

Apollo 15 Launch Checklist

Please note that most of the hand-written additions to this document were added during the compilation of the Apollo 15 Flight Journal in 1998 to 2000. To a large extent, they reflect changes read up to the crews during the course of the mission.

David Woods – Editor: Apollo Flight Journal

080-13C



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

* (JULY 26 LAUNCH)

* APOLLO 15

* CSM 112

* CHANGE C

131
126 P
SINGLE

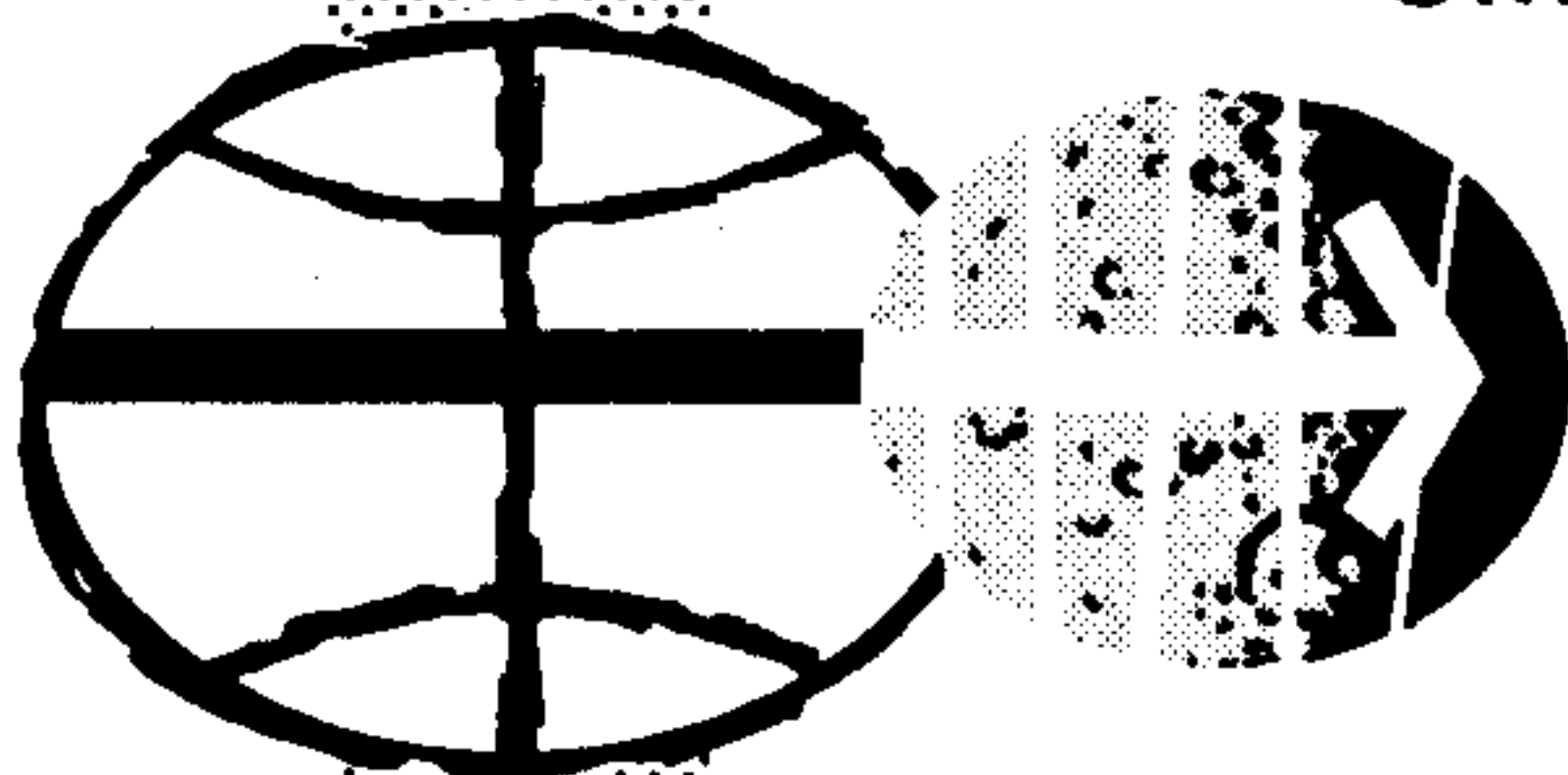
* CSM LAUNCH CHECKLIST

ISSUING DATA

7-9-71	OPR MSC	# 00	T R	PGM APO	SIGNATOR BENTLEY	LOC 080-13C	REVISION A
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PREPARED BY

GUIDANCE & CONTROL PROCEDURES SECTION
SYSTEMS PROCEDURES BRANCH
CREW PROCEDURES DIVISION



MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

JULY 9, 1971

APOLLO 15
CSM LAUNCH CHECKLIST

JULY 9, 1971

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CSM LAUNCH CHECKLIST

LIST OF EFFECTIVE PAGES

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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

LIFTOFF CONFIG

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

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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
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

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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 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 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

PWR - AUDIO/TONE

PAD COMM - OFF

INTERCOM - T/R

S BD - T/R

VHF AM - T/R

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L
1-8

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

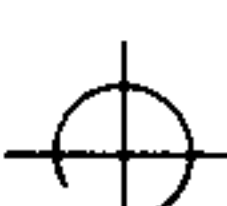
COAS PWR - OFF
UTIL PWR - OFF
PL BCN LT - off (center)
PL DYE MARKER - off (down)(guarded)
PL VENT - OFF

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 162

SCI PWR - OFF (verified at panel closeout)

PANEL 163

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

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)

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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
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

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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 O2 SUPPLY vlv - ON
SURGE TK O2 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)

DATE 3/29/71

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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

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)

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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 5/5/71

DATE

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 - 37-37.5 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
```

DATE 7/9/71

BOOST PREPARATION

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

-10:00 FC REAC vlv - LATCH

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

-04:10 L/V ENGINE lts (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

BOOST PREPARATION

DATE 7/9/71

SATURN BOOST 7/1/71
JULY 26&27

	DET	θ	VI	H	H
	00:00	90	1341	0	.0
	:30	86	1396	314	.7
	1	68	1892	857	3.5
	1:30	48	3123	1542	9.4
	2	34	5226	2321	18.9
a	2:16	29	6763	2794	25.5
	2:30	26	8073	3095	32.4
b	2:39	24	9014	3307	37.0
	3	24	9222	2904	47.8
	3:30	19	9763	2437	61.0
	4	17	10424	1958	71.8
	4:30	16	11191	1517	80.4
	5	14	12063	1115	86.9
	5:30	12	13041	757	91.5
	6	9	14133	448	94.4
	6:30	7	15351	193	96.0
	7	5	16713	5	96.4
	7:30	2	18244	-102	96.2
	8	5	19709	-117	95.5
	8:30	359	21016	-98	95.0
	9	356	22439	-32	94.7
c	9:10	356	22918	10	94.7
	9:30	353	23178	-56	94.6
	10	350	23703	-108	93.1
	10:30	348	24252	-125	93.5
	11	346	24824	-101	93.0
	11:30	345	25420	-33	92.6
d	11:39	345	25599	-1	92.6

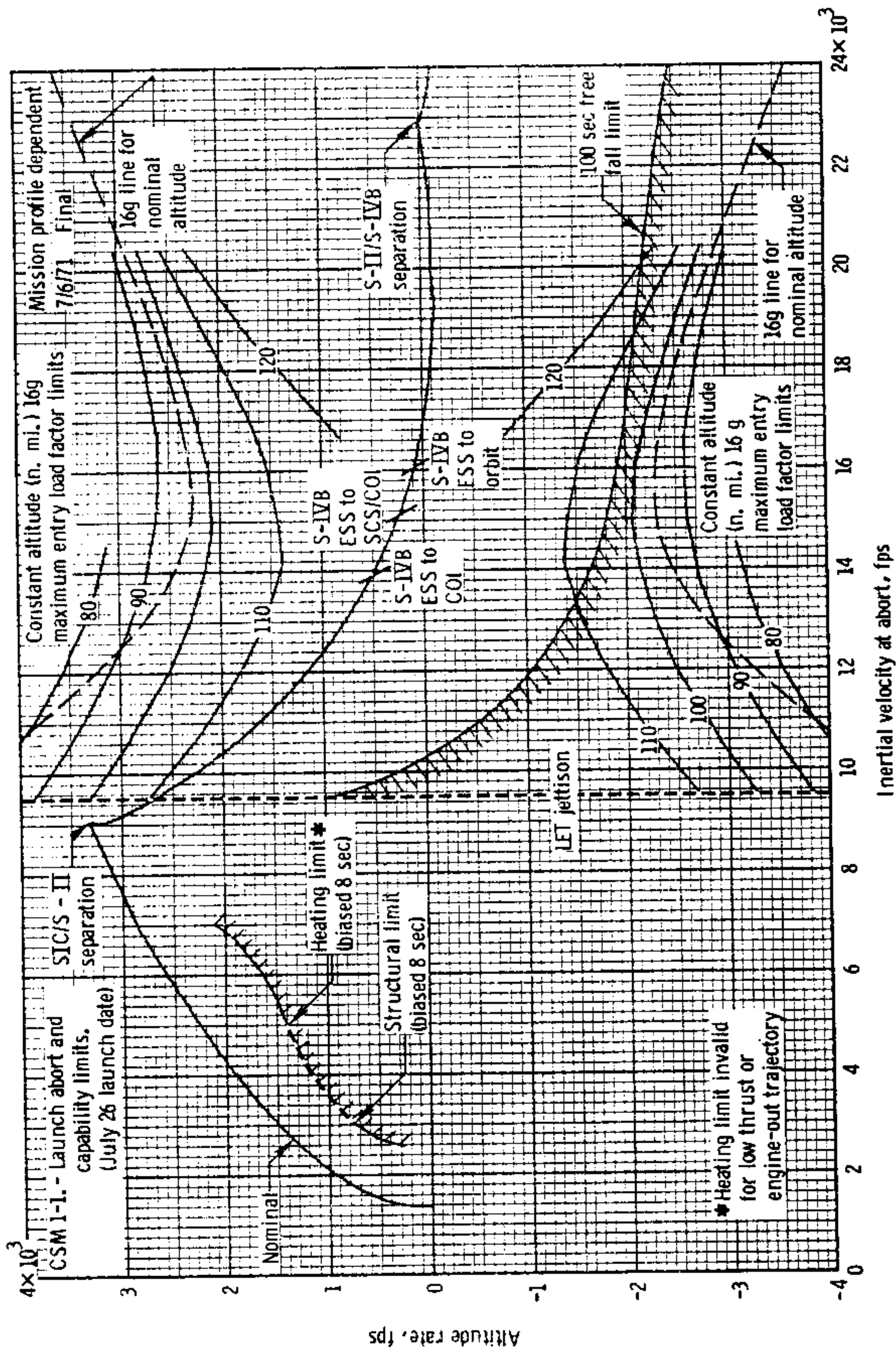
- ^aTimebase 2 (S-IC Center-engine cutoff + .01 sec)
^bTimebase 3 (S-IC outboard-engine cutoff + .01 sec)
^cTimebase 4 (S-II outboard-engine cutoff + .01 sec)
^dTimebase 5 (S-IVB guidance cutoff signal + .21 sec)

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LAUNCH TRAJECTORY

LAUNCH ABORT

2-4

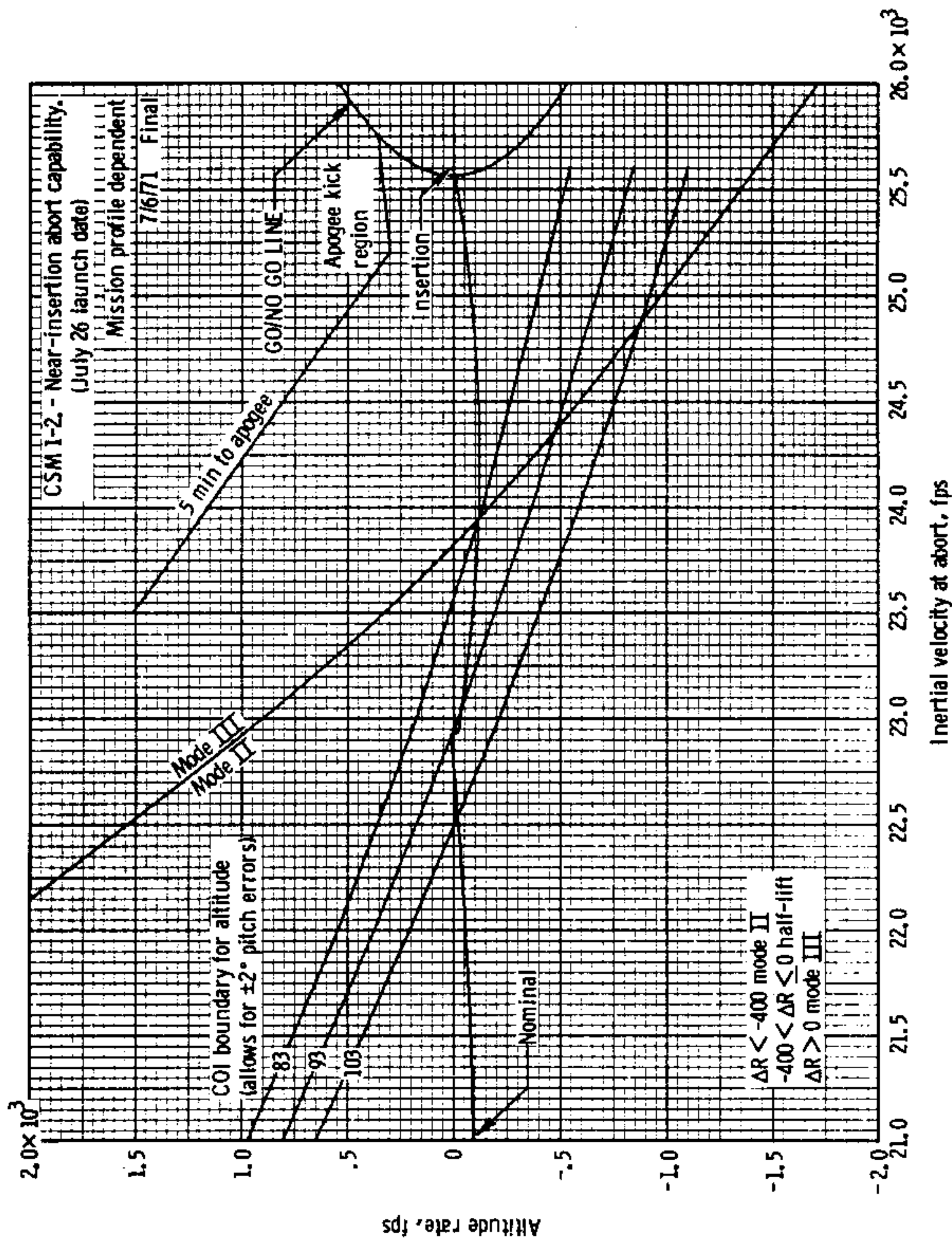


Launch abort and capability limits.

DATE 7/9/71

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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.

ALTITUDE vs V_i

DATE 5/5/71

BOOST

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

*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
* LV GUID - CMC *

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

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

CABIN PRESSURE DECREASING ~14K(2.3 nm)

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

+01:21 MAX Q
+01:54 MODE IC - report
V82E, N62E

00:00

+4°/sec P,Y
+20°/sec R

MODE IA

00:42

+4°/sec P,Y
+20°/sec R

MODE IB

H=16.5 nm

BOOST

DATE 5/5/71

BOOST

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

+9°/sec P,Y
+20°/sec R

+02:16 GO/NO GO FOR STAGING - report

MODE IC

+02:16 INBOARD CUTOFF - (1t 5 on)

+02:39 LIFTOFF 1t - out

+02:39 CMC BOOST Polynomial ends

+02:39 OUTBOARD CUTOFF - report (1ts on)

+02:40 SIC/SII STAGING (1ts - out)

+02:41 SII Ign Command (1ts on)

+02:41 SII SEP 1t - on

+02:42 SII 65% - 1ts out

+03:10 SII SEP 1t - out report

+03:16 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 *

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

+03:20 Guidance Initiate - report (OECO +41sec)

+03:50 Guidance Good

+04:00 Report Status

+05:00 Report Status

+06:00 Report Status

+06:05 SIVB to COI

+05:55 GMBL MOT (4) - START - ON (LMP Confirm)

Check GPI

LV/SPS IND GPI (Momentarily)

PITCH = -0.4°

YAW = +1.90°

DATE 5/5/71

L
2-9

+06:15 OMNI ANT - D (AZ < 96°)
- C (AZ > 96°)
+06:45 SIVB to orbit
+07:00 Report Status
+07:39 IECO (1t 5 - on)
+07:59 PU SHIFT
+08:00 Report Status
+08:30 GO/NO GO FOR STAGING - report
+08:39 Level sense arm
+09:08 Mode IV - Report

(VI ~ 22,695, H DOT ~ +97,
22,918, H ~ +93)
+94.7

Report Status
+09:10 OECO (1ts on)
+09:11 SII Staging - 1ts out
+09:12 SIVB Ign Cmd - 1t on
+09:14 SIVB 65% - 1t out

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

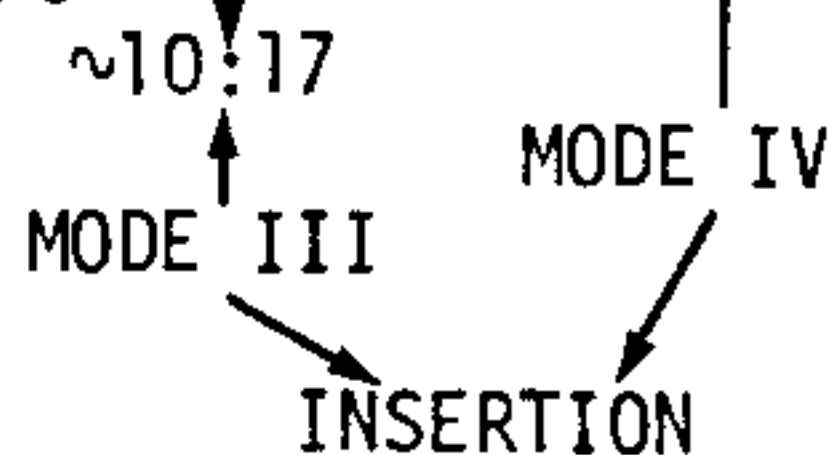
+11:00 Report Status
+11:45 SECO (1t on) - report
39 (Begin TB5)

*If LV GUID - CMC *
*LV STAGE sw - SII/SIVB *
*SECO *
*LV ENG 1 1t - 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 - 1t out (TB5 + 10 sec)
49

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



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DATE

KEY RLSE

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

V83E (check 0)

PRO

CSM WT

P TRIM

Y TRIM

US LOS
(00:16:06)

SM RCS Control of SIVB (APS module failed)

LV GUID - CMC

MAN ATT (ROLL) - MIN IMP

cb SECS ARM (2) - close

AUTO RCS SEL P&Y - OFF

AUTO RCS SEL A/C ROLL - MNB

AUTO RCS SEL B/D ROLL - MNA

RCS CMD - ON

BSE command BURN MODE ON

If successful: LV GUID - IU

Control PITCH & YAW with THC, ROLL with
RHC

Allow SIVB to drift in PITCH (Gravity
Gradient)

Control YAW within platform limits

Perform normal procedures except:

TB6-15min: Mnvr to TLI Att &

set up ORDEAL, pg L/2-29

Hold TLI Att until Ignition

Null Ullage deviations with SM RCS

After TLI IGNITION: RCS CMD - OFF

AUTO RCS SEL (16) - MNA/MNB

MAN ATT (3) - RATE CMD

After TLI CUTOFF: LV GUID - CMC

MAN ATT (3) - ACCEL CMD

RCS CMD - ON

DATE

DATE 3/29/71

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
cb DIRECT ULLAGE (2) - open
cb ELS/CM-SM SEP (2) - open
cb FLT/PL VENT - open
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*

NOTE: Steps 2 thru 30 are not sequential

- 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

DATE 5/5/71

CYI AOS
(00:17:12)

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
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
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
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) *Instrn CMS window cover*
Remove helmet & gloves & stow in PGA bag
Unstow & mount TSB's (U1)

10 MAIN REG CHECK
 MAIN REG B vlv - close
 EMER CABIN PRESS sel - 1
 PUSH TO TEST PB - PUSH (O2 FLOW INC)
 MAIN REG B vlv - open
 MAIN REG A vlv - close
 EMER CABIN PRESS sel - 2
 PUSH TO TEST PB - PUSH (O2 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 (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

CYI LOS (00:22:46) 13 { PCM BIT RATE - LOW
 UP TLM - CMD RSET, then NORM
 VHF AM A - SIMPLEX
 VHF AM B - off (ctr)

~~(00:25:00) Perform UV Photography, pg L/2-19~~

DATE 5/28/71

DATE

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

DATE

5/5/71

DATE

L
2-15

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 & UNBAL QTY
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

DATE 3/29/71

DATE

DATE

24 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

CRO AOS 25
(00:52:07)
CRO LOS
(00:58:17)
SUNRISE
(01:21:04)
US AOS 26
(01:28:12)

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

SCS ATT Ref Comp Check

VT6 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

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L
2-18

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

■(01:35:00) Perform UV Photography, pg L/2-19

US LOS
(01:48:28)

SUNSET
(02:11:11)

DATE

DATE 5/28/71

ULTRAVIOLET PHOTO PROCEDURES (Earth Orbit)

- 1 Configure camera: (UV - land/water/clouds)
 CM5/EL/105/UV, BRKT, CONT (f4.3, 1/60, ∞) (8 fr) ■
 Ringslide
 MAG N _____, fr# _____
 Remove R12 Flight Data File stowage box
 Remove CM5 Window Cover and mount camera ■

- 2 2 frames, filter 1, change shutter to B
 2 frames, filter 2, exp time 20 sec
 Change shutter to 1/250
 2 frames, filter 3, change shutter to 1/500
 2 frames, filter 4

 Record fr# _____ Record GET _____

- 3 Configure camera: (UV - color)
 CM5/EL/105/CEX, CONT (f8, 1/250, ∞) (1 fr) ■
 Ringslide
 MAG M _____, fr# _____ Note: Use f11 for clouds. ■
 1 frame, filter 4 _____ Use f8 for land/water.
 Record fr# _____

- 4 Note comments as to condition of window 5
 Replace CM5 Window Cover.

- 5 Insert Darkslide
 Configure camera: (T, D & E)
 CM/EL/80/CEX (f8, 1/250, 30)
 MAG M _____, fr# _____
 Remove Darkslide

DATE 7/9/71

DATE _____

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DATE _____

DATE 5/28/71

TLI

X	:	:		X	2	4	0	2	3	TB6p
X	X	X		X	X	X	1	8	0	R
X	X	X		X	X	X	0	4	5	P TLI
X	X	X		X	X	X	0	0	1	Y
X	X	X	:	X	X	X	5	5	5	BT
				1	0	4	0	1	1	$\Delta VC'$
+				+	3	5	5	9	9	VI
X	X	X		X	X	X	2	5	9	R
X	X	X		X	X	X	0	7	7	P SEP
X	X	X		X	X	X	3	2	0	Y
X	X	X		X	X	X	1	0	1	R
X	X	X		X	X	X	2	5	7	P EXTRACTION
X	X	X		X	X	X	0	4	0	Y
X	X			X	X	0	4	5	0	R2 Align
X	X			X	X	0	3	5	0	R2 Ign
X	X		:	X	X	1	0	2	0	ORDEAL Start
X	X	X		X	X	X	0	0		YAW

DATE 5/28/71

DATE

L
2-22

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

DATE _____

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P30 MANEUVER

L/2-23

SET STARS

R ALIGN _____
P ALIGN _____
Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

P37 FOR L/0+8

				GETI
X				ΔVT
X				LONG
				GET 400K

						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

DATE 5/28/71

DATE

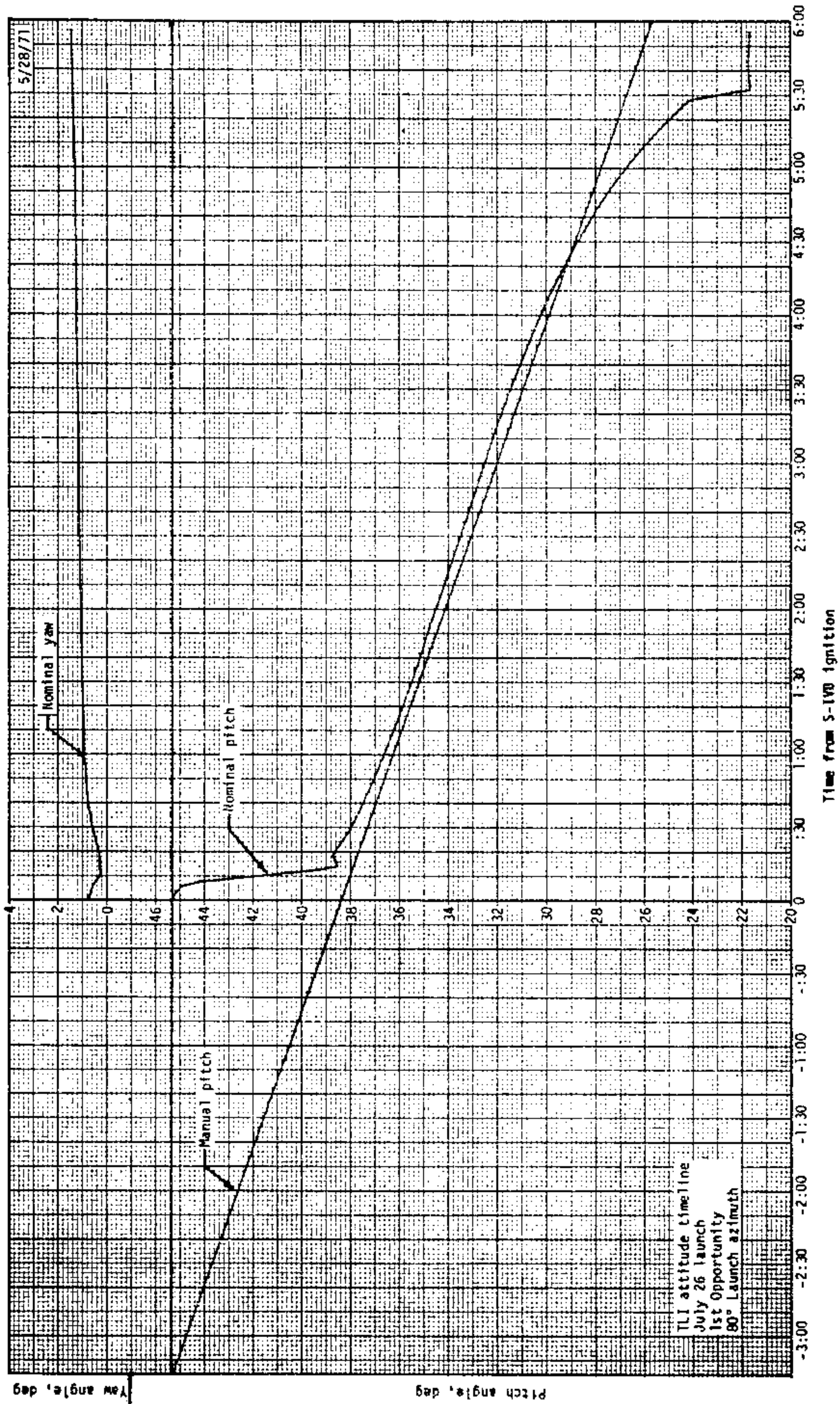
SET STARS										PURPOSE		
										PROP/GUID		
					+						WT	N47
R ALIGN _____						0	0		.		P _{TRIM}	N48
P ALIGN _____						0	0		.		Y _{TRIM}	
Y ALIGN _____					+	0	0				HRS	GETI
					+	0	0	0			MIN	N33
					+	0			.		SEC	
ULLAGE _____										.	ΔV_X	N81
										.	ΔV_Y	
										.	ΔV_Z	
					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	X			SXTS	
					+				.	0	SFT	
					+			.	0	0	TRN	
					X	X	X				BSS	
					X	X				.	SPA	
P37 FOR L/0+8					X	X	X			.	SXP	
0	0	8	0	0	GETI		0		.		LAT	N61
X	6	0	7	6	ΔVT				.		LONG	
X	-	1	7	5	LONG	+				.	RTGO	EMS
0	2	7	5	6	GET 400K	+					VIO	
							.		.		GET	0.05G

DATE _____

DATE 5/28/71

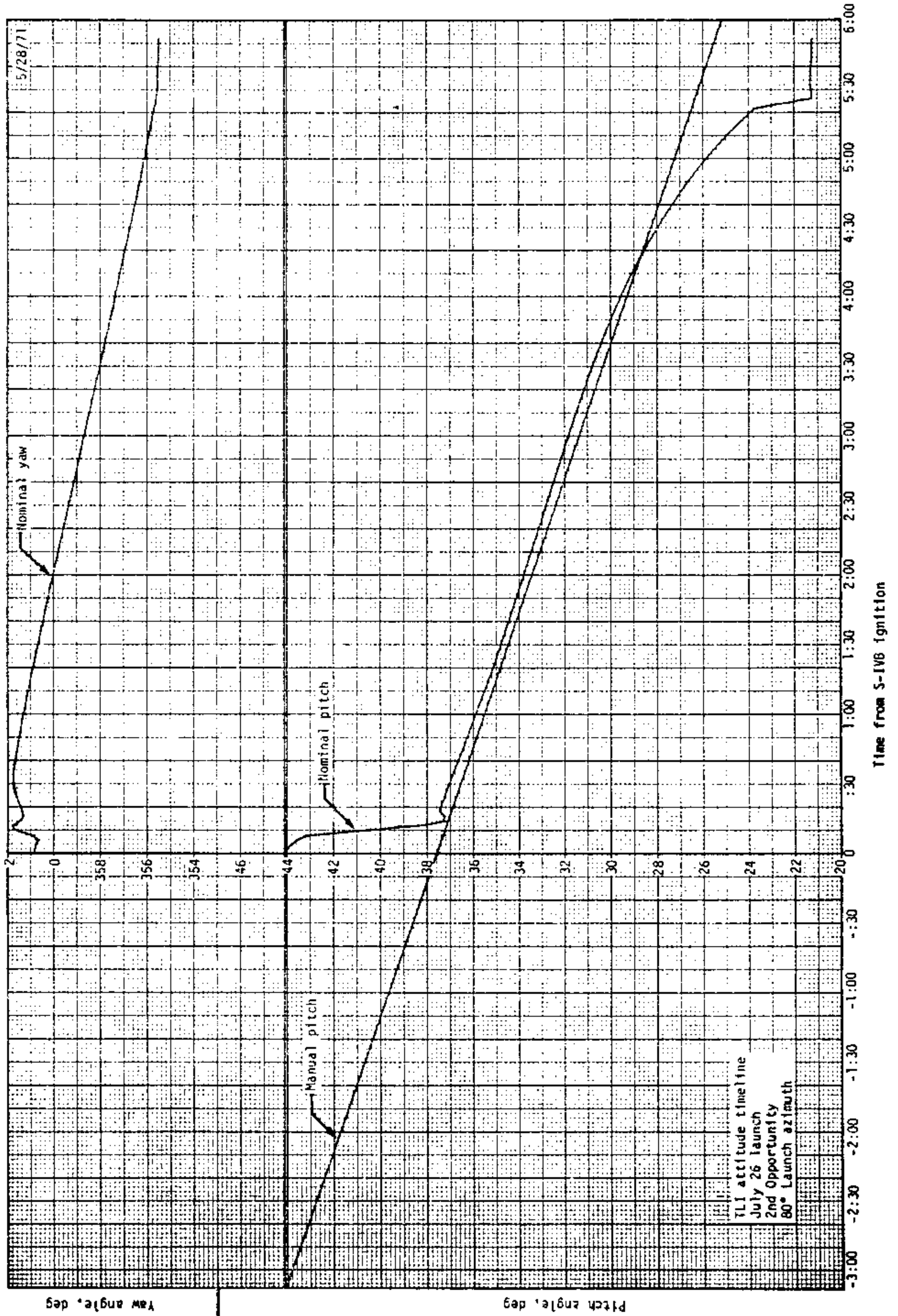
DATE 5/28/71

L
2-25



DATE

DATE _____



DATE 5/28/71

DATE 7/9/71

NOMINAL SIVB TLI 1
LAUNCH JULY 26, 1971

7/11/71

DET	θ	ψ	VI	H	H
0:00	45	0.7	25599	10	97
:30	38	0.4	26018	.7	97
1	37	0.9	26614	6	97
1:30	36	1.0	27299	62	97
2	35	1.1	28023	184	98
2:30	34	1.1	28784	379	99
3	33	1.1	29584	655	102
3:30	32	1.2	30426	1018	106
4	31	1.2	31315	1478	112
4:30	29	1.3	32258	2040	120
5	27	1.3	33262	2710	132
5:30	25	1.4	34338	3487	147
6:03	22	1.4	35599	4426	168

MANUAL SIVB TLI 1
LAUNCH JULY 26, 1971

7/11/71

DET	θ	ψ	VI	H	H
0:00	38.6	1	25599	10	97
:30	36.5	1	26018	.7	97
1	36.2	1	26614	6	97
1:30	35.0	1	27299	62	97
2	33.9	1	28023	184	98
2:30	32.7	1	28784	379	99
3	31.5	1	29584	655	102
3:30	30.4	1	30426	1018	106
4	29.2	1	31315	1478	112
4:30	28.0	1	32258	2040	120
5	26.8	1	33262	2710	132
5:30	25.7	1	34338	3487	147
6:03	24.8	1	35599	4426	168

TLI TRAJECTORY OPP 2
NOM & MAN

NOMINAL SIVB TLI 2
LAUNCH JULY 26, 1971

7/1/71

DET	θ	ψ	VI	$\dot{H}$	H
0:00	44	0.8	25594	10	98
:30	37	1.7	26202	-4	98
1:	36	1.3	26873	20	98
1:30	35	0.7	27579	106	99
2	34	0.0	28320	261	100
2:30	33	359.3	29099	493	101
3	32	358.7	29917	810	105
3:30	31	358.0	30779	1219	110
4	30	357.4	31690	1728	117
4:30	28	356.7	32658	2342	127
5	26	356.1	33691	3065	140
5:30	21	355.5	34800	3884	157
5:50	21	355.5	35591	4485	171

MANUAL SIVB TLI 2
LAUNCH JULY 26, 1971

7/1/71

DET	θ	ψ	VI	$\dot{H}$	H
0:00	37.7	358	25599	10	98
:30	36.7	358	26202	-4	98
1	35.6	358	26873	20	98
1:30	34.6	358	27572	106	99
2	33.5	358	28320	261	100
2:30	32.4	358	29099	493	101
3	31.4	358	29917	810	105
3:30	30.3	358	30779	1219	110
4	29.3	358	31690	1728	117
4:30	28.2	358	32658	2342	127
5	27.2	358	33691	3065	140
5:30	26.1	358	34800	3884	157
5:50	25.5	358	35591	4485	171

TLI PREPARATION

	XLUNAR - INJECT (verify)
	EDS PWR - on (up)
	Perform EMS ΔV TEST & NULL
	BIAS CHECK, pg G/2-5
CRO AOS (02:24:41)	Set ΔVC
	EMS FUNC - ΔV
	GDC ALIGN
CRO LOS (02:31:14)	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 - SII/SIVB (verify)
	cb DIRECT ULLAGE (2) - closed
	Cycle CRYO FANS
	Set DET - 51:00

P15 - TLI INITIATE/CUTOFF

V37E 15E

F 06 33	GET of TB6	(hrs,min,sec)
	Load GET of TB6	
	PRO	

F 06 14	VC/O	(fps)
	Load VC/O	
	PRO	

06 95	TFI, VG, VI	(min-sec,fps,fps)
-------	-------------	-------------------

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TLI PREPARATION

TLI, 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 = _____(45°)*

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 = 16°

- *If LV GUID - CMC: *
- * Slew FDAI #1 to PITCH = 0° *
- * V16 N20E *
- * Insure R2 Align = _____(45°)*

discontinued at 1400

Insure FDAI #1 PITCH = ~~12~~¹⁴

56:45
(-03:15)

ORDEAL MODE - OPERATE/SLOW, IU or CMC

*If LV GUID - CMC: *

* MNVR to R2 Ign = _____ (38°)*

58:15

DSKY BLANKS (Ave G on)

58:20 06 95 TFI, VG, VI
(-01:40)

(min-sec,fps,fps)

SCS TVC SERVO PWR #1 - AC1/MNA

SCS TVC SERVO PWR #2 - OFF (verify)

TAPE RCDR - HBR/RCD/FWD/CMD RESET

EMS MODE - NORMAL

58:36
(-01:24)

SII SEP 1t - on

*TLI Inhibit *

* 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

SIVB ULLAGE Begins

SUNRISE
(02:48:47)

HAW AOS
(02:49:29)

59:42

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

HAW LOS
(02:49:52)

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59:52 SIVB FUEL LEAD
59:55 SIVB ULLAGE discontinues
Insure FDAI #1 PITCH = 1°
*If LV GUID - CMC: *
* FDAI #1 PITCH = 0° *

59:59 LV ENG 1 1t - on

00:00 SIVB IGNITION (00:00:02) GETI

00:02 LV ENG 1 1t - out

00:10 06 95 TFC, VG, VI (min-sec,fps,fps)

HAW AOS
(02:55:29)

MONITOR THRUST & ATTITUDE

MONITOR LV TANK PRESS

*If LV GUID - CMC: *

* Fly PITCH = 0° *

* YAW = _____ ($+1^{\circ}$)*

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

HAW LOS
(02:55:59)

V16 N62E

KEY RLSE before ECO

~~05:54~~ 06.03 SIVB ECO (1t on) (BEGIN TB7)

*EMER SIVB CUTOFF *

If no ECO at +2 sec and VI attained

* LV STAGE sw - SII/SIVB *

*If still no ECO, *

* THC - CCW & NEUTRAL in 1 sec *

Key VERB (freeze display)

Record TFC

VG

VI

ΔVC

~~06:04~~ 06.13 LV ENG 1 1t - out (TB 7 + 10 sec)

KEY RLSE

F 16 95 TFC (Static), VG, VI (min-sec,fps,fps)

08:26 SIVB MNVR TO ORB RT (HDS DN) ($.3^{\circ}/\text{sec}$)

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MSFN AOS
(02:56:08)

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
OOE

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
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

5/28/71

DATE

DATE

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 (: :)
*If LV GUID - CMC * SEP (: :)
* 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 $\pm 1.8^\circ$ 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

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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 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

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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

*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)

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: $P = -2.0^\circ$, $Y = +2.75^\circ$

S BD ANT OMNI - HI GAIN

HI GAIN ANT TRACK - REACQ

TV TRANSMIT/STBY sw - TRANSMIT

Start DAC

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DATE

BEGIN

5 DOCKING

Stabilize & align CSM
BMAG MODE (3) - ATT 1/RATE 2
At capture:
PROBE EXTND/RETR tb-bp (A, pg S/2-10) mal f. 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
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
02 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
LM 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

Cycle CRYO FANS

Load RCS DAP 21101, X1111

Load N22 att (monitor APS mnvr, hatch window)

90.0°, 257.0°, 354.6°

V60E, V63E

(DAC - 6 fps)

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

RHC & THC - ARMED

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

(.1fps)

EMS MODE - NORMAL

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Start DAC

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 00E

When CMC Acty 1t out,

Key V66E

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)

Stop DAC

PCM BIT RATE - LOW

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

02 HTR 3 - OFF

DATE

DATE 3/29/71

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

*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)	<u>Roll</u>	<u>Pitch</u>	<u>Yaw</u>
* 25:00	69.3°	237.5°	0.0°*
* 30:00	90.0°	257.0°	1.0°*

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

*If no TLI:		Inertial Att		
*min-sec	<u>Event</u>	R	P	Y
*00:00	Ejection			
*00:05	3 sec -X			
*00:22	Mnvr	90.0°	257.0°	354.6°
*03:00	6 sec -X			

3/29/77

DATE

DATE

ABORT PROCEDURES

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

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 (00:42 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

MODE I

DATE 3/29/71

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)	Estab. +5°/SEC
MAN PITCH - RATE CMD	pitch rate
ENT ATT RO°,PI35°,YO°	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 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
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) - closed
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)
CSM/LM FNL SEP (2) - on (up)
EMS FUNC - ENTRY GET 300K
EMS MODE - NORMAL e (.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 3/29/71

MODE II, MODE III

MODE III SPS ABORT
($\Delta R = -400$ 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 *

00:05 THC - ARMED
 TRANS CONTR - NEUTRAL THEN +X
 LV/SPS IND sw - GPI

00:24 TRANS CONTR +X OFF
 N50E ΔR , 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 GETI
 ΔV THRUST A - NORMAL (6999.9)

02:05 DIRECT ULLAGE PB - PUSH ΔV
 THRUST ON PB - PUSH VC
 Burn to VC ($\Delta R=0$) θ
 ΔV THRUST (2) - OFF Δtb
 GET 300K
 θ (.05G)
 If TFF > 2min, Yaw 45° (LEFT) GET Droque
 out-of-plane
 cb MNA&B BAT C(2) - closed
 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)
 CSM/LM FNL SEP (2) - on (up)
 Note TFF

MODE II, MODE III

DATE 5/28/71

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 III, MODE IV

DATE 3/29/71

MODE IV SPS TO ORBIT
(VI ~ 22,695, HDOT ~ +97, H ~ +93)

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/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		6999.9
	SCS TVC (2) - AUTO (verify)	ΔV	_____
	ΔV THRUST A - NORMAL	VC	_____
	DIRECT ULLAGE PB - PUSH		
02:05	THRUST ON PB - PUSH	θ	_____
	BURN to VC (hp >70nm)		
	ΔV THRUST (2) - OFF	Δtb	_____
	EMS MODE - STBY		

DATE 5/5/71

L
4-7

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

KEY RLSE

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

PRO

V37E 00E

When CMC ACTY 1t out:

V66E

V45E

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

V46E

V83E (check θ)

PRO

CSM WT _____

P TRIM _____

Y TRIM _____

US LOS
(00:16:06)

GO TO INSERTION CHECKLIST pg L/2-11

LANDING PHASE

DATE 5/5/71

LANDING PHASE (30K, DESCENDING)

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

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

*ELS - AUTO *

49 sec

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)

*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

CABIN PRESS REL vlv - BOOST/ENTRY

LANDING PHASE

DATE 3/29/71

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 (terminates purge)
CABIN PRESS REL vlv (RH) - DUMP
FLOOD Lts - POST LDG
ELS - AUTO (verify)
ELS LOGIC - ON (verify)

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

Go to POSTLANDING PROCEDURES, pg L/9-2

DATE 3/29/71

PRE-TLI ABORT
FROM ORBIT

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 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
- 6 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

PRE-TLI ABORT
FROM ORBIT

3/29/71

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

(8) cb ELS/CM-SM SEP (2) - close
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 C 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 3/29/71

DATE

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

*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 & ENTRY, 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

DATE 3/29/71

L
4-13

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

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

MNVR TO RETRO ATT

R _____ (Block Data)
P _____ (Block Data)
Y _____ (Block Data)

DATE 3/29/71

TLI 90 MIN ABORT

L
4-14

RETRO UPDATE (NO COMM - use Block Data)

GETI _____ 0 .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 .

(Current b. 100000 EPS Group 5, two close - verify)

XX:XX

Set DET counting up to GETI

GDC ALIGN

EMS FUNC - ΔV SET/VHF RNG

SET ΔV_c ABORT *SET ΔV_c - 100*

EMS FUNC - ΔV

TVC CHECK & PREP

(8) cb STAB CONT SYS (all) - close *cb SPS pilot*

cb SPS (10) - close

MAN ATT (3) - RATE CMD

LIMIT CYCLE - on (up)

ATT DB - MIN

RATE - LOW

TRANS CONT PWR - ON

SCS TVC (2) - RATE CMD

ΔV CG - CSM/LM

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

TLI 90 MIN ABORT

3/29/71

L
4-15

(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 GPI returns to trim
Verify NO MTVC
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 *Get correct thrust on panel first. If not, see panel for correct value.*
V37E 47E *only after 1 sec on panel*
THC - ARMED
RHC (2) - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET *delete*
EMS MODE - NORMAL

(59:30)
(-00:30)

Result 2, 55 sec. from V37E 47E. I see same result. If not, see panel for correct value.

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)2 - OPEN
SPS He vlvs tb-gray
SPS FUEL/OXID PRESS - 170-195 psia
~~PUGS - BALANCED~~

DATE 3/29/71

DATE

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 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

DATE 3/29/71

16

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

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 *

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)

EMS FUNC - EMS TEST 3

.05G lt - on

RSI lower lt - on (10 sec later)

Set RANGE counter to 58 nm±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

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)

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 SET UP CAMERA
CM4/DAC/18/CIN - BRKT, MIR
(T16,250,7) 12 fps, MAG K

DATE 3/29/71

DATE

- 24 (-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)

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

- 26 (-00:40m) TERM. CM RCS PREHEAT
 (101) CM RCS HTRS - OFF (LMP confirm)
 CM RCS LOGIC - OFF
 (8) cb CM RCS HTR (2) - open

- 27 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

DATE

DATE 3/29/71

28

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

29

CONFIGURE PNL 8
All cb's closed except:
CM RCS HTRS (2) - open (verify)
DOCKING PROBE (2) - open (verify)
FLOAT BAG (3) - open (verify)
SECS ARM (2) - open (verify)
EDS BAT (3) - open (verify)
ELS/CM-SM SEP (2) - open (verify)
PL VENT - open (verify)

30

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

31

CM RCS ACTIVATION
(8) cb ELS/CM-SM SEP (2) - close
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 (up)
RCS IND sw - CM1, then 2
He PRESS stabilizes at 3300-3500
psia after 15 minutes
MANF PRESS 287-302 psia
SECS PYRO ARM (2) - SAFE

DATE 3/29/71

DATE

- 32 (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

33 P27 & ENTRY PAD UPDATE

HYBRID RCS DEORBIT & ENTRY, pg L/6-1
SM RCS DEORBIT & ENTRY, pg L/7-1
SPS DEORBIT & ENTRY, pg L/8-1

DATE _____

DATE 3/29/71

DATE 3/29/71

L/5-7										E. O. ENTRY UPDATE										
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									
X	X					X	X				RETDROG TO MAIN									

E.O. ENTRY UPDATE

L/5-8										E. O. ENTRY UPDATE									
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							

DATE 3/29/71

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
REMARKS:													

E.O. BLOCK DATA

EARTH ORBIT BLOCK DATA

L/5-10

E.O. BLOCK DATA

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:

DATE 3/29/71

P30 MANEUVER

L/5-11

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

P30 MNVR PAD

DATE 3/29/71

HYBRID RCS DEORBIT & ENTRY

VEHICLE PREP COMPLETE

P30 - EXTERNAL ΔV
V37E 30E

- 1
- 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 (REQ) (.1nm,.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
02 SM SUPPLY vlv - OFF
SURGE TK - ON (verify)
CAB PRESS REL vlv (2) - NORM
cb ELS/CM-SM SEP (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

DATE 3/29/71

HYBRID RCS
DEORBIT & ENTRY

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 TRNFR - CM
 AUTO RCS SEL (RING 1) - OFF
 AUTO RCS SEL (RING 2) - MNB
 TEST RING 2 THRUSTERS
 AUTO RCS SEL (RING 1) - MNA
 AUTO RCS SEL (RING 2) - OFF
 TEST RING 1 THRUSTERS
 AUTO RCS SEL (RING 2) - MNB
 RCS TRNFR - SM
 MAN ATT (3) - RATE CMD

9

RCS THRUSTING PREP

Load DAP
 BMAG MODE (3) - RATE 2
 SC CONT - CMC/AUTO

10

MNVR TO PAD BURN ATT (HDS DN)

V49E

R _____ (0°)
 P _____ (180°)
 Y _____ (0°)

11

PERFORM BORESIGHT & SXT STAR CHECK

V41 N91E

Stow optics eyepieces

12

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

DATE 3/29/71

HYBRID RCS
DEORBIT & ENTRY

13

PWR REDUCTION

MN BUS TIE (2) - ON
HI GAIN ANT PWR - OFF
FC PUMPS (3) - OFF
FC 2 MNA - OFF
Verify loads balanced
VHF AM (A&B) - off (ctr)
(5) cb ECS RAD CONT/HTR (2) - open
cb RAD HTRS OVLD (2) - open
cb WASTE H2O/URINE DUMP HTRS(2)-open
POT H2O HTR - OFF
GLY EVAP TEMP IN - MAN

14

P41 - RCS THRUSTING
V37E 41E

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

16 06 18 AUTO MNVR TO FDAI RPY (.01°)

17 F 50 18 REQ TRIM (.01°)
ALIGN SC ROLL
(AUTO TRIM) PRO
ATT DB - MIN
RATE - LOW
BMAG MODE (3) - ATT1/RATE 2
If long Lambert (P37) burn
BMAG MODE (3) - RATE 2
ENTR

DATE 3/29/71

DATE

55:00m
18 06 85 VG X,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 OMNI ANT - C
Cue MSFN
SECS LOGIC (2) - on (up)(verify)
MSFN confirm Go for PYRO ARM (if poss)
SECS PYRO ARM (2) - ARM
CM RCS LOGIC - on (up)

59:25
19 DSKY BLANKS

59:30
20 16 85 VG X,Y,Z (AVE G ON) (.1fps)
RHC's & THC - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET
EMS MODE - NORMAL

DATE

DATE 3/29/71

00:00

21 F 16 85

REQ NULL VG X,Y,Z (.1fps)

BURN EMS ΔV CTR TO 100
RESET DET & COUNT UP

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

CM/SM SEP (2) - on (up)
MAN ATT PITCH - ACCEL CMD
MAN ATT ROLL & YAW - MIN IMP
BMAG MODE(3) - RATE 2

Hybrid
1 min

V63E (N17, CM BURN ATT)

*If CMC NO GO: *

* FDAI SOURCE - ATT SET*

* FDAI SEL - 1 or 2 *

* ATT SET - GDC *

C&W MODE - CM

RCS TRNFR - CM

Monitor V MNA/B:

If <25 vdc, go to EMERG POWER DOWN
MNVR TO CM BURN ATT(NULL ERR NEEDLES)

($\theta \sim 290$) $\begin{matrix} R & 0^\circ \\ P & \underline{\quad\quad\quad} \\ Y & 0^\circ \end{matrix}$ ($\sim 110^\circ$ from SM BURN ATT)

CM RCS LOGIC - OFF

SECS PYRO ARM (2) - SAFE

22

CM RCS BURN

FDAI SCALE - 5/5

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 *

DATE 3/29/71

DATE

DATE

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

24 V82E

F 16 44 HA,HP,TFF (.1nm,min-sec)

Check HP <40nm:

If > Pad data, continue burn
until < Pad

PRO

25 F 16 85 VG X,Y,Z (.1fps)

Read VG residuals to MSFN

PRO

26 F 37 00E

When CMC ACTY 1t out:

V66E

EMS FUNC - OFF

EMS MODE - STBY

MAN ATT (3) - MIN IMP

TRANS CONT PWR - OFF

BMAG MODE (3) - RATE 2

cb DIRECT ULLAGE (2) - open

TAPE RCDR - off (ctr)

PCM BIT RATE - LOW

27 EMS INITIALIZATION

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

EMS MODE - STBY (verify)

EMS FUNC - ENTRY

DATE

DATE 3/29/71

28

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

P61 - ENTRY PREP

29

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

30

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

PAD VALUES

LAT _____
LONG _____
HDS UP +1 _____

PRO

31

F 06 60 GMAX, V400K, GAMMA EI (.01G, fps, .01°)

Record

GMAX _____
V400K _____
GAMMA EI _____

PRO

32

F 16 63 RTOGO (.1nm) _____ PAD _____
VIO (fps) _____ PAD _____
TFE (min-sec) _____

If NO COMM, Set RTOGO & VIO in EMS
& initialize

(ACCEPT) PRO

(RECYCLE) V32E to 31 (TFE sensitive to
oblateness)

DATE 3/29/71

DATE

DATE

P62 - CM/SM SEP & PRE-ENTRY MNVR

33 F 50 25 00041 REQUEST CM/SM SEP

MNVR TO ENTRY ATT
R 180° (Lift DN)
P
Y 0°

MAINTAIN HORIZ TRACK

PRO (Act ENTRY DAP Att Hold)

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

PRO (CMC Guidance)

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

P63 - ENTRY INIT

36 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/CMD RESET
HORIZ CK
Pitch error needle goes toward
zero approaching .05G time

DATE

DATE 3/29/71

P64 - ENTRY POST .05G

37 06 74 BETA, VI, G (.01°,fps,.01G) Start DAC

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

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

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

Track horiz with 9° window mk
Maintain SCS control,
Lift DN until 1G

If CMC is GO:

MAN ATT(3) - RATE CMD
SC CONT - CMC

*If DAP NO GO:

* SC CONT - SCS

* Fly BETA

*If CMC NO GO:

* SC CONT - SCS

* Fly EMS

*If after 1G, both RCS ring

* He press <1550 psia:

* Roll 20°/sec & disable RCS*

* After peak G, enable RCS

* & fly BETA = 90°

NOTE: To monitor N68, Key V16 N68E
Compare RSI & FDAI
EMS GO/NO GO
G-V Plot within limits

DATE 3/29/71

DATE

DATE 3/29/71

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

SM RCS DEORBIT & ENTRY

VEHICLE PREP COMPLETE

P30 - EXTERNAL ΔV
V37E 30E

- 1
- 2 F 06 33 GETI (hr,min,.01sec)
(ACCEPT) PRO
(REJECT) LOAD DESIRED GETI
- 3 F 06 81 $\Delta V X, Y, Z$ (LV) (.1fps)
(ACCEPT) PRO
(REJECT) LOAD DESIRED DATA
- 4 F 06 42 HA,HP, ΔV (REQ) (.1nm,.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

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/CM-SM SEP (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

DATE 3/29/71

SM RCS
DEORBIT & ENTRY

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 TRNFR - CM
AUTO RCS SEL (RING 1) - OFF
AUTO RCS SEL (RING 2) - MNB
TEST RING 2 THRUSTERS
AUTO RCS SEL (RING 1) - MNA
AUTO RCS SEL (RING 2) - OFF
TEST RING 1 THRUSTERS
AUTO RCS SEL (RING 2) - MNB
RCS TRNFR - SM
MAN ATT (3) - RATE CMD

9

RCS THRUSTING PREP

Load DAP
BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO

10

MNVR TO PAD BURN ATT (HDS DN)

V49E

R _____ (0°)
P _____ (180°)
Y _____ (0°)

11

PERFORM BORESIGHT & SXT STAR CHECK

V41 N91E

Stow optics eyepieces

12

P41 - RCS THRUSTING

V37E 41E

13

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

PRO

14

06 18 AUTO MNVR TO FDAI RPY (.01°)

SM RCS
DEORBIT & ENTRY

DATE 3/29/71

15 F 50 18 REQ TRIM (.01°)
ALIGN SC ROLL
(AUTO TRIM) PRO
ATT DB - MIN
RATE - LOW
BMAG MODE (3) - ATT1/RATE 2
If long Lambert (P37) burn
BMAG MODE (3) - RATE 2
ENTR

16 55:00m 06 85 VG X,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 OMNI ANT - C

17 59:25
DSKY BLANKS

18 59:30 16 85 VG X,Y,Z (AVE G ON) (.1fps)
RHC's & THC - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET
EMS MODE - NORMAL

19 00:00 F 16 85 REQ NULL VG X,Y,Z (.1fps)
BURN EMS ΔV CTR TO 100
RESET DET & COUNT UP

20 V82E

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

DATE 3/29/71

DATE

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

22 F 37 00E
When CMC ACTY 1t out:
V66E

EMS FUNC - OFF
EMS MODE - STBY
MAN ATT (3) - MIN IMP
TRANS CONT PWR - OFF
SC CONT - SCS
BMAG MODE (3) - RATE 2
cb DIRECT ULLAGE (2) - open
TAPE RCDR - off (ctr)
PCM BIT RATE - LOW

23 EMS INITIALIZATION
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
EMS MODE - STBY (verify)
EMS FUNC - ENTRY

24 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

25 MNVR TO CM/SM SEP ATT
MAN ATT (3) - RATE CMD
RATE - HIGH
YAW left 45° from Burn Att (315°)
BMAG MODE (3) - ATT 1/RATE 2

DATE

DATE 3/29/71

26

PWR REDUCT

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)
(5) cb ECS RAD CONT/HTR (2) - open
cb RAD HTRS OVLD (2) - open
cb WASTE H2O/URINE DUMP HTRS(2)-open
POT H2O HTR - OFF
GLY EVAP TEMP IN - MAN

P61 - ENTRY PREP

27

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

28

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

PAD VALUES

LAT _____
LONG _____
HDS UP +1

PRO

29

F 06 60 GMAX, V400K, GAMMA EI (.01G, fps, .01°)

Record

GMAX _____
V400K _____
GAMMA EI _____

PRO

30

F 16 63 RTOGO (.1nm) _____ PAD _____
VIO (fps) _____ PAD _____
TFE (min-sec) _____

If NO COMM, Set RTOGO & VIO in EMS
& initialize

(ACCEPT) PRO

(RECYCLE) V32E to 29 (TFE sensitive to
oblateness)

DATE 3/29/71

DATE

P62 - CM/SM SEP & PRE-ENTRY MNVR

31 F 50 25 00041 REQUEST CM/SM SEP

PRIM GLY to RAD - BYPASS (verify)
EMS MODE - STBY (verify)
CM RCS LOGIC - on (up)
Cue MSFN
SECS LOGIC (2) - on (up)(verify)
MSFN confirm GO for PYRO ARM (if poss)
SECS PYRO ARM (2) - ARM
MN BUS TIE (2) - ON (verify)

CM/SM SEP (2) - on (up)
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 V MNA/B:
If <25vdc go to EMERG POWER DOWN

YAW back to 0°
MNVR to ENTRY ATT
R 180° (Lift DN)
P 0°
Y 0°
MAINTAIN HORIZ TRACK

PRO (Act ENTRY DAP Att Hold)

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

PRO (CMC Guidance)

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

DATE

DATE 3/29/71

SPS DEORBIT & ENTRY

VEHICLE PREP COMPLETE (pg L/5-1 or pg L/4-10)

P30 - EXTERNAL ΔV

- 1 V37E 30E
- 2 F 06 33 GETI (hr,min,.01sec)
(ACCEPT) PRO
(REJECT) LOAD DESIRED GETI
- 3 F 06 81 $\Delta V_X, Y, Z$ (LV) (.1fps)
(ACCEPT) PRO
(REJECT) LOAD DESIRED DATA
- 4 F 06 42 HA,HP, ΔV (REQ) (.1nm,.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/CM-SM SEP (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

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SPS DEORBIT & ENTRY

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 TRNFR - CM
AUTO RCS SEL (RING 1) - OFF
AUTO RCS SEL (RING 2) - MNB
TEST RING 2 THRUSTERS
AUTO RCS SEL (RING 2) - OFF
AUTO RCS SEL (RING 1) - MNA
TEST RING 1 THRUSTERS
AUTO RCS SEL (RING 2) - MNB
RCS TRNFR - SM
MAN ATT(3) - RATE CMD

8

SPS THRUSTING PREP

Cycle CRYO FANS
SPS GAUGING - AC1 (verify)
PUG MODE - as req'd
Load DAP
BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO

9

MNVR TO PAD BURN ATT (HDS UP)

V49E

R _____ (180°)
P _____
Y _____ (0°)

10

PERFORM BORESIGHT & SXT STAR CHECK

V41 N91E

Stow Optics eyepieces

11

V37E 40E

12

F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO

PRO

13

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

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

TVC CHECK & PREP

(8) cb STAB CONT SYS (all) - close
cb SPS (12) - close
Set ΔVC (verify)
EMS FUNC - ΔV (verify)
MAN ATT (3) - RATE CMD
ATT DB - MIN
RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
ΔV CG - CSM
TVC GMBL DRIVE P&Y - AUTO
MN BUS TIE (2) - ON
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

+54:00m
(-06:00)

PRIMARY TVC CHECK

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

SEC TVC CHECK

GMBL MOT P2-Y2 - START/ON (LMP Cnfrm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC

55:00m
(-05:00)

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L
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Verify GPI returns to 0,0(CMC)
or trim (SCS)

(TRIM) ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
BMAG MODE (3) - RATE 2

PRO
BMAG MODE (3) - ATT1/RATE 2 (verify)
ENTR

15 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

16 06 40 TFI, VG, Δ V (min-sec,.1fps)
*PROG ALARM - TIG Slipped *
*V5N9E 01703 *
*KEY RLSE TO 16 *

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

TIG-3 min

HORIZ CHK - Horiz on 3° window mk
(hds up)(Limit +3° PGNCs GO/NO-GO)
*If NO GO, set tw 180°,180°,0° *
* Track horiz with 7° window mk *
* (hds up) *
* At TIG-2 min, Align GDC *

58:00
(-02:00)

Δ V THRUST A(B) - NORMAL
THC - ARMED
RHC (2) - ARMED
TAPE RCD - HBR/RCD/FWD/CMD RESET

59:25
(-00:35)

DSKY BLANKS

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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
(-00:XX) Horiz on 15° window mark (hds up)
*If no ULLAGE: *
* DIR ULLAGE PB - PUSH*
* Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP

59:55
(-00:05)
F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI >0 Sec
(BYPASS IGN) ENTR to 19 (prfrm switching in 18)
EXIT - V37E 00E

17 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

00:03 SPS THRUST Lt - ON
ΔV THRUST B(A) - NORMAL
IF SCS: +X & THRUST PB - PUSH

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

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00:XX ECO

18 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

19 F 16 85 VG XYZ (CM) (.1fps)

NULL RESIDUALS

RECORD ΔV COUNTER & RESIDUALS ΔVC

EMS FUNC - OFF

VGX

EMS MODE - STBY

VGY

TRANS CONT PWR - OFF

VGZ

BMAG MODE (3) - RATE 2

cb DIRECT ULLAGE (2) - open

cb SPS P & Y (4) - open

TAPE RCDR - off (ctr)

PRO

20 F 37 V82E

21 F 16 44 HA,HP,TFF (.1nm,min-sec)

PRO

22 F 37 00E

23 When COMP ACTY 1t out:
V66E

24 MNVR TO CM/SM SEP ATT

SC CONT - SCS

YAW right 45° from Burn Att (315°)

BMAG MODE (3) - ATT 1/RATE 2

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25

PWR REDUCT

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

P61 - ENTRY PREP

26

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

27

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

PAD VALUES

LAT _____
LONG _____
HDS DN -1 _____

PRO

28

F 06 60 GMAX, V400K, GAMMA EI (.01G, fps, .01°)

Record

GMAX _____
V400K _____
GAMMA EI _____

PRO

29

F 16 63 RTOGO (.1nm) _____ PAD _____
VIO (fps) _____ PAD _____
TFE (min-sec) _____
If NO COMM, Set RTOGO & VIO in EMS
& initialize

(ACCEPT) PRO
(RECYCLE) V32E to 28 (TFE sensitive to
oblateness)

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PRIM GLY to RAD - BYPASS (verify)
EMS MODE - STBY (verify)
CM RCS LOGIC - on (up)
Cue MSFN
SECS LOGIC (2) - on (up) (verify)
MSFN confirm GO for PYRO ARM (if poss)
SECS PYRO ARM (2) - ARM
MN BUS TIE (2) - ON (verify)

CM/SM SEP (2) - on (up)
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 V MNA/B:
 If <25vdc go to EMERG POWER DOWN

YAW back to 0°
MNVR to ENTRY ATT
R 0° (Lift UP)
P Horiz on 29° mark (400K)
Y 0°
MAINTAIN HORIZ TRACK

PRO (Act ENTRY DAP Att Hold)

```

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

```

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EMS INITIALIZATION

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
 EMS MODE - STBY (verify)
 EMS FUNC - ENTRY

RSI ALIGNMENT

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)

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

P63 - ENTRY INIT

33 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/CMD RESET
 HORIZ CK
 Pitch error needle goes toward
 zero approaching .05G time

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P64 - ENTRY POST .05G

34

06 74

BETA, VI, G

(.01°,fps,.01G)
Start DAC

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

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

EMS MODE - BACKUP/VHF RNG
.05 G Lt - on

If CMC is GO:

MAN ATT (3) - RATE CMD

SC CONT - CMC

*If DAP NO GO:

* SC CONT - SCS

* Fly BETA

*If CMC NO GO:

* SC CONT - SCS

* Track horiz with 29°

* window mk

* Maintain Lift UP until .2G*

* Fly EMS

*If after 1G, both RCS ring

* He press <1550 psia:

* Roll 20°/sec & disable RCS*

* After peak G, enable RCS

* & fly BETA = 90°

.05 G sw - on (up)

EMS ROLL - on (up)

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

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36      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
      Stop DAC
      DAC - T11

```

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

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EARTH/POST LANDING

EARTH/POST LANDING

RRT ():) STEAM PRESS - pegged at 90K
50K' ():) CABIN PRESS REL vlv (2) - BOOST/ENTRY
SECS PYRO ARM (2) - ARM
Check Altimeter

Start Watch

(00:00)

(00:52)

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)**
ELS - AUTO (01:24)
Start DAC

24K' ():) RCS disable (auto)
RCS CMD - OFF (01:38)

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 +48s)(02:29)
(Cabin Press = 10 psia)
MAIN DEPLOY PB - PUSH (within 1 sec)
VHF ANT - RECY
VHF AM A - SIMPLEX
VHF BCN - ON
DIRECT 02 vlv - OPEN (if suited)

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L
9-2

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

Stow DAC

STRUT LOCKS (4) - UNLOCK

If night landing:

cb FLOAT BAG #3, FLT/PL (1 cb) - close
PL BCN LT - LOW

- (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 (verify)
- (8) cb SPS P&Y (4) - open (verify)

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

POSTLANDING

STABILIZATION, VENTILATION, COMMUNICATIONS

- 1 (229) 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 *

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- (8) cb PL VENT - close
- cb FLOAT BAG (3) - close
- (278) 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

2

Post Stabilization And Ventilation

- PL BCN LT - BCN LT LOW (night landing)
- PL VENT vlv - UNLOCK (Pull into detent)
- Remove PL VENT Exh Cover
- PL VENT - HIGH or LOW
- If req'd:
- PL DYE MARKER - ON
- Release restraints
- (275) cb MNA BAT BUS A & BAT C (2) - open
- cb MNB BAT BUS B & BAT C (2) - open
- cb FLT & PL BAT C - open
- (250) cb PYRO A SEQ A - open
- cb PYRO B SEQ B - open
- Verify voltage > 27.5 vdc
- *If < 27.5 vdc: *
- * 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

NOMINAL EGRESS & POWER DOWN

- PL VENT - OFF
- cb Pn1 250 (all) - open
- Charge hatch counterbalance
- Open side hatch (*after ceiling installed*)
- ACTR HNDL SEL - N
- GN2 vlv HNDL - VENT (pull)
- GN2 vlv HNDL - PRESS (push)
- Check Pressure Guage (mid-white)
- *repeat vent/press to obtain mid-white*

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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)

STABLE I

PL VENT - OFF
cb Pnl 250 (all) - open
Charge hatch counterbalance
Open side hatch
ACTR HNDL SEL - N
GN2 vlv HNDL - VENT (pull)
GN2 vlv HNDL - PRESS (push)
Check Pressure Guage (mid-white)
repeat vent/press to obtain mid-white
Remove raft from kit No. 2
Put raft overboard & pull inflation lanyard
Pass hardware kit to raft
Egress, inflate life vest, board raft
If no ventilation or CM O2 supply,
* initiate egress within 2-1/2 hrs*

STABLE II

PWR (3) - OFF
SUIT PWR (3) - OFF
PRESS EQUAL vlv - OPEN
Remove & stow hatch
Lower hardware rucksack 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 or CM O2 supply,
* initiate egress within 2-1/2 hrs*

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POST LANDING COMMUNICATIONS

VHF ANT - RECV (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)

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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EMER
1-1

EMERGENCY PROCEDURES
(Flight copies only)

see CSM SYSTEMS CHECKLIST

EMERGENCY PROCEDURES