAL	_____	_____	B	_____
QUAD A	C	D	_____	_____
H ₂ TOTAL	_____	_____	_____	_____
O ₂ TOTAL	_____	_____	_____	_____

:10

:20

125:30

:40

:50

126:00

EAT PERIOD

N S F N

EAT PERIOD

UPDATE TO CSM
CONSUMABLES PAD
VERTICAL STEREO PAD
UPLINK TO CSM
CSM S.V.

CDR

LMP

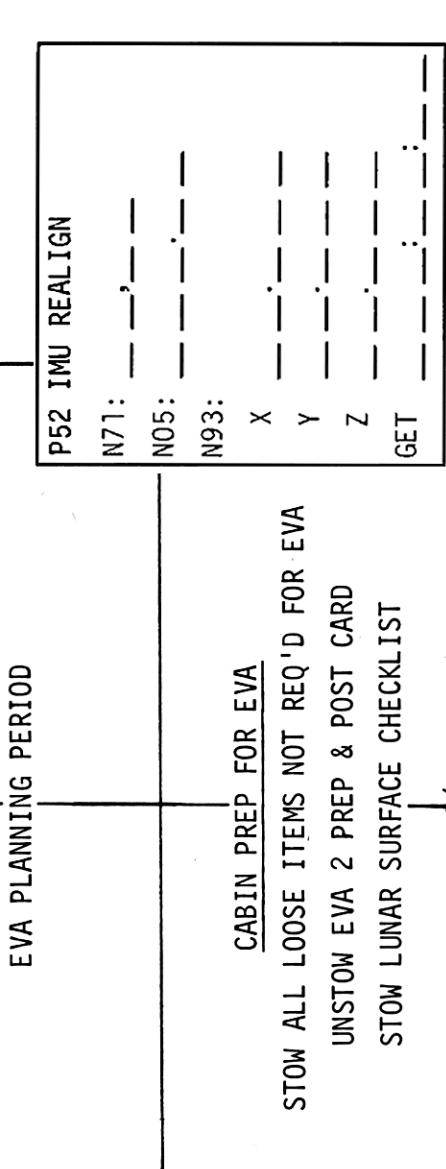
LM

LMP

EAT PERIOD

UPDATE TO CSM
CONSUMABLES PAD
VERTICAL STEREO PAD
UPLINK TO CSM
CSM S.V.

EVA PLANNING PERIOD



P52 IMU REALIGN

N71: _____, _____
N05: _____, _____
N93: _____, _____
GET _____, _____

CABIN PREP FOR EVA

STOW ALL LOOSE ITEMS NOT REQ'D FOR EVA
UNSTOW EVA 2 PREP & POST CARD
STOW LUNAR SURFACE CHECKLIST

MISSION **EDITION** **DATE** **TIME** **DAY/REV** **PAGE**

APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	125:00 - 126:00	6/25	3-95
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**STEREO STRIP PHOTOGRAPHY
(RESEAU & DAC)**

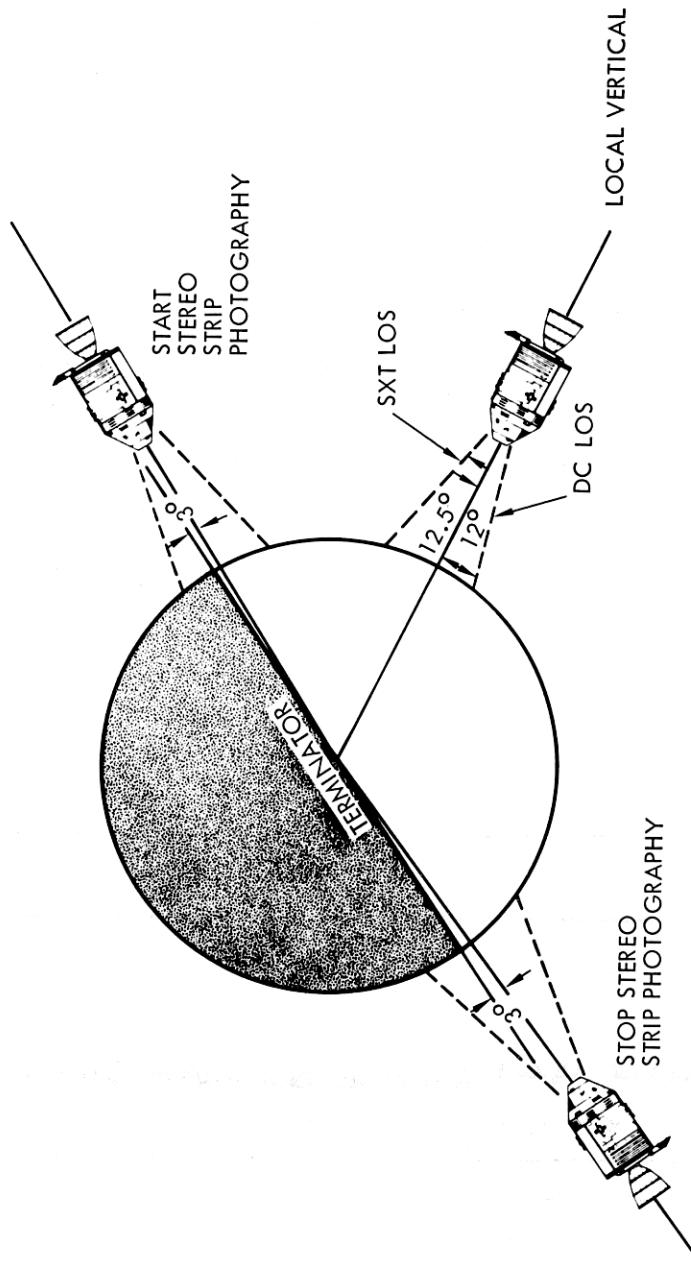
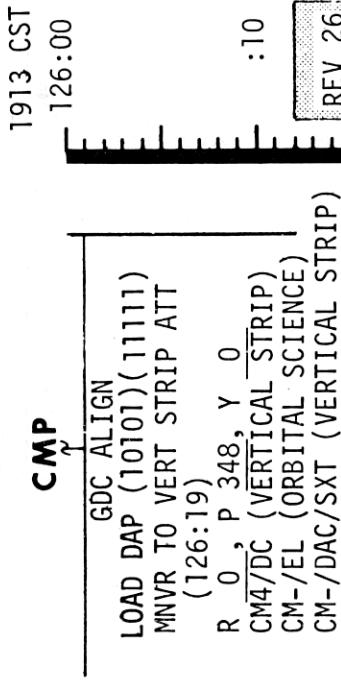


FIGURE 3-7
3-95A

FLIGHT PLAN

CSM

MCC-H



126:21

:20

126:30

:40

127:00

127:00

EQUIPMENT PREP

SET DET FOR CABIN DEPRESS
PREPARE CAMERAS

UNSTOW AND CHECK BOTH OPS

-1:10

ORBITAL SCIENCE
& VERTICAL STEREO STRIP

126:00 - 127:00

126:00 - 127:00

MAP UPDATE REV 26

LOS : _____ ; _____ ; _____ ; _____ ; _____ ; _____

180° : _____ ; _____ ; _____ ; _____ ; _____ ; _____

AOS : _____ ; _____ ; _____ ; _____ ; _____ ; _____

UPDATE TO CSM
FRA MAURO ZERO PHASE
PAD

-1:00

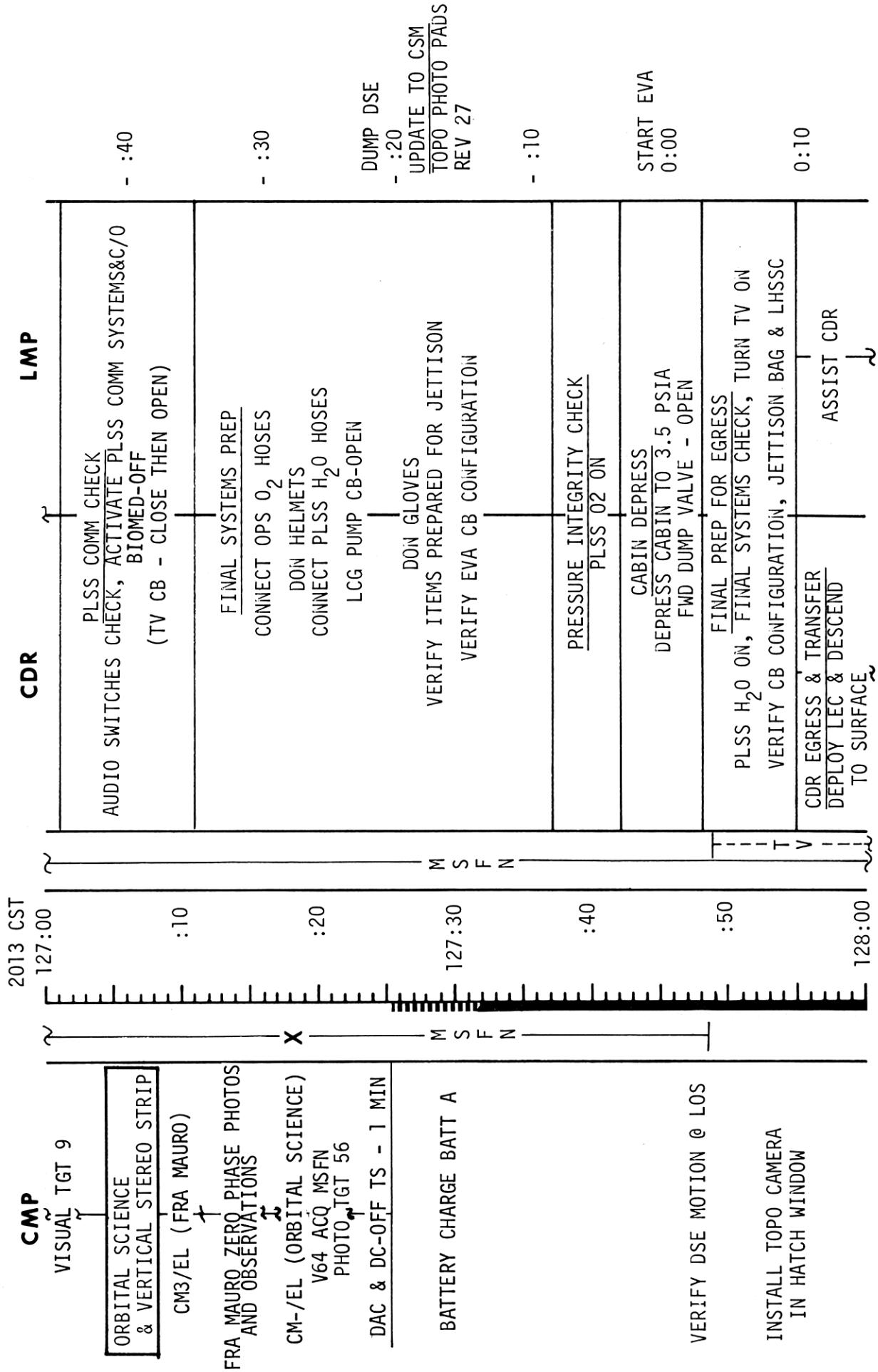
126:00 - 127:00

CONFIGURE LMP'S PLSS/OPS FOR DONNING
UNSTOW RCU'S
LMP DON PLSS/OPS
UNSTOW CDR'S PLSS/OPS FOR DONNING
CDR DON PLSS/OPS
VERIFY RCU CONTROLS AND CONNECT TO PLSS/PGA

FRA MAURO ZERO PHASE PAD

T-START:
START RECORDER at FRA
MAURO SUN ELEV X (-)3 1/2 MIN

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	126:00 - 127:00	6/25 - 26	3-96



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	127:00 - 128:00	6/26	3-97

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FLIGHT PLAN

TOPO PHOTO PAD TGT 6
R _____ P _____ Y _____
T START: _____ : _____ : _____
T STOP : _____ : _____ : _____
RNG _____

TOPO PHOTO PAD TGT 9
R _____ P _____ Y _____
T START: _____ : _____ : _____
T STOP : _____ : _____ : _____
RNG _____

TOPO PHOTO PAD CENSORINUS
R _____ P _____ Y _____
T START: _____ : _____ : _____
T STOP : _____ : _____ : _____
RNG _____

TOPO PHOTO PAD TGT 29
R _____ P _____ Y _____
T START: _____ : _____ : _____
T STOP : _____ : _____ : _____
RNG _____

TOPO PHOTO PAD TGT 34
R _____ P _____ Y _____
T START: _____ : _____ : _____
T STOP : _____ : _____ : _____
RNG _____

TOPO PHOTO PAD TGT 42
R _____ P _____ Y _____
T START: _____ : _____ : _____
T STOP : _____ : _____ : _____
RNG _____

TOPO PHOTO PAD TGT 46/54
R _____ P _____ Y _____
T START: _____ : _____ : _____
T STOP : _____ : _____ : _____
RNG _____

MAP UPDATE REV 27-
LOS : _____ : _____ : _____
180° : _____ : _____ : _____
AOS : _____ : _____ : _____

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970			3-97A

FLIGHT PLAN

CSM

CMP

MNVR TO TOPO TGT 6
ATT (128:20)
R 349, P 269, Y 353

2113 CST

128:00

128:00

128:00

128:00

128:00

128:00

128:00

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128:00

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128:00

128:00

CDR

TRANSFER ETB TO SURFACE

RETRIEVE SRC 2 & OPEN

ALHT CARRIER LOAD UP
OFFLOAD SRC 2 CONTENTS
LOAD GEOLOGY EQUIP & TOOLS
ON HTC

PUT TOTE BAG ON LMP
COLLECT CONTAMINATED
SAMPLE UNDER LM
PHOTO COLOR CHART

COLLECT SIEVE SAMPLE
POSITION TV FOR GEOLOGY
TRAVERSE

FIELD GEOLOGY TRAVERSE
OUTBOUND

TAKE DOCUMENTED SAMPLES & CSC PHOTOS THROUGHOUT
TRAVERSE

NOTE: SEE LUNAR SURFACE CHECKLIST FOR
DETAILS OF ACTIVITIES DURING TRAVERSE.

ACQ MSFN HGA P-21, Y 177
NOTE: A MINVR IS REQUIRED
FOR EACH TGT TO ORIENT
THE CAMERA'S IMAGE MOTION
COMPENSATION ALONG THE
S/C'S VELOCITY VECTOR.
THE ATTITUDES AND CAMERA
START AND STOP TIMES WILL
BE ON THE TOPO PAD FOR
EACH TARGET.

TOPO STRIP, CENSORINIUS
•

TIME / REV
6/26 - 27
3-98

LMP

ASSIST CDR

CLOSE HATCH & DESCEND TO
SURFACE

ALHT CARRIER LOAD UP
CSC PHOTOS IN LM VICINITY
STOW TOOLS ON HTC

COLLECT SIEVE SAMPLE
POSITION TV FOR GEOLOGY
TRAVERSE

FIELD GEOLOGY TRAVERSE
OUTBOUND

TAKE DOCUMENTED SAMPLES & CSC PHOTOS THROUGHOUT
TRAVERSE

NOTE: SEE LUNAR SURFACE CHECKLIST FOR
DETAILS OF ACTIVITIES DURING TRAVERSE.

ACQ MSFN HGA P-21, Y 177
NOTE: A MINVR IS REQUIRED
FOR EACH TGT TO ORIENT
THE CAMERA'S IMAGE MOTION
COMPENSATION ALONG THE
S/C'S VELOCITY VECTOR.
THE ATTITUDES AND CAMERA
START AND STOP TIMES WILL
BE ON THE TOPO PAD FOR
EACH TARGET.

TOPO STRIP, CENSORINIUS
•

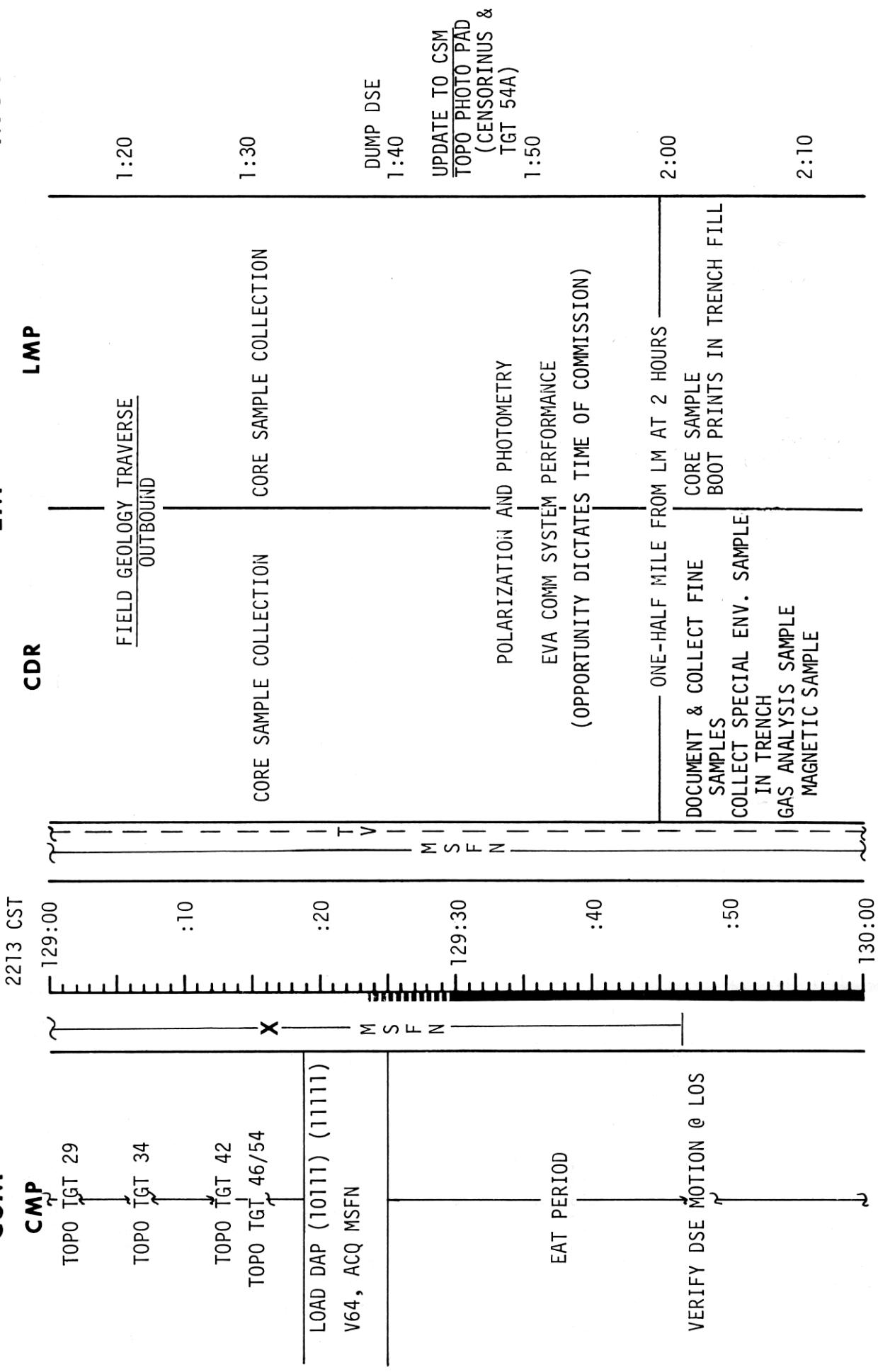
TIME / REV
6/26 - 27
3-98

MCC-H

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	128:00 - 129:00	6/26 - 27	3-98

MCC-H

LM

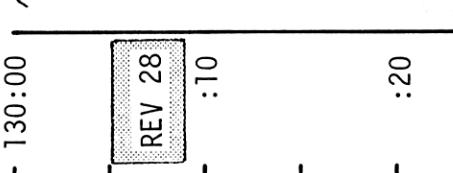


FLIGHT PLAN

CSM

CMP

2313 CST



EAT PERIOD
MNVR TO OBLIQUE STEREO ATT
(130:27)
R 0, P 227, Y 0

GO ORB RATE (130:29)
P 183/227
OMNI C

PHOTO TGT 18

CONFIGURE TOPO CAMERA

ORBITAL SCIENCE &
OBLIQUE STEREO

30° REAR OBLIQUE TOPO
STRIP (CENSORINUS)

MCC-H

LMP

FIELD GEOLOGY TRAVERSE
INBOUND

2:20

2:30

2:50

TOPO PHOTO PAD TGT 54A

R P Y
T START :
T STOP :
RNG

TOPO PHOTO PAD CENSORINUS
Y
T START :
T STOP :
RNG

TOPO PHOTO PAD TGT 54A
Y
T START :
T STOP :
RNG

MISSION EDITION DATE TIME

MISSION EDITION DATE TIME

MISSION EDITION DATE TIME

PAGE

ZODIACAL LIGHT PHOTOGRAPHY

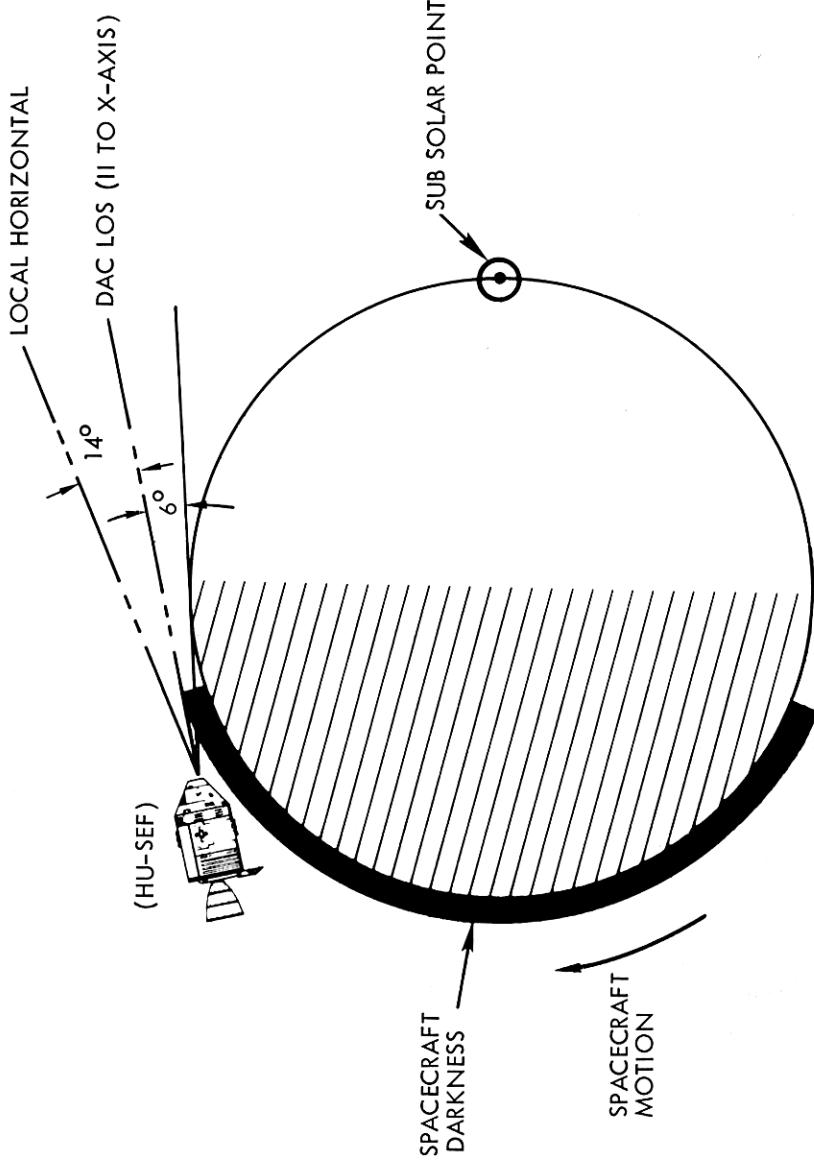


FIGURE 3-8
3-100 A

FLIGHT PLAN

MCC-C-H

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	131:00 - 132:00	6/28	3-101

CSM	CMP	0013 CST			
LOAD DAP (10102)(11111)			E 131:00		
PHOTO TGT 33					
MNVR TO TOPO TGT 54A ATT BY 131:14	X				
R TOPO, P 54A, Y —		:10			
LOAD DAP (10111)(11111)					
MNVR TO ZODIACAL LIGHT ATT (131:30)					
R 0, P 183, Y 0					
OMNI C					
CM-/EL (ORBITAL SCIENCE) CM4DAC (ZODIACAL LIGHT)					
STOW TOPO CAMERA					
GO ORB RATE (131:37)					
P 346/183		:40			
CREW RECORDER-ON					
VERIFY DSE MOTION @ LOS					
DIM INTERIOR LIGHTING					
ZODIACAL LIGHT PHOTOGRAPHY					
CDR	LMP				
DOCUMENTED SAMPLE OFFLOAD					
CHECK EMU EXPENDABLES					
OFFLOAD SAMPLES INTO SRC 2					
COMPLETE FILL WITH FINE					
SOIL & ROCKS NEAR LM					
STOW SAMPLES IN TOTE BAG					
SEAL SRC 2 & PREP FOR					
TRANSFER					
STOW CAMERAS & MAGS					
T IN ETB					
SUPPORT LMP INGRESS					
HOOK UP ETB ON LEC					
F TRANSFER ETB INTO LM					
TRANSFER TOTE BAG INTO LM					
TRANSFER SRC INTO LM					
EVA TERMINATION					
CLEAN EMU, ASCEND					
JETT LEC, INGRESS					
REPRESS CABIN					
POST EVA SYSTEMS CONFIGURATION					
CONFIGURE VALVES AND CIRCUIT BREAKERS, DOFF GLOVES					
DISCONNECT OPS 02 HOSES & PLSS H2O HOSES					
& CONNECT LM 02 & H2O HOSES					
LCG PUMP CB-CLOSE, SWITCH TO LM COMM SYSTEM, BIOMED-LEFT					
PLSS/OPS DOFFING					
REMOVE RCU'S DISCONNECT PLSS 02 HOSES					
ZODIACAL LIGHT PHOTOGRAPHY					
LM	CDR				
DOCUMENTED SAMPLE OFFLOAD					
CHECK EMU EXPENDABLES					
REPOSITION TV					
RETRIEVE & STOW SWC IN ETB					
STOW CSC MAG IN ETB					
COLLECT ENG. SAMPLE					
EVA TERMINATION					
CLEAN EMU & INGRESS					
HOOK UP LEC					
ASSIST CDR					
TEMP STOW ETB					
& TOTE BAG					
ASSIST CDR					
STOW SRC					
HAND LEC TO CDR					
CLOSE HATCH					
ZODIACAL LIGHT PHOTO PAD (SR)					
T-START:					
START RECORDER at SUNSET (-) 30 MIN					
4:00					
0:00					

CSM**LM****CMP****MCC-H**

0113 CST

ZODIACAL LIGHT
PHOTOGRAPHY

REV 29

:10

CREW RECORDER-OFF, LIGHTS UP
LOAD DAP (10102) (11111)
MNVR TO ORB SCIENCE ATT
R 0, P 230/287, Y 0
GO ORB RATE (132:23)

:20

PHOTO TGT 10

PHOTO TGT 12

PHOTO TGT 15

:40

ORBITAL SCIENCE

PHOTO TGT 21

MNVR TO TRK ATT (132:54)
R 0, P 291, Y 0
CM-/DAC/SXT (LDMK TRK)
P22 ORBITAL NAVIGATIONGO ORB RATE (132:57)
P 338/291GO ORB RATE (132:57)
P 338/291**MISSION****EDITION****DATE****TIME****DAY/REV****PAGE**

APOLLO 13 FINAL (APRIL)

MARCH 16, 1970

132:00 - 133:00

6/28 - 29

3-102

DOFF PLSS/OPS
REMOVE OPS & CHECKOUT

0:20

STOW OPS ON ENGINE COVER
STOW BOTH PLSS ON FLOOR
VERIFY CB CONFIGURATION
RR OPR HTR - ON

MAP UPDATE REV 29

:

:

:

:

LOS : _____
180° : _____
AOS : _____

0:40

PREP FOR EQUIPMENT JETTISON
DOFF LUNAR BOOTS
UNSTOW EQUIPMENT FROM ETB
STOW EQUIPMENT IN LHSSC FOR JETT
POSITION LHSSC, JETT BAG, AND PLSS'S FOR
JETTISON DON EV GLOVESPRESSURE INTEGRITY CHECK
CABIN DEPRESS
HATCH OPENING
OPEN HATCH & JETTISON EQUIPMENT
CABIN REPRESS
DUMP VALVES - AUTO, REPRESS CABIN
POST EVA CLEAN UP
SECURE OPS'S ON FLOOR

1:00

MSFN

RECORD PCM LBR ON

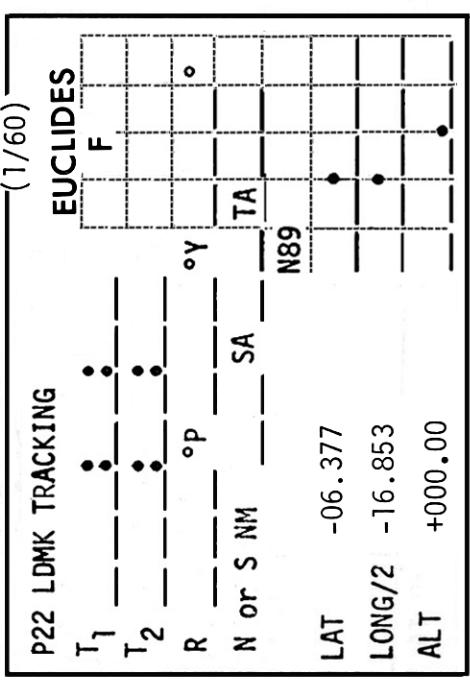
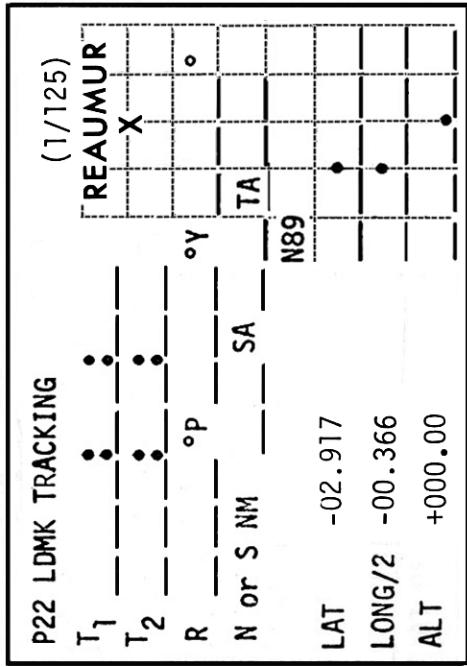
DSE DURING P22'S

1:10

PAGE

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FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970			3-102A

FLIGHT PLAN

CSM

CMP

0213 CST

DAC-ON @ T2-1 MIN
TRACK LDMK REAUMUR X
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89
DAC-OFF AFTER MARK 5
DAC-ON @ T2 - 1 MIN

TRACK EUCLIDES F
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

DAC-OFF AFTER MARK 5
LOAD DAP (10101) (11111)
MNVR TO P52/ANTI-SOLAR ATT
R 180, P 238, Y 0
HGA P -43, Y 184
CM4/DAC (GEGENSCHEIN)

P52-IMU REALIGN

OPTION 3 - REFSMMAT

(LIFT-OFF ORIENT)

GDC ALIGN

VERIFY DSE MOTION @ LOS

GEGENSCHEIN PHOTOS OF
3 CELESTIAL PTS (ANTI-
SOLAR, MIDWAY, &
MOULTON PT)

MNVR TO ORB SCIENCE ATT
(134:13)
R 0, P 306, Y 0

LM

T

LMP

133:00

1:20
MSFN
RECORD TOTE BAG #2
WEIGHT

1:30

EVA DEBRIEFING

:20

STOW EQUIPMENT
STOW SRC #2
STOW LM EVA ANT
STOW RETURN ITEMS IN ISA
REPORT TOTE BAG #2 WEIGHT
STOW EVA ONBOARD DATA
IN FLT DATA FILE

:10

CREW STATUS REPORT (MEDICATION, DOSIMETER)

133:30

UPDATE TO LM
LIFTOFF TIME FOR
REV 30 & 31
P22 ACQ TIME 28° EL
LM CONSUMABLES PAD
UPDATE TO CSM
P22 TRK PADS REV 30

:40

EAT PERIOD

134:00

EAT PERIOD

134:00

LM CONSUMABLES UPDATE

GET _____ : _____
RCS A _____ B _____
DESC O₂ _____
DESC A-H _____
ASC A-H _____

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	133:00 - 134:00	6/29	3-103

MCC-H

FLIGHT PLAN

P22 LDMK TRACKING (1/250)	
T ₁	•
T ₂	•
R	°P
N or S NM	SA
MOLTE	TA
N89	TA
LAT	-00.586
LONG/2	+12.064
ALT	+000.00

MAP UPDATE REV 30
 LOS : _____ : _____ : _____
 180° : _____ : _____ : _____
 AOS : _____ : _____ : _____

P22 LDMK TRACKING ($\frac{1}{60}$)	
T ₁	•
T ₂	•
R	°P
N or S NM	SA
Y	°Y
N89	TA
LAT	-04.043
LONG/2	-07.799
ALT	-000.18

LAT	13-2
LONG/2	13-3
ALT	+000.00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970			3-103A

FLIGHT PLAN

CSM

CMP

0313 CST

RNDZ XPNDR ACT & SELF TEST
P 230/306
CM-/EL (ORBITAL SCIENCE)
CM-/DAC (LDMK TRACKING)

134:00



:10

GO ORB RATE (134:15)

P 338/314

CM-/EL (ORBITAL SCIENCE)
CM-/DAC (LDMK TRACKING)

:20

PHOTO TARGET 11

OMNI C
PHOTO TARGET 16

PHOTO TARGET 11

OMNI C
PHOTO TARGET 16

MNVR TO TRACK ATT (134:45)
R 0, P 314, Y 0
OMNI D
RR XPOUNDER-PWR

P22 - ORBITAL NAVIGATION

•
TRACK LDMK MOLTEK
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

135:00

GO ORB RATE (134:48)
P 338/314
START DAC @ T2(-) 1 MIN

5 MARKS
DO NOT PRO ON FINAL N89

135:00

MISSION **EDITION** **DATE** **TIME** **DAY/REV** **PAGE**

APOLLO 13

FINAL (APRIL)

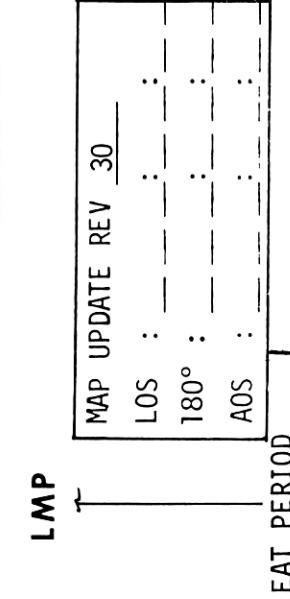
MARCH 16, 1970

134:00 - 135:00

6/29-30

3-104

MCC-H



EAT PERIOD

SYSTEMS STATUS CHECK
PGNCS-OPERATE
POWER UP SYSTEMS
(TV OFF)

AGS SELF TEST

ERASABLE MEMORY DUMP

MAP UPDATE REV 30
LOS : _____ :
180° : _____ :
AOS : _____ :

UPLINK TO LM
CSM S.V. (L/0)
ZERO POS/NEG CELLS

SYSTEMS STATUS CHECK
AGS STATUS-OPERATE
POWER UP SYSTEMS
AGS SELF TEST

LM

CDR

LMP

CSM

MAP UPDATE REV 30
LOS : _____ :
180° : _____ :
AOS : _____ :

EAT PERIOD

SYSTEMS STATUS CHECK
PGNCS-OPERATE
POWER UP SYSTEMS
(TV OFF)

AGS SELF TEST

ERASABLE MEMORY DUMP

MAP UPDATE REV 30
LOS : _____ :
180° : _____ :
AOS : _____ :

UPLINK TO LM
CSM S.V. (L/0)
ZERO POS/NEG CELLS

SYSTEMS STATUS CHECK
AGS STATUS-OPERATE
POWER UP SYSTEMS
AGS SELF TEST

MSFN

RECORD PCM LBR ON
DSE DURING P22'S

CSM**LM****MCC-H**

0413 CST

CMP

DAC-OFF AFTER MARK 5 &
REMOVE FROM SXT
TRACK LDMK 13-1
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89
N46 (10111, 11111)

P22-LUNAR SURFACE
NAVIGATION

N71: ____,-____,-
NO5: ____,-____,-
N93:
X ____,-____,-
Y ____,-____,-
Z ____,-____,-
GET ____,-____,-

MNVR TO P52 ATT (135:20)
R 180, P 240, Y 358
HGA P -45, Y 181

H₂ PURGE LINE HEATERS-ON
REPORT GYRO TORQUE ANGLES
VERIFY DSE MOTION @ LOS

CAMERA PREP FOR DOCKING:
CM2/DAC
CM-/EL
CM4/TV
FUEL CELL H₂ & O₂ PURGE
WASTE WATER DUMP
EAT PERIOD

:50
136:00

:20

135:30
M S F N

:40

RCS CHECKOUT

RATE GYRO CHECK

V47-AGS INITIALIZATION

S-BAND-SLEW
P 110, Y -41

LOAD AGS ASCENT
TARGETING

MAP UPDATE REV 31

:50

DUMP DSE
UPDATE TO CSM
CONSUMABLES PAD (IF
REQ'D)

UPLINK TO CSM
CSM S.V. (L/O)

LM S.V. (INS+18)
RESET SURFACE FLAG

UPDATE TO LM
ASCENT PAD

CSI PAD
AGS K-FACTOR

LM DAP WEIGHT
CSM DAP WEIGHT

CSM CONSUMABLES UPDATE

GET: ____,-____,-
RCS TOTAL ____

QUAD A ____ B ____
C ____ D ____

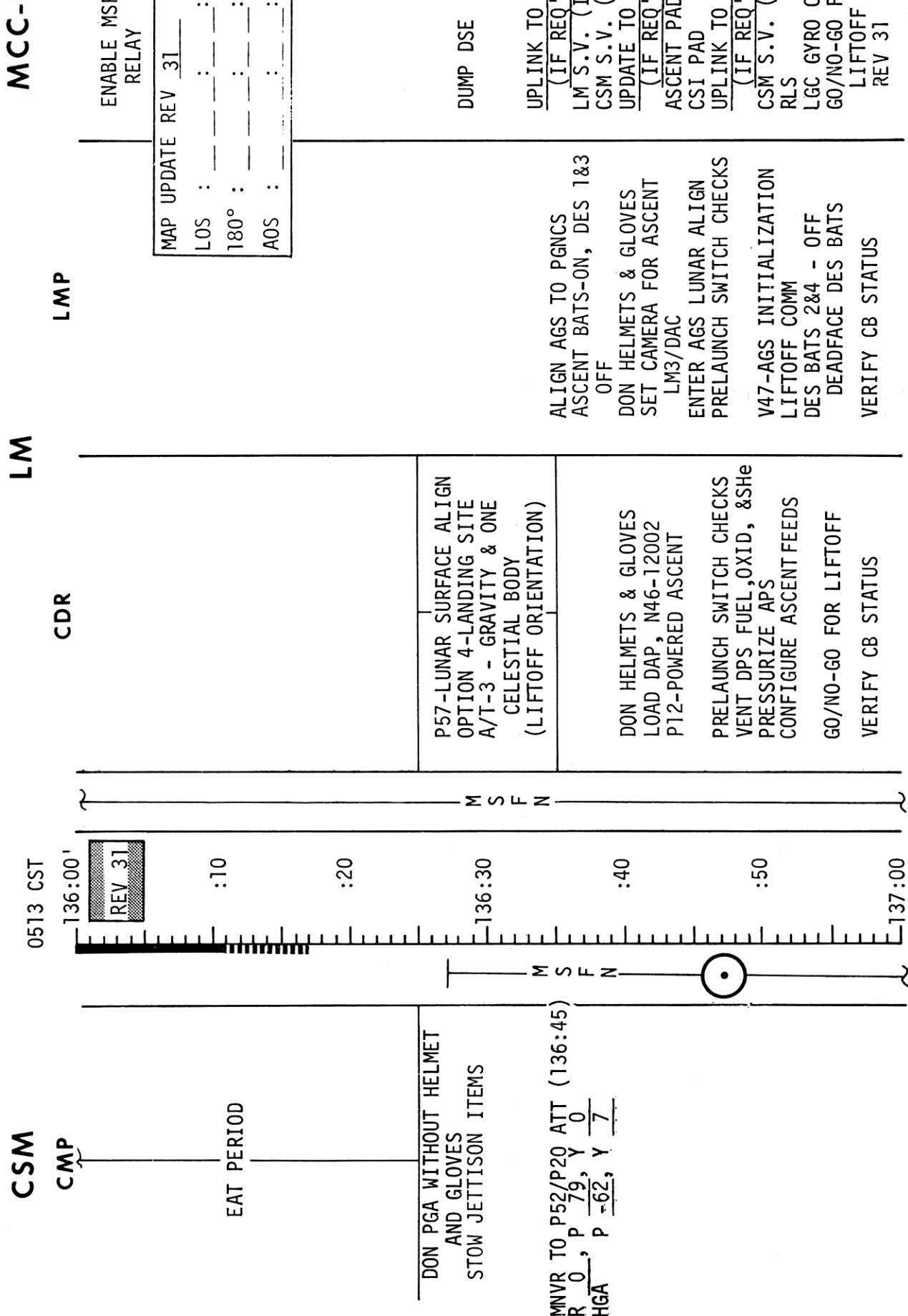
H₂ TOTAL ____

O₂ TOTAL ____

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	135:00 - 136:00	6/30	3-105

FLIGHT PLAN

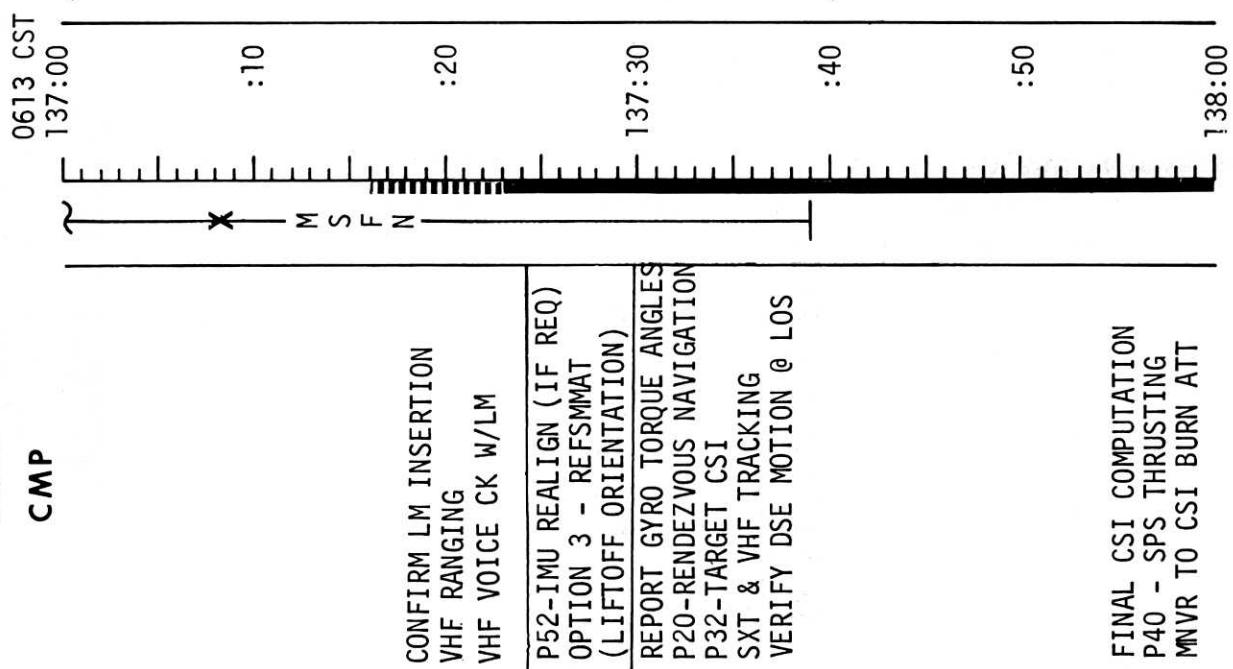
MCC-H



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	136:00 - 137:00	6/30-31	3-106

CSM

MCC-C-H



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	137:00 - 138:00	6/31	3-107

FLIGHT PLAN

CSM

CMP

SPS CHECKLIST

0713 CST



BACKUP CSI
CONFIRM LM CSI
P20-MNVR TO TRACK ATT
P33 - TARGET CDH
SXT & VHF TRACKING
V64-ACQUIRE MSFN

:10

:20

OMNI D

FINAL CDH COMP
P41-RCS THRUSTING
RCS CHECKLIST

FINAL CDH COMPUTATION
[IF CDH NOT REQUIRED,
TERMINATE P33]

P41 - RCS THRUSTING

:50

139:00

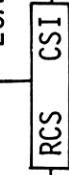
MCC-H

LM

CDR

P41-RCS THRUSTING

LOAD AGS CSI EXT ΔV



NULL RESIDUALS

P33 - TARGET CDH
RNDZ RADAR TRACKING

EXT LTG - OFF

[IF PLANE CHANGE NOT REQ, CONTINUE TRACKING FOR CDH]

P30-TARGET PLANE CHANGE
CSI BURN STATUS REPORT

P41-RCS THRUSTING

P33-TARGET CDH
RNDZ RADAR TRACKING

DUMP DSE

CHECK RCS, EPS, ECS

V47 - INITIALIZE AGS
[IF CDH NOT REQUIRED,
TERMINATE P33]

LOAD AGS CDH EXT ΔV

MISSION **EDITION** **DATE** **TIME** **DAY/REV** **PAGE**

APOLLO 13 FINAL (APRIL) MARCH 16, 1970 138:00 - 139:00 6/31 - 32 3-108



TIG: 138:06:01
BT: 44.4 SEC
AVR: 49.6 FT/SEC
ULLAGE: NONE
ORBIT: 44.9 X 43.4

DUMP DSE

CHECK RCS, EPS, ECS

V47 - INITIALIZE AGS
[IF CDH NOT REQUIRED,
TERMINATE P33]

LOAD AGS CDH EXT ΔV

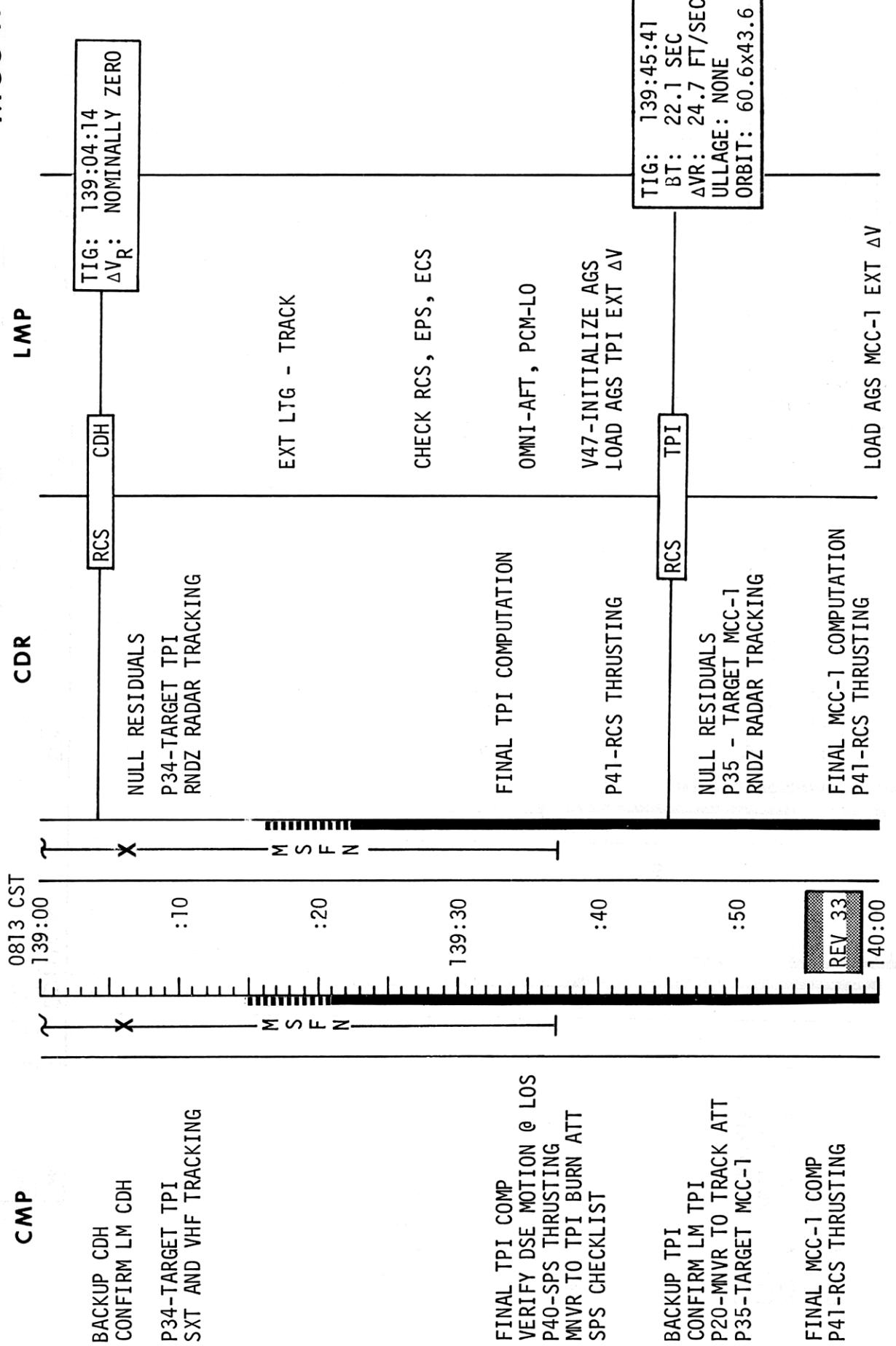
MISSION **EDITION** **DATE** **TIME** **DAY/REV** **PAGE**

APOLLO 13 FINAL (APRIL) MARCH 16, 1970 138:00 - 139:00 6/31 - 32 3-108

C S M

C M P

L M



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	139:00 - 140:00	6/32-33	3-109

CSM**CMP**

MCC-1 BACKUP
CONFIRM LM MCC-1
P35-TARGET MCC-2
SXT & VHF TRACKING

0913 CST
140:00

CDR

NULL RESIDUALS
P35-TARGET MCC-2
RNDZ RADAR TRACKING

:10

FINAL MCC-2 COMP
P41-RCS THRUSTING
MCC-2 BACKUP
CONFIRM LM MCC-2
PREDOCK CHECKLIST
P47-THRUST MONITOR
ROLL 180° FOR HI GAIN
HGA P -50, Y 358
TV (MAD) 140:23-140:35
START DAC

FINAL MCC-2 COMPUTATION
P41-RCS THRUSTING

:20

NULL RESIDUALS
V48-LOAD DAP, N46-11002
P47-THRUST MONITOR
V63-RR SELF TEST

PITCH 360° FOR LM PHOTOS
GO/NO-GO FOR PYRO ARM
(CUE MSFN), LOGIC-ON
ROLL RT 120° TO DOCK ATT:
R 300, P 332, Y 0
OMNI-D
PYRO ARM

ROLL LEFT 120° TO R 180
HGA: P -45, Y 356
SC CONT-SCS
N46 (61112, 11111)
FLIGHT PLAN

CSM ACTIVE DOCKING

MODE CONTROL-OFF
N46-12021
CONFIGURE ECS FOR
DECONTAMINATION

:50

141:00

SET UP CAMERAS FOR CSM
PHOTOS & DOCKING

LM3/DC
LM3/DAC

RR-OFF

PITCH 90° TO DOCK ATT
R 0, P 152, Y 0

EXTERIOR LTG-OFF
PHOTOGRAPH CSM

MODE CONTROL-OFF
N46-12021

140:30

DOCKING

140:50

OMNI-FWD

STEERABLE
P 32, Y -32

CONFIGURE ECS FOR
DECONTAMINATION

DUMP DSE
UPLINK TO LM
LM S.V. (TIG*-10)
P30 TARGET LOAD
*TIG OF LM
DEORBIT BURN

LMP ASSIST CDR WITH
DECONTAMINATION AND
TRANSFER:

LM

TIG: 140:00:41
ΔVR: NOMINALLY ZERO

TIG: 140:00:41
ΔVR: NOMINALLY ZERO

LOAD AGS MCC-2 EXT ΔV
RCS MCC-2

NULL RESIDUALS
OMNI-AFT
BIOMED-RIGHT

BRAKING PHASE

SET UP CAMERAS FOR CSM
PHOTOS & DOCKING

LM3/DC
LM3/DAC

EXTERIOR LTG-OFF
PHOTOGRAPH CSM

GO/NO-GO FOR PYRO
ARM

140:15:41

ΔVR: NOMINALLY ZERO

140:50

140:50

DUMP DSE
UPLINK TO LM
LM S.V. (TIG*-10)
P30 TARGET LOAD

*TIG OF LM

DEORBIT BURN

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	140:00 - 141:00	6/33	3-110

FLIGHT PLAN

CSM

MCC-H

1013 CST

UPDATE TO LM
DEORBIT BURN PAD
DAP WEIGHTS
UPDATE TO CSM

LM JETT ATT & TIME
CSM SEP BURN PAD
DAP LOAD
UPLINK TO CSM
CSM S.V. (TIG*-10)
LM S.V. (TIG*-10)

*TIG OF LM
DEORBIT BURN

141:00

VERIFY CRYO 02 PRESS
REPRESS PKG VLV-OFF
PRESSURIZE CABIN TO 5.5 PSIA
ADJUST 02 FLOW <0.5 LB/HR
ADJUST 02 FLOW TO 0.6 LB/HR
PRESSURIZE TUNNEL TO 3 PSID
VERIFY ΔP STABLE FOR 3 MINUTES
VERIFY LM FWD DUMP VALVE-AUTO

EQUALIZE TUNNEL PRESSURE
LiOH CANISTER CHANGE
12 INTO B, STOW 10 IN A3

STOW OPTICS
REMOVE HATCH AND STOW
VERIFY DOCKING LATCHES (>3)
REMOVE PROBE AND DROGUE
STOW TV CAMERA
PASS TO CDR AT HIS REQUEST:
PROBE
DROGUE

X

:20

HELMET/GLOVE BAGS
DECONTAMINATION BAGS (A8 & U1)
RECEIVE TRANSFER ITEMS FROM THE
LM AND STOW AS FOLLOWS:

A1 →
B5, B6 →
A7/A11 →
R13 →
R13 →
A8 →
B1 →
B1 → (IN B1 BAG) {

:40

UPPER EQUIPMENT BAY →

1 ISA IN BAG

2 HELMETS IN BAGS (GLOVES INSIDE)

2 SRC'S IN BAGS

1 TOTE BAG IN BAG

2 HASSELBLAD MAG BAGS (5 MAGS)

1 16MM MAG BAG (6 MAGS), DSEA, PPK'S

1 SURFACE HASSELBLAD IN BAG

1 CLOSEUP CAMERA CASSETTE IN BAG

1 CSRC IN BAG

1 SURFACE 16MM MAG BAG (2 MAGS)

REV 34

:50

142:00

TIME

DATE

MISSION

EDITION

PAGE

APOLLO 13

FINAL (APRIL)

MARCH 16, 1970

141:00 - 142:00

6/33-34

3-111

NOTES

LM

DOFF GLOVES
CONFIGURE HOSES AND BRUSH
FOR VACUUMMING
UNSTOW & VACUUM CSMC & CSC CASSETTE
UNSTOW, VACUUM & RESTOW SRC'S
UNSTOW, VACUUM & SET ASIDE:
LUNAR SURFACE HASSELBLAD
TOTE BAG
ISA
DOFF HELMETS, VACUUM & SET ASIDE
VACUUM PGA'S

DISCONNECT & STOW VACUUM
BRUSH & HOSES

VERIFY TUNNEL PRESSURIZED
OPEN HATCH
RECEIVE PROBE FROM CMP & STOW
RECEIVE DROGUE FROM CMP & STOW
OVER PROBE
RECEIVE BAGS FROM CSM
BAG TRANSFER ITEMS
TRANSFER TO CMP FOR STOWAGE:

1 ISA IN BAG

2 HELMETS IN BAGS (GLOVES INSIDE)

2 SRC'S IN BAGS

1 TOTE BAG IN BAG

2 HASSELBLAD MAG BAGS (5 MAGS)

1 16MM MAG BAG (6 MAGS), DSEA, PPK'S

1 SURFACE HASSELBLAD IN BAG

1 CLOSEUP CAMERA CASSETTE IN BAG

1 CSRC IN BAG

1 SURFACE 16MM MAG BAG (2 MAGS)

1113 CST

FLIGHT PLAN**CSM****NOTES****LM**

142:00

:10

N46 (61102, 11111)
 P30-TARGET SEPARATION
 SC CONT-CMC, MODE-AUTO
 V49-MNVR TO LM JETT ATT (142:15)
 R 285, P 356, Y 346
 HGA P -9, Y 25
 BIOMED-OFF
 STOW SUITS IN L-SHAPED BAG

TRANSFER JETTISON ITEMS TO LM

WARNING
 NO URINE/FECES
 ALL OPENED FOOD MUST
 BE TREATED AND STORED
 IN BETA BAG

UNSTOW AND INSTALL HATCH
 DIRECT 02 OFF

PERFORM HATCH INTEGRITY CHECK, DEPRESS TUNNEL FOR JETTISON BY 142:40
 GO/NO-GO FOR PYRO ARM (CUE MSFN), LOGIC-ON

GO/NO-GO FOR PYRO
ARM

:50

PYRO ARM
 S/C PREP FOR LM JETTISON PER
 CSM SYSTEMS CHECKLIST
 PREPARE DAC FOR JETTISON PHOTOS:
 CM4/DAC/18/CEX-BRKT, MIR (f8,250,7) 12 FPS, 0.5 MAG, 4 MIN, MAG F
 SC CONT-SCS
 N46 (10102, 11111)

143:00

DISABLE AUDIO COMM
 DISCONNECT LM HOSES & STOW
 DOFF SUITS

LM JETT ATTITUDE:

R ___, P ___, Y ___

CDR IVT TO CSM WITH SUITS
 LMP: CONFIGURE S-BD, VERIFY COMM
 STEERABLE: P Y
 INITIALIZE AGS, ALIGN TO PGNCs
 P30-TARGET PGNCs
 TARGET AGS ΔV
 CONFIGURE LM FOR JETTISON

CLOSE HATCH, IVT TO CSM

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	142:00 - 143:00	6/34	3-112

MCC-H**NOTES**

1213 CST

143:00

DUMP DSE
UPLINK TO LM
V48-LOAD DAP
R1-12011
P42-APS THRUSTING
UPDATE TO CSM
TOPO PHOTO PAD REV 35

:10

X

REV 35

143:30

:

:40

:

P47-THRUST MONITOR
LM JETTISON 143:04
P41-RCS THRUSTING
MNVR TO SEP ATT, (143:08) R 180, P 341.6, Y 0
V64-ACQUIRE MSFN

CSM SEPARATION 143:09

GO ORB RATE (143:10) P 087 / 342
PREPARE DAC FOR LM DEORBIT BURN
CM/DAC/SXT/CEX (FIXED, 250, FIXED) 12 FPS, 0.5 MAG, 4 MIN
PRESLEEP CHECKLIST
S/C CLEANUP

CMP DOFF PGA

CONFIGURE FOR BI-STATIC RADAR TEST
VERIFY VHF AM B - DUPLEX

VHF RANGING-RANGING
VHF ANTENNA-LEFT

VHF AM SQUELCH A-MAX
VHF AM T/R OFF

(3 AUDIO PANELS)
THIS VHF CONFIGURATION WILL BE
MAINTAINED UNTIL 166:10

VERIFY DSE MOTION @ LOS

ONBOARD READOUT
BAT C
PYRO BAT A
RCS A

B
C
D

TOPO PHOTO PAD REV 35

DC IND SEL - MNA OR B
MAP UPDATE REV 35

LOS : _____ : _____ : _____
180° : _____ : _____ : _____
AOS : _____ : _____ : _____

MISSION**EDITION****DATE****TIME****DAY/REV****PAGE**

APOLLO 13 FINAL (APRIL)

MARCH 16, 1970

143:00 - 144:00

6/34-35

3-113

FLIGHT PLAN

1313 CST

144:00

:10

EAT PERIOD
 SET: SHUTTER 1/50 SEC
 RANGE 92.0
 INTERVAL 8.4

UNSTOW AND INSTALL TOPO CAMERA
 ON HATCH WINDOW FOR LM IMPACT
 SITE PHOTOGRAPHY MAG V

UPDATE TO CSM
 TEI 40 PAD
 LM DEORBIT TIG

TEI 40 PAD ASSUMES
 NO PLANE CHANGE 2

:20

OMNI D

P20 - RENDEZVOUS NAVIGATION
 AUTO MNVR TO TRACK ATTITUDE

144:30

144:30

OMNI C

TRACK LM THROUGH SCANNING TELESCOPE
 PHOTOGRAPH BURN WITH DAC ON SEXTANT
 P76-LM TARGET ΔV
 V93-INITIALIZE W-MATRIX
 TRACK LM

:40

•

:50

MNVR TO TOPO PHOTO ATTITUDE (144:50)
 R 005, P 122, Y 008
 HGA P -74, Y 144

145:00

X

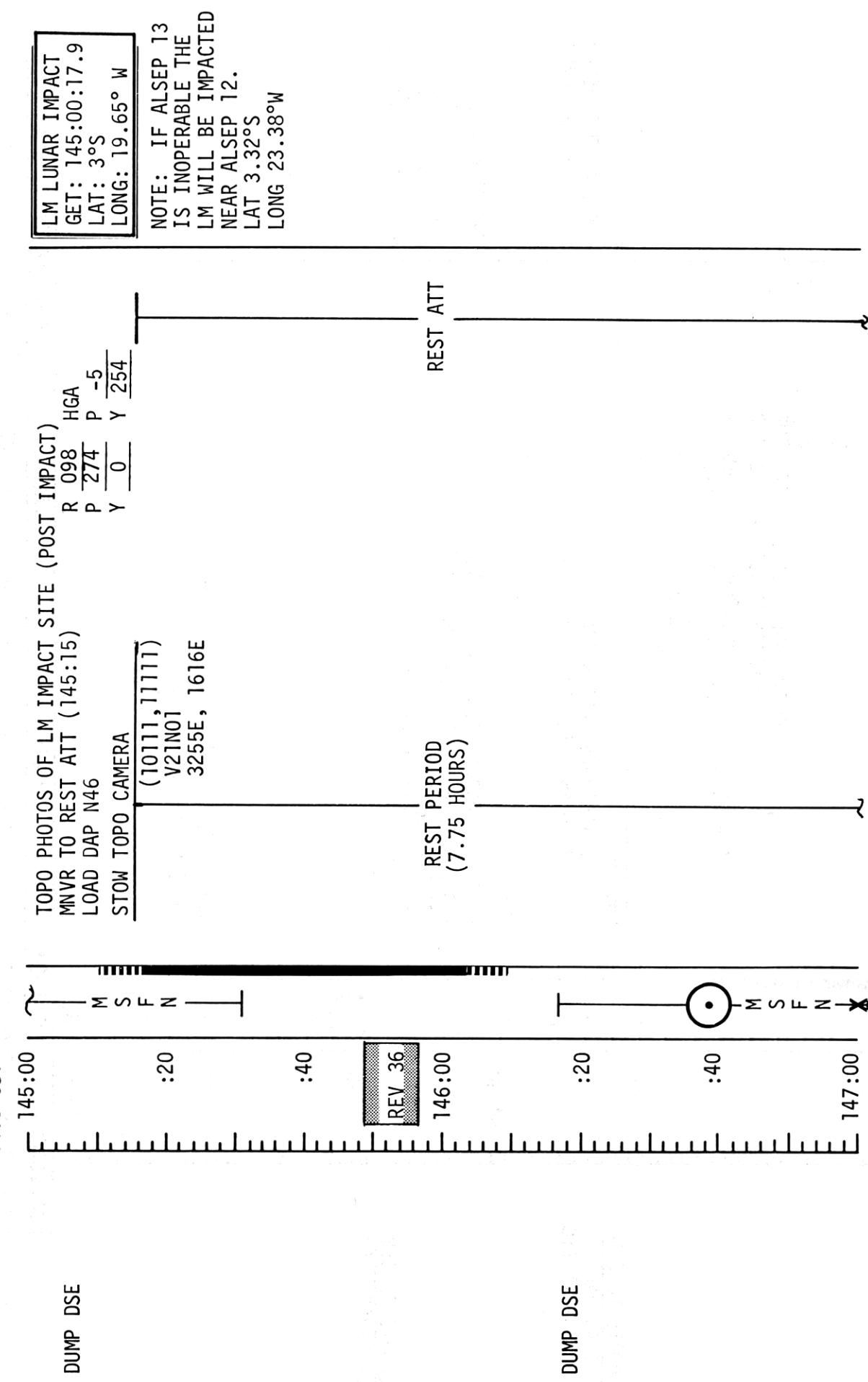
LM DEORBIT BURN
TIG: 144:32:20
BT: 75.2 SEC
ΔV : 185.5 FT/SEC

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	144:00 - 145:00	6/35	3-114

MCC-H

FLIGHT PLAN

NOTES



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	145:00 - 147:00	6/35-36	3-115

FLIGHT PLAN

1613 CST

147:00

:20

:40

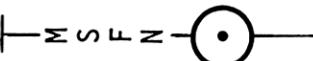
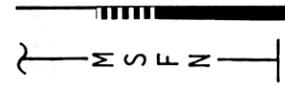


148:00

:20

:40

149:00

REST PERIOD
(7.75 HOURS)

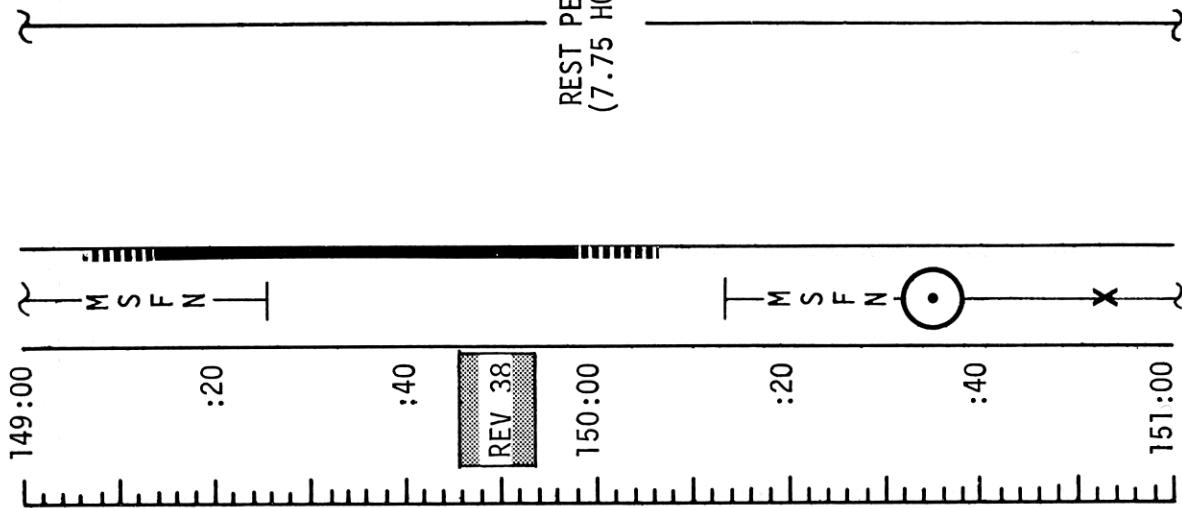
REST ATT

DUMP DSE

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	147:00 - 149:00	6/36-37	3-116

1813 CST



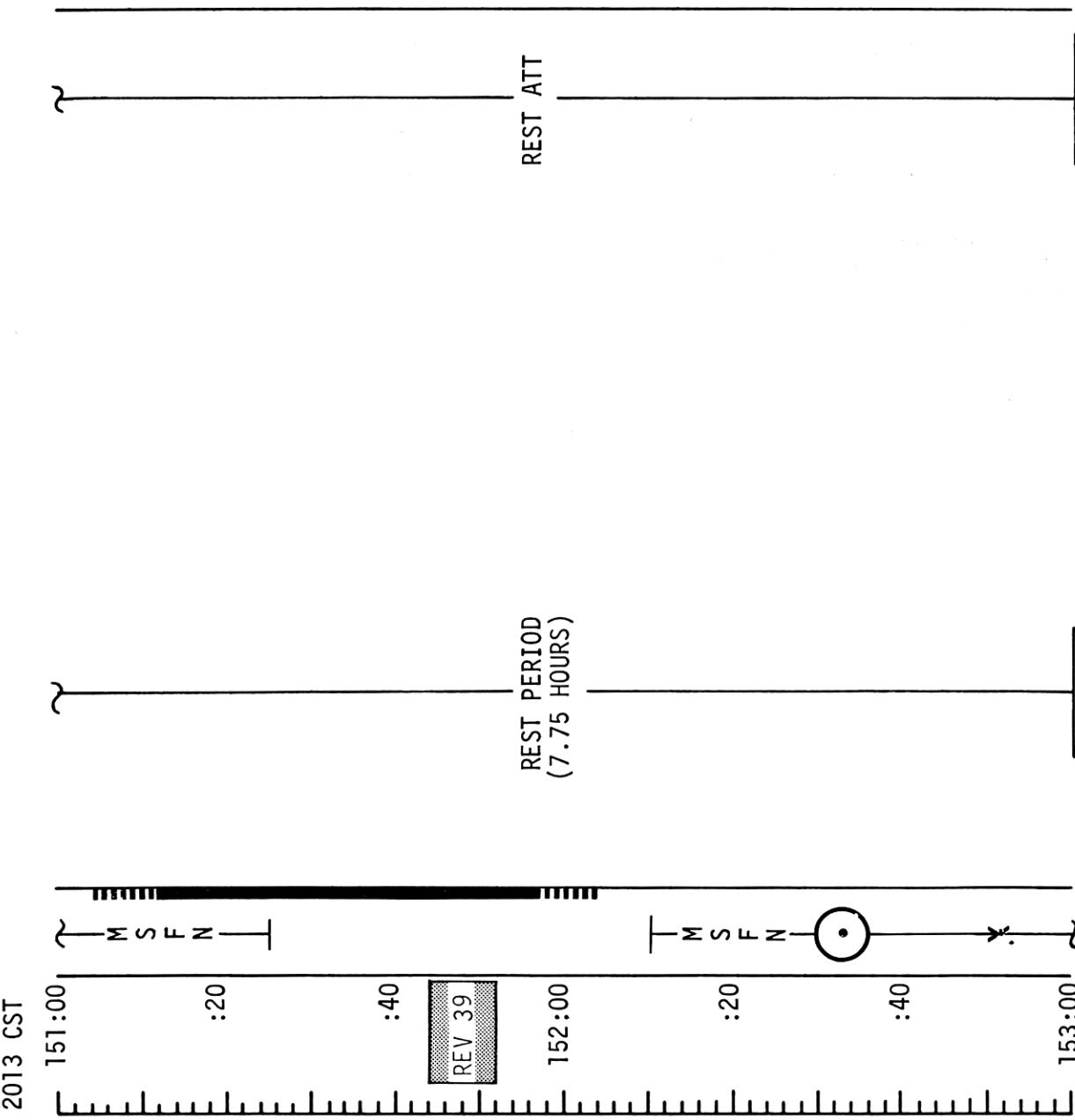
DUMP DSE

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	149:00 - 151:00	6/37-38	3-117

MCC-H

FLIGHT PLAN

NOTES



DUMP DSE

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	151:00 - 153:00	6/38-39	3-118

FLIGHT PLAN

NOTES

2213 CST

UPLINK TO CSM
CSM S.V. & V66
PLANE CHANGE TGT LOAD
DESIRED ORIENT
(PLANE CHANGE)

UPDATE TO CSM
MVNR PAD
(PLANE CHANGE)

CONSUMABLES
FLIGHT PLAN
TEI 42 PAD

MNVR TO P52 ATT
(153:15)

R 098, P 274, Y 315
HGA P -20, Y 253

P52 IMU REALIGN
OPTION 3 - REFSMMAT
(LIFT OFF ORIENT)

P52 IMU REALIGN
OPTION 1 - PREFERRED
(PLANE CHANGE ORIENT)
GYRO TORQUE

153:30

:40

:50

154:00

CSM CONSUMABLES UPDATE

GET: _____ ; _____

RCS TOTAL _____

QUAD A _____ B _____

C _____ D _____

H₂ TOTAL _____O₂ TOTAL _____

POSTSLEEP CHECKLIST

M

S

F

N

N

VERIFY DSE MOTION AT LOS

STARS _____

SA _____

TA _____

TEI 42 ASSUMES

PLANE CHANGE 2

MAP UPDATE REV

40 _____

LOS : _____ ; _____

180° : _____ ; _____

AOS : _____ ; _____

P52 IMU REALIGN

N71: _____ ; _____

NO5: _____ ; _____

N93: _____ ; _____

X _____

Y _____

Z _____

GET _____ ; _____

P30 - EXT ΔV
V49 MNVR TO BURN ATT
(153:50)

P40 SPS THRUST
SXT STAR CK

REV 40

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	153:00 - 154:00	7/39-40	3-119

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FLIGHT PLAN

CSM PLANE CHANGE #2
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+10° TAKEOVER	BT + 1 SEC	NO TRIM

TABLE 3-10
3-119A

MCC-H

FLIGHT PLAN

2313 CST

154:00

GDC ALIGN

HGA P 6, Y 264

PLANE CHANGE NO 2

V66-TRANSFER S.V. TO LM SLOT

LOAD DAP N46 (10112, 11111)

UPDATE TO CSM
VERT STEREO PHOTO
PAD (REV 41)

:20

:10

154:30

DUMP DSE

UPLINK TO CSM
DESIRED ORIENT
(PHOTO REFSMMAT)

:40

:50

155:00

L1OH CANISTER CHANGE
13 INTO A, STOW 11 IN A3REPORT GYRO TORQUING ANGLES (P52 AT 153:30)
START EAT PERIOD

BATTERY CHARGE, BATTERY B

:

MAP UPDATE REV 41

LOS :	—	—	—	—	—	—
180° :	—	—	—	—	—	—
AOS :	—	—	—	—	—	—

X

MNVR TO P52 ATT (155:00)

R 180
P 180
Y 040

OMNI D

Y

UNBAL

*

OX

*

FUEL

*

C

ΔV

Y

P

R

Y

Vgx

Vgy

Vgz

ΔV

C

FUEL

*

OX

*

UNBAL

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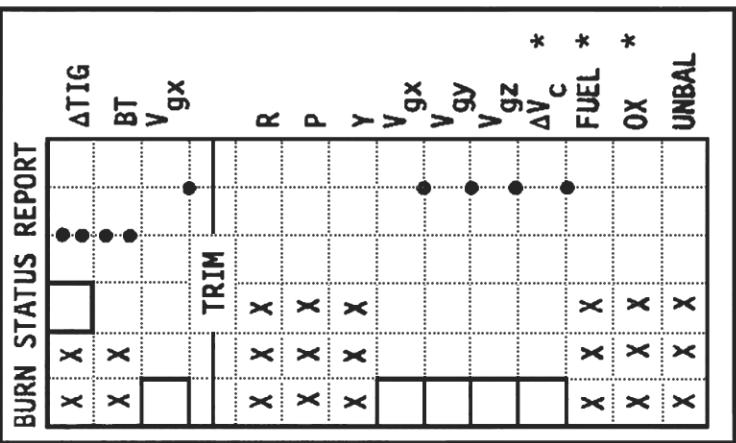
*

*

Notes

VERT STEREO PHOTO REV 41		
T START:	—	:
T STOP:	—	:
	—	:
	—	:

TIG:	154:13:11
BT:	43 SEC
AVR:	824.6 FPS
ULLAGE:	2 JET 15 SEC
ORBIT:	58.4x53.6 NM



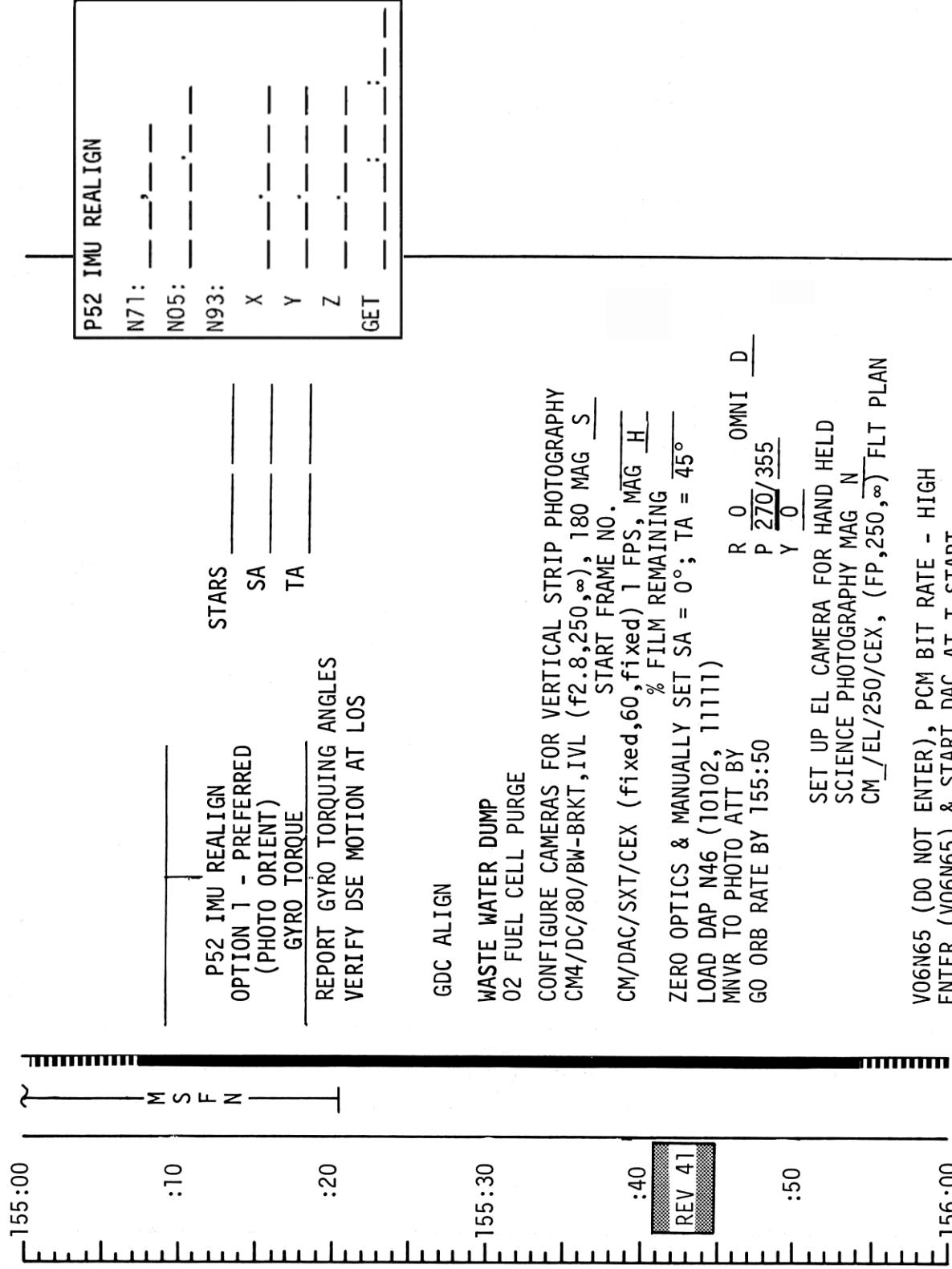
| * REPORT TO MCC-H

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	154:00 - 155:00	7/40	3-120

FLIGHT PLAN

0013 CST

NOTES



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	155:00 - 156:00	7/40-41	3-121

**STEREO STRIP PHOTOGRAPHY
(RESEAU & DAC)**

REV 41

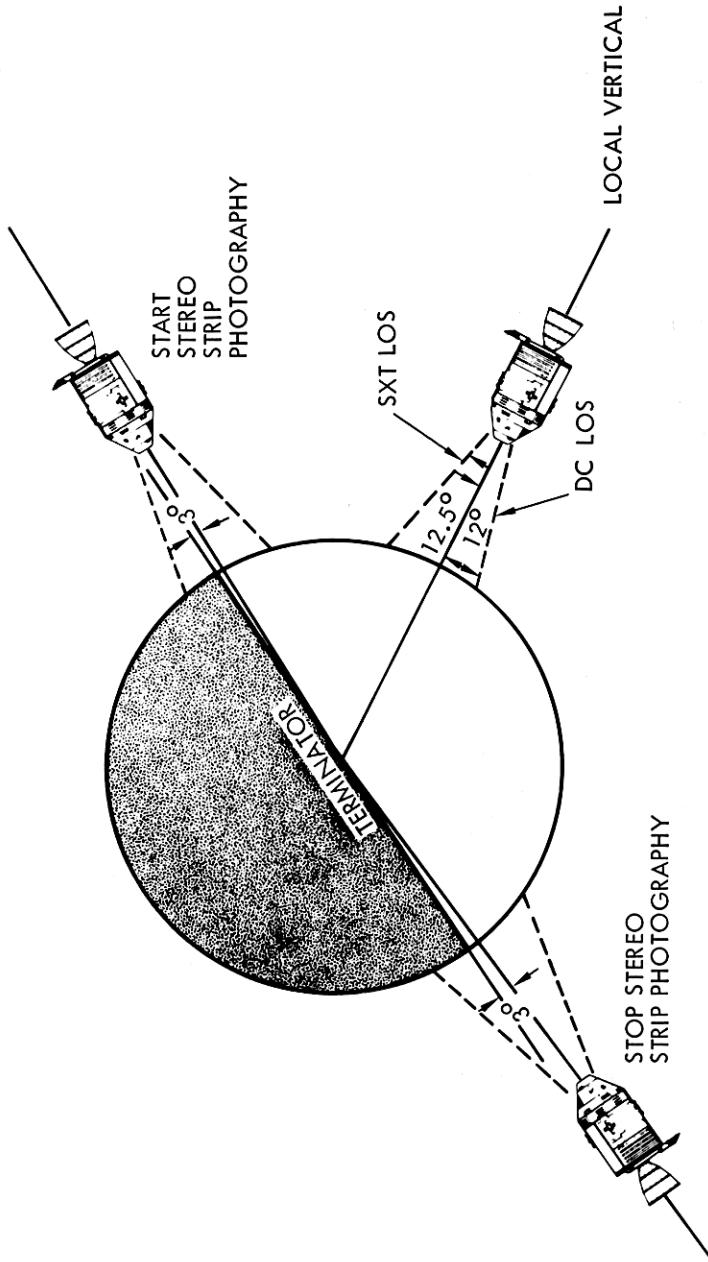


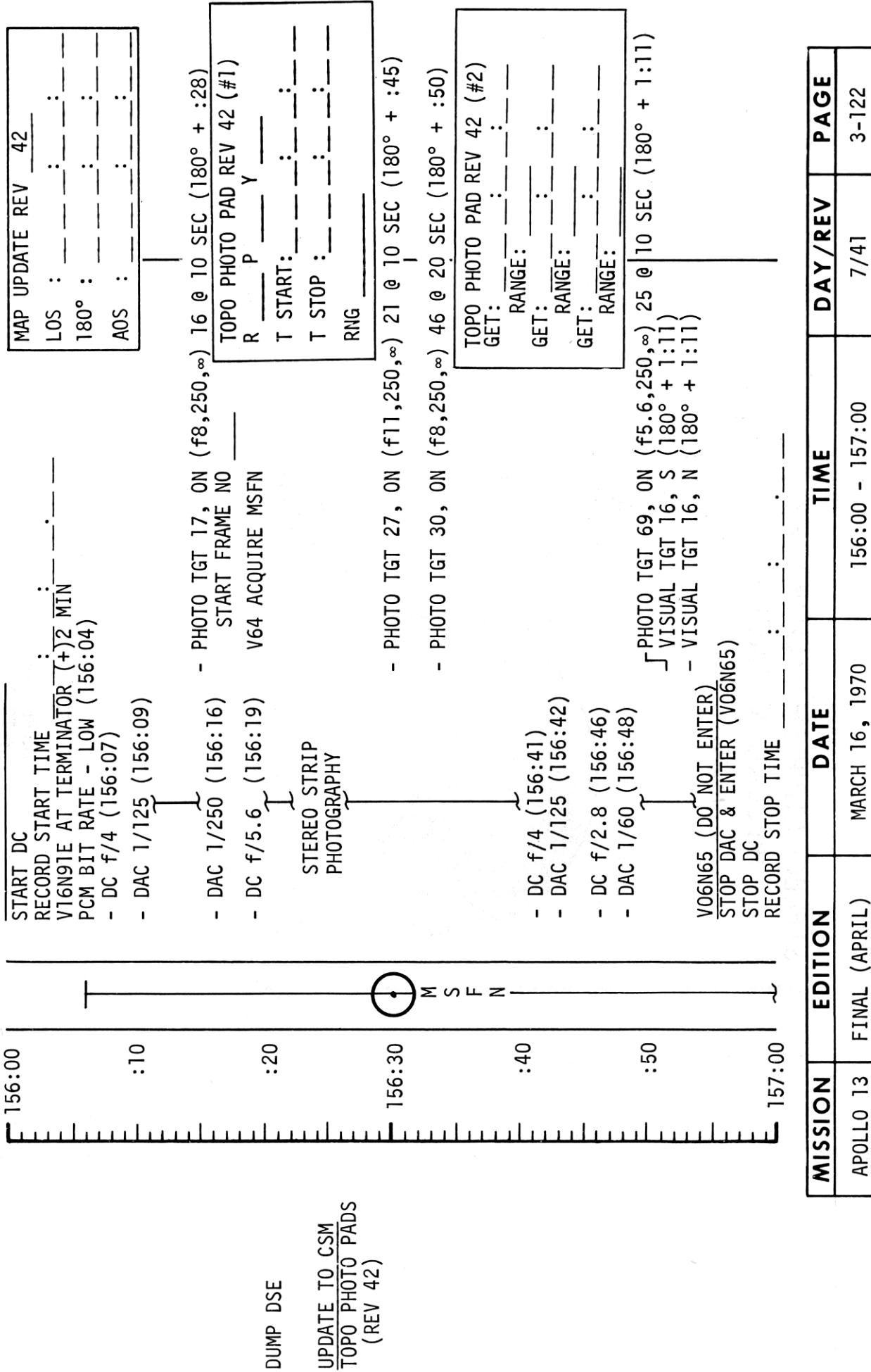
FIGURE 3-9
3-121A

MCC-H

FLIGHT PLAN

0113 CST

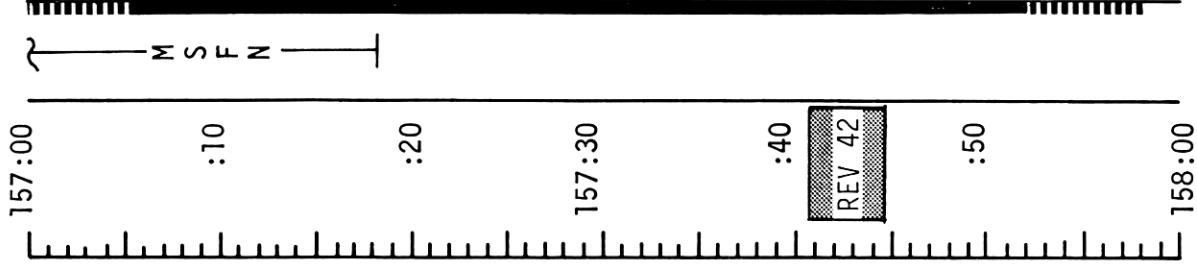
NOTES



FLIGHT PLAN

0213 CST

NOTES



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	157:00 - 158:00	7/41-42	3-123

HIGH RESOLUTION PHOTOGRAPHY (VERTICAL)

(LUNAR TOPOGRAPHIC CAMERA)

REV 42

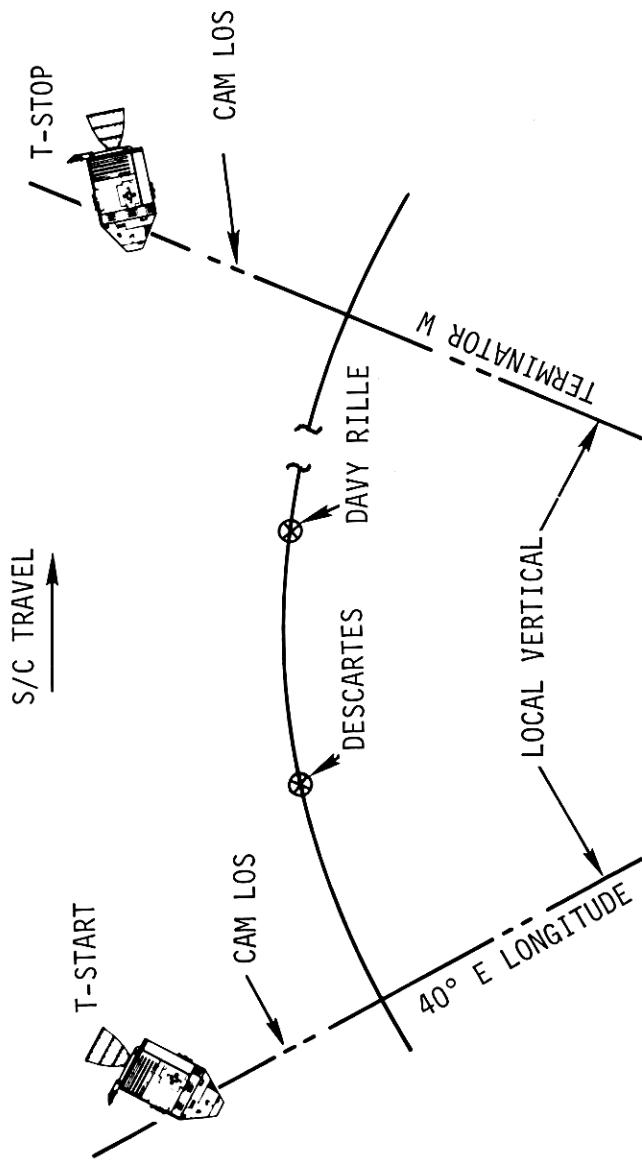


FIGURE 3-10
3-123 A

MCC-H**FLIGHT PLAN**

0313 CST

158:00



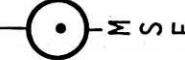
OMNI D

UPDATE TO CSM
TOPO PHOTO PAD
(REV 43)
CONTAMINATION FIELD
PHOTO PAD
(REV 43)
TEI 44 PAD

:10

RECORD PCM HBR
DATA FIRST 5 MIN
OF TOPO STRIP ON
DSE

158:30



:40

DUMP DSE

159:00

TOPO PHOTO PAD REV 43	MAP UPDATE REV 43
R _____ P _____ Y _____	LOS : _____ : _____ : _____
T START: _____ : _____ : _____	180° : _____ : _____ : _____
T STOP : _____ : _____ : _____	AOS : _____ : _____ : _____
RNG _____	CONTAMINATION PHOTO PAD REV 43
GET: _____ : _____ : _____	T-START: _____ : _____ : _____
RNG _____	START RECORDER AT _____
GET: _____ : _____ : _____	SUNRISE (-) 10 MIN.
RNG _____	

START VERT TOPO STRIP PHOTOGRAPHY AT 40°E
(T-START)

- TOPO RNG (91.7) _____
- DESCARTES
- TOPO RNG (91.9) _____ - PHOTO TGT 32, S(f11,250,∞) 8 @ 20 SEC (180° + :52)
- TOPO 1/100(158:41) - PHOTO TGT's 38 & 40,S(f8,250,∞), 7 @ 20 SEC (180° + :59)
- DAWY RILLE
- TOPO 1/50(158:46) - PHOTO TGT 47,S (f5.6,250,∞) 3 @ 20 SEC (180° + 1:03)
- TOPO V64 ACQUIRE MSFN
 - PHOTO TGT 59,S(f5.6,250,∞) 4 @ 20 SEC (180° + 1:08)
 - PHOTO TGT 63,S(f4,250,∞) 17 @ 20 SEC (180° + 1:10)

STOP VERT TOPO STRIP PHOTOGRAPHY AT TERMINATOR (T-STOP)

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	158:00 - 159:00	7/42	3-124

0413 CST

159:00 :20 :50 :40 :40

SETUP CAMERA FOR CONTAMINATION/STAR FIELD
PHOTOGRAPHY
CM4/EL/80/VHBM-BRKT, CONT (f2.8,1/4, ∞)
MAG T START FRAME NO. ____
INSTALL WINDOW SHADES

VERIFY DSE MOTION AT LOS

CONFIGURE TOPO CAMERA FOR 30° AFT
LOOKING PHOTOGRAPHY
SET: SHUTTER 200 SEC
MAG V START FRAME NO. ____ RANGE 94.1 NM
INTERVAL 6.2

MNVR TO CONTAMINATION FIELD PHOTOGRAPHY ATT
(159:30) R 343, P 086, Y 346
INHIBIT THRUSTERS A3, C4, B3, D4
ADVANCE FILM 5 FRAMES

159:40:16 CREW RECORDER - ON (SR - 10 MIN)
DIM INTERIOR LIGHTING

159:45:16 1 FRAME, EXP TIME 1/4 SEC (SR - 5 MIN)
CHANGE EXP TIME TO 1 SEC (2 CLOCKS)

1 FRAME, EXP TIME 1 SEC
CHANGE EXP TIME TO BULB

1 FRAME, EXP TIME 4 SEC
CHANGE EXP TIME 4 SEC (SR + 3 MIN)

1 FRAME, EXP TIME 1 SEC
CHANGE EXP TIME 1 SEC

1 FRAME, EXP TIME 1/4 SEC
CHANGE EXP TIME TO 1/4 SEC

1 FRAME, EXP TIME 1/4 SEC
CHANGE EXP TIME TO 1/4 SEC

CREW RECORDER - OFF, LIGHTS - UP
ADVANCE FILM 5 FRAMES

ENABLE THRUSTERS A3, C4, B3, D4
MNVR TO TOPO PHOTO ATT
GO ORB RATE (160:00)

R 0, P 183/226, Y 0 STOP FRAME NO. ____

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	159:00 - 160:00	7/42-43	3-125

HIGH RESOLUTION PHOTOGRAPHY (30 DEG OBLIQUE)
 (LUNAR TOPOGRAPHIC CAMERA)

REV 43

SPACECRAFT
 TRAVEL

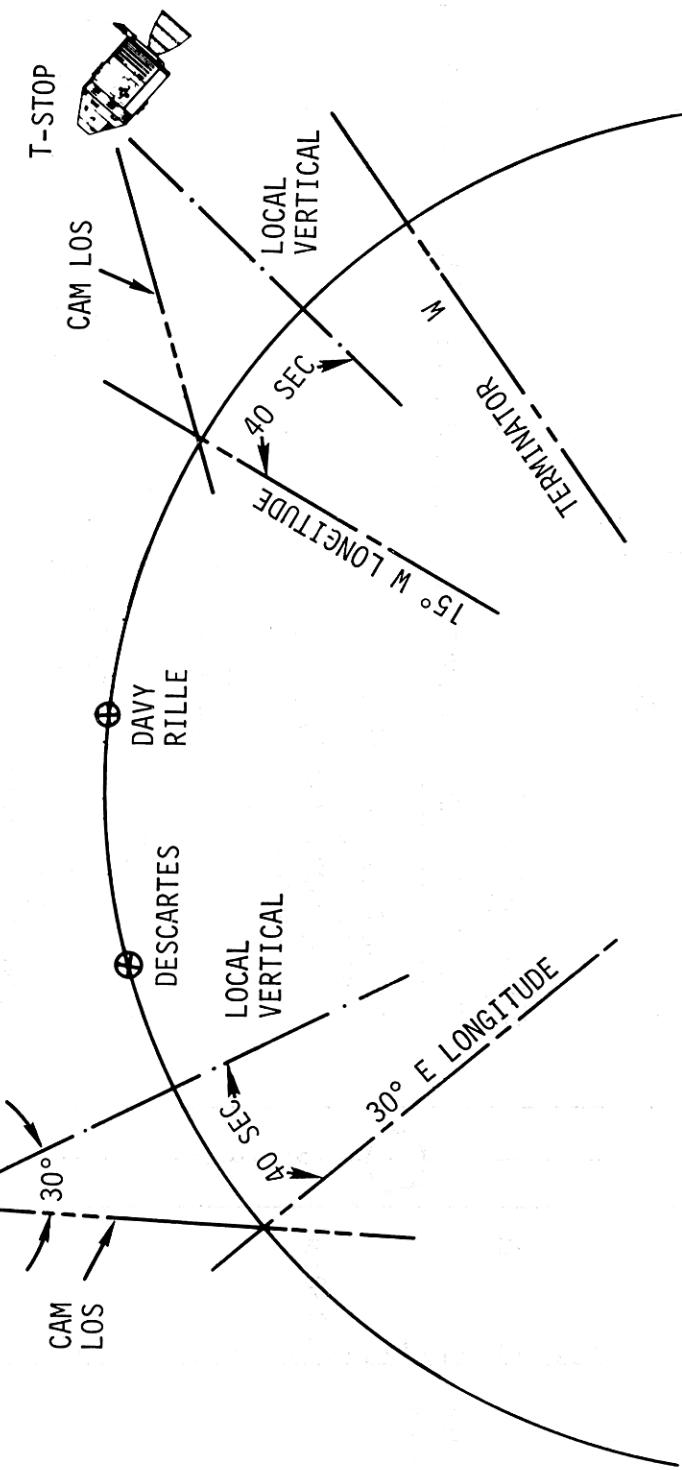


FIGURE 3-11
 3-125 A

0513 CST
160:00 OMNI D

:10

RECORD PCM HBR
DATA FIRST 5 MIN
OF TOPO STRIP ON
DSE

:20

- VISUAL TGT 4, N (180° + :28)
SET UP EL CAMERA FOR HAND HELD
SCIENCE PHOTOGRAPHY
CM / EL/250/CEX, (FP,250,∞) FLT PLAN
START FRAME NO. ____
MAG 0

START OBLIQUE TOPO
PHOTO STRIP
AT 30°E (T-START)

160:30

M S F N

X

•

○

○

○

:40

UPLINK TO CSM
CSM S.V. & V66
DUMP DSE

:50

~

- PHOTO TGT 26,N,(f 8 ,250,∞)10 @ 20SEC (180° + :45)
30° AFT LOOKING OBLIQUE
TOPO PHOTOGRAPHY
- TOPO RANGE (94.0) ____
- DESCARTES
- TOPO RANGE (94.2)
V64 ACQUIRE MSFN
- DAVY RILLE

- PHOTO TGT 48,N,(f5.6,250,∞) 3 @ 20 SEC (180° + 1:03)
- PHOTO TGT 52,ON,(f5.6,250,∞) 3 @ 20 SEC (180° + 1:04)
STOP OBLIQUE
TOPO PHOTO STRIP
AT 15°W (T-STOP)

- PHOTO TGT 66,S(f 4 ,250,∞) 3 @ 20 SEC (180° + 1:10)

START EAT PERIOD

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	160:00 - 161:00	7/43	3-126

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P22 LDMK TRACKING (1/60) **CP1**

T ₁	•	•	•	•	•	•	•	•
T ₂	•	•	•	•	•	•	•	•
R	◦P	◦Y						
N or S NM	SA	TA						
LAT	+06.850							
LONG/2	+53.573							
ALT	+000.00							

P22 LDMK TRACKING (1/125) **CP2**

T ₁	•	•	•	•	•	•	•	•
T ₂	•	•	•	•	•	•	•	•
R	◦P	◦Y						
N or S NM	SA	TA						
LAT	+00.550							
LONG/2	+34.050							
ALT	+000.00							

P22 LDMK TRACKING (1/250) **DAVY RILLE**

T ₁	•	•	•	•	•	•	•	•
T ₂	•	•	•	•	•	•	•	•
R	◦P	◦Y						
N or S NM	SA	TA						
LAT	-11.163							
LONG/2	-3.590							
ALT	+000.00							

P22 LDMK TRACKING (1/60) **CP5**

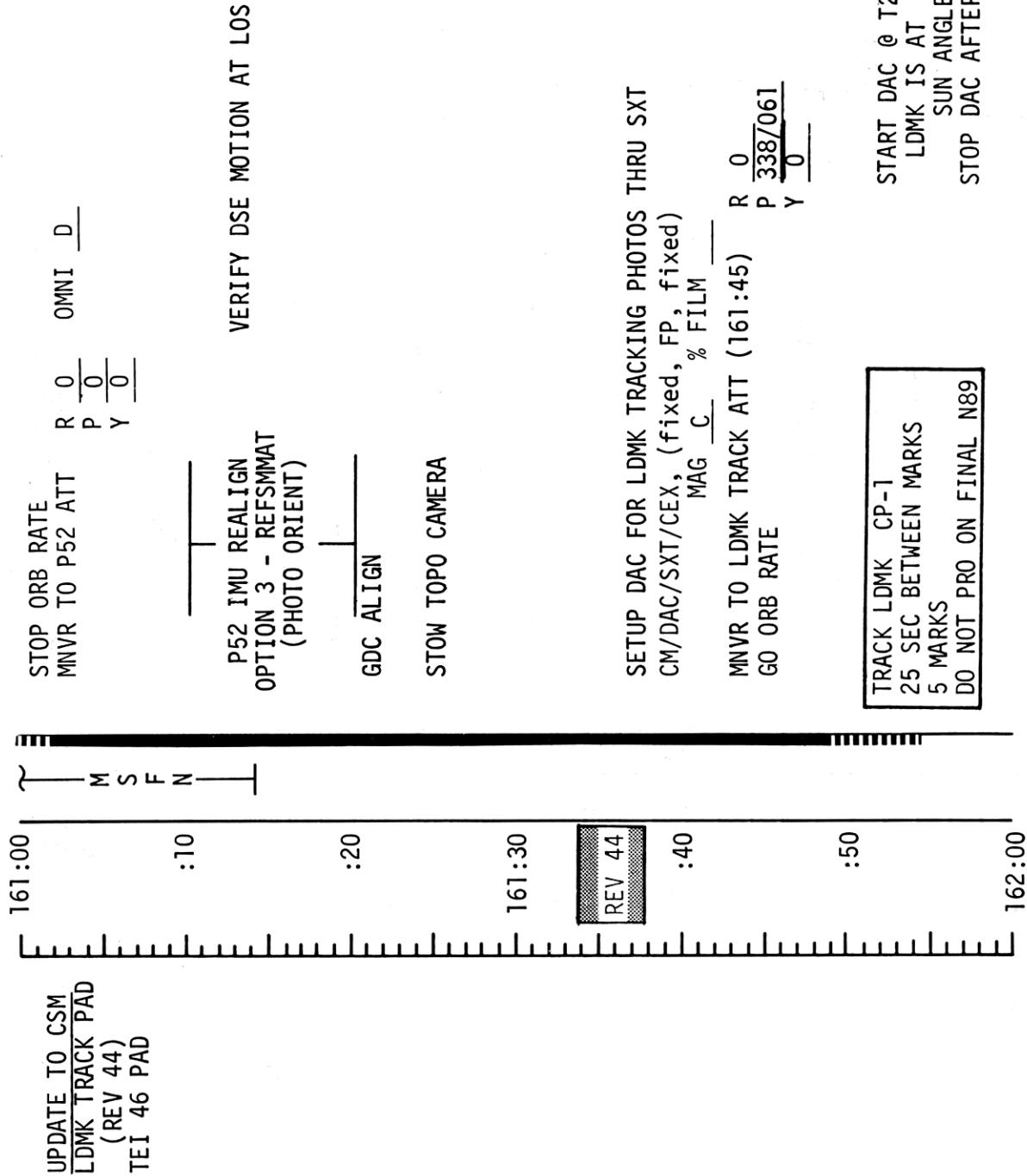
T ₁	•	•	•	•	•	•	•	•
T ₂	•	•	•	•	•	•	•	•
R	◦P	◦Y						
N or S NM	SA	TA						
LAT	-10.900							
LONG/2	-22.100							
ALT	+000.00							

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970		7/45	3-126A

FLIGHT PLAN

MCC-H

0613 CST



NOTES

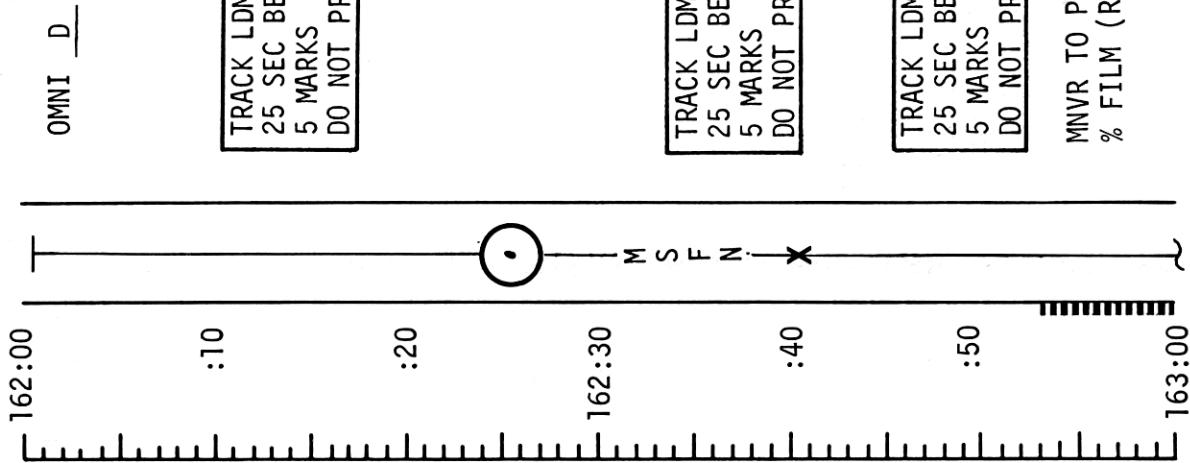
P52 IMU REALIGN
N71: _____
N05: _____
N93:
X _____
Y _____
Z _____
GET _____

MAP UPDATE REV 44
LOS : _____
180° : _____
AOS : _____

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	161:00 - 162:00	7/43-44	3-127

MCC-H 0713 CST

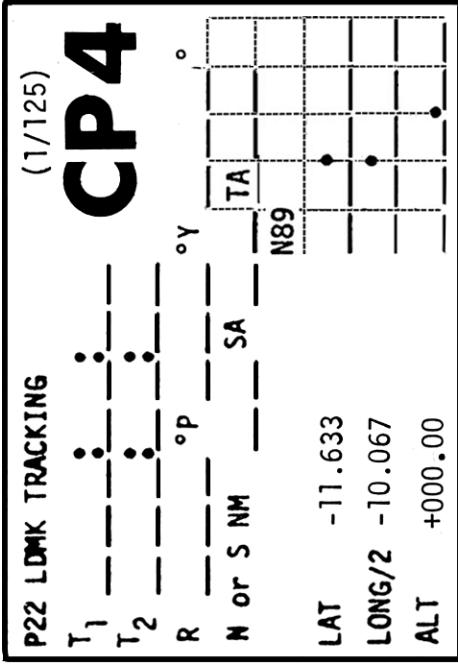
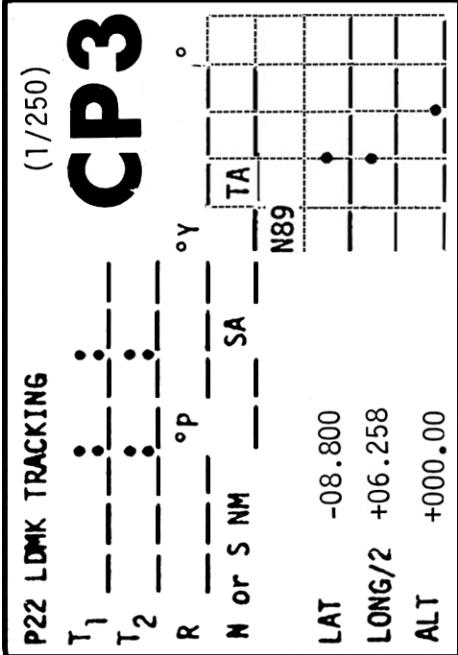
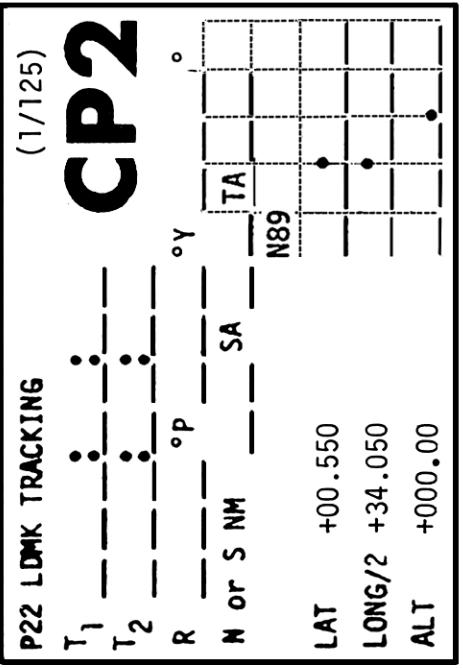
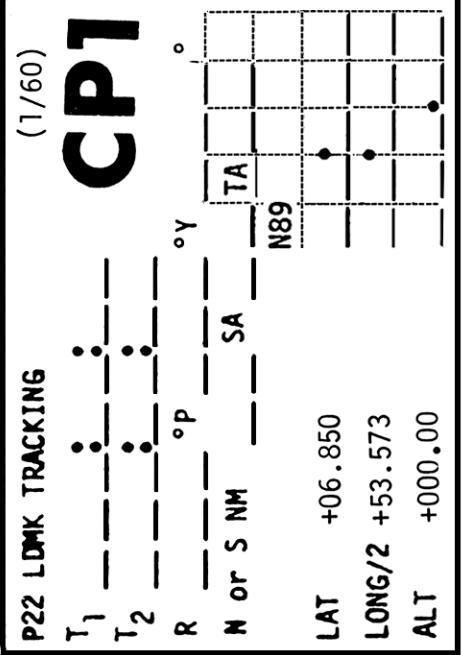
RECORD PCM LBR
DATA DURING EACH
LDMK TRK ON DSE



UPDATE TO CSM
LDMK TRACK PADS
(REV 45)
UPLINK TO CSM
CSM S.V. & V66
DUMP DSE

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	162:00 - 163:00	7/44	3-128

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MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970		7/44	3-128A

FLIGHT PLAN

0813 CST

NOTES

E 163:00 | T
M S F N | P52 IMU REALIGN
OPTION 3 - REFSMMAT
(PHOTO ORIENT)
REPORT GYRO TORQUING ANGLES VERIFY DSE MOTION AT LOS

GDC ALIGN

:10

:20

163:30

REV 45

:40

MNVR TO LDMK TRK ATT (163:45) R 0
GO ORB RATE P 338/056 OMNI D
Y 0

:50

TRACK LDMK CP-1
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

E 164:00 | T

START DAC @ T2 -1 MIN
LDMK IS AT 16°
SUN ANGLE
STOP DAC AFTER MARK 5

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	163:00 - 164:00	7/44-45	3-129

0913 CST

RECORD PCM LBR DATA
DURING EACH LDMK
TRK ON DSE

164:00 ↑

:10

TRACK LDMK CP-2
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

:20



M

S

F

N

164:30

X

:40

TRACK LDMK CP-3
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

:50

MNVR TO P52 ATT (164:55)
% FILM
(AT COMPLETION LDMK TRK)

UPDATE TO CSM
TEI 46 PAD
(PRELIMINARY)
UPLINK TO CSM
TEI DESIRED ORIENT
CSM S.V. & V66
DUMP DSE

START DAC @ T2 -1 MIN
LDMK IS AT 55°
SUN ANGLE
STOP DAC AFTER MARK 5

START DAC @ T2 -1 MIN
LDMK IS AT 70°
SUN ANGLE
STOP DAC AFTER MARK 5

START DAC @ T2 -1 MIN
LDMK IS AT 37°
SUN ANGLE
STOP DAC AFTER MARK 5

MAP UPDATE REV	<u>46</u>
LOS :	----- : -----
180° :	----- : -----
AOS :	----- : -----

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	164:00 - 165:00	7/45	3-130

FLIGHT PLAN

1013 CST

T 165:00 | **M**
S **F** **N** **L**

:10

VERIFY DSE MOTION AT LOS

:20

P52 IMU REALIGN
 OPTION 1 - PREFERRED
 (TEI ORIENT)
 GYRO TORQUE

165:30

GDC ALIGN

REV 46



:40

WIPE EXCESSIVE MOISTURE FROM
 TUNNEL HATCH AREA

CONTAMINATION CONTROL (OPERATIONS CHECKLIST)

:50

CM / TV-AVG (f22)
 TV (MAD) 166:10 TO 166:50 (RECORD AT MAD)
 MNVR TO TV ATT
 GO ORB RATE BY 165:50

OMNI C**T** 166:00

P52 IMU REALIGN	
N71:	---
N05:	---
N93:	---
X	---
Y	---
Z	---
GET	---

STARS	-----
SA	-----
TA	-----

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	165:00 - 166:00	7/45-46	3-131

MCC-H

1113 CST

NOTES

REPORT GYRO TORQUING ANGLES

UPDATE TO CSM
TEI 46 MNVR PAD
(NOMINAL)
TEI 47 MNVR PAD
& AOS TIME

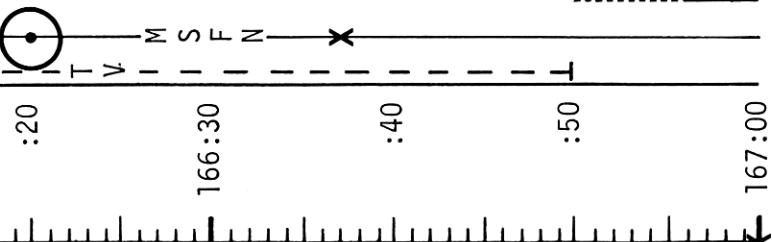
CSM S.V. & V66
TEI 46 TARGET LOAD

V64 ACQ MSFN (166:10)
HGA P -36, Y 345

DISCONTINUE BI-STATIC RADAR TEST
VHF RANGING-OFF
VHF AM B-OFF

MAP UPDATE REV	47
LOS	-----:-----:
180°	-----:-----:
AOS WITH TEI	-----:-----:
AOS WITHOUT TEI	-----:-----:

PRE TEI SYSTEMS CHECKS
C&W CHECK
CM RCS MONITOR CHECK
SM RCS MONITOR CHECK
EPS MONITOR CHECK



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	166:00 - 167:00	7/45	3-132

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FLIGHT PLAN

TEI
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME		RESIDUALS
		UNDERBURN	OVERBURN	
10°/SEC TAKEOVER	+10° TAKEOVER	FOR G&N C/O >3 SEC EARLY & ΔV_C >+50 FPS TO SCS AUTO & RESTART SPS	BT + 2 SEC & $\Delta V_C = -40$ FPS	TRIM X AND Z AXIS TO 0.2 FPS

TABLE 3-11
3-132A

FLIGHT PLAN

1213 CST

S ROLL TO BURN ATT
(167:00) R P 180
F Y 0 OMNI C

VERIFY DSE MOTION AT LOS

:10

SXT STAR CHECK

:20

GDC ALIGN

REV 47
167:30

TIG: 167:28:48
BT: 2MIN 15.0SEC
AVR: 3147.7 FPS
ULLAGE: 2JET, 17 SEC
TEI

V66 TRANSFER CSM SV TO LM SLOT
LOAD DAP, N46 (10111,11111)
UNSTOW EL AND PREPARE FOR LUNAR PHOTO
CM3/EL/80/BW-(f5.6,250,[∞]) MAG Q
CM3/DC/80/BW-(f5.6,250,[∞]) MAG R or S
MNVR TO PHOTOGRAPH LUNAR

SURFACE BY 167:42
(HATCH AT NADIR)

R 140 HGA
P 227 P -11
Y 337 Y 305

M
S
N

TEI BURN STATUS REPORT

DUMP DSE

CM-TV-PEAK (f22)
TV (MAD) 168:00 TO 168:25

E
168:00

BURN STATUS REPORT						
X	X		△TIG *	*		
X	X		BT *	*		
			V gx			
			TRIM			
X	X				R	
X	X				P	
X	X				Y	
			V gx	***		
			V gy	***		
			V gz	*		
			△V c			
			FUEL *			
			OX *			
			UNBAL			

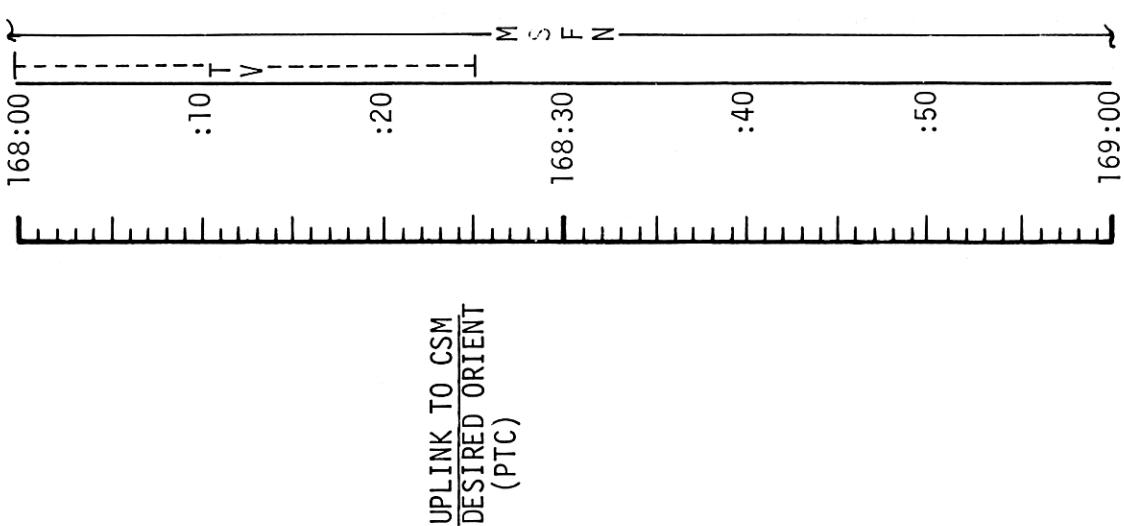
* ITEMS TO BE REPORTED
TO MSFN
**REPORT IF OFF MORE
THAN ONE SECOND
***REPORT IF 0.2 FPS

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	167:00 - 168:00	7/46-TEI	3-133

MCC-H

FLIGHT PLAN

1313 CST



NOTES

NOTE: IF NO FRAMES
ARE AVAILABLE FOR THE
DC (MAG R OR S), USE
THE EL WITH MAG Q
(B&W).

P52 IMU REALIGN

N71: —,—,—
N05: —,—.—.
N93:
X —,—.—
Y —,—.—
Z —,—.—
GET —,—.—:—

X —,—.—
Y —,—.—
Z —,—.—

SA —,—,
TA —,—

R 037 HGA
P 305 P -29
Y 34T Y 294

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	168:00 - 169:00	7/TEC	3-134

POST TEI PHOTO SEQUENCE
TEI + 32 MIN

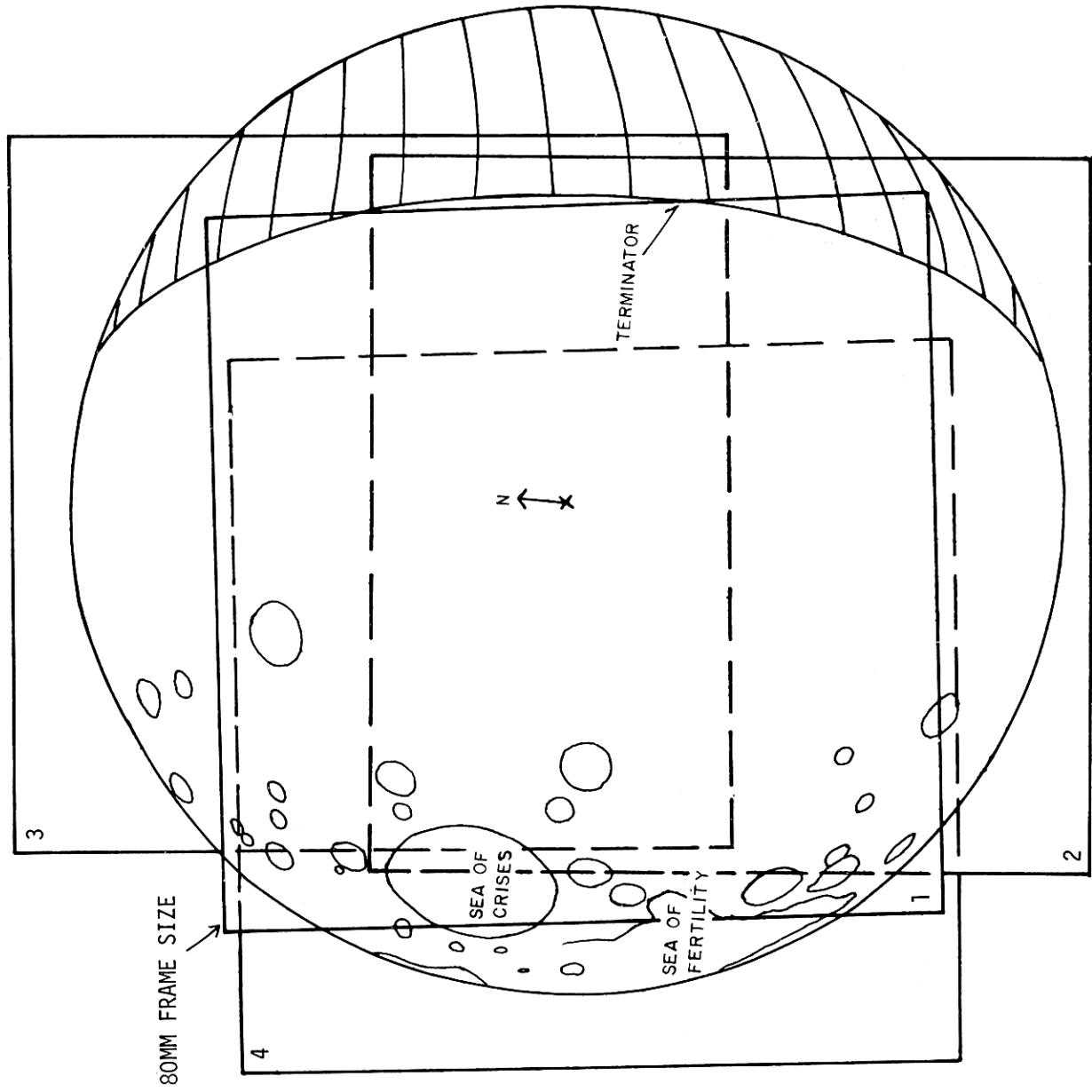


FIGURE 3-12
3-134A

POST TEI PHOTO SEQUENCE
TEI + 42 MIN

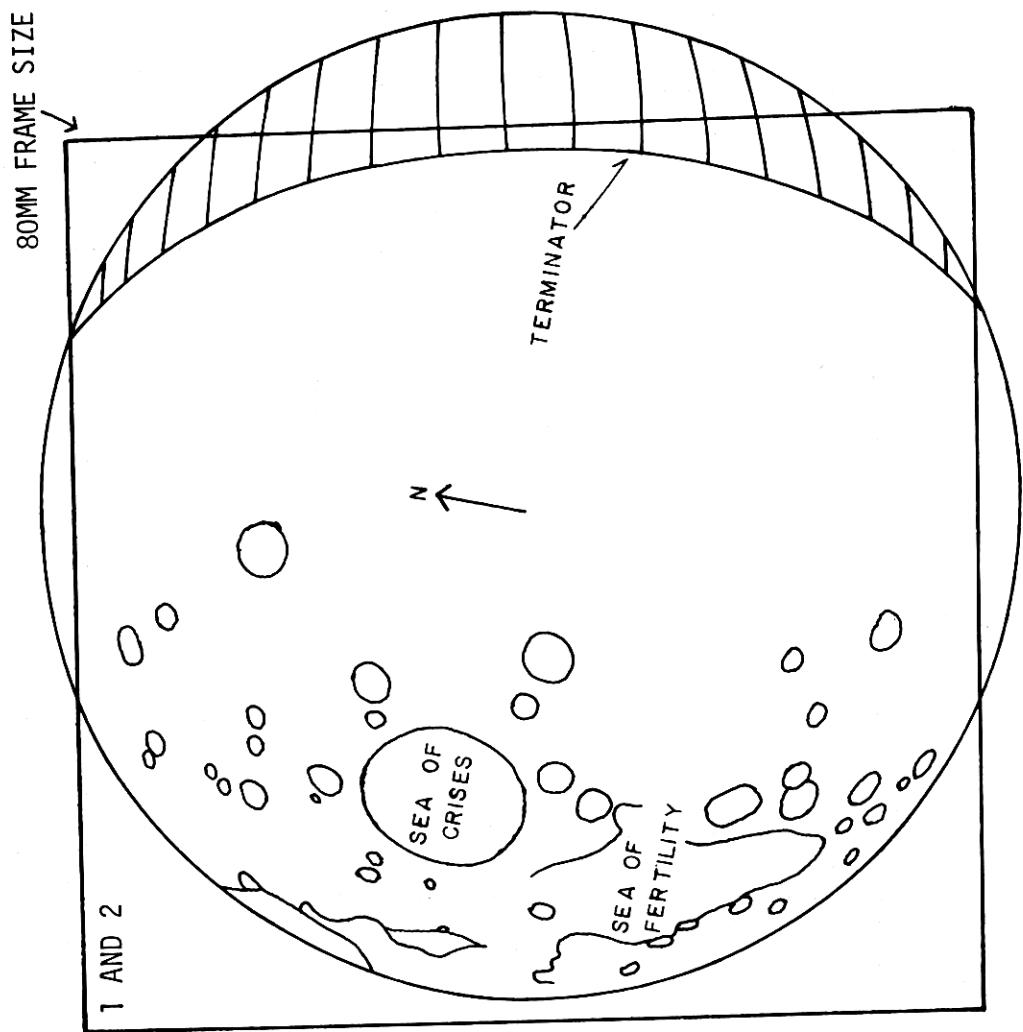


FIGURE 3-13
3-134B

POST TEI PHOTO SEQUENCE

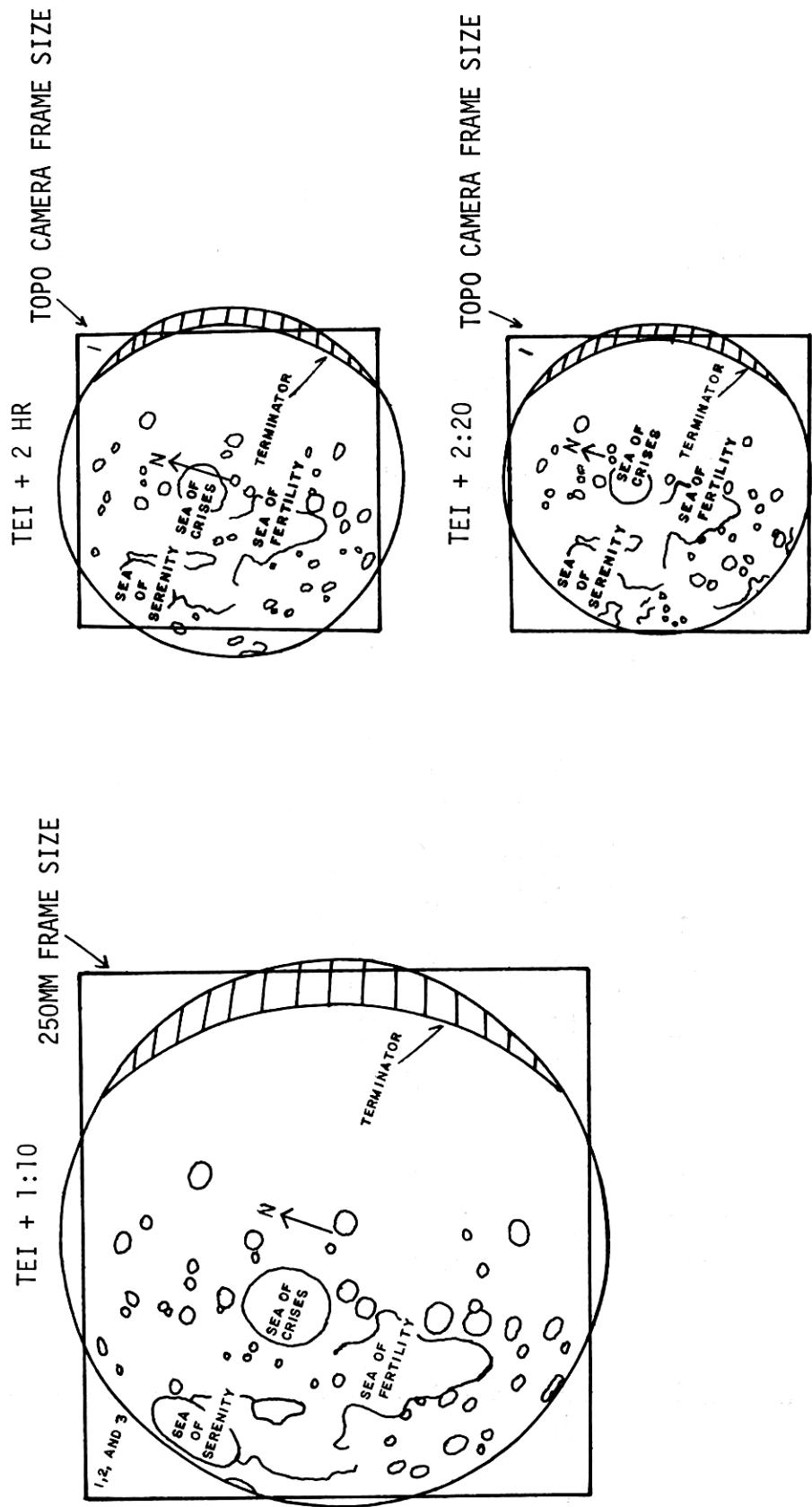


FIGURE 3-14
3-134C

FLIGHT PLAN

MCC-H

1413 CST

169:00

:10

UPDATE TO CSM
TOPO PHOTO ATT
(IF REQ)

:20

EAT PERIOD

MOUNT TOPO CAM ON HATCH WINDOW MAG V

DISABLE IMC

LOAD DAP, N46 (20101, 01111)

MNVR TO TOPO PHOTO ATT (169:25)

R	045	HGA
P	309	P -38
Y	350	Y 287

LUNAR PHOTOGRAPHY TEI + 2 HR
MAG V, START FRAME NO.
SINGLE FRAMES AT INTERVALS
OF 5 MINUTES FOR 20 MINUTES,
COVERING VISIBLE DISC

SET: SHUTTER 1/100 SEC
RANGE DISABLED (99.9 CM)
INTERVAL SINGLE FRAME

:40

RECORD GET:1. — :— :— :—

:50

2. — :— :— :—

170:00

3. — :— :— :—

STOW TOPO CAMERA

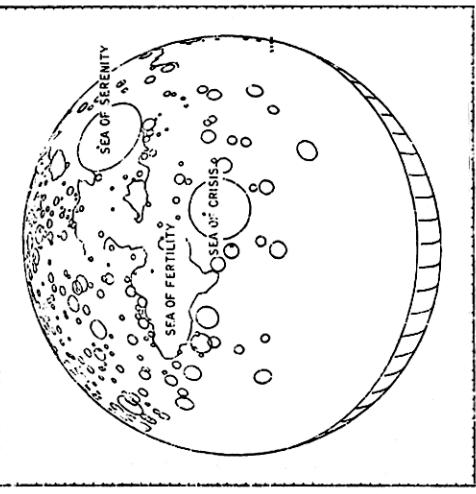
4. — :— :— :—

170:00

5. — :— :— :—

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	169:00 - 170:00	7/TEC	3-135

NOTES



GET 169:30 F.O.V. 20°

FLIGHT PLAN

MCC-H

1513 CST

170:00



MNVR TO OPTICS CALIBRATION ATT

R 235, P 287, Y 0

P23 - CISLUNAR NAVIGATION

OPTICS CALIBRATION

STAR 3 0

P00

V49 - MNVR TO SIGHTING ATT

R 212, P 299, Y 0

STAR/LUNAR HORIZON

P23 - CISLUNAR NAVIGATION

LOAD W MATRIX

$$(R1 + 4 \underline{5} \underline{0} \underline{0} \underline{0}) (R2 + 0 \underline{0} \underline{0} \underline{0} \underline{6})$$

:10

:20

170:30
M F
S N

1. STAR 26 LFH (R3 00220)
2. STAR 37 LNH (R3 00210)
3. STAR 33 LNH (R3 00210)
4. STAR 34 LNH (R3 00210)

:40

MNVR TO PTC ATT
START PTC
S-BAND ANT - OMNI B ON MCC CUE

:50

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

171:00
E
CSM S.V. (NO V47)

NOTES

The TEI CMC S.V. will be updated by onboard navigation (P-23's) during TEC. MCC's will be performed with a MSFN calculated S.V. replacing the CMC calculated S.V. which will be down-linked prior to the burns. After the MCC the previous CMC S.V. (corrected for the burn) will be up-linked to the LM slot and transferred to the CSM slot; thus preserving the original CMC S.V. and the W-Matrix. After the burn MCC-H will also up-link a current MSFN S.V. to the LM slot for reference purposes.

3 MARKS ON EACH STAR

INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

ONBOARD READOUT

BAT C	PTC	PYRO BAT A	PYRO BAT B
PYRO	PYRO	RCS A	RCS B
C	P 270, Y 0	D	C
D	DC IND SEL - MNA OR B	DC IND SEL - MNA OR B	3-136

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	170:00 - 171:00	8/TEC	3-136

MCC-H

FLIGHT PLAN

1613 CST

:20

:40

172:00

M S F N

:20

:40

173:00

REST PERIOD
(10 HOURS)

PTC
P 270 Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	171:00 - 173:00	7 / TEC	3-137

MCC-H

FLIGHT PLAN

1813 CST

E 173:00

:20

:40

174:00

REST PERIOD
(10 HOURS)

M S F N

:20

:40

E 175:00

PTC
P 270, Y 0

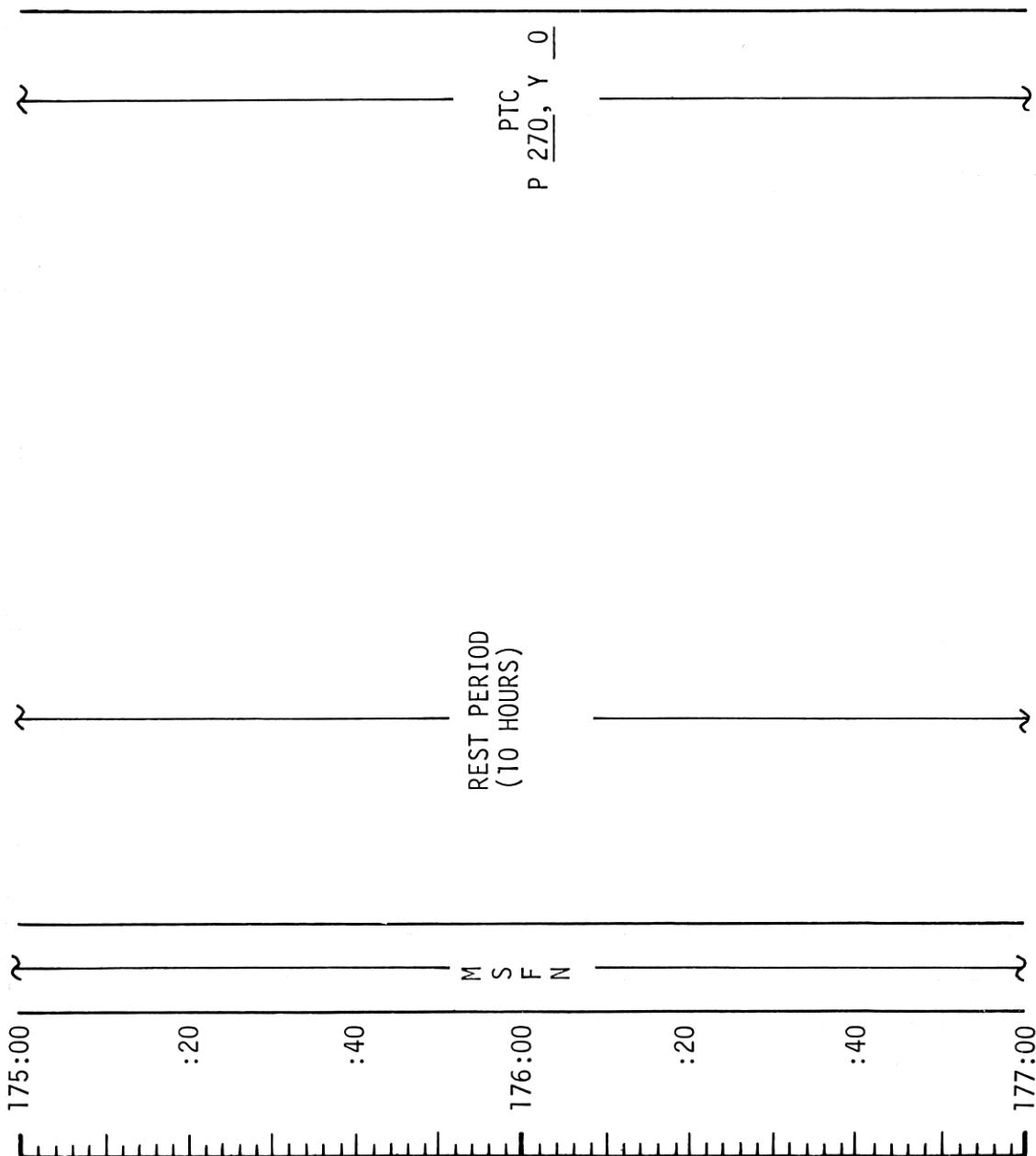
NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	173:00 - 175:00	7/TEC	3-138

MCC-H

FLIGHT PLAN

2013 CST



NOTES

PTC
P 270, Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	175:00 - 177:00	7/TEC	3-139

MCC-H

FLIGHT PLAN

2213 CST

177:00

:20

:40

178:00

REST PERIOD
(10 HOURS)

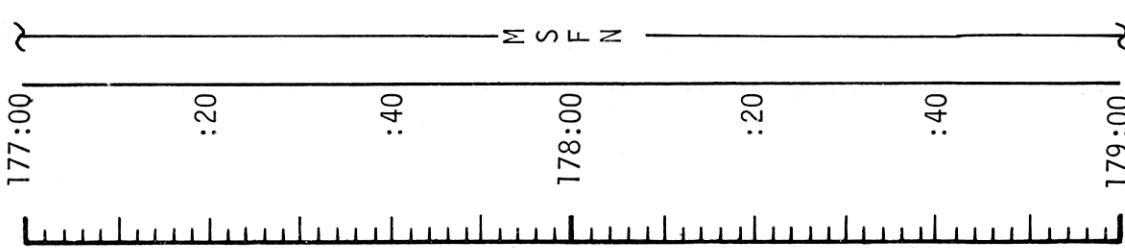
PTC
P 270, Y 0

:20

:40

179:00

M S F N



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	177:00 - 179:00	7/TEC	3-140

MCC-H

FLIGHT PLAN

NOTES

0013 CST

179:00

:20

:40

180:00

REST PERIOD
(10 HOURS)

M

S

F

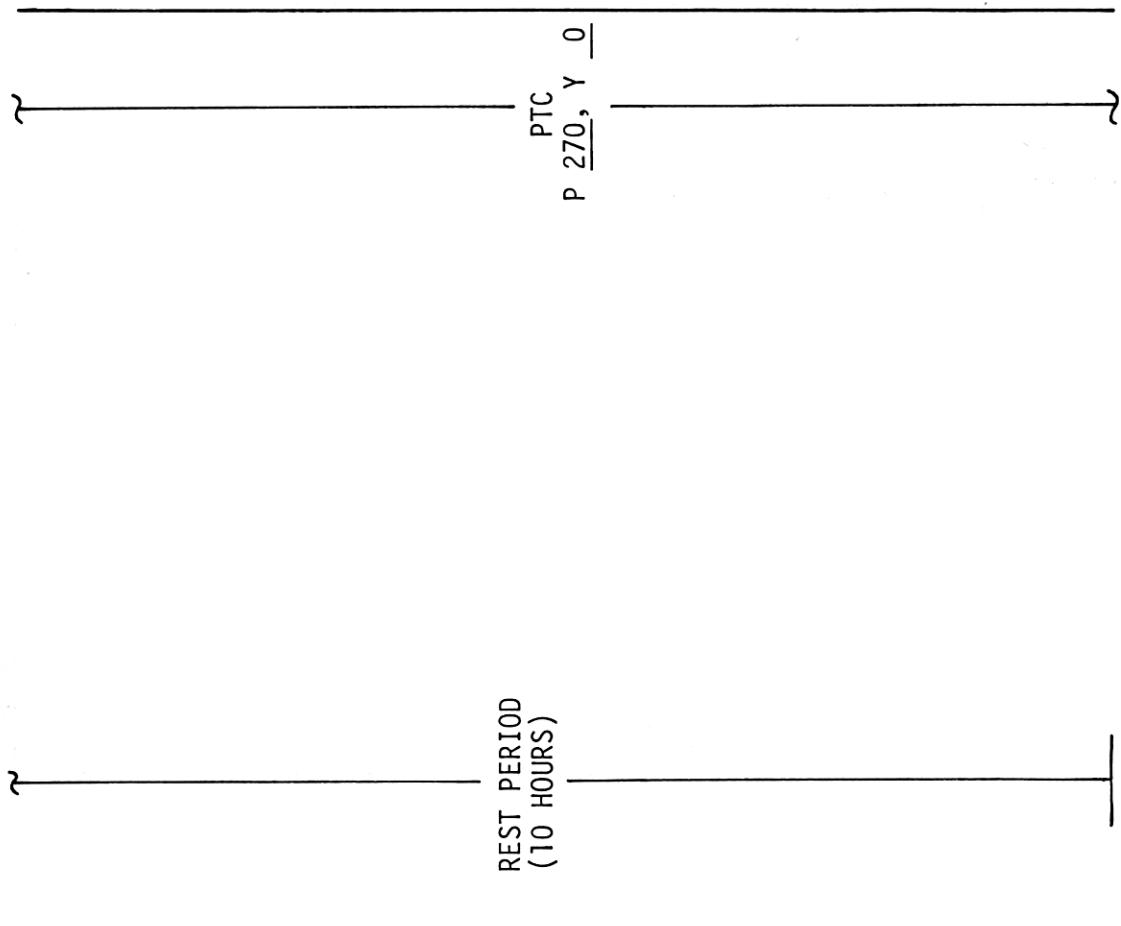
N

:20

:40

181:00

PTC
P 270, Y 0



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	179:00 - 181:00	7/TEC	3-141

MCC-H

FLIGHT PLAN

0213 CST

UPLINK TO CSM
CSM S.V. & V47E
MCC-5 TGT LOAD
UPDATE TO CSM
CONSUMABLES
MCC-5 MNVR PAD
FLIGHT PLAN
TOPO PHOTO ATT
(IF REQ)

181:00

P52 - IMU REALIGN
OPTION 3 REFSMMAT
(PTC ORIENT)
REPORT GYRO TORQUING ANGLES
LiOH CANISTER CHANGE
(15 INTO A, STOW 13 IN A4)

:10

POST SLEEP CHECKLIST

PTC

N71: _____, _____
N05: _____, _____
N93: _____
X _____, _____
Y _____, _____
Z _____, _____
GET _____, _____

P52 IMU REALIGN
N71: _____, _____
N05: _____, _____
N93: _____
X _____, _____
Y _____, _____
Z _____, _____
GET _____, _____

CSM CONSUMABLES UPDATE
GET: _____, _____
RCS TOTAL _____
QUAD A _____, B _____
C _____, D _____
H₂ TOTAL _____
O₂ TOTAL _____

IF NO MCC-5, MNVR
TO TOPO ATTITUDE (182:50)
FOR DAC WATER
DUMP PHOTOGRAPHY

H₂ PURGE LINE HEATERS-ON
SET UP DAC FOR WATER DUMP PHOTOGRAPHY (182:01)
CM1/DAC/18/VHBW-(f2.0,125,10)6 fps, 30 sec MAG G
P30 EXTERNAL ΔV % FILM _____

V49 - MNVR TO BURN ATT (181:50)

P40/41-SPS/RCS THRUST
SXT STAR CHECK
H₂ & O₂ FUEL CELL PURGE

182:00

:40

M

S

F

N

:50

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	181:00 - 182:00	8/TEC	3-142

FLIGHT PLAN

MCC-5
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+10° TAKEOVER	BT + 1 SEC	TRIM X AXIS ONLY TO 0.2 FPS

TABLE 3-12
3-142A

MCC-H

FLIGHT PLAN

0313 CST

WASTE

WATER DUMP

 H_2 PURGE LINE HTRS - OFF

:10

GDC ALIGN

M

S

F

N

:

182:30

:

40

:

50

:

183:00

WATER DUMP

PHOTOGRAPHY

HAND HELD, PHOTOGRAPH

EXPANSION OF WATER DROPLET CLOUD

CM1/DAC/18/VHBW-
(f2.0, 125, 10)

6 fps, 30 sec MAG G

CHANGE FOCUS TO ∞
AND EXP TIME TO
1/60, USE REMAINING
FILM

MCC-5

MCC-5 BURN STATUS REPORT
LOAD DAP N46 (20101,01111)

:

:

:

:

:

:

:

:

:

:

:

TIG: 182:28:48
BT: NOM. ZERO
 Δ VR: NOM. ZERO
ULLAGE: N/A
ORBIT: N/AR 054.8 HGA
P $\frac{313.6}{359.9}$ Y $\frac{-50}{274}$ SET: SHUTTER 1/100 SEC
RANGE DISABLED (99.9 CW)
INTERVAL SINGLE FRAME
RECORD GET OF EACH FRAME
UNSTOW TOPO CAMERA AND MOUNT ON HATCH WINDOW
DISABLE IMC
TOPO PHOTOGRAPHY MAG V
TWO SINGLE FRAMES COVERING
VISIBLE DISC
START FRAME NO. —UPLINK TO CSM
CSM S.V. (CMC) V47E
CSM S.V. (MSFN)
(NO V47)* ITEMS TO BE
REPORTED TO MSFN
UNBAL

— : — : —

— : — : —

— : — : —

— : — : —

— : — : —

— : — : —

— : — : —

— : — : —

— : — : —

— : — : —

— : — : —

NOTES

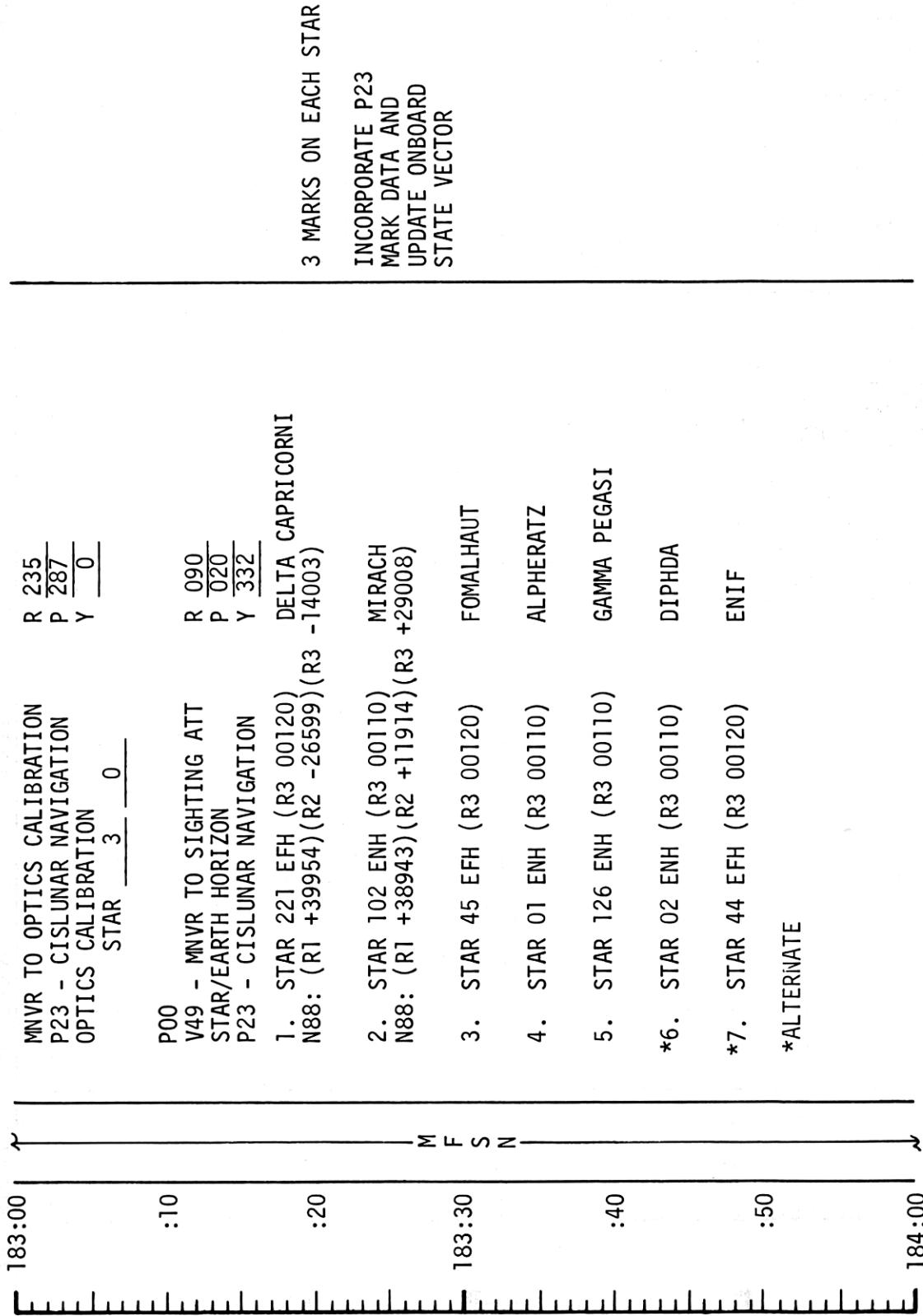
BURN STATUS REPORT	
X X	ATIG
X X	BT
X X	V gx
X X	TRIM
X X	R
X X	P
X X	Y
X X	V gy
X X	V gz
X X	ΔV^C
X X	FUEL *
X X	OX *
X X	UNBAL

* ITEMS TO BE
REPORTED TO MSFN

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	182:00 - 183:00	8/TEC	3-143

FLIGHT PLAN

0413 CST

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	183:00 - 184:00	8/TEC	3-144

FLIGHT PLAN

0513 CST

MCC-H

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

184:00

:10

:20

184:30

:40

185:00

START PTC

EAT PERIOD

M S F N

NOTES

P 270, Y 0

GET 185:00 F.O.V. 3°



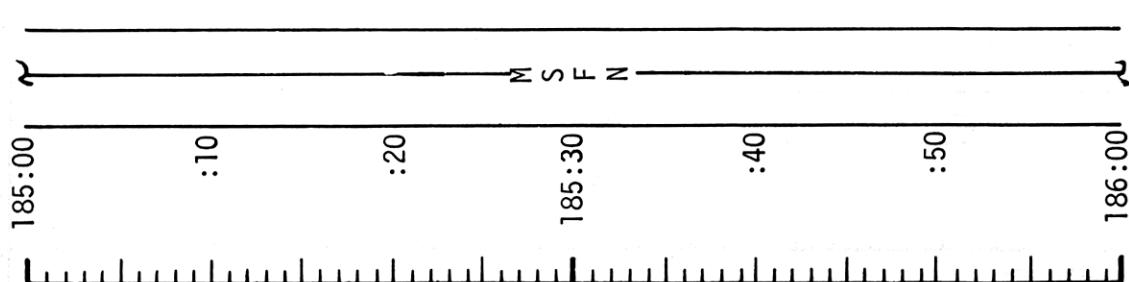
AL I

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	184:00 - 185:00	8/TEC	3-145

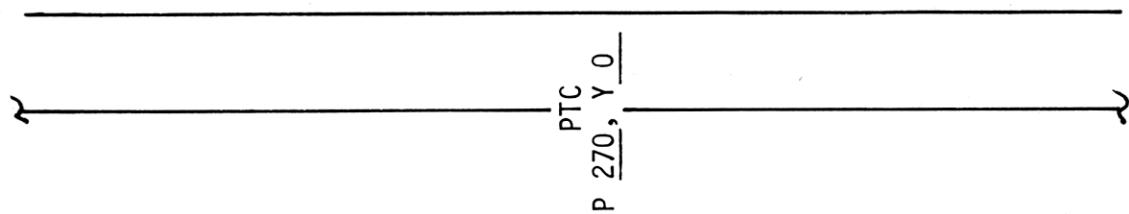
MCC-H

FLIGHT PLAN

0613 CST



NOTES



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	185:00 - 186:00	8/TEC	3-146

MCC-H

FLIGHT PLAN

0713 CST

186:00

:10

:20

186:30

:40

:50

187:00

M S F N

STOP PTC AT ROLL 235

PTC
P 270, Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	186:00 - 187:00	8/TEC	3-147

FLIGHT PLAN

0813 CST

NOTES

MNVR TO OPTICS CALIBRATION ATT
 P23 - CISLUNAR NAVIGATION
 OPTICS CALIBRATION
 STAR 3 0

R 235
 P 287
 Y 0

V49 - MNVR TO SIGHTING ATT
 STAR/LUNAR HORIZON
 P23 - CISLUNAR NAVIGATION

R 234
 P 3T3
 Y 0

3 MARKS ON EACH STAR
 INCORPORATE P23
 MARK DATA AND
 UPDATE ONBOARD
 STATE VECTOR

ANTARES

SPICA

GIENAH

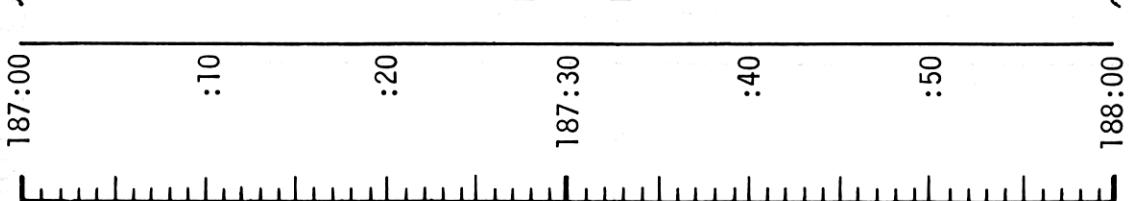
ARCTURUS

ACRUX

ALPHECCA

MENKENT

*ALTERNATES



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	187:00 - 188:00	8/TEC	3-148

MCC-H

FLIGHT PLAN

0913 CST

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

188:00

:10

:20

188:30

:40

189:00

START PTC

PTC
P 270, Y 0

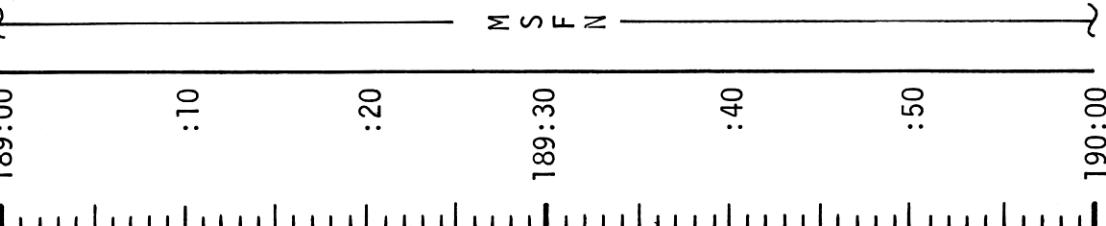
M S F N

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	188:00 - 189:00	8/TEC	3-149

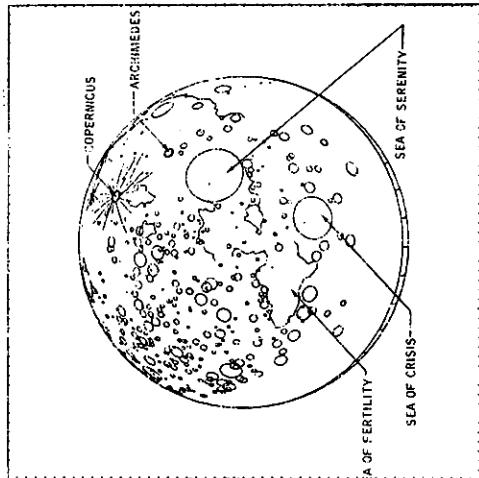
FLIGHT PLAN

1013 CST



BATTERY CHARGE, BATTERY A

GET 190:00 F.O.V. 3°



NOTES

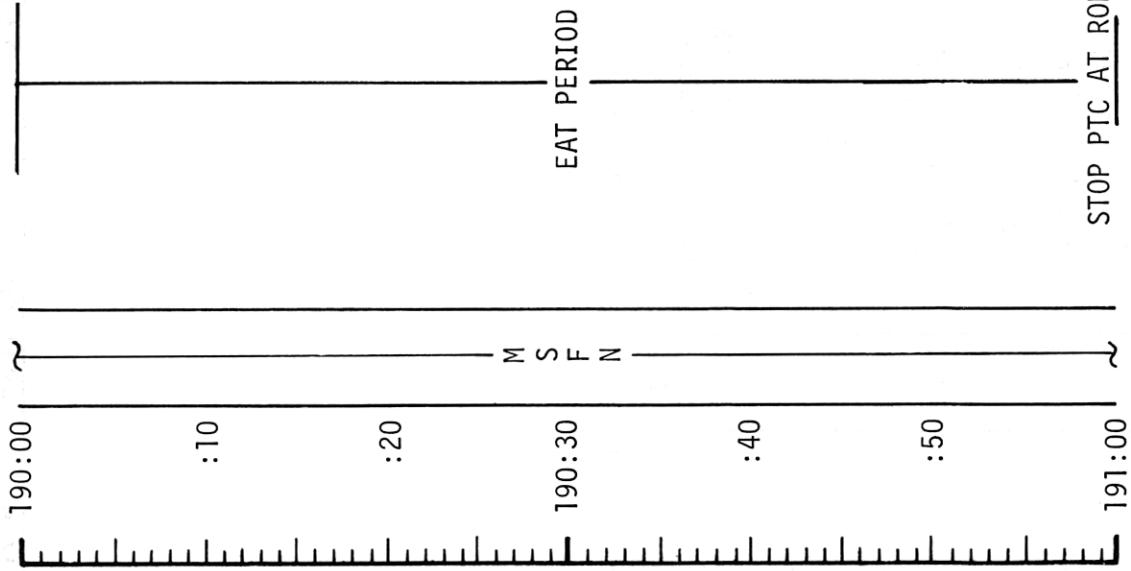
PTC
P 270, Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	189:00 - 190:00	8/TEC	3-150

MCC-H

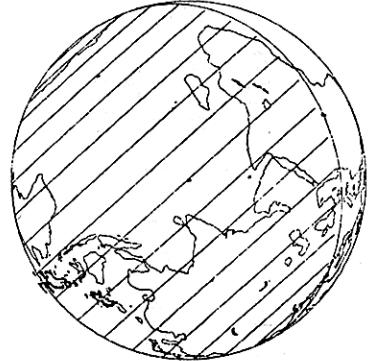
FLIGHT PLAN

1113 CST



NOTES

PTC
P 270, Y 0
GET 190:00 F.O.V. 3°



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	190:00 - 191:00	8/TEC	3-151

FLIGHT PLAN

1213 CST

NOTES

R 075
P 063
Y 0

MNVR TO OPTICS CALIBRATION
P23 - CISLUNAR NAVIGATION
OPTICS CALIBRATION
STAR 4 4
V49 - MNVR TO SIGHTING ATT
STAR/EARTH HORIZON
P23 - CISLUNAR NAVIGATION

3 MARKS ON EACH STAR

INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

P00
:10
V49: (R1 +39954) (R2 -26599) (R3 -14003)

1. STAR 221 EFH (R3 00120)
N88: (R1 +38943) (R2 +11914) (R3 +29008)

2. STAR 102 ENH (R3 00110)
N88: (R1 +48229) (R2 +02461) (R3 +12955)

3. STAR 45 EFH (R3 00120)

4. STAR 02 ENH (R3 00110)

5. STAR 126 ENH (R3 00110)
N88: (R1 +48229) (R2 +02461) (R3 +12955)

*6. STAR 44 EFH (R3 00120)

*7. STAR 01 ENH (R3 00110)

*ALTERNATES

192:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	191:00 - 192:00	8/TEC	3-152

NOTES**FLIGHT PLAN**

1313 CST

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

192:00

START PTC
 CONTAMINATION CONTROL (OPERATIONS CHECKLIST)

WIPE EXCESSIVE MOISTURE
 FROM TUNNEL HATCH AREA
 (IF REQUIRED)

:10

L10H CANISTER CHANGE
 (16 INTO B, STOW 14 IN A4)

:20

M S F N

192:30

:40

:50

193:00

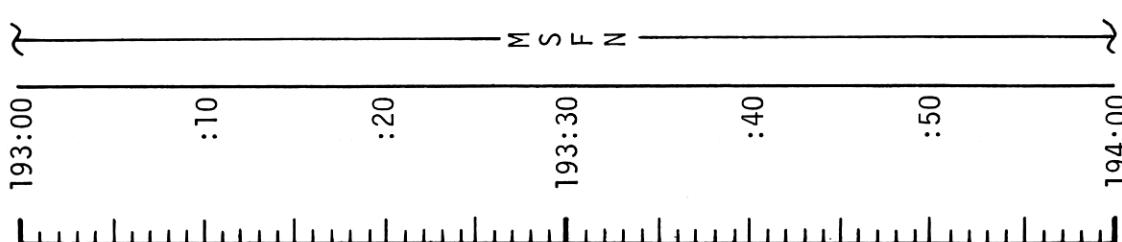
PTC
 P 270, Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	192:00 - 193:00	8/TEC	3-153

MCC-H

FLIGHT PLAN

1413 CST



PTC
P 270, Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	193:00 - 194:00	8/TEC	3-154

MCC-H

FLIGHT PLAN

1513 CST

194:00

:10

:20

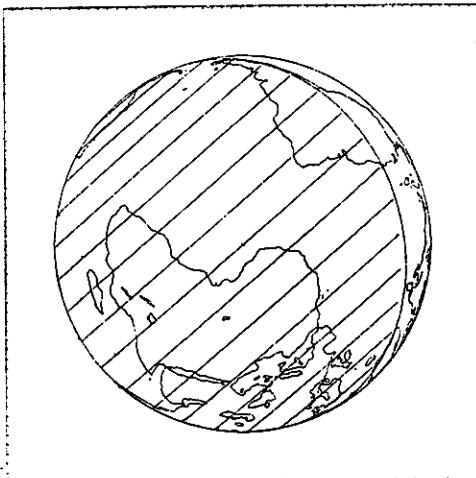
194:30

GET 195:00 F.O.V. 3°

:40

:50

195:00



STOP PTC AT ROLL 235

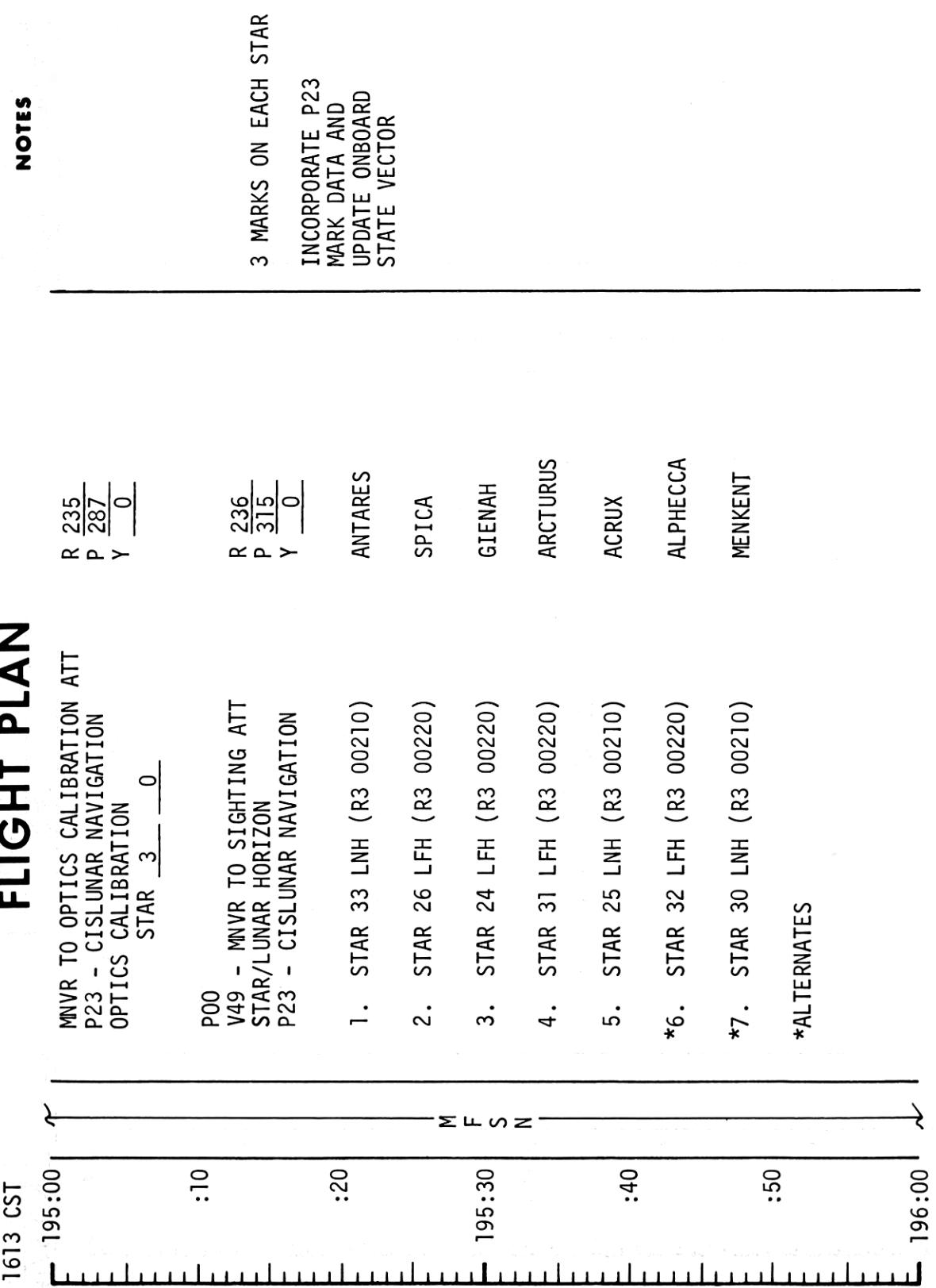
NOTES

PTC
P 270, Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	194:00 - 195:00	8/TEC	3-155

FLIGHT PLAN

1613 CST



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	195:00 - 196:00	8/TEC	3-156

FLIGHT PLAN

NOTES

MCC-H

1713 CST

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

196:00

START PTC

:10

196:30

:20

196:30

N
S
F
N

196:30

:40

197:00

:50

197:00

EAT PERIOD

PTC

P 270, Y 0

PRESLEEP CHECKLIST

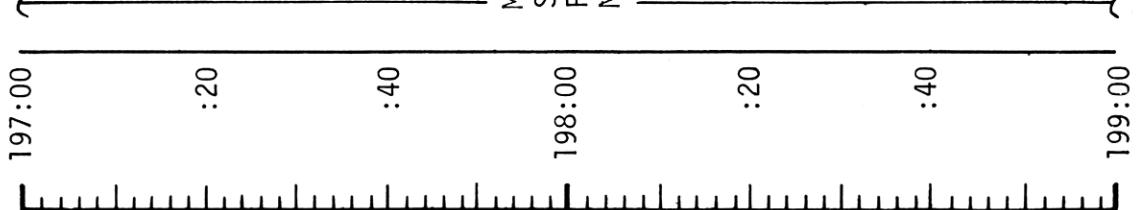
ONBOARD READOUT	
BAT C	_____
PYRO BAT A	_____
PYRO BAT B	_____
RCS A	_____
B	_____
C	_____
D	_____
DC IND SEL - MNA OR B	_____

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	196:00 - 197:00	8/TEC	3-157

MCC-H

FLIGHT PLAN

1813 CST



REST PERIOD
(10 HOURS)

PTC
P 270, Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	197:00 - 199:00	8/TEC	3-158

MCC-H

FLIGHT PLAN

2013 CST

199:00

:20

:40

200:00

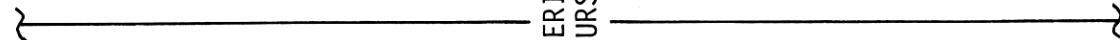
REST PERIOD
(10 HOURS)

M S F N

:20

:40

201:00



NOTES

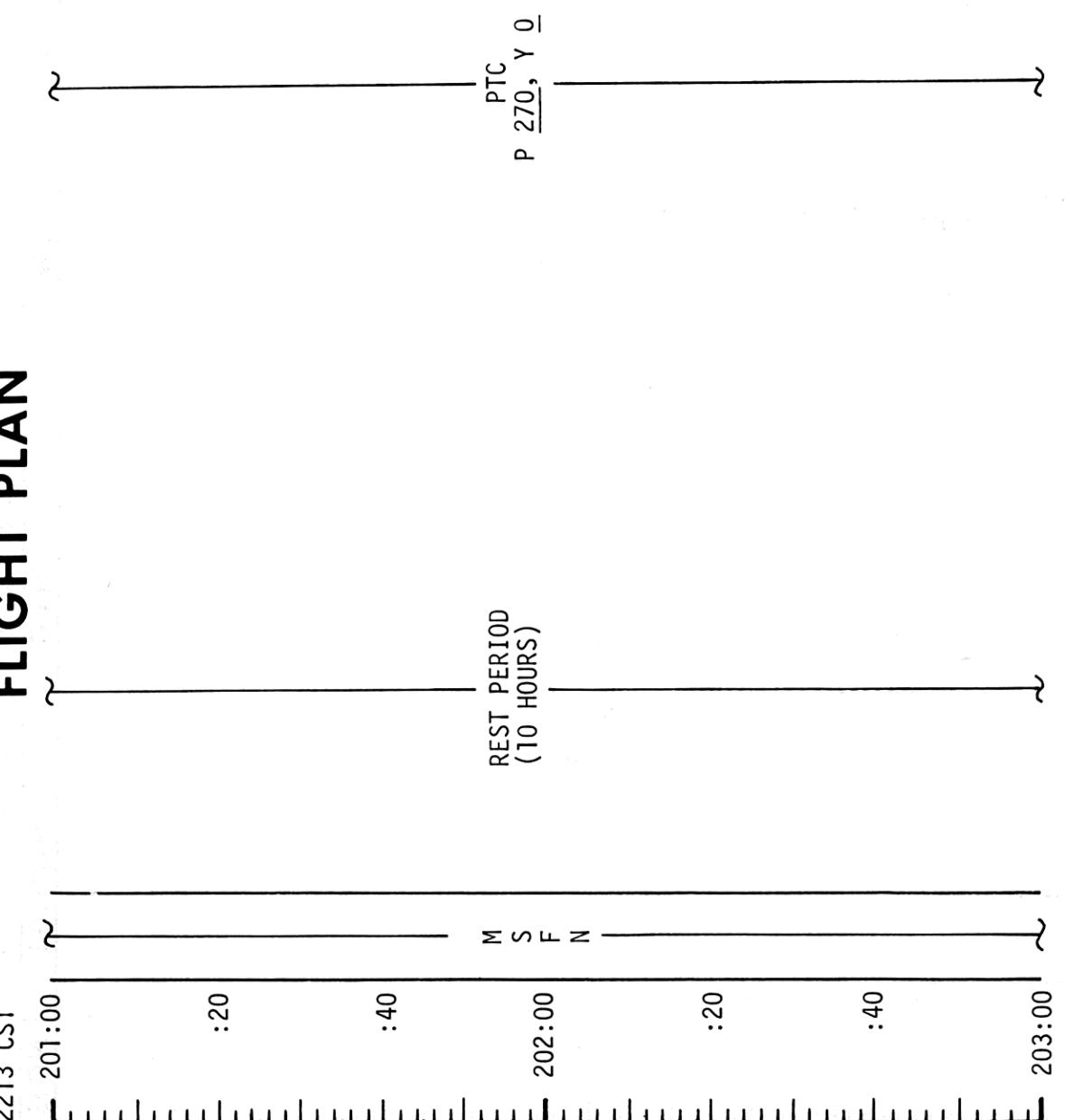
PTC
P 270, Y 0

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	199:00 - 201:00	8/TEC	3-159

MCC-N

FLIGHT PLAN

2213 CST



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	201:00 - 203:00	8/TEC	3-160

MCC-H

FLIGHT PLAN

0013 CST

203:00

:20

:40

204:00

REST PERIOD
(10 HOURS)

M S F N

:20

:40

205:00

~

~

~

PTC
P 270, Y 0

~

~

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	203:00 - 205:00	8/TEC	3-161

FLIGHT PLAN

0213 CST

205:00

:20

:40

206:00

M S F N

:20

:40

207:00

REST PERIOD
(10 HOURS)

PTC
P 270, Y 0

MCC-H

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	205:00 - 207:00	8/TEC	3-162

FLIGHT PLAN

0413 CST

MCC-H

POSTSLEEP CHECKLIST

UPDATE TO CSM
CONSUMABLES
FLIGHT PLAN

:10

:20

207:30

LIOH CANISTER CHANGE
(17 INTO A, STOW 15 IN A4)

N S F N

:40

:50

208:00

P52-IMU REALIGN
OPTION 3 REFMMAT
(PTC ORIENT)

REPORT GYRO TORQUING ANGLES

STOP PTC AT ROLL 075

NOTES

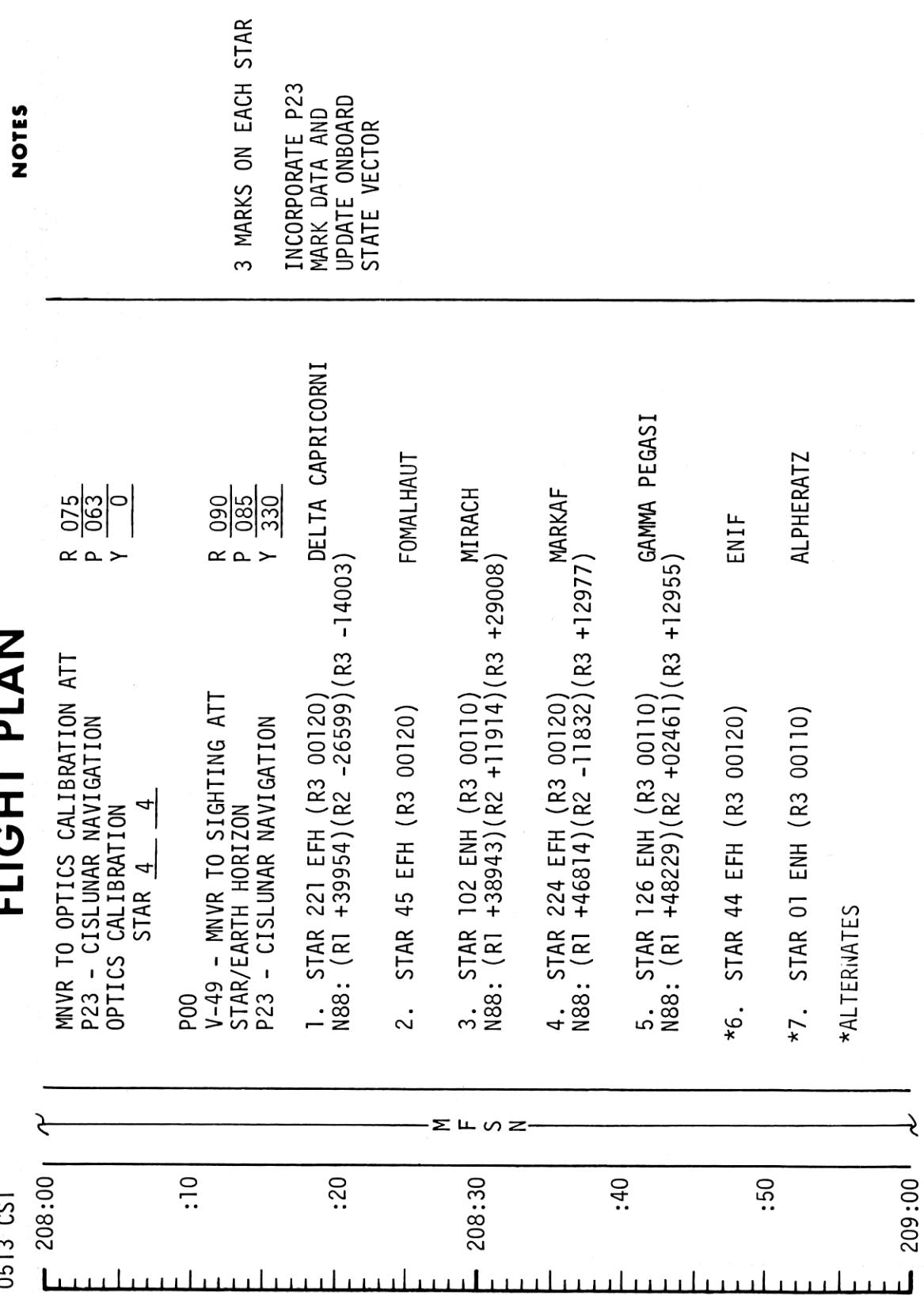
CSM CONSUMABLES UPDATE			
GET:	_____	:	_____
RCS TOTAL	_____	B	_____
QUAD A	_____	C	D
H ₂ TOTAL	_____	O ₂ TOTAL	_____

P52 IMU REALIGN			
N71:	_____	,	_____
N05:	_____	.	_____
N93:	_____	X	_____
	Y	_____	Z
	GET	_____	:

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	207:00 - 208:00	9/TEC	3-163

FLIGHT PLAN

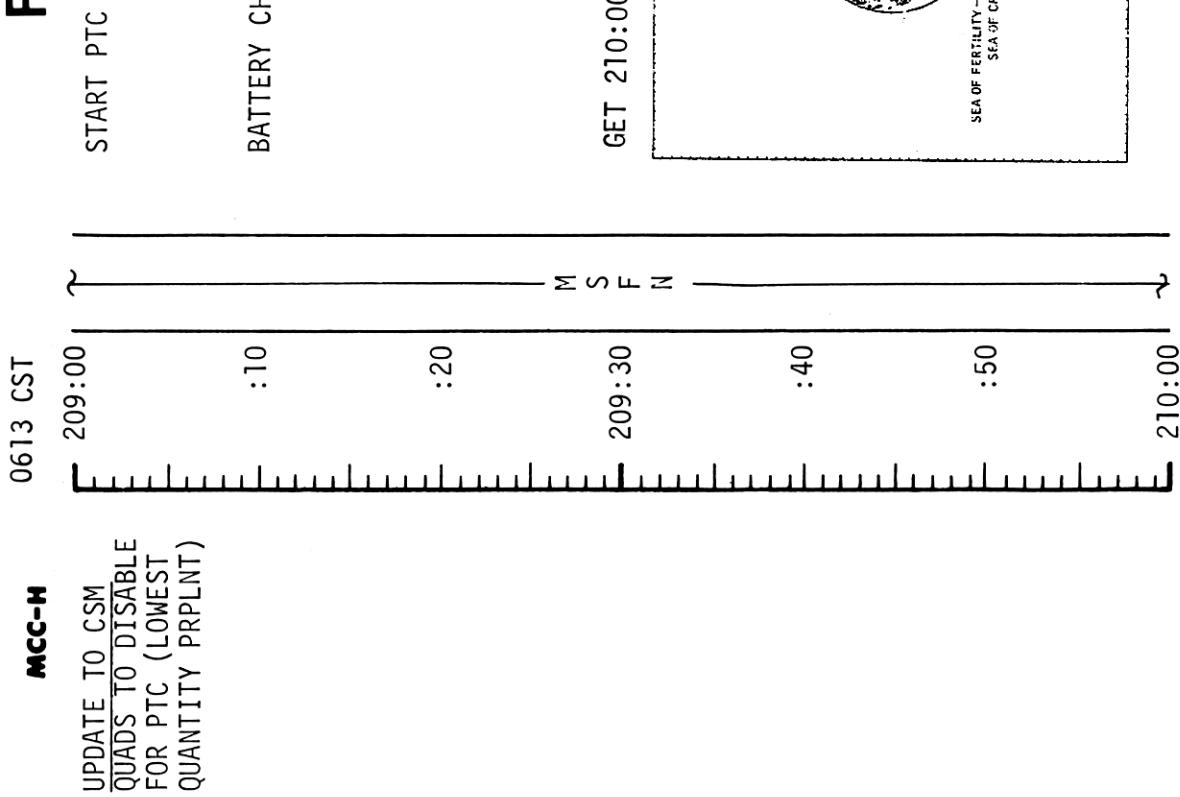
0513 CST



NOTES

3 MARKS ON EACH STAR
INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	208:00 - 209:00	9/TEC	3-164

MCC-H**FLIGHT PLAN****NOTES**

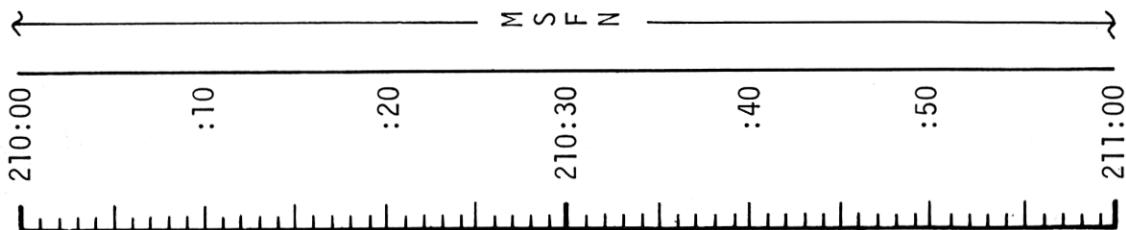
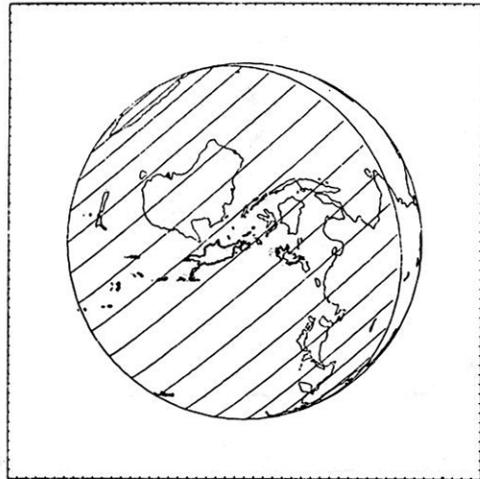
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	209:00 - 210:00	9/TEC	3-165

FLIGHT PLAN

0713 CST

MCC-H

GET 210:00 F.O.V. 3°



PTC
P 270, Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	210:00 - 211:00	9/TEC	3-166

MCC-H

FLIGHT PLAN

0813 CST

211:00

:10

:20

211:30
M
S
F
N

:40

:50

212:00

STOP PTC AT ROLL 075

P T C
P 270, Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	211:00 - 212:00	9/TEC	3-167

MCC-H

FLIGHT PLAN

0913 CST

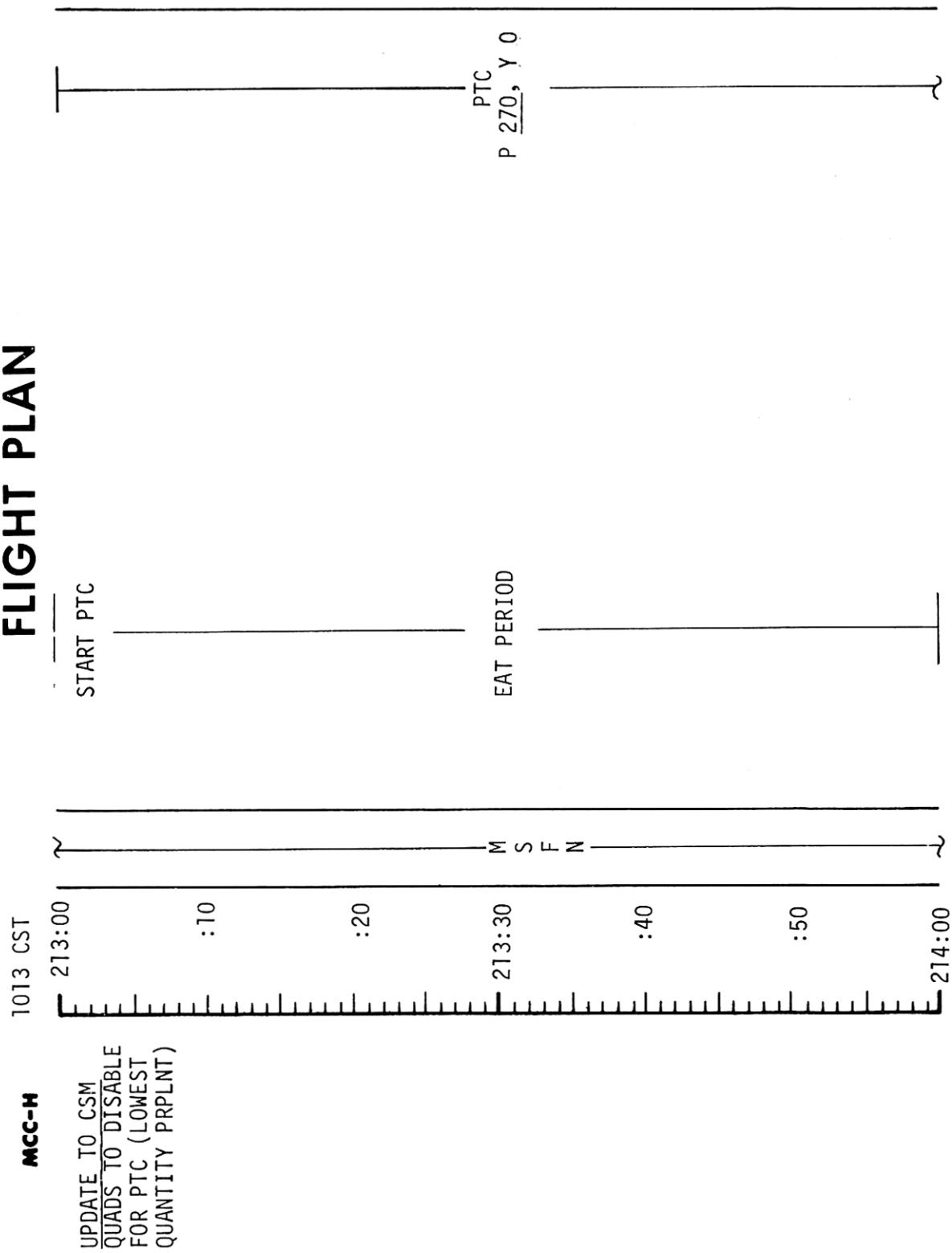
NOTES

212:00		MNVR TO OPTICS CALIBRATION ATT P23 - CISLUNAR NAVIGATION OPTICS CALIBRATION STAR <u>4</u> <u>4</u>	R <u>075</u> P <u>063</u> Y <u>0</u>	
:10		P00 V49 - MNVR TO SIGHTING ATT STAR/EARTH HORIZON P23 - CISLUNAR NAVIGATION	R <u>090</u> , P <u>105</u> , Y <u>331</u>	3 MARKS ON EACH STAR
:20		1. STAR 221 EFH (R3 00120) N88: (R1 +39954)(R2 -26599)(R3 -14003)	DELTA CAPRICORNI	INCORPORATE P23 MARK DATA AND UPDATE ONBOARD STATE VECTOR
		2. STAR 102 ENH (R3 00110) N88: (R1 +38943)(R2 +11914)(R3 +29008)	MIRACH	
212:30	S	3. STAR 45 EFH (R3 00120)	FOMALHAUT	
	F	4. STAR 01 ENH (R3 00110)	ALPHERATZ	
:40	N	5. STAR 224 EFH (R3 00120) N88: (R1 +46814)(R2 -11832)(R3 +12977)	MARKAF	
		*6. STAR 126 ENH (R3 00110) N88: (R1 +48229)(R2 +02461)(R3 +12955)	GAMMA PEGASI	
:50		*7. STAR 44 EFH (R3 00120)	ENIF	
			*ALTERNATES	
213:00				

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	212:00 - 213:00	9/TEC	3-168

FLIGHT PLAN

NOTES

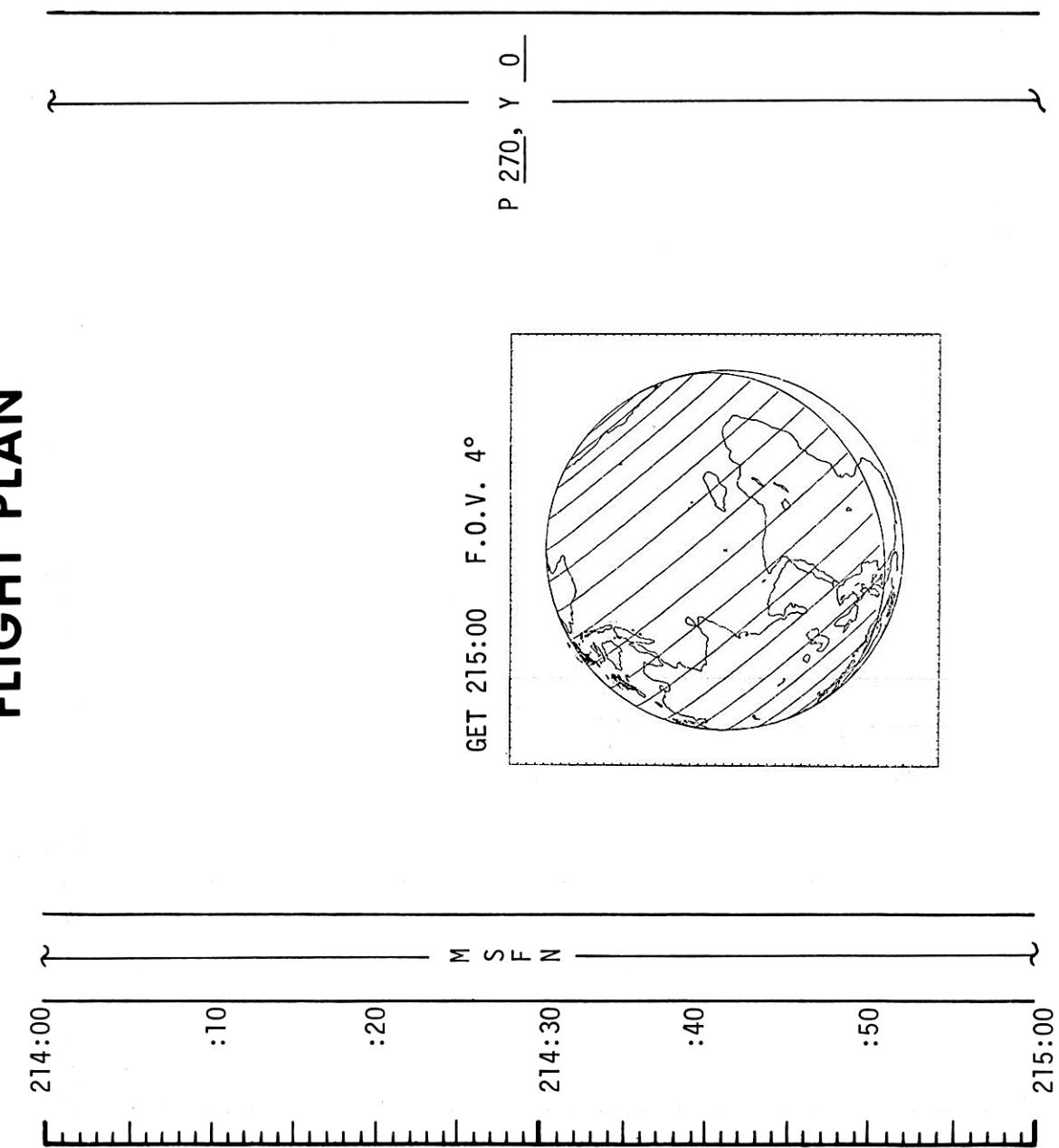


MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	213:00 - 214:00	9/TEC	3-169

FLIGHT PLAN

1113 CST

MCC-H



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	214:00 ~ 215:00	9/TEC	3-170

MCC-H

FLIGHT PLAN

1213 CST

215:00

:10

:20

215:30

W S F N

:40

:50

216:00

T

PTC
P 270, Y 0

NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	215:00 - 216:00	9/TEC	3-171



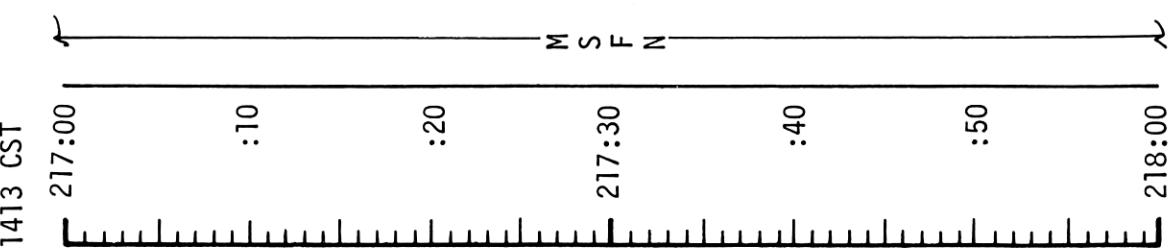
CONTAMINATION CONTROL (OPERATIONS CHECKLIST)

PTC
P 270, Y 0LiOH CANISTER CHANGE
(18 INTO B, STOW 16 IN A4)STOP PTC AT ROLL 075

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	216:00 - 217:00	9/TEC	3-172

MCC-H**FLIGHT PLAN**

1413 CST

**NOTES**

3 MARKS ON EACH STAR
INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	217:00 - 218:00	9/TEC	3-173

FLIGHT PLAN

MCC-6
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+10° TAKEOVER	BT + 1 SEC	TRIM X AXIS ONLY TO 0.2 FPS

TABLE 3-13
3-173A

1513 CST

FLIGHT PLAN

MCC-H

218:00

:10

:20

218:30

:40

50

219:00

↓

P52 - IMU REALIGN
OPTION 3 - REFSMMAT
(PTC ORIENT)

REPORT GYRO TORQUING ANGLES

P30 EXTERNAL ΔV
V49 - MNVR TO BURN ATT
P40/41 - SPS/RCS THRUST
SXT STAR CHECK
02 FUEL CELL PURGE
WASTE WATER DUMP

P40/41 - SPS/RCS THRUST

GDC ALIGN

[MCC-6]

V66 - TRANSFER CSM SV TO LM SLOT
MCC-6 BURN STATUS REPORT

(EI - 22 HRS)

UPLINK TO CSM
CSM S.V. (CMC) V47E
CSM S.V. (MSFN)
(NO V47)

P52 IMU REALIGN

N71: _____
N05: _____
N93: _____
X _____
Y _____
Z _____
GET _____

		BURN STATUS REPORT				
		X	X	X	ATIG	
		X	X	X	BT	
					V gx	
					V gy	*
					V gz	*
					ΔV_c	*
					FUEL	*
					OX	*
					UNBAL	

TIG:	218:49:37.6
BT:	NOM.
ΔV_R :	ZERO
ULLAGE:	NOM.
ORBIT:	N/A

*ITEMS TO BE
REPORTED TO MSFN

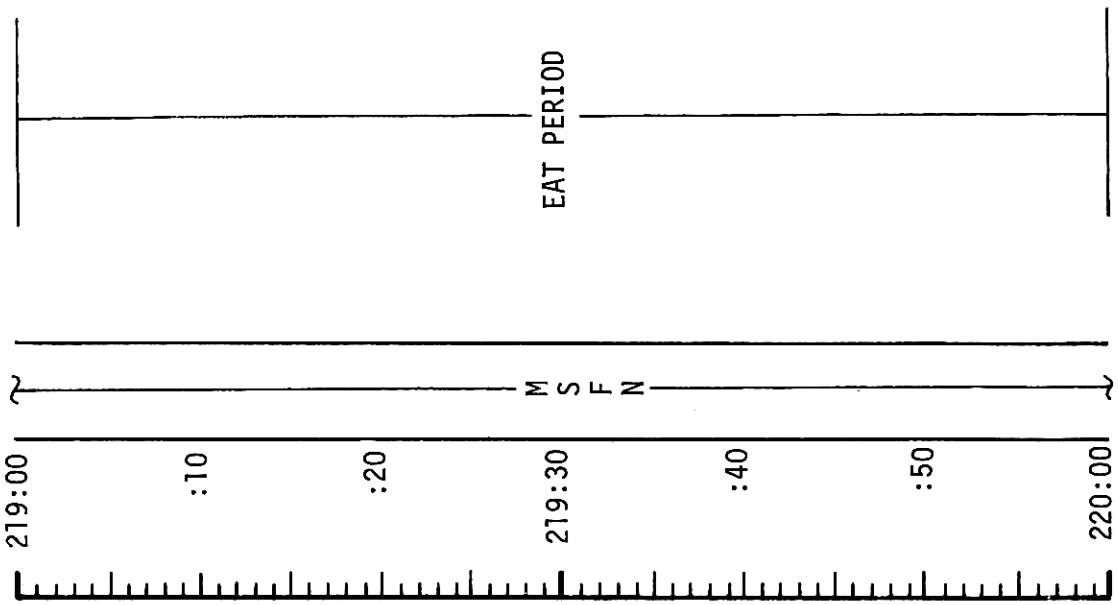
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	218:00 - 219:00	9/TEC	3-174

1613 CST

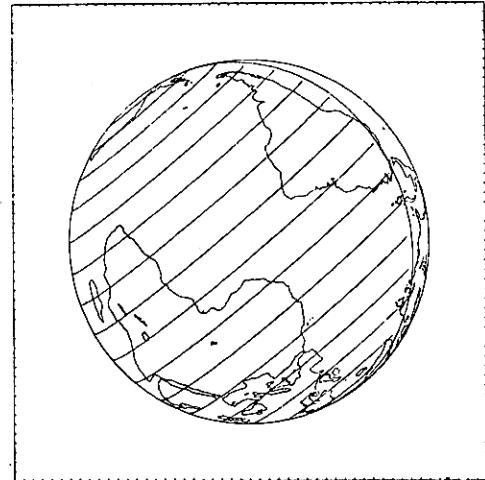
FLIGHT PLAN

MCC-H

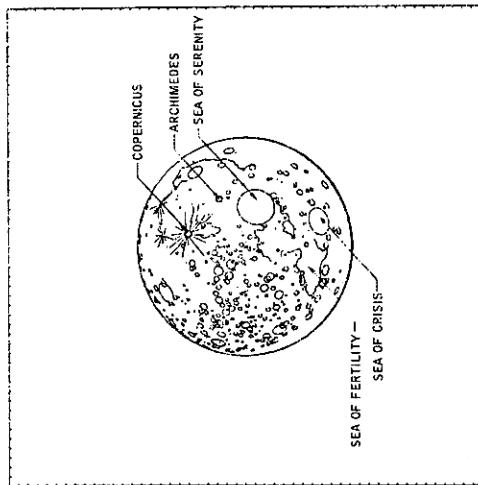
NOTES



GET 220:00 F.O.V. 5°



GET 220:00 F.O.V. 2°



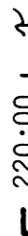
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	219:00 - 220:00	9/TEC	3-175

MCC-H

FLIGHT PLAN

1713 CST

220:00



MNVR TO OPTICS CALIBRATION ATT
P23 - CISLUNAR NAVIGATION
OPTICS CALIBRATION
STAR 4 4

P00

V49 - MNVR TO SIGHTING ATT
STAR/EARTH HORIZON
P23 - CISLUNAR NAVIGATION

:10

220:30



1. STAR 221 EFH (R3 00120)
N88: (R1 +39954)(R2 -26599)(R3 -14003)

2. STAR 45 EFH (R3 00110)
FOMALHAUT

3. STAR 102 ENH (R3 00110)
N88: (R1 +38943)(R2 +11914)(R3 +29008)

4. STAR 126 ENH (R3 00110)
N88: (R1 +48229)(R2 +02461)(R3 +12955)
MIRACH
GAMMA PEGASI

5. STAR 224 EFH (R3 00120)
N88: (R1 +46814)(R2 -11832)(R3 +12977)
MARKAF

*6. STAR 44 EFH (R3 00120)
ENIF

*ALTERNATE

MNVR TO TV ATT (220:55) R HGA
Y P
221:00

NOTES

3 MARKS ON EACH STAR

INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	220:00 - 221:00	9/TEC	3-176

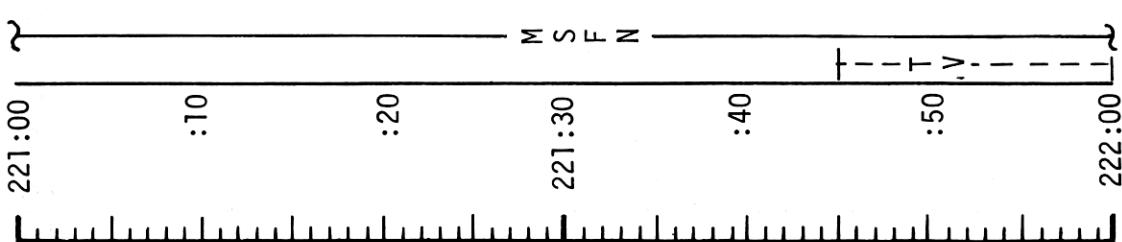
1813 CST

MCC-H

FLIGHT PLAN

NOTES

CM RCS INJECTOR TEMP	
5C	5D
6A	6B
6C	6D



REPORT CM RCS INJECTOR
VALVE TEMPS (SYS TEST METER
5C,5D,6A,6B,6C,6D)

TV (GDS) 221:45 TO 222:00
CM / TV-AVG (f22)

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	221:00 - 222:00	9/TEC	3-177

MCC-H

1913 CST

UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

222:00

PRESLEEP CHECKLIST
START PTC

:10

:20

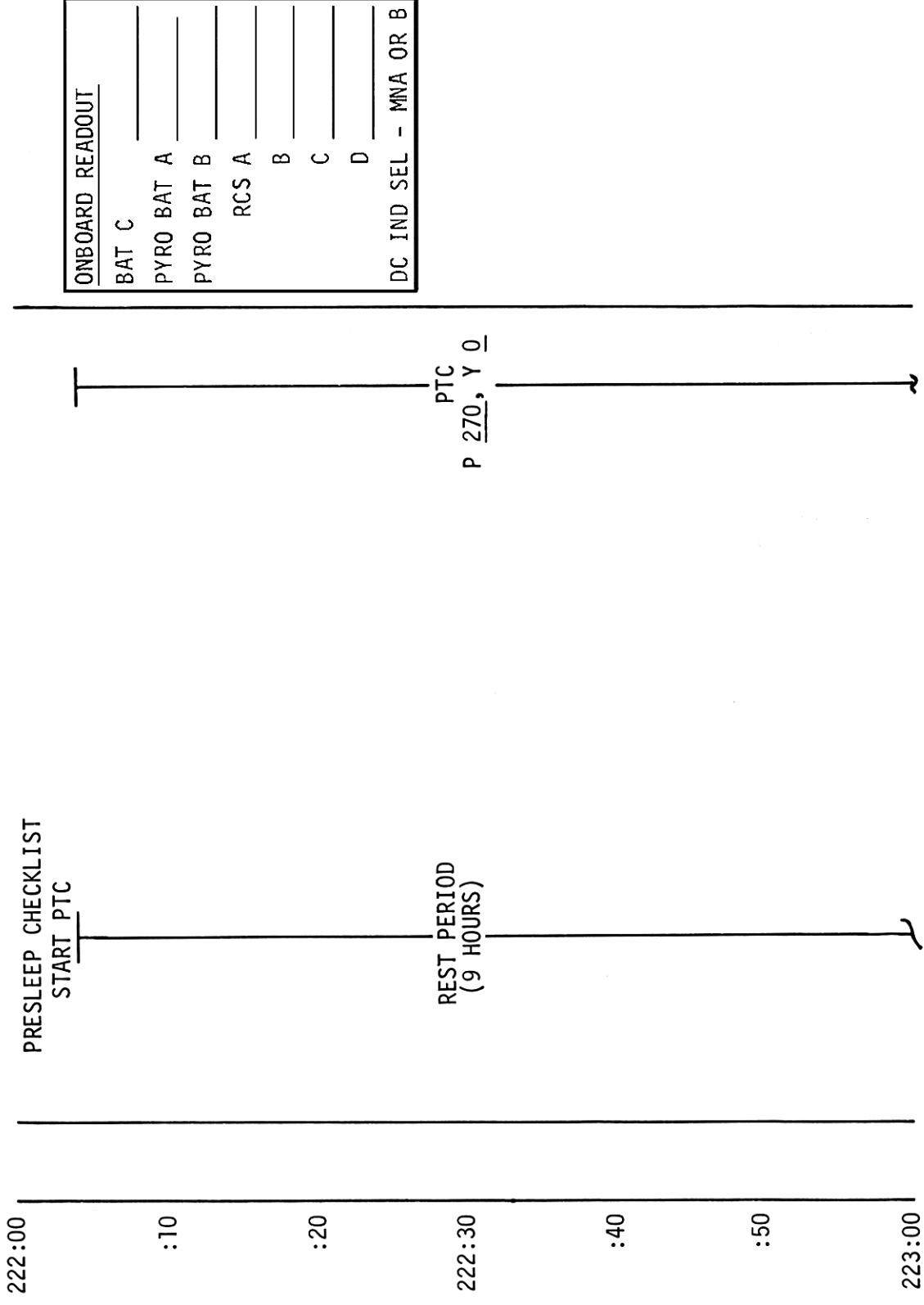
222:30

:40

:50

223:00

FLIGHT PLAN

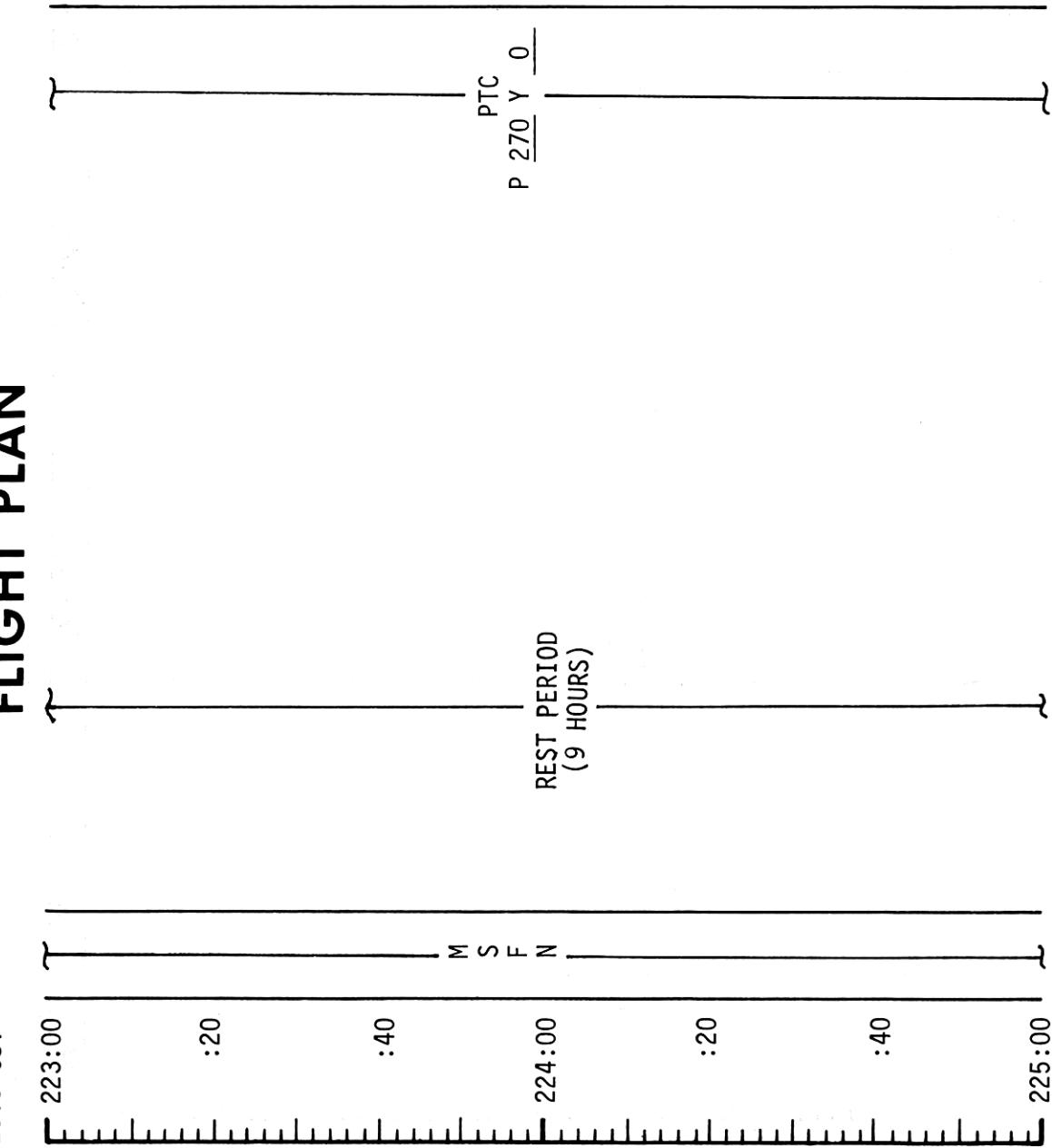


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	222:00 - 223:00	9/TEC	3-178

2013 CST

MCC-H

FLIGHT PLAN



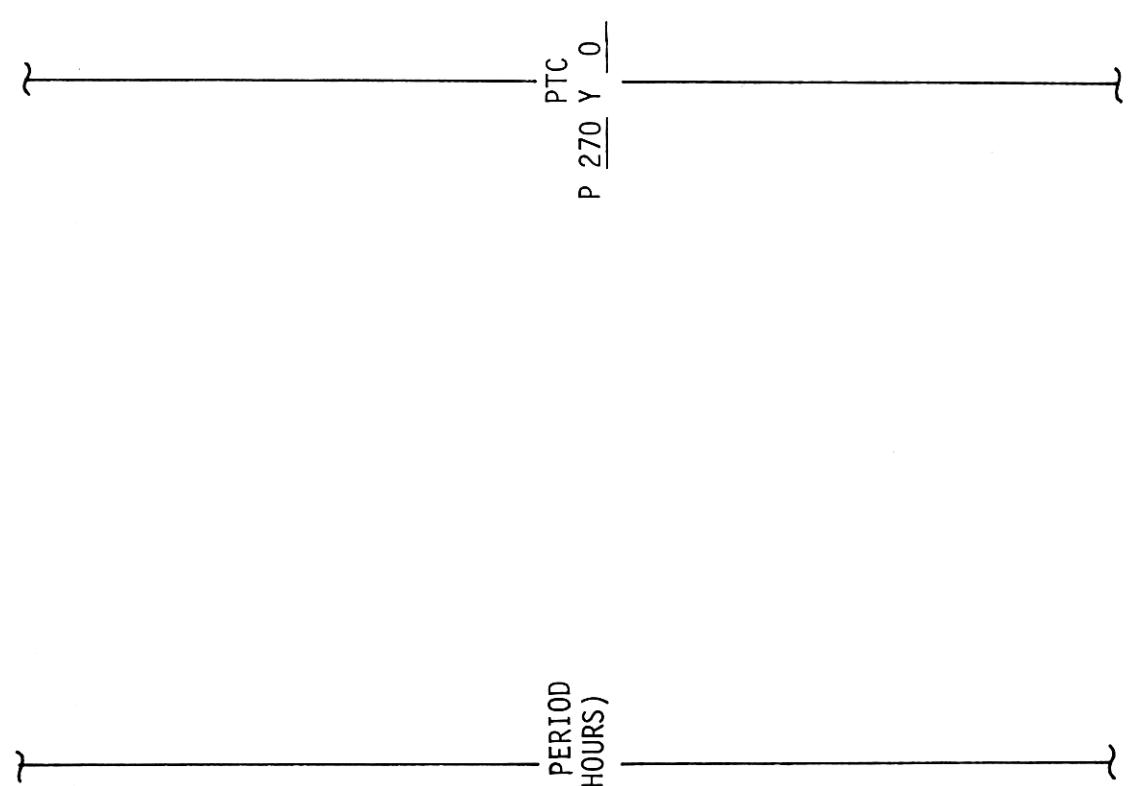
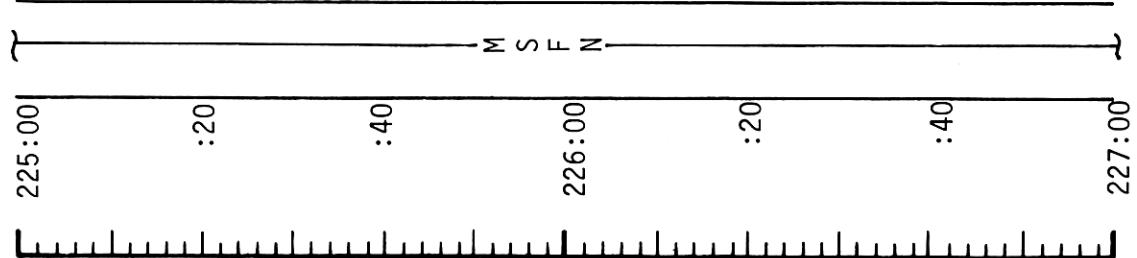
NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	223:00 - 225:00	9/TEC	3-179

MCC-H

FLIGHT PLAN

2213 CST



NOTES

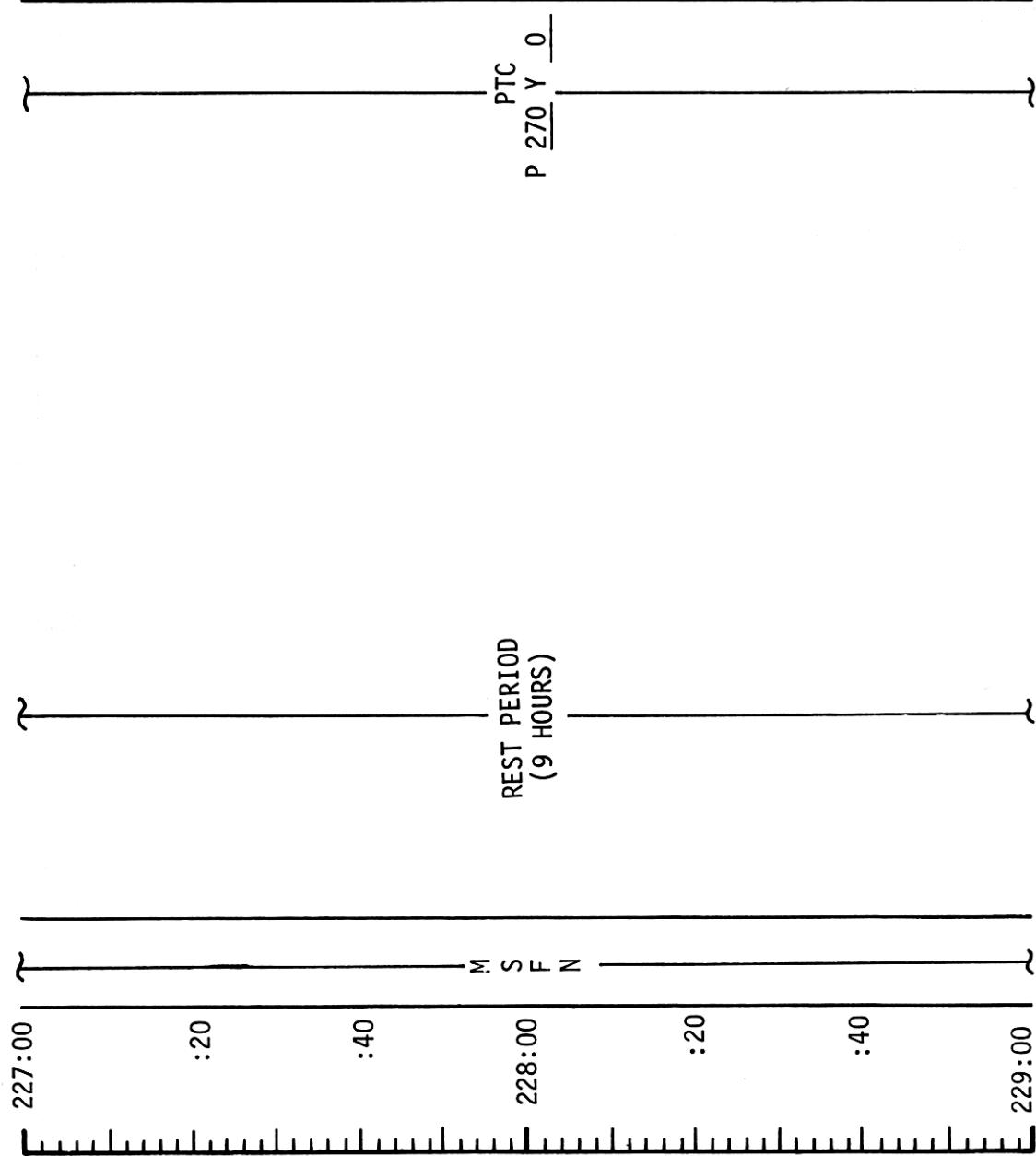
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	225:00 - 227:00	9/TEC	3-180

0013 CST

FLIGHT PLAN

MCC-H

NOTES

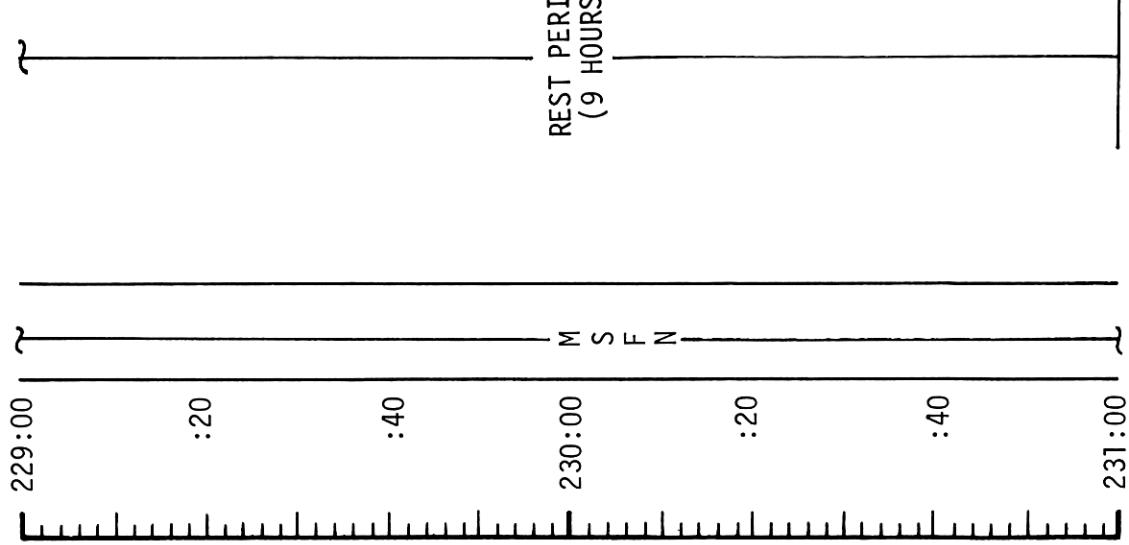


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	227:00 - 229:00	9/TEC	3-181

0213 CST

FLIGHT PLAN

MCC-H



NOTES

PTC
P 270 Y 0
REST PERIOD
(9 HOURS)

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	229:00 - 231:00	9/TEC	3-182

FLIGHT PLAN

MCC-H

0413 CST

UPDATE TO CSM
FLIGHT PLAN
CONSUMABLES

231:00

:10

231:30

:20

232:00

:40

232:00

POST SLEEP CHECKLIST

CSM CONSUMABLES UPDATE
GET: _____ ; _____
RCS TOTAL _____
QUAD A _____ B _____
C _____ D _____
H₂ TOTAL _____
O₂ TOTAL _____

PTC
P 270 Y 0

EAT PERIOD

M S F N

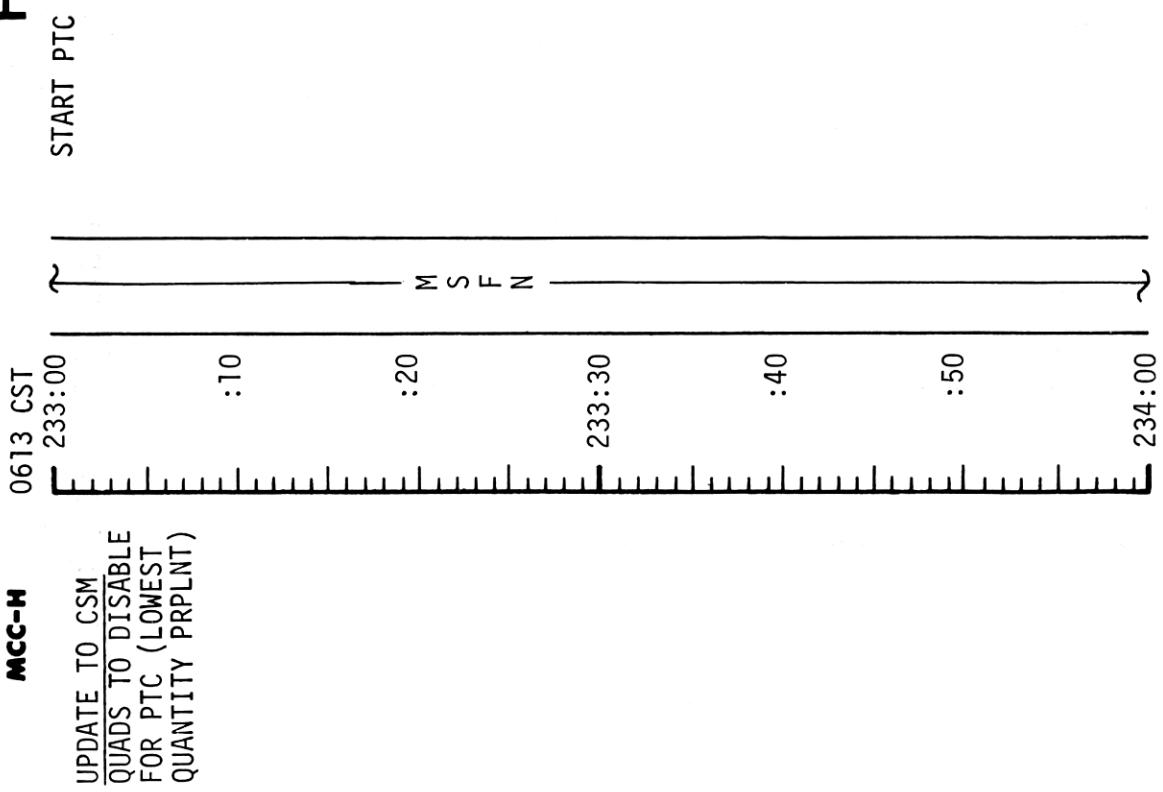
LiOH CANISTER CHANGE
(19 INTO A, STOW 17 IN A6)

STOP PTC AT ROLL 075

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	231:00 - 232:00	10/TEC	3-183

FLIGHT PLAN

MCC-H



NOTES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	233:00 - 234:00	10/TEC	3-185

MCC-H

FLIGHT PLAN

0713 CST

234:00



:10

:20

M S F N

234:30

:40



(EI-6 HRS)
GO/NO-GO

GO/NO-GO FOR MCC-7
REPORT CM RCS INJECTOR VALVE TEMPS
(SYS TEST METER 5C, D, 6A, B, C, D)

ENTRY CHECKLIST

PTC
P 270, Y 0

NOTES

CM	RCS	INJECTOR	TEMP
5C	—	5D	—
6A	—	6B	—
6C	—	6D	—

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	234:00 - 235:00	10/TEC	3-186

FLIGHT PLAN

0813 CST

NOTES

:10

:20

235:30

:40

:50

236:00

VHF SIMPLEX A - ON

P52 - IMU REALIGN
OPTION 3 - REFSMMAT
(PTC ORIENT)

PTC
P 270, Y 0

P52 IMU REALIGN

MNVR TO OPTICS CALIBRATION ATT
P23 - CISLUNAR NAVIGATION
OPTICS CALIBRATION
STAR _____

(EI-5HRS)

R _____
P _____
Y _____

N71: _____, _____
N05: _____, _____
N93: _____
GET _____; _____;

REPORT GYRO TORQUING ANGLES STOP PTC

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO	FINAL (APRIL)	MARCH 16, 1970	235:00 - 236:00	10/TEC	3-187

MCC-W

FLIGHT PLAN

NOTES

0913 CST
236:00 P00
V49 - MNVR TO SIGHTING ATT
STAR/EARTH HORIZON
P23 - CISLUNAR NAVIGATION
1. STAR 1 EFH (R3 00120)

PERFORM P23
IF TIME PERMITS

:10
2. STAR 10 ENH (R3 00110)
3. VENUS ENH (R3 00110)
*4. STAR 133 ENH (R3 00110)
N88: (R1 +22481)(R2 +36063) (R3 +26344) ZETA PERSEI

*5. STAR 223 EFH (R3 00120)
N88: (R1 +42788)(R2 -11002) (R3 +23411) BETA PEGASI

*ALTERNATES

236:30
:20
M S
F N
236:30
:40
UPDATE TO CSM
MCC-7 MNVR PAD
ENTRY PAD
UPLINK TO CSM
CSM S.V. & V66
MCC-7 TGT LOAD
DESIRED ORIENT (ENT)
ENT LAT & LONG
P52 - IMU REALIGN
OPTION 1 - PREFERRED
(ENTRY ORIENT)
GYRO TORQUE

REPORT GYRO TORQUING ANGLES

ECS & EPS CK
SPS CHECK
CM RCS MON CK
SM RCS MON CK
C & W SYS CK

(EI-4 HRS)

:50

237:00

R _____
P _____
Y _____
ALPHERATZ

MIRFAK
VENUS
ZETA PERSEI

STARS _____
SA _____
TA _____

MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	236:00 - 237:00	10/TEC	3-188

FLIGHT PLAN

MCC-7
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+10° TAKEOVER	BT + 1 SEC	TRIM X AXIS ONLY TO 0.2 FPS

TABLE 3-14
3-188A

FLIGHT PLAN

NOTES

1013 CST

237:00

:10

:20

237:30
N F S M

:40

:50

238:00

(EI - 3 HRS)

P30 - EXTERNAL ΔV
V49 - MNVR TO BURN ATT
P40/41-SPS/RCS THRUST
SXT STAR CHECK

GDC ALIGN

MCC-7

TIG: 237:49:37.6
BT: NOM. ZERO
 ΔV : NOM. ZERO
ULLAGE: N/A
ORBIT: N/A

MCC-7 BURN STATUS REPORT
V66 - TRANS CSM SV TO LM SLOT

BURN STATUS REPORT			
X	X	□	ΔTIG
X	X	●	BT
		●	V_{gx}
			TRIM
X	X	X	R
X	X	X	P
X	X	X	Y
		●	V_{gx}
		●	V_{gy}
			V_{gz}
			ΔV^C
			FUEL *
			OX *
			UNBAL

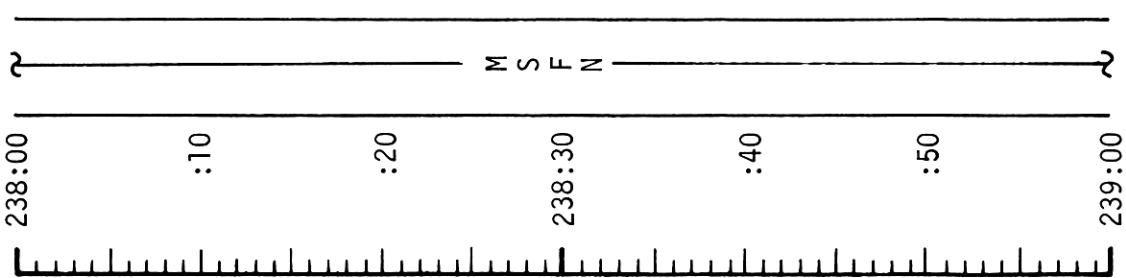
* ITEMS TO BE
REPORTED TO MSFN

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	237:00 - 238:00	10/TEC	3-189

FLIGHT PLAN

1113 CST

NOTES



(EI - 2 HRS)
GO/NO-GO
VHF A SIMPLEX
COMM CHECK

LOGIC SEQUENCE CHECK
GO/NO-GO FOR PYRO ARM SEQUENCE (CUE MSFN)
LOGIC - ON
MNVR TO ENTRY ATTITUDE R _____ OMNI
Y _____ VHF ANT _____

BORESIGHT AND SXT STAR CHECK

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	238:00 - 239:00	10/TEC	3-190

MCC-H

FLIGHT PLAN

1213 CST

239:00

:10

:20

239:30

:40

:50

240:00

P52 - IMU REALIGN
OPTION 3 - REFSMMAT
(ENTRY ORIENT)

REPORT GYRO TORQUING ANGLES

GDC ALIGN

EMS ENTRY CHECK

PRIME & SEC WATER EVAP ACTIVATION
CM RCS PRE-HEAT (IF REQ'D)

FINAL STOWAGE

CONFIGURE CAMERA EQUIP FOR FIREBALL AND CHUTES PHOTOS
CM4/DAC/18/CIN - (f16,250,7) 12 FPS, (4 MIN) FIREBALL MAG K
- (f11,250,7) 12 FPS, (4 MIN) CHUTES

(EI - 1 HR)

TERMINATE CM RCS PREHEAT

NOTES

P52 IMU REALIGN

N71:

-----,
-----,
-----.

N05:

-----,
-----,
-----.

N93:

X -----,
Y -----,
Z -----.

GET

-----,
-----,
-----;

-----,
-----,
-----;

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	239:00 - 240:00	10/TEC	3-191

FLIGHT PLAN

MCC-H

1313 CST

NOTES

UPDATE TO CSM
ENTRY PAD
RECOVERY PAD
UPLINK TO CSM
CSM S.V. & V66

SYS TEST PANEL CONFIGURATION
PYRO BATT CHECK
FINAL GDC DRIFT CK (IF REQUIRED)

CM RCS ACTIVATION
GO/NO-GO FOR PYRO ARM (CUE MSFN)

LOGIC - ON
SET DET (UP, TO EI)
EMS INITIALIZATION
RSI ALIGN

CM RCS CK
SEPARATION CHECKLIST
MNVR TO HORIZON CHECK ATT
P61 - ENTRY PREP
P62 - CM/SM SEP & PRE-ENTRY MNVR
SECS PYRO ARM

CM/SM SEP GET - 240:34

TIME	FROM 400K ft	MIN:SEC
240:00	TRAJECTORY EVENTS 400,000 FEET (GET 240:49:37.6)	00:00
240:30	ENTER S BAND BLACKOUT	00:18
:40	0.05G	00:28
:50	KA - INITIATE CONSTANT DRAG RDOT = -700 FPS PEAK G (6.5) SUBCIRCULAR VELOCITY P64 TO P67 EXIT S BAND BLACKOUT GUIDANCE TERMINATION DROGUE DEPLOYMENT MAIN DEPLOYMENT SPLASHDOWN	00:52
241:00		01:22
		02:06
		02:10
		03:36
		07:04
		08:06
		08:56
		T3:48

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	240:00 - 241:00	10/TEC	3-192

SECTION 4 - CONSUMABLES

SM RCS BUDGET

Ground Rules and Assumptions

1. Following transposition and docking, the S-IVB performs the evasive maneuver.
2. Two midcourse corrections (translunar) are executed as SPS burns with one MCC followed by an RCS trim.
3. One midcourse correction (transearth) is executed as an RCS burn of 5 fps.
4. Quad management is to be determined during the mission.
5. Redlines have been defined by the Flight Control Division as an aid in assuring that mission rules are not violated during the mission. They are subject to review during the mission as mission phases are completed and systems capabilities are evaluated. In the event the rescue redline is violated prior to rendezvous, lunar orbit photography activities can be curtailed to conserve propellant. The lunar orbit redline includes a nominal transearth coast phase (with all navigational sightings) plus a 3 sigma G&N TEI cutoff error MCC. If a rescue is required and the lunar orbit redline is violated prior to the nominal TEI, TEI can be performed early and navigational sighting activity curtailed during the transearth phase. The rescue redline is based on the minimized activity during the transearth phase.

CM RCS PROPELLANT SUMMARY

Item	Propellant required, lb	Propellant remaining, lb
Loaded	--	245.0
Trapped	36.4	208.6
Available for mission planning	--	208.6
Nominal usage	43.7	164.9
Nominal remaining	--	164.9

TABLE 4-1
4-2

SM RCS PROPELLANT LOADING AND USAGE SUMMARY

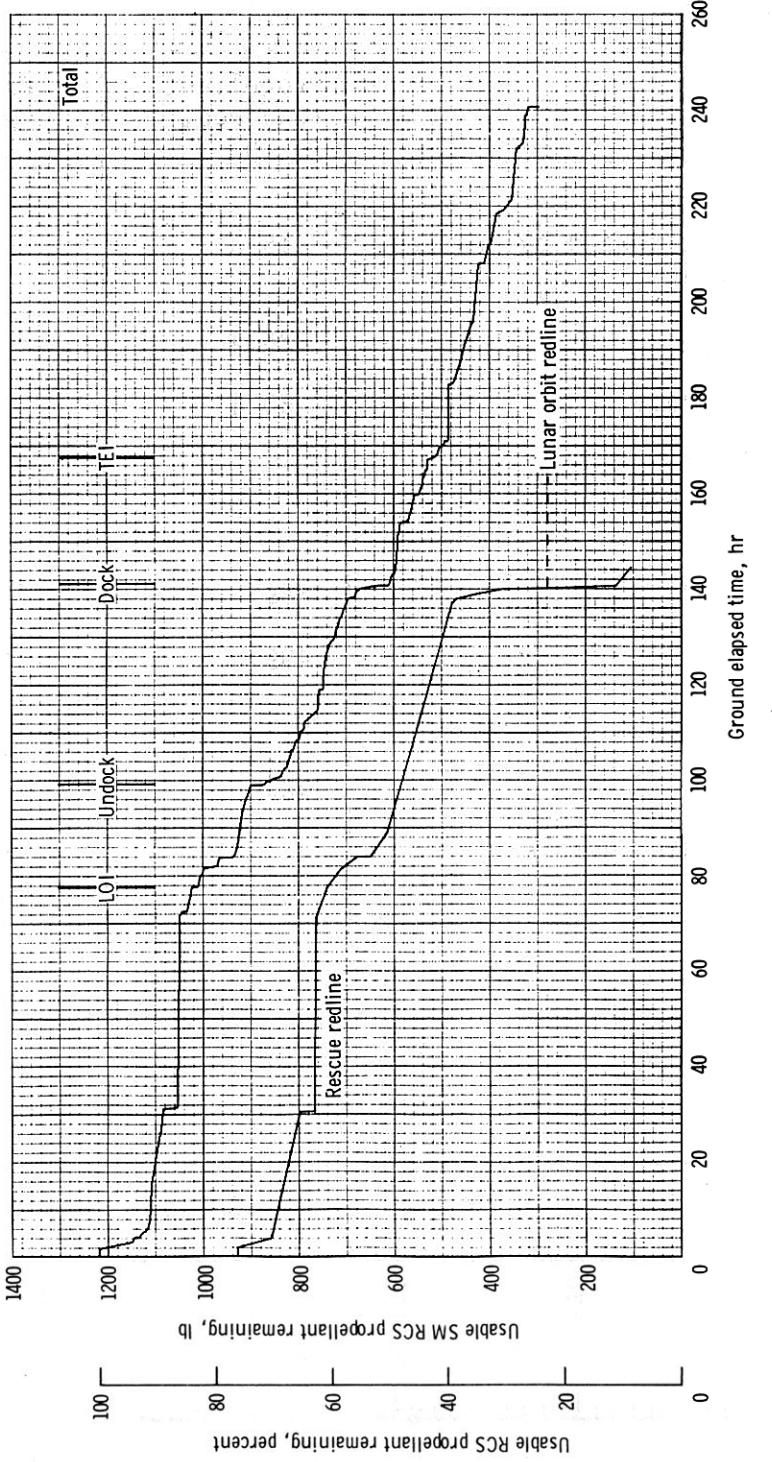
Item	Propellant required, lb	Propellant remaining, lb
Expected		1342.4
Initial outage caused by loading mixture ratio	15.6	
Total trapped	26.4	
Gaging inaccuracy	80.4	
Deliverable		1220.0
Nominal usage		
Translunar	189	
Lunar orbit	499	
Transearth	235	
Total	923	
Nominal remaining usable propellant		297

TABLE 4-2
4-3

Loyd/GPB/MPAD (for Flight Plan)
Data source: Final flight plan for April 11 launch

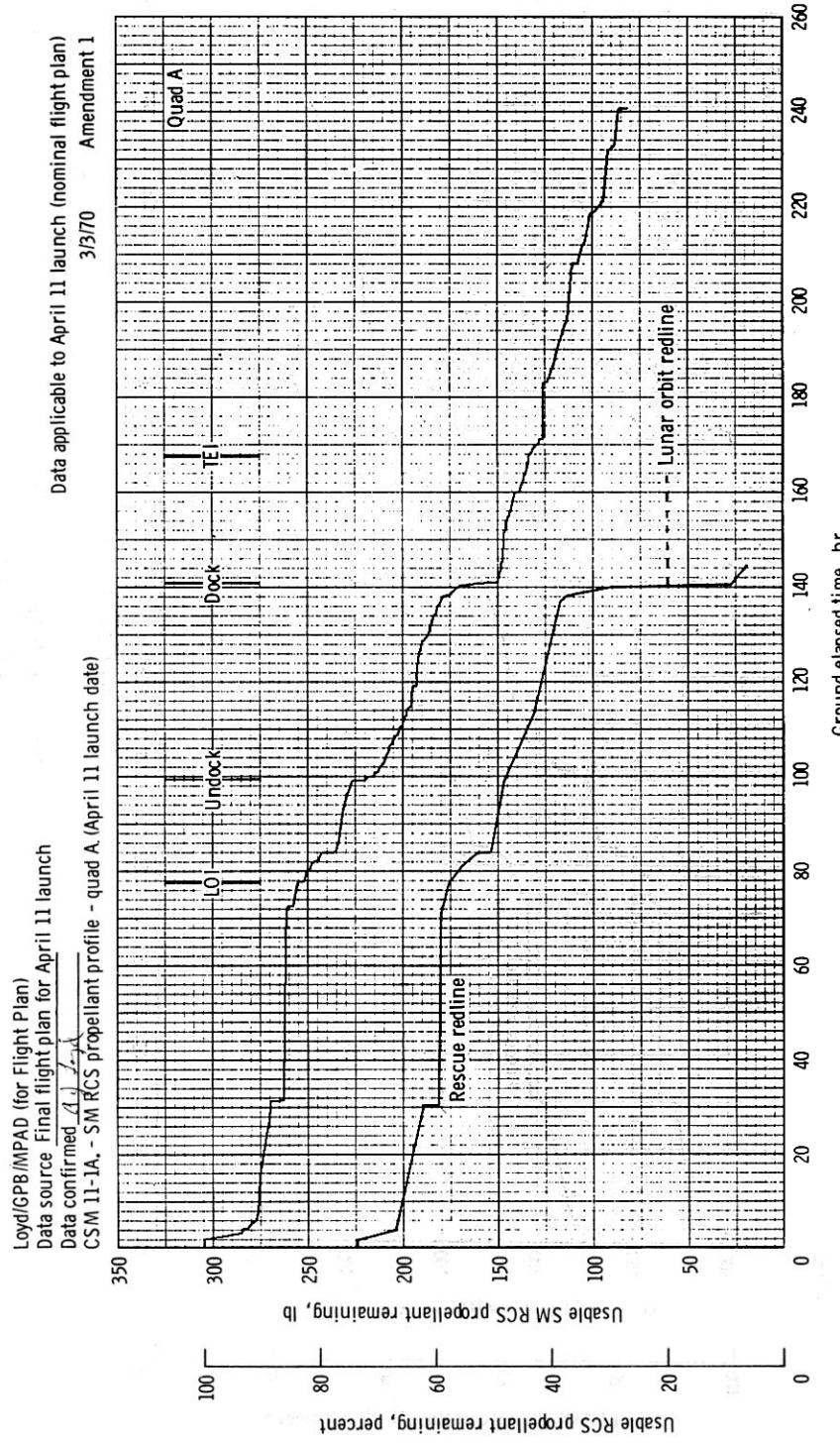
Data confirmed 2/2/81
CSM 11-E - Total SM RCS propellant usage profile. (April 11 launch date)

Data applicable to April 11 launch (nominal flight plan)
3/3/70 Amendment 1



Total SM RCS propellant usage profile.

TABLE 4-3



SM RCS propellant profile - quad A.
TABLE 4-4

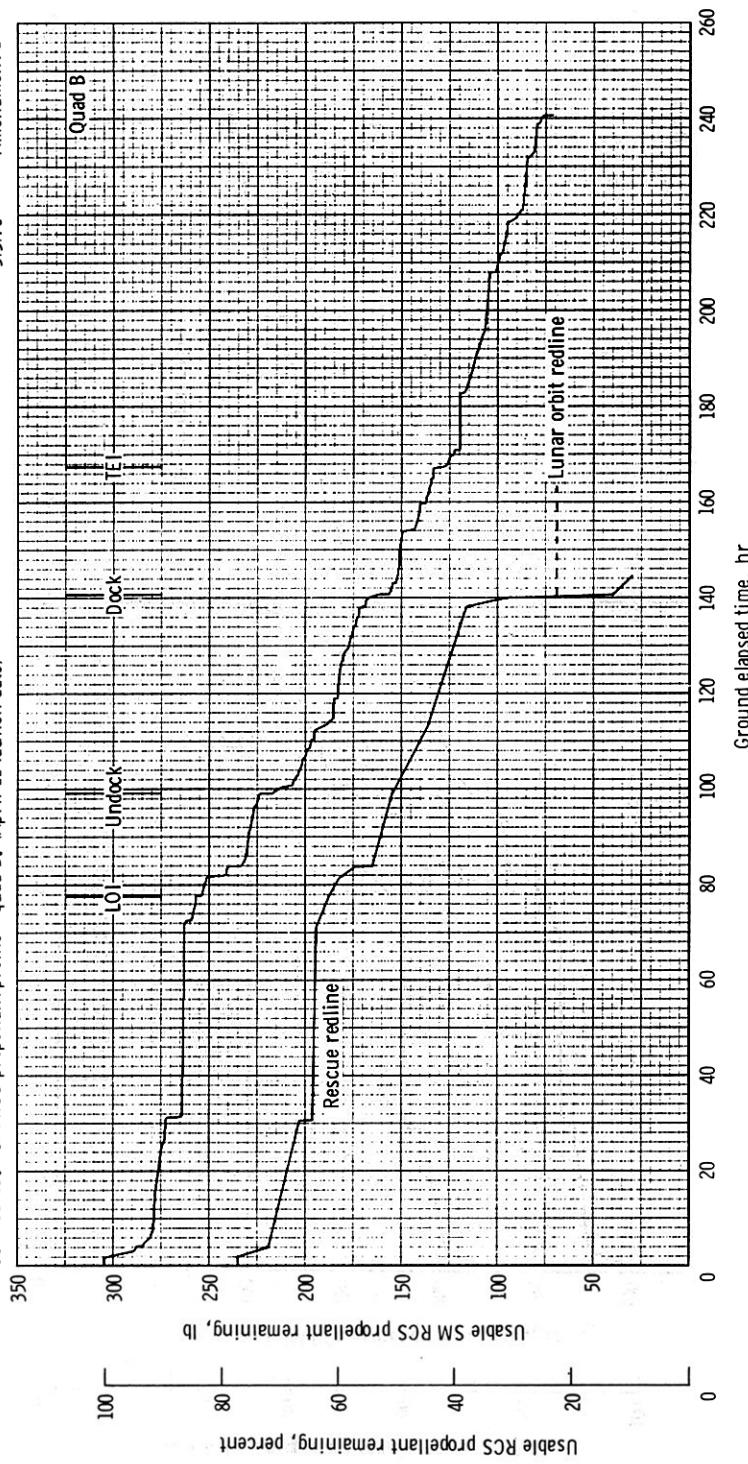
Loyd/GPB/MPAD (for Flight Plan)

Data source Final flight plan for April 11 launch

Data confirmed ~~3/3/70~~ - CSM 11-1B - SM RCS propellant profile - quad B. (April 11 launch date)

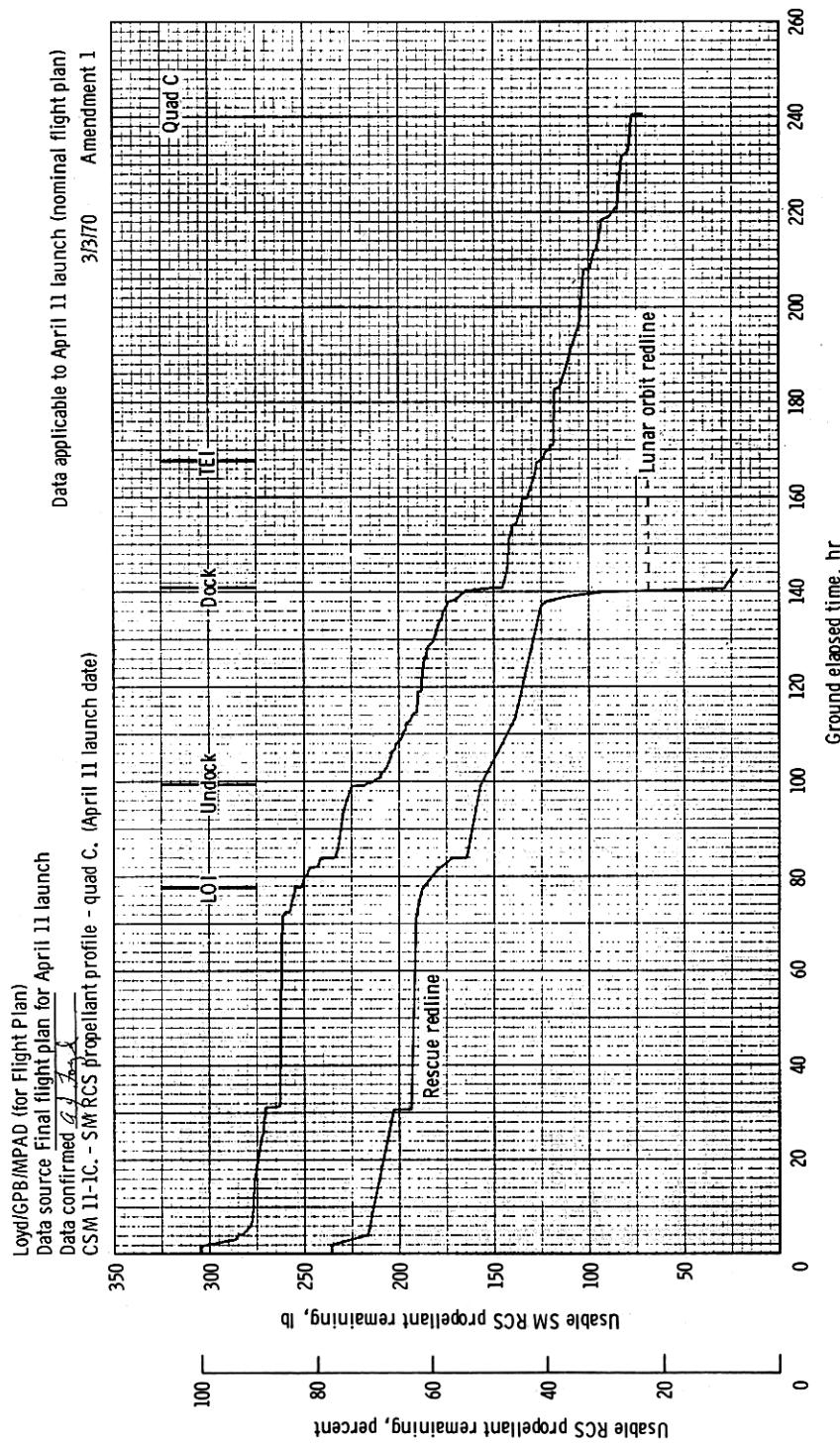
Data applicable to April 11 launch (nominal flight plan)

3/3/70 Amendment 1



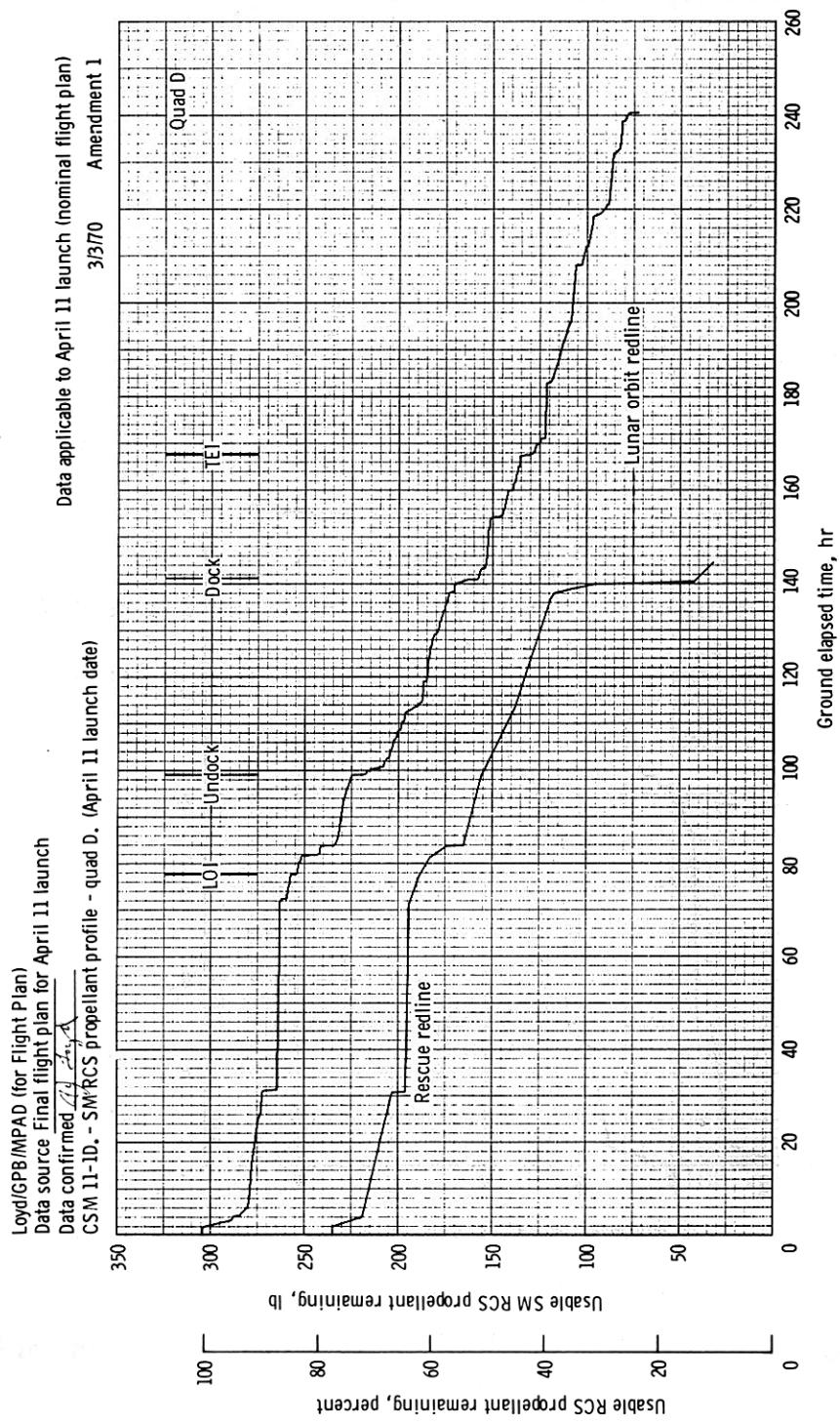
SM RCS propellant profile - quad B.

TABLE 4-5



SM RCS propellant profile - quad C.

TABLE 4-6



SM RCS propellant profile - quad D.
TABLE 4-7

SPS ANALYSIS

Ground Rules and Assumptions

There has recently been a significant change to the SPS budgeting philosophy, which is designed to show a more realistic nominal profile, and yet retain enough conservatism to allow for contingencies such as LM rescue or weather avoidance in the recovery area. This philosophy has been reviewed by FOD and ASPO.

The TLMC ΔV allocation has changed from 120 fps to 33 ± 42 fps. This is based on analyses performed by the Lunar Mission Analysis Branch, which indicate that 3σ usage on the translunar phase is 75 fps and the mean usage is 33 fps. Hence, the budget in the SPS table shows 33 fps allocated for all translunar midcourses (in addition to the nominal hybrid transfer maneuver). The 3σ variation of ± 42 fps is included in the 3σ dispersions.

LOI, DOI, AND TEI also have ΔV dispersions of ± 20 , ± 20 , and ± 10 fps, respectively, which have been included in the 3σ dispersions.

Allocations for contingency situations have changed to cover the largest worst case contingency, but not a combination of worst case events. Formerly, there was 1000 fps budgeted for contingencies, which was the RSS of 900 fps (LM rescue), 500 fps (weather avoidance), and 150 fps (SCS TEI). The updated philosophy is to budget for either 600 fps at the mission rendezvous phase or for 500 fps during TEC, whichever is worse. Analyses by the Orbital Mission Analysis Branch have indicated that 600 fps will cover all realistic LM rescue cases. This 600 fps will also cover either the weather avoidance or the SCS TEI, but it will not cover the combination of all three.

The 500 fps allocated for weather avoidance is assumed to be applied 24 hours before entry interface, and provides a landing point redesignation capability of 1000 miles.

The budget shown in the SPS table has the 500 fps as being the worst case contingency. For this budget, the mission performed with 600 fps LM rescue is not shown, since it was about 2800 lb better, based on the assumptions that LOPC-2 is deleted for a rescue situation, and that TEI ΔV reduces to 2711 fps after rescue to obtain the maximum transearth coast time within spacecraft system constraints.

The 3σ dispersions are the root-sum-square of the penalties imposed on the SPS margin by 3σ dispersions in propellant loading, mixture ratio, engine Isp, maneuver ΔV , spacecraft weights, and consumable weight losses. Engine Isp is 313.38 ± 1.593 seconds, and all spacecraft weights in the analysis are from Volume III of the Spacecraft Operational Data Book.

The SPS table shows the nominal mission reserves of 1893 lbs. For a 3σ low mission, this reduces to 1436 lbs. If the additional 500 fps contingency is included, total mission margin is 250 lbs or about 100 fps.

Apollo 13 SPS Summary

Launch April 11, 1970, 72° L Az

Item	Propellant required, lb	Propellant remaining, lb
Loaded	-	40796.0
Trapped and unavailable	441.4	40354.6
Outage	59.8	40294.8
Unbalance meter	100.0	40194.8
Available for ΔV	-	40194.8
Required for ΔV :		
TLMC (33 fps)	345.9	39848.9
Hybrid maneuver (15.1 fps)	159.0	39689.9
LOI (2815.3 fps)	23485.7	16204.2
DOI (212.9 fps)	1535.5	14668.7
Circ (70.4 fps)	273.2	14395.5
LOPC-1 (183.6 fps)	678.6	13716.9
LOPC-2 (824.6 fps)	2864.9	10852.0
TEI (3147.7 fps)	8958.9	1893.1
Nominal remaining	-	1893.1
3σ dispersions	456.9	1436.2
Margin above 3σ	-	1436.2
Contingency (500 fps)*	1186.2	250.0
Total propellant margin	-	250.0

* For weather avoidance at 24 hr prior to entry interface.

TABLE 4-8
4-10

LM RCS BUDGET

Ground Rules and Assumptions

1. Data for the LM RCS engine performance and propellant requirements were obtained from the Spacecraft Operational Data Book and postflight analysis of Apollo 9, 10, 11 and 12.
2. All orientation maneuvers, unless stated otherwise, are assumed to be three axis.

LM RCS Propellant Loading and Usage Summary

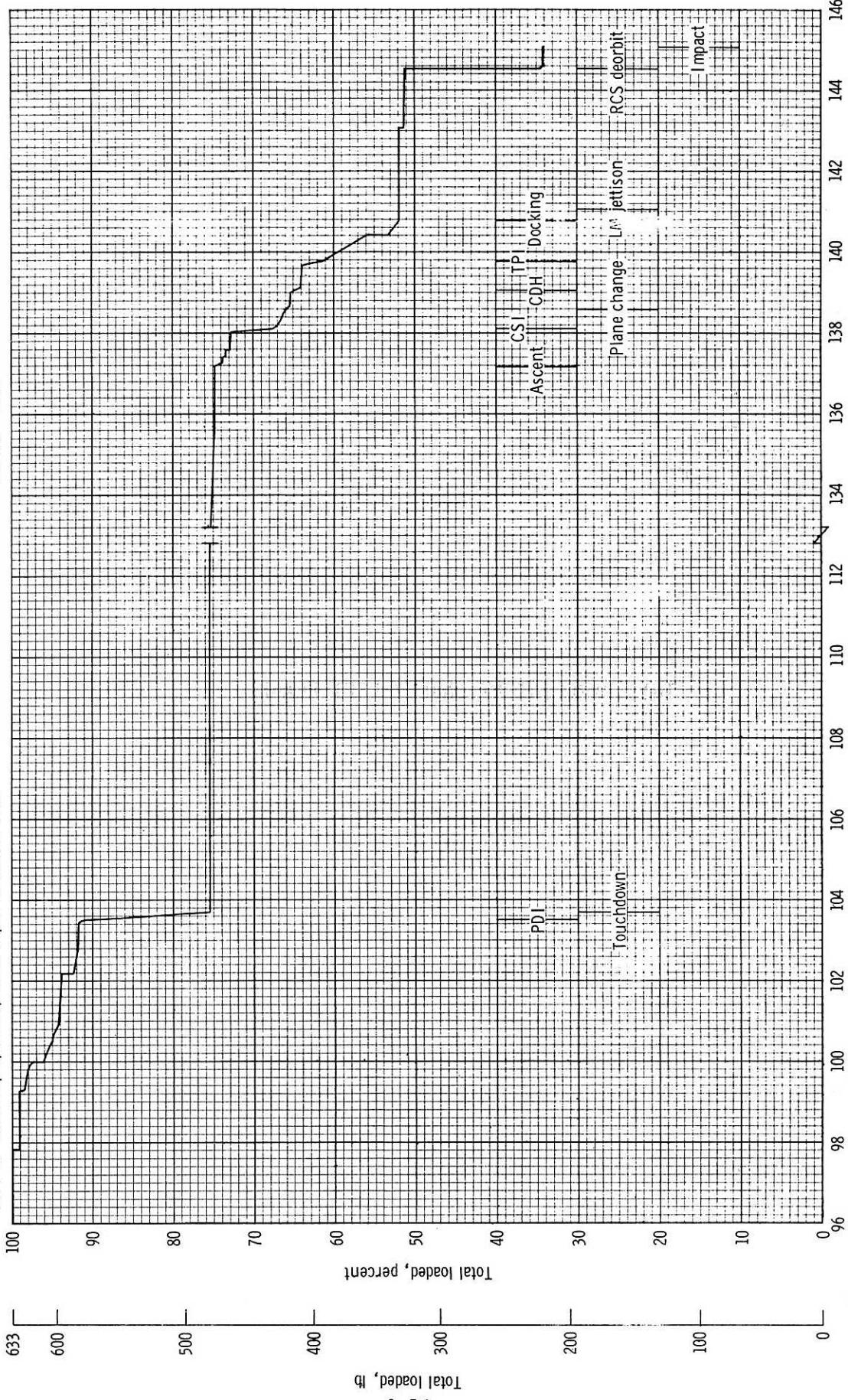
	Propellant required, 1b	Propellant remaining, 1b
Loaded		633.0
Trapped	40.6	592.4
Gaging inaccuracy and loading tolerance	39.5	552.9
Mixture ratio uncertainty	17.0	535.9
Usable		535.9
Nominal usage through landing	155.3	380.6
Nominal usage from landing to docking	149.4	231.2
Nominal usage from docking to impact	110.9	120.3

TABLE 4-9

Mayfield/GRB/MPAD (for LM Systems)
Data source Final flight plan for April 11 launch
Data confirmed 4-13-70

LW 9-1 - LM RCS propellant profile. (April 11 launch date)

Data applicable to April 11 launch window
2/24/70 Final



LM RCS propellant profile.
TABLE 4-10

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Descent Propulsion System Propellant Budget

The DPS propellant budget is presented in the DPS table and the assumptions used to prepare this budget are shown in the assumptions table. Propellant loading and trapped propellant data were taken from Volume III of the Spacecraft Operational Data Book. LM-7 data were used for engine performance and delta V requirements were coordinated with the Landing Analysis Branch.

Three sigma dispersions represent total propellant cost due to 3 sigma uncertainties in propellant loading, trapped Isp, delta V, separation weight, non-delta V consumables weight, and mixture ratio. There is a total propellant margin of 400 lbs.

The following philosophy changes have been included in the enclosed budget.

1. A flying time of 2 minutes below 500 feet will be called a nominal requirement.
2. The engine valve-pair malfunction has been deleted as a contingency since this malfunction was found not to cost propellant.
3. Redesignation and low-level sensor uncertainty have been removed as contingencies and considered as dispersions.
4. A contingency of 25 seconds has been included for possible early low-level light based on Apollo 11 and Apollo 12 experience.
5. An allowance of 20 seconds has been included as a contingency to insure that a mission will not be aborted.

ASSUMPTIONS FOR THE DPS ANALYSIS

1. Integrated average Isp = 302.87 ± 5.1 seconds
2. LM separation weight - 33872 lbs
3. Mixture ratio = 1.6000 ± .0225
4. Nominal delta V = 6891 ± 141 fps
5. Non-delta V consumables of 60.00 lbs from separation to PDI and
132.70 lbs from PDI to touchdown

DPS PROPELLANT SUMMARY

Item	Propellant required, 1b	Propellant remaining, 1b
Loaded	-	18434.8
Trapped and unavailable	180.0	18254.8
Outage	27.5	18227.3
Available for delta V		18227.3
Nominal guidance required for delta V of 6891 fps *	17094.5	1132.8
Dispersions (-3 sigma)	335.3	797.5
Contingencies		
Low-level sensor allowance (25 sec)	221.9	575.6
Abort reserve (20 sec)	176.0	399.6
Margin		399.6

* Includes 2 minutes flying time from 500 feet (48 seconds above automatic landing).

TABLE 4-11
4-16

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Ascent Propulsion System Propellant Budget

The APS table presents the ascent propellant budget for Apollo 13. Propellant loading and trapped propellant data were taken from Volume III of the Spacecraft Operational Data Book. LM-7 data was used for engine performance and delta V requirements were coordinated with the landing Analysis Branch.

The budget shown in the table accounts for an engine valve-pair malfunction, a PGNCS to AGS switchover and a touchdown abort. There is a total propellant margin of 173 lbs.

ASSUMPTIONS FOR THE APS ANALYSIS

1. Isp = 309.37 ± 4.11 seconds
2. Mixture ratio = 1.609 ± .029
3. Nominal delta V - 6044.4 ± 30.7 fps
4. Ascent stage liftoff weight = 10679.7 lbs

APS PROPELLANT SUMMARY

Item	Propellant required, 1b	Propellant remaining, 1b
Loaded		5242.6
Trapped and unavailable	48.9	5193.7
Outage	15.3	5178.4
Available for Delta V		5178.4
Nominal required for delta V of 6044.4 fps	4856.5	321.9
Dispersions (-3 sigma)	64.8	257.1
Contingencies		
Engine valve-pair malfunction Delta MR = $\pm .0100$ or $-.0180$	12.9	244.2
PGNS to AGS switchover (40 fps)	23.4	220.8
Half-degree out-of-plane (18 fps)	10.5	210.3
Touchdown abort (delta wt = 99.6 lb, delta V = -15.2 fps)	37	173.3
Margin		173.3

TABLE 4-12
4-19

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CSM EPS Budget Assumptions and Ground Rules

1. The system was assumed to operate with three fuel cells and two inverters.
2. Fuel cell purging is included in the EPS requirements.
3. Both H₂ and O₂ tanks are assumed to be fully loaded.
4. Three entry and postlanding batteries were considered available to supply the total spacecraft power required for entry, parachute descent, and postlanding time. Each battery was assumed to have a 40 A-h capacity until landing at which time the capacity was uprated to 45 A-h.
5. Two batteries were considered to be in parallel with the fuel cells during ascent and for each SPS maneuver.
6. No cryogenic venting was assumed in flight.
7. The EPS hydrogen consumption rate (lb/hr) = 0.00257 X I_{fc}.
8. The EPS oxygen consumption rate (lb/hr) = 7.936 X \dot{H}_2 .
9. No reserves are considered in plotting the nominal profile and redlines.

CSM CRYOGENIC SUMMARY

	H ₂ (1b)	O ₂ (1b)
Planning allowance		
Total loaded	58.60	660.20
Less residual	2.32	13.00
Less instrumentation error	<u>1.50</u>	<u>17.50</u>
Available for mission planning	54.78	629.70
Prelaunch requirement ^a	3.67	46.80
Flight requirement		
EPS (inc F/C purge)	44.18	345.35
ECS (inc cabin purge)	-	88.97
LM pressurizations	-	<u>12.93</u>
Total flight requirements	44.18	447.25
Nominal reserves		
EPS uncertainty (2.5%)	1.11	8.63
ECS uncertainty (.08 lb/hr)	<u>-</u>	<u>19.20</u>
	1.11	27.83
Total Requirement	48.96	521.88
Operational Reserves	5.82	107.82

^a Data supplied by KSC

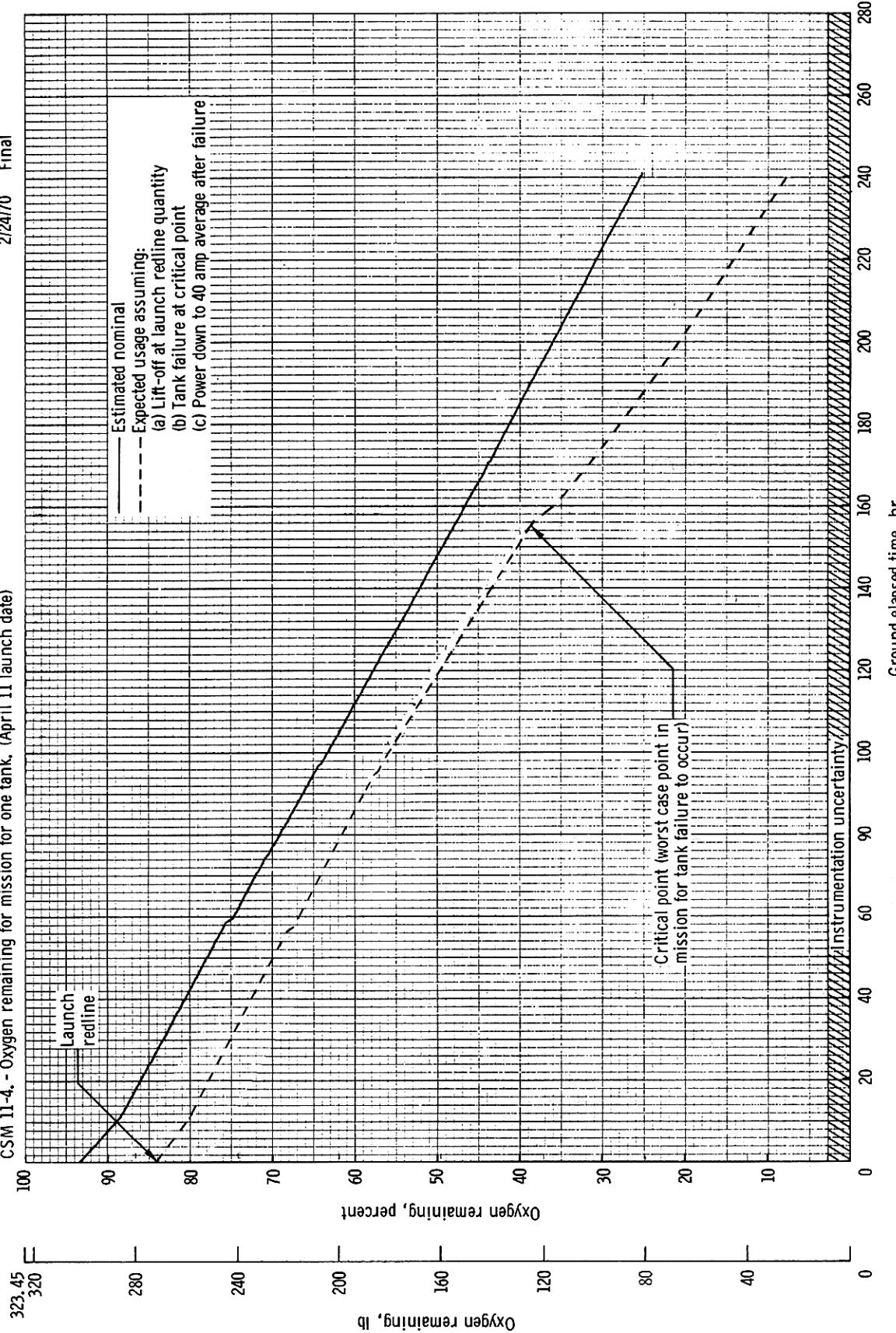
Scott/GPB/MPAD (for Flight Plan)
Data source Final flight plan for April 11 launch

Data confirmed *LLS*

CSM 11-4. - Oxygen remaining for mission for one tank. (April 11 launch date)

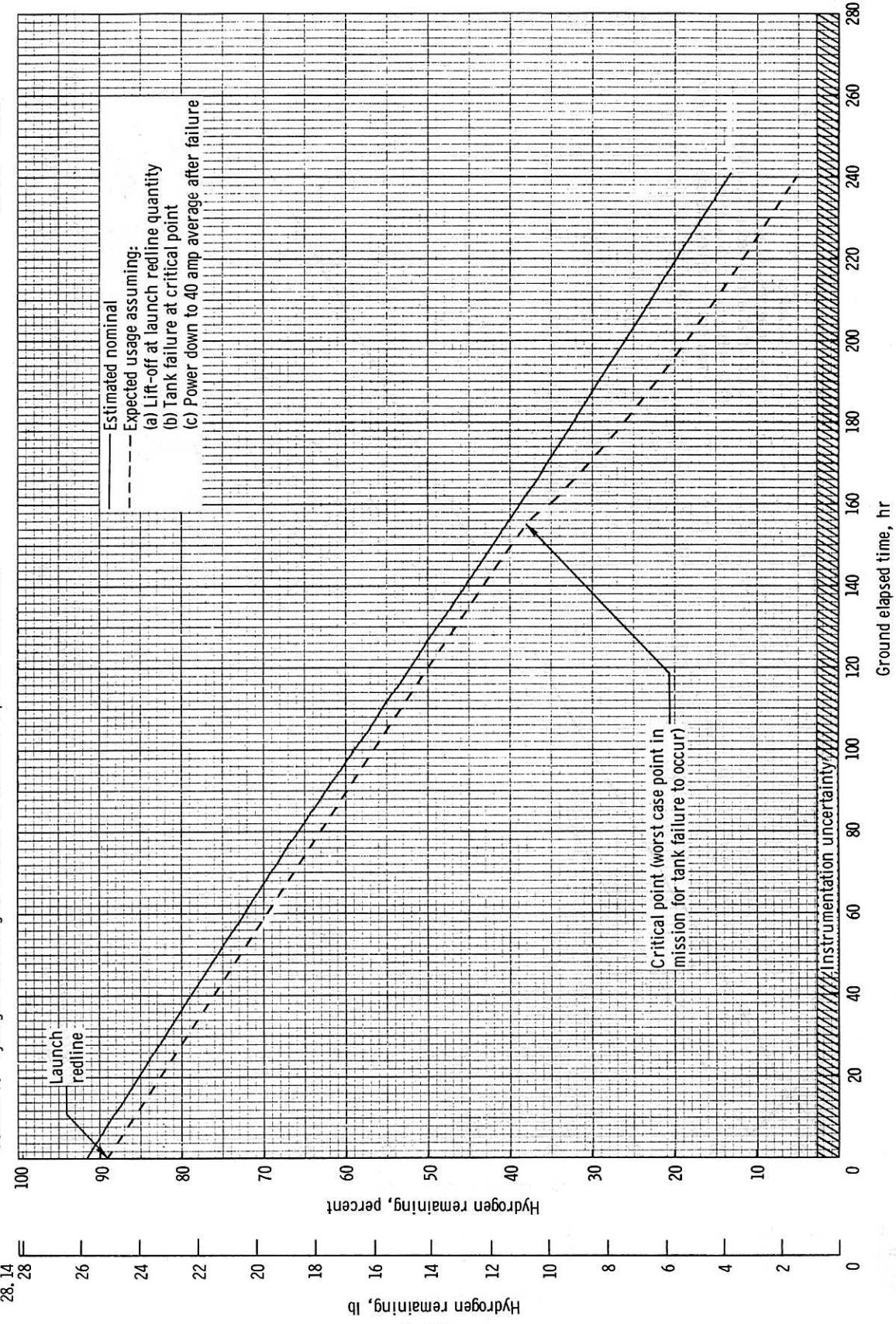
Data applicable to April 11 launch window

2/24/70 Final



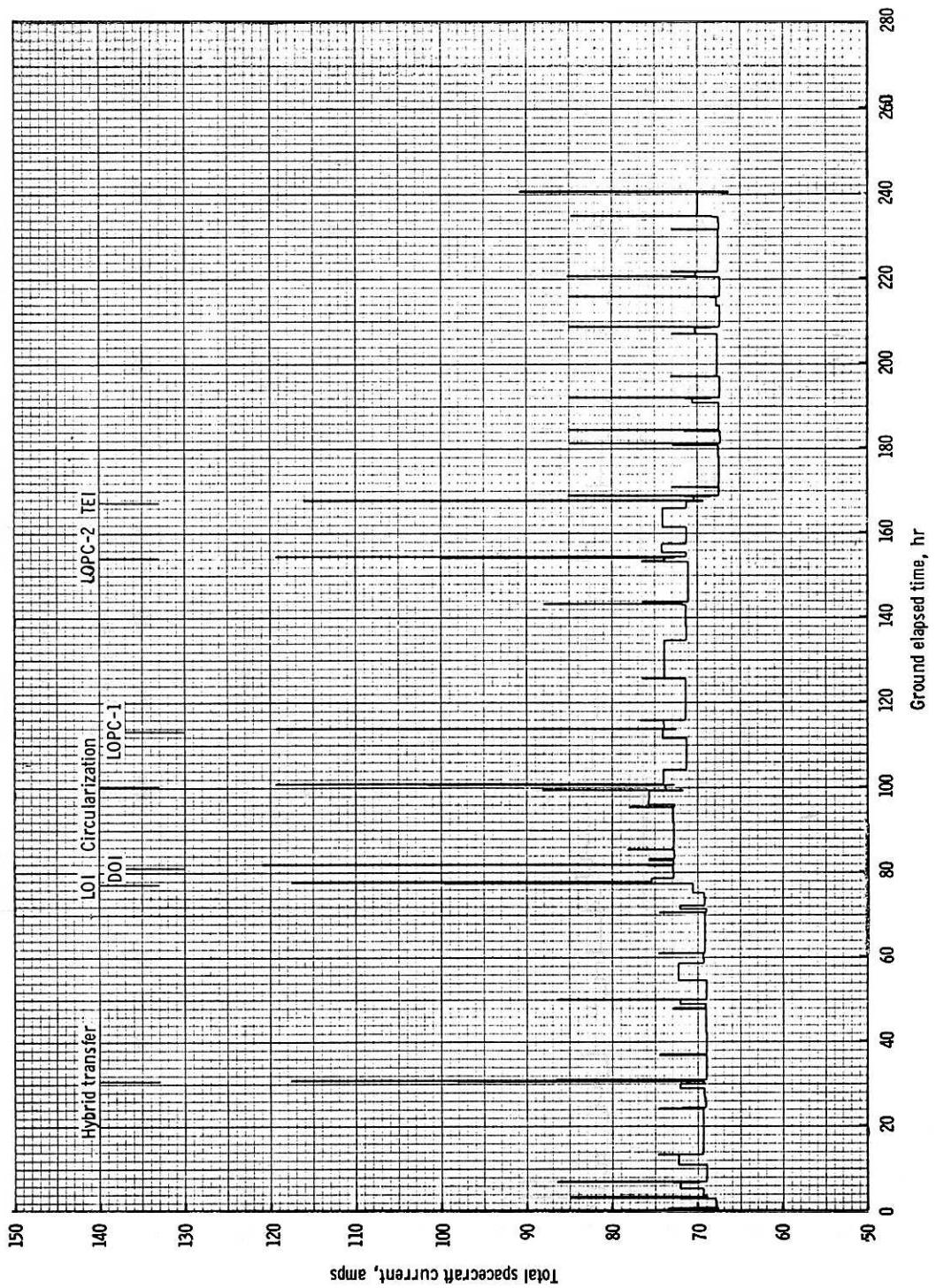
CSM 11-5. - Hydrogen remaining for mission for one tank. (April 11 launch date)

Data applicable to April 11 launch window
 2/24/70 Final



Hydrogen remaining for mission for one tank

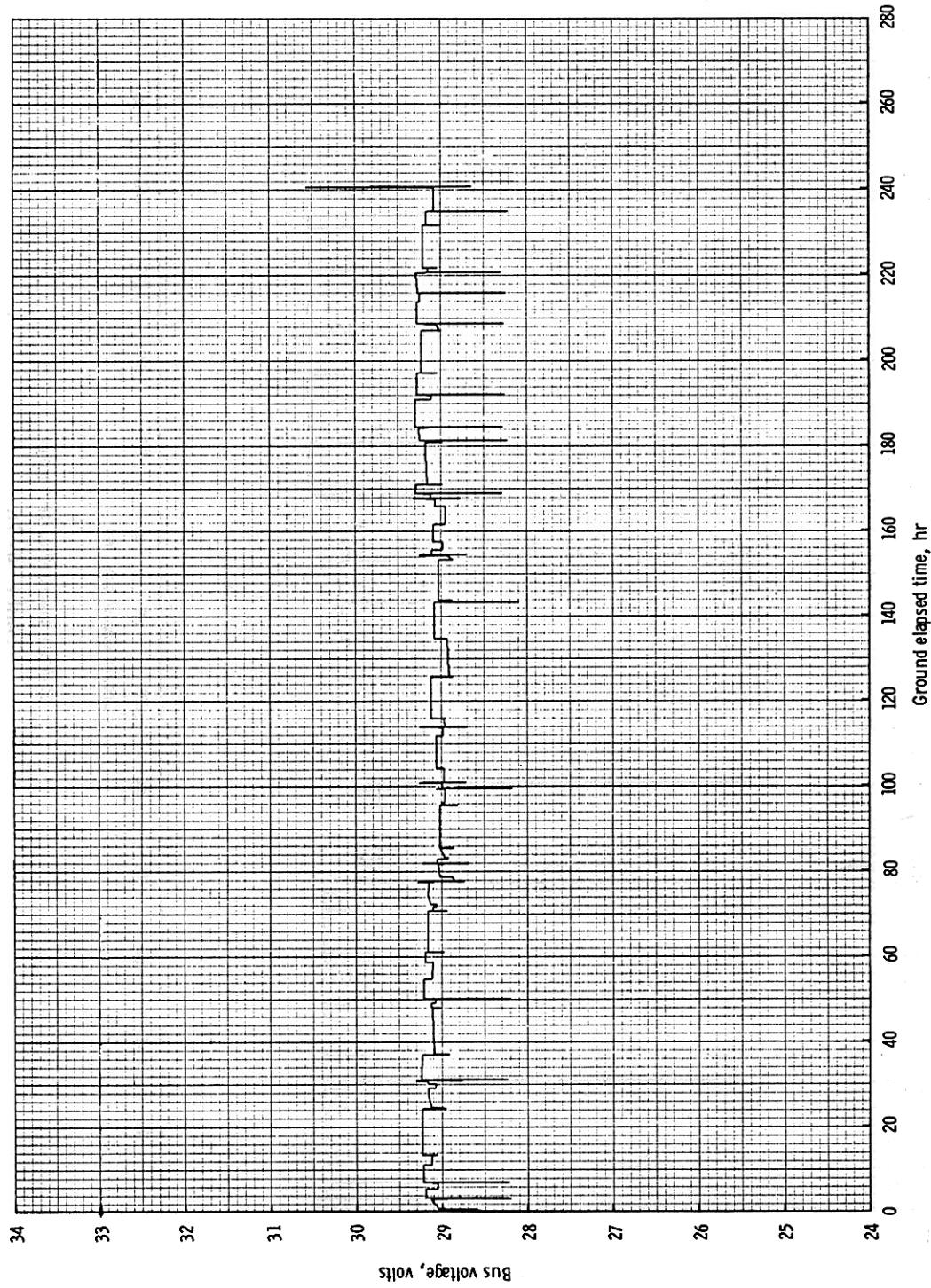
TABLE 4-15



4-24

CSM total spacecraft current profile.

TABLE 4-16



4-25

- CSM bus voltage versus time.
TABLE 4-17

LM EPS ASSUMPTIONS AND GROUND RULES

1. Energy available from the descent batteries is 1600 A-h and from the ascent batteries is 592 A-h.
2. Energy unusables due to lack of continuous Manned Space Flight Network (MSFN) coverage for the descent and ascent stages are 6 A-h and 3 A-h, respectively.
3. Energy unusables due to telemetry (TM) inaccuracies for the descent and ascent stages were 77 A-h and 12 A-h, respectively.
4. Electrical unusables due to energy dispersions for the descent and ascent stages were 22 A-h and 4 A-h, respectively. This dispersion is obtained by taking 2 percent of the energy used.
5. As per the flight plan, the Primary Guidance and Navigation Subsystem (PGNS) and Abort Guidance Subsystem (AGS) were left in the standby mode for the majority of the lunar stay.
6. The RCS heaters were assumed to have a 100 percent duty cycle for 15 minutes after initial activation and then dropping to a 7 percent duty cycle until undocking. From undocking until lunar touchdown plus 2 hours the heaters were assumed to cycle at 0 percent, but from touchdown plus 2 hours until lunar liftoff the duty cycle went up to 4.5 percent.
7. At the beginning of the analysis, it was assumed that a total of 10 A-h had been used from the descent batteries between 30 minutes before launch and the conclusion of transposition and docking (T and D).
8. The CDR and LMP forward window heaters were assumed not to be needed.
9. The cabin fan was assumed to be inoperative for the entire mission.
10. All flood lights were turned off at touchdown plus 2 hours and back on at power up.
11. No duty cycle was assigned to the portable utility lights.
12. The Liquid Cooled Garment (LCG) pump was cycled as dictated by the checklist.

DESCENT STAGE EPS SUMMARY

	A-h Required	Usable A-h Remaining
Initial capacity	-	1600
Unusables ¹ due to lack of continuous systems data	6	1594
TM unusables ¹	14	1580
Dispersion ¹	6	1574
Actual requirement through touchdown	304	1270
Unusables ² due to lack of continuous systems data	0	1270
TM unusables ²	63	1207
Dispersion ²	16	1191
Actual requirement from touchdown to liftoff	812	379
Total mission requirement	1116	-
Usable margin at liftoff		379 (24%)

¹ Unusables calculated from descent battery activation until lunar touchdown.

² Unusables calculated from touchdown until lunar liftoff.

ASCENT STAGE EPS SUMMARY

	A-h Required	Usable A-h Remaining
Initial capacity	-	592
Unusables ¹ due to lack of continuous systems data	3	589
TM unusables ¹	14	575
Dispersion ¹	5	570
Actual requirement through docking	231	339
Unusables ² due to lack of continuous systems data	2	337
TM unusables ²	2	335
Dispersion ²	2	333
Actual requirement from docking through crew transfer	84	249
Actual requirement from crew transfer through lunar impact	79	170
Total mission requirement	395	-
Usable margin at impact	-	170 (29%)

¹ Unusables calculated from ascent battery activation until docking.

² Unusables calculated from docking until crew transfer.

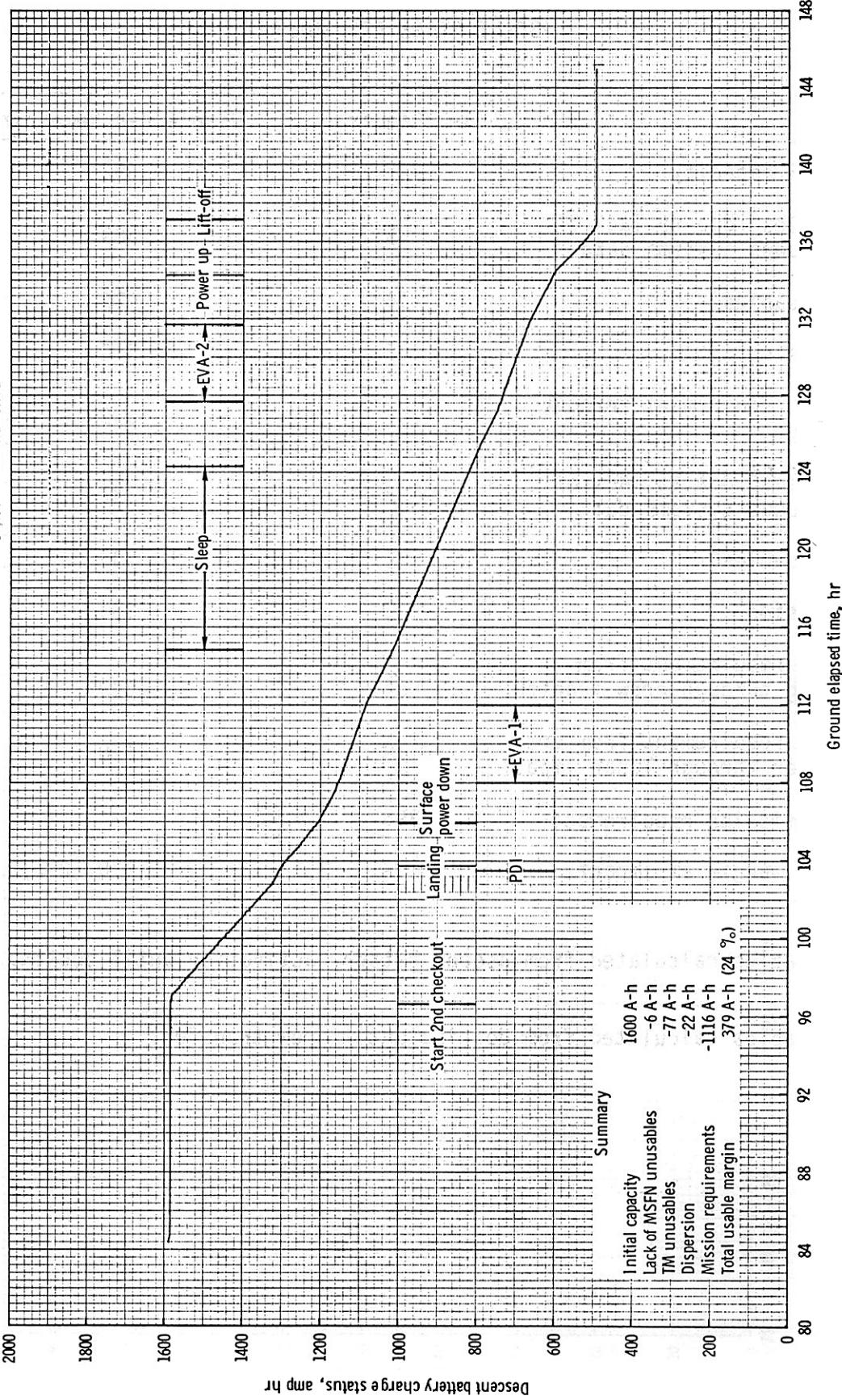
Alexander/GPB/NPAD (for LM Systems)

Data source LM checklist for April launch

Data confirmed

LM 9-2. - LM-7 descent stage amp hours remaining. (April 11 launch date)

Data applicable to April 11 launch
3/6/70 Amendment 2



LM-7 descent stage amp hours remaining.

TABLE 4-20

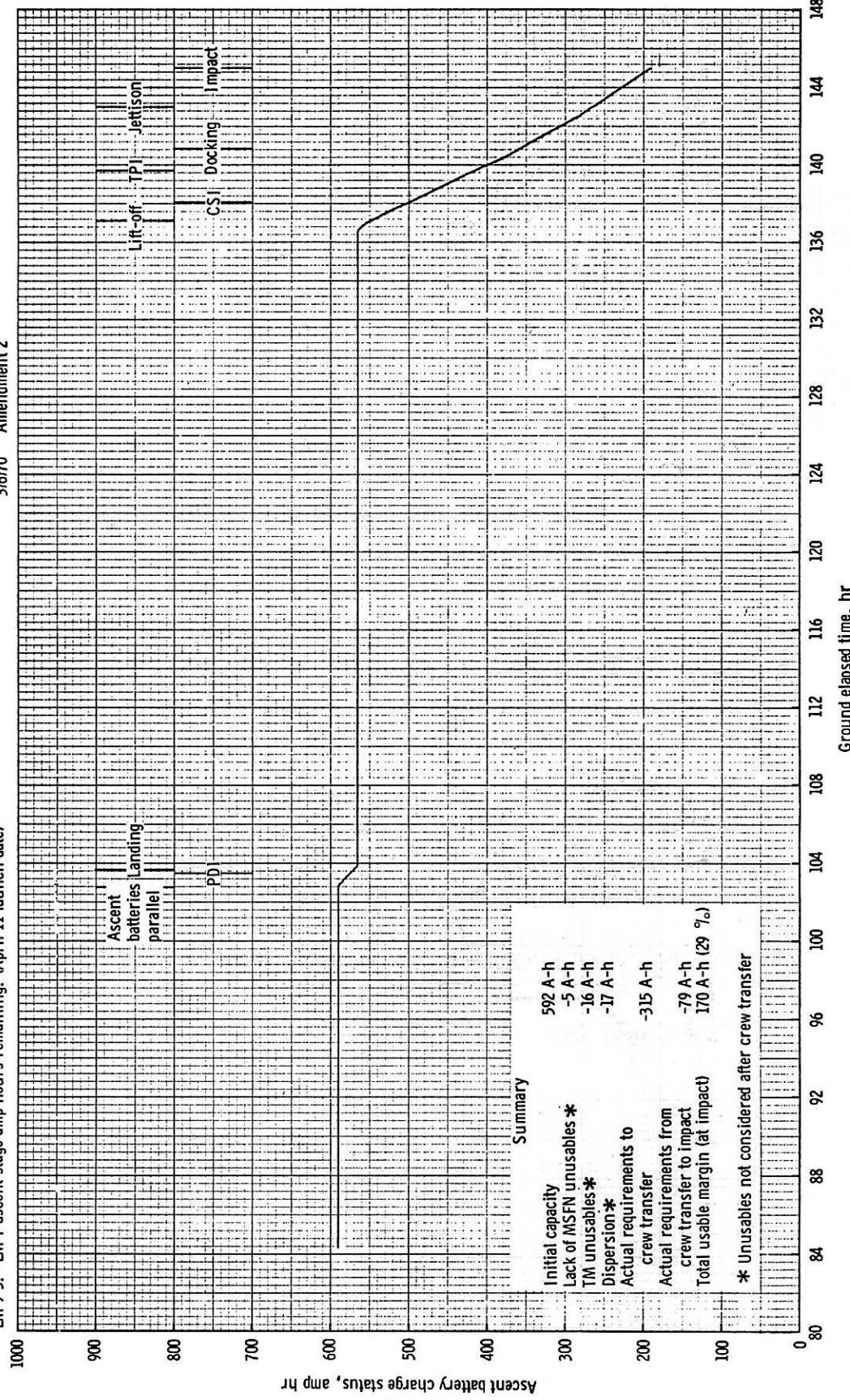
Alexander/GPR/MPPAD (for LM Systems)

Data source LM checklist for April launch

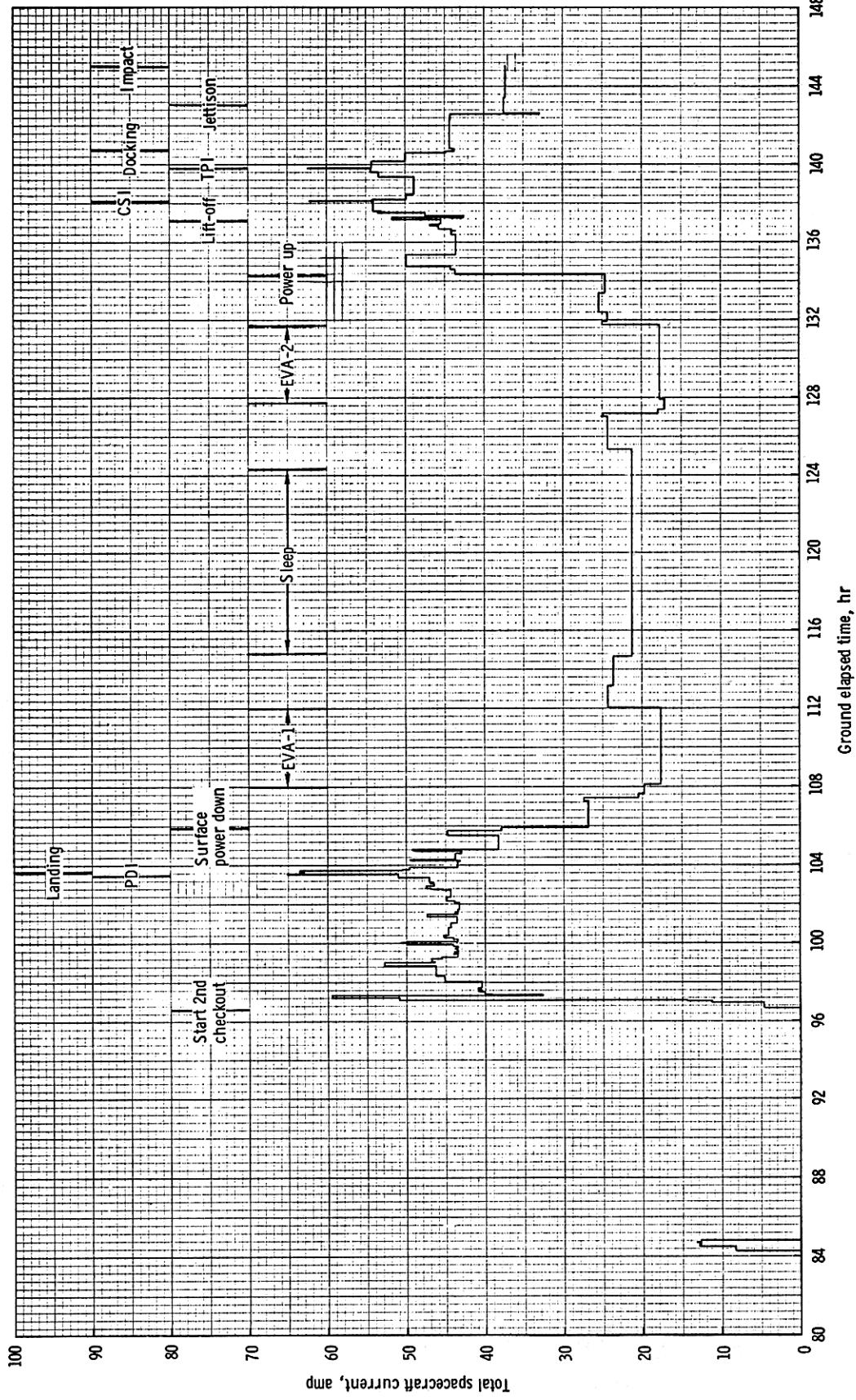
Data confirmed

LM 9-3 - LM-7 ascent stage amp hours remaining. (April 11 launch date)

Data applicable to April 11 launch
3/6/70 Amendment 2



Ascent battery charge status, amp hr



- LM-7 total spacecraft current.

TABLE 4-22

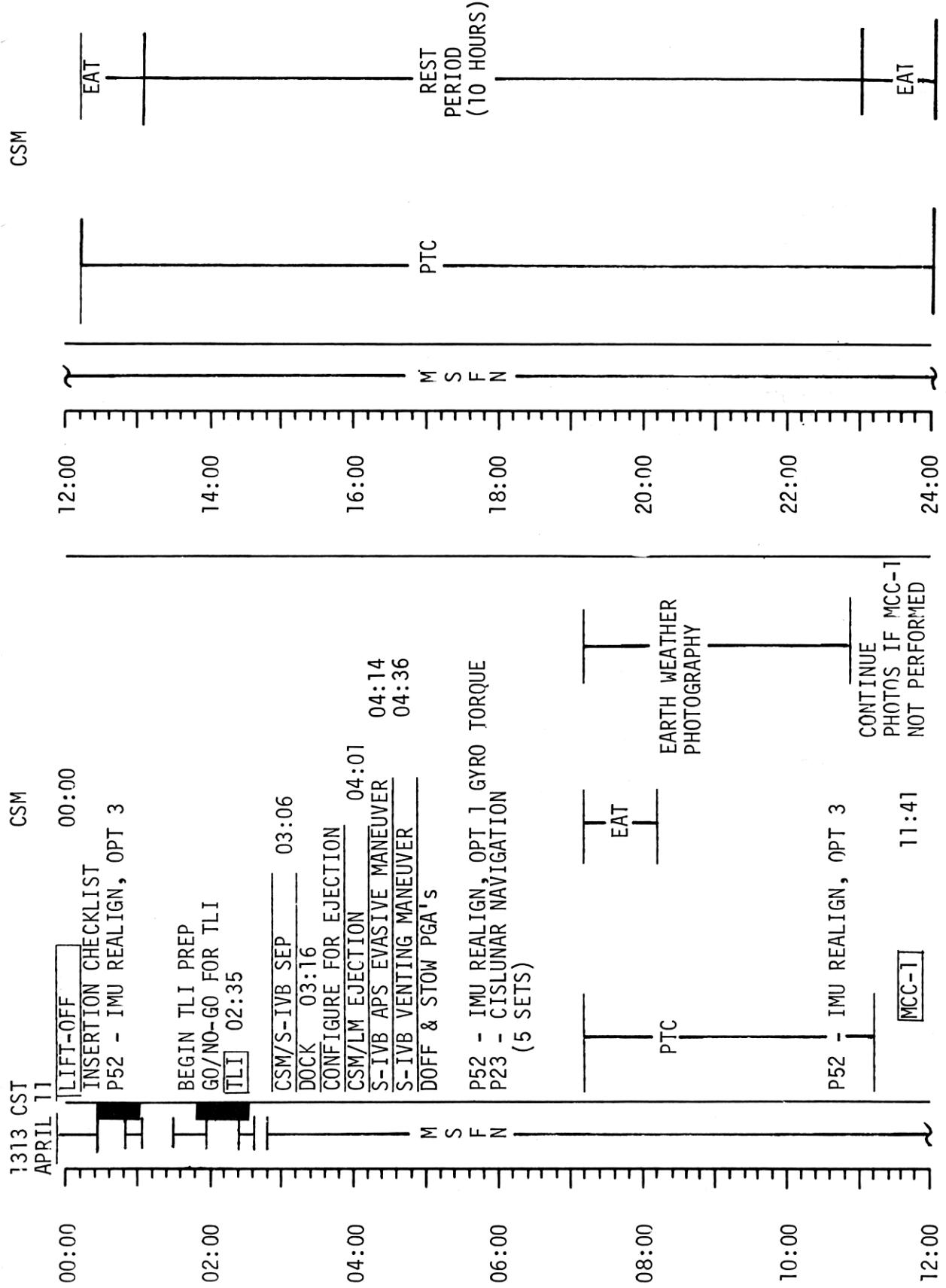
LM ECS

The LM ECS consumable analysis was not available for the final flight plan. For further information contact the Consumables Analysis Section (CAS) of the Mission Planning and Analysis Division (MPAD).

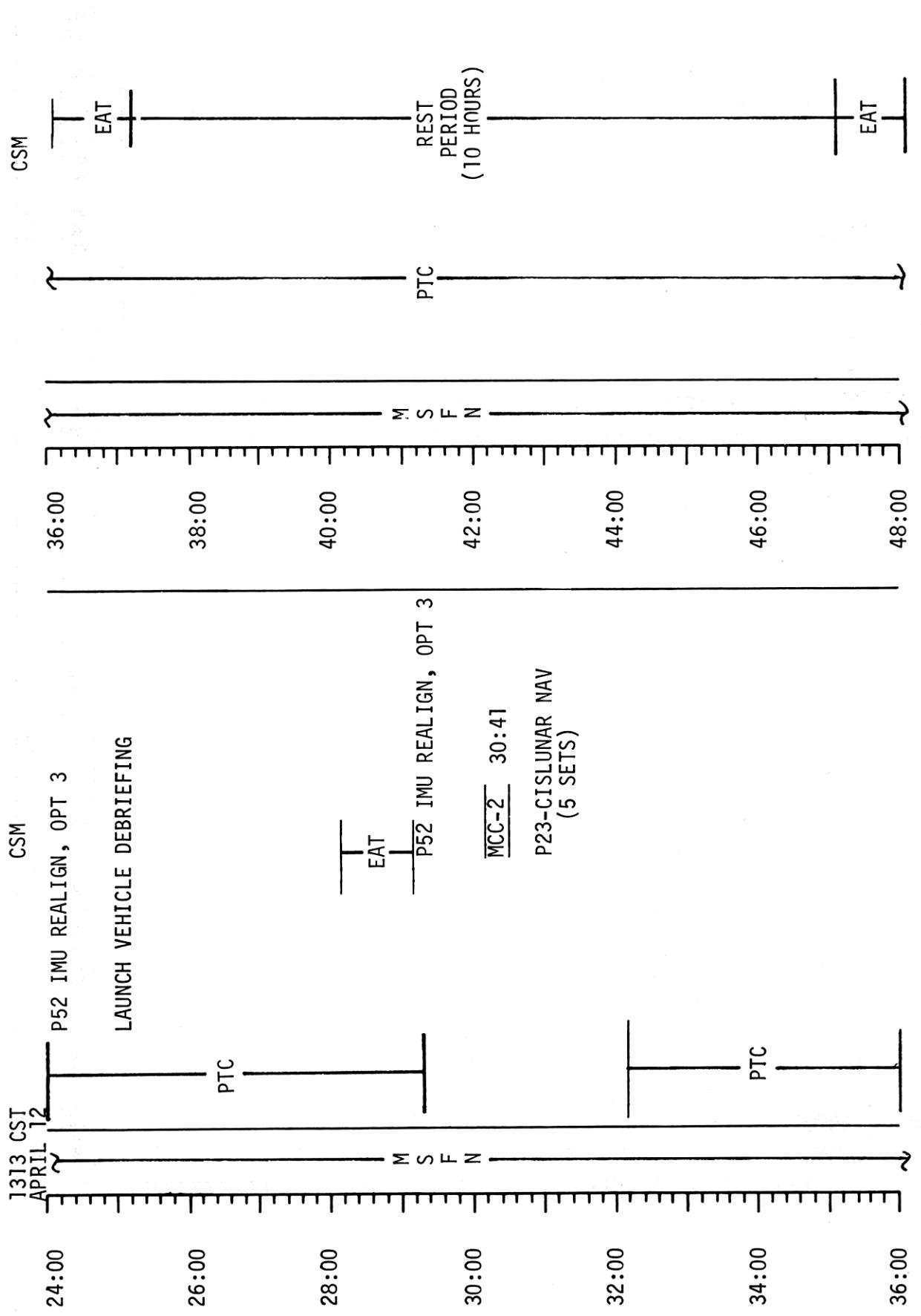
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SECTION V

SECTION 5 - ABBREVIATED TIMELINE



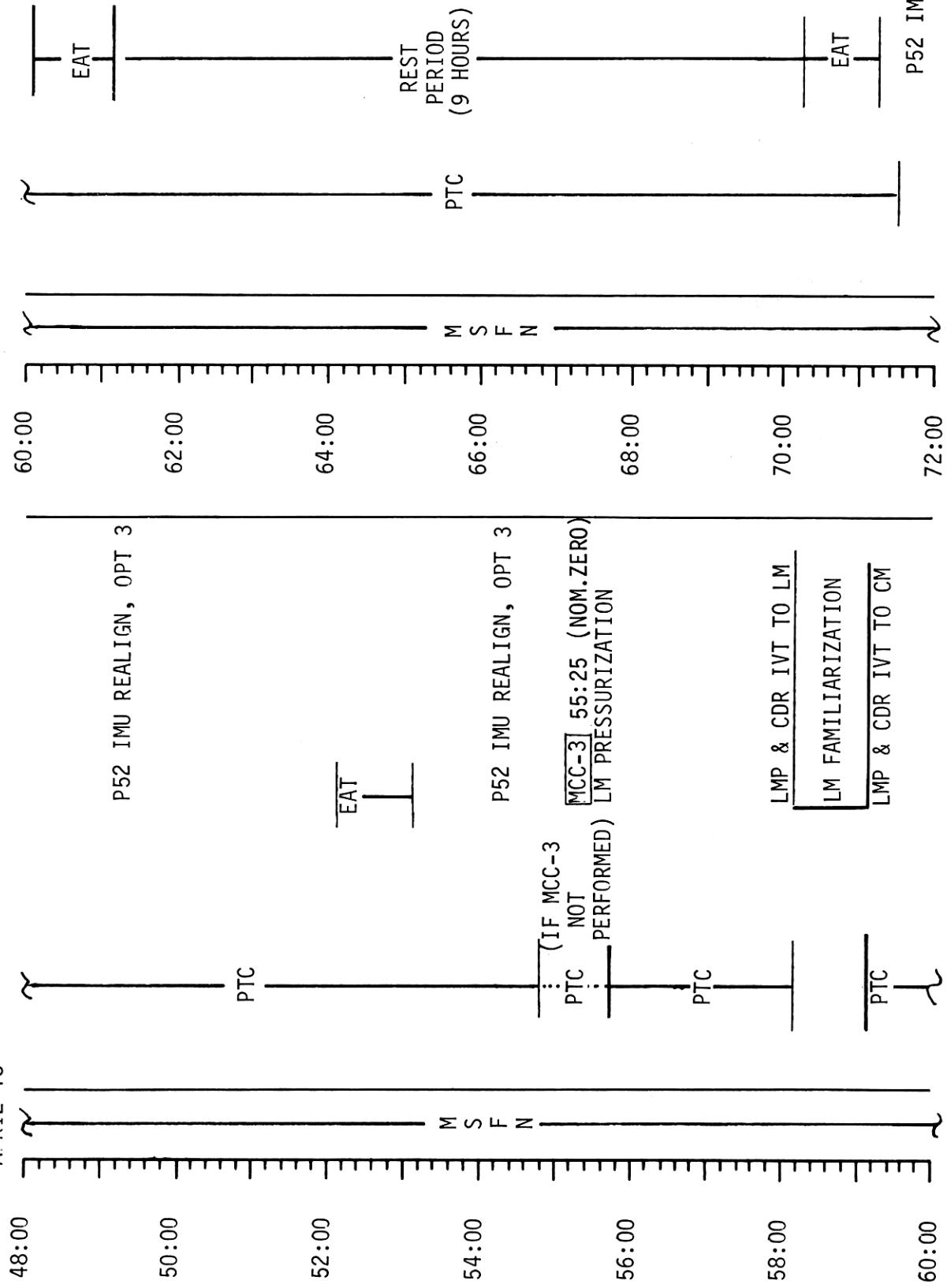
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	00:00 - 24:00	1 / TLC	5-1



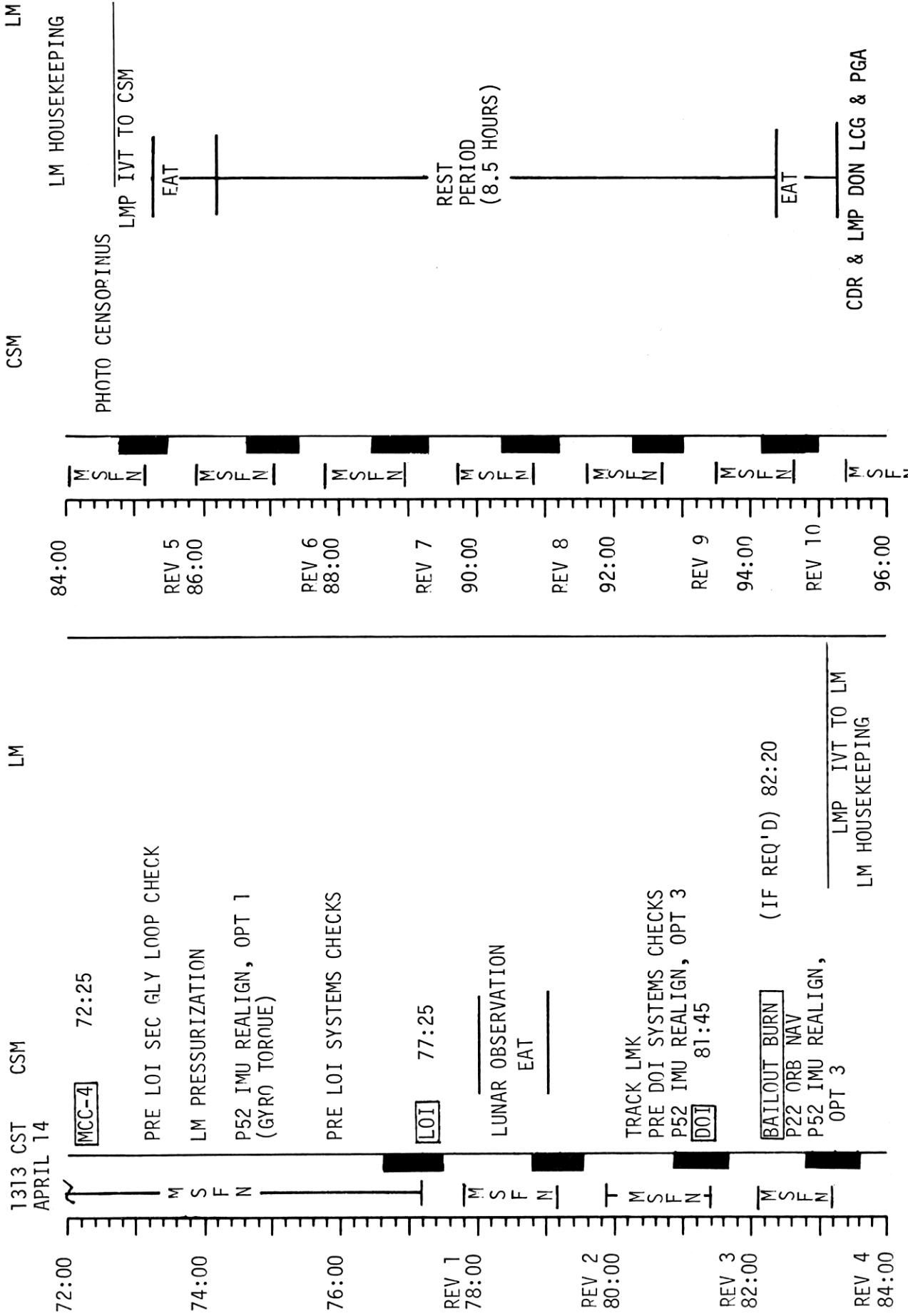
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	24:00 - 48:00	2/TLC	5-2

CSM

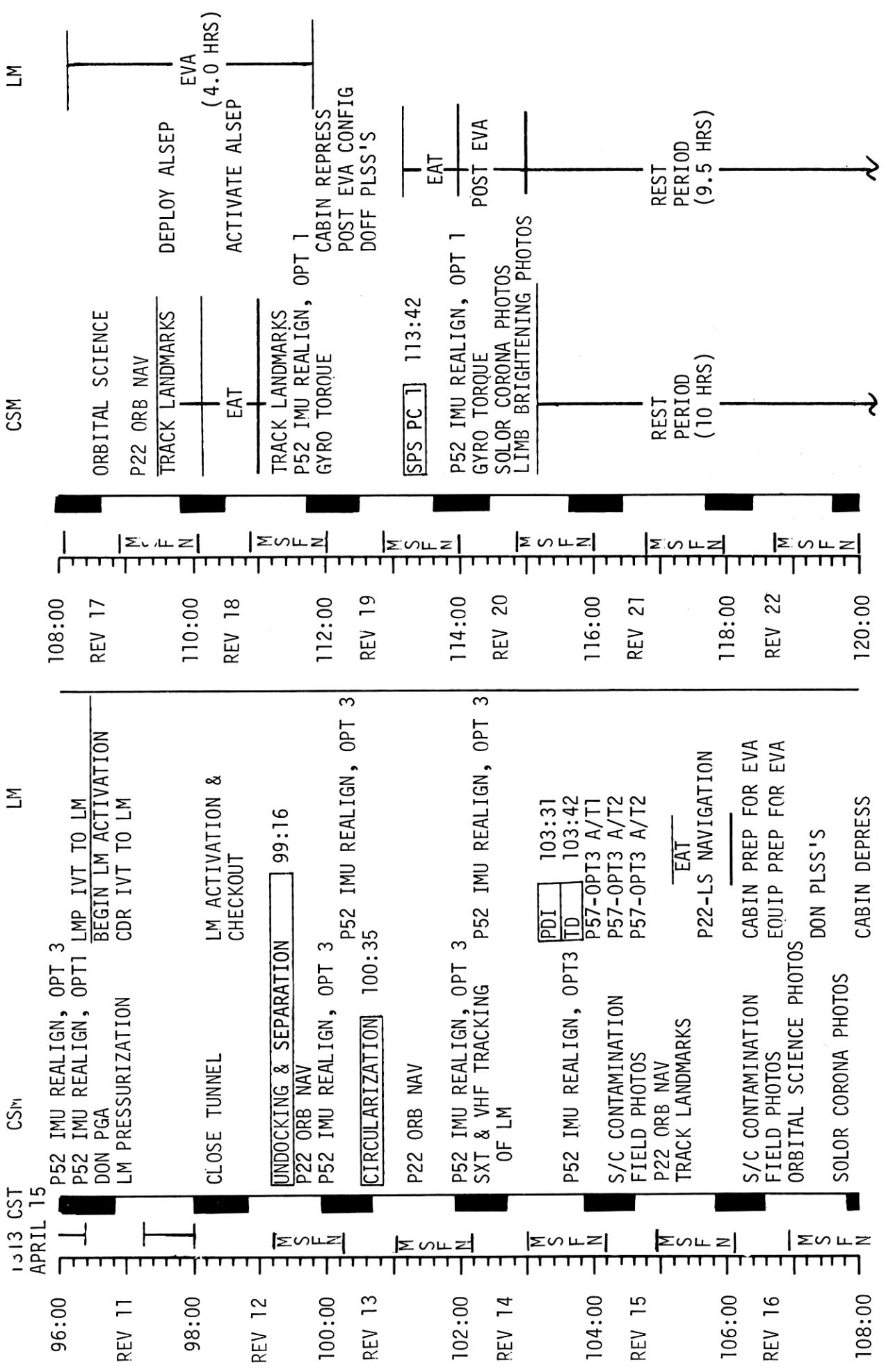
CSM

1313 CST
APRIL 13

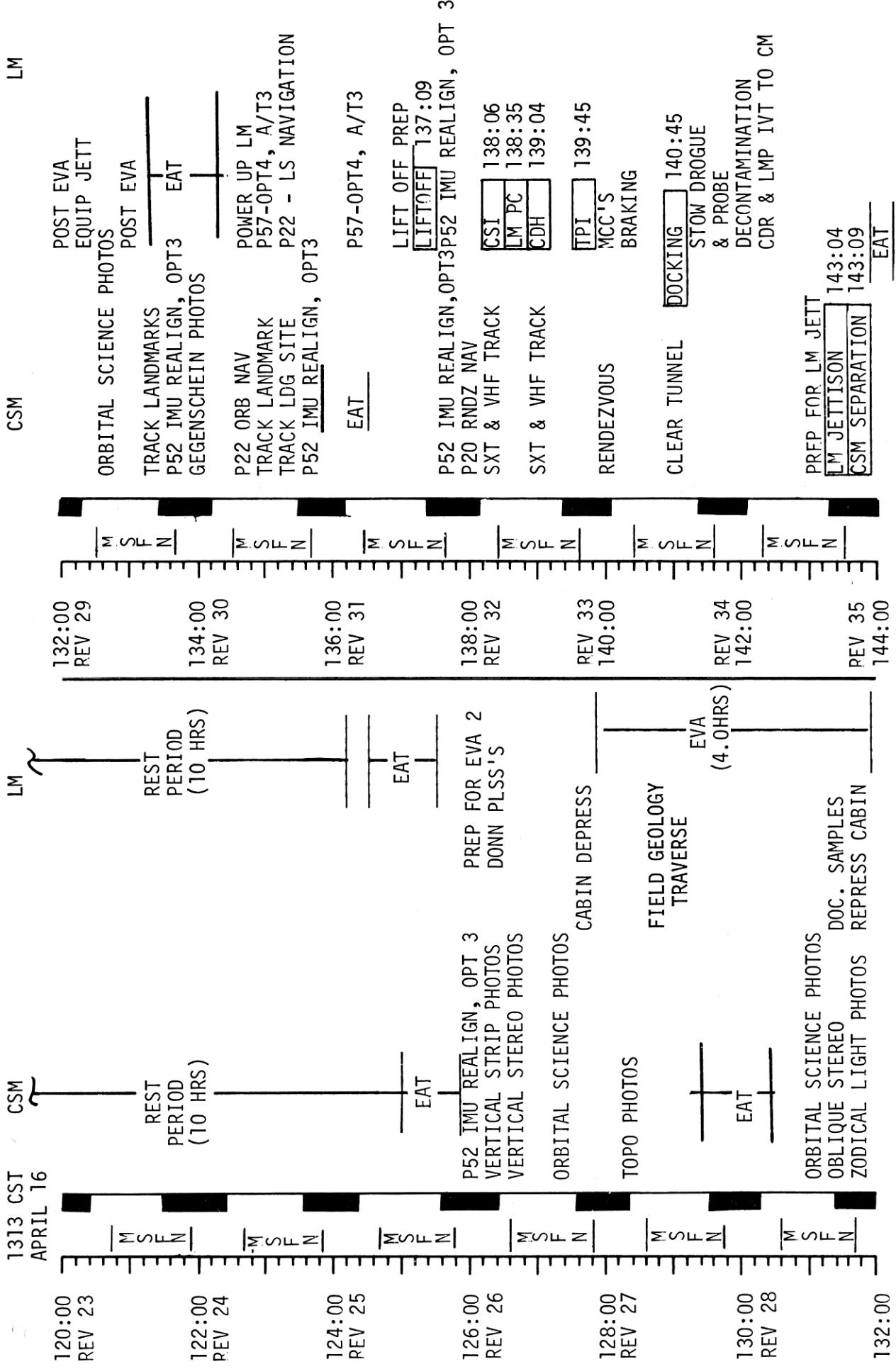
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	48:00 - 72:00	3/TLC	5-3



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	72:00 - 96:00	4/1-9	5-4

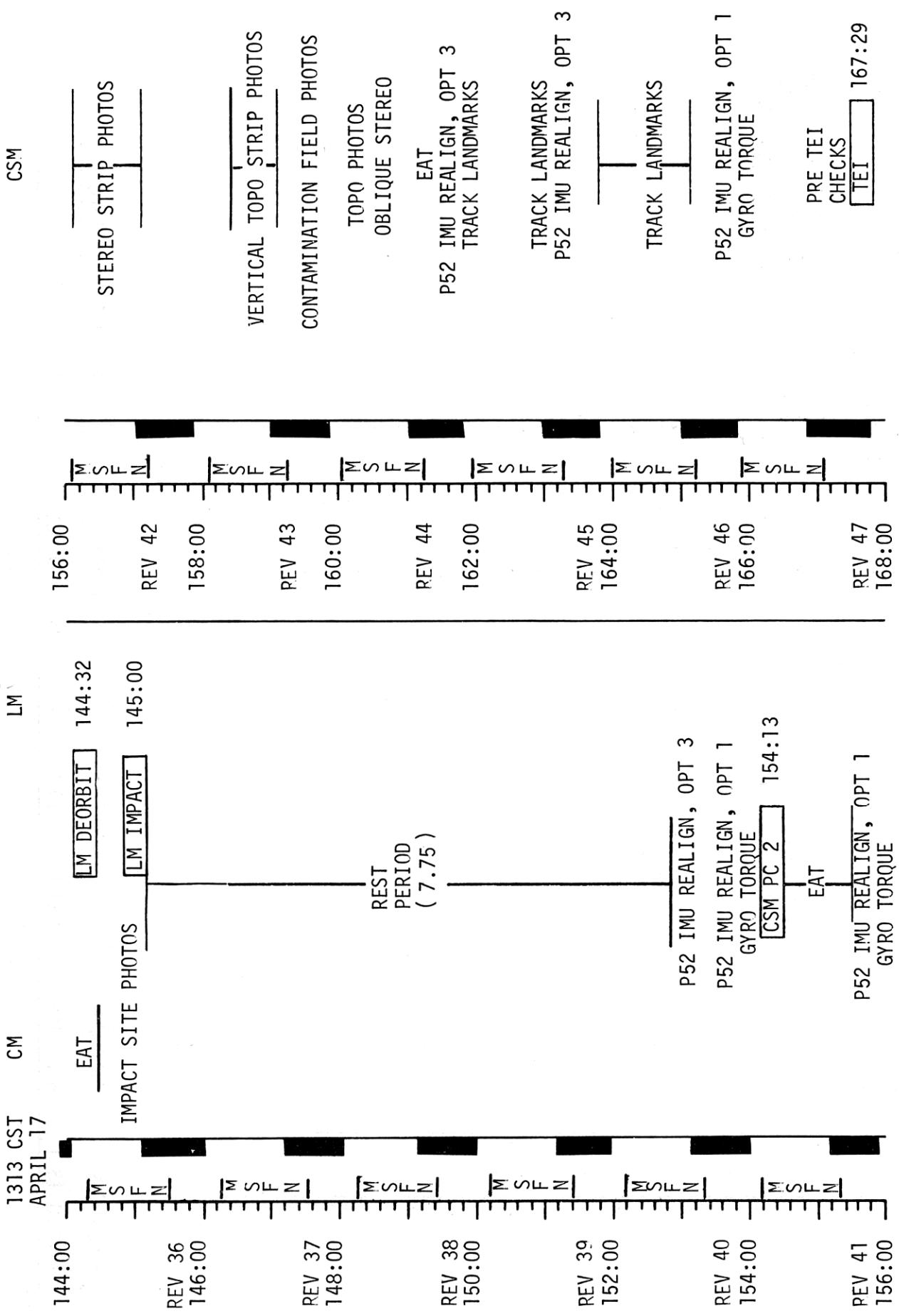


MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	96:00 - 120:00	5/10-21	5-5

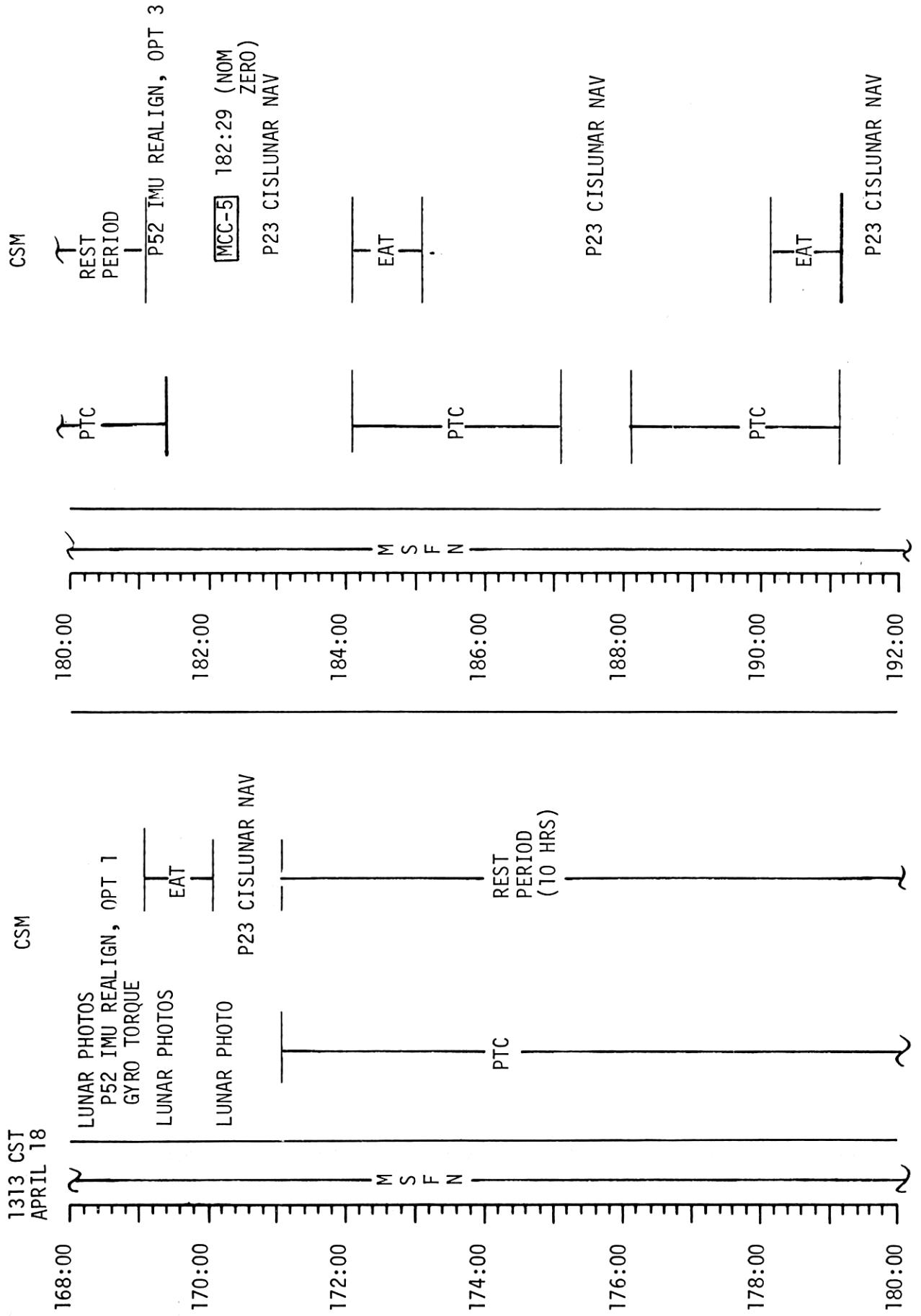


MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	120:00 - 144:00	6/22-34	5-6

FLIGHT PLAN

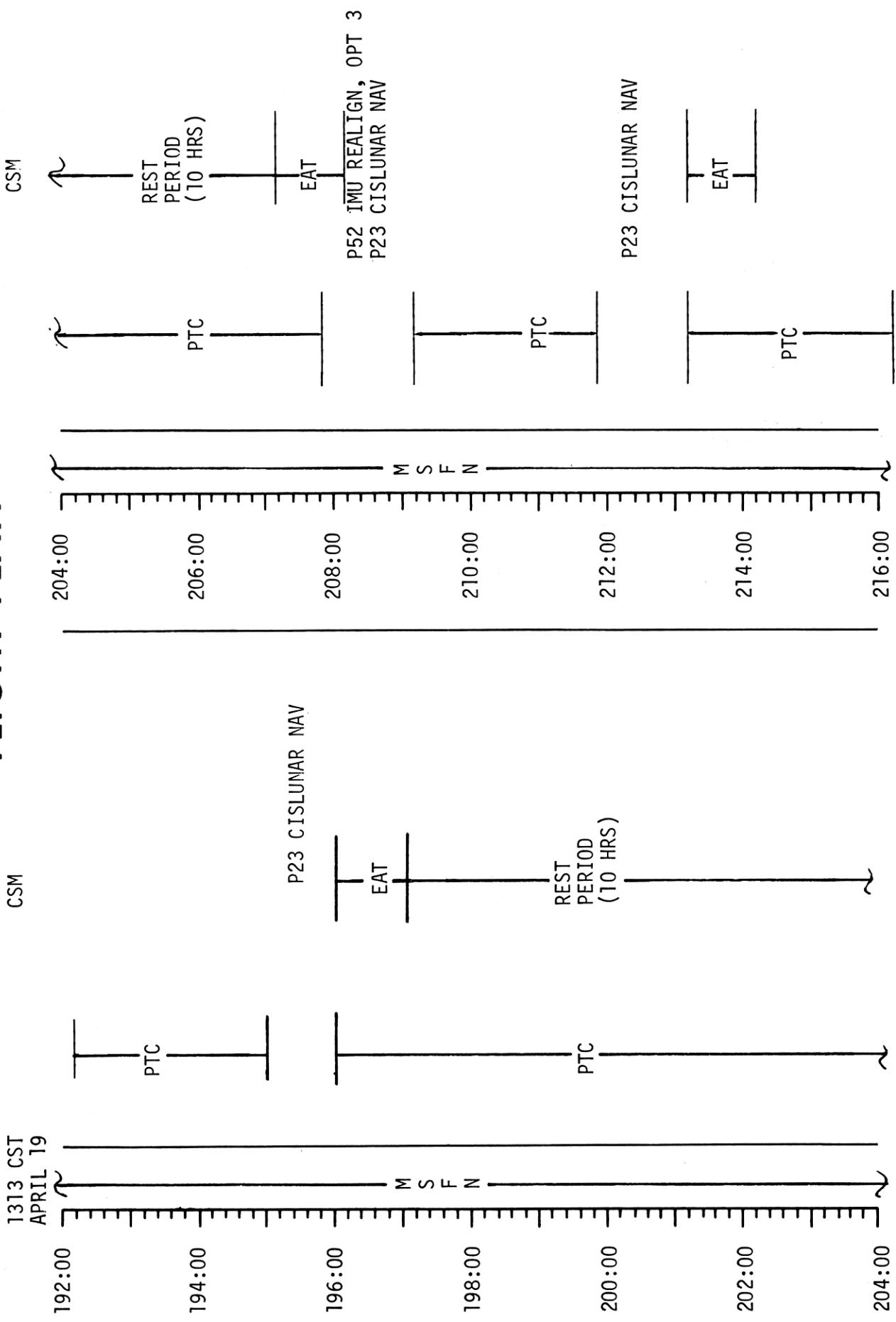


MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	144:00 - 168:00	7/35-46	5-7



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	168:00 - 192:00	8/TEC	5-8

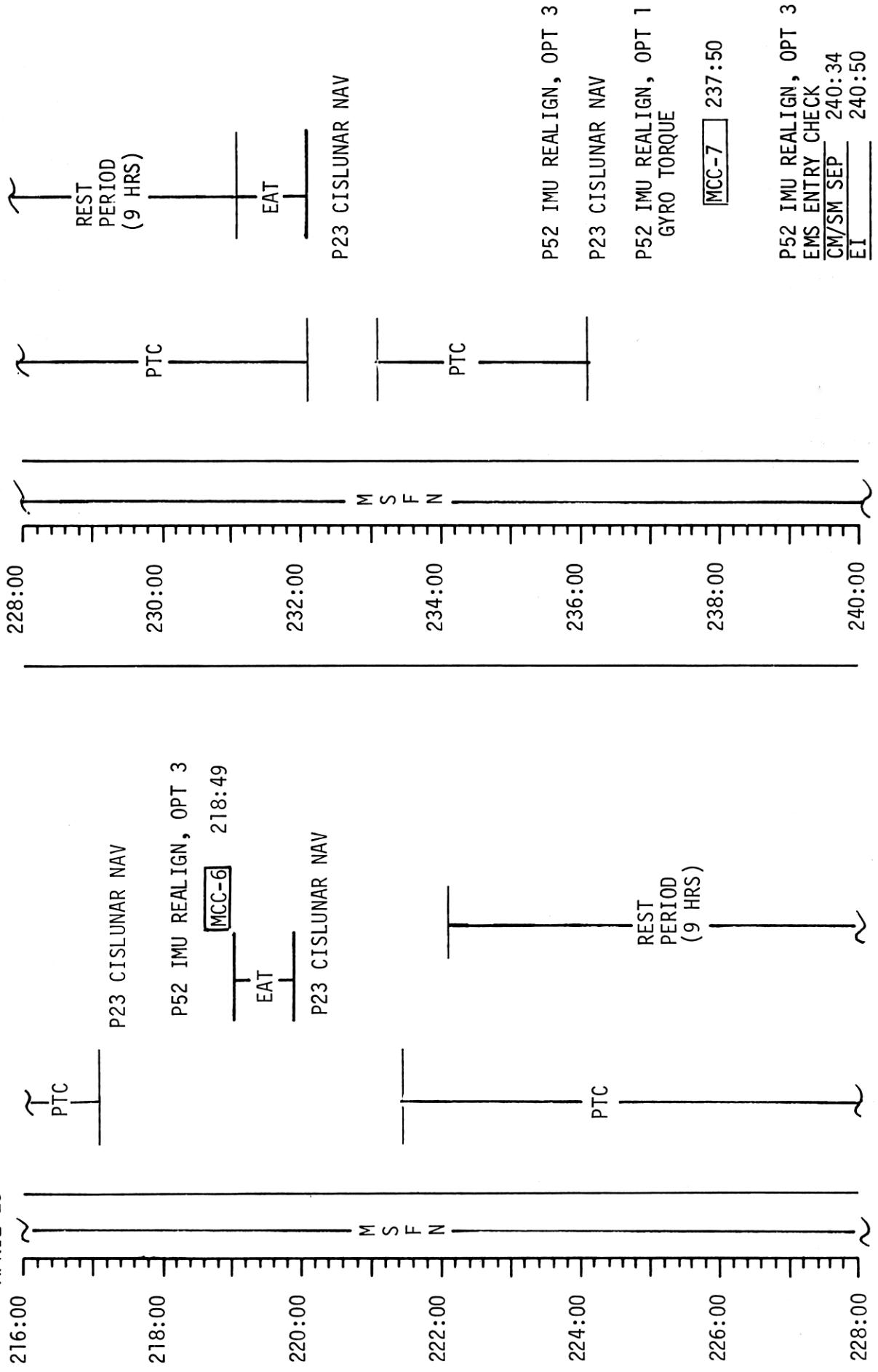
FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	192:00 - 216:00	9 / TEC	5-9

1313 CST
APRIL 20

CSM

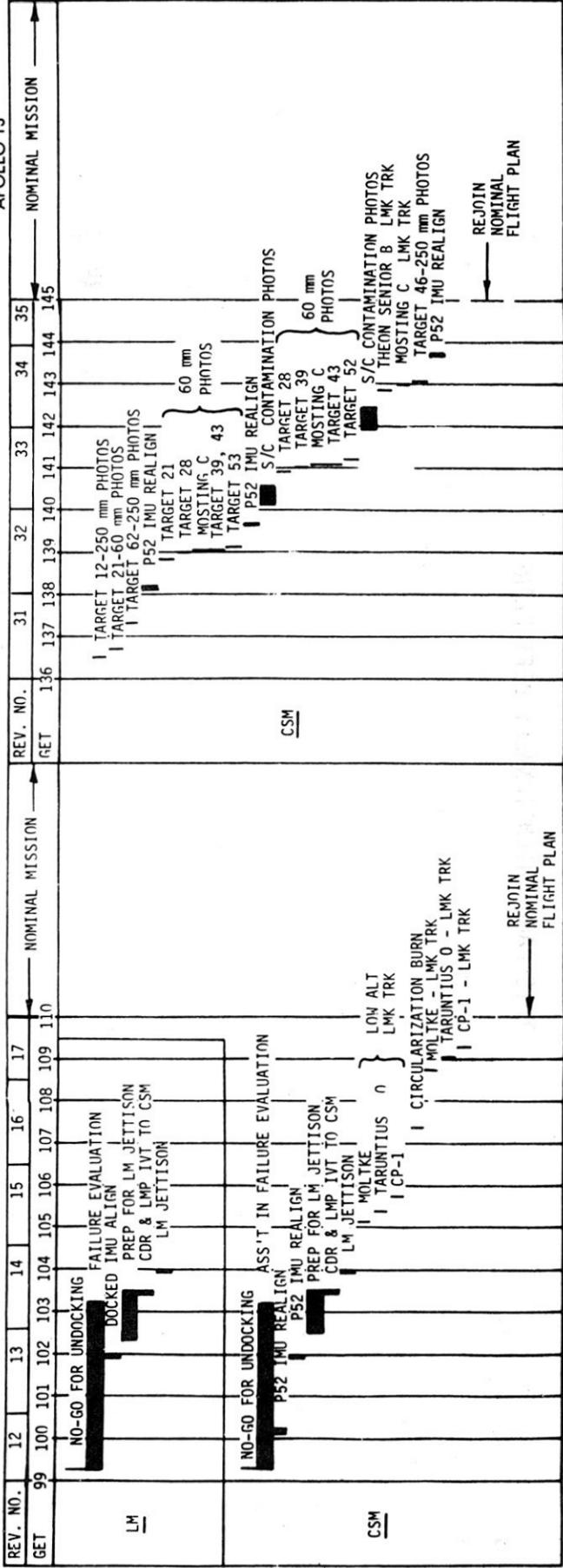


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	216:00 - 240:00	10/TEC	5-10

SECTION 6 - ALTERNATE MISSION TIMELINES

ALTERNATE MISSION I SUMMARY FLIGHT PLAN
APOLLO 13
CSM ONLY - LUNAR ORBIT

ALTERNATE MISSION 2
CSM/LM LUNAR ORBIT
NO-GO FOR UNDOCKING
APOLLO 13



ASSUMPTIONS

- I. NOMINAL LOI AND DOI HAVE BEEN PERFORMED BY THE SPS TO PLACE THE CSM/LM IN A 60 X 8 NM ORBIT.
- II. SOMETIME DURING LM CHECKOUT, A FAILURE HAS BEEN DISCOVERED RESULTING IN A NO-GO SITUATION FOR LUNAR LANDING

CONSTRAINTS

- I. LM JETTISON AS EARLY AS POSSIBLE.
- II. ADHERENCE TO THE NOMINAL FLIGHT PLAN AS MUCH AS POSSIBLE.

SEQUENCE OF EVENTS

SITE	250 mm	60 mm	LMK TRK
HOSTING C	32,33	35	
TARGET 12	31		
TARGET 21		31,32	
TARGET 28		32,33	
TARGET 39		32,33	
TARGET 43		32,33	
TARGET 46	34		
TARGET 52		33	
TARGET 53		32	
MOLTKE			15 { LOW
TARANTIUS			15 } ALT
CP-1			15 }
THEON SENIOR B			34

S/C CONTAMINATION PHOTOS - REVS 33 AND 34

THIS ALTERNATE MISSION IS INITIATED BY A FAILURE RESULTING IN A NO-GO FOR LANDING. THE ALTERNATE TIME LINE IS ENTERED AT THE NOMINAL TIME OF UNDOCKING AND ALLOWS FOR TWO REVOLUTIONS OF FAILURE EVALUATION AND POSSIBLE CORRECTION. AFTER THE NO-GO SITUATION HAS BEEN CONFIRMED, THE LM IS PREPARED FOR JETTISON AND THE CDR AND IMP IVT TO THE CSM AND THE LM IS JETTISONED. ONE REVOLUTION OF LOW ALTITUDE LANDMARK TRACKING IS PERFORMED. THE CSM PERFORMS THE CIRCULARIZATION BURN PLACING THE CSM BACK INTO THE NOMINAL SEQUENCE FOR A CSM SOLO FLIGHT USING THE NOMINAL FLIGHT PLAN. DURING THE NOMINAL RENDEZVOUS AND DOCKING PERIOD, THE ALTERNATE MISSION TIMELINE IS RE-ENTERED AND ADDITIONAL PHOTOGRAPHY AND LANDMARK TRACKING ARE PERFORMED. THE NOMINAL FLIGHT PLAN IS AGAIN RE-ENTERED AT APPROXIMATELY 145 HOURS G.E.T. LUNAR SURFACE FILM WILL BE USED ON THE ALTERNATE MISSION PHOTOGRAPHY

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ALTERNATE MISSION 3 SUMMARY FLIGHT PLAN

APOLLO 13

(CSM/LM LOW EARTH ORBIT)

