BOOST PREPARATION

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

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

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

-15:00 CTE UPDATE VERIFICATION

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

ASTRO LAUNCH OPERATIONS VOICE CHECK

LMP S BD sw - OFF
CDR VHF AM sw - OFF

VOICE CHECK WITH MCCH

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

DATE 12/13/71

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

-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

DATE 12/13/71

SATURN BOOST

12/13/71
MAR 17&18

	DET	θ	VI	Ḣ	H
	00:00	90	1341	1	.0
	:30	85	1399	292	.6
	1	68	1879	798	3.2
	1:30	49	3032	1471	8.8
	2	34	5047	2186	17.8
a	2:19	28	6813	2694	25.2
	2:30	25	7851	2907	30.5
b	2:41	22	9016	3132	36.0
	3	22	9173	2742	45.1
	3:30	24	9722	2262	57.5
	4	22	10349	1839	67.6
	4:30	20	11094	1456	75.7
	5	18	11912	1102	82.0
	5:30	15	12861	787	86.7
	6	12	13884	514	89.9
	6:30	9	15070	283	91.8
	7	7	16340	114	92.7
	7:30	3	17840	1	93.0
	8	6	19234	-32	92.9
	8:30	0	20653	-2	92.8
	9	357	21972	44	92.9
c	9:18	355	22905	106	93.1
	9:30	353	23027	59	93.2
	10	349	23531	-7	93.3
	10:30	346	24119	-52	93.2
	11	344	24684	-57	92.9
	11:30	341	25315	-32	92.6
d	11:44	341	25599	-1	92.6

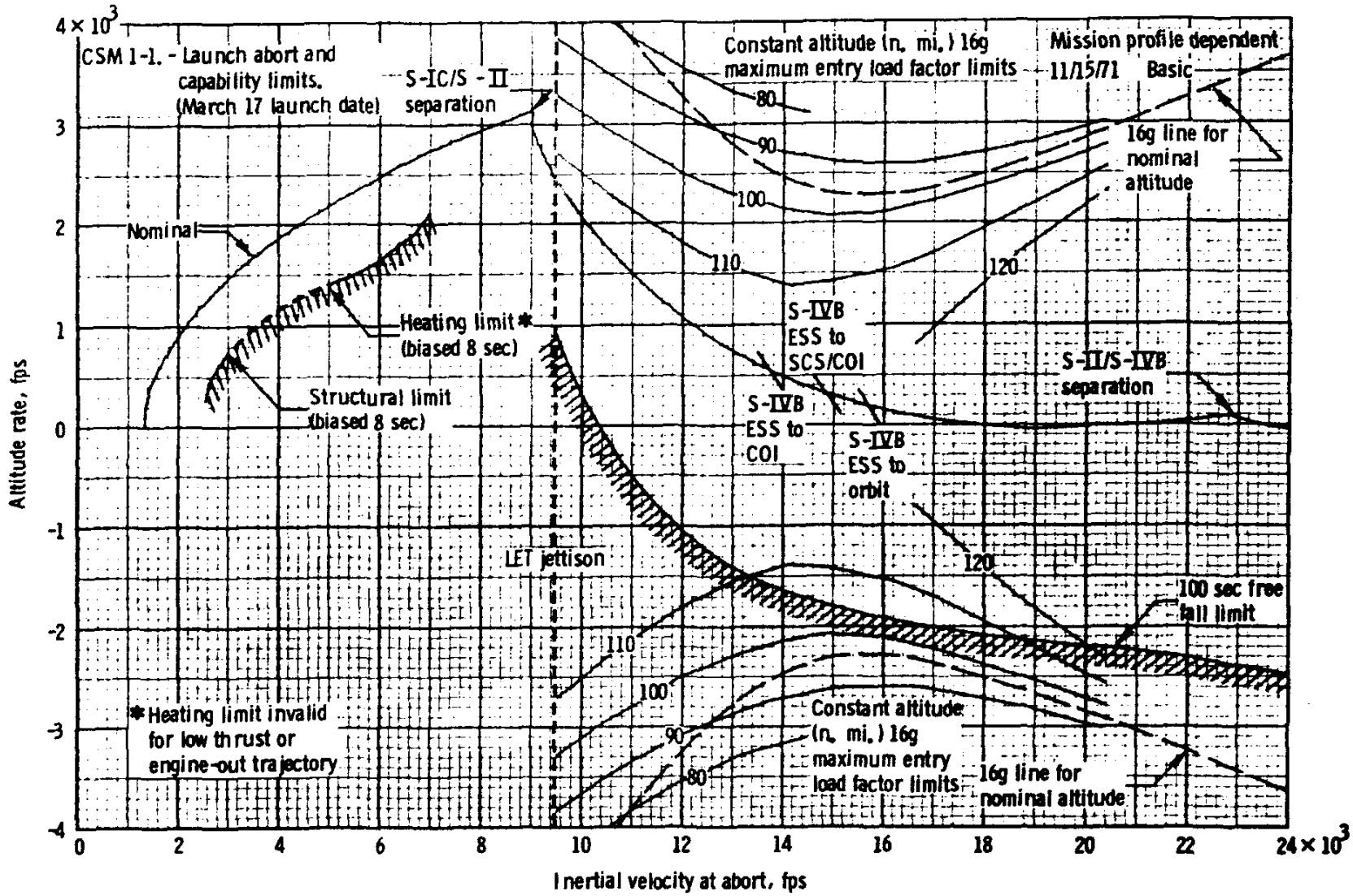
DATE 12/13/71

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

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

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

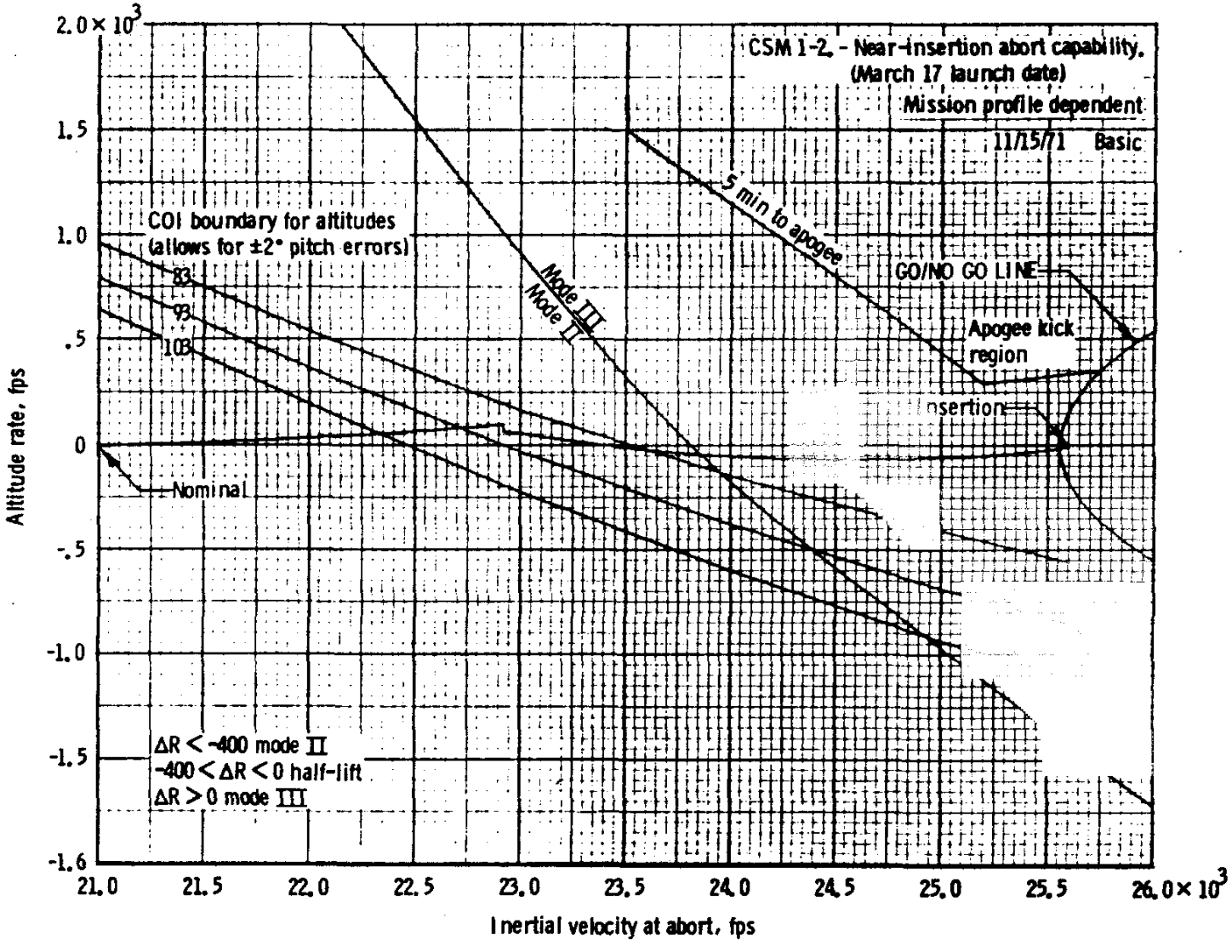
[d]Timebase 5 (S-IVB guidance cutoff signal +.21 sec)



Launch abort and capability limits.

DATE 12/13/71

DATE 12/13/71



Near-insertion abort capability.

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 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 12/13/71

BOOST

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

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

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

+4°/sec P,Y
±20°/sec R

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

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

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

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

CABIN PRESSURE DECREASING ~14K(2.3 nm)

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

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

MODE IB

+4°/sec P,Y
±20°/sec R

+01:24 MAX Q
+01:57 MODE IC - report — H=16.5 nm

DATE 12/13/71

+02:00	EDS AUTO - OFF	+9°/sec P,Y ±20°/sec R
	2 ENG OUT - OFF	
	LV RATES - OFF	
	LV RATE lt disabled as IU failure cue	
	V82E, N62E	
	GO/NO GO FOR STAGING - report	MODE IC
+02:19	INBOARD CUTOFF - (lt 5 on)	
	LIFTOFF lt - out	
+02:35	CMC BOOST Polynomial ends	
+02:41	OUTBOARD CUTOFF - report (lts on)	
+02:42	SIC/SII STAGING (lts off)	
+02:43	SII Ign Command (lts on)	
	SII SEP lt - on	
+02:44	SII 65% - lts out	
+03:12	SII SEP lt - out report	
+03:19	TWR JETT (2) - on (up) (TFF>1+20)	TWR JETT
	*NO TWR JETT, pg L/4-2 *	
	For MAN BOOSTER CONTROL:	
	* LV GUID - CMC *	
	* Key V46E *	
	α/Pc sw - Pc	
	MAN ATT PITCH - RATE CMD	
	Twr Jett & MODE II - Report	
	GLY EVAP STEAM PRESS - AUTO	
	GLY EVAP H2O FLOW - AUTO	
		MODE II
+03:22	Guidance Initiate - report (OECO +41sec)	
+03:52	Guidance Good	
+04:00	Report Status	
+05:00	Report Status	
+05:55	SIVB to COI	
+06:00	Report Status	
	GMBL MOT (4) - START - ON (LMP Confirm)	
	Check GPI	
	LV/SPS IND - GPI (Momentarily)	
	PITCH = -0.47°	
	YAW = +1.90°	

DATE 12/13/71

+06:15 OMNI ANT - D (AZ < 96°)
- C (AZ > 96°)
+06:45 SIVB to orbit
+07:00 Report Status
+07:41 IECO (lt 5 - on)
+08:00 Report Status
+08:17 PU SHIFT
+08:30 GO/NO GO FOR STAGING - report
+08:34 Level sense arm _____
+09:15 Mode IV - Report
(VI ~ 22,721, H DOT ~ +96,
H ~ +94)
Report Status
+09:18 OECO (lts on)
+09:19 SII Staging - lts out
+09:20 SIVB Ign Cmd - lt on
+09:22 SIVB 65% - lt out

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

~09:15

~10:17

MODE IV

MODE III

INSERTION

+11:00 Report Status
+11:44 SECO (lt on) - report _____
(Begin TB5)

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

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

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

Record VI_____ (fps)
H DOT_____ (fps)
H PAD_____ (.1nm)
KEY RLSE
Record HA_____ (.1nm)
HP_____ (.1nm)
TFF_____ (min-sec)
PRO

DATE 12/13/71

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

US LOS
(00:15:12)

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/2-28
  - 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 12/13/71

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)
  Remove helmet & gloves & stow in PGA bag
  Unstow & mount TSB's (U1)

DATE 12/13/71

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)
  Remove helmet & gloves & stow in PGA bag
  Unstow & mount TSB's (U1)

DATE 12/13/71

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

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

+20:00 12 ECS Post Insertion Config
- GLY RSVR BYPASS vlv - OPEN
- GLY RSVR OUT vlv - CLOSE
- GLY RSVR IN vlv - CLOSE
- PRIM GLY ACCUM QTY 25-50%
- PRIM ACCUM FILL vlv - ON until 50-55%
- ECS RAD FLOW CONT - PWR
- PRIM GLY TO RAD vlv - NORMAL (push)
- ECS RAD HTR - PRIM 1 (LMP)
  - ECS RAD TEMP PRIM OUT below PRIM IN
    - *If outlet temp after 5 min*
    - * above INLET TEMP *
    - *PRIM GLY TO RAD vlv - *
    - * BYPASS (pull) *
    - *Recheck in 10 min *
- ECS RAD tb - gray
- GLY EVAP TEMP IN - AUTO
- POT H2O HTR - MNA

13 CYI LOS (00:23:30)
- PCM BIT RATE - LOW
- UP TLM - CMD RSET, then NORM
- VHF AM A - SIMPLEX
- VHF AM B - off (ctr)

DATE 12/13/71

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 12/13/71

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 QTY & UNBAL
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 12/13/71

21 SECONDARY GLYCOL LOOP CHECK

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

22 UNSTOW CAMERAS

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

EL (f8,1/250,focus) 10fr, MAG NN (B3)
Spotmeter
(Stow in LMP TSB)

TV (ALC - PEAK, f44) (A1)
Power cable (A1)
SUNSET Bracket (A1)
(00:26:27) Monitor & cable (A1)
(Assemble, connect cables & hand to LMP)

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 12/13/71

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 Increase S-BD volume
(00:52:21) Two way S-BD VOICE Check
CRO LOS Report GYRO torquing angles
(00:57:44)
HSK AOS
(00:59:37)
26 SCS ATT Ref Comp Check
SUNRISE V16 N20E
(01:03:22) FDAI SELECT - 1
HSK LOS FDAI SOURCE - ATT SET
(01:05:13) ATT SET - GDC
ATT SET dials - null FDAI 1 err needles
(__:__:__) Key VERB when nulled (freeze display)
Record from DSKY:
US AOS R_____, P_____, Y_____
(01:28:59) Record from ATT SET dials:
R_____, P_____, Y_____
FDAI SEL - 1/2

DATE 12/13/71

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

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

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

28 COPY TLI, TLI ABORT, & P37 PADS

29 SV UPDATES (MCCH)

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

US LOS
(01:48:26)

CYI AOS
(01:49:58)

SUNSET
(01:54:14)

CYI LOS
(01:54:46)

DATE 12/13/71

TLI

X		⋮		⋮		X		⋮		⋮		TB6p
X	X	X				X	X	X				R
X	X	X				X	X	X				P TLI
X	X	X				X	X	X				Y
X	X	X		⋮		X	X	X		⋮		BT
					•						•	ΔVC'
+						+						VI
X	X	X				X	X	X				R
X	X	X				X	X	X				P SEP
X	X	X				X	X	X				Y
X	X	X				X	X	X				R
X	X	X				X	X	X				P EXTRACTION
X	X	X				X	X	X				Y
X	X				•	X	X				•	R2 Align
X	X				•	X	X				•	R2 Ign
X	X			⋮		X	X			⋮		ORDEAL Start
X	X	X				X	X	X				YAW

DATE 12/13/71