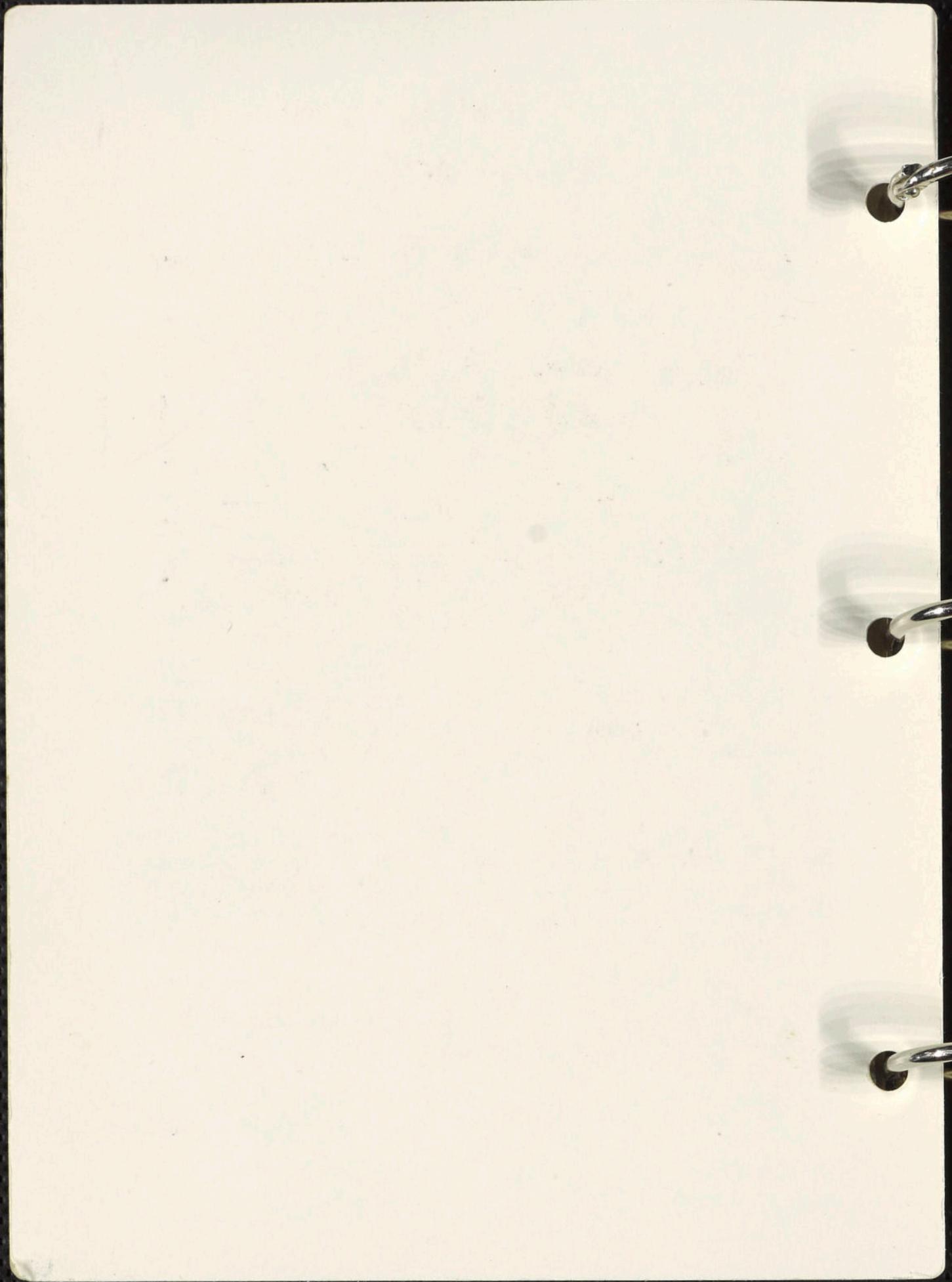


APOLLO 15

**CSM LAUNCH
CHECKLIST**

PART NO.	S/N
SKB32100115-309	1002



CONTENTS

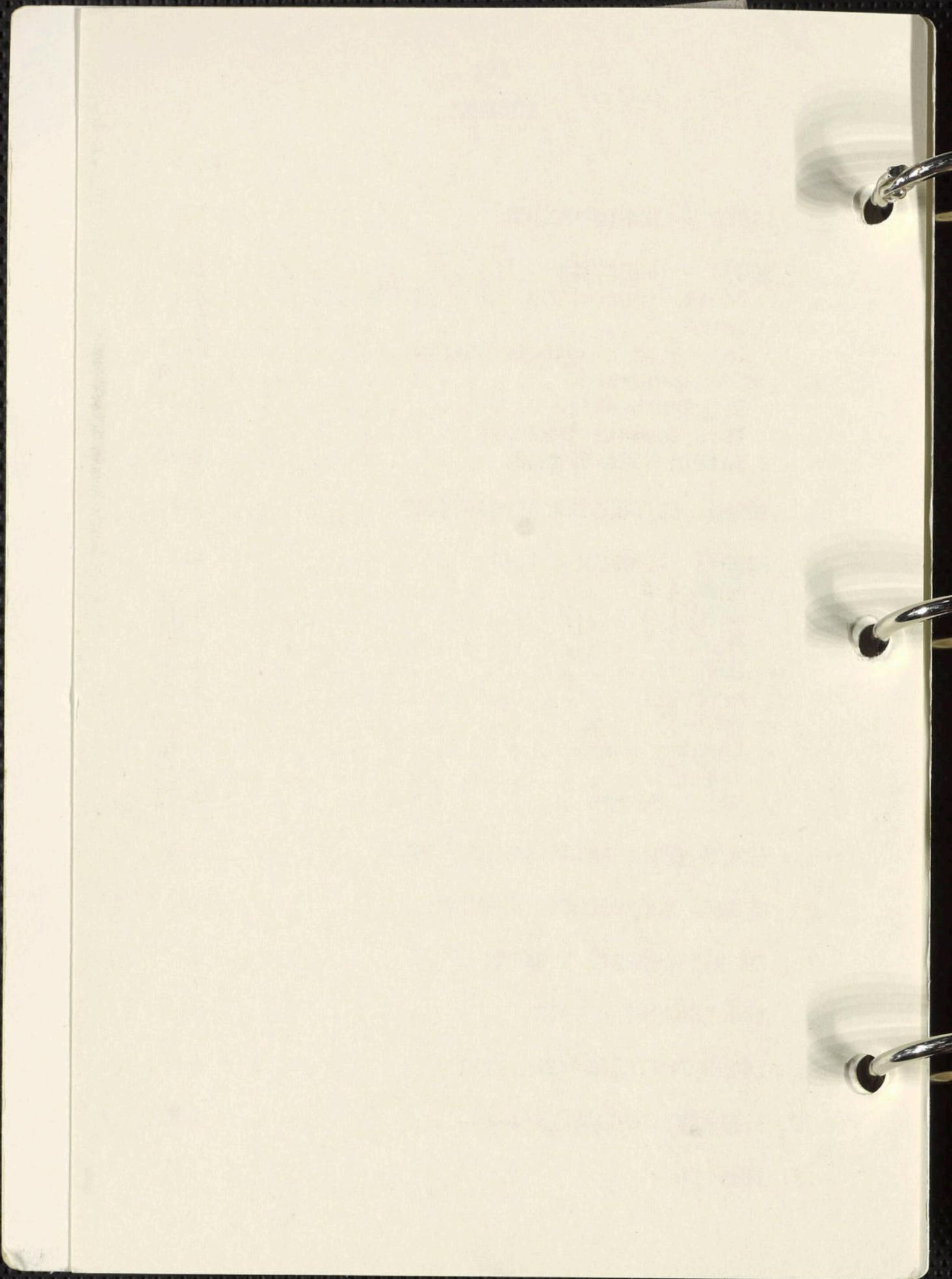
	Page
1. LIFTOFF CONFIGURATION	1-1
2. BOOST - INSERTION - TLI	2-1
Boost Preparation (T - 25:00)	2-1
Boost	2-7
Insertion & Systems Checks	2-11
UV Photography	2-19
TLI Preparation	2-29
TLI, Nominal & Manual	2-30
Saturn Rate Change.	2-33
3. NORMAL SC/BOOSTER SEPARATIONS	3-1
4. ABORTS (LAUNCH & TLI)	4-1
MODE I A	4-1
MODE I B	4-1
MODE I C	4-2
MODE II	4-3
MODE III	4-4
MODE IV	4-6
Landing Phase	4-8
Pre-TLI	4-10
TLI - 90 Min	4-13
5. EARTH ORBIT ENTRY VEHICLE PREP	5-1
6. HYBRID RCS DEORBIT & ENTRY	6-1
7. SM RCS DEORBIT & ENTRY	7-1
8. SPS DEORBIT & ENTRY	8-1
9. EARTH/POST LANDING	9-1
10. EMERGENCY PROCEDURES	EMER/1-1
11. CREW LOG	

DATE 5/28/71NEAR INSERTION
ABORT

LAUNCH TRAJECTORY

BOOST PREPARATION

LIFTOFF CONFIG



DATE 3/29/71LIFTOFF CONFIGURATIONPANEL 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

NEAR INSERTION
ABORT

LAUNCH TRAJECTORY

BOOST

LIFTOFF CONFIG

LIFTOFF CONFIG

L
1-2

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 vTv - 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

DATE 3/29/71

DATE 5/5/71

L
1-3

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°

NEAR INSERTION
ABORT

LAUNCH TRAJECTORY

BOOST PREPARATION

BOOST

L
1-4

LIFTOFF CONFIG

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

DATE 3/29/71

DATE 3/29/71

L
1-5

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

NEAR INSERTION
ABORT

LAUNCH TRAJECTORY

BOOST PREPARATION

BOOST

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

DATE 5/5/71

PANEL 7

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

SCS ELEC PWR - GDC/ECA

SCS SIG CONDR/DR BIAS 1 - AC1

SCS SIG CONDR/DR BIAS 2 - AC2

BMAG PWR (2) - ON

DIRECT O2 vlv - open (CCW) (>2 in H2O on SUIT/CAB ΔP ind)
(O2 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)

DATE 3/29/71PANEL 9

MODE - INTERCOM/PTT

PWR - AUDIO/TONE

PAD COMM - OFF

INTERCOM - T/R

S BD - T/R

VHF AM - T/R

NEAR INSERTION
ABORT

BOOST PREPARATION

BOOST

LIFTOFF CONFIG

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

5/5/71

DATE

DATE 5/5/71

L
1-9

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)

NEAR INSERTION
ABORT

LAUNCH TRAJECTORY

BOOST PREPARATION

BOOST

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 O2 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

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 v1v - OFF

PANEL 252

BAT VENT v1v - CLOSED
WASTE STOWAGE VENT v1v - 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

DATE 3/29/71

BOOST

BOOST PREPARATION

LAUNCH TRAJECTORY

NEAR INSERTION
ABORT

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

DATE 3/29/71

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 v1v (RH) - BOOST/ENTRY
CAB PRESS RELF v1v (LH) - BOOST/ENTRY
PRIM GLY TO RAD v1v - BYPASS (pull)

PANEL 326

REPRESS PKG v1v - ON
SM O2 SUPPLY v1v - ON
SURGE TK 02 v1v - ON
GLY RSVR IN v1v - OPEN
GLY RSVR BYPASS v1v - CLOSE
GLY RSVR OUT v1v - OPEN

PANEL 350

CO2 CSTR DIVERT v1v - both (center)

DATE 3/29/71

PANEL 351
MAIN REG v1v (2) - open
H2O/GLY TK PRESS REG v1v - BOTH
H2O/GLY TK PRESS RELF v1v - BOTH
EMER CAB PRESS v1v - OFF
CAB REPRESS v1v - OFF (CCW)

NEAR INSERTION
ABORT

LAUNCH TRAJECTORY

BOOST PREPARATION

BOOST

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)

DATE 5/5/71

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.

NEAR INSERTION
ABORT

LAUNCH TRAJECTORY

BOOST PREPARATION

BOOST

LIFTOFF CONFIG

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

BOOST PREPARATION

LAUNCH TRAJECTORY

NEAR INSERTION
ABORT

BOOST PREPARATION

LIFTOFF CONFIG

L
2-2

- 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 v1v - 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

DATE 7/9/71

SATURN BOOST 7/1/71
DET θ VI H H JULY 26&27

	00:00	90	1341	0	.0
a	:30	86	1396	314	.7
	1	68	1892	857	3.5
	1:30	48	3123	1542	9.4
	2	34	5226	2321	18.9
	2:16	29	6763	2794	25.5
b	2:30	26	8073	3095	32.4
	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
d	11:30	345	25420	-33	92.6
	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)

DATE 7/9/71

NEAR INSERTION
ABORT

LAUNCH TRAJECTORY

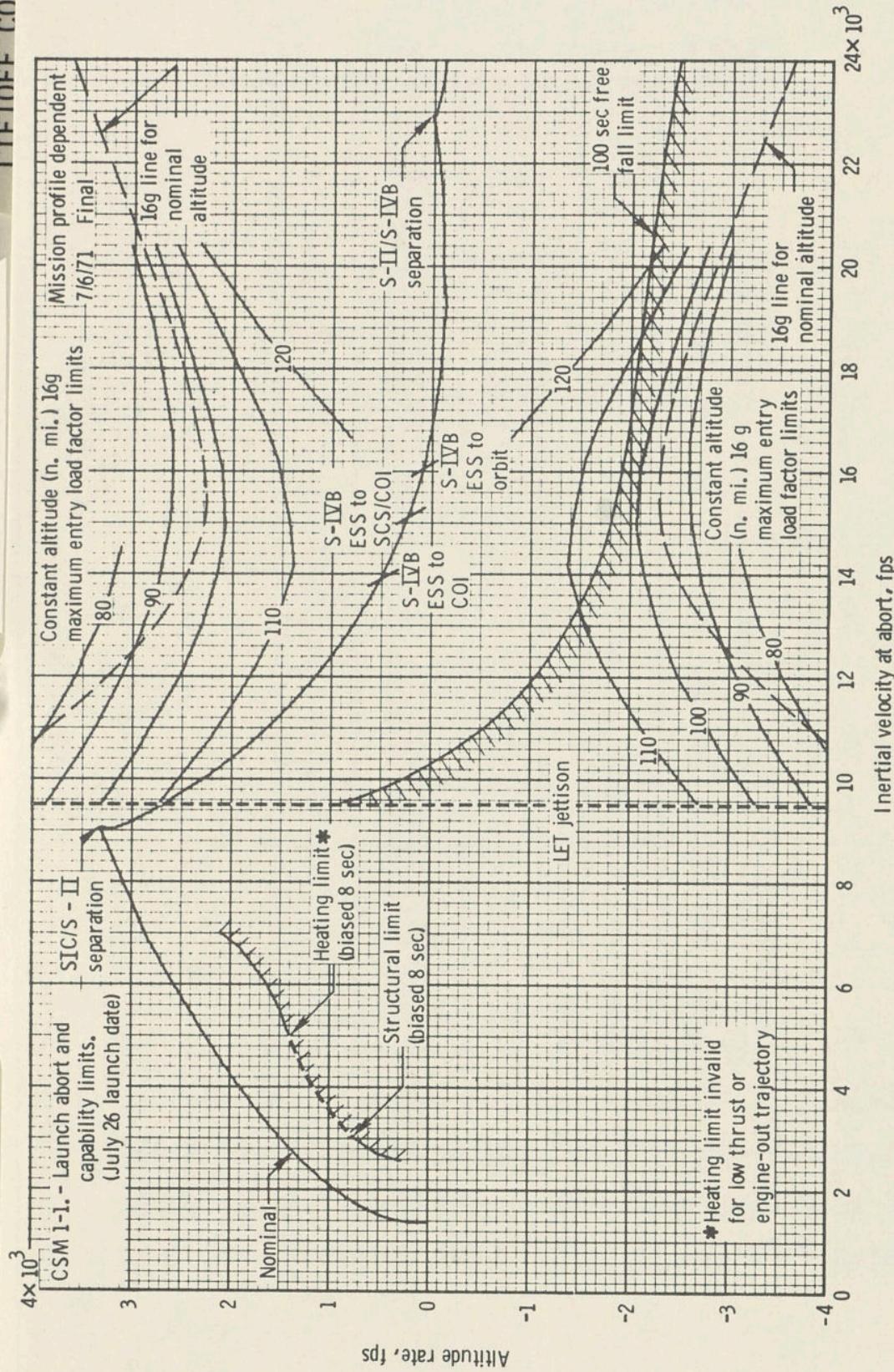
INSERTION & SYS CK

BOOST

LAUNCH ABORT

BOOST PREPARATION

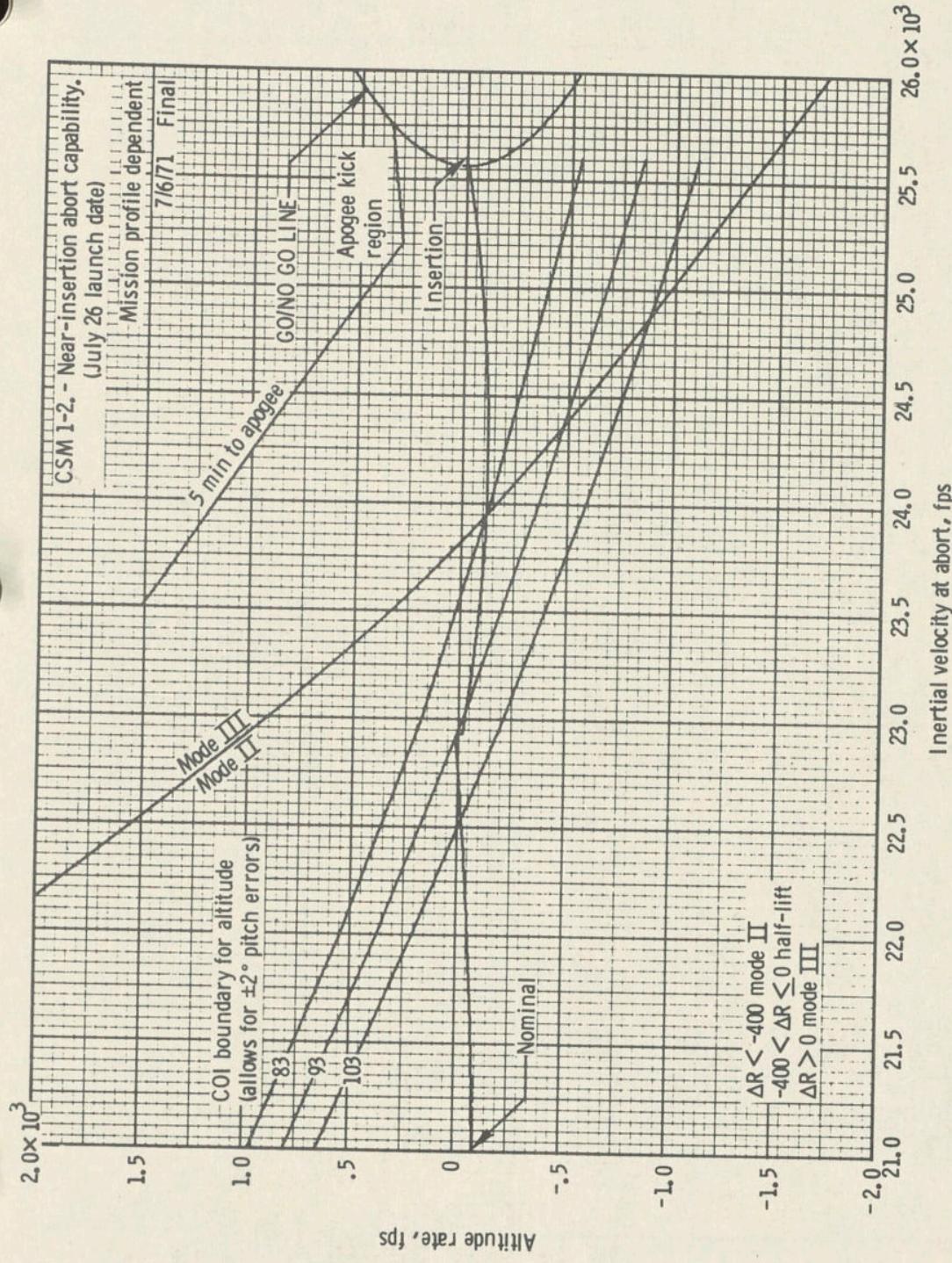
TITTOFF CONETIG



Launch abort and capability limits.

DATE 7/9/71

DATE 7/9/71



NEAR INSERTION
ABORT

TLI TRAJECTORY OPP 1
NOM & MAN
INSERTION & SYS CK

BOOST

2-5

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

SHUTDOWN ALTITUDE, h (N. MI.)	INERTIAL VELOCITY, Vi (fps)	ha/hp (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

DATE 5/5/71

ALTITUDE vs Vi

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.

LAUNCH ABORT

LIFTOFF CONFIG

BOOST PREPARATION

DATE 5/5/71

L
2-7

BOOST

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

00:00

*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

+4°/sec P,Y
+20°/sec R

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

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

MODE IA

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

00:42

+4°/sec P,Y
+20°/sec R

CABIN PRESSURE DECREASING ~14K(2.3 nm)

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

MODE IB

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

H=16.5 nm

BOOST

INSERTION & SYS CK

TLI TRAJECTORY OPP 1
NOM & MAN

TLI PREPARATION

BOOST

BOOST PREPARATION

LAUNCH ABORT

ALTITUDE vs Vi

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

$$\begin{array}{l} +9^\circ/\text{sec P,Y} \\ -20^\circ/\text{sec R} \end{array}$$

+02:16 GO/NO GO FOR STAGING - report
INBOARD CUTOFF - (1t 5 on)
LIFTOFF 1t - out
+02:39 OUTBOARD CUTOFF - report (1ts on)
+02:40 SIC/SII STAGING (1ts - out)
+02:41 SII Ign Command (1ts on)
SII SEP 1t - on
+02:42 SII 65% - 1ts out

MODE IC

+03:10 SII SEP 1t - out report
+03:15/16 TWR JETT (2) - on (up) (TFF>1+20)

TWR JETT

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

For MAN BOOSTER CONTROL

- * LV GUDI - CMC *
- * Key V46E *

 α/P_c sw - P_c

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

MODE II

7/9/77
5/5/77
DATE

+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 = ~~-0.41°~~ -0.52°
YAW = +1.90°

L
2-9

+06:15 OMNI ANT - D (AZ < 96°)
 - C (AZ > 96°)

+06:55 SIVB to orbit

+07:00 Report Status

+07:39 IECO (1t 5 - on)

+07:41 PU SHIFT

+08:00 Report Status

+08:30 GO/NO GO FOR STAGING - report

+08:39 Level sense arm

+09:10 Mode IV - Report
 (VI ~ 22,695, H DOT ~ +10,
 22,918 H ~ +93)
 Report Status +94.7

+09:14 ECO (1ts on)

+09:15 SII Staging - 1ts out

+09:16 SIVB Ign Cmd - 1t on

+09:18 SIVB 65% - 1t out

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

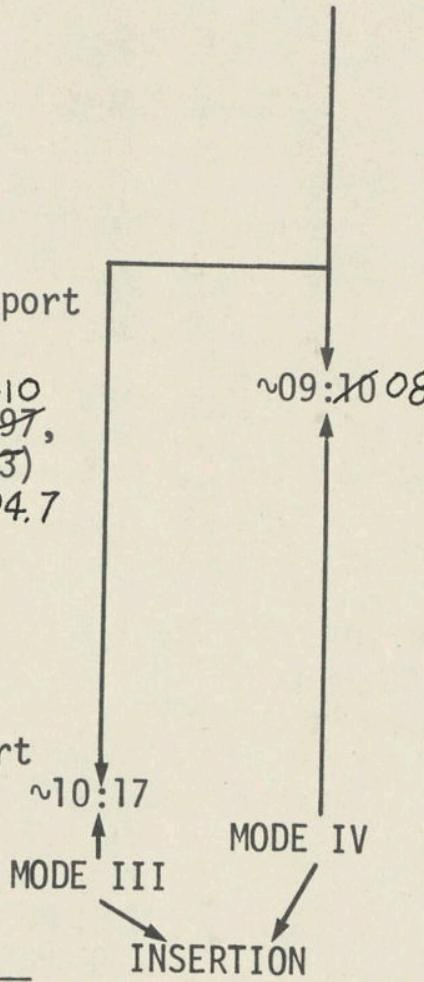
+11:00 Report Status

+11:45 SECO (1t on) - report
 (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)



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

ALTITUDE vs Vi

LAUNCH ABORT

BOOST PREPARATION

BOOST

L
2-10

KEY RLSE

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

PRO

V37E OOE

When CMC ACTY lt out:

V66E

V45E

Verify DAP load, V48: R1 = 31102, R2 = 01111

V46E CSM WT

V83E (check o) P TRIM

PRO Y TRIM

US LOS

(00:16:06)

SM RCS Control of SIVB (APS module failed)

LV GUD - 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 GUD - 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 GUD - CMC

MAN ATT (3) - ACCEL CMD

RCS CMD - ON

DATE 3/29/71

INSERTION AND SYSTEMS CHECKS

CHECK SIVB TANK P →

- 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 v1v (2) - NORMAL/LATCHED
- REPRESS PKG v1v - OFF
- DIRECT O2 v1v - 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 v1v HNDL - VENT (pull)
HATCH GEAR BOX - LATCH (verify)
ACTR HNDL SELECTOR - neutral
- 3 cb WASTE H2O/URINE DUMP HTRS (2) - close
FC REACS v1v - NORM
H2 PURGE LINE HTR - ON

DATE 5/5/71

CYI AOS
(00:17:12) ✓

TLI PREPARATION

TLI TRAJECTORY OPP 1
NOM & MAN

INSERTION & SYS CK

MODE III, MODE IV

ALTITUDE vs Vi

LAUNCH ABORT

INSERTION & SYS CK

BOOST

L
2-12

- 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 *4000, 4000*
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)
Remove helmet & gloves & stow in PGA bag
Unstow & mount TSB's (U1)
INSTALL CM5 WINDOW COVER

*B SE PR-P OF*DATE
7/9/71
5/5/71

L
2-13

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 5/28/77
7/9/77

TLI PREPARATION

TLI TRAJECTORY OPP 1
NOM & MAN

NORM SC/BOOSTER~SEP

MODE III, MODE IV

ALTITUDE vs Vi

LAUNCH ABORT

INSERTION & SYS CK

BOOST

FC 2 NO CK
2-14

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 3/29/71

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

TLI PREPARATION

NORM SC/BOOSTER/SEP

MODE III, MODE IV

ALTITUDE vs Vi

LAUNCH ABORT

INSERTION & SYS CK

BOOST

L
2-1621 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 (T8,250,7) 12 fps, MAG A (B3)
Power cable (B3)
18mm lens (B3)
Rt. angle mirror (B3)
(Assemble & mount in L.H. rendezvous
window)
(f4.3, 1/60/ ∞) 8fr, MAG M
EL (f8,250,30) 10 fr, MAG L (B3)
Spotmeter
(Stow in LMP TSB)
UV BRKT, FILTER, MAG N (A1)
TV (ALC - PEAK, f44) (A1)
Power cable (A1)
Bracket (A1)
Monitor & cable (A1)
(Assemble, connect cables & hand to
LMP)

SUNSET
(00:43:28)7/9/71
3/29/71

DATE

23 OPTICS DUST COVER JETT

Install Optics eyepieces
G/N PWR OPTICS - on (up)
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)

MODE III, MODE IV

TLI PREPARATION TLI TRAJECTORY OPP 1 NORM SC/BOOSTER\SEP
NOM & MAN

L
2-17

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)

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

CRO LOS
(00:58:17)

SUNRISE
(01:21:04)

US AOS 26
(01:28:12)

DATE 3/29/71

SCS ATT Ref Comp Check

V16 N2OE

FDAI SELECT - 1

FDAI SOURCE - ATT SET

ATT SET - GDC

ATT SET dials - null FDAO 1 err needles
Key VERB when nulled (freeze display)

Record from DSKY:

R _____, P _____, Y _____

Record from ATT SET dials:

R _____, P _____, Y _____

FDAO SEL - 1/2 _____

TLI PREPARATION

BOOST

INSERTION & SYS CK

LAUNCH ABORT

ALTITUDE vs Vi

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)

5/28/71

DATE

L
2-19

1-30

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# 10Record GET 1-29-40

- 3 Configure camera: (UV - color)
CM5/EL/105/CEX, CONT (f8, 1/250, ∞) (1 fr)

Ringslide

No 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

TLI PREPARATION

TLI TRAJECTORY OPP 1
NOM & MAN

NORM SC/BOOSTER\SEP

MODE III, MODE IV

ALTITUDE vs Vi

LAUNCH ABORT

INSERTION & SYS CK

BOOST

L
2-20

THIS PAGE INTENTIONALLY BLANK

DATE 5/28/71

DATE 5/28/71

L
2-21

$$\begin{array}{r}
 24023 \\
 938 \\
 \hline
 2-50031
 \end{array}$$

TLI

X	:	:	X	2	9	0	:	2	3	TB6p		
X	X	X	X	X	X	1	8	0	R			
X	X	X	X	X	X	0	9	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	$\Delta V_C'$	
+						+	3	5	5	9	9	VI
X	X	X	X	X	X	3	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	3	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	X	0	4	5	0	R2 Align		
X	X		X	X	X	0	3	8	0	R2 Ign		
X	X		X	X	X	5	6	4	5	ORDEAL Start		
X	X	X	X	X	X	0	0	1		YAW		

4-16-00

TLI PREPARATION

TLI TRAJECTORY OPP 1 NORM SC/BOOSTER^SEP

MODE III, MODE IV

ALTITUDE vs Vi

INSERTION & SYS CK

BOOST

LAUNCH ABORT

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

DATE 5/28/71

P30 MANEUVER

L/2-23

DATE 5/28/71

D Y R

SET STARS

R ALIGN 1 1 2
 P ALIGN 1 2 8
 Y ALIGN 3 5 6

ULLAGE ND

HORIZON/WINDOW

P37 FOR L/0+8

0	0	8	0	0	GETI
X	6	0	7	6	ΔVT
X	-	1	7	5	LONG
0	2	7	0	6	GET 400K

T/L	PURPOSE		
SPS	PROP/GUID		
+ 66 9 3 8	WT N47		
- 0 0 0 5 2	P TRIM N48		
+ 0 0 1 9 0	Y TRIM		
+ 0 0 0 0 4	HRS GETI		
+ 0 0 0 1 9	MIN N33		
+ 0 5 6 9 9	SEC		
- 0 7 2 5 4	ΔV X N81		
+ 4 0 1	ΔV Y -04254		
+ 4 9 2 1 7	ΔV Z +00001		
X X X 1 8 0	R		
X X X 1 6 6	P		
X X X 0 0 2	Y		
+ NA	H A N44		
+ 0 0 2 1 0	H P		
+ 4 9 4 0 1	ΔVT		
X X X 6 3 4	BT		
X 4 9 2 0 8	ΔVC		
X X X X 4 0	SXTS		
+ 0 7 9 5 0	SFT		
+ 3 5 9 0 0	TRN		
X X X NA	BSS		
X X	SPA		
X X X	SXP		
+ 0 1 6 0 4	LAT N61		
- 0 3 0 0 0	LONG		
+ 1 0 7 7 0	RTGO EMS		
+ 3 4 4 9 2	VIO		
0 1 7 4 3 5 8	GET 0.05G		

TLI PREPARATION

TLI TRAJECTORY OPP 1 NORM SC/BOOSTER/SEP

MODE III, MODE IV

L/2-24

P30 MANEUVER

BOOST

INSERTION & SYS CK

LAUNCH ABORT

ALTITUDE vs Vi

SET STARS

R ALIGN

P ALIGN

Y ALIGN

ULLAGE

HORIZON/WINDOW

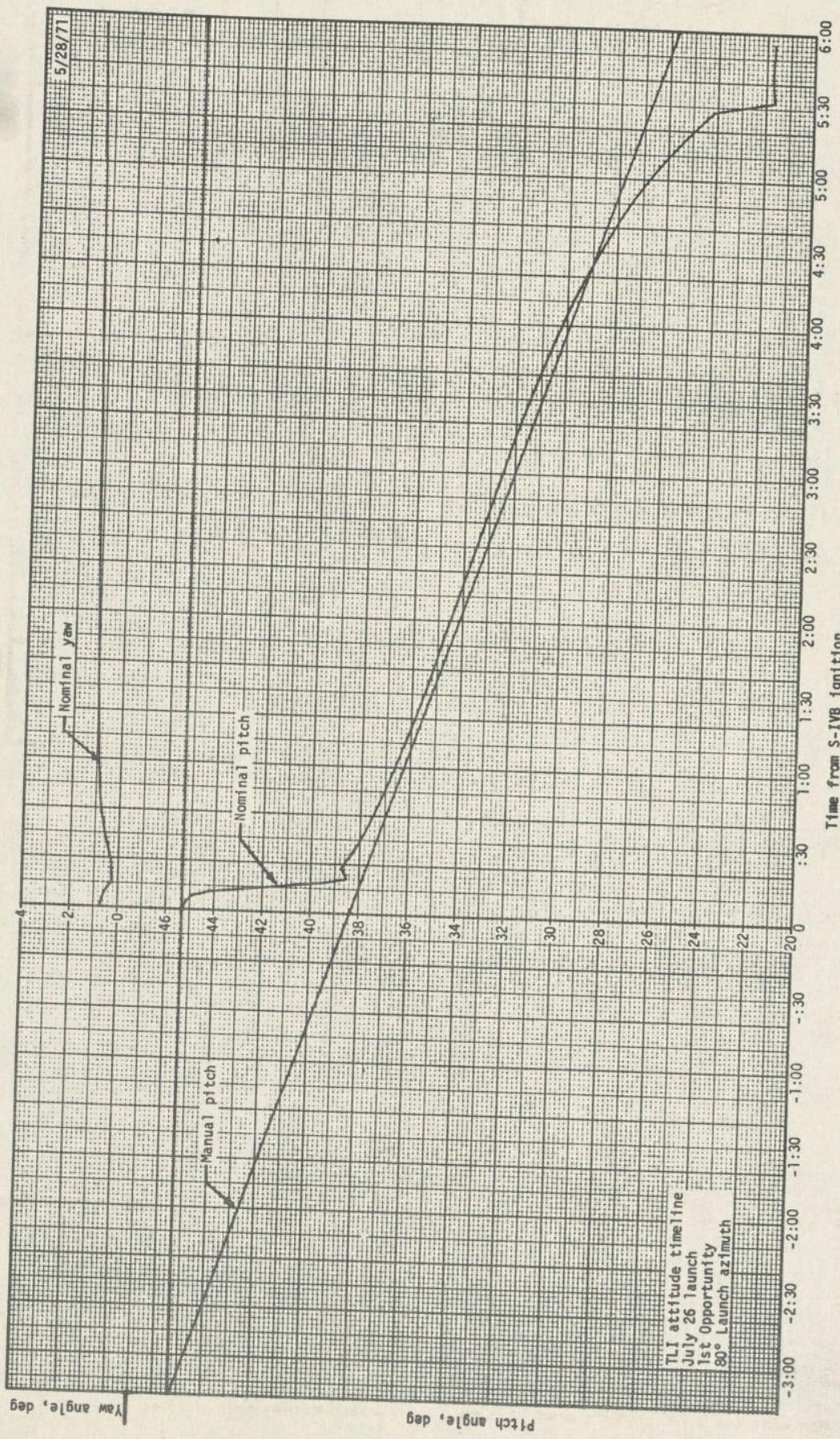
P37 FOR L/0+8

			GETI	
X			ΔV_T	
X			LONG	
			GET 400K	

				PURPOSE
+				PROP/GUID
	0 0			WT N47
	0 0			P TRIM N48
	+ 0 0			Y TRIM
	+ 0 0 0			HRS GETI
	+ 0			MIN N33
				SEC
				ΔV_X N81
				ΔV_Y
				ΔV_Z
	X X X			R
	X X X			P
	X X X			Y
	+ H A			H P N44
	+ H P			
	+			ΔV_T
	X X X			BT
	X			ΔV_C
	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 5/28/71



TLI PREPARATION

TLI TRAJECTORY OPP 1
NOM & MAN

MODE III, MODE IV

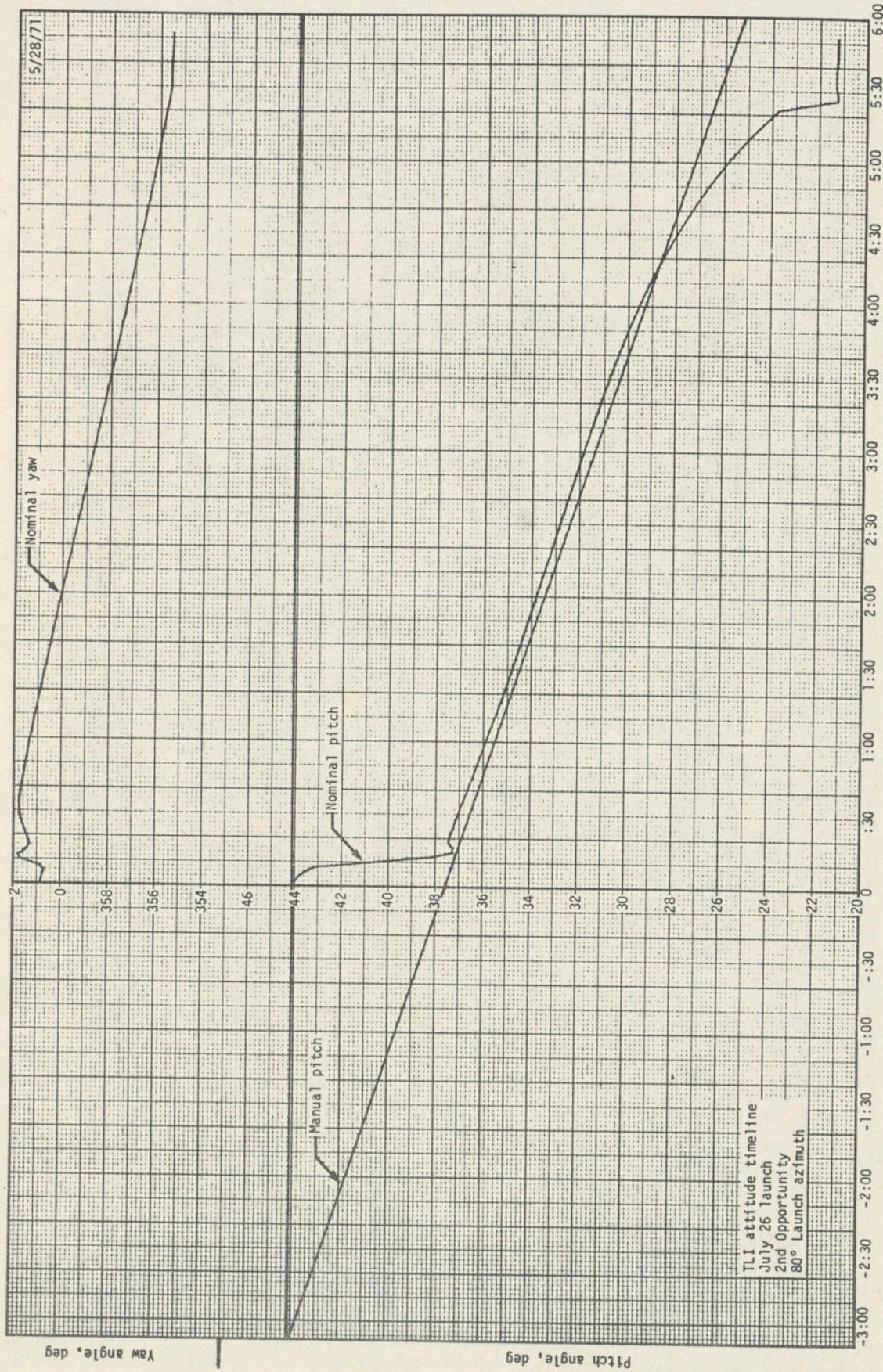
ALTITUDE vs Vi

LAUNCH ABORT

INSERTION & SYS CK

BOOST

L
2-26



DATE 7/9/71
NOMINAL SIVB TLI 1
 LAUNCH JULY 26, 1971

7/1/71

DET	Θ	Ψ	VI	\dot{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

7/1/71

DET	Θ	Ψ	VI	\dot{H}	H
0:00			0:00	38.6	1
			:30	36.5	1
1			1	36.2	1
			1:30	35.0	1
2			2	33.9	1
			2:30	32.7	1
3			3	31.5	1
			3:30	30.4	1
4			4	29.2	1
			4:30	28.0	1
5			5	26.8	1
			5:30	25.7	1
6:03			6:03	24.8	1

2-27

ALTITUDE vs Vi

TLI TRAJECTORY OPP 2
NOM & MAN

INSERTION & SYS CK

BOOST

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	0:00		37.7	358	25599
	:30		36.7	358	26202
1:	1		35.6	358	26873
1:30	1:30		34.6	358	27572
2	2		33.5	358	28320
2:30	2:30		32.4	358	29099
3	3		31.4	358	29917
3:30	3:30		30.3	358	30779
4	4		29.3	358	31690
4:30	4:30		28.2	358	32658
5	5		27.2	358	33691
5:30	5:30		26.1	358	34800
5:50	5:50		25.5	358	35591

2-28

DATE 7/9/71
NASA — MSC

L
2-29

TLI PREPARATION

CRO AOS
(02:24:41)

CRO LOS
(02:31:14)

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 - SII/SIVB (verify)
cb DIRECT ULLAGE (2) - closed
Cycle CRYO FANS
Set DET - 51:00

P15 - TLI INITIATE/CUTOFF
V37E 15E

DATE 5/28/71

F 06 33	GET of TB6 Load GET of TB6 PRO	(hrs,min,sec)
F 06 14	VC/0 Load VC/0 PRO	(fps)
06 95	TFI, VG, VI	(min-sec,fps,fps)

TLI PREPARATION

MODE I

NORM SC/BOOSTER\SEP

MODE III, MODE IV

TLI, NOMINAL & MANUAL

LV G UID - IU (verify)
*If LV G UID lt - on: *
* LV G UID - CMC *
* RHC PWR DIRECT (2) - OFF*

TB6 UPLINK ACTY lt - on
(-09:38) SII SEP lt - on (TIG-09:38)
TB6 + 10sec UPLINK ACTY lt - out
SII SEP lt - out
51:00 Start DET counting up
(-09:00) *If LV G UID - CMC: *
* V16 N20E *
* MNVR to R2 Align = _____ (45°)*

MONITOR LV TANK PRESS SEQUENCE

Nominal LOX ~ 40 psia
Nominal LH2 ~ 31 psia
*If ΔP > 36 psid (OXID > FUEL) *
*If ΔP > 26 psid (FUEL > OXID) *
*If LOX TK PRESS > 50 psia *
* EMERGENCY CSM/LV SEP pg EMER/1-1*

ORDEAL 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 Slew FDAI #1 to PITCH = $16^{\circ} 17^{\circ}$
(-04:00) *If LV G UID - CMC: *
* Slew FDAI #1 to PITCH = 0° *
* V16 N20E *
* Insure R2 Align = _____ (45°)*

DATE 5/28/71

L
2-31

Insure FDAO #1 PITCH = ~~13°~~ ^{14°}

ORDEAL MODE - OPERATE/SLOW, IU or CMC

*If LV GUDI - CMC: *

* MNVR to R2 Ign = _____ (38°)*

56:45
(-03:15)

58:15 DSKY BLANKS (Ave G on)

58:20 06 95 TFI, VG, VI (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)

*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
SUNRISE
(02:48:47)
HAW AOS
(02:49:29)
59:42
HAW LOS
(02:49:52)

SIVB ULLAGE Begins

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

MODE III, MODE IV

NORM SC/BOOSTER/SEP

MODE I

MODE II, MODE III

TLI, NOMINAL & MANUAL TLI TRAJECTORY OPP 2
NOM & MAN

INSERTION & SYS CK

BOOST

L
2-32

- 59:52 SIVB FUEL LEAD
59:55 SIVB ULLAGE discontinues
 Insure FDAI #1 PITCH = 7°
 *If LV GUDI - CMC: *
 * FDAI #1 PITCH = 0° * 
- 59:59 LV ENG 1 lt - on
- 00:00 SIVB IGNITION (____:____) GETI
00:02 LV ENG 1 lt - 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 GUDI - CMC: *
 * Fly PITCH = 0° *
 * YAW = (+1°)* +45°/P,Y
+10°/sec P,Y
+20°/sec R
- HAW LOS (02:55:59) V16 N62E
~~05:54~~
06:03 KEY RLSE before ECO
SIVB ECO (1t on) (BEGIN TB7)
- 06:04 13 *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 _____
 Δ VC _____
- 06:04 13 LV ENG 1 lt - 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°/sec)

DATE 7/28/77

MSFN AOS
(02:56:08)

L

2-33

CHECK SIVB TANK P

SCS TVC SERVO PWR #1 - OFF
PCM BIT RATE - LOW
EMS MODE - STBY
EMS FUNC - OFF
SECS PYRO ARM (2) - SAFE
FDAI #1 - INRTL
RHC #2 - LOCKED

PRO

F 37

00E

When CMC ACTY It 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

DATE 5/28/71

SATURN RATE CHANGE

V25 N1 E
3310E, OE, 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

MODE II, MODE III

MODE I

NORM SC/BOOSTER/SEP

MODE III, MODE IV

TLI, NOMINAL & MANUAL TLI TRAJECTORY OPP 2 INSERTION & SYS CK
NOM & MAN

BOOST

NORMAL SC/BOOSTER SEPARATIONS1 PRE CSM SEPARATION

DIRECT 02 v1v - OPEN until

CAB PRESS = 5.7, then close

cb DOCK PROBE (2) - close (verify)

COAS PWR - on

ALIGN GDC

*If LV GUID - CMC	SIVB MNVR (
* mnvr to SEP ATT	* SEP (
* 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

DATE 3/29/712 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 Δ VC to -100.0EMS FUNC - Δ V

FDAI SCALE - 5/1

MAN ATT (3) - RATE CMD

LIMIT CYCLE - OFF (verify)

ATT DB - MIN

RATE - LOW

MODE I

MODE II, MODE III

MODE III, MODE IV

NORM SC/BOOSTER^SEP

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 v1v - 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

3/29/71

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: $P = -21^\circ$, $Y = +275^\circ$
 S BD ANT OMNI - HI GAIN
 HI GAIN ANT TRACK - REACQ
 TV TRANSMIT/STBY sw - TRANSMIT
 Start DAC

DATE 3/29/71
 7/9/71

5 DOCKING

Stabilize & align CSM
BMAG MODE (3) - ATT 1/RATE 2

At capture:

PROBE EXTD/RETR tb-bp (A, pg S/2-10) //

CMC MODE - FREE

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 *

malf. DOCK
2 DOCK

After dock latches have engaged:

PROBE EXTD/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 EXTD/REL - OFF

DOCK PROBE RETRACT (2) - OFF

cb DOCK PROBE (2) - open

TAPE RCDR - off (ctr)

PCM BIT RATE - LOW

DAC/TV-off

S BD AUX TV - off (center)

7/9/74
3/29/77
7/3/77

DATE

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

- 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 ΔVX,Y,Z (.1fps)
EMS MODE - NORMAL

DATE 3/29/71

MODE III, MODE IV

LANDING PHASE

MODE I

MODE II, MODE III

TLI, NOMINAL & MANUAL TLI TRAJECTORY OPP 2
NOM & MAN

BOOST

NORM SC/BOOSTER SEP

L
3-6

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 OOE

When CMC Acty lt out,

Key V66E

SECS PYRO ARM (2) - SAFE

SECS LOGIC (2) - OFF

cb SECS ARM (2) - open

cb SIVB/LM SEP (2) - open

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

O₂ HTR 3 - OFF

DATE 3/29/77
7/13/77

L
3-7

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) Roll Pitch Yaw *

*

* 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 O2 ISOL/AUX BAT - open

*If no TLI:

* SIVB - CSM/LM SEP (Earth orbit) *

*

*

*min-sec Event Inertial Att

*

*00:00 Ejection R P Y

*

*00:05 3 sec -X

*

*00:22 Mnvr 90.0° 257.0° 354.6°

*

*03:00 6 sec -X

DATE 3/29/71

MODE III, MODE IV

LANDING PHASE

MODE I

MODE II, MODE III

TLI, NOMINAL & MANUAL

TLI TRAJECTORY OPP 2
NOM & MAN

NORM SC/BOOSTER SEP

BOOST

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

DATE 3/29/71

MODE III, MODE IV

LANDING PHASE

MODE I

MODE II, MODE III

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°, Y0° 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

3/29/71

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 - ($R=0^\circ$, $P=120^\circ$, $Y=0^\circ$) (Compl by 1:40)

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

EMS FUNC - ENTRY GET 300K

EMS MODE - NORMAL θ (.05G)

GET DROGUE

At .05G 1t - on

.05G sw - on (up)

EMS ROLL - on (up)

Fly Max. Lift

N62E VI, HDOT, H

DATE 3/29/71

GO TO LANDING PHASE pg L/4-8

PRE-TLI ABORT
FROM ORBIT

MODE II, MODE III

LANDING PHASE

MODE III, MODE IV

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

- 00:00 TRANS CONTR - CCW (4 Sec Min)
 *NO BECO - RESET THC, *
 * LV STAGE sw - SII/SIVB*
 *Reset & start DET *
- 00:03 *CSM/LV SEP - PUSH*
 *RCS CMD - ON *
- THC - ARMED
- 00:05 TRANS CONTR - NEUTRAL THEN +X
 LV/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)
 If $TFF > 2\text{min}$, Yaw 45° (LEFT) GET Drogue
 out-of-plane
 cb MNA&B BAT C(2) - closed
 CM/SM SEP - on (up)
 CM RCS PRESS - on (up)
 RCS 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

DATE 5/28/71

L
4-5

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

DATE 3/29/71

TLI 90 MIN ABORT

PRE-TLI ABORT
FROM ORBIT

LANDING PHASE

MODE III, MODE IV

L
4-6

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

θ

02:05 THRUST ON PB - PUSH

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 lt 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

DATE 5/5/71

TLI 90 MIN ABORT

PRE-TLI ABORT
FROM ORBIT

LANDING PHASE

EARTH ORBIT ENTRY
VEHICLE PREP

MODE III, MODE IV

LANDING PHASE

2
MODE I

MODE II, MODE III

L
4-8

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 v1v (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 v1v (2) - CLOSE
DIRECT O2 v1v - 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 v1v - BOOST/ENTRY

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 v1v (RH) - DUMP
FLOOD Lts - POST LDG
ELS - AUTO (verify)
ELS LOGIC - ON (verify)

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

Go to POSTLANDING PROCEDURES, pg L/9-2

DATE 3/29/71

TLI 90 MIN ABORT

PRE-TLI ABORT
FROM ORBIT

E.O. BLOCK DATA

EARTH ORBIT ENTRY
VEHICLE PREP

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 pn1 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

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 ΔVC to -100.0
- EMS FUNC - ΔV
- FDAI SCALE - 5/1
- MAN ATT (3) - RATE CMD
- LIMIT CYCLE - OFF (verify)
- ATT DB - MIN
- RATE - LOW
- TRANS CONT PWR - on (up) (verify)
- ROT CONT PWR NORMAL (2) - AC/DC (verify)
- ROT CONT PWR DIRECT (2) - MNA/MNB (verify)
- 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

TLI 90 MIN ABORT

SM RCS
DEORBIT & ENTRY

E.O. BLOCK DATA

EARTH ORBIT ENTRY
VEHICLE PREP

MODE III, MODE IV

LANDING PHASE

PRE-TLI ABORT
FROM ORBIT

MODE II, MODE III

L
4-12

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 *

~40:24 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
 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 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)
SIVB/CSM SEP
LV ENG 1 Lt - out
CSM/LV SEP PB - PUSH
*RCS CMD-ON *
- 00:03 THG - ARMED
TRANS CONTR - NEUTRAL THEN +X
LV/SPS IND sw - GPI
- 00:05 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
- 00:14 TRANS CONTR +X (8 to 10 sec)
V37E OOE
RATE - HIGH

MNVR TO RETRO ATT

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

DATE 3/29/71

EARTH ORBIT ENTRY
VEHICLE PREP

E. O. BLOCK DATA

SM RCS
DEORBIT & ENTRY

TLI 90 MIN ABORT

MODE III, MODE IV

LANDING PHASE

PRE-TLI ABORT
FROM ORBIT

TLI 90 MIN ABORT

L
4-14

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

ΔV _____ GET DROGUE _____
VC _____ ENTRY R _____
Δtb _____ P _____
GET 400K _____ Y _____

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

cb EPS GP 5 (2) close (normal)

XX:XX

Set DET counting up to GETI
GDC ALIGN
EMS FUNC - ΔV SET/VHF RNG
SET ΔVc ~~ABORT~~ - 100
EMS FUNC - ΔV

TVC CHECK & PREP

- (8) *cb STAB CONT SYS (all) - close cb SPS (10) - close* *Pilot V. (2) open (normal)*
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 ~~in~~ CSM
TVC GMBL DRIVE P&Y - AUTO

(54:00)
(-06:00)

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/RATE2
SC CONT - SCS
RHC #2 - ARMED

3/29/71

DATE 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

EARTH ORBIT ENTRY
VEHICLE PREP

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 v1vs (2) - AUTO (verify)

E. O. BLOCK DATA

(58:00)
~~(-02:00)~~
~~(-1:00)~~-
(59:30)
(-00:30)
00:00
00:03

ΔV THRUST A(B) - NORMAL
V37E 47E
THC - ARMED
RHC (2) - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET
EMS MODE - NORMAL
*ON RCDR CUE CLOSE SPS PILOT VALVE A
1 SEC OPEN 0.5 SEC*
UILLAGE & THRUST ON PB - PUSH
SPS THRUST Lt - ON
ΔV THRUST B(A) - NORMAL
UILLAGE & THRUST ON PB - PUSH

*IF THRUST LT ON
BY TAPPING POWER FIRST
NO LIGHT DANTS TEST*

*SPS PILOT
VALVE OPEN
1ST 3 SEC*

SM RCS
DEORBIT & ENTRY

P30 MNVR PAD

LANDING PHASE MODE III, MODE IV

PRE-TLI ABORT FROM ORBIT

TLI 90 MIN ABORT

L
4-16

00:XX

ECO ~~After ign. Conf.~~ SPS PILOT VALVE
~~P97 IMMEDIATELY AFTER MARY A GUN OPEN~~
ΔV THRUST A&E - OFF
VERIFY THRUST OFF
SPS INJ VLVS (4) - CLOSED
SPS He v1vs tb (2) - bp
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF
MN BUS TIE (2) - OFF

19 F 16 83 ΔV XYZ (CM) (.1fps)
RECORD ΔVC _____
EMS FUNC - OFF ΔVX _____
EMS MODE - STBY ΔVY _____
ΔVZ _____

ATT DB - MAX
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
BMAG MODE (3) - RATE 2
TAPE RCDR - off (ctr)
PCM BIT RATE - LOW

PRO
F37 OOE
When CMC Acty lt out:
V66E

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

AFTER TEST IF SPS GOES OUT
TRY TO GET OUT BY PULLING ON
PANEL.

3/29/71

DATE

L
5-1

EARTH ORBIT ENTRY VEHICLE PREPARATION

- 1 INITIAL STOWAGE COMPLETED
- 2 CMC POWER UP pg G/2-2
- 3 IMU POWER UP pg G/2-1
- 4 SCS POWER UP pg G/2-4
- 5 P51 - IMU ORIENTATION pg G/6-1
- 6 LOAD DAP
 V48E 11102, 01111, PRO, PRO, PRO
- 7 DON MAE WESTS & FOOT RESTRAINTS
- 8 (: :) P27 (SV,REFSMMAT), MNVR
 & ENTRY PAD UPDATES
- 9 ECS CKS
 O2 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

EARTH ORBIT ENTRY
VEHICLE PREP

E. O. BLOCK DATA

SM RCS
DEORBIT & ENTRY

P30 MNVR PAD

EARTH ORBIT ENTRY
VEHICLE PREP

LANDING PHASE

PRE-TLI ABORT
FROM ORBIT

TLI 90 MIN ABORT

L
5-2

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 $>1^\circ$, recycle P52 *

If confirmed, use SCS for

* EMS entry *

18

GDC ALIGN

If drift $>10^\circ/\text{hr}$, 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 1t - on (all others out)
EMS FUNC - EMS TEST 3
.05G 1t - on
RSI lower 1t - on (10 sec later)
Set RANGE counter to 58 nm+0.0

3/29/71

DATE

L
5-3

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

P30 MNVR PAD

SM RCS
DEORBIT & ENTRY

E.O. BLOCK DATA

E.O. ENTRY UPDATE

EARTH ORBIT ENTRY
VEHICLE PREP

LANDING PHASE

PRE-TLI ABORT
FROM ORBIT

TLI 90 MIN ABORT

L
5-4

- 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 pn1 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
- 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 3/29/71

L
5-5

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 CM CEP (3))

ELS/CM-SM SEP (2) - open
PI 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

P30 MNVR PAD

SM RCS
DEORBIT & ENTRY

SM RCS
DEORBIT & ENTRY

E.O. BLOCK DATA E.O. ENTRY UPDATE

EARTH ORBIT ENTRY
VEHICLE PREP

LANDING PHASE

PRE-TLI ABORT
FROM ORBIT

TLI 90 MIN ABORT

L
5-6

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 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 SEC
X X		X X		RETDROG TO MAIN

P30 MNVR PAD

SM RCS
DEORBIT & ENTRY

E.O. BLOCK DATA

E.O. ENTRY UPDATE

L/5-8

E. O. ENTRY UPDATE

E. O. ENTRY UPDATE

LANDING PHASE

PRE-TLI ABORT
FROM ORBIT

TLI 90 MIN ABORT

X	-	X	-	AREA
XX -	.	XX -	.	ΔV TAILOFF
XXX		XXX		R 0.05G EMS
XXX		XXX		P 0.05G
XXX		XXX		Y 0.05G
+	.	+	.	RTGO EMS
+	.	+	.	VIO
XX	.	XX	.	RET 0.05G
0	.	0	.	LAT N61
				LONG
XX	.	XX	.	RET 0.2G
R R	/	R R	/	DRE (55°) N66
XX	.	XX	.	BANK AN
XX	.	XX	.	RET RB
XX	.	XX	.	RETBBO
XX	.	XX	.	RETEBO
XX	.	XX	.	RETDROG
XXX		XXX		(90°/fps) CHART
XX		XX		DRE (90°) UPDATE

POST BURN

XXX		XXX		P 0.05G
+	.	+	.	RTGO EMS
+	.	+	.	VIO
XX	.	XX	.	RET 0.05G
XX	.	XX	.	RET 0.2G
R R	/	R R	/	DRE ±100 nm N66
XX	.	XX	.	BANK AN
XX	.	XX	.	RETRB
XX	.	XX	.	RETBBO
XX	.	XX	.	RETEBO SEC
XX	.	XX	.	RETDROG TO MAIN

DATE 3/29/71

DATE 3/29/71

EARTH ORBIT BLOCK DATA						L/5-9
X X		X X		1-4		AREA
X X X		X X X	+ 20.1			LAT
X X		X X - 148.0				LONG
		00 1:04:01				GETI
X X X		X X X	242.7			ΔV_C
X X		X X	2-1			AREA
X X X		X X X	+ 29.2			LAT
X X		X X - 067.0				LONG
		00 1:21:59				GETI
X X X		X X X	242.7			ΔV_C
X X		X X	2-4			AREA
X X X		X X X	+ 24.1			LAT
X X		X X - 148.0				LONG
		00 2:36:05				GETI
X X X		X X X	242.7			ΔV_C
X X		X X	3-4			AREA
X X X		X X X	+ 29.5			LAT
X X		X X - 148.0				LONG
		00 4:08:38				GETI
X X X		X X X	242.7			ΔV_C
X X		X X	4-4			AREA
X X X		X X X	+ 30.6			LAT
X X		X X - 148.0				LONG
		00 5:41:22				GETI
X X X		X X X	242.7			ΔV_C

REMARKS: 1) ROLL RIGHT 90° ENTRY

2) DO NOT USE 2-1 FOR LAUNCH AZIMUTHS > 86°

3) DO NOT USE 1-4 FOR LAUNCH AZIMUTHS < 86°

P30 MNVR PAD

SM RCS
DEORBIT & ENTRY

E.O. BLOCK DATA

EARTH/POST LANDING

TLI 90 MIN ABORT

PRE-TLI ABORT
FROM ORBIT

E.O. ENTRY UPDATE

E.O. BLOCK DATA

EARTH ORBIT BLOCK DATA												L/5-10
X	X				X	X			-			AREA
X	X	X			X	X	X					LAT
X	X				X	X						LONG
X	X		.	.	X	X	.	.				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
X	X		.	.	X	X		.				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
X	X		.	.	X	X		.				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
X	X		.	.	X	X		.				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
X	X		.	.	X	X		.				GETI
X	X	X		.	X	X	X		.			ΔV_C
REMARKS:												

DATE 3/29/71

P30 MANEUVER

L/5-11

DATE 3/29/71SET 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			
		•	ΔV_T
X X X		•	BT
X		•	ΔV_C
X X X X			SXTS
+ 0		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

SM RCS
DEORBIT & ENTRY

HYBRID RCS
DEORBIT & ENTRY

EARTH/POST LANDING

PRE-TLI ABORT
FROM ORBIT

E.O. BLOCK DATA

E.O. ENTRY UPDATE

HYBRID RCS DEORBIT & ENTRY

VEHICLE PREP COMPLETE

- 1 P30 = EXTERNAL ΔV
V37E 30E
- 2 F 06 33 GETI (hr,min,.01sec)
(ACCEPT) PRO
(REJECT) LOAD DESIRED GETI
- 3 F 06 81 ΔVX,Y,Z (LV) (.1fps)
(ACCEPT) PRO
(REJECT) LOAD DESIRED DATA
- 4 F 06 42 HA,HP,ΔV (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 OOE
- 7 SEPARATION CK LIST
 PRIM GLY TO RAD - BYPASS (Pull)
 REPRESS PKG v1v - FILL to 865-935,
 then ON
 O2 SM SUPPLY v1v - OFF
 SURGE TK - ON (verify)
 CAB PRESS REL v1v (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

EARTH/POST LANDING

HYBRID RCS
DEORBIT & ENTRYSM RCS
DEORBIT & ENTRY

SPS DEORBIT & ENTRY

HYBRID RCS
DEORBIT & ENTRY

E.O. ENTRY UPDATE

PRE-TLI ABORT
FROM ORBIT

L
6-2

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

($.01^\circ$)

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

L
6-3

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

SPS DEORBIT & ENTRY

SM RCS
DEORBIT & ENTRY

LV

EARTH/POST LANDING

PRE-TLI ABORT
FROM ORBIT

HYBRID RCS
DEORBIT & ENTRY

E.O. ENTRY UPDATE

L
6-4

- 18 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
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)
-
- 19 59:25 DSKY BLANKS
-
- 20 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

DATE 3/29/71

L
6-5

00:00
21 F 16 85 REQ NULL VG X,Y,Z (.1fps)
BURN EMS ΔV CTR TO 100

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
(N/AE, SLOWDOWN, ETC.)

Hybrid V63E (N17, CM BURN ATT)
1 min *If CMC NO GO

*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)
R 0°
(θ ~290) P (~ 110° from SM BURN ATT)

CM RCS LOGIC - OFF
SECS PYRO ARM (2) - SAFE

DATE 3/29/71

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

BURN VGZ TO ZERO

* If only 1 RHC

* Pulse + P=5° from re

* Maintain rates <3°/

Digitized by srujanika@gmail.com

SPS DEORBIT & ENTRY

SM RCS
DEORBIT & ENTRY

EURBI & ENIR

L
6-6

- 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 lt 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 3/29/71

L
6-7

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

DATE 3/29/71

32 F 16 63

RTOGO (.1nm) PAD

VIO (fps) PAD

TFE (min-sec) PAD

If NO COMM, Set RTOGO & VIO in EMS

& initialize

(ACCEPT) PRO

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

EARTH/POST LANDING

LV

SM RCS
DEORBIT & ENTRY

SPS DEORBIT & ENTRY

E.O. ENTRY UPDATE

HYBRID RCS
DEORBIT & ENTRY

PRE-TLI ABORT
FROM ORBIT

L
6-8

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
($.01^\circ$, $.01^\circ$, -00001)

PRO (CMC Guidance)

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

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 3/29/71

L
6-9

P64 - ENTRY POST .05G

37 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
.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

* 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

E.O. ENTRY UPDATE

HYBRID RCS
DEORBIT & ENTRY

PRE-TLI ABORT
FROM ORBIT

L
6-10

P67 - ENTRY - FINAL PHASE (0.2G)

- 38 06 66 BETA, CRSRNG ERR, DNRNG ERR (.01°, .1nm, .1nm)
(+ is north & long)
KEY VERB
Record DNRNG ERR _____
KEY RLSE
Limit: +100nm from PAD DRE
Monitor lift vector on RSI & FDAO
~~CM RCS: change rings when He PRESS~~
~~↔1150 psia~~
- 39 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

7/9/77
3/29/77

DATE

SM RCS DEORBIT & ENTRY

VEHICLE PREP COMPLETEP30 - EXTERNAL ΔV

V37E 30E

- 1 F 06 33 GETI (hr,min,.01sec)
 (ACCEPT) PRO
 (REJECT) LOAD DESIRED GETI
- 2 F 06 81 ΔVX,Y,Z (LV) (.1fps)
 (ACCEPT) PRO
 (REJECT) LOAD DESIRED DATA
- 3 F 06 42 HA,HP,ΔV (REQ) (.1nm,.1nm,.1fps)
 Record ΔV
 (ACCEPT) PRO
 (REJECT) Reselect P30 or P27. Load new param.
- 4 F 16 45 M,TFI,MGA (marks,min-sec,.01°)
 *MGA -00002: if *
 * IMU not aligned*
 SET DET
 PRO
- 5 F 37 OOE
- 6 SEPARATION CK LIST
 PRIM GLY TO RAD - BYPASS (Pull)
 REPRESS PKG vlv - FILL to 865-935,
 then ON
 O2 SM SUPPLY vlv - OFF
 SURGE TK - ON (verify)
 CAB PRESS REL vlv (2) - NORM
 cb ELS/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 3/29/71SM RCS
DEORBIT & ENTRY

SPS DEORBIT & ENTRY

LV

EARTH/POST LANDING

HYBRID RCS
DEORBIT & ENTRY

E. O. ENTRY UPDATE

SM RCS
DEORBIT & ENTRY

L
7-2

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°)

DATE 3/29/71

L
7-3

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 06 85 55:00m 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 16 85 59:30 VG X,Y,Z (AVE G ON) (.1fps)
RHC's & THC - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET
EMS MODE - NORMAL

19 F 16 85 00:00 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

EARTH/POST LANDING

LV

ECS, CRITICAL
BURNS (OVER)

SPS DEORBIT & ENTRY

HYBRID RCS
DEORBIT & ENTRY

E.O. ENTRY UPDATE

SM RCS
DEORBIT & ENTRY

L
7-4

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

22 F 37 00E
When CMC ACTY It 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 3/29/71

L
7-5

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

EARTH/POST LANDING

LV

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

ECS, CRITICAL
BURNS (OVER)

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

SPS DEORBIT & ENTRY

L
7-6P62 - 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
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 3/29/71

P63 - ENTRY INIT

34 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

P64 - ENTRY POST .05G

35 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

.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

* * * * *

ECS, CRITICAL
BURNS (OVER)

SPS DEORBIT & ENTRY

LV

*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 & FDAO

EMS GO/NO GO

G-V Plot within limits

HYBRID RCS
DEORBIT & ENTRY

E.O. ENTRY UPDATE

SM RCS
DEORBIT & ENTRY

L
7-8

P67 - ENTRY - FINAL PHASE (0.2G)

- 36 06 66 BETA,CRSRNG ERR,DNRNG ERR (.01°,.1nm,.1nm)
(+ is north & long)
KEY VERB
Record DNRNG ERR _____
KEY RLSE
Limit: +100nm from PAD DRE
Monitor lift vector on RSI & FDAI
~~-CM RCS: change rings when He PRESS~~
~~→±150 psia~~
- 37 F 16 67 RTGO,LAT,LONG (Vrel=1000fps)
(.1nm,.01°,.01°)
SC CONT - SCS
RTGO NEG - LIFT UP
RTGO 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

DATE

7/9/71
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 ΔVX,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.
- F 16 45 M,TFI,MGA (marks,min-sec,.01°)
 *MGA -00002: If *
 * IMU not aligned*
 Set DET
 PRO
- F 37 00E

DATE 3/29/71

6

SEPARATION CK LIST

PRIM GLY TO RAD - BYPASS (pull)
 REPRESS PKG vlv - FILL to 865-935,
 then ON

O2 SM SUPPLY vlv - OFF
 SURGE TK - ON (verify)
 CAB PRESS REL vlv (2) - NORM
 cb ELS/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

SPS DEORBIT & ENTRY

ECS, CRITICAL
BURNS (OVER)

LV

EARTH/POST LANDING

SPS DEORBIT & ENTRY SM RCS DEORBIT & ENTRY HYBRID RCS DEORBIT & ENTRY E.O. ENTRY UPDATE

L
8-2

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°)

DATE 3/29/71

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)

55:00m
(-05:00)

DATE 3/29/71

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

EARTH/POST LANDING

LV

ECS, CRITICAL
BURNS (OVER)

G&C, SPS
EPS (OVER)

E.O. ENTRY UPDATE

HYBRID RCS
DEORBIT & ENTRY

SM RCS
DEORBIT & ENTRY

SPS DEORBIT & ENTRY

L
8-4

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

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

PRO

BMAG MODE (3) - 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, ΔVM (min-sec,.1fps)
*PROG ALARM - TIG Slipped *
*V5N9E 01703 *
*KEY RLSE TO 16 *

FDAI SCALE - 5/5
RATE - HIGH
UPDATE DET
SPS He v1vs(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)

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

59:25
(-00:35)

DSKY BLANKS

DATE 3/29/71

L
8-5

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

06 40 TFI, VG, Δ VM (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 Δ VM (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 OOE

17 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, Δ VM (min-sec,.1fps,.1fps)
*F 97 40 SPS Thrust fail *
* Δ V THRUST B(A) - NORMAL *
*(RESTART) PRO to IGN *
(RECYCLE) ENTR to TIG-05sec

00:03 SPS THRUST Lt - ON
 Δ V 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

DATE 3/29/71

G&C, SPS
EPS (OVER)

LV

ECS, CRITICAL
BURNS (OVER)

EARTH/POST LANDING

SM DEORBIT & ENTRY

HYBRID RCS
DEORBIT & ENTRYHYBRID RCS
DEORBIT & ENTRY

E.O. ENTRY UPDATE

L
8-6

00:XX ECO

18 F 16 40 TFC (STATIC), VG, Δ VM (min-sec,.1fps)
 Δ V THRUST A&B - OFF

VERIFY THRUST OFF

SPS INJ VLVS (4) - CLOSED

SPS He v1vs 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 Δ V COUNTER & RESIDUALS Δ VC

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 lt 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

DATE 3/29/71

L
8-7

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

EARTH/POST LANDING

LV

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 (+/-)
($.01^\circ$, $.01^\circ$, ± 00001)

PAD VALUES

LAT _____

LONG _____

HDS DN _____ -1

PRO

28 F 06 60

GMAX, V400K, GAMMA EI (.01G, fps, $.01^\circ$)

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)

DATE 3/29/71

ECS, CRITICAL
BURNS (OVER)

G&C, SPS
EPS (OVER)

E.O. ENTRY UPDATE

HYBRID RCS
DEORBIT & ENTRY

SM RCS
DEORBIT & ENTRY

SPS DEORBIT & ENTRY

L
8-8

P62 - CM/SM SEP & PRE-ENTRY MNVR

30 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 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
($.01^\circ$, $.01^\circ$, -00001)

DATE 3/29/71

L
8-9

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)

DATE 3/29/71 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

EARTH/POST LANDING

LV

ECS, CRITICAL
BURNS (OVER)

G&C, SPS
EPS (OVER)

L
8-10P64 - ENTRY POST .05G

34 06 74

BETA, VI, G

(.01°,fps,.01G)
Start DACRTOGO 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

DATE 3/29/71

L
8-11

P67 - ENTRY - FINAL PHASE (0.2G)

35 06 66 BETA, CRS RNG ERR, DNRNG ERR (.01°, .1nm, .1nm)
(+ is north & long)

KEY VERB

Record DNRNG ERR _____

KEY RLSE

Limit: +100nm from PAD DRE

Monitor lift vector on RSI & FDAI

~~CM RCS: change rings when He PRESS~~

←1150 psia

36 F 16 67 RTGO, LAT, LONG (Vrel=1000fps)
(.1nm, .01°, .01°)

SC CONT - SCS

RTGO NEG - LIFT UP

RTGO 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

DATE 3/29/77
7/9/77

EARTH/POST LANDING

ECS, CRITICAL
BURNS (OVER)

G&C, SPS
EPS (OVER)

LV

SPS DEORBIT & ENTRY

SM RCS
DEORBIT & ENTRY

HYBRID RCS
DEORBIT & ENTRY

E.O. ENTRY UPDATE

EARTH/POST LANDING

- RRT (_____) STEAM PRESS - pegged at ~90K Start Watch (00:00)
 50K' (_____) CABIN PRESS REL vlv (2) - BOOST/ENTRY (00:54)
 SECS PYRO ARM (2) - ARM 52
- Check Altimeter
- 40K' (_____) * CM UNSTABLE *(01:08)
 *RCS CMD - OFF * 06
 * 40K' APEX COVER JETT PB-PUSH *
 DROGUE DEPLOY PB - PUSH (2 sec)
 *after apex cover jett) *
- 30K' ELS LOGIC - on (up) (01:26)
 ELS - AUTO Start DAC 24
- 24K' (_____) RCS disable (auto) (01:38)
 RCS CMD - OFF 37
- Apex cover jett (auto)
 APEX COVER JETT PB - PUSH
 (WAIT 2 SECS)
- Drogue parachutes deployed (auto)
 DROGUE DEPLOY PB - PUSH
- If Both Drogues Fail:
 *ELS - MAN *
 *Stabilize CM *
 5K' MAIN DPLY PB - PUSH
 *ELS - AUTO *
- 23.5K' Cabin Pressure increasing
 *If not increasing by 17K': *
 CABIN PRESS REL vlv (RH) - DUMP
- 10K' (_____) Main parachutes deployed (Drogues +49s) (02:29) +48s
 (CAB PRESS MAIN DEPLOY PB - PUSH (within 1 sec) 27
 = 10 psia) VHF ANT - RECY
 VHF AM A - SIMPLEX
 VHF BCN - ON
 DIRECT 02 vlv - OPEN (if suited)

EARTH/POST LANDING

LV

ECS, CRITICAL
BURNS (OVER)G&C, SPS
EPS (OVER)DATE 3/29/71
7/9/71

EARTH/POST LANDING

HYBRID RCS
DEORBIT & ENTRY

SM RCS
DEORBIT & ENTRY

SPS DEORBIT & ENTRY

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 Stabilization after landing

(229) 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 *

DATE 3/29/71

L
9-3

- (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

DATE 3/29/77
 7/9/77

NOMINAL EGRESS & POWER DOWN

PL VENT - OFF

cb Pnl 250 (all) - open

Charge hatch counterbalance

Open side hatch (AFTER COLLAR 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

SM RCS

LV

ECS, CRITICAL
BURNS (OVER)

G&C, SPS
EPS (OVER)

UNAIDED EGRESS PROCEDURESPREPARATION

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 Pn1 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*

POST LANDING COMMUNICATIONS

VHF ANT - RECY (verify)

VHF BCN - ON (verify)

If no contact with recovery forces
perform VHF BEACON Check

MONITOR VHF BEACON transmission with

VHF AM B Rcvr and/or Survival Transceiver

*VHF Beacon not operating *

*connect Survival Transceiver to ant *

cable conn P112 behind VHF ant access pn1

*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 pn1 & turn
radio on in BCN mode

DATE 3/29/71

G&C, SPS
EPS (OVER)

ECS, CRITICAL
BURNS (OVER)

LV

SM RCS

SPS DEORBIT & ENTRY

SM RCS
DEORBIT & ENTRY

HYBRID RCS
DEORBIT & ENTRY

EARTH/POST LANDING

EMER

1-1

EMERGENCY CSM/LV SEPARATION

IF POWERED FLT

TRANS CONTR - CCW (4 SEC)

MN BUS TIES - ON

TVC SERVO PWR 1 - AC1/MNA

TVC SERVO PWR 2 - AC2/MNB

B MAG MODE (3) - ATT 1/RATE 2

GMBL MTRS (4) - ON

ΔV THRUST A - NORMAL

DIR ULLAGE & THRUST ON PB - PUSH

SPS BURN (5 SEC) - THEN ΔV THRUST (2) - OFF

DATE 3/15/71

SM RCS

LV

ECS, CRITICAL
BURNS (OVER)

G&C, SPS
EPS (OVER)

EARTH/POST LANDING

EMER
1-2

IF COASTING FLT

cb SECS ARM (2) (Pn1 8) - CLOSE

SECS LOGIC (2) - ON

SECS PYRO ARM (2) - ARM

ROT CONTR PWR DIR (2) - MNA/MNB

SC CONT - SCS

SEPARATE FROM LV AS APPLICABLE -

IF BEFORE DOCKING, THC CCW (4 SEC)

IF DOCKED, UMBIL NOT CONNECTED,
CSM/LM FINAL SEP (2) - ON

IF DOCKED, UMBIL CONNECTED, SIVB/LM SEP - ON

TRANSLATE AWAY FROM LV & MANEUVER TO BURN ATTITUDE

Δ VCG - CSM OR LM/CSM AS APPLICABLE

MN BUS TIE (2) - ON

TVC SERVO PWR 1 - AC1/MNA

TVC SERVO PWR 2 - AC2/MNB

BMAG MODE (3) - ATT1/RATE 2

GMBL MTRS (4) - ON

Δ V THRUST A - NORMAL

DIR ULLAGE & THRUST ON PB - PUSH

SPS BURN (5) SEC - THEN Δ V THRUST (2) - OFF

SM RCS
DEORBIT & ENTRY

DATE 3/15/71

EMER

1-3

SUIT COMPRESSOR LITE - CLOSED SUIT LOOP

SWITCH TO OTHER COMPRESSOR ON OTHER BUS
SEE ECS 9

O2 FLOW HI + RAPID LOSS OF SURGE TK PRESS
+ CABIN PRESS <4.6 PSI

CABIN PRESS RELF v1vs (2) - CLOSE
✓ TUNNEL EQUALIZATION v1v - CLOSED
REPRESS PKG v1v - ON (WHEN SURGE TK PRESS <150 PSI)
✓ EMERG CABIN PRESS REGS - BOTH
DON SUITS

CONTAMINATION IN CM

DON O2 MASKS

CONTAMINATION IN CLOSED SUIT LOOP

CHANGE TO OTHER SUIT COMPR
DIRECT O2 v1v - FULL OPEN THEN ADJUST FOR SUIT
TO CABIN ΔP OF 2 IN OF H2O

IF CONDITION PERSISTS

SUIT COMPR (2) - OFF
DOFF HELMETS
DIRECT O2 v1v - CLOSE
DON O2 MASKS

FIRE/SMOKE IN CM

MONITOR DC FOR HI CURRENT - REMOVE POWER
FROM ASSOCIATED INVERTER
IF CURRENT REMAINS HI - REMOVE POWER FROM
ASSOCIATED DC BUS
IF CLOSED SUIT LOOP, SWITCH SUIT COMPR TO GOOD AC BUS
IF HELMET OFF, SUIT COMPR (2) - OFF
RECONFIGURE INVERTER 3 ON LOST AC BUS
VERIFY RCS CONTROL POWER CONFIGURATION
IF HELMETS [DON O2 MASKS
OFF] USE FIRE EXTINGUISHER OR H2O GUN (OPTIONAL)
IF CLOSED [USE FIRE EXTINGUISHER OR H2O GUN (OPTIONAL)]
SUIT LOOP ✓ EMERG CABIN PRESS REGS - OFF
[IF FIRE PERSISTS - DUMP CABIN]

DATE 6/19/71

SM RCS

ALARM CODES

ECS, CRITICAL
BURNS (OVER)

G&C, SPS
EPS (OVER)

EARTH/POST LANDING

EMER

1-4

G&N CRITICAL BURNS

IF NO START OR ISS LITE + PROG LITE
IF CMC LITE, PROG ALARM 1407 OR EARLY CUTOFF

SCS TVC (2) - AUTO

SC CONT - SCS

✓ ATTITUDE

SPS THRUST - DIRECT (MOMENTARY), IF REQ'd

IF ABNORMAL DYNAMICS

THC CW, control rates by MTVC

After SHUTDOWN, AUTO RCS (16) - OFF

LV

SCS CRITICAL BURN

IF NO START OR EARLY CUTOFF

SPS THRUST - DIRECT (MOMENTARY)

IF RATE NEEDLE HARDOVER & FDAIs DIVERGE OPPOSITE

BMAG MODE (3) - RATE 1

THC - CW, use MTVC

IF ABNORMAL DYNAMICS IN AUTO MODE

THC - CW, use MTVC

BMAG MODE (3) - RATE 2

IF ABNORMAL DYNAMICS IN MTVC MODE

THC - CW

IF PROBLEM PERSISTS, SHUTDOWN

AUTO RCS (16) - OFF

CRITICAL BURNS

SPS DEORBIT & ENTRY

DATE 6/19/71

EMER
1-5

SPS

IF NO CUTOFF AFTER ΔV THRUST (BOTH - OFF)

cb SPS PILOT VLVS - open

IF EMS & N40 (R3) STILL COUNTING AFTER SHUTDOWN

SC CONT - SCS

TRANS CONT PWR - OFF

cb DIR ULLAGE (2) - open

IF CONDITION PERSISTS, AUTO RCS SEL (16) - OFF

SM RCS PRPLNT (AFFECTED QUAD) - OFF

SPS PRESS LITE

CONTINUE CRITICAL BURN

IF FUEL & OX PRESS (BOTH) > 200 PSI

SPS HE v1vs (2) - OFF, THEN CONTROL MANUALLY
BETWEEN 170-200 PSI

IF FUEL/OX ΔP > 20 PSI

SPS HE v1vs (2) - ON

IF CONDITION PERSISTS, SPS HE v1vs(2)-OFF(Until $P_c < 70$)

G&C (COASTING, ENTRY)

CMC LITE

SC CONT - SCS

SEE G&N 5

ISS LITE + PROG ALARM LITE

SC CONT - SCS

SEE G&N 6

DATE 6/19/71

SM RCS

ALARM CODES

G&C, SPS
EPS (OVER)

EMERGENCY POWER DOWN

CAUTION: USE BATTERIES ONLY WHEN MAIN BUS VOLTS < 24.5

CONFIGURE FOR USE OF AUX BATTERY

FUEL CELL 2 MNA & MNB (2) - OFF
 cb CRYO O2 ISOL/AUX BAT - CLOSE (Pn1 226)
 SM PWR SOURCE - AUX BAT (mom) (Pn1 278)
 O2 TANK 3 ISOL - CLOSE (√TB-bp) (Pn1 278)
 FUEL CELL 2 MN A(B) - as desired

	DC AMPS
INSURE DSE IS RECORDING	
IF UNSUITED, SUIT COMP (2) - OFF	4.0
FC PUMPS (3) - OFF (Until Tskin > 475°F)	8.7 TOTAL
cb G&N OPTICS MNA & MNB (2)- OPEN (Pn1 5)	3.1
G&N PWR (AC) - OFF (Pn1 5)	0.9
O2 HTRS (3) - OFF (CTR)	17.0
H2 HTRS (2) - OFF (CTR)	1.4 EA
H2 FANS (3) - OFF (CTR)	1.0
C/W NORMAL - ACK	
LM PWR - RESET - OFF	15.0 MAX
ECS RAD HTRS (2) - OFF	17.2 EA
POT H2O HTR - OFF	1.6 MAX
SM RCS HTRS (4) - OFF	3.3 MAX EA
HGA PWR - OFF	2.9
LIGHTS - Min Rreqd	5.3 MAX
EXT LTS - OFF	4.6
NON ESS BUS - OFF (SPS Burn-Damage SIM CAM)	4 - 6
VHF RANGING - OFF	1.4
S BD AUX TV - OFF (CTR)	5.3
SPS LINE HTR - OFF (CTR)	6.2 (A/B)
RNDZ XPNDR PWR - OFF or HEATER (Pn1 100)	3.0
SIG CONDR/DRIVER BIAS PWR (2) - OFF	
SECURE ONE BMAG	2.6
SELECT SINGLE JET CONTROL	
EMS FUNC - OFF	
RHC PWR DIRECT (2) - OFF	
THC PWR - OFF	
CONFIGURE FOR SINGLE INVERTER OPERATION	
TURN OTHER INVERTER OFF	4.0 MAX
BAT CHGR - OFF	
NOTE MISSION TIME	
cb TIMERS (2) - OPEN (Pn1 229)	
AC INVERTER (9) - OFF	
CM RCS HTRS - OFF	
ISOLATE FAILED FC's from MAIN BUSES	

DATE 6/19/71

EMER

1-7

ECS POWER DOWN	3.7 TOTAL
ECS GLY PUMP sel - OFF (ISS LIMIT 2.5 HRS)	2.6
ECS RAD FLOW CONT PWR - off (CTR)	0.7
GLY EVAP TEMP IN - MAN	
ECS RAD HTRS (2) - OFF	
GLYCOL EVAP H2O FLOW - OFF	~0.1
GLYCOL EVAP STEAM PRESS - MAN	~0.2

COMM POWER DOWN	13.0 TOTAL
IF VOICE DESIRED	
UP TLM CMD RESET - RESET then OFF	
S-BD AUX TAPE - DN VOICE BU	
S-BD MODE PCM - OFF	
PCM BIT RATE - HIGH	
S-BD PWR AMP - OFF (CTR)	4.0
TAPE RCDR - OFF (CTR)	1.6
SCE PWR - OFF (CTR)	0.7
cb INSTR ESS MNA & MNB (2) - OPEN (Pn1 5)	4.9
TELCOM GRP 1 & 2 (2) - OFF	1.6

CMC/IMU POWER DOWN	6.0 IMU
COMPLETE ALIGNMENT TRANSFER	
CMC MODE - FREE	PROVIDES CMC MIN IMP
cb G&N IMU MNA & MNB (2) - OPEN (Pn1 5)	
V37E06E	3.0 CMC
F V50 N25, 00062, CMC PWR DN PRO, HOLD (~5 SEC) UNTIL STBY LT - ON	

SCS POWER DOWN	6.0
ACCEPTABLE S/C ATTITUDE	
BMAG PWR (2) - OFF	
FDAI/GPI PWR - OFF	PROVIDES MIN IMP
SCS ELECTRONICS PWR - ECA	(REQUIRES AC1 & MNB)
ORDEAL PWR & LIGHTING - OFF	
cb SCS LOGIC BUS (4) - OPEN (Pn1 8)	2.0
SCS ELECTRONICS PWR - OFF	
RHC PWR NORM (2) - OFF	

DATE 3/15/71

SM RCS

ALARM CODES

EARTH/POST LANDING

LAUNCH BUS LOSS

MN BUS A LOST - LAUNCH

EDS AUTO/OFF - OFF

TVC GMBL DR (P,Y) - 2

SCS TVC (P,Y) - RATE CMD

BMAG MODE (3) - RATE 2

FDAI SEL - 2

cb SPS PITCH 2 & YAW 2 (Pn1 8) - OPEN
(AFTER GIMBAL MOTORS ON)

AC INV 3 - MNB

AC INV 3 AC 1 - ON

AC INV 1 AC 1 - OFF

A11 F/C MNA - OFF

ALL F/C MNB - MNB (BEFORE CM/SM SEP)

cb MNA BAT BUS A (Pn1 275) - OPEN

cb MNB BAT C (Pn1 275) - CLOSED

CRITICAL BURNS

LV

MN BUS B LOST - LAUNCH

EDS AUTO/OFF - OFF

TVC GMBL DR (P,Y) - 1

SPS TVC (P,Y) - RATE CMD

✓BMAG MODE (3) - RATE 1

FDAI SEL - 1

cb SPS PITCH 1 & YAW 1 (Pn1 8) - OPEN
(AFTER GIMBAL MOTORS ON)

AC INV 3 - MNA

AC INV 3 AC 2 - ON

AC INV 2 AC 2 - OFF

A11 F/C MNB - OFF

A11 F/C MNA - MNA (BEFORE CM/SM SEP)

cb MNB BAT BUS B (Pn1 275) - OPEN

cb MNA BAT C (Pn1 275) - CLOSED

DATE 6/19/71

EMER
1-9

AC BUS 1 LOST - LAUNCH

BMAG MODE (3) - RATE 2
FDAL SEL - 2
TVC SERVO PWR 1 - AC2/MNB
SCS TVC PITCH, YAW - RATE CMD

AC INV 1 MNA - OFF
SUIT COMPR - AC 2
ECS GLY PUMP - AC 2
S BD NORM XPNDR - SEC
S BD NORM PWR AMP - SEC

AC BUS 2 LOST - LAUNCH

✓BMAG MODE (3) - RATE 1
FDAL SEL - 1
TVC SERVO PWR 2 - AC1/MNA
MTVC WITH THUMBWHEELS (MODE III OR IV)

AC INV 2 MNB - OFF
✓SUIT COMPR - AC 1
✓ECS GLY PUMP - AC 1

BAT BUS A LOST - LAUNCH

EDS AUTO/OFF - OFF
AUTO RCS SEL (RING 1) - OFF
IF BUS LOST BEFORE GMBL MTRS ON
 TVC GMBL DR (P,Y) - 2
 cb SPS P2 & Y2 (Pn1 8) - OPEN
 (AFTER SEC GIMBAL MOTORS ON)
cb MNA BAT C (Pn1 275) - CLOSED

6/19/71

DATE

BAT BUS B LOST - LAUNCH

EDS AUTO/OFF - OFF
AUTO RCS SEL (RING 2) - OFF
IF BUS LOST BEFORE GMBL MTRS ON
 TVC GMBL DR (P,Y) - 1
 cb SPS P1 & Y1 (Pn1 8) - OPEN
 (AFTER PRI GIMBAL MOTORS ON)
cb MNB BAT C (Pn1 275) - CLOSED

SM RCS

ALARM CODES

SPS BURN BUS LOSS**MN BUS A LOST - SPS BURN**

- TVC GMBL DR (P,Y) - 2
- ✓SCS TVC (P,Y) - RATE CMD
- cb SPS P2 & Y2 (Pn1 8) - OPEN
(CRIT BURNS - AFTER GMBL MTRS ON)
- FDAI SEL - 2
- ✓FDAI SOURCE - CMC
- RHC PWR DIRECT 2 - MNB
- BMAG MODE (3) - RATE 2
- ✓ΔV THRUST B - NORM
- AUTO RCS SEL - MNB

AC INV 3 - MNB
AC INV 3 AC 1 - ON
AC INV 1 AC 1 - OFF
A11 F/C MNA - OFF
ALL F/C MNB - MNB
cb MNA BAT BUS A (Pn1 275) - OPEN

MN BUS B LOST - SPS BURNS

- SCS TVC (P,Y) - RATE CMD
- TVC GMBL DR (P,Y) - 1
- cb SPS P1 & Y1 (Pn1 8) - OPEN
(CRIT BURNS - AFTER GMBL MTRS ON)
- FDAI SEL - 1
- ✓FDAI SOURCE - CMC
- RHC PWR DIRECT 1 - MNA
- BMAG MODE (3) - RATE 1
- ΔV THRUST A - NORM
- AUTO RCS SEL - MNA

AC INV 3 - MNA
AC INV 3 AC 2 - ON
AC INV 2 AC 2 - OFF
A11 F/C MNB - OFF
A11 F/C MNA - MNA
cb MNB BAT BUS B (Pn1 275) - OPEN

EMER
1-11

AC BUS 1 LOST - SPS BURNS

TVC SERVO PWR 1 - AC2/MNB
SCS TVC (P&Y) - RATE CMD
BMAG MODE (3) - RATE 2
FDAI SEL - 2
✓FDAI SOURCE - CMC

AC INV 1 MNA - OFF
SUIT COMPR - AC 2
ECS GLY PUMP - AC 2
S BD NORM XPNDR - SEC
S BD NORM PWR AMP - SEC
SPS GAUGING - AC 2

AC BUS 2 LOST - SPS BURNS

TVC SERVO PWR 2 - AC1/MNA
BMAG MODE (3) - RATE 1
SCS TVC (P&Y) - AUTO
ΔVCG - LM/CSM
MTVC WITH TRIM THUMBWHEELS (SCS BURN ONLY)
FDAI SEL - 1
✓FDAI SOURCE - CMC

AC INV 2 MNB - OFF
✓SUIT COMPR - AC 1
✓ECS GLY PUMP - AC 1

BAT BUS A LOST - SPS BURNS

TVC GMBL DR (P,Y) - 2
(IF BUS LOST BEFORE GMBL MTRS ON)
cb SPS P2 & Y2 (Pn1 8) - OPEN
(CRIT BURNS - AFTER GMBL MTRS ON)
cb MNA BAT C (Pn1 275) - CLOSED

BAT BUS B LOST - SPS BURNS

TVC GMBL DR (P,Y) - 1
(IF BUS LOST BEFORE GMBL MTRS ON)
cb SPS P1 & Y1 (Pn1 8) - OPEN
(CRIT BURNS - AFTER GMBL MTRS ON)
cb MNB BAT C (Pn1 275) - CLOSED

DATE 6/19/71

SM RCS

ALARM CODES

EARTH/POST LANDING

EMER
1-12

ENTRY BUS LOSS

MN BUS A LOST - ENTRY

- BMAG MODE (3) - RATE 2
- FDAI SEL - 2
- ✓FDAI SOURCE - CMC
- AUTO RCS SEL (12) - MNB(ONLY IF BUS LOST AFTER SM SEP)

LV

AC INV 3 - MNB
AC INV 3 AC 1 - ON
AC INV 1 AC 1 - OFF
A11 F/C MNA - OFF
ALL F/C MNB - MNB (BEFORE CM/SM SEP)
cb MNA BAT BUS A (Pn1 275) - OPEN
cb MNB BAT C (Pn1 275) - CLOSED

MN BUS B LOST - ENTRY

- BMAG MODE (3) - RATE 1
- FDAI SEL - 1
- ✓FDAI SOURCE - CMC
- AUTO RCS SEL (12) - MNA(ONLY IF BUS LOST AFTER SM SEP)

CRITICAL BURNS

AC INV 3 - MNA
AC INV 3 AC 2 - ON
AC INV 2 AC 2 - OFF
A11 F/C MNB - OFF
A11 F/C MNA - MNA (BEFORE CM/SM SEP)
cb MNB BAT BUS B (Pn1 275) - OPEN
cb MNA BAT C (Pn1 275) - CLOSED

7/9/71
6/19/74

DATE

AC BUS 1 LOST - ENTRY

- BMAG MODE (3) - RATE 2
- FDAI SEL - 2
- ✓FDAI SOURCE - CMC

AC INV 1 MNA - OFF
SUIT COMPR - AC 2
ECS GLY PUMP - AC 2
S BD NORM XPNDR - SEC
S BD NORM PWR AMP - SEC

EMER
1-13

AC BUS 2 LOST - ENTRY

BMAG MODE (3) - RATE 1
FDAI SEL - 1
✓FDAI SOURCE - CMC

AC INV 2 MNB - OFF
✓SUIT COMPR - AC 1
✓ECS GLY PUMP - AC 1

BAT BUS A LOST - ENTRY

cb SCS B/D ROLL, P&Y (MNA) (3) (Pn1 8)
Before CM/SM SEP - OPEN
After RCS transfer to CM - CLOSE
cb SCS CONTR/AUTO (2) (Pn1 8) - OPEN
(AFTER APEX COVER JET)
cb MNA BAT C (Pn1 275) - CLOSED

BAT BUS B LOST - ENTRY

cb SCS B/D ROLL, P&Y (MNB) (3) (Pn1 8)
Before CM/SM SEP - OPEN
After RCS transfer to CM - CLOSE
cb SCS CONTR/AUTO (2) (Pn1 8) - OPEN
(AFTER APEX COVER JET)
cb MNB BAT C (Pn1 275) - CLOSED

DATE 6/19/71

SM RCS

ALARM CODES

EMER
1-14

ALL FC'S DISCONNECTED - POWERED FLT
ATTEMPT FC RECONNECT (ONE BUS AT A TIME)

IF RECONNECT NOT SUCCESSFUL

FC 1 - MN B
FC 2 - MN B
FC 3 - MN A

IF STILL NO SUCCESS

SCE PWR - AUX
EDS AUTO/OFF - OFF
cb MNA BAT C (Pn1 275) - CLOSED
cb MNB BAT C (Pn1 275) - CLOSED

AC BUS OVERLD + AC BUS + MN BUS UNDER V LITES
AFFECTED AC BUS - OFF (REASON - AC BUS SHORT)

FC 1 (2,3) LITE

VERIFY FC 1 (2,3) REAC tb - gray

IF tb BP

FC 1 (2,3) REAC v1v - OPEN (up)

IF tb STILL BP & REAC FLOW ~0

OPEN CIRCUIT FC 1 (2,3)

CRITICAL BURNS

EARTH/POST LANDING

LV

DATE 6/19/71

EMER
1-15

SM RCS THRUSTER FAILED ON

BMAG MODE (3) - RATE 2
CHG TO OTHER SC CONT MODE
ROT CONT PWR DIR (2) - MNA/MNB
STOP SPACECRAFT RATES WITH DIRECT RCS
AUTO RCS SEL (16) - OFF

IF CONDITION PERSISTS

AUTO RCS SEL (16) - ON (AS REQ'D)
MAN ATT (3) - ACCEL CMD
STOP SPACECRAFT RATES
cb SCS DIR ULL (2)(Pn1 8) - open
ROT CONT PWR DIR (2) - OFF

IF CONDITION PERSISTS

NEUTRALIZE RHC
SM RCS PRPLNT (AFFECTED QUAD) - OFF

SM RCS LITE

SM RCS HE (2) - CLOSE
SEE RCS 1

SM RCS QUAD SECURE

SM RCS He 1 & 2 (AFFECTED QUAD) (2) - CLOSE
SM RCS PRIM PRPLNT (AFFECTED QUAD) - CLOSE
Fire one jet in affected quad - 2 sec continuously
AUTO RCS SELECT (AFFECTED QUAD) (4) - OFF (except BOOST)

DATE 4/15/71

SM RCS

ALARM CODES

CM RCS FAILS TO PRESSURIZE OR FEED PRPLNT

CM RCS

IF NO PRESSURIZATION

- ✓cb EPS BAT BUS (2) (Pn1 229) - CLOSE
 - ✓cb PYRO A/B SEQ A/B (2) (Pn1 250) - CLOSE
 - ✓cb SECS ARM (2) (Pn1 8) - CLOSE
 - ✓SECS PYRO ARM (2) - ARM
 - ✓SECS LOGIC (2) - ON
- CM RCS - PRESS

LV

IF NO RCS PRPLNT FEED

- ✓cb EPS GRP 1 & 3 (Pn1 229) - CLOSE
 - ✓cb SM RCS HTR A&B (Pn1 8) - CLOSE
 - ✓cb RCS PRPLNT ISOL (2) (Pn1 8) - CLOSE
- CM RCS PRPLNT - ON

CRITICAL BURNS

- IF STILL NO FEED**
- cb EPS GRP 5 (Pn1 229) - CLOSE
 - cb RCS LOGIC (2) (Pn1 8) - CLOSE
 - CM RCS LOGIC - ON
- CM PRPLNT - DUMP MOMENTARILY, THEN OFF

DATE 3/15/71

V05 N09 ALARM CODESDATE 5/12/71

- 00110 Mark reject has been entered but ignored
Continue
- 00113 No inbits (chan 16)
Continue: if alarm recurs use MDC DSKY.
- 00114 More marks made than desired
Continue
- 00115 V41 N91 keyed with OPTICS MODE not in CMC
OPTICS MODE - CMC and OPTICS ZERO - OFF
- 00116 Optics switch altered before 15 sec zero time elapsed
OPTICS ZERO - ZERO (15 sec).
- 00117 V41 N91 keyed but CMC has reserved OCDU (from start of gimbal test in P40 until termination of TVC functional allocation of the "optics" CDU Driving Output)
V41 N91 not yet available
- 00120 Optics torque has been requested but optics have not been zeroed since last FRESH START or RESTART
OPTICS ZERO - OFF then ZERO (15 sec).
- 00121 In 0.05 sec following mark, an ICDU changed by more than 0.033°
Repeat MK.
- (m)00205 PIPA saturated
Use SCS control (G&N 12).
- 00206 The IMU zero routine has been entered with both the GMBL LOCK It and NO ATT It on
- (m)00207 Coarse align to 0,0,0 Reselect V40E.
ISS turn-on request not present for 90 sec
Redo IMU turn on (G&N 12).
- (m)00210 The IMU is not operating
Redo IMU turn on. If alarm recurs perform fresh start (V36E).
Consult MSFN. (G&N 12).

CM RCS

ALARM CODES

CRITICAL BURNS

- (m)00211 Coarse align error
If P51(3)/52(4) in progress record gyro
torquing angles and perform fine align
check in P52(4)
Otherwise, see G/1-24. (G&N 12).
- (m)00212 PIPA fail, but PIPA is not being used
PIPA BIAS check (G&N 6/8).
- (m)00213 IMU not operating with turn-on request
See 00210
- 00214 Program using IMU when turned OFF
See 00210 or exit program.
- (m)00217 IMU coarse align or pulse torque
difficulty has occurred
If code 211 also, perform 211 cure only
Reinitiate current program.
If alarm recurs, terminate use of
ISS (G&N 12).
- 00220 IMU orientation unknown
Align or if aligned set REFSMMAT flag
- 00401 Desired middle gimbal angle is excessive
Call N22 - maneuver if MGA < 85° or
realign IMU.
- 00402 Second MINKEY pulse torque must be done.
- 00404 Target out of view (90 deg test)
(G/3-7,3-11,6-3,7-16)
- 00405 Acceptable star pair is not available
(G/6-3,6-6)
- 00406 Rend navigation not operating
Select P20 Opt. 0 or 4 or continue.
- 00421 W-matrix overflow
Notify MSFN but continue.
W-matrix automatically reinitialized at
next mark.
- 00600 No solution on first iteration in P31 or
P32/72
(G/4-6,4-8)
- 00601 Post CSI Perigee/lune alt <85nm/ 5.8nm
(G/4-6, 4-8)
- 00602 Post CDH Perigee/lune alt <85nm/ 5.8nm
(G/4-6, 4-8)
- 00603 Time from TIG (CSI) to TIG (CDH)
<10 min
(G/4-6, 4-8)

DATE 5/12/71

EMER
1-19

- 00604 Time from TIG (CDH) to TIG (TPI)
<10 min
(G/4-6,4-8)
- 00605 Number of iterations exceeds loop maximum
(G/4-6,4-8,4-15,4-16)
- 00606 ΔV (CSI) has been >1000 fps for last two iterations
(G/4-6,4-8)
- 00611 No TIG for given ELEV angle
(G/4-10,4-12)
- 00612 State vector in wrong sphere of influence at TIG
(G/4-15)
- 00613 Reentry angle out of limits
(G/4-16)
- (m)00777 ISS warning caused by PIPA fail
(G&N 6).
- 01102 CMC self test error
(G/2-3)
- (m)01105 Downlink too fast
Rset. If alarm recurs DOWNLINK FAILURE.
(G&N 12).
- (m)01106 Uplink too fast
Rset. If alarm recurs UPLINK FAILURE.
(G&N 12).
- (m)01107 Phase table failure-assume erasable memory is destroyed
If Comm:
1. V74 CMC DOWNLINK
2. P27 As Necessary.
3. V48 As Necessary (V46).
4. Reestablish REFSMMAT via P51 As Necessary.
If FRESH START recurs,
CMC FAILURE (SSR-3).
If no Comm, pg G/9-1
- 01301 Arcsin or arccos input is greater than one
Notify MSFN, continue.
- (m)01407 VG increasing
(G&N 12).
- 01426 IMU unsatisfactory
Realign or use SCS.

DATE
5/12/71

CM RCS

ALARM CODES

CRITICAL BURNS

- 01427 IMU reversed
Note FDAI operation is inverted.
- 01520 V37 request not permitted at this time
Wait till COMP ACTY lt.
not on continuously - reselect V37 or if
P62-67, select P00 and then desired
program.
- 01600 Overflow in drift test
This is gnd test alarm only.
- 01601 Bad IMU torque abort
See 01600
- 01703 Insufficient time for integration.
TIG slipped
(G/5-3,5-18)
- (m)03777 ISS warning caused by ICDU fail
(G&N 6)
- (m)04777 ISS warning caused by ICDU & PIPA fail
(G&N 6)
- (m)07777 ISS warning caused by IMU fail
(G&N 6)
- (m)10777 ISS warning caused by IMU & PIPA
fail (G&N 6)
- (m)13777 ISS warning caused by IMU & ICDU fail
(G&N 6)
- (m)14777 ISS warning caused by IMU,ICDU & PIPA
fail
(G&N 6)
- **20430 Orbital integration has been
terminated to avoid possible
infinite loop.
Notify MSFN.
Probable S.V. uplink required
- **20607 No solution to conic subroutine
Reselect program.
- **20610 Alt at specified TIG in P37 < 400K ft
Reselect P37 and decrease TIG.
- **21204 Negative or zero time waitlist call.
If ave-g or ext. vb. on, continue.
Otherwise reselect program.
- **21206 Second job attempts to go to sleep via
keyboard and display program
See 21204.

DATE 5/12/71

- **21210 Second attempt is made to stall
Reselect program
Do not attempt use of IMU while CMC is
using it.
- **21302 SQRT called with negative argument
See 21204
- **21501 Keyboard and display alarm during
internal use
See 21204
- **21502 Illegal flashing display
See 21204
- **21521 P01 selected and P11 has already been
performed
Select correct program
- *31104 Delay routine busy
Reselect extended verb or continue with
program.
Notify MSFN.
- *31201 Executive overflow - no vac area
Reselect Extended Verb and/or Continue
Program.
- *31202 Executive overflow - no core sets
See 31201
- *31203 Waitlist overflow - too many tasks
See 31201
- *31211 Illegal interrupt of extended verb
Reselect extended verb after optics
marking is completed.
(m) - Malf procedure indicated
- **(2xxxx) - Generates restart (no lt), F37 (POODOO)
- *(3xxxx) - Restart (no lt) and program
continues (i.e. attempted
recovery)(BAILOUT)
- NOTE - All **alarms act as *type if
they occur when Ave-g is on or
display type extended verb
is active.

DATE 5/12/71

CRITICAL BURNS

ALARM CODES

CM RCS



