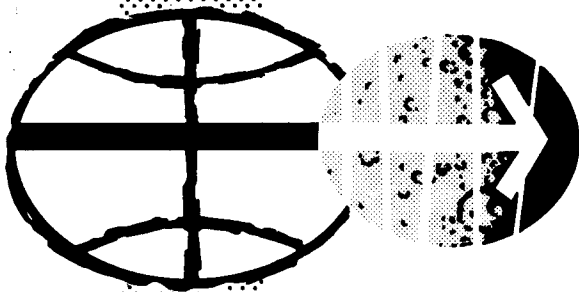




NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ALL SKYLAB MISSIONS

FINAL
SKYLAB
ENTRY
CHECKLIST

PREPARED BY
FLIGHT PROCEDURES BRANCH
CREW PROCEDURES DIVISION



MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

FEBRUARY 7, 1973

CHANGE CONTROL RECORD

SL ALL CSM ENTRY CHECKLIST

CONTROL NO.	FDF EDITION INCORPORATED		DISAPPROVED OR OTHER DISPOSITION
	TITLE	DATE	
001	UNDOCKING DAP ACTIVATION	11/13/72	Approved, implemented
002	NEW COMPLETION CHART	12/6/72	Approved, implemented
003	QUIESCENT CONFIGURATION	12/5/72	Approved, implemented
004 & A	ALTERNATE CHART PROCEDURE	12/15/72	Approved, implemented
005	CSM SV TO OWS SLOTS	12/15/72	Approved, implemented
006 & A	DELETE CMC - FREE	12/14/72	Approved, implemented
007	LOCATION OF BURN TABLES	12/14/72	Approved, superseded
008	BLOCK DATA PAD ENTRY DESCRIPTION	12/14/72	Approved, superseded
009	DELETE REFERENCES TO SM PWR SOURCE 2	12/12/72	Approved, implemented
010	ADD MISSING PRO (-7 DAYS)	12/19/72	Approved, implemented
011	UNDOCKING DAP DATA LOAD	12/19/72	Approved, implemented
012	HYBRID CM PREP TIME	12/19/72	Approved, implemented
013	DELETE HYBRID DET RESET	12/19/72	Approved, implemented
014	DELETE P52 ALIGN PAD (-7 DAYS)	12/14/72	Approved, implemented
015	DAP ACTIVATION (-7 DAYS)	12/14/72	Approved, implemented
016	P41 REMARKS (SEP BURN)	12/18/72	Approved, superseded
017	REMARKS, COMPLETION OF FLY AROUND	12/18/72	Approved, implemented
018	CMC/AUTO FOR ENTRY	12/19/72	Approved, implemented
019	CHART TO C/L TRANSITION	12/19/72	Approved, superseded
020	AVOID SOFT UNDOCK	12/19/72	Approved, implemented
021	DELETE REFERENCE TO COUCH STRUT, COOL PNL, & Y-Y STRUTS	12/19/72	Approved, implemented

CHANGE CONTROL RECORD

SL ALL CSM ENTRY CHECKLIST

CONTROL NO.	FDF EDITION INCORPORATED		DISAPPROVED OR OTHER DISPOSITION
	TITLE	DATE	
022	REMARK FOR 011	12/21/72	Approved, implemented
023	RESEQUENCE CHAPTERS	12/22/72	Approved, implemented
024	REWORD BURN TABLES	1/4/73	Approved, implemented
025	SET DET FOR SEP	1/5/73	Approved, implemented
026 & A	RESET EMS FOR SEP	1/5/73	Approved, implemented
027	INCLUDE SEP P30	1/5/73	Approved, implemented
028	DELETE REFERENCE TO GAUGING CB'S	1/9/73	Approved, implemented
029	CHANGE P51 PAD (-7 DAYS)	12/21/72	Approved, implemented
030	PERFORM MNVR TO DOCKING RING JETT ATT ASAP	1/8/73	Approved, implemented
031	SELECT RATE - HIGH AFTER SM RCST	1/8/73	Approved, implemented
032	LOG PAD UNDOCKING GMT	1/5/73	Approved, implemented
033	DELETE REFERENCE TO SM RCS QUAD SEC FUEL PRESS SWITCHING	1/9/73	Approved, implemented
034	DELETE SEC EVAP H2O CONT - AUTO	1/9/73	Approved, implemented
035	ADD 5 CREWMEN UNAIDED EGRESS PROCEDURE	1/9/73	Approved, implemented
036	ADD BURN ATT SKETCHES FOR QUADS FAILED	1/10/73	Approved, implemented
037	ADD BURN ATT SKETCH FOR HYBRID DEORBIT	1/12/73	Approved, implemented
038	ADD LIFT VECTOR ATT TO HEADS ATT	1/17/73	Approved, implemented
039	USE OF G METER FOR ENTRY	1/18/73	Approved, implemented
040	DELETE RHC THRUSTER ON CMD TEST	12/14/72	Approved, implemented
041	ADD COAS RANGING CHART	12/19/72	Approved, implemented
042	QUIESCENT CONFIGURATION	1/10/73	Approved, implemented

CHANGE CONTROL RECORD

SL. ALL CSM ENTRY CHECKLIST

CONTROL NO.	FDF EDITION INCORPORATED		DISAPPROVED OR OTHER DISPOSITION
	TITLE	DATE	
043	DIRECT 02 VLV - OPEN AT 800'	1/15/73	Approved, implemented
044	(2) SEC EVAP H2O FLOW - AUTO FOR SEC WATER EVAP ACTIVATION	1/15/73	Approved, implemented
045	MODIFY THRUST LT - OUT CALLOUT (-7 DAYS)	1/19/73	Approved, implemented
046	INCORPORATE RADIAL UNDOCKING	1/19/73	Approved, implemented
047	COAS RANGING (NEW DIAMETER)	1/19/73	Approved, implemented
048	DELETE SPS1 BURN PROCEDURES COVERED BY CUE CARD	1/15/73	Disapproved, implemented
049	DELETE SPS2 BURN PROCEDURES COVERED BY CUE CARD	1/15/73	Disapproved, implemented
050	ΔV THRUST - OFF ASAP	1/24/73	Disapproved, implemented
051	STANDARDIZE PADS	12/6/72	Approved, implemented
052	N56 USAGE DURING FLY AROUND	1/22/73	Approved, implemented
053	COAS RANGING (NEW DIAMETER)	1/19/73	Approved, implemented
054	RELOCATE "IF NO VENTILATION" DURING EARTH/POST LANDING	1/22/73	Approved, implemented

SKYLAB ENTRY CHECKLIST

LIST OF EFFECTIVE PAGES

Final 2/7/73

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iii	2/7/73	5-3	2/7/73	12-2	2/7/73
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2-1	2/7/73	8-5	2/7/73	14-2	2/7/73
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2-3	2/7/73	8-7	2/7/73	15-2	2/7/73
2-4	2/7/73	8-8	2/7/73	15-3	2/7/73
2-5	2/7/73	9-1	2/7/73	15-4	2/7/73
2-6	2/7/73	9-2	2/7/73	15-5	2/7/73
2-7	2/7/73	9-3	2/7/73	15-6	2/7/73
2-8	2/7/73	9-4	2/7/73	15-7	2/7/73
2-9	2/7/73	9-5	2/7/73	15-8	2/7/73
3-1	2/7/73	10-1	2/7/73	15-9	2/7/73
3-2	2/7/73	10-2	2/7/73	15-10	2/7/73
3-3	2/7/73	10-3	2/7/73	15-11	2/7/73
3-4	2/7/73	10-4	2/7/73	15-12	2/7/73
4-1	2/7/73	10-5	2/7/73	15-13	2/7/73
4-2	2/7/73	10-6	2/7/73	16-1	2/7/73
4-3	2/7/73	10-7	2/7/73	16-2	2/7/73
4-4	2/7/73	11-1	2/7/73	17-1	2/7/73
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MANEUVER UPDATE (P30)

PURPOSE								
N33 HR	+	X	X		+	X	X	
MIN	+	X	X	X	+	X	X	X
SEC	+	X			+	X		
N81 LOCAL ΔVX		X				X		
VERT ΔVY		X				X		
ΔVZ		X				X		
N22 R	+			0 0	+			0 0
P	+			0 0	+			0 0
Y	+			0 0	+			0 0
ΔVC	X	X			X	X		
BT	X	X			X	X		
ΔV ₇₀	X	X			X	X		

ULLAGE: _____ SECS _____ QUADS

N47 WT + STAR GDC R

N48 PT SFT + 0 P
 YT TRN + 0 0 Y

REMARKS: _____

MANEUVER UPDATE (P30) PAD DESCRIPTION

- a. GMT of ignition (GMTI) in noun 33 display
- b. Change in velocity components in noun 81 display
- c. Ground calculated S/C burn attitude relative to the IMU at GMTI called by V49 N22
- d. EMS ΔV counter load (ΔVC)
- e. Burn duration (BT)
- f. Change in velocity necessary to lower perigee below 70 nm (ΔV₇₀)
- g. Ullage duration, and number of quads (2 or 4) used
- h. Vehicle weight, and pitch and yaw trim engine gimbal angles, for DAP data load
- i. Star number, and optics shaft and trunnion angles
- j. GDC align angles for failed IMU

MANEUVER UPDATE (P30)												
PURPOSE												
N33 HR	+	X	X			+	X	X				
MIN	+	X	X	X		+	X	X	X			
SEC	+	X				+	X					
N81 LOCAL ΔVX		X					X					
VERT ΔVY		X					X					
ΔVZ		X					X					
N22 R	+			0	0	+			0	0		
P	+			0	0	+			0	0		
Y	+			0	0	+			0	0		
ΔVC	X	X				X	X					
BT	X	X				X	X					
ΔV70	X	X				X	X					
ULLAGE: _____ SECS _____ QUADS												
N47 WT	+					STAR	X	X	X	X		
						GDC R						
N48 PT		X	X			SFT	+				0	
YT		X	X			P						
						TRN	+				0	0
						Y						
REMARKS: _____												

MANEUVER UPDATE (P30)												
PURPOSE												
N33 HR	+	X	X			+	X	X				
MIN	+	X	X	X		+	X	X	X			
SEC	+	X				+	X					
N81 LOCAL ΔVX		X					X					
VERT ΔVY		X					X					
ΔVZ		X					X					
N22 R	+			0	0	+			0	0		
P	+			0	0	+			0	0		
Y	+			0	0	+			0	0		
ΔVC	X	X				X	X					
BT	X	X				X	X					
ΔV70	X	X				X	X					
ULLAGE: _____ SECS _____ QUADS												
N47 WT	+					STAR	X	X	X	X		
						GDC R						
N48 PT		X	X			SFT	+				0	
YT		X	X			P						
						TRN	+				0	0
						Y						
REMARKS: _____												

PRE-DEORBIT SYSTEMS CHECKS (ENTRY -7 DAYS)

GMT
hrs:min

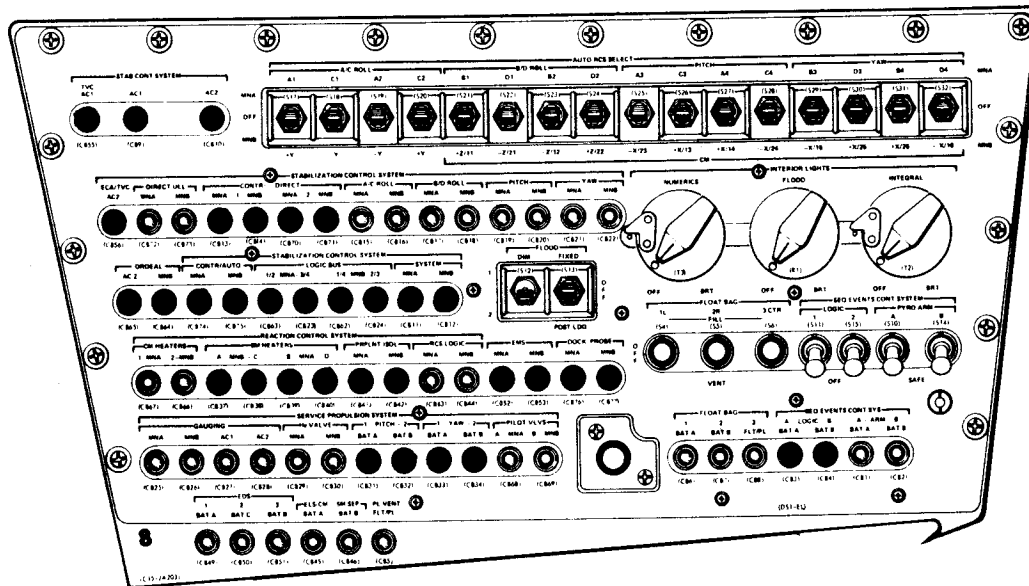
1 (:)

PANEL 8 CONFIGURATION

AUTO RCS SEL (16) - OFF (verify)

cb PANEL 8 - see diagram pg E/1-3

These switches are turned OFF to prevent jet firings during the following systems checks.



PANEL 8

- - CLOSE
- - OPEN

2

PANEL 7 CONFIGURATION

LOGIC PWR 2/3 - on (up)

SCS SIG CONDR/DR BIAS PWR 1 - AC1

SCS ELEC PWR - GDC/ECA

3

CMC POWER UP

PRO, hold (~5 sec) until STBY lt - out
(repeat, if necessary)

CMC warning, RESTART, PROG ALARM
*RSET and continue *

F 37

OOE
V96E

Terminate state vector integration.

4

IMU POWER UP PROCEDURE

FDAI/GPI POWER - BOTH

FDAI SEL - 1/2

CMC MODE - FREE (verify)

G/N IMU PWR - on (up)

NO ATT lt - on (90 sec)

NO ATT lt - out

Wait 15 sec (to allow

PIPA inhibit reset)

5

SCS POWER UP

BMAG MODE (3) - RATE 1

SC CONT - CMC/FREE

ATVC GAIN - HI (verify)

FDAI/GPI PWR - OFF

BMAG PWR 1 - ON

BMAG PWR 2 - WARMUP (40 min - ON)

FDAI/GPI PWR - BOTH

If FDAI's are powered when BMAG's come up to speed, rate needles will oscillate full scale.

6 CMC SELF CK
 V25 NOTE, 1365E
 F 21 01 E,E,E

 V15 N01E, 1365E
 15 01 R1 NUMBER OF ERRORS
 R2 NUMBER OF TESTS STARTED
 R3 NUMBER OF E-MEM TESTS SUCCESSFUL

 V21 N27E, 10E, SELF TEST ERASABLE
 & FIXED (4E SELF CHECKS ERASABLE
 & 5E SELF CHECKS FIXED)

15 01 TEST SUCCESSFUL WHEN R2 \geq 3
 (78 sec minimum)
 *If PROG 1t - on
 *V05 N09E 01102 SELF *
 * TEST ERROR *
 *N8E - Record for STDN *
 * R1 _____, R2 _____, R3 _____ *

(TERM) V21 N27E, 0E

7 (__:__) E-MEMORY DUMP
 V74E (wait ~42 sec if high bit rate, or
 208 sec if low bit rate)

8 (__:__) P27 (CLOCK SYNC, SV, ENTRY REFSMMAT)
 Key V16 N65E, synchronize MET
 with CMC time

9 ():) (8)

LOGIC SEQUENCE CK

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 STDN
SECS LOGIC (2) - on (up)
STDN 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

10 ():)

VHF CHECK

11

FDAI ERROR NEEDLES TEST

FDAI SCALE - 5/5
FDAI SEL - 1
FDAI SOURCE - ATT SET
ATT SET - GDC (verify)
ATT SET tw (3) - 0°, 180°, 0°
GDC ALIGN pb - push
FDAI 1 - errors null
ATT SET tw (3) - 5°, 175°, 5°
FDAI 1 - errors full scale (verify)
R right, P down, Y right
FDAI SEL - 2
FDAI 2 - ind same as FDAI 1 (verify)
GDC ALIGN pb - push
FDAI 2 - errors null
ATT SET tw (3) - 0°, 180°, 0°
FDAI 2 - errors full scale (verify)
R left, P up, Y left
FDAI SEL - 1
FDAI 1 - ind same as FDAI 2 (verify)
GDC ALIGN pb - push
FDAI 1 - total att (verify)
0°, 180°, 0°
FDAI SEL - 1/2

Checks status of ELS pushbuttons, CM/SM SEP switches and 24K' baro switches.

Inverter 1 is connected to AC1 and inverter 2 is connected to AC2. Inverter 3 is off.

12 (__:__)

ST - P51 - IMU ORIENTATION, pg G/___

Note: Complete prior to __:__ hrs
(SWS momentum dump)

Record

		P51					
N71	1ST STAR	<input checked="" type="checkbox"/>	0	0			
N71	2ND STAR	<input checked="" type="checkbox"/>	0	0			
N14	AZ	<input type="checkbox"/>					
	STAR	<input type="checkbox"/>					
	TRK ANGS	<input type="checkbox"/>					
	EL	<input type="checkbox"/>					
N05	(R1)ERR	<input checked="" type="checkbox"/>					

(100)

G/N LTS - AC1

Install optics eyepieces

13 (__:__)

SXT - P52 - IMU ALIGN,

pg G/___ (OPTION 1)

14

GDC ALIGN TO IMU, pg G/___

15 (__:__)

BEGIN BMAG 2 DRIFT TEST (1 HOUR)

BMAG MODE (3) - RATE 2

Record GMT _____:

16

EMS ENTRY CHECK

- (8) EMS FUNC - OFF
 cb EMS (2) - close
 EMS MODE - STBY
 EMS FUNC - EMS TEST 1 (wait 5 sec)
 EMS MODE - NORMAL (wait 10 sec)
 Check ind lts - out
 RANGE ind - 0.0
 Slew hairline over notch
 in self-test pattern
 EMS FUNC - EMS TEST 2
 .05G lt - on (all others out)
 Wait 10 sec
 EMS FUNC - EMS TEST 3
 .05G lt - on
 RSI lower lt - on (10 sec later)
 Set RANGE counter to 58 nm ± 0.0
- 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 ± 0.2 nm
- 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 $\pm 0.1G$
 EMS - OFF/STBY

17

EMS ΔV TEST & NULL BIAS CK, pg G/ _____

Light illumination other than those listed indicates malfunction. ΔV /EMS SET switch slews G-V scroll and sets RNG indicator. Lift vector up light ($G > 0.2$) & down light ($G < 0.2$) for lunar return mission only. Test 1 checks lower trip-point of .05G comparator. Ten seconds should be allowed to verify no malfunctions. No light on before or after 10 seconds.

EMS scroll can be slewed only one inch in reverse.

Test 2 checks upper trip-point of .05G comparator. No other light on before or after 10 seconds.

Test 3 checks corridor verification circuitry associated with lift vector down light.
 $G < 0.2$.

Ctr displays - sign for negative numbers or no sign for positive numbers in most significant digit. Test 4 checks range-to-go integrator circuits, range-to-go indicator, G-V servo circuits, G-V plotter.

Test 5 checks corridor verification circuitry associated with lift vector up light and enables scroll slewing to start of entry pattern. After scroll set to $< 37K$ fps, reselecting EMS TEST 5. switch position not permitted; range integrator and scroll synchronization would be lost.

In-flight verification of X-axis accelerometer output, ΔV indicator, SPS THRUST light, and thrust cutoff relay in EMS.

18 (__:__) P50 - CSM TO OA, pg G/__(OPTION 2)
Record

19 (__:__) P30 - EXTERNAL ΔV
V37E 30E

20 F 06 33 GMTI (hrs,min,.01sec)
Load desired TIG
R1 ____, R2 ____, R3 ____
PRO

21 F 06 81 ΔVX,Y,Z(LV) (.1fps)
Load desired ΔV's
R1 +1000.0, R2 0.0, R3 0.0
PRO

22 F 06 42 HA,HP,ΔV(req'd) (.1nm,.1fps)
PRO

23 F 16 45 MARKS,TFI,MGA (marks,.1nm,.1fps)

Set DET counting up to GMTI
PRO

24 F 37

Use sun sensor and star tracker.

P50 (OPTION 2)					
N71 STAR CODE		<input checked="" type="checkbox"/>	0	0	2
N14 STAR	AZ	<input type="checkbox"/>			
TRK ANG	EL	<input type="checkbox"/>			
N23 DOCK ANG	α	+			•
	β	+			•
	γ	+			•

Stored VG components along local vertical axes at GMTI.
Load a sufficiently large ΔV to avoid the P40 short burn logic.

MARKS not applicable. MGA is middle gimbal angle at GMTI. MGA is set to -00002 if REFSMMAT flag not set.

25

SPS THRUSTING PREP

Load DAP, 11102, 11111

V46E

EMS - ΔV SET/STBY

SET ΔVC = +100.0

EMS FUNC - ΔV

FDAI SCALE - 5/1

MAN ATT (3) - RATE CMD (verify)

BMAG MODE (3) - RATE 2 (verify)

SC CONT - CMC/AUTO

FDAI (2) - INRTL (verify)

(5) SM RCS HTRS ENG PKG (4) - OFF

SM RCS HTRS QUAD (4) - OFF

26 (__:__)

P40 - SPS THRUSTING

F 37

40E

27 F 50 18

REQ MNVR TO BURN ATT
Do not PRO

(.01°)

28

TVC CHECK & PREP

DBD/RATE - MIN/LOW

SCS TVC (2) - RATE CMD

TVC GMBL DRIVE P & Y - AUTO

ATVC GAIN - HI (verify)

cb PANEL 275 - see diagram pg E/1-10

MN BUS TIE (2) - on (up)

Monitor SWS current in MDA or STS

TVC SERVO PWR #1 - AC1/MNA

TVC SERVO PWR #2 - AC2/MNB

RHC PWR NORMAL #2 - AC

RHC PWR DIRECT #2 - OFF

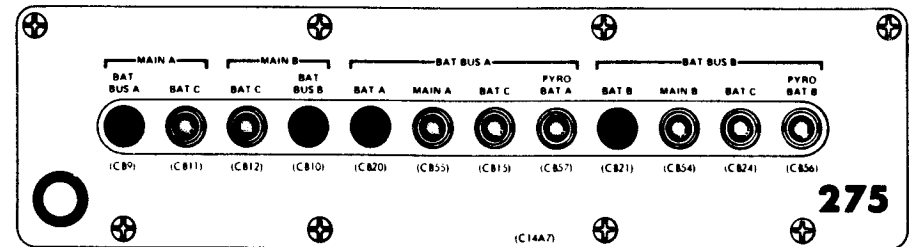
BMAG MODE (3) - ATT 1/RATE 2

SC CONT - SCS

RHC #2 - ARMED

+54:00m
(-06:00)

Required to ensure adequate voltage (25 vdc, CMC constraint) for gimbal motor drive test. If only SWS power available, SWS power consumption must be reduced.



PANEL 275

● - CLOSE

○ - OPEN

Monitor bat bus current increase.

Prevents attitude maneuvers during MTVC checks by removing power from breakout switches.

55:00
(-05:00)

PRIMARY TVC CHECK

TAPE RCDR - HBR/RCD/FWD/CMD RESET
GMBL MTRS P1-Y1 - START/ON
(PLT confirm)
Verify TRIM CONTROL & SET
Verify MTVC
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL MTRS P2-Y2 - START/ON
(PLT confirm)
Verify TRIM CONTROL & SET
SC CONT - CMC
Verify MTVC
THC - NEUTRAL
Verify NO MTVC
Verify GPI returns to 0,0
RHC PWR NORMAL #2 - AC/DC
ENTR

29 F 50 25 00204 GMBL TEST OPTION
SC CONT - CMC (verify)
DC IND - SM SOURCE 1
(ACCEPT) PRO
Monitor GPI response:
P & Y (0,+2,-2,0), trim
Monitor BAT 1 current: (TBD)

06 40 TFI, VG, ΔVM (min-sec,.1fps)
PROG ALARM - TIG slipped
* V5 N9E 01703 *
* KEY RLSE *
RATE - HIGH

UPDATE DET
SPS He v1vs (2) - AUTO (verify)
Check N2A & N2B

Verifies control of primary servo loops through RHC.
Verifies TVC switches to secondary servo loops.

Verifies control of secondary servo loops through RHC.
Verifies TVC switches to CMC control.

If MTVC required, RATE - HIGH bypasses noise problem in SCS gyro assemblies because of thrusting vibration levels, which can cause spurious roll jet firings. If SCS ΔV req'd, RATE - HIGH provides backup to auto selection of high rate in pitch and yaw TVC.

The nitrogen pressure should be greater than 200 psia and less than 2900 psia.

59:00 EMS MODE - NORMAL
THC PWR - OFF (verify)

59:25 DSKY BLANKS

59:30 ΔV THRUST A(B) - OFF (verify)

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

59:55
F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO at TFI ≥0 sec

30 00:00 NO IGNITION
06 40 TFC, VG, ΔVM (min-sec, .1fps)
(Expect F 97 40 SPS thrust fail)
SPS THRUST 1t - on (verify)

SPS He vlvs tb (2) - bp (verify)
SPS INJ VLVS (4) - CLOSED (verify)
Record N2A & N2B _____ & _____

31 F 97 40 SPS THRUST FAIL
ENTR

F 06 40 SPS THRUST 1t - out

F 99 40
ENTR

F 16 85
PRO

F 37
OOE
PCM BIT RATE - LOW
GMBL MTRS (4) - OFF (PLT confirm)
TVC SERVO PWR 1 & 2 - OFF
BMAG MODE (3) - RATE 2
MN BUS TIE (2) - OFF
EMS - OFF/STBY

No ullage will be performed.

SPS engine will not be fired.

SPS THRUST 1t - on indicates that the CMC is issuing an engine-on command.

The nitrogen pressure should be greater than 200 psia and less than 2900 psia.

SPS THRUST 1t - out indicates that the CMC has removed the engine - on command.

Monitor bat bus current decrease.

cb PANEL 275 - see diagram pg E/1-13
SM RCS HTRS ENG PKG (4) - 1
SM RCS HTRS QUAD (4) - PRIM

(_:_)

DSE DUMP

THC THRUSTER ON CMD TEST
(RCS DISABLED)

THC - LOCKED (verify)
cb SCS CONTR/AUTO (2) - close (verify)
THC PWR - on (up)
SC CONT - CMC/HOLD

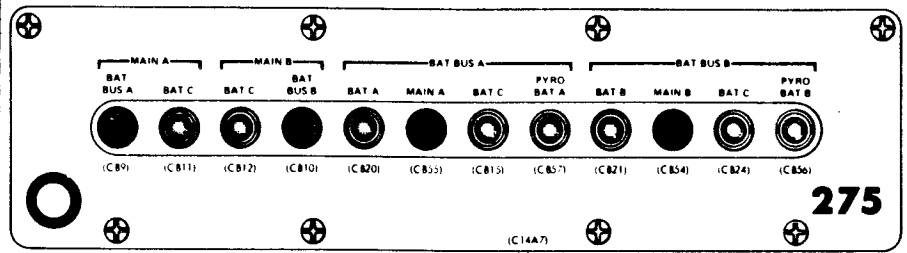
32

33

V11 N10E, 06E
11 10 R1 Octal Contents of Channel 6
RHC #1 & #2 - LOCKED
THC - ARMED and command:
+Y 00220
-Y 00140
+Z 00011
-Z 00006

34

V11 N10E, 05E
11 10 R1 Octal Contents of Channel 5
THC command:
+X 00231
-X 00146
THC - LOCKED
THC PWR - OFF
Load DAP, 11102, 01111



PANEL 275

● - CLOSE
○ - OPEN

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35 ():)

SCS DRIFT CHECK
Record

BMAG 2 DRIFT CHECK						
FDAI 1	R	+				
(IMU ATT)	P	+				
	Y	+				
FDAI 2	R	+				
(GDC ATT)	P	+				
	Y	+				
(60:00)	ΔT					

If drift >10°/hr, BMAG 2 failed

36

GDC ALIGN TO IMU, pg G/ _____

37 ():)

BEGIN BMAG 1 DRIFT TEST (30 min)

BMAG MODE (3) - RATE 1

Record GMT _____:

38 ():)

SXT - P52 - IMU ALIGN,

pg G/ _____ (OPTION 3)

Record

P52 (OPTION 3)

N71 1ST STAR						
N71 2ND STAR						
N05 (R1) ERR						
N93	X					
GYRO TORQUING ANGLES	Y					
	Z					
GMT OF GYRO TORQUE	HR	+	0	0	0	
	MIN	+	0	0	0	
	SEC	+	0			

If >1.5°/hr: Recycle P52
G/N LTS - OFF

39 (:)

SCS DRIFT CHECK
Record

BMAG 1 DRIFT CHECK						
FDAI 1	R	+				
(IMU ATT)	P	+				
	Y	+				
FDAI 2	R	+				
(GDC ATT)	P	+				
	Y	+				
(30:00)	ΔT		X	X		

If drift >10°/hr, BMAG 1 failed

40

IMU POWER DOWN PROCEDURE

CMC MODE - FREE
G/N IMU PWR - OFF
ISS warning
*RSET *

41

P06 - CMC PWR DOWN

Load DAP, 01111, 01111
V46E
V37E 06E
00062 CMC PWR DN
PRO, hold (~5 sec) until STBY 1t - on
(repeat, if necessary)

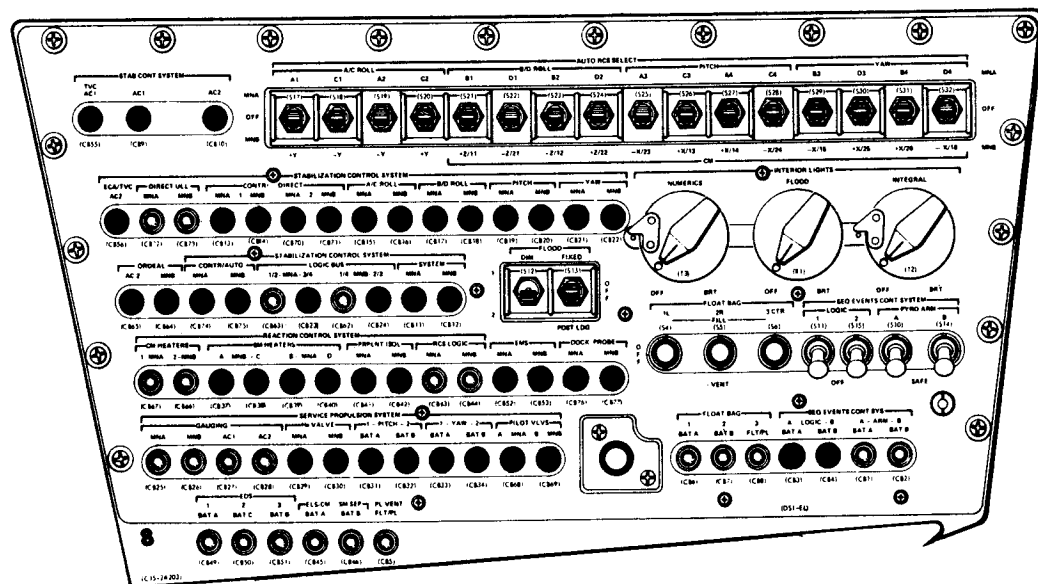
F 50 25

SCS POWER DOWN

FDAI SEL - 1
 MAN ATT (3) - RATE CMD
 DBD/RATE - MAX/HI
 SC CONT - SCS
 CMC MODE - FREE (verify)
 BMAG MODE (3) - RATE 1
 .05G sw - OFF (verify)
 α/Pc sw - Pc (verify)
 TVC GMBL DRIVE P & Y - AUTO (verify)
 BMAG PWR 1 - WARMUP
 BMAG PWR 2 - OFF
 FDAI/GPI PWR - OFF
 LOGIC PWR 2/3 - OFF
 SCS ELEC PWR - OFF
 SIG CONDR/DR BIAS PWR (2) - OFF

QUIESCENT PHASE PANEL 8 cb CONFIGURATION

See diagram pg E/1-16



PANEL 8

● - CLOSE

○ - OPEN

MANEUVER UPDATE (P30)											
PURPOSE											
N33 HR	+	X	X					+	X	X	
MIN	+	X	X	X				+	X	X	X
SEC	+	X						+	X		
N81 LOCAL ΔV_X		X							X		
VERT ΔV_Y		X							X		
ΔV_Z		X							X		
N22 R	+				0	0		+			0 0
P	+				0	0		+			0 0
Y	+				0	0		+			0 0
ΔVC		X	X						X	X	
BT		X	X						X	X	
ΔV_{70}		X	X						X	X	
ULLAGE: _____ SECS _____ QUADS											
N47 WT	+							STAR	X	X	X
								GDC R			
N48 PT		X	X					SFT	+		
YT		X	X								0
								TRN	+		
											0 0
								Y			
REMARKS: _____											

MANEUVER UPDATE (P30) PAD DESCRIPTION

- a. GMT of ignition (GMTI) in noun 33 display
- b. Change in velocity components in noun 81 display
- c. Ground calculated S/C burn attitude relative to the IMU at GMTI called by V49 N22
- d. EMS ΔV counter load (ΔVC)
- e. Burn duration (BT)
- f. Change in velocity necessary to lower perigee below 70 nm (ΔV_{70})
- g. Ullage duration, and number of quads (2 or 4) used
- h. Vehicle weight, and pitch and yaw trim engine gimbal angles, for DAP data load
- i. Star number, and optics shaft and trunnion angles
- j. GDC align angles for failed IMU

MANEUVER UPDATE (P30)													
PURPOSE													
N33 HR		+	X	X		+	X	X					
MIN		+	X	X	X	+	X	X	X				
SEC		+	X			+	X						
N81 LOCAL ΔVX		<input type="checkbox"/>	X			<input type="checkbox"/>	X						
VERT ΔVY		<input type="checkbox"/>	X			<input type="checkbox"/>	X						
ΔVZ		<input type="checkbox"/>	X			<input type="checkbox"/>	X						
N22 R		+			0 0	+			0 0				
P		+			0 0	+			0 0				
Y		+			0 0	+			0 0				
ΔVC		X	X			X	X						
BT		X	X			X	X						
ΔV70		X	X			X	X						
ULLAGE: _____ SECS _____ QUADS													
N47 WT		+	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	STAR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	GDC R	<input type="checkbox"/>	<input type="checkbox"/>
N48 PT		<input type="checkbox"/>	X	X		SFT	+	<input type="checkbox"/>	<input type="checkbox"/>	0	P	<input type="checkbox"/>	<input type="checkbox"/>
YT		<input type="checkbox"/>	X	X		TRN	+	<input type="checkbox"/>	<input type="checkbox"/>	0 0	Y	<input type="checkbox"/>	<input type="checkbox"/>
REMARKS: _____													

MANEUVER UPDATE (P30)													
PURPOSE													
N33 HR		+	X	X		+	X	X					
MIN		+	X	X	X	+	X	X	X				
SEC		+	X			+	X						
N81 LOCAL ΔVX		<input type="checkbox"/>	X			<input type="checkbox"/>	X						
VERT ΔVY		<input type="checkbox"/>	X			<input type="checkbox"/>	X						
ΔVZ		<input type="checkbox"/>	X			<input type="checkbox"/>	X						
N22 R		+			0 0	+			0 0				
P		+			0 0	+			0 0				
Y		+			0 0	+			0 0				
ΔVC		X	X			X	X						
BT		X	X			X	X						
ΔV70		X	X			X	X						
ULLAGE: _____ SECS _____ QUADS													
N47 WT		+	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	STAR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	GDC R	<input type="checkbox"/>	<input type="checkbox"/>
N48 PT		<input type="checkbox"/>	X	X		SFT	+	<input type="checkbox"/>	<input type="checkbox"/>	0	P	<input type="checkbox"/>	<input type="checkbox"/>
YT		<input type="checkbox"/>	X	X		TRN	+	<input type="checkbox"/>	<input type="checkbox"/>	0 0	Y	<input type="checkbox"/>	<input type="checkbox"/>
REMARKS: _____													

UNDOCKING, FLY AROUND, & SEP

Time to SPS1
(hrs:min)

1

CSM UNDOCKING

PAD UNDOCKING GMT

____:____:____

Set DET to 50:00
Start DET counting up

: h
50:00DET

Load DAP, 10103, X1111

V46E
Set $\Delta VC = +100.0$

EMS FUNC - ΔV
MAN ATT (3) - RATE CMD
LIMIT CYCLE - OFF (verify)
DBD/RATE - MIN/HIGH

RHC PWR NORMAL #2 - AC/DC
RHC PWR DIRECT #2 - MNA/B
THC PWR - on (up)
SC CONT - CMC/FREE
BMAG MODE (3) - RATE 2
SPOT LIGHT - ON
AUTO RCS SEL (16) - MNA/B
cb DOCK PROBE (2) - close
RHC #2 & THC - ARMED

Yaw instead of pitch +X jets are used because
c.g. offset is less in yaw plane.

If ΔV counter is set at 0.0, logic race causes counter
to jump when acceleration is sensed.

Selects 4° deadband which can be used for roll & yaw
attitude hold during coast periods.

CMC/FREE req'd to prevent -X jets from firing close to SWS.

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59:30 EMS MODE - NORMAL
00:00 PROBE EXTD/REL - EXTD REL
tb - bp/then gray
PROBE EXTD/REL - RETR
PROBE EXTD/REL - OFF
Record EMS ΔV _____
EMS - OFF/STBY

If undocking from radial port:
Go to step 3

01:00 Roll to 180° at $0.5^\circ/\text{sec}$
(If not in plane, yaw to 0°)
Point CSM with COAS on dock port

~02:50 Note time when dock port subtends
 3° in COAS (67 ft). If port
subtends 3° at 02:50, $\Delta V = 0.4$ fps

~04:50 When dock port subtends 1.3° ,
Thrust +X for 2.5 sec (~ 0.5 fps)
Thrust -Z (up) for 1.5 sec
NOTE: Thrust can be resultant
direction & magnitude if desired

Hold ~ 5 sec until undock verified, but < 20 sec.
Expected separation ΔV is 0.38 to 0.51 fps.
Provides capture latch tb's if redocking necessary.

Recorded for post flight evaluation of undocking ΔV .

CSM will undock with X body axis in plane.

FLY AROUND MNVR

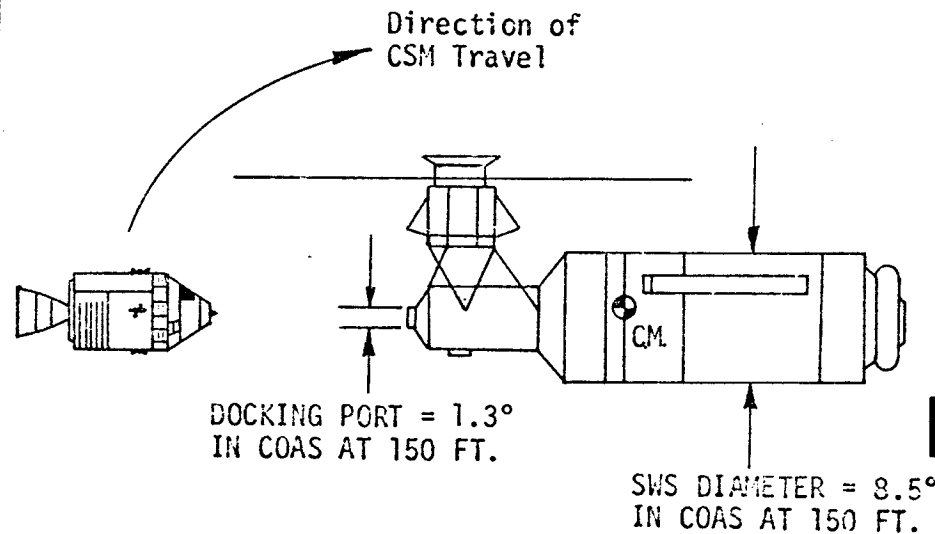
1. MnvR with RHC in min impulse to point COAS at SWS c.m. continuously ($R = 180^\circ$)
2. Maintain estimated 150 ft range from SWS c.m. Make corrections using occasional short +X pulses with THC
3. SPT log times for crossing 10° PITCH marks on INERTIAL FDAI. Maintain angular rate so that time to traverse 10° is 50-67 sec (N56, $R2 = .20$ to $.15$ deg/sec). Use occasional short +Z pulses with THC, +Z only if $\Delta T < 50$ seconds

THRUST DIRECTION	RADIAL CLOSURE RATE	ANGULAR RATE	RCS PULSE DURATIONS
+X	INCREASE	INCREASE	0.5 sec
+Z	INCREASE	DECREASE	
-Z	DECREASE	INCREASE	

NOTE: NO -X THRUSTING EXCEPT IN AN EMERGENCY

Crew preference over att hold mode.

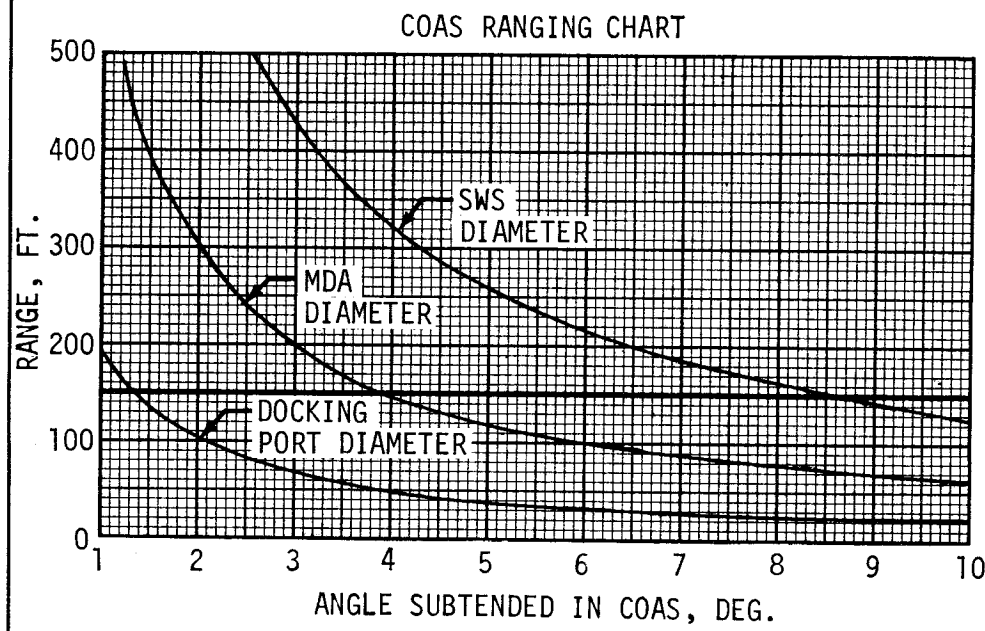
The FLY AROUND MNVR may be completed early, but it should not be completed late, or the CSM may not be in a favorable position relative to the SWS for the SEP BURN.



FLY AROUND CHART

(Enter times starting at bottom of page)

INERTIAL PITCH, °	TIME, SEC	ΔT, SEC	INERTIAL PITCH, °	TIME, SEC	ΔT, SEC
10	45:00		180		
0			170		
350			160		
340			150		
330			140		
320			130		
310			120		
300			110		
290			100	15:00	
280	35:00		90		
270			80		
260			70		
250			60		
240			50		
230			40		
220			30		
210			20		
200			10	05:00	
190	25:00				



3 45:00DET
(01:00DET)

SEP BURN

If undocking from radial port:
Use parenthesized DET times
to perform SEP BURN

Load DAP, 11102, X1111

P30 EXTERNAL ΔV (SEP BURN)

(-5.0 fps SEP BURN)

F 06 33 V37E 30E
GMTI (hrs,min,.01sec)

Load PAD SEP GMT
____:____:____

PRO

F 06 81 ΔVX,Y,Z(LV) (.1fps)
Load desired ΔV's
(-5.0,0,0)
PRO

F 06 42 HA,HP,ΔV(req'd) (.1mm,.1fps)
Set ΔV counter = +100.0
PRO

F 16 45 MARKS,TFI, MGA (marks,min-sec,.01°)
PRO

F 37 00E

48:00DET
(03:00DET)

P41 - RCS THRUSTING
V37E 4TE

Key 16 45 MARKS,TFI,MGA (marks,min-sec,.01°)

Set DET counting up to GMTI
KEY RLSE

F 50 18 REQ MNVR TO CMC BURN ATT (.01°)
DBD/RATE - MIN/LOW
SC CONT - CMC/AUTO
BMAG MODE (3) - ATT 1/RATE 2
(REJECT) ENTR
BYPASS AUTO MNVR
KEEP SWS IN WINDOW

06 85 VGX,Y,Z (.1fps)
EMS - ΔV SET/STBY
SET ΔVC = +100.0
EMS FUNC - ΔV

If undocking from axial port, P41 ensures retrograde burn for SEP. CSM should be above (or behind) SWS when retrograde burn is performed. If undocking from radial port, P41 ensures posigrade burn for SEP.

MARKS not applicable.
MGA is middle gimbal angle at GMTI. MGA set to -00002 if REFSMMAT flag not set.

49:00DET EMS MODE - NORMAL
(04:00DET)

49:25DET DSKY BLANKS
(04:25DET)

49:30DET
(04:30DET)
16 85 VGX,Y,Z(AVE G ON) (.1fps)

50:00DET
(05:00DET)
F 16 85 REQ NULL VGX,Y,Z (.1fps)
THC - NULL VG's

F 16 44 V82E
HA,HP,TFF (.1nm,min-sec)
PRO

F 16 85 VGX,Y,Z (.1fps)
PRO
EMS - OFF/STBY
RHC PWR NORMAL #2 - OFF
RHC PWR DIRECT #2 - OFF
BMAG MODE (3) - RATE 2
DBD/RATE - MIN/HIGH
THC PWR - OFF
RHC #2 & THC - LOCKED

F 37 00E
When COMP ACTY 1t out:
V66E

Go to SPS1 SHAPING BURN, pg E/3-1
or SM RCS1 SHAPING BURN, pg E/9-1

Transfers CSM SV to OWS slots. Do not do
when average G is running. Do not do
unless satisfied that CSM SV is good.

MANEUVER UPDATE (P30)											
PURPOSE											
N33 HR MIN SEC	+	X	X			+	X	X			
	+	X	X	X		+	X	X	X		
	+	X			.	+	X			.	
N81 LOCAL ΔV_X	.	X			.	.	X			.	
VERT ΔV_Y	.	X			.	.	X			.	
ΔV_Z	.	X			.	.	X			.	
N22 R	+			.	0	.	0	+		.	0
P	+			.	0	.	0	+		.	0
Y	+			.	0	.	0	+		.	0
ΔVC	X	X			.	.	X	X		.	
BT	X	X			.	.	X	X		.	
ΔV_{70}	X	X			.	.	X	X		.	
ULLAGE: _____ SECS _____ QUADS											
N47 WT	+					STAR	X	X	X	X	
						GDC R					
N48 PT	.	X	X			SFT	+				P
YT	.	X	X			TRN	+				Y
REMARKS: _____											

MANEUVER UPDATE (P30) PAD DESCRIPTION

- a. GMT of ignition (GMTI) in noun 33 display
- b. Change in velocity components in noun 81 display
- c. Ground calculated S/C burn attitude relative to the IMU at GMTI called by V49 N22
- d. EMS ΔV counter load (ΔVC)
- e. Burn duration (BT)
- f. Change in velocity necessary to lower perigee below 70 nm (ΔV_{70})
- g. Ullage duration, and number of quads (2 or 4) used
- h. Vehicle weight, and pitch and yaw trim engine gimbal angles, for DAP data load
- i. Star number, and optics shaft and trunnion angles
- j. GDC align angles for failed IMU

MANEUVER UPDATE (P30)														
PURPOSE														
N33 HR MIN SEC	+	X	X			+	X	X						
	+	X	X	X		+	X	X	X					
	+	X				+	X							
N81 LOCAL ΔVX VERT ΔVY ΔVZ		X					X							
		X					X							
		X					X							
N22 R P Y	+			0	0	+			0	0				
	+			0	0	+			0	0				
	+			0	0	+			0	0				
ΔVC	X	X				X	X							
BT	X	X				X	X							
ΔV70	X	X				X	X							
ULLAGE: _____ SECS _____ QUADS														
N47 WT	+					STAR	X	X	X	X	GDC R			
N48 PT		X	X			SFT	+				0	P		
YT		X	X			TRN	+				0	0	Y	
REMARKS: _____														

MANEUVER UPDATE (P30)														
PURPOSE														
N33 HR MIN SEC	+	X	X			+	X	X						
	+	X	X	X		+	X	X	X					
	+	X				+	X							
N81 LOCAL ΔVX VERT ΔVY ΔVZ		X					X							
		X					X							
		X					X							
N22 R P Y	+			0	0	+			0	0				
	+			0	0	+			0	0				
	+			0	0	+			0	0				
ΔVC	X	X				X	X							
BT	X	X				X	X							
ΔV70	X	X				X	X							
ULLAGE: _____ SECS _____ QUADS														
N47 WT	+					STAR	X	X	X	X	GDC R			
N48 PT		X	X			SFT	+				0	P		
YT		X	X			TRN	+				0	0	Y	
REMARKS: _____														

SPS1 SHAPING BURN

Performed two orbits before the deorbit burn. Changes trajectory from a 235 nm circular orbit to a 235 X 90 nm orbit and establishes apogee for possible RCS deorbit.

DATE 2/7/73

SHAPING BURN TABLE

P OR Y RATES	ATT DEVIATION	CO TIME	SITUATION & VG	RULE
+5°/sec Takeover complete	+5° Takeover complete	@BT +1 sec	>22	Restart SPS SCS
			No restart & >100	Do RCS1 at next HA
			No restart & <100	Trim VGX & VGZ to $\pm.2$
			<22 to overburn	Trim VGX & VGZ to $\pm.2$

- 1 P30 - EXTERNAL ΔV
V37E 30E
- 2 F 06 33 GMTI (hrs,min,.01sec)
Load desired TIG
PRO
- 3 F 06 81 ΔVX,Y,Z(LV) (.1fps)
Load desired ΔV's (Do not use all 0's)
PRO
- 4 F 06 42 HA,HP,ΔV(req'd) (.1nm,.1fps)
PRO
- 5 F 16 45 MARKS,TFI,MGA (marks,min-sec,.01°)
Set DET counting up to GMTI
PRO
- 6 F 37 OOE

Stored VG components along local vertical axes at GMTI.

MARKS not applicable.
MGA is middle gimbal angle at GMTI. MGA set to -00002 if REFSMMAT flag not set.

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7 MNVR TO PAD BURN ATT (HDS DN)
 V49E (.01°)
 R _____ (0°)
 P _____ (180°)
 Y _____ (0°)

8 IMU CK
 P52 (OPT 3) AUTO OPTICS TO STAR
 (Limit: SXT FOV, GNCS GO/NO-GO)
 Exit 06 92, V37E 00E

9 Go to SPS BURN-ENTRY CUE CARD

10 P00 (From last step of SPS BURN-ENTRY
 CUE CARD)
 When COMP ACTY lt out:
 V66E

Go to ENTRY VEHICLE PREP, pg E/4-1

Constrains roll to be zero.

SXT star should be within SXT FOV.
 If not, GNCS is NO-GO.

SPS BURN STATUS

		AFTER TRIM			
FDAI(ONLY IF NOT AT BURN ATT)	R	+			•
	P	+			•
	Y	+			•
N85	VGX	0	0		•
	VGY	0	0		•
	VGZ	0	0		•
EMS	ΔVC	•	•	•	•

Transfers CSM SV to OWS slots. Do not do when average G is running. Do not do unless satisfied that CSM SV is good.

ENTRY VEHICLE PREP

Time from:
SPSI/RCSI

- 1 ASAP MNVR TO DOCKING RING JETT ATT (HDS DN)
V49E (.01°)
R 0°
P (056°)
Y 0°
- 2 DON HELMET & GLOVES
SUIT PWR - OFF (for comm cable
connect)
PWR - OFF
AUDIO CONT - NORM
Connect supply and return hoses
to PGA
Connect Comm Control Head to PGA
SUIT FLOW vlv - FULL FLOW
(for suited crewman)
SUIT RET AIR vlv - CLOSE (push)
(351) EMER CABIN PRESS vlv - OFF
(if all suited)
- 3 +0:10 SUIT CKT/PGA INTEGRITY CK, pg S/___

This mnvr assures that the CSM is at the proper inertial attitude at the time specified for docking ring jettison.

The crew must be suited when jettisoning the docking ring.

DATE 2/7/73

PAGE E/4-1

ENTRY
VEHICLE PREP

- 4 +0:23 DOCKING RING JETT & SEQUENCER CK
 cb SECS LOGIC (2) - close (verify)
 cb SECS ARM (2) - close
 (278) cb DOCK RING SEP (2) - close
 cb ELS/CM-SM SEP (2) - close
 ELS LOGIC - on (up)
 ELS - AUTO
 Coordinate remaining steps with STDN
 SECS LOGIC (2) - on (up)
 STDN confirm GO for PYRO ARM as req'd
 ELS LOGIC - OFF
 ELS - MAN
 cb ELS/CM-SM SEP (2) - open
 SECS PYRO ARM (2) - on (up)
 + : (+0:28) Verify inrt1 att 0°, (056°), 0°
 (GMT :) DOCK RING SEP (2) - on (up)
 SECS PYRO ARM (2) - SAFE
 SECS LOGIC (2) - OFF
 cb SECS ARM (2) - open

- 5 DOFF PGA's
 EMER CABIN PRESS vlv - BOTH
 SUIT RET AIR vlv - OPEN (pull)
 Install hose screen on return hose
 PWR - OFF
 SUIT PWR - OFF for disconnect
 AUDIO CONT - NORM
 SUIT FLOW vlv - CABIN FLOW
 (for unsuited crewman)
 (FULL FLOW for 3 unsuited)

- 6 +0:33 P27 (SV, SPS2 TARGET LOAD),
or ASAP SPS2 & ENTRY PAD UPDATES

This procedure combines the docking ring jettison procedure with the logic sequence ck which checks status of ELS pushbuttons, CM/SM SEP switches, and 24K' baro switches.

STDN GDS, TEX, MILA

If SPS1 attempted and NO GO, request updates ASAP.

7 +1:35
or ASAP

SXT - P52 - IMU ALIGN,
pg G/____ (OPTION 3)
Record

OOE
*If >1.5°/hr: Recycle P52 *
If confirmed: Use SCS for
* EMS entry *

8 SCS DRIFT CK, pg G/____
*If drift >10°/hr: Change *
* rate source *

9 GDC ALIGN

10 COASTING PREP
RHC #2 - LOCKED
RHC PWR NORMAL #2 - OFF
RHC PWR DIRECT #2 - OFF
BMAG MODE (3) - RATE 2 (verify)
Load DAP, 11112, X1111

11 DON MAE WESTS & FOOT RESTRAINTS

12 +2:00/+1:00 PRIMARY WATER EVAP ACTIVATION
GLY EVAP H2O FLOW - AUTO
GLY EVAP STM PRESS - AUTO
PRI ECS GLY PUMP - ACT (verify)

If SPS1 attempted and NO GO, complete
P52 during SPS1 night pass ASAP.

P52 (OPTION 3)

N71 1ST STAR	X	0	0	0		
N71 2ND STAR	X	0	0	0		
N05 (R1) ERR	X					
N93 X						
GYRO Y						
TORQUING Z						
ANGLES						
HR						
GMT OF MIN						
GYRO TORQUE SEC						

Wide ATT DBD to conserve propellant.

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13

SEC WATER EVAP ACTIVATION

- ECS IND sel - SEC
 SEC COOL LOOP PUMP - AC2
 (2) SEC EVAP H2O FLOW - AUTO
 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

14

SET UP CAMERA

CM4/DAC/T8/CIN - BRKT, MIR
 (T16,250,7) 12 fps, MAG K

Configures camera for fireball photography.

15 +2:08/+1:08

CM RCS PREHEAT

- If sys test mtr 4b,5b,6b,7b,8b,9b
 all read 1.5 vdc (40°F) or more,
 omit preheat:
 (8) cb RCS LOGIC (2) - close
 (2) CM RCS LOGIC - on (up)
 (8) cb CM RCS HTRS (2) - close
 (101) CM RCS HTRS - on (up) (PLT confirm)
 (Monitor manf press for press drop)

Checks CM RCS 12,14,16,21,23 and 25 jet injector valve temperatures, respectively.

Energizes RCS logic bus.

Direct coils utilized for preheating jets, (15 min).

16

FINAL STOWAGE

- ORDEAL
 FDAI (2) - INRTL
 PWR - OFF
 (377) GLY TO RAD SEC vlv - BYPASS (CCW) (verify)
 Attach both strut unlock lanyards
 (101) URINE DUMP HTR - OFF (verify)
 (101) WASTE H2O DUMP HTR - OFF (verify)

17 +2:23/+1:23 TERM. CM RCS PREHEAT (If initiated)

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

18

- PYRO BATT CK
 (229) cb PYRO BUS A
 PYRO BAT A - close (verify)
 cb PYRO BUS B
 PYRO BAT B - close (verify)
 DC IND - PYRO BAT A(B)
 If PYRO BAT A(B) <31.5 vdc:
 * cb PYRO BUS A(B) PYRO BAT*
 * A(B) - open *
 * cb PYRO BUS A(B) BAT BUS *
 * A(B) - close *
 (275) cb MNA BAT C - close
 cb MNB BAT C - close
 DC IND - MNB

Replaces failed pyro battery with entry battery.

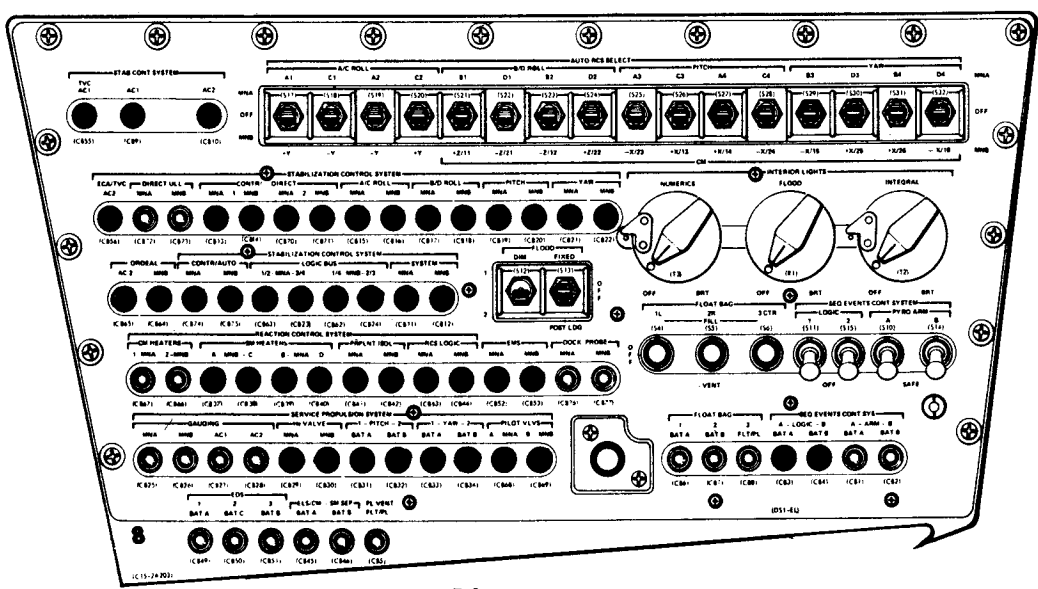
Applies entry battery C to both main buses when MN BUS TIE switches are on.

19

- SYSTEMS TEST PANEL CONFIGURATION
 SYS TEST METER - 3B (BAT RLY BUS)
 (100) LEB FLOOD & INTGL LIGHTING - OFF

20

PANEL 8 CB CHECK
 See diagram pg E/4-5



PANEL 8
 ● - CLOSE
 ○ - OPEN

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

22 RSI ALIGNMENT
 FDAI SOURCE - ATT SET
 ATT SET - GDC
 EMS ROLL - on (up)
 GDC ALIGN pb - push & hold
 YAW tw - Position RSI thru 45° &
 set to HDS DN (lift vector up)
 or to HDS UP (lift vector down)
 att per ENTRY UPDATE PAD
 GDC ALIGN pb - release
 EMS ROLL - OFF
 Align GDC to IMU
 FDAI SOURCE - CMC

23 CM RCS ACTIVATION
 cb SECS ARM (2) - close
 Cue STDN
 SECS LOGIC (2) - on (up)
 STDN confirm GO
 for PYRO ARM (if poss)
 SECS PYRO ARM (2) - on (up)
 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

24 +2:21/+1:21 P27 & ENTRY PAD UPDATE

25 Load DAP, 11102, X1111

Go to SPS2 DEORBIT BURN, pg E/5-1
 or SM RCS2 DEORBIT BURN, pg E/10-1

RSI ALIGNMENT is performed even if RSI alignment is correct in order to check operation of RSI.

Indicates fuel and oxidizer isolation valves open.

MANEUVER UPDATE (P30)															
PURPOSE															
N33 HR		+	X	X					+	X	X				
MIN		+	X	X	X				+	X	X	X			
SEC		+	X						+	X					
N81 LOCAL ΔV_X		<input type="checkbox"/>	X						<input type="checkbox"/>	X					
VERT ΔV_Y		<input type="checkbox"/>	X						<input type="checkbox"/>	X					
ΔV_Z		<input type="checkbox"/>	X						<input type="checkbox"/>	X					
N22 R		+				0	0		+				0	0	
P		+				0	0		+				0	0	
Y		+				0	0		+				0	0	
ΔVC		X	X						X	X					
BT		X	X						X	X					
ΔV_{70}		X	X						X	X					
ULLAGE: _____ SECS _____ QUADS															
N47 WT		+							STAR	X	X	X	X		
									GDC R						
N48 PT		<input type="checkbox"/>	X	X					SFT	+				0	
YT		<input type="checkbox"/>	X	X					TRN	+				0	0
									Y						
REMARKS: _____															

MANEUVER UPDATE (P30) PAD DESCRIPTION

- a. GMT of ignition (GMTI) in noun 33 display
- b. Change in velocity components in noun 81 display
- c. Ground calculated S/C burn attitude relative to the IMU at GMTI called by V49 N22
- d. EMS ΔV counter load (ΔVC)
- e. Burn duration (BT)
- f. Change in velocity necessary to lower perigee below 70 nm (ΔV_{70})
- g. Ullage duration, and number of quads (2 or 4) used
- h. Vehicle weight, and pitch and yaw trim engine gimbal angles, for DAP data load
- i. Star number, and optics shaft and trunnion angles
- j. GDC align angles for failed IMU

MANEUVER UPDATE (P30)										
PURPOSE										
N33 HR	+	X	X			+	X	X		
MIN	+	X	X	X		+	X	X	X	
SEC	+	X				+	X			
N81 LOCAL ΔVX	<input type="checkbox"/>	X				<input type="checkbox"/>	X			
VERT ΔVY	<input type="checkbox"/>	X				<input type="checkbox"/>	X			
ΔVZ	<input type="checkbox"/>	X				<input type="checkbox"/>	X			
N22 R	+			0	0	+			0	0
P	+			0	0	+			0	0
Y	+			0	0	+			0	0
ΔVC	X	X				X	X			
BT	X	X				X	X			
ΔV70	X	X				X	X			
ULLAGE: _____ SECS _____ QUADS										
N47 WT	+					STAR	X	X	X	X
N48 PT	<input type="checkbox"/>	X	X			SFT	+			0
YT	<input type="checkbox"/>	X	X			TRN	+			0
REMARKS: _____										

MANEUVER UPDATE (P30)										
PURPOSE										
N33 HR	+	X	X			+	X	X		
MIN	+	X	X	X		+	X	X	X	
SEC	+	X				+	X			
N81 LOCAL ΔVX	<input type="checkbox"/>	X				<input type="checkbox"/>	X			
VERT ΔVY	<input type="checkbox"/>	X				<input type="checkbox"/>	X			
ΔVZ	<input type="checkbox"/>	X				<input type="checkbox"/>	X			
N22 R	+			0	0	+			0	0
P	+			0	0	+			0	0
Y	+			0	0	+			0	0
ΔVC	X	X				X	X			
BT	X	X				X	X			
ΔV70	X	X				X	X			
ULLAGE: _____ SECS _____ QUADS										
N47 WT	+					STAR	X	X	X	X
N48 PT	<input type="checkbox"/>	X	X			SFT	+			0
YT	<input type="checkbox"/>	X	X			TRN	+			0
REMARKS: _____										

SPS2 DEORBIT BURN

DEORBIT BURN TABLE

P OR Y RATES	ATT DEVIATION	CO TIME	SITUATION & VG	RULE
+5°/sec Takeover complete	+5° Takeover complete	@BT +1 sec	>22	Restart SPS SCS
			No restart & >22	Use RCS completion chart
			<22 to overburn	Trim VGX & VGZ to <u>±.2</u>

Time from SPS1
(hrs:min)

- | | | | |
|---|---------|---|-------------------------------------|
| 1 | +02:45h | <u>P30 - EXTERNAL ΔV</u>
V37E 30E | |
| 2 | F 06 33 | GMTI
Load desired TIG
PRO | (hrs,min,.01sec) |
| 3 | F 06 81 | ΔVX,Y,Z(LV)

Load desired ΔV's
PRO | (.1fps)

(Do not use all 0's) |
| 4 | F 06 42 | HA,HP,ΔV(req'd)
PRO | (.1nm,.1fps) |
| 5 | F 16 45 | MARKS,TFI,MGA

Set DET counting up to GMTI
PRO | (marks,min-sec,.01°) |
| 6 | F 37 | OOE | |

Stored VG components along local vertical axes at GMTI.

MARKS not applicable.
MGA is middle gimbal angle at GMTI. MGA set to -00002 if REFSMMAT flag not set.

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

- (5) cb WASTE H2O/URINE DUMP HTR (2) - open
- cb ECS PRIM RAD CONTR MNA/B (2) - open
- POT H2O HTR - OFF
- GLY EVAP TEMP IN - MAN

ABORT SYS PRPLNT - RCS CMD (verify)

8

MNVR TO PAD BURN ATT (HDS DN)

V49E (.01°)

R _____ (0°)

P _____ (180°)

Y _____ (0°)

9

IMU CK

P52 (OPT 3) AUTO OPTICS TO STAR
(Limit: SXT FOV, GNCS GO/NO-GO)
Exit 06 92, V37E 00E

Stow optics eyepieces
Install optics covers
Stow COAS & lock in mount

Assures CM O2 supply full before CM/SM SEP.

Removes power from glycol mixer to conserve battery power.

Constrains roll to be zero.

SXT star should be within SXT FOV.
If not, GNCS is NO-GO.

12

CM RCS CHECK

AUTO RCS SEL A/C ROLL (4) - OFF

(verify)

cb RCS LOGIC (2) - close (verify)

SC CONT - CMC/FREE

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

*If both rings failed: *

* MNVR to 0°, _____, 0° *

* Just before CM/SM SEP:*

* Roll right ~20°/sec *

Control may be SCS/MIN IMP at option of crew.

MIN IMP may not produce audible jet firing. More than one cycle may be req'd to clear lines of residuals and allow propellant to jets.
If MIN IMP, use >1 cycle.

CM/SM SEP should be accomplished ASAP after deorbit.
If delayed to within 8 min of EI, recontact may occur.

13

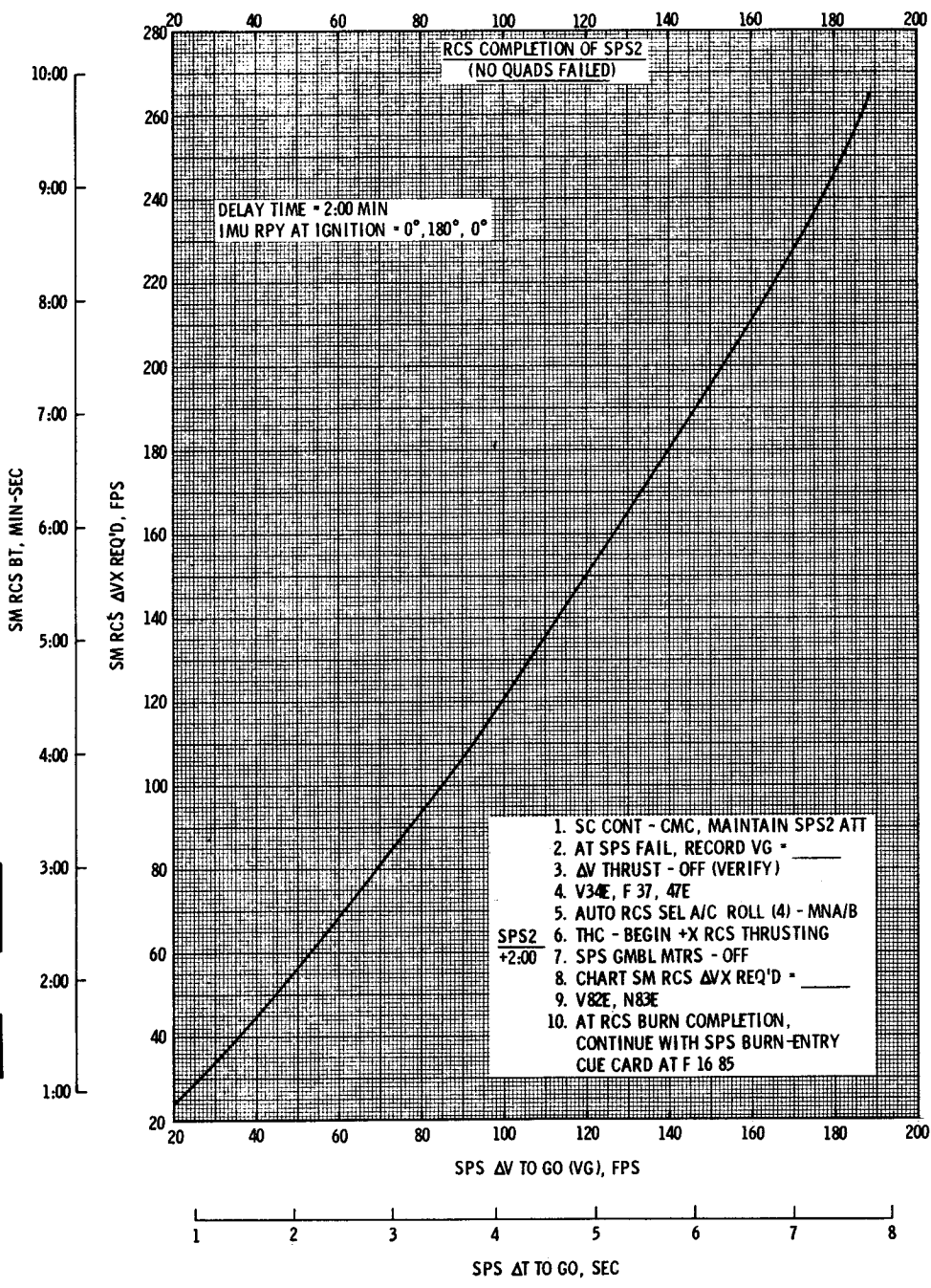
MNVR TO CM/SM SEP ATT (ASAP)

SC CONT - SCS

BMAG MODE (3) - ATT 1/RATE 2

YAW left 45° from burn att (315°)

Go to ENTRY, pg E/7-1



Option:

Use of P47 is specified, but if desired, a four quad completion burn can be made by monitoring P40 (V16 N85).

Procedure:

ENTR from F 99 40 to F 16 85, omit step 4, and burn SM RCS ΔVX REQ'D.

Equation:

$$\Delta V (R1 \text{ FINAL}) = \Delta V (R1 \text{ INITIAL}) - \text{CHART } \Delta V X \text{ REQ'D}$$

ENTRY UPDATE									
AREA	X			+		X		+	
P .05G	+			0 0	+			0 0	
N61 LAT	<input type="checkbox"/>	0			<input type="checkbox"/>	0			
LONG	<input type="checkbox"/>				<input type="checkbox"/>				
RTOGO .05G	+				+				
VIO .05G	+				+				
RET .05G	X	X			X	X			
RET .2G	X	X			X	X			
N66 DRE	<input type="checkbox"/>				<input type="checkbox"/>				
BANK AN	R	<input type="checkbox"/>		/	R	<input type="checkbox"/>		/	
RET RB	X	X			X	X			
RET BBO	X	X			X	X			
RET EBO	X	X			X	X			
RET DROG	X	X			X	X			
REMARKS:									
REMARKS:									

ENTRY UPDATE PAD DESCRIPTION

- a. Revolution number and landing area
- b. Pitch angle at .05G P .05G)
- c. Latitude and longitude of splashdown point (LAT, LONG), noun 61 display
- d. EMS initialization value for range-to-go at .05G (RTOGO .05G)
- e. EMS initialization value of inertial velocity at .05G (VIO .05G)
- f. Time to .05G referenced from retroburn (RET .05G)
- g. Time to .2G referenced from retroburn (RET .2G)
- h. Downrange error (DRE), noun 66 display
- i. Bank angle, roll (R) first in specified direction
- j. Time to bank angle reversal from retroburn (RET RB)
- k. Time to S-Band blackout from retroburn (RET BBO)
- l. Time to the end of S-Band blackout from retroburn (RET EBO)
- m. Time to drogue chute deployment from retroburn (RET DROG)

ENTRY UPDATE										
AREA	X			+		X			+	
P .05G	+			0	0	+			0	0
N61 LAT	<input type="checkbox"/>	0				<input type="checkbox"/>	0			
LONG	<input type="checkbox"/>					<input type="checkbox"/>				
RTOGO .05G	+					+				
VIO .05G	+					+				
RET .05G	X	X				X	X			
RET .2G	X	X				X	X			
N66 DRE	<input type="checkbox"/>					<input type="checkbox"/>				
BANK AN	R	<input type="checkbox"/>		/		R	<input type="checkbox"/>		/	
RET RB	X	X				X	X			
RET BBO	X	X				X	X			
RET EBO	X	X				X	X			
RET DROG	X	X				X	X			

REMARKS: _____

REMARKS: _____

ENTRY UPDATE										
AREA	X			+		X			+	
P .05G	+			0	0	+			0	0
N61 LAT	<input type="checkbox"/>	0				<input type="checkbox"/>	0			
LONG	<input type="checkbox"/>					<input type="checkbox"/>				
RTOGO .05G	+					+				
VIO .05G	+					+				
RET .05G	X	X				X	X			
RET .2G	X	X				X	X			
N66 DRE	<input type="checkbox"/>					<input type="checkbox"/>				
BANK AN	R	<input type="checkbox"/>		/		R	<input type="checkbox"/>		/	
RET RB	X	X				X	X			
RET BBO	X	X				X	X			
RET EBO	X	X				X	X			
RET DROG	X	X				X	X			

REMARKS: _____

REMARKS: _____

ENTRY

P62 - CM/SM SEP & PRE-ENTRY MNVR

1 V37E 62E (AVE G ON)
05 09 01427 - ROLL REVERSED
*05 09 01426 - IMU UNSAT *

2 F 50 25 00041 REQUEST CM/SM SEP

cb ELS/CM-SM SEP (2) - close
VHF AM (A & B) - off (ctr)
PRIM GLY TO RAD - BYPASS (verify)
EMS MODE - STBY (verify)
CM RCS LOGIC - on (up)
Cue STDN if in contact
SECS LOGIC (2) - on (up) (verify)
STDN confirm GO for PYRO ARM (if poss)
SECS PYRO ARM (2) - on (up)

MN BUS TIE (2) - on (up) (verify)
CM/SM SEP (2) - on (up)
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
Monitor V MNA/B:
If <25vdc go to EMERG POWER DOWN
YAW back to 0°
PRO

CM VHF antennas not available until apex cover jett.

Enables auto RCS transfer at CM/SM SEP.

Pyro bus should remain armed until splashdown because J series ELS pushbuttons are not single point failures.

Backup to auto transfer.

If SC CONT is CMC/AUTO, entry DAP will control spacecraft.

GNCS HORIZ CK

If hds dn (SPS1 + SPS2, or
 4 quad compl, or
 poss SPS1 + RCS2)
 R _____ (0°) hds dn
 P _____ (035°)
 Y _____ (0°)
 After sep, fly to pad
 entry att
 At RET .05G -1 min, ck horiz
 on 33° window mk (Limit:
 +5°, GNCS GO/NO-GO)
 If GO, continue hold
 pad entry att
 If NO-GO, track horiz
 * on 29° window mk *
 Hold hds dn to .2G

If hds up (RCS1 + RCS2, or
 hybrid, or 2 & 3 quad compl
 (VG >22), or poss SPS1 + RCS2)
 R _____ (180°) hds up
 P _____ (XXX°)
 Y _____ (0°)
 After sep, track horiz
 on 9° window mk
 At RET .05G, compare IMU
 with pad entry att
 (Limit: +5°, GNCS GO/NO-GO)
 Whether GO *or NO-GO*,
 continue track horiz on
 9° window mk
 Hold hds up to 1G

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

Load R3 = 71
PRO

EMS INITIALIZATION

EMS FUNC - TEST 5
Verify scroll on 37K fps
EMS FUNC - RNG SET
Set RNG to PAD DATA RTOGO
EMS FUNC - Vo SET
Slew scroll to PAD DATA VIO
EMS MODE - STBY (verify)
EMS FUNC - ENTRY
Verify .05G lt filter is down

RSI ALIGNMENT

Verify correct RSI alignment
hds dn = 0°
hds up = 180°

5 POSS 06 22 FINAL ATT DISP, RPY (.01°)
(Only if angle of attack >45°)

P63 - ENTRY - INIT

6 06 64 G, VI, RTOGO (.01G, fps, .1nm)
FDAI SCALE - 5/5
RHC PWR DIRECT #2 - MNA/B (verify)
TAPE RCDR - HBR/RCD/FWD/CMD RESET

RET .05G HORIZ CK (hds dn, 33° mk ±5°)
-1 min

RET .05G EMS MODE - BACKUP/VHF RNG
(+0 : :) (.05G lt - on)
(: : :) .05G sw - on (up)
EMS ROLL - on (up)
HORIZ CK (hds up, 9° mk ±5°)

SCS control is maintained because ENTRY DAP mnvr rate is 4°/sec.

Removing filter improves visibility of .05G lt.

CMC entry pitch att is indicated by pitch error needle. Spacecraft BEF capture envelope is P ±40°, Y ±60°. Horiz ck ensures good IMU.

EMS is started manually at RET .05G to ensure start of range counter at a fixed position (range from target) as defined by RTCC.

P64 - ENTRY - POST .05G

7 06 74 BETA,VI,G (.01°,fps,.01G)
Start DAC

RET .2G
(+0 :)
P67 - ENTRY - FINAL PHASE (POST .2G)

8 06 66 BETA,CRSRNG ERR,DNRNG ERR
(+ is north & long) (.01°, .1nm)

GNCS NAV CK:

KEY VERB

Record DNRNG ERR _____ PAD _____

KEY RLSE

(Limit: +70 nm (hds dn) or +120 nm
(hds up), GNCS GO/NO-GO)

MAN ATT (3) - RATE CMD

At .2G (hds dn) or 1G (hds up)

If GNCS is GO:

SC CONT - CMC/AUTO

*If DAP NO-GO *

* SC CONT - SCS *

* Fly BETA *

*If GNCS NO-GO *

* Fly EMS, reverse bank *

* at RET RB *

*If GNCS & EMS NO-GO: *

* Fly PAD bank/reverse bank*

*If both RCS rings *

* He pressure <2000 psia: *

* Roll right ~20°/sec *

GNCS suspicious if CMC program change from P63 to P64 is >+15 sec from RET .05G.

Fireball photography.

Other displays for monitoring entry:

N74 BETA,VI,G (.01°,fps,.01G)

N64 G,VI,RTOGO (.01G,fps,.1nm)

The g meter can be used as a third vote in the event of a discrepancy between CMC (N74 or N64) g and EMS g.

He source pressure for a guided entry: below 2000 psia (up from 1650 psia on Apollo) go ballistic. This is based on 30 lbs of RCS in each ring with a He bottle temperature of 50°F prior to arming the RCS. The 2000 psia figure increases to 2150 psia at 70°F.

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

SC CONT - SCS
RTOGO NEG - HDS DN
RTOGO POS - HDS UP

Monitor altimeter
Record LAT _____, LONG _____,
& voice to REC'Y at 10K'
Record EMS RTOGO _____
EMS - OFF/STBY _____
Stop DAC
DAC - T11

Go to EARTH/POST LANDING, pg E/8-1

This last bit of ranging must be done manually.
ENTRY DAP maintains last command after
Vrel = 1000 fps.

f-stop for parachute photography.

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EARTH/POST LANDING

RRT
 90K' (33:57) STEAM PRESS - pegged at ~90K' Start Watch (00:00)

50K' (34:47) CABIN PRESS REL vlv (2) - BOOST/ENTRY (00:50)
 SECS PYRO ARM (2) - on (up) (verify)
 Check altimeter

40K' (35:01) *If CM unstable: * (01:04)
 * RCS CMD - OFF *
 * 40K' APEX COVER JETT pb - push *
 * DROGUE DEPLOY pb - push *
 * (2 sec after apex cover jett)*

30K' ELS LOGIC - on (up)
 ELS - AUTO (01:23)

24K' (35:33) RCS disable (auto) Start DAC (01:36)
 RCS CMD - OFF
 Apex cover jett (auto)
 APEX COVER JETT pb - push
 (Wait 2 sec)
 Drogue parachutes deployed (auto)
 DROGUE DEPLOY pb - push

*If both drogues fail: *
 * ELS - MAN *
 * Stabilize CM (direct RCS)*
 * 5K' MAIN DPLY pb - push *
 * ELS - AUTO *

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

CM RCS PRPLNT (2) - OFF

10K' (36:19) Main chutes deployed (drogues +46 sec) (02:22)
 (Cab Press MAIN DEPLOY pb - push
 = 10 psia)

RRT is retrofire reference time from SPS2 ignition. Watch is used as a backup altimeter and gives an approximate time to expect cabin pressure increasing and cabin pressure = 10 psia, which are valid cues for drogue deploy and main deploy, respectively.

Arms ELS baro switches.

Parachute photography.

Drogue failure results in CM velocity too great for main chute deploy at 10K'. Increased drag will slow CM to acceptable velocity for main chute deploy at 5K'.

Cabin pressure increasing via BOOST/ENTRY position of PRESS REL vlv is an accurate indication of 23.5K'. If still no increase, assuming a valid altimeter, use side hatch dump valve to equalize pressure. Closes propellant isolation valves.

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Voice LAT, LONG to REC'Y
VHF ANT - RECY
VHF AM A - SIMPLEX

VHF BCN - ON
CABIN PRESS REL vlv (2) - DUMP

Stow DAC

STRUT LOCKS (4) - UNLOCK

*If night landing: *

* cb FLOAT BAG #3, FLT/PL (1) - close*

* PL BCN LT - LO *

- (5) cb FLT & PL BUS BAT A, B, & C (3) - close
cb FLT & PL BUS MNA & B (2) - open
cb BAT RLY BUS (2) - open
- (8) cb SPS P & Y (4) - open (verify)
ELS - AUTO (verify)
ELS LOGIC - on (up) (verify)
FLOOD LTS - POST LDG

800'

CAB PRESS RELF vlv (2) - CLOSE (latch off)
DIRECT O2 vlv - OPEN (CCW) (if suited)
MN BUS TIE (2) - OFF

STABILIZATION AFTER LANDING

- (229) cb MAIN REL PYRO (2) - close
MAIN RELEASE - on (up)
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
If 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

If B-SIMPLEX or A-DUPLEX req'd, turn beacon off during comm.

Allows pressure to equalize more rapidly than BOOST/ENTRY position of valve.

Beacon is powered through FLOAT BAG #3 circuit breaker. HI position reduces lifetime from 24 hrs to 4 hrs.

ELS AUTO & ELS LOGIC must be on for at least 14 sec after drogue deploy to enable MAIN RELEASE switch. Total on-time must be less than 14 hrs (power limitation) per 72 hr profile.

Prevents water from entering CM.

Last function that requires pyro power.

Wait 15 minutes before running compressors again.

POST STABILIZATION AND VENTILATION

PL BCN LT - BCN LT LO (night landing)
PL VENT vlv - UNLOCK (pull into detent)
Remove PL VENT exh cover
PL VENT - HIGH or LOW

If dye marker 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

(5) cb FLT & PL BUS BAT C - open

(229) cb PYRO BUS A PYRO BAT A - open

cb PYRO BUS B PYRO BAT B - open

Verify voltage >27.5 vdc

*If <27.5 vdc:

* cb FLT & PL BUS BAT C (1) - close*

* cb FLT & PL BUS BAT A & B *

* (2) - open *

* Go to LOW POWER CHECKLIST *

(U3) Unstow and install PLV DISTRIB DUCT (3)

Deploy grappling hook and line if req'd

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 Trncvr (VOICE)

*If VHF BEACON not operating:

* Connect Survival Trncvr cable conn *

* J1 to bcn ant cable conn P112 behind VHF*

* ant access pnl and place radio in BCN *

* mode *

PLV fan can operate in HIGH for 12 hrs maximum.

If PLV fan is frozen up, pull PL VENT cb with PL VENT switch in HIGH or LO to keep valves open.

If RCS fumes are noticed, prepare to egress immediately.

Battery C and pyro batteries held in reserve for use after depletion of battery A & B charge.

Stowed in U3 stowage area.

Adapter E and driver R tools req'd to remove side hatch dump valve and to secure cover plate on side hatch (over valve opening).

Use tool E to open VHF antenna access panel.

Use tool F to loosen connector P112.

DATE 2/7/73

PAGE E/8-3

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
- *If BAT C <27.5 vdc: *
- * cb BAT BUS A BAT A - open *
- * cb BAT BUS A PYRO BAT A - close*
- * cb FLT/PL BUS BAT A - close *
- * cb FLT/PL BUS BAT C - open *
- * Monitor PYRO BAT A voltage *
- * on BAT BUS A *
- *If PYRO BAT A <27.5 vdc: *
- * cb BAT BUS B BAT B - open *
- * cb BAT BUS B PYRO BAT B - close*
- * cb FLT/PL BUS BAT B - close *
- * cb FLT/PL BUS BAT A - open *
- * Monitor PYRO BAT B voltage *
- * on BAT BUS B *

NOMINAL EGRESS & POWER DOWN

- (5) PL VENT - OFF
- cb FLT/PL BUS BAT C (1) - open
- cb BAT CHRG BAT C/EDS 2 (1) - open
- cb PANEL 275 (all) - open
- Charge hatch counterbalance
- Open side hatch (after collar installed)
- ACTR HNDL SEL - N
- GN2 vlv HNDL - VENT (pull)
- GN2 vlv HNDL - PRESS (push)
- Check pressure gauge (mid-white)
- *Repeat vent/press to obtain mid-white*

Counterbalance vented to mid-white range to assist in securing spacecraft hatch after crew egress.

3 CREWMEN UNAIDED EGRESS PROCEDURES

If 5 crewmen, go to 5 Crewmen Unaided
* Egress Procedures, pg E/8-6 *

PREPARATION

- Disconnect umbilicals
- Neck dams on (if suited)
- Configure couch(es) - 270°
- Armrests stowed
- (R4) Unstow rucksacks #1 & #2
- Connect lanyards
(green to S/C, white to crew)

STABLE I

- (5) PL VENT - OFF
- cb FLT/PL BUS BAT C (1) - open
- cb BAT CHRG BAT C/EDS 2 (1) - open
- cb PANEL 275 (all) - open
- Charge hatch counterbalance
- Open side hatch
- *If no ventilation or CM O2 supply:*
- * Open side hatch, as req'd *
- ACTR HNDL SEL - N
- GN2 vlv HNDL - VENT (pull)
- GN2 vlv HNDL - PRESS (push)
- Check pressure gauge (mid-white)
- *Repeat vent/press to obtain mid-white*
- Remove raft from rucksack #2
- Put raft overboard & pull inflation lanyard
- Pass hardware kit to raft
- Egress, inflate life vest, board raft

STABLE II

- PWR (3) - OFF
- SUIT PWR (3) - OFF
- PRESS EQUAL vlv - OPEN

- *If no ventilation or CM O2 supply:*
- * Initiate egress within 2-1/2 hrs*
- Remove & stow hatch
- Lower hardware rucksack down tunnel
- Exit feet first; when clear of S/C inflate water wings
- Remove life raft from rucksack #2 and inflate

Pull detent knob on end of handle, then pivot up 90°. Rotate crank ~3 turns CCW to fully open valve. This will flood tunnel prior to opening hatch.

5 CREWMEN UNAIDED EGRESS PROCEDURESSTABLE I

Disconnect umbilicals
Neck dams on (if suited)
Configure center couch to 0°
Armrests stowed
Charge hatch counterbalance (per decal)
Unstow four rucksacks from R3 & R4

First three crewmen out:

Connect lanyards from rucksack 2 (green to head strut, white to first 3 crewmen to egress)

PL VENT - OFF

cb FLT/PL BUS BAT C (1) - open

cb BAT CHRG BAT C/EDS 2 (1) - open

cb PANEL 275 (all) - open

Open side hatch

If no ventilation or CM O2 supply:

* Open side hatch, as req'd *

ACTR HNDL SEL - N

GN2 vlv HNDL - VENT (pull)

GN2 vlv HNDL - PRESS (push)

Check pressure gauge (mid-white)

Repeat vent/press to obtain mid-white

Throw life raft overboard and inflate

Transfer to life raft with rucksack 1A

CAUTION: Inflate life vests and egress in order designated on white lanyards.

Last man out disconnect green lanyard from head strut.

Attach green lanyard to CM sea anchor attach fitting.

Last 2 crewmen out:

Connect lanyards (green to head strut, and white to remaining crewmen)

Throw life raft overboard and inflate

Transfer to life raft with rucksack 1B

CAUTION: Inflate life vests and egress in order designated on white lanyards.

Last man out disconnect green lanyard from head strut.

Attach green lanyard to first raft's green lanyard.

STABLE II

Disconnect umbilicals

Neck dams on (if suited)

Configure center couch to 0°

Armrests stowed

PWR (3) - OFF

SUIT PWR (3) - OFF

PRESS EQUAL vlv - OPEN

NOTE: Tunnel will fill with water.

Unstow (4) rucksacks from R3 & R4

Remove and stow tunnel hatch at foot of CDR's couch

Attach yellow lanyards (rucksack 2 to survival rucksack 1A, rucksack 3 to survival rucksack 1B)

Connect lanyards from rucksack 2 (green to foot strut, white to 3 crewmen closest to tunnel opening)

If no ventilation or CM O2 supply:

* Initiate egress within 2 hrs *

Pull detent knob on end of handle, then pivot up 90°
Rotate crank ~3 turns CCW to fully open valve. This will flood tunnel prior to opening hatch.

Egress Procedure: Face LEB, verify lanyard routing, exit feet first carrying rucksack. When clear of S/C inflate life vest and board raft.

CAUTION: Egress in order designated on white lanyards.

- 1st man out - Before egress lower rucksack 1A thru tunnel.
Carry rucksack 2 out. After egress inflate raft, retrieve rucksack 1A.
- 2nd - Egress
- 3rd - Before egress disconnect green lanyard from foot strut. After egress attach green lanyard to sea anchor attach fitting on CM.
- 4th - Before egress connect lanyards from rucksack 3 (green to foot strut, white to 2 crewmen). Lower rucksack 1B thru tunnel. Carry rucksack 3 out. After egress inflate raft, retrieve rucksack 1B.
- 5th - Before egress disconnect green lanyard from foot strut. After egress attach green lanyard to first raft's green lanyard.

CONTINGENCY
PROCEDURES

MANEUVER UPDATE (P30)												
PURPOSE												
N33 HR MIN SEC	+	X	X				+	X	X			
	+	X	X	X			+	X	X	X		
	+	X					+	X				
N81 LOCAL ΔV_X VERT ΔV_Y ΔV_Z		X						X				
		X						X				
		X						X				
N22 R P Y	+				0	0	+				0	0
	+				0	0	+				0	0
	+				0	0	+				0	0
ΔVC	X	X					X	X				
BT	X	X					X	X				
ΔV_{70}	X	X					X	X				
ULLAGE: _____ SECS _____ QUADS												
N47 WT	+						STAR	X	X	X	X	
							GDC R					
N48 PT		X	X				SFT	+				0
YT		X	X					P				
							TRN	+				0
								Y				
REMARKS: _____												

MANEUVER UPDATE (P30) PAD DESCRIPTION

- a. GMT of ignition (GMTI) in noun 33 display
- b. Change in velocity components in noun 81 display
- c. Ground calculated S/C burn attitude relative to the IMU at GMTI called by V49 N22
- d. EMS ΔV counter load (ΔVC)
- e. Burn duration (BT)
- f. Change in velocity necessary to lower perigee below 70 nm (ΔV_{70})
- g. Ullage duration, and number of quads (2 or 4) used
- h. Vehicle weight, and pitch and yaw trim engine gimbal angles, for DAP data load
- i. Star number, and optics shaft and trunnion angles
- j. GDC align angles for failed IMU

MANEUVER UPDATE (P30)														
PURPOSE														
N33 HR MIN SEC	+	X	X			+	X	X						
	+	X	X	X		+	X	X	X					
	+	X				+	X							
N81 LOCAL ΔVX VERT ΔVY ΔVZ		X					X							
		X					X							
		X					X							
N22 R P Y	+			0	0	+			0	0				
	+			0	0	+			0	0				
	+			0	0	+			0	0				
ΔVC	X	X				X	X							
BT	X	X				X	X							
ΔV70	X	X				X	X							
ULLAGE: _____ SECS _____ QUADS														
N47 WT	+					STAR	X	X	X	X	GDC R			
N48 PT		X	X			SFT	+				0	P		
YT		X	X			TRN	+				0	0	Y	
REMARKS: _____														

MANEUVER UPDATE (P30)														
PURPOSE														
N33 HR MIN SEC	+	X	X			+	X	X						
	+	X	X	X		+	X	X	X					
	+	X				+	X							
N81 LOCAL ΔVX VERT ΔVY ΔVZ		X					X							
		X					X							
		X					X							
N22 R P Y	+			0	0	+			0	0				
	+			0	0	+			0	0				
	+			0	0	+			0	0				
ΔVC	X	X				X	X							
BT	X	X				X	X							
ΔV70	X	X				X	X							
ULLAGE: _____ SECS _____ QUADS														
N47 WT	+					STAR	X	X	X	X	GDC R			
N48 PT		X	X			SFT	+				0	P		
YT		X	X			TRN	+				0	0	Y	
REMARKS: _____														

9 IMU CK
 P52 (OPT 3) AUTO OPTICS TO STAR
 (Limit: SXT FOV, GNCS GO/NO-GO)
 Exit 06 92, V37E 00E

10 P41 - RCS THRUSTING
 V37E 41E

11 F 50 18 REQ MNVR TO CMC BURN ATT (HDS DN) (.01°)
 PRO

12 06 18 AUTO MNVR TO BURN ATT (.01°)

13 F 50 18 REQ TRIM MNVR (.01°)
 Change S/C roll, if req'd
 (TRIM) PRO
 DBD/RATE - MIN/LOW
 BMAG MODE (3) - ATT 1/RATE 2
 GDC ALIGN
 ENTR

 55:00m

14 06 85 VGX,Y,Z (.1fps)
 EMS - ΔV SET/STBY
 SET ΔVC
 EMS FUNC - ΔV

 58:00 RHC #2 & THC - ARMED
 TAPE RCDR - HBR/RCD/FWD/CMD RESET

 59:00 EMS MODE - NORMAL
 THC PWR - on (up)

15 59:25 DSKY BLANKS

 59:30

16 16 85 VGX,Y,Z(AVE G ON) (.1fps)

SXT star should be within SXT FOV.
 If not, GNCS is NO-GO.

EMS ΔV counter set with pad ΔVC.

00:00 Horiz ~40° above X axis (hds dn)
 (~2° above window frame)
 Info only, not a GNCS GO/NO-GO CK

17 F 16 85 REQ NULL VGX,Y,Z (.1fps)
 Trim VGX & VGZ to +.2
 in burn att
 Verify EMS ΔV CTR ~ZERO

18 F 16 44 V82E
 HA,HP,TFF (.1nm,min-sec)
 PRO

19 F 16 85 VGX,Y,Z (.1fps)
 Record

RCS BURN STATUS

		AFTER BURN							
FDAI (ONLY IF NOT AT BURN ATT)	R	+							
	P	+							
	Y	+							
N85	VGX		0	0					
	VGY		0	0					
	VGZ		0	0					
EMS	ΔVC		X	X					

PRO
 EMS - OFF/STBY
 THC - LOCKED
 THC PWR - OFF
 RATE - HIGH
 BMAG MODE (3) - RATE 2
 TAPE RCDR - LBR/off(ctr)/CMD RESET/
 REWIND

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

Go to ENTRY VEHICLE PREP, pg E/4-1

Transfers CSM SV to OWS slots. Do not do when average G is running. Do not do unless satisfied that CSM SV is good.

MANEUVER UPDATE (P30)													
PURPOSE													
N33 HR MIN SEC	+	X	X			+	X	X					
	+	X	X	X		+	X	X	X				
	+	X				+	X						
N81 LOCAL VERT ΔVZ	<input type="checkbox"/>	X				<input type="checkbox"/>	X						
	<input type="checkbox"/>	X				<input type="checkbox"/>	X						
	<input type="checkbox"/>	X				<input type="checkbox"/>	X						
N22 R P Y	+			0	0	+			0	0			
	+			0	0	+			0	0			
	+			0	0	+			0	0			
ΔVC	X	X				X	X						
BT	X	X				X	X						
ΔV_{70}	X	X				X	X						
ULLAGE: _____ SECS _____ QUADS													
N47 WT	+	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	STAR	X	X	X	X	GDC R	<input type="text"/>	<input type="text"/>
N48 PT	<input type="checkbox"/>	X	X			SFT	+	<input type="text"/>	<input type="text"/>	<input type="text"/>	P	<input type="text"/>	<input type="text"/>
YT	<input type="checkbox"/>	X	X			TRN	+	<input type="text"/>	<input type="text"/>	<input type="text"/>	Y	<input type="text"/>	<input type="text"/>
REMARKS: _____													

MANEUVER UPDATE (P30) PAD DESCRIPTION

- a. GMT of ignition (GMTI) in noun 33 display
- b. Change in velocity components in noun 81 display
- c. Ground calculated S/C burn attitude relative to the IMU at GMTI called by V49 N22
- d. EMS ΔV counter load (ΔVC)
- e. Burn duration (BT)
- f. Change in velocity necessary to lower perigee below 70 nm (ΔV_{70})
- g. Ullage duration, and number of quads (2 or 4) used
- h. Vehicle weight, and pitch and yaw trim engine gimbal angles, for DAP data load
- i. Star number, and optics shaft and trunnion angles
- j. GDC align angles for failed IMU

MANEUVER UPDATE (P30)															
PURPOSE															
N33 HR MIN SEC	+	X	X			+	X	X							
	+	X	X	X		+	X	X	X						
	+	X				+	X								
N81 LOCAL ΔVX VERT ΔVY ΔVZ		X					X								
		X					X								
		X					X								
N22 R P Y	+				0	0	+			0	0				
	+				0	0	+			0	0				
	+				0	0	+			0	0				
ΔVC	X	X				X	X								
BT	X	X				X	X								
ΔV70	X	X				X	X								
ULLAGE: _____ SECS _____ QUADS															
N47 WT	+					STAR	X	X	X	X		GDC R			
N48 PT		X	X			SFT	+				0	P			
YT		X	X			TRN	+				0	0	Y		
REMARKS: _____															

MANEUVER UPDATE (P30)															
PURPOSE															
N33 HR MIN SEC	+	X	X			+	X	X							
	+	X	X	X		+	X	X	X						
	+	X				+	X								
N81 LOCAL ΔVX VERT ΔVY ΔVZ		X					X								
		X					X								
		X					X								
N22 R P Y	+				0	0	+			0	0				
	+				0	0	+			0	0				
	+				0	0	+			0	0				
ΔVC	X	X				X	X								
BT	X	X				X	X								
ΔV70	X	X				X	X								
ULLAGE: _____ SECS _____ QUADS															
N47 WT	+					STAR	X	X	X	X		GDC R			
N48 PT		X	X			SFT	+				0	P			
YT		X	X			TRN	+				0	0	Y		
REMARKS: _____															

SM RCS2 DEORBIT BURN

Time from RCS1
(hrs:min)

- 1 +_:_ h P30 - EXTERNAL ΔV
V37E 30E
- 2 F 06 33 GMTI (hrs,min,.01sec)
Load desired TIG
PRO
- 3 F 06 81 ΔVX,Y,Z(LV) (.1fps)
Load desired ΔV's (Do not use all 0's)
PRO
- 4 F 06 42 HA,HP,ΔV(req'd) (.1nm,.1fps)
PRO
- 5 F 16 45 MARKS,TFI,MGA (marks,min-sec,.01°)
Set DET counting up to GMTI
PRO
- 6 F 37 00E
- 7 SEPARATION CK LIST
PRIM GLY TO RAD - BYPASS (pull)
REPRESS PKG vlv - FILL to 865-935,
then ON
02 SM SUPPLY vlv - OFF
SURGE TK - ON (verify)
CAB PRESS REL vlv (2) - NORM
(5) cb WASTE H2O/URINE DUMP HTR (2) - open
cb ECS PRIM RAD CONTR MNA/B (2) - open
POT H2O HTR - OFF
GLY EVAP TEMP IN - MAN
ABORT SYS PRPLNT - RCS CMD (verify)

Stored VG components along local vertical axes
at GMTI.

MARKS not applicable.
MGA is middle gimbal angle at GMTI. MGA set to
-00002 if REFSMMAT flag not set.

Assures CM 02 supply full before CM/SM SEP.

Removes power from glycol mixer to conserve battery
power.

8

RCS THRUSTING PREP
 AUTO RCS SEL (T6) - MNA/B
 FDAI SCALE - 5/1
 MAN ATT (3) - RATE CMD
 RHC PWR NORMAL #2 - AC/DC
 RHC PWR DIRECT #2 - MNA/B
 BMAG MODE (3) - RATE 2
 SC CONT - CMC/AUTO

9

MNVR TO PAD BURN ATT (HDS DN) (.01°)
 V49E
 R _____ (0°)
 P _____ (180°)
 Y _____ (0°)

Constrains roll to be zero.

10

IMU CK
 P52 (OPT 3) AUTO OPTICS TO STAR
 (Limit: SXT FOV, GNCS GO/NO-GO)
 Exit 06 92, V37E 00E

SXT star should be within SXT FOV.
 If not, GNCS is NO-GO.

Stow optics eyepieces
 Install optics covers
 Stow COAS & lock in mount

11

P41 - RCS THRUSTING
 V37E 41E

12 F 50 18 REQ MNVR TO CMC BURN ATT (HDS DN) (.01°)
 PRO

13 06 18 AUTO MNVR TO BURN ATT (.01°)

14 F 50 18 REQ TRIM MNVR (.01°)

Change S/C roll, if req'd
 (TRIM) PRO
 DBD/RATE - MIN/LOW
 BMAG MODE (3) - ATT 1/RATE 2
 GDC ALIGN
 ENTR

55:00m
 15 06 85 VGX,Y,Z (.1fps)
 EMS - ΔV SET/STBY
 SET ΔVC
 EMS FUNC - ΔV

 58:00 RHC #2 & THC - ARMED
 TAPE RCDR - HBR/RCD/FWD/CMD RESET

 TIG -2 min HORIZ CK - Horiz on ____ (36°)
 window mk (hds dn) (Limit:
 +3°, GNCS GO/NO-GO)
 If NO GO, set tw to pad burn att
 * SC CONT - SCS *
 * Track horiz with ____ (32°) *
 * window mk (hds dn) *
 * At TIG -1 min, *
 * Hold att *
 * GDC ALIGN pb - push *

 59:00 EMS MODE - NORMAL
 THC PWR - on (up)

 16 59:25 DSKY BLANKS

 59:30
 17 16 85 VGX,Y,Z(AVE G ON) (.1fps)

 00:00 Horiz on ____ (28°) window mark (hds dn)

 18 F 16 85 REQ NULL VGX,Y,Z (.1fps)
 Trim VGX & VGZ to ±.2
 in burn att
 Verify EMS ΔV CTR ~ZERO

EMS ΔV counter set with pad ΔVC.

TIG -2 min HORIZ CK window mk will be in mnvr pad remarks. TIG -1 min horiz track window mk is 4° less. TIG burn att window mk is 8° less.

22

CM RCS CHECK

AUTO RCS SEL A/C ROLL (4) - OFF
(verify)
cb RCS LOGIC (2) - close (verify)
SC CONT - CMC/FREE
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
*If both rings failed: *
* MNVR to 0°, 0° *
* Just before CM/SM SEP:*
* Roll right ~20°/sec *

23

MNVR TO CM/SM SEP ATT (ASAP)
DBD/RATE - MIN/HIGH
SC CONT - SCS
BMAG MODE (3) - ATT 1/RATE 2
YAW left 45° from burn att (315°)

24

PRELOAD ENTRY BATTERIES
MN BUS TIE (2) - on (up)

Go to ENTRY, pg E/7-1

Control may be SCS/MIN IMP at option of crew.

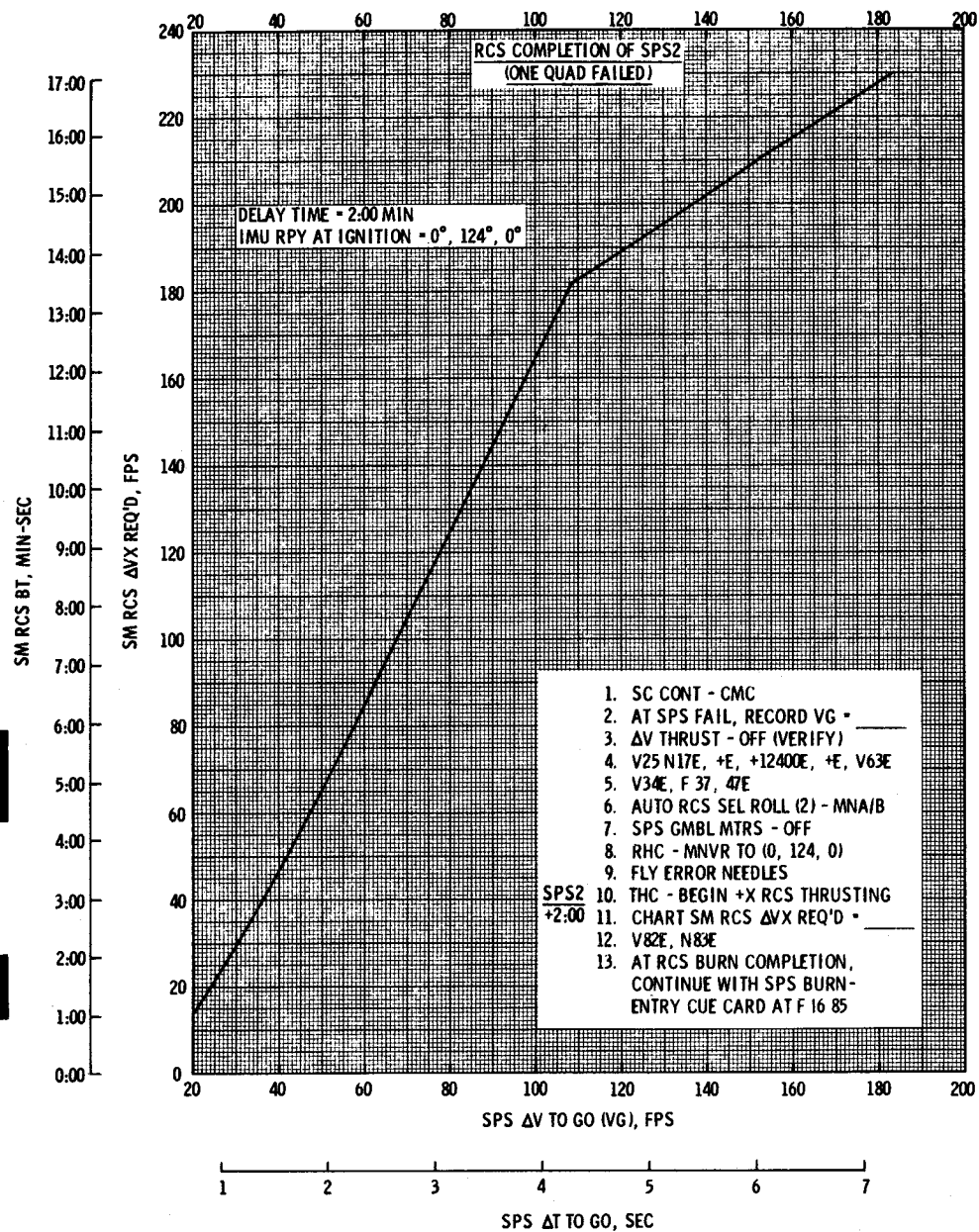
MIN IMP may not produce audible jet firing. More than one cycle may be req'd to clear lines of residuals and allow propellant to jets.
If MIN IMP, use >1 cycle.

CM/SM SEP should be accomplished ASAP after deorbit.
If delayed to within 8 min of EI, recontact may occur.

Monitor bat bus current increase.

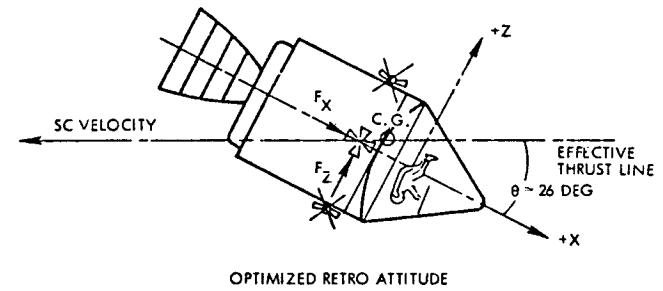
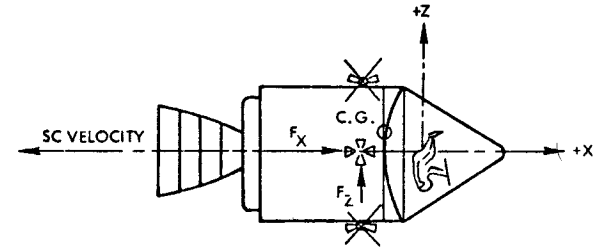
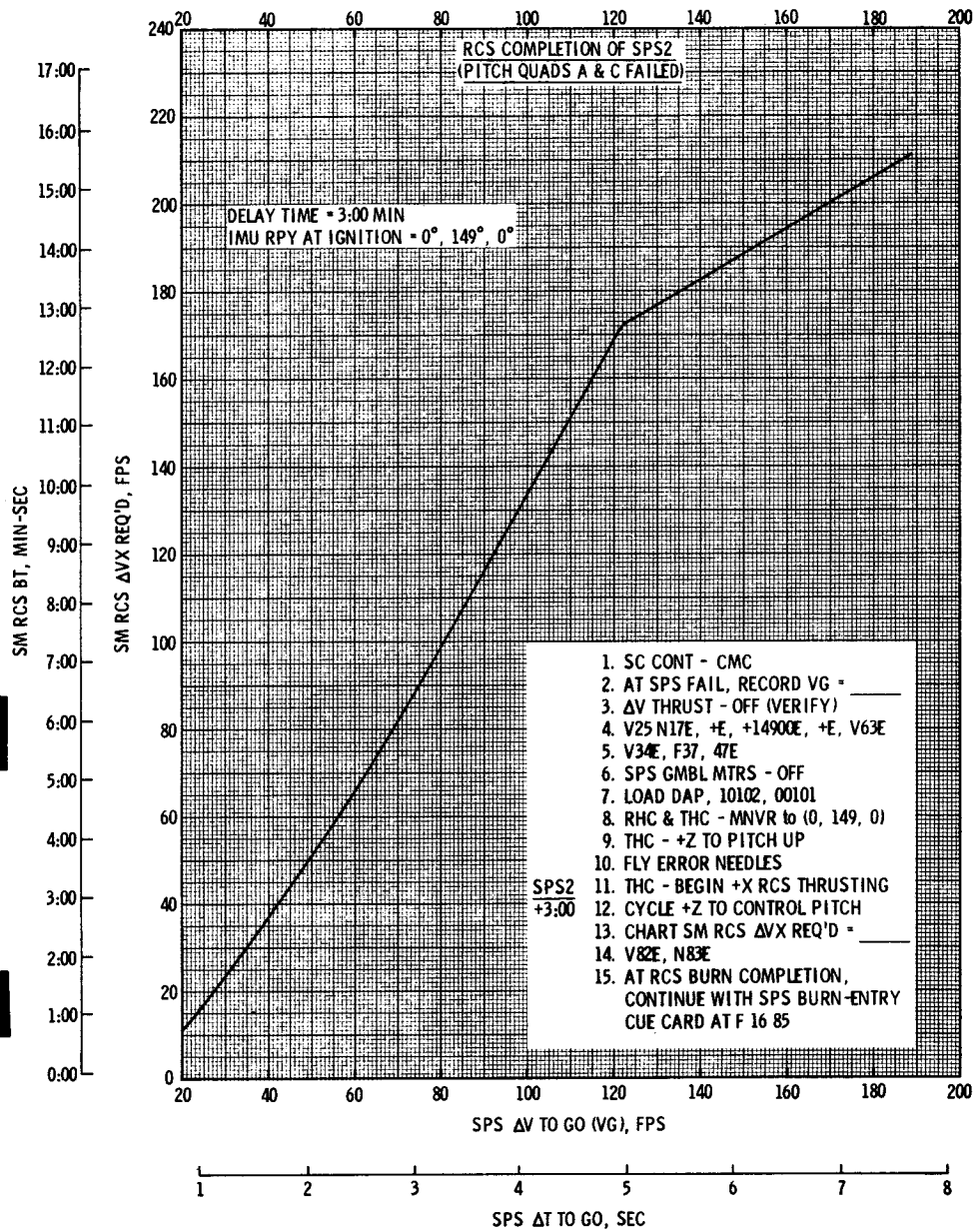
DATE 2/7/73

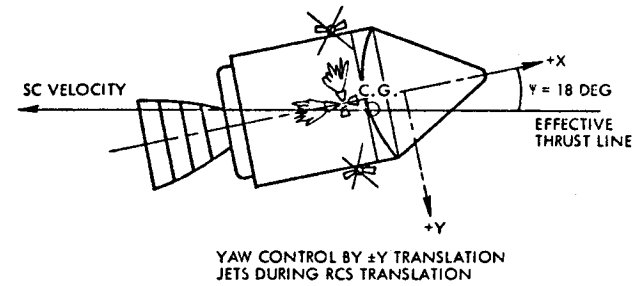
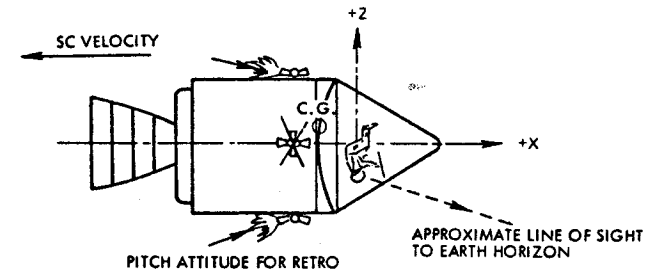
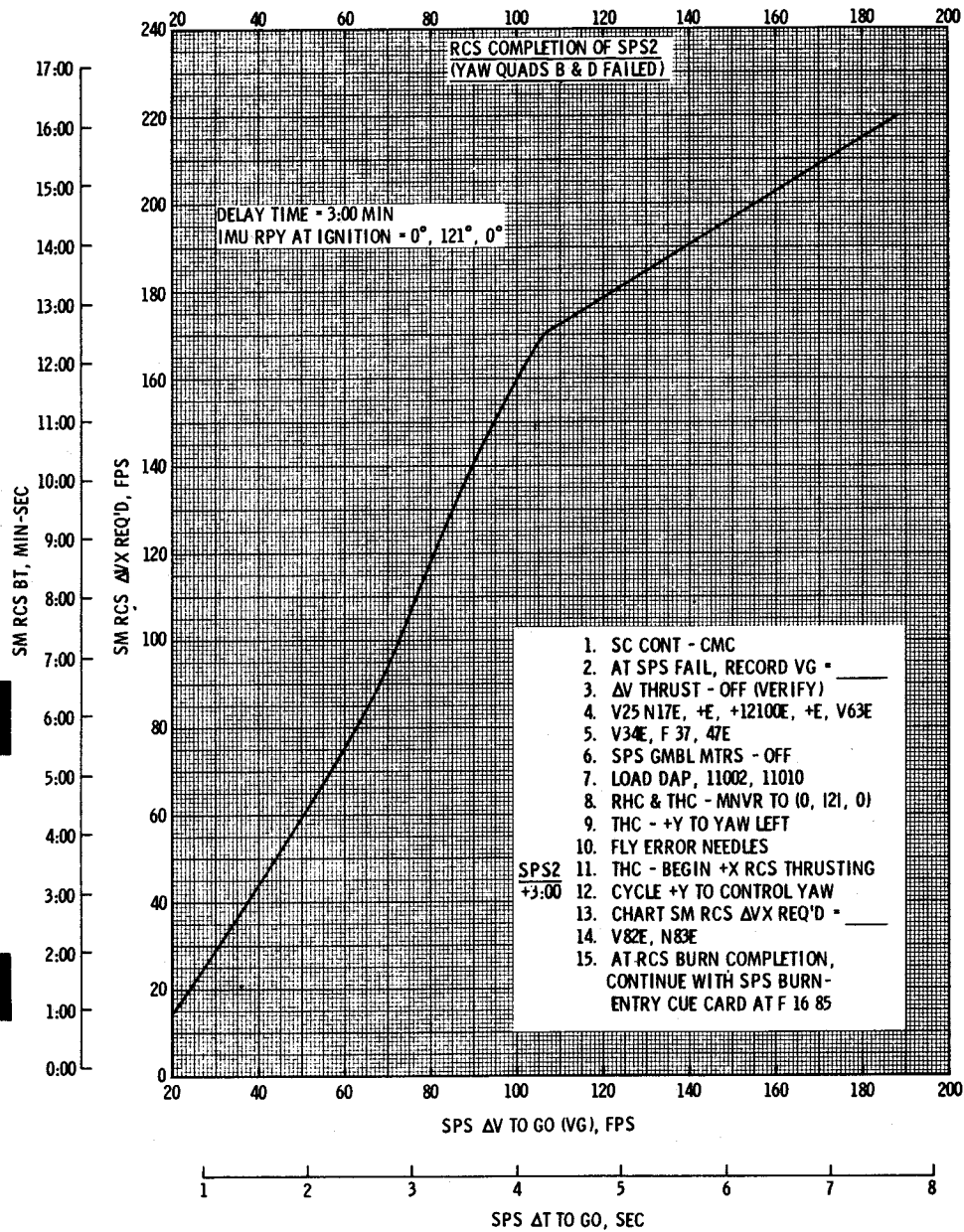
PAGE E/10-7

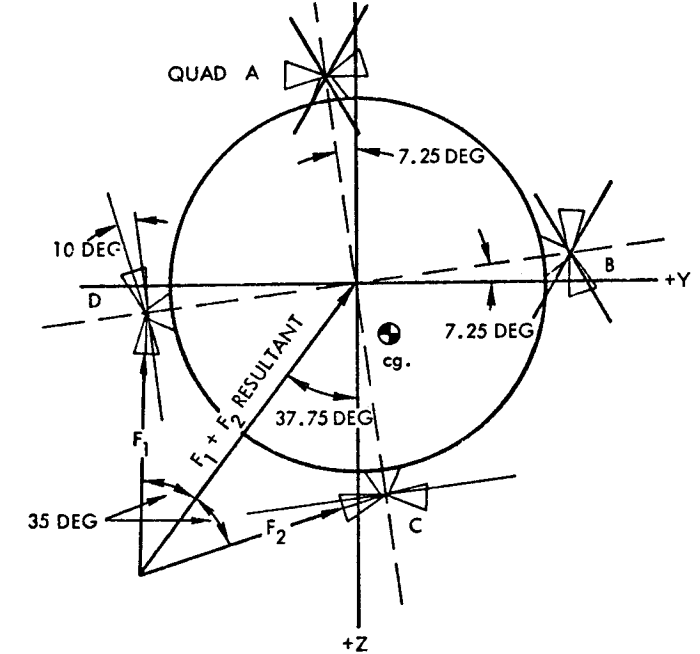
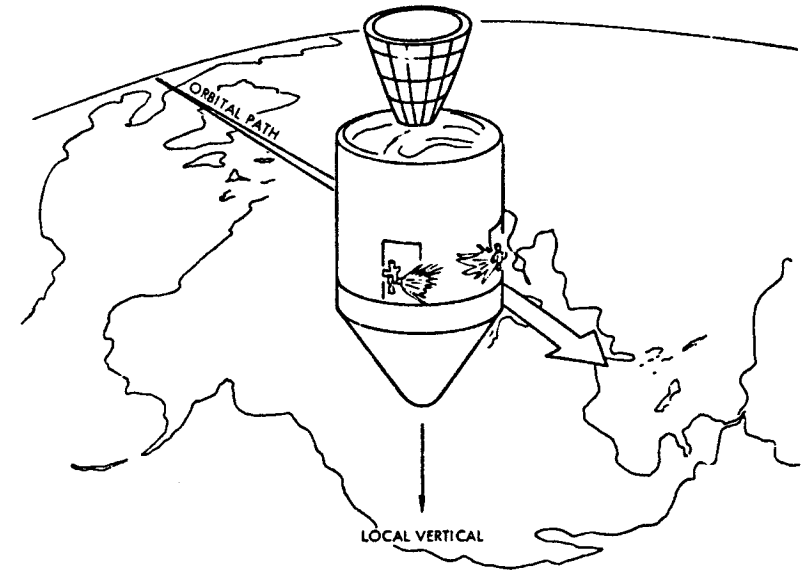
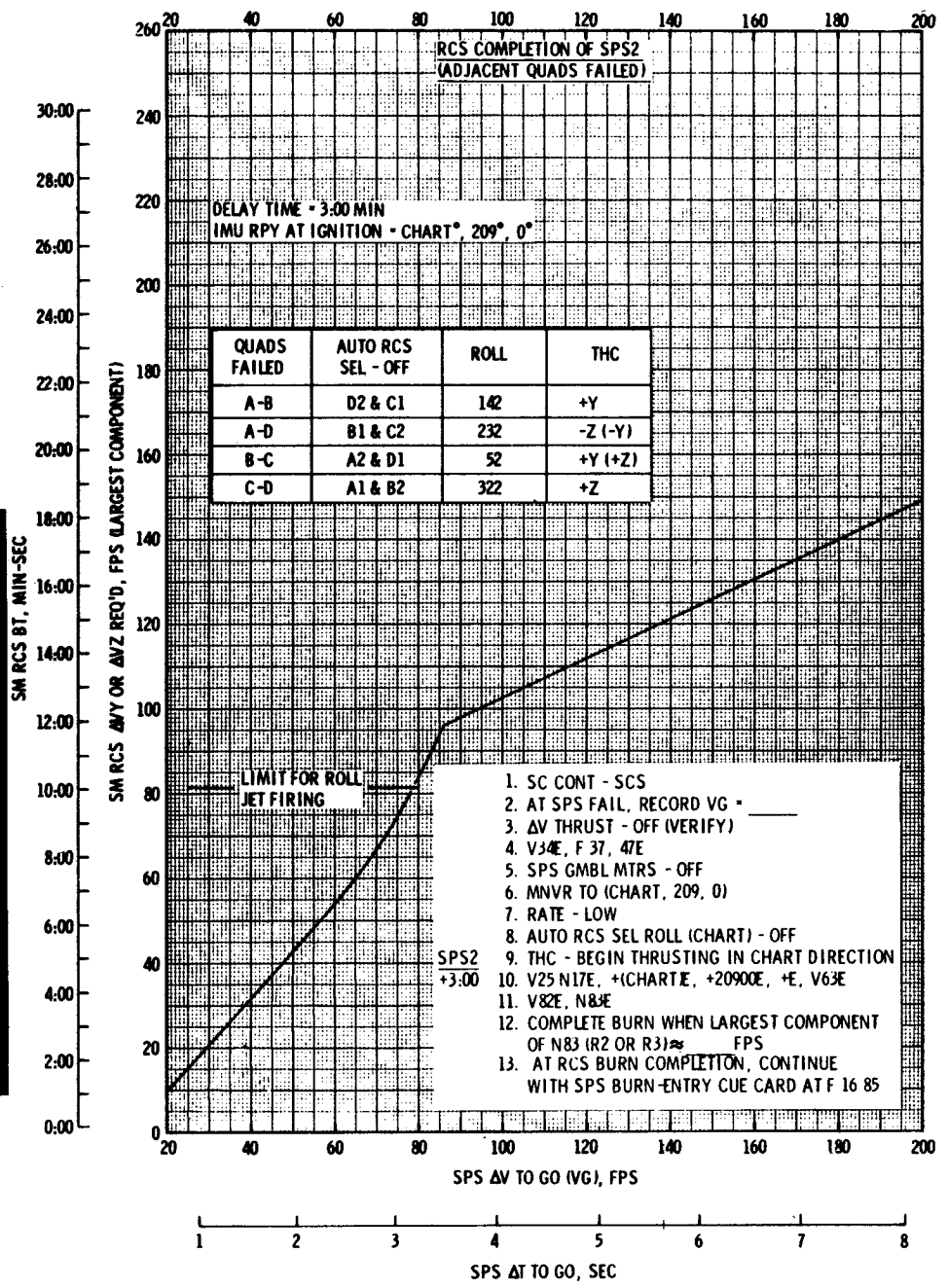


COMPLETION CHARTS
(QUADS FAILED)

COMPLETION CHARTS
(QUADS FAILED)







EXAMPLE USES COMBINED +Y, -Z TRANSLATION FOR QUADS A AND B DISABLED

HORIZONTAL RETRO THRUSTING MODE

X-AXIS ALONG LOCAL VERTICAL

SC ROLLED SO $F_1 + F_2$ RESULTANT OPPOSES SPACECRAFT VELOCITY VECTOR

MANEUVER UPDATE (P30)											
PURPOSE											
N33 HR		+	X	X				+	X	X	
MIN		+	X	X	X			+	X	X	X
SEC		+	X					+	X		
N81 LOCAL ΔV_X			X						X		
VERT ΔV_Y			X						X		
ΔV_Z			X						X		
N22 R		+			0	0		+			0
P		+			0	0		+			0
Y		+			0	0		+			0
ΔVC		X	X					X	X		
BT		X	X					X	X		
ΔV_{70}		X	X					X	X		
ULLAGE: _____ SECS _____ QUADS											
N47 WT		+						STAR	X	X	X
								GDC R			
N48 PT			X	X				SFT	+		0
YT			X	X							
								TRN	+		0
REMARKS: _____											

MANEUVER UPDATE (P30) PAD DESCRIPTION

- a. GMT of ignition (GMTI) in noun 33 display
- b. Change in velocity components in noun 81 display
- c. Ground calculated S/C burn attitude relative to the IMU at GMTI called by V49 N22
- d. EMS ΔV counter load (ΔVC)
- e. Burn duration (BT)
- f. Change in velocity necessary to lower perigee below 70 nm (ΔV_{70})
- g. Ullage duration, and number of quads (2 or 4) used
- h. Vehicle weight, and pitch and yaw trim engine gimbal angles, for DAP data load
- i. Star number, and optics shaft and trunnion angles
- j. GDC align angles for failed IMU

TWO QUADS FAILED
RCS DEORBIT BURN

MANEUVER UPDATE (P30)												
PURPOSE												
N33 HR		+	X	X			+	X	X			
MIN		+	X	X	X		+	X	X	X		
SEC		+	X				+	X				
N81 LOCAL ΔVX		<input type="checkbox"/>	X				<input type="checkbox"/>	X				
VERT ΔVY		<input type="checkbox"/>	X				<input type="checkbox"/>	X				
ΔVZ		<input type="checkbox"/>	X				<input type="checkbox"/>	X				
N22 R		+			0 0		+			0 0		
P		+			0 0		+			0 0		
Y		+			0 0		+			0 0		
ΔVC		X	X				X	X				
BT		X	X				X	X				
ΔV70		X	X				X	X				
ULLAGE: _____ SECS _____ QUADS												
N47 WT		+					STAR	X	X	X	X	
N48 PT		<input type="checkbox"/>	X	X			SFT	+			0	
YT		<input type="checkbox"/>	X	X								
							TRN	+			0 0	
REMARKS: _____												

MANEUVER UPDATE (P30)												
PURPOSE												
N33 HR		+	X	X			+	X	X			
MIN		+	X	X	X		+	X	X	X		
SEC		+	X				+	X				
N81 LOCAL ΔVX		<input type="checkbox"/>	X				<input type="checkbox"/>	X				
VERT ΔVY		<input type="checkbox"/>	X				<input type="checkbox"/>	X				
ΔVZ		<input type="checkbox"/>	X				<input type="checkbox"/>	X				
N22 R		+			0 0		+			0 0		
P		+			0 0		+			0 0		
Y		+			0 0		+			0 0		
ΔVC		X	X				X	X				
BT		X	X				X	X				
ΔV70		X	X				X	X				
ULLAGE: _____ SECS _____ QUADS												
N47 WT		+					STAR	X	X	X	X	
N48 PT		<input type="checkbox"/>	X	X			SFT	+			0	
YT		<input type="checkbox"/>	X	X								
							TRN	+			0 0	
REMARKS: _____												

TWO QUADS FAILED RCS DEORBIT BURN

(hrs:min)
1 +__:__h If deorbit burn:
ENTRY VEHICLE PREPARATION - complete

2 P30 - EXTERNAL ΔV
V37E 30E

3 F 06 33 GMTI (hrs,min,.01sec)
Load desired TIG
PRO

4 F 06 81 $\Delta VX,Y,Z(LV)$ (.1fps)
Load desired ΔV 's (Do not use all 0's)
PRO

5 F 06 42 HA,HP, ΔV (req'd) (.1nm,.1fps)
PRO

6 F 16 45 MARKS,TFI,MGA (marks,min-sec,.01°)
Set DET counting up to GMTI
PRO

7 F 37 00E

Stored VG components along local vertical axes
at GMTI.

MARKS not applicable.
MGA is middle gimbal angle at GMTI. MGA set to
-00002 if REFSMMAT flag not set.

8

If shaping burn:

Go to step 9

If deorbit burn:

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

(5) cb WASTE H2O/URINE DUMP HTR (2) - open

cb ECS PRIM RAD CONTR MNA/B (2) - open

POT H2O HTR - OFF

GLY EVAP TEMP IN - MAN

ABORT SYS PRPLNT - RCS CMD (verify)

RCS THRUSTING PREP

Load DAP

Quads failed:

A-B	A-C	A-D	B-C	B-D	C-D
11102	10102	11102	11102	11002	11102
00011	00101	10110	01001	11010	11100

AUTO RCS SEL (8) - switch OFF the
jets on the quads failed

FDAI SCALE - 5/1

MAN ATT (3) - RATE CMD

RHC PWR NORMAL #2 - AC/DC

RHC PWR DIRECT #2 - MNA/B

THC PWR - on (up)

THC - ARMED

BMAG MODE (3) - RATE 2

SC CONT - CMC/AUTO

Assures CM O2 supply full before CM/SM SEP.

Removes power from glycol mixer to conserve battery power.

9

10 MNVR TO PAD BURN ATT
V49E (.01°)

R _____
P _____
Y _____

If opposite quads failed, use THC to
mnvr about uncontrolled axis
A-C failed: THC - +Z to control +pitch
B-D failed: THC - +Y to control +yaw

11 IMU CK
P52 (OPT 3) AUTO OPTICS TO STAR
(Limit: SXT FOV, GNCS GO/NO-GO)
Exit 06 92, V37E 00E

If deorbit burn:

Stow optics eyepieces
Install optics covers
Stow COAS & lock in mount

V25 N17E (load PAD burn att)
V63E

GDC ALIGN TO IMU

Set ASCP tw to PAD burn att

12 P41 - RCS THRUSTING
V37E 4TE

13 F 50 18 REQ MNVR TO BURN ATT (.01°)

DBD/RATE - MIN/LOW
BMAG MODE (3) - ATT 1/RATE 2
SC CONT - CMC/AUTO (opp quads failed)
or - SCS (adj quads failed)
ENTR

The V49E mnvr is req'd because the P41 computed attitude is not optimal for the quads failed cases.

SXT star should be within SXT FOV.
If not, GNCS is NO-GO.

Displays correct error needles during thrust.
Displays difference between present attitude and N17,
the burn attitude.

Provides for backup attitude error display if GNCS fails.

The CMC computed attitude is not valid when two RCS quads are failed; bypass the auto mnvr.

55:00m
14 06 85 VGX,Y,Z (.1fps)

EMS - ΔV SET/STBY
SET ΔVC
EMS FUNC - ΔV
If adjacent quads failed:
AUTO RCS SEL (2) - switch OFF
the appropriate roll jets
Quads failed: A-B A-D B-C C-D
Disable: D2&C1 B1&C2 A2&D1 A1&B2

58:00 RHC #2 - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET

59:00 EMS MODE - NORMAL

15 59:25 DSKY BLANKS

59:30
16 16 85 VGX,Y,Z(AVE G ON) (.1fps)

00:00
17 F 16 85 REQ NULL VGX,Y,Z (.1fps)

Adjacent quads failed:
Trim largest initial VG to ±.2
A-B THC - +Y
A-D THC - -Z (-Y)
B-C THC - +Y (+Z)
C-D THC - +Z
Opposite quads failed:
Trim VGX to ±.2
THC - +X and cycle in following
direction:
Quads failed Direction
A-C +Z to control pitch
B-D +Y to control yaw
*If GNCS NO-GO *
* FDAI SELECT - 1 *
* Terminate burn on time*

Verify EMS ΔV CTR ~ZERO

EMS ΔV counter set with pad ΔVC.

The SCS will automatically hold attitude. As spacecraft weight decreases, c.g. may shift, requiring thrusting in the parenthesized direction for automatic SCS attitude control.

Maintain burn attitude by cycling THC in appropriate direction.

EMS ΔV counter should be zero at end of burn.

21

If deorbit burn:

Go to step 22

If shaping burn:AUTO RCS SEL (2) - enable appropriate
roll jets (adj quads failed only)Quads failed: A-B A-D B-C C-D
Enable: D2&C1 BT&C2 A2&D1 AT&B2

Go to ENTRY VEHICLE PREP, pg E/4-1

22

CM RCS CHECKAUTO RCS SEL A/C ROLL (4) - OFF
(verify)

cb RCS LOGIC (2) - close (verify)

SC CONT - CMC/FREE

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

*If both rings failed: *

* MNVR to 0°, __, 0° *

* Just before CM/SM SEP:*

* Roll right ~20°/sec *

23

MNVR TO CM/SM SEP ATT (ASAP)

DBD/RATE - MIN/HIGH

SC CONT - SCS

BMAG MODE (3) - ATT 1/RATE 2

ROLL to 180° (hds up)

YAW right to 315°

24

PRELOAD ENTRY BATTERIES

MN BUS TIE (2) - on (up)

Go to ENTRY, pg E/7-1

Control may be SCS/MIN IMP at option of crew.

MIN IMP may not produce audible jet firing. More than one cycle may be req'd to clear lines of residuals and allow propellant to jets.

If MIN IMP, use >1 cycle.

CM/SM SEP should be accomplished ASAP after deorbit. If delayed to within 8 min of EI, recontact may occur.

Monitor bat bus current increase.

MANEUVER UPDATE (P30)														
PURPOSE														
N33 HR MIN SEC	+	X	X			+	X	X						
	+	X	X	X		+	X	X	X					
	+	X				+	X							
N81 LOCAL	ΔVX	X				X								
VERT	ΔVY	X				X								
	ΔVZ	X				X								
N22 R	P	+			0 0	+				0 0				
	Y	+			0 0	+				0 0				
	ΔVC	X	X			X	X							
	BT	X	X			X	X							
	ΔV ₇₀	X	X			X	X							
ULLAGE: _____ SECS _____ QUADS														
N47 WT	+					STAR	X	X	X	X		GDC R		
N48 PT	X	X				SFT	+				0	P		
YT	X	X				TRN	+				0 0	Y		
REMARKS: _____														

MANEUVER UPDATE (P30) PAD DESCRIPTION

- a. GMT of ignition (GMTI) in noun 33 display
- b. Change in velocity components in noun 81 display
- c. Ground calculated S/C burn attitude relative to the IMU at GMTI called by V49 N22
- d. EMS ΔV counter load (ΔVC)
- e. Burn duration (BT)
- f. Change in velocity necessary to lower perigee below 70 nm (ΔV₇₀)
- g. Ullage duration, and number of quads (2 or 4) used
- h. Vehicle weight, and pitch and yaw trim engine gimbal angles, for DAP data load
- i. Star number, and optics shaft and trunnion angles
- j. GDC align angles for failed IMU

MANEUVER UPDATE (P30)														
PURPOSE														
N33 HR	+	X	X			+	X	X						
MIN	+	X	X	X		+	X	X	X					
SEC	+	X				+	X							
N81 LOCAL ΔVX		X					X							
VERT ΔVY		X					X							
ΔVZ		X					X							
N22 R	+			0	0	+			0	0				
P	+			0	0	+			0	0				
Y	+			0	0	+			0	0				
ΔVC	X	X				X	X							
BT	X	X				X	X							
ΔV70	X	X				X	X							
ULLAGE: _____ SECS _____ QUADS														
N47 WT	+					STAR	X	X	X	X	GDC R			
N48 PT		X	X			SFT	+			0	P			
YT		X	X			TRN	+			0	0	Y		
REMARKS: _____														

MANEUVER UPDATE (P30)														
PURPOSE														
N33 HR	+	X	X			+	X	X						
MIN	+	X	X	X		+	X	X	X					
SEC	+	X				+	X							
N81 LOCAL ΔVX		X					X							
VERT ΔVY		X					X							
ΔVZ		X					X							
N22 R	+			0	0	+			0	0				
P	+			0	0	+			0	0				
Y	+			0	0	+			0	0				
ΔVC	X	X				X	X							
BT	X	X				X	X							
ΔV70	X	X				X	X							
ULLAGE: _____ SECS _____ QUADS														
N47 WT	+					STAR	X	X	X	X	GDC R			
N48 PT		X	X			SFT	+			0	P			
YT		X	X			TRN	+			0	0	Y		
REMARKS: _____														

HYBRID RCS DEORBIT BURN

(hrs:min)
1 +__:__h ENTRY VEHICLE PREPARATION - complete
2 P30 - EXTERNAL ΔV
V37E 30E
3 F 06 33 GMTI (hrs,min,.01sec)
Load desired TIG
PRO
4 F 06 81 ΔVX,Y,Z(LV) (.1fps)
Load desired ΔV's (Do not use all 0's)
PRO
5 F 06 42 HA,HP,ΔV(req'd) (.1nm,.1fps)
PRO
6 F 16 45 MARKS,TFI,MGA (marks,min-sec,.01°)
Set DET counting up to GMTI
PRO
7 F 37 00E
8 SEPARATION CK LIST
PRIM GLY TO RAD - BYPASS (pull)
REPRESS PKG vlv - FILL to 865-935,
then ON
02 SM SUPPLY vlv - OFF
SURGE TK - ON (verify)
CAB PRESS REL vlv (2) - NORM
(5) cb WASTE H2O/URINE DUMP HTR (2) - open
cb ECS PRIM RAD CONTR MNA/B (2) - open
POT H2O HTR - OFF
GLY EVAP TEMP IN - MAN
ABORT SYS PRPLNT - RCS CMD (verify)

Stored VG components along local vertical axes
at GMTI.

MARKS not applicable.
MGA is middle gimbal angle at GMTI. MGA set to
-00002 if REFSMMAT flag not set

Assures CM 02 supply full before CM/SM SEP.

Removes power from glycol mixer to conserve battery
power.

9

CM RCS CHECK

AUTO RCS SEL A/C ROLL (4) - OFF
 (verify)
 cb RCS LOGIC (2) - close (verify)
 SC CONT - CMC/FREE
 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

Control may be SCS/MIN IMP at option of crew.

MIN IMP may not produce audible jet firing. More than one cycle may be req'd to clear lines of residuals and allow propellant to jets.
 If MIN IMP, use >1 cycle.

10

RCS THRUSTING PREP

Load DAP, 11102, X1111
 AUTO RCS SEL A/C ROLL (4) - MNA/B
 FDAI SCALE - 5/1
 MAN ATT (3) - RATE CMD
 RHC PWR NORMAL #1 & #2 - AC/DC
 RHC PWR DIRECT #1 & #2 - MNA/B
 BMAG MODE (3) - RATE 2
 SC CONT - CMC/AUTO

11

MNVR TO PAD BURN ATT (HDS DN)
 V49E (load N22 with PAD values) (.01°)
 R _____ (0°)
 P _____ (XXX°)
 Y _____ (0°)

Constrains roll to be zero.

12

IMU CK

P52 (OPT 3) AUTO OPTICS TO STAR
 (Limit: SXT FOV, GNCS GO/NO-GO)
 Exit 06 92, V37E 00E

SXT star should be within SXT FOV.
 If not, GNCS is NO-GO.

Stow optics eyepieces
 Install optics covers
 Stow COAS & lock in mount

13

GDC ALIGN TO IMU

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

Prepares CMC to display astronaut total attitude error
on FDAI 1 for attitude mnvr to CM burn attitude.

14

PRELOAD ENTRY BATTERIES

MN BUS TIE (2) - on (up)

Prepares EPS to switch from SM batteries to CM batteries.
Verify battery bus A & B currents increasing and/or
battery voltage decreasing.
The fuel cells were powered down after docking.

VHF AM (A & B) - off (ctr)
(5) cb WASTE H2O/URINE DUMP HTR (2) - open
POT H2O HTR - OFF
GLY EVAP TEMP IN - MAN

15

P41 - RCS THRUSTING

V37E 4TE

16 F 50 18 REQ MNVR TO BURN ATT (HDS DN) (.01°)
(AUTO) PRO

17 06 18 AUTO MNVR TO FDAI RPY (.01°)

18 F 50 18 REQ TRIM MNVR (.01°)

Change S/C roll, if req'd
(TRIM) PRO
DBD/RATE - MIN/LOW
BMAG MODE (3) - ATT 1/RATE 2
GDC ALIGN
ENTR

DATE 2/7/73

PAGE E/13-5

55:00m
19 06 85

VGX,Y,Z (.1fps)
EMS - ΔV SET/STBY
Set ΔV for SM burn = ΔVC pad +100.0
EMS FUNC - ΔV
S BD OMNI ANT - C
Cue STDN if in contact
SECS LOGIC (2) - on (up) (verify)
STDN confirm GO to PYRO ARM (if poss)
SECS PYRO ARM (2) - on (up)
CM RCS LOGIC - on (up)
PRIM GLY TO RAD - BYPASS (verify)
MN BUS TIE (2) - on (up) (verify)

58:00 RHC #1, #2, & THC - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET

TIG -2 min

HORIZ CK - Horiz on _____ (36°)
window mk (hds dn) (Limit:
+3°, GNCS GO/NO-GO)
If NO GO, set tw to pad burn att
* SC CONT - SCS *
* Track horiz with _____ (32°) *
* window mk (hds dn) *
* At TIG -1 min, *
* Hold att *
* GDC ALIGN pb - push *
* Redo step 13 after burn *

59:00 EMS MODE - NORMAL
THC PWR - on (up)

59:25
20 DSKY BLANKS

59:30
21 16 85 VGX,Y,Z(AVE G ON) (.1fps)

TIG -2 min HORIZ CK window mk will be
in mnvr pad remarks. TIG -1 min horiz
track window mk is 4° less. TIG burn
att window mk is 8° less.

00:00 Horiz on _____ (28°) window mark (hds dn)

22 F 16 85 REQ NULL VGX,Y,Z (.1fps)

Burn EMS ΔV CTR to +100.0
Monitor SM RCS fuel quantity
(all tanks)

RCS IND sw - TK PRESS/QTY
RCS IND sel - SM QUAD A,B,C,D,PSM 1
If fuel qty <TBD%, terminate thrust

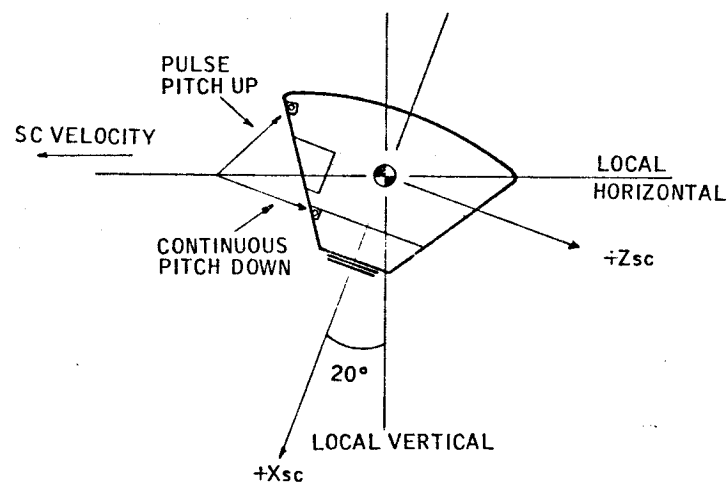
RATE - HIGH
SC CONT - SCS
(8) cb ELS/CM-SM SEP (2) - close
CM/SM SEP (2) - on (up)
MAN ATT PITCH - ACCEL CMD
V63E (N17, CM burn att)
*If CMC NO-GO: *
* FDAI SOURCE - ATT SET*
* FDAI SEL - 1 or 2 *
* ATT SET - GDC *
C/W MODE - CM
RCS TRNFR - CM
Monitor V MNA/B:
If <25 vdc, go to EMERG POWER DOWN
MNVR TO CM BURN ATT (NULL ERR NEEDLES)
R 0°
($\theta \sim 290^\circ$) P ($\sim 110^\circ$ from SM burn att)
Y 0°
CM RCS LOGIC - OFF

23 CM RCS BURN

FDAI SCALE - 5/5
RHC #1 - Continuous pitch down
RHC #2 - Modulate pitch
to null needles
Burn VGZ to +.2
*If only 1 RHC *
* Pulse +P = 5° from retro att*
* Maintain rates <3°/sec *

Must maintain at least 3 fps of available SM ΔV for CM-SM separation.

Establishes attitude error needle display.



CM RCS DEORBIT BURN ATTITUDE

There is 80 fps of CM RCS for a hybrid deorbit, which leaves enough RCS in each ring for a guided entry. Negative pitch jets have approx 25% less authority due to location of the jets relative to the CM c.g.

24 F 16 44 V82E
 HA,HP,TFF (.1nm,min-sec)

Check capture HP <TBD nm:
 *If >, continue burn until < *
 Check CM RCS He TK PRESS:
 RCS IND sel - CM1, CM2
 If both rings <2000 psia:
 * NO-GO for guided entry *
 * (Go ballistic) *

PRO

25 F 16 85 VGX,Y,Z (.1fps)
 Record

PRO

EMS - OFF/STBY
 MAN ATT (3) - MIN IMP
 RHC #1 - LOCKED
 RHC PWR NORMAL #1 - OFF
 RHC PWR DIRECT #1 - OFF
 THC - LOCKED
 THC PWR - OFF
 BMAG MODE (3) - RATE 2
 AUTO RCS SEL A/C ROLL (4) - OFF
 cb DIRECT ULLAGE (2) - open
 TAPE RCDR - off (ctr)
 PCM BIT RATE - LOW

He source pressure for a guided entry: below 2000 psia (up from 1650 psia on Apollo) go ballistic. This is based on 30 lbs of RCS in each ring with a He bottle temperature of 50°F prior to arming the RCS. The 2000 psia figure increases to 2150 psia at 70°F.

RCS BURN STATUS

AFTER BURN				
FDAI (ONLY IF NOT AT BURN ATT)	R	+		⊗
	P	+		⊗
	Y	+		⊗
N85	VGX		0 0	•
	VGY		0 0	•
	VGZ		0 0	•
EMS	ΔVC		⊗	•

26 F 37

OOE

When COMP ACTY 1t out:
V66E

27

Configure CM RCS
for single-ring entry

Go to ENTRY, pg E/7-1)

Transfers CSM SV to OWS slots. Do not do
when average G is running. Do not do
unless satisfied that CSM SV is good.

Single-ring operation (and switching to the other
ring if the first fails) following a hybrid deorbit
maximizes RCS capability.

BLOCK DATA

TIG DAY	X	X	X				X	X	X			
HR	X	X	X	X			X	X	X	X		
MIN	X	X	X	X			X	X	X	X		
SEC	X	X	X	X			X	X	X	X		
ΔVC	X	X					X	X				
BT	X	X					X	X				
GDC ALIGN R	X	X	X				X	X	X			
TW P	X	X	X				X	X	X			
SETTINGS Y	X	X	X				X	X	X			
BRN ATT GDC FDAI	R, P, Y						0°, 180°, 0°					
RET .05G	X	X					X	X				
RTOGO .05G	+						+					
VIO .05G	+						+					
RET EI	X	X					X	X				
LAT		0						0				
LONG												

REMARKS: _____

REMARKS: _____

BLOCK DATA PAD DESCRIPTION

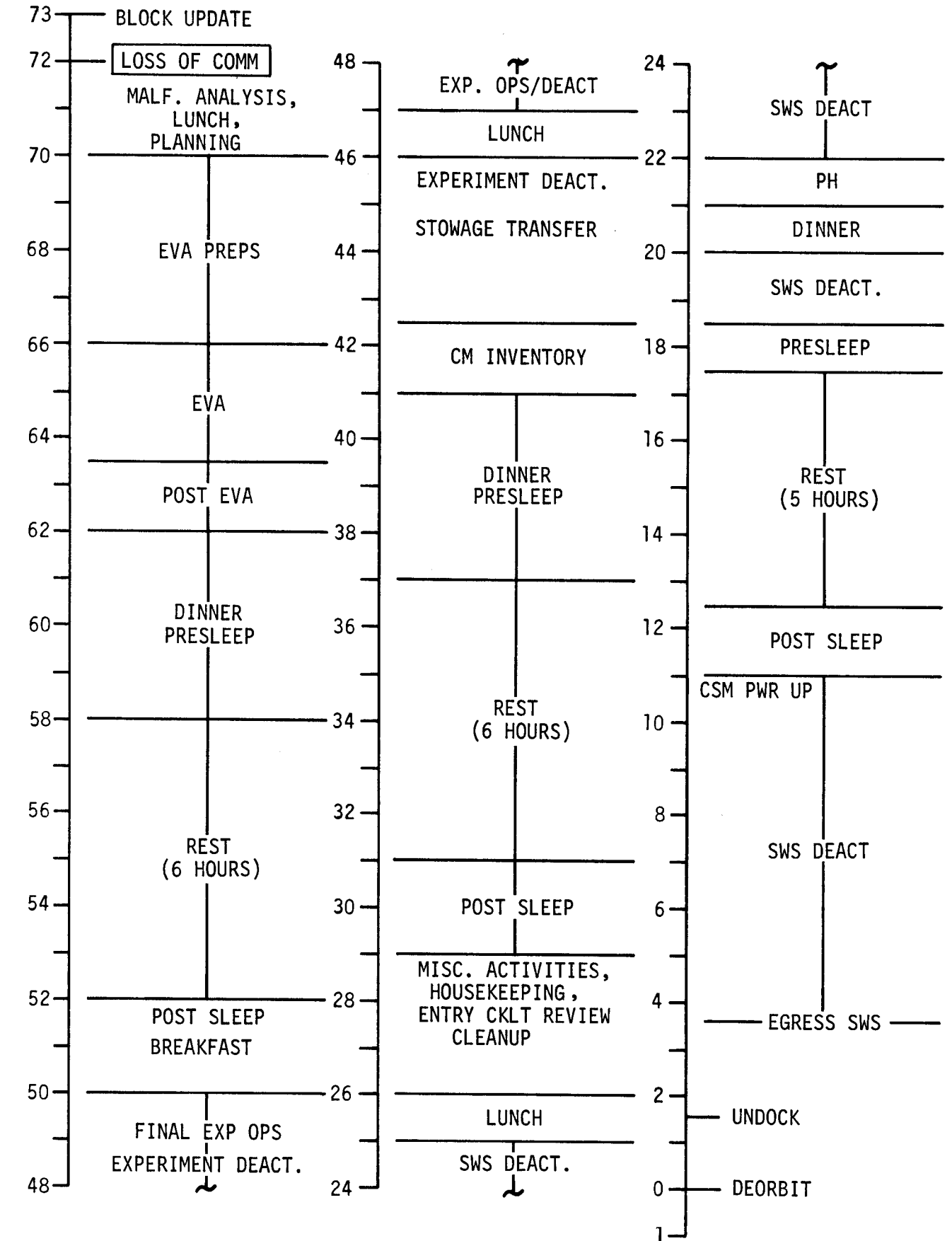
- a. Block data pads provide a single impulse deorbit capability in the event of communications failure or rapid deorbit requirements
- b. Deorbit burn ignition time (TIG) referenced to GMT in Julian days (i.e., 1 January = day 1)
- c. Deorbit burn velocity change, fps (ΔVC)
- d. Deorbit burn duration (BT)
- e. Backup GDC align attitude; R, P, & Y
- f. GDC burn attitude is 0°, 180°, 0°
- g. .05G time referenced from retroburn (RET .05G)
- h. EMS initialization value for range-to-go at .05G (RTOGO .05G)
- i. EMS initialization value of inertial velocity at .05G (VIO .05G)
- j. Entry interface (400,000-ft altitude) time referenced from retroburn (RET EI)
- k. Target latitude and longitude of splashdown

BLOCK DATA												
TIG DAY	X	X	X				X	X	X			
HR	X	X	X	X			X	X	X	X		
MIN	X	X	X	X			X	X	X	X		
SEC	X	X	X	X			X	X	X	X		
ΔVC	X	X					X	X				
BT	X	X					X	X				
GDC ALIGN R	X	X	X				X	X	X			
TW P	X	X	X				X	X	X			
SETTINGS Y	X	X	X				X	X	X			
BRN ATT GDC FDAI				R, P, Y			0°	180°	0°			
RET .05G	X	X					X	X				
RTOGO .05G	+						+					
VIO .05G	+						+					
RET EI	X	X					X	X				
LAT		0						0				
LONG												
REMARKS: _____												
REMARKS: _____												

BLOCK DATA												
TIG DAY	X	X	X				X	X	X			
HR	X	X	X	X			X	X	X	X		
MIN	X	X	X	X			X	X	X	X		
SEC	X	X	X	X			X	X	X	X		
ΔVC	X	X					X	X				
BT	X	X					X	X				
GDC ALIGN R	X	X	X				X	X	X			
TW P	X	X	X				X	X	X			
SETTINGS Y	X	X	X				X	X	X			
BRN ATT GDC FDAI				R, P, Y			0°	180°	0°			
RET .05G	X	X					X	X				
RTOGO .05G	+						+					
VIO .05G	+						+					
RET EI	X	X					X	X				
LAT		0						0				
LONG												
REMARKS: _____												
REMARKS: _____												

3-DAY LOSS OF COMM TIMELINE

TIME FROM
DEORBIT BURN



SPS SINGLE IMPULSE DEORBIT BURN AND ENTRY (NO COMM)

WHEN NO COMM OCCURS

- 1 Copy BLOCK DATA PAD (pg E/15-1) from
Teleprinter BLOCK DATA PAD.

- 2 Make the following changes to the
Deactivation Checklist:
 - pg 2-10 Delete: E-MEMORY DUMP
Delete: UPLINK/UPDATE
Add: BACKUP CMC CLOCK
INITIALIZATION
(G/2-14)
 - pg 2-18 Add: V41 N20, Coarse
Align (no dumps)
IMU to (GDC to
ATM) PAD angles,
V40E, then P51
 - pg 2-20 Delete: SXT P52 IMU REALIGN
(OPT 1)
 - pg 2-40 Delete: UPLINK/UPDATE
 - pg 2-68 Delete: P30 EXTERNAL ΔV
(SEP BURN)
 - pg 2-69 Delete: CSM UNDOCKING PREP
(ENTRY C/L)
Add: Go to SPS SINGLE
IMPULSE DEORBIT
BURN AND ENTRY
(NO COMM) (ENTRY
C/L)

DURING NO COMM SWS DEACTIVATION

Perform the following procedures prior to completion of the Deactivation Checklist.

- 1 CM RCS PREHEAT
If sys test mtr 4b,5b,6b,7b,8b,9b
all read 1.5 vdc (40°F) or more,
omit preheat:
(8) cb RCS LOGIC (2) - close
(2) CM RCS LOGIC - on (up)
(8) cb CM RCS HTRS (2) - close
(101) CM RCS HTRS - on (up) (PLT confirm)
(Monitor manf press for press drop)
- 2 DON MAE WESTS
- 3 SET UP CAMERA
CM4/DAC/18/CIN - BRKT, MIR
(T16,250,7) 12 fps, MAG K
- 4 FINAL STOWAGE
ORDEAL
FDAI (2) - INRTL
PWR - OFF
(377) GLY TO RAD SEC vlv - BYPASS (CCW) (verify)
Attach both strut unlock lanyards
- 5 TERM. CM RCS PREHEAT (If initiated)
(101) CM RCS HTRS - OFF (SPT confirm)
(2) CM RCS LOGIC - OFF
(8) cb CM RCS HTRS (2) - open

Checks CM RCS 12,14,16,21,23 and 25 jet injector valve temperatures, respectively.

Energizes RCS logic bus.

Direct coils utilized for preheating jets, (15 min).

Configures camera for fireball photography.

6

PYRO BATT CK
 (229) cb PYRO BUS A
 PYRO BAT A - close (verify)
 cb PYRO BUS B
 PYRO BAT B - close (verify)
 DC IND - PYRO BAT A (B)
 If PYRO BAT A(B) <31.5 vdc:
 * cb PYRO BUS A(B) PYRO BAT*
 * A(B) - open *
 * cb PYRO BUS A(B) BAT BUS *
 * A(B) - close *
 (275) cb MNA BAT C - close
 cb MNB BAT C - close
 DC IND - MNB

Replaces failed pyro battery with entry battery.

Applies entry battery C to both main buses when
 MN BUS TIE switches are on.

7

RSI ALIGNMENT
 FDAI SOURCE - ATT SET
 ATT SET - GDC
 EMS ROLL - on (up)
 GDC ALIGN pb - push & hold
 YAW tw - Position RSI thru 45° &
 set to HDS DN (lift vector up) or
 to HDS UP (lift vector down)
 att per ENTRY UPDATE PAD
 GDC ALIGN pb - release
 EMS ROLL - OFF
 Align GDC to IMU
 FDAI SOURCE - CMC

RSI ALIGNMENT is performed even if RSI alignment is
 correct in order to check operation of RSI.

UNDOCKING & SEP

Time to DEORBIT
(hrs:min)

1

CSM UNDOCKING

PAD UNDOCKING GMT
__:__:__

: h
50:00DET

Start DET counting up to undocking
Load DAP, 11103, X1111
V46E
Set $\Delta VC = +100.0$

EMS FUNC - ΔV
MAN ATT (3) - RATE CMD
DBD/RATE - MIN/HIGH

RHC PWR NORMAL #2 - AC/DC
RHC PWR DIRECT #2 - MNA/B
THC PWR - on (up)
SC CONT - CMC/FREE
BMAG MODE (3) - RATE 2
SPOT LIGHT - ON
AUTO RCS SEL (16) - MNA/B
cb DOCK PROBE (2) - close
RHC #2 & THC - ARMED

59:30

EMS MODE - NORMAL

00:00

PROBE EXTD/REL - EXTD REL
tb - bp/then gray
PROBE EXTD/REL - RETR
PROBE EXTD/REL - OFF
Note EMS ΔVC
*If EMS $\Delta VC < 100.4$, *
* Thrust -X for 2 sec*
EMS - OFF/STBY
THC PWR - OFF
RHC #2 & THC - LOCKED
CMC MODE - AUTO

PAD UNDOCKING GMT corresponds to orbit midnight.

If ΔV counter is set at 0.0, logic race causes counter to jump when acceleration is sensed.

Selects 4° deadband which can be used for roll & yaw attitude hold during coast periods.

CMC/FREE req'd to prevent -X jets from firing close to SWS.

Hold ~5 sec until undock verified, but <20 sec.
Expected separation ΔV is 0.38 to 0.51 fps.
Provides capture latch tb's if redocking necessary.

Need to verify sufficient separation ΔV .

ENTRY VEHICLE PREP

- 1 Set DET counting up to TIG
- 2 PRIMARY WATER EVAP ACTIVATION
GLY EVAP H2O FLOW - AUTO
GLY EVAP STM PRESS - AUTO
PRI ECS GLY PUMP - ACT (verify)
- 3 SEC WATER EVAP ACTIVATION
ECS IND sel - SEC
SEC COOL LOOP PUMP - AC2
(2) SEC EVAP H2O FLOW - AUTO
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
- 4 SYSTEMS TEST PANEL CONFIGURATION
SYS TEST METER - 3B (BAT RLY BUS)
(100) LEB FLOOD & INTGL LIGHTING - OFF
- 5 PANEL 8 CB CHECK
See diagram pg E/4-5
- 6 CM RCS ACTIVATION
cb SECS ARM (2) - close
SECS LOGIC (2) - on (up)
SEC PYRO ARM (2) - on (up)
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

Obtain TIG from BLOCK DATA PAD.

Indicates fuel and oxidizer isolation valves open.

SPS DEORBIT BURN

DEORBIT BURN TABLE (TBD)

1 MNVR TO PAD BURN ATT (HDS DN) (.01°)
V49E
R 0°
P 180°
Y 0°

2 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
(5) cb WASTE H2O/URINE DUMP HTR (2) - open
 cb ECS PRIM RAD CONTR MNA/B (2) - open
 POT H2O HTR - OFF
 GLY EVAP TEMP IN - MAN

ABORT SYS PRPLNT - RCS CMD (verify)

Assures CM 02 supply full before CM/SM SEP.

Removes power from glycol mixer to conserve battery power.

3 Go to SPS BURN-ENTRY CUE CARD (SCS DELTA)

CUE CARD horizon check still applies.

SPS BURN STATUS (TBD)

4 CM RCS CHECK
AUTO RCS SEL A/C ROLL (4) - OFF
(verify)
cb RCS LOGIC (2) - close (verify)
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
*If both rings failed: *
* MNVR to 0°, , 0° *
* Just before CM/SM SEP:*
* Roll right ~20°/sec *

MIN IMP may not produce audible jet firing. More than one cycle may be req'd to clear lines of residuals and allow propellant to jets.

5 MNVR TO CM/SM SEP ATT (ASAP)
MAN ATT (3) - RATE CMD
BMAG MODE (3) - ATT 1/RATE 2
YAW left 45° from burn att (315°)

CM/SM SEP should be accomplished ASAP after deorbit. If delayed to within 8 min of EI, recontact may occur.

ENTRY

1

CM/SM SEP & PRE-ENTRY MNVR

cb ELS/CM-SM SEP (2) - close
cb DOCK RING SEP (2) - close
VHF AM (A & B) - off (ctr)
PRIM GLY TO RAD - BYPASS (verify)
EMS MODE - STBY (verify)
CM RCS LOGIC - on (up)
SECS LOGIC (2) - on (up) (verify)
SECS PYRO ARM (2) - on (up)
MN BUS TIE (2) - on (up) (verify)

CM/SM SEP (2) - on (up)
DOCK RING SEP (2) - on (up)
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
Monitor V MNA/B

If <25 vdc go to EMERG POWER DOWN

YAW back to 0°
Track horiz on 29° window mark
hds dn until .2G

2

EMS INITIALIZATION

EMS FUNC - TEST 5
Verify scroll on 37K fps
EMS FUNC - RNG SET
Set RNG to PAD DATA RTOGO
EMS FUNC - Vo SET
Slew scroll to PAD DATA VIO
EMS MODE - STBY
EMS FUNC - ENTRY
Verify .05G lt filter is down

CM VHF antennas not available until apex cover jett.

Enables auto RCS transfer to CM/SM SEP.

Pyro bus should remain armed until splashdown because J series ELS pushbuttons are not single point failures.

Backup to auto transfer.

Removing filter improves visibility of .05G lt.

3

RSI ALIGNMENT

Verify correct RSI alignment

hds dn = 0°

hds up = 180°

FDAI SCALE - 5/5

RHC PWR DIRECT #2 - MNA/B (verify)

TAPE RCDR - HBR/RCD/FWD/CMD RESET

RET .05G

EMS MODE - BACKUP/VHF RNG

(.05G lt - on)

.05G sw - on (up)

EMS ROLL - on (up)

.2G

Roll to PAD bank angle

MAN ATT (3) - RATE CMD

4

1G

Fly EMS, no roll reversal

Monitor altimeter

Record EMS RTOGO _____ at EMS

SCROLL velocity = 4000 fps

EMS - OFF/STBY

Stop DAC

DAC - T11

Go to EARTH/POST LANDING, pg E/8-1

EMS is started manually at RET .05G to ensure start of range counter at a fixed position (range from target) as defined by RTCC.