

Basic Date Feb. 1, 1969
Changed _____

LAUNCH OPERATIONS

CSM 104

LAUNCH OPERATIONS

LAUNCH PREPARATION

- 30:00 CTE UPDATE VERIFICATION
Change X STABLE MEMBER AZIMUTH, if necessary
*V78E *
F 06 29 X SM AZ (.01°)
*V21E *
*Load new Azimuth _____ *
*PRO *
*GDC ALIGN, Pg L/2-6 *
- 20:00 SM RCS PRIM PROP (4)-open (up)
SM RCS PRIM PROP tb (8)-Gray
- 15:00 FDAI-1 - total att R=90+AZ, P=90, Y=0
BMAG MODE(3) - RATE 1
FDAI SCALE - 5/5
RATE - HIGH
RHC(2)-unlocked
ROT CONT PWR DIRECT(2)-MNA/MNB
CMC MODE - FREE
TRANS CONTR PWR -on(up) (verify)
- ASTRO LAUNCH OPERATIONS VOICE CHECK
VOICE CHECK WITH MCCH
S-bd VOL tw(CDR) - full decr
PAD COMM-OFF
ADJUST MASTER VOL CONTROLS
SPS THRUST - NORMAL
AV THRUST (2) - OFF
 α /PC - α
SII/SIVB/GPI - SII/SIVB
EDS AUTO - on (up)
LV RATE - AUTO
2 ENG OUT - AUTO
CM RCS PROP tb(2)-gray (verify)
RCS CMD - OFF
FC REACT vlv - LATCH
- 10:00 SCS TVC SERVO PWR 1 - AC1/MNA
SCS TVC SERVO PWR 2 - AC2/MNB

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L
1-16

- 04:00 ASTRO LAUNCH OPERATIONS COMM CHECK
- 03:00 DSKY - Verify P02
V75 (NO ENTR)
- 15
-2:~~00~~ TAPE RCD FWD - FWD (tb-gray)
- 1:15 GLY RAD PRI - pull (bypass)
- 00:45 MN BUS TIES (2)-ON
- GDC ALIGN pb - PUSH & HOLD
R=90+AZ, P=90, Y=0
FDAI 2 Total att - NO MOTION
GDC ALIGN pb - release

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CC 104

SECTION 2 - BOOST-INSERTION

-00:09 Ignition CMD
 -00:01 L/V ENGINES lts (5) - out
 00:00 LIFT OFF lt - on

- * LIFT OFF VERIFIED: *
- * If LIFTOFF lt out - push *
- * If NO AUTO ABORT lt on - push *

Clock Running (auto) - report
MET Resets & starts counting up auto
P11 auto

+4°/SEC P, Y
 +20°/SEC R

- * NO P11 - Key ENTR *
- * START DET & RSET MET *

06 62 VI,H DOT, H PAD (fps,fps,.1nm)

MODE IA

+00:02 Yaw Maneuv.
 +00:12 Roll & Pitch Program - report
 +00:31 Roll complete

+00:42 MODE IB - report
PRPLNT DUMP - RCS CMD
 +00:50 Monitor to T +02:00 (100%, 6° Roll error)

00:42

+4°/SEC P, Y
 +20°/SEC R

- * LV Guid & LV Rate lts on *
- * 00:50 - 01:25 ABORT *

CABIN PRESSURE DECREASING

- * NO PRESSURE DECREASE by 25K *
- * CAB PRESS RELIEF vlv (RH) - DUMP *
- * NO DUMP-HATCH REL vlv-OPEN *

* MODE IE

+01:21 MAX Q
 +01:54 MODE IC - report (R3 = 16.5NM)

1:50

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2. BOOST-INSERTION

- +02:00 EDS AUTO - OFF - report
 2 ENG OUT - OFF
 L/V RATES - OFF
 &/Pc sw - Pc
- +02:14 GO/NO GO FOR STAGING - report
INBOARD CUTOFF - report (1t 5 on)
LIFTOFF LIGHT - out
- +02:40 OUTBOARD CUTOFF - report (1ts 1,2,3,4 on)
- +02:41 SIC/SII STAGING (1ts out)
 SII Ign Command (1ts on)
 SII SEP 1t - on
- +02:44 SII 65% - 1ts out
 FDAO Scale - 50/10
GMBL MOT (4) - START - ON (LMP CK MNA)
 Check GPI
 SII/SIVB/GPI - GPI (Momentarily)
 YAW - +1.35
 PITCH - -1.41
- +03:11 SII SEP 1t - out report
- +03:16 TWR JETT (2) - ON (TFF>1+20)
 * NO TWR JETT *
 * LES MOT FIRE pb - push *
 * No response go to Pg L/6-6*
- MAN ATT PITCH - RATE CMD
Twr Jett & MODE II - report
- GLY EVAP STEAM PRESS - AUTO
 GLY EVAP H2O FLOW - AUTO
- +03:21 Guidance Initiate - report (OECO +41 Sec)
+03:53 Guidance Good
+04:00 Report Status
+05:00 Report Status
+05:50 Upstage Capability
+06:00 Report Status
+06:15 SBD ANT OMNI-D
+07:00 Report Status
+07:10 PU shift
- MODE IC
- 02:32
- +9°/SEC P,Y
+20°/SEC R
- MODE IC
- 3:05
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- MODE II
- MODE II
- CSM 10

+08:00 Report Status
 +08:20 GO/NO GO FOR STAGING - report
 +08:54 SII Cutoff - lts on
 +08:55 SII Staging - lts out
 +08:56 SIV Ign Cmd - lt on
 +09:00 SIV 65% lt - out
 Report Status
 +09:23 Mode IV - Report
 (VI 23,400, H DOT 0)
 V82E - F 16 44 (HA,HP,TFF)
 +10:00 GO/NO GO FOR ORBIT - report

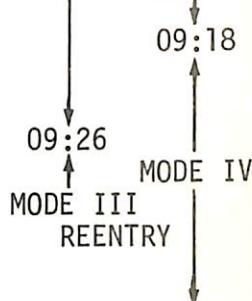
+10:49 SIVB CO (lt on) - report
 (Begin TB5)
 * If no SEC0, *
 * THC CCW for 1 sec *
 * SII/SIVB sw-LV STAGE *

+10:59 INSERTION
 N62 N44
 VI HA
 HDOT HP
 H -

V37E OOE

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1 POST INSERTION CHECKS

GMBL MOTS (4) - OFF (LMP Confirm)

EDS PWR - OFF

MN BUS TIES (2) - OFF

TVC SERVO PWR (2) - OFF

SECS PYRO ARM (2) - SAFE

SECS LOGIC (2) - OFF

ELS - MAN

CM RCS LOGIC - OFF

ROT CONTR PWR DIRECT (2) - OFF

AUTO RCS SELECT (16) - OFF

VHF AM A - SIMPLEX

~~CB EDS (3) - OPEN~~

VHF AM B - OFF

CB RCS LOGIC (2) - open

CB DOCK PROBE (2) - open

CB ELS BAT (2) - open

CB PL VENT - open

CB FLOAT BAG (3) - open

CB SECS ARM (2) - open

DIRECT O2 - OFF (CW)

SM RCS HTRS (4) - PRIM

SC/SIVB SEP LIMITS

LOX - FUEL > 36

FUEL - LOX > 26

LOX > 50

C/W FUNCTION - NORMAL

FC REACS vlv - NORM

H2 PURGE LINE HTR - ON

PCM BIT RATE - LOW

CB UPRIGHT COMPR (2) - open

HATCH ACTUATOR HANDLE - LATCH

2 ECS POSTINSERTION CONFIGURATION

CAB PRESS REL vlv (2) - NORMAL

CB WASTE H2O/UR DUMP HTR (2) - close

GLY RSVR BYPASS vlv - OPEN (CCW)

GLY RSVR OUT vlv - CLOSE (CW)

GLY RSVR IN vlv - CLOSE (CW)

ECS RAD FLOW CONT PWR - PWR

GLY TO RAD PRIM vlv - push (normal)

ECS RAD HTR - PRIM 1

ECS RAD TEMP PRIM OUT below PRIM IN

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- * If OUTLET TEMP ABOVE INLET TEMP:
- * GLY TO RAD PRIM v1v - pull (bypass) *
- * recheck in 5 minutes *

ECS RAD tb - gray
GLY EVAP TEMP PRIM IN - AUTO
CABIN TEMP - AUTO
DRINKING WATER SUPPLY v1v - ON (CCW)
POT H2O HTR-MNA

3 ECS REDUNDANT COMPONENT CHECK

Suit compressor

SUIT COMPR (2) - redundant compressor

SUIT COMPR ΔP - 0.3-0.4 psi

CMP to LEB for MN REG CK CYI AOS
MAIN REG B v1v - CLOSE (____:____:____)

EMER CABIN PRESS v1v - 1

PUSH TO TEST pb - push (O2 FLOW INC)

O2 PRESS - 90-110 psig (MSFN)

MAIN REG B v1v - OPEN

MAIN REG A v1v - CLOSE

EMER CABIN PRESS v1v - 2

PUSH TO TEST pb - push (O2 FLOW INC)

O2 PRESS - 90-110 psig (MSFN)

MAIN REG A v1v - OPEN

EMER CABIN PRESS v1v - BOTH (OFF if suited)

PNL COMM - NORMAL

SUIT CKT RET v1v - OPEN

CMP DOFF HELMET & GLOVES & MAE WEST

UNSTOW HELMET BAGS FROM A-5

STOW CMP HELMET IN L-SHAPED BAG

SEC RAD LEAK CK

ECS IND sel - SEC

Monitor Sec ACCUM QTY while CMP sets SEC GLY
to RAD v1v to NORMAL 30 sec then back to
BYPASS

Secondary Glycol Loop (if req'd)

EVAP H2O CONT SEC v1v - AUTO

SEC COOL LOOP PUMP - AC 1

GLY DISCH SEC PRESS - 39-51 psig

ACCUM SEC QTY ind - 30-55%

SEC COOL LOOP EVAP - EVAP

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SEC EVAP STEAM PRESS .1-.15 boiling
>.16 not boiling

After 5 min

SEC EVAP TEMP OUT - 40-50.5°F
SEC COOL LOOP EVAP - RESET for 1 min
then off (ctr)
SEC COOL LOOP PUMP - off (ctr)
ECS IND sw - PRIM

4 ECS MON CK (LMP)

5 GDC ALIGNMENT TO IMU GIMBAL ANGLES

ATT SET tw - FDAI GIMB ANG
FDIAI SELECT - 1
FDIAI SOURCE - ATT SET
ATT SET - IMU
ATT SET dials - null FDI 1 err needles
ATT SET - GDC
GDC ALIGN PB - push until needles nulled

6 EMS TEST

CB EMS (2) - close (verify)
EMS MODE - STBY
EMS FUNCT - ΔV SET (wait 5 sec)
EMS MODE - AUTO
 ΔV ind - 1586.8 fps
EMS FUNCT - ΔV TEST
SPS THRUST 1t - on
 ΔV ind - decr in 10 sec
SPS THRUST 1t - out (at -0.1 fps)
 ΔV ind - stop at -20.8 \pm 20.7 fps
EMS MODE - STBY
EMS NULL BIAS TEST

7 EPS MON CHECKS (LMP)

8 INSTALL OPTICS (CMP)

- 9 SM RCS MON CK
SM RCS He tb (8) - gray
SM RCS PRIM PRPLNT tb (4) - gray
SM RCS SEC PRPLNT tb (4) - gray
RCS IND sel - SM A, B, C, D
PKG TEMP ind - 105-195°F
He PRESS ind - record
He TK TEMP - record
PRPLNT QTY ind - record
SEC FUEL PRESS ind - 178-192 psia
(192-207 psia until jets fired)
- 10 CM RCS MONITORING CHECK
CM RCS PRPLNT tb (2) - bp
RCS IND sel - CM 1,2
He TEMP ind - 60-90°F
He PRESS ind - 4000-4450 psia
MANF PRESS ind - 25-105 psia
- 11 JETT DUST COVERS (CMP)
- 12 BACKUP COMM CHECK (LMP)
- 13 P52 (REFSMMAT) (CMP)
- 14 PIPA BIAS CK
(1:15 with MER-OPTIONAL)

DET - RESET
SC RATES <0.1°/sec
- V25N 21E, E,E,E/Start Event Timer
- V16 N21E
16 21 XYZ PIPA COUNTS
- At T + 4:16 - VERB
T4:16
(X) R1 (Y) R2 (Z) R3 (XXXAB)
If calculated - loaded >26400
V01 N01, 1452E, 1454E, 1456E

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V21N 01E
F 21 01 LOAD 1452 E (CALCULATED X BIAS) E,E,(+ABXXX)
1454 E (CALCULATED Y BIAS) E,E
1456 E (CALCULATED Z BIAS) E

(15) RH WINDOW PHOTOGRAPHY (LMP) — *DELETE*

16 FC PURGE CK (LMP)

17 C/W SYSTEM CHECKS (LMP)

18 SCS ATTITUDE REFERENCE COMPARISON

Key V37E00E

Key V16 N20E, (pres IMU angs)

FDAI SELECT - 1

FDAI SOURCE - ATT SET

ATT SET - GDC

ATT SET dials - null FDAO 1 err needles

Key V (when nulled to freeze display)

RECORD FROM DSKY:

N20

R= ____ °, P= ____ °, Y= ____ °

ATT SET dials (3) - Record

R= ____ °, P= ____ °, Y= ____ °

Key V37E 00E

19 SPS MON CHECK (LMP)

20 MOUNT & INIT ORDEAL (CDR)

21 PREPARE COAS (CDR)

22 UNSTOWAGE (CMP)

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SECTION 3. SEPARATION

CSM/SLA SEPARATION THRU WITHDRAWAL

PRE SEPARATION

STOW OPTICS EYEPIECES

Change Seats and Umbilicals, *DONN SUNGLASSES*

CB SIVB/LM SEP (2) - close (verify)

CB DOCK PROBE (2) - close (verify)

DOCK PROBE EXTD/REL - EXTD/REL until tb-bp

DOCK PROBE tb - grey at full extension

EXT RET

| | | |
|----------|------|------|
| FULL EXT | Grey | Grey |
| FULL RET | BP | BP |
| PART EXT | BP | Grey |

DOCK PROBE EXT/REL - RETRACT (tb-Grey)

COAS mounted

COAS PWR - on

Verify RCS DAP loaded

R1 - 11102 Noun 46 Display

R2 - 11111 "

N17 - (SEP ATT) 181.43 94.36 14.78

N22 - (DOCK ATT) 121.43 274.36 345.22

Set DOCK ATT on ATT SET DIALS (121.4,274.4,345.2)

SEPARATION PREP

SIVB attitude, DB & H2 Vent rate, Confirmed by MSFN

DONN HELMETS (Helmet visor on CDR) AND GLOVES

WASTE STOWAGE VENT - closed

SUIT CKT RETURN VLV - CLOSE

EMERG CABIN PRESS TEST - PRESS until cabin reaches 5.7

EMERG CABIN PRESS - OFF

EMS MODE - STBY

~~EMS FCN - ΔV SET~~~~SET AV IND TO 100~~EMS FCN - ΔV (*CTR ZEROS*)

ALIGN GDC

FDAI 1 - INRTL

FDAI 2 V83E - ADJUST ORDEAL

Key V37E OOE

MAT ATT (3) - RATE CMD

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LIMIT CYCLE - OFF
ATT DB - MIN
RATE - LOW
TRANS CONT PWR - on (up)
ROT CONT PWR NORMAL (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
SC CONT - CMC
CMC MODE - FREE
BMAG MODE (3) - RATE 2
LV/SPS IND - SII/SIVB
LV GUIDANCE - IU
XLUNAR INJECT - SAFE
UP TLM IU - BLOCK
AUTO RCS SEL (16) - MNB
CB RCS LOGIC (2) - close
TVC SERVO PWR 1 - AC1/MNA
TVC SERVO PWR 2 - AC2/MNB
DET RSET - RESET
DET - 00:00

3 CRO:

CB SECS ARM (2) - closed
Coordinate with HOU, then SECS LOGIC (2) - ON (at
~~ELS AUTO - AUTO~~
~~ELS LOGIC - ON~~
"mark")

Receive GO for PYRO ARM

~~ELS AUTO - MAN~~

~~ELS LOGIC - OFF~~

Up TLM IU - Accept

Receive MSFN Update

Up TLM IU - BLOCK

4 SEPARATION

V46E

2:34:00

SIVB MNVR to 181.43 94.36 14.78

THC - ARMED

RHC #2 - ARMED

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MAN ATT (3) - MIN IMP
SC CONT - SCS
RCS CMD - ON
CHECK RCS (Audible)
SC CONT - CMC
MAN ATT (3) - RATE CMD
EMS FUNCT - ΔV
EMS MODE - AUTO
Key V63E
V66E (transfer CSM state vector to LM storage)
Key V37E 47E
SECS PYRO ARM (2) - on(up)
CMC MODE - HOLD
THC - +X and hold
CSM/LV SEP pb - push and hold and release
LV TANK PRESS - full scale Low

00:00

DET - start up

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X X

No Separation:

(00:00) THC - CCW (leave in detent) until
1 fps

Event, Timer reset and counting up
(auto)

(00:03) LV TK PRESS-full scale low (SEP ind)

(00:07) THC - neutral

X Confirm ΔV -1 fps

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X

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00:04 max

THC - release

ΔV ind ~ 100.8 fps

5 POST SEPARATION

FDAI SCALE 5/5

MAN ATT PITCH - ACCEL CMD

SC CONT - SCS

At :15 Pitch up 180° to acquire SIVB

V62E

6 TRANSPOSITION

MAN ATT PITCH - RATE CMD

SC CONT - CMC

Null translation and rates

EMS ΔV IND: -101.6

MAN ATT(3) - MIN IMP

SC CONT - SCS

ROLL left 60° to null error needles

SC CONT - CMC

MAN ATT(3) - RATE CMD

FDAI SCALE 5/1

DOCK PROBE EXTD/REL - RETRACT (Verify)

7 DOCKING (GET : :)

Stabilize & align CSM at 50 ft.

BMAG MODE (3) - ATT 1/RATE 2

SC CONT - SCS

CMC MODE - FREE

THC +X to close at .25 to .5 fps

At contact (ASAP):

PROBE EXTD/RETR tb - bp

SC CONT - CMC

Allow probe to damp S/C motions
(approx 10 sec)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

X Divergent oscillation or abnormal X
motions:

EXTD/REL - EXTD/REL to acquire SIVB

SC CONT - SCS

Withdraw to stationkeeping

Evaluate and repeat sequence

MAN ATT PITCH - RATE CMD

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For Recycle:

PROBE EXTD/REL - EXTD/REL
for 5 Sec.
-RETRACT

X PROBE EXTD/REL tb-Grey (Verify)X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Align Pitch and Yaw with THC (<3°)
(min. possible)

DOCK PROBE RETRACT PRIM -1

After dock latches have engaged:

PROBE EXTD/RETR tb - grey
(A-1,5,9;B-3,7,11)

SECS PYRO ARM (2) - SAFE

SECS LOGIC (2) - OFF

CB SECS ARM (2) - open

EXTD/REL - OFF

RETRACT 1 - OFF

CB DOCK PROBE (2) - open

8 POST DOCKING

RATE - HIGH

PRO

F37 - OOE

COAS POWER - OFF

CB RCS LOGIC (2) - OPEN

TVC SERVO PWR (2) - OFF

THC, RHC - locked

EMS MODE - STBY

EMS FUNCT - OFF

BMAG MODE (3) - RATE 2

Verify Suit Integrity

COUCHES - CDR-0°, CMP-0°, LMP-180°

LM PWR - OFF

TUNNEL LIGHTS - ON

V83E Check STATE VECTOR

V47E LM to CSM

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CB Hi GAIN ANT FLT BUS - CLOSE
CB Hi GAIN ANT GRP 2 - CLOSE
Hi GAIN ANT TRACK - MAN
Hi GAIN ANT PWR - POWER
POSITION 0° PITCH 180° YAW

9 CM/LM PRESSURE EQUALIZATION

PLSS - OFF
SURGE TANK - ON
O2 PRESS ind - SURGE TANK
EMERG CABIN PRESS - OFF
CABIN REPRESS OFF
WASTE STORAGE VENT - CLOSED
LM TUNL VENT vlv - LM/CM ΔP
CABIN PRESS - 5.7 psi
HATCH PRESS EQUAL vlv - open full (E)

At Cabin = 4.5 psi, PRESS EQUAL vlv -
LM/CM ΔP ~2.8 psi close

Check LM pressure stabilization

HATCH PRESS EQUAL vlv - OPEN

When CABIN PRESS = 4.0, REPRESS O2 -
OPEN

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

X CAUTION X

If CABIN PRESS = 5.7, REPRESS O2 -

CLOSED

Recycle until O2 REPRESS PRESS~100,
X CABIN 4.0 X

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

REPRESS O2 - CLOSED

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

X If Cabin < 4.0, HATCH PRESS EQUAL X
X vlv - CLOSED) X

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

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Verify LM/CM ΔP < .2
LM TUNL VENT - LM PRESS
PLSS - FILL when Cabin reaches 5.0 psi
EMERG CABIN PRESS - BOTH
MONITOR SURGE TANK
WASTE STOWAGE VENT - OPEN
When Surge TK IND → 865
PLSS - OFF
RHC #1 - stow on mount on A-6

10 TUNNEL HATCH REMOVAL

HATCH PRESS EQUAL vlv - open (CCW)
PUMP HANDLE - unstow, pull to stop,(A) ↗
set to U
- Push to stop
Verify gearbox disconnect socket - U
PUMP HANDLE sel - stow
PUMP HANDLE ↘ - push to stow
Remove hatch, pass to LMP

11 DOCKING LATCH VERIFICATION

LATCH HANDLE - Pull to verify hook en-
gaged (12 latches)
Not Engaged - Attempt to engage before
recocking
LATCH IND BUTTON (Red) - Flush (12
latches)
POWER BUNGEE FAIRING-Parallel to +X
Not parallel - Push +X end of Bungee
Before Recocking

XXXXXXXXXXXXXXXXXXXXXXXXXXXX
X UNLOCKED LATCHES: X
 Recock Latches
 XXXXXXXXXXXXXXXXXXXXXXXXXXXX
 X Hook does not release: X
 AUX REL (yellow)-push
 X Cock latch X
 XXXXXXXXXXXXXXXXXXXXXXXXXXXX
Release Latch - push man-release
X (fish tail) X
XXXXXXXXXXXXXXXXXXXXXXXXXXXX

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GN2 BLEED button (red) - press (10 sec)

12 LM UMBILICAL CONNECTION

LM Connector Fairings (2) (orange)-open

Unstow one connector

SYS TEST - 4D Volts

Connect and lock

SYS TEST - 4D Volts

Position umbilical in slot, close fairing

Repeat for second umbilical

SYS TEST - 4D: Volts

LM PWR - CSM, Volts:

SYS TEST ind - 2.5-7.5 amps (1.25-3.75 volts)

13 HATCH INSTALLATION

Align Hatch in Tunnel

PUMP HANDLE - unstow, set to L
- push to stop

Verify gearbox disconnect socket - L

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

X If latches cannot be closed: X

GEARBOX DISCONNECT-180° CCW
(Tool B)

AUX LATCH DRIVE-LATCH(113° CW)

X Verify hatch latches, remove tool B X

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

PUMP HANDLE sel - stow

PUMP HANDLE - push to stow

HATCH PRESS EQUAL vlv - close (CW)

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LM TUNNEL LIGHTS - OFF
GET : :
Install RHC #1 on RLEB mount

14 PRE LM EJECTION 4:11:00 GET (nominal)

LOAD DAP: N46: 21102

V46E

V62E

V49E

V06 N22

Load N22: 142.8: 313.5: 305.5

: (127.6: 324.3: 355.4) = in

PRO plane)

E 50.18

Set ET: 00:00

CB SECS ARM (2) - close

At MSFN AOS 3:58:00

SECS LOGIC (2) - ON(up)

~~ECS AUTO - AUTO~~~~ECS LOGIC - On~~

Obtain GO from MSFN

~~ECS AUTO - N/A~~~~ECS LOGIC - OFF~~

SECS PYRO ARM (2) - on(up)

TVC SERVO PWR (2) - AC1/MNA

CB SIVB/LM SEP (2) - CLOSE (verify)

15 LM EJECTION (CRO 3:59:17, DAY 4:11:00,
HAW 4:24:14)

EMS FUNC - ΔV

EMS MODE - AUTO

SIVB/LM SEP - on (up)

Start DET

CMC MODE - AUTO

.05 Thrust AFT (-X) for 3 sec

16 EVASIVE MNVR

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L
3-10

F 50 18 142.8 313.5 305.5
PRO to pitch down 50° at Sep +25 sec
(20 ft)

THC, RHC - Unlocked

At completion of mnvr: ENTR

V37 - 47E

AT ET = 03 + 00

Thrust Aft (-X) 6 sec.

17 POST RCS EVASIVE MNVR

SECS PYRO ARM (2) - OFF

SECS LOGIC (2) - OFF

CB SECS ARM (2) - open

CB SIVB/LM SEP (2) -open

When clear of SIVB:

CMC - FREE

PRO

F37 - 00E

MAN ATT (3) - MIN IMP

S/C Cont - SCS

Reload DAP: N46:21111

EMS FUNC - OFF

EMS MODE - STBY

178 108 355

TRANS CONT PWR - OFF

LV/SPS IND - GPI

RHC, THC - Locked

TVC SERVO PWR (?) - OFF

Maintain SIVB in view thru hatch window with RHC No. 1

18 SIVB MNVR TO LCL HORIZ, OKB

RATE: 4:25:00

SIVB INERTIAL

4:45.51

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L
3-11/12

SIVB will maintain $\sim 30^\circ$ above X axis
at OP and OY errors with left roll rate
to $\sim 110^\circ$ Roll at 4:30:00
At 4:45:00 with R=110 $^\circ$, COAS + 30 $^\circ$,
SIVB
Boresighted, LV X axis: V83=344 $^\circ$;
V16 N20: P=280, Y=325
SIVB Ignition moves to left side window

EJECTION + 33:00 SIVB BORESIGHTED AT +30 $^\circ$
ON COAS, GIMBAL ANGLES = 146, 282, 337

| | R | P | Y |
|---------|-----|-----|-----|
| 4:20:00 | 267 | 310 | 4 |
| 4:30:00 | 339 | 306 | 344 |
| 4:40:00 | 1 | 320 | 349 |
| 4:50:00 | 180 | 60 | 2 |
| 5:00:00 | 180 | 50 | 3 |
| 5:10:00 | 180 | 26 | 3 |

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LAUNCH MONITORING

1. Comments on CM Acoustical Environment

2. Comments on Vehicle Dynamic Response During S-1C Operation

3. Observable Effects of LES Exhaust Impingement on CM Windows

T D & E DEBRIEFING

1. COMMENTS ON DOCKING OPERATION

- a. HANDLING CHARACTERISTICS
- b. DOCKING AIDS
- c. CSM/LM ROTATIONAL ALIGNMENT

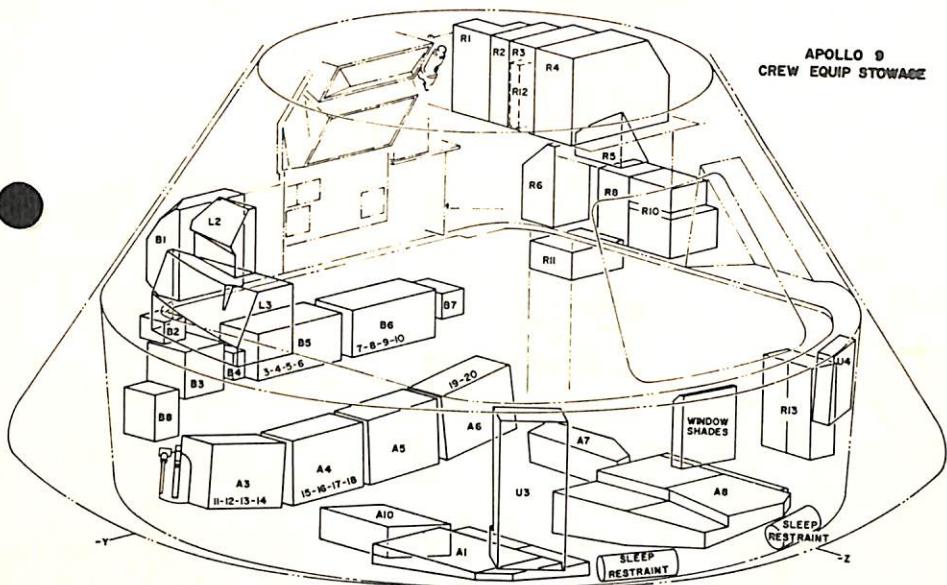
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2. COMMENTS ON EJECTION FROM SLA

- a. DYNAMIC CHARACTERISTICS
- b. ATTITUDE CONTROL & STABILITY OF S-IVB PRIOR TO, DURING & AFTER EJECTION
- c. ADEQUACY OF LIGHTING & VISUAL CUES

3. EFFECTS OF SM RCS EXHAUST ON CM WINDOWS DURING TD&E

APOLLO 9
CREW EQUIP STOWAGE



A1
Penlights-5
Utility towel assy.(RWB)-1 ea
Tissue disp.-5
Normal sample kit (bag & tether)-1

WMS QD press. cap-2
Snag line w/cont.-1
Temporary stowage cont.-3
Caps & screens, suit ex. hoses,w/cont.-3
PLV duct w/cont.-3
PGA O₂ intercon. coupling assy w/cont.-3
WMS coupling assy-1
Sea water pump w/cont.-1
WMS power cable-1
Inflight retainer strap-1
WMS water panel QD-1

A3
CO₂ absorber & shims-4

A4
CO₂ absorber & shims-4

A5
Helmet stowage bag-3
Accessory bag-3

EV gloves-1 pr.
Headrest pads-3
Hel restraints-3 pr.

Remote control cable (LM) -1
Sleep restraint rope-5

A6
CO₂ absorber & shims-2
Optical range finder-1

A7
SWA Hasselblad - 1
70mm film magazine-4 **PPK-2**
16mm film magazine-8

A8
LCG-1
FCS-3 †
EMU maintenance kit-1
ICG's (w/univ. ear tubes in pockets) 3 pr
PPK's-3
CWG's-5
Inflight exercisor-1
L/W headsets (w/earmolds inst.)-3
Tool kit assy-1 **CONT TOOLS**
Electrical CWG adapter w/cont.-4
Optical range finder bracket-1
Jackscrew Stowage Bag-1

A10
S065 camera bracket-1
S065 elect. Hasselblad camera-4
S065 70mm film magazine-4
S065 filters-4

B1
Food & hygiene-1

B2
Medical kit No. 1-1
Nasal emollient (in med. kit)-1

B3
Lens 18mm-1
Power cable-1
Spotmeter-1
70mm Hassel. w/80mm lens inst.-1
Ring sight-1

Photar filter-2A-1
Right angle mirror-1
5mm lens w/cover-2
70mm film magazine-1
75mm lens-1
16mm data acquisition camera-1
16mm magazine-1
Inflight retainer strap-1

B4
Chlorination ampules-3
Buffer ampules-3
Chlorination needle-1
Chlorination syringe casing-1
Chlorination syringe knob-1
Chlorination equip. cont.-1

B5
 CO_2 absorber & shims-4

B6
 CO_2 absorber & shims-4

B7
Chlorination ampules-3
Buffer ampules-4
Chlorination ampules cont.-1

B8
Power cable-1
16mm data acquisition camera-1
16mm film magazine-5
Inflight retainer strap-1

L2
Electrostatic ground cable-1
Adapter tool E-1
CCU control head (spare) w/cont.-1
CCU spare cable-1
CCU cable strap-1
Inflight retainer strap-1

L3
Food packages-1
R1
Flight data file books-~~12~~
G&N handles-2
OUA hi density sun filters(G&N)-2
Tissue dispenser-2

R2
Flight data file books-~~13~~
R3
Flight data card kit-1
Flight data file books-~~18~~
Flight data file clips-6
Floodlight glare shield-1
G&N panel ind.-2
Eye patch-1 **TELCOM**
Camera fuse-1 **SLIDE**
Meter cover-2 **RULE**

R4
Survival kits-2
R5
Gas & liquid WMS Q.D. filt assy-2
Inflight retainer strap-3
Back to back straps-6

R6
Cabin vent Q.D.-1
Chlorination ampules-4
Buffer ampules-3
Chlorination ampules cont.-1
Probe stowage strap-2
Inflight retainer strap-2

R8
Medical kit No. 2-1

R10
Fecal collection assy.-30
Sanitation supply box(aft)-1
Remote control cable(CM)-1
Data Acquisition camera bracket-1
EVA camera bracket-1
EVA camera equip.stowage box(fwd)-1

R11
Roll on cuffs (RWB)-1 pkg.ea.
UTS w/roll-ons-3
UTS spare w/roll-on-1

R12
Flight data file books-~~14~~

R13
Tape-1 roll
Camera handle-2
2-speed interval timer-1
Thermal sample box-1
MDC sun shades (DSKY,EMCA & mission timer)-3
Tape recorder w/tape & battery-1
Tape cassette-4
Battery packs-4

U3
Docking target adapter assy.-1
Data acquisition camera bracket-1
LM docking target-1
COAS light bulb-2

U4
Special food package-3
Spoon package-1

MISC'
Fwd. hatch container (under L/H couch)-1
Radiation survey meter (G&N panel LEB)-1
 O_2 mask & hose w/cont. (O_2 repress.sys)-3
PGA bag w/UCTA clamps-3
helmet shield-1 **LCG-1** -(under center couch)
couch restraint strap-3
Urine hose assy.w/cont.-1]-(aft blk'd. under A6)
Inflight retainer strap-1]-(aft blk'd. under A6)
Urine dump QD-1
CCU control head (on CCU)-3
MDC guards w/cont.(LC&R) (on side of A8)-3
Shades w/cont. (on UEB O_2 repress.sys)-5
Fire extinguisher (on side of A3)-1
COAS w/bulb (above L/H window)-1
Sleep restraints(L&R) (aft UEB)-1 ea
 CO_2 absorber (in ECU)-2
Inflight retainer strap (on O_2 cont)-3
Rotational contr. mount (LEB on side of A6)-1
Translational contr. mount (LEB on side of A3)-1

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MODE IA PAD → 42 SEC

| <u>TIME</u> | <u>CDR</u> | <u>CMP</u> | <u>LMP</u> | <u>SECTION</u> 4. |
|-------------|---|---|------------|----------------------|
| :00 | THC - CCW | SM SEP (2) - ON | START TIME | |
| :14 | ELS LOGIC - ON ELS AUTO - AUTO | TWR JETT (2) - ON APEX COVER JETT pb - push DROGUE DEPLOY pb - push | | |
| :28 | IF BELOW 3700': MAINS DEPLOY 10K MAINS DEPLOY pb - push | | | |
| | EARTH LANDING, pg L/4-7 | | | |

MODE IB → 42 SEC 100,000K (R3=16.5NM) FTA: 1+45

4-1 L

| <u>TIME</u> | <u>CDR</u> | <u>CMP</u> | <u>LMP</u> | <u>ABORTS</u> |
|-------------|--|--|------------|------------------------|
| :00 | THC - CCW | SM SEP (2) - ON | START TIME | |
| :11 | | CANARD DEPLOY pb - push | | |
| :14 | ELS LOGIC - ON ELS AUTO - AUTO | | | |
| 24K | | | | |
| 23K | | | | |
| 20K | | | | |
| 10K | (CABIN PRESS REL. vlv.-DUMP) MAINS DEPLOY pb - push | 24K TWR JETT (2) - ON APEX COVER JETT pb - push DROGUES DEPLOY pb - push | | CABIN PRESS-INCREASING |
| | EARTH LANDING, pg L/4-7 | | | |

4. ABORTS

| MODE IC | → 16.5 NM | TWR JETT | FTA: 3+00 |
|-------------------|---|--|------------------------|
| TIME | CDR | CMP | LMP |
| :00 | THC - CCW | SM SEP (2) - ON | START TIME |
| :11 | PLATFORM NO GO: GO: P+5°/sec (TWR JETT) *High P DAMP *Roll 90° * 0,135,0 Damp Rates BMAG 1/2 P+5°/s P: RATE CMD EMS:ENTRY,AUTO RCS SINGLE RING .05G - ON | CANARD DEPLOY pb - push | |
| 40K | ELS LOGIC - ON ELS AUTO - AUTO | | |
| 24K | | TWR JETT (2) - ON APEX COVER JETT pb - push DROGUES DEPLOY pb - push | |
| 23K 20K 10K | (CABIN PRESS REL. vlv. - DUMP) MAINS DEPLOY pb - push | | CABIN PRESS-INCREASING |

EARTH LANDING, pg L/4-7

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| MODE II → TWR JETT 9:23 | | FTA: 4+30 and 9+20 | |
|-------------------------|--|---|------------------------|
| TIME | CDR | CMP | LMP |
| :00 | THC-CCW | | START TIME |
| :03 | | LV SEP pb - push | |
| :05 | THC NEUTRAL +X (20 sec) | | |
| :06 | RATES: ΔV THRUST (1)-NORMAL THRUST on PB DIR. ULL PB ΔV THRUST (1)-OFF SPS THRUST-NORMAL | | |
| :24 | +X OFF 0,120,0 BMAG (3) - ATT 1/RATE 2 EMS-ENTRY,AUTO RCS SINGLE RING AT .05G-.05G ON | SM SEP (2) - ON LM FNL SEP (2)-ON | CW MODE - CM |
| 40K | ELS LOGIC - ON ELS AUTO - AUTO | | |
| 24K | | APEX COVER JETT pb-push DROGUES DEPLOY pb-push | |
| 23K 20K 10K | (CABIN PRESS REL.v1v-DUMP) MAINS DEPLOY pb-push | | CABIN PRESS-INCREASING |
| EARTH LANDING, pg L/4-7 | | | |

MODE III → 9:26 INSERTION

| <u>TIME</u> | <u>CDR</u> | <u>CMP</u> | <u>LMP</u> |
|-------------|--|--------------------------------------|--|
| :00 | THC-CCW | | START TIME |
| :03 | | LV SEP pb - push | |
| :05 | THC-NEUTRAL - +X(20 sec) | | |
| :06 | RATES: ΔV THRUST (1)-NORMAL THRUST PB-push DIR. ULL PB-push ΔV THRUST (1)-OFF SPS THRUST-NORMAL | | |
| :24 | +X OFF 180,194,0 BMAG(3)-ATT 1/RATE 2 ΔV THRUST (1) (NORMAL) EMS: ΔV - AUTO | | ATT: HORIZ,BEF,HDS UP |
| 2:05 | TH. PB. -push DIR. ULL. PB - push ΔV THRUST (1) - OFF SM SEP RCS SINGLE RING EMS-ENTRY,AUTO 0,105,0 AT .05G-.05G AT .2g 305,105,17 | SM SEP(2) - ON LM FNL SEP(2) - On | Δ R -368 To 0 - NO BURN (N50E) CW MODE - CM |

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| | | | |
|-----|-------------------------------|--|--------------------------|
| 40K | ELS LOGIC-ON ELS AUTO-AUTO | | |
| 24K | | APEX COVER JETT pb- push DROGUES DEPLOY pb - push | |
| 23K | | | CABIN PRESS - INCREASING |
| 20K | (CABIN PRESS REL.vlv.-DUMP) | | |
| 10K | MAINS DEPLOY pb-push | | |

EARTH LANDING, pg L/4-7

MODE IV → 9:23 INSERTION

4-6

| <u>TIME</u> | <u>CDR</u> | <u>CMP</u> | <u>LMP</u> |
|---|--|------------------|---------------------------|
| :00 | THC-CCW | | START TIME |
| :03 | | LV SEP pb - push | |
| :05 | THC-NEUTRAL +X (20 sec) | | |
| :06 | RATES: ΔV THRUST(1)-NORMAL ULL,PB - push Th. PB - push ΔV THRUST (1)-OFF SPS THRUST - NORMAL | | |
| :24 | +X OFF 180,347,0 BMAG(3) - ATT 1/RATE 2 ΔV THRUST (1) - NORMAL | | ATT: HORIZ,SEF,HDS DWN |
| 2:05 | EMS-AUTO ULL. PB Th. PB ΔV THRUST (1) - OFF | | |
| GO TO POSTINSERTION CHECKLIST, pg L/2-4 | | | |

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ABORT EARTH LANDING

10K MAINS DEPLOYED (MAIN DEPLOY PB)
VHF ANT - RECY
VHF AM - SIMPLEX A, BCN-ON
VOICE REPORT
CABIN PRESS REL vlv (2) - close
DIRECT 02 - OPEN (CCW)
CM RCS LOGIC - ON (UP)
CM PRPLNT DUMP - ON (Burn Audible)

No Burn, Use Both RHC's

*Do NOT Fire Pitch Jets *

CM PRPLNT PURGE - PURGE(up)(To Zero
He PRESS)

CM RCS He Dump pb - Push

RHC(2) 30 sec - No Pitch

CAB PRESS REL vlv(2) - Boost/Entry
STRUT LOCKS - UNLOCK
CB FLT & PL BAT BUS A,B,&BAT C(3) - close
CB FLT & PLS MNA & B(2) - open
FLOOD POST LDG
CB SPS GIMB MOT (4) - open
CM RCS PRPLNT(2) - OFF

3K CAB PRESS REL vlv - DUMP
ROT CONT PWR DIRECT (2) - OFF

≤1000 CAB PRESS REL vlv (2) - close
MN BUS TIES (2) - OFF

| <u>ABORT DATA</u> | | | | |
|-------------------|----|-----|----|----|
| I | II | III | IV | AK |
| TIG | | | | |
| ΔV | | | | |
| VC | | | | |
| PITCH (BURN) | | | | |
| BT | | | | |
| GET 300K | | | | |
| PITCH (300K) | | | | |
| GET DROGUE | | | | |

MODE III NO COMM-NO PINGS
 BT = abort time

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SECTION 5. POSTLANDING

1. TOUCHDOWN AND STABILIZATION
 - ELS AUTO - AUTO (verify)
 - CB MAIN RELEASE PYRO (2) - closed
 - DIRECT O2 - closed (CW)
 - ELS LOGIC - ON (verify)
 - MAIN RELEASE - on (up)
 - SECS PYRO ARM (2) - SAFE
 - SECS LOGIC (2) - OFF
 - CB BAT RELAY BUS (2) OPEN
 - VHF AM B - OFF (center)
 - CB UPRT COMPR (2)-close (verify)
 - CB FLT/PL VENT - close
 - CB FLOAT BAG (3) - close
 - If Stable II
 - FLOAT BAG (3) - FILL till 2 min after upright, then OFF
 - VHF AM A & BCN - OFF while inverted
 - If STABLE I
 - After 10 min Cooling Period,
 - FLOAT BAG (3) - FILL 7 min
 - FLOAT BAG (3) - OFF
2. POST STABILIZATION AND VENTILATION
 - CB MNA BAT BUS A AND BAT C (2) - open
 - CB MNB BAT BUS B AND BAT C (2) - open
 - CB FLT/PL BAT C - open
 - CB PYRO A SEQ A - open
 - CB PYRO B SEQ B - open
 - PL DUCT COVER - remove
 - PL VENT VLV handle - pull
 - PL VENT - HIGH or LOW
 - PL BCN LT & DYE MARKER - ON (swimmer COMM)
 - INTERCOM (3) - ~~T/R~~ T/R
 - DEPLOY GRAPPLING HOOK if required
 - Install directional air flow ducts
 - XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 - EACH HR - CHECK DC VOLTS > 27.5 V
 - If Not:
 - CB FLT & PL BAT BUS A&B (2) - open
 - CB FLT & PL BAT C - close
 - GO TO LOW POWER CHECKLIST
 - XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

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5. POST LANDING

L
5-2

3. POSTLANDING COMMUNICATIONS
VHF ANT-RECY (verify)
VHF BCN - ON (verify)
If no contact with recovery forces
MONITOR VHF BEACON Transmission with survival radio
~~Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx~~
X VHF Beacon not operating:
Connect survival transceiver to ant
cable and place radio in BCN mode
~~Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx~~
4. LOW POWER CHECKLIST
VHF BCN - OFF
VHF (3) - RCV
FLOOD FIXED - OFF
VHF AM B- off (center)
VHF AM REC ONLY - A (verify)
COUCH LIGHTS - OFF
POSTLANDING VENT SYS: minimize use
SURV RADIO - plug into VHF BCN ANT cable
CONN & turn radio on in BCN mode
5. STABLE I EGRESS
CB BAT A, B, C PWR ENT/PL (3) - open
CONNECT SURVIVAL RUCKSACKS TOGETHER
CONNECT RAFT WHITE LANYARDS TO SUITS
CONNECT RAFT GREEN LANYARD TO CM
OPEN HATCH - INFLATE RAFT
INFLATE WATER WINGS AND EGRESS
6. STABLE II EGRESS
RECONFIGURE COUCH
CONNECT RAFT TO CM WITH GREEN LANYARD
CONNECT RAFT WHITE LANYARDS TO "H2O" WINGS
VERIFY CABIN PRESSURE RELIEF VALVES (2) - closed
PRESSURE EQUALAZATION VALVE - open
REMOVE AND STOW FWD PRESSURE HATCH
WHEN TUNNEL HAS FLOODED
CB BAT A, B, C PWR ENT/PL (3) - open
REMOVE & STOW ABLATIVE HATCH
DROP HARDWARE RUCKSACK DOWN TUNNEL, EXIT FEET
FIRST WITH RAFT: WHEN CLEAR OF CM INFLATE
WATER WINGS AND RAFT

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SECTION 6. LAUNCH EMERGENCY PROCEDURES

RAPID HATCH OPENING

- 1 Actr handle ret - push or squeeze Side Hatch
- 2 Actr handle - operate (until hatch is unlatched)
 - * If hatch fails to open *
 - * GN2 charge knob (2) - CW *
 - * GN2 vlv handle - unlock and push*
(outboard) *

FIRE IN CM DURING BOOST

- 1 CABIN FAN (2) - OFF

- 2 Monitor EPS indicators for excessive current.
Immediately remove power from affected bus.
If in abort modes I or II:
Verify suit compressor on good AC bus
If in abort mode III with affected bus Main A (B)
TVC GMBL DRIVE (2) - 2(1)
AC INV 1 (2) AC BUS 1 (2) - OFF
AC INV 2 (1) AC BUS 1 (2) - ON(up)
- 3 CAB PRESS RELF vlv (RH) - DUMP
- 4 ABORT using appropriate mode

FIRE/SMOKE IN CM DURING ENTRY

- 1 CABIN FAN (2) - OFF

- 2 Monitor EPS indicators for excessive current.
Immediately remove power from affected bus.
- 3 ROT CONTR PWR DIRECT (2) - MNA/MNB
& maintain attitude if required.
- 4 If affected bus is:
MNA
 - AC INV 1 AC BUS 1 - OFF
 - AC INV 2 AC BUS 1 - ON
 - Set up for CM/RCS sys 2
 - AUTO RCS SEL A/C ROLL (4) - OFF

CM 1(6) - OFF

CM 2(6) - MNB

Follow normal RCS dump procedure
using TBD deviations for a fuel
rich dump.

MNB:

AC INV 2 AC BUS 2 - OFF

AC INV 1 AC BUS 2 - ON

Follow normal RCS dump procedures
using TBD deviations for an oxidizer
rich dump.

5 CAB PRESS RELF vlv (RH) - DUMP

6 Continue ENTRY

Contamination in CM

- 1 Don O2 masks and/or PGA's immediately
- 2 Evaluate contamination level (isolate & correct source of contamination if possible) and proceed with one of the following steps:
- a. Retain O2 masks or remain in suit and accept contamination level in cabin.

CAUTION

If in PGA's, adjust DIRECT O2 to maintain suit to cabin $\Delta P > 0,38$ psi.

- b. Retain O2 masks and scrub cabin atmosphere through suit loop. If initially suited, establish partially suited or shirtsleeve configuration and don O2 masks.

CAUTION

Change LiOH cartridges after scrub completed.

- c. Retain PGA's or don PGA's
Verify suit integrity (visually)
Perform Cabin Dump
Perform Cabin Repress

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Contamination In Suit

1 SUIT COMPR 2 - AC1

2 SUIT COMPR 1 - OFF

3 DIRECT 02 vlv - OPEN (CCW) for 1 minute
then close (CW)If condition persists:

4 SUIT COMPR 2 - OFF

5 DIRECT 02 vlv - OFF

6 Doff helmet

7 Don emergency 02 masks

LET FAILS TO JETTISON

LEGS CUT/NO MOTOR FIRE (pyro audible)

LES MOTOR FIRE pb - push

NO RESPONSE to ABRT SYS TWR JETT switches

CB SECS ARM (2) - close (verify)

CB SECS LOGIC (2) - close (verify)

CB EDS (3) - close (verify)

SECS LOGIC (2) - on (up) (verify)

SECS PYRO ARM (2) - ARM (verify)

EDS PWR - on (up) (verify)

ABRT SYS TWR JETT (2) - on (up) (verify)

EMERGENCY CSM/LV SEPARATIONCOASTING

LV XLUNAR - SAFE

SECS ARM cb (2) - close

SECS LOGIC (2) - ON

SECS PYRO ARM (2) - ARM

ROT CONTR PWR DIRECT (2) - MNA/MNB

SC CONT - SCS

BMAG MODE (3) - ATT 1/RATE 2

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SCS TVC SERVO PWR 1 - AC1/MNA
 2 - AC2/MNB
 (Continue through thrusting)

THRUSTING

- 00:00 TRANS CONTR - CCW (4 sec)
 MN BUS TIE (2) - ON
 GMBL MTRS (4) - ON (LMP Confirm)
- 00:04 TRANS CONTR - NEUTRAL & +X
 ΔV THRUST A&B - NORMAL
 THRUST ON PB - PUSH
 TRANS CONTR +X - RELEASE
 ΔV THRUST A&B - OFF When Clear

MN bus Voltage < 26.0, No Short
PWR DOWN Until MN Bus > 26.5 vdc

| | <u>Current (Amps)</u> |
|--|---------------------------|
| 1. O2 Heaters (both) - Off | 11.0 |
| 2. If GET > 2 min (EDS Safe) Main A Batt C CB Close | |
| Main B Batt C CB Close | |
| 3. Power Amp - Off | 3.53 |
| 4. FC Pumps - Off | 12.2 |
| 5. Pot. H2O Heater - Off | 1.6 |
| 6. H2 Heater (both) - Off | 1.44 |
| 7. Cabin Fans (both) - Off | 1.94 |
| 8. H2 Fans (both) - Off | 0.72 |
| 9. O2 Fans (both) - Off | 5.4 |
| 10. SPS Line Heaters - Off | A = 1.025 A/B=2.05 |
| 11. Lights (as required) | |
| 12. Tape Recorder Fwd/Rwd - Off | 1.82 |
| 13. VHF/AM A - OFF | 1.0 |
| 14. *SEC Gimbal Motors - Off | 10.0 |
| 15. CMC Standby Per Procedures | From OP to Standby 2.0 |
| 16. G&N Power - Off | 1.5 |
| 17. IMU Power Down Per Procedures | From OP to Standby 5.7 |

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| | <u>Current (Amps)</u> |
|---|--|
| 18. ECS Glycol Pumps (both) - Off | 2.77 for 1 Pump |
| 18A. Deactivate Pri Evap | 1.20 |
| 19. ECS Radiator Cont/Htr CB - OPEN | 2.69 for Rad. Prop. v1v Contr. Rad Htr. Contr. |
| 20. Power SCE - Off | 0.65 |
| 21. Telecom Group 1 & 2 - Off | 2.2 PCM, TM, S-Band Xmitter Xponder |
| 22. Instrumentation ESS Main A & B CB - Open | 4.7 |

* Crew Option

BUS LOSS RECONFIGURATION

A. Loss of Main Bus A

- 1. EDS Auto/Off - Off
- 2. FC 2 - Main B only
- 3. FC 1 - Off (Main A & B)
- 4. CB Main B Bat C - Closed
- 5. CB Main A Bat Bus A - Open
- 6. Inverter 3 - Main B, AC 1
- 7. SCS TVC P, Y - Rate CMD
- 8. FDAI Select - 2
- 9. TVC Gimbal Drive (P, Y) - 2
- 10. BMAG Mode - Rate 2
- 11. ROT Contr Power Direct 2 - MNB
- 12. Auto RCS Select Pitch, Yaw and B/D Roll
(12) - MNB
- 13. Insertion Checklist
 - a. FC 1 - Main B (If required to maintain
Main B voltage)
 - b. H₂O Accumulator - Auto 2
 - c. ECS RAD Auto/1/2 - 2

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B. Loss of Main Bus B

1. EDS Auto/Off - Off
2. FC 2 - Main A only
3. FC 3 - Off (Main A & B)
4. CB Main A Bat C - Closed
5. CB Main B Bat Bus B - Open
6. Inverter 3 - Main A, AC 2
7. TVC Gimbal Drive (P, Y) - 1
8. ROT Contr Power Direct 1 - MNA
9. Auto RCS Select Pitch, Yaw & B/D Roll (12)-MNA
10. Insertion Checklist
 - a. FC 3 - Main A (If required to maintain Main A voltage)
 - b. ECS Radiator Heater - PRI 2

C. Loss of Bat Bus A

1. EDS Auto/Off - Off
2. CB Main A to Bat C - Closed
3. TVC Gimbal Drive (P, y) - 2 (If bus lost prior gimbal motor turnon)
4. Auto RCS Select Pitch, Yaw and B/D Roll (12) - MNB
5. Insertion Checklist

After attempting to restore bus

 - (1) Main Bus Tie Bat B/C - On (Up)
 - (2) CB Main A Bat C - Open
 - (3) CB Main A Bat Bus A - Open
 - (4) CB Main B Bat C - Open
 - (5) CB Main B Bat Bus B - Open
 - (6) For subsequent main bus ties
 - (a) CB Main A Bat C - Closed
 - (b) CB Main B Bat Bus B - Closed
 - (7) CB Pyro A Seq A - Open
 - (8) ECS Radiator - PRI 2

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D. Loss of Bat Bus B

1. EDS Auto/Off - Off
2. CB Main B to Bat C - Closed
3. TVC Gimbal Drive (P, Y) - 1 (only if bus lost prior to gimbal turn on)
4. Auto RCS Select Pitch, Yaw & B/D Roll (12) - MNA
5. Insertion Checklist
 - (1) Main Bus Tie Bat A/C - On (Up)
 - (2) CB Main A Bat C - Open
 - (3) CB Main A Bat Bus A - Open
 - (4) CB Main B Bat C - Open
 - (5) CB Main B Bat Bus B - Open
 - (6) For subsequent main bus ties
 - (a) CB Main B Bat C - Closed
 - (b) CB Main A Bat Bus A - Closed
 - (7) CB Pyro B Seq B - Open
 - (8) ECS Radiator - PRI 1

E. Loss of AC Bus 1

1. AC Inverter 1 Main A - Off
2. Suit Compressor 2 - AC 2
3. FDAO Select - 2
4. BMAG Mode (3) - Rate 2
5. TVC Servo Power 1 - AC 2/MNB (loss of φ A only)
6. SCS TVC (2) - Rate CMD
7. Insertion Checklist
 - a. S-Band Normal Pwr Amp-Sec
 - b. Fuel Cell Pump 1 - AC 2
 - c. ECS Glycol Pump - AC 2
 - d. BMAG 1 Power - Off
 - e. G&N Power AC 2
 - f. Signal Cond/Bias power 1-AC 2
 - g. Manual control glycol evap temp inlet
(maintain above 40°F)
 - h. ECS Rad flow contr - 2

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F. Loss of AC Bus 2

1. AC Inverter 2 Main B - Off
2. TVC Servo Power 2 - AC1/MNA (Loss of φ A only)
3. SCS TVC(2) - AUTO
CSM/LM ΔV CG - CSM/LM
Control SPS With Trim Wheels
4. S-Band Normal Xponder - PRI
5. Insertion Checklist
 - a. F/C Pump 2 and 3 - AC 1
 - b. BMAG 2 Power - Off
 - c. FDAI Select - 1
 - d. Signal Cond/Bias power 2 - AC 1
 - e. Activate Sec Coolant Loop
 - f. Shut down Primary Evaporator

LOSS OF 2 FUEL CELL AT LIFT-OFF

Entry Area 3-1

After 2 + 00 EDS Auto off - Off

1. If loss of FC 1 & 2, tie Bat C to Main A
2. If loss of FC 2 & 3, tie Bat C to Main B
3. If loss of FC 1 & 3, tie Bat C to both Main Buses

Panel 5 failed FC pumps (2) - Off. At insertion:
Perform insertion checklist plus the following
power down. Note: Leave batteries on until
power down complete.

Panel 2

O2 & H2 tank fans and Htrs (4) - Off

Caution and Warning - ACK

Cabin Fans (2) - Off

Pot H2O Heater - Off

Glycol Evap Steam Press - Man

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Glycol Evap Temp In - Man
Glycol Evap H₂O Flow - Off
ECS Rad Htrs Prim - Off
ECS Rad Htrs Sec - Off
SMRCS Heaters (A, B, C, D) - Off

Power down CMC per checklist, leave IMU powered up
(Note: No need to realign IMU for 3-1 entry).

Panel 3

SPS Inline Heaters - Off
Tape Record Fwd/Rwd - Off
S-Band Normal Pwr Amp - Off
Remaining fuel cell to both Main Buses. Select single
inverter operation.

Panel 5

ECS Rad Htr OVLD CB (2) - Open

Panel 7

SCS Logic Power 2/3 - Off
FDI/GPI - Off
SCS Electronics - Off
BMAG Power (2) - Off*

Note: If voltage permitting leave BMAG in warmup
after Batts Off Main Bus, if not place BMAG
on 40 minute prior to IMU/GDC align.

Panel 8

Auto RCS Select (16) - Off
SCS Logic (CB 23, 24, 62, 63) Open

4. Batteries Off Line
Charge Lowest Battery

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5. SPS Ignition - 1 hour
BMAG Power (2) - warmup

Logic Arm
Pyro Arm
CMRCS Press
Pyro and Logic Safed

6. SPS Ignition - 10 minutes
*Power up CMC and SCS and perform IMU/GDC align.
7. Perform normal deorbit SPS ignition Seq.

LOSS OF 3 FUEL CELLS AT LIFTOFF

ENTRY AREA 2-1

Conditions:

1. 3 batteries supplying spacecraft power
2. G&N system is completely powered down
3. SCS is powered up
4. SCS - SPS ΔV for deorbit
5. SCS auto entry

At the loss of 3 fuel cells perform the following:

1. Tie Bat C to Main Bus A & B

Panel 275

| | | |
|--------------|----|-------|
| Main A/Bat C | CB | Close |
| Main B/Bat C | CB | Close |

2. Turn off cryo heaters and fuel cell pumps. Verify cryo fans off.

Panel 2

| | | |
|--------------------|--------|-----|
| H2/O2 fans (all) | Verify | Off |
| H2/O2 heaters(all) | | Off |

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Panel 5

| | |
|-----------------------|-----|
| Fuel cell pumps (all) | Off |
|-----------------------|-----|

At insertion perform insertion checklist and perform the following power down.

Panel 2

| | |
|----------------------------------|-----|
| Caution/Warning-Normal/Boost/ACK | ACK |
| Cabin fans - (both) | Off |
| Pot H2O Htr | Off |
| SMRCS Htrs (A, B, C, D) | Off |
| ECS Rad Htrs Prim 1-2 | Off |
| ECS Rad Htrs Sec | Off |

Panel 3

| | |
|----------------------------------|-----|
| SPS Line Htr | Off |
| Select Single Inverter Operation | Off |
| Tape Record Fwd/Rwd | Off |
| S-Band Normal Pwr Ampl. | Off |

Panel 5

| | |
|-------------------------------------|------|
| Guidance & Navigation CB (all - 10) | Open |
|-------------------------------------|------|

| | |
|----------|-------------|
| Power | AC-1 & AC-2 |
| IMU | MN A & MN B |
| IMU Htr | MN A & MN B |
| Computer | MN A & MN B |
| Optics | MN A & MN B |

| | |
|---------------------------------------|------|
| ECS radiators cont./htrs. MN A & MN B | Open |
|---------------------------------------|------|

Panel 8

| | |
|----------------------------|-----|
| Auto RCS Select - 16 (all) | Off |
|----------------------------|-----|

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L
6-12

Panel 100

Flood Fix - Off Off
LEB Lights Flood Off

Panel 101

Waste H₂O Dump Htr Off
Urine Dump Htr Off

Preparation for entry

Tig - 15 min

EMS ΔV Set

Logic Arm
Pyro Arm
CMRCS Press
Logic Safe
Pyro Safe

Tig - 5 min

Gimbal Motors On
to = SPS Ignition

GIMBAL MOTORS

Off

Entry

Logic Arm
Pyro Arm

CM/SM Sep
Configure RCS Jet select logic for 1 ring operation.

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