Apollo 15 Launch Checklist

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

David Woods – Editor: Apollo Flight Journal

080-13C

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

*(JULY 26 LAUNCH) 131 P
*APOLLO 15 ~~120~~
* CSM 112 SINGLE
*CHANGE C

*CSM LAUNCH CHECKLIST

ING DATA

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PREPARED BY

GUIDANCE & CONTROL PROCEDURES SECTION

SYSTEMS PROCEDURES BRANCH

CREW PROCEDURES DIVISION

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

JULY 9, 1971

APOLLO 15

CSM LAUNCH CHECKLIST

JULY 9, 1971

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CSM LAUNCH CHECKLIST

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LIFTOFF CONFIGURATION

PANEL 1

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

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LIFTOFF CONFIG

LIFTOFF CONFIG

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

PANEL 2

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

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TWR JETT (2) - AUTO (down) (guarded)
LV GUID - IU
LV STAGE - off(down)(guarded)
XLUNAR - INJECT
MN REL - off(down)(guarded)
MSN TMR HR, MIN, SEC - off (center)
C/W NORM - BOOST
C/W CSM - CSM
C/W PWR - 1
C/W LAMP TEST - off (center)
MSN TMR - START
RCS IND sel - SM D
CAB FANS - OFF
CRYO PRESS IND - SRG/3
CRYO QTY IND - 2
H2 HTRS (2) - AUTO
O2 HTRS 1&2 - AUTO
O2 HTR 3 - OFF
H2 FANS 1&2 - OFF
H2 FAN 3 - ON
ECS IND sel - PRIM
ECS RAD FLOW AUTO CONT - AUTO
ECS RAD tb - gray
ECS RAD FLOW PWR CONT - off (center)
ECS RAD MAN SEL - RAD 1
ECS RAD PRIM HTR - off (center)
ECS RAD SEC HTR - OFF
POT H2O HTR - OFF
SUIT CKT H2O ACCUM AUTO - 1
SUIT CKT H2O ACCUM ON - off (center)
SUIT CKT HT EXCH - off (center)
SEC COOL LOOP EVAP - off (center)
SEC COOL LOOP PUMP - off (center)
H2O QTY IND sw - POT
GLY EVAP IN TEMP - MAN
GLY EVAP STM PRESS AUTO - MAN
GLY EVAP STM PRESS INCR - center
GLY EVAP H2O FLOW - off (center)
CAB TEMP - MAN
CAB AUTO TEMP tw - max decr
HI GAIN ANT TRACK - AUTO
HI GAIN ANT BEAM - WIDE
HI GAIN ANT PITCH POS - 0°

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

PANEL 3

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

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

PANEL 4

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

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

PANEL 5

FC1 PUMPS - AC1
FC2 PUMPS - AC2
FC3 PUMPS - AC2
G/N PWR - AC1
MN BUS TIE (2) - on (up)
BAT CHGR - AC1
NONESS BUS - MNA
INT INTGL LT - as desired
INT FLOOD LT - OFF, full dim or full bright
INT FLOOD LT DIM - 1
INT FLOOD LT FIXED - OFF
cb Panel 5 all closed except:
  cb INST NONESS - open
  cb ECS XDUCR PRESS GRP 2 MNA - open
  cb WASTE H2O/UR DUMP HTR (2) - open

PANEL 6

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

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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 v1v - open (CCW) (>2 in H20 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)

PANEL 9

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

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

PANEL 10

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

PANEL 12

LM TUNL VENT vlv - LM/CM ΔP

PANEL 13

FDAI sw (2) - INRTL
EARTH/LUNAR - PWR OFF
ALT SET - 90
LTG - OFF
MODE - HOLD/FAST
SLEW - off (center)

PANEL 15

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

PANEL 16

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

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PANEL 100

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

PANEL 101

SYS TEST (LH) - 5
SYS TEST (RH) - B
CM RCS HTRS - OFF
WASTE H2O DUMP - HTR A
UR DUMP - HTR A
RNDZ XPNDR - OPR

PANEL 122

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

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PANEL 162

SCI PWR - OFF (verified at panel closeout)

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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)

PANEL 225

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

PANEL 226

cb Panel 226 - all closed except:
  cb COAS/TUNL LTG MNB - open

PANEL 227

SCI PWR - OFF

PANEL 229

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

PANEL 230

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

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

PANEL 250

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

PANEL 251

WASTE MGMT OVBD DRAIN vlv - OFF

PANEL 252

BAT VENT vlv - CLOSED
WASTE STOWAGE VENT vlv - VENT

PANEL 275

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

PANEL 276

cb Panel 276 - all closed

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PANEL 278

cb Panel 278 - all closed except:
  cb UPRT SYS COMPR (2) - open
MAP CAMR/LASER EXP COVERS - ctr
MAP CAMR/LASER EXP COVERS tb - gray
ALPHA/X-RAY EXP COVERS - ctr
ALPHA/X-RAY EXP COVERS tb - gray
SM PWR SOURCE - FC2 (guarded)
O2 TK 3 ISOL vlv - off (ctr)(OPEN*)
O2 TK 3 ISOL vlv tb - gray

PANEL 300

RH SUIT FLOW vlv - FULL FLOW

PANEL 301

LH SUIT FLOW vlv - FULL FLOW

PANEL 302

CTR SUIT FLOW vlv - FULL FLOW

PANEL 303

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

PANEL 304

DRNK H2O SUPPLY vlv - OFF (CW)

PANEL 305

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

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PANEL 306

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

PANEL 325

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

PANEL 326

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

PANEL 350

CO2 CSTR DIVERT vlv - both (center)

PANEL 351

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

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PANEL 352

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

PANEL 375

SURGE TK PRESS RELF vlv - open (CW)

PANEL 376

PLVC - NORMAL (up)

PANEL 377

GLY TO RAD SEC vlv - BYPASS (CCW)

PANEL 378

PRIM GLY ACCUM vlv - open (CCW)

PANEL 379

PRIM ACCUM FILL vlv - OFF (CW)

PANEL 380

O2 DEMAND REG vlv - BOTH
SUIT TEST vlv - OFF
SUIT CKT RET vlv - close (push)

PANEL 382

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

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PANEL 600

EMER O2 vlv - CLOSE

PANEL 601

REPRESS O2 vlv - CLOSE

PANEL 602

REPRESS O2 RELF vlv - OPEN (CW)

PANEL 603

EVA STA O2 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.

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BOOST PREPARATION

-20:00 Change X STABLE MEMBER AZIMUTH, if necessary:

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

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

-15:00 CTE UPDATE VERIFICATION
DC IND sel - BAT C
DC VOLTS ind - 37-37.5 vdc
DC IND sel - MNA
FDAI-1 total att R=90+AZ, P=90, Y=0
FDAI SCALE - 5/5
RATE - HIGH
TRANS CONTR PWR -on(up) (verify)
RHC PWR DIRECT(2)-MNA/MNB
CMC MODE - FREE
BMAG MODE (3) - RATE 1
RHC #2 - ARMED

ASTRO LAUNCH OPERATIONS VOICE CHECK
LMP S BD sw - OFF
CDR VHF AM sw - OFF

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

DATE 7/9/71

BOOST PREPARATION

BOOST PREPARATION

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

-10:00 FC REAC vlv - LATCH

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

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

-04:00 ASTRO LAUNCH OPERATIONS COMM CHECK

DSKY - Verify P02
V75 (Do not ENTR)
TAPE RCD FWD - FWD (tb-gray)

-2:15 PRIM GLY TO RAD - pull (bypass)

-1:15 MN BUS TIE (2) - on (up)
-1:00 PAD COMM (2) - OFF
VHF AM VOL tw - increase to above normal listening level

-00:45 GDC ALIGN pb - PUSH & HOLD
R=90+AZ, P=90, Y=0
FDAI 2 Total att - no motion
GDC ALIGN pb - release

L
2-3

SATURN BOOST

7/1/71
JULY 26&27

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

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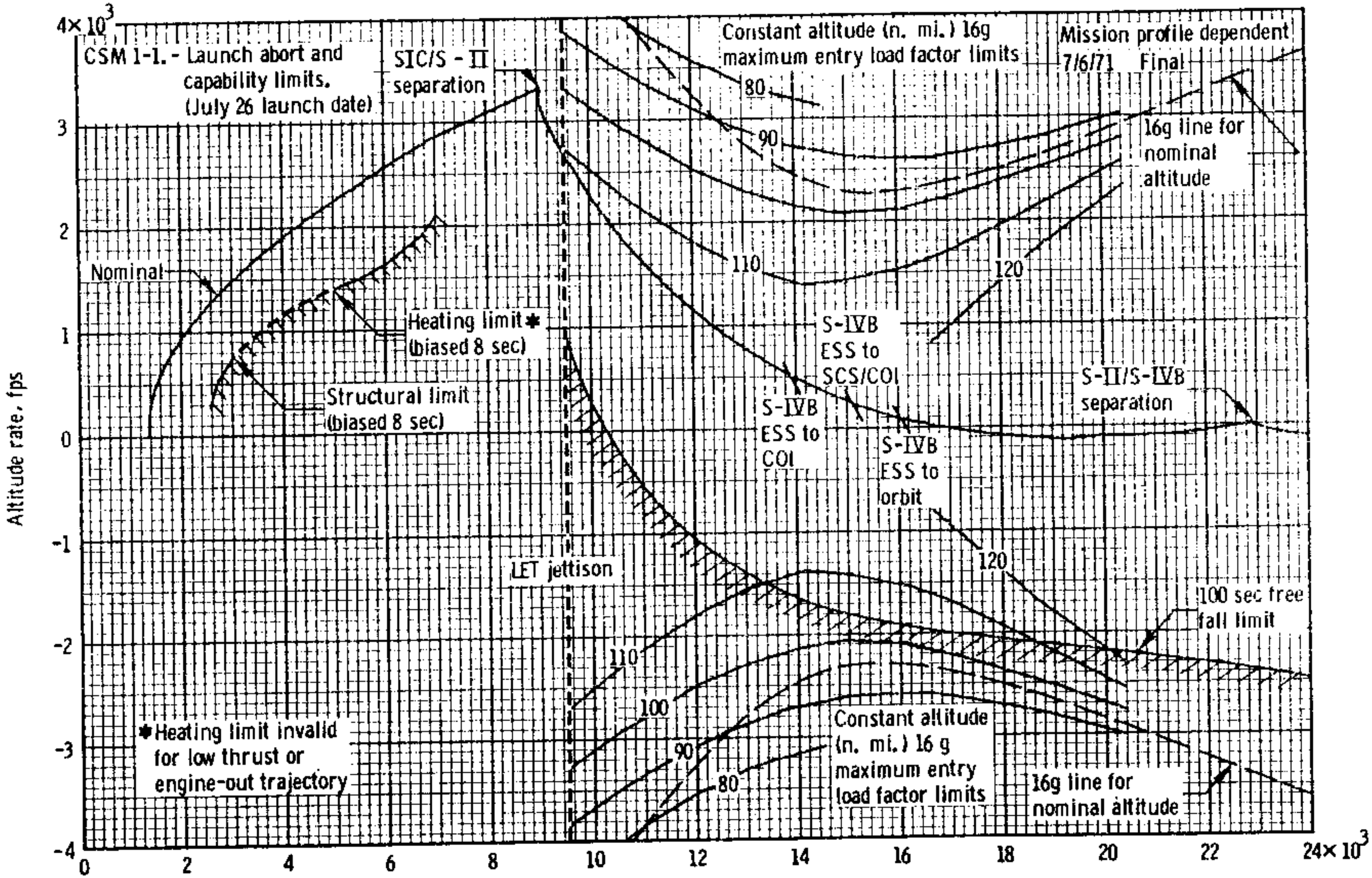
[a]Timebase 2 (S-IC Center-engine cutoff + .01 sec)
[b]Timebase 3 (S-IC outboard-engine cutoff + .01 sec)
[c]Timebase 4 (S-II outboard-engine cutoff + .01 sec)
[d]Timebase 5 (S-IVB guidance cutoff signal + .21 sec)

LAUNCH TRAJECTORY

LAUNCH ABORT



Launch abort and capability limits.

DATE 7/9/71

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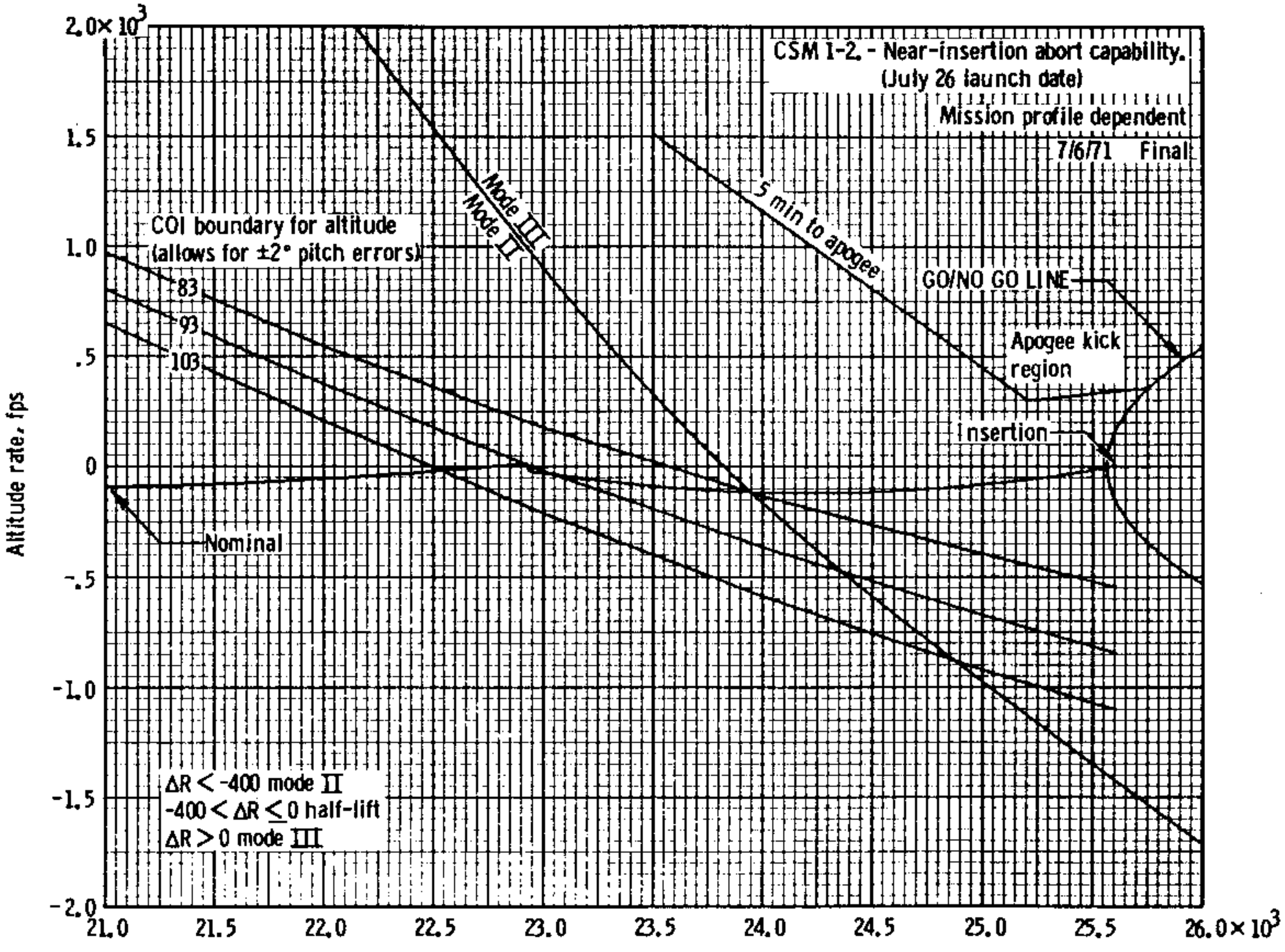

Near-insertion abort capability.

NEAR INSERTION ABORT

CSM 1-4.- Recommended manual EOI shutdown velocities.

Mission independent
4/15/71 Final

SHUTDOWN ALTITUDE, h (N. MI.)	INERTIAL VELOCITY, 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

NOTE: Insertion altitude defines cutoff velocity assuming $\dot{h}$ = 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.

DATE 5/5/71

ALTITUDE vs Vi

BOOST

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

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

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

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

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

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

CABIN PRESSURE DECREASING ~14K(2.3 nm)

NO PRESSURE DECREASE ~25K(4.1 nm)
* CAB PRESS RELIEF v1v(RH)-DUMP *

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

00:00
+4°/sec P,Y
±20°/sec R
MODE IA
00:42
+4°/sec P,Y
±20°/sec R
MODE IB
H=16.5 nm

BOOST

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BOOST

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

+9°/sec P,Y
±20°/sec R

GO/NO GO FOR STAGING - report
+02:16 INBOARD CUTOFF - (lt 5 on)
LIFTOFF lt - out
+02:39 CMC BOOST Polynomial ends
+02:39 OUTBOARD CUTOFF - report (lts on)
+02:40 SIC/SII STAGING (lts - out)
+02:41 SII Ign Command (lts on)
SII SEP lt - on
+02:42 SII 65% - lts out

MODE IC

+03:10 SII SEP lt - out report

+03:16 TWR JETT (2) - on (up) (TFF>1+20)

TWR JETT

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

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

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

MODE II

+03:20 Guidance Initiate - report (OECO +41sec)
+03:50 Guidance Good
+04:00 Report Status
+05:00 Report Status
+06:00 Report Status
~~+06:05~~ SIVB to COI
GMBL MOT (4) - START - ON (LMP Confirm)
Check GPI
LV/SPS IND = GPI (Momentarily)
PITCH = -0.5°
YAW = +1.90°

DATE 5/5/71

L
2-9

+06:15 OMNI ANT - D (AZ < 96°)
- C (AZ > 96°)
+06:45 SIVB to orbit
+07:00 Report Status
+07:39 IECO (lt 5 - on)
+07:59 PU SHIFT
+08:00 Report Status
+08:30 GO/NO GO FOR STAGING - report
+08:39 Level sense arm _____
+09:08 Mode IV - Report
(VI ~ ~~22,695~~ 22,918, H DOT ~ ~~+97~~ +102, H ~ ~~+93~~ +94.7)
Report Status
+09:10 OECO (lts on)
+09:18 SII Staging - lts out
+09:18 SIVB Ign Cmd - lt on
+09:19 SIVB 65% - lt out

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

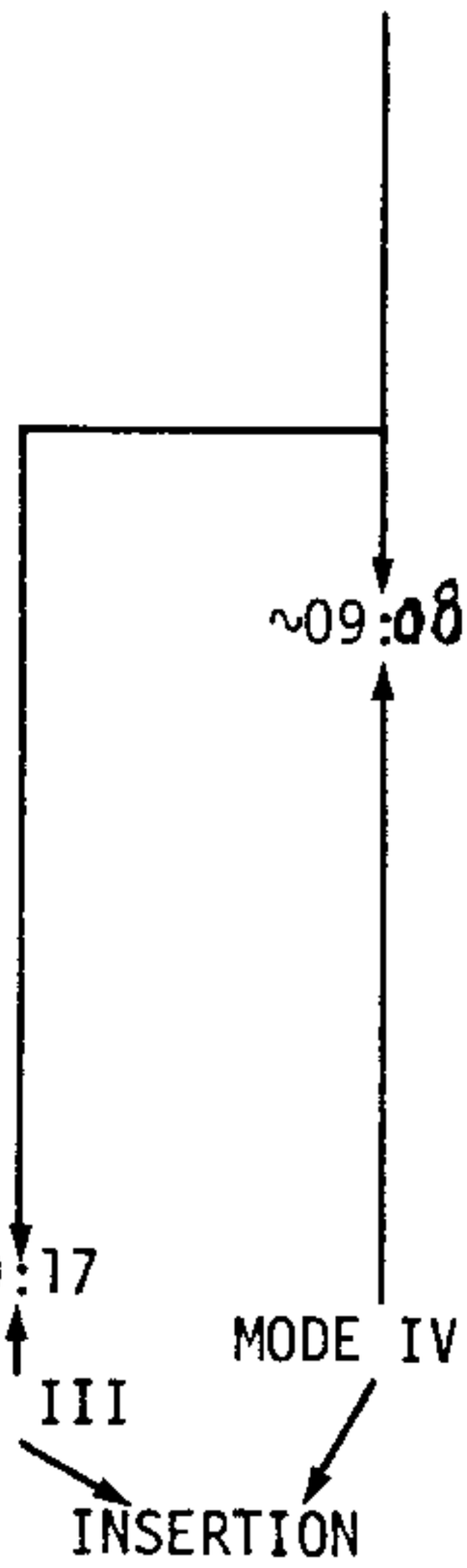
+11:00 Report Status
+11:45 SECO (lt on) - report _____
39 (Begin TB5)

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

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

+11:55 INSERTION - lt out (TB5 + 10 sec)
49

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



5/5/71

DATE _____

DATE _____

KEY RLSE

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

PRO

V37E 00E
When CMC ACTY lt out:
V66E
V45E
Verify DAP load, V48: R1 = 31102, R2 = 01111
V46E
V83E (check 0)
PRO

CSM WT _____
P TRIM _____
Y TRIM _____

US LOS
(00:16:06)

SM RCS Control of SIVB (APS module failed)

LV GUID - CMC
MAN ATT (ROLL) - MIN IMP
cb SECS ARM (2) - close
AUTO RCS SEL P&Y - OFF
AUTO RCS SEL A/C ROLL - MNB
AUTO RCS SEL B/D ROLL - MNA
RCS CMD - ON
BSE command BURN MODE ON
If successful: LV GUID - IU
Control PITCH & YAW with THC, ROLL with RHC
Allow SIVB to drift in PITCH (Gravity Gradient)
Control YAW within platform limits
Perform normal procedures except:
TB6-15min: Mnvr to TLI Att & set up ORDEAL, pg L/2-29
Hold TLI Att until Ignition
Null Ullage deviations with SM RCS

After TLI IGNITION: RCS CMD - OFF
AUTO RCS SEL (16) - MNA/MNB
MAN ATT (3) - RATE CMD
After TLI CUTOFF: LV GUID - CMC
MAN ATT (3) - ACCEL CMD
RCS CMD - ON

DATE _____

DATE 3/29/71

INSERTION AND SYSTEMS CHECKS

1 GMBL MTRS (4) - OFF (LMP confirm)
EDS PWR - OFF
TVC SERVO PWR (2) - OFF
MN BUS TIE (2) - OFF(LMP)
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
cb DIRECT ULLAGE (2) - open
cb ELS/CM-SM SEP (2) - open
cb FLT/PL VENT - open
EMS FUNC - OFF
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT(2) - OFF
BMAG MODE (3) - RATE 2
CM RCS LOGIC - OFF
LV STAGE sw - OFF (verify)
RHC #1 & #2 - LOCKED
CAB PRESS REL vlv (2) - NORMAL/LATCHED
REPRESS PKG vlv - OFF
DIRECT 02 vlv - CLOSE
cb ECS XDUCR PRESS GRP 2 MNA - close
INSTALL COAS

MONITOR LV TANK PRESS
*If ΔP >36 psid (OXID > FUEL) *
*If ΔP >26 psid (FUEL > OXID) *
*If LOX TK PRESS >50 psia *
* EMERGENCY CSM/LV SEP pg EMER/1-1*

DATE 5/5/71

CYI AOS
(00:17:12)

NOTE: Steps 2 thru 30 are not sequential

2 SM RCS HTRS (4) - PRIM
C/W - NORMAL
BPC JETT KNOB - 180° from BPC JETT
GN2 vlv HNDL - VENT (pull)
HATCH GEAR BOX - LATCH (verify)
ACTR HNDL SELECTOR - neutral

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

4 MCCH - G/N Status
Z Torquing angle _____

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

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

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

8 CMP to LEB for MN REG CHECK
STRUT UNLOCK LANYARD (2) - STOW
DRINKING WATER SUPPLY vlv - ON
cb COAS/TUNL LTG MNB - close
Unstow:
Helmet bags (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) Ensure CMS shield cover
Remove helmet & gloves & stow in PGA bag
Unstow & mount TSB's (U1)

INSERTION & SYS CK

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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

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

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

DATE 5/28/71

DATE

14 FC PURGE CHECK

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

15 EPS MONITORING CHECK

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

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

D-C Voltage-Amperage Check
MN BUS TIE (2) - OFF (verify)
FC MNA tb - 1 & 2 gray, 3 bp
FC MNB tb - 1 & 2 bp, 3 gray
FC 1, 2, & 3 (check amps)
MAIN BUS A, B, (26.5-31 vdc)
BAT BUS A, B, & BAT C (31.5-38 vdc < 3 amp)
PYRO BAT A, B (36.5 - 37.5 vdc)
DC IND sel - MNB
SYS TEST 5B (BAT RLY BUS - 3.4-4.1 vdc)

A-C VOLTS - 113 to 117 all phases

DATE _____

DATE 5/5/71

16 ECS MONITORING CHECK

SUIT COMP ΔP - .3-.4 psid
O2 SURGE TANK PRESS - 865-935 psia
REPRESS O2 >865 psia
PRIM RAD tb - gray
*If PRIM RAD tb - 2 *
* ECS RAD FLOW AUTO CONT - 1 until*
* tb gray, then AUTO *
ECS RAD TEMP PRIM IN - 67-97° F
ECS RAD TEMP PRIM OUT - -20° to +63° F
PRIM GLY EVAP TEMP OUT - 38-50.5° F
PRIM GLY DISCH PRESS - 40-52 psig
SUIT TEMP - 45-55° F
SUIT PRESS/CABIN PRESS - 4.7-5.3 psia
PART PRESS CO2 < 7.6 mm Hg
POT H2O QTY - 10-100%
WASTE H2O QTY - 25-85%

17 SPS MONITORING CHECK

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

18 GDC ALIGN

19 UNSTOW SEQ CAMERA BRACKET & ORDEAL

20 MOUNT ORDEAL BOX & INITIALIZE

DATE 3/29/71

DATE

21 SECONDARY GLYCOL LOOP CHECK

ECS IND sw - SEC
SEC COOL LOOP PUMP - AC1
GLY DISCH SEC PRESS - 39-51 psig
ACCUM SEC QTY IND - 30-55%
SEC COOL LOOP - EVAP
After 5 min:
SEC EVAP TEMP OUT - 38-50.5°F
SEC COOL LOOP EVAP - RSET 1 min, off (ctr)
SEC COOL LOOP PUMP - off (ctr)
ECS IND sw - PRIM

22 UNSTOW CAMERAS

DAC (T8,250,7) 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/∞) 8 fr, MAG M
EL ~~(f8,250,30) 10 fr, MAG L~~ (B3)
Spotmeter
(Stow in LMP TSB)
W/ 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)

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)

DATE 3/29/71

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

N71: __ __, __ __

N05: __ __ __ . __ __

N93:

X __ __ . __ __ __

Y __ __ . __ __ __

Z __ __ . __ __ __

GET: __ __:__ __:__ __

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

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

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

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

DATE 3/29/71

DATE

27 EXTEND DOCKING PROBE

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

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

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

28 COPY TLI, TLI ABORT, & P37 PADS

29 SV UPDATES (MCCH)

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

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

US LOS
(01:48:28)

SUNSET
(02:11:11)

DATE _____

DATE 5/28/71

ULTRAVIOLET PHOTO PROCEDURES (Earth Orbit)

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

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

Record fr#___ Record GET ___

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

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

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

7/9/71

DATE

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DATE _____

DATE 5/28/71

L
2-21

TLI

X						X	2	4	0	2	3	TB6p
X	X	X				X	X	X	1	8	0	R
X	X	X				X	X	X	0	4	5	P TLI
X	X	X				X	X	X	0	0	1	Y
X	X	X				X	X	X	5	5	5	BT
						1	0	4	3	1	1	ΔVC'
+						+	3	5	5	9	9	VI
X	X	X				X	X	X	2	5	7	R
X	X	X				X	X	X	6	7	7	P SEP
X	X	X				X	X	X	3	2	0	Y
X	X	X				X	X	X	1	0	1	R
X	X	X				X	X	X	2	5	7	P EXTRACTION
X	X	X				X	X	X	0	4	0	Y
X	X					X	X	0	4	5	0	R2 Align
X	X					X	X	0	3	5	0	R2 Ign
X	X					X	X	1	0	2	4	ORDEAL Start
X	X	X				X	X	X	0	3	1	YAW

DATE 5/28/71

DATE

L
2-22

P27 UPDATE

PURP	V	V	V
GET	• • • •	• • • •	• • • •
304 01	INDEX	INDEX	INDEX
02			
03			
04			
05			
06			
07			
10			
11			
12			
13			
14			
15			
16			
17			
20			
21			
22			
23			
24			
N34 HRS	X X X	X X X	X X X
MIN	X X X X	X X X X	X X X X
NAV CHECK SEC	X X	X	X
N43 LAT	0	0	0
LONG			
ALT	+ 0	+ 0	+ 0

DATE 5/28/71

DATE 5/28/71

P30 MANEUVER

L/2-23

SET STARS

R_{ALIGN} ___ ___ ___

P_{ALIGN} ___ ___ ___

Y_{ALIGN} ___ ___ ___

ULLAGE ___

___

___

___

___

HORIZON/WINDOW ___

___

___

___

___

P37 FOR L/O+8

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

GETI

X ΔVT

X LONG

GET 400K

5/28/71

DATE ___

DATE ___

P30 MANEUVER

SET STARS

R_{ALIGN} ___ ___ ___

P_{ALIGN} ___ ___ ___

Y_{ALIGN} ___ ___ ___

ULLAGE _____

_____

_____

_____

HORIZON/WINDOW _____

_____

_____

_____

P37 FOR L/0+8

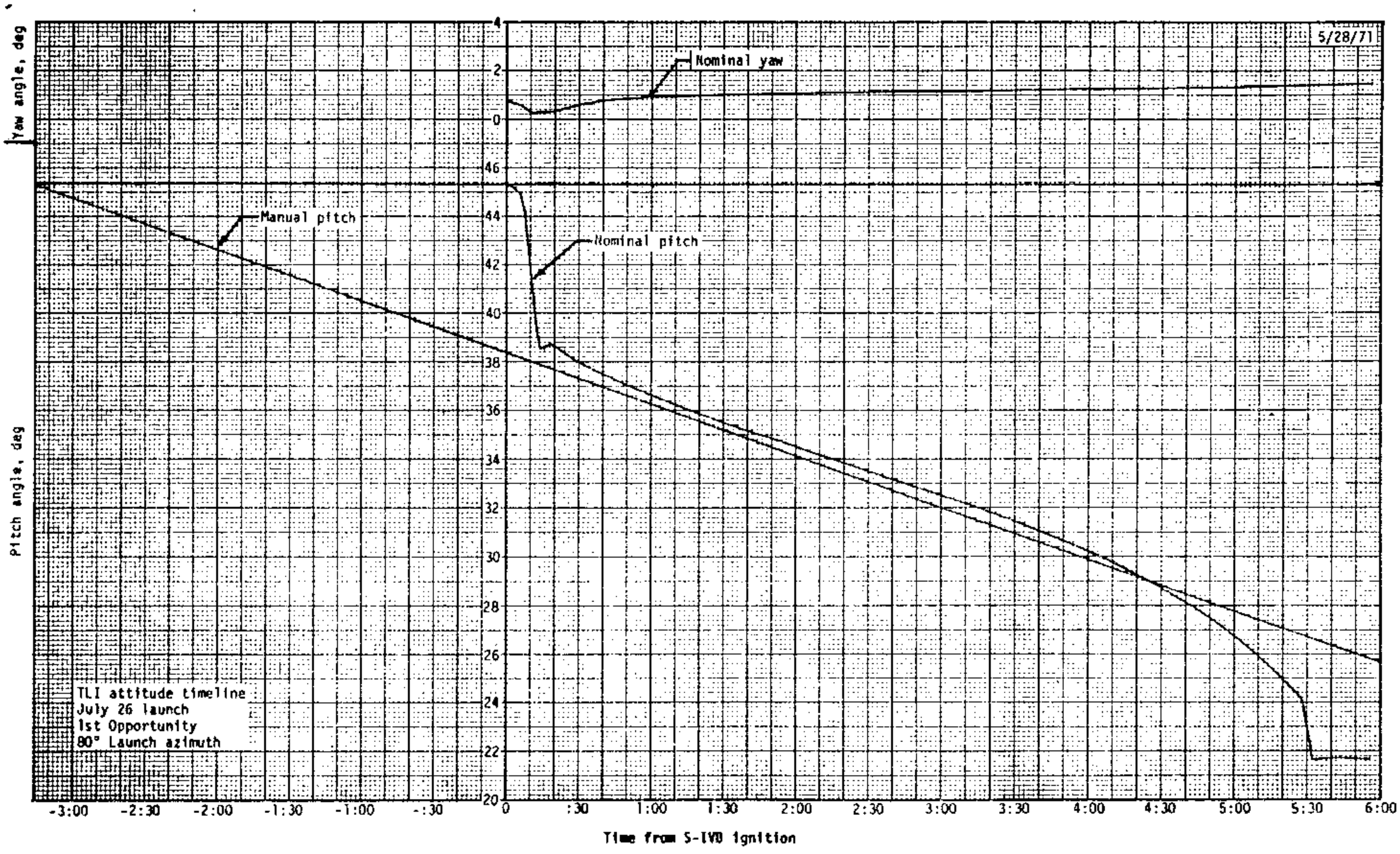
0	0	X	0	0	GETI
X	6	0	7	6	ΔVT
X	−	1	7	5	LONG
0	2	7	5	6	GET_{400K}

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

DATE _____

DATE 5/28/71

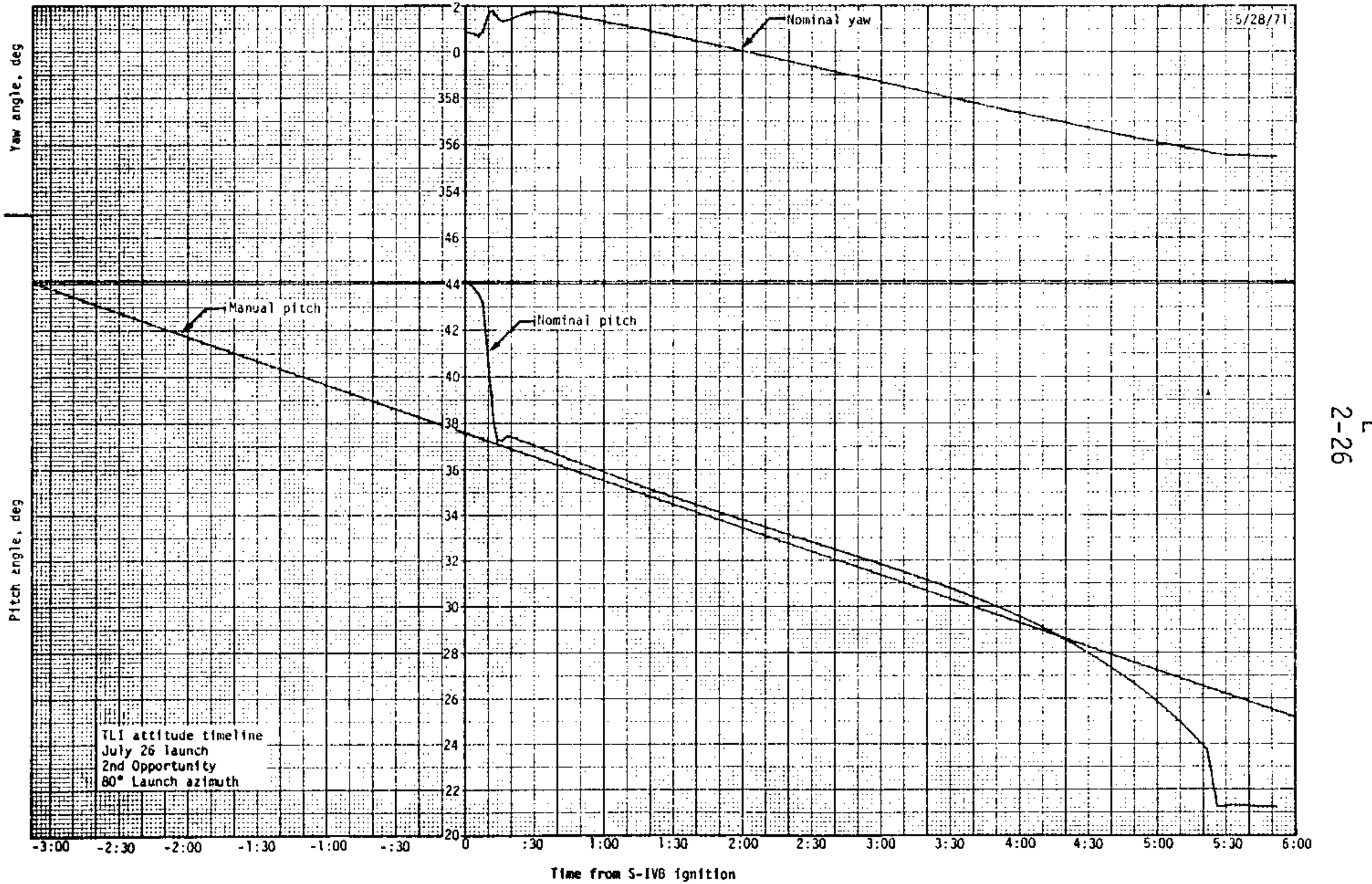
DATE 5/28/71



L
2-25

DATE _____

DATE _____



L
2-26

DATE 5/28/71

DATE 7/9/71

NOMINAL SIVB TLI 1

LAUNCH JULY 26, 1971

7/1/71

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

TLI TRAJECTORY OPP 1
NOM & MAN

TLI TRAJECTORY OPP 2
NOM & MAN

NOMINAL SIVB TLI 2

LAUNCH JULY 26, 1971

7/1/71

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

DATE 7/9/71

NASA — MSC

TLI PREPARATION

XLUNAR - INJECT (verify)
EDS PWR - on (up)
Perform EMS ΔV TEST & NULL
BIAS CHECK, pg G/2-5
CRO AOS (02:24:41) — Set ΔVC
EMS FUNC - ΔV
GDC ALIGN
CRO LOS (02:31:14) — V48E, 31102, 01111
Key V83E
Set ORDEAL - 90/EARTH
SECS PYRO ARM (2) - on (up)
TRANS CONTROL PWR - ON
ROT CONTR PWR NORMAL (2) - AC/DC (verify)
ROT CONTR PWR DIRECT (2) - MNA/MNB
SC CONT - SCS (verify)
LV/SPS IND - SII/SIVB (verify)
cb DIRECT ULLAGE (2) - closed
Cycle CRYO FANS
Set DET - 51:00

P15 - TLI INITIATE/CUTOFF

V37E 15E

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

F 06 14 — VC/O (fps)
Load VC/O
PRO

06 95 — TFI, VG, VI (min-sec,fps,fps)

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TLI, NOMINAL & MANUAL

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

TB6 (-09:38): UPLINK ACTY lt - on
SII SEP lt - on (TIG-09:38)

TB6 + 10sec: UPLINK ACTY lt - out
SII SEP lt - out

51:00 (-09:00): Start DET counting up
*If LV GUID - CMC: *
* V16 N20E *
* MNVR to R2 Align = _____(45°)*

MONITOR LV TANK PRESS SEQUENCE

Nominal LOX ~ 40 psia
Nominal LH2 ~ 31 psia
*If 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 (-04:00): Slew FDAI #1 to PITCH = ~~16°~~ 17°
*If LV GUID - CMC: *
* Slew FDAI #1 to PITCH = 0° *
* V16 N20E *
* Insure R2 Align = _____(45°)*

Insure FDAI #1 PITCH = 18°

56:45 (-03:15) ORDEAL MODE - OPERATE/SLOW, IU or CMC
*If LV GUID - CMC: *
* MNVR to R2 Ign = _____ (38°)*

58:15 DSKY BLANKS (Ave G on)

58:20 06 95 TFI, VG, VI (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
58:36 (-01:24) SII SEP lt - on

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

58:38 SIVB ULLAGE Begins

58:38 SUNRISE (02:48:47)

HAW AOS (02:49:29)

59:42 SII SEP lt - out (TIG - 18 sec)

HAW LOS (02:49:52)

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DATE

59:52 SIVB FUEL LEAD
59:55 SIVB ULLAGE discontinues
Insure FDAI #1 PITCH = 0°
*If LV GUID - 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 GUID - CMC: *
* Fly PITCH = 0° *
* YAW = _____(+1°)*

+45°/P,Y
±10°/sec P,Y
±20°/sec R

HAW LOS
(02:55:59)

V16 N62E
KEY RLSE before ECO
~~05:54~~ 06.03 SIVB ECO (lt on) (BEGIN TB7)

*EMER SIVB CUTOFF *
If no ECO at +2 sec and VI attained
* LV STAGE sw - SII/SIVB *
*If still no ECO, *
* THC - CCW & NEUTRAL in 1 sec *

Key VERB (freeze display)

Record TFC _____
VG _____
VI _____
ΔVC _____

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

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

08:26 SIVB MNVR TO ORB RT (HDS DN) (.3°/sec)

DATE _____

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SCS TVC SERVO PWR #1 - OFF
PCM BIT RATE - LOW
MSFN AOS
(02:56:08)
EMS MODE - STBY
EMS FUNC - OFF
SECS PYRO ARM (2) - SAFE
FDAI #1 - INRTL
RHC #2 - LOCKED

PRO

F 37

OOE

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

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SATURN RATE CHANGE

V25 N1 E
3310E, 0E, XXXE, YYYYYE

SIVB RATE		SAT RATE +1 address 3311 XXX	SAT RATE +2 address 3312 YYYYY
.05°/sec	RPY	161	77616
.1	RPY	210	77567
.2	RPY	266	77511
*.3	RPY	344	77433
.3P,Y .5	R	476	77301

*USE FOR TLI

DATE

NORMAL SC/BOOSTER SEPARATIONS

1 PRE CSM SEPARATION

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

	R	P	Y	
*N20	_____	_____	_____	*
*N22	_____	_____	_____	*

*Load new Docking Attitude *

2 CSM SEPARATION PREP

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

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NORM SC/BOOSTER SEP

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)

NORM SC/BOOSTER SEP

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

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59:50 CMC MODE - AUTO
59:58 Thrust +X and hold
00:00 CSM/LV SEP pb - push, hold, and release
LV TANK PRESS - full scale Low
*No Separation: *
* cb RCS LOGIC (2) - close *
* THC - CCW (leave in detent) *
* DET reset and counting up (auto) *
* LV TK PRESS - full scale low (SEP ind)*
* 00:03 THC - neutral *

00:03 THC - release (ΔV ~.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
O2 TK 3 ISOL vlv tb - gray (verify)

4 CSM TRANSPOSITION
V62E
MAN ATT (PITCH) - ACCEL CMD
00:15 Pitch up at .5°/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)(ΔV ~.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°, Y = +275°
S BD ANT OMNI - HI GAIN
HI GAIN ANT TRACK - REACQ
TV TRANSMIT/STBY sw - TRANSMIT
Start DAC

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DATE

DATE

5 DOCKING

Stabilize & align CSM
BMAG MODE (3) - ATT 1/RATE 2
At capture:
PROBE EXTD/RETR tb-bp (A, pg S/2-11) malf. DOCK
CMC MODE - FREE 2
Allow probe to damp S/C motions
(approx 10 sec)
Align Pitch and Yaw with THC (<3°)
(minimum possible)
DOCK PROBE RETRACT PRIM-1
*If no RETRACT in 30 sec: PRIM-2 *
*If still no RETRACT: SEC-1 *

After dock latches have engaged:
PROBE 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)

6 POST DOCKING

RATE - HIGH
ATT DB - MAX
COAS PWR - OFF
cb RCS LOGIC (2) - open (verify)
TVC SERVO PWR #1 - OFF
THC,RHC - locked
EMS MODE - STBY
EMS FUNC - OFF
BMAG MODE (3) - RATE 2 (verify)
COUCHES - CDR-90°,CMP-0°,LMP-180°
LM PWR - OFF (verify)
TUNNEL LIGHTS - ON ~~02 HTR~~
02 HTR 3 - AUTO

DATE _____ DATE 3/29/71

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 v1v - 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

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Start DAC

13 LM SEP & EJECTION
SIVB/LM SEP - on (up)
(___:___:___)

00:00 Start DET
CMC MODE - AUTO
00:05 Thrust -X (3 sec)

14 POST LM EJECTION
PRO

F37 00E
When CMC Acty lt out,
Key V66E
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
cb SIVB/LM SEP (2) - open
O2 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 _____

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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 *Ejection *(min:sec) *	Att for viewing SIVB after RCS EVASIVE mnvr		
	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 02 ISOL/AUX BAT - open

*If no TLI: *
* SIVB - CSM/LM SEP (Earth orbit) *
*

*min-sec	Event	Inertial Att R	P	Y
*00:00	Ejection	____	____	____
*00:05	3 sec -X			
*00:22	Mnvr	90.0°	257.0°	354.6°
*03:00	6 sec -X			

3/29/71 DATE

DATE

ABORT PROCEDURES

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

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

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

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

GO TO LANDING PHASE pg L/4-8

MODE IB ABORT
(00:42 to 16.5 nm)

00:00 TRANS CONTR - CCW then NEUTRAL
CM/SM SEP (2)-on (up)
ELS - AUTO
00:11 CANARD DEPLOY - PUSH

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

GO TO LANDING PHASE pg L/4-8

MODE IC ABORT
(16.5 nm to TWR JETT)

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

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

S/C PLATFORM GO/NO GO (Excessive Rates)
KEY RLSE to N44, Check HA

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

GO TO LANDING PHASE pg L/4-8

LET FAILS TO JETTISON
LEGS CUT/NO MOTOR FIRE (pyro audible)
LES MOTOR FIRE PB - push
NO RESPONSE to ABORT SYS TWR JETT switches
cb SECS ARM (2) - close (verify)
cb SECS LOGIC (2) - close (verify)
cb EDS (3) - close (verify)
SECS LOGIC (2) - on (up) (verify)
SECS PYRO ARM (2) - on (up) (verify)
EDS PWR - on (up) (verify)
ABORT SYS TWR JETT (2) - on (up) (verify)
NO TWR JETT - continue to orbit
ABORT SYS TWR JETT (2) - off (ctr)

MODE II RCS ABORT
(TWR JETT to MODE III)

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

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

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

00:24 TRANS CONTR +X OFF
KEY RLSE to N44, Check TFF
If TFF>2 min, Yaw 45° (LEFT) out-of-plane
BMAG MODE (3) - ATT1/RATE 2
cb MNA&B BAT C (2) - closed
CM/SM SEP - on (up)
CM RCS PRESS - on (up)
RCS TRNFR - CM
C&W MODE - CM
Entry ATT - (R=0°,P=120°,Y=0°)(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 lt - on
.05G sw - on (up)
EMS ROLL - on (up)
Fly Max. Lift
N62E VI, HDOT, H

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GO TO LANDING PHASE pg L/4-8

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

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

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

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

00:24 TRANS CONTR +X OFF
N50E ΔR,HP,TFF (.1nm,min-sec)
BMAG MODE (3) - ATT1/RATE2
If ΔR>0:
MNVR to retro att (R=180°,P=194°,Y=0°)
(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 (ΔR=0)
ΔV THRUST (2) - OFF

If TFF>2min,Yaw 45°(LEFT)
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°,P=105°,Y=0°)
(BEF, Hds Dn, Full Lift)
CSM/LM FNL SEP (2) - on (up)
Note TFF

GETI _____
(6999.9)
ΔV _____
VC _____
θ _____
Δtb _____
GET 300K _____
θ (.05G) _____
GET Drogue _____

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MODE II, MODE III

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

GO TO LANDING PHASE pg L/4-8

MODE III, MODE IV

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

GETI _____
6999.9
ΔV _____
VC _____
θ _____
Δtb _____

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

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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 *

LANDING PHASE — 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

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

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

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

Go to POSTLANDING PROCEDURES, pg L/9-2

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PRE-TLI ABORT
FROM ORBIT

PRE-TLI ABORT FROM ORBIT

1 MNVR TO SEP ATT
LV GUID - CMC
Pitch SIVB to Hds up, BEF, 15°
window mk on horizon
Then, LV GUID - IU for orb rate

2 LOAD RCS DAP
R1 = 11102, R2 = 01111
V46E

3 DON MAE WESTS & FOOT RESTRAINTS

4 FINAL STOWAGE
ORDEAL
(377) GLY TO RAD SEC vlv - BYPASS (verify)
Verify EVA COUCH STRUT disengaged
(382) Cool pnl installed
Y-Y struts (2) extended
Stow Data Box R-12
Attach both strut unlock lanyards
WASTE MGMT DRAIN vlv - OFF

5 SYSTEMS TEST PANEL CONFIGURATION
SYS TEST METER -5B (BAT RLY BUS 3.4-4.1 vdc)
(101) CM RCS HTRS - OFF (verify)
WASTE H2O DUMP HTR - OFF
URINE DUMP HTR - OFF
(100) LEB FLOOD & INTGL LIGHTING - OFF

6 PYRO BATT CK
(250) cb PYRO A SEQ A - close (verify)
cb PYRO B SEQ B - close (verify)
DC IND - PYRO BAT A(B)
*If PYRO BAT A(B) < 35 vdc *
*cb PYRO A(B) seq A(B) - open *
cb PYRO A(B)BAT BUS A(B) TO PYRO
* BUS TIE - close *
(275) cb MNA BAT C - close
cb MNB BAT C - close
DC IND - MNB

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

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DATE

11 CSM/LV SEPARATION

THC - ARMED
RHC #2 - ARMED
cb SECS LOGIC (2) - closed (verify)
cb SECS ARM (2) - closed (verify)
SECS LOGIC (2) - on (up) (verify)
RCS CMD - ON
TAPE RCDR - HBR/RCD/FWD/CMD RESET
SECS PYRO ARM (2) - ARM
GDC ALIGN
EMS FUNC - ΔV (verify)
EMS MODE - NORMAL

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

*No Separation: *
* THC - CCW (leave in detent) *
* DET reset and counting up (auto) *
* LV TK PRESS - full scale low (SEP ind)*
*00:03 THC - +X, neutral & hold *
*00:24 THC - release *

SM RCS PRPLNT tb(8) - gray (verify)
SM RCS He tb (8) - gray (verify)
SM RCS SEC PRPLNT FUEL PRESS (4) - CLOSE
FC REAC vlv - NORM
~40:24 ΔV = 5 fps
THC - release
SECS PYRO ARM (2) - SAFE
cb EDS (3) - open
PCM BIT RATE - LOW

12 Go to SPS DEORBIT & ENTRY, pg L/8-1

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

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DATE

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

V37E 47E

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

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

(TLI+25min)

00:00 TRANS CONTR - CCW (4 sec)
DET RESET (verify)

00:03 SIVB/CSM SEP
LV ENG 1 Lt - out
CSM/LV SEP PB - PUSH
*RCS CMD-ON *
THC - ARMED

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

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

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

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

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TLI 90 MIN ABORT

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.
(Circle is marking EPS Group 5, two close (verify)

XX:XX Set DET counting up to GETI
GDC ALIGN
EMS FUNC - ΔV SET/VHF RNG
SET ΔVc ABORT SET ΔVc = 129
EMS FUNC - ΔV

TVC CHECK & PREP

(8) cb STAB CONT SYS (all) - close cb SPS pilot
cb SPS (10) - close
MAN ATT (3) - RATE CMD
LIMIT CYCLE - on (up)
ATT DB - MIN
RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
ΔV CG - CSM/LM
TVC GMBL DRIVE P&Y - AUTO

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

(55:00) PRIMARY TVC CHECK
(05:00) GMBL MOT P1-Y1 - START/ON (LMP Confirm)
Verify TRIM CONTROL & SET
Verify MTVC
SCS TVC (2) - AUTO
THC - CW
Verify NO MTVC

SEC TVC CHECK
GMBL MOT P2-Y2 - START/ON (LMP Confirm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify GPI returns to trim
Verify NO MTVC
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
FDAI SCALE - 5/5
LIMIT CYCLE - OFF
~~RATE - HIGH~~
UPDATE DET
SPS He vlvs (2) - AUTO (verify)

(58:00)
(-02:00) ΔV THRUST A(~~B~~) - NORMAL
V37E 47E
THC - ARMED
RHC (2) - ARMED
(59:30) TAPE RCDR - HBR/RCD/FWD/CMD RESET
(-00:30) EMS MODE - NORMAL

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

~~MONITOR THRUSTING~~
~~Pc 95-105 psia~~
EMS COUNTING DOWN
SPS INJ VLVS (4)2 - OPEN
SPS He vlvs tb-gray
SPS FUEL/OXID PRESS - 170-195 psia
~~PUGS - BALANCED~~

DATE

00:XX ECO

ΔV THRUST A&B - OFF
VERIFY THRUST OFF
SPS INJ VLVS (4) - CLOSED
SPS He vlvs tb (2) - bp
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF
MN BUS TIE (2) - OFF

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

ATT DB - MAX
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
BMAG MODE (3) - RATE 2
TAPE RCDR - off (ctr)
PCM BIT RATE - LOW
PRO
F37 00E
When CMC Acty lt out:
V66E

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

DATE _____ DATE 3/29/71

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 T1102, 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

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EARTH ORBIT ENTRY VEHICLE PREP

EARTH ORBIT ENTRY
VEHICLE PREP

16 LOGIC SEQUENCE CK
(8) cb SECS LOGIC (2) - close (verify)
cb SECS ARM (2) - close
cb ELS/CM-SM SEP (2) - close
ELS LOGIC - on (up)
ELS - AUTO
Coordinate next 3 steps with MSFN
SECS LOGIC (2) - on (up)
MSFN confirm GO for PYRO ARM as req'd
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
ELS LOGIC - OFF
ELS - MAN
cb ELS/CM-SM SEP (2) - open

17 (__:__:__) P52-IMU REALIGN pg G/6-2 (OPTION 3)
Record gyro torquing angles
R _____
P _____
Y _____
*If >1°, recycle P52 *
If confirmed, use SCS for
* EMS entry *

18 GDC ALIGN
If drift >10°/hr, change rate source

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

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EMS FUNC - EMS TEST 4
.05G lt - on (all others out)
G-V trace within pattern to lwr rt corner @9G
RANGE ind counts down to 0±0.2
EMS FUNC - EMS TEST 5
.05G lt - on
RSI upper lt - on (10 sec later)
RANGE ind - 0.0
Scribe traces vertical line 9g to 0.28±0.1
ALIGN SCROLL TO ENTRY PATTERN (on 37K ft/sec line)
EMS FUNC - RNG SET
G-V scroll assy traces vert. line 0.28g to 0±0.1
EMS MODE - STBY

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

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

22 SEC WATER EVAP ACTIVATION
ECS IND sel - SEC
SEC COOL LOOP PUMP - AC2
GLY DISCH SEC PRESS - 39-51 psig
SEC COOL LOOP EVAP - EVAP
SEC GLY EVAP OUT TEMP - 38-50.5°F
SUIT CKT HT EXCH - BYPASS 20 sec,OFF
ECS IND sel - PRIM

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

DATE 3/29/71

DATE

24 (-01:00h) CM RCS PREHEAT

Note: If sys test mtr 5c,d,6a,b,c,d all read 3.9 vdc (28°F) or more, omit preheat

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

25 FINAL STOWAGE

ORDEAL
(377) GLY TO RAD SEC v1v - BYPASS (verify)
Verify EVA COUCH STRUT disengaged
(382) Cool pnl installed
Y-Y struts (2) extended
Stow Data Box R-12
Attach both strut unlock lanyards
Check for water in tunnel area
Stow gas separator (A8)
Stow Cl injector (R6)
WASTE MGMT DRAIN v1v - 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

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28 PYRO BATT CK

(250) cb PYRO A SEQ A - close (verify)
cb PYRO B SEQ B - close (verify)
DC IND - PYRO BAT A(B)
*If PYRO BAT A(B) < 35 vdc *
*cb PYRO A(B) seq A(B) - open *
cb PYRO A(B)BAT BUS A(B)TO PYRO
* BUS TIE - close*
(275) cb MNA BAT C - close
cb MNB BAT C - close
DC IND - MNB

29 CONFIGURE PNL 8

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

30 FINAL GDC DRIFT CK (if req'd)

If drift >10°/hr, Suspect GDC,
Do not use RSI & FDAI #2

31 CM RCS ACTIVATION

(8) cb ELS/CM-SM SEP (2) - close
cb SECS ARM (2) - close
Cue MSFN
SECS LOGIC (2) - on(up)
MSFN confirm GO for PYRO ARM (if poss)
SECS PYRO ARM (2) - ARM
CM RCS PRPLNT 1&2 tb(2)-gray (verify)
CM RCS PRESS - on (up)
RCS IND sw - CM1, then 2
He PRESS stabilizes at 3300-3500
psia after 15 minutes
MANF PRESS 287-302 psia
SECS PYRO ARM (2) - SAFE

DATE 3/29/71 DATE

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

33 P27 & ENTRY PAD UPDATE

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

DATE _____

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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

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

SEC TO MAIN

DATE 3/29/71

EARTH ORBIT BLOCK DATA

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

REMARKS:

EARTH ORBIT BLOCK DATA

X	X						X	X				−		AREA
X	X	X				.	X	X	X				.	LAT
X	X					.	X	X					.	LONG
		:		:					:		:			GETI
X	X	X				.	X	X	X				.	ΔV_C
X	X						X	X				−		AREA
X	X	X				.	X	X	X				.	LAT
X	X					.	X	X					.	LONG
		:		:					:		:			GETI
X	X	X				.	X	X	X				.	ΔV_C
X	X						X	X				−		AREA
X	X	X				.	X	X	X				.	LAT
X	X					.	X	X					.	LONG
		:		:					:		:			GETI
X	X	X				.	X	X	X				.	ΔV_C
X	X						X	X				−		AREA
X	X	X				.	X	X	X				.	LAT
X	X					.	X	X					.	LONG
		:		:					:		:			GETI
X	X	X				.	X	X	X				.	ΔV_C
X	X						X	X				−		AREA
X	X	X				.	X	X	X				.	LAT
X	X					.	X	X					.	LONG
		:		:					:		:			GETI
X	X	X				.	X	X	X				.	ΔV_C

REMARKS:

P30 MANEUVER

L/5-11

SET STARS

R ALIGN ___ ___ ___

P ALIGN ___ ___ ___

Y ALIGN ___ ___ ___

ULLAGE ___

___

___

___

HORIZON/WINDOW ___

___

___

___

OTHER ___

___

___

DATE 3/29/71

							PURPOSE
		/					PROP/GUID
+							WT N47
	0	0					P TRIM N48
	0	0					Y TRIM
+	0	0					HRS GETI
+	0	0	0				MIN N33
+	0						SEC
							ΔV X N81
							ΔV Y
							ΔV Z
X	X	X					R
X	X	X					P
X	X	X					Y
+							H A N44
							H P
+							ΔVT
X	X	X					BT
X							ΔVC
X	X	X	X				SXTS
+						0	SFT
+					0	0	TRN
X	X	X					BSS
X	X						SPA
X	X	X					SXP
	0						LAT N61
							LONG
+							RTGO EMS
+							VIO
							GET 0.05G

P30 MNVR PAD

HYBRID RCS DEORBIT & ENTRY

VEHICLE PREP COMPLETE

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 00E

7 SEPARATION CK LIST
PRIM GLY TO RAD - BYPASS (Pull)
REPRESS PKG vlv - FILL to 865-935,
then ON
O2 SM SUPPLY vlv - OFF
SURGE TK - ON (verify)
CAB PRESS REL vlv (2) - NORM
cb ELS/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

8 CM RCS CHECK

AUTO RCS A/C ROLL (4) - OFF (verify)
cb RCS LOGIC (2) - closed (verify)
SC CONT - SCS
MAN ATT (3) - MIN IMP
RCS TRNFR - CM
AUTO RCS SEL (RING 1) - OFF
AUTO RCS SEL (RING 2) - MNB
TEST RING 2 THRUSTERS
AUTO RCS SEL (RING 1) - MNA
AUTO RCS SEL (RING 2) - OFF
TEST RING 1 THRUSTERS
AUTO RCS SEL (RING 2) - MNB
RCS TRNFR - SM
MAN ATT (3) - RATE CMD

9 RCS THRUSTING PREP

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

10 MNVR TO PAD BURN ATT (HDS DN)

V49E

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

11 PERFORM BORESIGHT & SXT STAR CHECK

V41 N91E
Stow optics eyepieces

12 V25 N17E (.01°)

Load Pad Data GMBL Angles
for CM BURN ATT
ATT SET tw - SET
to PAD DATA GMBL ANGLES
for CM BURN ATT

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

P41 - RCS THRUSTING

14 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) - ATTI/RATE 2
If long Lambert (P37) burn
BMAG MODE (3) - RATE 2
ENTR

DATE 3/29/71

DATE

	55:00m			
18		06 85	VG X,Y,Z	(.1fps)
			RECHECK BORESIGHT STAR	
			TRANS CONTR PWR - on (up)	
			EMS MODE - STBY (verify)	
			EMS FUNC - ΔV SET/VHF RNG	
			SET ΔV for SM BURN = ΔV pad +100.0	
			EMS FUNC - ΔV	
			S BD OMNI ANT - C	
■			Cue MSFN	
			SECS LOGIC (2) - on (up)(verify)	
			MSFN confirm Go for PYRO ARM (if poss)	
			SECS PYRO ARM (2) - ARM	
			CM RCS LOGIC - on (up)	
	59:25			
19			DSKY BLANKS	
	59:30			
20		16 85	VG X,Y,Z (AVE G ON)	(.1fps)
			RHC's & THC - ARMED	
■			TAPE RCDR - HBR/RCD/FWD/CMD RESET	
			EMS MODE - NORMAL	

DATE _____

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00:00

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

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

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

Hybrid V63E (N17, CM BURN ATT)
1 min *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)
Y 0°
CM RCS LOGIC - OFF
SECS PYRO ARM (2) - SAFE

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

DATE

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

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

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32 F 16 63 RTOGO (.1nm) _____ PAD _____
VIO (fps) _____ PAD _____
TFE (min-sec) _____
If NO COMM, Set RTOGO & VIO in EMS
& initialize
(ACCEPT) PRO
(RECYCLE) V32E to 31 (TFE sensitive to oblateness)

DATE _____

P62 - CM/SM SEP & PRE-ENTRY MNVR

33 F 50 25 00041 REQUEST CM/SM SEP

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

PRO (Act ENTRY DAP Att Hold)

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

PRO (CMC Guidance)

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

P63 - ENTRY INIT

36 06 64 G,VI,RTOGO (.01G,fps,.1nm)
FDAI SCALE - 5/5
ROT CONTR PWR DIR(2) - MNA/MNB(verify)
TAPE RCDR - HBR/RCD/FWD/CMD RESET
HORIZ CK
Pitch error needle goes toward
zero approaching .05G time

DATE

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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 - SCS *
* Fly EMS *

*If after 1G, both RCS ring *
* He press <1550 psia: *
* Roll 20°/sec & disable RCS*
* After peak G, enable RCS *
* & fly BETA = 90° *

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

DATE 3/29/71

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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 & FDAI
~~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

SM RCS DEORBIT & ENTRY

VEHICLE PREP COMPLETE

P30 - EXTERNAL ΔV
V37E 30E

1

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

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

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

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

6 F 37 00E

7 SEPARATION CK LIST
PRIM GLY TO RAD - BYPASS (Pull)
REPRESS PKG vlv - FILL to 865-935,
then ON
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

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SM RCS
DEORBIT & ENTRY

8 CM RCS CHECK
AUTO RCS A/C ROLL (4) - OFF (verify)
cb RCS LOGIC (2) - closed (verify)
SC CONT - SCS
MAN ATT (3) - MIN IMP
RCS TRNFR - CM
AUTO RCS SEL (RING 1) - OFF
AUTO RCS SEL (RING 2) - MNB
TEST RING 2 THRUSTERS
AUTO RCS SEL (RING 1) - MNA
AUTO RCS SEL (RING 2) - OFF
TEST RING 1 THRUSTERS
AUTO RCS SEL (RING 2) - MNB
RCS TRNFR - SM
MAN ATT (3) - RATE CMD

9 RCS THRUSTING PREP
Load DAP
BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO

10 MNVR TO PAD BURN ATT (HDS DN)
V49E
R _____ (0°)
P _____ (180°)
Y _____ (0°)

11 PERFORM BORESIGHT & SXT STAR CHECK
V41 N91E
Stow optics eyepieces

12 P41 - RCS THRUSTING
V37E 41E

13	F	50	18 (AUTO)	REQ MNVR TO BURN ATT (HDS DN) BMAG MODE (3) - RATE 2 SC CONT - CMC/AUTO PRO	(.01°)
14		06	18	AUTO MNVR TO FDAI RPY	(.01°)

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	
	55:00m				
16		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	
	59:25				
17				DSKY BLANKS	
	59:30				
18		16	85	VG X,Y,Z (AVE G ON)	(.1fps)
				RHC's & THC - ARMED	
				TAPE RCDR - HBR/RCD/FWD/CMD RESET	
				EMS MODE - NORMAL	
	00:00				
19	F	16	85	REQ NULL VG X,Y,Z	(.1fps)
				BURN EMS ΔV CTR TO 100	
				RESET DET & COUNT UP	
20				V82E	
	F	16	44	HA,HP,TFF	(.1nm,min-sec)
				Check HP <40nm:	
				If > Pad data, continue burn	
				until < Pad	
				PRO	

DATE 3/29/71

DATE

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

22 F 37 00E
When CMC ACTY lt out:
V66E

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

23 EMS INITIALIZATION
If scroll not on 37K
* EMS FUNC - TEST 5 *
* Slew scroll to 37K*
EMS FUNC - RNG SET
Set RNG to PAD DATA RNG
EMS FUNC - Vo SET
Slew scroll to PAD DATA VIO
EMS MODE - STBY (verify)
EMS FUNC - ENTRY

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

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

DATE _____ DATE 3/29/71

26 PWR REDUCT

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

P61 - ENTRY PREP

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

28 F 06 61 IMPACT LAT, LONG, HDS UP/DN (+/-)
(.01°,.01°,±00001)
PAD VALUES
LAT _____
LONG _____
HDS UP +1 _____
PRO

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

DATE 3/29/71

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 _____

P62 - CM/SM SEP & PRE-ENTRY MNVR

31 F 50 25 00041 REQUEST CM/SM SEP

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

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

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

PRO (Act ENTRY DAP Att Hold)

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

PRO (CMC Guidance)

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

DATE _____

DATE 3/29/71

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 *

*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

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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~~
~~<1150 psia~~

37 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

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.

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

F 37 00E

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

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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 - ACI (verify)
PUG MODE - as req'd
Load DAP
BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO

9 MNVR TO PAD BURN ATT (HDS UP)

V49E

R _____ (180°)
P _____
Y _____ (0°)

10 PERFORM BORESIGHT & SXT STAR CHECK

V41 N91E
Stow Optics eyepieces

11 V37E 40E

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

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

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

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

55:00m PRIMARY TVC CHECK
(-05:00) 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

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Verify GPI returns to 0,0(CMC)
or trim (SCS)
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
(TRIM) BMAG MODE (3) - RATE 2
PRO
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 vlvs(2)- AUTO (verify)

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

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

59:25
(-00:35) DSKY BLANKS

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

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

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

MONITOR ΔVM (R3) COUNTING UP

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

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

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

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

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

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

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	00:XX		ECO
18	F 16 40		TFC (STATIC), VG, ΔVM (min-sec,.1fps) ΔV THRUST A&B - OFF VERIFY THRUST OFF SPS INJ VLVS (4) - CLOSED SPS He vlvs tb (2) - bp GMBL MTRS (4) - OFF (LMP Confirm) TVC SERVO PWR 1&2 - OFF PRO
19	F 16 85		VG XYZ (CM) (.1fps) NULL RESIDUALS RECORD ΔV COUNTER & RESIDUALS ΔVC _____ EMS FUNC - OFF VGX _____ EMS MODE - STBY VGY _____ TRANS CONT PWR - OFF VGZ _____ BMAG MODE (3) - RATE 2 cb DIRECT ULLAGE (2) - open cb SPS P & Y (4) - open TAPE RCDR - off (ctr) PRO
20	F 37		V82E
21	F 16 44		HA,HP,TFF (.1nm,min-sec) PRO
22	F 37		00E
23			When COMP ACTY 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

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25 PWR REDUCT

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

P61 - ENTRY PREP

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

27 F 06 61 IMPACT LAT, LONG, HDS UP/DN (+/-) (.01°,.01°,±00001)
PAD VALUES
LAT _____
LONG _____
HDS DN -1
PRO

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

29 F 16 63 RTOGO (.1nm) _____ PAD _____
VIO (fps) _____ PAD _____
TFE (min-sec) _____
If NO COMM, Set RTOGO & VIO in EMS
& initialize
(ACCEPT) PRO
(RECYCLE) V32E to 28 (TFE sensitive to oblateness)

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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°,.01°,-00001)

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EMS INITIALIZATION

If scroll not on 37K
* EMS FUNC - TEST 5 *
* Slew scroll to 37K*
EMS FUNC - RNG SET
Set RNG TO PAD DATA RNG
EMS FUNC - Vo SET
Slew scroll to PAD DATA VIO
EMS MODE - STBY (verify)
EMS FUNC - ENTRY

RSI ALIGNMENT

FDAI SOURCE - ATT SET
ATT SET - GDC
EMS ROLL - on(up)
GDC ALIGN PB - PUSH & HOLD
YAW tw - Position RSI thru 45° &
back to LIFT UP
GDC ALIGN PB - RELEASE
EMS ROLL - OFF
Align GDC to IMU
EMS FUNC - ENTRY (verify)
PRO (CMC Guidance)

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

P63 - ENTRY INIT

33 06 64 G,VI,RTOGO (.01G,fps,.1nm)
FDAI SCALE - 5/5
ROT CONTR PWR DIR (2)-MNA/MNB(verify)
TAPE RCDR - HBR/RCD/FWD/CMD RESET
HORIZ CK
Pitch error needle goes toward
zero approaching .05G time

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P64 - ENTRY POST .05G

134 06 74 BETA, VI, G (.01°,fps,.01G)
Start DAC

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

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

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

If CMC is GO:
MAN ATT (3) - RATE CMD
SC CONT - CMC
*If DAP NO GO: *
* SC CONT - SCS *
* Fly BETA *
*If CMC NO GO: *
* SC CONT - SCS *
* Track horiz with 29° *
* window mk *
* Maintain Lift UP until .2G*
* Fly EMS *

*If after 1G, both RCS ring *
* He press <1550 psia: *
* Roll 20°/sec & disable RCS*
* After peak G, enable RCS *
* & fly BETA = 90° *

.05 G sw - on (up)
EMS ROLL - on (up)

NOTE: To monitor N68, Key V16 N68E
Compare RSI & FDAI
If CMC or PAD cmds Lift DN,
* MNVR Lift DN *
EMS GO/NO GO
G-V Plot within limits

DATE _____

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P67 - ENTRY - FINAL PHASE (0.2G)

35 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 < 1150 psia~~

36 F 16 67 RTOGO,LAT,LONG (Vrel=1000fps)
(.1nm,.01°,.01°)
SC CONT - SCS
RTOGO NEG - LIFT UP
RTOGO POS - LIFT DOWN
Monitor altimeter
Record LAT,LONG,& voice to RECY at 10K'
Record EMS RTGO
EMS MODE - STBY
EMS FUNC - OFF
Stop DAC
DAC - T11

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

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EARTH/POST LANDING

Start Watch

RRT (__:__) STEAM PRESS - pegged at 90K (00:00)
50K'(__:__) CABIN PRESS REL vlv (2) - BOOST/ENTRY (00:52)
SECS PYRO ARM (2) - ARM
Check Altimeter

40K'(__:__) * CM UNSTABLE *(01:08)
*RCS CMD - OFF *
* 40K' APEX COVER JETT PB-PUSH *
DROGUE DEPLOY PB - PUSH (2 sec
*after apex cover jett) *

30K' ELS LOGIC - on (up) (01:24)
ELS - AUTO
Start DAC

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

Apex cover jett (auto)
APEX COVER JETT PB - PUSH
(WAIT 2 SECS)
Drogue parachutes deployed (auto)
DROGUE DEPLOY PB - PUSH

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

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

10K'(__:__) Main parachutes deployed (Drogues +48s)(02:29)
(Cab Press = 10 psia)
MAIN DEPLOY PB - PUSH (within 1 sec)
VHF ANT - RECY
VHF AM A - SIMPLEX
VHF BCN - ON
DIRECT O2 vlv - OPEN (if suited)

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EARTH/POST LANDING

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

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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 *

(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 v1v - 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

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NOMINAL EGRESS & POWER DOWN
PL VENT - OFF
cb Pnl 250 (all) - open
Charge hatch counterbalance
Open side hatch (after Cailer installed)
ACTR HNDL SEL - N
GN2 v1v HNDL - VENT (pull)
GN2 v1v HNDL - PRESS (push)
Check Pressure Guage (mid-white)
repeat vent/press to obtain mid-white

UNAIDED EGRESS PROCEDURES

PREPARATION

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

STABLE I

PL VENT - OFF
cb Pnl 250 (all) - open
Charge hatch counterbalance
Open side hatch
ACTR HNDL SEL - N
GN2 vlv HNDL - VENT (pull)
GN2 vlv HNDL - PRESS (push)
Check Pressure Guage (mid-white)
repeat vent/press to obtain mid-white
Remove raft from kit No. 2
Put raft overboard & pull inflation lanyard
Pass hardware kit to raft
Egress, inflate life vest, board raft
If no ventilation or CM 02 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 02 supply,
* initiate egress within 2-1/2 hrs*

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POST LANDING COMMUNICATIONS

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

LOW POWER CHECKLIST

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

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EMER
1-1

EMERGENCY PROCEDURES

(Flight copies only)

see CSM SYSTEMS CHECKLIST

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