

APOLLO 11

**ALTERNATE AND
CONTINGENCY CHECKLIST**

PART NO	S/N
SKB32100080-304	1001



GENERAL LOSS OF COMMUNICATIONS NAVIGATION PROCEDURES

1. TLI Plus 4 hrs Abort (detailed schedules provided)

A. Make abort burn.

B. Initialize W-Matrix at the first mark to value given on the detailed sighting schedule.

C. Initiate sighting as soon as possible after abort following the schedule given in the crew chart.

1. The horizontal lines represent the start of the sighting intervals.

2. The vertical lines represent stars which are available for use with P23.

3. The numbers adjacent to the vertical lines are the required sightings with the given star.

4. Only earth horizon marks will be made.

D. Crew charts are provided for each day to insure coverage for the entire daily launch window. The charts provide data for a short return time (25 hours or less) and for a long return time (greater than 25 hours); targets for aborts from trajectories other than those given on the crew charts are the same, but acquisition and loss times of the stars will differ.

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Changed June 27, 1969

NO COMM NAV

2. Lunar Orbit Aborts (Detailed schedules provided).

A. The first 17 hours and the last 25 hours of the schedule should not be changed.

B. The data in the middle of the TE leg may be moved around for rest periods and midcourse maneuvers.

C. Change to the EI chart at EI minus 40 hours.

D. The key for the detailed schedule is as follows:

1. Vertical solid line: Star/horizon combinations available for the earliest loss of communications TEI: 28 revolutions in lunar orbit, 72 degrees launch azimuth, first TLI opportunity.

2. Vertical dashed line: Star/horizon combinations available for a later TEI: 34 revolutions in lunar orbit, 108 degrees launch azimuth, second TLI opportunity.

3. Horizontal solid line: Start of a sighting interval.

4. The numbers and ascent to the vertical lines are the required sightings with the given star.

3. Loss of Communications during the nominal transearth trajectory.

The scheduled sightings and initial W-Matrices provided in the Flight Plan should be followed.

4. General TE optical navigation rules for cases not covered by Crew Charts and the Flight Plan.

A. A sighting is to consist of three marks.

B. A sighting interval is to consist of at least three star/horizon sightings, although as many as five are advisable (five should be used at the end of every sleep period). Observations using stars in the orbit plane should be emphasized. One sighting using an out-of-plane star ($\text{angle} > 45^\circ$ to the orbit plane) in every

five sets is sufficient. If only three stars are grouped together, all stars should be inplane.

C. The navigation sighting intervals should be scheduled so that, immediately following a period of length Δt , not to exceed 3 hours in a non-PTC mode, five times Δt should be spent in a PTC mode (thermal constraints), provided it does not interfere with navigation sightings which are essential for a safe entry.

D. The sextant calibration routine will be exercised at least every half hour while navigation sightings are in progress. The sextant calibration will be repeated until agreement of at least two checks (not necessarily sequential ones) are within 0.003° .

E. If an abort burn is performed during translunar coast, the W-Matrix will be initialized to 10,000 feet and 10 ft/sec for onboard processing of the transearth sighting data. Navigation sightings will be scheduled every 2.5 hours in the short return trajectory and only star/earth horizon marks will be made. The last sighting interval will be scheduled just after the last midcourse correction at EI minus 3 hours.

F. The transearth navigation sighting schedule in the flight plan is designed for a 60 hour return trajectory (30 revolutions in lunar orbit). If the return time is altered due to an early TEI because of communications loss or any other reason, the following rules are to be followed for setting up a navigation sighting schedule to ensure a safe entry.

1. TEI through TEI plus 17 hours

The nominal schedule is to be followed from TEI to TEI plus 17 hr. The first two batches of sightings are to be on the moon, and the second two batches are to be on the earth. They are scheduled at approximately TEI plus 1 hr 30 min, TEI plus 11 hr 30 min, TEI plus 13 hr, and TEI plus 15 hr. The corresponding sightings are shown in the flight plan.

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2. EI minus 25 hr through EI

The nominal scheduled is also to be followed from EI minus 25 hr to EI. The navigation sightings are scheduled at approximately EI minus 25 hr, EI minus 23 hr, EI minus 19 hr, EI minus 15 hr, EI minus 10 hr, EI minus 5 hr, and EI minus 2 hr 30 min. The corresponding central body for the star horizon sightings is shown in the flight plan.

3. TEI plus 17 hr through EI minus 25 hr

Between TEI plus 17 hr and EI minus 25 hr schedule two-thirds as many sightings as there are hours of coast during this period. Sightings should be scheduled in a ratio of 2 to 1 (earth to moon) with a minimum of 10 sightings during this coast period (i.e., if the time between TEI plus 17 hr and EI minus 25 hr is less than 18 hr, 10 sightings will be required).

G. Large state vector correction may be expected at the following times.

1. At initiation of tracking.
2. At the first switch of reference bodies.
3. After a long period of no sightings.
4. During the last hours of TE coast when the vehicle is near the earth.

If a large state vector correction (greater than 50 nautical miles in position and 50 feet per second in velocity) is displayed during the V06N49 display in P23, the mark should be rejected and repeated. If the large correction occurs again, it should be accepted and incorporated.

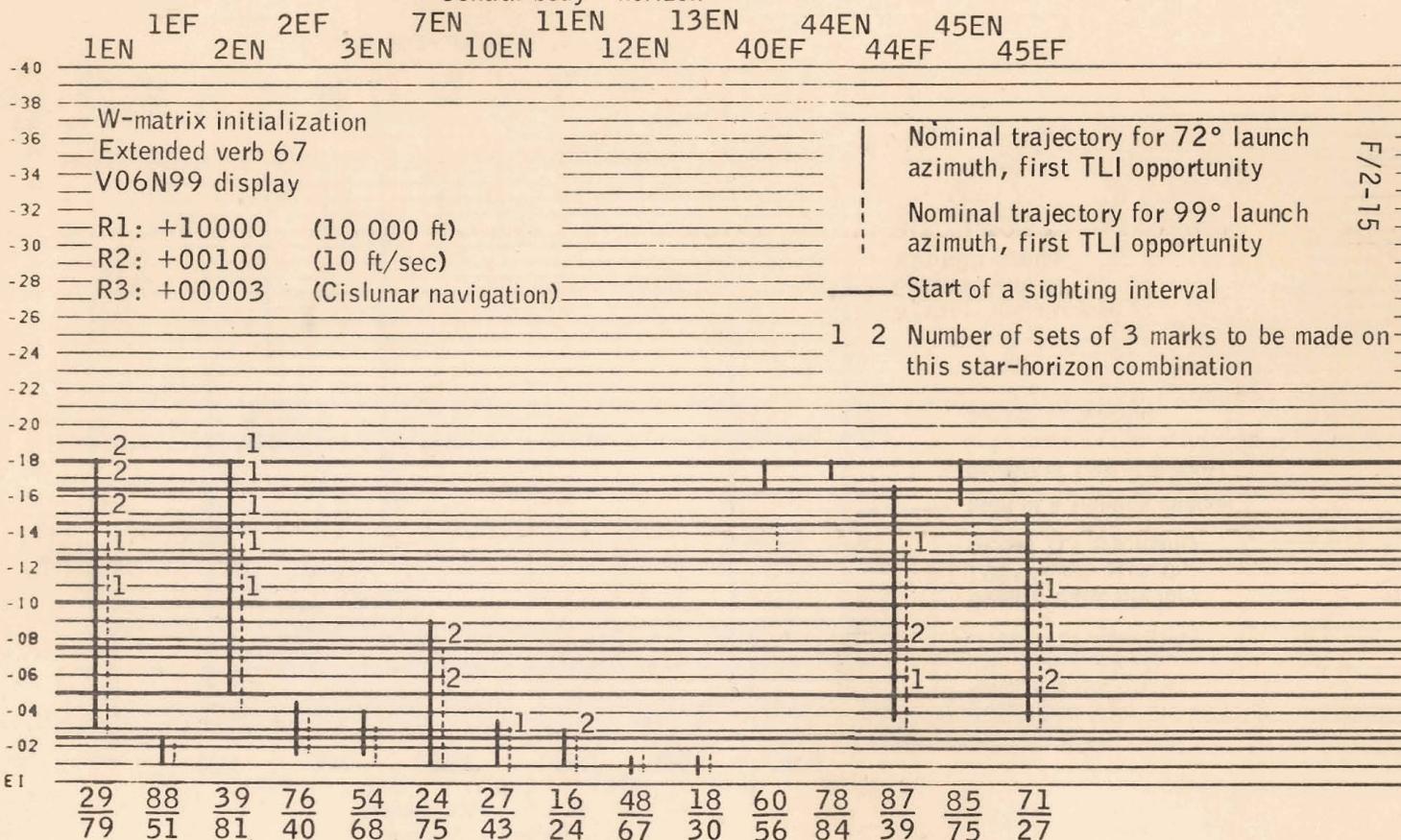
H. Star availability is directly related to the GMT of entry interface. In event of an abort not covered by a crew chart but having a GMT time of EI the same as that on a crew chart, the star availability from the crew chart may be used near the earth.

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Changed _____

Basic Date July 5, 1969 REV I

Changed
Star number (octal)

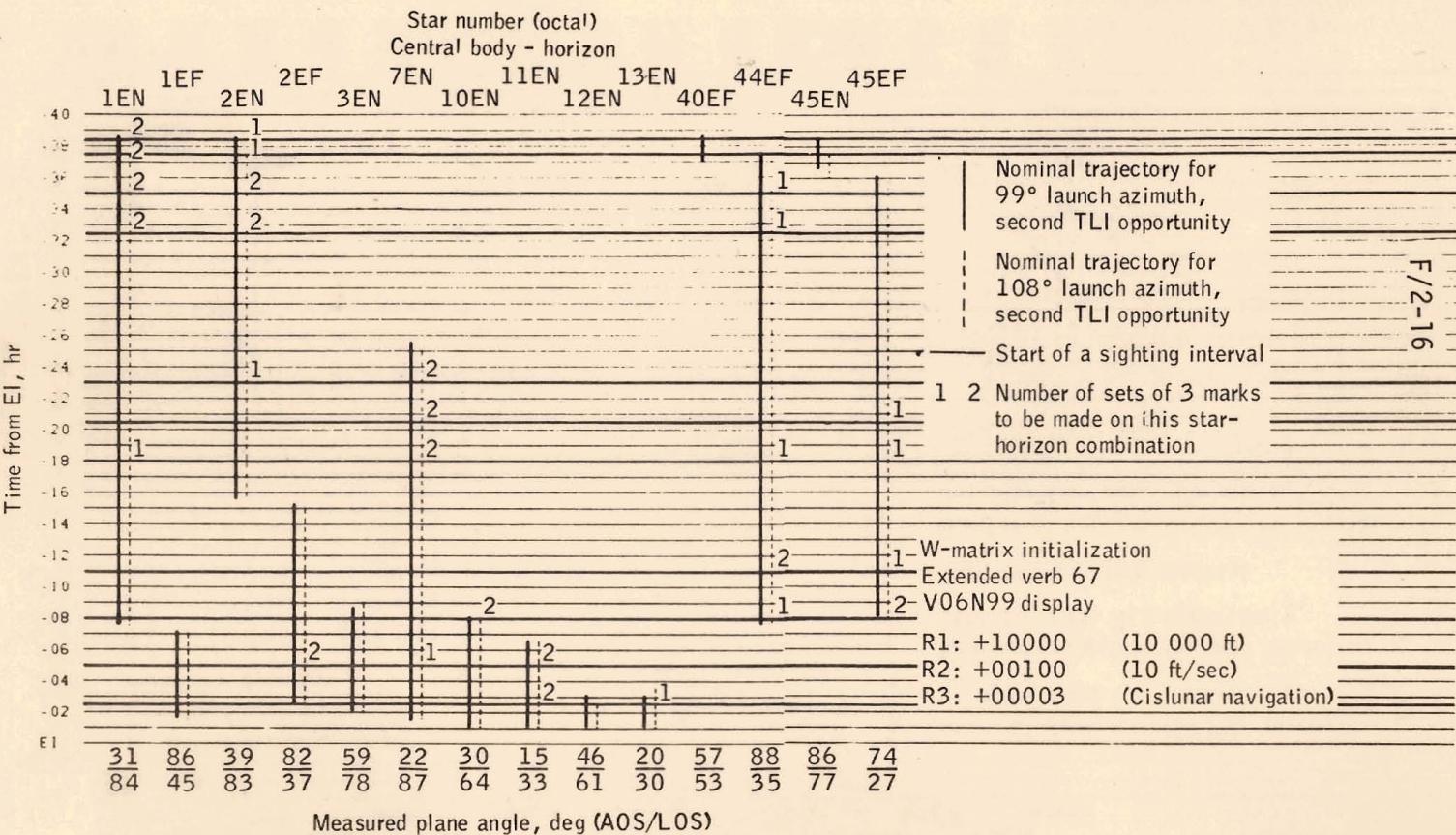
Central body - horizon



Measured plane angle, deg (AOS/LOS)

NAV SIGHTING
SHORT RETURN
16 JULY 1969

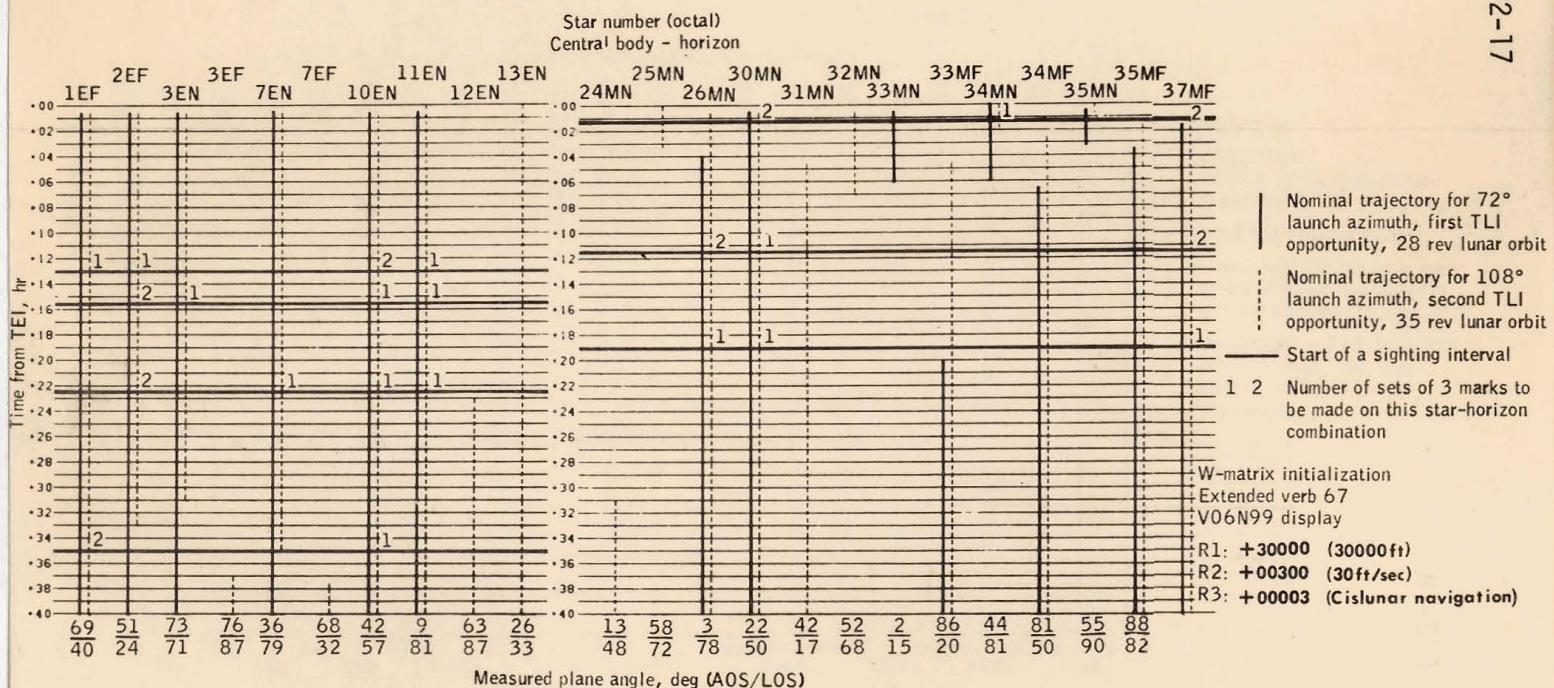
NAV SIGHTING
LONG RETURN
16 JULY 1969



Basic Date
Changed July 5, 1969 REV I

Basic Date _____
 Changed. Ju~~1~~⁵, 1969 REV I

F/2-17

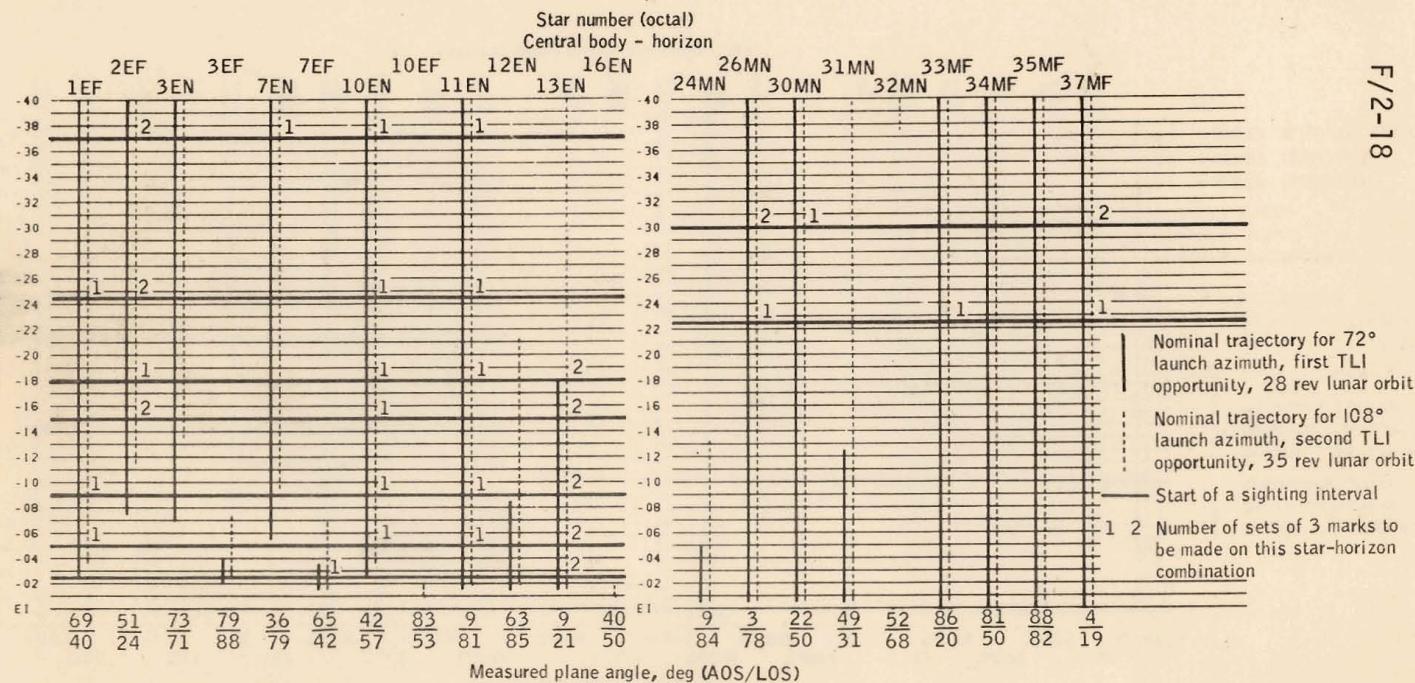


NAV SIGHTING
 TEI TO TEI + 40
 16 JULY 1969

NAV SIGHTING
EI - 40 TO EI
16 JULY 1969

F/2-18

Time from EI, hr



Basic Date _____
Changed July 5, 1969 REV I

ERASABLE LOAD UPDATE

IN THE EVENT OF PROG ALARM 1107 PERFORM THE FOLLOWING:

V21N1E 333E 10000E (DUMPCOUNT)

V74E (WAIT 3 MIN) (DUMP E MEMORY)

V36E

V48E (LOAD DAP AS DESIRED - USE

V46E LATEST KNOWN WEIGHTS) *1E*

V25N07E 77E 10000E (SET REFSMMAT)

V1N1E 104E (VERIFY CMOON FLAG AND LMOON FLAG)

(BITS 11 and 12 should be 0 in

EARTH SPHERE AND 1 IN MOON SPHERE) P52-OPTION

3-AUTO OPTICS

AUTO OPTICS SUCCESSFUL, REFSMMAT

VALID

AUTO OPTICS UNSUCCESSFUL, DO P51

V16 N65 VERIFY CMC CLOCK (UPDATE)

VERIFY E MEMORY (MAY BE USED WHEN DESIRED)

V1N1E

XXXXE (LOAD OID 2 OF UPDATE)

N15E, READ R1,E REPEAT FOR UPDATES A-~~R~~ *L*FOR UPDATE ~~A~~ *M*

VIN1E

1. XXXXE (LOAD EVEN OID'S)
2. READ R1,E (READ ODD OID'S IN R1)
3. RETURN TO 1

IN CASE OF A DISCREPANCY

LOAD THAT UPDATE AS A NORMAL P27

TO CHECK STATE VECTOR CALL P21

AND LOAD PRESENT TIME. WHEN COMP CYCLE

IS COMPLETE

VO6 N73E

READ R1 (R1 X 10=CURRENT ALT (NM))

COMPARE TO SOME KNOWN VALUE (E.G.FLIGHT PLAN)

IF ANSWER COMPARES - STATE VEOCTR IS OK AND
P23 SHOULD BE USED TO IMPROVE IT.IF GROSS ERRORS ARE OBSERVED, P23 IS UNLIKELY
TO CORRECT THEM. IN THIS CASE PERFORM

V71 LOAD OF LATEST PAD S.V. - SELECT

POO TO BRING S.V. TO PRESENT TIME.

Basic Date April 15, 1969
Changed May 5, 1969 REV I

F/2-20

	A	B	C	D	E	F	G
OID	V71 00021	V71 00015	V71 00013	V71 00023	V71 00023	V71 00024	V71 00024
02	01452	01706	01767	02000	02021	02042	02064
03	74267	00000	00001	00137	00001	00017	77650
04	00520	20017	30000	00763	03120	02707	67352
05	76188 01042	20616	00000	00023	00001	00053	77442
06	76540	30624	15514	00001	03120	10722	55253
07	01754 00256	01636	00552	00000	00301	00034	77247
10	77403	77777	02200	00000	36000	37215	64474
11	77432 00070	53172	15070	00471	00125	00020	77500
12	77663 00042	00000	12160	00364	06332	14142	75772
13	77746 77730	26056	03363	04400	00002	00135	75462
14	00435	37777		77775	21632	06210	46023

Basic Date _____
 Changed. July 5, 1969 REV I

Basic Date
Changed

	A	B	C	D	E	F	G
	V71	V71	V71	V71	V71	V71	V71
15	00137	37777		46355	00000	77716	00033
16	00023			77766	25276	70647	17456
17	77615			72372	04374	77746	77776
20	00071			77777	77774	60406	75725
21	00137			52552	72045	00064	76644
22				00002	00033	02353	70215
23				27422	30675	77536	04476
24						60066	04351

F/2-21

F/2-22

	H	I	J	K	L	M	S.V.
OID	V71 00024	V71 00022	V71 00024	V71 00021	V71 00010	V72 00017	
02	02106	02130	03000	03025	01351	00110	
03	02401	77014	00000 00436*	37777	06510	01153	
04	14466	44315	00000 02732*	00000	07025	01341	
05	10510	67365	00000	00000	00620	00005	
06	07453	73001	00000	54360	00000 00000	01477	
07	02536	16164	77777	21075	02134 27340	00000	
10	24014	27246	77777	37777	37777	02377	
11	01444	06126	00000 42757	60465		00142	
12	34353	34737	10510	00000		03022	
13	03772	57770	06477	54360		00232	
14	21412	77361	74414	21075		03376	

Basic Date _____
 Changed. July 5, 1969 Rev I

Basic Date 1/2/71
Changed

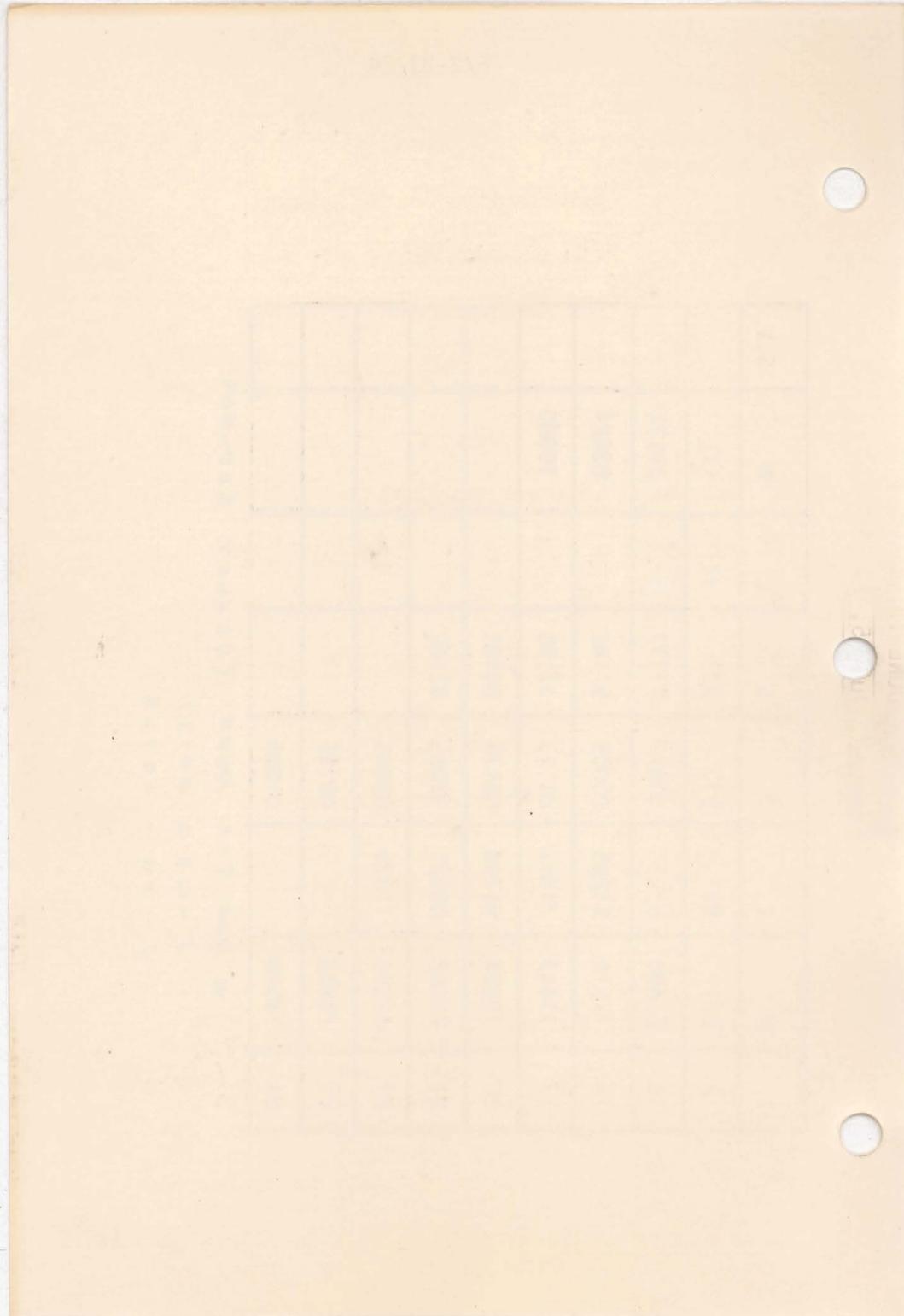
	H	I	J	K	L	M	S.V.
	V71	V71	V71	V71	V71	V72	
15	67600	67654	00077	37777		01637	
16	77510	43265	00005	57142		03424	
17	73443	74353	00123	33106		10000	
20	74224	56704	00175	50741			
21	72462	00521	37065	31162			
22	62354	17370	02245				
23	76253		00156				
24	73520		01000				

* FOR TLC ABORT (DIRECT RETURN):

J - 03 = 00137

J - 04 = 00763

F/2-23/24



SECTION 1. VEHICLE PREPARATION

For deorbits perform steps with "*" ; timeline is for
Lunar Return

- 1 *INITIAL STOWAGE COMPLETED
- 2 *CMC & ISS START UP pg F/2-1
- 3 *SCS POWER UP pg F/9-1
- 4 *P51 - IMU ORIENTATION pg F/6-1
- 5 *LOAD DAP
 V48E 11102, 01111, PRO, PRO, PRO
- 6 -06:00h LAST MCC DECISION
- 7 -05:35h NO COMM - P52 & NAV SIGHTINGS
- 8 *DON MAE WESTS & FOOT RESTRAINTS
- 9 ACTIVATE VHF FOR COMM CHECKS
- 10 -04:30h *P27 (SV, REFSMMAT), MNVR
 & ENTRY PAD UPDATES
- 11 -04:15h P52 - IMU REALIGN pg F/6-2
 (OPTION 1)
- 12 P37 (NO COMM ONLY)
- 13 *CABIN COLD SOAK (CREW OPTION) pg F/10-12
- 14 *ECS CKS
 O2 SUPPLY REFILL pg F/10-7
 PGA verification, (if suited) F/10-10
 ECS Monitor Ck pg F/10-4
 (382) EVAP H2O CONT PRI vlv - AUTO
 EVAP H2O CONT SEC vlv - AUTO
 SUIT HEAT EXCH SEC GLY - FLOW
- 15 *EPS CKS #1, 3, 4 (5 if req'd) pg F/10-2

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CSM 10 SUBS

1. VEH PREP
ENTRY

ENTRY

1. VEH PREP

16 *SPS CK (If req'd) pg F/10-1

17 *RCS CKS

SM RCS Monit Ck pg F/10-1

CM RCS Monit Ck pg F/10-1

18 *C&W SYS CK pg F/10-15

19 *CMC SELF CK pg F/2-2

20 *DSKY COND LT TEST pg F/8-1

21 -03:45h MIDCOURSE MANEUVER

P30 - EXT ΔV

-03:15h P40/41 - SPS/RCS THRUSTING

-03:00h MIDCOURSE (#7) BURN

Key V66E

-02:00h *LOGIC SEQUENCE CK

(8) cb SECS LOGIC (2) - close (verify)

cb SECS ARM (2) - close

cb ELS (2) - close

ELS LOGIC - on (up)

ELS - AUTO

Coordinate next 3 steps with MSFN

SECS LOGIC (2) - on (up)

MSFN confirm GO for PYRO ARM as req'd

SECS LOGIC (2) - OFF

cb SECS ARM (2) - open

ELS LOGIC - OFF

ELS - MAN

cb ELS (2) - open

22 NO COMM NAV SIGHTINGS

23 MNVR TO SUPERCIRCULAR ENTRY ATT _____ ° PITCH
V62E

23A V49E

23B F 06 22 DESIRED FINAL GMBL ANGLES (.01°)
LOAD ENTRY ATT PAD ANGLES
PRO

CSM 10 Subs

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23C F 50 18 REQ MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) SC CONT - CMC
BMAG MODE (3) - RATE 2
CMC MODE - AUTO

PRO
(MAN) SC CONT - SCS
MNVR to 23E

23D 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

23E F 50 18 REQUEST TRIM (.01°)
(TRIM) Go to 23C
(BYPASS) ENTR

SBD ANT-OMNI C

24 BORESIGHT & SXT STAR CHECK
OPT MODE - CMC
OPT ZERO - OFF

V41 N91E

F 21 92 SHAFT, TRUN (.01°, .001°)
Load SXTS angles

41 OPTICS DRIVE

CHECK SXT STAR
OPT ZERO - ZERO
CHECK BORESIGHT STAR (If avail)

25 -01:35h *P52 - IMU REALIGN pg F/6-2 (OPTION 3)
Record gyro torquing angles

R _____

P _____

Y _____

If $>1^\circ$, recycle P52

If confirmed, use SCS for EMS entry
OPTICS PWR - OFF

26(_____) *GDC ALIGN
If drift $>10^\circ/\text{hr}$, change rate source

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CSM 107 & Subs

27 -01:15h

E
1-4

*EMS ENTRY CHECK

EMS FUNC - OFF

(8) cb EMS (2) - close

EMS MODE - STBY

EMS FUNC - EMS TEST 1 (wait 5 sec)

EMS MODE - NORMAL (wait 10 sec)

Check ind lts - off

RANGE ind - 0.0

Slew hairline over notch

in self-test pattern

EMS FUNC - EMS TEST 2 (wait 10 sec)

.05G lt - on (all others out)

EMS FUNC - EMS TEST 3

.05G lt - on

RSI Lower lt - on (10 sec later)

Set RANGE counter to 58 nm \pm 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 \pm 0.2

EMS FUNC - EMS TEST 5

.05G lt - on

RSI upper lt - on (10 sec later)

RANGE ind - 0.0

Scribe traces vertical line 9g to 0.22 \pm 0.1

ALIGN SCROLL TO ENTRY PATTERN (on

37K ft sec line)

EMS FUNC - RNG SET

G-V scroll assy traces vert. line

0.22g to 0 \pm 0.1

EMS MODE - STBY

28

*EMS ΔV TEST (DEORBIT ONLY)

EMS FUNCT - ΔV SET/VHF RNG

Set ΔV ind to 1586.8 fps

EMS MODE - NORMAL

EMS FUNCT - ΔV TEST

SPS THRUST lt - on/off (10 sec)

ΔV ind stops at - 0.1 to -41.5

EMS MODE - STBY

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CSM 107 & SUBS

29

*PRIMARY WATER EVAP ACTIVATION

GLY EVAP H2O FLOW - AUTO

GLY EVAP STM PRESS - AUTO

PRI ECS GLY PUMP - AC1

30

*SEC WATER EVAP ACTIVATION (if NO cold soak)

ECS IND sel - SEC

SEC COOL LOOP PUMP - AC2

GLY DISCH SEC PRESS - 39-51 psig

SEC COOL LOOP EVAP - EVAP

SEC GLY EVAP OUT TEMP - 40 - 50.5°F

SUIT CKT HT EXCH - BYPASS 20 sec, OFF

ECS IND sel - PRIM

31 -01:10h

*CM RCS PREHEAT

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

- (8) cb RCS LOGIC (2) - close
- CM RCS LOGIC - on(up)

UP TLM CM - BLOCK (verify)

- (8) cb CM RCS HTRS (2) - close

- (101) CM RCS HTRS - ON (LMP Confirm)
 (20 min or til lowest rdg is
 3.9 vdc) (Monitor Manf
 press for press drop)

32

*FINAL STOWAGE

OPTICS (except for deorbits)

ORDEAL

- (377) GLY TO RAD SEC vlv - BYPASS (verify)

Verify COUCH STRUT disengaged

- (382) Cool pn1 installed

Y-Y struts (2) extended

Stow Data Box R-12

Attach both strut unlock lanyards

33 -00:50m

*TERM. CM RCS PREHEAT

UP TLM CM - BLOCK (verify)

- (101) CM RCS HTRS - OFF

CM RCS LOGIC - OFF

- (8) cb CM RCS HTR (2) - open

34

*SYSTEMS TEST PANEL CONFIGURATION

SYS TEST METER - 4B (BAT RLY BUS

3.4-4.1 vdc)

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CSM 10: SUBS

- (101) CM RCS HTRS - OFF (verify)
 WASTE H₂O DUMP HTR - OFF
 (101) URINE DUMP HTR - OFF

35 (100) LEB FLOOD & INTGL LIGHTING - OFF

36 *PYRO BATT CK

- (250) CB PYRO A SEQ A - close (verify)
 CB PRYO B SEQ B - close (verify)
 DC IND - PYRO BAT A(B)
 *If PYRO BAT A(B) < 35 vdc *
 (250) *cb PYRO A(B) seq A(B) - open*
 CB ~~*PYRO A(B)BAT BUS A(B)TO PYRO*~~
 * BUS TIE - close *
 [REDACTED]
 (275) cb MNA BAT C - close
 cb MNB BAT C - close
 DC IND - MNB
 PNL 8 - All cb's closed except:
 EDS BAT (3) - open (verify)
 PL VENT - open (verify)
 FLOAT BAG (3) - open (verify)
 SPS P&Y (4) - open (verify)
 CM RCS HTRS (2) - open (verify)
 DOCKING PROBE (2) - open (verify)
 DIRECT ULLAGE (2) - open

37 (_____) *FINAL GDC DRIFT CK (If req'd)

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

38 *CM RCS ACTIVATION

- (8) SECS LOGIC (2) - on(up)
 MSFN confirm GO for PYRO ARM(if poss)
 SECS PYRO ARM (2) - ARM
 CM RCS PRPLNT 1&2 - ON
 CM RCS PRESS - ON

E
1-7/8

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

39 -00:45m

P27 & ENTRY PAD UPDATE

SUPERCIRCULAR ENTRY, pg E/2-1
SPS DEORBIT , pg E/4-1
SM RCS/HYBRID DEORBIT, pg E/3-1

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Changed None 16, 1969

CSM 107 & Subs

EARTH ORBIT ENTRY UPDATE E/1-9

X		-	X		-	AREA
X X -		.	X X -		.	ΔV TO
X X X			X X X			R 0.05G EMS
X X X			X X X			P 0.05G
X X X			X X X			Y 0.05G
+		.	+		.	RTGO EMS
+		.	+			V10
X X	.	.	X X	.	.	RET 0.05G
0	.	.	0	.	.	LAT N61
						LONG
X X	.	.	X X	.	.	RET 0.2G
		.				DRE (55°) N66
R R	/		R R	/		BANK AN
X X	.	.	X X	.	.	RET RB
X X	.	.	X X	.	.	RET BBO
X X	.	.	X X	.	.	RETEBO
X X	.	.	X X	.	.	RET DROG
X X X			X X X			(90° /fps) CHART
X X			X X			DRE (90°) UPDATE

POST BURN

X X X			X X X			P 0.05G
+		.	+		.	RTGO EMS
+		.	+		.	V10
X X	.	.	X X	.	.	RET 0.05G
X X	.	.	X X	.	.	RET 0.2G
		.				DRE ± 100 nm N66
R R	/	/	R R	/	/	BANK AN
X X	.	.	X X	.	.	RETRB
X X	.	.	X X	.	.	RET BBO
X X	.	.	X X	.	.	RETEBO SEC
X X	.	.	X X	.	.	RET DROG TO MAIN

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 Changed _____

E.O. ENTRY UPDATE

E.O. ENTRY UPDATE

EARTH ORBIT ENTRY UPDATE E/1-10

X		-	X		-	AREA
X X	-	.	X X	-	.	ΔV TO
X X X			X X X			R 0.05G EMS
X X X			X X X			P 0.05G
X X X			X X X			Y 0.05G
+		.	+		.	RTGO EMS
+		.	+			V10
X X	.	.	X X	.	.	RET 0.05G
0	.	.	0	.	.	LAT N61
	LONG
X X	.	.	X X	.	.	RET 0.2G
	DRE (55°) N66
R R	/		R R	/		BANK AN
X X	.	.	X X	.	.	RET RB
X X	.	.	X X	.	.	RETBBO
X X	.	.	X X	.	.	RETEBO
X X	.	.	X X	.	.	RETDROG
X X X			X X X			(90°/fps) CHART
X X			X X			DRE (90°) UPDATE

POST BURN

X X X		X X X		P 0.05G
+	.	+	.	RTGO EMS
+	.	+	.	V10
X X	.	X X	.	RET 0.05G
X X	.	X X	.	RET 0.2G
	.		.	DRE ± 100 nm N66
R R	/	R R	/	BANK AN
X X	.	X X	.	RETRB
X X	.	X X	.	RETBBO
X X	.	X X	.	RETEBO SEC
X X	.	X X	.	RETDROG TO MAIN

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Channel

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Changed

(NO COMM) EARTH ORBIT BLOCK DATA							E/1-11
X	X		1-4	X	X		AREA
X	X	X	+ 2 1 6	X	X	X	LAT
X	X	- 1 4 8	0	X	X		LONG
0	0	1	0 5	0 2			GETI
X	X	X	3 1 7 0	X	X	X	ΔV_C
X	X		2-1	X	X		AREA
X	X	X	+ 3 3 5	X	X	X	LAT
X	X	- 0 7 0	0	X	X		LONG
0	0	1	2 2 2	6			GETI
X	X	X	3 1 7 0	X	X	X	ΔV_C
X	X		2-4	X	X		AREA
X	X	X	+ 2 1 0	X	X	X	LAT
X	X	- 1 4 8	0	X	X		LONG
0	0	2	3 7	3 1			GETI
X	X	X	3 1 7 0	X	X	X	ΔV_C
X	X		3-4	X	X		AREA
X	X	X	+ 2 9 6	X	X	X	LAT
X	X	- 1 4 8	0	X	X		LONG
0	0	4	1 0	4 8			GETI
X	X	X	3 1 7 0	X	X	X	ΔV_C
X	X		4-4	X	X		AREA
X	X	X	+ 3 3 4	X	X	X	LAT
X	X	- 1 4 8	0	X	X		LONG
0	0	5	4 3	5 0			GETI
X	X	X	3 1 7 0	X	X	X	ΔV_C

REMARKS:

1. ROLL RIGHT 90°
2. DO NOT USE 2-1 FOR LAUNCH
AZIMUTH GREATER THAN 86°
3. DO NOT USE 1-4 FOR LAUNCH
AZIMUTH LESS THAN 86°

E. O. BLOCK DATA

EARTH ORBIT BLOCK DATA E/1-12

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

REMARKS:

Basic Date A 1, 1969
Changed _____

SECTION 3. SM RCS/HYBRID DEORBIT

VEHICLE PREP COMPLETEP30 - EXTERNAL ΔV

1 V37E 30E

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

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

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

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

SET DET
 PRO

6 F 37 00E

SEPARATION CK LIST

(380) PRI GLY TO RAD vlv - BYPASS (PULL)

SURGE TK-ON (VERIFY) REPRESS PKG vlv - FILL
REPRESS PKG VLV-ON Q2 SM SUPPLY vlv - OFF
 CAB PRESS REL vlv (2) - NORM
 (8) cb ELS (2) - close (verify)
 cb SECS ARM (2) - close (verify)
 cb SECS LOGIC (2) - close (verify)
 ROT CONTR PWR NORM (2) - AC/DC
 ABORT SYS PRPLNT - RCS CMD
 SM RCS SEC PRPLNT FUEL PRESS (4)-OPEN
 If docking ring still on:
 CSM/LM FNL SEP (2) - on(up)(verify)
 (out of plane preferred)

8

CM RCS CHECK

- AUTO RCS A/C ROLL (4) - OFF (verify)
 (8) cb RCS LOGIC (2) - closed (verify)
 SC CONT - SCS
 RCS TRANSFER - CM
 AUTO RCS SEL (RING 1) - OFF
 AUTO RCS SEL (RING 2) - MNB
 TEST RING 2 THRUSTERS
 AUTO RCS SEL (RING 2) - OFF
 AUTO RCS SEL (RING 1) - MNA
 TEST RING 1 THRUSTERS
 AUTO RCS SEL (RING 2) - MNB
 RCS TRANSFER - SM

9

MNVR TO PAD BURN ATT

- LOAD DAP
 BMAG MODE (3) - RATE 2
 SC CONT - CMC/AUTO
 ATT DB - MIN
 MAN ATT(3) - RATE CMD

10

V62E

11

V49E

12

F 06 22 DESIRED FINAL GMBL ANGLES (.01°)
 LOAD MNVR PAD GMBL ANGLES
 PRO

13

F 50 18 REQ MNVR TO FDAI RPY ANGLES (.01°)
 (AUTO) PRO
 (MAN) SC CONT - SCS
 BMAG MODE (3) - RATE 2
 MNVR To 15

14

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

15

F 50 18 REQ TRIM TO FDAI RPY ANGLES (.01°)
 (TRIM) Go to 13
 (BYPASS) ENTR

16

CHECK BORESIGHT & SXT STARS
 OPTICS PWR - on (up)

3. SM RCS/HYBRID DEORB

CSM 1 & Subs

Basic Date April 15, 1969
 Changed June 27, 1969

OPT MODE - CMC
OPT ZERO - OFF

- 17 V41 N91E
- 18 F 21 92 SHAFT, TRUN (.01°, .001°)
Load SXTS angles
- 19 41 OPTICS DRIVE
Check SXT STAR
OPT ZERO - ZERO
Check BORESIGHT STAR (if avail)
- 20 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
- 21 PWR REDUCTION
MN BUS TIE (2) - ON
HGA PWR - OFF
FC PUMPS (3) - OFF
FC 2 MN A&B - OFF
Verify loads balanced
VHF AM (A&B)-off (ctr)
S BD PWR AMP - LOW
cb ECS RAD CONT/HTR (2) - open
cb WASTE H2O/URINE DUMP HTRS(2)-open
cb RAD HTRS OVLD (2) - open
POT H2O HTR - OFF
GLY EVAP TEMP IN - MAN
- 22 P41 - RCS THRUSTING
V37E 41E
- 23 F 50 18 REQ MNVR TO LCL HORIZ (HDS DN) (.01°)
(AUTO) BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO
PRO To 24
(MAN/DAP) BMAG MODE (3) - RATE 2
SC CONT - CMC/HOLD

Basic Date April 15, 1969
Changed April 16, 1969

CSM 107 & Subs

V62E

MNVR To 25

24 06 18 AUTO MNVR TO FDAI RPY (.01°)

25 F 50 18 REQ TRIM TO LCL HORIZ (.01°)
 ALIGN SC ROLL
 (AUTO TRIM) PRO To 24
 (BYPASS) ATT DB - MIN
 RATE - LOW
 MAN ATT (3) - RATE CMD
 BMAG MODE (3) - ATT1/RATE 2
 ENTR

55:00m

26 06 85 VGX,Y,Z (.1fps)
 RECHECK BORESIGHT STAR
 TRANS CONTR PWR - on (up)
 EMS MODE - STBY (verify)
 EMS FUNC - ΔV SET/VHF RNG
 SET ΔV for SM BURN _____
 EMS FUNC - ΔV
 S BD ANT - OMNI C
 SECS LOGIC (2) - ON
 MSFN confirm Go for PYRO ARM
 SECS PYRO ARM (2) - ARM
 CM RCS LOGIC - ON (verify)

59:25

27 DSKY BLANKS

59:30

28 16 85 VG X,Y,Z (AVE G ON) (.1fps)
 RHC's & THC - armed
 LIMIT CYCLE - OFF
 TAPE RCDR - CMD RESET/HBR
 EMS MODE - NORMAL

CSM 10 Subs

Basic Date _____ April 15, 1969
 Changed _____ June 16, 1969

00:00

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

If SM ONLY burn go to step 32

THC - locked
SC CONT - SCS/FREE
RATE - HIGH
PRIM GLY TO RAD - BYPASS (verify)
MN BUS TIE (2) - ON (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 LOGIC - OFF

Monitor VM A/B:

If <25 vdc, go to EMERG
POWER DOWN Pg E/7-1

V63E

* If CMC NO GO:
* FDAI SOURCE - ATT SET *
* FDAI SEL - 1 or 2 *
* ATT SET - GDC *

MAN ATT PITCH - ACCEL CMD
FDAI SCALE - 5/5
MNVR TO CM BURN ATT(NULL ERR NEEDLES)

R 0°
P
Y 0°

30 CM RCS BURN

RHC #1-Continuous Pitch Down
RHC #2-Module Pitch to null needles
BURN VGZ TO ZERO

* If only 1 RHC *
* Pulse + P=5° from retro att. *
* Maintain rates <3°/sec *

Basic Date April 15, 1969
Changed April 27, 1969

CSM 107 & Subs

E
3-6

- 31 BURN COMPLETION AT:
 ΔV CTR= _____ or DET= _____
 V82E
- 32 F 16 44 HA,HP,TFF (.1nm,min-sec)
 Check HP:
 If > Pad data, continue burn
 until < Pad
 PRO
- 33 F 16 85 VGX,Y,Z (.1fps)
 Read VG residuals to MSFN
 (HYBRID) PRO to 34

 (SM ONLY BURN)
 PRO
F 37 OOE
- EI-15:00 V37E 47E
F 16 83 AVX,Y,Z (.1fps)
 SC CONT - SCS/FREE
 YAW left 45°
 MAN ATT (PITCH) - RATE CMD
 RATE - HIGH
 PRIM GLY To RAD - BYPASS (verify)
 MN BUS TIE (2) - ON (verify)

 CM/SM SEP (2) - ON
 MAN ATT(3)-MIN IMP
 BMAG MODE(3)-RATE 2
 C&W MODE - CM
 RCS TRNFR - CM
 CM RCS LOGIC - OFF
 SECS PYRO ARM (2) - SAFE
 PRO
 Monitor VMA/B:
 If <25 vdc go to EMERG
 POWER DOWN Pg E/7-1

CSM 1C Subs

Basic Date 11 15, 1969
Changed June 27, 1969

E
3-7/8

34 F 37

00E

PCM BIT RATE - LOW
ATT DB - MAX
EMS MODE - STBY
EMS FUNC - RNG SET

Go To EARTH ORBIT ENTRY, pg E.5-1

Basic Date April 15, 1969
Changed None 16, 1969

CSM 107 & Subs

8
3-718

300 72 4 32 M

PCW BIL RAY - JOM
ATT DB - WAD
EWA, WOKE - GLO
TBS SUNG - TEP

CD TO DIAHOL EMBL ENTRE, BE 8-27

SECTION 4. SPS DEORBIT

VEHICLE PREP COMPLETEP30 - EXTERNAL ΔV

Basic Date April 15, 1969
 Changed June 27, 1969

CSM 107 & Subs

- 1 V37E 30E
- 2 F 06 33 GETI (hr,min,.01sec)
 (ACCEPT) PRO
 (REJECT) LOAD DESIRED GETI
- 3 F 06 81 ΔVX,Y,Z (LV) (.1fps)
 (ACCEPT) PRO
 (REJECT) LOAD DESIRED DATA
- 4 F 06 42 HA,HP,ΔV (.1nm,.1fps)
 Record ΔV
 (ACCEPT) PRO
 (REJECT) Reselect P30 or P27. Load new param.
- 5 F 16 45 M,TFI,MGA (marks,min-sec,.01°)
 *MGA -00002: If *
 * IMU not aligned*
 SET DET
 PRO
- F 37 00E
- 6 SEPARATION CK LIST
(380) PRI GLY TO RAD VLV- BYPASS (PULL)
 SURGE TK-ON(VERIFY) REPRESS PKG vlv - FILL
 REPRESS PKG VLV- ON 102 SM SUPPLY vlv - OFF
 CAB PRESS REL vlv (2) - NORM
 cb ELS (2) - close (verify)
 (8) cb SECS ARM (2) - close (verify)
 cb SECS LOGIC (2) - close (verify)
 ROT CONTR PWR NORM (2) - AC/DC
 ABORT SYS PRPLNT - RCS CMD
 SM RCS SEC PRPLNT FUEL PRESS (4)-OPEN

7

CM RCS CHECK

- AUTO RCS A/C ROLL (4) - OFF (verify)
 (8) cb RCS LOGIC (2) - closed (verify)
 SC CONT - SCS
 RCS TRANSFER - CM
 AUTO RCS SEL (RING 1) - OFF
 AUTO RCS SEL (RING 2) - MNB
 TEST RING 2 THRUSTERS
 AUTO RCS SEL (RING 2) - OFF
 AUTO RCS SEL (RING 1) - MNA
 TEST RING 1 THRUSTERS
 AUTO RCS SEL (RING 2) - MNB
 RCS TRANSFER - SM

8

SPS THRUSTING PREP

- CYCLE CRYO FANS
 SPS GAUGING - AC1 (verify)
 PUGS MODE - NORM (verify)
 BMAG MODE (3) - RATE 2
 ΔV CG - CSM
 CMC MODE - FREE
 AUTO RCS SEL (16) - MNA or MNB
 (liftoff config)
 SC CONT - CMC/AUTO

9

MNVR TO PAD BURN ATT

V62E

10

V49E

11

F 06 22 DESIRED FINAL GMBL ANGLES (.01°)
 LOAD MNVR PAD GMBL ANGLES
 PRO

12

F 50 18 REQ MNVR TO FDAI RPY ANGLES (.01°)
 (AUTO) PRO
 (MAN) SC CONT - SCS
 MNVR to 14

13

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

14

F 50 18 REQ TRIM TO FDAI RPY ANGLES (.01°)
 (TRIM) Go to 12
 (BYPASS) ENTR

4. SPS DEORB

CSM & Subs

Basic Date April 15, 1969
Changed June 27, 1969

- 15 BORESIGHT STAR CHECK
- 16 V37E 40E
 OPT PWR - OFF
- 17 F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)
 (AUTO) BMAG MODE (3) - RATE 2
 SC CONT - CMC/AUTO
 PRO to 18
 (MAN/DAP) BMAG MODE (3) - RATE 2
 SC CONT - CMC/HOLD
 MNVR to 19
 (MAN/SCS) SC CONT - SCS
 MNVR to 19
- 18 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)
- 19 F 50 18 REQUEST TRIM MNVR TO FDAI RPY ANGLES
 ALIGN S/C ROLL (.01°)
 GDC ALIGN

TVC CHECK & PREP

cb STAB CONT SYS (all)-close(verify)
cb SPS (12) - close
ATT DB - MIN
RATE - LOW
LIMIT CYCLE - ON
MAN ATT (3) - RATE CMD
BMAG MODE (3) - RATE 2
ROT CONTR PWR DIRECT (2) - OFF
SCS TVC (2) - RATE CMD
If SCS, SCS TVC (2) - AUTO
* SC CONT - SCS *
TVC GMBL DRIVE P&Y - AUTO
MN BUS TIE (2) - ON
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
TRANS CONTR PWR - ON
ROT CONTR PWR NORMAL #2 - AC
RHC #2 - armed

+54:00m
(-06:00)

TIG-5min

HORIZ CHK - Horiz on 12° window mark (Limit +3° PNGCS GO/NO GO)
 If NO GO set tw 180°,180°,0°
 Track horiz with 24° window mark
 At TIG-2 min Align GDC

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

GMBL MOT P1-Y1 -START/ON(LMP confirm)
 If SCS, verify Thumbwheel Trim
 THC - CW
 Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2-Y2 -START/ON(LMP confirm)
 SET GPI TRIM
 Verify MTVC
 THC NEUTRAL
 GPI returns to 0,0 (CMC) or trim(SCS)
 ROT CONT PWR NORMAL #2 - AC/DC
 (TRIM) Go to step 17
 (BYPASS) BMAG MODE(3) - ATT1/RATE2
 ENTR

20 F 50 25 00204 GMBL TEST OPTION

(ACCEPT) SC CONT - CMC (verify)
PRO

Monitor GPI Response:
 00,02,-02,00,02,-02,00,Trim
 *TEST FAIL: *
 *SC CONT - SCS *
 SCS TVC (2) - AUTO

(REJECT) ENTR

21 06 40 TFI, VG, ΔVM (min-sec,.1fps)

PROG ALM - TIG slipped
 *V5N9E 01703 *
 *KEY RLSE To 21 *
 ROT CONTR PWR DIRECT (2) - MNA/B
 SPS He vlvs (2) - AUTO (verify)
 LIMIT CYCLE - OFF
 FDAI SCALE - 50/15

CSM 10 Subs

Basic Date A 1 15, 1969
Changed June 16, 1969

58:00 ΔV THRUST A(B) - NORMAL
(-02:00) THC - armed
 RHC #1 & #2 - armed
 TAPE RCDR - CMD RESET/HBR

59:25 DSKY BLANKS
(-00:35)

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

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

59:XX ULLAGE AS REQ
(-00:XX)

*IF NO ULLAGE: *
DIR ULLAGE PB - PUSH
*CONTROL ATT W/RHC *
MONITOR ΔVM (R3) COUNTING UP

59:55 ENG ON ENABLE REQUEST
(-00:05) (AUTO IGN) PRO AT TFI \geq 0 sec
 (BYPASS IGN) ENTR to 24

22 00:00 IGN *If SCS - THRUST ON PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec, .1fps, .1fps)
 *F 97 40 SPS Thrust fail *
 *(RESTART) PRO To IGN *
 (RECYCLE) ENTR To TIG-05 sec
 SPS THRUST LT - ON
 MONITOR THRUSTING
 Pc 95-105 psia
 EMS COUNTING DOWN
 SPS INJ vlvs (4) - OPEN
 SPS He vlvs tb (2) - gray
 SPS FUEL/OXID PRESS - 175-195 psia
 PUGS - BALANCED

Basic Date April 15, 1969
Changed April 16, 1969

E
4-6

*PROG ALARM *
V5N9E 01407 VG INC
THC - CW, FLY MTVC

ECO

*EMER SPS CUTOFF: *
* ΔV THRUST (2) - OFF*

23 F 16 40 TFC(STATIC), VG,ΔVM (min-sec,.1fps)
ΔV THRUST A/B - OFF
SPS INJ vlv (4) - CLOSED
SPS He tb (2) - bp
cb SPS P2,Y2 - closed (verify)
GIMB MOT(4)-OFF
TVC SERVO PWR (2) - OFF
cb SPS P1 & P2, Y1 & Y2 - open

PRO

24 F 16 85 VG XYZ(CM) (.1fps)
NULL RESIDUALS
RECORD ΔV CTR & RESIDUALS ΔVC
EMS FUNC - RNG SET VGX |||||
EMS MODE - STBY VGY |||||
BMAG MODE (3) - RATE 2
ATT DB - MAX VGZ |||||
TRANS CONT PWR - OFF

PRO

25 F 37 V82E

26 F 16 44 HA,HP,TFF (.1nm,min-sec)
R3-59B59 HP >49.4 nm

PRO

27 F 37 OOE

Go to EARTH ORBIT ENTRY, pg E/5-1

Basic Date A115, 1969
Changed June 16, 1969

CSM 107 Subs

E
5-1

SECTION 5. EARTH ORBIT ENTRY

1 Verify CM/SM SEP ATT (SPS DEORB only)

R _____ (180°)

P

Y _____ (0°)

2 EMS INITIALIZATION

*Scroll not in 37K: *

*EMS FUNCT - TEST 5 *

*Slew Scroll to 37K *

EMS FUNC - RNG SET (verify)

EMS MODE NORMAL

SET RNG TO PAD DATA RNG

EMS FUNC - Vo SET

Slew scroll to pad data VIO

Do not go thru TEST 3 or 5

EMS MODE - STBY (██████████)

EMS FUNC - ENTRY

3 RSI ALIGNMENT

FDAI SOURCE - ATT SET

ATT SET - GDC

EMS ROLL - on(up)

GDC ALIGN PB - PUSH & HOLD

YAW tw - Position RSI thru 45° &
back to LIFT UP

GDC ALIGN PB - RELEASE

EMS ROLL - OFF

Align GDC to IMU

4 PWR REDUCT (SPS DEORB only)

HGA PWR - OFF

FC PUMPS (3) - OFF

FC 2 MNA & B - OFF

Verify loads balanced

S BD PWR AMP - LOW

VHF AM (A&B)-off (ctr)

cb ECS RAD CONT/HTR (2) - open

cb WASTE H2O/URINE DUMP HTRS (2)-open

cb RAD HTRS OVLD (2) - open

POT H2O HTR - OFF

GLY EVAP TEMP IN - MAN

Basic Date April 15, 1969
Changed June 27, 1969

CSM 107 & Subs

E

5-2

05 09 01427 - ROLL REVERSED

*05 09 01426 - IMU UNSAT *

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

PAD VALUES

LAT _____

LONG _____

HDS UP/DN _____

PRO

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

Record

GMAX _____

V400K _____

GAMMA EI _____

PRO

8 F 06 63 RTOGO (.1nm) _____ PAD _____
VIO (fps) _____ PAD _____
TFE (min-sec) _____
NO COMM, SET RTOGO & VIO IN EMS &
INITIALIZE

(ACCEPT) PRO

(UPDATE TFE) V32E to 8

P62 - CM/SM SEP & PRE-ENTRY MNVR

9 F 50 25 For HYBRID DEORBIT, PRO to 10
00041 REQUEST CM/SM SEP
SC CONT - SCS/FREE
YAW - 45° out-of-plane (left for RCS,
right for SPS)
RATE - HIGH
ATT DB - MIN
MAN ATT (3) - RATE CMD
BMAG MODE (3) - ATT1/RATE2
PRIM GLY to RAD - BYPASS (verify)
EMS MODE-STBY (verify)
SECS LOGIC (2) - on (up)
MSFN confirm GO for PYRO ARM
SECS PYRO ARM - ARM

CSM 1 & Subs

Basic Date April 15, 1969
Changed June 27, 1969

MN BUS TIE (2) - ON (verify)
CM/SM SEP (2) - ON
If docking ring still on:
 CSM/LM FNL SEP (2) - on(up)(verify)
MAN ATT(3)-MIN IMP
BMAG MODE(3)-RATE 2
C&W MODE - CM
RCS TRNFR - CM
CM RCS MANF PRESS - 287-302 psia
CM RCS LOGIC - OFF
SECS PYRO ARM - SAFE
Monitor VMA/B:

If <25vdc go to EMERG POWERDOWN

Pg E/7-1

AUTO RCS SEL A/C ROLL (4) - OFF
AUTO RCS SEL CM 2(6) - OFF
AUTO RCS SEL CM 1(6) - MNA or MNB
YAW back to 0°

PITCH TO ENTRY ATT

ROLL 0° (LIFT UP)

PITCH - HORIZ on 29° MARK (400K)
YAW 0°

ATT DB - MAX

MAINTAIN HORIZ TRK

MAN ATT (3)-RATE CMD

PRO (Act ENTRY DAP)

10

EMS DATA - Verify

EMS FUNC - ENTRY (verify)

EMS MODE - NORMAL

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

PRO

11 POSS 06 22

FINAL ATT DISP, RPY

(.01°)

(Only if X-axis beyond 45° of Vel vector)

P63 - ENTRY INIT

12

06 64

G, VI, RTOGO

(.01G, fps, .1nm)

FDAI SCALE - 50/15

ROT CONTR PWR DIR (2) - MNA/MNB

Basic Date April 15, 1969
Changed June 1, 1969

CSM 107 & SUBS

TAPE RCDR - HBR/FWD

HORIZ CK

Pitch error needle goes toward
zero approaching .05G time

If CMC is GO:

SC CONT - CMC/AUTO

*If DAP NO GO: *

* SC CONT - SCS*

* FLY BETA *

*If CMC NO GO: *

* SC CONT - SCS*

* FLY EMS *

RCS Deorb: Roll HDS UP

TRACK HORIZ with 29° window mk

P64 - ENTRY POST .05G

13 RTOGO AT .05G AGREES WITH EMS-verify
 HORIZ CK
 .05G Lt - on (EMS start)

.05G time
 (+0 : : :)

No EMS start within 3 secs
 *EMS MODE - BACKUP/VHF RNG *

.05G sw - on (up)

EMS ROLL - on (up)

06 74 BETA, VI, G (.01°, fps, .01G)

NOTE: To monitor N68, Key V16 N68E

Compare RSI & FDAI

If CMC or PAD cmd Lift DN,

MNVR Lift DN

EMS GO/NO GO

G-V Plot within limits

Go To 17 (P67)

or continue

P65 - ENTRY - UP CONT (VL>18K fps)

14 F 16 69 BETA (.01°) _____
 DL (.01G) _____ PAD _____
 VL (fps) _____ PAD _____

IF NO AGREEMENT:

*SC CONT - SCS *

*FLY EMS *

Basic Date A 15, 1969
 Changed June 27, 1968

CSM 10 Subs

PRO

15 06 74 BETA, VI, G (.01°, fps, .01G)
(V<VL +500 fps & RDOT Neg) Go To 17

P66 - ENTRY - BALLISTIC (D<DL)

16 06 22 DESIRED GMBL ANGLES RPY (.01°)
Monitor horiz +12° of 31.7° mark

P67 - ENTRY - FINAL PHASE (0.2G)

17 06 66 BETA,CRSRNG ERR,DNRNG ERR (.01°,.1nm,.1nm)
KEY VERB

Record DNRNG ERR _____

KEY RLSE

Limit: +100nm from PAD DRE

Monitor lift vector on RSI & FDAI

CM RCS: change rings when He PRESS

<1150 psia

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

SC CONT - SCS

RTOGO NEG - LIFT UP

RTOGO POS - LIFT DOWN

Monitor altimeter

Record LAT,LONG,& voice to RECY at 10K'

Record EMS RTGO

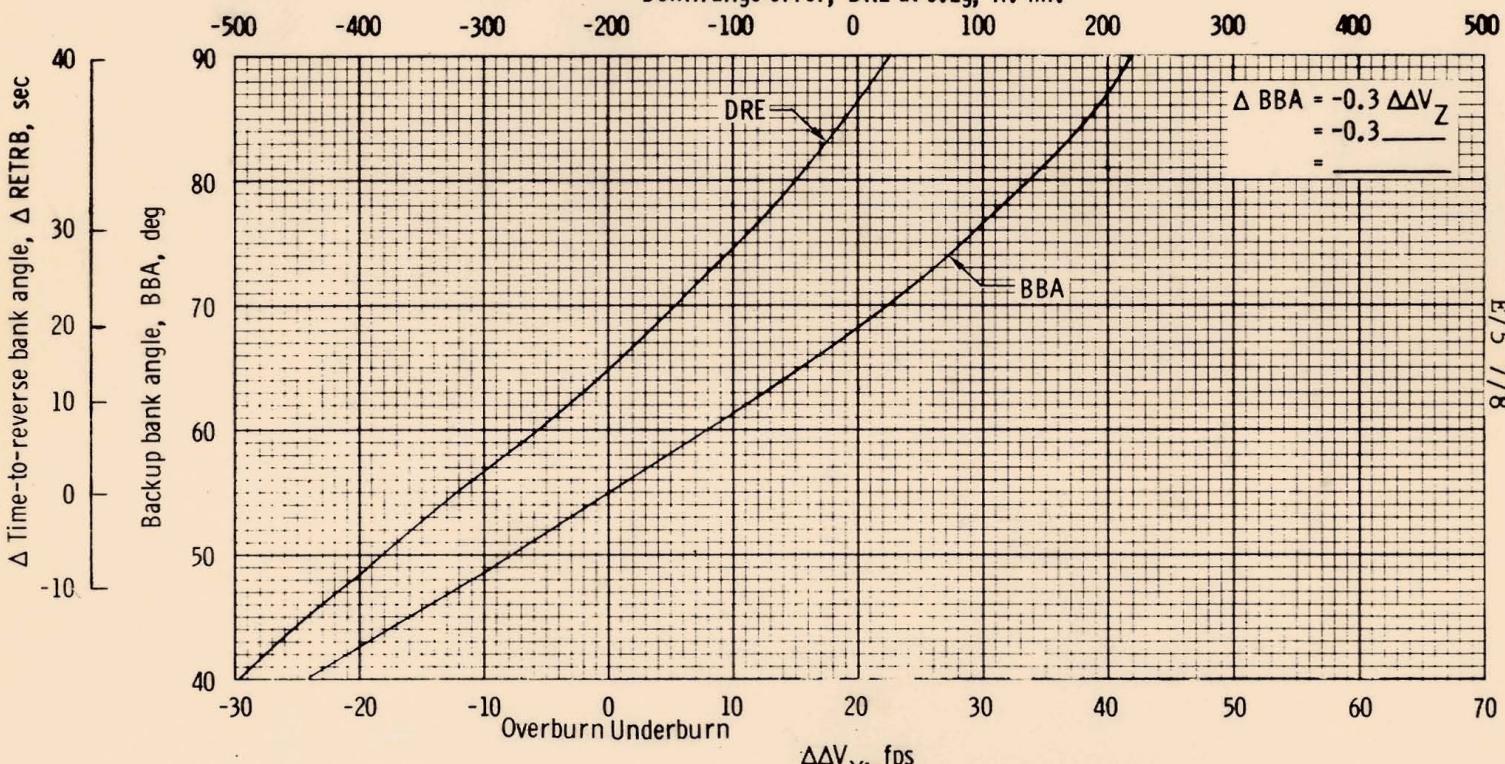
EMS MODE - STBY

EMS FUNCT - OFF

Go To EARTH LANDING pg E/6-1

Basic Date _____
Changed _____

Downrange error, DRE at 0.2g, n. mi.



Earth orbit BBA versus $\Delta\Delta V_x$.

E.O. BBA vs $\Delta\Delta V_x$

815 212

DR

TELEGRAM
TO VACATION
SCHOOL

100



8-12

UL 333

SECTION 6. EARTH/POST LANDING

Basic Date April 15, 1969
 Changed June 27, 1969

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- :36 RRT (06:~~52~~) STEAM PRESS - pegged at 90K(0:00) Start watch
 50K' (07:~~52~~) CABIN PRESS REL vlv (2) - BOOST/ENTRY(~~01:00~~)
 :32 SECS PYRO ARM (2) - ARM 00:56
 Check Altimeter
- 40K' (08:~~00~~) * CM UNSTABLE (01:~~05~~) *
 07:46 *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
- 24K' (08:~~00~~) RCS disable (auto) (01:~~05~~)
 :18 *RCS CMD - OFF* :42
- Apex cover jett (auto)
 APEX COVER JETT PB - PUSH
 (WAIT 2 SECS)
 Drogue parachutes deployed (auto)
 DROGUE DEPLOY PB - PUSH
- If Both Drogues Fail:
 *ELS - MAN *
 *Stabilize CM *
 5K' MAIN DPLY PB - PUSH
 *ELS - AUTO *
- 23.5K' Cabin Pressure increasing (Drogues + 50s)
 *If not increasing by 17K': *
 CABIN PRESS REL vlv (RH) - DUMP
- 10K' (09:~~00~~) Main parachutes deployed (02:31)
 :07 MAIN DEPLOY PB - PUSH (within 1 sec)
 VHF ANT - RECY
 VHF AM A - SIMPLEX
 VHF BCN - ON
 DIRECT O2 - ON (if suited)

E
6-2

CABIN PRESS REL vlv (2) - CLOSE

CM RCS LOGIC - on (up)

CM PRPLNT - DUMP (burn audible)

Monitor CM RCS 1&2 for He press decrease

*NO BURN or PRESS DECREASE *

* USE BOTH RHC's *

*DO NOT FIRE PITCH JETS *

CM PRPLNT-PURGE (to zero He press)

*CM RCS He DUMP PB - PUSH *

*RHC (2) - 30 secs *

* NO PITCH *

STRUT LOCKS (4) - UNLOCK

If night landing:(8) cb FLOAT BAG #3, FLT/PL (1 cb)-close |
PL BCN LT - HIGH

(275) cb FLT & PL BAT BUS A,B,&BAT C (3)-close

cb FLT & PL MNA & B (2) - open

(5) cb RAD HTR OVLD (2) - open (verify)

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

(5) cb BAT RELAY BUS (2) - open

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

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

POSTLANDING
STABILIZATION, VENTILATION, COMMUNICATIONS

1 Stabilization after landing

(229) cb MAIN REL PYRO (2) - close

MAIN RELEASE - on (up)

SECS PYRO ARM (2) - SAFE

SECS LOGIC (2) - OFF

DIRECT O2 - OFF (verify)

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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

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Post Stabilization And Ventilation

- (15) PL BCN LT - BCN LT LOW
 PL VENT v1v - UNLOCK (Pull)
 Remove PL VENT Exh Cover
 (15) PL VENT - HIGH or LOW
 PL DYE MARKER - ON (swimmer comm)
 Release footstraps and restraints
 (275) cb MNA BAT BUS A & BAT C (2) - open
 cb MNB BAT BUS B & BAT C (2) - open
 cb FLT & PL BAT C - open
 (250) cb PYRO A SEQ A - open
 cb PYRO B SEQ B - open
 *EACH HR - CHECK DC VOLTS \geq 27.5 V *
 *If Not: *
 (275) * cb FLT & PL-BAT BUS A&B (2) -open*
 * cb FLT & PL BAT C (1) - close *
 * GO TO LOW POWER CHECKLIST *
 Unstow and install PLV DISTRIB DUCT
 Deploy grappling hook and line if req.

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EGRESS PROCEDURES

CMP	PL VENT - OFF (15)
LMP	cb Pn1 250 (all) - open

- STABLE I
 ALL Disconnect umbilicals
 Neck dam on (if suited)
 CMP Center couch - 270° position

CDR, LMP Armrests stowed
 CDR Connect raft to S/C, if desired, with green lanyard
 Connect raft white lanyards to suits
 inflate water wings when exiting
 CMP GN2 RATCHET HNDL - CW
 GN2 VLV HNDL - UNLATCH & PUSH (Outbd)
 Side Hatch opened
 ACTR HNDL SEL - N
 Egress with liferaft
 LMP Put hardware kit out
 LMP, CDR Egress

or C. STABLE II

LMP cb CREW STA AUDIO (3) - open
 ALL Disconnect umbilicals
 Couch seat pans (3) - 170° position
 Neck dam on (if suited)
 CMP Arm rests stowed
 Survival kits removed from stowage
 CDR Connect life raft mainline to CDR or S/C
 CMP Connect first raft white lanyard to suit
 CDR Connect third raft white lanyard to suit
 CMP PRESSURE EQUALIZATION vlv - OPEN
 CMP, LMP Remove and stow hatch
 CMP Exit feet first with rucksacks; when clear of S/C inflate water wings and raft
 LMP Exit feet first; when clear of S/C inflate water wings
 CDR Exit feet first; when clear of S/C inflate water wings

POST LANDING COMMUNICATIONS

VHF ANT-RECY (verify)

VHF BCN - ON (verify)

If no contact with recovery forces
 perform VHF BEACON Check

MONITOR VHF BEACON transmission with

VHF AM B Rcvr and/or Survival Transceiver

*VHF Beacon not operating *

connect Survival Transceiver to ant

cable behind VHF ant access pnl and

*place radio in BCN mode *

E
6-5/6

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)
COUCH LIGHTS - OFF
POSTLANDING VENT SYS: minimize use
SURV RADIO - plug into VHF BCN ANT cable
conn behind VHF ant access pnl & turn
radio on in BCN mode

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II
8-2-8

LOW POWER CHECKLIST

AVL-BCH - OIL

AVL - (E) NO. 304

AVL - OIL

AVL - 320 NO. 304

SECTION 7. ENTRY EMERGENCY PROCEDURES

CM RCS FAILS TO PRESSURIZE OR FEED PRPLNT

1. Verify electrical power for pressurization
 - cb EPS BAT BUS (2) - close (Pnl 229)
 - cb PYRO A/B SEQ A/B (2) - close (Pnl 250)
 - cb SECS ARM (2) - close (Pnl 8)
 - SECS PYRO ARM (2) - ARM
 - SECS LOGIC (2) - on (up)
2. Cycle CM RCS - PRESS (Pnl 2)
3. Verify electrical power to CM RCS prplnt vlvs
 - cb EPS GRP 1&3 - close (Pnl 229)
 - cb SM RCS HTR A&B - close (Pnl 8)
 - cb RCS PRPLNT ISOL (2) - close
4. Cycle CM RCS PRPLNT 1&2 - on (up) (Pnl 2)
5. Open He & PRPLNT Crossfeed
 - cb EPS GRP 5 - close (Pnl 229)
 - cb RCS LOGIC (2) - close (Pnl 8)
 - CM RCS LOGIC - on (up) (Pnl 1)
 - CM PRPLNT - DUMP (momentarily, then OFF)

EMERGENCY POWERDOWN

(MN BUS voltage <26.0 vdc, no short verified)

	Amps
S BD PWR AMP - off (ctr)	4.35
SEC COOL EVAP - RESET for 58 sec, then OFF	4.26
SEC COOL PUMP - OFF	
SUIT COMPR (2) - OFF	8.44
DIRECT O2 vlv - ON (if suited)	
TAPE RCDR FWD - off (ctr)	1.69
POT H2O HTR - OFF	1.62
LIGHTS - (min req'd)	
cb G&N OPT (2) - open	3.1
ECS GLY PUMPS (2) - OFF	2.76 per pump
PWR SCE - off (ctr)	0.70
TELECOM GRP 1&2 - OFF	1.8
cb INSTR ESS (2) - open	1.10

Note: After 0.05G, cb G&N (all 10) - open

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BUS LOST RECONFIGURATION

A. Loss of MN BUS A

FC 2 - MNB only
FC 1 (MNA&B) - off (ctr) (on line
for deorbit burn)
INV 3 - MNB, AC1
cb MNA BAT BUS A - open
cb MNA BAT C - open
cb MNB BAT C - closed
cb BAT C BAT BUS A - closed
AUTO RCS SEL (desired thrusters) - MNB
FDAAI SEL - 2
RHC PWR DIR (2) - MNB
BMAG MODE (3) - RATE 2

B. Loss of MN BUS B

FC 2 - MNA only
FC 3 (MNA&B) - off (ctr)(on line for
deorbit burn)
INV 3 - MNA, AC2
cb MNB BAT C - open
cb MNB BAT BUS B - open
cb BAT C BAT BUS B - closed
cb MNA BAT C - closed
AUTO RCS SEL (desired thrusters) - MNA
FDAAI SEL - 1
RHC PWR DIR 1 - MNA
SCS ELEC PWR - ECA
BMAG MODE (3) - RATE 1

C. Loss of BAT BUS A

Prepare for two battery entry
AUTO RCS SEL (desired thrusters) - MNB
After CM/SM SEP
RCS TRNFR - CM (mom)
At APEX COVER JETT
cb SCS CONTR/AUTO (2) - open

D. Loss of BAT BUS B

Prepare for two battery entry
AUTO RCS SEL (desired thrusters) - MNA

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After CM/SM SEP
RCS TRNFR - CM (mom)
At APEX COVER JETT
cb SCS CONTR/AUTO (2) - open

E. Loss of AC BUS 1

AC INV 1 MNA - OFF
BMAG MODE (3) - RATE 2
FDAI SEL - 2
SUIT COMPR 2 - AC2
S BD NORM XPNDR - SEC
S BD NORM PWR AMP - SEC
ECS GLY PUMP 2 - AC 2
G&N PWR - AC2

F. Loss of AC BUS 2

AC INV 2 MNB - OFF
FC PUMP 2&3 - AC1
FDAI SEL - 1
BMAG MODE (3) - RATE 1
G/N PWR - AC1
S BD NORM XPNDR - PRI
S BD NORM PWR AMP - PRI

EMERGENCY SAFE OF APEX COVER JETT

If MSFN NO GO For Pyro Arm Indicates Apex Cover Jettison,

SECS LOGIC (2) - OFF
cb ELS (2) - open
SECS LOGIC (2) - ON

If MSFN GO, Go To Step A

If Still Apex Cover Jettison,
cb SECS LOGIC A - open

If MSFN GO, Go To Step B

If Still Apex Cover Jettison,
cb SECS LOGIC A - close
cb SECS LOGIC B - open

If MSFN GO, Go To Step C

If Still Apex Cover Jettison,
ELS - MAN
ELS LOGIC - OFF
SECS LOGIC (2) - OFF

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cb SECS LOGIC (2) - open
cb SECS ARM (2) - open
 CMP To LEB
cb SEQ A&B PYRO A&B (2) - open (Pn1 250)
Verify PYRO BUS A&B voltage = 0
Use Tool E, (5/32 allen head) to remove
closeout panel located beneath panels
276 & 277 (approx 10 fasteners on panel).
Remove, or cut all wires to, connector
marked "cut" with white tag (P545). Tape
ends of any wires cut. Replace closeout
panel.
cb SEQ A&B PYRO A&B - close
Verify PYRO BUS A&B voltage >35 vdc
cb ELS (2) - close
cb SECS LOGIC (2) - close
cb SECS ARM (2) - open (verify)
DO NOT ARM PYRO BUSES

Continue Normal Entry Except,

Perform CM RCS pressurization & CM/SM
Separation together at which time ARM
PYRO's in the following manner:
 SECS PYRO ARM (B) - SAFE (verify)
 SECS PYRO ARM (A) - ARM

To Jettison Apex Cover At 24K':
 SECS PYRO ARM (B) - ARM

STEP A

 cb ELS (2) - open (verify), close
 at or after apex cover jettison
 at 24K'

 Continue normal entry

STEP B

 cb SECS LOGIC A - open (verify),
 close at or after apex cover jettison
 at 24K'

 Continue normal entry

STEP C

cb SECS LOGIC B - open (verify), close
at or after apex cover jettison
at 24K'

Continue normal entry

FIRE/SMOKE IN CM DURING ENTRY

WARNING: CM water must not be used
to extinguish fire

- 1 CABIN FAN (2) - OFF (verify)
- 2 Monitor EPS indicators for excessive current.
Immediately remove power from affected bus.
- 3 ROT CONTR PWR DIRECT (2) - MNA/MNB
& maintain attitude if required.
- 4 If affected bus is:
MNA
AC INV 1 AC BUS 1 - OFF
AC INV 2 AC BUS 1 - on (up)
Set up for CM/RCS sys 2
AUTO RCS SEL A/C ROLL (4) - OFF
AUTO RCS SEL CM 1(6) - OFF
AUTO RCS SEL CM 2(6) - MNB
RCS dump is fuel rich
MNB
AC INV 2 AC BUS 2 - OFF
AC INV 1 AC BUS 2 - on (up)
RCS dump is oxidizer rich
- 5 CAB PRESS REL vlv (RH) - DUMP
- 6 Continue ENTRY

Top
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Model 1 (filter) - 2000 ft. ~~do~~ ^{TTR}
negative 1000 ft. exp. test

