MSC-07614

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MSC INTERNAL NOTE NO. 72-FM-282

November 24, 1972

FINAL CREW CHARTS
FOR APOLLO 17
LAUNCH DECEMBER 6, 1972, C.S.T.
(DECEMBER 7, 1972, G.M.T.)

Mission Planning Support Office

MISSION PLANNING AND ANALYSIS DIVISION

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

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PROJECT APOLLO

FINAL CREW CHARTS FOR APOLLO 17
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By Data Management Office
Mission Planning Support Office

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MISSION PLANNING AND ANALYSIS DIVISION
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MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

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FOREWORD

The purpose of this document is to present the Mission Planning and Analysis Division (MPAD) final crew charts for the Apollo 17 (J-3) mission onboard data file for December 7, 1972, (G.m.t.) launch. The command and service module (CSM) charts are in part I, and the lunar module (LM) charts are in part II. These charts were generated by MPAD in response to a request from the Crew Procedures Division (CPD) and were coordinated by the Data Management Office with Tom Holloway of the Flight Planning Branch of CPD.

The crew charts presented in this document reflect the Apollo 17 trajectory, consumables, and flight plan status as of November 27, 1972. The dependence of each crew chart (i.e., mission independent, profile dependent, flight plan dependent, etc.) is noted on each chart.

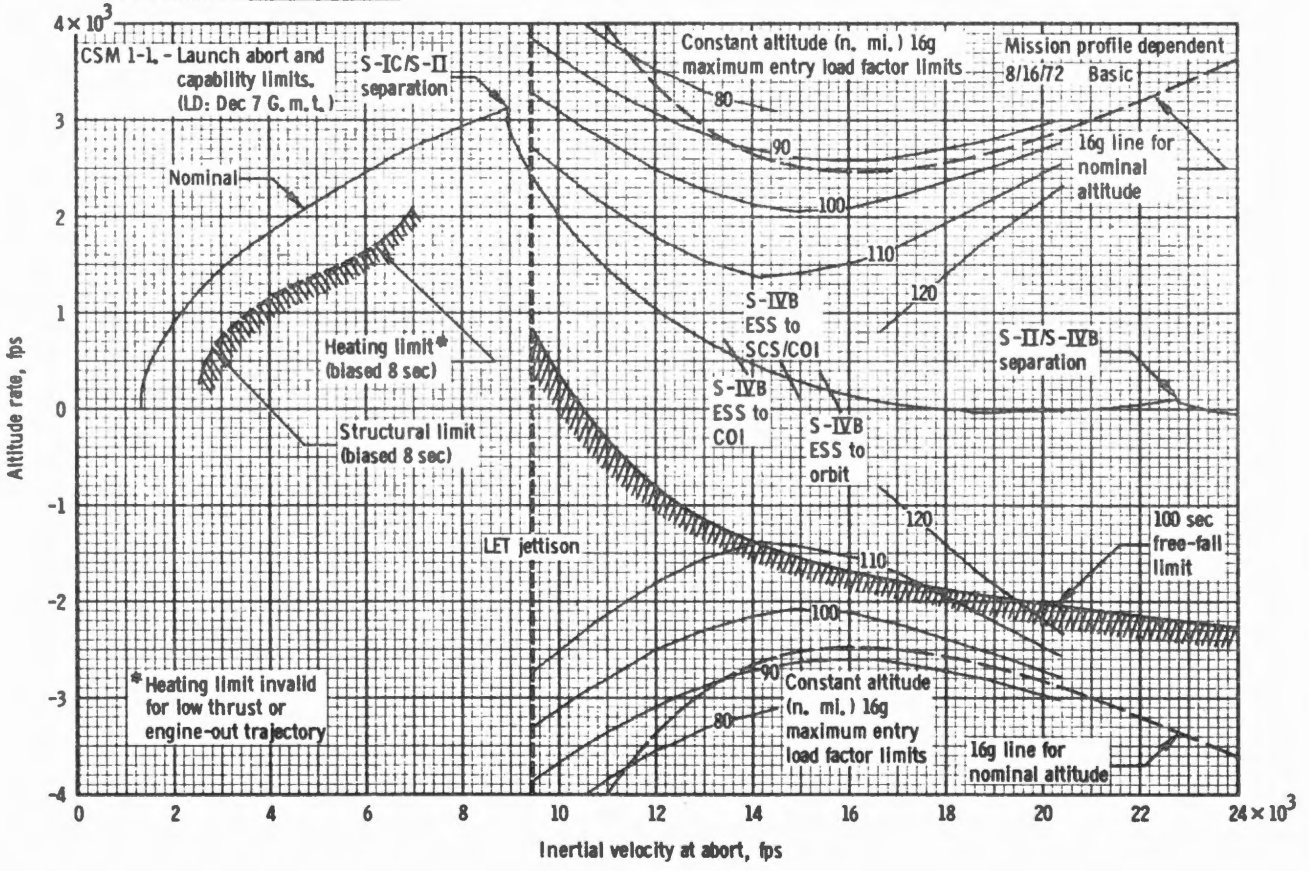
Any questions concerning the enclosed crew charts should be directed to Larry D. Davis, Data Management Office, HU3-6361.

CREW CHARTS

Part I

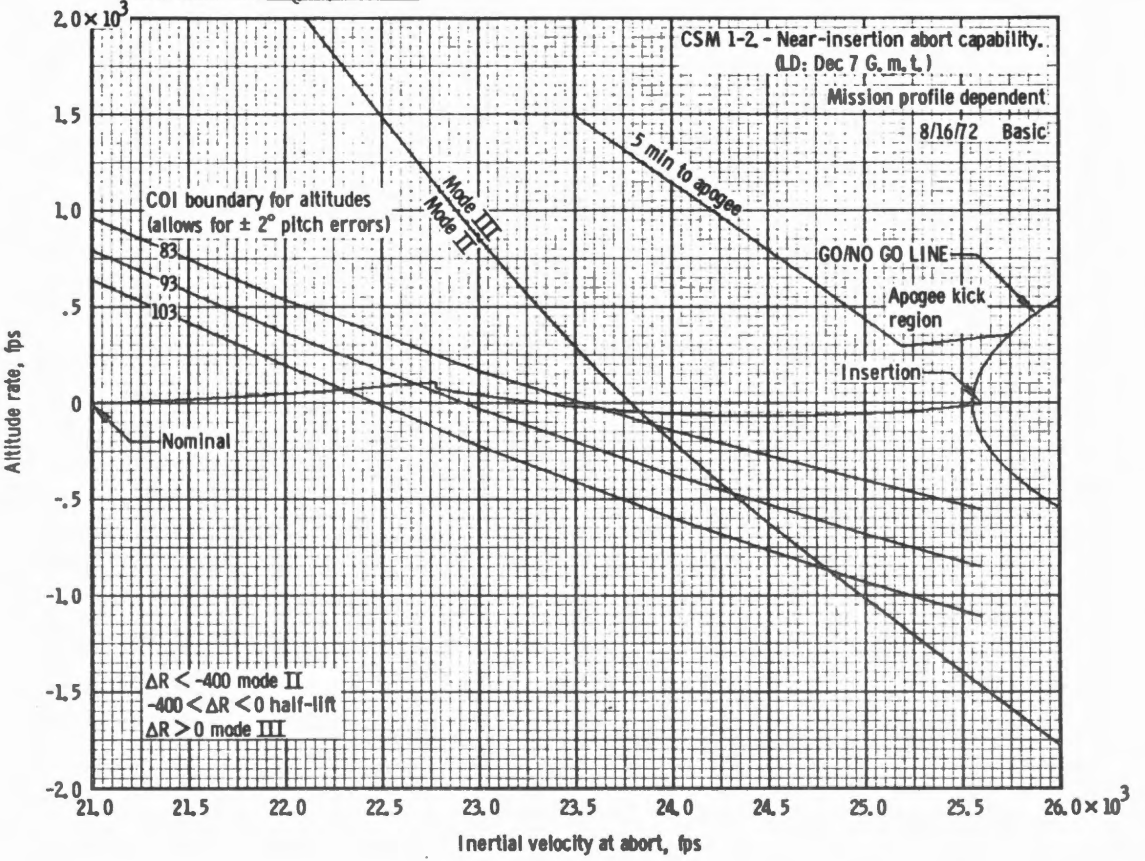
CSM Charts

Henderson/FPB/MPAD (for Launch Checklist)
Data source AS-512 Launch Trajectories (MSC Tape M12177)
Vol. I Amend 25 & Vol. III Amend 127 of SC Data Book
Data confirmed GMH



Launch abort and capability limits.

Henderson/FPB/MPAD (for Launch Checklist)
Data source AS-512 Launch Traj. (MSC Tape #12177) Vol I Amend 65 & Vol III Amend 127 of SC Data Book
Data confirmed



Near-insertion abort capability.

Fraley/GDB/MPAD (for Launch Checklist)
Data source Spdlg 11 SEP Proc. doc.
Data confirmed 9/14/72 C.W.F.

CSM 2-1.- Gimbal angles for observing S-IVB through CSM hatch window after CSM/LM ejection. (LD: Dec 7 G.m.t.)

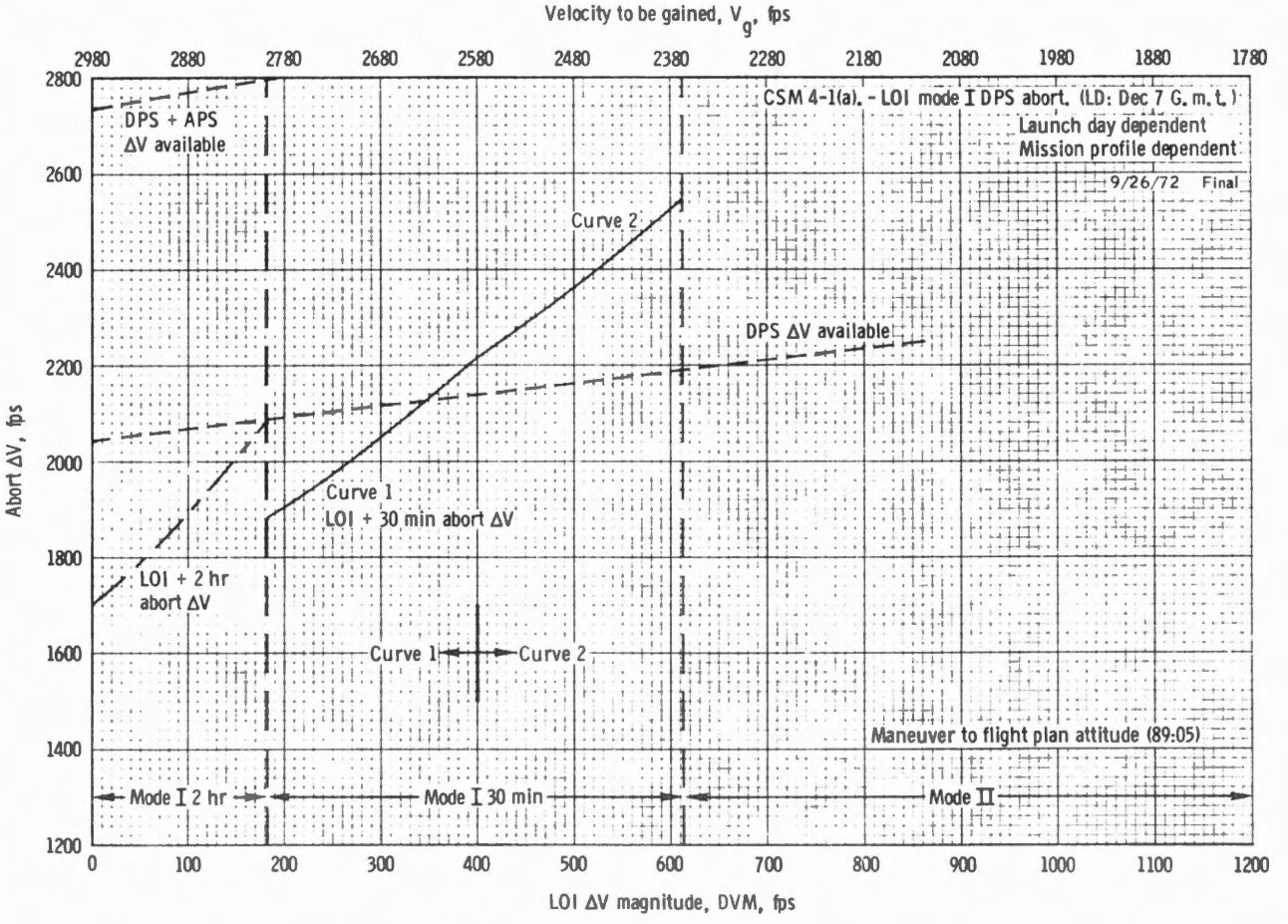
Launch day dependent
Launch month dependent
Mission profile dependent

9/14/72 Final

Time from ejection min:sec		S-IVB APS evasive maneuver			SM RCS backup evasive maneuver		
		SC inertial attitude, deg			SC inertial attitude, deg		
		Roll	Pitch	Yaw	Roll	Pitch	Yaw
CSM/LM ejection	00:00	298.4	129.8	319.3	298.4	129.8	319.3
S-IVB acquired in hatch window	13:00	270.0	129.8	4.3	270.0	129.8	4.3
	23:00	270.0	129.8	4.3	270.0	129.8	4.3
	25:00	270.0	129.8	337.8	286.3	114.1	0.0
	30:00	270.0	309.9	334.7	270.0	129.7	358.1
	35:00	270.0	309.9	344.8	270.0	129.7	354.8
	40:00	270.0	309.9	348.9	270.0	129.7	352.1
S-IVB venting maneuver	44:20	270.0	310.1	351.4	270.0	128.3	346.2
	50:00	296.7	290.7	0.0	308.1	290.1	0.0
	55:00	306.7	285.2	0.0	320.2	283.3	0.0

Based on launch site refsmmat

Gonzales/MAB/MPAD (for Contingency C/L, Flight Plan)
Data source Apollo 17 O.T.
Data confirmed A.M.



LOI mode I DPS abort.

Gonzales/MAB/MPAD (for Contingency C/L, Flight Plan)
Data source Apollo 12 CT.
Data confirmed K.A.

CSM 4-1(b). - LOI mode I DPS abort. (LD: Dec 7 G.m.t.)

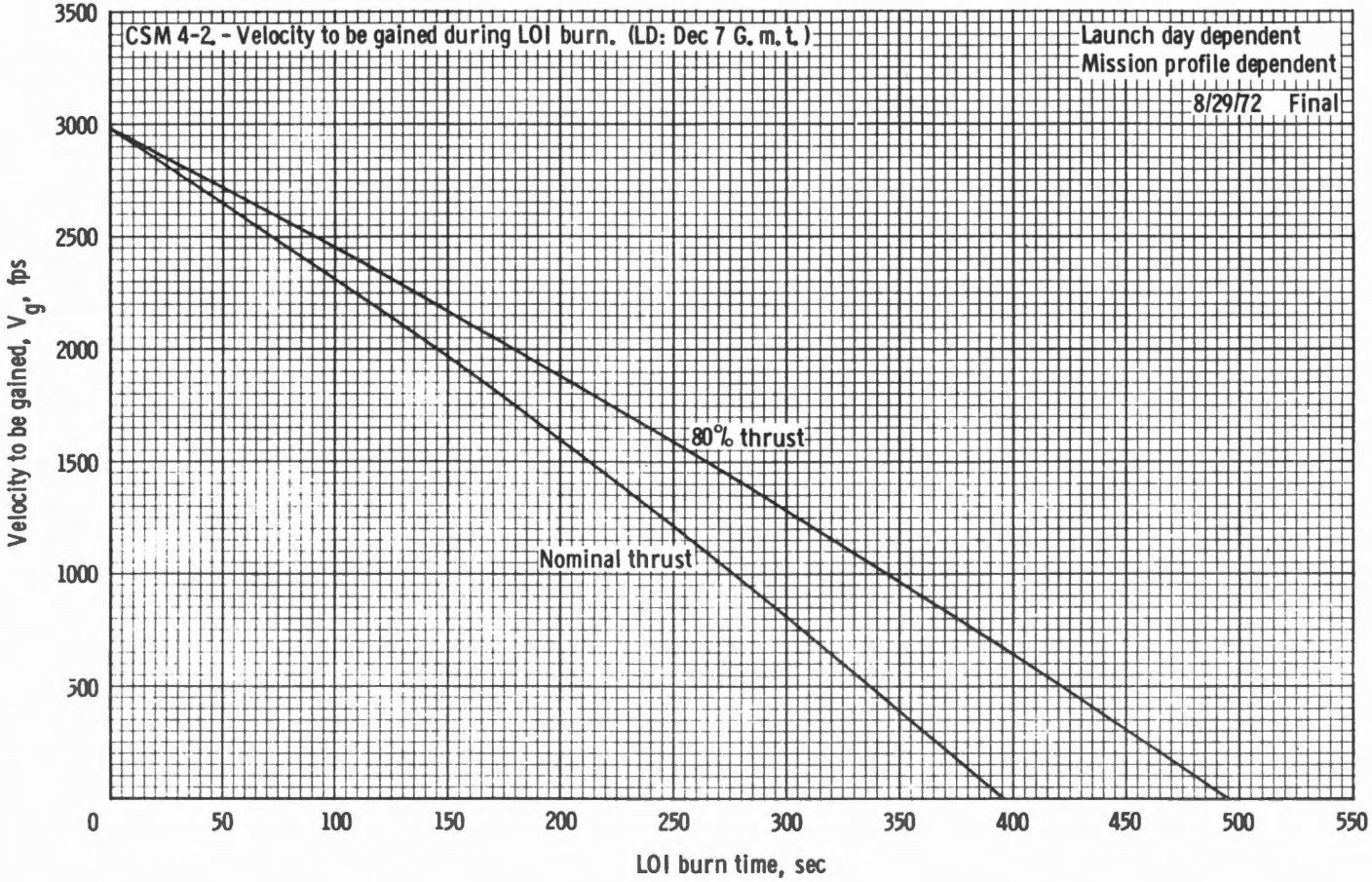
Launch day dependent
Mission profile dependent

9/26/72 Final

Burntime	ΔVM	Mode	SPS limits	Procedure
0:00 - 0:28	0 - 183	I	TIGHT	DPS at 2 hr (RTCC)
0:28 - 0:53	183 - 348	I	TIGHT	DPS at 30 min (crewchart)
0:53 - 1:31	348 - 613	I	LOOSE	DPS at 30 min to depletion + APS at 2 1/2 hr (RTCC); loss of comm, DPS followed immediately by APS (crewchart)
1:31 - 2:03	613 - 833	II	LOOSE	DPS at 2 hr + DPS to depletion at perilune + APS at 2 hr after DPS depletion (RTCC)
2:03 - 2:54	833 - 1200	II	LOOSE	DPS at 2 hr + DPS at perilune (RTCC)
2:54 - 3:40	1200 - 1543	III	LOOSE	DPS at perilune (RTCC)
3:40 - 4:30	1543 - 1930	III	TIGHT	DPS at perilune (RTCC)
4:30 - Cutoff	1930 - 2980	III	TIGHT	DPS to depletion at perilune + APS at 2 hr after DPS depletion (RTCC)

		Nominal	Update
GET LOI ignition		88:55:37.6	
CSM IMU angles for LOI + 30 min DPS abort	HGA	Pitch = -48°, Yaw = 111°	
GET abort ignition		89:25:37.6	
Curve 1			
Roll		210	
Pitch		10	
Yaw		19	
Curve 2	HGA	Pitch = -45°, Yaw = 109°	
Roll		212	
Pitch		10	
Yaw		13	
CSM IMU angles for LOI + 2 hr DPS abort	HGA	Pitch = -69°, Yaw = 263°	
GET abort ignition		90:55:37.6	
Roll		146	
Pitch		21	
Yaw		13	
LM FDAI angles for LOI + 2 hr DPS abort			
GET abort ignition		90:55:37.6	
Roll		194	
Pitch		27	
Yaw		334	

Gonzales/MAB/MPAD (for Contingency C/L, Flight Plan)
Data source Apollo 17 O.T.
Data confirmed L.d.



Velocity to be gained during LOI burn.

Blucker/MPB/MPAD (for G and C Checklist)
Data source JPL Ephemeris
Data confirmed [illegible] 8/29/72

CSM 6-1.- Venus unit vectors. (LD: Dec 7 G.m.t.)

Launch day dependent
Launch month dependent
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)
.0	-.70001	-.66634	-.25686
5.0	-.69677	-.66922	-.25818
10.0	-.69352	-.67208	-.25950
15.0	-.69025	-.67493	-.26081
20.0	-.68697	-.67777	-.26212
25.0	-.68367	-.68059	-.26342
30.0	-.68036	-.68340	-.26472
35.0	-.67704	-.68619	-.26601
40.0	-.67371	-.68897	-.26729
45.0	-.67036	-.69173	-.26857
50.0	-.66700	-.69448	-.26985
55.0	-.66362	-.69721	-.27112
60.0	-.66024	-.69993	-.27238
65.0	-.65684	-.70263	-.27364
70.0	-.65342	-.70532	-.27489
75.0	-.65000	-.70799	-.27613
80.0	-.64656	-.71065	-.27738
85.0	-.64311	-.71329	-.27861
90.0	-.63965	-.71591	-.27984
95.0	-.63618	-.71853	-.28106
100.0	-.63269	-.72112	-.28228
105.0	-.62920	-.72370	-.28349
110.0	-.62569	-.72626	-.28470
115.0	-.62217	-.72881	-.28590
120.0	-.61864	-.73135	-.28709
125.0	-.61509	-.73386	-.28828
130.0	-.61154	-.73636	-.28947
135.0	-.60797	-.73885	-.29064
140.0	-.60439	-.74132	-.29181
145.0	-.60080	-.74377	-.29298
150.0	-.59720	-.74621	-.29414
155.0	-.59359	-.74863	-.29529
160.0	-.58997	-.75104	-.29644
165.0	-.58634	-.75343	-.29758
170.0	-.58269	-.75580	-.29872
175.0	-.57904	-.75816	-.29985
180.0	-.57537	-.76050	-.30097
185.0	-.57169	-.76283	-.30209
190.0	-.56801	-.76514	-.30320
195.0	-.56431	-.76743	-.30431

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

CSM 6-1.- Concluded

Launch day dependent
Launch month dependent
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)
200.0	-.56060	-.76971	-.30541
205.0	-.55688	-.77197	-.30651
210.0	-.55315	-.77422	-.30760
215.0	-.54941	-.77644	-.30868
220.0	-.54566	-.77866	-.30975
225.0	-.54190	-.78085	-.31083
230.0	-.53813	-.78304	-.31189
235.0	-.53434	-.78520	-.31295
240.0	-.53055	-.78735	-.31400
245.0	-.52675	-.78948	-.31505
250.0	-.52293	-.79160	-.31609
255.0	-.51911	-.79370	-.31713
260.0	-.51528	-.79578	-.31815
265.0	-.51143	-.79785	-.31918
270.0	-.50758	-.79990	-.32019
275.0	-.50371	-.80194	-.32121
280.0	-.49983	-.80396	-.32221
285.0	-.49595	-.80596	-.32321
290.0	-.49205	-.80795	-.32420
295.0	-.48814	-.80992	-.32519
300.0	-.48422	-.81188	-.32617
305.0	-.48030	-.81381	-.32714
310.0	-.47636	-.81574	-.32811
315.0	-.47241	-.81764	-.32907
320.0	-.46845	-.81954	-.33003

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

Blucker/MPB/MPAD (for G and C Checklist)
Data source JPL Ephemeris
Data confirmed CSC 8/23/72

CSM 6-2.- Mars, Jupiter, Saturn unit vectors. (LD: Dec 7 G.m.t.)

Launch day dependent
Launch month dependent
8/23/72 Basic

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

MARS UNIT VECTOR*

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
.0	-.71790	-.64212	-.26888
10.0	-.71448	-.64532	-.27033
20.0	-.71104	-.64850	-.27177
30.0	-.70759	-.65167	-.27321
40.0	-.70412	-.65482	-.27464
50.0	-.70064	-.65795	-.27606
60.0	-.69714	-.66107	-.27747
70.0	-.69362	-.66416	-.27888
80.0	-.69010	-.66724	-.28028
90.0	-.68655	-.67030	-.28167
100.0	-.68300	-.67335	-.28305
110.0	-.67943	-.67637	-.28443
120.0	-.67584	-.67938	-.28580
130.0	-.67224	-.68237	-.28716
140.0	-.66863	-.68534	-.28852
150.0	-.66501	-.68829	-.28986
160.0	-.66137	-.69122	-.29120
170.0	-.65772	-.69414	-.29254
180.0	-.65405	-.69704	-.29386
190.0	-.65037	-.69992	-.29518
200.0	-.64668	-.70278	-.29649
210.0	-.64297	-.70562	-.29780
220.0	-.63925	-.70845	-.29910
230.0	-.63552	-.71126	-.30039
240.0	-.63177	-.71405	-.30167
250.0	-.62800	-.71682	-.30295
260.0	-.62422	-.71958	-.30422
270.0	-.62043	-.72232	-.30549
280.0	-.61662	-.72504	-.30675
290.0	-.61279	-.72775	-.30800
300.0	-.60894	-.73045	-.30925
310.0	-.60508	-.73312	-.31049
320.0	-.60120	-.73579	-.31172

* PLANET vectors are less than 40 degrees from the sun.

CSM 6-2.- Concluded.

Launch day dependent
Launch month dependent
8/23/72 Basic

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

JUPITER UNIT VECTOR*

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
.0	.21043	-.89597	-.39110
40.0	.21676	-.89468	-.39058
80.0	.22312	-.89335	-.39005
120.0	.22949	-.89198	-.38949
160.0	.23586	-.89057	-.38892
200.0	.24222	-.88911	-.38834
240.0	.24857	-.88762	-.38774
280.0	.25491	-.88609	-.38713
320.0	.26124	-.88452	-.38650

SATURN UNIT VECTOR

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
.0	.22086	.90593	.36126
100.0	.22682	.90463	.36083
200.0	.23263	.90332	.36041
300.0	.23821	.90203	.36001

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

Lowes/MPB/MPAD (for Contingency C/L)
Data source MPB
Data confirmed

CSM 7-2.- Star sighting schedule for lift-off + 8 hr abort.
(LD: Dec 7 G.m.t.)

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE I.- LIFT-OFF + 8 HR ABORT

W-MATRIX REINITIALIZATION

R1 + 80000
R2 + 00070
R3 + 00003

NAVIGATION SCHEDULE

ΔT to EI < 29 hrs, TABLE I(a)
ΔT to EI > 29 hrs, TABLE I(b)

TABLE I(a)

Sighting Schedule for Abort from Translunar Coast at 8:00 Hours GET, Apollo 17
December 7, 1972 Launch Date (GMT)
Short Return (Less than 29 Hours)
(GMT of EI = 8 December 1972, 11 Hours)

Time	Star	Horizon	R3
EI - 11.0	16 PROCYON	EF	00120
	23 DENEBOLA	EN	00110
	22 REGULUS	EN	00110
	50 POLLUX	EF	00120
	67 CASTOR	EF	00120
EI - 9.0	22 REGULUS	EN	00110
	16 PROCYON	EF	00120
	50 POLLUX	EF	00120
	*67 CASTOR	EF	00120
	*23 DENEBOLA	EN	00110
EI - 7.0	50 POLLUX	EF	00120
	24 GIENAH	EN	00110
	153	EN	00110
	*16 PROCYON	EF	00120
	*156	EN	00110
EI - 5.0	23 DENEBOLA	EN	00110
	160	EN	00110
	156	EN	00110
	24 GIENAH	EN	00110
	154	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-2.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE I(a)

Sighting Schedule for Abort from Translunar Coast at 8:00 Hours GET, Apollo 17 December 7, 1972 Launch Date (GMT) Short Return (Less than 29 Hours) (GMT of EI = 8 December 1972, 11 Hours) (Concluded)

Time	Star	Horizon	R3
EI - 2.5	22 REGULUS	EF	00120
	154	EN	00110
	26 SPICA	EN	00110
	*31 ARCTURUS	EN	00110
	*161	EN	00110

TABLE I(b)

Sighting Schedule for Abort from Translunar Coast at 8:00 Hours GET, Apollo 17 December 7, 1972 Launch Date (GMT) Long Return (Greater than 29 Hours) (GMT of EI = 9 December 1972, 12 Hours)

Time	Star	Horizon	R3
EI - 13.0	50 POLLUX	EF	00120
	24 GIENAH	EN	00110
	156	EN	00110
	16 PROCYON	EF	00120
	153	EN	00110
EI - 11.0	50 POLLUX	EF	00120
	24 GIENAH	EN	00110
	153	EN	00110
	*16 PROCYON	EF	00120
	*156	EN	00110
EI - 9.0	153	EN	00110
	16 PROCYON	EF	00120
	24 GIENAH	EN	00110
	*154	EN	00110
	*156	EN	00110
EI - 7.0	21 ALPHARD	EF	00120
	26 SPICA	EN	00110
	24 GIENAH	EN	00110
	*154	EN	00110
	*156	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-2.- Concluded.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE I(b)

Sighting Schedule for Abort from Translunar
Coast at 8:00 Hours GET, Apollo 17
December 7, 1972 Launch Date (GMT)
Long Return (Greater than 29 Hours)
(GMT of EI = 9 December 1972, 12 Hours)
(Concluded)

Time	Star	Horizon	R3
EI - 5.0	21 ALPHARD	EF	00120
	26 SPICA	EN	00110
	24 GIENAH	EN	00110
	154	EN	00110
	22 REGULUS	EF	00120
EI - 2.5	31 ARCTURUS	EN	00110
	26 SPICA	EN	00110
	30 MENKENT	EN	00110
	*161	EN	00110
	*53	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

Lowes/MPB/MPAD (for Contingency C/L)
Data source MPB
Data confirmed SBS

CSM 7-3.- Star sighting schedule for aborts from lunar orbit. (LD: Dec 7 G.m.t.)

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II.- ABORTS FROM LUNAR ORBIT

A. ABORTS BECAUSE OF LOSS OF COMM

W-MATRIX REINITIALIZATION
R1 +30000
R2 +00300
R3 +00003

NAVIGATION SCHEDULE
GMT RETURN ON DECEMBER 16, TABLE II(a)
GMT RETURN ON DECEMBER 17, TABLE II(b)
GMT RETURN ON DECEMBER 18, TABLE II(c)
GMT RETURN ON DECEMBER 19, TABLE II(d)

B. COMM LOSS AFTER ABORT FROM LUNAR ORBIT

W-MATRIX REINITIALIZATION

a. COMM LOSS PRIOR TO TIME FOR NAV STG BATCH 1
R1 + 30000
R2 + 00300
R3 + 00003

b. COMM LOSS AFTER TIME FOR BATCH 1 AND NO SV UPDATE AFTER TEI
R1 + 99000
R2 + 00020
R3 + 00003

c. COMM LOSS AFTER TIME FOR BATCH 1 AND AT LEAST ONE SV UPDATE AFTER TEI
R1 + 45000
R2 + 00006
R3 + 00003

NAVIGATION SCHEDULE
GMT EI DECEMBER 16, TABLE II(a)
GMT EI DECEMBER 17, TABLE II(b)
GMT EI DECEMBER 18, TABLE II(c)
GMT EI DECEMBER 19, TABLE II(d)

GMT NOT COVERED BY ABOVE, GO TO "DO-IT-YOURSELF", TABLE IV.

CSM 7-3.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II(a)

Sighting Schedule for Abort from Lunar Orbit
(GMT of EI = 16 December 1972, 15 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)

Time	Star	Horizon	R3
TEI + 2.0	7 MENKAR	MN	00210
	226	MN	00210
	131	MN	00210
	46 HAMAL	MN	00210
	55 BETELGEUSE	MF	00220
TEI + 14.0	12 RIGEL	MF	00220
	60 EL NATH	MF	00220
	226	MN	00210
	*7 MENKAR	MN	00210
	*106 MENKALINAN	MF	00220
TEI + 14.5	24 GIENAH	EN	00110
	156	EN	00110
	23 DENEBOLA	EN	00110
TEI + 18.0	24 GIENAH	EN	00110
(SAME AS	156	EN	00110
TEI + 14.5)	23 DENEBOLA	EN	00110
TEI + 27.0	24 GIENAH	EN	00110
(SAME AS	156	EN	00110
TEI + 18.0)	23 DENEBOLA	EN	00110
EI - 29.0	160	EN	00110
	22 REGULUS	EF	00120
	151	EF	00120
	*154	EN	00110
	*24 GIENAH	EN	00110
EI - 23.0	160	EN	00110
(SAME AS	22 REGULUS	EF	00120
EI - 29.0)	151	EF	00120
	*154	EN	00110
	*24 GIENAH	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-3.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II(a)

Sighting Schedule for Abort from Lunar Orbit
(GMT of EI = 16 December 1972, 15 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)
(Concluded)

Time	Star	Horizon	R3
EI - 21.0	21 ALPHARD	EF	00120
	22 REGULUS	EF	00120
	152	EN	00110
	*151	EF	00120
	*154	EN	00110
EI - 15.5	21 ALPHARD	EF	00120
	22 REGULUS	EF	00120
	152	EN	00110
	*151	EF	00120
	*154	EN	00110
EI - 5.0	26 SPICA	EN	00110
	21 ALPHARD	EF	00120
	53	EN	00110
	72 GACRUX	EN	00110
	25 ACRUX	EN	00110
EI - 2.5	30 MENKENT	EN	00110
	56 HADAR	EN	00110
	72 GACRUX	EN	00110
	*25 ACRUX	EN	00110
	*155	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-3.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II(b)

Sighting Schedule for Abort from Lunar Orbit
(GMT of EI = 17 December 1972, 16 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)

Time	Star	Horizon	R3
TEI + 2.0	103 ALMACH	MN	00210
	10 MIRFAK	MN	00210
	57 BELLATRIX	MF	00220
	141	MF	00220
	136	MF	00220
TEI + 14.0	13 CAPELLA	MF	00220
	7 MENKAR	MN	00210
	226	MN	00210
	*60 EL NATH	MF	00220
	*144	MF	00220
TEI + 14.5	26 SPICA	EN	00110
	22 REGULUS	EF	00120
	151	EF	00120
	*154	EN	00110
	*24 GIENAH	EN	00110
TEI + 18.0 (SAME AS TEI + 14.5)	26 SPICA	EN	00110
	22 REGULUS	EF	00120
	151	EF	00120
	*154	EN	00110
	*24 GIENAH	EN	00110
TEI + 27.0 (SAME AS TEI + 18.0)	26 SPICA	EN	00110
	22 REGULUS	EF	00120
	151	EF	00120
	*154	EN	00110
	*24 GIENAH	EN	00110
EI - 29.0	21 ALPHARD	EF	00120
	22 REGULUS	EF	00120
	53	EN	00110
	*232	EN	00110
	*153	EF	00120
EI - 23.0	26 SPICA	EN	00110
	153	EF	00120
	53	EN	00110
	*232	EN	00110
	*161	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-3.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II(b)

Sighting Schedule for Abort from Lunar Orbit
(GMT of EI = 17 December 1972, 16 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)
(Concluded)

Time	Star		Horizon	R3
EI - 21.0	26	SPICA	EN	00110
(SAME AS	153		EF	00120
EI - 23.0)	53		EN	00110
	*232		EN	00110
	*161		EN	00110
EI - 15.5	72	GACRUX	EN	00110
	53		EN	00110
	26	SPICA	EN	00110
	*30	MENKENT	EN	00110
	*154		EN	00110
EI - 5.0	30	MENKENT	EN	00110
	166		EN	00110
	54	RIGIL KENT	EN	00110
	162		EN	00110
	56	HADAR	EN	00110
EI - 2.5	233		EN	00110
	166		EN	00110
	173		EN	00110
	*170	ZUBEN'UBI	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-3.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II(c)

Sightings Schedule for Abort from Lunar Orbit
(GMT of EI = 18 December 1972, 17 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)

Time	Star		Horizon	R3
TEI + 2.0	16	PROCYON	MN	00210
	11	ALDEBARAN	MF	00220
	142		MF	00220
	57	BELLATRIX	MF	00220
	55	BETELGEUSE	MF	00220
TEI + 14.0	106	MENKALINAN	MF	00220
	60	EL NATH	MF	00220
	140		MN	00210
	*137		MN	00210
	*144		MF	00220
TEI + 14.5	23	DENEBOLA	EF	00120
	153		EF	00120
	26	SPICA	EN	00110
	*165		EN	00110
	*30	MENKENT	EN	00110
TEI + 18.0	26	SPICA	EN	00110
	153		EF	00120
	23	DENEBOLA	EF	00120
	*30	MENKENT	EN	00110
	*161		EN	00110
TEI + 27.0	26	SPICA	EN	00110
(SAME AS	153		EF	00120
TEI + 18.0)	23	DENEBOLA	EF	00120
	*30	MENKENT	EN	00110
	*161		EN	00110
EI - 29.0	26	SPICA	EN	00110
	23	DENEBOLA	EF	00120
	162		EN	00110
	*161		EN	00110
	*30	MENKENT	EN	00110
EI - 23.0	24	GIENAH	EF	00120
	23	DENEBOLA	EF	00120
	56	HADAR	EN	00110
	*161		EN	00110
	*162		EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-3.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II(c)

Sightings Schedule for Abort from Lunar Orbit
(GMT of EI = 18 December 1972, 17 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)
(Concluded)

Time	Star	Horizon	R3
EI - 21.0	24 GIENAH	EF	00120
(SAME AS	23 DENEBOLA	EF	00120
EI - 23.0)	56 HADAR	EN	00110
	*161	EN	00110
	*162	EN	00110
EI - 15.5	172	EN	00110
	54 RIGIL KENT	EN	00110
	56 HADAR	EN	00110
	*162	EN	00110
	*24 GIENAH	EF	00120
EI - 5.0	33 ANTARES	EN	00110
	154	EF	00120
	165	EN	00110
	24 GIENAH	EF	00120
	166	EN	00110
EI - 2.5	205	EN	00110
	76	EN	00110
	232	EF	00120
	*33 ANTARES	EN	00110
	*207	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-3.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II(d)

Sighting Schedule for Abort from Lunar Orbit
(GMT of EI = 19 December 1972, 18 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)

Time	Star		Horizon	R3
TEI + 2.0	64	ALHENA	MF	00220
	22	REGULUS	MN	00210
	144		MF	00220
	21	ALPHARD	MN	00210
	106	MENKALINAN	MF	00220
TEI + 14.0	16	PROCYON	MN	00210
	11	ALDEBARAN	MF	00220
	50	POLLUX	MN	00210
	*57	BELLATRIX	MF	00220
	*142		MF	00220
TEI + 14.5	24	GIENAH	EF	00120
	173		EN	00110
	171		EN	00110
	*165		EN	00110
	*124		EN	00110
TEI + 18.0	24	GIENAH	EF	00120
(SAME AS	173		EN	00110
TEI + 14.5)	171		EN	00110
	*165		EN	00110
	*124		EN	00110
TEI + 27.0	24	GIENAH	EF	00120
	124		EN	00110
	173		EN	00110
	*171		EN	00110
	*165		EN	00110
EI - 29.0	174		EN	00110
	33	ANTARES	EN	00110
	156		EF	00120
	*175		EN	00110
	*124		EN	00110
EI - 23.0	174		EN	00110
	33	ANTARES	EN	00110
	156		EF	00120
	*125		EN	00110
	*124		EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-3.- Concluded.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE II(d)

Sighting Schedule for Abort from Lunar Orbit
(GMT of EI = 19 December 1972, 18 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)
(Concluded)

Time	Star		Horizon	R3
EI - 21.0	174		EN	00110
(SAME AS	33	ANTARES	EN	00110
EI - 23.0)	156		EF	00120
	*125		EN	00110
	*124		EN	00110
EI - 15.5	174		EN	00110
	33	ANTARES	EN	00110
	26	SPICA	EF	00120
	*156		EF	00120
	*124		EN	00110
EI - 5.0	53		EF	00120
	33	ANTARES	EN	00110
	127		EN	00110
	76		EN	00110
	207		EN	00110
EI - 2.5	11	ALDEBARAN	MN	00210
	46	HAMAL	MN	00210
	16	PROCYON	MF	00220
	*64	ALHENA	MF	00220
	*50	POLLUX	MF	00220

*Alternate stars - to be used if other sightings cannot be made.

Lowes/MPB/MPAD (for Contingency C/L)
Data source MPAD
Data confirmed SRS

CSM 7-4.- Comm loss during nominal TEC. (LD: Dec 7 G.m.t.)

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE III.- COMM LOSS DURING NOMINAL TEC

W-MATRIX REINITIALIZATION

a. COMM LOSS PRIOR TO TIME FOR NAV STG BATCH 1
R1 + 30000
R2 + 00300
R3 + 00003

b. COMM LOSS AFTER TIME FOR NAV STG BATCH 1
AND NO SV UPDATE AFTER TEI
R1 + 99000
R2 + 00020
R3 + 00003

c. COMM LOSS AFTER TIME FOR NAV STG BATCH 1
AND AT LEAST ONE SV UPDATE AFTER TEI
R1 + 45000
R2 + 00006
R3 + 00003

TABLE III

Sighting Schedule for Nominal Transearth Coast
(GMT of EI = 19 December 1972, 19 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)

Time	Star	Horizon	R3
TEI + 2.0	55 BETELGEUSE	MF	00220
	64 ALHENA	MF	00220
	151	MN	00210
	22 REGULUS	MN	00210
	16 PROCYON	MN	00210
TEI + 14.0	15 SIRIUS	MN	00210
	11 ALDEBARAN	MF	00220
	50 POLLUX	MN	00210
	*57 BELLATRIX	MF	00220
	*142	MF	00220
TEI + 14.5	202	EN	00110
	160	EF	00120
	165	EN	00110
	*166	EN	00110
	*171	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

CSM 7-4.- Concluded.

Launch day dependent
Launch month dependent
Mission profile dependent
8/22/72 Basic

TABLE III

Sighting Schedule for Nominal Transearth Coast
(GMT of EI = 19 December 1972, 19 Hours)
Apollo 17, December 7, 1972 Launch Date (GMT)
(Concluded)

Time	Star	Horizon	R3
TEI + 18.0	202	EN	00110
(SAME AS	160	EF	00120
TEI + 14.5)	165	EN	00110
	*166	EN	00110
	*171	EN	00110
TEI + 27.0	154	EF	00120
	171	EN	00110
	165	EN	00110
	*166	EN	00110
	*26 SPICA	EF	00120
EI - 29.0	202	EN	00110
	160	EF	00120
	171	EN	00110
	*205	EN	00110
	*173	EN	00110
EI - 23.0	202	EN	00110
(SAME AS	160	EF	00120
EI - 29.0)	171	EN	00110
	*205	EN	00110
	*173	EN	00110
EI - 21.0	202	EN	00110
	160	EF	00120
	171	EN	00110
	*205	EN	00110
	*26 SPICA	EF	00120
EI - 15.5	202	EN	00110
	26 SPICA	EF	00120
	171	EN	00110
	*205	EN	00110
	*173	EN	00110
EI - 5.0	207	EN	00110
	76	EN	00110
	30 MENKENT	EF	00120
	77 KAUS AUST	EN	00110
	33 ANTARES	EN	00110
EI - 2.5	207	EN	00110
	76	EN	00110
	25 ACRUX	EF	00120
	*124	EN	00110
	*77 KAUS AUST	EN	00110

*Alternate stars - to be used if other sightings cannot be made.

Yencharis/MAB/MPAD (for Contingency C/L)
Data source MSC TECH. O.I
Data confirmed TNT

CSM 7-6.- Loss of comm midcourse procedures. (L.D: Dec 7 G.m.t.)

Launch day dependent
Launch month dependent
11/24/72 Final

LOSS OF COMM MIDCOURSE PROCEDURES

TIME OF MIDCOURSE AND MIDCOURSE EXECUTION CRITERIA

1 For midcourses following translunar coast aborts, execute the midcourse maneuvers whenever it is felt that a good estimate of the trajectory has been obtained by P23 and the ΔV shown by P37 is greater than 0 fps. The last midcourse maneuver should be executed no later than EI - 3 hours.

2 For midcourses following TEI, execute midcourse maneuvers at the times specified in the flight plan. These times are:
MCC5: TEI + 17 hours
MCC6: EI - 22 hours
MCC7: EI - 3 hours
These midcourse maneuvers should be executed if the ΔV from P37 is greater than 0 fps.

MIDCOURSE MANEUVER RULES

Follow monitoring, shutdown and trim criteria as outlined in flight plan for MCC5, MCC6 and MCC7. Follow this criteria both for transearth midcourses and midcourses following TLC aborts.

GENERAL INFORMATION

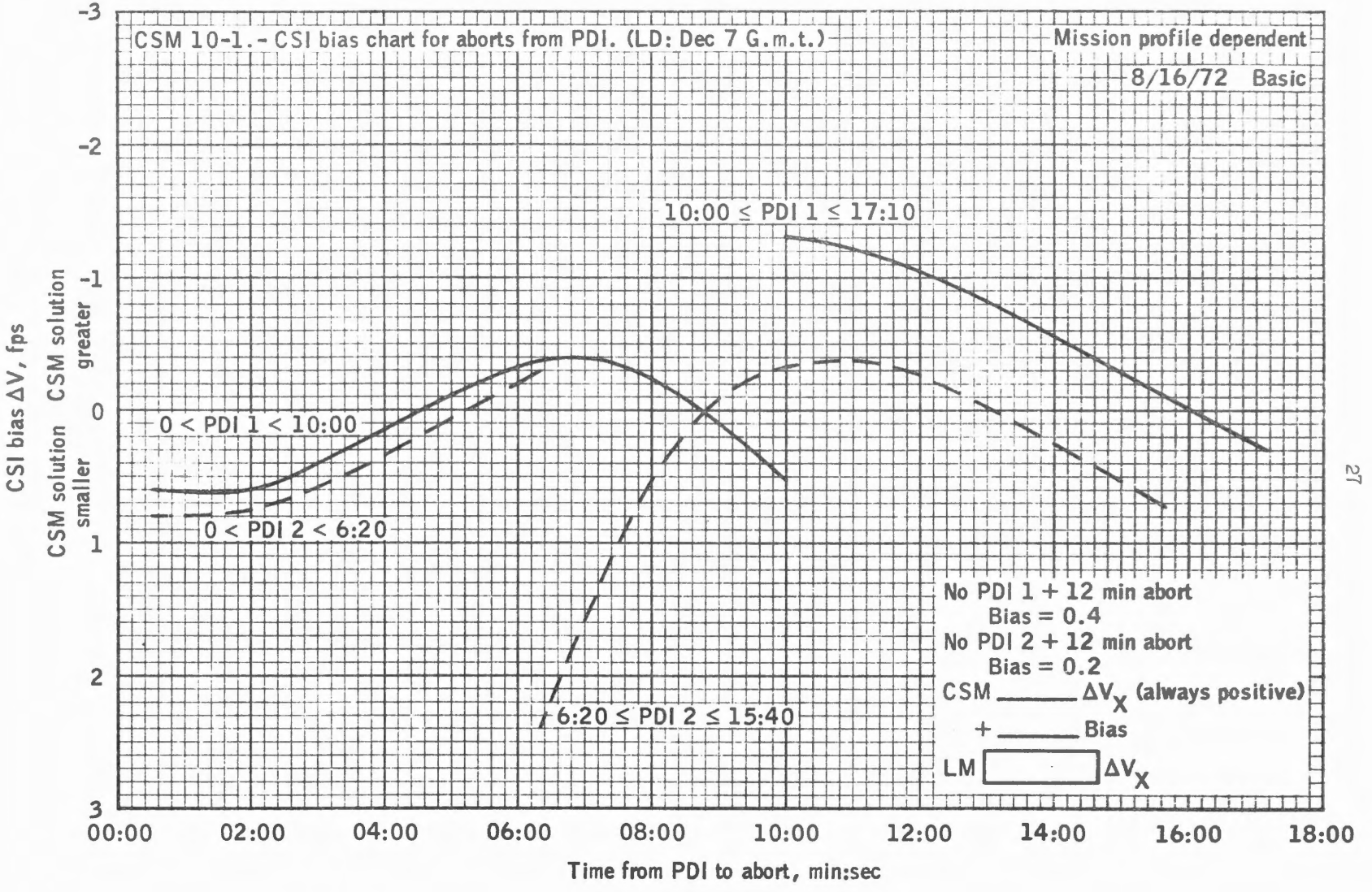
It can be determined if the entry corridor is being attained by determining Hp (vacuum perigee altitude) using the procedure outlined in the General Loss-of-Comm Navigation Procedure section, (steps 8, 9, 10) and comparing that value to the Hp limits listed in the following table.

Hp LIMITS FOR ENTRY CORRIDOR

	Minimum* Hp (n. mi.)	Nominal Hp (n. mi.)	Maximum** Hp (n. mi.
TLC aborts			
Lift-off + 9 hrs			
≈28 hr trip time	5.8	19.7	33.5
≈52 hr trip time	6.7	19.9	32.7
Lift-off + 15 hrs	6.5	19.8	33.2
Lift-off + 25 hrs	7.1	20.0	33.0
Lift-off + 35 hrs	7.5	20.1	32.8
Lift-off + 45 hrs	8.1	20.3	33.0
Lift-off + 55 hrs	8.0	20.2	33.0
Lift-off + 65 hrs	8.0	20.2	33.0
Nominal transearth coast	8.0	20.2	32.8

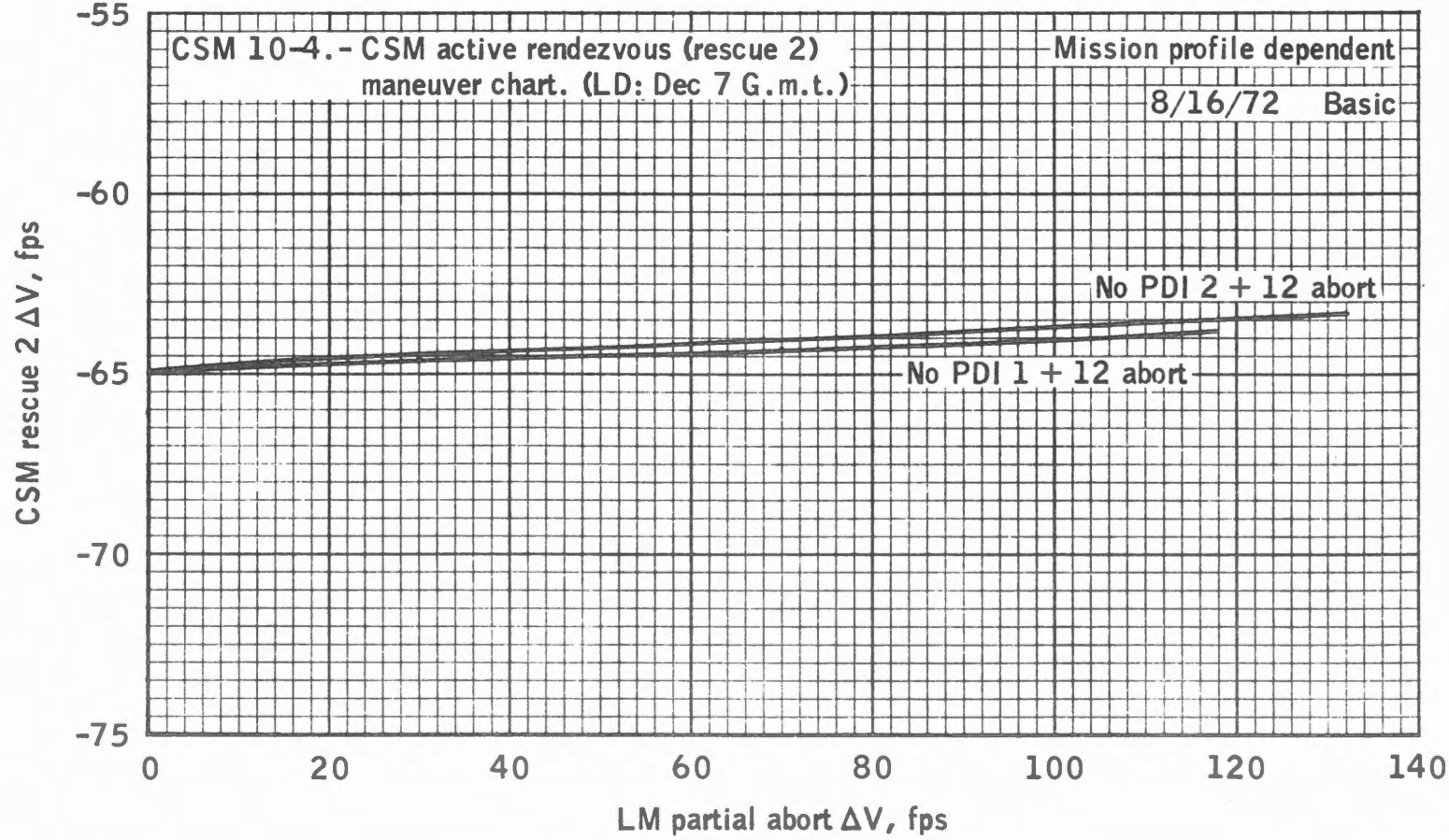
*Corresponds to entry with bank 15° 12g undershoot
**Corresponds to entry with constant g - 2500 n. mi. overshoot

DuPont/MAB/MPAD (for CSM Rescue, LM Time line)
Data source Spacecraft O.T.
Data confirmed MPAD



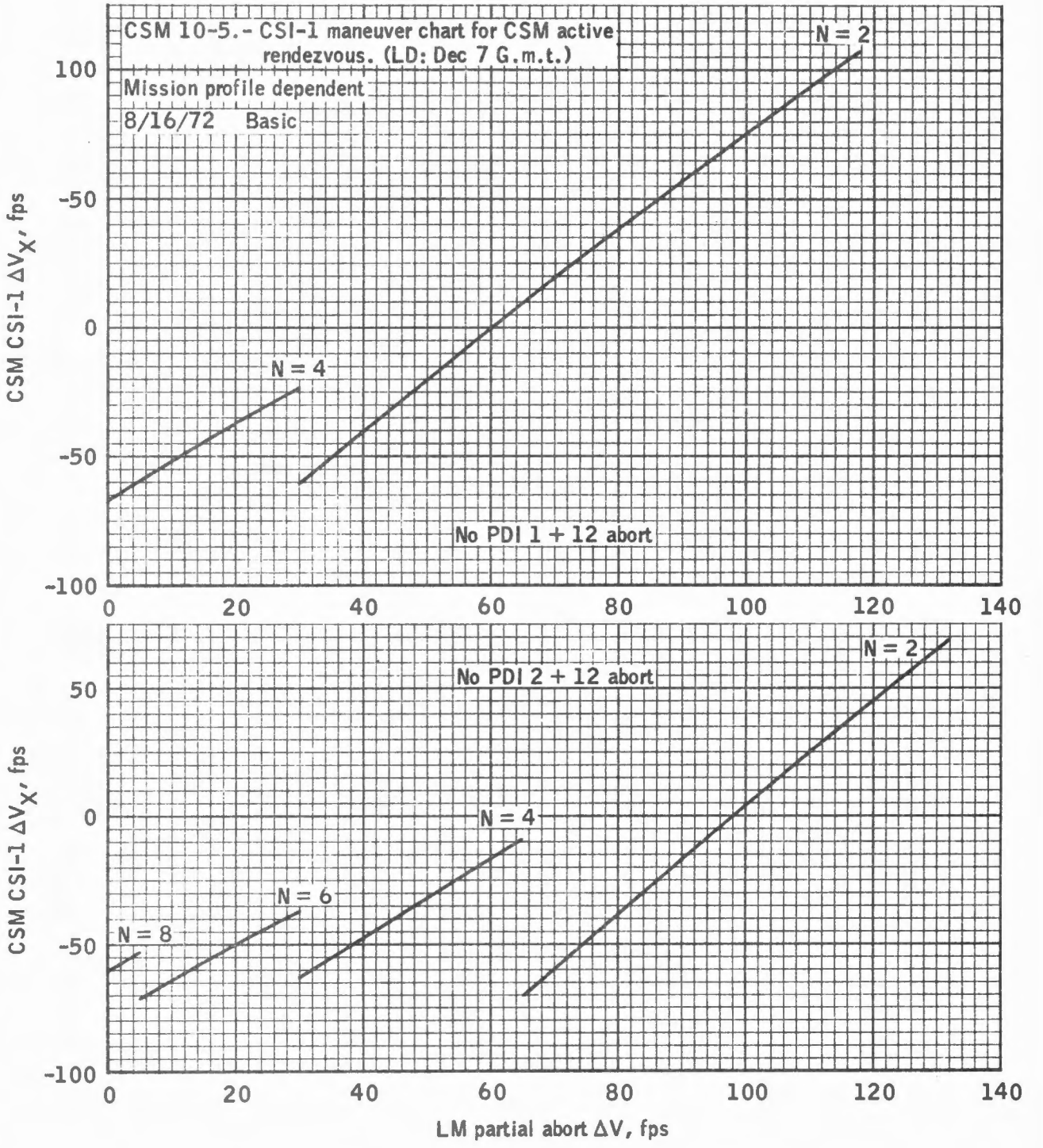
CSI bias chart for aborts from PDI.

DuPont/MAB/MPAD (for CSM Rescue)
Data source Spacecraft O.T.
Data confirmed

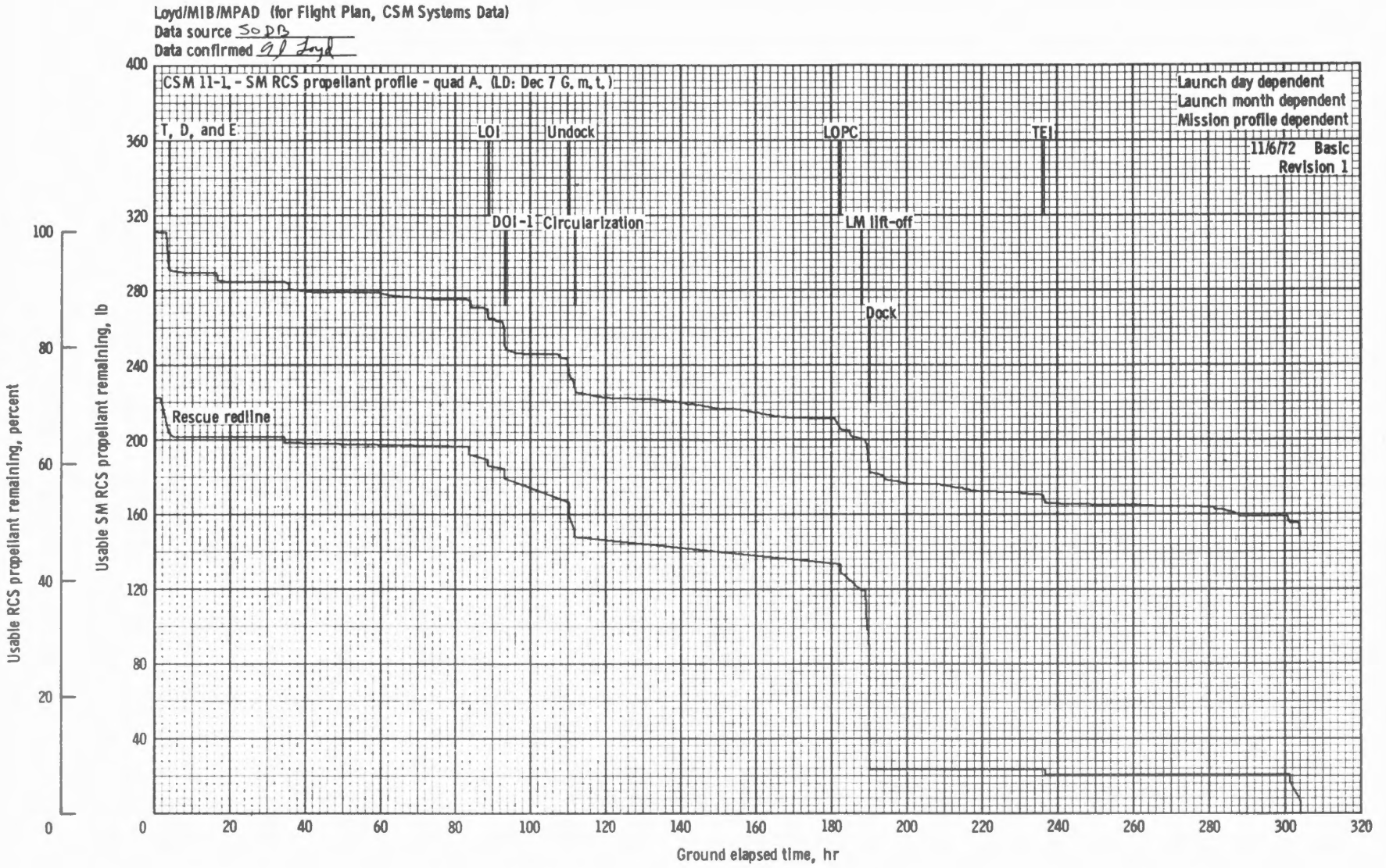


CSM active rendezvous (rescue 2) maneuver chart.

DuPont/MAB/MPAD (for CSM Rescue)
Data source Spacecraft ar.
Data confirmed CSD

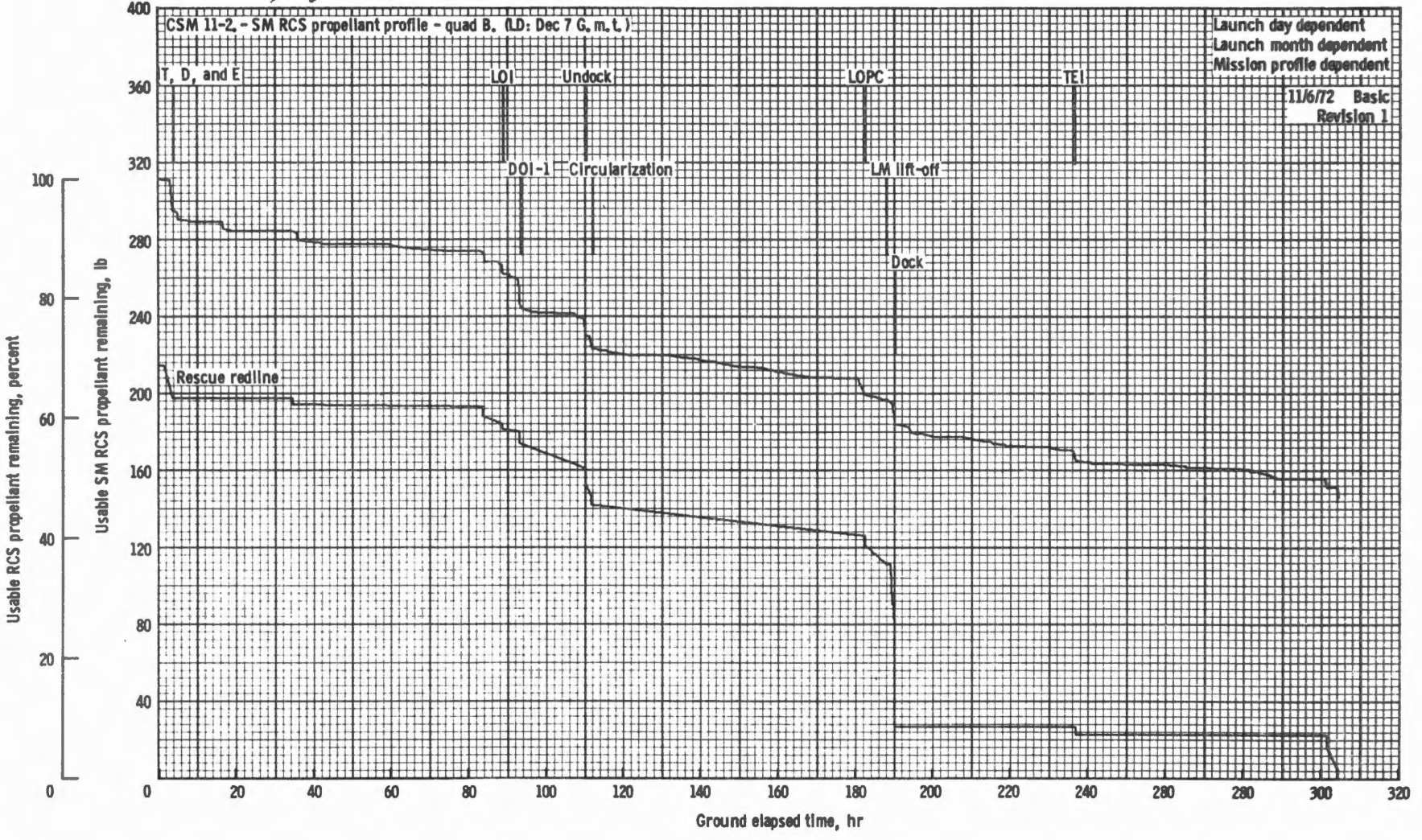


CSI-1 maneuver chart for CSM active rendezvous.



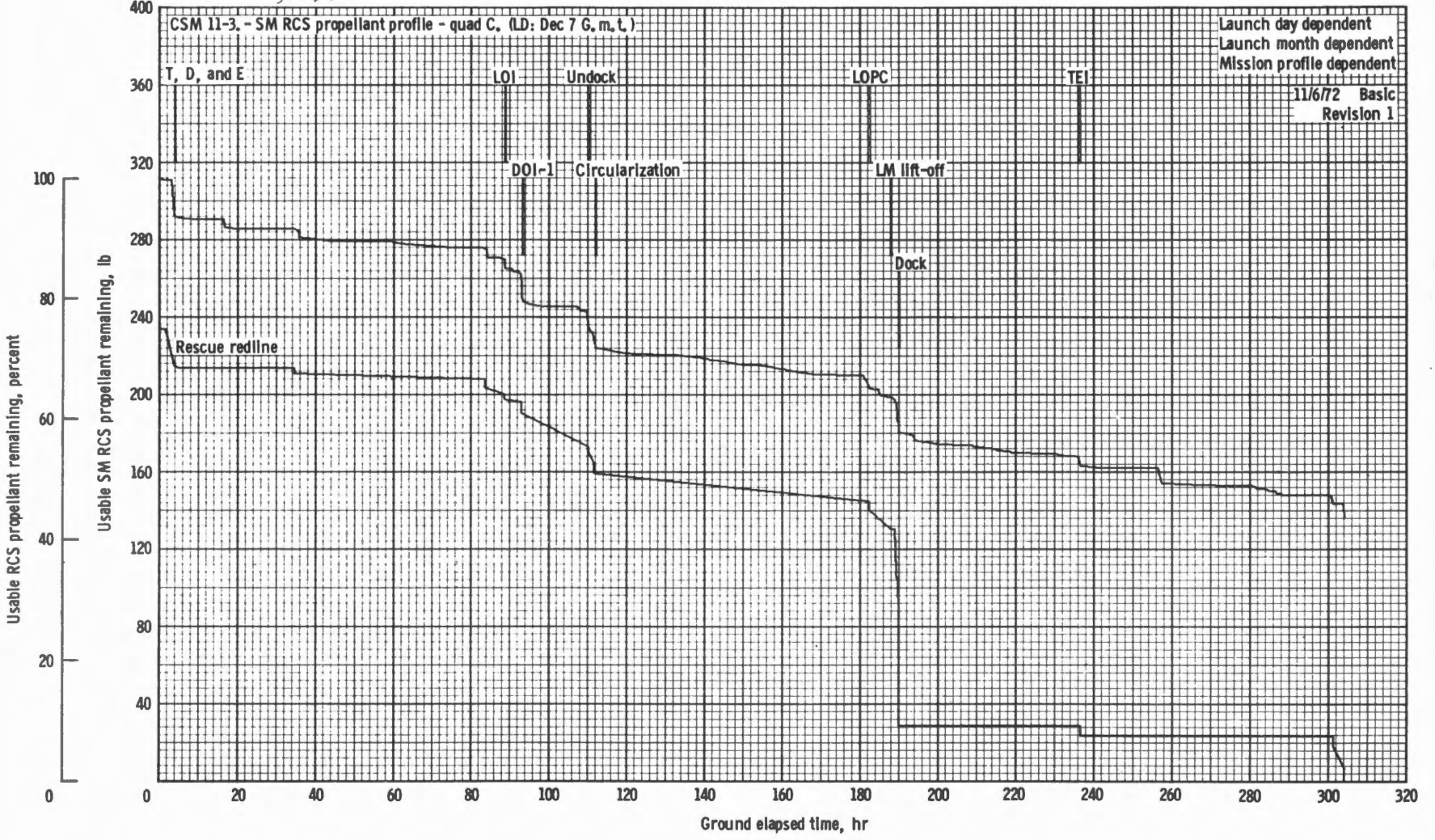
SM RCS propellant profile - quad A.

Loyd/MIB/MPAD (for Flight Plan, CSM Systems Data)
Data source SODB
Data confirmed J Boyd

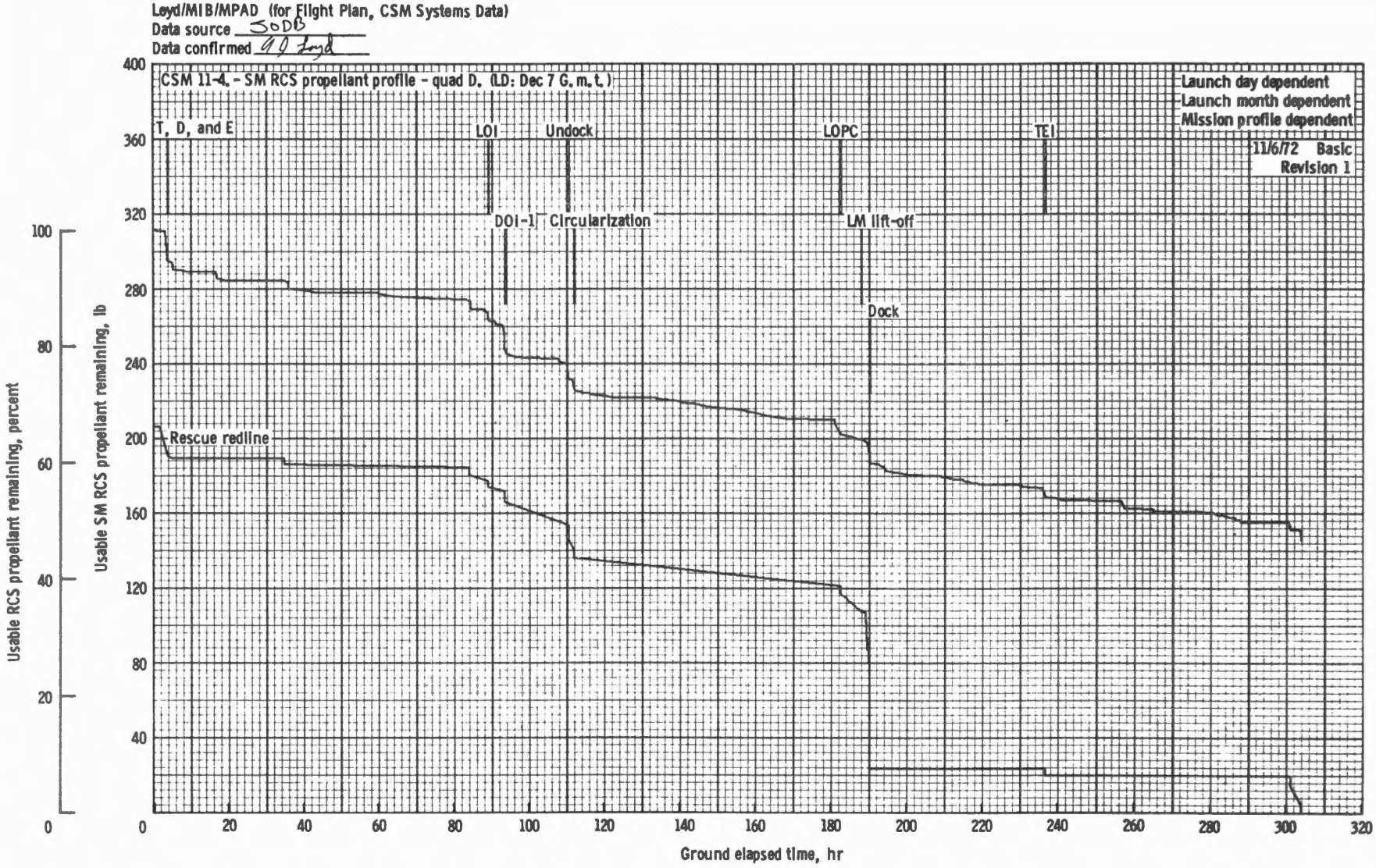


SM RCS propellant profile - quad B.

Loyd/MIB/MPAD (for Flight Plan, CSM Systems Data)
Data source SODB
Data confirmed Gl Loyd

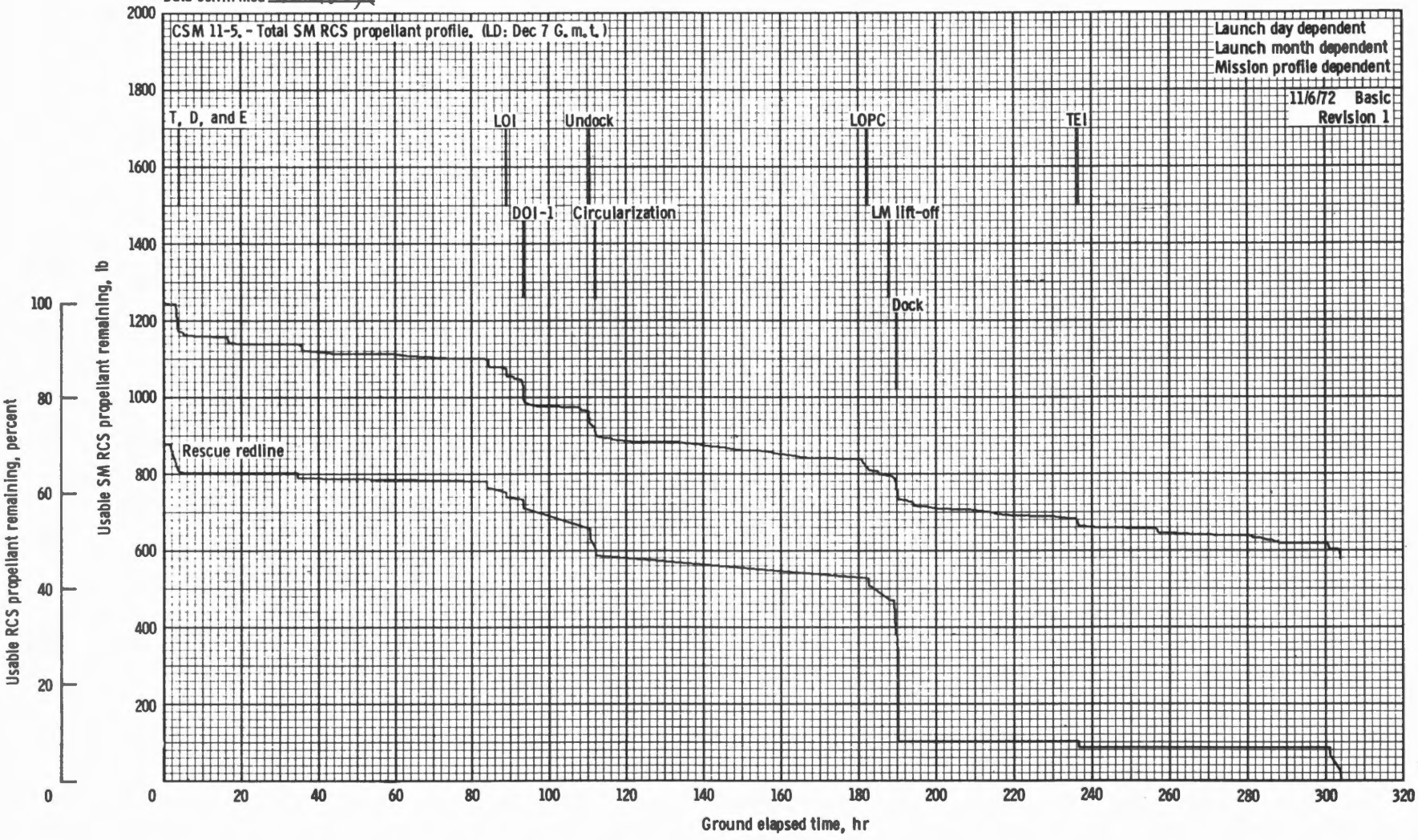


SM RCS propellant profile - quad C.



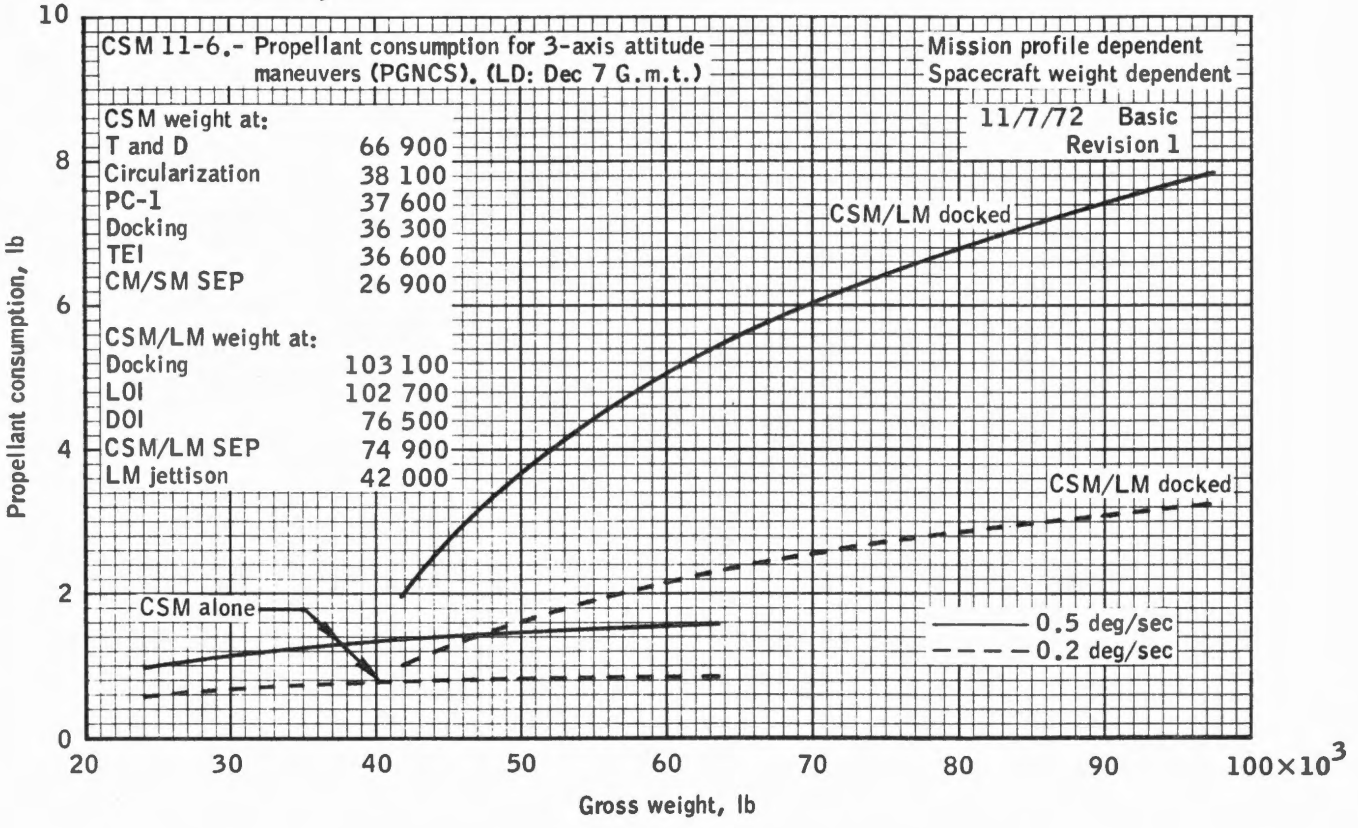
SM RCS propellant profile - quad D.

Loyd/MIB/MPAD (for Flight Plan, CSM Systems Data)
Data source SODB
Data confirmed Arnold Loyd

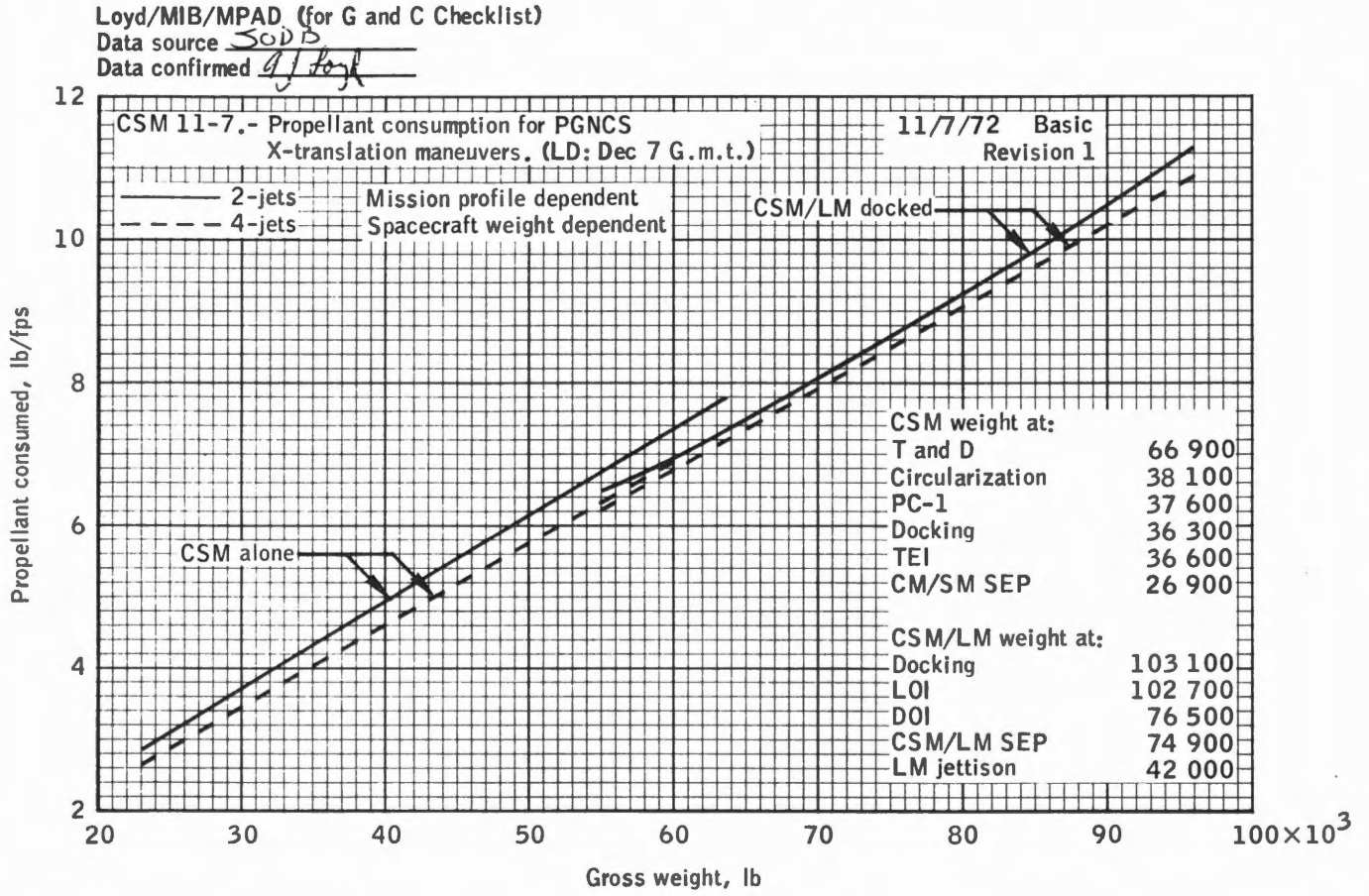


Total SM RCS propellant usage profile.

Loyd/MIB/MPAD (for G and C Checklist)
Data source SODB
Data confirmed A. J. Loyd

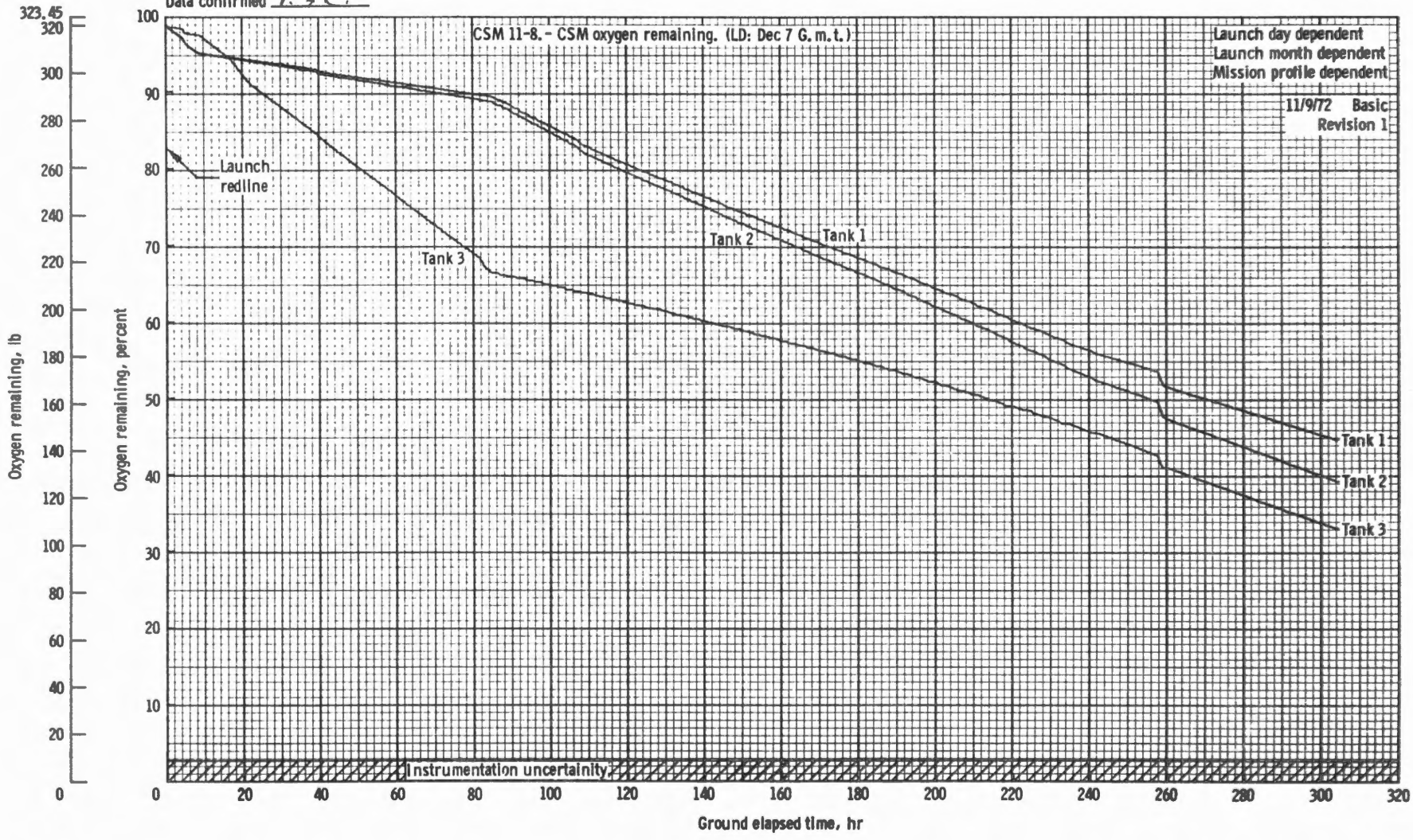


Propellant consumption 3-axis attitude maneuvers (PGNCS).



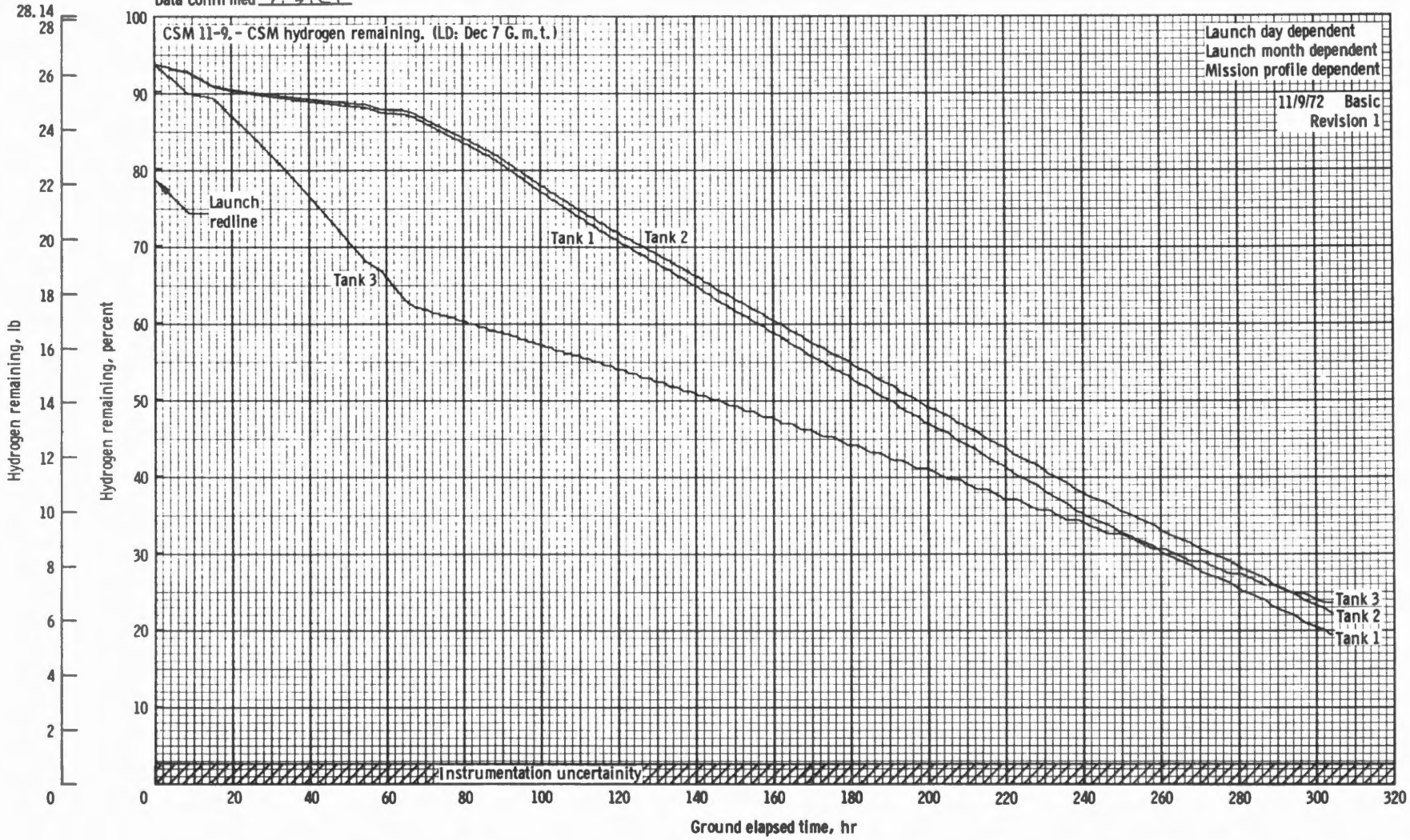
Propellant consumption for PGNCS X-translation maneuvers.

Cantin/SMB/MPAD (for Flight Plan)
Data source SODB, Flt. Plan.
Data confirmed P.T.C.



CSM oxygen remaining.

Cantin/SMB/MPAD (for Flight Plan)
Data source SODB, A-17 Fct. Mis.
Data confirmed P.T.C.



CSM hydrogen remaining.

Cantin/SMB/MPAD (for Flight Plan)
Data source SOD
Data confirmed P.T.C.

CSM 11-10.- Ground rules and assumptions for the CSM cryogenics. (LD: Dec 7 G.m.t.)

Mission profile dependent
11/9/72 Basic
Revision 1

GROUND RULES AND ASSUMPTIONS FOR THE CSM CRYOGENICS

1. Three O_2 and H_2 tanks are available.

2. Fuel cell purging is included in the EPS requirements.

3. No cryogenic venting was assumed in flight.

4. The EPS hydrogen consumption rate ($\dot{H}_2$) (lb/hr) = $0.00257 \times I_{fc}$ when I_{fc} is the total fuel cell current.

5. The EPS oxygen consumption rate ($\dot{O}_2$) (lb/hr) = $7.936 \times \dot{H}_2$.

6. No allowance for the SM enhancement battery is assumed.

CSM 11-10.- Concluded.

Mission profile dependent
11/9/72 Basic
Revision 1

7. The following tank depletion schedules are being used:

CRYO MANAGEMENT SCHEDULE

GET (hrs:min)	Tank numbers				
	Oxygen htrs[a]		H_2 tank 1, 2 htrs, tank 3 fan		
	Auto	Off	Auto	Manual	Off
0:00	1, 2	3	1, 2	3	
4:17	1, 2, 3				
5:05	1, 2	3			
8:40	3	1, 2	3		
15:10					1, 2
39:05	1, 2, 3				
39:55	3	1, 2			
65:00			1, 2		3
[b]84:40	1, 2	3			
[c]234:17					
257:00	1, 2, 3				
259:23	1, 2	3			

[a] O_2 tank 1 and 2 heaters may be required if the LM pressure equalization at approximately 60 and 81 hrs GET causes a pressure decay in the O_2 tanks.

[b] Switch to 50-watt heaters in O_2 tanks 1, 2 at this time.

[c] Switch to 100-watt heaters in O_2 tanks 1, 2 and 3 at this time.

The CSM consumables summary (table 5-I) shows that a significant H_2 and O_2 margin exists at the end of the mission. This is reflected in the H_2 and O_2 usage profiles shown in figures 5-1 and 5-2. However, these curves do not include dispersions.

In summary, the nominal mission requirements can be satisfied with the existent consumables.

Cantin/SMB/MPAD (for Flight Plan)
Data source SCAMA A-17 > Lo. Pln.
Data confirmed P.F.C.

CSM 11-11.- Cryogenic summary.
(LD: Dec 7 G.m.t.)

Mission profile dependent
11/9/72 Basic
Revision 1

APOLLO 17 CRYOGENIC SUMMARY

	H_2 lbs	O_2 lbs
Planning allowance		
Total loaded	87.9	990.3
Less residual	3.5	19.8
Less instrumentation error	2.3	26.0
Available for mission planning	82.1	944.5
Prelaunch requirement*	5.7	44.8
Flight requirement		
EPS (including fuel cell purge)	60.6	480.1
ECS (including cabin purge + EVA)	--	86.0
LM pressurization	--	11.9
	60.6	578.0
Nominal reserves		
EPS uncertainty (2.5%)	1.5	12.0
ECS uncertainty (.08 #/hr)	--	24.3
	1.5	36.3
Total requirement	67.8	659.1
Margin T = 0 (fill/launch)	14.3	285.4

*Supplied by KSC.

Nelson/MIB/MPAD (for Flight Plan)
Data source OT/SC/29 FLS
Data confirmed [illegible]

CSM 11-12.- CM RCS propellant summary. (LD: Dec 7 G.m.t.)

Mission profile dependent
8/29/72 Basic

CM RCS PROPELLANT SUMMARY

Item	Propellant required, lb	Propellant remaining, lb
Loaded	--	233.2
Trapped	36.4	196.8
Available for mission planning . . .	--	196.8
Nominal usage*	54.7	142.1
Nominal remaining	--	142.1

*CM RCS propellant usage is for dual ring operation with DAP control

Loyd/MIB/MPAD (for Flight Plan)
Data source SODB and I-C
Data confirmed G. J. Loyd

CSM 11-13.- SM RCS budget
(LD: Dec 7 G.m.t.)

Mission profile dependent
11/7/72 Basic
Revision 1

Ground Rules and Assumptions

1. Following transposition and docking, the S-IVB performs the evasive maneuver.

2. Two midcourse corrections (translunar) are executed as SPS burns with one MCC followed by an RCS trim.

3. One midcourse correction (transearth) is executed as an RCS burn of 5 fps.

4. Quad management is to be determined during the mission.

5. Single jet RCS control during SIM exps.

6. Couple jet RCS control during SIM off periods (major burns).

7. All maneuvering at low rate (0.2°/sec) both docked and undocked.

8. Attitude hold deadband during SIM photography and major burns - 0.5°.

9. Attitude hold deadband at other times - 2.5°.

10. Lunar orbit usage

Sim photography	1.0 lb/hr
Rest periods	0.1 lb/hr
Other	0.5 lb/hr

11. Nominal ullages.

12. Redlines are defined by the Flight Control Division as an aid in assuring that mission rules are not violated during the mission. They are subject to review during the mission as mission phases are completed and systems capabilities are evaluated. In the event the rescue redline is violated prior to rendezvous, lunar orbit photography activities can be curtailed to conserve propellant. The lunar orbit redline includes a nominal transearth coast phase (with all navigational sightings) plus a 3 sigma G&N TEI cutoff error MCC. If a rescue is required and the lunar orbit redline is violated prior to the nominal TEI, TEI can be performed early and navigational sighting activity curtailed during the transearth phase. The rescue redline is based on the minimized activity during the transearth phase.

Loyd/MIB/MPAD (for Flight Plan)
Data source SCIDS
Data confirmed J. Loyd

CSM 11-14.- SM RCS propellant loading and usage summary. (LD: Dec 7 G.m.t.)

Mission profile dependent
11/7/72 Basic
Revision 1

APOLLO 17 SM RCS ANALYSIS

Item	Required, lb	Remaining, lb
Nominal loading	- -	1338.4
Initial M/R outage	15.6	- -
Total trapped	26.4	- -
Gaging inaccuracy	56.0	- -
Deliverable		1240.4
Nominal usage		
Translunar coast(1)	181.6	- -
Lunar orbit(2)	397.4	- -
Transearth coast	86.8	- -
Total	665.8	- -
Nominal remaining usable		574.6

(1) Includes LOI burn and activity.
(2) Includes TEI burn.

Nelson/MIB/MPAD (for Flight Plan)
Data source SODB
Data confirmed JAN 11/14/72

CSM 11-15.- Assumptions for the SPS propellant analysis. (LD: Dec 7 G.m.t.)

Mission profile dependent
11/14/72 Final

THE SPS ANALYSIS ASSUMPTIONS

FOR THE SPS PROPELLANT ANALYSIS

1. All spacecraft weights and the sequential consumables losses were taken from the Spacecraft Operational Data Book, Amendment 127.

2. The engine I_{sp} assumed for this analysis is 314.3 seconds.

3. The 3σ dispersions are the RSS of the penalties imposed on the SPS margin by 3σ dispersions in propellant loading, mixture ratio, engine I_{sp}, maneuver ΔV, spacecraft weight, consumable weight losses, and an S-IVB ΔV deficit.

4. The CSM/LM weights for the J-missions have increased to an extent that, for some launch dates, the S-IVB will not have sufficient propellant reserves to compensate for a 3σ engine. Thus, in order to have a combined 3σ confidence level for the S-IVB and SPS, the S-IVB ΔV deficit is covered in the SPS propellant budget.

5. The ground rule for a contingency allowance is to budget for either a LM rescue or for a maneuver to avoid adverse weather conditions at entry, whichever produces the least SPS margin. The ΔV for the LM rescue allowance and the weather avoidance allowance is 600 fps and 300 fps, respectively. For this mission, the weather avoidance allowance produces the least SPS margin.

Nelson/MIB/MPAD (for Flight Plan)
Data source SODB
Data confirmed DAW 11/14/72

CSM 11-16.- SPS propellant summary.
(LD: Dec 7 G.m.t.)

Mission profile dependent
11/14/72 Final
Revision 1

APOLLO 17 SPS PROPELLANT SUMMARY

[DECEMBER 7, 1972, G.m.t., LAUNCH DATE; 72° LAUNCH AZIMUTH]

Item	Required, lb	Remaining, lb
Loading		40 742
Trapped and unavailable	441	40 301
Outage	36	40 265
Unbalance meter	100	40 164
Available for ΔV		40 165
Required for ΔV		
LOI (2979.9 fps)	26 201	13 964
DOI (198.7 fps)	1 500	12 464
CIRC (70.1 fps)	276	12 188
LOPC-1 (336.7 fps)	1 241	10 947
TEI (3045.7 fps)	9 468	1 479
Nominal remaining		1 479
Dispersions		
TLMC (23 fps)	122	1 357
-3σ performance	514	843
Margin above 3σ		843
Available for contingencies[a]		843

[a]843 pounds is equivalent to 312 fps end-of-mission reserve. Weather avoidance contingency allowance of 300 fps requires 824 pounds, which results in a margin after contingencies of 19 pounds.

Loyd/MIB/MPAD (for Flight Plan)
Data source SODB
Data confirmed A. J. Loyd

CSM 11-17.- SM RCS propellant translation cost.
(LD: Dec 7 G.m.t.)

Mission profile dependent
8/29/72 Basic

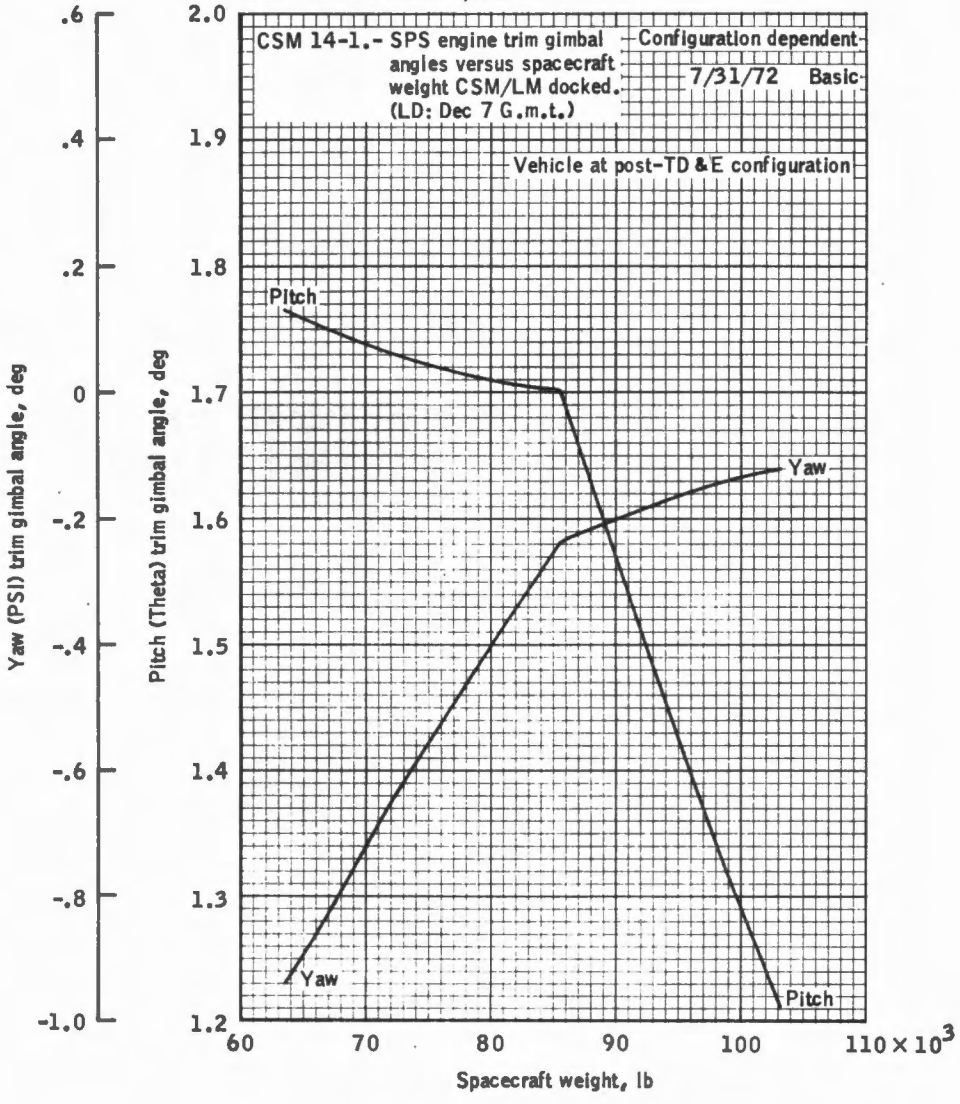
SM RCS PROPELLANT TRANSLATION COST

APOLLO 17

(CSM 114/LM-12)

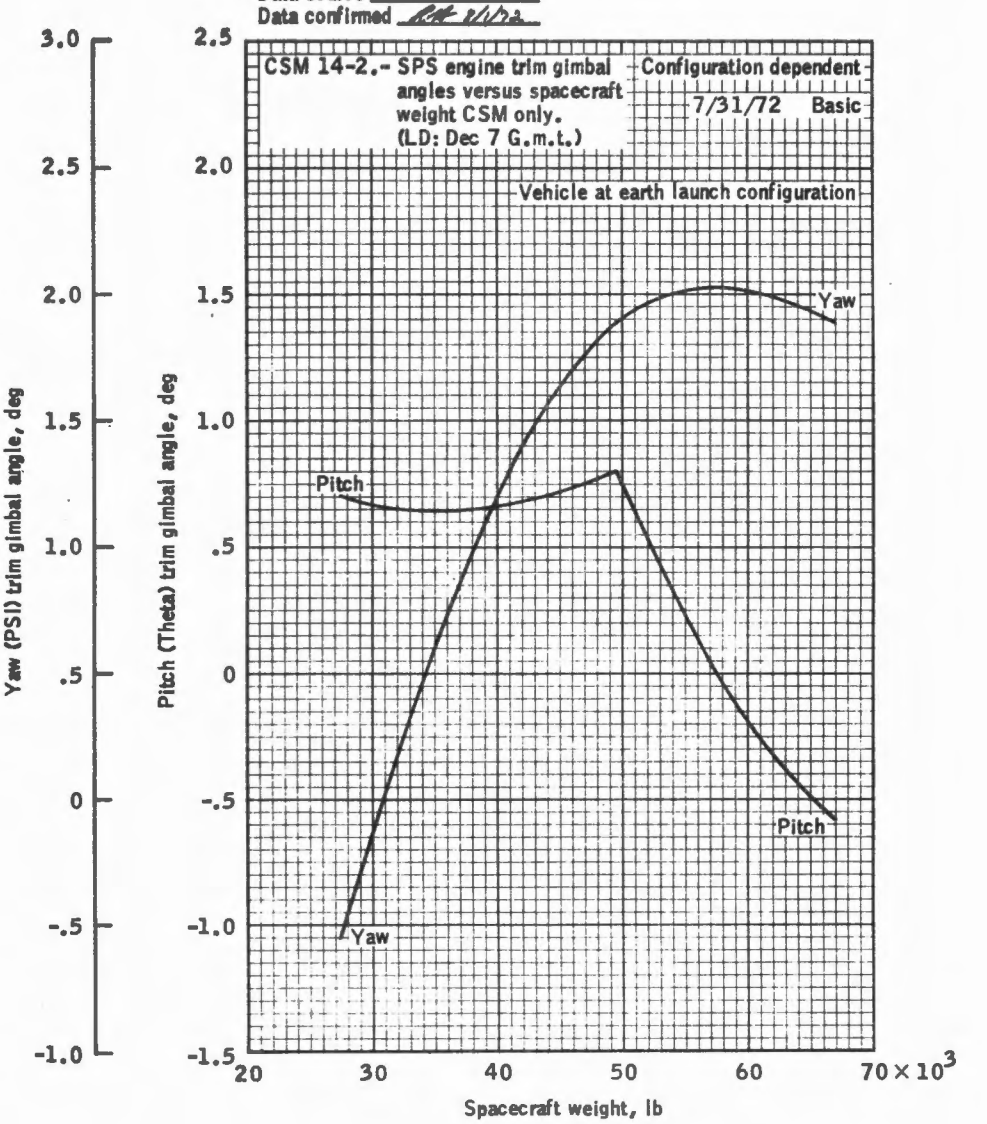
Mission phase	Typical S/C weight (lb)	+X 4 jet G&C (lb/fps)	+X 4 jet SCS (lb/fps)	+X 2 jet A/C G&C (lb/fps)	+X 2 jet A/C SCS (lb/fps)	+X 2 jet B/D G&C (lb/fps)	+X 2 jet B/D SCS (lb/fps)	±Y or ±Z G&C (lb/fps)
Translunar	103 000	11.7	13.3	12.0	13.3	12.4	13.3	--
Lunar orbit docked	75 000	8.6	9.3	8.7	9.3	8.8	9.3	--
Lunar orbit undocked	36 500	4.0	4.7	4.1	4.7	4.3	4.7	5.0
Transearth	26 900	3.1	3.8	3.2	3.8	3.4	3.8	3.5

Hischke/SMB/MPAD (for G and C Checklist)
Data source SPDB V-III A-127
Data confirmed RME 8/1/72



SPS engine trim gimbal angles versus spacecraft weight CSM/LM docked.

Hischke/SMB/MPAD (for G and C Checklist)
Data source SNDA V-XX A-12?
Data confirmed RHK 8/1/72



SPS engine trim gimbal angles versus spacecraft weight CSM only.

Moore/OMAB/MPAD (for LM Timeline)
Data source OT
Data confirmed 7/7 RAM

LM 2-1.- Range and range rate table (M=1).
(LD: Dec 7 G.m.t.)

Rendezvous sequence dependent
7/17/72 Basic

M = 1

TIME min:sec	RANGE n. mi.	RANGE RATE fps
L.O.		
5:00	147.7	1667.3
6:00	160.2	825.3
7:00	163.7	-157.1
INS	162.7	-470.9
1:00	158.1	-467.7
2:00	153.5	-464.0
3:00	148.9	-459.7
4:00	144.3	-454.9
5:00	139.9	-449.5
6:00	135.4	-443.7
7:00	131.0	-437.3
8:00	126.7	-430.5
9:00	122.5	-423.3
10:00	118.3	-415.6

Moore/OMAB/MPAD (for LM Timeline)
Data source OT
Data confirmed RHM

LM 2-2.- Range and range rate table (M=2).
(LD: Dec 7 G.m.t.)

Rendezvous sequence dependent
7/18/72 Basic

M = 2

TIME min:sec	RANGE n. mi.	RANGE RATE fps
INS	287.7	-477.1
1:00	283.0	-472.8
2:00	278.4	-467.8
3:00	273.7	-462.2
4:00	269.2	-456.0
5:00	264.7	-449.4
6:00	260.3	-442.1
7:00	255.9	-434.4
8:00	251.6	-426.2
9:00	247.5	-417.5
10:00	243.4	-408.3

Fridge, DuPont/SDB/MAB/MPAD (for LM Time Line)
Data source OI
Data confirmed G.m.t. 1975

LM 3-1.- PDI abort summary data. (LD: Dec 7 G.m.t.)

Launch month dependent
Mission profile dependent

8/30/72 Final

PAGE	ABORT	INS			BOOST	HAM	CSI		CDH			TPI	AIM		
	TIME PDI+	TIME PDI+	N76	HA/HINS	TIME INS+	TIME INS+	TIME INS+	ΔVX	TIME INS+	ΔVX	ΔVZ	TIME PDI+	TIME PDI+	ΔVX	ΔVZ
	NO 1+12	NA	NA	NA	NA	NA	1+07+00*	58.4	2+09+35*	-126.1	8.4	2+47+26	12+00	106.5	-50.0
	NO 1+12Δ	NA	NA	NA	NA	NA	1+07+00*	49.4	2+09+15*	-118.2	13.1	2+47+25	12+00	98.0	-50.0
	1+00	2+05	5656.2	132.6/53784.	NA	NA	0+55+00	57.2	1+57+08	-115.2	-42.4	2+47+30	NA	NA	NA
	2+00	4+00	5651.9	131.8/58323.				55.5	1+57+03	-113.0	-38.2				
	3+00	5+43	5646.3	128.3/60018.				54.7	1+56+54	-108.5	-31.4				
	4+00	7+18	5639.5	122.9/60023.				54.4	1+56+39	-101.6	-22.5				
	5+00	8+49	5630.0	115.3/60030.				54.4	1+56+18	-92.1	-11.3				
	6+00	10+13	5617.5	105.5/60039.				54.5	1+55+51	-79.8	1.5				
	7+00	12+35	5596.3	91.9/64950.				53.1	1+55+14	-61.8	17.7				
	8+00	14+27	5571.5	76.4/71046.				51.5	1+54+31	-41.4	32.6				
	9+00	16+06	5546.3	59.3/74249.				50.7	1+53+45	-18.2	45.2				
	10+00	17+18	5564.0	71.7/72715.	50+00	1+50+00	2+40+00	38.9	3+39+14	-32.3	-59.4	4+46+26	NA	NA	NA
	11+00	18+21	5559.6	65.7/67727.				41.8	3+39+01	-26.1	-43.6				
	12+00	19+24	5555.9	59.9/62049.				44.5	3+38+49	-19.8	-29.3				
	13+00	20+27	5547.3	52.7/60251.				46.4	3+38+32	-11.5	-12.3				
	14+00	21+27	5539.8	47.2/60250.				47.2	3+38+19	-4.8	.1				
	15+00	22+26	5532.2	41.8/60248.				47.9	3+38+05	2.2	11.8				
	16+00	23+26	5524.6	36.3/60246.				48.2	3+37+51	9.3	22.1				
	17+00	24+25	5517.0	30.9/60244.				48.5	3+37+37	16.7	31.4				
	T2-1	7+22Ω	5515.7	30.0/60154.	50+00	3+50+00	4+40+00	42.9	5+37+23	22.9	55.1	6+45+14	NA	NA	NA
	NO 2+12	NA	NA	NA	1+12+00*	2+12+00*	3+12+00*	47.4	4+15+07*	-141.9	29.0	4+51+40	12+00	122.5	-50.0
	NO 2+12Δ	NA	NA	NA	1+12+00*	2+12+00*	3+12+00*	38.6	4+14+40*	-130.0	37.6	4+51+39	12+00	110.0	-50.0
	1+00	2+07	5676.9	149.7/54128.	1+00+00	2+00+00	3+00+00	47.3	4+02+55	-136.4	-18.8	4+51+49	NA	NA	NA
	2+00	4+02	5672.6	149.1/59080.				45.1	4+02+51	-134.8	-15.8				
	3+00	5+44	5669.5	147.1/60019.				44.6	4+02+45	-131.8	-8.7				
	4+00	7+20	5666.3	144.5/60024.				44.2	4+02+37	-128.2	.5				
	5+00	8+50	5661.7	140.7/60031.				43.8	4+02+26	-123.4	11.7				
	6+00	10+15	5655.9	136.0/60040.				43.5	4+02+13	-117.2	25.2				
	7+00	12+41	5665.0	146.4/65188.	NA	NA	0+55+00	50.4	1+57+38	-127.8	-57.1	2+52+54	NA	NA	NA
	8+00	14+33	5641.5	130.9/71212.				49.9	1+56+57	-109.7	-32.3				
	9+00	16+11	5617.9	113.9/74326.				50.0	1+56+12	-89.3	-8.6				
	10+00	17+20	5602.3	100.8/72751.				50.9	1+55+37	-72.9	7.4				
	11+00	18+23	5590.1	88.7/67752.				52.3	1+55+05	-57.5	20.2				
	12+00	19+25	5578.4	76.7/62072.				53.8	1+54+33	-41.9	31.1				
	13+00	20+28	5560.6	62.5/60253.				54.3	1+53+54	-22.9	42.0				
	14+00	21+27	5545.8	51.6/60250.				54.2	1+53+25	-8.0	48.4				
	15+00	22+26	5530.8	40.8/60247.				54.0	1+52+56	7.3	53.6				
	T2-2	7+22Ω	5515.7	30.0/60154	50+00	1+50+00	2+40+00	48.4	3+37+34	17.8	32.9	4+51+43	NA	NA	NA

Ω INDICATES TIME IS REFERENCED TO LIFT-OFF. * INDICATES TIME IS REFERENCED TO PDI. Δ ASSUMES NO DOI-2

DuPont/MAB/MPAD (for LM Time line)
Data source Spacecraft C.T.
Data confirmed [illegible]

LM 4-1.- Range and range rate data at insertion and 10 minutes prior to subsequent maneuvers. (LD: Dec 7 G.m.t.)

Mission profile dependent

8/30/72 Final

PAGE	ABORT TIME PDI+	INS RANGE	INS RANGE RATE	BOOST RANGE	BOOST RANGE RATE	HAM RANGE	HAM RANGE RATE	CSI RANGE	CSI RANGE RATE	CDH RANGE	CDH RANGE RATE
	NO 1+12	NA	NA	NA	NA	NA	NA	177.3	-592.2	97.7	-167.9
	NO 1+12Δ	NA	NA	NA	NA	NA	NA	151.6	-536.6	97.2	-172.5
	01+00	133.5	570.0	NA	NA	NA	NA	163.7	-495.8	106.5	-125.8
	02+00	130.6	555.2					158.8	-485.4	101.8	-126.1
	03+00	117.5	526.6					144.1	-460.1	100.2	-131.8
	04+00	96.1	472.7					121.9	-417.4	99.9	-144.9
	05+00	69.4	331.8					91.7	-346.6	99.4	-138.8
	06+00	53.2	-86.6					55.6	-208.5	98.0	-150.2
	07+00	78.7	-454.3					30.8	203.1	94.1	-159.3
	08+00	144.9	-497.4					74.9	215.5	92.3	-163.1
	09+00	219.9	-473.2					135.3	72.1	90.2	-170.1
	10+00	283.7	-452.9	216.8	152.4	188.7	-390.4	37.3	47.2	97.5	-67.3
	11+00	339.9	-481.8	261.2	91.3	214.3	-405.6	69.7	28.9	98.6	-79.1
	12+00	397.3	-474.7	314.2	49.3	241.6	-420.7	96.0	-0.4	99.6	-93.8
	13+00	462.1	-459.9	374.5	-2.8	271.6	-430.2	126.2	-37.5	99.9	-105.7
	14+00	511.9	-445.3	420.8	-45.6	294.2	-433.3	149.3	-69.2	98.1	-116.7
	15+00	561.4	-430.6	466.5	-88.9	287.1	-426.7	172.1	-103.0	96.3	-126.2
	16+00	610.5	-415.7	511.7	-132.7	339.7	-432.6	194.5	-138.8	94.1	-133.9
	17+00	659.3	-400.7	556.5	-177.3	362.5	-429.2	216.3	-177.0	92.3	-142.2
	T2-1	1024.9	-334.7	934.1	-187.4	373.0	-394.8	244.9	-200.9	88.3	-174.6
	NO 2+12	NA	NA	398.8	-815.2	174.9	562.0	208.2	-693.5	99.9	-192.0
	NO 2+12Δ	NA	NA	345.9	-742.6	149.1	500.3	169.1	-613.2	98.9	200.0
	01+00	381.6	666.8	385.8	-738.2	143.5	516.3	209.7	-635.0	107.4	-160.7
	02+00	379.2	652.6	380.7	-728.7	144.8	506.5	206.4	-627.7	103.8	-146.4
	03+00	365.7	643.2	365.2	-717.7	138.3	504.6	196.5	-615.3	101.7	-166.5
	04+00	341.8	634.0	340.7	-699.7	127.6	505.6	182.6	-596.5	100.3	-174.0
	05+00	307.5	622.8	306.6	-673.9	112.1	506.1	163.9	-568.0	99.2	-183.9
	06+00	262.8	608.2	263.1	-638.0	92.9	500.8	141.2	-527.2	98.8	-184.6
	07+00	208.1	599.4	NA	NA	NA	NA	224.3	-591.1	101.6	-125.6
	08+00	135.1	530.3					155.3	-480.1	97.9	-131.0
	09+00	68.8	337.1					88.6	-337.2	95.4	-138.2
	10+00	53.8	-246.9					41.5	-105.0	94.6	-144.2
	11+00	92.5	-482.8					36.0	278.7	94.6	-157.2
	12+00	145.4	-512.8					72.8	227.6	95.3	-163.7
	13+00	209.0	-502.4					122.7	108.1	92.9	-170.5
	14+00	259.0	-484.8					161.7	15.0	92.2	-174.9
	15+00	309.2	-465.0					200.3	-78.7	89.7	-175.3
	T2-2	677.7	-396.9	573.6	-188.3	374.1	-428.6	227.5	-187.1	96.6	-149.3

Δ ASSUMES NO DOI-2

Moore/OMAB/MPAD (for LM Timeline)
Data source OT
Data confirmed RHM

LM 7-1.- Lift-off table.
(LD: Dec 7 G.m.t.)

Launch day dependent
Launch month dependent
Mission profile dependent
7/18/72 Basic

REV	NEW TIG	NOM TIG
14		114:57:30
15		116:56:11
16		118:54:47
17		120:53:22
18		122:51:58
19		124:50:34
20		126:49:09
21		128:47:46
22		130:46:20
23		132:44:56
24		134:43:32
25		136:42:07
26		138:40:43
27		140:39:18
28		142:37:54
29		144:36:29
30		146:35:05
31		148:33:40
32		150:32:16
33		152:30:51
34		154:29:27
35		156:28:02
36		158:26:38
37		160:25:13
38		162:23:48
39		164:22:24
40		166:20:59
41		168:19:34
42		170:18:09
43		172:16:45
44		174:15:20
45		176:13:55
46		178:12:30
47		180:11:05
48		182:09:40
49		184:08:30
50		186:07:05
NOM		188:03:15

Blucker/MPB/MPAD (for G and C Checklist)
Data source JPL Ephemeris
Data confirmed JSC 8/2072

LM 8-1.- Planet unit vectors (lunar referenced) Launch day dependent
Venus, Mars, Jupiter, Saturn. Launch month dependent
(LD: Dec 7 G.m.t.) 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.

LM 8-1.- Concluded.

Launch day dependent
Launch month dependent
8/23/72 Basic

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.

Blucker/MPB/MPAD (for G and C Checklist)
Data source JPL Ephemeris
Data confirmed [illegible] 8/23/72

LM 8-2.- Earth unit vectors.
(LD: Dec 7 G.m.t.)

Launch day dependent
Launch month dependent
Mission profile dependent
8/23/72 Basic

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

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
100.00	-.75887	.61603	.21127
100.50	-.76182	.61297	.20956
101.00	-.76475	.60989	.20784
101.50	-.76767	.60681	.20612
102.00	-.77057	.60370	.20440
102.50	-.77346	.60059	.20266
103.00	-.77633	.59746	.20093
103.50	-.77918	.59432	.19918
104.00	-.78203	.59116	.19744
104.50	-.78485	.58799	.19568
105.00	-.78766	.58480	.19393
105.50	-.79046	.58161	.19217
106.00	-.79324	.57839	.19040
106.50	-.79600	.57517	.18863
107.00	-.79875	.57193	.18685
107.50	-.80148	.56868	.18507
108.00	-.80420	.56541	.18328
108.50	-.80690	.56213	.18149
109.00	-.80958	.55884	.17970
109.50	-.81225	.55553	.17790
110.00	-.81491	.55221	.17609
110.50	-.81754	.54888	.17428
111.00	-.82016	.54553	.17247
111.50	-.82277	.54217	.17065
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

LM 8-2.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/23/72 Basic

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

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
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
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

LM 8-2.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/23/72 Basic

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

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
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
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

LM 8-2.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/23/72 Basic

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

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
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
187.00	-.98779	-.07853	-.13459
187.50	-.98714	-.08308	-.13664

LM 8-2.- Continued.

Launch day dependent
Launch month dependent
Mission profile dependent
8/23/72 Basic

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

TIME (GET) HOURS	X(R1)	Y(R2)	Z(R3)
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

Cockrell/MPB/MPAD (for Star Charts)
Data source NAV
Data confirmed BAC

LM 8-3.- Star unit vectors. (LD: Dec 7 G.m.t.)

Nearst mean Besselian year
8/15/72 Basic

DATA VALID FROM 1 JULY 71 TO 30 JUNE 73

STAR NO. (OCTAL)	UNIT VECTORS X (R1)	Y (R2)	Z (R3)	ECLIPTIC COORDINATES LONGITUDE (DEG.)	LATITUDE (DEG.)	STAR IDENTIFICATION COMMON NAME	GREEK IDENTIFIER AND CONSTELLATION
046	.78378	.47837	.39604	37.3	10.0	HAMAL	ALPHA ARIETIS
047	.58785	.64650	-.48628	34.2	-44.7		ALPHA FORNACIS
050	-.38535	.79355	.47094	112.8	6.7	POLLUX	BETA GEMINORUM
051	-.25993	.23220	-.93729	211.6	-72.2	MIAPLACIDUS	BETA CARINAE
052	-.45598	.11790	.88215	134.8	49.7	DUBHE	ALPHA URSAE MAJORIS
053	-.64862	-.11426	-.75249	211.9	-40.2		GAMMA CENTAURI
054	-.37780	-.31056	-.87225	239.1	-42.6	RIGIL KENT	ALPHA CENTAURI
055	.02745	.99128	.12885	88.4	-16.0	BETELGEUSE	ALPHA ORIONIS
056	-.42788	-.25162	-.86810	233.4	-44.1	HADAR	BETA CENTAURI
057	.15707	.98142	.11018	80.6	-16.8	BELLATRIX	GAMMA ORIONIS
060	.13540	.86760	.47847	82.2	5.4	EL NATH	BETA TAURI
061	.10975	.99373	-.02127	83.1	-24.5	ALNI LAM	EPSILON ORIONIS
062	.08995	.99536	-.03413	84.3	-25.3	ALNITAK	ZETA ORIONIS
063	-.08898	.94720	-.30804	96.8	-41.3	MURZIM	BETA CANIS MAJORIS
064	-.15044	.94732	.28275	98.7	-6.7	ALHENA	GAMMA GEMINORUM
065	-.21737	.84776	-.48379	110.4	-51.4	ADHERA	EPSILON CANIS MAJORIS
066	-.25920	.85781	-.44382	113.0	-48.5	AL WAZOR	DELTA CANIS MAJORIS
067	-.33431	.77987	.52919	109.9	10.1	CASTOR	ALPHA GEMINORUM
070	-.29533	.41426	-.86091	172.8	-72.7	AVIOR	EPSILON CARINAE
071	-.37986	.43725	-.81518	168.6	-67.2		DELTA VELORUM
072	-.54073	-.07023	-.83826	216.3	-47.8	GACRUX	GAMMA CRUCIS
073	-.49678	-.10124	-.86195	221.3	-48.6	BECRUX	BETA CRUCIS
074	-.54285	-.12733	.83012	158.5	54.3	ALIOTH	EPSILON URSAE MAJORIS
075	-.09824	-.79167	-.60300	264.2	-13.8	SHAULA	LAMBDA SCORPII
076	-.07868	-.72733	-.68176	265.2	-19.6		THETA SCORPII
077	.08021	-.82121	-.56496	274.7	-11.0	KAUS AUST	EPSILON SAGITTARII
100	.51482	.01724	.85712	34.7	51.2	CAPH	BETA CASSIOPEIAE
101	.73342	.08001	-.67505	345.1	-40.6	ANKAA	ALPHA PHOENICIS
102	.77864	.23864	.58031	30.0	25.9	MIRACH	BETA ANDROMEDAE
103	.63806	.37649	.67167	43.8	27.8	ALMACH	GAMMA-PRIME ANDROMEDAE
104	.12804	.99175	-.00556	82.0	-23.6	MINTAKA	DELTA ORIONIS
105	.05834	.98404	-.16812	86.0	-33.1	SAIPH	KAPPA ORIONIS
106	.00780	.70773	.70644	89.5	21.5	MENKALINAN	BETA AURIGAE
107	-.30908	.81594	-.48858	119.1	-50.6	ALUDRA	ETA CANIS MAJORIS
110	-.39096	.65976	-.64177	138.2	-58.3		ZETA PUPPIS
111	-.52985	.49858	-.68606	160.8	-55.9	SUHAIL	LAMBDA VELORUM
112	-.38743	.33577	-.85858	184.9	-67.1		IOTA CARINAE
113	-.53277	.14235	.83420	139.0	45.1	MERAK	BETA URSAE MAJORIS
114	-.53560	-.20239	.81986	165.3	56.4	MIZAR	ZETA URSAE MAJORIS
115	-.19927	-.18383	.96255	132.9	73.0	KOCHAB	BETA URSAE MINORIS
116	-.01099	-.62254	.78251	267.6	74.9	ELTANIN	GAMMA DRACONIS
117	.44164	-.62363	.64501	324.5	57.1	SADR	GAMMA CYGNI
120	.59893	-.32359	-.73251	315.5	-32.9	AL NA'IR	ALPHA GRUIS
121	.64150	-.23032	-.73173	321.9	-35.4		BETA GRUIS
122	.54566	.09353	.83277	37.4	46.6	SCHEDAR	ALPHA CASSIOPEIAE
123	-.58957	.01965	.80748	150.1	47.1	PHECDA	GAMMA URSAE MAJORIS
124	-.46642	-.79717	-.38338	242.2	-2.0		DELTA SCORPII
125	-.25426	-.78658	-.56272	254.9	-11.7		EPSILON SCORPII
126	.96452	.04966	.25929	8.8	12.6		GAMMA PEGASI
127	-.06586	-.77416	-.62955	266.1	-15.6		KAPPA SCORPII
130	.46554	.17863	.86681	47.5	46.4		DELTA CASSIOPEIAE
131	.82401	.44316	.35301	33.6	8.5		BETA ARIETIS
132	.50475	.76127	.40705	59.6	4.0		ETA TAURI
133	.44921	.72146	.52698	62.7	11.3		ZETA PERSEI
134	.39503	.65724	.64186	65.3	19.1		EPSILON PERSEI
135	.23377	.80421	.54644	76.2	10.5		IOTA AURIGAE
136	.23052	.96896	-.08927	74.9	-27.9		BETA ERIDANI
137	.13398	.92530	-.35479	79.3	-43.9		BETA LEPORIS

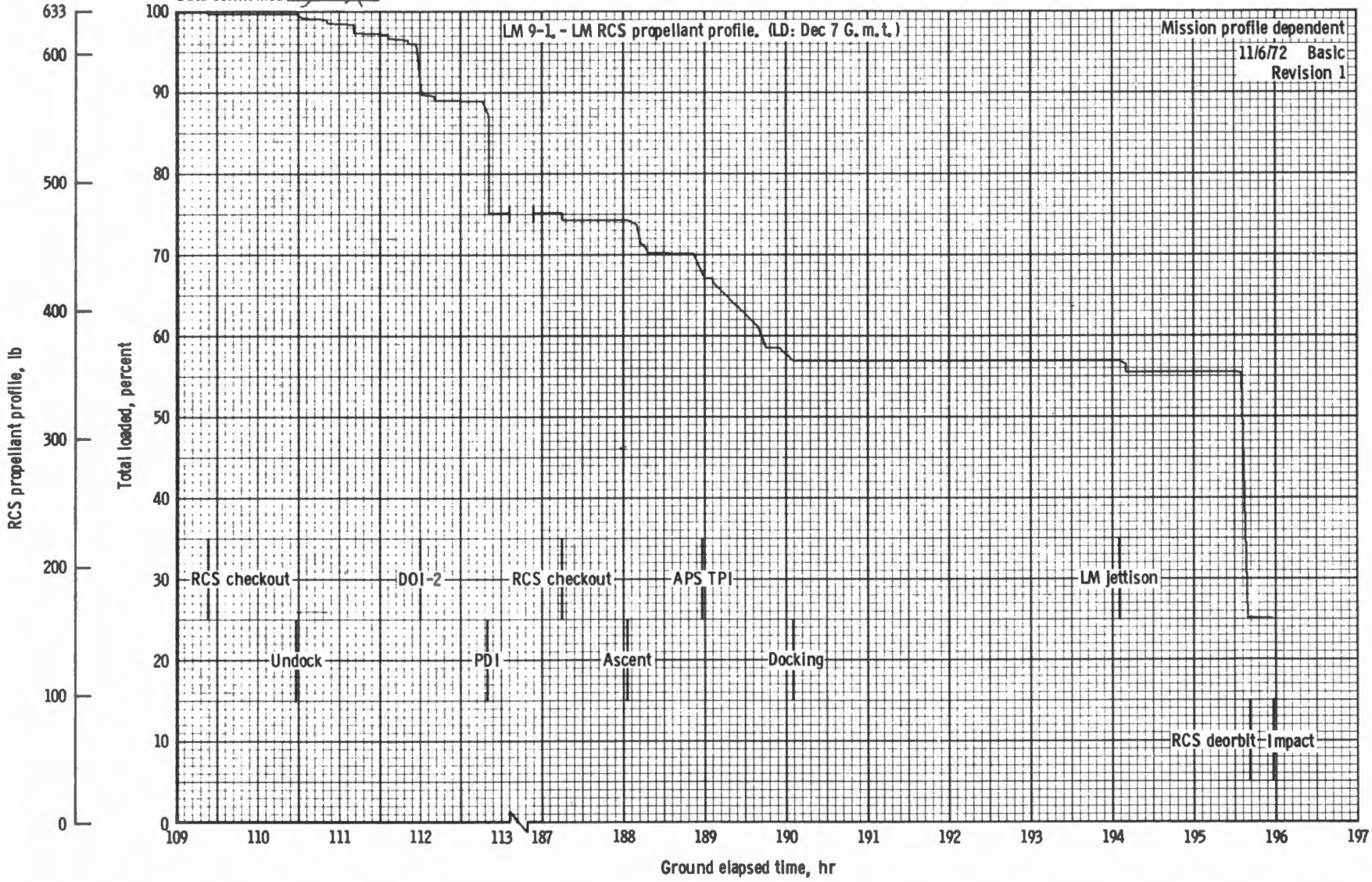
LM 8-3.- Concluded.

DATA VALID FROM 1 JULY 71 TO 30 JUNE 73

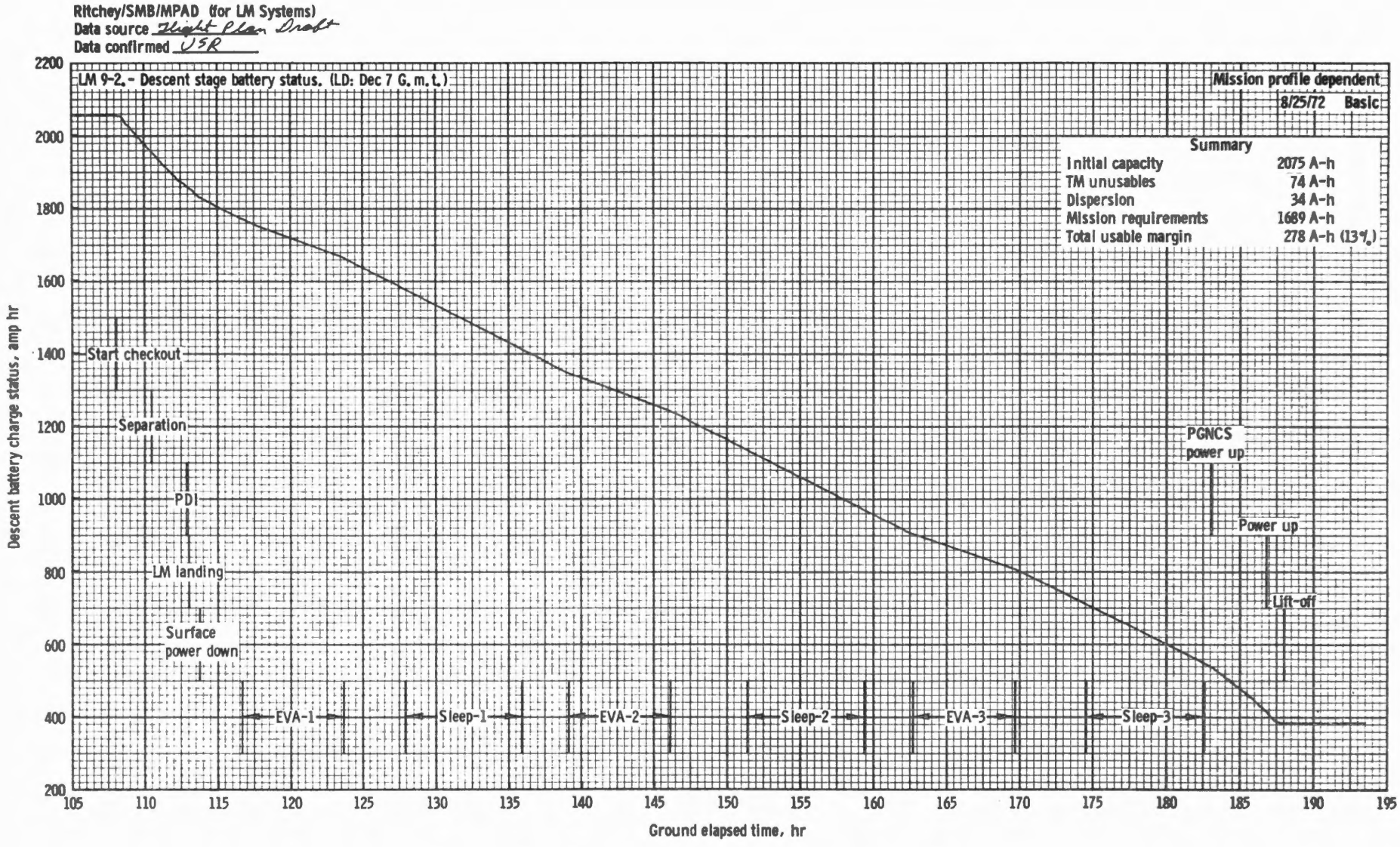
Nearst mean Besselian year 8/15/72 Basic

STAR NO. (OCTAL)	UNIT VECTORS X (R1)	Y (R2)	Z (R3)	ECLIPTIC COORDINATES LONGITUDE (DEG.)	LATITUDE (DEG.)	STAR IDENTIFICATION COMMON NAME	GREEK IDENTIFIER AND CONSTELLATION
140	.11809	.94456	-.30638	81.0	-41.1		ALPHA LEPORIS
141	.11233	.98829	-.10326	82.6	-29.2		IOTA ORIONIS
142	.09762	.92766	.36044	84.4	-2.2		ZETA TAURI
143	.07710	.82458	-.56047	81.8	-57.4		ALPHA COLUMBAE
144	.00760	.79636	.60477	89.6	13.8		THETA AURIGAE
145	-.13538	.62039	-.77252	117.3	-72.9		TAU PUPPIS
146	-.26036	.75449	-.60246	119.9	-58.5		PI PUPPIS
147	-.47769	.77684	-.41029	131.0	-43.3		RHO PUPPIS
150	-.44258	.36729	-.81806	178.5	-63.7		KAPPA VELORUM
151	-.84900	.40299	.34176	149.2	8.8		GAMMA-PRIME LEONIS
152	-.61835	.20822	-.75781	190.1	-51.1		MU VELORUM
153	-.91566	.19204	.35310	160.9	14.3		DELTA LEONIS
154	-.90939	-.13150	-.39462	197.0	-18.0		BETA CORVI
155	-.35438	-.05533	-.93346	230.0	-56.6		ALPHA MUSCAE
156	-.98437	-.17463	-.02262	189.8	2.8		GAMMA VIRGINIS
157	-.76073	-.18517	.62209	174.2	40.1		ALPHA-SQUARED CANES VENATICI
160	-.94695	-.25720	.19268	189.6	16.2		EPSILON VIRGINIS
161	-.75591	-.27146	-.59574	212.7	-26.0		IOTA CENTAURI
162	-.54339	-.24793	-.80203	225.2	-39.6		EPSILON CENTAURI
163	-.83450	-.45004	.31792	198.9	28.1		ETA BOOTIS
164	-.61951	-.47946	.62156	197.3	49.6		GAMMA BOOTIS
165	-.58182	-.46165	-.66960	229.9	-25.5		ETA CENTAURI
166	-.51969	-.43630	-.73455	233.1	-30.0		ALPHA LUPORIS
167	-.67191	-.58286	.45696	207.7	40.6		EPSILON BOOTIS
170	-.71089	-.64757	-.27440	224.7	.3	ZUBEN'UBI	ALPHA-SQUARED LIBRAE
171	-.52437	-.50943	-.68229	234.6	-25.0		BETA LUPI
172	-.64911	-.74341	-.16127	229.0	8.5		BETA LIBRAE
173	-.45035	-.60456	-.65703	241.1	-21.2		GAMMA LUPI
174	-.55958	-.82098	.11342	231.7	25.5		ALPHA SERPENTIS
175	-.45889	-.77251	-.43892	242.5	-5.5		PI SCORPII
176	-.45705	-.82288	-.33759	242.8	1.0		BETA-PRIME SCORPII
177	-.19434	-.43449	.87946	194.1	78.4		ETA DRACONIS
200	-.35962	-.85776	.36730	240.7	42.7		BETA HERCULIS
201	-.32264	-.82048	-.47193	251.1	-6.1		TAU SCORPII
202	-.35390	-.91732	-.18244	248.8	11.4		ZETA OPHIUCHI
203	-.29034	-.80020	.52477	241.1	53.1		ZETA HERCULIS
204	-.21341	-.93878	-.27046	257.6	7.2	SABIK	ETA OPHIUCHI
205	-.09111	-.55895	-.82418	263.8	-32.3		BETA ARAE
206	-.10780	-.78840	-.60565	263.6	-14.0		NU SCORPII
207	-.08506	-.63908	-.76442	264.5	-26.6		ALPHA ARAE
210	-.08031	-.60593	.79145	251.6	75.3		BETA DRACONIS
211	-.07783	-.99377	.07981	264.9	27.9		BETA OPHIUCHI
212	.07258	-.86436	-.49760	274.2	-6.5		DELTA SAGITTARII
213	.10317	-.89713	-.42955	275.9	-2.1		LAMBDA SAGITTARII
214	.22735	-.83636	-.49882	283.2	-7.2		ZETA SAGITTARII
215	.30991	-.63473	.70787	315.9	64.4		DELTA CYGNI
216	.43454	-.88187	.18299	300.5	31.2		GAMMA AQUILAE
217	.54770	-.62411	.55723	327.4	49.4		EPSILON CYGNI
220	.35139	-.30035	.88674	12.4	68.9		ALPHA CEPHI
221	.79939	-.53163	-.27991	323.1	-2.6		DELTA CAPRICORNI
222	.44451	-.21537	-.86949	309.3	-45.4		ALPHA TUCANAE
223	.85577	-.21967	.46840	359.0	31.1		BETA PEGASI
224	.93634	-.23622	.25973	353.1	19.4	MARKAB	ALPHA PEGASI
225	.41267	.23321	-.88052	341.7	-64.2		ALPHA HYDRI
226	.82309	.56532	-.05415	31.1	-15.9		OMICRON CETI
227	.51988	.54947	.65407	55.8	22.4		BETA PERSEI
230	-.43367	.33165	-.83782	183.8	-64.2		N VELORUM
231	-.40953	.14512	-.90068	208.8	-62.1		THETA CARINAE
232	-.63489	-.01912	-.77236	207.1	-44.5		DELTA CENTAURI
233	-.23663	-.38112	-.89373	251.5	-41.9		BETA TRIANGULI AUSTRALIS
234	.26815	-.93329	.23888	289.4	36.2		ZETA AQUILAE
235	.27321	-.89225	-.35950	285.9	1.4		PI SAGITTARII
236	-.44968	-.89095	-.06320	241.9	17.2		DELTA OPHIUCHI

Loyd/MIB/MPAD (for LM Systems)
Data source FH. Plan & SODB
Data confirmed J. Loyd

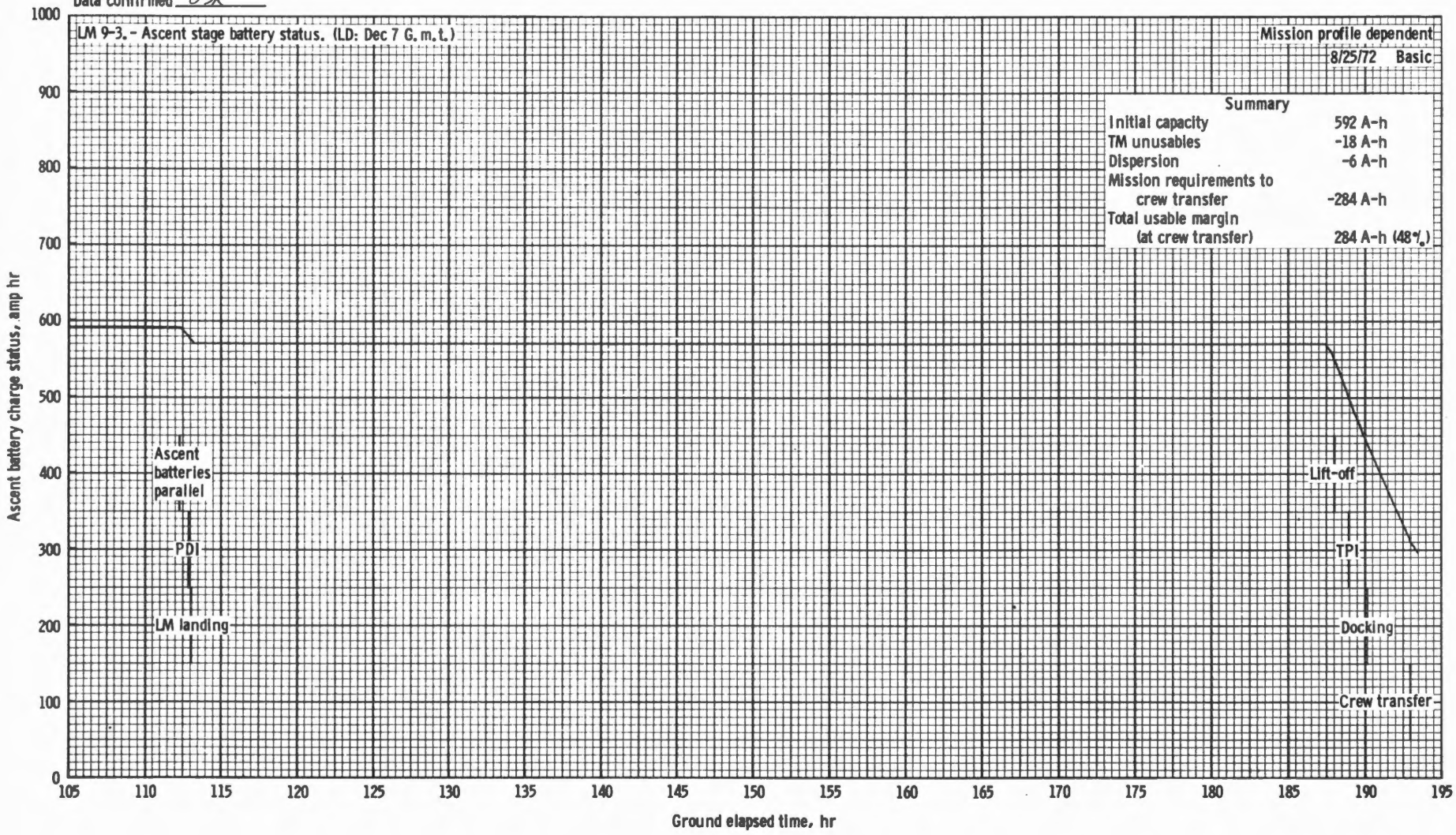


LM RCS propellant profile.

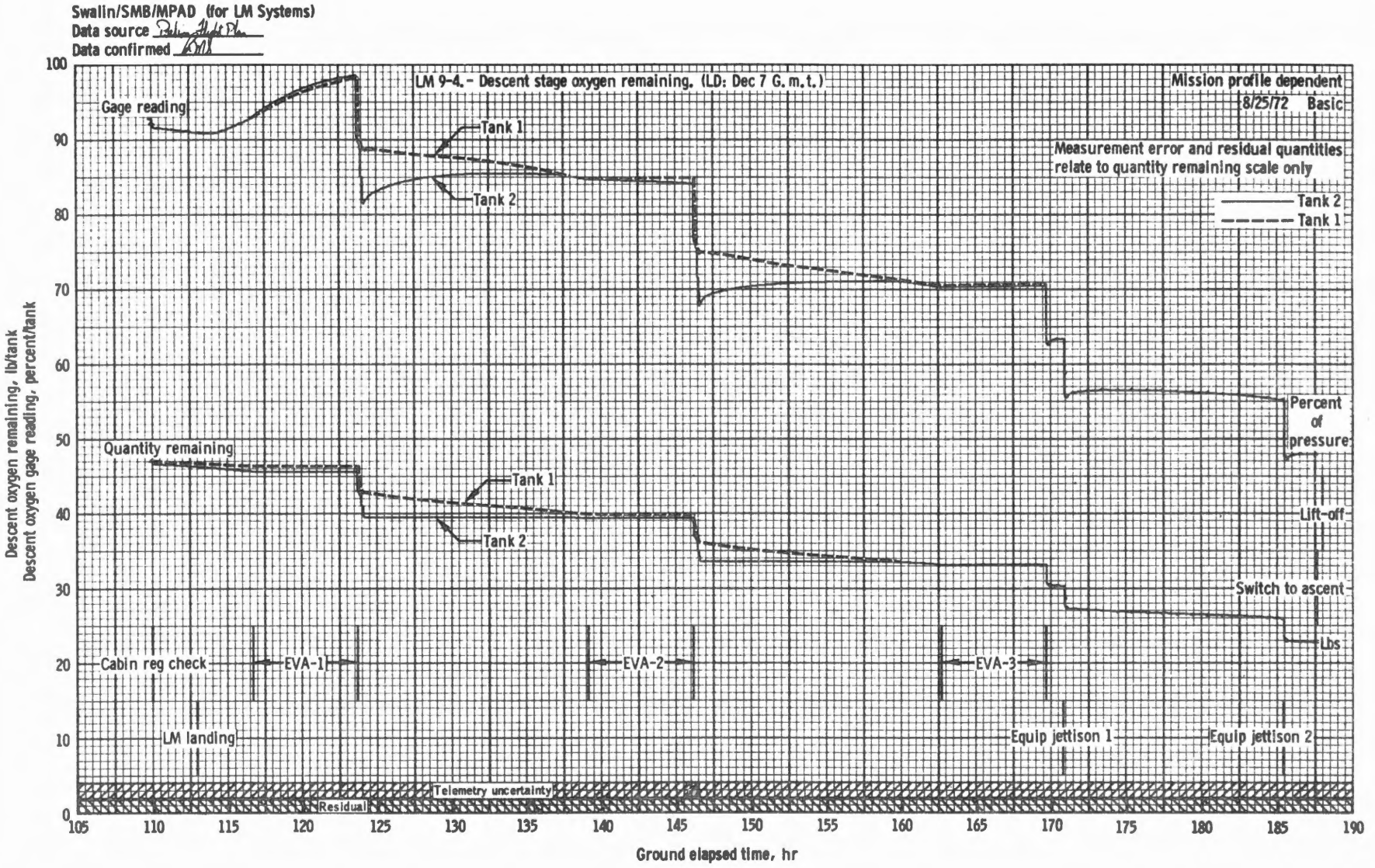


Apollo 17 descent electrical energy remaining.

Ritchey/SMB/MPAD (for LM Systems)
Data source Flight Plan Draft
Data confirmed USR

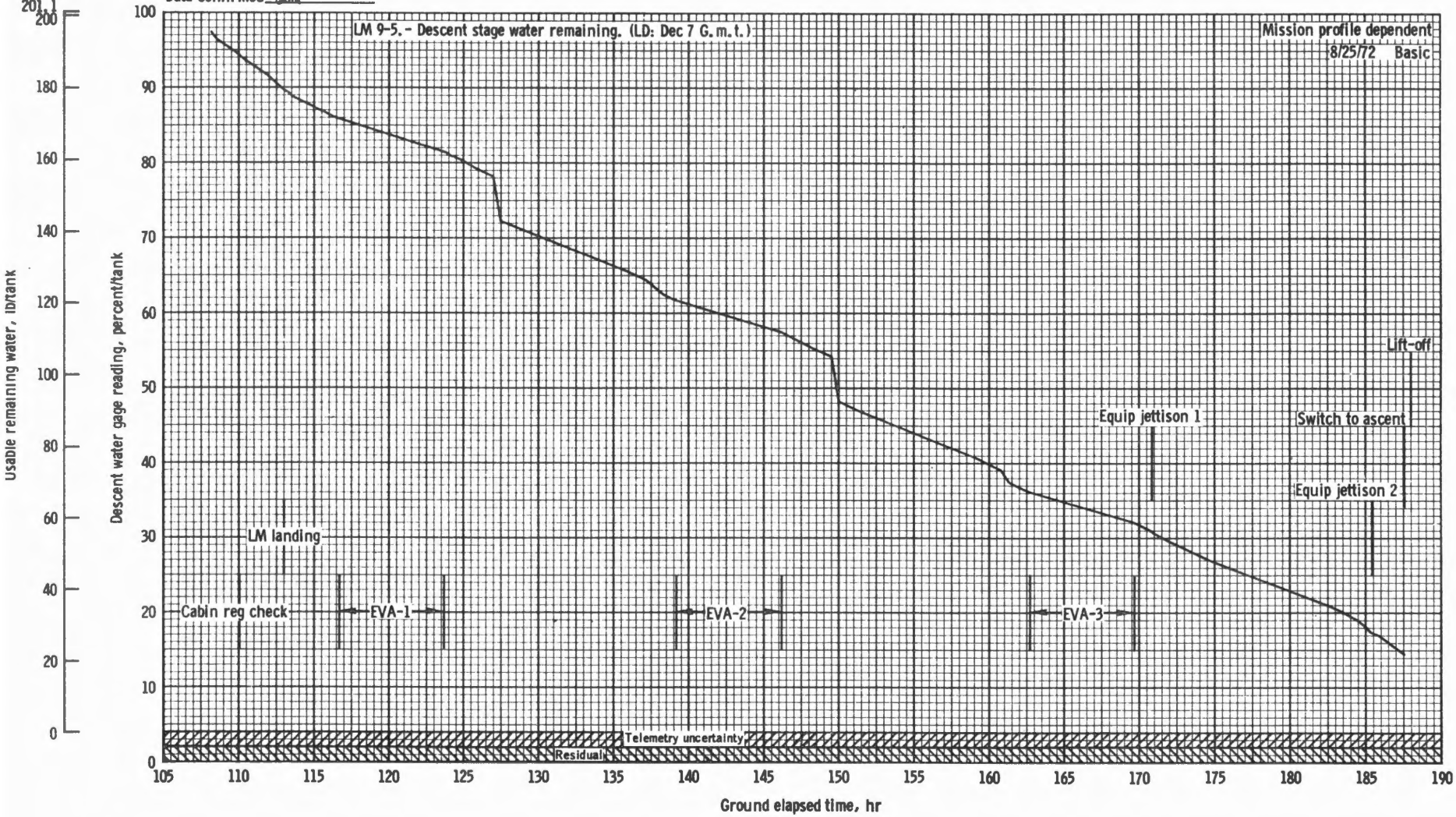


Apollo 17 ascent electrical energy remaining.

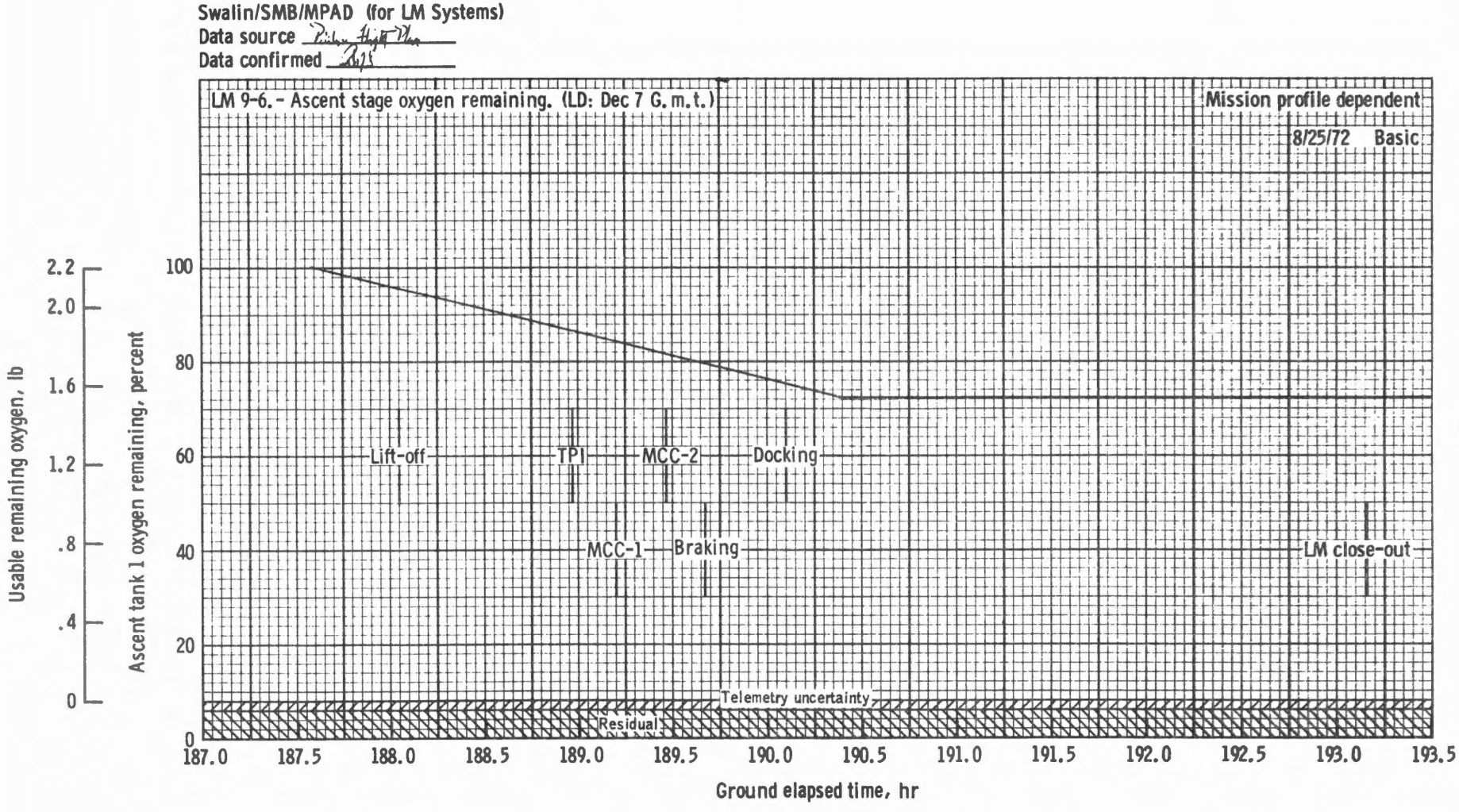


Descent stage oxygen remaining.

Swalin/SMB/MPAD (for LM Systems)
Data source Pub. Flight Plan
Data confirmed Final

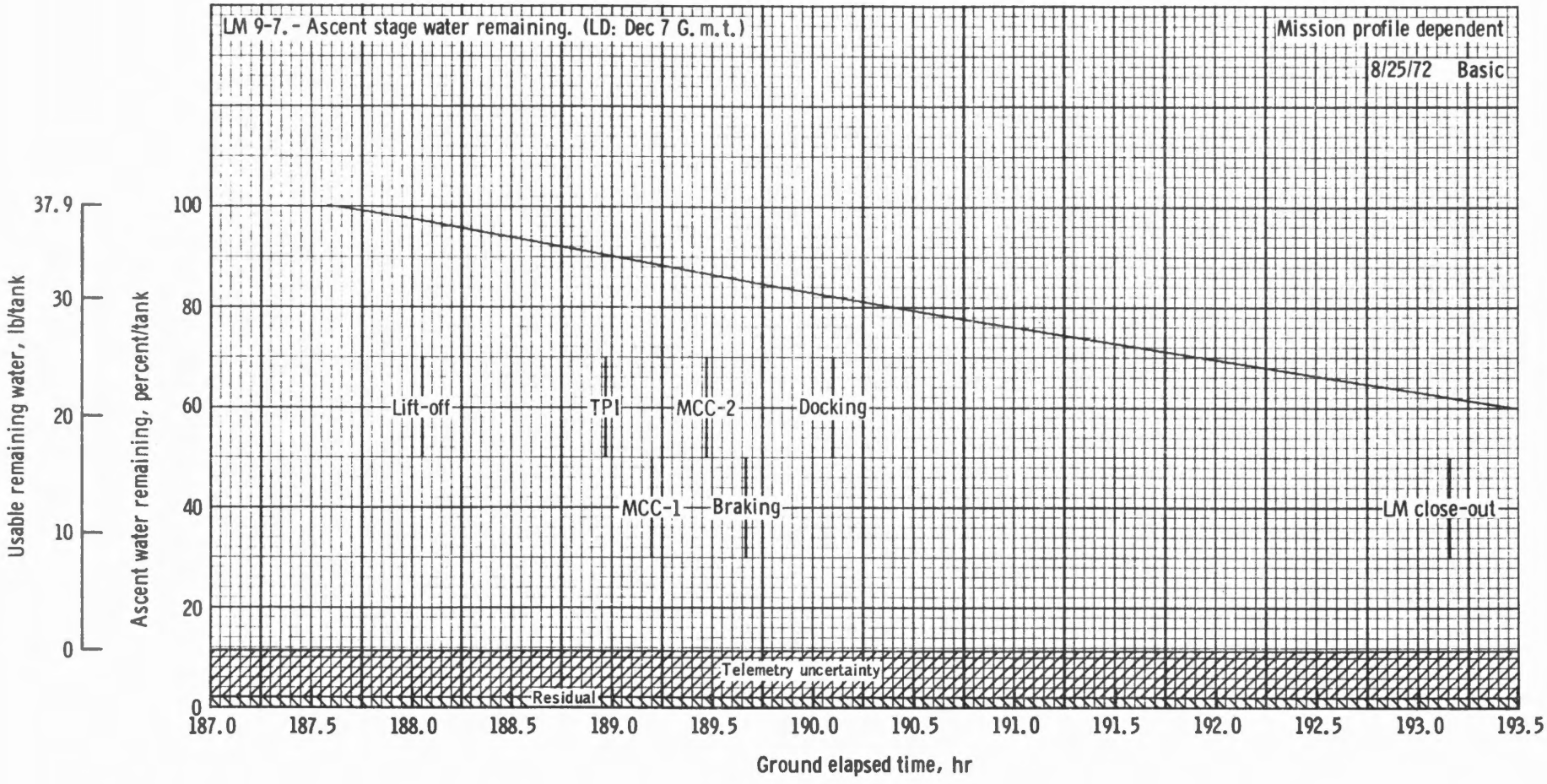


Descent stage water remaining.



Ascent tank 1 oxygen remaining.

Swalin/SMB/MPAD (for LM Systems)
Data source Pocket Flight Plan
Data confirmed [signature]



Ascent stage water remaining.

Ritchey/GPB/MPAD (for Flight Plan)
Data source Flight Plan Draft-1500B
Data confirmed USR

LM 9-8.- Assumptions for LM EPS analysis. (LD: Dec 7 G.m.t.)

Mission profile dependent
8/28/72 Basic

ASSUMPTIONS FOR THE LM EPS ANALYSIS

a. Energy available from the descent batteries is 2075 A-h and from the ascent batteries is 592 A-h.

b. Energy unusables caused by lack of continuous STDN coverage for the descent and ascent stages are zero.

c. Energy unusables caused by TM inaccuracies for the descent and ascent stages were 74 and 18 A-h, respectively. The new descent battery current measurement uncertainty of 0.5 amperes per battery was used.

d. Energy unusables caused by checklist deviations (dispersion) for the descent and ascent stages were 34 and 6 A-h, respectively. This dispersion is obtained by calculating 2 percent of the energy used.

e. In accordance with the Flight Plan, the PGNCS was in standby mode from surface powerdown until 3.7 hours before powerup.

f. The RCS heaters were assumed to have a 100 percent duty cycle for 15 minutes after initial activation and then to decrease to an 18.3 percent duty cycle until undocking. For the remainder of the mission, except for lunar surface stay, the duty cycle was 2.6 percent. The duty cycle during lunar surface stay was 3.9 percent.

g. The invertor was operated throughout the mission.

h. The CDR and LMP forward window heaters were assumed not to be needed.

i. The six MESA heaters have a total power rating of 150 watts. The power required by the heaters during the period LM activation to touchdown was assumed to be 5.6 watts. From touchdown until 1 hour into EVA-2, the heating were assumed to draw 27.5 watts. The power required until the beginning of EVA-3 was 20 watts. The MESA heaters were turned off at that point.

j. TV power is supplied by the LM during the first hour of EVA-1. For the remainder of EVA-1 and the other EVA's, the TV will be powered by the lunar communications relay unit (LCRU).

k. The liquid cooled garment pump was operated before each EVA for 10 minutes.

LM 9-8.- Concluded.

Mission profile dependent
8/28/72 Basic

ASSUMPTIONS FOR THE LM EPS ANALYSIS - Concluded

l. The S-band power amplifier was cycled as dictated by the time line.

m. The portable utility lights were assumed to be off throughout the mission.

n. In accordance with the Flight Plan, the floodlights were turned off at surface powerdown, and on again at powerup. The overhead and forward floodlights were not used.

o. The short (M=1) rendezvous was considered nominal.

p. At the beginning of the analysis, it was assumed that a total of 10 A-h had been used from the descent batteries between the period starting 30 minutes before launch and ending at the conclusion of transposition and docking.

Ritchey/GPB/MPAD (for LM Systems)
Data source Flight Plan Draft
Data confirmed USR

LM 9-9.- Descent and ascent stage EPS summary. (LD: Dec 7 G.m.t.)

Mission profile dependent
8/28/72 Basic

DESCENT STAGE EPS SUMMARY

Item	A-h required	A-h remaining
Initial capacity	--	2075
Total unusables	108	1967
Required through touchdown	219	1748
Required for surface stay	1470	278
Total usable margin	--	278

ASCENT STAGE EPS SUMMARY

Item	A-h required	A-h remaining
Initial capacity	--	592
Total unusables	24	568
Required through docking	150	418
Required through crew transfer	284	284

Swalin/GPB/MPAD (for Flight Plan)
Data source Swalin Flight Plan
Data confirmed Bond

LM 9-10.- LM ECS assumptions. (LD: Dec 7 G.m.t.)

Mission profile dependent
8/28/72 Basic

LM ECS ASSUMPTIONS

a. The oxygen analyses were calculated using a cabin leak rate of 0.06 lb/hr based on previous Apollo postflight analyses.

b. Metabolic rates were varied using the final flight plan and table 4.3-II of SODB Vol. II.

c. Metabolic oxygen consumed was calculated by $(1.643 \times 10^{-4} \times \text{lb/Btu})$ (metabolic rate, Btu/hr).

d. The cabin regulator check and the suit integrity check were assumed to require 0.5 pound of oxygen.

e. The cabin was pressurized five times with 5.5 pounds required for each pressurization except the last two which required 5.8 pounds.

f. The dispersion in the oxygen profile was calculated as 5 percent of the nominal oxygen requirement.

g. The PLSS refills required 47.0 pounds of water and 5.4 pounds of oxygen.

h. The sublimator fill required 2.23 pounds.

i. The drink bags required 8.0 pounds of water.

j. Water list through crew micturition was 0.11 lb/hr per man.

k. Water required for thermal control was calculated by dividing the total spacecraft heat load by 1040 Btu/lb.

l. The dispersion in the water profile was calculated as 5 percent of the nominal usage.

m. The descent oxygen tanks were loaded to 2610.0 psi at 70.0°F.

Swalin /GPB/MPAD (for Flight Plan)
Data source Baseline Flight Plan
Data confirmed

LM 9-11.- LM ECS summary.
(LD: Dec 7 G.m.t.)

Mission profile dependent
9/1/72 Basic

LM ECS SUMMARY

(a) Water

Description	Descent, lb	Ascent, lb
Loaded	419.0	85.0
Sampling	11.0	0
Residual	8.4	1.7
Telemetry uncertainty	8.4	7.5
Loading uncertainty	3.0	1.8
Available for mission	388.2	74.0
Required to lunar landing	28.1	0
Required to lunar lift-off	319.2	0
Required to LM/CSM docking	0	17.2
Required to LM close-out	0	15.1
Remaining in tanks	40.9	41.7
Dispersion	17.4	1.6
Margin	23.5	40.1

(b) Oxygen

Description	Descent, lb	Ascent 1, lb	Ascent 2, lb
Loaded	93.8	2.4	2.4
Residual	1.6	0.1	0.1
Measurement uncertainty	2.2	0.1	0.1
Available for mission	90.0	2.2	2.2
Required to lunar landing	1.3	0	0
Required to lunar lift-off	47.5	0	0
Required to LM/CSM docking	0	0.6	0
Required to LM close-out	0	0.1	0
Remaining in tank	41.2	1.5	2.2
Dispersion	2.4	0.1	0
Margin	38.8	1.4	2.2

Loyd/MIB/MPAD (for Flight Plan)
Data source SODB
Data confirmed A.D. Loyd

LM 9-12.- Assumptions and ground rules for the LM RCS analysis. (LD: Dec 7 G.m.t.)

Mission profile dependent
8/29/72 Basic

ASSUMPTIONS AND GROUND RULES FOR THE LM RCS ANALYSIS

1. Data for the LM RCS engine performance and propellant requirements were obtained from the SODB, Volume II, and from postflight analyses of Apollo 9-16 missions.

2. The analysis assumes an insertion trim or RCS tweak burn (nominally zero) of 20 fps.

3. It is assumed there will be a 5-fps RCS trim following the APS TPI maneuver.

Loyd/MIB/MPAD (for Flight Plan)
Data source Sc 1213.
Data confirmed C J Loyd

LM 9-13.- LM RCS propellant loading and usage summary. (LD: Dec 7 G.m.t.)

Mission profile dependent
11/7/72 Basic
Revision 1

LM RCS PROPELLANT LOADING AND USAGE SUMMARY

Item	Required, lb	Remaining, lb
Loaded		631.2
Trapped	38.0	593.2
Gaging inaccuracy and loading tolerance	43.5	549.7
Mixture ratio uncertainty	17.0	532.7
Usable		532.7
Nominal usage through lunar landing	158.8	373.9
Nominal usage from landing through docking	114.4	259.5
Nominal usage from docking through impact	200.0	59.5
Usable propellant remaining		59.5

Loyd/MIB/MPAD (for Flight Plan)
Data source SODB
Data confirmed J. J. Loyd

LM 9-14.- Assumptions for the APS analysis. Mission profile dependent
(LD: Dec 7 G.m.t.) 11/7/72 Basic
Revision 1

ASSUMPTIONS FOR THE APS ANALYSIS

The propellant loading is based on the optimization of the fuel and oxidizer balance that was computed from the LM-12 engine data. The ΔV requirements were coordinated with the Landing Analysis Branch. The ΔV requirement for the lunar ascent differs from that in the Operational Trajectory because of differences in the inert vehicle weight.

The APS analysis accounts for an APS TPI, engine valve-pair malfunction, and balanced couples. The following data were used in determining the APS propellant requirements for Apollo 17.

a. I_{sp} = 310.3 $\pm$ 3.77 seconds.

b. Mixture ratio = 1.5988 $\pm$ .027.

c. Lift-off weight = 10 923.3 $\pm$ 38.7 pounds.

Loyd/MIB/MPAD (for Flight Plan)
Data source SODB
Data confirmed

LM 9-15.- APS propellant summary.
(LD: Dec 7 G.m.t.)

Mission profile dependent
11/7/72 Basic
Revision 1

APS PROPELLANT SUMMARY

Item	Total propellant, lb
Loaded	5261.4
Trapped and unavailable	-51.9
Outage	-11.8
Available for ΔV	5197.7
Required for Ascent (6062.2 fps)	-4968.3
Remaining	229.4
Required for APS TPI[a] (54.8 fps)	-32.6
Remaining	196.8
Dispersions (-3σ)	-67.7
Pad	129.1
Operational allowances	
Engine valve-pair malfunction (ΔMR = +.0097 or -.0183)	-23.0
Balanced couples on	-38.3
Half-degree out of plane (18 fps)	-10.7
Margin	57.1

[a]The total TPI ΔV is 76.6 fps. It is assumed that 22 fps is obtained by a 10-sec, 4-jet ullage.

Loyd/MIB/MPAD (for Flight Plan)
Data source SODB
Data confirmed [signature]

LM 9-16.- Assumptions for the DPS analysis. (LD: Dec 7 G.m.t.)

Mission profile dependent
11/7/72 Basic
Revision 1

ASSUMPTIONS FOR THE DPS ANALYSIS

The propellant loading is based on the optimization of the fuel and oxidizer balance that was computed from the LM-12 engine data. The ΔV requirements were coordinated with the Landing Analysis Branch. The ΔV requirement for lunar descent differs from that in the operational trajectory because of the allowance for 155 seconds from low gate to touchdown.

The 3σ dispersions represent total propellant cost based on 3σ uncertainties in propellant loading, trapped propellant, specific impulse, ΔV, separation weight, non-ΔV consumables weight, mixture ratio, and physical location of the low level sensor.

A flying time of 2 minutes and 35 seconds below low gate will be called a nominal requirement.

The following data were used:

a. The separation weight is 36 759.3 $\pm$ 39.3 pounds.

b. Integrated average I_{sp} is 306.1 $\pm$ 1.8 seconds.

c. Mixture ratio is 1.5999 $\pm$ .012.

d. Non-ΔV consumables from separation to PDI are 106.1 pounds.

Loyd/MIB/MFAD (for Flight Plan)
Data source CT & SODB
Data confirmed A J Loyd

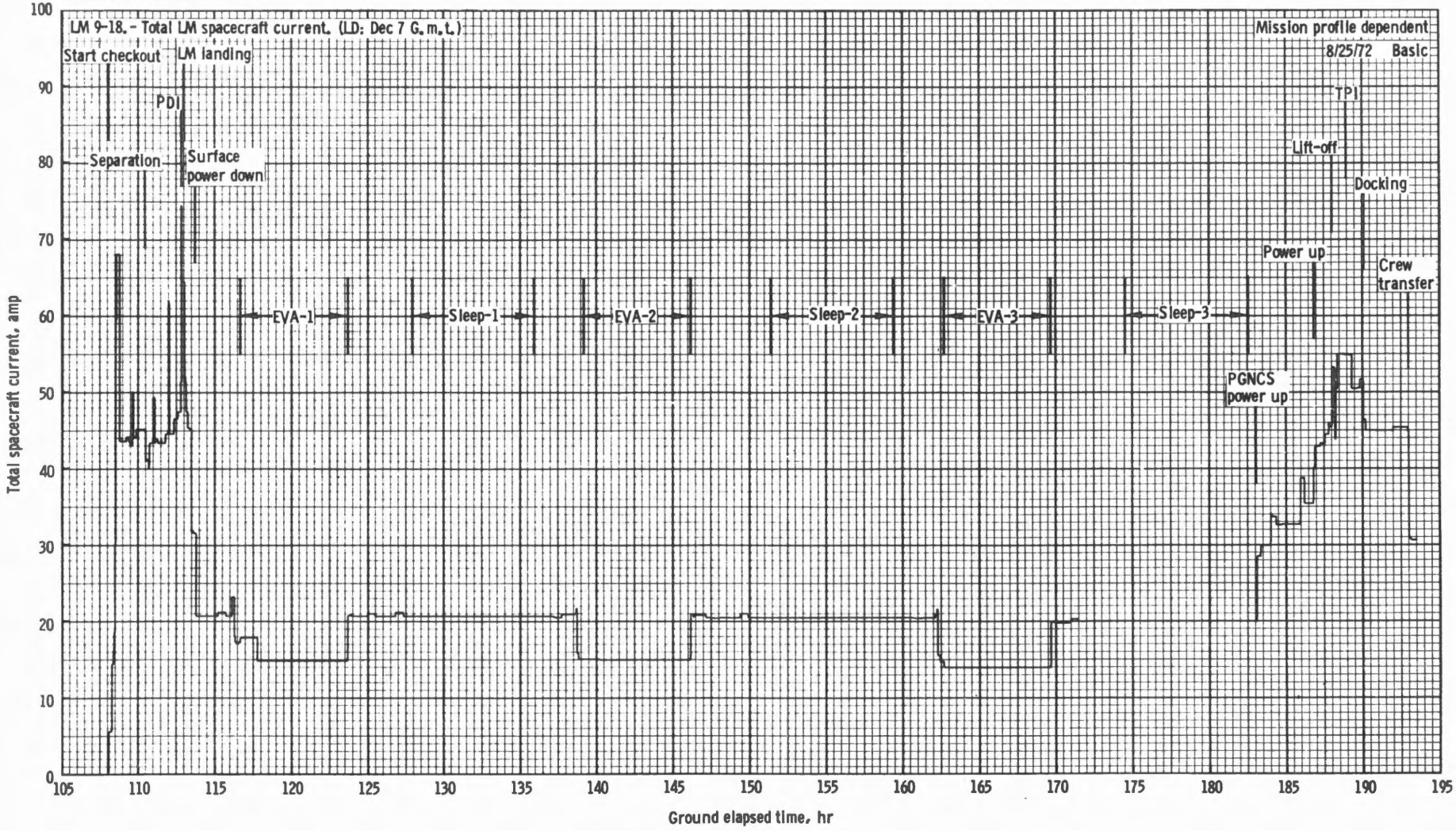
LM 9-17.- DPS propellant summary.
(LD: Dec 7 G.m.t.)

Mission profile dependent
11/7/72 Basic
Revision 1

DPS PROPELLANT SUMMARY

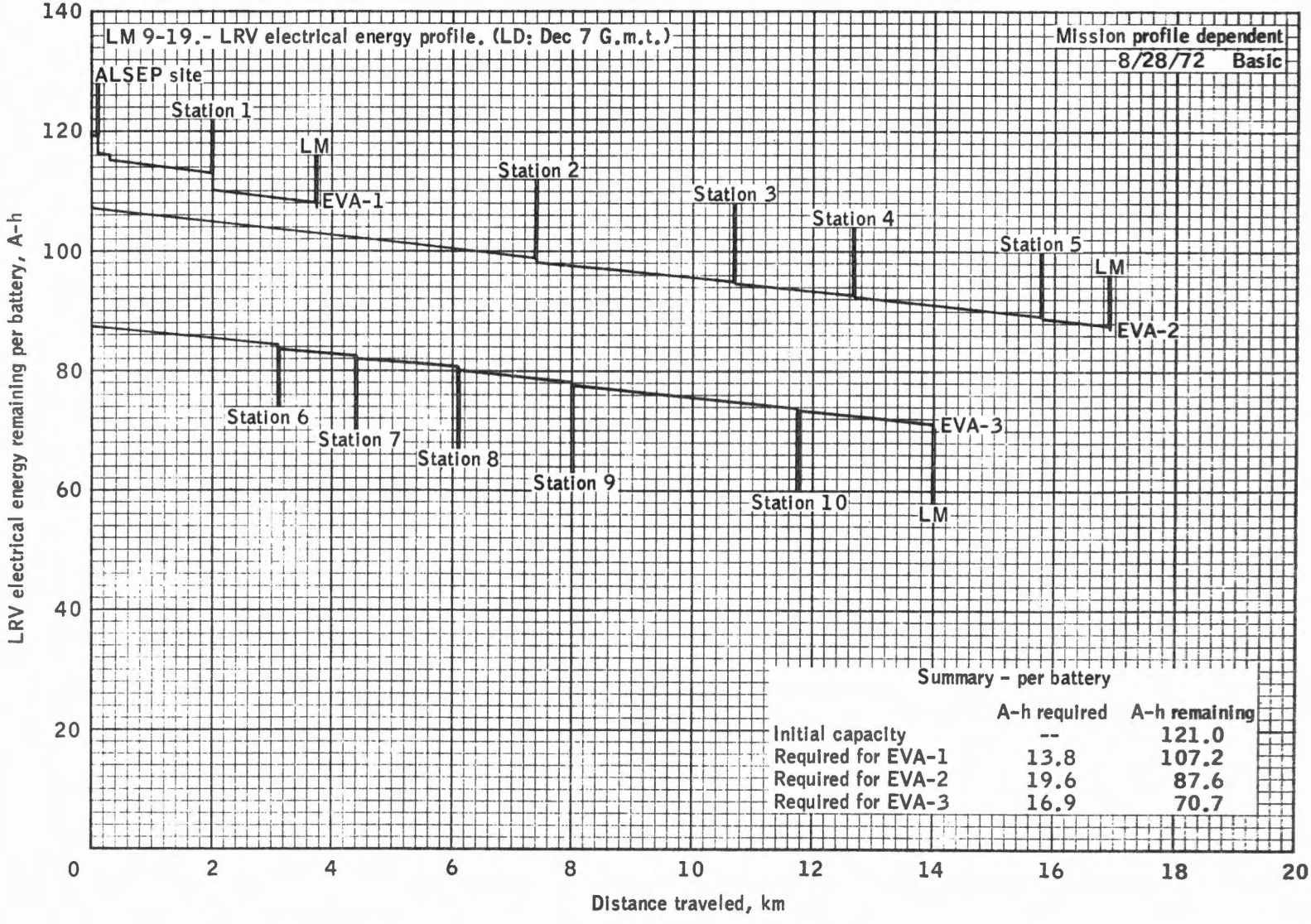
Item	Total propellant, lb	Hover time, sec
Loaded	19 564.0	--
Trapped and unavailable	-90.6	--
Outage	-16.7	--
Available for ΔV	19 456.7	--
Required for ΔV (155-sec flying time from low gate, ΔV = 7099.3 fps)	-18 779.8	--
Remaining	676.9	73
Dispersion (-3σ)	-280.9	--
Pad	396.0	43
Operational allowances		
Low-level (5 sec, 26.5 fps)	-47.3	--
Abort reserve (20 sec, 106 fps)	-187.8	--
Margin (hover time before abort decision point)	164.0	18

Ritchey/SMB/MPAD (for LM Systems)
Data source Flight Plan Draft
Data confirmed USR



Apollo 17 total LM spacecraft current.

Ritchey/GPB/MPAD (for LM Systems)
Data source Landing Traverse Plan
Data confirmed USR



LRV electrical energy profile.

Ritchey/GPB/MPAD (for LM Systems)
Data source Prelim Traverse Plan
Data confirmed USR

LM 9-20.- Assumptions for the LRV EPS analysis. (LD: Dec 7 G.m.t.)

Mission profile dependent
8/28/72 Basic

ASSUMPTIONS FOR THE LRV EPS ANALYSIS

a. The energy available from each of the two batteries is 121 A-h.

b. No unusables or uncertainties are considered in the budget.

c. Slopes were derived from the Apollo 17 landing site form line map.

d. Terrain types and stop times were derived from the traverse data package.

e. The MSFC soil model L-3 was used.

f. The vehicle speed was 8 km/hr except where mobility conditions dictated lower speeds.

g. The traction drive system was off during stops longer than 5 minutes.

h. The navigation and caution systems were operated throughout each traverse.

i. Electrical power required by the LCRU during EVA-1 was supplied by LRV batteries. While driving, the LCRU was in the PM1/WB mode. During all station stops the LCRU mode of operation was FM/TV.

j. The vehicle weight was 1470 pounds.

k. A wander factor of 1.1 is included in the analysis.

l. The distance traveled is the map or straight line distance between points.

m. An effective alpha of 0.40 was assumed for all cool-down periods.

Scheffman/MIB/MPAD (for LM Cue Cards)
Data source DSS (TRW)
Data confirmed DSS

LM 11-1.- S-band antenna angles. 8/30/72
(LD: Dec 7 G.m.t.) Basic

Launch day dependent
Launch month dependent
Mission profile dependent

S-BAND
ANTENNA ANGLES
DESCENT REFSMMAT

YAW=0° ANTENNA		IGA (PITCH)	YAW=180° ANTENNA	
P	Y		P	Y
23	-48	0	130	-15
14	-41	10	138	-10
6	-35	20	145	-5
-2	-27	30	153	1
-8	-20	40	159	8
-15	-14	50	166	15
-22	-7	60	173	22
-29	-0	70	180	29
-36	6	80	187	36
-44	11	90	195	43
-52	16	100	205	50
-61	20	110	216	55
-71	23	120	231	60
280	24	130	250	64
269	25	140	272	65
259	24	150	-67	64
249	22	160	-49	60
239	19	170	-34	54
231	15	180	-23	48
222	10	190	-14	41
215	5	200	-6	35
207	-1	210	2	27
201	-8	220	8	20
194	-15	230	15	14
187	-22	240	22	7
180	-29	250	29	0
173	-36	260	36	-6
165	-43	270	44	-11
155	-50	280	52	-16
144	-55	290	61	-20
129	-60	300	70	-23
110	-64	310	81	-25
88	-65	320	91	-25
67	-64	330	101	-24
49	-60	340	111	-22
34	-54	350	121	-19

Scheffman/MIB/MPAD (for LM Cue Cards)
Data source TRW
Data confirmed ASS

LM 11-2.- S-band antenna angles. (LD: Dec 7 G.m.t.)

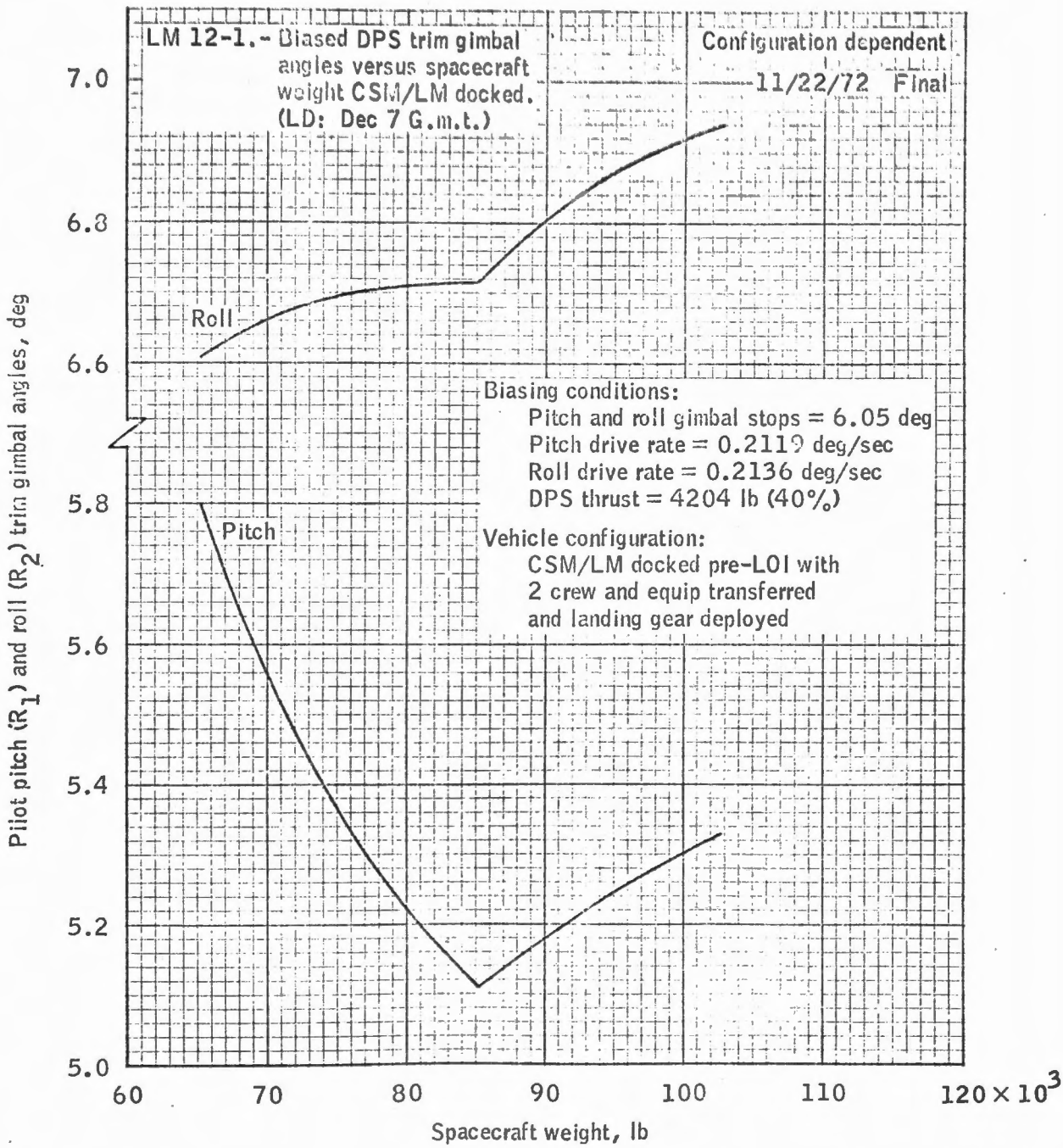
9/1/72
Basic

Launch day dependent
Launch month dependent
Mission profile dependent

S-BAND
ANTENNA ANGLES
ASCENT REFSMMAT

YAW=0° ANTENNA		IGA (PITCH)	YAW=180° ANTENNA	
P	Y		P	Y
15	-58	0	121	-8
6	-51	10	129	-4
-1	-44	20	136	1
-8	-37	30	143	6
-14	-30	40	150	12
-20	-23	50	156	18
-26	-16	60	162	25
-32	-10	70	168	32
-39	-5	80	174	39
-46	1	90	181	46
-53	5	100	189	53
-61	9	110	198	60
-69	12	120	211	66
282	14	130	230	72
273	15	140	258	75
264	15	150	-69	74
255	14	160	-44	70
247	11	170	-27	64
239	8	180	-15	58
231	4	190	-6	51
224	-1	200	1	44
217	-6	210	8	37
211	-12	220	14	30
204	-18	230	20	23
198	-25	240	26	17
192	-32	250	32	10
186	-39	260	39	5
179	-46	270	46	-1
171	-53	280	53	-5
162	-60	290	61	-9
149	-66	300	69	-12
130	-72	310	78	-14
102	-75	320	87	-15
69	-74	330	96	-15
44	-70	340	105	-14
27	-64	350	113	-11

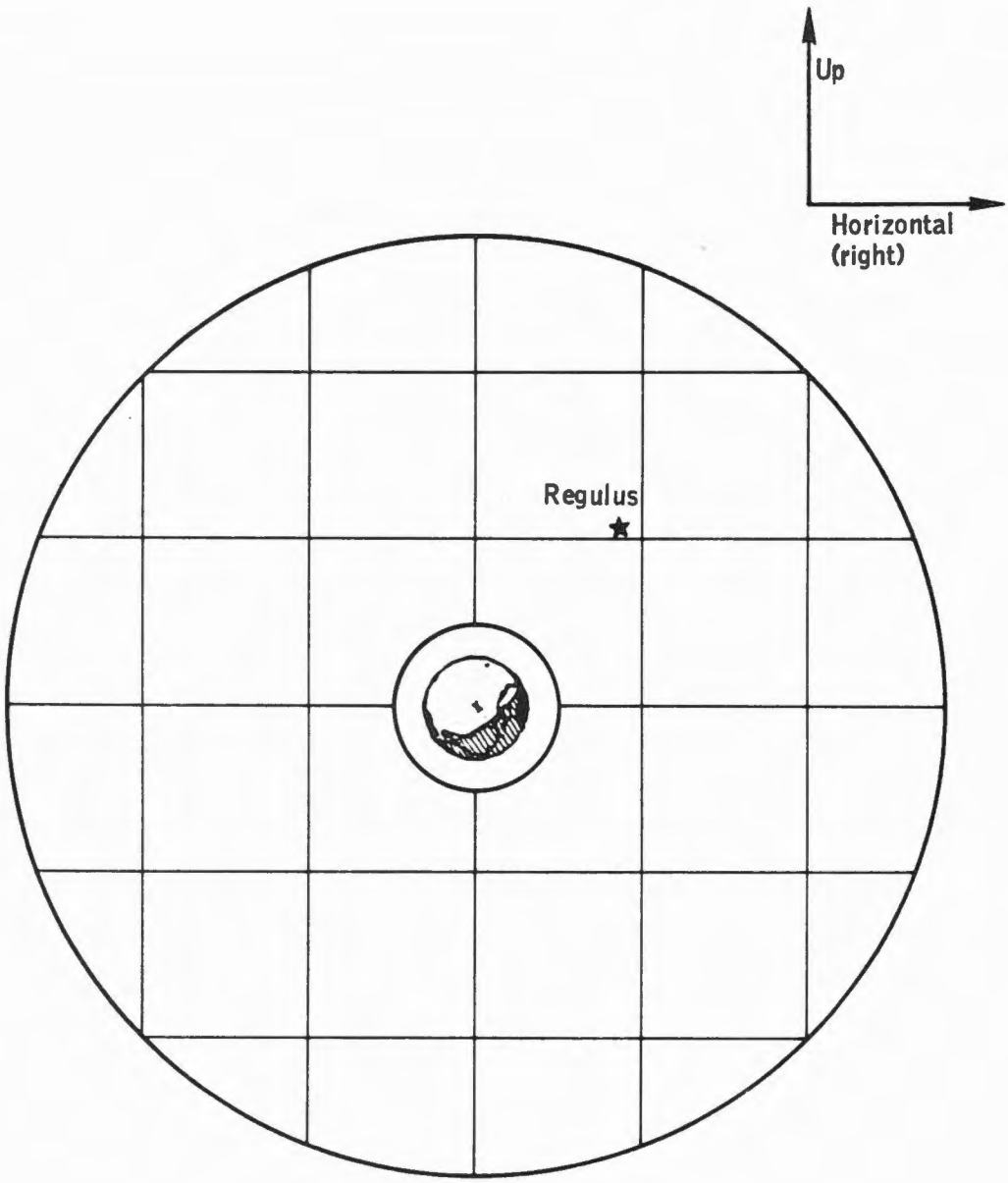
Hischke/SMB/MPAD (for LM Contingency)
Data source [illegible]
Data confirmed [illegible]



Biased DPS trim gimbal angles versus spacecraft weight CSM/LM docked.

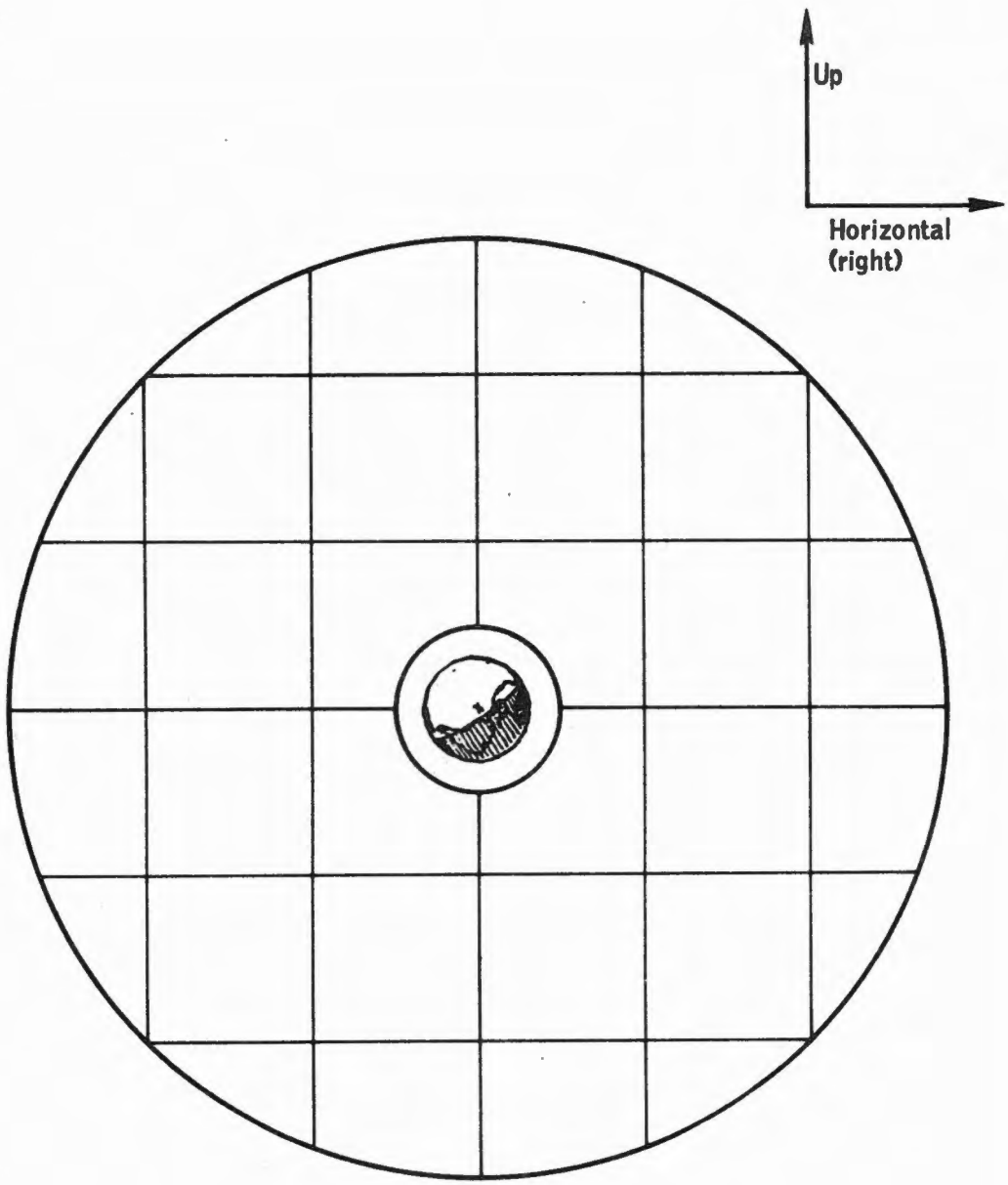
Jenness/MIB/MPAD
Data source Flight Mobl. O.T. views
Data confirmed MJ

LM 13-1.- LCRU high gain antenna/optical sight reticle showing earth crescent for EVA-1. (LD: Dec 7 G.m.t.) 8/24/72 Basic



Jenness/MIB/MPAD
Data source Flight Mech. Off. Notes
Data confirmed MDF

LM 13-2.- LCRU high gain antenna/optical sight reticle showing earth crescent for EVA-2. (LD: Dec 7 G.m.t.) 8/24/72 Basic



Jenness/MIB/MPAD
Data source: Flight Mech. Jour. O.T. News
Data confirmed: MOR

LM 13-3.- LCRU high gain antenna/optical sight reticle showing earth crescent for EVA-3. (LD: Dec 7 G.m.t.) 8/24/72 Basic