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SPACECRAFT OPERATIONAL TRAJECTORY
FOR APOLLO 15 (MISSION J-1)

LAUNCHED JULY 26, 1971

VOLUME I - MISSION PROFILE

Planetary Mission Analysis Branch,
Orbital Mission Analysis Branch,

and

Landing Analysis Branch

MISSION PLANNING AND ANALYSIS DIVISION

The logo for the Manned Spacecraft Center in Houston, Texas. It features a stylized Earth with a horizontal line through it, and the number "13" integrated into the design. The text "MANAGED BY" is above "MANNED SPACECRAFT CENTER" and "HOUSTON, TEXAS" is below it.

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PROJECT APOLLO

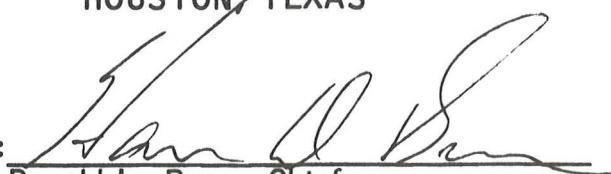
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By Planetary Mission Analysis Branch, Orbital Mission
Analysis Branch, and Landing Analysis Branch

April 16, 1971

MISSION PLANNING AND ANALYSIS DIVISION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOREWORD

This document contains a verbal and graphic description of the Apollo 15 mission and is volume I of the Apollo 15 spacecraft operational trajectory. Volume II is the trajectory printout (MSC IN 71-FM-112).

At this time no revision to this trajectory is planned. Some corrections to volume II will be published in the near future and consist of the following items.

a. The ascent REFSMMAT given on page 709 is in error but the data were generated with the correct one. The ascent REFSMMAT contained in volume I is correct.

b. The lunar orbit plane change (LOPC) REFSMMAT used in generating the LOPC maneuver in volume II (pp. 678-681) was with the crew "heads down." Subsequent study revealed that this attitude provided inadequate communications but a heads-up attitude would yield good communications. The REFSMMAT in volume I does reflect a heads-up attitude and a correction of the affected pages of volume II is in process.

c. The portion of data contained in volume II between pp. 362 and 454 has an error in the TRALT for the lunar module (LM). The numerical value of the TRALT for the LM reflects the command and service module (CSM) altitude above the landing site rather than the LM altitude. The LM altitude can be determined by adding the value of ALTS to the difference in altitude between the mean lunar radius and the radius of the landing site (approximately 1.92 n. mi.). A correction to these data will not be published.

d. The ascent section of volume II (pp. 709-751) is in error. The error is relatively minor and results from the data being generated under the assumption that the LM body axes are aligned with the CSM orbit plane at lift-off when actually there will be small misalignments in the yaw and roll axes. This section will be recomputed. The ascent data contained in volume I is correct.

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1.0 SUMMARY AND INTRODUCTION

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4.0 MISSION SUMMARY

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4.2 EARTH PARKING ORBIT

4.3 TRANSLUNAR INJECTION

4.4 TRANSLUNAR TRAJECTORY

4.5 POST-TRANSLUNAR INJECTION EVENTS

4.6 TRANSLUNAR COAST

4.7 LUNAR ORBIT INSERTION

4.8 DESCENT ORBIT INSERTION

4.9 CSM/LM TRAJECTORY FROM DOI TO PDI

4.10 LM TRAJECTORY FROM PDI TO LANDING

4.11 CSM SOLO ACTIVITIES

1.0 SUMMARY AND INTRODUCTION

THE SPACECRAFT OPERATIONAL TRAJECTORY FOR

APOLLO 15 (MISSION J-1)

LAUNCHED JULY 26, 1971

VOLUME I - MISSION PROFILE

By Lunar Mission Analysis Branch, Orbital Mission Analysis Branch,
and Landing Analysis Branch

1.0 SUMMARY AND INTRODUCTION

1.1 Summary

In volumes I and II of the Spacecraft Operational Trajectory, a detailed description of the mission profile for Apollo 15 is presented. The nominal launch date of July 26, 1971 was used for this trajectory simulation.

Translunar injection places the spacecraft on a translunar trajectory with a 68.1 n. mi. perilune altitude. The translunar trajectory is restricted such that the spacecraft is earth-returnable within RCS capability up to TLI + 5 hours, and in the event that LOI is not performed the spacecraft is returnable within DPS capability at perilune + 2 hours. The evasive maneuver is performed by the S-IVB prior to the blowdown as was done on Apollo 14. The S-IVB blowdown maneuver will place the discarded S-IVB on a lunar impact trajectory.

The lunar orbit time line from LOI to LM landing is similar to that of Apollo 14. The lunar surface stay time has been doubled to $3\frac{1}{4}$ revolutions or 67 hours. After LM jettison, there is a LM ascent stage deorbit maneuver which results in a lunar impact as was done on Apollo 14. There is no plane change after LM jettison and there is a 2-day lunar orbit science period. TEI occurs at the end of revolution $7\frac{1}{4}$.

For the nominal mission, the launch time is $8^{\text{h}}34^{\text{m}}$ c.d.t., and the flight azimuth is $\sim 80.1^{\circ}$. Translunar injection occurs during the second revolution over the Pacific Ocean.

The mission duration is approximately 12 days, 7 hours. The trans-lunar flight time is $75^{\text{h}}36^{\text{m}}$. The time spent in lunar orbit is approximately $145^{\text{h}}06^{\text{m}}$, and the transearth flight time is $71^{\text{h}}12^{\text{m}}$.

The nominal mission is summarized in the following tables.

- a. Table 1.1-I.- Sequence of major events
- b. Table 1.1-II.- Lunar orbit activities
- c. Table 1.1-III.- Launch window summary
- d. Table 1.1-IV.- Timetable of mission events

1.2 Introduction

The operational trajectory document is divided into numbered sections with index tabs. The symbols and nomenclature are presented in section 2.0, and a list of the primary mission guidelines and constraints is presented in section 3.0.

The main body of the document is section 4.0. This section is divided into subsections according to mission phases, and each subsection contains the text, tables, and figures related to the particular mission phase. In general, the information in each subsection includes a tracking time line summary, a shadow time line summary, target parameters, and a sequence of events table with a standard set of parameters. The propellant consumption predictions in section 4.0 are approximate and are included for completeness. The official predictions will be published in the operational consumables document.

The input data that were used to generate the operational trajectory are presented in section 5.0, which also contains the REFSMMAT's. Almost all of the input data are tabulated; however, for some data, only the source is identified. The references are listed in section 6.0.

The mission tracking time line, shadow time line, and more detailed trajectory data are contained in volume II of the operational trajectory document (ref. 1).

TABLE 1.1-I.- SEQUENCE OF MAJOR EVENTS

L-7

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.d.t.	Data summary	
Launch	00:00:00	July 26, 1971 08:34:00	Flight azimuth, deg	80.1
			Launch complex	39A
EPO insertion	00:11:54.5	08:45:54.5	Geodetic latitude, deg	29.3
			Longitude, deg	-52.4
			Geodetic altitude, n. mi.	92.7
			Velocity, fps	25 603.7
Translunar injection Burn initiation	02:49:52.3	11:23:52.3	Geodetic latitude, deg	14.3
			Longitude, deg	-168.5
			Velocity, fps	25 620.0
			Apogee altitude, n. mi.	95.6
			Geodetic altitude, n. mi.	89.4
Burn termination (guidance cutoff signal)	02:55:29.1	11:29:29.1	Geodetic latitude, deg	24.7
			Longitude, deg	-142.9
			Burn duration, sec	336.8
			Plane change, deg	0.0
			Apogee altitude, n. mi.	292 296
			Geodetic altitude, n. mi.	158.8
Post-TLI events				
CSM/S-IVB separation	03:20:29.1	11:54:29.1		
Docking	03:30:29.1	12:04:29.1		
CSM/LM ejection	04:15:29.1	12:49:29.1		
Evasive maneuver (performed by S-IVB)	04:28:29.1	13:02:29.1	ΔV , fps	9.8
Translunar coast, midcourse correction maneuvers				
MCC-1	TLI plus 9 hr	20:29:29.1	Geodetic altitude, n. mi.	\approx 57 000
MCC-2	TLI plus 28 hr	July 27, 1971 15:29:29.1	Geodetic altitude, n. mi.	\approx 121 000
MCC-3	LOI minus 22 hr	July 28, 1971 17:05:14.7	Geodetic altitude, n. mi.	\approx 177 500
MCC-4	LOI minus 5 hr	July 29, 1971 10:05:14.7	Altitude above mean lunar radius, n. mi.	\approx 12 600
SIM door jettison	LOI minus 4.5 hr	10:35:14.7	Average ΔV imparted to door, fps	9.1
Lunar orbit insertion (LOI)				
Burn initiation	78:31:14.7	15:05:14.7	Mass, lb	102 816.5
			Altitude above LLS radius, n. mi.	95.0
			Selenographic latitude, deg	-27.9
			Selenographic longitude, deg	-169.9
			Perilune altitude above LLS radius, n. mi.	68.1
			Selenographic inclination, deg	30.0
			Velocity, fps	8170.9

TABLE 1.1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.d.t.	Data summary	
Burn termination	78:37:46.8	July 29, 1971 15:11:46.8	Altitude above LLS radius, n. mi. Selenographic latitude, deg Selenographic longitude, deg Selenographic inclination, deg Burn duration, sec Inertial burn arc, deg Plane change, deg ΔV , fps SPS propellant used, lb Velocity, fps Orbital period, hr:min:sec Perilune altitude above LLS radius, n. mi. Apolune altitude above LLS radius, n. mi.	73.9 -21.7 163.2 26.0 392.0 25.1 7.9 2997.9 26 400.0 5 411.2 02:08:22.8 58.3 170.0
S-IVB predicted lunar impact	79:13:26.0	15:47:26.0	Selenographic latitude, deg Selenographic longitude, deg	-3.65 -7.58
Descent orbit insertion (DOI) Burn initiation	82:39:32.5	19:13:32.5	Mass, lb Altitude above LLS radius, n. mi. Selenographic latitude, deg Selenographic longitude, deg Perilune altitude above LLS radius, n. mi. Apolune altitude above LLS radius, n. mi. Velocity, fps	76 363.6 58.4 -25.3 -148.7 58.4 169.8 5 491.4
Burn termination	82:39:55.4	19:13:55.4	Altitude above LLS radius, n. mi. Selenographic latitude, deg Selenographic longitude, deg Selenographic inclination, deg Burn duration, sec Inertial burn arc, deg Plane change, deg ΔV , fps Velocity, fps SPS propellant used, lb Orbital period, hr:min:sec Perilune altitude above LLS radius, n. mi. Apolune altitude above LLS radius, n. mi. Revolution number	58.4 -25.4 -150.0 26.0 22.9 1.2 0.0 207.6 5 283.7 1 553.1 01:53:58.9 9.6 58.4 2
CSM/LM undock and SEP	100:13:56.0	July 30, 1971 12:47:56.0	Selenographic latitude Selenographic longitude, deg Revolution number	-6.0 110.5 12
Circularization (CSM) Burn initiation	101:34:55.1	14:08:55.1	Mass, lb Selenographic latitude, deg Selenographic longitude, deg Selenographic inclination, deg Altitude above LLS, n. mi. Perilune altitude above LLS, n. mi. Velocity, fps Revolution number	37 918.0 -23.6 -146.0 26.1 59.0 8.6 5 280.8 12

TABLE 1.1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.d.t.	Data summary	
Burn termination	101:34:59.0	14:08:59.0	ΔV, fps	70.8
			Burn duration, sec	3.9
			Altitude above LLS, n. mi.	59.0
			Perilune altitude above LLS, n. mi.	54.5
			Apolune altitude above LLS, n. mi.	64.7
			Velocity, fps	5 351.5
			SPS propellant consumed, lb	264.9
			Burn arc, deg	0.2
			Orbital period, hr:min:sec	01:58:31.1
			Revolution number	12
PDI (DPS ignition time)	104:28:54.8	17:02:54.8	Altitude above LLS, ft	50 086.2
			Velocity, fps	5 575.7
			Revolution number	14
High gate (P63 to P64)	104:38:18.8	17:12:18.8	Altitude above LLS, ft	7 028.6
			Velocity, fps	329.8
Low gate	104:39:36.8	17:13:36.8	Altitude above LLS, ft	694.4
			Velocity, fps	79.4
Vertical descent (P64 to P65)	104:40:16.8	17:14:16.8	Altitude above LLS, ft	206.1
			Velocity, fps	10.7
LM landing	104:40:57.0	17:14:57.0	ΔV, fps	6 697.6
			Burn duration, sec	722.1
			DPS propellant consumed, lb	18 387.9
			Revolution number	14
			Selenographic latitude, deg	26.1
			Selenographic longitude, deg	3.65
CSM first pass over LLS	104:41:33.2	17:15:33.2	Revolution number	14
Satellite jettison	106:09:13.4	18:43:13.4	Revolution number	15
CSM plane change Burn initiation	165:12:50.6	Aug. 2, 1971 05:46:50.6	Mass, lb	37 276.8
			Selenographic latitude, deg	-12.5
			Selenographic longitude, deg	93.0
			Altitude above LLS, n. mi.	59.8
			Perilune altitude above LLS, n. mi.	59.2
			Apolune altitude above LLS, n. mi.	59.8
			Revolution number	45
			Velocity, fps	5346.9
Burn termination	165:13:07.1	05:47:07.1	SPS propellant consumed, lb	1 121.2
			ΔV, fps	308.6
			Burn duration, sec	16.5
			Selenographic latitude, deg	-12.2
			Selenographic longitude, deg	92.3
			Altitude above LLS, n. mi.	59.8
			Perilune altitude above LLS, n. mi.	59.2
			Apolune altitude above LLS, n. mi.	59.8
			Plane change, deg	3.3
			Selenographic inclination, deg	28.9
			Velocity, fps	5 346.9
			Revolution number	45

TABLE 1.1-I-- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.d.t.	Data summary	
CSM second pass over LLS	171:38:28.2	Aug. 2, 1971 12:12:28.2	Revolution number	48
Ascent				
LM lift-off	171:37:23.9	12:11:23.9	Mass, lb	10 873.1
			Selenographic latitude, deg	26.1
			Selenographic longitude, deg	3.65
			Revolution number	48
LM insertion	171:44:39.1	12:18:39.1	Mass, lb	5 913.3
			ΔV, fps	6 055.5
			Burn duration, sec	435.2
			Latitude, deg	27.9
			Longitude, deg	-7.6
			Altitude above LLS, ft	59 936.3
			Perilune altitude above LLS, ft	54 848.4
			Apolune altitude above LLS, ft	277 065.2
Rendezvous				
TPI (APS ignition)	172:29:39.1	13:03:39.1	Burn duration, sec	2.6
			ΔV, fps	51.8
			Propellant used, lb	30.8
			Resultant h_a/h_p , n. mi.	61.5/43.9
			Range at cutoff, n. mi.	32.5
			Range rate at cutoff, fps	-134.3
			Propulsion system	APS
			Revolution number	48
Braking	173:10:46.3	13:44:46.3	Burn duration, sec	28.6
			ΔV, fps	31.6
			Propellant used, lb	20.4
			Range at final braking, n. mi.	0.01
			Range rate at final braking, fps	-0.22
			h_a/h_p at final braking, n. mi.	59.6/59.1
			Propulsion system	LM RCS
			Revolution number	49
Docking	173:30:00.0	14:04:00.0		
LM jettison	177:30:27.4	18:04:27.4	Selenographic latitude, deg	23.4
			Selenographic longitude, deg	11.4
			Revolution number	51
CSM/LM separation				
Burn initiation	177:35:27.4	18:09:27.4	Revolution number	51

TABLE 1.1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.d.t.	Data summary	
Burn termination	177:35:33.8	18:09:33.8	Mass, lb ΔV , fps Burn duration, sec Selenographic latitude, deg Selenographic longitude, deg Altitude above LLS radius, n. mi. Perilune altitude above LLS radius, n. mi. Apolune altitude above LLS radius, n. mi. Plane change, deg Selenographic inclination, deg Velocity, fps Revolution number	36 523.1 1.0 6.4 28.4 -15.4 59.8 58.6 59.9 0.0 29.0 5 346.2 51
LM deorbit	179:06:22.7	19:40:22.7	Mass, lb ΔV , fps Burn duration, sec Selenographic latitude, deg Selenographic longitude, deg	5 309.2 195.4 82.3 -6.2 73.9
LM impact	179:31:07.9	20:05:07.9	Mass, lb Selenographic latitude, deg Selenographic longitude, deg Velocity, fps CSM revolution number	5 195.7 26.3 1.7 5 527.9 52
Transearth injection Burn initiation	223:43:47.6	Aug. 4, 1971 16:17:47.6	Mass, lb Altitude above LLS radius, n. mi. Selenographic latitude, deg Selenographic longitude, deg Perilune altitude above LLS, n. mi. Selenographic inclination, deg Velocity, fps Revolution number	36 280.9 58.6 -13.5 -166.1 54.6 28.6 5 353.0 74
Burn termination	223:46:06.6	16:20:06.6	Altitude above LLS radius, n. mi. Selenographic latitude, deg Selenographic longitude, deg Perilune altitude above LLS, n. mi. Selenographic inclination, deg Burn duration, sec Inertial burn arc, deg Plane change, deg ΔV , fps SPS propellant used, lb Velocity, fps	61.3 -17.6 -174.2 58.3 33.5 139.0 8.9 5.6 3 046.7 9 444.3 8 317.2

TABLE 1.1-I.- SEQUENCE OF MAJOR EVENTS - Concluded

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.d.t.	Data summary	
Transearth coast, midcourse correction maneuvers				
MCC-5	TEI plus 17 hr	Aug. 5, 1971 09:20:06.6	Geodetic altitude, n. mi.	\approx 173 500
MCC-6	EI minus 22 hr	Aug. 6, 1971 17:32:20.0	Geodetic altitude, n. mi.	\approx 102 400
MCC-7	EI minus 3 hr	Aug. 7, 1971 12:32:20.0	Geodetic altitude, n. mi.	\approx 25 000
CM/SM sep	EI minus 15 min	15:17:20.0	Geodetic altitude, n. mi.	1 951.6
Entry interface	294:58:20.0	15:32:20.0	Transearth coast time, hr Inertial velocity, fps Geodetic altitude, n. mi. (ft) Inertial flight-path angle, deg Geodetic latitude, deg Longitude, deg Equatorial inclination (ascending), deg	71.2 36 097.2 65.77(399 622) -6.49 14.3 -174.95 40
CM landing	295:11:45.6	15:45:45.6	Geodetic latitude, deg Longitude, deg	26.119 -158.00

TABLE 1.1-II.-- LUNAR ORBIT ACTIVITIES

Activity	Revolution number	Time, hr:min:, g.e.t.
LOI	Beginning of 1	78:38
DOI	End of 2	82:40
Begin rest period	4	86:00
End rest period	9	94:30
Begin IVT to LM	10	97:40
Undocking and separation	12	100:14
CSM circularization	12	101:35
PDI	14	104:29
Landing	14	104:41
Subsatellite jettison	15	106:09
Standup EVA	15	106:10
Begin first EVA	22	119:50
Terminate first EVA	25	126:50
Begin second EVA	32	141:15
Terminate second EVA	36	148:15
Begin third EVA	43	161:50
CSM plane change	45	165:13
End third EVA	46	167:50
LM ascent	48	171:37
Docking	49	173:30
LM jettison	51	177:30

TABLE 1.1-II.- LUNAR ORBIT ACTIVITIES - Concluded

Activity	Revolution number	Time, hr:min:, g.e.t.
CSM separation	51	173:35
LM deorbit burn	52	179:06
LM lunar impact	52	179:31
TEI	End of 74	223:46

TABLE 1.1-III.- LAUNCH WINDOW SUMMARY

Launch date	July 26, 1971
Site	Hadley
Flight azimuth, deg	80 to 100
Launch time, hr:min, c.d.t.	8:34 to 11:10
Non-free-return h _p , n. mi.	68
Translunar flight time, hr:min	75:30
Lunar orbit inclination, deg	26.0
Approach azimuth at landing, deg	-91.0
Sun elevation at landing, deg	13.6
Goldstone landing coverage, hr:min	8:05
Lunar surface stay time, hr	67.0
Total lunar orbit stay time	145 hr, 74 revs
Transearth flight time, hr	71:12 to 68:00
Total mission time, hr	295:12 to 292:36

Event	Launch	EOI	TLI initiation	TLI cutoff	Evasive maneuver (S-IVB)	SIM door jettison	LOI initiation	LOI cutoff	S-IVB predicted lunar impact	DOI	CSM/LM undock and separation	CSM circularization	PDI	LM landing	CSM first pass over LLS	Satellite jettison	C/C
Launch																	
EOI	00:11:55																
TLI initiation	02:49:52	02:37:57															
TLI cutoff	02:55:29	02:43:34	00:05:37														
Evasive maneuver (S-IVB)	04:37:29	04:25:34	01:47:37	01:42:00													
SIM door jettison	74:01:15	73:49:20	71:11:23	71:05:46	69:23:46												
LOI initiation	78:31:15	78:19:20	75:41:23	75:35:46	73:53:46	04:30:00											
LOI cutoff	78:37:47	78:25:52	75:47:55	75:42:18	74:00:18	04:36:32	00:06:32										
S-IVB predicted lunar impact	79:13:26	79:01:31	76:23:34	76:17:57	74:35:57	05:12:11	00:42:11	00:35:39									
DOI	82:39:33	82:27:38	79:49:41	79:44:04	78:02:04	08:38:18	04:08:18	04:01:46	03:26:07								
CSM/LM undock and separation	100:13:56	100:02:01	97:24:04	97:18:27	95:36:27	26:12:41	21:42:41	21:36:09	21:00:30	17:34:23							
CSM circularization	101:34:55	101:23:00	98:45:03	98:39:26	96:57:26	27:33:40	23:03:40	22:57:08	22:21:29	18:55:22	01:20:59						
PDI	104:28:55	104:17:00	101:39:03	101:33:26	99:51:26	30:27:40	25:57:40	25:51:08	25:15:29	21:49:22	04:14:59	02:54:00					
LM landing	104:40:57	104:29:02	101:51:05	101:45:28	100:03:28	30:39:42	26:09:42	26:03:10	25:27:31	22:01:24	04:27:01	03:06:02	00:12:02				
CSM first pass over LLS	104:41:33	104:29:38	101:51:41	101:46:04	100:04:04	30:40:18	26:10:18	26:03:46	25:28:07	22:02:00	04:27:37	03:06:38	00:12:38	00:00:36			
Satellite jettison	106:09:13	105:57:18	103:19:21	103:13:44	101:31:44	32:07:58	27:37:58	27:31:26	26:55:47	23:29:40	05:55:17	04:34:18	01:40:18	01:28:16	01:27:40		
CSM plane change 1	165:12:51	165:00:56	162:22:59	162:17:22	160:35:22	91:11:36	86:41:36	86:35:04	85:59:25	82:33:18	64:58:55	63:37:56	60:43:56	60:31:54	60:31:18	59:03:38	
LM lift-off	171:37:24	171:25:29	168:47:32	168:41:55	166:59:55	97:36:09	93:06:09	92:59:37	92:23:58	88:57:51	71:23:28	70:02:29	67:08:29	66:56:27	66:55:51	65:28:11	0
TPI	172:29:39	172:17:44	169:39:47	169:34:10	167:52:10	98:28:24	93:58:24	93:51:52	93:16:13	89:50:06	72:15:43	70:54:44	68:00:44	67:48:42	67:48:06	66:20:26	0
Braking	173:10:46	172:58:51	170:20:54	170:15:17	168:33:17	99:09:31	94:39:31	94:32:59	93:57:20	90:31:13	72:56:50	71:35:51	68:41:51	68:29:49	68:29:13	67:01:33	0
Docking	173:30:00	173:18:05	170:40:08	170:34:31	168:52:31	99:28:45	94:58:45	94:52:13	94:16:34	90:50:27	73:16:04	71:55:05	69:01:05	68:49:03	68:48:27	67:20:47	0
LM jettison	177:30:27	177:18:32	174:40:35	174:34:58	172:52:58	103:29:12	98:59:12	98:52:40	98:17:01	94:50:54	77:16:31	75:55:32	73:01:32	72:49:30	72:48:54	71:21:14	1
CSM separation	177:35:27	177:23:32	174:45:35	174:39:58	172:57:58	103:34:12	99:04:12	98:57:40	98:22:01	94:55:54	77:21:31	76:00:32	73:06:32	72:54:30	72:53:54	71:26:14	1
LM deorbit	179:06:23	178:54:28	176:16:31	176:10:54	174:28:54	105:05:08	100:35:08	100:28:36	99:52:57	96:26:50	78:52:27	77:31:28	74:37:28	74:25:26	74:24:50	72:57:10	1
LM lunar impact	179:31:08	179:19:13	176:41:16	176:35:39	174:53:39	105:29:53	100:59:53	100:53:21	100:17:42	96:51:35	79:17:12	77:56:13	75:02:13	74:50:11	74:49:35	73:21:55	1
TEI initiation	223:43:48	223:31:53	220:53:56	220:48:19	219:06:19	149:42:33	145:12:33	145:06:01	144:30:22	141:04:15	123:29:52	122:08:53	119:14:53	119:02:51	119:02:15	117:34:35	5
TEI cutoff	223:46:07	223:34:12	220:56:15	220:50:38	219:08:38	149:44:52	145:14:52	145:08:20	144:32:41	141:06:34	123:32:11	122:11:12	119:17:12	119:05:10	119:04:34	117:36:54	5
Entry interface	294:58:20	294:46:25	292:08:28	292:02:51	290:20:51	220:57:05	216:27:05	216:20:33	215:44:54	212:18:47	194:44:24	193:23:25	190:29:25	190:17:23	190:16:47	188:49:07	12
Landing	295:11:42	294:59:47	292:21:50	292:16:13	290:34:13	221:10:27	216:40:27	216:33:55	215:58:16	212:32:09	194:57:46	193:36:47	190:42:47	190:30:45	189:02:29	189:02:09	12

TABLE 1.1-IV.- TIMETABLE OF MISSION EVENTS

S-IVB predicted lunar impact	DOI	CSM/IM undock and separation	CSM circularization	PDI	LM landing	CSM first pass over LLS	Satellite jettison	CSM plane change 1	LM lift-off	TPI	Braking	Docking	LM jettison	CSM separation	LM deorbit	LM lunar impact	TEI initiation	TEI cutoff	Entry interface
03:26:07																			
21:00:30	17:34:23																		
22:21:29	18:55:22	01:20:59																	
25:15:29	21:49:22	04:14:59	02:54:00																
25:27:31	22:01:24	04:27:01	03:06:02	00:12:02															
25:28:07	22:02:00	04:27:37	03:06:38	00:12:38	00:00:36														
26:55:47	23:29:40	05:55:17	04:34:18	01:40:18	01:28:16	01:27:40													
85:59:25	82:33:18	64:58:55	63:37:56	60:43:56	60:31:54	60:31:18	59:03:38												
92:23:58	88:57:51	71:23:28	70:02:29	67:08:29	66:56:27	66:55:51	65:28:11	06:24:33											
93:16:13	89:50:06	72:15:43	70:54:44	68:00:44	67:48:42	67:48:06	66:20:26	07:16:48	00:52:15										
93:57:20	90:31:13	72:56:50	71:35:51	68:41:51	68:29:49	68:29:13	67:01:33	07:57:55	01:33:22	00:41:07									
94:16:34	90:50:27	73:16:04	71:55:05	69:01:05	68:49:03	68:48:27	67:20:47	08:17:09	01:52:36	01:00:21	00:19:14								
98:17:01	94:50:54	77:16:31	75:55:32	73:01:32	72:49:30	72:48:54	71:21:14	12:17:36	05:53:03	05:00:48	04:19:41	04:00:27							
98:22:01	94:55:54	77:21:31	76:00:32	73:06:32	72:54:30	72:53:54	71:26:14	12:22:36	05:58:03	05:05:48	04:24:41	04:05:27	00:05:00						
99:52:57	96:26:50	78:52:27	77:31:28	74:37:28	74:25:26	74:24:50	72:57:10	13:53:32	07:28:59	06:36:44	05:55:37	05:36:23	01:35:56	01:30:56					
100:17:42	96:51:35	79:17:12	77:56:13	75:02:13	74:50:11	74:49:35	73:21:55	14:18:17	07:53:44	07:01:29	06:20:22	06:01:08	02:00:41	01:55:41	00:24:45				
144:30:22	141:04:15	123:29:52	122:08:53	119:14:53	119:02:51	119:02:15	117:34:35	58:30:57	52:06:24	51:14:09	50:33:02	50:13:48	46:13:21	46:08:21	44:37:25	44:12:40			
144:32:41	141:06:34	123:32:11	122:11:12	119:17:12	119:05:10	119:04:34	117:36:54	58:33:16	52:08:43	51:16:28	50:35:21	50:16:07	46:15:40	46:10:40	44:39:44	44:14:59	00:02:19		
215:44:54	212:18:47	194:44:24	193:23:25	190:29:25	190:17:23	190:16:47	188:49:07	129:45:29	123:20:56	122:28:41	121:47:34	121:28:20	117:27:53	117:22:53	115:51:57	115:27:12	71:14:32	71:12:13	
215:58:16	212:32:09	194:57:46	193:36:47	190:42:47	190:30:45	190:30:09	189:02:29	129:58:51	123:34:18	122:42:03	122:00:56	121:41:42	117:41:15	117:36:15	116:05:19	115:40:34	71:27:54	71:25:35	
																	00:13:22		

2.0 SYMBOLS AND NOMENCLATURE

2.0 SYMBOLS AND NOMENCLATURE

AGS	abort guidance system
AOS	acquisition of signal
APS	ascent propulsion system
C	cross-product steering gain constant
CDH	constant delta height
CDR	commander
CM	command module
CMC	command module computer
CMP	command module pilot
CSI	coelliptic sequence initiation
CSM	command and service modules
c.g.	center of gravity
DOI	descent orbit insertion
DPS	descent propulsion system
DSKY	display keyboard
ECI	earth centered inertial
EC	entry interface
EMS	entry monitor system
EPO	earth parking orbit
FTP	fixed throttle point
g.e.t.	ground elapsed time
h_a	apogee altitude
h_p	perigee altitude

IGA	inner gimbal angle
IMU	inertial measurement unit
IVT	intravehicular transfer
Jerk	time derivative of acceleration
L/D	lift-to-drag ratio
LGC	LM guidance computer
LLM	lunar landing mission
LLS	lunar landing site
LM	lunar module
LMP	lunar module pilot
LOI	lunar orbit insertion
LOS	loss of signal
LPO	lunar parking orbit
LOX	liquid oxygen
LV	launch vehicle
MC	LM midcourse correction
MCC	midcourse correction
MCI	moon centered inertial
MGA	middle gimbal angle
MNBY	mean nearest Besselian year
MSFC	Marshall Space Flight Center
MSFN	Manned Space Flight Network
OGA	outer gimbal angle
OPS	oxygen purge system
PC	plane change

PDI	powered descent initiation
PGNCS	primary guidance and navigation control subsystem
PTC	passive thermal control
RDG	position target for LM powered descent
RCS	reaction control system
REFSMMAT	transformation matrix from the basic reference coordinate system to the stable member (IMU) coordinate system
RR	rendezvous radar
RT	target vector for Lambert guidance scheme
SC	spacecraft
SPS	service propulsion system
TB7	time elapsed since TLI engine cutoff
T&D	transposition and docking
TD&E	transposition and docking and extraction
TEI	transearth injection
t_{IG}	time at ignition
TLI	translunar injection
Tf	Δt from ignition time (t_{IG}) to Lambert target vector (RT)
TPF	terminal phase finalization
TPI	terminal phase initiation
VHF	very high frequency
ΔV	change in velocity caused by thrusting
Δt	change in time

ΔV_X	{	components of velocity to be gained in the local vertical coordinate system
ΔV_Y		
ΔV_Z		
X_I	{	components of unit vector in inertial coordinate system
Y_I		
Z_I		
X_{SM}	{	components of unit vector in vehicle stable member system
Y_{SM}		
Z_{SM}		

**3.0 PRIMARY GUIDELINES AND
CONSTRAINTS**

3.0 PRIMARY GUIDELINES AND CONSTRAINTS

The design of the mission and the monthly and daily launch windows were based on the guidelines and constraints listed below.

- a. The primary lunar landing site is Hadley. There is no backup site.
- b. Daylight launch is highly desirable.
- c. The launch windows and profiles will be designed to achieve favorable lunar lighting at the lunar landing sites. For the primary launch date, the sun elevation is approximately 12° to 14° .
- d. The flight azimuth range following launch is limited to 80° to 100° .
- e. The mission will be designed for a translunar injection over the Pacific Ocean.
- f. Two TLI opportunities will be targeted: the first on the second revolution and the second on the third revolution.
- g. The translunar trajectory is restricted such that the spacecraft is earth-returnable within RCS capability up to TLI + 5 hours, and in the event that LOI is not performed the spacecraft is returnable within DPS capability at perilune + 2 hours.
- h. The S-IVB will perform an evasive maneuver prior to the blowdown. The blowdown will be targeted to achieve an S-IVB lunar impact.
- i. The LOI maneuver will result in a 58- by 170-n. mi. elliptical orbit. DOI will be performed with the SPS after two revs in the 58- by 170-n. mi. orbit established by LOI. The targeting will be biased to place the spacecraft in a 50 000-foot by 60-n. mi. orbit at the time of PDI on rev 14.
- j. The lunar surface stay time will be approximately 67 hours. The CSM lunar orbit orientation will be restricted to permit an any-orbit LM lift-off.
- k. A CSM plane change will be made on rev 45 approximately 3.25 revolutions prior to LM ascent to place the landing site in the orbital plane at the planned time of lift-off on rev 48.

- l. The LM ascent stage will be deorbited for lunar impact.
- m. The lunar orbit will be designed within the SPS capability to return to earth from any orbit including the cryogenic tank failure situation.
- n. The TEI maneuver will be targeted to return as soon as possible to the prime recovery area within the available ΔV capability.
- o. The earth relative entry range will be 1190 n. mi.

4.0 MISSION SUMMARY

4.0 MISSION SUMMARY

In this section, a mission profile is summarized for a mission launched July 26, 1971. Major events, spacecraft performance characteristics, and significant trajectory parameters are described in detail for each phase.

In the design of the spacecraft operational mission, the LV mission phases were simulated independently of the exact LV operational trajectory (ref. 2). The trajectory data presented here for the LV mission phases were simulated with data received from the MSFC for the Apollo 15 mission. No attempt was made to duplicate exactly the LV operational mission, and the information for the LV phases will differ from information that will be presented in the official MSFC trajectory document.

4.1 EARTH LAUNCH

4.1 Earth Launch^a

The launch time for this mission was determined to provide an optimized injected payload to support two injection opportunities. The launch is summarized as follows.

Date, month, day, year	July 26, 1971
Time, hr:min, c.d.t.	08:34
Azimuth, deg	~80.1
Location (Cape Kennedy, complex 39A)	
Geodetic latitude, deg:min:sec . . .	28°36'30.32"
Longitude, deg:min:sec	80°36'14.88" West

The CSM launch pad REFSMMAT is presented in table 5-I.

^aThe parameters for this phase are approximate and are presented for information only. The official source for this phase is the MSFC LV operational trajectory (ref. 2).

4.2 EARTH PARKING ORBIT

4.2 Earth Parking Orbit^a (EPO)

The EPO insertion conditions are as follows.

Time, hr:min:sec, g.e.t.	00:11:54.5
Geodetic latitude, deg	29.3
Longitude, deg W	52.4
Altitude, n. mi.	92.7
Inclination, deg	29.7

The insertion ship positioned at 25°N latitude and 50°W longitude tracks the vehicle for approximately 3 minutes after insertion for a minimum elevation angle of 5°.

The LV maintains local horizontal attitude throughout the EPO phase except for an inertial hold of approximately 10 seconds immediately after EPO insertion. The total time spent in EPO is $2^{\text{h}}37^{\text{m}}57.8^{\text{s}}$. The EPO ground-track from insertion through translunar injection is shown in figure 4.2-1.

^aThe parameters for this phase are approximate and are presented for information only. The official source for this phase is the MSFC LV operational trajectory (ref. 2).

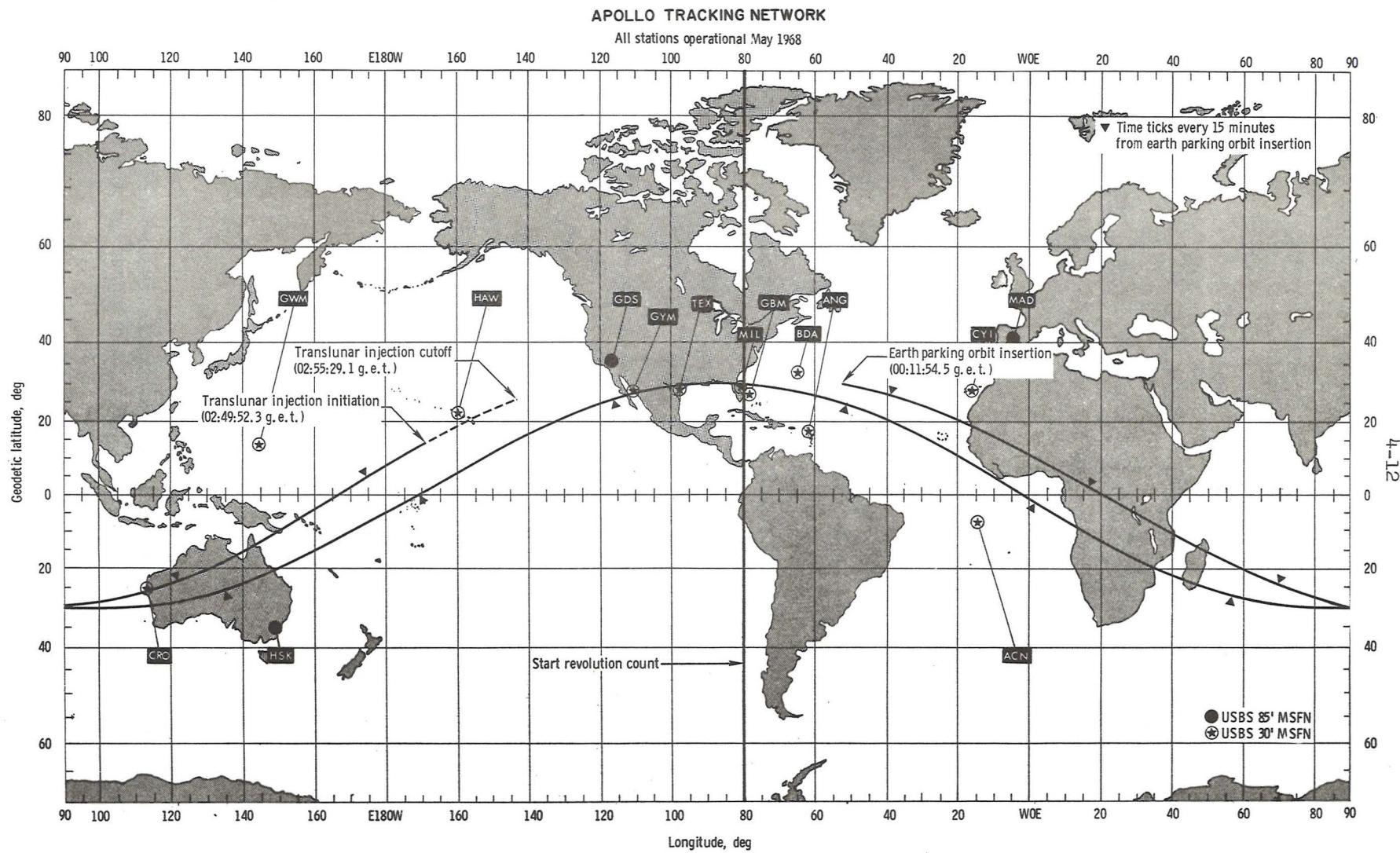


Figure 4.2-1. - Earth parking orbit groundtrack.

4.3 TRANSLUNAR INJECTION

4.3 Translunar Injection^a (TLI)

The TLI burn is initiated near Hawaii on the second revolution in earth orbit, and the burn is totally in sunlight. Four ARIA support the burn. The TLI ships are not used for this mission. The TLI burn geometry is shown in figure 4.3-1.

The TLI burn places the spacecraft on a translunar trajectory with a 68.1 n. mi. perilune altitude. The evasive maneuver after CSM/LM ejection is made with the S-IVB APS. The characteristics of the TLI burn are as follows.

Burn initiation

Time, hr:min:sec, g.e.t.	02:49:52.3
Geodetic latitude, deg	14.3
Longitude, deg	-168.5
Velocity, fps	25 620.0
Apogee altitude above mean radius, n. mi.	95.6

Burn cutoff

Time, hr:min:sec, g.e.t.	02:55:29.1
Geodetic latitude, deg	24.7
Longitude, deg	-142.9
Velocity, fps	35 655.6
Burn duration, sec	336.8
S-IVB propellant used, lb	163 600
Plane change, deg	0.0
Inclination to earth-moon plane, deg	2.7
Apogee altitude above mean radius, n. mi.	292 296

^aThe parameters for this phase are approximate and are presented for information only. The official source for this phase is the MSFC LV operational trajectory (ref. 2).

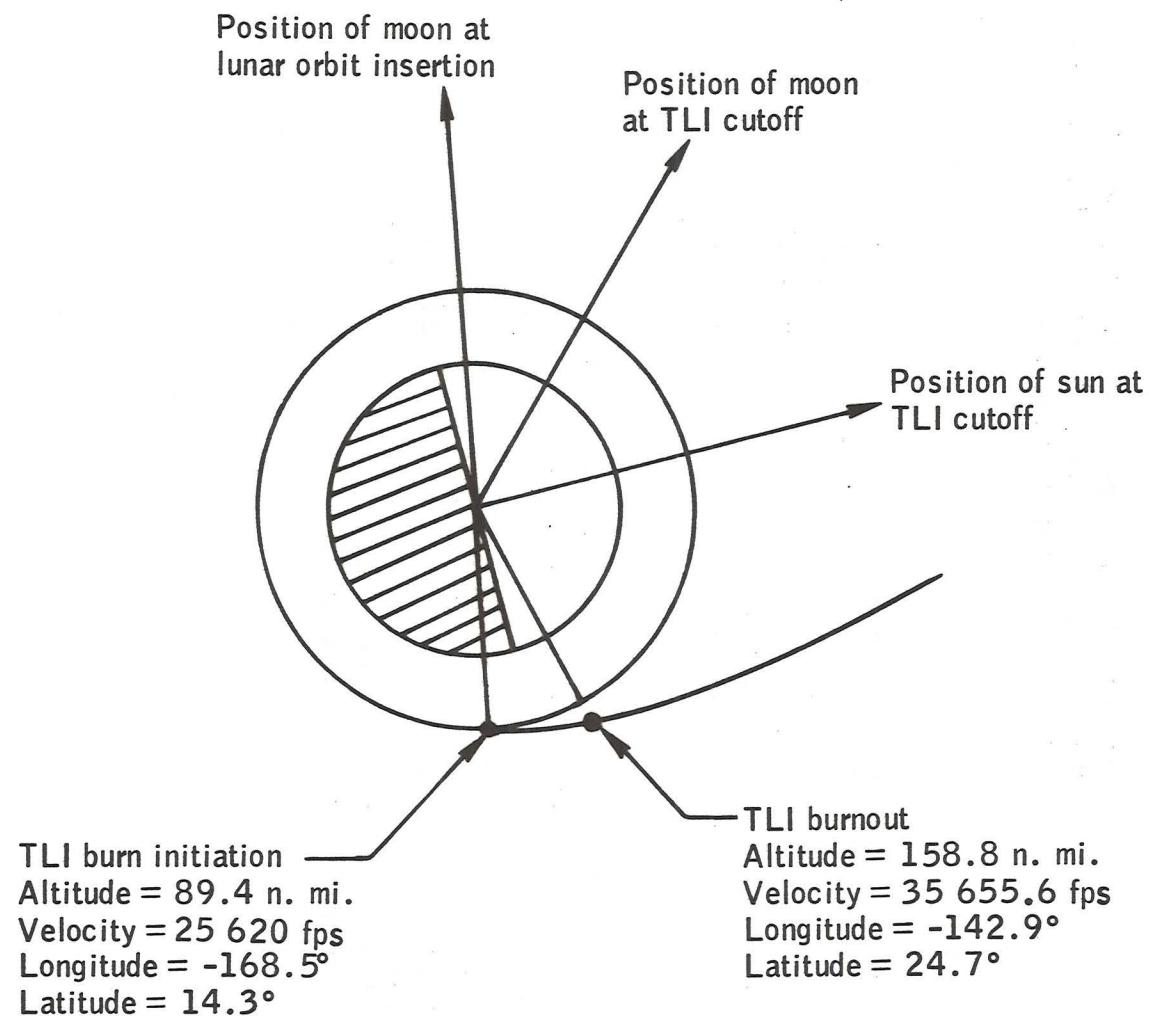


Figure 4.3-1.- TLI geometry.

4.4 TRANSLUNAR TRAJECTORY

4.4 Translunar Trajectory

The characteristics of the translunar trajectory are the following:

Perilune

Time, hr:min:sec, g.e.t.	78:35:00.5
Altitude above LLS, n. mi.	68.1
Selenographic latitude, deg	-23.3
Selenographic longitude, deg	171.7

In the event of no LOI burn the characteristics of the return-to-earth trajectory are the following:

Earth perigee

Time, hr:min:sec, g.e.t.	164:07:26
Altitude, n. mi.	28 807
Geodetic latitude, deg	28.3
Longitude, deg	-98.0
Inclination, deg	36.0

4.5 POST-TRANSLUNAR INJECTION
EVENTS

4.5 Posttranslunar Injection Events

The summary of the major events from TLI cutoff through S-IVB LOX blowdown is given in table 4.5-I. To determine the separation attitude maneuver (TB7 plus 900 sec), the sun was constrained to between 32° and 90° of the LV +X-axis. This constraint provides over-the-shoulder lighting and avoids any CSM shadow on the S-IVB for the docking phase.

Upon ground command, the S-IVB performs an APS evasive maneuver approximately 23 minutes after CSM/LM separation. The S-IVB attitude for this maneuver will be the same as the separation attitude except that the sign of the middle gimbal angle (yaw gimbal) will be reversed. The APS burn will be 10.0 fps.

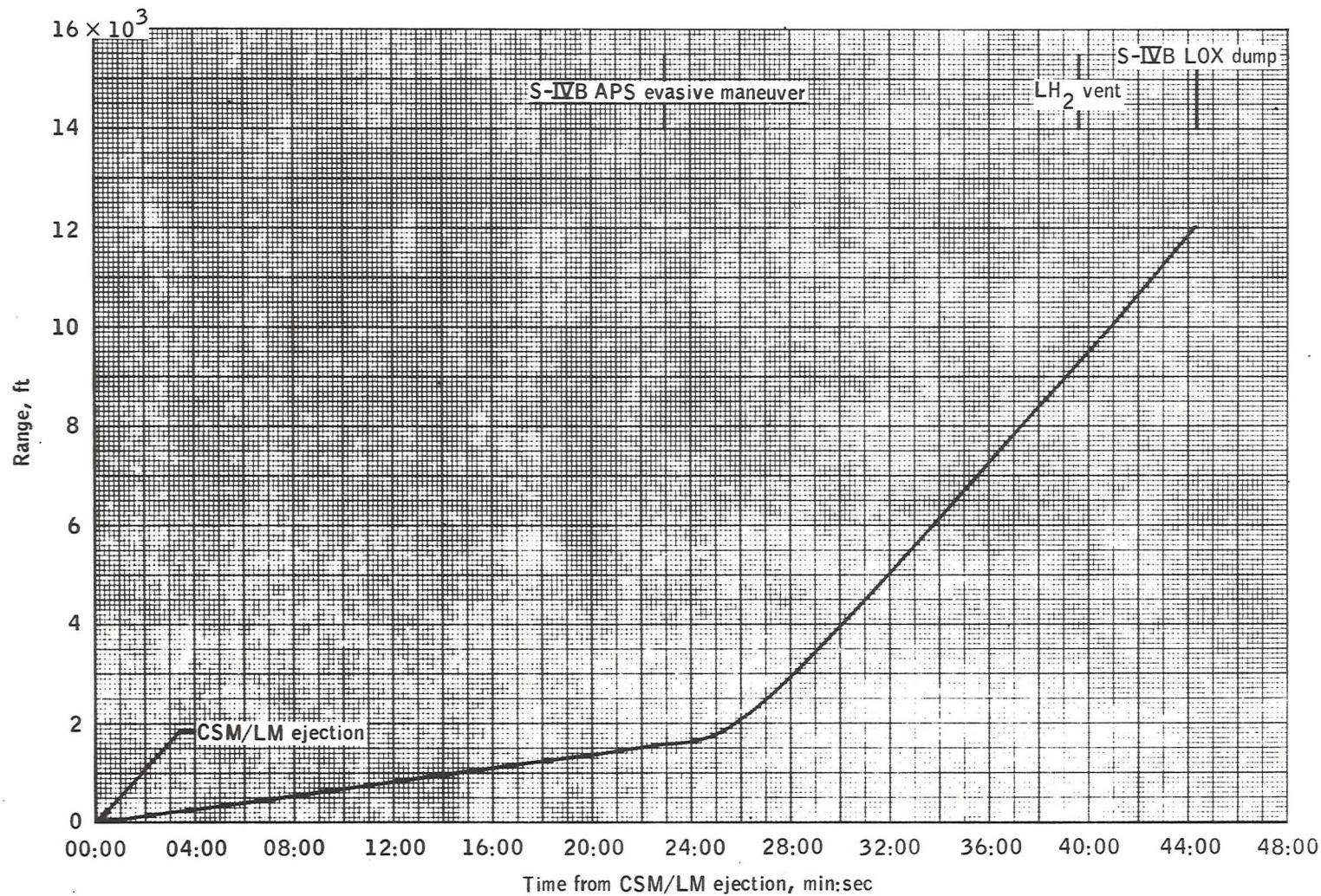
The S-IVB performs a LOX dump 21 minutes 20 seconds after the APS evasive maneuver. The preliminary local horizontal attitude for this dump is pitch -135° , yaw -10° , roll 180° .

The LOX dump maneuver is designed to reduce the probability of spacecraft recontact with the S-IVB and also to achieve an S-IVB impact on the moon. Nominally, an S-IVB APS lunar impact burn will be executed after the APS evasive and LOX dump maneuvers (g.e.t. is approximately 6.5 hr) to target the S-IVB for a lunar impact at 7.58°W and 3.65°S .

The relative motion between the S-IVB and spacecraft for this post-T, D, and E phase is shown in figure 4.5-1.

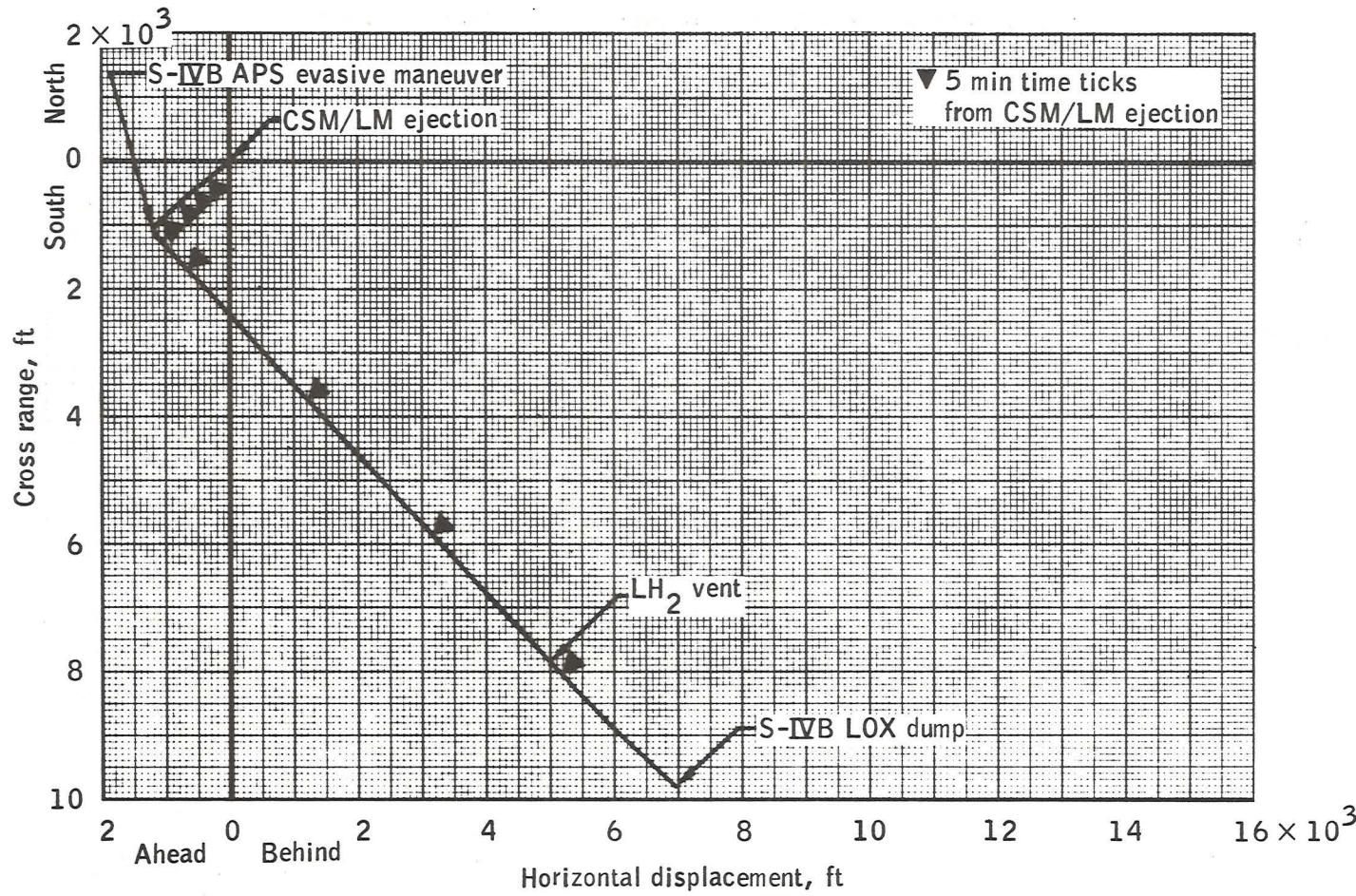
TABLE 4.5-I.- SUMMARY OF EVENTS FROM TLI CUTOFF THROUGH LOX DUMP

Time from TB7, hr:min:sec	Event	ΔV , fps	Comments
00:00:00	Hold cutoff attitude		
00:00:20	Command and hold local horizontal		
00:15:00	Initiate maneuver to separation attitude		Local horizontal attitude Pitch = 120° Yaw = -40° Roll = 180° 0.8 deg/sec
00:20:00	Freeze separation attitude inertially		Latest time for maneuver to be completed
00:25:00	Begin SC separation/SLA jettison	0.5	
00:25:15	AUTO maneuver to docking attitude	2.0 deg/sec	
	Null rates and translation		
	Initiate 0.7-fps closing rate		4-sec RCS +X
	Null 0.7-fps closing rate	0.7	-X RCS
00:35:00	Begin dock		
01:20:00	LM/CSM ejection from S-IVB	1.1	Spring ejection and 3-sec -X RCS
01:43:00	S-IVB APS evasive maneuver	9.8	Start TB8
02:04:20	S-IVB LOX dump		Local horizontal attitude Pitch = -135° Yaw = -10° Roll = 180°



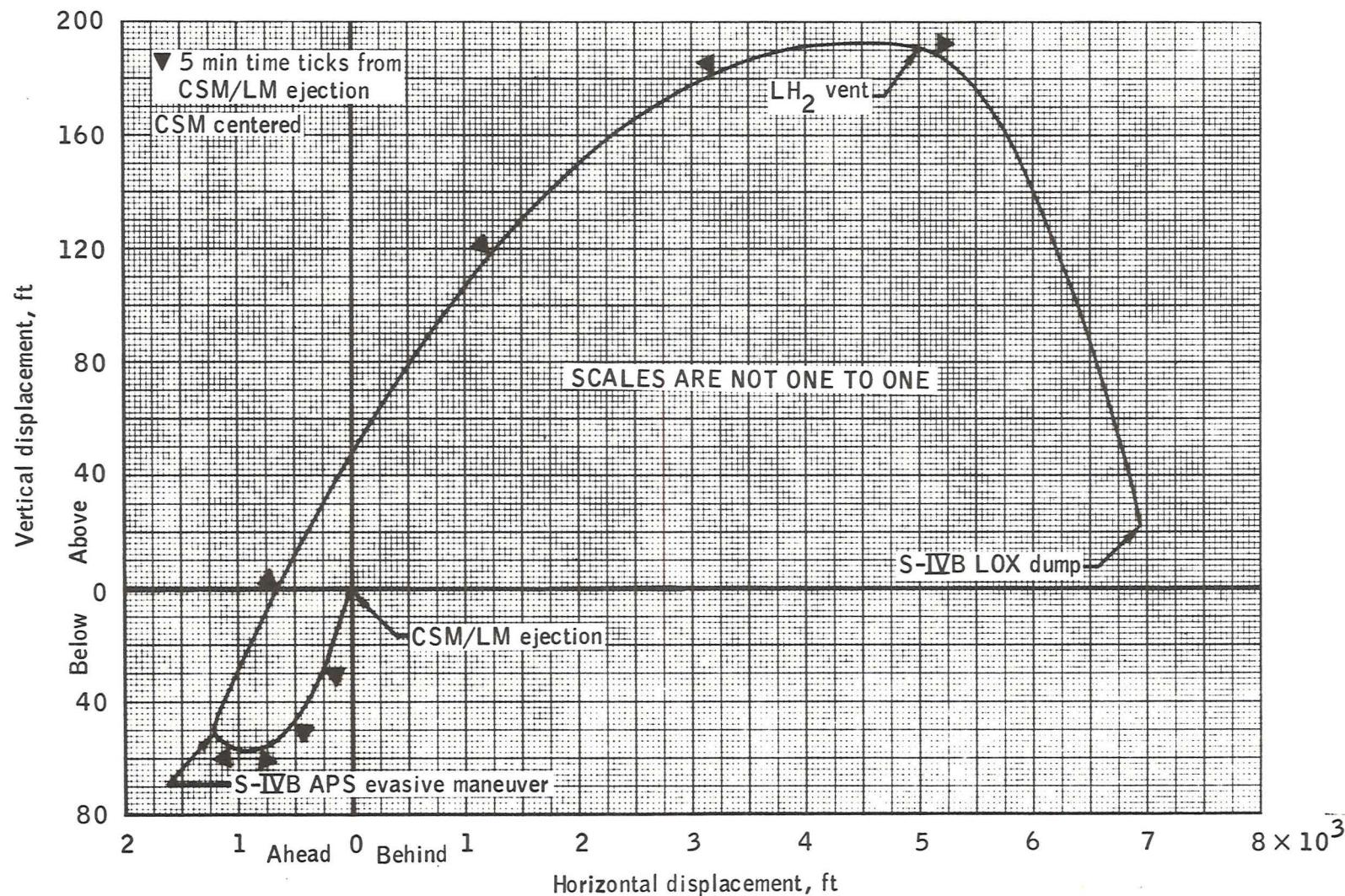
(a) Range versus time.

Figure 4.5-1.- Motion of the S-IVB relative to the spacecraft for the S-IVB evasive maneuver of Apollo 15.



(b) Cross range versus horizontal displacement.

Figure 4.5-1.- Continued.



(c) Vertical displacement versus horizontal displacement.

Figure 4.5-1.- Concluded.

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4.6 TRANSLUNAR COAST

4.6 Translunar Coast

A groundtrack of the translunar coast phase is shown in figure 4.6-6. Time histories of altitude and true anomaly for the first 10 hours of translunar coast are provided in figures 4.6-2 and 4.6-3. After TLI, the spacecraft is on a trajectory with a perilune altitude of 68.1 n. mi. Passive thermal control attitude will be maintained during most of the translunar coast phase. The PTC REFSMMAT is given in table 5-III.

Four midcourse correction maneuver points have been defined at the following times.

- a. TLI plus 9 hours (MCC-1)
- b. TLI plus 28 hours (MCC-2)
- c. LOI minus 22 hours (MCC-3)
- d. LOI minus 5 hours (MCC-4)

The midcourse correction strategy has been defined and documented through the Apollo Data Priority Coordination Office. The maneuvers are GNCS controlled, and external ΔV guidance is used. The PTC REFSMMAT (table 5-III) will be used for MCC-1, MCC-2, MCC-3, and MCC-4. The alignment criteria are presented in section 5.0.

The SC enters the lunar umbra approximately 62 minutes prior to LOI ignition but is back in sunlight 15 minutes before the time of ignition. ACN terminates approximately 8 minutes before TLI ignition, and there is no MSFN coverage until after the burn and the spacecraft appears on the eastern limb of the moon.

The duration of the translunar coast phase is 75 hours 36 minutes. However, a thorough review of mission design scans indicated that no even-integer day was possible without violation of other mandatory ground rules.

Geodetic altitude from translunar injection to LOI is shown in figure 4.6-4. Altitude above the lunar surface during the last 10 hours of translunar coast is shown in figure 4.6-5.

SIM bay door jettison occurs one half hour after the scheduled MCC-4 or approximately 4 1/2 hours before LOI. The CSM is pitched down 135° with respect to the local horizontal plane such that the SIM door is jettisoned forward and above the CSM velocity vector (at 45° below the local horizontal plane). In order for the jettison maneuver to be performed with the PTC REFSMMAT, a $30''$ local horizontal yaw is required

to reduce the middle gimbal angle from -68.95° (with 0° yaw) to -39.4° . This jettison attitude places the SIM door approximately 26 n. mi. above and 6 n. mi. behind the CSM at LOI and it continues in its hyperbolic trajectory until it exits the lunar sphere of influence.

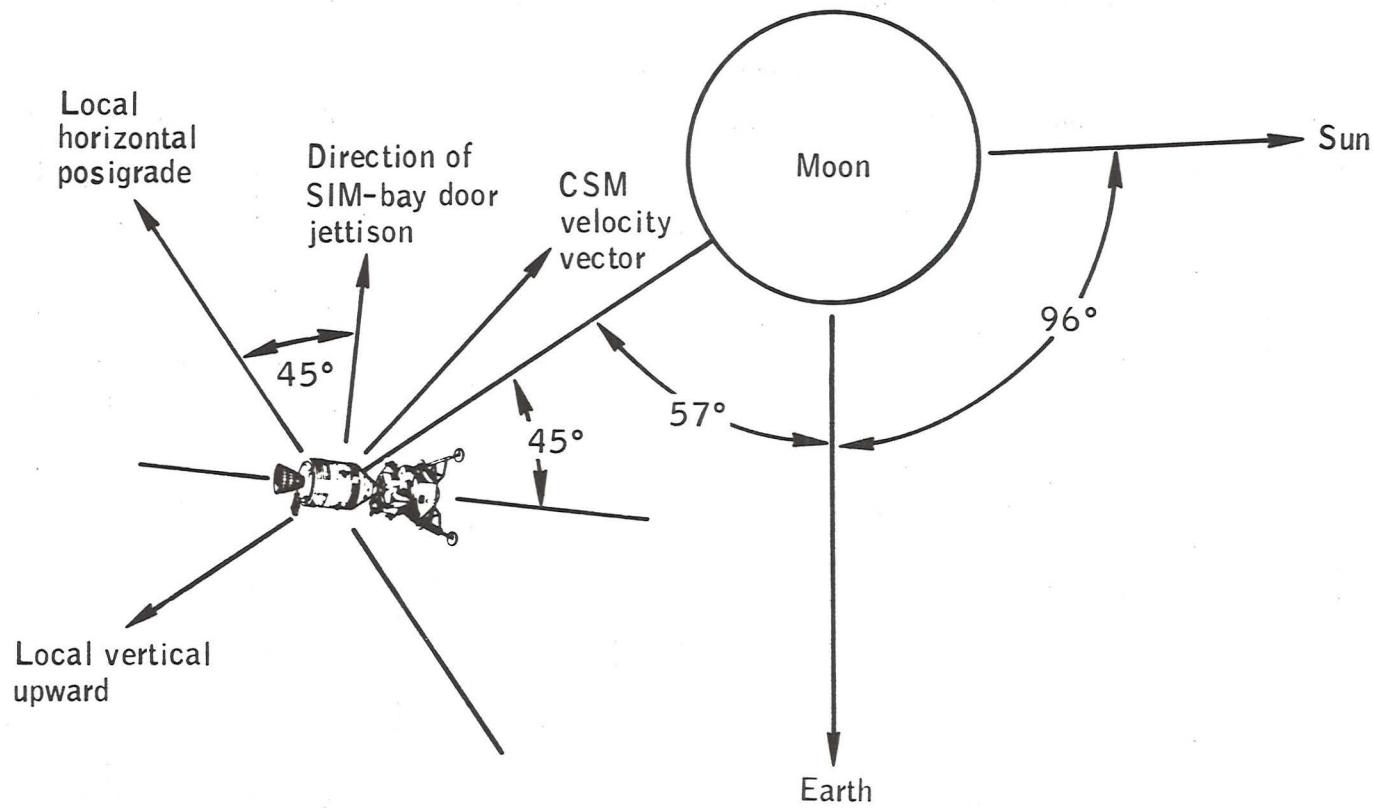


Figure 4.6-1.- Relative configuration of the sun, moon, earth and spacecraft for SIM-bay door jettison at LOI minus 4.5 hours.

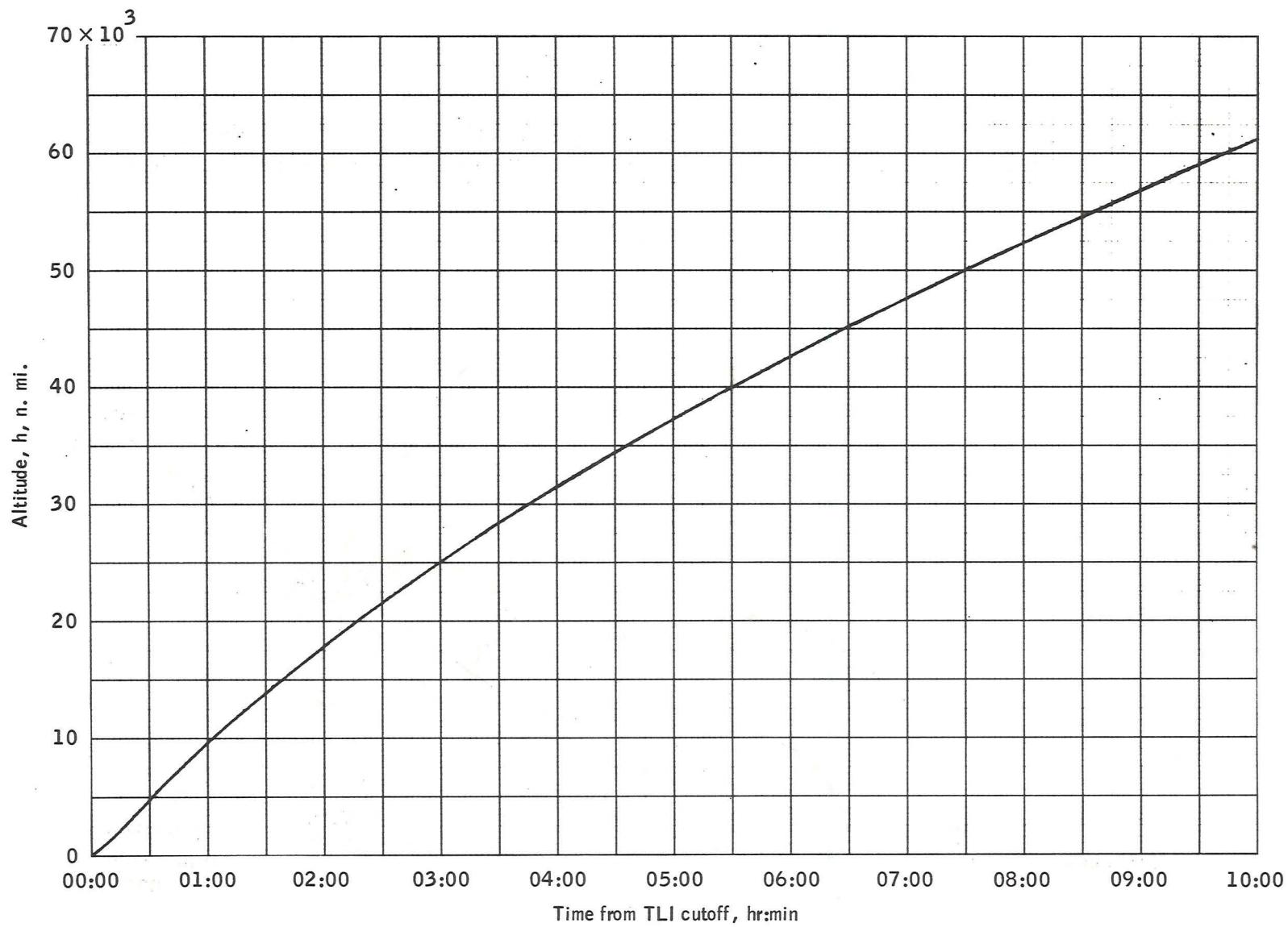


Figure 4.6-2.- Time history of altitude for first 10 hours of translunar coast.

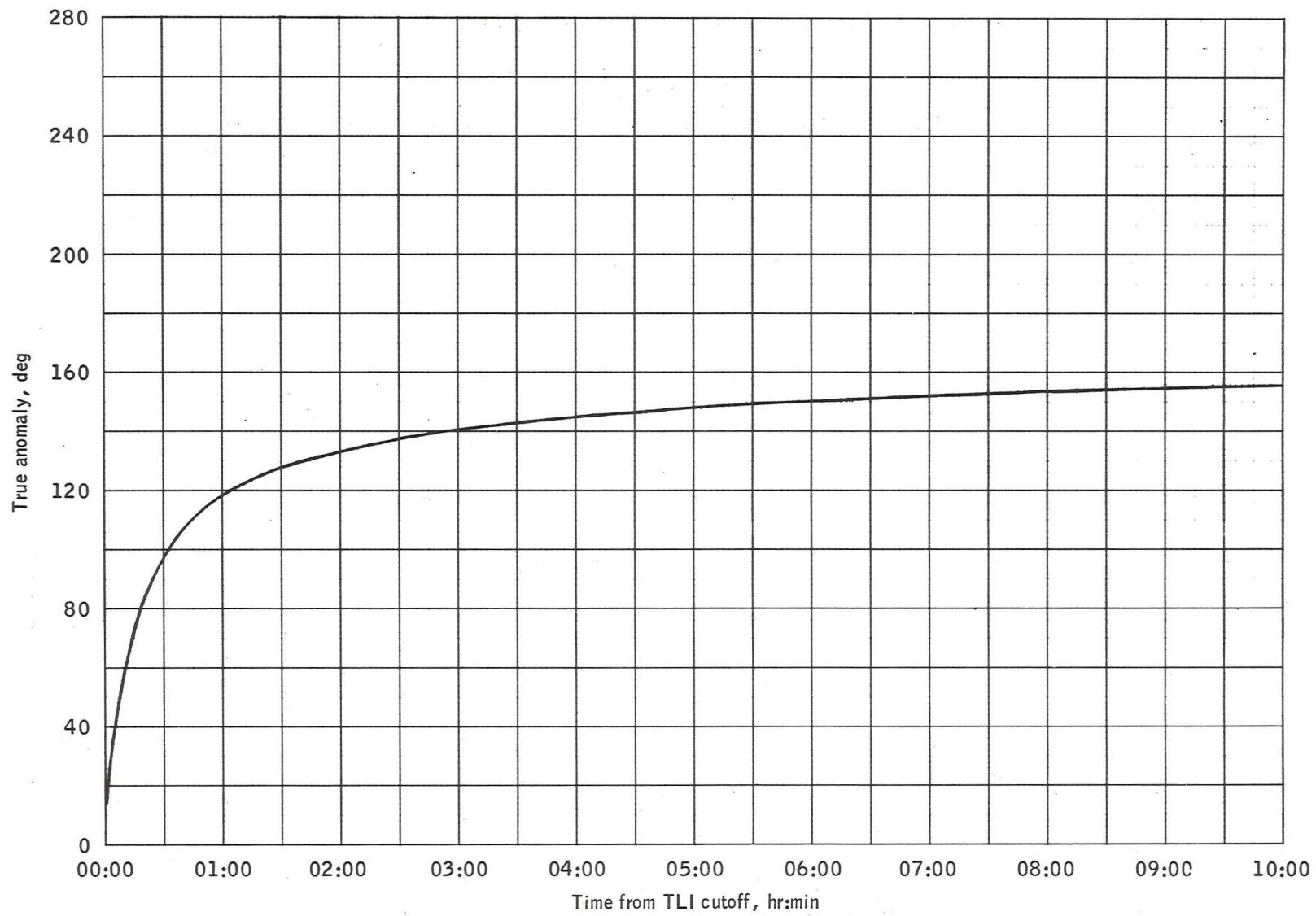


Figure 4.6-3.- Time history of true anomaly for first 10 hours of translunar coast.

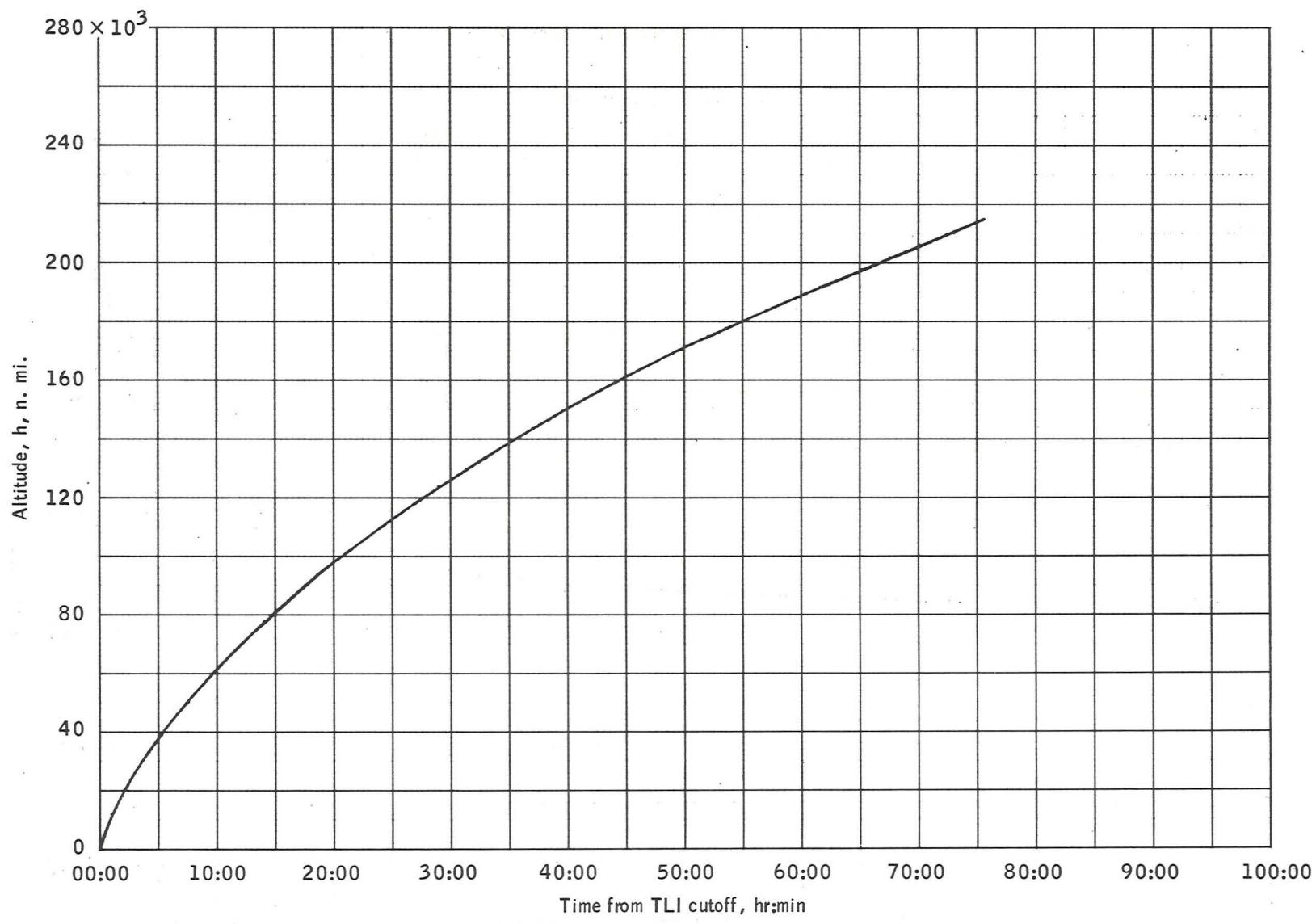


Figure 4.6-4.- Altitude time history from translunar injection to lunar orbit insertion.

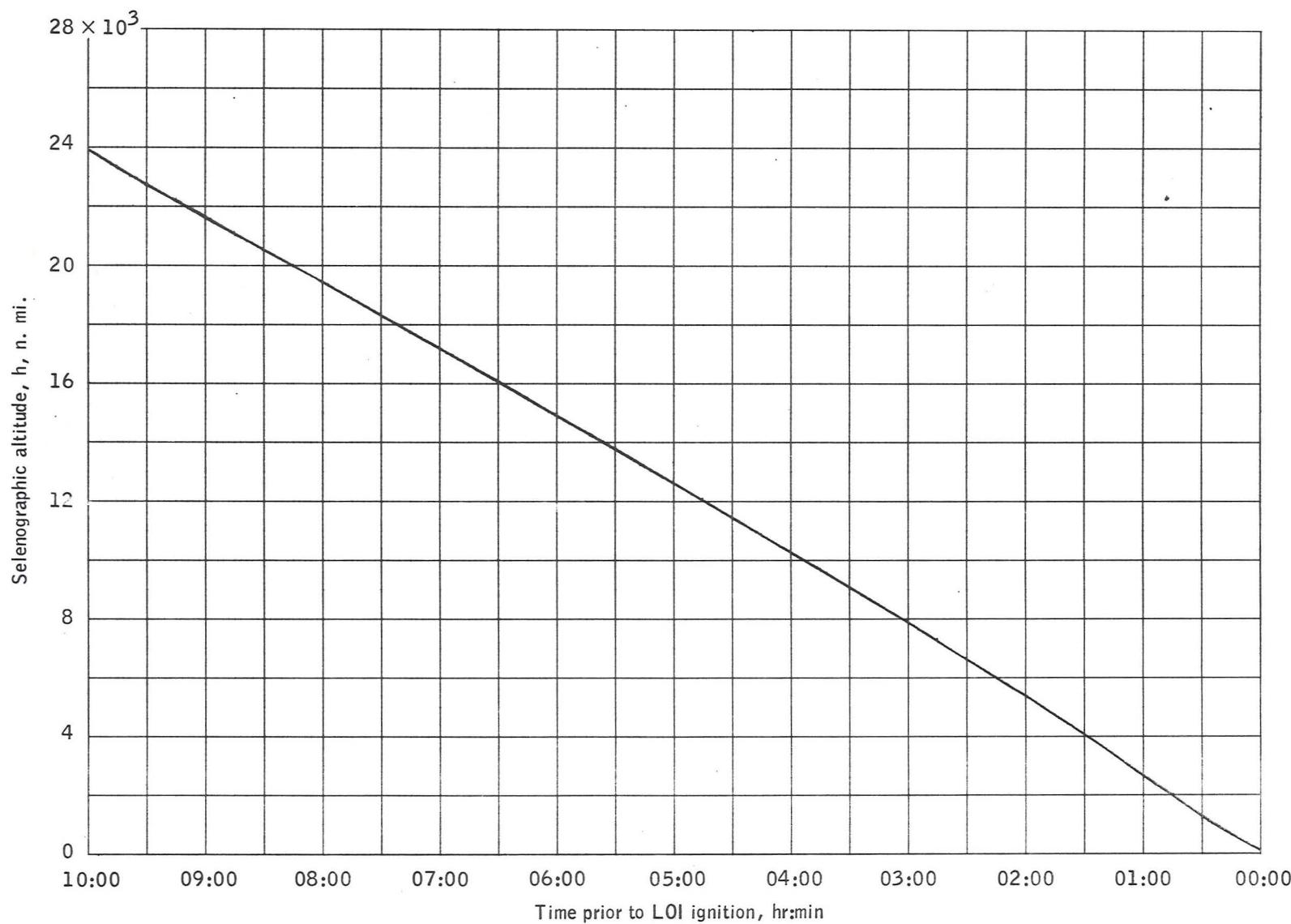


Figure 4.6-5.- Time history of altitude 10 hours prior to LOI ignition.

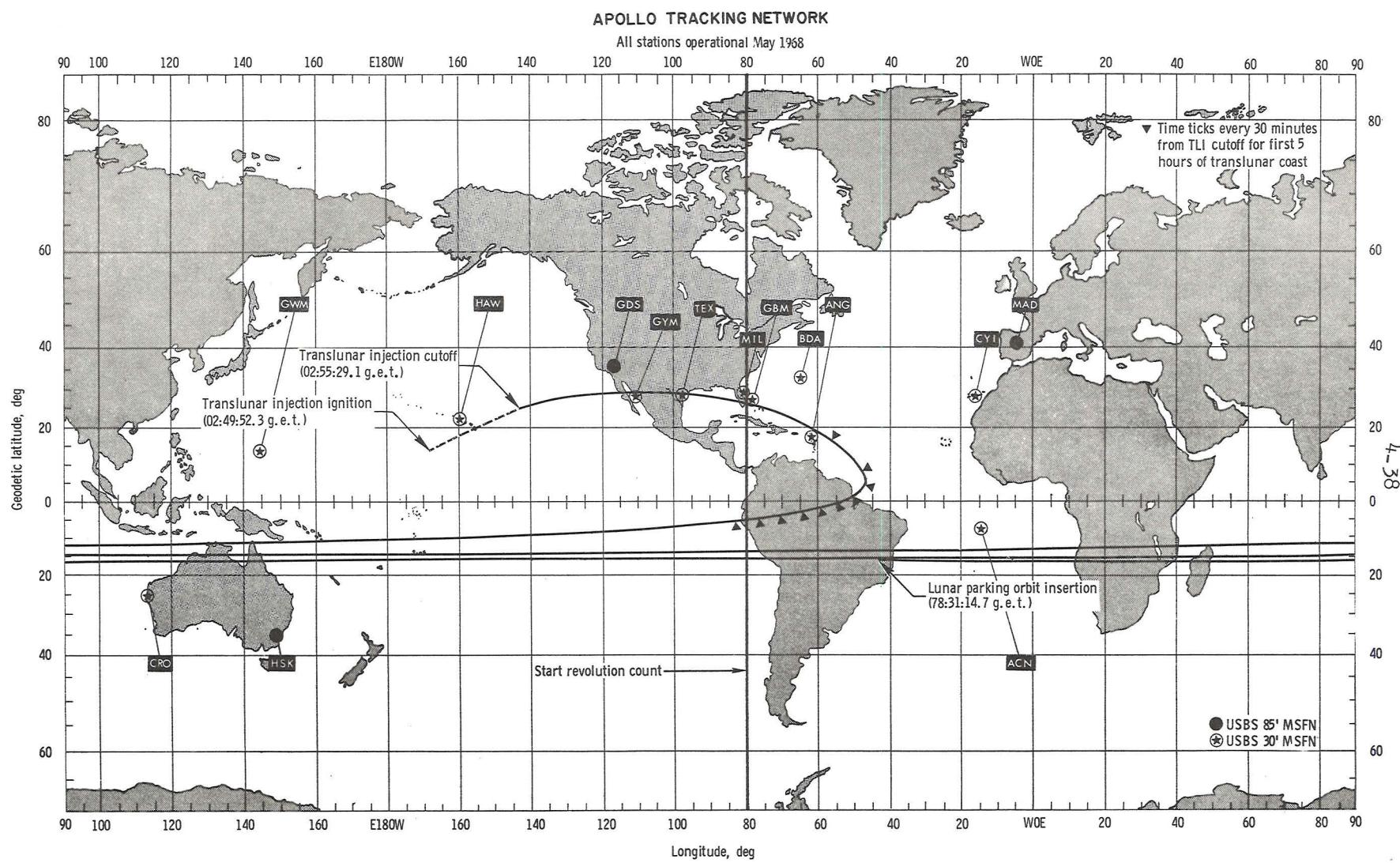


Figure 4.4-6. - Translunar coast groundtrack.

4.7 LUNAR ORBIT INSERTION

4.7 Lunar Orbit Insertion (LOI)

The LOI maneuver is designed to insert the CSM into approximately a 58- by 170-n. mi. lunar parking orbit (LPO). The lunar orbit insertion geometry is shown in figure 4.7-1, and the lunar orbit groundtrack from LOI to LM landing is shown in figure 4.7-2. A time history of trajectory parameters during the burn is presented in figure 4.7-3. The burn was simulated with external ΔV guidance. A description of the burn is as follows.

LOI burn initiation

Time, hr:min:sec, g.e.t.	78:31:14.7
Mass, lb	102 816.5
Altitude above LLS, n. mi.	95.0
Selenographic latitude, deg	-27.9
Selenographic longitude, deg	-169.9
Inertial velocity, fps	8170.9
Perilune altitude above LLS, n. mi.	68.1
Selenographic inclination, deg	30.0

LOI burnout - start LPO

Time, hr:min:sec, g.e.t.	78:37:46.8
Altitude above LLS, n. mi.	73.9
Selenographic latitude, deg	-21.7
Selenographic longitude, deg	163.2
Inertial velocity, fps	5411.2
Selenographic inclination, deg	26.0
Burn duration, sec	392.0
Inertial burn arc, deg	25.1
Plane change, deg	-7.9
ΔV , fps	2997.9
SPS propellant used, lb	26 400
Orbit period, hr:min:sec	02:08:22.8
Perilune altitude above LLS, n. mi.	58.3
Apolune altitude above LLS, n. mi.	170.0

The LOI burn parameters were computed without simulation of the SPS thrust buildup and tailoff. However, the effect of these is reflected in the burn parameters presented in the simulation data package (ref. 3).

The REFSMMAT used for the LOI burn is the LOI preferred REFSMMAT.

The target load for the LOI burn is given in table 5-IV. More detailed information about the burn, including reset point, navigation updates, and ignition gimbal angles, is given in reference 3.

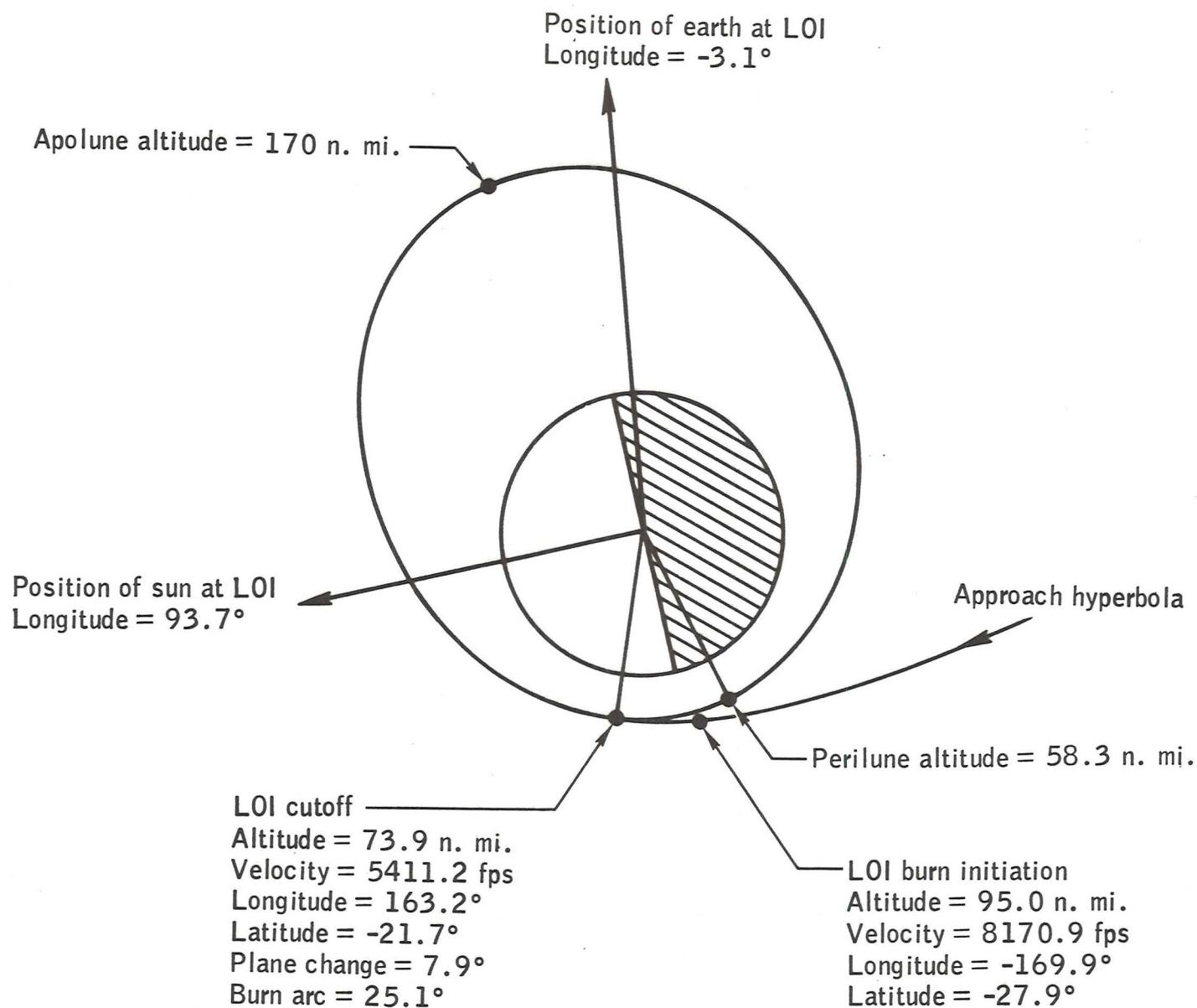
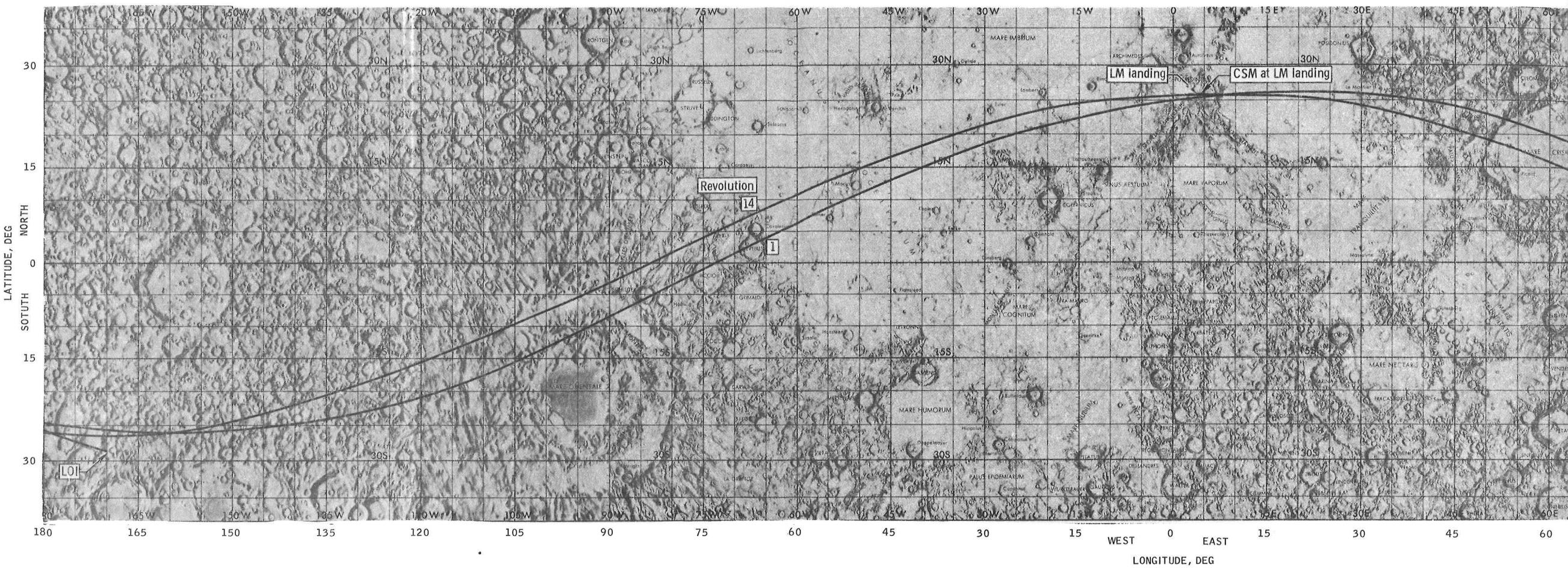


Figure 4.7-1.- LOI geometry.



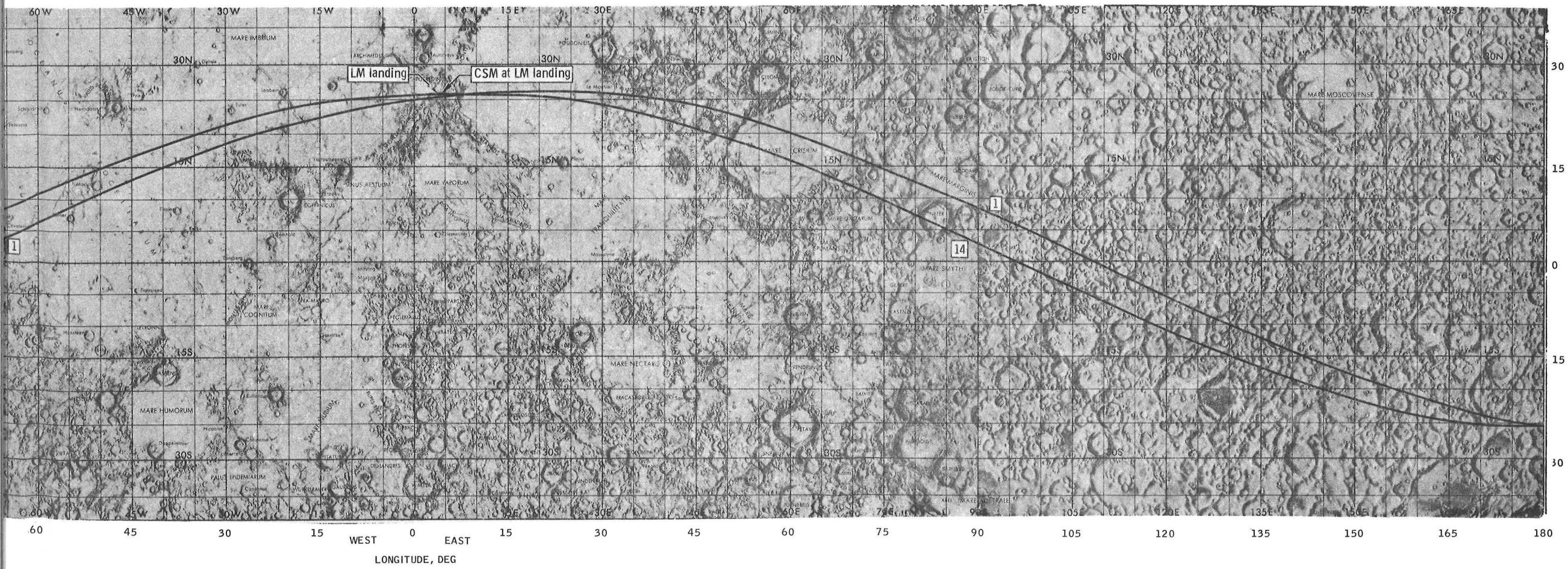
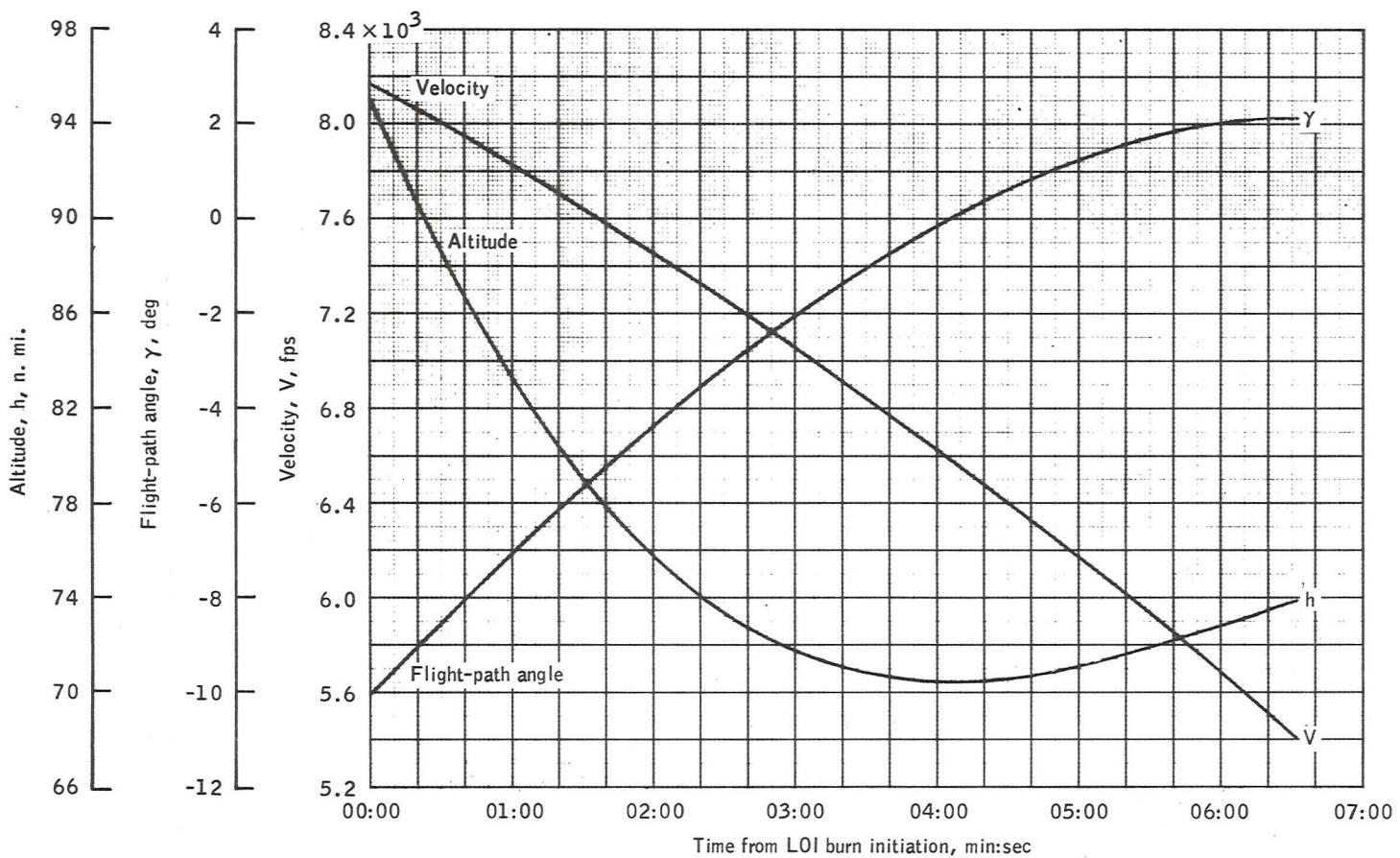
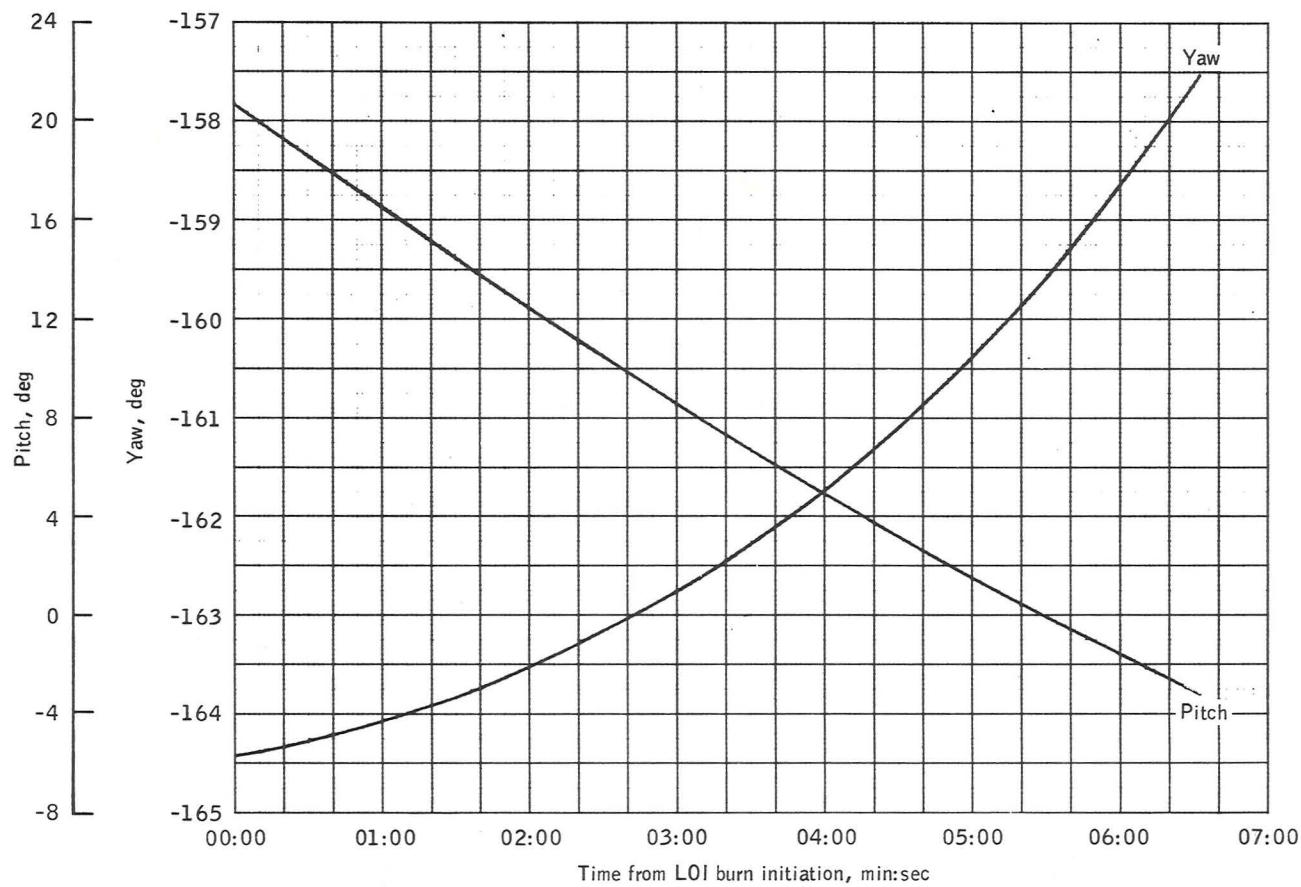


Figure 4.7-2. - Lunar orbit groundtrack from LOI to LM landing.



(a) Velocity, flight-path angle, and altitude versus time from LOI burn initiation.

Figure 4.7-3.- Time history of trajectory parameters for LOI.



(b) Local horizontal pitch and yaw versus time from LOI burn initiation.

Figure 4.7-3.- Concluded.

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4.8 DESCENT ORBIT INSERTION

4.8 Descent Orbit Insertion (DOI)

The DOI maneuver occurs after two revolutions in the 58- by 170-n. mi. orbit. The targeting is biased to place the spacecraft in an initial 9.6- by 58.4-n. mi. lunar orbit so that the predicted lunar potential perturbation will place the spacecraft in a 50 000-foot by 60-n. mi. orbit at PDI on rev 14. The orbit is designed so that the perilune is at 20.6°E selenographic longitude at PDI. The altitudes are relative to the landing site radius.

For the DOI burn, the landing REFSMMAT (table 5-V) is used, and the CSM is oriented heads down. The burn is initiated near perilune of the second revolution in the 58- by 170-n. mi. orbit. The target load for the DOI maneuver is presented in table 4.8-I. The characteristics of the burn are the following.

DOI burn initiation

Time, hr:min:sec, g.e.t.	82:39:32.5
Mass, lb	76 363.6
Altitude above LLS, n. mi.	58.4
Selenographic latitude, deg	-25.3
Selenographic longitude, deg	-148.7
Inertial velocity, fps	5491.4
Perilune altitude above LLS, n. mi.	58.4
Apolune altitude above LLS, n. mi.	169.8

DOI burnout

Time, hr:min:sec, g.e.t.	82:39:55.4
Altitude above LLS, n. mi.	58.4
Selenographic latitude, deg	-25.4
Selenographic longitude, deg	-150.0
Inertial velocity, fps	5283.7
Selenographic inclination, deg	26.0
Burn duration, sec	22.9
Inertial burn arc, deg	1.2
Plane change, deg	0.0
ΔV, fps	207.6
SPS propellant used, lb	1553.1
Orbit period, hr:min:sec	01:53:58.9
Perilune altitude above LLS, n. mi.	9.6
Apolune altitude above LLS, n. mi.	58.4

4.9 CSM/LM TRAJECTORY FROM
DOI TO PDI

4.9 CSM/LM TRAJECTORY FROM DOI TO PDI

The CSM/LM activities in lunar orbit prior to undock include the CSM DOI maneuver at the beginning of the third revolution. This maneuver is performed approximately 4 hours after S-IVB impact. Undocking and separation are performed at $100^{\text{h}}13^{\text{m}}56^{\text{s}}$ g.e.t. (approximately 17 hr 30 min after DOI). IVT to the LM is begun approximately 2 1/2 hours prior to undocking.

Activity	Revolution number	Time, hr:min:, g.e.t.
LOI	Beginning of 1	hr:min:, g.e.t. 78:38
DOI	End of 2	82:40
Begin rest period	4	86:00
End rest period	9	94:30
Begin IVT to LM	10	97:40
Undocking and separation	12	100:14

4.9.1 CSM/LM undock and separation.- The undocking and separation maneuver is performed as a single maneuver to separate the LM and CSM in preparation for the LM descent. The maneuver occurs at 6.0°S and 110.5°E during the twelfth orbit 4.45 hours before landing. The required data for this maneuver are given in table 5-V.

Undocking is accomplished by simultaneously releasing a set of clamps that allows springs to push the two spacecraft apart. Immediately after undocking, the CSM performs a manual maneuver directed radially downward toward the center of the moon to achieve a total ΔV of 1.0 fps. This maneuver provides an increase in LM-CSM separation distance.

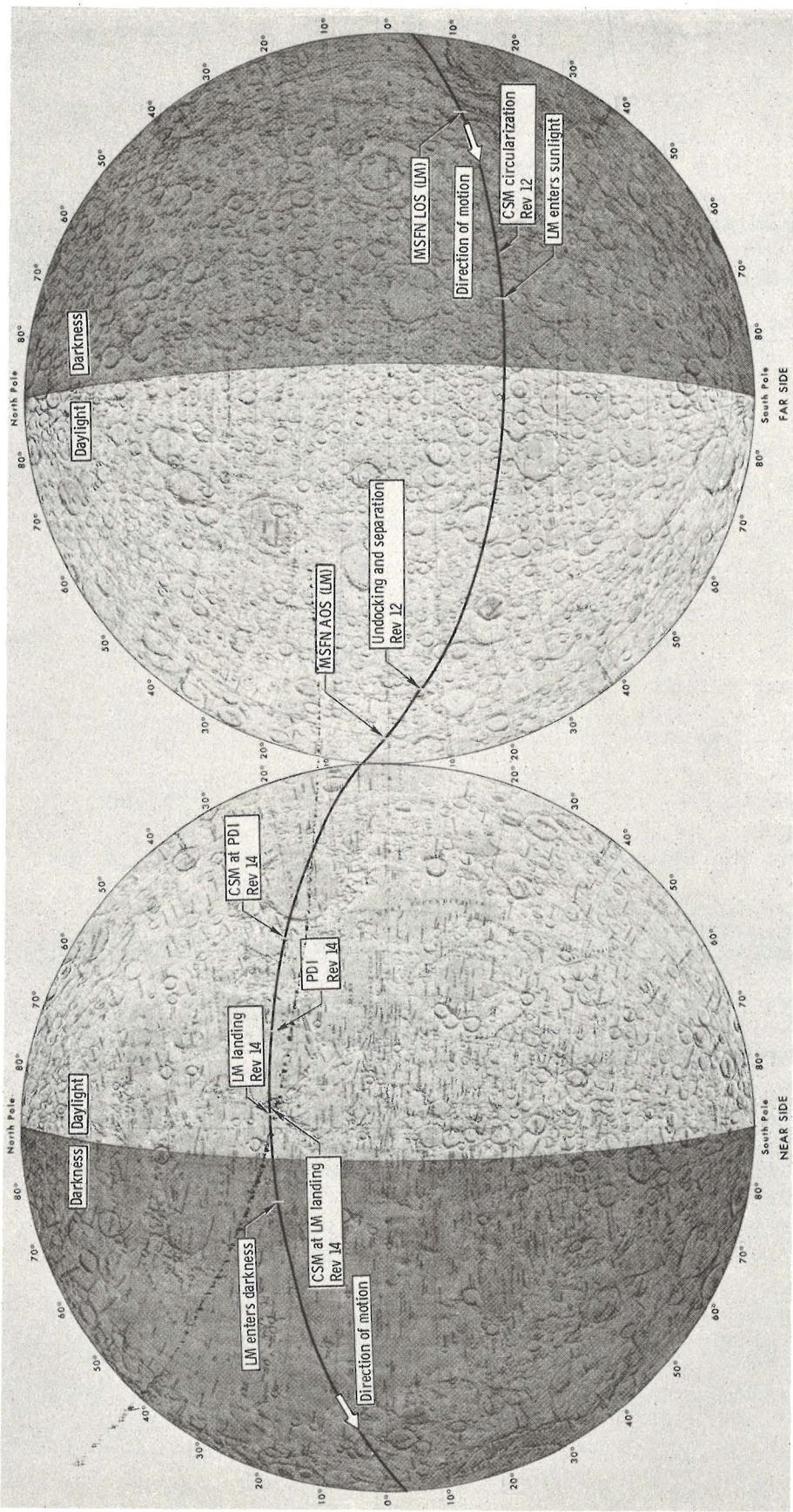
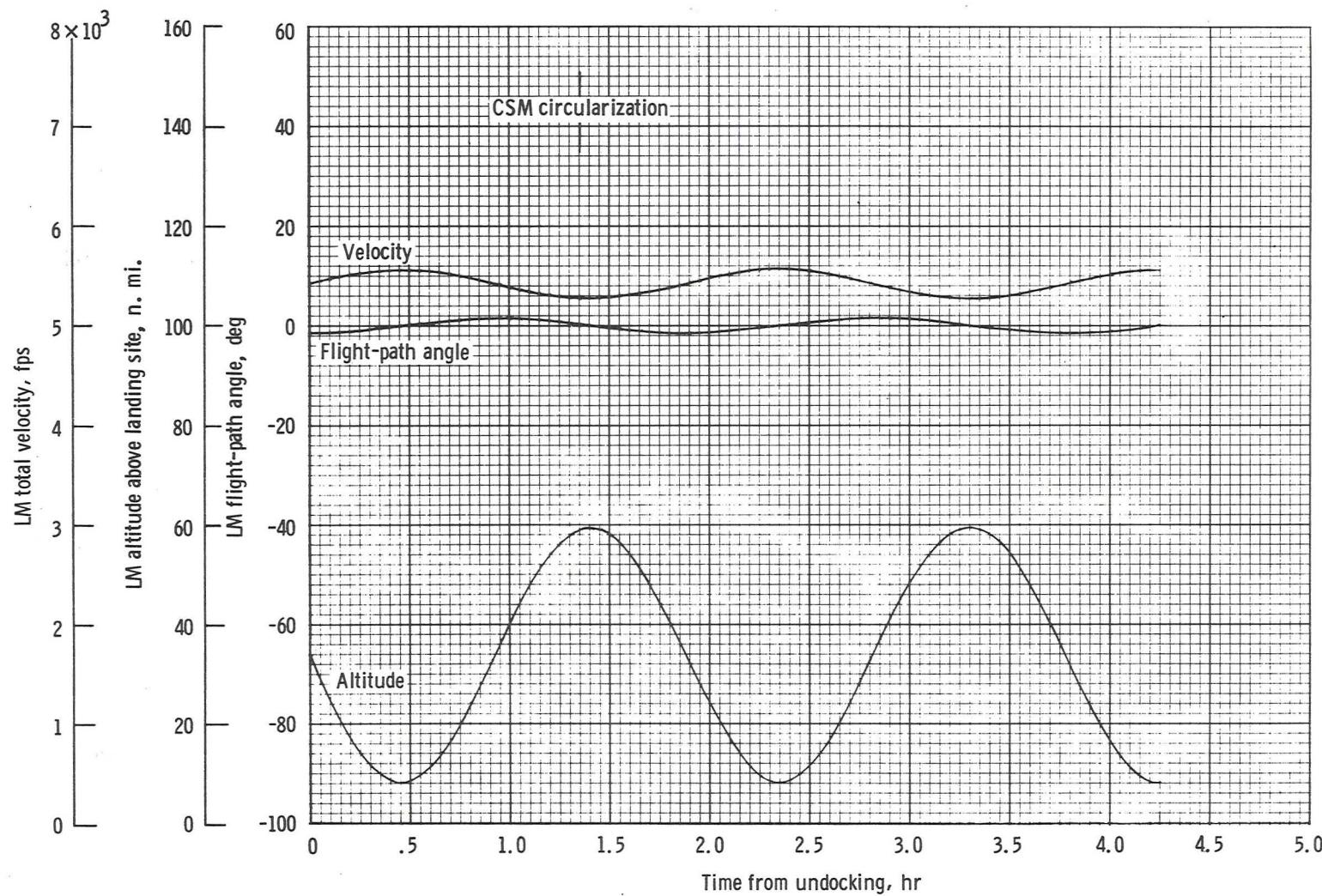
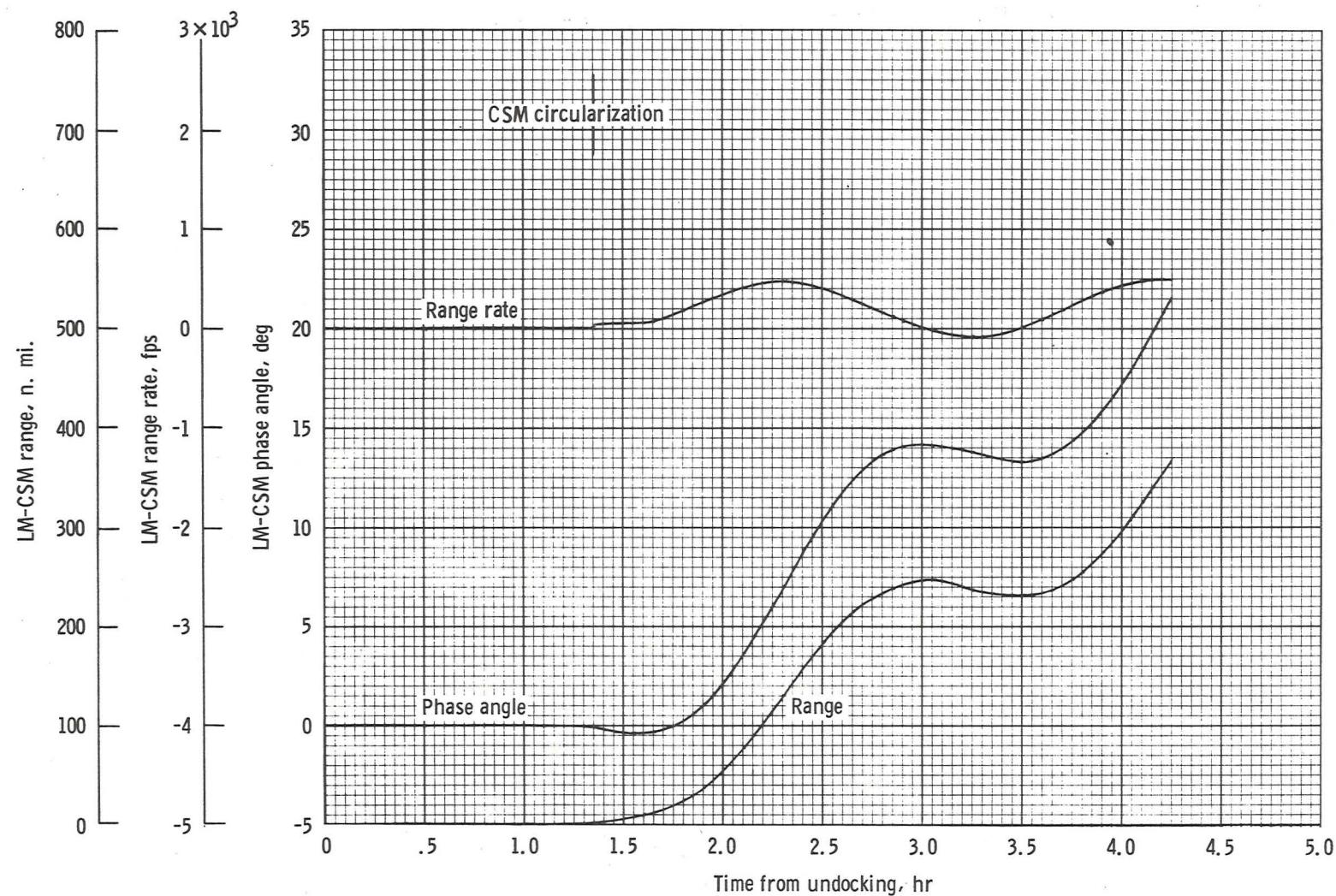


Figure 4.9-1. - LM and CSM events from undocking to landing.



(a) LM total velocity, altitude above landing site, and flight-path angle.

Figure 4.9-2.- Time history of LM and LM-CSM trajectory parameters from undocking to PDI .



(b) LM-CSM range, range rate, and phase angle.

Figure 4.9-2.- Concluded.

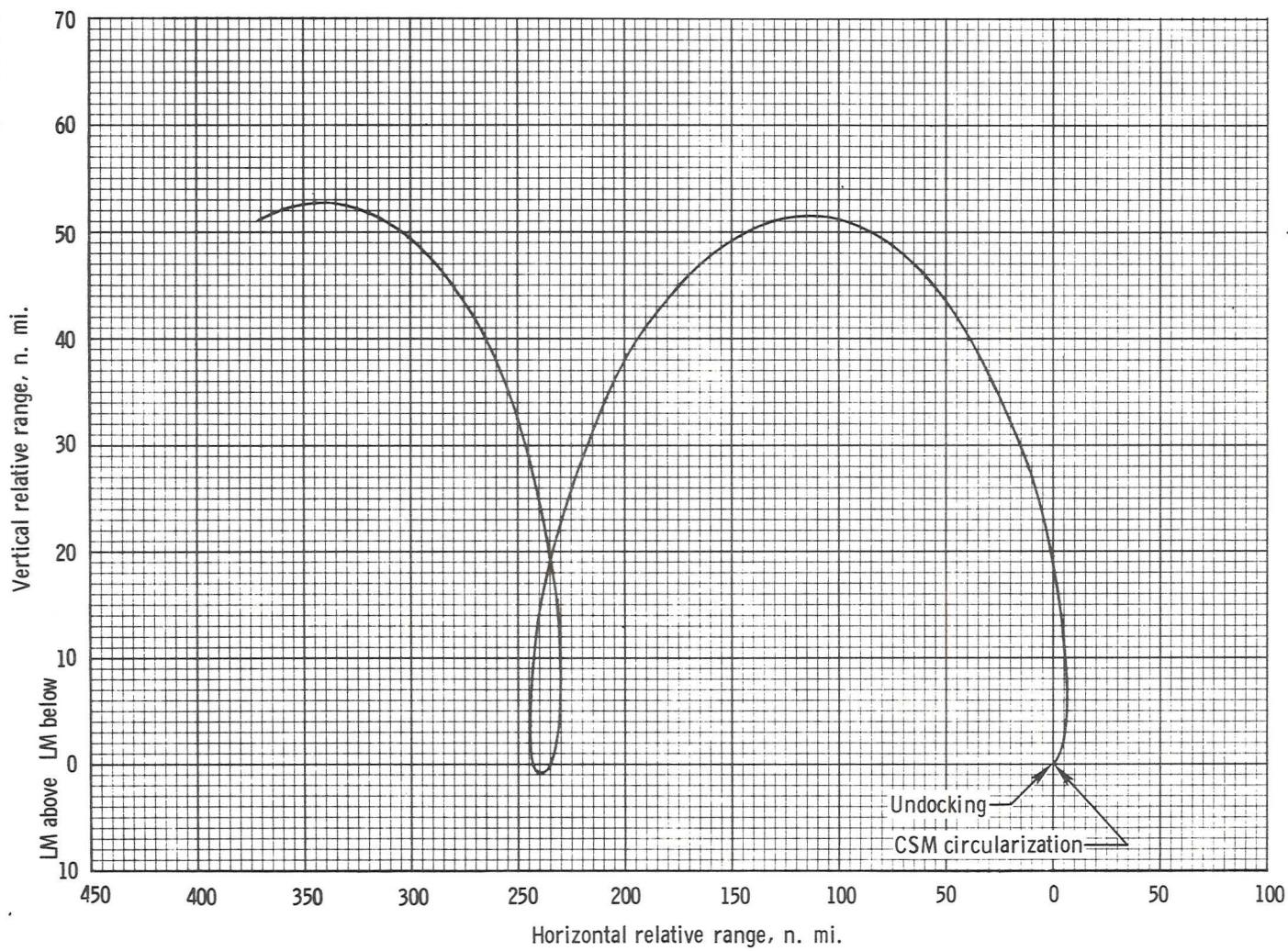


Figure 4.9-3.- LM-CSM relative motion from undocking to PDI (curvilinear coordinate system).

4.10 LM TRAJECTORY FROM
PDI TO LANDING

4.10 LM TRAJECTORY FROM PDI TO LANDING

This section describes LM powered descent to the landing site at Hadley.

4.10.1 Powered descent.- The LM powered descent is designed to transfer the LM from the perilune of a 64.4- by 54.6-n. mi. orbit to a soft landing on the lunar surface at the Hadley landing site (latitude 26.07°N, longitude 3.65°E). The central angle traversed from PDI to landing is 19°. The maneuver is a controlled guidance maneuver consisting of three phases, the braking phase, the approach (or visibility) phase, and the landing phase. A summary of the descent events is shown in figure 4.10-1.

4.10.2 Braking phase.- The braking phase is designed for efficient reduction of orbital velocity. The phase begins with a 7.5-second ullage performed with the LM RCS to settle the DPS propellants. The DPS is then ignited and burned at the minimum throttle setting (approximately 10 percent) for 26 seconds to allow time for the DPS engine gimbal to trim through the center of gravity. The ullage and trim are performed at the constant inertial attitude required by PGNCS guidance at DPS ignition. After the trim the DPS is throttled to maximum thrust and remains at this setting for most of the phase; however, during the final 2 minutes of the phase, the DPS is throttled for guidance control.

To maintain continuous S-band communication during the powered descent, the spacecraft attitude must include a 50° left yaw from pre-PDI to 3 minutes after ignition (see fig. 4.10-8). At 3 minutes the spacecraft is returned to 0° yaw (windows-up attitude), which is the proper attitude for the landing radar to be used. The yaw maneuver does not affect the time of landing radar incorporation (approximately 4 min after PDI).

The guidance logic for the braking phase is designed to satisfy a predetermined set of targets. Because of guidance sensitivity, however, as time-to-go (TGO) (to achieve targets) becomes small (less than 62 sec), the guidance automatically switches from the braking phase targets (table 5-V) to the approach phase targets (table 5-V).

4.10.3 Approach phase.- The approach phase, which begins at an altitude of approximately 7000 feet (high gate), provides for pilot visual monitoring of the approach to the lunar surface; that is, the guidance is targeted to provide a 30° pitch transient at high gate to immediately bring the landing area into view in the forward window. The guidance provides an attitude that will maintain the landing area in the commander's window until late in the approach phase. The quadratic acceleration guidance law is used in the approach phase and the braking

phase. The approach phase altitude target (table 5-V) is approximately 158 feet. The approach phase, however, is considered to be operationally terminated 80 seconds before automatic landing (low gate, approximately 700-ft altitude), when the landing phase is initiated.

4.10.4 Landing phase.- The landing phase is designed to provide continued visual assessment of the landing site and to provide capability for pilot takeover from the automatic control. The guidance law and targets at this point are unchanged because the approach phase targets have been selected to satisfy these additional constraints. Under the automatic guidance, a vertical descent is initiated when TGO becomes less than 12 seconds. The vertical descent portion of the landing phase starts at an altitude of 200 feet and terminates at landing. The vertical descent guidance is a velocity nulling routine that nulls the horizontal velocity while accepting the commanded vertical rate from the rate-of-descent (ROD) switch. A 5-fps rate of descent is used throughout the automatically controlled vertical descent. This vertical rate is controllable by use of the ROD switch or by manual throttle control. The rate will normally be adjusted so that the touchdown rate is less than 5 fps.

4.10.5 Graphical description of the powered descent.- The LM lunar groundtrack from PDI to landing is shown in figure 4.10-2. Events indicated are PDI, FTP, yaw to vertical, landing radar altitude, landing radar velocity, throttle recovery, high gate, and landing.

The time histories of the LM and LM-CSM trajectory parameters from PDI to landing are shown in figure 4.10-3. Major events indicated are throttle recovery, high gate, low gate, and landing. In figure 4.10-3(a), time histories of the LM total velocity, altitude above the landing site, and flight-path angle are shown. The time histories of the LM-CSM range, range rate, and phase angle are shown in figure 4.10-3(b). Time histories of the LM thrust angle and FDAI pitch angle are shown in figure 4.10-3(c). The thrust angle is the angle between the thrust vector and the local vertical, and the FDAO pitch angle is the angle between the X-body axis and the X-platform axis. The time histories of the commanded and actual thrust profiles are shown in figure 4.10-3(d). The two profiles are different because the DPS is not throttled between 63-percent thrust and FTP (100 percent is 10 500 lb of thrust) because the engine is physically degraded when the intermediate thrust values are used. Therefore, the throttle is set at the maximum level, FTP (approximately 93-percent thrust), until the commanded value is below 57-percent thrust; then the DPS is throttled to the commanded values for the remainder of the descent. The 57-percent level allows a margin for throttle operation without requiring a pulse back to the FTP.

In figure 4.10-4, the LM altitude versus altitude rate profile from PDI to landing is shown. Events indicated are PDI, throttle recovery, high gate, low gate, and landing.

Shown in figure 4.10-5 is the S-band gimbal profile, which indicates the position the S-band antenna must maintain for S-band communication. The vehicle blockage pattern is also shown. Any antenna position inside this pattern will cause loss of communication because parts of the LM hardware will reflect or interfere with the signal. If no preventive action is taken, body blockage will occur during the early part of the Apollo 15 powered descent. Therefore, a 50° left yaw maneuver is required from pre-PDI to 3 minutes after PDI. At 3 minutes the spacecraft is returned to 0° yaw (spacecraft windows-up attitude) at the rate of 5 deg/sec. If the crew chose to initiate the powered descent in a windows-down attitude the body blockage would be similar to the blockage for the windows-up attitude.

Events indicated in figure 4.10-5 are PDI, yaw to vertical, landing radar accepted, throttle recovery, high gate, low gate, and landing.

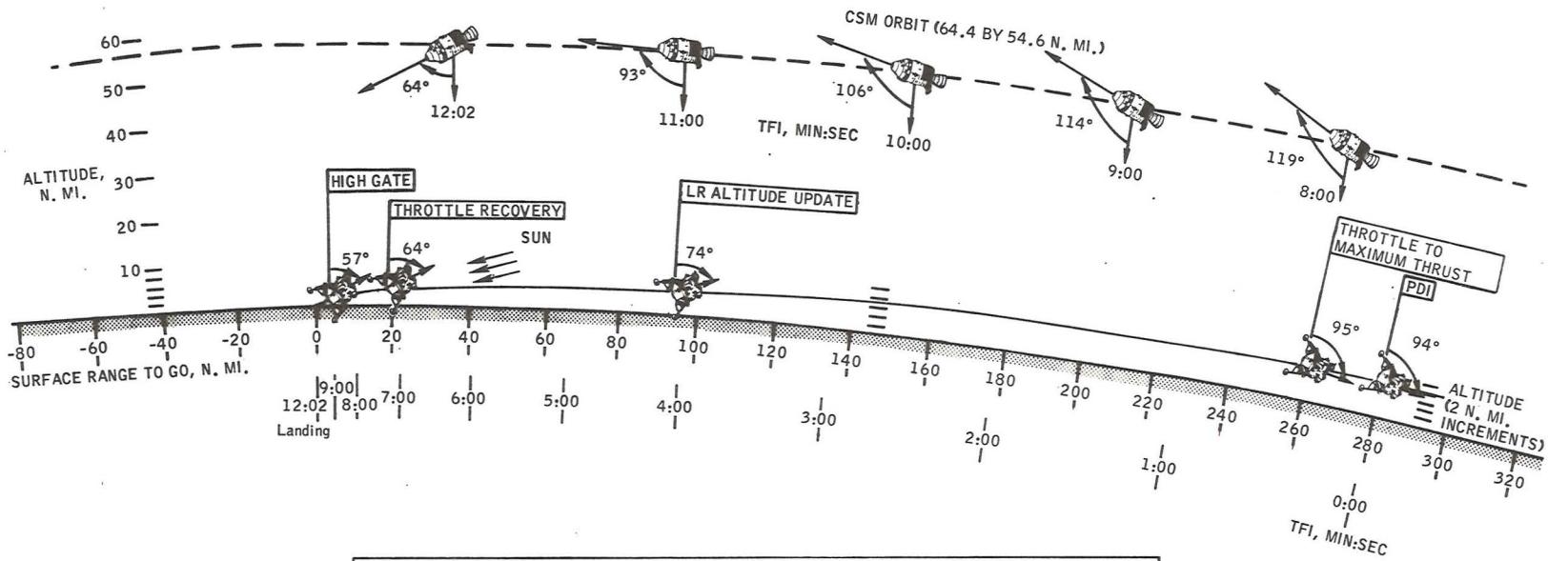
To decrease the effects of the local terrain on the descent trajectory, a simple terrain model (called an a priori model) has been introduced into the guidance system. This model allows the guidance to compensate in advance for general terrain variations, thus providing a smoother trajectory. Figure 4.10-6 shows the terrain for the nominal -91° approach azimuth into the landing site at Hadley. The a priori model (a series of slopes) has been superimposed over the actual terrain.

A map of the Apennine mountain region and the Hadley Rille that surround the landing area is shown in figure 4.10-7. The LM approach path is shown from a surface range of approximately 19 n. mi. to the landing site.

An approach phase summary from high gate to low gate is presented in figure 4.10-8. The LM landing point designator (LPD) and LM altitude above the landing site are shown as functions of surface range to the landing site. A table presents the LM altitude rate, thrust angle, and horizontal velocity as functions of time from high gate.

A map showing the topography in the immediate vicinity of the landing site at Hadley is presented in figure 4.10-9. The LM approach path is shown from a surface range of approximately 10 000 feet to the landing site.

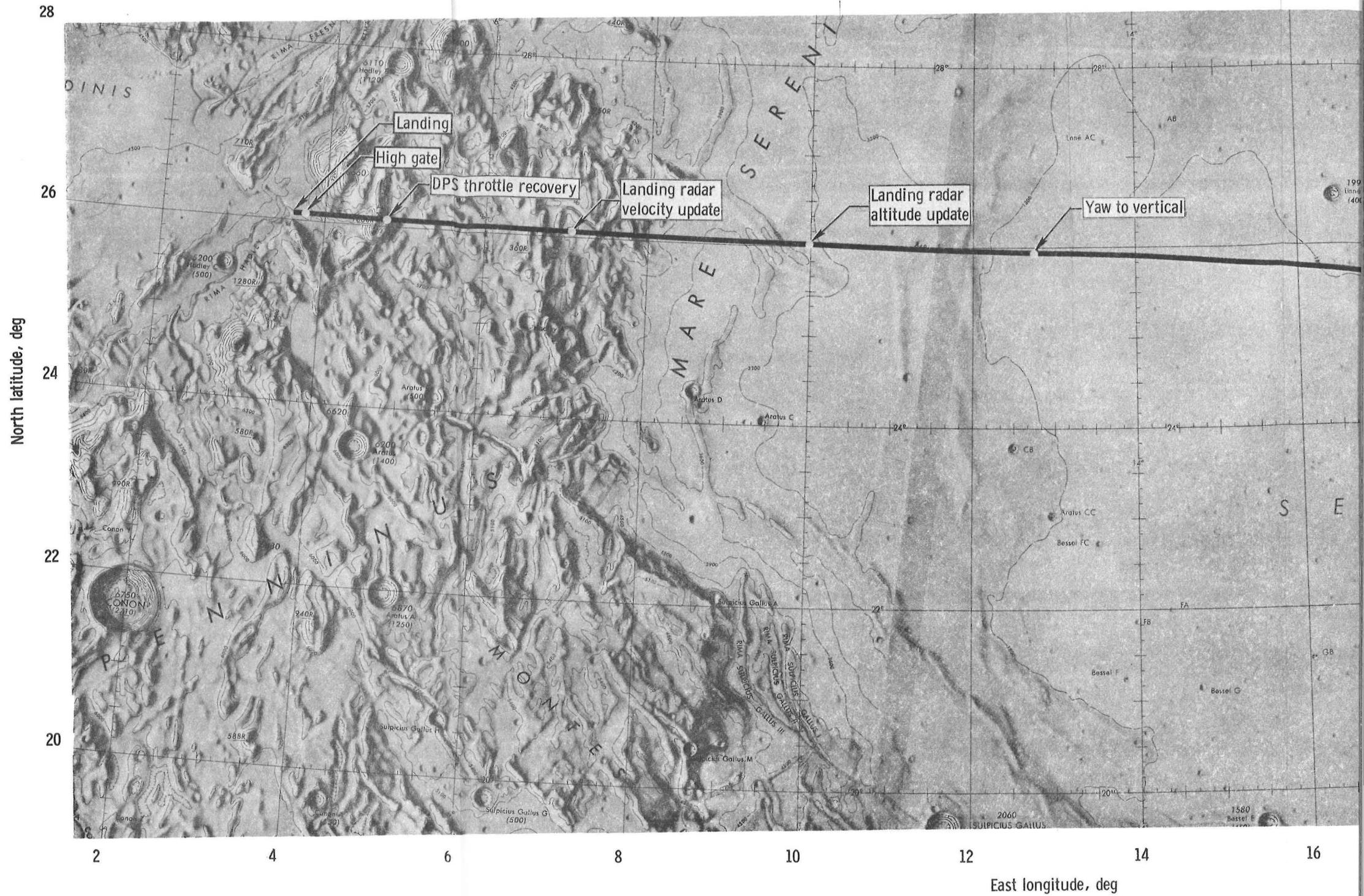
A landing phase summary (from low gate to landing) is presented in figure 4.10-10. The LM LPD and LM altitude are shown as functions of surface range to the landing site. The LM altitude versus altitude rate profile and the APS abort boundary are also presented. The table presents the LM thrust angle and horizontal velocity as functions of time from low gate.



SUMMARY					
EVENT	TFI, MIN:SEC	V _I , FPS	\dot{H} , FPS	H, FT	ΔV , FPS
POWERED DESCENT INITIATION	0:00	5562	-5	50 087	0
THROTTLE TO MAXIMUM THRUST	0:26	5534	-4	49 979	28
YAW TO VERTICAL	3:00	4111	-58	44 040	1468
LANDING RADAR ALTITUDE UPDATE	4:06	3444	-67	39 878	2159
LANDING RADAR VELOCITY UPDATE	5:34	2500	-85	33 623	3167
THROTTLE RECOVERY	7:24	1163	-80	22 950	4597
HIGH GATE	9:24	318	-162	7 029	5640
LOW GATE	10:42	66 (76)*	-23	694	6241
LANDING	12:02	-15 (0)*	-5	5	6698

* (HORIZONTAL VELOCITY RELATIVE TO SURFACE)

Figure 4.10-1.- Powered descent profile.



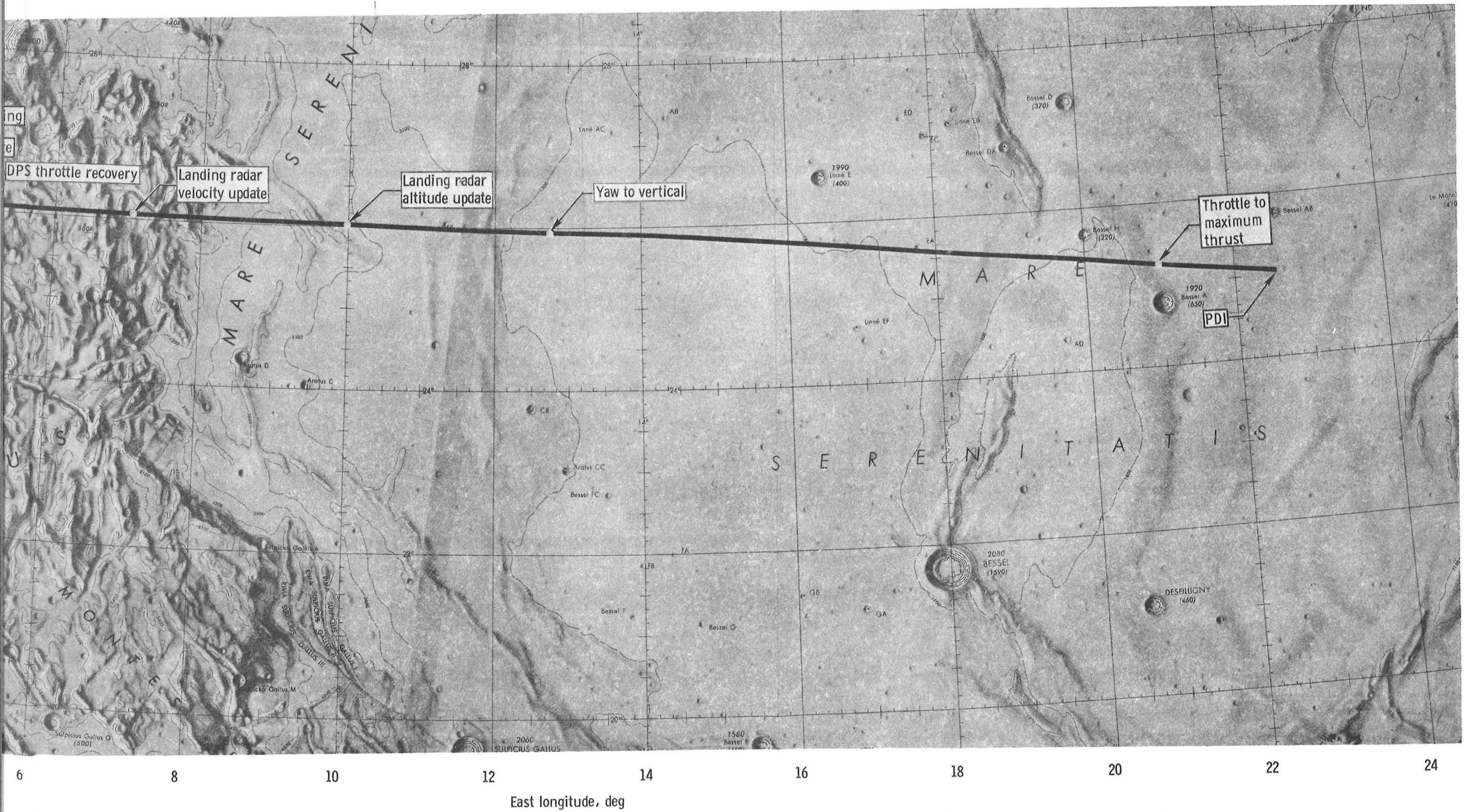
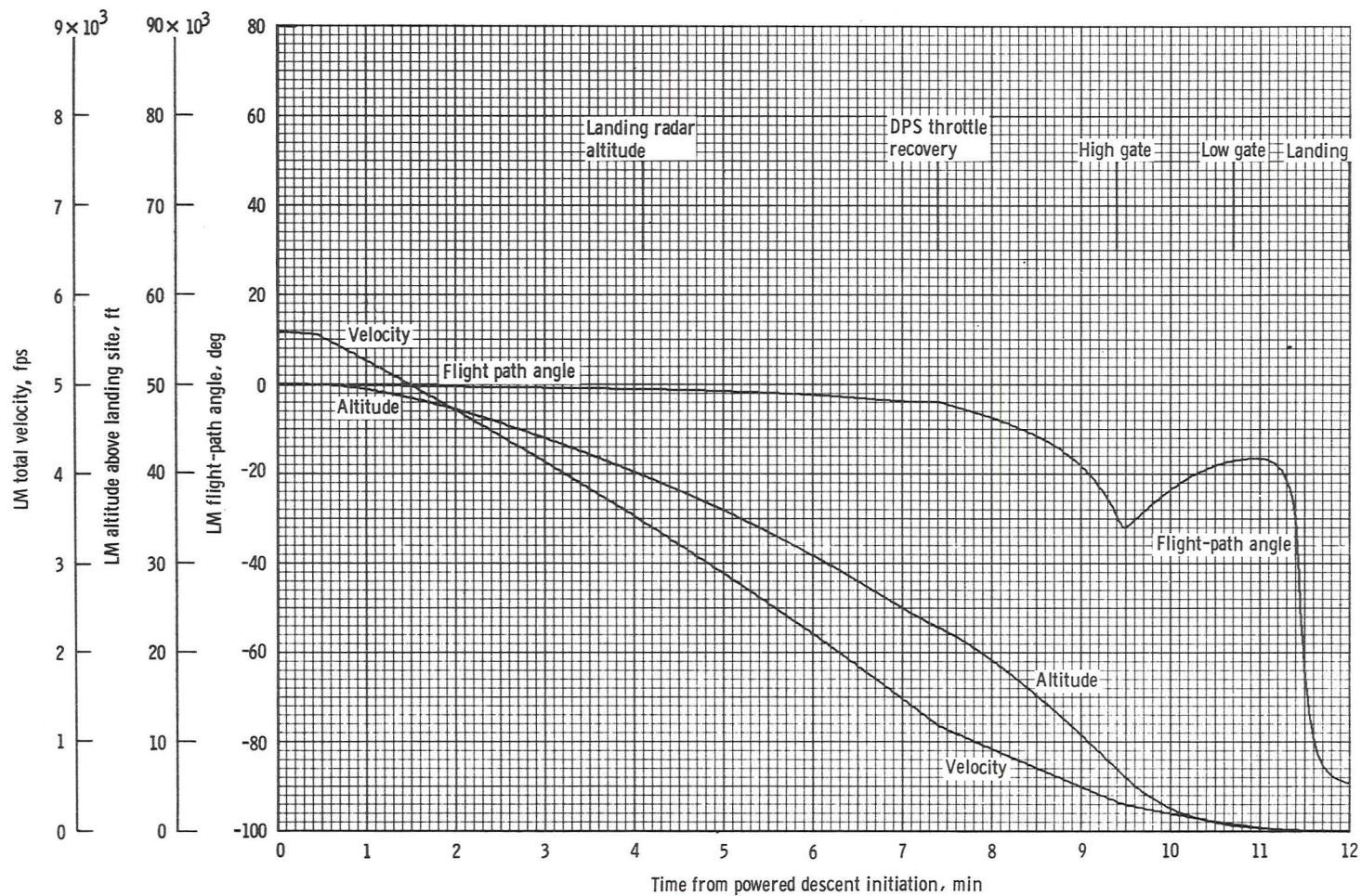
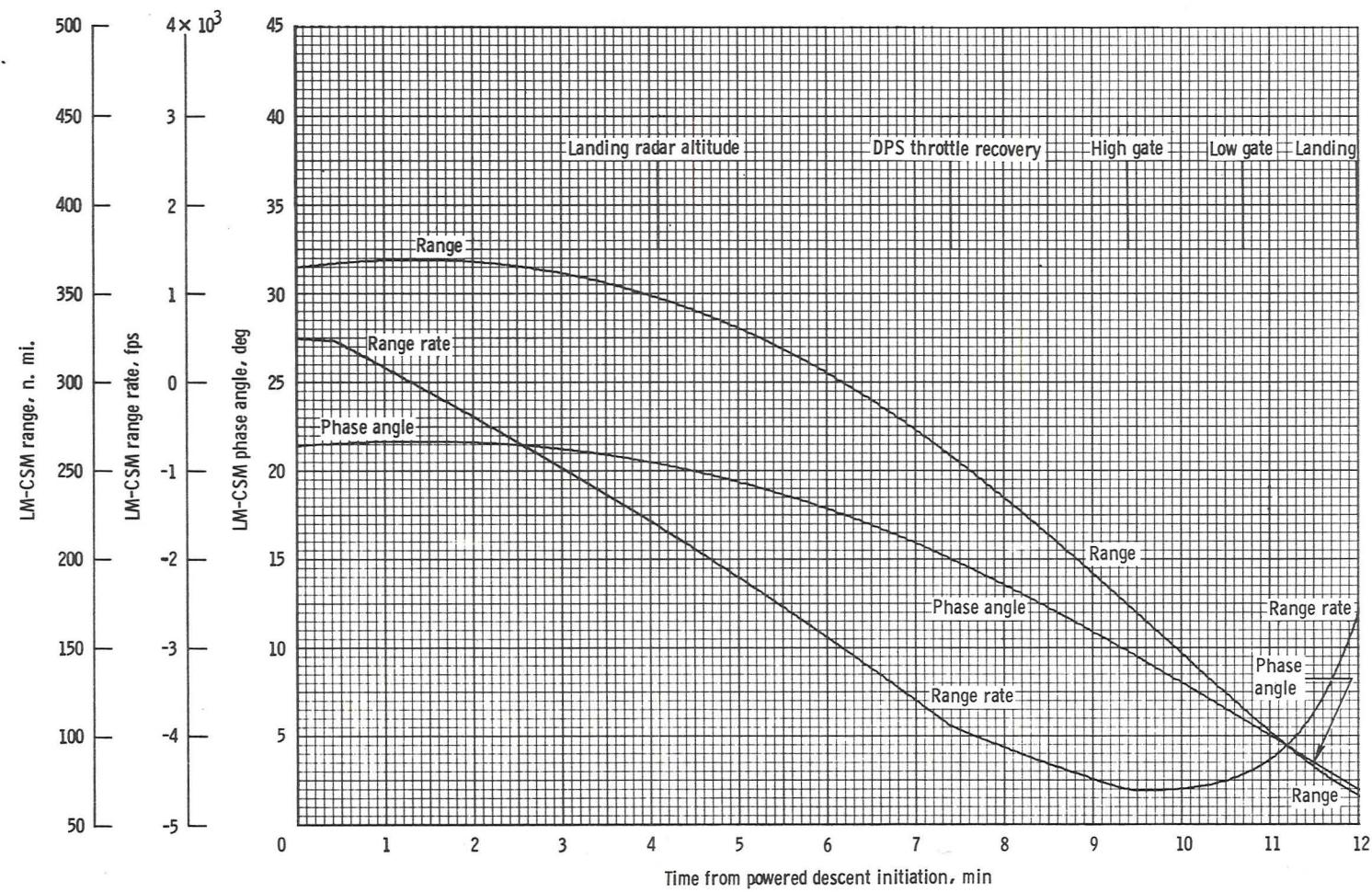


Figure 4.10-2-- LM powered descent groundtrack.



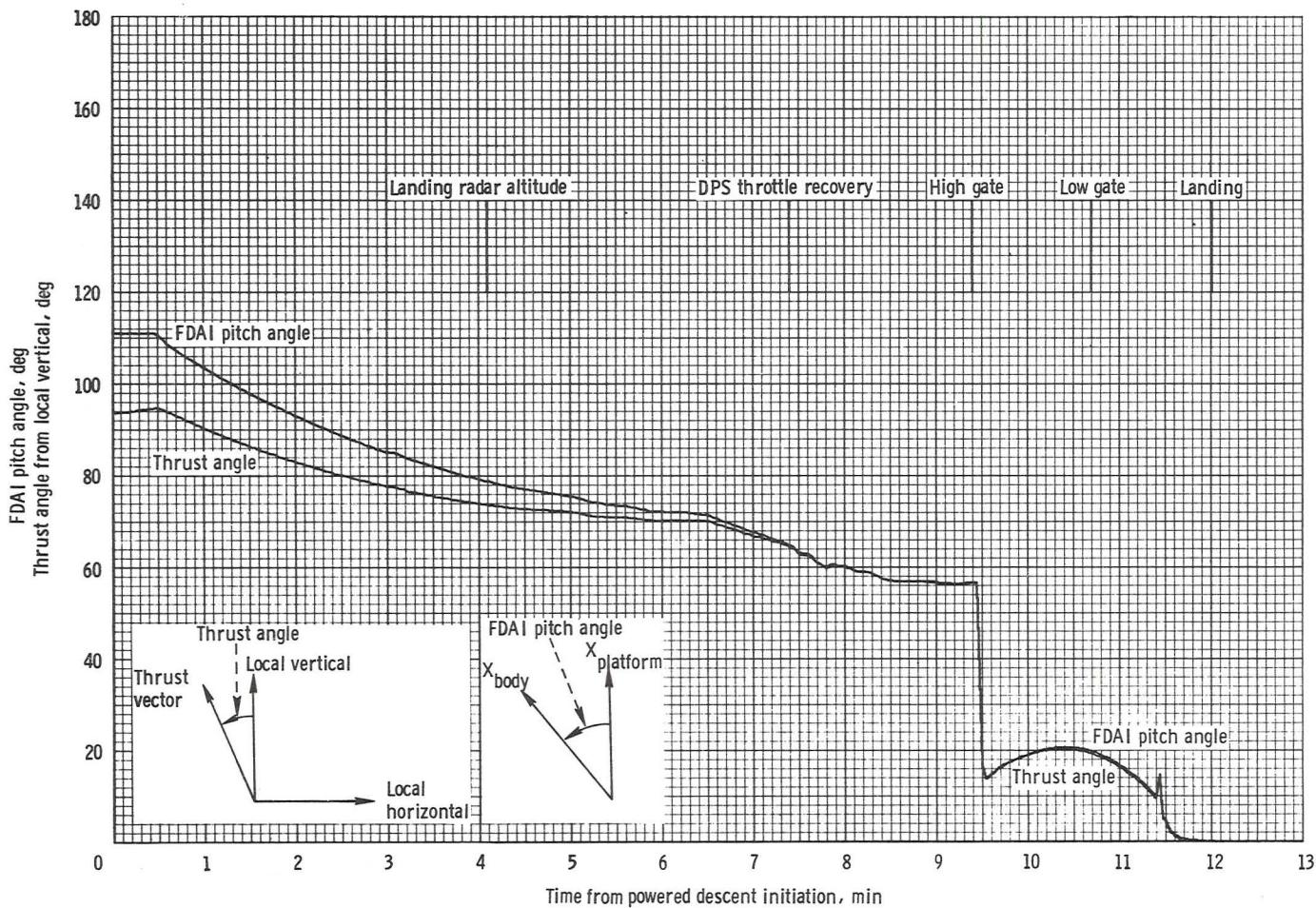
(a) LM velocity, altitude, and flight-path angle.

Figure 4.10-3. - Time histories of LM and LM-CSM trajectory parameters from PDI to landing.



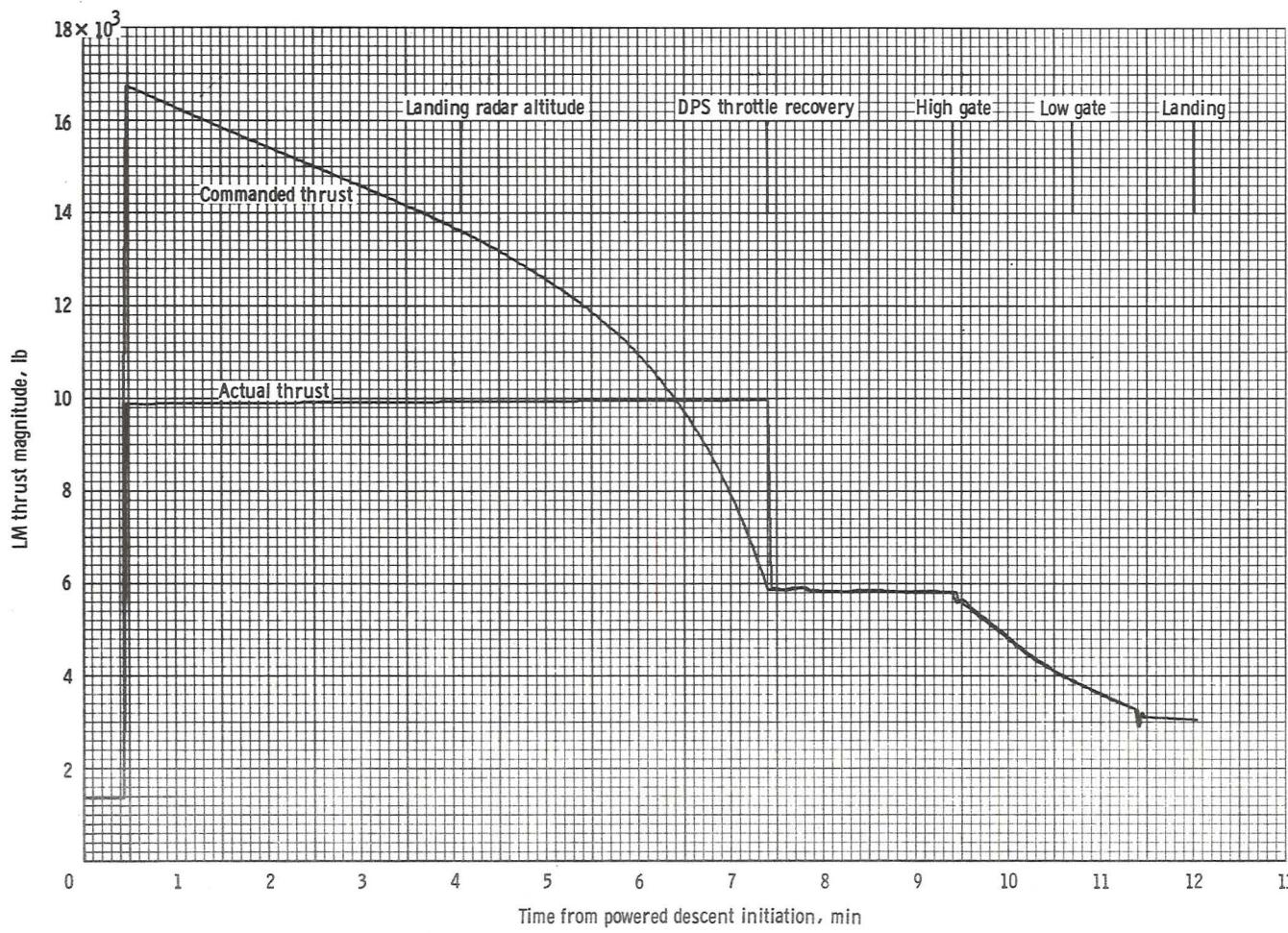
(b) LM-CSM range, range rate, and phase angle.

Figure 4.10-3.- Continued.



(c) FDAO pitch angle and thrust angle from local vertical.

Figure 4.10-3.- Continued.



(d) LM thrust magnitude.

Figure 4.10-3. - Concluded.

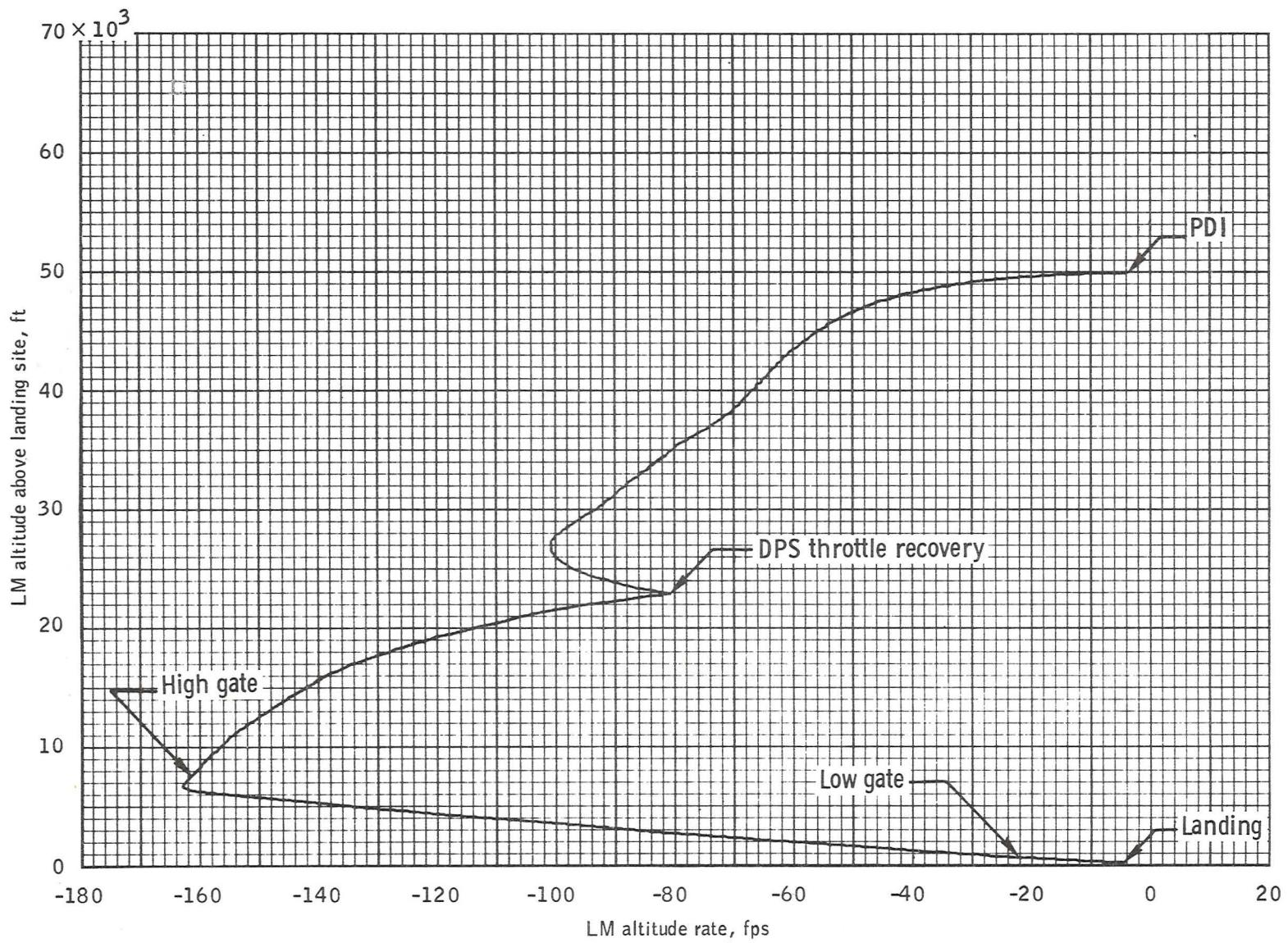


Figure 4.10-4.- Altitude above landing site versus altitude rates.

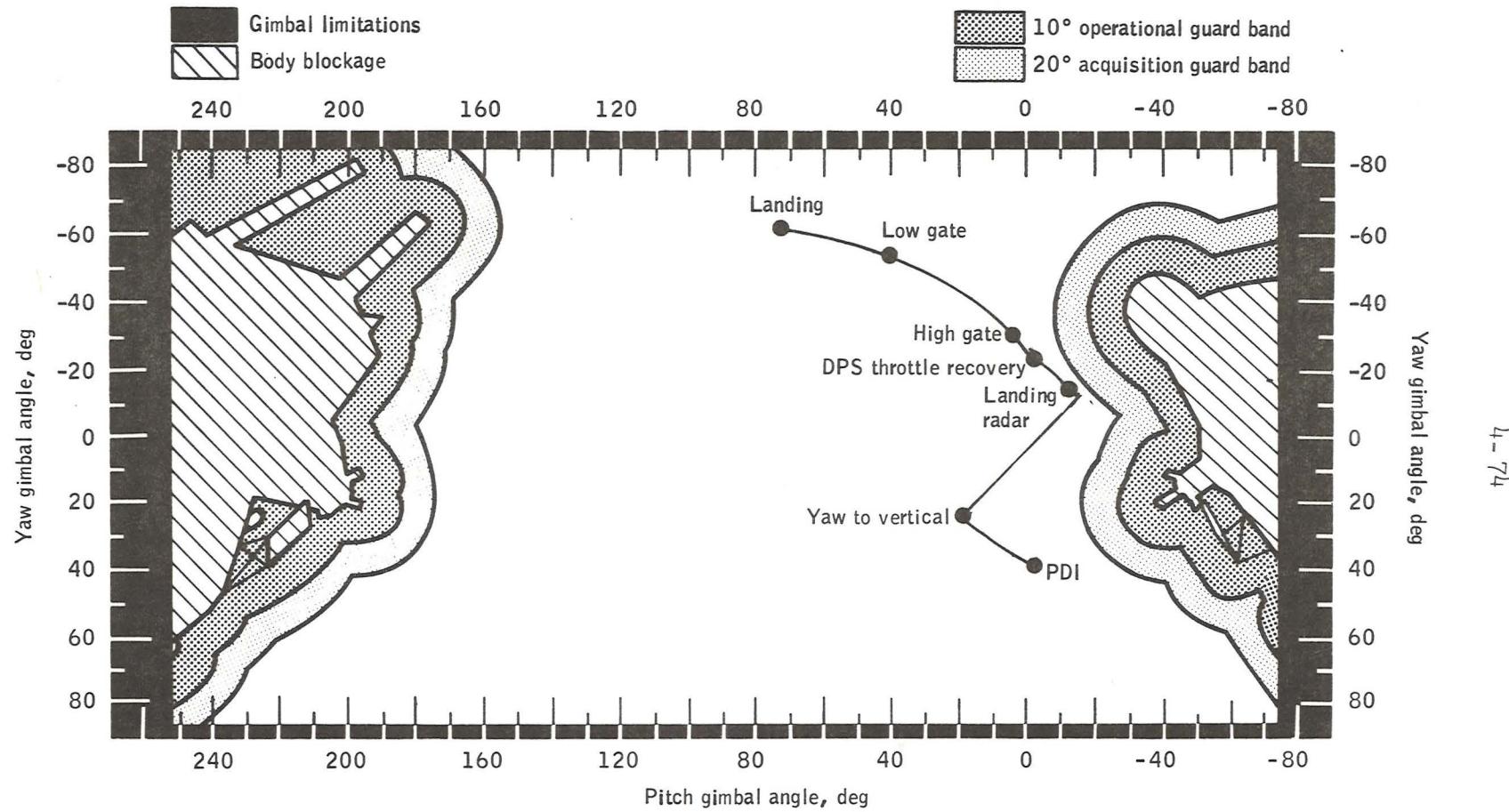


Figure 4.10-5.- S-band gimbal angle profile.

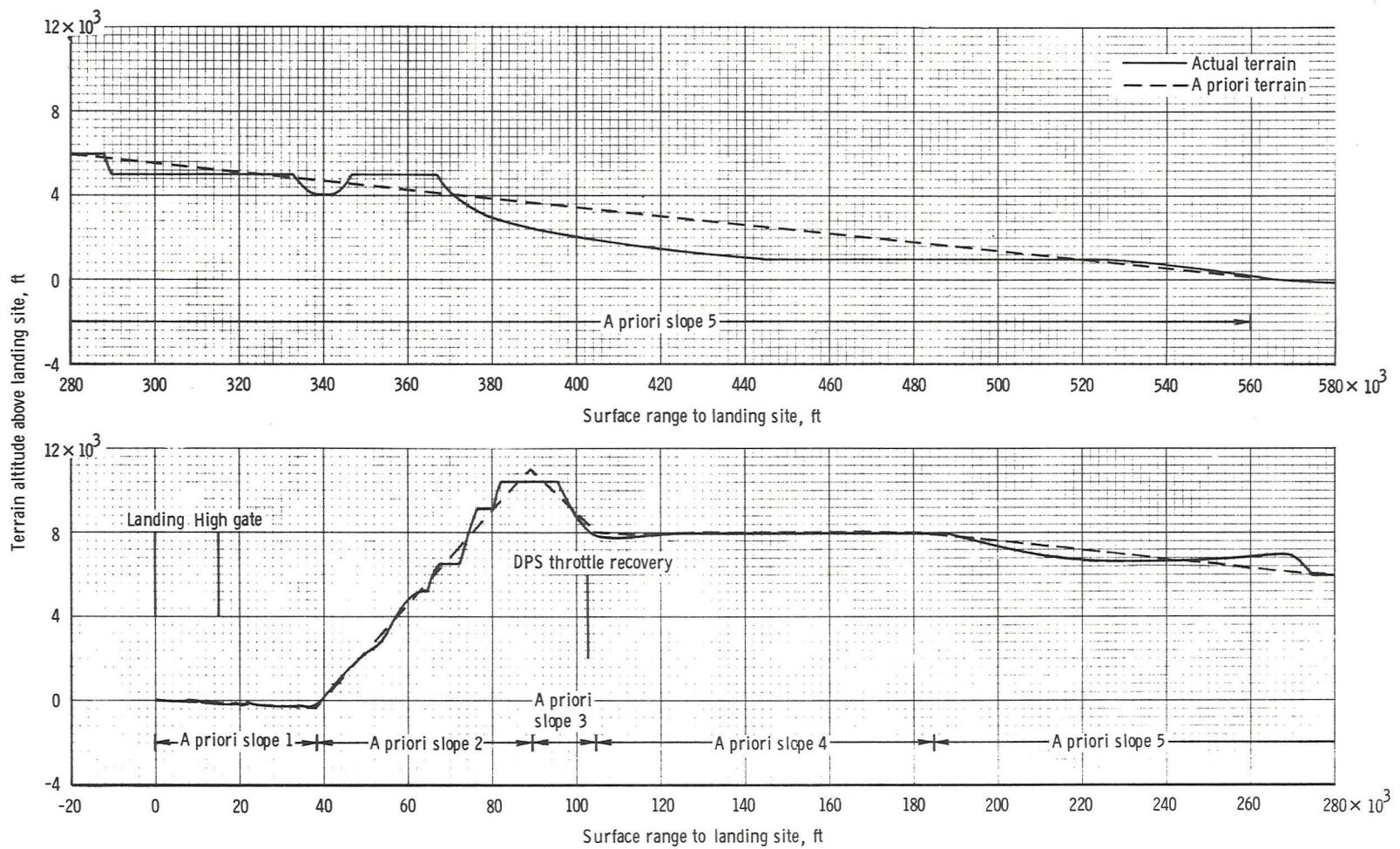


Figure 4.10-6. - Hadley terrain profile.

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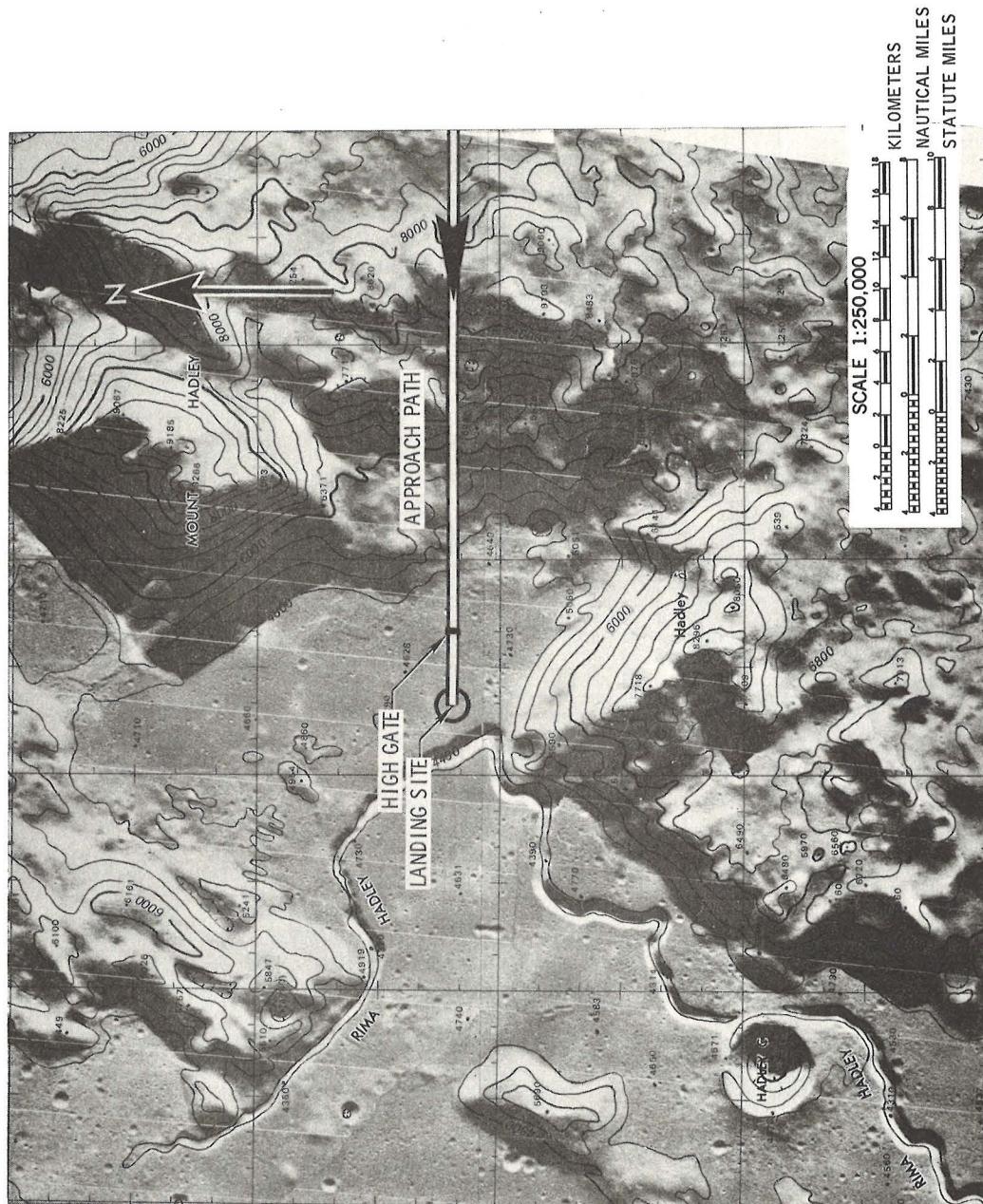


Figure 4.10-7.- The Hadley Apennines region.

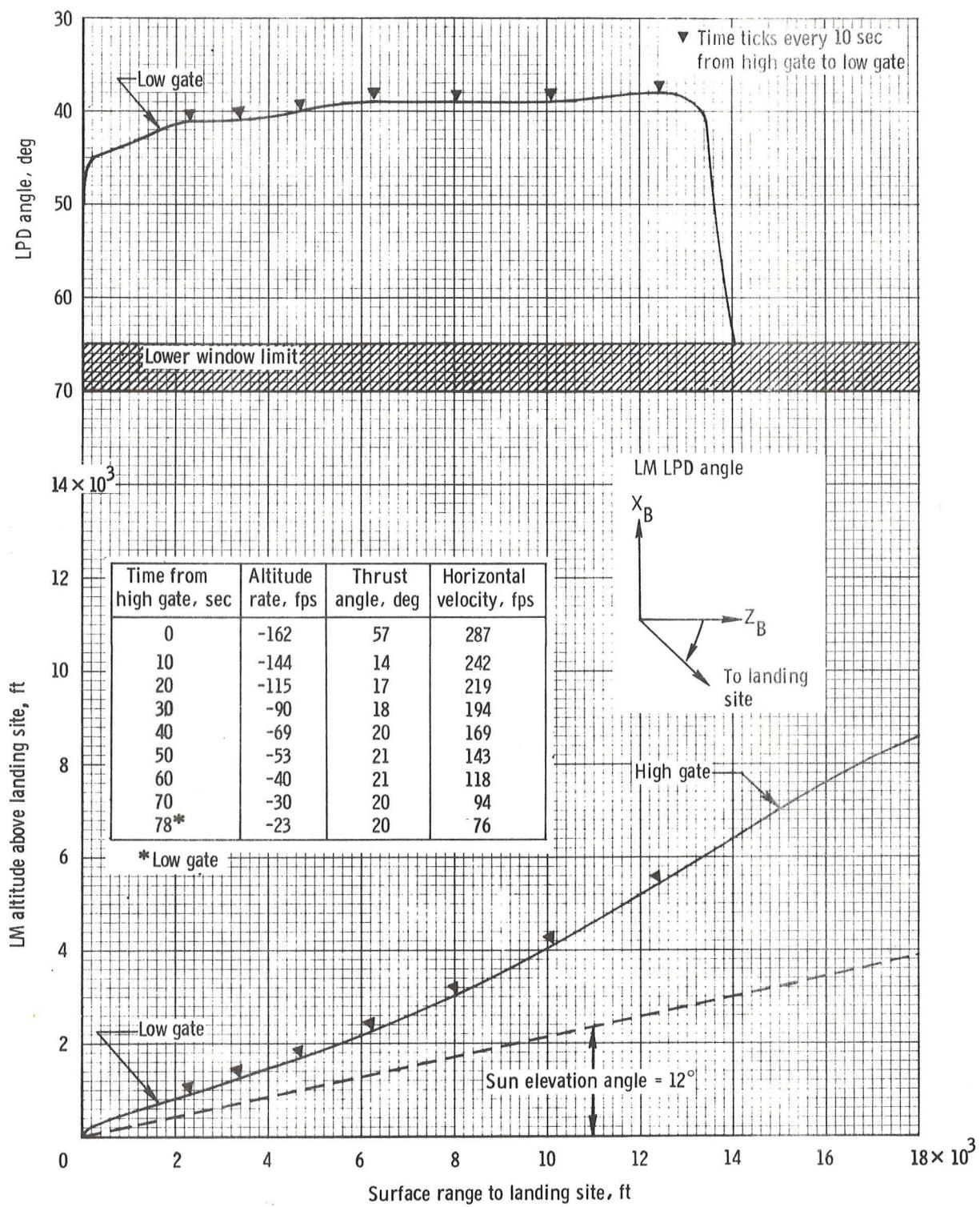


Figure 4.10-8.- Approach phase summary.

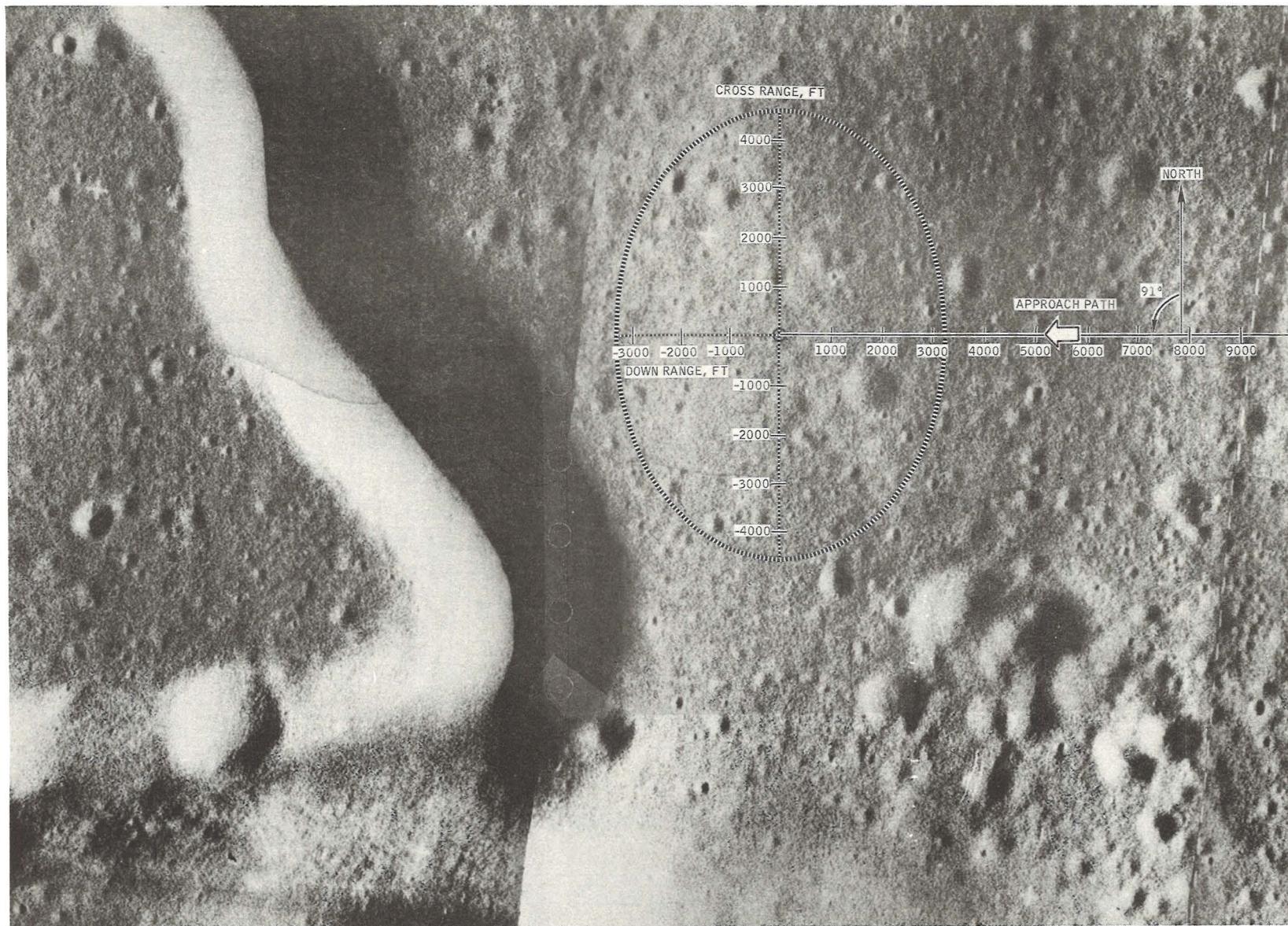


Figure 4.10-9. - Hadley landing site topography.

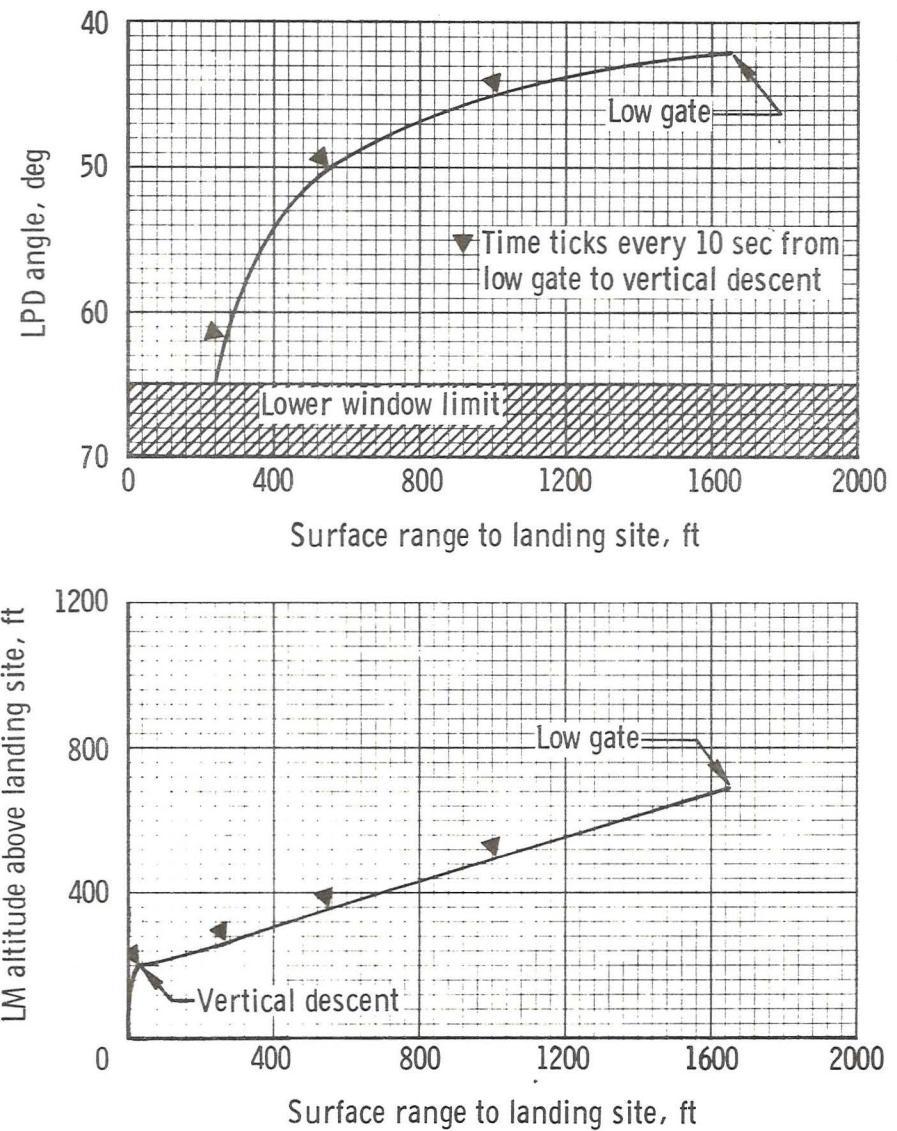
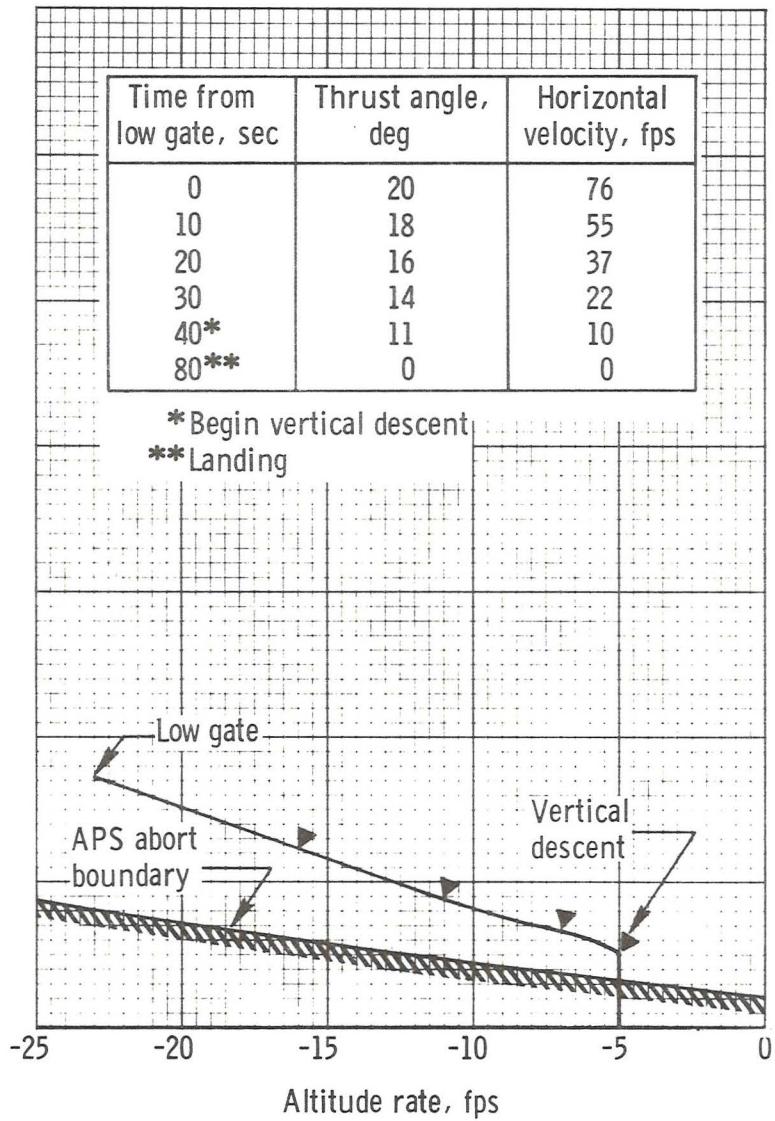


Figure 4.10-10.- Landing phase summary

4.11 CSM SOLO ACTIVITIES

4.11.1 CSM circularization.- This maneuver, which occurs at 23.6° S and 146.0° W and 81 minutes after undocking, transfers the CSM from the initial elliptical orbit to a near circular parking orbit which is necessary for two reasons: (1) landmark tracking is less difficult at higher altitudes and (2) after the powered ascent (or a descent abort), the rendezvous phasing is improved.

The maneuver is a 3.9-second external ΔV burn performed by the SPS. The target load for the maneuver is shown in table 5-V.

4.11.2 Subsatellite jettison.- The lunar orbit subsatellite is jettisoned at $106^{\text{h}}09^{\text{m}}13^{\text{s}}$ g.e.t. as the CSM crosses the lunar equator at the ascending node of rev. 15. The CSM will be in an inertial hold attitude, which will allow the subsatellite to be jettisoned perpendicular to the ecliptic plane toward the north in order that the spin axis of the subsatellite will be perpendicular to the line of sight to the sun, thus allowing maximum sunlight incidence on the solar cells. The CSM attitude will be maintained until the subsatellite jettison photography requirements are met.

4.11.3 CSM lunar orbit plane change.- Approximately 86 hours 42 minutes after LOI and 59 hours 03 minutes after subsatellite jettison, the CSM performs a plane change to place the LM in the CSM orbital plane at the time of LM lift-off. The maneuver is performed approximately 3.25 revolutions before LM ascent. The target load for the maneuver is presented in table 5-VI.

The burn characteristics are the following.

Burn initiation

Time, hr:min:sec, g.e.t.	165:12:50.6
Mass, lb	37 276.8
Altitude above LLS, n. mi.	59.8
Selenographic latitude, deg	-12.5
Selenographic longitude, deg	93.0
Inertial velocity, fps	5346.9
Selenographic inclination, deg	26.0
Perilune altitude above LLS, n. mi.	59.2
Apolune altitude above LLS, n. mi.	59.8

Burn cutoff

Time, hr:min:sec, g.e.t.	165:13:07.1
Altitude above LLS, n. mi.	59.8
Selenographic latitude, deg	-12.2
Selenographic longitude, deg	92.3
Inertial velocity, fps	5346.9
Selenographic inclination, deg	28.9
Burn duration, sec	16.5
Inertial burn arc, deg	0.8
Plane change, deg	3.3
ΔV , fps	308.6
SPS propellant used, lb	1121.2
Perilune altitude above LLS, n. mi.	59.2
Apolune altitude above LLS, n. mi.	59.8

4.12 LM ASCENT

4.13 RENDEZVOUS SEQUENCE

4.14 LM JETTISON AND SEPARATION
TO TEI

4.15 TRANSEARTH INJECTION

4.16 TRANSEARTH COAST

4.17 ENTRY

5.0 INPUT DATA AND TARGET LOADS
FOR NOMINAL MANEUVERS

6.0 RADAR AND SHADOW DATA

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4.12 LM ASCENT

4.12 LM Ascent

The LM powered ascent trajectory is an inplane launch into a 9.03-n. mi. (54 848-ft) by 45.6-n. mi. orbit about the moon. The LM lift-off time, which is determined primarily by the LM-CSM phasing requirements for rendezvous, occurs after approximately 67 hours of lunar staytime. A sketch of the powered ascent maneuver is shown in figure 4.12-1.

The LM ascent consists of two operational phases, a vertical rise phase and an orbital insertion phase. The first phase is necessary to achieve the desired altitude for terrain clearance. A description of trajectory parameters, vehicle attitudes, and the transition to the orbital insertion phase during vertical rise is shown in figure 4.12-2. For radial rates greater than 40 fps, the guidance switches to the orbital insertion phase; but, because of DAP steering lags, the pitchover does not occur until a radial rate of approximately 50 fps is achieved. Thus, the vertical rise phase is actually terminated 10 seconds after LM lift-off. During the vertical rise phase, the LM Z-body axis is rotated toward the desired azimuth, which is normally in the CSM orbital plane.

The orbital insertion phase, which is designed to insert the LM into the desired lunar orbit, is described in figure 4.12-3. Included in this figure are orbital insertion parameters, total ascent phase performance, and onboard displays at insertion. Yaw steering is used during the orbital insertion phase, if required, to maneuver the LM into the CSM orbital plane or into a plane that is coplanar with the CSM orbit. The nominal ascent is essentially inplane requiring no yaw steering. To avoid S-band communication blockage near the end of the orbit insertion phase, a 40° pilot yaw maneuver is initiated approximately 48 seconds into the ascent. Groundtrack information for the LM and CSM during powered ascent is shown in figure 4.12-4. The LM ascent radar coverage for 0° and 3° minimum elevation angles is included in the mission radar time line, table 6-III. The LM ascent weight summary is shown in table 5-XI. The target load for LM ascent is presented in table 5-VII, and the propulsion performance summary for LM ascent is shown in table 4.12-I. Because +X-axis RCS thrusting is used for attitude control, the data in table 4.12-I include the effect of both APS and RCS thrust. The APS interconnect is open during LM ascent, and all propellant is assumed to come from the APS tank.

Time histories of LM trajectory, attitude parameters, LM-CSM phasing, range, range rate, and LM-CSM relative parameters are shown in figures 4.12-5, 4.12-6, and 4.12-7, respectively.

The LM-CSM range-range rate profile is shown in figure 4.12-8.
The S-band gimbal angle profile, which shows the vehicle body blockage
constraints, is shown in figure 4.12-9.

TABLE 4.12-I.- LM ASCENT PROPULSION PERFORMANCE SUMMARY

[Combined APS and RCS]

Event	Time from lift-off, sec	APS thrust, lb	APS \dot{W} , lb/sec	RCS effective thrust, lb	RCS effective \dot{W} , lb/sec	Total thrust, lb	Total \dot{W} , lb/sec	I_{sp} , sec
LM lift-off	0	3517.07	11.35	64.99	0.23	3582.06	11.58	309.27
	60	3504.13	11.30	56.39	0.20	3560.52	11.50	309.67
	120	3494.45	11.26	46.51	0.17	3540.96	11.43	309.84
	180	3487.37	11.24	35.16	0.13	3522.53	11.37	309.86
	240	3482.48	11.23	21.98	0.08	3504.46	11.31	309.81
	300	3479.63	11.23	7.74	0.03	3487.37	11.26	309.74
	360	3478.89	11.24	12.10	0.04	3490.99	11.28	309.53
	420	3480.60	11.25	34.74	0.12	3515.34	11.37	309.21
LM insertion	435.2	3481.47	11.25	41.29	0.15	3522.76	11.40	309.13

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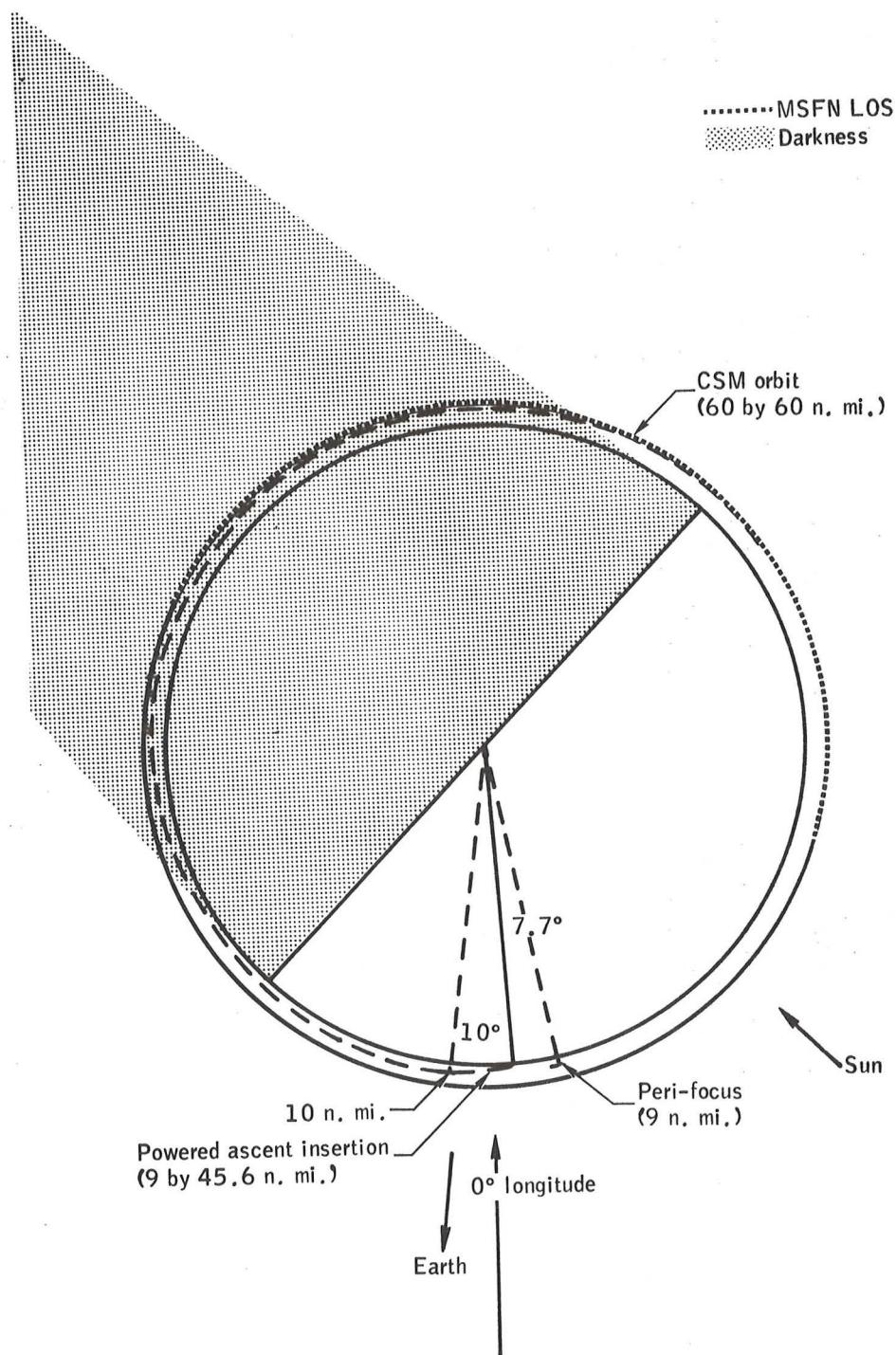


Figure 4.12-1.- LM ascent.

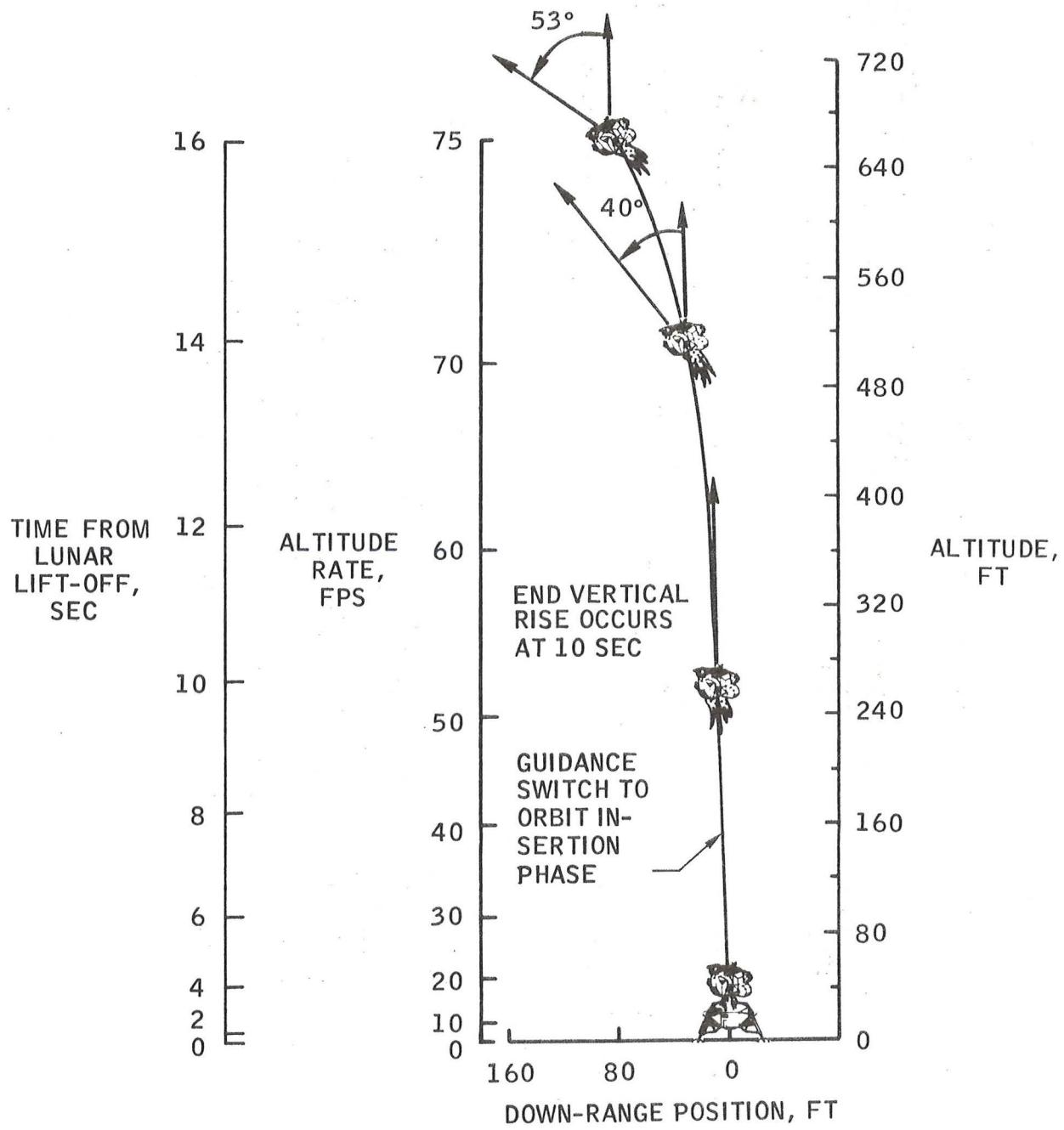
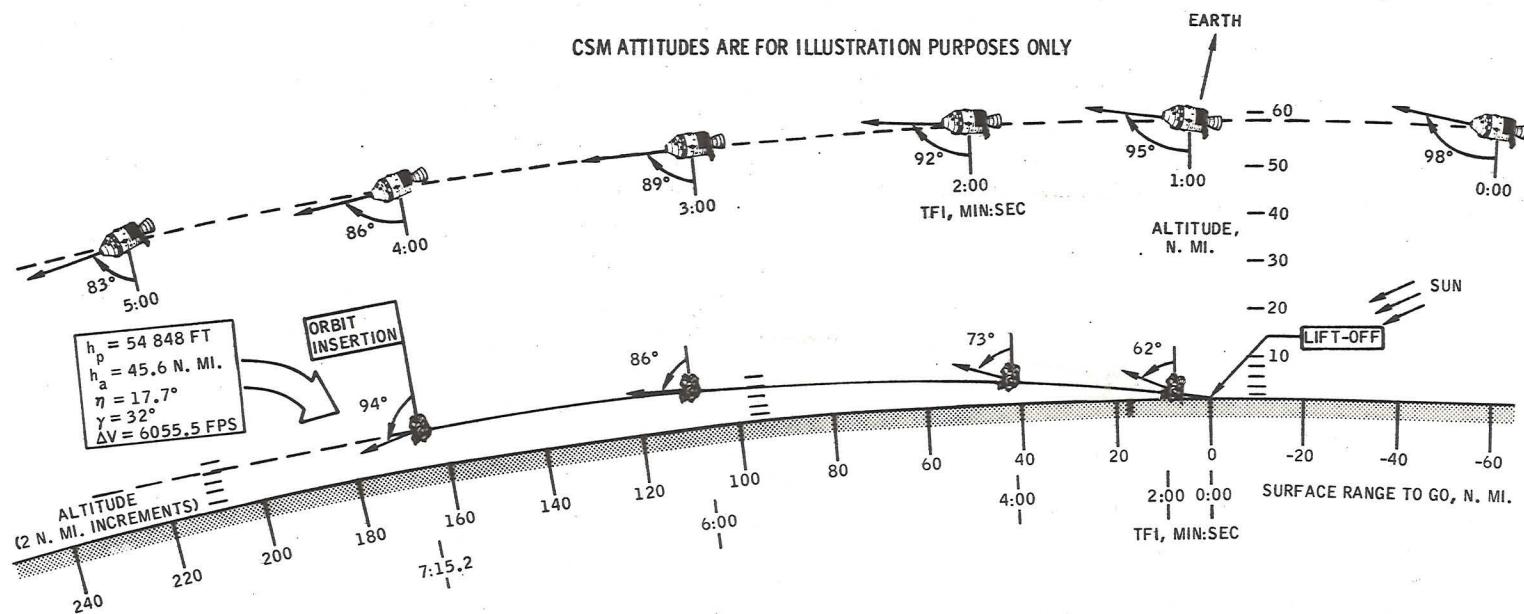


Figure 4.12-2.- Vertical rise phase.



SUMMARY

EVENT	TFI MIN:SEC	INERTIAL VELOCITY, FPS	ALTITUDE RATE, FPS	ALTITUDE, FT	ΔV , FPS	WEIGHT, LB	PROPELLANT, LB
LIFT-OFF	0:00	13.6	0	0	0	10 873.1	0
END OF VERTICAL RISE	0:10	54.2	53.0	263.7	106.5	10 757.1	115.7
BEGIN LM PILOT YAW	0:48	321.0	111.6	3650.5	520.7	10 317.7	554.3
END LM PILOT YAW	1:00	429.6	124.2	5066.6	654.9	10 179.4	692.3
	2:00	1021.0	169.9	14 029.9	1352.2	9490.3	1380.1
	4:00	2436.3	183.7	36 230.8	2899.6	8123.2	2744.4
	6:00	4203.1	108.5	54 542.8	4715.1	6767.7	4097.2
ORBIT INSERTION	7:15.2	5536.5	31.4	59 936.3	6055.5	5913.3	4949.8

Figure 4.12-3.- Orbit insertion phase.

North latitude, deg

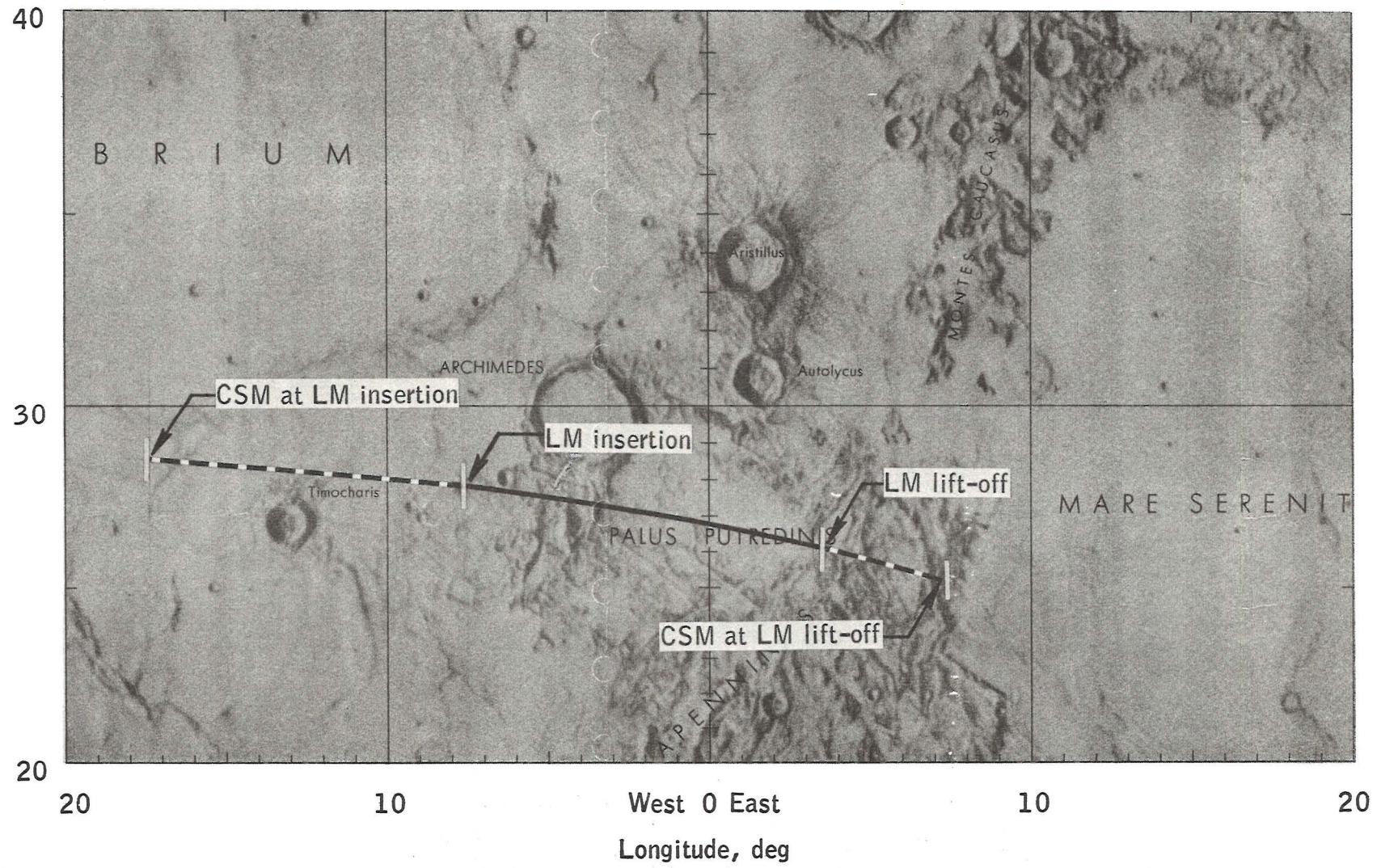
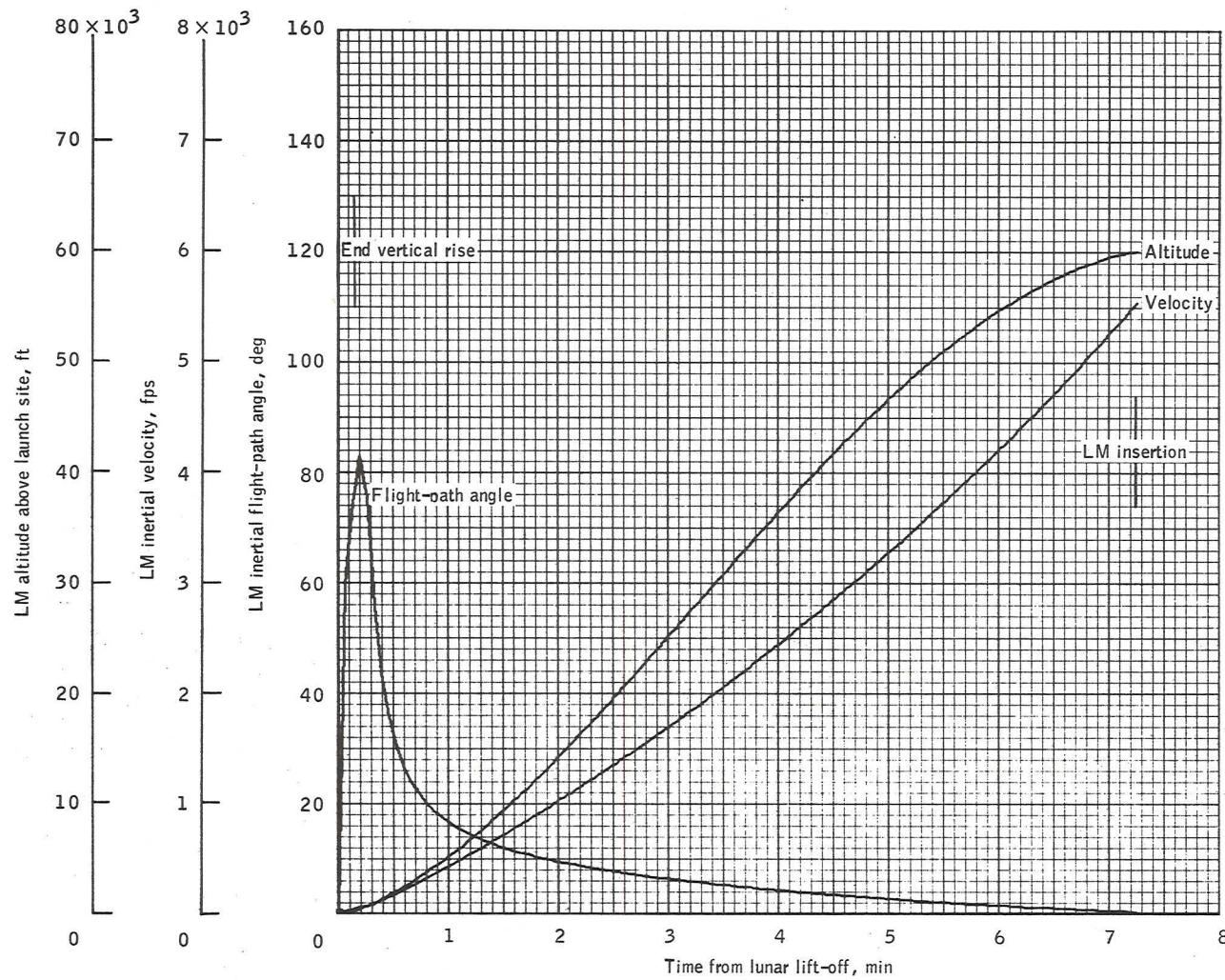
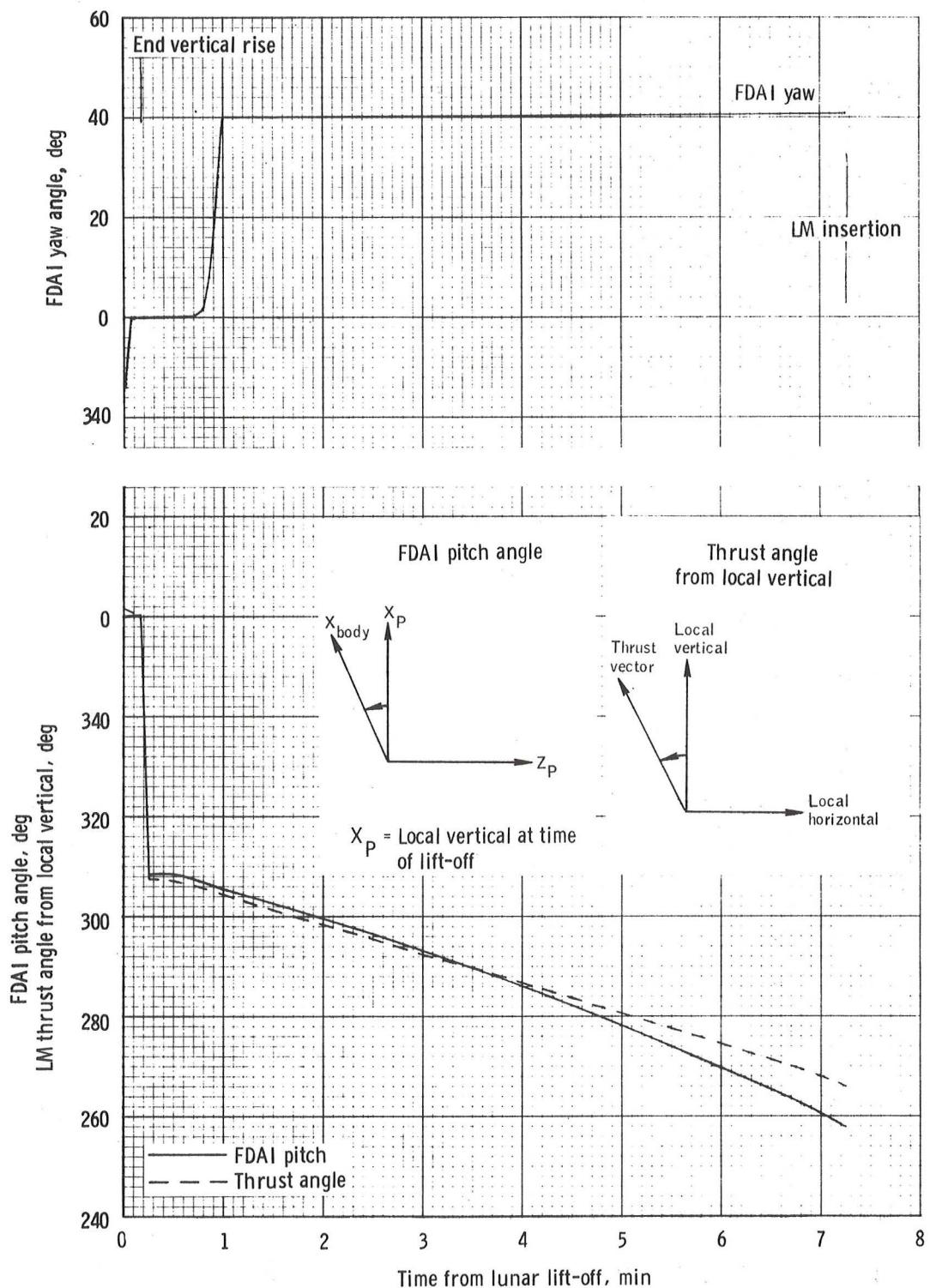


Figure 4.12-4.- LM and CSM groundtracks.



(a) LM altitude, inertial velocity, and inertial flight-path angle.

Figure 4.12-5.- Time histories of LM trajectory parameters from lunar lift-off to LM insertion.



(b) LM thrust angle and FDAO pitch and yaw angles.

Figure 4.12-5. - Concluded.

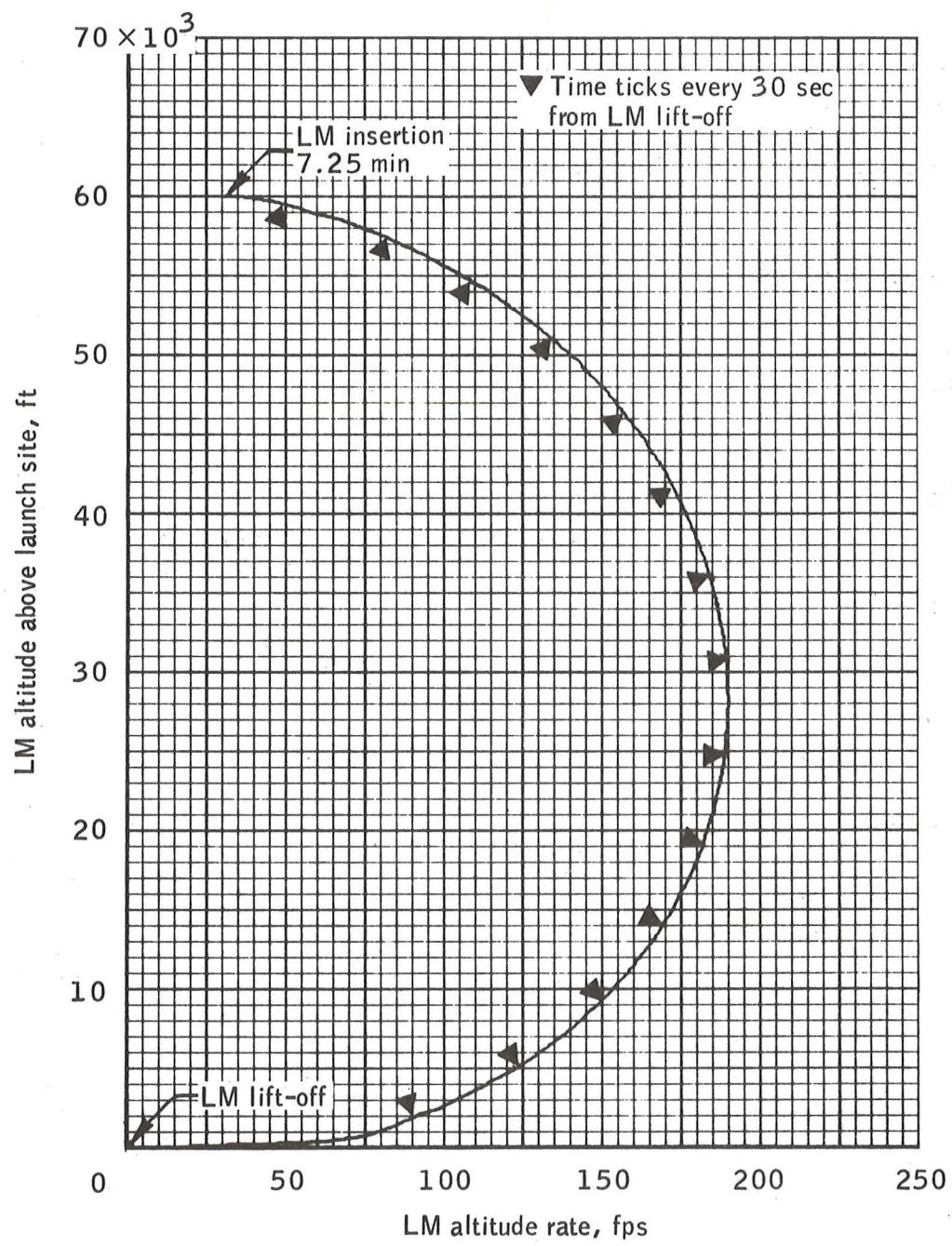


Figure 4.12-6.- LM altitude versus altitude rate during powered ascent.

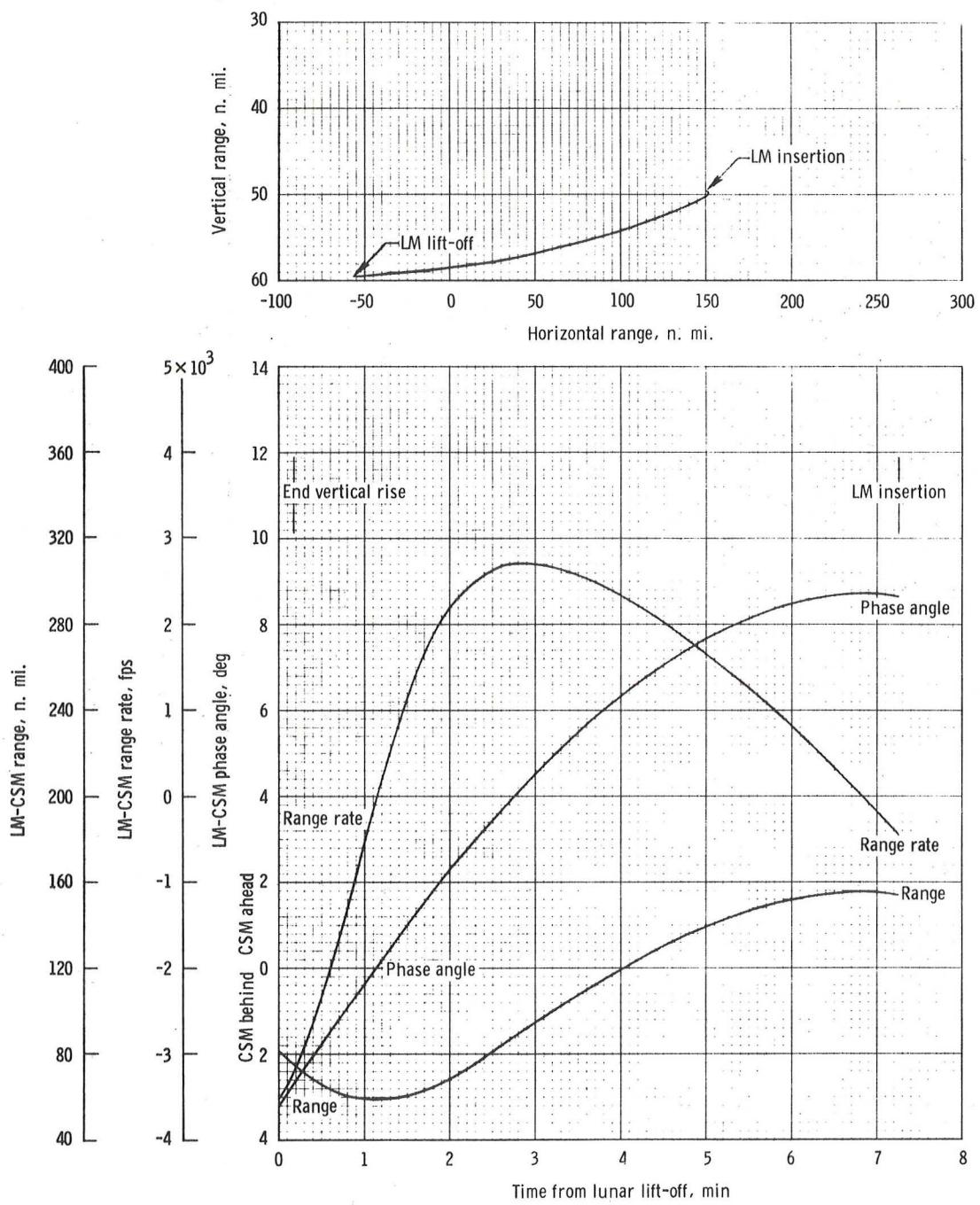


Figure 4.12-7. - LM-CSM phase angle, range and range rate versus time from lift-off and vertical range versus horizontal range (CSM referenced).

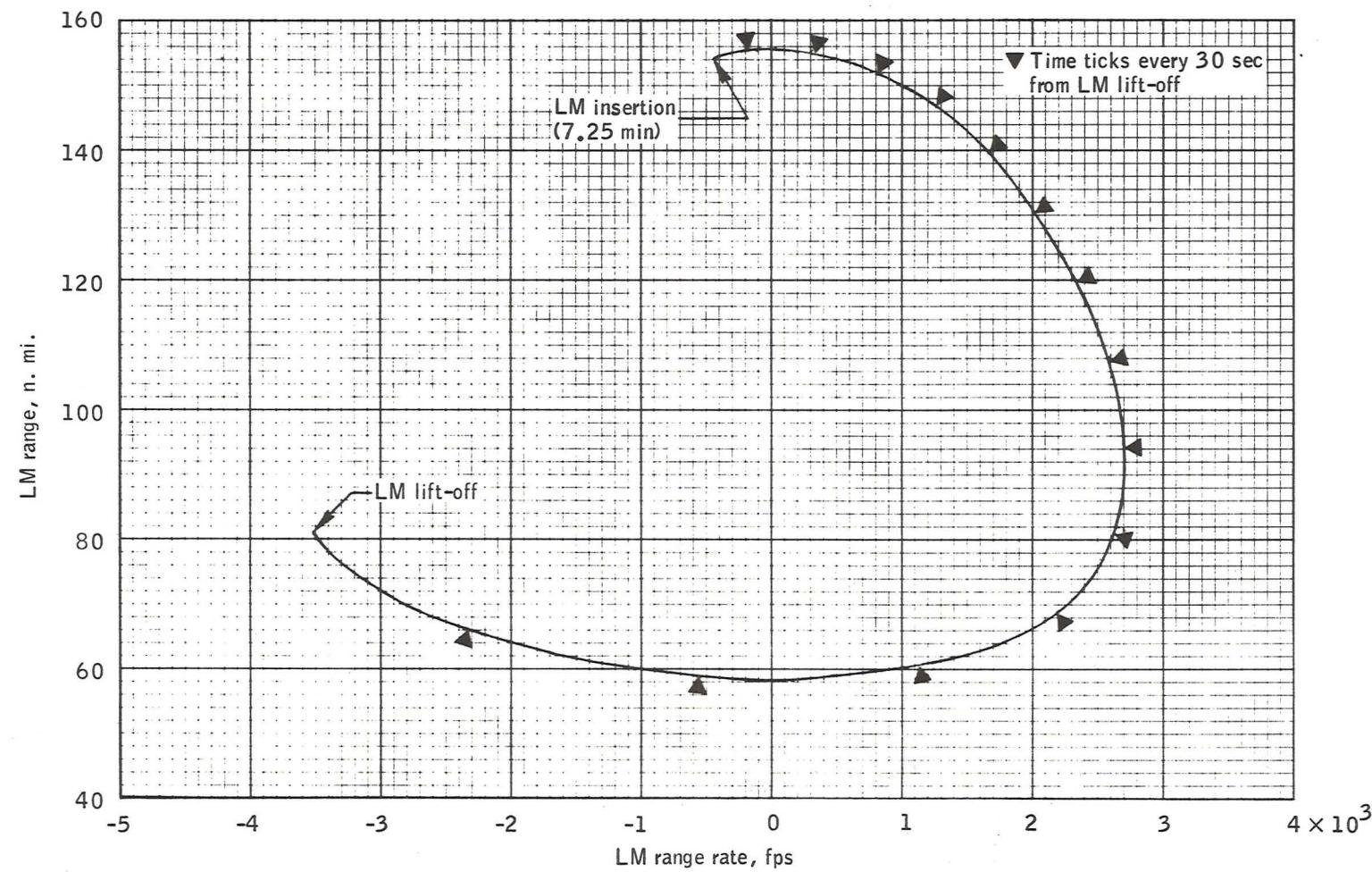


Figure 4.12-8.- LM-CSM range versus LM-CSM range rate during powered ascent.



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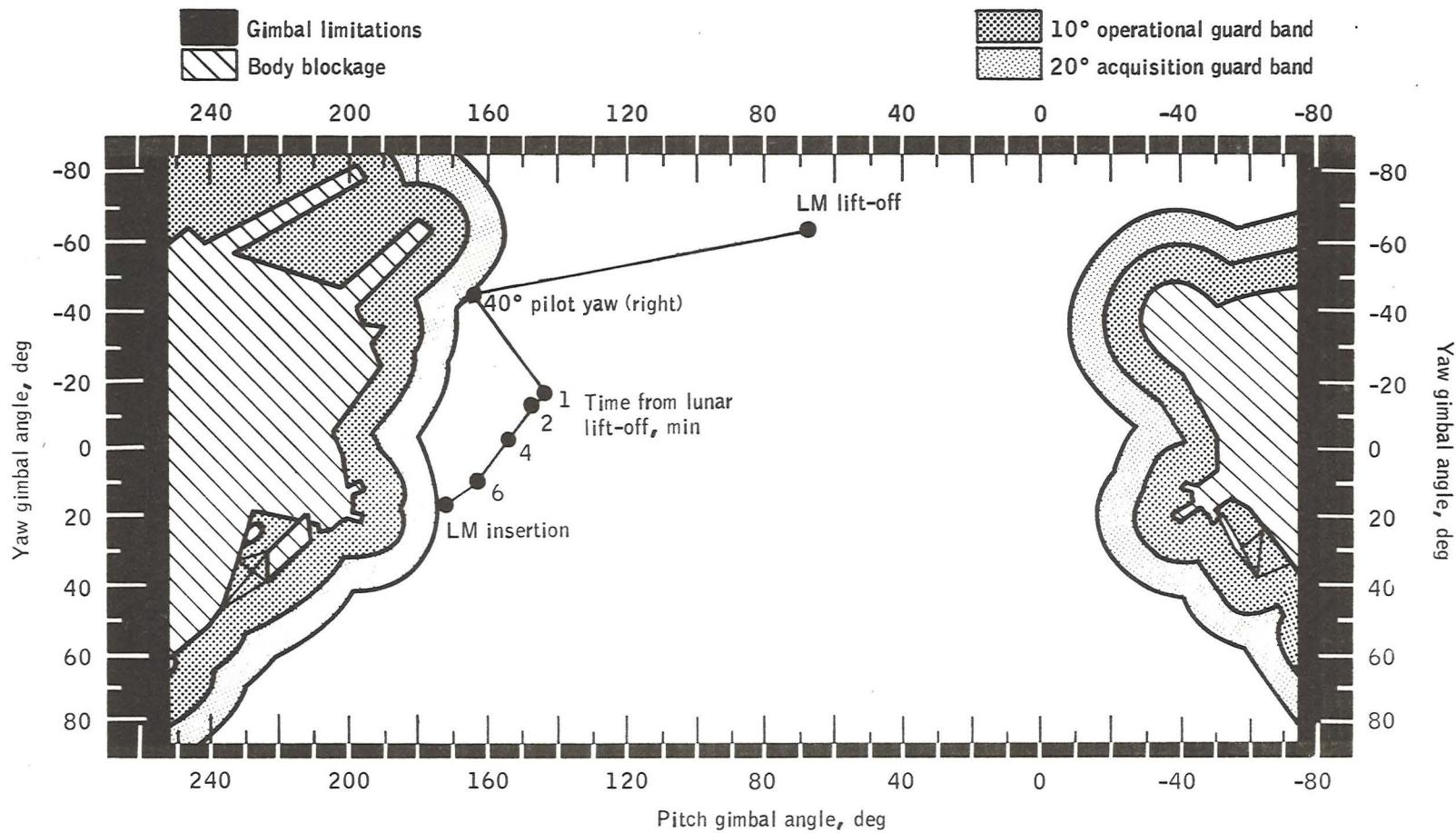


Figure 4.12-9.- S-band gimbal angle profile during powered ascent.

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4.13 RENDEZVOUS SEQUENCE

4.13 Rendezvous Sequence

4.13.1 Sequence summary.- After insertion of the LM into orbit, the LM will compute and execute the early rendezvous sequence which nominally consists of two major maneuvers, TPI and TPF. A nominally-zero tweak maneuver will be scheduled 2 minutes after insertion, and two nominally-zero midcourse correction maneuvers will be scheduled between TPI and TPF; the TPF maneuver is actually divided into several braking maneuvers. The complete maneuver sequence is presented in table 4.13-I. All maneuvers except TPI will be performed with the LM RCS system with either two jets or four jets for a prescribed quad for thrust vector control. TPI will be performed with the APS preceded by a 10-second, four-jet RCS ullage. The entire maneuver sequence from lift-off through docking requires approximately 1.9 hours.

Before detailed information is presented about each maneuver, some general mission and trajectory design requirements for the rendezvous plan are noted.

- a. TPI will occur 16 minutes prior to the first sunrise following insertion.
- b. The LM will be 15 n. mi. below the CSM orbit at TPI.
- c. The LM-CSM elevation angle will be 26.6° .
- d. Braking should occur in daylight; stationkeeping should begin approximately 29 minutes after the vehicles enter sunlight.

The orbital schematic for the rendezvous sequence is presented in figure 4.13-1. The time histories of range, range rate, phase angle, CSM-LM elevation angles, and the CSM-LM-sun angles are presented in figures 4.13-2(a) through 4.13-2(e). The relative motion of the LM with respect to the CSM is shown in figure 4.13-2(f). The onboard tracking, lighting, and mission events summary are presented in figure 4.13-3 and in table 4.13-II.

4.13.2 Tweak maneuver.- A nominally-zero tweak maneuver is scheduled 2 minutes after insertion. The purpose of this maneuver is to maintain the nominal TPI offsets (both inplane and out of plane) when insertion dispersions occur. Out-of-plane dispersions will be eliminated by a tweak/TPI combination. The tweak maneuver would force a common node at TPI, and the out-of-plane velocity component would be reduced to zero at TPI. Any out-of-plane situation not eliminated by the tweak/TPI combination must be eliminated during terminal phase.

4.13.3 TPI.- The TPI maneuver executed with the APS 16 minutes prior to daylight is initiated 45 minutes after insertion. TPI occurred 38 minutes after insertion on Apollo 14, but, due to a longer lunar staytime on Apollo 15, the sun will be farther west at lunar lift-off. Therefore, an extra 7 minutes coast to provide the 16-minute lighting requirement for TPI is necessary. A shorter Δt from insertion to TPI would be acceptable; however, if the LM tracking light should fail, TPI lighting significantly earlier than 16 minutes prior to sunlight would not allow adequate daylight sextant tracking for the second midcourse. The insertion orbit is such that at this time the LM will be 29 n. mi. behind and 15.0 n. mi. below the CSM. The thrust direction is posigrade 16.5° below the local horizontal. The APS burn is preceded by a +X (four-jet) RCS ullage maneuver which is 10.5 seconds long and overlaps the main engine burn by 0.5 second. The APS burn duration is 2.6 seconds.

The Lambert targeting for this maneuver is based on a 130° CSM central travel angle between TPI and TPF. The target load for this maneuver is presented in table 5-VII. The LM-CSM orbital geometry is shown in figure 4.13-4. The characteristics of the TPI maneuver are as follows.

Ullage maneuver (four-jet RCS, +X)

Start time, hr:min:sec, g.e.t.	172:29:29.1
Latitude, deg S	17.6
Longitude, deg W	149.5
Altitude above landing site, n. mi.	44.1
Phase angle, deg	1.7
Duration, sec	10.5
ΔV , fps	21.9
Propellant used, lb	14.3

Main engine burn

Start time, hr:min:sec, g.e.t.	172:29:39.1
ΔV , fps	51.8
Duration, sec	2.6
Propellant used, lb	30.8

TPI termination

Time, hr:min:sec, g.e.t.	172:29:41.7
Latitude, deg S	17.9
Longitude, deg W	150.1
Altitude above landing site, n. mi.	44.2
Resultant h_a/h_p , n. mi.	61.5/43.9
Catchup rate, deg/min	0.032

4.13.4 Midcourse corrections and TPF. - MC-1 and MC-2 occur 15 and 30 minutes after TPI, respectively, and are nominally-zero maneuvers. The terminal phase braking schedule performed with the two-jet -Z thrusters is presented in table 5-XVIII. Line-of-sight corrections will be made as required. Final approach and stationkeeping should occur at approximately $7^{\text{d}} 05^{\text{h}} 15^{\text{m}} 01.7^{\text{s}}$ g.e.t., approximately 29 minutes after the vehicles enter sunlight on the back side of the moon. Docking should occur at approximately $7^{\text{d}} 05^{\text{h}} 30^{\text{m}} 00^{\text{s}}$ g.e.t. to complete 1.9 hours of rendezvous activities.

TABLE 4.13-I.- RENDEZVOUS MANEUVER SUMMARY

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Event	Time, day:hr:min:sec, g.e.t.	Propulsion system	Burn time, sec	ΔV , fps	Weight at ignition, lb	Propellant used ^a , lb	Resultant orbit ^b h_a/h_p , n. mi.	Range at cutoff, n. mi.	Range rate at cutoff, fps
Tweak ^c	7:03:46:39.1	RCS	0.0	0.0	5913.3	0.0	50.3/9.1	145.8	-441.3
TPI APS burn ^d	7:04:29:39.1	APS	2.6	51.8	5899.0	30.8	61.5/43.9	32.5	-134.3
MC-1 ^c	7:04:44:39.1	RCS +Z (two-jet)	0.0	0.0	5868.2	0.0	61.5/43.9	15.0	-97.5
MC-2 ^c	7:04:59:39.1	RCS +Z (two-jet)	0.0	0.0	5868.2	0.0	61.5/43.9	4.5	-46.0
First braking maneuver	7:05:10:46.3	RCS -Z (two-jet)	11.2	12.3	5868.2	8.0	60.1/49.0	0.4	-19.6
Second braking maneuver	7:05:11:59.4	RCS -Z (two-jet)	8.9	9.8	5860.2	6.3	59.7/53.9	0.2	-9.7
Third braking maneuver	7:05:13:37.8	RCS -Z (two-jet)	4.3	4.8	5853.9	3.1	59.6/56.6	0.08	-4.9
Fourth braking maneuver	7:05:14:57.4	RCS -Z (two-jet)	4.2	4.7	5850.8	3.0	59.6/59.1	0.01	-0.2
Docking	7:05:30:00.0	--	--	--	5847.8	--	59.6/59.1	0.0	0.0

^aEstimates for completing consumables document will present official propellant usage. Slight changes caused by rigor of analysis are expected.

^bAltitudes measured above landing site.

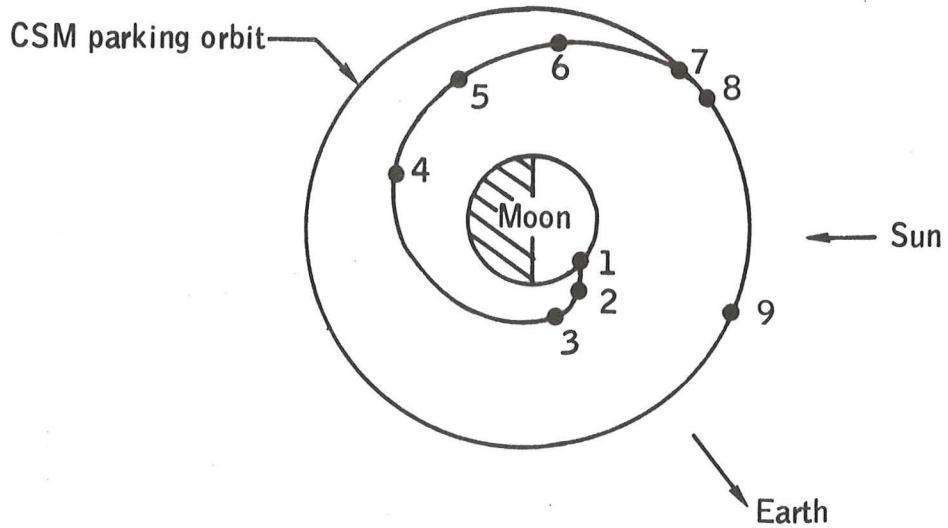
^cNominally a zero ΔV maneuver.

^dPreceded by a 10.0-sec, four-jet, +X, RCS ullage.

TABLE 4.13-II.- MSFN TRACKING AND SHADOW TIME LINE

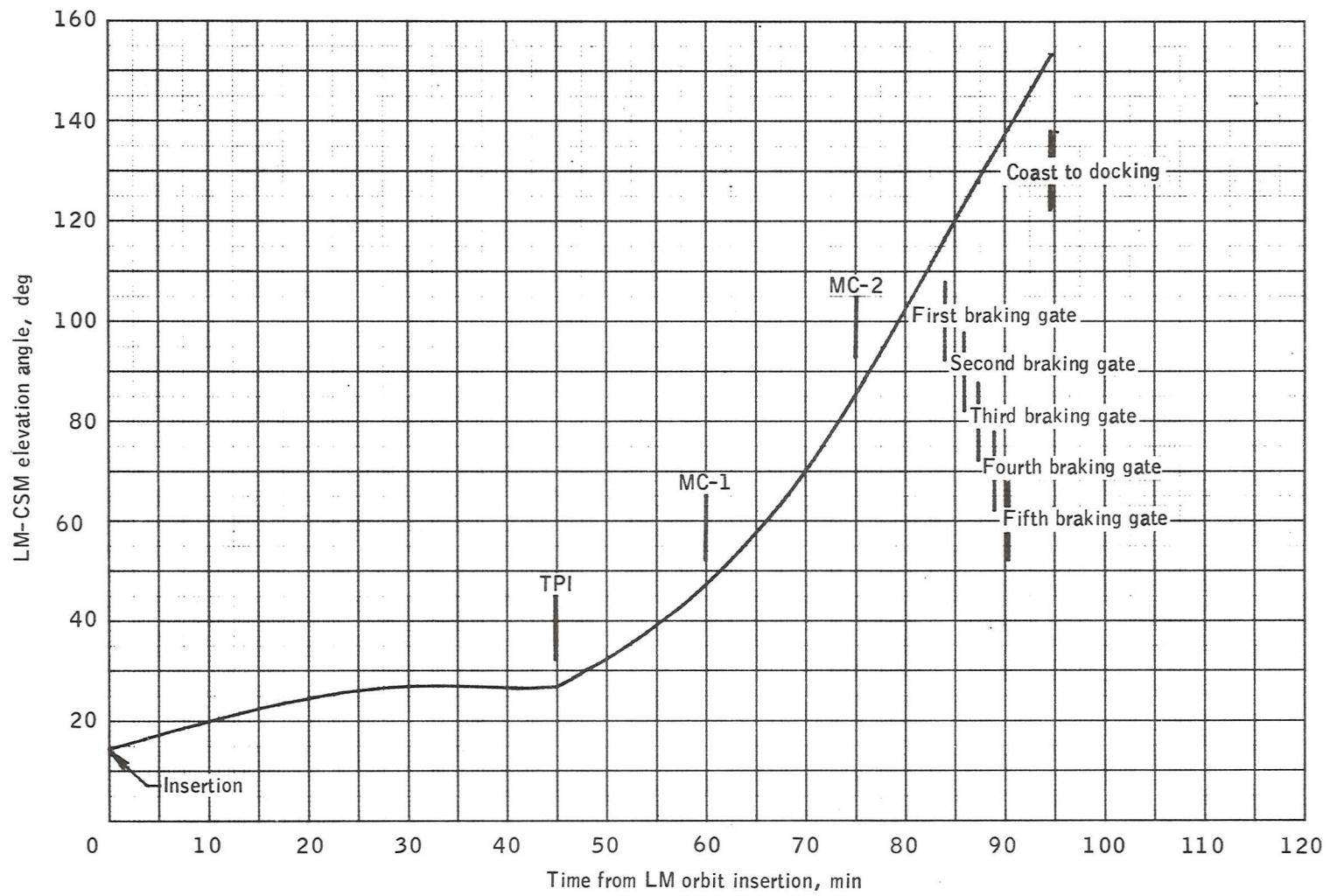
Event	Time, day:hr:min:sec, g.e.t.
Insertion	7:03:44:39.1
Tweak	7:03:46:39.1
Sunset	7:03:57:43.4
MSFN LOS	7:04:16:16.0
TPI (ullage on)	7:04:29:29.1
MC-1	7:04:44:39.1
Sunrise	7:04:45:44.0
MC-2	7:04:59:39.1
MSFN AOS	7:05:02:27.8
First braking maneuver	7:05:10:46.3
Second braking maneuver	7:05:11:59.4
Third braking maneuver	7:05:13:37.8
Fourth braking maneuver	7:05:14:57.4
Docking	7:05:30:00.0

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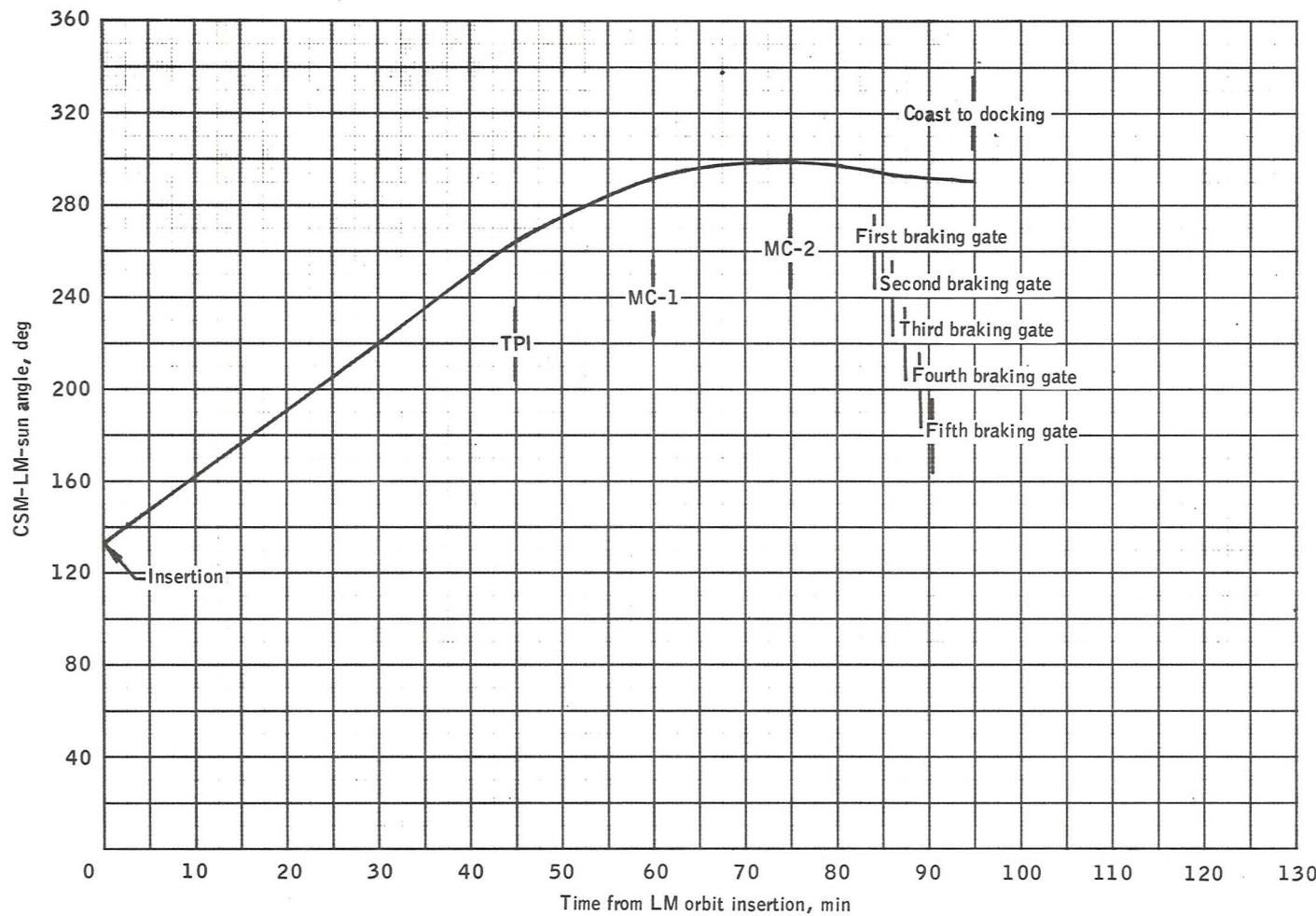
Event	Ground elapsed time, hr:min:sec
1. Lift-off	171:37:23.9
2. LM insertion	171:44:39.1
3. Tweak	171:46:39.1
4. TPI (ullage on)	172:29:29.1
5. MC-1	172:44:39.1
6. MC-2	172:59:39.1
7. Begin braking	173:10:46.3
8. Begin stationkeeping	173:15:01.6
9. Docking	173:30:00.0

Figure 4.13-1.- Orbital schematic of ascent through docking.



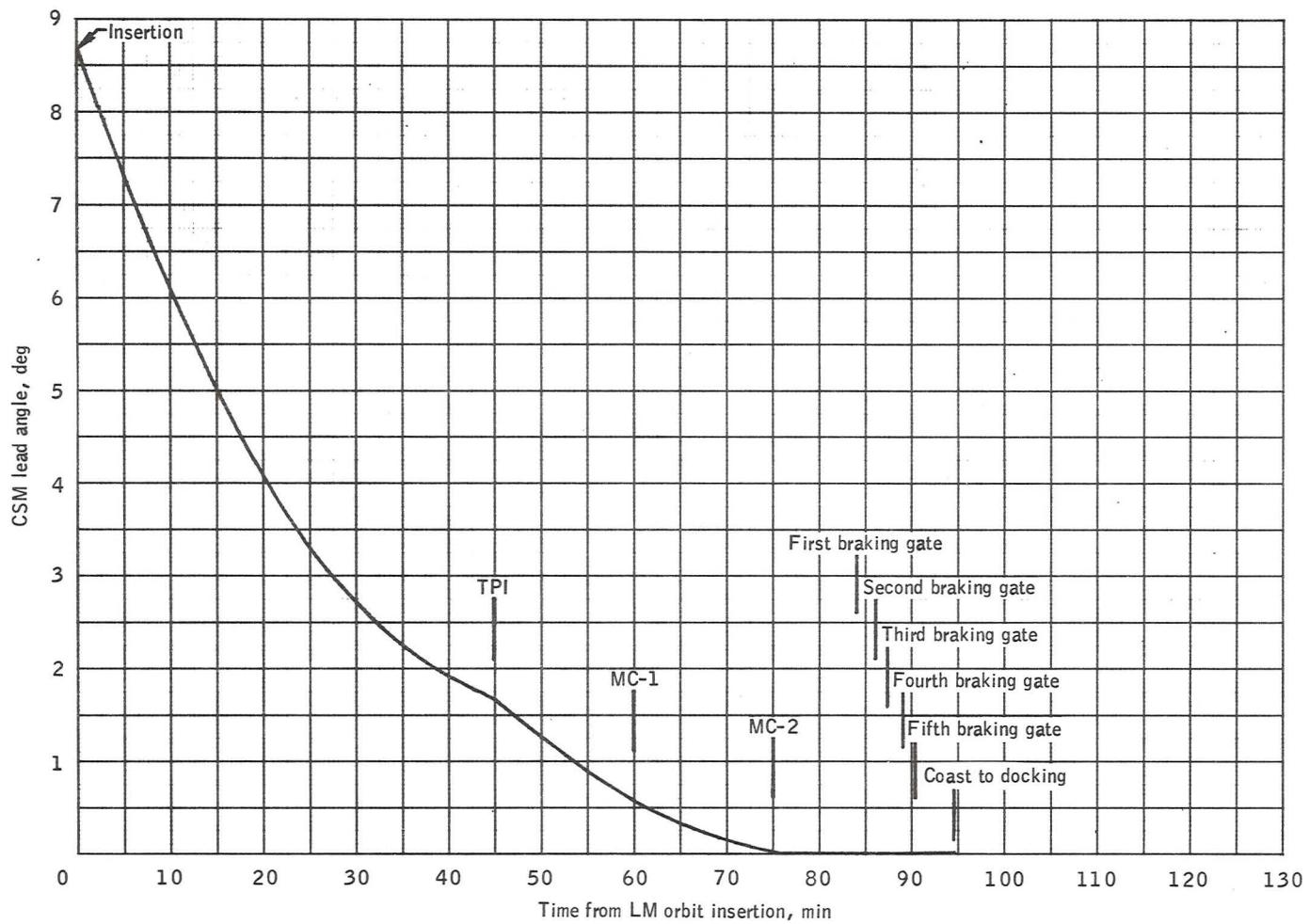
(a) LM-CSM elevation angle versus time from LM orbit insertion.

Figure 4.13-2.- Parameters from LM orbit insertion through terminal rendezvous.



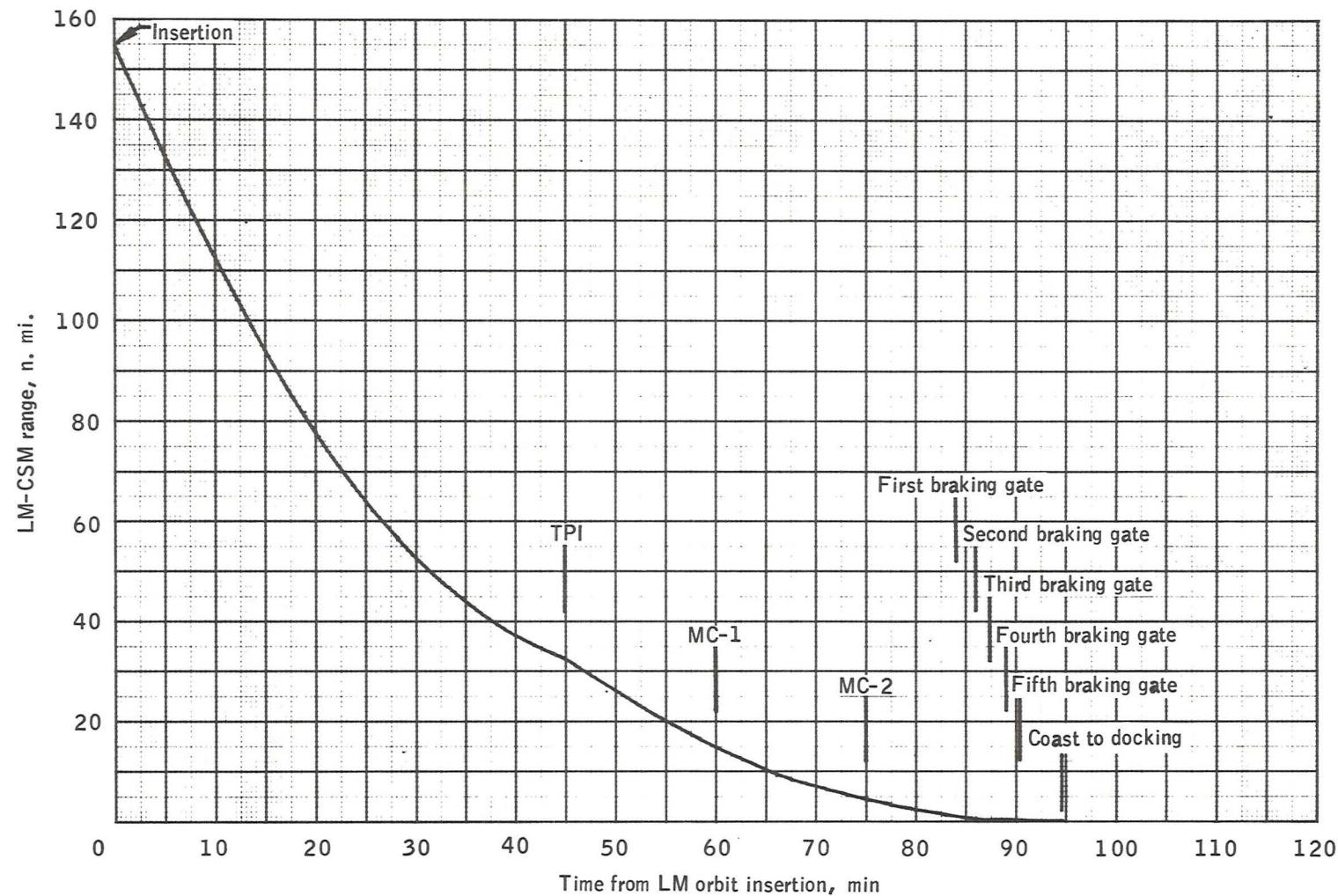
(b) CSM-LM-sun angle versus time from LM orbit insertion.

Figure 4.13-2.- Continued.



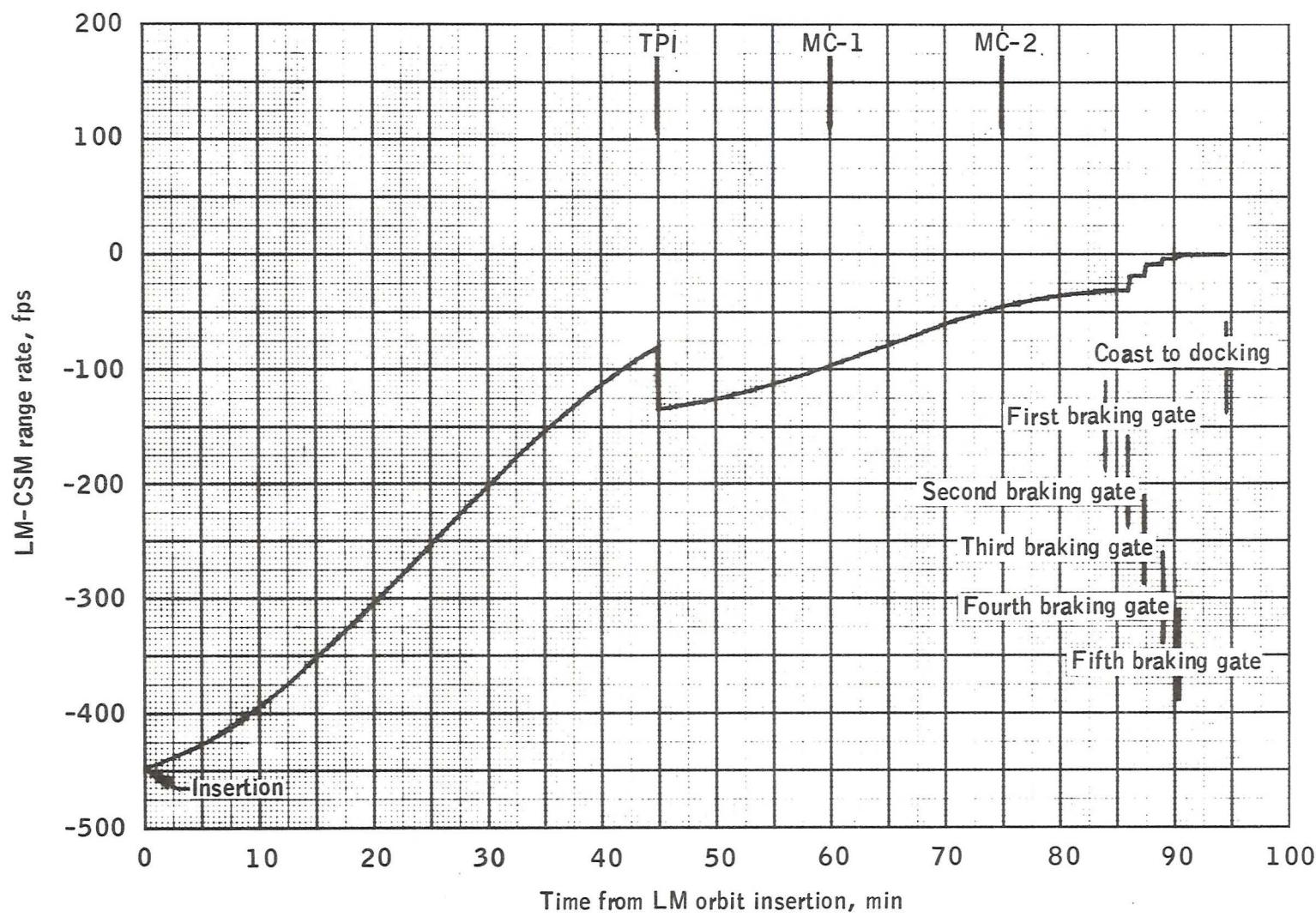
(c) CSM lead angle versus time from LM orbit insertion.

Figure 4.13-2.- Continued.



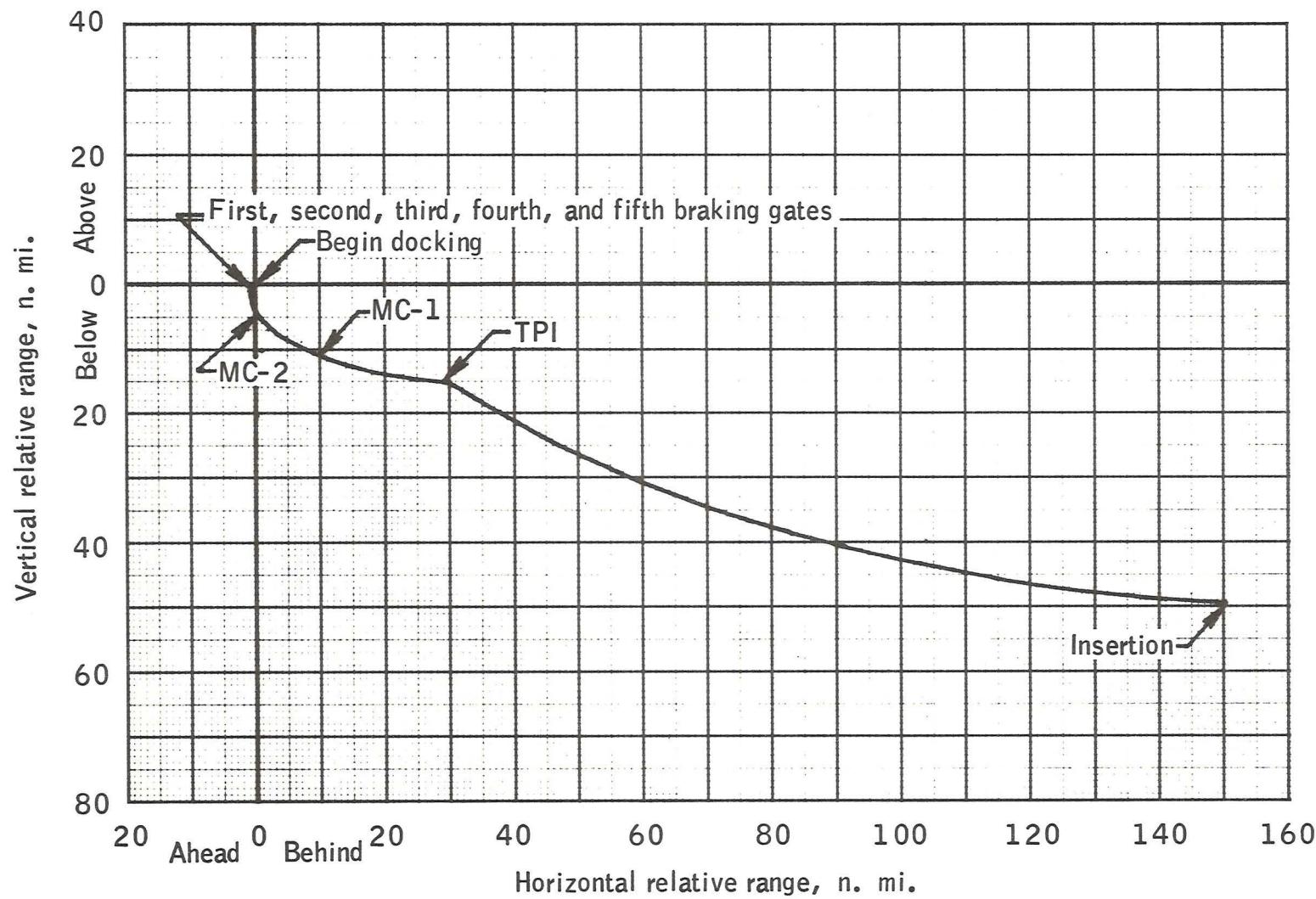
(d) LM-CSM range versus time from LM orbit insertion.

Figure 4.13-2.- Continued.



(e) LM-CSM range rate versus time from LM orbit insertion.

Figure 4.13-2.- Continued.



(f) Vertical relative range versus horizontal relative range.

Figure 4.13-2.- Concluded.

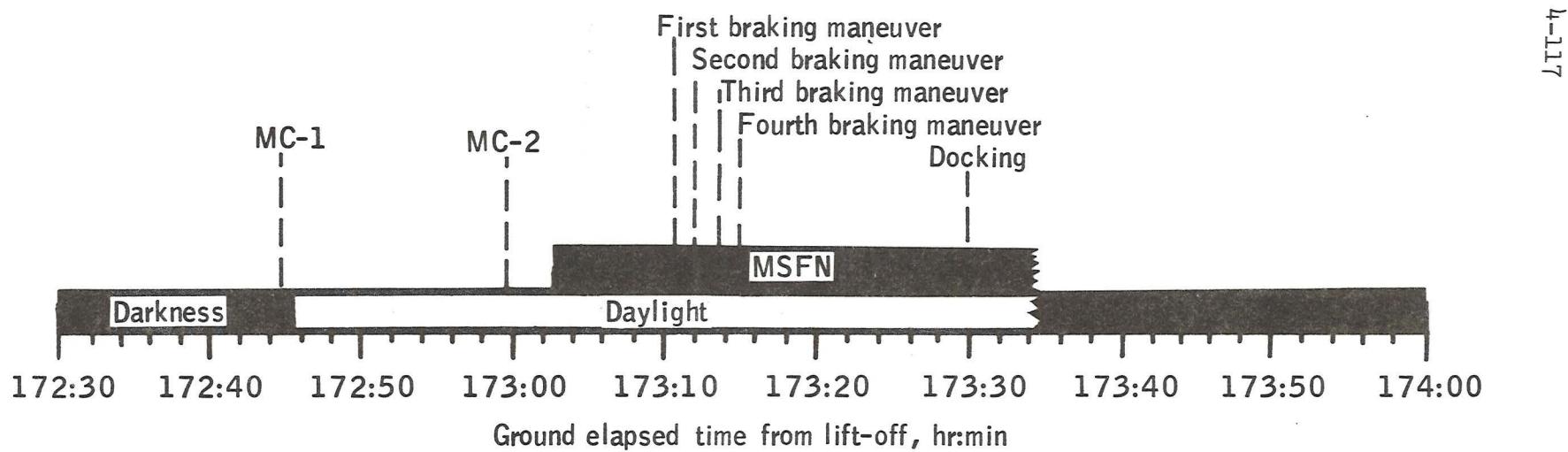
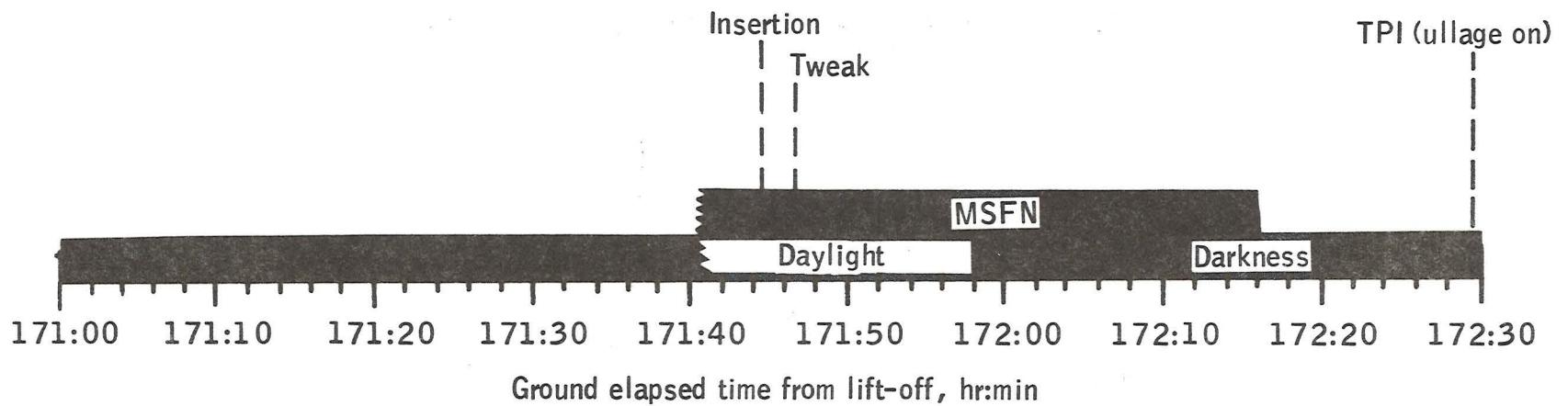


Figure 4.13-3.- Mission events and tracking summaries for LM-active rendezvous.

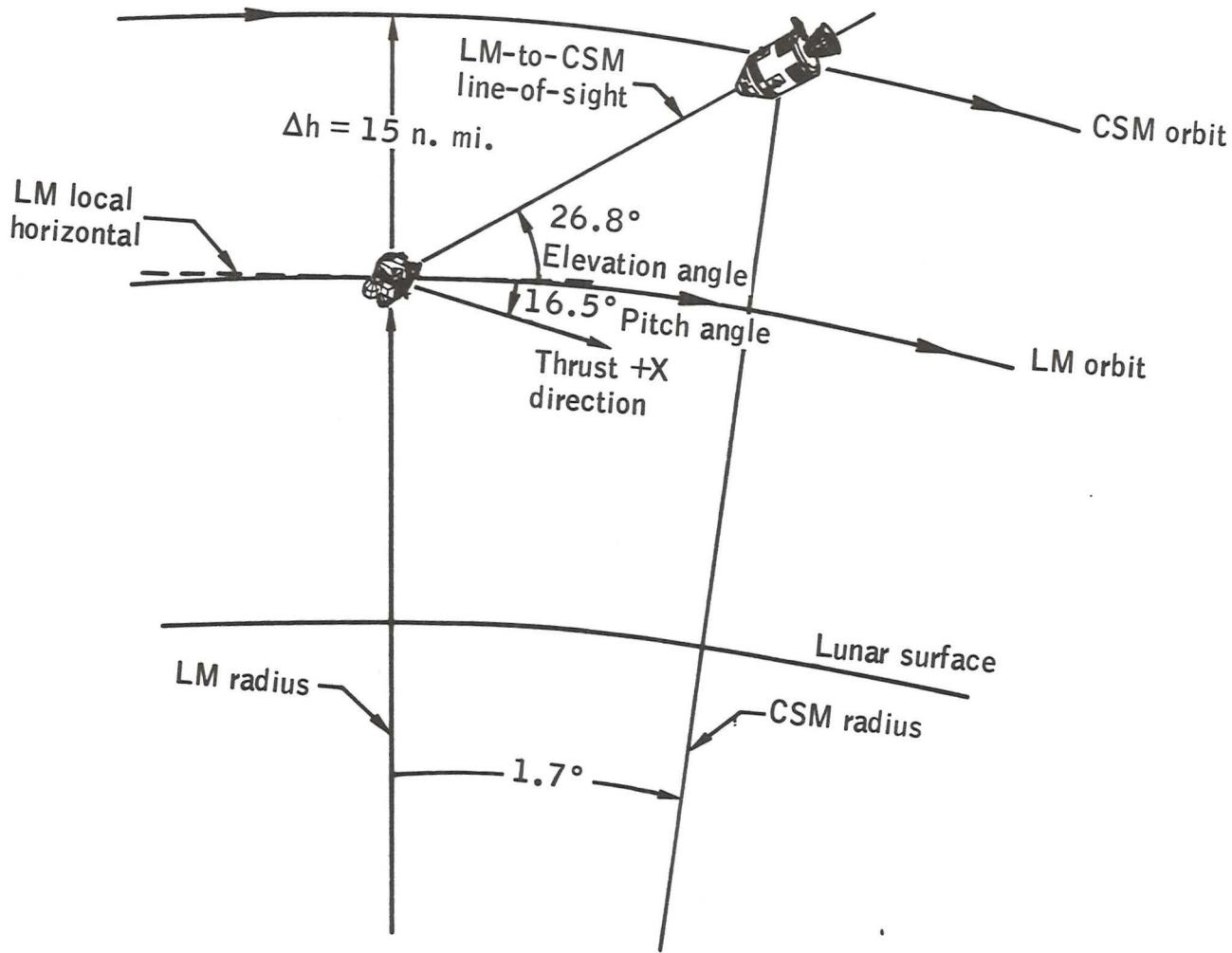


Figure 4.13-4.- LM-CSM relative geometry at TPI.

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4.14 LM JETTISON AND SEPARATION
TO TEI

4.14 LM Ascent Stage Jettison and Separation to CSM Transearth Injection

The LM ascent stage is jettisoned from the CSM about two revolutions after docking at $177^{\text{h}}30^{\text{m}}27.4^{\text{s}}$ g.e.t. The LM is jettisoned in the inertial attitude required for the LM deorbit maneuver which occurs about 96 minutes later. A 2.5-fps radial up velocity is imparted to the LM at jettison due to a 1.5 psi tunnel pressure between the LM and CSM.

The CSM performs a 1-fps retrograde maneuver 5 minutes after jettison to avoid any recontact with the LM. The CSM target load for this separation maneuver is shown in table 5-VII.

The LM deorbit burn occurs at $179^{\text{h}}06^{\text{m}}22.7^{\text{s}}$ g.e.t. at a longitude of 73.85°E . There are about 10 minutes of MSFN coverage prior to the deorbit maneuver in which to command the LM for deorbit. The deorbit is targeted to impact the lunar surface at 1.67°E longitude and 26.25°N latitude. Because of the far easterly longitude of the deorbit maneuver, for the LM antenna to be acquired by MSFN stations the LM must be inertially oriented to a pitched-down attitude of approximately 28° from the pure retrograde attitude at the maneuver initiation. The local horizontal pitch and yaw angles are presented in table 4-14-I. The roll has been optimized for MSFN communication. The total ΔV required for deorbit is 195.4 fps. This is a 12-fps increase above that required on Apollo 14 and is due to the pitch required for MSFN communication. This RCS burn (+X, 4-jet) will be about 82.3 seconds long. The target load for deorbit is shown in table 5-VII.

After deorbit the LM coasts for about 25 minutes in a 62.0 by -52.8 n. mi. orbit prior to impacting the lunar surface. The velocity of impact is 5527.9 fps with a flight-path angle of -3.5° .

The LM deorbit groundtrack is shown in figure 4.14-1. The 3σ dispersion ellipse shown in this figure is ± 19.25 n. mi. down range and ± 0.73 n. mi. cross range. The Apollo 15 landing site is outside of this ellipse; therefore, no damage to the experiment packages left from lunar stay is probable.

TABLE 4.14-I.- LM DEORBIT SUMMARY

Event	Time, hr:min:sec g.e.t.	Latitude, deg	Longitude, deg	Burn duration, sec	ΔV , fps	Inertial velocity, fps	Mass, lb	Local horizontal attitudes, deg	
								Pitch	Yaw
Deorbit	179:06:22.7	-6.23	73.86	82.3	195.4	5353.6	5309.2	-151.7	17.1
Impact	179:31:07.9	26.25	1.67	--	--	5527.9	5195.7	-74.8	17.6

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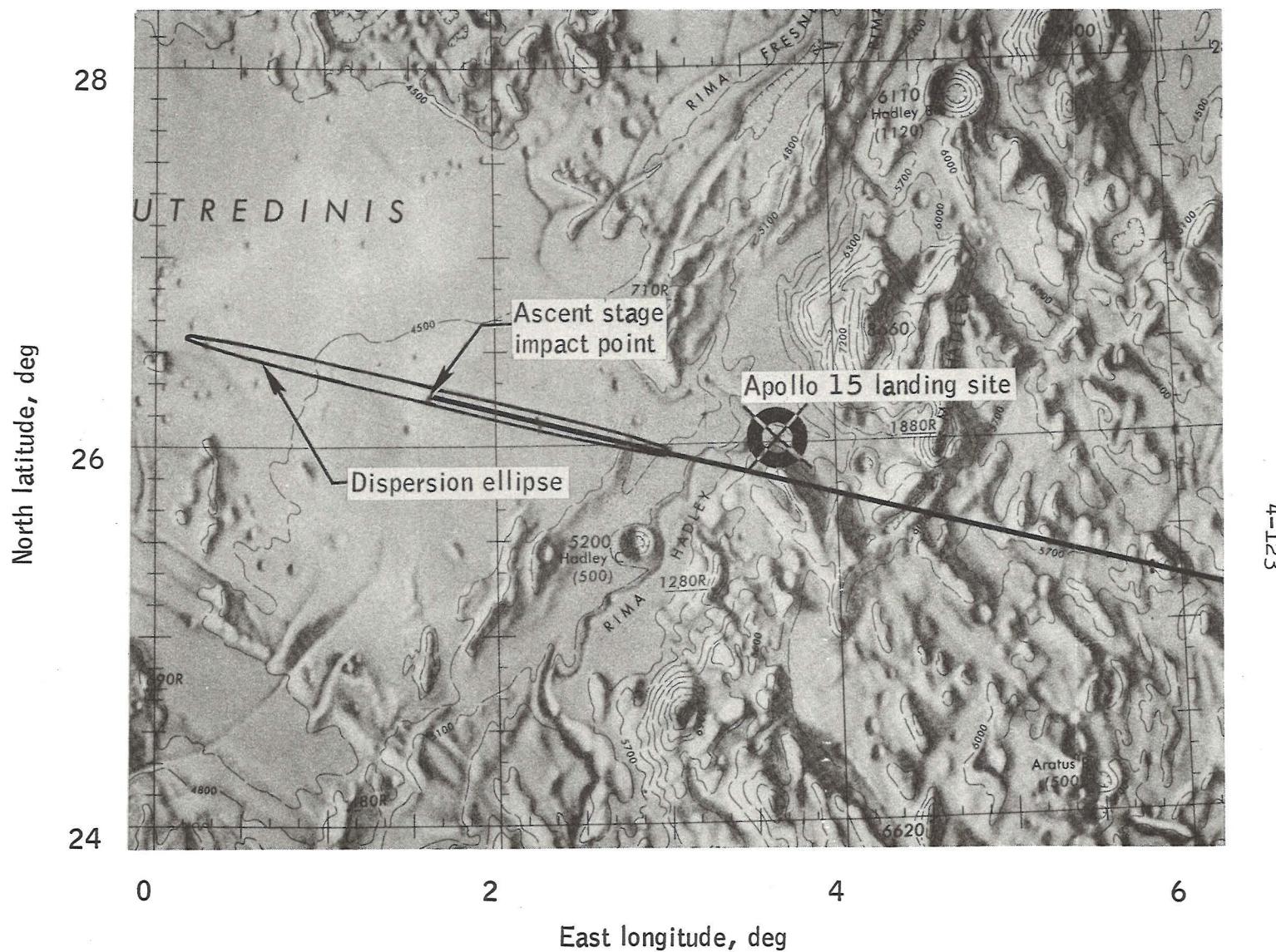
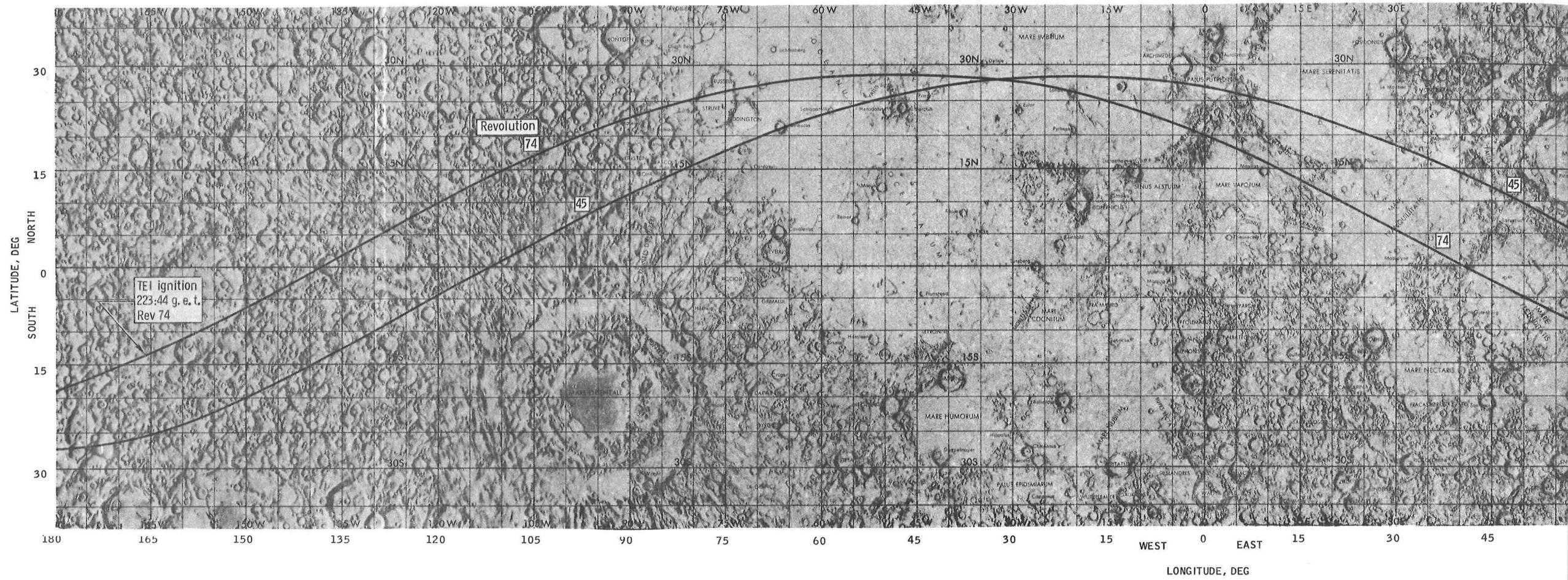
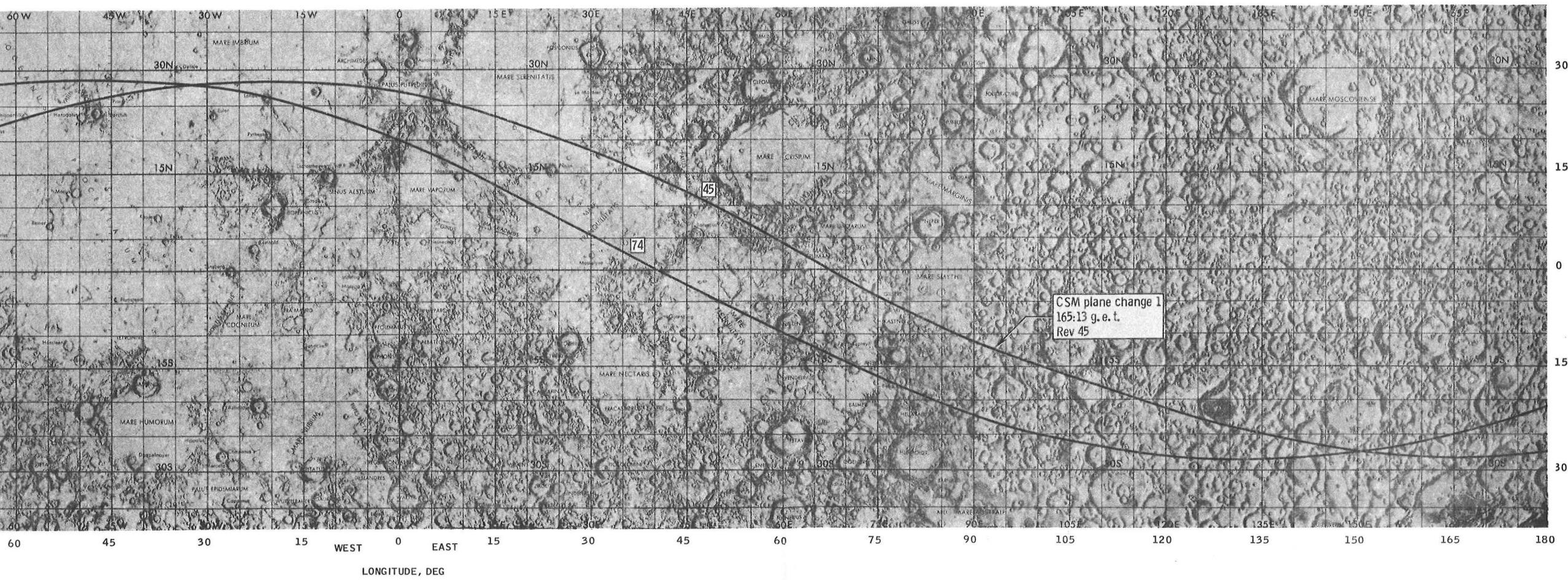


Figure 4.14-1.- Apollo 15 LM ascent stage impact groundtrack.





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4.15 TRANSEARTH INJECTION

4.15 Transearth Injection

The TEI maneuver occurs $6^d 01^h 33^m$ after LOI and $2^d 04^h 06^m$ after LM ascent. For a 71.2-hour transearth flight time and a 40° ascending return inclination relative to the earth's equator. A time history of the trajectory parameters during the burn is presented in figure 4.15-1. The transearth injection geometry is shown in figure 4.15-2.

For the TEI burn, the IMU is aligned to the TEI preferred REFSMMAT. The target load is presented in table 5-VIII.

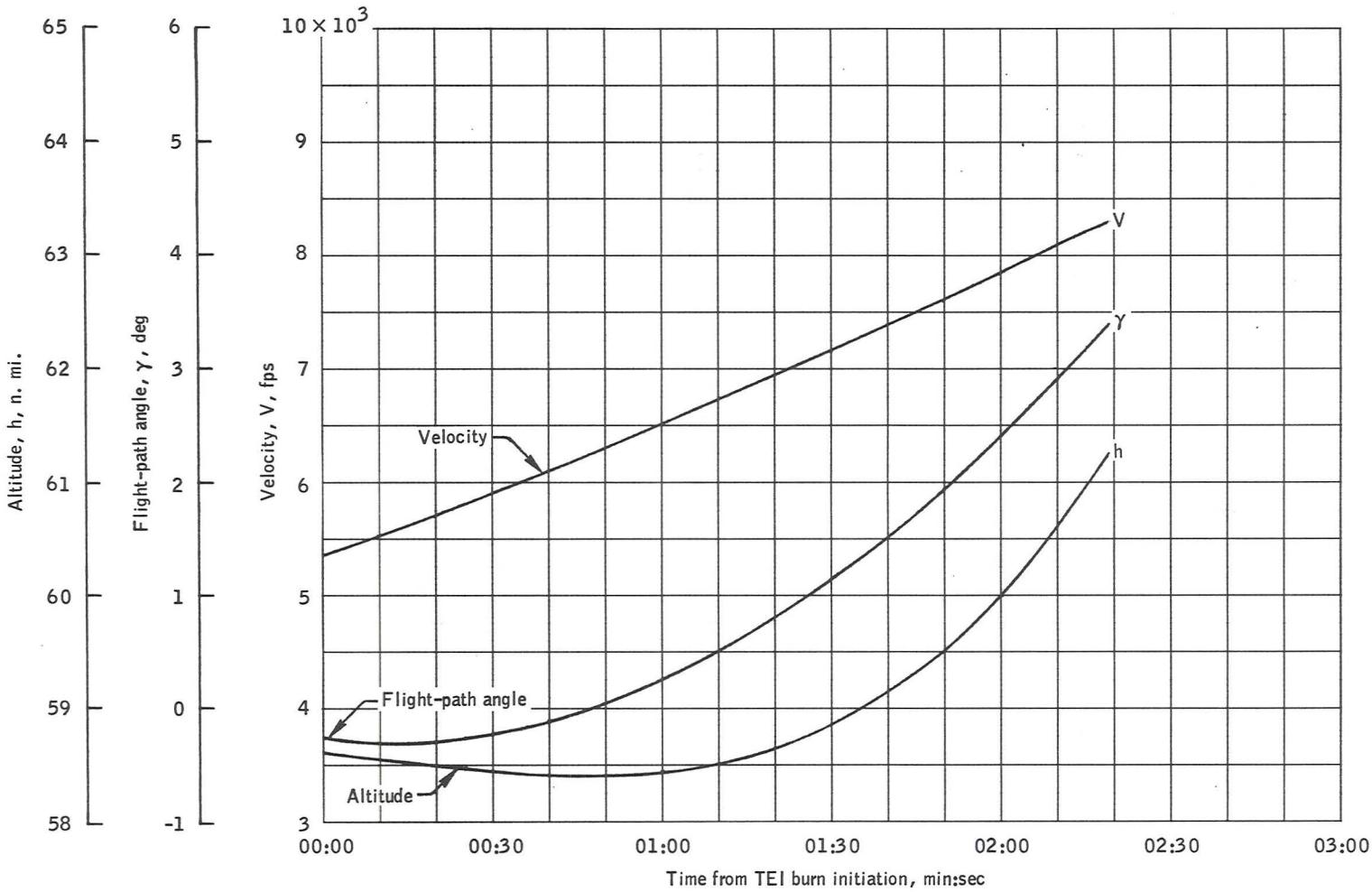
The characteristics of the burn are the following.

TEI burn initiation

Time, hr:min:sec, g.e.t.	223:43:47.6
Mass, lb	36 280.9
Altitude above LLS, n. mi.	58.6
Selenographic latitude, deg	-13.5
Selenographic longitude, deg	-166.1
Inertial velocity, fps	5353.0
Selenographic inclination, deg	28.6
Perilune altitude above LLS, n. mi.	54.6

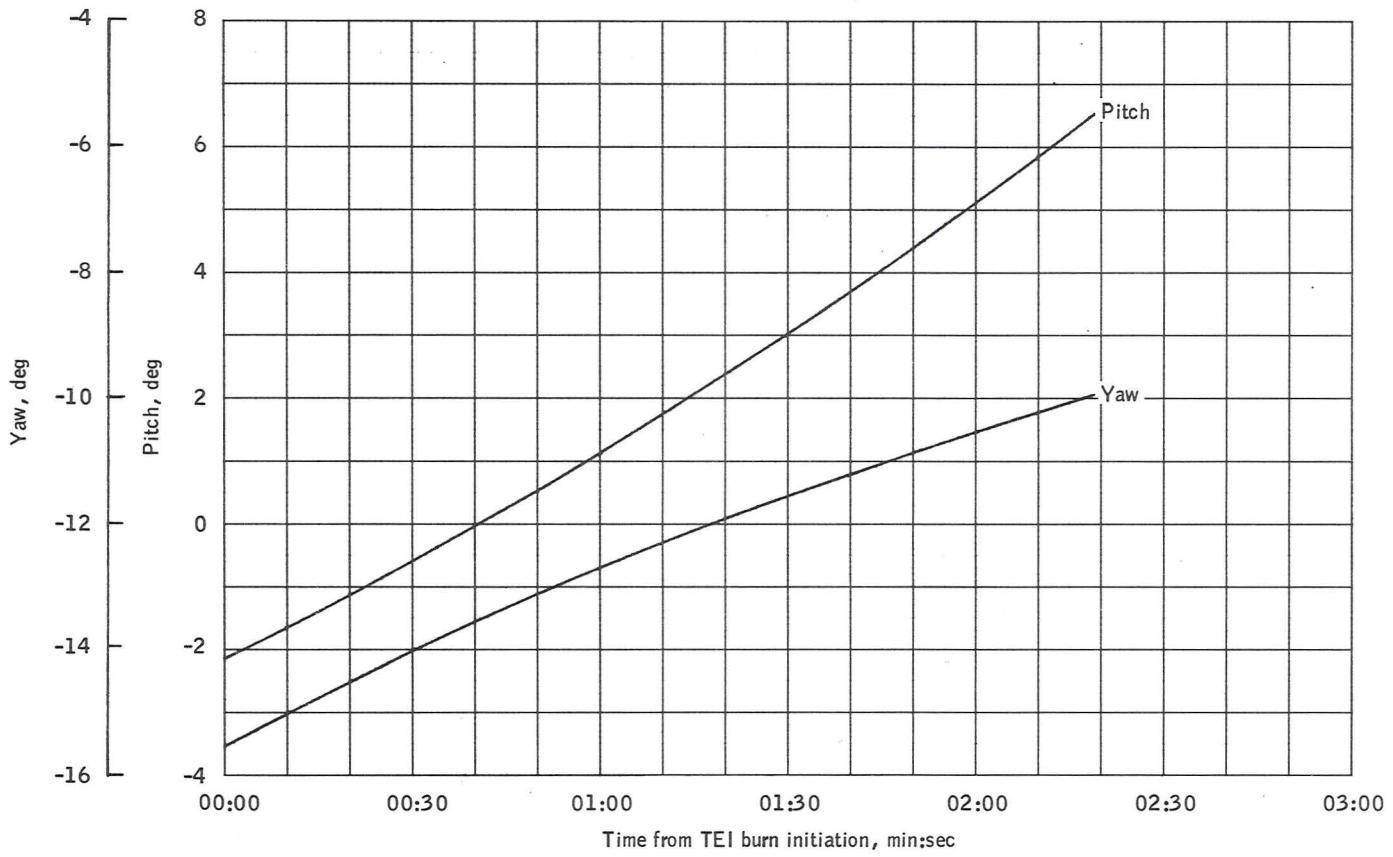
TEI burnout

Time, hr:min:sec, g.e.t.	223:46:06.6
Altitude above LLS, n. mi.	61.3
Selenographic latitude, deg	-17.6
Selenographic longitude, deg	-174.2
Inertial velocity, fps	8317.2
Selenographic inclination, deg	33.5
Burn duration, sec	139.0
Inertial burn arc, deg	8.9
Plane change, deg	5.6
ΔV , fps	3046.7
SPS propellant used, lb	9444.3
Perilune altitude above LLS, n. mi.	58.3



(a) Velocity, flight-path angle and altitude versus time from TEI burn initiation.

Figure 4.15-1.- Time history of trajectory parameters for transearth injection.



(b) Local horizontal pitch and yaw versus time from TEI burn initiation.

Figure 4.15-1.- Concluded.

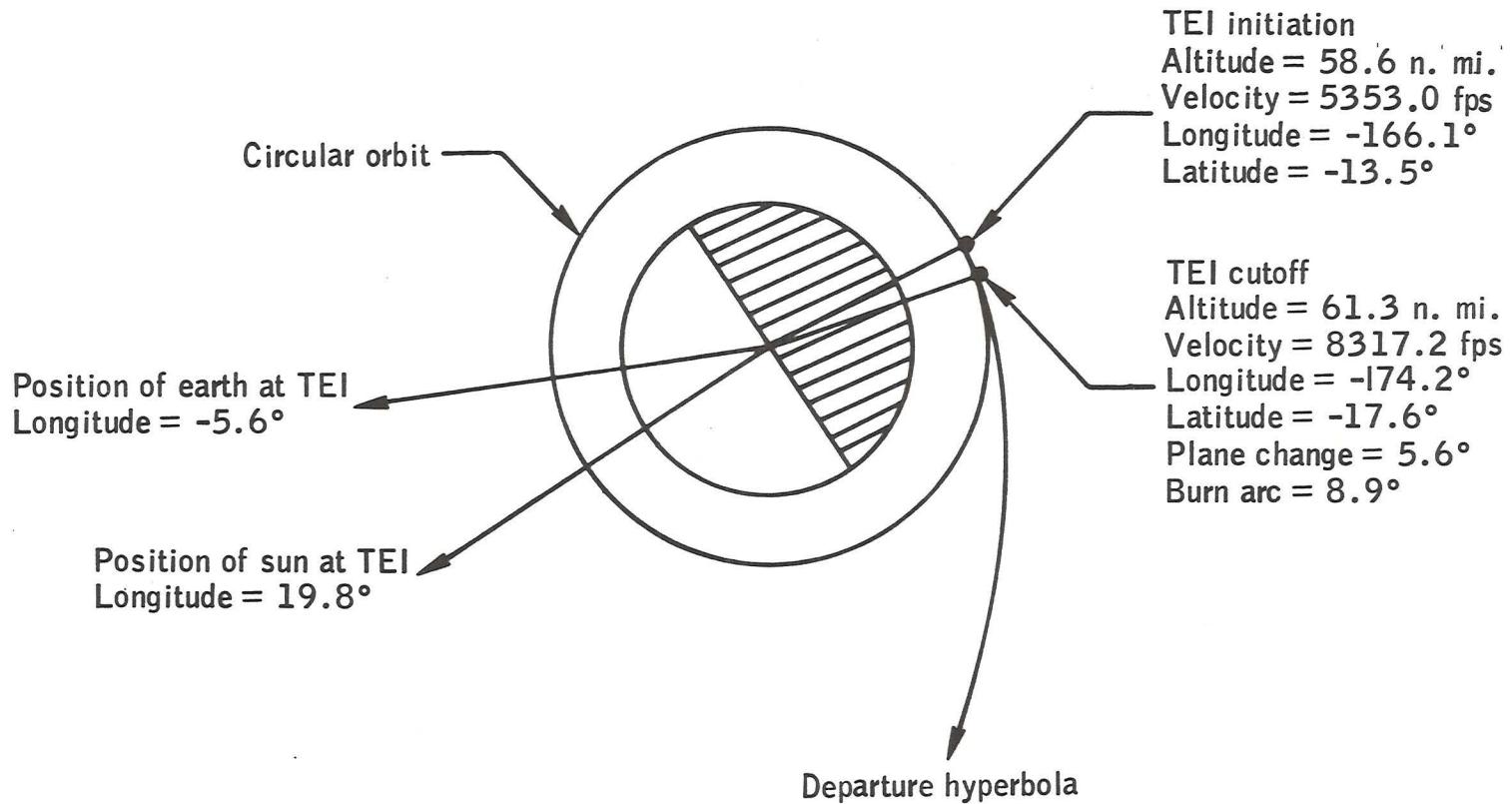


Figure 4.15-2.- TEI geometry.

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4.16 TRANSEARTH COAST

4.16 Transearth Coast

A groundtrack of the transearth coast phase is provided in figure 4.16-1. Altitude above the moon is shown for the first 10 hours of coast in figure 4.16-2. The altitude time history for TEI to entry is shown in figure 4.16-3. Three midcourse decision points have been defined for the transearth phase.

- a. MCC-5, TEI plus 17 hours
- b. MCC-6, EI minus 22 hours
- c. MCC-7, EI minus 3 hours

The maneuvers will be targeted for corridor control only. The midcourse strategy, which includes the threshold values for each maneuver, is contained in reference 4. Altitude is plotted against time for the last 10 hours of transearth coast in figure 4.16-4.

The SC remains in the lunar umbra during the entire TEI burn, enters sunlight approximately 5 minutes after cutoff, and remains in sunlight until entry.

Passive thermal control will be maintained during most of the trans-earth coast phase. The PTC REFSMMAT (table 5-III) will be used for MCC-5 and MCC-6; the entry REFSMMAT (table 5-IX) will be used for MCC-7. The CM/SM separation occurs approximately 15 minutes prior to entry.

The SC is acquired by MSFN approximately 12 minutes after TEI cutoff, and the last station to lose signal is Guam (5° minimum elevation) which loses signal at $294^{\text{h}}53^{\text{m}}$ g.e.t., or approximately 5 minutes prior to entry.

The primary trajectory parameters at entry interface are the following.

Time, hr:min:sec, g.e.t. .	294:58:20.0
Transearth coast time, hr .	71.2
Inertial velocity, fps .	36 097.2
Altitude, n. mi. .	65.8
Inertial flight-path angle, deg	-6.5
Latitude, deg .	14.3
Longitude, deg .	-175.0
Equatorial inclination (ascending), deg	40

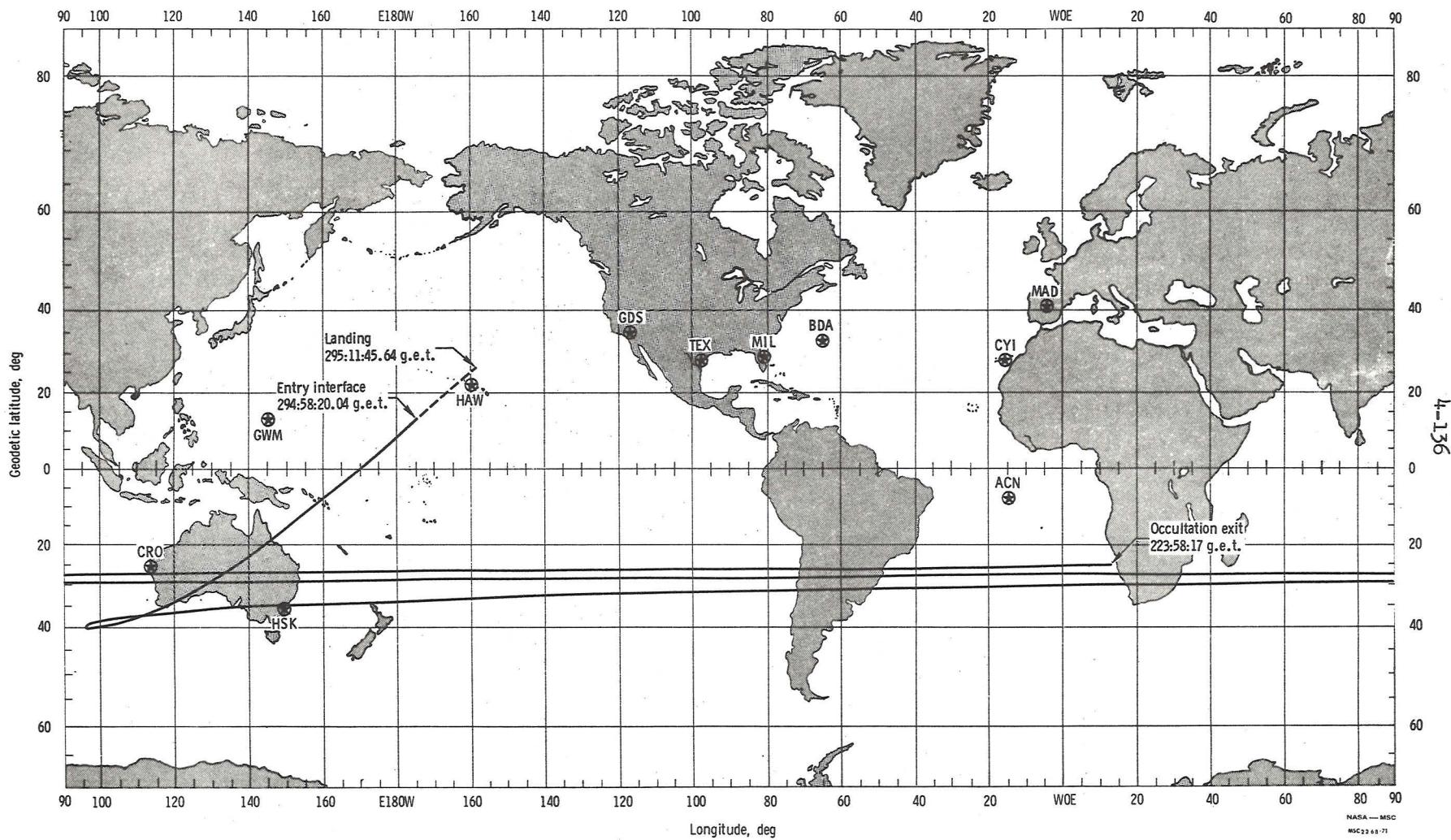


Figure 4.16-1. - Transearth coast groundtrack.

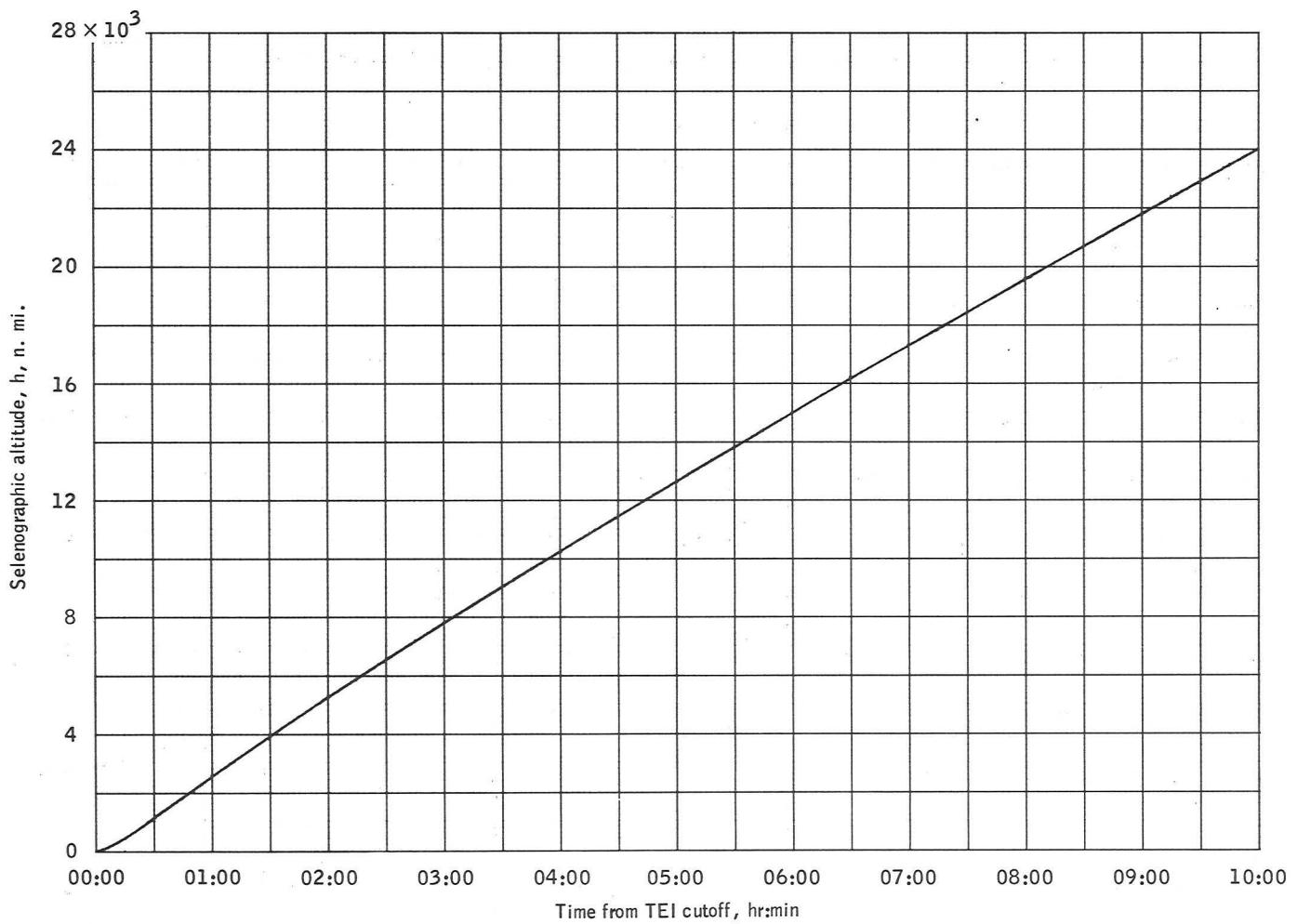


Figure 4.16-2.- Selenographic altitude time history during the first 10 hours of transearth coast.

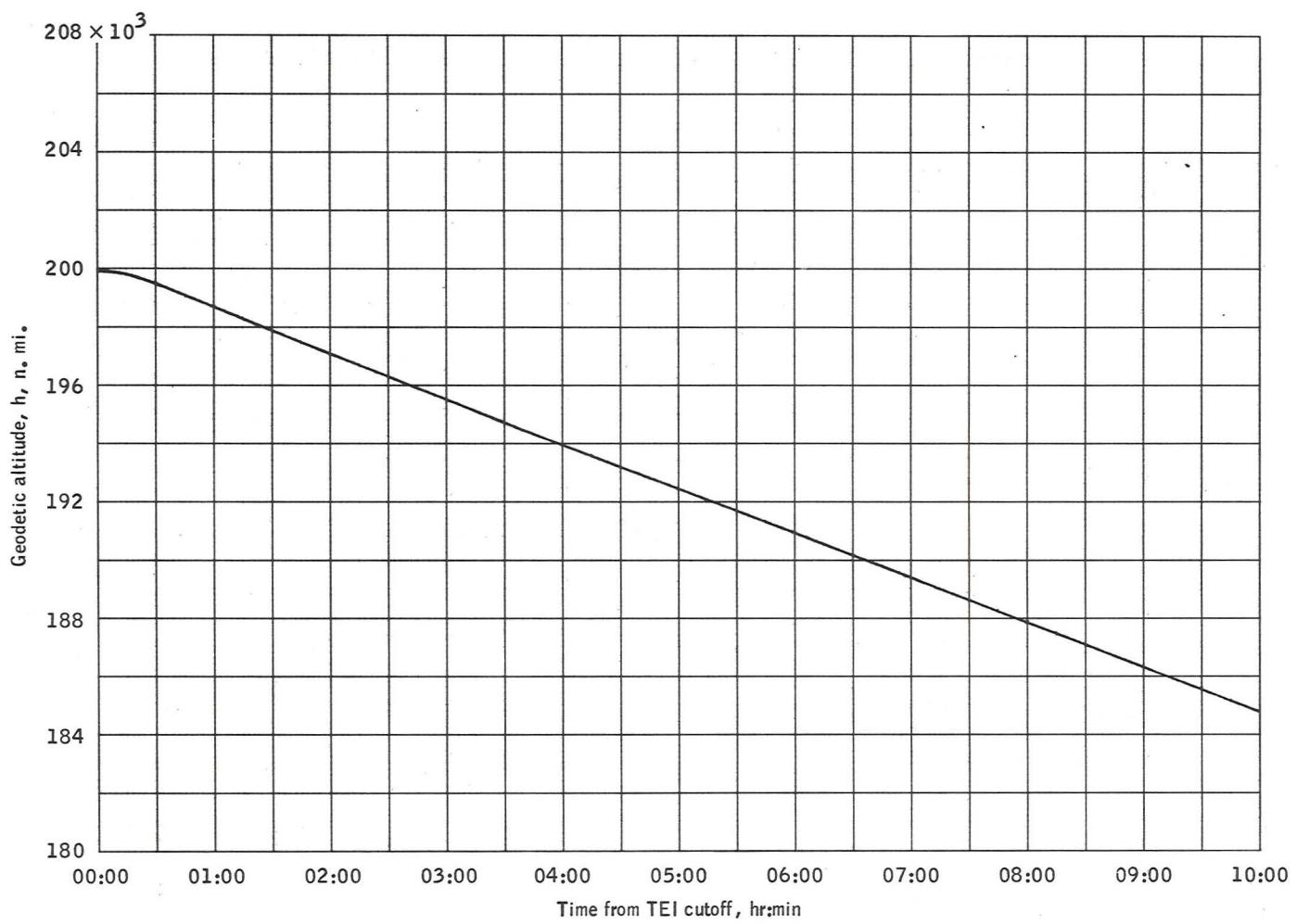


Figure 4.16-3.- Geodetic altitude time history during the first 10 hours of transearth coast.

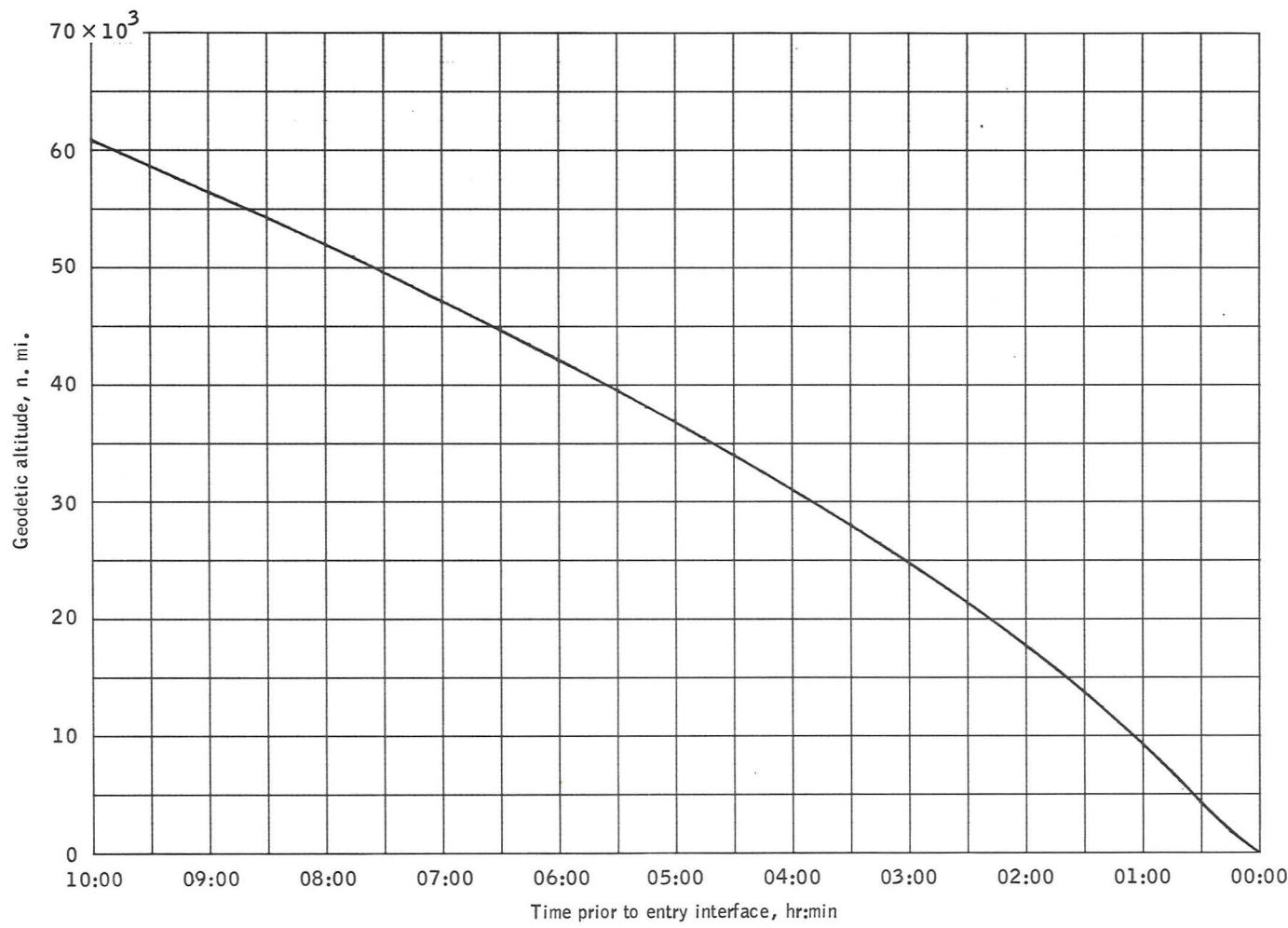


Figure 4.16-4.- Geodetic altitude time history 10 hours prior to entry interface.

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4.17 ENTRY

4.17 Entry

The entry phase of the operational trajectory was simulated with the Apollo re-entry simulation program with six degrees-of-freedom. Three-degrees-of-freedom trajectories were used to determine the CM maneuver footprint. The entry corridor is presented in figure 1.

At the nominal entry interface, 294 hours, 58 minutes, 20 seconds after lift-off, the CM is at an altitude of 399 622 feet, and the coordinates are 14.299°N geodetic latitude and 174.953°W longitude. Inertial velocity, flight-path angle, and azimuth at this point are 36 097 fps, 6.49° below the local horizontal, and 52.206° , respectively. The gimbal angles are as follows: yaw = 0° , pitch = 152° , roll = 0° .

The CM maneuver footprint and the nominal ground trace on a map of the entry area are presented in figure 2. The footprint is extended to a 3500-n. mi. entry range. The nominal touchdown target location is 1190 n. mi. down range from the entry interface position, and the coordinates of the target are 158.0°W longitude and 26.119°N geodetic latitude. A sequence of pertinent events is given in table I and includes the period of communications blackout which occurs along the trajectory. The guidance phases are shown in figure 3, which shows altitude as a function of range to the target. Time histories of the bank angle commanded by the guidance system, of the altitude rate, and of the altitude are presented in figure 4. Time histories of the total heating rate and the total heat load are presented in figure 5. The maximum total heating rate is 288.8 Btu/ ft^2/sec , and the total heat load is 25881.2 Btu/ ft^2 . Time histories for inertial and relative velocity and flight-path angles are presented in figures 6 and 7, respectively.

The CM RCS uses 11.6 pounds of propellant for the separation and attitude hold maneuvers before the spacecraft reaches 400 000 feet. The RCS uses 39.0 pounds of propellant, using dual ring operation, to perform the guidance commands during the remainder of the entry. A time history of the total RCS propellant consumed from 0.05g is presented in figure 8. In figure 9, the altitude is plotted in relation to relative velocity, and the boundary for S-band communication blackout is shown (ref. 3). Time histories for the primary DSKY displays, commanded bank angle, inertial velocity, and load factor are shown in figure 10. The load factor at the center of gravity reaches a first maximum of 6.1g and a second maximum of 3.2g. Time histories for the FINAL PHASE DSKY displays, commanded bank angle, cross-range error, and down-range error are shown in figure 11.

The drogue parachute deployment sequence begins at an altitude of 23 300 feet, which is 7 minutes, 47 seconds after entry interface. The two drogue parachutes are deployed 2 seconds later. At an altitude of

10 500 feet, the low altitude baroswitch closes, and the drogue parachutes are disconnected. The three main parachutes are deployed 1 second after the baroswitch closes. The CM, suspended on the main parachutes, reaches landing 13 minutes 26 seconds after entry interface. The relative velocity and relative flight-path angle are plotted against time from drogue chute deployment in figure 12. Load factor and altitude are plotted against time from drogue chute deployment in figure 13.

The two traces of entry monitor subsystem (EMS) parameters in figure 14 present the load factor, the commanded bank angle, and the range-to-go as functions of the inertial velocity.

The CM mass properties are shown in table 5-XII. The conditions at entry interface and several CMC entry erasable load quantities are presented in table 4.17-II, and the entry REFSMMAT is presented in table 5-IX.

TABLE 4.17-I.- ENTRY EVENTS SEQUENCE

<u>Event</u>	<u>Time from Lift-Off hr:min:sec</u>	<u>Time from 400 000 ft min:sec</u>
Entry	294:58:20	0:00
Enter S-Band Communication Blackout	294:58:38	0:18
Guidance Changes from P63 to P64		
Load Factor > 0.05g	294:58:49	0:29
Initiate Constant Drag Control		
Load Factor > KA	294:59:14	0:54
Maximum Heating Rate	294:59:30	1:10
Guidance Initiate at RDOT = -700 ft/sec	294:59:40	1:20
Maximum Load Factor (First)	294:59:44	1:24
Subcircular Velocity	295:00:30	2:10
Guidance Change from P64 to P67	295:00:32	2:12
Exit S-Band Communication Blackout	295:01:54	3:34
Maximum Load Factor (Second)	295:04:02	5:42
Termination of CMC Guidance	295:05:10	6:50
Drogues Parachute Deployment	295:06:07	7:47
Main Parachutes Deployment	295:06:56	8:36
Landing	295:11:46	13:26

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TABLE 4.17-II.- CONDITIONS AT ENTRY INTERFACE AND TARGET POINT

Elapsed time from launch, hr:min:sec	294:58:20
Inertial velocity, ft/sec	36 097
Inertial flight path angle, deg	-6.49
Inertial azimuth, deg	52.21
Spacecraft geodetic latitude, deg N	14.299
Spacecraft longitude, deg W	174.95
Altitude, ft	399 623
Target geodetic latitude, deg N	26.12
Target longitude, deg W	158.0

CMC ERASABLE LOAD PARAMETERS

<u>Parameter Name</u>	<u>Description</u>	<u>Preliminary Value</u>
ALFAPAD	Hypersonic value of angle-of-attack (α) for CM in trimmed flight	-19.00 deg
EMSALT	EMS initialization altitude	297689.9 ft
LADPAD	Update value for minimum reference L/D	0.27
LODPAD	Update value for minimum reference L/D, final phase	0.207

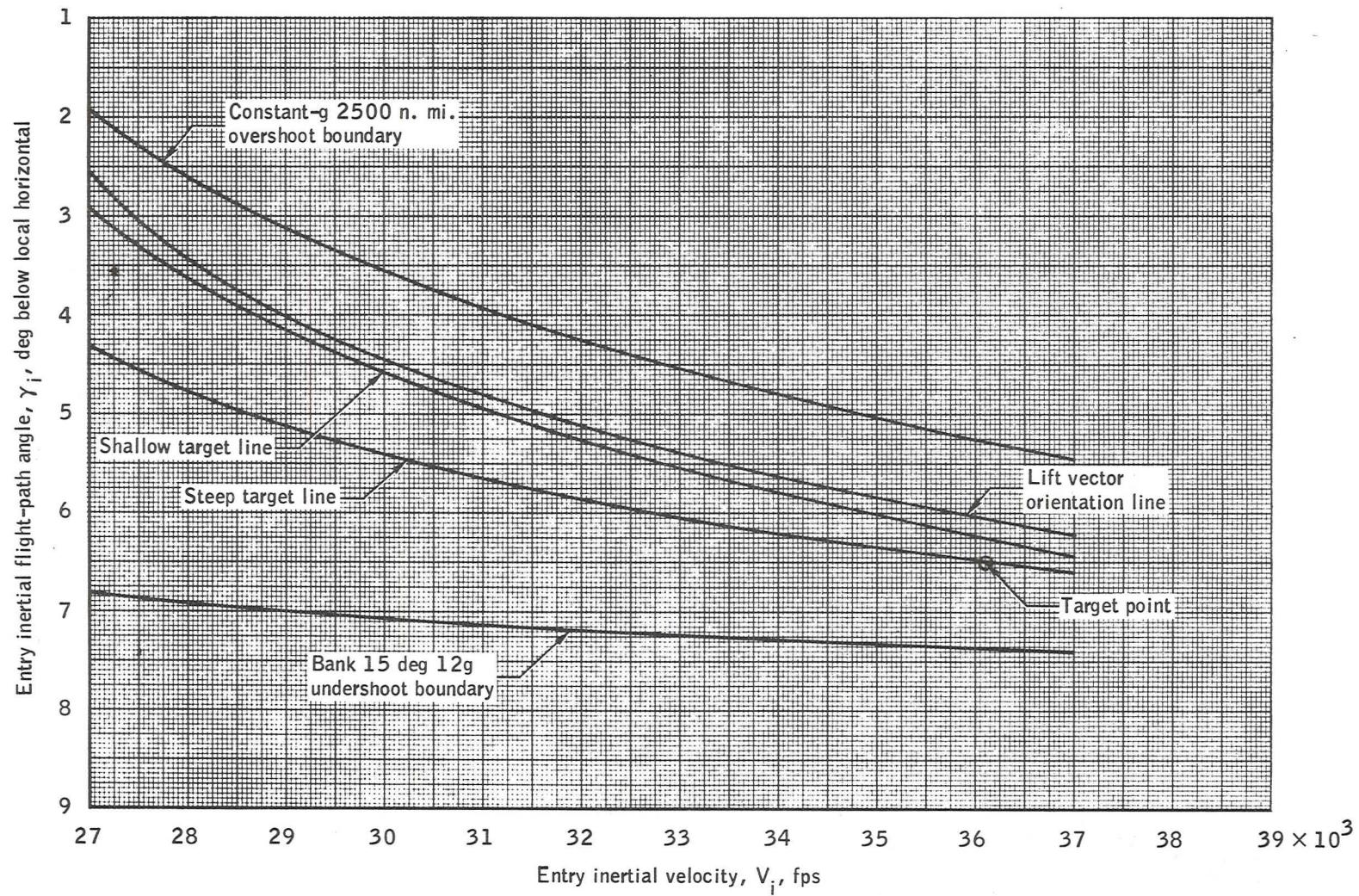


Figure 4.17-1.- Entry corridor.

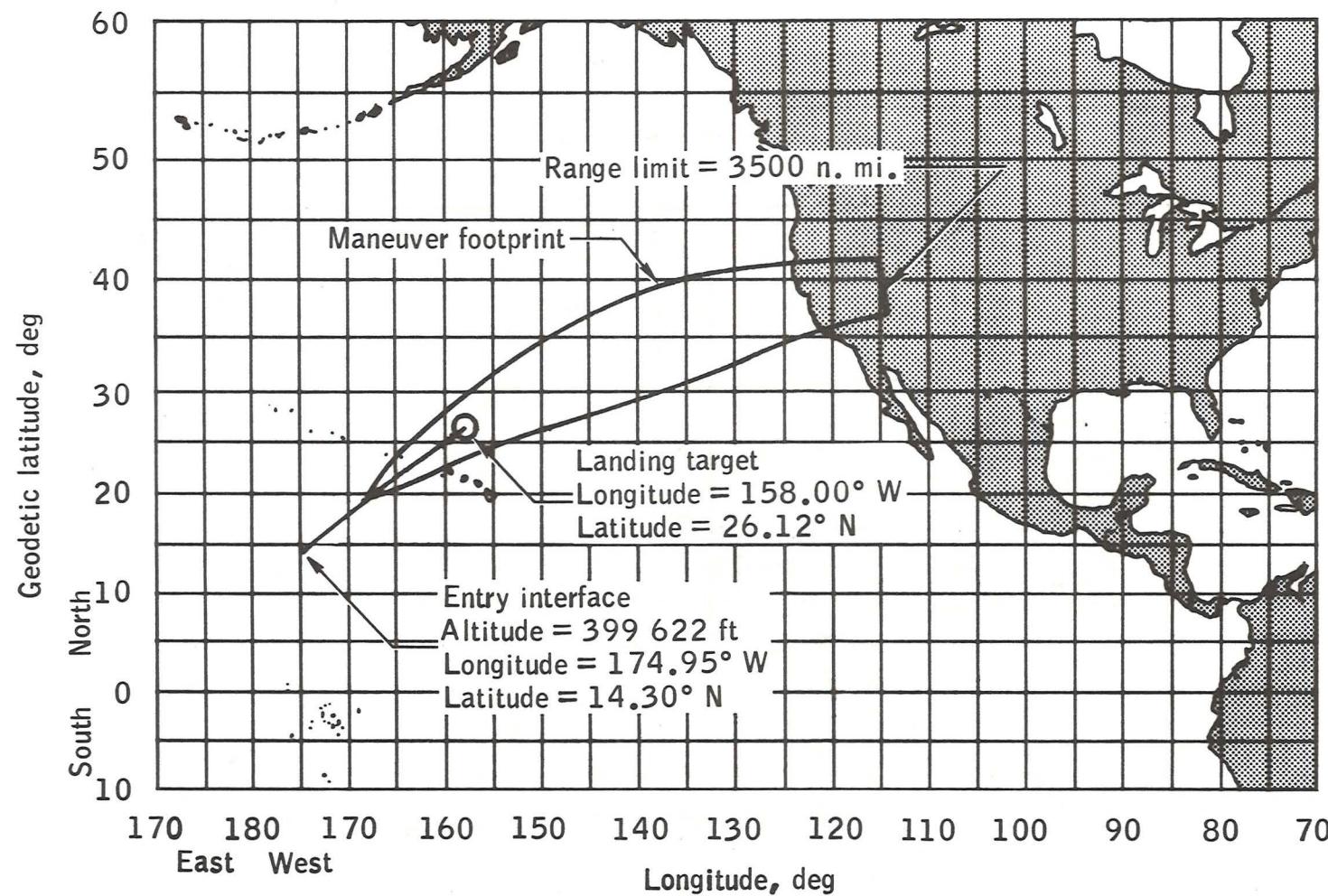


Figure 4.17-2.- Maneuver footprint and nominal groundtrack.

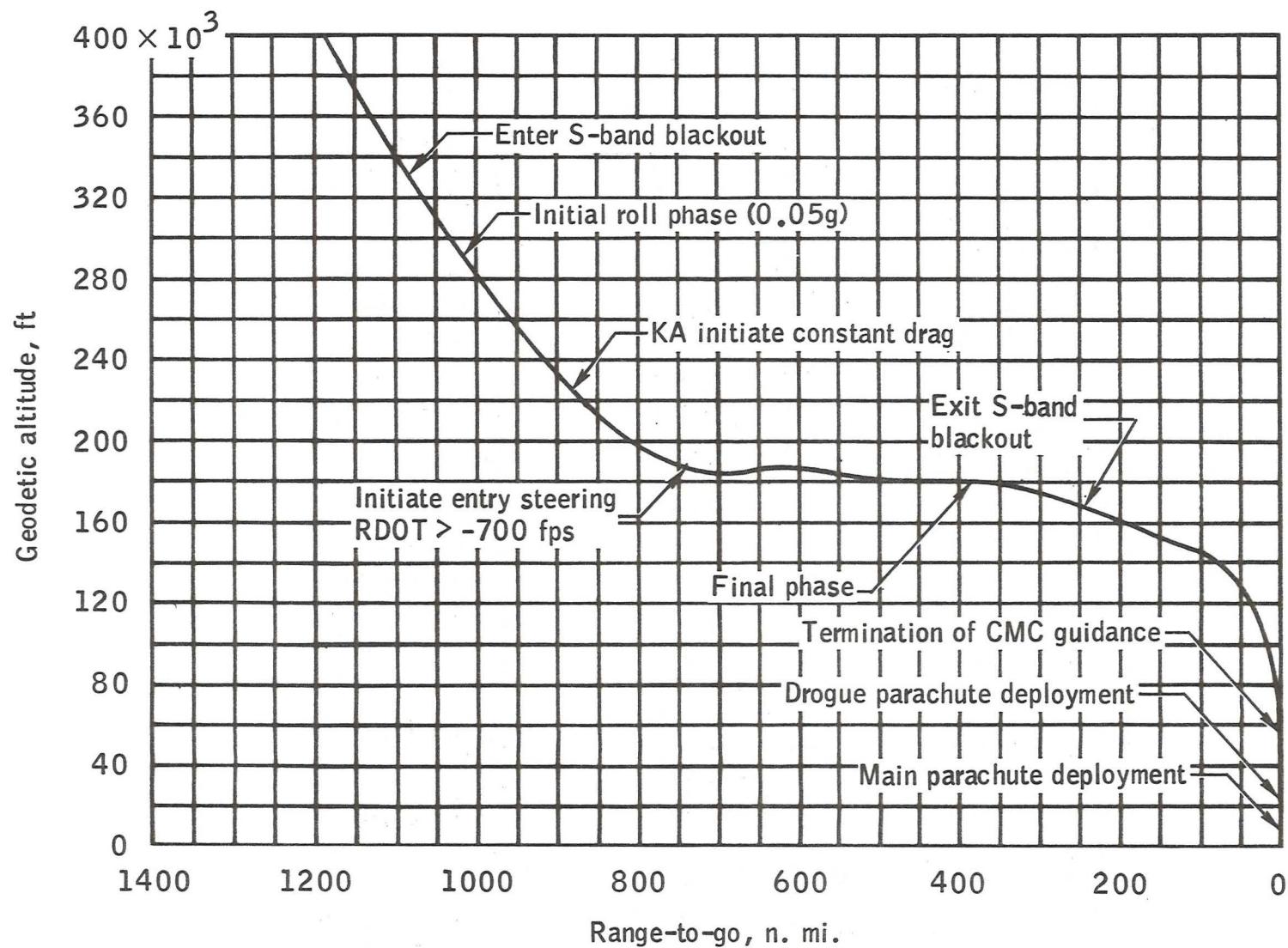


Figure 4.17-3.- Geodetic altitude versus range-to-go.

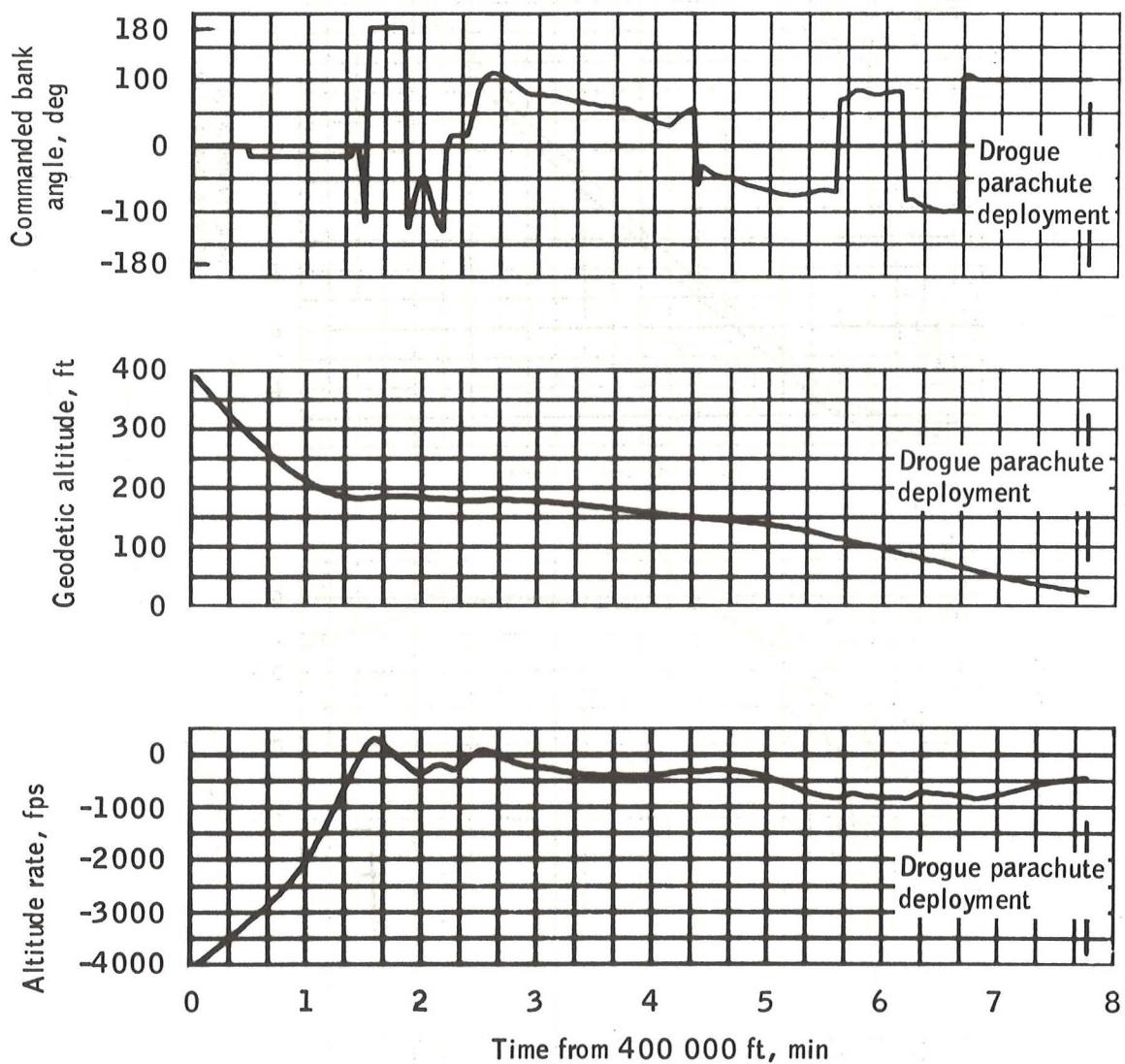


Figure 4.17-4.- CMC commanded bank angle, altitude, and altitude rate time histories.

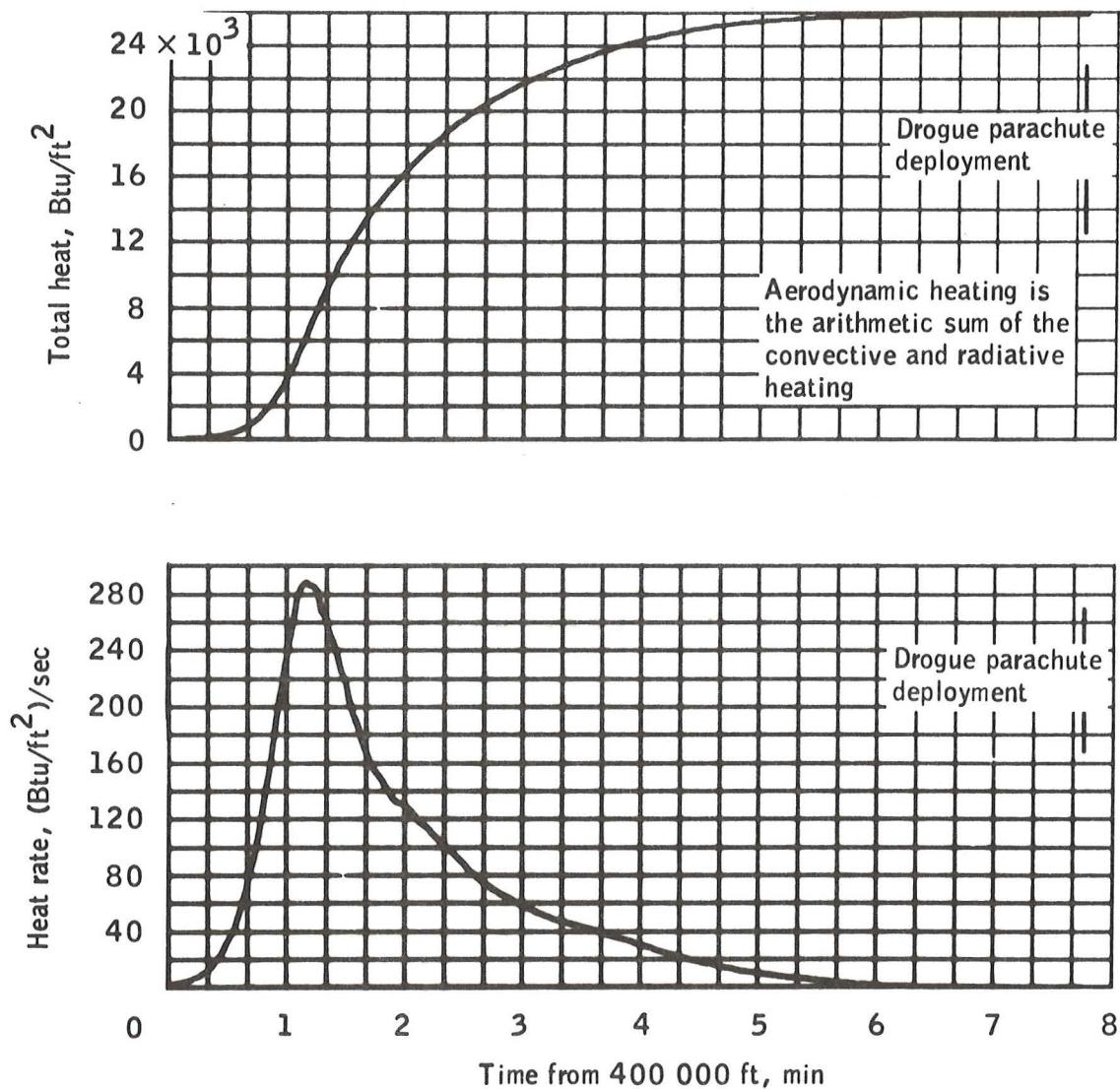
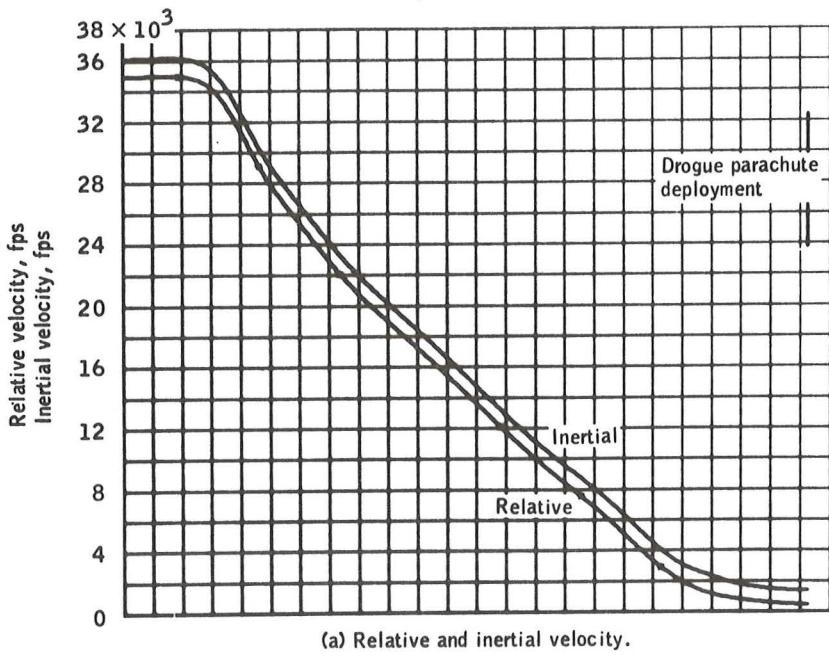
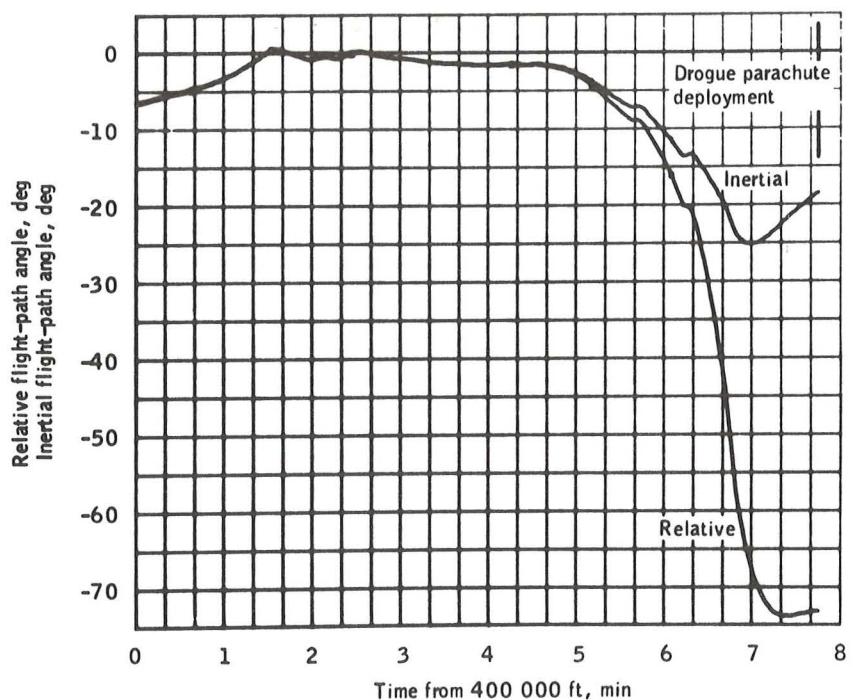


Figure 4.17-5.- Total aerodynamic heating rate and heat load time histories.



(a) Relative and inertial velocity.



(b) Relative and inertial flight-path angle.

Figure 4.17-6. - Time histories of velocity and flight-path angle for entry.

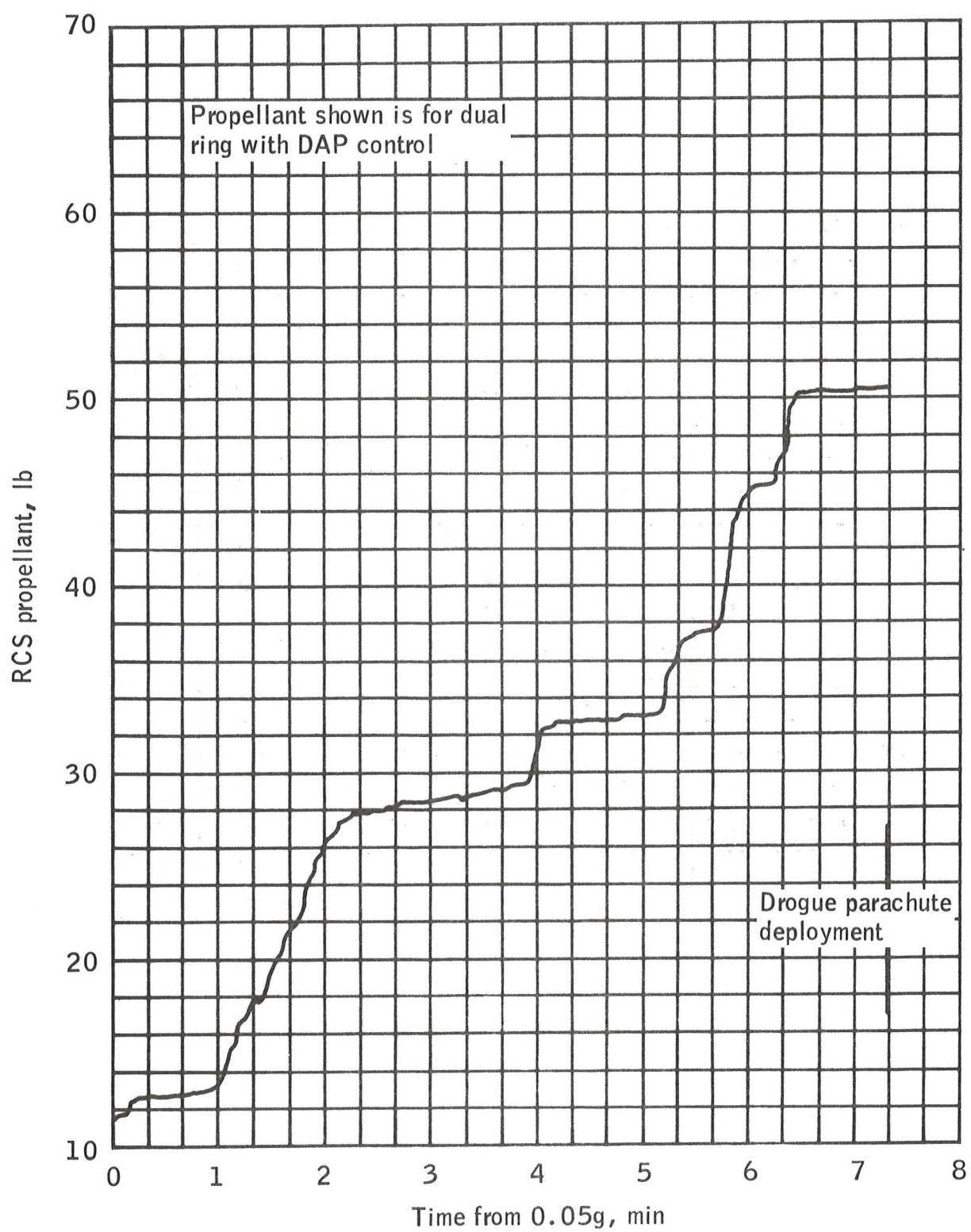


Figure 4.17-7.- Total propellant consumed from CSM separation.

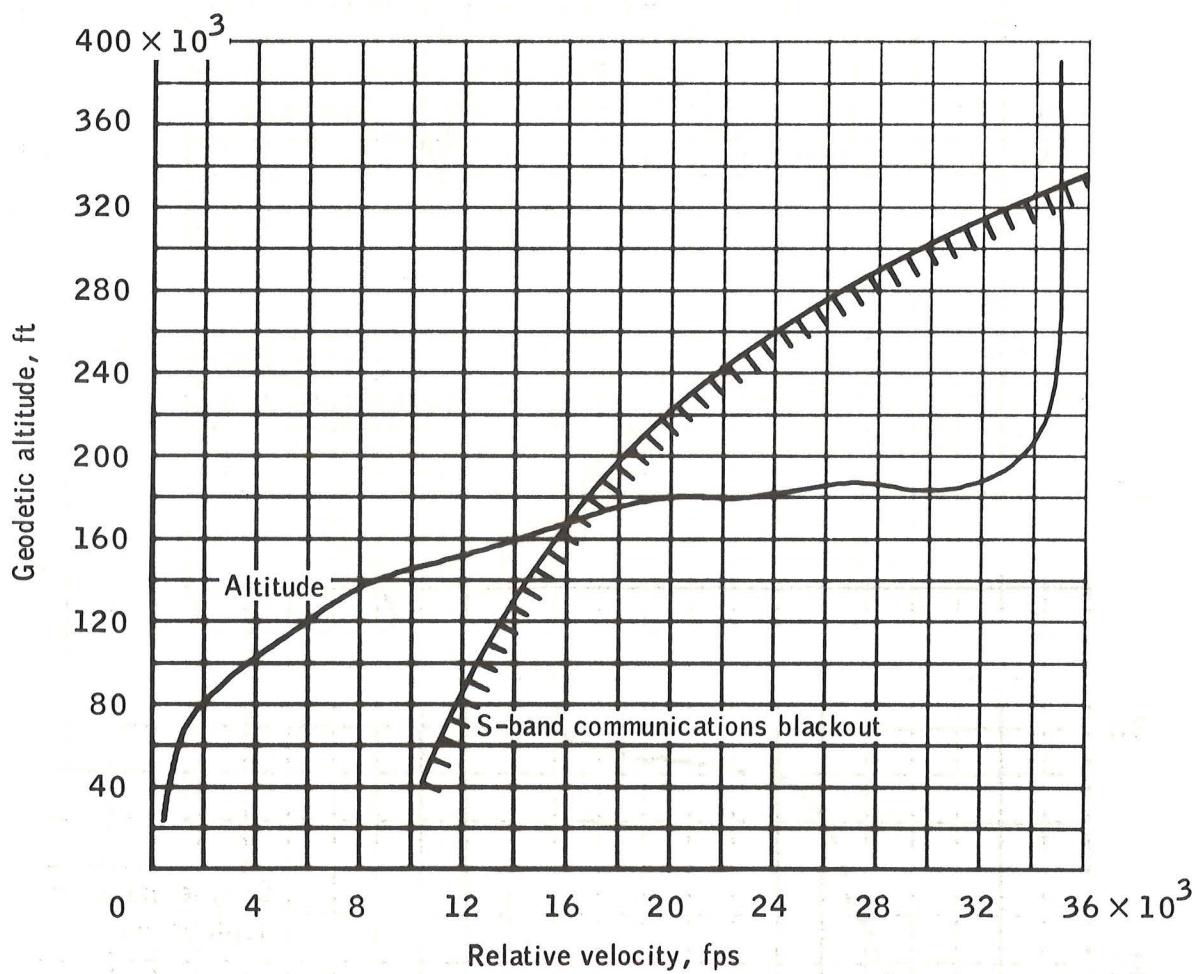


Figure 4.17-8.- Communications blackout.

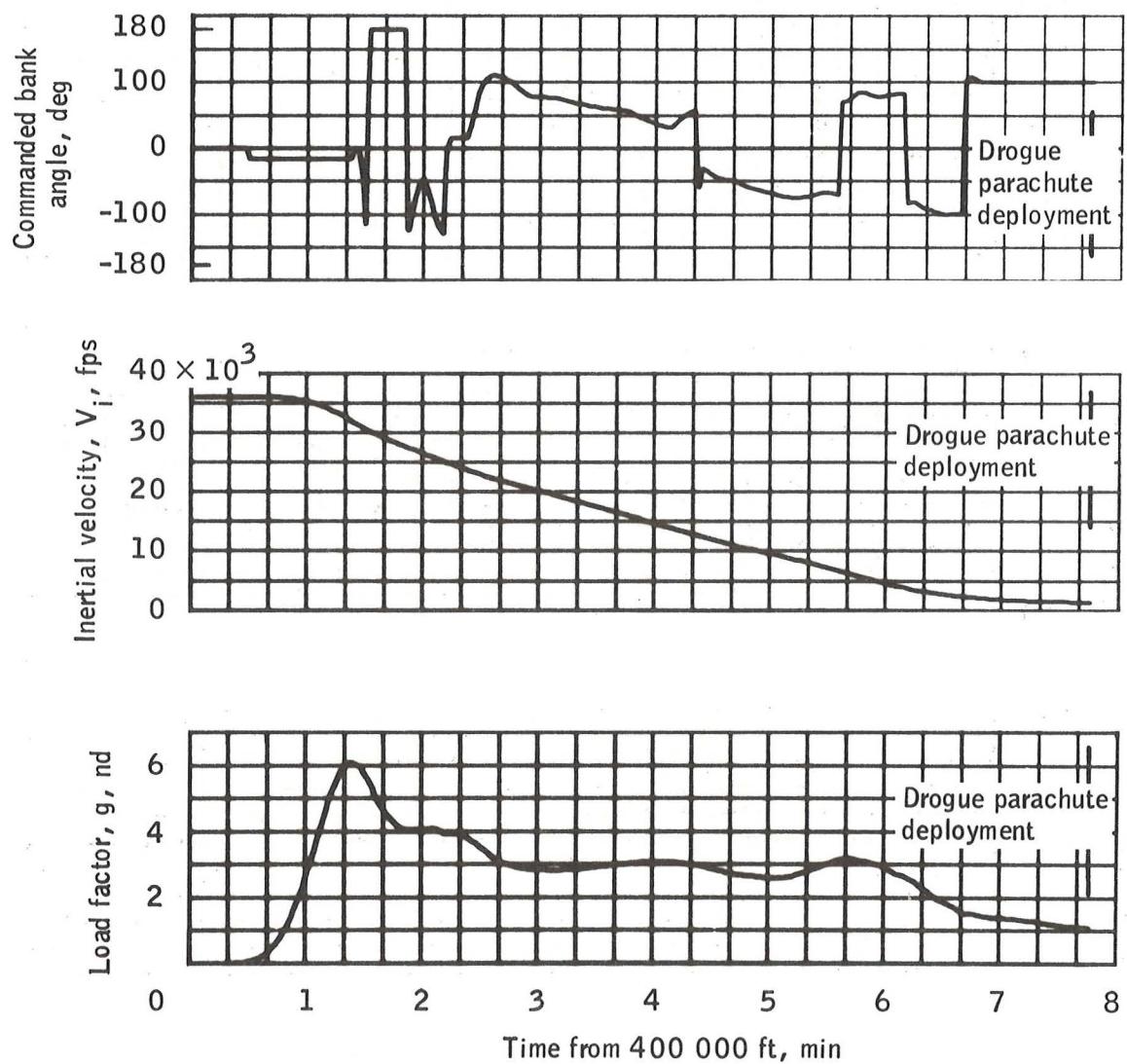


Figure 4.17-9.- Primary DSKY displays VERB 06 NOUN 74.

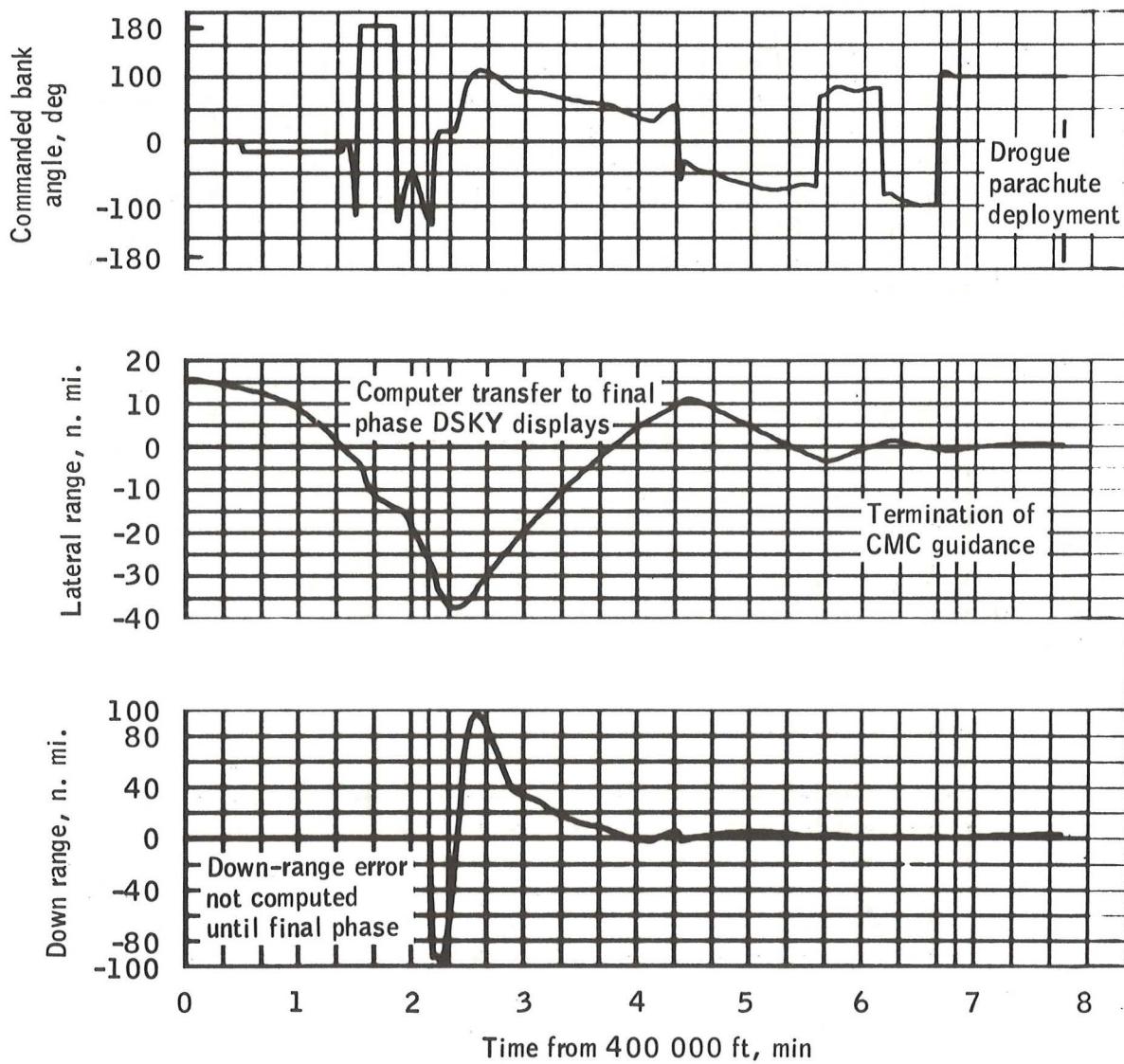


Figure 4.17-10.- DSKY displays (final phase) VERB 06 NOUN 66.

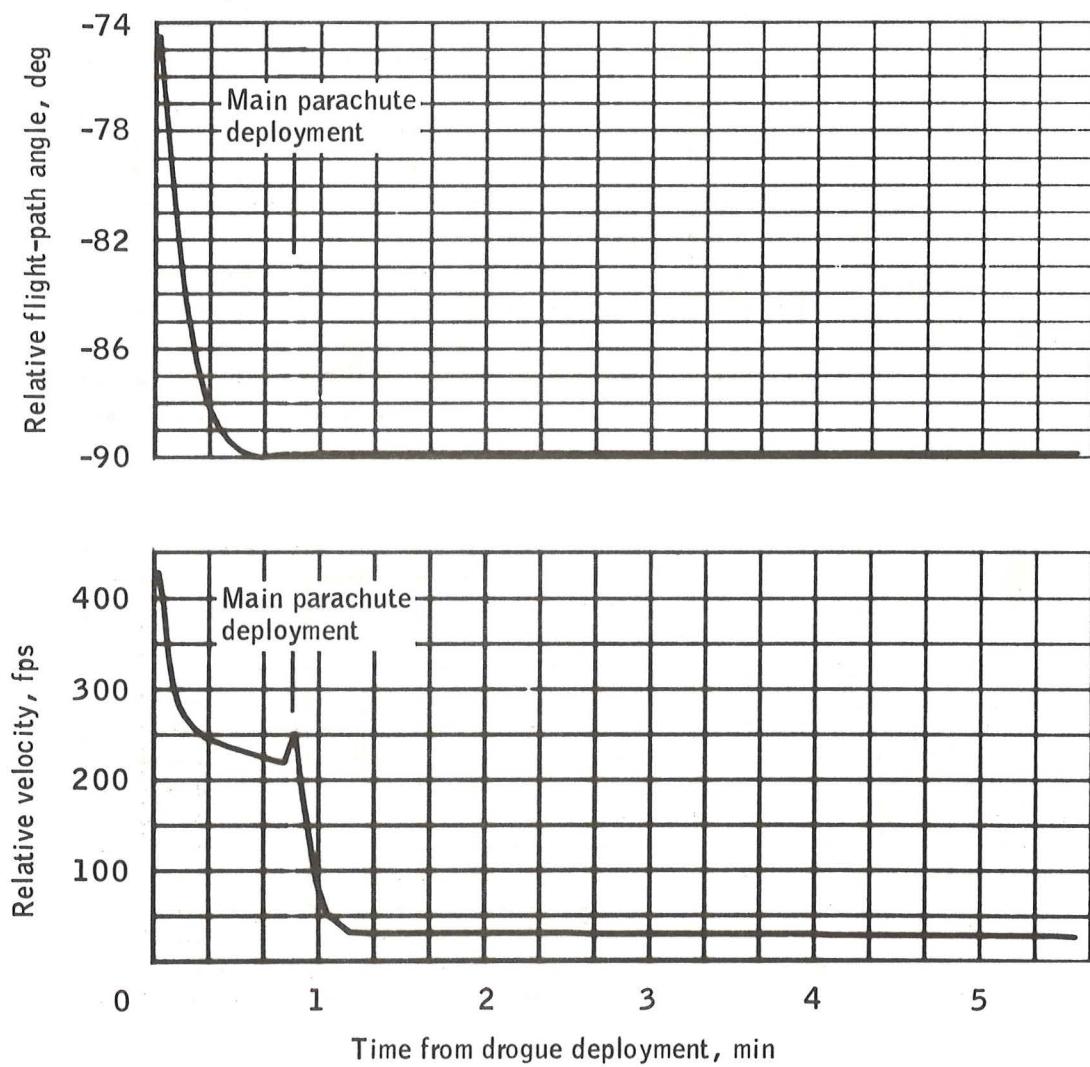


Figure 4.17-11.- Relative velocity and relative flight-path angle time histories from drogue parachute deployment.

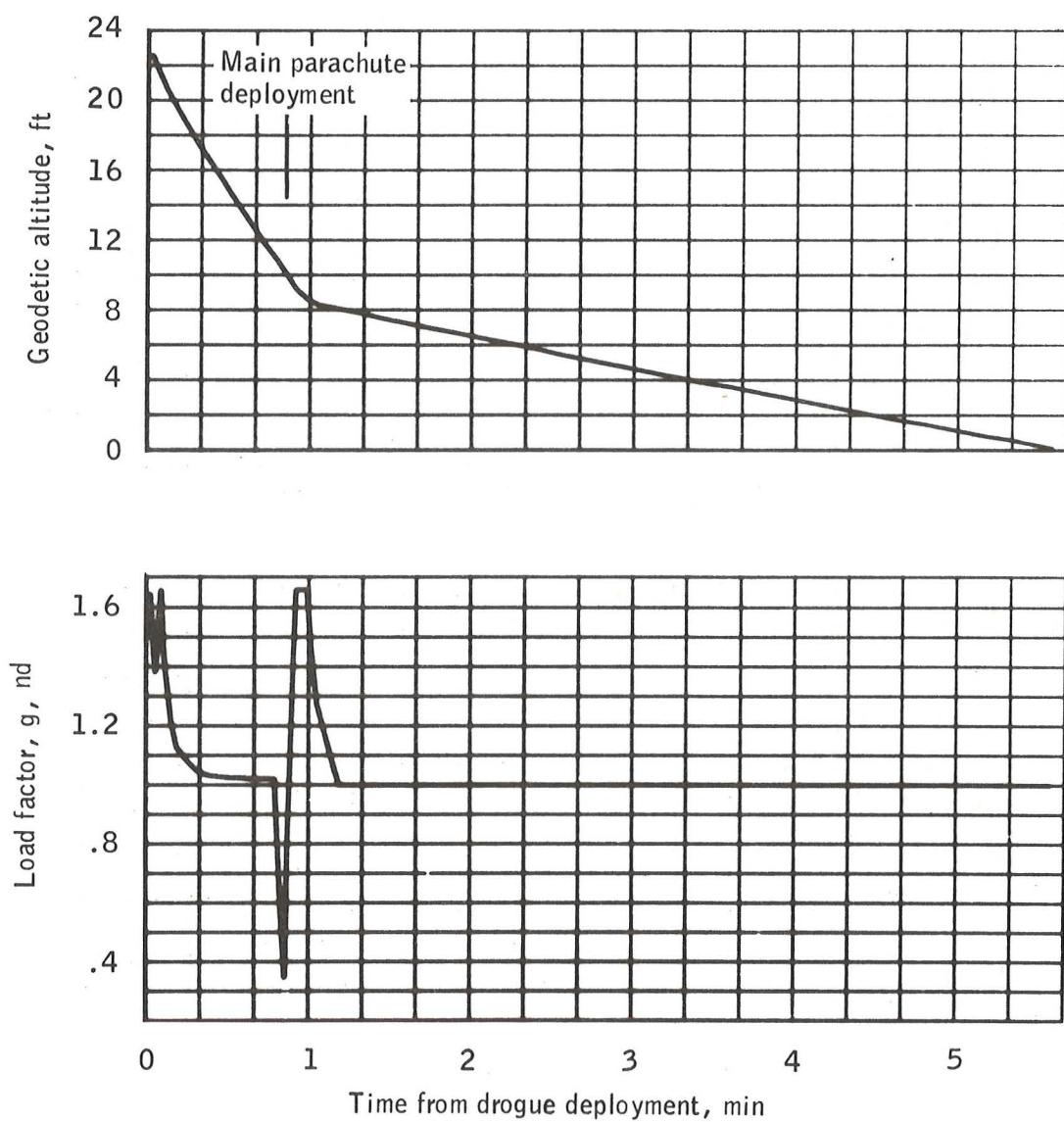
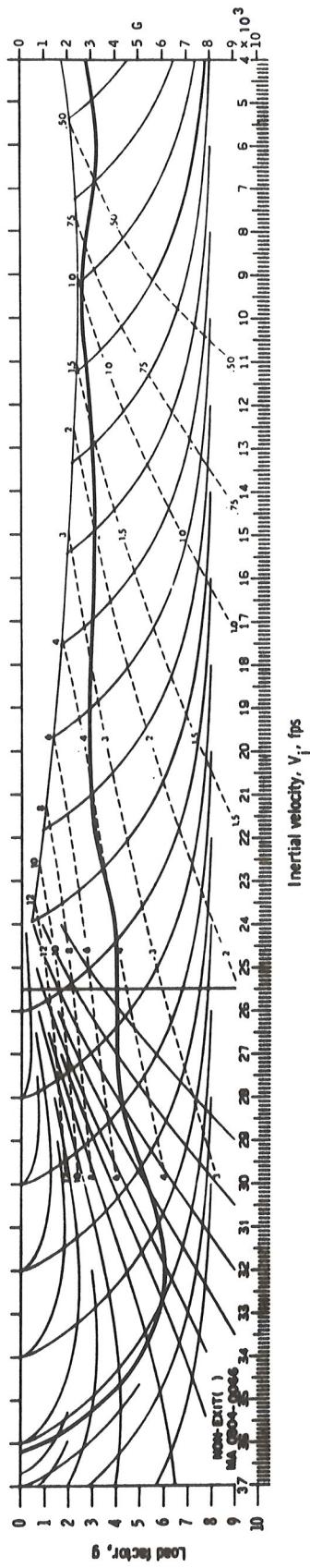
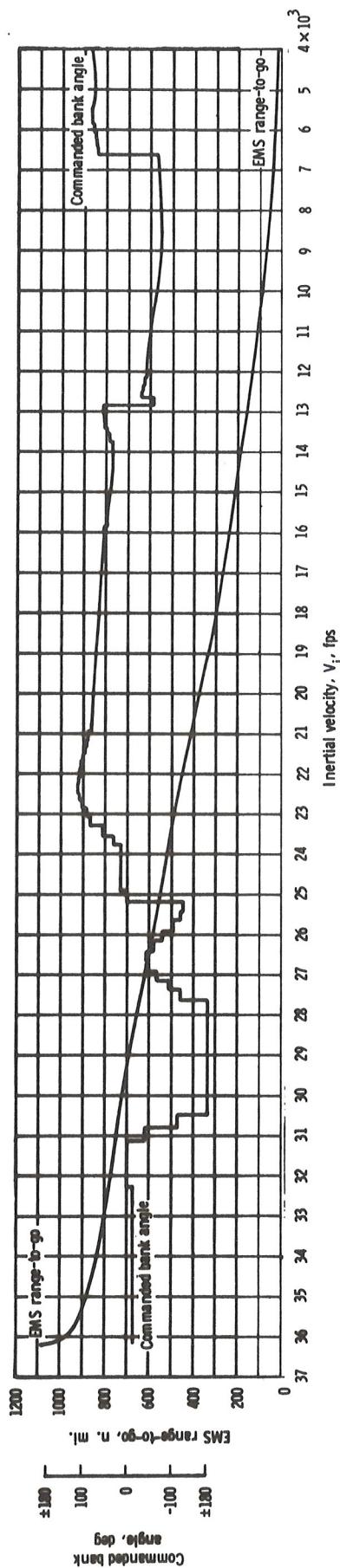


Figure 4.17-12.- Geodetic altitude and load factor time histories from drogue parachute deployment.



(a) Load factor versus inertial velocity.



(b) CMC commanded bank angle and EMS range-to-go versus inertial velocity.

Figure 4.17-13. - EMS parameters.

5.0 INPUT DATA AND TARGET LOADS
FOR NOMINAL MANEUVERS

5.0 INPUT DATA

The following input data or reference sources were used to compute the Apollo 15 (J-1) mission operational trajectory.

IMU alignment criteria and REFSMMAT	
definition	Table 5-I
Launch pad REFSMMAT	Table 5-II
PTC REFSMMAT	Table 5-III
Preferred (LOI) REFSMMAT, target load, and gimbal angles	Table 5-IV
Landing site REFSMMAT, target loads, and gimbal angles	Table 5-V
Preferred (LOPC) REFSMMAT, target load, and gimbal angles	Table 5-VI
LM ascent REFSMMAT, target loads, and gimbal angles	Table 5-VII
TEI REFSMMAT, target loads, and gimbal angles	Table 5-VIII
Entry REFSMMAT	Table 5-IX
Spacecraft weight summary	Table 5-X
LM ascent weight summary	Table 5-XI
Command module mass properties	Table 5-XII
Assumed mission-independent expendables . . .	Table 5-XIII
Service module propulsion performance summary	Table 5-XIV
Lunar module propulsion performance summary	Table 5-XV
Command module aerodynamic coefficients . . .	Table 5-XVI
Lunar landing site position	Table 5-XVII

TABLE 5-I.- J-1 MISSION REFSMMAT SUMMARY

(July 26 launch)

Applicable maneuvers	REFSMMAT	Alinement criteria (IMU axis)	Remarks
Launch	"Launch Pad"	X-axis along flight azimuth at launch Z-axis along negative radius vector Y-axis completes right-hand system	At earth launch the FDAI will display: Roll = 90+ flight azimuth Pitch = 90 Yaw = 0
MCC-1 MCC-2 MCC-3 MCC-4	"PTC" (Passive Thermal Control) (CSM only)	X-axis in the ecliptic plane and perpendicular to the earth-moon line projection in the ecliptic plane at the average time of transearth injection for the monthly launch window and azimuth range. Z-axis perpendicular to the ecliptic and directed south. Y-axis complete the right-hand system.	At the beginning of the Bar-B-Que mode, the spacecraft will maneuver to an FDAI display of: Roll = 0 Pitch = 90 Yaw = 0
LOI	Preferred (heads down CSM)	X-axis alined with the spacecraft X-body axis at the vehicle attitude for ignition with the thrust directed through the center of gravity. Z-axis in the plane formed by the X-axis and the position vector. Positive direction away from moon for a heads down attitude. Positive direction towards moon for heads-up attitude. Y-axis completes the right-hand system.	In a heads down orientation at burn ignition, the CSM FDAI will display: Roll = 0 Pitch = 0 Yaw = 0

TABLE 5-I.- J-1 MISSION REFSMMAT SUMMARY - Concluded

Applicable maneuvers	REFSMMAT	Alinement criteria (IMU axis)	Remarks
DOI Circularization PDI Landing	"Landing Site: (CSM and LM)	X-axis along positive lunar radius vector at landing site at predicted landing time. Z-axis in direction of flight parallel to the CSM orbital plane and perpendicular to X. Y-axis completes the right-hand system.	At nominal touchdown, the LM FDAI will display: Roll = 0 Pitch = 0 Yaw = 0
CSM plane change	"Preferred" (CSM only) (heads up)	Same as above "preferred," alinement definition.	At burn ignition, the FDAI will display: Roll = 0 Pitch = 0 Yaw = 0
LM ascent Rendezvous	"Liftoff" (CSM & LM)	X-axis along positive lunar radius vector at landing site at predicted liftoff time. Z-axis down range parallel to the CSM orbital plane and perpendicular to X. Y-axis completes the right-hand system.	At nominal liftoff time, the LM FDAI will display: Roll = 359 Pitch = 0 Yaw = 346
TEI	"Preferred" (heads down)	Same as above "Preferred", alinement definition.	In a heads down orientation at burn ignition, the FDAI will display: Roll = 0 Pitch = 0 Yaw = 0
MCC-5 MCC-6 MCC-7	"PTC" (CSM only)	Same as above "PTC" alinement.	Same as above "PTC" remarks.
Entry	"Entry" (CSM only)	X-axis is in local horizontal plane in the direction of flight at entry entry interface (400 000). Z-axis id down along negative radius at entry interface. Y-axis completes right-hand system.	At entry interface with wings level local horizontal, heat shield forward, inplane, lift up, heads down, the FDAI will display: Roll = 0 Pitch = 180 Yaw = 0

TABLE 5-II.- LAUNCH PAD REFSMMAT

(a) Applicable maneuver

1. Launch
2. TLI
3. T&D

(b) Definition of REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{SPACECRAFT PLATFORM STABLE MEMBERS}} = \begin{bmatrix} XIX & XIY & XIZ \\ YIX & YIY & YIZ \\ ZIX & ZIY & ZIZ \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ECI(MNBY)}}$$

(c) REFSMMAT components

$XIX = -0.93615136$	$XIY = 0.31765305$	$XIZ = 0.15072214$
$YIX = 0.030764652$	$YIY = 0.50103907$	$YIZ = -0.86487766$
$ZIX = -0.35024871$	$ZIY = -0.80501950$	$ZIZ = -0.47882089$

TABLE 5-III.- PTC REFSMMAT

(a) Applicable maneuvers

1. MCC-1
2. MCC-2
3. Passive thermal control
4. MCC-3
5. MCC-4
6. SIM bay door jettison
7. MCC-5
8. MCC-6

(b) Definition of REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{SPACECRAFT}} = \begin{bmatrix} X_{IX} & X_{IY} & X_{IZ} \\ Y_{IX} & Y_{IY} & Y_{IZ} \\ Z_{IX} & Z_{IY} & Z_{IZ} \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\substack{\text{ECI}(\text{MNBY}) \text{ or} \\ \text{MCI}(\text{MNBY})}}$$

PLATFORM
STABLE
MEMBERS

(c) REFSMMAT components

$X_{IX} = 0.93969262$	$X_{IY} = 0.31378939$	$X_{IZ} = 0.13606614$
$Y_{IX} = 0.34202014$	$Y_{IY} = -0.86212926$	$Y_{IZ} = -0.37383864$
$Z_{IX} = 0.0$	$Z_{IY} = 0.39783077$	$Z_{IZ} = -0.91745881$

TABLE 5-IV.- PREFERRED (LOI) REFSMMAT, TARGET LOAD, AND GIMBAL ANGLES

(a) Applicable maneuvers

1. LOI

(b) Definition of REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{SPACECRAFT PLATFORM STABLE MEMBERS}} = \begin{bmatrix} X_{IX} & X_{IY} & X_{IZ} \\ Y_{IX} & Y_{IY} & Y_{IZ} \\ Z_{IX} & Z_{IY} & Z_{IZ} \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\substack{\text{ECI(MNBY)} \\ \text{or} \\ \text{MCI(MNBY)}}}$$

(c) REFSMMAT components

$X_{IX} = 0.48089333$	$X_{IY} = -0.41515140$	$X_{IZ} = -0.77226350$
$Y_{IX} = 0.019274318$	$Y_{IY} = -0.87557755$	$Y_{IZ} = 0.48269293$
$Z_{IX} = -0.87656721$	$Z_{IY} = -0.24700866$	$Z_{IZ} = -0.41305764$

(d) Target load for LOI maneuver

[Propulsion system: SPS; guidance: external ΔV]

t_{IG} , hr:min:sec, g.e.t.	78:31:14.7
ΔV_X , fps	-2894.0
ΔV_Y , fps	-752.7
ΔV_Z , fps	-213.6
Mass, lb	102 816.5

(e) Gimbal angles at t_{IG}

IGA , deg	0.0
MGA , deg	0.0
OGA , deg	0.0

TABLE 5-V.- LANDING SITE REFSMMAT, TARGET LOAD, AND GIMBAL ANGLES

(a) Applicable maneuvers

1. DOI
2. CSM separation
3. CSM circularization
4. LM powered descent
5. Subsatellite jettison

(b) Definition of REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{SPACECRAFT PLATFORM STABLE MEMBERS}} = \begin{bmatrix} X_{IX} & X_{IY} & X_{IZ} \\ Y_{IX} & Y_{IY} & Y_{IZ} \\ Z_{IX} & Z_{IY} & Z_{IZ} \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\substack{\text{ECI (MNBY)} \\ \text{or} \\ \text{MCI (MNBY)}}}$$

(c) REFSMMAT components

X_{IX} = 0.58256124

X_{IY} = 0.47618509

X_{IZ} = 0.65868822

Y_{IX} = -0.25065581

Y_{IY} = -0.66565295

Y_{IZ} = 0.70290671

Z_{IX} = 0.77317145

Z_{IY} = -0.57459023

Z_{IZ} = -0.26842505

TABLE 5-V.- LANDING SITE REFSMMAT, TARGET LOAD,
AND GIMBAL ANGLES - Continued.

(d) Desired ΔV 's for manual CSM separation maneuver

[Propulsion system: SM RCS]

(e) CSM gimbal angles at t_{TG}

IGA, deg	105.5
MGA, deg	-0.1
OGA, deg	-0.1

(f) Target load for CSM circularization maneuver

[Propulsion system: SM SPS; guidance: external ΔV]

(g) Gimbal angles at t_{TG}

IGA, deg	114.0
MGA, deg	1.9
OGA, deg	-179.9

TABLE 5-V.- LANDING SITE REFSMMAT, TARGET LOAD,
AND GIMBAL ANGLES - Continued

(h) Target load for LM powered descent maneuver (P63)

[Propulsion system: LM DPS; guidance programs: P63, P64, P66]

Ignition algorithm targets

Ignition algorithm correction factors

(i) Gimbal angles at t_{IG}

TABLE 5-V.- LANDING SITE REFSMMAT, TARGET LOAD,
AND GIMBAL ANGLES - Continued

(j) Target load for braking phase (P63)^a

[Propulsion system; LM DPS; guidance programs; P63, P64, P66]

Position, ft	
R _x	-3468.0131
R _y	0.0
R _z	-11 851.733
Velocity, fps	
V _x	-191.00682
V _y	0.0
V _z	-188.47235
Acceleration, ft/sec ²	
A _x	-0.71451776
A _y	0.0
A _z	-8.2875265
Jerk, ft/sec ³	
J _z	-0.01380454

^aTENDBRAK = 62 sec (time-to-go at program switch).

TABLE 5-V.- LANDING SITE REFSMMAT, TARGET LOAD,
AND GIMBAL ANGLES - Concluded

(k) Target load for approach phase (P64)^a

[Propulsion system: LM DPS; guidance program: P63, P64, P66]

Position, ft

R_x	158.500
R_y	0.0
R_z	-27.3554

Velocity, fps

V_x	-3.53476
V_y	0.0
V_z	0.0249505

Acceleration, ft/sec²

A_x	0.0771783
A_y	0.0
A_z	-0.589627

Jerk, ft/sec³

J_z	0.0431736
-------	-----------

^aTENDAPP = 12 sec (time-to-go at program switch).

(l) Target load for vertical descent (P66)

Velocity, fps

V_x	-5.0
V_y	0.0
V_z	0.0

TABLE 5-VI.- PREFERRED (LOPC) REFSMMAT, TARGET LOAD, AND GIMBAL ANGLES

(a) Applicable maneuver

1. LOPC

(b) Definition of REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{SPACECRAFT}} = \begin{bmatrix} X_{IX} & X_{IY} & X_{IZ} \\ Y_{IX} & Y_{IY} & Y_{IZ} \\ Z_{IX} & Z_{IY} & Z_{IZ} \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\substack{\text{ECI (MNBY)} \\ \text{or} \\ \text{MCI (MNBY)}}}$$

PLATFROM
STABLE
MEMBERS

(c) REFSMMAT components

$X_{IX} = -0.25509020$	$X_{IY} = -0.66899247$	$X_{IZ} = 0.69812468$
$Y_{IX} = -0.038763394$	$Y_{IY} = -0.71435482$	$Y_{IZ} = -0.69870923$
$Z_{IX} = 0.96613994$	$Z_{IY} = -0.20529556$	$Z_{IZ} = 0.15629250$

(d) Target load for lunar orbit plane change maneuver

[Propulsion system: SPS; guidance: external ΔV]

t_{IG} , hr:min:sec, g.e.t.	165:12:50.6
ΔV_X , fps	-8.8
ΔV_Y , fps	308.5
ΔV_Z , fps	0.0
Mass _{IG} , lb	37 276.8

(e) Gimbal angles at t_{IG}

IGA, deg	0.0
MGA, deg	0.0
OGA, deg	0.0

TABLE 5-VII.- LM ASCENT REFSMMAT, TARGET LOAD, AND GIMBAL ANGLES

(a) Applicable maneuvers

1. LM ascent
2. TPI
3. CSM separation following LM jettison
4. LM deorbit

(b) Definition of REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{SPACECRAFT}} = \begin{bmatrix} X_{IX} & X_{IY} & X_{IZ} \\ Y_{IX} & Y_{IY} & Y_{IZ} \\ Z_{IX} & Z_{IY} & Z_{IZ} \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\substack{\text{ECI (MNBY)} \\ \text{or} \\ \text{MCI (MNBY)}}}$$

PLATFORM
STABLE
MEMBERS

(c) REFSMMAT components

$X_{IX} = 0.055099073$

$X_{IY} = 0.66312594$

$X_{IZ} = 0.74647713$

$Y_{IZ} = -0.22872524$

$Y_{IY} = -0.71935067$

$Y_{IX} = 0.65591112$

$Z_{IX} = 0.97193049$

$Z_{IY} = -0.20687825$

$Z_{IZ} = 0.11203809$

TABLE 5-VII.- LM ASCENT REFSMMAT, TARGET LOAD, AND GIMBAL ANGLES - Continued

(d) Target load for LM ascent

[Propulsion systems: APS, RCS; guidance: orbit insertion (P12)]

t_{IG} (lift-off), hr:min:sec, g.e.t.	171:37:23.87
R_D (desired injection radius), ft	5 750 745.6
y_D (desired injection cross-range distance), ft	0.0
R_D (desired injection radial velocity), fps	32.0
y_D (desired injection cross-range velocity), fps	0.0
z_D (down-range velocity for desired injection), fps	5 536.4
Weight at t_{IG} , lb	10 873.1

(e) Gimbal angles at t_{IG}

IGA, deg	-0.1
MGA, deg	-1.1
OGA, deg	13.7

TABLE 5.VII.- LM ASCENT REFSMMAT, TARGET LOAD, AND GIMBAL ANGLES - Continued

(f) Target loads for TPI maneuver^a

[Propulsion system: APS; guidance: external ΔV]

t_{IG} , ^b hr:min:sec, g.e.t.	172:29:29.1
ΔV_x , fps	70.6
ΔV_y , fps	-0.5
ΔV_z , fps	21.0
Weight at t_{IG} , lb	5913.3

(g) Gimbal angles at t_{IG} ^b

IGA, deg	100.2
MGA, deg	0.0
OGA, deg	0.0

^aAll targets include ΔV's from ullage.^b t_{IG} is ullage on time.

TABLE 5-VII.-- LM ASCENT REFSMMAT, TARGET LOAD, AND GIMBAL ANGLES - Concluded

(h) Target load for CSM separation maneuver following LM jettison

[Propulsion system: CSM RCS]

t_{IG} , hr:min:sec, g.e.t.	177:35:27.4
ΔV_x , fps	-1.
ΔV_y , fps	0.0
ΔV_z , fps	0.0
Weight, lb	36 528.1

(i) Gimbal angles at t_{IG}

IGA, deg	26.4
MGA, deg	-22.9
OGA, deg	120.0

(j) Target load for LM deorbit

[Propulsion system: LM RCS]

t_{IG} , hr:min:sec, g.e.t.	179:06:22.7
ΔV_x , fps	-161.1
ΔV_y , fps	57.3
ΔV_z , fps	94.6
Weight, lb	5309.2

(k) Gimbal angles at t_{IG}

IGA, deg	197.2
MGA, deg	16.9
OGA, deg	293.8

TABLE 5-VIII.— PREFERRED (TEI) REFSMMAT, TARGET LOAD, AND GIMBAL ANGLES

(a) Applicable maneuvers

1. TEI

(b) Definition of REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{SPACECRAFT}} = \begin{bmatrix} XIX & XIY & XIZ \\ YIX & YIY & YIZ \\ ZIX & ZIY & ZIZ \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ECI(MNBY) or MCI(MNBY)}}$$

PLATFROM
STABLE
MEMBERS

(c) REFSMMAT components

$$x_{19} = -0.76029649$$

XIY = -0.043428479

$$x_{12} = -0.64812285$$

YIX = 0.38932093

YIIY = 0.76823375

YIZ = -0.50817920

ZIX = 0.51997930

ZIY = -0.63869464.

ZIZ = -0.56717782

(d) Target load for TEI maneuver

[Propulsion system: SPS; guidance: external ΔV]

(e) Gimbal angles at t_{TG}

IGA, deg	0.0
MGA, deg	0.0
OGA, deg	0.0

TABLE 5-IX.- ENTRY REFSMMAT

(a) Applicable maneuver

1. MCC-7

2. Entry

(b) Definition of REFSMMAT

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{SPACECRAFT}} = \begin{bmatrix} X_{IX} & X_{IY} & X_{IZ} \\ Y_{IX} & Y_{IY} & Y_{IZ} \\ Z_{IX} & Z_{IY} & Z_{IZ} \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ECI(MNBY)}}$$

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PLATFORM
STABLE
MEMBERS

(c) REFSMMAT components

X_{IX} = -0.79310282

X_{IY} = -0.13441632

X_{IZ} = 0.59407084

Y_{IX} = -0.60877234

Y_{IY} = 0.20632025

Y_{IZ} = -0.76604711

Z_{IX} = -0.019599619

Z_{IY} = -0.96920805

Z_{IZ} = -0.24546211

TABLE 5-X.- SPACECRAFT WEIGHT SUMMARY

Total CSM inert, lb	26	436.0
CM, lb	12	863.0
SM, lb	13	475.0
SLA ring, lb		98.0
Total SPS propellant tanked, lb	40	593.7
SPS deliverable, lb	40	354.6
SPS trapped inside tanks, lb		239.1
Total LM at earth launch, lb	36	240.2
LM descent stage, lb	6	179.0
LM DPS tanked, lb	19	508.5
LM ascent stage + RCS propellant, lb	5	332.5
LM APS tanked, lb	5	220.2
Spacecraft at earth launch (including LES), lb	116	445.3
Spacecraft before T&D, lb	107	243.5

TABLE 5-XI.- LM ASCENT WEIGHT SUMMARY

	lb
Weight of LM crew, inert weights, consumables and unusable APS propellant	5 652.9
LM APS fuel	2 002.7
LM APS oxidizer	3 217.5
Tanked APS propellant	5 220.2
Total weight of ascent stage	10 888.0
Net off-loaded weight on lunar surface	-14.9
Total ascent stage lift-off weight	10 873.1

TABLE 5-XII.- COMMAND MODULE MASS PROPERTIES

CM WEIGHT, LB

Entry	12	934.2
Main chute deploy	12	361.5
Landing	11	711.9

CENTERS OF GRAVITY IN APOLLO COORDINATE SYSTEM, IN

x_A	1	039.4
y_A		-0.1
z_A		5.8

MOMENTS OF INERTIA, SLUG-FT²

I_{XX}	5	963.0
I_{YY}	5	319.0
I_{ZZ}	4	819.0

PRODUCTS OF INERTIA, SLUG-FT²

I_{XY}	38.0
I_{XZ}	-382.0
I_{YZ}	-9.0

TABLE 5-XIII.- ASSUMED MISSION-INDEPENDENT EXPENDABLES

Mission-independent SPS budget

Translunar MCC (0 fps), lb	0
Transearth MCC (0 fps), lb	0

SPS propellant allowances

Unbalance meter, lb	100
Mean outage, lb	59
Dispersions, lb	426

TABLE 5-XIV.- SERVICE MODULE PROPULSION PERFORMANCE SUMMARY

Propulsion system	I_{sp} , sec	Thrust, lb	Flow rate, lb/sec
SPS ^a	313.962	21 043	67.03
SPS ^b	314.053	21 343	67.96
RCS ^c	227.31	177.30	0.78
RCS ^d	269.13	355.25	1.32

^aBefore crossover during LOI burn (260 sec burn time).

^bAfter crossover during LOI burn (260 sec burn time).

^cTwo-quad.

^dFour-quad.

TABLE 5-XV.- LUNAR MODULE PROPULSION PERFORMANCE SUMMARY

Descent				Ascent		
DPS		RCS		APS + RCS		
Thrust, lb	I _{sp} , sec	Thrust per engine, lb	I _{sp} , sec	Burn time, sec	Effective thrust, lb	Effective I _{sp} , sec
1376	298.9	89.6	281.0	0	3582.1	309.5
3055	298.4			40	3567.4	309.6
3808	299.0			80	3553.8	309.7
4966	301.0			120	3541.0	309.8
5909	304.4			160	3528.6	309.9
9882	306.3			200	3516.5	309.8
9965	303.6			240	3504.5	309.8
				280	3492.3	309.8
				320	3487.0	309.7
				360	3491.0	309.5
				400	3506.4	309.3
				427.8	3522.8	309.1

TABLE 5-XVI. - COMMAND MODULE AERODYNAMIC COEFFICIENTS

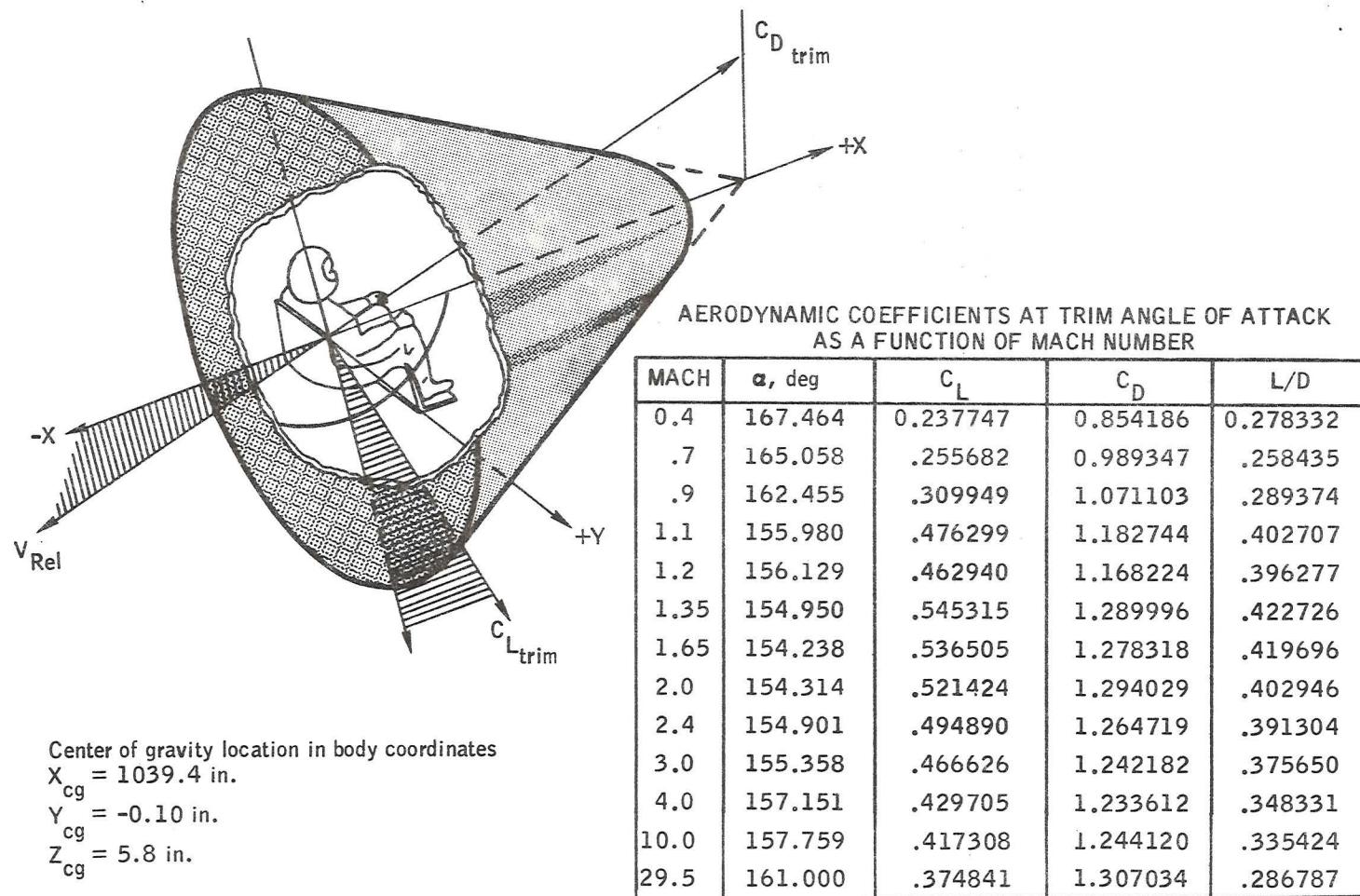


TABLE 5-XVII.- LUNAR LANDING SITE POSITION

Parameter	Lunar landing site
Launch date	July 26, 1971
Lunar site name	Hadley
Latitude, deg	26.0739
Longitude, deg	3.6539
Altitude, ^a n. mi.	-1.92

^aAll altitudes shown are referenced to mean lunar radius of 938.4935 n. mi.

TABLE 5-XVIII.- LM BRAKING SCHEDULE
DURING TERMINAL RENDEZVOUS PHASE

Gate	Range, n. mi.	Range rate at cutoff, fps
First	0.4	-19.6
Second	0.2	-0.8
Third	0.08	-4.9
Fourth	0.01	-0.2
Fifth	0.0	0.0

6-1

6.0 RADAR AND SHADOW DATA

TABLE 6-I.- MSFN STATION CHARACTERISTICS

Geodetic latitude, LATR, deg
 Longitude, LONR, deg
 Altitude, ALTR, ft
 Range capability, SRANGE, n. mi.

Keyhole, FTINDC: 0 = none
 1 = north-south
 2 = east-west

RADAR =MAD-23 X-Y USB-85, LATR = 40.454991, LONR = 355.831549
 ALTR = 2552.489, SRANGE = 850000.0, FTINDC = 2.0
 RADAR =HSK-25 X-Y USB-85, LATR = -35.583494, LONR = 148.977827
 ALTR = 3756.555, SRANGE = 850000.0, FTINCC = 2.0
 RADAR =GDS-28 X-Y USB-85, LATR = 35.341594, LONR = 243.126402
 ALTR = 2976.716, SRANGE = 850000.0, FTINDC = 2.0
 RADAR =PKS-96 H-D USB210, LATR = -32.998769, LONR = 148.263517
 ALTR = 1322.176, SRANGE = 2100000.0, FTINCC = 0.0
 RADAR =MIL-71 X-Y USB-30, LATR = 28.508272, LONR = 279.306186
 ALTR = -59.055, SRANGE = 300000.0, FTINCC = 1.0
 RADAR =BDA-02 X-Y USB-30, LATR = 32.351250, LONR = 295.341502
 ALTR = -6.562, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =CYI-04 X-Y USB-30, LATR = 27.764536, LONR = 344.366150
 ALTR = 567.584, SRANGE = 300000.0, FTINCC = 1.0
 RADAR =ACN-75 X-Y USB-30, LATR = -7.954794, LONR = 345.672685
 ALTR = 1712.595, SRANGE = 300000.0, FTINCC = 1.0
 RADAR =CRO-08 X-Y USB-30, LATR = -24.906577, LONR = 113.725796
 ALTR = 49.213, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =GWM-24 X-Y USB-30, LATR = 13.310575, LONR = 144.736338
 ALTR = 469.159, SRANGE = 300000.0, FTINCC = 1.0
 RADAR =HAW-12 X-Y USB-30, LATR = 22.126307, LONR = 200.234802
 ALTR = 3723.747, SRANGE = 300000.0, FTINCC = 1.0
 RADAR =TEX-16 X-Y USB-30, LATR = 27.653750, LONR = 262.621132
 ALTR = -65.617, SRANGE = 300000.0, FTINCC = 1.0
 RADAR =SHIP 1 INSERTION, LATR = 28.000000, LONR = 311.000000
 ALTR = 0.000, SRANGE = 23400.0, FTINCC = 0.0
 RADAR =STN-00 A-E USB150, LATR = 37.409722, LONR = 237.822083
 ALTR = 525.000, SRANGE = 1500000.0, FTINCC = 0.0
 RADAR =MAR-95 H-D USB210, LATR = 35.425958, LONR = 243.110517
 ALTR = 3169.446, SRANGE = 2100000.0, FTINDC = 0.0

TABLE 6-II.- MSFN STATION IDENTIFICATION

Ship 1	Insertion ship C-band
MIL-71	Merritt Island S-band
BDA-02	Bermuda S-band
CYI-04	Grand Canary S-band
ACN-75	Ascension S-band
CRO-08	Carnarvon S-band
GWM-24	Guam S-band
HAW-12	Hawaii S-band
MAD-23	Madrid deep space
HSK-25	Canberra deep space
GDS-28	Goldstone deep space (85 ft)
PKS-96	Parks deep space
TEX-16	Texas S-band
MAR-95	Goldstone deep space (210 ft)

TABLE 6-III.- MISSION RADAR TIMELINE

(a) CSM acquisition and termination 0° minimum elevation

26 JUL 71 EOI TO TLI LAZ 80.1

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
BCA-C2 X-Y USE-30	0	0	35	0	0	11	55	166	-10	103	2	88	-13	672	0	0	12	30	170	-9	101	0	90	-11	805
SHIP 1 INSERTION	0	4	11	0	0	11	55	23	31	-66	23	-65	22	220	0	0	16	6	-170	-4	95	0	90	-5	802
CVI-C4 X-Y LSP-30	0	5	34	0	0	17	12	50	-8	-99	0	-90	-9	799	0	0	22	46	-169	-48	148	0	90	-58	790
CRO-C8 X-Y USE-30	0	6	10	0	0	52	7	173	-23	-115	0	-90	-25	783	0	0	58	17	12	-14	105	0	90	-15	782
GDS-28 X-Y LSE-85	0	4	48	0	1	28	12	8	-45	-151	0	90	-29	795	0	1	33	0	127	-22	118	0	90	62	800
MAR-55 H-E LSE210	0	4	46	0	1	28	14	9	-46	-151	0	-90	-61	795	0	1	32	60	126	-22	118	0	90	-28	802
STA-03 A-F USB150	0	2	9	0	1	28	38	48	-53	179	0	91	-89	798	0	1	30	47	100	-39	142	0	90	-52	801
TEX-16 X-Y LSP-30	0	6	44	0	1	31	3	-18	0	-90	0	-90	0	802	0	1	37	46	170	11	77	0	90	13	805
MIL-71 X-Y USE-30	0	6	45	0	1	34	50	-4	7	-82	0	-90	8	804	0	1	41	35	-177	1	86	0	90	2	804
BCA-C2 X-Y LSR-30	0	6	22	0	1	38	25	21	-7	-98	0	-90	-8	803	0	1	44	47	-179	-26	121	0	90	-31	801

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
SHIP 1 INSERTION	0	6	26	0	1	42	2	33	2	-88	0	-90	2	803	0	1	48	28	-164	-32	127	0	90	-37	790
CRO-C8 X-Y LSR-30	0	6	32	0	2	24	41	-161	-18	-110	0	-90	-20	782	0	2	31	14	23	12	77	0	90	13	780
HAW-12 X-Y LSR-30	0	0	23	0	2	49	29	-43	-36	-130	0	-90	-40	786	0	2	49	52	-40	-37	-132	2	-88	-42	700
	26 JUL 71 TLI TO LDI LAZ 80.1																								
HAW-12 X-Y LSE-30	0	0	30	0	2	55	29	125	12	77	1	88	13	971	0	2	55	59	127	13	75	0	90	15	1133
STN-CC A-E LSR150	13	31	58	0	2	56	8	1	-26	-124	0	-90	-34	1159	0	16	28	5	-168	-12	-106	0	-90	-16	78848
GDS-28 X-Y USR-85	13	12	33	0	2	56	31	-2	-18	-112	0	90	-68	1224	0	16	9	4	-168	-12	-105	0	90	-75	77648
MAR-95 H-E LSR210	13	12	30	0	2	56	31	-2	-15	-112	0	-90	-22	1224	0	16	9	1	-168	-12	-105	0	-90	-15	77645
TFX-16 X-Y LSF-30	11	58	44	0	2	58	33	0	8	-81	0	-90	9	1623	0	14	57	17	-169	-11	-103	0	-90	-13	73004
MIL-71 X-Y LSR-30	10	45	56	0	3	0	31	17	9	-79	0	-90	11	2046	0	13	46	26	-170	-11	-103	0	-90	-13	68227
BCA-C2 X-Y LSE-30	9	31	57	0	3	2	30	34	6	-83	0	-90	7	2489	0	12	34	27	-171	-11	-103	0	-90	-13	65147

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
SHIP 1 INSERTION	2	31	36	0	3	5	2	48	12	-76	0	-90	14	3050	0	5	36	40	176	-5	-167	56	-8	-33	23400
CYI-C4 X-Y LSE-30	5	53	41	0	3	12	29	84	11	-78	0	-90	12	4677	0	9	6	9	-177	-9	-100	0	-90	-10	46784
MAD-23 X-Y LSE-85	4	45	3	0	3	15	46	99	3	-86	0	-90	-86	5366	0	8	0	49	-179	-9	-101	0	90	-79	40953
ACN-75 X-Y LSE-30	6	5	32	0	3	18	7	97	31	-59	0	-90	31	5645	0	9	23	40	-177	-6	-97	0	-90	-7	48280
HAW-12 X-Y LSE-30	11	48	1	0	7	33	24	-172	-7	97	0	90	-7	38371	0	19	21	25	-166	-12	-103	0	-90	-13	89273
HSK-25 X-Y LSE-85	13	3	57	0	10	45	18	-168	-6	97	0	90	83	54931	0	23	49	15	-164	-11	-104	0	90	-76	103885
GWM-24 X-Y LSE-30	11	45	12	0	11	33	30	-167	-9	100	0	90	-10	56643	0	23	18	42	-164	-13	-103	0	-90	-13	102294
PKS-96 F-C LSE210	8	5	45	0	13	15	4	-166	-8	80	30	60	9	66345	0	21	20	49	-165	-11	-84	30	-60	5	94282
CRC-C8 X-Y LSE-30	12	44	56	0	13	17	28	-165	-8	99	0	90	-9	66215	1	2	2	24	-163	-12	-103	0	-90	-13	110600
ACN-75 X-Y LSE-30	12	12	51	0	22	14	52	-161	-12	102	0	90	-12	58517	1	10	27	43	-161	-14	-104	0	-90	-14	133549

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VEHICLE 1 RADAR TABLE

	TRACKING TIME				STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC		DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAC-23 X-Y LSE-85	10	20	38		0	22	26	40	-161	-14	108	0	90	72	99544	1	8	47	18	-161	-15	-110	0	90	-70	129263
CYI-C4 X-Y USB-30	10	58	30		0	22	55	14	-161	-13	105	0	90	-15	1C1060	1	9	53	44	-161	-15	-107	0	-90	-17	132110
BEP-C2 X-Y LSP-30	10	42	52		1	2	22	9	-160	-14	107	0	90	-17	111565	1	13	5	1	-160	-15	-108	C	-90	-18	142016
MIL-71 X-Y LSP-30	10	53	4		1	3	22	21	-160	-14	106	0	90	-16	114479	1	14	15	25	-160	-15	-107	C	-90	-17	142825
TEX-16 X-Y LSP-30	10	54	35		1	4	29	17	-159	-14	106	0	90	-16	117650	1	15	23	52	-160	-15	-107	0	-90	-17	145505
GCS-28 X-Y LSE-85	10	30	45		1	5	59	50	-159	-14	108	0	90	72	121831	1	16	30	35	-159	-15	-109	0	90	-71	148072
MAR-95 H-E USB210	10	30	28		1	6	0	2	-159	-14	108	0	90	-18	121840	1	16	30	31	-159	-15	-109	C	-90	-19	148069
STN-00 A-E USB150	10	23	32		1	6	24	52	-159	-15	108	0	90	-18	122966	1	16	48	24	-159	-15	-110	0	-90	-20	148751
HAW-12 X-Y LSE-30	11	6	47		1	8	35	23	-158	-14	106	0	90	-16	128754	1	19	42	20	-159	-15	-107	C	-90	-17	155221
HSK-25 X-Y LSP-85	13	19	12		1	10	59	22	-158	-13	106	0	90	74	134876	2	0	18	34	-158	-14	-108	0	90	-72	164964

VEHICLE 1 RACAR TABLE

VEHICLE X-Y USE-30	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GWM-24 X-Y USE-30	11	26	30	1	12	10	35	-158	-14	105	0	90	-15	137810	1	23	37	5	-158	-15	-106	0	-90	-16	163536
PKS-56 H-D USB210	8	21	18	1	13	30	18	-158	-14	87	30	60	2	139323	1	21	51	36	-158	-14	-88	30	-60	2	156146
CRO-C9 X-Y LSE-30	12	50	47	1	13	35	0	-157	-14	105	0	90	-15	141224	2	2	25	47	-158	-15	-106	0	-90	-16	169248
ACN-75 X-Y USP-30	12	12	13	1	22	29	10	-156	-15	105	0	90	-15	161179	2	10	41	23	-157	-16	-106	0	-90	-16	184888
MAD-23 X-Y LSP-85	10	2	24	1	22	51	56	-156	-16	111	0	90	69	161970	2	8	54	20	-157	-16	-112	0	90	-68	181635
CYI-C4 X-Y USE-30	10	46	16	1	23	16	28	-156	-16	108	0	90	-18	162823	2	10	2	44	-157	-16	-108	0	-90	-18	185719
BDA-02 X-Y LSE-30	10	30	50	2	2	41	19	-156	-16	109	0	90	-19	169757	2	13	12	9	-156	-16	-110	0	-90	-20	189352
MIL-71 X-Y USE-30	10	42	43	2	3	39	55	-155	-16	108	0	90	-18	171685	2	14	22	38	-156	-16	-109	0	-90	-19	191401
TEX-16 X-Y LSE-30	10	45	1	2	4	45	49	-155	-16	108	0	90	-18	173825	2	15	30	51	-156	-16	-109	0	-90	-19	193360
GDS-28 X-Y LSP-85	10	19	18	2	6	16	50	-155	-16	110	0	90	70	176731	2	16	36	9	-156	-17	-111	0	90	-69	195227

VEHICLE 1 RADAR TABLE

	TRACKING TIME				STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SFC		DAY	HRS	MIN	SEC	RA	DFC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAR-95 F-C LSPB210	10	18	60		2	6	17	4	-155	-16	110	0	90	-20	176738	2	16	36	3	-156	-17	-111	0	-90	-21	195225
STN-00 A-E LSPB150	10	11	23		2	6	42	5	-155	-16	111	0	90	-21	177527	2	16	53	28	-156	-17	-111	0	-90	-21	195709
HAW-12 X-Y LSE-30	10	59	54		2	8	48	42	-155	-16	107	0	90	-17	181464	2	19	48	36	-156	-17	-108	0	-90	-18	200600
HSK-25 X-Y LSP-B5	13	27	2		2	11	2	39	-155	-15	109	0	90	71	185529	3	0	29	41	-155	-16	-109	0	-90	-71	208269
GWM-24 X-Y LSP-30	11	22	27		2	12	20	52	-154	-16	107	0	90	-17	187848	2	23	43	19	-155	-17	-107	0	-90	-17	207010
PKS-46 F-C USPB210	8	27	56		2	13	34	39	-154	-15	90	30	60	0	188299	2	22	2	34	-155	-16	-90	30	-60	0	202558
CRC-C8 X-Y LSE-30	12	54	16		2	13	39	48	-154	-15	107	0	90	-17	190164	3	2	34	4	-155	-16	-108	0	-90	-18	211658
ACN-75 X-Y LSPB-30	7	49	41		2	22	33	46	-154	-16	106	0	90	-16	205121	3	6	23	27	-155	-16	-110	62	-26	-9	215352
MAC-23 X-Y LSP-B5	7	21	33		2	23	1	48	-154	-17	112	0	90	68	205876	3	6	23	20	-155	-17	-141	23	61	-35	217024
CYI-C4 X-Y LSP-30	6	59	11		2	23	24	10	-154	-17	109	0	90	-19	206474	3	6	23	21	-155	-17	-148	39	-33	-41	216215

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
BDA-C2 X-Y LSE-30	3	25	8	3	2	48	8	-154	-17	110	0	90	-20	212040	3	6	23	16	-154	-17	151	36	34	-45	216372
MIL-71 X-Y LSE-30	2	37	24	3	3	45	51	-153	-17	109	0	90	-19	213655	3	6	23	15	-154	-17	134	30	51	-37	216645
TEX-16 X-Y USB-30	1	32	47	3	4	50	28	-154	-17	109	0	90	-19	215524	3	6	23	14	-154	-17	122	19	68	-30	217253
GCS-28 X-Y LSE-85	0	3	39	3	6	19	35	-154	-17	111	0	90	69	218281	3	6	23	14	-154	-17	111	1	88	69	218330
MAR-55 H-C LSE210	0	3	26	3	6	19	48	-154	-17	111	0	90	-21	218287	3	6	23	13	-154	-17	111	1	89	-21	218333
				26	JUL	71	LOI TO DOI		LAZ	80.1															
MAR-55 H-C LSE210	1	24	46	3	6	55	20	-154	-16	116	7	82	-26	217631	3	8	20	6	-153	-17	130	20	64	-37	216624
GDS-28 X-Y LSE-85	1	24	46	3	6	55	20	-154	-16	116	7	74	63	217628	3	8	20	6	-153	-17	130	20	60	46	216621
TEX-16 X-Y USB-30	1	24	47	3	6	55	22	-154	-16	127	25	60	-33	216583	3	8	20	9	-153	-17	145	37	37	-40	215739
STN-CO A-F LSE150	1	24	44	3	6	55	22	-154	-16	113	2	88	-23	217911	3	8	20	6	-153	-17	127	16	71	-35	216885
MIL-71 X-Y LSE-30	1	24	44	3	6	55	26	-154	-17	141	35	41	-40	216060	3	8	20	10	-154	-17	165	43	16	-45	215484

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ED4-C2 X-Y USE-30	1	24	45	3	6	55	30	-155	-17	160	39	23	-47	215892	3	8	20	14	-154	-17	-174	40	-7	-49	215606
MAD-23 X-Y LSP-85	1	24	42	3	6	55	41	-155	-17	134	19	63	-43	216909	3	8	20	23	-154	-17	-119	6	77	-61	217456
CYI-C4 X-Y USF-30	1	24	42	3	6	55	42	-155	-17	129	35	43	-38	216071	3	8	20	24	-154	-17	-124	21	-65	-31	215601
ACN-75 X-Y USE-30	1	24	45	3	6	55	46	-155	-16	106	55	34	-9	215244	3	8	20	31	-154	-16	-105	35	-54	-12	215872
HAB-12 X-Y LSP-30	1	24	48	3	9	3	17	-153	-17	129	2	88	-19	217808	3	10	28	5	-152	-17	119	19	68	-27	216589
STR-C0 A-E LSP150	1	24	49	3	9	3	21	-153	-17	136	22	59	-41	216626	3	10	28	10	-152	-18	155	31	35	-51	215938
MAR-95 H-C USB210	1	24	48	3	9	3	22	-153	-17	140	27	52	-43	216388	3	10	28	10	-152	-18	160	35	26	-51	215763
GDS-28 X-Y LSP-85	1	24	48	3	9	3	22	-153	-17	140	27	56	35	216384	3	10	28	10	-152	-18	160	35	54	16	215760
TEX-16 X-Y LSP-30	1	24	50	3	9	3	26	-154	-17	157	42	23	-43	215629	3	10	28	15	-153	-17	-176	45	-4	-45	215306
MIL-71 X-Y LSP-30	1	24	48	3	9	3	31	-154	-17	175	45	1	-45	215528	3	10	28	10	-153	-17	-155	40	-27	-44	215511

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VEHICLE 1 RADAR TABLE

VEHICLE	X-Y	LSE	TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA																		
				HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
BDA-02	X-Y	LSE-30	1 24 48		3	9	3	33	-154	-17	-161	38	-23	-48	215798		3	10	28	22	-153	-17	-140	29	-49	-42	216040					
CVI-C4	X-Y	LSE-30	1 4 57		3	9	3	44	-155	-17	-117	13	-76	-26	217168		3	10	8	42	-154	-17	-109	0	-90	-19	216796					
ACN-75	X-Y	LSE-30	1 24 48		3	9	3	50	-155	-16	-104	24	-65	-13	216500		3	10	28	38	-154	-17	-106	5	-85	-16	217431					
										26 JUL 71	DCI	TO SEP	LAZ 80.1																			
FAB-12	X-Y	LSP-30	1 5 3		3	11	15	36	-152	-17	126	29	56	-31	215898		3	12	20	39	-151	-18	139	39	39	-36	215421					
HSK-25	X-Y	LSE-85	1 5 8		3	11	15	42	-152	-16	109	2	84	71	217433		3	12	20	50	-151	-17	101	14	36	72	216746					
STN-00	A-E	LSP150	1 5 7		3	11	15	43	-153	-17	168	34	17	-54	215599		3	12	20	50	-152	-18	-174	34	-9	-55	215642					
GDS-28	X-Y	LSP-85	1 5 5		3	11	15	47	-153	-17	174	37	53	5	215465		3	12	20	52	-152	-18	-167	36	54	-10	215576					
MAR-95	H-C	LSE210	1 5 4		3	11	15	48	-153	-17	174	37	7	-53	215468		3	12	20	52	-152	-18	-167	36	-17	-52	215582					
TEX-16	X-Y	LSP-30	1 5 13		3	11	15	51	-153	-17	-160	43	-40	-44	215205		3	12	21	4	-152	-18	-143	36	-40	-41	215594					
MIL-71	X-Y	LSE-30	1 5 8		3	11	15	56	-153	-17	-142	35	-42	-40	215571		3	12	21	4	-152	-18	-129	25	-59	-35	215154					

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
ECA-C2 X-Y LSE-30	1 5 7	3	11	15	60	-153	-17	-130	22	-62	-36	216221		3	12	21	6	-153	-18	-120	11	-77	-29	216929
GWM-24 X-Y LSE-30	1 5 8	3	13	9	3	-151	-17	110	9	81	-20	216539		3	14	14	12	-150	-18	116	22	66	-24	216169
HSK-25 X-Y LSE-85	1 5 14	3	13	9	9	-151	-17	94	24	8	66	216054		3	14	14	22	-150	-17	85	37	-6	53	215424
HAW-12 X-Y LSP-30	1 5 8	3	13	9	10	-152	-18	152	46	25	-38	214997		3	14	14	18	-151	-18	173	50	6	-40	214865
MAR-95 H-C USE210	1 5 11	3	13	9	15	-152	-18	-154	32	-35	-49	215596		3	14	14	27	-151	-18	-139	25	-55	-43	216022
STN-03 A-E LSE150	1 5 12	3	13	9	15	-152	-18	-160	32	-20	-53	215603		3	14	14	27	-151	-18	-144	26	-50	-47	215963
GDS-28 X-Y LSE-85	1 5 12	3	13	9	17	-152	-18	-154	33	55	-22	215591		3	14	14	29	-151	-18	-139	25	58	-36	216021
BKA-C2 X-Y LSE-30	C 10 33	3	13	9	22	-153	-18	-112	2	-68	-22	217314		3	13	19	55	-152	-18	-111	0	-90	-21	216886
TEX-16 X-Y LSE-30	1 5 9	3	13	9	22	-152	-18	-132	28	-54	-36	215796		3	14	14	32	-152	-18	-122	17	-70	-30	216461
WIL-71 X-Y USE-30	1 5 9	3	13	9	24	-153	-18	-121	16	-71	-30	216479		3	14	14	34	-152	-18	-113	4	-86	-23	217257

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H-4

VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
PKS-96 H-C LSP210	0	31	6	3	13	43	17	-151	-17	91	30	60	-1	214605	3	14	14	23	-150	-17	88	36	54	2	215446
CRC-C8 X-Y USE-30	0	25	12	3	13	49	5	-150	-17	109	0	90	-19	216409	3	14	14	18	-150	-17	106	5	84	-16	217157
GWM-24 X-Y LSB-30	1	5	21	3	15	2	20	-150	-18	122	33	53	-26	215499	3	16	7	50	-149	-18	133	45	37	-29	214958
PKS-96 H-C LSE210	1	5	17	3	15	2	38	-150	-17	80	47	43	7	214861	3	16	7	54	-150	-18	67	59	29	11	214423
CRC-C8 X-Y USE-20	1	5	8	3	15	2	41	-150	-17	102	16	74	-11	216397	3	16	7	49	-149	-18	97	30	60	-6	215648
HSK-25 X-Y LSE-85	1	5	8	3	15	2	49	-150	-17	77	47	-12	42	214848	3	16	7	57	-150	-18	62	59	-16	27	214442
HAW-12 X-Y LSB-30	1	5	3	3	15	2	56	-151	-18	-169	49	-10	-40	214737	3	16	7	58	-150	-18	-149	43	-29	-38	215007
STM-00 A-E LSP150	1	5	4	3	15	3	0	-151	-18	-134	20	-64	-41	216159	3	16	8	4	-151	-18	-123	10	-78	-32	216779
GDS-28 X-Y LSE-95	1	5	1	3	15	3	4	-152	-18	-129	18	63	-48	216261	3	16	8	5	-151	-18	-119	7	75	-60	215937
MAR-95 H-C USB210	1	4	58	3	15	3	5	-152	-18	-129	19	-67	-37	216263	3	16	8	3	-151	-18	-119	7	-82	-29	216937

VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA													
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y
TEX-16 X-Y LSE-30	0 39 59		3	15	3	9	-152	-18	-115	8	-81	-25	216853		3	15	43	9	-151	-18	-111	0	-90	-21	216307
GWM-24 X-Y LSE-30	1 5 6		3	16	56	30	-150	-18	147	52	23	-31	214511		3	18	1	36	-149	-19	171	58	6	-32	214366
CRC-C8 X-Y USE-30	1 5 5		3	16	56	31	-149	-18	92	41	49	-2	214571		3	18	1	36	-148	-18	86	55	35	2	214443
PKS-96 H-C LSP210	1 5 6		3	16	56	40	-150	-18	49	68	17	14	214044		3	18	1	49	-149	-18	5	75	1	15	213966
HSK-25 X-Y LSE-85	1 5 4		3	16	56	43	-150	-17	43	67	-17	16	214072		3	18	1	47	-149	-18	2	72	-18	1	214009
HAW-12 X-Y USB-30	1 5 4		3	16	56	46	-151	-18	-136	37	-43	-36	215167		3	18	1	50	-150	-19	-125	25	-60	-31	215795
STN-OC A-E LSR150	0 7 29		3	16	56	53	-151	-18	-114	1	-89	-24	217123		3	17	4	22	-151	-18	-113	0	-90	-23	216810
CRC-C8 X-Y USE-30	1 5 11		3	18	50	9	-149	-18	78	66	23	5	213979		3	19	55	20	-148	-18	53	80	8	6	213782
GWM-24 X-Y LSE-30	1 5 11		3	18	50	11	-149	-19	-167	57	-8	-32	214228		3	19	55	22	-148	-19	-145	51	-25	-31	214497
PKS-96 H-C LSP210	1 5 16		3	18	50	16	-149	-18	-35	72	-11	15	213856		3	19	55	32	-148	-18	-65	62	-26	12	214131

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y LSP-85	1	5	12	3	18	50	19	-149	-18	-33	69	-17	-11	213902	3	19	55	30	-148	-18	-61	60	-15	-26	214178
FHW-12 X-Y LSP-30	1	5	9	3	18	50	22	-150	-19	-118	16	-72	-27	216168	3	19	55	31	-149	-19	-112	3	-87	-22	216994
CRC-C9 X-Y LSE-30	1	5	22	3	20	43	33	-148	-18	-28	83	-4	7	213619	3	21	48	55	-147	-19	-75	71	-18	5	213790
GWM-24 X-Y LSP-30	1	5	18	3	20	43	39	-149	-19	-132	43	-39	-30	214678	3	21	49	57	-148	-19	-122	30	-55	-27	215289
PKS-56 H-C USE210	1	5	18	3	20	43	45	-149	-18	-77	52	-37	8	214285	3	21	49	2	-148	-19	-87	40	-50	2	214844
HSK-25 X-Y LSP-85	1	5	16	3	20	43	48	-149	-18	-74	51	-13	-37	214327	3	21	49	4	-148	-18	-86	39	-5	-51	214880
CRC-C8 X-Y LSP-30	1	4	58	3	22	37	44	-148	-19	-84	60	-30	3	213896	3	23	42	42	-147	-19	-92	46	-44	-1	214445
GWM-24 X-Y LSP-30	1	5	1	3	22	37	44	-148	-19	-116	20	-68	-25	215665	3	23	42	45	-147	-19	-112	6	-83	-22	216544
HSK-25 X-Y LSP-85	1	4	60	3	22	37	52	-148	-18	-93	29	5	-61	215200	3	23	42	52	-147	-19	-101	17	34	-70	215938
AGN-75 X-Y LSP-30	0	43	23	3	22	58	46	-146	-19	109	0	90	-19	215888	3	23	42	10	-145	-19	108	10	80	-18	215306

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
MAD-23 X-Y LSP-85	0 0 3	3	23	42	3	-145	-20	116	0	90	64	216871	3	23	42	6	-145	-20	116	0	90	64	216873	
MAD-23 X-Y USE-85	1 5 12	4	0	30	47	-146	-20	125	8	76	54	216267	4	1	35	60	-145	-20	137	17	68	41	215771	
ACN-75 X-Y USE-30	1 5 13	4	0	30	48	-145	-19	107	21	68	-16	215513	4	1	36	2	-144	-20	108	36	53	-15	214759	
CYI-C4 X-Y LSE-30	1 5 13	4	0	30	48	-145	-20	116	6	83	-26	216375	4	1	36	2	-145	-20	125	18	69	-33	215710	
CRC-C8 X-Y LSE-30	1 5 13	4	0	31	19	-147	-19	-96	35	-55	-5	214778	4	1	36	31	-146	-19	-102	21	-68	-11	215551	
HSK-25 X-Y LSP-85	0 39 18	4	0	31	19	-147	-19	-108	7	69	-71	216323	4	1	10	37	-146	-19	-113	0	90	-67	215699	
CYI-C4 X-Y LSF-30	1 5 13	4	2	24	14	-145	-20	134	26	56	-38	215117	4	3	29	27	-144	-20	147	35	38	-44	214668	
MAD-23 X-Y LSP-85	1 5 14	4	2	24	17	-145	-20	147	22	64	30	215317	4	3	29	31	-144	-21	163	27	62	15	215056	
ACN-75 X-Y LSF-30	1 5 11	4	2	24	20	-145	-20	110	47	41	-14	214115	4	3	29	32	-144	-20	118	61	26	-13	213624	
CRC-C8 X-Y USE-30	0 52 3	4	2	24	48	-145	-19	-106	10	-79	-16	215956	4	3	16	49	-145	-19	-111	0	-90	-21	216017	

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26 JUL 71 SEP TO CIR LAZ 80.1

VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA													
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y
ACN-75 X-Y LSE-30	1 7 22	4	4	15	52	-144	-20	131	71	14	-12	213367		4	5	23	14	-143	-20	-175	78	-1	-12	213155	
BDA-02 X-Y USB-30	1 5 21	4	4	17	37	-144	-20	120	8	80	-30	216016		4	5	22	58	-143	-21	131	19	66	-38	215380	
CYI-C4 X-Y LSE-30	1 5 25	4	4	17	43	-144	-20	161	39	22	-47	214329		4	5	23	8	-143	-21	180	41	0	-49	214216	
MAD-23 X-Y USB-E5	1 5 20	4	4	17	48	-144	-21	175	29	61	4	214837		4	5	23	8	-143	-21	-168	28	62	-11	214884	
MIL-71 X-Y LSE-30	0 52 33	4	4	30	24	-143	-20	113	0	90	-23	215855		4	5	22	57	-143	-21	120	9	79	-29	215910	
		26 JUL 71 CIR TO PCH LAZ 80.1																							
TEX-16 X-Y USR-20	1 12 5	4	6	9	28	-143	-21	117	6	83	-27	216127		4	7	21	33	-142	-21	127	19	67	-35	215249	
MIL-71 X-Y LSE-30	1 12 3	4	6	9	30	-143	-21	127	18	68	-35	215417		4	7	21	33	-142	-21	140	29	49	-42	214692	
BDA-C2 X-Y USB-30	1 12 4	4	6	9	33	-143	-21	140	26	53	-44	214999		4	7	21	37	-142	-21	157	33	31	-50	214486	
CYI-04 X-Y LSP-30	1 12 3	4	6	9	46	-144	-21	-166	40	-16	-48	214263		4	7	21	49	-143	-21	-147	34	-39	-44	214455	
MAD-23 X-Y LSE-85	1 12 2	4	6	9	48	-144	-21	-156	25	63	-22	215021		4	7	21	50	-143	-21	-141	18	67	-37	215308	

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y LSB-30	1	12	4	4	6	9	52	-144	-20	-136	72	-13	-12	213218	4	7	21	56	-143	-21	-117	58	-29	-14	213465
GDS-26 X-Y USE-85	0	2	33	4	7	18	56	-142	-21	116	0	90	64	216224	4	7	21	29	-142	-21	116	0	89	64	216316
MAR-55 F-C LSB210	0	2	16	4	7	19	13	-142	-21	116	0	90	-26	216237	4	7	21	29	-142	-21	116	0	90	-26	216319
STN-00 A-E LSB150	1	12	15	4	8	7	38	-142	-21	120	4	85	-30	216100	4	9	19	53	-141	-21	132	15	70	-41	215337
MAR-55 F-C LSB210	1	12	13	4	8	7	40	-142	-21	124	9	80	-33	215820	4	9	19	53	-141	-21	136	19	63	-43	215082
GDS-28 X-Y LSB-85	1	12	14	4	8	7	41	-142	-21	124	9	74	55	215816	4	9	19	55	-141	-21	136	19	64	41	215079
TEX-16 X-Y LSB-30	1	14	10	4	8	7	42	-142	-21	135	26	55	-40	214807	4	9	21	52	-141	-21	152	35	34	-46	214304
MIL-71 X-Y LSB-30	1	12	14	4	8	7	47	-142	-21	151	35	35	-46	214280	4	9	20	1	-141	-21	170	39	12	-50	214032
BCA-02 X-Y LSB-30	1	12	19	4	8	7	47	-142	-21	170	36	14	-53	214325	4	9	20	7	-141	-22	-171	36	-13	-53	214217
CVI-04 X-Y LSB-30	1	12	18	4	8	7	60	-142	-21	-137	27	-53	-40	214749	4	9	20	18	-142	-21	-125	16	-71	-34	215299

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SFC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USE-85	1	12	14	4	8	8	2	-143	-21	-131	12	73	-48	215629	4	9	20	16	-142	-21	-119	1	88	-61	216174
ACN-75 X-Y USE-30	1	12	16	4	8	8	6	-143	-20	-112	47	-40	-15	213805	4	9	20	22	-142	-21	-110	31	-57	-17	214443
FAW-12 X-Y USE-30	1	12	7	4	10	5	40	-141	-21	115	4	86	-25	215952	4	11	17	47	-140	-22	123	18	69	-31	214999
STN-00 A-E USE150	1	12	7	4	10	5	47	-141	-21	142	21	58	-47	214955	4	11	17	53	-140	-22	158	27	36	-55	214456
MAR-55 H-C USB210	1	12	8	4	10	5	48	-141	-21	146	25	50	-49	214726	4	11	17	57	-140	-22	163	31	26	-55	214287
GDS-28 X-Y LSP-85	1	12	4	4	10	5	49	-141	-21	146	25	60	30	214721	4	11	17	53	-140	-22	163	31	56	15	214280
TEX-16 X-Y USE-30	1	12	8	4	10	5	54	-141	-21	164	39	19	-48	214009	4	11	18	1	-140	-22	-175	40	-6	-49	213828
MIL-71 X-Y USE-30	1	12	6	4	10	5	59	-141	-21	175	40	-5	-50	213975	4	11	18	5	-141	-22	-156	36	-30	-48	214047
BDA-C2 X-Y USE-30	1	12	4	4	10	6	5	-142	-21	-158	33	-30	-51	214307	4	11	18	8	-141	-22	-142	25	-53	-45	214590
CYI-C4 X-Y USE-30	0	36	24	4	10	6	15	-142	-21	-118	7	-82	-28	215755	4	10	42	39	-142	-21	-114	0	-90	-24	214846

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	H	P	S	DAY	HR	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HR	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USE-30	1	12	4	4	10	6	20	-142	-21	-1 ⁹	20	-68	-18	214964	4	11	18	24	-141	-21	-111	5	-85	-20	215796
FAW-12 X-Y USE-30	1	12	20	4	12	3	55	-140	-22	1 ⁰	26	57	-35	214506	4	13	16	15	-139	-22	144	37	38	-40	215833
FSK-25 X-Y USE-85	1	12	20	4	12	3	58	-140	-20	112	5	77	68	215742	4	13	16	18	-138	-21	103	18	34	68	214822
MAR-95 F-E LSP210	1	12	20	4	12	4	2	-140	-22	176	33	7	-57	214173	4	13	16	23	-139	-22	-166	31	-22	-56	214128
STN-00 E-E LSP150	1	12	17	4	12	4	4	-140	-22	170	30	17	-58	214300	4	13	16	21	-139	-22	-172	30	-14	-59	214183
GDS-28 X-Y USP-85	1	12	19	4	12	4	4	-140	-22	176	33	57	4	214167	4	13	16	24	-139	-22	-166	31	58	-12	214125
TEX-16 X-Y LSP-30	1	12	17	4	12	4	12	-141	-22	-1 ¹	38	-22	-48	213893	4	13	16	28	-140	-22	-144	31	-45	-44	214142
MIL-71 X-Y USE-30	1	12	21	4	12	4	13	-141	-22	-144	31	-45	-44	214267	4	13	16	34	-140	-22	-131	20	-64	-38	214723
BDA-C2 X-Y LSP-30	1	12	17	4	12	4	16	-141	-22	-1 ²	19	-66	-40	214924	4	13	16	32	-140	-22	-121	7	-82	-31	215504
GWM-24 X-Y USE-30	1	12	6	4	14	1	58	-138	-22	11 ⁵	9	80	-25	215345	4	15	14	4	-137	-22	121	23	63	-29	214360

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y LSE-85	1	12	9	4	14	2	5	-139	-21	97	28	13	62	214281	4	15	14	14	-138	-21	88	42	-2	48	213453
HAW-12 X-Y LSE-30	1	12	4	4	14	2	12	-139	-22	157	42	23	-43	213551	4	15	14	16	-138	-22	178	46	2	-44	213284
STA-CC A-E USB150	1	12	2	4	14	2	20	-140	-22	-159	28	-34	-56	214259	4	15	14	23	-139	-22	-144	21	-57	-49	214509
MAR-55 F-C LSR210	1	12	3	4	14	2	21	-140	-22	-154	28	-40	-52	214252	4	15	14	24	-139	-22	-139	20	-61	-45	214574
GDS-29 X-Y USB-85	1	12	1	4	14	2	22	-140	-22	-154	28	59	-23	214248	4	15	14	23	-139	-22	-139	20	64	-38	214570
TEX-16 X-Y LSR-30	1	12	2	4	14	2	31	-140	-22	-134	24	-58	-39	214443	4	15	14	33	-139	-22	-123	12	-76	-32	215020
MIL-71 X-Y LSE-30	1	5	57	4	14	2	32	-140	-22	-123	12	-76	-32	215128	4	15	8	29	-139	-22	-115	0	-90	-25	215455
PKS-56 H-C USB210	0	55	52	4	14	18	19	-138	-21	97	30	60	-6	213355	4	15	14	12	-138	-21	91	41	49	0	213476
CRO-C8 X-Y LSP-30	0	49	23	4	14	24	47	-138	-21	113	0	90	-23	214806	4	15	14	10	-137	-21	109	10	80	-19	215139
CRC-C8 X-Y LSE-30	1	12	19	4	16	0	13	-138	-21	105	20	69	-14	214534	4	17	12	32	-136	-22	100	35	54	-8	213592

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	PANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GWM-24 X-Y LSE-30	1	12	18	4	16	0	14	-138	-22	128	33	51	-31	213848	4	17	12	32	-137	-22	142	45	32	-34	213166
HSK-25 X-Y LSE-85	1	12	20	4	16	0	18	-138	-21	40	51	-8	38	213039	4	17	12	38	-137	-22	63	65	-12	22	212484
PKS-96 F-C USB210	1	12	23	4	16	0	18	-138	-21	84	51	39	4	213047	4	17	12	41	-137	-22	69	65	23	8	212474
HAW-12 X-Y LSE-30	1	12	20	4	16	0	26	-139	-22	-166	44	-14	-44	213299	4	17	12	45	-138	-23	-147	38	-35	-42	213483
STN-00 A-E USB150	1	12	18	4	16	0	31	-139	-22	-174	15	-70	-42	214813	4	17	12	49	-138	-23	-122	4	-85	-32	215345
MAR-55 F-C LSE210	1	12	17	4	16	0	33	-139	-22	-180	13	-73	-39	214920	4	17	12	49	-138	-23	-119	1	-89	-29	215504
GDS-28 X-Y LSE-85	1	12	14	4	16	0	35	-139	-22	-180	13	70	-48	214916	4	17	12	49	-138	-23	-119	1	87	-61	215501
TEX-16 X-Y LSE-30	0	16	50	4	16	0	37	-139	-22	-117	3	-86	-27	215496	4	16	17	27	-139	-22	-115	0	-90	-25	214851
CFC-C2 X-Y LSE-30	1	12	7	4	17	58	22	-137	-22	56	46	44	-4	213085	4	19	10	29	-136	-22	91	61	29	0	212395
GWM-24 X-Y LSE-30	1	12	7	4	17	58	26	-137	-22	155	51	19	-35	212886	4	19	10	33	-136	-23	-179	54	0	-36	212631

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y USE-85	1	12	11	4	17	58	31	-137	-22	41	72	-13	12	212275	4	19	10	42	-136	-22	-18	76	-13	-4	212093
PKS-96 H-C USB210	1	12	9	4	17	58	32	-137	-22	49	74	12	10	212251	4	19	10	40	-136	-22	-19	79	-4	11	212057
HAW-12 X-Y USE-30	1	12	3	4	17	58	45	-138	-22	-136	31	-49	-38	213753	4	19	10	47	-137	-23	-125	19	-67	-33	214301
CRC-C8 X-Y USE-30	1	12	22	4	19	56	35	-136	-22	85	72	18	2	212113	4	21	8	57	-135	-22	38	87	2	2	211824
HSK-25 X-Y USE-85	1	12	22	4	19	56	44	-137	-22	-51	70	-13	-15	212144	4	21	9	6	-136	-22	-75	58	-9	-31	212348
GWM-24 X-Y USE-30	1	12	15	4	19	56	45	-137	-23	-161	52	-14	-36	212659	4	21	8	59	-136	-23	-141	44	-33	-34	212873
PKS-96 H-C USB210	1	12	18	4	19	56	46	-137	-22	-56	72	-15	10	212104	4	21	9	4	-136	-22	-78	59	-30	6	212310
HAW-12 X-Y USE-30	0	49	35	4	19	56	53	-137	-23	-119	10	-79	-29	214773	4	20	46	29	-136	-23	-115	0	-90	-25	214234
CRC-C8 X-Y USE-30	1	12	10	4	21	54	53	-135	-22	-77	81	-9	2	211808	4	23	7	3	-135	-23	-91	65	-25	0	211956
GWM-24 X-Y USE-30	1	12	4	4	21	55	3	-136	-23	-132	36	-46	-33	213170	4	23	7	7	-135	-23	-122	22	-64	-30	213763

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VEHICLE I RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y LSP-85	1	12	7	4	21	55	5	-136	-22	-84	48	-5	-41	212613	4	23	7	11	-135	-22	-94	35	6	-55	213120
PKS-56 H-C LSP210	1	12	7	4	21	55	5	-136	-22	-86	49	-41	2	212581	4	23	7	12	-135	-22	-96	35	-55	-5	213103
ACN-75 X-Y LSE-30	1	12	19	4	23	52	41	-133	-23	113	2	88	-23	214883	5	1	5	0	-132	-23	112	18	71	-21	213812
CRC-C8 X-Y LSP-30	1	12	21	4	23	53	6	-135	-23	-95	55	-35	-3	212214	5	1	5	27	-134	-23	-100	39	-50	-8	212725
GWM-24 X-Y LSE-30	0	59	46	4	23	53	9	-135	-23	-118	12	-76	-27	214261	5	0	52	55	-134	-23	-114	0	-90	-24	214289
HSK-25 X-Y LSP-85	1	12	21	4	23	53	10	-135	-22	-100	25	21	-62	213541	5	1	5	31	-134	-23	-109	12	58	-67	214184
MAD-23 X-Y LSE-85	0	19	29	5	0	45	31	-133	-24	122	0	90	58	213975	5	1	5	0	-132	-24	125	3	85	55	214687
CYI-C4 X-Y LSE-30	0	4	60	5	0	58	7	-132	-23	117	0	90	-27	214535	5	1	3	7	-132	-24	117	1	89	-27	214719
CYI-C4 X-Y LSE-30	1	12	11	5	1	50	45	-132	-24	124	10	78	-33	214223	5	3	2	55	-131	-24	135	22	61	-41	213401
ACN-75 X-Y LSE-30	1	12	10	5	1	50	46	-132	-23	112	29	60	-19	213192	5	3	2	55	-131	-23	115	44	43	-18	212290

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USE-85	1	12	7	5	1	50	51	-133	-24	133	10	76	46	214239	5	3	2	58	-132	-24	147	18	69	31	213616
HSK-25 X-Y USE-85	0	17	55	5	1	51	21	-134	-22	-116	3	83	-64	214622	5	2	9	15	-134	-22	-118	0	90	-62	213927
CRC-C8 X-Y USE-30	1	12	10	5	1	51	22	-134	-23	-102	29	-61	-12	213159	5	3	3	32	-133	-23	-109	14	-75	-19	213873
CYI-C4 X-Y USE-30	1	12	19	5	3	49	1	-132	-24	144	28	47	-45	213002	5	5	1	19	-131	-24	160	35	25	-50	212508
ACN-75 X-Y USE-30	1	12	20	5	3	49	2	-132	-23	120	55	32	-17	211857	5	5	1	23	-131	-24	138	68	15	-16	211331
MAD-23 X-Y USE-85	1	12	20	5	3	49	4	-132	-24	157	22	66	21	213345	5	5	1	24	-131	-24	174	25	65	5	213044
CRO-C8 X-Y USE-30	0	20	55	5	3	49	27	-133	-23	-113	4	-86	-23	214379	5	4	10	22	-133	-23	-115	0	-90	-25	213620
BCA-C2 X-Y USE-30	0	28	22	5	4	32	54	-131	-24	119	0	90	-29	213357	5	5	1	16	-130	-24	123	5	84	-32	214202
MIL-71 X-Y USE-30	1	12	9	5	5	47	0	-130	-24	120	3	86	-30	214243	5	6	59	9	-129	-24	130	16	70	-38	213365
BDA-C2 X-Y USE-30	1	12	10	5	5	47	2	-130	-24	130	13	74	-39	213694	5	6	59	12	-129	-25	143	22	56	-47	212976

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CYI-C4 X-Y USE-30	1	12	9	5	5	47	15	-131	-24	174	38	8	-52	212344	5	6	59	25	-130	-25	-167	37	-17	-52	212259
ACN-75 X-Y USE-30	1	12	12	5	5	47	16	-131	-24	166	74	4	-16	211166	5	6	59	28	-130	-24	-144	70	-12	-16	211102
MAD-23 X-Y USE-85	1	12	5	5	5	47	19	-131	-24	-174	25	65	-6	212987	5	6	59	24	-130	-25	-157	21	67	-21	213041
TEX-16 X-Y USE-30	0	21	35	5	6	37	33	-129	-24	117	0	90	-27	213332	5	6	59	8	-129	-24	120	4	85	-30	214051
TEX-16 X-Y USE-30	1	12	26	5	7	45	9	-129	-24	126	13	74	-35	213511	5	8	57	34	-128	-25	138	24	57	-43	212728
MIL-71 X-Y USE-30	1	12	22	5	7	45	14	-129	-24	128	23	58	-43	212913	5	8	57	35	-128	-25	153	31	37	-49	212316
BDA-C2 X-Y USE-30	1	12	23	5	7	45	17	-130	-25	153	28	41	-52	212652	5	8	57	40	-129	-25	170	32	15	-57	212280
CYI-C4 X-Y USE-30	1	12	24	5	7	45	28	-130	-24	-154	33	-34	-49	212373	5	8	57	52	-129	-25	-139	25	55	-44	212689
MAD-23 X-Y USE-85	1	12	21	5	7	45	30	-130	-25	-147	17	70	-31	213221	5	8	57	51	-129	-25	-134	9	77	-46	213589
ACN-75 X-Y USE-30	1	12	25	5	7	45	20	-130	-24	-127	61	-24	-17	211249	5	8	57	55	-129	-24	-117	47	-40	-18	211635

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VEHICLE 1 RADAR TABLE

	TRACKING TIME				STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC		DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GDS-28 X-Y USE-85	0	39	14		5	8	18	17	-129	-24	120	0	90	60	212934	5	8	57	31	-128	-25	126	6	80	53	213735
MAR-55 H-C USB210	0	38	53		5	8	18	38	-129	-24	120	0	90	-30	212931	5	8	57	31	-128	-25	126	6	83	-36	213738
STN-CC A-E USB150	0	8	47		5	8	48	45	-128	-25	122	0	90	-32	213685	5	8	57	32	-128	-25	123	1	88	-33	214017
STN-CO A-E USB150	1	12	11		5	9	43	19	-128	-25	131	9	78	-40	213530	5	10	55	31	-127	-25	144	18	62	-50	212847
MAR-55 H-C USB210	1	12	11		5	9	43	20	-128	-25	134	13	72	-43	213265	5	10	55	31	-127	-25	148	22	53	-52	212619
GDS-28 X-Y USE-85	1	12	11		5	9	43	20	-128	-25	134	13	71	44	213261	5	10	55	31	-127	-25	148	22	65	30	212615
TEX-16 X-Y LSR-30	1	12	11		5	9	43	23	-128	-25	148	30	43	-47	212345	5	10	55	35	-128	-25	165	36	20	-52	211897
MIL-71 X-Y LSR-30	1	12	11		5	9	43	28	-129	-25	165	35	20	-52	212077	5	10	55	39	-128	-25	-176	36	-5	-53	211871
BDA-C2 X-Y USE-30	1	12	12		5	9	43	32	-129	-25	-177	33	-4	-57	212189	5	10	55	44	-128	-25	-159	30	-32	-54	212214
CYI-C4 X-Y LSR-30	1	12	9		5	9	43	47	-130	-25	-131	17	-68	-39	213015	5	10	55	56	-129	-25	-121	5	-84	-31	213618

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VEHICLE 1 RADAR TABLE

	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
MAD-23 X-Y LSP-85	0 12 52	5	9	43	47	-130	-25	-125	2	87	-55	213917	5	9	56	40	-130	-25	-123	0	90	-57	213386	
ACN-75 X-Y LSP-30	1 12 10	5	9	43	51	-130	-24	-114	36	-51	-19	212014	5	10	56	1	-129	-24	-113	21	-68	-21	212714	
HAW-12 X-Y LSP-30	0 11 19	5	10	44	6	-127	-25	117	0	90	-27	213356	5	10	55	25	-127	-25	118	2	87	-28	213761	
HAW-12 X-Y LSP-30	1 12 23	5	11	41	25	-127	-25	123	12	76	-32	213173	5	12	53	48	-126	-25	133	24	59	-38	212312	
STN-C0 A-E LSP150	1 12 24	5	11	41	32	-127	-25	154	23	47	-56	212532	5	12	53	56	-126	-25	170	27	19	-62	212167	
MAR-95 F-D LSP210	1 12 23	5	11	41	34	-128	-25	158	26	37	-56	212337	5	12	53	57	-127	-25	176	29	8	-61	212036	
GDS-28 X-Y LSP-85	1 12 24	5	11	41	34	-128	-25	158	26	62	19	212332	5	12	53	58	-127	-25	176	29	61	4	212032	
TEX-16 X-Y LSP-30	1 12 23	5	11	41	39	-128	-25	178	37	2	-53	211772	5	12	54	2	-127	-25	-163	35	-23	-51	211744	
MIL-71 X-Y LSP-30	1 12 23	5	11	41	43	-128	-25	-163	34	-23	-52	211905	5	12	54	6	-127	-25	-147	28	-46	-48	212110	
ECA-C2 X-Y LSP-30	1 12 22	5	11	41	44	-128	-25	-148	25	-48	-50	212383	5	12	54	6	-127	-25	-135	16	-68	-43	212762	

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	0	47	47	5	11	41	56	-129	-24	-113	10	-79	-23	213243	5	12	29	43	-128	-24	-114	0	-90	-24	212676
HSK-25 X-Y USB-85	0	39	10	5	12	14	44	-127	-24	120	0	90	60	212544	5	12	53	54	-126	-24	115	7	74	64	213309
HSK-25 X-Y USB-85	1	12	12	5	13	39	35	-126	-24	109	16	49	66	212741	5	14	51	46	-125	-24	101	29	18	59	211835
HAW-12 X-Y USB-30	1	12	12	5	13	39	37	-126	-25	142	31	46	-42	211871	5	14	51	49	-125	-25	158	39	25	-46	211333
STN-00 A-E USB150	1	12	9	5	13	39	48	-127	-25	-178	27	-4	-63	212069	5	14	51	57	-126	-26	-161	24	-36	-59	212074
MAR-55 H-C USB210	1	12	10	5	13	39	51	-127	-25	-172	29	-14	-60	211982	5	14	52	2	-126	-26	-156	25	-42	-56	212064
GDS-28 X-Y USB-85	1	12	8	5	13	39	52	-127	-25	-172	29	61	-7	211977	5	14	52	0	-126	-26	-155	25	63	-22	212059
TEX-16 X-Y USB-20	1	12	10	5	13	39	56	-127	-25	-151	31	-39	-49	211871	5	14	52	6	-126	-25	-137	22	-60	-43	212226
MIL-71 X-Y USB-30	1	12	7	5	13	40	2	-127	-25	-137	22	-60	-43	212372	5	14	52	9	-126	-25	-126	10	-77	-36	212899
BDA-C2 X-Y USB-30	0	52	26	5	13	40	4	-127	-25	-127	9	-79	-37	213112	5	14	32	31	-127	-25	-120	0	-90	-30	212614

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GWM-24 X-Y LSE-30	0	36	43	5	14	14	56	-125	-25	115	0	90	-25	212316	5	14	51	39	-125	-25	118	7	82	-28	213045
CRC-C X-Y USB-30	1	12	25	5	15	37	40	-125	-24	114	6	83	-24	213082	5	16	50	5	-124	-25	108	21	68	-17	212081
GWM-24 X-Y LSE-30	1	12	22	5	15	37	41	-125	-25	122	17	70	-30	212432	5	16	50	3	-124	-25	131	31	52	-34	211547
HSK-25 X-Y LSE-85	1	12	27	5	15	37	43	-125	-24	95	38	6	51	211324	5	16	50	10	-124	-25	85	52	-4	37	210585
PKS-56 H-C USB210	1	12	25	5	15	37	44	-125	-24	97	38	52	-6	211363	5	16	50	10	-124	-25	89	52	38	1	210602
HAW-12 X-Y LSE-30	1	12	21	5	15	37	53	-126	-25	172	42	9	-47	211149	5	16	50	14	-125	-26	-168	41	-14	-47	211038
STN-00 A-E LSE150	1	12	20	5	15	38	1	-126	-26	-160	21	-53	-54	212221	5	16	50	21	-125	-26	-137	12	-72	-45	212563
GDS-28 X-Y LSE-85	1	12	23	5	15	38	1	-126	-25	-145	20	66	-32	212252	5	16	50	24	-125	-26	-132	11	74	-46	212660
MAR-55 H-C USB210	1	12	19	5	15	38	1	-126	-25	-145	20	-57	-50	212254	5	16	50	22	-125	-26	-132	11	-76	-42	212661
MIL-71 X-Y USB-30	0	8	53	5	15	38	9	-127	-25	-120	2	-86	-30	213331	5	15	47	1	-126	-25	-119	0	-90	-29	212972

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
TEX-16 X-Y USE-30	1	12	20	5	15	38	8	-126	-25	-129	14	-72	-38	212581	5	16	50	28	-125	-25	-120	2	-88	-30	215200
CRO-C8 X-Y LSB-30	1	12	14	5	17	35	48	-124	-25	105	31	58	-13	211486	5	18	48	1	-123	-25	101	46	43	-8	210617
GWM-24 X-Y LSB-30	1	12	8	5	17	35	54	-124	-25	129	39	39	-36	211094	5	18	48	2	-123	-26	157	47	20	-38	210553
HSK-25 X-Y LSE-85	1	12	16	5	17	35	55	-124	-25	76	62	-8	27	210221	5	18	48	12	-123	-25	50	75	-10	12	209792
PKS-56 F-C USB210	1	12	13	5	17	35	58	-124	-25	81	62	28	4	210222	5	18	48	11	-123	-25	60	76	13	7	209777
HAh-12 X-Y USB-30	1	12	7	5	17	36	14	-125	-26	-155	38	-29	-46	211121	5	18	48	21	-124	-26	-139	29	-50	-42	211430
MAR-95 F-C LSB210	0	20	31	5	17	36	18	-125	-26	-125	3	-86	-35	213014	5	17	56	49	-125	-25	-122	0	-90	-32	212224
STN-CO A-E LSB150	0	26	44	5	17	36	19	-125	-26	-128	6	-83	-38	212879	5	18	13	3	-125	-26	-123	0	-90	-33	211885
GDS-28 X-Y LSF-85	0	20	42	5	17	36	20	-125	-26	-125	3	84	-55	213011	5	17	57	2	-125	-25	-122	0	90	-58	212216
CRO-C8 X-Y LSB-30	1	12	26	5	19	34	0	-123	-25	98	57	33	-5	210178	5	20	46	27	-122	-25	96	72	18	-2	209626

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y
GWM-24 X-Y USE-30	1	12	24	5	19	34	7	-123 -26	172	51	6 -39	210376	5	20	46	32	-122 -26	-164	49 -14	-39	210286			
FSK-25 X-Y LSF-85	1	12	27	5	19	34	9	-123 -25	6	79	-11	1 209666	5	20	46	35	-122 -25	-57	73 -10	-14	209618			
PKS-56 H-C LSE210	1	12	26	5	19	34	10	-123 -25	12	82	2	8 209642	5	20	46	35	-122 -25	-64	75 -14	7	209588			
FAM-12 X-Y LSE-30	1	12	24	5	19	34	20	-124 -26	-131	21	-63	-38 211764	5	20	46	44	-123 -26	-122	9 -80	-32	212372			
CRC-C8 X-Y LSE-30	1	12	11	5	21	32	19	-122 -25	95	83	7 -1	209415	5	22	44	30	-121 -26	-96	82 -8	-1	209278			
GWM-24 X-Y LSE-30	1	12	11	5	21	32	27	-123 -26	-150	45	-27	-38 210387	5	22	44	38	-122 -26	-135	34 -46	-36	210732			
FSK-25 X-Y LSF-85	1	12	12	5	21	32	29	-123 -25	-74	64	-8 -25	209722	5	22	44	40	-122 -25	-88	50 -2	-40	210031			
PKS-56 H-C LSE210	1	12	11	5	21	32	30	-123 -25	-79	65	-24	5 209641	5	22	44	41	-122 -25	-90	51 -39	0	210009			
CRC-C8 X-Y USB-30	1	12	27	5	23	30	28	-122 -26	-96	71	-19	-2 209353	6	0	42	56	-121 -26	-100	56 -34	-5	209625			
FSK-25 X-Y LSF-85	1	12	24	5	23	30	36	-122 -25	-94	41	5 -49	210343	6	0	43	50	-121 -25	-103	27	24	-60 210887			

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GWM-24 X-Y LSB-30	1	12	23	5	23	30	36	-122	-26	-128	26	-59	-34	211090	6	0	42	59	-121	-26	-121	12	-76	-30	211741
PKS-56 H-D LSR210	0	57	51	5	23	30	37	-122	-25	-96	41	-49	-5	210326	6	0	28	28	-121	-25	-102	30	-59	-11	210058
ACN-75 X-Y USB-30	0	6	56	6	0	23	41	-119	-26	116	0	90	-26	212016	6	0	40	37	-119	-26	116	1	88	-26	212256
ACN-75 X-Y USE-30	1	12	13	6	1	28	14	-119	-26	115	12	76	-24	211645	6	2	40	26	-118	-26	115	28	60	-22	210615
CRC-C8 X-Y USE-30	1	12	11	6	1	28	49	-121	-26	-102	45	-44	-8	209922	6	2	41	0	-120	-26	-106	30	-59	-14	210502
HSK-25 X-Y LSB-85	1	12	9	6	1	28	50	-121	-25	-109	18	44	-64	211288	6	2	40	59	-120	-25	-117	6	76	-62	211902
GWM-24 X-Y LSB-30	0	9	16	6	1	28	55	-121	-26	-117	2	-88	-27	212225	6	1	38	11	-121	-26	-117	0	-90	-27	211872
MAD-23 X-Y LSB-85	0	52	54	6	1	47	32	-119	-26	126	0	90	54	211421	6	2	40	27	-118	-27	134	7	80	45	211777
CVI-C4 X-Y LSB-30	0	45	40	6	1	54	43	-119	-26	120	0	90	-30	211171	6	2	40	23	-118	-26	125	8	80	-35	211729
ACN-75 X-Y USB-30	1	12	25	6	2	26	27	-118	-26	117	38	49	-21	210042	6	4	38	51	-117	-26	124	53	32	-20	209268

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W
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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CYI-C4 X-Y LSE-30	1	12	23	6	3	26	29	-118	-27	132	16	69	-40	211207	6	4	38	51	-117	-27	145	26	50	-47	210495
MAD-23 X-Y USE-85	1	12	25	6	3	26	30	-118	-27	143	13	74	36	211376	6	4	38	55	-117	-27	158	19	69	21	210858
CRC-C8 X-Y LSF-30	1	12	25	6	3	26	53	-120	-26	110	20	-69	-18	210950	6	4	39	18	-119	-26	-116	6	-83	-25	210649
ACN-75 X-Y LSF-30	1	12	16	6	5	24	39	-117	-26	133	62	21	-19	208905	6	6	36	54	-116	-27	165	71	5	-19	208535
CYI-C4 X-Y LSE-30	1	12	11	6	5	24	40	-117	-27	155	31	35	-51	210152	6	6	36	50	-116	-27	173	35	10	-54	209790
MAD-23 X-Y USE-85	1	12	10	6	5	24	44	-118	-27	168	22	68	11	210636	6	6	36	54	-117	-27	-175	22	68	-4	210447
BDA-C2 X-Y LSP-30	1	4	56	6	5	31	44	-117	-27	122	0	90	-32	211554	6	6	36	39	-116	-27	131	10	77	-40	211138
MIL-71 X-Y LSP-30	0	6	43	6	6	29	54	-116	-27	121	0	90	-31	211426	6	6	36	37	-116	-27	122	1	89	-32	211670
MIL-71 X-Y LSP-30	1	12	22	6	7	22	42	-116	-27	128	10	78	-37	211115	6	8	35	4	-115	-27	139	20	61	-45	210328
BDA-C2 X-Y LSP-30	1	12	22	6	7	22	44	-116	-27	139	17	65	-46	210677	6	8	35	5	-115	-27	153	25	44	-54	210072

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SFC	RA	DEC	AZ	ELV	X	Y	RANGE
CYI-04 X-Y LSE-30	1	12	23	6	7	22	55	-117	-27	-174	35	-8	-55	2C9713	6	8	35	18	-116	-27	-157	31	-33	-52	209763
ACN-75 X-Y USE-30	1	12	26	6	7	22	56	-117	-27	-162	70	-6	-19	208466	6	8	35	22	-116	-27	-133	61	-22	-19	208561
MAE-23 X-Y LSE-85	1	12	21	6	7	22	59	-117	-27	-164	21	69	-15	210462	6	8	35	20	-116	-27	-149	15	72	-30	210621
TEX-16 X-Y LSE-30	1	0	39	6	7	34	22	-116	-27	120	0	90	-30	211098	6	8	35	1	-115	-27	128	10	77	-37	210914
MAR-95 H-C LSE210	1	12	12	6	9	20	45	-115	-27	124	0	90	-34	211450	6	10	32	57	-114	-27	135	11	75	-44	210646
GDS-28 X-Y LSE-85	1	12	10	6	9	20	47	-115	-27	124	0	90	56	211445	6	10	32	58	-114	-27	135	11	75	44	210642
TEX-16 X-Y LSE-30	1	12	9	6	9	20	49	-115	-27	135	18	65	-42	210399	6	10	32	59	-114	-27	148	27	46	-49	209719
MIL-71 X-Y LSE-30	1	12	10	6	9	20	54	-115	-27	148	26	47	-49	209921	6	10	33	4	-114	-27	164	32	23	-54	209451
BDA-C2 X-Y LSE-30	1	12	9	6	9	20	59	-115	-27	164	29	27	-58	2C98C2	6	10	33	8	-114	-27	-179	30	-2	-60	209560
CYI-04 X-Y LSE-30	1	12	8	6	9	21	16	-116	-27	-146	26	-49	-48	2C9925	6	10	33	24	-115	-27	-134	16	-68	-42	210339

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USE-85	1	12	6	6	9	21	16	-116	-27	-140	10	77	-40	210823	6	10	33	22	-115	-27	-128	1	89	-52	211252
ACN-75 X-Y LSP-30	1	12	11	6	9	21	16	-116	-27	-123	52	34	-20	208763	6	10	33	28	-115	-27	-117	37	-50	-22	209260
STN-CC A-E LSP150	0	43	54	6	9	49	4	-114	-27	125	0	90	-35	210213	6	10	32	58	-114	-27	131	6	82	-41	210912
STN-CC A-E US8157	1	12	21	6	11	18	59	-114	-27	140	13	71	-48	210467	6	12	31	20	-113	-27	154	20	51	-57	209884
GDS-28 X-Y LSP-85	1	12	24	6	11	18	59	-114	-27	143	17	69	35	210219	6	12	31	23	-113	-27	158	24	65	20	209683
MAR-55 H-C LSP210	1	12	23	6	11	18	59	-114	-27	143	17	63	-50	210223	6	12	31	22	-113	-27	158	24	41	-58	209687
TEX-16 X-Y LSP-30	1	12	23	6	11	19	2	-114	-27	150	32	30	-52	209414	6	12	31	25	-113	-27	177	35	5	-55	209104
MIL-71 X-Y LSP-30	1	12	22	6	11	19	7	-114	-27	177	34	5	-56	209254	6	12	31	30	-113	-27	-165	33	-22	-55	209224
BDA-C2 X-Y LSE-30	1	12	22	6	11	19	11	-115	-27	-167	29	-23	-58	209549	6	12	31	33	-114	-27	-151	24	-48	-53	209691
CYI-C4 X-Y LSP-30	0	49	37	6	11	19	21	-115	-27	-127	8	-80	-36	210703	6	12	8	58	-114	-27	-121	0	-90	-31	210080

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SFC	RA	DEC	AZ	ELV	X	Y	RANGE	
ACN-75 X-Y USE-30	1	12	23	6	11	19	23	-115	-27	-116	26	-61	-23	209685	6	12	31	46	-114	-27	-116	11	-77	-25	210414	
HAW-12 X-Y LSE-30	0	50	C	6	11	30	21	-113	-27	110	0	90	-29	210228	6	12	29	22	-112	-27	124	9	79	-34	210436	
HSK-25 X-Y LSP-85	1	12	12	6	13	16	59	-112	-26	120	3	84	60	210808	6	14	29	11	-111	-26	111	16	52	64	209899	
HAW-12 X-Y USE-30	1	12	5	6	13	17	2	-112	-27	131	18	67	-38	209933	6	14	29	11	-111	-27	142	29	48	-44	209169	
STN-00 A-E LSE150	1	12	7	6	13	17	16	-113	-27	164	23	32	-62	209616	6	14	29	23	-112	-28	-179	25	-2	-65	209372	
MAR-55 H-D LSE210	1	12	8	6	13	17	17	-113	-27	169	26	21	-62	209457	6	14	29	24	-112	-28	-174	27	-12	-63	209280	
GCS-28 X-Y USF-85	1	12	8	6	13	17	17	-113	-27	169	26	21	-63	10	209452	6	14	29	25	-112	-28	-174	27	63	-5	209276
TEX-16 X-Y USE-30	1	12	8	6	13	17	23	-113	-27	-170	34	-14	-55	209041	6	14	29	31	-112	-27	-153	30	-38	-51	209142	
MIL-71 X-Y LSE-30	1	12	7	6	13	17	27	-114	-27	-164	29	-39	-52	209313	6	14	29	34	-113	-27	-140	21	-60	-46	209626	
BDA-C2 X-Y LSE-30	1	12	9	6	13	17	29	-114	-27	-141	18	-62	-48	209899	6	14	29	38	-113	-27	-130	8	-80	-39	210357	

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y LSE-30	0	4	19	6	13	17	39	-114	-27	-117	1	-89	-27	210910	6	13	21	58	-114	-26	-117	0	-90	-27	210749
GWM-24 X-Y LSE-30	1	14	16	6	15	15	5	-111	-27	118	1	89	-28	210696	6	16	29	22	-110	-27	124	16	71	-32	209749
HSK-25 X-Y LSE-85	1	12	26	6	15	16	8	-111	-26	106	25	31	61	209333	6	16	27	34	-110	-27	98	38	10	51	208475
FAN-12 X-Y LSE-30	1	12	25	6	15	15	17	-112	-27	152	35	34	-47	208803	6	16	27	41	-111	-28	170	40	11	-49	208407
STN-CC A-E LSP150	1	12	22	6	15	15	26	-112	-28	168	24	-25	-63	209349	6	16	27	49	-111	-28	-152	19	-53	-57	209465
MAR-55 F-C LSP210	1	12	26	6	15	15	27	-112	-28	162	25	-33	-60	209303	6	16	27	53	-111	-28	-147	19	-58	-53	209493
GDS-28 X-Y LSP-85	1	12	22	6	15	15	29	-112	-28	162	25	64	-16	209297	6	16	27	51	-111	-28	-147	19	68	-31	209488
TEX-16 X-Y LSE-30	1	12	22	6	15	15	33	-113	-27	-143	24	-53	-47	209340	6	16	27	55	-112	-27	-132	14	-72	-40	209783
MIL-71 X-Y LSE-30	1	12	23	6	15	15	35	-113	-27	-132	13	-72	-40	209940	6	16	27	58	-112	-27	-123	2	-88	-33	210516
ECA-C2 X-Y LSE-30	0	0	21	6	15	15	37	-113	-27	-123	0	-90	-33	210731	6	15	15	58	-113	-27	-123	0	-90	-33	210718

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRs	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRs	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
PKS-96 H-E LSE210	0	37	30	6	15	50	4	-111	-26	104	30	59	-12	207659	6	16	27	34	-110	-27	100	37	52	-8	206522
CRC-C8 X-Y USR-30	0	21	40	6	15	55	51	-110	-26	119	0	90	-29	209427	6	16	27	31	-110	-26	116	6	83	-26	210236
CRC-C8 X-Y LSE-30	1	12	14	6	17	13	10	-110	-27	112	16	73	-22	209605	6	18	25	24	-109	-27	108	30	59	-15	208631
GWM-24 X-Y LSE-30	1	12	15	6	17	13	13	-110	-27	129	24	60	-35	209102	6	18	25	28	-109	-27	140	36	41	-38	208318
PKS-96 H-C LSE210	1	12	12	6	17	13	18	-110	-27	95	47	43	-3	208017	6	18	25	30	-109	-27	86	61	29	2	207352
HSK-25 X-Y LSE-85	1	12	11	6	17	13	20	-110	-27	92	48	2	42	207584	6	18	25	31	-109	-27	81	62	-5	28	207344
HAB-12 X-Y LSE-30	1	12	9	6	17	13	33	-111	-28	-176	40	-5	-50	208290	6	18	25	42	-110	-28	-157	36	-28	-48	208318
MAR-95 H-E USB210	1	12	11	6	17	13	42	-112	-28	-138	13	-71	-47	209715	6	18	25	53	-110	-28	-127	3	-86	-37	210185
STN-CC A-E LSE150	1	12	7	6	17	13	43	-111	-28	-143	14	-67	-51	209646	6	18	25	50	-110	-28	-131	5	-83	-41	210058
GDS-28 X-Y USB-E5	1	12	8	6	17	13	43	-112	-28	-138	13	73	-40	209711	6	18	25	51	-110	-28	-127	3	85	-53	210181

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
TEX-16 X-Y LSP-30	0	33	1	6	17	13	47	-112	-27	-125	6	-83	-35	210148	6	17	46	48	-111	-27	-121	0	-90	-31	204175
CRC-C8 X-Y USE-30	1	12	20	6	19	11	26	-109	-27	105	40	49	-11	208C68	6	20	23	46	-108	-27	102	55	34	-7	207302
GWM-24 X-Y LSP-30	1	12	24	6	19	11	32	-109	-28	150	43	28	-40	207543	6	20	23	56	-108	-28	170	48	8	-41	207555
HSK-25 X-Y USE-85	1	12	23	6	19	11	33	-109	-27	68	71	-7	18	207047	6	20	23	56	-108	-27	16	81	-9	4	205748
PKS-56 F-C USH210	1	12	22	6	19	11	33	-109	-27	76	71	18	4	207043	6	20	23	55	-108	-27	28	83	3	6	206730
HAK-12 X-Y LSP-30	1	12	21	6	19	11	48	-110	-28	-146	31	-42	-45	208479	6	20	24	5	-109	-28	-134	21	-62	-40	206890
CRO-C8 X-Y LSP-30	0	3	12	6	21	9	39	-108	-27	101	66	24	-4	206914	6	21	12	51	-108	-27	101	67	23	-4	206743
PKS-56 F-C USH210	0	3	2	6	21	9	49	-109	-27	-52	81	-7	6	206654	6	21	12	51	-109	-27	-55	80	-8	6	206512
GWM-24 X-Y LSP-30	0	3	2	6	21	9	49	-109	-28	-174	49	-6	-41	207446	6	21	12	51	-109	-28	-173	49	-6	-41	207302
HSK-25 X-Y LSP-85	0	3	2	6	21	9	49	-109	-27	-44	78	-8	-8	206677	6	21	12	51	-109	-27	-47	78	-8	-9	206536

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VEHICLE 1 RADAR TABLE

VEHICLE	X-Y	LSE-30	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
			HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HAW-12			0	2	47	6	21	10	3	-109	-28	-127	13	-74	-36	209243	6	21	12	51	-109	-28	-127	12	-75	-36	209138
						26	JUL	71	PCH TO JET		LAZ	80.1															
HAW-12			1	7	57	6	21	13	7	-109	-28	-127	12	-75	-36	209127	6	22	21	4	-108	-28	-120	0	-90	-30	209019
CPC-C8			1	8	59	6	21	13	7	-108	-27	101	67	23	-4	206727	6	22	22	6	-107	-27	107	81	9	-3	206501
GWM-24			1	9	7	6	21	13	7	-109	-28	-173	49	-7	-41	207288	6	22	22	14	-108	-28	-153	44	-25	-40	207504
HSK-25			1	9	8	6	21	13	7	-109	-27	-47	78	-8	-9	206522	6	22	22	15	-108	-27	-76	66	-6	-23	206755
PKS-96			1	9	8	6	21	13	7	-109	-27	-55	80	-8	6	206499	6	22	22	15	-108	-27	-81	67	-23	3	206730
CRO-C8			1	12	41	6	23	7	51	-107	-27	-141	87	-2	-2	206373	7	0	20	32	-106	-27	-102	73	-17	-4	206390
HSK-25			1	12	43	6	23	7	57	-108	-27	-86	57	-3	-33	206919	7	0	20	40	-107	-27	-95	43	6	-47	207320
PKS-96			1	12	43	6	23	7	58	-108	-27	-69	57	-33	0	206896	7	0	20	41	-107	-27	-98	43	-47	-6	207308
GWM-24			1	12	39	6	23	8	1	-108	-26	-142	38	-39	-38	207680	7	0	20	40	-107	-28	-130	26	-57	-35	206140

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CRC-C8 X-Y LSE-30	1	12	35	7	1	5	58	-107	-27	-102	62	-27	-5	206511	7	2	18	33	-106	-27	-104	47	-42	-9	206893
PKS-96 H-C LSE-210	0	17	54	7	1	6	1	-107	-27	-103	34	-56	-10	207637	7	1	23	55	-107	-27	-104	30	-59	-12	206946
HSK-25 X-Y LSE-E5	1	12	34	7	1	6	1	-107	-27	-101	34	16	-55	207639	7	2	18	36	-106	-27	-109	20	42	-62	206216
GWM-24 X-Y USP-30	1	12	30	7	1	6	9	-107	-28	-125	17	-70	-33	206515	7	2	18	39	-106	-28	-119	3	-87	-29	206216
ACN-75 X-Y LSE-30	0	52	58	7	1	25	3	-105	-27	117	0	90	-27	208607	7	2	18	1	-104	-27	116	11	78	-26	206727
ACN-75 X-Y LSE-30	1	12	29	7	3	3	45	-104	-27	116	21	67	-24	208C67	7	4	16	14	-103	-27	118	36	50	-23	207112
CYI-C4 X-Y LSE-30	1	12	26	7	3	3	57	-104	-28	123	2	88	-33	209187	7	4	16	16	-103	-28	132	14	72	-41	206316
MAD-23 X-Y LSE-95	1	12	28	7	3	3	53	-104	-26	130	2	87	50	209175	7	4	16	22	-103	-28	142	11	76	37	206486
CRO-C8 X-Y LSE-30	1	12	43	7	3	4	17	-106	-27	-106	37	-52	-13	207232	7	4	16	59	-105	-27	-111	22	-67	-19	207871
HSK-25 X-Y LSE-95	1	9	12	7	3	4	13	-106	-27	-115	11	64	-63	208603	7	4	13	31	-105	-27	-123	0	90	-57	209009

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAC-23 X-Y USB-85	1	14	29	7	4	59	60	-103	-28	151	15	73	27	208227	7	6	14	28	-102	-28	167	20	69	12	207698
ACN-75 X-Y LSE-30	1	12	41	7	5	1	44	-103	-28	122	46	39	-21	206601	7	6	14	25	-102	-28	133	60	23	-20	205935
CYI-C4 X-Y LSE-30	1	12	38	7	5	1	47	-103	-28	140	21	59	-46	207843	7	6	14	25	-102	-28	154	29	38	-52	207218
CRO-C8 X-Y LSE-30	1	6	15	7	5	2	10	-105	-27	-114	12	-76	-24	208296	7	6	8	32	-103	-27	-120	0	-90	-30	208621
BDA-C2 X-Y LSE-30	1	12	25	7	7	0	5	-102	-28	128	5	84	-37	208519	7	8	12	30	-101	-28	138	15	68	-46	207737
ACN-75 X-Y LSE-30	1	12	35	7	7	0	15	-102	-28	150	67	12	-20	205653	7	8	12	50	-101	-28	-168	70	-4	-20	205449
CYI-C4 X-Y LSF-30	1	12	32	7	7	0	15	-102	-28	165	33	22	-55	206947	7	8	12	48	-101	-28	-177	34	-5	-56	206730
MAD-23 X-Y USB-85	1	12	33	7	7	0	20	-103	-28	178	21	69	2	207540	7	8	12	53	-102	-28	-166	20	70	-13	207478
MIL-71 X-Y LSE-30	0	45	42	7	7	26	45	-101	-28	122	0	90	-32	207607	7	8	12	27	-100	-28	128	8	80	-37	208180
TEX-16 X-Y LSE-30	0	40	28	7	8	57	57	-101	-28	125	4	85	-35	208305	7	9	38	25	-100	-28	130	11	76	-39	206570

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G

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MIL-71 X-Y USE-30	0	40	23	7	8	58	2	-101	-28	125	15	69	-43	207660	7	9	38	25	-100	-28	141	21	59	-47	206006
BDA-02 X-Y USE-30	0	40	22	7	8	58	3	-101	-28	147	21	55	-52	207329	7	9	38	25	-100	-28	155	25	42	-55	205780
ACN-75 X-Y USE-30	0	40	5	7	8	58	20	-102	-28	-144	65	-15	-20	205449	7	9	38	25	-101	-28	-132	59	-24	-20	204314
CYI-C4 X-Y USE-30	0	40	5	7	8	58	21	-102	-28	-164	32	-23	-55	206709	7	9	38	25	-101	-28	-155	20	-37	-52	205540
MAD-23 X-Y USE-85	0	39	59	7	8	58	26	-102	-28	-156	17	71	-23	207527	7	9	39	25	-101	-28	-148	14	74	-31	206410
				26	JUL	71		JET TO TFI		LAZ	80.1														
TFX-16 X-Y USE-30	0	31	57	7	9	28	32	-100	-28	130	11	76	-36	206569	7	10	10	29	-99	-28	134	16	68	-42	207436
MIL-71 X-Y USP-30	0	32	2	7	9	38	32	-100	-28	141	21	59	-47	206006	7	10	10	33	-100	-28	147	25	50	-50	206949
BDA-02 X-Y USE-30	0	32	9	7	9	38	32	-100	-28	155	25	42	-55	205781	7	10	10	40	-100	-28	162	27	31	-58	205819
CYI-C4 X-Y USP-20	0	32	22	7	9	38	32	-101	-28	-165	29	-37	-52	205541	7	10	10	54	-101	-28	-149	26	-47	-50	206880
MAD-23 X-Y USE-85	0	32	24	7	9	38	32	-101	-28	-148	14	74	-31	206411	7	10	10	56	-101	-28	-142	10	77	-37	207780

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y LSP-30	0	32	24	7	9	38	32	-101	-28	-132	59	-24	-20	204316	7	10	10	56	-101	-28	-126	53	-32	-21	205682
STN-CC A-E LSP150	1	12	31	7	10	56	13	-99	-28	127	1	89	-37	208239	7	12	8	44	-98	-28	139	11	74	-48	207483
MAR-55 H-C USB210	1	12	28	7	10	56	16	-99	-28	131	6	83	-40	207963	7	12	8	44	-98	-28	142	15	66	-50	207235
GDS-28 X-Y LSE-85	1	12	28	7	10	56	16	-99	-28	131	6	81	49	207959	7	12	8	45	-98	-28	142	15	71	36	207232
TEX-16 X-Y LSE-30	1	12	32	7	10	56	18	-100	-28	143	23	55	-47	206974	7	12	8	50	-99	-28	157	30	33	-53	206409
MIL-71 X-Y LSP-30	1	12	33	7	10	56	21	-100	-28	157	29	34	-54	206613	7	12	8	53	-99	-28	175	33	8	-57	206269
BDA-C2 X-Y USB-30	1	12	34	7	10	56	25	-100	-28	174	29	11	-60	206623	7	12	8	59	-99	-28	-169	29	-20	-60	206506
ACN-75 X-Y USE-30	1	12	33	7	10	56	37	-101	-28	-121	43	-43	-22	205955	7	12	9	10	-100	-27	-117	28	-59	-24	206539
CYI-C4 X-Y LSP-30	1	12	30	7	10	56	37	-101	-28	-139	20	-61	-46	207104	7	12	9	7	-100	-28	-129	9	-78	-38	207594
MAD-23 X-Y LSP-85	0	32	49	7	10	56	38	-101	-28	-133	4	84	-46	208023	7	11	29	27	-100	-28	-128	0	90	-52	206982

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HAW-12 X-Y USE-30	1	12	18	7	12	54	14	-98	-28	122	3	86	-32	207860	7	14	6	32	-97	-28	130	16	70	-38	206937
STN-00 A-E USE150	1	12	16	7	12	54	25	-98	-28	148	16	61	-54	207072	7	14	6	40	-97	-28	162	22	37	-62	206590
MAR-95 H-C USB210	1	12	19	7	12	54	25	-99	-28	152	20	52	-56	206851	7	14	6	44	-97	-28	167	25	25	-62	206426
GDS-28 X-Y USE-85	1	12	18	7	12	54	26	-99	-28	152	20	67	26	206846	7	14	6	44	-97	-28	167	25	64	12	205421
TEX-16 X-Y USE-30	1	12	15	7	12	54	32	-99	-28	159	33	16	-55	206156	7	14	6	47	-98	-28	-173	34	-10	-56	205980
MIL-71 X-Y USE-30	1	12	19	7	12	54	37	-99	-28	-173	33	-11	-56	206168	7	14	6	56	-98	-28	-156	29	-36	-53	206233
ECA-C2 X-Y USE-30	1	12	17	7	12	54	40	-99	-28	-158	26	-38	-57	206544	7	14	6	57	-98	-28	-143	19	-61	-49	206799
ACK-75 X-Y USE-30	1	12	19	7	12	54	49	-100	-27	-116	18	-70	-25	206973	7	14	7	8	-99	-27	-117	3	-87	-27	207733
CVI-C4 X-Y USE-30	0	5	13	7	12	54	51	-100	-28	-123	1	-89	-33	207964	7	13	0	4	-100	-28	-122	0	-90	-32	207761
HSK-25 X-Y USE-65	0	13	12	7	13	53	20	-97	-27	124	0	90	56	207281	7	14	6	32	-97	-27	122	2	86	58	207757

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y LSE-85	1	12	32	7	14	52	15	-97	-27	116	11	67	62	207187	7	16	4	48	-96	-27	107	23	35	61	206288
HAW-12 X-Y USB-30	1	12	31	7	14	52	24	-97	-28	137	24	57	-42	206418	7	16	4	55	-96	-28	151	33	37	-47	205768
STN-CC A-F LSR150	1	12	30	7	14	52	34	-98	-28	173	24	14	-65	206393	7	16	5	4	-97	-28	-170	24	-22	-64	206267
MAR-55 H-C LSE210	1	12	30	7	14	52	34	-98	-28	179	26	3	-64	206269	7	16	5	5	-97	-28	-165	25	-30	-61	206212
CDS-28 X-Y USB-85	1	12	30	7	14	52	36	-98	-28	179	26	64	1	206263	7	16	5	6	-97	-28	-165	25	64	-14	206209
TEX-16 X-Y LSE-30	1	12	30	7	14	52	41	-98	-28	-161	31	-28	-54	205997	7	16	5	11	-97	-28	-146	25	-51	-49	206219
MIL-71 X-Y USB-30	1	12	29	7	14	52	44	-98	-28	-146	24	-52	-49	206388	7	16	5	12	-97	-28	-134	14	-70	-42	206798
BDA-C2 X-Y LSE-30	1	12	29	7	14	52	45	-98	-28	-135	12	-73	-44	207058	7	16	5	13	-97	-28	-125	1	-89	-35	207578
CRO-C8 X-Y LSE-30	1	12	25	7	16	50	9	-96	-27	120	0	90	-30	207555	7	18	2	33	-94	-27	114	14	75	-23	206562
PKS-96 H-C LSE210	1	12	31	7	16	50	9	-96	-27	104	31	58	-12	205787	7	18	2	39	-95	-27	97	45	45	-5	204956

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA															
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
HSK-25 X-Y USE-85	1	12	26	7	16	50	13	-96	-27	102	32	18	56	205724	7	18	2	39	-95	-27	94	46	4	44	204921		
GWM-24 X-Y USP-30	1	12	23	7	16	50	13	-96	-28	121	9	80	-31	207032	7	18	2	37	-94	-28	128	22	62	-35	206073		
FAW-12 X-Y LSP-30	1	12	22	7	16	50	30	-96	-28	162	37	22	-49	205459	7	18	2	52	-95	-28	-179	40	-1	-50	205196		
MAR-55 H-C LSE210	1	12	20	7	16	50	45	-97	-28	-154	21	-48	-57	206280	7	18	3	5	-96	-28	-140	14	-69	-48	206571		
STN-CO A-E LSB150	1	12	17	7	16	50	45	-97	-28	-159	21	-43	-61	206287	7	18	3	2	-96	-28	-145	15	-65	-52	206510		
EDS-28 X-Y LSE-85	1	12	16	7	16	50	47	-97	-28	-154	21	67	-24	206274	7	18	3	4	-96	-28	-140	14	72	-38	206567		
TFX-16 X-Y USE-30	1	12	20	7	16	50	49	-97	-28	-137	18	-64	-44	206453	7	18	3	9	-96	-28	-127	7	-81	-36	206979		
MIL-71 X-Y LSF-30	0	29	31	7	16	50	54	-97	-28	-127	7	-82	-37	207127	7	17	30	25	-97	-28	-122	0	-90	-32	206223		
CRC-C8 X-Y USE-30	1	12	25	7	18	48	21	-94	-27	110	24	65	-19	205933	7	20	0	46	-93	-27	106	38	51	-12	205021		
PKS-56 H-C USB210	1	10	42	7	18	48	27	-95	-27	91	55	35	-1	204500	7	19	59	6	-94	-27	80	69	21	3	203877		

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y LSE-85	1	10	42	7	18	48	27	-95	-27	87	56	-2	34	204480	7	19	59	9	-94	-27	73	69	-7	20	203877
GWM-24 X-Y USR-30	1	12	29	7	18	48	29	-95	-28	135	31	50	-37	205537	7	20	0	58	-94	-28	148	41	31	-40	204883
HAW-12 X-Y LSE-30	1	12	28	7	18	48	46	-96	-28	-166	38	-18	-50	205162	7	20	1	13	-94	-28	-149	32	-40	-46	205325
GDS-28 X-Y USB-85	0	50	41	7	18	48	53	-96	-28	-132	7	79	-47	206835	7	19	39	33	-95	-28	-125	0	90	-55	206200
MAR-95 H-C LSP210	0	50	25	7	18	48	53	-96	-28	-132	7	-80	-42	206838	7	19	39	18	-95	-28	-125	0	-90	-35	206191
STN-00 A-E LSP150	1	5	19	7	18	48	53	-96	-28	-136	9	-77	-46	206738	7	19	54	13	-95	-28	-126	0	-90	-36	206822
CRC-08 X-Y LSP-30	1	12	24	7	20	46	24	-93	-27	104	48	41	-9	204490	7	21	58	48	-92	-27	102	64	26	-5	203826
HSK-25 X-Y LSE-85	1	12	23	7	20	46	34	-94	-27	50	78	-8	9	203705	7	21	58	57	-93	-27	-35	80	-8	-6	203531
PKS-96 H-C USB210	1	12	20	7	20	46	37	-94	-27	63	79	10	5	203652	7	21	58	57	-93	-27	-42	82	-5	6	203509
GWM-24 X-Y LSP-30	1	12	18	7	20	46	41	-94	-28	161	46	17	-41	204562	7	21	58	59	-93	-28	-177	49	-3	-41	204316

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
HAW-12 X-Y LSF-30	1 12 16	7	20	46	56	-95	-28	-139	26	-54	-43	205531		7	21	59	12	-94	-28	-129	14	-72	-37	206039
CRC-08 X-Y LSF-30	1 12 31	7	22	44	40	-93	-27	103	74	16	-3	203510		7	23	57	10	-92	-27	171	88	0	-2	203244
HSK-25 X-Y LSF-85	1 12 31	7	22	44	49	-93	-27	-67	72	-7	-16	203531		7	23	57	19	-92	-27	-84	59	-4	-31	203730
PKS-56 H-C LSF210	1 12 32	7	22	44	49	-93	-27	-74	74	-16	4	203506		7	23	57	21	-92	-27	-88	60	-30	1	203709
GWM-24 X-Y LSF-30	1 12 28	7	22	44	53	-93	-28	-162	47	-16	-41	204294		7	23	57	20	-92	-28	-144	39	-36	-39	204495
HAW-12 X-Y LSF-30	0 31 15	7	22	45	1	-94	-28	-123	6	-83	-33	206428		7	23	16	16	-93	-28	-120	0	-90	-30	205485
CRC-08 X-Y LSF-30	1 12 23	8	0	42	44	-92	-27	-106	80	-10	-3	203177		8	1	55	8	-91	-27	-101	64	-25	-5	203314
HSK-25 X-Y LSF-85	1 12 26	8	0	42	50	-92	-27	-91	49	1	-41	203936		8	1	55	16	-91	-27	-100	36	13	-53	204414
PKS-56 H-C LSF210	1 12 24	8	0	42	51	-92	-27	-94	50	-40	-3	203917		8	1	55	16	-91	-27	-101	36	-54	-9	204409
GWM-24 X-Y LSF-30	1 12 15	8	0	43	1	-92	-28	-135	32	-49	-37	204724		8	1	55	16	-91	-28	-126	19	-67	-34	205276

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y LSF-30	1	12	18	8	2	40	33	-89	-27	117	4	86	-27	206067	8	3	52	52	-88	-27	116	19	69	-25	205028
HSK-25 X-Y LSR-85	1	12	32	8	2	41	1	-91	-27	-105	26	28	-60	204760	8	3	53	32	-90	-27	-113	13	59	-63	205377
CRC-C8 X-Y LSF-30	1	12	29	8	2	41	1	-91	-27	-103	54	-35	-7	203511	8	3	53	30	-90	-27	-105	39	-50	-12	204013
GWM-24 X-Y LSE-30	0	49	17	8	2	41	10	-91	-28	-122	10	-79	-31	205695	8	3	30	27	-91	-27	-118	0	-90	-28	205163
MAD-23 X-Y LSB-E5	0	3	49	8	3	49	9	-88	-26	128	0	90	52	205958	8	3	52	58	-88	-28	128	1	89	52	206101
ACN-75 X-Y LSB-30	1	12	25	8	4	38	26	-88	-27	117	29	58	-23	204391	8	5	50	51	-87	-27	120	44	42	-21	203504
CYI-C4 X-Y LSF-30	1	12	19	8	4	38	35	-88	-28	126	8	80	-37	205540	8	5	50	53	-87	-28	138	19	62	-44	204732
MAD-23 X-Y LSF-85	1	12	18	8	4	38	40	-89	-28	126	7	80	43	205616	8	5	50	57	-87	-28	149	15	73	29	204996
HSK-25 X-Y LSF-85	0	29	8	8	4	38	58	-90	-27	-119	5	80	-60	205736	8	5	8	7	-90	-26	-123	0	90	-57	204786
CRC-C8 X-Y LSB-30	1	12	17	8	4	36	4	-90	-27	-108	29	-60	-16	204364	8	5	51	22	-89	-27	-113	15	-74	-22	205046

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y LSE-30	1	12	14	8	6	36	51	-87	-27	126	54	31	-21	203032	8	7	49	4	-86	-27	145	66	14	-20	202526
CYI-C4 X-Y USB-30	1	12	15	8	6	36	54	-87	-28	147	26	49	-49	204291	8	7	49	9	-86	-28	163	32	25	-54	203809
MAD-23 X-Y LSF-85	1	12	13	8	6	36	58	-88	-28	160	19	70	19	204678	8	7	49	10	-87	-28	175	22	68	4	204376
CRC-C8 X-Y LSF-30	0	26	6	8	6	37	10	-99	-27	-117	5	-84	-27	205476	8	7	3	16	-89	-26	-119	0	-90	-29	204597
BCA-C2 X-Y LSE-30	0	18	59	8	7	29	55	-86	-27	123	0	90	-33	204775	8	7	48	54	-86	-28	126	3	86	-36	205444
ACN-75 X-Y LSE-30	1	14	19	8	8	32	54	-87	-27	164	70	4	-19	202418	8	9	47	13	-86	-27	-148	67	-13	-19	202253
MIL-71 X-Y LSE-30	1	12	20	8	8	34	38	-86	-28	123	2	88	-33	205429	8	9	46	58	-85	-27	132	14	72	-41	204557
BCA-C2 X-Y LSE-30	1	12	18	8	8	34	43	-86	-28	133	11	76	-42	204910	8	9	47	1	-85	-28	145	20	57	-50	204194
CYI-C4 X-Y LSE-30	1	12	20	8	8	34	55	-87	-28	175	34	8	-55	203597	8	9	47	15	-86	-28	-167	33	-19	-54	203503
MAD-23 X-Y LSF-85	1	12	22	8	8	34	55	-87	-28	-174	21	69	-6	204272	8	9	47	17	-86	-28	-158	18	70	-21	204307

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
TEX-16 X-Y USE-30	0	15	7	8	9	31	47	-85	-27	121	0	90	-31	204678	8	9	46	55	-85	-27	123	3	87	-33	205218
TEX-16 X-Y LSE-30	1	12	8	8	10	22	54	-85	-27	129	11	76	-38	204633	8	11	45	2	-84	-27	140	22	58	-45	203866
MIL-71 X-Y LSE-30	1	12	10	8	10	32	58	-85	-28	140	21	59	-46	204058	8	11	45	8	-84	-27	154	29	38	-52	203474
BDA-C2 X-Y LSE-30	1	12	10	8	10	33	3	-85	-28	155	25	42	-55	203820	8	11	45	13	-84	-28	171	30	15	-59	203453
ACN-75 X-Y LSB-30	1	12	19	8	10	23	13	-86	-27	-132	59	-24	-20	202338	8	11	45	32	-85	-27	-121	46	-40	-21	202722
CYI-C4 X-Y LSE-30	1	12	18	8	10	33	14	-86	-28	-155	30	-36	-52	203554	8	11	45	32	-85	-27	-141	22	-57	-46	203862
MAD-23 X-Y LSP-85	1	12	16	8	10	33	16	-86	-28	-148	14	73	-31	204419	8	11	45	32	-85	-27	-135	6	81	-45	204774
GDS-28 X-Y LSE-85	0	29	8	8	11	15	53	-84	-27	124	0	90	56	204002	8	11	45	2	-83	-27	128	4	83	51	204870
MAR-55 H-D LSB21D	0	28	42	8	11	16	16	-84	-27	124	0	90	-34	204003	8	11	44	58	-83	-27	128	4	84	-38	204871
BDA-C2 X-Y LSP-30	1	14	13	8	12	29	9	-84	-28	-178	30	-4	-60	203408	8	13	43	22	-83	-27	-160	27	-33	-57	203325

6-55

VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAR-55 F-D LSP210	1	12	19	8	12	30	49	-84	-28	136	11	74	-45	204372	8	13	43	8	-82	-27	149	20	55	-54	203721
STN-CC A-E LSP150	1	12	18	8	12	30	49	-84	-28	133	7	81	-42	204634	8	13	43	8	-82	-27	145	16	64	-52	203948
GDS-28 X-Y USE-85	1	12	17	8	12	30	50	-84	-28	136	11	74	43	204367	8	13	43	6	-82	-27	149	20	67	29	203715
TEX-16 X-Y LSP-30	1	12	21	8	12	30	52	-84	-28	150	28	44	-50	203455	8	13	43	12	-83	-27	166	34	20	-54	202999
MIL-71 X-Y LSP-30	1	12	19	8	12	30	57	-84	-28	166	32	21	-55	203200	8	13	43	16	-83	-27	176	34	-6	-56	202978
ACN-75 X-Y LSP-30	1	12	23	8	12	31	6	-85	-27	118	36	-51	-22	203041	8	13	43	30	-84	-27	115	20	-66	-24	203714
CYI-C4 X-Y LSP-30	1	12	18	8	12	31	11	-85	-27	133	15	-70	-41	204121	8	13	43	30	-84	-27	123	4	-86	-33	204694
HAW-12 X-Y LSP-30	0	7	4	8	13	35	54	-82	-27	119	0	90	-29	204555	8	13	42	58	-82	-27	120	1	88	-30	204804
HAW-12 X-Y LSP-30	1	12	4	8	14	28	59	-82	-27	125	10	77	-34	204172	8	15	41	3	-81	-27	134	23	60	-40	203328
STN-CC A-E LSP150	1	12	7	8	14	29	11	-83	-27	155	20	49	-58	203579	8	15	41	19	-82	-27	171	25	20	-64	203220

6156

VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CDS-28 X-Y LSB-85	1	12	6	8	14	29	12	-83	-27	159	24	65	19	203380	8	15	41	18	-82	-27	176	27	63	4	203082
MAR-55 H-E LSB210	1	12	4	8	14	29	13	-83	-27	159	24	38	-59	203384	8	15	41	18	-82	-27	176	27	8	-63	203086
TEX-16 X-Y USB-30	1	12	7	8	14	29	17	-83	-27	178	35	2	-55	202815	8	15	41	23	-82	-27	-163	33	-24	-53	202784
MIL-71 X-Y LSB-30	1	12	10	8	14	29	22	-83	-27	-164	32	-24	-54	202949	8	15	41	32	-82	-27	-148	26	-47	-49	203152
BDA-C2 X-Y LSB-30	1	12	11	8	14	29	24	-84	-27	-149	23	-50	-52	203428	8	15	41	34	-82	-27	-136	15	-69	-44	203803
ACN-75 X-Y LSB-30	0	48	32	8	14	29	25	-84	-27	-116	10	-79	-25	204177	8	15	17	56	-83	-26	-116	0	-90	-26	203650
HSK-25 X-Y LSB-85	0	48	6	8	14	52	48	-82	-26	122	0	90	58	203684	8	15	40	54	-81	-26	116	8	73	63	204183
HSK-25 X-Y LSB-85	1	12	20	8	16	26	43	-81	-26	111	17	50	64	203597	8	17	39	3	-80	-26	102	30	20	58	202713
HAB-12 X-Y LSB-30	1	12	21	8	16	26	56	-81	-27	143	30	47	-44	202859	8	17	39	17	-80	-27	159	38	25	-48	202317
STN-CC A-E LSB150	1	12	22	8	16	27	6	-82	-27	-178	25	-4	-65	203084	8	17	39	28	-81	-27	-161	23	-37	-61	203070

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GDS-28 X-Y LSE-85	1	12	21	8	16	27	7	-82	-27	-173	27	63	-7	202991	8	17	39	28	-81	-27	-156	23	65	-22	203049
MAR-55 H-C USB210	1	12	23	8	16	27	8	-82	-27	-173	27	-14	-62	202995	8	17	39	31	-81	-27	-156	23	-43	-57	203055
TEX-16 X-Y LSP-30	1	12	25	8	16	27	10	-82	-27	-152	29	-40	-51	202872	8	17	39	35	-81	-27	-138	21	-60	-44	203204
MIL-71 X-Y LSE-30	1	12	24	8	16	27	12	-82	-27	-139	20	-61	-45	203367	8	17	39	36	-81	-27	-128	9	-78	-37	203865
BCA-32 X-Y LSP-30	0	46	48	8	16	27	16	-83	-27	-129	7	-81	-38	204102	8	17	14	3	-82	-27	-122	0	-90	-32	203345
GWM-24 X-Y LSE-30	0	24	5	8	17	4	60	-80	-27	117	0	90	-27	203211	8	17	39	4	-79	-27	119	7	82	-29	203995
CRC-C8 X-Y LSE-30	1	12	1	8	18	24	54	-80	-26	116	7	83	-25	203915	8	19	36	55	-78	-26	110	21	68	-16	202944
PKS-96 H-C USB210	1	12	3	8	18	24	59	-80	-26	99	38	52	-7	202202	8	19	37	2	-79	-26	91	52	38	0	201464
HSK-25 X-Y LSE-85	1	12	0	8	18	24	60	-80	-25	97	39	8	51	202157	8	19	37	0	-79	-26	87	53	-2	37	201442
GWM-24 X-Y LSP-30	1	12	2	8	18	25	2	-80	-27	123	16	71	-32	203337	8	19	37	4	-79	-27	132	30	53	-35	202466

6158

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HAW-12 X-Y LSE-30	1	12	4	8	18	25	20	-80	-27	172	40	10	-49	202074	8	19	37	23	-79	-27	-168	40	-13	-49	201964
STA-00 A-E LSE150	1	12	2	8	18	25	29	-81	-27	-151	19	-54	-56	203151	8	19	37	31	-80	-27	-137	12	-73	-46	203485
GDS-28 X-Y LSE-85	1	12	3	8	18	25	30	-81	-27	-146	19	68	-32	203177	8	19	37	33	-80	-27	-133	10	76	-46	203577
MAR-55 H-C LSE210	1	12	4	8	18	25	31	-81	-27	-146	19	-59	-52	203180	8	19	37	35	-80	-27	-133	10	-76	-43	203582
TEX-16 X-Y LSE-30	1	12	4	8	18	25	34	-81	-27	-131	13	-73	-39	203488	8	19	37	38	-80	-27	-121	1	-88	-31	204102
MIL-71 X-Y LSE-30	0	4	28	8	18	25	35	-81	-27	-122	1	-89	-32	204227	8	18	30	3	-81	-27	-121	0	-90	-31	204049
CRC-C8 X-Y LSE-30	1	12	19	8	20	22	57	-78	-26	107	31	58	-14	202326	8	21	35	11	-77	-26	102	46	44	-8	201476
HSK-25 X-Y LSE-85	1	12	21	8	20	22	59	-79	-26	78	62	-6	27	201053	8	21	35	19	-78	-26	53	75	-9	12	200634
PKS-56 H-C LSE210	1	12	21	8	20	22	59	-79	-26	84	62	28	3	201058	8	21	35	21	-78	-26	63	76	13	6	200622
GWM-24 X-Y LSE-30	1	12	18	8	20	23	3	-79	-27	140	37	40	-37	201983	8	21	35	21	-78	-27	156	47	21	-39	201442

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VEHICLE 1 RACER TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DFC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DFC	AZ	ELV	X	Y	RANGE
HAW-12 X-Y LSP-30	1	12	21	8	20	23	18	-80	-27	-156	37	-29	-47	202008	8	21	35	39	-79	-27	-140	29	-50	-43	202300
CDS-28 X-Y LSB-85	0	17	7	8	20	23	23	-80	-27	-126	3	85	-54	203887	8	20	40	30	-80	-27	-123	0	90	-57	203182
STN-CC A-E LSB150	0	23	20	8	20	23	24	-80	-27	-130	5	-84	-39	203760	8	20	56	44	-80	-27	-124	0	-90	-34	202735
MAR-55 F-C LSB210	0	16	50	8	20	23	26	-80	-27	-126	3	-87	-36	203888	8	20	40	16	-80	-27	-124	0	-90	-34	203192
CRC-CB X-Y LSP-30	1	12	9	8	22	21	7	-77	-26	100	56	33	-6	200988	8	23	33	16	-76	-26	97	71	16	-2	202453
PKS-55 F-C LSB210	1	12	8	8	22	21	17	-78	-26	18	83	2	7	200432	8	23	33	25	-77	-26	-64	75	-13	6	200395
HSK-25 X-Y LSP-85	1	12	7	8	22	21	18	-78	-26	9	80	-10	2	200453	8	23	33	24	-77	-26	-57	73	-9	-14	200422
GWM-24 X-Y LSP-30	1	12	6	8	22	21	23	-78	-27	172	50	7	-40	201203	8	23	33	29	-77	-26	-165	49	-13	-39	201117
HAW-12 X-Y LSP-30	1	12	7	8	22	21	36	-79	-27	-132	21	-63	-39	202567	8	23	33	43	-78	-26	-123	9	-80	-35	203182
CRC-CB X-Y LSP-30	1	12	21	9	0	19	12	-77	-26	99	82	8	-1	200208	9	1	21	32	-76	-26	-97	82	-8	-1	200077

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y LSP-85	1	12	19	9	0	19	19	-77	-26	-74	65	-7	-24	200493	9	1	31	37	-76	-25	-87	51	-2	-39	200809
PKS-56 H-C LSP210	1	12	21	9	0	19	19	-77	-26	-79	66	-24	4	200463	9	1	31	40	-76	-25	-90	52	-38	0	201787
GWM-24 X-Y LSP-30	1	12	17	9	0	19	26	-77	-26	-151	44	-26	-39	201176	9	1	31	43	-76	-26	-135	35	-45	-36	201514
CRO-C8 X-Y LSP-30	1	12	3	9	2	17	31	-76	-26	-97	72	-18	-2	200090	9	3	29	34	-75	-25	-99	56	-33	-5	200381
HSK-25 X-Y LSP-85	1	12	1	9	2	17	34	-76	-25	-94	41	5	-48	201065	9	3	29	35	-75	-25	-102	28	22	-60	201638
PKS-56 H-C LSP210	1	0	20	9	2	17	34	-76	-25	-96	42	-48	-4	201049	9	3	17	55	-75	-25	-102	30	-59	-10	200963
GWM-24 X-Y LSP-30	1	11	60	9	2	17	45	-76	-26	-128	26	-58	-34	201809	9	3	29	45	-75	-26	-121	13	-75	-30	202477
ACN-75 X-Y LSP-30	0	4	34	9	3	24	28	-73	-25	115	0	90	-25	202991	9	3	29	3	-73	-25	115	1	89	-25	203147
ACN-75 X-Y LSP-30	1	12	16	9	4	15	5	-73	-25	114	11	77	-24	202444	9	5	27	22	-72	-25	114	27	61	-21	201441
HSK-25 X-Y LSP-85	1	12	17	9	4	15	28	-75	-25	-108	19	42	-64	202013	9	5	27	45	-74	-25	-116	6	77	-63	202662

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SFC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SFC	RA	DEC	AZ	ELV	X	Y	RANGE
CRC-C8 X-Y LSE-30	1	12	18	9	4	15	30	-75	-25	-101	46	-43	-8	200646	9	5	27	48	-74	-25	-105	31	-58	-13	201243
GWM-24 X-Y LSE-30	0	13	25	9	4	15	37	-75	-26	-117	3	-87	-27	202928	9	4	29	.2	-75	-26	-116	0	-90	-26	202400
MAD-23 X-Y LSE-85	0	50	41	9	4	36	49	-73	-26	125	0	90	55	202059	9	5	27	30	-72	-26	133	7	80	46	202559
CYI-C4 X-Y LSE-30	0	42	57	9	4	44	29	-73	-26	119	0	90	-29	201842	9	5	27	26	-72	-26	124	8	81	-34	202530
ACN-75 X-Y LSE-30	1	12	2	9	6	13	13	-72	-25	116	37	50	-20	200815	9	7	25	15	-71	-25	121	52	34	-19	200049
CYI-C4 X-Y LSE-30	1	11	58	9	6	13	23	-72	-26	131	16	70	-39	201949	9	7	25	21	-71	-26	143	26	51	-46	201242
MAD-23 X-Y LSE-85	1	11	59	9	6	13	28	-73	-26	142	13	74	37	202057	9	7	25	27	-72	-26	156	20	68	22	201583
CRC-C8 X-Y LSE-30	1	12	1	9	6	13	39	-74	-25	-109	21	-68	-17	201643	9	7	25	40	-73	-24	-114	6	-83	-24	202382
				26 JUL 71				TEI TO FNT			LAZ	80.1													
ACN-75 X-Y LSE-30	7	54	58	9	7	58	17	-72	-25	127	59	26	-18	200320	9	15	53	15	-73	-26	-116	0	-90	-26	191032
CYI-C4 X-Y LSE-30	6	44	2	9	7	58	22	-72	-26	151	30	40	-49	201532	9	14	42	24	-73	-26	-120	0	-90	-30	192854

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USE-85	5	19	30	9	7	58	25	-72	-26	164	22	67	15	201963	9	13	17	55	-73	-27	-126	0	90	-54	194961
BCA-02 X-Y LSB-30	9	25	39	9	8	19	30	-71	-26	121	0	90	-31	202753	9	17	45	9	-73	-27	-122	0	90	-32	168167
MIL-71 X-Y LSE-30	9	47	12	9	9	12	54	-71	-26	120	0	90	-30	201306	9	19	0	6	-73	-27	-121	0	90	-31	186202
TEX-16 X-Y LSB-30	9	51	33	9	10	17	53	-71	-26	120	0	90	-30	169563	9	20	9	26	-73	-27	-121	0	90	-31	184328
GDS-28 X-Y LSB-85	9	7	16	9	11	57	34	-72	-26	123	0	90	57	167040	9	21	4	50	-73	-27	-124	0	90	-56	182807
MAR-55 H-E LSB210	9	6	44	9	11	57	54	-72	-26	123	0	90	-33	167033	9	21	4	38	-73	-27	-124	0	90	-34	182812
STR-00 A-E LSB150	8	53	17	9	12	25	43	-72	-26	124	0	90	-34	166319	9	21	19	1	-73	-27	-125	0	90	-35	182418
HAW-12 X-Y LSB-30	10	18	50	9	14	13	37	-71	-26	119	0	90	-29	163596	10	0	32	27	-73	-27	-119	0	90	-29	177159
HSK-25 X-Y USE-85	14	37	36	9	15	33	40	-71	-25	122	0	90	58	161516	10	6	11	16	-72	-26	-123	0	90	-57	167248
GWM-24 X-Y LSE-30	10	57	54	9	17	37	45	-71	-26	117	0	90	-27	168322	10	4	35	39	-72	-27	-118	0	90	-28	170119

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRs	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRs	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
PKS-56 H-C LSE210	9	12	14	9	18	17	45	-71	-26	103	30	59	-11	185540	10	3	29	59	-72	-26	-104	30	-59	-12	170350
CRC-08 X-Y LSE-30	13	40	15	9	18	22	57	-71	-26	119	0	90	-29	187148	10	8	3	12	-72	-27	-120	0	-90	-30	163792
ACN-75 X-Y LSE-30	12	27	27	10	3	33	34	-70	-27	117	0	90	-27	171956	10	16	1	1	-71	-28	-118	0	-90	-28	147902
MAD-23 X-Y LSE-85	8	17	50	10	4	55	3	-70	-28	128	0	90	52	169536	10	13	12	53	-71	-29	-129	0	-90	-51	153710
CYT-04 X-Y LSE-30	9	44	21	10	4	58	38	-70	-28	122	0	90	-32	169431	10	14	42	56	-71	-29	-123	0	-90	-33	150628
BDA-02 X-Y LSE-30	9	14	32	10	8	30	47	-69	-28	124	0	90	-34	162919	10	17	45	19	-70	-29	-125	0	-90	-35	144152
MIL-71 X-Y LSE-30	9	27	47	10	0	24	10	-69	-28	122	0	90	-32	161226	10	19	1	57	-70	-29	-124	0	-90	-34	141334
TEX-16 X-Y LSE-30	9	42	10	10	10	26	14	-69	-28	122	0	90	-32	159134	10	20	11	25	-70	-29	-123	0	-90	-33	138723
GDS-28 X-Y LSE-85	8	51	8	10	12	13	4	-69	-28	126	0	90	54	155719	10	21	4	12	-69	-29	-127	0	-90	-53	136705
MAR-55 H-C LSE210	8	50	31	10	12	13	26	-69	-28	126	0	90	-36	155707	10	21	3	57	-69	-29	-127	0	-90	-37	135714

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA										
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y
STN-OC A-E LSE150	8	35	2	10	12	42	19	-69 -29	127	0	90 -37	154741		10	21	17	21	-69 -30	-128	0	-90 -38	136195		
HAW-12 X-Y LSE-30	10	11	2	10	14	26	42	-68 -28	121	0	90 -31	151192		11	0	37	45	-69 -30	-122	0	-90 -32	128208		
HSK-2E X-Y LSE-65	14	59	30	10	15	35	25	-68 -27	124	0	90 56	148809		11	6	34	55	-67 -29	-126	0	90 -54	112643		
GWM-24 X-Y LSE-30	10	54	32	10	17	50	33	-67 -29	119	0	90 -29	143965		11	4	45	5	-68 -30	-121	0	-90 -31	117625		
PKS-6E H-E LSE210	9	23	41	10	18	23	44	-67 -28	105	30	59 -13	141044		11	3	47	25	-68 -29	-107	30 -59 -14	118468			
CRC-C6 X-Y LSE-30	13	56	17	10	18	28	51	-67 -28	121	0	90 -31	142567		11	8	25	7	-67 -29	-123	0	-90 -33	107433		
ACN-75 X-Y LSE-30	12	38	58	11	3	48	45	-65 -29	119	0	90 -29	120116		11	16	27	43	-64 -31	-122	0	-90 -32	81645		
CYI-C4 X-Y LSE-30	9	27	54	11	5	25	5	-64 -31	125	0	90 -35	115828		11	14	52	59	-64 -33	-128	0	-90 -38	87154		
MAC-23 X-Y LSE-85	7	44	21	11	5	28	9	-65 -31	122	0	90 48	115688		11	13	12	31	-64 -33	-135	0	90 -45	92732		
BDA-C2 X-Y LSE-30	8	49	56	11	9	4	24	-62 -31	128	0	90 -38	105515		11	17	54	20	-62 -34	-131	0	-90 -41	76352		

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MIL-71 X-Y LSE-30	9	18	4	11	9	57	8	-62	-31	126	0	90	-36	102906	11	19	15	12	-61	-34	-130	0	-90	-40	71179
TEX-16 X-Y LSE-30	9	23	17	11	11	3	45	-62	-32	126	0	90	-36	55531	11	20	27	2	-60	-35	-130	0	-90	-40	66364
GCS-28 X-Y LSE-85	8	16	23	11	12	56	5	-61	-32	131	0	90	49	53622	11	21	12	28	-59	-36	-136	0	90	-44	63194
MAR-55 H-E LSE210	8	15	35	11	12	56	31	-61	-32	131	0	90	-41	53598	11	21	12	6	-59	-36	-136	0	-90	-46	63220
STA-CC A-E LSE150	7	54	39	11	13	28	20	-61	-33	133	0	90	-43	51872	11	21	22	58	-59	-36	-138	0	-90	-48	62447
MAW-12 X-Y LSP-30	10	2	53	11	15	7	10	-59	-33	125	0	90	-35	66345	12	1	10	4	-55	-38	-131	0	-90	-41	44627
HSK-25 X-Y LSE-85	14	57	16	11	15	54	51	-59	-30	128	0	90	52	63593	12	6	52	7	90	48	25	0	-90	25	4124
GWM-24 X-Y LSE-30	12	16	39	11	18	37	10	-56	-33	124	0	90	-34	73647	12	6	53	49	130	-30	121	0	90	-31	1724
PKS-56 H-E LSE210	11	52	28	11	18	56	14	-56	-32	110	30	58	-18	70724	12	6	48	42	61	26	12	30	19	58	1681
CRC-C8 X-Y LSP-30	11	48	56	11	19	0	19	-56	-31	125	0	90	-35	72160	12	6	49	15	101	9	80	0	90	10	2807

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TABLE 6-III.- MISSION RADAR TIMELINE - Continued

(b) LM acquisition and termination during descent - 0° minimum elevation

LM FROM SEP TO PDI

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
BDA-02 X-Y USB-30	1	5	19	4	4	17	37	-144	-20	120	8	80	-30	216016	4	5	22	56	-143	-21	131	19	66	-38	215378
CYI-04 X-Y USB-30	1	5	22	4	4	17	45	-144	-20	161	39	22	-47	214323	4	5	23	7	-143	-21	180	41	0	-49	214214
ACN-75 X-Y USB-30	1	5	20	4	4	17	52	-144	-20	132	72	14	-12	213258	4	5	23	12	-143	-20	-175	78	-1	-12	213154
MAD-23 X-Y USB-85	1	5	13	4	4	17	56	-144	-21	176	29	61	4	214831	4	5	23	9	-143	-21	-168	28	62	-11	214884
MIL-71 X-Y USB-30	0	52	32	4	4	30	24	-143	-20	113	0	90	-23	215855	4	5	22	57	-143	-21	120	9	79	-29	215909
MIL-71 X-Y USB-30	1	5	2	4	6	11	36	-143	-21	127	19	67	-35	215261	4	7	16	37	-142	-21	139	28	51	-42	214719
TEX-16 X-Y USB-30	1	4	60	4	6	11	37	-143	-21	117	6	83	-27	215964	4	7	16	37	-142	-21	126	18	68	-34	215287
BDA-02 X-Y USB-30	1	4	60	4	6	11	41	-143	-21	141	26	53	-44	214846	4	7	16	41	-142	-21	155	32	33	-50	214497
CYI-04 X-Y USB-30	1	5	4	4	6	11	54	-144	-21	-165	40	-17	-48	214130	4	7	16	58	-143	-21	-148	34	-38	-45	214422
MAD-23 X-Y USB-85	1	4	60	4	6	11	60	-144	-21	-155	25	63	-22	214889	4	7	16	60	-143	-21	-142	18	67	-36	215271

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	1	5	5	4	6	11	60	-144	-20	-134	72	-13	-12	213087	4	7	17	5	-143	-21	-117	59	-28	-14	213428
MAR-95 H-D USB210	0	23	43	4	8	5	12	-142	-21	123	8	80	-33	215717	4	8	28	55	-141	-21	127	12	75	-36	214444
TEX-16 X-Y USB-30	0	23	42	4	8	5	13	-142	-21	135	26	55	-39	214701	4	8	28	55	-142	-21	140	29	49	-42	213471
STN-00 A-E USB150	0	23	42	4	8	5	13	-142	-21	120	4	86	-30	215994	4	8	28	55	-141	-21	124	7	81	-33	214718
GDS-28 X-Y USB-85	0	23	41	4	8	5	14	-142	-21	123	8	75	56	215712	4	8	28	55	-141	-21	127	12	70	51	214441
BDA-02 X-Y USB-30	0	23	34	4	8	5	21	-142	-21	169	36	15	-53	214200	4	8	28	55	-142	-21	175	36	6	-53	213125
MIL-71 X-Y USB-30	0	23	33	4	8	5	22	-142	-21	150	35	36	-46	214262	4	8	28	55	-142	-21	156	37	28	-47	213111
MAD-23 X-Y USB-85	0	23	22	4	8	5	33	-143	-21	-132	12	72	-47	215480	4	8	28	55	-143	-21	-128	9	76	-52	214637
CYI-04 X-Y USB-30	0	23	20	4	8	5	35	-143	-21	-137	26	-52	-40	214599	4	8	28	55	-143	-21	-133	24	-58	-38	213751
ACN-75 X-Y USB-30	0	23	19	4	8	5	36	-143	-20	-112	48	-40	-14	213655	4	8	28	55	-143	-20	-111	43	-45	-15	212835

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TABLE 6-III.- MISSION RADAR TIMELINE - Continued

(c) LM acquisition and termination during ascent - 0° minimum elevation

LEM FROM ASCENT TO INSERTION

VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
MAD-23 X-Y USB-85	0 7 15	7	3	37	24	-104	-28	136	6	81	44	207596	7	3	44	39	-104	-28	137	7	80	43	207544	
HSK-25 X-Y USB-85	0 7 15	7	3	37	24	-105	-27	-119	6	78	-61	207649	7	3	44	39	-105	-27	-120	5	81	-50	207718	
CYI-04 X-Y USB-30	0 7 15	7	3	37	24	-104	-28	127	8	81	-37	207526	7	3	44	39	-103	-28	128	9	79	-37	207458	
ACN-75 X-Y USB-30	0 7 15	7	3	37	24	-104	-27	117	28	59	-23	206368	7	3	44	39	-103	-27	117	30	57	-23	206291	
CRO-08 X-Y USB-30	0 7 15	7	3	37	24	-105	-27	-108	30	-59	-16	206277	7	3	44	39	-105	-27	-108	29	-60	-16	206350	

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TABLE 6-III.- MISSION RADAR TIMELINE - Continued

(d) LM acquisition and termination during rendezvous - 0° minimum elevation

COAST TO RENDEZVOUS RADAR TRACKING PRIOR TO TPI																								
VEHICLE	RADAR TABLE			STATION ACQUISITION DATA						STATION TERMINATION DATA														
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y
MAD-23 X-Y USB-85	0	9	60	7	3	44	39 -104 -28	137	7 80 43	207567		7	3 54	39 -103 -28	138	8 79 41	207656							
HSK-25 X-Y USB-85	0	9	60	7	3	44	39 -105 -27 -120	5 81 -60	207743		7	3 54	39 -105 -27 -121	3 84 -59	207994									
PKS-96 H-D USB210	0	9	60	7	3	44	39 -105 -27 -120	4 -86 +29	207789		7	3 54	39 -105 -27 -121	2 -87 -31	208043									
CYI-04 X-Y USB-30	0	9	60	7	3	44	39 -103 -28	128	9 79 +37	207480		7	3 54	39 -103 -28	129	10 77 +38	207545							
ACN-75 X-Y USB-30	0	9	60	7	3	44	39 -103 -27	117	30 57 -23	206313		7	3 54	39 -103 -27	117	32 55 -23	206368							
CRO-08 X-Y USB-30	0	9	60	7	3	44	39 -105 -27 -108	29 -60 -16	206376		7	3 54	39 -105 -27 -109	27 -62 -17	206636									
RENDEZVOUS RADAR TRACKING PRIOR TO TPI																								
PKS-96 H-D USB210	0	13	13	7	3	54	39 -105 -27 -121	2 -87 -31	208043		7	4 7	53 -105 -27 -122	0 -90 -32	208698									
MAD-23 X-Y USB-85	0	18	0	7	3	54	39 -103 -28	138	8 79 41	207656		7	4 12	39 -103 -28	142	10 77 38	208292							
HSK-25 X-Y USB-85	0	18	0	7	3	54	39 -105 -27 -121	3 84 -59	207994		7	4 12	39 -105 -27 -123	0 90 -57	208919									
CYI-04 X-Y USB-30	0	18	0	7	3	54	39 -103 -28	129	10 77 +38	207545		7	4 12	39 -103 -28	132	13 73 +40	208135							

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
ACN-75 X-Y USB-30	0	18	0	7	3	54	39	-103	-27	117	32	55	-23	206368	7	4	12	39	-103	-27	118	35	51	-23	206937		
CRO-08 X-Y USB-30	0	18	0	7	3	54	39	-105	-27	109	27	-62	-17	206636	7	4	12	39	-105	-27	-110	23	-66	-19	207585		
COAST TO TPI																											
HSK-25 X-Y USB-85	0	0	49	7	4	12	39	-105	-27	-123	0	90	-57	208919	7	4	13	28	-105	-27	-123	0	90	-57	208966		
ACN-75 X-Y USB-30	0	3	3	7	4	12	39	-103	-27	118	35	51	-23	206937	7	4	15	42	-103	-27	118	36	50	-23	207047		
CYI-04 X-Y USB-30	0	3	5	7	4	12	39	-103	-28	132	13	73	-40	208135	7	4	15	44	-103	-28	132	14	72	-41	208250		
MAD-23 X-Y USB-85	0	3	6	7	4	12	39	-103	-28	142	10	77	38	208292	7	4	15	46	-103	-28	142	11	77	37	208416		
CRO-08 X-Y USB-30	0	3	37	7	4	12	39	-105	-27	-110	23	-66	-19	207585	7	4	16	16	-105	-27	-111	22	-66	-19	207793		
ULLAGE FOR TPI																											
TPI																											
COAST TO 1ST BRAKING GATE																											
ACN-75 X-Y USB-30	0	6	46	7	5	1	56	-103	-28	122	46	39	-21	206587	7	5	8	42	-103	-28	123	48	38	-21	206192		
CYI-04 X-Y USB-30	0	6	42	7	5	2	0	-103	-28	140	21	59	-46	207828	7	5	8	42	-103	-28	141	22	57	-46	207442		
MAD-23 X-Y USB-85	0	6	39	7	5	2	3	-103	-28	152	16	72	27	208120	7	5	8	42	-103	-28	153	16	72	26	207753		

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA															
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
CRO-08 X-Y USB-30	0	6	17	7	5	2	24	-105	-27	-114	12	-76	-24	208299	7	5	8	42	-105	-27	-115	11	-78	-24	208059		
COAST TO 2ND BRAKING GATE																											
MAD-23 X-Y USB-85	0	2	5	7	5	8	42	-103	-28	153	16	72	26	207753	7	5	10	46	-103	-28	154	16	72	25	207637		
CTI-04 X-Y USB-30	0	2	5	7	5	8	42	-103	-28	141	22	57	-46	207442	7	5	10	46	-103	-28	142	22	57	-47	207320		
ACN-75 X-Y USB-30	0	2	5	7	5	8	42	-103	-28	123	48	38	-21	206192	7	5	10	46	-103	-28	123	48	37	-21	206069		
CRO-08 X-Y USB-30	0	2	5	7	5	8	42	-105	-27	-115	11	-78	-24	208059	7	5	10	46	-105	-27	-115	11	-78	-24	207977		
1ST BRAKING MANEUVER *																											
MAD-23 X-Y USB-85	0	0	11	7	5	10	46	-103	-28	154	16	72	25	207637	7	5	10	57	-103	-28	154	16	72	25	207627		
CTI-04 X-Y USB-30	0	0	11	7	5	10	46	-103	-28	142	22	57	-47	207320	7	5	10	57	-103	-28	142	22	57	-47	207309		
ACN-75 X-Y USB-30	0	0	11	7	5	10	46	-103	-28	123	48	37	-21	206069	7	5	10	57	-103	-28	123	48	37	-21	206058		
CRO-08 X-Y USB-30	0	0	11	7	5	10	46	-105	-27	-115	11	-78	-24	207977	7	5	10	57	-105	-27	-115	11	-78	-24	207970		
COAST TO 3RD BRAKING GATE																											
MAD-23 X-Y USB-85	0	1	2	7	5	10	57	-103	-28	154	16	72	25	207627	7	5	11	59	-103	-28	154	16	72	25	207569		

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VEHICLE 2 RADAR TABLE

TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA												
HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	
CYI-04 X=Y USB=30	0	1	2	7	5	10	57	-103	-28	142	22	57	-47	207309	7	5	11	59	-103	-28	142	22	57	-47	207249
ACN-75 X=Y USB=30	0	1	2	7	5	10	57	-103	-28	123	48	37	-21	206058	7	5	11	59	-103	-28	123	48	37	-21	205998
CRO-08 X=Y USB=30	0	1	2	7	5	10	57	-105	-27	-115	11	-78	-24	207970	7	5	11	59	-105	-27	-115	10	-78	-25	207929
2ND BRAKING MANEUVER *																									
MAD-23 X=Y USB=85	0	0	9	7	5	11	59	-103	-28	154	16	72	25	207569	7	5	12	8	-103	-28	154	16	72	25	207561
CYI-04 X=Y USB=30	0	0	9	7	5	11	59	-103	-28	142	22	57	-47	207249	7	5	12	8	-103	-28	142	22	56	-47	207240
ACN-75 X=Y USB=30	0	0	9	7	5	11	59	-103	-28	123	48	37	-21	205998	7	5	12	8	-103	-28	123	48	37	-21	205989
CRO-08 X=Y USB=30	0	0	9	7	5	11	59	-105	-27	-115	10	-78	-25	207929	7	5	12	8	-105	-27	-115	10	-79	-25	207924
COAST TO 4TH BRAKING GATE																									
MAD-23 X=Y USB=85	0	1	30	7	5	12	8	-103	-28	154	16	72	25	207561	7	5	13	38	-103	-28	154	17	72	25	207479
CYI-04 X=Y USB=30	0	1	30	7	5	12	8	-103	-28	142	22	56	-47	207240	7	5	13	38	-103	-28	142	22	56	-47	207154
ACN-75 X=Y USB=30	0	1	30	7	5	12	8	-103	-28	123	48	37	-21	205989	7	5	13	38	-103	-28	123	49	36	-21	205902

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VEHICLE 2 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA															
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	
CRO-08 X-Y USB-30	0 1 30	7	5	12	8	-105	-27	+115	10	-79	-25	207924	7	5	13	38	-105	-27	+115	10	-79	-25	207866				
3RD BRAKING MANEUVER *																											
MAD-23 X-Y USB-85	0 0 4	7	5	13	38	-103	-28	154	17	72	25	207479	7	5	13	42	-103	-28	154	17	72	25	207475				
CYI-04 X-Y USB-30	0 0 4	7	5	13	38	-103	-28	142	22	56	-47	207154	7	5	13	42	-103	-28	142	22	56	-47	207150				
ACN-75 X-Y USB-30	0 0 4	7	5	13	38	-103	-28	123	49	36	-21	205902	7	5	13	42	-103	-28	123	49	36	-21	205898				
CRO-08 X-Y USB-30	0 0 4	7	5	13	38	-105	-27	+115	10	-79	-25	207866	7	5	13	42	-105	-27	+115	10	-79	-25	207863				
COAST TO 5TH BRAKING GATE																											
MAD-23 X-Y USB-85	0 1 15	7	5	13	42	-103	-28	154	17	72	25	207475	7	5	14	57	-103	-28	154	17	72	24	207407				
CYI-04 X-Y USB-30	0 1 15	7	5	13	42	-103	-28	142	22	56	-47	207150	7	5	14	57	-103	-28	142	23	56	-47	207079				
ACN-75 X-Y USB-30	0 1 15	7	5	13	42	-103	-28	123	49	36	-21	205898	7	5	14	57	-103	-28	123	49	36	-21	205826				
CRO-08 X-Y USB-30	0 1 15	7	5	13	42	-105	-27	+115	10	-79	-25	207863	7	5	14	57	-105	-27	+115	10	-79	-25	207816				
4TH BRAKING MANEUVER																											
MAD-23 X-Y USB-85	0 0 4	7	5	14	57	-103	-28	154	17	72	24	207407	7	5	15	2	-103	-28	154	17	72	24	207403				

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CYI-04 X=Y USB=30	0	0	4	7	5	14	57	+103	-28	142	23	56	-47	207079	7	5	15	2	+103	-28	142	23	56	-47	207075
ACN-75 X=Y USB=30	0	0	4	7	5	14	57	+103	-28	123	49	36	-21	205826	7	5	15	2	+103	-28	123	49	36	-21	205822
CRO-08 X=Y USB=30	0	0	4	7	5	14	57	+105	-27	+115	10	-79	-25	207816	7	5	15	2	+105	-27	-115	10	-79	-25	207813
COAST TO DOCKING																									
MAD-23 X=Y USB=85	0	4	24	7	5	15	2	+103	-28	154	17	72	24	207403	7	5	19	25	+103	-28	155	17	71	23	207179
CYI-04 X=Y USB=30	0	4	24	7	5	15	2	+103	-28	142	23	56	-47	207075	7	5	19	25	+103	-28	143	23	54	-47	206839
ACN-75 X=Y USB=30	0	4	24	7	5	15	2	+103	-28	123	49	36	-21	205822	7	5	19	25	+103	-27	124	50	35	-21	205584
CRO-08 X=Y USB=30	0	4	24	7	5	15	2	+105	-27	+115	10	-79	-25	207813	7	5	19	25	+105	-27	-116	9	-80	-25	207659

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TABLE 6-III.- MISSION RADAR TIMELINE - Continued

(e) CSM acquisition and termination - 3° minimum elevation

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VEHICLE	RADAR TABLE																								
	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
SHIP 1 INSERTION	0	3	30	0	0	11	55	23	31	-66	23	-65	22	220	0	0	15	24	-172	-2	93	3	87	-3	642
CYI-04 X-Y USB-30	0	3	50	0	0	18	4	58	-16	-110	3	-87	-20	639	0	0	21	54	175	-53	158	3	82	-68	633
CPN-08 X-Y USB-30	0	4	40	0	0	52	52	173	-29	-121	3	-86	-31	623	0	0	57	33	12	-21	112	3	87	-21	622
GDS-28 X-Y USB-85	0	2	34	0	1	29	19	34	-50	-168	3	87	-12	636	0	1	31	53	111	-33	135	3	86	45	640
MAR-95 H-D US8210	0	2	30	0	1	29	22	35	-50	-169	3	-75	-79	636	0	1	31	52	110	-33	135	3	86	-45	641
TEX-16 X-Y USB-30	0	5	20	0	1	31	44	-16	4	-88	3	-87	2	641	0	1	37	4	168	14	75	3	87	15	644
MIL-71 X-Y USB-30	0	5	22	0	1	35	31	-1	10	-81	3	-87	9	643	0	1	40	53	-179	4	87	3	87	3	644
BDA-02 X-Y USB-30	0	4	54	0	1	39	0	27	-6	-103	3	-87	-13	644	0	1	44	3	174	-28	126	3	86	-36	641
SHIP 1 INSERTION	0	4	58	0	1	42	46	38	-1	-92	3	-87	-2	642	0	1	47	44	-170	-34	131	3	86	-41	635
CRO-08 X-Y USB-30	0	5	11	0	2	25	22	-159	-20	-111	3	-87	-21	622	0	2	30	33	20	10	78	3	87	12	620

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
STN-00 A-E USB150	0	51	57	0	2	56	31	6	-26	-127	3	-86	-37	1058	0	3	48	28	169	1	91	3	87	-1	11212
GDS-28 X-Y USB-85	12	56	21	0	2	56	53	1	-17	-114	3	83	-66	1123	0	15	53	14	-168	-12	-107	3	80	-73	76460
MAR-95 H-D USB210	12	56	17	0	2	56	53	2	-17	-114	3	-87	-24	1124	0	15	53	1C	-168	-12	-107	3	-87	-17	76455
TEX-16 X-Y USB-30	11	43	50	0	2	58	55	3	9	-81	3	-87	9	1532	0	14	42	45	-169	-11	-105	3	-87	-15	71861
MIL-71 X-Y USB-30	10	30	43	0	3	0	56	19	11	-79	3	-87	10	1964	0	13	31	39	-171	-11	-104	3	-87	-14	67022
BDA-02 X-Y USB-30	9	16	0	0	3	2	60	37	7	-83	3	-87	7	2423	0	12	18	6C	-172	-11	-105	3	-87	-15	61844
SHIP 1 INSERTION	2	31	4	0	3	5	36	51	13	-77	3	-87	13	3004	0	5	36	40	176	-5	-167	56	-8	-33	23400
CYI-04 X-Y USB-30	5	37	2	0	3	13	34	88	11	-79	3	-87	11	4731	0	8	50	36	-178	-9	-101	3	-87	-11	45254
MAD-23 X-Y USB-85	4	24	46	0	3	17	26	104	3	-88	3	-29	-87	5533	0	7	42	12	-180	-8	-104	3	78	-76	39031
ACN-75 X-Y USB-30	5	49	55	0	3	19	30	101	30	-59	3	-86	31	5948	0	9	9	25	-177	-6	-96	3	-87	-6	46887

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA												STATION TERMINATION DATA											
		HRS	MIN	SEC	DAY	HRs	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRs	MIN	SEC	RA	DEC	AZ	ELV	X	Y
STN-00 A-E USB150	11 47 3	0	4	24	48	176	-2	95	3	87	-5	16758	0	16	11	51	-168	-12	-108	3	-87	-18	77645		
HAW-12 X-Y USB-30	11 18 55	0	7	48	45	-171	-7	99	3	87	-9	39648	0	19	7	40	-166	-12	-105	3	-87	-15	88298		
HSK-25 X-Y USB-85	12 33 12	0	11	0	25	-168	-6	95	3	81	84	55532	0	23	33	37	-164	-11	-102	3	76	-78	102895		
GWM-24 X-Y USB-30	11 18 52	0	11	46	51	-166	-10	101	3	87	-11	59467	0	23	5	43	-165	-13	-104	3	-87	-14	101433		
PKS-96 H-D USB210	8 5 45	0	13	15	4	-166	-8	80	30	60	9	64345	0	21	20	49	-165	-11	-84	30	-60	5	94282		
CRO-08 X-Y USB-30	12 17 16	0	13	31	9	-165	-8	98	3	87	-8	65992	1	1	48	26	-163	-12	-102	3	-87	-12	109730		
ACN-75 X-Y USB-30	11 47 36	0	22	27	26	-161	-12	102	3	87	-12	99409	1	10	15	3	-161	-14	-103	3	-87	-13	132835		
MAD-23 X-Y USB-85	9 46 22	0	22	43	49	-161	-14	111	3	82	69	100277	1	8	30	12	-161	-15	-112	3	82	-67	128339		
CYI-04 X-Y USB-30	10 29 43	0	23	9	40	-161	-13	107	3	87	-17	101640	1	9	39	23	-161	-15	-106	3	-87	-18	131320		
BCA-02 X-Y USB-30	10 12 33	1	2	37	23	-160	-14	109	3	87	-19	112127	1	12	49	56	-160	-15	-110	3	-87	-20	139227		

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MIL-71 X-Y USB-30	10	23	59	1	3	36	54	-160	-14	108	3	87	-18	114994	1	14	0	53	-160	-15	-109	3	-87	-19	142069
TEX-16 X-Y USB-30	10	25	53	1	4	43	39	-159	-14	108	3	87	-18	118141	1	15	9	32	-160	-15	-109	3	-87	-19	144767
GDS-28 X-Y USB-85	9	59	20	1	6	15	36	-159	-14	110	3	81	70	122367	1	16	14	56	-159	-15	-111	3	82	-69	147294
MAR-95 H-D USB210	9	59	1	1	6	15	49	-159	-14	110	3	87	-20	122377	1	16	14	50	-159	-15	-111	3	-87	-21	147290
STN-00 A-E USB150	9	50	55	1	6	41	10	-159	-15	111	3	87	-21	123520	1	16	32	5	-159	-15	-112	3	-87	-22	147949
HAW-12 X-Y USB-30	10	39	28	1	8	49	12	-158	-14	107	3	87	-17	129166	1	19	28	40	-159	-15	-108	3	-87	-18	154541
HSK-25 X-Y USB-85	12	48	17	1	11	14	47	-158	-13	104	3	78	76	135336	2	0	3	4	-158	-14	-106	3	79	-74	164254
GWM-24 X-Y USB-30	11	0	40	1	12	23	30	-158	-15	106	3	87	-16	138157	1	23	24	10	-158	-15	-107	3	-87	-17	162910
PKS-96 H-D USB210	8	21	18	1	13	30	18	-158	-14	87	30	60	2	139323	1	21	51	36	-158	-14	-88	30	-60	2	158146
CRO-08 X-Y USB-30	12	23	8	1	13	48	46	-157	-14	104	3	87	-14	141592	2	2	11	55	-158	-15	-105	3	-87	-15	168606

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA													
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y
ACN-75 X-Y USB-30	11 46 59		1	22	41	47	-156	-15	105	3	87	-15	161439		2	10	28	45	-157	-16	-105	3	-87	-15	184328
MAD-23 X-Y USB-85	9 27 58		1	23	9	11	-156	-16	114	3	83	66	162389		2	8	37	9	-157	-16	-115	3	83	-65	180927
CYI-04 X-Y USB-30	10 17 25		1	23	30	58	-156	-16	109	3	87	-19	163143		2	9	48	23	-157	-16	-110	3	-87	-20	183105
BDA-02 X-Y USB-30	10 0 20		2	2	56	34	-156	-16	111	3	87	-21	170081		2	12	56	54	-156	-16	-112	3	-87	-22	188725
MIL-71 X-Y USB-30	10 13 38		2	3	54	28	-155	-16	110	3	87	-20	171680		2	14	8	6	-156	-16	-111	3	-87	-21	190800
TEX-16 X-Y USB-30	10 16 13		2	5	0	18	-155	-16	110	3	87	-20	174110		2	15	16	31	-156	-16	-110	3	-87	-20	192770
GDS-23 X-Y USB-85	9 47 29		2	6	32	49	-155	-16	112	3	82	67	177054		2	16	20	18	-156	-17	-113	3	82	-67	194601
MAR-95 H-C USB210	9 47 8		2	6	33	3	-155	-16	112	3	87	-22	177052		2	15	20	11	-156	-17	-113	3	-87	-23	194598
STN-00 A-E USB150	9 38 36		2	6	58	31	-155	-16	113	3	87	-23	177863		2	16	37	7	-156	-17	-114	3	-87	-24	195071
HAW-12 X-Y USB-30	10 32 29		2	9	2	26	-155	-16	109	3	87	-19	181704		2	19	34	55	-156	-17	-109	3	-87	-19	200040

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y USB-85	12	55	56	2	11	18	12	-155	-15	107	3	80	73	185812	3	0	14	8	-155	-16	-107	3	80	-72	207668
GWM-24 X-Y USB-30	10	56	30	2	12	33	49	-154	-16	107	3	87	-17	188049	2	23	30	20	-155	-17	-108	3	-87	-18	206475
PKS-96 H-D USB210	8	27	56	2	13	34	39	-154	-15	90	30	60	0	188299	2	22	2	34	-155	-16	-90	30	-60	0	202558
CRO-08 X-Y USB-30	12	26	23	2	13	53	36	-154	-15	106	3	87	-16	190385	3	2	19	59	-155	-16	-106	3	-87	-16	211086
ACN-75 X-Y USB-30	7	36	47	2	22	46	39	-153	-16	106	3	87	-16	205291	3	6	23	27	-155	-16	-110	62	-26	-9	215352
MAD-23 X-Y USB-85	7	4	22	2	23	18	58	-154	-17	115	3	83	65	206158	3	6	23	20	-155	-17	-141	23	61	-35	217024
CYI-04 X-Y USB-30	6	44	45	2	23	38	36	-154	-17	111	3	87	-21	206686	3	6	23	21	-155	-17	-148	39	-33	-41	216215
BCA-02 X-Y USB-30	3	19	57	3	3	3	19	-154	-17	112	3	87	-22	212281	3	6	23	16	-154	-17	151	36	34	-45	216372
MIL-71 X-Y USB-30	2	22	54	3	4	0	20	-153	-17	111	3	87	-21	213686	3	6	23	15	-154	-17	134	30	51	-37	216645
TEX-16 X-Y USB-30	1	18	31	3	5	4	44	-154	-17	111	3	87	-21	215771	3	6	23	14	-154	-17	122	19	68	-30	217253

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
MAP-95 H-D USB210	1 24 46	3	6	55	20	-154	-16	116	7	82	-26	217631	3	6	20	6	-153	-17	130	20	64	-37	216624	
GDS-28 X-Y USB-85	1 24 46	3	6	55	20	-154	-16	116	7	74	63	217628	3	8	20	6	-153	-17	130	20	60	46	216621	
TEX-16 X-Y USB-30	1 24 47	3	6	55	22	-154	-16	127	25	60	-33	216583	3	8	20	9	-153	-17	145	37	37	-40	215739	
MIL-71 X-Y USB-30	1 24 44	3	6	55	26	-154	-17	141	35	41	-40	216060	3	8	20	10	-154	-17	165	43	16	-45	215484	
BDA-02 X-Y USB-30	1 24 45	3	6	55	30	-155	-17	160	39	23	-47	215892	3	8	20	14	-154	-17	-174	40	-7	-49	215606	
MAD-23 X-Y USB-85	1 24 42	3	6	55	41	-155	-17	-134	19	63	-43	216909	3	8	20	23	-154	-17	-119	6	77	-61	217456	
CYI-04 X-Y USB-30	1 24 42	3	6	55	42	-155	-17	-139	35	-43	-38	216071	3	8	20	24	-154	-17	-124	21	-65	-31	216601	
ACN-75 X-Y USB-30	1 24 45	3	6	55	46	-155	-16	-106	55	-34	-9	215244	3	8	20	31	-154	-16	-105	35	-54	-12	215872	
STN-00 A-E USB150	1 20 32	3	6	59	34	-154	-16	113	3	87	-23	217673	3	8	20	6	-153	-17	127	16	71	-35	216885	
STN-00 A-E USB150	1 24 49	3	6	3	21	-153	-17	136	22	59	-41	216626	3	10	28	10	-152	-18	155	31	35	-51	215938	

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRs	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRs	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAR-95 H-D USB210	1	24	48	3	9	3	22	-153	-17	140	27	52	-43	216388	3	10	28	10	-152	-18	160	35	26	-51	215763
GDS-28 X-Y USB-85	1	24	48	3	9	3	22	-153	-17	140	27	56	35	216384	3	10	28	10	-152	-18	160	35	54	16	215760
TEX-16 X-Y USB-30	1	24	50	3	9	3	26	-154	-17	157	42	23	-43	215629	3	10	28	15	-153	-17	-176	45	-4	-45	215306
MIL-71 X-Y USB-30	1	24	48	3	9	3	31	-154	-17	179	45	1	-45	215528	3	10	28	19	-153	-17	-155	40	-27	-44	215511
BDA-02 X-Y USB-30	1	24	48	3	9	3	33	-154	-17	-161	38	-23	-48	215798	3	10	28	22	-153	-17	-140	29	-49	-42	216040
CYI-04 X-Y USB-30	0	49	56	3	9	3	44	-155	-17	-117	13	-76	-26	217168	3	9	53	40	-154	-17	-111	3	-87	-21	216217
ACN-75 X-Y USB-30	1	24	48	3	9	3	50	-155	-16	-104	24	-65	-13	216500	3	10	28	28	-154	-17	-106	5	-85	-16	217431
HAW-12 X-Y USB-30	1	21	15	3	9	6	50	-153	-17	109	3	87	-19	217605	3	10	28	5	-152	-17	119	19	68	-27	216589
				26	JUL	71	DOI TO SEP		LAZ	80.1															
HAW-12 X-Y USB-30	1	5	3	3	11	15	36	-152	-17	126	29	56	-31	215898	3	12	20	39	-151	-18	139	39	39	-36	215421
STN-00 A-E USB150	1	5	7	3	11	15	43	-153	-17	168	34	17	-54	215599	3	12	20	50	-152	-18	-174	34	-9	-55	215642

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VEHICLE 1 RADAR TABLE

VEHICLE	X-Y	USB-85	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
			HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GDS-28			1	5	5	3	11	15	47	-153	-17	174	37	53	5	215465	3	12	20	52	-152	-18	-167	36	54	-10	215578
MAR-95			1	5	4	3	11	15	49	-153	-17	174	37	7	-53	215468	3	12	20	52	-152	-18	-167	36	-17	-52	215582
TEX-16			1	5	13	3	11	15	51	-153	-17	-160	43	-20	-44	215205	3	12	21	4	-152	-18	-143	36	-40	-41	215592
MIL-71			1	5	8	3	11	15	56	-153	-17	-142	35	-42	-40	215571	3	12	21	4	-152	-18	-129	25	-59	-35	216154
BDA-02			1	5	7	3	11	15	60	-153	-17	-130	22	-62	-36	216221	3	12	21	6	-153	-18	-120	11	-77	-26	216929
HSK-25			0	58	50	3	11	22	0	-152	-16	108	3	80	72	217032	3	12	20	50	-151	-17	101	14	36	72	216748
GWM-24			1	5	8	3	13	9	3	-151	-17	110	9	81	-20	216439	3	14	14	12	-150	-18	116	22	66	-24	216169
HSK-25			1	5	14	3	13	9	9	-151	-17	94	24	8	66	216054	3	14	14	22	-150	-17	85	37	-6	53	215424
HAW-12			1	5	8	3	13	9	10	-152	-18	152	46	25	-38	214997	3	14	14	18	-151	-18	173	50	6	-40	214865
MAR-95			1	5	11	3	13	9	15	-152	-18	-154	32	-35	-49	215596	3	14	14	27	-151	-18	-139	25	-55	-43	216022

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
STN-00 A-E USB150	1	5	12	3	13	9	15	-152	-18	-160	32	-29	-53	215603	3	14	14	27	-151	-18	-144	26	-50	-47	215963
GDS-28 X-Y USB-85	1	5	12	3	13	9	17	-152	-18	-154	33	55	-22	215591	3	14	14	29	-151	-18	-139	25	58	-36	216021
TEX-16 X-Y USB-30	1	5	9	3	13	9	22	-152	-18	-132	28	54	-36	215796	3	14	14	32	-152	-18	-122	17	70	-30	216461
MIL-71 X-Y USB-30	1	5	9	3	13	9	24	-153	-18	-121	16	71	-30	216479	3	14	14	34	-152	-18	-113	4	86	-23	217257
PKS-96 H-D USB210	0	31	6	3	13	43	17	-151	-17	91	30	60	-1	214605	3	14	14	23	-150	-17	88	36	54	2	215446
CRO-09 X-Y USB-30	0	10	49	3	14	3	29	-150	-17	107	3	87	-17	216771	3	14	14	18	-150	-17	106	5	84	-16	217157
GWM-24 X-Y USB-30	1	5	21	3	15	2	30	-150	-18	122	33	53	-26	215499	3	16	7	50	-149	-18	133	45	37	-29	214958
PKS-96 H-D USB210	1	5	17	3	15	2	38	-150	-17	80	47	43	7	214861	3	16	7	54	-150	-18	67	59	29	11	214423
CRO-08 X-Y USB-30	1	5	8	3	15	2	41	-150	-17	102	16	74	-11	216397	3	16	7	49	-149	-18	97	30	60	-6	215648
HSK-25 X-Y USB-85	1	5	8	3	15	2	49	-150	-17	77	47	-12	42	214848	3	16	7	57	-150	-18	62	59	-16	27	214442

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HAW-12 X-Y USB-30	1	5	3	3	15	2	56	-151	-18	-169	49	-10	-40	214737	3	16	7	58	-150	-18	-149	43	-29	-38	215007
STN-00 A-E USB150	1	5	4	3	15	3	0	-151	-18	-134	20	-64	-41	216159	3	16	8	4	-151	-18	-123	10	-78	-32	216779
GDS-28 X-Y USB-85	1	5	1	3	15	3	4	-152	-18	-129	18	63	-48	216261	3	16	8	5	-151	-18	-119	7	75	-60	216937
MAR-95 H-D USB210	1	4	58	3	15	3	5	-152	-18	-129	18	-67	-37	216263	3	16	8	3	-151	-18	-119	7	-82	-29	216937
TEX-16 X-Y USB-30	0	24	35	3	15	3	9	-152	-18	-115	8	-81	-25	216853	3	15	27	44	-151	-18	-112	3	-87	-22	216085
GWM-24 X-Y USB-30	1	5	6	3	16	56	30	-150	-18	147	52	23	-31	214511	3	18	1	36	-149	-19	171	58	6	-32	214366
CRO-08 X-Y USB-30	1	5	5	3	16	56	31	-149	-18	92	41	49	-2	214971	3	18	1	36	-148	-18	86	55	35	2	214443
PKS-96 H-D USB210	1	5	9	3	16	56	40	-150	-18	49	68	17	14	214044	3	18	1	49	-149	-18	5	75	1	15	213968
HSK-25 X-Y USB-85	1	5	4	3	16	56	43	-150	-17	43	67	-17	16	214072	3	18	1	47	-149	-18	2	72	-18	1	214009
HAW-12 X-Y USB-30	1	5	4	3	16	56	46	-151	-18	-136	37	-43	-36	215157	3	18	1	50	-150	-19	-125	25	-60	-31	215795

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CRO-08 X-Y USB-30	1	5	11	3	18	50	9	-149	-18	78	66	23	5	213979	3	19	55	20	-148	-18	53	80	8	6	213782
GWM-24 X-Y USB-30	1	5	11	3	18	50	11	-149	-19	-167	57	-8	-32	214228	3	19	55	22	-148	-19	-145	51	-25	-31	214497
PKS-96 H-D USB210	1	5	16	3	18	50	16	-149	-18	-35	72	-11	15	213856	3	19	55	32	-148	-18	-65	62	-26	12	214131
HSK-25 X-Y USB-85	1	5	12	3	18	50	19	-149	-18	-33	69	-17	-11	213902	3	19	55	30	-148	-18	-61	60	-15	-26	214178
HAW-12 X-Y USB-30	1	3	7	3	18	50	22	-150	-19	-118	16	-72	-27	216168	3	19	53	28	-148	-19	-112	3	-87	-22	216873
CRO-08 X-Y USB-30	1	5	22	3	20	43	33	-148	-18	-28	83	-4	7	213519	3	21	48	55	-147	-19	-75	71	-18	5	213790
GWM-24 X-Y USB-30	1	5	18	3	20	43	39	-149	-19	-132	43	-39	-30	214678	3	21	48	57	-148	-19	-122	30	-55	-27	215289
PKS-96 H-D USB210	1	5	18	3	20	43	45	-149	-18	-77	52	-37	8	214285	3	21	49	2	-148	-19	-87	40	-50	2	214844
HSK-25 X-Y USB-85	1	5	16	3	20	43	48	-149	-19	-74	51	-13	-37	214327	?	21	49	4	-148	-18	-86	39	-5	-51	214880
CRO-08 X-Y USB-30	1	4	58	3	22	37	44	-148	-19	-84	60	-30	3	213896	3	23	42	42	-147	-19	-92	46	-44	-1	214445

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GWM-24 X-Y USB-30	1	5	1	3	22	37	44	-148	-19	-116	20	-68	-25	215685	3	23	42	45	-147	-19	-112	6	-83	-22	216544
HSK-25 X-Y USB-85	1	4	60	3	22	37	52	-148	-18	-93	29	5	-61	215200	3	23	42	52	-147	-19	-101	17	34	-70	215938
ACN-75 X-Y USB-30	0	29	29	3	23	12	41	-146	-19	109	3	87	-19	215575	3	23	42	10	-145	-19	108	10	80	-18	216306
MAD-23 X-Y USB-85	1	5	12	4	0	30	47	-146	-20	125	8	76	54	216267	4	1	35	60	-145	-20	137	17	68	41	215771
ACN-75 X-Y USB-30	1	5	13	4	0	30	48	-145	-19	107	21	68	-16	215513	4	1	36	2	-144	-20	108	36	53	-15	214759
CYI-04 X-Y USB-30	1	5	13	4	0	30	48	-145	-20	116	6	83	-26	215375	4	1	36	2	-145	-20	125	18	69	-33	215710
CRO-08 X-Y USB-30	1	5	13	4	0	31	19	-147	-19	-96	35	55	-5	214778	4	1	36	31	-146	-19	-102	21	68	-11	215551
HSK-25 X-Y USB-85	0	21	23	4	0	31	19	-147	-19	-108	7	69	-71	216323	4	0	52	42	-147	-19	-111	3	82	-69	215575
CYI-04 X-Y USB-30	1	5	13	4	2	24	14	-145	-20	134	26	56	-38	215117	4	3	29	27	-144	-20	147	35	38	-44	214668
MAD-23 X-Y USB-85	1	5	14	4	2	24	17	-145	-20	147	22	64	30	215317	4	3	29	31	-144	-21	163	27	62	15	215056

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VEHICLE 1 RADAR TABLE

TRACKING TIME

STATION ACQUISITION DATA

STATION TERMINATION DATA

	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	1	5	11	4	2	24	20	-145	-20	110	47	41	-14	214115	4	3	29	32	-144	-20	118	61	26	-13	213624
CRO-08 X-Y USB-30	0	36	35	4	2	24	46	-146	-19	-106	10	-79	-16	215099	4	3	1	21	-146	-19	-110	3	-87	-20	215336
				26	JUL	71	SEP	TC	CIR		LAZ	80.1													
ACN-75 X-Y USB-30	1	7	22	4	4	15	52	-144	-20	131	71	14	-12	213367	4	5	23	14	-143	-20	-175	78	-1	-12	213155
BDA-02 X-Y USB-30	1	5	21	4	4	17	37	-144	-20	120	8	80	-30	216016	4	5	22	58	-143	-21	131	19	66	-38	215380
CYI-04 X-Y USB-30	1	5	25	4	4	17	43	-144	-20	161	39	22	-47	214329	4	5	23	8	-143	-21	180	41	0	-49	214216
MAD-23 X-Y USB-85	1	5	20	4	4	17	48	-144	-21	175	29	61	4	214837	4	5	23	8	-143	-21	-168	28	62	-11	214884
MIL-71 X-Y USB-30	0	36	3	4	4	46	55	-143	-20	115	3	87	-25	215173	4	5	22	57	-143	-21	120	5	79	-29	215910
				26	JUL	71	CIR	TC	PCH		LAZ	80.1													
TEX-16 X-Y USB-30	1	12	5	4	6	9	28	-143	-21	117	6	83	-27	216127	4	7	21	33	-142	-21	127	19	67	-35	215249
MIL-71 X-Y USB-30	1	12	3	4	6	9	30	-143	-21	127	18	68	-35	215417	4	7	21	33	-142	-21	140	29	49	-42	214692
BDA-02 X-Y USB-30	1	12	4	4	6	9	33	-143	-21	140	26	53	-44	214999	4	7	21	37	-142	-21	157	33	31	-50	214486

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE
CYI-04 X-Y USB-30	1	12	3	4	6	9	46	-144	-21	-166	40	-16	-48	214263	4	7	21	49	-143	-21	-147	34	-39	-44	214455
MAD-23 X-Y USB-85	1	12	2	4	6	9	48	-144	-21	-156	25	63	-22	215021	4	7	21	50	-143	-21	-141	18	67	-37	215308
ACN-75 X-Y USB-30	1	12	4	4	6	9	52	-144	-20	-136	72	-13	-12	213218	4	7	21	56	-143	-21	-117	58	-29	-14	213465
STN-00 A-E USB150	1	12	15	4	8	7	38	-142	-21	120	4	85	-30	216100	4	9	19	53	-141	-21	132	15	70	-41	215337
MAR-95 H-D USB210	1	12	13	4	8	7	40	-142	-21	124	9	80	-33	215820	4	9	19	53	-141	-21	136	19	63	-43	215082
GDS-78 X-Y USB-85	1	12	14	4	8	7	41	-142	-21	124	9	74	55	215816	4	9	19	55	-141	-21	136	19	64	41	215079
TEX-16 X-Y USB-30	1	14	10	4	8	7	42	-142	-21	135	26	55	-40	214807	4	9	21	52	-141	-21	152	35	34	-46	214304
MIL-71 X-Y USB-30	1	12	14	4	8	7	47	-142	-21	151	35	35	-46	214390	4	9	20	1	-141	-21	170	39	12	-50	214032
BDA-02 X-Y USB-30	1	12	19	4	8	7	47	-142	-21	170	36	14	-53	214325	4	9	20	7	-141	-22	-171	36	-13	-53	214217
CYI-04 X-Y USB-30	1	12	18	4	8	7	60	-143	-21	-137	27	-53	-40	214749	4	9	20	18	-142	-21	-125	16	-71	-34	215299

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USB-85	0	58	32	4	8	8	2	-143	-21	-131	12	73	-48	215629	4	9	6	34	-142	-21	-122	3	84	-58.	215384
ACN-75 X-Y USB-30	1	12	16	4	8	8	6	-143	-20	-112	47	-40	-15	213805	4	9	20	22	-142	-21	-110	31	-57	-17	214443
HAW-12 X-Y USB-30	1	12	7	4	10	5	40	-141	-21	115	4	86	-25	215952	4	11	17	47	-140	-22	123	18	69	-31	214999
STN-00 A-E USB150	1	12	7	4	10	5	47	-141	-21	142	21	58	-47	214955	4	11	17	53	-140	-22	158	27	36	-55	214458
MAR-95 H-D USB210	1	12	8	4	10	5	48	-141	-21	146	25	50	-49	214726	4	11	17	57	-140	-22	163	31	26	-55	214287
GDS-28 X-Y USB-85	1	12	4	4	10	5	49	-141	-21	146	25	60	30	214721	4	11	17	53	-140	-22	163	31	58	15	214280
TEX-16 X-Y USB-30	1	12	8	4	10	5	54	-141	-21	164	39	19	-48	214CC9	4	11	18	1	-140	-22	-175	40	-6	-49	213828
MIL-71 X-Y USB-30	1	12	6	4	10	5	59	-141	-21	-175	40	-5	-50	213975	4	11	18	5	-141	-22	-156	36	-30	-48	214047
BDA-02 X-Y USB-30	1	12	4	4	10	6	5	-142	-21	-158	33	-30	-51	214307	4	11	18	3	-141	-22	-142	25	-53	-45	214590
CYI-04 X-Y USB-30	0	20	21	4	10	6	15	-142	-21	-118	7	-82	-28	215755	4	10	26	36	-142	-21	-116	3	-87	-26	215009

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	1	12	4	4	10	6	20	-142	-21	-109	20	-68	-18	214964	4	11	18	24	-141	-21	-111	5	-85	-20	215796
HAW-12 X-Y USB-30	1	12	20	4	12	3	55	-140	-22	130	26	57	-35	214506	4	13	16	15	-139	-22	144	37	38	-40	213833
HSK-25 X-Y USB-85	1	12	20	4	12	3	58	-140	-20	112	5	77	68	215742	4	13	16	18	-138	-21	103	18	34	68	214822
MAR-95 H-D USB210	1	12	20	4	12	4	2	-140	-22	176	33	7	-57	214172	4	13	16	23	-139	-22	-166	31	-22	-56	214128
STN-00 A-E USB150	1	12	17	4	12	4	4	-140	-22	170	30	17	-58	214300	4	13	16	21	-139	-22	-172	30	-14	-59	214183
GDS-28 X-Y USB-85	1	12	19	4	12	4	4	-140	-22	176	33	57	4	214167	4	13	16	24	-139	-22	-166	31	58	-12	214125
TEX-16 X-Y USB-30	1	12	17	4	12	4	12	-141	-22	-161	38	-22	-48	213893	4	13	16	28	-140	-22	-144	31	-45	-44	214142
MIL-71 X-Y USB-30	1	12	21	4	12	4	13	-141	-22	-144	31	-45	-44	214267	4	13	16	34	-140	-22	-131	20	-64	-38	214723
BDA-02 X-Y USB-30	1	12	17	4	12	4	16	-141	-22	-132	19	-66	-40	214924	4	13	16	32	-140	-22	-121	7	-82	-31	215504
GWM-24 X-Y USB-30	1	12	6	4	14	1	58	-138	-22	115	9	80	-25	215345	4	15	14	4	-137	-22	121	23	63	-29	214360

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y USB-85	1	12	9	4	14	2	5	-139	-21	97	28	13	62	214281	4	15	14	14	-138	-21	88	42	-2	48	213453
HAW-12 X-Y USB-30	1	12	4	4	14	2	12	-139	-22	157	42	23	-43	213551	4	15	14	16	-138	-22	178	46	2	-44	213284
STN-00 A-E USB150	1	12	2	4	14	2	20	-140	-22	-159	28	-34	-56	214259	4	15	14	23	-139	-22	-144	21	-57	-49	214509
MAR-95 H-D USB210	1	12	3	4	14	2	21	-140	-22	-154	28	-40	-52	214252	4	15	14	24	-139	-22	-139	20	-61	-45	214574
GDS-28 X-Y USB-85	1	12	1	4	14	2	22	-140	-22	-154	28	59	-23	214248	4	15	14	23	-139	-22	-139	20	64	-38	214570
TEX-16 X-Y USB-30	1	12	2	4	14	2	31	-140	-22	-134	24	-58	-39	214443	4	15	14	33	-139	-22	-123	12	-76	-32	215020
MIL-71 X-Y USB-30	0	50	20	4	14	2	32	-140	-22	-123	12	-76	-32	215128	4	14	52	53	-139	-22	-117	3	-87	-27	214591
PKS-96 H-D USB210	0	55	52	4	14	18	19	-138	-21	97	30	60	-6	213355	4	15	14	12	-138	-21	91	41	49	0	213476
CRO-08 X-Y USB-30	0	33	55	4	14	40	15	-138	-21	112	3	87	-22	214360	4	15	14	10	-137	-21	109	10	80	-19	215139
CRO-08 X-Y USB-30	1	12	19	4	16	0	13	-138	-21	105	20	69	-14	214534	4	17	12	32	-136	-22	100	35	54	-8	213592

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GWM-24 X-Y USB-30	1	12	18	4	16	0	14	-138	-22	128	33	51	-31	213848	4	17	12	32	-137	-22	142	45	32	-34	213166
HSK-25 X-Y USB-85	1	12	20	4	16	0	18	-138	-21	80	51	-8	38	213039	4	17	12	38	-137	-22	63	65	-12	22	212484
PKS-96 H-D USB210	1	12	23	4	16	0	18	-138	-21	84	51	39	4	213047	4	17	12	41	-137	-22	65	65	23	8	212474
HAW-12 X-Y USB-30	1	12	20	4	16	0	26	-139	-22	-166	44	-14	-44	213299	4	17	12	45	-138	-23	-147	38	-35	-42	213483
STN-00 A-E USB150	1	12	18	4	16	0	31	-139	-22	-134	15	-70	-42	214813	4	17	12	49	-138	-23	-122	4	-85	-32	215345
MAR-95 H-D USB210	1	2	22	4	16	0	33	-139	-22	-130	13	-73	-39	214020	4	17	2	54	-138	-22	-121	3	-87	-30	214924
GDS-28 X-Y USB-85	1	2	31	4	16	0	35	-139	-22	-130	13	70	-48	214915	4	17	3	5	-138	-22	-120	3	84	-59	214933
TEX-16 X-Y USB-30	0	1	2	4	16	0	37	-139	-22	-117	3	-86	-27	215496	4	16	1	39	-139	-22	-117	3	-87	-27	215452
CRO-08 X-Y USB-30	1	12	7	4	17	58	22	-137	-22	96	46	44	-4	213085	4	19	10	29	-136	-22	91	61	29	0	212393
GWM-24 X-Y USB-30	1	12	7	4	17	58	26	-137	-22	155	51	19	-35	212886	4	19	10	33	-126	-23	-179	54	0	-36	212631

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y USB-85	1	12	11	4	17	58	31	-137	-22	41	72	-13	12	212275	4	19	10	42	-136	-22	-18	76	-13	-4	212093
PKS-96 H-D USB210	1	12	9	4	17	58	32	-137	-22	49	74	12	10	212751	4	19	10	40	-136	-22	-19	79	-4	11	212057
HAW-12 X-Y USB-30	1	12	3	4	17	58	45	-138	-22	-136	31	-49	-39	213752	4	19	10	47	-137	-23	-125	19	-67	-33	214301
CRO-08 X-Y USA-30	1	12	22	4	19	56	35	-136	-22	85	72	18	2	212113	4	21	8	57	-135	-22	38	87	2	2	211824
HSK-25 X-Y USB-85	1	12	22	4	19	56	44	-137	-22	-51	70	-13	-15	212144	4	21	9	6	-136	-22	-75	58	-9	-31	212348
GWM-24 X-Y USB-30	1	12	15	4	19	56	45	-137	-23	-161	52	-14	-36	212659	4	21	8	59	-136	-23	-141	44	-33	-34	212873
PKS-96 H-D USB210	1	12	18	4	19	56	46	-137	-22	-56	72	-15	10	212104	4	21	9	4	-136	-22	-78	59	-30	6	212310
HAW-12 X-Y USB-30	0	34	13	4	19	56	53	-137	-23	-116	10	-79	-29	214773	4	20	31	6	-137	-23	-116	3	-87	-26	213856
CRO-08 X-Y USB-30	1	12	10	4	21	54	53	-135	-22	-77	81	-9	2	211808	4	23	7	3	-135	-23	-91	65	-25	0	211956
GWM-24 X-Y USB-30	1	12	4	4	21	55	3	-136	-23	-132	36	-46	-32	213170	4	23	7	7	-135	-23	-122	22	-64	-30	213763

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y USB-85	1	12	7	4	21	55	5	-136	-22	-84	48	-5	-41	212613	4	23	7	11	-135	-22	-94	35	6	-55	213120
PKS-96 H-D USB210	1	12	7	4	21	55	5	-136	-22	-86	49	-41	2	212581	4	23	7	12	-135	-22	-96	35	-55	-5	213103
CRO-08 X-Y USB-30	1	12	21	4	23	53	6	-135	-23	-95	55	-35	-3	212214	5	1	5	27	-134	-23	-100	35	-50	-8	212725
GWM-24 X-Y USB-30	0	45	27	4	23	53	9	-135	-23	-118	12	-76	-27	214261	5	0	38	35	-134	-23	-115	3	-87	-25	213592
HSK-25 X-Y USB-85	1	12	21	4	23	53	10	-135	-22	-100	25	21	-63	213541	5	1	5	31	-134	-23	-109	12	58	-67	214184
ACN-75 X-Y USB-30	1	9	0	4	23	55	60	-133	-23	112	3	87	-22	214675	5	1	5	0	-132	-23	112	18	71	-21	213812
CYI-04 X-Y USB-30	1	12	11	5	1	50	45	-132	-24	124	10	78	-33	214223	5	3	2	55	-131	-24	135	22	61	-41	213401
ACN-75 X-Y USB-30	1	12	10	5	1	50	46	-132	-23	112	29	60	-19	213192	5	3	2	55	-131	-23	115	44	43	-18	212290
MAD-23 X-Y USB-85	1	12	7	5	1	50	51	-133	-24	133	10	76	46	214239	5	3	2	58	-132	-24	147	18	69	31	213616
HSK-25 X-Y USB-85	0	0	41	5	1	51	21	-134	-22	-116	3	83	-64	214622	5	1	52	1	-134	-22	-116	3	83	-64	214598

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HR	S	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HR	S	MIN	SEC	RA	DEC	AZ	ELV	X	Y
CRO-08 X-Y USB-30	1	12	10	5	1	51	22	-134	-23	-103	29	-61	-12	213159	5	3	3	32	-133	-23	-109	14	-75	-19	213873
CYI-04 X-Y USB-30	1	12	19	5	3	49	1	-132	-24	144	28	47	-45	213002	5	5	1	19	-131	-24	160	35	25	-50	212508
ACN-75 X-Y USB-30	1	12	20	5	3	49	2	-132	-23	120	55	32	-17	211857	5	5	1	23	-131	-24	138	68	15	-16	211331
MAD-23 X-Y USB-85	1	12	20	5	3	49	4	-132	-24	157	22	66	21	213345	5	5	1	24	-131	-24	174	25	65	5	213044
CRO-08 X-Y USB-30	0	5	31	5	3	49	27	-133	-23	-113	4	-86	-23	214379	5	3	54	58	-133	-23	-114	3	-87	-24	214165
BDA-02 X-Y USB-30	0	10	21	5	4	50	55	-130	-24	121	3	37	-31	213815	5	5	1	16	-130	-24	123	5	84	-32	214202
MIL-71 X-Y USB-30	1	12	9	5	5	47	0	-130	-24	120	3	86	-30	214243	5	6	59	9	-129	-24	130	16	70	-38	213365
BDA-02 X-Y USB-30	1	12	10	5	5	47	2	-130	-24	130	13	74	-39	213694	5	6	59	12	-129	-25	143	22	56	-47	212976
CYI-04 X-Y USB-30	1	12	9	5	5	47	15	-131	-24	174	38	8	-52	212344	5	6	59	25	-130	-25	-167	37	-17	-52	212259
ACN-75 X-Y USB-30	1	12	12	5	5	47	16	-131	-24	166	74	4	-16	211165	5	6	59	28	-130	-24	-144	70	-12	-16	211102

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USB-85	1	12	5	5	5	47	19	-131	-24	-174	25	65	-6	212087	5	6	59	24	-130	-25	-157	21	67	-21	213041
TEX-16 X-Y USB-30	0	5	1	5	6	54	7	-129	-24	11 ^c	3	87	-29	213867	5	6	50	8	-129	-24	120	4	85	-30	214051
TEX-16 X-Y USB-30	1	12	26	5	7	45	9	-129	-24	126	13	74	-35	213511	5	8	57	34	-128	-25	138	24	57	-43	212728
MIL-71 X-Y USB-30	1	12	22	5	7	45	14	-129	-24	138	23	58	-43	212913	5	8	57	35	-128	-25	153	31	37	-49	212318
BKA-02 X-Y USB-30	1	12	23	5	7	45	17	-130	-25	152	28	41	-52	212652	5	8	57	40	-129	-25	170	32	15	-57	212280
CYI-04 X-Y USB-30	1	12	24	5	7	45	28	-130	-24	154	33	34	-49	212373	5	9	57	52	-129	-25	-139	25	55	-44	212689
MAD-23 X-Y USB-85	1	12	21	5	7	45	30	-130	-25	147	17	70	-31	213221	5	9	57	51	-129	-25	-134	9	77	-46	213589
ACN-75 X-Y USB-30	1	12	25	5	7	45	30	-130	-24	127	61	-24	-17	211249	5	9	57	55	-129	-24	-117	47	-40	-18	211633
GDS-28 X-Y USB-85	0	19	46	5	8	37	45	-129	-25	123	3	85	57	213027	5	9	57	31	-128	-25	126	6	80	53	213735
MAR-95 H-D USB210	0	19	24	5	8	38	8	-128	-25	123	3	86	-33	213041	5	9	57	31	-128	-25	126	6	82	-36	213738

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VEHICLE 1 RACAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SFC	RA	DEC	AZ	ELV	X	Y	RANGE
STN-00 A-E USB150	1	12	11	5	9	43	19	-128	-25	131	9	78	-40	213530	5	10	55	31	-127	-25	144	18	62	-50	212847
MAR-95 H-D USB210	1	12	11	5	9	43	20	-128	-25	134	13	72	-43	213265	5	10	55	31	-127	-25	148	22	53	-52	212619
GCS-28 X-Y USB-85	1	12	11	5	9	43	20	-128	-25	134	13	71	44	213261	5	10	55	31	-127	-25	148	22	65	30	212615
TEX-16 X-Y USB-30	1	12	11	5	9	43	23	-128	-25	148	30	43	-47	212345	5	10	55	35	-128	-25	165	36	20	-52	211897
MIL-71 X-Y USB-30	1	12	11	5	9	43	28	-129	-25	165	35	20	-52	212077	5	10	55	36	-128	-25	176	36	-5	-53	211871
BDA-02 X-Y USB-30	1	12	12	5	9	43	32	-129	-25	177	33	-4	-57	212189	5	10	55	44	-128	-25	159	30	-32	-54	212214
CYI-04 X-Y USB-30	1	12	9	5	9	43	47	-130	-25	-131	17	-68	-34	213015	5	10	55	56	-129	-25	-121	5	-84	-31	213618
ACN-75 X-Y USB-30	1	12	10	5	9	43	51	-130	-24	-114	36	-51	-19	212014	5	10	56	1	-129	-24	-113	21	-68	-21	212714
HAW-12 X-Y USB-30	1	12	23	5	11	41	25	-127	-25	123	12	75	-32	213173	5	12	53	48	-126	-25	133	24	59	-38	212312
STN-00 A-E USB150	1	12	24	5	11	41	32	-127	-25	154	23	47	-56	212532	5	12	53	56	-126	-25	170	27	19	-62	212167

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VEHICLE 1 RADAR TABLE

	TRACKING TIME				STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC		DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAR-05 H-D USB210	1	12	23		5	11	41	34	-128	-25	158	26	37	-56	212337	5	12	53	57	-127	-25	176	29	8	-61	212036
GDS-28 X-Y USB-85	1	12	24		5	11	41	34	-128	-25	158	26	62	19	212332	5	12	53	58	-127	-25	176	29	61	4	212032
TEX-16 X-Y USB-30	1	12	23		5	11	41	39	-128	-25	178	37	2	-53	211772	5	12	54	2	-127	-25	-163	35	-23	-51	211744
MIL-71 X-Y USB-30	1	12	23		5	11	41	43	-128	-25	-163	34	-23	-52	211905	5	12	54	6	-127	-25	-147	28	-46	-48	212110
BDA-02 X-Y USB-30	1	12	22		5	11	41	44	-128	-25	-148	25	-48	-50	212383	5	12	54	6	-127	-25	-135	16	-68	-43	212762
ACN-75 X-Y USB-30	0	33	7		5	11	41	56	-129	-24	-11?	10	-79	-23	213243	5	12	15	3	-128	-24	-114	3	-87	-24	212356
HSK-25 X-Y USB-85	0	21	11		5	12	32	43	-126	-24	117	3	84	6?	21259?	5	12	53	54	-126	-24	115	7	74	64	213309
HSK-25 X-Y USB-85	1	12	12		5	13	39	35	-126	-24	109	16	49	66	21274!	5	14	51	46	-125	-24	101	29	18	59	211835
HAW-12 X-Y USB-30	1	12	12		5	13	39	37	-126	-25	142	31	46	-42	211871	5	14	51	49	-125	-25	158	36	25	-46	211333
STN-00 A-E USB150	1	12	9		5	13	39	48	-127	-25	-176	27	-4	-63	212069	5	14	51	57	-126	-26	-161	24	-36	-59	212074

VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
MAR-95 H-D USB210	1 12 10	5 13 39	51	-127	-25	-172	29	-14	-60	211982	5 14 52	2	-126	-26	-156	25	-42	-56	212064					
GDS-28 X-Y USB-85	1 12 8	5 13 39	52	-127	-25	-172	29	61	-7	211977	5 14 52	0	-126	-26	-155	25	63	-22	212059					
TEX-16 X-Y USB-30	1 12 10	5 13 39	56	-127	-25	-151	31	-39	-49	211971	5 14 52	6	-126	-25	-137	22	-60	-43	212228					
MIL-71 X-Y USB-30	1 12 7	5 13 40	2	-127	-25	-137	22	-60	-43	212372	5 14 52	9	-126	-25	-126	10	-77	-36	212899					
BDA-02 X-Y USB-30	0 34 39	5 13 40	4	-127	-25	-127	9	-79	-37	213112	5 14 14	43	-127	-25	-122	3	-86	-32	212133					
GWM-24 X-Y USB-30	0 21 33	5 14 30	6	-125	-25	116	3	87	-26	212357	5 14 51	39	-125	-25	118	7	82	-28	213045					
CRN-08 X-Y USB-30	1 12 25	5 15 37	40	-125	-24	114	6	83	-24	213082	5 16 50	5	-124	-25	108	21	68	-17	212081					
GWM-24 X-Y USB-30	1 12 22	5 15 37	41	-125	-25	122	17	70	-30	212432	5 16 50	3	-124	-25	131	31	52	-34	211547					
HSK-25 X-Y USB-85	1 12 27	5 15 37	43	-125	-24	95	38	6	51	211324	5 16 50	10	-124	-25	85	52	-4	37	210585					
PKS-96 H-D USB?10	1 12 25	5 15 37	44	-125	-24	97	38	52	-6	211363	5 16 50	10	-124	-25	89	52	38	1	210602					

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VFHICLE 1 RADAR TABLE

VFHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
HAW-12 X-Y USB-30	1 12 21	5 15 37	53	-126	-25	172	42	9	-47	211149		5 16 50	14	-125	-26	-168	41	-14	-47	211038				
STN-00 A-E USB150	1 12 20	5 15 38	1	-126	-26	-150	21	-53	-54	212221		5 16 50	21	-125	-26	-137	12	-72	-45	212563				
GDS-28 X-Y USB-85	1 12 23	5 15 38	1	-126	-25	-145	20	66	-32	212252		5 15 50	24	-125	-26	-132	11	74	-46	212660				
MAR-25 H-D USB210	1 12 19	5 15 38	3	-126	-25	-145	20	-57	-50	212254		5 16 50	22	-125	-26	-132	11	-76	-42	212661				
TEX-16 X-Y USB-30	1 5 48	5 15 38	8	-126	-25	-129	14	-72	-39	212581		5 16 43	56	-125	-25	-121	3	-86	-31	212820				
CPO-08 X-Y USB-30	1 12 14	5 17 35	48	-124	-25	105	31	58	-13	211486		5 18 48	1	-123	-25	101	46	43	-8	210617				
GWM-24 X-Y USB-30	1 12 8	5 17 35	54	-124	-25	139	39	39	-36	211094		5 18 48	2	-123	-26	157	47	20	-38	210553				
HSK-25 X-Y USB-85	1 12 16	5 17 35	55	-124	-25	76	62	-8	27	210221		5 18 48	12	-123	-25	50	75	-10	12	209792				
PKS-96 H-D USB210	1 12 13	5 17 35	58	-124	-25	81	62	28	4	210222		5 18 48	11	-123	-25	60	76	13	7	209777				
HAW-12 X-Y USB-30	1 12 7	5 17 36	14	-125	-26	-155	38	-29	-46	211121		5 18 48	21	-124	-26	-139	29	-50	-42	211430				

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE
MAR-95 H-D USB210	0	1	49	5	17	36	18	-125	-26	-125	3	-86	-35	213014	5	17	38	8	-125	-26	-125	3	-86	-35	212946
STN-00 A-E USB150	0	16	52	5	17	36	19	-125	-26	-128	6	-83	-38	212879	5	17	53	11	-125	-26	-126	3	-86	-36	212195
GDS-28 X-Y USB-85	0	2	2	5	17	36	20	-125	-26	-125	3	84	-55	213011	5	17	38	21	-125	-26	-125	3	85	-55	212935
CRO-08 X-Y USB-30	1	12	26	5	19	34	0	-123	-25	98	57	33	-5	210178	5	20	46	27	-122	-25	96	72	18	-2	209626
GWM-24 X-Y USB-30	1	12	24	5	19	34	7	-123	-26	17?	51	6	-39	210376	5	20	46	32	-122	-26	-164	49	-14	-39	210286
HSK-25 X-Y USB-85	1	12	27	5	19	34	9	-123	-25	6	79	-11	1	209666	5	20	46	35	-122	-25	-57	73	-10	-14	209618
PKS-96 H-C USB210	1	12	26	5	19	34	10	-123	-25	12	62	2	8	209642	5	20	46	35	-122	-25	-64	75	-14	7	209588
HAW-12 X-Y USB-30	1	12	24	5	19	34	20	-124	-25	-131	21	-63	-38	211764	5	20	46	44	-123	-26	-122	9	-8C	-32	212372
CRO-08 X-Y USB-30	1	12	11	5	21	32	19	-122	-25	95	83	7	-1	209415	5	22	44	30	-121	-26	-96	82	-8	-1	209278
GWM-24 X-Y USB-30	1	12	11	5	21	32	27	-123	-26	-150	45	-27	-38	210387	5	22	44	38	-122	-26	-135	34	-46	-36	210732

CONT'D

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y USB-85	1	12	12	5	21	32	29	-123	-25	-74	64	-8	-25	209722	5	22	44	40	-122	-25	-88	50	-2	-40	210031
PKS-96 H-D USB210	1	12	11	5	21	32	30	-123	-25	-79	65	-24	5	209691	5	22	44	41	-122	-25	-90	51	-39	0	210009
CRO-08 X-Y USB-30	1	12	27	5	23	30	28	-122	-26	-96	71	-19	-2	209353	6	0	42	56	-121	-26	-100	56	-34	-5	209625
HSK-25 X-Y USB-85	1	12	24	5	23	30	36	-122	-25	-94	41	5	-49	210343	6	0	43	0	-121	-25	-103	27	24	-60	210887
GWM-24 X-Y USB-30	1	12	23	5	23	30	36	-122	-26	-128	26	-59	-34	211090	6	0	42	59	-121	-26	-121	12	-76	-30	211741
PKS-96 H-D USB210	0	57	51	5	23	30	37	-122	-25	-96	41	-49	-5	210326	6	0	28	28	-121	-25	-102	30	-59	-11	210058
ACN-75 X-Y USB-30	1	12	13	6	1	28	14	-119	-26	115	12	76	-24	211645	6	2	40	26	-118	-26	115	28	60	-22	210615
CRO-08 X-Y USB-30	1	12	11	6	1	28	49	-121	-26	-102	45	-44	-8	209922	6	2	41	0	-120	-26	-106	30	-59	-14	210502
HSK-25 X-Y USB-85	1	12	9	6	1	28	50	-121	-25	-109	18	44	-64	211288	6	2	40	59	-120	-25	-117	6	78	-62	211902
MAD-23 X-Y USB-85	0	30	49	6	2	9	37	-119	-26	129	3	85	51	210859	6	2	40	27	-118	-27	134	7	80	45	211777

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CYI-04 X-Y USB-30	0	28	1	6	2	12	22	-118	-26	122	3	86	-32	210904	6	2	40	23	-118	-26	125	8	80	-35	211729
ACN-75 X-Y USB-30	1	12	25	6	3	26	27	-118	-26	117	38	49	-21	210042	6	4	38	51	-117	-26	124	53	32	-20	2C9268
CYI-04 X-Y USB-30	1	12	23	6	3	26	29	-118	-27	132	16	69	-40	211207	6	4	38	51	-117	-27	145	26	50	-47	210495
MAD-23 X-Y USB-85	1	12	25	6	3	26	30	-118	-27	143	13	74	36	211376	6	4	38	55	-117	-27	158	19	69	21	210858
CRO-08 X-Y USB-30	1	12	25	6	3	26	53	-120	-26	110	20	69	-18	210950	6	4	39	18	-119	-26	116	6	-83	-25	211649
ACN-75 X-Y USB-30	1	12	16	6	5	24	39	-117	-26	133	62	21	-19	208905	6	6	36	54	-116	-27	165	71	5	-19	208535
CYI-04 X-Y USB-30	1	12	11	6	5	24	40	-117	-27	155	31	35	-51	210152	6	6	36	50	-116	-27	173	35	10	-54	209790
MAD-23 X-Y USB-85	1	12	10	6	5	24	44	-118	-27	168	22	68	11	210636	6	6	36	54	-117	-27	-175	22	68	-4	210447
PCA-02 X-Y USB-30	0	46	52	6	5	49	47	-117	-27	124	3	86	-34	210577	6	6	36	39	-116	-27	131	10	77	-40	211138
MIL-71 X-Y USB-30	1	12	22	6	7	22	42	-116	-27	128	10	78	-37	211115	6	8	35	4	-115	-27	139	20	61	-45	21C328

GOT-9

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HR	S	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HR	S	RA	DEC	AZ	ELV	X	Y	RANGE		
BDA-02 X-Y USB-30	1	12	22	6	7	22	44	-116	-27	139	17	65	-46	210677	6	8	35	5	-115	-27	153	25	44	-54	210072
CYI-04 X-Y USB-30	1	12	23	6	7	22	55	-117	-27	-174	35	-8	-55	209713	6	8	35	18	-116	-27	-157	31	-33	-52	209763
ACN-75 X-Y USB-30	1	12	26	6	7	22	56	-117	-27	-162	70	-6	-19	208466	6	8	35	22	-116	-27	-133	61	-22	-19	208561
MAD-23 X-Y USB-85	1	12	21	6	7	22	59	-117	-27	-164	21	69	-15	210462	6	8	35	20	-116	-27	-149	15	72	-30	210621
TEX-16 X-Y USB-30	0	43	31	6	7	51	30	-115	-27	122	3	86	-32	210252	6	8	35	1	-115	-27	128	10	77	-37	210914
TEX-16 X-Y USB-30	1	12	9	6	9	20	49	-115	-27	135	18	65	-42	210399	5	10	32	55	-114	-27	148	27	46	-49	209719
MIL-71 X-Y USB-30	1	12	10	6	9	20	54	-115	-27	148	26	47	-49	209921	6	10	33	4	-114	-27	164	32	23	-54	209451
BDA-02 X-Y USB-30	1	12	9	6	9	20	59	-115	-27	164	29	27	-58	209802	6	10	33	8	-114	-27	-179	30	-2	-60	209560
CYI-04 X-Y USB-30	1	12	8	6	9	21	16	-116	-27	-146	26	-49	-48	209925	6	10	33	24	-115	-27	-134	16	-68	-42	210339
MAD-23 X-Y USB-85	0	57	30	6	9	21	16	-116	-27	-140	10	77	-40	210823	6	10	18	45	-115	-27	-130	3	85	-50	210439

60106

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA										
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y
ACN-75 X-Y USB-30	1	12	11	6	9	21	16	-116 -27	-123	52	-34	-20	208763	6	10	33	28	-115 -27	-117	37	-50	-22	209260	
GDS-28 X-Y USB-85	0	55	3	6	9	37	55	-115 -27	126	3	85	54	210424	6	10	32	58	-114 -27	135	11	75	44	210642	
MAR-95 H-D USB210	0	54	39	6	9	38	19	-115 -27	126	3	86	-36	210407	6	10	32	57	-114 -27	135	11	75	-44	210646	
STN-00 A-E USB150	0	22	53	6	10	10	5	-114 -27	128	3	86	-38	210113	6	10	32	58	-114 -27	131	6	82	-41	210912	
STN-00 A-E USB150	1	12	21	6	11	18	59	-114 -27	140	13	71	-48	210467	6	12	31	20	-113 -27	154	20	51	-57	209884	
GDS-28 X-Y USB-85	1	12	24	6	11	18	59	-114 -27	143	17	69	35	210219	6	12	31	23	-113 -27	158	24	65	20	209683	
MAR-95 H-D USB210	1	12	23	6	11	18	59	-114 -27	143	17	63	-50	210223	6	12	31	22	-113 -27	158	24	41	-58	209687	
TEX-16 X-Y USB-30	1	12	23	6	11	19	2	-114 -27	159	32	30	-52	209414	6	12	31	25	-113 -27	177	35	5	-55	209104	
MIL-71 X-Y USB-30	1	12	22	6	11	19	7	-114 -27	177	34	5	-56	209294	6	12	31	30	-113 -27	-165	33	-22	-55	209224	
BDA-02 X-Y USB-30	1	12	22	6	11	19	11	-115 -27	-167	29	-23	-58	209540	6	12	31	33	-114 -27	-151	24	-48	-53	209691	

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VEHICLE 1 RADAR TABLE

TRACKING TIME

STATION ACQUISITION DATA

STATION TERMINATION DATA

HRS MIN SEC

DAY HRS MIN SEC RA DEC AZ ELV X Y RANGE

DAY HRS MIN SEC RA DEC AZ ELV X Y RANGE

CYI-04
X-Y USB-30

0 32 8 6 11 19 21 -115 -27 -127 8 -80 -36 210703

6 11 51 30 -115 -27 -123 3 -86 -33 209720

ACN-75
X-Y USB-30

1 12 23 6 11 19 23 -115 -27 -116 26 -61 -23 209685

6 12 31 46 -114 -27 -116 11 -77 -25 210414

HAW-12
X-Y USB-30

0 33 30 6 11 55 51 -113 -27 121 3 87 -31 209696

6 12 29 22 -112 -27 124 9 79 -34 210436

HSK-25
X-Y USB-85

1 12 12 6 13 16 59 -112 -26 120 3 84 60 210808

6 14 29 11 -111 -26 111 16 52 64 209899

HAW-12
X-Y USB-30

1 12 9 6 13 17 2 -112 -27 131 18 67 -38 209933

6 14 29 11 -111 -27 142 29 48 -44 209169

STN-00
A-E USB150

1 12 7 6 13 17 16 -113 -27 164 23 32 -62 209616

6 14 29 23 -112 -28 -179 25 -2 -65 209372

MAR-95
H-D USB210

1 12 8 6 13 17 17 -113 -27 169 26 21 -62 209457

6 14 29 24 -112 -28 -174 27 -12 -63 209280

GDS-28
X-Y USB-85

1 12 8 6 13 17 17 -113 -27 169 26 63 10 209452

6 14 29 25 -112 -28 -174 27 63 -5 209276

TEX-16
X-Y USB-30

1 12 8 6 13 17 23 -113 -27 -170 34 -14 -55 209041

6 14 29 31 -112 -27 -153 30 -38 -51 209142

MIL-71
X-Y USB-30

1 12 7 6 13 17 27 -114 -27 -154 29 -39 -52 209313

6 14 29 34 -113 -27 -140 21 -60 -46 209626

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SFC	RA	DEC	AZ	ELV	X	Y	RANGE
BDA-02 X-Y USB-30	1	12	9	6	13	17	29	-114	-27	-141	18	-62	-48	209899	6	14	29	38	-113	-27	-130	8	-80	-39	210357
HSK-25 X-Y USB-85	1	12	26	6	15	15	8	-111	-26	106	25	31	61	209333	6	16	27	34	-110	-27	98	38	10	51	208475
HAW-12 X-Y USB-30	1	12	25	6	15	15	17	-112	-27	152	35	34	-47	208803	6	16	27	41	-111	-28	170	40	11	-49	208407
STN-00 A-E USB150	1	12	23	6	15	15	26	-112	-28	-168	24	-25	-63	209349	6	16	27	49	-111	-28	-152	19	-53	-57	209465
MAR-95 H-D USB210	1	12	26	6	15	15	27	-112	-28	-162	25	-33	-60	209303	6	16	27	53	-111	-28	-147	19	-58	-53	209493
GDS-28 X-Y USB-85	1	12	22	6	15	15	29	-112	-28	-162	25	54	-16	209297	6	16	27	51	-111	-28	-147	19	68	-31	209488
TEX-16 X-Y USB-30	1	12	22	6	15	15	33	-113	-27	-143	24	-53	-47	209340	6	16	27	55	-112	-27	-132	14	-72	-40	209783
MIL-71 X-Y USB-30	1	4	7	6	15	15	35	-113	-27	-132	13	-72	-40	209940	6	16	19	42	-112	-27	-123	3	-86	-33	210042
GWM-24 X-Y USB-30	1	5	18	6	15	24	4	-111	-27	11°	?	87	-29	210120	6	16	29	??	-110	-27	124	16	71	-32	209749
PKS-96 H-D USB210	0	37	30	6	15	50	4	-111	-25	104	30	59	-12	207699	6	16	27	34	-110	-27	100	37	52	-8	208522

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CRO-08 X-Y USB-30	0	15	23	6	16	12	8	-110	-26	118	3	87	-28	209704	6	16	27	31	-110	-26	116	6	83	-26	210236
CRO-08 X-Y USB-30	1	12	14	6	17	13	10	-110	-27	112	16	73	-22	209605	6	18	25	24	-109	-27	108	30	59	-15	208631
GWM-24 X-Y USB-30	1	12	15	6	17	13	13	-110	-27	129	24	60	-35	209102	6	18	25	28	-109	-27	140	36	41	-38	208318
PKS-96 H-D USB210	1	12	12	6	17	13	18	-110	-27	95	47	43	-3	208017	6	18	25	30	-109	-27	86	61	29	2	207352
HSK-25 X-Y USB-85	1	12	11	6	17	13	20	-110	-27	92	48	2	42	207984	6	18	25	31	-109	-27	81	62	-5	28	207344
HAW-12 X-Y USB-30	1	12	9	6	17	13	33	-111	-28	-176	40	-5	-50	208290	6	18	25	42	-110	-28	-157	36	-28	-48	208318
MAR-95 H-C USB210	1	11	43	6	17	13	42	-112	-28	-138	13	-71	-47	208715	6	18	25	25	-110	-28	-127	3	-86	-37	210158
STN-00 A-E USB150	1	12	7	6	17	13	43	-111	-28	-143	14	-67	-51	209646	6	18	25	50	-110	-28	-131	5	-83	-41	210058
GDS-28 X-Y USB-85	1	11	57	6	17	13	43	-112	-28	-138	13	73	-40	209711	6	18	25	40	-110	-28	-127	3	85	-53	210170
TEX-16 X-Y USB-30	0	15	25	6	17	13	47	-112	-27	-125	6	-83	-35	210148	6	17	29	12	-112	-27	-123	3	-86	-33	209529

OTTO

VEHICLE 1 RADAR TABLE

	TRACKING TIME				STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC		DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CRO-08 X-Y USB-30	1	12	20		6	19	11	26	-109	-27	105	40	49	-11	208069	6	20	23	46	-108	-27	102	55	34	-7	207302
GWM-24 X-Y USB-30	1	12	24		6	19	11	32	-109	-28	150	43	28	-40	207943	6	20	23	56	-108	-28	170	48	8	-41	207555
HSK-25 X-Y USB-85	1	12	23		6	19	11	33	-109	-27	68	71	-7	18	207047	6	20	23	56	-108	-27	16	81	-9	2	206748
PKS-96 H-D USB210	1	12	22		6	19	11	33	-109	-27	76	71	18	4	207043	6	20	23	55	-108	-27	28	83	3	6	206730
HAW-12 X-Y USB-30	1	12	21		6	19	11	48	-110	-28	146	31	-42	-45	208479	6	20	24	9	-109	-28	-134	21	-62	-40	208890
CRO-08 X-Y USB-30	0	3	12		6	21	9	39	-108	-27	101	6	24	-4	206914	6	21	12	51	-108	-27	101	67	23	-4	206743
PKS-96 H-D USB210	0	3	2		6	21	9	48	-109	-27	-52	81	-7	6	206654	6	21	12	51	-109	-27	-55	80	-8	6	206512
GWM-24 X-Y USB-30	0	3	2		6	21	9	49	-109	-28	-174	49	-6	-41	207446	6	21	12	51	-109	-28	-173	49	-6	-41	207302
HSK-25 X-Y USB-85	0	3	2		6	21	9	49	-109	-27	-44	78	-8	-8	205677	6	21	12	51	-109	-27	-47	78	-8	-9	206536
HAW-12 X-Y USB-30	0	2	47		6	21	10	3	-109	-28	-127	13	-74	-36	209243	6	21	12	51	-109	-28	-127	12	-75	-36	209138

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26 JUL 71 PCH TO JET LAZ 80.1

VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA																
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	FLV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
HAW-12 X-Y USB-30	0 52 24				6	21	13	7	-109	-28	-127	12	-75	-36	205127		6	22	5	31	-108	-27	-121	3	-86	-31	208940	
CRO-08 X-Y USB-30	1 8 59				6	21	13	7	-108	-27	101	67	23	-4	205727		6	22	22	6	-107	-27	107	81	9	-3	206501	
GWM-24 X-Y USB-30	1 9 7				6	21	13	7	-109	-28	-173	49	-7	-41	207288		6	22	22	14	-108	-28	-153	44	-25	-40	2075C4	
HSK-25 X-Y USB-85	1 9 8				6	21	13	7	-109	-27	-47	78	-8	-9	206522		6	22	22	15	-108	-27	-76	66	-6	-23	206755	
PKS-96 H-D USB210	1 9 8				6	21	13	7	-109	-27	-55	80	-8	6	206499		6	22	22	15	-108	-27	-81	67	-23	3	206730	
CRO-08 X-Y USB-30	1 12 41				6	23	7	51	-107	-27	-141	87	-2	-2	206373		7	0	20	32	-106	-27	-102	73	-17	-4	206390	
HSK-25 X-Y USB-85	1 12 43				6	23	7	57	-108	-27	-86	57	-3	-33	206919		7	0	20	40	-107	-27	-95	43	6	-47	207320	
PKS-96 H-D USB210	1 12 43				6	23	7	58	-108	-27	-85	57	-3	-33	0	206896		7	0	20	41	-107	-27	-98	43	-47	-6	207308
GWM-24 X-Y USB-30	1 12 39				6	23	8	1	-108	-28	-142	38	-39	-38	207680		7	0	20	40	-107	-28	-130	26	-57	-35	208140	
CRO-08 X-Y USB-30	1 12 35				7	1	5	58	-107	-27	-102	62	-27	-5	206511		7	2	18	33	-106	-27	-104	47	-42	-9	206893	

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
PKS-96 H-D USB210	0	17	54	7	1	6	1	-107	-27	-103	34	-56	-10	207677	7	1	23	55	-107	-27	-104	30	-59	-12	206946
HSK-25 X-Y USB-85	1	12	34	7	1	6	1	-107	-27	-101	34	16	-55	207639	7	2	18	36	-106	-27	-109	20	42	-62	208216
GWM-24 X-Y USB-30	1	12	29	7	1	6	9	-107	-28	-125	17	-70	-33	208515	7	2	18	38	-106	-28	-119	3	-87	-29	209215
ACN-75 X-Y USB-30	0	37	57	7	1	40	5	-105	-27	117	3	87	-27	208043	7	2	18	1	-104	-27	116	11	78	-26	208727
ACN-75 X-Y USB-30	1	12	29	7	3	3	45	-104	-27	116	21	67	-24	208067	7	4	16	14	-103	-27	118	36	50	-23	207112
CRD-08 X-Y USB-30	1	12	43	7	3	4	17	-106	-27	-106	37	-52	-13	207232	7	4	16	59	-105	-27	-111	22	-67	-19	207871
HSK-25 X-Y USB-85	0	50	19	7	3	4	18	-106	-27	-115	11	64	-63	203603	7	3	54	37	-105	-27	-121	3	84	-59	208016
CYI-04 X-Y USB-30	1	6	5	7	3	10	11	-104	-28	124	3	86	-34	208767	7	4	16	16	-103	-28	132	14	72	-41	208316
MAD-23 X-Y USB-85	1	5	6	7	3	11	16	-104	-28	131	3	85	48	208741	7	4	16	22	-103	-28	142	11	76	37	208486
MAD-23 X-Y USB-85	1	14	29	7	4	50	60	-103	-28	151	15	73	27	208727	7	6	14	28	-102	-28	167	20	69	12	207698

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	1	12	41	7	5	1	44	-103	-28	122	46	39	-21	205601	7	6	14	25	-102	-28	133	60	23	-20	205935
CYI-04 X-Y USB-30	1	12	38	7	5	1	47	-103	-28	140	21	59	-46	207843	7	6	14	25	-102	-28	154	29	38	-52	207218
CRO-08 X-Y USB-30	0	49	53	7	5	2	16	-105	-27	-114	12	-76	-24	208255	7	5	52	5	-104	-27	-118	3	-87	-28	207752
BDA-02 X-Y USB-30	1	12	25	7	7	0	5	-102	-28	128	5	84	-37	208519	7	8	12	30	-101	-28	138	15	68	-46	207737
ACN-75 X-Y USB-30	1	12	35	7	7	0	15	-102	-28	150	67	12	-20	205653	7	8	12	50	-101	-28	-168	70	-4	-20	205449
CYI-04 X-Y USB-30	1	12	32	7	7	0	15	-102	-28	165	33	22	-55	206947	7	8	12	48	-101	-28	-177	34	-5	-56	206730
MAD-23 X-Y USB-85	1	12	33	7	7	0	20	-103	-28	178	21	69	-2	207540	7	8	12	53	-102	-28	-166	20	70	-13	207478
MIL-71 X-Y USB-30	0	27	39	7	7	44	48	-101	-28	124	3	86	-34	207357	7	8	12	27	-100	-28	128	8	80	-37	208180
TEX-16 X-Y USB-30	0	40	28	7	8	57	57	-101	-28	125	4	85	-35	208305	7	9	38	25	-100	-28	130	11	76	-39	206570
MIL-71 X-Y USB-30	0	40	23	7	8	58	2	-101	-28	135	15	69	-43	207660	7	9	38	25	-100	-28	141	21	59	-47	206006

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
BDA-02 X-Y USB-30	0	40	22	7	8	58	3	-101	-28	147	21	55	-52	207329	7	9	38	25	-100	-28	155	25	42	-55	2C5780
ACN-75 X-Y USB-30	0	40	5	7	8	58	20	-102	-28	-144	65	-15	-20	205449	7	9	38	25	-1C1	-28	-132	59	-24	-20	204314
CYI-04 X-Y USB-30	0	40	5	7	8	58	20	-102	-28	-164	32	-23	-55	206709	7	9	38	25	-1C1	-28	-155	29	-37	-52	205540
MAD-23 X-Y USB-85	0	39	59	7	8	58	26	-102	-28	-156	17	71	-23	207527	7	9	38	25	-1C1	-28	-148	14	74	-31	206410
				26	JUL	71	JET TO TFI		LAZ	80.1															
TEX-16 X-Y USB-30	0	31	57	7	9	38	32	-100	-28	130	11	76	-39	206569	7	10	10	25	-99	-28	134	16	68	-42	207436
MIL-71 X-Y USB-30	0	32	2	7	9	38	32	-100	-28	141	21	59	-47	206006	7	1C	10	33	-100	-28	147	25	5C	-50	206949
BDA-02 X-Y USB-30	0	32	9	7	9	38	32	-100	-28	155	25	42	-55	205781	7	1C	10	40	-100	-28	162	27	31	-58	206819
CYI-04 X-Y USB-30	0	32	22	7	9	38	32	-101	-28	-155	29	-37	-52	205541	7	10	10	54	-1C1	-28	-149	26	-47	-50	206880
MAD-23 X-Y USB-85	0	32	24	7	9	38	32	-101	-28	-148	14	74	-31	206411	7	10	10	56	-101	-28	-142	10	77	-37	207780
ACN-75 X-Y USB-30	0	32	24	7	9	38	32	-101	-28	-132	59	-24	-20	204316	7	10	10	56	-101	-28	-126	53	-32	-21	2C5682

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAR-95 H-D USB210	1	12	28	7	10	56	16	-99	-28	131	6	83	-40	207963	7	12	8	44	-98	-28	142	15	66	-50	207235
GDS-28 X-Y USB-85	1	12	28	7	10	56	16	-99	-28	131	6	81	49	207950	7	12	8	45	-98	-28	142	15	71	36	207232
TEX-16 X-Y USB-30	1	12	32	7	10	56	18	-100	-28	143	23	55	-47	206974	7	12	8	50	-99	-28	157	30	33	-53	206409
MIL-71 X-Y USB-30	1	12	33	7	10	56	21	-100	-28	157	29	34	-54	206613	7	12	8	53	-99	-28	175	33	8	-57	206269
BDA-02 X-Y USB-30	1	12	34	7	10	56	25	-100	-28	174	29	11	-60	206623	7	12	8	55	-99	-28	-165	29	-20	-60	206506
ACN-75 X-Y USB-30	1	12	33	7	10	56	37	-101	-28	-121	43	-43	-22	205955	7	12	9	10	-100	-27	-117	28	-59	-24	206539
CYI-04 X-Y USB-30	1	12	30	7	10	56	37	-101	-28	-139	20	-61	-46	207104	7	12	9	7	-100	-28	-129	9	-78	-38	207594
MAD-23 X-Y USB-85	0	9	56	7	10	56	38	-101	-28	-133	4	84	-46	208023	7	11	6	34	-101	-28	-132	3	85	-48	207594
STN-00 A-E USB150	0	59	52	7	11	8	52	-99	-28	129	3	86	-39	207478	7	12	8	44	-98	-28	139	11	74	-48	207483
HAW-12 X-Y USB-30	1	12	18	7	12	54	14	-98	-28	122	3	86	-32	207860	7	14	6	32	-97	-28	130	16	70	-38	206937

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HR S	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HR S	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
STN-00 A-E USB150	1	12	16	7	12	54	25	-98	-28	148	16	61	-54	207072	7	14	6	40	-97	-28	162	22	37	-62	206590
MAR-95 H-D USB210	1	12	19	7	12	54	25	-99	-28	152	20	52	-56	206851	7	14	6	44	-97	-28	167	25	25	-62	206426
GDS-28 X-Y USB-85	1	12	18	7	12	54	26	-99	-28	152	20	67	26	206846	7	14	6	44	-97	-28	167	25	64	12	206421
TEX-16 X-Y USB-30	1	12	15	7	12	54	32	-99	-28	169	33	16	-55	206156	7	14	6	47	-98	-28	-173	34	-10	-56	205980
MIL-71 X-Y USB-30	1	12	19	7	12	54	37	-99	-28	-173	33	-11	-56	206168	7	14	6	56	-98	-28	-156	29	-36	-53	206233
BCA-02 X-Y USB-30	1	12	17	7	12	54	40	-99	-28	-158	26	-38	-57	206544	7	14	6	57	-98	-28	-143	19	-61	-49	206799
ACN-75 X-Y USB-30	1	12	7	7	12	54	49	-100	-27	-116	18	-70	-25	206973	7	14	6	56	-99	-27	-117	3	-87	-27	207721
HSK-25 X-Y USB-85	1	12	32	7	14	52	15	-97	-27	116	11	67	62	207187	7	16	4	48	-96	-27	107	23	35	61	206288
HAW-12 X-Y USB-30	1	12	31	7	14	52	24	-97	-28	137	24	57	-42	206418	7	16	4	55	-96	-28	151	33	37	-47	205766
STN-00 A-E USB150	1	12	30	7	14	52	34	-98	-28	173	24	14	-65	206393	7	16	5	4	-97	-28	-170	24	-22	-64	206267

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAR-95 H-D USB210	1	12	30	7	14	52	34	-98	-28	179	26	3	-64	206269	7	16	5	5	-97	-28	-165	25	-30	-61	206212
GDS-28 X-Y USB-85	1	12	30	7	14	52	36	-98	-28	179	26	64	1	206263	7	16	5	6	-97	-28	-165	25	64	-14	206209
TEX-16 X-Y USB-30	1	12	30	7	14	52	41	-98	-28	-161	31	-28	-54	205997	7	16	5	11	-97	-28	-146	25	-51	-49	206219
MIL-71 X-Y USB-30	1	12	29	7	14	52	44	-98	-28	-146	24	-52	-49	206388	7	16	5	12	-97	-28	-134	14	-70	-42	206798
BDA-02 X-Y USB-30	1	1	53	7	14	52	45	-98	-28	-135	12	-73	-44	207058	7	15	54	38	-97	-28	-126	3	-86	-36	206981
PKS-96 H-D USB210	1	12	31	7	16	50	9	-96	-27	104	31	58	-12	205787	7	18	2	39	-95	-27	97	45	45	-5	204956
HSK-25 X-Y USB-85	1	12	26	7	16	50	13	-96	-27	102	32	18	56	205724	7	18	2	39	-95	-27	94	46	4	44	204921
GWM-24 X-Y USB-30	1	12	23	7	16	50	13	-96	-28	121	9	80	-31	207032	7	18	2	37	-94	-28	128	22	62	-35	206073
HAW-12 X-Y USB-30	1	12	22	7	16	50	30	-96	-28	162	37	22	-49	205459	7	18	2	52	-95	-28	-179	40	-1	-50	205196
MAR-95 H-D USB210	1	12	20	7	16	50	45	-97	-28	-154	21	-48	-57	206280	7	18	3	5	-96	-28	-140	14	-69	-48	206571

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
STN-00 A-E USB150	1	12	17	7	16	50	45	-97	-28	-159	21	-43	-61	206287	7	18	3	2	-96	-28	-145	15	-65	-52	206510
GDS-28 X-Y USB-85	1	12	16	7	16	50	47	-97	-28	-154	21	67	-24	206274	7	18	3	4	-96	-28	-140	14	72	-38	206567
TEX-16 X-Y USB-30	1	12	20	7	16	50	49	-97	-28	-137	18	-64	-44	206453	7	18	3	5	-96	-28	-127	7	-81	-36	206979
MIL-71 X-Y USB-30	0	21	14	7	16	50	54	-97	-28	-127	7	-82	-37	207127	7	17	12	8	-97	-28	-124	3	-86	-34	206330
CRO-08 X-Y USB-30	0	57	36	7	17	4	56	-95	-27	118	3	87	-28	206640	7	18	2	33	-94	-27	114	14	75	-23	206562
CRO-08 X-Y USB-30	1	12	25	7	18	48	21	-94	-27	110	24	65	-19	205933	7	20	0	46	-93	-27	106	38	51	-12	205021
PKS-96 H-D USB210	1	10	42	7	18	48	27	-95	-27	91	55	35	-1	204500	7	19	59	9	-94	-27	80	69	21	3	203877
HSK-25 X-Y USB-85	1	10	42	7	18	48	27	-95	-27	87	56	-2	34	204480	7	19	59	9	-94	-27	73	69	-7	20	203877
GWM-24 X-Y USB-30	1	12	29	7	18	48	29	-95	-28	135	31	50	-37	205537	7	20	0	58	-94	-28	148	41	31	-40	204883
HAW-12 X-Y USB-30	1	12	28	7	18	48	46	-96	-28	-166	38	-18	-50	205162	7	20	1	13	-94	-28	-149	32	-40	-46	205325

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
GDS-28 X-Y USB-85	0	30	15	7	18	48	53	-96	-28	-132	7	79	-47	206835	7	19	19	8	-96	-28	-128	3	85	-52	205831
MAR-95 H-D USB210	0	29	57	7	18	48	53	-96	-28	-132	7	80	-42	206838	7	19	18	51	-96	-28	-128	3	86	-38	205835
STN-00 A-E USB150	0	44	58	7	18	48	53	-96	-28	-136	9	77	-46	206738	7	19	33	52	-95	-28	-129	3	86	-39	205867
CRO-C8 X-Y USB-30	1	12	24	7	20	46	24	-93	-27	104	48	41	-9	204490	7	21	58	48	-92	-27	102	64	26	-5	203826
HSK-25 X-Y USB-85	1	12	23	7	20	46	34	-94	-27	50	78	-8	9	203705	7	21	58	57	-93	-27	-35	80	-8	-6	203531
PKS-96 H-D USB210	1	12	20	7	20	46	37	-94	-27	63	79	10	5	203692	7	21	58	57	-93	-27	-42	82	-5	6	203509
GWM-24 X-Y USB-30	1	12	18	7	20	46	41	-94	-28	161	46	17	-41	204562	7	21	58	59	-93	-28	-177	49	-3	-41	204318
HAW-12 X-Y USB-30	1	12	16	7	20	46	56	-95	-28	-135	26	-54	-43	205531	7	21	59	12	-94	-28	-129	14	-72	-37	206039
CRO-08 X-Y USB-30	1	12	31	7	22	44	40	-93	-27	103	74	16	-3	203510	7	23	57	10	-92	-27	171	88	0	-2	203244
HSK-25 X-Y USB-85	1	12	31	7	22	44	49	-93	-27	-67	72	-7	-16	203531	7	23	57	19	-92	-27	-84	59	-4	-31	203730

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
PKS-96 H-D USB210	1	12	32	7	22	44	49	-93	-27	-74	74	-16	4	203506	7	23	57	21	-92	-27	-88	60	-30	1	203709
GWM-24 X-Y USB-30	1	12	28	7	22	44	53	-93	-28	-162	47	-16	-41	204294	7	23	57	20	-92	-28	-144	39	-36	-39	204495
HAW-12 X-Y USB-30	0	14	33	7	22	45	1	-94	-28	-123	6	-83	-33	206428	7	22	59	35	-94	-28	-122	3	-86	-32	205853
CRO-08 X-Y USB-30	1	12	23	8	0	42	44	-92	-27	-106	80	-10	-3	203177	8	1	55	8	-91	-27	-101	64	-25	-5	203314
HSK-25 X-Y USB-85	1	12	26	8	0	42	50	-92	-27	-91	49	1	-41	203936	8	1	55	16	-91	-27	-100	36	13	-52	204414
PKS-96 H-D USB210	1	12	24	8	0	42	51	-92	-27	-94	50	-40	-3	203517	8	1	55	16	-91	-27	-101	36	-54	-9	204409
GWM-24 X-Y USB-30	1	12	15	8	0	43	1	-92	-28	-135	32	-49	-37	204724	8	1	55	16	-91	-28	-126	19	-67	-34	205278
ACN-75 X-Y USB-30	1	12	18	8	2	40	33	-89	-27	117	4	86	-27	206067	8	3	52	52	-88	-27	116	19	69	-25	205028
HSK-25 X-Y USB-85	1	12	32	8	2	41	1	-91	-27	-105	26	28	-60	204760	8	3	53	32	-90	-27	-113	13	59	-63	205377
CRO-08 X-Y USB-30	1	12	29	8	2	41	1	-91	-27	-103	54	-35	-7	203511	8	3	53	30	-90	-27	-105	39	-50	-12	204013

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VEHICLE 1 RADAR TABLE

VEHICLE X-Y USB-30	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SFC	RA	DEC	AZ	ELV	X	Y	RANGE
GWM-24	0	33	38	8	2	41	10	-91	-28	-122	10	-79	-31	205695	8	3	14	48	-91	-27	-119	3	-87	-29	204783
ACN-75	1	12	25	8	4	38	26	-88	-27	117	29	58	-23	204391	8	5	50	51	-87	-27	120	44	42	-21	203504
CYT-04	1	12	19	8	4	38	35	-88	-28	128	8	80	-37	205540	8	5	50	53	-87	-28	138	16	62	-44	204732
MAD-23	1	12	18	8	4	38	40	-89	-28	136	7	80	43	205616	8	5	50	57	-87	-28	149	15	73	29	204996
HSK-25	0	10	49	8	4	38	58	-90	-27	-119	5	80	-60	205736	8	4	49	47	-90	-27	-121	3	84	-59	205294
CRD-08	1	12	17	8	4	36	4	-90	-27	-108	29	-60	-16	204364	8	5	51	22	-89	-27	-113	15	-74	-22	205046
ACN-75	1	12	14	8	6	36	51	-87	-27	126	54	31	-21	203032	8	7	49	4	-86	-27	145	66	14	-20	202526
CYT-04	1	12	15	8	6	36	54	-87	-28	147	26	49	-49	204291	8	7	49	5	-86	-28	163	32	25	-54	203809
MAD-23	1	12	13	8	6	36	58	-88	-28	160	19	70	19	204678	8	7	49	10	-87	-28	175	22	68	4	204376
CRD-08	0	10	9	8	6	37	10	-89	-27	-117	5	-84	-27	205476	8	6	47	18	-85	-27	-118	3	-87	-28	205072

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
BDA-02 X-Y USB-30	0	0	37	9	7	48	17	-86	-28	125	3	86	-35	205421	8	7	48	54	-86	-28	126	3	86	-36	205444
ACN-75 X-Y USB-30	1	14	19	8	8	32	54	-87	-27	169	70	4	-16	202418	8	9	47	13	-86	-27	-148	67	-13	-19	202253
PDA-02 X-Y USB-30	1	12	18	8	8	34	43	-86	-28	133	11	76	-42	204910	8	9	47	1	-85	-28	145	20	57	-50	204194
CYI-04 X-Y USB-30	1	12	20	8	8	34	55	-87	-26	175	34	8	-55	203597	8	9	47	15	-86	-28	-167	33	-19	-54	203503
MAD-23 X-Y USB-85	1	12	22	8	8	34	55	-87	-28	-174	21	69	-6	204272	8	9	47	17	-86	-28	-158	18	70	-21	204307
MIL-71 X-Y USB-30	1	6	53	8	8	40	5	-86	-28	124	3	86	-34	205088	8	9	46	58	-85	-27	132	14	72	-41	204557
TEX-16 X-Y USB-30	1	12	8	8	10	32	54	-85	-27	129	11	76	-38	204633	8	11	45	2	-84	-27	140	22	58	-45	203866
MIL-71 X-Y USB-30	1	12	10	8	10	32	58	-85	-28	140	21	59	-46	204058	8	11	45	8	-84	-27	154	25	38	-52	203474
BDA-02 X-Y USB-30	1	12	10	8	10	33	3	-85	-28	155	25	42	-55	203820	8	11	45	13	-84	-28	171	30	15	-59	203453
ACN-75 X-Y USB-30	1	12	19	8	10	33	13	-86	-27	-132	59	-24	-20	202338	8	11	45	32	-85	-27	-121	46	-40	-21	202722

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
CYI-04 X-Y USB-30	1 12 18	8	10	33	14	-86	-28	-155	3C	-36	-52	203554	8	11	45	32	-85	-27	-141	22	-57	-46	2C3862	
MAD-23 X-Y USB-85	1 12 16	8	10	33	16	-86	-28	-148	14	73	-31	204419	8	11	45	32	-85	-27	-135	6	81	-45	204774	
GDS-28 X-Y USB-85	0 9 30	8	11	35	31	-83	-27	127	3	85	53	204507	8	11	45	2	-83	-27	128	4	83	51	204870	
MAR-95 H-D USB210	0 9 3	8	11	35	55	-83	-27	127	3	86	-37	204526	8	11	44	58	-83	-27	128	4	84	-38	204871	
BDA-02 X-Y USB-30	1 14 13	8	12	29	9	-84	-28	-178	30	-4	-60	203408	8	13	43	22	-82	-27	-160	27	-33	-57	203325	
MAR-95 H-D USB210	1 12 19	8	12	30	49	-84	-28	136	11	74	-45	204372	8	13	43	8	-82	-27	149	20	55	-54	203721	
STN-00 A-E USB150	1 12 18	8	12	30	49	-84	-28	133	7	81	-42	204634	8	13	43	8	-82	-27	145	16	64	-52	203948	
GDS-28 X-Y USB-85	1 12 17	8	12	30	50	-84	-28	136	11	74	43	204367	8	13	43	6	-82	-27	149	20	67	29	203715	
TEX-16 X-Y USB-30	1 12 21	8	12	30	52	-84	-28	150	28	44	-50	203455	8	13	43	12	-83	-27	166	34	20	-54	202999	
MIL-71 X-Y USB-30	1 12 19	8	12	30	57	-84	-28	166	32	21	-55	203700	8	13	43	16	-83	-27	-176	34	-6	-56	202978	

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	1	12	23	8	12	31	6	-85	-27	-118	36	-51	-22	203041	8	13	43	30	-84	-27	-115	20	-68	-24	203714
CYT-04 X-Y USB-30	1	12	18	8	12	31	11	-85	-27	-133	15	-70	-41	204121	8	13	43	30	-84	-27	-123	4	-86	-33	204694
HAW-12 X-Y USB-30	1	12	4	8	14	28	59	-82	-27	125	10	77	-34	204172	8	15	41	3	-81	-27	134	23	60	-40	203328
STN-00 A-E USB150	1	12	7	8	14	29	11	-83	-27	155	20	49	-58	203579	8	15	41	18	-82	-27	171	25	20	-64	203220
GDS-28 X-Y USB-85	1	12	6	8	14	29	12	-83	-27	156	24	65	19	203380	8	15	41	18	-82	-27	176	27	63	4	203082
MAR-95 H-D USB210	1	12	4	8	14	29	13	-83	-27	156	24	38	-59	203384	8	15	41	18	-82	-27	176	27	8	-63	203086
TEX-16 X-Y USB-30	1	12	7	8	14	29	17	-83	-27	178	35	2	-55	202815	8	15	41	23	-82	-27	-163	33	-24	-53	202784
MIL-71 X-Y USB-30	1	12	10	8	14	29	22	-83	-27	-164	32	-24	-54	202949	8	15	41	32	-82	-27	-148	26	-47	-49	203152
BCA-02 X-Y USB-30	1	12	11	8	14	29	24	-84	-27	-149	23	-50	-52	203428	8	15	41	34	-82	-27	-136	15	-69	-44	203803
ACN-75 X-Y USB-30	0	33	33	8	14	29	25	-84	-27	-116	10	-79	-25	204177	8	15	2	58	-84	-26	-116	3	-87	-26	203289

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X
HSK-25 X-Y USB-85	0 28 30	8	15	12	25	-81	-26	120	3	84	60	203342	8	15	40	54	-81	-26	116	8	73	63	204183	
HSK-25 X-Y USB-85	1 12 20	8	16	26	43	-81	-26	111	17	50	64	203597	8	17	39	3	-80	-26	102	30	20	58	202713	
HAW-12 X-Y USB-30	1 12 21	8	16	26	56	-81	-27	143	30	47	-44	202859	8	17	39	17	-80	-27	159	38	25	-48	202317	
STN-00 A-E US8150	1 12 22	8	16	27	6	-82	-27	-178	25	-4	-65	203084	8	17	39	28	-81	-27	-161	23	-37	-61	203070	
GDS-28 X-Y USB-85	1 12 21	8	16	27	7	-82	-27	-173	27	63	-7	202991	8	17	39	28	-81	-27	-156	23	65	-22	203049	
MAR-95 H-D US8210	1 12 23	8	16	27	8	-82	-27	-173	27	-14	-62	202995	8	17	39	31	-81	-27	-156	23	-43	-57	203055	
TFX-16 X-Y USB-30	1 12 25	8	16	27	10	-82	-27	-152	29	-40	-51	202872	8	17	39	35	-81	-27	-138	21	-60	-44	203204	
MIL-71 X-Y USB-30	1 12 24	8	16	27	12	-82	-27	-139	20	-61	-45	203367	8	17	39	36	-81	-27	-128	9	-78	-37	203865	
BDA-02 X-Y USB-30	0 27 27	8	16	27	16	-83	-27	-129	7	-81	-38	204102	8	16	54	42	-82	-27	-125	3	-86	-35	203132	
GWM-24 X-Y USB-30	0 18 46	8	17	20	18	-80	-26	118	3	87	-28	203369	8	17	39	4	-79	-27	119	7	82	-29	203995	

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA												
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CRO-08 X-Y USB-30	1	12	1	8	18	24	54	-80	-26	116	7	83	-25	203915	8	19	36	55	-78	-26	110	21	68	-18	202944
PKS-96 H-D USB210	1	12	3	8	18	24	59	-80	-26	99	38	52	-7	202202	8	19	37	2	-79	-26	91	52	38	0	201464
HSK-25 X-Y USB-85	1	12	0	8	18	24	60	-80	-26	97	39	8	51	202157	8	19	37	C	-79	-26	87	53	-2	37	201442
GWM-24 X-Y USB-30	1	12	2	8	18	25	2	-80	-27	123	16	71	-32	203337	8	19	37	4	-79	-27	132	3C	53	-35	202466
HAW-12 X-Y USB-30	1	12	4	8	18	25	20	-80	-27	172	40	10	-49	202074	8	19	37	23	-79	-27	-168	40	-13	-49	2C1964
STN-00 A-E USB150	1	12	2	8	18	25	29	-81	-27	-151	19	-54	-56	203151	8	19	37	31	-80	-27	-137	12	-73	-46	203485
GDS-28 X-Y USB-85	1	12	3	8	18	25	30	-81	-27	-146	19	68	-32	203177	8	19	37	33	-80	-27	-133	1C	76	-46	203577
MAR-95 H-D USB210	1	12	4	8	18	25	31	-81	-27	-146	19	-59	-52	203180	8	19	37	35	-80	-27	-133	10	-76	-43	2C3582
TEX-16 X-Y USB-30	1	3	5	9	18	25	34	-81	-27	-131	13	-73	-39	203488	8	19	29	39	-80	-27	-122	3	-86	-32	203576
CRO-08 X-Y USB-30	1	12	19	8	20	22	52	-78	-26	107	31	58	-14	202326	8	21	35	11	-77	-26	102	46	44	-8	201476

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HSK-25 X-Y USB-85	1	12	21	8	20	22	59	-79	-26	78	62	-6	27	201053	8	21	35	19	-78	-26	53	75	-9	12	200634
PKS-96 H-D USB210	1	12	21	8	20	22	59	-79	-26	84	62	28	3	201058	8	21	35	21	-78	-26	63	76	13	6	200622
GWM-24 X-Y USB-30	1	12	18	8	20	23	3	-79	-27	140	37	40	-37	201483	8	21	35	21	-78	-27	156	47	21	-39	201442
HAW-12 X-Y USB-30	1	12	21	8	20	23	18	-80	-27	-156	37	-29	-47	202008	8	21	35	39	-79	-27	-140	29	-50	-43	202300
STN-00 A-F USB150	0	12	17	8	20	23	24	-80	-27	-130	5	-84	-35	203760	8	20	35	41	-80	-27	-128	3	-86	-37	203227
CRD-08 X-Y USB-30	1	12	9	8	22	21	7	-77	-26	100	56	33	-6	200988	8	23	33	16	-76	-26	97	71	18	-2	200453
PKS-96 H-D USB210	1	12	8	8	22	21	17	-78	-26	18	83	2	7	200432	8	23	33	25	-77	-26	-64	75	-13	6	200395
HSK-25 X-Y USB-85	1	12	7	8	22	21	18	-78	-26	9	80	-10	2	200453	8	23	33	24	-77	-26	-57	73	-9	-14	200422
GWM-24 X-Y USB-30	1	12	6	8	22	21	23	-78	-27	172	50	7	-40	2012C3	8	23	33	29	-77	-26	-165	49	-13	-39	201117
HAW-12 X-Y USB-30	1	12	7	8	22	21	36	-79	-27	-132	21	-63	-39	202567	8	23	33	43	-78	-26	-123	9	-80	-33	203182

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CRO-08 X-Y USB-30	1	12	21	9	0	19	12	-77	-26	99	82	8	-1	200208	9	1	31	32	-76	-26	-97	82	-6	-1	200077
HSK-25 X-Y USB-85	1	12	19	9	0	19	18	-77	-26	-74	65	-7	-24	200493	9	1	31	37	-76	-25	-87	51	-2	-35	200809
PKS-96 H-D USB210	1	12	21	9	0	19	19	-77	-26	-79	66	-24	4	200463	9	1	31	40	-76	-25	-90	52	-38	0	200787
GWM-24 X-Y USB-30	1	12	17	9	0	19	26	-77	-26	-151	44	-26	-39	201176	9	1	31	43	-76	-26	-135	35	-45	-36	201514
CRO-08 X-Y USB-30	1	12	3	9	2	17	31	-76	-26	-97	72	-18	-2	200090	9	3	29	34	-75	-25	-99	56	-33	-5	200381
HSK-25 X-Y USB-85	1	12	1	9	2	17	34	-76	-25	-94	41	5	-48	201065	9	3	29	35	-75	-25	-102	28	22	-60	201638
PKS-96 H-D USB210	1	0	20	9	2	17	34	-76	-25	-96	42	-48	-4	201049	9	3	17	55	-75	-25	-102	30	-55	-10	200963
GWM-24 X-Y USR-30	1	11	60	9	2	17	45	-76	-26	-128	26	-58	-34	201809	9	3	29	45	-75	-26	-121	13	-75	-30	202477
ACN-75 X-Y USB-30	1	12	16	9	4	15	5	-73	-25	114	11	77	-24	202444	9	5	27	22	-72	-25	114	27	61	-21	201441
HSK-25 X-Y USB-85	1	12	17	9	4	15	28	-75	-25	-108	19	42	-64	202012	9	5	27	45	-74	-25	-116	6	77	-63	202662

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CRO-08 X-Y USB-30	1	12	18	9	4	15	30	-75	-25	-101	46	-43	-8	20C646	9	5	27	48	-74	-25	-105	31	-58	-13	201243
MAD-23 X-Y USB-85	0	29	55	9	4	57	34	-73	-26	128	3	85	52	201629	9	5	27	30	-72	-26	133	7	80	46	202559
CYI-04 X-Y USB-30	0	25	57	9	5	1	29	-73	-26	121	3	87	-31	201710	9	5	27	26	-72	-26	124	8	81	-34	202530
ACN-75 X-Y USB-30	1	12	2	9	6	13	13	-72	-25	116	37	50	-20	200815	9	7	25	15	-71	-25	121	52	34	-19	200049
CYI-04 X-Y USB-30	1	11	58	9	6	13	23	-72	-26	131	16	70	-39	201949	9	7	25	21	-71	-26	143	26	51	-46	201242
MAD-23 X-Y USB-85	1	11	59	9	6	13	28	-73	-26	142	13	74	37	202097	9	7	25	27	-72	-26	156	20	68	22	201583
CRO-08 X-Y USB-30	1	12	1	9	6	13	39	-74	-25	-10c	21	-68	-17	201642	9	7	25	40	-73	-24	-114	6	-83	-24	202382
				26	JUL	71		TEI TO FNT		LAZ	80.1														
ACN-75 X-Y USB-30	7	41	25	9	7	58	17	-72	-25	127	59	26	-18	20C320	9	15	39	41	-73	-26	-116	3	-87	-26	191206
CYI-04 X-Y USB-30	6	28	15	9	7	58	22	-72	-26	151	30	40	-49	201532	9	14	26	37	-73	-26	-122	3	-86	-32	193072
MAD-23 X-Y USB-85	4	59	3	9	7	58	25	-72	-26	164	22	67	15	201963	9	12	57	28	-73	-27	-129	3	85	-51	195336

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VFMICLE 1 RADAR TABLE

VFMICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA												
		HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SFC	RA	DEC	AZ	ELV	X
BDA-02 X-Y USB-30	8 52 1	9	8	36	11	-71	-26	123	3	86	-33	202120		9	17	28	12	-73	-27	-125	3	-86	-25	188416
MIL-71 X-Y USB-30	9 15 18	9	9	28	46	-71	-26	122	3	86	-32	200704		9	18	44	3	-73	-27	-123	3	-86	-33	186438
TEX-16 X-Y USB-30	9 19 59	9	10	33	37	-71	-26	122	3	86	-32	198977		9	19	53	35	-73	-27	-123	3	-86	-33	184565
GDS-28 X-Y USB-85	8 31 33	9	12	15	28	-72	-26	126	3	85	54	196415		9	20	47	2	-73	-27	-127	3	85	-53	183090
MAR-95 H-D USB210	8 30 8	9	12	15	50	-72	-26	126	3	86	-36	196407		9	20	45	58	-73	-27	-127	3	-86	-37	183207
STN-00 A-E USB150	8 15 9	9	12	44	25	-72	-26	127	3	86	-37	195677		9	20	59	34	-73	-27	-128	3	-86	-38	182831
HAW-12 X-Y USB-30	9 48 51	9	14	28	32	-71	-26	120	3	87	-30	193036		10	0	17	23	-73	-27	-121	3	-87	-31	177401
HSK-25 X-Y USB-85	14 3 4	9	15	50	39	-71	-25	119	3	84	61	190909		10	5	53	43	-72	-26	-121	3	84	-55	167601
GWM-24 X-Y USB-30	10 29 47	9	17	51	46	-71	-26	118	3	87	-28	187771		10	4	21	33	-72	-27	-119	3	-87	-29	170357
PKS-96 H-D USR210	9 12 14	9	18	17	45	-71	-26	103	30	59	-11	195540		10	3	29	59	-72	-26	-104	30	-59	-12	170350

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VEHICLE 1 RADAR TABLE

VEHICLE	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CRO-08 X-Y USB-30	13	10	8	9	18	37	55	-71	-26	117	3	87	-27	186574	10	7	48	3	-72	-27	-118	3	-87	-28	164086
ACN-75 X-Y USB-30	12	0	3	10	3	47	11	-70	-27	117	3	87	-27	171376	10	15	47	14	-71	-28	-118	3	-87	-28	148209
CYI-04 X-Y USB-30	9	11	44	10	5	14	60	-70	-28	124	3	86	-34	168759	10	14	26	44	-71	-29	-125	3	-86	-35	151010
MAD-23 X-Y USB-85	7	36	14	10	5	15	54	-70	-28	131	3	85	49	168729	10	12	52	8	-71	-29	-133	3	86	-47	154230
BDA-02 X-Y USB-30	8	39	16	10	8	48	33	-69	-28	126	3	86	-36	162176	10	17	27	49	-70	-29	-127	3	-86	-37	144609
MIL-71 X-Y USB-30	9	4	28	10	9	40	44	-69	-28	124	3	86	-34	160516	10	18	45	12	-70	-29	-126	3	-86	-36	141774
TEX-16 X-Y USB-30	9	9	15	10	10	45	44	-69	-28	124	3	86	-34	158416	10	19	54	59	-70	-29	-125	3	-86	-35	139165
GDS-28 X-Y USB-85	8	13	40	10	12	31	35	-69	-29	129	3	85	51	154927	10	20	45	16	-69	-29	-130	3	85	-50	137251
MAR-95 H-D USB210	8	12	59	10	12	31	60	-69	-29	129	3	86	-39	154908	10	20	44	59	-69	-29	-130	3	-86	-40	137262
STN-00 A-E USB150	7	56	6	10	13	1	43	-69	-29	130	3	86	-40	153910	10	20	57	49	-69	-30	-131	3	-86	-41	136770

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	DAY	HRS	MIN SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN SEC	RA	DEC	AZ	ELV	X	Y	RANGE					
	HR	MIN	SEC									HR	MIN	SEC											
HAW-12 X-Y USB-30	9	40	1	10	14	42	11	-68	-28	122	3	86	-32	150477	11	0	22	11	-69	-30	-124	3	-86	-34	128665
HSK-25 X-Y USB-85	14	23	36	10	15	53	0	-68	-27	122	3	84	58	148010	11	6	16	36	-67	-29	-124	3	85	-56	113309
GWM-24 X-Y USB-30	10	25	38	10	18	4	56	-67	-29	120	3	87	-30	143260	11	4	30	34	-68	-30	-122	3	-86	-32	118051
PKS-96 H-D USB210	9	23	41	10	18	23	44	-67	-28	105	30	59	-13	141044	11	?	47	25	-68	-29	-107	30	-59	-14	118468
CRO-08 X-Y USB-30	13	25	3	10	18	44	9	-67	-28	119	3	87	-29	141823	11	8	9	12	-67	-29	-121	3	-86	-31	108019
ACN-75 X-Y USB-30	12	10	6	11	4	2	55	-64	-29	119	3	87	-29	119315	11	16	13	1	-64	-32	-121	3	-86	-31	82335
CYT-04 X-Y USB-30	8	53	1	11	5	42	26	-64	-31	127	3	86	-37	114861	11	14	35	26	-64	-33	-130	3	-86	-40	87967
MAD-23 X-Y USB-85	6	58	8	11	5	51	15	-65	-31	136	3	86	44	114457	11	12	49	23	-64	-33	-139	3	86	-41	93800
BCA-02 X-Y USB-30	8	11	13	11	9	23	38	-62	-32	131	3	86	-41	104389	11	17	34	51	-62	-34	-134	3	-86	-44	77384
MIL-71 X-Y USB-30	8	41	40	11	10	15	11	-62	-32	129	3	86	-39	101819	11	19	56	51	-62	-34	-132	3	-86	-42	72196

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
TEX-16 X-Y USB-30	8	46	52	11	11	21	41	-62	-32	129	3	86	-39	98426	11	20	8	33	-61	-35	-132	3	-86	-42	67445
GDS-28 X-Y USB-85	7	33	11	11	13	17	25	-61	-33	134	3	86	46	92286	11	20	50	35	-60	-36	-139	3	86	-41	64552
MAR-95 H-D USB210	7	32	16	11	13	17	54	-61	-33	134	3	86	-44	92259	11	20	50	10	-60	-36	-139	3	-85	-49	64581
STN-00 A-E USB150	7	8	50	11	13	51	4	-61	-33	136	3	86	-46	90441	11	20	59	55	-59	-36	-141	3	-85	-51	63901
HAW-12 X-Y USB-30	9	27	2	11	15	24	13	-59	-33	127	3	86	-37	85185	12	0	51	15	-55	-38	-133	3	-86	-43	46071
HSK-25 X-Y USB-85	14	37	49	11	16	13	52	-59	-30	126	3	85	54	82294	12	6	51	41	85	46	23	3	-87	23	2058
GWM-24 X-Y USB-30	11	59	42	11	18	53	25	-56	-33	125	3	86	-35	72421	12	6	53	7	124	-36	128	3	86	-38	1722
PKS-96 H-D USB210	11	52	28	11	18	56	14	-56	-32	110	30	58	-18	70724	12	6	48	42	61	26	12	30	19	58	1681
CRO-08 X-Y USB-30	11	31	34	11	19	17	9	-56	-31	124	3	86	-33	70882	12	6	48	43	99	7	81	3	87	9	2757

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TABLE 6-III.- MISSION RADAR TIMELINE - Continued

(f) LM acquisition and termination during descent - 3° minimum elevation

LM FROM SEP TO PDI

VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
BDA-02 X-Y USB-30	1	5	19	4	4	17	37	-144	-20	120	8	80	-30	216016	4	5	22	56	-143	-21	131	19	66	-38	215378
CYI-04 X-Y USB-30	1	5	22	4	4	17	45	-144	-20	161	39	22	-47	214323	4	5	23	7	-143	-21	180	41	0	-49	214214
ACN-75 X-Y USB-30	1	5	20	4	4	17	52	-144	-20	132	72	14	-12	213258	4	5	23	12	-143	-20	-175	78	-1	-12	213154
MAD-23 X-Y USB-85	1	5	13	4	4	17	56	-144	-21	176	29	61	4	214831	4	5	23	9	-143	-21	-168	28	62	-11	214884
MIL-71 X-Y USB-30	0	36	2	4	4	46	54	-143	-20	115	3	87	-25	215173	4	5	22	57	-143	-21	120	9	79	-29	215909
MIL-71 X-Y USB-30	1	5	2	4	6	11	36	-143	-21	127	19	67	-35	215261	4	7	16	37	-142	-21	139	28	51	-42	214719
TEX-16 X-Y USB-30	1	4	60	4	6	11	37	-143	-21	117	6	83	-27	215964	4	7	16	37	-142	-21	126	18	68	-34	215287
BDA-02 X-Y USB-30	1	4	60	4	6	11	41	-143	-21	141	26	53	-44	214846	4	7	16	41	-142	-21	155	32	33	-50	214497
CYI-04 X-Y USB-30	1	5	4	4	6	11	54	-144	-21	-165	40	-17	-48	214130	4	7	16	58	-143	-21	-148	34	-38	-45	214422
MAD-23 X-Y USB-85	1	4	60	4	6	11	60	-144	-21	-155	25	63	-22	214889	4	7	16	60	-143	-21	-142	18	67	-36	215271

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	1	5	5	4	6	11	60	-144	-20	-134	72	-13	-12	213087	4	7	17	5	-143	-21	-117	59	-28	-14	213428
MAR-95 H-D USB210	0	23	48	4	8	5	12	-142	-21	123	8	80	-33	215717	4	8	28	55	-141	-21	127	12	75	-36	214444
TEX-16 X-Y USB-30	0	23	42	4	8	5	13	-142	-21	135	26	55	-39	214701	4	8	28	55	-142	-21	140	29	49	-42	213471
STN-00 A-E USB150	0	23	42	4	8	5	13	-142	-21	120	4	86	-30	215994	4	8	28	55	-141	-21	124	7	81	-33	214718
GDS-28 X-Y USB-85	0	23	41	4	8	5	14	-142	-21	123	8	75	56	215712	4	8	28	55	-141	-21	127	12	70	51	214441
BDA-02 X-Y USB-30	0	23	34	4	8	5	21	-142	-21	169	36	15	-53	214200	4	8	28	55	-142	-21	175	36	6	-53	213125
MIL-71 X-Y USB-30	0	23	33	4	8	5	22	-142	-21	150	35	36	-46	214262	4	8	28	55	-142	-21	156	37	28	-47	213111
MAD-23 X-Y USB-85	0	23	22	4	8	5	33	-143	-21	-132	12	72	-47	215480	4	8	28	55	-143	-21	-128	9	76	-52	214637
CYI-04 X-Y USB-30	0	23	20	4	8	5	35	-143	-21	-137	28	-52	-40	214599	4	8	28	55	-143	-21	-133	24	-58	-38	213751
ACN-75 X-Y USB-30	0	23	19	4	8	5	36	-143	-20	-112	48	-40	-14	213655	4	8	28	55	-143	-20	-111	43	-45	-15	212835

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TABLE 6-III.- MISSION RADAR TIMELINE - Continued

(g) LM acquisition and termination during ascent - 3° minimum elevation

LEM FROM ASCENT TO INSERTION											
MAD-23 X-Y USB-85	0	7	15	7	3	37	24	-104	-28	136	6 81 44 207596
HSK-25 X-Y USB-85	0	7	15	7	3	37	24	-105	-27	-119	6 78 -61 207649
CYI-04 X-Y USB-30	0	7	15	7	3	37	24	-104	-28	127	8 81 -37 207526
ACN-75 X-Y USB-30	0	7	15	7	3	37	24	-104	-27	117	28 59 -23 206368
CRO-08 X-Y USR-30	0	7	15	7	3	37	24	-105	-27	-108	30 -59 -16 206277
											7 3 44 39 -105 -27 137 7 80 43 207544
											7 3 44 39 -105 -27 -120 5 81 -60 207718
											7 3 44 39 -103 -28 128 9 79 -37 207458
											7 3 44 39 -103 -27 117 30 57 -23 205291
											7 3 44 39 -105 -27 -108 29 -60 -16 205350

TABLE 6-III.- MISSION RADAR TIMELINE - Concluded

(h) LM acquisition and termination during rendezvous - 3° minimum elevation

COAST TO RENDEZVOUS RADAR TRACKING PRIOR TO TPI																											
VEHICLE	RADAR TABLE			STATION ACQUISITION DATA						STATION TERMINATION DATA																	
	TRACKING TIME			HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y
PKS-96 H-D USB210	0	4	46	7	3	44	39	-105	-27	-120	4	-86	-29	207789	7	3	49	25	-105	-27	-120	3	-87	-30	207876		
HSK-25 X-Y USB-85	0	9	49	7	3	44	39	-105	-27	-120	5	81	-60	207743	7	3	54	28	-105	-27	-121	3	84	-59	207987		
MAD-23 X-Y USB-85	0	9	60	7	3	44	39	-104	-28	137	7	80	43	207567	7	3	54	39	-103	-28	138	8	79	41	207656		
CYI-04 X-Y USB-30	0	9	60	7	3	44	39	-103	-28	128	9	79	-37	207480	7	3	54	39	-103	-28	129	10	77	-38	207545		
ACN-75 X-Y USB-30	0	9	60	7	3	44	39	-103	-27	117	30	57	-23	206313	7	3	54	39	-103	-27	117	32	55	-23	206368		
CRO-08 X-Y USB-30	0	9	60	7	3	44	39	-105	-27	-108	29	-60	-16	206376	7	3	54	39	-105	-27	-109	27	-62	-17	206636		
RENDEZVOUS RADAR TRACKING PRIOR TO TPI																											
MAD-23 X-Y USB-85	0	18	0	7	3	54	39	-103	-28	138	8	79	41	207656	7	4	12	39	-103	-28	142	10	77	38	208292		
CYI-04 X-Y USB-30	0	18	0	7	3	54	39	-103	-28	129	10	77	-38	207545	7	4	12	39	-103	-28	132	13	73	-40	208135		
ACN-75 X-Y USB-30	0	18	0	7	3	54	39	-103	-27	117	32	55	-23	206368	7	4	12	39	-103	-27	118	35	51	-23	206937		
CRO-08 X-Y USB-30	0	18	0	7	3	54	39	-105	-27	-109	27	-62	-17	206636	7	4	12	39	-105	-27	-110	23	-66	-19	207585		

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COAST TO TPI

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	0	3	3	7	4	12	39	-103	-27	118	35	51	-23	206937	7	4	15	42	-103	-27	118	36	50	-23	207047
CYI-04 X-Y USB-30	0	3	5	7	4	12	39	-103	-28	132	13	73	-40	208135	7	4	15	44	-103	-28	132	14	72	-41	208250
MAD-23 X-Y USB-85	0	3	6	7	4	12	39	-103	-28	142	10	77	38	208292	7	4	15	46	-103	-28	142	11	77	37	208416
CRO-08 X-Y USB-30	0	3	37	7	4	12	39	-105	-27	-110	23	-66	-19	207585	7	4	16	16	-105	-27	-111	22	-66	-19	207793

ULLAGE FOR TPI

TPI

	COAST TO 1ST BRAKING GATE																								
ACN-75 X-Y USB-30	0	6	46	7	5	1	56	-103	-28	122	46	39	-21	206587	7	5	8	42	-103	-28	123	48	38	-21	206192
CYI-04 X-Y USB-30	0	6	42	7	5	2	0	-103	-28	140	21	59	-46	207828	7	5	8	42	-103	-28	141	22	57	-46	207442
MAD-23 X-Y USB-85	0	6	39	7	5	2	3	-103	-28	152	16	72	27	208120	7	5	8	42	-103	-28	153	16	72	26	207753
CRO-08 X-Y USB-30	0	6	17	7	5	2	24	-105	-27	-114	12	-76	-24	208299	7	5	8	42	-105	-27	-115	11	-78	-24	208059

	COAST TO 2ND BRAKING GATE																								
MAD-23 X-Y USB-85	0	2	5	7	5	8	42	-103	-28	153	16	72	26	207753	7	5	10	46	-103	-28	154	16	72	25	207637
CYI-04 X-Y USB-30	0	2	5	7	5	8	42	-103	-28	141	22	57	-46	207442	7	5	10	46	-103	-28	142	22	57	-47	207320

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VEHICLE 2 RADAR TABLE

TRACKING TIME

HRS MIN SEC

STATION ACQUISITION DATA

STATION TERMINATION DATA

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
ACN-75 X-Y USB-30	0	2	5		7	5	8	42	-103	-28	123	48	38	-21	206192	7	5	10	46	-103	-28	123	48	37	-21	206069

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
CRO-08 X-Y USB-30	0	2	5		7	5	8	42	-105	-27	-115	11	-78	-24	208059	7	5	10	46	-105	-27	-115	11	-78	-24	207977

1ST BRAKING MANEUVER *

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
MAD-23 X-Y USB-85	0	0	11		7	5	10	46	-103	-28	154	16	72	25	207637	7	5	10	57	-103	-28	154	16	72	25	207627

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
CYI-04 X-Y USB-30	0	0	11		7	5	10	46	-103	-28	142	22	57	-47	207320	7	5	10	57	-103	-28	142	22	57	-47	207309

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
ACN-75 X-Y USB-30	0	0	11		7	5	10	46	-103	-28	123	48	37	-21	206069	7	5	10	57	-103	-28	123	48	37	-21	206058

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
CRO-08 X-Y USB-30	0	0	11		7	5	10	46	-105	-27	-115	11	-78	-24	207977	7	5	10	57	-105	-27	-115	11	-78	-24	207970

COAST TO 3RD BRAKING GATE

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
MAD-23 X-Y USB-85	0	1	2		7	5	10	57	-103	-28	154	16	72	25	207627	7	5	11	59	-103	-28	154	16	72	25	207569

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
CYI-04 X-Y USB-30	0	1	2		7	5	10	57	-103	-28	142	22	57	-47	207309	7	5	11	59	-103	-28	142	22	57	-47	207249

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
ACN-75 X-Y USB-30	0	1	2		7	5	10	57	-103	-28	123	48	37	-21	206058	7	5	11	59	-103	-28	123	48	37	-21	205998

	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE				
CRO-08 X-Y USB-30	0	1	2		7	5	10	57	-105	-27	-115	11	-78	-24	207970	7	5	11	59	-105	-27	-115	10	-78	-25	207929

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2ND BRAKING MANEUVER •

VEHICLE 2 RADAR TABLE

TRACKING TIME

HRS MIN SEC

STATION ACQUISITION DATA

STATION TERMINATION DATA

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA	STATION TERMINATION DATA
	HRS MIN SEC	DAY HRS MIN SEC RA DEC AZ ELV X Y RANGE	DAY HRS MIN SEC RA DEC AZ ELV X Y RANGE
MAD-23 X-Y USB-85	0 0 9	7 5 11 59 -103 -28 154 16 72 25 207569	7 5 12 8 -103 -28 154 16 72 25 207561
CYI-04 X-Y USB-30	0 0 9	7 5 11 59 -103 -28 142 22 57 -47 207249	7 5 12 8 -103 -28 142 22 56 -47 207240
ACN-75 X-Y USB-30	0 0 9	7 5 11 59 -103 -28 123 48 37 -21 205989	7 5 12 8 -103 -28 123 48 37 -21 205989
CRO-08 X-Y USB-30	0 0 9	7 5 11 59 -105 -27 -115 10 -78 -25 207929	7 5 12 8 -105 -27 -115 10 -79 -25 207924

COAST TO 4TH BRAKING GATE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA	STATION TERMINATION DATA
	HRS MIN SEC	DAY HRS MIN SEC RA DEC AZ ELV X Y RANGE	DAY HRS MIN SEC RA DEC AZ ELV X Y RANGE
MAD-23 X-Y USB-85	0 1 30	7 5 12 8 -103 -28 154 16 72 25 207561	7 5 13 38 -103 -28 154 17 72 25 207479
CYI-04 X-Y USB-30	0 1 30	7 5 12 8 -103 -28 142 22 56 -47 207240	7 5 13 38 -103 -28 142 22 56 -47 207154
ACN-75 X-Y USB-30	0 1 30	7 5 12 8 -103 -28 123 48 37 -21 205989	7 5 13 38 -103 -28 123 49 36 -21 205902
CRO-08 X-Y USB-30	0 1 30	7 5 12 8 -105 -27 -115 10 -79 -25 207924	7 5 13 38 -105 -27 -115 10 -79 -25 207866

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T+T

3RD BRAKING MANEUVER •

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA	STATION TERMINATION DATA
	HRS MIN SEC	DAY HRS MIN SEC RA DEC AZ ELV X Y RANGE	DAY HRS MIN SEC RA DEC AZ ELV X Y RANGE
MAD-23 X-Y USB-85	0 0 4	7 5 13 38 -103 -28 154 17 72 25 207479	7 5 13 42 -103 -28 154 17 72 25 207475
CYI-04 X-Y USB-30	0 0 4	7 5 13 38 -103 -28 142 22 56 -47 207154	7 5 13 42 -103 -28 142 22 56 -47 207150

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
ACN-75 X-Y USB-30	0	0	4	7	5	13	38	-103	-28	123	49	36	-21	205902	7	5	13	42	-103	-28	123	49	36	-21	205898		
CRO-08 X-Y USB-30	0	0	4	7	5	13	38	-105	-27	-115	10	-79	-25	207866	7	5	13	42	-105	-27	-115	10	-79	-25	207863		
COAST TO 5TH BRAKING GATE																											
MAD-23 X-Y USB-85	0	1	15	7	5	13	42	-103	-28	154	17	72	25	207475	7	5	14	57	-103	-28	154	17	72	24	207407		
CYI-04 X-Y USB-30	0	1	15	7	5	13	42	-103	-28	142	22	56	-47	207150	7	5	14	57	-103	-28	142	23	56	-47	207079		
ACN-75 X-Y USB-30	0	1	15	7	5	13	42	-103	-28	123	49	36	-21	205898	7	5	14	57	-103	-28	123	49	36	-21	205826		
CRO-08 X-Y USB-30	0	1	15	7	5	13	42	-105	-27	-115	10	-79	-25	207863	7	5	14	57	-105	-27	-115	10	-79	-25	207816		
4TH BRAKING MANEUVER																											
MAD-23 X-Y USB-85	0	0	4	7	5	14	57	-103	-28	154	17	72	24	207407	7	5	15	2	-103	-28	154	17	72	24	207403		
CYI-04 X-Y USB-30	0	0	4	7	5	14	57	-103	-28	142	23	56	-47	207079	7	5	15	2	-103	-28	142	23	56	-47	207075		
ACN-75 X-Y USB-30	0	0	4	7	5	14	57	-103	-28	123	49	36	-21	205826	7	5	15	2	-103	-28	123	49	36	-21	205822		
CRO-08 X-Y USB-30	0	0	4	7	5	14	57	-105	-27	-115	10	-79	-25	207816	7	5	15	2	-105	-27	-115	10	-79	-25	207813		

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COAST TO DOCKING

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USB-85	0	4	24	7	5	15	2	-103	-28	154	17	72	24	207403	7	5	19	25	-103	-28	155	17	71	23	207179
CYI-04 X-Y USB-30	0	4	24	7	5	15	2	-103	-28	142	23	56	-47	207075	7	5	19	25	-103	-28	143	23	54	-47	206839
ACN-75 X-Y USB-30	0	4	24	7	5	15	2	-103	-28	123	49	36	-21	205822	7	5	19	25	-103	-27	124	50	35	-21	205584
CRO-08 X-Y USB-30	0	4	24	7	5	15	2	-105	-27	115	10	-79	-25	207813	7	5	19	25	-105	-27	-116	9	-80	-25	207659

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TABLE 6-IV.- MISSION SHADOW TIMELINE

(a) CSM

LIGHTING CONDITION FOR VEH 1

26 JUL 71 EOI TO TLI LAZ 80.1

VEH IN SUNLIGHT AT PHASE INITIATION

VEH ENTERING FARTH PENUMBRA	0	0	43	19.9	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING EARTH UMBRA	0	0	43	27.8		0	0	0
						0	0	7.9
VEH ENTERING EARTH PENUMBRA	0	1	20	57.0		0	0	0
						0	0	7.2
VEH ENTERING SUNLIGHT	0	1	21	4.2		0	0	49
						0	0	59.8
VEH ENTERING FARTH PENUMBRA	0	2	11	4.0		0	0	0
						0	0	7.0
VEH ENTERING EARTH UMBRA	0	2	11	10.4		0	0	37
						0	0	29.2
VEH ENTERING FARTH PENUMBRA	0	2	48	39.1		0	0	0
						0	0	3.2
VEH ENTERING SUNLIGHT	0	2	48	47.4				

6-144

LIGHTING CONDITION FOR VEH 1

26 JUL 71 TLI TO LOI LAZ 80.1

VEH IN SUNLIGHT AT PHASE INITIATION

	VEH ENTERING LUNAR PENUMBRA	TIME SPENT IN REGION							
		DAY	HRS	MIN	SECS	DAY	HRS	MIN	SECS
	3	5	27	43.8	0	0	?	2.3	
	VEH ENTERING LUNAR UMBRA	3	5	29	46.1	0	0	45	33.4
	VEH ENTERING LUNAR PENUMBRA	3	6	15	19.5	0	0	0	54.8
	VEH ENTERING SUNLIGHT	3	6	16	14.3				

LIGHTING CONDITION FOR VEH 1

26 JUL 71 LOI TO DOI LAZ 80.1

VEH IN SUNLIGHT AT PHASE INITIATION

	VEH ENTERING LUNAR PENUMBRA	TIME SPENT IN REGION		
		DAYS	HRS	MINS SECS
	VEH ENTERING LUNAR PENUMBRA	3	7	49 3.3
				0 0 0 9.8
	VEH ENTERING LUNAR UMBRA	3	7	49 13.1
				0 0 44 24.0
	VEH ENTERING LUNAR PENUMBRA	3	8	33 37.0
				0 0 0 8.2
	VEH ENTERING SUNLIGHT	3	8	33 45.2
				0 1 23 35.2
	VEH ENTERING LUNAR PENUMBRA	3	9	57 20.4
				0 0 0 11.1
	VEH ENTERING LUNAR UMBRA	3	9	57 31.5

6-146

LIGHTING CONDITION FOR VEH 1

26 JUL 71 DOI TO SEP LAZ 80.1

VEH IN LUNAR UMBRA AT PHASE INITIATION

	VEH ENTERING LUNAR PENUMBRA	TIME SPENT IN REGION			
		DAYS	HRS	mins	SECS
	VEH ENTERING LUNAR PENUMBRA	3	10	41	56.1
				0	0 0 11.0
	VEH ENTERING SUNLIGHT	3	10	42	7.0
				0	1 5 19.1
	VEH ENTERING LUNAR UMBRA	3	11	47	26.2
				0	0 48 28.2
	VEH ENTERING LUNAR PENUMBRA	3	12	35	54.4
				0	0 0 8.5
	VEH ENTERING SUNLIGHT	3	12	36	2.8
				0	1 4 59.3
	VEH ENTERING LUNAR PENUMBRA	3	13	41	2.1
				0	0 0 10.7
	VEH ENTERING LUNAR UMBRA	3	13	41	12.8
				0	0 49 30.2
	VEH ENTERING LUNAR PENUMBRA	3	14	29	42.9
				0	0 0 11.1
	VEH ENTERING SUNLIGHT	3	14	29	54.1
				0	1 5 3.7
	VEH ENTERING LUNAR UMBRA	3	15	35	2.7
				0	0 0 12.3
	VEH ENTERING LUNAR PENUMBRA	3	15	35	15.1

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6-148

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SECS
VEH ENTERING LUNAR PENUMBRA	3	16	23	40.8
				0 0 48 25.7
VEH ENTERING SUNLIGHT	3	16	23	51.5
				0 0 0 10.7
VEH ENTERING LUNAR PENUMBRA	3	17	28	51.1
				0 1 4 59.6
VEH ENTERING LUNAR UMBRA	3	17	28	57.3
				0 0 48 40.2
VEH ENTERING LUNAR PENUMBRA	3	18	17	37.6
				0 0 0 14.1
VEH ENTERING SUNLIGHT	3	18	17	51.6
				0 1 4 54.2
VEH ENTERING LUNAR PENUMBRA	3	19	22	45.8
				0 0 0 12.1
VEH ENTERING LUNAR UMBRA	3	19	22	57.9
				0 0 48 30.5
VEH ENTERING LUNAR PENUMBRA	3	20	11	28.4
				0 0 0 11.1
VEH ENTERING SUNLIGHT	3	20	11	39.5
				0 1 53 45.5
VEH ENTERING LUNAR PENUMBRA	3	22	5	25.0

6-149

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION	DAYS	HRS	MINS	SECS
	0	0	0	16.4		0	0	0	0
VEH ENTERING SUNLIGHT	3	22	5	41.5		0	1	4	53.6
VEH ENTERING LUNAR PENUMBRA	3	23	10	35.0		0	0	0	9.7
VEH ENTERING LUNAR UMBRA	3	23	10	44.8		0	0	48	31.1
VEH ENTERING LUNAR PENUMBRA	3	23	59	15.9		0	0	0	10.8
VEH ENTERING SUNLIGHT	3	23	59	26.7		0	1	5	7.4
VEH ENTERING LUNAR PENUMBRA	4	1	4	34.2		0	0	0	14.4
VEH ENTERING LUNAR UMBRA	4	1	4	48.5		0	0	48	25.3
VEH ENTERING LUNAR PENUMBRA	4	1	53	13.9		0	0	0	11.0
VEH ENTERING SUNLIGHT	4	1	53	24.9		0	1	5	16.0
VEH ENTERING LUNAR UMBRA	4	2	58	40.9		0	0	48	30.8
VEH ENTERING LUNAR PENUMBRA	4	3	47	11.7					

LIGHTING CONDITION FOR VEH 1

TIME SPENT IN REGION DAYS HRS MINS SECS	TIME SPENT IN REGION			
	DAYS	HRS	MINS	SECS
0 0 C 8.5	0	0	C	8.5
VEH ENTERING SUNLIGHT 4 3 47 20.1	4	3	47	20.1

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6-151

LIGHTING CONDITION FOR VEH 1

26 JUL 71 SEP TO CIR LAZ 80.1

VEH IN SUNLIGHT AT PHASE INITIATION

	TIME SPENT IN REGION		
	DAY	HRS	MINS SECS
VEH ENTERING LUNAR PENUMBRA	4	4	52 15.8
	0	0	0 10.0
VEH ENTERING LUNAR UMBRA	4	4	52 25.7

LIGHTING CONDITION FOR VEH 1

26 JUL 71 CIR TO PCH LAZ 80.1

VEH IN LUNAR UMBRA AT PHASE INITIATION

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	4	5	40	54.1		0	0	0
					0	0	0	10.5
VEH ENTERING SUNLIGHT	4	5	41	4.7		0	1	12
					0	1	12	10.5
VEH ENTERING LUNAR PENUMBRA	4	6	53	15.1		0	0	0
					0	0	0	10.0
VEH ENTERING LUNAR UMBRA	4	6	53	25.1		0	0	45
					0	0	45	52.8
VEH ENTERING LUNAR PENUMBRA	4	7	39	17.9		0	0	0
					0	0	0	10.4
VEH ENTERING SUNLIGHT	4	7	39	28.3		0	1	12
					0	1	12	10.1
VEH ENTERING LUNAR PENUMBRA	4	8	51	38.4		0	0	0
					0	0	0	10.6
VEH ENTERING LUNAR UMBRA	4	8	51	49.0		0	0	45
					0	0	45	59.2
VEH ENTERING LUNAR PENUMBRA	4	9	37	48.2		0	0	0
					0	0	0	10.3
VEH ENTERING SUNLIGHT	4	9	37	58.5		0	1	12
					0	1	12	5.8
VEH ENTERING LUNAR PENUMBRA	4	10	50	4.3				

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6-153

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	3.1
VEH ENTERING LUNAR UMBRA	4	10	50	12.4				
					0	0	46	.0
VEH ENTERING LUNAR PENUMBRA	4	11	36	12.5				
					0	0	0	10.8
VEH ENTERING SUNLIGHT	4	11	36	23.2				
					0	1	12	3.8
VEH ENTERING LUNAR PENUMBRA	4	12	48	33.0				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	4	12	48	43.8				
					0	0	46	.4
VEH ENTERING LUNAR PENUMBRA	4	13	34	44.2				
					0	0	0	3.3
VEH ENTERING SUNLIGHT	4	13	34	52.5				
					0	1	12	4.9
VEH ENTERING LUNAR PENUMBRA	4	14	46	57.5				
					0	0	0	10.2
VEH ENTERING LUNAR UMBRA	4	14	47	7.7				
					0	0	46	.0
VEH ENTERING LUNAR PENUMBRA	4	15	33	7.7				
					0	0	0	10.7
VEH ENTERING SUNLIGHT	4	15	33	18.3				

6-154

LIGHTING CONDITION FOR VEH 1

				TIME SPENT IN REGION				
	DAYS	HRS	MINS	SECS	DAYS	HRS	MINS	SECS
					0	1	12	9.4
VEH ENTERING LUNAR PENUMBRA	4	16	45	27.8				
					0	0	0	10.5
VEH ENTERING LUNAR UMBRA	4	16	45	38.2				
					0	0	46	2.6
VEH ENTERING LUNAR PENUMBRA	4	17	31	40.8				
					0	0	0	1.6
VEH ENTERING SUNLIGHT	4	17	31	42.4				
					0	1	12	8.4
VEH ENTERING LUNAR PENUMBRA	4	18	43	50.9				
					0	0	0	10.5
VEH ENTERING LUNAR UMBRA	4	18	44	1.4				
					0	0	46	1.0
VEH ENTERING LUNAR PENUMBRA	4	19	30	2.3				
					0	0	0	10.4
VEH ENTERING SUNLIGHT	4	19	30	12.7				
					0	1	12	2.0
VEH ENTERING LUNAR PENUMBRA	4	20	42	14.8				
					0	0	0	14.2
VEH ENTERING LUNAR UMBRA	4	20	42	28.9				
					0	0	45	57.2
VEH ENTERING LUNAR PENUMBRA	4	21	28	26.2				

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SECS
	0	0	0	10.7
VEH ENTERING SUNLIGHT	4	21	28	36.9
	0	1	12	8.4
VEH ENTERING LUNAR PENUMBRA	4	22	40	45.4
	0	0	0	10.8
VEH ENTERING LUNAR UMBRA	4	22	40	56.1
	0	0	46	5.3
VEH ENTERING LUNAR PENUMBRA	4	23	27	1.5
	0	0	0	8.5
VEH ENTERING SUNLIGHT	4	23	27	10.0
	0	1	11	56.4
VEH ENTERING LUNAR PENUMBRA	5	0	39	6.4
	0	0	0	14.7
VEH ENTERING LUNAR UMBRA	5	0	39	21.0
	0	0	46	.5
VEH ENTERING LUNAR PENUMBRA	5	1	25	21.6
	0	0	0	10.8
VEH ENTERING SUNLIGHT	5	1	25	32.3
	0	1	12	8.1
VEH ENTERING LUNAR PENUMBRA	5	2	37	40.4
	0	0	0	10.7
VEH ENTERING LUNAR UMBRA	5	2	37	51.2

6-155

LIGHTING CONDITION FOR VEH 1

	DAYS HRS MINS SECS				TIME SPENT IN REGION			
	0	0	45	59.4	0	0	0	13.7
VEH ENTERING LUNAR PENUMBRA	5	3	23	50.6				
VEH ENTERING SUNLIGHT	5	3	24	4.3				
VEH ENTERING LUNAR PENUMBRA	5	4	36	4.0				
VEH ENTERING LUNAR UMBRA	5	4	36	14.4				
VEH ENTERING LUNAR PENUMBRA	5	5	22	16.7				
VEH ENTERING SUNLIGHT	5	5	22	27.2				
VEH ENTERING LUNAR PENUMBRA	5	6	34	34.4				
VEH ENTERING LUNAR UMBRA	5	6	34	36.5				
VEH ENTERING LUNAR PENUMBRA	5	7	20	40.5				
VEH ENTERING SUNLIGHT	5	7	20	51.1				
VEH ENTERING LUNAR PENUMBRA	5	8	32	58.2				

6-157

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	10.7
VEH ENTERING LUNAR UMBRA	5	8	33	8.9				
					0	0	46	2.0
VEH ENTERING LUNAR PENUMBRA	5	9	19	11.0				
					0	0	0	10.3
VEH ENTERING SUNLIGHT	5	9	19	21.2				
					0	1	12	1.9
VEH ENTERING LUNAR PENUMBRA	5	10	31	23.2				
					0	0	0	9.3
VEH ENTERING LUNAR UMBRA	5	10	31	31.4				
					0	0	46	4.3
VEH ENTERING LUNAR PENUMBRA	5	11	17	35.8				
					0	0	0	10.8
VEH ENTERING SUNLIGHT	5	11	17	46.6				
					0	1	12	4.8
VEH ENTERING LUNAR PENUMBRA	5	12	29	53.4				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	5	12	30	4.2				
					0	0	46	1.6
VEH ENTERING LUNAR PENUMBRA	5	13	16	5.8				
					0	0	0	8.3
VEH ENTERING SUNLIGHT	5	13	16	14.1				

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION	DAYS HRS MINS SECS				DAYS HRS MINS SECS			
		0	1	12	3.6	0	0	0	10.3
VEH ENTERING LUNAR PENUMBRA	5 14 28 17.7								
		0	0	0	10.3				
VEH ENTERING LUNAR UMBRA	5 14 28 28.1								
		0	0	46	3.2				
VEH ENTERING LUNAR PENUMBRA	5 15 14 31.3								
		0	0	0	10.7				
VEH ENTERING SUNLIGHT	5 15 14 41.9								
		0	1	12	6.4				
VEH ENTERING LUNAR PENUMBRA	5 16 26 48.3								
		0	0	0	10.4				
VEH ENTERING LUNAR UMBRA	5 16 26 58.7								
		0	0	45	56.3				
VEH ENTERING LUNAR PENUMBRA	5 17 12 55.5								
		0	0	0	10.4				
VEH ENTERING SUNLIGHT	5 17 13 5.9								
		0	1	12	5.8				
VEH ENTERING LUNAR PENUMBRA	5 18 25 11.7								
		0	0	0	10.6				
VEH ENTERING LUNAR UMBRA	5 18 25 22.3								
		0	0	46	3.7				
VEH ENTERING LUNAR PENUMBRA	5 19 11 26.0								

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAYS	HRS	mins	SECS
	0	0	0	10.4
VEH ENTERING SUNLIGHT	5	19	11	36.4
	0	1	12	1.4
VEH ENTERING LUNAR PENUMBRA	5	20	23	37.8
	0	0	0	10.9
VEH ENTERING LUNAR UMBRA	5	20	23	48.7
	0	0	46	1.6
VEH ENTERING LUNAR PENUMBRA	5	21	9	50.3
	0	0	0	10.8
VEH ENTERING SUNLIGHT	5	21	10	1.1
	0	1	12	5.6
VEH ENTERING LUNAR PENUMBRA	5	22	22	6.7
	0	0	0	10.8
VEH ENTERING LUNAR UMBRA	5	22	22	17.5
	0	0	46	6.3
VEH ENTERING LUNAR PENUMBRA	5	23	8	23.8
	0	0	0	3.4
VEH ENTERING SUNLIGHT	5	23	8	32.3
	0	1	11	54.3
VEH ENTERING LUNAR PENUMBRA	6	0	20	26.5
	0	0	0	15.8
VEH ENTERING LUNAR UMBRA	6	0	20	42.3

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LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SECS
VEH ENTERING LUNAR PENUMBRA	6	1	6	46.0
				0 0 0 10.8
VEH ENTERING SUNLIGHT	6	1	6	56.8
				0 1 12 5.3
VEH ENTERING LUNAR PENUMBRA	6	2	19	2.0
				0 0 0 10.7
VEH ENTERING LUNAR UMBRA	6	2	19	12.8
				0 0 46 5.1
VEH ENTERING LUNAR PENUMBRA	6	3	5	17.9
				0 0 0 3.5
VEH ENTERING SUNLIGHT	6	3	5	21.3
				0 1 12 4.3
VEH ENTERING LUNAR PENUMBRA	6	4	17	25.7
				0 0 0 10.5
VEH ENTERING LUNAR UMBRA	6	4	17	36.2
				0 0 46 5.0
VEH ENTERING LUNAR PENUMBRA	6	5	3	41.2
				0 0 0 10.5
VEH ENTERING SUNLIGHT	6	5	3	51.7
				0 1 11 55.3
VEH ENTERING LUNAR PENUMBRA	6	5	15	47.0
				0 0 0 10.5

6-160

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	13.6
VEH ENTERING LUNAR UMBRA	6	6	16	.6				
					0	0	46	4.5
VEH ENTERING LUNAR PENUMBRA	6	7	2	5.1				
					0	0	0	10.8
VEH ENTERING SUNLIGHT	6	7	2	15.9				
					0	1	12	4.5
VEH ENTERING LUNAR PENUMBRA	6	8	14	20.4				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	6	8	14	31.2				
					0	0	46	4.2
VEH ENTERING LUNAR PENUMBRA	6	9	0	35.5				
					0	0	0	15.0
VEH ENTERING SUNLIGHT	6	9	0	50.4				
					0	1	11	53.5
VEH ENTERING LUNAR PENUMBRA	6	10	12	43.9				
					0	0	0	3.4
VEH ENTERING LUNAR UMBRA	6	10	12	52.3				
					0	0	46	8.5
VEH ENTERING LUNAR PENUMBRA	6	10	52	.2				
					0	0	0	10.0
VEH ENTERING SUNLIGHT	6	10	59	11.7				

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6-162

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	1	12	4.2
VEH ENTERING LUNAR PENUMBRA	6	12	11	15.9				
					0	0	0	10.9
VEH ENTERING LUNAR UMBRA	6	12	11	26.8				
					0	0	46	1.9
VEH ENTERING LUNAR PENUMBRA	6	12	57	28.6				
					0	0	0	13.9
VEH ENTERING SUNLIGHT	6	12	57	42.5				
					0	1	11	57.7
VEH ENTERING LUNAR PENUMBRA	6	14	9	40.2				
					0	0	0	10.4
VEH ENTERING LUNAR UMBRA	6	14	9	50.6				
					0	0	46	5.9
VEH ENTERING LUNAR PENUMBRA	6	14	55	56.5				
					0	0	0	10.5
VEH ENTERING SUNLIGHT	6	14	56	7.1				
					0	1	12	3.7
VEH ENTERING LUNAR PENUMBRA	6	16	8	10.8				
					0	0	0	10.3
VEH ENTERING LUNAR UMBRA	6	16	8	21.1				
					0	0	45	59.3
VEH ENTERING LUNAR PENUMBRA	6	16	54	20.4				

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION		
	DAYS	HRS	SECS
	0	0	10.6
VEH ENTERING SUNLIGHT	6	16	54
	0	1	12
VEH ENTERING LUNAR PENUMBRA	6	18	6
	0	0	0
VEH ENTERING LUNAR UMBRA	6	18	6
	0	0	46
VEH ENTERING LUNAR PENUMBRA	6	18	52
	0	0	0
VEH ENTERING SUNLIGHT	6	18	53
	0	1	12
VEH ENTERING LUNAR PENUMBRA	6	20	5
	0	0	0
VEH ENTERING LUNAR UMBRA	6	20	5
	0	0	46
VEH ENTERING LUNAR PENUMBRA	6	20	51
	0	0	0
VEH ENTERING SUNLIGHT	6	20	51

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LIGHTING CONDITION FOR VEH 1

26 JUL 71 PCH TO JET LAZ 80.1

VEH IN SUNLIGHT AT PHASE INITIATION

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	6	22	3	24.2		0	0	0
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	6	22	3	34.9		0	0	45
					0	0	45	1.6
VEH ENTERING LUNAR PENUMBRA	6	22	49	36.5		0	0	0
					0	0	0	10.5
VEH ENTERING SUNLIGHT	6	22	49	47.0		0	1	12
					0	1	12	5.2
VEH ENTERING LUNAR PENUMBRA	7	0	1	52.2		0	0	0
					0	0	0	8.3
VEH ENTERING LUNAR UMBRA	7	0	2	.6		0	0	46
					0	0	46	.5
VEH ENTERING LUNAR PENUMBRA	7	0	48	1.1		0	0	0
					0	0	0	11.0
VEH ENTERING SUNLIGHT	7	0	48	12.0		0	1	12
					0	1	12	7.9
VEH ENTERING LUNAR PENUMBRA	7	2	0	20.0		0	0	0
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	7	2	0	30.9		0	0	46
					0	0	46	3.4
VEH ENTERING LUNAR PENUMBRA	7	2	45	34.3				

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LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	8.5
VEH ENTERING SUNLIGHT	7	2	46	42.8				
					0	1	12	2.7
VEH ENTERING LUNAR PENUMBRA	7	3	58	45.5				
					0	0	0	10.4
VEH ENTERING LUNAR UMBRA	7	3	58	55.9				
					0	0	46	1.5
VEH ENTERING LUNAR PENUMBRA	7	4	44	57.4				
					0	0	0	10.9
VEH ENTERING SUNLIGHT	7	4	45	8.2				
					0	1	12	7.7
VEH ENTERING LUNAR PENUMBRA	7	5	57	15.9				
					0	0	0	10.7
VEH ENTERING LUNAR UMBRA	7	5	57	26.7				
					0	0	46	3.6
VEH ENTERING LUNAR PENUMBRA	7	6	43	30.5				
					0	0	0	2.3
VEH ENTERING SUNLIGHT	7	5	43	22.8				
					0	1	12	7.2
VEH ENTERING LUNAR PENUMBRA	7	7	55	40.0				
					0	0	0	10.7
VEH ENTERING LUNAR UMBRA	7	7	55	50.7				

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LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SECS
	0	0	46	2.3
VEH ENTERING LUNAR PENUMBRA	7	8	41	53.0
	0	0	0	10.6
VEH ENTERING SUNLIGHT	7	8	42	3.6

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LIGHTING CONDITION FOR VEH 1

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VEH IN SUNLIGHT AT PHASE INITIATION

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	7	9	54	1.2		0	0	0
					0	0	0	16.2
VEH ENTERING LUNAR UMBRA	7	9	54	17.3		0	0	46
					0	0	46	2.1
VEH ENTERING LUNAR PENUMBRA	7	10	40	19.5		0	0	0
					0	0	0	10.9
VEH ENTERING SUNLIGHT	7	10	40	30.3		0	1	12
					0	1	12	2.8
VEH ENTERING LUNAR PENUMBRA	7	11	52	33.1		0	0	0
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	7	11	52	44.0		0	0	46
					0	0	46	2.8
VEH ENTERING LUNAR PENUMBRA	7	12	33	46.8		0	0	0
					0	0	0	4.3
VEH ENTERING SUNLIGHT	7	12	33	51.1		0	1	12
					0	1	12	2.2
VEH ENTERING LUNAR PENUMBRA	7	13	50	53.3		0	0	0
					0	0	0	10.6
VEH ENTERING LUNAR UMBRA	7	13	51	53.9		0	0	46
					0	0	46	3.2
VEH ENTERING LUNAR PENUMBRA	7	14	37	7.1				

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6-168

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	10.6
VEH ENTERING SUNLIGHT	7	14	37	17.8				
					0	1	12	2.2
VEH ENTERING LUNAR PENUMBRA	7	15	49	20.0				
					0	0	0	2.3
VEH ENTERING LUNAR UMBRA	7	15	49	22.3				
					0	0	46	4.7
VEH ENTERING LUNAR PENUMBRA	7	16	35	27.0				
					0	0	0	10.7
VEH ENTERING SUNLIGHT	7	16	35	27.7				
					0	1	12	2.7
VEH ENTERING LUNAR PENUMBRA	7	17	47	40.4				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	7	17	47	51.3				
					0	0	46	2.8
VEH ENTERING LUNAR PENUMBRA	7	18	33	54.1				
					0	0	0	10.4
VEH ENTERING SUNLIGHT	7	18	34	4.5				
					0	1	11	51.3
VEH ENTERING LUNAR PENUMBRA	7	19	46	2.8				
					0	0	0	4.4
VEH ENTERING LUNAR UMBRA	7	19	46	12.2				



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LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	46	2.5
VEH ENTERING LUNAR PENUMBRA	7	20	32	14.7				
					0	0	0	11.0
VEH ENTERING SUNLIGHT	7	20	32	25.7				
					0	1	12	2.4
VEH ENTERING LUNAR PENUMBRA	7	21	44	28.0				
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	7	21	44	39.0				
					0	0	46	4.9
VEH ENTERING LUNAR PENUMBRA	7	22	30	43.4				
					0	0	0	3.4
VEH ENTERING SUNLIGHT	7	22	30	52.3				
					0	1	11	52.1
VEH ENTERING LUNAR PENUMBRA	7	23	42	44.4				
					0	0	0	15.8
VEH ENTERING LUNAR UMBRA	7	23	43	.2				
					0	0	46	2.6
VEH ENTERING LUNAR PENUMBRA	8	0	29	2.7				
					0	0	0	10.9
VEH ENTERING SUNLIGHT	8	0	29	13.5				
					0	1	12	2.2
VEH ENTERING LUNAR PENUMBRA	8	1	41	15.8				

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LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SEC
VEH ENTERING LUNAR UMBRA	8	1	41	26.7
				0 0 0 10.9
VEH ENTERING LUNAR PENUMBRA	8	2	27	29.6
				0 0 46 2.9
VEH ENTERING SUNLIGHT	8	2	27	43.4
				0 1 11 52.8
VEH ENTERING LUNAR PENUMBRA	8	3	39	36.1
				0 0 0 10.6
VEH ENTERING LUNAR UMBRA	8	3	39	46.7
				0 0 46 3.6
VEH ENTERING LUNAR PENUMBRA	8	4	25	50.4
				0 0 0 10.7
VEH ENTERING SUNLIGHT	8	4	26	1.1
				0 1 12 1.7
VEH ENTERING LUNAR PENUMBRA	8	5	38	2.7
				0 0 0 1.8
VEH ENTERING LUNAR UMBRA	8	5	38	4.6
				0 0 46 5.6
VEH ENTERING LUNAR PENUMBRA	8	6	24	10.2
				0 0 0 10.7
VEH ENTERING SUNLIGHT	8	6	24	20.2

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LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION							
	DAYS	HRS	mins	SECS	DAYS	HRS	mins	SECS
					0	1	12	23
VEH ENTERING LUNAR PENUMBRA	8	7	36	23.1				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	8	7	36	34.0				
					0	0	46	3.3
VEH ENTERING LUNAR PENUMBRA	8	8	22	37.3				
					0	0	0	10.4
VEH ENTERING SUNLIGHT	8	8	22	47.7				
					0	1	11	59.3
VFH ENTERING LUNAR PENUMBRA	8	9	34	47.0				
					0	0	0	8.4
VEH ENTERING LUNAR UMBRA	8	9	34	55.4				
					0	0	46	2.4
VEH ENTERING LUNAR PENUMBRA	8	10	20	57.5				
					0	0	0	11.0
VEH ENTERING SUNLIGHT	8	10	21	8.7				
					0	1	12	1.0
VEH ENTERING LUNAR PENUMBRA	8	11	33	10.7				
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	8	11	33	21.7				
					0	0	46	5.8
VEH ENTERING LUNAR PENUMBRA	8	12	19	27.4				

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LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	8.4
VEH ENTERING SUNLIGHT	8	12	19	35.9				
					0	1	11	51.7
VEH ENTERING LUNAR PENUMBRA	8	13	31	27.5				
					0	0	0	15.4
VEH ENTERING LUNAR UMRA	8	13	31	42.9				
					0	0	46	2.8
VEH ENTERING LUNAR PENUMBRA	8	14	17	45.8				
					0	0	0	10.9
VEH ENTERING SUNLIGHT	8	14	17	56.7				
					0	1	12	1.7
VEH ENTERING LUNAR PENUMBRA	8	15	20	58.3				
					0	0	0	10.7
VEH ENTERING LUNAR UMRA	8	15	30	9.2				
					0	0	46	2.8
VEH ENTERING LUNAR PENUMBRA	8	16	16	12.0				
					0	0	0	12.0
VEH ENTERING SUNLIGHT	8	16	16	26.0				
					0	1	11	52.8
VEH ENTERING LUNAR PENUMBRA	8	17	25	18.8				
					0	0	0	10.6
VEH ENTERING LUNAR UMRA	8	17	28	29.4				

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LIGHTING CONDITION FOR VEH 1

					TIME SPENT IN REGION			
	DAYS	HRS	MINS	SECS	DAYS	HRS	MINS	SECS
					0	0	46	4.0
VEH ENTERING LUNAR PENUMBRA	8	18	14	33.4				
					0	0	0	10.7
VEH ENTERING SUNLIGHT	8	18	14	44.1				
					0	1	12	1.2
VEH ENTERING LUNAR PENUMBRA	8	19	26	45.3				
					0	0	0	10.4
VEH ENTERING LUNAR UMBRA	8	19	26	55.7				
					0	0	45	57.4
VEH ENTERING LUNAR PENUMBRA	8	20	12	53.1				
					0	0	0	10.7
VEH ENTERING SUNLIGHT	8	20	13	3.8				
					0	1	12	1.9
VEH ENTERING LUNAR PENUMBRA	8	21	25	5.6				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	8	21	25	16.5				
					0	0	46	3.9
VEH ENTERING LUNAR PENUMBRA	8	22	11	20.3				
					0	0	0	10.4
VEH ENTERING SUNLIGHT	8	22	11	30.7				
					0	1	11	59.2
VEH ENTERING LUNAR PENUMBRA	8	23	23	28.9				

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LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SEC
	0	0	0	9.5
VEH ENTERING LUNAR UMBRA	8	23	23	38.4
	0	0	46	2.1
VEH ENTERING LUNAR PENUMBRA	9	0	9	40.5
	0	0	0	11.0
VEH ENTERING SUNLIGHT	9	0	9	51.5
	0	1	12	1.5
VEH ENTERING LUNAR PENUMBRA	9	1	21	53.0
	0	0	0	11.0
VEH ENTERING LUNAR UMBRA	9	1	22	4.0
	0	0	46	5.7
VEH ENTERING LUNAR PENUMBRA	9	2	8	10.7
	0	0	0	8.4
VEH ENTERING SUNLIGHT	9	2	8	19.1
	0	1	11	51.3
VEH ENTERING LUNAR PENUMBRA	9	3	20	10.4
	0	0	0	15.0
VEH ENTERING LUNAR UMBRA	9	3	20	25.4
	0	0	46	3.1
VEH ENTERING LUNAR PENUMBRA	9	4	6	28.4
	0	0	0	10.9
VEH ENTERING SUNLIGHT	9	4	6	39.4

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAYS	HRS	MINS	SECS
	0	1	12	1.2
VEH ENTERING LUNAR PENUMBRA	9	5	18	40.6
				0 0 0 10.9
VEH ENTERING LUNAR UMERA	9	5	18	51.5
				0 0 46 2.5
VEH ENTERING LUNAR PENUMBRA	9	6	4	53.9
				0 0 0 14.1
VEH ENTERING SUNLIGHT	9	6	5	8.0
				0 1 11 53.0
VEH ENTERING LUNAR PENUMBRA	9	7	17	1.1
				0 0 0 10.6
VEH ENTERING LUNAR UMERA	9	7	17	11.7

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LIGHTING CONDITION FOR VEH 1

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VEH IN LUNAR UMBRA AT PHASE INITIATION

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SECS
VEH ENTERING LUNAR PENUMBRA	9	7	54	.9
	0	0	0	5.7
VEH ENTERING SUNLIGHT	9	7	54	6.6

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TABLE 6-IV.- MISSION SHADOW TIMELINE - Continued

(b)LM descent

LIGHTING CONDITION

LM FROM SEP TO PDI

VEH IN SUNLIGHT

AT PHASE INITIATION

VEH ENTERING LUNAR PENUMBRA	4	4	52	17.2	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR UMBRA	4	4	52	27.3	0	0	0	10.1
VEH ENTERING LUNAR PENUMBRA	4	5	41	.6	0	0	48	33.2
VEH ENTERING SUNLIGHT	4	5	41	11.6	0	1	5	10.5
VEH ENTERING LUNAR PENUMBRA	4	6	46	22.2	0	0	0	15.0
VEH ENTERING LUNAR UMBRA	4	6	46	38.0	0	0	48	20.7
VEH ENTERING LUNAR PENUMBRA	4	7	34	58.8	0	0	0	10.9
VEH ENTERING SUNLIGHT	4	7	35	9.6				

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TABLE 6-IV.- MISSION SHADOW TIMELINE - Concluded

(c) LM rendezvous

LIGHTING CONDITION FOR LM

RENDEZVOUS RADAR TRACKING PRIOR TO TPI

VEH IN PENUMBRA 00000 AT PHASE INITIATION

TIME SPENT IN REGION DAYS HRS MINS SECS	VEH ENTERING LUNAR UMBRA		
	7	3	57
42.7			

COAST TO 1ST BRAKING GATE

VEH IN PENUMBRA 00000 AT PHASE INITIATION

TIME SPENT IN REGION DAYS HRS MINS SECS	VEH ENTERING SUNLIGHT		
	7	4	45
54.9			

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1. Lunar Mission Analysis Branch, Orbital Mission Analysis Branch, and Landing Analysis Branch: Spacecraft Operational Trajectory for Apollo 15 (Mission J-1) Launched July 26, 1971, Vol. II - Trajectory Parameters. MSC IN 71-FM-112, Mar. 26, 1971.
2. AS-510 B-7 Tapes for July 26 and July 27, MSFC S&E-AERO-MFT-40-71, Mar. 26, 1971.
3. The Apollo 15 (J-1) Mission Operational Trajectory Simulator Data Package. MSC IN to be published.
4. Apollo Mission Techniques, Mission F and G, Transearth Injection, Midcourse Corrections, and Entry. MSC IN SPS-040, Feb. 24, 1969, revised June 6, 1969.
5. RTCC Requirements: Revised S-Band Communication Blackout Data for Apollo F and Subsequent Missions. MSC memo 69-FM23-43, Feb. 26, 1969.