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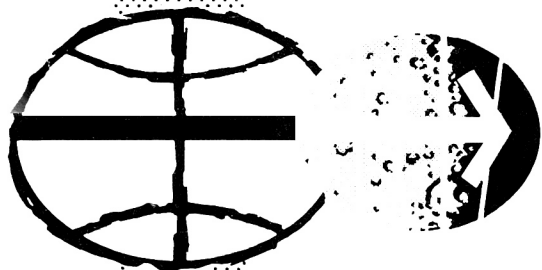
FINAL

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 I

SECTION II

SECTION III

SECTION IV

SECTION V

SECTION VI

APOLLO 13

APOLLO AS-508/CSM-109/LM-7

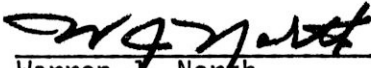
FINAL FLIGHT PLAN

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Submitted by:


T. R. Lindsey
Flight Planning Branch

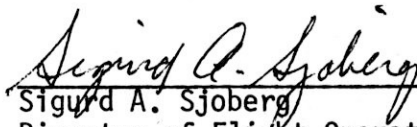
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INTRODUCTION

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 approval of the Chief, Flight Crew Support Division.

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

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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
CPLLE	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	Mission Control Center - Houston
or MCC	
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
REFSMAT	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)

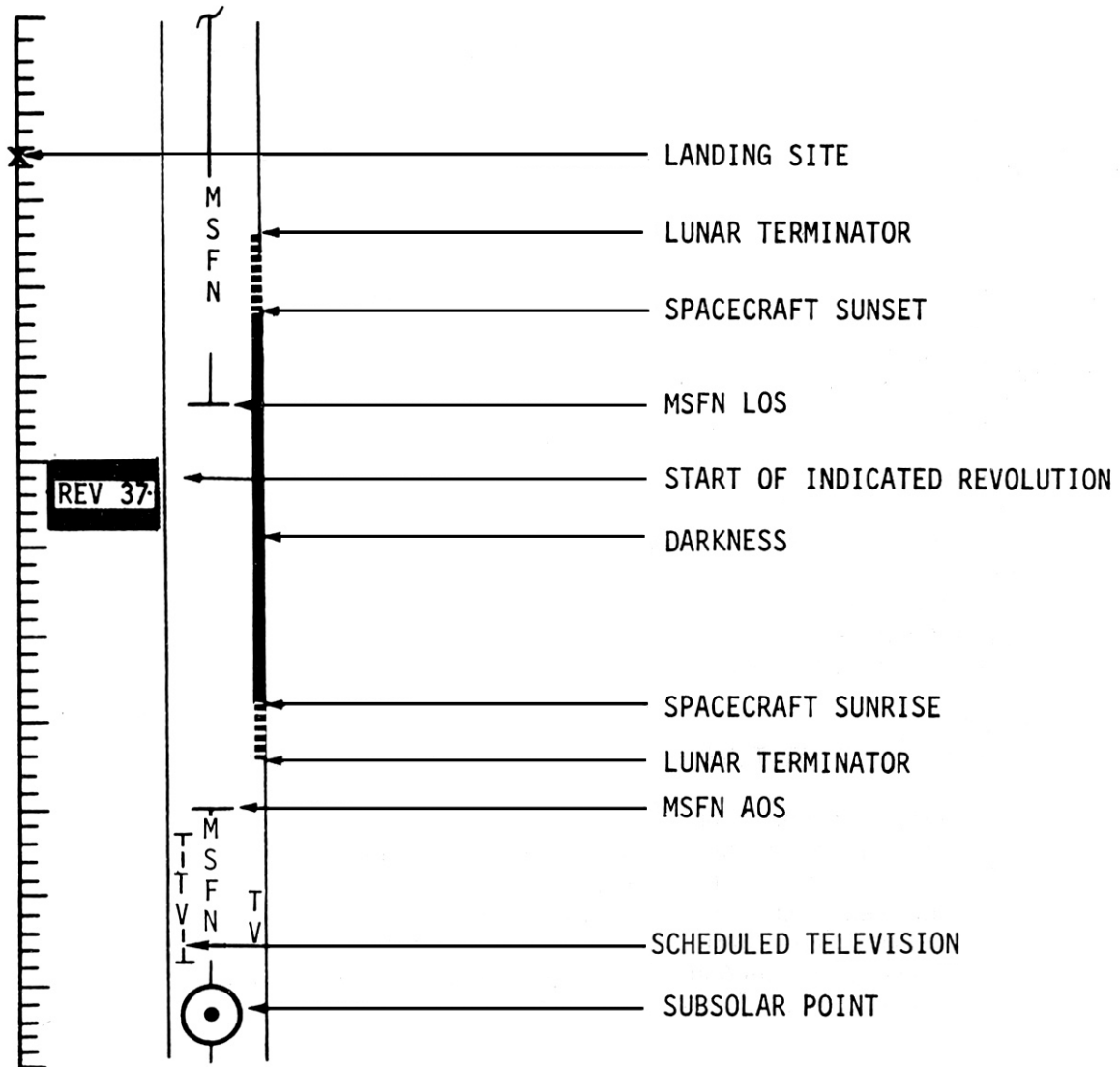
Operating time (minutes) for TV

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

1. 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:

ACTIVITY	PRESSURIZED HARD SUIT	SUITED (SOFT SUIT)	PARTIAL SUIT W/O HELMET & GLOVES	SHIRT SLEEVES
LAUNCH		ALL		
EARTH ORBIT			ALL	
TLI THROUGH S-IVB			ALL	
EVASIVE MNVR				ALL
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 Udata)
 - (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 list 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 FDAI, 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 FDAI 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 FDAI 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 $0.2^\circ/\text{sec}$ ($0.5^\circ/\text{sec}$ 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, Udata)
 - (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

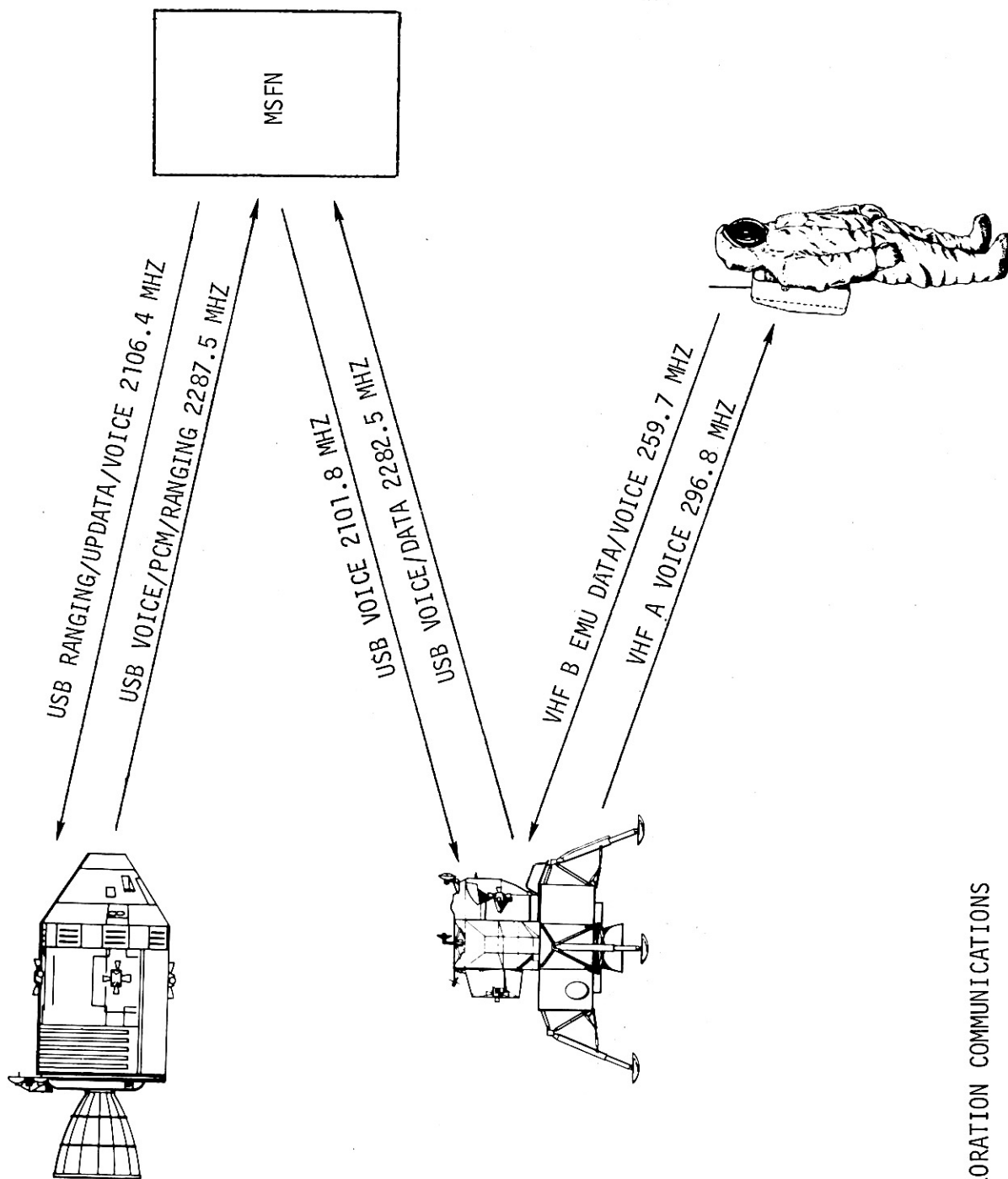
- (b) Crew Checklists
- (c) LM Rendezvous Procedures
- (d) LM Descent/Ascent Procedures
- (e) Photographic and T.V. Procedures
- (f) Orbital EVA Procedures
- (g) Lunar Surface Procedures

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.

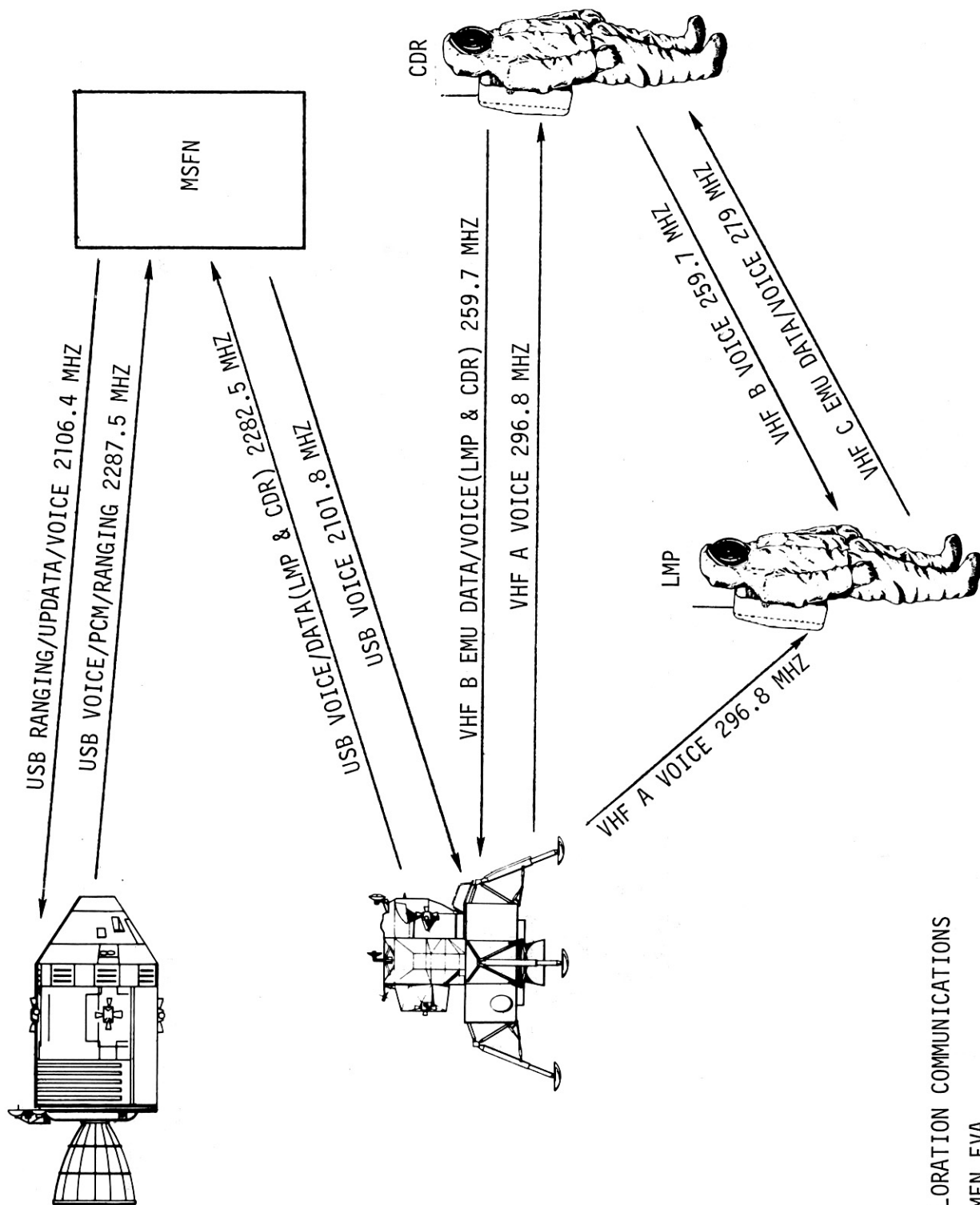
F. Miscellaneous

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

FIGURE 1-1



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	1:29	1:34	WILL NOT NORMALLY BE AVAILABLE FOR AN APOLLO 13 LAUNCH		1:00	1:06		
	2:51	14:16					3:59	5:42
					8:55	18:09		
TRANS LUNAR COAST	24:32	38:46					16:30	30:41
	48:54	62:53			35:17	42:52	41:05	55:34
	73:02	77:15			57:21	67:06	65:17	77:16
	172:25	184:21					167:42	176:52
TRANS EARTH COAST					178:48	190:36		
	196:34	208:20					188:59	200:48
					202:50	214:53		
	221:04	232:21					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	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							89:44	90:48
9	94:58							91:36	92:40
10	96:52							93:30	94:34
11	98:56							95:23	96:29
12	100:39					97:46	98:21	97:17	98:22
13	102:37					99:11	100:15	99:11	100:15
14	104:35					101:03	102:14	101:03	102:14
15	106:33	105:51	106:10			103:01	104:12	103:01	104:01
16	108:31	106:57	108:08			104:59	106:10		
17	110:29	108:55	110:06			106:57	108:09		
18	112:27	110:53	112:05			108:55	110:06		
19	114:25	112:51	114:03			110:53	111:30		
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	HONEYSUCKLE (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	122:41	123:52
25	126:13					124:39	125:50	124:39	125:51
26	128:11					126:37	127:48	126:37	127:49
27	130:09					128:35	129:47		
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					140:23	141:35
34	143:55							142:21	143:32
35	145:53							144:19	145:30
36	147:50							146:17	147:29
37	149:48					148:15	149:26	148:15	149:27
38	151:46					150:13	151:24	150:13	151:25
39	153:44					152:11	153:22	152:11	152:42
40	155:42	154:38	155:20			154:09	155:20		
41	157:40	156:07	157:18			156:07	157:18		
42	159:38	158:05	159:16			158:05	159:16		
43	161:36	160:03	161:14			160:03	160:17		
44	163:34	162:01	163:12						
45	165:31	163:59	165:10					164:51	165:09
46	167:29	165:57	166:33					165:56	167:07

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	Δ TIME	NUMBER	Δ TIME	
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	14	3	A	1	B5
2	23:00	12	4	B	2	B5
3	35:00	13	5	A	3	B5
4	47:45	12	6	B	4	B5
5	60:00	11	7	A	5	B6
6	71:00	14	8	B	6	B6
7	85:15	13	9	A	7	B6
8	98:30	14	10	B	8	B6
9	112:40	29	11	A	9	A3
10	141:20	13	12	B	10	A3
11	154:30	12	13	A	11	A3
12	166:35	15	14	B	12	A3
13	181:15	11	15	A	13	A4
14	192:20	15	16	B	14	A4
15	207:30	9	17	A	15	A4
16	216:30	15	18	B	16	A4
17	231:50		19	A	17	A6

TABLE 1-5
CSM BURN SCHEDULE

BURN/ MNV	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 MNV	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 POST UNDOCKING	99:13 99:26	ICS/PTT	00:13 x 100% = 00:13	00:13
PDI PREP POST TD (PDI+20)	103:11 103:50	VOX	00:39 x 63% = 00:25	00:38
EVA 1 PLSS COMM POST EVA 1	107:25 112:10	VOX	4:45 x 63% = 3:00	3:38
EVA 2 PLSS COMM POST EVA 2	127:10 131:55	VOX	4:45 x 63% = 3:00	6:38
ASCENT COMM LIFT-OFF (-) 2	136:53 137:07	ICS/PTT	00:14 x 100% = 00:14	6:52
LIFT-OFF (-) 2 INSERTION	137:07 137:18	VOX	00:11 x 63% = 00:07	6:59
INSERTION AOS AFTER CSI	137:18 138:28	ICS/PTT	1:10 x 100% = 1:10	8:09
LOS BEFORE TPI POST DOCKING	139:37 140:50	ICS/PTT	1:13 x 100% = 1:13	9:22

*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

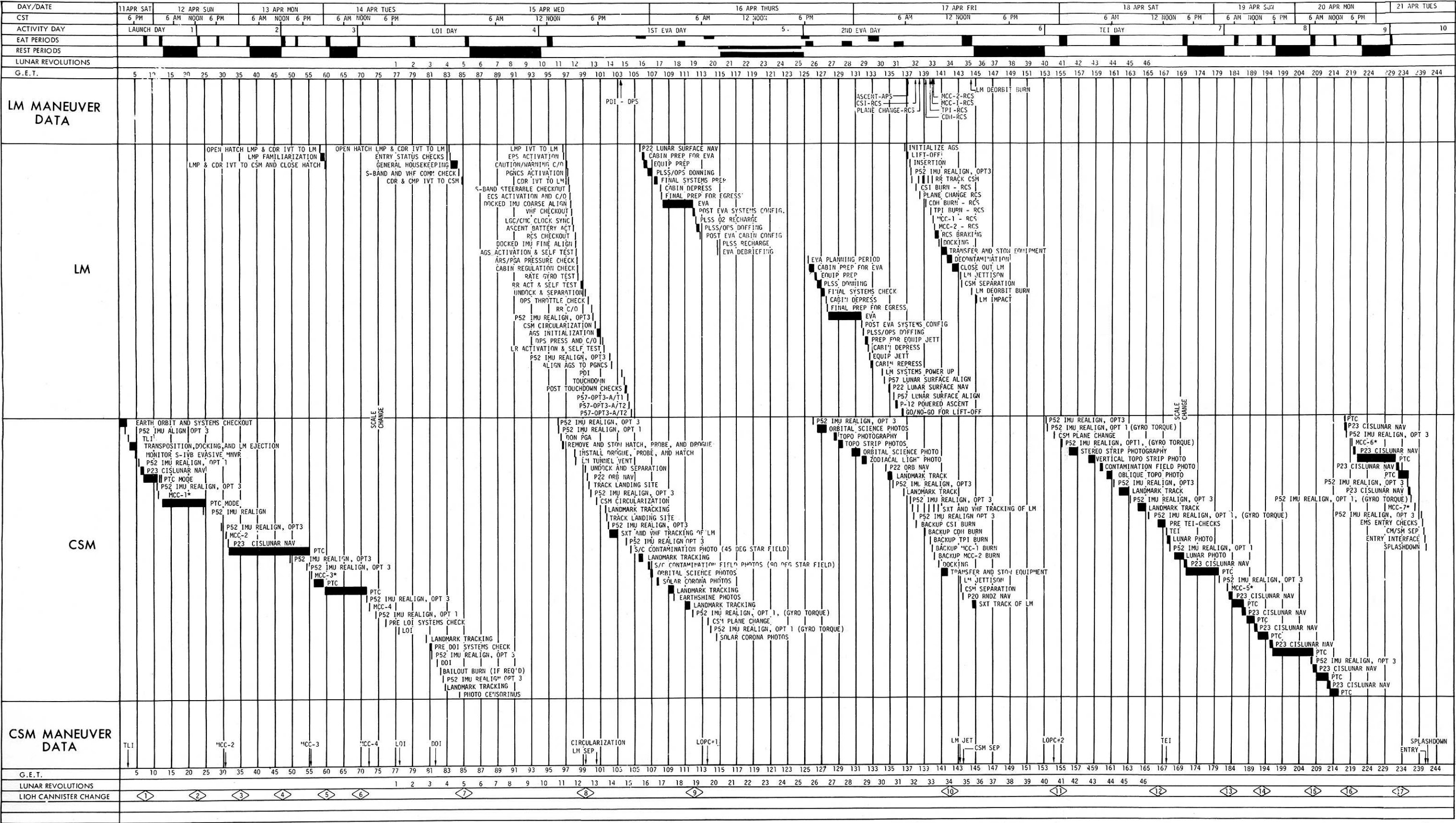


TABLE 1-12

P23 CISELUNAR 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 CISELUNAR NAVIGATION

GET	SET NUMBER	STAR/HORIZON	COMMON NAME
195:00	TEC-5	33/LNH	ANTARES
		26/LFH	SPICA
		24/LFH	GIENAH
		31/LFH	ARCTURUS
		25/LNH	ACRUX
		* 32/LFH	ALPHECCA
		* 30/LNH	MENKENT
208:00	TEC-6	221/EFH	DELTA CAPRICORNI
		45/EFH	FOMALHAUT
		102/ENH	MIRACH
		224/EFH	MARKAF
		126/ENH	GAMMA PEGASI
		* 44/EFH	ENIF
		* 01/ENH	ALPHERATZ
212:00	TEC-7	221/EFH	DELTA CAPRICORNI
		102/ENH	MIRACH
		45/EFH	FOMALHAUT
		01/ENH	ALPHERATZ
		224/EFH	MARKAF
		* 126/ENH	GAMMA PEGASI
		* 44/EFH	ENIF
217:00	TEC-8	221/EFH	DELTA CAPRICORNI
		45/EFH	FOMALHAUT
		102/ENH	MIRACH
		224/EFH	MARKAF
		44/EFH	ENIF
		* 126/ENH	GAMMA PEGASI
220:00	TEC-9	221/EFH	DELTA CAPRICORNI
		45/EFH	FOMALHAUT
		102/ENH	MIRACH
		126/ENH	GAMMA PEGASI
		224/EFH	MARKAF
		* 44/EFH	ENIF
232:00	TEC-10	227/ENH	BETA PERSEI
		44/EFH	ENIF
		224/EFH	MARKAF
		VENUS/ENH	VENUS
		103/ENH	ALMACH
		* 223/EFH	BETA PEGASI
236:00	TEC-11	1/EFH	ALPHERATZ
		10/ENH	MIRFAK
		VENUS/ENH	VENUS
		* 133/ENH	ZETA PERSEI
		* 233/EFH	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	3-82/97
B-2	Provide TV camera coverage of an external view of the landed LM.	EVA-1/2	3-82/98
B-3	Provide TV camera coverage of the lunar surface in the general vicinity of the LM.	EVA-1/2	3-82/98
B-4	Provide TV camera panoramic coverage of distant terrain features.	EVA-1	3-83
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		
C-1	Provide a contingency sample for postflight scientific investigations.	EVA-1	3-82
D	Selected Sample Collection		
D-1	Collect rock samples and fine grained fragmental material.	EVA-1	3-85
D-2	Collect one large rock.	EVA-1	3-85
E	Evaluation of Landing Accuracy Techniques		
E-1	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		
F-1	Obtain photographs of a selected lunar site from low altitude.	REV-4	3-62
F-2	Obtain stereoscopic and sequence photographs of selected lunar sites.	CSM SOLO	3-96
F-3	Obtain high resolution photographs of selected lunar sites.	BOOTSTRAP	3-122
G	EVA Communications System Performance	CSM SOLO	3-98/100
G-1	Determine the effects upon communication of obstructing lunar surface features between EVC-1 and the LM.	BOOTSTRAP	3-124
H	Lunar Soil Mechanics	EVA-2	3-99
H-1	Obtain data on lunar soil mechanical behavior.	EVA-2	3-99
H-2	Obtain data on lunar surface characteristics relative to the mobility of men and roving vehicles.	EVA-1/2	3-82/97
H-3	Obtain data on the lunar sub-surface characteristics relative to construction either on or within the lunar surface.	EVA-2	3-99

TABLE 2-1
MISSION OBJECTIVE/ACTIVITY
REFERENCE

NUMBER	OBJECTIVE	ACTIVITY	PAGE NO.
I	Dim Light Photography		
I-1	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	3-78/80
I-5	Obtain photographs of the ice particles resulting from a water dump.	BOOTSSTRAP	3-125
I-6	Obtain photographs of the lunar limb brightening just after lunar sunset.	TEC	3-143
		CSM SOLO	3-88
J	Selenodetic Reference Point Update		
J-1	Obtain lunar landmark tracking data to permit an update of the selenodetic coordinates of selected lunar reference points.	PRE DOI	3-58
		CSM SOLO	3-79/83/85/103/104
K	CSM Orbital Science Photography		
K-1	Obtain photographs from the CSM using the Lunar Topographic camera of lunar surface areas of prime scientific interest.	CSM SOLO	3-81/98/99
		BOOTSSTRAP	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	3-96/97
		BOOTSSTRAP	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	3-79 through 104
		BOOTSSTRAP	3-122/124/126
K-4	Obtain photographs from the CSM using the 16 mm sequence camera and the I-1 (f.95) lens in earthshine of specific segments of the lunar surface.	CSM SOLO	3-83
L	Transearth Lunar Photography		
L-1	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>	
00:02	CDR: <u>REPORT YAW MNVR</u>	
00:13	CDR: <u>REPORT ROLL AND PITCH PROGRAM</u>	
00:31	CDR: <u>REPORT ROLL COMPLETE</u>	LIFT-OFF 1313 CST APRIL 11, 1970, 72° L.A. TARGETED FOR FRA MAURO
00:42	MCC: <u>REPORT MARK MODE IB</u>	
00:50	LMP: <u>REPORT CABIN PRESS DECREASING</u>	
01:25	MAX Q	
01:58	MCC: <u>REPORT MARK MODE IC</u>	ALTITUDE 14,000 ft
02:00	MCC: CDR: <u>REPORT GO/NO-GO FOR STAGING</u>	ALTITUDE 100,000 ft
02:15	CDR: <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-i

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-IVB 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 APOLLO 13		DATE MARCH 16, 1970
		PAGE 3-ii

FLIGHT PLAN

TIME	EVENT	REMARKS
11:00	CDR: <u>REPORT S/C GO/NO-GO</u>	INSERTION
11:46	CDR: <u>REPORT SECO</u> TB5 = 0	
	S-IVB MAINTAINS COMMANDED CUTOFF	
	INERTIAL ATTITUDE	
SECO	MCC: <u>REPORT ORBITAL GO/NO GO</u>	
+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-REFSMAT (LAUNCH ORIENT) GDC ALIGN 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 UNSTOW TV CAMERA CDR INSTALL COAS CMP JETTISON OPTICS COVERS CRO AOS DUMP DSE REPORT GYRO TORQUING ANGLES CRO LOS	LMP HOLDS CAMERA P52 N71: , - - - N05: - - - . - - - N93: - - - - - - - X - - - . - - - Y - - - . - - - Z - - - . - - - GET: - - - : - - -
52:17		
58:07		
MISSION APOLLO 13		EDITION FINAL (APRIL)
		DATE MARCH 16, 1970
		PAGE 3-iv

FLIGHT PLAN

MCC-H

1313 CST

LIFT-OFF APRIL 11, 1970 LAUNCH OPERATIONS CHECKLIST



UPDATE TO CSM
Z TORQUING ANGLE

DUMP DSE

SECO
INSERTION AND SYSTEMS CHECKS

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

SET UP CAMERA EQUIPMENT

REPORT GYRO TORQUING ANGLES

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

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

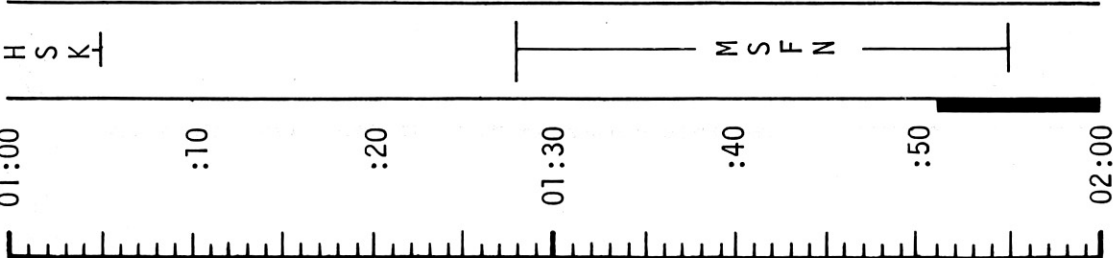
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	00:00 - 01:00	1/E.O.	3-1

FLIGHT PLAN

MCC-H

1413 CST

NOTES



DUMP DSE

UPLINK TO CM

CSM S.V. & V66

UPDATE TO CSM

TLI PAD

TLI +90 MIN

ABORT PAD

P37 (L/O+8) PAD

GO/NO-GO FOR PYRO

ARM

SCS ATT REF COMPARISON CK
EXTEND DOCKING PROBE

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

LOGIC ON

TLI PREPARATION CHECKLIST

GDC ALIGN

PYRO ARM

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

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 = PAD VALUE	NO TRIM

TABLE 3-1
3-2A

MCC-H

1513 CST

FLIGHT PLAN

NOTES



GO/NO-GO

GO/NO-GO FOR TLI
TB-6 (02:25:49.65)

P47 - THRUST MONITOR

TLI

TIG: 02:35:27.65
BT: 5 MIN 55.7 SEC

P00 - CMC IDLING
V66 - TRANS CSM SV TO LM SLOT
TLI BURN STATUS REPORT
CDR - TRANS TO CENTER COUCH, CMP - LEFT COUCH
LMP - RIGHT COUCH
WASTE STOWAGE VENT - CLOSED
DIRECT 02 VLV-OPEN, UNTIL CABIN IS 5.7 PSI, THEN CLOSE
GDC ALIGN
SIVB MNVRS TO SEP ATT
(2:56:25)
R 358 OMNI
P 140
Y 320

AT SECO: S-IVB INERTIAL
AT SECO+2 MIN 31 SEC:
S-IVB TO LOCAL
HORIZONTAL ORB RATE,
HEADS DOWN

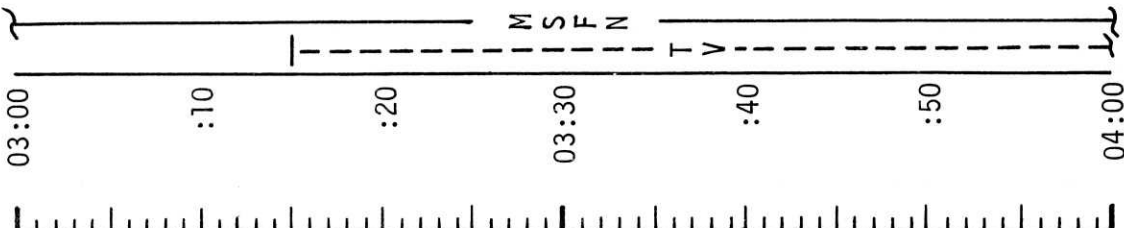
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	02:00 - 03:00	1/TLC	3-3

FLIGHT PLAN

1613 CST

MCC-H

GO/NO GO FOR T & D



ACTIVATE AND LOAD DAP N46 (11103, 01111)
LOAD DOCKING GIMBAL ANGLES
CSM SEP PREPARATION

CSM/SIVB SEP GET:03:06

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

DOCK GET: 03:16

BEGIN CSM/LM CABIN PRESSURE EQUALIZATION
CDR:CONFIGURE FOR LM EJECTION
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 VLV - LM/CM AP
LEAVE TUNNEL EQUALIZATION VALVE CLOSED
CYCLE O₂ & H₂ 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

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)

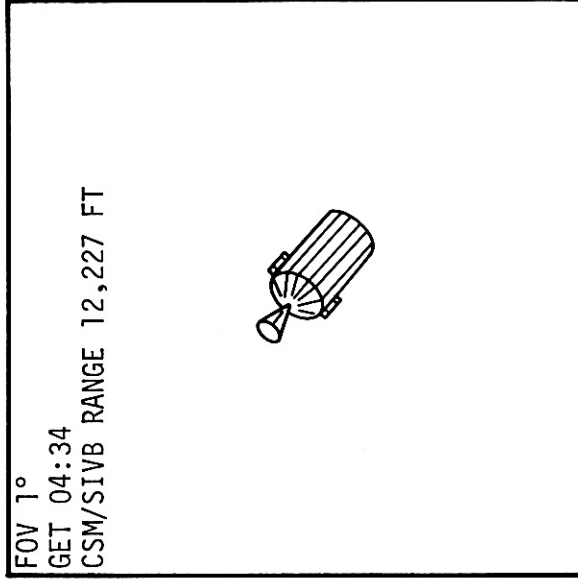
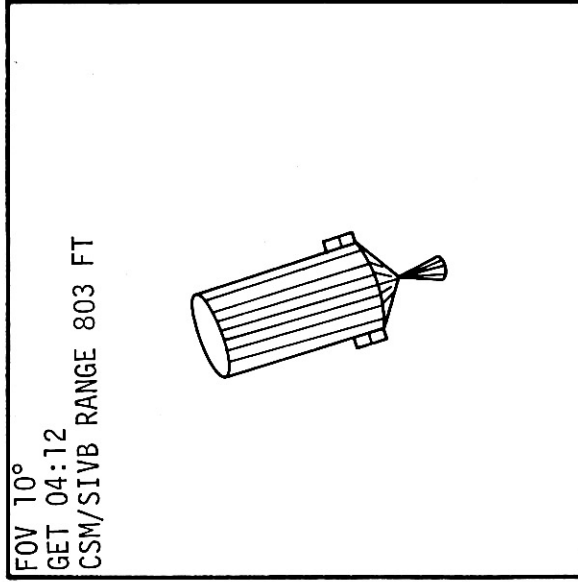
CAMERA SETTINGS FOR
TRANSPPOSITION/DOCKING:
CM2/DAC/18/CEX-BRKT,
MIR(f8,250,7)12fps,
0.7 MAG (5 MIN) MAG A
CM/EL/80 CEX - SPOT
(f8,250,FOCUS)10,MAG L

CAMERA SETTINGS FOR
LM EJECTION:
CM 2/DAC/18/CEX - BRKT,
MIR (f8,250,7) 6 fps,
0.3 MAG (5 MIN) MAG A

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.

TIG: 04:01
BT: 3 SEC
 ΔV : 0.4 FPS
ULLAGE: N/A
ORBIT: N/A

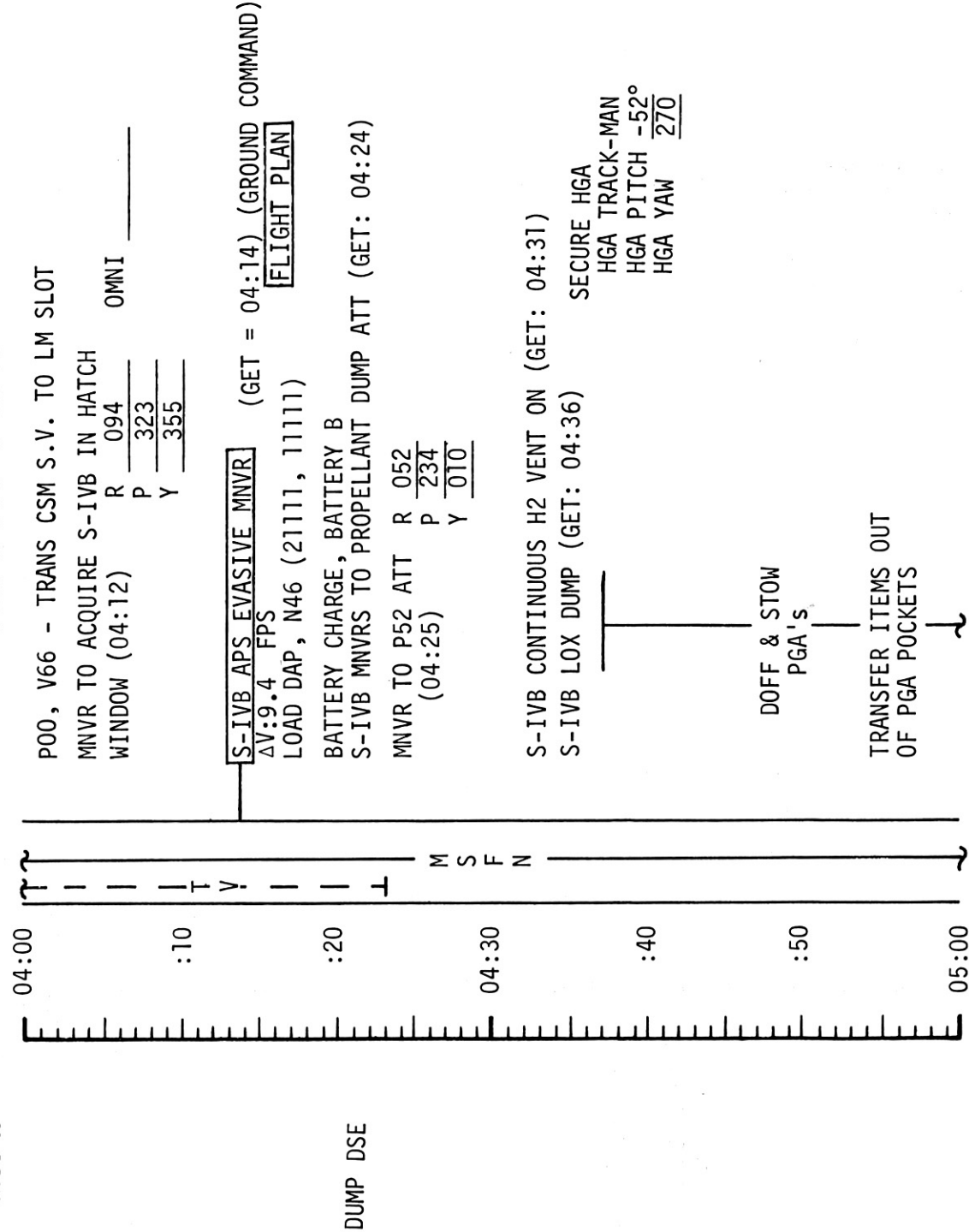
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	03:00 - 04:00	1/TLC	3-4



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 HGA IS REQUIRED ONLY FOR TD&E, TV TRANSMISSIONS AND MCC'S. THE ANTENNA WILL BE STOWED AT OTHER TIMES.

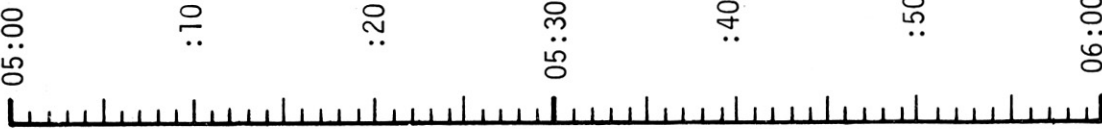
LOX DUMP ΔV
= 28.1 FPS

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



UPLINK TO CSM
DESIRED ORIENTATION
(PTC)
ZERO TRUNION BIAS

UPDATE TO CSM
P37 PAD (L/O+15)

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

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

STARS _____,
SA _____,
TA _____,

REPORT GYRO TORQUING ANGLES

GDC ALIGN

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

P52 IMU REALIGN	
N71:	____
N05:	____
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

FLIGHT PLAN

NOTES



MNVR TO OPTICS CALIBRATION ATT
LOAD DAP, N46 (21101, 11111)
P23 - CISELUNAR NAVIGATION
OPTICS CALIBRATION STAR 4 0
P00
V49 - MNVR TO SIGHTING ATT
STAR/EARTH HORIZON
P23 - CISELUNAR NAVIGATION
LOAD W MATRIX (R1 + 8 0 0 0 0)(R2 + 0 0 0 7 0)

R 147 OMNI
P 340
Y 0
R 159 OMNI
P 297
Y 0

S-IVB APS MCC-1
GET: 06:00
ΔV ~3 FPS

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

1. STAR 33 EFH (R3 00120) ANTARES

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

3. STAR 76 EFH (R3 00120) THETA SCORPII
N88: (R1 -03957)(R2 -36365)(R3 -34088)

4. STAR 40 ENH (R3 00110) ALTAIR

5. STAR 42 ENH (R3 00110) PEACOCK

O₂ FUEL CELL PURGE }
WASTE WATER DUMP } IF NO MCC-1

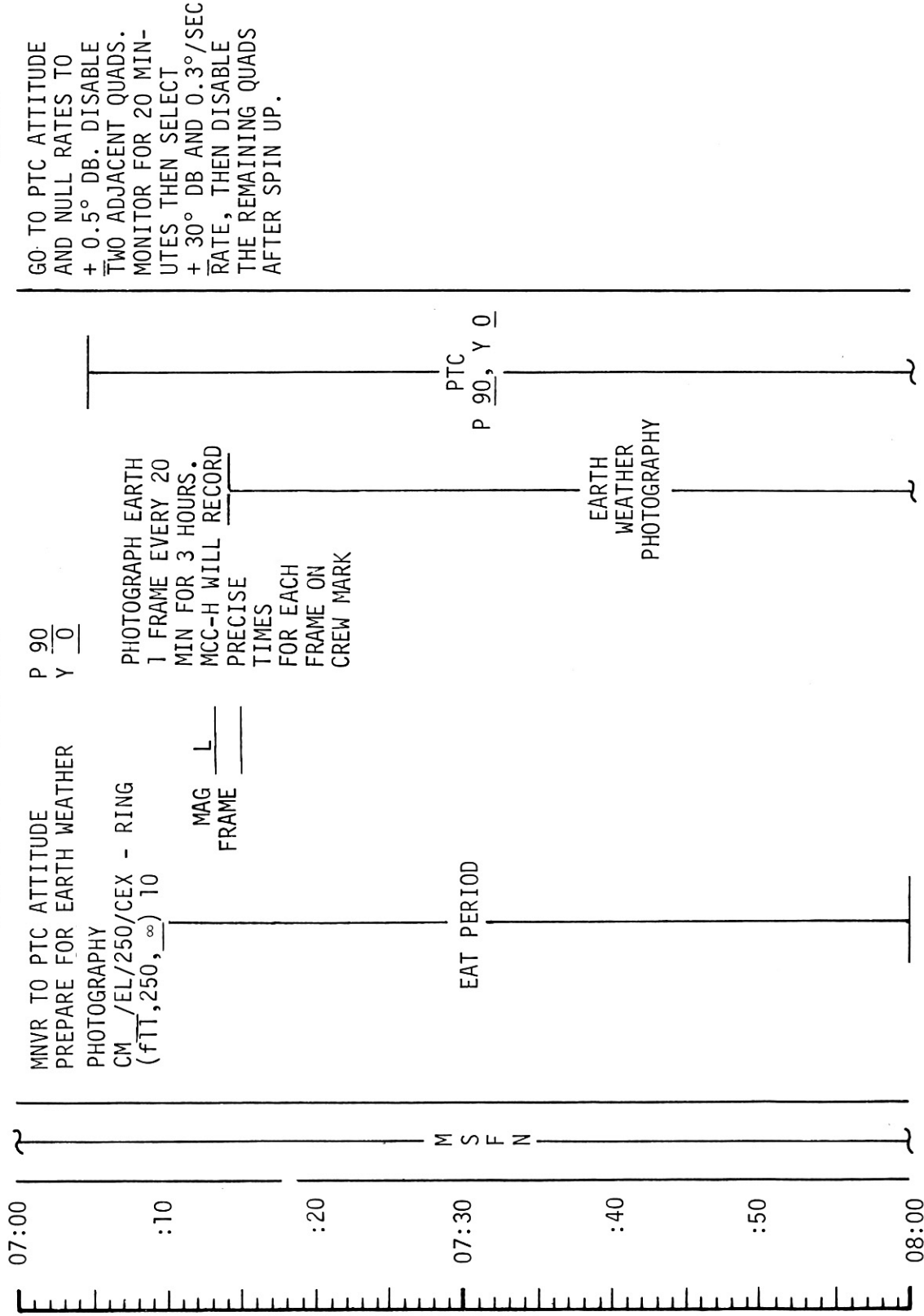
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	06:00 - 07:00	1/TLC	3-7

FLIGHT PLAN

MCC-H

2013 CST

NOTES



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

MCC-H

2113 CST

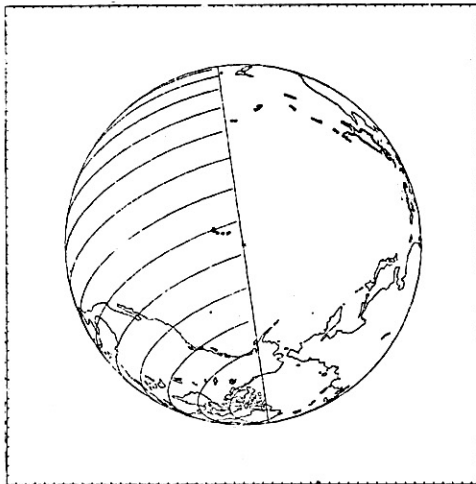
FLIGHT PLAN

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

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

GET 8 HRS F.O.V. 11°



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

PTC
P 90, Y 0

EARTH
WEATHER
PHOTOGRAPHY

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

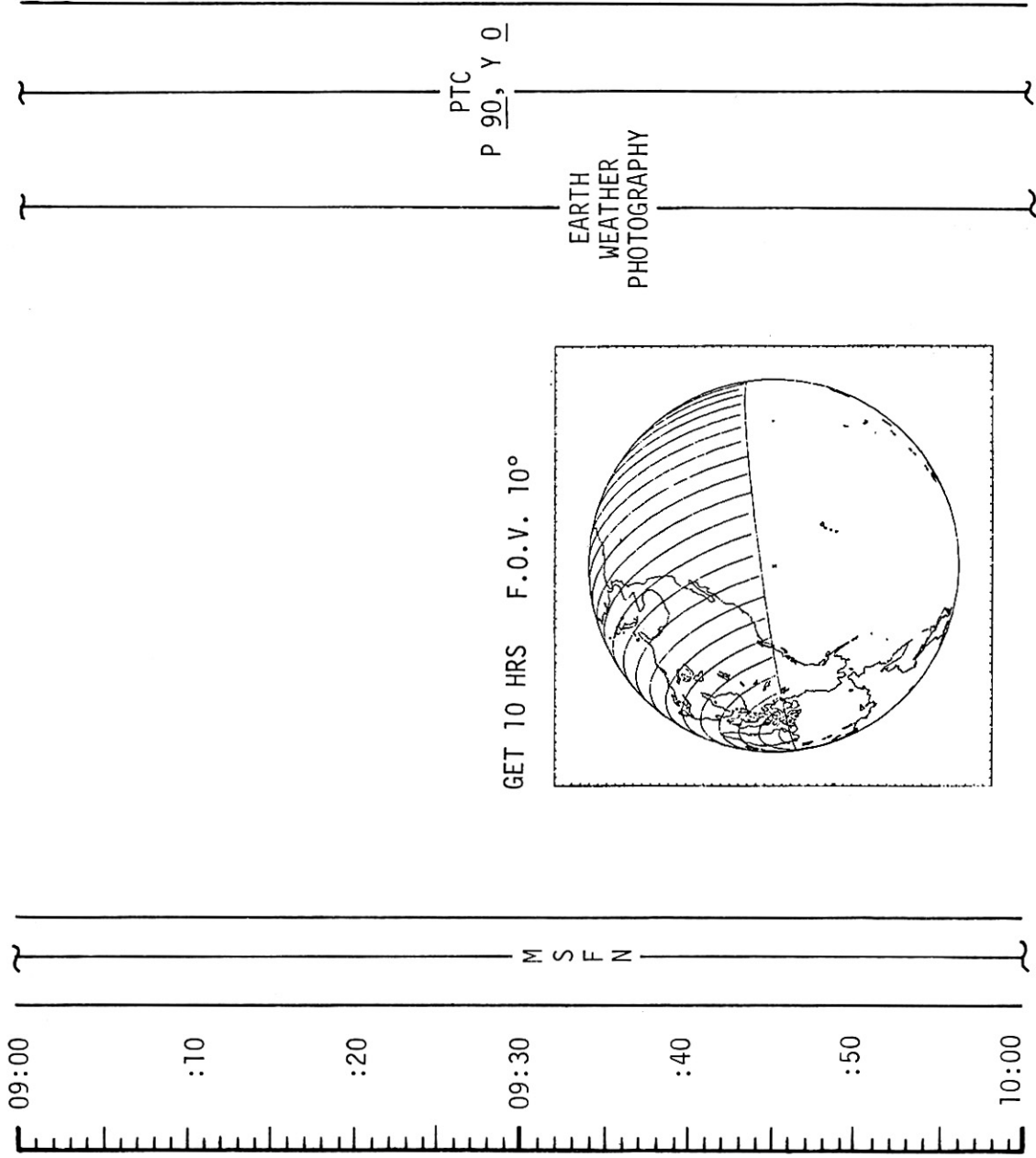
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	08:00 - 09:00	1/TLC	3-9

2213 CST

MCC-H

FLIGHT PLAN

NOTES



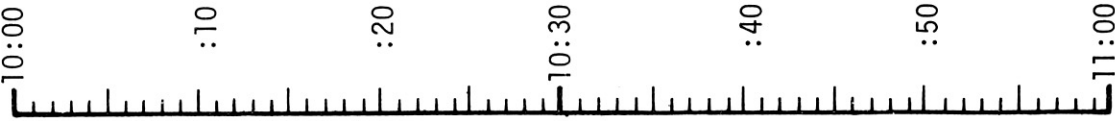
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	09:00 - 10:00	1/TLC	3-10

FLIGHT PLAN

NOTES

2313 CST

MCC-H



EMS ACCEL NULL BIAS TEST (REPORT)

EARTH
WEATHER
PHOTOGRAPHY

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

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

PTC

P 90, Y 0

10:30

M S F N

UPDATE TO CSM
MCC-1 MNVR PAD

:40

P52 - IMU REALIGN
OPTION 3 REFSMMAT
(PTC ORIENT)

:50

REPORT GYRO TORQUING ANGLES

CONTINUE PTC IF MCC-1 IS NOT PERFORMED

11:00

P52 IMU REALIGN

N71: ---

N05: ---

N93: ---

X ---

Y ---

Z ---

GET ---

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

FLIGHT PLAN

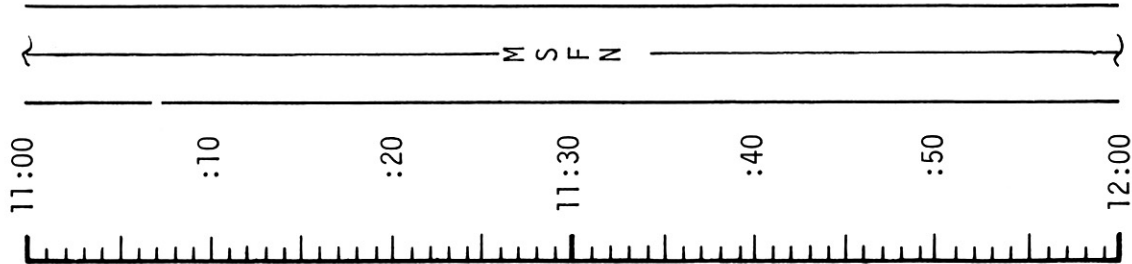
MCC-1
BURN TABLE

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

0013 CST

FLIGHT PLAN



P30 - EXTERNAL ΔV

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

O₂ FUEL CELL PURGE } IF NOT PERFORMED
WASTE WATER DUMP } AT 06:55

GDC ALIGN

EARTH WEATHER
PHOTOGRAPHY

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

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

NOTES

BURN STATUS REPORT													
X	X												ΔTIG
X	X												BT
													Vgx
X	X												R
X	X												P
X	X												Y
													Vgx
													Vgx
													Vgx
													ΔV_c
													FUEL *
X	X												OX *
X	X												UNBAL

*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

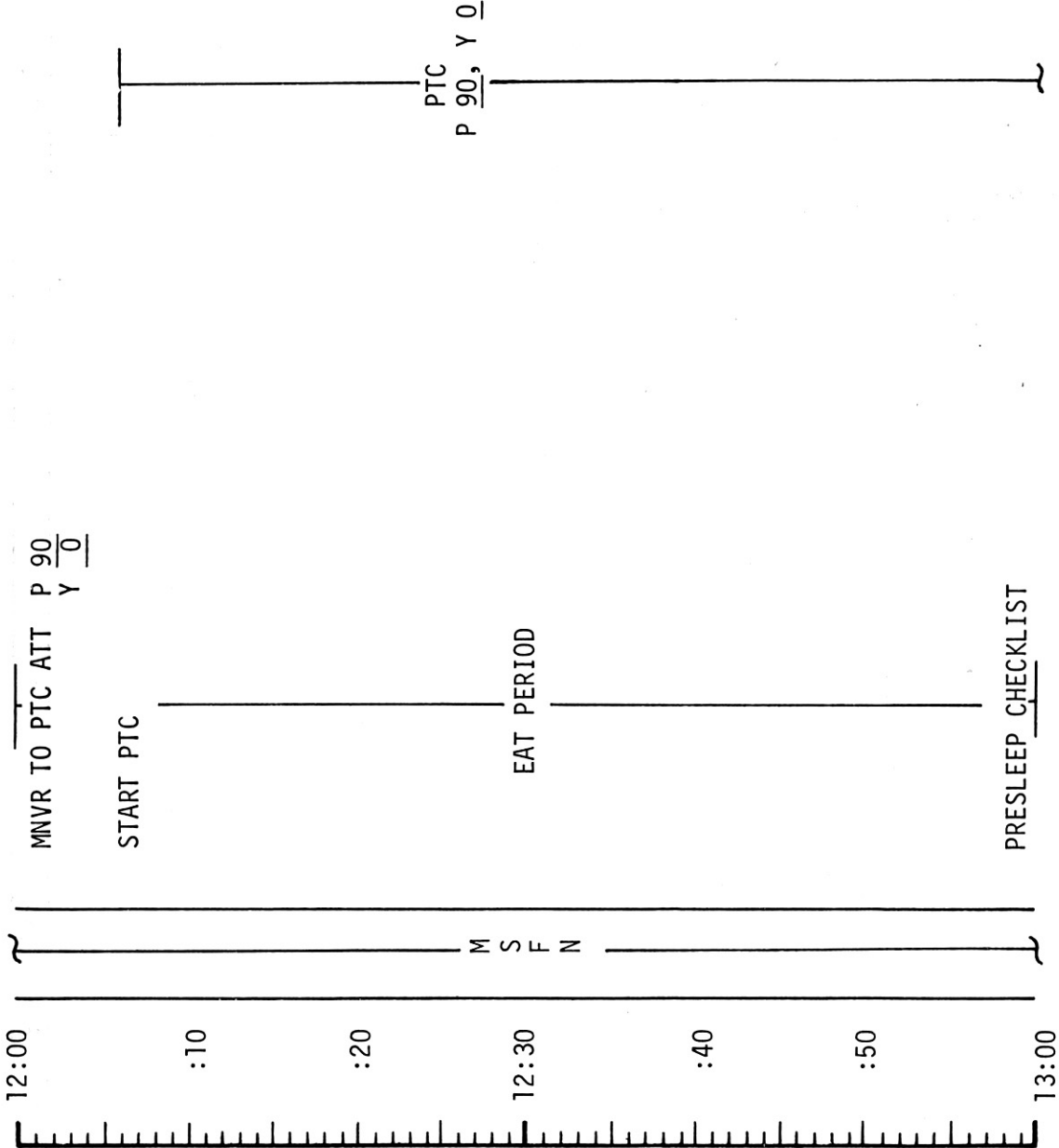
NOTES

0113 CST

MCC-H

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

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



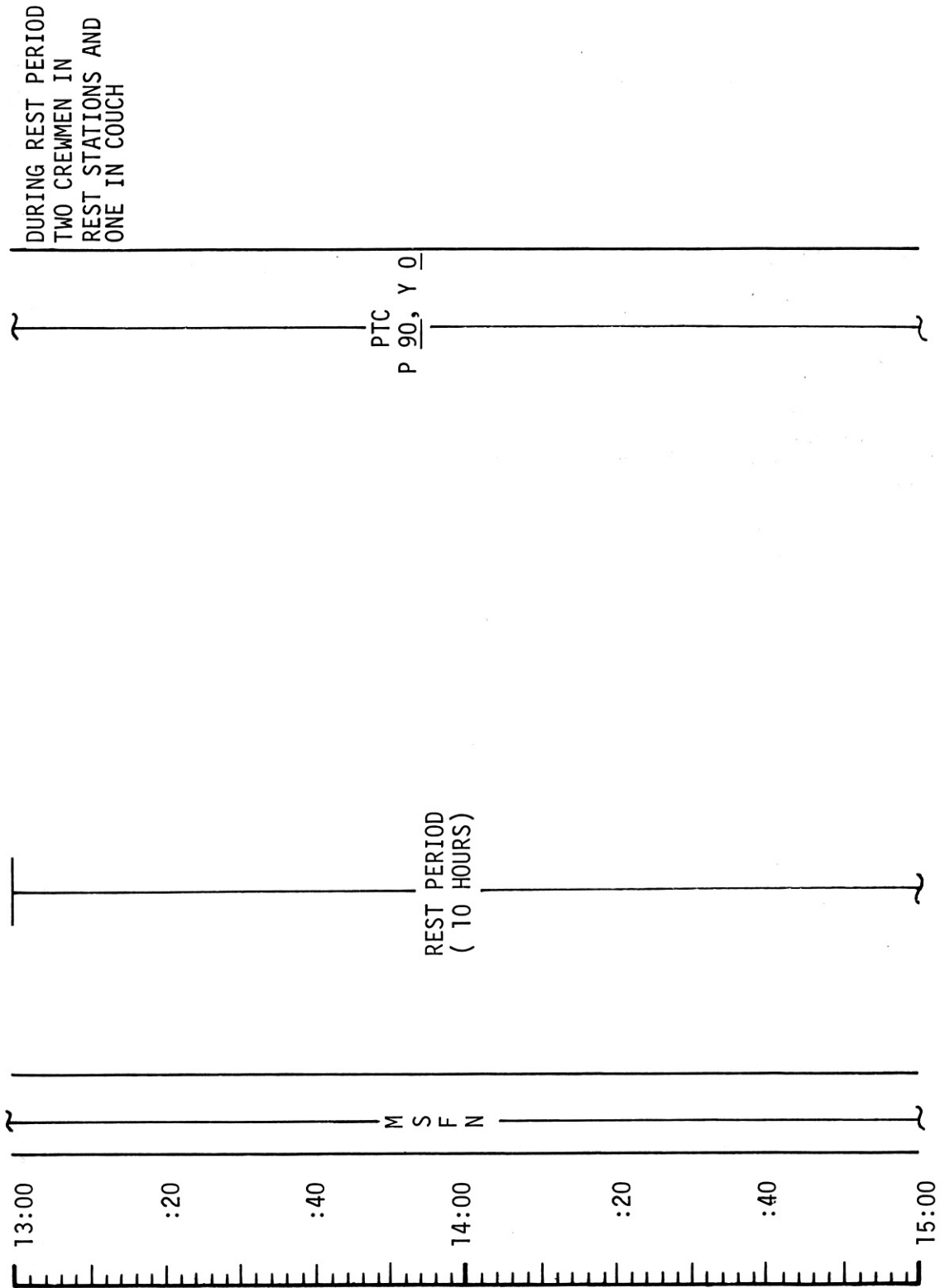
ONBOARD READOUT	
BAT C	
PYRO BAT A	
PYRO BAT B	
RCS A	
B	
C	
D	
DC IND SEL - MNA OR B	

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

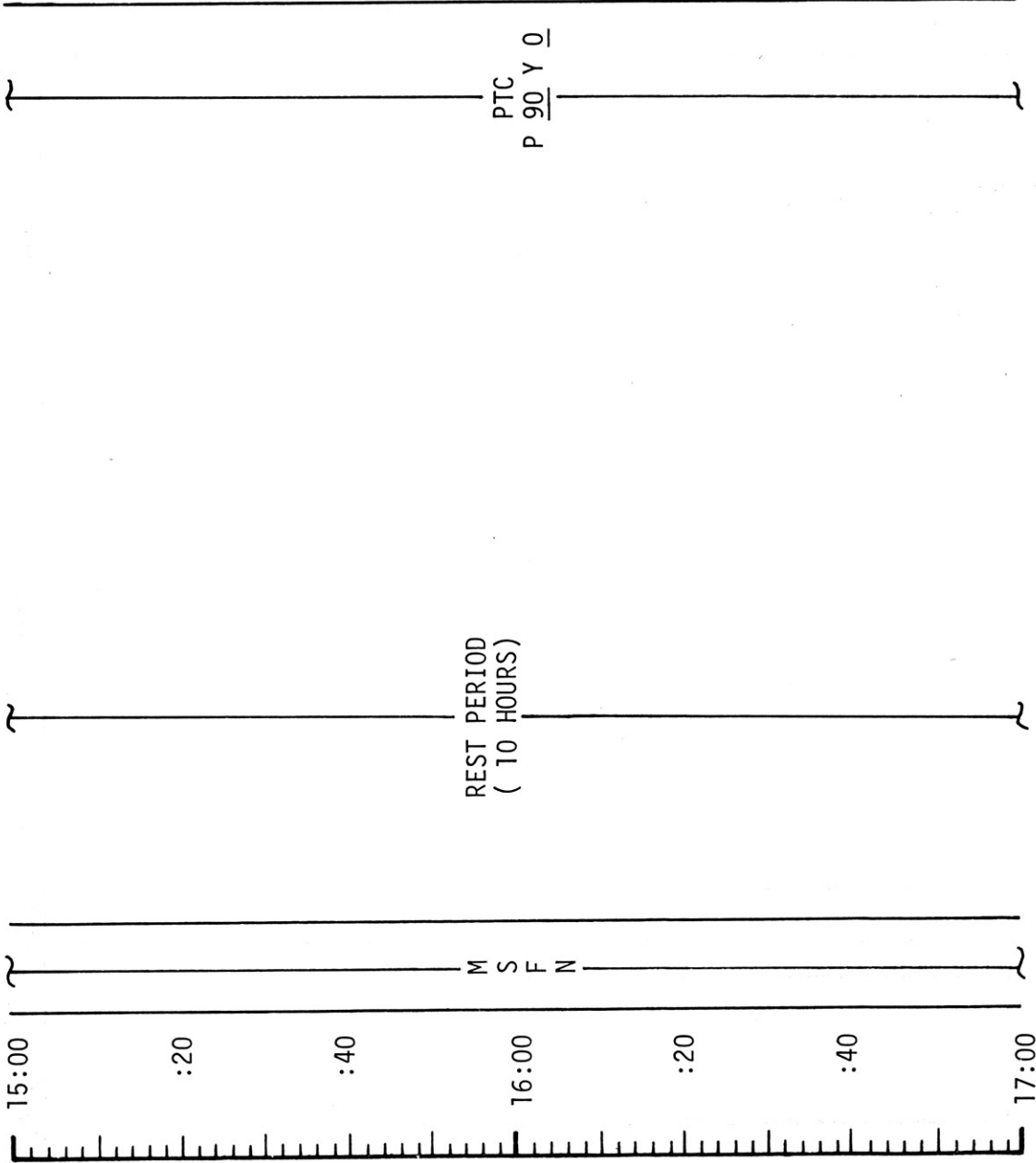
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	13:00 - 15:00	1/TLC	3-14

FLIGHT PLAN

NOTES

0413 CST

MCC-H



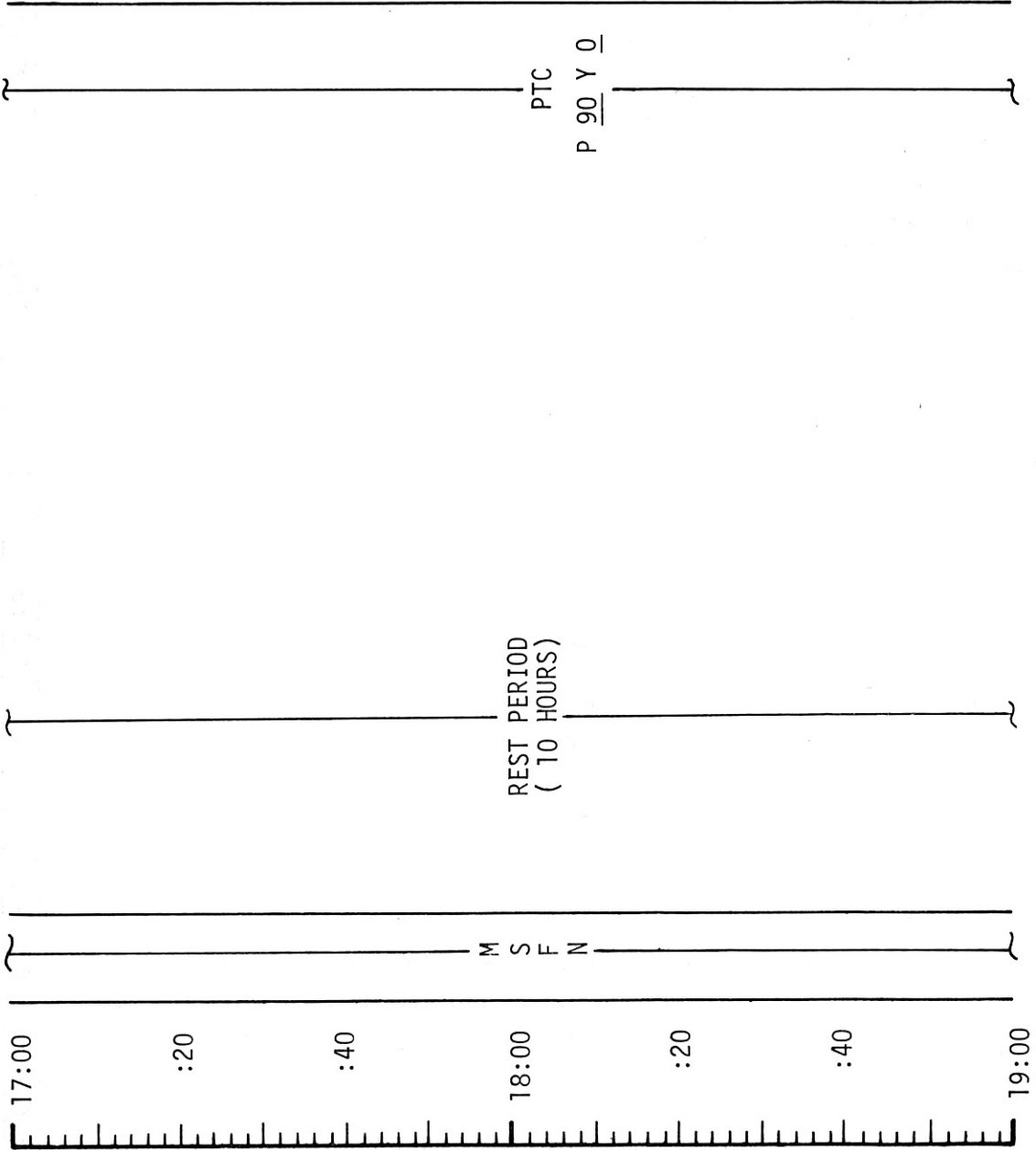
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	15:00 - 17:00	1/TLC	3-15

MCC-H

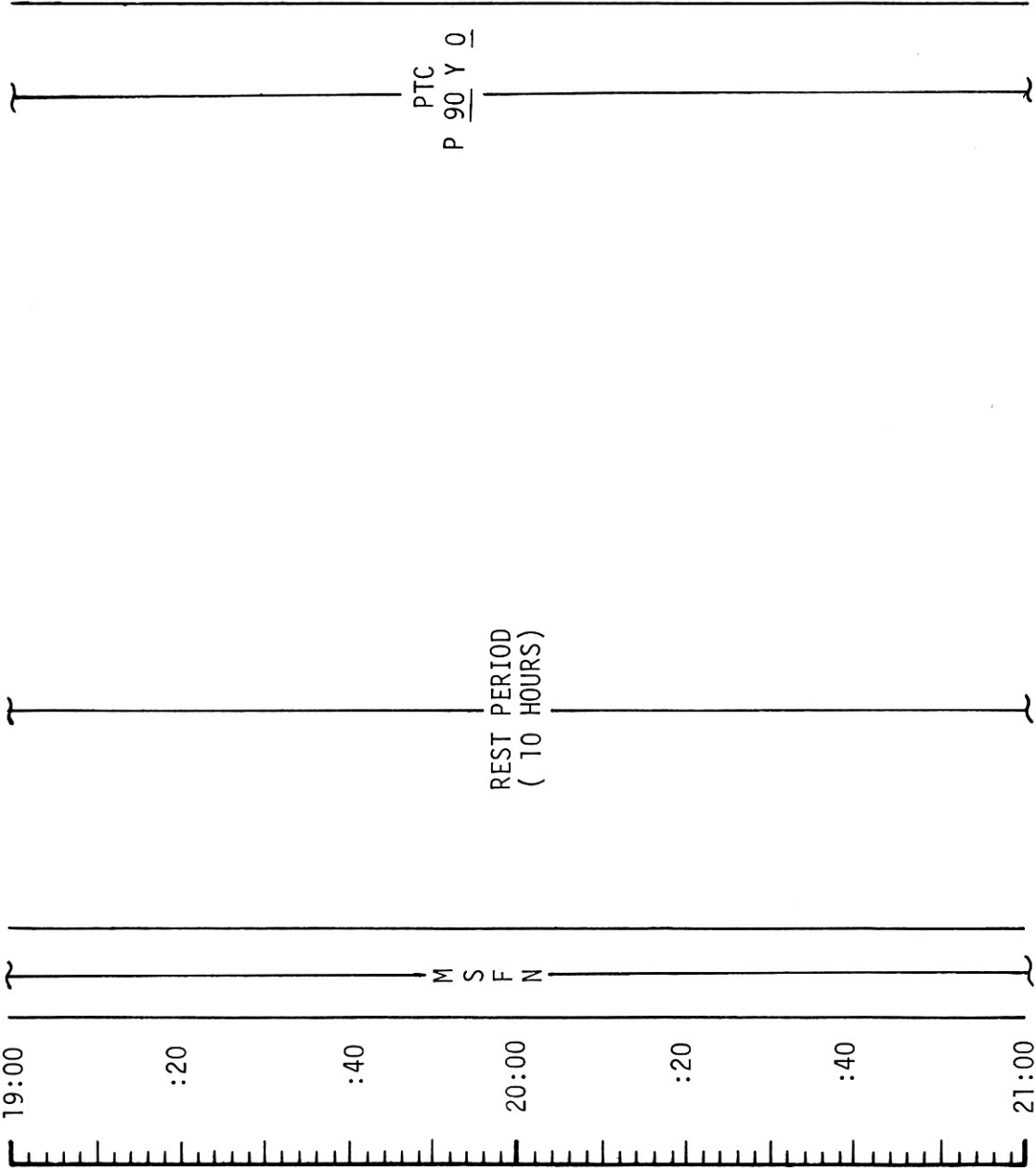
0613 CST

FLIGHT PLAN

NOTES



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



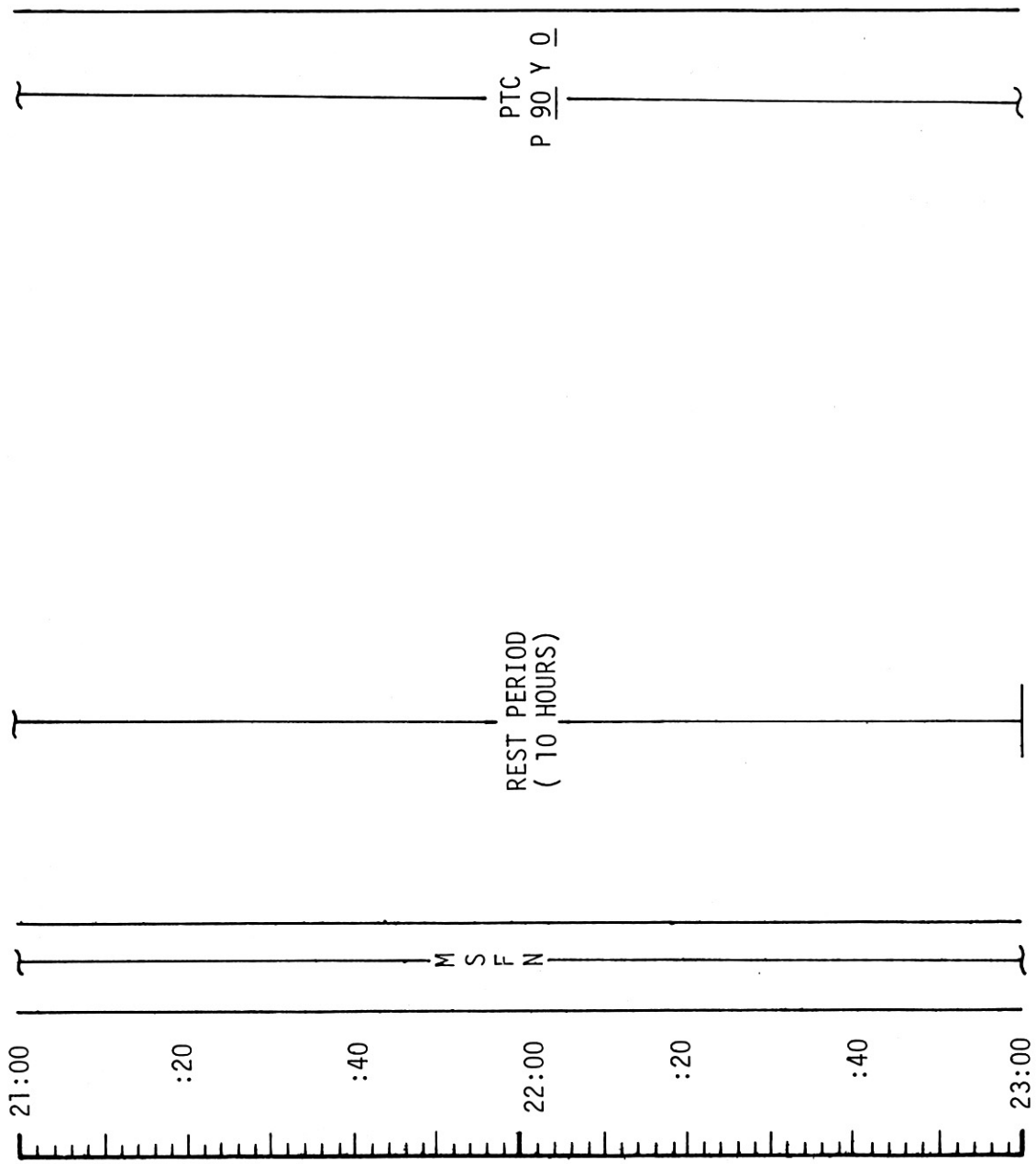
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	19:00 - 21:00	1/TLC	3-17

FLIGHT PLAN

MCC-H

1013 CST

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

MCC-H

UPDATE TO CSM
CONSUMABLES
FLIGHT PLAN

FLIGHT PLAN

POSTSLEEP CHECKLIST

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

BATTERY CHARGE, BATTERY A

EAT PERIOD

REPORT LM/CM ΔP

M S F N

PTC

P 90, Y 0

NOTES

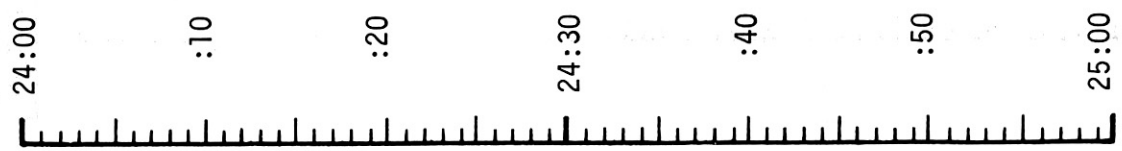
CSM CONSUMABLES UPDATE	
GET: _____	: _____
RCS TOTAL _____	
QUAD A _____	B _____
C _____	D _____
H ₂ TOTAL _____	
O ₂ TOTAL _____	

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

FLIGHT PLAN

1313 CST

MCC-H

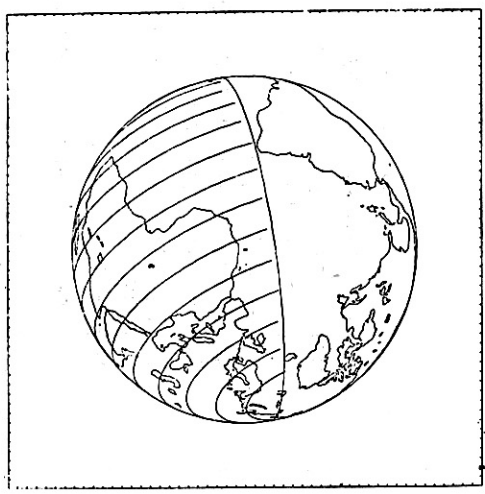


P52 IMU REALIGN
OPTION 3 REFSMMAT
(PTC ORIENT)

REPORT GYRO TORQUING ANGLES

GDC ALIGN

GET 25 HRS F.O.V. 5°



PTC
P 90, Y 0

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/TLC	3-20

1413 CST

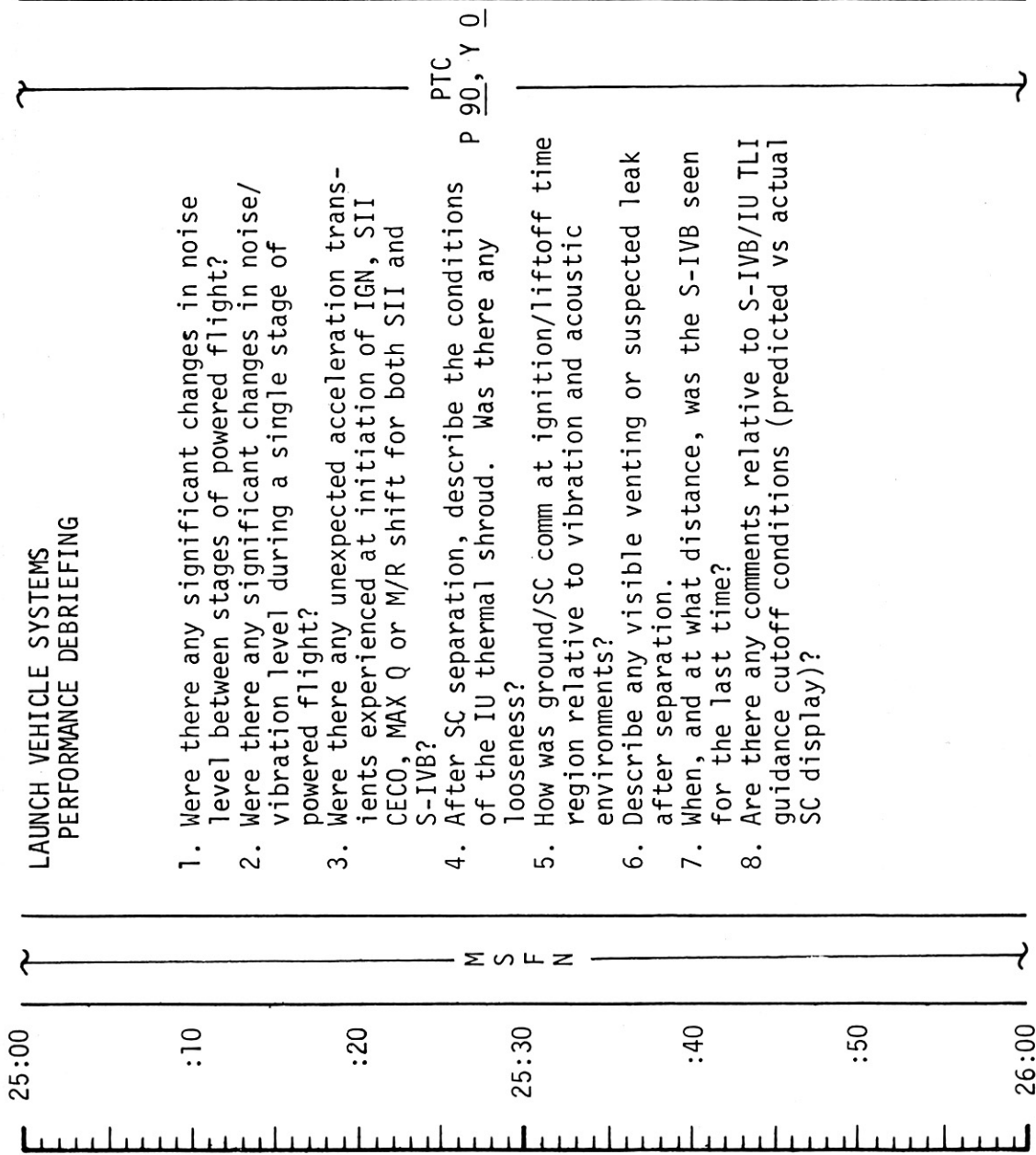
FLIGHT PLAN

NOTES

MCC-H

LAUNCH VEHICLE
DEBRIEFING

LAUNCH VEHICLE SYSTEMS
PERFORMANCE DEBRIEFING



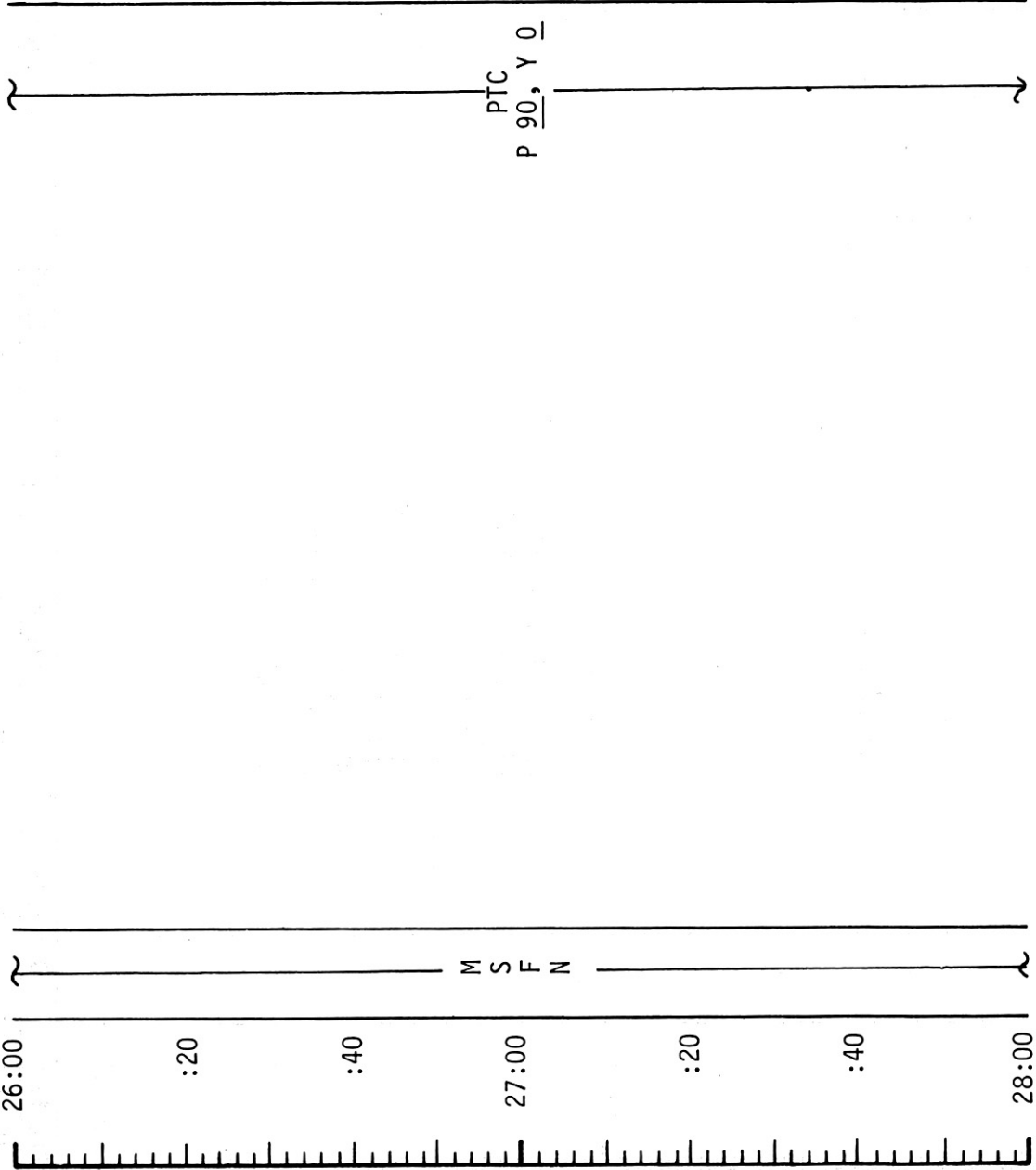
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	25:00 - 26:00	2/TLC	3-21

FLIGHT PLAN

MCC-H

1513 CST

NOTES



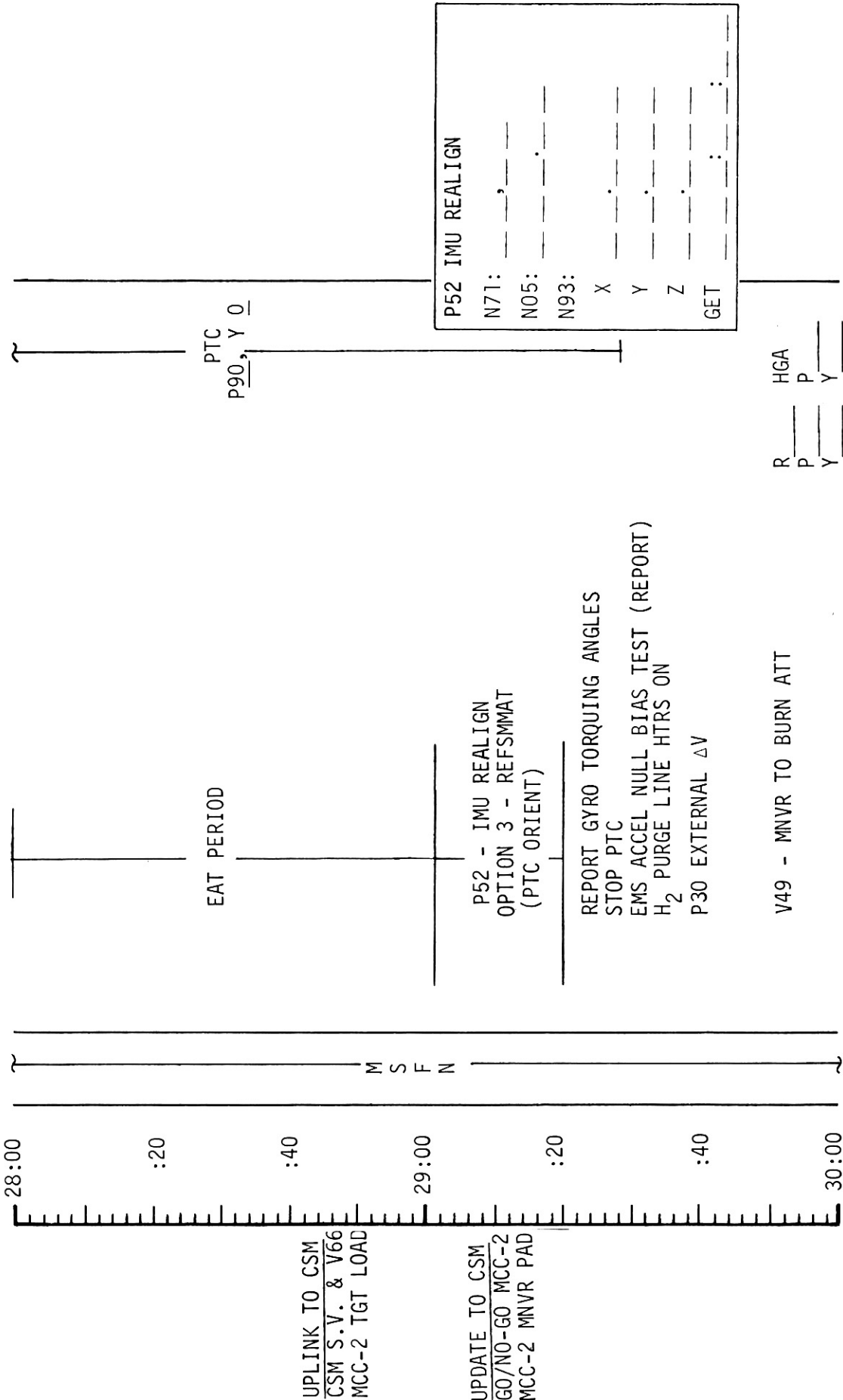
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	26:00 - 28:00	2/TLC	3-22

MCC-H

1713 CST

FLIGHT PLAN

NOTES



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

P40 - SPS THRUST
SXT STAR CHECK

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

H₂ & O₂ FUEL CELL PURGE
WASTE WATER DUMP
H₂ PURGE LINE HEATERS - OFF

GDC ALIGN

NOTE: MCC-2 WILL
BE ACCOMPLISHED
ON BANK A ONLY

TLI CUTOFF
+ 28 HRS

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

V66 - TRANSFER CSM SV TO LM SLOT
MCC-2 BURN STATUS REPORT

*ITEMS TO BE
REPORTED TO MSFN

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

NOTES

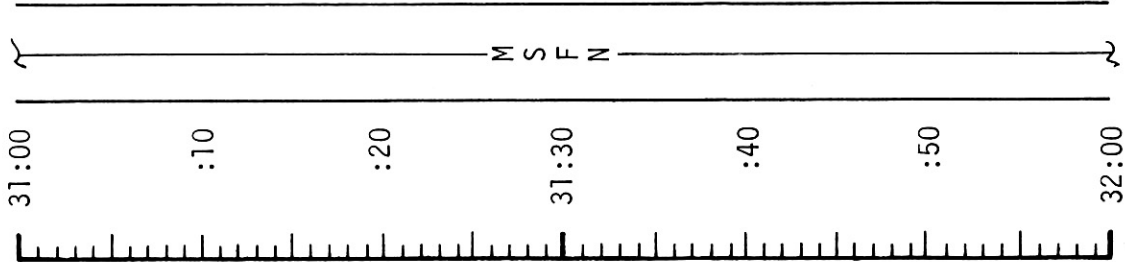
BURN STATUS REPORT	X	X			ΔTIG
	X	X			BT
					V gx
					R
					P
					Y
					V gx
					V gy
					V gz
					ΔV_c^*
					FUEL *
					OX *
					UNBAL

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

FLIGHT PLAN

NOTES

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



MNVR TO OPTICS CALIBRATION ATT R 147
P23-CISLUNAR NAVIGATION P 340
OPTICS CALIBRATION Y 0
STAR 4 0
P00
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 0) (R2 + 0 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°



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

MCC-H

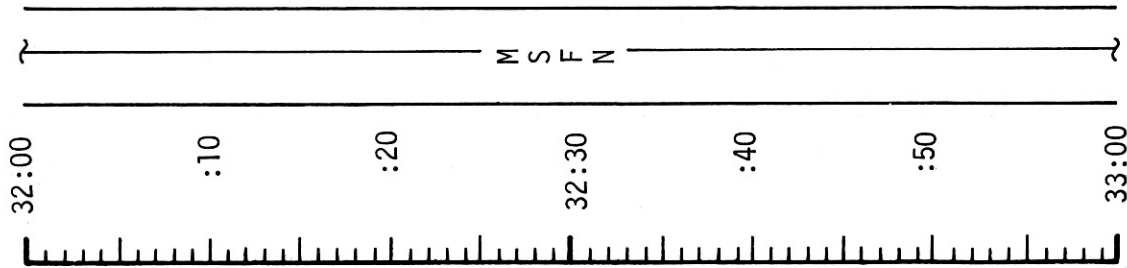
UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)

2113 CST

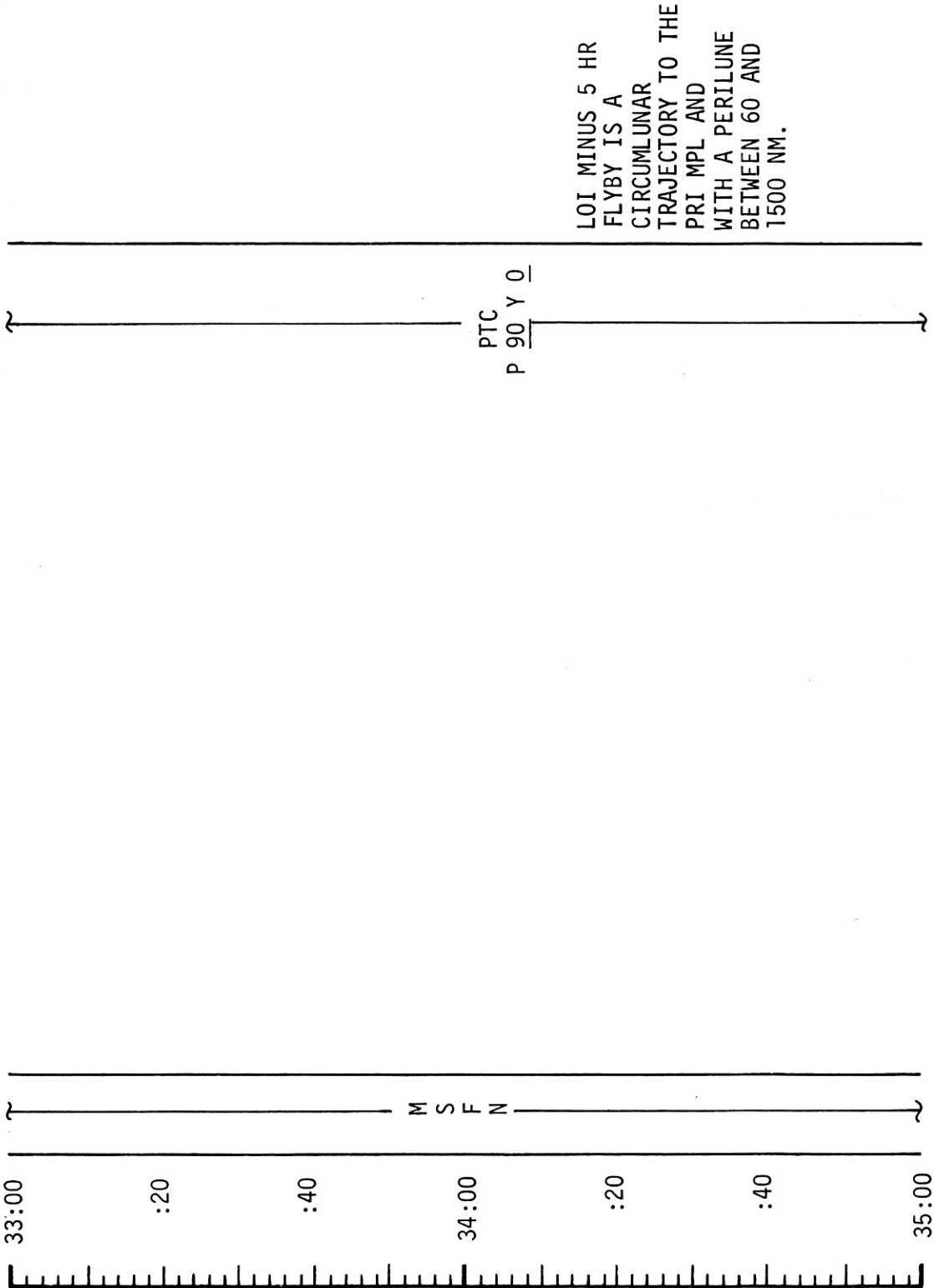
FLIGHT PLAN

NOTES

MANEUVER TO PTC ATTITUDE P 90
START PTC Y 0
S-BAND ANT - OMNI B ON MCC CUE
SECURE HGA
HGA TRACK - MAN
HGA PITCH -52°
HGA YAW 270°
CHECK BAT VENT (TEST METER 4A)



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



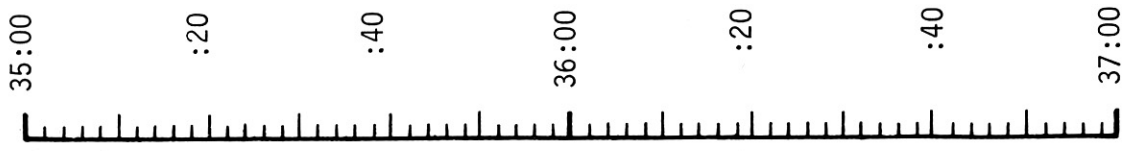
UPDATE TO CSM
LOI MINUS 5 HR
FLYBY

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



L10H CANISTER CHANGE
(5 INTO A, STOW 3 IN B5)

M S F N

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

UPLINK TO CSM
CSM S.V. & V66

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

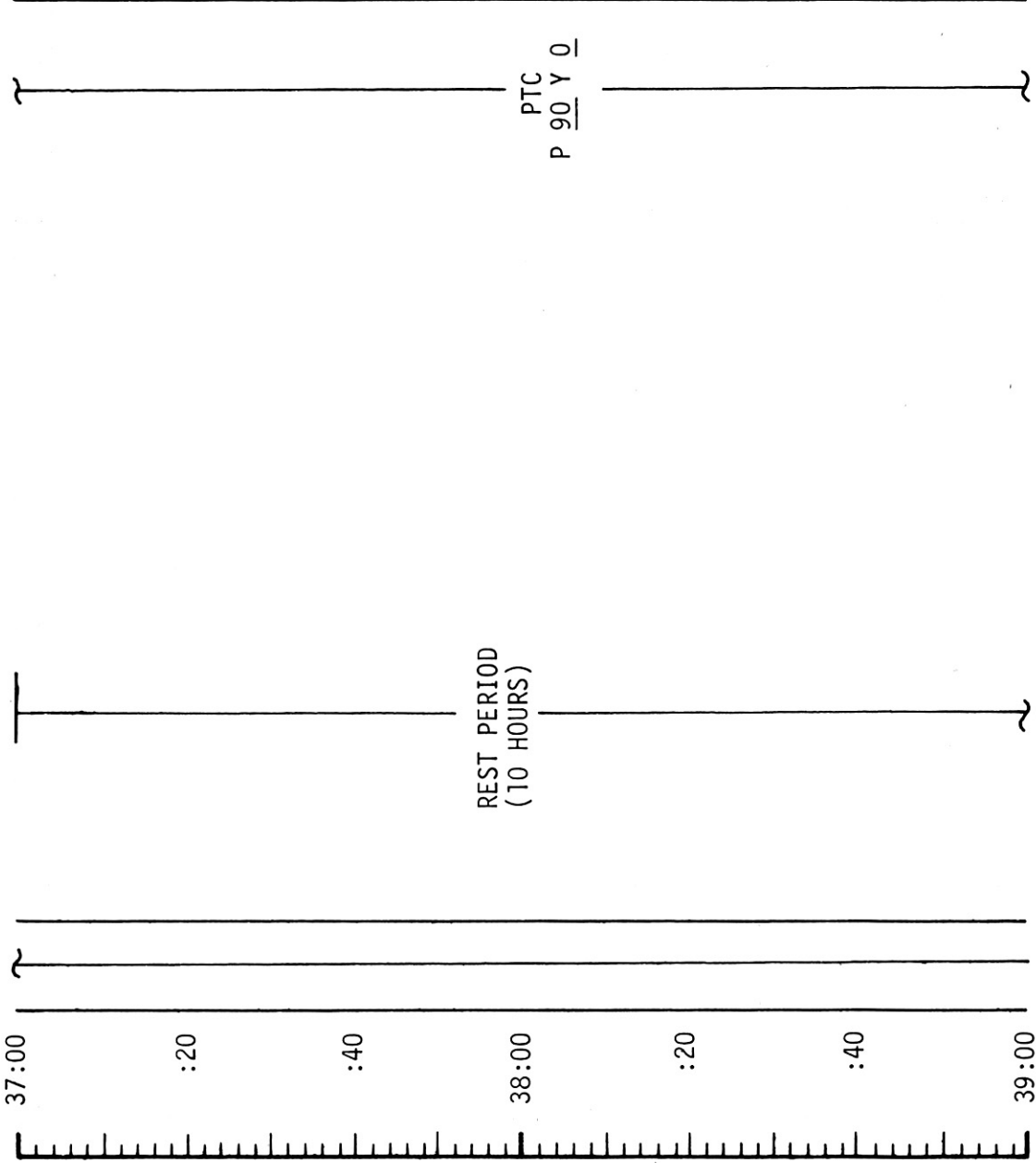
FLIGHT PLAN

0213 CST

MCC-H

NOTES

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



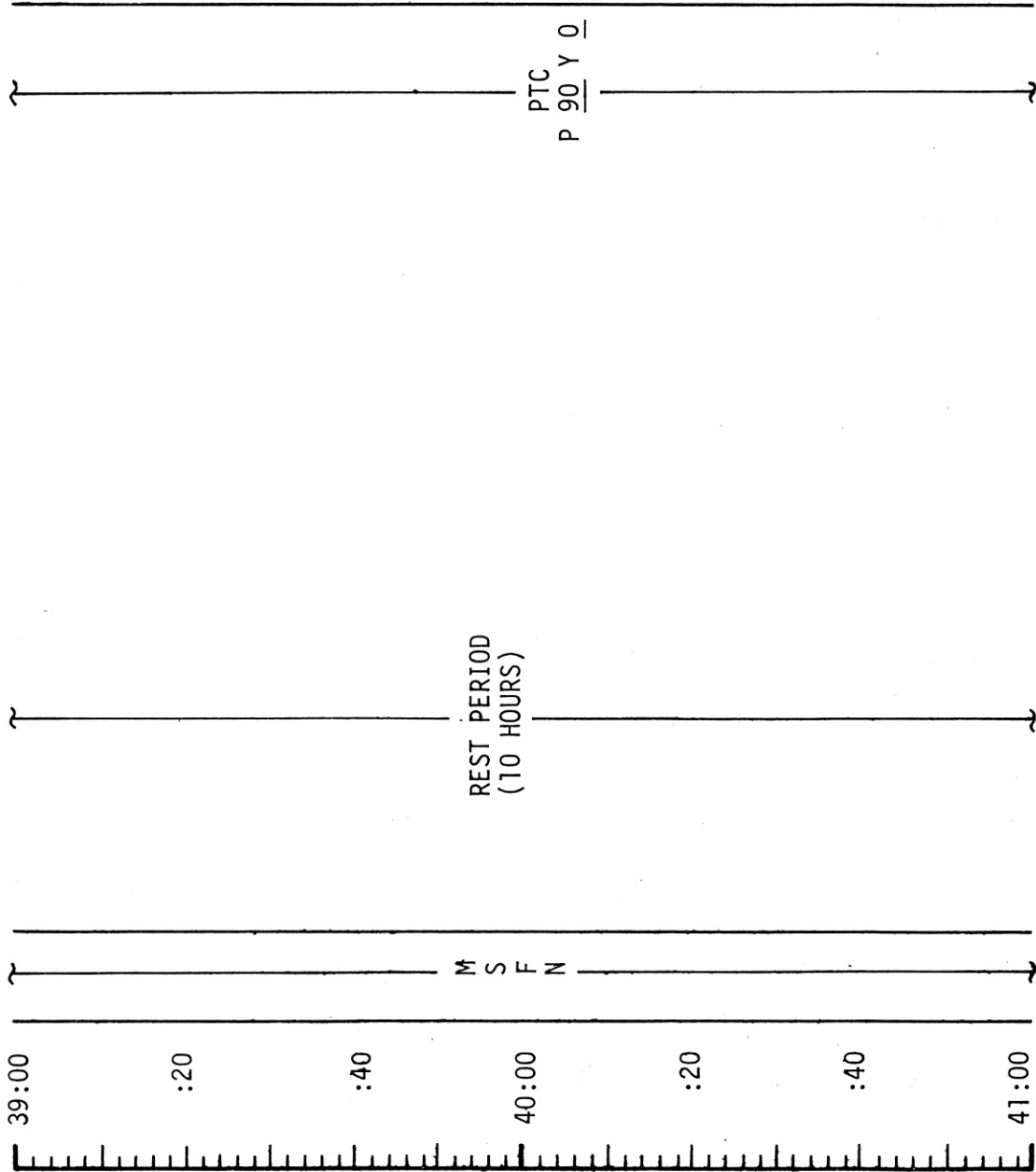
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	37:00 - 39:00	2/TLC	3-29

MCC-H

0413 CST

FLIGHT PLAN

NOTES

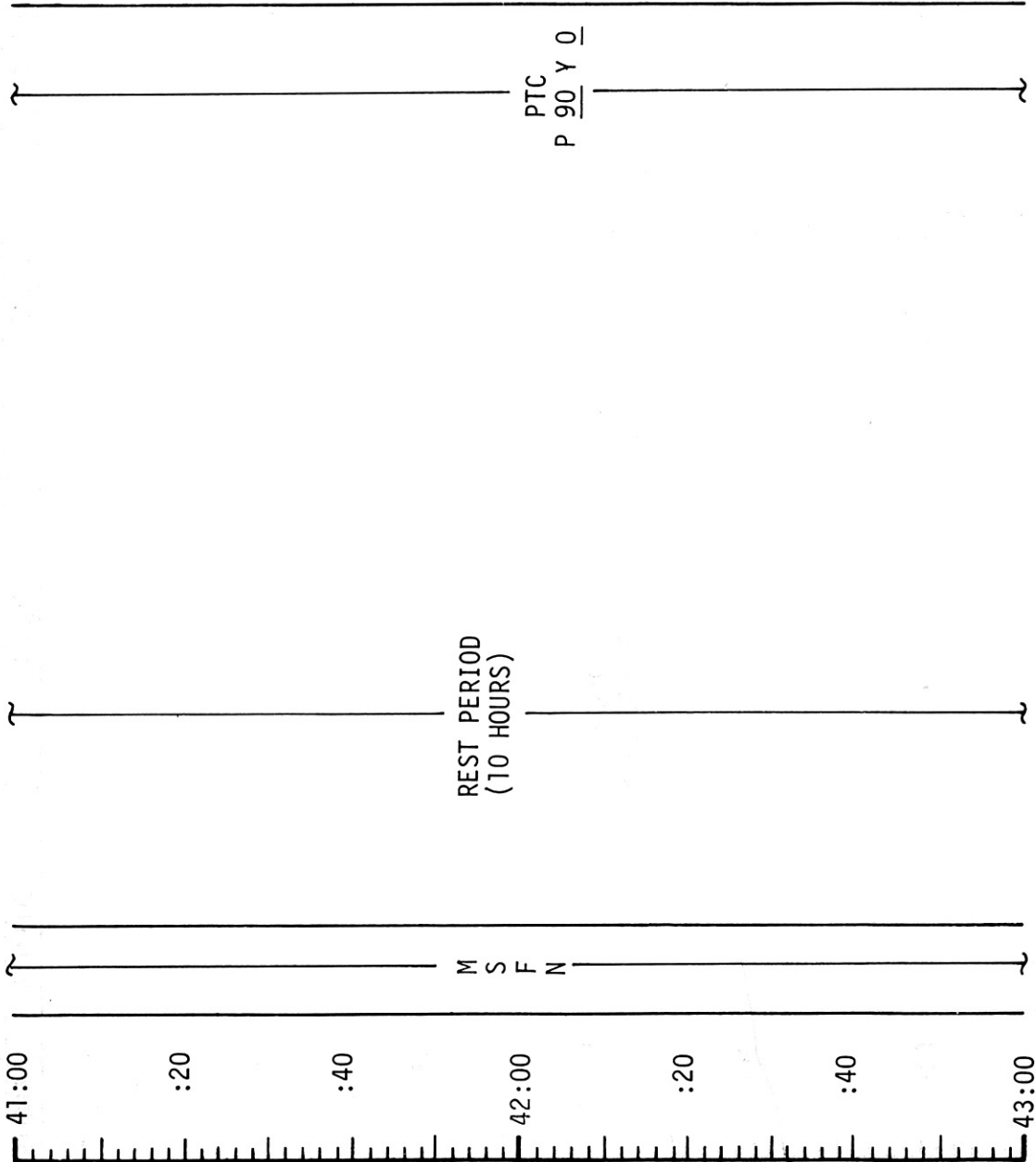


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	39:00 - 41:00	2/TLC	3-30

FLIGHT PLAN

NOTES

MCC-H 0613 CST



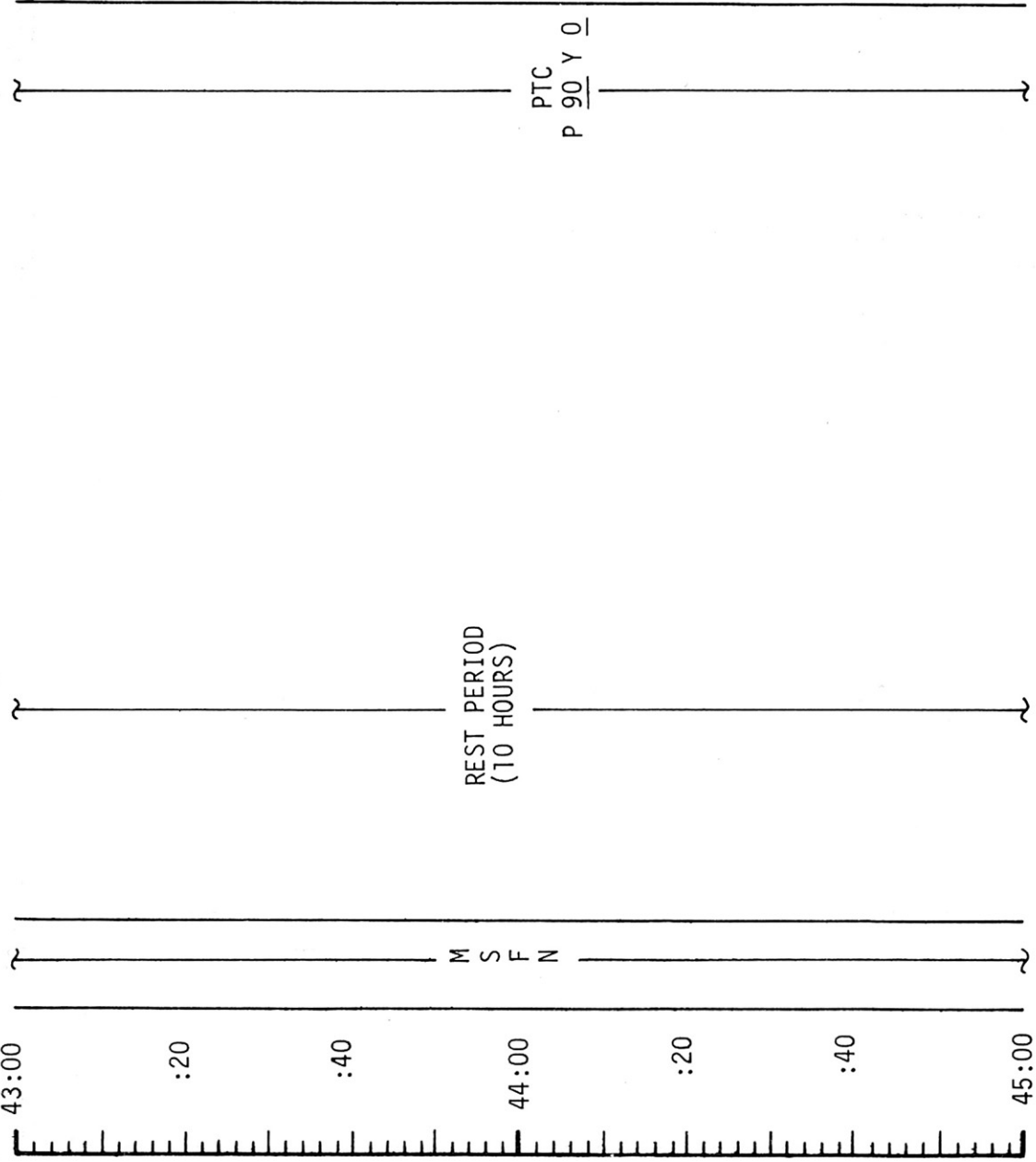
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	41:00 - 43:00	2/TLC	3-31

MCC-H

0813 CST

FLIGHT PLAN

NOTES



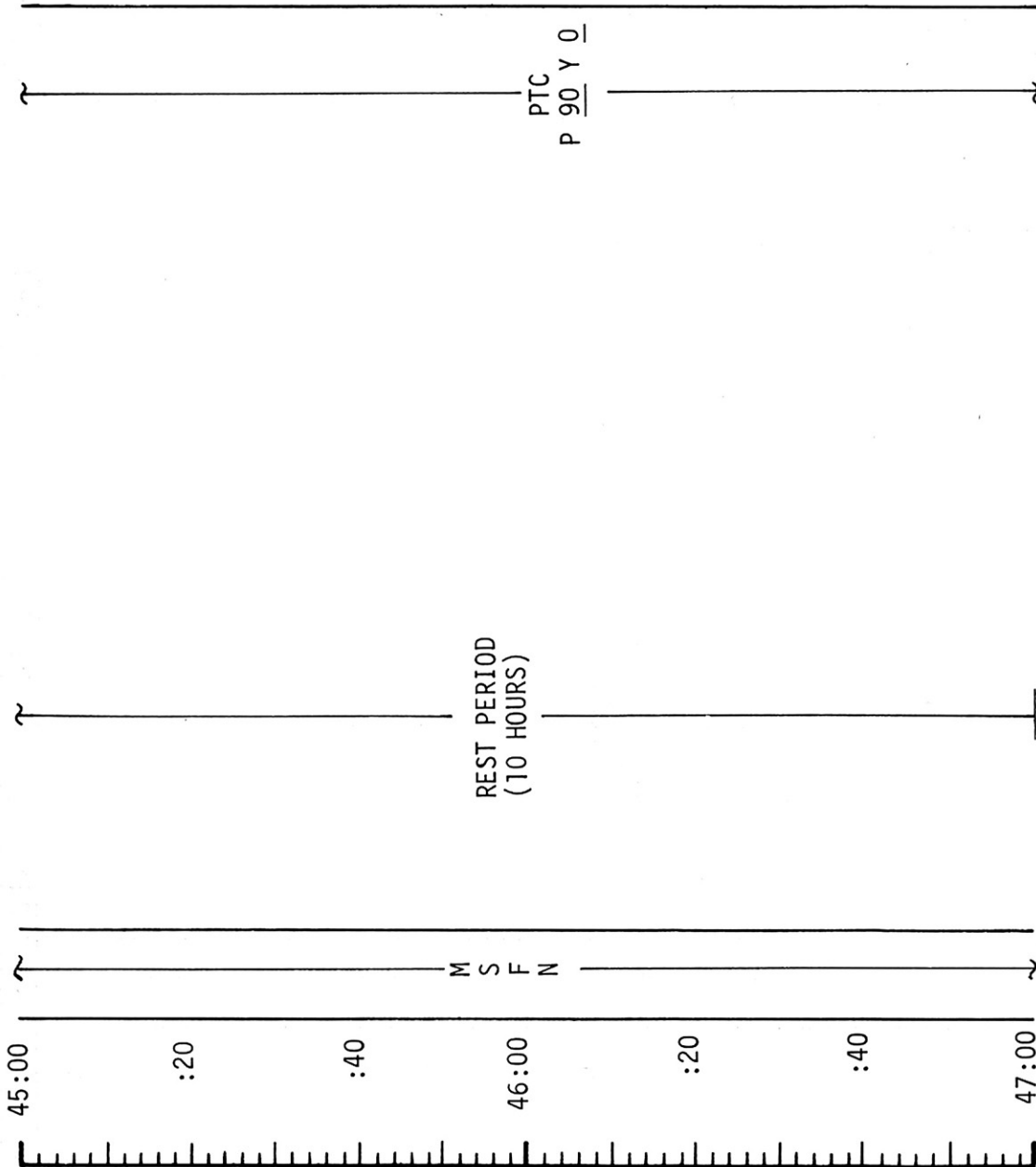
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	43:00 - 45:00	2/TLC	3-32

1013 CST

MCC-H

FLIGHT PLAN

NOTES

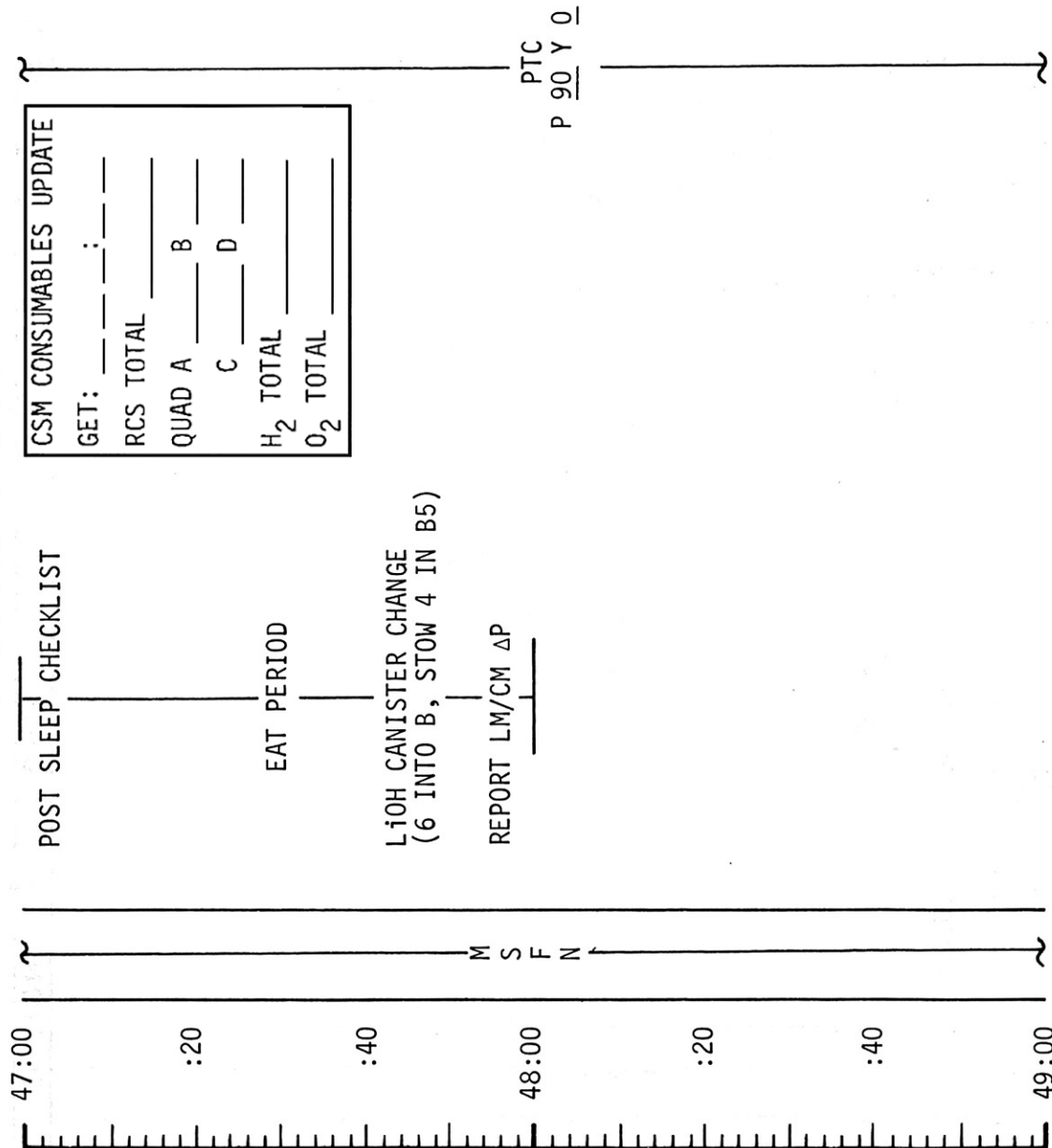


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	45:00 - 47:00	2/TLC	3-33

NOTES

FLIGHT PLAN

UPDATE TO CSM
CONSUMABLES
FLIGHT PLAN



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

FLIGHT PLAN

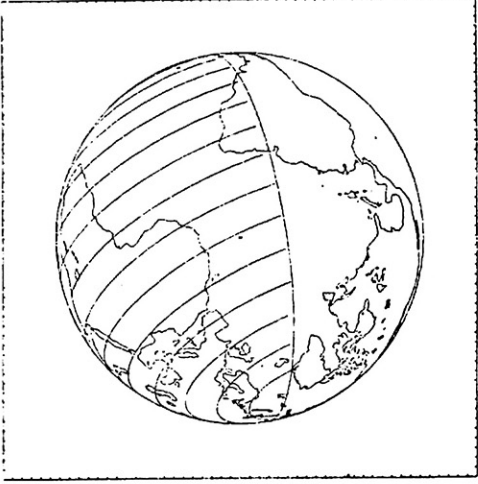
NOTES



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

REPORT GYRO TORQUING ANGLES

GET 50 HRS F.O.V. 3°



PTC
P 90 Y 0

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

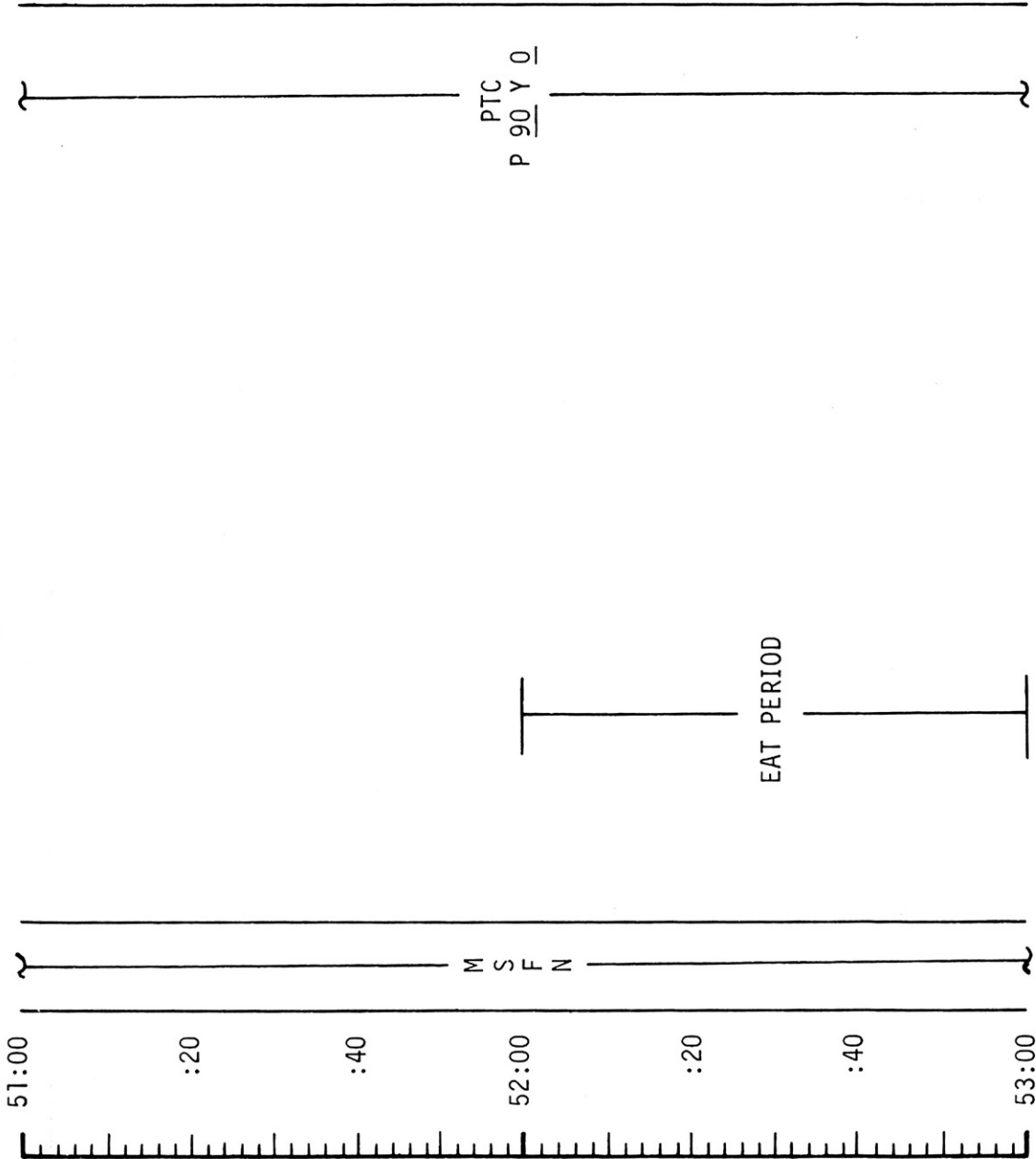
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	49:00 - 51:00	3/TLC	3-35

MCC-H

1613 CST

FLIGHT PLAN

NOTES



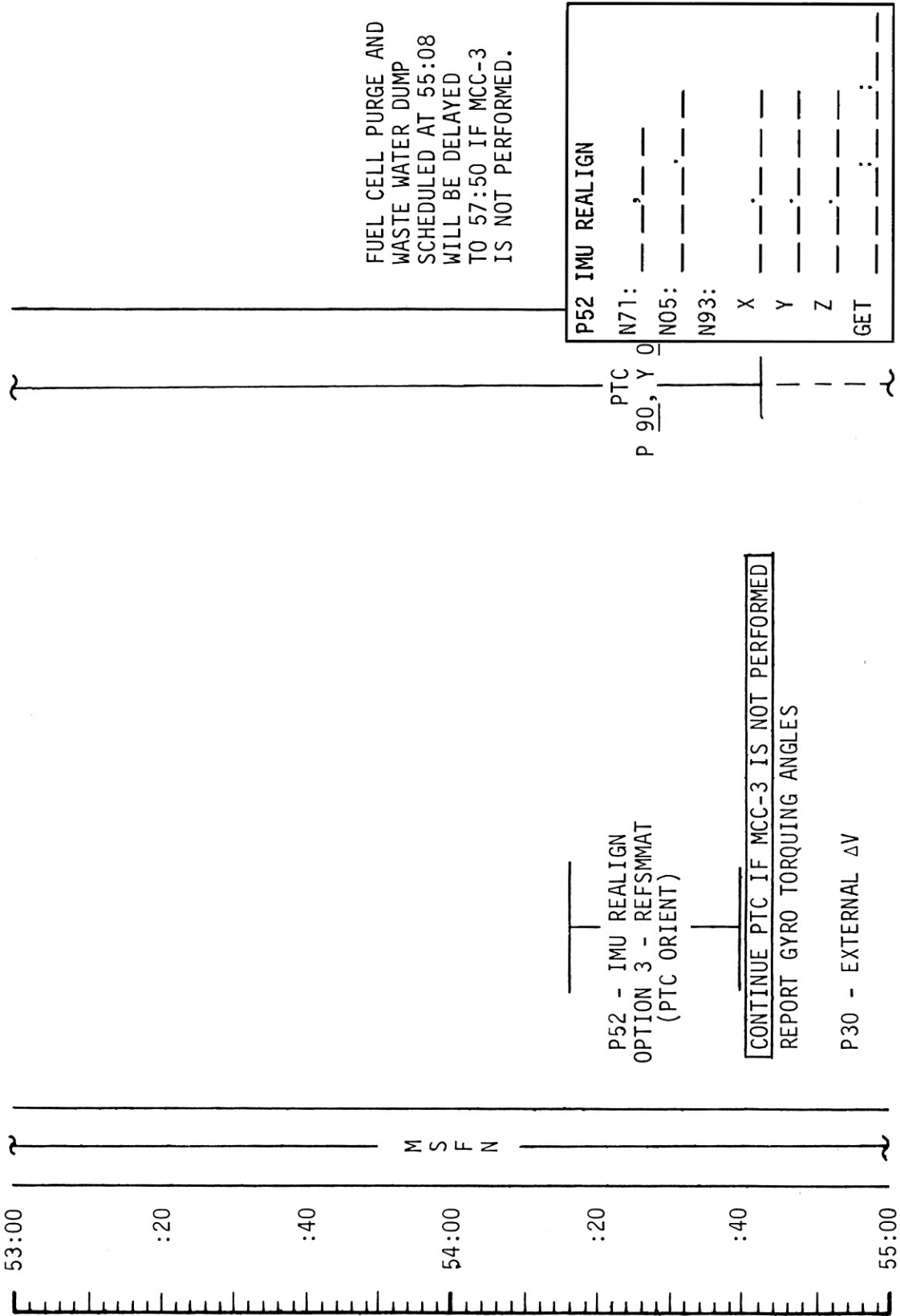
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	51:00 - 53:00	3/TLC	3-36

FLIGHT PLAN

MCC-H

1813 CST

NOTES



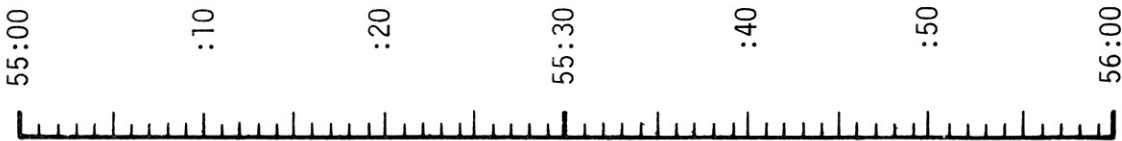
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	53:00 - 55:00	3/TLC	3-37

MCC-H

2013 CST

FLIGHT PLAN

NOTES



V49 - MNVR TO BURN ATT
P40/P41 - SPS/RCS THRUST
SXT STAR CHECK
O2 FUEL CELL PURGE
WASTE WATER DUMP

GDC ALIGN

MCC-3

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

BATTERY CHARGE, BATTERY B

START PTC

LM TUNL VENT VALVE - LM/CM ΔP
IF LM/CM ΔP < 1.7 psid - VENT
UNTIL ΔP ≥ 1.7

TIG: 55:24:53
BT: NOM. ZERO
ΔVR: NOM. ZERO
ULLAGE: NONE
ORBIT: N/A

PTC
P 90, Y 0

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

BURN STATUS REPORT									
X	X								ΔTIG
X	X								BT
									Vgx
									TRIM
X	X	X	X	X	X				R
X	X	X	X	X	X				P
X	X	X	X	X	X				Y
									Vgx
									Vgy
									Vgz
									ΔV _C
X	X	X	X	X	X				FUEL *
X	X	X	X	X	X				OX *
X	X	X	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

(LOI - 22 HRS)

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

FLIGHT PLAN

MCC-H

2113 CST

NOTES



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

M S F N

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

FLIGHT PLAN

2213 CST

MCC-H

UPLINK TO CSM
ΔH (IF REQUIRED)

NOTES

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

PRESSURIZE CSM TO 5.7 PSIA
PRESSURIZE LM

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

PTC
P 90, Y 0

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

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

LOAD DAP, N46 (21111, 11111)

O₂ FUEL CELL PURGE
& WASTE WATER DUMP
@ 57:50 IF NOT
PERFORMED AT 55:08

STOP PTC ROLL AT ___, HGA P ___ Y ___

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

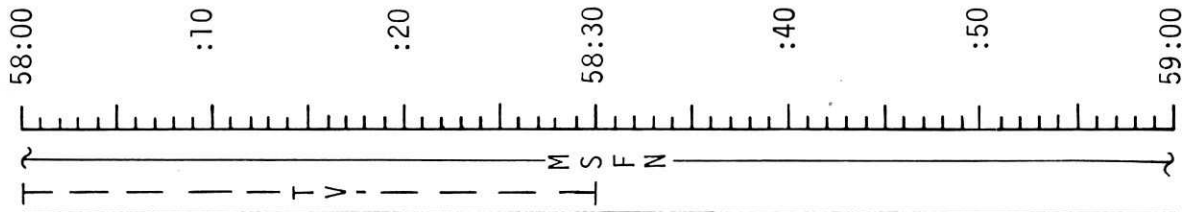
CMP

TEMPORARILY STOW
PROBE & DROGUE

LM

MCC-H

2313 CST



CDR		LMP	
ACTIVATION CHECKLIST		OPEN LM HATCH RECORD AND REPORT DOCKING TUNNEL INDEX ANGLE IVT TO LM	
IVT TO LM		ASSIST CDR	
FAMILIARIZATION LM		FAMILIARIZATION LM	

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

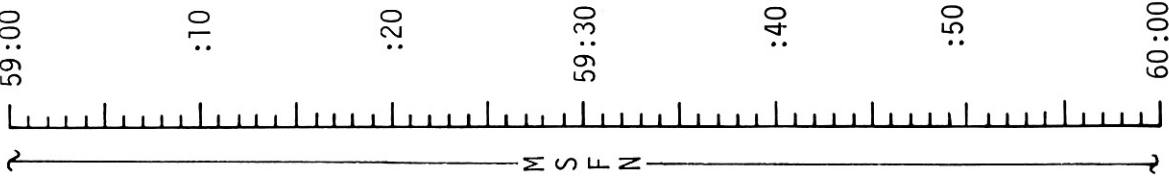
CMP

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

P 90
Y 0

PTC
P 90 Y 0

0013 CST



LM

CDR

LMP

FAMILIARIZATION

FAMILIARIZATION

IVT TO CSM

IVT TO CSM

CLOSE LM HATCH

FLIGHT PLAN

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

MCC-H

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

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

FLIGHT PLAN

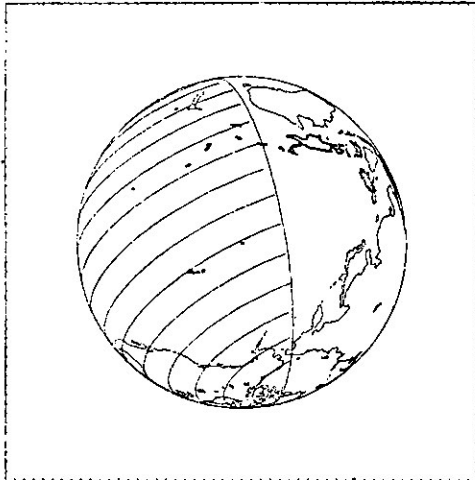
0113 CST



M S F N

L10H CANISTER CHANGE
(7 INTO A, STOW 5 IN B6)

GET 60 HRS F.O.V. 3°



EAT PERIOD

PRESLEEP CHECKLIST

PTC
P 90, Y 0

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

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

NOTES

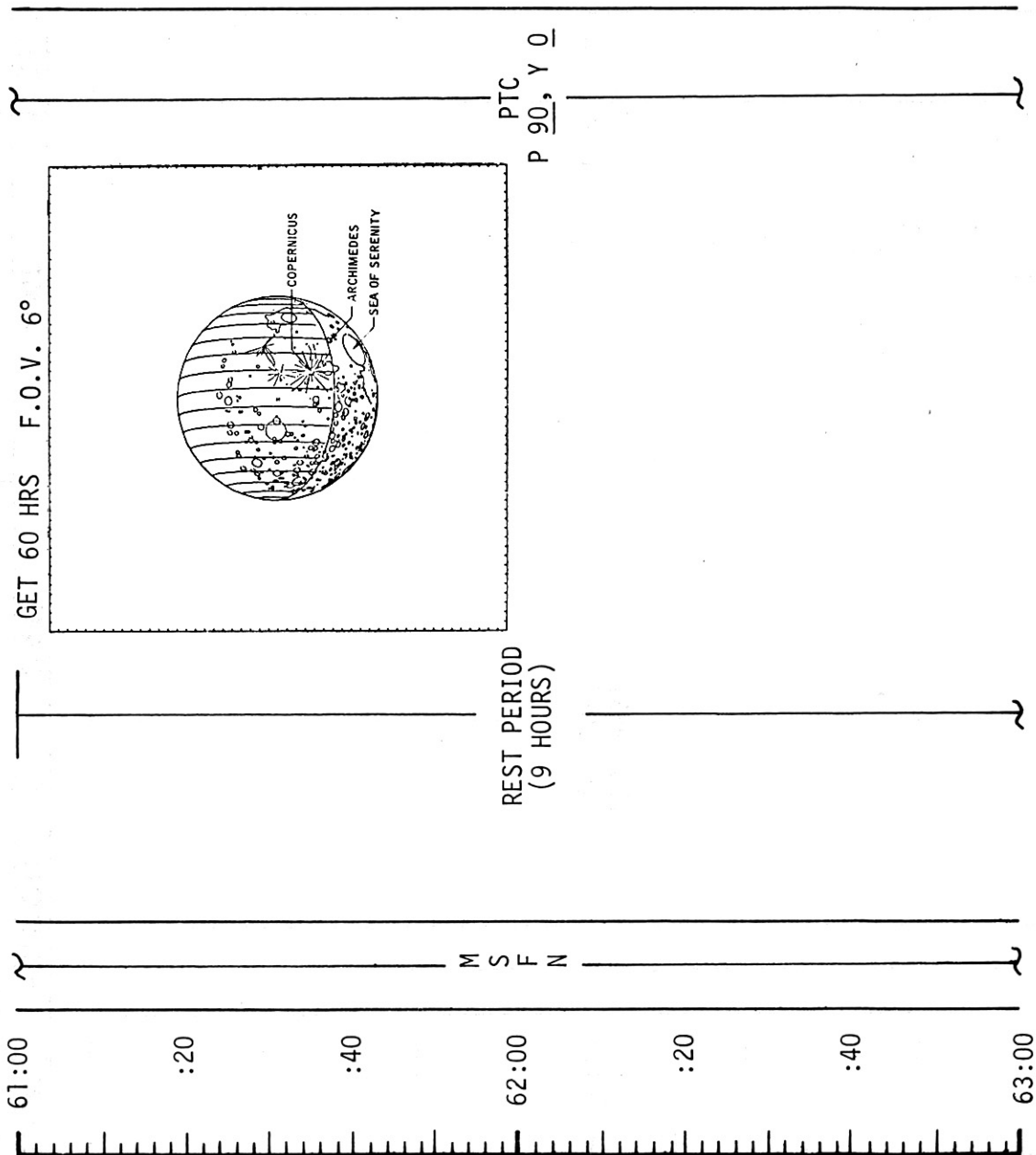
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	60:00 - 61:00	3/TLC	3-43

MCC-H

FLIGHT PLAN

0213 CST

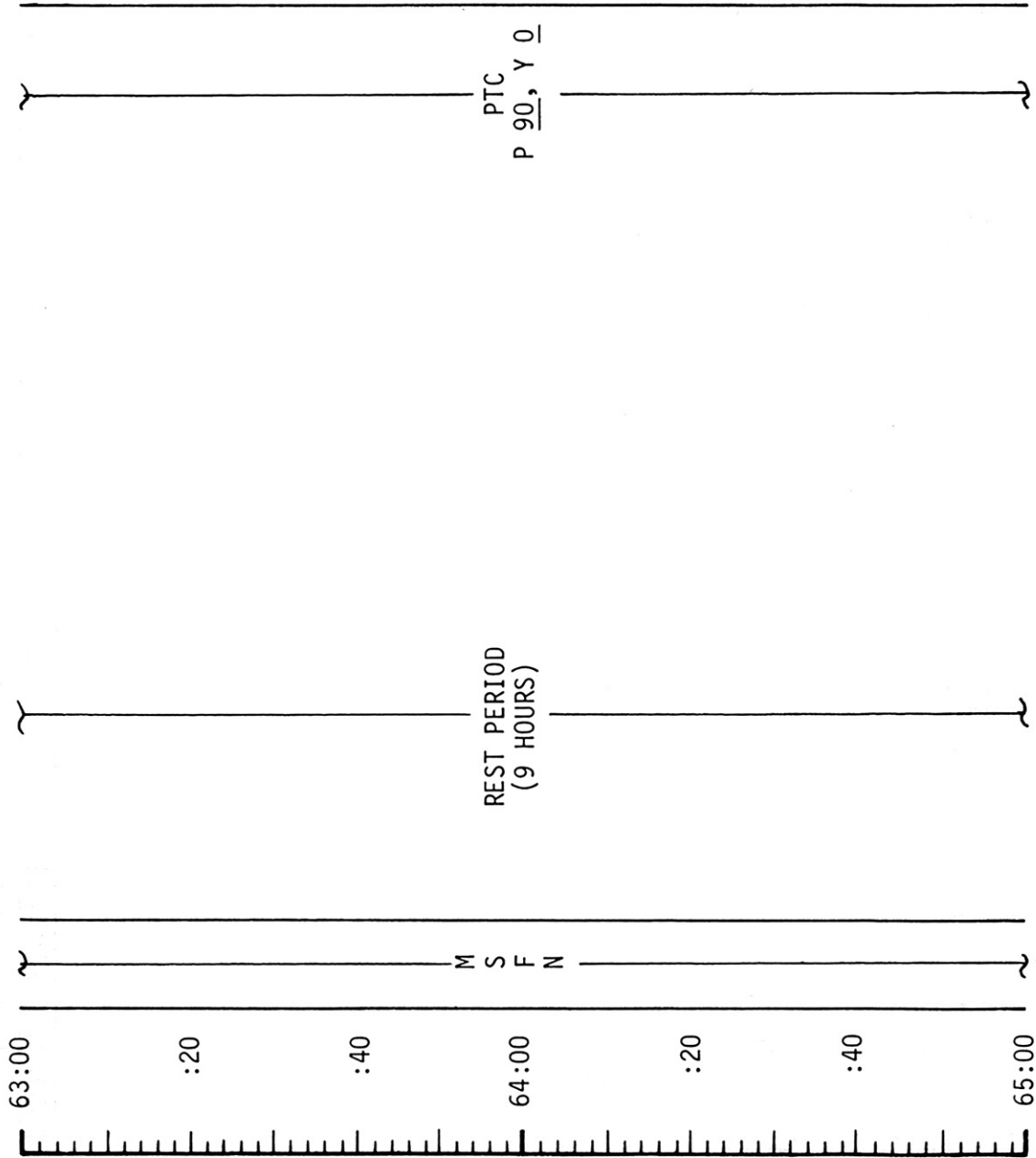
NOTES



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

FLIGHT PLAN

NOTES



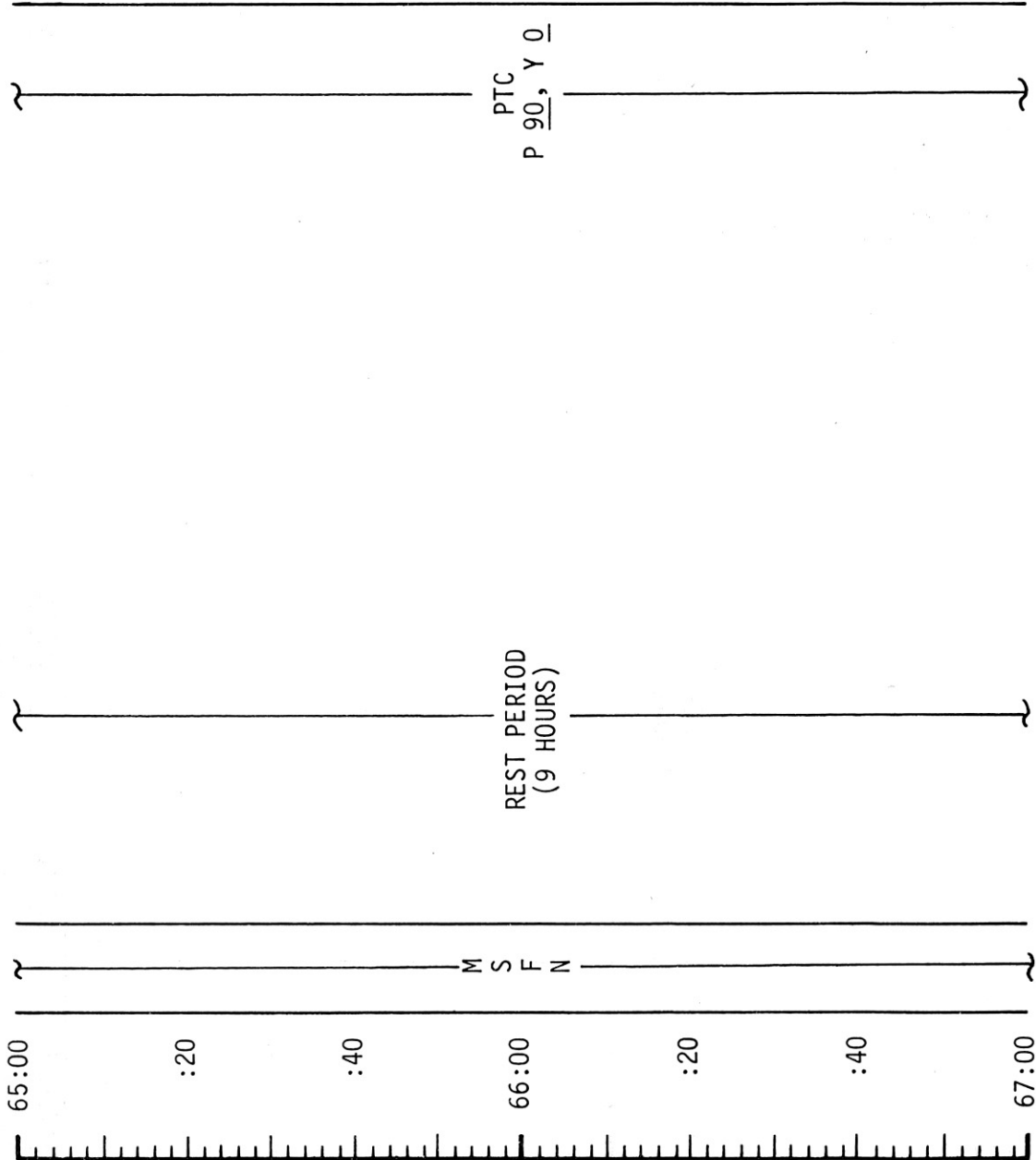
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	63:00 - 65:00	3/TLC	3-45

MCC-H

0613 CST

FLIGHT PLAN

NOTES



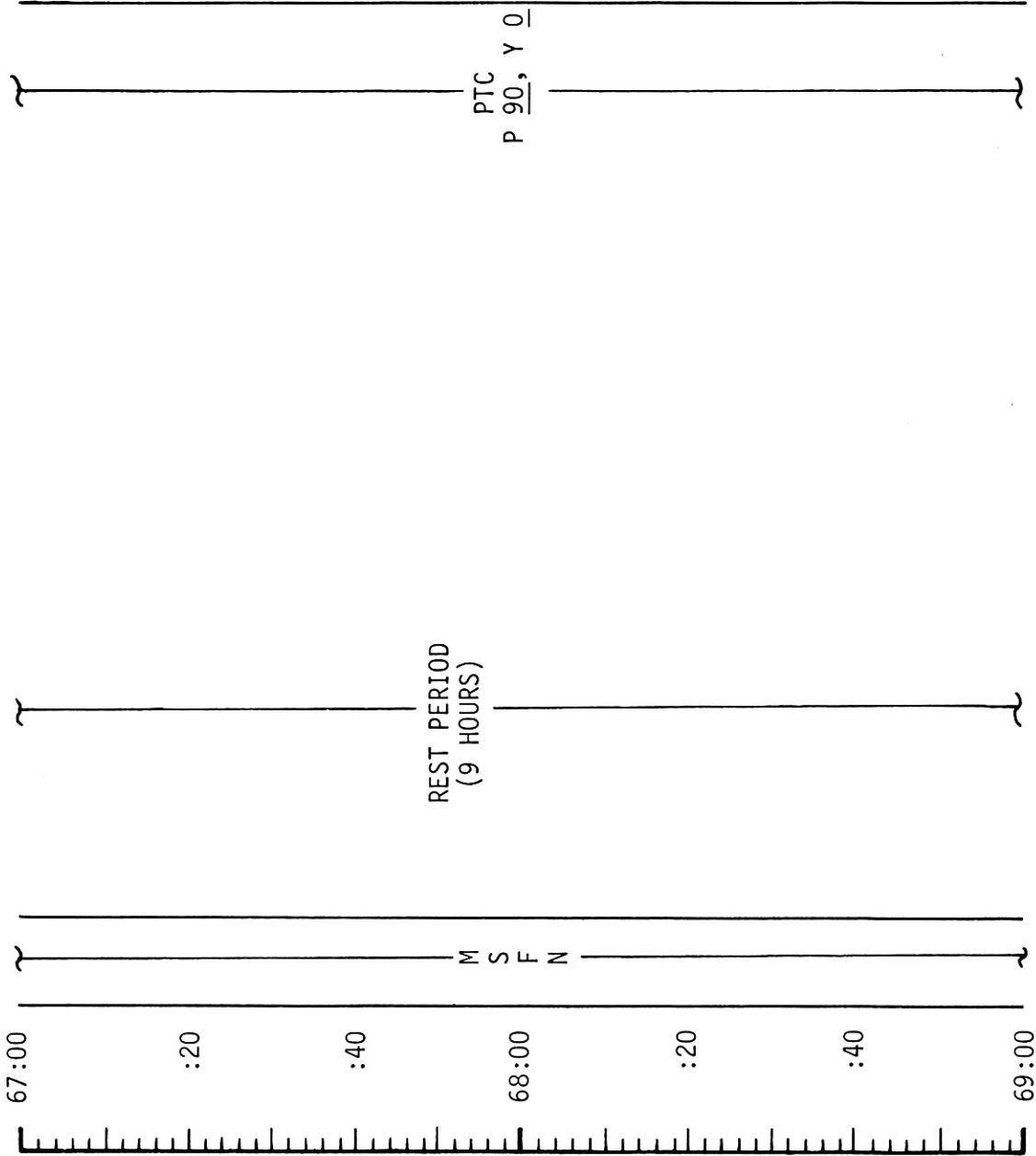
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	65:00 - 67:00	3/TLC	3-46

MCC-H

0813 CST

FLIGHT PLAN

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

1013 CST

FLIGHT PLAN

NOTES



REST PERIOD
(9 HOURS)

M S F N

POST SLEEP CHECKLIST

EAT PERIOD

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

PTC
P 90, Y 0

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

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	69:00 - 71:00	3-4/TLC	3-48

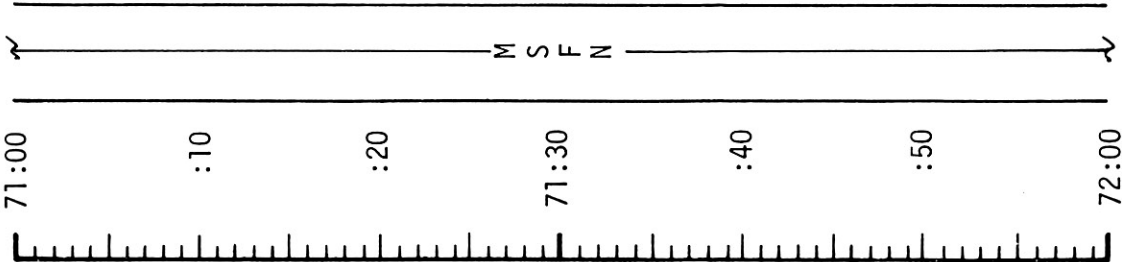
FLIGHT PLAN

1213 CST

MCC-H

UPLINK TO CSM
CSM S.V. & V66
MCC-4 TGT LOAD

UPDATE TO CSM
MCC-4 MNVR PAD
CONSUMABLES
FLIGHT PLAN
PERICYNTHION +2HR
ABORT PAD



P52 IMU REALIGN
OPTION 3-REFSMMAT
(PTC ORIENT)

REPORT GYRO TORQUING ANGLES
STOP PTC AT
BURN ROLL ATT

P30 EXT. ΔV

LOAD DAP, N46 (20101,011111)

V49 MNVR TO BURN ATT

STOP PTC AT
BURN ROLL ATT

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

NOTES

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

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-H

FLIGHT PLAN

NOTES

1313 CST

72:00

:10

:20

72:30

:40

:50

73:00

P40/41 - SPS/RCS THRUST
SXT STAR CHECK

GDC ALIGN

MCC-4

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

LOAD DAP, N46 (20111, 01111)
BATTERY CHARGE, BATTERY A

TIG: 72:24:53
BT: NOM ZERO
ΔVR: NOM. ZERO
ULLAGE: N/A
ORBIT: N/A

LOI - 5 HRS

M S F N

BURN STATUS REPORT									
X	X								ΔTIG
X	X								BT
									V gx
X	X								R
X	X								P
X	X								Y
									V gx
									V gy
									V gz
									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	72:00 - 73:00	4/TLC	3-50

1413 CST

FLIGHT PLAN

NOTES

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)

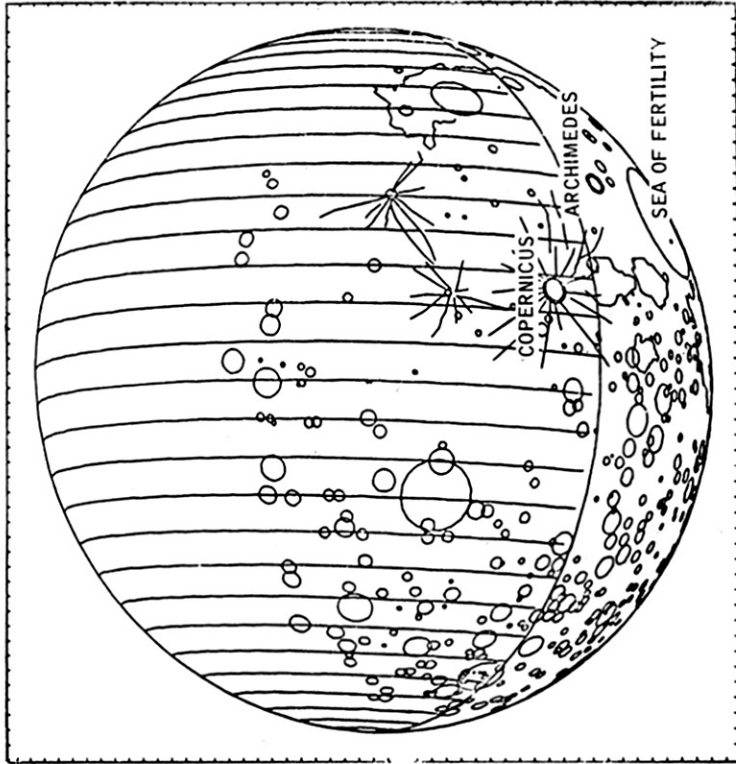
SEC GLY TO RAD VLV - BYPASS

ECS IND SW - PRIMARY

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 NOM-
INALLY SCHEDULED
AT 71:20 AND
72:37 RESPECTIVELY
AND PROCEED WITH
SCHEDULED ACTIVITIES
AT 73:00.

PRESSURIZE CSM TO 5.4 PSI



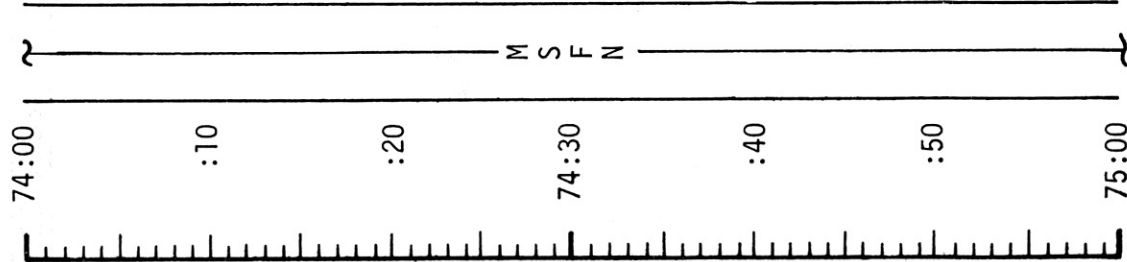
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	73:00 - 74:00	4/TLC	3-51

MCC-H

FLIGHT PLAN

NOTES

1513 CST



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

PRESSURIZE LM
(IN CASE OF LOI ABORT)

LM TUNNEL VENT VALVE-CM/LM ΔP

CHECK MISSION TIMER AGAINST CMC CLOCK

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

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

STARS
SA
TA

REPORT GYRO TORQUING ANGLES

P52 IMU REALIGN

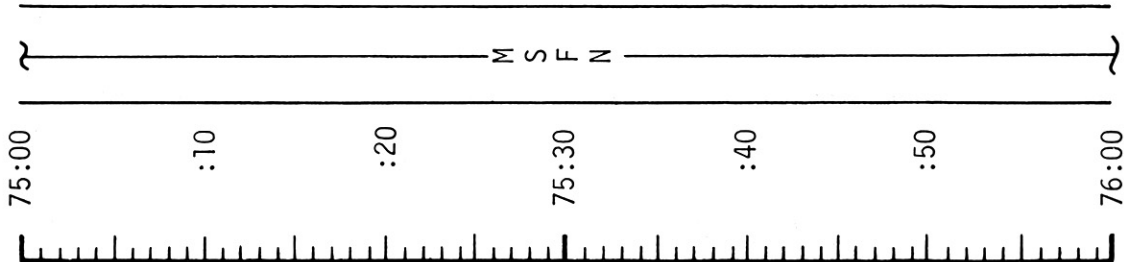
N71:	—	—	—	—
N05:	—	—	—	—
N93:	—	—	—	—
X	—	—	—	—
Y	—	—	—	—
Z	—	—	—	—
GET	:	:	:	:

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

FLIGHT PLAN

MCC-H

1613 CST



MNVR TO BURN ATT R 180 HGA
EXCEPT FOR ROLL P 272 P -88
(75:40) Y 357 Y 172

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

MAP UPDATE REV	1			
LOS	:	:	:	:
180°	:	:	:	:
AOS	:	:	:	:

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

FLIGHT PLAN

NOTES

SUBEARTH POINT
REV 1
3.215W
0.868N

1713 CST

MCC-H

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

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



P30-EXT ΔV

P40-SPS THRUST

LOAD DAP N46 (20101) (011111)

ROLL TO BURN ATT
(76:40)

OMNI D

R 0
P 272
Y 357

SXT STAR CHECK

UPDATE TO CSM
GO/NO GO LOI

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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CSM GNC GO CRITERIA

SPS

- 0 FU/OX TANK (W/O LEAK) -FU/OX
- 0 GN₂ TANK (W/O LEAK) - 1 OF 2 (CANT CONFIRM)
- 0 BALL VALVE BANK - BOTH
- 0 FEEDLINE TEMP >40° F
- 0 FU/OX ΔP<20 PSI
- 0 PC>70 PSI
- 0 ULLAGE CAPABILITY - 1 OF 2
- 0 HE TANK (W/O LEAK)

SM RCS

- 0 HE TANK (W/O LEAK) - ALL
- 0 NO LEAK BELOW ISO VLV - ALL
- 0 PKG TEMP > 55° - ALL
- 0 THRUSTERS - 3 OF 4 P & Y, 6 OF 8 R

CM RCS

- 0 HE TANK (W/O LEAK) - BOTH
- 0 MANIFOLD (W/O LEAK) - BOTH
- 0 NOT ARMED

SYSTEMS MANAGEMENT

- 0 START BURN ON BANK B
- 0 OPEN BANK A TIG + 2-5 SECONDS

LOI INHIBIT CRITERIA

- 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 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

CSM GNC GO CRITERIA
GNCS/SCS

- 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 FDAI -- 1 OF 2
- 0 CMC, ISS, OSS, OPTICS DAC
- 0 TVC SERVO LOOP -- BOTH
- 0 DSKY -- 1 OF 2

FLIGHT PLAN

LOI
BURN TABLE

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

TABLE 3-6
LOI ABORT TABLE

MODE I	MODE II	MODE III
(DPS ONLY)	(DPS ONLY)	(DPS ONLY)
0-1 MIN 45 SEC ΔV_m 0-750 (TIGHT)	1 MIN 45 SEC TO 2 MIN 50 SEC ΔV_m 750-1245 (LOOSE)	3 MIN 50 SEC 5 MIN 57 SEC (CUTOFF) ΔV_m 1700-2815 (TIGHT)
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 MCC-H TARGET

TABLE 3-7

TIGHT SPS LIMITS
FUEL - OXID DELTA P GREATER THAN 20 PSI
CONFIRMED BY LOW PC
PROP TANK PRESS LESS THAN 160 PSI CON-
FIRMED 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)

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.

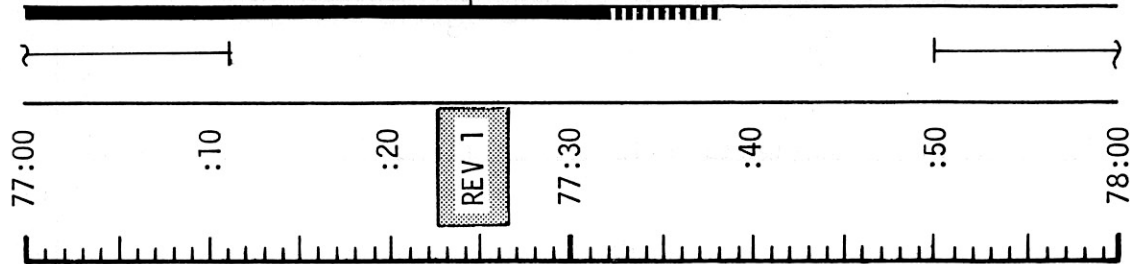
LOOSE SPS LIMITS

PC LESS THAN 70 PSI CONFIRMED BY OTHER
CUES

PROP TANK PRESS LESS THAN 115 PSI CONFIRM-
ED BY LOW PC

PHYSIOLOGICAL INDICATIONS OF ERRATIC
ENGINE PERFORMANCE (VIBRATION, POPPING,
ETC.)

FLIGHT PLAN



VERIFY DSE MOTION AT LOS

GDC ALIGN

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
ΔVR: 2815.3
ULLAGE: NONE
ORBIT: 168.3 x 57.0

V66 TRANSFER CSM SV TO LM SLOT

MNVR TO COMM ATT (77:45)

LOI BURN STATUS REPORT

DUMP DSE

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

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 *
X	X	X	FUEL *
X	X	X	OX *
X	X	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

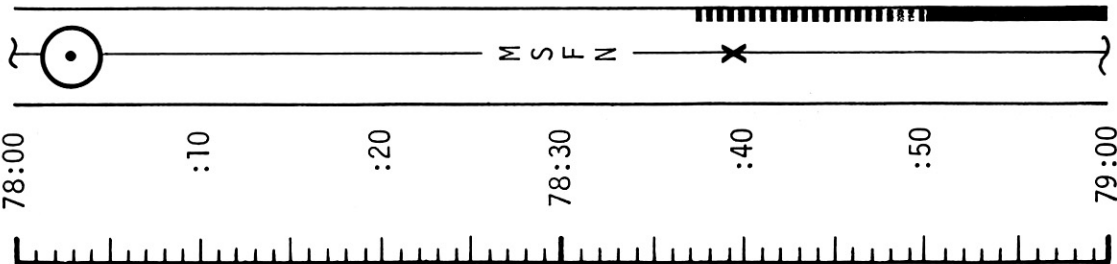
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	77:00 - 78:00	4/1	3-55

MCC-H

1913 CST

FLIGHT PLAN

NOTES



MNVR TO LUNAR SURFACE
OBSERVATION ATT (78:00)

GO ORB RATE

V64 ACQUIRE MSFN

EAT PERIOD

R 0 OMNI D
P 215/213
Y 0

A HEAVY LINE
UNDER A PITCH
ATTITUDE (P 215/)
INDICATES AN
ORDEAL (L/H)
ANGLE.

MAP UPDATE REV	2			
LOS	:	:	:	:
180°	:	:	:	:
AOS	:	:	:	:

UPDATE TO CSM
LDMK TRK PAD REV 2

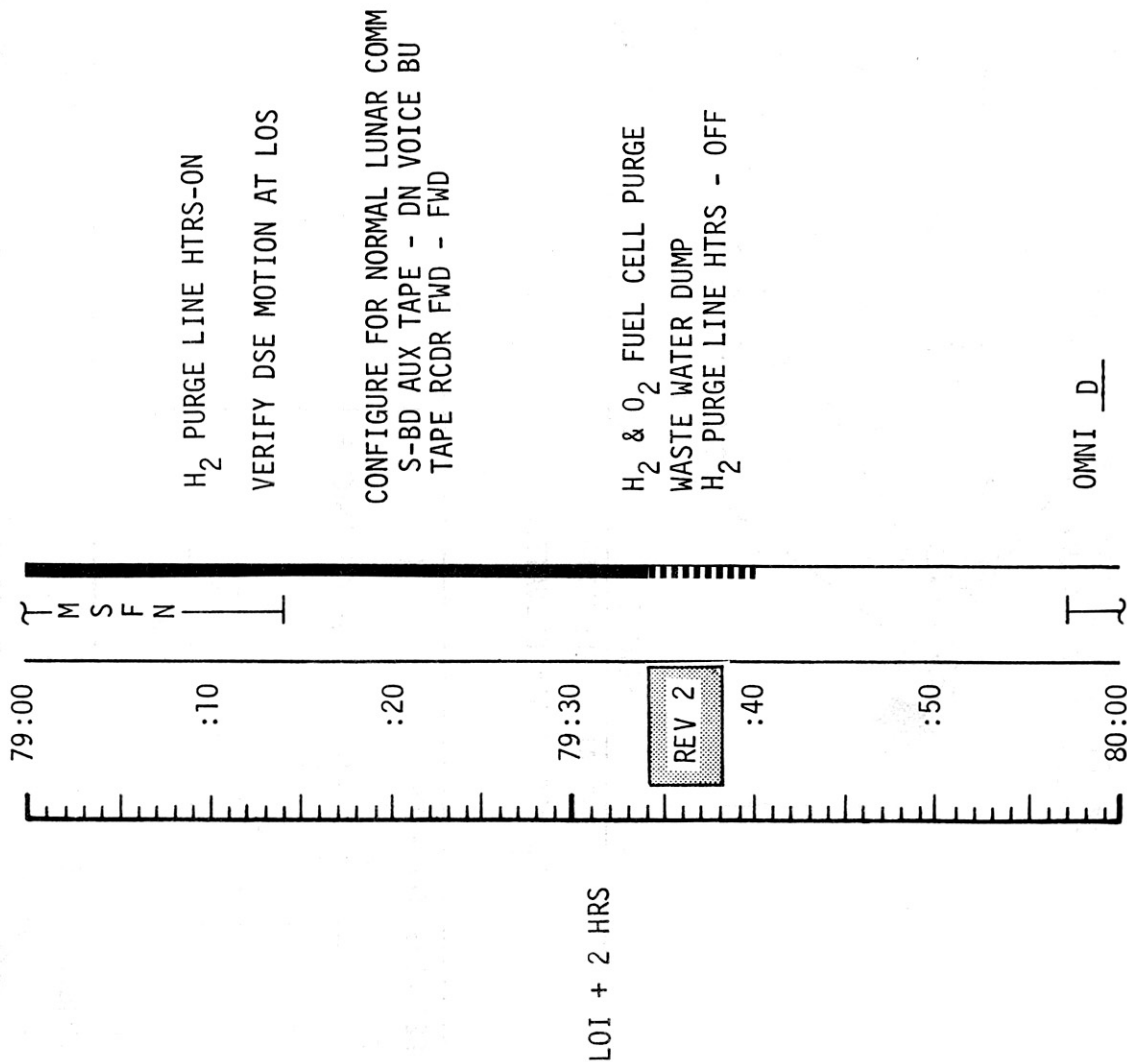
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	78:00 - 79:00	4/1	3-56

2013 CST

MCC-H

FLIGHT PLAN

NOTES



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

19° PITCH DOWN FROM LOCAL HORIZONTAL ORBITAL RATE THROUGHOUT TRACKING

19°

MARK NO 1

15°

MARK NO 2

21°

MARK NO 3

23°

MARK NO 4

19°

MARK NO 5

5°

LOS

19°

52°

HORIZON

HORIZON

30°

AOS

ΔT_1

ΔT_2

ΔT_3

ΔT_4

ΔT_5

ΔT_6

ΔT_7

RADIUS OF MOON

CENTER OF MOON

$\Delta T_1 = 424 \text{ SEC}$

$\Delta T_2 = 110 \text{ SEC}$

$\Delta T_3 = 80 \text{ SEC}$

$\Delta T_4 = 80 \text{ SEC}$

$\Delta T_5 = 80 \text{ SEC}$

$\Delta T_6 = 80 \text{ SEC}$

$\Delta T_7 = 20 \text{ SEC}$

AOS TO LOS 450 SEC

AOS TO FINAL MARK - 430 SEC

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 = $T_2 + 7 \text{ MIN } 10 \text{ SEC}$

FIGURE 3-1
3-57A

P22 LDMK TRACKING (1/125)

PICKERING B

T_1 T_2 R N or S NM SA TA N89

LAT -02.097

LONG/2 +03.677

ALT +000.00

CENTER OF MOON
FIGURE 3-7
3-57A

MCC-H

FLIGHT PLAN

NOTES

2113 CST



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

R 0
P 341/302
Y 0

OMNI D

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

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

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

MNVR TO BURN ATT R 180 HGA
EXCEPT FOR ROLL P 283 P -83
BY 80:45 Y 0 Y 2

LOAD DAP FOR TWO JET ULLAGE
(20111) (11111)
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

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

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

MSFN
RECORD PCM LBR ON
DSE DURING P22

DUMP DSE
UPLINK TO CSM
CSM S.V. & V66
DOI TARGET LOAD

UPDATE TO CSM
DOI MNVR PAD &
AOS TIME
TEI 5 PAD
H-2 TIMES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	80:00 - 81:00	4/2	3-58

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

2213 CST

P52 IMU REALIGN
OPTION 3 REFSMMAT
(LDG SITE ORIENT)

DRIET CHECK

REPORT GYRO TORQUING ANGLES

P30 EXT ΔV

P40 SPS THRUST

MNVR TO BURN ATT (81:15)

SXT STAR CHECK

R 0 OMNI C

283

$$\frac{0}{Y}$$

VERIFY DSE MOTION AT LOS

GDC ALIGN

DOI

V66 TRANSFER CSM SV TO LM SLOT

MNVR TO BAILOUT BURN ATT
(82:00)

$$\begin{array}{r} 0 \\ \hline 053 \\ \hline 0 \end{array}$$

TIG: 81:45:20

BT: 23.1 SEC

ΔVR: 212.9

UULLAGE: 2 JET 19 SEC

ORBIT: 57.4x7.7 NM

***ITEMS TO BE REPORTED
TO MSFN**

TO REPORT IF OFF MORE
THAN 1 SEC

***REPORT IF >0.2 FPS

NOTES

BURN STATUS REPORT
X X TRIM ●●
X X BT** ●●
V gx Vgx ●
R P Y V*** Vgy *** Vgz *** ΔVc *
FUEL * UNBAL
Ox *
X X X X
X X X X
X X X X

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

82:00

HGA P -47, Y 0
DOI BURN STATUS REPORT

TIG: 82:20:20
BT: 12.8 SEC
 Δ VR: 120 FPS
ULLAGE: 2 JET 19 SEC
ORBIT: N/A

P47-THRUST MONITOR

IF REQ'D

EQUALIZE CM/LM PRESSURE
TUNNEL VENT VALVE - LM PRESS
MNVR TO LANDMARK TRACK ATT
BY 82:35

R 350 OMNI D

$$\frac{295}{0}$$

MAP UPDATE REV 4

.. : SOT

180° : ::

AOS : : : :

LMK H-2

P22 ORB NAV
MONITOR LMK
NO MARKS

T-HOR _____
TCA-20SEC _____

LAT: -03.033

ALT: +00000

 : :
LONG/2 -02.383

MNVR TO P52 (82:54)

DUMP DSE

Y	0
Y	7

OPTION 3 - REFSMMAT
(LDG SITE ORIENT)

REPORT GYRO TORQUING ANGLES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	82:00-83:00	4/3	3-60

FLIGHT PLAN

MCC-H

CSM

LM

CMP

CDR

LMP

0013 CST

M S F N I

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

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 163
Y 0

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

CDR

AID CMP OR LMP
AS REQUIRED

S-BAND/VHF SIMPLEX VOICE AND TM TEST

RNG

REPORT OPS SOURCE
PRESSURE

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

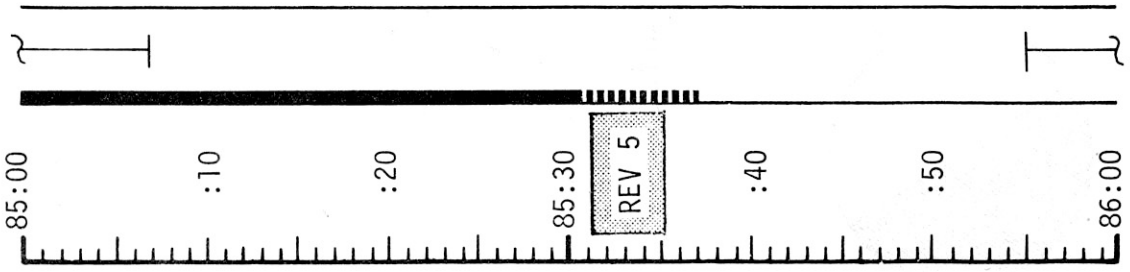
0213 CST

FLIGHT PLAN

NOTES

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



DUMP DSE
UPDATE TO CSM
TRAJECTORY
STATUS

EAT PERIOD

PRESLEEP CHECKLIST

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	

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

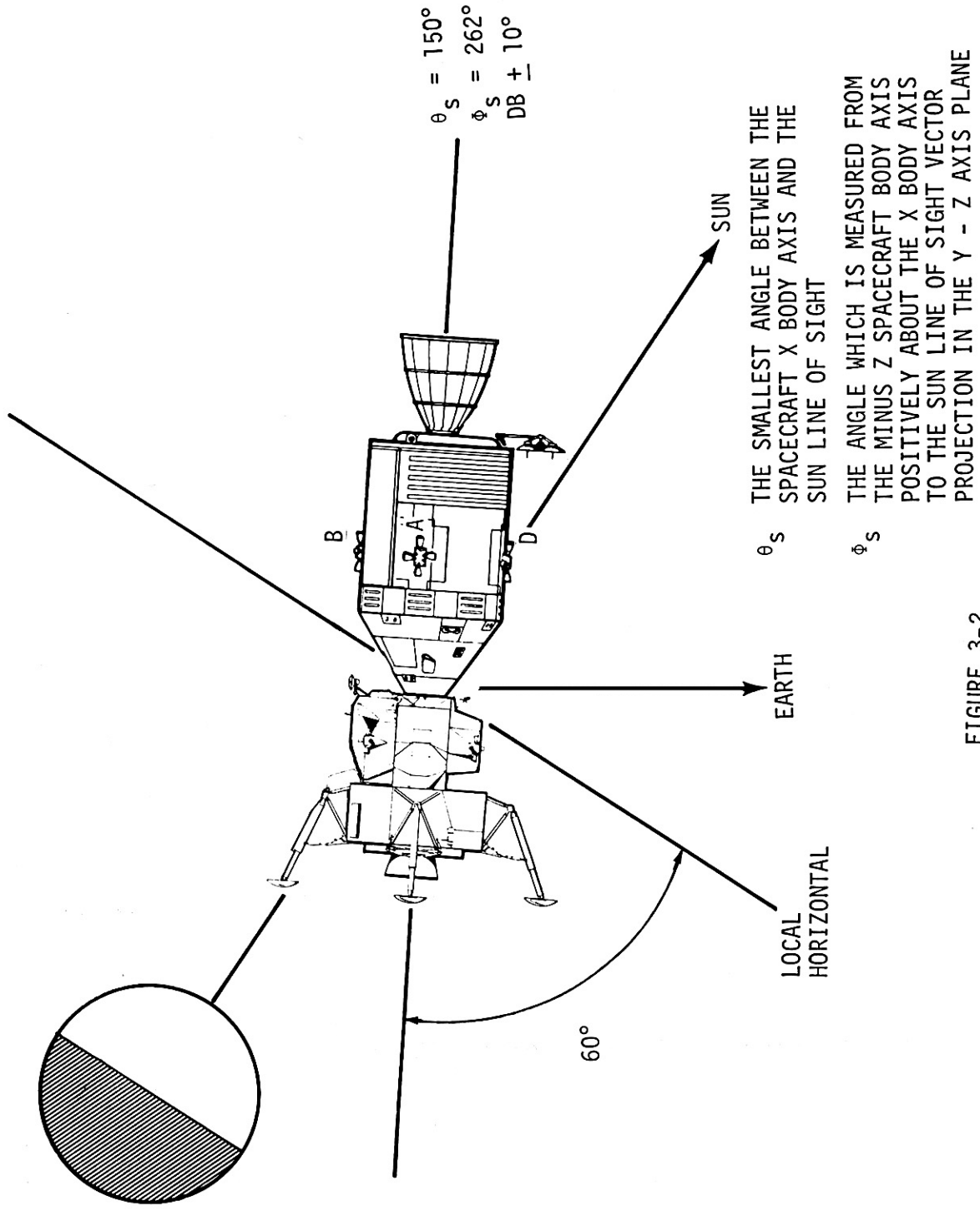


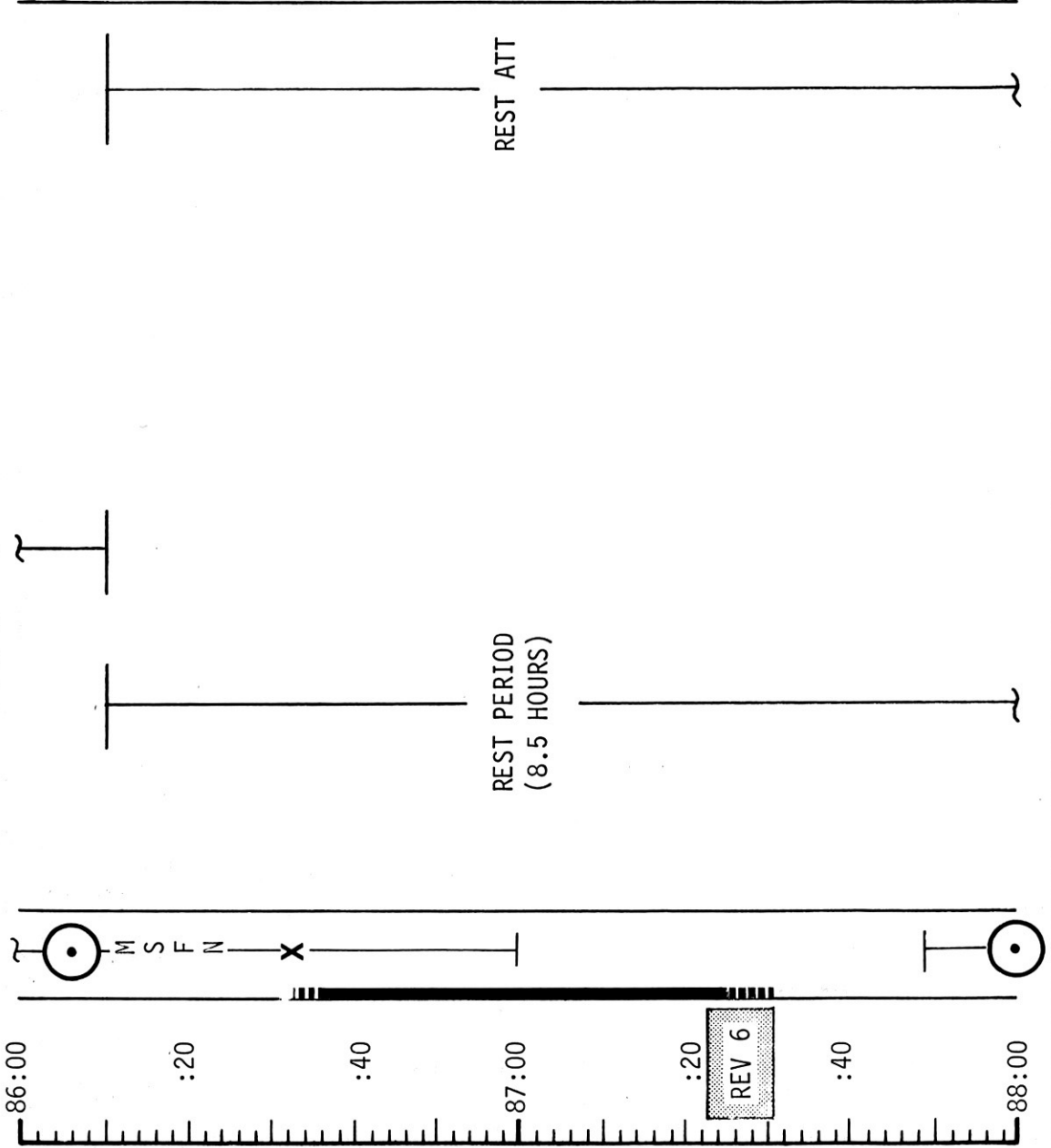
FIGURE 3-2
3-63A

0313 CST

MCC-H

FLIGHT PLAN

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

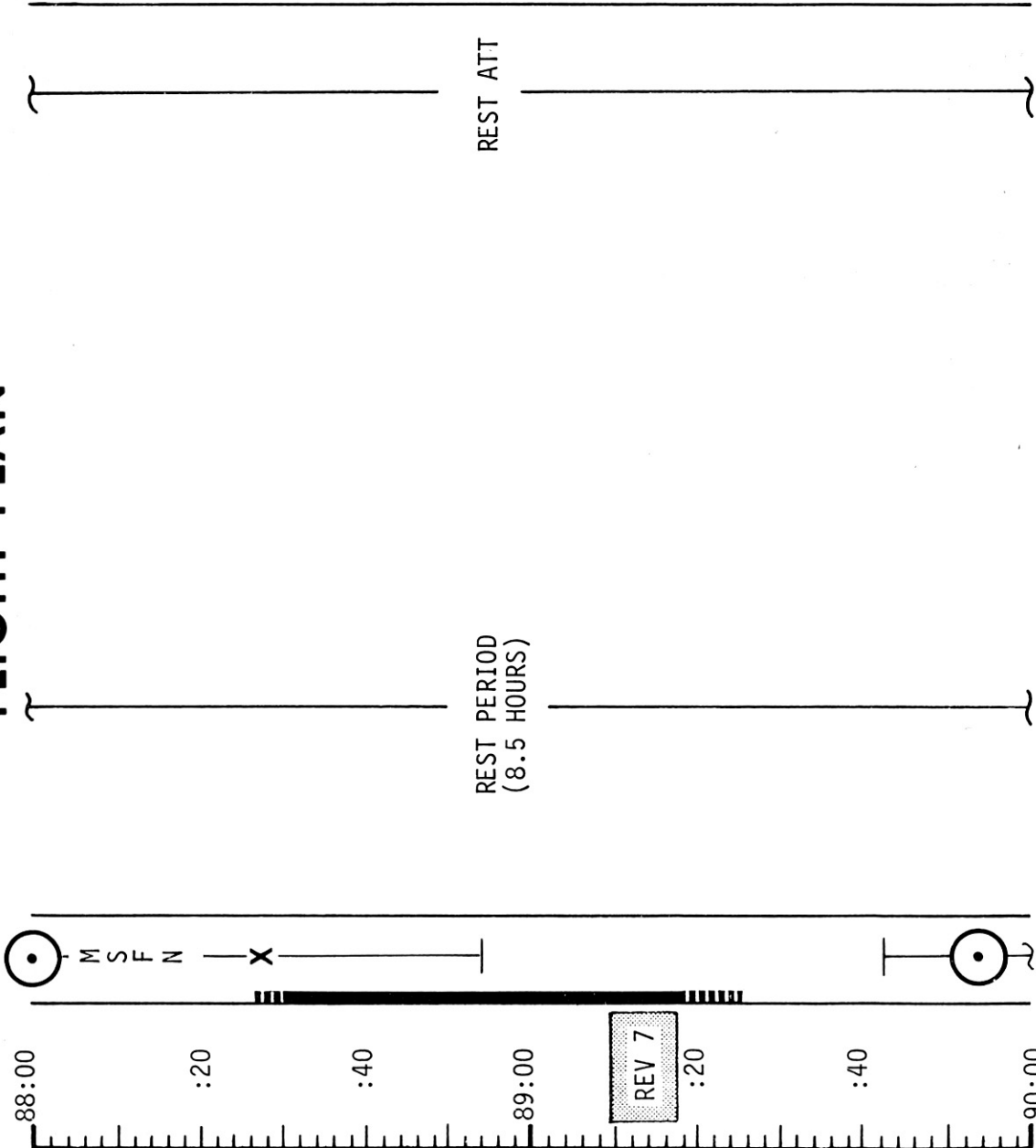
NOTES

FLIGHT PLAN

0513 CST

MCC-H

DUMP DSE

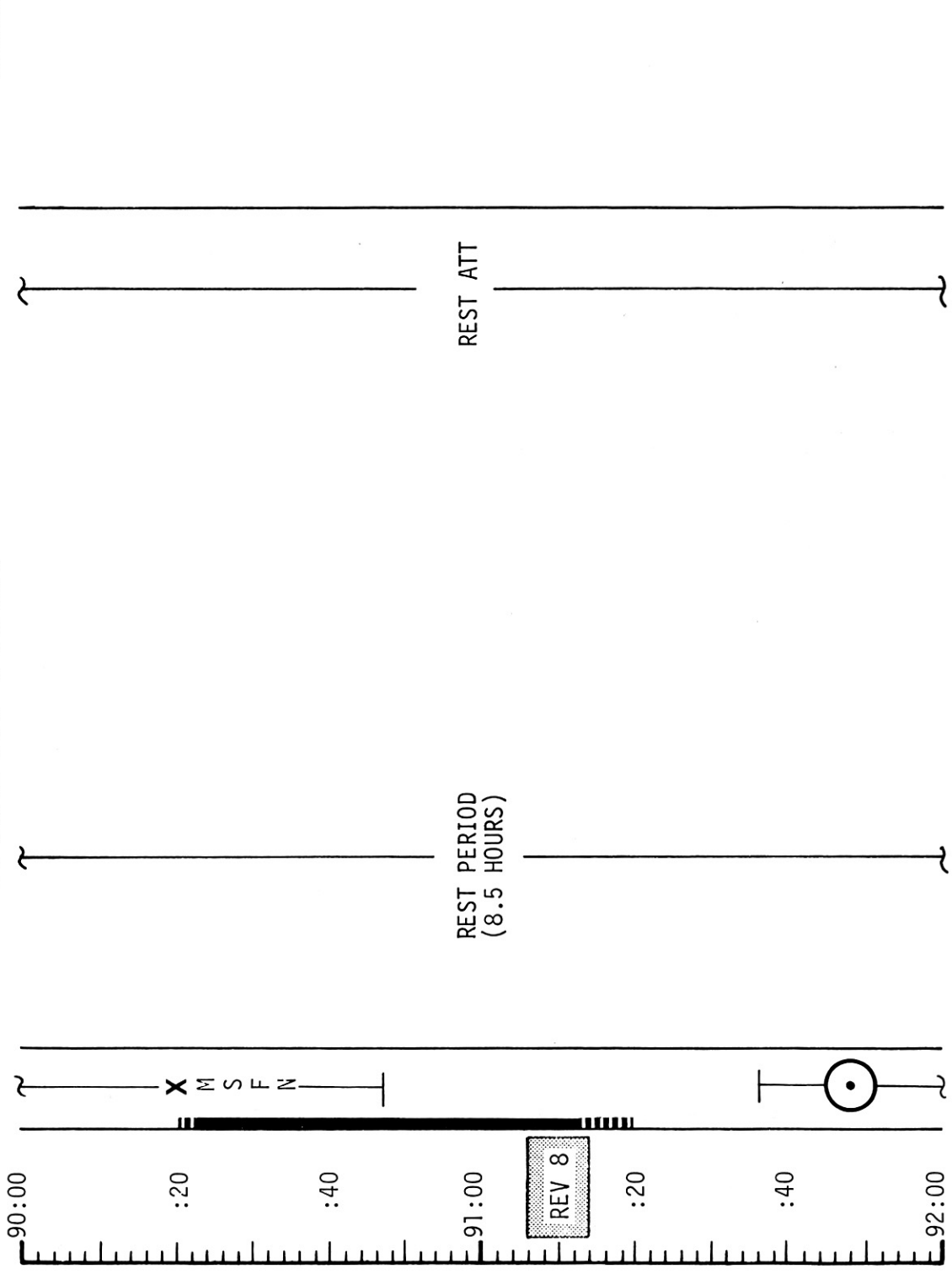


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	88:00 - 90:00	4/6-7	3-65

MCC-H

FLIGHT PLAN

0713 CST



NOTES

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

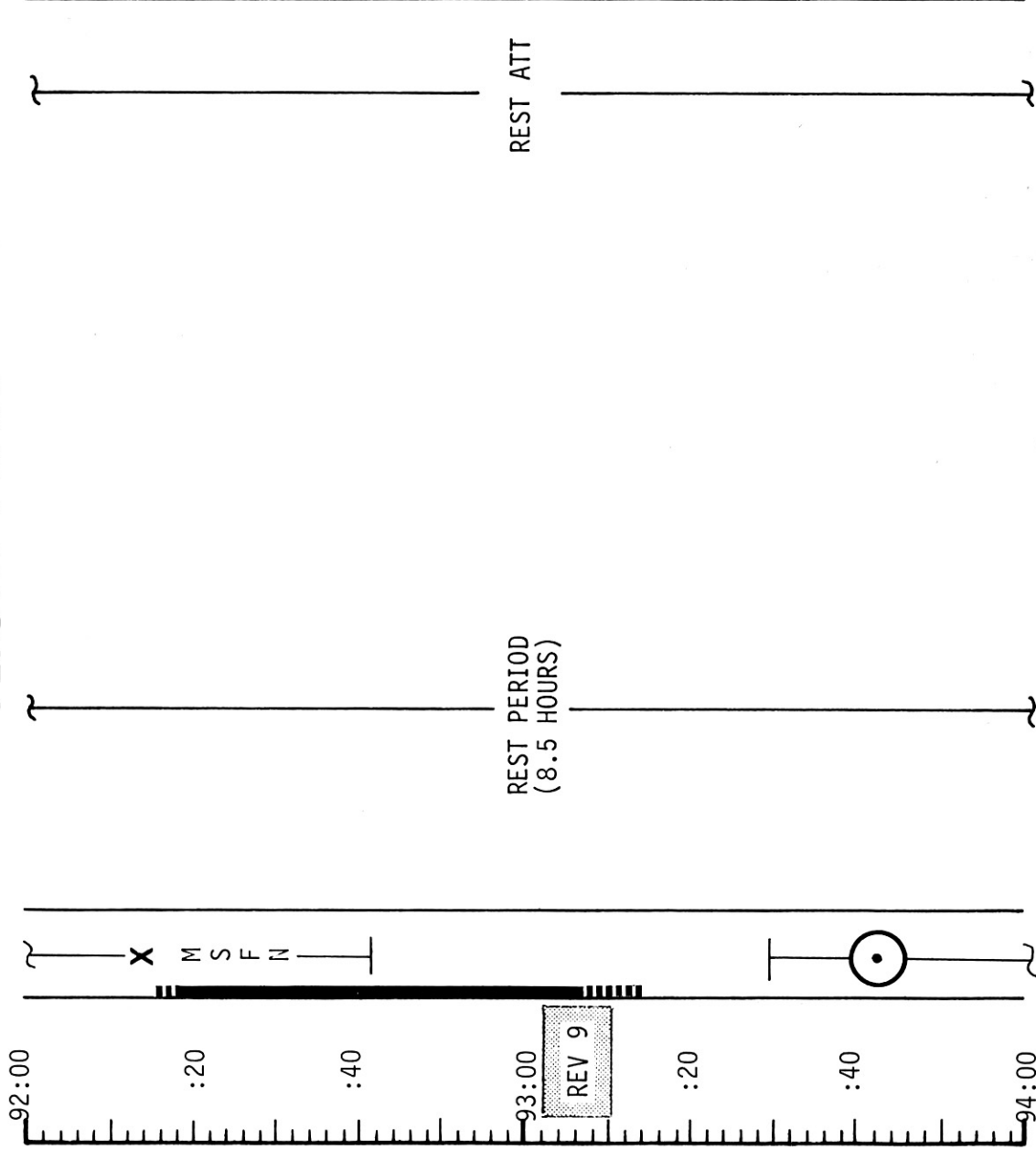
0913 CST

MCC-H

FLIGHT PLAN

NOTES

DUMP DSE



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

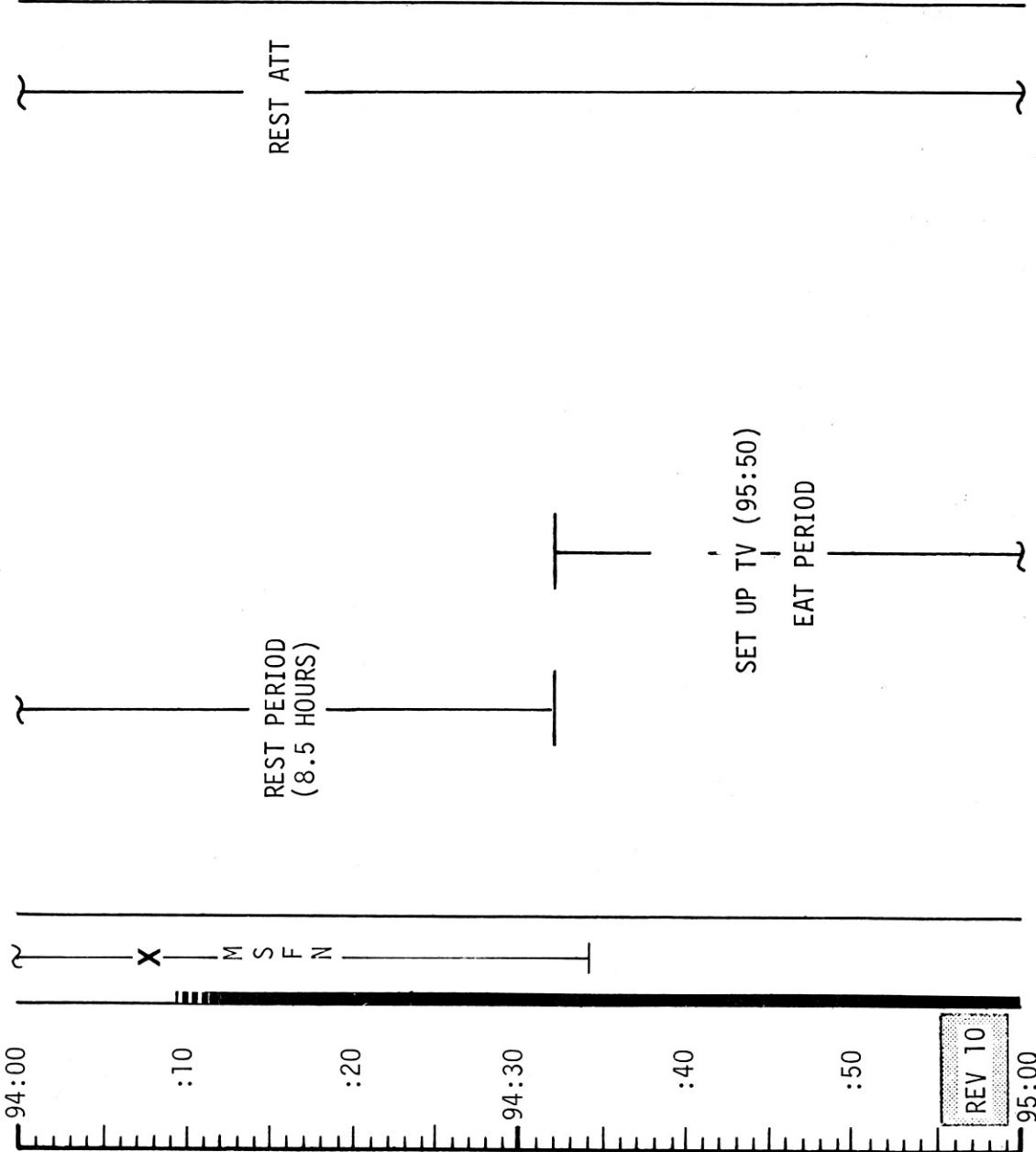
MCC-H

1113 CST

FLIGHT PLAN

NOTES

WAKE CREW AT 94:00
IF TWEAK BURN REQ.
AT 94:40



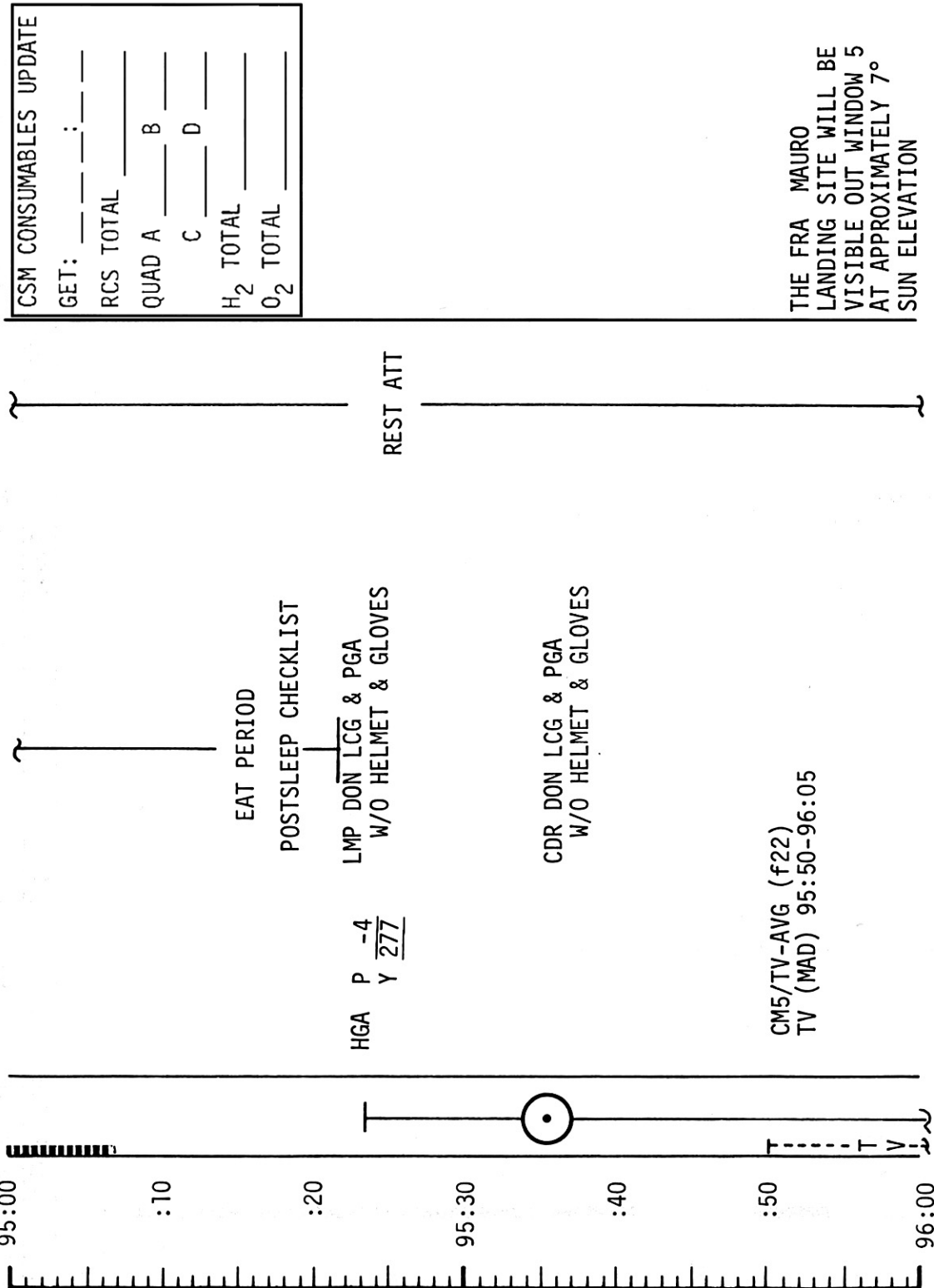
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	94:00 - 95:00	5/9-10	3-68

MCC-H

1213 CST

FLIGHT PLAN

NOTES



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

96:00

96:10

96:20

96:30

96:40

96:50

97:00

CMP

CMP SOLO BOOK

P52 - IMU REALIGN
OPTION 3 - REFMMAT
(LDG SITE ORIENT)

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

DON PGA

W/O HELMET & GLOVES

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

CDR

OBSERVE LDG SITE THROUGH CM 5

MNVR TO AGS CAL ATT
(96:35)

R 007.5, P 112.5, Y 022.5

HGA: P -76, Y 127

LOAD DAP
R1=21111
R2=11111

LMP

VERIFY DSE MOTION AT LOS

LM ACTIVATION CHECKLIST

VERIFY DOCKING TUNNEL
INDEX ANGLE
OPEN LM HATCH
IVT TO LM

TRANSFER TO LM POWER
LM FAMILIARIZATION &
HOUSEKEEPING
(IF NECESSARY)

DISCONNECT AND STOW
LM POWER UMBILICAL

IVT TO LM
TRANSFER CDR & LMP
HELMET & GLOVES

EPS ACTIVATION
CONFIGURE S-BAND

MCC-H

P52 IMU REALIGN

N71: ---

N05: ---

N93: ---

X ---

Y ---

Z ---

GET ---

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

REV 11

CSM

LM

MCC-H

CMF

LMP

CONFIGURE CAMERAS FOR
UNDOCKING

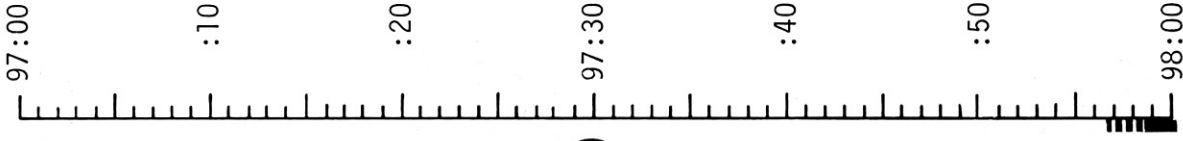
REACQUIRE MSFN
HGA: P -76, Y 127
REPORT DOCKING TUNNEL
INDEX ANGLE
COPY UPDATE

S/C CONT - SCS, MIN DB
V06N20E FOR LM COARSE
ALIGN ON CDR'S MARK
V06N20E & VOICE ANGLES
TO LM
S/C CONT-CMC
LM CLOCK SYNC: V16N65E
DON HELMET & GLOVES

SUIT LOOP INTEGRITY
CHECK

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

1413 CST

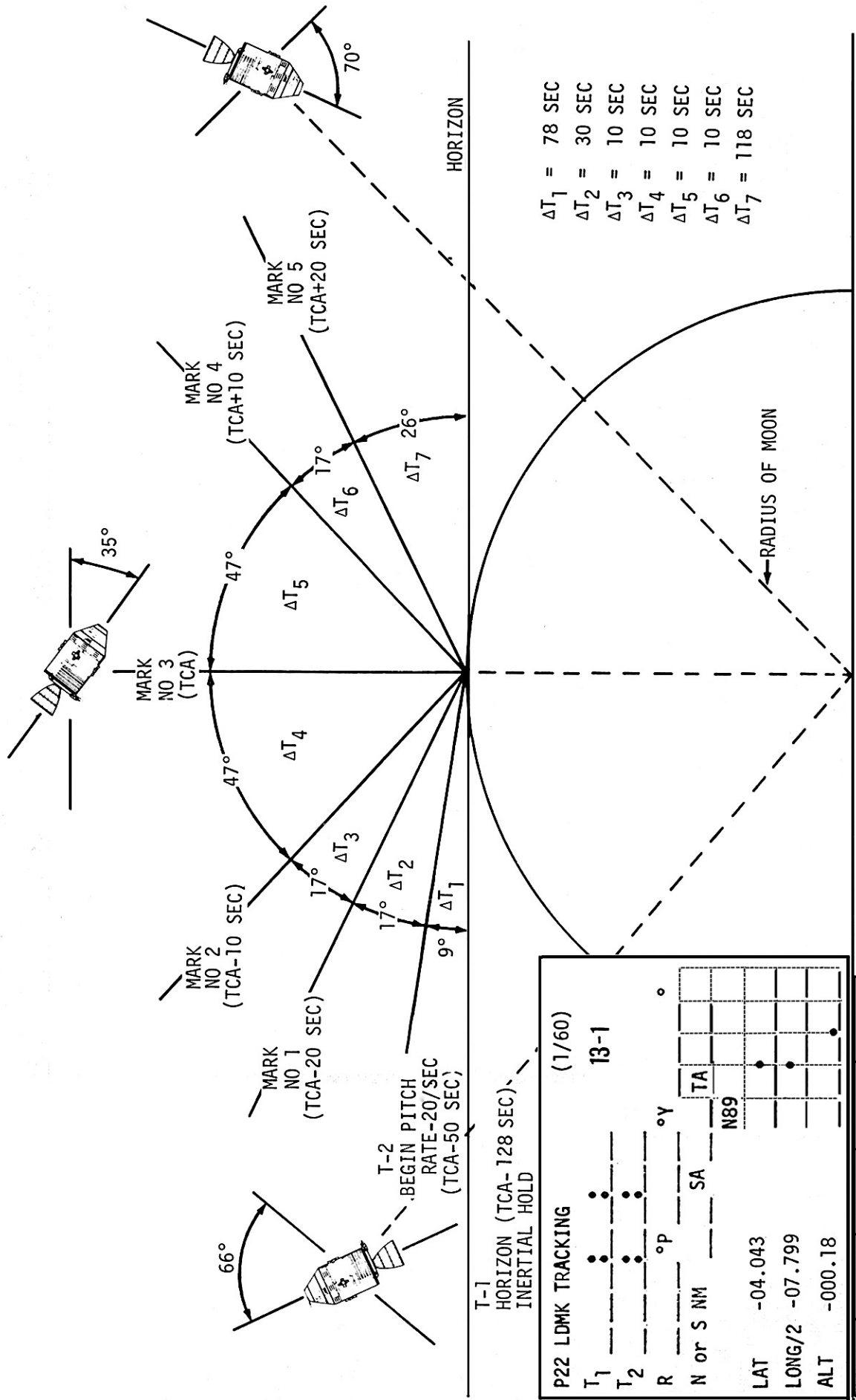


CDR
CONNECT TO LM COMM

ECS ACTIVATION & C/O CONNECT TO LM ECS	MISSION TIMER ACTIVATION PRIMARY GLYCOL LOOP ACT
	CAUTION/WARNING C/O CB ACTIVATION TB VERIFICATION
	PGNCS TURN-ON & SELF TEST
	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
DOCKED IMU COARSE ALIGN REPORT GIMBAL ANGLES & TIME TO MSFN	SUIT FAN/H2O SEP CHECK GLYCOL PUMP CHECK BIOMED SW-RT VHF CHECKOUT
	ASCENT BATTERY ACTIVATION AND C/O
LGC/CMC CLOCK SYNC T EPHEM UPDATE E MEMORY DUMP SET DAP R1=32022 DEPLOY LANDING GEAR	RCS PRESSURIZATION
RCS CHECKOUT	RCS PRESSURIZATION
	RCS CHECKOUT

DUMP DSE
UPDATE TO LM
STEERABLE ANT
(97:19)
(IF REQ'D)
UPDATE TO CSM
P22 TRK PAD
REV 12
UNDOCK & SEP
TIME & IMU PITCH
UPLINK TO CSM
CSM S.V. & V66

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



P22 LDMK TRACKING		(1/60)
T ₁	•	13-1
T ₂	•	
R	•	
N or S NM	SA	TA
LAT	-04.043	
LONG/2	-07.799	
ALT	-000.18	

	13-2	13-3	13-4	13-5
LAT	-03.606	-03.189	-03.707	-03.226
LONG/2	-07.658	-07.739	-07.006	-07.057
ALT	+000.00	-000.76	-000.73	-000.85

- ΔT₁ = 78 SEC
- ΔT₂ = 30 SEC
- ΔT₃ = 10 SEC
- ΔT₄ = 10 SEC
- ΔT₅ = 10 SEC
- ΔT₆ = 10 SEC
- ΔT₇ = 118 SEC

CENTER OF MOON
FIGURE 3-3
3-72A

FLIGHT PLAN

CSM

CMP

LM

MCC-H

1613 CST

CDR

LMP

GDC ALIGN

REACQUIRE MSFN

HGA: P -87, Y 0

GO/NO-GO FOR UNDOCK

LOAD DAP-CSM ONLY

S/C CONTROL - SC5

R1=111101, R2=111111

DAC-ON

UNDOCK & SEP -X, 1fps

S/C CONTROL - CMC

VERIFY LM TRACKING LT

ON, OFF

DAC - OFF

GDC ALIGN

MNVR TO TRACKING

ATT (99:35), OMNI C

R 0, P 335, Y 0

CM/DAC/SXT

P22-ORBITAL NAVIGATION

ESTABLISH - 2°/SEC

PITCH RATE AT T2

TRACK LDMK 13-1

25 SEC BETWEEN MARKS

5 MARKS

DO NOT PRO ON FINAL N89

STOP AT BURN ATT: P 111

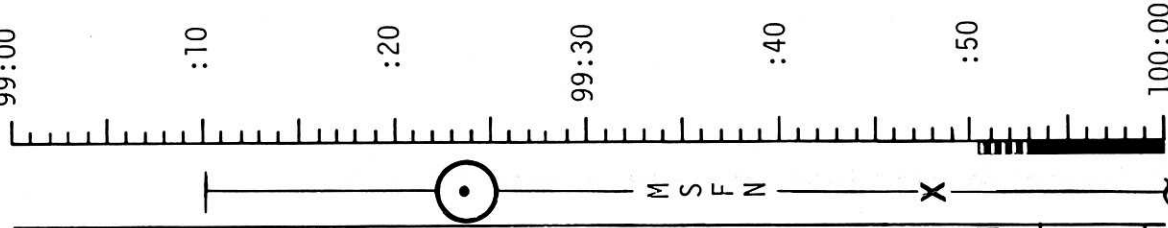
LOAD DAP R1=10111, R2=111111

HGA P= -83, Y= 180

P52-IMU REALIGN

OPTION 3-REFSMAT

(LDG SITE ORIENT)



<u>LM TIMELINE</u>	MOUNT CAMERA ON WINDOW BAR
VOICE DRIFT CHECK GIMBAL ANGLES & TIME TO MSFN	DON HELMETS & GLOVES
P47-THRUST MONITOR	STEERABLE ANT: P 131, Y 41 BIOMED SW-LEFT TAPE RECORDER - ON
UNDOCKING & SEPARATION 99:16:21	
YAW LEFT 60°, PITCH UP 90° R 0, P 012, Y 0 TRACKING LT ON, OFF	STEERABLE ANT: P 94, Y -45 DAC - ON DAC - OFF TAPE RECORDER - OFF
V83 - SET ORDEAL	DOFF HELMETS & GLOVES V47-AGS INITIALIZATION & ALIGNMENT
DPS THROTTLE CHECK	
MNVR TO R 0, P 325/337, Y 0 (99:44) & GO ORB RATE	STEERABLE ANT P 138, Y -34
OBSERVE LDG SITE & (PHOTO LANDING SITE)	
MNVR TO R 0, P 331, Y 0	DAC-ON DAC-OFF STEERABLE ANT P 144, Y -30
RR C/O	

DUMP DSE
GO/NO-GO FOR
UNDOCKING &
SEPARATION

UPLINK TO LM
CSM S.V.
PIPA BIAS (IF REQ'D)
GYRO COMPENSATION
(IF REQ'D)

UPDATE TO LM
REV 12 TCA (LS)

MSFN
RECORD PCM LBR ON
DSE DURING P22

UPLINK TO CSM
CSM S.V.
CIRC TARGET LOAD

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

CSM

CMP

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

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

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

P20 - AUTO MNVR
SXT & VHF TRACKING
OF LM

V49 MNVR TO COMM
ATT (100:58)

R 60, P 282, Y 0

CSM

CMP

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

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

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

P20 - AUTO MNVR
SXT & VHF TRACKING
OF LM

V49 MNVR TO COMM
ATT (100:58)

R 60, P 282, Y 0

LM

CDR

P52-OBSERVE THRU AOT

LPD CALIBRATION

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

LMP

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

SLEW STEERABLE
ANT: P 15, Y -14

AGS ALIGN

UNDocked AGS CALIBRATION

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

CSM CIRCULARIZATION 100:35:05

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

V47 - AGS INITIALIZATION
& ALIGNMENT

MAP UPDATE REV 13

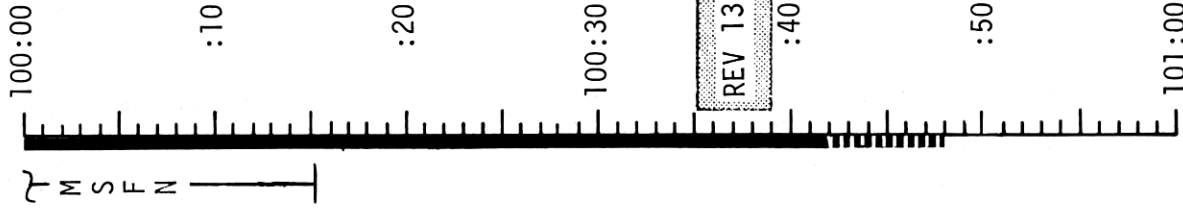
LOS : : :
180° : : :
AOS : : :
MAP UPDATE REV 13

MCC-H

UPDATE TO CSM
CIRC PAD
P22 TRACK PAD
REV 13
UPDATE TO LM
PDI₀ ABORT PAD

GO/NO-GO FOR CIRC

1713 CST

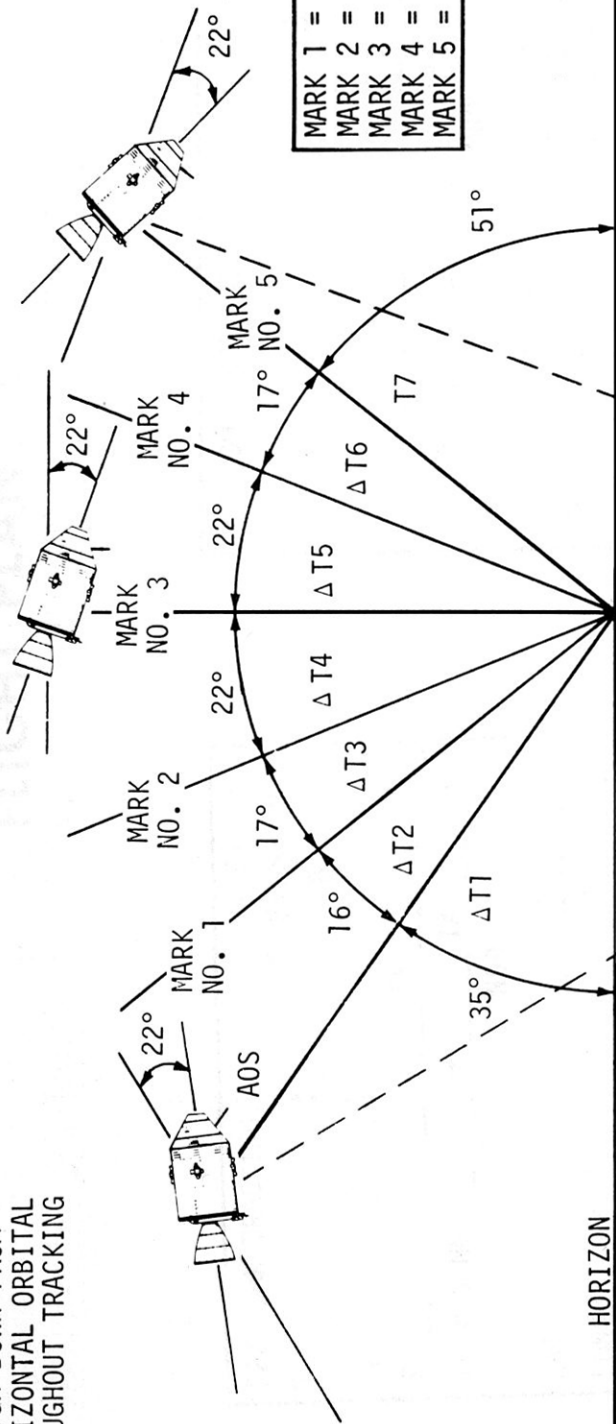


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	100:00 - 101:00	5/12-13	3-74

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CSM LANDMARK TRACKING PROFILE

22 DEG PITCH DOWN FROM
LOCAL HORIZONTAL ORBITAL
RATE THROUGHOUT TRACKING



MARK 1	=	T2 + 40 SEC
MARK 2	=	T2 + 1 MIN 5 SEC
MARK 3	=	T2 + 1 MIN 30 SEC
MARK 4	=	T2 + 1 MIN 55 SEC
MARK 5	=	T2 + 2 MIN 20 SEC

HORIZON

HORIZON

T1 GET AT 0° ELEVATION

T2 GET AT 35° ELEVATION

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

Δ T ₁	=	300 SEC
Δ T ₂	=	40 SEC
Δ T ₃	=	25 SEC
Δ T ₄	=	25 SEC
Δ T ₅	=	25 SEC
Δ T ₆	=	25 SEC
Δ T ₇	=	340 SEC

AOS TO LOS - 146 SEC

AOS TO FINAL MARK -
140 SEC

CENTER OF MOON

FIGURE 3-4

3-74A

FLIGHT PLAN

CSM

LM

MCC-H

CMP

CDR

LMP

HGA: P 30, Y 266
BATTERY CHARGE, BATTERY B

MAP UPDATE REV	14
LOS :	: :
180° :	: :
AOS :	: :

CMC-FREE/AUTO

LOAD DAP

R1=10101, R2=11111

MNVR TO TRACKING

ATT (101:24)

R 0, P 282, Y 0

OMNI D

CM/DAC/SXT

GO ORB RATE P 338/282
(101:33)

P22-ORBITAL NAVIGATION

TRACK LDMK 13-1
25 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

STOP PITCH (101:45)

MNVR TO

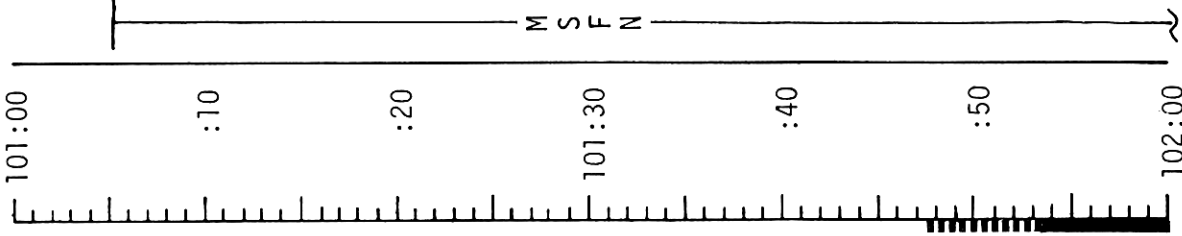
R 0, P 258, Y 0

OMNI D

LOAD DAP

R1=10111, R2=11111

1813 CST



	STEERABLE ANT P 15, Y -14 BIOMED SW-RIGHT	
DPS PRESS & C/O	DPS PRESS & C/O	
LR ACTIVATION & SELF TEST		
V83-SET ORDEAL MNVR TO LPD ALT CK ATT (101:27) & GO ORB RATE R 0, P 295/343, Y 0	STEERABLE ANT P _____, Y _____	
LPD ALTITUDE CK	V47-AGS INITIALIZATION & ALIGNMENT	

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

RELOCATE CAMERA

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

CSM

CMP

LM

MCC-H

1913 CST

M S F N

M S F N T

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

INSTALL TOPO
CAMERA

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

REACQUIRE MSFN
V64

CDR

LMP

STEERABLE ANT
P -2, Y 2

P52 - OBSERVE THRU AOT

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

START MNVR TO PDI ATT
P30-EXT ΔV
LOAD NO PDI +12 ABORT
VERIFY DAP - 21112
P63-COMPLETE MNVR TO PDI ATT
P00; R 0, P 110, Y 0
COAS TO OVHD WINDOW

ALIGN AGS TO PGNS
VERIFY LOOSE GEAR STOWED
RESTRAINTS ATTACHED
(102:50)

DON HELMETS & GLOVES

CONFIGURE EGRESS MODE
CHECK SYS CONFIGURATION

PRE-PDI SW SETTINGS

BATTS 5&6 NORM FEED-ON
REACQUIRE MSFN
STEERABLE ANTENNA
P -2, Y 2
310MED SW - LEFT

ENABLE MSFN
S-BD
RELAY

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

CSM

LM

MCC-H

CMP

MNVR TO CONTAM PHOTO ATT
R 320, P 133, Y 348
(104:10)
CM4/EL
(S/C CONTAM FIELD PHOTOS)
VERIFY DSE MOTION AT LOS
INSTALL WINDOW SHADES

START RECORDER
DIM INTERIOR LIGHTS

S/C CONTAMINATION
FIELD PHOTOGRAPHY
(BETELGEUSE)

CREW RECORDER-OFF, LIGHTS UP
REMOVE WINDOW SHADES
LOAD DAP(R1=10102)(R2=11111)
MNVR TO ORB SCIENCE ATT
(104:55)
R 0, P 230/279, Y 0
GO ORB RATE (HD, BEF)

OMNI D

CDR

LMP

P57 - IMU ALIGN
OPTION 3 - REFSMMAT
A/T 1 - GRAVITY

AGS LUNAR SURFACE
GYRO CALIBRATION

BIOMED SW-RIGHT

DOFF HELMETS & GLOVES

INSTALL WINDOW SHADES

TERMINATE AGS
GYRO CALIBRATION

P57 - OBSERVE THRU AOT

P57 - IMU ALIGN
OPTION 3 - REFSMMAT
A/T 2 - TWO CELESTIAL
BODIES

P57 - IMU ALIGN
OPTION 3 REFSMMAT
A/T 2 - TWO CELESTIAL
BODIES

P57 - OBSERVE THRU AOT

STOW WINDOW SHADES

ALIGN AGS TO PGNC

CONFIGURE FOR PARTIAL POWER DOWN
(BIOMED - AS DESIRED)

DESCRIBE & PHOTOGRAPH LUNAR SURFACE
REPORT FEATURES SEEN DURING DESCENT
AND DETERMINE LM LOCATION WITH MSFN
REPORT ANGLE OF +Z WRT WEST

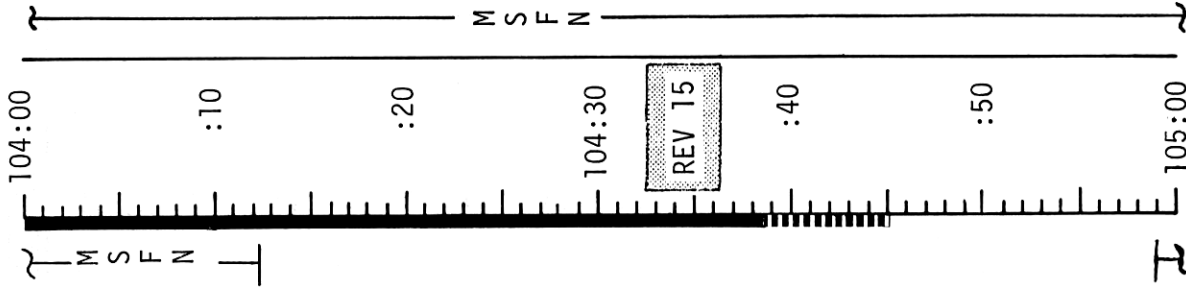
UPDATE TO CSM
CONTAMINATION
PHOTO PAD

DISABLE MSFN
S-BD RELAY

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

UPLINK TO LM
RLS
CSM S.V.

STAY/NO-STAY
FOR POWER DOWN



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	°y
N or S NM	SA	TA	---
LAT		+00.171	
LONG/2		+07.028	
ALT		+000.00	

P22 LDMK TRACKING		(1/60)	
13-1		13-1	
T ₁	---	---	---
T ₂	---	---	---
R	---	°p	°y
N or S NM	SA	TA	---
LAT		-04.043	
LONG/2		-07.799	
ALT		-000.18	

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

FLIGHT PLAN

CSM

CMP

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

DOFF PGA

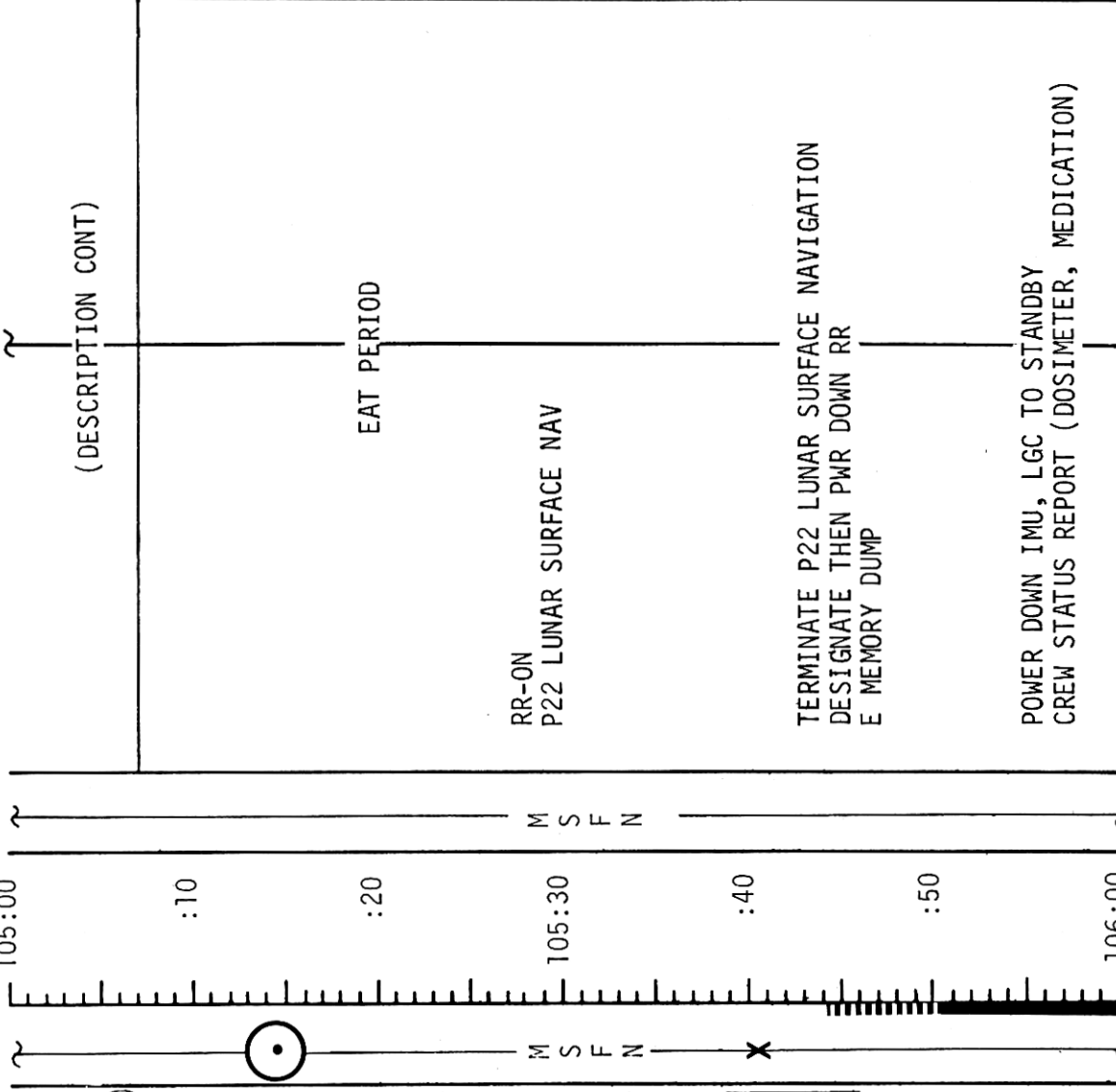
STOP ORB RATE (105:59)
P 192

MCC-H

LM

CDR

LMP



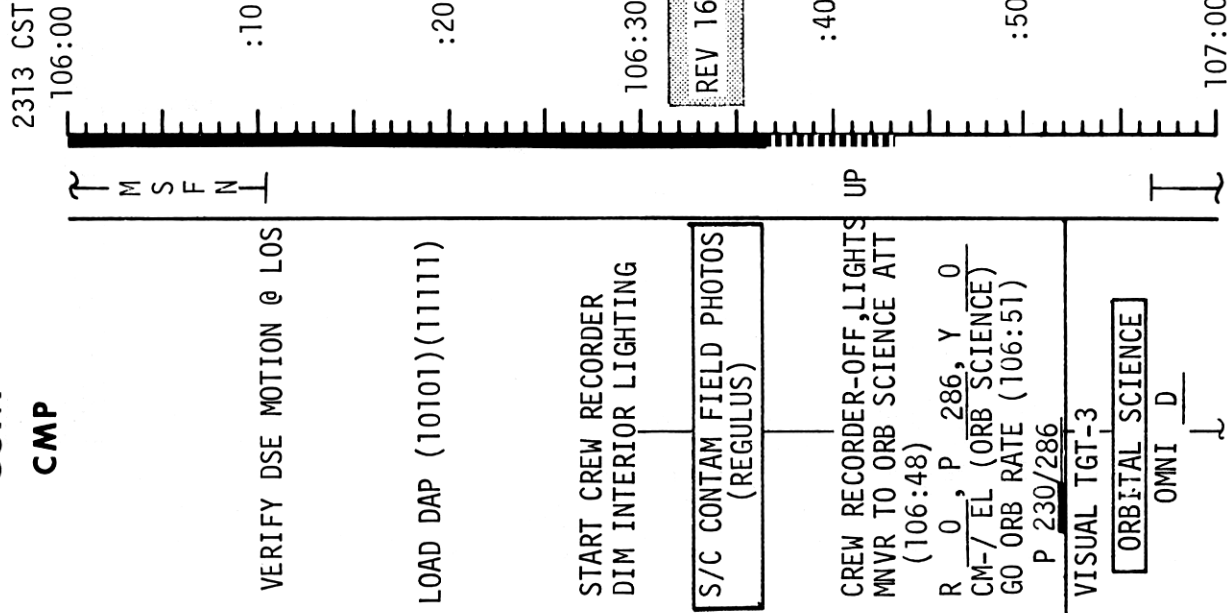
UPDATE TO CSM
P22 TRK PADS REV 15
CONTAM PHOTO PAD
UPLINK TO CSM
CSM S.V.

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



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

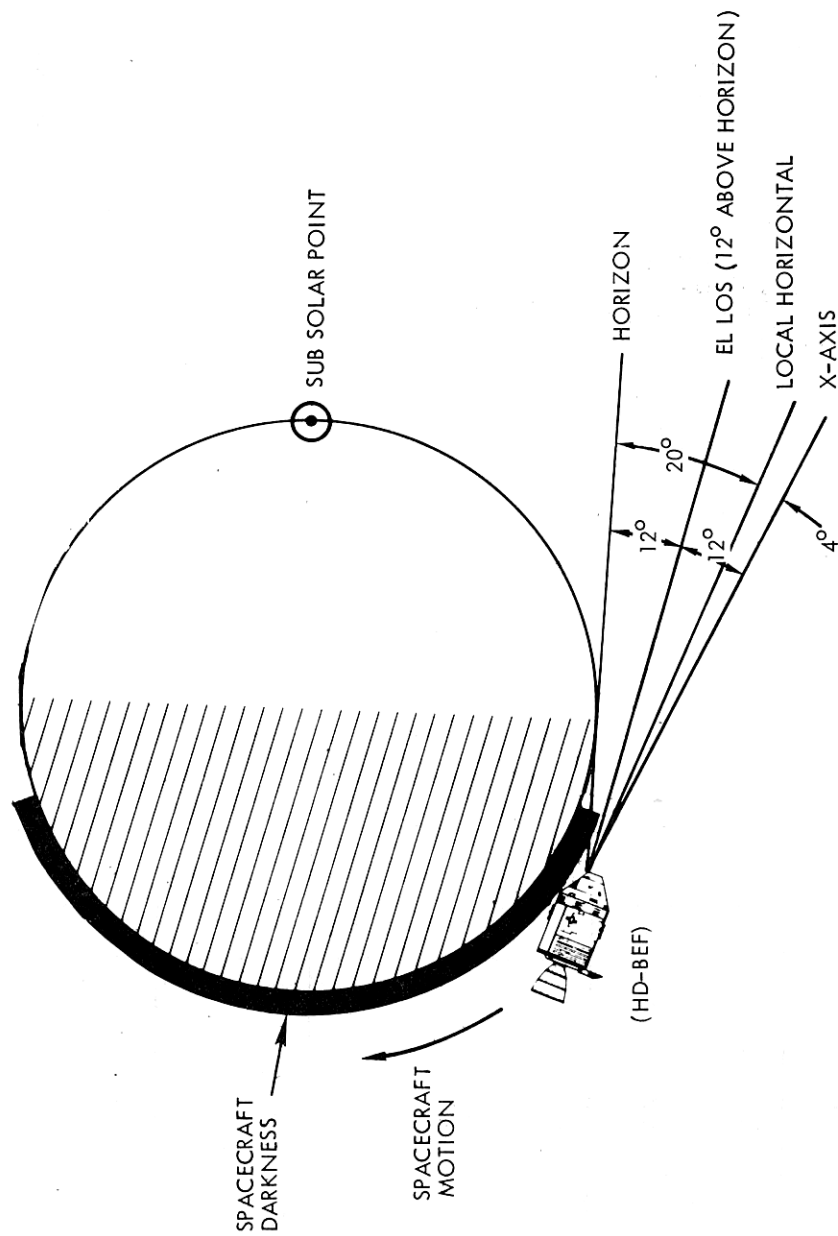


FIGURE 3-5
3-80A

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

CMP

VISUAL TGT 5

ORBITAL SCIENCE

PHOTO TGT 23

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)

LOAD DAP (10102)(11111)

TOPO PHOTOS OF LM
MNVR TO SOLAR CORONA ATT
R 0, P 176/074, Y 0
GO ORB RATE (107:43)
HGA P -55, Y 1
START CREW RECORDER
DIM INTERIOR LIGHTING
SOLAR CORONA PHOTOS
CREW RECORDER-OFF, LIGHTS UP

LM

CDR

LMP

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

PLSS COMM CHECK
AUDIO SWITCHES CK, ACTIVATE PLSS COMM SYSTEMS &C/O
BIOMED-OFF
(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 02 ON

CABIN DEPRESS
DEPRESS CABIN TO 3.5 PSIA

0013 CST

107:00

:10

:20

107:30

:40

:50

108:00

M S F N

M S F N

UP

MCC-H

- 1:00

- :50

UPDATE TO CSM
TOPO PHOTO PAD (LM)
SOLAR CORONA PAD

- :40

- :30

UPDATE TO CSM
P22 TRK PADS REV 17
MAP COORD OF LM
DUMP DSE

- :20

- :10

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

CSM

LM

MCC-H

CMP

STOP ORB RATE (108:01)
P 018
LOAD DAP (10101)(111111)
STOW TOPO CAMERA
VERIFY DSE MOTION @ LOS

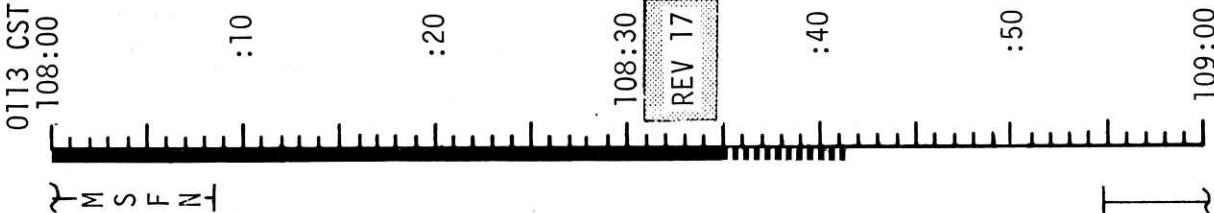
GO ORB RATE (108:19)
P 230/018
CM-/DAC/SXT

WASTE WATER DUMP
O₂ FUEL CELL PURGE

ORBITAL SCIENCE
VISUAL TGT 1

MNVR TO TRK ATT (109:00)
R 0, P 353, Y 0
OMNI D

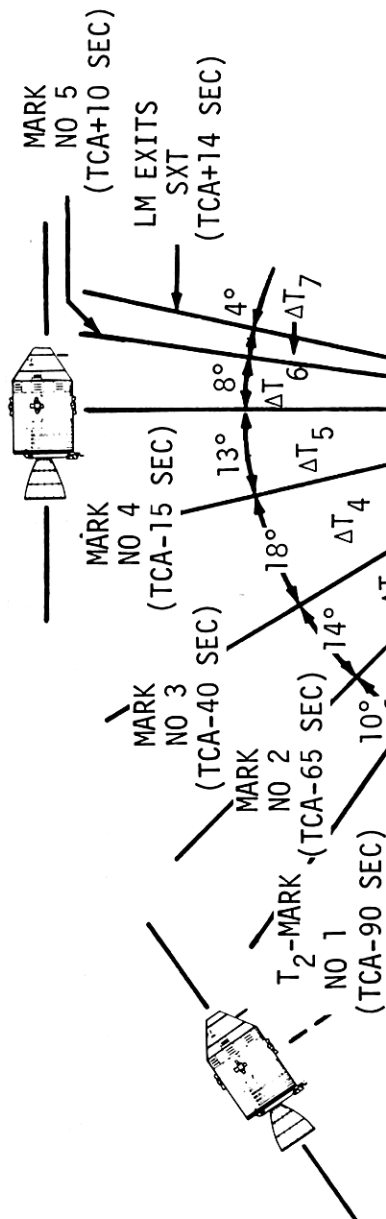
CM4/EL (EARTHSHINE)



CDR		LMP	
FWD DUMP VALVE - OPEN, OPEN FWD HATCH			
FINAL PREP FOR EGRESS PLSS H2O ON, FINAL SYSTEMS CHECK TURN TV ON, VERIFY CB CONFIGURATION			
CDR EGRESS EQUIP JETT, DEPLOY LEC & MESA, DESCEND TO SURFACE ENVIRONMENTAL FAM & TRANSFER DC CAMERA CONT. SAMPLE COLLECTION LMP EGRESS SUPPORT S-BD ERECT ANT DEPLOY UNSTOW S-BAND ANT ORIENT TOWARDS EARTH DEPLOY LEGS ERECT MAST & DEPLOY DISH ALIGN S-BAND ANT PHOTOS & INGRESS SUPPORT	ASSIST & MONITOR CDR HAND JETT BAG TO CDR MONITOR & PHOTO CDR TRANSFER 70MM CAMERA ON LEC		
	LMP EGRESS CLOSE HATCH & DESCEND TO SURFACE		
	ENVIRONMENTAL FAM		
	DEPLOY TRIPOD & TV CAMERA DEPLOY MESA & ETB, STOW PLSS CONSUMABLES & CONT. SAMPLE IN ETB, ASSIST CDR WITH S-BD ANT ALIGN		
	INGRESS		
ANT CHECK & TRANSFERS CHECK S-BAND TRANSFER ETB TO LMP TRANSFER ETB TO SURFACE	ANT SW & TRANSFERS S-BD ANT-LUNAR STAY AID CDR WITH ETB TRANSFER OFFLOAD PLSS CONSUMABLES AND STOW AID CDR WITH ETB TRANSFER		
PHOTOS CONTINGENCY SAMPLE AREA LMP EGRESS	EGRESS & DESCEND TO SURFACE		

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



$\Delta T_1 = 300 \text{ SEC}$
 $\Delta T_2 = 25 \text{ SEC}$
 $\Delta T_3 = 25 \text{ SEC}$
 $\Delta T_4 = 25 \text{ SEC}$
 $\Delta T_5 = 15 \text{ SEC}$
 $\Delta T_6 = 10 \text{ SEC}$
 $\Delta T_7 = 4 \text{ SEC}$

HORIZON

T₁-HORIZON
 LM ENTERS SXT
 (TCA-390 SEC)
 ORB RATE

CENTER OF MOON
 FIGURE 3-5
 3-82A

P22 LDMK TRACKING

(1/250)

TARUNTIUS

O

T₁

T₂

R

N or S NM

SA

TA

N89

LAT

LONG/2

ALT

+02.333

+27.158

+000.00

P22 LDMK TRACKING

(1/125)

T₁

T₂

R

N or S NM

SA

TA

N89

LAT

LONG/2

ALT

+01.266

+11.839

+000.00

P22 LDMK TRACKING

LM

T₁

T₂

R

N or S NM

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

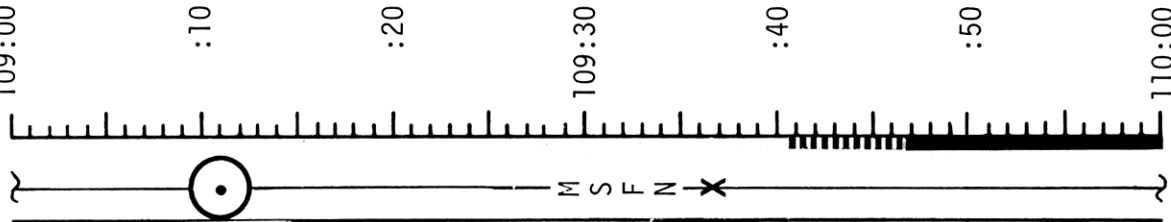
MCC-H

CMP

P22 ORBITAL NAV GO ORB RATE (109:03) P 338/353
START DAC @ T2 - 1 MIN
TRACK LDMK TARUNTIUS 0 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

0213 CST

109:00



CDR

LMP

FLAG DEPLOY	TV RELOCATION
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
ALSEP PREP OPEN SEQ BAY DOORS OFFLOAD PKG 1 RTG FUEL SUPPORT CLOSE SEQ BAY&CONNECT PKGS	ALSEP PREP OFFLOAD PKG 2 DEPLOY HTC OFFLOAD ALSD & PLACE ON PAD DEPLOY FUEL CASK EXTRACT FUEL ELEMENT FUEL RTG
TV & PHOTO PAN	TAKE HTC & ALSD TO MESA REMOVE CSC & PLACE DOWN SUN NW UNLOAD SRC 1 CONTENTS INTO HTC
POSITION TV TO COVER TRAVERSE & CHECK TRAVERSE > 300 FT WITH ALSEP	TRAVERSE >300 FT WITH HTC AND ALSD
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	ALSEP DEPLOY PLACE ALSD ON HTC AID CDR WITH HOOKUP
DEPLOY CCGE	REMOVE HFE & LOCATE DEPLOY HFE CABLES & LOCATE HOLES ASSEMBLE ALSD

1:00

MSFN

RECORD PCM LBR ON
DSE DURING P22'S

1:10

1:20

1:30

1:40

DUMP DSE

1:50

UPLINK TO CSM
CSM S.V.

2:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	109:00 - 110:00	5/17	3-83

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FLIGHT PLAN

P22 LDMK TRACKING

(1/250)

T₁

T₂

R

N or S NM

SA

TA

N89

LAT

LONG/2

ALT

°p

°y

°

SECCHI

MO STING

A

°

P22 LDMK TRACKING

(1/60)

T₁

T₂

R

N or S NM

SA

TA

N89

LAT

LONG/2

ALT

°p

°y

°

MO STING

A

°

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

CSM

CMP

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

DAC-ON @ T2 - 1 MIN

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 P -86, Y 130

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

GDC ALIGN

0413 CST

111:00

:10

:20

111:30

:40

:50

112:00

M S F N X

M S F N

LM

CDR

LMP

MCC-H

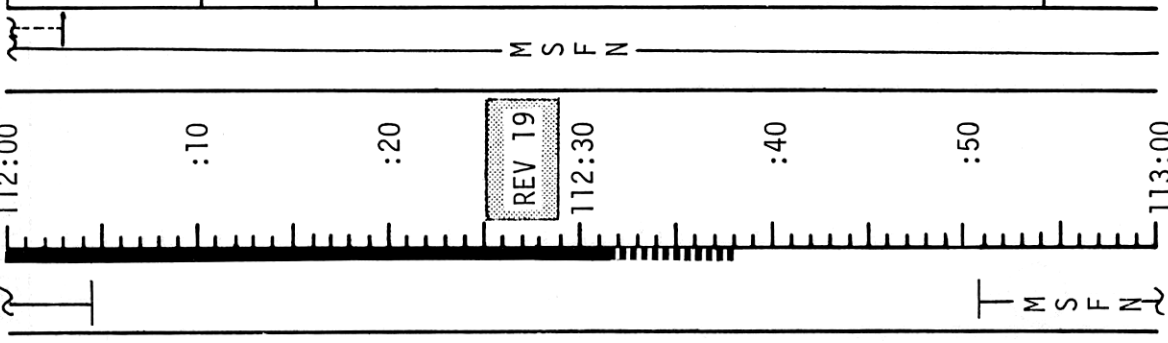
ASSIST LMP WITH CORE STEM REMOVAL CLEAN UP DEBRIS CHECK EMU	REMOVE CORE STEMS CAP AND STOW CORE STEMS CLEANUP DEBRIS CHECK EMU	3:00 MSFN RECORD PCM LBR ON DSE DURING P22'S EMU CONSUMABLES GO/NO-GO FOR EVA 3:10 EXTENSION
RETURN TRAVERSE COLLECT SELECTED SAMPLES PHOTO SAMPLE AREA	RETURN TRAVERSE COLLECT SELECTED SAMPLES	3:20
SRC 1 PACKING 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	SRC 1 PACKING PLACE HTC AT MESA STOW CDR TOTE BAG, CAMERA & LENS IN ETB UNLOAD SRC 2 & PUT ON +Y PAD PLACE S-BAND COVER OVER SRC 2 UNSTOW & DEPLOY SWC CLEAN EMU & CHECK ETB PACK	3:30
TRANSFER ETB INTO LM TRANSFER SRC INTO LM CLEAN EMU EVA TERMINATION ASCEND, STOW LEC & INGRESS	EVA TERMINATION INGRESS, CHECK LM & EMU STOW DAC & MOUNT LEC ASSIST CDR - TRANSFER HAND LEC TO CDR	UPDATE TO CSM MNVR PAD (PLANE CHANGE) DUMP DSE UPLINK TO CSM CSM S.V. PLANE CHANGE TGT LOAD DESIRED ORIENT (PLANE CHANGE)
REPRESS CABIN		4:00

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	111:00 - 112:00	5/18	3-85

CMP

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

0513 CST



CDR

LMP

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	0:00
PLSS 02 RECHARGE CONNECT LMP'S PLSS TO LM 02 SUPPLY & FILL (2 MIN) CONNECT CDR'S PLSS TO LM 02 SUPPLY & FILL (2 MIN)	0:10
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
	0:30
	0:50
POST EVA CABIN CONFIGURATION STOW SRC IN LOWER & CDR OPS IN TOP OPS COMPARTMENT REPORT TOTE BAG #1 WEIGHT	1:00

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

LiOH CANISTER CHANGE
11 INTO A, STOW 9 IN A3

HGA P -44, Y 270

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

MCC-H

LMP

1:00
GO/NO-GO FOR PC 1
UPDATE TO CSM
SOLAR CORONA PAD

EAT PERIOD

P52 - IMU REALIGN

MSFN

*ITEMS TO BE
REPORTED TO MSFN
DUMP DSE
UPLINK TO CSM
DESIRE ORIENT
(LIFTOFF)
RLS UPDATE (IF RLS
UPDATE TO CSM)
2:00 REF5MMAT 00 T

2:00 UPDATE TO CSM
REFSMMAT 00 TIME

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

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

LM

MCC-H

CMF

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

0713 CST
114:00
:10
:20
REV 20
114:30
:40
:50
115:00

M S F N

CDR

EAT PERIOD

LMP

EAT PERIOD

PLSS RECHARGE

PLSS FEEDWATER COLLECTION (BOTH)

REPORT PLSS FEEDWATER QUANTITIES

CONNECT LM O₂ SUPPLY TO PLSS & FILL (10 MIN)

CONNECT LM H₂O SUPPLY TO PLSS & FILL (3 MIN)

CONNECT LM O₂ SUPPLY TO 2ND PLSS & FILL (10 MIN)

CONNECT LM H₂O SUPPLY TO 2ND PLSS & FILL (3 MIN)

EVA DEBRIEFING

CREW STATUS (RADIATION, MEDICATION)
VOICE - DN VOICE BU, S-BD PWR AMPL - OFF

CONFIGURE SLEEP STATIONS

REST PERIOD
(9 1/2 HOURS)

REST PERIOD
(9 1/2 HOURS)

DUMP DSE

2:40

UPDATE TO LM

LIFT OFF TIME FOR

REV 20 THRU 24

(ASSUMES NOM PLANE

CHANGE)

2:50

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

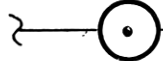
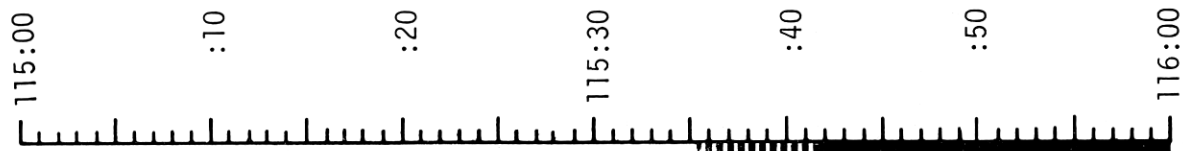
MCC-H

LM

CSM

CMP

0813 CST



M S F N X

M S F N

CDR

LMP

REST PERIOD
(10 HOURS)

REST PERIOD
(9 1/2 HOURS)

REST PERIOD
(9 1/2 HOURS)

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

CSM

CMP

REST PERIOD
(10 HOURS)

LM

CDR

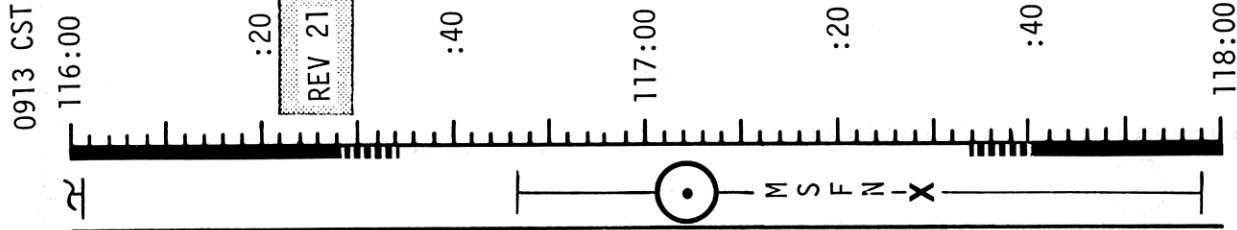
REST PERIOD
(9 1/2 HOURS)

LMP

REST PERIOD
(9 1/2 HOURS)

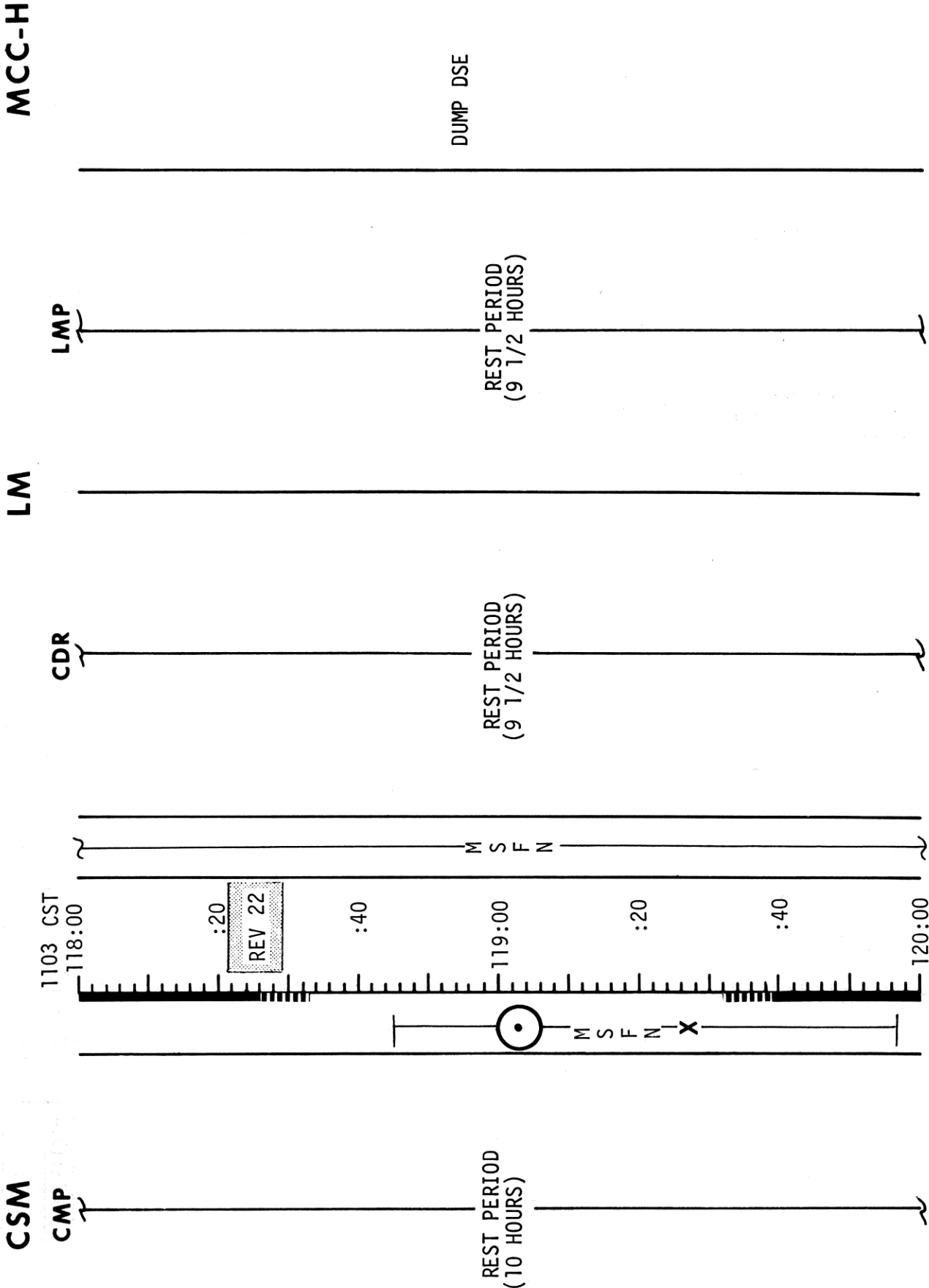
DUMP DSE

MCC-H



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

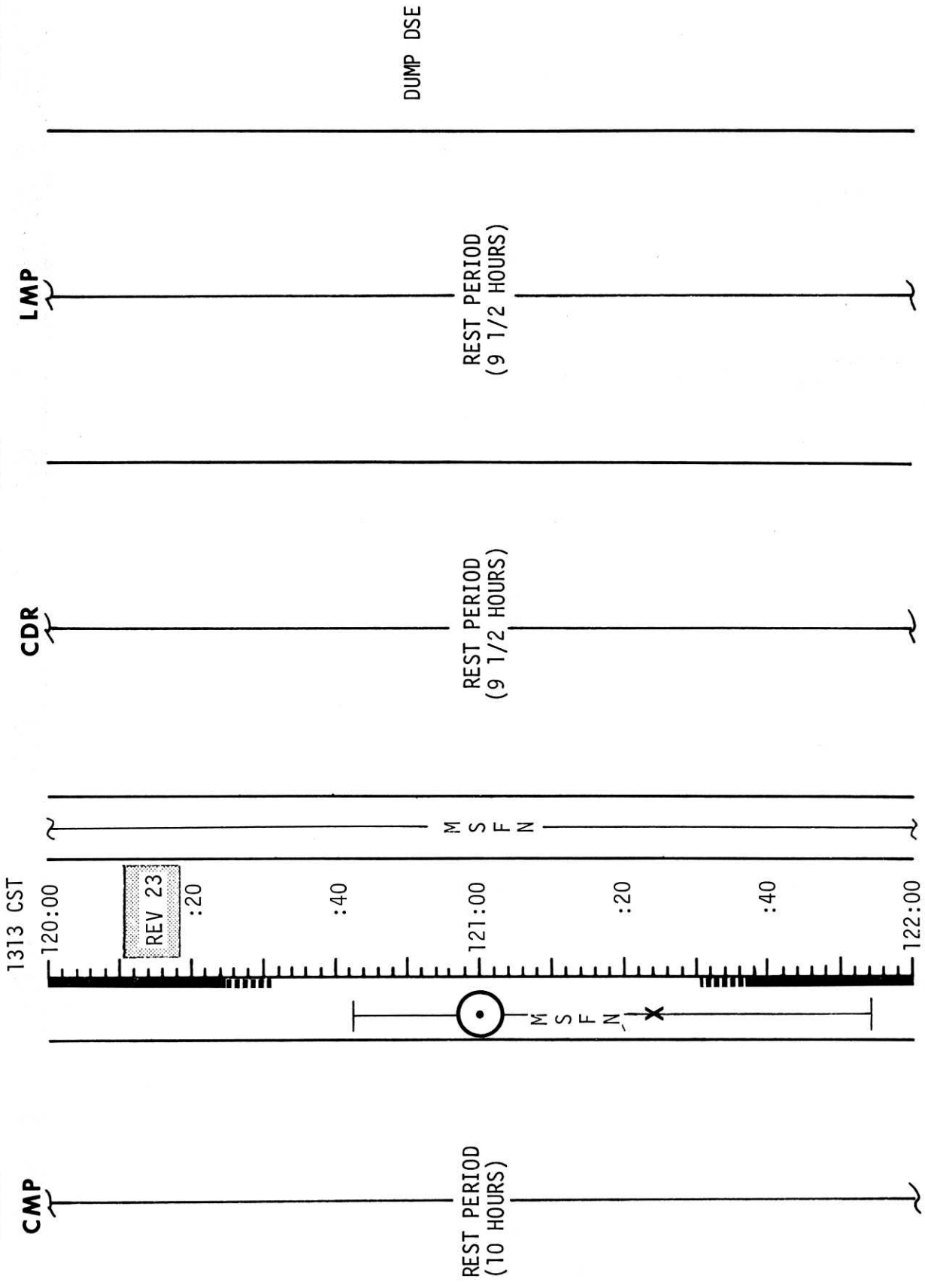
FLIGHT PLAN



MCC-H

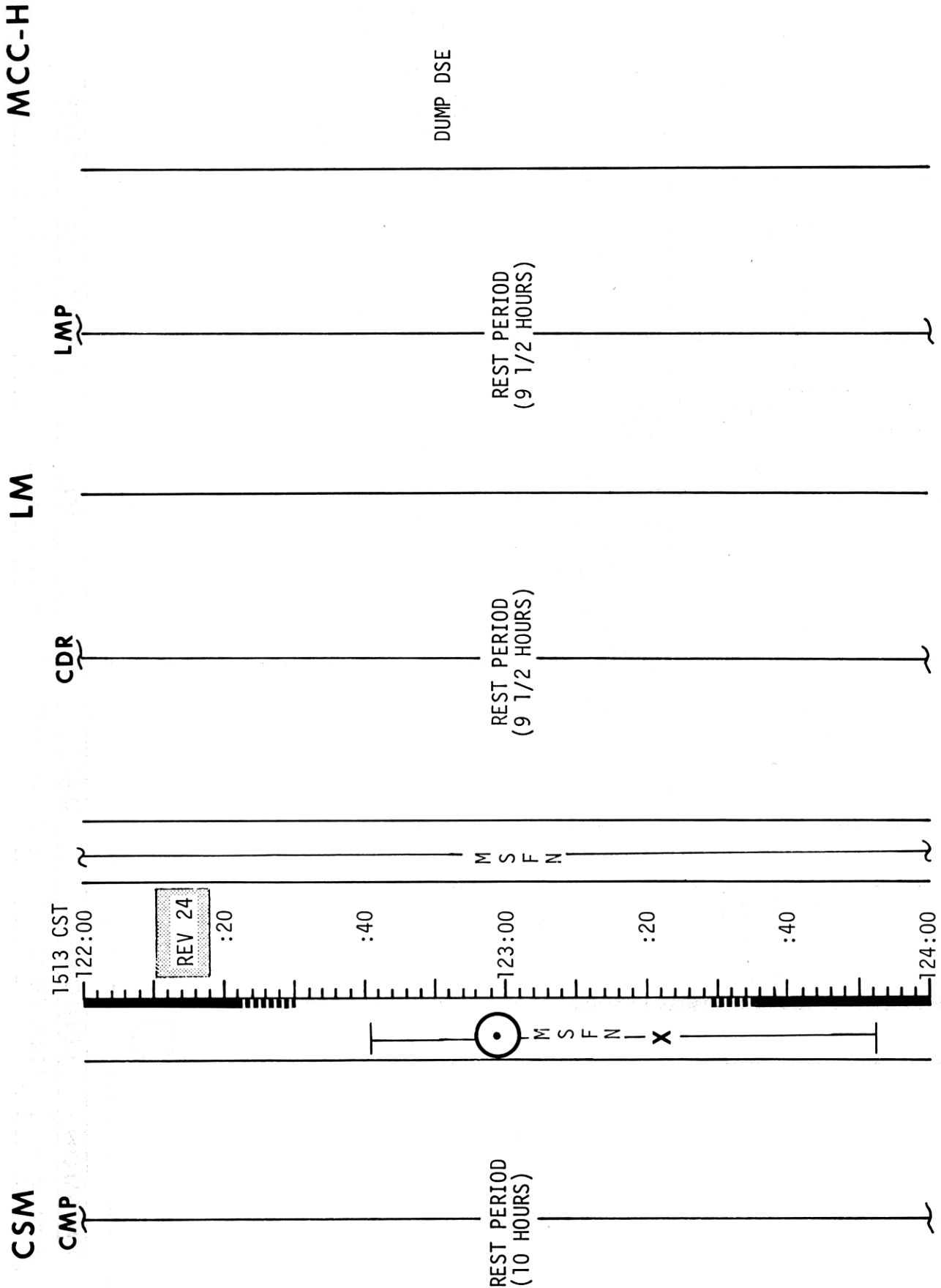
LM

CSM



MISSION	EDITION	DATE	TIME	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	120:00 - 122:00	3-92

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	122:00 - 124:00	5/23-24	3-93

LM

MCC-H

CMP

CDR

LMP

**REST PERIOD
(10 HOURS)**

REST PERIOD
(9 1/2 HOURS)REST PERIOD
(9 1/2 HOURS)

S-BD PWR AMPL-PRIM, VOICE-VOICE
CHANGE LM L10H CARTRIDGE
CONFIGURE HAMMOCKS FOR JETTISON, LGC PUMP CB-CLOSE
LGC TO OPERATE TO UPDATE LGC CLOCK
THEN BACK TO STANDBY

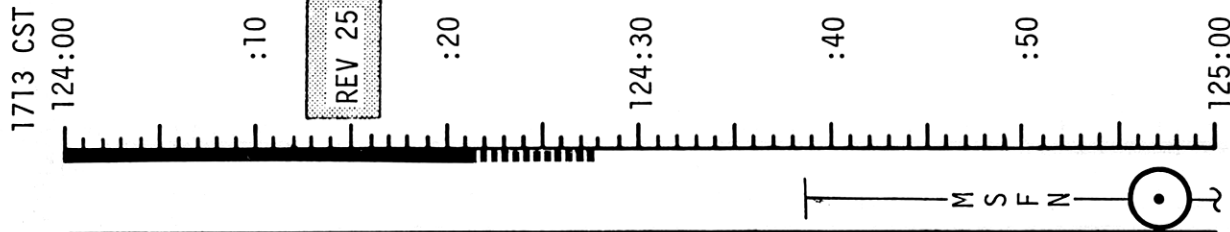
STAY/NO STAY FOR EVA PREP
CREW STATUS REPORT (SLEEP, DORS

EAT PERIOD

EAT PERIOD

UPDATE TO LM
LM CONSUMABLES
LIFTOFF TIME FOR
REV 25 THRU 29
STAY/NO STAY

DUMP DSE



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

LM

MCC-H

1813 CST
125:00

CMP

WAKE UP
PERFORM POSTSLEEP
CHECKLIST

CSM CONSUMABLES UPDATE

GET: ____:____

RCS TOTAL ____

QUAD A ____ B ____

C ____ D ____

H₂ TOTAL ____

O₂ TOTAL ____

EAT PERIOD

VERIFY DSE MOTION @ LOS
LOAD DAP (10101)(11111)

P52 IMU REALIGN
OPTION 3 - REFSMMAT
(LIFTOFF ORIENT)

CDR

LMP

EAT PERIOD

EAT PERIOD

EVA PLANNING PERIOD

CABIN PREP FOR EVA

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

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

P52 IMU REALIGN

N71: ____:____

N05: ____:____

N93: ____:____

X ____:____

Y ____:____

Z ____:____

GET ____:____

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	125:00 - 126:00	6/25	3-95

STEREO STRIP PHOTOGRAPHY (RESEAU & DAC)

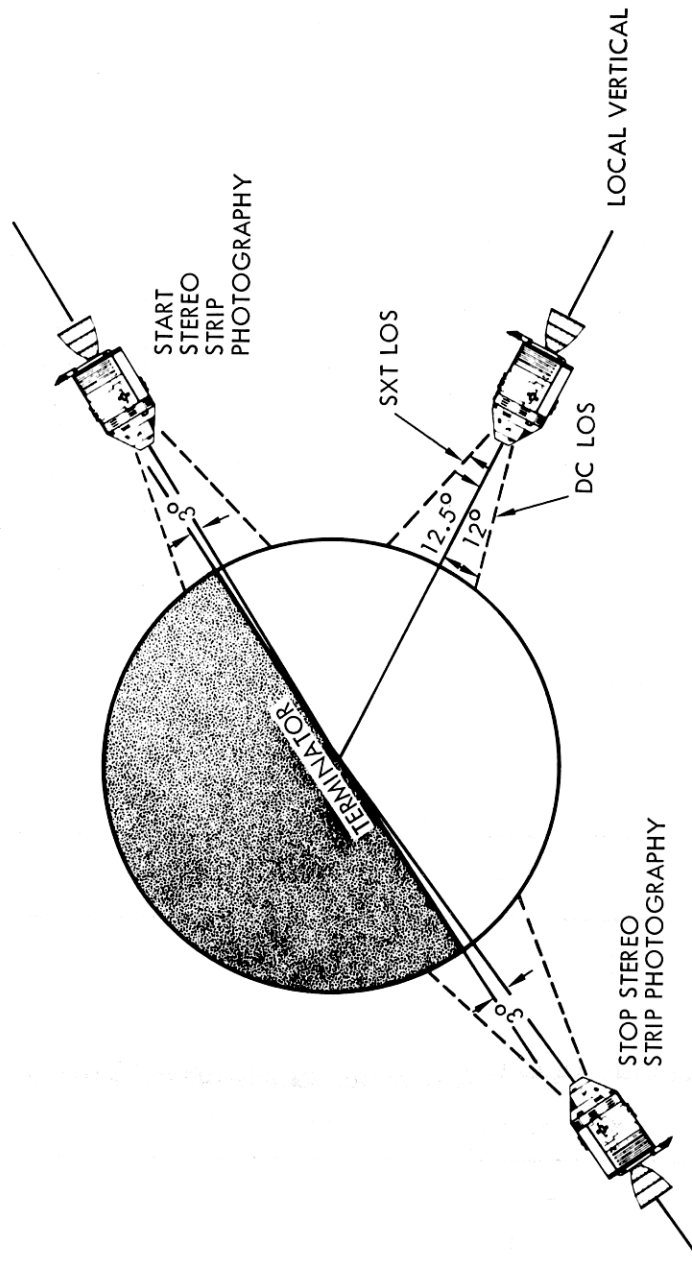


FIGURE 3-7
3-95A

FLIGHT PLAN

CSM

CMP

GDC ALIGN

LOAD DAP (10101)(11111)
MNVR TO VERT STRIP ATT
(126:19)

R 0. P 348. Y 0

CM4/DC (VERTICAL_STRIP)

CM-/EL (ORBITAL SCIENCE)

CM-/DAC/SXT (VERTICAL STRIP)

GO ORB RATE (126:21)
P 270/348

DAC & DC-ON @ TR + 1 MIN

PHOTO TGT 5

PHOTO TGT 13
OMNI D

ORBITAL SCIENCE
& VERTICAL STEREO STRIP

PHOTO TGT 25

LM

CDR

LMP

CABIN PREP FOR EVA (CONT)

EQUIPMENT PREP

SET DET FOR CABIN DEPRESS

PREPARE CAMERAS

UNSTOW AND CHECK BOTH OPS

PLSS DONNING
CONFIGURE LMP'S PLSS/OPS FOR DONNING

UNSTOW RCU'S

LMP DOWN 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 REORDER at FRA

MAURO SUN ELEV X (-) 3 1/2 MIN

MCC-H

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

MAP UPDATE REV 26

SOT

180° : :

ANS . . .

-1:10

UPDATE TO CSM

FRA MAURO ZERO PHASE
PAD

-1:00

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

CSM

CMP

VISUAL TGT 9

ORBITAL SCIENCE
& VERTICAL STEREO STRIP

CM3/EL (FRA MAURO)

FRA MAURO ZERO PHASE PHOTOS
AND OBSERVATIONS

CM-/EL (ORBITAL SCIENCE)

V64 ACQ MSFN
PHOTO TGT 56

DAC & DC-OFF TS - 1 MIN

BATTERY CHARGE BATT A

VERIFY DSE MOTION @ LOS

INSTALL TOPO CAMERA
IN HATCH WINDOW

LM

CDR

PLSS COMM CHECK
AUDIO SWITCHES CHECK, ACTIVATE PLSS COMM SYSTEMS&C/O
BIOMED-OFF
(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 ITEMS PREPARED FOR JETTISON
VERIFY EVA CB CONFIGURATION

PRESSURE INTEGRITY CHECK
PLSS O₂ ON

CABIN DEPRESS
DEPRESS CABIN TO 3.5 PSIA
FWD DUMP VALVE - OPEN

FINAL PREP FOR EGRESS
PLSS H₂O ON, FINAL SYSTEMS CHECK, TURN TV ON
VERIFY CB CONFIGURATION, JETTISON BAG & LHSSC

CDR EGRESS & TRANSFER
DEPLOY LEC & DESCEND
TO SURFACE
ASSIST CDR

MCC-H

- :40

- :30

DUMP DSE

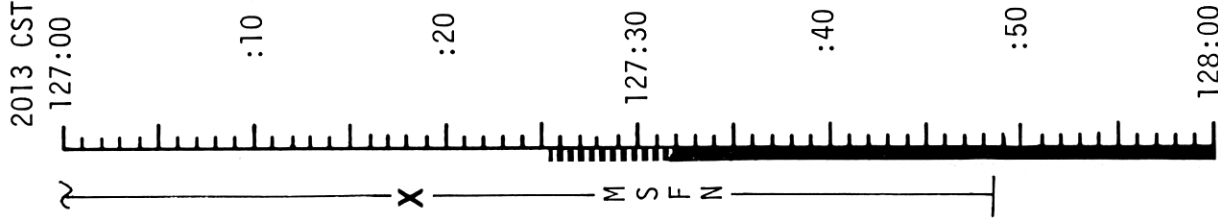
- :20

UPDATE TO CSM
TOPO PHOTO PADS
REV 27

- :10

START EVA
0:00

0:10



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

MCC-H

LM

CMP

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

LOAD DAP (10102)(11111)

TOPO PHOTOGRAPHY

PCM-HBR
TOPO TGT 6

TOPO TGT 9

PCM-LBR

OMNI D

ACQ MSFN HGA P-21, Y 177

NOTE: A MNVR 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, CENSORINUS

2113 CST

128:00

:10

REV 27

:20

128:30

:40

:50

129:00

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

FIELD GEOLOGY TRAVERSE
OUTBOUND

TAKE DOCUMENTED SAMPLES & CSC PHOTOS THROUGHOUT
TRAVERSE

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

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.

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

CSM

CMP

TOP0 TGT 29

TOP0 TGT 34

TOP0 TGT 42

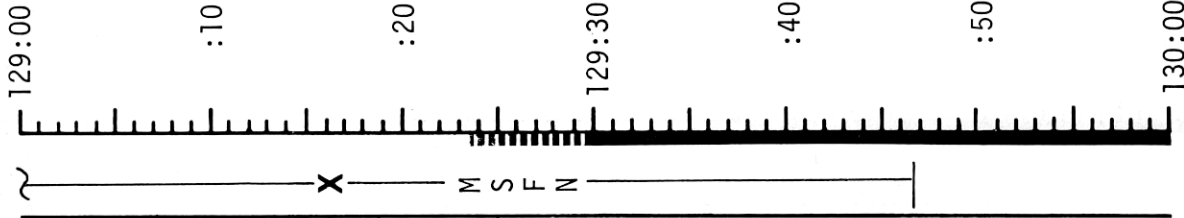
TOP0 TGT 46/54

LOAD DAP (10111) (111111)
V64, ACQ MSFN

EAT PERIOD

VERIFY DSE MOTION @ LOS

2213 CST



LM

CDR

LMP

MCC-H

FIELD GEOLOGY TRAVERSE
OUTBOUND

CORE SAMPLE COLLECTION

CORE SAMPLE COLLECTION

POLARIZATION AND PHOTOMETRY
EVA COMM SYSTEM PERFORMANCE
(OPPORTUNITY DICTATES TIME OF COMMISSION)

ONE-HALF MILE FROM LM AT 2 HOURS

DOCUMENT & COLLECT FINE
SAMPLES
COLLECT SPECIAL ENV. SAMPLE
IN TRENCH
GAS ANALYSIS SAMPLE
MAGNETIC SAMPLE

CORE SAMPLE
BOOT PRINTS IN TRENCH FILL

1:20

1:30

DUMP DSE
1:40

UPDATE TO CSM
TOP0 PHOTO PAD
(CENSORINUS &
TGT 54A)
1:50

2:00

2:10

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	129:00 - 130:00	6/27	3-99

FLIGHT PLAN

CSM

CMP

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)

2373 CST

130:00

REV 28

10:

20

130:30

:40

50

137:00

CDR

LM

LMP

MCC-H

FIELD GEOLOGY TRAVERSE
INBOUND

MAP UPDATE REV 28

... : S07

 180°

AOS : : :

2:50

TOPO PHOTO PAD CENSORINUS

R P Y

T START: _____

T STOP : — — — :

RNG

TOPO PHOTO PAD TGT 54A

Re: p. Y

START: _____

STOP

RNG

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	130:00 - 131:00	6/27 - 28	3-100

ZODIACAL LIGHT PHOTOGRAPHY

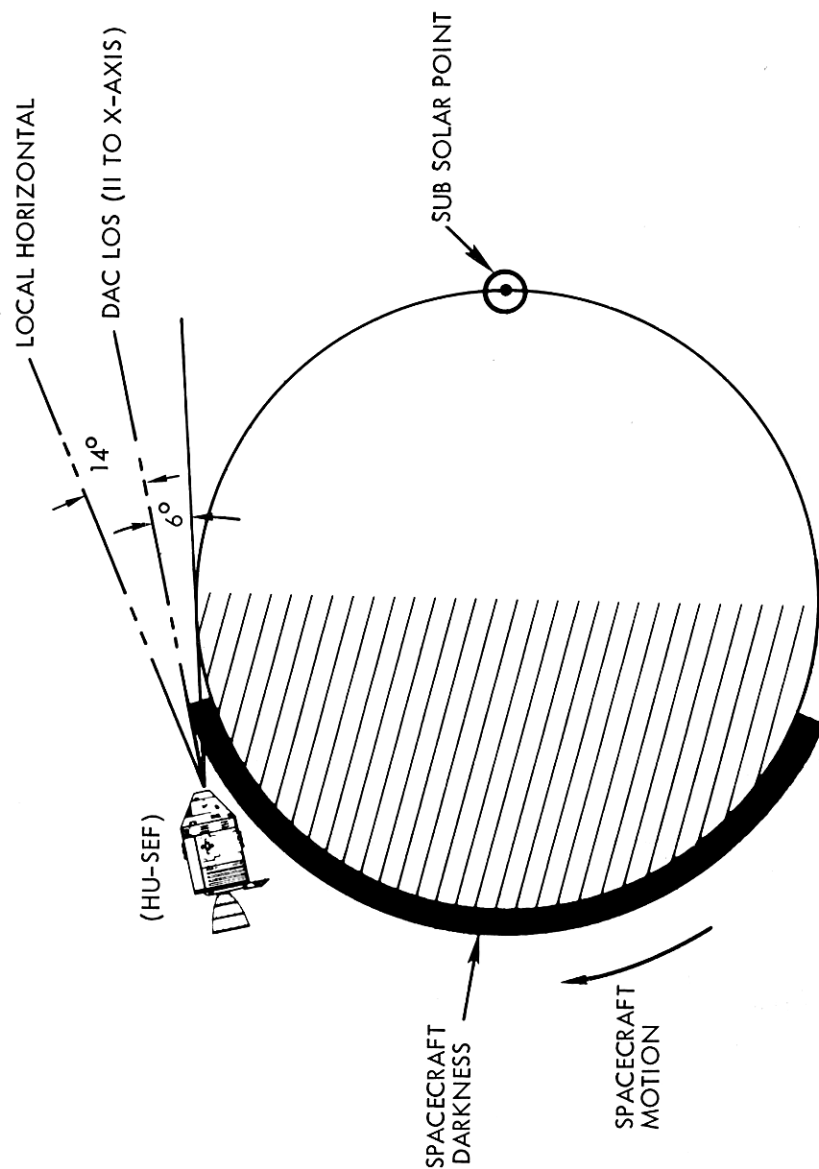


FIGURE 3-8
3-100 A

FLIGHT PLAN

CSM

LM

MCC-H

CMP

CDR

LMP

0013 CST

LOAD DAP (10102)(11111)

PHOTO TGT 33

MNVR TO TOPO TGT 54A ATT
BY 131:14

R , P , Y

TOPO TGT 54A

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

CREW RECORDER-ON

VERIFY DSE MOTION @ LOS

DIM INTERIOR LIGHTING

ZODIACAL LIGHT
PHOTOGRAPHY



DOCUMENTED SAMPLE OFFLOAD CHECK EMU EXPENDABLES OFFLOAD SAMPLES INTO SRC 2 COMPLETE FILL WITH FINE SOIL & ROCKS NEAR LM	DOCUMENTED SAMPLE OFFLOAD CHECK EMU EXPENDABLES REPOSITION TV
STOW SAMPLES IN TOTE BAG SEAL SRC 2 & PREP FOR TRANSFER	RETRIEVE & STOW SWC IN ETB
STOW CAMERAS & MAGS IN ETB	STOW CSC MAG IN ETB
SUPPORT LMP INGRESS HOOK UP ETB ON LEC	STOW CAMERAS & MAGS IN ETB
TRANSFER ETB INTO LM TRANSFER TOTE BAG INTO LM TRANSFER SRC INTO LM	COLLECT ENG. SAMPLE
EVA TERMINATION CLEAN EMU, ASCEND JETT LEC, INGRESS	EVA TERMINATION CLEAN EMU & INGRESS
REPRESS CABIN	HOOK UP LEC ASSIST CDR TEMP STOW ETB & TOTE BAG ASSIST CDR STOW SRC HAND LEC TO CDR CLOSE HATCH
POST EVA SYSTEMS CONFIGURATION CONFIGURE VALVES AND CIRCUIT BREAKERS, DOFF GLOVES DISCONNECT OPS 02 HOSES & PLSS H2O HOSES & CONNECT LM 02 & H2O HOSES	UPDATE TO CSM ZODIACAL PHOTO PAD P22 TRK PADS REV 29 UPLINK TO CSM CSM S.V. (L/S LDMK T1-10 MIN)
LCG PUMP CB-CLOSE, SWITCH TO LM COMM SYSTEM, BIOMED-LEFT	ZODIACAL LIGHT PHOTO PAD (SR) T-START: : : : START RECORDER at : : : SUNSET (-) 30 MIN
PLSS/OPS DOFFING REMOVE RCU'S DISCONNECT PLSS 02 HOSES	

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

MCC-H

LMP

132:00

0:20

10:

MAP UPDATE REV 29

LOS...

180°

AOS :

PHOTO TGT 10

PHOTO TGT 12

PHOTO TGT 15

PHOTO TGT 21

MNVR TO TRK ATT (132:54)

R 0, P 291, Y 0

CM-/DAC/SXT (LDMK TRK)

P22 ORBITAL NAVIGATION (EDIR) / SAT

GO ORB RATE (132:57)

P 338/291

0:40

0:50

1:00

MSF

RECORD PCM LBR ON
DSE DURING P22'S

1:10

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	132:00 - 133:00	6/28 - 29	3-102

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MCC-H

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

134:00

W

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
DUMP DSE

ASC A-H

[illegible]

MAP UPDATE REV 30					
L0S	:	—	:	—	—
180°	:	—	:	—	—
A0S	:	—	:	—	—

P22 LDMK TRACKING	($\frac{1}{60}$)
T ₁	13-1
T ₂	
R °P _____ °Y _____	
N or S NM SA _____ IN89 _____ TA _____	
LAT -04.043	
LONG/2 -07.799	
ALT -000.18	
13-2	13-3
LAT LONG/2 ALT	-03.606 -07.658 +000.00
	-03.189 -07.739 -000.76

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

FLIGHT PLAN

CSM

CMP

RNDZ XPNDR ACT & SELF TEST

GO ORB RATE (134:15)

P 230/306

CM-/EL (ORBITAL SCIENCE)

CM-/DAC (LDMK TRACKING)

PHOTO TARGET 11

ORBITAL SCIENCE

OMNI C

PHOTO TARGET 16

MNVR TO TRACK ATT(134:45)

R 0, P 314, Y 0

OMNI D

RR XPONDER-PWR

P22 - ORBITAL NAVIGATION

GO ORB RATE (134:48)

P 338/314

START DAC @ T2(-) 1 MIN

TRACK LDMK MOLTKE

25 SEC BETWEEN MARKS

5 MARKS

DO NOT PRO ON FINAL N89

CSM

LM

MCC-H

0313 CST

134:00

REV 30

:10

:20

134:30

:40

:50

135:00

CDR

EAT PERIOD

LMP

EAT PERIOD

SYSTEMS STATUS CHECK

PGNCS-OPERATE

POWER UP SYSTEMS

(TV OFF)

PGNCS SELF TEST

ERASABLE MEMORY DUMP

SYSTEMS STATUS CHECK

AGS STATUS-OPERATE

POWER UP SYSTEMS

AGS SELF TEST

P57-LUNAR SURFACE ALIGN

OPTION 4-LANDING SITE

A/T-3-GRAVITY & ONE

CELESTIAL BODY

(LIFTOFF ORIENTATION)

V63 - RR SELF TEST

CONFIGURE FOR RNDZ

RADAR TRACKING

ALIGN AGS TO PGNC

AGS GYRO CALIBRATION

ALIGN AGS TO PGNC

MAP UPDATE REV	30
LOS	:
180°	:
AOS	:

UPLINK TO LM

CSM S.V. (L/O)

ZERO POS/NEG CELLS

MSFN

RECORD PCM LBR ON

DSE DURING P22'S

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	134:00 - 135:00	6/29-30	3-104

CSM
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)

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

H₂ PURGE LINE HEATERS-ON

P52-IMU REALIGN
OPTION 3 - REFSMMAT
COAS CALIBRATION(SPICA)
(LIFTOFF ORIENTATION)

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

H₂ PURGE HTRS - OFF

LM

CDR

P22-LUNAR SURFACE
NAVIGATION

TRACK CSM WITH RNDZ
RADAR

RCS CHECKOUT

LMP

RATE GYRO CHECK

V47-AGS INITIALIZATION

S-BAND-SLEW
P 110, Y -41

LOAD AGS ASCENT
TARGETING

MCC-H

P52 IMU REALIGN

N71: --,--

N05: --,--

N93: --,--

X --,--

Y --,--

Z --,--

GET --,--

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 --

MAP UPDATE REV 31
LOS : : :
180° : : :
AOS : : :
MAP UPDATE REV 31

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

FLIGHT PLAN

CSM

CMP

EAT PERIOD

DON PGA WITHOUT HELMET
AND GLOVES
STOW JETTISON ITEMS

MNVR TO P52/P20 ATT (136:45)
R 0, P 79, Y 0
HGA P -62, Y 7

LM

MCC-H

CDR

LMP

ENABLE MSFN S-BD
RELAY

MAP UPDATE REV	31
LOS :	_____ :
180° :	_____ :
AOS :	_____ :

DUMP DSE

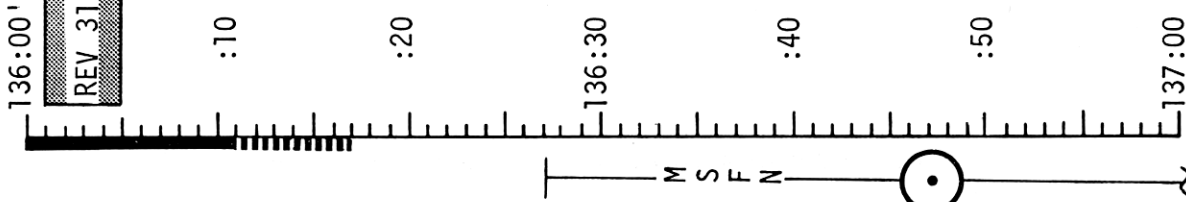
UPLINK TO CSM
(IF REQ'D)
LM S.V. (INS +18)
CSM S.V. (L/O)
UPDATE TO LM
(IF REQ'D)
ASCENT PAD
CSI PAD
UPLINK TO LM
(IF REQ'D)
CSM S.V. (L/O)
RLS
LGC GYRO COMP
GO/NO-GO FOR
LIFTOFF FOR
REV 31

ALIGN AGS TO PGNC
ASCENT BATS-ON, DES 1&3
OFF
DON HELMETS & GLOVES
SET CAMERA FOR ASCENT
LM3/DAC
ENTER AGS LUNAR ALIGN
PRELAUNCH SWITCH CHECKS
V47-AGS INITIALIZATION
LIFTOFF COMM
DES BATS 2&4 - OFF
DEADFACE DES BATS
VERIFY CB STATUS

P57-LUNAR SURFACE ALIGN
OPTION 4-LANDING SITE
A/T-3 - GRAVITY & ONE
CELESTIAL BODY
(LIFTOFF ORIENTATION)

DON HELMETS & GLOVES
LOAD DAP, N46-12002
P12-POWERED ASCENT
PRELAUNCH SWITCH CHECKS
VENT DPS FUEL, OXID, & SHE
PRESSURIZE APS
CONFIGURE ASCENT FEEDS
GO/NO-GO FOR LIFTOFF
VERIFY CB STATUS

0513 CST



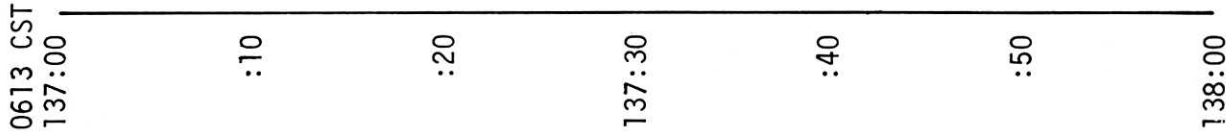
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	136:00 - 137:00	6/30-31	3-106

CSM

CMP

LM

MCC-H



CONFIRM LM INSERTION
VHF RANGING
VHF VOICE CK W/LM

P52-IMU REALIGN (IF REQ)
OPTION 3 - REFSMMAT
(LIFTOFF ORIENTATION)
REPORT GYRO TORQUE ANGLES
P20-RENDEZVOUS NAVIGATION
P32-TARGET CSI
SXT & VHF TRACKING
VERIFY DSE MOTION @ LOS

FINAL CSI COMPUTATION
P40 - SPS THRUSTING
MNVR TO CSI BURN ATT

CDR

LMP

CHECK APS BURN CARD

CHECK APS, RCS, ECS, EPS

LM TIMELINE BOOK

ABORT STAGE

YAW RIGHT 30°

APS LIFTOFF

CHECK APS BURN CARD

CHECK APS, RCS, ECS, EPS

DAC-ON

TIG: 137:09:16

BT: 7:08

ΔVR: 6044.4

ULLAGE: NONE

ORBIT: 43.9x8.7

137:16:23

LUNAR ORBIT INSERTION

TWEAK OR TRIM PER MCC

UPDATE

LOAD DAP, N46 - 11002

DAC - OFF

TARGET AGS CSI

VHF VOICE CK W/CSM

EXT LTG - TRACK

UPDATE TO LM

TWEAK OR TRIM
INSTRUCTIONS

UPLINK TO CSM
LM S.V.

UPDATE TO LM

MSFN CSI ΔV
DISABLE MSFN S-BD
RELAY

P52 IMU REALIGN (LM)

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

FINAL CSI COMPUTATION

P52 IMU REALIGN

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

PCM-LO, OMNI-AFT

CHECK RCS, EPS, ECS

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

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

OMNI D

CONFIRM LM PC
P33 - TARGET CDH
SXT & VHF TRACKING
V64-ACQUIRE MSFN

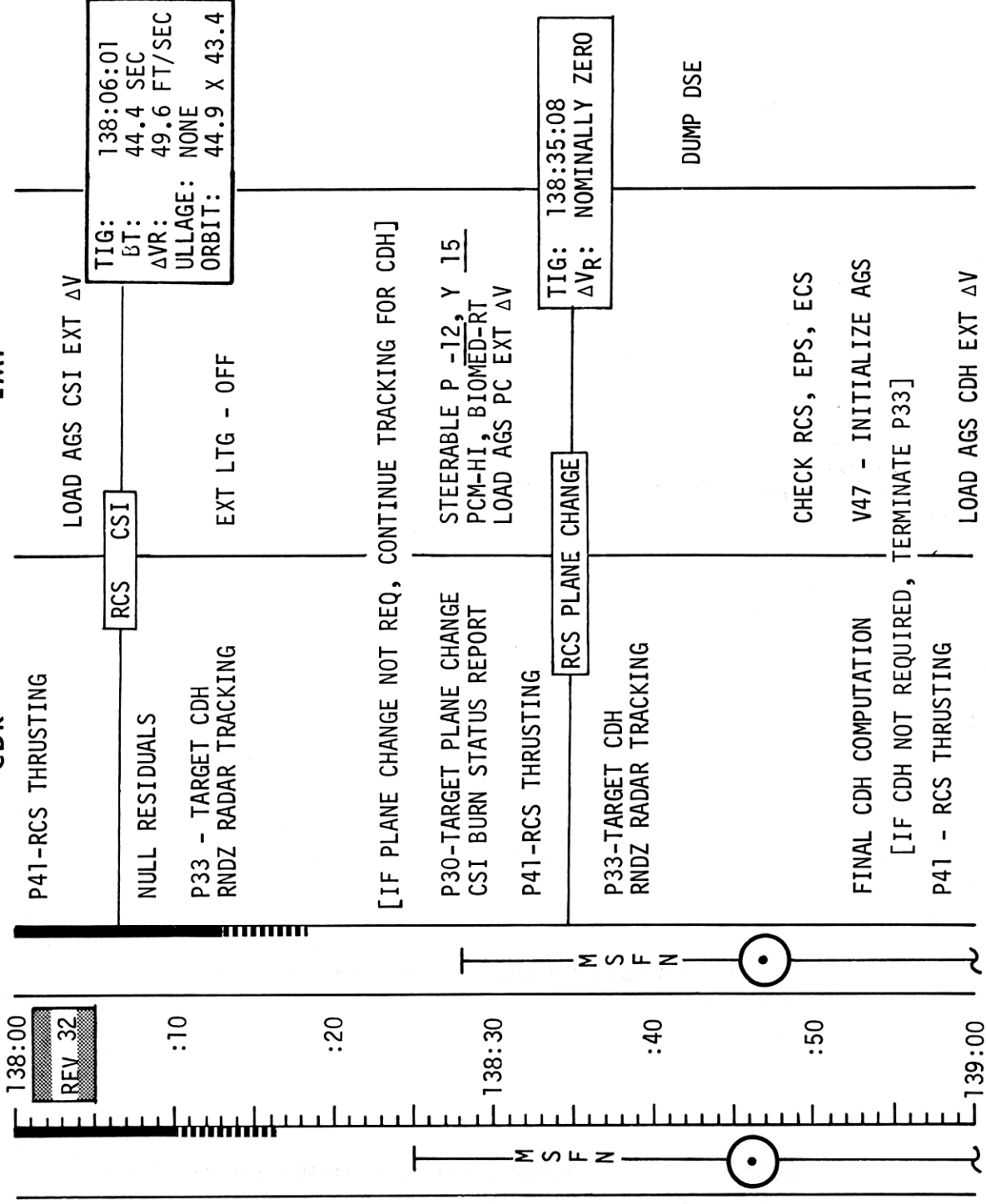
FINAL CDH COMP
P41-RCS THRUSTING
RCS CHECKLIST

MCC-H

LM

CDR

LMP



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	138:00 - 139:00	6/31 - 32	3-108

CSM

CMP

BACKUP CDH
CONFIRM LM CDH
P34-TARGET TPI
SXT AND VHF TRACKING

FINAL TPI COMP
VERIFY DSE MOTION @ LOS
P40-SPS THRUSTING
MNVR TO TPI BURN ATT
SPS CHECKLIST

BACKUP TPI
CONFIRM LM TPI
P20-MNVR TO TRACK ATT
P35-TARGET MCC-1

FINAL MCC-1 COMP
P41-RCS THRUSTING

LM

CDR

NULL RESIDUALS
P34-TARGET TPI
RNDZ RADAR TRACKING

FINAL TPI COMPUTATION

P41-RCS THRUSTING

NULL RESIDUALS
P35 - TARGET MCC-1
RNDZ RADAR TRACKING

FINAL MCC-1 COMPUTATION
P41-RCS THRUSTING

RCS

CDH

TIG: 139:04:14
ΔV_R: NOMINALLY ZERO

EXT LTG - TRACK

CHECK RCS, EPS, ECS

OMNI-AFT, PCM-LO

V47-INITIALIZE AGS
LOAD AGS TPI EXT ΔV

TPI

RCS

LOAD AGS MCC-1 EXT ΔV

TIG: 139:45:41
BT: 22.1 SEC
ΔVR: 24.7 FT/SEC
ULLAGE: NONE
ORBIT: 60.6x43.6 NM

MCC-H

LMP

0813 CST
139:00

:10

:20

139:30

:40

:50

REV 33

140:00

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

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

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

CSM ACTIVE DOCKING

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

FLIGHT PLAN

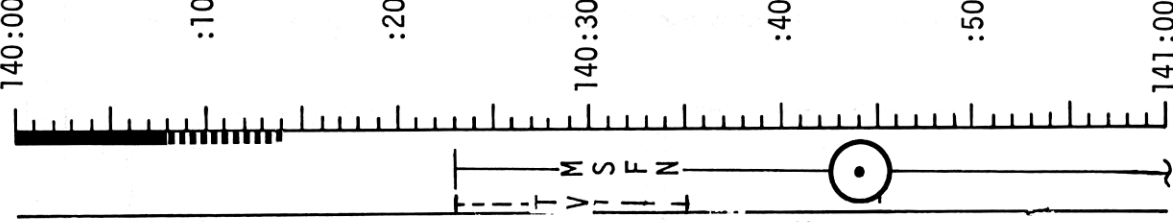
LM

MCC-H

0913 CST

CDR

LMP



TIG: 140:00:41
 ΔV_R : NOMINALLY ZERO

NULL RESIDUALS
P35-TARGET MCC-2
RNDZ RADAR TRACKING

FINAL MCC-2 COMPUTATION
P41-RCS THRUSTING

LOAD AGS MCC-2 EXT ΔV

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

TIG: 140:15:41
 ΔV_R : NOMINALLY ZERO

OMNI-AFT
BIOMED-RIGHT

BRAKING PHASE

SET UP CAMERAS FOR CSM
PHOTOS & DOCKING
LM3/DC
LM3/DAC
EXTERIOR LTG-OFF
PHOTOGRAPH CSM

RR-OFF

PITCH 90° TO DOCK ATT
R 0, P 152, Y 0

GO/NO-GO FOR PYRO
ARM

OMNI-FWD

DOCKING

MODE CONTROL-OFF
N46-12021

STEERABLE
P 32, Y -32

CONFIGURE ECS FOR
DECONTAMINATION

LMP ASSIST CDR WITH
DECONTAMINATION AND
TRANSFER:

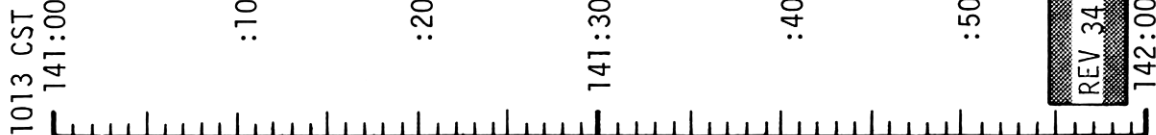
DUMP DSE
UPLINK TO LM
LM S.V. (TIG*-10)
P30 TARGET LOAD
*TIG OF LM
DEORBIT BURN

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

NOTES



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

VERIFY CRYO O2 PRESS
REPRESS PKG VLV-OFF
PRESSURIZE CABIN TO 5.5 PSIA
ADJUST O2 FLOW <0.5 LB/HR
ADJUST O2 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

T2 INTO B, STOW T0 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

HELMET/GLOVE BAGS

DECONTAMINATION BAGS (A8 & U1)

RECEIVE TRANSFER ITEMS FROM THE
LM AND STOW AS FOLLOWS:

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

LM

DOFF GLOVES
CONFIGURE HOSES AND BRUSH
FOR VACUUMING
UNSTOW & VACUUM CSRC & 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)

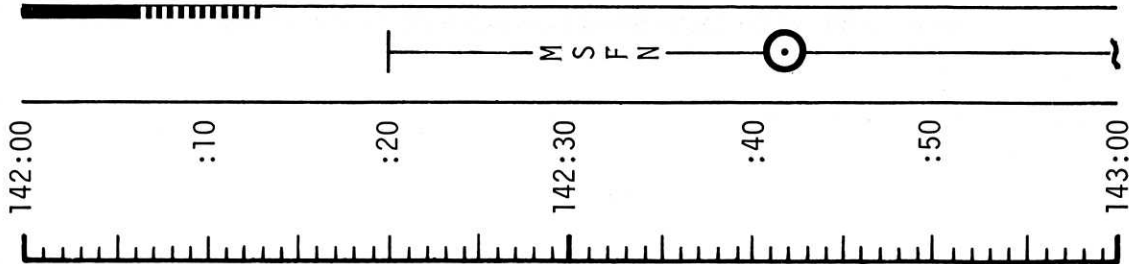
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	141:00 - 142:00	6/33-34	3-111

1113 CST

MCC-H

FLIGHT PLAN

NOTES



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 O2 OFF

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

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)

CSM

LM

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 PGNC
P30-TARGET PGNC
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

1213 CST

143:00 :10 :20 :30 :40 :50 144:00

REV 35

DAC ON
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

G0 ORB RATE (143:10) P 087/342

PREPARE DAC FOR LM DEORBIT BURN PHOTOGRAPHY

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

VERIFY DSE MOTION @ LOS (3 AUDIO PANELS)

THIS VHF CONFIGURATION WILL BE

MAINTAINED UNTIL 166:10

EAT PERIOD

TOPO PHOTO PAD REV 35

R P Y

T START: : : :

T STOP: : : :

RNG NM.

TOPO PHOTO PAD REV 35

R P Y

T START: : : :

T STOP: : : :

RNG NM.

MAP UPDATE REV 35

LOS : : :

180° : : :

AOS : : :

DC IND SEL - MNA OR B

ONBOARD READOUT

BAT C

PYRO BAT A

PYRO BAT B

RCS A

B

C

D

TIG: 143:09

BT: 6.12 SEC

ΔVR: 1.0 FT/SEC

ULLAGE: N/A

ORBIT: 57.7 x 55.3

LM IS TARGETED FOR

APS IMPULSE BURN.

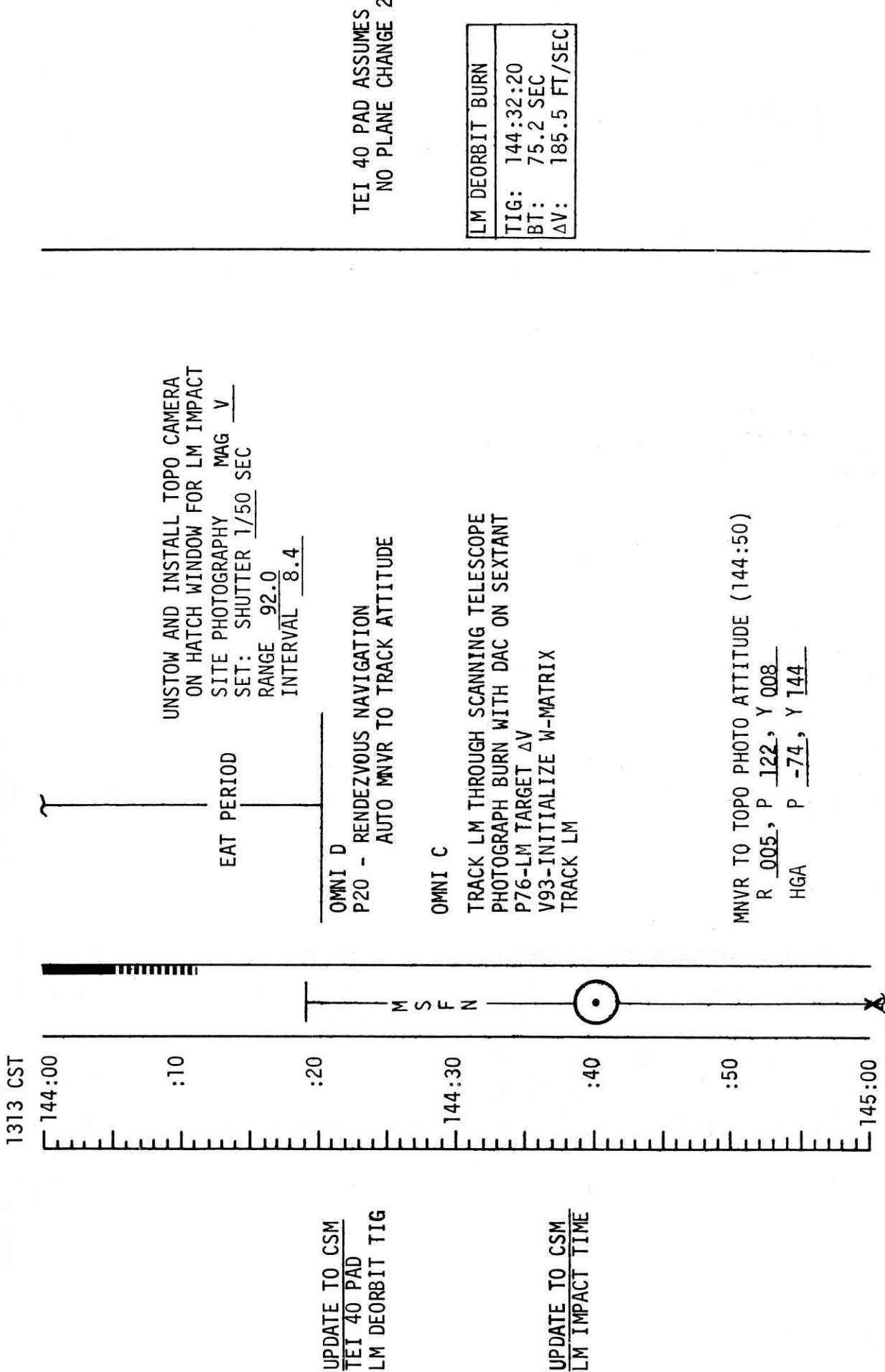
THRUST IS RCS

ULLAGE ONLY.

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

NOTES



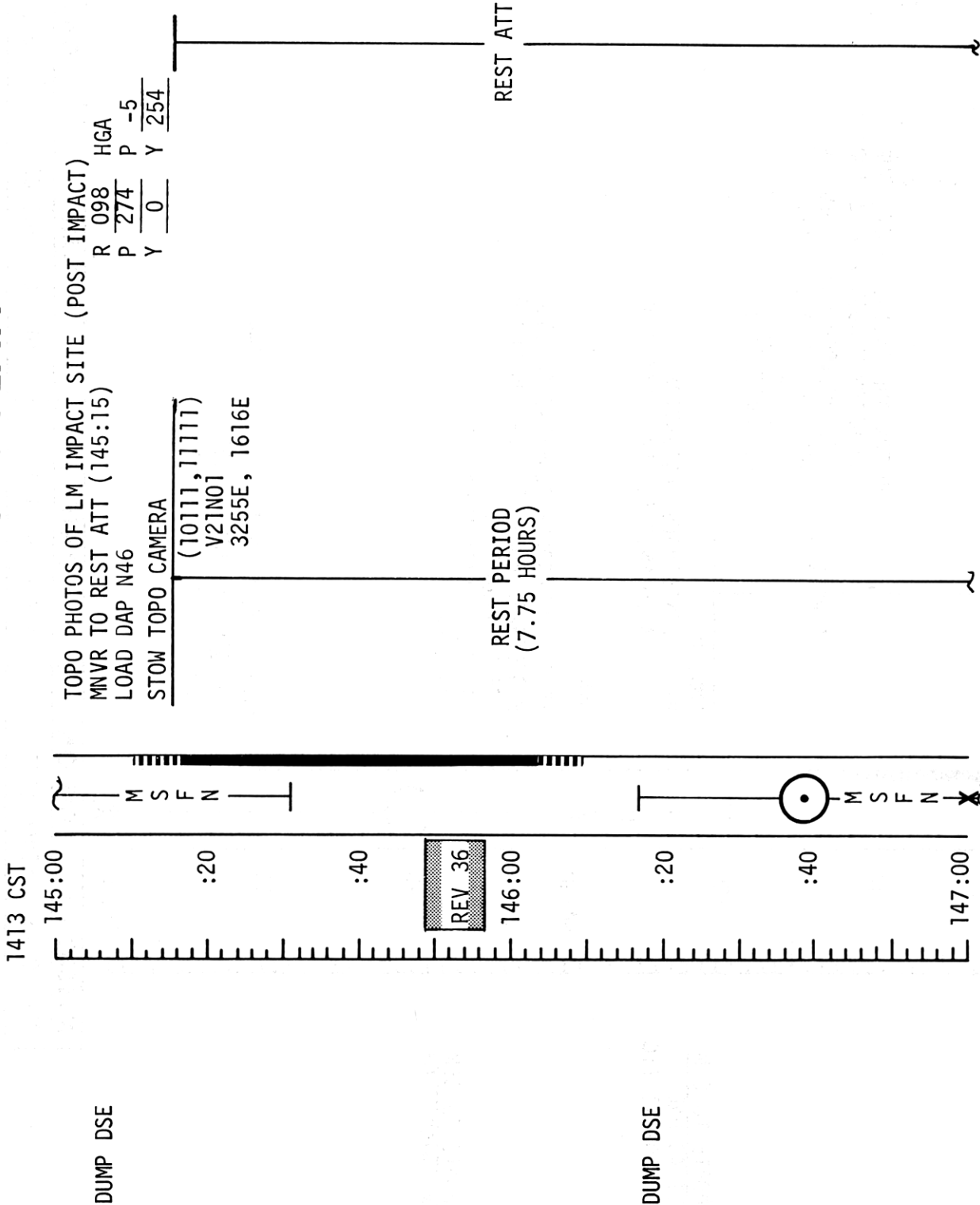
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	144:00 - 145:00	6/35	3-114

FLIGHT PLAN

NOTES

LM LUNAR IMPACT
GET: 145:00:17.9
LAT: 3°S
LONG: 19.65° W

NOTE: IF ALSEP 13
IS INOPERABLE THE
LM WILL BE IMPACTED
NEAR ALSEP 12.
LAT 3.32°S
LONG 23.38°W



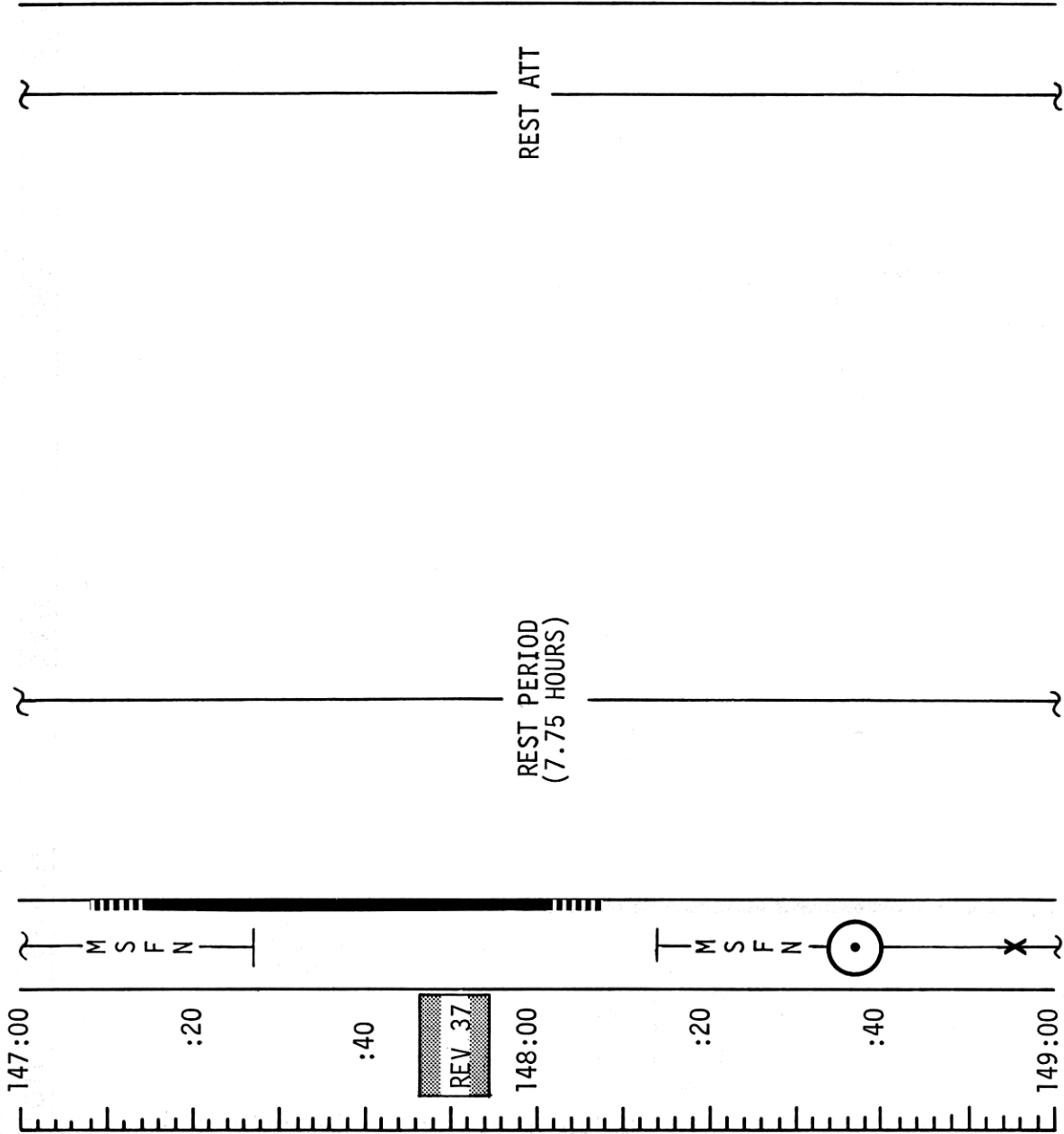
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	145:00 - 147:00	6/35-36	3-115

FLIGHT PLAN

NOTES

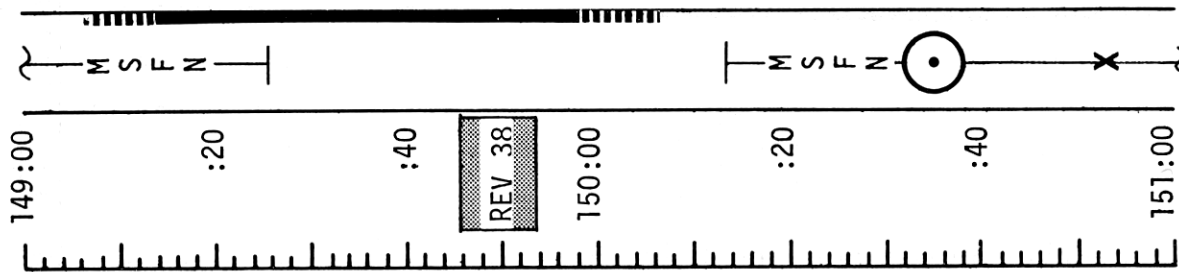
MCC-H

1613 CST



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

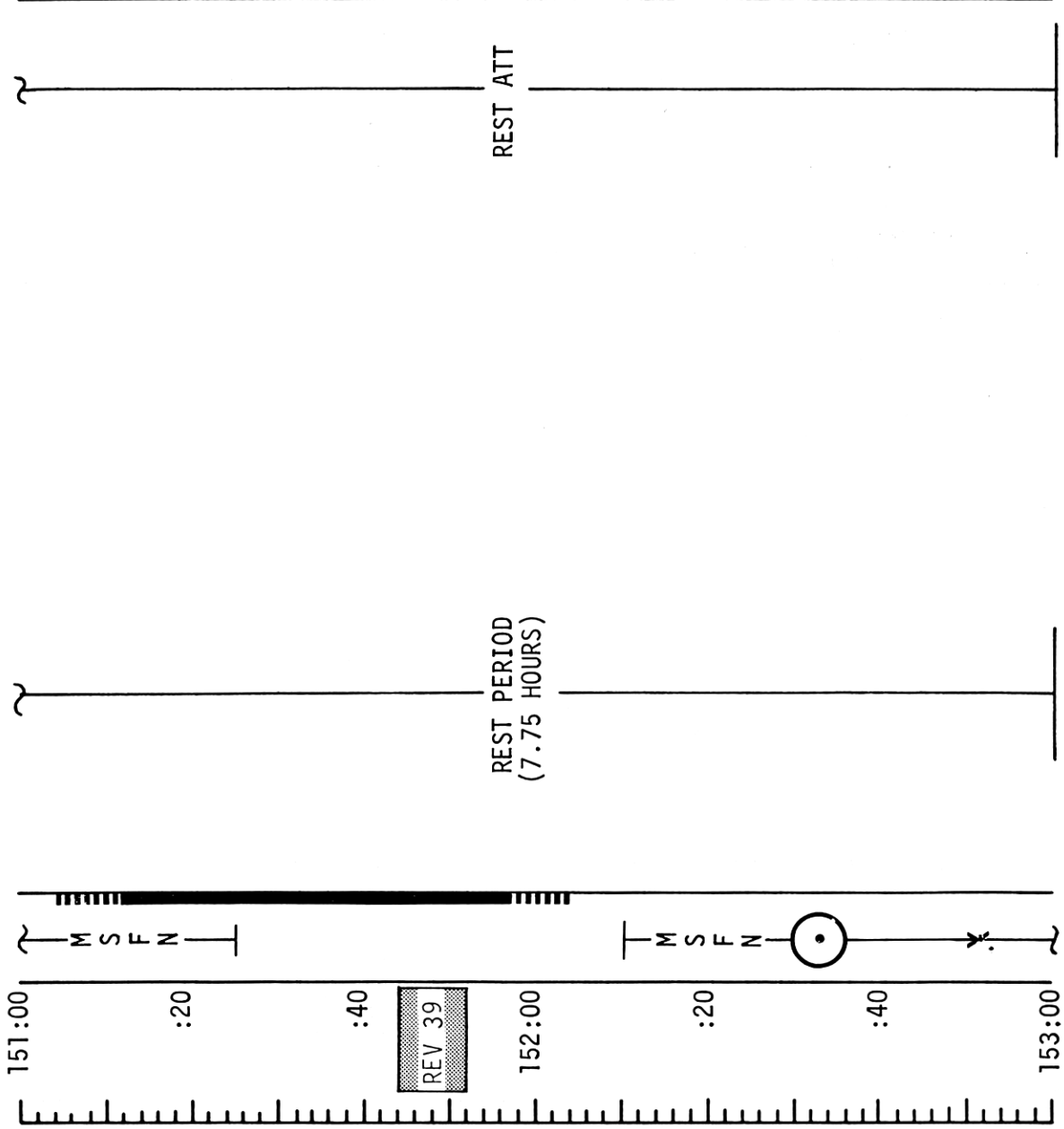
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	149:00 - 151:00	6/37-38	3-117

FLIGHT PLAN

MCC-H

NOTES

2013 CST



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

153:00

PLANE CHANGE TGT LOAD	DESIRED ORIENT (PLANE CHANGE)
100	0
200	0
300	0
400	0
500	0
600	0
700	0
800	0
900	0
1000	0
1100	0
1200	0
1300	0
1400	0
1500	0
1600	0
1700	0
1800	0
1900	0
2000	0
2100	0
2200	0
2300	0
2400	0
2500	0
2600	0
2700	0
2800	0
2900	0
3000	0
3100	0
3200	0
3300	0
3400	0
3500	0
3600	0
3700	0
3800	0
3900	0
4000	0
4100	0
4200	0
4300	0
4400	0
4500	0
4600	0
4700	0
4800	0
4900	0
5000	0
5100	0
5200	0
5300	0
5400	0
5500	0
5600	0
5700	0
5800	0
5900	0
6000	0
6100	0
6200	0
6300	0
6400	0
6500	0
6600	0
6700	0
6800	0
6900	0
7000	0
7100	0
7200	0
7300	0
7400	0
7500	0
7600	0
7700	0
7800	0
7900	0
8000	0
8100	0
8200	0
8300	0
8400	0
8500	0
8600	0
8700	0
8800	0
8900	0
9000	0
9100	0
9200	0
9300	0
9400	0
9500	0
9600	0
9700	0
9800	0
9900	0
10000	0

MVNR PAD
(PLANE CHANGE)

CONSUMABLES
FLIGHT PLAN
TEI 42 PAD

MNVR TO P52 ATT
(153:15)

$$\begin{array}{r} \text{R } 098, \text{ P } \underline{274}, \text{ Y } \underline{315} \\ \text{HGA } \text{ P } -20, \text{ Y } \underline{253} \end{array}$$

P52 IMU REALIGN

OPTION 3 - REFSMMAT
(LIFT OFF ORIENT)

P52 IMU REALIGN

OPTION 1 - PREFERRED
(PLANE CHANGE ORIENT)

GYRO TORQUE

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

P40 SPS THRUST
SXT STAR CK

CSM CONSUMABLES UPDATE

```
GET: _____:_____
```

RCS TOTAL

QUAD A B

D C

H₂ TOTAL _____

0, TOTAL _____

VERIFY DSE MOTION AT LOS

STARS

SA

TA

$$\begin{array}{r} \text{R} \quad 0 \\ \text{P} \quad 0 \\ \text{Y} \quad 45 \end{array} \quad \begin{array}{r} \text{OMNI} \quad A \\ \hline \end{array}$$

P52 IMU REALIGN

N71: _____,

N05: .

N93:

X

Y

Z

```
GET      : : :
```

TEI 42 ASSUMES
PLANE CHANGE 2

MAP UPDATE REV 40

.. : S07

$$180^\circ :: ::$$

A0S : : :

P52 IMU REALIGN

N71:

N05: .

N93:

X

 γ

Z

GET

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

FLIGHT PLAN

MCC-H

NOTES

2313 CST

154:00

:10

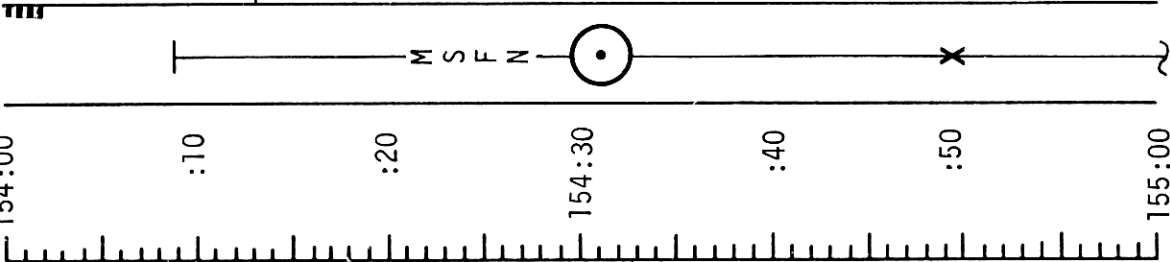
:20

154:30

:40

:50

155:00



GDC ALIGN

HGA P 6, Y 264

PLANE CHANGE NO 2

V66-TRANSFER S.V. TO LM SLOT

LOAD DAP N46 (10112, 11111)

L10H CANISTER CHANGE
13 INTO A, STOW 11 IN A3

REPORT GYRO TORQUING ANGLES (P52 AT 153:30)
START EAT PERIOD

BATTERY CHARGE, BATTERY B

MNVR TO P52 ATT (155:00)

R 180 OMNI D

P 180

Y 040

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

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

UPDATE TO CSM
VERT STEREO PHOTO
PAD (REV 41)

UPLINK TO CSM
DESIRED ORIENT
(PHOTO REFSMMAT)

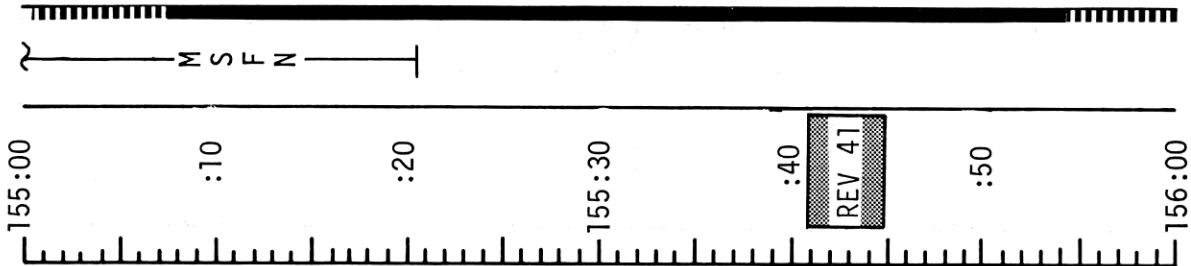
BURN STATUS REPORT											
X	X									ΔTIG	
X	X									BT	
										V	
										gx	
TRIM											
X	X	X								R	
X	X	X								P	
X	X	X								Y	
										V	
										gx	
										V	
										gy	
										V	
										gz	
										ΔV	*
										C	*
X	X	X								FUEL	*
X	X	X								OX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

| * 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



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

STARS _____
SA _____
TA _____

REPORT GYRO TORQUING ANGLES
VERIFY DSE MOTION AT LOS

GDC ALIGN

WASTE WATER DUMP
02 FUEL CELL PURGE

CONFIGURE CAMERAS FOR VERTICAL STRIP PHOTOGRAPHY
CM4/DC/80/BW-BRKT,IVL (f2.8,250, ∞), 180 MAG S

CM/DAC/SXT/CEX (fixed,60,fixed) 1 FPS, MAG H

START FRAME NO. _____

ZERO OPTICS & MANUALLY SET SA = 0°; TA = 45°

LOAD DAP N46 (10102, 11111)

MNVR TO PHOTO ATT BY _____

GO ORB RATE BY 155:50

R 0 OMNI D _____
P 270/355
Y 0

SET UP EL CAMERA FOR HAND HELD
SCIENCE PHOTOGRAPHY MAG N
CM/EL/250/CEX, (FP,250, ∞) FLT PLAN

V06N65 (DO NOT ENTER), PCM BIT RATE - HIGH
ENTER (V06N65) & START DAC AT T-START

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

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 4T

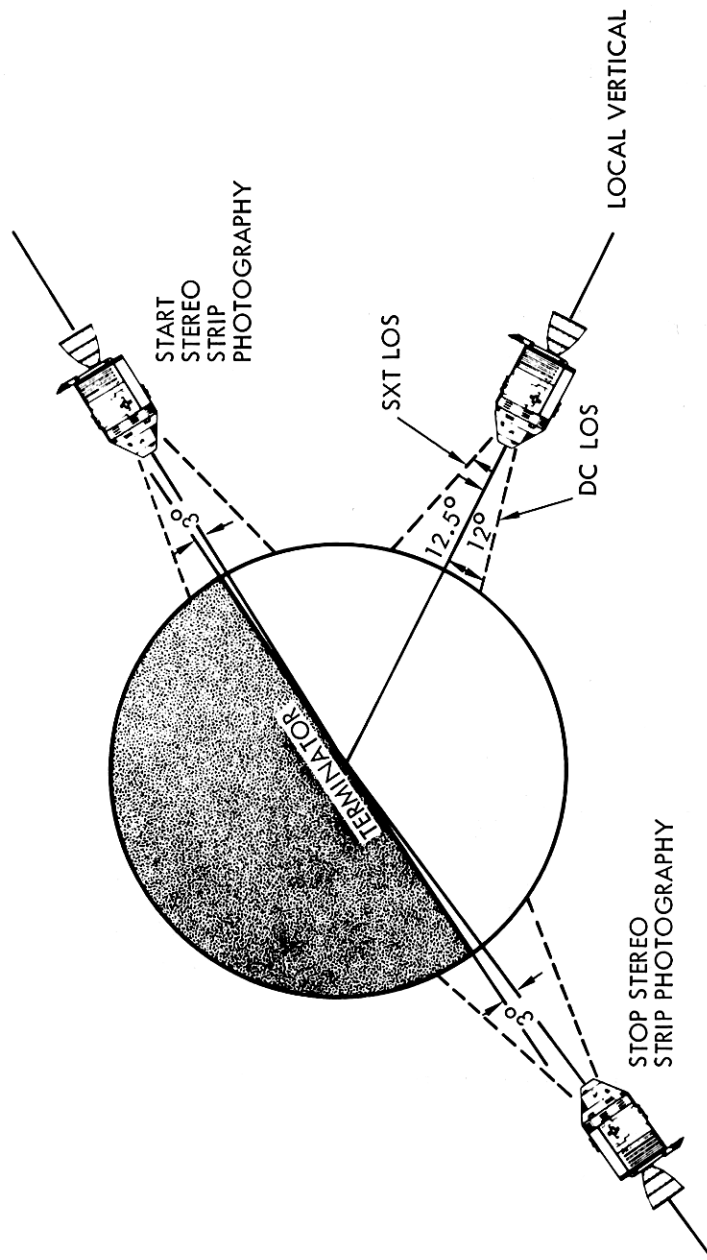
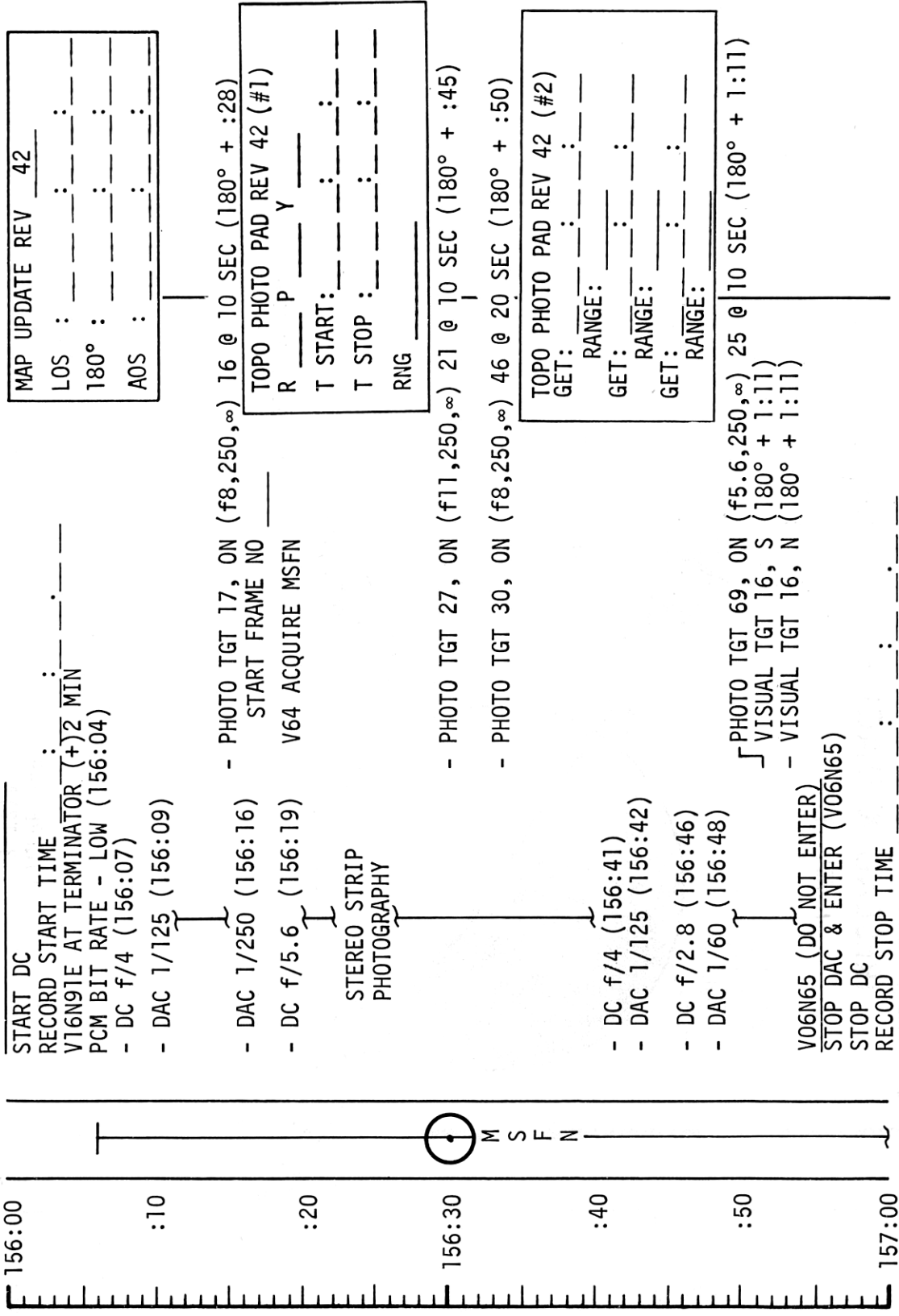
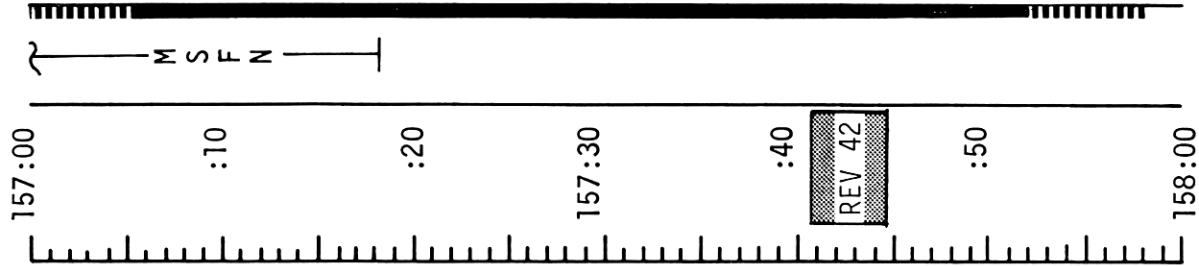


FIGURE 3-9
3-121A



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	156:00 - 157:00	7/41	3-122

FLIGHT PLAN



VERIFY DSE MOTION AT LOS

UNSTOW AND INSTALL TOPO CAMERA IN HATCH
WINDOW FJR VERTICAL PHOTOGRAPHY MAG V FRAME NO.

SET: SHUTTER 200 SEC
RANGE 91.8
INTERVAL 8.7

MNVR TO VERTICAL TOPO PHOTO ATT R 0
(157:55) P 213/277
GO ORB RATE Y U

SET UP EL CAMERA FOR HAND HELD
SCIENCE PHOTOGRAPHY
CM / EL/250/CEX, (FP,250,∞) FLT. PLAN
MAG N START FRAME NO.

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

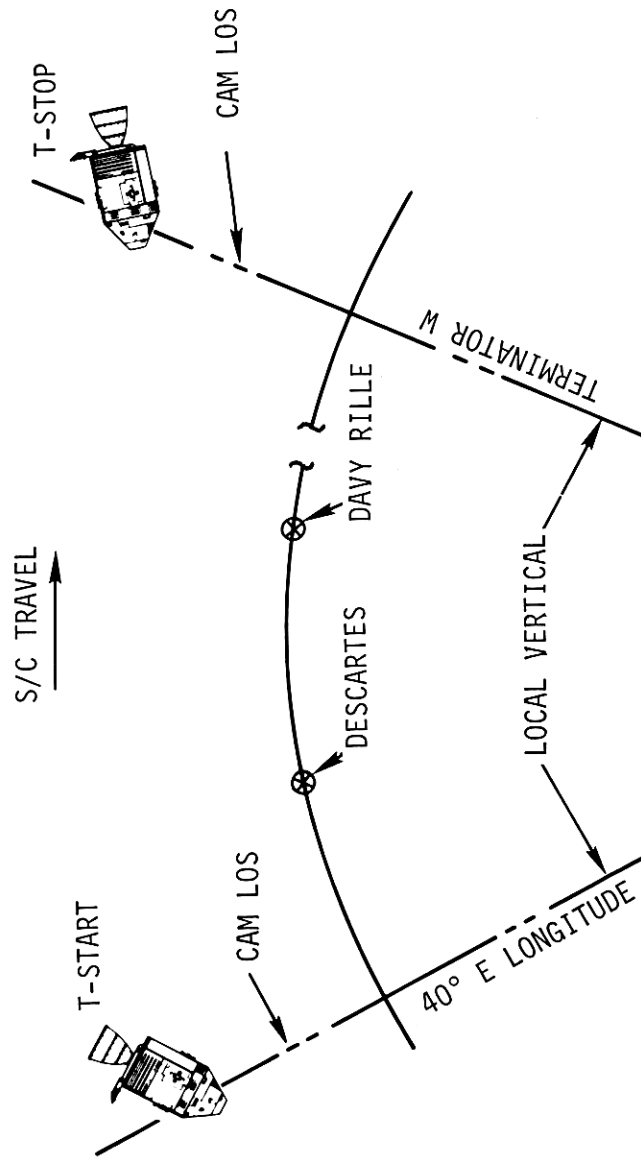


FIGURE 3-10
3-123 A

MCC-H

FLIGHT PLAN

NOTES

0313 CST



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

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

DUMP DSE

OMNI D

TOPO PHOTO PAD REV 43

R P Y

T START: : :

T STOP: : :

RNG

GLT: : :

RNG

GET: : :

RNG

MAP UPDATE REV 43

LOS: : :

180°: : :

AOS: : :

CONTAMINATION PHOTO PAD REV 43

T-START: : :

START RECORDER AT : :

SUNRISE (-) 10 MIN.

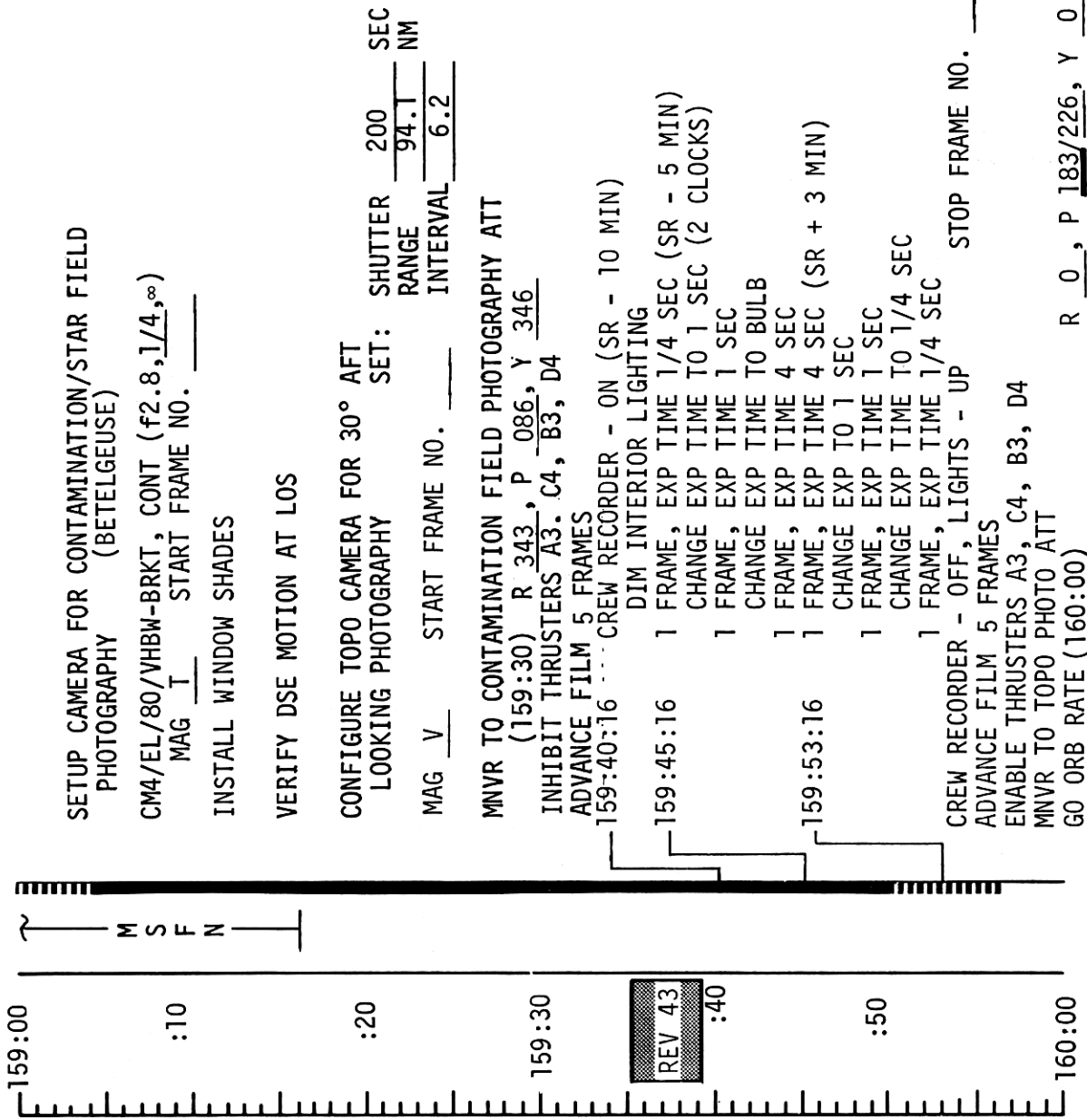
START VERT TOPO STRIP PHOTOGRAPHY AT 40°E
(T-START)

- TOPO RNG (91.7)
- DESCARTES
- TOPO RNG (91.9) - PHOTO TGT 32, S(f11,250,∞) 8 @ 20 SEC (180° + :52)
START FRAME NO.
- TOPO 1/100(158:41) - PHOTO TGT's 38 & 40, S(f8,250,∞), 7 @ 20 SEC (180° + :59)
- DAVY RILLE
- TOPO RNG (92.2)
- TOPO 1/50(158:46) - PHOTO TGT 47, S (f5.6,250,∞) 3 @ 20 SEC (180° + 1:03)
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



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

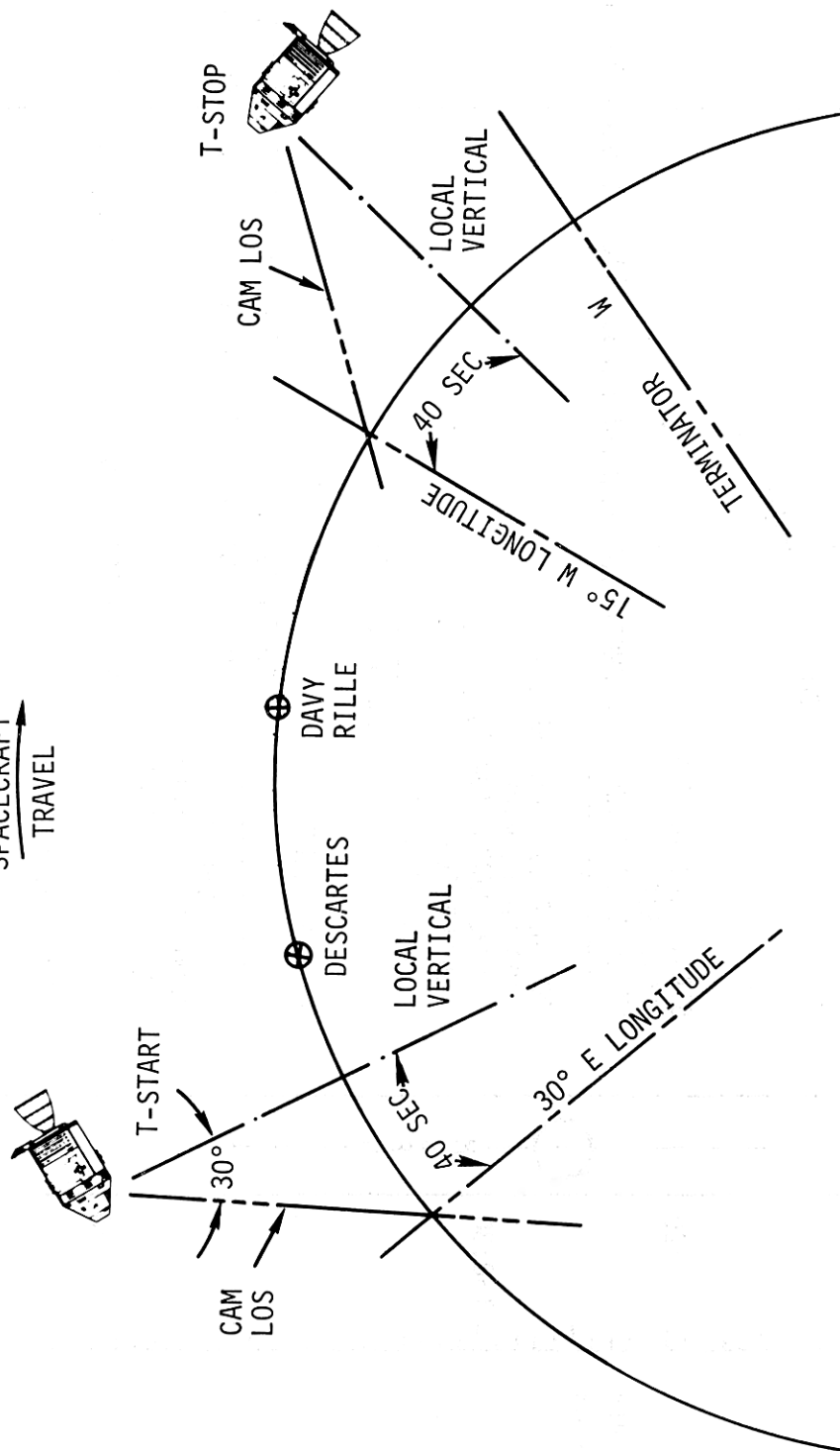
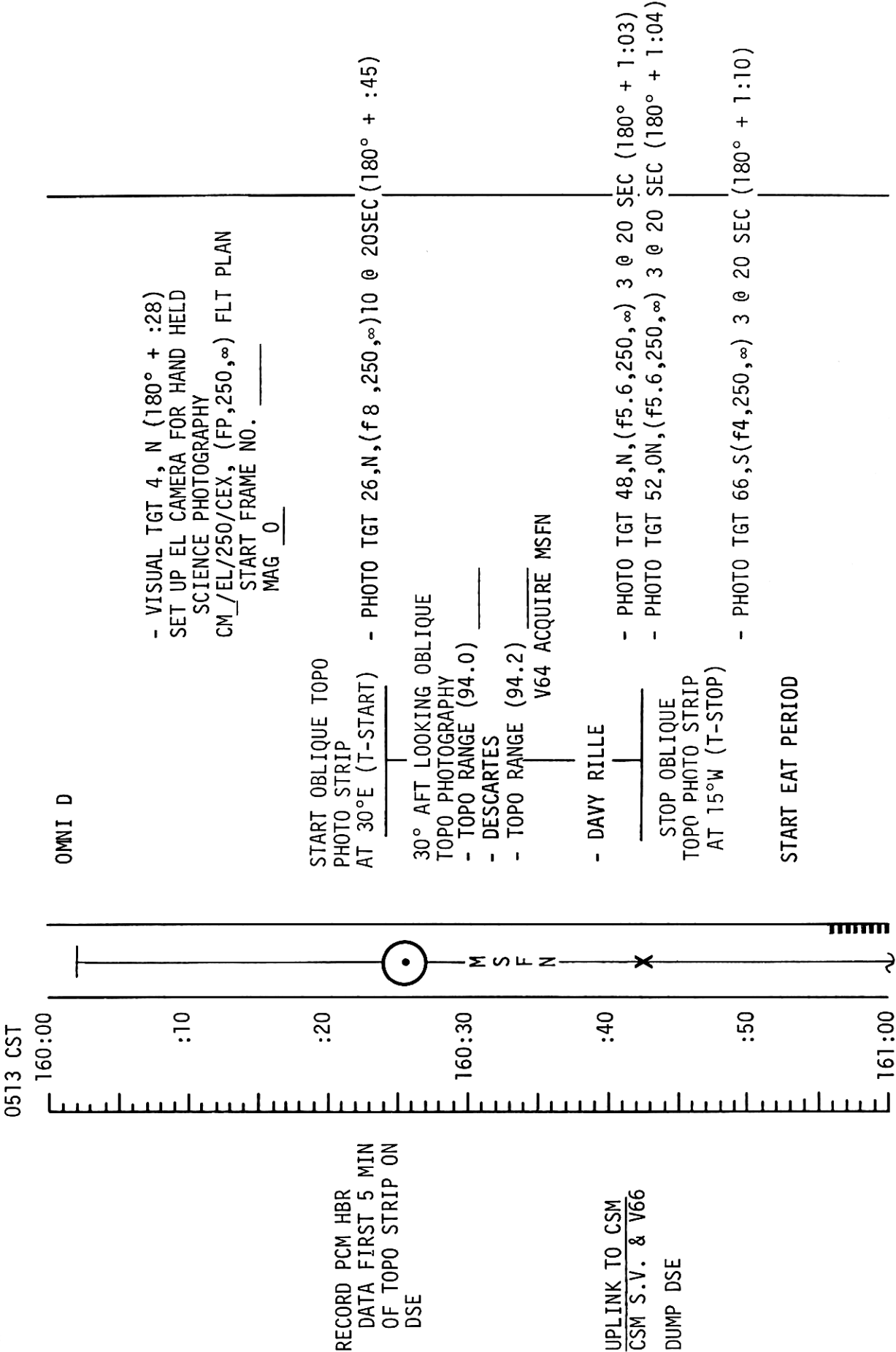


FIGURE 3-11
3-125 A



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

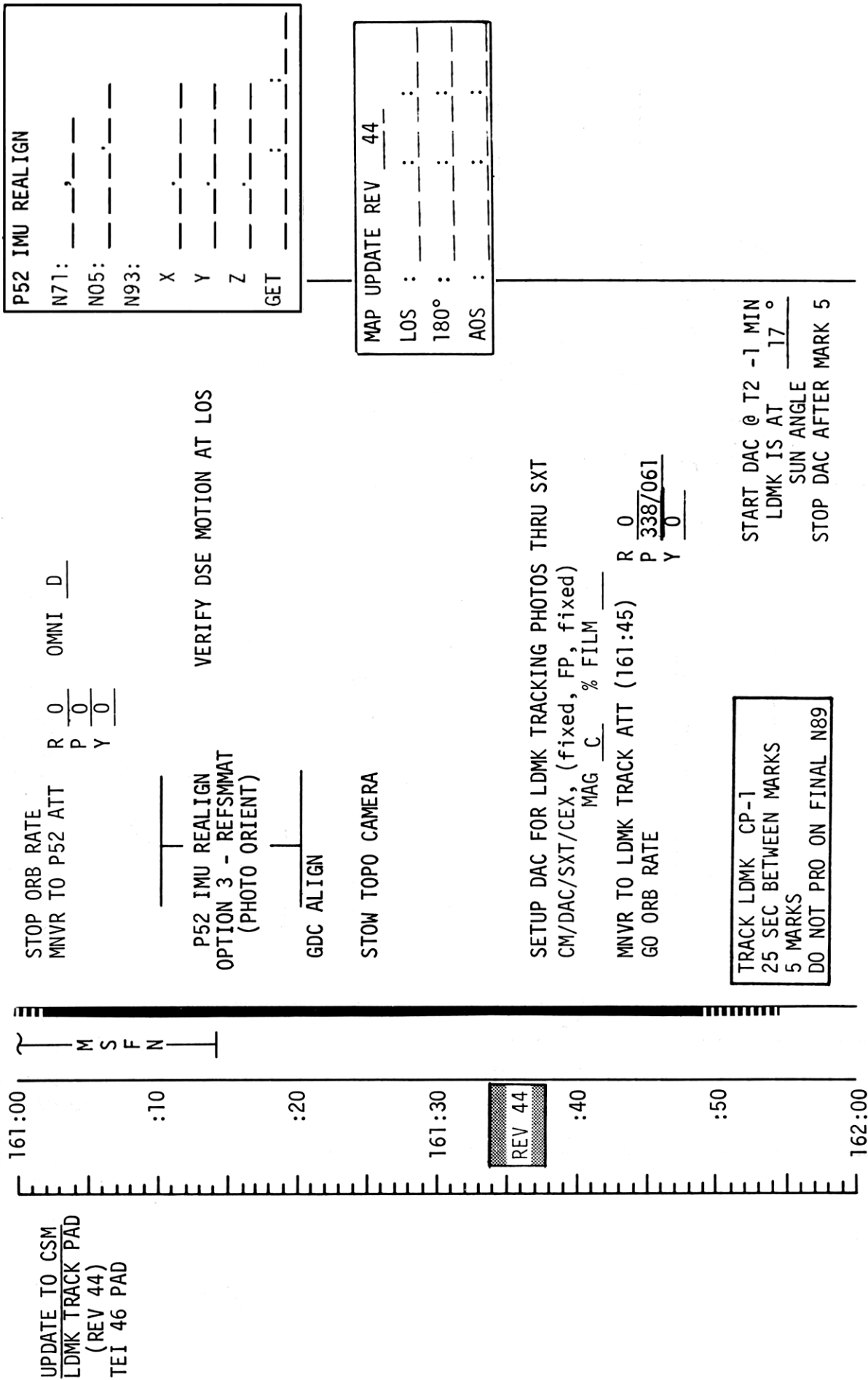
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MCC-H

0613 CST

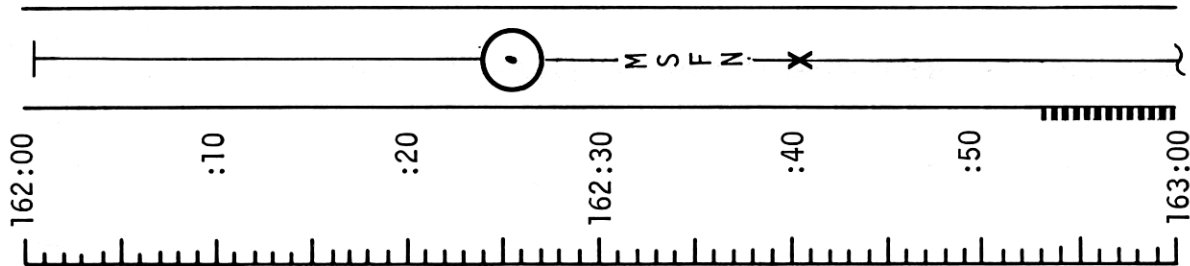
FLIGHT PLAN

NOTES



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

RECORD PCM LBR
DATA DURING EACH
LDMK TRK ON DSE



OMNI D

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

START DAC @ T2 -1 MIN
LDMK IS AT 56°
SUN ANGLE
STOP DAC AFTER MARK 5

MAP UPDATE REV 45

LOS : : : :
180° : : : :
AOS : : : :

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

START DAC @ T2 -1 MIN
LDMK IS AT 49°
SUN ANGLE
STOP DAC AFTER MARK 5

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

START DAC @ T2 -1 MIN
LDMK IS AT 12°
SUN ANGLE
STOP DAC AFTER MARK 5

MNVR TO P52 ATT (163:00)
% FILM (REMAINING)

R 180
P 223
Y 0

HGA
P -24
Y 193

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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[illegible][illegible][illegible]

P22 LDMK TRACKING

T₁

T₂

R

N or S

SA

°P

°Y

(1/125)

CP4

N89

°

°

LAT -11.633

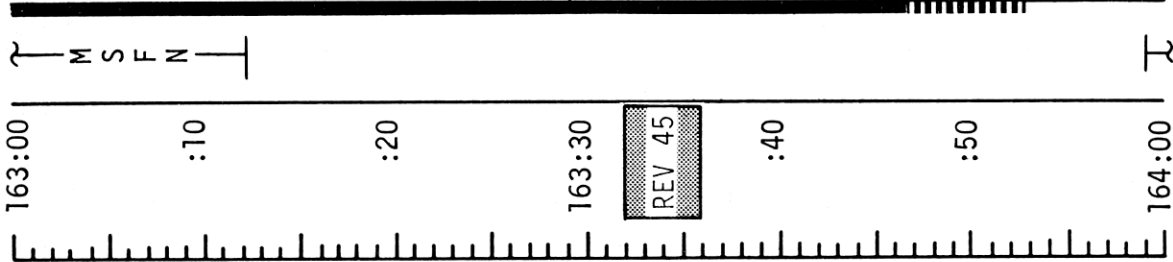
LONG/2 -10.067

ALT +000.00

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

FLIGHT PLAN

0813 CST



P52 IMU REALIGN
OPTION 3 - REFMMAT
(PHOTO ORIENT)

REPORT GYRO TORQUING ANGLES
VERIFY DSE MOTION AT LOS

GDC ALIGN

SET UP DAC FOR LDMK TRACKING PHOTOS THRU SXT
CM/DAC/SXT/CEX, (fixed,FP,fixed) 1 fps

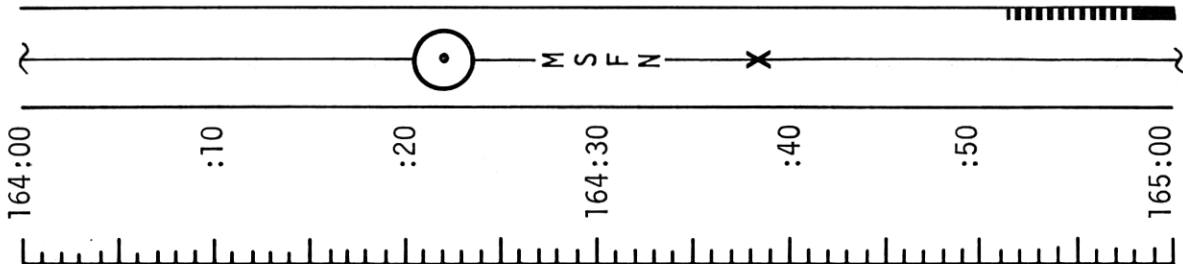
MAG C % FILM _____ R 0 OMNI D _____
MNVR TO LDMK TRK ATT (163:45) P 338/056
GO ORB RATE Y 0

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

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

RECORD PCM LBR DATA
DURING EACH LDMK
TRK ON DSE



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

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

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

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

TRACK LDMK CP-4
225 SEC BETWEEN MARKS
5 MARKS
DO NOT PRO ON FINAL N89

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

UPDATE TO CSM

TEI 46 PAD

(PRELIMINARY)

UPLINK TO CSM

TEI DESIRED ORIENT

CSM S.V. & V66

DUMP DSE

MNVR T0 P52 ATT (164:55)

% FILM

(AT COMPLETION LDMK TRK)

R	180		HGA:	
P	202		P	-3
Y	0		Y	197

180°
S07

MAP UPDATE REV 46

.. : S07

 180°

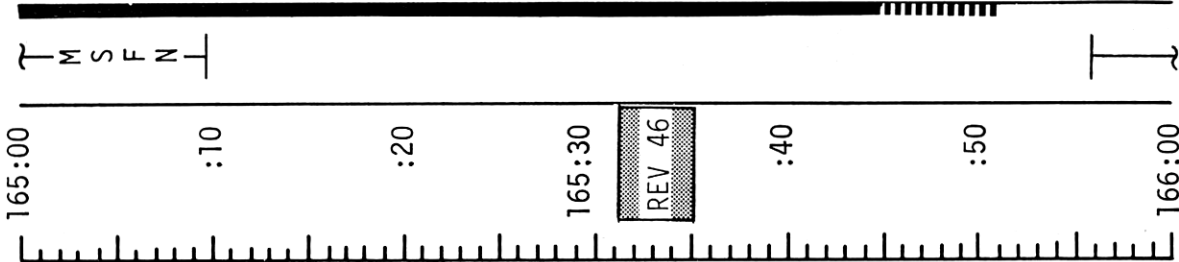
AOS • • •

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

FLIGHT PLAN

NOTES

1013 CST



VERIFY DSE MOTION AT LOS

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

STARS

SA

TA

GDC ALIGN

WIPE EXCESSIVE MOISTURE FROM
TUNNEL HATCH AREA

CONTAMINATION CONTROL (OPERATIONS CHECKLIST)

CM /TV-AVG (f22)
TV (MAD) 166:10 TO 166:50 (RECORD AT MAD)
MNVR TO TV ATT R 155
GO ORB RATE BY 165:50 P 286
Y 358

OMNI C

P52 IMU REALIGN

N71: - - - - -

N05: - - - - -

N93: - - - - -

X - - - - -

Y - - - - -

Z - - - - -

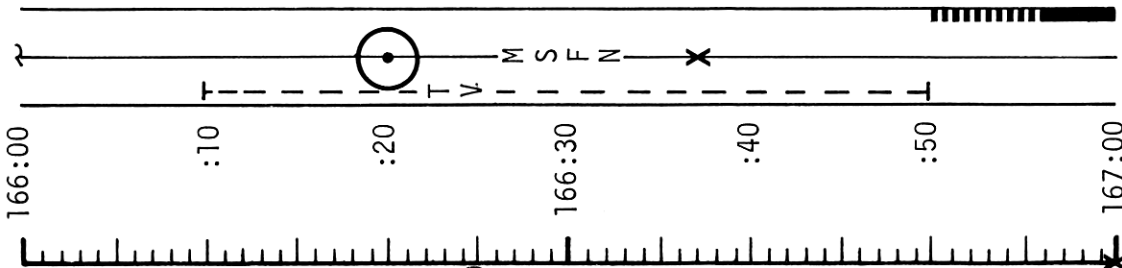
GET : : - - - - -

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

NOTES

MCC-H

1113 CST



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

UPLINK TO CSM
CSM S.V. & V66
TEI 46 TARGET LOAD

DUMP DSE

REPORT GYRO TORQUING ANGLES

V64 ACQ MSFN(166:10)
HGA P -36, Y 345
DISCONTINUE BI-STATIC RADAR TEST
VHF RANGING-OFF
VHF AM B-OFF

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

LiOH CANISTER CHANGE
(14 INTO B, STOW 12 IN A3)

MNVR TO BURN ATT
EXCEPT FOR ROLL (166:55)
P30 - EXT ΔV
P40 - SPS THRUST

R 0 HGA
P 0 P -77
Y 0 Y 88

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

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 & ΔVC >+50 FPS SWITCH TO SCS AUTO & RESTART SPS	BT + 2 SEC & ΔVC = -40 FPS	TRIM X AND Z AXIS TO 0.2 FPS

TABLE 3-11
3-132A

FLIGHT PLAN

NOTES

1213 CST

167:00

:10

:20

REV 47

167:30

:40

:50

168:00

M S F N

M S F N

ROLL TO BURN ATT R 180 OMNI C

(167:00) P 0
Y 0

VERIFY DSE MOTION AT LOS

SXT STAR CHECK

GDC ALIGN

TEI

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

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

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

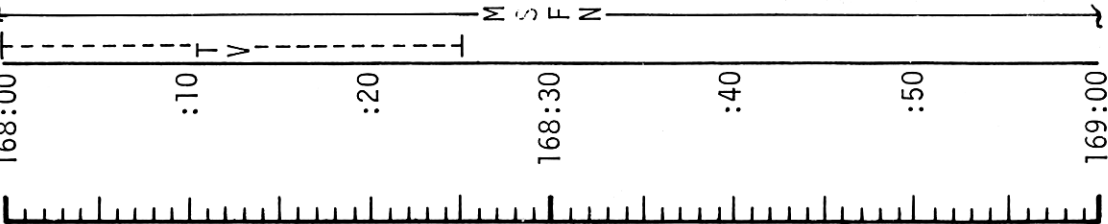
CM/TV-PEAK (f22)
TV (MAD) 168:00 TO 168:25

BURN STATUS REPORT									
X	X								ΔTIG**
X	X								BT**
									Vgx
X	X								R
X	X								P
X	X								Y
									Vgx***
									Vgy***
									Vgz***
									ΔV _C *
X	X								FUEL*
X	X								OX*
X	X								UNBAL

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

FLIGHT PLAN

NOTES



LUNAR PHOTOGRAPHY TEI + 32 MIN (168:01)
CM3/DC/80/BW-(f5.6,250,∞) MAG R OR S
HAND HELD, OVERLAPPING,
4 FRAMES MINIMUM, PAN
OF VISIBLE DISC, RAPID
SEQUENCE

LUNAR PHOTOGRAPHY TEI + 42 MIN (168:11)
CM3/DC/80/BW-(f5.6,250,∞) MAG R OR S
HAND HELD, TWO SINGLE FRAMES,
COVERS VISIBLE DISC

UPLINK TO CSM
DESIRED ORIENT
(PTC)

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

STARS _____,
SA _____,
TA _____

REPORT GYRO TORQUING ANGLES

CHANGE EL LENS TO 250
MNVR TO PHOTO ATT
LUNAR PHOTOGRAPHY TEI + 1 HR 10 MIN(168:39)
CM3/EL/250/BW-(f5.6,250,∞) MAG Q
HAND HELD, OVERLAPPING,
4 FRAMES MINIMUM,
PAN OF VISIBLE DISC,
RAPID SEQUENCE

R 037 HGA
P 305
Y 34T

P -29
Y 294

VISUAL ASSESSMENT OF
LUNAR TGTS 7 AND 8

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	---	---

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

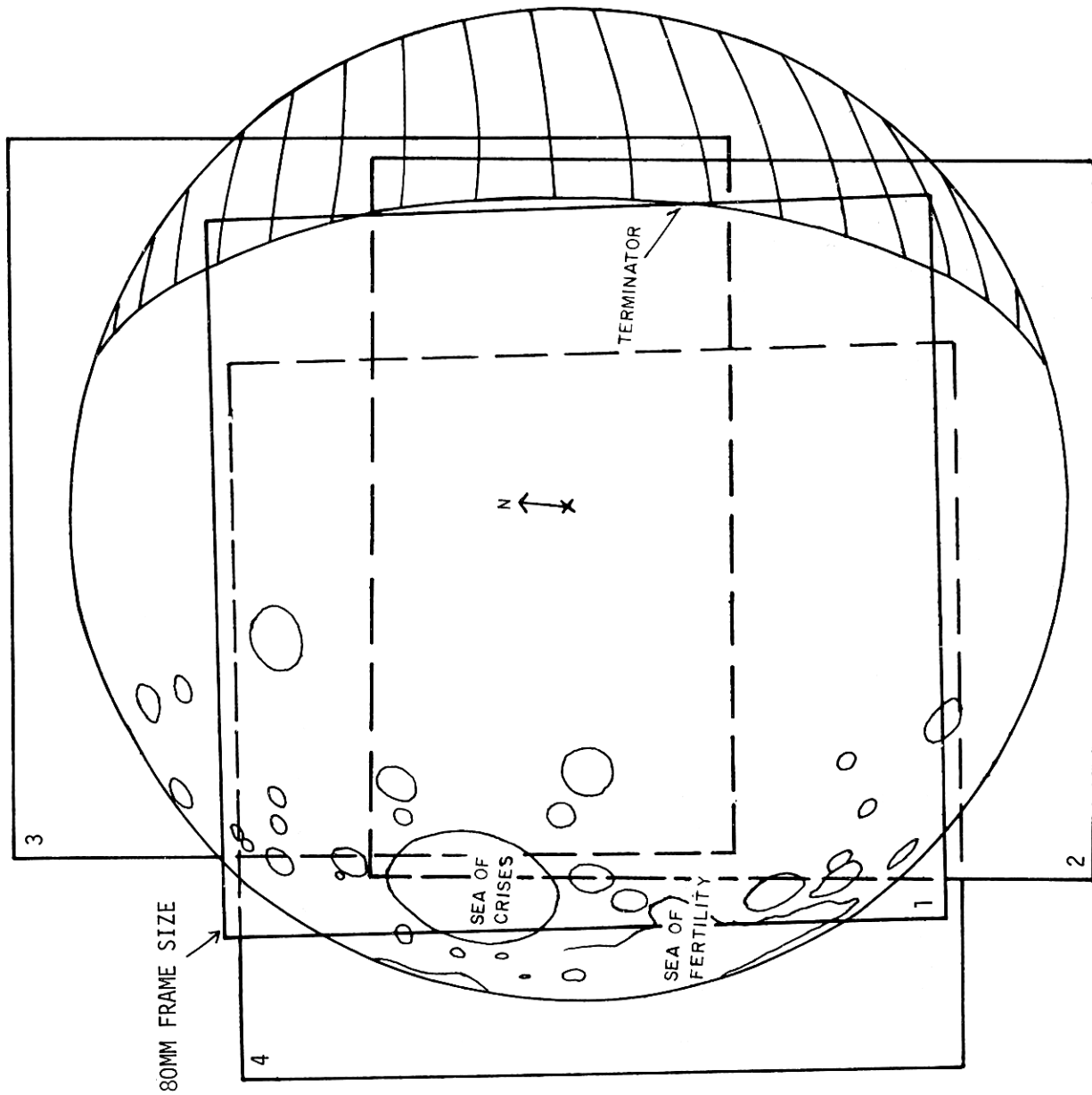


FIGURE 3-12
3-134A

POST TEI PHOTO SEQUENCE

TEI + 42 MIN

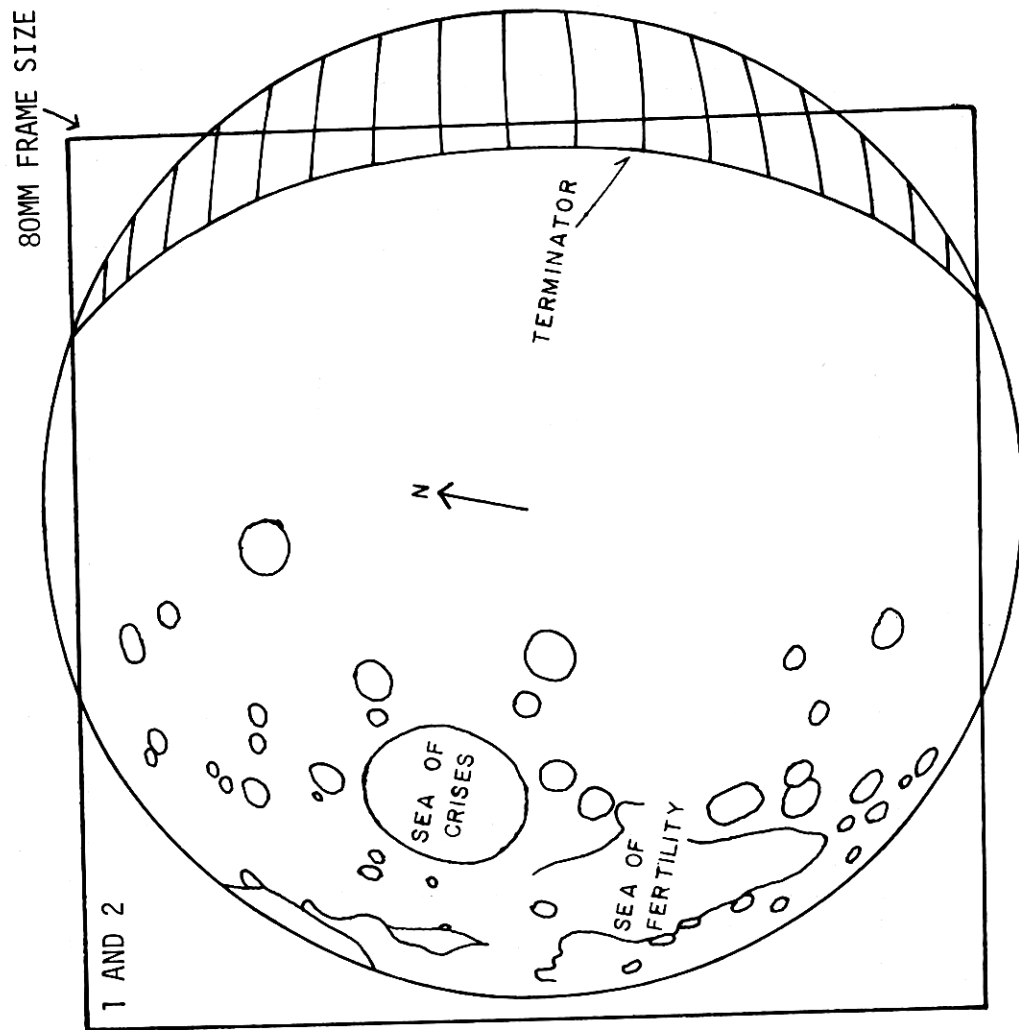


FIGURE 3-13
3-134B

POST TEI PHOTO SEQUENCE

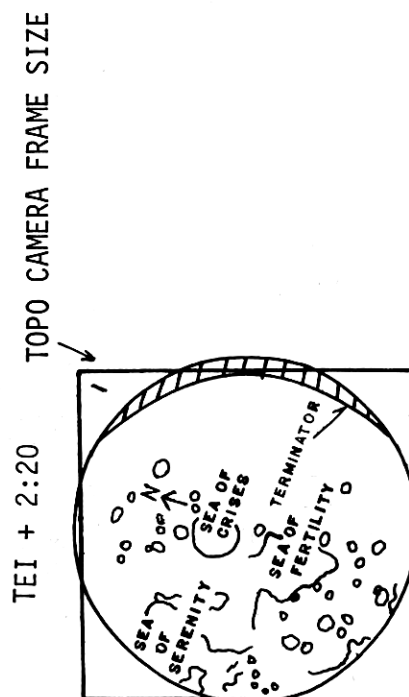
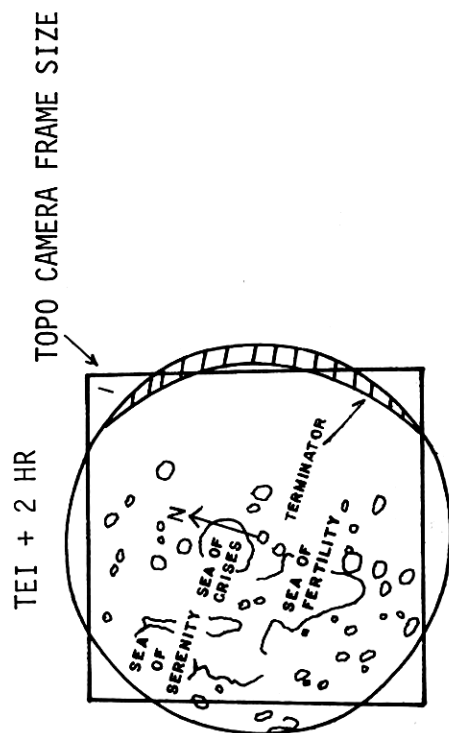
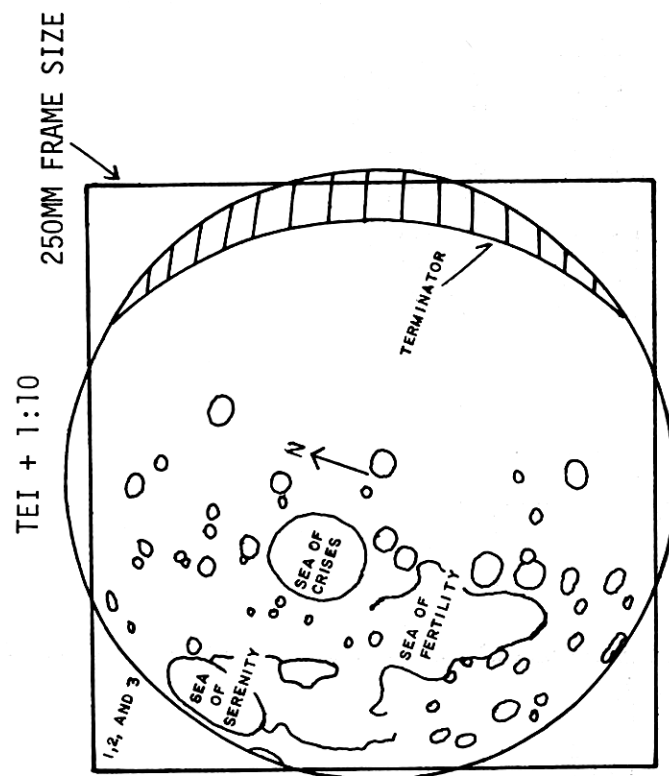


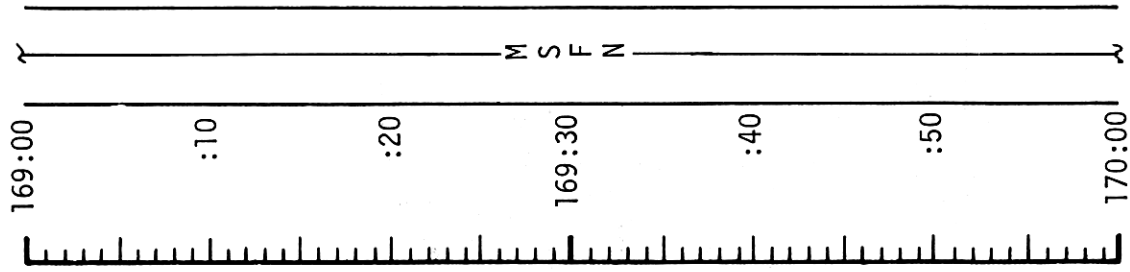
FIGURE 3-14
3-134C

FLIGHT PLAN

MCC-H

NOTES

1413 CST



UPDATE TO CSM
TOPO PHOTO ATT
(IF REQ)

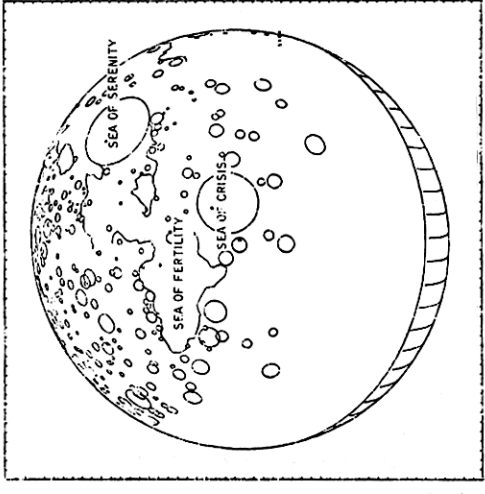
EAT PERIOD

MOUNT TOPO CAM ON HATCH WINDOW MAG V
DISABLE IMC
LOAD DAP, N46 (20101, 011111)
MNVR TO TOPO PHOTO ATT (169:25)

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

STOW TOPO CAMERA

GET 169:30 F.O.V. 20°



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

SET: SHUTTER 1/100 SEC
RANGE DISABLED (99.9 CW)

INTERVAL SINGLE FRAME

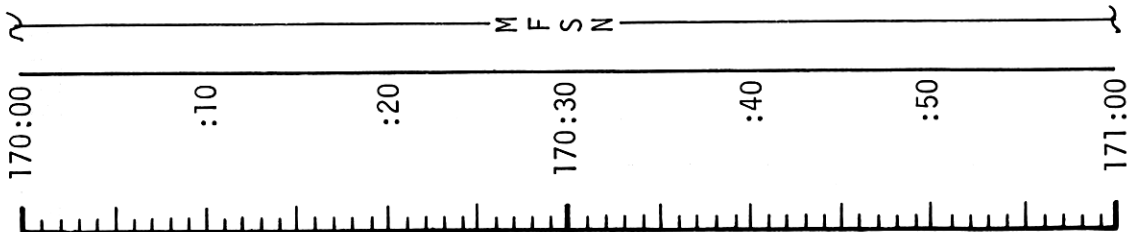
RECORD GET: 1. : :
2. : :
3. : :
4. : :
5. : :

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

MCC-H

FLIGHT PLAN

1513 CST



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 5 0 0 0)(R2 + 0 0 0 0 6)

- 1. STAR 26 LFH (R3 00220) SPICA
- 2. STAR 37 LNH (R3 00210) NUNKI
- 3. STAR 33 LNH (R3 00210) ANTARES
- 4. STAR 34 LNH (R3 00210) ATRIA

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

SECURE HGA
HGA TRACK - MAN
HGA PITCH -52°
HGA YAW 270°

PRESLEEP CHECKLIST

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

UPLINK TO CSM
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 uplinked 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 uplink a current MSFN S.V. to the LM slot for reference purposes.

3 MARKS ON EACH STAR

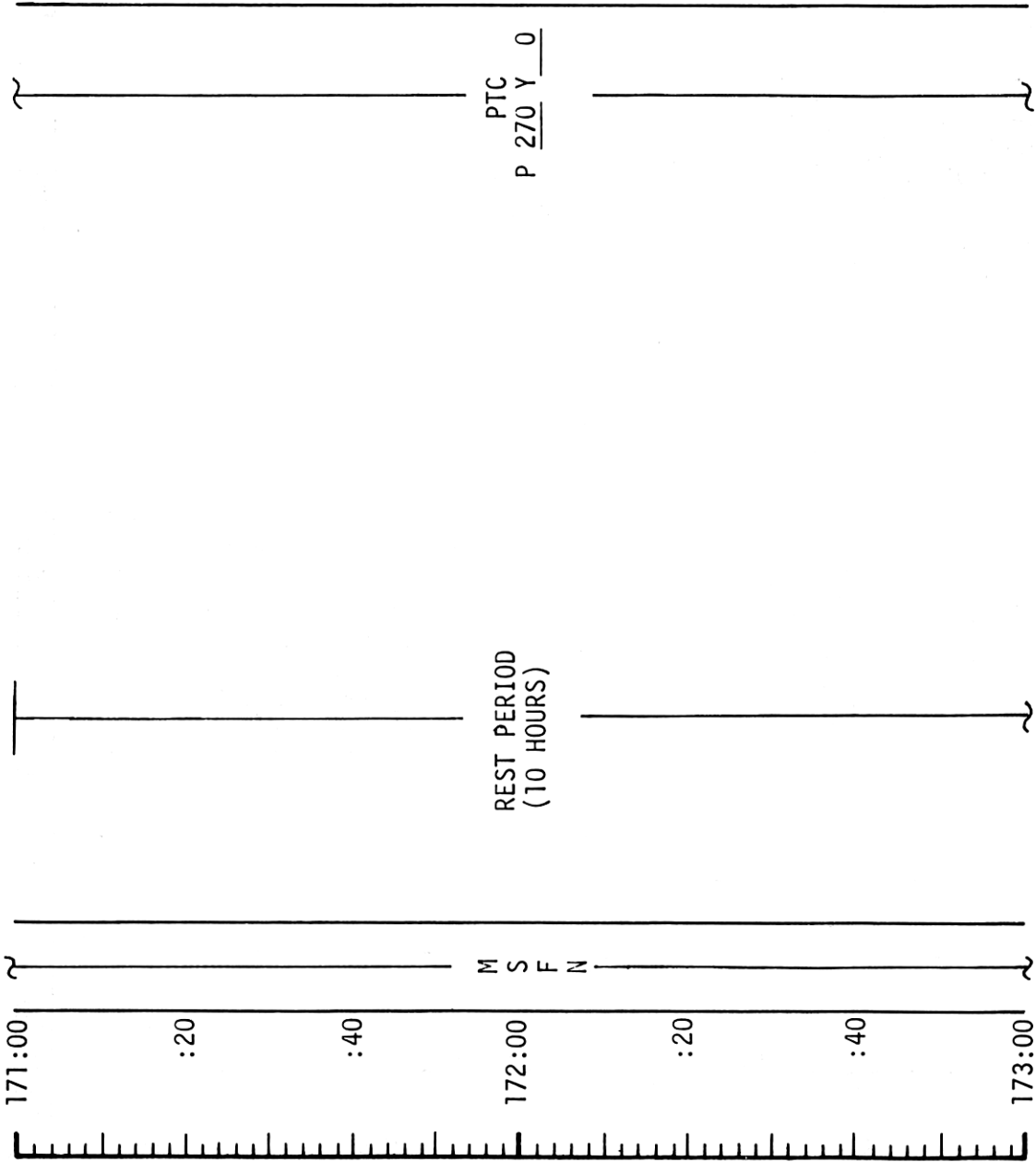
INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

ONBOARD READOUT	
BAT C	
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	170:00 - 171:00	8/TEC	3-136

FLIGHT PLAN



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

NOTES

1813 CST

173:00

:20

:40

174:00

:20

:40

175:00

M S F N

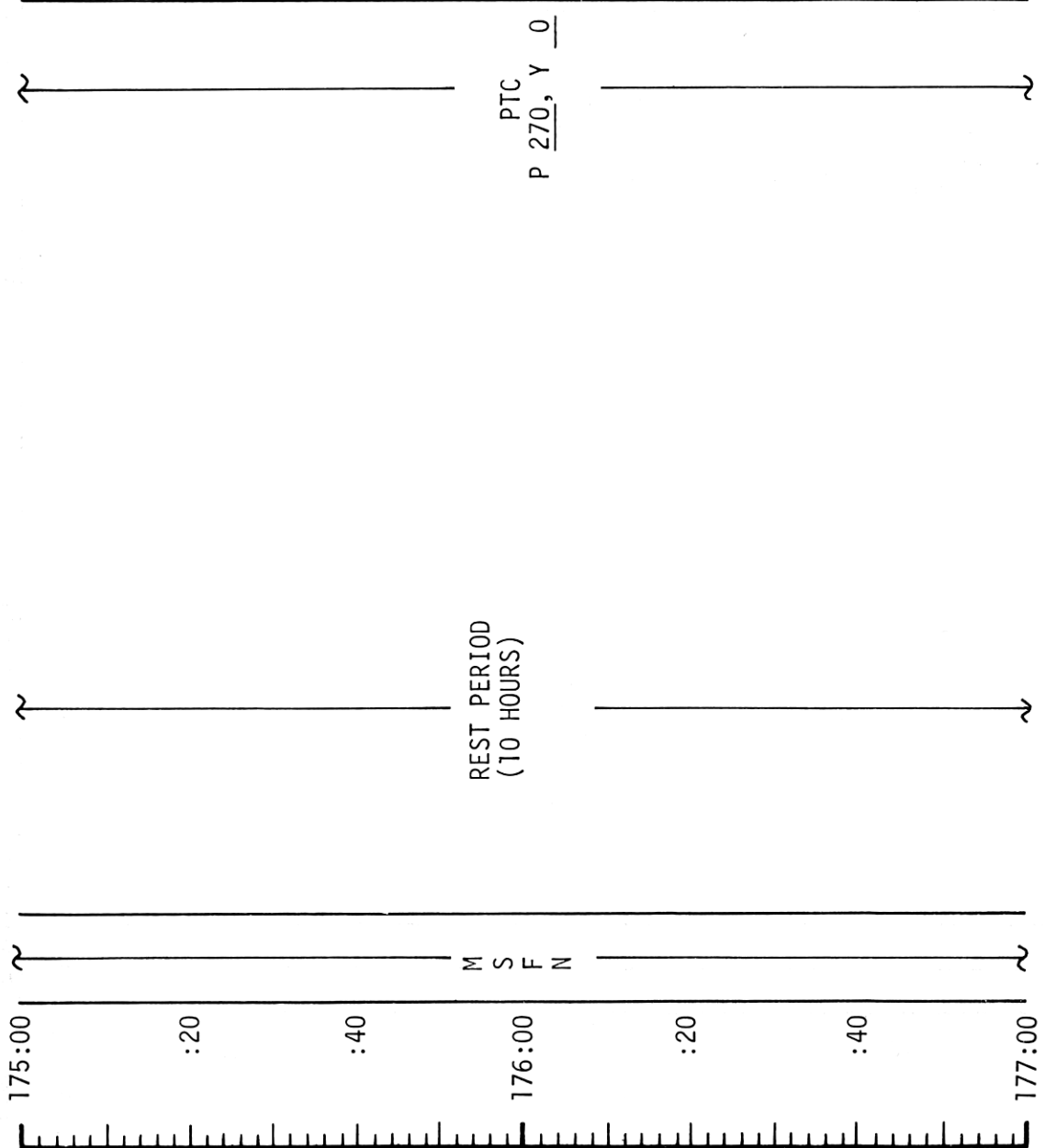
REST PERIOD
(10 HOURS)

PTC
P 270, Y 0

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

FLIGHT PLAN

NOTES

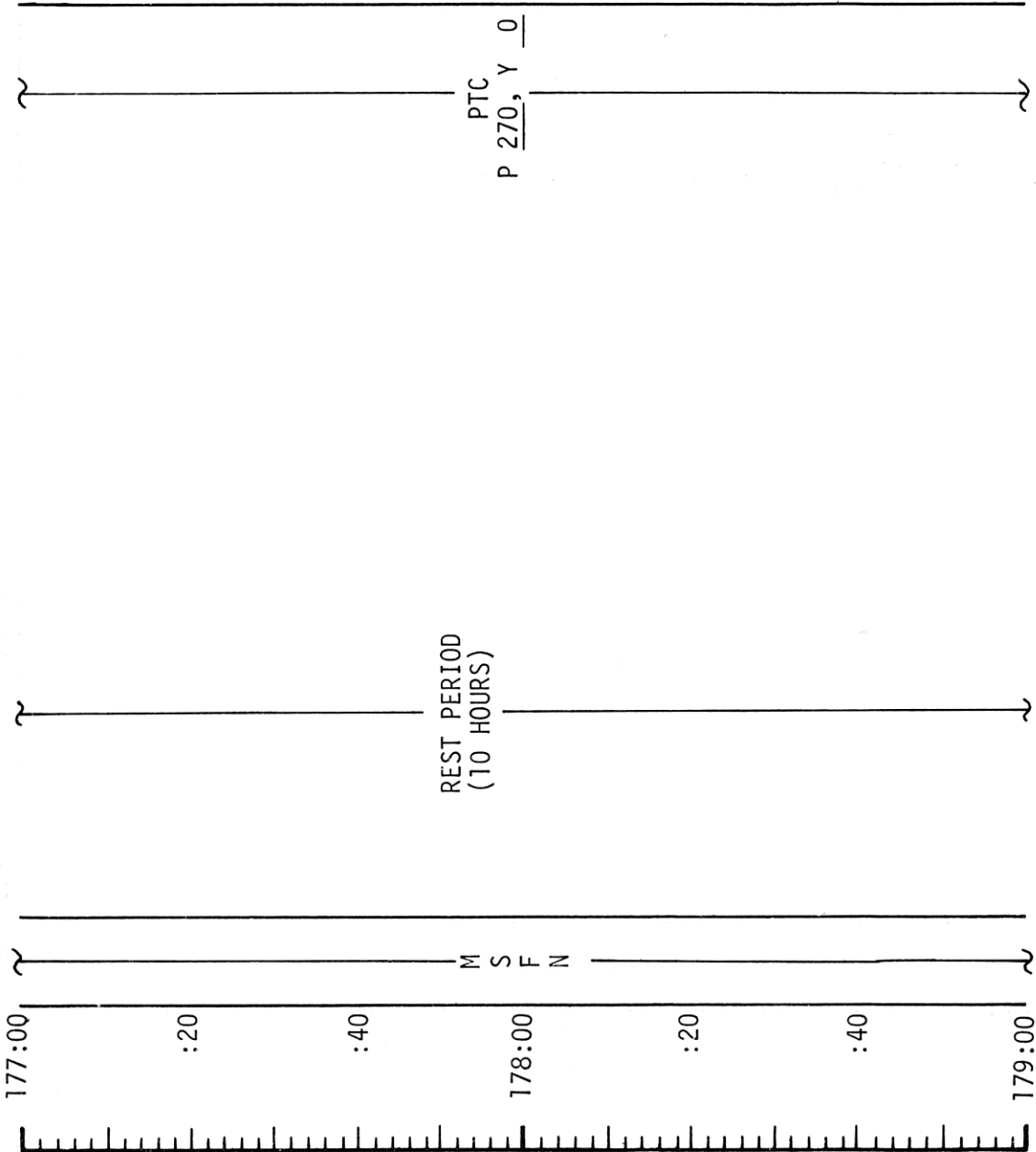


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	175:00 - 177:00	7/TEC	3-139

2213 CST

FLIGHT PLAN

NOTES

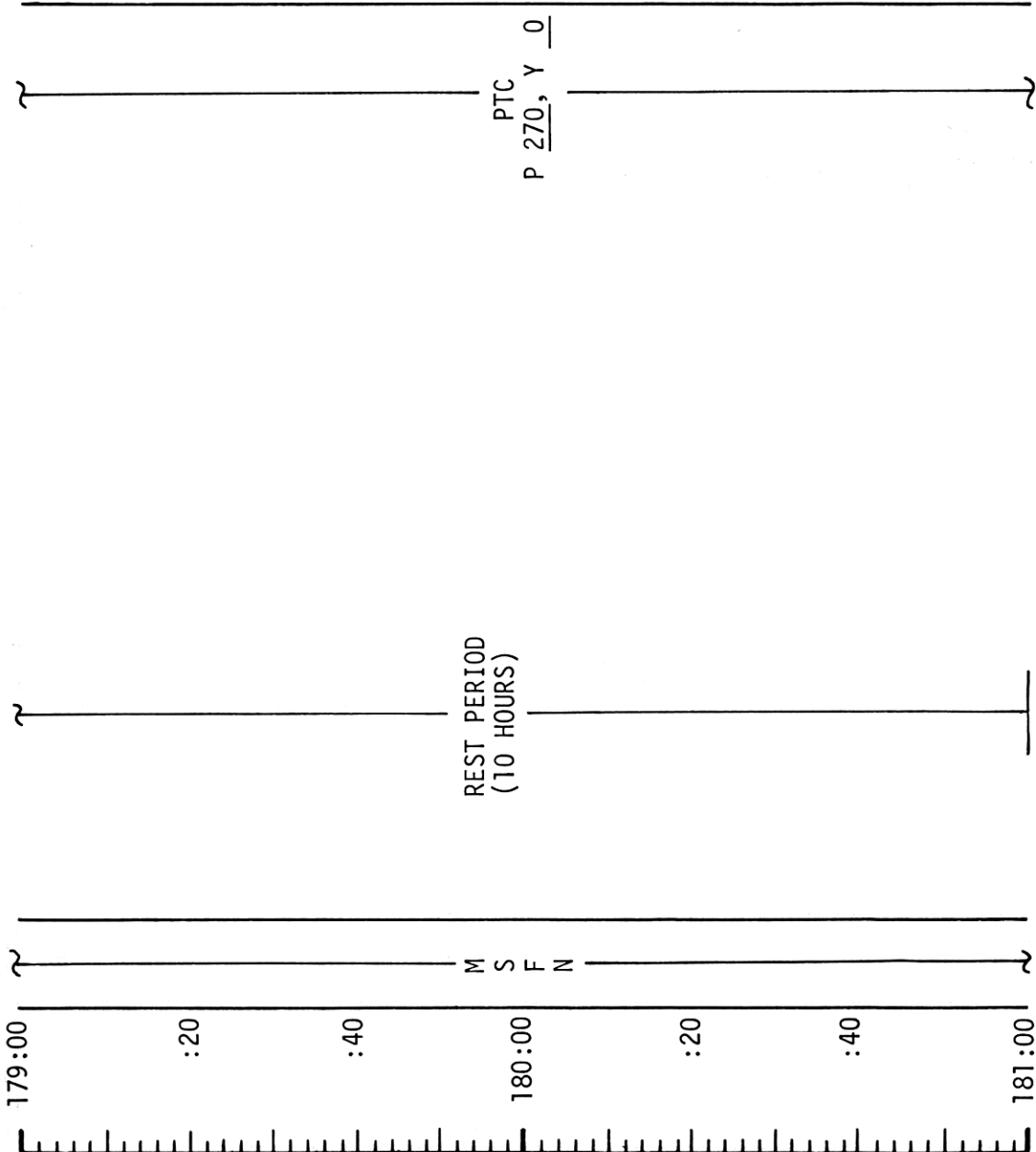


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	177:00 - 179:00	7/TEC	3-140

0013 CST

FLIGHT PLAN

NOTES



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

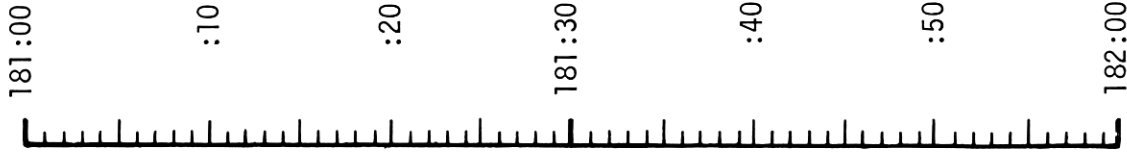
FLIGHT PLAN

MCC-H

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)



POST SLEEP CHECKLIST

P52 - IMU REALIGN
OPTION 3 REFSMMAT
(PTC ORIENT)

REPORT GYRO TORQUING ANGLES

LiOH CANISTER CHANGE
(15 INTO A, STOW 13 IN A4)

STOP PTC

H₂ PURGE LINE HEATERS-ON

SET UP DAC FOR WATER DUMP PHOTOGRAPHY (182:01)
CM1/DAC/18/VHBM-(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

PTC

NOTES

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

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

WASTE WATER DUMP _____
H₂ PURGE LINE HTRS - OFF _____

WATER DUMP PHOTOGRAPHY
HAND HELD, PHOTOGRAPH
EXPANSION OF WATER
DROPLET CLOUD

CMT/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

GDC ALIGN

MCC-5

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

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

R	054.8	HGA
P	<u>313.6</u>	P
Y	<u>359.9</u>	Y
		<u>-50</u>
		274

UNSTOW TOPO CAMERA AND MOUNT ON HATCH WINDOW
DISABLE IMC

TOPO PHOTOGRAPHY MAG V
TWO SINGLE FRAMES COVERING
VISIBLE DISC

START FRAME NO.

NOTES

BURN STATUS REPORT

[illegible]

*ITEMS TO BE
REPORTED TO MSFN

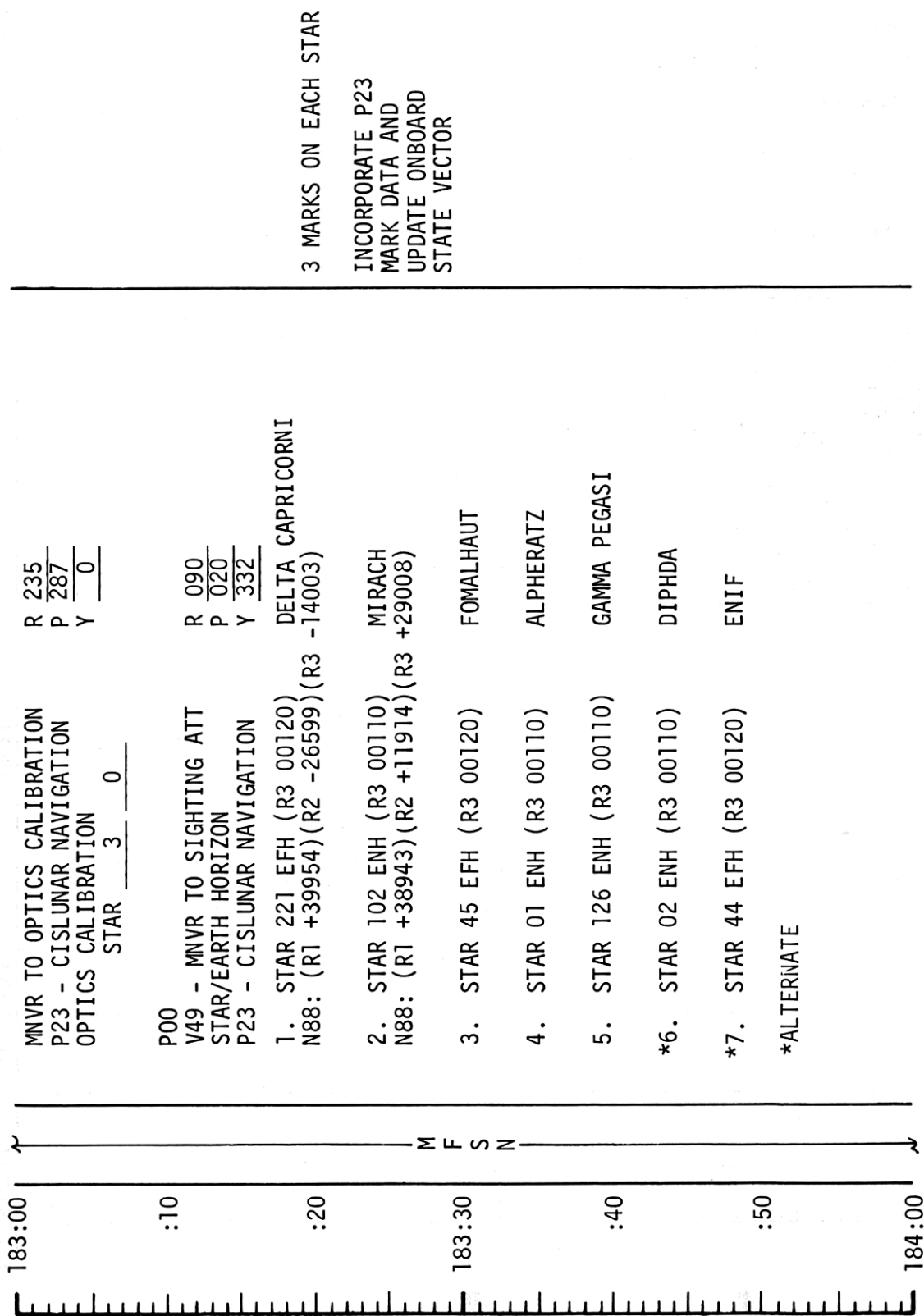
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	182:00 - 183:00	8/TEC	3-143

FLIGHT PLAN

0413 CST

MCC-H

NOTES



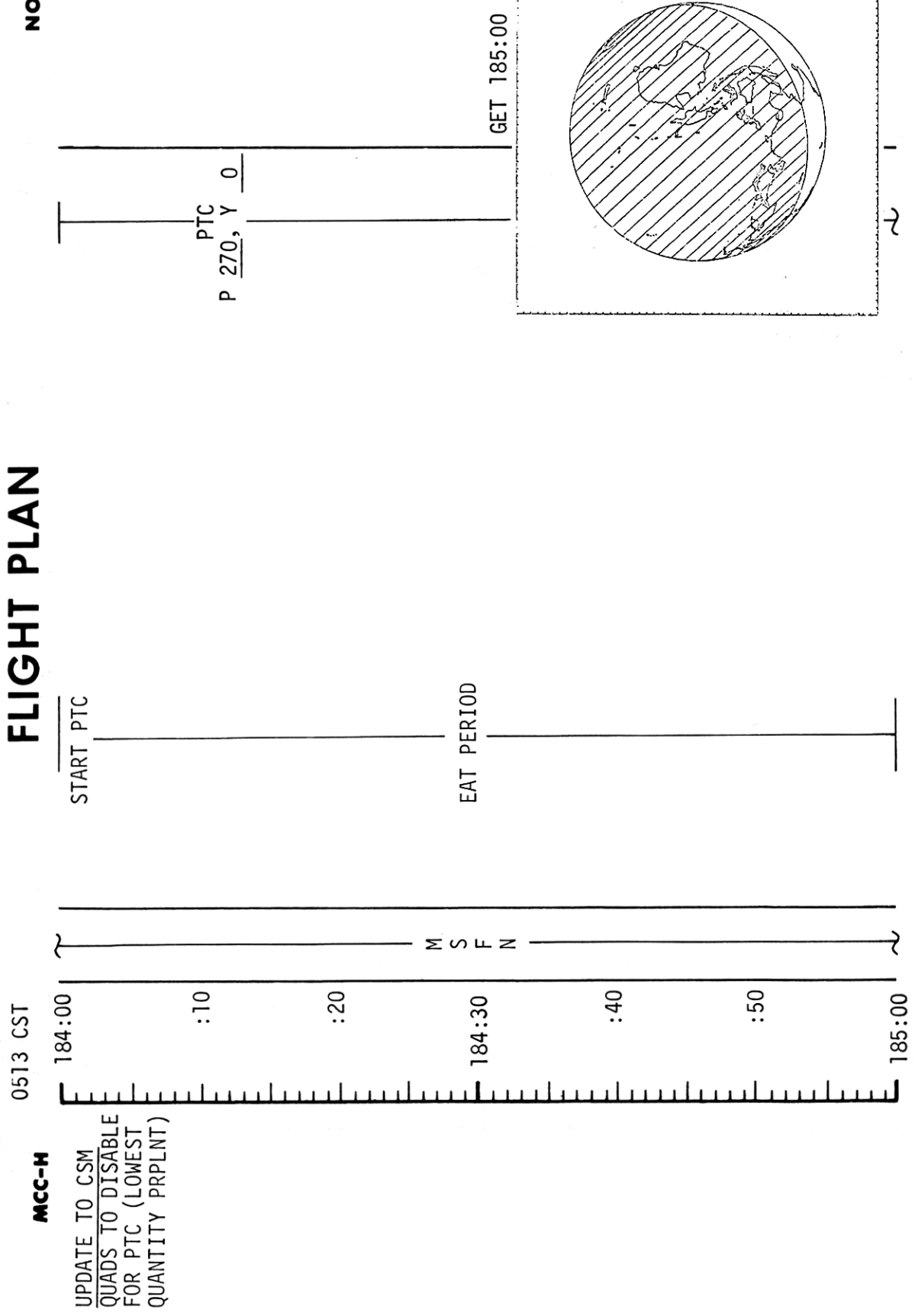
3 MARKS ON EACH STAR

INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

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

FLIGHT PLAN

NOTES



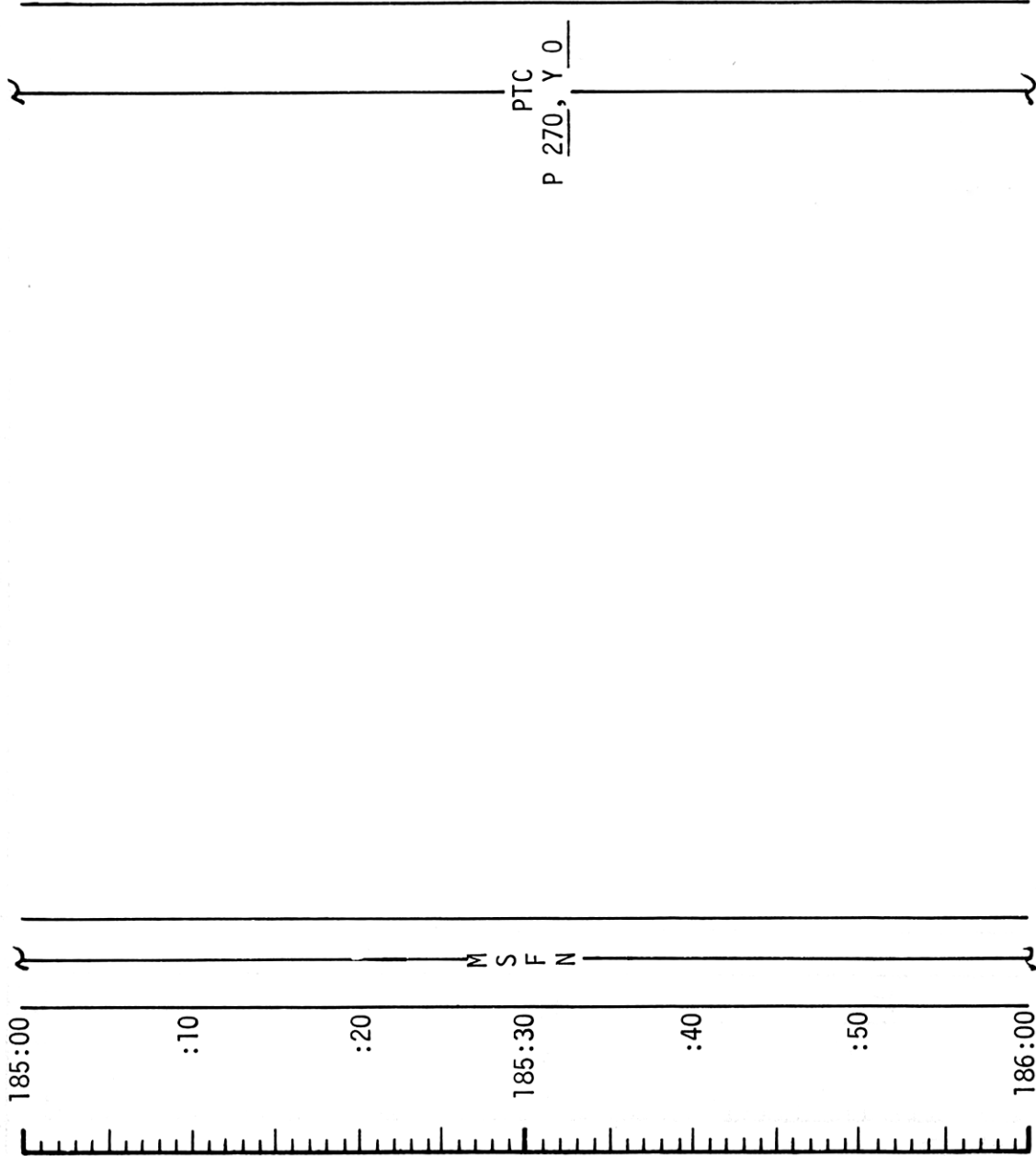
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	184:00 - 185:00	8/TEC	3-145

FLIGHT PLAN

MCC-H

0613 CST

NOTES



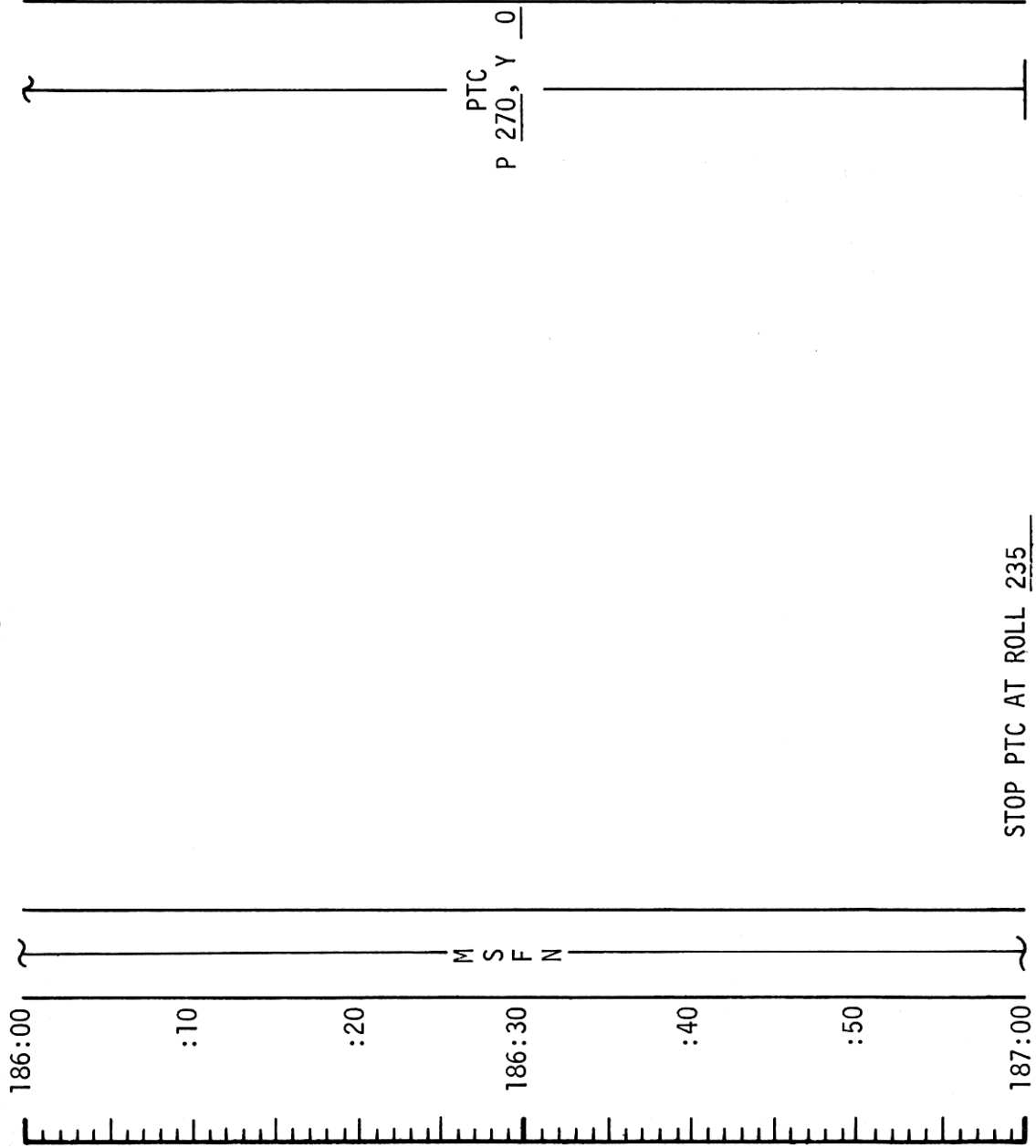
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	185:00 - 186:00	8/TEC	3-146

FLIGHT PLAN

NOTES

MCC-H

0713 CST

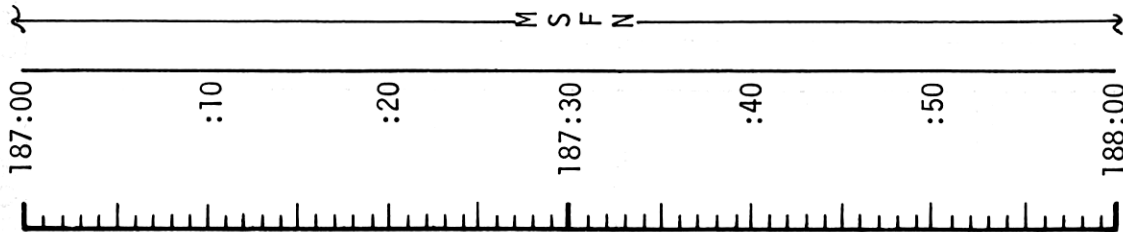


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	186:00 - 187:00	8/TEC	3-147

0813 CST

FLIGHT PLAN

NOTES



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

R 235
 P 287
 Y 0

P00

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

R 234
 P 313
 Y 0

3 MARKS ON EACH STAR

1. STAR 33 LNH (R3 00210) ANTARES

INCORPORATE P23
 MARK DATA AND
 UPDATE ONBOARD
 STATE VECTOR

2. STAR 26 LFH (R3 00220) SPICA

3. STAR 24 LFH (R3 00220) GIENAH

4. STAR 31 LFH (R3 00220) ARCTURUS

5. STAR 25 LNH (R3 00210) ACRUX

*6. STAR 32 LFH (R3 00220) ALPHECCA

*7. STAR 30 LNH (R3 00210) MENKENT

*ALTERNATES

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

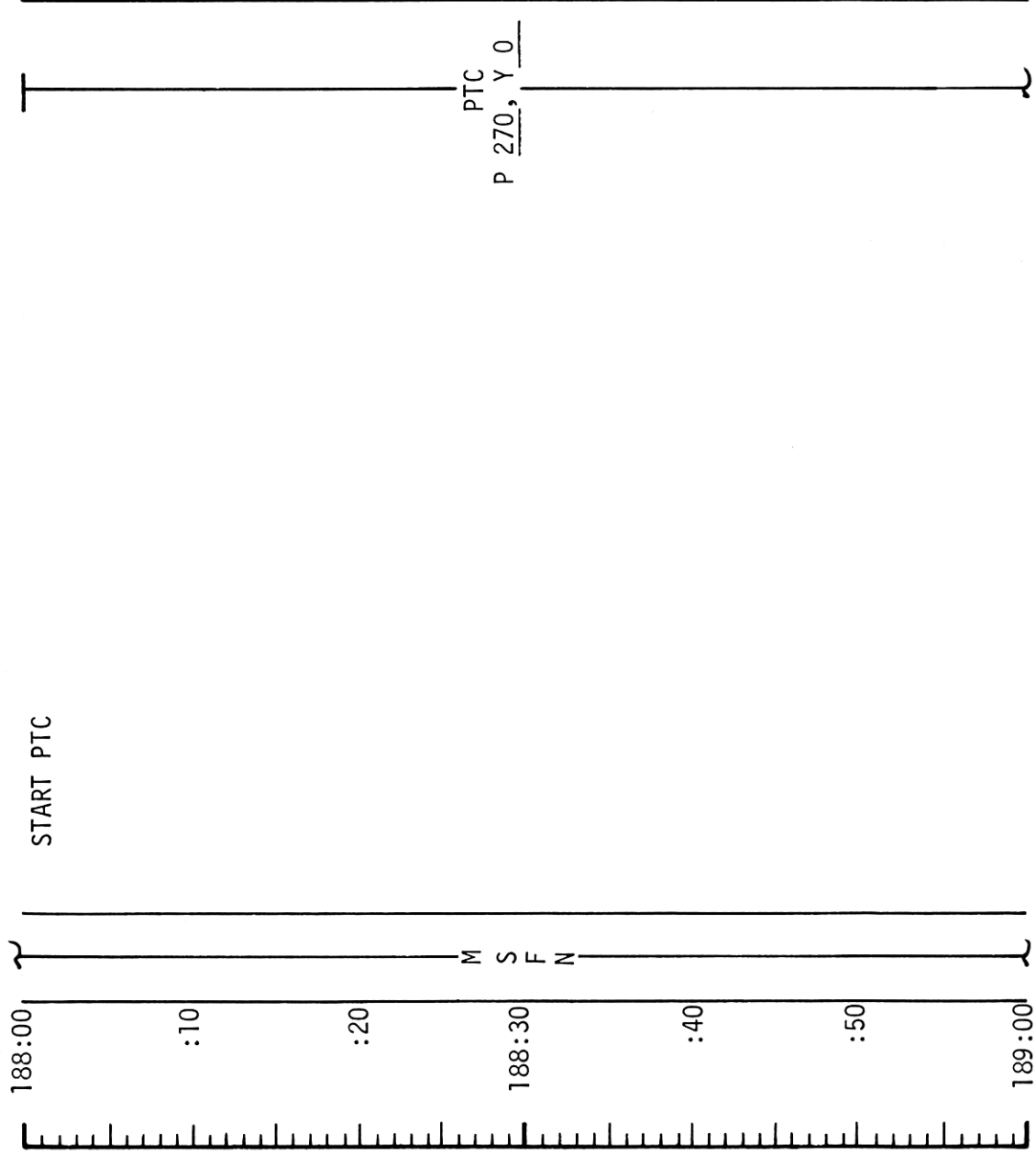
FLIGHT PLAN

NOTES

MCC-H

0913 CST

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



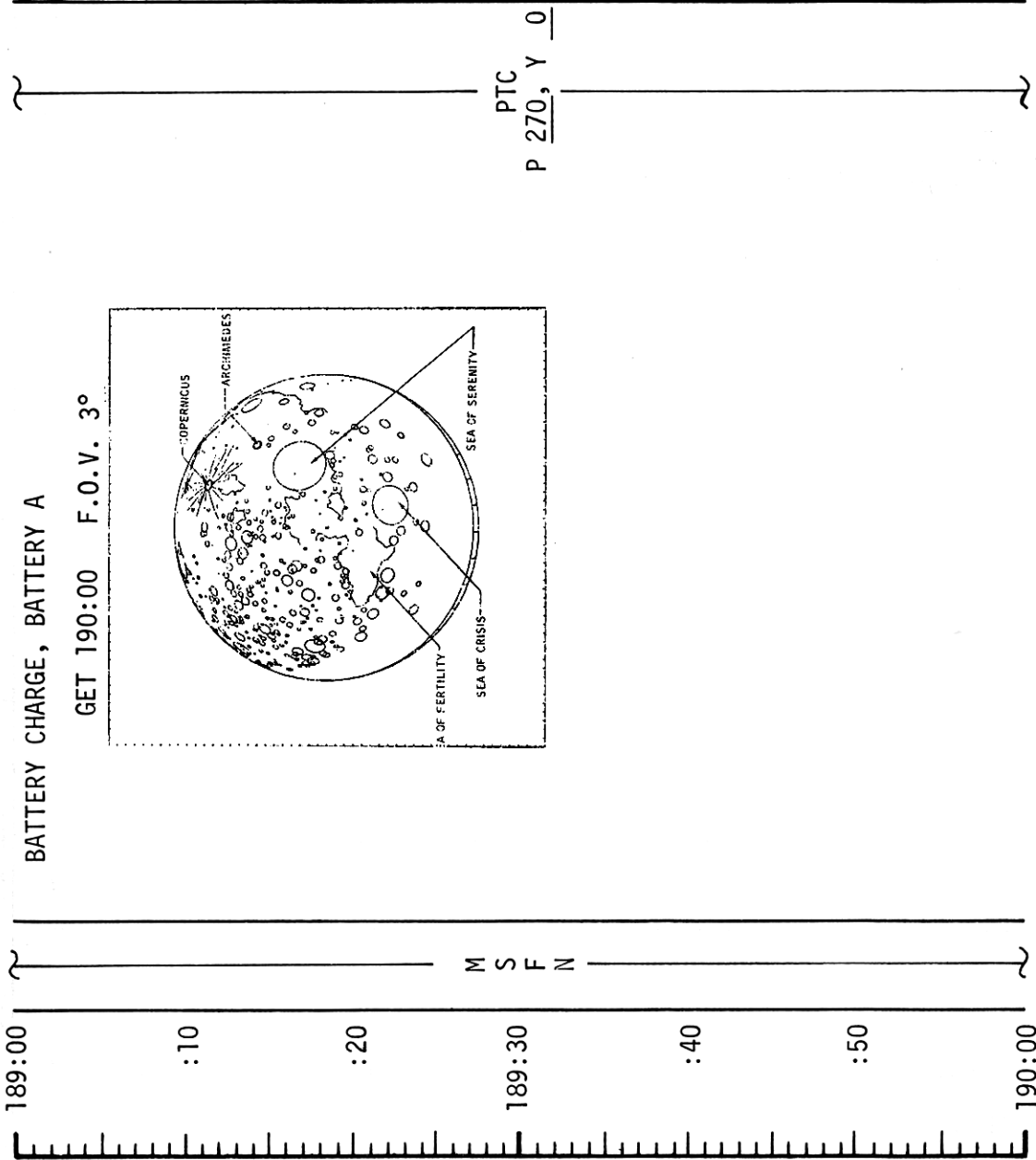
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	188:00 - 189:00	8/TEC	3-149

FLIGHT PLAN

NOTES

1013 CST

MCC-H



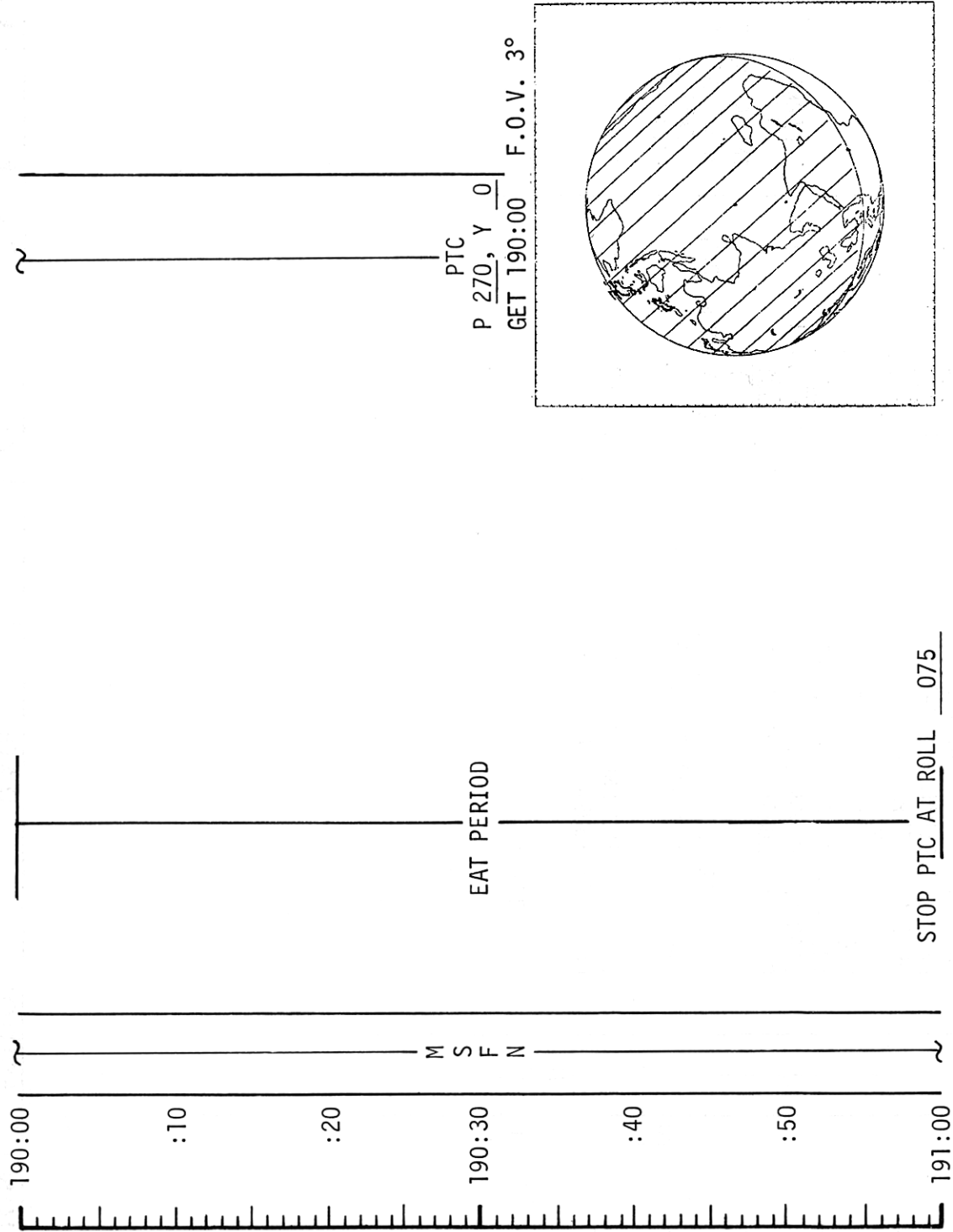
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	189:00 - 190:00	8/TEC	3-150

FLIGHT PLAN

MCC-H

1113 CST

NOTES



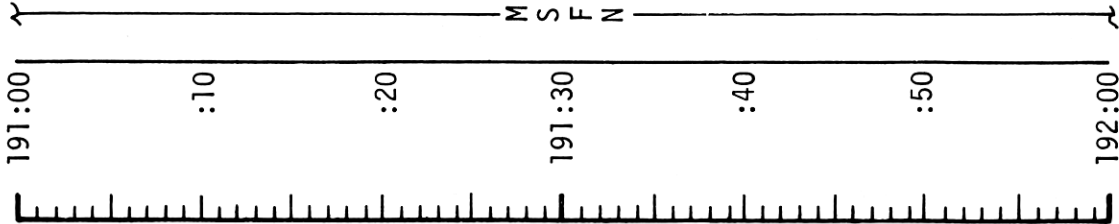
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	190:00 - 191:00	8/TEC	3-151

FLIGHT PLAN

MCC-H

1213 CST

NOTES



MNVR TO OPTICS CALIBRATION ATT
P23 - CISELUNAR NAVIGATION
OPTICS CALIBRATION

R 075
P 063
Y 0

STAR 4 4

P00

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

R 090
P 030
Y 331

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

DELTA CAPRICORNI

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

MIRACH

3. STAR 45 EFH (R3 00120)

FOMALHAUT

4. STAR 02 ENH (R3 00110)

DIPHA

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

GAMMA PEGASI

*6. STAR 44 EFH (R3 00120)

ENIF

*7. STAR 01 ENH (R3 00110)

ALPHERATZ

*ALTERNATES

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	191:00 - 192:00	8/TEC	3-152

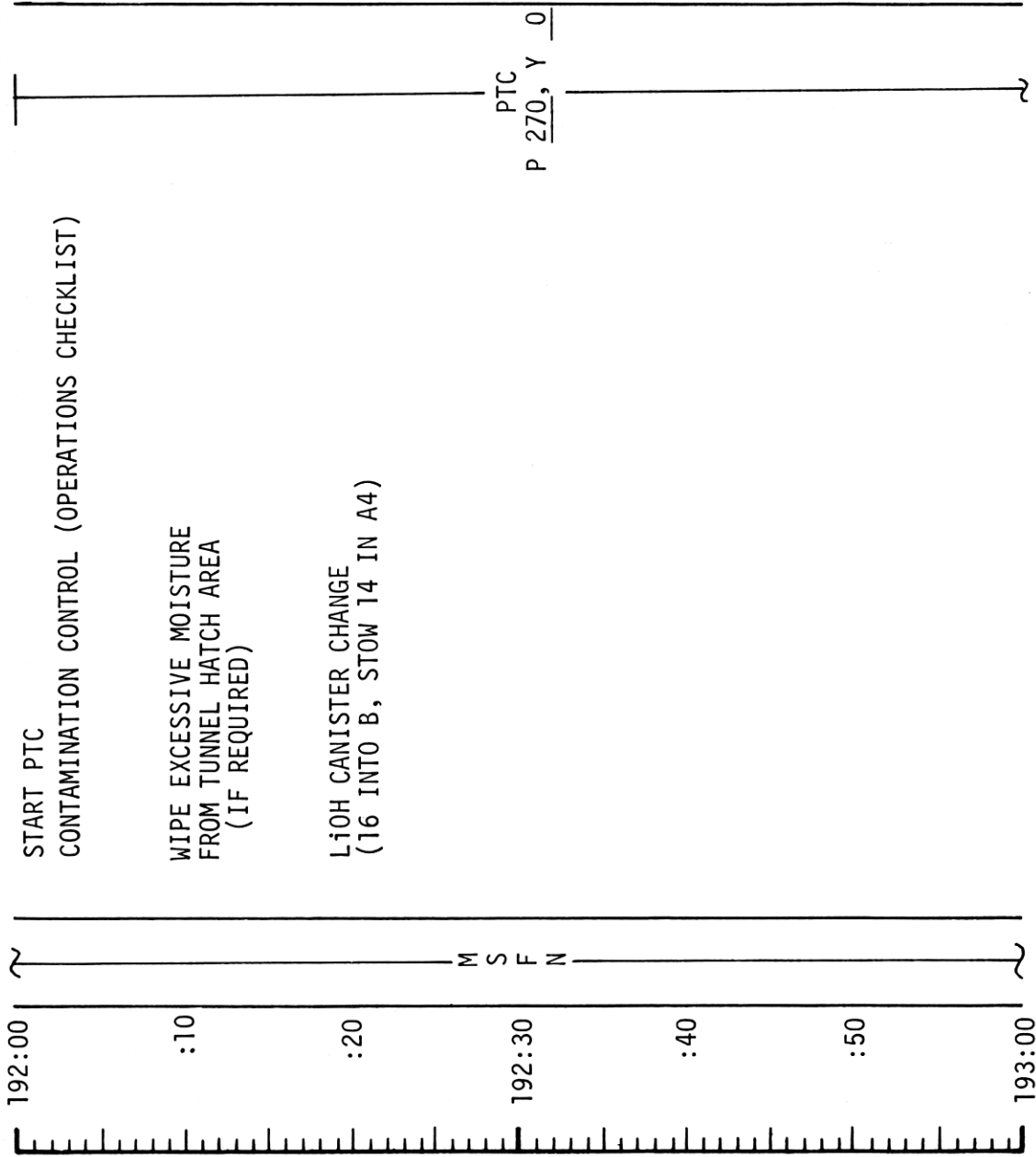
FLIGHT PLAN

MCC-H

1313 CST

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

NOTES



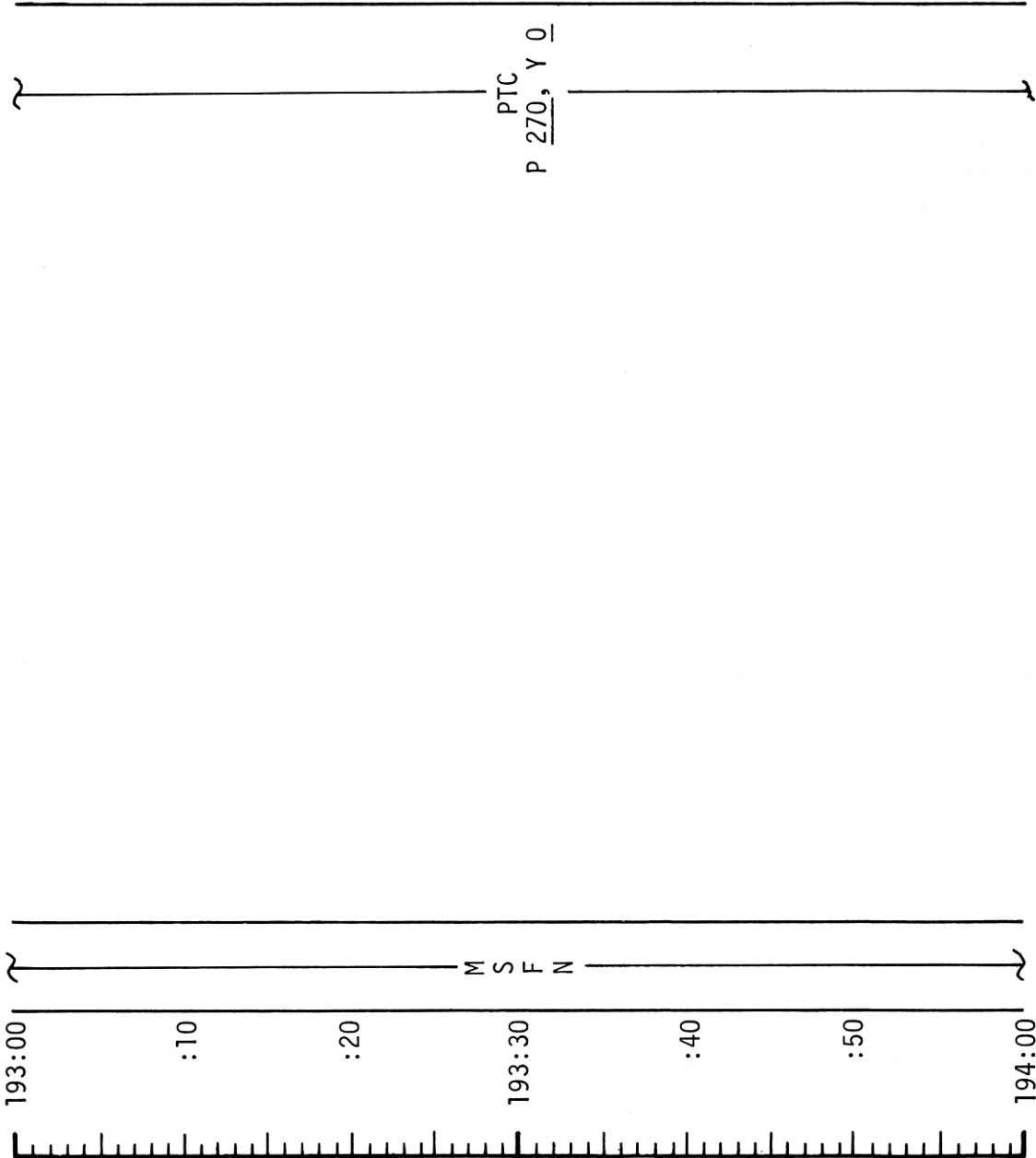
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	192:00 - 193:00	8/TEC	3-153

MCC-H

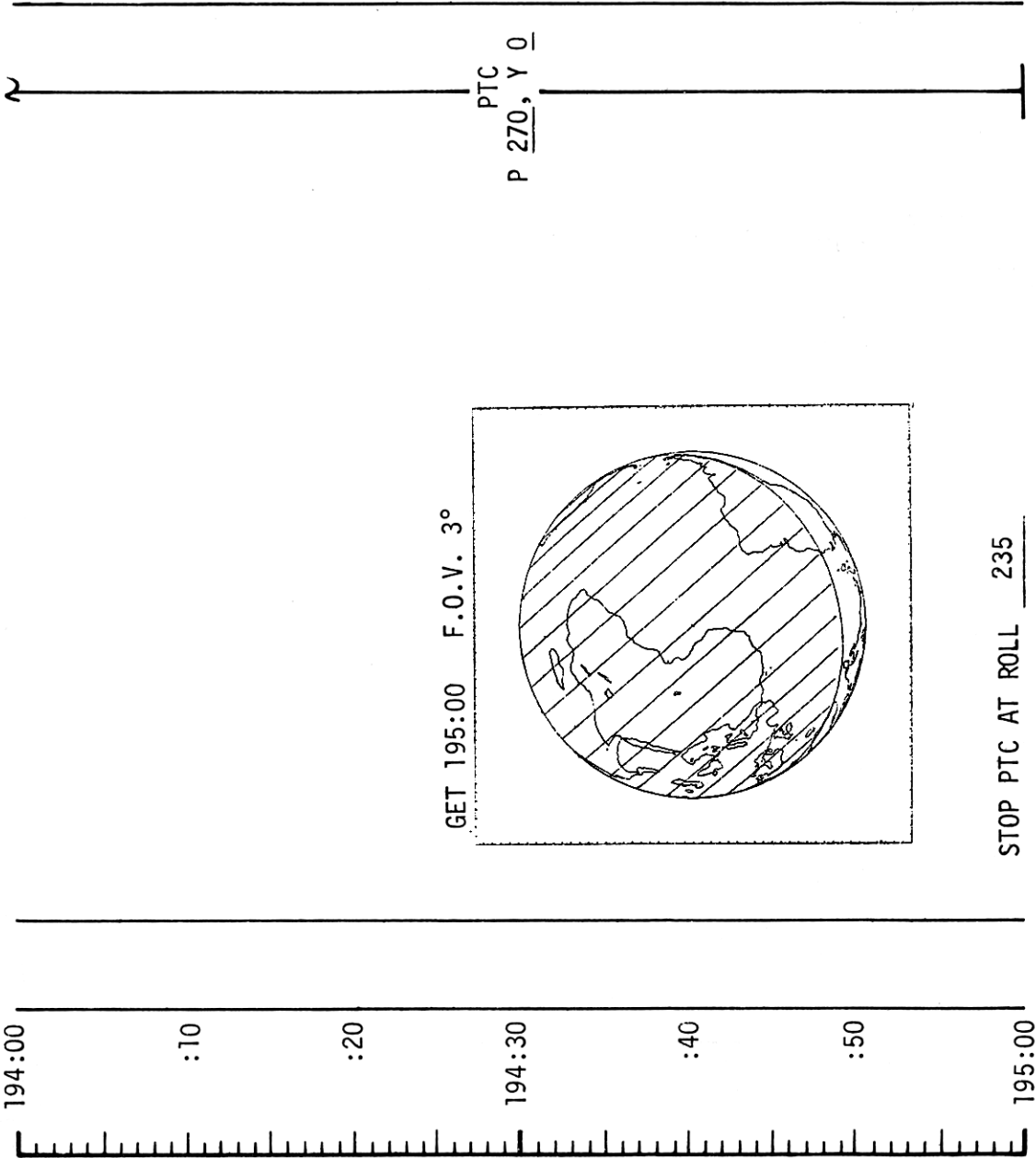
1413 CST

FLIGHT PLAN

NOTES



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

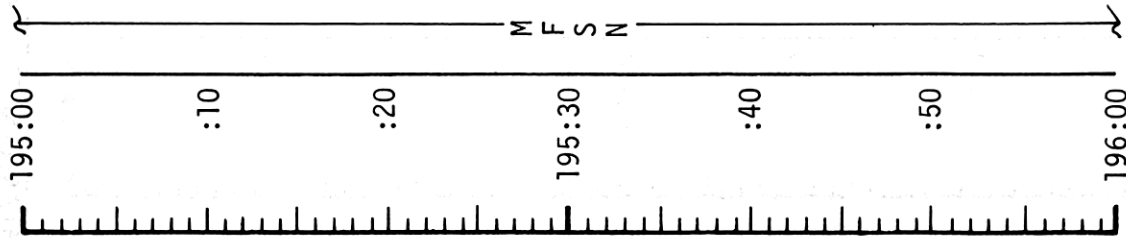


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	194:00 - 195:00	8/TEC	3-155

1613 CST

FLIGHT PLAN

NOTES



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

R 235
P 287
Y 0

P00

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

R 236
P 315
Y 0

1. STAR 33 LNH (R3 00210)

ANTARES

2. STAR 26 LFH (R3 00220)

SPICA

3. STAR 24 LFH (R3 00220)

GIENAH

4. STAR 31 LFH (R3 00220)

ARCTURUS

5. STAR 25 LNH (R3 00210)

ACRUX

*6. STAR 32 LFH (R3 00220)

ALPHECCA

*7. STAR 30 LNH (R3 00210)

MENKENT

*ALTERNATES

3 MARKS ON EACH STAR

INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

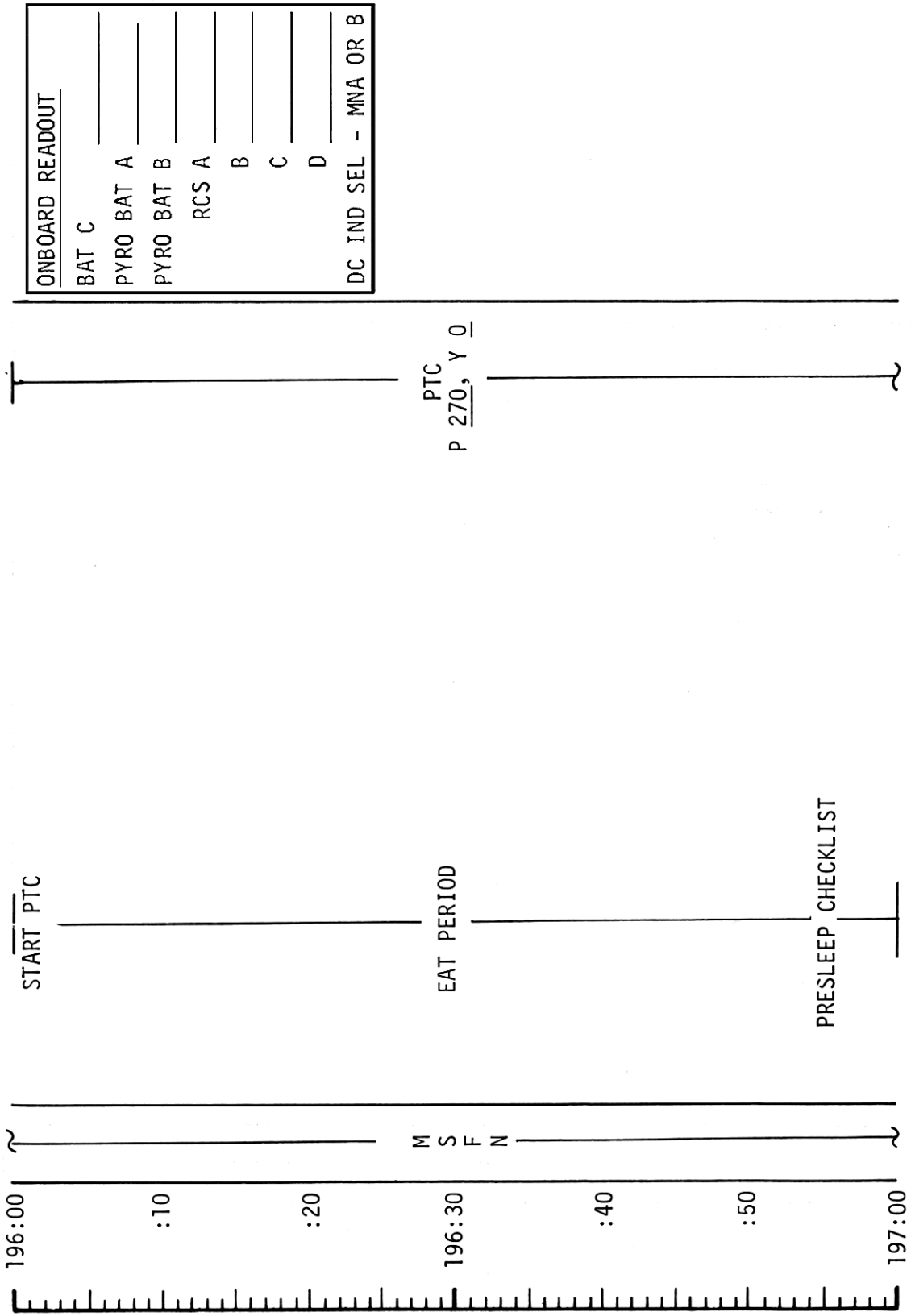
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	195:00 - 196:00	8/TEC	3-156

FLIGHT PLAN

MCC-H

1713 CST

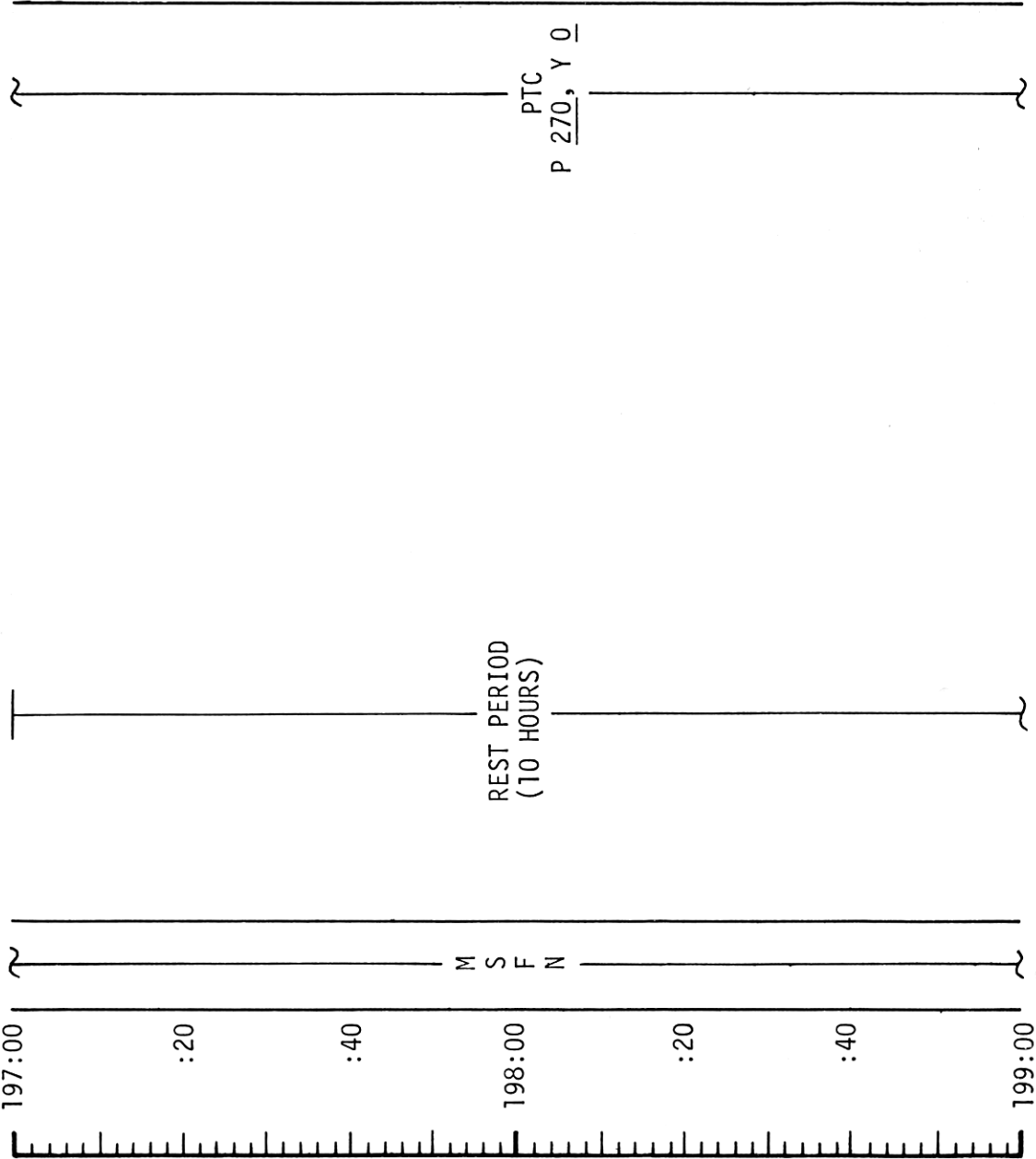
UPDATE TO CSM
QUADS TO DISABLE
FOR PTC (LOWEST
QUANTITY PRPLNT)



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	196:00 - 197:00	8/TEC	3-157



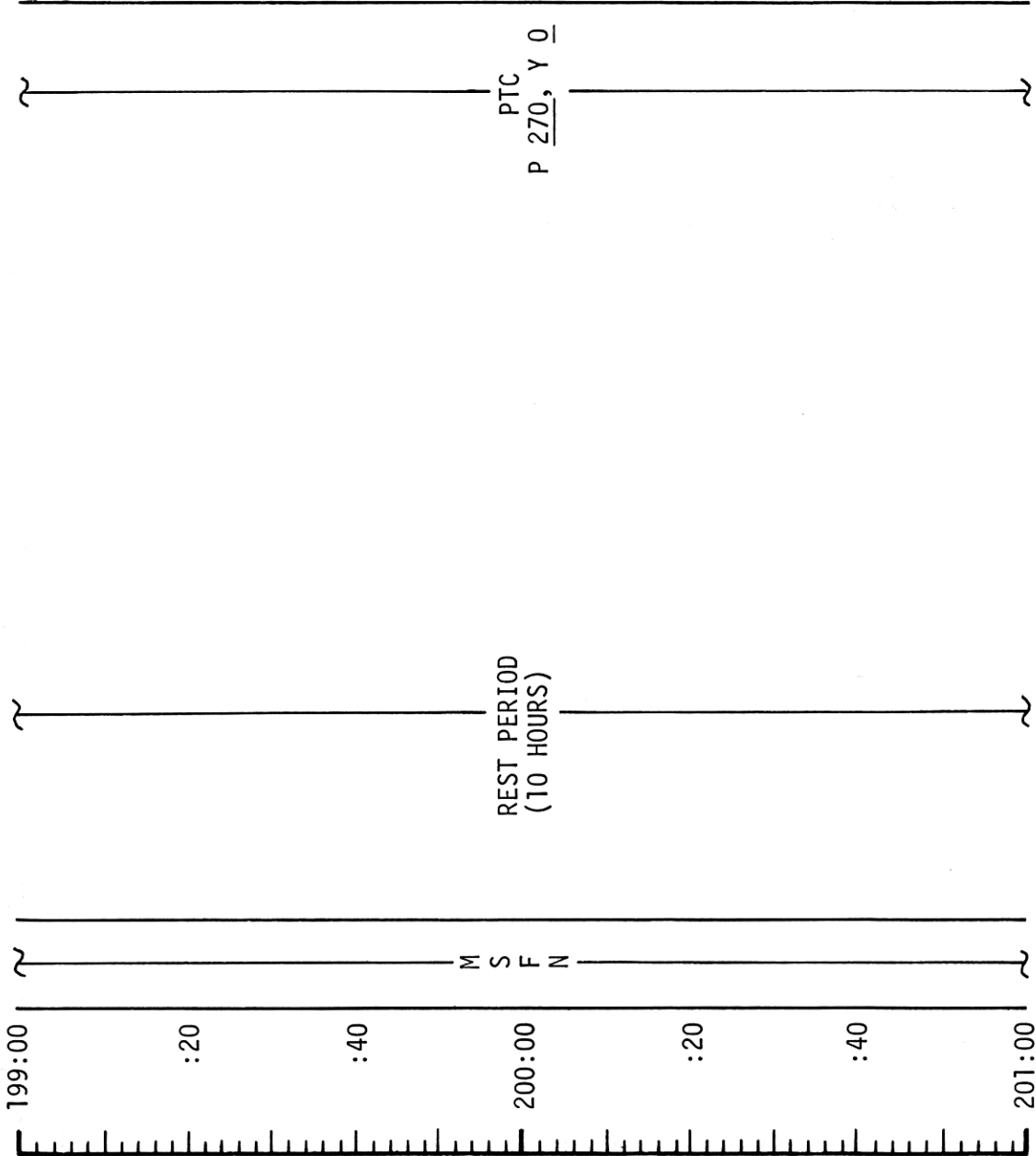
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	197:00 - 199:00	8/TEC	3-158

MCC-H

2013 CST

FLIGHT PLAN

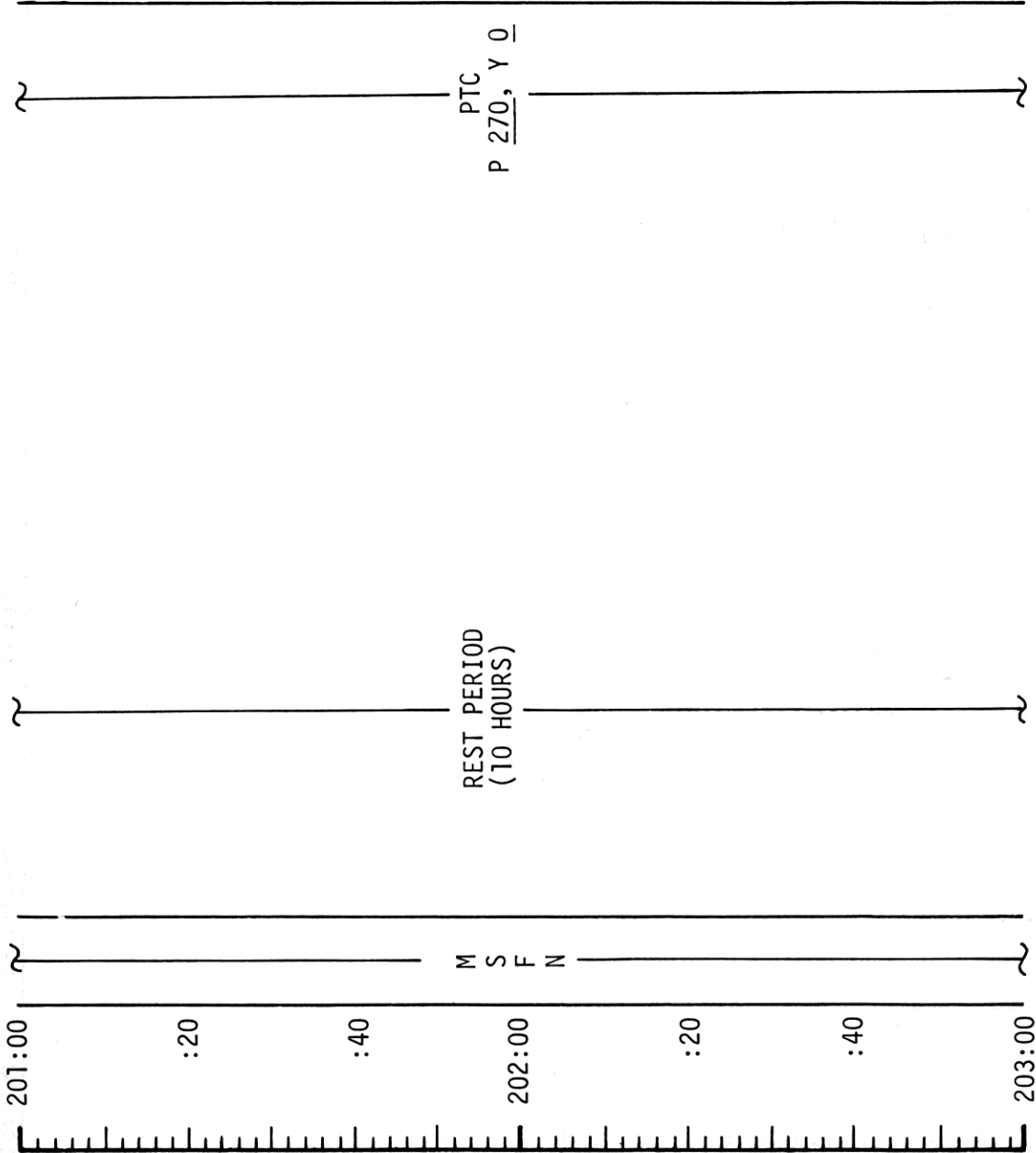
NOTES



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

FLIGHT PLAN

NOTES

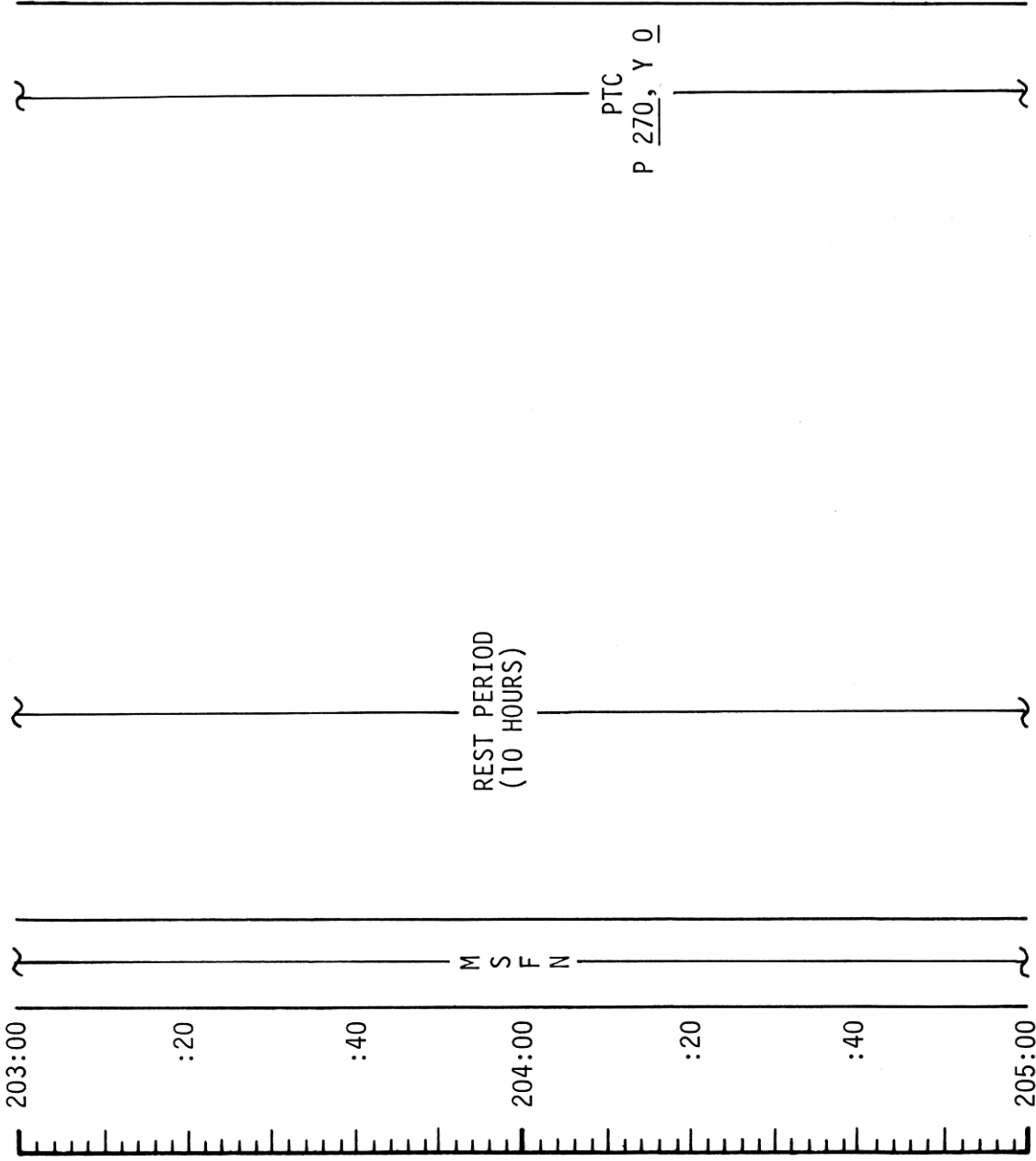


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	201:00 - 203:00	8/TEC	3-160

MCC-H

FLIGHT PLAN

0013 CST



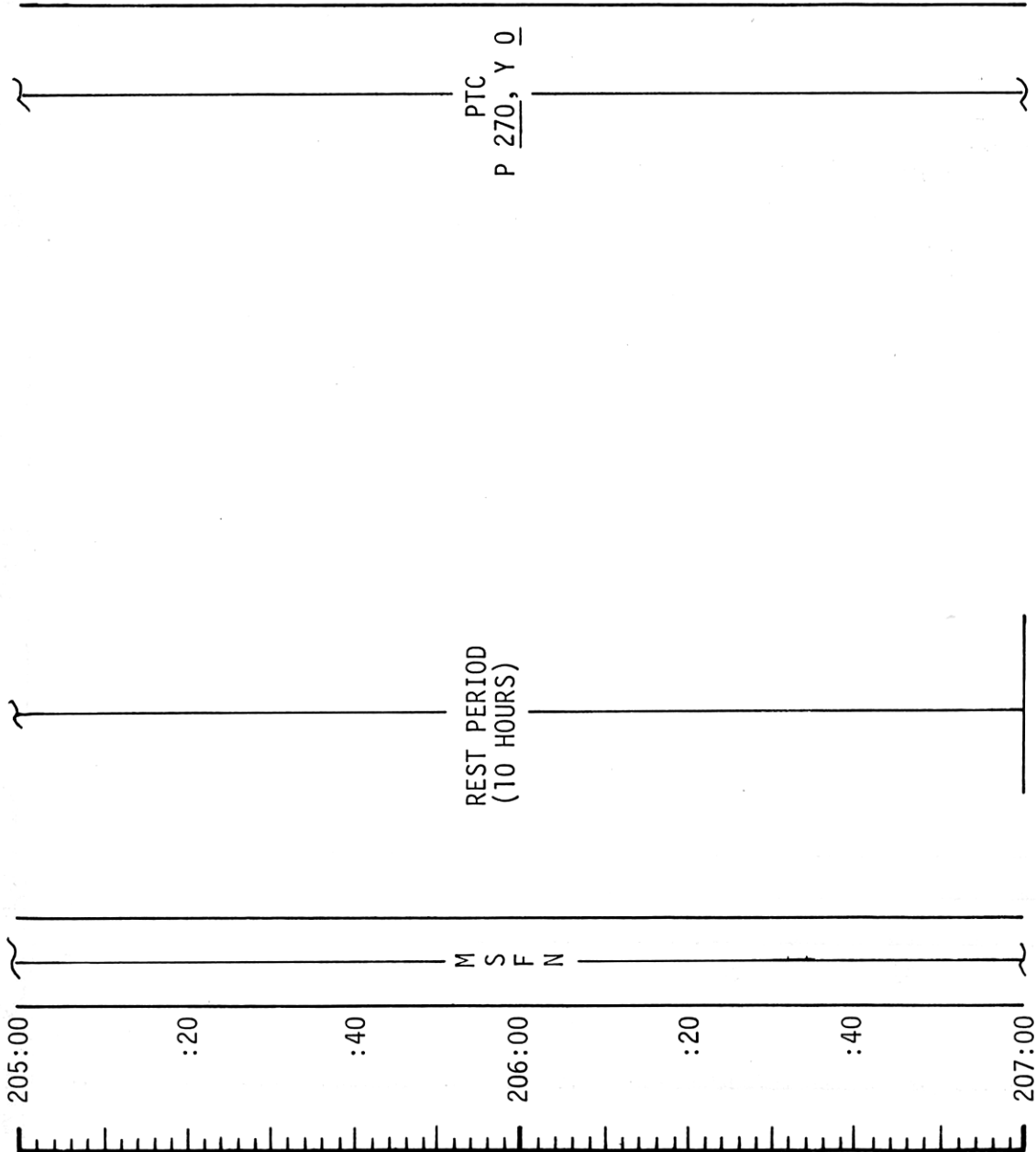
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	203:00 - 205:00	8/TEC	3-161

FLIGHT PLAN

NOTES

0213 CST

MCC-H



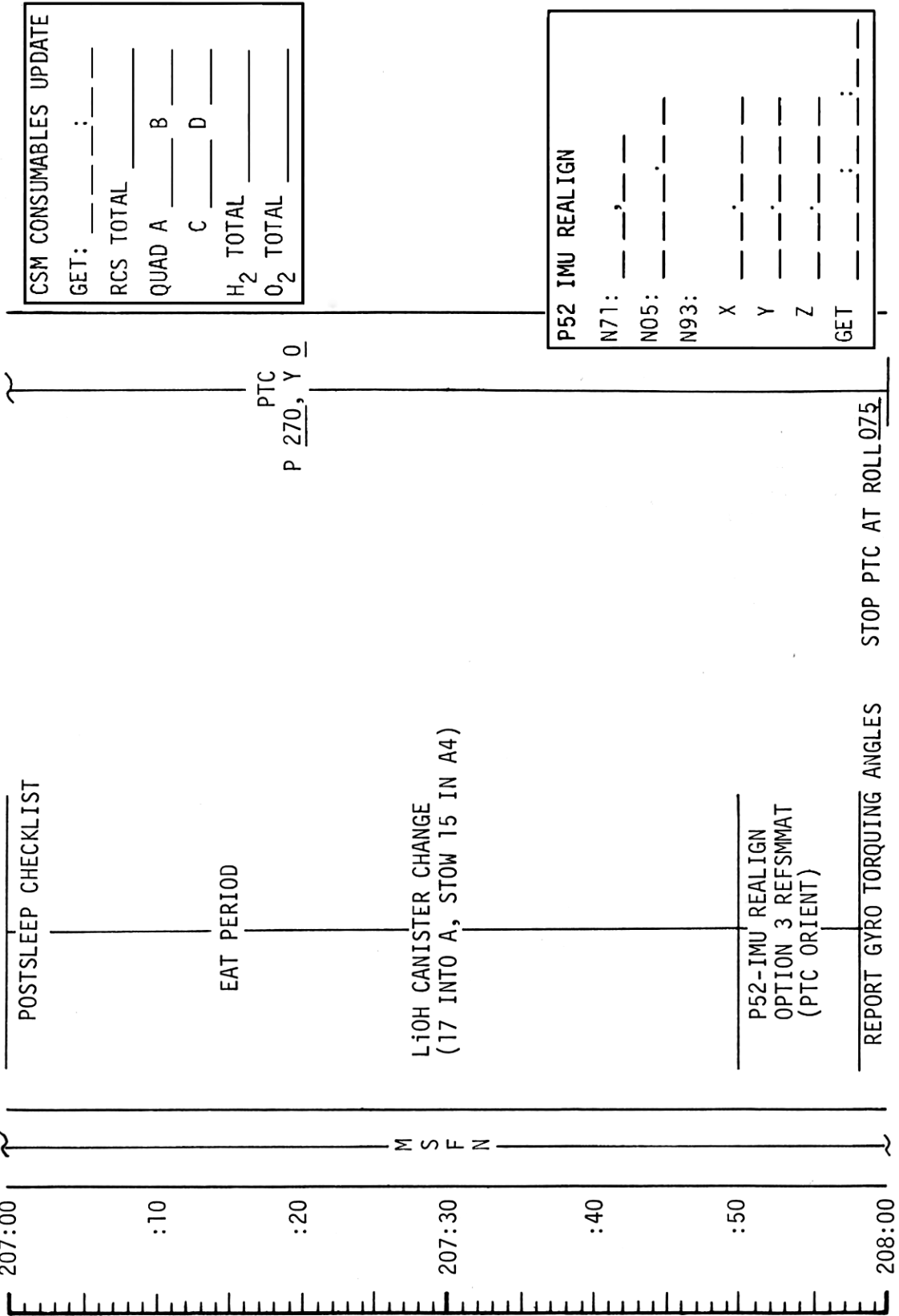
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	205:00 - 207:00	8/TEC	3-162

0413 CST

MCC-H

FLIGHT PLAN

NOTES



CSM CONSUMABLES UPDATE

GET: ____:____:____

RCS TOTAL ____

QUAD A ____ B ____

C ____ D ____

H₂ TOTAL ____

O₂ 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

NOTES

0513 CST

208:00

:10

:20

208:30

:40

:50

209:00

M F S N

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

R 075
P 063
Y 0

P00

V-49 - MNVR TO SIGHTING ATT
STAR/EARTH HORIZON
P23 - CISELUNAR NAVIGATION

R 090
P 085
Y 330

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

2. STAR 45 EFH (R3 00120) FOMALHAUT

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

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

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

*6. STAR 44 EFH (R3 00120) ENIF

*7. STAR 01 ENH (R3 00110) ALPHERATZ

*ALTERNATES

3 MARKS ON EACH STAR

INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

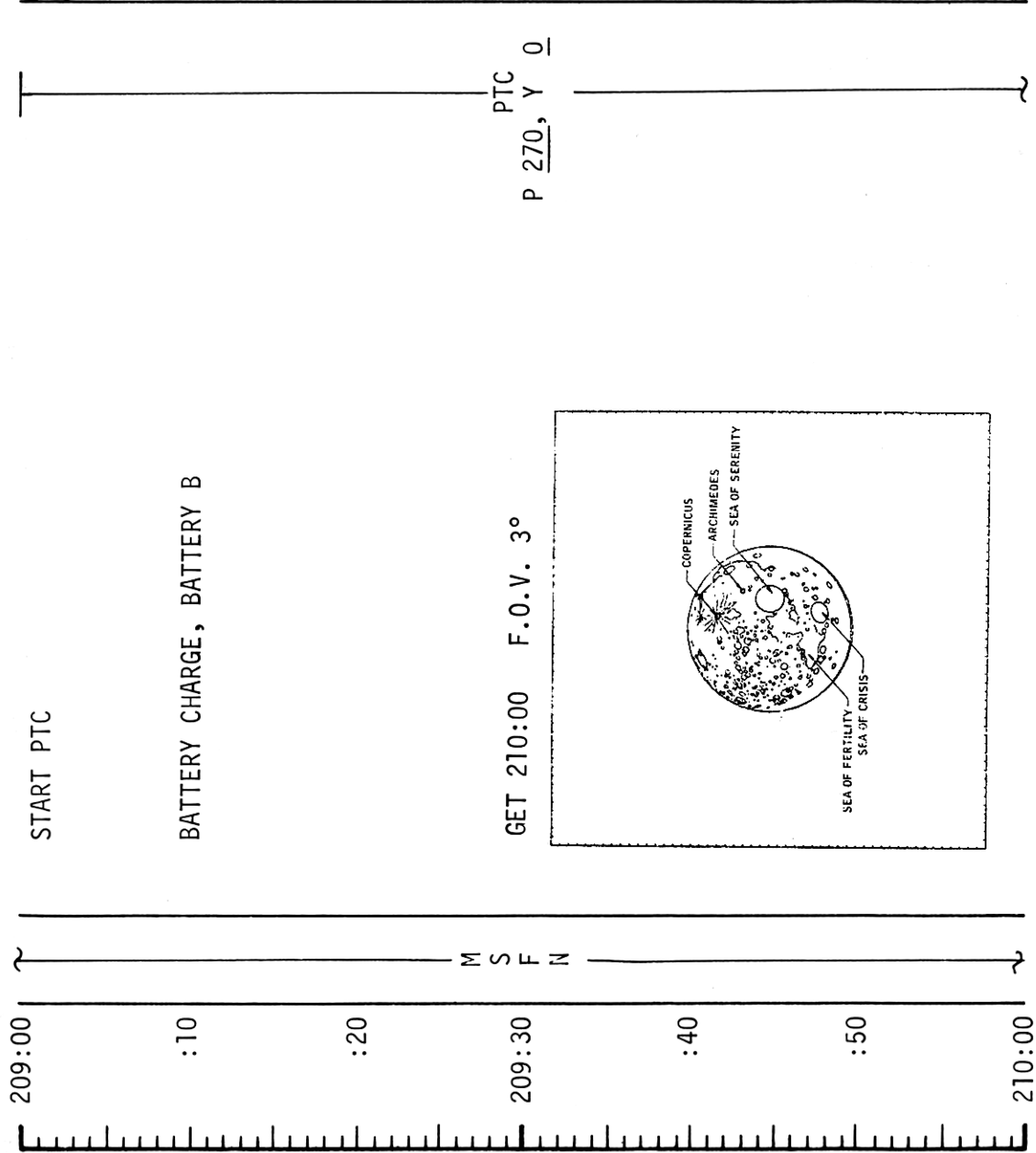
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	208:00 - 209:00	9/TEC	3-164

FLIGHT PLAN

NOTES

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

0613 CST

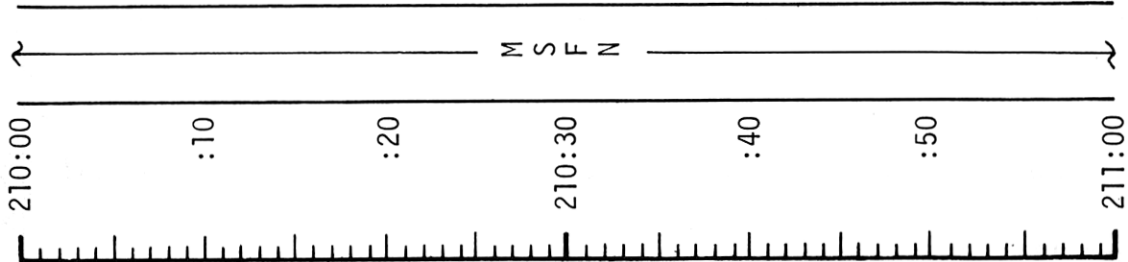


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	209:00 - 210:00	9/TEC	3-165

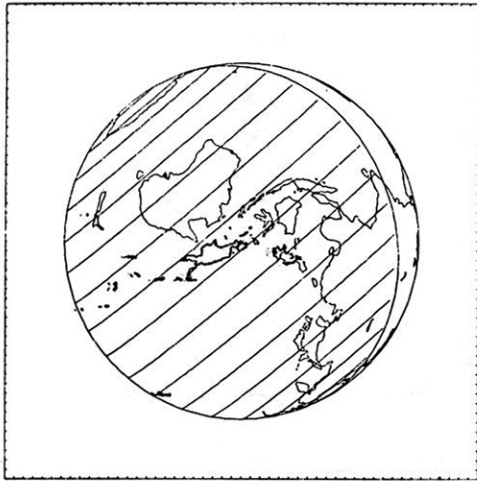
FLIGHT PLAN

NOTES

0713 CST



GET 210:00 F.O.V. 3°



PTC
P 270, Y 0

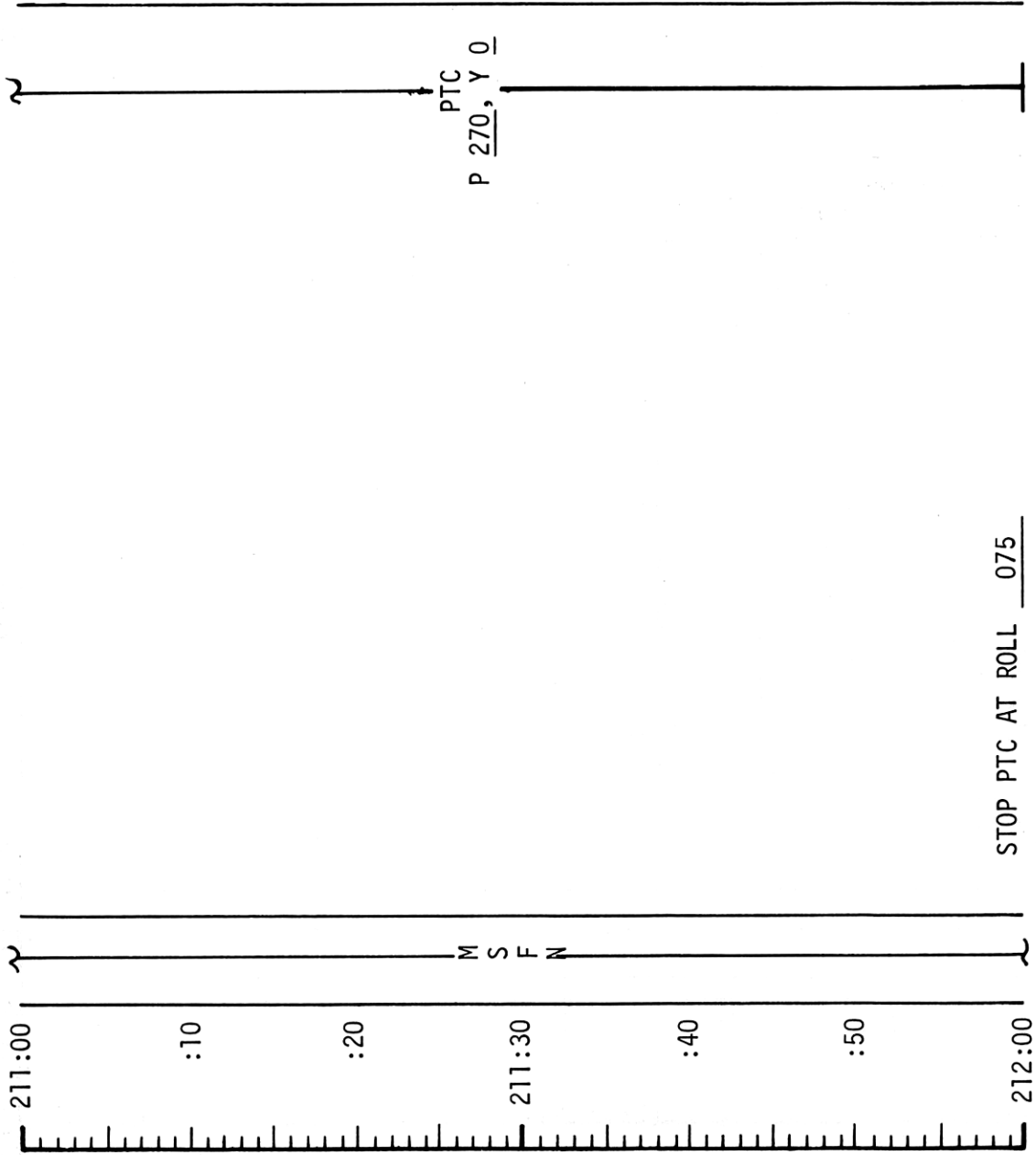
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	210:00 - 211:00	9/TEC	3-166

FLIGHT PLAN

MCC-H

0813 CST

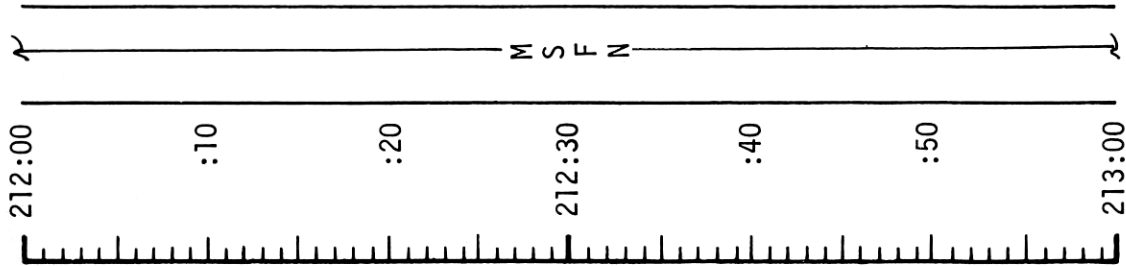
NOTES



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

FLIGHT PLAN

NOTES



MNVR TO OPTICS CALIBRATION ATT R 075
P23 - CISLUNAR NAVIGATION P 063
OPTICS CALIBRATION Y 0
STAR 4 4

P00
V49 - MNVR TO SIGHTING ATT R 090, P 105, Y 331
STAR/EARTH HORIZON
P23 - CISLUNAR NAVIGATION

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

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

3. STAR 45 EFH (R3 00120) FOMALHAUT

4. STAR 01 ENH (R3 00110) ALPHERATZ

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

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

*7. STAR 44 EFH (R3 00120) ENIF

*ALTERNATES

3 MARKS ON EACH STAR

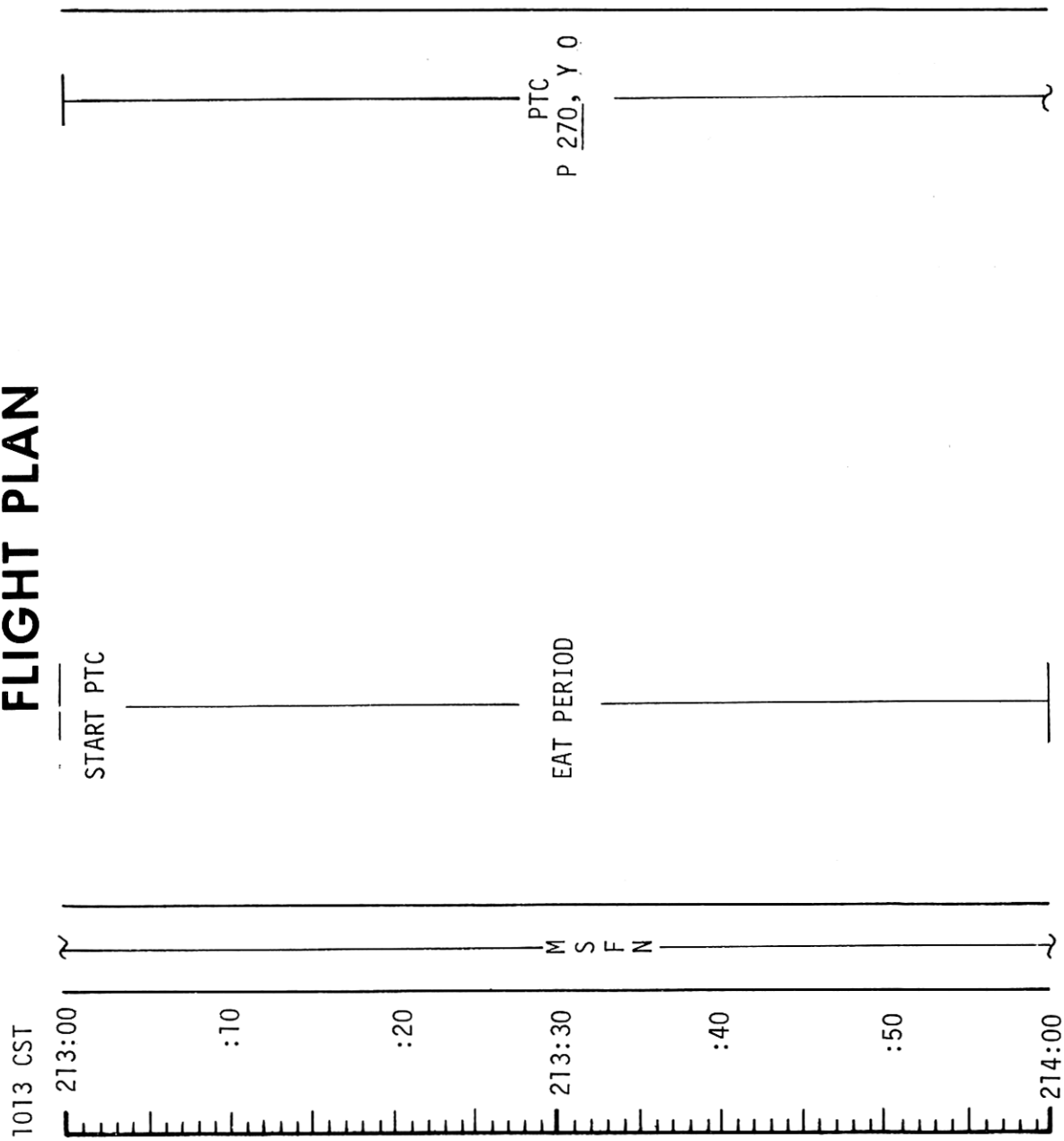
INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

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

FLIGHT PLAN

NOTES

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



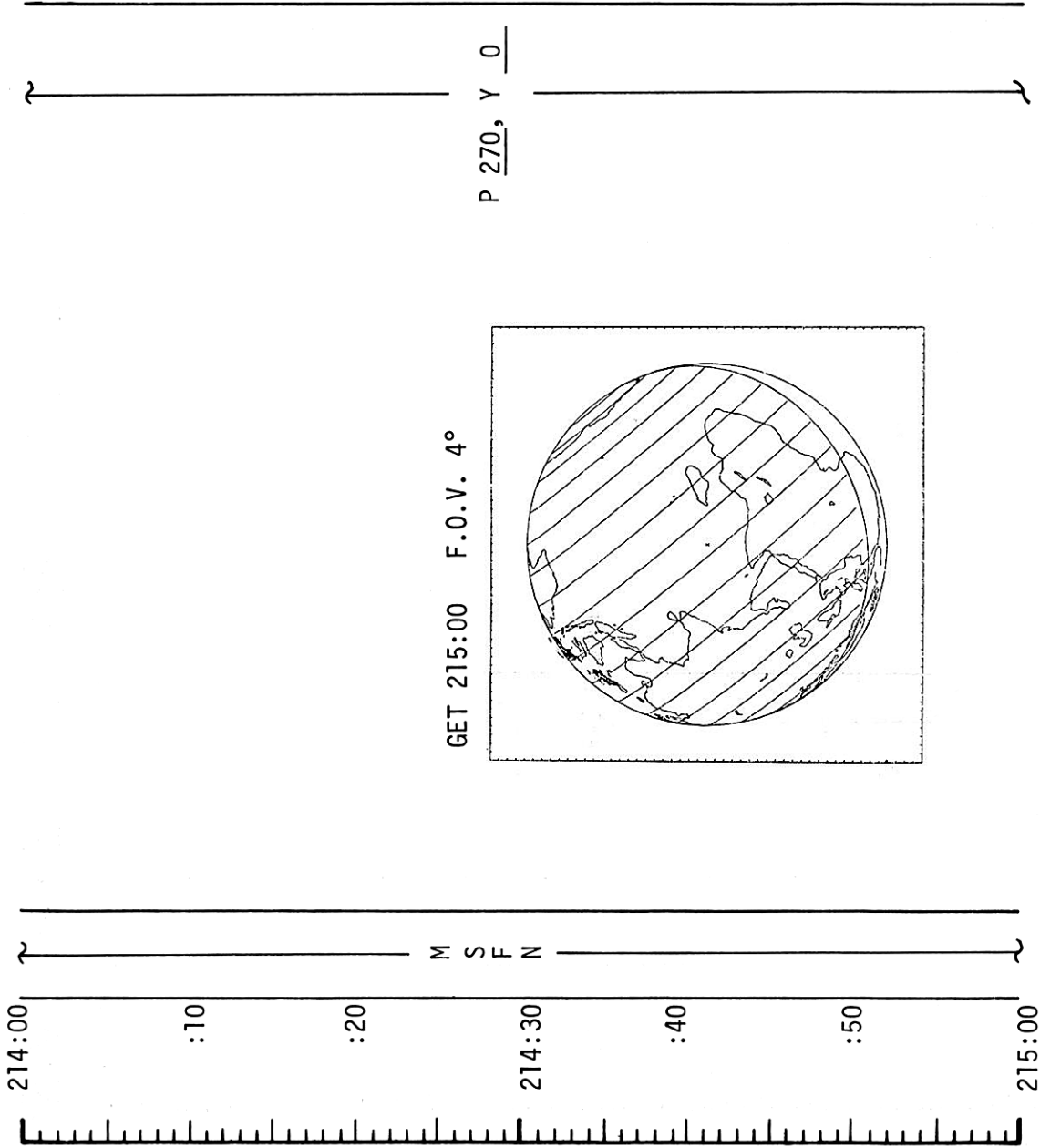
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	213:00 - 214:00	9/TEC	3-169

1113 CST

MCC-H

FLIGHT PLAN

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

NOTES

1213 CST

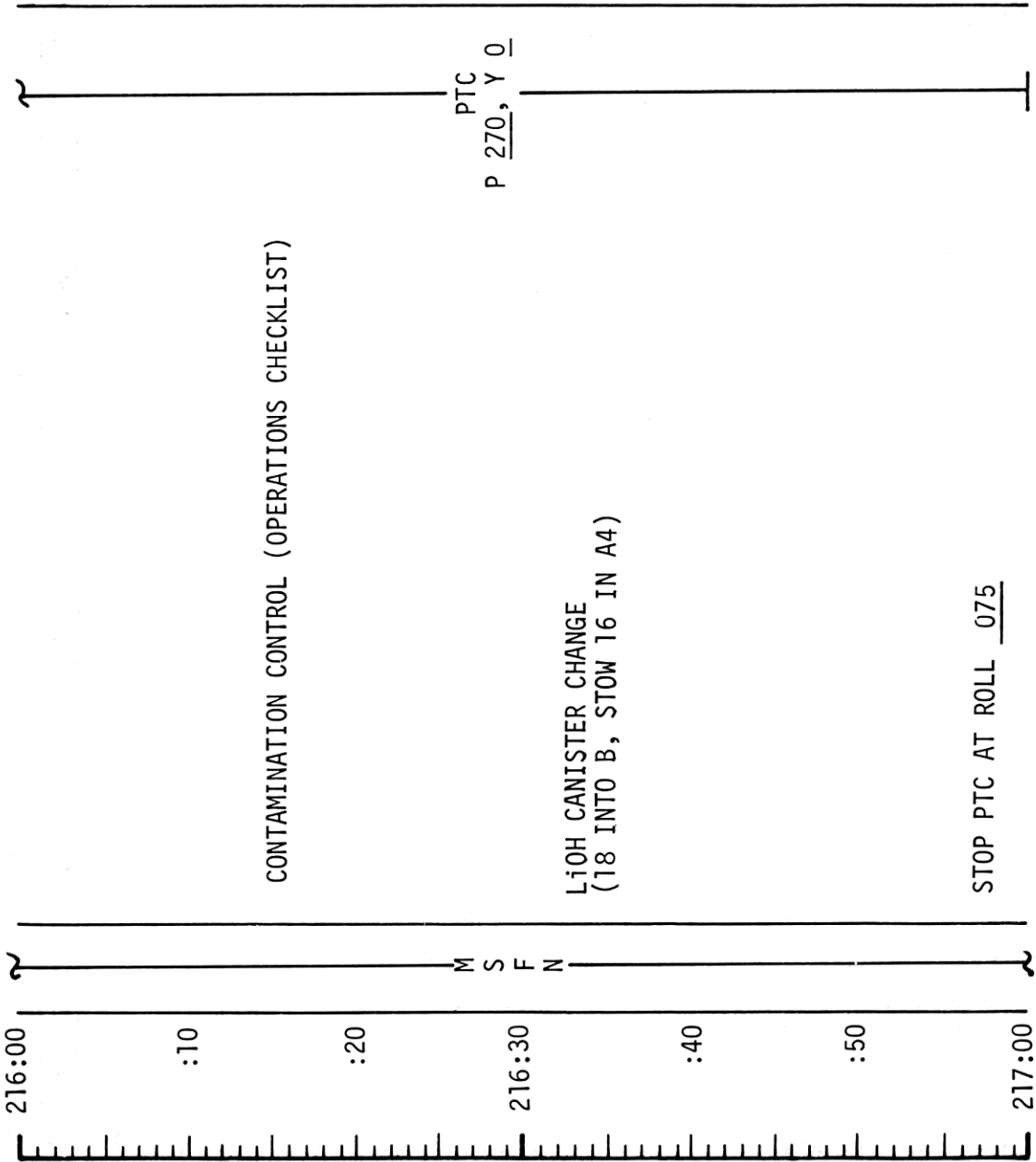


M S F N

PTC
P 270, Y 0

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

FLIGHT PLAN



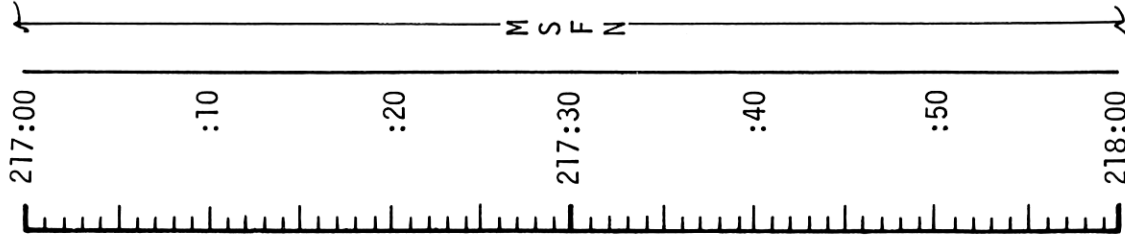
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	216:00 - 217:00	9/TEC	3-172

MCC-H

FLIGHT PLAN

NOTES

1413 CST



MNVR TO OPTICS CALIBRATION ATT
P23 - Cislunar Navigation
OPTICS CALIBRATION

R 075
P 063
Y 0

STAR 4 4

P00

V49 - MNVR TO SIGHTING ATT R 090, P 126, Y 332

STAR/EARTH HORIZON

P23 - Cislunar Navigation

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

2. STAR 45 EFH (R3 00120) FOMALHAUT

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

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

5. STAR 44 EFH (R3 00120) ENIF

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

*ALTERNATE

3 MARKS ON EACH STAR

INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

UPDATE TO CSM
MCC-6 PAD DATA
ENTRY PAD (ASSUMES
MCC-6)

UPLINK TO CSM
CSM S.V. & V47E
MCC-6 TGT LOAD

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

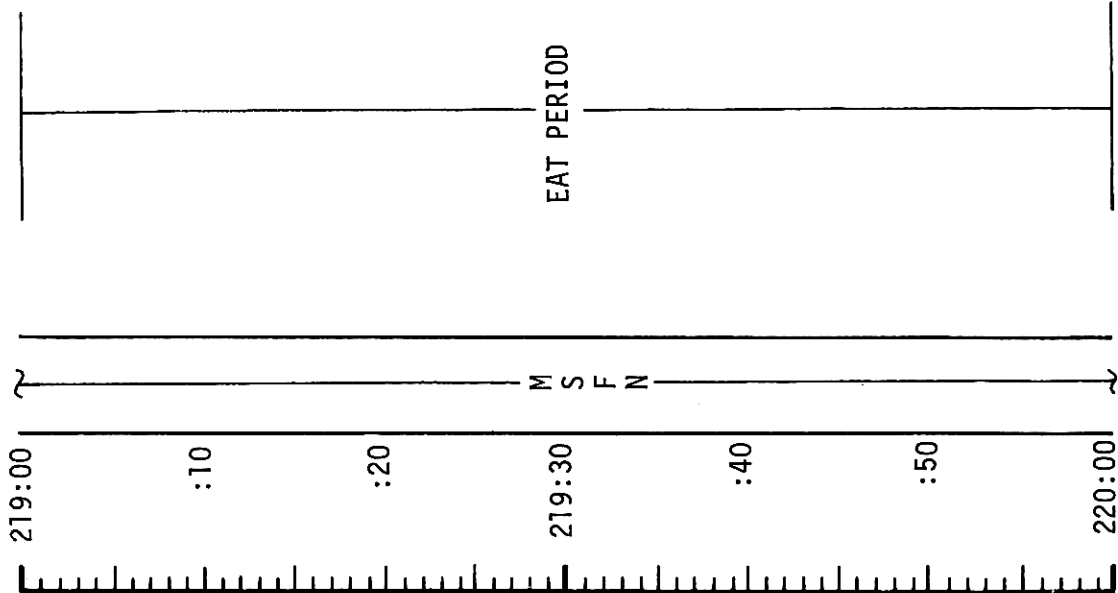
TABLE 3-13
3-173A

1613 CST

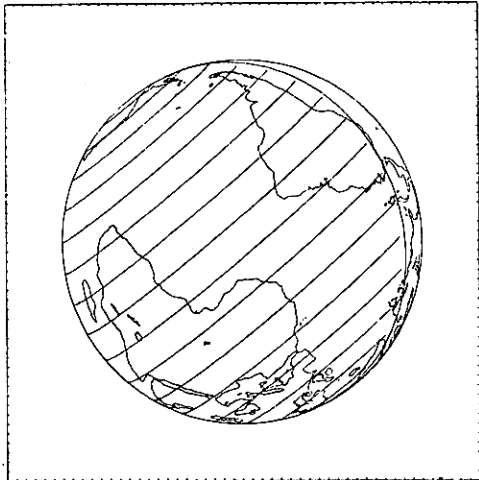
MCC-H

FLIGHT PLAN

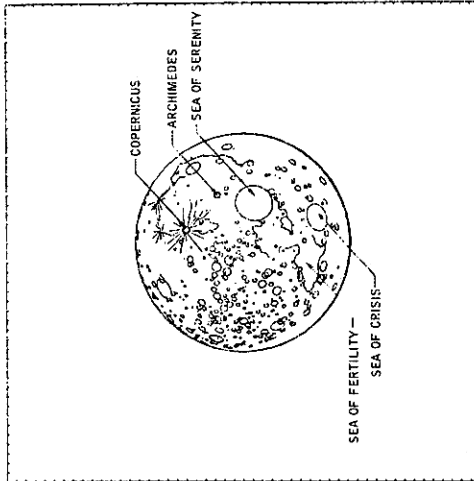
NOTES



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

1713 CST

FLIGHT PLAN

NOTES



MNVR TO OPTICS CALIBRATION ATT R 075
P23 - CISELUNAR NAVIGATION P 063
OPTICS CALIBRATION Y 0

STAR 4 4

P00

V49 - MNVR TO SIGHTING ATT R 090, P 133, Y 333

STAR/EARTH HORIZON

P23 - CISELUNAR NAVIGATION

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

2. STAR 45 EFH (R3 00110) FOMALHAUT

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

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

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

*6. STAR 44 EFH (R3 00120) ENIF

*ALTERNATE

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

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

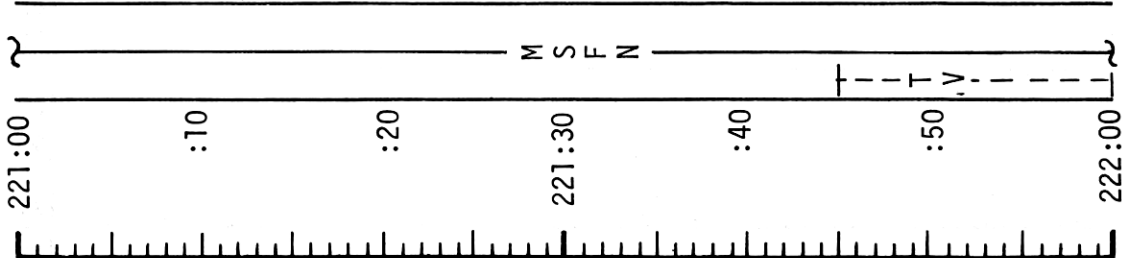
FLIGHT PLAN

1813 CST

MCC-H

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)

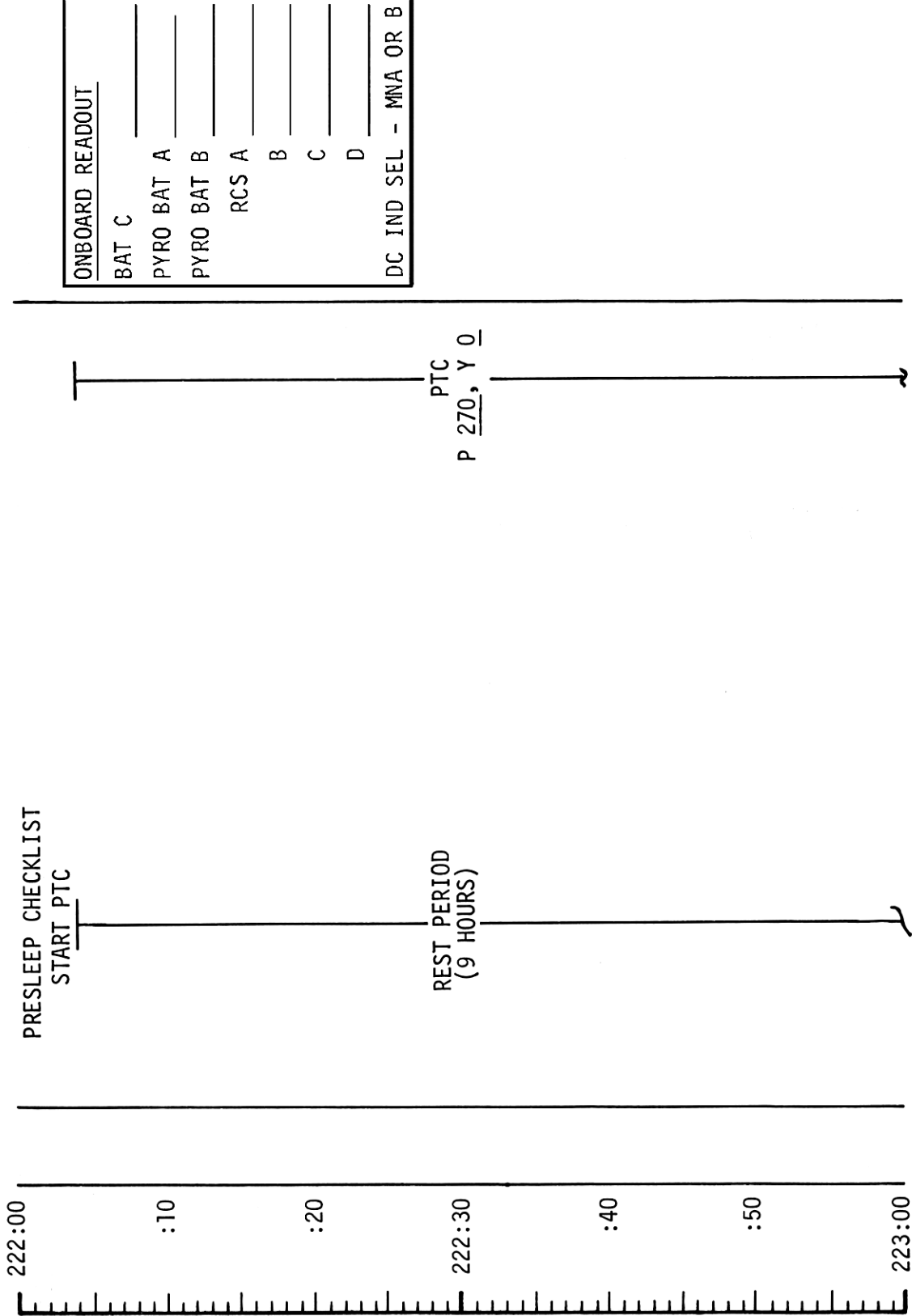
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	221:00 - 222:00	9/TEC	3-177

MCC-H

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

FLIGHT PLAN

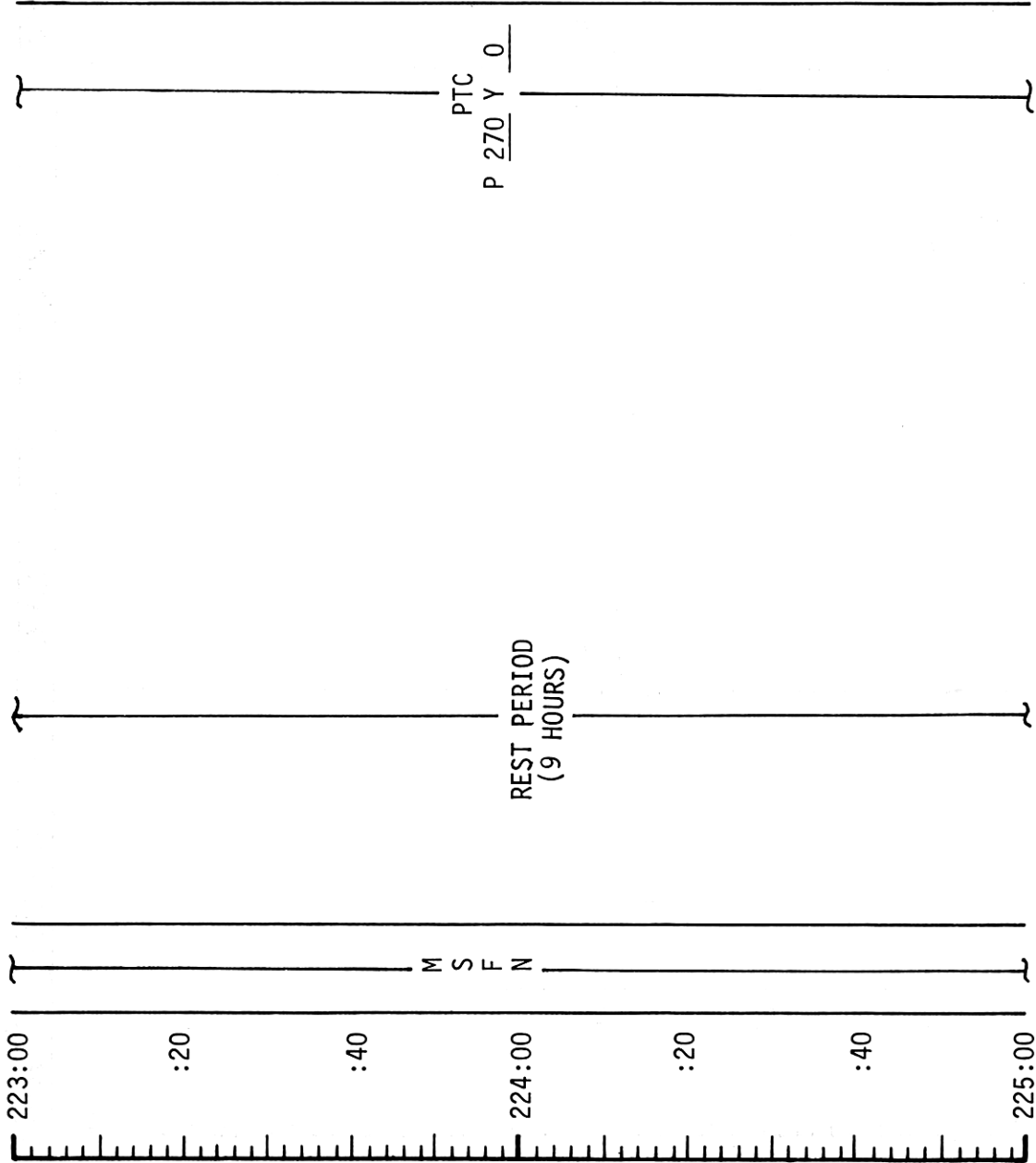
NOTES



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

FLIGHT PLAN

NOTES



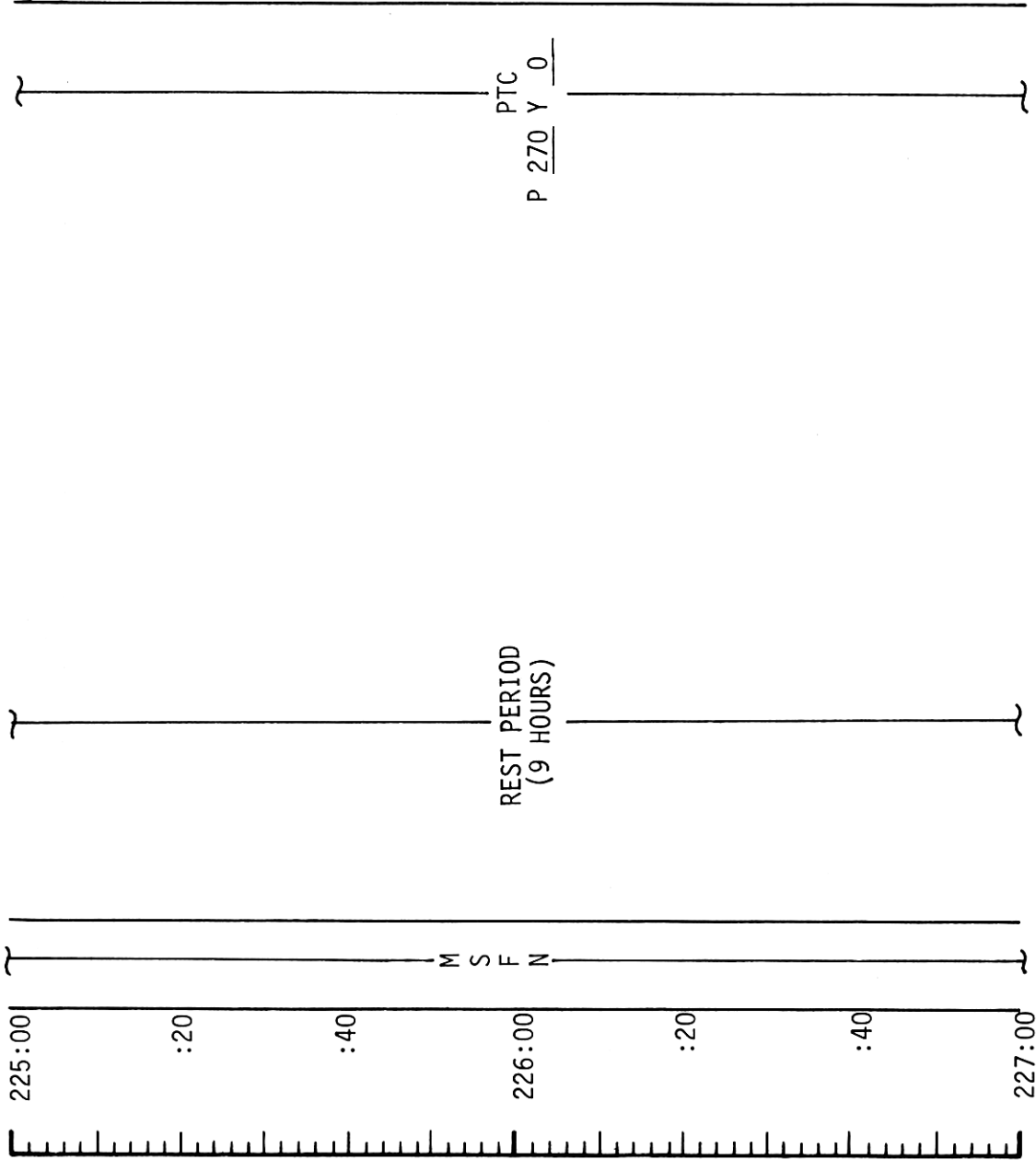
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	223:00 - 225:00	9/TEC	3-179

MCC-H

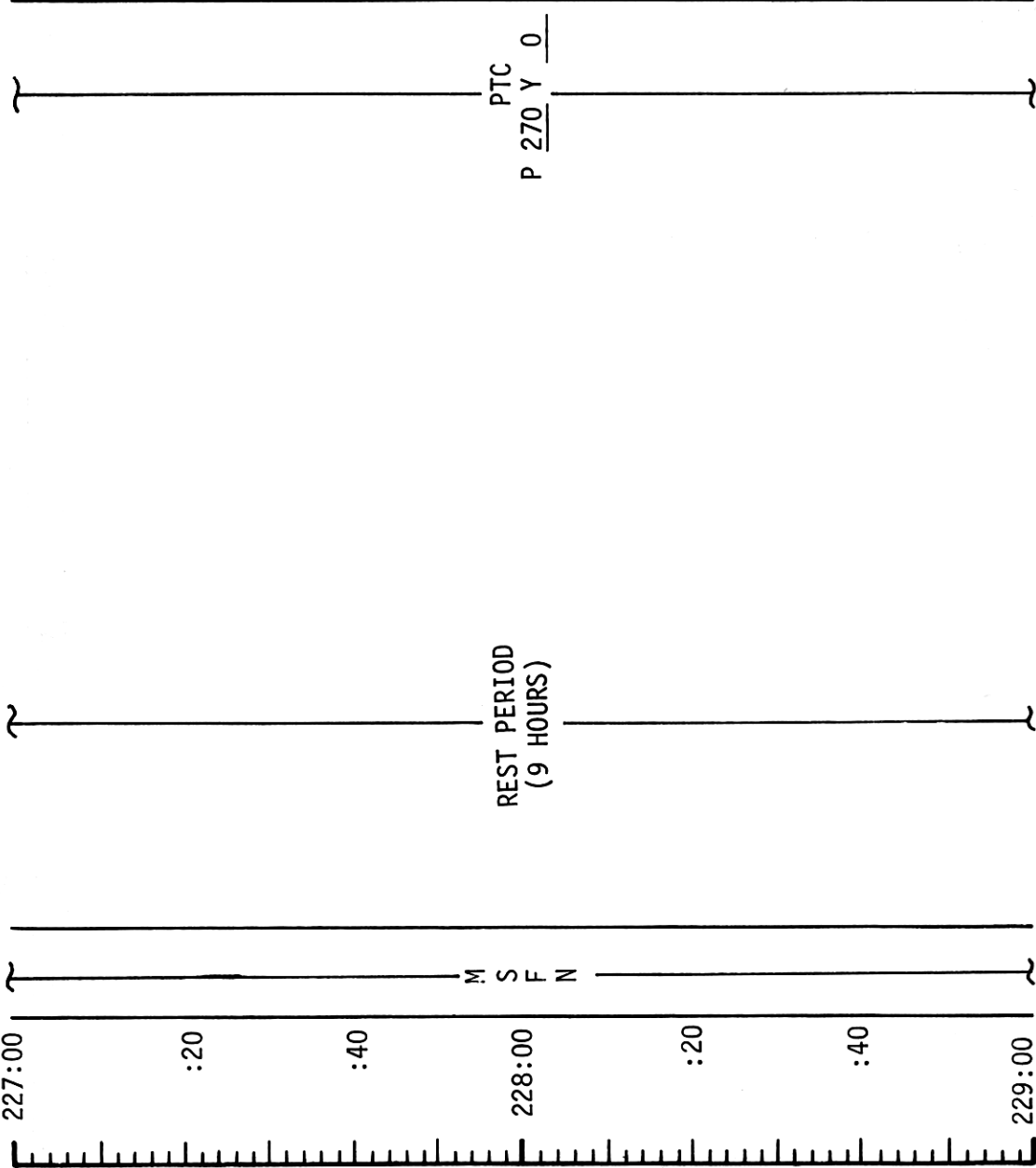
2213 CST

FLIGHT PLAN

NOTES



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



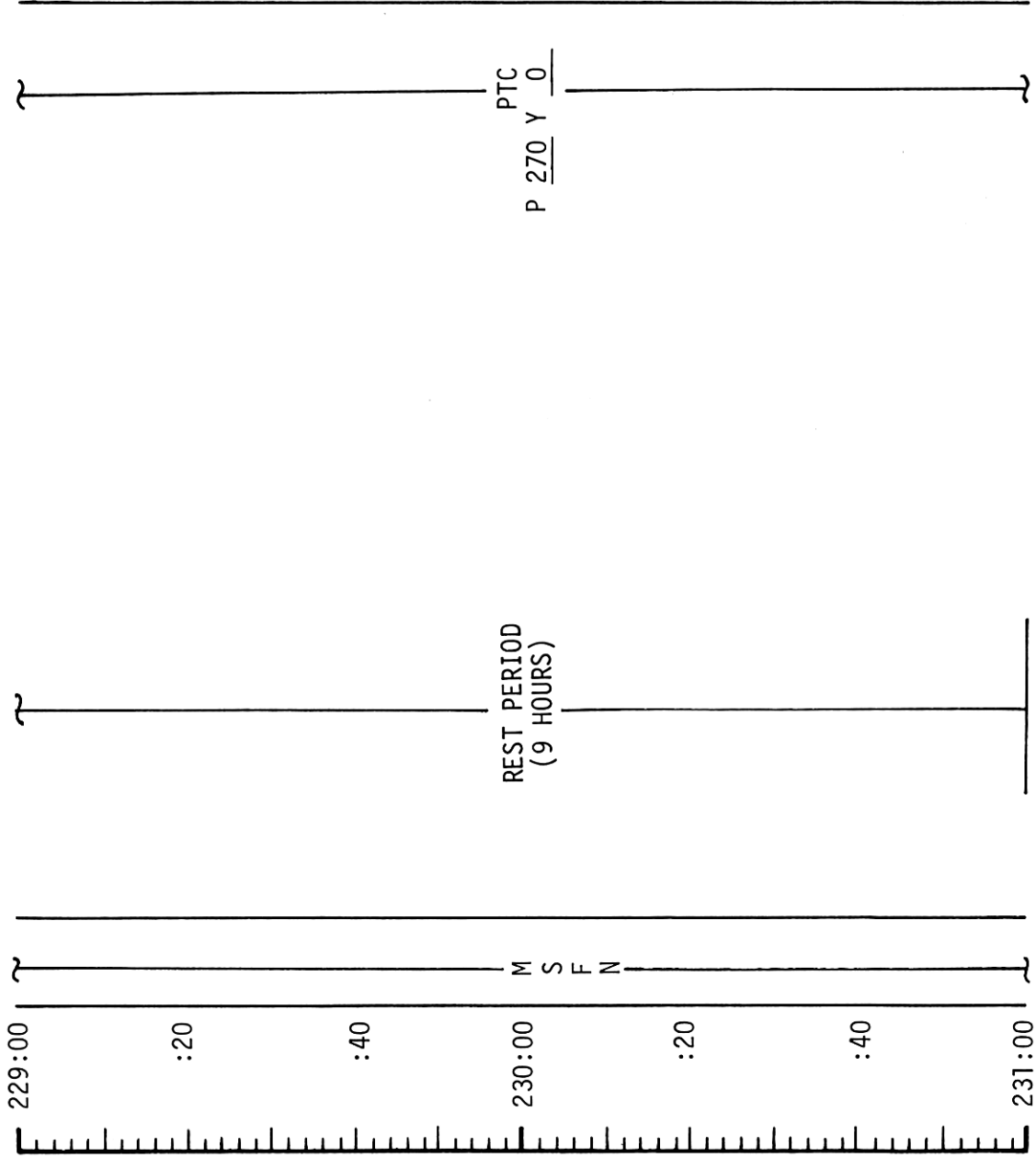
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	227:00 - 229:00	9/TEC	3-181

0213 CST

MCC-H

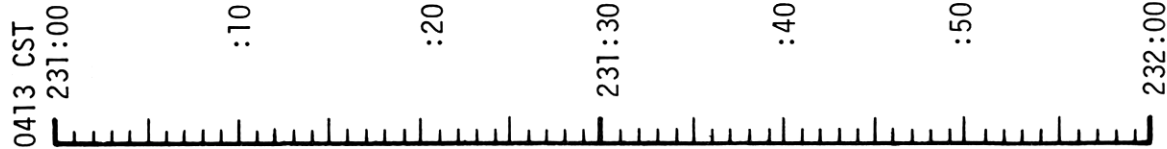
FLIGHT PLAN

NOTES



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

FLIGHT PLAN



POST SLEEP CHECKLIST

EAT PERIOD

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

STOP PTC AT ROLL 075

NOTES

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

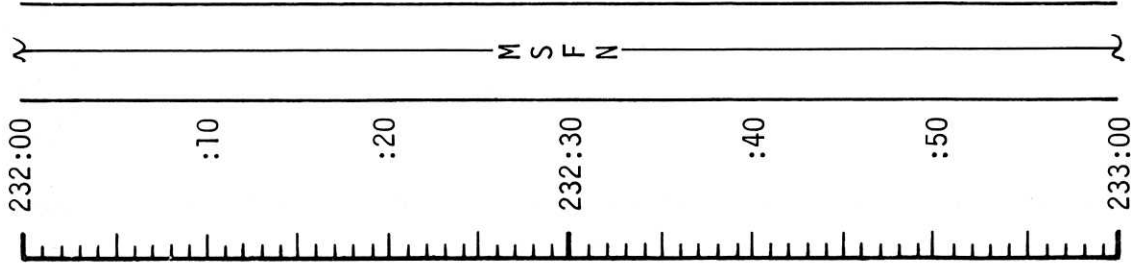
PTC
P 270 Y 0

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

0513 CST

FLIGHT PLAN

NOTES



MNVR TO OPTICS CALIBRATION ATT R 075
P23 - Cislunar Navigation P 063
OPTICS CALIBRATION Y 0
STAR 4 4
P00
V49 - MNVR TO SIGHTING ATT R 090, P 150, Y 342
STAR/EARTH HORIZON
P23 - Cislunar Navigation
1. STAR 227 ENH (R3 00110) BETA PERSEI
N88: (R1 +26012)(R2 +27461)(R3 +32698)
2. STAR 44 EFH (R3 00120) ENIF
3. STAR 224 EFH (R3 00120) MARKAF
N88: (R1 +46814)(R2 -11832)(R3 +12977)
4. VENUS ENH (R3 00110) VENUS
5. STAR 103 ENH (R3 00110) ALMACH
N88: (R1 +31917)(R2 +18810)(R3 +33577)
*6. STAR 223 EFH (R3 00120) BETA PEGASI
N88: (R1 +42788)(R2 -11002)(R3 +23411)
*ALTERNATE

3 MARKS ON EACH STAR

INCORPORATE P23
MARK DATA AND
UPDATE ONBOARD
STATE VECTOR

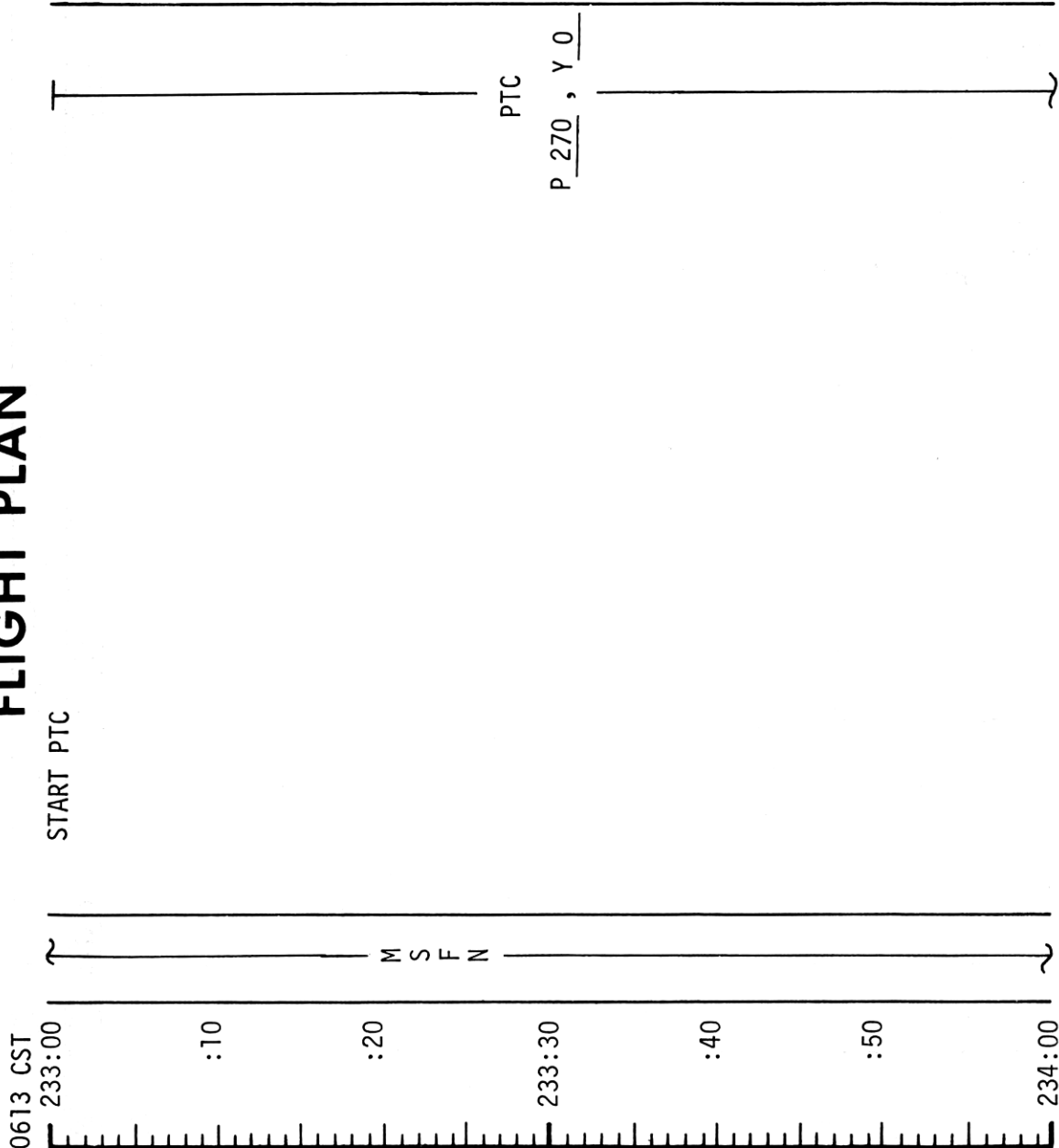
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	232:00 - 233:00	10/TEC	3-184

MCC-H

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

FLIGHT PLAN

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

0713 CST

FLIGHT PLAN

NOTES



PTC
P 270, Y 0

ENTRY CHECKLIST

GO/NO-GO FOR MCC-7
REPORT CM RCS INJECTOR VALVE TEMPS
(SYS TEST METER 5C, D, 6A, B, C, D)

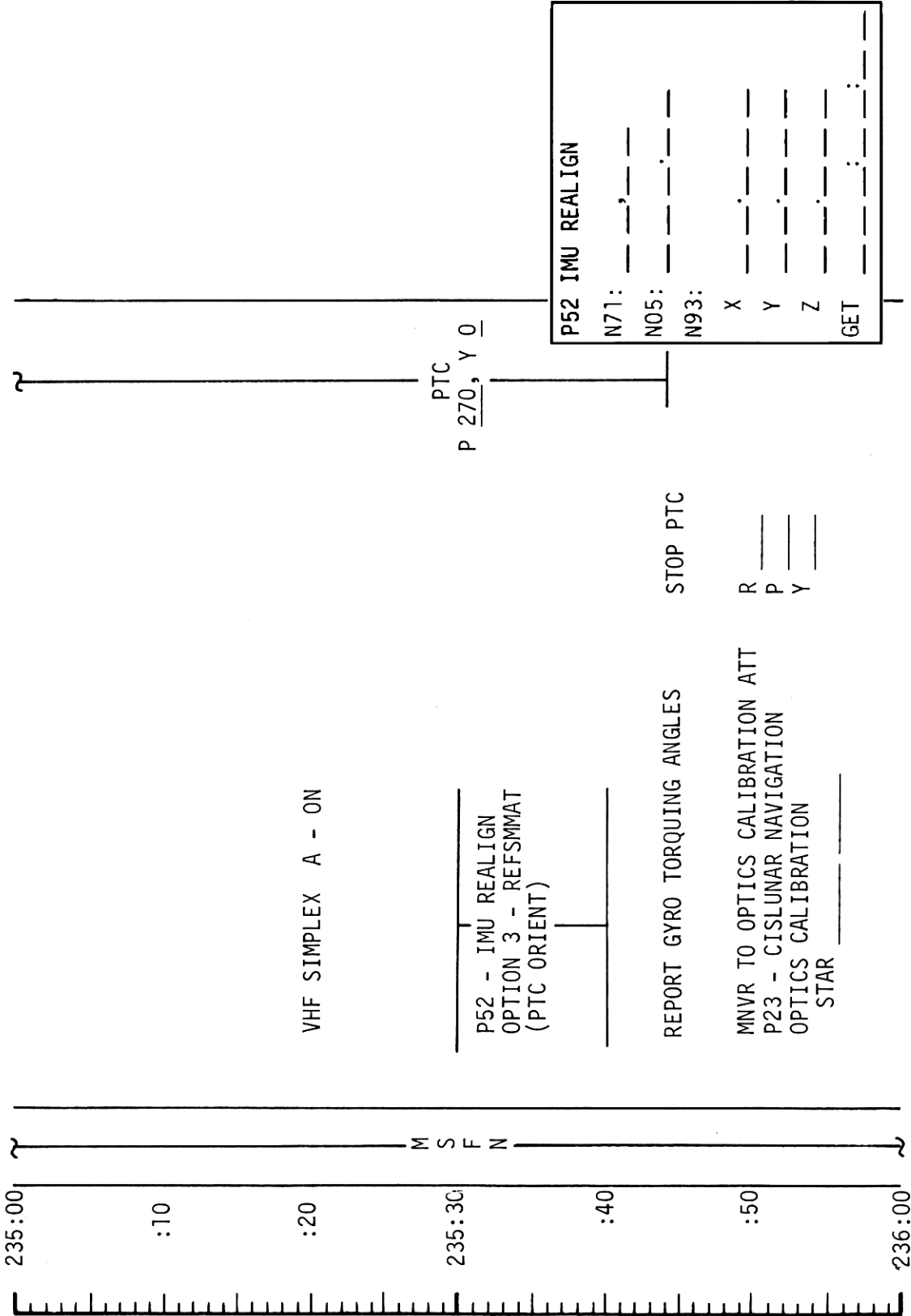
(EI-6 HRS)
GO/NO-GO

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

NOTES



(EI-5HRS)

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO	FINAL (APRIL)	MARCH 16, 1970	235:00 - 236:00	10/TEC	3-187

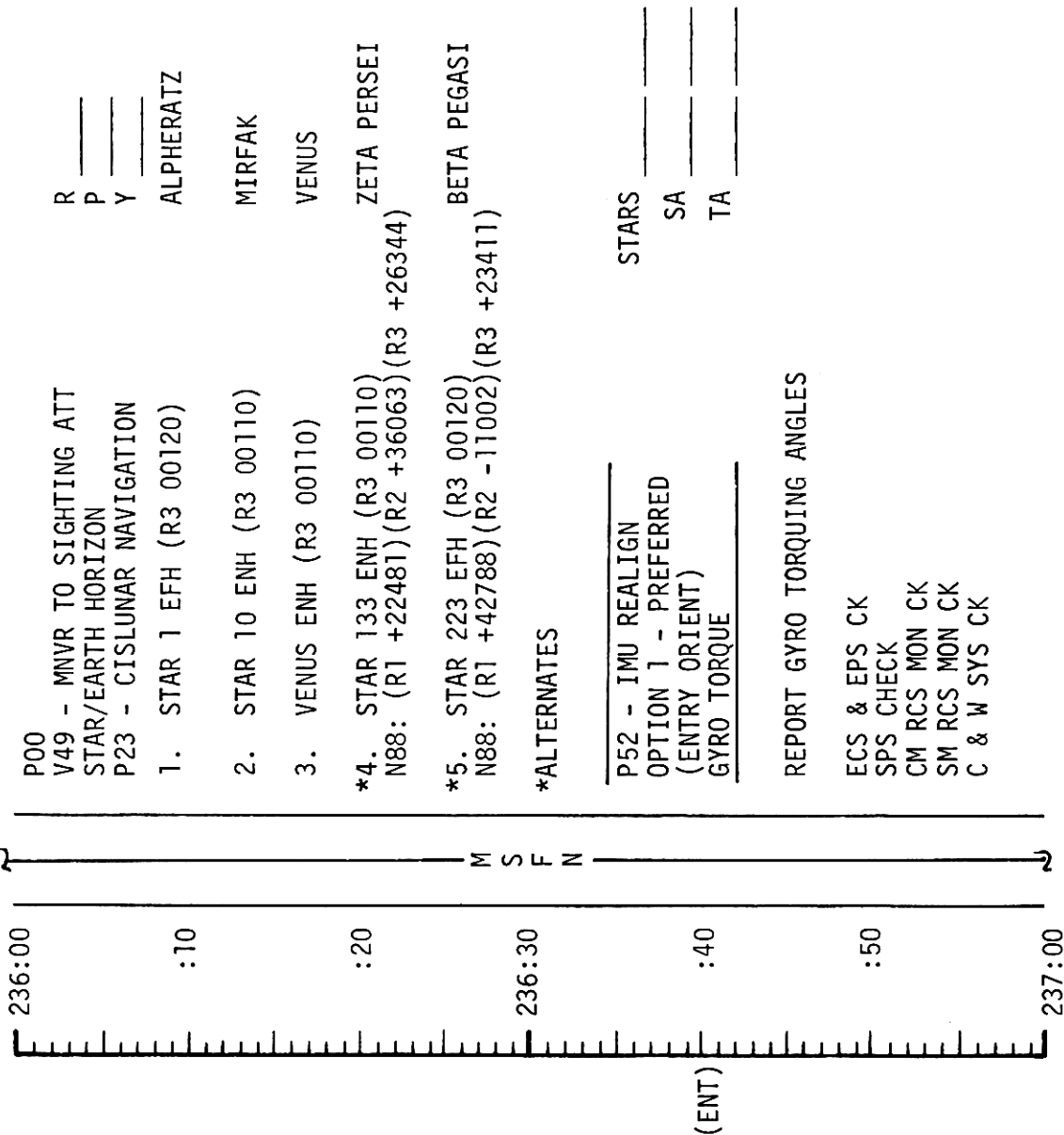
0913 CST

MCC-H

FLIGHT PLAN

NOTES

PERFORM P23
IF TIME PERMITS



UPDATE TO CSM
MCC-7 MNVR PAD
ENTRY PAD
UPLINK TO CSM
CSM S.V. & V66
MCC-7 TGT LOAD
DESIRED ORIENT
ENT LAT & LONG

(EI-4 HRS)

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

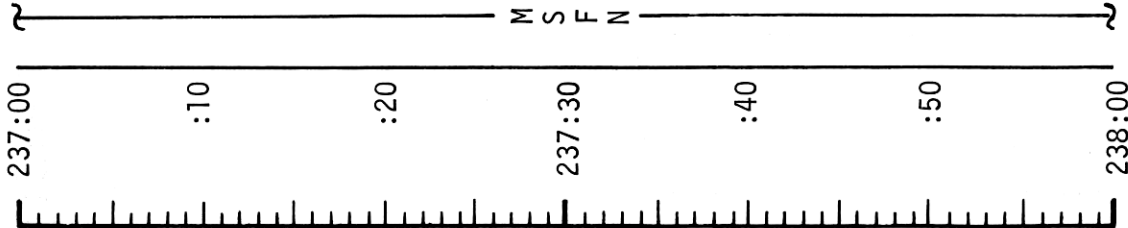
TABLE 3-14
3-188A

MCC-H

FLIGHT PLAN

NOTES

1013 CST



P30 - EXTERNAL ΔV
V49 - MNVR TO BURN ATT
P40/41-SPS/RCS THRUST
SXT STAR CHECK

GDC ALIGN

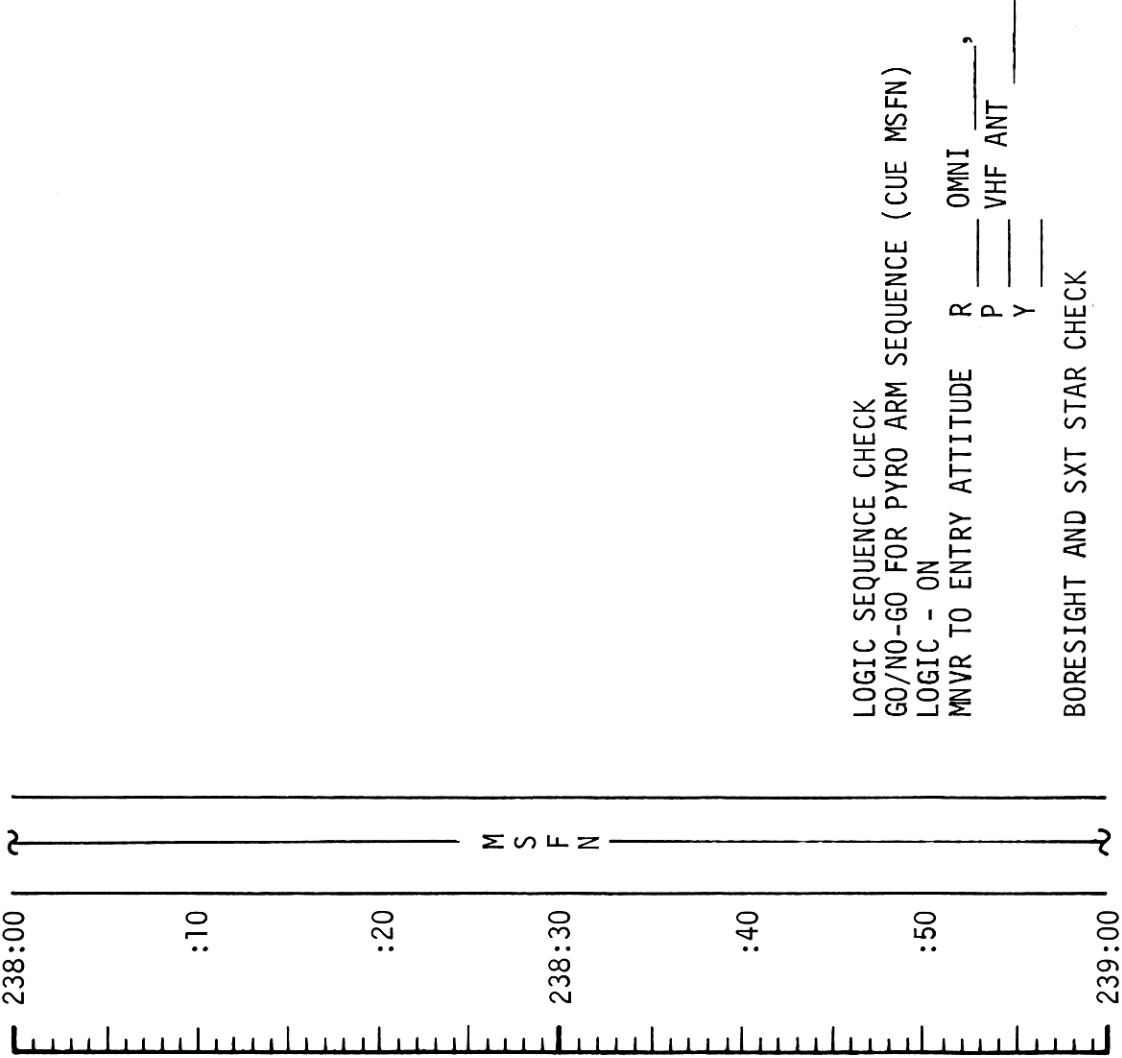
TIG: 237:49:37.6
BT: NOM. ZERO
ΔVR: NOM. ZERO
ULLAGE: N/A
ORBIT: N/A

MCC-7 BURN STATUS REPORT
V66 - TRANS CSM SV TO LM SLOT

BURN STATUS REPORT									
X	X								ΔTIG
X	X								BT
									V
									gx
X	X	X							R
X	X	X							P
X	X	X							Y
									V
									gx
									V
									gy
									V
									gz
									ΔV _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	237:00 - 238:00	10/TEC	3-189



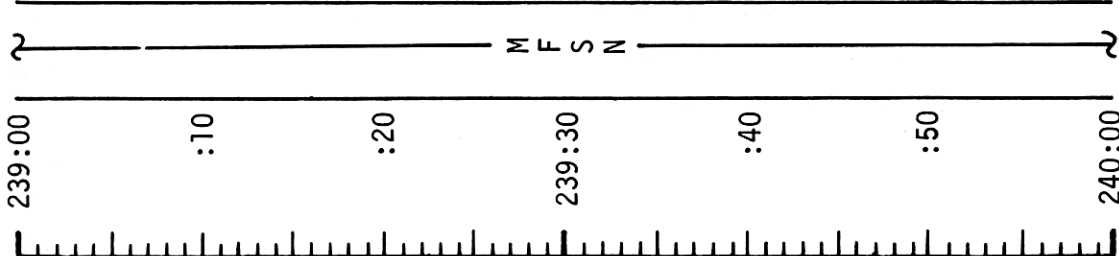
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	238:00 - 239:00	10/TEC	3-190

FLIGHT PLAN

MCC-H

1213 CST

NOTES



P52 - IMU REALIGN
OPTION 3 - REFMMAT
(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

TERMINATE CM RCS PREHEAT

P52 IMU REALIGN

N71: ---

N05: ---

N93: ---

X ---

Y ---

Z ---

GET ---

(EI - 1 HR)

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	239:00 - 240:00	10/TEC	3-191

FLIGHT PLAN

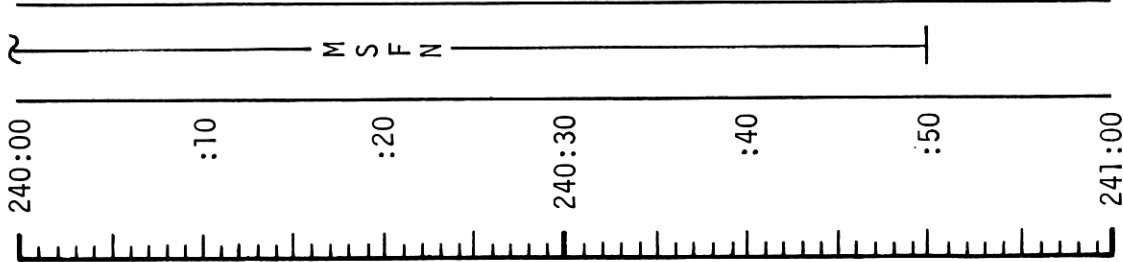
MCC-H

1313 CST

NOTES

UPDATE TO CSM
ENTRY PAD
RECOVERY PAD
UPLINK TO CSM
CSM S.V. & V66

GO/NO-GO FOR PYRO
ARM
(EI - 30)



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

MNVR TO ENTRY ATT R
P
Y

P63 - ENTRY INITIATE

EI - GET = 240:49:37.6

P64 - ENTRY POST 0.05G

TRAJECTORY EVENTS
400,000 FEET (GET 240:49:37.6)
ENTER S BAND BLACKOUT
0.05G
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

Y = - 6 . 5 0
L/D = . 3 2 4 0 7
V = 3 3 6 1 2 9
R = 1 2 2 5 0

TIME FROM 400K ft
MIN:SEC

00:00
00:18
00:28
00:52
01:18
01:22
02:06
02:10
03:36
07:04
08:06
08:56
13:48

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

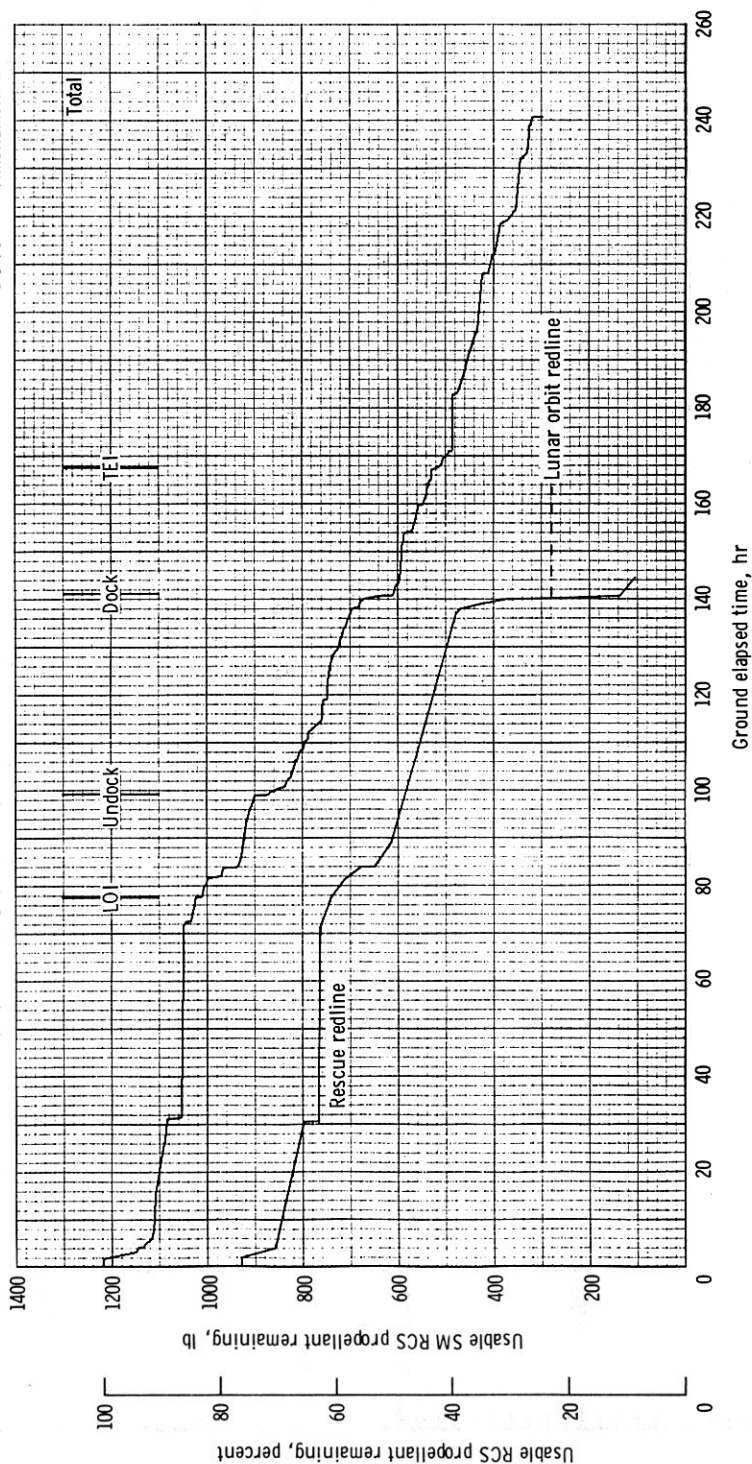
TABLE 4-1
4-2

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

CSM 11-1E. - Total SM RCS propellant usage profile. (April 11 launch date)

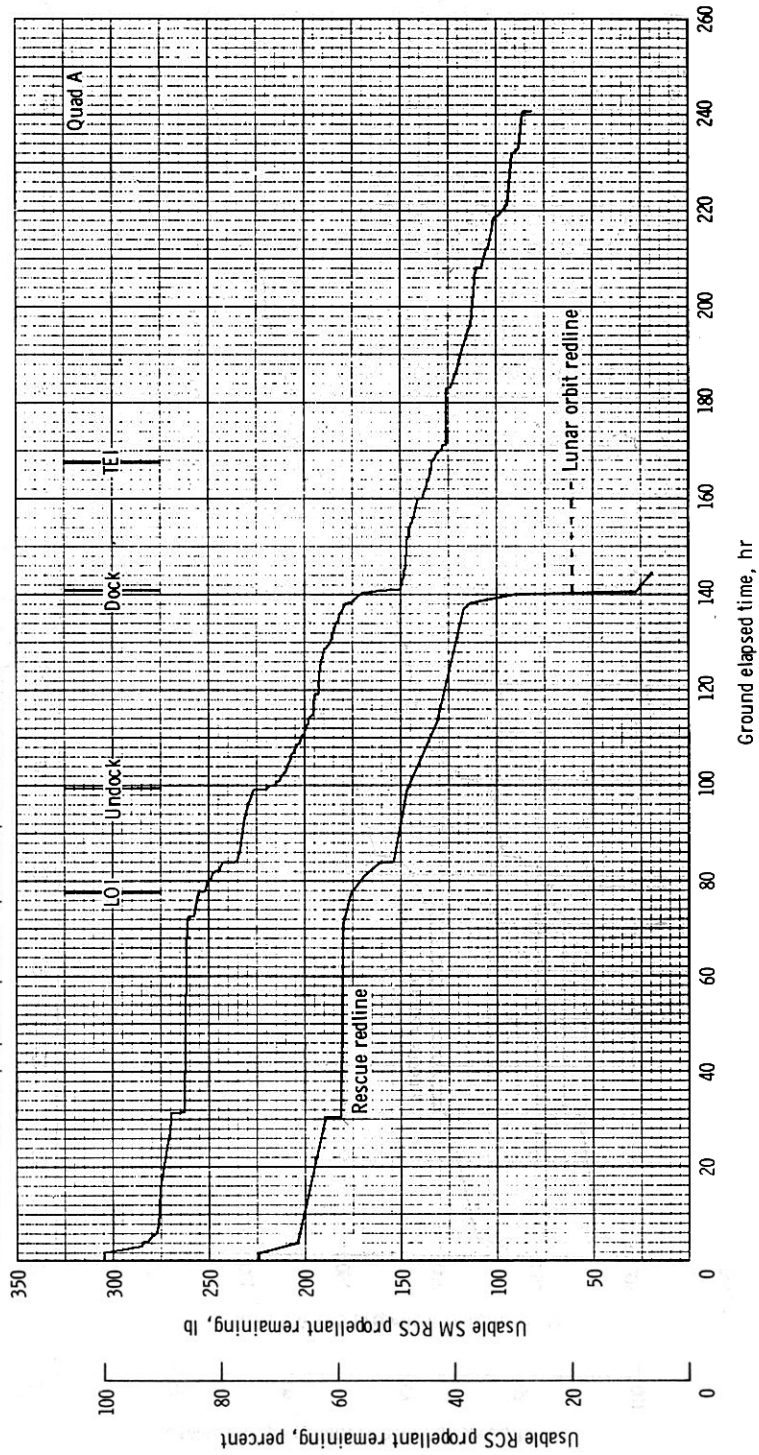


Total SM RCS propellant usage profile.

TABLE 4-3

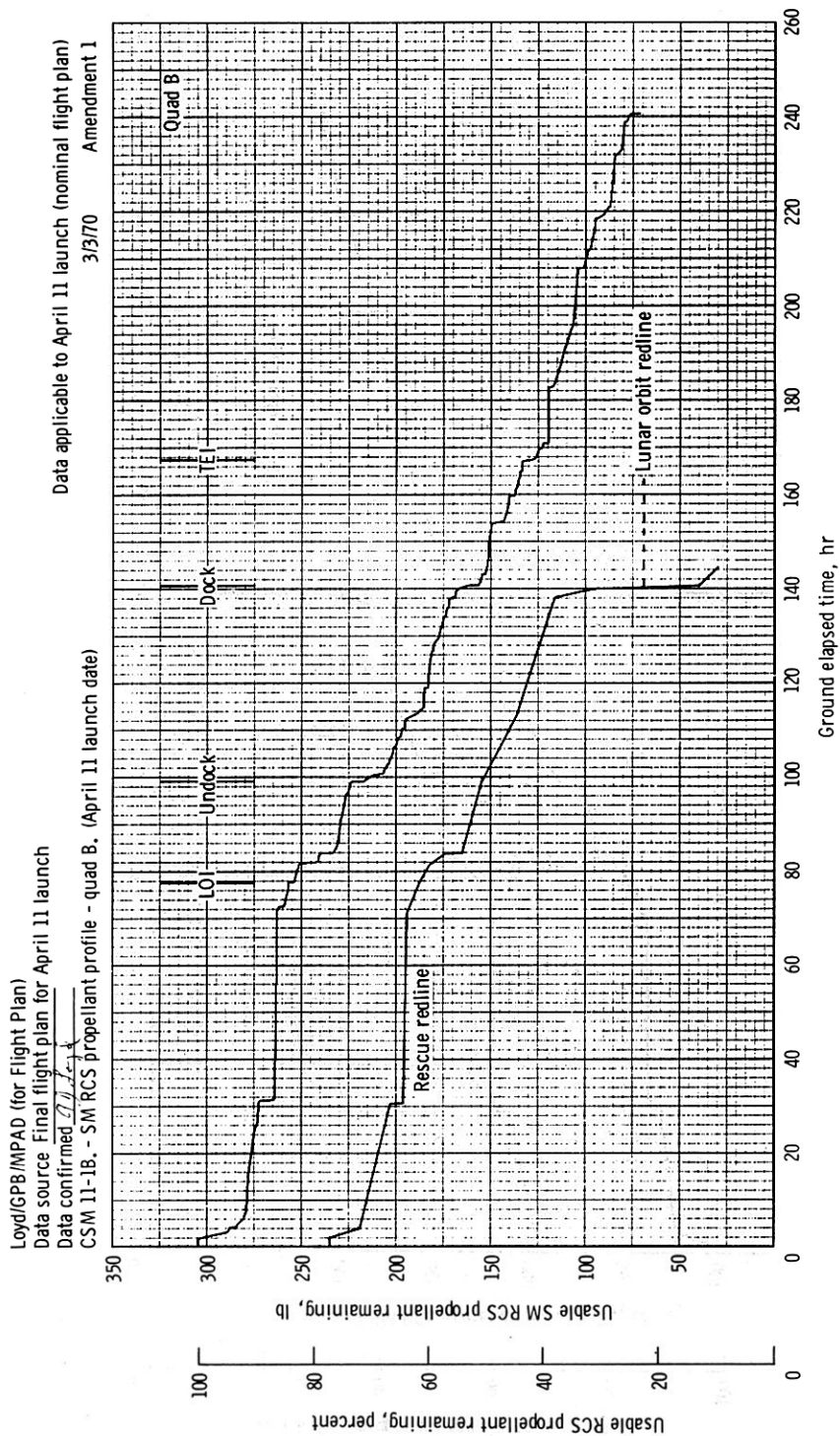
Loyd/GPB/MPAD (for Flight Plan)
 Data source Final flight plan for April 11 launch
 Data confirmed 4.1 4.2
 CSM 11-1A, - SM RCS propellant profile - quad A (April 11 launch date)

Data applicable to April 11 launch (nominal flight plan)
 3/3/70 Amendment 1

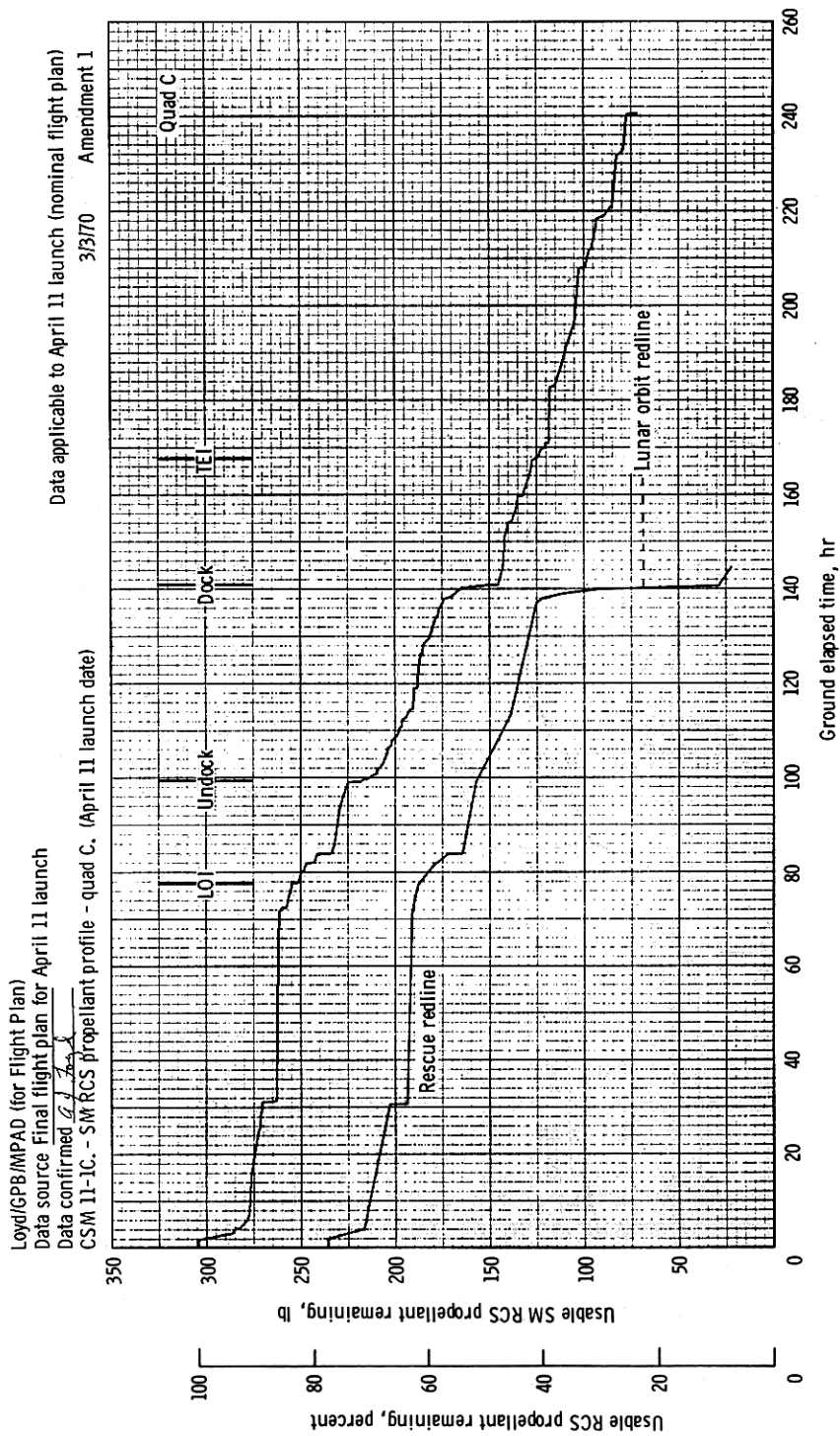


SM RCS propellant profile - quad A.

TABLE 4-4

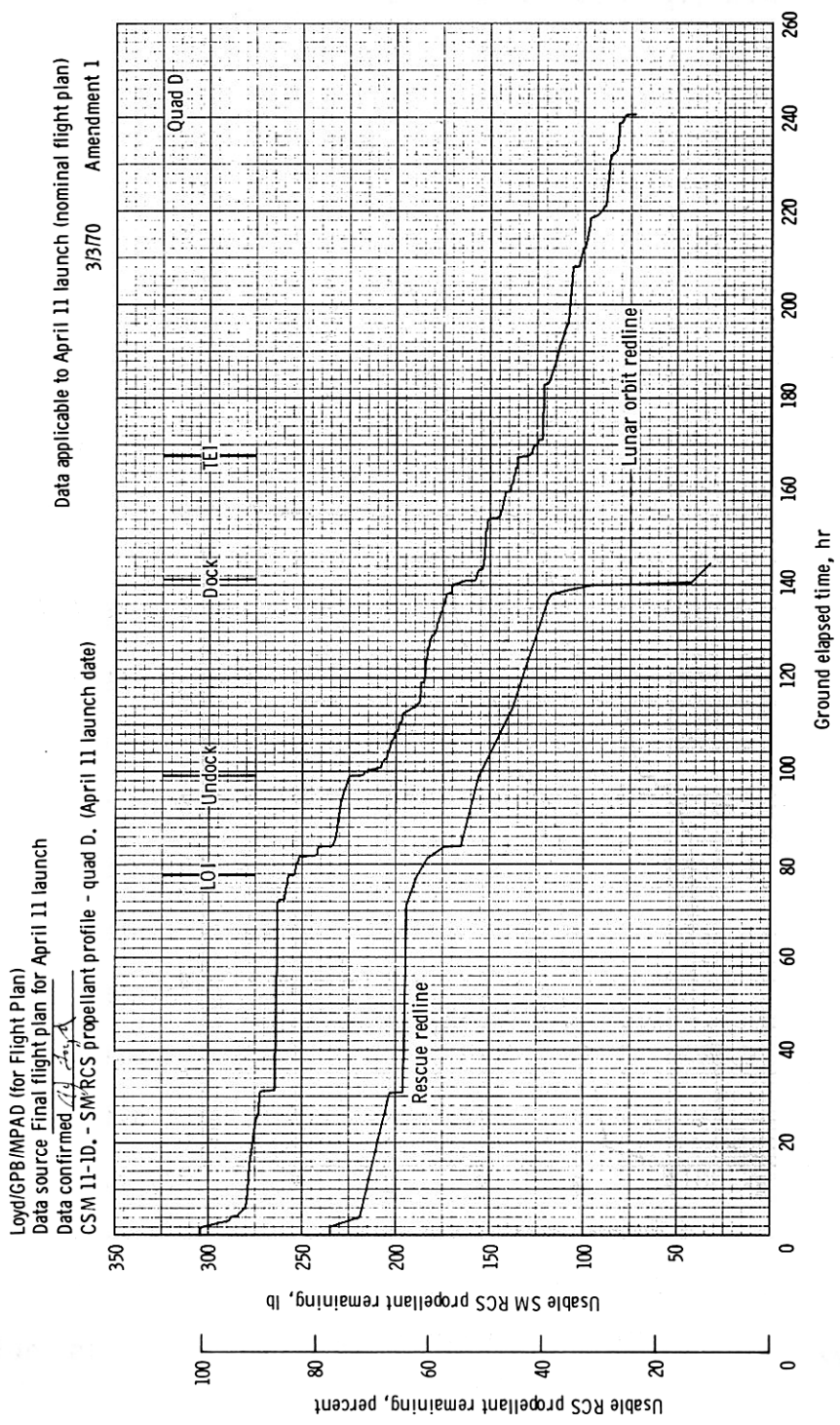


SM RCS propellant profile - quad B.
 TABLE 4-5



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 ASP0.

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.

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.

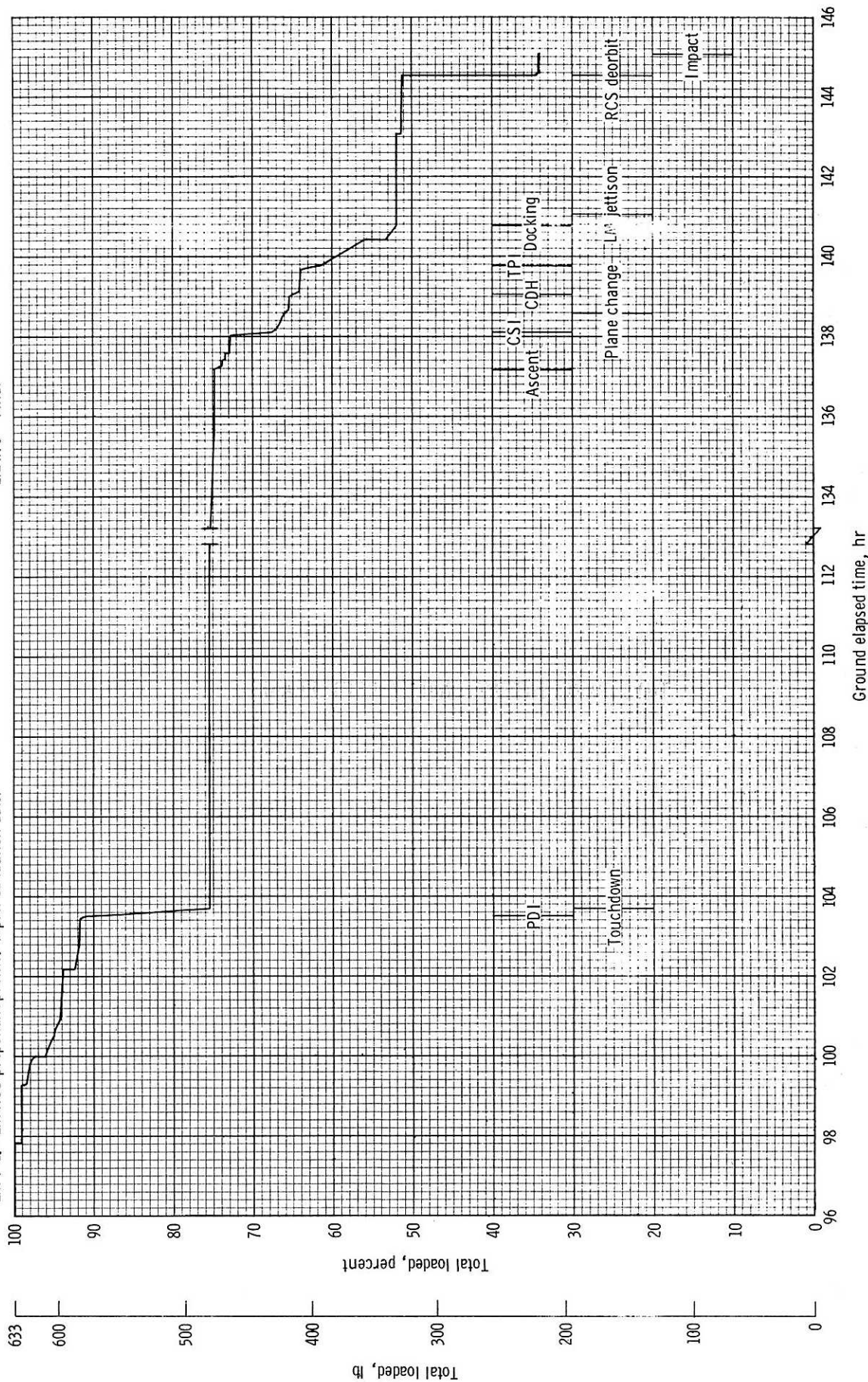
LM RCS Propellant Loading and Usage Summary

	Propellant required, lb	Propellant remaining, lb
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/GPB/MPAD (for LM Systems)
 Data source Final flight plan for April 11 launch
 Data confirmed *2/24/70*
 LM 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 = $1.6000 \pm .0225$
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, lb	Propellant remaining, lb
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).

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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. $I_{sp} = 309.37 \pm 4.11$ seconds
2. Mixture ratio = $1.609 \pm .029$
3. Nominal delta V - 6044.4 ± 30.7 fps
4. Ascent stage liftoff weight = 10679.7 lbs

APS PROPELLANT SUMMARY

Item	Propellant required, lb	Propellant remaining, lb
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 H_2 and O_2 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) = $0.00257 \times I_{fc}$.
8. The EPS oxygen consumption rate (lb/hr) = $7.936 \times \dot{H}_2$.
9. No reserves are considered in plotting the nominal profile and redlines.

CSM CRYOGENIC SUMMARY

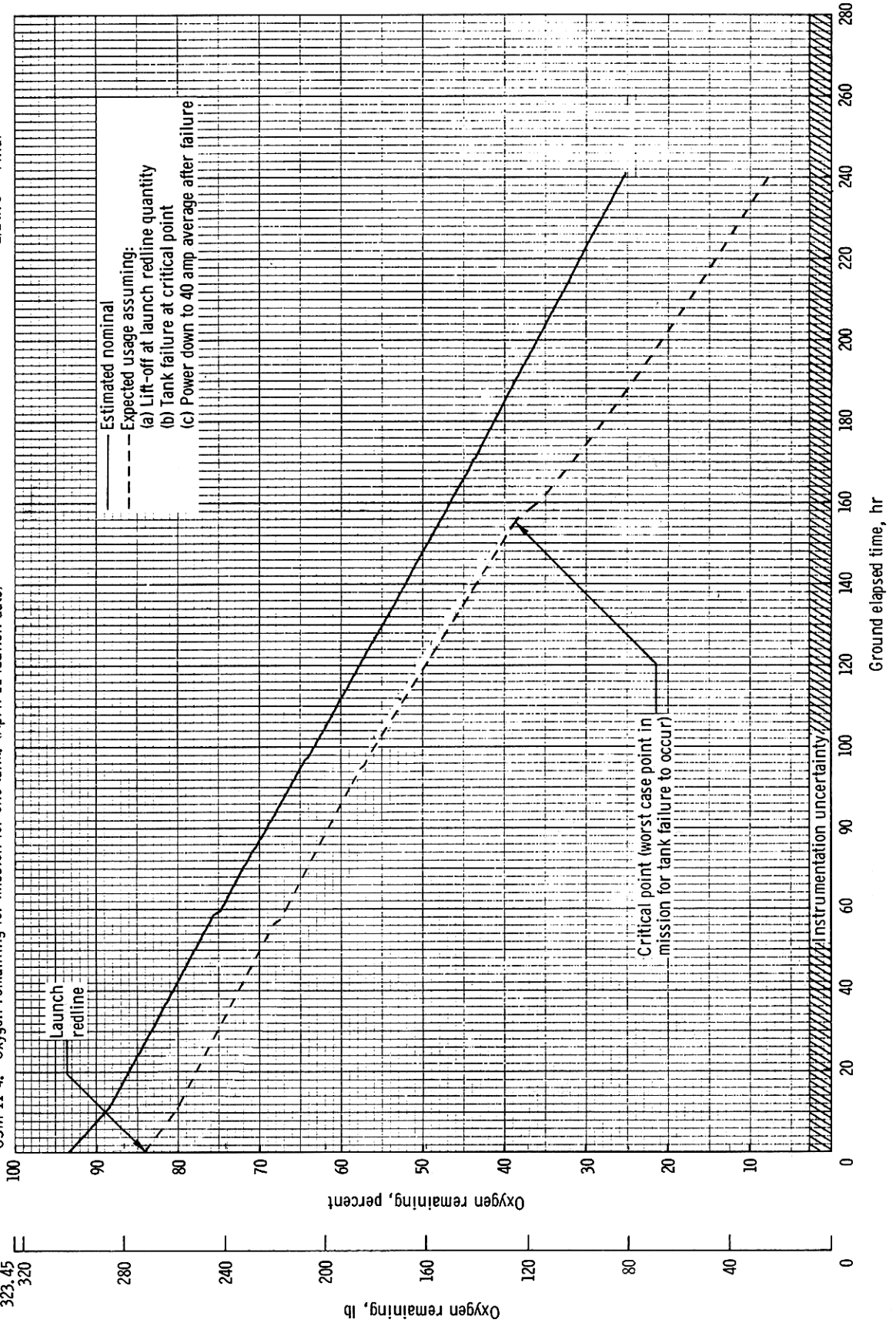
	H ₂ (lb)	O ₂ (lb)
Planning allowance		
Total loaded	58.60	660.20
Less residual	2.32	13.00
Less instrumentation error	<u>1.50</u>	<u>17.50</u>
Available for mission planning	54.78	629.70
Prelaunch requirement ^a	3.67	46.80
Flight requirement		
EPS (inc F/C purge)	44.18	345.35
ECS (inc cabin purge)	-	88.97
LM pressurizations	<u>-</u>	<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

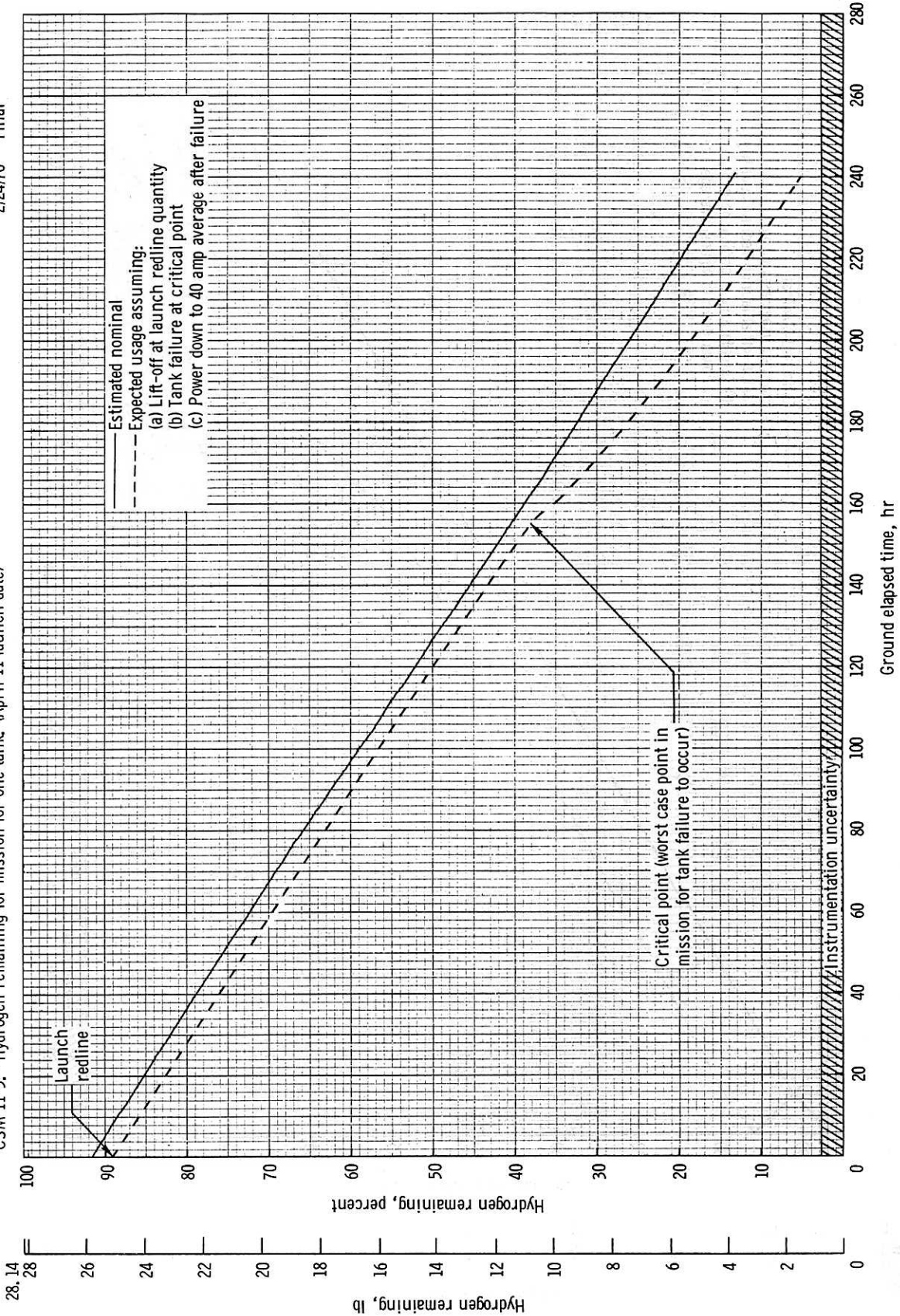
^a Data supplied by KSC

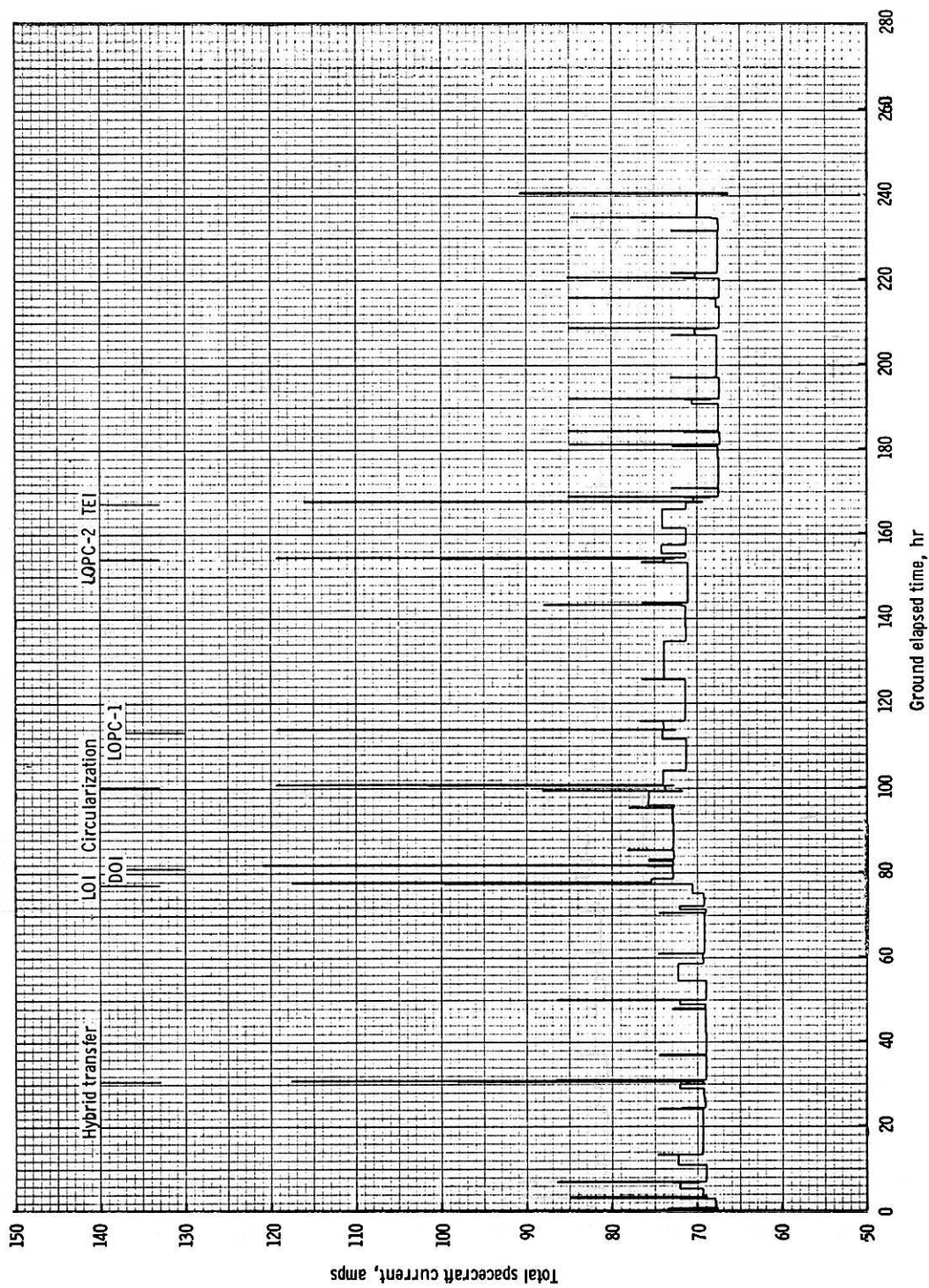
Scott/GB/MPAD (for Flight Plan)
Data source Final flight plan for April 11 launch
Data confirmed 4/5

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

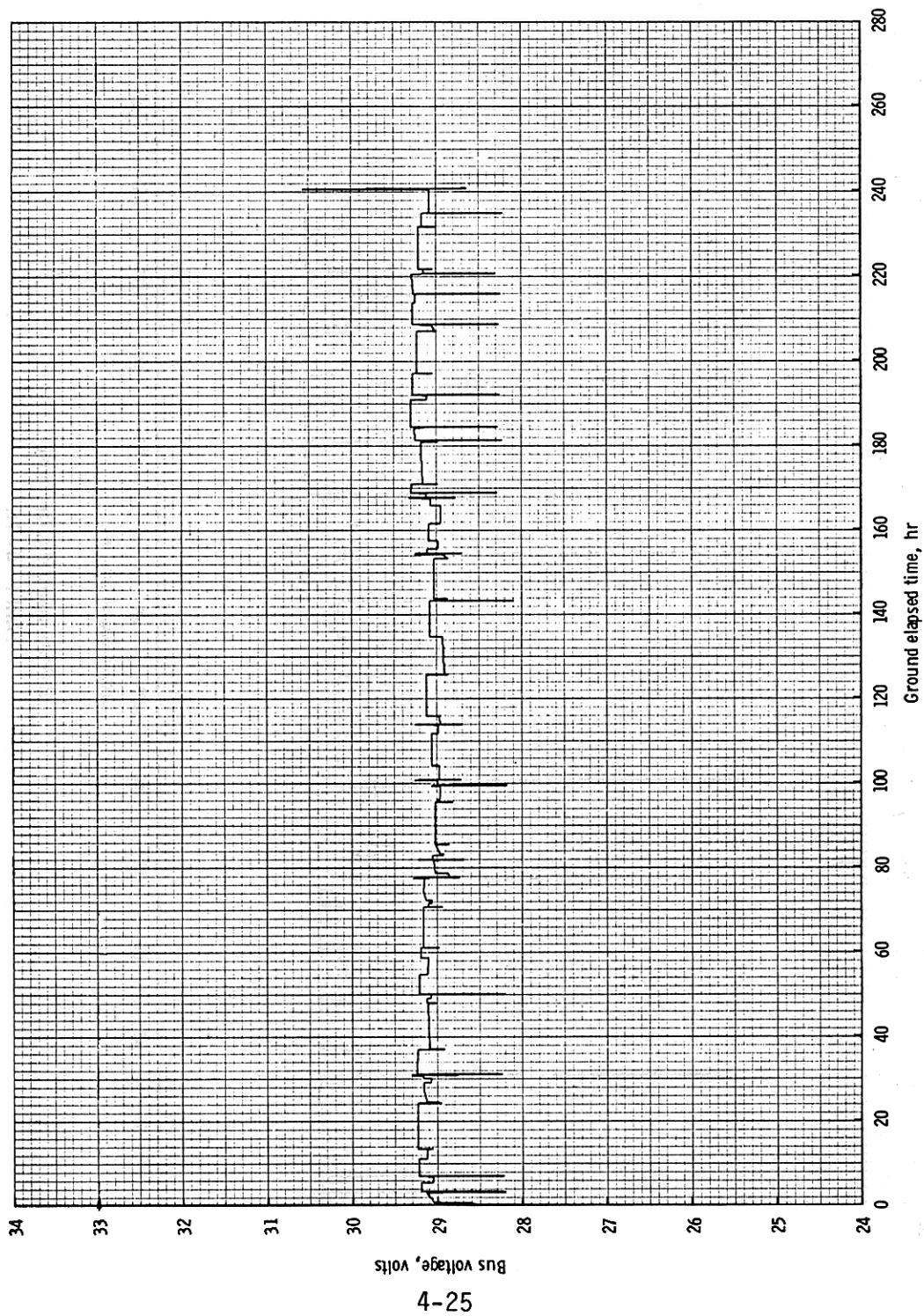






CSM total spacecraft current profile.

TABLE 4-16



- 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

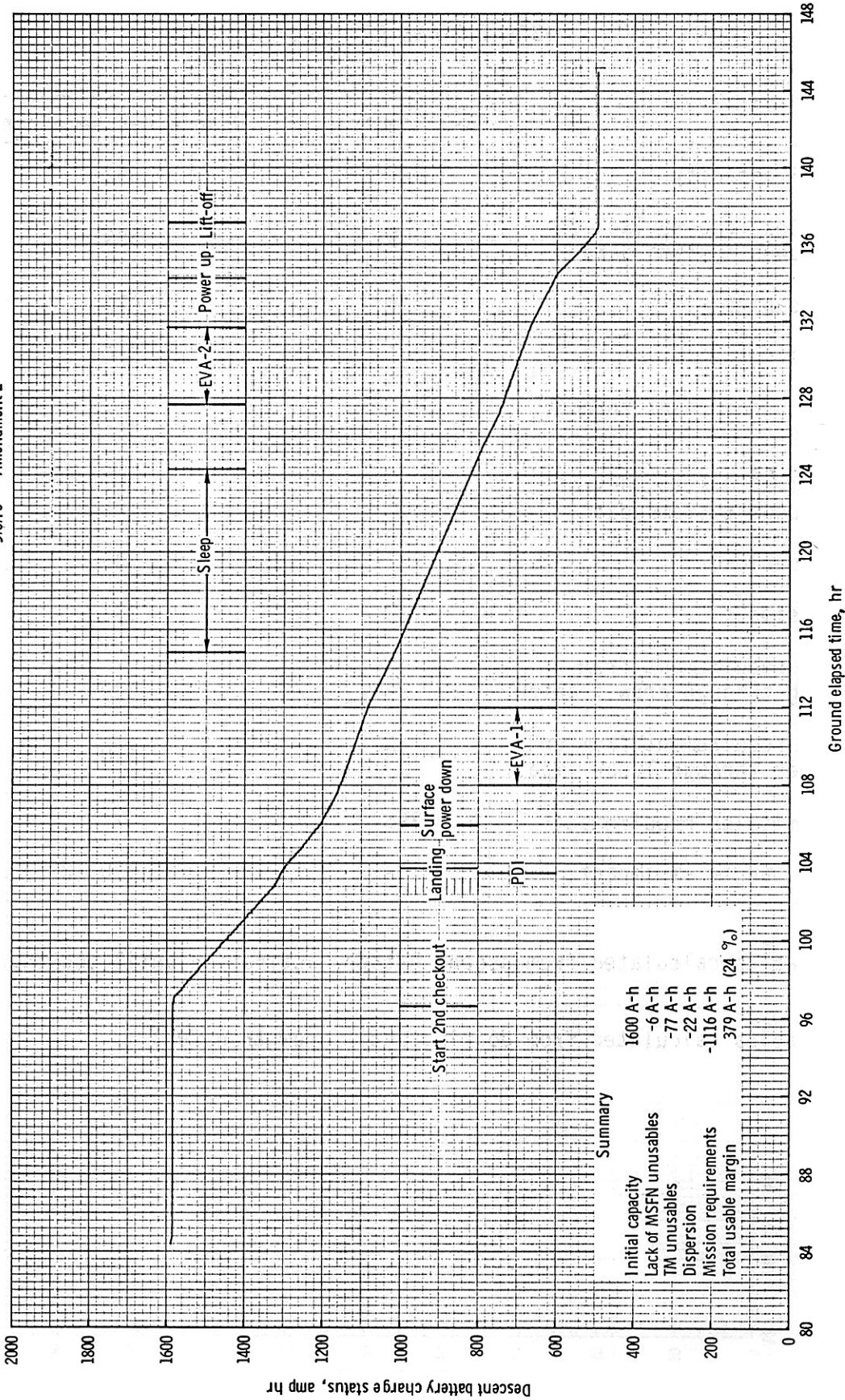
	A-h Required	Usable A-h Remaining
Initial capacity	-	592
Unusables ¹ due to lack of continuous systems data	3	589
TM unusables ¹	14	575
Dispersion ¹	5	570
Actual requirement through docking	231	339
Unusables ² due to lack of continuous systems data	2	337
TM unusables ²	2	335
Dispersion ²	2	333
Actual 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/MPAD (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



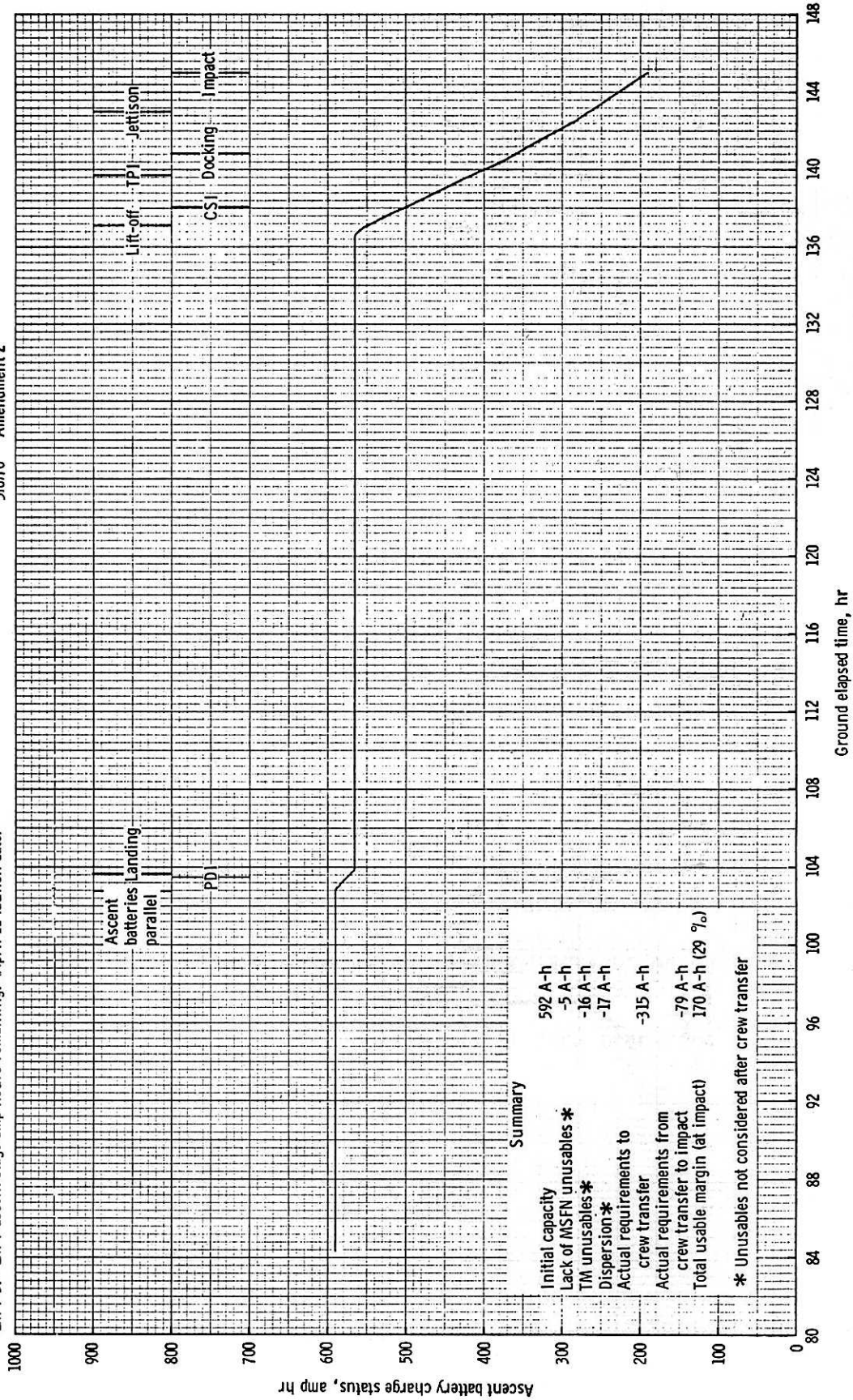
LM-7 descent stage amp hours remaining.

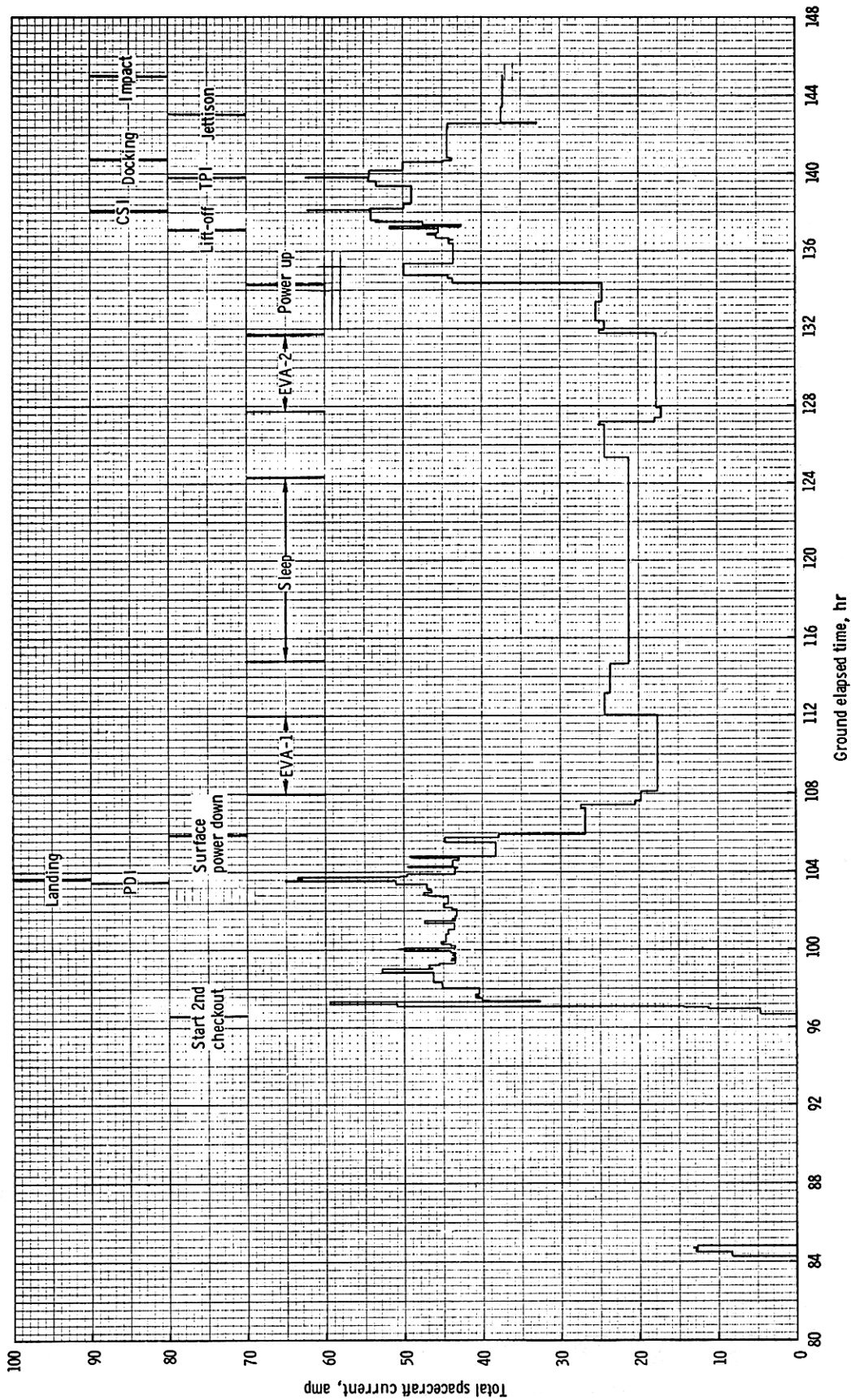
TABLE 4-20

Alexander/GPB/MPAD (for LM Systems)
 Data source LM checklist for April launch
 Data confirmed LL

Data applicable to April 11 launch
 3/6/70 Amendment 2

LM 9-3 - LM-7 ascent stage amp hours remaining. (April 11 launch date)





- LM-7 total spacecraft current

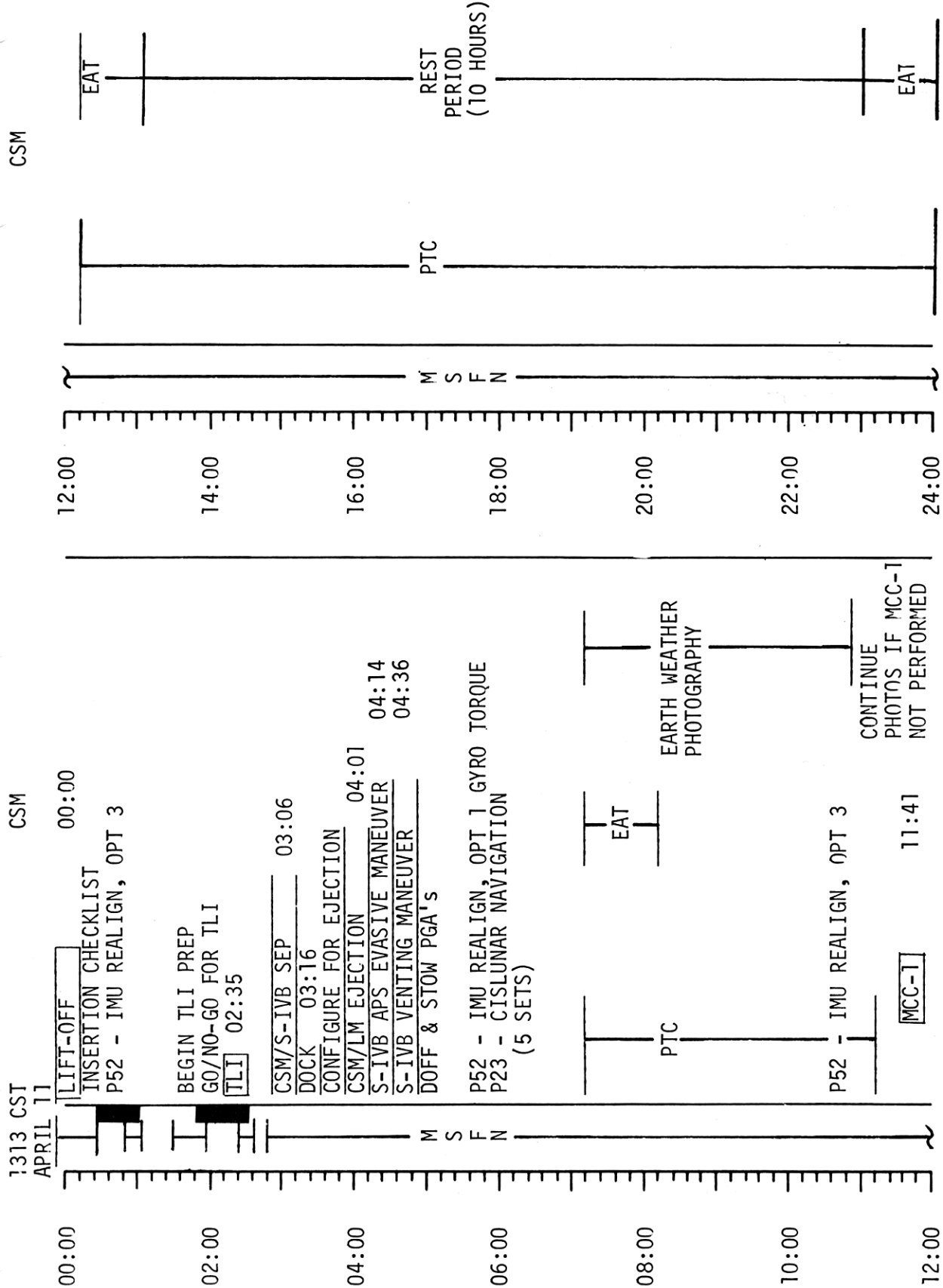
TABLE 4-22

LM ECS

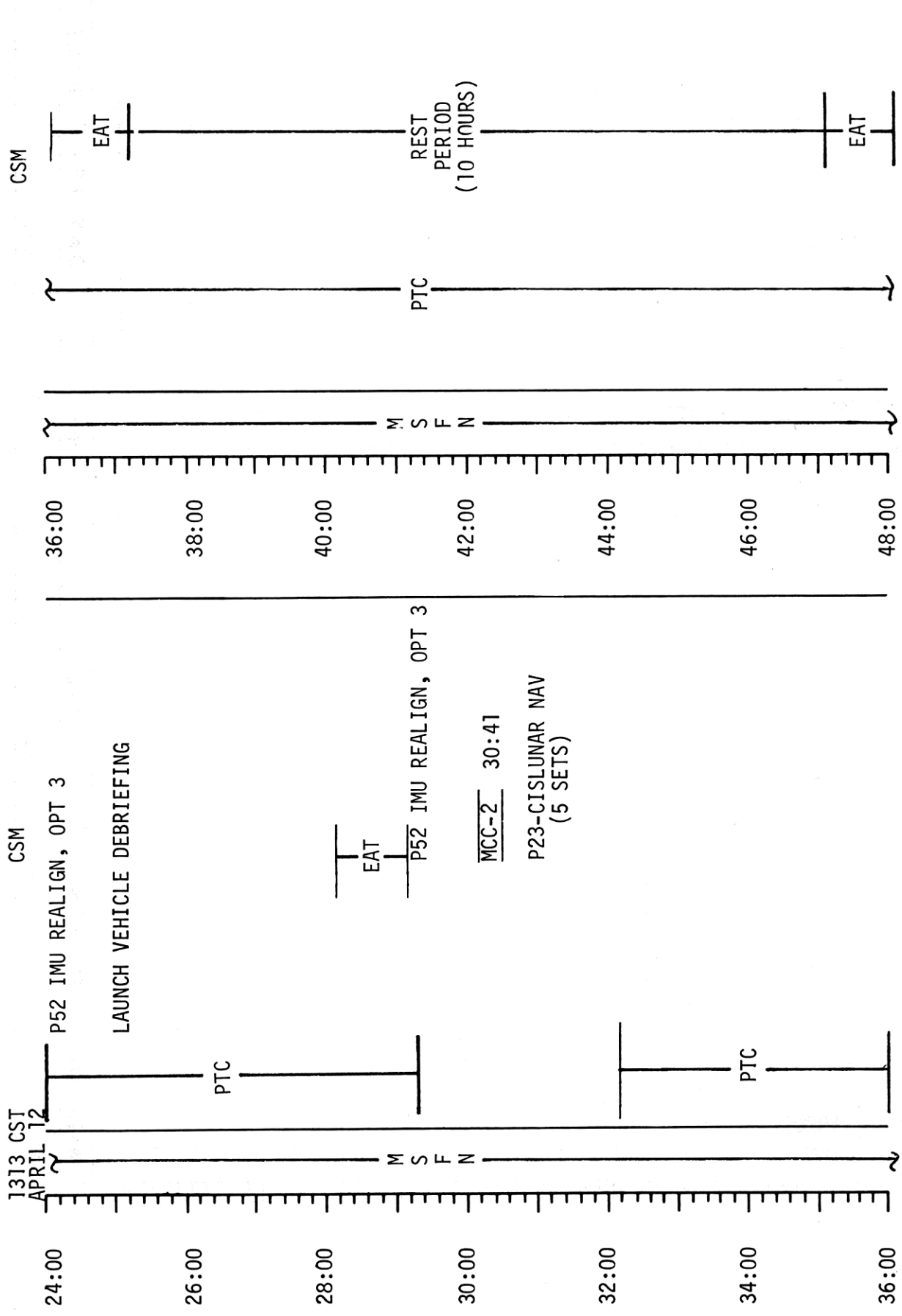
The LM ECS consumable analysis was not available for the final flight plan. For further information contact the Consumables Analysis Section (CAS) of the Mission Planning and Analysis Division (MPAD).

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SECTION 5 - ABBREVIATED TIMELINE



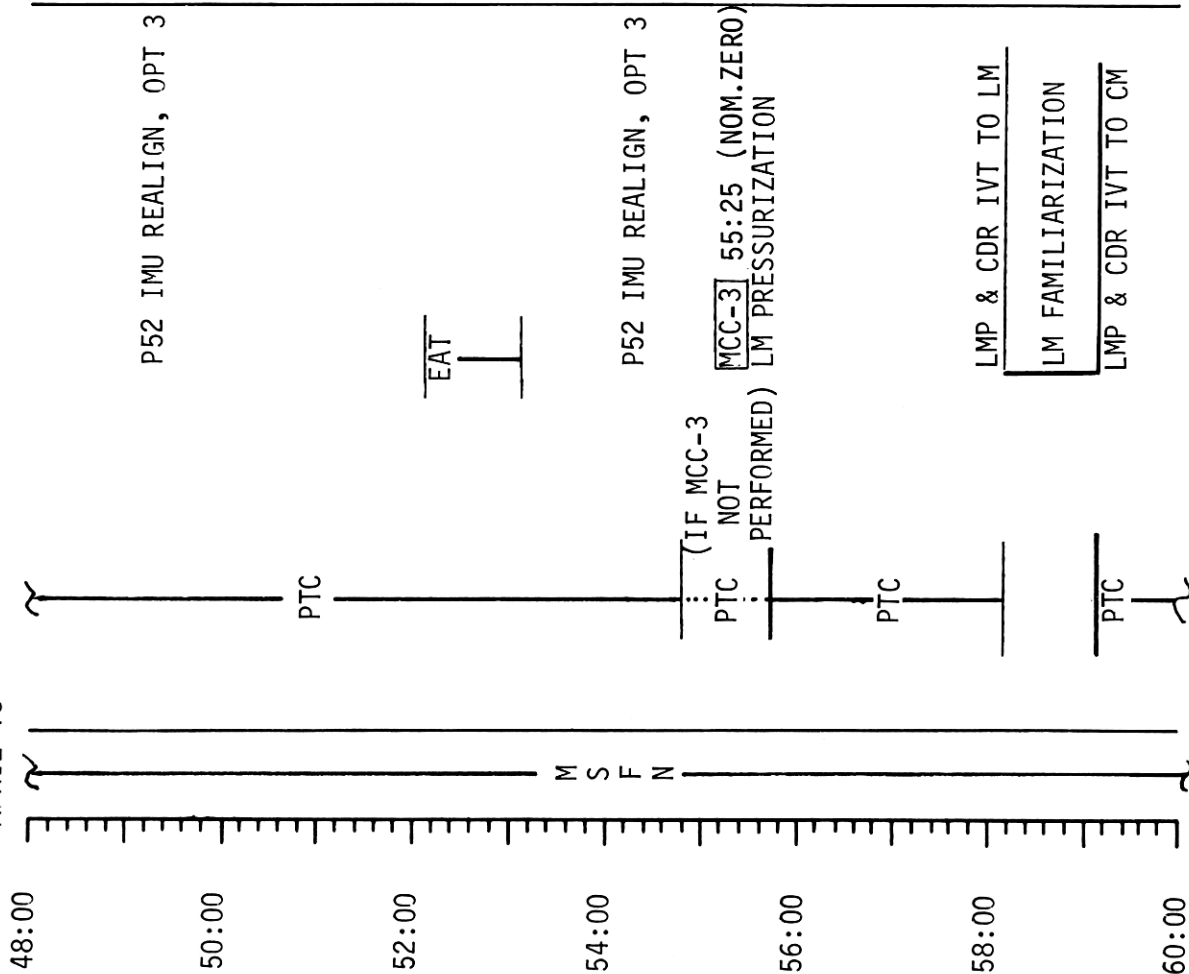
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	00:00 - 24:00	1/TLC	5-1



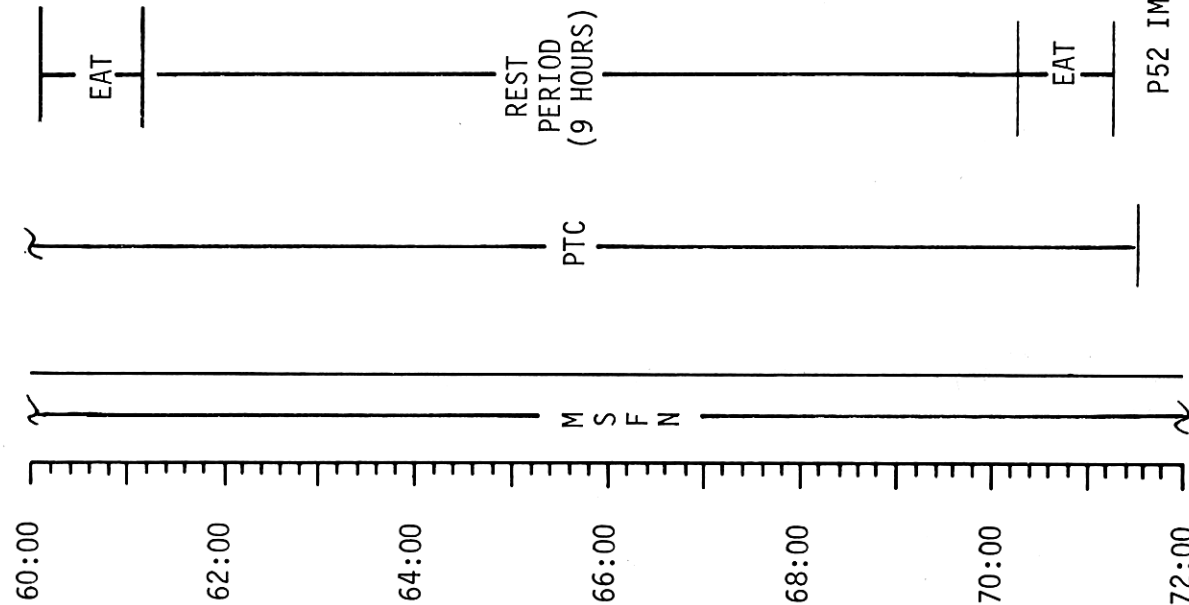
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	24:00 - 48:00	2/TLC	5-2

1313 CST
APRIL 13

CSM

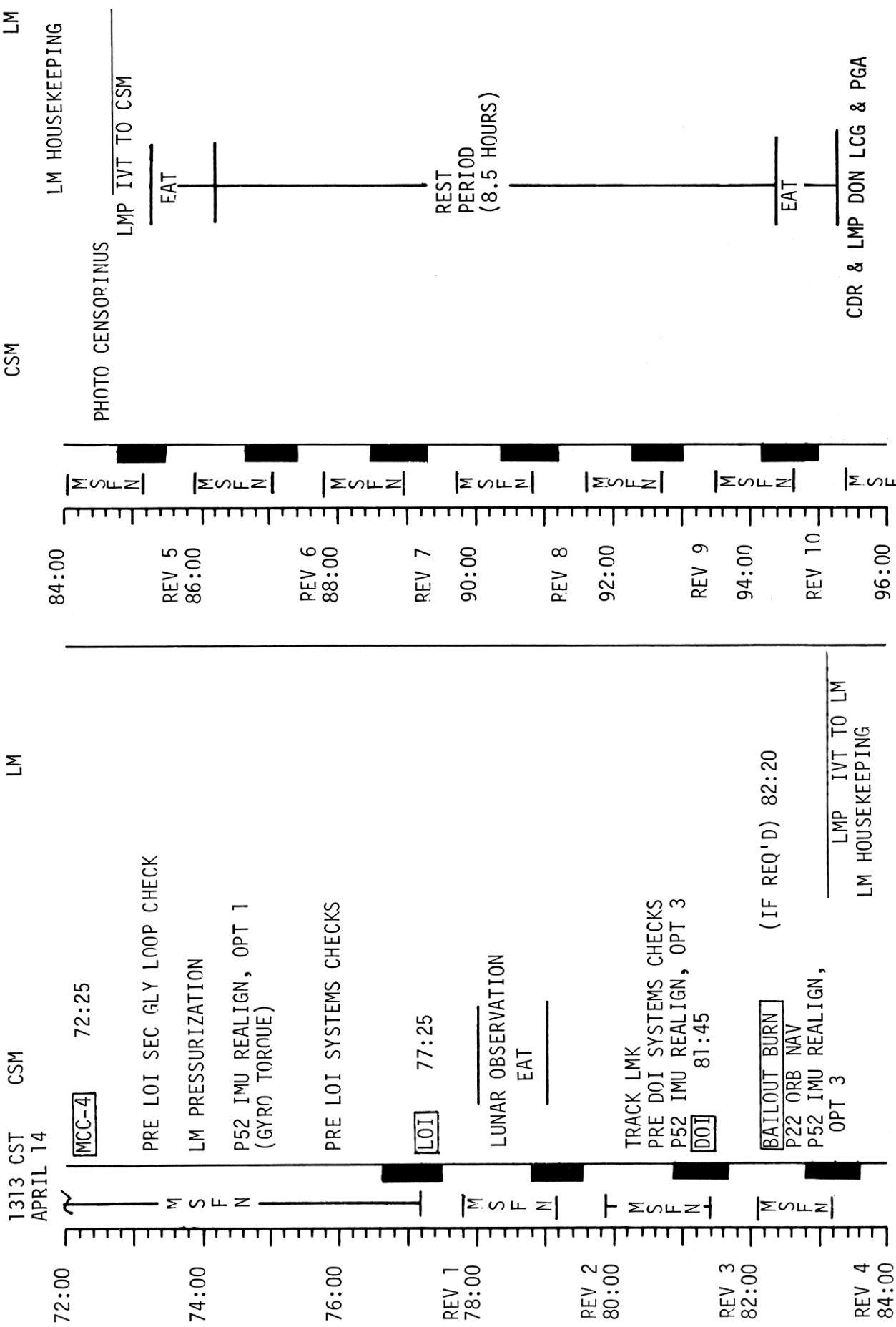


CSM

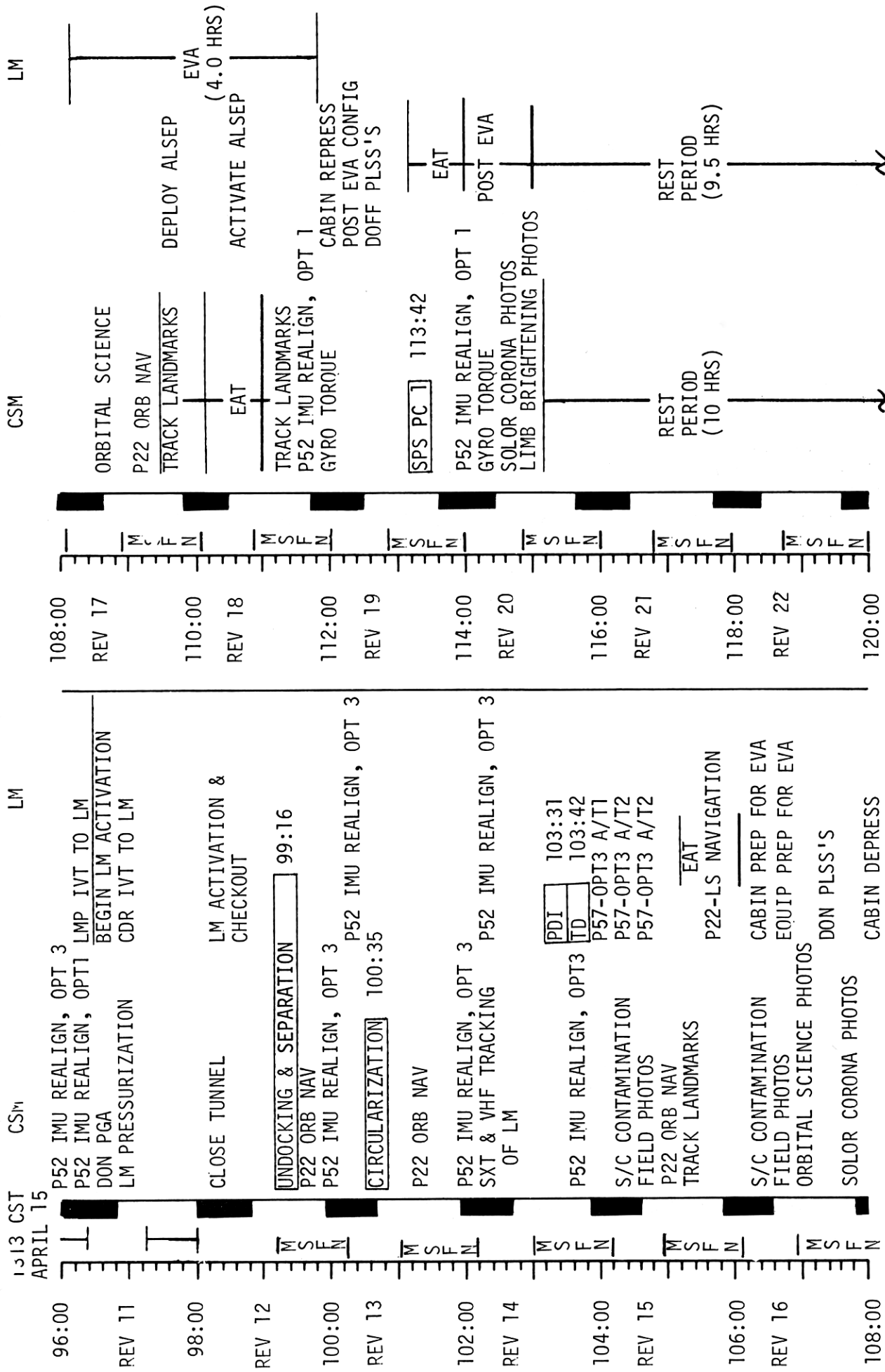


P52 IMU REALIGN, OPT 3

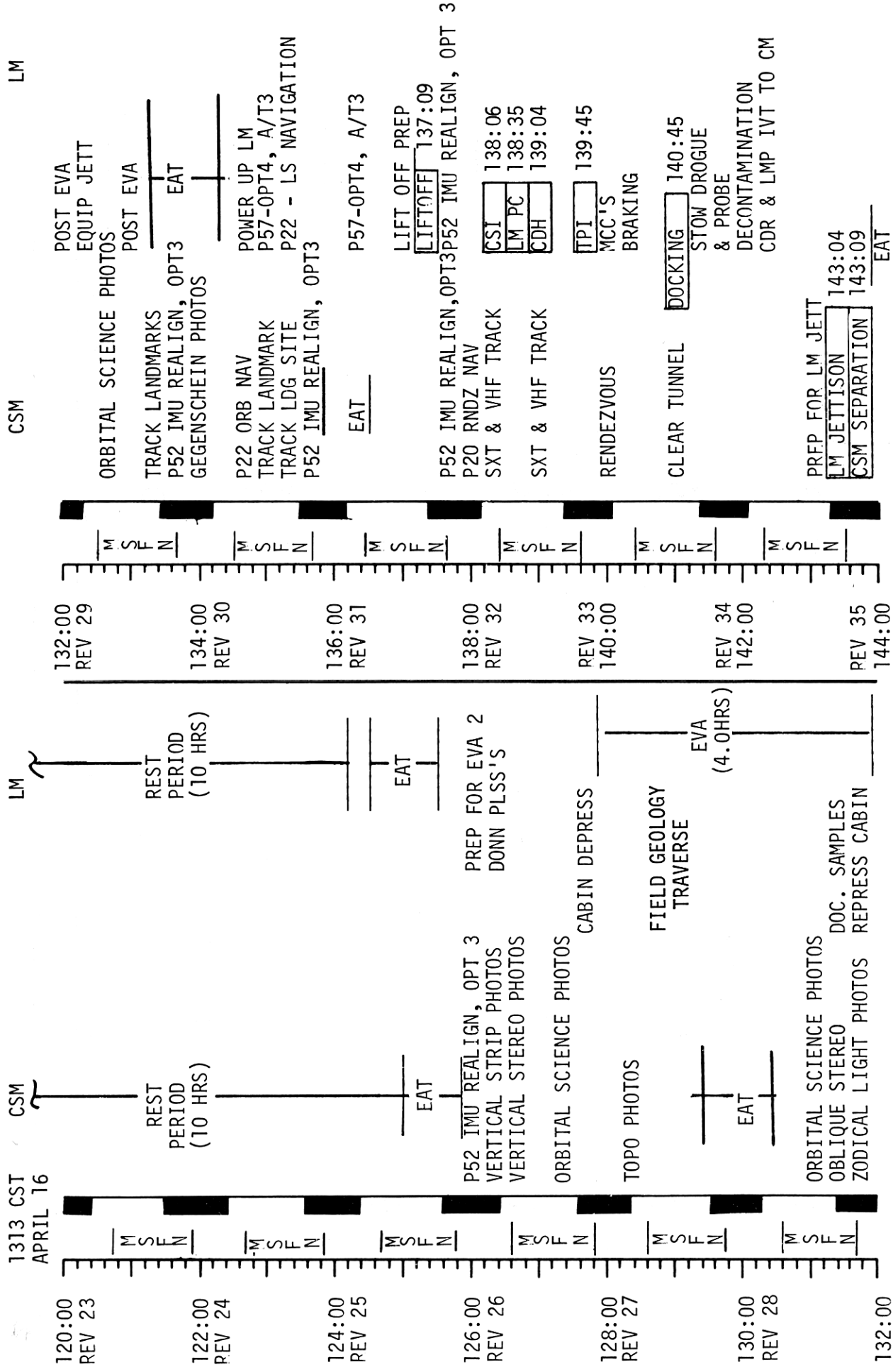
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	48:00 - 72:00	3/TLC	5-3



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	72:00 - 96:00	4/1-9	5-4

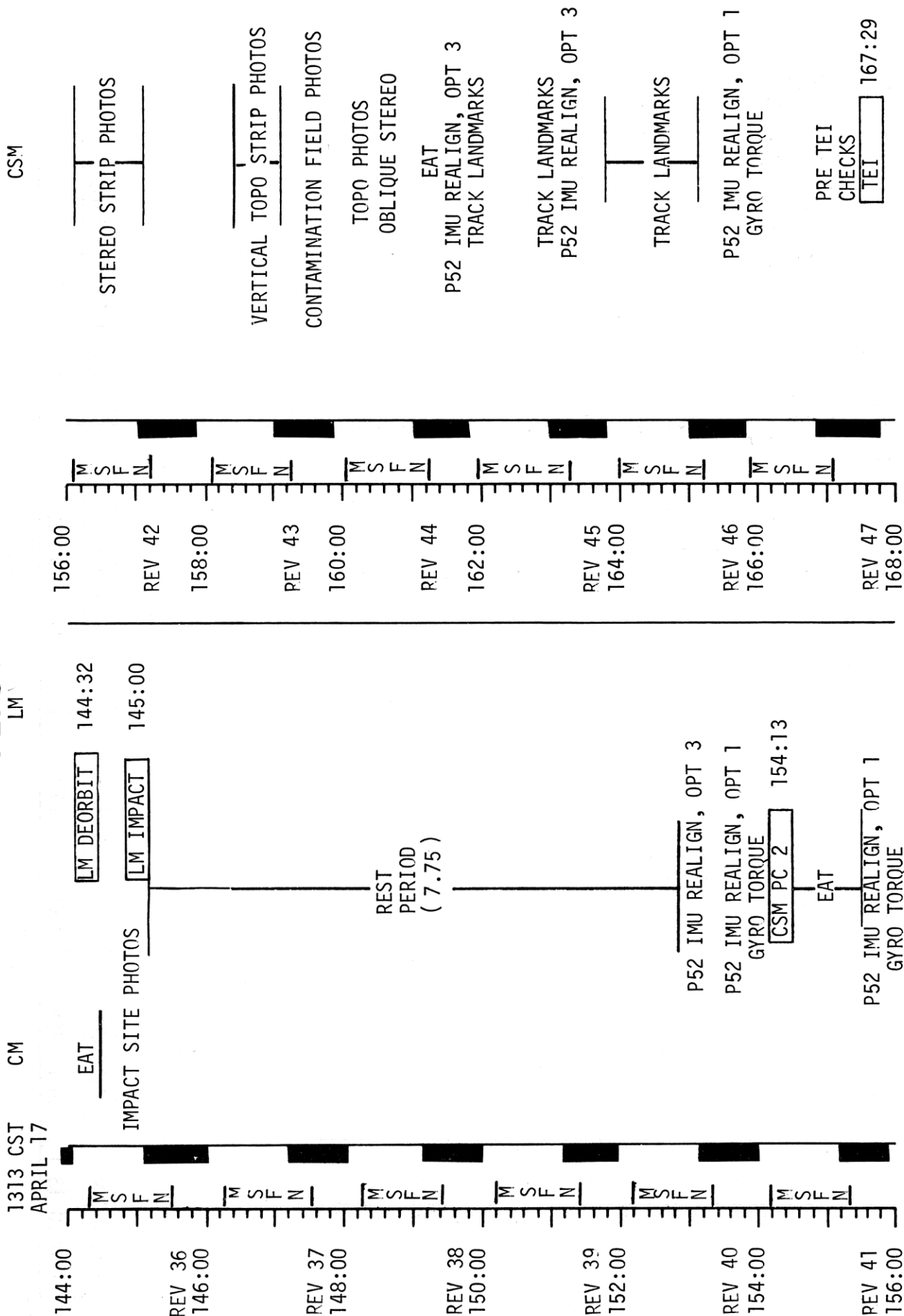


MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	96:00 - 120:00	5/10-21	5-5



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	120:00 - 144:00	6/22-34	5-6

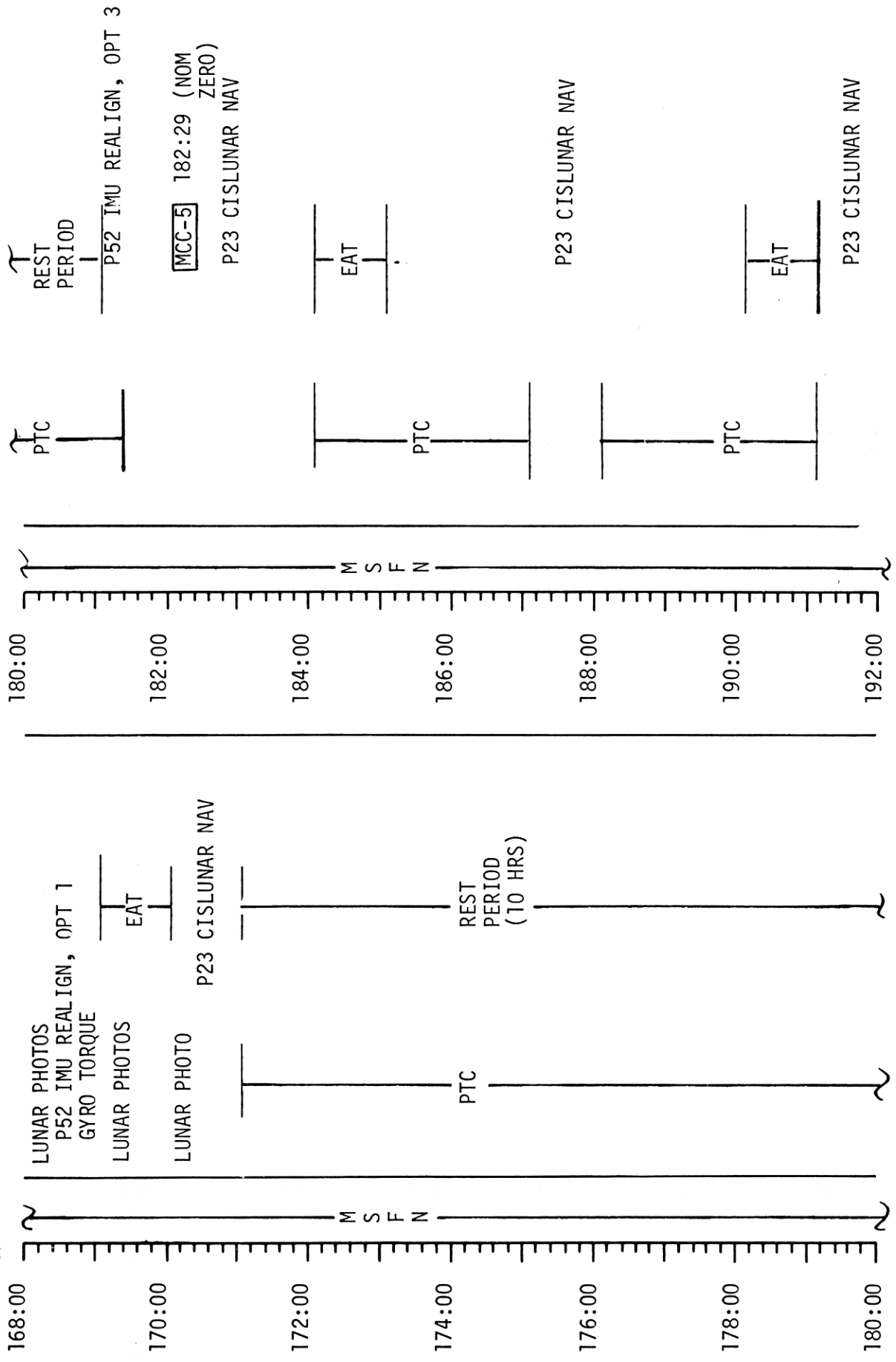
FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	144:00 - 168:00	7/35-46	5-7

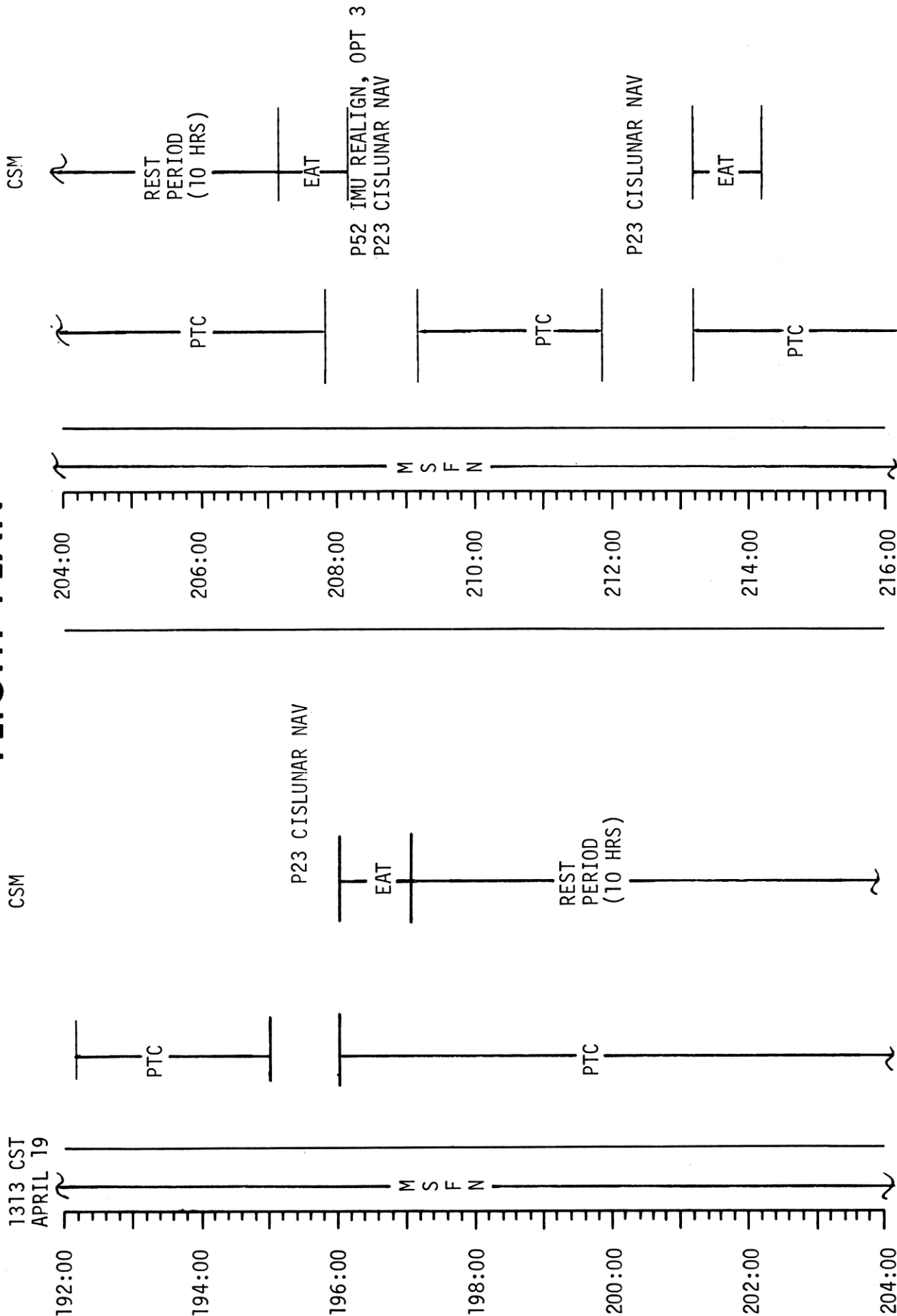
1313 CST
APRIL 18

CSM



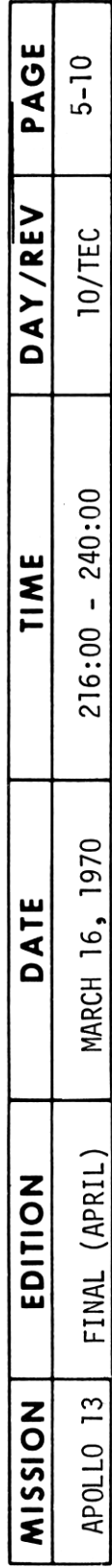
MISSION	EDITION	DATE	TIME	DAY / REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	168:00 - 192:00	8/TEC	5-8

FLIGHT PLAN



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	192:00 - 216:00	9/TEC	5-9

CSM



SECTION 6 - ALTERNATE MISSION TIMELINES

ALTERNATE MISSION I SUMMARY FLIGHT PLAN
APOLLO 13
CSM ONLY - LUNAR ORBIT

DAY/DATE	TUES 14 APR										WED 15 APR										THUR 16 APR										FRI 17 APRIL																																					
ACTIVITY DAY	FIRST LUNAR ORBIT DAY										SECOND LUNAR ORBIT DAY										THIRD LUNAR ORBIT DAY																																															
REV NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32																																				
SLEEP PERIOD																																																																				
EAT PERIODS																																																																				
G.E.T.	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	
PHOTOGRAPHIC DATA	SCIENCE SITE PHOTOGRAPHY										DIMLIGHT PHOTOGRAPHY										TARGETS OF OPPORTUNITY										ASSUMPTIONS										SEQUENCE OF EVENTS																											
	SITE VS TOPO NW OF CENSORINUS 3 4,5 MOSTING C 3 4,5 DESCARTES 13 14,15 ALPHONSUS 26 27,28 GASSENDI 26 27,28 DAVY RILLE 13 14,15 LANDMARK TRACKING SITE REV # NW OF CENSORINUS 5,6 MOSTING C 5,6 DESCARTES 15,16 DAVY RILLE 15,16 ALPHONSUS 28,29 GASSENDI 28,29 PICKERING B 5,6 TARUNTIUS O 28,29 CP-1 15,17 CP-2 16,17 CP-3 16,17 CP-4 16,17										TYPE REV # S/C CONTAMINATION 12,13,25,26 SOLAR CORONA 14,27 LUNAR LIMB BRIGHTENING 16,28 ZODIACAL LIGHT 18,30 GEGENSCHIEIEN 6,17,29										TARGET # 250 mm 80 mm 2 3,5 6 15 11 22 23 28 26 16,25 27 16 28 28 30 30 31 34 34 35 35 13,29 37 44 46 26 47 5 50 30										TARGET # 250 mm TOPO 3 52 56 56 59 24 60 18 63 24 18 11,18 30 30 18 30 3,4 18,30 18,30 18,30 4 30 14,18										I CSM HAS NOT PERFORMED T.D.&E. II MCC-2 HAS BEEN RETARGETED TO KEEP THE CSM ON A FREE RETURN TRAJECTORY AND ARRIVE IN LUNAR ORBIT FOUR HOURS EARLIER THAN NOMINAL. III AN SPS-DOI WILL NOT BE PLANNED. IV AN LOI-2 BURN IS PERFORMED AT APPROXIMATELY 81:30 HOURS G.E.T. AND THE RESULTING ORBIT IS 60 NAUTICAL MILE CIRCULAR INCLINED 2.94 DEGREES WITH THE LONGITUDE OF THE ASCENDING NODE 144 DEGREES WEST. CONSTRAINTS I LANDMARK TRACKING, VERTICAL STEREO PHOTOGRAPHY AND HIGH RESOLUTION PHOTOGRAPHY OF CENSORINUS, DESCARTES, AND DAVY RILLE MUST BE PERFORMED. (NOMINAL BOOTSTRAP SITES) II SIMULTANEOUS SLEEP PERIODS OF NOT LESS THAN 6 HOURS.										I THE ALTERNATE MISSION FOR THE IN-FLIGHT CONTINGENCY OF FAILING TO EJECT THE LM FROM THE S-IVB IS A CSM-ONLY TYPE MISSION. THIS ALTERNATE WILL BE A LANDMARK TRACKING AND PHOTOGRAPHIC MISSION WITH SPECIAL EMPHASIS ON OBTAINING PHOTOGRAPHS OF THE NOMINAL BOOTSTRAP SITES. II THE FIRST ACTIVITY DAY IN LUNAR ORBIT WILL CONSIST OF LOI-1, LOI-2, LANDMARK TRACKING, TOPOGRAPHICAL, AND VERTICAL STEREO PHOTOGRAPHY FOLLOWED BY AN EIGHT HOUR SLEEP CYCLE. III THE SECOND ACTIVITY DAY WILL CONSIST OF A PLANE CHANGE WITH LANDMARK TRACKING, VERTICAL STEREO PHOTOGRAPHY, SPACE CRAFT CONTAMINATION PHOTOS AND ZODIACAL LIGHT PHOTOS IV THE THIRD ACTIVITY DAY CONSISTS OF A PLANE CHANGE, LANDMARK TRACKING, VERTICAL STEREO AND ZODIACAL LIGHT PHOTOS V TEI IS THEN PERFORMED AND THE NOMINAL MISSION TIME LINE IS RE-ENTERED. ALL AVAILABLE FILM ONBOARD IS USED.																	
	TO BE DETERMINED IN REAL TIME																																																																			
CSM	LOI-1 BURN P52 IMU REALIGN OBSERVE AND PHOTO LUNAR SURFACE LOI-2 PREPARATION P52 IMU REALIGN SXT STAR CHK LOI-2 BURN NW OF CENSORINUS VERTICAL STEREO MOSTING C-VERTICAL STEREO P52 IMU REALIGN TARGET 2 TOPO TARGET 6 250 mm PHOTO NW OF CENSORINUS - TOPO TARGET 22,34 - TOPO MOSTING C-TOPO NW OF CENSORINUS-TOPO TARGET 28-TOPO TARGET 34 & 39-TOPO MOSTING C-TOPO P52 IMU REALIGN TARGET 2-250 mm PHOTO NW OF CENSORINUS-LMK TRK PICKERING B-LMK TRK MOSTING C-LMK TRK TARGET 46 - 250 mm PHOTO S/C CONTAMINATION PHOTOS NW OF CENSORINUS-LMK TRK PICKERING B-LMK TRK MOSTING C-LMK TRK																																																																			
	PLANE CHANGE #1 - PREP P52 IMU REALIGN SXT STAR CHK PLANE CHANGE #1 BURN TARGET 22-80 mm PHOTOS TARGET 56-250 mm PHOTO P52 IMU REALIGN TARGET 22-80 mm PHOTO DESCARTES-VERTICAL STEREO TARGET 35-250 mm PHOTO DAVY RILLE - VERTICAL STEREO S/C CONTAMINATION PHOTOS TARGET 22-80 mm PHOTOS DESCARTES-TOPO DAVY RILLE-TOPO TARGET 50-TOPO P52 IMU REALIGN SOLAR CORONA PHOTOS DESCARTES-TOPO DAVY RILLE-TOPO CP-1 - LMK TRK DESCARTES-LMK TRK TARGET 11-250 mm PHOTO DAVY RILLE-LMK TRK CP-4-LMK TRK LUNAR LIMB BRIGHTENING PHOTOS P52 IMU REALIGN CP-2-LMK TRK TARGET 26 & 27-250 mm PHOTOS DESCARTES-LMK TRK CP-3 - LMK TRK DAVY RILLE-LMK TRK P52 IMU REALIGN ZODIACAL LIGHT PHOTO CP-6-LMK TRK CP-7-LMK TRK CP-8-LMK TRK CP-9-LMK TRK TARGETS 52 & 56-250 mm PHOTOS GEGENSCHIEIEN PHOTO TARGET 26-TOPO TARGET 31,35-TOPO TARGET 37-TOPO TARGET 50-TOPO TARGET 60-TOPO P52 IMU REALIGN																																																																			
	PLANE CHANGE #2 PREP P52 IMU REALIGN SXT STAR CHK PLANE CHANGE BURN #2 TARGETS 59 AND 63 - 250 mm PHOTO P52 IMU REALIGN TARGET 26-250 mm ALPHONSUS-VERTICAL STEREO TARGET 44-250 mm GASSENDI-VERTICAL STEREO S/C CONTAMINATION PHOTOS TARGET 26-TOPO ALPHONSUS-TOPO GASSENDI-TOPO P52 IMU REALIGN SOLAR CORONA PHOTOS ALPHONSUS - TOPO GASSENDI-TOPO LUNAR LIMB BRIGHTENING PHOTOS TARUNTIUS O - LMK TRK TARGETS 28 & 30-250 mm PHOTOS ALPHONSUS-LMK TRK GASSENDI-LMK TRK P52 IMU REALIGN ZODIACAL LIGHT PHOTOS TARUNTIUS O-LMK TRK TARGET 35-250 mm PHOTO ALPHONSUS-LMK TRK GASSENDI-LMK TRK GEGENSCHIEIEN PHOTOS TARGET 28-TOPO TARGET 31 & 35-TOPO TARGET 37 & 44-TOPO TARGET 47-250 mm PHOTO TARGET 59-TOPO TARGET 63-TOPO TEI PREPARATION P52 IMU REALIGN SXT STAR CHK TEI BURN REJOIN NOMINAL MISSION																																																																			
CSM BURN SCHEDULE	LOI-1 BURN LOI-2 BURN PLANE CHANGE #1 PLANE CHANGE #2 TEI BURN																																																																			
G.E.T.	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142
DAY/NIGHT																																																																				
MSFN																																																																				
REV NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32																																				
LIQH CANNISTER CHANGE																																																																				

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ALTERNATE MISSION 3 SUMMARY FLIGHT PLAN
 APOLLO 13
 (CSM/LM LOW EARTH ORBIT)

