

APOLLO 16

CSM LAUNCH CHECKLIST

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APOLLO 16

CSM LAUNCH CHECKLIST

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CSM LAUNCH CHECKLIST

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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 - MAN
 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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LIFTOFF CONFIG

α/Pc IND sw - α
■ LV/SPS IND - 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 EXT/REL - OFF (guarded)
PROBE EXT/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

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TWR JETT (2) - AUTO (down) (guarded)
 LV GUID - IU
 LV STAGE - off(down)(guarded)
 XLUNAR - INJECT
 MN REL - off(down)(guarded)
 MSN TMR HR, MIN, 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 FANS - OFF
 CRYO PRESS IND - SRG/3
 CRYO QTY IND - 2
 H2 HTRS (2) - AUTO
 O2 HTRS 1&2 - AUTO
 O2 HTR 3 - OFF
 H2 FANS 1&2 - OFF
 H2 FAN 3 - ON
 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 ON - 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 - gray
FC HTRS (3) - on (up)
FC IND sel - 2
SPS QTY TEST - off (center)
OXID FLOW VLV INCR - NORM
OXID FLOW VLV PRIM - ~~PRIM~~ SEC
PUG MODE - ~~NORM~~ PRIM
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

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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 vlv - 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 20C

PANEL 4

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

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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 (2) - on (up)
BAT CHGR - AC1
NONESS BUS - MNA
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 ECS XDUCR PRESS GRP 2 MNA - open
 cb WASTE H2O/UR DUMP HTR (2) - open

PANEL 6

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 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)

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SCS ELEC PWR - GDC/ECA
SCS SIG CONDR/DR BIAS 1 - AC1
SCS SIG CONDR/DR BIAS 2 - AC2
BMAG PWR (2) - ON
DIRECT 02 vlv - OPEN (CCW) (>2 in H2O on SUIT/CAB ΔP ind)
(02 flow - 0.6-0.8 lb/hr)

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

PIR - AUDIO/TONE

PAD COMM - OFF

INTERCOM - T/R

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 - 90
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

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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) - 5
SYS TEST (RH) - B
CM RCS HTRS - OFF
WASTE H2O DUMP - HTR A
UR 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 181

cb Panel 181 - all closed except:
 cb LOGIC PWR (2) - open
CRYO 3 AC PWR - on (up)
SM/AC PWR - on (up)
DOOR JETT - off (down) (guarded)
LOGIC PWR (2) - OFF (ctr)

PANEL 201

AC UTIL PWR - OFF

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PANEL 225

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

PANEL 226

cb Panel 226 - all closed except:
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 230

MAP CAMR ON - STBY
MAP CAMR ON tb - gray
MAP CAMR TRACK - OFF
MAP CAMR TRACK tb - gray
GAMMA RAY BOOM DPLY - off (ctr)
GAMMA RAY BOOM DPLY tb - gray
GAMMA RAY BOOM JETT - off (down)
GAMMA RAY BOOM JETT tb - gray
MASS SPECT BOOM DPLY - off (ctr)
MASS SPECT BOOM DPLY tb - gray
MASS SPECT BOOM JETT - off (down)
MASS SPECT BOOM JETT tb - gray
MAP CAMR IMAGE MTN - OFF
LASER ALTM - OFF
GAMMA RAY EXP - OFF
MASS SPECT EXP - OFF
MASS SPECT ION SOURCE - OFF
DATA SYS ON - OFF
DATA SYS CAL - off (down)
GAMMA RAY GAIN - ctr
MASS SPECT MULT - LO
MASS SPECT DSCRM - HI

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PAN CAMR SELF TEST - off (ctr)
 PAN CAMR STEREO - STEREO
 α RAY/X DR - α OFF
 SUB SAT - off (ctr)
 SUB SAT tb - gray
 PAN CAMR MODE - STBY
 PAN CAMR OPR tb - gray
 PAN CAMR PWR - BOOST
~~PAN CAMR EXPOSURE - OFF~~ PAN CAMR V/h OVRD - OFF(ctr)
 X RAY - OFF

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 277

cb Panel 277 - all open

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PANEL 278

cb Panel 278 - all closed except:
 cb UPRT SYS COMPR (2) - open
MAP CAMR/LASER EXP COVERS - ctr
MAP CAMR/LASER EXP COVERS tb - gray
ALPHA/X-RAY EXP COVERS - ctr
ALPHA/X-RAY EXP COVERS tb - gray
SM PWR SOURCE - FC2 (guarded)
02 TK 3 ISOL vlv - off (ctr)(OPEN*)
02 TK 3 ISOL vlv tb - gray

PANEL 300

RH SUIT FLOW vlv - FULL FLOW

PANEL 301

LH 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

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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

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)

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PANEL 352

WASTE TK SERVICING vlv - CLOSE
PRESS RELF vlv - RELF
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

O2 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)

PANEL 603

EVA STA 02 SUP - OFF

PANEL 604

SUIT PRESS ALARM - OFF

FWD HATCH

PRESS EQUAL vlv - CLOSE

ACTR HNDL sel - stow/check locked

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.

DATE 12/13/71

BOOST PREPARATION

-20:00

Change X STABLE MEMBER AZIMUTH, if necessary:

```
*V78E *
*f 06 29 X SM AZ (.01°)*
*v21E *
*Load new Azimuth *
*PRO *
*ALIGN GDC *
```

```
AUTO RCS A/C ROLL (4) - OFF (verify)
AUTO RCS B/D ROLL B1 & B2 - MNA
AUTO RCS B/D ROLL D1 & D2 - MNB
AUTO RCS PITCH A3 & C4 - MNB
AUTO RCS PITCH C3 & A4 - MNA
AUTO RCS YAW B3 & D4 - MNA
AUTO RCS YAW D3 & B4 - MNB
```

-15:00

CTE UPDATE VERIFICATION

```
DC IND sel - BAT C
DC VOLTS ind - 35-37.5 vdc
DC IND sel - MNA
FDAI-1 total att R=90+AZ, P=90, Y=0
FDAI SCALE - 5/5
RATE - HIGH
TRANS CONTR PWR - on(up) (verify)
RHC PWR DIRECT(2) - MNA/MNB
CMC MODE - FREE
BMAG MODE (3) - RATE 1
RHC #2 - ARMED
```

ASTRO LAUNCH OPERATIONS VOICE CHECK

```
LMP S BD sw - OFF
CDR VHF AM sw - OFF
VOICE CHECK WITH MCCH
LMP S BD sw - T/R
CDR VHF AM sw - T/R
SPS THRUST - NORMAL (locked)
ΔV THRUST (2) - OFF
α/PC IND sw - α
```

BOOST PREPARATION

DATE 12/13/71

EDS AUTO - on (up)
2 ENG OUT - AUTO
LV RATES - AUTO
RCS CMD - OFF
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB

BOOST PREPARATION

-10:00 FC REAC vlv - LATCH

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

-04:10 L/V ENGINE 1ts (5) - on

-04:00 ASTRO LAUNCH OPERATIONS COMM CHECK

DSKY - Verify P02
V75 (Do not 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
VHF AM VOL tw - increase to above
normal listening level

-00:45 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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SATURN BOOST

 3/8/72
APR 16

	DET	θ	VI	$\dot{H}$	H
	00:00	90	1341	0	-.0
	:30	85	1400	299	.6
	1	68	1883	817	3.3
	1:30	49	3044	1504	9.0
	2	34	5087	2234	18.2
a	2:18	28	6783	2726	25.4
	2:30	25	7902	2961	31.1
b	2:41	22	8976	3174	36.3
	3	22	9164	2777	46.0
	3:30	24	9702	2290	58.4
	4	21	10341	1861	68.7
	4:30	19	11079	1464	76.9
	5	17	11914	1102	83.2
	5:30	14	12852	778	87.8
	6	12	13899	497	90.9
	6:30	9	15067	263	92.8
	7	6	16374	86	93.6
	7:30	3	17842	-23	93.7
	8	6	19262	-58	93.5
	8:30	0	20618	-28	93.3
	9	357	22003	21	93.2
c	9:18	355	22869	86	93.4
	9:30	353	22998	36	93.5
	10	350	23535	-40	93.5
	10:30	347	24100	-66	93.3
	11	344	24690	-69	92.9
	11:30	342	25306	-36	92.6
d	11:44	342	25599	-1	92.6

^aTimebase 2 (S-IC center-engine +.01 sec)

^bTimebase 3 (S-IC outboard-engine cutoff +.01 sec)

^cTimebase 4 (S-II engine cutoff +.01 sec)

^dTimebase 5 (S-IVB guidance cutoff signal +.21 sec)

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LAUNCH TRAJECTORY

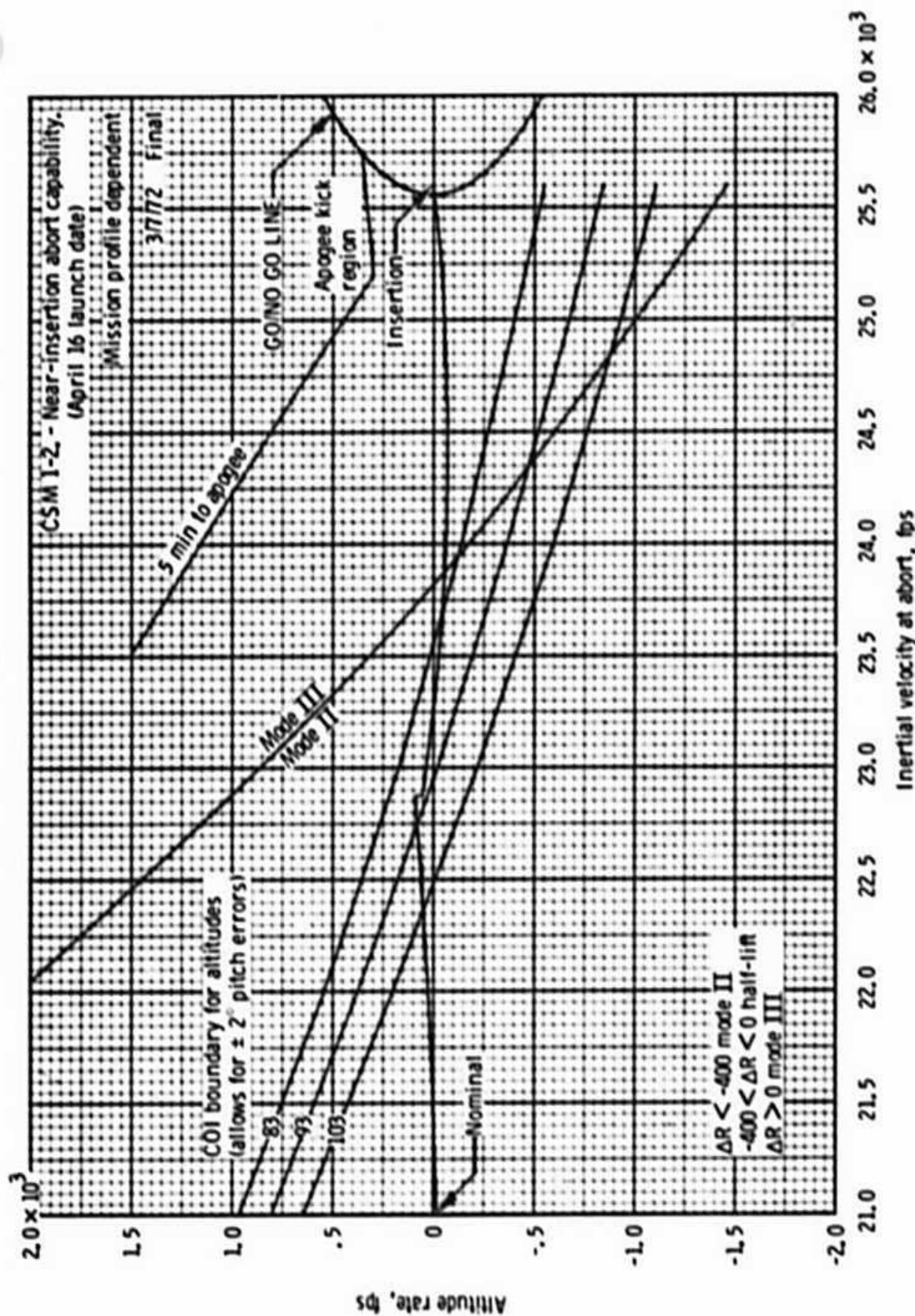
L
2-4



DATE 3/7/72

DATE 3/7/72

L
2-5



Near-insertion abort capability.

NEAR INSERTION
ABORT

CSM 1-4.- Recommended manual EOI
shutdown velocities.Mission independent
4/15/71 Final

SHUTDOWN ALTITUDE, h (N. MI.)	INERTIAL VELOCITY, V_i (fps)	h_a/h_p (N. MI.)
150	25291	150/90
145	25318	145/90
140	25344	140/90
135	25371	135/90
130	25398	130/90
125	25424	125/90
120	25451	120/90
115	25478	115/90
110	25505	110/90
105	25532	105/90
100	25559	100/90
95	25586	95/90
90	25613	90/90
85	25641	90/85
80	25668	90/80
75	25695	90/75
70	25723	90/70

NOTE: Insertion altitude defines cutoff velocity assuming $h = 0$ and results in $h = 90$ n mi (h_a or h_p) $1/2$ rev. later, example: If $h = 75$, V_i @ cutoff = 25,695 results in a 75/90 orbit.

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BOOST

-00:09 Ignition CMD
 -00:01 L/V ENGINES 1ts (5) - out
 00:00 LIFTOFF 1t - on

*LIFTOFF VERIFIED:
 * If LIFTOFF 1t off - push *
 * If NO AUTO ABORT 1t on - push*

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

*If no P11: Key ENTR *
 * START DET & RESET MET*

06 62 VI,H DOT, H PAD (fps,fps,.1nm)
 If LV GUID & LV RATE 1ts on:
 * LV GUID - CMC *

+00:02 Yaw Mnvr - report
 +00:11 Roll & Pitch Program - report
 +00:30 Roll complete - report

+00:50 Monitor q_a to T +02:00
 (100%, 5° Att error)

CABIN PRESSURE DECREASING ~14K(2.3 nm)

If no Press decrease ~25K(4.1 nm):
 * CAB PRESS RELIEF vlv(RH)-DUMP *

+01:01 MODE IB - report
PRPLNT DUMP - RCS CMD

+01:21
 +01:24 MAX Q
 +01:57 MODE IC - report
 +01:55

00:00

+4°/sec P,Y
 +20°/sec R

MODE IA

01:01

MODE IB

+4°/sec P,Y
 +20°/sec R

H=16.5 nm

BOOST

3/29/72
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BOOST

+02:00 EDS AUTO - OFF
2 ENG OUT - OFF
LV RATES - OFF
LV RATE 1t disabled as IU failure cue
V82E, N62E

+9°/sec P,Y
+20°/sec R

+02:18 GO/NO GO FOR STAGING - report

MODE IC

+02:18 INBOARD CUTOFF - (1t 5 on)
LIFTOFF 1t - out

+02:39 CMC BOOST Polynomial ends

+02:41 OUTBOARD CUTOFF - report (1ts on)

+02:42 SIC/SII STAGING (1ts off)

+02:43 SII Ign Command (1ts on)

SII SEP 1t - on

+02:44 SII 65% - 1ts out

+03:12 SII SEP 1t - out report

+03:18 TWR JETT (2) - on (up) (TFF>1+20)
*NO TWR JETT, pg L/4-2 *

TWR JETT

For MAN BOOSTER CONTROL:

* LV GUID - CMC *

* Key V46E *

α/Pc sw - Pc

MAN ATT PITCH - RATE CMD

Twr Jett & MODE II - Report

GLY EVAP STEAM PRESS - AUTO

GLY EVAP H2O FLOW - AUTO

MODE II

+03:22 Guidance Initiate - report (OECO +41sec)

+03:52 Guidance Good

+04:00 Report Status

+05:00 Report Status

+05:55 SIVB to COI

+06:00 Report Status

GMBL MOT (4) - START - ON (LMP Confirm)

Check GPI

LV/SPS IND - GPI (Momentarily)

PITCH = ~~-0.47°~~ - 0.53°

YAW = +1.90°

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4/6/72

+06:15 OMNI ANT - D (AZ < 96°)
- C (AZ > 96°)
+06:45 SIVB to orbit
+07:00 Report Status
+07:41 IECO (1t 5 - on)
+08:00 Report Status
+08:17 PU SHIFT
+08:30 GO/NO GO FOR STAGING - report
+08:34 Level sense arm
+09:15 Mode IV - Report
(VI ~ 22,704, H DOT ~ +72,
H ~ +94)

Report Status
+09:18 OECO (1ts on)
+09:19 SII Staging - 1ts out
+09:20 SIVB Ign Cmd - 1t on
+09:22 SIVB 65% - 1t out

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

~10:19

MODE III

MODE IV

INSERTION

+11:00 Report Status
+11:44 SECO (1t on) - report
(Begin TB5)

*If LV GUID - CMC: *
* LV STAGE sw - SII/SIVB *
* SECO (1t on, begin TB5)*

*If no SECO (VI +100 fps): *
* THC-CCW & neutral in 1 sec *

+11:54 INSERTION - 1t out (TB5 + 10 sec)

Record VI _____ (fps)
H DOT _____ (fps)
H PAD _____ (.1nm)

KEY RLSE

Record HA _____ (.1nm)
HP _____ (.1nm)
TFF _____ (min-sec)

PRO

DATE 3/7/72

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
NAV	CHECK SEC	X	X		.	X		.
N43	LAT		0		.		0	.
	LONG				.			.
	ALT	+	0		.	+	0	.

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COMMENTS	CM			RCS			PURPOSE
	R	C	S	MAN	N		PROP/GUID
① EMS ΔV_c WILL COUNT FROM 100 TO 128.6 #	+	6	6	9	7	1	V/T N47
		0	0	NA			TRIM N48
		0	0	NA			Y TRIM
	+	0	0	0	0	0	HRS GETI
② TERMINATE BURN AT NBS $V_{y2} = 0$ (R3) AND N44 $h_p < 45$ (R2) OR CM-RCS PRESS ≤ 1450 AND $h_p < 56$ (FOR CAPTURE)	+	0	0	0	4	0	MIN N33
	+	0	0	0	0	0	SEC
	-	0	0	8	7	9	ΔV_x N81
	+	0	0	0	0	0	ΔV_y
③ GO TO SINGLE RING AFTER BURN	+	0	0	1	9	2	ΔV_z
	X	X	X	1	8	0	R
	X	X	X	2	8	9	P
	X	X	X	0	0	0	Y
④ TRACK HORIZON (HEADS UP) WITH 9° WINDOW MARK	+			NA			H _A N44
	+	0	0	4	5	0	H _p
	+	0	0	9	0	0	ΔVT
	X	X	X	2	1	8	BT
⑤ R .05g ≈ 180 P .05g ≈ 281 Y .05g ≈ 000	X	0	0	0	0	0	ΔVC #
	X	X	X	X	NA		SXTS
	+		NA		0		SFT
	+	NA		0	0		TRN
⑥ FLY LEFT DOWN (HEADS UP) To 1g THEN ROLL	X	X	X	NA			BSS
	X	X		NA			SPA
	X	X	X	NA			SXP
	-	0	0	1	5	1	LAT N61
⑦ PWR DOWN after Deorbit Burn	-	1	5	9	5	4	LONG
	+			NA			RTGO EMS
	+	2	5	7	0	0	V10
	0	0	1	1	2	5	2 GET 0.05G

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CM RCS DEORBIT

(Inadvertent CM/SM SEP between HP>45nm &
PYRO's SAFE)

(275)	cb MNA BAT C - close cb MNB BAT C - close C&W MODE - CM RCS TRNFR - CM *If NO CM RCS PRESS, Go to EMER/1-16*
(326)	BMAG MODE (3) - ATT 1/RATE 2 02 SM SUPPLY vlv - OFF TVC SERVO PWR (2) - OFF DIRECT 02 vlv - CLOSE CM RCS LOGIC - OFF Load RCS DAP, 11102, 01111, V46E Perform P30, pg L/6-1 Load CM BURN ATT in N17, V63E MNVR to CM BURN ATT
TIG -5 min	cb CSM/LM FNL SEP (2) - close CSM/LM FNL SEP (2) - on (up) V37E 41E
F 50 18	ENTR
06 85	Set $\Delta VC = +100.0$
59:25	DSKY BLANKS
59:30	
16 85	TAPE RCDR - HBR/RCD/FWD/CMD RESET EMS MODE - NORMAL MAN ATT (PITCH) - ACCEL CMD
	Go to step 22, pg L/6-5 & continue in C/L
00:00	CM RCS BURN
	Perform single ring rolling Entry

INSERTION AND SYSTEMS CHECKS

- 1 GMBL MTRS (4) - OFF (LMP confirm)
 EDS PWR - OFF
 TVC SERVO PWR (2) - OFF
 SECS PYRO ARM (2) - SAFE
 SECS LOGIC (2) - OFF
 cb SECS ARM (2) - open
 cb DIRECT ULLAGE (2) - open
 cb ELS/CM-SM SEP (2) - open
 cb FLT/PL VENT - open
 MN BUS TIE (2) - OFF(LMP)
 EMS FUNC - OFF
 TRANS CONT PWR - OFF
 ROT CONTR PWR DIRECT(2) - OFF
 BMAG MODE (3) - RATE 2
 CM RCS LOGIC - OFF
 LV STAGE sw - OFF (verify)
 RHC #1 & #2 - LOCKED
 CAB PRESS REL vlv (2) - NORMAL/LATCHED
 REPRESS PKG vlv - OFF
 DIRECT O2 vlv - CLOSE
 cb ECS XDUCR PRESS GRP 2 MNA - close
 INSTALL COAS

MONITOR LV TANK PRESS

- *If $\Delta P > 36$ psid (OXID > FUEL) *
- *If $\Delta P > 26$ psid (FUEL > OXID) *
- *If LOX TK PRESS > 50 psia *
- * EMERGENCY CSM/LV SEP pg EMER/1-1*

CYI AOS
(00:16:46)

NOTE: Steps 2 thru 30 are not sequential

CMP 1

- 2 SM RCS HTRS (4) - PRIM
 C/W - NORMAL
 BPC JETT KNOB - 180° from BPC JETT
 GN2 vlv HNDL - VENT (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

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INSERTION & SYS CK

- 4 MCCH - G/N Status
Z Torquing angle _____

5 SM RCS MONITORING CHECK

- SM RCS PRPLNT tb (8) - gray
SM RCS He 1 & 2 tb (8) - gray
CMP 2 SM RCS IND - He TK TEMP
RCS IND sel - SM A, B, C, D
PKG TEMP - 115°-175° F (C/W 75°-205°)
He PRESS - 4100-4200 psia
MANF PRESS - 192-207 psia (C/W 145-215 psia)
He TK TEMP - 60°-90°F

6 CM RCS MONITORING CHECK

- CM RCS PRPLNT tb (2) - gray
CMP 3 RCS IND sw - CM 1,2
He TEMP - 60°-90°F
He PRESS - 4100-4200 psia
MANF 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 1t (2) - on)
C/W CSM - CSM (CM RCS 1t (2) - out)

8 CMP to LEB for MN REG CHECK

- CMP 4 STRUT UNLOCK LANYARD (2) - STOW
DRINKING WATER SUPPLY vlv - ON
cb COAS/TUNL LTG MNB - close
Unstow:
Helmet bags (U1)
Accessory bags (U1)
Tool E (L2)

9 Confirm normal suit and cabin pressure

- If cabin press > 5.3:
O2 flow - 0.2 lb/hr
If 4.7 < cabin press < 5.3:
O2 flow - pegged lo or hi, ~0.7 lb/hr stable
EMERG CABIN PRESS vlv - BOTH
SUIT CKT RET vlv - open (pull)
Install CM5 Window Cover
Remove helmet & gloves & stow in PGA bag
Unstow & mount TSB's (U1)

10 MAIN REG CHECK

CMP 5

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

CMP 6

Monitor SEC ACCUM QUANTITY
SEC GLY To RAD vlv - NORM for 30 sec,
then BYPASS (CDR)

+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
POT H2O HTR - MNA

13

CYI LOS
(00:23:30)

{ PCM BIT RATE - LOW
UP TLM - CMD RSET, then NORM
VHF AM A - SIMPLEX
VHF AM B - off (ctr)

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- 14 FC PURGE CHECK
H2/O2 PURGE (6) - ON (monitor)
Observe Flow rate inc
Reset MA (as req'd)
H2 PURGE LINE HTR - OFF

- 15 EPS MONITORING CHECK
Cryogenic Pressure - Quantity Check
H2 PRESS (3) - 225-260 psia
O2 PRESS (3) - 865-935 psia
SURGE TK PRESS - 865-935 psia
CRYO FANS - OFF; ON as req'd

FC Power Plant Check
FC HTRS(3) - on(up)
FC RAD tb (3) - gray
FC REAC tb (3) - gray
FC IND sel - 1, 2, 3
H2 FLOW - 0.03-0.15 lb/hr
O2 FLOW - 0.25-1.2 lb/hr
MOD SKIN TEMP - 390-440° F
MOD COND EXH TEMP - 150-175° F
FC pH HI tb - gray
FC RAD TEMP LO tb - gray

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 (check amps)
MAIN BUS A, B, (26.5-31 vdc)
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 5B (BAT RLY BUS - 3.4-4.1 vdc)

A-C VOLTS - 113 to 117 all phases

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16 ECS MONITORING CHECK

SUIT COMP ΔP - .3-.4 psid
 O2 SURGE TANK PRESS - 865-935 psia
 REPRESS O2 >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 H2O QTY - 10-100%
 WASTE H2O 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
 Check SPS OXID, FUEL QTY & UNBAL
 OXID FLOW VLV PRIM - ~~PRIM~~ SEC (verify)
 SPS He VLV (1&2) - AUTO, tb - bp

18 GDC ALIGN (__:__:__)

19 UNSTOW SEQ CAMERA BRACKET & ORDEAL

20 MOUNT ORDEAL BOX & INITIALIZE

CMP7
 AI UV MAG / 21
 UV BKT /
 UV Lens /
 Times RT Grith Shelf

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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 (T8,1/250,10) 12 fps, MAG AA (B3)
Power cable (B3)
CMP II 18mm lens (B3)
Rt. angle mirror (B3)
(Assemble & mount in L.H. rendezvous window)

EL (f8,1/250,focus) 10fr, MAG NN (B3)

CMP IO Spotmeter
(Stow in LMP TSB)

TV (ALC - PEAK, f44) (A1)

Power cable (A1)
CMP 2 Bracket (A1)
Monitor & cable (A1)
(Assemble, connect cables & hand to LMP)

23 OPTICS DUST COVER JETT

Install Optics eyepieces
G/N PWR OPTICS - on (up)
CMP 9 OPT ZERO - OFF, then ZERO (15 sec)
OPT ZERO - OFF
OPT MODE - MAN
OPT COUPLING CONT - DIRECT
OPT SPEED CONT - HI
OHC - MAX RIGHT (Obs eject thru SCT)
(SXT 40°, SCT 150° shaft angle)

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

CMP 12

N71: __ __, __ __

N05: __ __ __ . __ __

N93:
X __ __ . __ __ __

Y __ __ . __ __ __

Z __ __ . __ __ __

GET: __ __: __ __: __ __

If IMU is realigned,
Realign GDC (CDR)

OOE

RETICLE BRIGHTNESS - DIM
Stow Optics Eyepieces

CRO AOS 25
(00:52:21)

CRO LOS
(00:57:44)

HSK AOS
(00:59:37)

26

SUNRISE
(01:04:45)

HSK LOS
(01:05:13)

(__:__:__)

US AOS
(01:28:59)

Increase S-BD volume
Two way S-BD VOICE Check
Report GYRO torquing angles

SCS ATT Ref Comp Check

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

DATE 3/7/72

DATE

27 EXTEND DOCKING PROBE

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

	EXT	RET
FULL EXT	Gray	Gray
FULL RET	BP	BP
PART EXT	BP	Gray

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

28 COPY TLI, TLI ABORT, & P37 PADS

29 SV UPDATES (MCCH)

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

US LOS
(01:48:42)

CYI AOS
(01:49:58)

*UNSTOW: GEC ck VWP
sys cl - R12
R12
FLIGHT PLAN Z - R12
Updates - R12
DATA CARDS - MOC
STAR CHARTS - LEB
STOWAGE LISTS - LEB*

CYI LOS
(01:54:46)

VERIFY DSE TAPE MOTION
(LBR/RCD/FWD/CMD RESET)

SUNSET
(01:55:08)

TLI

X		:		:		X		:		:		TB6p
X	X	X				X	X	X				R
X	X	X				X	X	X				P
X	X	X				X	X	X				Y
X	X	X		:		X	X	X		:		BT
					.						.	$\Delta VC'$
+						+						VI
X	X	X				X	X	X				R
X	X	X				X	X	X				P
X	X	X				X	X	X				Y
X	X	X				X	X	X				R
X	X	X				X	X	X				P
X	X	X				X	X	X				Y
X	X				.	X	X				.	R2 Align
X	X				.	X	X				.	R2 Ign
X	X			:		X	X			:		ORDEAL Start
X	X	X				X	X	X				YAW

DATE 12/13/71

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
NAV	CHECK SEC	X	X		.	X		.
N43	LAT		0		.		0	.
	LONG				.			.
	ALT	+	0		.	+	0	.

DATE 12/13/71

P30 MANEUVER

L/2-21

DATE 12/13/71

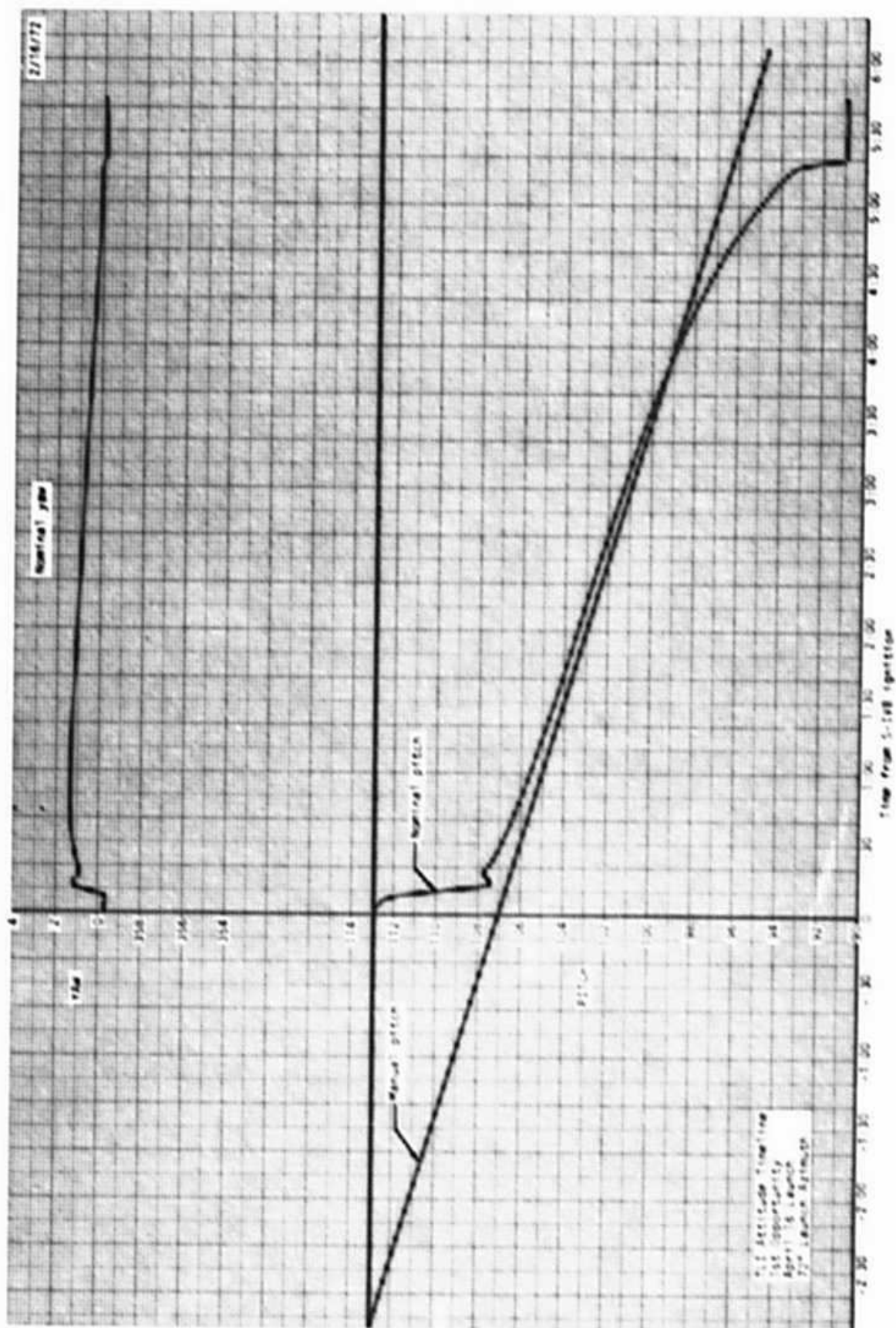
SET STARS					PURPOSE				
					PROP/GUID				
+ 0 0 0 0					WT N47				
R ALIGN					P TRIM N48				
P ALIGN					Y TRIM				
Y ALIGN					HRS GETI				
+ 0 0 0 0					MIN N33				
+ 0 0 0 0					SEC				
ULLAGE					ΔV_X N81				
					ΔV_Y				
					ΔV_Z				
X X X					R				
X X X					P				
X X X					Y				
+ 0 0 0 0					H _A N44				
					H _P				
+ 0 0 0 0					ΔVT				
X X X					BT				
X					ΔVC				
X X X X					SXTS				
+ 0 0 0 0					SFT				
+ 0 0 0 0					TRN				
X X X					BSS				
X X					SPA				
X X X					SXP				
P37 FOR L/0+8					GETI				
X					ΔVT				
X					LONG				
					RTGO EMS				
					VIO				
					GET 0.05G				

SET STARS				PURPOSE			
				PROP/GUID			
				+			WT N47
R ALIGN	_____	_____	_____		0	0	P _{TRIM} N48
P ALIGN	_____	_____	_____		0	0	Y _{TRIM}
Y ALIGN	_____	_____	_____	+	0	0	HRS GETI
				+	0	0	MIN N33
				+	0		SEC
ULLAGE _____							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
HORIZON/WINDOW _____				X	X	X	BT
_____				X			ΔVC
_____				X	X	X	SXTS
_____				+			SFT
				+			TRN
				X	X	X	BSS
				X	X		SPA
P37 FOR L/0+8				X	X	X	SXP
					0		LAT N61
X							LONG
X				+			RTGO EMS
				+			VIO
							GET 0.05G

DATE 12/13/71

DATE 3/7/72

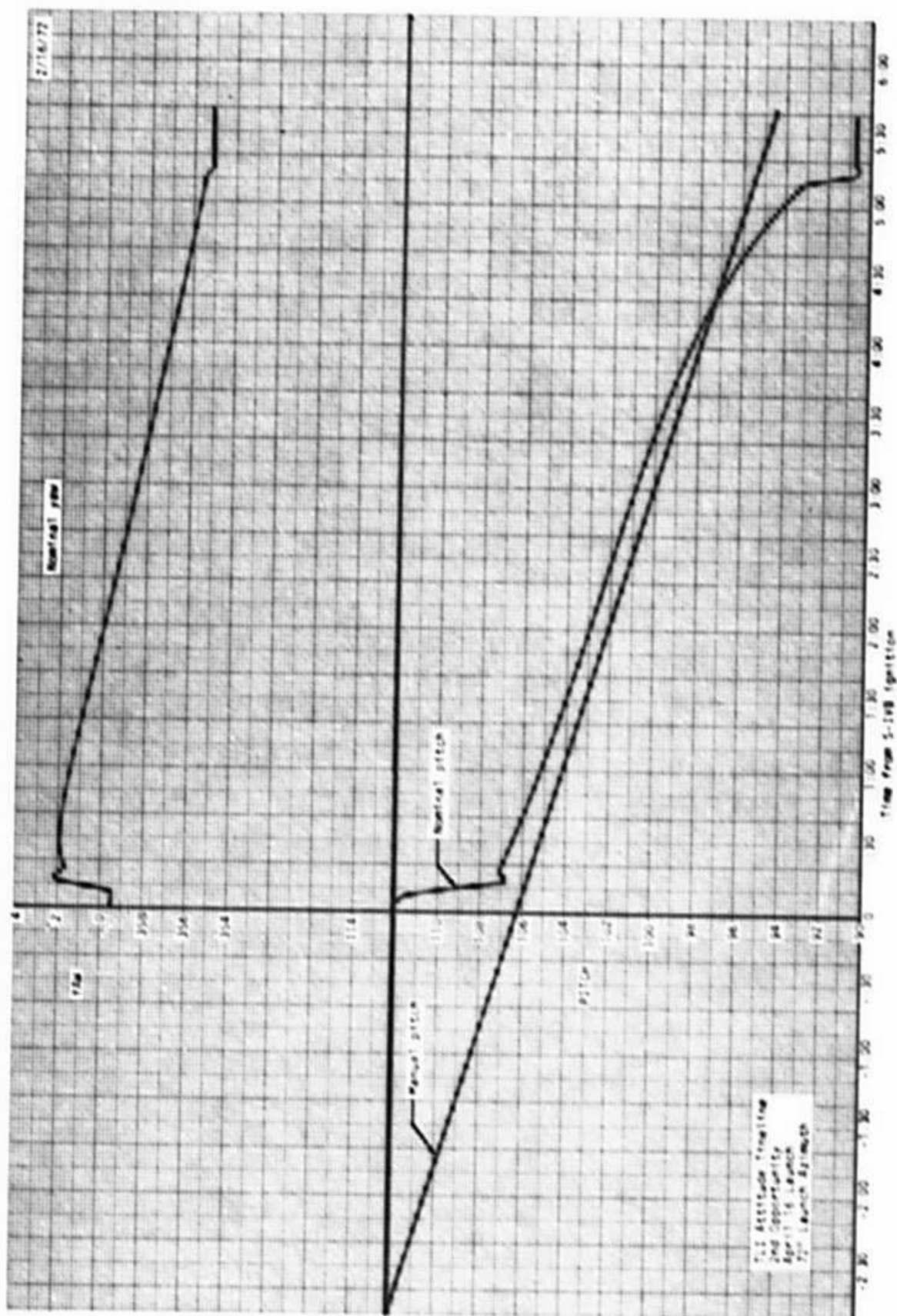
L
2-23



TLI ATT TIMELINE
OPP 1

TLI ATT TIMELINE OPP 2

L
2-24



DATE 3/7/72

DATE 3/7/72**NOMINAL SIVB TLI 1**

LAUNCH APR 16		2/10/72			
DET	θ	ψ	VI	H	H
0:00	113	359.7	25607	16	96
:30	107	1.2	26157	12	96
1	106	1.3	26801	41	96
1:30	104	1.2	27527	130	96
2	103	1.1	28289	290	97
2:30	102	0.9	29089	528	99
3	101	0.7	29931	852	103
3:30	100	0.6	30821	1271	108
4	99	0.4	31763	1792	115
4:30	97	0.2	32765	2422	126
5	95	0.1	33837	3164	139
5:30	91	359.9	34997	4000	157
5:44	91	359.9	35584	4440	167

MANUAL SIVB TLI 1

LAUNCH APR 16		2/10/72			
DET	θ	ψ	VI	H	H
0:00	107.0	0.5	25607	16	96
:30	106.0	0.5	26157	12	96
1	105.7	0.5	26801	41	96
1:30	104.6	0.5	27527	130	96
2	103.5	0.5	28289	290	97
2:30	102.5	0.5	29089	528	99
3	100.9	0.5	29931	852	103
3:30	99.9	0.5	30821	1271	108
4	98.9	0.5	31763	1792	115
4:30	97.9	0.5	32765	2422	126
5	96.8	0.5	33837	3164	139
5:30	95.8	0.5	34997	4000	157
5:44	95.3	0.5	35584	4440	167

L
2-25TLI TRAJECTORY
OPP 1 NOM & MAN

TLI TRAJECTORY
OPP 2 NOM & MAN

NOMINAL SIVB TLI 2

LAUNCH APR 16

2/10/72

DET	Θ	Ψ	VI	H
0:00	112	359.6	25601	17 97
:30	107	1.9	26218	13 97
1	105	1.4	26916	51 97
1:30	104	0.7	27649	154 98
2	103	0.0	28417	330 99
2:30	102	359.2	29224	585 101
3	101	358.5	30074	929 105
3:30	98	357.7	30971	1369 111
4	98	357.0	31922	1912 119
4:30	97	356.3	32936	2566 130
5	94	355.7	34021	3331 144
5:30	91	355.1	35193	4185 163
5:39	91	355.2	35579	4480 169

MANUAL SIVB TLI 2

LAUNCH APR 16

2/10/72

DET	Θ	Ψ	VI	H
0:00	106.2	357	25601	17 97
:30	105.2	357	26218	13 97
1	104.2	357	26916	51 97
1:30	103.1	357	27649	154 98
2	102.1	357	28417	330 99
2:30	101.1	357	29224	585 101
3	100.0	357	30074	929 105
3:30	99.0	357	30971	1369 111
4	98.0	357	31922	1912 119
4:30	96.9	357	32936	2566 130
5	95.9	357	34021	3331 144
5:30	94.8	357	35193	4185 163
5:39	94.6	357	35579	4480 169

DATE 3/7/72

7/6/72

L
2-27

TLI PREPARATION

CRO AOS
(02:25:02)

CRO LOS
(02:30:53)

XLUNAR - INJECT (verify)
EDS PWR - on (up)
Perform EMS ΔV TEST & NULL
BIAS CHECK, pg G/2-5

Set ΔVC
EMS FUNC - ΔV
GDC ALIGN
V48E, 31102, 01111
Key V83E
Set ORDEAL - 90/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
SC CONT - SCS (verify)
LV/SPS IND - SIVB (verify)
cb DIRECT ULLAGE (2) - close
Set DET - 51:00

P15 - TLI INITIATE/CUTOFF
V37E 15E

F 06 33	GET of TB6 Load GET of TB6 PRO	(hrs,min,.01sec)
F 06 14	VC/O Load VC/O PRO	(fps)
06 95	TFI, VG, VI	(min-sec,fps,fps)

TLI PREPARATION

DATE 3/7/72

L
2-28TLI, NOMINAL & MANUAL

LV GUID - IU (verify)

*If LV GUID 1t - on: *

* LV GUID - CMC *

* RHC PWR DIRECT (2) - OFF*

TB6
(-09:38)

TB6 + 10sec

UPLINK ACTY 1t - on

SII SEP 1t - on (TIG-09:38)

UPLINK ACTY 1t - out

SII SEP 1t - out

51:00
(-09:00)

Start DET counting up

*If LV GUID - CMC: *

* V16 N20E *

* MNVR to R2 Align = ____ (113°)*

MONITOR LV TANK PRESS SEQUENCE

Nominal LOX ~ 40 psia

Nominal LH2 ~ 31 psia

*If $\Delta P > 36$ psid (OXID > FUEL) **If $\Delta P > 26$ psid (FUEL > OXID) *

*If LOX TK PRESS > 50 psia *

* EMERGENCY CSM/LV SEP pg EMER/1-1*

ORDEAL FDAI #1 - ORB RATE

ORDEAL FDAI #2 - INERTIAL

ORDEAL MODE - HOLD/FAST

ORDEAL - 300/LUNAR

RHC #2 - ARMED

UP TLM CM - BLOCK (verify)

UP TLM IU - BLOCK (verify)

56:00
(-04:00)

Slew FDAI #1 to PITCH = 17°

*If LV GUID - CMC: *

* Slew FDAI #1 to PITCH = 0° *

* V16 N20E *

* Insure R2 Align = ____ (113°)*

DATE 3/7/72

57:00
(-03:00)

Insure FDAI #1 PITCH = 13°
ORDEAL MODE - OPERATE/SLOW, IU or CMC

*If LV GUID - CMC:
* MNVR to R2 Ign = ____ (107°) *

58:15 DSKY BLANKS

58:20 06 95 TFI, VG, VI (Ave G on) (min-sec,fps,fps)
(-01:40)

SCS TVC SERVO PWR #1 - AC1/MNA
SCS TVC SERVO PWR #2 - OFF (verify)
TAPE RCDR - HBR/RCD/FWD/CMD RESET
EMS MODE - NORMAL
SII SEP 1t - on

58:36
(-01:24)

*If TLI Inhibit req'd:
* before 59:42 - XLUNAR INJECT - SAFE*
* (recycle to TB5) *
* 59:42-00:12 - LV STAGE - SII/SIVB *
* (recycle to TB5) *
* after 00:12 - LV STAGE - SII/SIVB *
* (permanent inhibit)*

58:38
SUNRISE
(02:32:29)
59:42

SIVB ULLAGE Begins

SII SEP 1t - out (TIG - 18 sec)

DATE 3/7/72

L
2-30

59:52
59:55

SIVB FUEL LEAD
SIVB ULLAGE discontinues
Insure FDAI #1 PITCH = 6°
*If LV GUID - CMC: *
* FDAI #1 PITCH = 0° *

59:59

LV ENG 1 1t - on

00:00
00:02

SIVB IGNITION (___:___:___) GETI
LV ENG 1 1t - out

00:10 06 95

TFC, VG, VI

(min-sec, fps, fps)

MONITOR THRUST & ATTITUDE
MONITOR LV TANK PRESS

*If LV GUID - CMC: *

* Fly PITCH = 0° *

* YAW = 0.5° *

$+45^{\circ}/P, Y$
$+10^{\circ}/\text{sec } P, Y$
$+20^{\circ}/\text{sec } R$

00:46

PU SHIFT
VI6 N62E

05:44

KEY RLSE before ECO
SIVB ECO (1t on) (BEGIN TB7)

If no ECO at +2 sec and VI attained
* or EMS = -200 fps (CMC failed): *
* THC - CCW & NEUTRAL in 1 sec *

Key VERB (freeze display)

Record TFC

VG

VI

ΔVC

05:54

LV ENG 1 1t - out (TB 7 + 10 sec)

F 16 95

KEY RLSE
TFC (Static), VG, VI (min-sec, fps, fps)

08:26

SIVB MNVR TO ORB RT (HDS DN) ($.3^{\circ}/\text{sec}$)

DATE 3/7/72
4/6/72

L
2-31

MSFN AOS
(02:43:24)

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

F 37

PRO

00E

When CMC ACTY 1t 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

Go to T, D, & E, pg L/3-1

SATURN RATE CHANGE

V25 N1 E

3310E, 0E, XXXE, YYYYYE

SIVB RATE		SAT RATE +1 address 3311	SAT RATE +2 address 3312
		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

DATE 3/7/72

NORMAL SC/BOOSTER SEPARATIONS

1 PRE CSM SEPARATION

DIRECT 02 vlv - OPEN until
CAB PRESS = 5.7, then close
cb DOCK PROBE (2) - close (verify)
COAS PWR - on
ALIGN GDC

SIVB MNVR (: :)
SEP (: :)

*If LV GUID - CMC: *
* Mnvr to SEP ATT *
* Do not reload DAP*

Load RCS DAP
R1=11103, R2=01111

V46E

OMNI ANT-C

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 *

Moon
out
CMI

2 CSM SEPARATION PREP

DOCK PROBE EXTEND/REL - RETRACT (verify)
RCS TRNFR - SM (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

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NORM SC/BOOSTER SEP

L
3-2

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
 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) - open
 TVC SERVO PWR #1 - AC1/MNA
 Set DET - 59:30
 FC REAC vlv - LATCH

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 RCD - 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

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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

*If No Separation:

* cb RCS LOGIC (2) - close *
* 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
02 TK 3 ISOL vlv tb - gray (verify)

4 CSM TRANSPOSITION

V62E

MAN ATT (PITCH) - ACCEL CMD

00:15 Pitch up at $.5^\circ/\text{sec}$

When Pitch error needle positive,

PRO F 50 18

OMNI ANT - B

PRO 06 18

MAN ATT (PITCH) - RATE CMD

F 50 18 (completion of mnvr)

ENTR

Thrust +X(4 sec)($\Delta V \sim .7$ fps)

cb DIRECT ULLAGE (2) - open

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: $P = -8^\circ$, $Y = +294^\circ$

S BD ANT OMNI - HI GAIN

HI GAIN ANT TRACK - REACQ

TV TRANSMIT/STBY sw - TRANSMIT

Start DAC

3/29/72
DATE 3/7/72

5 DOCKING

Stabilize & align CSM

BMAG MODE (3) - ATT 1/RATE 2

At capture:

PROBE EXTND/RETR tb-bp (A, pg S/2-11) malf. DOCK
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 EXTND/RETR tb - gray
(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 EXTND/REL - OFF

DOCK PROBE RETRACT (2) - OFF

cb DOCK PROBE (2) - open

EXT LTS - OFF (verify)

TAPE RCDR - off (ctr)

PCM BIT RATE - LOW

DAC/TV - off

S BD AUX TV - off (center)

6 POST DOCKING

RATE - HIGH

ATT DB - MAX

COAS PWR - OFF

cb RCS LOGIC (2) - open (verify)

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

O2 HTR 3 - AUTO

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- 7 EQUALIZE CM/LM PRESSURE (Decal) (pg S/2-4)
- 8 REMOVE TUNNEL HATCH (Decal) (pg S/2-5)
- 9 VERIFY DOCKING LATCHES (Decal) (pg S/2-10)
- 10 CONNECT LM UMBILICALS (Decal) (pg S/2-11)
- 11 INSTALL TUNNEL HATCH (Decal) (pg S/2-8)

LM TUNL VENT vlv - LM/CM ΔP (verify hatch integrity)
TUNNEL LIGHTS - OFF

12 PRE LM SEP & EJECTION

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

ΔV CG - LM/CSM (verify)

EMS FUNC - ΔV SET/VHF RNG

Slew ΔV ind to +100.0

EMS FUNC - ΔV

TAPE RCDR - HBR/RCD/FWD/CMD RESET

DAC - 6 fps

Load RCS DAP 21101, X1111, $LOAD P_{min} + 1.23, Y_{min} - 0.12$

Load N22 att (monitor APS mnvr, hatch window)

90.0°, 325.5°, 355.9°

V60E, V63E

GDC ALIGN

DET - RESET

cb SECS ARM (2) - close (verify)

Cue MSFN

SECS LOGIC (2) - on (up)

Obtain GO from MSFN

SECS PYRO ARM (2) - ARM

TVC SERVO PWR #1 - AC1/MNA

TRANS CONTR PWR - on (up) (verify)

RHC & THC - ARMED

V37E 47E F 16 83 $\Delta V_{X,Y,Z}$

EMS MODE - NORMAL

Start DAC

(.1fps)

13 LM SEP & EJECTION

SIVB/LM SEP - on (up)

(__:__:__)

00:00 Start DET

CMC MODE - AUTO

00:05 Thrust -X (3 sec)

14 POST LM EJECTION

PRO

F37 OOE

When CMC Acty 1t out,

Key V66E, **V49 MANVR ASAP AFTER 30 SEC**

SECS PYRO ARM (2) - SAFE

SECS LOGIC (2) - OFF

cb SECS ARM (2) - open

cb SIVB/LM SEP (2) - open

02 TK 3 ISOL vlv tb - gray (verify)

MAP CAMR ON - OFF

PAN CAMR PWR - OFF

SM/AC PWR - OFF

LV/SPS IND sw - GPI

TVC SERVO PWR (2) - OFF

EMS MODE - STBY

EMS FUNC - OFF

TAPE RCDR - off (ctr)

PCM BIT RATE - LOW

Stop DAC

AUTO RCS SEL AC ROLL or BD ROLL (4) - OFF

02 HTR 3 - OFF

DATE 3/7/72

MNVR TO SIVB VIEW ATT
V49E

13:00 GO/NO GO for S-IVB YAW mnvr
 17:30 GO/NO GO for S-IVB EVASIVE mnvr

*If NO APS EVASIVE at 23:00: *
 * Thrust +X (6 sec) *
 * Monitor SIVB thru Hatch Window *

*Time from	Att for viewing SIVB			
*Ejection	after RCS EVASIVE mnvr			
*(min:sec)	Roll	Pitch	Yaw	
* 25:00	74.3°	310.3°	0.0°	*
* 30:00	90.0°	325.4°	2.1°	*

cb DIRECT ULLAGE (2) - open (verify)
 TRANS CONT PWR - OFF
 ROT CONTR PWR DIR (2) - OFF
 RHC & THC - LOCKED
 REPRESS PKG vlv - OFF
 cb 02 ISOL/AUX BAT - open

*min-sec	Event	R	Inertial Att P	Y
*00:00	Ejection	301.2°	325.5°	40.9°
*00:05	3 sec -X			
*00:22	Mnvr	90.0°	325.5°	355.9°
*03:00	6 sec -X			

DATE 3/7/72

ABORT PROCEDURES

MODE IA ABORT (00:00 to 01:01)

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

ELS - AUTO

00:14 ELS LOGIC - on (up)
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 (01:01 to 16.5 nm)

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

ELS - AUTO

00:11 CANARD DEPLOY - PUSH

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

Go to LANDING PHASE pg L/4-8

DATE 3/7/72

MODE I

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)
KEY RLSE to N44, Check HA

HA>32nm & PLAT GO

HA<32nm or PLAT NO GO

TWR JETT sw(2)-on(up)
MAN PITCH - RATE CMD
ENT ATT RO°, P135°, YO°
BMAG (3)- ATT1/RATE 2
EMS FUNC - ENTRY
EMS MODE - NORMAL
At .05G Lt,
.05G sw - on (up)
Fly Max Lift

Estab. +5°/SEC
pitch rate
EXCESSIVE + PITCH RATES

*ROLL 90° *
*USE YAW THRUSTERS TO *
*CONTROL RATE *
ROLL BACK TO HEADS DN

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 I

DATE 12/13/71

MODE II RCS ABORT
(TWR JETT to MODE III)

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

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

00:05 THC - ARMED
 TRANS CONTR - NEUTRAL THEN +X

00:24 TRANS CONTR +X OFF
 KEY RLSE to N44, Check TFF
 If TFF>2 min, Yaw 45° (LEFT) out-of-plane
 BMAG MODE (3) - ATT1/RATE 2
 cb MNA&B BAT C (2) - close
 CM/SM SEP - on (up)
 CM RCS PRESS - on (up)
 RCS TRNFR - CM
 C&W MODE - CM
 Entry ATT - (R=0°,P=120°,Y=0°)(Comp1 by 1:40)
 cb CSM/LM FNL SEP (2) - close (pull lanyard)
 CSM/LM FNL SEP (2) - on (up)
 EMS FUNC - ENTRY
 EMS MODE - NORMAL
 GET 300K _____
 θ (.05G) _____
 GET DROGUE _____

At .05G lt - on
 .05G sw - on (up)
 EMS ROLL - on (up)
 Fly Max Lift
 N62E, VI, HDOT, H

Go to LANDING PHASE pg L/4-8

DATE 12/13/71

MODE II, MODE III

MODE III SPS ABORT
($\Delta R = -400$ NM to INSERTION)

00:00 TRANS CONTR - CCW (4 Sec Min)
*If 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/SPS IND sw - GPI

00:24 TRANS CONTR +X OFF
N50E $\Delta R, HP, TFF$ (.1nm,min-sec)
BMAG MODE (3) - ATT1/RATE2
If $\Delta R > 0$:

MNVR to retro att ($R=180^\circ, P=194^\circ, Y=0^\circ$)
(Scribe on horiz, BEF, Hds up)

SCS TVC P&Y - AUTO (verify)

EMS MODE - NORMAL

ΔV THRUST A - NORMAL

02:05 DIRECT ULLAGE PB - PUSH
THRUST ON PB - PUSH
Burn to VC ($\Delta R=0$)
 ΔV THRUST (2) - OFF

GETI

(6999.9)

ΔV

VC

θ

Δtb

GET 300K

θ (.05G)

GET Drogue

If $TFF > 2$ min, Yaw 45° (LEFT)
out-of-plane

cb MNA&B BAT C(2) - close

CM/SM SEP - on (up)

CM RCS PRESS - on (up)

RCS TRNFR - CM

C&W MODE - CM

Mnvr to entry att ($R=0^\circ, P=105^\circ, Y=0^\circ$)
(BEF, Hds Dn, Full Lift)

cb CSM/LM FNL SEP (2) - close (pull lanyard)

CSM/LM ENL SEP (2) - on (up)

Note TFF

EMS MODE - STBY
EMS FUNC - ENTRY
EMS MODE - NORMAL
At .05G lt - on
 .05G sw - on (up)
 EMS ROLL - on (up)
At .2G lt - on
 Roll left 55°
Fly Half Lift

Go to LANDING PHASE pg L/4-8

MODE IV SPS TO ORBIT

(VI ~ 22,704, HDOT ~ +72, H ~ +94)

00:00 TRANS CONT - CCW (4 sec min)

*If 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/SPS IND sw - GPI

00:24 TRANS CONTR - +X OFF

Perform PITCH PROFILE or FIXED ATTITUDE BURN:PITCH PROFILE (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 >70 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 GETI

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 >70nm)

 ΔV THRUST (2) - OFF

EMS MODE - STBY

6999.9

 ΔV

VC

 θ Δtb

DATE 3/7/72

L
4-7

Record VI _____ (fps)
H DOT _____ (fps)
H PAD _____ (.1nm)
KEY RLSE

Record HA _____ (.1nm)
HP _____ (.1nm)
TFF _____ (min-sec)
PRO

V37E OOE
When CMC ACTY 1t out:

V66E

V45E

Load DAP, V48: R1=11102, R2=01111

V46E

V83E (check e)

PRO

CSM WT

P TRIM

Y TRIM

US LOS
(00:15:12)

Go to INSERTION CHECKLIST pg L/2-11

DATE 12/13/71

LANDING PHASE

LANDING PHASE (30K, DESCENDING)

30K' ELS LOGIC - on (up)
ELS - AUTO

24K' Twr jett (auto)
*TWR JETT (2) - on (up) *
Apex cover jett (auto)
APEX COVER JETT PB - PUSH
(wait 2 sec)

Drogues deployed (auto)
DROGUE DPLY PB - PUSH

*If Both drogues Fail: *
* ELS - MAN *
* STABILIZE CM *
* 5K' MAIN DPLY PB - PUSH*
* ELS - AUTO *

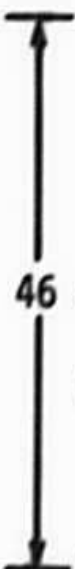
23.5K' Cabin Pressure increasing
*If not increasing by 17K': *
* CABIN PRESS REL vlv (RH) - DUMP*

10K' Main parachutes deployed
MAIN DEPLOY PB - PUSH (within 1 sec)
DIRECT O2 vlv - OPEN (verify)
VHF ANT - RECY
VHF AM A - SIMPLEX
VHF BCN - ON

*If No Comm and abort occurred between *
* ~~61 & 75 sec~~ or if land impact expected: *
* Perform CM RCS DUMP, pg L/4-9 *

1:01 & 2:00 min

LANDING PHASE



DATE 3/7/72
3/29/72

- CABIN PRESS REL vlv (RH) - DUMP
STRUT LOCKS (4) - UNLOCK
(275) cb FLT & PL BAT BUS A,B,&BAT C (3) - close
cb FLT & PL MNA & B (2) - open
(5) cb BAT RLY BUS (2) - open
cb RAD HTRS OVLD (2) - open
(8) cb SPS P&Y (4) - open
- 3K' CM RCS PRPLNT (2) - OFF
FLOOD Lts - POST LDG
ELS - AUTO (verify)
ELS LOGIC - on (up) (verify)
- 800' CAB PRESS REL vlv (2) - CLOSE (latch off)
MN BUS TIE (2) - OFF
COMMAND + E - YAW (1 sec) (Direct RCS)
Go to POSTLANDING PROCEDURES, pg L/9-2

CM RCS DUMP

- CABIN PRESS REL vlv (2) - CLOSE
CM RCS LOGIC - on (up)
*If main or pyro bus lost: *
* Use RHC's for burn, *
* not DUMP sw *
CM PRPLNT - DUMP (burn audible)
MONITOR CM RCS 1&2 for He press decrease
*If 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

PRE-TLI ABORT
FROM ORBIT

3/29/72
12/13/71
DATE

PRE-TLI ABORT FROM ORBIT

- 1 MNVR TO SEP ATT
LV GUID - CMC
Pitch SIVB to Hds up, BEF, 15°
window mk on horizon
Then, LV GUID - IU for orb rate
- 2 LOAD RCS DAP
R1 = 11102, R2 = 01111
V46E
- 3 DON MAE WESTS & FOOT RESTRAINTS
- 4 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
WASTE MGMT DRAIN vlv - OFF
- 5 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: *
* 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
- 6 SYSTEMS TEST PANEL CONFIGURATION
SYS TEST METER -5B (BAT RLY BUS
3.4-4.1 vdc)
(101) CM RCS HTRS - OFF (verify)
WASTE H2O DUMP HTR - OFF
URINE DUMP HTR - OFF
(100) LEB FLOOD & INTGL LIGHTING - OFF

PRE-TLI ABORT
FROM ORBIT

DATE 12/13/71

7

CONFIGURE PNL 8

All cb's closed except:
DOCKING PROBE (2) - open (verify)
CM RCS HTRS (2) - open (verify)
FLOAT BAG (3) - open (verify)
SECS ARM (2) - open (verify)
ELS/CM-SM SEP (2) - open (verify)
PL VENT - open (verify)

8

CM RCS ACTIVATION

cb SECS ARM(2) - close
Cue MSFN
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

9

Set DET (counting up to deorbit burn)

10

CSM/LV SEPARATION PREP

SM RCS PRPLNT tb (8) - gray (verify)
AUTO RCS SELECT (16) - MNA/MNB
Set ΔV 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)
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
FC REAC vlv - LATCH

DATE 12/13/71

11

CSM/LV SEPARATION

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
GDC ALIGN
EMS FUNC - ΔV (verify)
EMS MODE - NORMAL

38:00 V37E 47E
39:50 CMC MODE - AUTO
39:58 Thrust +X and hold
40:00 CSM/LV SEP pb - push, hold, and release
(-20:00min) LV TANK PRESS - full scale Low

*If No Separation:

* THC - CCW (leave in detent) *
* DET reset and counting up (auto) *
* LV TK PRESS - full scale low (SEP ind)*
*00:03 THC - +X, neutral & hold *
*00:24 THC - release *

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
~40:24 ΔV = 5 fps
THC - release
SECS PYRO ARM (2) - SAFE
cb EDS (3) - open
PCM BIT RATE - LOW

12

Go to SPS DEORBIT, pg L/8-1

*If time permits, after mnvr to Burn Att: *
* Perform EMS ENTRY CHECK, pg L/5-2 & *
* EMS ΔV TEST & NULL BIAS CHECK, pg G/2-5*

DATE 12/13/71

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 *

00:05

THC - ARMED

TRANS CONTR - NEUTRAL THEN +X

LV/SPS IND 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

V37E TRANS CONTR +X (8 to 10 sec)
OOE

RATE - HIGH

TRANS CONTR PWR - OFF

MNVR TO RETRO ATT

R _____ (Block Data)

P _____ (Block Data)

Y _____ (Block Data)

DATE 12/13/71

TLI 90 MIN ABORT

RETRO UPDATE (NO COMM - use Block Data)
GETI _____ @ .05G _____

ΔV	_____	GET DROGUE	_____
VC	_____	ENTRY R	_____
Δt_b	_____	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 ΔV_c ABORT
EMS FUNC - ΔV

TVC CHECK & PREP

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

(54:00) MN BUS TIE (2) - ON
(-06:00) TAPE RCDR - HBR/RCD/FWD/CMD RESET
SPS He vlvs (2) - AUTO (verify)
Check N2A & N2B
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
BMAG MODE (3) - ATT1/RATE2
SC CONT - SCS
RHC #2 - ARMED

TLI 90 MIN ABORT

DATE 12/13/71

L
4-15

(55:00) PRIMARY TVC CHECK

(05:00) GMBL MOT P1-Y1 - START/ON (LMP Cnfrm)
Verify TRIM CONTROL & SET
Verify MTVC
SCS TVC (2) - AUTO
THC - CW
Verify NO MTVC

SEC TVC CHECK

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

(59:00)
(-01:00)

EMS MODE - NORMAL
TRANS CONTR PWR - on (up)
 ΔV THRUST A(B) - NORMAL
V37E 47E
THC - ARMED
RHC (2) - ARMED

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

00:XX

ECO

DATE 12/13/71

L
4-16

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

19 F 16 83

ΔV XYZ (CM) (.1fps)
RHC & THC - LOCKED
TRANS CONTR PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
cb DIRECT ULLAGE (2) - open
RECORD ΔV ΔVC _____
EMS FUNC - OFF ΔVX _____
EMS MODE - STBY ΔVY _____
PRO ΔVZ _____
ATT DB - MAX
BMAG MODE (3) - RATE 2
MN BUS TIE (2) - OFF
TAPE RCDR - off (ctr)
PCM BIT RATE - LOW

F37 00E
When CMC ACTY 1t out:
V66E

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

DATE 12/13/71

EARTH ORBIT ENTRY VEHICLE PREPARATION

EARTH ORBIT ENTRY
VEHICLE PREP

- 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 T1102, 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/1-14
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/1-20
- 14 CMC SELF CK pg G/2-3

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15

LOGIC SEQUENCE CK

(8) cb SECS LOGIC (2) - close (verify)
cb SECS ARM (2) - close
cb ELS/CM-SM SEP (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/CM-SM SEP (2) - open

16 (__:__:__) P52-IMU REALIGN pg G/6-2 (OPTION 3)

Record gyro torquing angles

R _____
P _____
Y _____

*If $>1^\circ$, recycle P52 *
If confirmed, use SCS for
* EMS entry *

17

GDC ALIGNIf drift $>10^\circ/\text{hr}$, change rate source

18

EMS ENTRY CHECK

EMS FUNC - OFF
(8) cb EMS (2) - close
EMS MODE - STBY
EMS FUNC - EMS TEST 1 (wait 5 sec)
EMS MODE - NORMAL (wait 10 sec)
Check ind lts - off
RANGE ind - 0.0
Slew hairline over notch
in self-test pattern
EMS FUNC - EMS TEST 2 (wait 10 sec)
.05G lt - on (all others out)
EMS FUNC - EMS TEST 3
.05G lt - on
RSI lower lt - on (10 sec later)
Set RANGE counter to 58 nm $\pm$ 0.0

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EMS FUNC - EMS TEST 4
.05G 1t - 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 1t - on
RSI upper 1t - 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

19 Perform EMS ΔV TEST & NULL
BIAS CHECK, Pg G/2-5

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

21 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

22 SET UP CAMERA
CM4/DAC/18/CEX - BRKT, MIR
(T11, 1/250/7) 12 fps, MAG GG

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)
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) *(NOTE: IF MANF PRESS
Drop-Burst Disk Rupture, CM RCS HTRS-OFF, CM ISO VLV-CLOSED, CONTACT MEFN)*

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 (A8)
Stow C1 injector (R6)
WASTE MGMT DRAIN vlv - OFF
Remove & Stow URA, urine transfer
hose and urine filter

25 (-00:40m)

TERM. CM RCS PREHEAT

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

26

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: *
* 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

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ERROR: ioerror
OFFENDING COMMAND: flushfile

STACK:

- filestream-
- filestream-
- filestream-
- filestream-
- savelevel-