15 pp.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

*APOLLO 17

DECEMBER 6 LAUNCH

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CHANGE B

LM DATA CARD BOOK

INDEXING DATA

DATE	OPR	#	T	PGM	SUBJECT	SIGNATOR	LOC
11-10-72	MSC	00	R	APO	*	Mitchell	080-44E

PREPARED BY

FLIGHT PLANNING BRANCH

CREW PROCEDURES DIVISION

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

NOVEMBER 10, 1972

APOLLO 17

LM DATA CARD BOOK

NOVEMBER 10, 1972

PREPARED BY: R. A. MITCHELL
BOOK MANAGER

APPROVED BY: J. W. O'NEILL, CHIEF
FLIGHT PLANNING BRANCH
CREW PROCEDURES DIVISION

It is requested that any organization having comments, questions, or suggestions concerning this document contact R. A. Mitchell, TRW Task 81, Building 4, room 265, telephone 483-3953.

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Distribution of this document is controlled by Flight Data File Manager, T. W. Holloway, Flight Planning Branch, Crew Procedures Division.

APOLLO 17

LM DATA CARD BOOK

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LM ACTIVATION CARD

PRIM EVAP ACTIVATION TIME

: : GET

DAP PAD

+ +	LM WT (36744)N47
+ +	CSM WT(37831)
+ +	GMBL (00645)N48
+ +	(00641)

ED BATT VOLTAGE

	BATT A
	BATT B
	GET

DOCKED P52 ALIGN

	R_1 N93
	R_2
	R_3
	GET

V06 N20

LM	CSM	R	GET
		R1	__:__:__
		R2	(109: 12: 00)
		R3	
		R1	__:__:__
		R2	(109: 22: 00)
		R3	
		R1	__:__:__
		R2	(110: 22: 00)
		R3	

S-BD

P	(+125)	AOS	(108 47 04)
Y	(-22)		
P	(+9)	AOS	(110 41 08)
Y	(-37)		
P	(-34)	AOS	(112 35 41)
Y	(+54)		

UNDOCK/SEP GET (110 27 55)

AGS

K FACTOR (110 00 00)

+ +	(+60458)	224
+ +	(+29364)	225
+ +	(+60366)	226
+ +	(+00643)	305
- -	(-33007)	662
- -	(-54455)	673
	(-00002)	540
	(+00007)	541
	(-00002)	542
	(+00000)	544
	(-00101)	545
	(-00023)	546

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ACTIVATION
PIPA/GYRO/DOI2

PIPA BIAS UPDATE

										PBIASX	V21N01E 1452E PBIASX XXXXXE E
										PBIASY	1454E PBIASY XXXXXE E
										PBIASZ	1456E PBIASZ XXXXXE E

GYRO DRIFT COMPENSATION

																NBDX
																NBDY
																NBDZ

PROCEDURES	
V25N01E 1460E NBDX XXXXXE NBDY XXXXXE NBDZ XXXXXE	V21N01E 1460E NBDX XXXXXE E 1461E NBDY XXXXXE E 1462E NBDZ XXXXXE

CSM CIRC

P76													
+	0	0				+	0	0				HRS (111)	N33
+	0	0	0			+	0	0	0			MIN (55)	TIG
+	0					+	0					SEC (22.67)	
												ΔVX (+70.1)	N84
												ΔVY (+0.0)	
												ΔVZ (-2.4)	

CSM HA/HP		
CMC	LGC	V82
/	/	OPT 2

DOI-2

+	0	0				+	0	0				HRS (112)	N33
+	0	0	0			+	0	0	0			MIN (00)	TIG
+	0					+	0					SEC (33.71)	
												ΔVX (-9.4)	N81
												ΔVY (0.0)	LOCAL
												ΔVZ (+0.8)	VERT
+						+						H_A (+60.0)	N42
												H_p (+ 7.2)	
+						+						ΔVR (+9.4)	
X	X	X	0			X	X	X				BT (0:27)	
X	X	X				X	X	X				R (000)	FDAI
X	X	X				X	X	X				P (085)	INER
+						+						TIG (120.6)	AGS 373
												ΔVX AGS (-9.4)	
												ΔVY AGS (0.0)	
												ΔVZ AGS (+0.8)	

DOI-2 RULES

1. RCS -X BURN LIMIT 30 SECONDS
2. IF 2-JET BURN REQ'D, AFTER 30 SECONDS, PITCH 180° AND COMPLETE WITH +X JETS

NO CSM CIRC

+	0	0				+	0	0				HRS TIME
+	0	0	0			+	0	0	0			MIN CLOSEST
+	0					+	0					SEC APPROACH
												RANGE
												RDOT
	0						0					θ

PDI RULES

1. REQUIRE AUTO ULLAGE OR AUTO-ON (NO AUTO ULLAGE OR NO AUTO-ON CONSULT EMER CARD)
2. PDI +31 SEC: .MAX BURN TIME FOR PDI-2 OPPORTUNITY
   .MAX TIME WITHOUT FTP
3. LR GO'S: .ACCEPTED AND CONVERGED BY P64
   .ACCEPTED AND CONVERGED IN P63, LOST REGAINED IN P64 (DATA NOT ACCEPTED BY LGC: ΔH<1500')
   .ACCEPTED AND CONVERGING IN P63, CONVERGED IN P64 (DATA NOT ACCEPTED BY LGC: ΔH<1500')
4. NO LR ABORTS: .PGNS H<10000', NO 3-69
   .PGNS H<6000', WITH 3-69
5. NO PGNS: ABORT UNLESS AFTER HI GATE
6. THRUST: NO-GO IF GTC HAS NOT DECREASED TO 57% BY P64 +15 SEC
7. BINGO PRPLNT 1 MIN 31 SEC AFTER LOW LEVEL OR LOWEST PRPLNT QTY <2% UNLESS LANDING IMMINENT

NOTE: FLASHING LR ALT OR VEL LTS PRECEDED BY STEADY LR LT WITH ALT LOCK-ON (<35K FT), CYCLE LR CB

NO PDI + 12

+	0	0				+	0	0				HRS (113) N33
+	0	0	0			+	0	0	0			MIN (01) TIG
+	0					+	0					SEC (08.20) E
												ΔVX (+107.9) N81
												ΔVY (+0.0) LV
												ΔVZ (-46.9) F
+						+						HA (+143.8) N42
												HP (+5.6)
+						+						ΔVR (+117.7)
X	X	X				X	X	X				BT (0:39)
X	X	X				X	X	X				R (000) FDAI
X	X	X				X	X	X				P (272) INER
+						+						TIG (+181.1) 373
												ΔVX (+107.9) N86
												ΔVY (0.0) AGS
												ΔVZ (-46.9)
+	0	0				+	0	0				HRS (113) N11
+	0	0	0			+	0	0	0			MIN (56) CSI
+	0					+	0					SEC (37.70) G
+	0	0				+	0	0				HRS (115) N37
+	0	0	0			+	0	0	0			MIN (37) TPI
+	0					+	0					SEC (08.20) H
+						+						ΔVX(98.0)NO DOI-2
PGNS				RESIDUALS								AGS
			ΔVX	N85								ΔVX 500
			ΔVY									ΔVY 501
			ΔVZ									ΔVZ 502

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CIRC/NO PDI +12
PDI1/PDI2 ABORT

PDI 1 ABORT CARD

PDI 1 PAD		
+ 0 0	+ 0 0	HRS (112) N33
+ 0 0 0	+ 0 0 0	MIN (49) PDI
+ 0	+ 0	SEC (37.70) I
+	+	TIG(169.6)AGS 373
X X :	X X :	TGO(11:33) N61
		X RANGE (+0.0)
X X X	X X X	R (000) FDAI
X X X	X X X	P (108) AT TIG
X X X	X X X	Y (290)
		DEDA 231 IF ROD

(0<PDI 1<10:00) ABORT PAD EARLY

LOG INSERTION GET = ___ ___ ___:___ ___:___ ___
+ 5 5 0 0
CSI GET = ___ ___ ___:___ ___:___ ___

+ 0 0	+ 0 0	HRS (115) N37
+ 0 0 0	+ 0 0 0	MIN (37) TPI
+ 0	+ 0	SEC (08.20) J
+	+	TPI(337.1)AGS 275

T1-1 (10:00≤PDI 1≤17:10) ABORT PAD LATE

LOG INSERTION GET = ___ ___ ___:___ ___:___ ___
+ 5 0 0 0
BOOST GET = ___ ___ ___:___ ___:___ ___
+ 1 0 0 0 0
HAM GET = ___ ___ ___:___ ___:___ ___
+ 5 0 0 0
CSI GET = ___ ___ ___:___ ___:___ ___

+ 0 0	+ 0 0	HRS (117) N37
+ 0 0 0	+ 0 0 0	MIN (36) TPI
+ 0	+ 0	SEC (03.70) K
+	+	TPI(456.1)AGS 275

T2-1(PDI 1 + 24:45 ___:___) ABORT PAD		
LOG INSERTION GET = ___ ___ ___:___ ___:___ ___		
+ 5 0 0 0		
BOOST GET = ___ ___ ___:___ ___:___ ___		
+ 3 0 0 0 0		
HAM GET = ___ ___ ___:___ ___:___ ___		
+ 5 0 0 0		
CSI GET = ___ ___ ___:___ ___:___		
+ 0 0	+ 0 0	HRS (113) N33
+ 0 0 0	+ 0 0 0	MIN (14) TIG
+ 0	+ 0	SEC (22.60) L
+	+	TIG(194.4)AGS 373
+ 0 0	+ 0 0	HRS (119) N37
+ 0 0 0	+ 0 0 0	MIN (34) TPI
+ 0	+ 0	SEC (59.10) M
+	+	TPI(575.0)AGS 275

N69 TARGET UPDATE	
ΔDN RNG ΔX RNG ΔRLS	V25
ΔDN RNG	V21
ΔDN RNG ΔX RNG	V24
ΔRLS	V23

THROTTLE DOWN ___:___

T3-1 (1 REV) ABORT TIME		
+ 0 0	+ 0 0	HRS (114) N33
+ 0 0 0	+ 0 0 0	MIN (57) TIG
+ 0	+ 0	SEC (30.00) N
+	+	TIG(297.5)AGS 373

PDI 2 ABORT CARD

PDI 2 PAD		
+ 0 0 ___ ___ ___	+ 0 0 ___ ___ ___	HRS (114) N33
+ 0 0 0 ___ ___	+ 0 0 0 ___ ___	MIN (43) PDI
+ 0 ___ ___ . ___	+ 0 ___ ___ . ___	SEC (09.70)
+ ___ ___ ___ ___ .	+ ___ ___ ___ ___ .	TIG(283.2)AGS 373
X X ___ ___ : ___	X X ___ ___ : ___	TGO(11:33) N61
___ ___ ___ ___ ___ .	___ ___ ___ ___ ___ .	X RANGE (+0.0)
X X X ___ ___ ___	X X X ___ ___ ___	R ( ) FDAI
X X X ___ ___ ___	X X X ___ ___ ___	P ( ) AT TIG
X X X ___ ___ ___	X X X ___ ___ ___	Y ( )
___ ___ ___ ___ ___ ___	___ ___ ___ ___ ___ ___	DEDA 231 IF RQD

(0<PDI 2<6:20) ABORT PAD EARLY		
LOG INSERTION GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 1 0 0 0 0		
BOOST GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 1 0 0 0 0		
HAM GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 1 0 0 0 0		
CSI GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 0 0 0 ___ ___	+ 0 0 ___ ___ ___	HRS (119) N37
+ 0 0 0 ___ ___	+ 0 0 0 ___ ___	MIN (34) TPI
+ 0 ___ ___ . ___	+ 0 ___ ___ . ___	SEC (59.10)
+ ___ ___ ___ ___ .	+ ___ ___ ___ ___ .	TPI(575.0)AGS 275

T1-2(6:20≤PDI 2≤15:40) ABORT PAD LATE		
LOG INSERTION GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 5 5 0 0		
CSI TIG = ___ ___ ___ : ___ ___ : ___ ___		
+ 0 0 ___ ___ ___	+ 0 0 ___ ___ ___	HRS (117) N37
+ 0 0 0 ___ ___	+ 0 0 0 ___ ___	MIN (36) TPI
+ 0 ___ ___ . ___	+ 0 ___ ___ . ___	SEC (03.70)
+ ___ ___ ___ ___ .	+ ___ ___ ___ ___ .	TPI(456.1)AGS 275

T2-2(PDI 2 + 22:19 ___ : ___) ABORT PAD		
LOG INSERTION GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 5 0 0 0		
BOOST GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 1 0 0 0 0		
HAM GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 5 0 0 0		
CSI GET = ___ ___ ___ : ___ ___ : ___ ___		
+ 0 0 ___ ___ ___	+ 0 0 ___ ___ ___	HRS (115) N33
+ 0 0 0 ___ ___	+ 0 0 0 ___ ___	MIN (05) TIG
+ 0 ___ ___ . ___	+ 0 ___ ___ . ___	SEC (29.00)
+ ___ ___ ___ ___ .	+ ___ ___ ___ ___ .	TIG(305.5)AGS 373
+ 0 0 ___ ___ ___	+ 0 0 ___ ___ ___	HRS (119) N37
+ 0 0 0 ___ ___	+ 0 0 0 ___ ___	MIN (34) TPI
+ 0 ___ ___ . ___	+ 0 ___ ___ . ___	SEC (59.10)
+ ___ ___ ___ ___ .	+ ___ ___ ___ ___ .	TPI(575.0)AGS 275

N69 TARGET UPDATE	
___ ___ ___ ___ ___ ___	ΔDN RNG
___ ___ ___ ___ ___ ___	ΔX RNG V25
___ ___ ___ ___ ___ ___	ΔRLS
___ ___ ___ ___ ___ ___	ΔDN RNG V21
___ ___ ___ ___ ___ ___	ΔDN RNG
___ ___ ___ ___ ___ ___	ΔX RNG V24
___ ___ ___ ___ ___ ___	ΔRLS V23
THROTTLE DOWN ___ : ___	

T3-2 (1 REV) ABORT TIME		
+ 0 0 ___ ___ ___	+ 0 0 ___ ___ ___	HRS (116) N33
+ 0 0 0 ___ ___	+ 0 0 0 ___ ___	MIN (51) TIG
+ 0 ___ ___ . ___	+ 0 ___ ___ . ___	SEC (00.00)
+ ___ ___ ___ ___ .	+ ___ ___ ___ ___ .	TIG(411.0)AGS 373

PDI2/PDI2 ABORT
LUNAR SURFACE

DATE 10/10/72

LUNAR SURFACE CARD

FIRST REV ACTIVITY

N20 (EMERGENCY LIFTOFF)
_____OG_____IG_____MG

P57, A/T 3, REFSMMAT
NO4 _____, _____ GRAV ERR
STAR _____ (N71)
NO5 _____ ANGLE DIFF
N93 _____ X
_____ Y
_____ Z

N20 (PARKING)
_____OG 0.00 IG_____MG

NO VOICE LGC CLOCK SYNCH
CST ZERO = : :
+(i)·(24) = : : (1)
Latest CST = : : (2)
+CST(Watch)= : : (3)
GET = : :

NOTES:
(1) i=1, 2, 3, -----
(2) Latest CST not exceeding NOM TIG for this REV
(3) Must be in 24 hour day

LM SHADOW LENGTH

GET	LENGTH (ft)
110	110
130	60
150	40
160	32
180	22

N43
LAT(+N) ___•___
LONG(+E) ___•___
ALT _____•

047 _____053 _____

544 _____ +5:02 _____
545 _____ _____
546 _____ _____

P57, A/T 3, LANDING SITE
NO4 _____, _____ GRAV ERR
ALIGN STAR _____ (N71)
NO5 _____ ANGLE DIFF
N93 _____ X
_____ Y
_____ Z

DATA STAR 1 _____
DATA STAR 2 _____
DATA STAR 3 _____
DATA STAR 4 _____

LIFT-OFF TABLE

NOMINAL = (M=2) (M=1) ~ (M=2) -2:30

REV	NEW TIG	NOM TIG	REV	NEW TIG	NOM TIG
15		116:56:11	32		150:32:16
16		118:54:47	33		152:30:51
17		120:53:22	34		154:29:27
18		122:51:58	35		156:28:02
19		124:50:34	36		158:26:38
20		126:49:09	37		160:25:13
21		128:47:46	38		162:23:48
22		130:46:20	39		164:22:24
23		132:44:56	40		166:20:59
24		134:43:32	41		168:19:34
25		136:42:07	42		170:18:09
26		138:40:43	43		172:16:45
27		140:39:18	44		174:15:20
28		142:37:54	45		176:13:55
29		144:36:29	46		178:12:30
30		146:35:05	47		180:11:05
31		148:33:40	48		182:09:40
			49		184:08:30
			50		186:07:05

LAUNCH PREP

P57, A/T 3, LANDING SITE
NO4 _____, _____ GRAV ERR
STAR _____ (N71)
NO5 _____ ANGLE DIFF
N 93 _____ X
_____ Y
_____ Z

P22 ACQ : : (185 : 54 : 00)

REV 50 TIG : : (188 : 03 : 15)

544 _____ +5:02 _____
545 _____ _____
546 _____ _____
377 _____ _____

K FACTOR : : (180 : 00 : 00)

047 _____
053 _____

PIPA BIAS UPDATE*

	PBIASX
	PBIASY
	PBIASZ

GYRO DRIFT UPDATE*

	NBDX
	NBDY
	NBDZ

*PROCEDURES ON PAGE 2

ABORT/ASCENT CARD

ASCENT RULES

UNDERBURN

ΔV(FPS)	TIME(SEC)	PGNS	AGS
<400	<20	NULL RESIDUALS	AUTO,A/H 15fps
>400	>20	A/H BURN HA,HP Ḣ CONTROL	AUTO,A/H 15fps

INSERTION

WITH VOICE-GROUND RECOMMENDS TRIM SOURCE AT T_{GO}= 1 MIN

- DIRECT ASCENT RNDZ
  TRIM X-AXIS ONLY TO <2 FPS AND STANDBY FOR TWEAK AT INSERTION ATTITUDE
- COELLIPTIC RNDZ
  TRIM X-AXIS ONLY TO <2 FPS AND STANDBY FOR TWEAK (10° OHW OR 257° FDAI)
- TWEAK AT INSERTION PLUS 3 MINUTES

FOR NO VOICE (TRIM TO <2 fps)
PGNS,AGS DIFFER <10FPS, TRIM ACTIVE SYSTEM
PGNS,AGS DIFFER >10FPS, TRIM SYSTEM WHICH AGREES WITH RR

ATT/RATE ERROR >10°/SEC , SWITCH GUIDANCE

T3 (1 REV) ABORT PAD

LOG INSERTION GET= ___ ___ ___:___ ___:___ ___
+ 5 0 0 0
CSI TIG= ___ ___ ___:___ ___:___ ___
+ 1 3 3 0 0
TPI TIG= ___ ___ ___:___ ___:___ ___

+	0	0				+	0	0				HRS (114) N33
+	0	0	0			+	0	0	0			MIN (57) TIG
+	0					+	0					SEC (30:00)

ONE REV LATE ___:___:___
(190 : 04 : 20)

LM ASCENT PAD

+	0	0				+	0	0				+	0	0				HRS (188) N33
+	0	0	0			+	0	0	0			+	0	0	0			MIN (03) TIG
+	0					+	0					+	0					SEC (14.64)
+						+						+						V(H) (5539.2)
+						+						+						V(V) (32.0)N76
	0						0						0					X RANGE(+0.0)*
+						+						+						047 (+37153)
+						+						+						053 (+07045)
+						+						+						224/226(+58624)
+						+						+						231 (+56906)
+						+						+						465 (+32.0)
+						+						+						373 TPI(+537.5)
+	0	0				+	0	0				+	0	0				HRS (188) N37
+	0	0	0			+	0	0	0			+	0	0	0			MIN (57) TPI
+	0					+	0					+	0					SEC (32.30)
+						+						+						LM WT (10917)
+	0	0				+	0	0				+	0	0				HA (62.0)
+	0	0				+	0	0				+	0	0				HP (62.0) CSM
+						HA V82						+						HA 315
+						HP						+						HP 403

RESIDUALS

PGNS		AGS	
ΔVX	N85	ΔVX	500
ΔVY		ΔVY	501
ΔVZ		ΔVZ	502

*NOTE: LOAD 8 NM CROSSRANGE IF GREATER THAN 8 NM

ABORT/ASCENT
DIRECT TPI

DATE 11/10/72

DIRECT TPI CARD

IF TWO OF THREE SOLUTIONS AGREE,
BURN PRIORITY SOLUTION.

PRIORITY OF SOLUTION: PGNS, AGS, CMC, CHARTS.
GUIDE VALUES: $\dot{X}$=3 fps, $\dot{Y}$=7 fps, $\dot{Z}$=9 fps

RR AGREES WITH VHF WHERE
$\Delta R = 0.01R + 0.5$ NM, ΔR IS ALWAYS $\geq$ 1 NM
RR DOES NOT AGREE WITH VHF,
MSFN ISOLATES FAILED SYSTEM.

APS FOR ΔV>40fps, DPS FOR ΔV>6fps(DPS FULL)

AGS RECOVERY FROM BAD RADAR MARKS, PAGE 9

TPI SOLUTIONS

		PGNS	AGS	CMC	CHARTS
TIG		N37	373	N37	
θ LOS	(+26.6)	N55	303	N55	
HP	(+46.7)	N58	402	N58	
ΔV TPI	(+76.5)		370		
ΔV TPF	(+31.7)**		371		
ΔVX		N81	450	N81*	ΔVX
ΔVY			451	*	
ΔVZ			452	*	ΔVZ

**{IF ΔV TPF>100 fps, OR 1 RCS LOST AND ΔV TPF>55 fps} DO TPI 2 PAGE 9

*CHANGE SIGN
BIAS; ΔVX = -1.0
ΔVZ = +2.0

TPI PAD

+00 00 00	HRS(188) N37
+00 00 00	MIN(57) TPI
+00.00	SEC(32.30)
R1(+00000),R2(+000.00),R3(+130.00)	N55
0 0 0	ΔVX(+75.1) N81
0 0 0	ΔVY(-0.3) LV
0 0 0	ΔVZ(+14.7)
+ 0 + 0	R(+36.74) N54
- 0 - 0	$\dot{R}$(-101.7) TPI TIG-5
X X X X	BT(00:03)

TIG	N37	373	N37
θ LOS	N55	303	N55
HP	N58	402	N58
ΔV TPI		370	
ΔV TPF**		371	
ΔVX	N81	450	N81* ΔVX
ΔVY		451	*
ΔVZ		452	* ΔVZ

RESIDUALS

PGNS		AGS	
ΔVX	N85	ΔVX	500
ΔVY		ΔVY	501
ΔVZ		ΔVZ	502

AGS RECOVERY FROM BAD RADAR MARKS

PRE TPI

ASSUMED STEADY STATE BEFORE N49
411+0
✓ ANGLE, RANGE AND RANGE RATE
606R -XXXXX RANGE AND ANGLES USED IN LAST UPDATE
+00000 RANGE RATE USED IN LAST UPDATE
DO AN IMMEDIATE V47 FOR THE FOLLOWING:
1) LESS THAN 10 MIN OF TRACKING LEFT (AND ANOTHER AT TIG -5 MIN)
2) FOR θ,R, OR Ṙ GREATER THAN 5°, 5NM, OR 15FPS: ALSO REINITIALIZE FILTER, AND CONTINUE MANUAL UPDATING.

DON'T DO A V47 FOR THE FOLLOWING:
1) FOR θ,R, OR Ṙ LESS THAN 5°, 5NM, OR 15FPS: DO REINITIALIZE FILTER, AND CONTINUE MANUAL UPDATING.

POST TPI

N49 ON FIRST PGNCS UPDATE
1) DO NOT INCORPORATE INTO PGNCS, WAIT FOR SECOND UPDATE.
2) AT SECOND UPDATE:
IF N49 REPEATS: KEEP AGS AUTO UPDATING
IF N49 DOES NOT REPEAT: DO V47 AND NO UPDATES

N49 AFTER STEADY-STATE
DO V47 WITH NO FURTHER UPDATES

TPI 2 PROCEDURE

PERFORM MCC-1

PGNS

P34

LOG N37
+ 3 7

GET TPI 2 = [ ][ ][:][:][.][ ][ ]

N55 (ω_t) = $\frac{(\Delta V\ TPF)}{2}$ = [ ][ ][ ][.][ ]

V93

AGS

410 + 4

LOG TIG TPI (373)
+ 3 7 . 0

GET TPI 2 = [ ][ ][ ][ ][.]

307 = $\frac{(\Delta V\ TPF)}{6}$ = [ ][ ][ ][.][ ]

417 + 1

411 + 1

CSI CARD

BURN RULES

IF TWO OF THREE SOLUTIONS AGREE
BURN PRIORITY SOLUTION.

PRIORITY OF SOLUTIONS: PGNS, AGS, CMC, CHARTS.

GUIDE VALUE: $\dot{X}$ = 3 fps.

RR AGREES WITH VHF WHERE
$\Delta R = 0.01R + 0.5$ NM, ΔR IS ALWAYS $\geq$ 1 NM
RR DOES NOT AGREE WITH VHF,
MSFN ISOLATES FAILED SYSTEM.

V90 < 5 fps - NO BURN

APS FOR $\Delta V > 40$fps, DPS FOR $\Delta V > 6$ fps (DPS FULL)

CSI PAD

+ 0 0 . . . + 0 0 . . .	HRS(189) N11
+ 0 0 0 . . + 0 0 0 . .	MIN(02) CSI
+ 0 . . . . + 0	SEC(38.40)
R1(+00001),R2(+026.60),R3(+130.00)	N55
+ 0 0 . . . + 0 0 . . .	HRS(190) N37
+ 0 0 0 . . + 0 0 0 . .	MIN(56) TPI
+ 0 . . . . + 0	SEC(06.60)
0 . . . . 0	ΔVX(+54.8)N81
0 . . . . 0	ΔVY(+0.0)LV
410+1, 605+00777, 416+1, 623+0	
+ . . . . + ...	373(542.6)
+ . . . . + ...	275(656.1)
0 . . . . 0	ΔVX(+54.7)N86
0 . . . . 0	ΔVY(+0.0)AGS
0 . . . . 0	ΔVZ(+1.2)

CSI SOLUTIONS

	PGNS	AGS	CMC	CHARTS
ΔH (+15.0)	N75 _____	402 _____		
CSI/CDH(58:35)	_____	372 _____		
CDH/TPI(54:53)	_____			
ΔVX (ΔVG)	N81 _____	450 _____	N81* _____	ΔV _____
ΔVY	_____	263 _____	* _____	
CDH ΔVX(0.0)	N82 _____		*CHANGE SIGN	
CDH ΔVX(0.0)	_____		BIAS; ΔVX = -1.0	

ΔH	N75 _____	402 _____		
CSI/CDH	_____	372 _____		
CDH/TPI	_____			
ΔVX (ΔVG)	N81 _____	370 _____	N81* _____	ΔV _____
ΔVY	_____	263 _____	* _____	
CDH ΔVX	N82 _____			
CDH ΔVZ	_____			

RESIDUALS

PGNS		AGS	
ΔVX	N85	ΔVX	500
ΔVY		ΔVY	501
ΔVZ		ΔVZ	502

IF TWO OF THREE SOLUTIONS AGREE, BURN PRIORITY SOLUTION.
PRIORITY OF SOLUTION: PGNS, AGS, CMC, CHARTS.
GUIDE VALUES: X=3fps, Z=9fps
RR AGREES WITH VHF WHERE ΔR=0.01 + 0.5 NM, ΔR IS ALWAYS >1 NM
RR DOES NOT AGREE WITH VHF, MSFN ISOLATES FAILED SYSTEM.
V90 <5fps - NO BURN
APS FOR ΔV>40fps, DPS FOR ΔV>6fps(DPS FULL)

CDH/PLANE CHANGE CARD

DATE 9/11/72

CDH PAD

+	0	0				+	0	0				HRS(190) N13
+	0	0	0			+	0	0	0			MIN(01) CDH
+	0		•			+	0		•			SEC(13.20)
	0			•			0			•		ΔVX(+0.0) N81
	0			•			0			•		ΔVY(+0.0) LV
	0			•			0			•		ΔVZ(+0.0)
X	X	X				X	X	X				PLM FDAI
+				•		+				•		373(601.2)
	0			•			0			•		ΔVX(+0.0) N86
	0			•			0			•		ΔVY(+0.0) AGS
	0			•			0			•		ΔVZ(+0.0)

PLANE CHANGE P30

TIG CDH ___ ___ ___ : ___ ___ : ___ ___ . ___ ___

- : 30 : 00 . 00

TIG PC ___ ___ ___ : ___ ___ : ___ ___ . ___ ___

YDOT AND Y

CSM(N90)		PGNS(N90)		AGS(270)
YDOT	Y	YDOT	Y	YDOT
(-) ___ •	___ •	(-) ___ •	___ •	( ) ___ •	___ •
(-) ___ •	___ •	(-) ___ •	___ •	( ) ___ •	___ •

CDH SOLUTIONS

		PGNS	AGS	CMC	CHARTS
ΔH	(14.7) N75		402		
CDH/TPI	(54:53)				
ΔT SLIP	(00:00)				
ΔVX	N81		450	N81*	ΔVX
ΔVY			263	*	
ΔVZ			452	*	ΔVY

*CHANGE SIGN
NO BIAS

ΔH	N75		402		
CDH/TPI					
ΔT SLIP					
ΔVX	N81		450	N81*	ΔVX
ΔVY			263	*	
ΔVZ			452	*	ΔVY

RESIDUALS

PGNS		AGS	
ΔVX	N85	ΔVX	500
ΔVY		ΔVY	501
ΔVZ		ΔVZ	502

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CDH/PLANE CHANGE
COELLIPTIC TPI

COELLIPTIC TPI CARD

BURN RULES

IF TWO OF THREE SOLUTIONS AGREE,
BURN PRIORITY SOLUTION.

PRIORITY OF SOLUTIONS: PGNS, AGS, CMC, CHARTS.
GUIDE VALUES: $\dot{X}$=3 fps, $\dot{Y}$=7 fps, $\dot{Z}$=9 fps

RR AGREES WITH VHF WHERE
$\Delta R = 0.01R + 0.5$ NM, ΔR IS ALWAYS $\geq$ 1 NM
RR DOES NOT AGREE WITH VHF,
MSFN ISOLATES FAILED SYSTEM.

IF TIG TPI $\geq$ 8 min EARLY - RECYCLE P34
WITH TIG EQUAL TO NOMINAL TIG-8 min

DPS FOR ΔV > 6 fps (DPS FULL)

TPI SOLUTIONS

		PGNS	AGS	CMC	CHARTS
TIG		N37	373	N37	
θ LOS	(+26.6)	N55	303	N55	
HP	(+46.8)	N58	402	N58	
ΔV TPI	(+24.3)		370		
ΔV TPF	(+31.1)		371		
ΔVX		N81	450	N81*	ΔVX
ΔVY			451	*	
ΔVZ			452	*	ΔVZ

*CHANGE SIGN
NO BIAS

TPI PAD

+	0	0				+	0	0				HRS(190) N37
+	0	0	0			+	0	0	0			MIN(56) TPI
+	0			.		+	0			.		SEC(06.60)
R1(+00000),R2(+026.60),R3(+130.00)												N55
	0			.			0			.		ΔVX(+21.6)N81
	0			.			0			.		ΔVY(-0.8) LV
	0			.			0			.		ΔVZ(-10.8)
+	0		.			+	0		.			R(+37.34) N54 TPI
-	0			.		-	0			.		R(-109.9)TIG-5
X	X		.			X	X		.			BT(00:22)

TIG		N37			373			N37				
θ LOS		N55			303			N55				
HP		N58			402			N58				
ΔV TPI					370							
ΔV TPF					371							
ΔVX		N81			450			N81*			ΔVX	
ΔVY					451			*				
ΔVZ					452			*			ΔVZ	

RESIDUALS

PGNS				AGS			
		ΔVX	N85			ΔVX	500
		ΔVY				ΔVY	501
		ΔVZ				ΔVZ	502

P76/77 PADS

		PURPOSE	
+ 0 0	+ 0 0	HRS	N33
+ 0 0 0	+ 0 0 0	MIN	TIG
+ 0	+ 0	SEC	
		ΔVX	N84/N81
		ΔVY	
		ΔVZ	

		PURPOSE	
+ 0 0	+ 0 0	HRS	N33
+ 0 0 0	+ 0 0 0	MIN	TIG
+ 0	+ 0	SEC	
		ΔVX	N84/N81
		ΔVY	
		ΔVZ	

		PURPOSE	
+ 0 0	+ 0 0	HRS	N33
+ 0 0 0	+ 0 0 0	MIN	TIG
+ 0	+ 0	SEC	
		ΔVX	N84/N81
		ΔVY	
		ΔVZ	

		PURPOSE	
+ 0 0	+ 0 0	HRS	N33
+ 0 0 0	+ 0 0 0	MIN	TIG
+ 0	+ 0	SEC	
		ΔVX	N84/N81
		ΔVY	
		ΔVZ	

AGS SV PADS

	LM INSERTION	PURP	LOAD
	+ 5 6 6 0 2	240	
	+ 0 0 0 0 3	241	
	+ 1 0 1 5 6	242	
	- 0 9 4 6 5	260	
	- 0 0 0 0 1	261	
	+ 5 4 5 7 8	262	
	+ 0 4 9 0 5	254	414+2
	+ 5 7 3 0 2	244	
	+ 0 0 0 0 2	245	
	+ 2 0 0 2 0	246	
	- 1 7 6 2 3	264	
	- 0 0 0 0 4	265	
	+ 5 0 4 1 5	266	
	+ 0 4 9 0 5	272	414+3

		PURP	LOAD
		240	
		241	
		242	
		260	
		261	
		262	
		254	414+2
		244	
		245	
		246	
		264	
		265	
		266	
		272	414+3

P27 PADS

V			V			V			PURP	
: :			: :			: :			GET	
INDEX			INDEX			INDEX			01	1173
									02	1174
									03	1175
									04	1176
									05	1177
									06	1200
									07	1201
									10	1202
									11	1203
									12	1204
									13	1205
									14	1206
									15	1207
									16	1210
									17	1211
									20	1212
									21	1213
									22	1214
									23	1215
									24	1216

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

V			V			V			PURP	
: :			: :			: :			GET	
INDEX			INDEX			INDEX			01	1173
									02	1174
									03	1175
									04	1176
									05	1177
									06	1200
									07	1201
									10	1202
									11	1203
									12	1204
									13	1205
									14	1206
									15	1207
									16	1210
									17	1211
									20	1212
									21	1213
									22	1214
									23	1215
									24	1216

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

P30 PADS

+	0	0				+	0	0				HRS	N33
+	0	0	0			+	0	0	0			MIN	TIG
+	0			•		+	0			•		SEC	
					•						•	ΔVX	N81
					•						•	ΔVY	LV
					•						•	ΔVZ	
+					•	+					•	HA	N42
					•						•	HP	
+					•	+					•	ΔVR	
X	X	X		•		X	X	X		•		BT	
X	X	X				X	X	X				R	FDAI
X	X	X				X	X	X				P	INER
+					•	+					•	TIG	373
					•						•	ΔVX	N86
					•						•	ΔVY	AGS
					•						•	ΔVZ	
X	X	X				X	X	X				BSS	
X	X	□			•	X	X	□			•	SPA	
X	X	X	□		•	X	X	X	□		•	SXP	

RESIDUALS

PGNS				AGS			
		•	ΔVX N85			•	ΔVX 500
		•	ΔVY			•	ΔVY 501
		•	ΔVZ			•	ΔVZ 502

+	0	0				+	0	0				HRS	N33
+	0	0	0			+	0	0	0			MIN	TIG
+	0			•		+	0			•		SEC	
					•						•	ΔVX	N81
					•						•	ΔVY	LV
					•						•	ΔVZ	
+					•	+					•	HA	N42
					•						•	HP	
+					•	+					•	ΔVR	
X	X	X		•		X	X	X		•		BT	
X	X	X				X	X	X				R	FDAI
X	X	X				X	X	X				P	INER
+					•	+					•	TIG	373
					•						•	ΔVX	N86
					•						•	ΔVY	AGS
					•						•	ΔVZ	
X	X	X				X	X	X				BSS	
X	X	□			•	X	X	□			•	SPA	
X	X	X	□		•	X	X	X	□		•	SXP	

RESIDUALS

PGNS				AGS			
		•	ΔVX N85			•	ΔVX 500
		•	ΔVY			•	ΔVY 501
		•	ΔVZ			•	ΔVZ 502

ASCENT

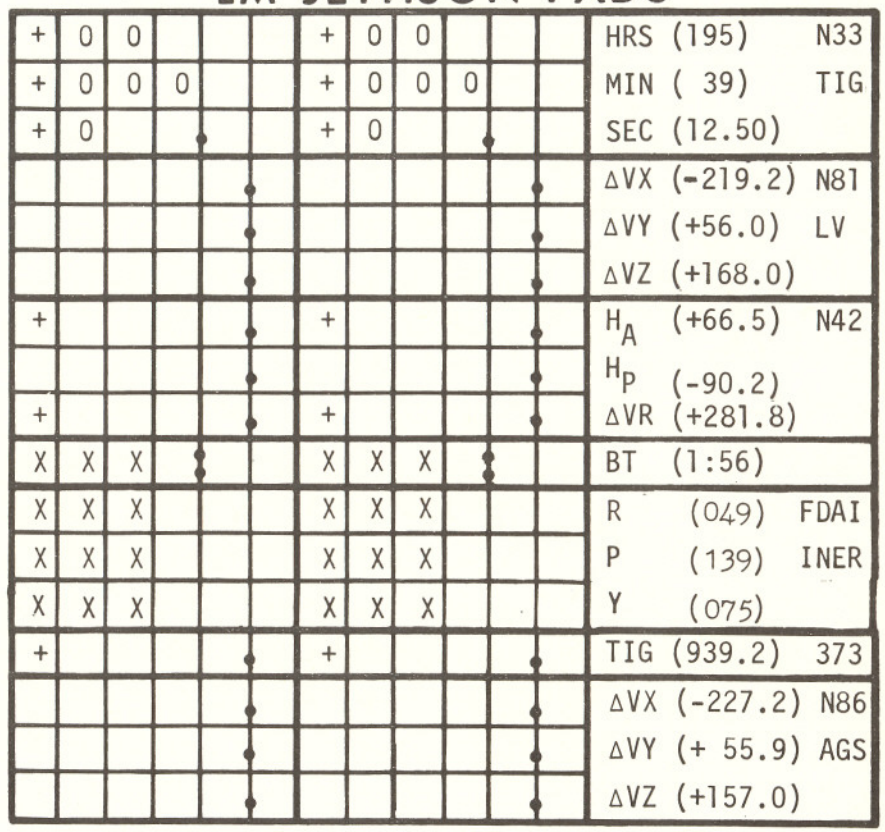
+00000	HRS	N33
+00000	MIN	TIG
+00.00	SEC	
+	V(H)	
+	V(V)N76	
0	*CROSSRANGE	
+	047	
+	053	
+	224/226	
+	231	
+	465	
+	373	
+00000	HRS	N37
+00000	MIN	TPI
+00.00	SEC	
+	LM WT	

*NOTE: LOAD 8 NM CROSSRANGE IF GREATER THAN 8 NM

CSI

+00000	HRS	N11
+00000	MIN	CSI
+00.00	SEC	
R_1(+00001), R_2(+026.60), R_3(+130.00)		N55
+00000	HRS	N37
+00000	MIN	TPI
+00.00	SEC	
0	ΔVX	N81
0	ΔVY	LV
410+1, 605+00777, 416+1, 623+0		
+	373	
+	275	
0	ΔVX	
0	ΔVY	AGS
0	ΔVZ	

LM JETTISON PADS



LM TELMU MISSION RULES
9/1/72

GO/NO-GO ITEM		UNDOCK TO PDI	POWERED DESCENT: PDI TO 6+10	POWERED DESCENT: 6+10 TO HI GATE	POWERED DESCENT: HI GATE TO TD	LUNAR STAY WITH EVA	LM ACTIVE RNDZ
SEQUENTIAL AND PYROTECHNIC							
1. OPERATIONAL PYRO BATTERIES	(2)	(7)		BOTH	(4)	(4) (1)	
2. ARM/DEARM (K1) CAPABILITY	ARM (2)			BOTH			
	DEARM (5)			BOTH		(46)	
3. STAGING RELAYS (K2-K6) NOT CLOSED	(5) (6)			BOTH		(46)	
ELECTRICAL POWER							
1. CDR AND LMP BUS	(3) (11) (61)			(12) BOTH (12)			1 OF 2
2. DC FEEDERS (13) (61)	DESCENT (16)			BOTH		(14)	
	ASCENT			(12) BOTH (12)		(15)	1 OF 2
3. OPERATIONAL BATTERIES	DESCENT		2 OF 5			2 OF 5 (14)	
	ASCENT (17)	(18) (61)	BOTH	(19)	(19)	BOTH (18)	1 OF 2
4. OPERATIONAL AC SYSTEM (23)	INVERTERS (24)		1 OF 2				
	AC BUSES (25)		BUS A OR B				
ENVIRONMENTAL CONTROL							
1. SUIT/CABIN INTEGRITY	(41)		(61) SUIT AND CABIN		SUIT	SUIT AND CABIN	
2. SUIT FANS	(42)		1 OF 2	(43)	(43)	1 OF 2	
3. O_2 DEMAND REGULATORS	(61) (44)		1 OF 2			1 OF 2	
4. H_2O SEPARATORS	(61)		1 OF 2			1 OF 2	
5. OPERATIONAL O_2 TANKS (61)	DESCENT		1 OF 2			1 OF 2	
	ASCENT (45)		1 OF 2			1 OF 2	
6. COOLANT LOOPS (61)	PRIMARY						
	SECONDARY						(47)
7. H_2O FEEDPATHS			1 OF 2			1 OF 2	
8. OPERATIONAL H_2O TANKS (61)	DESCENT		1 OF 2			1 OF 2	
	ASCENT		1 OF 2			1 OF 2	(47)
9. NO FIRE, SMOKE, OR GLYCOL IN SUIT OR CABIN	(48)						

LEGEND ■ NO REQUIREMENT

SPECIFIC RULES

IF NO-GO AT UNDOCKING
DO NOT UNDOCK

IF NO-GO UNDOCKED
NO-GO FOR CIRC

IF NO-GO AT CIRC OR PRE-PDI
NO-GO FOR PDI

IF NO-GO DURING POWERED DESCENT
ABORT/ABORT STAGE

IF NO-GO FOR LUNAR STAY
L/O NEXT BEST OPPORTUNITY

IF NO-GO FOR LM ACTIVE RENDZ
CSM ACTIVE RENDZ

DOCK ASAP FOR ALL NO-GO CONDITIONS EXCEPT:

PYRO
- UNABLE TO DEARM SYSTEM*
- STAGING RELAYS (K2 TO K6) FAILED CLOSED

ELECTRICAL
- LOSS OF 1 ASCENT BATTERY (UNSTAGED)
- LOSS OF AC POWER

ENVIRONMENTAL
- LOSS OF DEMAND REGULATORS
- LOSS OF PRIMARY COOLANT LOOP**
- LOSS OF H_2O TANKS**

*ALTERNATE MISSION WITHIN STAGED RNDZ CAPABILITY MAY BE PERFORMED
**RETURN TO VICINITY OF CSM

NOTE: T_1 NO STAY CONDITIONS
NONE
T_2 NO STAY CONDITIONS
NONE

GENERAL NOTES

SEQUENTIAL AND PYROTECHNIC

LOSS OF A PYRO SYSTEM (MANUAL STAGING)

(1) A. NO DETECTABLE PYRO SYSTEM FAILURES WILL BE CAUSE FOR EVA TERMINATION.

B. WITH THE IMPENDING LOSS OF A PYRO SYSTEM(S) DUE TO A DEGRADING PYRO BATTERY OR BATTERIES, MANUAL STAGING USING BOTH SYSTEMS WILL BE PERFORMED PRIOR TO LOSS OF THE BATTERY OR BATTERIES.

C. IF ONLY A SINGLE PYRO SYSTEM REMAINS, MANUAL STAGING WILL BE DELAYED AS LONG AS POSSIBLE.

D. IF MANUAL STAGING ATTITUDE/DES GOX PRESSURE CONSTRAINTS CANNOT BE MET, MANUAL STAGING WILL NOT BE PERFORMED. THE DES GOX HIGH PRESSURE LINE WILL BE VENTED, IF NECESSARY, TO INSURE SAFE MANUAL STAGING.

(2) A. UNDOCKED STAGING WITH ONE PYRO SYSTEM WILL BE PERFORMED ONLY IF ABSOLUTELY NECESSARY TO MAINTAIN CREW SAFETY.

B. CSM RESCUE MAY BE REQUIRED DUE TO RCS REDLINES IF STAGING CANNOT BE ACCOMPLISHED.

(3) LOSS OF A DC BUS RESULTS IN LOSS OF ONE PYRO SYSTEM.

(4) FOR LOSS OF A PYRO SYSTEM AFTER LOSS OF DPS-TO-ORBIT CAPABILITY DURING POWERED DESCENT IT IS BETTER TO LAND. MANUALLY STAGE AND LIFTOFF NEXT BEST OPPORTUNITY.

K1-K2 FAILED CLOSED

(5) A. A FUNCTIONALLY CONFIRMED FAILED CLOSED K1 OR K2 RELAY IS CONSIDERED UNSAFE FOR THE VIBRATION/SHOCK ENVIRONMENT ASSOCIATED WITH LUNAR TOUCHDOWN. FOR UNSTAGED ORBITAL OPERATION, PLACE ONE ASCENT BATTERY ON THE BUS POWERING THE ACTIVE GUIDANCE SYSTEM. STAGE AS REQUIRED IN ORBIT.

B. IF UNABLE TO VERIFY VIA ONBOARD INST OR TM THAT A PYRO SYS IS DEARMED (FAILED ARMED OR DEARMED INDICATION) THEN: (1) PRIOR TO SHE PRESS THE DEARMED STATUS WILL BE VERIFIED ONLY THE FIRST TIME IT IS DEARMED. (2) FOR SHE PRESS THE DEARMED STATUS WILL BE VERIFIED ONLY FOR AN ARMED INDICATION, (3) AFTER TD THE DEARMED STATUS WILL NOT BE VERIFIED.

K2-K6 FAILURE

(6) A. PRIOR TO PDI, A K2 TO K6 FAILURE WILL BE CONFIRMED. CONFIRMATION WILL RESULT IN A PARTIAL OR COMPLETE STAGING SEQUENCE. HOWEVER, A STAGED ALTERNATE MISSION MAY BE PERFORMED.

B. AFTER PDI, THE FAILURE CANNOT BE CONFIRMED. THE LOGIC POWER B CB MUST REMAIN CLOSED DURING MAIN DESCENT PROPULSION BURNS TO MAINTAIN REDUNDANT ENGINE "ON" CAPABILITY. PRIOR TO ANY MASTER ARM, HOWEVER, THE CB MUST BE OPENED AS ARMING THE SYSTEM MAY STAGE THE LM.

PYRO BATTERY REDLINE

(7) IF THE PYRO BATTERY READING JUST PRIOR TO PDI INDICATES A DECREASE FROM THE VOLTAGE LEVEL READ AT ACTIVATION, THEN PDI WILL BE DELAYED BY ONE REV TO DETERMINE IF THE BATTERY IS CONTINUING TO DEGRADE.

ALTERNATE MISSIONS

(8) A. FOR ORBITAL ALTERNATE MISSIONS, IF INCOMPLETE STAGING OCCURS, THE MISSION MAY BE CONTINUED IF THE ASCENT AND DESCENT STAGES ARE RIGIDLY ATTACHED. IF THE LM STAGES ARE NON-RIGIDLY ATTACHED, THE LM SHOULD GO TO DRIFTING FLIGHT AND A CSM RESCUE INITIATED. CEVA WILL BE REQUIRED IF UNABLE TO DOCK.

B. THERE IS NO REQUIREMENT TO MAINTAIN A LM STAGING CAPABILITY FOR ORBITAL ALTERNATE MISSIONS.

LANDING GEAR

(9) IF UNABLE TO DEPLOY ONE OR MORE LANDING GEAR, A LANDING WILL NOT BE ATTEMPTED. DESCENT ENGINE BURNS WILL BE CONTINUED SINCE CONTROL PROBLEMS ARE NOT EXPECTED TO EXIST AND DAMAGE TO THE LANDING GEAR FROM THE BURN WILL NOT AFFECT ALTERNATE MISSIONS.

(10) RESERVED

ELECTRICAL POWER

BUSES

(11) A. LOSS OF EITHER DC BUS DURING DESCENT ENGINE BURNS RESULTS IN THROTTLING TO 10D PERCENT. IF ON INV 2, LOSS OF THE LMP BUS CAUSES THE ENGINE TO SHUT DOWN UNLESS EVG START PBI HAS BEEN PUSHED.

B. IF A DC BUS IS DETERMINED TO BE CRITICAL (LOSS OF THE BUS RESULTS IN A CATASTROPHIC SITUATION DUE TO OTHER SYSTEMS FAILURES), THE ASCENT BATTERIES WILL BE CONFIGURED SPLIT BUS ON BACKUP FEED PATHS (NORMAL FEED OFF) FOR ASCENT AND DESCENT IF TIME PERMITS.

FEEDERS

(12) DURING POWERED DESCENT WHEN TIME IS NOT AVAILABLE TO TROUBLESHOOT, A SHORT ON EITHER AN ASCENT OR DESCENT FEEDER WILL BE CONSIDERED LOSS OF A BUS AND THUS REQUIRE AN ABORT.

(13) A SHORTED ASCENT OR DESCENT DC FEEDER WILL ALWAYS BE REASON FOR ABORTING THE LANDING MISSION. ONE OPEN DESCENT FEEDER WILL NOT BE REASON FOR ABORTING THE LANDING MISSION.

ELECTRICAL POWER (CONT)

(14) FOR AN OPEN DESCENT FEEDER OR FOR THE LOSS OF THREE DESCENT BATTERIES ON THE SAME BUS, THE CROSSTIE BAL LOAD CIRCUIT BREAKERS WILL BE CLOSED ON THE LUNAR SURFACE AND THE MISSION CONTINUED WITHIN THE CONSUMABLES BUDGET.

(15) FOR A SHORTED ASCENT FEEDER ON THE LUNAR SURFACE, THE ASCENT BATTERIES WILL NOT BE CONNECTED UNTIL THE NOMINAL TIME TO MEED PRECONDITIONING REQUIREMENTS.

(16) FOR A SHORTED DESCENT FEEDER, THE ASCENT BATTERIES WILL BE PLACED ON NORMAL FEED WITH THE SHORT ISOLATED VIA THE DEADFACE RELAY. OPERATIONALLY, THIS RESULTS IN THE LOSS OF ALL REMAINING DESCENT ELECTRICAL ENERGY FOR CONSUMABLE CONSIDERATIONS. THE DESCENT BATTERIES THAT STILL HAVE AN OPERABLE FEED PATH WILL BE USED ONLY IF NECESSARY TO MAINTAIN CREW SAFETY.

BATTERIES

(17) IF THE ASCENT BATTERY OCV AT HOUSEKEEPING IS 37.2 OR 37.0 VDC AND AT ACTIVATION IS 36.5 THROUGH 35.3 VDC, THEN STOP ACTIVATION PROCEDURES AND GO INTO A HOLD STATUS CONSERVING LM CONSUMABLES UNTIL THE ASCENT BATTERY STATUS CAN BE DETERMINED.

(18) ASCENT BATTERY CONFIRMED LOST (ORBIT OR SURFACE-UNSTAGED). WHEN REMAINING ASCENT BATTERY REQUIRED:

1. GOOD BATTERY NORMAL AND BACKUP FEED PATHS
2. BUS CROSSTIE (100A) CB CLOSED
3. DESCENT BATTERIES OFF AT 5 SECOND INTERVALS
4. DES ECA CB'S (2) OPEN
5. ABORT STAGE-PUSH

(19) ASCENT BATTERY CONFIRMED LOST BY REVERSE CURRENT DURING POWERED DESCENT (REVERSE CURRENT ONLY ACCEPTABLE LOSS OF BATTERY CRITERIA).

PDI TO HI GATE	HI GATE TO TOUCHDOWN
1. PANEL 11 DES ECA CB-OPEN IF STAGING REQUIRED:	1. PANEL 11 DES ECA CB-OPEN 2. BUS CROSSTIE (100A) CB-CLOSED
2. BUS CROSSTIE (100A) CB-CLOSED 3. DESCENT BATS OFF AT 5 SEC INTERVALS 4. PANEL 16 DES ECA CB-OPEN 5. GOOD ASCENT BATTERY BACKUP FEED-ON 6. ABORT STAGE-PUSH	IF ABORT REQUIRED: 3. PANEL 16 DES ECA CB-OPEN 4. IF TIME PERMITS, GOOD ASCENT BAT BACKUP FEED-ON 5. IF TIME PERMITS, DESCENT BATS OFF AT 5 SEC INTERVALS 6. ABORT STAGE-PUSH

(20) BATTERY MANAGEMENT WILL BE PERFORMED ONLY DURING LUNAR STAY PERIODS. THE DESCENT BATTERY STATE OF CHARGE WILL BE KEPT AS EQUAL AS PRACTICAL.

(21) A BATTERY WILL NOT BE PUT ONLINE IF ITS OCV IS LESS THAN BUS VOLTAGE.

(22) THE ASCENT BATTERIES WILL BE PRECONDITIONED FOR:

A. ABORT STAGING WITH TWO ASCENT BATTERIES/SPLIT BUS OPERATION - BY REMOVING A MINIMUM OF 2.5 AMP HOURS FROM THE BATTERY ON THE LMP BUS (NORMALLY BATTERY 5) AND A MINIMUM OF 5 AMP HOURS FROM THE BATTERY ON THE CDR BUS (NORMALLY BATTERY 6) IMMEDIATELY PRIOR TO PDI. WITH THE LOSS OF A CELL, THE AFFECTED BAT WILL BE PRECONDITIONED BY REMOVING A TOTAL OF 10 AMP HOURS.

B. LUNAR L/O OR STAGING DURING COASTING FLIGHT WITH TWO ASCENT BATTERIES/SPLIT BUS OPERATION - BY REMOVING A MINIMUM OF 2.5 AMP HOURS FROM EACH ASCENT BATTERY IMMEDIATELY PRIOR TO DISCONNECTING THE LAST DESCENT BATTERY FROM EACH BUS.

C. LUNAR L/O OR STAGING DURING COASTING FLIGHT WITH ONE ASCENT BATTERY/TWO BUS OPERATION--BY REMOVING A MINIMUM OF 5 AMP HOURS FROM THE REMAINING ASCENT BATTERY IMMEDIATELY PRIOR TO DISCONNECTING THE LAST DESCENT BATTERY FROM THE BUSES.

AC POWER

(23) IF ON INV 2 OR AC BUS A IS LOST, PUSH ENGINE START PBI FOR ALL DPS BURNS.

(24) THE INVERTERS WILL BE SWITCHED FOR A VOLTAGE LESS THAN OR EQUAL TO 112 VAC OR A FREQUENCY GREATER THAN OR EQUAL TO 402 OR LESS THAN OR EQUAL TO 398 Hz TO TURN OFF THE INVERTER CAUTION LIGHT.

(25) AC BUS A IS REQUIRED IF THE RR IS REQUIRED.

GENERAL

(26) ELECTRICAL POWER WILL NEVER BE INTENTIONALLY APPLIED TO A SHORT TO HELP DETERMINE ITS LOCATION UNLESS THE FEEDER FAULT LIGHT HAS FAILED. A GOOD BUS WILL NEVER BE CROSSTIED INTO A SHORT OR POSSIBLE SHORT.

(27) THE BAL LOAD CROSSTIES (30 A) WILL BE OPEN FOR MAIN PROPULSION BURNS, STAGING, AND WHENEVER AGS IS IN THE OPERATE MODE WITH BOTH "AEA" CIRCUIT BREAKERS CLOSED. BOTH BUS CROSS TIES (100 A) WILL NOMINALLY NEVER BE CLOSED EXCEPT DURING DESCENT BATTERY LOW TAP TO HIGH TAP SWITCHOVER.

28 THE MISSION WILL BE CONTINUED AFTER LIFTOFF WITH THE LOSS OF OVERCURRENT PROTECTION. IF THIS PROTECTION IS LOST PRIOR TO LIFTOFF, A HOLD WILL BE CALLED.

A. IF OVERCURRENT PROTECTION IS LOST ON AN INDIVIDUAL DESCENT BATTERY, THE BATTERY WILL BE LEFT ON LINE EXCEPT FOR EVA IF POSSIBLE.

B. TO MONITOR CURRENT AND OBTAIN A CONSUMABLES TREND IF ALL DESCENT OVERCURRENT PROTECTION IS LOST, BOTH ASCENT BATTERIES WILL BE PARALLELED WITH THE DESCENT BATTERIES PERIODICALLY DURING ACTIVATION. DURING LUNAR SURFACE OPERATIONS WITH THE COMPUTERS OFF, THE ASCENT BATTERIES WILL BE TURNED ON ALONE FOR PERIODIC CURRENT MONITORING. FOR AN EVA, THE CDR AND LMP BUSES WILL BE SPLIT (THE CROSSTIE CIRCUIT BREAKERS ON PANEL 16 OPENED).

C. IF ONE OR BOTH ASCENT BATTERY NORMAL FEED CONTACTORS FAIL OPEN, THE SPACECRAFT WILL BE CONFIGURED WHEN ASCENT STAGE ONLY OPERATIONS ARE REQUIRED, USING THE BACKUP FEEDS ON BOTH ASCENT BATTERIES WITH THE CROSSTIES LEFT OPEN.

29 ANY REQUIREMENT FOR A NEXT BEST OPPORTUNITY LIFTOFF WILL BE CAUSE FOR TERMINATION OF AN EVA. ADDITIONALLY A CREWMAN WILL BE REQUIRED TO RETURN FROM AN EVA TO CORRECT A DESCENT BATTERY MALFUNCTION REQUIRING THE BATTERY TO BE TAKEN OFFLINE.

30 WHEN AGS IS IN THE OPERATE MODE MOMENTARILY CLOSE THE AEA C/B ON THE CDR BUS WHEN POWERING UP INV 2.

31 FOR ANY MISSION PLANNING CASE (NOMINAL, ALTERNATE, CONTINGENCY, EMERGENCY, ETC.) THE DESCENT BATS WILL BE CONSIDERED TO HAVE A MAXIMUM OF 415 AH AND THE DES COOLING VLV WILL NOT BE USED UNLESS THE DES BATS MUST BE RUN BEYOND 415 AH. IF, AND ONLY IF, THE DES BATS MUST BE RUN BEYOND 415 AH, THE VLV WILL BE CLOSED BASED ON DES BAT CAPABILITIES DETERMINED BY THE MISSION SIM ATP WITHOUT COOLING AND A MAXIMUM INTERNAL BATTERY TEMP OF 130° F.

32-40 RESERVED

ENVIRONMENTAL

SUIT/CABIN INTEGRITY

41 CREW WILL GO TO EGRESS MODE IF INSUFFICIENT O_2 IS AVAILABLE TO MAINTAIN CABIN PRESSURE. A MISSION PHASE WILL NOT INITIATED IF THIS CONDITION CAN BE ANTICIPATED.

SUIT FAN

42 RETAIN PLSS'S, IF POSSIBLE WHEN BOTH SUIT FANS ARE LOST, AND DO NOT DEPRESS CABIN OR STAGE WHILE UNDOCKED.

43 FOR LOSS OF BOTH SUIT FANS PLACE DEMAND REG B TO "DIRECT O_2" IMMEDIATELY OR REMOVE HELMETS. (HELMETS MUST BE REMOVED FOR STAGING.)

O_2 REGULATORS

44 DO NOT DEPRESS CABIN WITH LOSS OF BOTH DMD REGS.

O_2 TANKS

45 IF EITHER ASCENT O_2 TANK IS LESS THAN OR EQUAL TO 90 PERCENT, IT WILL BE REPLENISHED FROM THE DESCENT O_2 WHEN THE DESCENT TANK QUANTITY IS GREATER THAN OR EQUAL TO 35 PERCENT AND AS CLOSE TO STAGING AS POSSIBLE.

46 DESCENT OXYGEN TANK 2 WILL BE VENTED, IF NECESSARY, TO PROVIDE AN ACCEPTABLE LANDING ATTITUDE FOR AN INADVERTENT STAGING. IF INADVERTENT STAGING IS UNACCEPTABLE, LIFTOFF AT NEXT BEST OPPORTUNITY.

COOLANT LOOPS

47 CREW MAY ELECT TO REMOVE PGA'S FOR COOLING FOR LOSS OF BOTH COOLANT LOOPS OR LOSS OF BOTH ASCENT WATER TANKS.

CONTAMINATION

48 FOR CONTAMINATION IN THE CABIN OR SUIT LOOP (GLYCOL, FIRE, SMOKE, ETC.) THE CREW MAY ELECT TO DECOMPRESS THE CABIN OR PURGE THE SUIT LOOP.

GENERAL

49 OXYGEN PURGE SYSTEM AND PLSS CONSUMABLES WILL BE RESERVED FOR POSSIBLE CEVA AND WILL NOT BE CONSIDERED FOR LM GO/NO-GO'S OR REDLINES.

50 ANY REQUIREMENT FOR A NEXT BEST OPPORTUNITY LIFTOFF WILL BE CAUSE FOR TERMINATION OF EVA. ADDITIONALLY, A CREWMAN WILL BE REQUIRED TO RETURN FROM AN EVA TO CORRECT A FAILED OPEN DEMAND REGULATOR.

51-60 RESERVED

MISCELLANEOUS

61 WHERE ADVANTAGEOUS, THE DESCENT STAGE WILL BE RETAINED ALAP.

LM CONTROL MISSION RULES

9/1/72

GO/NO-GO CRITERIA

MISSION RULES
TELMU/CONTROL

GO/NO-GO ITEM		UNDOCK TO PDI	POWERED DESCENT: PDI TO 6+10	POWERED DESCENT: 6+10 TO HI GATE	POWERED DESCENT: HI GATE TO TD	LUNAR STAY W/EVA	LM ACTIVE RNDZ
GNC							
1. GUIDANCE STEERING	OPERATIONAL PGNS	←	→	→		(2) PGNS OR AGS	→
	OPERATIONAL AGS	←	(1)	→			
2. 3-AXIS ATT CONT	PGNS RATE CMD OR PGNS AUTO	←	BOTH	→	(3)	BOTH (10)	PGNS OR AGS
	AGS RATE CMD (4)						
3. 3-AXIS TRANS (5)		+3 AXIS (17)					(18) 1 AXIS →
4. FDAI-ATT/RATES/ERR		←	CREW OPTION		→		
5. T/D 40 SEC OF 57 PERCENT GTC		←	→	→			
6. VHF RNG/CSM OPTICS		2 OF 3 →					
7. RR							
8. AOT							
9. LR		←	→	→			
10. DPS AUTO ON (5)							
11. REDNT APS ON (6)		←	→				
12. P&R GDA TRIM		←	(7) NO IMPINGEMENT CONSTRAINTS		→		
13. MAN THTL (8) (1 TTCA)		←	1 OF 2		→		
14. AUTO THTL							
DPS							
1. OPERATIONAL DPS		← (9)	→	→	→		
2. ADEQUATE PROP	(12)	←	→	→	→		
3. FTP BLOWNDOWN CAPABILITY		←	→	(11) 34% PQGS	→		
APS							
1. OPERATIONAL APS		←	→	→	→	→	APS NOT REQ FOR RNDZ
2. NO PROP LEAKS		←	→	→	→	IMMED L/O →	
3. NO HE LEAKS/ REDUNDANT PRESS PATH		←	→	→	→	(13) →	
RCS							
1. OPERATIONAL RCS		←	A AND B →	→	A OR B →	A & B →	(18) A OR B →
2. RCS LEAKS (14)		←	NO LEAKS →	(15) →	A OR B →	(15) NO LKS →	
3. NO IMPINGEMENT LIMITS EXCEEDED (16)		←	→	→	→		

LEGEND: NO REQUIREMENT

GENERAL NOTES

(1) LOSS OF AGS GUIDANCE STEERING IS ACCEPTABLE PROVIDED RDNT 3-AXIS ATT CONT EXISTS

(2) LOSS OF PGNS OR AGS GUIDANCE STEERING IS ACCEPTABLE PROVIDED RDNT 3-AXIS CONT EXISTS

(3) FOR SINGLE CONTROL MODE, LANDING IS CREW OPTION

(4) AGS RATE CMD MAY CONSIST OF 2 AXIS RATE CMD AND ONE DIRECT, I.E. ONE RATE GYRO FAILED

(5) NO AUTO ULLAGE PLUS NO AUTO START--PDI NO GO

(6) MANUAL IS MANDATORY PLUS EITHER PGNS AUTO OR AGS AUTO

(7) GDA WILL BE COMMANDED OFF--ABORT STAGE IF IMPINGEMENT LIMITS VIOLATED

(8) WORK-AROUND PROCEDURE EXISTS FOR MAXIMUM THRUST

(9) INHIBIT DPS BURNS

(10) ASCEND NEXT BEST OPPORTUNITY

(11) ABORT STAGE PRIOR TO INLET PRESSURES REACHING 150 PSIA

(12) ABORT, THEN ABORT STAGE AT DPS DEPLETION IF:

A. LOW LEVEL CONFIRMS INSUFFICIENT PROPELLANT TO LAND

B. Δ BETWEEN FUEL AND OXIDIZER QUANTITY IS GREATER THAN 10 PERCENT

C. PQGS READING 2 PERCENT AND NO VALID TIME ESTIMATE FROM LOW LEVEL

D. DPS PROPELLANT MARGIN PREDICTED LESS THAN MINUS 0.2 PERCENT AFTER ENTRY INTO P64 (CONFIRMED BY OTHER CUES)

(13) APS HELIUM SOURCE LEAK AFTER PRESSURIZATION REQUIRES IMMEDIATE LIFTOFF

(14) IF MANIFOLD PRESSURE LESS THAN 100 PSIA, AND LEAK UPSTREAM OF MAIN SOV, CROSSFEED FROM GOOD SYSTEM

(15) CONTINUE MISSION ONLY IF RCS BLOWDOWN CAPABILITY EXISTS TO MEET CONSUMABLE REDLINES

(16) ABORT STAGE AS SOON AS POSSIBLE

(17) CONTINUE MISSION AFTER CIRC

(18) LOSS OF SOME TRANSLATIONAL CAPABILITY REQUIRES HYBRID LM/CSM MANEUVERS DURING DOCKING PHASE

NOTE

1 T_1 NO STAY CONDITIONS:
- APS PROP LEAK
- RCS PROP LEAK (BOTH SYS)

2 T_2 NO STAY CONDITIONS:
- APS PROP LEAK
- RCS LEAK (BOTH SYS)

SPECIFIC RULES

IF NO-GO AT UNDOCKING
DO NOT UNDOCK

IF NO-GO UNDOCKED
NO GO FOR CIRC/DOCK

IF NO-GO AT CIRC OR PRE-PDI
NO GO FOR PDI/DOCK

IF NO-GO DURING POWERED DESCENT
ABORT
ABORT STAGE AT LOSS OF DPS CAPABILITY

IF NO-GO LUNAR STAY
L/O NEXT BEST OPPORTUNITY

IF NO-GO RENDEZVOUS
CSM ACTIVE RENDEZVOUS

EVA MISSION RULES

9/1/72

LUNAR SURFACE EVA

GO/NO-GO ITEM	IF NO-GO		NOTES
	TERMINATE EVA IMMEDIATELY	TERMINATE EVA	
PROPER VENTILATION	X		①
PLSS POWER	X		②
CONTAMINATION CONTROL	X		①
EMU PRESS INTEGRITY			③
A. PRESS <3.4 PSID	X		
B. 3.4 <PRESS <3.5 PSID		X	
THERMAL CONTROL		X	②
PRIMARY O_2 SUPPLY		X	③ ④
CRITICAL INSTRUMENTATION		X	
OPERATIONAL OPS		X	
OPERATIONAL PGA		X	

NOTES:

① ACTIVATE OPS: OPEN PGA PURGE VLV -- LOW FLOW.

② ACTIVATE BSLSS AND/OR OPS PURGE AS REQUIRED.

③ ACTIVATE OPS

④ IF EMU REG PRESS GREATER THAN 4.05 PSID, CLOSE POS SHUTOFF VLV AFTER ACTUATING OPS.

CMP EVA

GO/NO-GO ITEM	IF NO-GO	
	TERMINATE EVA ACTIVATE OPS AS REQUIRED	TERMINATE EVA
EMU PRESSURE INTEGRITY	X	
ADEQUATE O_2 FLOW (FROM SCU)	X	
CRITICAL INSTRUMENTATION		X

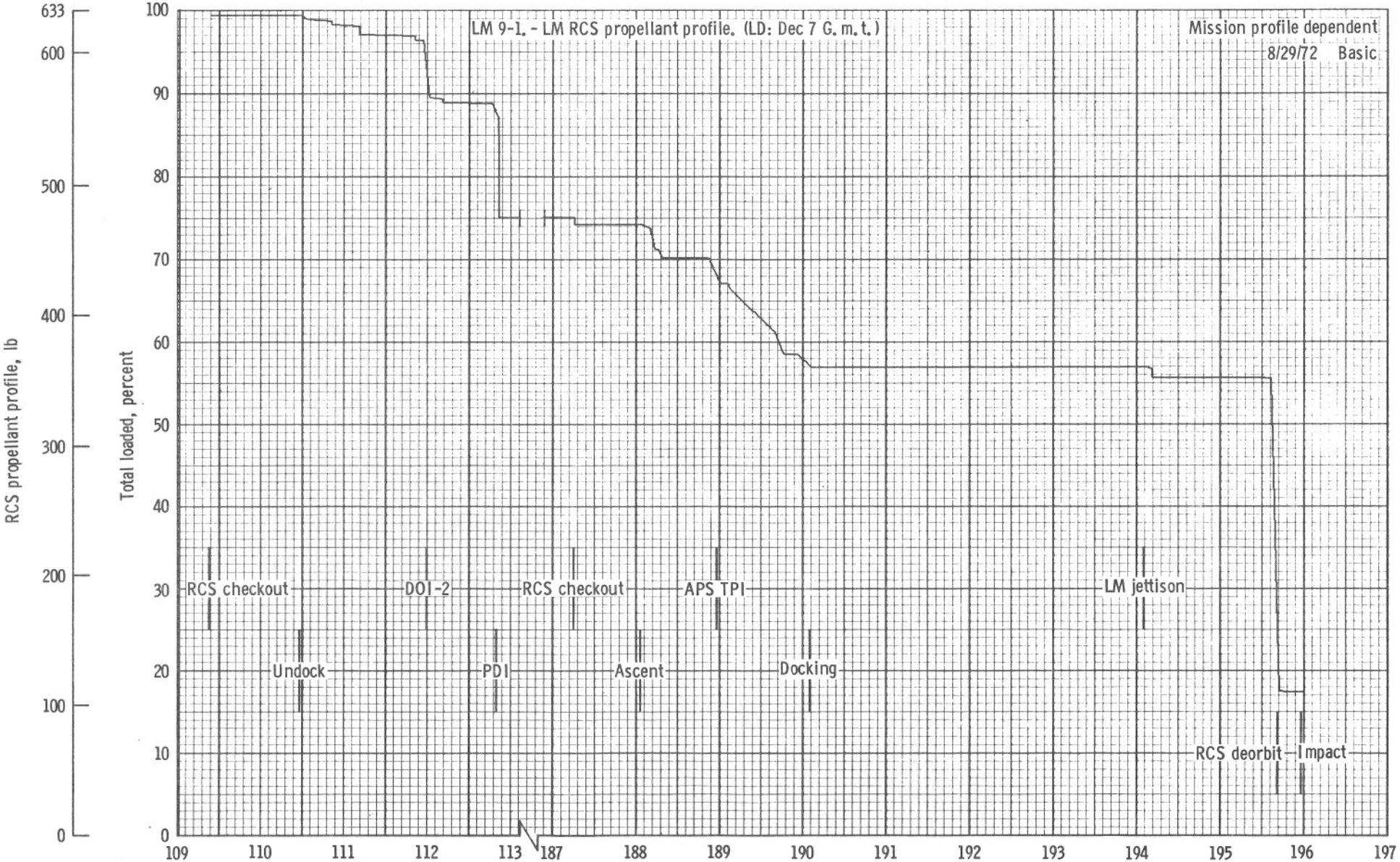
FCD 5-69.25.5B

COMMUNICATIONS/INSTRUMENTATION GO CRITERIA
9/1/72

GO/NO-GO ITEM	EARTH ORBIT		TLC			LUNAR ORBIT (BEFORE UNDOCKING)			UNDOCKING	CIRC/ DOI 2	POWERED DESCENT				LUNAR STAY			RENDEZVOUS LM ACTIVE	LUNAR ORBIT POST REND	POST DOCK	TEC
	CONT BOOST	CONT E.O.	TLI	TD&E	CONT TLC	LOI	CONT LOI	CONT L.O./DOI (5)	NOMINAL MISSION		PDI	PDI TO PDI +6:10	PDI+6:10 TO HI GATE	HI GATE TO T/D	STAY W/O EVA	2-MAN EVA	1-MAN EVA		CONT L.O.	LM JETT	CSM EVA
USB 2-WAY VOICE COMM		(1)	CSM			CSM OR LM		CSM OR LM (5)	CSM & LM	CSM	CSM AND LM				CSM /LM (3)	CSM /LM (3)	CSM /LM (3)		CSM	CSM	
VHF COMM LM/CSM									SIMPLEX OR DUPLEX	(9)											
VHF COMM LM (LCRU)/ EVA																SIMP (6)	SIMP (6)				
VHF COMM EVA/EVA																					
MSFN/EVA VOICE																(8)	(8)				
CRITICAL INSTRUMENTATION		CSM				CSM		CSM (7)	LM & CSM	CSM AND LM	CSM AND LM	(4) LM (4)		(4)	LM AND CSM			LM	CSM		
LM TELEMETRY									LBR OR HBR	LBR OR HBR	LBR OR HBR				LBR OR HBR						
CSM TELEMETRY		HBR OR LBR																			
CSM SCE																					

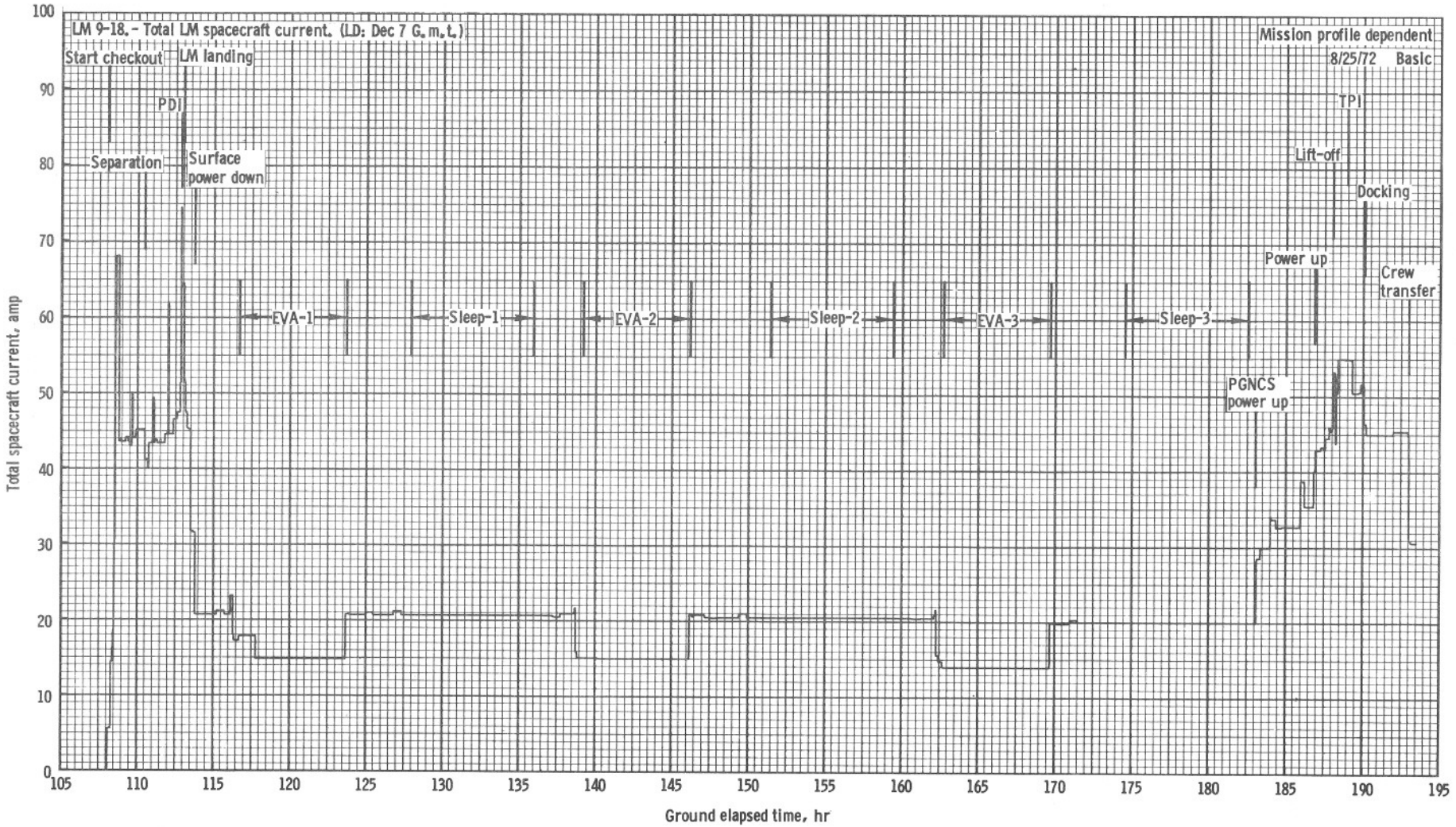
(1) VHF IS ACCEPTABLE
(2) RESERVED
(3) LM RELAY TO CSM IS ACCEPTABLE
(4) ADQUATE DATA TO MAKE FINAL GO/NO-GO TO CONTINUE POWERED DESCENT (TM OR ONBOARD DISPLAY)
(5) CSM AND LM COMM IS REQUIRED FOR DOI
(6) IF LM PROBLEM IS DEFINED, CONTINUE EVA PREP AND ACTIVATE LCRU ASAP
(7) CSM AND LM CRITICAL INST REQUIRED FOR DOI
(8) VOICE UPLINK TO EITHER CREWMAN, VOICE DOWNLINK FROM ONE CREWMAN OR TV
(9) VOICE CONFIRMATION OF CIRC MNVR IS MANDATORY FOR DOI 2

LEGEND: NO REQUIREMENT

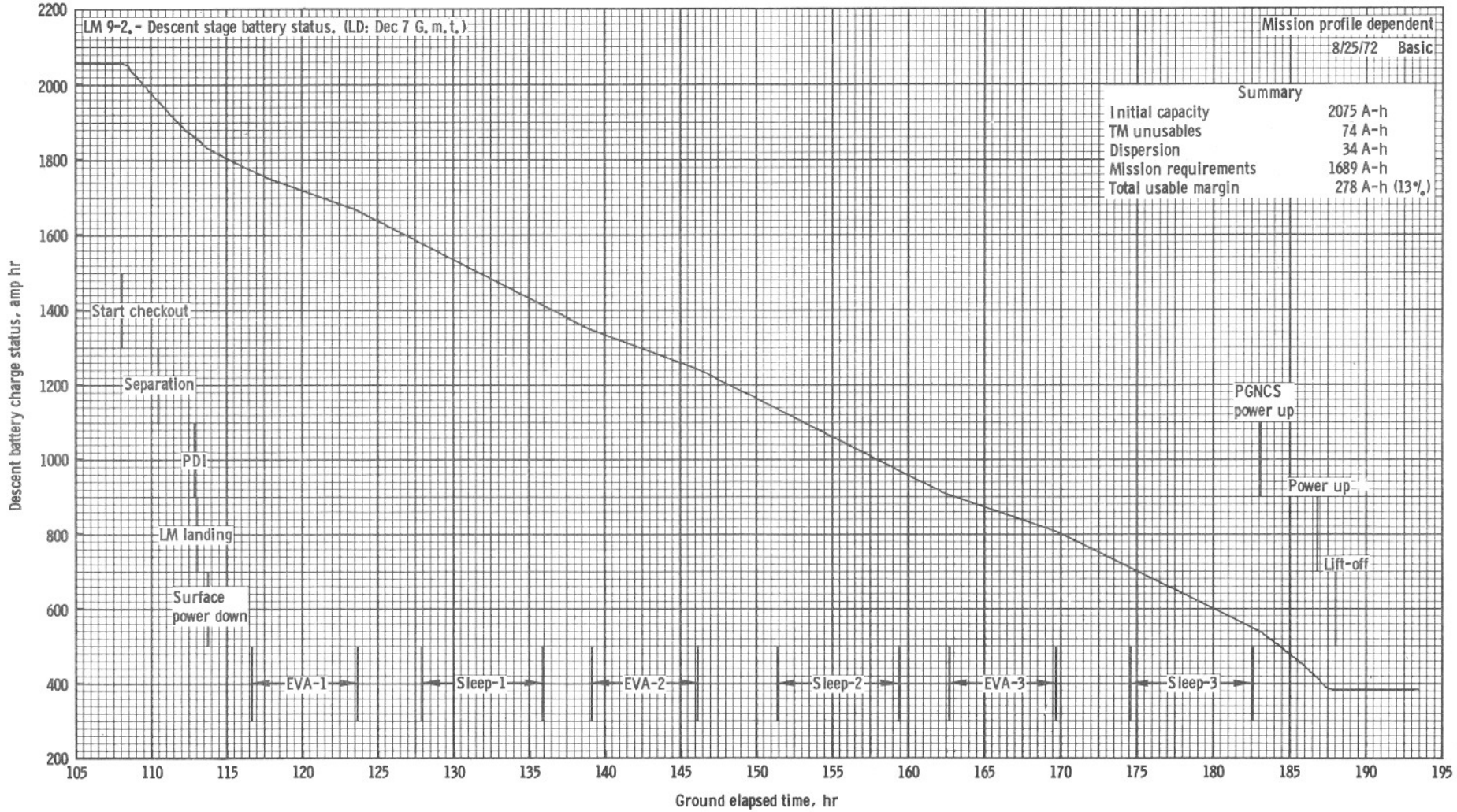


LM RCS propellant profile.

CONSUMABLES
RCS/CURRENT

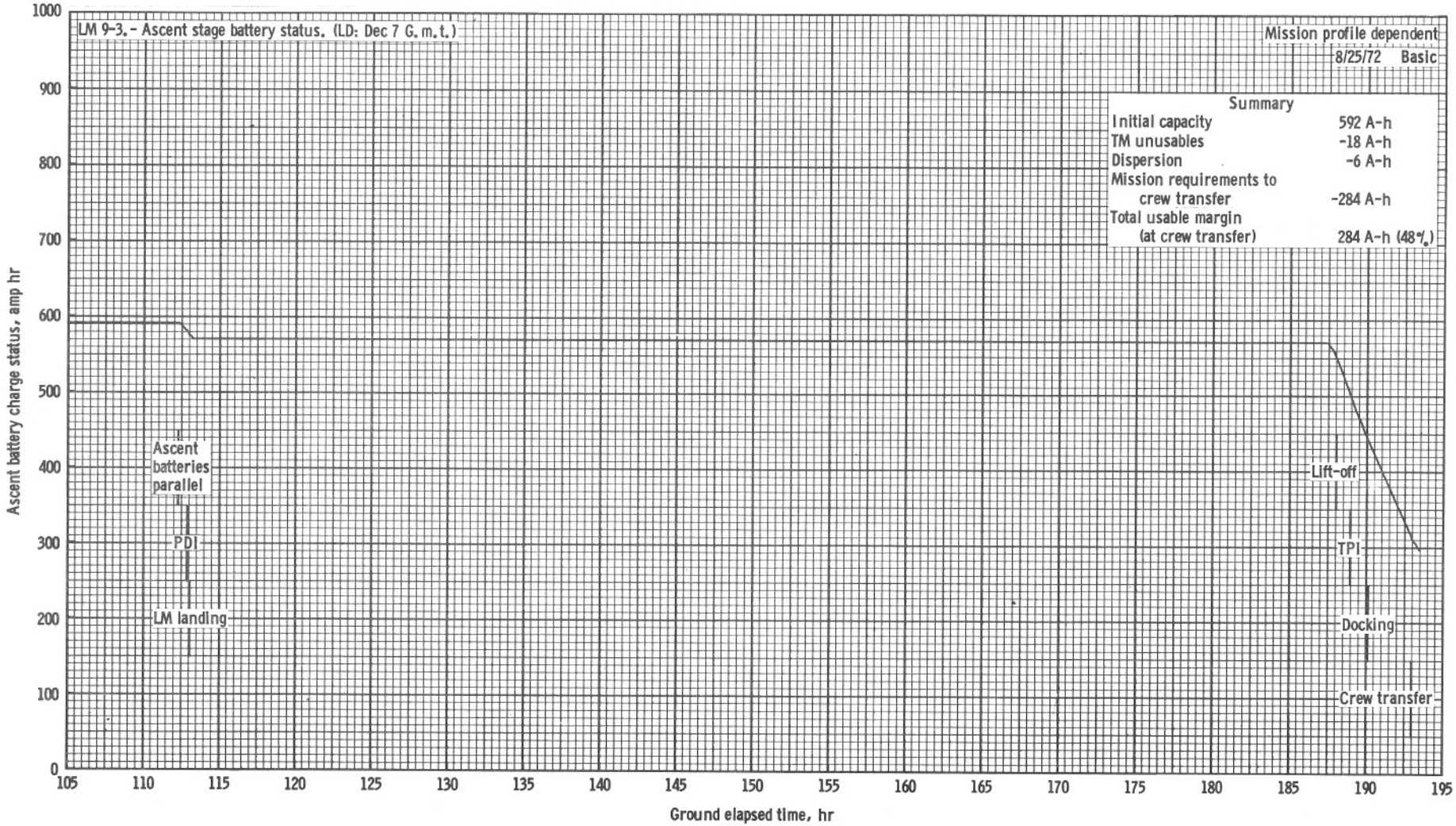


Apollo 17 total LM spacecraft current.

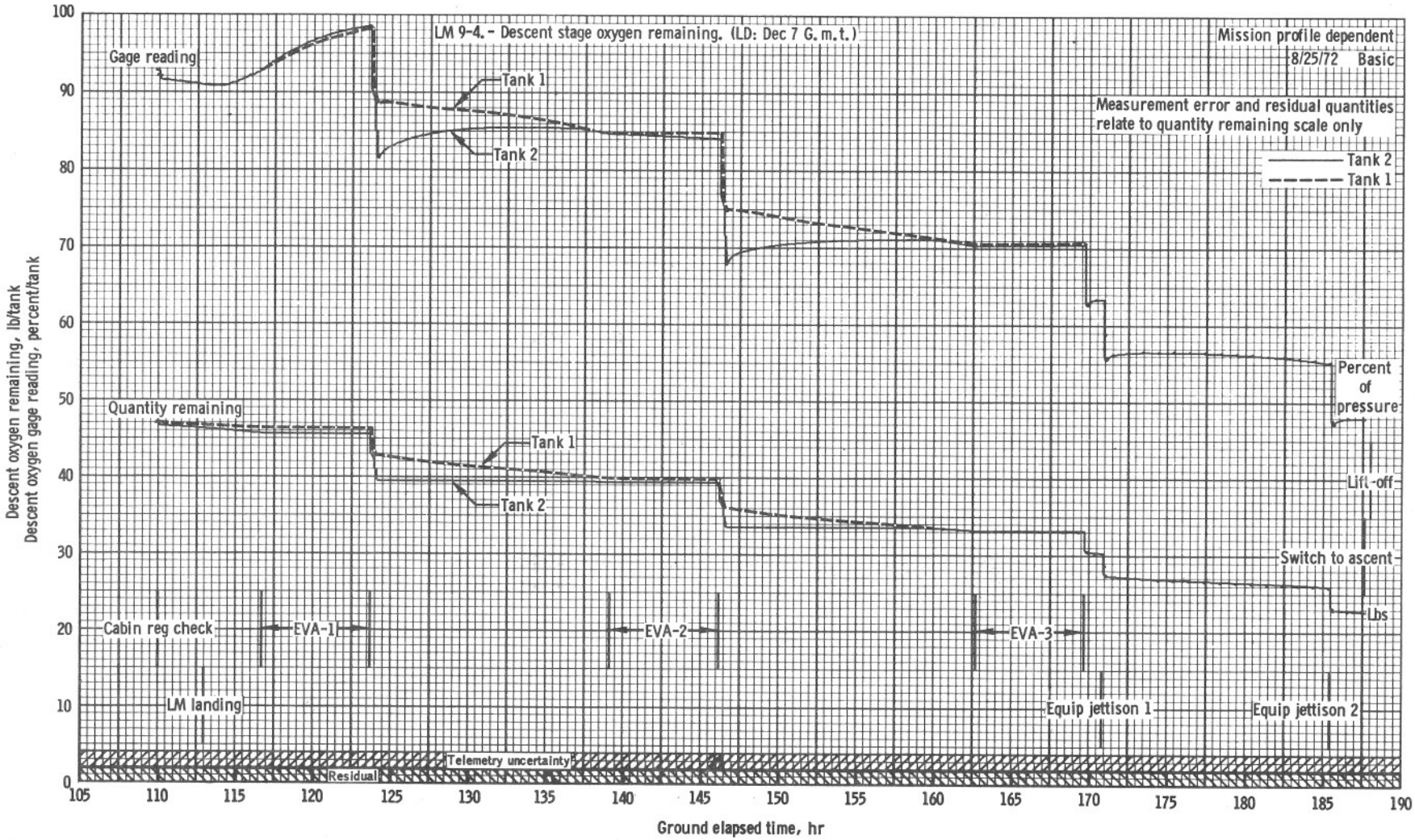


Apollo 17 descent electrical energy remaining.

CONSUMABLES
DESC/ASC A-H

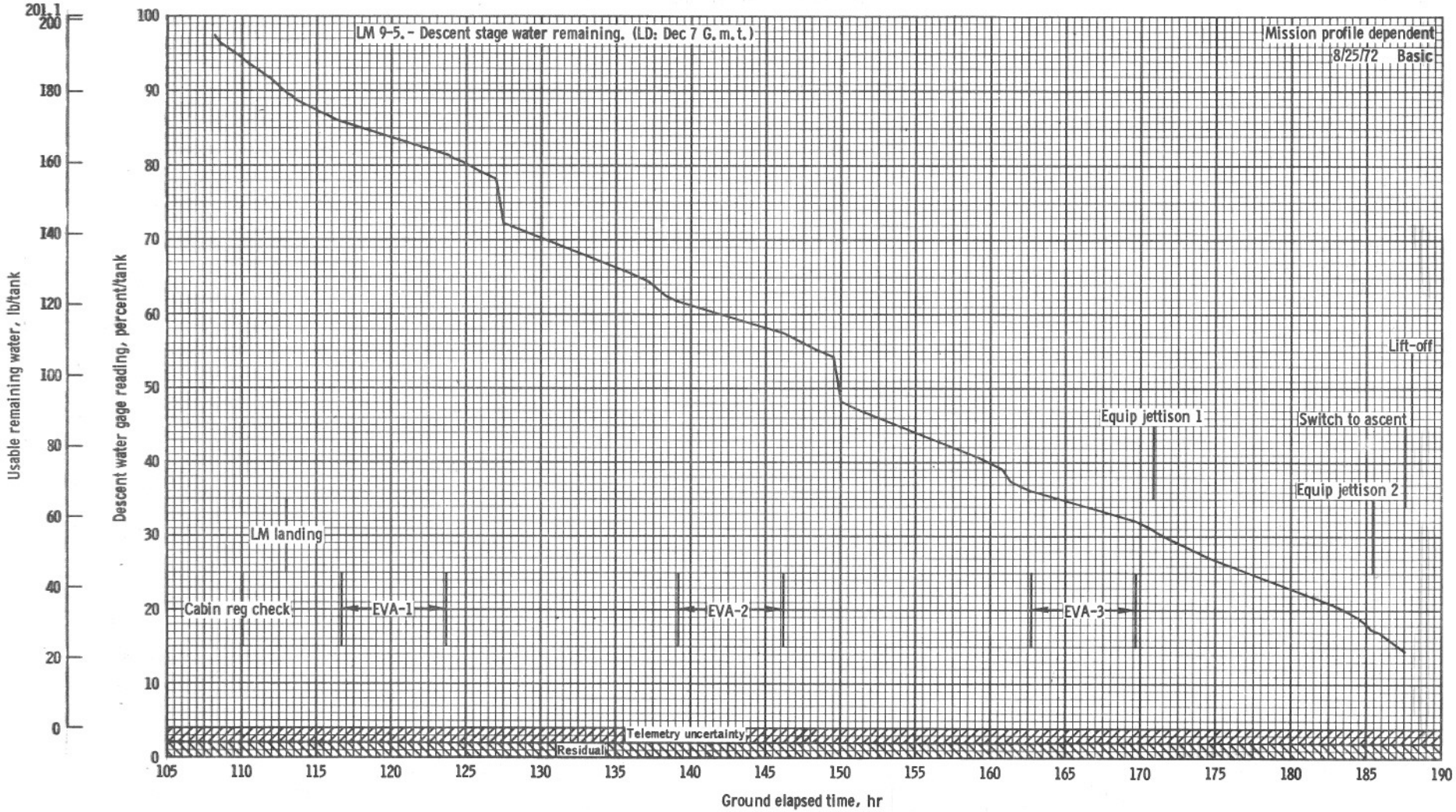


Apollo 17 ascent electrical energy remaining.

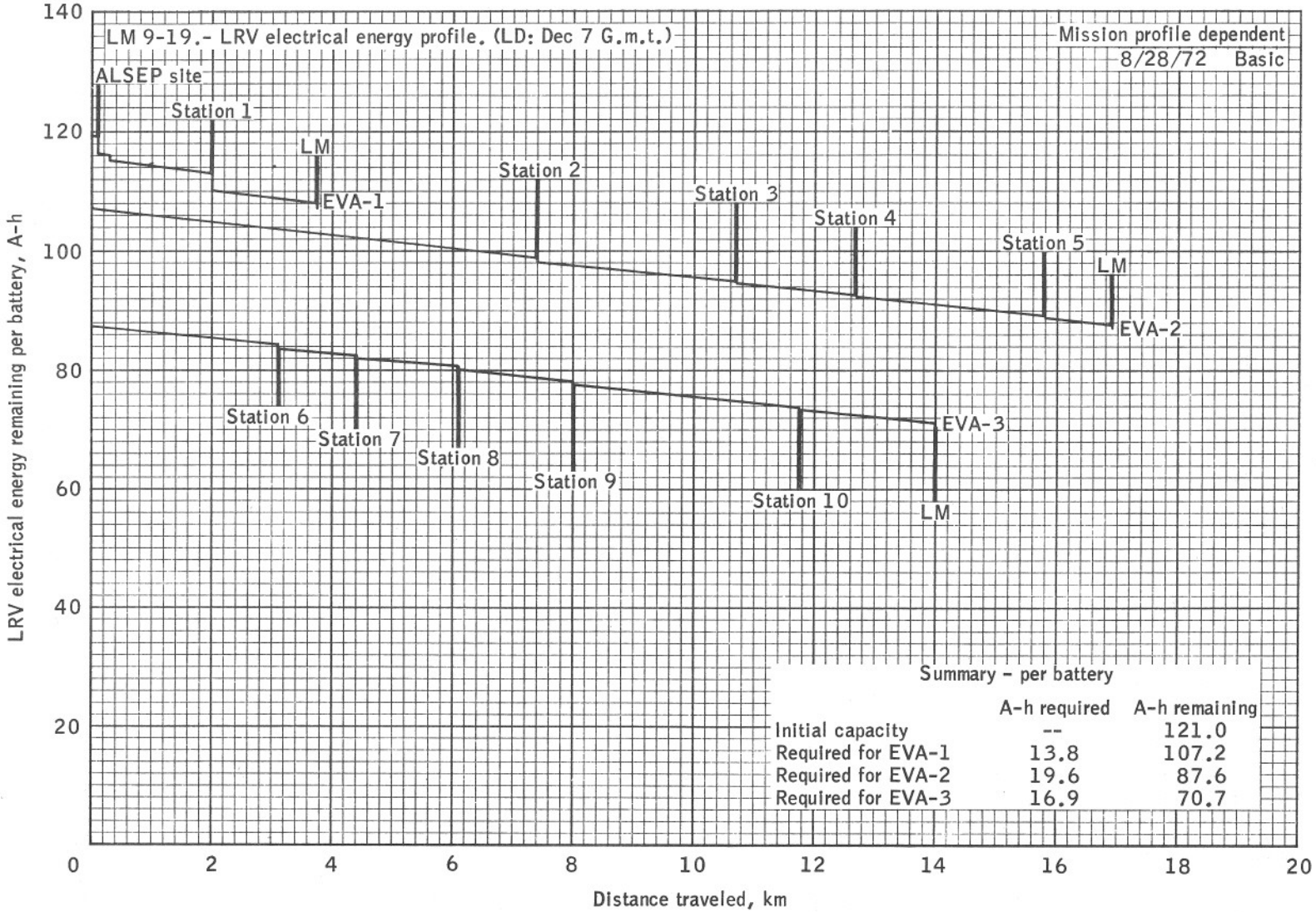


Descent stage oxygen remaining.

CONSUMABLES
DESC O2/H2O



Descent stage water remaining.



LRV electrical energy profile.

EARTH UNIT VECTORS
8/23/72 BASIC

0 Hours GET = 12:7:2:54
Liftoff = 12:7:_:__

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
112.00	-.82535	.53880	.16883
112.50	-.82792	.53541	.16700
113.00	-.83048	.53201	.16517
113.50	-.83302	.52860	.16333
114.00	-.83554	.52518	.16149
114.50	-.83804	.52174	.15965
115.00	-.84053	.51829	.15780
115.50	-.84300	.51483	.15594
116.00	-.84545	.51135	.15409
116.50	-.84789	.50786	.15222
117.00	-.85031	.50436	.15036
117.50	-.85271	.50085	.14849
118.00	-.85510	.49732	.14661
118.50	-.85746	.49379	.14473
119.00	-.85981	.49024	.14285
119.50	-.86214	.48667	.14096
120.00	-.86446	.48310	.13907
120.50	-.86676	.47951	.13718
121.00	-.86904	.47591	.13528
121.50	-.87130	.47230	.13338
122.00	-.87354	.46868	.13147
122.50	-.87577	.46504	.12956
123.00	-.87797	.46139	.12765
123.50	-.88016	.45773	.12573
124.00	-.88233	.45406	.12381
124.50	-.88449	.45038	.12188
125.00	-.88662	.44668	.11995
125.50	-.88874	.44298	.11802
126.00	-.89084	.43926	.11608
126.50	-.89292	.43553	.11414
127.00	-.89498	.43179	.11220
127.50	-.89702	.42804	.11025
128.00	-.89904	.42428	.10830
128.50	-.90105	.42050	.10635
129.00	-.90303	.41671	.10439
129.50	-.90500	.41292	.10243
130.00	-.90695	.40911	.10047
130.50	-.90887	.40529	.09850
131.00	-.91078	.40146	.09653
131.50	-.91267	.39762	.09456
132.00	-.91454	.39377	.09258
132.50	-.91640	.38990	.09060
133.00	-.91823	.38603	.08862
133.50	-.92004	.38215	.08663
134.00	-.92183	.37825	.08464
134.50	-.92360	.37435	.08265
135.00	-.92536	.37043	.08066
135.50	-.92709	.36651	.07866
136.00	-.92881	.36257	.07666
136.50	-.93050	.35862	.07466

0 Hours GET = 12:7:2:54
Liftoff = 12:7:_:__

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
137.00	-.93217	.35467	.07265
137.50	-.93383	.35070	.07064
138.00	-.93546	.34672	.06863
138.50	-.93707	.34274	.06661
139.00	-.93867	.33874	.06460
139.50	-.94024	.33474	.06258
140.00	-.94179	.33072	.06056
140.50	-.94332	.32669	.05853
141.00	-.94483	.32266	.05650
141.50	-.94632	.31861	.05447
142.00	-.94779	.31456	.05244
142.50	-.94924	.31050	.05041
143.00	-.95067	.30642	.04837
143.50	-.95208	.30234	.04633
144.00	-.95347	.29825	.04429
144.50	-.95483	.29415	.04225
145.00	-.95618	.29004	.04020
145.50	-.95750	.28592	.03816
146.00	-.95880	.28180	.03611
146.50	-.96008	.27766	.03406
147.00	-.96134	.27352	.03200
147.50	-.96258	.26936	.02995
148.00	-.96380	.26520	.02789
148.50	-.96499	.26103	.02583
149.00	-.96616	.25685	.02377
149.50	-.96732	.25267	.02171
150.00	-.96845	.24847	.01964
150.50	-.96955	.24427	.01758
151.00	-.97064	.24006	.01551
151.50	-.97171	.23584	.01344
152.00	-.97275	.23161	.01137
152.50	-.97377	.22738	.00930
153.00	-.97477	.22313	.00722
153.50	-.97574	.21888	.00515
154.00	-.97670	.21462	.00307
154.50	-.97763	.21036	.00099
155.00	-.97854	.20609	-.00110
155.50	-.97943	.20181	-.00318
156.00	-.98029	.19752	-.00526
156.50	-.98113	.19322	-.00734
157.00	-.98195	.18892	-.00943
157.50	-.98275	.18461	-.01151
158.00	-.98352	.18030	-.01360
158.50	-.98428	.17598	-.01568
159.00	-.98500	.17165	-.01777
159.50	-.98571	.16731	-.01986
160.00	-.98639	.16297	-.02195
160.50	-.98705	.15862	-.02404
161.00	-.98769	.15427	-.02613
161.50	-.98830	.14991	-.02822

EARTH UNIT VECTORS
8/23/72 BASIC

0 Hours GET = 12:7:2:54
Liftoff = 12:7:_:__

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
162.00	-.98889	.14554	-.03031
162.50	-.98946	.14117	-.03241
163.00	-.99001	.13679	-.03450
163.50	-.99053	.13240	-.03659
164.00	-.99102	.12801	-.03869
164.50	-.99150	.12361	-.04078
165.00	-.99195	.11921	-.04288
165.50	-.99238	.11480	-.04497
166.00	-.99278	.11039	-.04707
166.50	-.99316	.10597	-.04916
167.00	-.99352	.10155	-.05126
167.50	-.99385	.09712	-.05335
168.00	-.99416	.09268	-.05545
168.50	-.99444	.08825	-.05754
169.00	-.99470	.08380	-.05964
169.50	-.99494	.07935	-.06174
170.00	-.99515	.07490	-.06383
170.50	-.99534	.07044	-.06593
171.00	-.99551	.06598	-.06802
171.50	-.99565	.06151	-.07012
172.00	-.99576	.05704	-.07221
172.50	-.99585	.05257	-.07430
173.00	-.99592	.04809	-.07640
173.50	-.99597	.04361	-.07849
174.00	-.99599	.03912	-.08058
174.50	-.99598	.03463	-.08267
175.00	-.99595	.03014	-.08476
175.50	-.99590	.02564	-.08685
176.00	-.99582	.02114	-.08894
176.50	-.99571	.01663	-.09103
177.00	-.99559	.01213	-.09312
177.50	-.99543	.00762	-.09520
178.00	-.99526	.00310	-.09729
178.50	-.99505	-.00142	-.09937
179.00	-.99483	-.00594	-.10146
179.50	-.99458	-.01046	-.10354
180.00	-.99430	-.01499	-.10562
180.50	-.99400	-.01951	-.10770
181.00	-.99367	-.02404	-.10978
181.50	-.99332	-.02857	-.11185
182.00	-.99294	-.03311	-.11393
182.50	-.99254	-.03764	-.11600
183.00	-.99211	-.04218	-.11807
183.50	-.99166	-.04672	-.12015
184.00	-.99118	-.05126	-.12221
184.50	-.99068	-.05580	-.12428
185.00	-.99015	-.06035	-.12635
185.50	-.98960	-.06489	-.12841
186.00	-.98902	-.06944	-.13047
186.50	-.98842	-.07398	-.13253

0 Hours GET = 12:7:2:54
Liftoff = 12:7:_:__

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
187.00	-.98779	-.07853	-.13459
187.50	-.98714	-.08308	-.13664
188.00	-.98646	-.08763	-.13870
188.50	-.98575	-.09218	-.14075
189.00	-.98502	-.09673	-.14280
189.50	-.98426	-.10128	-.14484
190.00	-.98348	-.10584	-.14689
190.50	-.98267	-.11039	-.14893
191.00	-.98184	-.11494	-.15097
191.50	-.98098	-.11949	-.15301
192.00	-.98010	-.12404	-.15504
192.50	-.97919	-.12859	-.15707
193.00	-.97825	-.13314	-.15910
193.50	-.97729	-.13769	-.16113
194.00	-.97630	-.14224	-.16315
194.50	-.97529	-.14679	-.16517
195.00	-.97425	-.15134	-.16719
195.50	-.97318	-.15589	-.16920
196.00	-.97209	-.16043	-.17121
196.50	-.97097	-.16498	-.17322
197.00	-.96983	-.16952	-.17522
197.50	-.96866	-.17406	-.17723
198.00	-.96747	-.17860	-.17922
198.50	-.96625	-.18314	-.18122
199.00	-.96500	-.18767	-.18321
199.50	-.96373	-.19220	-.18520
200.00	-.96243	-.19674	-.18718

8/23/72 BASIC

0 Hours GET = 12:7:2:54
Liftoff = 12:7:_:__

VENUS UNIT VECTOR*

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
100.0	-.63197	-.72168	-.28247
104.0	-.62918	-.72374	-.28344
108.0	-.62637	-.72579	-.28440
112.0	-.62356	-.72783	-.28536
116.0	-.62074	-.72986	-.28631
120.0	-.61792	-.73188	-.28726
124.0	-.61509	-.73389	-.28821
128.0	-.61225	-.73589	-.28915
132.0	-.60941	-.73788	-.29009
136.0	-.60656	-.73986	-.29102
140.0	-.60371	-.74182	-.29195
144.0	-.60084	-.74378	-.29288
148.0	-.59798	-.74572	-.29380
152.0	-.59510	-.74766	-.29472
156.0	-.59222	-.74958	-.29564
160.0	-.58933	-.75150	-.29655
164.0	-.58644	-.75340	-.29745
168.0	-.58354	-.75529	-.29836
172.0	-.58064	-.75717	-.29926
176.0	-.57772	-.75904	-.30015
180.0	-.57481	-.76090	-.30105
184.0	-.57188	-.76275	-.30193
188.0	-.56895	-.76459	-.30282
192.0	-.56602	-.76641	-.30370
196.0	-.56308	-.76823	-.30458
200.0	-.56013	-.77004	-.30545

* PLANET vectors are less than 30 degrees from the sun.

0 Hours GET = 12:7:2:54
Liftoff = 12:7:_:__

MARS UNIT VECTOR*

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
100.0	-.68259	-.67371	-.28318
108.0	-.67974	-.67613	-.28428
116.0	-.67688	-.67853	-.28537
124.0	-.67401	-.68092	-.28645
132.0	-.67114	-.68330	-.28754
140.0	-.66826	-.68567	-.28861
148.0	-.66537	-.68802	-.28968
156.0	-.66248	-.69035	-.29075
164.0	-.65958	-.69268	-.29181
172.0	-.65667	-.69499	-.29286
180.0	-.65376	-.69729	-.29392
188.0	-.65084	-.69957	-.29496
196.0	-.64791	-.70185	-.29600

JUPITER UNIT VECTOR**

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
100.0	.22643	-.89265	-.38975
120.0	.22964	-.89195	-.38946
140.0	.23285	-.89125	-.38918
160.0	.23605	-.89053	-.38889
180.0	.23924	-.88981	-.38859
200.0	.24242	-.88908	-.38830

SATURN UNIT VECTOR

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
100.0	.22697	.90460	.36082
150.0	.22991	.90393	.36062
200.0	.23276	.90328	.36042

* PLANET vectors are less than 35 degrees from the sun.
**PLANET vectors are less than 25 degress from the sun.

CERNAN - RED

CHECK OFF AS EATEN - LOG ADDITIONAL SNACKS

DATE 11/10/72

DAY 6	DAY 7	DAY 8	DAY 9
MEAL B	MEAL A	MEAL A	MEAL A
___ CORN CHOWDER ___ FRANKFURTERS (WP) (4) ___ BREAD, WHITE (2) ___ CATSUP (WP) ___ APRICOTS ___ ORANGE GF DRINK ___ TEA ___ LEMONADE ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ EVA APRICOT BAR	___ SCRAMBLED EGGS ___ BACON SQUARES (8) ___ PEACHES ___ PEANUT BUTTER (WP) ___ JELLY (WP) ___ BREAD, WHITE (1) ___ CHOCOLATE BAR ___ PINEAPPLE GF DRINK ___ ORANGE GF DRINK W/K ___ COCOA ___ TEA ___ _____ ___ _____ ___ _____ ___ EVA CHERRY BAR	___ SAUSAGE PATTIES ___ SPICED OAT CEREAL ___ APRICOT CEREAL CUBES (6) ___ FRUIT COCKTAIL ___ PEARS ___ CEREAL BAR ___ CHEESE CRACKERS (4) ___ HAM (IR) (WP) ___ COCOA ___ TEA ___ LEMONADE ___ _____ ___ _____ ___ _____ ___ EVA APRICOT BAR	___ BACON SQUARES (8) ___ SCRAMBLED EGGS ___ CORNFLAKES ___ BEEF AND GRAVY (WP) ___ FRUITCAKE (WP) ___ PEACHES ___ COCOA ___ ORANGE BEVERAGE ___ TEA ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ _____
MEAL C	MEAL B	MEAL B	
___ SPAGHETTI WITH MEAT ___ TURKEY AND GRAVY (WP) ___ PORK AND POTATOES ___ BROWNIES (4) ___ ORANGE BEVERAGE ___ TEA ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ VITAMINS	___ SHRIMP COCKTAIL ___ BEEF STEAK (WP) ___ CHICKEN AND RICE ___ BEEF SANDWICHES (4) ___ BUTTERSCOTCH PUDDING ___ GRAHAM CRACKER CUBE (6) ___ ORANGE DRINK W/K ___ TEA ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ VITAMINS	___ LOBSTER BISQUE ___ HAMBURGER (WP) ___ MUSTARD (WP) ___ CHEDDAR CHEESE SPREAD (WP) ___ BREAD, RYE (1) ___ DATE FRUITCAKE (4) ___ ORANGE P/A DRINK W/K ___ ORANGE BEVERAGE ___ TEA ___ _____ ___ _____ ___ _____ ___ _____ ___ _____ ___ VITAMINS	

SCHMITT - BLUE

CHECK OFF AS EATEN - LOG ADDITIONAL SNACKS

DAY 6	DAY 7	DAY 8	DAY 9
MEAL B	MEAL A	MEAL A	MEAL A
___ CORN CHOWDER	___ SCRAMBLED EGGS	___ SAUSAGE PATTIES	___ BACON SQUARES (8)
___ FRANKFURTERS (WP) (4)	___ BACON SQUARES (8)	___ SPICED OAT CEREAL	___ SCRAMBLED EGGS
___ BREAD, WHITE (2)	___ FRUIT COCKTAIL	___ PEACHES	___ CORNFLAKES
___ CATSUP (WP)	___ PEACHES	___ PEARS	___ APRICOTS
___ CHOCOLATE PUDDING	___ PEANUT BUTTER (WP)	___ CEREAL BAR	___ COCOA
___ ORANGE GF DRINK	___ JELLY (WP)	___ GINGER BREAD (4)	___ TEA
___ TEA	___ BREAD, WHITE (1)	___ HAM (IR)(WP)	___ BEEF AND GRAVY (WP)
___ LEMONADE	___ ORANGE GF DRINK W/K	___ PINEAPPLE GF DRINK	___ FRUIT CAKE (WP)
___ _____	___ COCOA	___ TEA	___ _____
___ _____	___ TEA	___ _____	___ _____
___ _____	___ _____	___ _____	___ _____
___ _____	___ _____	___ _____	___ _____
___ _____	___ _____	___ _____	___ _____
___ _____	___ _____	___ _____	___ _____
___ EVA APRICOT BAR	___ EVA CHERRY BAR	___ EVA APRICOT BAR	___ _____
MEAL C	MEAL B	MEAL B	
___ TURKEY AND GRAVY (WP)	___ SHRIMP COCKTAIL	___ POTATO SOUP	
___ PORK AND POTATOES	___ BEEF STEAK (WP)	___ HAMBURGER (WP)	
___ CARMEL CANDY (4)	___ BEEF SANDWICHES (4)	___ MUSTARD (WP)	
___ ORANGE BEVERAGE	___ BUTTERSCOTCH PUDDING	___ CHEDDAR CHEESE SPREAD (WP)	
___ TEA	___ GRAHAM CRACKER CUBE (6)	___ BREAD, RYE (1)	
___ _____	___ ORANGE DRINK W/K	___ CHOCOLATE BAR	
___ _____	___ ORANGE P/A DRINK	___ BANANA PUDDING	
___ _____	___ TEA	___ ORANGE DRINK W/K	
___ _____	___ _____	___ GRAPE DRINK W/K	
___ _____	___ _____	___ TEA	
___ _____	___ _____	___ _____	
___ _____	___ _____	___ _____	
___ _____	___ _____	___ _____	
___ _____	___ _____	___ _____	
___ _____	___ _____	___ _____	
___ VITAMINS	___ VITAMINS	___ VITAMINS	

CERNAN

CDR CREW MEDICAL LOG		
DAYS	MEDICATION (TYPE & QTY)	SLEEP* (COMMENTS)
DAY 6 105:45- 131:15		
DAY 7 131:15- 154:35		
DAY 8 154:35- 179:40		
DAY 9 179:40- 206:30		

* REPORT QUANTITY & QUALITY ONLY

SCHMITT

LMP CREW MEDICAL LOG		
DAYS	MEDICATION (TYPE & QTY)	SLEEP* (COMMENTS)
DAY 6 105:45- 131:15		
DAY 7 131:15- 154:35		
DAY 8 154:35- 179:40		
DAY 9 179:40- 206:30		

* REPORT QUANTITY AND QUALITY ONLY

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