TRANS'LUNAR, LUNAR PARKING ORBIT, 
AND TRANSEARTh PROCEDURES 

C-PRIME MISSION 

FINAL COPY 

NOVEMBER 12, 1968

MANNED SPACECRAFT CENTER 
HOUSTON, TEXAS
TRANSLUNAR, LUNAR PARKING ORBIT, AND
TRANSEARTH PROCEDURES

C-PRIME MISSION

AS-503/CSM-103
12 November 1968
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This document contains the nominal primary crew procedures for the CSM-103 spacecraft during the lunar Mission C-Prime. The specific time period covered by these procedures is from CSM/S-IVB separation at 3:20 GET through the last TEMCC (MCC7) at 144:50 GET.

The purpose of the Translunar, Lunar Parking Orbit and Transearth procedures document is to provide a single source of guidance, navigation and control procedures information for use in flight planning, in crew training, and in preparation of onboard checklists.

This document is a control document for this phase of the Mission C-Prime nominal crew procedures. Revisions to this document are subject to approval by the Procedures Configuration Control Board. Comments should be directed to Mr. Duane K Mosel, Flight Procedures Branch, Extension 5340 or to Stephen G. Paddock, Jr., Apollo Flight Crew Support Group, Houston Operations, McDonnell Douglas Astronautics Company, Extension 6101.
2.0 **LIST OF ACRONYMS AND ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOS</td>
<td>Acquisition of Signal</td>
</tr>
<tr>
<td>ATT</td>
<td>Attitude</td>
</tr>
<tr>
<td>BEF</td>
<td>Blunt End Forward</td>
</tr>
<tr>
<td>CB</td>
<td>Circuit Breaker</td>
</tr>
<tr>
<td>CDR</td>
<td>Commander</td>
</tr>
<tr>
<td>CM</td>
<td>Command Module</td>
</tr>
<tr>
<td>CMC</td>
<td>Command Module Computer</td>
</tr>
<tr>
<td>CMP</td>
<td>Command Module Pilot</td>
</tr>
<tr>
<td>COAS</td>
<td>Crew Optical Alignment Sight</td>
</tr>
<tr>
<td>CSM</td>
<td>Command and Service Module</td>
</tr>
<tr>
<td>DAP</td>
<td>Digital Autopilot</td>
</tr>
<tr>
<td>DB</td>
<td>Deadband</td>
</tr>
<tr>
<td>DSKY</td>
<td>Display and Keyboard</td>
</tr>
<tr>
<td>DV</td>
<td>Delta Velocity</td>
</tr>
<tr>
<td>EMS</td>
<td>Entry Monitor System</td>
</tr>
<tr>
<td>ET</td>
<td>Event Timer</td>
</tr>
<tr>
<td>FDAI</td>
<td>Flight Director Attitude Indicator</td>
</tr>
<tr>
<td>FPS</td>
<td>Feet Per Second</td>
</tr>
<tr>
<td>GDC</td>
<td>Gyro Display Coupler</td>
</tr>
<tr>
<td>GETI</td>
<td>Ground Elapsed Time of Ignition</td>
</tr>
<tr>
<td>GMBL</td>
<td>Gimbal</td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>GPI</td>
<td>Gimbal Position Indicator</td>
</tr>
<tr>
<td>HA</td>
<td>Apogee Altitude</td>
</tr>
<tr>
<td>HOR</td>
<td>Horizon</td>
</tr>
<tr>
<td>HP</td>
<td>Perigee Altitude</td>
</tr>
<tr>
<td>IMU</td>
<td>Inertial Measurement Unit</td>
</tr>
<tr>
<td>LEB</td>
<td>Lower Equipment Bay</td>
</tr>
</tbody>
</table>
LOS  Loss of Signal
LM    Lunar Module
LMK   Landmark
LMP   Lunar Module Pilot
LOI   Lunar Orbit Injection
LV    Launch Vehicle
MDC   Main Display Console
MGA   Middle Gimbal Angle
MTVC  Manual Thrust Vector Control
OPT   Optics
ORDEAL Orbital Rate Drive Earth and Lunar
OSS   Optical Subsystem
PAD   Data Voiced to Crew From Ground
PB    Pushbutton
PGNCS Primary Guidance, Navigation, and Control System
PIPA  Pulse Integrating Pendulous Accelerometers
R     Range
R DOT Range Rate
REFSMMAT Reference Stable Member Matrix
RCS   Reaction Control System
RHC   Rotation Hand Controller
S-IVB  Saturn S-IVB Stage
SCS   Stabilization and Control System
SCT   Scanning Telescope
SECS  Sequence Events Control System
SEF   Small End Forward
SEP   Separation
SM    Service Module
SPS   Service Propulsion System
SC    Spacecraft
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/U</td>
<td>Setup</td>
</tr>
<tr>
<td>SXT</td>
<td>Sextant</td>
</tr>
<tr>
<td>TEMCC</td>
<td>Transearth Midcourse Correction</td>
</tr>
<tr>
<td>TFI</td>
<td>Time From Ignition</td>
</tr>
<tr>
<td>THC</td>
<td>Translation Hand Controller</td>
</tr>
<tr>
<td>THETA</td>
<td>Angle Between SC +X Axis and Local Horizontal</td>
</tr>
<tr>
<td>TIGN</td>
<td>Time of Ignition</td>
</tr>
<tr>
<td>TLI</td>
<td>Translunar Injection</td>
</tr>
<tr>
<td>TEI</td>
<td>Transearth Injection</td>
</tr>
<tr>
<td>TLM</td>
<td>Telemetry</td>
</tr>
<tr>
<td>TLMCC</td>
<td>Translunar Midcourse Correction</td>
</tr>
<tr>
<td>TRUN</td>
<td>Trunnion</td>
</tr>
<tr>
<td>TVC</td>
<td>Thrust Vector Control</td>
</tr>
<tr>
<td>VG</td>
<td>Velocity to be Gained</td>
</tr>
<tr>
<td>(XX:XX)</td>
<td>Indicates ground elapsed time from liftoff in hours: minutes</td>
</tr>
</tbody>
</table>
3.0 NOMINAL MISSION PROCEDURES

The nominal Mission C-Prime Translunar, Lunar Parking Orbit, and Transearth flight crew procedures presented in this document are divided into two sections, a major activities timeline and standard procedures. The timeline identifies all guidance, navigation, and control related activities as a function of GET. The procedures necessary to successfully perform an activity required only once during the mission, e.g. CSM/S-IVB separation, are presented in detail within the timeline. Whereas, the procedures for an activity reoccurring periodically throughout the mission, e.g. an IMU alignment, are presented in detail in an addendum to avoid repetition. The timeline identifies how and when the standard procedure should be applied and the standard procedure is sufficiently flexible to cover any option required during the mission.

3.1 Major Activities

3.1.1 Introduction

The major procedures timeline for the Mission C-Prime includes activities from after the TLI (2:51 GET) through the last Transearth midcourse correction (144:50 GET). Figure 3-1 shows the locations in time and approximate positions in space of selected major activities during the Translunar and Transearth phases. Figure 3-2 is a CSM attitude profile for the Lunar Parking Orbit phase. The nominal Mission C-Prime timeline assumes a 21 December 1968 launch, a 72 degree launch azimuth, and a nominal TLI ignition time of 02:50:31 GET.

The procedures presented in this document include primarily guidance, navigation, and control functions. Management of other systems, such as electrical power and environmental control are recommended as identified in Reference (1).
LUNAR PARKING ORBIT CSM ATTITUDE PROFILE

FIGURE 3-2

-58-
Section 3.1.2

MISSION C-PRIME PROCEDURES
TLT TO CM/SM SEP
MAJOR PROCEDURE TIMELINE

---

PROCEDURES FOR CSM/S-IVP SEP
(ASSUMES P47 BEING MONITORED)

CDR SET FT=58+00 (COUNTER UP)

P47 F 16 83 (DVX+DVY+DVZ)

-6 MIN

CDR START ET COUNT UP
THM=ARMED
RMC=ARMED
CB PYRO A SEQ A=CLOSED 250
CB PYRO B SEQ A=CLOSED 250
CB SFCS ARM(ROTH)=CLOSED 8
SEC LOGIC(ROTH)=ON (UP) 8
LMP REPORT LOGIC ARM TO GND
RECEIVE GO FROM GND
NONESS BUS=MNA
FLT RCDR=RECORD
TLM INPUTS PCM=HIGH
UP TLM CMD=RESET THF NORM
TAPE RCDR PCM=PCM/ANLG

FINAL MISSION C-PRIME TRANSLUNAR+LUNAR PARKING ORBIT+AND TRANSEARTH TIMELINE -12 NOV 1968
TAPE RCDR RCD=OFF
TAPE RCDR FWD=ON
TAPE MOTION TB=ON

CMP COPY POST TLI DVS FROM DS=U
KEY V32E
VERIFY DSKY DVS ZERO

-1MIN
CDR SECS PYRO ARM(ANTH)=ON(UP)
CM RCS LOGIC=ON(UP)
RCS CMD=ON
CMP KEY V60E (N17=N20)
CDR EMS FUNCTION=OFF
FMS MODE=OFF
CMC MODE=HOLD

-2SEC
THC=THRU(X) A AND HOLD
(PRESEP TENSION)

-03+20
CSM/LV SEP PB=PUSH AND HIDE
VERIY LV ENG 1 LT=OFF
CSM/LV SEP PB=RELEASE

+5SEC
THC=RELEASE
VERIY EMS DV IND REAS 1-P5
(APPROXIMATE)
MAINTAIN INERTIAL SEP ATT
USING FDL
RMU PWR DIRECT(ANTH)=OFF
CM RCS LOGIC=OFF
EDS PWR=OFF
TVC SERVO PWR 1=OFF
SEC LOGIC(ANTH)=OFF
SEC PYRO ARM(ANTH)=OFF
CR SECS ARM(ANTH)=SAFE
CB SECS LOGIC(ANTH)=OFF
CM RCS LOGIC=OFF

CB EOS(ALL)=OPEN 8
CB PYRO A SEQ A=OPEN 250
CB PYRO A SEQ B=OPEN 250

+40SEC
LMP FLT RCDR=OFF(CTRL)
TAPE RCDR FWD=OFF(CTRL)
NONESS RUS=OFF

+1MIN
CDR THC=THRU(X) FOR 5SEC
EMS MODE=STBY
EMS FUNCTION=OFF

CMP PRO
F 37 BB
KEY 00E

CDR CMC MODE=AUTO
HMAG MODE=RATEZ
MAN ATT=RATEZ
CMP KEY V16 N20E
16 20 (CURRENT RPY)
COPY CURRENT RPY
COMPUTE COMMANDED RPy FOR
180 DEG PITCH AND 60 DEG
ROLL LEFT ATT MANEUVER
PRO

KEY V49E
F 06 22 (COMMAND RPY)
LOAD COMPUTED RPy
KEY V62E
PRO

F 50 18 (COMMAND RPY)
PRO

06 18 (COMMAND RPY)
MONITOR ATT MANEUVER
OBSERVE S=V5 IN CMD WINDOW
F 50 18 (COMMANDER R, P, Y) KEY ENTER
F 04 46 (CAP CONFIGURATION) LOAD
   11102 (MIN DR, LOW RATE)
   11111 B
   PRO
   PRO
   PRO

F 06 47 (CSM AND LM WT) VERIFY PAU DATA PRO
F 06 47 (SPS GMSL TRIM) VERIFY PAU DATA PRO

ATT DR, MIN
RATE - LOW
MAN ATT(3) - RATE CMD
HOLD LOCAL VERTICAL ATTITUDE
(\$SKY THETA APPROX 270 DEG)
WITH S-IVB BETWEEN SC
AND EARTH
CMF PRO

P 47 KEY V37E47E
F 16 83 (DVX, DVY, DVZ)
COR X MAG MODE(3) - ATT1/RATE2
EMS FUNCTION - OV
EMS MODE - AUTO

(07.35)
THC - THRUST AFT (-X) UNTIL
\$SKY READS 1.6FPS
VERIFY S-IVB RANGE OPENING
VISUALLY
THC-LOCKED
PITCH UP FOR MSFN COVERAGE
CMF PRO

F 37 86

PROCEDURES FOR CSM DFSIVEF MANEUVER

000
CMP WHEN CMP LT OUT (NO INTEGR)
KEY V46E
KEY V83E
F 16 54 (R, RNOT, THETA)
COR MAN ATT(3) - ACC CMD
MANEUVER SC TO LOCAL VERTICAL (+X AXIS TOWARD EARTH) WHILE TRANSLATING TO MAINTAIN S-IVR IN CMD WINDOW

FINAL MISSION C-PRIME TRANSLUNAR LUNAR PARKING ORBIT AND TRANS EARTH TIMELINE - 12 NOV 1968
(04+04) PROCEDURES FOR IMU REALIGN TO REF/SHUT (ADJNENDUM 2)
BACKUP ALIGN NAV STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)
BACKUP ALIGN CHECK NAV STAR
NO. 15 (SIRIUS)

(04+05) PROCEDURES FOR GNC ALIGN TO IMU (ADJNENDUM 3)

(04+20) PROCEDURES FOR STAR/earth HORIZON SIGHTINGS - 5 SETS
OF 3 MARKS EACH (ADJNENDUM 4)
RECOMMENDED NAV STARS
NO. 14 (CANOPUS) (FAR HOR)
NO. 15 (SIRIUS) (FAR HOR)

FINAL MISSION C-PRIME TRANS-LUNAR LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE - 12 NOV 1968
HI GAIN ANT REALIGN AS REQUIRED
PERFORM HI GAIN ANT CHECK-OUT

(07+30) PROCEDURES FOR GNC DRIFT CHECK
(ADDENDUM 7)

(07+40) PROCEDURES FOR IMU REALIGN TO REFSGMAT FOR DRIFT CHECK
(ADDENDUM 2)

BACKUP ALIGN NAV STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)
BACKUP ALIGN CHECK NAV STAR
NO. 15 (SIRIUS)

(07+55) PROCEDURES FOR GNC ALIGN TO IMU
(ADDENDUM 3)

(08+00) PROCEDURES FOR GND UPLINK OF CSM
STATE VECTOR AND P30 TARGET (ADDENDUM 4)

FOLLOWING GND UPLINK

P00

LIE WHEN COMPT LT=011 (NO INTEGRATION)
KEY V89E

F 16 54 (R, DOT THETA)
COPY R AND DOT

KEY V89E
F 04 06 (TRACK AXIS OPTION)
LOAD 000 02 IN R2
PRO

F 06 18 (COMPUTED R, P, Y)
COPY R, P, Y
KEY V34E

P00

KEY V37E00E

KEY V47E (TRANSFER CSM SYM FROM LM SLOTS TO CSM SLOTS)

(08+20) PROCEDURES FOR EXT DV TARGETING
(ADDENDUM 9)

PROPULSION SYSTEM SELECTION
USE RCS FOR DV GREATER THAN 1 FPS AND LESS THAN OR EQUAL TO 5 FPS
USE SPS FOR DV GREATER THAN 5 FPS

TRIM DVS TO ZERO

(08+25) PROCEDURES FOR SM RCS PROPULSION MONITOR CHECK
(ADDENDUM 10)

(08+30) PROCEDURES FOR SPS THRUST SETUP
(ADDENDUM 11)

FINAL MISSION C=PRIME TRANSLUNAR+LUNAR PARKING ORBIT: AND TRANSSEARFT EARTH TIMELINE =12 NOV 1968
FIRST TRANSLUNAR MTOCOURSE

PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECK (ADDENDUM 10)

PROCEDURES FOR STAR/Earth LANDMARK SIGHTINGS = 3 SETS OF 3 MARKS EACH (ADDENDUM 4) (P21)

RECOMMENDED NAV STARS
- No. 15 (SIRIUS)
- No. 15 (SIRIUS)
- No. 16 (PROCYON)

RECOMMENDED LANDMARK
- No. 5 (ALTERNATES 7, 10, 20, 32, 40, 41, 58, 69, 70, 107915, 127, 128)

PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5) (P21)

PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)

LMP RECEIVE BLOCK DATA PAD FROM AND

PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)

PROCEDURES FOR IMU REALIGN TO REFSMAT (ADDENDUM 2) (P52)

BACKUP ALIGN NAV STARS
- No. 14 (CANOPUS)
- No. 12 (RIGEL)

BACKUP ALIGN CHECK NAV STAR
- No. 15 (SIRIUS)

PROCEDURES FOR GOC ALIGN TO IMU (ADDENDUM 3)

PROCEDURES FOR STAR/Earth HORIZON SIGHTINGS = 5 SETS OF 3 MARKS EACH (ADDENDUM 4) (P23)

RECOMMENDED NAV STARS
- No. 22 (REGULUS) (FAR HOR)
- No. 22 (REGULUS) (FAR HOR)
- No. 16 (PROCYON) (FAR HOR)
- No. 16 (PROCYON) (FAR HOR)
- No. 16 (PROCYON) (FAR HOR)

PROCEDURES FOR LOI POSITION DETERMINATION

FINAL MISSION C=PRIME TRANSLUNAR+LUNAR PARKING ORBIT AND TRANS-EARTH TIMELINE - 12 NOV 1968
ADUENDUM 5

18-25 PROCEDURES FOR ESTABLISHING PTO
(ADUENDUM 13)

25-10 LMP RECEIVE BLOCK DATA PAM
FROM GND

25-55 PROCEDURES FOR TERMINATING PTO
(ADUENDUM 14)

26-00 PROCEDURES FOR IMU REALIGN
TO REFISHMAT
(ADUENDUM 2)

26-00 PROCEDURES FOR IMU ALIGN TO IMU
(ADUENDUM 3)

26-00 PROCEDURES FOR STAR/EAR
HORIZON SIGHTINGS - 3 SETS
OF 3 MARKS EACH
(ADUENDUM 4)

RECOMMENDED NAV STARS

P00 NO. 16 (PROCYON) (FAR MOR)
NO. 22 (REGULUS) (FAR MOR)
NO. 26 (SPICA) (NEAR MOR)

2A-00 PROCEDURES FOR LOI POSITON
DETERMINATION
(ADUENDUM 5)

27-00 PROCEDURES FOR GND UPLINK OF CSM
STATE VECTOR AND P30 TARGET LOAD
(ADUENDUM 8)

FOLLOWING GND UPLINK

P00 LER WHEN COMP LT-OUT (NO INEG)
KEY V98E
KEY V83E

F 16 54 (K,ROOT,THETA)
COPY R AND R007
PRO

KEY V89E

F 04 06 (TRACK AXIS OPTION)
LOAD 00002 IN R2
PRO

F 06 1A (COMPUTED R+P+Y)
COPY R+P+Y
KEY V34E

P00 KEY V37EO0E

KEY V47E (TRANSFER CSM 5V
FROM LM SLOTS TO CSM SLOTS)

FINAL MISSION C-PRIME TRANSATLANTIC-LUNAR PARKING ORBIT AND TRANSATLANTIC TIMELINE -12 NOV 1968
PROCEDURES FOR EXT DV TARGETING (ADDENDUM 9)

PROPULSION SYSTEM SELECTION
USE ADCS FOR DV GREATER THAN 1FPS AND LESS THAN OR EQUAL TO 5FPS (A DV GREATER THAN 5FPS REQUIRES SCHEDULING THE MIDCOURSE AT THE EARLIEST POSSIBLE TIME, HENCE THE 5FPS SHOULD NOT BE REQUIRED FOR THIS MIDCOURSE CONDITION)

TRIM DVS TO ZERO

PROCEDURES FOR SM RCS PROPULSION MONITOR CHECK (ADDENDUM 10)

PROCEDURES FOR RCS THRUST SETUP (ADDENDUM 12)

SECOND TRANSLUNAR MIDCOURSE

PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECKS (ADDENDUM 10)

PROCEDURES FOR STAR/Earth HORIZON SIGHTINGS - 4 SETS OF 3 MARKS EACH (ADDENDUM 4)

RECOMMENDED NAV STARS
No. 16 (PROCYON) (FAR MOR) No. 22 (REGULUS) (FAR MOR)
No. 21 (ALPHARD) (FAR MOR) No. 26 (SPICA) (NEAR MOR)
No. 21 (ALPHARD) HAS MAG 2.2 AND MAY NOT BE VISIBLE IF NOT SELECT NO. 22 (REGULUS)

PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5)

PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)

PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)

PROCEDURES FOR IMU REALIGN TO REFMMAT (ADDENDUM 2)

BACKUP ALIGN STARS
No. 14 (CANOPUS) No. 12 (RIGEL)

FINAL MISSION C-PRIME TRANSLUNAR LINEAR PARKING ORBIT AND TRANS-EARTH TIMELINE -12 NOV 1968
BACKUP ALIGN CHECK NAV STAR
NO. 15 (SIRIUS)

(34+15)

PROCEDURES FOR GNC ALIGN TO I-U
(ADDENDUM 3)

(34+20)

PROCEDURES FOR STAR/earth
horizon sightings = 3 sets
of 3 marks each
(ADDENDUM 4)

RECOMMENDED NAV STARS
NO. 16 (PROCYON)
NO. 22 (REGULUS)
NO. 26 (SPICA)

(34+50)

PROCEDURES FOR LOI POSITION
DETERMINATION
(ADDENDUM 5)

(34+55)

LMP RECEIVE BLOCK DATA PAN
FROM ANG

(35+00)

PROCEDURES FOR ESTABLISHING P+g
(ADDENDUM 13)

(44+00)

LMP RECEIVE BLOCK DATA PAN
FROM ANG

(44+35)

PROCEDURES FOR TERMINATING PTC
(ADDENDUM 14)

(44+60)

PROCEDURES FOR IMU REALIGN
TO REFLEXMAT
(ADDENDUM 2)

BACKUP ALIGN STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)
BACKUP ALIGN CHECK NAV STAR
NO. 15 (SIRIUS)

(44+55)

PROCEDURES FOR GNC ALIGN TO IMU
(ADDENDUM 3)

(45+00)

PROCEDURES FOR STAR/LUNAR
horizon sightings = 5 sets
of 3 marks each
(ADDENDUM 4)

RECOMMENDED NAV STARS
NO. 33 (ANTARES) (NEAR HOR)
NO. 33 (ANTARES) (NEAR HOR)
NO. 37 (FUNKI) (NEAR HOR)
NO. 45 (FOMALHAUT) (FAR HOR)
NO. 42 (PEACOCK) (FAP HOR)

(45+50)

PROCEDURES FOR LOI POSITION
DETERMINATION
(ADDENDUM 5)

(45+60)

FINAL MISSION C=PRIME TRANSLEARNER, LUNAR PARKING ORBIT, AND TRANS-EARTH TIMELINE - 12 Nov 1968
PROCEDURES FOR GND UPLINK OF CSM STATE VECTOR AND P30 TARGET (ADDENDUM H) (P27)

FOLLOWING GND UPLINK

P00

LEH WHEN COMP LT-011T (NO INTEGRATION)

KEY V96E

KEY V83E

F 16 54 (H, HDOT, THETA)

COPY R AND READY PRO

KEY V89E

F 04 05 (TRACK AXIS OPTION)

LOAD 00002 IN R2 PRO

F 06 18 (COMPUTED R, P, Y)

COPY R, P, Y

KEY V34E

P00

KEY V37E00E

KEY V4TE (TRANSFER CSM SV FROM LM SLOTS TO CSM SLOTS)

PROcedures FOR EXT DV TARGETING (ADDENDUM 9) (P30)

---------------------

PROPELLANT SYSTEM SELECTION

USE RCS FOR DV GREATER THAN 1 FPS AND LESS THAN OR EQUAL TO 5 FPS (A DV GREATER THAN

SFPs REQUIRE SCHEDULING THE MIDCOURSE AT THE EARLIEST POSSIBLE TIME, HENCE THE SPS SHOULDN'T BE REQUIRED FOR THIS MIDCOURSE CORRECTION)

TRIM OV5 TO ZERO

---------------------

PROcedures FOR SM RCS PROPULSION MONITOR CHECK (ADDENDUM 10)

PROcedures FOR RCS THRUST SETUP (ADDENDUM 12) (P41)

THIRD TRANSLUNAR MIDCOURSE (P47)

PROcedures FOR SM RCS AND SPS PROPULSION MONITOR CHECKS (ADDENDUM 10)

PROcedures FOR STAR/Earth Horizon Sightings - 3 Sets of 3 Marks Each (ADDENDUM 4) (P23)

Recommended NAV Stars

No. 16 (Procyon) (Far Hor)

No. 22 (Regulus) (Far Hor)

No. 26 (Spica) (Near Hor)

FINAL MISSION C-PRIME TRANSLUNAR LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE - 12 NOV 1968
(47+55) PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5) (P21)

(48+00) PROCEDURES FOR ESTABLISHING P+T (ADDENDUM 13)

(51+00) LMP RECEIVE BLOCK DATA PAD FROM GND

(52+03) PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)

(52+10) PROCEDURES FOR IMU REALIGN TO REFSMAT (ADDENDUM 2) (P52)

BACKUP ALIGN NAV STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)
BACKUP ALIGN CHECK NAV ST, R
NO. 15 (SIRIUS)

(52+25) PROCEDURES FOR GOC ALIGN TO IMU (ADDENDUM 3)

(52+30) PROCEDURES FOR STAR/LUNAR HORIZON SIGHTINGS - 5 SETS

OF 3 MARKS EACH (ADDENDUM 4) (P23)

RECOMMENDED NAV STARS
NO. 37 (NUNKI) (NEAR MOR)
NO. 37 (NUNKI) (NEAR MOR)
NO. 33 (ANTARES) (NEAR MOR)
NO. 33 (ANTARES) (NEAR MOR)
NO. 33 (ANTARES) (NEAR MOR)

(57+20) PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5) (P21)

(57+25) PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)

(58+25) PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)

(58+30) PROCEDURES FOR GND UPLINK OF CSM STATE VECTOR. P30 TARGET LOAD AND PREFERRED LUNAR ORBIT REFSMAT (ADDENDUM 8) (P27)

LMP RECEIVE GND BLOCK DATA PAD

(60+00) PROCEDURES FOR IMU ALIGN TO UPLINKED PREFERRED REFSMAT (ADDENDUM 2) (P52)

FINAL MISSION C-PRIME TRANSLUNAR/LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE - 12 NOV 1968
RCS UP ALIGN NAV STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)
BACKUP ALIGN CHECK NAV STARS
NO. 15 (SIRIUS)

(60+25)
PROCEDURES FOR GOC ALIGN TO IMU
(ADDENDUM 3)

(60+30)
PROCEDURES FOR EXT DV TARGETING
(ADDENDUM 9) (P30)

-------------------------------
PROPULSION SYSTEM SELECTION
USE RCS FOR DV LESS THAN 5R
EQUAL TO SFRS (A MV GREATER
THAN 5FRS WILL BE SCHEDULED
AT THE EARLIEST POSSIBLE TIME
AND HENCE THIS MICOURSE
SHOULD NOT REQUIRE THE SDS)

TRIM DVS TO ZERO
-------------------------------

(60+35)
PROCEDURES FOR SM RCS PROPULSION
MONITOR CHECK
(ADDENDUM 10)

(60+40)
PROCEDURES FOR RCS THRUST SETUP
(ADDENDUM 12) (P47)

(61+00)
FOURTH TRANSLUNAR MICOURSE

(61+05)
PROCEDURES FOR SW RCS AND SPS
PROPULSION MONITOR CHECKS
(ADDENDUM 10)

(61+10)
PROCEDURES FOR LOII POSITION
DETERMINATION
(ADDENDUM 5) (P21)

(61+15)
PROCEDURES FOR ESTABLISHING PTC
(ADDENDUM 13)

(65+55)
PROCEDURES FOR TERMINATING PTC
(ADDENDUM 14)

(66+00)
PROCEDURES FOR IMU REALIGN
TO REFSMAT
(ADDENDUM 2) (P52)
BACKUP ALIGN NAV STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)
BACKUP ALIGN CHECK NAV STARS
NO. 15 (SIRIUS)

(66+15)
PROCEDURES FOR GOC ALIGN TO IMU
(ADDENDUM 3)

(66+20)
POO LMP RECEIVE LOII PAD FROM GND

FINAL MISSION C-PRIME TRANSLUNAR+LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE 12 NOV 1968
FOR STAR CHECK
(ROLL GMBL WILL BE THAT
WHICH PROVIDES COMM)

CDR FAI SCALE=5/1
FAI SELECT=1/2
MAN ATT(3)=RATE CMD
LIMIT CYCLE=OFF
ATT DB-MAX
RATE=LOW
SC CONT=CNC
CMC MODE=AUTO
RMAG MODE(3)=RATE2
RMC=ARMED

LER KEY V40E
F 06 22 (FINAL GMBL ANGLES)
LOAD BIJRN ATT STAR
CHECK GMBL ANGLES
KEY V02E
PRO
F 50 18 (COMMANDER R,P,Y)
PRO
06 18 (COMMANDER R,P,Y)
CDR MONITOR ATT MANEUVER
FOR GMBL LOCK
F 50 18 (COMMANDER R,P,Y)
VERIFY R,P,Y AGREE WITH
PAU R,P,Y WITHIN 5 DEG
NULL FAI NEEDLES WITH RM-
LER PRO
A/N P=OPTICS-ON
OPT ZERO-ZERO(15SEC)
OPT TELTRUN-SLAVE TO SXT
RETICLE BRT TW=ADJUST

OPT ZERO-OFF
OPT MODE=CNC
KEY V4191E
F 21 92 (BLANK+BLANK+BLANK)
LOAD PAD SHAFT ANGLE(XXX,XX)
IN R1 AND PAD TRU NVIDIA ANGLE
(4XX,XXX) IN R2
41 BB (SHAFT+TRU NVIDIA+BLANK)
MONITOR OPT DRIVE TO PAD
VALUES
VERIFY PAD STAR IN SXT
OPT MODE=MAN
DRIVE TRUN LESS THAN 5 DEG
OPT ZERO-ZERO
RETICLE BRT TW=MIN ARThESS

(64+30)
PROCEDURES FOR ESTABLISHING PTC
(ADDENDUM 13)

(67+30)
PROCEDURES FOR TERMINATING PTC
(ADDENDUM 14)

(67+35)
PROCEDURES FOR GDC DRIFT CHECK
(ADDENDUM 7)

(67+40)
PROCEDURES FOR IMU REALIGN TO
REFSMAAT FOR DRIFT CHECK
(ADDENDUM 2)
(HACKUP ALIGN NAV STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)

FINAL MISSION C-PRIME TRANSLUNAR+L-NAR PARKING ORBIT AND TRANSEARTH TIMELINE - 12 NOV 1968
RACKUP ALIGN CHECK NAV STK
NO. 14 (SIRIUS)

(67+55)
PROCEDURES FOR GDC ALIGN TO IMU
(ADDENDUM 3)

(68+00)
CDR RECEIVE GO/NO-GO FOR LOI
PROCEDURES FOR GND UPLINK OF SM
STATE VECTOR AND P30 TARGET LOAD
(ADDENDUM 8) (P27)

LMP INITIATE PRE-LOI SYSTEMS CHECK

(68+20)
PROCEDURES FOR LOI POSITION
DETERMINATION
(ADDENDUM 5) (P27)

(68+25)
PROCEDURES FOR EXTERNAL DV TARGETING
(ADDENDUM 9) (P30)

************
PROPULSION SYSTEM SELECTION
USE SPS AND DO NOT TRIM DUS
************

(68+30)
PROCEDURES FOR SM RCS PROPULSION
MONITOR CHECKS
(ADDENDUM 10)

(68+75)

PROCEDURES FOR SPS THRUST SETUP
(ADDENDUM 11) (P40)

MSFN LOS
(69+57)

(69+07)
FIRST LUNAR ORBIT INJECTION

*** BEGIN REV 1 ***
(69+09)

LMP TLM INPUTS PCM-LBR
TAPE RCDR-FWD

(69+20)
PROCEDURES FOR SM RCS AND SPS
PROPULSION MONITOR CHECKS
(ADDENDUM 10)

PROCEDURES FOR GDC ALIGN TO IMU
(ADDENDUM 3)

PROCEDURES FOR ORDEAL SETUP
(ADDENDUM 18)

(69+28)
CDR ATT DB-MAX
RATE=LOW
BMAG MODE(3)=ATT1/RATE2
SC CONT=SCS
MAN ATT(R)=ACC CMD

FINAL MISSION C-PRIME TRANSLUNAR LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE —12 NOV 1968
MAN ATT(P+Y)=RATE CMD
MANEUVER SC IN ROLL 180 DEG
MAN ATT(3)=RATE CMD
LMP SELECT S 80 ANT OMNI-A OR B
OVBH=ON
SH RANGING-OFF

MSFN AOS
(69+30)

PROCEDURES FOR HI GAIN ACQUISITION
OF MSFN
(ADDENDUM 19)

LMP RECEIVE BLOCK DATA FOR
TEI FROM MSFN

SUNDOWN
(70+14)

PROCEDURES FOR I/U REALIGN
TO REF/SMAT
(ADDENDUM 2)

RACKUP ALIGN NAV STARS
NO. 14(CANOPUS)
NO. 17(RIGEL)
RACKUP ALIGN CHECK NAV STAR
NO. 15(SIRIUS)

(70+30)

PROCEDURES FOR GDC ALIGN TO I/U
(ADDENDUM 3)

PROCEDURES FOR ORDEAL

VERIFICATION
(ADDENDUM 18)

LMP UP TLMM=CMD RESET
UP TLMM=NORMAL

MSFN LOS
(70+59)

CDR MAN ATT(P)=ACC CMD
MANEUVER SC TO 315 DEG PITCH
AND 180 DEG ROLL W.R.T.
LOCAL HORIZONTAL
MAN ATT(P)=MIN IMP
INITIATE ORBITAL PITCH RATE

SUNUP
(71+00)

(71+05)

CMP CONTROL POINT LMK
FAMILIARIZATION
IDENTIFY IDENTIFICATION POINTS
AND CONTROL POINTS AT
RESPECTIVE TIMES OF CLOSEST
APPROACH

***BEGIN REV 2 ***
(71+21)

(71+30)

**PREPARE FOR TV PICTURES**

FINAL MISSION C=PRIME TRANSLUNAR-LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE = 12 NOV 1968
COR MAN ATT(y)-ACCEL CMD
YAW SC RIGHT TO 45 DEG YAW
315 DEG PITCH AND 180 DEG
ROLL W.R.T. LOCAL HORIZON-TAI
MAN ATT(y)-RATE CMD
MAINTAIN ORBITAL PITCH RATE
FOR TV PICTURES

LMP SELECT S BD ANT OMNI= A OR B
NVBU=ON
SH RANGING=OFF

MSFN AOS
(71*38)

PROCEDURES FOR HI GAIN ACQUISITION
OF MSFN
(ADDENDUM 19)
(71*40)

PROCEDURES FOR GND UPLINK OF FSHP
STATE VECTOR AND P30 TARGET; OAD
(ADDENDUM 8)
(71*50)

COR MAN ATT(y)-ACCEL CMD
YAW SC LEFT TO 0 DEG YAW
315 DEG PITCH AND 180 DEG
ROLL W.R.T. LOCAL HORIZON-TAI
MAN ATT(y)-RATE CMD
MAINTAIN ORBITAL PITCH RATE

(72*00)

LMP PSEUDO LANDING SITE
FAMILIARIZATION
IDENTIFY IDENTIFICATION POINTS

AND PSEUDO LANDING SITE AT
RESPECTIVE TIMES OF CLOSEST
APPROACH

COR STOP PITCH RATE BY SWITCHING
MAN ATT(3)-RATE CMD
(72*15)

COR RECEIVE GO/NO-GO FOR LO12
SUNBURN
(72*22)

LMP RECEIVE BLOCK DATA FROM TEI
FROM MSFN
(72*30)

PROCEDURES FOR IMU REALIGN
TO REF SHMAT
(ADDENDUM 2)
(P52)

BACKUP ALIGN NAV STARS
NO. 14(CANOPUS)
NO. 12(ARIEL)
BACKUP ALIGN CHECK NAV STAR
NO. 15(SIRIUS)
(72*45)

PROCEDURES FOR OCD ALIGN TO IMU
(ADDENDUM 3)
(72*50)

PROCEDURES FOR EXT DV TARGETING
(ADDENDUM 9)
(P58)

FINAL MISSION CAPRIME TRANSLUNAR-LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE -12 NOV 1969
PROPULSION SYSTEM SELECTION
USE SPS/DO NOT TRIM NV

(ADDENDUM 10)

PROCEDURES FOR SPS THRUST SETUP
(ADDENDUM 11)

(ADDENDUM 10)

PROCEDURES FOR GDC ALIGN TO IMU

(ADDENDUM 3)

PROCEDURES FOR ORDEAL SETUP

(ADDENDUM 18)

CDR ATT DB-MAX
RATE=LOW
H/MODE(3)=ATT 1/RATE 2
SC CONT=SCS
MAN ATT(R,P)=ACCEL CMD
MAN ATT(Y)=RATE CMD
MANEUVER SC TO 307 DEG PITCH
AND 140 DEG ROLL W.R.T.
LOCAL HORIZONTAL
MAN ATT(R)=RATE CMD
MAN ATT(P)=MIN IMP
INITIATE ORBITAL PITCH RATE

LMP SELECT S BD ANT OMNI-A OR B
OVBU=ON
SB RANGING-OFF

MSFN AOS

(ADDENDUM 19)

PROCEDURES FOR HI GAIN ACQUISITION
OF MSFN

(74+15)

CDR WHEN PSEUDO LANDING SITE IS

FINAL MISSION C-PRIME TRANSLUNAR/LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE - 12 NOV 1968
ACQUIRED IN CMASS INCREASE THE PITCH RATE TO KEEP X-AXIS CAMERAS POINTED AT IT TERMINATE PITCH RATE WHEN LANDMARK IS NO LONGER VISIBLE CDR MAN ATT(P)=ACCEL CMD PITCH SC DOWN TO 0 DEG PITCH AND 180 DEG ROLL W.R.T. LOCAL HORIZONTAL MAN ATT(P)=RATE CMD

SUNDOWN (74.22)

LMP RECEIVE BLOCK DATA FOR TFI FROM MSFN

(74.30)

PROCEDURES FOR IMU REALIGN TO RFSNAVAT (ADDENDUM 2) (P52)

BACKUP ALIGN NAV STARS
NO 14(CANOPUS)
NO 12 (RIGEL)
BACKUP ALIGN CHECK NAV STAR
NO 15(SIRIUS)

(74.45)

PROCEDURES FOR GGC ALIGN TO IMU (ADDENDUM 3)

(74.50)

PROCEDURES FOR ORDEAL VERIFICATION (ADDENDUM 18)

(74.55)

LMP BEGIN PHOTOGRAPHIC PREPARATION FOR VERTICAL STEREO NAVIGATION PHOTOGRAPHY

LMP UP TLM=CMD RESET
UP TLM=NORMAL

MSFN LOS (74.59)

CDR MAN ATT(P)=ACCEL CMD PITCH SC UP TO 270 DEG PITCH AND 180 DEG ROLL W.R.T. LOCAL HORIZONTAL MAN ATT(P)=MIN IMP INITIATE ORBITAL PITCH RATE

SUNUP (75.09)

(75.13)

LMP KEY V06N65

(75.15)

CDR+LMP WHEN X-AXIS CROSSES TERMINATOR KEY ENTER/START CAMERA FOR VERTICAL STEREO NAVIGATION PHOTOGRAPHY

06 65 (GET)
LMP RECORD GET
CDR KEY N20E
06 20 (H,P,Y)
LMP RECORD PRESENT GMBL ANGLES
LMP MONITOR PHOTOGRAPHY

FINAL MISSION C-PRIME TRANSLUNAR+LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE -12 NOV 1968
CDR MONITOR ORBITAL PITCH RATE

*** BEGIN REV A ***

(75+30)

(75+40)

CDR MAN AT(T)-ACCEL CMD
AT THE SUBSOLAR POINT,
ROLL SC 180 DEG TO 0 DEG ROLL
AND 270 DEG PITCH W.R.T.
LOCAL HORIZONTAL
MAN AT(T)-RATE CMD
REINITIATE ORBITAL PITCH RATE
LMP SELECT S BD ANT OMNI-C OR D
DVRU-ON
SR HANGING-OFF

(75+55)

CDR KEY VON665
CDR-LMP KEY ENTER/STOP CAMERA
06 45 (GET)
LMP RECORD GET
CDR KEY N2#E
06 20 (R,Py)
LMP RECORD PRESENT OMNI ANGLE
CDR STOP PITCH RATE

(76+00) (TCA OF 70 DEG LONGITUDE WILL
BE UPDATED REALTIME)

CDR MAN AT(T)-ACCEL CMD
PITCH UP TO 5 DEG PITCH
AND 0 DEG ROLL W.R.T.
LOCAL HORIZONTAL
MAN AT(T)-MIN IMP
REINITIATE ORBITAL PITCH RATE
LMP ENTER LEB

(76+05)

**BEGIN LANDING SITE LIGHTING EVALUATION**

LEB KEY V37E22E

F 06 45 (BLANK, BLANK, MAX MGA)
LEB PRO
F 05 70 (LANDMARK CODE)
LOAD 10001 IN R2
LEB OPE 760-OFF
OPE MDE=MAN
POSITION TRUNNION TO 10 DEG
LEB IDENTIFY IDENTIFICATION POINTS
AND PSEUDO LANDING SITE AT
THEIR RESPECTIVE ACQUISITION TIMES
EVALUATE THE LIGHTING BETWEEN
THE LANDING SITE AND THE
TERMINATOR
LEB UPON ACQUISITION OF THE
TERMINATOR
OPE MDE=CME
LEB PRO
06 92 (SHAFT, TRUN, BLANK)
EVALUATE AUTO OPTICS ACQUISI-
TION OF THE PSEUDO LANDING

FINAL MISSION C-PRIME TRANSLUNAR L: LAR PARKING ORBIT AND TRANSEARTH TIMELINE 12 NOV 1968
SITE
CDR ROLL TO AVOID SHAFT AXIS
WITHIN 10 DEG OF LANDING SITE
LEB WHEN LANDING SITE NO LONGER
VISABLE=
OPT MODE=MAN
EVALUATE EARTHSIDE TRACKING
FEASIBILITY
LEB POSITION TRUNK TOP TO 5 DEG
OPT ZERO-ZERO
OPT MODE=MAN
LEB KEY V37E00E

LMP RECEIVE BLOCk DATA FOR
TEI FROM MSFN
(7A+30)

PROCEDURES FOR IMU REALIGN
TO REFSMAT
(ADDENDUM 2)
(P52)

BACKUP ALIGN NAV STARS
NO 14(CANOPUS)
NO 12(RIGEL)
BACKUP ALIGN CHECK NAV STAR
NO 15(SIRIUS)
(76+45)

PROCEDURES FOR GNC ALIGN TO IMU
(ADDENDUM 3)

(76+50)

PROCEDURES FOR ORDEAL VERIFICATION
(ADDENDUM 18)

LMP UP TLM-CMD RESET
UP TLM-NORMAL

(76+58)

CDR MAN ATT(R,P)=ACCEL CMD
MAN ATT(R)=ACCEL CMD
MAN ATT(P)=MIN IMP
INITIATE ORBITAL PITCH RATE
FOR LANDMARK SIGHTINGS

SUNDOWN
(76+21)

PROCEDURES FOR HI GAIN ACQUISITION
OF MSFN
(ADDENDUM 19)

(76+25)

PROCEDURES FOR GND UPLINK OF ASH
STATE VECTOR
(ADDENDUM 8)

CNP KEY V47E

FINAL MISSION C=PRIME TRANSLUNAR+Lunar PARKING ORBIT+AND TRANSEARTH TIMELINE =12 NOV 1968
**SUNUP** (77*07)

(77*25)

PROCEDURES FOR TRACKING THE SECOND CONTROL POINT LANDMARK (NO AUTO OPTICS)
(ADDITIONAL 16) (P22)

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***BEGIN REV 5***

(77*29)

LMP SELECT S 90 ANTI OMNI-C OR U DVRU-ON SR RANGING-OFF

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**MSFN AOS**

(77*44)

(78*05)

PROCEDURES FOR TRACKING THE PSEUDO LANDING SITE
(ADDITIONAL 19) (P22)

(78*15)

CNR MAN ATT(R)-ACCFL CMD
ROLL SC 180 DEG TO ABOUT 300 DEG PITCH AND 180 DEG ROLL W*RT LOCAL HORIZON TAI
MAN ATT(RSP)-RATE CMD

(78*20)

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**SUNDOWN**

PROCEDURES FOR HI GAIN ACQUISITION OF MSFN
(ADDITIONAL 19)

(78*25)

PROCEDURES FOR GND UPLINK OF CSM STATE VECTOR
(ADDITIONAL 8)

CMR KEY VATE

LMP RECEIVE BLOCK DATA FOR TF1 FROM MSFN

(78*30)

PROCEDURES FOR IMU REALIGN TO REFRESH MAT
(ADDITIONAL 12) (P52)

HACKUP ALIGN NAV STARS
NO 14(CANOPUS)
NO 12(ARIEL)
HACKUP ALIGN CHECK NAV STAR
NO 15(SIRIUS)

(78*45)

PROCEDURES FOR SDC ALIGN TO IMU
(ADDITIONAL 3)

(78*50)

PROCEDURES FOR ORDEAL VERIFYATION
(ADDITIONAL 16)

LMP UP TLM-CMD RESET

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FINAL MISSION C-PRIME TRANS-LUNAR+LUNAR PARKING ORBIT+AND TRANSEARTH TIMELINE NOV 1968
UP TLM=NORMAL

MSFN LOS

(7A+5A)

CDR MAN ATT(R+P)=ACCEL CMD
MANEUVER SC TO 5 DEG PITCH
AND 0 DEG ROLL W.R.T.
LOCAL HORIZONTAL
MAN ATT(R)=HATF CMD
MAN ATT(P)=MIN IMP
INITIATE ORBITAL PITCH RATE
FOR LANDMARK SIGHTINGS

SUNUP

(79+06)

(79+25)

PROCEDURES FOR TRACKING THE
SECOND CONTROL POINT LANDMARK
(WITH AUTO OPTICS)
(ADDENDUM 17)

PROCEDURES FOR TRACKING THE
PSEUDO LANDING SITE
(ADDENDUM 15)

(8A+00)

PROCEDURES FOR HI GAIN ACQUISITION
OF MSFN
(ADDENDUM 19)

(8A+15)

SUNDOWN

(8A+18)

PROCEDURES FOR OND UPLINK OF CSM
STATE VECTOR
(ADDENDUM 8)

(8A+25)

CMP KEY V47E

(8A+30)

LMP RECEIVE BLOCK DATA FOR
TEI FROM MSFN

LMP SELECT S WD ANY OMNI-C OR D
DV8U-ON
SB RANGING-OFF

MSFN AOS

(79+47)

BACKUP ALIGN NAV STARS
NO 14(CANOPUS)

FINAL MISSION C=PRIME TRANS Lunar+Lunar PARKing ORBIT+AND TRANSEarth TIMELINE =12 NOV 1968
(81-25)
PROCEDURES FOR TRACKING THE SECOND CONTROL POINT LANDMARK
(WITH AUTO OPTICS)
(ADDENDUM 17)  (P22)

(81-27)
*** BEGIN REV 7 ***

LMP SELECT S BD ANT OMNI-C OR D
DVBUS-ON
SB RANGING-OFF

(81-40)
PROCEDURES FOR TRACKING THE THIRD CONTROL POINT LANDMARK
(NO AUTO OPTICS)
(ADDENDUM 16)  (P22)

(82-00)
PROCEDURES FOR TRACKING THE PSEUDOLANDING SITE
(ADDENDUM 15)  (P22)

(82-15)
COR MAN ATT(R,P)=ACCEL CMD
ROLL SF 180 DEG TO ABOUT
360 DEG PITCH AND 180 DEG
ROLL W.R.T. LOCAL HORIZONTAL
MAN ATT(R,P)=RATE CMD

(81-10)
PROCEDURES FOR TRACKING THE FIRST CONTROL POINT LANDMARK
(NO AUTO OPTICS)
(ADDENDUM 16)  (P22)

NO 12(RIGEL)
BACKUP ALIGN CHECK NAV STATION
NO 15(SIRIUS)

NO 12(RIGEL)
BACKUP ALIGN CHECK NAV STATION
NO 15(SIRIUS)

PROCEDURES FOR GOC ALIGN TO I-U
(ADDENDUM 3)

PROCEDURES FOR ORDEAL VERIFICATION
(ADDENDUM 18)

LMP UP TLM=CMU RESET
UP TLM=NORMAL

MSFN LOS
(80-40)

COR MAN ATT(R,P)=ACCEL CMD
MANEUVER SC TO 5 DEG PITCH
AND 0 DEG ROLL W.R.T.
LOCAL HORIZONTAL
MAN ATT(R)=RATE CMD
MAN ATT(P)=MIN IMP
INITIATE ORBITAL PITCH RATE
FOR LANDMARK SIGHTINGS

SUNUP
(81-04)

PROCEDURES FOR TRACKING THE SECOND CONTROL POINT LANDMARK
(WITH AUTO OPTICS)
(ADDENDUM 17)  (P22)

FINAL MISSION C-PRIME TRANS'LUNAR LUNAR MARKING ORBIT AND TRANSEARTH TIMELINE -12 NOV 1968
PROCEDURES FOR HI GAIN ACQUISITION OF MSFN (ADDENDUM 19)

PROCEDURES FOR GND UPLINK OF ASM STATF VELOCITY (ADDENDUM 8)

CMP KEY V47E

LMP RECEIVE BLOCK DATA FOR TEI FROM MSFN

PROCEDURES FOR IMU REALIGN TO REF SSMAT (ADDENDUM 12) (P53)

BACKUP ALIGN NAV STARS
NO 14 (CANOPUS)
NO 12 (RIGEL)
BACKUP ALIGN CHECK NAV STARS
NO 15 (SIRIUS)

PROCEDURES FOR GOC ALIGN TO IMU (ADDENDUM 3)

PROCEDURES FOR ORDEAL VERIFICATION (ADDENDUM 18)

LMP UP TLM=CMD RESET UP TLM=NORMAL

MSFN LOS (82-52)

CDR MAN ATT(R,P)-ACCEL CMD MANEUVER SC TO 5 DEG PITCH AND 0 DEG ROLL W.R.T. LOCAL HORIZONTAL MAN ATT(R)-RATE CMD MAN ATT(P)-MIN IMP INITIATE ORBITAL PITCH RATE FOR LANDMARK SIGHTINGS

SUNUP (87-03)

PROCEDURES FOR TRACKING THE FIRST CONTROL POINT LANDMARK (WITH AUTO OPTICS) (ADDENDUM 17) (P22)

(87-20)

PROCEDURES FOR TRACKING THE SECOND CONTROL POINT LANDMARK (WITH AUTO OPTICS) (ADDENDUM 17) (P22)

FINAL MISSION C-PRIME TRANSLUNAR+L-NAR PARKING ORBIT AND TRANSEARTH TIMELINE -12 NOV 1968
MSFN AOS (84-39)

PROCEDURES FOR TRACKING THE THIRD CONTROL POINT LANDMARK (WITH AUTO OPTICS)
(ADDENDUM 17) (P22)

(84-00)

PROCEDURES FOR TRACKING THE PSEUDO LANDING SITE
(ADDENDUM 15) (P22)

(84-10)

CDR MAN ATT(R)=ACCL CMD
ROLL SC 180 DEG TO ABOUT 300 DEG PITCH AND 1AN DEG
ROLL W.R.T. LOCAL HORIZ TAI
MAN ATT(R,P)=RATE CMD

(84-15)

SUNDOWN

PROCEDURES FOR HI GAIN ACQUISITION
OF MSFN
(ADDENDUM 19)

(84-20)

PROCEDURES FOR GND UPLINK OF ASM
STATE VECTOR
(ADDENDUM 8)

CMP KEY V47E

LMP RECEIVE BLOCK DATA FOR TE1 FROM MSFN

(84-25)

PROCEDURES FOR IMU REALIGN
TO REFWSMAT
(ADDENDUM 12) (P52)

BACKUP ALIGN NAV STARS
NO 14(CANOPUS)
NO 12(RIGEL)
BACKUP ALIGN CHECK NAV STAR
NO 15(SIRIUS)

(84-40)

PROCEDURES FOR GDC ALIGN TO IMU
(ADDENDUM 3)

PROCEDURES FOR ORDEAL VERIFICATION
(ADDENDUM 18)

LMP BEGIN PHOTOGRAPHIC PREPARATION
FOR DARKSIDE AND SOLAR CORONA PHOTOGRAPHY

CDR MAN ATT(P)=ACCEL CMD
PITCH SC UP TO 0 DEG PITCH
AND 180 DEG ROLL W.R.T.
LOCAL HORIZONTAL
MAN ATT(P)=MIN LMP
INITIATE ORBITAL PITCH RATE

(84-45)

LMP PERFORM DARKSIDE AND SOLAR CORONA PHOTOGRAPHY

FINAL MISSION C-PRIME TRANSLUNAR+LUNAR PARKING ORBIT AND THANSEARTH TIMELINE -12 NOV 1968
LMP UP TLM=CMD RESET
UP TLM=NORMAL

MSFN LOS
(84:51)

LMP BEGIN PHOTOGRAPHIC PREPARATION
FOR CONVERGENT STEREO
NAVIGATION PHOTOGRAPHY

CDR MAN ATT(P)=ACCEL CMD
PITCH SC UP TO 290 DEG PITCH
AND 180 DEG ROLL W.R.T.
LOCAL HORIZONTAL MAN ATT(P)=MIN IMP
INITIATE ORBITAL PITCH RATE

SUNUP
(85:02)

LMP KEY V06N65

CDR LMP WHEN X-AXIS CROSSES TERMINATOR
KEY ENTER/START CAMERA FOR
CONVERGENT STEREO NAVIGATION
PHOTOGRAPHY

06 65 (GET)
LMP RECORD GET
CDR KEY N20E
06 20 (R,P,Y)
LMP RECORD PRESENT GMML ANGLE

LMP MONITOR PHOTOGRAPHY;
CDR MONITOR ORBITAL PITCH RATE

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*** BEGIN REV 9 ***
(84:25)

CDR MAN ATT(P)=ACCEL CMD
PITCH SC UP 40 DEG TO 250 DEG
PITCH AND 180 DEG ROLL W.R.T.
LOCAL HORIZONTAL AT THE
SUBSOLAR POINT
MAN ATT(P)=MIN IMP
REINITIATE ORBITAL PITCH RATE
(ROLL AS REQUIRED TO SHADE
WINDOWS)

LMP SELECT S BD ANT OMNI=C OR D
DVBU=ON
SB RANGING=OFF

MSFN AOS
(85:37)

(86:10)

CDR KEY V06N65

CDR LMP KEY ENTER/STOP CAMERA
06 65 (GET)
LMP RECORD GET
CDR KEY N20E
06 20 (R,P,Y)
LMP RECORD PRESENT GMML ANGLES
CDR STOP PITCH RATE

SUNDOWN

FINAL MISSION C=PRIME TRANSLUNAR;LUNAR PARKING ORBIT;AND TRANSEARTH TIMELINE =12 NOV 1968
CDR MAN ATT(p)-ACCEL CMD
PITCH SC DOWN 60 DEG TO ABQT
310 DEG PITCH AND 180 DEG
ROLL W.R.T. LOCAL HORIZONTAL
ROLL 180 DEG IF REQUIRED
MAN ATT(p)-RATE CMD

PROCEDURES FOR HI GAIN ACQUISITION OF MSFN
(ADDENDUM 19)

PROCEDURES FOR GND UPLINK OF ASV
STATE VECTOR
(ADDENDUM 8)

CMP KEY V47E
LMP RECEIVE BLOCK DATA FOR TEI FROM MSFN

PROCEDURES FOR IMU REALIGN TO REF SMTRAT
(ADDENDUM 12)
BACKUP ALIGN NAV STARS
NO 14(CANOPUS)
NO 12(RIGEL)
BACKUP ALIGN CHECK NAV STAR
NO 15(SIRIUS)

PROCEDURES FOR GDC ALIGN TO IMU

(ADDENDUM 3)

PROCEDURES FOR DEEAL VERIFICATION
(ADDENDUM 11)
LMP UP TLM-CMD) RESET
UP TLM-NORMAL
MSFN LOS
(87-49)

CDR MAN ATT(p)-ACCEL CMD
PITCH SC UP TO 270 DEG PITCH
AND 180 DEG ROLL W.R.T.
LOCAL HORIZONTAL
MAN ATT(p)-MIN IMP
INITIATE ORBITAL PITCH RATE
FOR LUNAR OBSERVATION

SUN/LP
(87-00)

*** BEGIN REV 10 ***
(87-24)

LMP SELECT S BD ANT OMNI=A OR B
DVNU-ON
SB RANGING-OFF

MSFN AOS
(87-35)

CDR MAN ATT(p)-RATE CMD

FINAL MISSION C-PRIME TRANSLUNAR/Lunar Parking Orbit AND TRANSARTH TIMELINE -12 NOV 1968
PROCEDURES FOR HI GAIN ACQUISITION
OF MSFN
(ADDENDUM 19)

(87+40)

PROCEDURES FOR GND UPLINK OF -SM
STATE VECTOR AND P30 TARGET TASK
(ADDENDUM 8), P27)

LMP RECEIVE BLOCK DATA FOR
TEI FROM MSFN

(87+55)

PROCEDURES FOR TEI ROLL ATT
CHECK EXCEPT ROLL

CDR FDAI SCALE=5/1
FDAI SELECT=1/2
MAN ATT(3) ROLL CMD
LIMIT CYCLE=OFF
ATT DB=MAX
RATE=LOW
SC CONT=CNC
CNC MODE=AUTO
RMAG MODE(3)=RATE2
RMC-ARMED

LEB KEY V49E
F 06 22 (FINAL GMBL ANGLES)
LOAD BURN ATT STAR
CHECK GMBL ANGLES
KEY V62E
PRO
F 50 18 (COMMANDED R,P,Y)
PRO

06 18 (COMMANDED R,P,Y)
CDR MONITOR ATT MANEUVER
FOR GMRAL LOCK

F 50 18 (COMMANDED R,P,Y)
VERIFY R,P,Y AGREE WITH
PAD R,P,Y WITHIN 5 DEG
NULL FDAI NEEDLES WITH RMC

LEB PRO

G/N PWR, OPTICS-ON
OPT ZERO-ZERO(15SEC)
OPT TELTRUN-SLAVE TO SXT
RETICLE BRT TW-ADJUST
OPT ZERO-OFF
OPT MODE=CNC
KEY V499E

F 21 92 (BLANK,BLANK,BLANK)
LOAD PAD SHAFT ANGLE(*XXX,XX)
IN R1 AND PAD TRUNNION ANGLES
(*XX,XXX) IN R2

41 88 (SHAFT,TRUNNION,BLANK)
MONITOR OPT DRIVE TO PAD
VALUES
VERIFY PAD STAR IN SXT
OPT MODE=MAN
DRIVE TRUN LESS THAN 5 DEG
OPT ZERO-ZERO
RETICLE BRT W, MIN ARRETTNESS

(8A+05)

PROCEDURES FOR GOC DRIFT CHECK
(ADDENDUM 7)

(8A+10)

CDR RECEIVE GO/NO-GO FOR TEI

FINAL MISSION C-PRIME TRANS-LUNAR LUNAR PARKING ORBIT AND TRANS-EARTH TIMELINE -12 NOV 1968
LMP INITIATE PRE-TEI SYSTEMS CHECK

SUNDOWN (88.13)

(88.15) PROCEDURES FOR IMU REALIGN TO REFNMAT FOR DRIFT CHECK (ADDENDUM 2) (P52)
BACKUP ALIGN NAV STARS NO. 14 (CANOPUS)
NO. 12 (RIGEL)
BACKUP ALIGN CHECK NAV STARS NO. 15 (SIRIUS)

(88.30) PROCEDURES FOR GDC ALIGN TO I-U (ADDENDUM 3)

(88.75) PROCEDURES FOR EXT NV TARGETING (ADDENDUM 9) (P37)

*******************************
PROPELLION SYSTEM SELECTION
USE SPS AND TRIM DVS TO 2FPS
*******************************

(88.40) PROCEDURES FOR SM RCS PROPULSION MONITOR CHECK (ADDENDUM 10)
LMP UP TLM CMD = RESET THEN NOR...

MSFN LOS (88.48)

(88.45) PROCEDURES FOR SPS THRUST SETUP (ADDENDUM 11) (P40)

SUNUP (88.59)

(89.15) TRANSEARCH INJECTION

(89.20) PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECKS (ADDENDUM 10)

P00

CDR MAN ATT (P) = ACC CMD
RHCP-ARMED
MANEUVER SC IN PITCH (UP) TO
MONITOR MOON IN CMD WINDOW
MAN ATT (3) = RATE CMD

MSFN AOS (89.20)

(89.20) PROCEDURES FOR HIGH GAIN ANT ACQUISITION (ADDENDUM 19)

(90.00) PROCEDURES FOR IMU REALIGN TO REFNMAT (ADDENDUM 2) (P52)

FINAL MISSION C-PRIME TRANS LUNAR LUNAR PARKING ORBIT AND TRANS EARTH TIMELINE - 12 NOV 1968
RAILGUP ALINE NAV STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)
RAILGUP ALINE CHECK NAV STAR
NO. 15 (SIRIUS)

(90-15)
PROCEDURES FOR GDC ALIGN TO I - U
(ADDENDUM 3)

(90-30)
PROCEDURES FOR STAR/LUNAR
HORIZON SIGHTINGS = 8 SETS
OF 3 MARKS EACH
(ADDENDUM 4) (P23)

RECOMMENDED NAV STARS
NO. 1 (ALPHERATZ) (NEAR MARS)
NO. 1 (ALPHERATZ) (NEAR MARS)
NO. 10 (MIRFAK) (FAR MOON)
NO. 10 (MIRFAK) (FAR MOON)
NO. 11 (ALDEBARAN) (FAR MOON)
NO. 11 (ALDEBARAN) (FAR MOON)
NO. 2 (DIANA) (NEAR MARS)
NO. 2 (DIANA) (NEAR MARS)

(91-50)
PROCEDURES FOR ESTABLISHING PI C
(ADDENDUM 13)

(91-55)
PROCEDURES FOR RETURN TO
EARTH TARGETING
(ADDENDUM 6) (P37)

(100-05)

PROCEDURES FOR TERMINATING PTC
(ADDENDUM 14) (10-10)

PROCEDURES FOR IMU REALIGN
TO REFERENCE
(ADDENDUM 2) (P52)

RAILGUP ALINE NAV STARS
NO. 14 (CANOPUS)
NO. 12 (RIGEL)
RAILGUP ALINE CHECK NAV STAR
NO. 15 (SIRIUS)

(10-25)
PROCEDURES FOR GDC ALIGN TO IMU
(ADDENDUM 3)

(10-30)
PROCEDURES FOR STAR/LUNAR
HORIZON SIGHTINGS = 3 SETS
OF 3 MARKS EACH
(ADDENDUM 4) (P23)

RECOMMENDED NAV STARS
NO. 1 (ALPHERATZ) (NEAR MARS)
NO. 11 (ALDEBARAN) (FAR MOON)
NO. 2 (DIANA) (NEAR MARS)

(101-20)
PROCEDURES FOR STAR/ EARTH
HORIZON SIGHTINGS = 6 SETS
OF 3 MARKS EACH
(ADDENDUM 4) (P23)

RECOMMENDED NAV STARS

FINAL MISSION C-PRIME TRANS LUNAR/ LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE = 12 NOV 1968
NO. 22 (REGULUS) (FAR HOR)   KEY V47E (TRANSFER CSM SV  
NO. 22 (REGULUS) (FAR HOR) FROM LM SLOTS TO CSM SLOTS)  
NO. 26 (SPICA) (NEAR HOR)   (103.10)  
NO. 26 (SPICA) (NEAR HOR) PROCEDURES FOR IMU ALIGN TO  
NO. 31 (ARCTURUS) (NEAR HOR) UPLINKED PREFERRED REFSPMAT  
NO. 31 (ARCTURUS) (NEAR HOR) (ADDENDUM 2)  

(102.20)  
PROCEDURES FOR RETURN TO  BACKUP ALIGN NAV STARS  
EARTH TARGETING  NO. 14 (CANOPUS)  
(ADDENDUM 6)  NO. 12 (RIGEL)  
(P37)  BACKUP ALIGN CHECK NAV STAR  

NO. 15 (SIRIUS)  

(102.50)  
PROCEDURES FOR GND UPLINK OF CSM  PROCEDURES FOR GDC ALIGN TO IMU  
STATE VECTOR, P30 TARGET LOAD, AND  (103.25)  
PREFERRED ENTRY REFSPMAT  PROCEDURES FOR EXT DV TARGETING  
(ADDENDUM 9)  (ADDENDUM 9)  
FOLLOWING GND UPLINK  (P30)  
P00  PROPERGBGY  
LEB WHEN COMP LT-0.17 (NO INTEG)  
KEY V96E  

****SYSTEM WARNING****  

PROPSION SYSTEM SELECTION  
USE RCS FOR DV LESS THAN OR  
EQUAL TO 12 FPS 
USE SPS FOR DV GREATER THAN 12 FPS  

TRIM DVS TO ZERO  

****SYSTEM WARNING****  

(103.30)  
PROCEDURES FOR EXT DV TARGETING  
(ADDENDUM 9)  
(P30)  

****SYSTEM WARNING****  

PROPSION SYSTEM SELECTION  
USE RCS FOR DV LESS THAN OR  
EQUAL TO 12 FPS 
USE SPS FOR DV GREATER THAN 12 FPS  

TRIM DVS TO ZERO  

****SYSTEM WARNING****  

(107.35)  
PROCEDURES FOR SM RCS PROPSION  
MONITOR CHECK  
(ADDENDUM 10)  

FINAL MISSION C-PRIME TRANS/LUNAR/L-NAV PARKING ORBIT AND TRANSEARTH TIMELINE - 12 NOV 1968
PROCEDURES FOR RCS THRUST SETUP (ADDENDUM 12) (P41)

FIRST TRANSEARTH MIDDLE

PROCEDURES FOR SM RCS AND SPS PROPELLANT MONITOR CHECKS (ADDENDUM 10)

PROCEDURES FOR STAR/Earth HORIZON SIGHTINGS - 5 SETS OF 3 MARKS EACH
(RECOMMENDED NAV STARS
NO. 22(REGULUS) (FAR HORIZON)
NO. 22(REGULUS) (FAR HORIZON)
NO. 26(SPICA) (NEAR HORIZON)
NO. 31(ARCTURUS) (NEAR HORIZON)
NO. 31(ARCTURUS) (NEAR HORIZON)

PROCEDURES FOR RETURN TO EARTH TARGETING (ADDENDUM 6) (P37)

PROCEDURES FOR IMU REALIGN TO REFERENCE (ADDENDUM 2) (P52)
BACKUP ALIGN NAV STARS
NO. 14(CANOPUS)
NO. 12(RIGEL)
BACKUP ALIGN CHECK NAV STAR
NO. 15(SIRIUS)

PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)

PROCEDURES FOR STAR/Earth HORIZON SIGHTINGS - 5 SETS OF 3 MARKS EACH
(RECOMMENDED NAV STARS
NO. 22(REGULUS) (FAR HORIZON)
NO. 22(REGULUS) (FAR HORIZON)
NO. 26(SPICA) (NEAR HORIZON)
NO. 31(ARCTURUS) (NEAR HORIZON)
NO. 31(ARCTURUS) (NEAR HORIZON)

PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)

FINAL MISSION COMPARE TRANSPIRABLE LUNAR PARKING GRRITT AND TRANSEARTH TIMELINE 12 NOV 1968
(108.55) PROCEDURES FOR RETURN TO EARTH TARGETING (ADDENDUM 6) (P37)

(119.75) PROCEDURES FOR TERMINATING PT (ADDENDUM 14)

(119.40) PROCEDURES FOR IMU REALIGN TO REFNUMAT (ADDENDUM 2) (P57)

RACKUP ALIGN NAV STARS
NO. 16(CANOPUS)
NO. 12(RIGEL)
RACKUP ALIGN CHECK NAV STAR
NO. 15(SIRIUS)

(119.55) PROCEDURES FOR GNC ALIGN TO I-U (ADDENDUM 3)

(120.00) PROCEDURES FOR STAY/EARTH HORIZON SIGHTINGS = 3 SETS OF 3 MARKS EACH (ADDENDUM 4) (P29)

RECOMMENDED NAV STARS
NO. 22(REGULUS) (FAR HOR)
NO. 26(SPICA) (NEAR HON)
NO. 31(AHCKTURIS) (NEAR HON)

(121.30) PROCEDURES FOR RETURN TO EARTH TARGETING (ADDENDUM 6) (P37)

(121.00) PROCEDURES FOR GND UPLINK OF CSM STATE VEC TOR AND P30 TARGET LOAD (ADDENDUM 8) (P30)

FOLLOWING GND UPLINK
P00 LEB WHEN COMP LT-OUT (NO INTEG)
KEY V96E
KEY V83E
F 16 54 (RDOT,THETA)
COPY R AND RDOT
PRO
KEY V89E
F 04 06 (TRACK AXIS OPTION)
LOAD 00002 IN R2
PRO
F 06 18 (COMPUTED R,P,Y)
COPY R,P,Y
KEY V34E

P00 KEY V37E00E

KEY V47E (TRANSFER CSM SV FROM LM SLOTS TO CSM SLOTS)

(121.30) PROCEDURES FOR EXT DV TARGETING (ADDENDUM 9) (P30)

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
PROPULSION SYSTEM SELECTION

FINAL MISSION C-PRIME TRANSLUNAR LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE = 12 NOV 1968
USE RCS FOR NV LESS THAN AN EQUAL TO 12FPS
USE SPS FOR NV GREATER THAN 12FPS

TRIM DVS TO ZERO

(121+35)
PROCEDURES FOR SM RCS PROPULSION MONITOR CHECKS
(ADDENDUM 10)

(121+40)
PROCEDURES FOR RCS THRUST SET UP
(ADDENDUM 12)

(122+00)
SECOND TRANSEARTH MIDCOURSE

(122+05)
PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECKS
(ADDENDUM 10)

(122+35)
PROCEDURES FOR STAR/LUNAR HORIZON SIGHTINGS - 3 SETS OF 3 MARKS EACH
(ADDENDUM 4)

RECOMMENDED NAV STARS
NO. 2 (DIPHTHA) (NEAR HAR)
NO. 2 (DIPHTHA) (NEAR HAR)
NO. 1 (ALPHERATZ) (NEAR HAR)

(123+35)
PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 5 SETS OF 3 MARKS EACH
(ADDENDUM 4)
RECOMMENDED NAV STARS
NO. 22 (REGULUS) (FAR HOR)
NO. 22 (REGULUS) (FAR HOR)
NO. 26 (SPICA) (NEAR HOR)
NO. 31 (ARCTURUS) (NEAR FAR HOR)
NO. 31 (ARCTURUS) (NEAR FAR HOR)

(124+25)
PROCEDURES FOR ESTABLISHING PTC
(ADDENDUM 13)

(124+30)
PROCEDURES FOR RETURN TO EARTH TARGETING
(ADDENDUM 6)

(124+35)
PROCEDURES FOR TERMINATING PTC
ADDENDUM 14

(124+40)
PROCEDURES FOR IMU REALIGN TO REFSSMATT
(ADDENDUM 2)

BACKUP ALIGN NAV STARS
NO. 14 (CANORUS)
NO. 12 (RIGEL)
BACKUP ALIGN CHECK NAV STARS
NO. 15 (SIRIUS)

FINAL MISSION C-PRIME TRANS/LUNAR/LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE = 12 NOV 1968
(129+55) PROCEDURES FOR GNC ALIGN TO I\U
(ADDENDUM 3)

(EI=17HRS)

(130+00)
PROCEDURES FOR STAR/LUNAR
HORIZON SIGHTINGS = 2 SETS
OF 3 MARKS EACH
(ADDENDUM 4) (P27)

RECOMMENDED NAV STARS
NO. 2(DIPHOA) (NEAR I\R)
NO. 2(DIPHOA) (NEAR I\R)

(FI=16HRS)

(130+50)
PROCEDURES FOR STAR/\RTH
HORIZON SIGHTINGS = 6 SETS
OF 3 MARKS EACH
(ADDENDUM 4) (P27)

RECOMMENDED NAV STARS
NO. 2(\REGULUS)
NO. 2(\REGULUS)
NO. 2(\SPICA)
NO. 2(\SPICA)
NO. 31(\ARCURIUS)
NO. 31(\ARCURIUS)

(131+55) PROCEDURES FOR RETURN TO
EARTH TARGETING
(ADDENDUM 5) (P37)

(EI=15HRS)

(132+05)
PROCEDURES FOR GND UPLINK
OF CSM STATE VECTOR
(UPLINK INTO LM SLOTS ONLY)
(ADDENDUM 8) (P27)

FOLLOWING GND UPLINK
P00 LEB WHEN COMP I,T,D\C(NO INTEG)
KEY V96E
KEY V83E
F 16 54 (R,\D,\THETA)
COPY R AND ROOT
PRO
KEY V91E
F 04 06 (TRACK AXIS OPTION)
LOAD 00002 IN R2
PRO
F 06 19 (COMPUTED R,P,Y)
COPY R,P,Y
KEY V34E
P00 KEY V37E00E

(140+25) PROCEDURES FOR TERMINATING PTC
(ADDENDUM 14)

(140+30)

FINAL MISSION C-PRIME TRANS\UAR, L\R PARKING ORBIT AND TRANSEARTH TIMELINE 12 NOV 1968
PROCEDURES FOR IMU ALIGN TO REFShMAT
(ADDENDUM 2)
(142.20)
PROCEDURES FOR RETURN TO EARTH TARGETING
(ADDENDUM 6)
(142.00)
PROCEDURES FOR IMU REALIGN TO REFShMAT
(ADDENDUM 2)
(142.15)
PROCEDURES FOR GDC ALIGN TO IMU
(ADDENDUM 3)
(EI=4.5 HRS)
(142.20)
PROCEDURES FOR STAR/earth HORIZON SIGHTINGS - 2 SETS OF 3 MARKS EACH
(COMM FAILURE ONLY)
(ADDENDUM 4)
(RECOMMENDED NAV STARS
No. 22 (Regulus) (Far Hor)
No. 26 (Spica) (Near Hor)
(Final Mission C=Prime TransLunar / Linear Parking Orbit, and Transearth Timeline = 12 Nov 1969

1970026619-048
PROCEDURES FOR RETURN TO EARTH TARGETING
(ADDENDUM 6) (P3)

---------------------------------------------

(143+25)
PROCEDURES FOR TERMINATING PT (ONLY IF COMM AVAILABLE)
(ADDENDUM 14)

(143+30)
PROCEDURES FOR IMU REALIGN TO REFSSMAT
(ADDENDUM 2) (P5)
RACKUP ALIGN NAV STARS
NO. 14 (CANOPUS)
NO. 12 (REGEL)
RACKUP ALIGN CHECK NAV STARS
NO. 15 (SIRIUS)

(143+45)
PROCEDURES FOR GNC ALIGN TO IMU
(ADDENDUM 3)

(143+50)
PROCEDURES FOR GNU UPLINK OF SM STATE VECTOR AND P30 TARGETS
(ADDENDUM 9) (P29)

(144+20)
PROCEDURES FOR EXT DV TARGETING
(ADDENDUM 9) (P30)

---------------------------------------------

PROPULSION SYSTEM SELECTION
USE RCS FOR DV LESS THAN OR EQUAL TO 12FPS
USE SPS FOR DV GREATER THAN 12FPS
TRIM DV TO ZERO
---------------------------------------------

(144+25)
PROCEDURES FOR SM RCS PROPULSION MONITOR CHECKS
(ADDENDUM 10)

(144+30)
PROCEDURES FOR RCS THRUST SETUP
(ADDENDUM 12) (P41)

(144+50)
THIRD TRANSEARTH MIDCOURSE

(144+55)
PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECKS
(ADDENDUM 10)

---------------------------------------------

THE FOLLOWING SIGHTING PERIOD
REQUIRED ONLY FOR A COMM FAILURE

(144+05)
PROCEDURES FOR STAR/earth HORIZON SIGHTINGS - 1 SET
OF 3 MARKS
(COMM FAILURE ONLY)
(ADDENDUM 4) (P23)

FINAL MISSION COMPRIME TRANSLUNAR/LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE - 12 NOV 1968
RECOMMENDED NAV STAR
NO. 33 (ANTARES) (NEAR HORIZON)

CM/SM SEPARATION

ENTRY INTERFACE

FINAL MISSION C-PRIME TRANSLUNAR LUNAR PARKING ORBIT AND TRANSEARCH TIMELINE - 12 NOV 1968
Section 3.2.1

SUMMARY OF ADDENDUMS

**ADDENDUM 1**
ASSUMED PRE-SEP SC CONFIGURATION

**ADDENDUM 2**
IMU ALIGN (OR REALIGN) (P52)

**ADDENDUM 3**
GDC ALIGN TO IMU

**ADDENDUM 4**
STAR/EARTH (OR LUNAR) HORIZON
(OR LANDMARK) SIGHTINGS (P23)

**ADDENDUM 5**
GROUND TRACK DETERMINATION (P21)

**ADDENDUM 6**
RETURN TO EARTH TARGETING (P37)

**ADDENDUM 7**
GDC DRIFT CHECK

**ADDENDUM 8**
GND UPLINK (P27)

**ADDENDUM 9**
EXTERNAL OV TARGETING (P30)

**ADDENDUM 10**
SM RCS AND SPS PROPULSION CHECKS

ADDENDUM 11
SPS THRUST SETUP (P40)

ADDENDUM 12
RCS THRUST SETUP (P41)

ADDENDUM 13
ESTABLISH PTC

ADDENDUM 14
TERMINATE PTC

ADDENDUM 15
ORBITAL NAVIGATION PROCEDURES (P22)
(PSEUDO LANDING SITE TRACKING)

ADDENDUM 16
ORBITAL NAVIGATION PROCEDURES (P22)
(LANDMARK TRACKING—NO AUTO OPTICS)

ADDENDUM 17
ORBITAL NAVIGATION PROCEDURES (P22)
(LANDMARK TRACKING—WITH AUTO OPT)

ADDENDUM 18
ORDEAL INITIALIZATION/VERIFICATION

ADDENDUM 19
HIGH GAIN ANT ACQUISITION

FINAL MISSION C-PRIME PROCEDURES DATED 12 NOV 1968
Section 3.2.2

ASSUMED PRE-SEP SC CONFIGURATION

CMC ATT=IMU
FDAO SCALE=5/1
FDAO SELECT=1/P
FDAO SOURCE=CMC
ATT SET=GUC
MAN ATT(3)=RATF CMD
LIMIT CYCLE=OFF
ATT DB-MAX
RATE=LOW
THC LOCKED
RHC LOCKED
TRANS CONT PWR-OFF
RHC PWR NORM(both)=AC/DC
RHC PWR DIRECT(both)=OFF
SC CONT=CMC
CMC MODE=FREE
RMAG MODE(3)=RATE 2
SPS THRUST DIRECT=NORMAL
NV THR/ST(A,R)=OFF
SCS TVC(2)=AUTO

SPS GNBBL MTR(4)=OFF
DV CA=CSM
ELS LOGIC=OFF
ELS AUTO-MAN
CM RCS LOGIC=OFF
CM PRLNT DUMP=OFF
CM PRLNT PVRG=OFF(DOWN)
IMU CASE=OFF
EMS ROLL=OFF
LOS O=OFF
LV/SPS IND(2)=PC, GP
TVC GNBBL DRIVE(both)=AUTO
FCSM(A,B)=RESET/OVERRIDE
EMS FUNCTION=OFF
EMS MODE=STBY
COAS PWR=ON
UTIL PWR=ON
PL BCH LT=OFF(CENTER)
PL DYE MARKER=OFF(DOWN)
PL VENT=OFF
UP TLM(CH, IU)=BLCK
RCS TRNFR=SM

FINAL MISSION C=PRIME PROCEDURES DATED=12 NOV 1968
**ASSUMED DAP CONFIGURATION**

**KEY V46E**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>F 04 46 (DAP CONFIGURATION)</td>
<td>LOAD 11103</td>
</tr>
<tr>
<td>F 06 47 (CSM AND LM WT)</td>
<td>LOAD PAD DATA <em>XXXXX</em> 00000</td>
</tr>
<tr>
<td>F 06 48 (SPS GLBL TRIM)</td>
<td>LOAD PAD DATA <em>XXXXX</em> <em>XXXXX</em></td>
</tr>
</tbody>
</table>

**PRG**

- **ASSUMED PROGRAM CONFIGURATION**

**KEY V37E47E**

5

**FINAL MISSION C-PRIME PROCEDURES DATED 12 NOV 1964**
ADDENDUM 2
IMU ALIGN (OR REALIGN) (P52)

**PROCEDURES FOR IMU REALIGN**

P00
LMP G/N PWR=AC1
LER G/N PWR OPTICS=ON
OPT ZERO=ZERO (15 SEC)
OPT ZERO=OFF
OPT MODE=MAN
COND LAMPS=ON
RETICLE BRT TW=ADJUST

CDP ATT DB=MIN
RATE=LOW
LIMIT CYCLE=OFF
+MAG MODE(3)=ATT1/RATE2
+MAG ATT(3)=RATE CMD
SC CONT=SCS

P52
LER KEY VM7E52E
F 04 06 (ALIGN OPTION CODE)
LOAD 00001 IN R2 FOR ALIGN TO
UNLINKED PREFERRED REF SNSMAT
AND GO TO F 06 22 DISPLAY
OR LOAD 00003 FOR REALIGN TO

FINAL MISSION C=PRIME PROCEDURES DATED 12 NOV 1988
REFRESH AND GO TO
F 50 25 DISPLAY
PRO
F 06 22 (H: P: Y AT PROPOSED ALIGNMENT)
VERIFY NO GIMAL LOCK AT
PROPOSED ALIGNMENT
PRO/MONITOR COARSE ALIGN
F 50 25 (00015, PERFORM STAR ACQ)
RHC-ARMED
PRO
IF TWO STARS NOT AVAILABLE:
A F US NY (CODE 405) ALARM
WILL OCCUR. COR MANUALLY
MANEUVER SC TO ACQUIRE R-CMP
ALIGN NAV STARS IN SC FAV.
CMP KEY V32E, RETURN TO
F 50 25 (00015; DISPLAY AND PRO
IF TWO STARS AVAILABLE AT
THIS ATTITUDE
F 01 70 (STAR CODE)
CHECK FIRST STAR CODE
OR LOAD THIRD STAR CARD.
IF DEVIATING ALIGN CHECK
OPT MODE=CMC
PRO
06 92 (SHAFT, TRU, BLANK)
MONITOR OPTICS DRIVE TO
STAR ONE
(IF VERIFYING SXT DRIVE TO
THIRD STAR KEY V37EONE)
IDENTIFY STAR ONE
OPT MODE=MAN
F 51 RR (PLEASE MARK)
MARK ON STAR ONE WITH SXT
F 50 25 (00016, TERMINATE MARK SEQ)
PRO

F 01 71 (MARKED STAR CODE)
PRO
F 01 70 (STAR CODE)
CHECK SECOND STAR CODE
OPT MODE=CMC
PRO
06 92 (SHAFT, TRU, BLANK)
MONITOR OPTICS DRIVE TO
STAR TWO
IDENTIFY STAR TWO
OPT MODE=MAN
F 51 BB (PLEASE MARK)
MARK ON STAR TWO WITH SXT
F 50 25 (00016, TERMINATE MARK SEQ)
PRO
F 01 71 (MARKED STAR CODE)
PRO
F 06 05 (ANGLE DIFF)
IF GREATER THAN 0.05 DEG, KEY
V32F, NO TO F 50 25 (00014)
AND REPEAT ALIGNMENT
IF < .05 DEG OR LESS, PRO
F 06 93 (GYRO TORQ ANGLES)
LMP RECORD GYRO TORQ ANGLES
V01C TO GND
LEB PRO IF GYRO TORQ ANGLES OK
F 50 25 (00014, PERFORM FINE ALIGN)
IF REPEAT ALIGNMENT REQUIRED:
PRO, RETURN TO F 50 25 (00015),
VERIFY STAR ID AND REPEAT
MARK PROCESS ON TWO STARS
IF ONLY ALIGN CHECK REQUIRED:
PRO, RETURN TO F 50 25 (00015),
KEY ENTER, NO TO F 01 70,
AND VERIFY SXT DRIVES TO
THIRD STAR

FINAL MISSION C=PRIME PROCEDURES DATED=12 NOV 1968
P00
(CALLED AFTER THIRD STAR = MK)
OPT MODE = \textit{MAN}
DRIVE TRUE TO LFSS THAN 5 DEG
OPT ZERO=ZERO
RETICLE BTM TW-MIN BTNNS

**PROCEDURE FOR GDC ALIGN TO IMU**

P00
COR ATT DB-MIN
RATE=LOW
HMAF MODE(3)=ATT1/RAT2E
MAN ATT(3)=RATE CMD
SC CONT=SCS
F/DAI SELECT=1
F/DAI SOURCE=ATT SET
ATT SET=IMU
KEY W16N20E
16 20 (CURRENT R>P,Y)
NULL ATT ERROR NEEDLES
ON F/DAI 1 WITH
ATT SET THUMBWHEELS
(AVOID FALSE NULL MY
COMPARING ATT SET IND
WITH D20)
ATT SET=GDC
DEPRESS GDC ALIGN BUTTON
F/DAI SELECT 1/2
ATT DB=MAX

FINAL MISSION C-PRIME PROCEDURES DATED=12 NOV 1969
ADDENDUM 4

STAR/EARTh (OR LUNAR) HOR (P23)
(OR LMK SIGHTINGS)

DISP

PROCEDURES FOR CISLUNAR NAV

P00 LMP G/N PWR=A1
   TLM INPUTS PCM=LOW
   UP TLM CMD=RESET THEN NORM
   TAPE RCDR PCM=PCM/ANLG
   TAPE RCDR RCD=RCD
   TAPE RCDR FWD=FWD
   TAPE MOTION TO-BP

LEB G/N PWR=OPTICS=ON (OPTICS PWR
   MUST BE ON AT LEAST
   30 MIN PRIOR TO TAKING MARKS)
   OPT ZERO=ZERO(15SEC)
   OPT TELTRUN=SLAVE TO SXT
   COND LAMPS=ON
   OPT MODE=MAN
   RETCL BRT TW=ADJUST

CDR SC CONT=CNC
   CMC MODE=AUTO
   BMAG MODE(3)=RATE2
   MAN ATT(3)=RATE CMD

FINAL MISSION C-PRINT PROCEDURES DATED=12 NOV 1969

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14
F 05 70 (MEASUREMENT IDENTIFICATION)
LOAD
000XX STAR ID
XX0XX LMK ID
000XX0 MOR ID
FOR MOR MARKS R2=00000
AND LOAD MOR DATA IN R3
FOR LMK MARKS R3=00000
AND LOAD LMK DATA IN R2
(ASSUMED TO BE ALL KNOWN LMKs)

PRO
F 50 25 (002D2, PERFORM AUTO MANEUVER)
KEY ENTER
F 59 88 (PERFORM CALIBRATION MARK)
CALIBRATION OF OPTICS TRUN ANGLE...
REQUIRED AT THE BEGINNING
OF EACH SIGHTING PERIOD.
IF OPTICS CALIBRATION ALREADY
PERFORMED
OPT MODE=CMC
OPT ZERO-OFF
KEY ENTER AND GO TO
AS 92 DISPLAY
IF OPTICS CALIBRATION REQUIRED
OPT MODE=MAN
RMC 2-ARMED
MANEUVER SC TO ACQUIRE A STAR
WITH THE SXT LMK LOS
CMC MODE-FREE
LER FIX STAR IN SXT LMK LOS FIELD
OF VIEW WITH MIN IMP CONTROLS
OPT ZERO-OFF
OPT COUPLING=RSLV
OPT SPEED=LOW

SUPERIMPOSE SXT STAR LOS
ON SXT LMK LOS WITH THE
OPTICS HAND CONTROLLER
MARK WHEN THE TWO LINES OF
SIGHT ARE SUPERIMPOSED

F 06 87 (BLANK, TRUN ANGLE BIAS, BLANK)
COPY TRUN ANGLE BIAS
KEY V32E

F 59 88 (PERFORM CALIBRATION MARK)
SUPERIMPOSE SXT STAR LOS
ON THE SXT LMK LOS
MARK WHEN THE TWO LINES OF
SIGHT ARE SUPERIMPOSED

F 06 87 (BLANK, TRUN ANGLE BIAS, BLANK)
COPY TRUN ANGLE BIAS
IF THE TWO TRUN ANGLE BIAS
MEASUREMENTS ARE NOT WITHIN
0.003 DEG,
KEY V32E AND REPEAT THE
CALIBRATION PROCESS
IF ANY TWO TRUN ANGLE BIAS
MEASUREMENTS ARE
WITHIN 0.003 DEG,
PRO (INTEGRATE TRUN BIAS)

F 51 88 (PLEASE MARK)
KEY V32E (PERFORM LMK(MOR)
ACQUISITION)

F 50 18 (COMMANDED R,P,Y ANGLES)
CMC CONT=CMC
CMC MODE=CMC
LER PRO

06 18 (COMMANDED R,P,Y ANGLES)
CMC MONITOR AUTOMATIC MANEUVER
FOR GIMBAL LOCK
LER MONITOR AUTO MANEUVER, VERIFY
LMK/MOR IN SXT FIELD OF VIEW

FINAL MISSION C-PRIME PROCEDURES DATED 12 NOV 1969
F 50 1H (COMMANDEU REPLY ANGLFS)
OPT MOTE-CMC
KEY ENTER
06 92 (COMMANDEU OPTICS ANGLES)
MONITOR OPTICS DRIVE
TO SELECTED STAR
OPT MOTE-MAN
F 51 RR (PLEASE MARK ON STAR-LMK/HOR)
CMC MOTE-FREE
LFR MANEUVER SC WITH M IN TMP
CONTROLLER TO POSITION
LMK(HOR) IN SXT AT
STELLAR POINT
FIX LMK(HOR) IN SXT
OPT COUPLING-RSLV
OPT SPEED-LO
MANEUVER OPTICS TO SUPERI-PORE
STAR ON LMK/HOR
MARK ON STAR-LMK/HOR
F 50 25 (DECEBTER MARK SEG.),
PRO
F 05 71 (MEASUREMENT IDENTIFICATION)
VERIFY MARKED DATA
PRO
F 06 49 (DR+DV,BLANK)
**HOLD AT THIS DISPLAY FOR
20 SECONDS**
KEY V0100E 362F
COPY TRUN (OCTAL) IN R1
**HOLD AT THIS DISPLAY FOR
20 SECONDS**
KEY RELEASE
F 06 49 (DR+DV,BLANK)
PRO IF DR AND DV ACCEPTABLE
OR IF NOT ACCEPTABLE,
KEY V32E, RETURN TO F 05 70

DISPLAY AND SPEAT MARK

F 37 BB TAKE 2 ADDITIONAL MARKS ON
EACH STAR-LMK(HOR) SET
KEY 23E, RETURN TO
F 05 70 DISPLAY
AND REPEAT MARK PROCESS
WHEN SELECTING A NEW
STAR-LMK(HOR) SET TO MARK ON,
KEY 23E, RETURN TO THE
F 05 70 DISPLAY PERFORM THE
REQUIRED ATT MANEUVER AND
TAKE THREE MARKS ON THE SET
WHEN TERMINATING THE NAV
SIGHTING PERIOD
KEY 00F
OPT MOTE-MAN
DRIVE TRUN LESS THAN 5 DEG
OPT ZERO-ZERO
RETICLE BRT THE-MIN ARTNESS
CMC MOTE-AUTO
LMP IF TAPE RCDR CRATING
TAPE RCDR FWD-OFF(CTR)
TAPE MOTION TR-GRAY
(ASSUME AND PLAYBACK AT
NEXT OPPORTUNITY)

FINAL MISSION CPP:ME PROCEDURES DATE=12 NOV 1966
**ADDITIONAL**
GROUND TRACK DETERMINATION (P21)

**PROCEDURES FOR RETURN TO EARTH TARGETING**

**ADDITIONAL 6**
RETURN TO EARTH TARGETING (P37)

P00
CMP KEY V37E37E
F 06 33 (TIG OF MIDCOURSE)
LOAD TIG (GET) OF MIDCOURSE
PRO
F 06 60 (BLANK, VPREP, GAMMA E1)
LOAD ZERO IN R1(VPREP) AND
LOAD ZERO IN R3(GAMMA E1)
PRO
KEY V16N3BE, MONITOR ITERATION
KEY RELEASE WHEN KEY REL LT=ON
IF F 06 09 ALARM 612, 605, OR
613 OCCUR, KEY V32E, GO TO
F 06 33 DISPLAY, AND ADJUST
INPUT PARAMETERS
F 06 61 (IMPACT LAT, IMPACT LONG, BLANK)
COPY LAT AND LONG AND IF NOT
ACCEPTABLE, KEY V32E, GO TO
F 06 33 DISPLAY, AND ADJUST
INPUT PARAMETERS
PRO IF ACCEPTABLE
F 06 39 (DELTA T TRANSFER)
COPY DELTA T TRANSFER (GET)
AND IF NOT ACCEPTABLE, KEY
V32E, GO TO F 06 33 DISPLAY,
AND ADJUST INPUT PARAMETERS
PRO IF ACCEPTABLE
F 06 60 (BLANK, VPREP, GAMMA E1)

P21
CMP KEY V37E21E
F 04 06 (00002, VEHICLE OPTION)
LOAD 00001 IN R2
PRO
F 06 34 (T LAT AND LONG)
LOAD NOMINAL TIME OF
LO11 RECEIVED FROM GND
PRO
F 06 43 (LAT, LONG, ALT)
COPY LAT, LONG, AND ALT
IF A 10 MIN INCREMENT FROM THE
LOADED TIME IS DESIRED,
KEY V32E AND RETURN TO
F 06 34 DISPLAY (TIME IS
AUTOMATICALLY INCREMENTED)
IF PROGRAM TERMINATION
IS DESIRED
PRO

P00
KEY 00E

FINAL MISSION C-PRIME PROCEDURES DATE=12 NOV 1981
COPY VPRED AND GAMMA FI AND
IF NOT ACCEPTABLE, KEY V3=0,
GO TO F 06 33 DISPLAY, AND
ADJUST INPUT PARAMETERS
PRO IF ACCEPTABLE
F 06 81 (DELTA VX=VY=VZ=LOCAL VER+)
COPY DVS
PRO
IF F 05 09 ALARM 605 OR 613
OCUR, KEY V32E, GO TO F 06 33
DISPLAY, AND ADJUST
INPUT PARAMETERS
F 06 61 (IMPACT LAT, IMPACT LONG, BLANK)
COPY PRECISION IMPACT
LAT AND LONG
IF NOT ACCEPTABLE, KEY V3E,
RETURN TO F 06 33 DISPLAY
AND ADJUST INPUT PARAMETERS
PRO IF ACCEPTABLE
F 06 39 (DELTA T TRANSFER)
COPY PRECISION DELTA T
TRANSFER
IF NOT ACCEPTABLE, KEY V32E,
GO TO F 06 33 DISPLAY, AND
ADJUST INPUT PARAMETERS
PRO IF ACCEPTABLE
F 06 60 (BLANK, VPRED, GAMMA EI)
COPY PRECISION VPRED
AND GAMMA EI
IF NOT ACCEPTABLE, KEY V32E,
GO TO F 06 33 DISPLAY, AND
ADJUST INPUT PARAMETERS
PRO IF ACCEPTABLE
F 06 81 (DELTA VX=VY=VZ=LOCAL VER+)
COPY PRECISION DELTA V
PRO

F 04 06 (00007,00001,BLANK)
VERIFY R2=00001 FOR SPS OR
LOAD R2=00002 FOR RCS
PRO
F 06 33 (TIG OF MIDCOURSE)
COPY TIG OF MIDCOURSE
ADJUSTED FOR FINIF
BURN TIME
PRO
F 16 45 (MKS, TFI, MGA)
COPY MGA
PRO
F 37 BB
KEY 00E
POO

21

FINAL MISSION C-PRIME PROCEDURES DATED 12 NOV 1968

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ADDENDUM 7
GDC DRIFT CHECK

**PROCEDURES FOR GDC DRIFT TEST**

POO  CDR ATT DB=MIN

RATE=LOW
RMAG MODE(3)=ATT1/RATF2
MAN ATT(3)=RATE CMD
SC CMPT=SCS
KEY V06N20E

06 20 (R,P,Y)
FDAI SELECT=1
FDAI SOURCE=ATT SET
ATT SET=GDC
NULL ATT ERROR NEEDLES
ON FDAI 1 WITH
ATT SET THUMBWHEELS
(AVOID FALSE NULL BY
COMPARING ATT SET IND
WITH N20)
KEY ENTER WHEN FDAI ERROR
NEEDLES NULLEN
READ DSKY N20 AND ATT SET
VALUES AND CONFIRM DRIFT
LESS THAN 10 DEG PER HR

LMP RECORD DRIFT DATA AND
VOICE TO GND
CDR ATT DB-MAX
FDX SEL=1/2
ATT SET=IMU

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FINAL MISSION C-PRIME PROCEDURES DATED=12 NOV 1968
ADDENDUM 8
GND UPLINK  (P27)

**PROCEDURES FOR GND UPLINK**

P00  CMP KEY V37E00E

P27  CDR UP TLM(CM)(MDC)=ACCEPT

P00  CMP MONITOR UPLINK ACT LT=ON

P27  MONITOR GND UPLINK

P00  CMP MONITOR UPLINK ACT LT=OFF

LMP RECORD VOICE SV AND MANEUVER

PAD DATA

CDR UP TLM(CM)(MDC)=BLOCK

ADDENDUM 9
EXTERNAL DV TARGETING  (P30)

**PROCEDURES FOR EXT DV TARGETING**

P30  LEB KEY V37E30E

F 06 33 (GETI OF BURN)

VERIFY GND GETI

PRO

F 06 01 (VG = LV)

VERIFY GND DVX, DVY, DVZ

PRO

F 06 42 (MH, MP, VG)

COPY VG/COMPARE WITH PAD DV

PRO

F 16 45 (MKG, TFI, MGA)

CDR SET MDC ET COUNT DWN

CONFIRM MGA LESS THAN 45 DEG

LEB PRO

F 37 BB

P00  KEY 00E

25

FINAL MISSION C=PRIME PROCEDURES DATED=12 NOV 1968
ADDENDUM 10
SM RCS AND SPS PROPULSION CHECKS

**PROC FOR SPS MONITORING CHECK**

SPS PRPLNT TK TEMP IND
57 TO 75 DEG
IF < 950 DEG, SPS LINE HTS = A
IF > 750 DEG, SPS LINE HTS = OFF
SPS PRESS IND SW = ME, N2A, N2B 3
SPS HE/N2 PRESS IND
SPS ME PRESS = 3000 PSI MAX
SPS N2A PRESS = 2900 PSI MAX
SPS N2B PRESS = 2900 PSI MAX
SPS PRESS IND SW = ME
SPS FUEL AND OXID PRESS
INOS = 170 = 195 PSI
(FUEL/OXID MAX DELTAP = 20 PSI)
SPS FNG INJ VLV IND (4) = CLOSE 3
RECORD
SPS OXID QTY IND
SPS FUEL QTY IND
SPS OXID UNBAL IND
OXID FLOW VLV PRIM = PRIM 3
SPS ME VLV (BOTH) = AUTO 3
SPS ME VLV (BOTH) = BP 3

27

FINAL MISSION C-PRIME PROCEDURES DATE 12 NOV 1964
ADDENDUM II
SPS THRUST SETUP

**PROcedures FOR SPS THRUST**

P00
LEB KEY V37E00
CDR CONFIRM GND PIC & BIAS CHECK

**PROcedures FOR EMS TEST AND E/U6**

CDR CAN.EMS(2)/CLOSED
SC CONT-CONC
CMC MODE-FREE
EMS MODE-STBY
EMS FUNCTION-OFF
EMS FUNCTION-ON
EMS MODE-AUTO
VERIFY DV LESS THAN
3.4 IPS PER 100SEC
CMC MODE-AUTO
EMS FUNCTION-OFF
EMS MODE-STBY
EMS FUNCTION-ON
EMS MODE-AUTO
LOAD DV = 1586.8

EMS FUNCTION=DV TEST
MONITOR SPS LT-ON
MONITOR DV COUNTDOWN
MONITOR SPS LT-OFF
CONFIRM DV = -20.84/-20.7
EMS MODE-STBY
EMS FUNCTION=DV SET
LOAD BURN VC
EMS FUNCTION=DV

LEB KEY V49E
F 06 22 (FINAL GMBL ANGLES)
LOAD BURN R,P,Y GMBL ANGLES
KEY V42E
CDR MAG MODE(3)=RATE2
RMC-ARMED
LEB PRO
F 50 18 (COMMANDED R,P,Y)
Pro
06 18 (COMMANDED R,P,Y)
CDR MONITOR ATT MANEUVER
FOR GMBL LOCK
F 50 18 (COMMANDED R,P,Y)
VERIFY R,P,Y AGREE WITH BURN
PAD R,P,Y WITHIN 5 DEG
LEB KEY ENTER

**PROC FOR SPS THRUST PROG**

P40
LEB KEY V37E40E
F 50 18 (COMMANDED R,P,Y)
VERIFY R,P,Y AGREE WITH PAD
VALUES WITHIN 5 DEG
CDR ALIGN SC IN ROLL TO PAD VALUE
LEB PRO
06 18 (COMMANDED R,P,Y)

29

FINAL MISSION C-PRIME PROCEDURES DATED=12 NOV 1964
CDR MONITOR BURN ATT TRIM
F 50 18 (COMMANDED R, P, Y)
LEO G/N PWR OPTICS-ON
OPT ZERO-ZERO (15 SEC)
OPT TELTRUN-SLAVE TO SXT
RETICLE BHT TW-ADJUST
OPT ZERO-OFF
OPT MODE-CMC
KEY V41N91E
F 21 92 (BLANK, BLANK, BLANK)
LOAD PDA SHAFT ANGLE (+XX, XX)
in R1 AND PAD TRUINION A-GLF
(+XX, XXX) IN R2
41 RB (SHAFT, TRUINION, BLANK)
MONITOR OPT URVE TO PAD
VALUES
F 50 18 (COMMANDED R, P, Y)
VERIFY PAD STAR IN SXT
OPT MODE-MAN
DRIVE TRUINION LESS THAN 5 DEG
OPT ZERO-ZERO
RETICLE BHT TW-MIN BRTNESS
MOVE TO CENTER SEAT
LMP MN BUS TIE(2)-ON
PRI MODE-NORM(ALT FOR TEI)
SPS HE VLV TR (ROTH)-RP
SPS HE VLV (ROTH)-AUTO

CDR RMC PWR DIRECT(ROTH)-OFF
SC CONT-CMC
CMC MODE-AUTO
SCS TVC (ROTH)-RATE CMD
TVC GMRL DRIVE (2)-AUTO
PERFORM TVC CHECKS
TVC SERVO PWR 1-AC 1/MNA
TVC SERVO PWR 2-AC 2/MNB

TRANS CONT PWR-ON (UP)
RHC PWR NORM 2-AC
GMRL MTRS PITCH 1-STRT-ON
GMRL MTRS YAW 1-STRT-ON
THC-CLOCKWISE
RHC-VERIFY NO MTVC
GMRL MTRS PITCH 2-STRT ON
GMRL MTRS YAW 2-STRT ON
SFT GDI PTRIM TO PAD VALUE
YTRIM TO PAD VALUE
RHC-VERIFY MTVC
THC-NEUTRAL
RHC PWR NORM 2-AC/DC
ALIGN SC IN ROLL TO PAD VALUE

CMP PRO
06 18 (COMMANDED R, P, Y)
MONITOR ATT TRIM
F 50 18 (COMMANDED R, P, Y)
VERIFY R, P, Y AGREE WITH PAD
VALUES WITHIN 5 DEG
KEY ENTER
F 50 25 (00204, GMRL DRIVE TEST)
CPR RMC PWR DIRECT(ROTH)-MNA/MNB
MAN ATT (3)-RATE CMD
ATT MO-MIN
RATE-HIGH
HMAQ MODE (3)-ATT1/RATE 2
AUTO RCS SEL (16)-MNA

**ALIGN GNC TO IMU**
CDR FDAI SELECT 1
F DAIS SOURCE-ATT SET
ATT SET-IMU
CPR KEY V16N30OE
F 16 20 (R, P, Y)
CDR NULL FDAI NEEDLES WITH

FINAL MISSION C-PRIME PROCEDURES D-10 NOS 1964
ATT SET TW (AVOID FALSE
NULL RV COMPAREING ATT SET
IND WITH N10)
ATT SET-GDC
DEPRESS GDC ALIGN PB
FDAL SELECT-1/2
CMP KEY RELEASE
F 50 25 (OBS2-O4,HGM DRIV TEST)

CMP PRO
CMP MONITOR GMHL DRIVE
SAY AND TRIM
06 40 (TFI*V6+DVM)
VERIFY SPS GIPI TRIM AGREE
WITH PAD WITHIN 0.5 NEG

MP RMES BUS-MNA
TAPE RCOR FWD-OFF(CTR)
TLM INPUTS PCM-HIGH
UP TLM CMD-RESET THEN NORM
TAPE RCOR PCM-PCM/ANALR
TAPE RCOR RD=RD
TAPE RCOR FWD-FWD
TAPE MOTION TH-RR
FTL RCOR-RECORD
(FOR LO11,LO22,AND TE1)

CDR FDAL SCALE-5/5
VERIFY SPS TH LT-OFF
CB SPS P2-OPEN(TEI ONLY)
CB SPS Y2-OPEN(TEI ONLY)
DV THRUST(BOTH)=NORMAL
THC-ARMED
RMC-ARMED

-35SEC
DSKY BLANKS
-30 06 40 (TFI*V6+DVM)
CMP EMS MODE-AUTO
-25 CMP CK DVM FOR HI RIPA BIAS

(LESS THAN 2FPS PER 5 SEC)
CDR APPLY ULLAGE THRUST
(IF REQUIRED)
-5 F 99 40 (REQUEST FOR ENGINE ENABLE)
CMP PRO
0 06 40 (TFI*V6+DVM)
+1 CDR MONITOR SPS LT-ON/START
MDC ET COUNT UP
TERMINATE ULLAGE 1 SEC
AFTER SPS IGNITION
CONFIRM FDAL 1 RATES LESS THAN
10 NEG/SEC
MONITOR PC GAUGE 95-105 PSIA
CMP VERIFY VG/DECOR AND DVM/INCOR
MONITOR FDAL 2 RATES LESS THAN
10 NEG/SEC
LMP MONITOR VALVES OPEN AND
SPS GAUGES
CDR MONITOR SPS ENGINE CUTOFF
MONITOR SPS LT-OFF
F 16 40 (TFI*V6+DVM) (COPY VG AND DVM)
CUT-OFF+1SEC
DV THRUST(BOTH)=OFF
MONITOR PC GAUGE ZERO
LMP MONITOR VALVES CLOSED
SPS HE VLV TB(BOTH)=BP
FLT RCOR-OFF(CTR)
CDR CB SPS P2-CLOSED
CB SPS Y2-CLOSED
SPS GMBL MTRRS(4)=OFF
(SEQUENTIALLY=P2Y,P1Y1)
TVC SERVO PWR(BOTH)=OFF
(SEQUENTIALLY=2,1)

CMP PRO
F 16 85 (VG=BODY)
CDR NULL VG RESIDUALS AS REQD
THC-LOCKED

FINAL MISSION C=PRIME PROCEDURES DATED=12 NOV 1968
**CALL IDLING PROGRAM**

POO

**KEY 008**
- KEY V66E (TRANSFER PORT A\RN
- SV FROM CSM SLOTS
- TO LM SLOTS)

**LWP**
- NONE SS BUS-OFF
- TAPE RCRD WWD-OFF (CTR)
- TAPE MOTION TB=GRAY
  (ASSUME GND PLAYBACK AT
  NEXT OPPORTUNITY)
- MN BUS TIE(2)=OFF
- CHARGE BATTERIES

**CDR MENU**
- FUNCTION-OFF
- F/1 SCALE=5/1
- ATT DB=MAX
- RATE=LOW
- TRANS CTRL PWR-OFF
- RMC PWR DIRECT (BOTH)=OFF
- RMAG MODE (3)=RATE 2

**ADDITIONAL 12**
RCS THRUST SETUP

**PROCEDURES FOR RCS THRUST**
- LEA KEY V3700E
- CDR CONFIRK AND PIPA BIAS CHECK

**PROCEDURES FOR EMS SETUP**
- CDR SC CONT-CMC
  - CMC MODE=FREE
  - EMS MODE-STBY
  - EMS FUNCTION=DV
  - EMS MODE=AUTO
  - VERIFY DV LESS THAN
    - 3.2FPS PER 100SF
  - CMC MODE=AUTO
  - EMS FUNCTION-OFF
  - EMS MODE-STBY
  - EMS FUNCTION=EV
  - CMC MODE=AUTO
  - EMS FUNCTION-OFF
  - EMS MODE-STBY
  - EMS FUNCTION=EV
  - CMC MODE=AUTO

**LEA KEY V49E**
F 06 22 (FINAL GMDL ANGLES)
LOAD BURN R*P*Y GMDL ANGLES
KEY V62E
CNR RMAG MODE(3)=RATE2
RHC-ARMED
LIB PRO
F 50 18 (COMMANDED R*P*Y)
PHN
06 18 (COMMANDED R*P*Y)
CNR MONITOR ATT MANUVER
FOR GMDL LOCK
F 50 18 (COMMANDED R*P*Y)
VERIFY R*P*Y AGREE WITH
PAO R*P*Y WITHIN 5 DFG
LIB KEY ENTER
**PROC FOR RCS THRUST PROG**

P#1
LIB KEY V37E41E
F 50 18 (COMMANDED R*P*Y)
CNR ALIGN SC IN ROLL TO PAD VALUE
LIB PRO
06 18 (COMMANDED R*P*Y)
CNR MONITOR BURN ATT TRIM
F 50 18 (COMMANDED R*P*Y)
VERIFY R*P*Y AGREE WITH PAD
VALUES WITHIN 5 DEG
LIB OPT MODE=MAN
G/N PWR OPTICS=ON
OPT ZERO=ZERO(15SEC)
OPT TELTRUN-SLAVE TO SXT
RETICLE BRT TW=ADJUST
OPT ZERO=OFF
OPT MODE=CSC
LIB KEY V41NQ1E
F 21 92 (BLANK,BLANK,BLANK)

LOAD PAD SHAFT ANGLE(*XXX,XX)
IN R1 AND PAD TRUNNION ANGLE
(*XXX,X XXX) IN R2
41 88 (SHAFT.TRUNNION,BLANK)
MONITOR OPT DRIVE TO PAD
VALUES
F 50 18 (COMMANDED R*P*Y)
VERIFY PAD STAR IN SXT
OPT MODE=MAN
DRIVE TRUN LESS THAN 5 DEG
OPT ZERO=ZERO
RETICLE BRT TW=MIN ARRNESS
MOVE TO CENTER SEAT
LIB KEY ENTER
06 85 (VG=RODY)
CNR ATT DB=MIN
RATE=LOW
BMAG MODE(3)=ATT1/RATE2
AUTO RCS SEL(16)=MINA
TRANS CONT PWR-ON(UP)

**ALIGN GDC TO IMU**
CNR FDAI SELECT 1
FDAI SOURCE=ATT SET
ATT SET=IMU
LIB KEY V16N20E
16 20 (R*P*Y)
CNR NULL FDAI NEEDLES WITH
ATT SET TW (AVOID FALSE
NULL BY COMPARING ATT SET
IND WITH N20)
ATT SET=00C
DEPRESS GDC ALIGN PB
FDAI SELECT=1/2
CNR KEY RELEASE

FINAL MISSION C-PRIME PROCEDURES DATE=12 NOV 1969
-2MIN
LMP TLM INPUTS PCM-HIGH
UP TLM CND-RESET THEN NOR-
TAPE RCDR PCM-PCM/ANLR
TAPE RCDR RCD-RCD
TAPE RCDR FWR=FWD
TAPE MOTION TB-RP

-35 SEC
DSKY BLANKS

-30 16 A5 (VG=BODY)
EMS MODE-AUTO

-25 SEC
CMP KEY N40E
16 40 (TFI=VG=DVM)
MONITOR DVM FOR HT DPAR RTX
(LESS THAN 2FPS PER 5SEC.
KEY RELEASE
COR RMC-ARMED
THC-ARMED

-0 F 16 A5 (VG=BODY)
SET MUC ET COUNTING UP AND
NULL VG AS REQUIRED
THC-LOCKED
RMC-LOCKED
CMP PHO
F 37 AB

**CALL IDLING PROGRAM**

P00
KEY 00F
KEY V6FE (TRANSFER POST FROM CM
SLOTS TO LM SLOTS)
LMP TAPE RCDR FWR-OFF (CTR)
TAPE MOTION TB-GRAY
(ASSUME GND PLAYBACK AT
NEXT OPPORTUNITY
CORR EMS MODE-STBY

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FINAL MISSION C-PRIMa PROCEDURE:3 DATE=12 NOV 196A
LMP RECEIVE PTC R:P,Y FROM GND
OR USE PREVIOUS PTC ANGLES
IF STILL VALID, COORDINATE PTC
GMBL ANGLE UPDATES WITH GND

CMP KEY V4E
F 06 22 (FINAL GMBL ANGLES)
LOAD PTC GMBL ANGLES
KEY V62E
ARM-ARMED
PRO

F 50 18 (COMMANDED R:P,Y)
PRO
06 18 (COMMANDED R:P,Y)
CDR MONITOR ATT MANEUVER
FOR GMBL LOCK
F 50 18 (COMMANDED R:P,Y)
VERIFY R:P,Y AGREE WITH PTC
PAD R:P,Y WITHIN 5 DEG
NULL FOAI NEEDLES WITH RMC
CMP KEY ENTER

CDR BMAG MODE(3)=ATT1/RATE2
SC CONT=SCS
AUTO RCS SEL ROLL(8)=MAN
CONFIGURE AUTO RCS SEL FOR
SINGLE JET PITCH AND YAW
(PITCH=(*)A3(+)(*C4)
YAW=(*)B3(+)(*D4)
LIMIT CYCLE-ON(UP)
ATT DB-MAX
RATE-HIGH
BMAG MODE(3)=RATE2
MAN ATT(3)=RATE CMD
MAN ATT(3)=ACC CMD
MANEUVER SC IN ROLL ABOUT THE

FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 1968
ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

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LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC

LMP RECORD PTC STOP GET IN LOG

ADDENDUM 14

TERMATE PTC
ADDENDUM 15
ORRITAL NAVIGATION PROCEDURES (P22) (PSEUDO LANDING SITE TRACKING)

P L A N E W PROCEDURES

LEB KEY V37E22E

P22

F 05 45 (BLANK, BLANK, MAX MGA)
LEB PRO
F 05 70 (LANDMARK CODE)
LOAD 10001 IN R2
LEB OPT ZERO-OFF
OPT MODE-MAN
POSITION TRUNNNION TO 35 DEG
OPT MODE-CWC
LEB PRO

06 92 (SHAFT, TRUN, BLANK)
MONITOR OPT DRIVE TO LANDING SITE
LEB IDENTIFY IDENTIFICATION POINTS
IF VISIBLE
LEB: CDR WHEN LANDING SITE IDENTIFIED:
START 0.3 DEG/SEC
PITCH RATE
CDR ROLL TO AVOID SHAFT AXIS
WITHIN 10 DEG OF LANDING

SITE

LEB OPT MODE-MAN
F 51 88 (PLEASE MARK)
MAKE 5 MARKS- 20 SEC APART
POSITION TRUNNNION TO 5 DEG
OPT ZERO-ZERO
CDR STOP PITCH RATE
LEB PRO
F 05 71 (LANDING SITE DATA)
VERIFY R2
LEB PRO
F 06 49 (DELT A R, DELTA V, BLANK)
RECORD VALUES

**HOLD AT THIS DISPLAY FOR
ONE MINUTE**

LEB PRO
F 05 89 (LAT, LUNG/2, ALT)
RECORD VALUES

**HOLD AT THIS DISPLAY FOR
20 SECONDS**

LEB KEY V37E00E

FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 1968
ADDENDUM 16
ORBITAL NAVIGATION PROCEDURES (P22)
(LANDMARK TRACKING--NO AUTO OPTICS)

POSITION TRUNNION TO 5 DEG
OPT ZERO-ZERO

CDR STOP PITCH RATE
MAN ATT(P)-ACCEL CMD
PITCH SC UP TO 5 DEG PITCH
AND 0 DEG ROLL W.R.T.
LOCAL HORIZONTAL
MAN ATT(P)-MIN IMP
INITIATE ORBITAL PITCH RATE
FOR NEXT LANDMARK SIGHTING

LER PRO
F 05 71 (LANDMARK DATA)
VERIFY R2

LER PRO
F 06 49 (DELTA R,DELTA V,BLANK)
RECORD VALUES

**HOLD AT THIS DISPLAY FOR
20 SECONDS**

LER PRO
F 06 89 (LAT,LONG/ALT)
RECORD VALUES

**HOLD AT THIS DISPLAY FOR
20 SECONDS**

LER KEY V37E00E

F 06 45 (BLANK,BLANK,MAX MGA)
LER PRO
F 05 70 (LANDMARK CODE)
LOAD 20000 IN R2
LER OPT ZERO-OFF
OPT MODE-MAN

LER PRO
F 51 RR (PLEASE MARK)
PLACE OPTICS AT 10 DEG
TRUNNION ANGLE
IDENTIFY IDENTIFICATION POINTS
AT THEIR RESPECTIVE
ACQUISITION TIMES

LER, CDR WHEN LANDMARK IDENTIFIED-
START 0.3 DEG/SEC
PITCH RATE
CDR ROLL TO AVOID SHAFT AXIS
WITHIN 10 DEG OF LANDMARK
LER MAKE 5 MARKS-20 SEC APART

FINAL MISSION C-PRIME PROCEDURES DATE-12 NOV 1968
ADDENDUM 17
ORBITAL NAVIGATION PROCEDURES (P21)
(LANDMARK TRACKING—WITH AUTO ON)

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P22

F 06 45  (BLANK, BLANK, MAX MGA)
  LER PRO

F 05 70  (LANDMARK CODE)
  LOAD 10000 IN R2
  LER PRO

F 06 R9  (LAT, LONG/2 + ALT)
  LOAD PREVIOUSLY COMPUTED
  LANDMARK COORDINATES
  LER OPT ZERO-OFF
  OPT MODE=MAN
  POSITION TRUNITION TO 35 DEG
  OPT MODE=CMI
  PRO

F 06 R2  (SHAFT, TRUN, BLANK)
  MONITOR OPT DRIVE TO LANDMARK
  IDENTIFY IDENTIFICATION POINTS
  IF VISIBLE
  LER, CDR WHEN LANDMARK IDENTIFIED=
  START 0.3 DEG/SEC

49

PITCH RATE
CDR ROLL TO AVOID SHAFT AXIS
WITHIN 15 DEG OF LANDMARK
LER OPT MODE=MAN

F 51 BB  (FLEAS: E MARK)
MAKE 4 MARKS=20 SEC APART
POSITION TRUNITION TO 5 DEG
OPT ZERO-ZERO

CDR STOP PITCH RATE
MAN ATT(P)=ACCEL CMD
PITCH SC UP TO 5 DEG PITCH
AND 0 DEG ROLL W.R.T
LOCAL HORIZONTAL
MAN ATT(P)=MIN IMP
INITIATE ORBITAL PITCH RATE
FOR NEXT LANDMARK SIGHTING

LER PRO

F 05 71  (LANDMARK DATA)
  VERIFY R2

LER PRO

F 06 69  (LAT, LONG/2 + ALT)
  VERIFY LANDMARK COORDINATES

LER PRO

F 06 49  (DELTA R, DELTA V, BLANK)
  RECORD VALUES

**HOLD AT THIS DISPLAY FOR
20 SECONDS**

LER PRO

F 06 69  (LAT, LONG/2 + ALT)
  RECORD VALUES

**HOLD AT THIS DISPLAY FOR
20 SECONDS**

50
ADDENDUM 18
ORDEAL INITIALIZATION/VERIFICATION

**PROCEDURES FOR ORDEAL SETUP**

CDR SET ORDEAL ON FDAI 1
FDAI/SPU PWR= BOTH
LOGIC 2/3 PWR=ON
CMC ATT=IMU
FDAI SELECT=1/2
FDAI 1=OPR RATE
EARTH/LUNAR=LUNAR
MODE=HOLD/FAST
KEY V82E
F 04 06 (00002*00001)
PR0
F 16 44 (HA, HP, TFF)
ALT SET=SET ALT TO HA, HP AVG
PR0
KEY V83E
F 16 54 (R, RROT, THETA)
VERIFY 0 DEG YAW
SLEW FDAI 1 TO THETA
MODE=OPR/SLOW
SLEW FDAI PRECISELY

FINAL MISSION C-PRIME PROCEDURES DATE=12 NOV 1962

51

70
ADDENDUM 19
HIGH GAIN ANT ACQUISITION

P00

LMP HI GAIN ANT TRACK=MAN
HI GAIN ANT REAM=WIDE

CMP KEY V6AE
F 06 51 (RHO,GAMMA,BLANK)
LMP RECORD HI GAIN ANT
GMBL COORDINATES

CMP PRO
LMP HI GAIN ANT POSITION
SET ANT PITCH TO RHO
SET ANT YAW TO GAMMA
S=BAND ANT OMNI=HI GAIN
VERIFY HI GAIN S=BAND
ANT IND GREATER THAN
HALF SCALE
HI GAIN ANT TRACK=
AUTO OR REACO AS REQUIRED
HI GAIN ANT REAM=AS REQUIRED
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(3) Preliminary Mission C Flight Plan, dated 8 October 1968

(4) Preliminary Apollo Entry Summary Document Mission C-Prime (SA-503,5/C-103), dated 1 October 1968

(5) Guidance System Operations Plan for Manned CM Earth Orbital and Lunar Missions Using Program COLOSSUS; Section Four GNCS Operational Modes, Revision 1; dated July 1968


(7) Mission C-Prime preliminary Midcourse Correction, LOI, and TEI Flow Diagrams; dated 14 September 1968

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(9) MSC Internal Note No. 68-FM-252; "Apollo Mission C-Prime Alternate 1, Lunar Orbit Mission, (AS-503/CSM-103/LTA-B) Spacecraft Operational Trajectory, Volume 1”; dated 25 October 1968

(10) Apollo Mission Techniques (Draft Document); "Mission C-Prime Translunar Midcourse and Lunar Orbit Insertion, Volume I, Techniques Description"; dated 16 October 1968

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(12) MSC Internal Note No. 68-FM-272; "Apollo Mission C-Prime, Alternate 1 Preliminary Attitude Sequence, Volume II Lunar Orbit"; dated 8 November 1968

(13) MSC Memo 68-FM55-303; "C-Prime Mission Post TLI Sequence of Events"; dated 7 October 1968

(14) Savely, Robert T.; Preliminary Sighting Schedules for the Translunar and Transearth Legs of the Mission C-Prime for the 21 December 1968 Launch Windows; Informally Received; dated 6 November 1968

(15) MSC Memo 68-FM47-477; "Detailed Sighting Schedule for Translunar Leg of the 21 December 1968 Launch Windows"; dated 8 November 1968 (Amended per 18 November Meeting)

(16) MSC Memo 68-FM47-441; "Detailed Sighting Schedule for the Transearth Leg of the 21 December 1968 Launch Windows (Fast 1 turn)"; dated 13 November 1968 (Amended per 18 November Meeting)