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May 12, 1969

APOLLO MISSION F (AS-505/CSM-106/LM-4) SPACECRAFT OPERATIONAL TRAJECTORY, REVISION 1

VOLUME II
TRAJECTORY DATA
PART 3
FLIGHT CREW SIMULATOR DATA

Flight Analysis Branch

MISSION PLANNING AND ANALYSIS DIVISION

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

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PROJECT APOLLO

APOLLO MISSION F (AS-505/CSM-106/LM-4) SPACECRAFT OPERATIONAL TRAJECTORY, REVISION 1 VOLUME II - TRAJECTORY DATA PART 3 - FLIGHT CREW SIMULATOR DATA

By Ron D. Davis and Larry D. Davis
Flight Analysis Branch

May 12, 1969

MISSION PLANNING AND ANALYSIS DIVISION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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Approved: Charlie C. Allen
Charlie C. Allen, Chief
Flight Analysis Branch

Approved:
John P. Mayer, Chief
Mission Planning and Analysis Division

TABLES

APOLLO MISSION F (AS-505/CSM-106/LM-4)

SPACECRAFT OPERATIONAL TRAJECTORY, REVSION 1

VOLUME II - TRAJECTORY DATA

PART 3 - FLIGHT CREW SIMULATOR DATA

By Ron D. Davis and Larry D. Davis

SUMMARY

The data in this document are compiled to satisfy flight crew and flight controller training and simulation requirements for the F mission. This data pack is based on a F mission operational trajectory, revision 1 (ref. 1). This document contains reset vectors, REFSMMAT updates, navigation updates, navigation checks, detailed maneuver tables, entry data, and associated flight crew data.

INTRODUCTION

The nominal Mission F plan involves the following mission phases

1. Launch, which ends with insertion into earth parking orbit.

2. Earth orbit coast, which ends with TLI.

3. Translunar coast, which ends with LOI.

4. Lunar orbit operations, which ends with TEI.

The prime objective of this phase will be to demonstrate all phases of Mission G except those which directly involve LM powered descent and powered ascent. These operations will include a LM-active rendezvous.

5. Transearth coast, which ends with entry into the mid-Pacific recovery area.

The total mission duration will be approximately 8 days. The data presented in this document were computed by the use of the RTACF processors.

ABBREVIATIONS

AGS	abort guidance system
ALPHA	angle of attack
APS	ascent propulsion system
CD	coefficient of drag
CDH	constant differential height
CL	coefficient of lift
CM	command module
CSI	coelliptic sequence initiation
CSM	command and service modules
cg	center of gravity
DOI	descent orbit insertion
DPS	descent propulsion system
DSKY	display keyboard
EECOM	electrical, environmental, and communications
EL	earth launch
EOI	earth orbital insertion
ER	earth radii
FDAI	flight director attitude indicator
GET GEN	time of data generation
g.e.t.	ground elapsed time
G.m.t.	Greenwich mean time
GMT ID	identification of time
I_{sp}	specific impulse

LES	launch escape system
LGC	lunar module guidance computer
LM	lunar module
LOI-1	lunar orbit insertion
LOI-2	circularization maneuver after LOI-1
PAD	pre-advisory data
RCS	reaction control system
REF	reference body
REFSMMAT	reference to stable member matrix
RTACF	Real-Time Auxiliary Computing Facility
S and S	start and stop
SLA	spacecraft/LM adapter
SM	service module
SPS	service propulsion system
STA ID	station identification
t	time
TEI	transearth injection
TEC	transearth coast
TIGN	time of main engine ignition
TLC	translunar coast
TLI	translunar injection
TPF	terminal phase finalization
TPI	terminal phase initiation
WT	weight
$\dot{w}$	flow rate

RESULTS

A set of data that consists of the following is provided for each of the Mission F maneuvers (or entry): reset vectors, REFSMMAT updates, navigation updates, navigation checks, detailed maneuver tables, and other required flight crew data. This data pack supersedes all earlier F mission data packs.

A brief summary of mission-dependent constants used in the generation of this document are presented in table I. A more detailed tabulation of mass properties data can be found in references 2 and 3.

The CSM and LM reset vectors for each maneuver and entry are contained in tables II and III. These vectors are in the mean Besselian coordinate system. This system can be defined as follows: an inertial Cartesian system with origin at the center of the reference body (earth or moon) with the X- and Y-axes in the mean equatorial plane and the Z-axis coincident with the mean polar axis (positive to the north). The X-axis is alined at the intersection of the earth's equatorial plane with the ecliptic at the nearest beginning of a Besselian year.

The CSM and LM REFSMMAT update quantities for the various phases of the F mission are contained in table IV. The required navigation updates for the various maneuver sequences are presented in tables V and VI.

The "detailed maneuver table" quantities for each of the planned maneuvers are presented in table VII. A tabulation of LM gimbal angles converted to LM FDAI angles is given in table VIII. The external ΔV updates for each of the maneuvers are presented in tables IX and X. Additional information in the form of pre-advisory data (PAD) is provided in table XI.

TABLE I.- MISSION-DEPENDENT CONSTANTS

(a) Launch data

Date of launch	May 18, 1969
G.m.t. of launch	16:49:00

(b) Thruster data

SPS steady state	
Thrust, lb	20 500
$\dot{w}$, lb/sec	65.162
I_{sp}, sec	314.60
SPS tailoff	
Burn time, sec	0.59
Thrust, lb	20 847.5
$\dot{w}$, lb/sec	66.590
I_{sp}, sec	313.07
SM RCS (per quad)	
Thrust, lb	102.8
$\dot{w}$, lb/sec	0.371
I_{sp}, sec	277.09
CM RCS (per quad)	
Thrust, lb	96.0
$\dot{w}$, lb/sec	0.353
I_{sp}, sec	271.95
LM RCS (per quad)	
Thrust, lb	100.0
$\dot{w}$, lb/sec	0.367
I_{sp}, sec	272.48
APS steady-state	
Thrust, lb	3 500.0
$\dot{w}$, lb/sec	11.427
I_{sp}, sec	306.29

APS tailoff

Burn time, sec	0.1
Thrust, lb	2990.0
$\dot{w}$, lb/sec	9.65
I_{sp}, sec	309.84

DPS onboard (92.5%)

Thrust, lb	9712.5
$\dot{w}$, lb/sec	32.270
I_{sp}, sec	300.98

DPS (40% level)

Thrust, lb	4200.0
$\dot{w}$, lb/sec	13.952
I_{sp}, sec	301.03

DPS (10% level)

Thrust, lb	1050.0
$\dot{w}$, lb/sec	3.488
I_{sp}, sec	301.03

DPS tailoff

Burn time, sec	0.38
Thrust, lb	6503.0
$\dot{w}$, lb/sec	20.080
I_{sp}, sec	301.44

TABLE I.- MISSION-DEPENDENT CONSTANTS - Continued

(c) Center of gravity computed from weight[a]

[CSM propellant on bottom of tanks]

WEIGHT LB	X INCHES	Y INCHES	Z INCHES	PITCH TRIM[b] DEG	YAW TRIM[b] DEG
23200.00	983.59	-2.82	8.01	-3.05	-1.07
25400.00	971.98	-1.61	7.45	-3.07	-0.66
27600.00	962.87	-0.59	6.98	-3.08	-0.26
29800.00	956.14	0.28	6.58	-3.06	0.13
32000.00	951.27	1.02	6.23	-3.02	0.50
34200.00	947.83	1.67	5.93	-2.96	0.84
36400.00	945.61	2.25	5.66	-2.88	1.15
38600.00	944.33	2.75	5.42	-2.79	1.42
40800.00	943.91	3.21	5.21	-2.70	1.66
43000.00	944.15	3.61	5.03	-2.59	1.87
45200.00	944.98	3.98	4.85	-2.49	2.04
47400.00	942.86	4.15	4.90	-2.56	2.17
49600.00	939.03	4.12	5.17	-2.80	2.23
51800.00	936.22	4.09	5.42	-3.01	2.27
54000.00	934.30	4.06	5.65	-3.20	2.30
56200.00	933.17	4.03	5.86	-3.35	2.31
58400.00	932.72	4.01	6.05	-3.48	2.31
60600.00	932.90	3.99	6.24	-3.58	2.29
62800.00	933.62	3.97	6.40	-3.65	2.26
65000.00	934.89	3.95	6.56	-3.69	2.23
[CSM propellant on top of tanks]					
23200.00	982.28	-2.58	8.25	-3.17	-0.99
25400.00	981.18	-1.40	7.67	-2.97	-0.54
27600.00	979.27	-0.40	7.18	-2.81	-0.16
29800.00	976.62	0.46	6.76	-2.70	0.18
32000.00	973.41	1.19	6.40	-2.61	0.49
34200.00	969.77	1.83	6.09	-2.55	0.77
36400.00	965.84	2.39	5.81	-2.51	1.03
38600.00	961.63	2.89	5.57	-2.48	1.29
40800.00	957.15	3.34	5.35	-2.47	1.54
43000.00	952.52	3.74	5.15	-2.47	1.79
45200.00	947.72	4.10	4.98	-2.49	2.05
47400.00	947.64	4.18	5.11	-2.56	2.09
49600.00	948.14	4.15	5.38	-2.68	2.07
51800.00	947.91	4.12	5.62	-2.80	2.06
54000.00	947.04	4.09	5.84	-2.94	2.06
56200.00	945.59	4.06	6.04	-3.08	2.07
58400.00	943.66	4.04	6.23	-3.23	2.09
60600.00	941.28	4.02	6.40	-3.39	2.13
62800.00	938.50	4.00	6.56	-3.57	2.17
65000.00	935.70	3.98	6.72	-3.75	2.22

[a] These values are based on reference 2.

[b] These angles are measured from longitudinal axis and do not include electronic null bias.

TABLE I.- MISSION-DEPENDENT CONSTANTS - Continued

(c) Center of gravity computed from weight[a] - Continued

[LM with APS and DPS propellant on bottom of tanks]

WEIGHT LB	X INCHES	Y INCHES	Z INCHES	PITCH TRIM[b] DEG	YAW TRIM[b] DEG
14000.00	208.60	-0.67	0.58	-0.60	-0.70
14500.00	206.04	-0.65	0.56	-0.61	-0.71
15000.00	203.73	-0.62	0.54	-0.62	-0.72
15500.00	201.63	-0.60	0.52	-0.63	-0.73
16000.00	199.72	-0.59	0.50	-0.63	-0.73
16500.00	197.97	-0.57	0.49	-0.64	-0.74
17000.00	196.38	-0.55	0.47	-0.64	-0.74
17500.00	194.92	-0.54	0.46	-0.64	-0.75
18000.00	193.59	-0.52	0.45	-0.65	-0.75
18500.00	192.35	-0.51	0.44	-0.65	-0.76
19000.00	191.23	-0.49	0.42	-0.65	-0.76
19500.00	190.21	-0.48	0.41	-0.65	-0.76
20000.00	189.27	-0.47	0.40	-0.65	-0.76
20500.00	188.41	-0.46	0.39	-0.65	-0.76
21000.00	187.62	-0.45	0.38	-0.65	-0.76
21500.00	186.92	-0.44	0.37	-0.65	-0.76
22000.00	186.24	-0.43	0.37	-0.65	-0.76
22500.00	185.66	-0.42	0.36	-0.65	-0.75
23000.00	185.14	-0.41	0.35	-0.64	-0.75
23500.00	184.67	-0.40	0.34	-0.64	-0.74
24000.00	184.21	-0.39	0.34	-0.64	-0.74
24500.00	183.85	-0.38	0.33	-0.63	-0.73
25000.00	183.52	-0.37	0.32	-0.63	-0.73
25500.00	183.22	-0.37	0.32	-0.62	-0.72
26000.00	182.95	-0.36	0.31	-0.61	-0.71
26500.00	182.73	-0.35	0.30	-0.61	-0.70
27000.00	182.56	-0.35	0.30	-0.60	-0.70
27500.00	182.41	-0.34	0.29	-0.59	-0.69
28000.00	182.28	-0.33	0.29	-0.58	-0.68
28500.00	182.19	-0.33	0.28	-0.57	-0.67
29000.00	182.15	-0.32	0.28	-0.57	-0.66
29500.00	182.11	-0.32	0.27	-0.56	-0.65
30000.00	182.11	-0.31	0.27	-0.55	-0.64
30500.00	182.16	-0.31	0.26	-0.54	-0.62
31000.00	182.20	-0.30	0.26	-0.53	-0.61
31500.00	181.88	-0.30	0.26	-0.53	-0.61
32000.00	181.52	-0.29	0.25	-0.52	-0.61
32500.00	181.18	-0.29	0.25	-0.52	-0.61

[LM with APS and DPS propellant on top of tanks]

14000.00	213.14	-0.64	-0.90	0.87	-0.62
14500.00	212.13	-0.62	-0.87	0.85	-0.61
15000.00	211.12	-0.60	-0.84	0.84	-0.60
15500.00	210.13	-0.58	-0.81	0.83	-0.59
16000.00	209.13	-0.56	-0.78	0.82	-0.58
16500.00	208.15	-0.54	-0.76	0.80	-0.58
17000.00	207.19	-0.53	-0.74	0.80	-0.57
17500.00	206.23	-0.51	-0.72	0.79	-0.56
18000.00	205.29	-0.50	-0.70	0.78	-0.56
18500.00	204.36	-0.49	-0.68	0.77	-0.55
19000.00	203.43	-0.47	-0.66	0.77	-0.55

[a] These values are based on reference 2.

[b] These angles are measured from longitudinal axis and do not include electronic null bias.

TABLE I.- MISSION-DEPENDENT CONSTANTS - Continued

(c) Center of gravity computed from weight[a] - Concluded

[LM with APS and DPS propellant on top of tanks]

WEIGHT LB	X INCHES	Y INCHES	Z INCHES	PITCH TRIM[b] DEG	YAW TRIM[b] DEG
19500.00	202.53	-0.46	-0.64	0.76	-0.54
20000.00	201.63	-0.45	-0.63	0.75	-0.54
20500.00	200.73	-0.44	-0.61	0.75	-0.54
21000.00	199.84	-0.43	-0.60	0.75	-0.53
21500.00	198.99	-0.42	-0.58	0.74	-0.53
22000.00	198.12	-0.41	-0.57	0.74	-0.53
22500.00	197.25	-0.40	-0.56	0.74	-0.53
23000.00	196.38	-0.39	-0.55	0.74	-0.53
23500.00	195.56	-0.38	-0.53	0.74	-0.53
24000.00	194.69	-0.37	-0.52	0.74	-0.53
24500.00	193.85	-0.37	-0.51	0.74	-0.53
25000.00	193.02	-0.36	-0.50	0.74	-0.53
25500.00	192.20	-0.35	-0.49	0.74	-0.53
26000.00	191.37	-0.35	-0.48	0.74	-0.53
26500.00	190.53	-0.34	-0.47	0.74	-0.53
27000.00	189.72	-0.33	-0.46	0.75	-0.53
27500.00	188.91	-0.33	-0.46	0.75	-0.54
28000.00	188.09	-0.32	-0.45	0.75	-0.54
28500.00	187.26	-0.32	-0.44	0.76	-0.54
29000.00	186.47	-0.31	-0.43	0.76	-0.55
29500.00	185.64	-0.30	-0.43	0.77	-0.55
30000.00	184.81	-0.30	-0.42	0.78	-0.56
30500.00	183.99	-0.29	-0.41	0.79	-0.56
31000.00	183.58	-0.29	-0.40	0.78	-0.56
31500.00	183.23	-0.29	-0.40	0.78	-0.56
32000.00	182.88	-0.28	-0.39	0.78	-0.56
32500.00	182.55	-0.28	-0.39	0.77	-0.55
	[Ascent stage with propellant on bottom of tanks]				
5000.00	267.62	0.13	5.94	0.	0.
5500.00	262.72	0.11	5.40	0.	0.
6000.00	258.15	0.10	4.95	0.	0.
6500.00	254.53	0.09	4.57	0.	0.
7000.00	251.79	0.08	4.24	0.	0.
7500.00	249.65	0.07	3.96	0.	0.
8000.00	247.99	0.07	3.71	0.	0.
8500.00	246.71	0.06	3.49	0.	0.
9000.00	245.74	0.05	3.30	0.	0.
9500.00	245.04	0.05	3.13	0.	0.
10000.00	244.57	0.05	2.97	0.	0.
	[Ascent stage with propellant on top of tanks]				
5000.00	260.51	0.20	1.82	0.	0.
5500.00	259.37	0.18	1.65	0.	0.
6000.00	258.18	0.16	1.51	0.	0.
6500.00	256.79	0.15	1.40	0.	0.
7000.00	255.33	0.13	1.30	0.	0.
7500.00	253.85	0.12	1.21	0.	0.
8000.00	252.35	0.11	1.14	0.	0.
8500.00	250.85	0.10	1.07	0.	0.
9000.00	249.34	0.09	1.01	0.	0.
9500.00	247.82	0.09	0.96	0.	0.
10000.00	246.27	0.08	0.91	0.	0.

[a] These values are based on reference 2.

[b] These angles are measured from longitudinal axis and do not include electronic null bias.

TABLE I.- MISSION-DEPENDENT CONSTANTS - Continued

(d) Aerodynamics[a]

[X_{cg} = 1040.90; Y_{cg} = -0.20; Z_{cg} = 5.80; Weight = 12 121.50 lb;

ΔX = -100.35 inches; Bank angle bias = -1.97°]

MACH NO.	ALPHA	CL	CD	CL/CD
[illegible]	170.95	[illegible]	[illegible]	[illegible]
[illegible]	167.63	[illegible]	[illegible]	[illegible]
[illegible]	165.[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	163.33	[illegible]	[illegible]	[illegible]
[illegible]	165.72	[illegible]	[illegible]	[illegible]
[illegible]	165.37	[illegible]	[illegible]	[illegible]
[illegible]	164.73	[illegible]	[illegible]	[illegible]
[illegible]	163.82	[illegible]	[illegible]	[illegible]
[illegible]	163.38	[illegible]	[illegible]	[illegible]
[illegible]	164.42	[illegible]	[illegible]	[illegible]
[illegible]	164.87	[illegible]	[illegible]	[illegible]
[illegible]	166.77	[illegible]	[illegible]	[illegible]
[illegible]	167.40	[illegible]	[illegible]	[illegible]
[illegible]	169.72	[illegible]	[illegible]	[illegible]

[a]These values are based on reference 2.

TABLE I.- MISSION-DEPENDENT CONSTANTS - Concluded

(e) Cross-section area

CSM, ft^2	129.4
CM, ft^2	129.4
LM, ft^2	200.6
APS, ft^2	200.6

(f) Mass properties, spacecraft weight - See reference 3

TABLE II.- CSM RESET VECTORS

(a) Evasive maneuver

(MEAN BESSILIAN)
EARTH REFERENCED

GET	=	4 HR 16 MIN 47,56 SEC	
X	=	18403573,75	FT
Y	=	93966810,00	FT
Z	=	58881136,50	FT
X_{DOT}	=	-4537,85	FT/SEC
Y_{DOT}	=	12713,88	FT/SEC
Z_{DOT}	=	7320,02	FT/SEC
X	=	,8794707209	ER
Y	=	4,4904896617	ER
Z	=	2,8138141036	ER
X_{DOT}	=	-,7806772068	ER/HR
Y_{DOT}	=	2,1872568429	ER/HR
Z_{DOT}	=	1,2593141049	ER/HR
WT	=	94575,60	LB

TABLE II.- CSM RESET VECTORS - Continued

(b) MCC-1 maneuver

(MEAN BESSILIAN)
EARTH REFERENCED

GET	=	9 HR 26 MIN 46,38 SEC	
X	=	-6748291$_5$,00	FT
Y	=	256582328,00	FT
Z	=	149940978,00	FT
X_{DOT}	=	-4338,75	FT/SEC
Y_{DOT}	=	6704,25	FT/SEC
Z_{DOT}	=	3680,61	FT/SEC
X	=	-3,2248762548	ER
Y	=	12,26156651$_9$7	ER
Z	=	7,1653854847	ER
X_{DOT}	=	-,7464253753	ER/HR
Y_{DOT}	=	1,1533786654	ER/HR
Z_{DOT}	=	,6332005560	ER/HR
WT	=	94575,60	LB

TABLE II.- CSM RESET VECTORS - Continued

(c) LOI-1 maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GE_T	=	74 HR 46 MIN ,00 SEC	
X	=	-1530972,12	FT
Y	=	-13694786,75	FT
Z	=	-8513336,87	FT
X_{DOT}	=	1677,85	FT/SEC
Y_{DOT}	=	4439,36	FT/SEC
Z_{DOT}	=	2379,54	FT/SEC
X	=	-,7316096649	ER
Y	=	-,6544470191	ER
Z	=	-,4068356864	ER
X_{DOT}	=	,2886519656	ER/HR
Y_{DOT}	=	,7637346163	ER/HR
Z_{DOT}	=	,4093680419	ER/HR
WT	=	92428,00	LB

TABLE II.- CSM RESET VECTORS - Continued

(d) LOI-2 maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	79 HR 11 MIN	,00 SEC
X	=	1122574,86	FT
Y	=	-6121706,00	FT
Z	=	-2526169,66	FT
X_{DOT}	=	-4884,16	FT/SEC
Y_{DOT}	=	-683,48	FT/SEC
Z_{DOT}	=	-373,33	FT/SEC
X	=	,0536456527	ER
Y	=	-,2925443314	ER
Z	=	-,1207206966	ER
X_{DOT}	=	-,8402562216	ER/HR
Y_{DOT}	=	-,1175842471	ER/HR
Z_{DOT}	=	-,0642265659	ER/HR
WT	=	68867,15	LB

TABLE II.- CSM RESET VECTORS - Continued

(e) Separation maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	97 HR 35 MIN ,00	SEC
X	=	-6052171,62	FT
Y	=	109467,14	FT
Z	=	-64037,54	FT
X_{DOT}	=	66,93	FT/SEC
Y_{DOT}	=	4937,23	FT/SEC
Z_{DOT}	=	2056,68	FT/SEC
X	=	-,2892214209	ER
Y	=	,0052312201	ER
Z	=	-,0030602286	ER
X_{DOT}	=	,0115147795	ER/HR
Y_{DOT}	=	,8493856415	ER/HR
Z_{DOT}	=	,3538256884	ER/HR
WT	=	67885,96	LB

TABLE II.- CSM RESET VECTORS - Continued

(f) DOI maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	99 HR 14 MIN	,00 SEC
X	=	-3160406.16	FT
Y	=	-4742651.00	FT
Z	=	-2031807.47	FT
X_{DOT}	=	-4562.92	FT/SEC
Y_{DOT}	=	2609.11	FT/SEC
Z_{DOT}	=	1003.69	FT/SEC
X	=	-.1510296166	ER
Y	=	-.2266419958	ER
Z	=	-.0970960967	ER
X_{DOT}	=	-.7849913910	ER/HR
Y_{DOT}	=	.4488640055	ER/HR
Z_{DOT}	=	.1726716720	ER/HR
WT	=	36474.12	LB

TABLE II.- CSM RESET VECTORS - Continued

(g) Phasing maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	100 HR 26 MIN	.00 SEC
X	=	5692865.50	FT
Y	=	1866233.95	FT
Z	=	880054.66	FT
X_{DOT}	=	1817.43	FT/SEC
Y_{DOT}	=	-4654.04	FT/SEC
Z_{DOT}	=	-1904.93	FT/SEC
X	=	.2720508836	ER
Y	=	.0891836630	ER
Z	=	.0420560874	ER
X_{DOT}	=	.3126658387	ER/HR
Y_{DOT}	=	-.8006676137	ER/HR
Z_{DOT}	=	-.3277175874	ER/HR
WT	=	36474.12	LB

TABLE II.- CSM RESET VECTORS - Continued

(h) Insertion maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	102 HR 23 MIN	.00 SEC
X	=	5508380.37	FT
Y	=	2285113.84	FT
Z	=	1051145.53	FT
X_{DOT}	=	2216.93	FT/SEC
Y_{DOT}	=	-4505.88	FT/SEC
Z_{DOT}	=	-1836.19	FT/SEC
X	=	.2632347010	ER
Y	=	.1092011128	ER
Z	=	.0502321846	ER
X_{DOT}	=	.3813938536	ER/HR
Y_{DOT}	=	-.7751784548	ER/HR
Z_{DOT}	=	-.3158928268	ER/HR
WT	=	36474.12	LB

TABLE II.- CSM RESET VECTORS - Continued

(i) CSI maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	103 HR 14 MIN	.00 SEC
X	=	-3926831.00	FT
Y	=	-4224122.69	FT
Z	=	-1830011.25	FT
X_{DOT}	=	-4071.13	FT/SEC
Y_{DOT}	=	3231.20	FT/SEC
Z_{DOT}	=	1271.93	FT/SEC
X	=	-.1876555569	ER
Y	=	-.2018625457	ER
Z	=	-.0874926510	ER
X_{DOT}	=	-.7003839687	ER/HR
Y_{DOT}	=	.5558852777	ER/HR
Z_{DOT}	=	.2188193612	ER/HR
WT	=	36474.12	LB

TABLE II.- CSM RESET VECTORS - Continued

(j) CDH maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	104 HR 12 MIN	,00 SEC
X	=	3608290,09	FT
Y	=	4467148,94	FT
Z	=	1925514,17	FT
X_{DOT}	=	4291,74	FT/SEC
Y_{DOT}	=	-2969,07	FT/SEC
Z_{DOT}	=	-1158,86	FT/SEC
X	=	,1724331118	ER
Y	=	,2134762928	ER
Z	=	,0920165479	ER
X_{DOT}	=	,7383384481	ER/HR
Y_{DOT}	=	-,5107899234	ER/HR
Z_{DOT}	=	-,1993675288	ER/HR
WT	=	36474,12	LB

TABLE II.- CSM RESET VECTORS - Continued

(k) TPI maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	104 HR 49 MIN 36.00 SEC	
X	=	2954318.16	FT
Y	=	-4893702.44	FT
Z	=	-1984615.77	FT
X_{DOT}	=	-4670.21	FT/SEC
Y_{DOT}	=	-2380.74	FT/SEC
Z_{DOT}	=	-1075.88	FT/SEC
X	=	.1411810741	ER
Y	=	-.2338604480	ER
Z	=	-.0948408972	ER
X_{DOT}	=	-.8034492284	ER/HR
Y_{DOT}	=	-.4095758647	ER/HR
Z_{DOT}	=	-.1850913800	ER/HR
WT	=	36474.12	LB

TABLE II.- CSM RESET VECTORS - Continued

(1) TEI maneuver

(MEAN BESSELIAN)
LUNAR REFERENCED

GET	=	136 HR 20 MIN	.00 SEC
X	=	4458963.75	FT
Y	=	+3807283.09	FT
Z	=	+1508257.50	FT
X_{DOT}	=	-3618.79	FT/SEC
Y_{DOT}	=	-3611.56	FT/SEC
Z_{DOT}	=	-1571.00	FT/SEC
X	=	.2130851392	ER
Y	=	-.1819425970	ER
Z	=	-.0720766699	ER
X_{DOT}	=	-.6225655451	ER/HR
Y_{DOT}	=	-.6213224381	ER/HR
Z_{DOT}	=	-.2702703401	ER/HR
WT	=	36665.79	LB

TABLE II.- CSM RESET VECTORS - Concluded

(m) Entry

(MEAN BESSILIAN)
EARTH REFERENCED

GET	=	191 HR 31 MIN	.00 SEC
X	=	-22381895.75	FT
Y	=	-27107139.25	FT
Z	=	-13999170.87	FT
XDOT	=	27103.43	FT/SEC
YDOT	=	2360.07	FT/SEC
ZDOT	=	1074.46	FT/SEC
X	=	-1.0695869327	ER
Y	=	-1.2953966260	ER
Z	=	-.6689929366	ER
XDOT	=	4.6627917886	ER/HR
YDOT	=	.4060195200	ER/HR
ZDOT	=	.1848475356	ER/HR
WT	=	24581.0	LB

TABLE III.- LM RESET VECTORS

(a) DOI maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	99 HR 14 MIN .00	SEC
X	=	-3154653.62	FT
Y	=	-4748653.12	FT
Z	=	-2034202.37	FT
X_{DOT}	=	-4564.25	FT/SEC
Y_{DOT}	=	2603.20	FT/SEC
Z_{DOT}	=	1001.20	FT/SEC
X	=	-.1507547144	ER
Y	=	-.2269288264	ER
Z	=	-.0972105442	ER
X_{DOT}	=	-.7852188349	ER/HR
Y_{DOT}	=	.4478467666	ER/HR
Z_{DOT}	=	.1722440217	ER/HR
WT	=	36484.00	LB

TABLE III.- LM RESET VECTORS - Continued

(b) Phasing maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	= 100 HR 26 MIN	.00 SEC
X	= 5564995.87	FT
Y	= 1294554.19	FT
Z	= 639728.96	FT
XDOT	= 1350.77	FT/SEC
YDOT	= -4984.91	FT/SEC
ZDOT	= -2051.16	FT/SEC
X	= .2659402452	ER
Y	= .0618642070	ER
Z	= .0305713932	ER
X_{DOT}	= .2323820926	ER/HR
Y_{DOT}	= -.8575888053	ER/HR
Z_{DOT}	= -.3528748788	ER/HR
WT	= 31069.90	LB

TABLE III.- LM RESET VECTORS - Continued

(c) Insertion maneuver

(MEAN BESSELIAN)
LUNAR REFERENCED

GET	=	102 HR 23 MIN	.00 SEC
X	=	4328721.31	FT
Y	=	3940551.06	FT
Z	=	1719106.14	FT
XDOT	=	3487.22	FT/SEC
YDOT	=	-3848.39	FT/SEC
ZDOT	=	-1539.42	FT/SEC
X	=	.2067177426	ER
Y	=	.1883112118	ER
Z	=	.0821527131	ER
XDOT	=	.5999312997	ER/HR
YDOT	=	-.6620660424	ER/HR
ZDOT	=	-.2648365460	ER/HR
WT	=	30678.70	LB

TABLE III.- LM RESET VECTORS - Continued

(d) CSI maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	103 HR 14 MIN ,00 SEC	
X	=	-3029604.81	FT
Y	=	-4660675.94	FT
Z	=	-1995469.22	FT
XDOT	=	-4672.10	FT/SEC
YDOT	=	2511.59	FT/SEC
ZDOT	=	961.37	FT/SEC
X	=	-.1447788756	ER
Y	=	-.2227245700	ER
Z	=	-.0953595629	ER
XDOT	=	-.8037744686	ER/HR
YDOT	=	.4320862293	ER/HR
ZDOT	=	.1653914154	ER/HR
WT	=	8242.80	LB

TABLE III.- LM RESET VECTORS - Continued

(e) CDH maneuver

(MEAN BESSELIAN)
LUNAR REFERENCED

GET	=	104 HR 12 MIN	,00 SEC
X	=	3057672,19	FT
Y	=	4705019,00	FT
Z	=	2014531,12	FT
X_{DOT}	=	4626,05	FT/SEC
Y_{DOT}	=	-2582,51	FT/SEC
Z_{DOT}	=	-991,81	FT/SEC
X	=	,1461201608	ER
Y	=	,2248436362	ER
Z	=	,0962704942	ER
X_{DOT}	=	,7958512306	ER/HR
Y_{DOT}	=	-,4442872070	ER/HR
Z_{DOT}	=	-,1706281286	ER/HR
WT	=	8196,90	LB

TABLE III.- LM RESET VECTORS - Concluded

(f) TPI maneuver

(MEAN BESSILIAN)
LUNAR REFERENCED

GET	=	104 HR 49 MIN 56,00 SEC	
X	=	3182044,47	FT
Y	=	-4671600,50	FT
Z	=	-1887936,83	FT
X_{DOT}	=	-4559,49	FT/SEC
Y_{DOT}	=	-2627,51	FT/SEC
Z_{DOT}	=	-1176,58	FT/SEC
X	=	,1520636678	ER
Y	=	-,2232466321	ER
Z	=	-,0902208006	ER
X_{DOT}	=	-,7844002768	ER/HR
Y_{DOT}	=	-,4520296119	ER/HR
Z_{DOT}	=	-,2024147492	ER/HR
WT	=	8193,70	LB

TABLE IV.- CSM REFSMMAT

(a) Launch through MCC-3 maneuver

[Earth orbit insertion]

FCT	DSKY	DECIMAL
$X_I X_E$	63113	-,80333900
$X_I X_E$	41400	
$X_I Y_E$	10366	,53013970
$X_I Y_E$	34742	
$X_I Z_E$	04256	,27128990
$X_I Z_E$	15012	
$Y_I X_E$	01173	,07758620
$Y_I X_E$	22604	
$Y_I Y_E$	10557	,54483760
$Y_I Y_E$	11721	
$Y_I Z_E$	62510	-,83494450
$Y_I Z_E$	44235	
$Z_I X_E$	66433	-,59044620
$Z_I X_E$	42044	
$Z_I Y_E$	65465	-,64969520
$Z_I Y_E$	66231	
$Z_I Z_E$	70255	-,47882090
$Z_I Z_E$	57761	

TABLE IV.- CSM REFSMMAT - Continued

(b) MCC-4 maneuver through MCC-6 maneuver

[Lunar landing site]

FCT	DSKY	DECIMAL
$X_I X_E$	17152	,95054740
$X_I X_E$	34231	
$X_I Y_E$	73244	-,29246010
$X_I Y_E$	45255	
$X_I Z_E$	76247	-,10453090
$X_I Z_E$	65663	
$Y_I X_E$	77566	-,01675490
$Y_I X_E$	67632	
$Y_I Y_E$	71663	-,38436480
$Y_I Y_E$	51045	
$Y_I Z_E$	16611	,92302920
$Y_I Z_E$	16442	
$Z_I X_E$	73023	-,31012720
$Z_I X_E$	56007	
$Z_I Y_E$	61772	-,87563160
$Z_I Y_E$	72333	
$Z_I Z_E$	72046	-,37025720
$Z_I Z_E$	73227	

TABLE IV.- CSM REFSMMAT - Concluded

(c) MCC-7 maneuver through entry

FCT	DSKY	DECIMAL
XIXE	15153	.82559312
XIXE	10221	
XIYE	10021	.50208553
XIYE	02553	
XIZE	04075	.25749975
XIZE	16010	
YIXE	77733	-.00450192
YIXE	43662	
YIYE	07312	.46219120
YIYE	10516	
YIZE	61637	-.88676888
YIZE	62667	
ZIXE	66761	-.56424794
ZIXE	65622	
ZIYE	13543	.73095103
ZIYE	36333	
ZIZE	06110	.38384222
ZIZE	15740	

TABLE V.- CSM NAVIGATION UPDATES

(a) Evasive maneuver

X	00253	1.8403574*07
X	05741	
Y	01552	9.3966810*07
Y	01636	
Z	01043	5.8881136*07
Z	26255	
X-DOT	74425	-4.5378463*03
X-DOT	62610	
Y-DOT	11540	1.2713879*04
Y-DOT	07626	
Z-DOT	05447	7.3200214*03
Z-DOT	33462	
T	00136	4 16 47.56
T	01224	

TABLE V.- CSM NAVIGATION UPDATES - Continued

(b) MCC-1 maneuver

X	76614	-6.7482915+07
X	51223	
Y	04522	2.5658233+08
Y	25254	
Z	02562	1.4994098+08
Z	26675	
X-DOT	74543	-4.3387505+03
X-DOT	50314	
Y-DOT	05067	6.7042499+03
Y-DOT	23736	
Z-DOT	02633	3.6806080+03
Z-DOT	36746	
T	00317	9 26 46.38
T	21676	

TABLE V.- CSM NAVIGATION UPDATES - Continued

(c) LOI-1 maneuver

X	77310	-8.3641035*06
X	71371	
Y	00007	2.0739391*05
Y	26737	
Z	77737	-8.6592552*05
Z	71003	
X-DOT	14305	4.0638651*03
X-DOT	37034	
Y-DOT	20054	5.2776469*03
Y-DOT	05322	
Z-DOT	11264	3.0683802*03
Z-DOT	16061	
T	03174	75 33 43.17
T	11415	

TABLE V.- CSM NAVIGATION UPDATES - Continued

(d) LOI-2 maneuver

X	77476	-5.1958790+06
X	65517	
Y	0016C	3.0127422+06
Y	0303C	
Z	00053	1.1586670+06
Z	0344C	
X-DOT	11121	3.0052858+03
X-DOT	37206	
Y-DOT	14533	4.1595726+03
Y-DOT	12421	
Z-DOT	05341	1.7851842+03
Z-DOT	35232	
T	03335	79 58 45,52
T	1335C	

TABLE V.- CSM NAVIGATION UPDATES - Continued

(e) Separation from LM

X	00278	5.0934732+06
X	20325	
Y	00157	2.9874074+06
Y	04704	
Z	00061	1.3359819+06
Z	26517	
X-DOT	10634	2.8892391+03
X-DOT	34044	
Y-DOT	63217	-4.1730077+03
Y-DOT	66423	
Z-DOT	72672	-1.6850430+03
Z-DOT	53457	
T	04161	98 23 15.62
T	32652	

TABLE V.- CSM NAVIGATION UPDATES - Concluded

(f) TEI maneuver

X	77442	-5.9666077+06
X	40003	
Y	00044	9.6763257+05
Y	00055	
Z	00013	2.9700952+05
Z	01501	
X-DOT	02552	8.8854185+02
X-DOT	24306	
Y-DOT	16646	4.8640506+03
Y-DOT	27037	
Z-DOT	06166	2.0446628+03
Z-DOT	33202	
T	05705	137 8 22.40
T	12200	

TABLE VI.- LM NAVIGATION UPDATES

(a) DOI maneuver

X	77506	-4.9972561+06
X	42110	
Y	77613	-3.1204168+06
Y	74601	
Z	77714	-1.3896442+06
Z	51350	
X-DOT	66633	-3.0173978+03
X-DOT	43705	
Y-DOT	14370	4.0963631+03
Y-DOT	26747	
Z-DOT	05020	1.6509127+03
Z-DOT	13774	
T	04207	99 21 58.80
T	12750	

TABLE VI.- LM NAVIGATION UPDATES - Continued

(b) Phasing

X	00320	5.5904285+06
X	00065	
Y	77721	-1.2536341+06
Y	53310	
Z	77760	-4.2082524+05
Z	52750	
X-DOT	74135	-1.2523074+03
X-DOT	65565	
Y-DOT	60615	-4.9945052+03
Y-DOT	66173	
Z-DOT	71457	-2.1022879+03
Z-DOT	47023	
T	04241	100 34 20.89
T	33012	

TABLE VI.- LM NAVIGATION UPDATES - Continued

(c) Insertion

X	00317	5.5876326+06
X	34615	
Y	00077	1.7080111+06
Y	21464	
Z	00036	8.1228364+05
Z	07100	
X-DOT	04355	1.4646465+03
X-DOT	26114	
Y-DOT	60623	-4.9909998+03
Y-DOT	45225	
Z-DOT	71575	-2.0518125+03
Z-DOT	77547	
T	04314	102 31 17.80
T	25404	

TABLE VI.- LM NAVIGATION UPDATES - Continued

(d) CSI maneuver

X	77512	-4.8712492+06
X	70125	
Y	77614	-3.1090074+06
Y	52254	
Z	77714	-1.3826389+06
Z	61626	
X-DOT	66377	-3.1172173+03
X-DOT	53034	
Y-DOT	14244	4.0426842+03
Y-DOT	35237	
Z-DOT	04753	1.6270494+03
Z-DOT	04226	
T	04337	103 21 46.00
T	04750	

TABLE VI.- LM NAVIGATION UPDATES - Continued

(e) CDH maneuver

X	00265	4.8717576+06
X	10337	
Y	00164	3.1402653+06
Y	32702	
Z	00063	1.3957127+06
Z	35612	
X-DOT	11356	3.1057709+03
X-DOT	31251	
Y-DOT	63426	-4.0866718+03
Y-DOT	56007	
Z-DOT	72767	-1.6456741+03
Z-DOT	71473	
T	04364	104 19 42.40
T	13740	

TABLE VI.- LM NAVIGATION UPDATES - Concluded

(f) TPI maneuver

X	00043	9.6158129+05
X	30704	
Y	77465	-5.4347532+06
Y	71175	
Z	77654	-2.2458622+06
Z	56011	
X-DOT	57617	-5.3214652+03
X-DOT	56275	
Y-DOT	75520	-7.6840517+02
Y-DOT	73031	
Z-DOT	76566	-4.1614191+02
Z-DOT	62414	
T	04402	104 56 59.40
T	00664	

TABLE VII.- DETAILED MANEUVER TABLES

(a) Evasive maneuver

C STA ID				L STA ID				STA ID				WT	94575.60					
												WC						
GETV	0	0	,0	GETV	0	0	,0	GETV	0	0	,0	WL	------					
CODE				REF		EARTH		GETR	0	0	,0	WF	,00					
GETI	4	28	47,6	DT B	0	2.2		DT TO	0.59			REFSMMAT		DEL P	.91			
PETI	21	17	47,6	DT L		,00		DV TO	4.13			OI REF		DEL Y	-,23			
DVM	19,7			VGX	-4,9			OR	180,7			YB	,0	YH	3.0			
DVREM	,0			VGY	-,6			IP	254,4			PB	,0	PH	283,8			
DVC	15.5			VGZ	19,1			MY	359,1			RB	,0	RH	177,1			
VF	5,09			H BI	16656,0			HA	300310,887			VP	,00					
VS	-,00			P BI	31 36 N			HP	119,410			THETA P	,00					
VD	19,01			L BI	114 9 W			L AN	0 0 E			DELTA P	,00					
DH	-20103,45			F BI	131,69			E	,97681696			P LLS	0 0 N					
PHASE	,000							I	31,6128			L LLS	0 0 E					
PHASE DOT	,00				0 0			WP	318,5305			R LLS	,000					
WEDGE ANG	,000				LATIL													
YD	,0000																	
							TARGETS											
PGNS				AGS														
EXT DV	CSM			EXT DV							LAMBERT			MVR				
GETI	4	28	47,6	GETI	0	0	,0	GETI			0 0 ,0	GETI		0	0	,0		
VX	5,0949			VX	,0000			T F			0 0 ,0	APSIS			0			
VY	-,0000			VY	,0000			X			,00	ELEV			,00			
VZ	19,0144			VZ	,0000			Y			,00	TPI		0	0	,0		
								Z			,00	DT			0	,0		
								C			,000	OPTION						

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(b) MCC-1 maneuver

C STA ID		L STA ID		STA ID						WT	94575,60
										WC	
GETV	0 0 ,0	GETV	0 0 ,0	GETV	0 0 ,0					WL	
CODE		REF	EARTH	GETR	0 0 ,0					WF	,00
GET I	9 38 46,4	DT B	0 7.5	DT TO	.59	REFSMMAT				DEL P	,91
PET I	26 27 46,4	DT L	,00	DV TO	4.14	01 REF				DEL Y	-,23
DVM	57,0	VGX	-,6	OR	7,3	YB	,0	YH	167,2		
DVREM	,0	VGY	11,8	IP	92,0	PB	,0	PH	37,9		
DVC	53.9	VGZ	-55,7	MY	11,4	RB	,0	RH	180,6		
VF	-42,90	H BI	47705,4	HA	308867,715	VP		,00			
VS	10,47	P BI	29 24 N	HP	-5,101	THETA P		,00			
VD	-35,99	L BI	168 24 W	L AN	0 0 E	DELTA P		,00			
DH	-51157,91	F BI	151,98	E	,97822648	P LLS		0 0 N			
PHASE	,000			I	31,7000	L LLS		0 0 E			
PHASE DOT	,00	0 0		WP	318,4688	R LLS		,000			
WEDGE ANG	,000	UNTIL									
YD	,0000										

TARGETS

PGNS		AGS						
EXT DV CSM		EXT DV		LAMBERT		MVR		
GETI	9 38 46,4	GETI	0 0 ,0	GETI	0 0 ,0	GETI	0 0 ,0	
VX	-42,9022	VX	,0000	T F	0 0 ,0	APSIS	0	
VY	10,4653	VY	,0000	X	,00	ELEV	,00	
VZ	-35,9920	VZ	,0000	Y	,00	TPI	0 0 ,0	
				Z	,00	DT	0 ,0	
				C	,000	OPTION		

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(c) LOI-1 maneuver

C STA ID			L STA ID			STA ID			WT	92428.00	
									WC		
GETV	0	0 ,0	GETV	0	0 ,0	GETV	0	0 ,0	WL		
CODE			REF		LUNAR	GETR	0	0 ,0	WF		,00
GET I	75 45 43,2		DT B	6	1.0	DT TO		.59	REFSMMAT		DEL P	,96
PET I	92 34 43,2		DT L		,00	DV TO		5.66	LANDIN		DEL Y	-,25
DVM	2978,4	VGX	-1927,7		OR	355,6		YB ,0		YH	192,8	
DVREM	,0	VGY	-894,0		IP	228,5		PB ,0		PH	18.2	
DVC	2972.2	VGZ	2086,9		MY	341,7		RB ,0		RH	180.2	
VF	-2748,01	H BI	77,7		HA	171,296		VP	,00			
VS	-587,45	P BI	1 41 S		HP	52,090		THETA P	,00			
VD	-986,87	L BI	165 33 W		L AN	179 36 W		DELTA P	359,10			
CH	-993,83	F BI	343,18		E	,0568446		P LLS	0 0 N			
PHASE	,000				I	178,7021		L LLS	0 0 E			
PHASE DOT	,00		0 0		WP	-7,1044		R LLS	938,493			
WEDGE ANG	,000		UNTIL									
YD	,0000											

TARGETS

PGNS EXT DV	CSM	AGS EXT DV		LAMBERT		MVR	
GETI	75 45 43,2	GETI	0 0 ,0	GETI	0 0 ,0	GETI	0 0 ,0
VX	-2912,9198	VX	,0000	T F	0 0 ,0	APSIS	0
VY	-587,4500	VY	,0000	X	,00	ELEV	,00
VZ	-200,9700	VZ	,0000	Y	,00	TPI	0 0 ,0
				Z	,00	DT	0 ,0
				C	,000	OPTION	

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(d) LOI-2 maneuver

C STA ID				L STA ID				STA ID				WT		68867.15				
												WC						
GETV	0	0	.0	GETV	0	0	,0	GETV	0	0	,0	WL						
CODE				REF			LUNAR	GETR	0	0	,0	WF						
GETI	80	10	45.5	DT B		0	13,6	DT TO			,59	REFSMMAT		DEL P		1,44		
PETI	96	59	45.5	DT L			20,00	DV TO			5,82	LANDIN		DEL Y		-,66		
DVM		138.5		VGX		-108,0		OR			,0	YB	,0	YH		180,3		
DVREM		,0		VGY			,0	IP		219,4		PB	.0	PH		359,7		
DVC		132.3		VGZ			86,7	MY		359,7		RB	.0	RH		180.0		
VF		-138,50		H BI			57,9	HA		58,619		VP			.00			
VS		.00		P BI		C 17	N	HP		57,900		THETA P			,00			
VD		-,91		L BI	164	2	E	L AN	176	41	E	DELTA P			359,04			
DH		-996,40		F BI		359,68		E	.00036066			P LLS			0 0 N			
PHASE			,000					I	178,7598			L LLS			0 0 E			
PHASE DOT			.00		0	0		WP		7,9068		R LLS			938,493			
WEDGE ANG			,000		UNTIL													
YD			,0000															

TARGETS

PGNS EXT DV			AGS EXT DV				LAMBERT			MVR			
GETI	CSM	80 10 45,5	GETI	0	0	,0	GETI	0	0	,0	GETI	0	0 ,0
VX		-138,5000	VX			,0000	T F	0	0	,0	APSIS		0
VY		,0000	VY			,0000	X			,00	ELEV		,00
VZ		,0000	VZ			,0000	Y			,00	TPI	0	0 ,0
							Z			,00	DT		0 ,0
							C			,000	OPTION		

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(e) Separation from LM

C STA ID			L STA ID			STA ID			WT	36484.00				
GETV	0	0 .0	GETV	0	0 .0	GETV	0	0 .0	%C					
CODE			REF		LUNAR	GETR	0	0 .0	WF					
GETI	98 35 15.6		DT B	0	6.4	DT TO	.00		REFSMMAT		DEL P	0.00		
PETI	115 24 15.6		DT U		.00	DV TO	.00		LANDIN		DEL Y	0.00		
DVM	2.5		VGA	-2.9		OR	360.0		YB	.0	YH	180.0		
DVREM	.0		VGY	.0		IP	194.0		PB	.0	PH	270.3		
DVG	2.5		VGZ	.6		MY	.0		RB	.0	RH	180.0		
VF	-.01		H BI	57.9		HA	60.377		VP	.00				
VS	.00		P BI	0 57 N		HP	59.177		THETA P	.00				
VU	2.50		L BI	39 8 E		L AN	177 45 E		DELTA P	359.04				
DH	-996.35		F BI	344.11		E	.00006219		P LLS	0 0 N				
PHASE	.000					I	178.7624		L LLS	0 0 E				
PHASE DOT	.00		0 0			WP	194.1333		R LLS	938.493				
WEDGE ANG	.000		UNTIL											
YD	.0000													

TARGETS

PGNS		AGS							
EXT DV	CSM	EXT DV		LAMBERT		MVR			
GETI	98 35 15.6	GETI	0 0 .0	GETI	0 0 .0	GETI	0 0 .0		
VX	.0000	VX	.0000	T F	0 0 .0	APSIS	0		
VY	.0000	VY	.0000	X	.00	ELEV	.00		
VZ	2.5000	VZ	.0000	Y	.00	TPI	0 0 .0		
				Z	.00	DT	0 .0		
				C	.000	OPTION			

WT AFTER	67866.93	PTRIM	.00	YTRIM	.00

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(f) DOI maneuver

C STA ID			L STA ID			STA ID			WT	31302.00			
									WC				
GETV	0	0 .0	GETV	0	0 .0	GETV	0	0 .0	WL				
CODE			REF		LUNAR	GETR	0	0 .0	WF	.00			
GETI	99 33 58.8		DT B	0	26.9	DT TO	0.38		REFSMMAT		DEL P	5.47	
PETI	116 22 58.8		DT U		8.00	DV TO	2.38		LANDIN		DEL Y	5.39	
DVM	71.1		VGX	19.1		OY	360.0		YB	.0	YH	179.4	
DVREM	.0		VGY	.0		IP	286.1		PB	286.1	PH	359.9	
DVC	69.6		VGZ	68.5		MR	.6		RB	.6	RH	180.0	
VF	-71.10		H BI	57.8		HA	59.450		VP	1.00			
VS	.00		P BI	0 58 S		HP	8.786		THETA P	.00			
VD	-.49		L BI	139 45 W		L AN	178 3 E		DELTA P	359.04			
DH	.00		F BI	159.07		E	.02608959		P LLS	0 0 N			
PHASE	.000.000					I	178.7623		L LLS	0 0 E			
PHASE DOT	0.00		0 0			WP	128.7389		R LLS	938.493			
WEDGE ANG	0.00		UNTIL										
YD	.0000												

TARGETS

PGNS EXT DV LM		AGS EXT DV			LAMBERT		MVR	
GETI	99 33 58.8	GETI	99 33 58.8	GETI	0 0 .0	GETI	0 0 .0	
VX	-71.1000	VX	-71.0935	T F	0 0 .0	APSIS	0	
VY	.0000	VY	-.0000	X	.00	ELEV	.00	
VZ	-.2700	VZ	-.9963	Y	.00	TPI	0 0 .0	
				Z	.00	DT	0 .0	
				C	.000	OPTION		

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(g) Phasing

C STA ID		L STA ID		STA ID		WI	31069.90
						WC	
GETV	0 0 .0	GETV	0 0 .0	GETV	0 0 .0	WL	
CODE		REF	LUNAR	GETR	0 0 .0	WF	

GETI	100 46 20.9	DT B	0 41.7	DT TO	.38	REFSMMAT		DEL P	5.47
PETI	117 35 20.9	DT U	8.00	DV TO	2.43	LANDIN		DEL Y	5.39
DVM	195.4	VGX	-20.8	DY	360.0	YB	.0	YH	.7
DVREM	.0	VGY	.0	IP	264.4	PB	264.4	PH	29.3
DVC	193.0	VGZ	194.3	MR	.6	RB	.6	RH	.3

VF	171.28	H BI	15.3	HA	190.942	VP	-.61
VS	-.00	P BI	0 1 N	HP	7.549	THETA P	.00
VD	-94.02	L BI	11 14 W	L AN	176 52 E	DELTA P	359.04
DH	0.00	F BI	48.46	E	.08836181	P LLS	0 0 N
PHASE	000.000			I	178.7621	L LLS	0 0 E
PHASE DOT	0.00		0 0	WP	-206.3255	R LLS	938.493
WEDGE ANG	.000	UNTIL					
YD	.0000						

TARGETS

PGNS		AGS		LAMBERT		MVR	
EXT DV	LM	EXT DV					
GETI	100 46 20.9	GETI	100 46 20.9	GETI	0 0 .0	GETI	0 0 .0
VX	170.4000	VX	171.9869	T F	0 0 .0	APSIS	0
VY	-.0000	VY	-.0000	X	.00	ELEV	.00
VZ	-95.6000	VZ	-92.7148	Y	.00	TPI	0 0 .0
				Z	.00	DT	0 .0
				C	.000	OPTION	

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(h) Insertion maneuver

C STA ID		L STA ID			STA ID			WT	8420.80		
								WC			
GETV	0 0 .0	GETV	0 0 .0		GETV	0 0 .0		WL			
CODE		REF	LUNAR		GETR	0 0 .0		WF	.00		
GETI	102 43 17.9	DT B	0 15.0	DT TO	.10	REFSMMAT		DEL P	.00		
PETI	119 32 17.8	DT U	4.00	DV TO	1.17	LANDIN		DEL Y	.00		
DVM	207.0	VGX	96.8	DY	180.0	YB	.0	YH	180.0		
DVREM	.0	VGY	.1	IP	62.1	PB	242.1	PH	24.4		
DVC	205.8	VGZ	-182.9	MR	.0	RB	180.0	RH	360.0		
VF	-188.55	H BI	8.0	HA	43.962	VP		-.93			
VS	.10	P BI	0 39 N	HP	6.857	THETA P		.00			
VD	-85.36	L BI	19 0 E	L AN	176 22 E	DELTA P		359.04			
DH	0.00	F BI	353.72	E	.01924742	P LLS		0 0 N			
PHASE	000.000			I	178.7634	L LLS		0 0 E			
PHASE DOT	0.00	0 0		WP	128.1438	R LLS		938.493			
WEDGE ANG	.000	UNTIL									
YD	.0000										

TARGETS

PGNS		AGS							
EXT DV LM		EXT DV			LAMBERT		MVR		
GETI	102 43 17.3	GETI	102 43 17.8	GETI	0 0 .0		GETI	0 0 .0	
VX	-189.2000	VX	-188.2066	T F	0 0 .0		APSIS	0	
VY	.1000	VY	.1000	X	.00		ELEV	.00	
VZ	-83.9000	VZ	-86.1053	Y	.00		TPI	0 0 .0	
				Z	.00		DT	0 .0	
				C	.000		OPTION		

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(i) CSI maneuver

C STA ID			L STA ID			STA ID			WT		8242.8
									WC		
GETV	0	0 .0	GETV	0	0 .0	GETV	0	0 .0	WL		
CODE			REF		LUNAR	GETR	0	0 .0	WF		
GETI	103	33 46.0	DT B	0	32.3	DT TO	.00		REFSMMAT		DEL P .00
PETI	120	42 46.0	DT U		.00	DV TO	.00		LANDIN		DEL Y .00
DVM		50.5	VGX		-13.8	DY	.0	YB	.0	YH	360.0
DVREM		.0	VGY		-.0	PR	105.8	PB	105.8	PH	359.9
DVC		50.5	VGZ		-48.6	MR	360.0	RB	360.0	RH	360.0
VE		36.50	H BI		43.2	HA	45.166	VP		1.00	
VS		.00	P BI	0	58 S	HP	44.739	THETA P		.00	
VD		.13	L BI	141	55 W	L AN	177 10 E	DELTA P		359.04	
DH		0.00	R BI		180.08	E	.0002174	P LLS		0 0 N	
PHASE		000.000				I	178.7636	L LLS		0 0 E	
PHASE DOT		0.00		0	0	AP	12.2674	R LLS		938.493	
WEDGE ANG		.000		UNTIL							
VD		.0000									

TARGETS

PGNS EXT DV LM			AGS EXT DV			LAMBERT			MVR		
GETI	103	33 46.0	GETI	103	33 46.0	GETI	0	0 .0	GETI	0	0 .0
VX		50.5000	VX		50.5034	T F	0	0 .0	APSIS		0
VY		.0000	VY		.0000	X		.00	ELEV		.00
VZ		-.6000	VZ		-.1309	Y		.00	TPI	0	0 .0
						Z		.00	DT		0 .0
						C		.000	OPTION		

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(j) CDH maneuver

C STA ID			L STA ID			STA ID			WT	8196.90		
									WC			
GETV	0 0 .0		GETV	0 0 .0		GETV	0 0 .0		WL			
CODE			REF	LUNAR		GETR	0 0 .0		WF			
GETI	104 31 42.4		DT B	0 2.2		DT TO	.00		REFSMMAT		DEL P	.00
PETI	121 20 42.4		DT U	.00		DV TO	.00		LANDIN		DEL Y	.00
DVM	3.4		VGX	-3.4		DY	180.0	YB	.0	YH	180.0	
DVREM	.0		VGY	.0		IP	182.3	PB	2.3	PH	283.7	
DVC	3.4		VGZ	.1		MR	.0	RB	180.0	RH	360.0	
VF	-.80		H BI	42.8		HA	45.129	VP		-1.00		
VS	.00		P BI	0 58 N		HP	44.186	THETA P		.00		
VD	3.30		L BI	37 30 E		L AN	179 55 E	DELTA P		359.04		
DH	.00		F BI	19.98		E	.00048071	P LLS		0 0 N		
PHASE	000.000					I	178.7635	L LLS		0 0 E		
PHASE DOT	0.00		0 0			AP	188.8133	R LLS		938.493		
WEDGE ANG	.000		UNTIL									
YD	.0000											

TARGETS

PGNS			AGS								
EXT DV LM			EXT DV				LAMBERT		MVR		
GETI	104 31 42.4		GETI	104 31 42.4		GETI	0 0 .0		GETI	0 0 .0	
VX	-.8000		VX	-.8032		T F	0 0 .0		APSIS	0	
VY	.0000		VY	.0000		X	.00		ELEV	.00	
VZ	3.3000		VZ	3.2992		Y	.00		TPI	0 0 .0	
						Z	.00		DT	0 .0	
						C	.000		OPTION		

TABLE VII.- DETAILED MANEUVER TABLES - Continued

(k) TPI maneuver

C STA ID			L STA ID			STA ID			WT	$8^{1}9_{3}\cdot7^{0}$			
									WC				
GETV	0	0 .0	GETV	0	0 .0	GETV	0	0 .0	WL				
CODE			REF		LUNAR	GETR	0	0 .0	WF				
GETI	105	8 59.4	DT B	0	15.8	DT TO		.00	REFSMMAT		DEL P		.00
PETI	121	57 59.4	DT U		.00	DV TO		.00	LANDIN		DEL Y		.00
DVM		24.8	VGX		-23.8	OY	359.9		YB	.1	YH		.3
DVREM		.0	VGY		.1	IP	196.7		PB	196.7	PH		26.7
DVC		24.8	VGZ		7.1	MR	.2		RB	.2	RH		.0
VF		22.18	H BI		42.2	HA	61.797		VP		.47		
VS		.10	P BI	1	6 S	HP	43.543		THETA P		.00		
VD		-11.14	L BI	78	45 W	L AN	177	3 E	DELTA P		359.05		
DH		0.00	F BI		14.57	E	.00922387		P LLS		0	0 N	
PHASE		000.000				I	178.7641		L LLS		0	0 E	
PHASE DOT		0.00		0	0	WP	-130.0033		R LLS		938.493		
WEDGE ANG		.000		UNTIL									
YD		.0000											

TARGETS

PGNS			AGS									
EXT DV	LM		EXT DV				LAMBERT			MVR		
GETI	105	8 59.4	GETI	105	8 59.4	GETI	0	0 .0	GETI	0	0	.0
VX		22.1000	VX		22.1802	T F	0	0 .0	APSIS		0	
VY		.1000	VY		.1000	X		.00	ELEV		.00	
VZ		-11.3000	VZ		-11.1417	Y		.00	TPI	0	0	.0
						Z		.00	DT		0	.0
						C		.000	OPTION			

TABLE VII.- DETAILED MANEUVER TABLES - Concluded

(1) TEI maneuver

C STA ID		L STA ID		STA ID				WT	36665.79		
								WC			
GETV	0 0 .0	GETV	0 0 .0	GETV	0 0 .0			WL			
CODE		REF	LUNAR	GETR	0 0 .0			WF			
GETI	137 20 22.4	DT B	2 48.5	DT TO	.59	REFSMMAT		DEL P	-.72		
PETI	154 9 22.4	DT L	20.00	DV TO	15.20	LANDIN		DEL Y	.23		
DVM	3622.7	VGX	2122.1	OR	179.9	YB	.0	YH	.6		
DVREM	.0	VGY	-34.3	IP	51.3	PB	.0	PH	349.2		
DVC	3607.0	VGZ	-2935.7	MY	.6	RB	.0	RH	179.8		
VF	3588.08	H BI	57.8	HA	-4393.760	VP		.00			
VS	-34.75	P BI	C 8 S	HP	59.063	THETA P		.00			
VD	497.21	L BI	152 33 E	L AN	0 0 E	DELTA P		359.23			
DH	-998.03	F BI	11.68	E	1.809 33174	P LLS		0 0 N			
PHASE	.000			I	178.9841	L LLS		0 0 E			
PHASE DOT	.00		0 0	WP	-.7381	R LLS		938.493			
WEDGE ANG	.000		UNTIL								
YD	.0000										

TARGETS

PGNS EXT DV	CSM	AGS EXT DV			LAMBERT		MVR	
GETI	137 20 22.4	GETI	0 0 .0	GETI	0 0 .0	GETI	0 0 .0	
VX	3618.0662	VX	.0000	T F	0 0 .0	APSIS	0	
VY	-34.7524	VY	.0000	X	.00	ELEV	.00	
VZ	176.4497	VZ	.0000	Y	.00	TPI	0 0 .0	
				Z	.00	DT	0 .0	
				C	.000	OPTION		

TABLE VIII.- FDAI ANGLES FOR LM MANEUVERS

Maneuver	Roll	Pitch	Yaw
DOI	0.600	286.100	-0.
Phasing	0.600	264.400	-0.
Insertion	180.000	242.100	360.000
CSI	0.	105.800	-0.
CDH	180.000	2.300	360.000
TPI	0.240	196.689	0.120

TABLE IX.- CSM EXTERNAL ΔV UPDATES

(a) Evasive maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	00001	0.50949000E 01
4	VGX	37467	
5	VGY	00000	0.
6	VGY	00000	
7	VGZ	00007	0.19014399E 02
10	VGZ	15306	
11	TIGN	00142	4 28 47.56
12	TIGN	15724	

TABLE IX.- CSM EXTERNAL ΔV UPDATES - Continued

(b) MCC-1 maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	77757	-0.42902246E 02
4	VGX	50303	
5	VGY	00004	0.10465287E 02
6	VGY	02517	
7	VGZ	77761	-0.35992011E 02
10	VGZ	76516	
11	TIGN	00323	9 38 46.38
12	TIGN	36376	

TABLE IX.- CSM EXTERNAL ΔV UPDATES - Continued

(c) LOI-1 maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	75617	-0.29129198E 04
4	VGX	61254	
5	VGY	77432	-0.58744998E 03
6	VGY	71725	
7	VGZ	77661	-0.20097003E 03
10	VGZ	62757	
11	TIGN	03200	75 45 43.17
12	TIGN	26115	

TABLE IX.- CSM EXTERNAL ΔV UPDATES - Continued

(d) LOI-2 maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	77711	-0.13849999E 03
4	VGX	76703	
5	VGY	00000	0.
6	VGY	00000	
7	VGZ	00000	0.
10	VGZ	00000	
11	TIGN	03341	80 10 45.52
12	TIGN	30050	

TABLE IX.- CSM EXTERNAL ΔV UPDATES - Continued

(e) Separation from LM

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	00000	0.
4	VGX	00000	
5	VGY	00000	0.
6	VGY	00000	
7	VGZ	00000	0.25000000E 01
10	VGZ	37154	
11	TIGN	04166	98 35 15.60
12	TIGN	07350	

TABLE IX.- CSM EXTERNAL ΔV UPDATES - Concluded

(*f*) TEI maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	02603	0.36180662E 04
4	VGX	22107	
5	VGY	77762	-0.34752418E 02
6	VGY	56101	
7	VGZ	00104	0.17644970E 03
10	VGZ	32720	
11	TIGN	05711	137 20 22.41
12	TIGN	26700	

TABLE X.- LM EXTERNAL ΔV UPDATES

(a) DOI maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	77744	-0.71099997E 02
4	VGX	50257	
5	VGY	00000	0.
6	VGY	00000	
7	VGZ	77777	-0.27000000E 00
10	VGZ	74501	
11	TIGN	04213	99 33 58.80
12	TIGN	27450	

TABLE X.- LM EXTERNAL ΔV UPDATES - Continued

(b) Phasing maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	00102	0.17040000E 03
4	VGX	17301	
5	VGY	00000	0.
6	VGY	00000	
7	VGZ	77732	-0.95599996E 02
10	VGZ	66360	
11	TIGN	04246	100 46 20.89
12	TIGN	07510	

TABLE X.- LM EXTERNAL ΔV UPDATES - Continued

(c) Insertion maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	77666	-0.18919999E 03
4	VGX	45722	
5	VGY	00000	0.99998000E-01
6	VGY	01177	
7	VGZ	77737	-0.83899994E 02
10	VGZ	50424	
11	TIGN	04321	102 43 17.80
12	TIGN	02104	

TABLE X.- LM EXTERNAL ΔV UPDATES - Continued

(d) CSI maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	00023	0.50500000E 02
4	VGX	26362	
5	VGY	00000	0.
6	VGY	00000	
7	VGZ	77777	-0.60000000E 00
10	VGZ	70404	
11	TIGN	04343	103 33 46.00
12	TIGN	21450	

TABLE X.- LM EXTERNAL ΔV UPDATES - Continued

(e) CDH maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	77777	-0.80000000E 00
4	VGX	66005	
5	VGY	00000	0.
6	VGY	00000	
7	VGZ	00001	0.33000000E 01
10	VGZ	11146	
11	TIGN	04370	104 31 42.40
12	TIGN	30440	

TABLE X.- LM EXTERNAL ΔV UPDATES - Concluded

(f) TPI maneuver

OID	FCT	DSKY V71	DECIMAL
1	INDEX		
2	ADD		
3	VGX	00010	0.22099999E 02
4	VGX	23722	
5	VGY	00000	0.09999999E 00
6	VGY	01177	
7	VGZ	77773	-0.11300000E 02
10	VGZ	62730	
11	TIGN	04406	105 8 59.40
12	TIGN	15364	

TABLE XI.- MANEUVER PADS

(a) Evasive maneuver

P30 MANEUVER

							PURPOSE
SET STARS	S	P	S	/ G	&	N	PROP/GUID
	9	4	5	7	5	.6	WT N47
R ALIGN ___ ___ ___	+	0	0	0	9	1	P_{TRIM} N48
P ALIGN ___ ___ ___	+	0	0	0	2	3	Y_{TRIM}
Y ALIGN ___ ___ ___	+	0	0	0	0	4	HRS GETI
	+	0	0	0	2	8	MIN N33
	+	0	4	7	5	6	SEC
ULLAGE No ullage	+	0	0	0	5	1	ΔV_X N81
	+	0	0	0	0	0	ΔV_Y
	+	0	0	1	9	0	ΔV_Z
	X	X	X	1	8	1	R
	X	X	X	2	5	4	P
	X	X	X	3	5	9	Y
	+						H_A N44
	+		1	1	9	4	H_P (DMT)
	+	0	0	1	9	7	ΔVT
HORIZON/WINDOW ___	X	X	X	0	0	3	BT
	X	0	0	1	5	5	ΔVC
	X	X	X	X	2	4	SXTS
	+	2	7	3	3	0	SFT
	+	0	8	2	0	0	TRN
	X	X	X				BSS
	X	X					SPA
	X	X	X				SXP
		0					LAT N61
OTHER ___							LONG
	+						RTGO EMS
	+						V10
							GET 0.05G

TABLE XI.- MANEUVER PADS - Continued

(b) MCC-1

P30 MANEUVER

SET STARS	S	P	S/G	&	N	PURPOSE PROP/GUID
	9	4	5 7	5	.6	WT N47
R ALIGN ___ ___ ___	+	0	0 0	9	1	P_{TRIM} N48
P ALIGN ___ ___ ___	+	0	0 0	2	3	Y_{TRIM}
Y ALIGN ___ ___ ___	+	0	0 0	0	9	HRS GETI
	+	0	0 0	3	8	MIN N33
	+	0	4 6	3	8	SEC
ULLAGE No ullage	-	0	0 4	2	9	ΔV_X N81
	+	0	0 1	0	5	ΔV_Y
	-	0	0 3	6	0	ΔV_Z
	X	X	X 0	0	7	R
	X	X	X 0	9	2	P
	X	X	X 0	1	1	Y
	+					H_A N44
	-	0	0 0	5	1	H_P (DMT)
	+	0	0 5	7	0	ΔVT
HORIZON/WINDOW ___	X	X	X 0	0	8	BT
	X	0	0 5	3	9	ΔVC
	X	X	X X	1	6	SXTS
	+	0	9 9	5	0	SFT
	+	2	4 6	0	0	TRN
	X	X	X			BSS
	X	X				SPA
	X	X	X			SXP
OTHER ___		0				LAT N61
						LONG
	+					RTGO EMS
	+					V10
						GET 0.05G

TABLE XI.- MANEUVER PADS - Continued

(c) LOI-1

P30 MANEUVER

SET STARS	S	P	S/G	&	N	PURPOSE / PROP/GUID
	+	9	2	4	2	8	WT N47
R ALIGN ___ ___ ___	+	0	0	0	9	6	P_{TRIM} N48
P ALIGN ___ ___ ___	-	0	0	0	2	5	Y_{TRIM}
Y ALIGN ___ ___ ___	+	0	0	0	7	5	HRS GETI
	+	0	0	0	4	5	MIN N33
	+	0	4	3	1	7	SEC
ULLAGE No ullage	-	2	9	1	2	9	ΔV_X N81
	-	0	5	8	7	4	ΔV_Y
	-	0	2	0	1	0	ΔV_Z
	X	X	X	3	5	6	R
	X	X	X	2	2	8	P
	X	X	X	3	4	2	Y
	+	0	1	7	1	3	H_A N44
	+	0	0	5	2	1	H_P (DMT)
	+	2	9	7	7	9	ΔVT
HORIZON/WINDOW ___	X	X	X	6	0	2	BT
	X	2	9	7	2	2	ΔVC
	X	X	X	X	2	1	SXTS
	+	2	6	7	5	0	SFT
	+	1	6	0	0	0	TRN
	X	X	X				BSS
	X	X					SPA
	X	X	X				SXP
OTHER ___		0					LAT N61
							LONG
	+						RTGO EMS
	+						V10
							GET 0.05G

TABLE XI.- MANEUVER PADS - Continued

(d) LOI-2

P30 MANEUVER

SET STARS		S	P	S/G	&	N	PURPOSE / PROP/GUID
		+	6	8	8	6	7	WT N47
R ALIGN ___ ___ ___		+	0	0	1	4	4	P_{TRIM} N48
P ALIGN ___ ___ ___		-	0	0	0	6	6	Y_{TRIM}
Y ALIGN ___ ___ ___		+	0	0	0	8	0	HRS GETI
		+	0	0	0	1	0	MIN N33
		+	0	4	5	5	2	SEC
ULLAGE 2 quad		-	0	1	3	8	5	ΔV_X N81
20 second		+	0	0	0	0	0	ΔV_Y
		+	0	0	0	0	0	ΔV_Z
		X	X	X	0	0	0	R
		X	X	X	2	1	9	P
		X	X	X	0	0	0	Y
		+	0	0	5	8	6	H_A N44
		+	0	0	5	7	9	H_P (DMT)
		+	0	1	3	8	5	ΔVT
HORIZON/WINDOW ___		X	X	X	0	1	4	BT
		X	0	1	3	2	3	ΔVC
		X	X	X	X	2	2	SXTS
		+	0	1	9	1	0	SFT
		+	0	5	8	0	0	TRN
		X	X	X				BSS
		X	X					SPA
		X	X	X				SXP
OTHER ___			0					LAT N61
								LONG
		+						RTGO EMS
		+						V10
								GET 0.05G

TABLE XI.- MANEUVER PADS - Continued

(e) Separation from LM

P30 MANEUVER

SET STARS	R	C	S/G	&	N	PURPOSE PROP/GUID
	+	6	7	8	8	6	WT N47
R ALIGN ___ ___ ___	+	0	0	0	0	0	P_{TRIM} N48
P ALIGN ___ ___ ___	+	0	0	0	0	0	Y_{TRIM}
Y ALIGN ___ ___ ___	+	0	0	0	9	8	HRS GETI
	+	0	0	0	3	5	MIN N33
	+	0	1	5	6	2	SEC
ULLAGE RCS only	+	0	0	0	0	0	ΔV_X N81
	+	0	0	0	0	0	ΔV_Y
	+	0	0	0	2	5	ΔV_Z
	X	X	X	3	5	9	R
	X	X	X	1	9	4	P
	X	X	X	0	0	0	Y
	+	0	0	6	0	0	H_A N44
	+	0	0	5	9	5	H_P (DMT)
	+	0	0	0	2	5	ΔVT
HORIZON/WINDOW ___	X	X	X	0	0	6	BT
	X	0	0	0	2	5	ΔVC
	X	X	X	X	1	6	SXTS
	+	2	5	8	6	0	SFT
	+	1	5	8	0	0	TRN
	X	X	X				BSS
	X	X					SPA
	X	X	X				SXP
OTHER ___		0					LAT N61
							LONG
	+						RTGO EMS
	+						V10
							GET 0.05G

TABLE XI.- MANEUVER PADS - Continued

(f) DOI

P30 LM MANEUVER

						D	O	I				PURPOSE
+	0	0				+	0	0	0	9	9	HR N33
+	0	0	0			+	0	0	0	3	3	MIN TIG
+	0					+	0	5	8	8	0	SEC
						-	0	0	7	1	1	ΔVX N81
						+	0	0	0	0	0	ΔVY LOCAL
						-	0	0	0	0	3	ΔVZ VERT
+						+	0	0	7	1	1	ΔVR
X	X	X				X	X	X	0	2	7	BT
X	X	X				X	X	X	0	0	1	R FDAI
X	X	X				X	X	X	2	8	6	P INER
						-	0	0	7	1	1	ΔVX AGS N86
						+	0	0	0	0	0	ΔVY AGS
						-	0	0	0	1	0	ΔVZ AGS
X	X	X				X	X	X	0	2	7	COAS (Z axis)
X	X					X	X		+	0	5	AZ
X	X					X	X	-	2	5	4	EL

REMARKS:

Ullage: 2 quad, 8 sec

TABLE XI.- MANEUVER PADS - Continued

(g) Phasing

P30 LM MANEUVER

					P	H	A	S	I	N	G	PURPOSE
+	0	0				+	0	0	1	0	0	HR N33
+	0	0	0			+	0	0	0	4	6	MIN TIG
+	0					+	0	2	0	9	0	SEC
						+	0	1	7	0	4	ΔVX N81
						+	0	0	0	0	0	ΔVY LOCAL
						−	0	0	9	5	6	ΔVZ VERT
+						+	0	1	9	5	4	ΔVR
X	X	X				X	X	X	0	4	2	BT
X	X	X				X	X	X	0	0	1	R FDAI
X	X	X				X	X	X	2	6	4	P INER
						+	0	1	7	2	0	ΔVX AGS N86
						+	0	0	0	0	0	ΔVY AGS
						−	0	0	9	2	7	ΔVZ AGS
X	X	X				X	X	X		N	A	COAS
X	X					X	X					AZ
X	X					X	X					EL

REMARKS:

Ullage: 2 quad, 8 sec

TABLE XI.- MANEUVER PADS - Continued

(h) Insertion

P30 LM MANEUVER

			INS			ERTION					PURPOSE
+	0	0				+	0	0	1	0	2	HR N33
+	0	0	0			+	0	0	0	4	3	MIN TIG
+	0			•		+	0	1	7	8	0	SEC
					•	-	0	1	8	9	2	ΔVX N81
					•	+	0	0	0	0	1	ΔVY LOCAL
					•	-	0	0	8	3	9	ΔVZ VERT
+					•	+	0	2	0	7	0	ΔVR
X	X	X		•		X	X	X	0	1	5	BT
X	X	X				X	X	X	1	8	0	R FDAI
X	X	X				X	X	X	0	6	2	P INER
					•	-	0	1	8	8	2	ΔVX AGS N86
					•	+	0	0	0	0	1	ΔVY AGS
					•	-	0	0	8	6	1	ΔVZ AGS
X	X	X				X	X	X		N	A	COAS
X	X					X	X					AZ
X	X					X	X					EL

REMARKS:

Ullage: 2 quad, 4 sec

TABLE XI.- MANEUVER PADS - Continued

(i) CSI

CSI	P32 CSI UPDATE			CSI
	+ 0 0	+ 0 0 1 0 3	HR TIG CSI MIN SEC	N11
	+ 0 0 0	+ 0 0 0 3 3		
	+ 0	+ 0 4 6 0 0		
	+ 0 0	+ 0 0 1 0 5	HR TIG TPI MIN SEC	N37
	+ 0 0 0	+ 0 0 0 0 8		
	+ 0	+ 0 5 9 4 0		
	0	+ 0 0 5 0 5	ΔVX LOCAL VERT ΔVY	N81
	0 0	- 0 0 0 0 6		
	X X X	X X X 1 0 6	PLM FDAI	
	0 0	+ 0 0 5 0 5	ΔVX AGS	N86
	0 0	+ 0 0 0 0 0	ΔVY AGS	
	0 0	+ 0 0 0 0 1	ΔVZ AGS	
	ONBOARD LOG			
	0 0	0 0	ΔVX PGNCS LOCAL VERT ΔVY ΔVZ	N81
	0 0	0 0		
	0 0	0 0		
	0 0	0 0	ΔVX CHARTS LOCAL VERT ΔVY ΔVZ	N81
	X X X X X X	X X X X X X		
	X X X X X X	X X X X X X		
	REMARKS: 4 quad, +X			

(j) CDH

P33 CDH UPDATE

+ 0 0	+ 0 0 1 0 4	HR	TIG CDH N13
+ 0 0 0	+ 0 0 0 3 1	MIN	
+ 0 .	+ 0 4 2 . 4 0	SEC	
0 .	− 0 0 0 0 . 8	ΔVX	LOCAL VERT N81
0 0 .	+ 0 0 0 0 . 0	ΔVY	
0 0 .	+ 0 0 0 3 . 0	ΔVZ	
X X X	X X X 0 0 2	PLM FDAI	
0 .	− 0 0 0 0 . 8	ΔVX AGS	N86
0 0 .	+ 0 0 0 0 . 0	ΔVY AGS	
0 0 .	+ 0 0 0 3 . 3	ΔVZ AGS	
ONBOARD LOG			
0 0 .	0 0 .	ΔVX	PGNCS LOCAL VERT N81
0 0 .	0 0 .	ΔVY	
0 0 .	0 0 .	ΔVZ	
0 0 .	0 0 .	ΔVX	CHARTS LOCAL VERT N81
X X X X X X	X X X X X X		
0 0 .	0 0 .	ΔVZ	

CDH

CDH

REMARKS:

4 quad, +X

TABLE XI.- MANEUVER PADS - Continued

(k) TPI

	P34 TPI UPDATE			
	+00	+00105	HR TIG	N37
	+000	+00008	MIN	
	+0 .	+05940	SEC TPI	
	.	+00221	ΔVX	N81
	.	+00001	ΔVY LOCAL	
	.	-00113	ΔVZ VERT	
	+00 .	+00248	ΔVR	
	XXX	XXX000	RLM FDAI	N42
	XXX	XXX197	PLM INER	
	+0 .	+03314	R TPI TIG-5	N54
	-0 .	-01097	Ṙ TPI	
	00 .	+00248	F/A(+/-)	N59
	00 .	+00001	R/L(+/-) ΔV	
	00 .	-00001	D/U(+/-) LOS	
	XX :	XX :016	BT	
	ONBOARD LOG			
	00 .	00 .	F/A PGNCS	N59
	00 .	00 .	R/L ΔV	
	00 .	00 .	D/U LOS	
TPI	00 .	00 .	F/A CHARTS	N59
	XXXXXX	XXXXXX	R/L ΔV	
	00 .	00 .	D/U LOS	TPI
	REMARKS:			
	4 quad, +X			

TABLE XI.- MANEUVER PADS - Continued

(1) TEI

P30 MANEUVER

SET STARS	S	P	S/G	&	N	PURPOSE PROP/GUID
	+	3	6	6	6	WT N47
R ALIGN ___ ___ ___	-	0	0	0	7	2	P TRIM N48
P ALIGN ___ ___ ___	+	0	0	0	2	3	Y TRIM
Y ALIGN ___ ___ ___	+	0	0	1	3	7	HRS GETI
	+	0	0	0	2	0	MIN N33
	+	0	2	2	4	1	SEC
ULLAGE 2 quads	+	0	3	6	1	3.1	ΔV_X N81
20 second	-	0	0	3	4	8	ΔV_Y
	+	0	1	7	6	4	ΔV_Z
	X	X	X	1	8	0	R
	X	X	X	0	5	1	P
	X	X	X	0	0	1	Y
	+		N	A			H_A N44
	+	0	0	5	9	1	H_P (DMT)
	+	3	6	2	2	7	ΔVT
HORIZON/WINDOW ___	X	X	X	2	4	9	BT
	X	3	6	0	4	8	ΔVC
	X	X	X	X	1	1	SXTS
	+	0	1	4	9	0	SFT
	+	2	1	8	0	0	TRN
	X	X	X				BSS
	X	X					SPA
	X	X	X				SXP
OTHER ___		0					LAT N61
							LONG
	+						RTGO EMS
	+						V10
							GET 0.05G

TABLE XI.- MANEUVER PADS - Concluded

(m) Lunar entry

LUNAR ENTRY														
							M	I	D	P	A	C	AREA
X	X	X					X	X	X	0	0	0	R .05 G
X	X	X					X	X	X	1	5	3	P .05G
X	X	X					X	X	X	0	0	1	Y .05G
		•		•		1	9	1•	3	3•	3	2	GET HOR CK
X	X	X					X	X	X		N	A	P EI-17
	0			•			-	0	1	5	1	1	LAT N61
				•			-	1	6	5	0	0	LONG
X	X	X			•		X	X	X	0	6•	8	MAX G
+					•		+	3	6	3	1	0	V_{400K} N60
-	0	0		•			-	0	0	6•	5	2	γ 400K
+					•		+	1	2	2	2•	0	RTGO EMS
+					•		+	3	6	3	9	0	V10
		•		•		1	9	1•	5	0•	3	2	RRT
X	X			•			X	X	0	0•	2	8	RET .05G
+	0	0		•			+	0	0		N	A	D_L MAX N69
+	0	0		•			+	0	0		N	A	D_L MIN
+							+				N	A	V_L MAX
+							+				N	A	V_L MIN
X	X	X		•			X	X	X	4•	0	3	D_O
X	X			•			X	X	0	2•	0	8	RET V_{CIRC}
X	X			•			X	X	0	0•	1	8	RETBBO
X	X			•			X	X	0	3•	2	0	RETEBO
X	X			•			X	X	0	8•	1	6	RETDRO
X	X	X	X				X	X	X	X	N	A	SXTS
+				•		0	+			N•	A	0	SFT EI - 2
+			•		0	0	+		N	A	0	0	TRN
X	X	X					X	X	X		N	A	BSS
X	X					•	X	X			N	A	SPA EI-2
X	X	X				•	X	X	X		N	A	SXP
X	X	X	X				X	X	X	X	U	P	LIFT VECTOR

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