CSM CONTINGENCY CHECKLIST

August 29, 1972

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CSM CONTINGENCY CHECKLIST

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CSM POWER CRITICAL LUNAR ORBIT
CSM POWER CRITICAL LUNAR ORBIT

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CSM

Failure Emergency Par On
Maintain: Voice Comm (On Voice B/U)
One Inv - On
SCS - Min Imp

LM

MVR To Comm Att X-Axis South
Earth In Left Window
ROZ-Xponder Self-Test

AGS

Comm & Th Up
Annip MSFN
Annip And Use
DUMP At MSFN
Request, When
DUMP Comp: Go Free
Drift & SELECT OMNI

MSFN-Status
L/M 1/O Time
T/T Time

COMM & TH OFF

CSM

MVR To RADAR Track Att
L/H Vent, Heads Pnd, "DRB"
Rate, Maintain Within 20°
All Axes Thru ROZ

LM

PLSS Off-Stowage
L/M Power-Up
(L/M-1:15)

CSM

Comm-Up Suit Comp
On (10 Min)
ROZ Pads
T/E Pad

INSTALL Docking
Target

CSM Power Critical (L/M On Surface)

LM on Surface
CSM POWER CRITICAL LUNAR ORBIT

LM on Surface Rndz & TEI Prep

**FAILURE**

Perform EMERG PWR DOWN, pg EMER/1-6

Verify power on MNB

**AC BUS PWR UP**

INV 2 - MNB
INV 2 AC1 & AC2 - on (up)
AC1 & AC2 RSET - RSET, on
Verify AC volts > 110 vac

**ENABLE MIN IMPULSE (CMC or SCS)**

*If AC Inverter on for COMM,*
* use SCS min impulse *

CMC MIN IMPULSE (~ 3 amp)
PRO, push (~ 5 sec)
F37 OOE
SC CONT - CMC/FREE
ROT CONTR PWR NORMAL 2 - AC/DC
AUTO RCS SELECT - single jet (MNB)

When min impulse not req'd:
AUTO RCS SELECT (a11) - OFF
ROT CONTR PWR NORMAL 2 - OFF
V37E 06E
PRO, push (~ 5 sec) until DSKY blanks

or

SCS MIN IMPULSE (~ 1 amp)
INV 2 - MNB (~ 5 amp)
cb SCS LOGIC BUS (4) - close
SCS ELEC PWR - ECA
ROT CONTR PWR NORMAL 2 - AC/DC
SC CONT - SCS
MAN ATT (3) - MIN IMP
AUTO RCS SELECT - single jet (MNB)

When min impulse not req'd:
AUTO RCS SELECT (a11) - OFF
ROT CONTR PWR NORMAL 2 - OFF
cb SCS LOGIC BUS (4) - open
SCS ELEC PWR - OFF
MNVR TO COMM ATTITUDE
(+X south, earth out left window, provides continuous visual contact with surface and continuous OMNI coverage)

Perform RNDZ XPNDR SELF-TEST, pg S/1-25 then RNDZ XPNDR - OFF

AOS 1
L.O. -02:08
COMM/TM PWR UP
cb INST ESS MNB - close
PWR AMP - HIGH
S-BD MODE PCM - PCM
S-BD AUX - DN VOICE BU
SCE PWR - NORM
PCM BIT RATE - LOW
TELCOM GRP 1 & 2 - AC2
Select best OMNI
Check Quad Temps

At MSFN request:
UP TLM CMD - NORM
HGA PWR - on (up) (~6 min)
P = 0°, Y = 290° (earth out left window)
MSFN perform tape dump
HGA PWR - OFF
UP TLM CMD - OFF

L.O. -57 min
COMM/TM - OFF
INV 2 - OFF
PWR AMP - OFF
S-BD MODE PCM - OFF
SCE PWR - off (ctr)
TELCOM GRP 1 & 2 - OFF

cb INST ESS MNB - open
cb panel 5 ECS - all open
AOS 2

MNVR TO RNDZ TRACK ATTITUDE
+X radially down at moon, head forward, zero yaw. Establish orb rate & hold att +20° (horizon ~ 20° below local horizontal)

COMM PWR UP
INV 2 - MNB
TELCOM GRP 1 & 2 - AC2
Select best OMNI
PCM BIT RATE - HIGH
SUIT COMPRESSOR - ON (10 min)

COPY RNDZ & TEI PADS

VHF AM B - DUPLEX
Configure Audio Pnl for VHF, Select VHF Antenna
Establish VHF with LM
INV 2 - OFF
TELCOM GRP 1 & 2 - OFF
SUIT COMPRESSOR - OFF

L.O. -5 min cb RNDZ XPNDR FLT BUS - close
RNDZ XPNDR - HTR

L.O. LM LIFT OFF

L.O. +20 min RNDZ XPNDR - PWR
*If no VHF contact with LM *
* call MSFN on S-BD, pg C/1-4*

L.O. +50 min RNDZ XPNDR - HTR
*If plane change req'd, *
* leave XPNDR on *

L.O. +01:00 LM CSI BURN

L.O. +01:30 RNDZ XPNDR - PWR

L.O. +02:00 LM CDH BURN

Install DOCKING TARGET
Braking -10 min
L.O. + 03:11 DAMP SC RATES

CHECK RCS QUAD TEMPS
cb INST ESS MNB - close
If any Quad < 60°:
RCS HTR - on until > 60°
to heat B or D: FC2 MNA - on (up)
cb INST ESS MNB - open

C
1-6

DAMP SC RATES
INV 2 - MNB
SUIT COMPRESSOR - ON (10 min)
cb SCS LOGIC BUS (4) - close
SCS ELEC PWR - ECA
ROT CONTR PWR NORMAL 2 - AC/DC
FC 2 MNA - on (up)
BMAG PWR 1 - ON (wait 90 sec)
FDAS/GPI PWR - 1
BMAG MODE (3) - RATE 1
AUTO RCS SELECT (16) - MNA or MNB

PRE-Docking
BMAG PWR 2 - ON
(wait 90 sec)
BMAG MODE (3) - ATT 1/RATE 2
MAN ATT (3) - RATE CMD
TRANS CONTR PWR - on (up)
DOCKING TARGET - BRIGHT
cb DOCK PROBE (2) - close
PROBE RETR (2) - OFF (verify)
PROBE EXT/REL - RETR
cb SECS ARM - close
SECS LOGIC (2) - on (up)
SECS PYRO ARM (2) - ARM
RNDZ XPNDR - OFF

DOCKING
At capture:
MAN ATT (3) - MIN IMP
DOCK PROBE RETRACT - SEC-1
POST-DOCKING
SECS PYRO ARM (2) – SAFE
SECS LOGIC (2) – OFF
cb SECS ARM (2) – open
DOCKING TARGET – OFF
AUTO RCS SELECT (all) – OFF
RHC PWR NORMAL 2 – OFF
BMAG PWR (2) – OFF
FDAI/GPI PWR – OFF
SCS ELEC PWR – OFF
cb SCS LOGIC BUS (4) – open
INV 2 – OFF

Pressurize tunnel from LM
Open Hatch
VHF DUPLEX – OFF

AOS 4
L.O. +03:36
Report Docking from LM

LM TO CSM POWER TRANSFER
Connect LM/CSM Umbilicals
cb LM PWR 1 MNB – close
cb LM PWR 2 MNB – close
Verify total amperage < 25
After LM configured for PWR Transfer:
LM PWR – CSM

Note: LM/CSM Umbilical is "Hot"
Main Bus Voltage may be monitored by
selecting MNB
cb G/N IMU HTR (2) – close (verify)

LM MNVR TO CSM ALIGN/COMM ATT AND HOLD

LOS -20 MIN
COMM/TM PWR UP
INV 2 – MNB
TELCOM GRP 1 & 2 – AC2
Select best OMNI
S-BD MODE PCM – PCM
PCM BIT RATE – LOW
PWR AMP – HIGH
COPY TEI PAD UPDATE

G&N PWR UP
PRO, push (~ 5 sec) until STBY Lt off
F37 OOE
Verify OMNI
UP TLM - CMD RSET, then NORM
UP TLM CM - ACCEPT (State Vector (V66),
Clock Increment,
Actual & Preferred(TEI)
REFSMAT, TEI Burn Pad)

Perform P30 pg G/4-1
(229) cb TIMERS (2) - close
Set DET
TIG -50 min cb IMU (2) - close
G/N PWR IMU - on (up) (wait 90 sec)
Perform DOCKED IMU ALIGN
CM(OGA)r = 300° - LM OGA + ΔØ
CM(IGA)p = LM IGA ±180°
CM(MGA)y = 360° - LM MGA

V41 N20E, OG__, IG__, MG__

V40E (free platform)
Set REFSMFLG:
V25 N7E, 77E, 10000E, 1E
Set DRIFTFLG:
V37E 51E, PRO, V37E 00E
*If G&N failed:
*TIG-30 min
*or sunset
*SCS PWR UP
*FC 2 MNA - on (up)
*SCS LOGIC BUS (4) - close
*SCS ELEC PWR - GDC/ECA
*BMAF PWR (2) - ON
*(wait 90 sec)
*FDxA/GPI PWR - 1
*FDAO SELECT - 1
*
*MNVR TO ALIGNMENT ATTITUDE
*cb OPTICS (2) - close
*G/N PWR - AC 2
*G/N PWR OPTICS - on (up)
*
*ALIGN GDC
*(Use technique recommended by*
*MSFN)
*G/N PWR (AC) - OFF
*G/N PWR OPTICS - OFF
*
*LOS
*COMM/TM - OFF
*PWR AMP - OFF
*S-BD MODE PCM - OFF
*SCE PWR - off (ctr)
*TELCOM GRP 1 & 2 - OFF
*
*Go to SPS TEI (SCS w/G&N Failed), *
*pg C/1-25

Sunset
*cb OPTICS (2) - close (verify)
G/N PWR - AC 2
G/N PWR OPTICS - on (up)
OPT ZERO - OFF
OPT ZERO - ZERO (15 sec)
OPT ZERO - OFF
Perform P52 (option 1)
MSFN supply optics angles for stars
G/N PWR OPTICS - OFF
G/N PWR (AC) - OFF
LOS 4 TELCOM GRP 1 & 2 - OFF
S-BD MODE PCM - OFF
PWR AMP - OFF

LM MNVR TO BURN ATTITUDE
* If LM JETTISON req'd:
  * use LM JETT PROCEDURES, pg C/6-1*

TIG -30 min
DC IND SEL - MNA
FC 2 MNA - on (up)
DC volts > 26.5 vdc
BMAG PWR 1 - WARMUP

Go to SPS TEI (G&N/SCS), pg C/1-17
DATE 8/29/72

FAILURE OF PWR DN
MAINTAIN =
ONE INV MIN IMP IMU

MNVR TO COMM ATT
(ERCOUT LEFT WINDOW)

COMM/TM - UP
HGA - ON (AT MSFN REQ)
COPY TEI PAD & TRACK SCHED

TIG - 60 MIN
MNVR TO TEI ATT
(HDS UP, BEF AT TIG - 1 HR)

TIG - 50 MIN
IMU - ON (IF REQ)

ASAP AFTER SUNSET
(NLT TIG - 30 MIN)
PS2 - OPT 3

IF LESS THAN 20 MIN IS AVAILABLE FOR TEI
PREP, TEI SHOULD BE DELAYED ONE REV

CISMMAN (POST LM JETTISON)

POST LM JETT

LOSS:
COMM-OFF

GO TO PWR CRIT
SPS TEI

TEI
POST LM JETTISON - TEI PREP

FAILURE

Perform EMERG PWR DOWN, pg EMER/1-6

Verify power on MNB

AC BUS PWR UP
INV 2 - MNB
INV 2 AC1 & AC2 - on (up)
AC1 & AC2 RSET - RSET, on
Verify AC volts > 110 vac

ENABLE MIN IMPULSE (CMC or SCS)
*If AC Inverter on for COMM,*
* use SCS min impulse *

CMC MIN IMPULSE (~ 3 amp)
PRO, push (~ 5 sec)
F37 O0E
SC CONT - CMC/FREE
ROT CONTR PWR NORMAL 2 - AC/DC
AUTO RCS SELECT - single jet (MNB)

When min impulse not req'd:
AUTO RCS SELECT (all) - OFF
ROT CONTR PWR NORMAL 2 - OFF
V37E O6E
PRO, push (~ 5 sec) until DSKY blanks

or

SCS MIN IMPULSE (~ 1 amp)
INV 2 - MNB (~ 5 amp)
cb SCS LOGIC BUS (4) - close
SCS ELEC PWR - ECA
ROT CONTR PWR NORMAL 2 - AC/DC
SC CONT - SCS
MAN ATT (3) - MIN IMP
AUTO RCS SELECT - single jet (MNB)

When min impulse not req'd:
AUTO RCS SELECT (all) - OFF
ROT CONTR PWR NORMAL 2 - OFF
cb SCS LOGIC BUS (4) - open
SCS ELEC PWR - OFF
MNVR TO COMM ATTITUDE
(earth out left window)

AOS 1

COMM/TM PWR UP
Cb INST ESS MNB - close
PWR AMP - HIGH
S-BD MODE PCM - PCM
S-BD AUX - DN VOICE BU
SCE PWR - NORM
PCM BIT RATE - LOW
TELCOM GRP 1 & 2 - AC2
Select best OMNI
Check Quad Temps

At MSFN request:
UP TLM CMD - NORM
HGA PWR - on (up) (~ 6 min)
P = 0°, Y = 290° (earth out left window)
MSFN perform tape dump
HGA PWR - OFF
UP TLM CMD - OFF

COPY TEI PAD & TRACKING SCHEDULE

G&N PWR UP
PRO, push (~ 5 sec)
F37 OOE
Verify OMNI
UP TLM - CMD RSET, then NORM
UP TLM CM - ACCEPT (State Vector (V66),
Clock Increment
Actual REFSMMAAT,
TEI Burn Pad)

Perform P30 pg G/4-1

(229) cb TIMERS (2) - close
Set DET
Before sunset

MNVR TO APPROXIMATE TEI INERTIAL ATTITUDE
(HEADS up, BEF ~ 1 hr before TIG)

TIG - 50 min
cb IMU (2) - close
G/N PWR IMU - on (up) (wait 90 sec)

Set REFSMFLG:
V25 N7E, 77E, 10000E, 1E
Set DRIFTFLG:
V37E 51E, PRO, V37E 00E

*If G&N failed:
*TIG -30 min
*or sunset

* SCS PWR UP
* FC 2 MNA - on (up)
* SCS LOGIC BUS (4) - close
* SCS ELEC PWR - GDC/ECA
* BMAG PWR (2) - ON
* (wait 90 sec)
* FDAI/GPI PWR - 1
* FDAI SELECT - 1

MNVR TO ALIGNMENT ATTITUDE
cb OPTICS (2) - close
G/N PWR - AC 2
G/N PWR OPTICS - on (up)

ALIGN GDC
(Use technique recommended* by STDN)
G/N PWR (AC) - OFF
G/N PWR OPTICS - OFF

*LOS
COMM/TM - OFF
PWR AMP - OFF
S-BD MODE PCM - OFF
SCE PWR - off (ctr)
TELECOM GRP 1 & 2 - OFF

*Go to SPS TEI (SCS w/G&N failed), *
pg C/1-25

*
**C**

1-16

**LOS**
- PWR AMP - OFF
- S-BD MODE PCM - OFF
- SCE PWR - off (ctr)
- TELCOM GRP 1 & 2 - OFF
- cb INST ESS MNB - open

**TIG -30 min or sunset**
- DC IND SEL - MNA
- FC 2 MNA - on (up)
  - DC volts > 26.5 vdc
- BMAG PWR 1 - WARMUP
- cb SCS LOGIC BUS (4) - close
- FDAI/GPI PWR - 1
- cb OPTICS (2) - close (verify)
- G/N PWR - AC 2
- G/N PWR OPTICS - on (up)
- OPT ZERO - OFF
- OPT ZERO - ZERO (15 sec)
- OPT ZERO - OFF
- Perform P52 (option 3)
  - (expect long gyro torque)
- Repeat P52
- G/N PWR OPTICS - OFF
- G/N PWR (AC) - OFF

Go to SPS TEI (G&N/SCS), pg C/1-17
SPS TEI G\&N/SCS

Assumes CSM POWER CRITICAL TEI PREP has been performed

+35:00
(-25:00)

P40 - SPS THRUSTING
Prethrust Program Complete
FLOOD Lts - as req'd
CMC & ISS - on
TEST C/W LAMPS
SPS GAUGING - AC1
PUG MODE - NORM
OXID FLOW vlv - PRI
CMC MODE - FREE
AUTO RCS SELECT (16) - as req'd
LOAD DAP (check roll jets)
(A=1 & total mass in R1 of N47)
ROT CONTR PWR NORM (2) - AC/DC
Set DET
V37E OOE

LM GO TO FREE
SC CONT - CMC/AUTO

1
MNVR TO PAD BURN ATT
V49E

2
SXT STAR CHECK
G/N PWR OPTICS - on (up)
G/N PWR - AC2
OPT ZERO - OFF, then ZERO (15 sec)
OPT ZERO - OFF
OPT MODE - CMC
CHECK SXT STAR (V41 N91E)
OPT ZERO - ZERO
G/N PWR OPTICS - OFF
G/N PWR (AC) - OFF

3
V37E 40E
(TFI available via N40, N45 or N35)
4 F 50 18 REQUEST MNVR TO FFAI RPY ANGLES (0.01°) (AUTO) SC CONT - CMC/AUTO PRO

5 06 18 AUTO MNVR TO FFAI RPY ANGLES (0.01°)

6 F 50 18 REQUEST TRIM MNVR TO FFAI RPY ANGLES ALIGN S/C ROLL (0.01°)

+50:00m
(-10:00)

cb INV PWR 1 MNA - close
cb INV CONT 1 - close
INV 1 - MNA
INV 2 AC1 - OFF
INV 1 AC1 - on (up)
cb SCS LOGIC BUS (4) - close
SCS ELEC PWR - GDC/ECA
BMAG PWR (2) - ON
FFAI/GPI PWR - BOTH
GDC ALIGN

TVC CHECK & PREP

(8) cb STAB CONT SYS (all) - close
cb SPS (12) - close
Perform EMS ΔV TEST & NULL BIAS CHECK, pg G/2-5, if desired
Set ΔVC
EMS FUNC - ΔV
MAN ATT (3) - RATE CMD
ATT DB - MIN
RATE - LOW
SCS TVC (2) - RATE CMD
ΔV CG - CSM (with or without A/S)
TVC GMBL DRIVE P&Y - AUTO

+54:00m
(-06:00)

(275) cb MNA BAT BUS A - close (verify)
cb MNB BAT C - close
cb MNB BAT BUS B - close (verify)
cb BAT CHGR BAT A & B (2) - close (verify)

(5) MN BUS TIE (2) - ON
SPS He vlv (2) - AUTO (verify)
Check N2A and N2B
FC 2 MNB - OFF
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
55:00m  PRIMARY TVC CHECK
(-05:00)

GMBL MOT P1-Y1 - START/ON (LMP Cnfrm)
Verify TRIM CONTROL & SET
Verify MTVC
  *IF SCS: SCS TVC (2) - AUTO*
SC CONT - CMC (SCS)
THC - CW
Verify NO MTVC

SEC TVC CHECK
GMBL MOT P2-Y2 - START/ON (LMP Cnfrm)
Set GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC
Verify GPI returns to 0,0(CMC)
or trim (SCS)
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
BMAG MODE (3) - RATE 2
PRO
BMAG MODE (3) - ATT/ RATE 2
ENTR

(ACCEPt) SC CONT - CMC (verify)

Monitor GPI Response:
00,02,-02,00,02,-02,00, Trim

*TEST FAIL: *
*SC CONT - SCS *
*SCS TVC (2) - AUTO*
8 06 40 TFI, VG, ΔVM (min-sec,.1fps)
  *PROG ALARM - TIG Slipped*
  *V5N9E 01703 *
  *KEY RLSE TO 8 *
FDAO SCALE - 5/1
RATE - HIGH
UPDATE DET

59:00 (-01:00)
EMS MODE - NORMAL
TRANS CONT PWR - ON
ΔV THRUST A(B) - NORMAL
THC - ARMED
RHC (2) - ARMED
(5) cb INST ESS (2) - close
SCE PWR - NORM
TELCOM GRP 1 & 2 - AC2
TAPE RCDR - HBR/RCD/FWD/CMD RESET

59:25 (-00:35)
DSKY BLANKS

59:30 (-00:30)
(AVE G ON)

06 40 TFI, VG, ΔVM (min-sec,.1fps)
CHECK PIPA BIAS < 2fps for 5 sec

59:XX (-00:XX)
ULLAGE

*If no ULLAGE:
  * DIR ULLAGE PB - PUSH*
  * Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP
59:55
(-00:05)
F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI > 0 Sec
(BYPASS IGN) ENTR to 11 (perform switching in 10)
EXIT - V37E OOE

9 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec, lfps, lfps)

*F 97 40 SPS Thrust fail *
*ΔV THRUST B(A) - NORMAL *
*(CONT GUID) PRO to 06 40 *
*(RECYCLE) ENTR to TIG-05sec*

SPS THRUST Lt - ON
ΔV THRUST B(A) - NORMAL
*IF SCS: +X & THRUST PB - PUSH*

MONITOR THRUSTING
Pc 95-105 psia
EMS COUNTING DOWN
SPS INJ VLVS (4) - OPEN
SPS He vlvs tb - gray
SPS FUEL/OXID PRESS - 170-195 psia
PUGS - BALANCED

XX:XX ECO

10 16 40 TFC (STATIC), VG, ΔVM (min-sec, lfps)

ΔV THRUST A&B - OFF
VERIFY THRUST OFF
SPS INJ VLVS (4) - CLOSED
SPS He vlvs tb (2) - bp
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF

PRO
C
1-22
11 F 16 85 VG XYZ (CM)
NULL RESIDUALS
RHC & THC - LOCKED
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
cb DIRECT ULLAGE (2) - open
cb SPS P1 & Y1 - open
RECORD ΔV COUNTER & RESIDUALS ΔVC
EMS FUNC - OFF
EMS MODE - STBY
PRO
ATT DB - MAX
BMAG MODE (3) - RATE 2
FC 2 MNB - on (up)
(275) cb MNA BAT BUS A - open
cb MNB BAT C - open
cb MNB BAT BUS B - open
PCM BIT RATE - LOW
TAPE RCDR - off (ctr)

12 F 37 V82E

13 F 16 44 HA, HP, TFF
PRO

14 F 37 OOE
When COMP ACTY lt out:
V66E
INV 1 AC1 - OFF
INV 2 AC1 - on (up)
INV 1 - OFF

SUIT COMPRESSORS - ON (10 min each hr)

MNVR TO COMM/PTC ATT
V49E
Load GMBL angles, PRO
PRO (start mnvr)
V16 N20E (monitor mnvr)
KEY REL
ENTR (completion of mnvr)

Perform EMERG PWR DOWN, Pg EMER/1-6:
- except COMM & G&N

AUTO RCS SELECT - single jet
(allow rates to damp for 20 min)

COMM/TM PWR UP (10 min track)
PWR AMP - HIGH
S-BD MODE PCM - PCM
S-BD AUX - DN VOICE BU

At MSFN request:
- UP TLM CMD - NORM
- HGA PWR - on (up) (~ 6 min)
- MSFN perform tape dump
- HGA PWR - OFF
- UP TLM CMD - OFF

COMM/TM - OFF
INV 2 - OFF
SCE PWR - off (ctr)
TELCOM GRP 1 & 2 - OFF
PWR AMP - OFF

Set up G/N PTC

Complete EMERG PWR DOWN, Pg EMER/1-6

Establish DORMANT CONFIGURATION, Pg C/2-1
SPS TEI-SCS w/G&N FAILED

Assumes TEI PREP has been performed

MNVR TO BURN ATTITUDE

FLOOD LTS - as req'd

50:00
(-10:00)

POWER UP 2nd INVERTER
INV 1 - MNA
INV 2 AC1 - OFF
INV 1 AC1 - on (up)

Perform EMS ΔV TEST & NULL BIAS CHECK, pg G/2-5, if desired
Set ΔVC
EMS FUNC - ΔV

TVC CHECK & PREP
(8) cb STAB CONT SYS (all) - close
cb SPS (12) - close
MAN ATT (3) - RATE CMD
LIMIT CYCLE - on (up)
ATT DB - MIN
RATE - LOW
BMAG MODE (3) - ATT 1/RATE 2
SCS TVC (2) - RATE CMD
ΔV CG - CSM (with or without A/S)
TVC GMBL DRIVE P&Y - AUTO
AUTO RCS SEL (RING 2) - MNB

(275) cb MNA BAT BUS A - close (verify)
cb MNB BAT C - close
cb MNB BAT BUS B - close (verify)
(5) cb BAT CHGR A&B (2) - close (verify)
54:00
MN BUS TIE (2) - ON
FC 2 MNB - OFF
SPS He vlv (2) - AUTO (verify)
Check N2A and N2B
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
RHC #2 - ARMED

55:00
PRIMARY TVC CHECK
GMBL MOT PT-Y1 - START/ON (LMP Cnfrm)
Verify TRIM CONTROL & SET
Verify MTVC
SCS TVC (2) - AUTO
THC - CW
Verify NO MTVC

SEC TVC CHECK
GMBL MOT P2-Y2 - START/ON (LMP Cnfrm)
Set GPI TRIM
Verify MTVC
THC NEUTRAL
Verify GPI returns to trim
Verify NO MTVC
ROT CONT PWR NORMAL (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
FDAI SCALE - 5/1
LIMIT CYCLE - OFF
UPDATE DET

59:00
EMS MODE - NORMAL
TRANS CONT PWR - ON
ΔV THRUST A (B) - NORMAL
THC - ARMED
RHC (2) - ARMED
cb INST ESS (2) - close
SCE PWR - NORM
TELCOM GRP 1&2 - AC2
TAPE RCDR - HBR/RCD/FWD/CMD RESET
ULLAGE
THRUST ON PB - PUSH
SPS THRUST Lt - ON
ΔV THRUST B (A) - NORMAL
ULLAGE & THRUST ON PB - PUSH

ECO
ΔV THRUST A&B - OFF
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
RECORD ΔVC
EMS FUNC - OFF
EMS MODE - STBY
ATT DB - MAX
BMAG MODE (3) - RATE 2
FC 2 MNB - on (up)
cb MNA BAT BUS A - open
cb MNB BAT C - open
cb MNB BAT BUS B - open
PCM BIT RATE - LOW
TAPE RCDR - off (ctr)
INV 1 AC1 - OFF
INV 2 AC1 - on (up)
INV 1 - OFF
SUIT COMPRESSORS - ON (10 min ea hr)

MNVR TO COMM/PTC ATT

Perform EMERG PWR DOWN, Pg EMER/1-6:
except COMM & SCS

AUTO RCS SELECT - single jet
(allow rates to damp for 20 min)

AOS COMM/TM PWR UP (10 min track)
PWR AMP - HIGH
S-BD MODE PCM - PCM
S-BD AUX - DN VOICE BU

At MSFN request:
UP TLM CMD - NORM
HGA PWR - on (up) (~ 6 min)
MSFN perform tape dump
HGA PWR - OFF
UP TLM CMD - OFF

COMM/TM - OFF
INV 2 - OFF
SCE PWR - off (ctr)
TELCOM GRP 1&2 - OFF
PWR AMP - OFF

Set up SCS PTC, pg G/8-3
(use couples for roll rate)

Complete EMERG PWR DOWN,
Pg EMER/1-6

Establish DORMANT CONFIGURATION,
pG C/2-1
CSM POWER CRITICAL COASTING
CSM POWER CRITICAL COASTING

DATE 8/29/72
CSM POWER CRITICAL COASTING

DORMANT CONFIGURATION LIST

1. PANEL 13 (ORDEAL)
   - FDAI sw (2) - INRTL
   - EARTH/LUNAR - PWR OFF
   - ALT SET - 60
   - LTG - OFF
   - MODE - HOLD/FAST

2. PANEL 15
   - COAS PWR - OFF
   - UTIL PWR - OFF
   - PL BCN LT - off (center)
   - PL VENT - OFF

3. PANEL 325
   - CAB PRESS RELF vlv (2) - NORMAL
   - PRIM GLY TO RAD vlv - BYPASS (pull)

4. PANEL 326
   - REPRESS PKG vlv - OFF
   - SM O2 SUPPLY vlv - OPEN
   - SURGE TK 02 vlv - OFF
   - GLY RSVR IN vlv - CLOSE
   - GLY RSVR BYPASS vlv - OPEN
   - GLY RSVR OUT vlv - CLOSE

5. PANEL 380
   - O2 DEMAND REG vlv - OFF
   - SUIT TEST vlv - OFF
   - SUIT CKT RET vlv - open (pull)

6. PANEL 7
   - EDS PWR - OFF
   - SCS TVC SERVO PWR #1 & #2 (2) - OFF
   - FDAI/GPI PWR - OFF
   - LOGIC 2/3 PWR - on (up)
   - SCS ELEC PWR - OFF
   - SCS SIG CONDR/DR BIAS 1 & 2 (2) - OFF
   - BMAG PWR (2) - OFF
   - DIRECT O2 vlv - close (CW)
1 PANEL 8
2 ch Panel 8 - see diagram C/2-3
3 AUTO RCS SEL (16) - OFF
4 INT NUM LT - OFF
5 INT INTGL LT - OFF
6 INT FLOOD LT - OFF
7 FLOOD LTS DIM - 1
8 FLOOD LTS FIXED - OFF
9 FLOAT BAG (3) - OFF (locked)
10 SECS LOGIC (2) - OFF (locked)
11 SECS PYRO ARM (2) - SAFE (locked)
12
13 PANEL 9, 6, 10
14 MODE (3) - INTERCOM/PTT
15 PAD COMM (3) - OFF
16 S BD (3) - T/R
17 PWR (3) - OFF
18 INTERCOM (3) - T/R
19 VHF AM (3) - T/R
20 AUDIO CONT (3) - NORM
21 SUIT PWR (3) - OFF
22
23 PANEL 1
24 EMS FUNC sel - OFF
25 EMS MODE - STBY
26 CMC ATT - IMU
27 FDAI SCALE - 5/1
28 FDAI SEL - 1/2
29 FDAI SOURCE - ATT SET
30 ATT SET - GDC
31 MAN ATT ROLL, PITCH & YAW (3) - MIN IMP
32 LIM CYCLE - on (up)
33 ATT DBD - MAX
34 RATE - LOW
35 TRANS CONTR PWR - OFF
36 RHC PWR NORM (2) - OFF
37 RHC PWR DIR (2) - OFF
38 SC CONT - SCS
39 CMC MODE - FREE
40 BMAG MODE ROLL, PITCH & YAW (3) - RATE 2
41 SPS THRUST - NORMAL (lock)
42 ΔV THRUST (2) - OFF (down) (guarded)
43 SCS TVC PITCH & YAW (2) - RATE CMD
44
1  SPS GMBL MOT PITCH & YAW (4) - OFF
2  ∆V CG - CSM
3  ELS LOGIC - OFF (down) (guarded)
4  ELS AUTO - MAN
5  CM RCS LOGIC - OFF
6  CM PRPLNT DUMP - OFF (down) (guarded)
7  CM PRPLNT PURG - off (down) (guarded)
8  EMS ROLL - OFF
9  .05G sw - OFF
10  α/Pc IND sw - Pc
11  LV/SPS IND - GPI
12  TVC GMBL DR PITCH & YAW (2) - AUTO
13  EVNT TMR STRT - STOP
14
15  PANEL 2
16  PRPLNT DUMP - RCS CMD
17  EDS AUTO - OFF
18  SM RCS HTRS (4) - OFF
19  UP TLM CM - BLOCK
20  PROBE EXTD/REL - OFF (guarded)
21  DOCK PROBE RETR PRIM & SEC (2) - OFF
22  EXT RUN/EVA LT - OFF
23  EXT RNDZ LT - off (center)
24  TUNL LT - OFF
25  LM PWR - OFF
26  PL VENT vlv - push (lock)
27  C/W NORM - ACK
28  C/W CSM - CSM
29  C/W PWR - 1
30  MSN TMR - STOP
31  CAB FANS - OFF
32  CRYO PRESS IND - SRG/3
33  O2 QTY IND - 3
34  H2 HTRS (2) - OFF
35  O2 HTRS (3) - OFF
36  H2 FANS (3) - OFF
37  ECS RAD FLOW AUTO CONT - AUTO
38  ECS RAD FLOW CONT PWR - off (center)
39  ECS RAD MAN SEL - RAD 1
40
41
42
43
44
1 ECS RAD PRIM HTR - off (center)
2 ECS RAD SEC HTR - OFF
3 POT H2O HTR - OFF
4 SUIT CKT H2O ACCUM AUTO - OFF
5 SUIT CKT HT EXCH - off (center)
6 SEC COOL LOOP EVAP - off (center)
7 SEC COOL LOOP PUMP - off (center)
8 GLY EVAP TEMP IN - MAN
9 GLY EVAP STM PRESS AUTO - MAN
10 GLY EVAP H2O FLOW - off (center)
11 CAB TEMP - MAN
12 HI GAIN ANT TRACK - MAN
13 HI GAIN ANT BEAM - WIDE
14 HI GAIN ANT PWR - OFF
15 HI GAIN ANT SERVO ELECT - PRIM
16 PANEL 3
18 FC HTRS (3) - OFF
19 SPS QTY TEST - off (center)
20 OXID FLOW VLV INCR - as desired
21 OXID FLOW VLV PRIM - PRIM
22 PUG MODE - PRIM
23 FC PURG (3) - OFF
24 FC 1, 2 & 3 MN BUS A (3) - OFF
25 MN BUS A & B RSET (2) - OFF
26 FC 1, 2 & 3 MN BUS B (3) - OFF
27 SPS PRESS IND sw - He
28 SPS LINE HTRS - off (center)
29 SPS He vlv (2) - AUTO
30 S BD XPNDR - PRIM
31 S BD PWR AMPL PRIM - PRIM
32 S BD PWR AMPL HI - off (center)
33 S BD MODE VOICE - VOICE
34 S BD MODE PCM - off (center)
35 S BD MODE RNG - RNG
36 S BD AUX TAPE - DN VOICE BU
37 S BD AUX TV - off (center)
38 UP TLM DATA - DATA
39 UP TLM CMD - OFF
40 S BD SQUELCH - OFF
41 VHF RNG - OFF
42 VHF BNC - OFF
43 VHF AM RCV ONLY - off (center)
44
1 VHF AM A & B (2) - off (center)
2 FC REACS vlv - NORMAL
3 H2 PURG LINE HTR - OFF
4 TAPE RCDR PCM - PCM/ANLG
5 TAPE RCDR RCD - off (center)
6 TAPE RCDR FWD - off (center)
7 SCE PWR - off (center)
8 PMP PWR - off (center)
9 PCM BIT RATE - LOW
10 AC INV (9) - OFF
11 AC 1 & 2 RSET (2) - OFF
12 DC IND sel - FC 2
13 BAT CHARGE sel - OFF
14
15 PANEL 16
16 DOCK TRGT - OFF
17 UTIL PWR - OFF
18 COAS PWR - OFF
19
20 PANEL 5
21 FC 1, 2 & 3 PUMPS (3) - OFF
22 G/N PWR - OFF
23 MN BUS TIE BAT A/C - BAT A/C
24 MN BUS TIE BAT B/C - BAT B/C
25 BAT CHGR - AC 1
26 NONESS BUS - OFF
27 INT INTGL LT - OFF
28 INT FLOOD LT - OFF
29 INT FLOOD LT DIM - 1
30 INT FLOOD LT FIXED - OFF
31 cb Panel 5 - see diagram C/2-7
32
33 PANEL 4
34 SPS GAUGING - OFF
35 TELCOM GRP 1 & 2 (2) - OFF
36 GLY PUMPS - OFF
37 SUIT COMPR 1 & 2 (2) - OFF
38 cb Panel 4 - all closed
39
40 PANEL 278
41 cb Panel 278 - all open
42 SM PWR SOURCE - (center) (if AUX BAT configured)
43 EXPERIMENT COVERS (3) - off (center)
PNL 277
- cb Panel 277 - all open
- SPS PRESS FUEL IND - 1
- SPS PRESS OXID IND - 1

PANEL 276
- cb Panel 276 - all open

PANEL 275
- cb Panel 275 - all open except:
  - cb FLIGHT/PL MN A & MN B (2) - close

PANEL 229
- cb Panel 229 all closed except:
  - cb MAIN REL PYRO (2) - open
  - cb 02 VAC ION PUMPS (2) - open
  - cb TIMERS MNA & MNB (2) - open

PANEL 230
- MAP CAMERA ON - OFF
- MAP CAMERA TRACK - off (center)
- MAP CAMERA IMAGE MTN - OFF
- LASER ALTR - OFF
- DATA SYS ON - OFF
- IR - OFF
- LUNAR SOUNDER OPERATE - STBY
- LUNAR SOUNDER HF ANT (2) - ctr
- LUNAR SOUNDER RCDR - off (center)
- LUNAR SOUNDER RADAR - OFF
- LUNAR SOUNDER MODE - HF
- PAN CAMERA MODE - STBY
- PAN CAMERA SELF TEST - off (center)
- PAN CAMERA PWR - off (center)
- PAN CAMERA - MONO
- PAN CAMERA V/h OVRD - off (center)
- UV SPECT - OFF

PANEL 225
- cb Panel 225 - all closed except:
  - cb FLT BUS MNA & MNB (2) - open
  - cb CTE (2) - open
1 PANEL 226, 250
2 cb Panel 226 & 250 - see diagrams right
3
4 PANEL 251
5 WASTE MGMT OVBD DRAIN vlv - OFF
6
7 PANEL 252
8 BAT VENT vlv - CLOSED
9 WASTE STOWAGE VENT vlv - CLOSED
10
11 PANEL 181
12 cb Panel 181 - all open
13 CRYO 3 AC PWR - OFF
14 SM/AC PWR - OFF
15 DOOR JETT - OFF (down) (guarded)
16 LOGIC PWR (2) - OFF
17
18 PANEL 201
19 AC UTIL PWR - OFF
20
21 PANEL 12
22 LM TUNL VENT vlv - OFF
23
24 PANEL 300, 301, 302
25 SUIT FLOW vlv (3) - FULL FLOW
26
27 PANEL 304
28 DRNK H2O SUPPLY vlv - OFF
29
30 PANEL 306
31 MSN TMR - STOP
32 EVNT TMR STRT - STOP
33
34 PANEL 101
35 CM RCS HTRS - OFF
36 WASTE H2O DUMP - OFF
37 UR DUMP - OFF
38
39
40
41
42
43
44
1 PANEL 100
  2 UTIL PWR - OFF
  3 FLOOD LTS DIM - 1
  4 FLOOD LTS FIXED - OFF
  5 OPT PWR - OFF
  6 IMU PWR - OFF
  7 RNDZ XPNDR - OFF
  8 NUMERICS LT - OFF
  9 FLOOD LTS - OFF
 10 INTGL LT - OFF
11
12 PANEL 122
13 OPT ZERO - ZERO
14 OPT TELTRUN - SLAVE TO SXT
15 OPT COUPLING - RSLV
16 OPT MODE - MAN
17 OPT SPEED - LO
18 COND LAMPS - OFF
19 UP TLM - ACCEPT
20
21 PANEL 352
22 WASTE TK SERVICING vlv - CLOSE
23 PRESS RELF vlv - 2
24 POT TK IN vlv - OPEN
25 WASTE TK IN vlv - AUTO
26
27 PANEL 351
28 MAIN REG vlv (2) - close
29 H2O/GLY TK PRESS REG vlv - OFF
30 EMER CAB PRESS vlv - BOTH
31
32 PANEL 382
33 SUIT HT EXCH PRIM GLY vlv - FLOW (CCW)
34 SUIT FLOW RELF vlv - OFF
35 GLY EVAP IN TEMP vlv - MIN (CCW)
36 SUIT HT EXCH SEC GLY vlv - FLOW (CCW)
37 SEC EVAP H2O CONT vlv - AUTO
38 PRIM EVAP H2O CONT vlv - AUTO
39 H2O ACCUM vlv (2) - RMTE
40
41 PANEL 378
42 PRIM GLY ACCUM vlv - open (CCW)
43
44
1. PANEL 379
2. PRIM ACCUM FILL vlv - OFF (CW)
3. PANEL 375
4. SURGE TK PRESS RELF vlv - open (CW)
5. PANEL 376
6. PLVC - NORMAL (up)
7. PANEL 377
8. GLY TO RAD SEC vlv - BYPASS (CCW)
9. PANEL 600
10. EMER 02 vlv - CLOSE
11. PANEL 602
12. REPRESS 02 RELF vlv - open (CW)
13. PANEL 601
14. REPRESS 02 vlv - CLOSE (guarded)
15. PANEL 603
16. EVA STA 02 SUPPLY - OFF
17. PANEL 604
18. SUIT PRESS ALARM - OFF
19. FWD HATCH
20. PRESS EQUAL vlv - CLOSE
21. ACTR HNDL sel - stow/check locked
22. SIDE HATCH
23. CAB PRESS DUMP vlv - close (CW)
24. GEAR BOX sel - LATCH
25. ACTR HANDLE sel - UNLATCH
26. LOCK PIN REL KNOB - LOCK
27. LOCK PIN ind - flush
28. GN2 VLV HANDLE - outboard
29. BPC JETT KNOB - 180° from BPC JETT decal

DATE: 8/29/72
DATE 8/29/72

MCC
COMM(TRACKING) ______:____:____
TIG ______:____:____

TIG-(TRIM-RT)
COMM/TH-UP
CK RCS QUAD TEMPS
MSFN-MCC TIG: ALIGN
MENT(TYPE)
10 MIN OF MSFN TRACKING

MCC
COMM(ACKING) ______:____:____
TIG ______:____:____

MCC
COMM(ACKING) ______:____:____
TIG ______:____:____

MCC
COMM(ACKING) ______:____:____
TIG ______:____:____

MCC
COMM(ACKING) ______:____:____
TIG ______:____:____

MCC TIMELINE
SCS MCC - PREPARATION

Assumes DORMANT CONFIGURATION, pg C/2-1

TIG-1:00 hr

(5) cb C/W (2) - close
(250) cb BAT A,B&C PWR ENTRY/PL (3) - close
(275) cb INVERTER POWER (4) - close
(276) cb INST PWR CONT (4) - close
(225) cb CTE (2) - close
(229) cb TIMERS (2) - close

FC 2 MNA - on (up)
MNA RSET - RSET, on
BMAG 1 - WARMUP

If MNB not powered by LM
FC 2 MNB - on (up)
MNB RSET - RSET, on

AC BUS PWR UP
INV 2 - MNB
INV 2 AC1 & AC2 - on (up)
AC1 & AC2 RSET - RSET, on

COMM PWR UP Pg C/2-33, 1A

Check Quad Temps
If any Quad < 60°:
cb SM RCS HTRS (4) - close
RCS HTR - on until > 60°
Then, cb SM RCS HTRS (4) - open

COPY BURN & ALIGNMENT PADS
Set DET

COMM - OFF
TELCOM GRP 1 & 2 - OFF
PMP PWR - off (ctr)
COLOR

C
2-16
SCS PWR UP
cb SCS LOGIC (4) - close
SCS ELEC PWR - GDC/ECA
BMAG PWR (2) - ON
(wait 90 sec)
FDAI/GPI PWR - 1
FDAI SELECT - 1
ROT CONTR PWR NORMAL 2 - AC/DC
AUTO RCS SEL (RING 1) - MNA

TIG - 50 min  MNVR TO ALIGNMENT ATTITUDE

ALIGN GDC
(Use technique recommended by STDN)

TIG - 25 min  MNVR TO BURN ATTITUDE

SCS MCC - PREP

DATE 8/29/72
SCS MCC - SPS ΔV
Assumes SCS MCC PREPARATION has been performed

50:00
(-10:00)

FLOOD LTS - as req'd
SIG CONDR/DRIVER BIAS PWR - AC1
SCE PWR - NORM
PMP PWR - NORM
TELCOM GRP 1 & 2 - AC1
PWR AMP - HIGH

POWER UP 2nd INVERTER
INV 1 - MNA
INV 2 AC1 - OFF
INV 1 AC1 - on (up)

Perform EMS ΔV TEST & NULL BIAS CHECK, pg G/2-5, if desired
Set ΔVC
EMS FUNC - ΔV

TVC CHECK & PREP
(8) cb STAB CONT SYS (all) - close
cb SPS (12) - close
MAN ATT (3) - RATE CMD
LIMIT CYCLE - on (up)
ATT DB - MIN
RATE - LOW
BMAG MODE (3) - ATT 1/RATE 2
SCS TVC (2) - RATE CMD
ΔV CG - CSM (with or without A/S)
TVC GMBL DRIVE P&Y - AUTO
AUTO RCS SEL (RING 2) - MNB

54:00
(-06:00)

cb MNA BAT BUS A - close
cb MNB BAT C - close
cb MNB BAT BUS B - close
FC 2 MNB - OFF
SPS He vlv - AUTO (verify)
Check N2A and N2B
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
C
2-18

ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
RHC #2 - ARMED

55:00

PRIM TVC CHECK

GMBL MOT P1-Y1 - START/ON (LMP Cnfrm)
Verify TRIM CONTROL & SET
Verify MTVC
SCS TVC (2) - AUTO
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2-Y2 - START/ON (LMP Cnfrm)
Set GPI TRIM
Verify MTVC
THC NEUTRAL
Verify GPI returns to trim
Verify NO MTVC
ROT CONT PWR NORMAL (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
FDAI SCALE - 5/1
LIMIT CYCLE - OFF
UPDATE DET

59:00

EMS MODE - NORMAL
TRANS CONTR PWR - ON
ΔV THRUST A (B) - NORMAL
THC - ARMED
RHC (2) - ARMED

59:XX

ULLAGE

00:00

THRU ON PB - PUSH
SPS THRUST Lt - ON

00:03

ΔV THRUST B (A) - NORMAL
ULLAGE & THRUST ON PB - PUSH

00:XX

ECO

ΔV THRUST A&B - OFF
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF

8/29/72
C
2-19

TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
RECORD ΔVC
EMS FUNC - OFF
EMS MODE - STBY
ATT DB - MAX
BMAG MODE (3) - RATE 2
FC 2 MNB - on (up)
cb MNA BAT BUS A - open
cb MNB BAT C - open
cb MNB BAT BUS B - open

INV 1 AC1 - OFF
INV 2 AC2 - on (up)
INV 1 - OFF

PCM BIT RATE - LOW
PWR AMP - OFF

Set up SCS PTC, pg G/8-3
(Use couples for roll rate)

STDN TRACKING (10 min)

Perform EMERG PWR DOWN, pg EMER/1-6

Establish DORMANT CONFIGURATION,
pg C/2-1
COLOR

C
2-20

SCS SPS MIN PWR ΔV

Assumes SCS MCC PREPARATION has been performed

FLOOD LTS - as req'd

Perform ΔV TEST, pg G/2-5

50:00
(-10:00)

Set ΔVC

EMS FUNC - ΔV

TVC CHECK & PREP

(8) cb STAB CONT SYS (all) - close
cb SPS (12) - close
MAN ATT (3) - RATE CMD
LIMIT CYCLE - on (up)
ATT DB - MIN
RATE - LOW
BMAG MODE (3) - ATT 1/RATE 2
SCS TVC (2) - RATE CMD
ΔV CG - CSM
TVC GMBL DRIVE P&Y - 1
AUTO RCS SEL (RING 2) - MNB

54:00
(-06:00)

cb MNA BAT BUS A - close
cb MNB BAT C - close
cb MNB BAT BUS B - close
FC 2 MNB - OFF
SPS He vlv (2) - AUTO (verify)
Check N2A and N2B
TVC SERVO PWR #1 - AC1/MNA
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
SC CONT - SCS
RHC #2 - ARMED

DATE 8/29/72
2-21

55:00 PRIMARY TVC CHECK
(-05:00) GMBL MOT PT-YT - START/ON (LMP Cnfrm)
Verify TRIM CONTROL & SET
Verify MTVC
SCS TVC (2) - AUTO
THC - CW
Verify MTVC
THC NEUTRAL
Verify GPI returns to trim
Verify NO MTVC
ROT CONT PWR NORMAL (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
FDAI SCALE - 5/1
LIMIT CYCLE - OFF
UPDATE DET

59:00 EMS MODE - NORMAL
(-01:00) TRANS CONT PWR - ON
ΔV THRUST A (B) - NORMAL
THC - ARMED
RHC (2) - ARMED

59:XX
(-00:XX) ULLAGE

DATE 8/29/72

00:00 THRUST ON PB - PUSH
SPS THRUST Lt - ON
00:03 ΔV THRUST B (A) - NORMAL
ULLAGE & THRUST ON PB - PUSH
00:XX ECO

ΔV THRUST A&B - OFF
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF
C
2-22
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
RECORD ΔVC
EMS FUNC - OFF
EMS MODE - STBY
BMAG MODE (3) - RATE 2
FC 2 MNB - on (up)
cb MNA BAT BUS A - open
cb MNB BAT C - open
cb MNB BAT BUS B - open
Set up SCS PTC, pg G/8-3
(Use couples for roll rate)
STDN TRACKING (10 min)
Perform EMERG PWR DOWN, pg EMER/1-6
Establish DORMANT CONFIGURATION,
pg C/2-1
SCS MCC - RCS ΔV

Assumes SCS MCC PREPARATION has been performed

FLOOD LTS - as req'd

Perform ΔV TEST, pg G/2-5

50:00
(-10:00)
Set ΔVC
EMS FUNC - ΔV
MAN ATT (3) - RATE CMD
LIMIT CYCLE - on (up)
ATT DB - MIN
RATE - LOW
BMAG MODE (3) - ATT 1/RATE 2
SC CONT - SCS
RHC #2 - ARMED
ROT CONT PWR NORMAL (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
UPDATE DET
AUTO RCS SEL (RING 2) - MNB

59:00
(-01:00)
EMS MODE - NORMAL
TRANS CONT PWR - ON
THC - ARMED
LIMIT CYCLE - OFF
00:00
THC - +X and hold
00:XX
THC - release

TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
RECORD ΔVC
EMS FUNC - OFF
EMS MODE - STBY
ATT DB - MAX
BMAG MODE (3) - RATE 2
Set up SCS PTC, pg G/8-3
(Use couples for roll rate)

STDN TRACKING (10 min)

Perform EMERG PWR DOWN, pg EMER/1-6

Establish DORMANT CONFIGURATION,
pg C/2-1.
DORMANT SYSTEMS MANAGEMENT

ECS

1. WATER PRESSURIZATION
   - MAIN REG vlv (either) - open
   - H2O/GLY TK PRESS REG vlv - BOTH, 1 or 2
   - To withdraw water cycle SURGE TK
   - 02 vlv as required
   - Water tank pressure will bleed ovbd 0.04 lb/hr after tank isolation (1 hr full tk, 9 hrs empty tk)

2. WASTE WATER TRANSFER CM TO PLSS
   - Install H2O Adapter Assy on Waste Tank Service Port
   - Connect Urine Dump Hose to H2O Adapter Assy
   - PLSS H2O SHUTOFF & RELIEF vlv - CLOSE (verify)
   - Connect Urine Dump Hose to PLSS H2O FILL conn
   - Use Filter if Urine Dump Hose is Contaminated
   - Connect Urine Bag conn to PLSS H2O DRAIN conn
   - Cut hole in Urine Bag to Provide Vent
   - Pressurize CM Water Tanks (as above)
   - WASTE TK SERVICING vlv - OPEN (3 min) - CLOSE
   - SURGE TK 02 vlv - OFF
   - Disconnect Urine Dump Hose from PLSS H2O FILL conn
   - Disconnect Urine Bag conn from PLSS H2O DRAIN conn

3. SUIT COMPRESSOR OPERATION
   - Configure for AC & DC MNA BUS POWER
   - SUIT COMPRESSOR 1 - AC 1 or AC 2
   - cb ECS PRESS GRP 2 MNA - CLOSE (Pnl 5)
   - Monitor O2 PP <~7.5 (~15 min-ON/60 min-OFF)
   - Monitor Cabin Pressure (Maintain >3.0 psia)
CM LiOH CANISTER UTILIZATION (IN CM)
Refer to Diagram C/2-27
Tape LM CDR Red Hose to CM Center Blue Hose
Tape LM LMP Red Hose to CM Right Blue Hose
Firmly butt together to minimize leaks
Install 02 Hose Coupling on CM Center Red Hose
Install 02 Hose Coupling on CM Right Red Hose
Install 02 Hose Coupling interconnecting CM Left Red and Blue Hoses
SUIT RETURN vlv - OPEN (Pull)
Remove LM LiOH Canister from ARS
Activate LM Suit Compressor

CM LiOH CANISTER UTILIZATION (LM BOX)
Refer to Diagram Below

METABOLIC MAKEUP WITH OPS 02
Verify OPS 02 conn Locked in STOWAGE PLATE
Cycle OPS ACTUATION LEVER as required
Flow Rate ~0.3 lb/hr.

OPS QUICK BLEED DOWN
Verify OPS 02 ACTUATION LEVER - OFF
Unstow OPS 02 conn from 02 conn STOWAGE PLATE
Restrain Hose and DIRECT INTO OPEN VOLUME
CAUTION: Flow Rate ~250 lb/hr at 5880 psi
Cycle OPS ACTUATION LEVER as required
DATE 8/29/72

CM LIOH CANISTER UTILIZATION (IN CM)

CM SUPPLY UTILIZATION (IN CM)
USE OF RE H2O BAG

H2O BAG FILL (POTABLE WATER)
DRINK WATER SUPPLY vlv - OFF
Disconnect Water Gun from Hose Assy & Stow
Connect Male QD on RE Flex
Trans Hose to Water Gun Hose
Connect H2O Bag Assy QD to other end of
RE Flex Trans Hose
DRINK WATER SUPPLY vlv - ON (5-8 min)
CAUTION: Do Not Overfill Bag (< taut)
When H2O Bag is full
DRINK WATER SUPPLY vlv - OFF
Disconnect H2O Bag & Flex Hose & stow
Connect Water Gun to Hose Assy
DRINK WATER SUPPLY vlv - ON

H2O BAG FILL (WASTE WATER)
Install Female QD on Waste Tank Service Port
Connect H2O Bag Assy QD to Female QD
CAUTION: If Waste H2O Qty < 10%
POTABLE TANK INLET - CLOSE
WASTE TK SERVICING vlv - OPEN (5-8 min)
CAUTION: Do Not Overfill Bag (< taut)
When H2O Bag is Full
WASTE TK SERVICING vlv - CLOSE
Disconnect H2O Bag and stow

H2O BAG DUMP
Configure for MNB POWER
cb ECS WASTE H2O/URINE DUMP HTR MNB-CLOSE
Remove H2O vlv from H2O Bag Hose Assy QD
Connect Urine Line Filter to Urine Transfer Hose
Connect Urine Transfer Hose QD to
H2O Bag Hose Assy QD
Attach Urine Transfer Hose/Filter to
Waste Management QD
URINE DUMP - HTR B
OVBD DRAIN DUMP vlv - DUMP (~ 5-10 min)
When H2O Bag is empty
OVBD DRAIN DUMP vlv - OFF
Stow Empty H2O Bag in U1
9 HARD SUIT TRANSFER TO LM
(Does not require dormant config)

LMP Transfer to LM w/CM hoses
Activate LM EPS & ECS as reqd.
Activate LM VHF SIMPLEX A

CMP Activate VHF SIMPLEX A

LMP Transfer to LM ECS

CMP (on cue) SUIT FLOW vlv (LMP, pnl 300) - OFF
LMP Disconnect CM hoses
Transfer OPS and CM hoses to CM
Establish LM Att reference & control mode
Transfer Attitude Control to LM

CDR Verify Surge Tk & Repress Pkg full & isolated

CMP Assist CDR in switching to LMP hoses
SUIT FLOW vlv (LMP, pnl 300) - SUIT FULL FLOW
SUIT FLOW vlv (CDR, pnl 301) - OFF
Disconnect CDR's hoses & install interconnect

CDR & CMP Reconfigure CSM
AUTO RCS SEL (16) - OFF
LM Power Transfer to CSM(C/2-35)(ASC Stage Only)
RHC PWR DIR (2) - OFF
Purge FC O2 & H2
SCS Power Down (EMER/1-7)
IMU & CMC to Standby (Descent Stage Attached)
HGA POWER - OFF
S BD ANT OMNI - OMNI B
S BD ANT - OMNI
SM RCS HTRS (4) - OFF
Dump Waste & Pot H2O Tks
Transfer items per CSM/LM Transfer List (C/2-32)
CDR assist CMP to don OPS
Transfer to LM w/CM (LMP) hoses
LMP Connect LM hoses to CDR
CMP (on cue) SUIT FLOW vlv (LMP, Pnl 300) - OFF
LMP Disconnect CDR from CM hoses
Transfer CM hoses to CM
CMP Install Interconnect on LMP hoses
Tape LMP hoses in Tunnel area
Reconfigure Suit Loop
   Activate OPS (do not purge)
   Remove most used LiOH cann
   SUIT CKT H2O ACCUM - OFF
   cb C/W (2) - OPEN (Pnl 5)
   VHF AM A - OFF
   Activate PGA PURGE vlv at 4 lb/hr
   SUIT COMPR 1 & 2 (2) - OFF
   SUIT FLOW vlv (CMP, Pnl 302) - OFF
   Disconnect CM hoses and install Interconnect
CMP Transfer to LM and close Hatch
   PGA PURGE vlv - max flow
When LM cabin press = 3.0 psia
   OPS 02 ACTUATION LEVER - OFF
   Remove Helmet and Disconnect OPS
   OPS 02 ACTUATION LEVER - ON (deplete)
10 HARD SUIT TRANSFER TO CSM
(Does not require dormant config)

CMP
Verify OPS prior to cabin depress
Transfer to CM w/OPS (purge 4 lb/hr)
Verify CM Suit Loop Press
Attach CMP hoses
SUIT FLOW vlv (CMP, Pnl 302) - SUIT FULL FLOW
SUIT COMPR 1 - AC 1
VHF AM A - SIMPLEX
Check PART PRESS CO2
PGA PURGE vlv - OFF (install pin)
Transfer CM LMP (Pnl 300) hoses to LM
SUIT CKT H2O ACCUM - AUTO 1
Install LiOH cann in empty compartment
OPS 02 ACTUATION LEVER - OFF

LMP
Assist CDR in switching to CM LMP hoses
CMP (on cue) SUIT FLOW vlv (LMP, Pnl 300) - SUIT FULL FLOW

CDR
Transfer to CM

CMP
Assist CDR in connecting to CM CDR hoses
SUIT FLOW vlv (CDR, Pnl 301) - SUIT FULL FLOW
SUIT FLOW vlv (LMP, Pnl 300) - OFF

Reconfigure CSM
cb C/W (2) - CLOSE (Pnl 5)
SM RCS HTRS (4) - ON
Perform CMC Powerup (G/2-2)
Perform IMU Powerup (G/2-1)
Transfer Alignment to CM (G/7-10)
Perform SCS Powerup (G/2-4)
Transfer items per LM/CSM Transfer List (C/2-32)

LMP
Transfer to CM LMP hoses
CMP (On cue) SUIT FLOW vlv (LMP, Pnl 300) - SUIT FULL FLOW
Verify quad temps > 55°F

CDR
Transfer S/C Control to CSM
AUTO RCS SEL (16) - as req'd

LMP
Complete LM closeout
Transfer to CM & close hatch
Establish CM Power as required
CSM/LM TRANSFER LIST

CM LiOH cann (2/day)
Meals (9/day)
Water Bags, filled (TBD/day)
Hygiene Equipment
  Towels
  Tissue Dispenser
  Urine Bags, empty
  Fecal Bags
  Medical Kit
  Inflight Coverals w/Comm Carriers
Booties
Tape, Plastic Bags, etc
Pens, scissors, penlights, etc
FDF Documents

LM/CSM TRANSFER LIST

FDF Documents
Pens, scissors, penlights, etc
Tape, Plastic Bags, etc
Medical Kit
Water Bags, filled
Unused CM LiOH cann
Lunar surface return items
Cameras, magazines, etc
COMM

1A BASIC ACTIVATION (VOICE/RANGING)
CONFIGURE FOR AC & DC BUS POWER
cb FLT BUS MNA & MNB (2) - CLOSE (Pnl 225)
UP TLM CMD RESET - RESET then OFF
TELCOM GRP 1 & 2 (2) - AC1 or AC2 OFF
POWER PMP - NORM OFF
PCM BIT RATE - HIGH
PWR - AUDIO/TONE OFF
SUIT PWR - ON
Verify S/C Attitude and Select Best OMNI
S BD NORMAL PWR AMPL - as required OFF

1B TM (FOLLOWS BASIC ACTIVATION)
S BD PWR AMPL - HIGH OFF
S BD MODE PCM - PCM OFF
PCM BIT RATE - LOW
PROVIDE ADDITIONAL TM
SCE PWR - NORM OFF
  cb ECS XDUCER PRESS GRP 1&2 MNA(B)(2) - CLOSE(Pnl 5)
  cb ECS XDUCER TEMP MNA(B) - CLOSE (Pnl 5)
  cb ECS SEC COOL LOOP XDUCER MNA(B) - CLOSE(Pnl 5)
  cb ECS RAD CONT/HTRS MNA(B) - CLOSE (Pnl 5)
  cb ECS WASTE/POT H2O MNA(B) - CLOSE (Pnl 5)
  cb INSTR PWR CONT (4) - CLOSE (Pnl 276)
  cb BAT C PWR ENTRY/PL - CLOSE (Pnl 250)

2 VOICE RECORD (NO XMTR)
CONFIGURE FOR AC & DC BUS POWER
cb FLT BUS MNA(B) - CLOSE (Pnl 225)
UP TLM CMD RESET - RESET then OFF
TELCOM GRP 1 - AC1 or AC2
POWER PMP - NORM OFF
TAPE RECORDER RECORD - RECORD OFF
TAPE RECORDER FWD - FWD OFF
PWR - AUDIO/TONE
SUIT PWR - ON
To add PCM Record See "PROVIDE ADDITIONAL TM" Above
1. INITIAL MAIN BUS TIES CLOSURE
   - CB BAT A & B PWR ENTRY/PL (2) - CLOSE (Pnl 250)
   - CB MAIN A BAT BUS A - CLOSE (Pnl 275)
   - CB MAIN B BAT BUS B - CLOSE (Pnl 275)
   Verify BAT BUS A & B VOLTS 31.5 - 38.0
   MAIN BUS TIE BAT A/C - BAT A/C
   Check BAT BUS A AMPS and MNA VOLTS
   MAIN BUS TIE BAT B/C - BAT B/C
   Check BAT BUS B AMPS and MNB VOLTS
   TO OPEN BUS TIES:
   - CB MAIN A BAT BUS A - OPEN (Pnl 275)
   - CB MAIN B BAT BUS B - OPEN (Pnl 275)
   - CB BAT A & B PWR ENTRY/PL (2) - OPEN (Pnl 250)

2. LM PWR TRANSFER TO CSM
   After LM Configured for PWR TRANSFER
   Do NOT Connect LM to CSM if CSM load >25 AMPS
   If load >25 AMPS or Unable to keep LM PWR
   Transfer loads to MNA
   LM PWR - CSM

3. BATTERY A(B) CHARGING
   - CB BAT A(B) PWR ENTRY/PL - CLOSE (Pnl 250)
   - CB INVERTER PWR 2 MAIN B - CLOSE (Pnl 275)
   MAIN BUS TIE BAT A/C(B/C) - OFF A/C(B/C)
   BAT CHGR - AC2
   AC INVERTER 2 - MNB
   AC INVERTER 2 AC BUS 2 - on (up)
   AC BUS 2 RESET - RESET - ON OFF
   BATTERY CHARGE sel - A(B) OFF
   DC INDICATOR sel - BAT CHARGER FC2
   To Terminate Procedure, Reverse Procedure

4. BATTERY C CHARGING
   Replace First Line of BAT A CHARGING with:
   - CB BAT C PWR ENTRY/PL - CLOSE (Pnl 250)
   - CB BAT C TO BAT BUS A - CLOSE (Pnl 250)
   Charge through BAT A Procedure
5. USE OF AUX BATTERY
   cb BAT B PWR ENTRY/PL - CLOSE (Pnl 250)
   SM PWR SOURCE - AUX BAT (mom) (Pnl 278)
   FUEL CELL 2 - desired main bus
   Verify MAIN BUS VOLTS > 26.5
   Monitor FC 2 AMPS

6. AC POWER
   cb BAT A PWR ENTRY/PL - CLOSE (Pnl 250)
   cb INVERTER PWR 2 MAIN B - CLOSE (Pnl 275)
   AC INVERTER 2 - MN B
   AC INVERTER 2 AC BUS 1 & 2 (2) - on (up)
   AC BUS 1&2 RESET (2) - RESET - ON OFF
   Verify AC VOLTS > 110
G&C

1. DISPLAY RATE (SCS) (FDAI SCALE = 5/1 w/o LOGIC BUS)  
   Configure for AC2 & MNB BUS POWER  
   BMAG POWER 2 - ON [OFF]  
   FDAI/GPI POWER - 2 [OFF]

2. DISPLAY ATTITUDE (SCS)  
   Configure for AC1 & 2 and MNB BUS POWER  
   BMAG POWER 2 - ON [OFF]  
   cb SCS LOGIC BUS MNB 2/3 - CLOSE (Pnl 8)  
   cb SCS LOGIC BUS MNB 1/4 - CLOSE (Pnl 8)  
   FDAI SELECT - 2 [1/2]  
   FDAI/GPI POWER - 2 [OFF]  
   SCS ELECTRONICS PWR - GDC/ECA [OFF]

3. DISPLAY ATTITUDE (G&N)  
   Configure for AC2 & MNB BUS POWER  
   cb SCS LOGIC BUS MNB 2/3 - CLOSE (Pnl 8)  
   cb SCS LOGIC BUS MNB 1/4 - CLOSE (Pnl 8)  
   FDAI/GPI POWER - 2 [OFF]  
   FDAI SELECT - 2 [1/2]  
   FDAI SOURCE - CMC [GDC]

4. CMC MIN IMPULSE  
   Configure for one MN BUS and active DAP  
   cb G/N COMPUTER (2) - CLOSE (Pnl 5)  
   *PRO, push (~5 sec), if req'd*  
   F37 OOE  
   SC CONT - CMC/FREE  
   ROT CONTR PWR NORMAL 2 - AC/DC  
   AUTO RCS SELECT - single jet  
   When min impulse not req'd  
   AUTO RCS SELECT (16) - OFF  
   ROT CONTR PWR NORMAL 2 - OFF  
   V37E 06E  
   PRO, push (~5 sec) until DSKY blanks  
   cb G/N COMPUTER (2) - OPEN (Pnl 5)  

DATE  8/29/72
5  SCS MIN IMPULSE
   Configure for AC1 & MNB BUS POWER
   AC INV 2 - MNB (verify)
   cb SCS LOGIC BUS MNB 1/4 - CLOSE
   cb SCS LOGIC BUS MNB 2/3 - CLOSE
   SCS ELECTRONICS PWR - ECA [OFF]
   ROT CONTR PWR NORMAL 2 - AC/DC [OFF]
   AUTO RCS SELECT - single jet

6  OPTICS POWER
   Configure for MN BUS POWER
   G&N POWER OPTICS - on (up)
   If Reticle Required
   G/N PWR - AC1 or AC2 [OFF]
DATE 8/29/72

CSM POWER CRITICAL ENTRY
## CSM POWER CRITICAL ENTRY—LM ATTACHED or CSM ONLY

Assumes DORMANT CONFIGURATION, pg C/2-1

### 1. Verify Stowage Transfer complete

### 2. LM MIDCOURSE MANEUVER, if req'd

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI-5:30hr</td>
<td>LM copy MCC-7, ALIGN &amp; SEP PADS</td>
</tr>
<tr>
<td></td>
<td>LM AGS/PGNS ALIGN</td>
</tr>
<tr>
<td>EI-5:00hr</td>
<td>LM MCC-7</td>
</tr>
</tbody>
</table>

### 3. EI-4:55hr POWER CSM MAIN BUSES

<table>
<thead>
<tr>
<th>Action</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(250) cb BAT A,B,&amp; C PWR ENTRY/PL(3)</td>
<td>close</td>
</tr>
<tr>
<td>FC 2 MNA</td>
<td>on (up)</td>
</tr>
<tr>
<td>FC 2 MNB</td>
<td>on (up)</td>
</tr>
<tr>
<td>MNA &amp; MNB RSET</td>
<td>RSET, on</td>
</tr>
<tr>
<td>Verify Main Buses</td>
<td>&gt; 26.5 vdc</td>
</tr>
<tr>
<td>(5) cb C/W (2)</td>
<td>close</td>
</tr>
<tr>
<td>cb IMU HTR MNB</td>
<td>close</td>
</tr>
<tr>
<td>(276) cb INST PWR CONT (4)</td>
<td>close</td>
</tr>
</tbody>
</table>

### 4. ENABLE SM RCS HEATERS

<table>
<thead>
<tr>
<th>Action</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8) cb SM RCS HTRS (4)</td>
<td>close</td>
</tr>
<tr>
<td>SM RCS HTRS (4)</td>
<td>PRIM</td>
</tr>
</tbody>
</table>

### 5. CM RCS PREHEAT

Note: If sys test mtr 5c,d,6a,b,c,d all read 3.9 vdc (28°F) or more, omit preheat

<table>
<thead>
<tr>
<th>Action</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM RCS LOGIC</td>
<td>on (up)</td>
</tr>
<tr>
<td>(8) cb CM RCS HTRS (2)</td>
<td>close</td>
</tr>
<tr>
<td>(101) CM RCS HTRS</td>
<td>ON (LMP Confirm)</td>
</tr>
<tr>
<td>(20 min or til lowest rdg is 3.9 vdc)</td>
<td>(Monitor Manf press for press drop)</td>
</tr>
</tbody>
</table>

### 6. TERM. CM RCS PREHEAT

<table>
<thead>
<tr>
<th>Action</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM RCS HTRS</td>
<td>OFF (LMP Confirm)</td>
</tr>
<tr>
<td>CM RCS LOGIC</td>
<td>OFF</td>
</tr>
<tr>
<td>cb CM RCS HTR (2)</td>
<td>open</td>
</tr>
</tbody>
</table>
7 EI-4:40hr AC BUS PWR UP
(275) cb INVERTER POWER (4) - close
INV 2 - MNB
INV 2 AC1 & AC2 - on (up)
AC1 & AC2 RSET - RSET, on

8 COMM PWR UP
(225) cb FLT BUS (2) - close
TELCOM GRP 1 - AC1
TELCOM GRP 2 - AC2
S-BD MODE PCM - PCM
SCE PWR - NORM
PMP PWR - NORM
Configure Pnl 6, 9, 10 for voice

9 G/N POWER UP
INTEGRAL lts (NUMERICS) - INCR
cb G/N COMPUTER (2) - close
*PRO, push (~ 5 sec), if req'd*
F37 OOE
Verify OMNI
UP TLM - CMD RSET, then NORM
UP TLM CM - ACCEPT (V74, State Vector
(V66), Clock Increment,
REFSMAT(S), Entry TGT)

(229) cb TIMERS (2) - close
(225) cb CTE (2) - close
MISSION TIMER - RSET
Set MISSION TIMER
G/N PWR IMU - on (up) (wait 90 sec)
Perform DOCKED IMU ALIGN
CM(OGA)r = 300° - LM OGA + Δθ
CM(IGA)p = LM IGA ± 180°
CM(MGA)y = 360° - LM MGA

V41 N20E, O0G____, I0G____, M0G____

V40E (free platform)
Set REFSMFLG:
V25 N7E, 77E, 10000E, 1E
Set DRIFTFLG:
V37E 51E, PRO, V37E 00E
C
3-5

(8) cb SCS LOGIC BUS (4) - close
FDAI/GPI PWR - 1
FDAI SOURCE - CMC

G/N PWR - AC2
G/N PWR OPTICS - on (up)
OPT ZERO - OFF
OPT ZERO - ZERO (15 sec)
OPT ZERO - OFF
If CSM only, perform P51
Perform P52 (option 1)
STDN supply optics angles for stars

G/N PWR OPTICS - OFF
G/N PWR (AC) - OFF

SCS POWER UP
SCS ELEC PWR - GDC/ECA
SIG CONDR/DRIVER BIAS PWR - AC1
FDAI/GPI PWR - OFF
BMAG PWR (both) - ON
(wait 90 sec)
FDAI/GPI PWR - BOTH
GDC ALIGN

SUIT COMPRESSOR 1 - AC1

ECS CKS
cb ECS TRANSDUCERS (8) - close
O2 SUPPLY REFILL pg S/1-7
PGA verification, (if suited)S/1-14

EPS CKS #1, 3, 4 (5 if req'd) pg S/1-2

SPS CK (If req'd) pg S/1-1

RCS CKS
SM RCS Monit Ck pg S/1-1
CM RCS Monit Ck pg S/1-1

C&W SYS CK pg S/1-20
17 -03:45h CSM MIDCOURSE MANEUVER, if req'd
   P30 - EXT ΔV
-03:15h P40/41 - SPS/RCS THRUSTING
   (If P40 req'd, go to pg C/1-17)
-03:00h CSM MCC-7

18 Select best OMNI

19 PRIMARY WATER EVAP ACTIVATION
   H2O/GLY TK PRESS REG vlv - BOTH
   PRI ECS GLY PUMP - AC1
   SUIT CKRT H2O ACCUM - AUTO 1
   GLY EVAP H2O FLOW - AUTO
   GLY EVAP STM PRESS - AUTO

20 -02:00h LOGIC SEQUENCE CK
   cb SECS ARM (2) - close
   cb ELS/CM-SM SEP (2) - close
   ELS LOGIC - on (up)
   ELS - AUTO
   Coordinate next 3 steps with STDN
   SECS LOGIC (2) - on (up)
   MSFN confirm GO for PYRO ARM as req'd
   SECS LOGIC (2) - OFF
   cb SECS ARM (2) - open
   ELS LOGIC - OFF
   ELS - MAN
   cb ELS/CM-SM SEP (2) - open

21 (250) cb PYRO A SEQ A - close (verify)
   cb PYRO B SEQ B - close (verify)
   DC IND - PYRO BAT A(B)
   *If PYRO BAT A(B) < 35 vdc
   *cb PYRO A(B) seq A(B) - open
   *cb PYRO A(B)BAT BUS A(B) TO PYRO
   * BUS TIE - close
22  -01:35h  P52 - IMU REALIGN pg G/6-2 (OPTION 3)
   Record gyro torquing angles
   R
   P
   Y
   *IF > 1° - recycle P52
   *If confirmed, use SCS for EMS entry*
   G/N PWR OPTICS - OFF
   G/N PWR (AC) - OFF

23  (-:--)  GDC ALIGN
   If drift > 10°/hr, change rate source

24  -01:30h  LM MNVR TO JETTISON ATTITUDE
   MONITOR TO AVOID GIMBAL LOCK
   LM ATT HOLD, MAX DB

25  LM CLOSE OUT
   Close LM HATCH and DUMP vlv
   Perform HATCH DECAL
   Perform HATCH INTEGRITY CHECK
   SURGE TK - ON
   MAIN REG vlv (2) - OPEN
   EMER CABIN PRESS vlv - BOTH
   LM PWR - OFF

26  -01:20h  EMS ENTRY CHECK
   EMS FUNC - OFF
   (8) cb EMS (2) - close
   EMS MODE - STBY
   EMS FUNC - EMS TEST 1 (wait 5 sec)
   EMS MODE - NORMAL (wait 10 sec)
   Check ind lts - off
   RANGE ind - 0.0
   Slew hairline over notch
   in self-test pattern
   EMS FUNC - EMS TEST 2 (wait 10 sec)
   .05G lt - on (all others out)
   EMS FUNC - EMS TEST 3
   .05G lt - on
   RSI lower lt - on (10 sec later)
   Set RANGE counter to 58 nm ±0.0
EMS FUNC - EMS TEST 4
.05G lt - on (all others out)
G-V trace within pattern to lwr rt corner at 9G
RANGE ind counts down to 0±0.2
EMS FUNC - EMS TEST 5
.05G lt - on
RSI upper lt - on (10 sec later)
RANGE ind - 0.0
Scribe traces vertical line 9g to 0.28±0.1
ALIGN SCROLL TO ENTRY PATTERN (on 37K ft/sec line)
EMS FUNC - RNG SET
G-V scroll assy traces vert. line 0.28g to 0±0.1
EMS MODE - STBY

27-01:00h LM JETTISON
AUTO RCS SELECT (12) - MNA or MNB
ROT CONTR PWR NORMAL 2 - AC/DC
ROT CONTR PWR DIRECT 2 - MNA/MNB
cb SECS ARM (2) - close
Cue MSFN
SECS LOGIC (2) - on (up)
V37E 47E
SC CONT - CMC/FREE
MSFN confirm GO for PYRO ARM
SECS PYRO ARM (2) - ARM
CSM/LM FINAL SEP (2) - on (up)
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
Load DAP 11102
SC CONT - CMC/AUTO
PRO OOE
Select best OMNI

BORESIGHT & SXT STAR CHECK
G/N PWR - AC2
G/N PWR OPTICS - on (up)
OPT ZERO - OFF
OPT ZERO - ZERO (15 sec)
OPT ZERO - OFF
OPT MODE - CMC
Check SXT STAR (V41 N91E)
Drive Optics to 90° shaft angle
G/N PWR OPTICS - OFF

FINAL STOWAGE
OPTICS
Install Optics Covers
ORDEAL
GLY TO RAD SEC vlv - BYPASS (verify)
Verify EVA COUCH STRUT disengaged
Cool pnl installed
Y-Y struts (2) extended
Stow Data Box R-12
Attach Both strut unlock lanyards
Check for water in tunnel area
Stow gas separator (A8)
Stow Cl injector (R6)
WASTE MGMT DRAIN vlv - OFF (verify)
Remove & stow URA, urine transfer
hose and urine filter
Verify COAS locked in stowage mount

cb FC 1 BUS CONT - close
SYS TEST METER - 5B (BAT RLY BUS
3.4-4.1 vdc)

FINAL GDC DRIFT CK (if req'd)
If drift > 10°/hr, Suspect GDC, Do not
use RSI & FDAI #2
CM RCS ACTIVATION
  cb SECS ARM (2) - close (verify)
  Cue MSFN
  SECS LOGIC (2) - on (up)
  MSFN confirm GO for PYRO ARM
  SECS PYRO ARM (2) - ARM
  CM RCS PRPLNT 1&2 tb(2) - gray(verify)
  CM RCS PRESS - on (up)
  RCS IND sw - CM1, then 2
  He PRESS stabilizes at 3300-3500
  psia after 15 minutes
  MANF PRESS 287-302 psia
  SECS PYRO ARM (2) - SAFE

P27 & ENTRY PAD UPDATE, pg E/1-7

Set DET (up, to EI)

EMS INITIALIZATION

  *Scroll not on 37K - *
  * EMS FUNC - TEST 5 *
  * Slew scroll to 37K*

  EMS FUNC - RNG SET (verify)
  SET RNG TO PAD DATA RNG
  EMS FUNC - Vo SET
  Slew Scroll to Pad Data VIO
  EMS MODE - STBY (verify)
  EMS FUNC - ENTRY

RSI ALIGNMENT
FDAA SOURCE - ATT SET
ATT SET - GDC
EMS ROLL - on (up)
GDC ALIGN pb - push & hold
YAW THUMBWHEEL - Position RSI thru
  45° & back to LIFT UP
GDC ALIGN pb - release
EMS ROLL - OFF
Align GDC to IMU

DATE: 8/29/72
CM RCS CHECK
AUTO RCS A/C ROLL (4) - OFF (verify)
cb RCS LOGIC (2) - close (verify)
SC CONT - SCS
MAN ATT (3) - MIN IMP
RCS TRNFR - CM
AUTO RCS SEL (RING 1) - OFF
AUTO RCS SEL (RING 2) - MNB
TEST RING 2 THRUSTERS
AUTO RCS SEL (RING 1) - MNA
AUTO RCS SEL (RING 2) - OFF
TEST RING 1 THRUSTERS
AUTO RCS SEL (RING 2) - MNB
RCS TRNFR - SM
MAN ATT (3) - RATE CMD
SC CONT - CMC/AUTO

cb MNA BAT BUS A - close
(-30:00)
cb MNA BAT C - close
cb MNB BAT C - close
cb MNB BAT BUS B - close
TAPE RCDR - REWIND

SEPARATION CK LIST
(-25:00)
cb SECS ARM (2) - close (verify)
cb ELS/CM-SM SEP (2) - close
PRIM GLY TO RAD - BYPASS (pull)
REPRESS PKG vlv - FILL to 865-935,
then ON
O2 SM SUPPLY vlv - OFF
SURGE TK - ON (verify)
CAB PRESS REL vlv (2) - NORM
ABORT SYS PRPLNT - RCS CMD (verify)
SM RCS SEC PRPLNT FUEL PRESS (4) - OPEN
VHF AM A&B - off (ctr)
HI GAIN ANT PWR - OFF (verify)
Verify Loads Balanced
(5) cb ECS RAD CONT/HTR (2) - open
POWER UP 2nd INVERTER

INV 1 - MNA
INV 2 AC1 - OFF
INV 1 AC1 - on (up)
AC1 RSET - RSET, on

Go to ENTRY CHECKLIST, Pg E/2-2, Step 7
DATE 8/29/72

POWER

CSM MN BUSES
DURING LAST PWR UP FOR TRACKING
SET RSI
EMS TEST
SET MISSION TIMER
NCC-7

STOW CH FOR ENTRY
STOW ORDEAL
DOM MAE VESTS +
FOOT RESTRAINTS

EI-3:00
-2:50
-2:40
EI-2:30
-2:20
-2:10
-2:00

EI-2:00
-1:50
-1:40
EI-1:00
-1:00
-1:00

EI-1:00
-1:00
-1:00

EI-1:00
-1:00

MIN PWR G&N
POWER CRITICAL ENTRY-CSM ONLY-MIN PWR G&N

EI -3:00 hr MCC-7

Set RSI and do EMS test during pwr up for last tracking and MCC

POWER CSM MAIN BUSES
FC 2 MNA & MNB - on (up)
MNA & MNB RSET - RSET, on
Verify Main Buses > 26.5 vdc
Verify PYRO BATS > 35 vdc

(5) cb C/W (2) - close
cb IMU HTR (2) - close
Set MISSION TIMER

Make the following changes in the ENTRY CHECKLIST:

Pg E/2-2, step 6
   delete: FC PUMPS (3) - OFF
   FC 2 MNA - OFF
   add: S-BD PWR AMP - OFF

STOW CM FOR ENTRY
STOW ORDEAL
DON MAE WESTS & FOOT RESTRAINTS
EI -2:00 hr ENTRY PREP
LIMIT CYCLE - OFF
RATE - HIGH
ROT CONTR PWR NORMAL (2) - AC/DC
SC CONT - CMC/FREE
BMAG MODE (3) - RATE 1
ATT SET dials - Set MSFN GDC angles
(EI-10 min ALIGNMENT, if req'd)
(8) cb SCS LOGIC BUS (4) - close
cb SM RCS HTRS (4) - close
AUTO RCS SEL (RING 1) - MNA
AUTO RCS SEL (RING 2) - MNB
MAN ATT (3) - ACCEL CMD
cb SCS B/D ROLL, P&Y MNB (3) - open
(5) cb ECS PRESS GRPS 1&2 MNA(2)-close
(276) cb INST PWR CONTR (4) - close
(275) cb FLIGHT/PL BAT BUS A&B(2)-close
(229) cb TIMERS MNA - close
(225) cb FLT BUS (2) - close
(225) cb CTE (2) - close
(250) cb BAT A,B&C PWR ENTRY/PL (3)-close
After Tunnel is closed:
(351) MAIN 02 REG vlvs (2) - OPEN
Configure Audio Pnls

EI -1:40 hr Check Quad Temps
If any Quad < 60°
RCS HTR - on until > 60°

PREHEAT CM RCS RING 2
(concurrent with IMU align)
Check CM RCS Temps > 3.9 vdc on sys
test mtr
RING 2 - 5c, d, 6d
RING 1 - 6a, b, c
If heat req'd:
(8) cb CM RCS HTR MNB - close
CM RCS LOGIC - on (up)
CM RCS HTRS - on (up) (LMP Confirm)
When lowest temp is > 3.9 vdc or at
20 min, whichever comes first:
CM RCS HTRS - OFF (LMP Confirm)
CM RCS LOGIC - OFF
cb CM RCS HTR MNB - open
C
3-17

AC BUS PWR UP
(275) cb INV PWR (4) - close
INV 3 - MNA
INV 3 AC1 & AC2 - on (up)
AC1 & AC2 RSET - RSET, on
PWR PMP - NORM
TELCOM GRP 1&2 - AC1

G/N PWR UP
(5) cb G/N COMPUTER (2) - close
    *PRO, push (~ 5 sec), if req'd*
F37 OOE
Verify DAP set for B/D roll
UP TLM - CMD RSET, then NORM
UP TLM CM - ACCEPT
    (V74, State Vector (V66), Clock Increment, REFSMMAT, Entry TGT)

EI -1:30 hr SUIT COMPRESSOR 1 - AC1 (10 min)
G/N PWR IMU - on (up)
    NO ATT lt - on (90 sec)
    NO ATT lt - out
G/N PWR OPTICS - on (up)

IMU ALIGNMENT
G/N PWR - AC2
OPT ZERO - OFF
OPT ZERO - ZERO (15 sec)
OPT ZERO - OFF

Perform P51
Perform P52 (option 1)

Set DET (counting up to EI)
Verify Mission Timer
Drive Optics to 90° shaft angle
G/N PWR OPTICS - OFF
G/N PWR (AC) - OFF
TELCOM GRP 1&2 - OFF

EI -1:20hr SUIT COMPRESSOR 1 - OFF
INV 3 AC1 & AC2 - OFF
INV 3 - OFF

V16 N20E (monitor R3 to avoid GMBL LOCK)
CM RCS ACTIVATION
(8) cb SECS ARM (2) - close
SECS LOGIC (2) - on(up)
SECS PYRO ARM (2) - ARM
CM RCS PRPLNT 1&2 tb (2) - gray (verify)
CM RCS PRESS - on (up)
RCS IND sw - CM1, then 2
He PRESS stabilizes at 3300-3500 psia after 15 minutes
MANF PRESS 287-302 psia
SECS PYRO ARM (2) - SAFE

CM RCS CHECK (within 5 min of press.)
(firing jets heats ring 1)
RCS TRNFR - CM
TEST RING 1 THRUSTERS (1 sec each)
cb SCS B/D ROLL, P&Y MNB (3) - close
cb SCS B/D ROLL, P&Y MNA (3) - open
TEST RING 2 THRUSTERS (1 sec each)
RCS TRNFR - SM
cb SCS B/D ROLL, P&Y MNA-(3) - close
Damp S/C rates with SM RCS
MAN ATT (3) - MIN IMP

IE -1:00 hr VHF AM A - SIMPLEX
Contact STDN

IE -50 min CMP strap in for Entry

EI -45 min COPY ENTRY PAD

AC BUS PWR UP
INV 3 - MNA
INV 3 AC1 & AC2 - on (up)
AC1 & AC2 RSET - RSET, on

EMS INITIALIZATION
EMS MODE - STBY
EMS FUNC - TEST 5
slew scroll to 37K
EMS FUNC - RNG SET
set PAD RNG
EMS FUNC - Vo SET
slew scroll to PAD VIO
EMS FUNC - ENTRY
EI -40 min
MNVR TO 0°, 267°, 0°
SC CONT - CMC/AUTO
V49E
AUTO RCS SEL A/C ROLL (4) - OFF
CB SPS P&Y (4) - open
At completion of V49 mnvr:
CMC MODE - FREE

EI -35 min
CDR & LMP strap in for Entry
SUIT COMPRESSOR 1 - AC1 (10 min)

SCS PWR UP
SCS ELEC PWR - GDC/ECA
BMAG PWR 1 - ON
FDAI/GPI PWR - BOTH

TELCOM GRP 1&2 - AC1
S-BD OMNI ANT - C
VHF AM A - OFF
UP TLM CM - ACCEPT
(IMU compensation & State Vector)
GDC ALIGN to IMU
UP TLM CM - BLOCK

EI -30 min
(275)
cb MNA BAT BUS A - close
cb MNA BAT C - close
cb MNB BAT C - close
cb MNB BAT BUS B - close

EI -25 min
SUIT COMPRESSOR 1 - OFF
BMAG PWR 2 - ON

Go to ENTRY CHECKLIST, pg E/2-2, step 6
DATE 8/29/72

ENTRY PREP
ENTRY PAD ENTRY ALIGNMENT
TIG + 10 MIN POSITION RIS
EMS ENTRY ENTRY TEST
COMM/TH - OFF
STOW CH FOR ENTRY

TIG - 70 MIN
COMM/TH - UP
TIG - 60 MIN
COMM/TH - OFF
SELECT CONTROL
SECURE ALIGNMENT

POWER CM MAIN BUSES
PRE-HEAT CM RCS RING 2
PRE-HEAT SR RCS AS REQ

DISCONTINUE RCS PRE-HEAT
CM RCS ACTIVATION
CM RCS TEST (RINGS 1 & 2)
DAMP RATES W/SH RCS

VHF - ON
CONTACT MSFN
SET DET

ENTRY PREP
ENTRY PAD ENTRY ALIGNMENT
TIG + 10 MIN
POSITION RIS
EMS ENTRY ENTRY TEST
COMM/TH - OFF
STOW CH FOR ENTRY

MINIMUM POWER ENTRY
POWER CRITICAL ENTRY - CSM ONLY - MIN PWR SCS

EI -3:00 hr MCC-7
Set RSI and do EMS test during pwr up for last tracking and MCC and set Mission Timer, if pwr available.

STOW CM FOR ENTRY

STOW ORDEAL

DON MAE WESTS & FOOT RESTRAINTS

EI -2:00 hr ENTRY PREP
FDAI SELECT - 1
LIMIT CYCLE - OFF
RATE - HIGH
ROT CONTR PWR NORMAL (2) - AC/DC
SC CONT - CMC/FREE
BMAG MODE (3) - RATE 1
ATT SET dials - Set STDN GDC angles (EI-10 min ALIGNMENT)

(8) cb SCS LOGIC BUS (4) - close
(276) cb INST PWR CONTR (4) - close
(275) cb FLIGHT/PL BAT BUS A&B(2)-close
(229) cb TIMERS MNA - close
(225) cb CTE (2) - close
(250) cb BAT A,B&C PWR ENTRY/PL (3)-close

After Tunnel is closed:
(351) MAIN 02 REG vlv (2) - OPEN
Configure Audio Pnls

EI -1:40 hr POWER CSM MAIN BUSES
FC 2 MNA & MNB - on (up)
MNA & MNB RSET - RSET, on
Verify Main Buses > 26.5 vdc
Verify PYRO BATS > 35 vdc
(5) cb C/W (2) - close
3-24

Check Quad Temps
If any Quad < 60°
   RCS HTR - on until > 60°

PREHEAT CM RCS RING 2
Check CM RCS Temps > 3.9 vdc on sys test mtr
   RING 2 - 5c, d, 6d
   RING 1 - 6a, b, c
If heat req'd:
   (8) cb CM RCS HTR MN8 (1) - close
   CM RCS LOGIC - on (up)
   CM RCS HTRS - on (up) (LMP Confirm)
When lowest temp is > 3.9 vdc or at 20
   min, whichever comes first:
   CM RCS HTRS - OFF (LMP Confirm)
   CM RCS LOGIC - OFF
   cb CM RCS HTR MN8 - open

EI -1:20 hr CM RCS ACTIVATION
   (8) cb SECS ARM (2) - close
   SECS LOGIC (2) - on (up)
   SECS PYRO ARM (2) - ARM
   CM RCS PRPLNT 1&2 tb (2) - gray (verify)
   CM RCS PRESS - ON
   RCS IND sw - CM, then 2
   He PRESS stabilizes at 3300-3500
   psia after 15 minutes
   MANF PRESS 287-302 psia
   SECS PYRO ARM (2) - SAFE

   CM RCS CHECK (within 5 min of press.)
   (firing jets heats ring 1)
   RCS TRNFR - CM
   TEST RING 1 THRUSTERS (1 sec each)
   cb SCS B/D ROLL, P&Y MN8 (3) - close
   cb SCS B/D ROLL, P&Y MNA (3) - open
   TEST RING 2 THRUSTERS (1 sec each)
   RCS TRNFR - SM
   cb SCS B/D ROLL, P&Y MNA (3) - close
   Damp S/C rates with SM RCS
   MAN ATT (3) - MIN IMP
EI -1:00 hr VHF AM A - SIMPLEX
Contact STDN
Set DET (counting up to EI)

EI -50 min CMP strap in for Entry

ENABLE CMC MIN IMPULSE
cb G/N COMPUTER (2) - close
*PRO, push (~5 sec), if req'd*
F37 OOE
Verify DAP loaded for B/D roll

EI -40 min MNVR TO SM JETT ATTITUDE
(+X at center of earth)
SURGE TK - ON
PRIM GLY TO RAD - BYPASS (pull)
SM 02 SUPPLY vlv - OFF
AUTO RCS SEL A/C ROLL (4) - OFF
SM RCS PRIM PRPLNT (4) - OPEN
SM RCS SEC PRPLNT FUEL PRESS (4) - OPEN
CM RCS LOGIC - on (up)
RCS IND sw - CM2 (275)
cb MNA BAT BUS A - close
cb MNA BAT C - close
cb MNB BAT C - close
cb MNB BAT BUS B - close
Check BAT BUS current
cb SPS P&Y (4) - open
cb ELS/CM-SM SEP (2) - close
SECS PYRO ARM (2) - ARM
Verify attitude & control
VHF AM A - OFF

EI -30 min SM JETT
CM/SM SEP (2) - on (up)
CSM/LM FNL SEP (2) - on (up)
RCS TRNFR - CM
Damp SC rates
C/W MODE - CM
SECS PYRO ARM (2) - SAFE
CM RCS LOGIC - OFF
CM RCS MANF PRESS - 287-302 psia
Verify attitude control (RING 2/MNB)
MNVR TO TRACK MOON WITH COAS, Pg C/3-22

CDR & LMP strap in for Entry

EI -20 min  AC BUS PWR UP
(275) cb INV PWR 3 MNA & MNB (2) - close
INV 3 - MNA
INV 3 AC1 & AC2 - on (up)
AC1 & AC2 RSET - RSET, on

SUIT COMPRESSOR 1 - AC1

SCS PWR UP
SCS ELEC PWR - GDC/ECA
BMAG PWR 1 - ON
FDAI/GPI PWR - 1
SC CONT - SCS

CMC PWR DOWN
V37E 06E
PRO, push (~5 sec) until STBY Lt - on

(5) cb G/N COMPUTER (2) - open

EMS INITIALIZATION
EMS MODE - STBY
EMS FUNC - TEST 5
  slew scroll to 37K
EMS FUNC - RNG SET
  set PAD RNG
EMS FUNC - Vo SET
  slew scroll to PAD VIO
EMS FUNC - ENTRY

EI -10 min  GDC ALIGN (to STDN angles set at -2:00 hr)
C
3-27

TRACK MOON, HORIZON OR ENTRY ATTITUDE
(moon set ~ EI -2 min)

SUIT COMPRESSOR - OFF
FDAI SCALE - 5/5
BMAG PWR 2 - ON
ROT CONTR PWR DIRECT (2) - MNA/MNB
Verify attitude
BMAG MODE (3) - RATE 2
MAN ATT (3) - RATE CMD
Stow COAS & lock in mount
EMS MODE - NORMAL
Verify .05G lt filter is down

PERFORM EMS ENTRY

Go to EARTH/POST LANDING,
pg E/3-1
GENERAL CONTINGENCY PROCEDURES

DATE 8/29/72
LOI 30 MIN DPS ABORT

ΔV THRUST A/B - OFF
SPS INJ vlvs (4) - CLOSED
SPS He tb (2) - bp
GMBL MOTS(4) - OFF (LMP Verify)
TVC SERVO PWR (2) - OFF
MN BUS TIE (2) - OFF
SC CONT - SCs
PCM BIT RATE - LOW
EMS MODE - STBY (verify)

RECORD DATA AND COMPUTE PAD

F 97 40
Record TFC

ΔVM
EMS ΔVC

ENTR

F 99 40
ENTR

F 16 85
Record VGX

R
P

VGZ

Y

PRO

ALTERNATE

F 37 00E
When CMC ACTY lt out:

ΔVC LOI PAD
EMS ΔVC(Shutdown)
V66E

ΔVC(Burned)
ΔVC ABORT(Chart)

PRIMARY

G&N ΔVM
ΔVC ABORT(Chart)

GET LOI +30:00

GET TEI ABORT:
1. **MNVR TO PAD BURN ATTITUDE V62E**

2. **V49E**
   - F 06 22: New ICDU angles RPY
   - Load desired angles PRO

3. **F 50 18: REQ MNVR TO FDAI RPY ANGLES**
   - (AUTO) BMAG MODE (3) - RATE 2
   - SC CONT - CMC
   - CMC MODE - AUTO
   - PRO
   - (MAN) MNVR - To 5

4. **F 50 18: AUTO MNVR TO FDAI RPY ANGLES**
   - (.01°)

5. **F 50 18: REQ TRIM MNVR TO FDAI RPY ANGLES**
   - (TRIM) PRO To 4
   - (BYPASS) ENTR
   - EMS FUNC - OFF
   - Set ΔVC = +100.0
   - EMS FUNC - ΔV
   - TVC SERVO PWR 1 - AC1/MNA

28:00
   - (-02:00) V37E 47E
   - F 16 83 ΔV XYZ (CSM) (.1fps)

   *VI, HDOT, H available by N62E*
   *KEY RLSE to return to N83 *

29:30
   - (-00:30) EMS MODE - NORMAL

29:58
   - (-00:02) CMC MODE - FREE
   - or SC CONT - SCS
   - MAN ATT (3) - ACCEL CMD

30:00
   - (00:00) DPS IGNITION
   - After engine cutoff (on LM callout)
   - CMC MODE - AUTO
TRIM FRONT PAGE ON SOLID CROP MARKS: BACK PAGE ON DASH CROP MARKS.

PINK

C
4-3

RECORD ΔV COUNTER & RESIDUALS
ΔVC _______ R _______
                  P _______
                        Y _______

F 37  OOE

When CMC ACTY lit out, V66E
EMS FUNC - OFF
EMS MODE - STBY
TVC SERVO PWR 1 - OFF

DATE 8/29/72

DATE
2 LOI 2 HR DOCKED DPS/APS ABORT

ΔV THRUST A/B - OFF
SPS INJ vlv (4) - CLOSED
SPS He tb (2) - bp
GMBL MTRS (4) - OFF (LMP verify)
TVC SERVO PWR (2) - OFF
MN BUS TIE(2) - OFF
SC CONT - SCS
PCM BIT RATE - LOW
EMS MODE - STBY

RECORD DATA AND COMPUTE PAD

F 97 40
Record TFC
........................................
VG
........................................
ΔVM
........................................
EMS ΔVC
........................................
ENTR

F 99 40
ENTR

F 16 85
Record VGX R
.................
VGY P
.................
VGZ Y
.................

PRO

F 37 00E
When CMC ACTY 1t out, V66E
Perform P52 Star Check. If star not in SXT,
perform P52, OPT 3
MODE I - Mnvr to Chart Burn Attitude
MODE II - Mnvr to Flight Plan AOS Attitude

ASSIST CDR & LMP IVT & LM ACT.
Couches: CDR - 0°, CMP - 0°, LMP - 180°
TUNL LTS - ON
TUNL VENT vlv - LM/CM ΔP
Verify LM/CM ΔP <0.2
*LM/CM ΔP >0.2
* Equalize CM/LM Pressure (Decal)*
Remove tunnel hatch (Decal)
Remove probe & stow (Decal)
Remove drogue & stow (Decal)
Verify docking tunnel index angle
Open LM hatch
LMP transfer to LM
At LM request,
  LM PWR - RESET, then OFF
  SYS TEST - 7D
  SYS TEST ind - 0 volts
Transfer PGA's, Helmets, Gloves & Wristwatch
CDR transfer to LM

ALIGN LM IMU TO CSM IMU
  ATT DB - MIN
  RATE - LO
  LIMIT CYCLE - ON
  SC CONT - SCS (verify)
  MAN ATT (3) - RATE CMD
  BMAG MODE (3) - ATT1/RATE2
  VO6 N20E

Voice ICDU angles to LM
Terminate attitude hold on LM cmd
VO6 N20 (On LM request)
On LM MARK, Key ENTR
Compare CSM & LM ICDU ANGLES

<table>
<thead>
<tr>
<th>OG</th>
<th>CM</th>
<th>IG</th>
<th>CM</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM</td>
<td>LM</td>
<td>LM</td>
<td></td>
</tr>
</tbody>
</table>

LM (IGA)p = P20 + 180°
LM (OQA)y = 300° - R20 + ΔØ
LM (MGA)r = 360° - Y20

VHF CHECKOUT
Establish AWAKE CONFIGURATION (S/1-27)
Configure for VHF Simplex B and respond
to LM comm check
Configure for VHF Simplex A

LM set MSN TMR to CSM MSN TMR on MARK

CMC/LGC CLOCK SYNC/TEPHEM UPDATE

V16 N65E (On LM request) ______:____:
LM ENTR time on CSM MARK
VO6 N65E on LM MARK and compare with
  LM N65
  CSM Time ______:____:
  LM Time ______:____:
VO5 NO1E 1706E, Call TEPHEM to LM
  R1 ________, R2 ________, R3 ________
Note: Rotation of docking interface may be performed at this point if desired.

DOCKING INTERFACE ROLL MNVR

COMPLETE IVT & CLOSEOUT
Restow LM Umbilicals in LM tunnel
Install drogue (Decal)
Install probe (Decal)
Preload probe (Decal)
LM hatch closed
Verify CSM roll cmds inhibited until
LM/CM ΔP >3.5 psid (>4.0 psid, 4 jet)
Don PGA, Helmet & Gloves
Verify LM & CM Suit Check complete
Release docking latches (Decal)
Install tunnel hatch (Decal)
Perform hatch integrity check (Decal)

Perform Soft Undocking Switch Configuration
AUTO RCS - YAW, PITCH, B/D ROLL (12) - ON
  A/C ROLL (4) - OFF
MAN ATT - ROLL - MIN IMP
  PITCH, YAW - RATE CMD
LIMIT CYCLE - OFF
ATT DB - MIN
RATE - LOW
THC PWR - ON
RHC POWER NORM - AC/DC
RHC PWR DIR (2) - OFF
SC CONT - SCS
CMC MODE - FREE
BMAG MODE (3) - ATT1/RATE2
cb DOCKING PROBE (2) - close
PROBE RETR (2) - OFF (verify)
PROBE EXTD/REL - RETR
PROBE EXTD/REL tb (2) - bp (verify, 1 reqd)
PROBE EXTD/REL - OFF
cb SECS LOGIC (2) - close (verify)
cb SECS ARM (2) - close
Cue STDN for LOGIC ARM
SECS LOGIC (2) - on (up)
STDN go for PYRO ARM
SECS PYRO ARM (2) - on (up)
PROBE EXT/REL-EXT/REL (mom) (Cue LM)
Verify Probe Extended, LM Attached
Allow Motion to Damp (5 sec)
CSM Roll Left to Optimum Position

*If LM to perform rotation:*

* SC CONT - CMC/AUTO *

At Completion of Roll Mvr
Allow Motion to Damp (5 sec)
SC CONT - CMC (Cue LM)
PROBE EXTD/REL - RETRACT
On LM Go - PROBE RETRACT - SEC 1 (PRIM 2)

At Dock Latch
PROBE EXTD/REL tb (2) - gray

After Hard Dock
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
cb DOCK PROBE (2) - open
THC - LOCKED
RHC - LOCKED
PROBE EXT/REL - OFF
PROBE RETRACT (2) - OFF
THC PWR - OFF
RHC PWR DIR (2) - OFF (verify)
BMAG MODE (3) - RATE 2
CMC MODE - AUTO

Prepare Couch for Hatch
Remove Probe Straps (A1)
CDR - verify FWD DUMP vlv - AUTO
CABIN FANS - ON
Equalize CSM/LM Pressure (Decal A)
Remove Hatch and Stow (Decal)
Verify Docking Latches (Decal)
Connect LM Umbilicals (both, if poss)
Remove and Stow Probe and Drogue (Decal)
DPS/APS BURN MONITOR CHECKLIST

Copy P-30 Pad

TIG (_____:_____:_____

V48E - R1 21102, R2 01111, (DPS)
R1 61102, R2 01111, (APS)

MNVR TO PAD BURN ATT
V49E

50:00
(-10:00) START DET
V37E 00E

PERFORM BORESIGHT & SXT STAR CHECK, if poss
V41 N91E

54:00
(-06:00) CMC MODE - FREE
BMAG MODE - ATT1/RATE 2

If APS Burn
SC CONT - SCS
LIMIT CYCLE-ON
ATT DB - MIN (verify)
RATE-LOW (verify)

EMS FUNC - ΔV SET/VHF RNG
Set ΔV = +100.0
EMS FUNC - ΔV
TVC SERVO PWR 1 - AC1/MNA
58:00
(-02:00) V37E 47E
F 16 83 ΔV XYZ(CSM) (.1fps)

*VI, HDOT, H available by N62*
*KEY RLSE to return to NB3 *

59:30
(-00:30) EMS MODE - NORMAL

59:58
(-00:02) If APS Burn
SC CONT - CMC
BMAG MODE (3) - RATE 2

00:00 IGNITION
After engine cutoff (on LM callout)
CMC MODE - AUTO
RECORD ΔV COUNTER & RESIDUALS
ΔVC _______ R _______
P _______
Y _______

F 37 00E

PRO

When CMC ACTY lit out, V66E
EMS FUNC - OFF
EMS MODE - STBY
TVC SERVO PWR 1 - OFF
BMAG MODE (3) - RATE 2

If DPS/APS Burn go to C/4-8 for APS Burn
If DPS Burn Incomplete go to C/4-6 for Docking Interface Roll Mnvr (if reqd)
and C/4-8 for APS Burn.
LOSS OF COMM NAVIGATION

GENERAL RULES

1 A sighting or set is to consist of three marks.

2 Calibrate optics at the beginning of each batch and every half hour while navigation sightings in progress if the remaining sightings require more than 30 minutes to complete. The sextant calibration will be repeated until agreement of at least two checks (not necessarily sequential ones) are within 1 bit (0.003°).

3 All attitude control should be done using coupled RCS thruster pairs.

4 See loss of comm midcourse prcdr. for mnvr times.

5 While in P23 VO6N49 display:
   If ΔR > 50 nm, or ΔV > 50 fps;
   Reject mark, reselect star and horizon, verify procedures, and repeat mark.

   If large correction re-occurs, accept.

Large ΔR, ΔV values may be expected at the following times:

   At initiation of tracking (first mark of each star of first batch).

   At first switch of reference bodies.

   After long periods between sightings.

   Last hours before EI.
Loss of W-Matrix after initiation of navigation sightings:

(a) Upon loss of W-Matrix, current onboard state vector is retained.

(b) W-Matrix Reinitialization and Navigation Procedures

(1) Sightings Not In Progress:

Before next batch, reinitialize W-Matrix, V67 V06N99 Load values shown in tables.

Continue Navigation

(2) Sightings In Progress:

Immediately reinitialize W-Matrix, V67 V06N99 Load values shown in tables.

Restart interrupted batch of navigation sightings.

Continue navigation

GENERAL PROCEDURE

1 If entry pad previously received, no tracking performed.

If not, proceed.

2 Execute abort - if required (unless comm loss during nominal TEC).

3 Reinitialize W-Matrix, V67 (diagonal values, V06N99, from tables)

4 Determine return time

5 Select navigation schedule (see Flight Plan No Comm P23 Schedule tables). If table I, II, or III are not applicable, refer to do-it-yourself procedures.
6. Select starting batch
   first navigation sightings to use stars
   corresponding to navigation schedule
   time first occurring after abort.

7. Alternate sightings are provided in the event
   the preferred sighting cannot be performed.

8. After each batch (or two batches if the batches
   are back to back), determine entry time from P37
   by calling N38 after integration has been completed
   and before proceeding on the lat, long display.

9. Determine and record Hp using routine 30 V82 N44
   by specifying the time load equal to entry time
   determined in above step.

10. The state vector from each previous batch of
    P23 sightings is retained in the LM state
    vector slot until the navigator has determined
    the current batch to be acceptable. When the
    state vector from the current batch has been
    determined to be acceptable, the state is
    transferred to the LM state vector slot (V66).
    If the batch is unacceptable, use V47 to
    transfer the good state vector from the LM
    slot to the CSM slot (do not reinitialize the
    W-Matrix) and repeat current batch.

**DO-IT-YOURSELF PROCEDURES**

1. Reinitialize W-Matrix and schedule a tracking
   interval as soon as possible after the abort
   burn; or in the case of the lunar flyby, about
   1 hour after perilune. If sightings are per-
   formed translunar for any reason, reinitialize
   the W-Matrix 1 hour after perilune for trans-
   earth sightings. W-Matrix values are given in
   tables A and B for each return type.
A batch is to consist of at least three star/horizon sightings, although as many as five can be advantageous, particularly following a sleep period.

All available stars should be used in the sighting schedule. No more than three marks should be taken on a star within a batch of data.

Sightings during the last 10 hours before entry interface are important. Five earth horizon sightings should be scheduled at EI-5 hours and three earth horizon sightings should be scheduled following the MCC at EI-3 hours. If no earth horizon sightings are available, lunar horizon sightings should be used.

Whenever possible, the navigation batches should be scheduled so that, immediately following a time period of length $\Delta t$ (not to exceed 3 hours) in a non-PTC mode, five times $\Delta t$ should be spent in a PTC mode (thermal constraints). This rule will be violated most frequently in the following situations: (1) aborts from a translunar trajectory with short return lengths, (2) time critical aborts, (3) the 10-hour period before entry interface.

If possible, both near and far horizons should be included in each batch of data.

Star availability is related to GMT not GET. Therefore, as a clue to determine star availability, refer to Flight Plan No Comm P23 Schedule table which has a GMT for entry corresponding to your GMT for entry. In addition, the star charts should be used to select available stars.
8 DO-IT-YOURSELF TABLES

A. ABORTS FROM TLC

W-MATRIX INITIALIZATION

\[
\begin{align*}
R1 & = 80000 \\
R2 & = 00070 \\
R3 & = 00003 \\
\end{align*}
\]

NAVIGATION SCHEDULE

\[\Delta T \leq 20 \text{ hrs}\]
BATCHES OF 3 SETS EVERY 2.5 hrs
BATCH OF 5 SETS AT EL-5
(BEFORE LAST MCC AT EL-3)
BATCH OF 3 SETS AFTER LAST MCC

\[\Delta T > 20 \text{ hrs}\]
SLEEP PERIODS OF 8 HOURS MAY BE SCHEDULED.
CREW SHOULD BE AWAKE LAST 10 HOURS PRIOR TO EI.
WHILE AWAKE:
BATCHES OF 3 SETS EVERY 3 HRS
BATCHES OF 5 SETS AFTER SLEEP PERIODS
BATCH OF 5 SETS PRIOR TO LAST MCC (AT EI-3)
BATCH OF 3 SETS AFTER LAST MCC

NOTE - ONLY STAR/earth HORIZON MARKS WILL BE MADE.

B. FLYBY, ABORT FROM LUNAR ORBIT, TEC.

W-MATRIX INITIALIZATION

1. COMM LOSS BEFORE BATCH 1
(at TEI + 1 or perilune +1 hr)

\[
\begin{align*}
R1 & = 30000 \\
R2 & = 00300 \\
R3 & = 00003 \\
\end{align*}
\]
2. COMM LOSS AFTER BATCH 1
   (at TEI + 1 or perilune + 1 hr)
   and
   No SV update after TEI
   \[ R1 + 99000 \]
   \[ R2 + 00020 \]
   \[ R3 + 00003 \]

3. COMM LOSS AFTER BATCH 1
   (at TEI + 1 or perilune + 1 hr)
   and
   At least one SV update after TEI
   \[ R1 + 45000 \]
   \[ R2 + 00006 \]
   \[ R3 + 00003 \]

9 NAVIGATION SCHEDULE

A. RETURN LENGTH >70 hrs

1 Refer to Table III of Flight Plan No Comm P23
   Schedules for placement of batches of star/horizon sightings and relate the times given at
   "TEI +" and "EI -" to the specific transearth situation. For each batch scheduled, take three
   marks on each available star (up to 5 stars).

2 Schedule three earth horizon sightings for every 5 hours between TEI + 32 and EI - 40 hours, or
   if an additional sleep period is needed for very slow returns, schedule five earth horizon sightings
   before the sleep period and five earth horizon sightings upon awakening.
B. RETURN LENGTH <70 hrs

1 Sleep periods of 8 hours should be provided. Astronauts should be awake the last 10 hours before entry interface.

2 Three sets of star horizon observations should be scheduled every three hours while awake with five sets scheduled before and after each sleep period.

(a) A batch of lunar horizon sightings should be taken at TEI + 1 hour or perilune + 1 hr.

(b) The second batch of data should consist of earth horizon sightings.

(c) The third batch of data should consist of lunar horizon sightings.

(d) The remainder of the data should be earth horizon sightings. If no earth horizon sightings are available, lunar horizon sightings should be substituted.

3 Five earth/horizon sets should be scheduled at EI-5 hours before the MCC at EI - 3 hours. Three sets should be taken after the midcourse. If no earth horizon sightings are available, lunar horizon sightings should be substituted.
MIDCOURSE PROCEDURES

Time Of Midcourse And Midcourse Execution Criteria

1. For midcourses following translunar coast aborts, execute the midcourse maneuvers whenever it is felt that a good estimate of the trajectory has been obtained by P23 and the ΔV shown by P37 is greater than 0 fps. The last midcourse maneuver should be executed no later than EI - 3 hours.

2. For midcourses following TEI, execute midcourse maneuvers at the times specified in the flight plan. These times are: MCC5: TEI + 17 hours MCC6: EI - 22 hours MCC7: EI - 3 hours These midcourse maneuvers should be executed only if the ΔV from P37 is greater than 0 fps.

Midcourse Maneuver Rules

Follow monitoring, shutdown and trim criteria as outlined in flight plan for MCC5, MCC6 and MCC7. Follow this criteria both for transearth midcourses and midcourses following TLC aborts.
GENERAL INFORMATION

It can be determined if the entry corridor is being attained by determining Hp (vacuum perigee altitude) using the procedure outlined in the Loss-of-Comm Navigation General Procedure section, (steps 8-10) and comparing that value to the Hp Limits for Entry Corridor Table of the Flight Plan.
NAVIGATION TIME DETERMINATION

1. To determine GET of navigation, GET (nav), from tables defining time in EI-XX.

\[
\text{GET(EI)} = \text{TIG (abort)} + \Delta T (P37)
\]

Where: \( \text{TIG (abort)} = \text{time (GETI) of abort} \)
\( \Delta T (P37) = \text{at from TIG (abort) to EI} \)
from P37

Computation:

\[
\begin{array}{c|c|c|c}
\text{TIG (abort)} & +\Delta T (P37) & \text{GET (EI)} \\
\hline
& & \\
\end{array}
\]

\[
\text{GET (nav)} = \text{GET (EI)} - XX
\]

2. To determine GET of navigation, GET (nav), from tables defining time in TEI +YY

\[
\text{GET (nav)} = \text{GET (TEI)} + YY
\]
CONTINGENCY JETTISON

NO COMM LM JETTISON

1 EARTH ORBIT - (LM/CSM CONTINGENCY DEORBIT)

   MNVR TO POSIGRADE/HEADS DOWN ATTITUDE
   POSITION 31.7° LINE ON HORIZON
   USE P47 AND EMS TO MONITOR SEP MNVR
   RETRO FIRE - 20 MIN

   JETTISON LM
   PERFORM -X 4 JET TRANSLATION (24 SEC)
   MNVR TO RETRO FIRE ATTITUDE

2 TRANSLUNAR COAST - (DIRECT ABORT FROM TLC)

   PITCH 180° FROM ABORT ATTITUDE
   USE P47 AND EMS TO MONITOR SEP MNVR
   ABORT BURN - 30 MIN

   JETTISON LM
   PERFORM -X TRANSLATION (ΔV = 1 FPS)
   MNVR TO ABORT BURN ATTITUDE

3 LUNAR ORBIT - (CONTINGENCY TL)

   (PERFORM ~ 1 HOUR (NO LATER THAN 30 MIN) PRIOR
   TO TL)
   MNVR TO LV/LH ATT R = 180° (HEADS DOWN)
   P = 000°
   Y = 000°
   USE P47 AND EMS TO MONITOR SEP MNVR
TEI - 1 HR

JETTISON LM
PERFORM -X TRANSLATION (NET ΔV = 1 FPS RETROGRADE)
MNVR TO TEI ATTITUDE

4 TRANSEEARTH COAST - LATE LM JETTISON)

(PERFORM ~ 1 HOUR TO 45 MIN PRIOR TO EI)
REALIGN IMU TO ENTRY REFSSMAT
MNVR TO INERTIAL ATT R = +0°(ARBITRARY)
P = +196°
Y = +45°
USE P47 AND EMS TO MONITOR SEP MNVR

EI - 1 HOUR

JETTISON LM
PERFORM -X TRANSLATION (NET ΔV = 3 FPS)
MNVR TO ENTRY ATTITUDE

DATE 8/29/72
2. SERVICE MODULE JETTISON

PRIMARY GLYCOL TO RADIATORS - BYPASS (Pu11)
SM 02 SUPPLY - OFF
Power SM MAIN BUS
   cb INSTR PWR CONTROL (4) - CLOSE (Pnl 276)
   or cb INSTR ESS MN A & MN B (2) - CLOSE (Pnl 5)
   cb C/W MNA & MNB (2) - CLOSE (Pnl 5)
   cb RCS SM HEATERS (4) - CLOSE (Pnl 8)
Verify SM RCS Quad Temps - If <60°:
   SM RCS HEATERS - as required
   cb PYRO A SEQ A - CLOSE (Pnl 250)
   cb PYRO B SEQ B - CLOSE (Pnl 250)
   cb BAT A PWR ENTRY/PL - CLOSE (Pnl 250)
   cb BAT B PWR ENTRY/PL - CLOSE (Pnl 250)
   cb SECS LOGIC A & B (2) - CLOSE (Pnl 8)
   cb SECS ARM A & B (2) - CLOSE (Pnl 8)
   cb ELS/CM-SM SEP BAT A & B (2) - CLOSE (Pnl 8)
   AUTO RCS SELECT A/C ROLL (4) - OFF
   cb SPS PITCH & YAW (4) - OPEN (Pnl 8)
   SM RCS PRIM PRPLNT (4) - OPEN (mom)
   SM RCS SEC PRPLNT FUEL PRESS (4) - OPEN (mom)
   CM RCS LOGIC - on(up)
   RCS TRNFR - SM (mom)
   MAIN BUS TIE BAT A/C - BAT A/C
   MAIN BUS TIE BAT B/C - BAT B/C
   cb MAIN A BAT BUS A - CLOSE (Pnl 275)
   cb MAIN B BAT BUS B - CLOSE (Pnl 275)
Verify Voltage on BAT BUS and PYRO BATS
   RCS Ind - CM 1
   CM RCS PRPLNT (2) - OPEN (mom)
   SECS LOGIC (2) - on(up)
   SECS PYRO ARM (2) - ARM
   Verify Attitude Control
   CM/SM SEP (2) - on(up)
   C/W - CM
   RCS TRNFR - CM (mom)
   SECS PYRO ARM (2) - SAFE
   SECS LOGIC (2) - OFF
   cb SECS ARM A & B (2) - OPEN (Pnl 8)
   cb ELS/CM-SM SEP BAT A & B (2) - OPEN (Pnl 8)
CM RCS LOGIC - OFF
Verify CM RCS Pressure
cb RCS SM HEATERS (4) - OPEN (Pnl 8)
cb MAIN A BAT BUS A - OPEN (Pnl 275)
cb MAIN B BAT BUS B - OPEN (Pnl 275)
cb INSTR PWR CONTROL (4) - OPEN (Pnl 276)
cb BAT A PWR ENTRY/PL - OPEN (Pnl 250)
cb BAT B PWR ENTRY/PL - OPEN (Pnl 250)
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EMERGENCY PROCEDURES
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