APOLLO 13	
CSM LAUNCH CHECKLIST	
PART NO.	S / N
SKB32100082– 309	1001

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

APOLLO XIII
CSM 109

CSM LAUNCH CHECKLIST

PREPARED BY
FLIGHT CREW SUPPORT DIVISION
SPACECRAFT SYSTEMS BRANCH

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

JANUARY 5, 1970
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LAUNCH TABLE OF CONTENTS

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APOLLO FLIGHT DATA FILE
CSM LAUNCH CHECKLIST

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LIST OF EFFECTIVE PAGES

* INDICATES CURRENT CHANGE

PAGE NUMBER	ISSUE
Title	Basic
L/TC-1	Basic
L/1-1 thru L/1-14	Basic
L/2-1 thru L/2-31	Basic
L/3-1 thru L/3-8	Basic
L/4-1 thru L/4-15	Basic
L/5-1 thru L/5-10	Basic
L/6-1 thru L/6-6	Basic
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L/10-1 thru L/10-2	Basic

This is a complete reprint of the 1/5/70 edition.

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LIFTOFF CONFIGURATION

PANEL 1

EMS FUNC - ΔV
EMS MODE - STBY
GTA - off (down)
EMS GTA COVER - Secure
CMC ATT - IMU
FDAI SCALE - 5/5
FDAI SEL - 1/2
FDAI SOURCE - CMC
ATT SET - GDC
MAN ATT ROLL - RATE CMD
MAN ATT PITCH - ACCEL CMD
MAN ATT YAW - RATE CMD
LIM CYCLE - OFF
ATT DBD - MIN
RATE - HIGH
TRANS CONTR PWR - on (up)
RHC PWR NORM (2) - AC/DC
RHC PWR DIR (2) - MNA/MNB
SC CONT - SCS
CMC MODE - FREE
BMAG MODE ROLL - RATE 1
BMAG MODE PITCH - RATE 1
BMAG MODE YAW - RATE 1
SPS THRUST - NORMAL (lock)
ΔV THRUST (2) - OFF (guarded)
SCS TVC PITCH - AUTO
SCS TVC YAW - AUTO
SPS GMBL MOT PITCH (2) - OFF
SPS GMBL MOT YAW (2) - OFF
ΔV CG - LM/CSM
ELS LOGIC - OFF (guarded)
ELS AUTO - AUTO
CM RCS LOGIC - on (up)
CM PRPLNT DUMP - OFF (guarded)
CM PRPLNT PURG - off (down) (guarded)
IMU CAGE - off (down) (guarded)
EMS ROLL - OFF
.05G sw - OFF

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α/Pc IND sw - α
LV/SPS IND SII/SIVB - SII/SIVB
TVC GMBL DR PITCH - AUTO
TVC GMBL DR YAW - AUTO
EVNT TMR RSET - up (center)
EVNT TMR STRT - center
EVNT TMR MIN - center
EVNT TMR SEC - center

PANEL 2

PL VENT vlv - push (lock)
PROBE EXTD/REL - OFF (guarded)
PROBE EXTD/RETR (2) tb - gray
DOCK PROBE RETR PRIM - OFF
DOCK PROBE RETR SEC - OFF
EXT RUN/EVA LT - OFF
EXT RNDZ LT - off (center)
TUNL LT - OFF
LM PWR - OFF
SM RCS He 1 (4) - center (on,up*)
SM RCS He 1 tb(4) - gray
UP TLM CM - BLOCK
UP TLM IU - BLOCK
CM RCS PRESS - off (down) (guarded)
SM RCS IND sw - PRPLNT QTY
SM RCS He 2 (4) - center (on,up*)
SM RCS He 2 (4) tb - gray
SM RCS HTRS (4) - OFF
SM RCS PRPLNT (4) - center (on, up*)
SM RCS PRPLNT tb (8) - gray
RCS CMD - center (OFF*)
RCS TRNFR - center (SM*)
CM RCS PRPLNT (2) - center (on,up*)
CM RCS PRPLNT tb(2) - gray
SM RCS SEC FUEL PRESS (4) - Center (CLOSE*)
EDS AUTO - on (up)
CSM/LM FINAL SEP (2) - off (down) (guarded)
CM/SM SEP (2) - off (down) (guarded)
SIVB/LM SEP - off(down)(guarded)
PRPLNT DUMP - AUTO
2 ENG OUT - AUTO
LV RATES - AUTO

TWR JETT (2) - AUTO (down) (guarded)
LV GUID - IU
LV STAGE - off(down)(guarded)
XLUNAR - INJECT
MN REL - off(down)(guarded)
MSN TMR HR - off (center)
MSN TMR MIN - off (center)
MSN TMR SEC - off (center)
C/W NORM - BOOST
C/W CSM - CSM
C/W PWR - 1
C/W LAMP TEST - off (center)
MSN TMR - START
RCS IND sel - SM D
CAB FAN (2) - OFF
H2 HTRS (2) - AUTO
O2 HTRS (2) - AUTO
O2 PRES IND sw - SURGE TK
H2 FANS (2) - OFF
O2 FANS (2) - OFF
ECS IND sel - PRIM
ECS RAD FLOW AUTO CONT - AUTO
ECS RAD tb - gray
ECS RAD FLOW PWR CONT - off (center)
ECS RAD MAN SEL - RAD 1
ECS RAD PRIM HTR - off (center)
ECS RAD SEC HTR - OFF
POT H2O HTR - OFF
SUIT CKT H2O ACCUM AUTO - 1
SUIT CKT H2O ACCUM - off (center)
SUIT CKT HT EXCH - off (center)
SEC COOL LOOP EVAP - off (center)
SEC COOL LOOP PUMP - off (center)
H2O QTY IND sw - POT
GLY EVAP IN TEMP - MAN
GLY EVAP STM PRESS AUTO - MAN
GLY EVAP STM PRESS INCR - center
GLY EVAP H2O FLOW - off (center)
CAB TEMP - MAN
CAB AUTO TEMP tw - max decr
HI GAIN ANT TRACK - AUTO
HI GAIN ANT BEAM - WIDE
HI GAIN ANT PITCH POS - 0°

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HI GAIN ANT YAW POS - 180°
HI GAIN ANT PWR - OFF
HI GAIN ANT SERVO ELECT - PRIM

PANEL 3

VHF ANT - SM LEFT
SPS ENG INJ VLV ind (4) - CLOSE
FC RAD (3) - center (NORMAL*)
FC RAD (3) tb - N/A
FC HTRS (3) - on (up)
FC IND sel - 2
SPS QTY TEST - off (center)
OXID FLOW VLV INCR - NORM
OXID FLOW VLV PRIM - PRIM
PUG MODE - NORM
FC PURG (3) - OFF
FC REAC (3) - center (on,up*)
FC REAC tb (3) - gray
FC 1 MN BUS A - center (on,up*)
FC 1 MN BUS A tb - gray
FC 2 MN BUS A - center (on,up*)
FC 2 MN BUS A tb - gray
FC 3 MN BUS A - OFF
FC 3 MN BUS A tb - bp
MN BUS A RSET - center (RESET*)
FC 1 MN BUS B - OFF
FC 1 MN BUS B tb - bp
FC 2 MN BUS B - OFF
FC 2 MN BUS B tb - bp
FC 3 MN BUS B - center (on,up*)
FC 3 MN BUS B tb - gray
MN BUS B RSET - center (RESET*)
DC IND sel - MNA
BAT CHARGE - OFF
SPS He vlv (2) - AUTO
SPS He vlv tb (2) - bp
SPS LINE HTRS - off (center)
SPS PRESS IND sw - He
S BD XPNDR - PRIM
S BD PWR AMPL PRIM - PRIM
S BD PWR AMPL HI - HIGH
PWR AMPL tb - gray

S BD MODE VOICE - VOICE
S BD MODE PCM - PCM
S BD MODE RNG - RNG
S BD AUX TAPE - off (center)
S BD AUX TV - off (center)
UP TLM DATA - DATA
UP TLM CMD - NORM
S BD ANT OMNI - B
S BD ANT - OMNI
VHF AM A - (center)
VHF AM B - DUPLEX
VHF AM RCV - off (center)
VHF AM SQLCH tw (2) - noise threshold + 1 div
VHF BCN - OFF
VHF RNG - OFF
S BD SQUELCH - ENABLE
FC REACS v1v - LATCH
H2 PURG LINE HTR - OFF
TAPE RCDR PCM - PCM/ANLG
TAPE RCDR RCD - RCD
TAPE RCDR FWD - FWD
TAPE MOTION tb - gray
SCE PWR - NORM
PMP PWR - NORM
PCM BIT RATE - HI
AC INV 1 - MNA
AC INV 2 - MNB
AC INV 3 - OFF
INV 1 AC 1 - on (up)
INV 2 AC 1 - OFF
INV 3 AC 1 - OFF
AC 1 RSET - center (RSET*)
INV 1 AC 2 - OFF
INV 2 AC 2 - on (up)
INV 3 AC 2 - OFF
AC BUS 2 RSET - center (RSET*)
AC IND sel - BUS 2ØC

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PANEL 4

SPS GAUGING - AC1
TELCOM GRP 1 - AC1
TELCOM GRP 2 - AC2
GLY PUMPS - 1 - AC1

SUIT COMPR 1 - AC1
SUIT COMPR 2 - OFF
CB Panel 4 - all closed

PANEL 5

FC1 PUMPS - AC1
FC2 PUMPS - AC2
FC3 PUMPS - AC2
G/N PWR - AC1
MN BUS TIE BAT A/C - on (up)
MN BUS TIE BAT B/C - on (up)
BAT CHGR - AC1
NONESS BUS - OFF
INT INTGL LT - as desired
INT FLOOD LT - OFF, full dim or full bright
INT FLOOD LT DIM - 1
INT FLOOD LT FIXED - OFF
cb Panel 5 all closed except:
  cb INST NONESS - open
  cb INST SCI EQUIP SEB 1 - open
  cb INST SCI EQUIP SEB 2 - open
  cb INST SCI EQUIP HATCH - open
  cb WASTE H2O/UR DUMP HTRS (2)-open

PANEL 6

MODE - INTERCOM/PTT
PWR - AUDIO/TONE
INTERCOM - T/R
PAD COMM - OFF
S BD - T/R
VHF AM - T/R
AUDIO CONT - NORM
SUIT PWR - on (up)
tw settings - as desired

PANEL 7

EDS PWR - on (up)
SCS TVC SERVO PWR #1 - AC1/MNA
SCS TVC SERVO PWR #2 - AC2/MNB
FDAI/GPI PWR - BOTH
LOGIC 2/3 PWR - on (up)

SCS ELEC PWR - GDC/ECA
SCS SIG CONDR/DR BIAS 1 - AC1
SCS SIG CONDR/DR BIAS 2 - AC2
BMAG PWR (2) - ON
DIRECT O2 vlv - open (CCW) (>2 in H20 on SUIT/CAB ΔP ind)

PANEL 8

cb Panel 8 - all closed except:
  cb CM RCS HTRS (2) - open
  cb FLOAT BAG (3) - open
AUTO RCS SEL A/C ROLL A1 - OFF
AUTO RCS SEL A/C ROLL C1 - OFF
AUTO RCS SEL A/C ROLL A2 - OFF
AUTO RCS SEL A/C ROLL C2 - OFF
AUTO RCS SEL B/D ROLL B1 - MNA
AUTO RCS SEL B/D ROLL D1 - MNB
AUTO RCS SEL B/D ROLL B2 - MNA
AUTO RCS SEL B/D ROLL D2 - MNB
AUTO RCS SEL PITCH A3 - MNB
AUTO RCS SEL PITCH C3 - MNA
AUTO RCS SEL PITCH A4 - MNA
AUTO RCS SEL PITCH C4 - MNB
AUTO RCS SEL YAW B3 - MNA
AUTO RCS SEL YAW D3 - MNB
AUTO RCS SEL YAW B4 - MNB
AUTO RCS SEL YAW D4 - MNA
INT NUM LT - as desired
INT INTGL LT - as desired
INT FLOOD LT - OFF, full dim, or full brt
FLOOD LTS DIM - 1
FLOOD LTS FIXED - OFF
FLOAT BAG (3) - VENT (locked)
SECS LOGIC (2) - on (up) (locked)
SECS PYRO ARM (2) - on (up) (locked)

PANEL 9

MODE - INTERCOM/PTT
PWR - AUDIO/TONE
INTERCOM - T/R
PAD COMM - OFF
S BD - T/R
VHF AM - T/R

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AUDIO CONT - NORM
SUIT PWR - on (up)
VHF RNG - NORM
tw settings - as desired

PANEL 10

MODE - INTERCOM/PTT
PWR - AUDIO/TONE
PAD COMM - OFF
INTERCOM - T/R
S BD - T/R
VHF AM - T/R
AUDIO CONT - NORM
SUIT PWR - on (up)
tw settings - as desired

PANEL 12

LM TUNL VENT vlv - LM/CM ΔP

PANEL 13

FDAI sw (2) - INRTL
EARTH/LUNAR - PWR OFF
ALT SET - 100
LTG - OFF
MODE - HOLD/FAST
SLEW - off (center)

PANEL 15

COAS PWR - OFF
UTIL PWR - OFF
PL BCN LT - off (center)
PL DYE MARKER - off (down)(guarded)
PL VENT - OFF

PANEL 16

DOCK TRGT - OFF
UTIL PWR - OFF
COAS PWR - OFF

PANEL 100

UTIL PWR - OFF
FLOOD LTS DIM - 1
FLOOD LTS FIXED - OFF
OPT PWR - OFF
IMU PWR - on (up) (guarded)
RNDZ XPNDR - OFF
NUMERICS LT - as desired
FLOOD LTS - off, full dim, or full bright
INTGL LT - as desired

PANEL 101

SYS TEST (LH) - 4
SYS TEST (RH) - B
CM RCS HTRS - OFF
UR DUMP - HTR A
WASTE H2O DUMP - HTR A
RNDZ XPNDR - OPR

PANEL 122

OPT ZERO - ZERO
OPT TELTRUN - SLAVE TO SXT
OPT COUPLING - DIRECT
OPT MODE - MAN
OPT SPEED - LO
COND LAMPS - ON
UP TLM - ACCEPT

PANEL 162

SCI PWR - OFF (verified at panel closeout)

PANEL 163

SCI/UTIL PWR - OFF (verified at panel closeout)

PANEL 225

cb Panel 225 - all closed except:
cb HI GAIN ANT FLT BUS - open
cb HI GAIN ANT GRP 2 - open

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PANEL 226

cb Panel 226 - all closed except:
  cb FC REACS (3)-open
  cb FC RAD (3) - open
  cb COAS/TUNL LTG MNB - open

PANEL 227

SCI PWR - OFF

PANEL 229

cb Panel 229 all closed except:
  cb MAIN REL PYRO (2)- open
  cb 02 VAC ION PUMPS (2) - open

PANEL 250

cb Panel 250 - all closed except:
  cb PYRO A TIE TO BAT BUS A - open
  cb PYRO B TIE TO BAT BUS B - open
  cb BAT C TO BAT BUS A - open
  cb BAT C TO BAT BUS B - open

PANEL 251

WASTE MGMT OVBD DRAIN vlv - OFF

PANEL 252

BAT VENT vlv - CLOSED
WASTE STOWAGE VENT vlv - VENT

PANEL 275

cb Panel 275 - all closed except:
  cb MNA BAT C - open
  cb MNB BAT C - open
  cb FLT/PL BAT BUS A - open
  cb FLT/PL BAT BUS B - open
  cb FLT/PL BAT C - open

PANEL 276

cb Panel 276 - all closed

PANEL 278

cb Panel 278 - all closed except:
  cb UPRT SYS COMPR (2) - open

PANEL 300

LH SUIT FLOW vlv - FULL FLOW

PANEL 301

RH SUIT FLOW vlv - FULL FLOW

PANEL 302

CTR SUIT FLOW vlv - FULL FLOW

PANEL 303

PRIM CAB TEMP vlv - COLD (CW)
SEC CAB TEMP vlv - COOL-MAX (CW)

PANEL 304

DRNK H2O SUPPLY vlv - OFF (CW)

PANEL 305

FOOD PREP COLD H2O vlv - rel
FOOD PREP HOT H2O vlv - rel

PANEL 306

MSN TMR - START
EVNT TMR RSET - UP (center)
EVNT TMR STRT - center
EVNT TMR MIN - center
EVNT TMR SEC - center
MSN TMR HR - center
MSN TMR MIN - center
MSN TMR SEC - center

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PANEL 325

CAB PRESS RELF vlv (RH) - BOOST/ENTRY
CAB PRESS RELF vlv (LH) - BOOST/ENTRY
PRIM GLY TO RAD vlv - BYPASS (pull)

PANEL 326

REPRESS PKG vlv - ON
SM 02 SUPPLY vlv - ON
SURGE TK 02 vlv - ON
GLY RSVR IN vlv - OPEN
GLY RSVR BYPASS vlv - CLOSE
GLY RSVR OUT vlv - OPEN

PANEL 350

CO2 CSTR DIVERT vlv - both (center)

PANEL 351

MAIN REG vlv (2) - open
H2O/GLY TK PRESS REG vlv - BOTH
H2O/GLY TK PRESS RELF vlv - BOTH
EMER CAB PRESS vlv - OFF
CAB REPRESS vlv - OFF (CCW)

PANEL 352

WASTE TK SERVICING vlv - CLOSE
PRESS RELF vlv - 2
POT TK IN vlv - OPEN
WASTE TK IN vlv - AUTO

PANEL 375

SURGE TK PRESS RELF vlv - open (CW)

PANEL 376

PLVC - NORMAL (up)

PANEL 377

GLY TO RAD SEC vlv - BYPASS (CCW)

PANEL 378

PRIM GLY ACCUM vlv - open (CCW)

PANEL 379

PRIM ACCUM FILL vlv - OFF (CW)

PANEL 380

02 DEMAND REG vlv - BOTH
SUIT TEST vlv - OFF
SUIT CKT RET vlv - close (push)

PANEL 382

SUIT HT EXCH PRIM GLY vlv - FLOW (CCW)
SUIT FLOW RELF vlv - OFF
PRIM GLY EVAP IN TEMP vlv - MIN (CCW)
SUIT HT EXCH SEC GLY vlv - FLOW (CCW)
SEC EVAP H2O CONT vlv - AUTO (CW)
PRIM EVAP H2O CONT vlv - AUTO (CW)
H2O ACCUM vlv (2) - RMTE (CCW)

PANEL 600

EMER 02 vlv - close

PANEL 601

REPRESS 02 vlv - close

PANEL 602

REPRESS 02 RELF vlv - OPEN (CW)

FWD HATCH

PRESS EQUAL vlv - CLOSE
ACTR HNDL sel - stow/check locked

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SIDE HATCH

CAB PRESS DUMP vlv - close (CW)
GEAR BOX sel - LATCH
ACTR HANDLE sel - UNLATCH
LOCK PIN REL KNOB - LOCK
LOCK PIN ind - flush
GN2 VLV HANDLE - outboard
BPC JETT KNOB - toward BPC JETT

* - last momentary position before liftoff.

BOOST-INSERTION

BOOST PREPARATION

-20:00 SM RCS PRPLNT (4) - on (up)
SM RCS PRPLNT tb (8) - gray

-15:00 CTE UPDATE VERIFICATION
Change X STABLE MEMBER AZIMUTH, if necessary:

*V78E *
F 06 29 X SM AZ (.01°)
*V21E *
Load new Azimuth_____
*PRO *
*ALIGN GDC *

FDAI-1 total att R=90+AZ, P=90, Y=0
BMAG MODE(3) - RATE 1
FDAI SCALE - 5/5
RATE - HIGH
RHC #1&#2 - ARMED
RHC PWR DIRECT(2)-MNA/MNB
CMC MODE - FREE
TRANS CONTR PWR -on(up) (verify)
ASTRO LAUNCH OPERATIONS VOICE CHECK
VOICE CHECK WITH MCCH
ADJUST MASTER VOL CONTROLS
SPS THRUST - NORMAL (locked)
ΔV THRUST (2) - OFF
α/PC IND sw - α
LV IND/GPI - SII/SIVB
EDS AUTO - on (up)
LV RATES - AUTO
2 ENG OUT - AUTO
CM RCS PROP tb(2)-gray (verify)
RCS CMD - OFF

-10:00 FC REAC vlv - LATCH

-08:30 SEC COOL LOOP PUMP - off (ctr) (verify)

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-06:00	TVC SERVO PWR #1 - AC1/MNA TVC SERVO PWR #2 - AC2/MNB
-04:10	L/V ENGINE lts (5) - on
-04:00	ASTRO LAUNCH OPERATIONS COMM CHECK
-03:00	DSKY - Verify P02 V75 (NO ENTR) TAPE RCD FWD - FWD (tb-gray)
-2:15	PRIM GLY TO RAD - pull (bypass)
-1:15	MN BUS TIE (2)-on (up)
-1:00	PAD COMM (2) - OFF
-00:45	GDC ALIGN pb - PUSH & HOLD R=90+AZ, P=90, Y=0 FDAI 2 Total att - no motion GDC ALIGN pb - release

CSM 1-3 Launch Trajectory Parameters - Saturn V Boost
(April 11 Launch) MPAD

	SATURN V BOOST				
	θ	DET	V_I	$\dot{H}$	H
	90	00:00	1341	0	0.0
	85	00:30	1390	271	0.6
	69	01:00	1834	765	3.0
	51	01:30	2938	1437	8.4
	33	02:00	4916	2131	17.2
a	28	02:15	6298	2504	23.0
	24	02:30	7570	2726	29.4
b	21	02:44	8990	2964	35.8
	21	03:00	9173	2641	43.3
	24	03:30	9734	2141	55.1
	27	04:00	10366	1794	64.8
	24	04:30	11090	1478	72.8
	21	05:00	11912	1192	79.4
	18	05:30	12839	937	84.7
	14	06:00	13879	716	88.7
	11	06:30	15047	533	91.8
	7	07:00	16362	394	94.1
	4	07:30	17851	308	95.8
	4	08:00	19335	267	97.2
	358	08:30	20773	284	98.5
	354	09:00	22026	266	99.9
c	352	09:18	22831	279	100.7
	350	09:30	22949	224	101.2
	346	10:00	23478	129	102.0
	343	10:30	24036	56	102.5
	340	11:00	24621	9	102.6
	337	11:30	25235	-11	102.6
d	337	11:46	25562	0	102.6
	APOLLO 13 MARCH 9, 1970				

[a]Timebase 2 (S-IC Center-engine cutoff + .01 sec)

[b]Timebase 3 (S-IC outboard-engine cutoff + .01 sec)

[c]Timebase 4 (S-II outboard-engine cutoff + .01 sec)

[d]Timebase 5 (S-IVB guidance cutoff signal + .21 sec)

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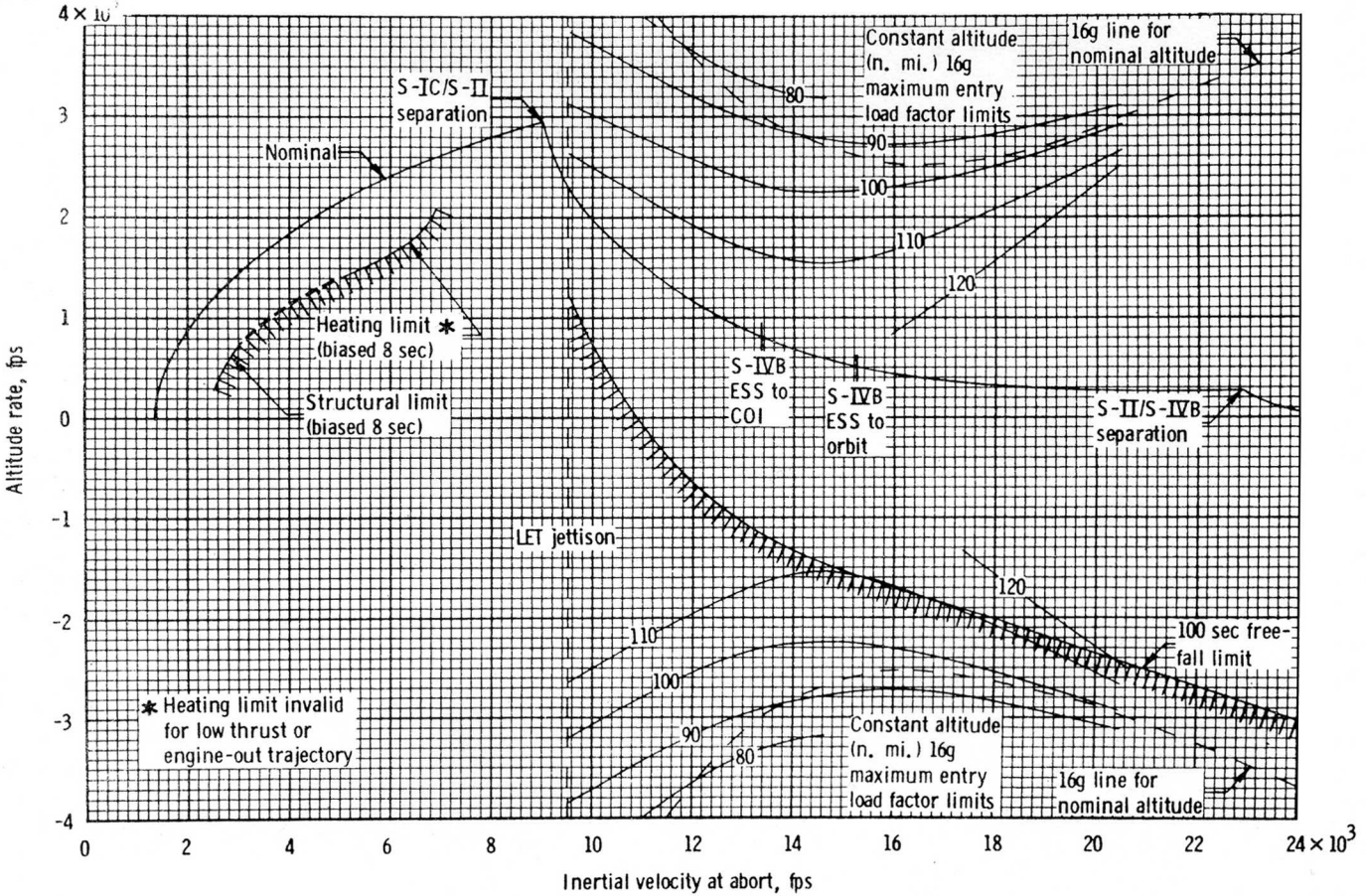

Launch abort and Capability limits.

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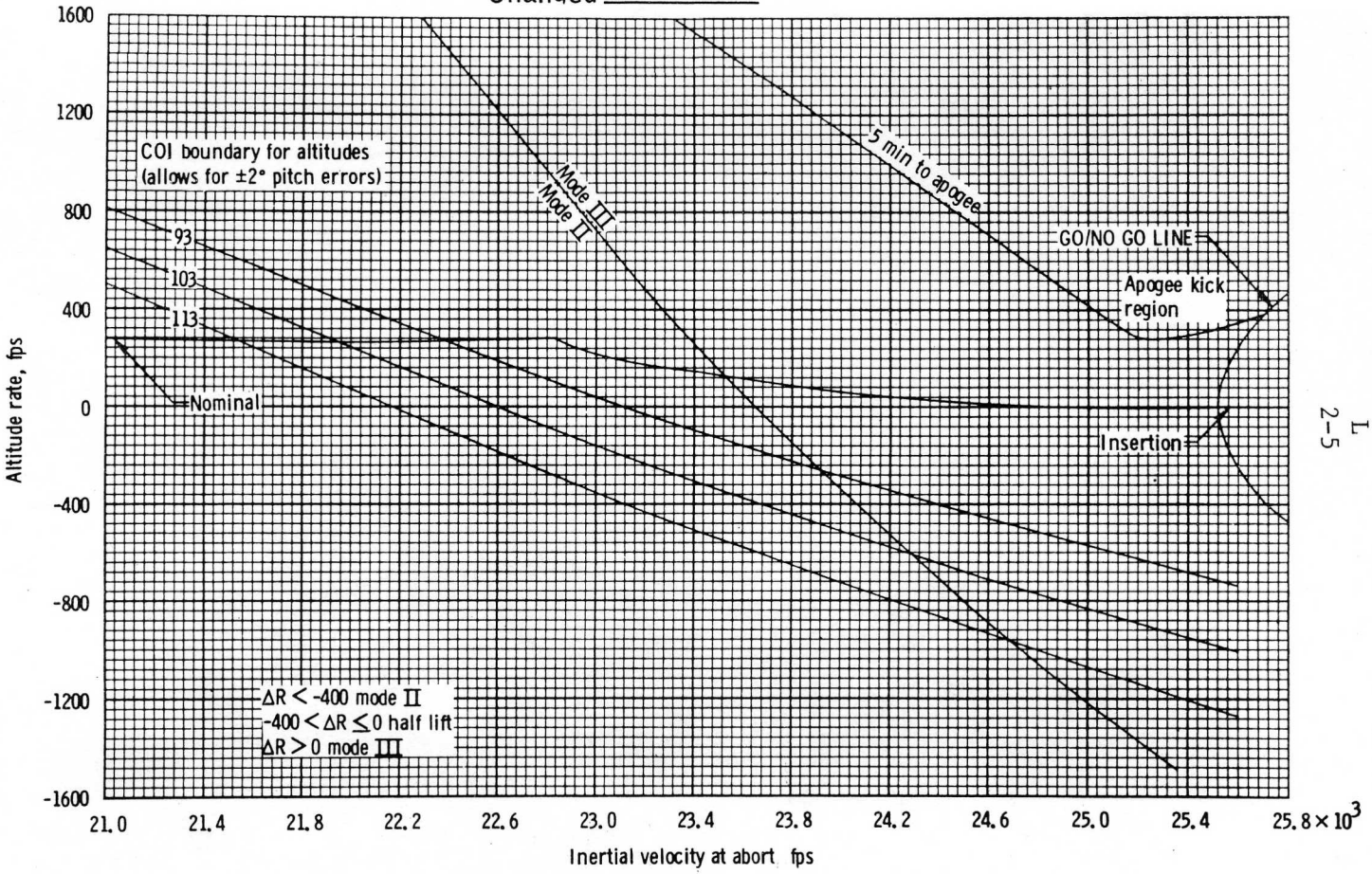

Near-insertion abort capability

2-5

NEAR INSERTION ABORT

CSM 1-4 RECOMMENDED MANUAL S-IVB SHUTDOWN VELOCITIES FOR EARTH ORBIT INSERTION AT NON-NOMINAL ALTITUDES

SHUTDOWN ALTITUDE, h (N. MI.)	INERTIAL VELOCITY, Vi (fps)	ha/hp (N. MI.)
150	25309	150/100
145	25336	145/100
140	25362	140/100
135	25389	135/100
130	25416	130/100
125	25442	125/100
120	25469	120/100
115	25496	115/100
110	25523	110/100
105	25550	105/100
100	25577	100/100
95	25604	100/95
90	25631	100/90
85	25659	100/85
80	25686	100/80
75	25713	100/75

NOTE: $\dot{h}$ = 0 AT SHUTDOWN

ALTITUDE vs Vi

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BOOST

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

*LIFTOFF VERIFIED: *
* If LIFTOFF lt off - 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 & RESET MET

06 62 VI,H DOT, H PAD (fps,fps,.1nm)
If LV GUID & LV RATE lts-on — MODE IA
* LV GUID - CMC *
+00:02 Yaw Mnvr - report
+00:11 Roll & Pitch Program - report
+00:30 Roll complete - report

+00:42 MODE IB - report — 00:42
PRPLNT DUMP - RCS CMD
+00:50 Monitor qα to T +02:00
(100%, 5° Att error)

+4°/sec P,Y
±20°/sec R

CABIN PRESSURE DECREASING ∿14K(2.3 nm)

NO PRESSURE DECREASE ∿25K(4.1 nm)
* CAB PRESS RELIEF vlv(RH)-DUMP *
MODE IB

+01:21 MAX Q
+01:56 MODE IC - report — H=16.5 nm

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+9°/sec P,Y
+20°/sec R

+02:00 EDS AUTO - OFF
2 ENG OUT - OFF
LV RATES - OFF
α/Pc sw - Pc
LV RATE lt disabled as IU failure cue
GO/NO GO FOR STAGING - report

MODE IC

+02:16 INBOARD CUTOFF - (lt 5 on)
LIFTOFF lt - out
+02:41 CMC BOOST Polynomial ends
+02:43 OUTBOARD CUTOFF - report (lts 1,2,3,4 on)
+02:44 SIC/SII STAGING (lts off)
+02:45 SII Ign Command (lts on)
SII SEP lt - on
+02:46 SII 65% - lts out

+03:14 SII SEP lt - out report

+03:19 TWR JETT (2) - on(up) (TFF>1+20)

TWR JETT

*NO TWR JETT, pg L/4-2 *

For MAN BOOSTER CONTROL
* LV GUID - CMC *
* Key V46E *

MAN ATT PITCH - RATE CMD
Twr Jett & MODE II - Report
GLY EVAP STEAM PRESS - AUTO
GLY EVAP H2O FLOW - AUTO

MODE II

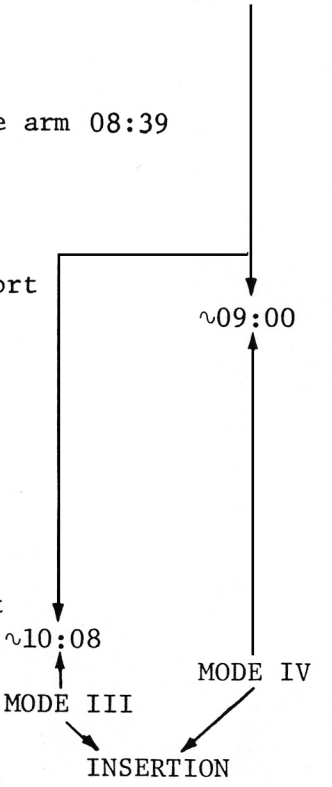
+03:24 Guidance Initiate - report (OECO +41sec
+03:53 Guidance Good
+04:00 Report status
+05:00 Report Status
+05:45 SIVB to COI
+06:00 Report Status
GMBL MOT (4) - START - ON (LMP Confirm)
Check GPI
SII/SIVB/GPI - GPI (Momentarily)
PITCH = -1.52
YAW = +1.32

Basic Date 3/9/70
Changed
CSM 109

+06:15 OMNI ANT - D (AZ < 96°)
- C (AZ > 96°)
+06:35 SIVB to orbit - Level sense arm 08:39
+07:00 Report Status
+07:42 IECO (lt 5 - on)
+08:00 Report Status
+08:01 PU SHIFT
+08:30 GO/NO GO FOR STAGING - report
+09:00 Mode IV - Report
(VI∿22,000, HDOT∿+265,
H∿+100)
Report Status
+09:17 OECO (lts 1,2,3, & 4 - on)
+09:18 SII Staging - lts out
+09:20 SIVB Ign Cmd - lt on
+09:22 SIVB 65% - lt out

+10:00 GO/NO GO FOR ORBIT - report

+11:00 Report Status
+11;45 SECO (lt on) - report
(Begin TB5)



*If LV GUID - CMC *
*LV STAGE sw - SII/SIVB *
*SECO *
*LV ENG 1 lt - on *
*Begin TB5 *

*If no SECO,(VI +100 fps) *
*LV STAGE sw SII/SIVB *
*If still no SECO, THC *
* CCW & neutral in 1 sec *

+11:55 INSERTION - lt out (TB5 + 10 sec)

Record VI_____ (fps)
H DOT_____ (fps)
H PAD_____ (.1nm)

Basic Date 3/9/70
Changed

CSM 109

KEY V82E

Record HA_____ (.1nm)
HP_____ (.1nm)
TFF_____ (min-sec)
PRO

V37E 00E
When CMC ACTY 1t out:
V66E
V45E
Verify DAP load, V48: R1 = 31102, R2 = 01111
V46E CSM WT _____
V83E (check θ) P TRIM _____
PRO Y TRIM _____

BDA LOS
(00:12:46)

Basic Date 3/9/70
Changed _____

INSERTION AND SYSTEMS CHECKS

1 GMBL MTRS (4) - OFF (LMP confirm)
EDS PWR - OFF
TVC SERVO PWR (2) - OFF
MN BUS TIE (2) - OFF(LMP)
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
BMAG MODE (3) - RATE 2
ELS - MAN
CM RCS LOGIC - OFF
CAB PRESS REL vlv (2) - NORMAL/LATCHED
REPRESS PKG vlv - OFF
cb DIRECT ULLAGE (2) - open
cb FLT/PL VENT - open
cb ELS BAT (2) - open
DIRECT O2 vlv - CLOSE
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT(2) - OFF
RHC #1 & #2 - LOCKED
EMS FUNC - OFF
LV STAGE SW - OFF(verify)
INSTALL COAS
MONITOR LV TANK PRESS
*If ΔP >36 psid (OXID > FUEL) *
*If ΔP >26 psid (FUEL > OXID) *
CYI AOS *If LOX TK PRESS >50 psia *
(00:16:34) * EMERGENCY CSM/LV SEP pg EMER/1-1 *

Note: Steps 2 thru 31 are not sequential

2 SM RCS HTRS (4) - PRIM

C/W - NORMAL
BPC JETT KNOB - 180° from BPC JETT
GN2 VLV HNDL - pull
HATCH GEAR BOX - LATCH (verify)
ACTR HNDL SELECTOR - neutral

3 cb WASTE H2O/URINE DUMP HTRS (2) - close
FC REACS vlv - NORM
H2 PURGE LINE HTR - ON

Basic Date 3/9/70
Changed

CSM 109

4 MCCH - G/N Status
Z Torquing angle _____

5 SM RCS MONITORING CHECK

SUNSET
(00:22:59)

SM RCS PRPLNT tb (8) - gray
SM RCS He 1 & 2 tb (8) - gray
RCS IND sel - SM A, B, C, D
PKG TEMP - 115°-175° F (C/W 75°-205°)
He PRESS - record
MANF PRESS - 192-207 psia (C/W 145-215 psia)
He TK TEMP - record
PRPLNT QTY - record

6 CM RCS MONITORING CHECK
CM RCS PRPLNT tb (2) - bp
RCS IND sw - CM 1,2
He TEMP - 60-90°F
He PRESS - 4100-4200 psia
MANIF PRESS - 80-105 psia

7 C/W OPERATIONAL CHECK
C/W LAMP TEST - 1 (LH MA & 15 lts)
C/W LAMP TEST - 2 (RH MA & 20 lts)
C/W CSM - CM (CM RCS lt (2) - on)
C/W CSM - CSM (CM RCS lt (2) - out)

8 CMP to LEB for MN REG CHECK
STRUT UNLOCK LANYARD (2) - STOW
DRINKING WATER SUPPLY vlv - ON
cb COAS/TUNL LTG MNB - close
Unstow:
Helmet bags (R6)
Accessory bags (R6)
Tool E (L2)

9 Confirm normal suit pressure, cabin pressure, & 02 flow
EMERG CABIN PRESS vlv - BOTH
SUIT CKT RET vlv - open (pull)
Remove helmet & gloves & stow in PGA bag
Stow water wings
Unstow & mount TSB's (A1)

Basic Date 3/9/70
Changed _____

CSM 109

10 MAIN REG CHECK
MAIN REG B vlv - close
EMER CABIN PRESS sel - 1
PUSH TO TEST PB - PUSH (02 FLOW INC)
MAIN REG B vlv - open
MAIN REG A vlv - close
EMER CABIN PRESS sel - 2
PUSH TO TEST PB - PUSH (02 FLOW INC)
MAIN REG A vlv - open
EMER CABIN PRESS sel - BOTH

11 SEC RAD LEAK CHECK
Monitor SEC ACCUM QUANTITY
SEC GLY To RAD vlv - NORM for 30 sec, then BYPASS

+20:00 12 ECS Post Insertion Config
GLY RSVR BYPASS vlv - OPEN
GLY RSVR OUT vlv - CLOSE
GLY RSVR IN vlv - CLOSE
PRIM GLY ACCUM QTY 25-50%
PRIM ACCUM FILL vlv - ON until 50-55%
ECS RAD FLOW CONT - PWR
PRIM GLY TO RAD vlv - NORMAL (push)
ECS RAD HTR - PRIM 1 (LMP)
ECS RAD TEMP PRIM OUT below PRIM IN
If outlet temp after 5 min
* above INLET TEMP *
*PRIM GLY TO RAD vlv - *
* BYPASS (pull) *
*Recheck in 10 min *
ECS RAD tb - gray
GLY EVAP TEMP IN - AUTO

13 POT H2O HTR - MNA

CYI LOS (00:23:40)
- PCM BIT RATE - LOW
- UP TLM - CMD RSET, then NORM
- VHF AM A - SIMPLEX
- VHF AM B - off (ctr)

Basic Date 3/9/70
Changed

CSM 109

14 FC PURGE CHECK

H2/02 PURGE (6) - on, then OFF (sequentially)
Observe Flow rate inc
Reset MA (as req'd)
H2 PURGE LINE HTR - OFF

15 EPS MONITORING CHECK

Cryogenic Pressure - Quantity Check
H2 PRESS (2) - 225-260 psia
02 PRESS (2) - 865-935 psia
SURGE TK PRESS - 865-935 psia
H2 QTY (2) - record
02 QTY (2) - record
CRYO FANS - OFF; ON as req'd

FC Power Plant Check
FC HTRS(3) -on(up)
FC REACT tb (3) - gray
FC IND sel - 1, 2, 3
H2 FLOW - 0.03-0.15 lb/hr
02 FLOW - 0.25-1.2 lb/hr
MOD SKIN TEMP - 390-450° F
MOD COND EXH TEMP - 150-175° F
FC pH HI tb - gray
FC RAD TEMP LO tb - gray
FC REACS & RAD cb (6) - out, all others in(verify)

D-C Voltage-Amperage Check
MN BUS TIE (2) - OFF (verify)
FC MNA tb - 1 & 2 gray, 3 bp
FC MNB tb - 1 & 2 bp, 3 gray
FC 1, 2, & 3 (RECORD AMPS)
MAIN BUS A, B, (26.5-31 vdc - Record)
BAT BUS A, B, & BAT C (31.5-38 vdc < 3 amp)
PYRO BAT A, B (36.5 - 37.5 vdc)
DC IND sel - MNB
SYS TEST 4B (BAT RLY BUS - 3.4-4.1 vdc)

A-C VOLTS - 113 to 117 all phases

Basic Date 3/9/70
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CSM 109

16 ECS MONITORING CHECK

SUIT COMP ΔP - .3-.4 psid
02 FLOW - 0.2-0.45 lb/hr (after changeover)
02 SURGE TANK PRESS - 865-935 psia
REPRESS 02 >865 psia
PRIM RAD tb - gray
*If PRIM RAD tb - 2 *
* ECS RAD FLOW AUTO CONT - 1 until*
* tb gray, then AUTO *
ECS RAD TEMP PRIM IN - 67-97° F
ECS RAD TEMP PRIM OUT - -20° to +63° F
PRIM GLY EVAP TEMP OUT - 38-50.5° F

PRIM GLY DISCH PRESS - 40-52 psig
SUIT TEMP - 45-55° F
SUIT PRESS/CABIN PRESS - 4.7-5.3 psia
PART PRESS CO2 < 7.6 mm Hg
POT H20 QTY - 10-100%
WASTE H20 QTY - 25-85%

17 SPS MONITORING CHECK

SPS PRPLNT TK TEMP ind - +45 to +75° F
*IF<45°F, SPS LINE HTRS - A *
IF>75°F, SPS LINE HTRS - off (ctr)
SPS PRESS IND sw - He, N2A, & N2B
SPS PRPLNT TK PRESS ind
He 3900 psia max
N2A 2900 psia max
N2B 2900 psia max
SPS PRESS IND sw - He
FUEL & OXID PRESS ind - 170 to 195 psia
SPS ENG INJ VLVS (4) - CLOSE
SPS OXID, FUEL & UNBAL QTY - record
OXID FLOW VLV PRIM - PRIM
SPS He VLV (1&2) - AUTO, tb - bp

18 GDC ALIGN

19 UNSTOW SEQ CAMERA BRACKET & ORDEAL

20 MOUNT ORDEAL BOX & INITIALIZE

21 SECONDARY GLYCOL LOOP CHECK

ECS IND sw - SEC
SEC COOL LOOP PUMP - AC1
GLY DISCH SEC PRESS - 39-51 psig
ACCUM SEC QTY IND - 30-55%
SEC COOL LOOP - EVAP

After 5 min:
SEC EVAP TEMP OUT - 38-50.5°F
SEC COOL LOOP EVAP - RSET 1 min, off (ctr)
SEC COOL LOOP PUMP - off (ctr)
ECS IND sw - PRIM

22 UNSTOW CAMERAS

DAC (f8,250,7) 12 fps,MAG A (B3)
Power cable (B3)
18mm lens (B3)
Rt. angle mirror (B3)
(Assemble & mount in L.H. rendezvous window)

EL (f8,250,30) (B3)
(Stow in LMP TSB)

23 UNSTOW TV CAMERA

TV (ALC - PEAK, f44) (A7)
Power cable (A6)
Bracket (A6)
Monitor & cable (A6)
(Assemble, connect cables & hand to LMP)

24 OPTICS DUST COVER JETT

Install Optics eyepieces
OPT ZERO - OFF
G/N PWR OPTICS - on (up)
OPT MODE - MAN
OPT COUPLING CONT - DIRECT
OPT SPEED CONT - HI
OHC - MAX RIGHT (Obs eject thru eyepiece)
(SXT 40°, SCT 80° shaft ang)

Basic Date 3/9/70
Changed

CSM 109

25 IMU REFSMMAT Realign Check (P52),
P52 - (PAD REFSMMAT)

N71: __ __, __ __

N05: __ __ __ . __ __

N93:
X __ __ . __ __ __

Y __ __ . __ __ __

Z __ __ . __ __ __

GET: __ __:__ __:__ __

If IMU is realigned,
Realign GDC (CDR)
OOE
RETICLE BRIGHTNESS - DIM
Stow Optics Eyepieces
Increase S BD volume

CRO AOS
(00:52:17)
SUNRISE
(01:00:07)

CRO LOS
(00:58:07)

HSK AOS(s) 26 Two way S BD VOICE Check
(00:59:35) Report GYRO torquing angles

HSK LOS
(01:05:37)

US AOS 27 SCS ATT Ref Comp Check
(01:28:19)
V16 N20E
FDAI SELECT - 1
FDAI SOURCE - ATT SET
ATT SET - GDC
ATT SET dials - null FDAI 1 err needles
Key VERB when nulled (freeze display)
Record from DSKY:
R_____, P_____, Y_____
Record from ATT SET dials:
R_____, P_____, Y_____
FDAI SEL - 1/2

Basic Date 3/9/70
Changed

CSM 109

28 EXTEND DOCKING PROBE

cb DOCK PROBE (2) - close (verify)
DOCK PROBE EXTD/REL - EXTD/REL until full probe extension
(DOCK PROBE tb - grey at full extension)

	EXT	RET
FULL EXT	Grey	Grey
FULL RET	BP	BP
PART EXT	BP	Grey

DOCK PROBE EXTD/REL - RETRACT (tb-gray)

29 COPY TLI, TLI ABORT, & P37 PADS

30 SV UPDATES (MCCH)

31 cb SECS ARM (2) - close
SECS LOGIC (2) - on (up)
MSFN confirm GO for PYRO ARM

US LOS
(01:45:40)

CYI AOS
(01:50:07)

Basic Date 3/9/70
Changed

CSM 109

TLI

X						X						TB6p	
X	X	X				X	X	X				R	
X	X	X				X	X	X				P	TLI
X	X	X				X	X	X				Y	
X	X	X				X	X	X				BT	
												ΔVC'	
+						+						VI	
X	X	X				X	X	X				R	
X	X	X				X	X	X				P	SEP
X	X	X				X	X	X				Y	
X	X	X				X	X	X				R	
X	X	X				X	X	X				P	EXTRACTION
X	X	X				X	X	X				Y	

Basic Date 3/9/70
Changed _____

CSM 109

L
2-20

P27 UPDATE

PURP	V			V			V		
GET	: :			: :			: :		
304 01	INDEX			INDEX			INDEX		
02									
03									
04									
05									
06									
07									
10									
11									
12									
13									
14									
15									
16									
17									
20									
21									
22									
23									
24									

N34	HRS	X	X	X				X	X	X			
	MIN	X	X	X	X			X	X	X	X		
NAV CHECK	SEC	X	X					X	X				
N43	LAT		0						0				
	LONG												
	ALT	+	0					+	0				

Basic Date 3/9/70
Changed

CSM 109

L/2-21

P30 MANEUVER

SET STARS

R_{ALIGN} ___ ___ ___

P_{ALIGN} ___ ___ ___

Y_{ALIGN} ___ ___ ___

ULLAGE ___

___

___

___

HORIZON/WINDOW ___

___

___

___

P37 FOR L/0+8

Basic Date 3/9/70

Changed ___

CSM 109

							PURPOSE
							PROP/GUID
+							WT N47
	0	0		•			P_{TRIM} N48
	0	0		•			Y_{TRIM}
+	0	0					HRS GETI
+	0	0	0				MIN N33
+	0			•			SEC
						•	ΔV_X N81
						•	ΔV_Y
						•	ΔV_Z
X	X	X					R
X	X	X					P
X	X	X					Y
+						•	H_A N44
						•	H_P
+						•	ΔVT
X	X	X		•			BT
X						•	ΔVC
X	X	X	X				SXTS
+				•		0	SFT
+			•		0	0	TRN
X	X	X					BSS
X	X					•	SPA
X	X	X				•	SXP
	0			•			LAT N61
				•			LONG
+						•	RTGO EMS
+							VIO
		•		•			GET 0.05G

		•			GETI
X					ΔVT
X					LONG
		•			GET_{400K}

P30 MANEUVER

L/2-22

SET STARS

R_{ALIGN} ___ ___ ___

P_{ALIGN} ___ ___ ___

Y_{ALIGN} ___ ___ ___

ULLAGE ___

HORIZON/WINDOW ___

P37 FOR L/0+8

								PURPOSE
								PROP/GUID
			+					WT N47
				0	0			P_{TRIM} N48
				0	0			Y_{TRIM}
			+	0	0			HRS GETI
			+	0	0	0		MIN N33
			+	0				SEC
								ΔV_X N81
								ΔV_Y
								ΔV_Z
			X	X	X			R
			X	X	X			P
			X	X	X			Y
			+					H_A N44
								H_P
			+					ΔVT
			X	X	X			BT
			X					ΔVC
			X	X	X	X		SXTS
			+				0	SFT
			+				0	0	TRN
			X	X	X			BSS
			X	X				SPA
			X	X	X			SXP
				0				LAT N61
								LONG
			+					RTGO EMS
			+					VIO
								GET 0.05G

				GETI
X				ΔVT
X				LONG
				GET_{400K}

Basic Date 3/9/70
Changed ___

CSM 109

TLI PREPARATION

(01:50:00) XLUNAR - INJECT (verify)
EDS PWR - on (up)
SUNSET Perform EMS ΔV TEST & NULL
(01:51:06) BIAS CHECK, pg G/2-5
Set ΔVC
EMS FUNC - ΔV
GDC ALIGN
V48E, 31102, 01111
CYI LOS Key V83E
(01:55:25) Set ORDEAL - 100/EARTH
SECS PYRO ARM (2) - on (up)
TRANS CONTROL PWR - ON
ROT CONTR PWR NORMAL (2)-AC/DC (verify)
ROT CONTR PWR DIRECT (2)-MNA/MNB
LV IND/GPI - SII/SIVB (verify)
cb DIRECT ULLAGE (2) - closed
Cycle CRYO FANS
Set DET - 51:00

*If P17,P20,P22,P23,P3X,P4X,P6X or P7X is inadvertently *
* called prior to TB6, do not attempt CMC TB6 LOAD *
* MANUAL TB6 must be used, pg L/2-31 *

CMC TB6 LOAD

V96E
V25 N33E
Load GET of TB6
V25 N26E
26000E
01513E
10067E
V30E
06 34 Time from TB6

If V37E XXE or RESTART occurs, key V21 N1E,
* 3573EE & repeat CMC TB6 LOAD *

For MANUAL TLI, go to pg L/2-29

Basic Date 3/9/70
Changed

CSM 109

NOMINAL TLI

LV GUID - IU (verify)

TB 6 - SII SEP lt on (TIG-9 min, 38 sec)
SII SEP lt out (38 sec later)

51:00 Start DET counting up
SC CONT - SCS (verify)
MONITOR LV TANK PRESS
*If ΔP > 36 psid (OXID > FUEL) *
CRO AOS *If ΔP > 26 psid (FUEL > OXID) *
(02:25:25) *If LOX TK PRESS >50 psia *
* EMERGENCY CSM/LV SEP pg EMER/1-1 *

SUNRISE
(02:28:24) UP TLM CM - BLOCK (verify)
UP TLM IU - BLOCK (verify)
CRO LOS RHC #2 - ARMED
(02:31:41)

ORDEAL - 300/LUNAR
ORDEAL FDAI #1 - ORB RATE
FDAI #2 - INERTIAL
57:00 Slew FDAI to PITCH = 18°
ORDEAL MODE - HOLD/FAST

V37E 47E (bias limit = 9.8 fps/min)

F 16 83 ΔVX,Y,Z (.1fps)

58:00 N62E
F 16 62 VI,HDOT,HPAD (fps,fps,.1nm)
SCS TVC SERVO PWR #1 - AC1/MNA
SCS TVC SERVO PWR #2 - OFF (verify)
TAPE RCDR - HBR/RCD/FWD/CMD RESET
58:20 EMS MODE - NORMAL
58:36 SII SEP lt - on

*TLI Inhibit will not be honored *
* after 59:42, except LV STAGE sw *
* (Permanent Inhibit) *

Basic Date 3/9/70
Changed

CSM 109

58:38	SIVB ULLAGE Begins
59:00	Insure FDAI #1 PITCH = 10°
59:42	SII SEP lt - out (TIG - 18 sec)
59:52	SIVB FUEL LEAD
59:55	SIVB ULLAGE discontinues Insure FDAI #1 PITCH = 6°
59:59	LV ENG 1 lt - on ORDEAL MODE - OPERATE/SLOW
00:00	SIVB IGNITION (__:__:__GETI)
00:02	LV ENG 1 lt - out MONITOR THRUST & ATTITUDE MONITOR LV TANK PRESS
05:55	SIVB ECO (1t on) (BEGIN TB7)

±45°/P,Y
±10°/sec P,Y
±20°/sec R

*EMER SIVB CUTOFF *
If no ECO at +6 sec and VI attained
* LV STAGE sw - SII/SIVB *
*If still no ECO, *
* THC CCW & NEUTRAL in 1 sec *
*If LV GUID - CMC, *
* LV STAGE sw-SII/SIVB on VI *

KEY VERB (freeze display)

06:05	LV ENG 1 lt - out (TB 7 + 10 sec)
08:26	SIVB MNVR TO ORB RT (HDS DN) (.3°/sec) VI _____ & ΔVC _____ report HDOT_____ HPAD_____
	KEY RLSE
F 16 62	
	KEY RLSE
F 16 83	ΔVX,Y,Z (.1fps) SCS TVC SERVO PWR #1 - OFF PCM BIT RATE - LOW EMS MODE - STBY EMS FUNC - OFF SECS PYRO ARM (2) - SAFE FDAI #1 - INRTL RHC #2 - LOCKED
	PRO
F 37	
	00E

Basic Date 3/9/70
Changed

CSM 109

MSFN AOS
(02:44:40)

When CMC ACTY lt out,
  Key V66E
CMP to LH couch
CDR to CTR couch
WASTE STOWAGE VENT vlv - CLOSED
HI GAIN ANT PWR - OFF (Verify)
cb HI GAIN ANT FLT BUS - close
cb HI GAIN ANT GRP 2 - close
T, D, & E, pg L/3-1

Basic Date 3/9/70
Changed _____

SIVB TLI - NOMINAL APR 11, 1970 AZ 72° FIRST OPPORTUNITY						SIVB TLI - MANUAL APR 11, 1970 AZ 72° FIRST OPPORTUNITY					
θ	ψ	DET	V_I	$\dot{H}$	H	θ	ψ	DET	V_I	$\dot{H}$	H
108	0.0	00:00	25566	19	106	102	4.0	00:00	25566	.19	106
102	0.5	00:30	26100	15	106	101	4.0	00:30	26100	15	106
100	1.2	01:00	26684	40	106	100	4.0	01:00	26684	40	106
99	1.7	01:30	27295	117	106	98	4.0	01:30	27295	117	106
98	2.2	02:00	27996	251	107	97	4.0	02:00	27996	251	107
97	2.6	02:30	28781	459	108	96	4.0	02:30	28781	459	108
96	3.0	03:00	29606	750	111	95	4.0	03:00	29606	750	111
95	3.4	03:30	30475	1134	116	94	4.0	03:30	30475	1134	116
94	3.8	04:00	31395	1617	122	93	4.0	04:00	31395	1617	122
92	4.2	04:30	32371	2207	132	92	4.0	04:30	32371	2207	132
90	4.6	05:00	33412	2907	144	91	4.0	05:00	33412	2907	144
86	5.0	05:30	34529	3716	160	90	4.0	05:30	34529	3716	160
86	5.0	05:55	35553	4470	177	88	4.0	05:55	35553	4470	177

TLI TRAJECTORY OPP 1
NOM & MAN

SIVB TLI - NOMINAL						SIVB TLI - MANUAL					
APR 11, 1970 AZ 72° SECOND OPPORTUNITY						APR 11, 1970 AZ 72° SECOND OPPORTUNITY					
θ	ψ	DET	V_I	$\dot{H}$	H	θ	ψ	DET	V_I	$\dot{H}$	H
107	0.0	00:00	25559	19	108	107	0.5	00:00	25559	19	108
101	1.0	00:30	26175	9	108	99	0.5	00:30	26175	9	108
99	1.0	01:00	26870	34	108	98	0.5	01:00	26870	34	108
98	1.0	01:30	27600	120	108	97	0.5	01:30	27600	120	108
97	1.0	02:00	28369	277	109	96	0.5	02:00	28369	277	109
96	1.0	02:30	29179	512	110	95	0.5	02:30	29179	512	110
95	0.5	03:00	30031	834	114	94	0.5	03:00	30031	834	114
94	0.5	03:30	30932	1251	119	93	0.5	03:30	30932	1251	119
92	0.0	04:00	31823	1772	125	92	0.5	04:00	31823	1772	125
91	0.0	04:30	32907	2402	136	91	0.5	04:30	32907	2402	136
88	0.0	05:00	33998	3147	150	89	0.5	05:00	33998	3147	150
85	0.0	05:30	35177	3986	167	88	0.5	05:30	35177	3986	167
85	0.0	05:39	35587	4292	174	88	0.5	05:39	35587	4292	174

CSM 109

Basic Date 3/9/70
Changed _____

TLI BACKUP GUIDANCE PROCEDURES

LV GUID - CMC
SC CONT - SCS (verify)
MONITOR LV TANK PRESS
*If ΔP > 36 psid (OXID > FUEL) *
*If ΔP > 26 psid (FUEL > OXID) *
*If LOX TK PRESS >50 psia *
* EMERGENCY CSM/LV SEP pg EMER/1-1 *
ORDEAL - 300/LUNAR
V16 N20E
Mnvr SIVB to MANUAL TLI Att: R2 = 107.9°
Null SIVB rates
ORDEAL FDAI #1 = ORB RATE
ORDEAL MODE - HOLD/FAST
Slew FDAI #1 TO PITCH = 0°
KEY REL

06 34 Time from TB6

R2_____
ORDEAL Start
Time (__:__)
YAW _____

TB6	UPLK ACTY lt - on
	S-II SEP lt - on
TB6+10sec	UPLK ACTY lt - out
	F37 00E
51:00	S-II SEP lt - out
	Start DET
57:00	V37E 47E (bias limit: 9.8 fps/min)
F 16 83	ΔVX,Y,Z (.1fps)
	N20E
	Hold MANUAL TLI Att
	Insure FDAI #1 PITCH = 0°
57:20	ORDEAL MODE - OPERATE/SLOW
	Fly FDAI #1 PITCH = 0°
	SCS TVC SERVO PWR #1 - AC1/MNA
	SCS TVC SERVO PWR #2 - OFF (verify)
	TAPE RECR - HBR/RCD/FWD/CMD RESET
58:20	EMS MODE - NORMAL
58:36	SII SEP lt - on

*TLI Inhibit will not be honored *
* after 59:42, except LV STAGE sw *
* (Permanent Inhibit) *

Basic Date 3/9/70
Changed

CSM 109

58:38 SIVB ULLAGE Begins
59:42 S-II SEP lt - out (TIG - 18 sec)
59:52 SIVB FUEL LEAD
59:55 SIVB ULLAGE discontinues
59:59 LV ENG 1 lt - on
00:00 SIVB IGNITION (___:___:___) GETI
00:02 LV ENG 1 lt - out
FLY P = 0°, Y = +4°
MONITOR THRUST & ATTITUDE
MONITOR LV TANK PRESS

±45°/P,Y
±10°/sec P,Y
±20°sec R

N62E
F 16 62 VI,HDOT,HPAD (fps,fps,.1nm)
05:55 (1st) CUTOFF ON PAD VI (lead by 100 fps)
05:39 (2nd) LV STAGE sw -SII/SIVB
*If still no ECO *
* THC -CCW & NEUTRAL in 1 sec*
Key VERB (freeze display)
VI _____ & ΔVC _____ report
HDOT _____
HPAD _____
KEY RLSE
F 16 62
KEY RLSE
F 16 83 ΔVX,Y,Z (.1fps)
SCS TVC SERVO PWR #1 - OFF
PCM BIT RATE - LOW
EMS MODE - STBY
EMS FUNC - OFF
SECS PYRO ARM (2) - SAFE
FDAI #1 - INRTL
PRO
F 37
00E

When CMC ACTY lt out,
Key V66E
CMP to LH couch
CDR to CTR couch
WASTE STOWAGE VENT vlv - CLOSED
HI GAIN ANT PWR - OFF (verify)
cb HI GAIN ANT FLT BUS - close
cb HI GAIN ANT GRP 2 - close
T, D, & E, pg L/3-1

Basic Date 3/9/70
Changed

CSM 109

```
                    *MANUAL TB6          *
                    *  V25 N7E           *
                    *  12E               *
                    *  10000E            *
                    *  1                 *
(__:__:__)(TB6)     *  ENTR to start TB6 *
                    *  After S-II SEP    *
                    *        1t - on     *
                    *  V37E 00E          *
```

SATURN RATE CHANGE

V24 N1 E
3322E, XXXE, YYYYYE

SIVB RATE		SAT RATE +1 address 3322	SAT RATE +2 address 3323
		XXX	YYYYY
.05°/sec	RPY	161	77616
.1	RPY	210	77567
.2	RPY	266	77511
*.3	RPY	344	77433
.3P,Y .5	R	476	77301

*USE FOR TLI

Basic Date 3/9/70
Changed

NORMAL SC/BOOSTER SEPARATIONS

1 PRE CSM SEPARATION

DIRECT O2 vlv - OPEN until
  CAB PRESS = 5.7, then close
cb DOCK PROBE (2) - close (verify)
COAS PWR - on
ALIGN GDC SIVB MNVR (__:__:__)
  *If LV GUID - CMC * SEP (__:__:__)
  * mnvr to SEP ATT *
  * Do not reload DAP*
Load RCS DAP
  R1=11103, R2=01111
V46E OMNI ANT-B
Load N17 (SEP) & N22 (EXTRACTION)
V63E (Monitor SIVB Mnvr) (TB7 + 15 min)
  *If error needles not nulled: *
  * V60E (SIVB ±1.8°db)*
  * V16 N20E *
  * R22 = 300° - R20 *
  * P22 = P20° + 180° *
  * Y22 = 360° - Y20 *
  * R P Y *
  *N20 _____ _____ _____ *
  * *
  *N22 _____ _____ _____ *
  * *
  *Load new Docking Attitude *

2 CSM SEPARATION PREP

DOCK PROBE EXTD/REL - RETRACT (verify)
SM RCS PRPLNT tb (8) - gray (verify)
AUTO RCS SELECT (16) - MNA/MNB
Perform EMS NULL BIAS CHECK, pg G/2-5
Set ΔVC to -100.0
EMS FUNC - ΔV
FDAI SCALE - 5/1
MAN ATT (3) - RATE CMD
LIMIT CYCLE - OFF (verify)
ATT DB - MIN
RATE - LOW

TRANS CONT PWR - on (up) (verify)
ROT CONT PWR NORMAL (2) - AC/DC (verify)
ROT CONT PWR DIRECT (2) - MNA/MNB (verify)
ATT SET tw - R=0°, P=180°, Y=0°

Set up TV
Mount TV in R.H. rendezvous window
S BD AUX TV - TV (90 sec delay)
TV monitor power sw - ON
Adjust monitor for proper picture
Adjust lens aperture(f22), zoom and focus controls
S BD AUX TV - off (center)

CMC MODE - FREE (verify)
SC CONT - CMC
BMAG MODE (3) - RATE 2 (verify)
cb RCS LOGIC (2) - close (verify)
TVC SERVO PWR #1 - AC1/MNA
Set DET - 59:30
FC REAC vlv - LATCH

NORM SC BOOSTER SEP

3 CSM SEPARATION

V49E F 06 22 (EXTRACT ATT)
THC - ARMED
RHC #2 - ARMED
cb SECS LOGIC (2) - closed (verify)
cb SECS ARM (2) - closed (verify)
SECS LOGIC (2) - on (up)(verify)
RCS CMD - ON
TAPE RCDR - HBR/RCD/FWD/CMD RESET
SECS PYRO ARM (2) - ARM
*If LV GUID - CMC *
* Insure rates nulled and *
* yaw drifting towards 0° *
* Load DAP 11103, 01111 *
* V46E, V60E, V63E *
GDC ALIGN
EMS FUNC - ΔV (verify)
EMS MODE - NORMAL
59:30 Start DET

Basic Date 3/9/70
Changed

CSM 109

59:50 CMC MODE - AUTO
59:58 Thrust +X and hold
00:00 CSM/LV SEP pb - push, hold, and release
LV TANK PRESS - full scale Low

*No Separation: *
* THC - CCW (leave in detent) *
* DET reset and counting up (auto) *
* LV TK PRESS - full scale low (SEP ind)*
*00:03 THC - neutral *

00:03 THC - release ($\Delta V \sim .5$ fps)
SM RCS PRPLNT tb (8)-gray (verify)
SM RCS He tb (8)-gray (verify)
SM RCS SEC PRPLNT FUEL PRESS (4) - CLOSE
FC REAC vlv - NORM

V62E
MAN ATT (PITCH) - ACCEL CMD
00:15 Pitch up at .5°/sec
When Pitch error needle positive,
PRO F 50 18 OMNI ANT - C
PRO 06 18
MAN ATT (PITCH) - RATE CMD
F 50 18 (completion of mnvr)
ENTR
Thrust +X(4 sec)($\Delta V \sim .7$ fps)
Load RCS DAP 11102, 01111
S BD AUX TV - TV (90 sec delay)
HI GAIN ANT TRACK - MAN
HI GAIN ANT PWR - POWER
Slew ANT to verify operation
HGA angles: P = -20, Y = 290
S BD ANT OMNI - HI GAIN
HI GAIN ANT TRACK - REACQ
TV TRANSMIT/STBY sw - TRANSMIT
Start DAC

3/9/70

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Basic Date
Changed

CSM 109

4 DOCKING

Stabilize & align CSM
BMAG MODE (3) - ATT 1/RATE 2
At capture:
PROBE EXTD/RETR tb-bp (A, pg S/2-7) malf. DOCKING
CMC MODE - FREE 2
Allow probe to damp S/C motions
(approx 10 sec)
Align Pitch and Yaw with THC (<3°)
(minimum possible)
DOCK PROBE RETRACT PRIM-1
*If no RETRACT in 30 sec: PRIM-2 *
*If still no RETRACT: SEC-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
EDS PWR - OFF
cb EDS (3) - open
DOCK PROBE EXTD/REL - OFF
DOCK PROBE RETRACT (2) - OFF
cb DOCK PROBE (2) - open
TAPE RCDR - off (ctr)
PCM BIT RATE - LOW
DAC/TV-off
S BD AUX TV - off (center)

5 POST DOCKING

RATE - HIGH
ATT DB - MAX
COAS PWR - OFF
cb RCS LOGIC (2) - open
TVC SERVO PWR #1 - OFF
THC,RHC - locked
EMS MODE - STBY
EMS FUNC - OFF
BMAG MODE (3) - RATE 2 (verify)
COUCHES - CDR-90°,CMP-0°,LMP-180°
LM PWR - OFF (verify)
TUNNEL LIGHTS - ON

Basic Date 3/9/70
Changed

CSM 109

6 CM/LM PRESSURE EQUALIZATION (Decal)

02 PRESS IND sw - SURGE TANK
Verify CRYO 02 PRESS 1 ind - 865-935 psia
EMER CAB PRESS sel - OFF
REPRESS PKG vlv - OFF
DIRECT 02 vlv - CLOSE (verify)
TUNL VENT vlv - LM/CM ΔP
LM/CM ΔP ind - +4 psid (pegged)
PRESS EQUAL vlv - OPEN (D, pg S/2-8)
CAB PRESS ind - 4.5 psia
PRESS EQUAL vlv - CLOSE
LM/CM ΔP ind - ∿2.4 psid
Monitor LM/CM ΔP ind for 3 min
and verify ΔP stable
PRESS EQUAL vlv - OPEN
CAB PRESS ind - 4.0 psia
REPRESS 02 vlv - OPEN
CAB PRESS ind 5.7 psia
Cycle REPRESS 02 as required
between 4.0 and 5.7 psia limits
until REPRESS 02 PRESS ind
∿0.0 psia
REPRESS 02 - CLOSE
CAB PRESS ind $\geq$ 4.0 psia
*If CAB PRESS ind <4.0 psia *
* PRESS EQUAL vlv - CLOSE *
LM/CM ΔP ind - ∿0.0 psid
CRYO 02 PRESS 1 ind (SURGE TK) $\geq$ 400 psia
REPRESS PKG vlv - FILL to 865-935
EMER CAB PRESS sel - BOTH
TUNL VENT vlv - OFF
WASTE STOW vlv - VENT (until cabin purge complete at 8 hrs)

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7 TUNNEL HATCH REMOVAL (Decal)

CSM 109

HATCH PRESS EQUAL vlv - open (CCW) (verify) malf. HATCH 1
ACTR HNDL sel - unstow, pull to stop,
- set to U
- Push to stop
Verify gearbox disconnect socket - U
ACTR HNDL sel - stow
ACTR HNDL - push to stow
Remove hatch, stow

8 DOCKING LATCH VERIFICATION (Decal)

LATCH HANDLE - Pull to verify hook engaged (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*

*UNLOCKED LATCHES: *

* Recock Latches *

* Hook does not release: *

* AUX REL (yellow)-push *

* Cock latch *

Release Latch - push man-release

Verify EXTEND LATCH ENGAGED INDICATOR (RED) not visible

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

9 LM UMBILICAL CONNECTION (Decal)

LM connector fairings (2) (orange)-open

LM umbilical connectors (2)-install & lock

LM connector fairings (2)(orange) - close

SYS Test - 4D

LM PWR - CSM

SYS Test ind - 0.5-3.2 volts

10 HATCH INSTALLATION (Decal)

Align Hatch in Tunnel

ACTR HNDL sel - unstow, set to L

- push to stop

Verify gearbox disconnect socket - L

*If latches cannot be closed: *

GEARBOX DISCONNECT - 180° CCW (Tool B)

*AUX LATCH DRIVE - LATCH (113° CW) *

*Verify hatch latches, remove tool B *

ACTR HNDL sel - stow

ACTR HNDL - push to stow

HATCH PRESS EQUAL vlv - close (CW) (C,pg S/2-8)

LM TUNL VENT vlv - LM/CM ΔP

LM TUNNEL LIGHTS - OFF

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CSM 109

11 PRE LM SEP & EJECTION

cb SIVB/LM SEP (2) - close (verify)
ΔV CG - LM/CSM (verify)
EMS FUNCT - ΔV SET/VHF RNG
Slew ΔV ind to +100.0
EMS FUNC - ΔV
TAPE RCDR - HBR/RCD/FWD/CMD RESET
Load RCS DAP 21101, X1111
V60E, V63E (DAC - 6 fps)
GDC ALIGN
DET - RESET
cb SECS ARM (2) - close (verify)
SECS LOGIC (2) - on (up)
Obtain GO from MSFN
SECS PYRO ARM (2) - ARM
TVC SERVO PWR #1 - AC1/MNA
RHC & THC - ARMED
V37E 47E F 16 83 ΔVX, Y, Z (.1fps)
EMS MODE - NORMAL
Start DAC

12 LM SEP & EJECTION
SIVB/LM SEP - on (up) (___:___:___)
00:00 Start DET
CMC MODE - AUTO
00:05 Thrust -X (3 sec)

13 POST LM EJECTION
PRO
F37 00E
When CMC Acty lt out,
Key V66E
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
cb SIVB/LM SEP (2) - open
LV/SPS IND sw - GPI
TVC SERVO PWR (2) - OFF
EMS MODE - STBY
EMS FUNC - OFF
TAPE RCDR - off (ctr)
PCM BIT RATE - LOW
AUTO RCS SEL AC ROLL or BD ROLL (4) - OFF
Stop DAC

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Changed

CSM 10

V49E
F 06 22
Load N22 att (monitor APS mnvr, hatch window)
94.1°,323.4°,355.5°
PRO F 50 18
PRO 06 18
F 50 18 (completion of mnvr)
ENTR
cb DIRECT ULLAGE (2) - open
TRANS CONT PWR - OFF
ROT CONTR PWR DIR (2) - OFF
RHC & THC - LOCKED
REPRESS PKG vlv - OFF

*NO APS EVASIVE at 13:00 *
*Thrust +X (6 sec) *
*Monitor SIVB thru Hatch Window *

Time from Ejection (min:sec)	Att for viewing SIVB after RCS EVASIVE mnvr Roll	Pitch	Yaw
15:00	36.9°	267.5°	26.3°
20:00	43.1°	263.7°	30.1°

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Changed

*If no TLI: *
* *
* SIVB - CMS/LM SEP (Earth orbit) *
* Inertial Att. *
*min-sec Event R P Y *
* *
00:00 Ejection 302.1° 319.6° 40.4°
* *
*00:05 3 sec -X *
* *
00:22 Mnvr 94.1° 323.4° 355.5°
* *
*03:00 6 sec -X *

CSM 109

ABORT PROCEDURES

MODE IA ABORT
(00:00 to 00:42) (10K)

00:00 TRANS CONTR - CCW then NEUTRAL
CM/SM SEP (2) - on (up)
00:14 ELS LOGIC - on
TWR JETT (2) - on (up)
APEX COVER JETT PB - PUSH
00:16 DROGUE DEPLOY PB - PUSH
00:18 CM RCS He DUMP PB - PUSH
Monitor altimeter
If <alidade - DEPLOY MAINS
>alidade - NO ACTION

00:28 If <10,000 ft - DEPLOY MAINS

Note: Alidade set for 3800 ft true altitude prior to Launch

GO TO LANDING PHASE pg L/4-8

MODE IB ABORT
(00:42 to 16.5 nm) (1:56)

00:00 TRANS CONTR - CCW then NEUTRAL
CM/SM SEP (2)-on (up)

00:11 CANARD DEPLOY - PUSH

00:14 ELS LOGIC - on (up)
RCS CMD - ON

GO TO LANDING PHASE pg L/4-8

MODE IC ABORT
(16.5 nm to TWR JETT)

00:00 TRANS CONTR - CCW then NEUTRAL
CM/SM SEP (2) - on (up)
RCS CMD - ON

00:11 CANARDS DEPLOY
CM RCS PRESS - on (up)
RCS TRNFR - CM
RCS IND - CM (1 or 2)
C/W MODE - CM

S/C PLATFORM GO/NO GO (Excessive Rates)
V82E Check HA

HA>32nm & PLAT GO	HA<32nm or PLAT NO GO
TWR JETT sw(2)-on(up)	Estab. +5°/SEC
MAN PITCH - RATE CMD	pitch rate
ENT ATT R0°,P135°,Y0°	EXCESSIVE + PITCH RATES
BMAG (3)- ATT1/RATE 2	
EMS FUNC - ENTRY	*ROLL 90° *
EMS MODE - NORMAL	*USE YAW THRUSTERS TO *
At .05G Lt,	*CONTROL RATE *
.05G sw - on (up)	*ROLL BACK TO HEADS DN*
Fly Max Lift	

θ(.05G)_____
GET DROGUE_____

GO TO LANDING PHASE pg L/4-8

LET FAILS TO JETTISON
LEGS CUT/NO MOTOR FIRE (pyro audible)
LES MOTOR FIRE PB - push
NO RESPONSE to ABORT 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) - on (up) (verify)
EDS PWR - on (up) (verify)
ABORT SYS TWR JETT (2) - on (up) (verify)
NO TWR JETT - continue to orbit
ABORT SYS TWR JETT (2) - off (ctr)

MODE 1

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CSM 109

MODE II RCS ABORT
(TWR JETT to MODE III)

00:00 TRANS CONTR - CCW (4 sec min)
No BECO-Reset THC,Req. RSO Shutdown
*Reset & start DET *

00:03 *CSM/LV SEP - PUSH*
*RCS CMD - ON *
THC - ARMED

00:05 TRANS CONTR - NEUTRAL THEN +X

00:24 TRANS CONTR +X OFF
V82E - NOTE TFF (Ha, Hp, TFF)
If TFF>2 min, Yaw 45° (LEFT) out-of-plane
BMAG MODE (3) - ATT1/RATE 2
cb MNA&B BAT C (2) - closed
CM/SM SEP - on (up)
Entry Att - (R=0°,P=120°,Y=0°)(Compl by 1:40)
CSM/LM FNL SEP (2) - on (up)
CM RCS - PRESS GET 300K_____
RCS TRNFR - CM
C&W MODE - CM θ (.05G)_____
EMS FUNC - ENTRY GET DROGUE_____
EMS MODE - NORMAL

Set up Single Ring RCS
At .05G Lt, Sw - on (up)
EMS ROLL - ON
Fly Max. Lift
N62E VI, HDOT, H

GO TO LANDING PHASE pg L/4-8

Basic Date 3/9/70
Changed _____

CSM 109

MODE II, MODE III

MODE III SPS ABORT
(ΔR= -400 NM to INSERTION)

00:00 TRANS CONTR - CCW (4 Sec Min)
*NO BECO - RESET THC, *
* LV STAGE sw - SII/SIVB*
*Reset & start DET *

00:03 *CSM/LV SEP - PUSH*
*RCS CMD - ON *
THC - ARMED
00:05 TRANS CONTR - NEUTRAL THEN +X
LV IND/GPI sw - GPI

00:24 TRANS CONTR +X OFF
KEY V82E N50E ΔR,HP,TFF (.1nm,min-sec)
If ΔR>0:
MNVR to retro att (R=180°,P=194°,Y=0°)
(Scribe on horiz, BEF, Hds up)
BMAG MODE (3) - ATT1/RATE2
SCS TVC P&Y - AUTO(verify)
EMS MODE - NORMAL GETI_____
ΔV THRUST A - NORMAL 6999.9
DIRECT ULLAGE PB - PUSH ΔV_____
02:05 THRUST ON PB - PUSH VC_____
Burn to VC (ΔR=0) Δtb_____
ΔV THRUST (2) - OFF GET 300K_____
θ (.05G)_____
If TFF>2min,Yaw 45°(LEFT) GET Drogue_____
out-of-plane
cb MNA&B BAT C(2) - closed
CM/SM SEP - on (up)

CM RCS PRESS - on (up)
RCS TRANSFER - CM
C&W MODE - CM
Mnvr to entry att (R=0°,P=105°,Y=0°)
(BEF, Hds Dn, Full Lift)
CSM/LM FNL SEP (2) - on (up)
Note TFF

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Changed

MODE II, MODE III

CSM 109

EMS MODE - STBY
EMS FUNC - ENTRY
EMS MODE - NORMAL
Set up single ring RCS
.05G Lt., Sw - on (up)
EMS Roll - on (up)
.2G Lt., Roll left 55° (305° inertial)
Fly Half Lift

GO TO LANDING PHASE pg L/4-8

MODE IV SPS TO ORBIT

(VI ∿ 22,000, HDOT ∿ + 265, H ∿ 100 nm)

00:00 TRANS CONT - CCW (4 sec min)
*NO BECO-RESET THC, *
* LV STAGE sw - SII/SIVB *
*RESET & START DET *

00:03 *CSM/LV SEP - PUSH*
*RCS CMD - ON *
THC - ARMED
00:05 TRANS CONTR - NEUTRAL THEN +X
LV IND/GPI sw - GPI

00:24 TRANS CONTR - +X OFF

Perform AUTO TVC (tw trim) or FIXED ATTITUDE BURN:

AUTO TVC (tw trim)
BMAG MODE (3) - ATT1/RATE2
EMS MODE - NORMAL
SCS TVC (2) - AUTO (verify)
ΔV THRUST A - NORMAL
DIRECT ULLAGE PB - PUSH
<01:30 THRUST ON PB - PUSH
BMAG MODE (PITCH) - RATE 1
FLY HDOT with thumbwheel
Burn to (hp>75 nm + 6 sec BT)
*or (ha=200 nm & +HDOT) *

ΔV THRUST (2) - OFF
EMS MODE - STBY

or FIXED ATTITUDE BURN (Scribe on horiz,SEF,Hds Dn)
BMAG MODE (3) - ATT1/RATE2
EMS MODE - NORMAL
SCS TVC (2) - AUTO (verify)
ΔV THRUST A - NORMAL
DIRECT ULLAGE PB - PUSH
02:05 THRUST ON PB - PUSH
BURN to VC (hp >75nm)
ΔV THRUST (2) - OFF
EMS MODE - STBY

GETI _____
6999.9
ΔV _____
VC _____
θ _____
Δtb _____

Basic Date 3/9/70
Changed _____

CSM 109

Record VI_____ (fps)
H DOT_____ (fps)
H PAD_____ (.1nm)

V82E

Record HA_____ (.1nm)
HP_____ (.1nm)
TFF_____ (min-sec)

PRO

V37E 00E
When CMC ACTY lt out:
V66E
V45E
Verify DAP load, V48: R1=11102, R2=01111
V46E CSM WT _____
V83E (check 0) P TRIM _____
PRO Y TRIM _____

BDA LOS
(00:12:50)

GO TO INSERTION CHECKLIST pg L/2-11

Basic Date 3/9/70
Changed _____

CSM 109

LANDING PHASE (30K, DESCENDING)

LANDING PHASE

30K' cb ELS (2) - close
ELS - AUTO
ELS LOGIC - on (up)

24K' Twr jett (auto)
*TWR JETT (2) - on (up) *
*CSM/LM FNL SEP(2)-on(up) *
Apex cover jett (auto)
*APEX COVER JETT PB-PUSH) *
(WAIT 2 SECS)
Drogues deployed (auto)
DROGUE DPLY PB-PUSH
If Both drogues Fail:
*ELS - Man *
*STABILIZE CM *
5K' MAIN DPLY PB - PUSH
49 sec *ELS - AUTO *

23.5K' Cabin Pressure increasing
*If not increasing by 17K': *
*CABIN PRESS REL vlv (RH)-DUMP *

10K' Main parachutes deployed
MAIN DEPLOY PB - PUSH (within 1 sec)
VHF ANT - RECY
VHF AM A - SIMPLEX
VHF BCN - ON
CABIN PRESS REL vlv (2) - CLOSE
DIRECT O2 vlv - OPEN (verify)
RCS DUMP (Auto for Mode IA)
CM RCS LOGIC - on (up)
CM PRPLNT - DUMP (burn audible)
MONITOR CM RCS 1&2 for He press decrease
NO BURN or PRESS DECREASE
* USE BOTH RHC's *
*DO NOT FIRE PITCH JETS *
CM PRPLNT - PURGE
CM RCS He DUMP PB-PUSH
*RHC (both) - 30 secs *
* NO PITCH *
CABIN PRESS REL vlv - BOOST/ENTRY

Basic Date 3/9/70
Changed

CSM 109

STRUT LOCKS (4) - UNLOCK
cb FLT & PL BAT BUS A,B,&BAT C (3) - close
cb FLT & PL MNA & B (2) - open
cb ECS RAD HTR OVLD (2) - open
cb SPS P&Y (4) - open
cb BAT RLY BUS (2) - open

3K' CM RCS PRPLNT (2) - OFF (terminates purge)
CABIN PRESS REL v1v (RH) - DUMP
FLOOD Lts - POST LDG
ELS - AUTO (verify)
ELS LOGIC - ON (verify)

800' CAB PRESS REL v1v - CLOSE (latch off)
MN BUS TIE (2) - OFF

POSTLANDING
STABILIZATION, VENTILATION, COMMUNICATIONS

1 Stabilization after landing
cb MAIN REL PYRO (2) - close
MAIN RELEASE - on (up)
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
No contact with recovery forces
*VHF AM A&B - off (ctr) *
*VHF AM RCV ONLY - A *
cb PL VENT - close
cb FLOAT BAG (3) - close
cb UPRIGHT SYS COMPRESS (2) - close
If Stable II:
FLOAT BAG(3)-FILL till 2 min after upright, then - OFF
VHF AM A/B & BCN - OFF while inverted
If Stable I:
After 10 Min Cooling Period,
FLOAT BAG (3) - FILL 7 min, then OFF

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2 Post Stabilization And Ventilation
PL BCN LT - BCN LT LOW
PL VENT vlv - UNLOCK (Pull)
Remove PL VENT Exh Cover
PL VENT - HIGH or LOW
If req'd:
PL DYE MARKER - ON
Deploy auxiliary dye marker
Release restraints
cb MNA BAT BUS A & BAT C (2) - open
cb MNB BAT BUS B & BAT C (2) - open
cb FLT & PL BAT C - open
cb PYRO A SEQ A - open
cb PYRO B SEQ B - open
*EACH HR - CHECK DC VOLTS $\geq$ 27.5 V *
*If Not: *
* cb FLT & PL-BAT BUS A&B (2) -open*
* cb FLT & PL BAT C (1) - close *
* GO TO LOW POWER CHECKLIST *
Unstow and install PLV DISTRIB DUCT
Deploy grappling hook and line if req'd

UNAIDED EGRESS PROCEDURES

PREPARATION
Disconnect umbilicals
Neck dams on (if suited)
Configure couch(s) - 270°
Armrests stowed
Unstow survival kits
Connect lanyards, (green to S/C, white to crew)

STABLE I
PL VENT - OFF
cb Pnl 250 (all) - open
Charge hatch counterbalance
Open side hatch
ACTR HNDL SEL - N
Remove raft from kit No. 2
Put raft overboard & pull inflation lanyard
Pass kits to raft
Egress, inflate life vest, board raft
If no ventilation - CM 02 supply ~1 hr

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CSM 109

STABLE II

cb CREW STA AUDIO (3) open
PWR (3) - OFF
SUIT PWR (3) - OFF
PRESS EQUAL vlv - OPEN
Remove & stow hatch
Put survival rucksacks down tunnel
Exit feet first; when clear of S/C inflate water wings
Remove life raft from kit No. 2 and inflate
If no ventilation - CM 02 supply ~1 hr

POST LANDING COMMUNICATIONS

VHF ANT-RECY (verify)
VHF BCN - ON (verify)
If no contact with recovery forces perform VHF BEACON Check
MONITOR VHF BEACON transmission with
VHF AM B Rcvr and/or Survival Transceiver
*VHF Beacon not operating *
*connect Survival Transceiver to ant *
cable conn P112 behind VHF ant access pnl
*and place radio in BCN mode *

LOW POWER CHECKLIST

VHF BCN - OFF
VHF AM (3) - RCV
FLOOD LTS - OFF
VHF AM A&B - off (ctr)
VHF AM RCV ONLY - A (verify)
COUCH LIGHTS - OFF
POSTLANDING VENT SYS: minimize use
SURV RADIO - plug into VHF BCN ANT cable conn P112 behind VHF ant access pnl & turn radio on in BCN mode

TLI 90 MIN ABORT
(Return to targeted splash point;
SPS burn at SIVB C/O +90 min)

V37E 47E

If abort decision occurs after CSM/LV separation, go to 00:14.

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

(TLI+25min)
00:00 TRANS CONTR - CCW (4 sec)
DET RESET (verify)
00:03 SIVB/CSM SEP
LV ENG 1 Lt - out
CSM/LV SEP PB - PUSH
*RCS CMD-ON *
THC - ARMED
00:05 TRANS CONTR - NEUTRAL THEN +X
SIVB/GPI sw - GPI

00:14 TRANS CONTR +X - OFF
PITCH UP to LOCAL VERT (+X axis toward the earth)
RATE - LOW
BMAG MODE (3) - ATT1/RATE 2
EDS PWR - OFF
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
cb EDS (3) - open

01:00 TRANS CONTR +X (8 to 10 sec)
V37E 00E
RATE - HIGH

MNVR TO RETRO ATT
R _____ (Block Data)
P _____ (Block Data)
Y _____ (Block Data)

RETRO UPDATE (NO COMM - use Block Data)

GETI	_____	Θ .05G	_____
ΔV	_____	GET DROGUE	_____
VC	_____	ENTRY R	_____
Δtb	_____	P	_____
GET 400K	_____	Y	_____

If time permits, go to G&N thrusting procedures;
if time critical, continue with SCS ΔV.

XX:XX — Set DET counting up to GETI
GDC ALIGN
EMS FUNC - ΔV SET/VHF RNG
SET ΔVc ABORT
EMS FUNCT - ΔV

TVC CHECK & PREP

cb STAB CONT SYS (Pnl 8) - close
cb SPS (12) - close
MAN ATT (3) - RATE CMD
LIMIT CYCLE - ON
ATT DB - MIN
RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
ΔVCG - CSM
TVC GMBL DRIVE P&Y - AUTO

(54:00) MN BUS TIE (2) - ON
(-06:00) TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
BMAG MODE (3) - ATT1/RATE2
SC CONT - SCS
RHC #2 - ARMED

Basic Date 3/9/70
Changed _____

(55:00) PRIMARY TVC CHECK
(05:00) GMBL MOT P1-Y1 - START/ON (LMP Confirm)
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 Confirm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC
Verify GPI returns to trim
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
FDAI SCALE - 5/5
LIMIT CYCLE - OFF
RATE - HIGH
UPDATE DET
SPS He vlvs (2) - AUTO (verify)
(58:00)
(-02:00) ΔV THRUST A(B) - NORMAL
V37E 47E
THC - ARMED
RHC (2) - ARMED
(59:30) TAPE RCDR - HBR/RCD/FWD/CMD RESET
(-00:30) EMS MODE - NORMAL

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

Basic Date 3/9/70
Changed

CSM 109

00:XX ECO

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
MN BUS TIE (2) - OFF

19 F 16 83 ΔV XYZ (CM) (.1fps)

RECORD	ΔVC _____
EMS FUNC - OFF	ΔVX _____
EMS MODE - STBY	ΔVY _____
LIMIT CYCLE - ON	ΔVZ _____
ATT DB - MAX	
TRANS CONT PWR - OFF	
ROT CONTR PWR DIRECT (2) - OFF	
BMAG MODE (3) - RATE 2	
TAPE RCDR - off (ctr)	
PCM BIT RATE - LOW	

PRO
F37 00E
V66E

Go to ENTRY PREP & SUPERCIRC ENTRY PROCEDURE
pg E/1-1

Basic Date 3/9/70
Changed _____

EARTH ORBIT VEHICLE PREPARATION

1 INITIAL STOWAGE COMPLETED

2 CMC POWER UP pg G/2-2

3 IMU POWER UP pg G/2-1

4 SCS POWER UP pg G/2-4

5 P51 - IMU ORIENTATION pg G/6-1

6 LOAD DAP
V48E 11102, 01111, PRO, PRO, PRO

7 DON MAE WESTS & FOOT RESTRAINTS

8 (__:__:__) P27 (SV,REFSMMAT), MNVR
& ENTRY PAD UPDATES

9 ECS CKS
02 SUPPLY REFILL pg S/1-7
PGA verification, (if suited) S/1-11
ECS Monitor Ck pg S/1-5
(382) EVAP H2O CONT PRI vlv - AUTO
EVAP H2O CONT SEC vlv - AUTO
SUIT HEAT EXCH SEC GLY - FLOW

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

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

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

13 C&W SYS CK pg S/1-17

14 CMC SELF CK pg G/2-3

15 DSKY COND LT TEST pg G/1-23

Basic Date 3/9/70
Changed

CSM 109

EARTH ORBIT ENTRY
VEHICLE PREP

EARTH ORBIT ENTRY
VEHICLE PREP

16 LOGIC SEQUENCE CK

(8) cb SECS LOGIC (2) - close (verify)
cb SECS ARM (2) - close
cb ELS (2) - close
ELS LOGIC - on (up)
ELS - AUTO
Coordinate next 3 steps with MSFN
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 (2) - open

17 (__:__:__) 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
*If still on SIVB: *
* LV GUID - CMC *
* Pitch SIVB to Hds up, BEF, 31.7°*
* window mk on horiz (SEP Att) *
* Then, LV GUID - IU for orb rate *

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Changed _____

18 GDC ALIGN

If drift >10°/hr, change rate source

19 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)

CSM 109

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 @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

Basic Date _____
Changed _____

20 Perform EMS ΔV TEST & NULL BIAS CHECK, pg G/2-5

21 PRIMARY WATER EVAP ACTIVATION
GLY EVAP H2O FLOW - AUTO
GLY EVAP STM PRESS - AUTO
PRI ECS GLY PUMP - AC1 (verify)

21A SET UP CAMERA
CM4/DAC/18/CIN - BRKT, MIR
(f16,250,7) 6fps, 8 min, MAG K

22 SEC WATER EVAP ACTIVATION

ECS IND sel - SEC
SEC COOL LOOP PUMP - AC2
GLY DISCH SEC PRESS - 39-51 psig
SEC COOL LOOP EVAP - EVAP
SEC GLY EVAP OUT TEMP - 38 - 50.5°F

SUIT CKT HT EXCH - BYPASS 20 sec, OFF
ECS IND sel - PRIM

23 (-01:00h) 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

(8) cb RCS LOGIC (2) - close
CM RCS LOGIC - on (up)
(8) cb CM RCS HTRS (2) - close
(101) CM RCS HTRS - ON (LMP Confirm) (20 min or til lowest rdg is 3.9 vdc) (Monitor Manf press for press drop)

24 FINAL STOWAGE

ORDEAL
(377) GLY TO RAD SEC vlv - BYPASS (verify)
Verify EVA COUCH STRUT disengaged
(382) 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 and C1 injector (A1)

25 (-00:40m) TERM. CM RCS PREHEAT

(101) CM RCS HTRS - OFF
CM RCS LOGIC - OFF
(8) cb CM RCS HTR (2) - open

26 SYSTEMS TEST PANEL CONFIGURATION

SYS TEST METER - 4B (BAT RLY BUS 3.4-4.1 vdc)
(101) CM RCS HTRS - OFF (verify)
WASTE H2O DUMP HTR - OFF
(101) URINE DUMP HTR - OFF
(100) LEB FLOOD & INTGL LIGHTING - OFF

Basic Date 3/9/70
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CSM 109

27 PYRO BATT CK

(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 *
(250) *cb PYRO A(B) seq A(B) - open *
cb PYRO A(B)BAT BUS A(B)TO PYRO
* BUS TIE - close *
(275) cb MNA BAT C - close
cb MNB BAT C - close
DC IND - MNB
PNL 8 - All cb's closed except:
EDS BAT (3) - open (verify)
PL VENT - open (verify)
FLOAT BAG (3) - open (verify)
CM RCS HTRS (2) - open (verify)
DOCKING PROBE (2) - open (verify)

28 FINAL GDC DRIFT CK (if req'd)
If drift >10°/hr, Suspect GDC,
Do not use RSI & FDAI #2

29 CM RCS ACTIVATION
(8) cb SECS ARM(2)-close(verify)
SECS LOGIC (2) - on(up)
MSFN confirm GO for PYRO ARM (if poss)
SECS PYRO ARM (2) - ARM
CM RCS PRPLNT 1&2 tb(2)-gray (verify)
CM RCS PRESS - ON
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

29A (Hybrid only) DOCKING RING JETTISON (if req'd)
(Deorbit-20:00m) SECS PYRO ARM (2) - ARM
YAW 45° out of plane
CSM/LM FNL SEP (2) - on (up)
SECS PYRO ARM (2) - SAFE

30 P27 & ENTRY PAD UPDATE

SPS DEORBIT, pg L/7-1
SM RCS/HYBRID DEORBIT, pg L/6-1

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Changed

CSM 109

P30 MANEUVER

L/5-6

SET STARS

R_{ALIGN} ___ ___ ___

P_{ALIGN} ___ ___ ___

Y_{ALIGN} ___ ___ ___

ULLAGE ___

HORIZON/WINDOW ___

OTHER ___

							PURPOSE	
							PROP/GUID	
+							WT	N47
	0	0					P_{TRIM}	N48
	0	0					Y_{TRIM}	
+	0	0					HRS	GETI
+	0	0	0				MIN	N33
+	0			•			SEC	
					•		ΔV_X	N81
					•		ΔV_Y	
					•		ΔV_Z	
X	X	X					R	
X	X	X					P	
X	X	X					Y	
+					•		H_A	N44
					•		H_P	
+					•		ΔVT	
X	X	X		•			BT	
X					•		ΔVC	
X	X	X	X				SXTS	
+				•		0	SFT	
+			•		0	0	TRN	
X	X	X					BSS	
X	X				•		SPA	
X	X	X			•		SXP	
	0			•			LAT	N61
				•			LONG	
+						•	RTGO	EMS
+							VIO	
		•		•			GET	0.05G

Basic Date 3/9/70
Changed ___

CSM 109

E.O. ENTRY UPDATE (RET ref. to PAD GETI)											L/5-7
X			–			X			–			AREA
X	X	–			•	X	X	–			•	△V TAILOFF
X	X	X				X	X	X				R 0.05G EMS
X	X	X				X	X	X				P 0.05G
X	X	X				X	X	X				Y 0.05G
+					•	+					•	RTGO EMS
+						+						VIO
X	X		•			X	X		•			RET 0.05G
	0		•				0		•			LAT N61
			•						•			LONG
X	X		•			X	X		•			RET 0.2G
					•						•	DRE (55°) N66
R	R		/			R	R		/			BANK AN
X	X		•			X	X		•			RET RB
X	X		•			X	X		•			RETBBO
X	X		•			X	X		•			RETEBO
X	X		•			X	X		•			RETDROG
X	X	X				X	X	X				(90°/fps) CHART
X	X					X	X					DRE (90°) UPDATE
POST BURN												
X	X	X				X	X	X				P 0.05G
+					•	+					•	RTGO EMS
+						+						VIO
X	X		•			X	X					RET 0.05G
X	X		•			X	X					RET 0.2G
					•						•	DRE ±100 nm N66
R	R		/			R	R		/			BANK AN
X	X		•			X	X		•			RETRB
X	X		•			X	X		•			RETBBO
X	X		•			X	X		•			RETEBO
X	X		•			X	X		•			RETDROG TO MAIN SEC

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Changed _____

CSM 109

E.O. ENTRY UPDATE

E.O. ENTRY UPDATE (RET ref. to PAD GETI) L/5-8											
X						X						AREA
X	X	-			•	X	X	-			•	ΔV TAILOFF
X	X	X				X	X	X				R 0.05G EMS
X	X	X				X	X	X				P 0.05G
X	X	X				X	X	X				Y 0.05G
+					•	+					•	RTGO EMS
+						+						VIO
X	X			•		X	X			•		RET 0.05G
	0			•			0			•		LAT N61
				•						•		LONG
X	X			•		X	X			•		RET 0.2G
					•						•	DRE (55°) N66
R	R		/			R	R		/			BANK AN
X	X			•		X	X			•		RET RB
X	X			•		X	X			•		RETBBO
X	X			•		X	X			•		RETEBO
X	X			•		X	X			•		RETDROG
X	X	X				X	X	X				(90°/fps) CHART
X	X					X	X					DRE (90°) UPDATE
POST BURN												
X	X	X				X	X	X				P 0.05G
+					•	+					•	RTGO EMS
+						+						VIO
X	X			•		X	X					RET 0.05G
X	X			•		X	X					RET 0.2G
					•						•	DRE ±100 nm N66
R	R		/			R	R		/			BANK AN
X	X			•		X	X			•		RETRB
X	X			•		X	X			•		RETBBO
X	X			•		X	X			•		RETEBO SEC
X	X			•		X	X			•		RETDROG TO MAIN

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Changed

EARTH ORBIT BLOCK DATA L/5-9

X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C
X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C
X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C
X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C
X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C

EARTH ORBIT BLOCK DATA L/5-10

X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C
X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C
X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C
X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C
X	X						X	X						AREA
X	X	X					X	X	X					LAT
X	X						X	X						LONG
														GETI
X	X	X					X	X	X					ΔV_C

REMARKS:

Basic Date 3/9/70
Changed ______

SM RCS/HYBRID DEORBIT

VEHICLE PREP COMPLETE

P30 - EXTERNAL ΔV

1 V37E 30E

2 F 06 33 GETI (hr,min,.01sec)
(ACCEPT) PRO
(REJECT) LOAD DESIRED GETI

3 F 06 81 ΔVX,Y,Z (LV) (.1fps)
(ACCEPT) PRO
(REJECT) LOAD DESIRED DATA

4 F 06 42 HA,HP,ΔV (.1nm,.1fps)
Record ΔV _____
(ACCEPT) PRO
(REJECT) Reselect P30 or P27. Load new param.

5 F 16 45 M,TFI,MGA (marks,min-sec,.01°)
*MGA -00002: if *
* IMU not aligned*
Set DET
PRO

6 F 37 00E

7 SEPARATION CK LIST
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
cb ELS (2) - close (verify)
cb SECS ARM (2) - close (verify)
cb SECS LOGIC (2) - close (verify)
ROT CONTR PWR NORM (2) - AC/DC
ABORT SYS PRPLNT - RCS CMD
SM RCS SEC PRPLNT FUEL PRESS(4)-OPEN

Basic Date 3/9/70
Changed _____

8 CM RCS CHECK
AUTO RCS A/C ROLL (4) - OFF (verify)
cb RCS LOGIC (2) - closed (verify)
SC CONT - SCS
MAN ATT (3) - MIN IMP
RCS TRANSFER - CM
AUTO RCS SEL (RING 1) - MNA
AUTO RCS SEL (RING 2) - MNB
cb SCS B/D ROLL,P&Y MNA(3)-open
TEST RING 2 THRUSTERS
cb SCS B/D ROLL,P&Y MNA(3)-close
cb SCS B/D ROLL,P&Y MNB(3)-open
TEST RING 1 THRUSTERS
cb SCS B/D ROLL,P&Y MNB(2)-close
RCS TRANSFER - SM
MAN ATT (3) - RATE CMD

9 MNVR TO PAD BURN ATT (BEF, HDS DN)
LOAD DAP
BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO
ATT DB - MIN

10 V62E

11 V49E

12 F 06 22 DESIRED FINAL GMBL ANGLES (.01°)
LOAD MNVR PAD GMBL ANGLES (0°,180°,0°)
PRO

13 F 50 18 REQ MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) PRO
(MAN) SC CONT - SCS
BMAG MODE (3) - RATE 2
MNVR To 15

14 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

15 F 50 18 REQ TRIM TO FDAI RPY ANGLES (.01°)
(TRIM) Go to 13
(BYPASS) ENTR

Basic Date 3/9/70
Changed

16 CHECK BORESIGHT & SXT STARS
OPT MODE - CMC
OPT ZERO - OFF

17 V41 N91E

18 F 21 92 SHAFT,TRUN (.01°,.001°)
Load SXTS angles

19 41 OPTICS DRIVE
Check SXT STAR
Stow Optics eyepieces
Check BORESIGHT STAR (if avail)

20 V25 N17E (.01°)
Load Pad Data GMBL Angles
for CM BURN ATT
ATT SET tw - SET
to PAD DATA GMBL ANGLES
for CM BURN ATT

21 PWR REDUCTION (Hybrid only)
MN BUS TIE (2) - ON
HGA PWR - OFF
FC PUMPS (3) - OFF
FC 2 MNA - OFF
Verify loads balanced
VHF AM (A&B)-off (ctr)
S BD PWR AMP - LOW
cb ECS RAD CONT/HTR (2) - open
cb WASTE H2O/URINE DUMP HTRS(2)-open
cb RAD HTRS OVLD (2) - open
POT H2O HTR - OFF
GLY EVAP TEMP IN - MAN

P41 - RCS THRUSTING

22 V37E 41E

23 F 50 18 REQ MNVR TO BURN ATT (HDS DN) (.01°)
(AUTO) BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO
PRO To 24

Basic Date 3/9/70
Changed

CSM 109

			(MAN/DAP)	BMAG MODE (3) - RATE 2	
				SC CONT - CMC/HOLD	
			V62E		
				MNVR To 25	
24	06	18		AUTO MNVR TO FDAI RPY	(.01°)
25	F 50	18		REQ TRIM	(.01°)
				ALIGN SC ROLL	
			(AUTO TRIM)	PRO To 24	
			(BYPASS)	ATT DB - MIN	
				RATE - LOW	
				MAN ATT (3) - RATE CMD	
				BMAG MODE (3) - ATT1/RATE 2	
				If long Lambert (P37) burn	
				BMAG MODE (3) - RATE 2	
				ENTR	
55:00m					
26	06	85		VGX,Y,Z	(.1fps)
				RECHECK BORESIGHT STAR	
				TRANS CONTR PWR - on (up)	
				EMS MODE - STBY (verify)	
				EMS FUNC - ΔV SET/VHF RNG	
				SET ΔV for SM BURN = ΔV pad +100.0	
				EMS FUNC - ΔV	
				S BD ANT - OMNI C	
				SECS LOGIC (2) - ON	
				MSFN confirm Go for PYRO ARM	
				SECS PYRO ARM (2) - ARM	
				CM RCS LOGIC - ON	
59:25					
27				DSKY BLANKS	
59:30					
28	16	85		VG X,Y,Z (AVE G ON)	(.1fps)
				RHC's & THC - ARMED	
				LIMIT CYCLE - OFF	
				TAPE RCDR - HBR/RCD/FWD/CMD RESET	
				EMS MODE - NORMAL	

Basic Date 3/9/70
Changed

CSM 109

00:00

29 F 16 85 REQ NULL VG X,Y,Z (.1fps)

BURN EMS ΔV CTR TO 100

RESET DET & COUNT UP

If SM ONLY burn go to step 32

THC - LOCKED
SC CONT - SCS/FREE
RATE - HIGH
PRIM GLY To RAD - BYPASS (verify)
MN BUS TIE (2) - ON (verify)

CM/SM SEP (2) - on (up)
MAN ATT(3)-MIN IMP
BMAG MODE(3)-RATE 2
C&W MODE - CM
Hybrid RCS TRNFR - CM
1 min CM RCS LOGIC - OFF
SECS PYRO ARM (2) - SAFE

Monitor VM A/B:
If <25 vdc, go to EMERG POWER DOWN

V63E (N17, CM BURN ATT)
* If CMC NO GO: *
* FDAI SOURCE - ATT SET *
* FDAI SEL - 1 or 2 *
* ATT SET - GDC *

MAN ATT PITCH - ACCEL CMD
FDAI SCALE - 5/5
MNVR TO CM BURN ATT(NULL ERR NEEDLES)

R 0°
(Θ ∿290°) P _____ (∿ 110° from SM BURN ATT)
Y 0°

CM RCS BURN
RATE - HI
B/D ROLL & YAW - single ring
RHC #1-Continuous Pitch Down
RHC #2-Modulate Pitch to null needles
BURN VGZ TO ZERO
* If only 1 RHC *
* Pulse ± P=5° from retro att*
* Maintain rates <3°/sec *

Basic Date 3/9/70
Changed

CSM 109

31 BURN COMPLETION AT:
ΔV CTR= _____ or DET= _____

32 V82E

F 16 44 HA,HP,TFF (.1nm,min-sec)
Check HP <40nm:
If > Pad data, continue burn
until < Pad
PRO

33 F 16 85 VGX,Y,Z (.1fps)
Read VG residuals to MSFN
PRO

34 F 37 00E
TAPE RCDR - off (ctr)
PCM BIT RATE - LOW
MAN ATT (3) - MIN IMP (Hybrid only)
ATT DB - MAX
EMS MODE - STBY
EMS FUNC - OFF
cb DIRECT ULLAGE (2) - open

35 EMS INITIALIZATION
If scroll not on 37K
* EMS FUNC - TEST 5 *
Slew scroll to 37K*
NC - RNG SET
G to PAD DATA RNG
NC - Vo SET
croll to PAD DATA VIO
Do not go thru TEST 3 or 5*
DE - STBY (verify)
EMS FUNC - ENTRY

CSM 109

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Changed

CSM 109

RSI ALIGNMENT

FDAI SOURCE - ATT SET
ATT SET - GDC
EMS ROLL - on (up)
GDC ALIGN PB - PUSH & HOLD
YAW tw - Position RSI to LIFT DN
GDC ALIGN PB - RELEASE
EMS ROLL - OFF
Align GDC to IMU

Go to EARTH ORBIT ENTRY, pg L/8-1

Basic Date 3/9/70
Changed

SPS DEORBIT

VEHICLE PREP COMPLETE

P30 - EXTERNAL ΔV

1 V37E 30E

2 F 06 33 GETI (hr,min,.01sec)
(ACCEPT) PRO
(REJECT) LOAD DESIRED GETI

3 F 06 81 ΔVX,Y,Z (LV) (.1fps)
(ACCEPT) PRO
(REJECT) LOAD DESIRED DATA

4 F 06 42 HA,HP,ΔV (.1nm,.1fps)
Set ΔV counter
(ACCEPT) PRO
(REJECT) Reselect P30 or P27. Load new param.

5 F 16 45 M,TFI,MGA (marks,min-sec,.01°)
*MGA -00002: If *
* IMU not aligned*
Set DET
PRO

F 37 00E

6 SEPARATION CK LIST
PRIM GLY TO RAD - BYPASS (pull)
REPRESS PKG vlv - FILL to 865-935, then ON
02 SM SUPPLY vlv - OFF
SURGE TK-ON (verify)
CAB PRESS REL vlv (2) - NORM
cb ELS (2) - close (verify)
cb SECS ARM (2) - close (verify)
cb SECS LOGIC (2) - close (verify)
ROT CONTR PWR NORM (2) - AC/DC
ABORT SYS PRPLNT - RCS CMD
SM RCS SEC PRPLNT FUEL PRESS (4)-OPEN

7 CM RCS CHECK
AUTO RCS A/C ROLL (4) - OFF (verify)
cb RCS LOGIC (2) - closed (verify)
SC CONT - SCS
MAN ATT (3) - MIN IMP
RCS TRANSFER - CM
AUTO RCS SEL (RING 1) - MNA
AUTO RCS SEL (RING 2) - MNB
cb SCS B/D ROLL,P&Y MNA(3)-open
TEST RING 2 THRUSTERS
cb SCS B/D ROLL,P&Y MNA(3)-close
cb SCS B/D ROLL,P&Y MNB(3)-open
TEST RING 1 THRUSTERS
cb SCS B/D ROLL,P&Y MNB(3)-close
RCS TRANSFER - SM
MAN ATT(3) - RATE CMD

8 SPS THRUSTING PREP
Cycle CRYO FANS
SPS GAUGING - AC1 (verify)
PUGS MODE - NORM (verify)
BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO

9 MNVR TO PAD BURN ATT (HDS UP)
V62E

10 V49E

11 F 06 22 DESIRED FINAL GMBL ANGLES (.01°)
LOAD MNVR PAD GMBL ANGLES (180°,180°,0°)
PRO

12 F 50 18 REQ MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) PRO
(MAN) SC CONT - SCS
MNVR to 14

13 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

14 F 50 18 REQ TRIM TO FDAI RPY ANGLES (.01°)
(TRIM) Go to 12
(BYPASS) ENTR

Basic Date 3/9/70
Changed

15 PERFORM BORESIGHT & SXT STAR CHECKS
Stow Optics eyepieces

16 V37E 40E

17 F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO
PRO to 18
(MAN/DAP) BMAG MODE (3) - RATE 2
SC CONT - CMC/HOLD
MNVR to 19
(MAN/SCS) SC CONT - SCS
MNVR to 19

18 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

19 F 50 18 REQUEST TRIM MNVR TO FDAI RPY ANGLES
ALIGN S/C ROLL (.01°)
GDC ALIGN

TVC CHECK & PREP

cb STAB CONT SYS (Pnl 8) - close
cb SPS (12) - close
SET ΔVC (verify)
EMS FUNCT - ΔV (verify)
MAN ATT (3) - RATE CMD
LIMIT CYCLE - ON
ATT DB - MIN
RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
ΔVCG - CSM
TVC GMBL DRIVE P&Y - AUTO
+54:00m MN BUS TIE (2) - ON
(-06:00) TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
BMAG MODE (3) - ATT1/RATE 2
SC CONT - SCS
RHC #2 - ARMED

Basic Date 3/9/70
Changed

TIG-5min HORIZ CHK - Horiz on 12° window mk
(hds up) (Limit +3° PGNCS GO/NO GO)
If NO GO set tw 180°, 180°; 0°
Track horiz 24° window mk (hds up)
At TIG-2 min - Align GDC

55:00m (-05:00) PRIMARY TVC CHECK
GMBL MOT P1-Y1 - START/ON (LMP Confirm)
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 Confirm)
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
(TRIM) BMAG MODE (3) - RATE 2
PRO
(BYPASS) BMAG MODE (3) - ATT1/RATE 2 (verify)
ENTR

Basic Date 3/9/70
Changed

20 F 50 25 00204 GMBL TEST OPTION
(ACCEPT) SC CONT - CMC (verify)
PRO

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

*TEST FAIL: *
*SC CONT - SCS *
SCS TVC(2) - AUTO

(REJECT) ENTR

CSM 109

21 06 40 TFI, VG, ΔVM (min-sec,.1fps)
*PROG ALARM - TIG Slipped *
*V5N9E 01703 *
*KEY RLSE TO 21 *

FDAI SCALE - 5/5
LIMIT CYCLE - OFF
RATE - HIGH
UPDATE DET
SPS He vlvs (2) - AUTO (verify)

58:00
(-02:00) ΔV THRUST A(B) - NORMAL
THC - ARMED
RHC (2) - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET

59:25
(-00:35) DSKY BLANKS

59:30 (AVE G ON)
(-00:30) EMS MODE - NORMAL

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

59:XX ULLAGE AS REQ
(-00:XX) Horiz on 31.7° window mark (hds up)
*If no ULLAGE: *
* DIR ULLAGE PB - PUSH*
* Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP

Basic Date 3/9/70
Changed

59:55
(-00:05)
F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI ≥0 Sec
(BYPASS IGN) ENTR to 24
EXIT - V37E 00E

22 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec,.1fps,.1fps)

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

SPS THRUST Lt - ON
00:03 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
*PROG ALARM *
V5N9E 01407 VG INC
THC - CW, FLY MTVC
ECO
*EMER SPS CUTOFF: *
* ΔV THRUST (2) - OFF*

23 F 16 40 TFC (STATIC), VG, ΔVM (min-sec,.1fps)
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

Basic Date 3/9/70
Changed

24	F 16 85	VG XYZ (CM) (.1fps) NULL RESIDUALS (TEI & MCC) RECORD ΔV COUNTER & RESIDUALS ΔVC _____ EMS FUNC - OFF VGX _____ EMS MODE - STBY VGY _____ LIMIT CYCLE - On VGZ _____ ATT DB - MAX TRANS CONT PWR - OFF BMAG MODE (3) - RATE 2 cb DIRECT ULLAGE (2) - open cb SPS P&Y (4) - open TAPE RCDR - off(ctr) PRO
25	F 37	V82E
26	F 16 44	HA,HP,TFF (.1nm,min-sec) *R3-59B59HP >49.4 nm* PRO
27	F 37	00E
28		When COMP ACTY lt not on continuously: V66E (If Lm S.V. not needed)

Go to EARTH ORBIT ENTRY pg L/8-1

Basic Date 3/9/70
Changed _____

CSM 109

EARTH ORBIT ENTRY

1 Verify CM/SM SEP ATT

SPS		SM RCS		Hybrid
R _____	(180°)	R _____	(0°)	Go to
P _____		P _____		Step 3
Y _____	(0°)	Y _____	(0°)	

2 PWR REDUCT

HGA PWR - OFF
FC PUMPS (3) - OFF
FC 2 MNA - OFF
Verify loads balanced
S BD PWR AMP - LOW
VHF AM (A&B)-off (ctr)
cb ECS RAD CONT/HTR (2) - open
cb WASTE H2O/URINE DUMP HTRS (2)-open
cb RAD HTRS OVLD (2) - open
POT H2O HTR - OFF
GLY EVAP TEMP IN - MAN

P61 - ENTRY PREP

3 V37E 61E (AVE G ON)
05 09 01427 - ROLL REVERSED
*05 09 01426 - IMU UNSAT *

4 F 06 61 IMPACT LAT, LONG, HDS UP/DN (+/-)
(.01°,.01°,
±00001)

PAD VALUES
LAT_____
LONG_____
HDS UP/DN_____

PRO

5 F 06 60 GMAX,V400K,GAMMA EI (.01G, fps,.01°)
Record
GMAX _____
V400K _____
GAMMA EI _____
PRO

Basic Date 3/9/70
Changed

CSM 109

EARTH ORBIT ENTRY

6 F 16 63 RTOGO (.1nm) _____ PAD _____
VIO (fps) _____ PAD _____
TFE (min-sec)_____
NO COMM, SET RTOGO & VIO IN EMS & INITIALIZE

(ACCEPT) PRO
(RECYCLE) V32E to 5 (TFE sensitive to oblateness)

P62 - CM/SM SEP & PRE-ENTRY MNVR

7 F 50 25 00041 REQUEST CM/SM SEP

For HYBRID DEORBIT, PRO to 8

SC CONT - SCS/FREE
YAW - 45° out-of-plane (left for RCS, right for SPS)
RATE - HIGH
ATT DB - MIN
MAN ATT (3) - RATE CMD
BMAG MODE (3) - ATT1/RATE2
PRIM GLY to RAD - BYPASS (verify)
EMS MODE-STBY (verify)
CM RCS LOGIC - on (up)
SECS LOGIC (2) - on (up)
MSFN confirm GO for PYRO ARM
SECS PYRO ARM (2) - ARM
MN BUS TIE (2) - ON (verify)

CM/SM SEP (2) - ON
If docking ring still on:
CSM/LM FNL SEP (2) - on(up)(verify)
MAN ATT(3)-MIN IMP
BMAG MODE(3)-RATE 2
C&W MODE - CM
RCS TRNFR - CM
CM RCS MANF PRESS - 287-302 psia
CM RCS LOGIC - OFF
SECS PYRO ARM (2) - SAFE
Monitor VMA/B:
If <25 vdc, go to EMERG POWER DOWN

Basic Date 3/9/70
Changed _____
CSM 109

MNVR TO ENTRY ATT

SPS		RCS	
R	0° (Lift up)	R	180° (Lift dn)
P	Horiz on 29° mark(400K)	P	
Y	0°	Y	0°

ATT DB - MAX
MAINTAIN HORIZ TRK
MAN ATT (3)-RATE CMD
PRO (Act ENTRY DAP Att Hold)

8 F 06 61 IMPACT LAT, LONG, HDS/DN (.01°,.01°,-00001)

EMS INITIALIZATION (except RCS DEORBIT)
If scroll not on 37K
* EMS FUNC-TEST 5 *
* Slew scroll to 37K*
EMS FUNC - RNG SET
Set RNG TO PAD DATA RNG
EMS FUNC - Vo SET
Slew scroll to PAD DATA VIO
Do not go thru TEST 3 or 5
EMS MODE - STBY (verify)
EMS FUNC - ENTRY

RSI ALIGNMENT (except RCS DEORBIT)
FDAI SOURCE - ATT SET
ATT SET - GDC
EMS ROLL - on(up)
GDC ALIGN PB - PUSH & HOLD
YAW tw - Position RSI thru 45° & back to LIFT UP
GDC ALIGN PB - RELEASE
EMS ROLL - OFF
Align GDC to IMU

EMS FUNC - ENTRY (verify)

PRO (CMC Guidance)

9 POSS 06 22 FINAL ATT DISP, RPY (.01°)
(Only if X-axis beyond 45° of Vel vector)

Basic Date 3/9/70
Changed

CSM 109

P63 - ENTRY INIT

10 06 64 G,VI,RTOGO (.01G,fps,.1nm)

FDAI SCALE - 5/5
ROT CONTR PWR DIR (2)-MNA/MNB (verify)
TAPE RCDR - HBR/RCD/FWD
HORIZ CK
Pitch error needle goes toward
zero approaching .05G time
If CMC is GO:
SC CONT - CMC/AUTO
*If DAP NO GO: *
* SC CONT - SCS*
* FLY BETA *
*If CMC NO GO: *
* SC CONT - SCS*
* FLY EMS *

SPS DEORBIT: Track horiz with 29° window mk
Maintain Lift up until .2G

RCS DEORBIT: Track horiz with 9° window mk
Maintain SCS control, Lift dn
until 1G
*After 1G, if both RCS ring *
* He press <1550 psia, *
* roll 20°/sec & disable RCS*
*After peak G, enable RCS & *
* fly BETA = 90° *

Basic Date 3/9/70
Changed

P64 - ENTRY POST .05G

Start DAC

RTOGO AT .05G AGREES WITH EMS-verify
HORIZ CK

.05G time
(+0__:__)
(__:__:__)

EMS MODE - BACKUP/VHF RNG
.05 G Lt - on
.05 G sw - on (up)
EMS ROLL - on (up)

06 74 BETA, VI, G (.01°,fps,.01G)
NOTE: To monitor N68, Key V16 N68E
Compare RSI & FDAI
If CMC or PAD cmds Lift DN,
MNVR Lift DN
EMS GO/NO GO
G-V Plot within limits
Go to 12 (P67) or continue

P67 - ENTRY - FINAL PHASE (0.2G)

12 06 66 BETA,CRSRNG ERR,DNRNG ERR (.01°,.1nm,.1nm)
KEY VERB
Record DNRNG ERR _____
KEY RLSE
Limit: ±100nm from PAD DRE
Monitor lift vector on RSI & FDAI
CM RCS: change rings when He PRESS
<1150 psia
F 16 67 RTOGO,LAT,LONG (Vrel=1000fps)
(.1nm,.01°,.01°)
SC CONT - SCS
RTOGO NEG - LIFT UP
RTOGO POS - LIFT DOWN
Monitor altimeter
Record LAT,LONG,& voice to RECY at 10K'
Record EMS RTGO
EMS MODE - STBY
EMS FUNC - OFF
DAC - fll

Go To EARTH/POST LANDING pg L/9-1

EARTH/POST LANDING

		Start Watch
RRT (__:__)	STEAM PRESS - pegged at 90K	(00:00)
50K'(__:__)	CABIN PRESS REL vlv (2) - BOOST/ENTRY	(00:54)
	SECS PYRO ARM (2) - ARM	
	Check Altimeter	
40K'(__:__)	* CM UNSTABLE *	*(01:08)
	*RCS CMD - OFF *	
	* 40K' APEX COVER JETT PB-PUSH *	
	DROGUE DEPLOY PB - PUSH (2 sec	
	*after apex cover jett) *	
30K'	ELS LOGIC - on (up)	(01:26)
	ELS - AUTO	
24K'(__:__)	RCS disable (auto)	(01:40)
	RCS CMD - OFF	
	Apex cover jett (auto)	
	APEX COVER JETT PB - PUSH	
	(WAIT 2 SECS)	
	Drogue parachutes deployed (auto)	
	DROGUE DEPLOY PB - PUSH	
	If Both Drogues Fail:	
	*ELS - MAN *	
	*Stabilize CM *	
	5K' MAIN DPLY PB - PUSH	
	*ELS - AUTO *	
23.5K'	Cabin Pressure increasing	
	*If not increasing by 17K': *	
	CABIN PRESS REL vlv (RH) - DUMP	
10K'(__:__)	Main parachutes deployed (Drogues +49s)	(02:31)
	MAIN DEPLOY PB - PUSH (within 1 sec)	
	VHF ANT - RECY	
	VHF AM A - SIMPLEX	
	VHF BCN - ON	
	DIRECT 02 vlv - OPEN (if suited)	

Basic Date 3/9/70
Changed

CSM 109

CABIN PRESS REL vlv (2) - CLOSE
CM RCS LOGIC - on (up)
CM PRPLNT - DUMP (burn audible)
Monitor CM RCS 1&2 for He press decrease
*NO BURN or PRESS DECREASE *
* USE BOTH RHC's *
*DO NOT FIRE PITCH JETS *
CM PRPLNT-PURGE
*CM RCS He DUMP PB - PUSH *
RHC (2) - 30 secs, No PITCH
Stow DAC
STRUT LOCKS (4) - UNLOCK
If night landing:
cb FLOAT BAG #3, FLT/PL (1 cb)-close
PL BCN LT - LOW
cb FLT & PL BAT BUS A,B,&BAT C (3)-close
cb FLT & PL MNA & B (2) - open
cb RAD HTR OVLD (2) - open (verify)
cb SPS P&Y (4) - open (verify)
cb BAT RELAY BUS (2) - open

3K' CM RCS PRPLNT (2) - OFF (terminates purge)
CABIN PRESS REL vlv (RH) - DUMP
ELS AUTO (verify)
ELS LOGIC - ON (verify)
FLOOD Lts - POST LDG

800' CAB PRESS RELF vlv - CLOSE (latch off)
MN BUS TIE (2) - OFF

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POSTLANDING
STABILIZATION, VENTILATION, COMMUNICATIONS

1 Stabilization after landing
cb MAIN REL PYRO (2) - close
MAIN RELEASE - on (up)
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
No contact with recovery forces
*VHF AM A&B - off (ctr) *
*VHF AM RCV ONLY - A *
cb PL VENT - close
cb FLOAT BAG (3) - close
cb UPRIGHT SYS COMPRESS (2) - close

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If Stable II:
FLOAT BAG(3)-FILL till 2 min after upright, then - OFF
VHF AM A/B & BCN - OFF while inverted
If Stable I:
After 10 Min Cooling Period,
FLOAT BAG (3) - FILL 7 min, then OFF

2 Post Stabilization And Ventilation
PL BCN LT - BCN LT LOW
PL VENT vlv - UNLOCK (Pull)
Remove PL VENT Exh Cover
PL VENT - HIGH or LOW
If req'd
PL DYE MARKER - ON
*Deploy auxiliary dye marker *
Release restraints
cb MNA BAT BUS A & BAT C (2) - open
cb MNB BAT BUS B & BAT C (2) - open
cb FLT & PL BAT C - open
cb PYRO A SEQ A - open
cb PYRO B SEQ B - open
*EACH HR - CHECK DC VOLTS $\geq$ 27.5 V *
*If Not: *
* cb FLT & PL-BAT BUS A&B (2) -open*
* cb FLT & PL BAT C (1) - close *
* GO TO LOW POWER CHECKLIST *
Unstow and install PLV DISTRIB DUCT
Deploy grappling hook and line if req'd

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UNAIDED EGRESS PROCEDURES

PREPARATION
Disconnect umbilicals
Neck dams on (if suited)
Configure couch(s) - 270°
Armrests stowed
Unstow survival kits
Connect lanyards, (green to S/C, white to crew)

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STABLE I
PL VENT - OFF
cb Pnl 250 (all) - open

Charge hatch counterbalance
Open side hatch
ACTR HNDL SEL - N
Remove raft from kit No. 2
Put raft overboard & pull inflation lanyard
Pass kits to raft
Egress, inflate life vest, board raft
If no ventilation - CM 02 supply ~1 hr

STABLE II

cb CREW STA AUDIO (3) open
PWR (3) - OFF
SUIT PWR (3) - OFF
PRESS EQUAL vlv - OPEN
Remove & stow hatch
Put survival rucksacks down tunnel
Exit feet first; when clear of S/C inflate water wings
Remove life raft from kit No. 2 and inflate
If no ventilation - CM 02 supply ~1 hr

POST LANDING COMMUNICATIONS

VHF ANT-RECY (verify)
VHF BCN - ON (verify)
If no contact with recovery forces perform VHF BEACON Check
MONITOR VHF BEACON transmission with VHF AM B Rcvr and/or Survival Transceiver
*VHF Beacon not operating *
*connect Survival Transceiver to ant *
cable conn P112 behind VHF ant access pnl
*and place radio in BCN mode *

LOW POWER CHECKLIST

VHF BCN - OFF
VHF AM (3) - RCV
FLOOD LTS - OFF
VHF AM A&B - off (ctr)
VHF AM RCV ONLY - A (verify)
COUCH LIGHTS - OFF
POSTLANDING VENT SYS: minimize use
SURV RADIO - plug into VHF BCN ANT cable conn P112 behind VHF ant access pnl & turn radio on in BCN mode

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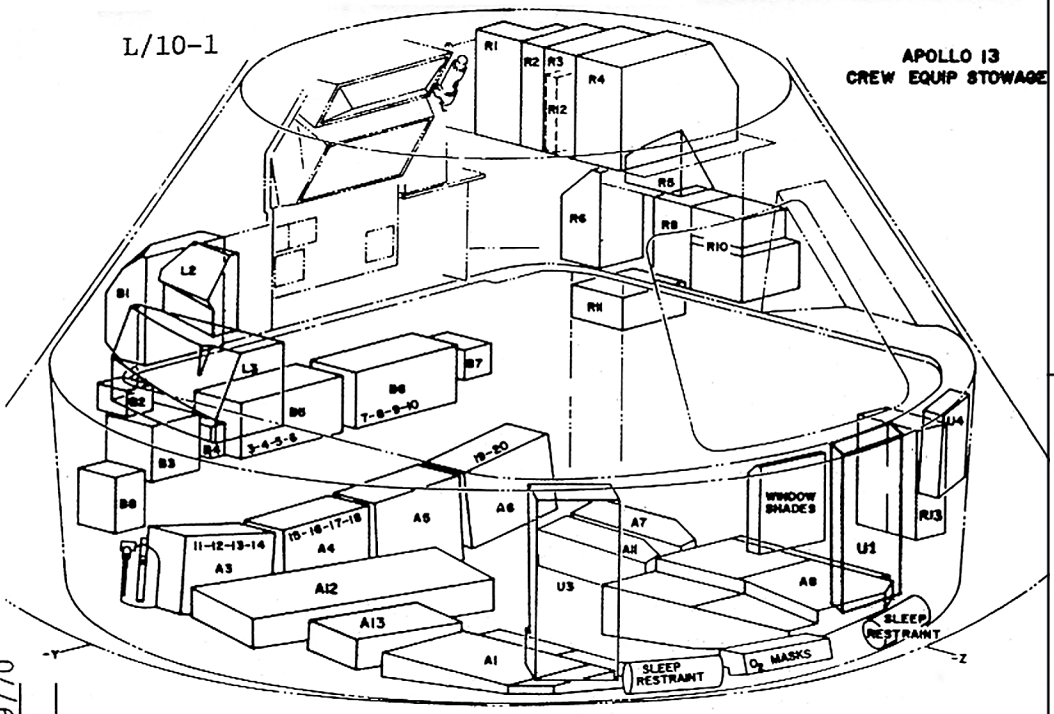
CREW EQUIP STOWAGE



2	Cabin Fan Filter Bag	A8
1	Cabin Vent QD	R6
1	CCU Cable, Spare	L2
1	CCU Control Head, Spare	L2
1	Chlorination Equipment	B4, B8, A1
1	COAS	Above LH Window
	2 Bulbs	U3
	1 Filer	U3
20	CO_2 Absorbers	4-U3, 4-A4, 2-A6, 4-B5, 4-B6, 2-ECU
1	CO_2 Absorber Ground Cable	L2
3	CWG	A8
4	CWG Elect. Adapters	A8
1	Camera, 16mm L.S. W/Mag, Lens, Handle, Battery Pack, RCU Bracket & Spare Mag	A8 (LM Xfr)
1	Camera, 16mm W/Mag	B3
	10 Mag	5-B2, 5-B8
	6 Mag	R-13 (LM Xfr)
	1 Power Cable	B3
	1 ea Lens, 5mm, 18mm, 75mm	B3
	1 Mirror	B3
	1 Bracket	U3
	1 Sextant Adapter	A5
	1 Fuse, Spare	R3 (Data Kit)
1	Camera, 70mm Reseau, Mag & Spare Mag	A13
1	Camera, 70mm W/Mag	B3
	6 Mag	1-A8, 5-A13
	5 Mag	R-13, (LM Xfr)
	1 Bracket, 80/250	A1
	1 Bracket, 500	A11
	1 Lens, 250	U4
	1 Lens, 500	A11
	1 Remote Cable	A11
	1 Intervalometer	U4
	1 PCM Cable	L2
1	Camera Hycon (CTC) W/Mag	A12
	1 Mag	A13
	1 Control Box	A13
	2 Cables	A12

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STOWAGE

STOWAGE

1	Camera, TV & Ringsight	A7
	1 Monitor	A6
	2 Cables	A6
	1 Bracket	A6
2	Data Card Kit	R3 (1-Xfr to LM)
	1 Eyepatch	Data Kit
	6 Data Clips	Data Kit
	2 Meter Covers	Data Kit
11	Decontamination Bags	A8, U1
3	Diapers (FCS)	A8
1	Docking Target	U3
1	Exerciser	A8
30	Fecal Bags	R10
1	Flight Data File	R1, R2, R3
1	Fire Extinguisher	A3
2	Food	B1, L3
1	Gas Separator	A1
4	Glare Shades	R1
3	Helmet & Accessory Bags	R6
2	Handhold, G&N	R1
3	Headrest Pads	A5
3	Heel Restraints	A5
1	Helmet Shield	PGA Bag
3	Inflight Coveralls	PGA Bag
1	Jettison Bag	R13
2	Liquid Cooled Garments	U1
3	Lightweight Headsets	A8
1	Maintenance Kit	A8
1	Medical Kit	R8
1	Monocular	U4
3	O_2 Screen Caps	PGA Bag
3	O_2 Mask	Under Repress Rack
3	O_2 Interconnect	2-A1, 1-side A8
2	Penlight	A1
3	PGA Elect Covers	PGA Bag
3	PLV Ducts	A1
3	PPK	A8
1	Radiation Meter	G&N Panel
3	Roll-on-cuff	R11
5	Rope	A5
1	Side Hatch Dump Equipment	R10
3	Sleep Restraint	UEB
1	Snag Line	A1
1	Spotmeter	A5
2	Sun Filters, G&N	R1
1	S-178 Shade	Window Shade Bag
1	Sea Dye Marker	A1
32	Springs, Snaps, Clips	Curtain in front B5, B6
2	Survival Kits	R4
3	Strap, Couch	PGA Bag
6	Strap, Utility	R5
2	Strap, Probe	A1
1	Tone Booster	Under A3
1	Tape	R5
1	Tape Recorder	B8
4	Tape Cassettes & Batteries	U4
	Tape Cassettes & Batteries (pre-recorded)	
3	Temporary Stowage Bags	A1
1	Timer	A5
7	Tissue Dispenser	5-A1, 2-A8
1	Tool "E"	L2
1	Tool Kit	A1
3	Towels	A1
3	UCTA Clamps	PGA Bag
1	Urine Hose & Suit Adapter	Under A6
3	Urine Transfer System	R11
3	Urine Filters	R5
1	UTS Receiver, Spare	R11
1	Urine Receptacle	A8
1	Vacuum Hose, 2 Brushes, & Interconnect	Side A8
5	Window Shades	On Repress Rack

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EMERGENCY PROCEDURES
(Flight copies only)

see CSM SYSTEMS CHECKLIST

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EMERGENCY PROCEDURES
(Flight copies only)

see CSM SYSTEMS CHECKLIST

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EMERGENCY POWER DOWN	AMPS	
HYCON CAMERA - OFF	5.1	
02 HTRS (2) - OFF (CTR)	11.1	
02 FANS (2) - OFF (CTR)	5.4	
H2 HTRS (2) - OFF (CTR)	1.4	
H2 FANS (2) - OFF (CTR)	0.7	
G&N OPT PWR - OFF	3.1	
POT H20 HTR - OFF	1.6	MAX
ECS RAD HTRS (2) - OFF	17.2	EA
SPS LINE HTR - OFF (CTR)	6.2	(A/B)
SPS GAUGING - OFF	3.0	
GMBL MTRS P2 & Y2 - OFF (NOT LAUNCH)	10.0	
cb SPS P1 & Y1 (Pnl 3) - OPEN		
TVC GMBL DR (P&Y) - 1		
IF UNSUITED, SUIT COMP - OFF	4.0	
FC PUMPS (3) - OFF (UNTIL TSKIN >460°F)	3.7	TOTAL
SM RCS HTRS (4) - OFF	2.9	EA MAX
(ELECTRICALLY ISOLATE IF QUAD <55°F)		
BMAG #2 - OFF	2.6	from ON
	1.9	from WARMUP
LIGHTS - MIN REQD	1.6	
S BD PWR AMP - OFF (CTR)	4.0	
TAPE RCDR - OFF (CTR)	1.6	
ECS PRI GLY PUMP - OFF (G&N LIMIT 2.5 HRS)	2.6	
SEC COOL EVAP - RESET (58 SEC), THEN OFF	4.3	
SEC COOL PUMP - OFF (CTR)		
cb ECS RAD CONT/HTRS (2) (Pnl 5) - OPEN		
CMC POWERDOWN	6.3	
CMC MODE - FREE		
G&N IMU PWR - OFF		
V48E		
F V04 N46 LOAD 0 (NO DAP) IN LEFT DIGIT OF R1		
PRO,PRO,PRO		
V46E		
V37E06E		
F V50 N25, 00062 CMC PWR DN		
PRO REPEATEDLY UNTIL STBY LT - ON		
G&N PWR - OFF	1.5	
SCE PWR - OFF (CTR)	0.7	
C/W NORMAL - ACK		
VHF AM (2) - OFF (CTR)	0.2	EA
HGA PWR - OFF	1.9	
TELECOM GRP 1&2 - OFF	1.8	
cb INSTR ESS MN A&B (Pnl 5) - OPEN	4.9	

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TIME	REMARKS

CREW LOG

CREW LOG

TIME	REMARKS

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TIME	REMARKS

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