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Volume I



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MSC INTERNAL NOTE NO. 72-FM-39

March 14, 1972

SPACECRAFT OPERATIONAL
TRAJECTORY FOR
APOLLO 16 (MISSION J-2)
LAUNCHED APRIL 16, 1972
VOLUME I - MISSION PROFILE

Mission Integration Branch,
Flight Performance Branch,
Systems Management Branch,
and Guidance and Dynamics Branch

MISSION PLANNING AND ANALYSIS DIVISION

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

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PROJECT APOLLO

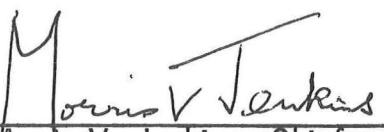
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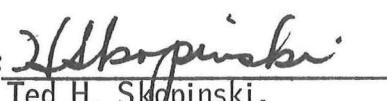
By Mission Integration Branch, Flight Performance Branch,
Systems Management Branch, and Guidance and Dynamics Branch

March 14, 1972

MISSION PLANNING AND ANALYSIS DIVISION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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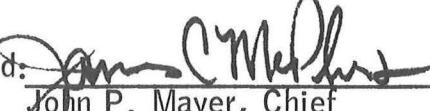
Approved: 
Floyd V. Bennett, Chief
Mission Integration Branch

Approved: 
Morris V. Jenkins, Chief
Flight Performance Branch

Approved: 
Ted H. Skopinski,
Assistant Chief
Systems Management Branch

Approved: 
Marlowe D. Cassetti, Chief
Guidance and Dynamics
Branch

Approved: 
Floyd V. Bennett
Project Manager

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

FOREWORD

This operational trajectory document contains the operational trajectory data for an April 16, 1972, launch. It supersedes the Apollo 16 documents MSC IN 71-FM-388, MSC IN 71-FM-401, and MSC IN 72-FM-14. The document comprises two volumes. Volume I contains a verbal and graphical description of the mission, and volume II contains the trajectory printout.

At this time no revision to this trajectory document is planned. Any mission changes that occur subsequent to publication will be published as changes notifications.

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SPACECRAFT OPERATIONAL TRAJECTORY

FOR APOLLO 16 (MISSION J-2)

LAUNCHED APRIL 16, 1972

VOLUME I - MISSION PROFILE

By Mission Integration Branch, Flight Performance Branch,
Systems Management Branch, and Guidance and Dynamics Branch

1.0 SUMMARY AND INTRODUCTION

1.1 Summary

The Spacecraft Operational Trajectory, published in two volumes, is a detailed description of the Apollo 16 trajectory (for an April 16, 1972, launch date). The launch time for the nominal Apollo 16 mission is $11^{\text{h}} 54^{\text{m}} \text{ c.s.t.}$, and the flight azimuth is approximately 72.0° . During the second revolution of the earth parking orbit, the translunar injection (TLI) burn will place the spacecraft on a translunar trajectory with a 71.4-n. mi. perilune altitude. This trajectory meets the requirements that

- a. The spacecraft be earth-returnable within reaction control system (RCS) capability up to TLI plus 5 hours
- b. The spacecraft be earth-returnable within descent propulsion system (DPS) capability at perilune plus 2 hours in case of no lunar orbit insertion (LOI) burn

As on Apollo 15, the S-IVB performs an evasive maneuver before its liquid oxygen (LOX) dump. This maneuver will place the S-IVB on a lunar impact trajectory.

To shorten the period from LOI to lunar module (LM) landing, one orbit has been deleted between CSM/LM separation and LM landing. The lunar surface time has been increased to 37 CSM revolutions (73 hr). After LM lift-off, rendezvous, and docking, the ascent stage is jettisoned and de-orbited for lunar impact. After LM jettison, a plane change is performed, followed by a 1-day lunar orbit science period. Transearth injection is

at the beginning of revolution 76. The command module will land at $14^{\text{h}}30^{\text{m}}$ c.s.t. in the Pacific Ocean on April 28.

The mission duration is approximately 12 days, 3 hours. The trans-lunar flight time is $71^{\text{h}}50^{\text{m}}$. The time spent in lunar orbit is approximately $147^{\text{h}}46^{\text{m}}$, and the transearth flight time is $68^{\text{h}}00^{\text{m}}$.

1.2 Introduction

Many aspects of mission operations require a foreknowledge of the spacecraft trajectory - both its shape and its schedule of events. This document is the best and most complete prelaunch estimate of that trajectory. The trajectory event schedule presented will be followed as near as possible during the actual flight. This information will provide input data for preflight simulations and will be the basis for the preliminary ground station tracking schedule. Many other facets of the mission operations, however, also require these data.

This trajectory reflects the mission requirements as documented in reference 1 and all known constraints and guidelines, and is based on the spacecraft characteristics defined by the Spacecraft Operational Data Book (ref. 2). The launch portion of the trajectory, which is generated by the Marshall Space Flight Center, is omitted from this document.

TABLE 1-I.- SEQUENCE OF MAJOR EVENTS

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.s.t.	Data summary	
Launch	00:00:00	April 16, 1972 11:54:00.0	Flight azimuth, deg Launch complex	72.0 39A
EPO insertion	00:11:57.2	12:05:57.2	Geodetic latitude, deg Longitude, deg Geodetic altitude, n. mi. Velocity, fps	32.7 -52.1 93.3 25 603.7
Translunar injection ^a				
Burn initiation	02:33:15.1	14:27:15.1	Geodetic latitude, deg Longitude, deg Velocity, fps Apogee altitude, n. mi. Geodetic altitude, n. mi.	-24.8 137.3 25 630.7 95.8 88.9
Burn termination (guidance cutoff signal)	02:38:50.0	14:32:50.0	Geodetic latitude, deg Longitude, deg Burn duration, sec Plane change, deg Apogee altitude, n. mi. Geodetic altitude, n. mi.	-12.5 161.7 334.9 0.0 266 387.7 154.6
Post-TLI events ^a				
CSM/S-IVB separation	03:03:50.0	14:57:50.0		
Docking	03:13:50.0	15:07:50.0		
CSM/LM ejection	03:58:50.0	15:52:50.0		
Evasive maneuver ^a (performed by S-IVB)	04:21:50.0	16:15:50.0	ΔV, fps	9.8
Translunar coast, midcourse correction maneuvers				
MCC-1	TLI + 9 hr	23:32:50.0	Geodetic altitude, n. mi.	≈ 56 500
MCC-2	TLI + 28 hr	April 17, 1972 18:32:50.0	Geodetic altitude, n. mi.	≈ 119 000
MCC-3	LOI - 22 hr	April 18, 1972 16:22:38.6	Geodetic altitude, n. mi.	≈ 166 500
MCC-4	LOI - 5 hr	April 19, 1972 9:22:38.6	Altitude above mean lunar radius, n. mi.	≈ 12 200

^aThis information is approximate and is presented for information only. The official source is the MSFC LV operational trajectory (ref. 2).

TABLE 1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.s.t.	Data summary	
SIM door jettison	LOI - 4.5 hr	April 19, 1972 9:52:38.6	Average ΔV imparted to door, fps	13.7
Lunar orbit insertion (LOI) Burn initiation	74:28:38.6	14:22:38.6	Mass, lb Altitude above LLS radius, n. mi. Selenographic latitude, deg Selenographic longitude, deg Perilune altitude above LLS radius, n. mi. Selenographic inclination, deg Velocity, fps	102 642.7 95.1 8.1 -166.9 71.4 8.1 8104.0
Burn termination	74:34:53.6	14:28:53.6	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.	77.5 7.1 169.2 9.0 375.0 23.7 2.3 2807.0 24 838.4 5388.4 02:08:46.4 58.5 170.6
S-IVB predicted lunar impact	74:30:08.0	14:24:08.0	Selenographic latitude, deg Selenographic longitude, deg	-2.3 -31.7
Descent orbit insertion (DOI) Burn initiation	78:35:30.3	18:29:30.3	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	77 770.4 58.6 8.7 -140.9 58.6 170.4 5486.2

TABLE 1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec g.e.t.	Time, hr:min:sec, c.s.t.	Data summary
DOI Burn termination	78:35:54.4	April 19, 1972 18:29:54.4	Altitude above LLS radius, n. mi. 58.6 Selenographic latitude, deg 8.8 Selenographic longitude, deg -142.2 Selenographic inclination, deg 9.0 Burn duration, sec 24.1 Inertial burn arc, deg 1.2 Plane change, deg 0.0 ΔV , fps 206.0 Velocity, fps 5280.2 SPS propellant used, lb 1566.2 Orbital period, hr:min:sec 01:54:25.2 Perilune altitude above LLS radius, n. mi. 10.9 Apolune altitude above LLS radius, n. mi. 58.6 Revolution number 2
CSM/LM undock and SEP	96:13:30.8	April 20, 1972 12:07:30.8	Selenographic latitude, deg 2.2 Selenographic longitude, deg 121.0 Revolution number 12
Circularization (CSM) Burn initiation	97:41:44.5	13:35:44.5	Mass, lb 39 318.1 Selenographic latitude, deg 9.0 Selenographic longitude, deg -159.8 Selenographic inclination, deg 9.0 Altitude above LLS, n. mi. 59.8 Perilune altitude above LLS, n. mi. 9.3 Velocity, fps 5274.0 Revolution number 12
Burn termination	97:41:50.4	13:35:50.4	ΔV , fps 99.6 Burn duration, sec 5.9 Altitude above LLS, n. mi. 59.8 Perilune altitude above LLS, n. mi. 51.8 Apolune altitude above LLS, n. mi. 68.2 Velocity, fps 5343.8 SPS propellant consumed, lb 384.7 Burn arc, deg 0.3 Orbital period, hr:min:sec 01:58:54.4 Revolution number 12

TABLE 1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.s.t.	Data summary
PDI (DPS ignition time)	98:34:40.9	April 20, 1972 14:28:40.9	Altitude above LLS, ft 52 707.3 Velocity, fps 5571.1 Revolution number 13
High gate (P63 to P64)	98:44:00.9	14:38:00.9	Altitude above LLS, ft 7900.3 Velocity, fps 355.0
Low gate	98:45:22.9	14:39:22.9	Altitude above LLS, ft 605.5 Velocity, fps 79.6
Vertical descent (P64 to P65)	98:46:02.9	14:40:02.9	Altitude above LLS, ft 213.7 Velocity, fps 10.3
LM landing	98:46:42.4	14:40:42.4	ΔV , fps 6696.3 Burn duration, sec 721.5 DPS propellant consumed, lb 18 100.3 Revolution number 13 Selenographic latitude, deg -9.0 Selenographic longitude, deg 15.5
CSM first pass over LLS	98:43:06.7	14:37:06.7	Revolution number 13
First CSM plane change Burn initiation	152:28:48.1	April 22, 1972 20:22:48.1	Mass, lb 38 752.8 Selenographic latitude, deg -4.9 Selenographic longitude, deg -67.8 Altitude above LLS, n. mi. 57.4 Perilune altitude above LLS, n. mi. 57.3 Apolune altitude above LLS, n. mi. 62.2 Revolution number 40 Velocity, fps 5355.6
Burn termination	152:28:57.2	20:22:57.2	SPS propellant consumed, lb 602.3 ΔV , fps 158.7 Burn duration, sec 9.1 Selenographic latitude, deg -4.9 Selenographic longitude, deg -68.3 Altitude above LLS, n. mi. 57.4 Perilune altitude above LLS, n. mi. 57.3 Apolune altitude above LLS, n. mi. 62.0 Plane change, deg 1.7 Selenographic inclination, deg 10.5 Velocity, fps 5355.4 Revolution number 40

TABLE 1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.s.t.	Data summary
CSM second pass over LLS	171:46:10.3	April 23, 1972 15:40:10.3	Revolution number 50
Ascent			
IM lift-off	171:45:08.6	15:39:08.6	Mass, lb 10 892.2 Selenographic latitude, deg -9.0 Selenographic longitude, deg 15.5 Revolution number 50
LM insertion	171:52:22.9	15:46:22.9	Mass, lb 5923.9 ΔV , fps 6047.9 Burn duration, sec 434.3 Latitude, deg -9.8 Longitude, deg 5.3 Altitude above LLS, ft 59 889.1 Perilune altitude above LLS, ft 54 783.9 Apolune altitude above LLS, ft 276 088.1
Rendezvous			
TPI (APS ignition)	172:39:22.9	16:33:22.9	Burn duration, sec 2.5 ΔV , fps 50.3 Propellant used, lb 30.0 Resultant h_a/h_p , n. mi. 61.9/44.0
Preceded by a 10-sec RCS ullage $\Delta V = 21.8$ fps			Range at cutoff, n. mi. 32.0 Range rate at cutoff, fps -132.5 Propulsion system APS Revolution number 50
Braking	173:20:16.4	17:14:16.4	Burn duration, sec 30.2 ΔV , fps 33.4 Propellant used, lb 21.6 Range at final braking, n. mi. 0.02 Range rate at final braking, fps -0.23 h_a/h_p at final braking, n. mi. 59.8/59.3 Propulsion system IM RCS Revolution number 51
Docking	173:40:00.0	17:34:00.0	

TABLE 1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.s.t.	Data summary	
LM jettison	177:31:15.0	April 23, 1972 21:25:15.0	Selenographic latitude, deg Selenographic longitude, deg Revolution number	-4.5 46.7 53
CSM/LM separation				
Burn initiation	177:36:15.0	21:30:15.0	Revolution number	53
Burn termination	177:36:28.2	21:30:28.2	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	38 514.8 2.0 13.2 -6.9 30.9 59.6 59.5 61.7 0.0 10.4 5346.0 53
LM deorbit	179:16:29.2	23:10:29.2	Mass, lb ΔV , fps Burn duration, sec Selenographic latitude, deg Selenographic longitude, deg	5253.9 229.6 95.5 2.7 86.2
LM impact	179:39:28.6	23:33:28.6	Mass, lb Selenographic latitude, deg Selenographic longitude, deg Velocity, fps CSM revolution number	5122.2 -9.5 15.0 5550.1 54
Second CSM plane change				
Burn initiation	193:13:46.2	April 24, 1972 13:07:46.2	Mass, lb Selenographic latitude, deg Selenographic longitude, deg Altitude above LLS, n. mi. Perilune altitude above LLS, n. mi. Apolune altitude above LLS, n. mi. Velocity, fps Revolution number	38 433.2 0.1 65.0 58.0 57.9 62.9 5354.5 61

TABLE 1-I.- SEQUENCE OF MAJOR EVENTS - Continued

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.s.t.	Data summary
Second CSM plane change Burn termination	193:14:02.0	April 24, 1972 13:08:02.0	SPS propellant consumed, lb 1056.8 ΔV , fps 282.5 Burn duration, sec 15.8 Selenographic latitude, deg 0.0 Selenographic longitude, deg 64.2 Altitude above LLS, n. mi. 58.0 Perilune altitude above LLS, n. mi. 57.9 Apolune altitude above LLS, n. mi. 62.9 Plane change, deg 3.0 Selenographic inclination, deg 13.4 Velocity, fps 5354.5 Revolution number 61
Shaping burn Burn initiation	216:49:11.7	April 25, 1972 12:43:11.7	Mass, lb 37 305.3 Altitude above LLS radius, n. mi. 55.8 Selenographic latitude, deg 7.8 Selenographic longitude, deg 87.6 Perilune altitude above LLS, n. mi. 55.7 Apolune altitude above LLS, n. mi. 65.2 Selenographic inclination, deg 13.4 Velocity, fps 5366.4 Revolution number 73
Burn termination	216:49:13.9	12:43:13.9	Selenographic latitude, deg 7.7 Selenographic longitude, deg 87.5 Perilune altitude above LLS, n. mi. 55.0 Apolune altitude above LLS, n. mi. 85.0 Burn duration, sec 2.2 Inertial burn arc, deg 0.1 Plane change, deg 0.0 ΔV , fps 38.0 SPS propellant used, lb 139.6 Velocity, fps 5391.6
Subsatellite jettison	218:02:08.3	13:56:08.3	Altitude above LLS radius, n. mi. 78.5 Selenographic latitude, deg 0.0 Selenographic longitude, deg -128.0 Velocity, fps 5272.0 Perilune altitude above LLS, n. mi. 55.4 Apolune altitude above LLS, n. mi. 85.0 Revolution number 73

TABLE 1-I.- SEQUENCE OF MAJOR EVENTS - Concluded

Event	Time, hr:min:sec, g.e.t.	Time, hr:min:sec, c.s.t.	Data summary
Transearth injection Burn initiation	222:20:32.8	April 25, 1972 18:14:32.8	Mass, lb 37 025.0 Altitude above LLS radius, n. mi. 65.7 Selenographic latitude, deg 10.3 Selenographic longitude, deg 179.7 Perilune altitude above LLS, n. mi. 54.7 Selenographic inclination, deg 13.4 Velocity, fps 5339.3 Revolution number 76
Burn termination	222:23:03.3	18:17:03.3	Altitude above LLS radius, n. mi. 67.3 Selenographic latitude, deg 11.9 Selenographic longitude, deg 170.0 Perilune altitude above LLS, n. mi. 64.7 Selenographic inclination, deg 15.5 Burn duration, sec 150.5 Inertial burn arc, deg 9.7 Plane change, deg 3.3 ΔV , fps 3212.2 SPS propellant used, lb 10 059.7 Velocity, fps 8521.2
Transearth coast midcourse correction maneuvers		April 26, 1972	
MCC-5	TEI + 17 hr	11:17:03.3	Geodetic altitude, n. mi. \approx 181 000
MCC-6	EI - 22 hr	April 27, 1972 16:16:45.4	Geodetic altitude, n. mi. \approx 106 500
MCC-7	EI - 3 hr	April 28, 1972 11:16:45.4	Geodetic altitude, n. mi. \approx 25 500
CM/SM sep	EI - 15 min	14:01:45.4	Geodetic altitude, n. mi. 1971.0
Entry interface	290:22:45.4	14:16:45.4	Transearth coast time, hr 68 Inertial velocity, fps 36 175.8 Geodetic altitude, n. mi. (ft) 65.8 (399 681.0) Inertial flight-path angle, deg -6.5 Geodetic latitude, deg -13.0 Longitude, deg -167.2 Equatorial inclination (ascending), deg 61.8
CM landing	290:36:03	14:30:03.0	Geodetic latitude, deg 5.0 Longitude, deg -158.7

TABLE 1-II.- LAUNCH WINDOW SUMMARY

Launch date	April 16, 1972
Site	Descartes
Flight azimuth, deg	72 to 100
Launch time, hr:min, c.s.t.	11:54 to 15:43
Translunar flight time, hr:min	71:50 to 66:43
Lunar orbit inclination, deg	9.0
Approach azimuth at landing, deg	-90.0
Sun elevation at landing, deg	11.9
Goldstone landing coverage, hr:min	12:20
Lunar surface stay time, hr	73.0
Total lunar orbit stay time	147:46, 75 revs
Transearth flight time, hr	68
Total mission time, hr	290:36 to 286:47

TABLE 1-III.- LUNAR ORBIT ACTIVITIES

Activity	Revolution number	Time, hr:min, g.e.t.
LOI	Beginning of 1	74:35
DOI	End of 2	78:36
Begin rest period	4	82:30
End rest period	9	91:30
Begin IVT to LM	10	93:45
Undocking and separation	12	96:14
CSM circularization	12	97:42
PDI	13	98:35
Landing	13	98:47
Begin first EVA	15	102:25
Terminate first EVA	18	109:30
Begin second EVA	26	124:50
Terminate second EVA	30	131:40
Begin third EVA	38	148:25
First CSM plane change	40	152:29
End third EVA	42	155:25
LM ascent	50	171:45
Docking	51	173:40
LM jettison	53	177:31
CSM separation	53	177:36

TABLE 1-III.- LUNAR ORBIT ACTIVITIES - Concluded

Activity	Revolution number	Time, hr:min, g.e.t.
LM deorbit burn	54	179:16
LM lunar impact	54	179:39
Second CSM plane change	61	193:14
Shaping burn	73	216:49
Subsatellite jettison	73	218:02
TEI	Beginning of 76	222:21

Event	Launch	EOI	TLI initiation	TLI cutoff	Evasive maneuver (S-IVB)	SIM door jettison	LOI initiation	S-IVB predicted lunar impact	LOI cutoff	DOI	CSM/LM undock and separation	CSM circularization	PDI	CSM first pass over LLS	LM landing	CSM plane change 1	LM lift-off	TPI	Braking	Docking	LM jettison	CSM separation	LM deo					
Launch																												
EOI	00:11:57																											
TLI initiation	02:33:15	02:21:18																										
TLI cutoff	02:38:50	02:26:53	00:05:35																									
Evasive maneuver (S-IVB)	04:21:50	04:09:53	01:48:35	01:43:00	65:36:49																							
SIM door jettison	69:58:39	69:46:42	67:25:24	67:19:49	70:06:49	04:30:00																						
LOI initiation	74:28:39	74:16:42	71:55:24	71:49:49	70:06:49	04:31:29	00:01:29		00:04:46																			
S-IVB predicted lunar impact	74:30:08	74:18:11	71:56:53	71:51:18	70:08:18	04:36:15	00:06:15	00:04:46	04:05:22	04:00:36																		
LOI cutoff	74:34:54	74:22:57	72:01:39	71:56:04	70:13:04	04:36:15	00:06:15	00:04:46	04:05:22	04:00:36																		
DOI	78:35:30	78:23:33	76:02:15	75:56:40	74:13:40	08:36:51	04:06:51	04:05:22	04:00:36																			
CSM/LM undock and separation	96:13:31	96:01:34	93:40:16	93:34:41	91:51:41	26:14:52	21:44:52	21:43:23	21:38:37	17:38:01																		
CSM circularization	97:41:14	97:29:47	95:08:29	95:02:54	93:19:54	27:43:05	23:13:05	23:11:36	23:06:50	19:06:14	01:28:13																	
PDI	98:34:11	98:22:44	96:01:26	95:55:51	94:12:51	28:36:02	24:06:02	24:04:33	23:59:47	19:59:11	02:21:10	00:52:57																
CSM first pass over LLS	98:43:07	98:31:10	96:09:52	96:04:17	94:21:17	28:44:28	24:14:28	24:12:59	24:08:13	20:07:37	02:29:36	01:01:23	00:08:26															
LM landing	98:46:42	98:34:45	96:13:27	96:07:52	94:24:52	28:48:03	24:18:03	24:16:34	24:11:48	20:11:12	02:33:11	01:04:58	00:12:01	00:03:35														
CSM plane change 1	152:28:48	152:16:51	149:55:33	149:49:58	148:06:58	82:30:09	78:00:09	77:58:40	77:53:54	73:53:18	56:15:17	54:47:04	53:54:07	53:45:41	53:42:06													
LM lift-off	171:45:09	171:33:12	169:11:54	169:06:19	167:23:19	101:46:30	97:16:30	97:15:01	97:10:15	93:09:39	75:31:38	74:03:25	73:10:28	73:02:02	72:58:27	19:16:21												
TPI	172:39:23	172:27:26	170:06:08	170:00:33	168:17:33	102:40:44	98:10:44	98:09:15	98:04:29	94:03:53	76:25:52	74:57:39	74:04:42	73:56:16	73:52:41	20:10:35	00:54:14											
Braking	173:20:16	173:08:19	170:47:01	170:41:26	168:58:26	103:21:37	98:51:37	98:50:08	98:45:22	94:44:46	77:06:45	75:38:32	74:45:35	74:37:09	74:33:34	20:51:28	01:35:07	00:40:53										
Docking	173:40:00	173:28:03	171:06:45	171:01:10	169:18:10	103:41:21	99:11:21	99:09:52	99:05:06	95:04:30	77:26:29	75:58:16	75:05:19	74:56:53	74:53:18	21:11:12	01:54:51	01:00:37	00:19:44									
LM jettison	177:31:15	177:19:18	174:58:00	174:52:25	173:09:25	107:32:36	103:02:36	103:01:07	102:56:21	98:55:45	81:17:44	79:49:31	78:56:34	78:48:08	78:44:33	25:02:27	05:46:06	04:51:52	04:10:59	03:51:15								
CSM separation	177:36:15	177:24:18	175:03:00	174:57:25	173:14:25	107:37:36	103:07:36	103:06:07	103:01:21	99:00:45	81:22:44	79:54:31	79:01:34	78:53:08	78:49:33	25:07:27	05:51:06	04:56:52	04:15:59	03:56:15	00:05:00							
LM deorbit	179:16:29	179:04:32	176:43:14	176:37:39	174:54:39	109:17:50	104:47:50	104:46:21	104:41:35	100:40:59	83:02:58	81:34:45	80:41:48	80:33:22	80:29:47	26:47:41	07:31:20	06:37:06	05:56:13	05:36:29	01:45:14	01:40:14						
LM lunar impact	179:39:29	179:27:32	177:06:14	177:00:39	175:17:39	109:40:50	105:10:50	105:09:21	105:04:35	101:03:59	83:25:58	81:57:45	81:04:48	80:56:22	80:52:47	27:10:41	07:54:20	07:00:06	06:19:13	05:59:29	02:08:14	02:03:14	00:					
CSM plane change 2	193:13:46	193:01:49	190:40:31	190:34:56	188:51:56	123:15:07	118:45:07	118:43:38	118:38:52	114:38:16	97:00:15	95:32:02	94:39:05	94:30:39	94:27:04	40:44:58	21:28:37	20:34:23	19:53:30	19:33:46	15:42:31	15:37:31	13:					
CSM shaping burn	216:49:12	216:37:15	214:15:57	214:10:22	212:27:22	146:50:33	142:20:33	142:19:01	142:14:18	138:13:42	120:35:41	119:07:28	118:14:31	118:06:05	118:02:30	64:20:24	45:04:03	44:09:49	43:28:56	43:09:12	39:17:57	39:12:57	37:					
Subsatellite jettison	218:02:08	217:50:11	215:28:53	215:23:18	213:40:18	148:03:29	143:33:29	143:32:00	143:27:14	139:26:38	121:48:37	120:20:24	119:27:27	119:19:01	119:15:26	65:33:20	46:16:59	45:22:45	44:41:52	44:22:08	40:30:53	40:25:53	38:					
TEI initiation	222:20:33	222:08:36	219:47:18	219:41:43	217:58:43	152:21:54	147:51:54	147:50:25	147:45:39	143:45:03	126:07:02	124:38:49	123:45:52	123:37:26	123:33:51	69:51:45	50:35:24	49:41:10	49:00:17	48:40:33	44:49:18	44:44:18	43:					
TEI cutoff	222:23:03	222:11:06	219:49:48	219:44:13	218:01:13	152:24:24	147:54:24	147:52:55	147:48:09	143:47:33	126:09:32	124:41:19	123:48:22	123:39:56	123:36:21	69:54:15	50:37:54	49:43:40	49:02:47	48:43:03	44:51:48	44:46:48	43:					
Entry interface	290:22:45	290:10:48	287:49:30	287:43:55	286:00:55	220:24:06	215:54:06	215:																				

TABLE 1-IV.- TIMETABLE OF MISSION EVENTS

Evasive maneuver (S-IVB)	SIM door jettison	LOI initiation	S-IVB predicted lunar impact	LOI cutoff	DOI	CSM/LM undock and separation	CSM circularization	PDI	CSM first pass over LLS	LM landing	CSM plane change 1	LM lift-off	TPI	Braking	Docking	LM jettison	CSM separation	LM deorbit	LM lunar impact	CSM plane change 2	CSM shaping burn	Sub-satellite jettison	TEI initiation	TEI cutoff	Entry interface
65:36:49																									
70:06:49	04:30:00																								
70:08:18	04:31:29	00:01:29																							
70:13:04	04:36:15	00:06:15	00:04:46																						
74:13:40	08:36:51	04:06:51	04:05:22	04:00:36																					
91:51:41	26:14:52	21:44:52	21:43:23	21:38:37	17:38:01																				
93:19:54	27:43:05	23:13:05	23:11:36	23:06:50	19:06:14	01:28:13																			
94:12:51	28:36:02	24:06:02	24:04:33	23:59:47	19:59:11	02:21:10	00:52:57																		
94:21:17	28:44:28	24:14:28	24:12:59	24:08:13	20:07:37	02:29:36	01:01:23	00:08:26																	
94:24:52	28:48:03	24:18:03	24:16:34	24:11:48	20:11:12	02:33:11	01:04:58	00:12:01	00:03:35																
148:06:58	82:30:09	78:00:09	77:58:40	77:53:54	73:53:18	56:15:17	54:47:04	53:54:07	53:45:41	53:42:06															
167:23:19	101:46:30	97:16:30	97:15:01	97:10:15	93:09:39	75:31:38	74:03:25	73:10:28	73:02:02	72:58:27	19:16:21														
168:17:33	102:40:44	98:10:44	98:09:15	98:04:29	94:03:53	76:25:52	74:57:39	74:04:42	73:56:16	73:52:41	20:10:35	00:54:14													
168:58:26	103:21:37	98:51:37	98:50:08	98:45:22	94:44:46	77:06:45	75:38:32	74:45:35	74:37:09	74:33:34	20:51:28	01:35:07	00:40:53												
169:18:10	103:41:21	99:11:21	99:09:52	99:05:06	95:04:30	77:26:29	75:58:16	75:05:19	74:56:53	74:53:18	21:11:12	01:54:51	01:00:37	00:19:44											
173:09:25	107:32:36	103:02:36	103:01:07	102:56:21	98:55:45	81:17:44	79:49:31	78:56:34	78:48:08	78:44:33	25:02:27	05:46:06	04:51:52	04:10:59	03:51:15										
173:14:25	107:37:36	103:07:36	103:06:07	103:01:21	99:00:45	81:22:44	79:54:31	79:01:34	78:53:08	78:49:33	25:07:27	05:51:06	04:56:52	04:15:59	03:56:15	00:05:00									
174:54:39	109:17:50	104:47:50	104:46:21	104:41:35	100:40:59	83:02:58	81:34:45	80:41:48	80:33:22	80:29:47	26:47:41	07:31:20	06:37:06	05:56:13	05:36:29	01:45:14	01:40:14								
175:17:39	109:40:50	105:10:50	105:09:21	105:04:35	101:03:59	83:25:58	81:57:45	81:04:48	80:56:22	80:52:47	27:10:41	07:54:20	07:00:06	06:19:13	05:59:29	02:08:14	02:03:14	00:23:00							
188:51:56	123:15:07	118:45:07	118:43:38	118:38:52	114:38:16	97:00:15	95:32:02	94:39:05	94:30:39	94:27:04	40:44:58	21:28:37	20:34:23	19:53:30	19:33:46	15:42:31	15:37:31	13:57:17	13:34:17						
212:27:22	146:50:33	142:20:33	142:19:04	142:14:18	138:13:42	120:35:41	119:07:28	118:14:31	118:06:05	118:02:30	64:20:24	45:04:03	44:09:49	43:28:56	43:09:12	39:17:57	39:12:57	37:32:43	37:09:43	23:35:26					
213:40:18	148:03:29	143:33:29	143:32:00	143:27:14	139:26:38	121:48:37	120:20:24	119:27:27	119:19:01	119:15:26	65:33:20	46:16:59	45:22:45	44:41:52	44:22:08	40:30:53	40:25:53	38:45:39	38:22:39	24:48:22	01:12:56				
217:58:43	152:21:54	147:51:54	147:50:25	147:45:39	143:45:03	126:07:02	124:38:49	123:45:52	123:37:26	123:33:51	69:51:45	50:35:24	49:41:10	49:00:17	48:40:33	44:49:18	44:44:18	43:04:04	42:41:04	29:06:47	05:31:21	04:18:25			
218:01:13	152:24:24	147:54:24	147:52:55	147:48:09	143:47:33	126:09:32	124:41:19	123:48:22	123:39:56	123:36:21	69:54:15	50:37:54	49:43:40	49:02:47	48:43:03	44:51:48	44:46:48	43:06:34	42:43:34	29:09:17	05:33:51	04:20:55	00:02:30		
286:00:55	220:24:06	215:54:06	215:52:37	215:47:51	211:47:15	194:09:14	192:41:01	191:48:04	191:39:38	191:36:03	137:53:57	118:37:36	117:43:22	117:02:29	116:42:45	112:51:30	112:46:30	111:06:16	110:43:16	97:08:59	73:33:33	72:20:37	68:02:12		
286:14:13	220:37:24	216:07:24	216:05:55	216:01:09	212:00:33	194:22:32	192:54:19	192:01:22	191:52:56	191:49:21	138:07:15	118:50:54	117:56:40	117:15:47	116:56:03	113:04:48	112:59:48	111:19:34	110:56:34	97:22:17	73:46:51	72:33:55	68:15:30	00:13:18	

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
EI	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	midcourse correction
MCC	midcourse correction
MCI	moon centered inertial
MGA	middle gimbal angle
MNBY	mean nearest Besselian year
MSFC	Marshall Space Flight Center
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
STDN	Spacecraft Tracking and Data Network
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 MISSION GUIDELINES AND CONSTRAINTS

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

- a. The primary lunar landing site is the Descartes region. 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 11.9°.
- d. The flight azimuth range following launch is limited to 72° 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 must be 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 must be returnable within DPS capability at perilune + 2 hours.
- h. The S-IVB will perform an evasive maneuver prior to the LOX dump. The LOX dump 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 an approximately 52 500-foot by 60-n. mi. orbit at the time of PDI on rev 13.
- j. The lunar surface stay time will be approximately 73 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 40 approximately 10 revolutions prior to LM ascent to place the landing site in the orbital plane at the planned time of lift-off on rev 50.

l. The LM ascent stage will be deorbited for lunar impact. A second CSM plane change of 3° will be made on rev 61 to increase lunar surface coverage for photography. A shaping burn will be performed by the CSM on rev 73 to achieve proper orbital lifetime for the subsatellite jettisoned on rev 73.

m. The lunar orbit will be designed within the SPS capability to return to earth from an 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 April 16, 1972. 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 launch vehicle mission phases were simulated independently of the exact launch vehicle operational trajectory (ref. 3). The trajectory data presented here for the launch vehicle mission phases were simulated with data received from the MSFC for the Apollo 16 mission. No attempt was made to duplicate exactly the launch vehicle operational mission, and the information for the launch vehicle 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 for the first injection opportunity over the Pacific Ocean. The launch is summarized as follows.

Date, month, day, year	April 16, 1972
Time, hr:min, c.s.t.	11:54
Azimuth, deg	72.034
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-VII.

^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. 3).

4.2 EARTH PARKING ORBIT

4.2 Earth Parking Orbit^a (EPO)

The EPO insertion conditions are as follows.

The insertion ship positioned at 27°N latitude and 49°W longitude tracks the vehicle for approximately 3 minutes after insertion for a minimum elevation angle of 3°.

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 $2^{\text{h}}21^{\text{m}}17.9^{\text{s}}$. The EPO groundtrack 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. 3).

APOLLO TRACKING NETWORK

All stations operational May 1968

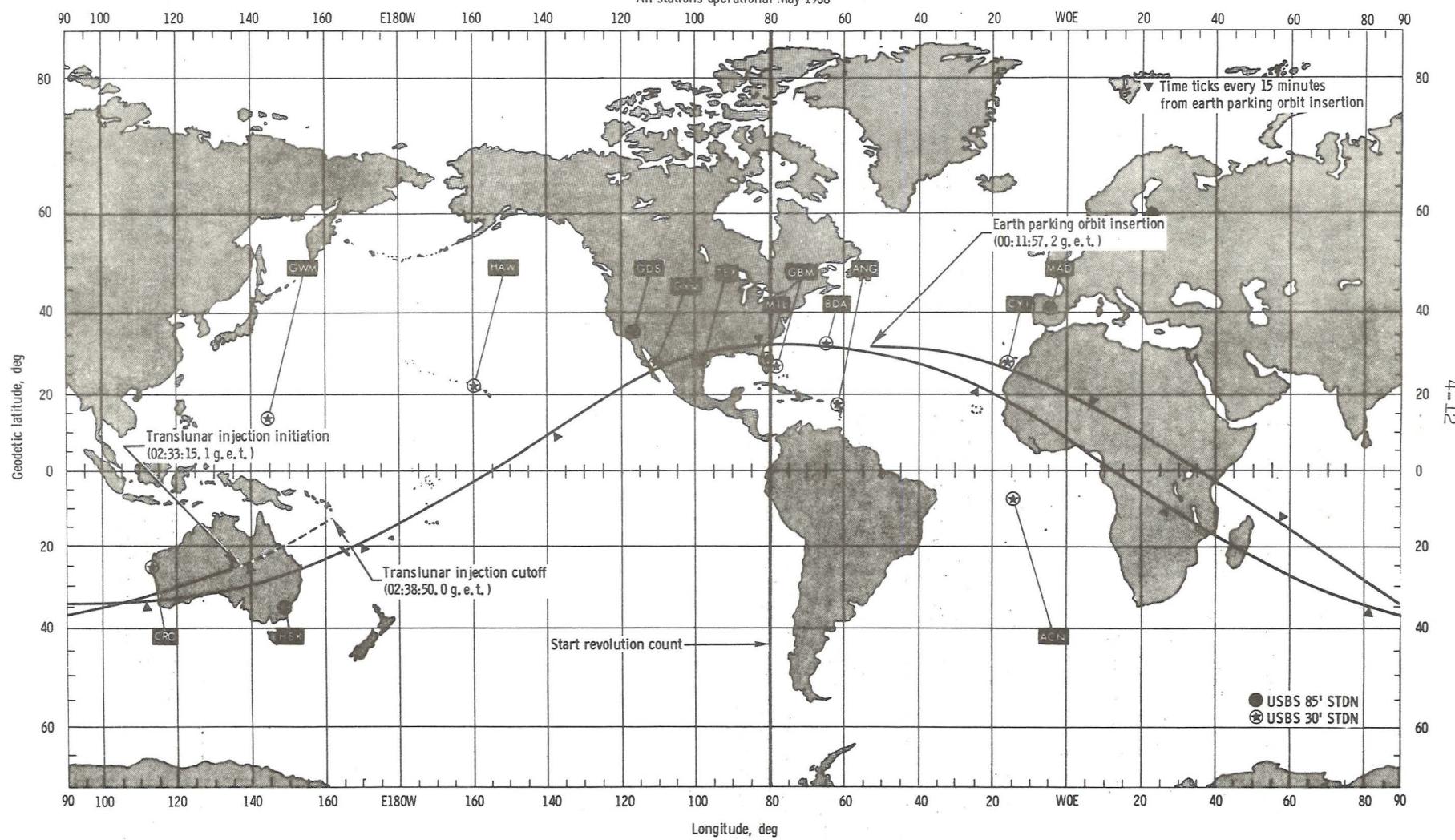


Figure 4.2-1. - Earth parking orbit groundtrack.

4.3 TRANSLUNAR INJECTION

4.3 Translunar Injection^a (TLI)

The TLI burn is initiated over Australia on the second revolution in earth orbit, and the burn is totally in sunlight. The TLI burn geometry is shown in figure 4.3-1.

The TLI burn places the spacecraft on a translunar trajectory with a 71.4 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

Burn cutoff

Time, hr:min:sec, g.e.t.	02:38:50.0
Geodetic latitude, deg	-12.5
Longitude, deg	161.7
Velocity, fps	35 648.7
Burn duration, sec	334.9
S-IVB propellant used, lb	162 297
Plane change, deg	0.0
Inclination to earth-moon plane, deg	9.7
Apogee altitude above mean radius, n. mi.	266 388

^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. 3).

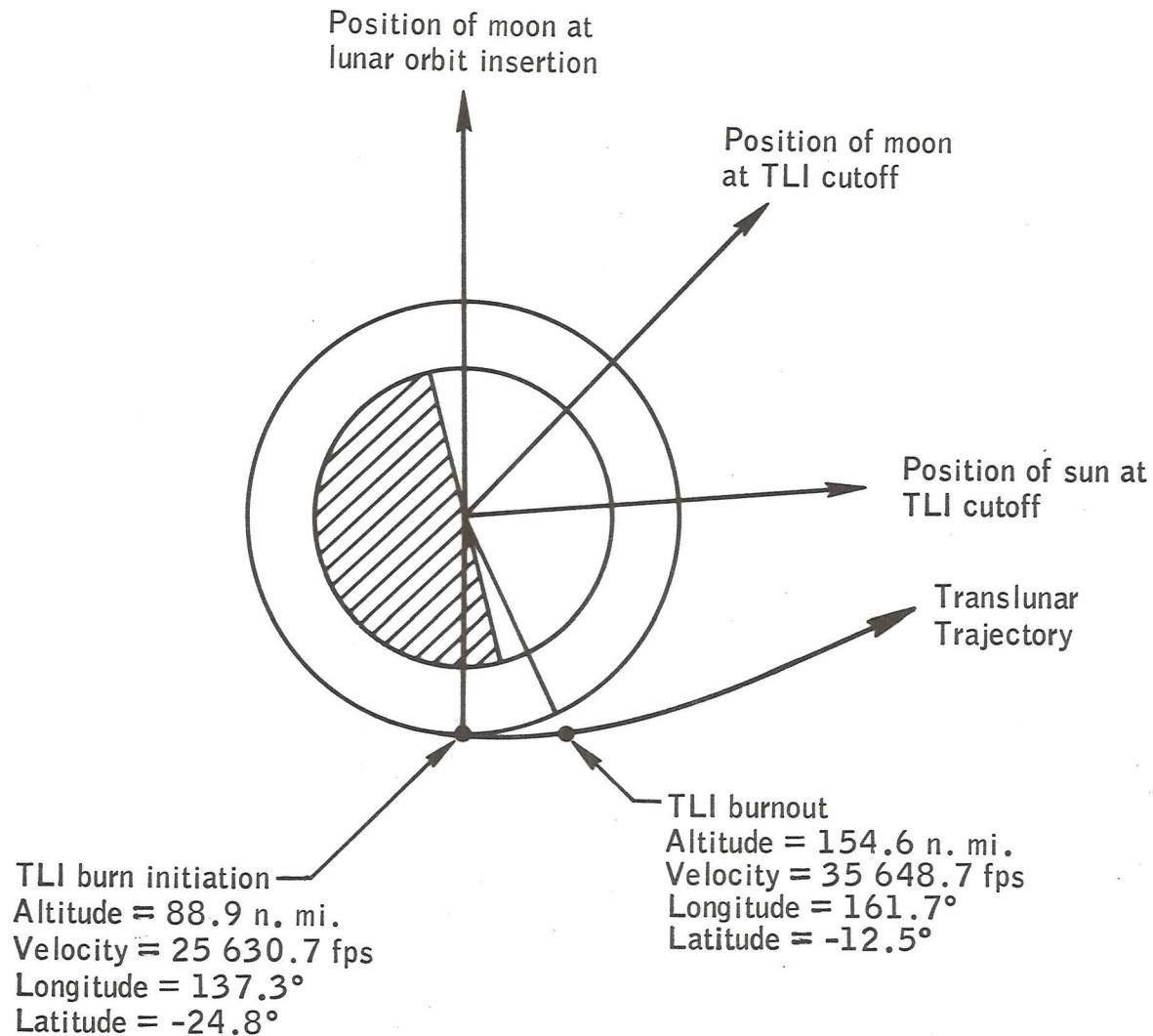


Figure 4.3-1.- TLI geometry.

4.4 TRANSLUNAR TRAJECTORY

4.4 Translunar Trajectory

The characteristics of the translunar trajectory are the following:

Perilune

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

Earth perigee

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 9.8 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 189° , yaw 14° , roll 180° .

The LOX dump maneuver is designed to reduce the probability of space-craft 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 5.5 hr) to target the S-IVB for a lunar impact at 31.7°W and 2.3°S .

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 = 189° Yaw = 14° Roll = 180°

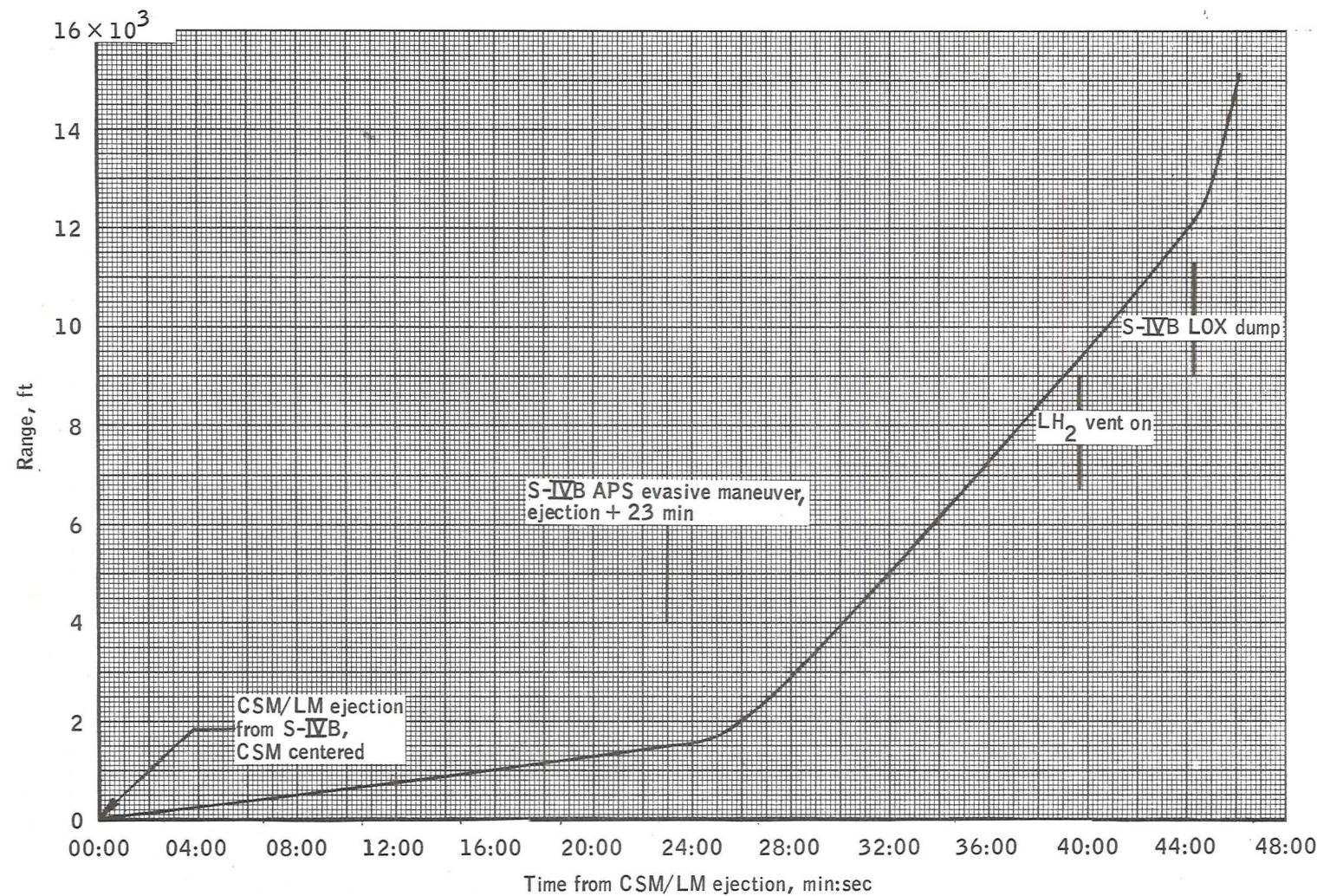
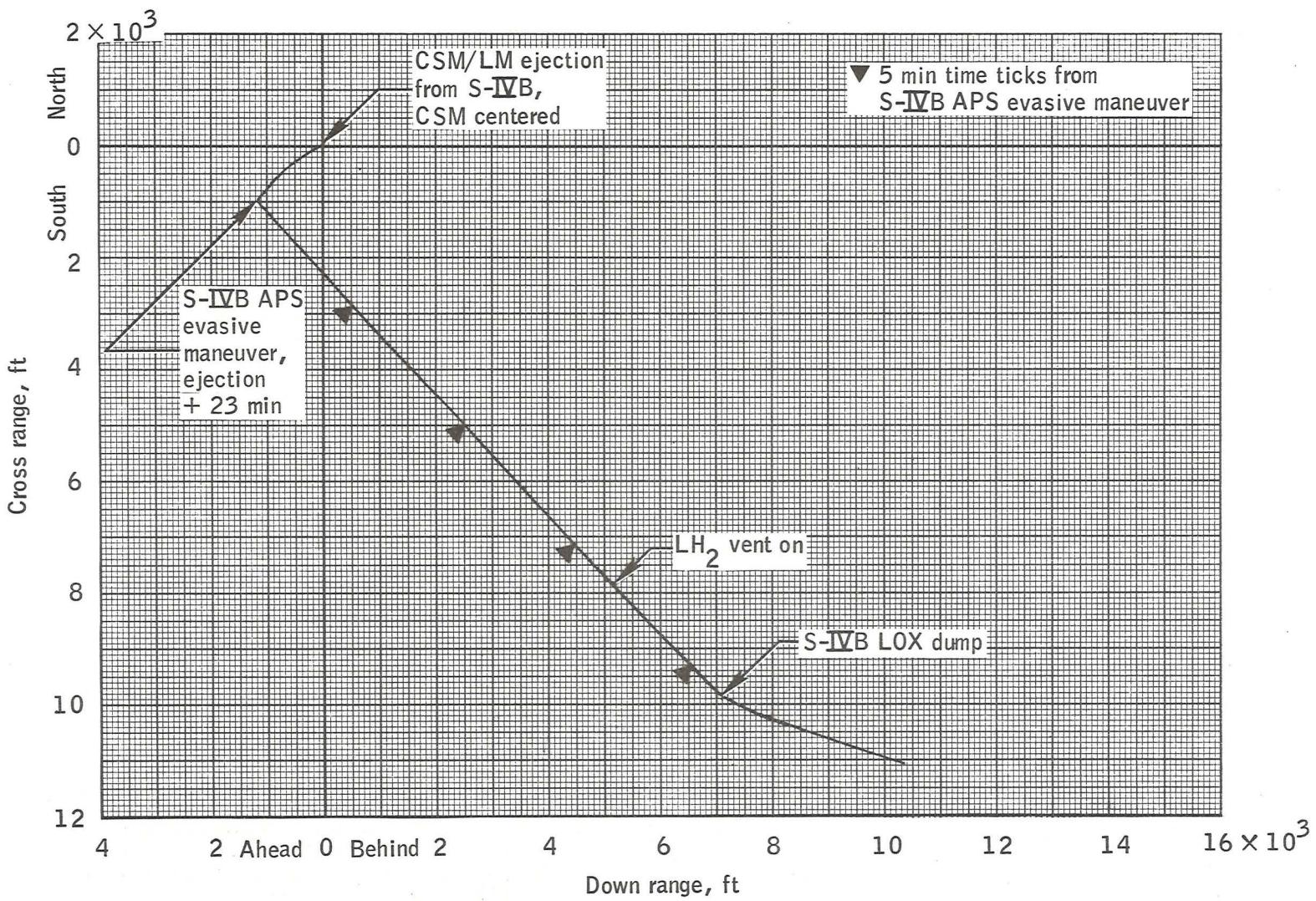
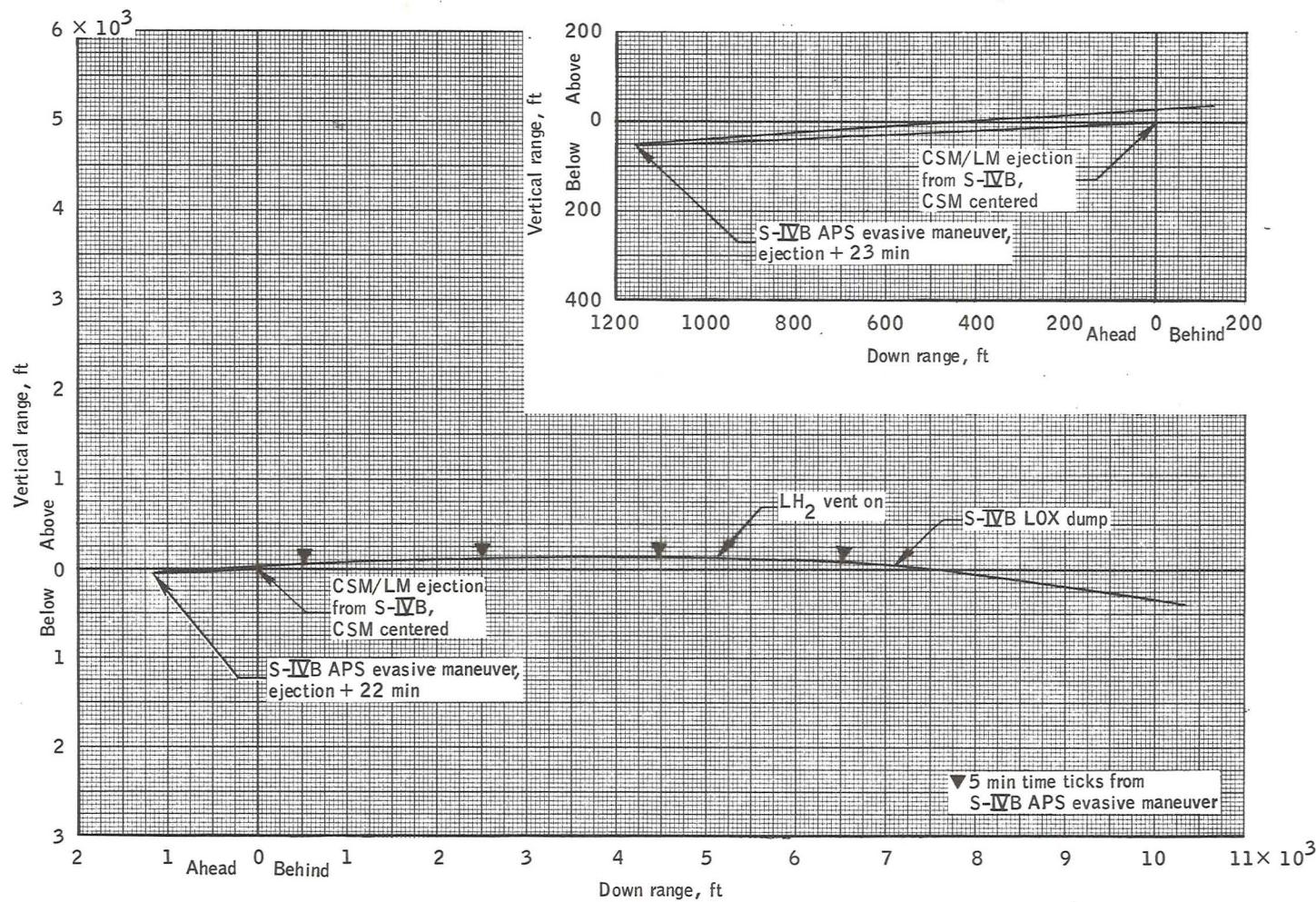


Figure 4.5-1.- Motion of the S-IVB relative to the spacecraft for the S-IVB evasive maneuver of Apollo 16.



(b) Cross range versus down range.

Figure 4.5-1.- Continued.



(c) Vertical range versus down range.

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 4.6-1. 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 71.4 n. mi. Passive thermal control attitude will be maintained during most of the translunar coast phase. The PTC REFSMMAT is given in table 5-VIII.

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-VIII) will be used for MCC-1, MCC-2, MCC-3, and MCC-4. The alignment criteria are presented in section 5.0.

The translunar coast phase duration is 71 hours 50 minutes. The SC enters the lunar umbra 2 hours 3 minutes prior to LOI ignition but re-enters sunlight 24 minutes before ignition. SC LOS occurs approximately 11 minutes before LOI ignition, and the vehicle remains occulted until LOI + 21 minutes (g.e.t.).

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 oriented such that the SIM bay door is jettisoned forward and below the local horizontal plane at a pitch of -23.8° , and out of plane to the north at a yaw of 32° . This jettison attitude places the SIM door approximately 26 n. mi. above and 10 n. mi. behind the CSM at LOI and it continues in its hyperbolic trajectory until it exits the lunar sphere of influence.

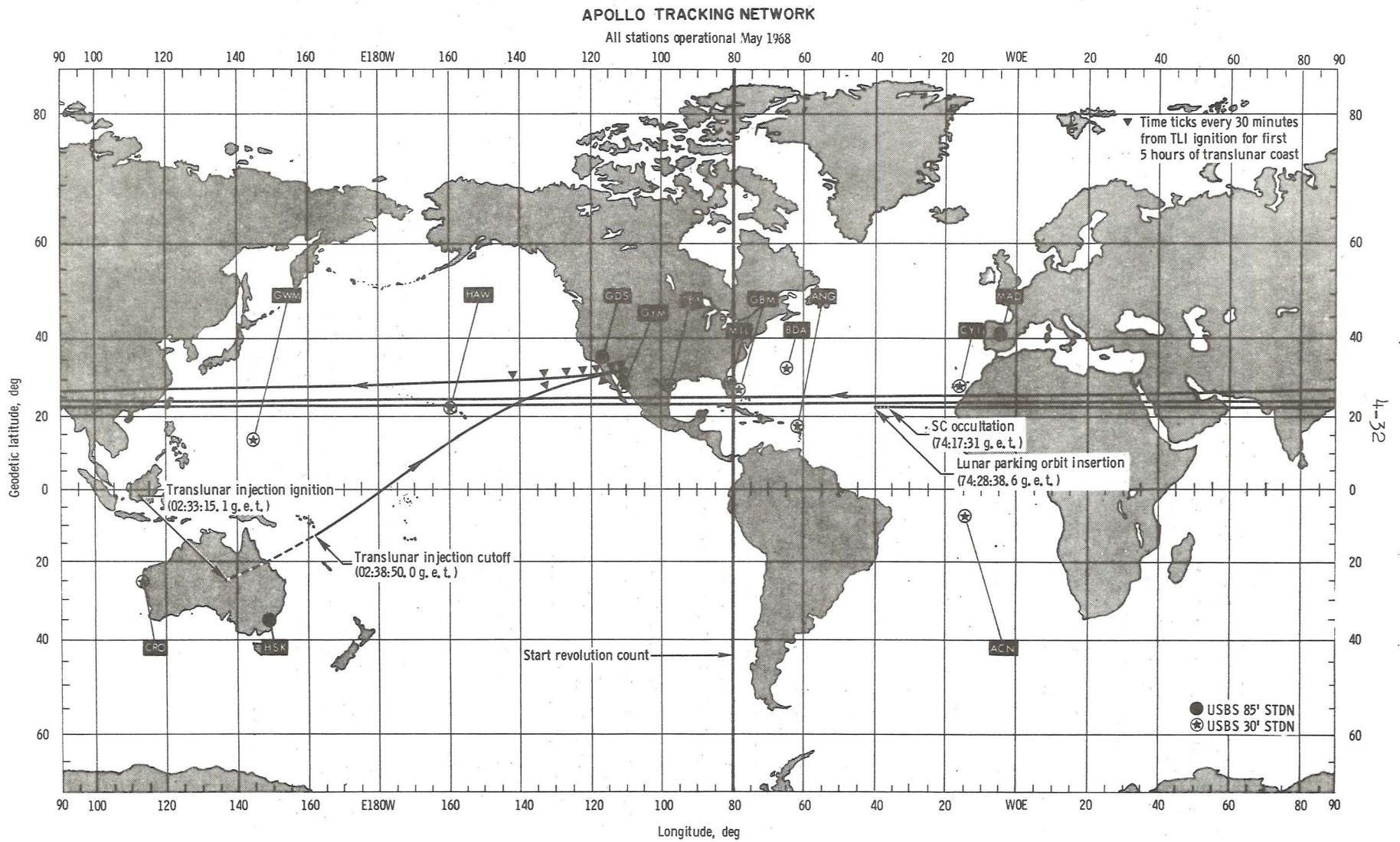


Figure 4.6-1. - Translunar coast groundtrack.

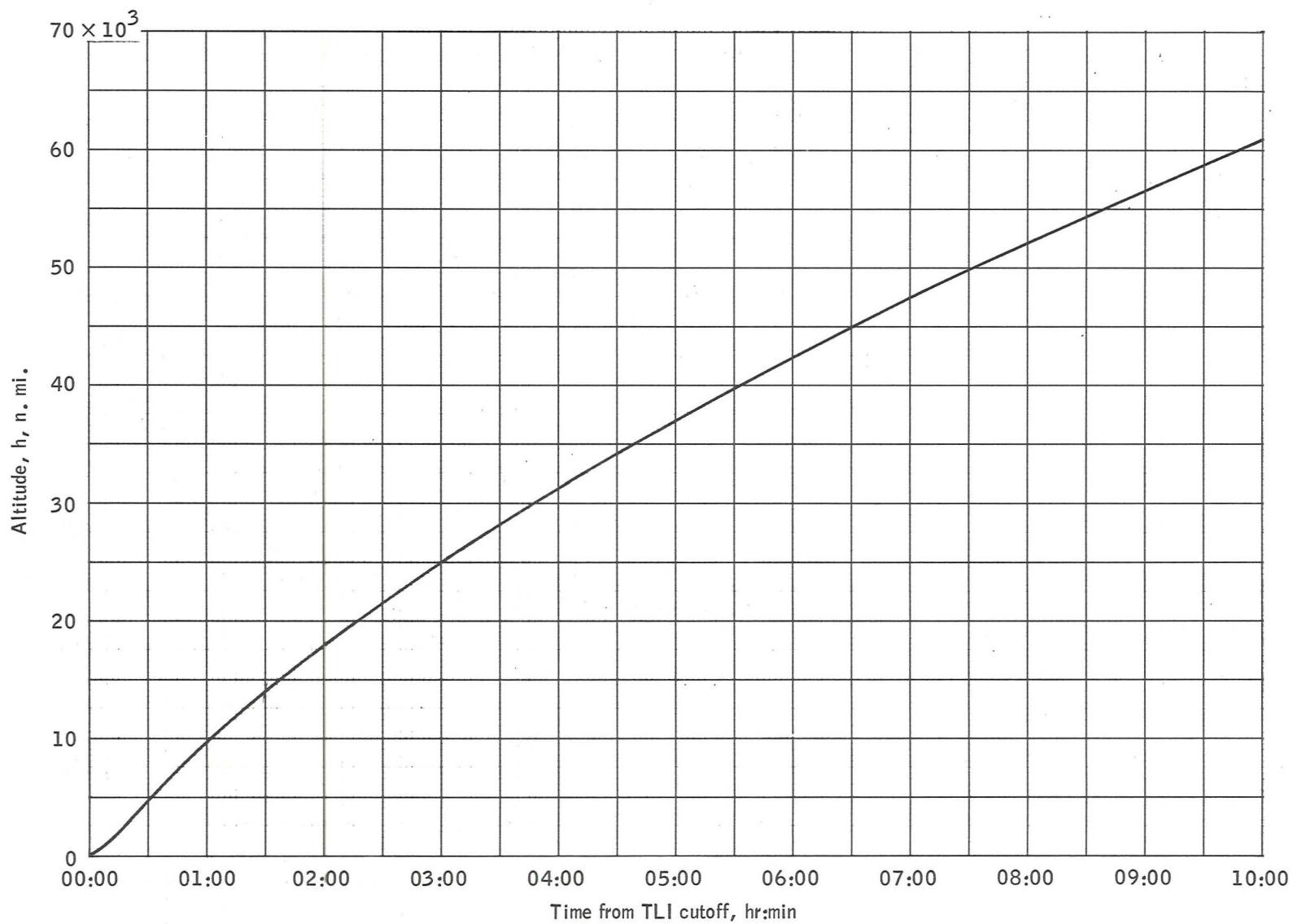


Figure 4.6-2.- Time history of altitude for first 10 hours of translunar coast.

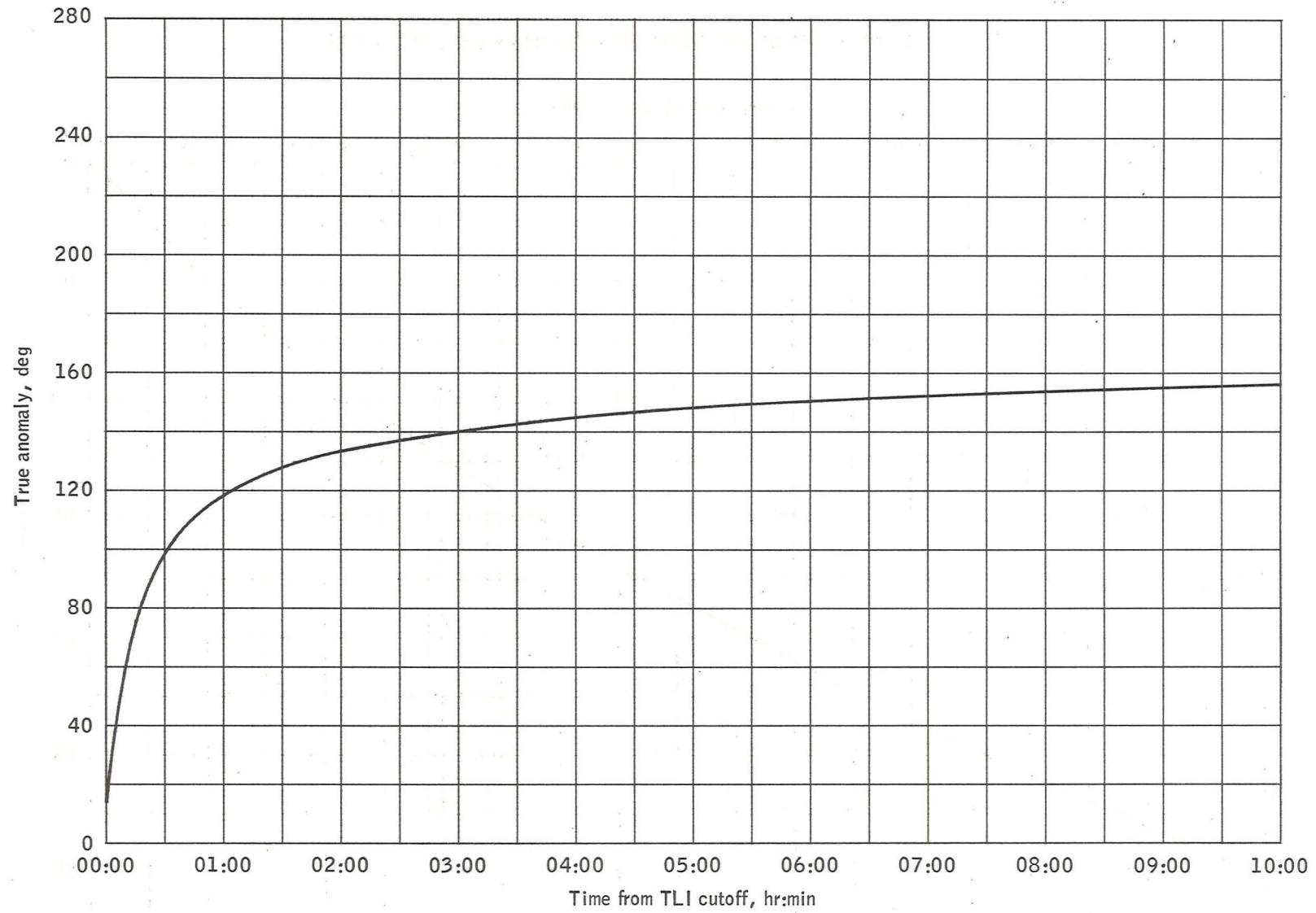


Figure 4.6-3.- Time history of true anomaly for first 10 hours of translunar coast.

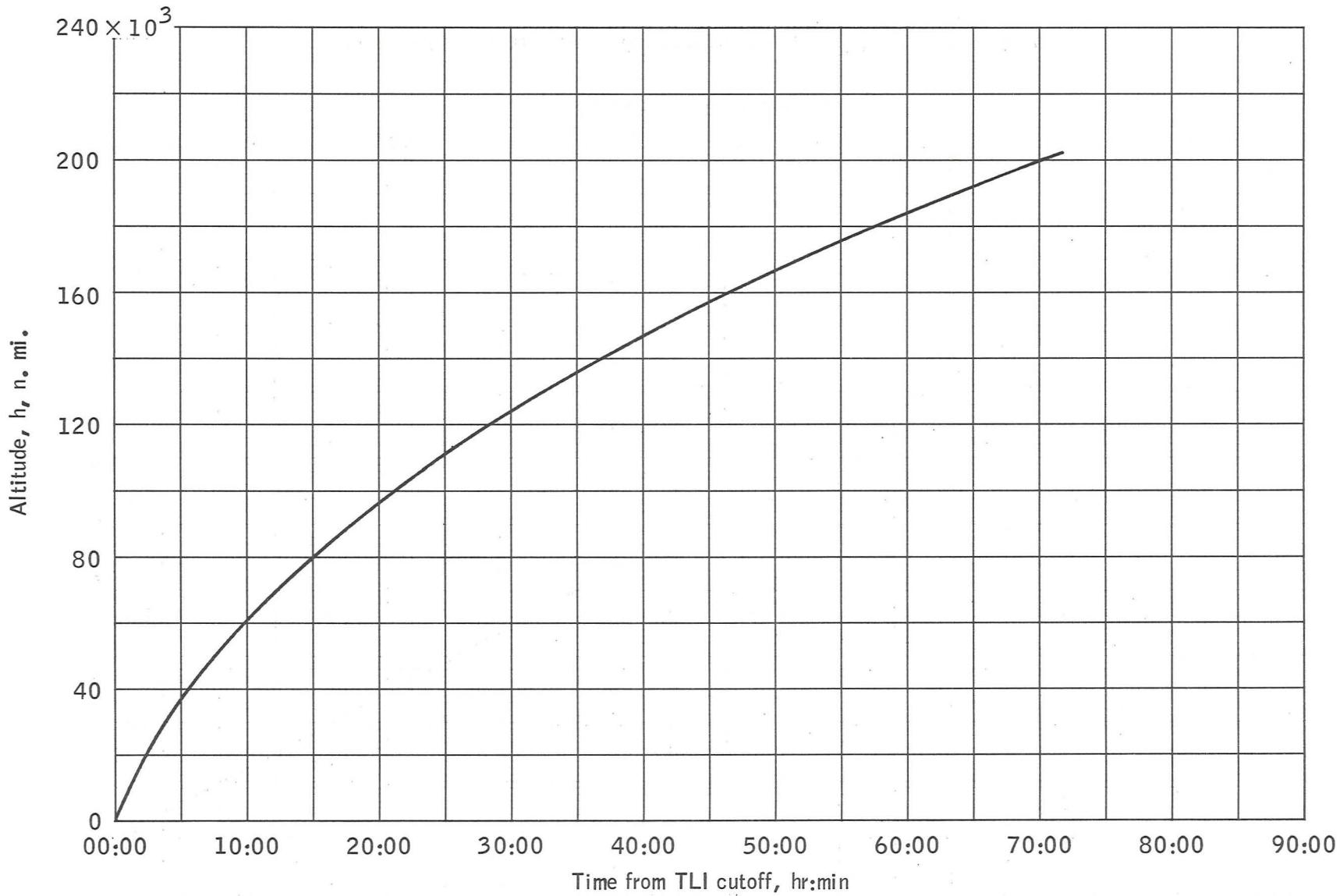


Figure 4.6-4.- Altitude time history from translunar injection to lunar orbit insertion.

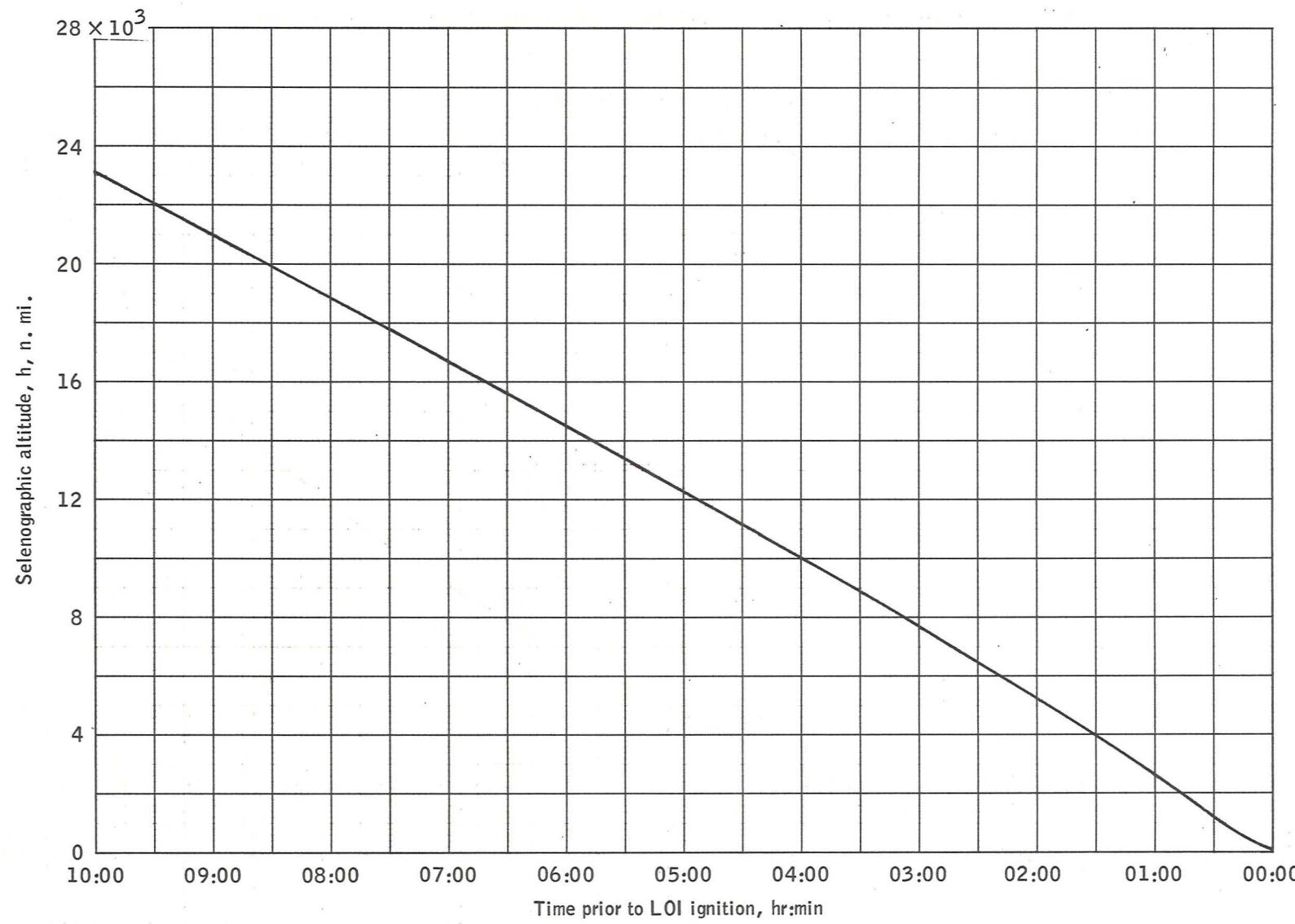


Figure 4.6-5.- Time history of altitude above landing site 10 hours prior to LOI ignition.

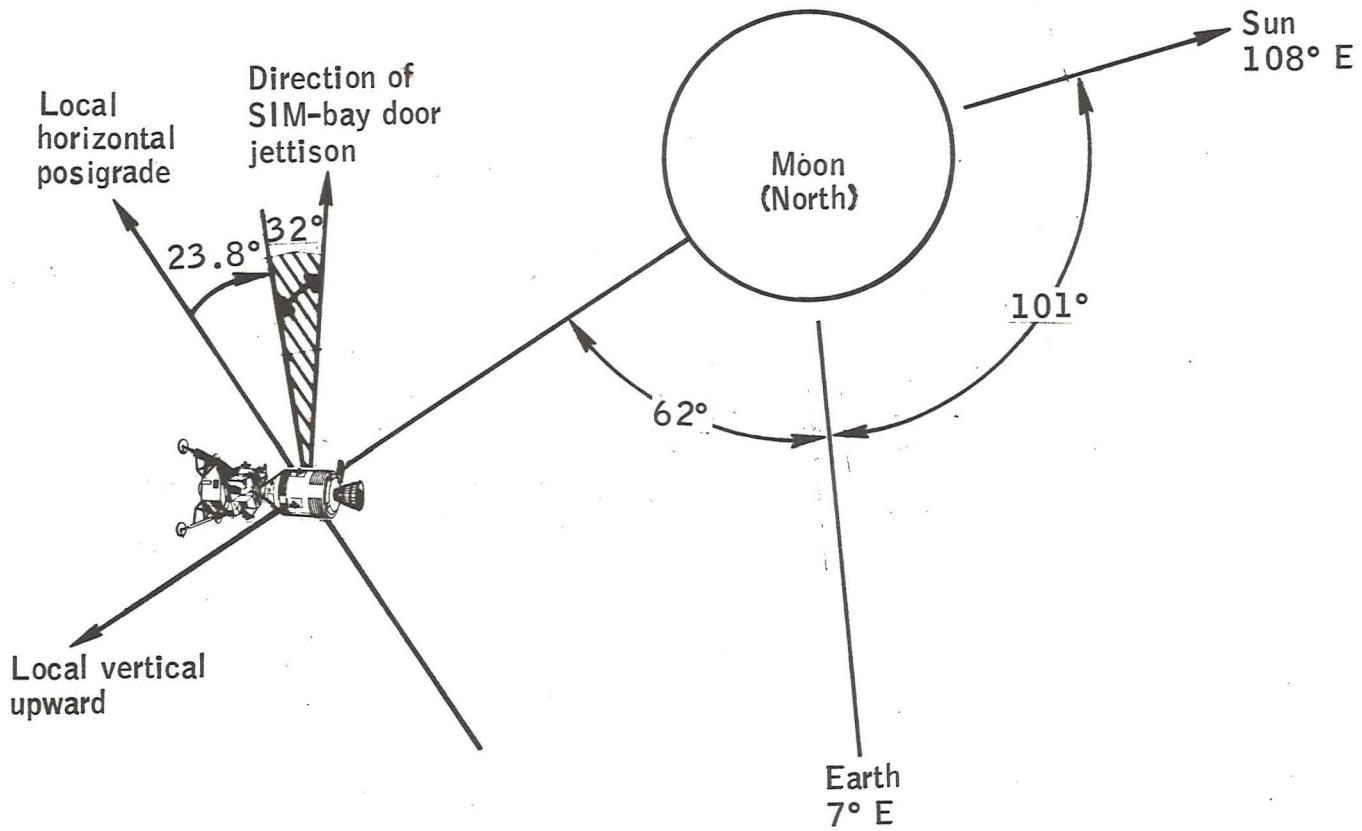


Figure 4.6-6.- Relative configuration of the sun, moon, earth and spacecraft for SIM-bay door jettison at LOI minus 4.5 hours.

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.	74:28:38.6
Mass, lb	102 642.7
Altitude above LLS, n. mi.	95.1
Selenographic latitude, deg	8.1
Selenographic longitude, deg	-166.9
Inertial velocity, fps	8104.0
Perilune altitude above LLS, n. mi.	71.4
Selenographic inclination, deg	8.1

LOI burnout - start LPO

Time, hr:min:sec, g.e.t.	74:34:53.6
Altitude above LLS, n. mi.	77.5
Selenographic latitude, deg	7.1
Selenographic longitude, deg	169.2
Inertial velocity, fps	5388.4
Selenographic inclination, deg	9.0
Burn duration, sec	375.0
Inertial burn arc, deg	23.7
Plane change, deg	2.3
ΔV , fps	2807.0
SPS propellant used, lb	24 838.4
Orbit period, hr:min:sec	02:08:46.4
Perilune altitude above LLS, n. mi.	58.5
Apolune altitude above LLS, n. mi.	170.6

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. 4).

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

The target load for the LOI burn is given in table 5-IX. More detailed information about the burn, including reset point, navigation updates, and ignition gimbal angles, is given in reference 4.

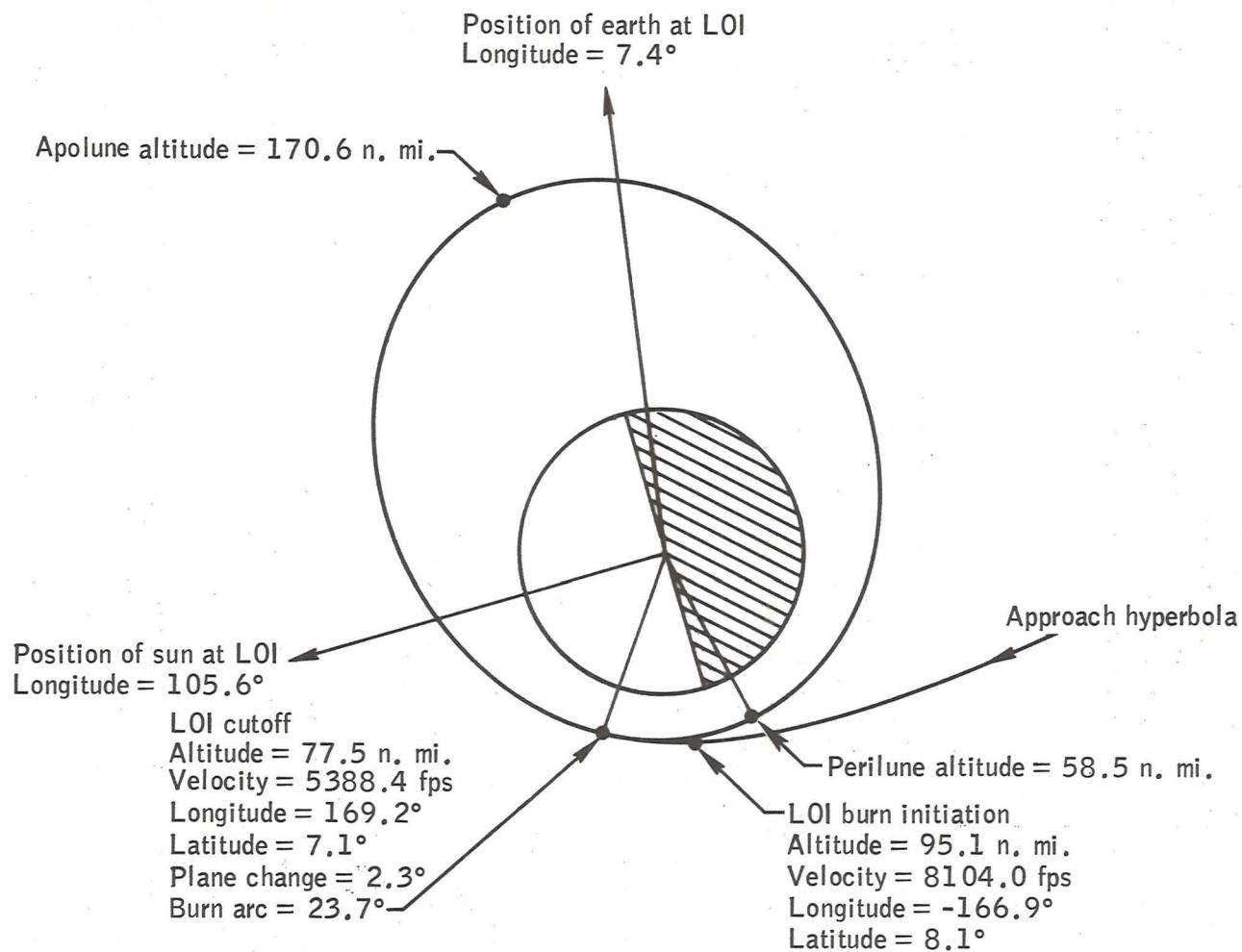


Figure 4.7-1.- LOI geometry.

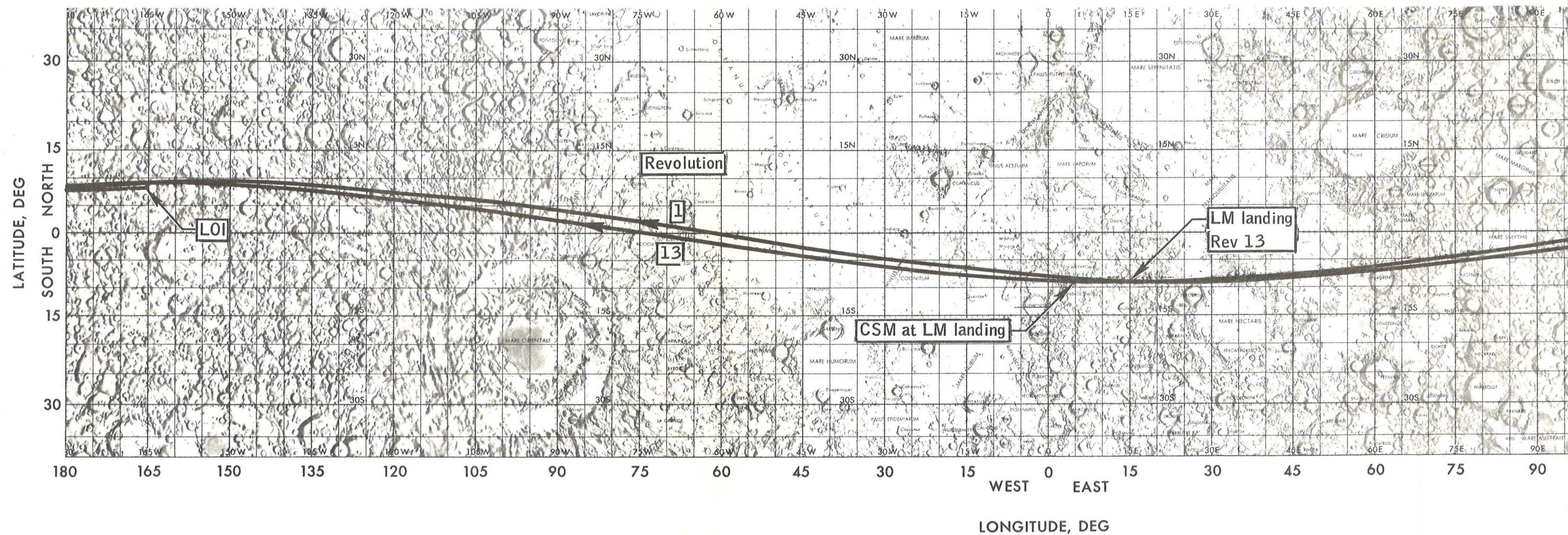


Figure 4

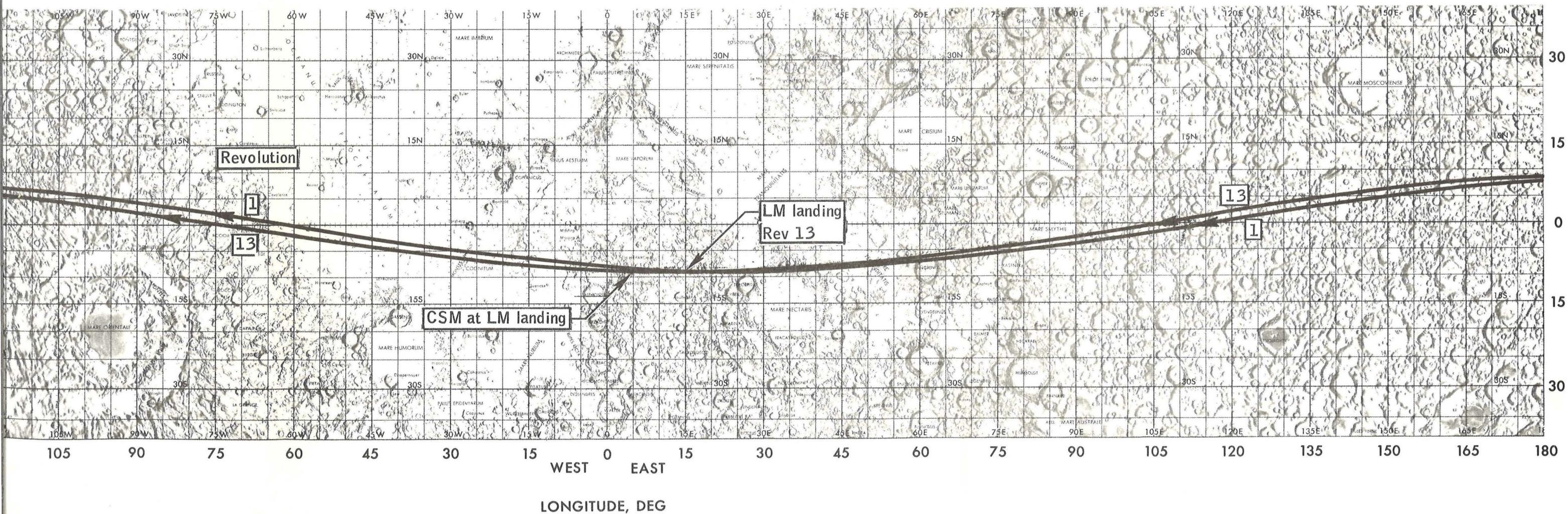
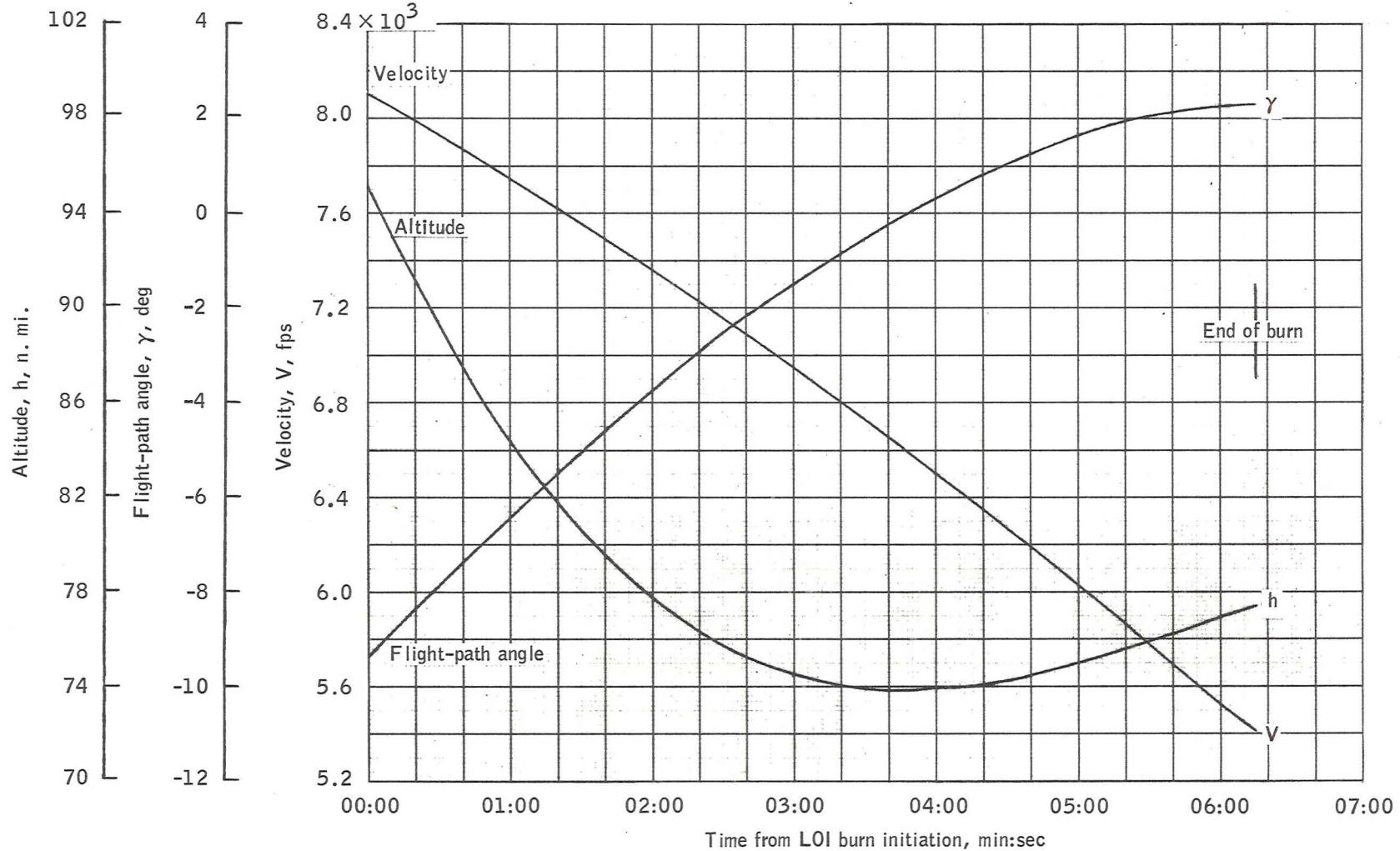
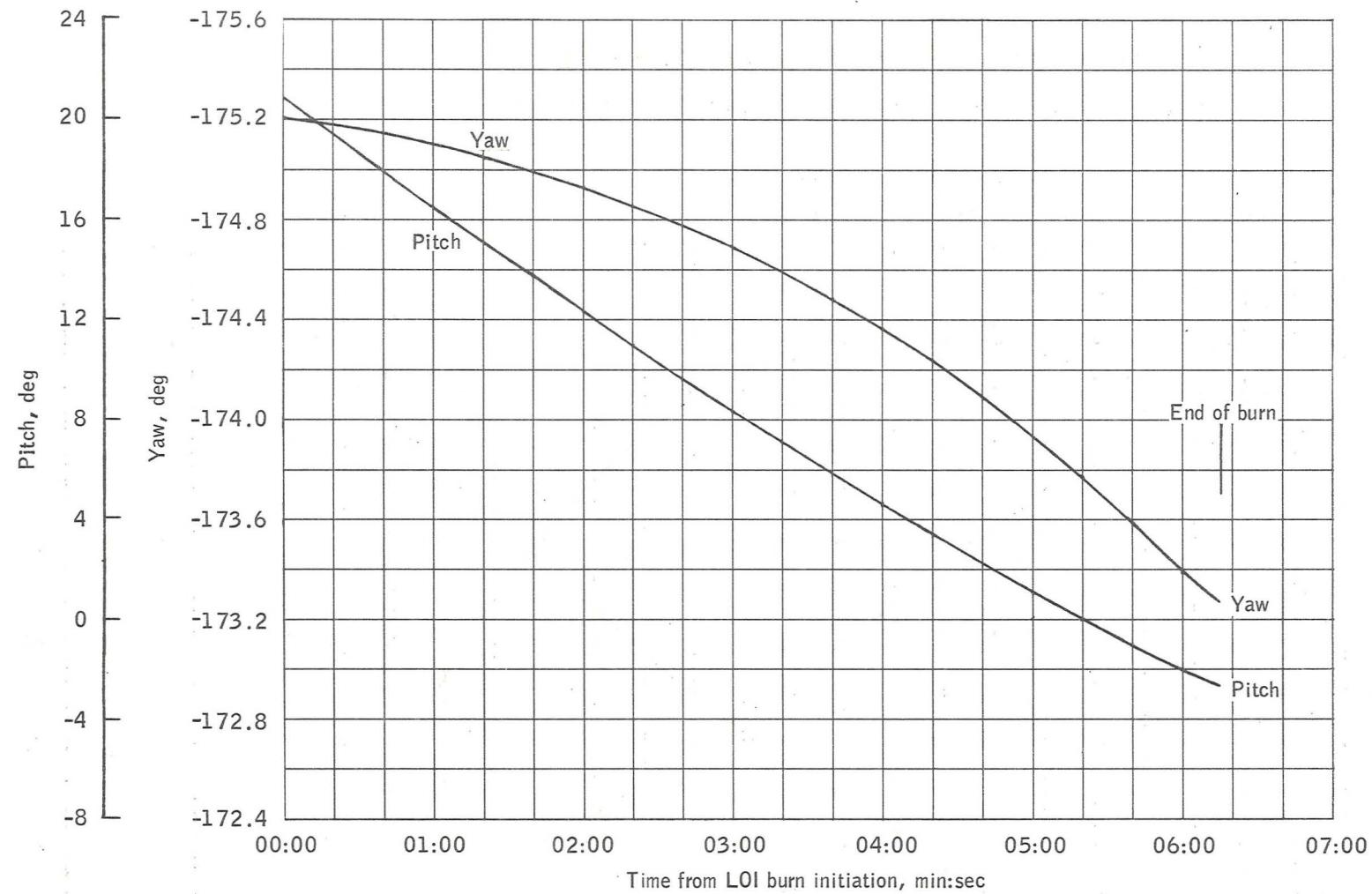


Figure 4.7-2.- Lunar orbit groundtrack from LOI to LM landing.



(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 10.9- by 58.6-n. mi. lunar orbit so that the predicted lunar potential perturbation will place the spacecraft in an approximately 52 500-foot by 60-n. mi. orbit at PDI on rev 13. The orbit is designed so that the perilune is at 30.9°E selenographic longitude with PDI occurring at 32.7°E longitude. The altitudes are relative to the landing site radius.

For the DOI burn, the landing REFSMMAT (table 5-X) 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 5-X. The characteristics of the burn are the following.

DOI burn initiation

Time, hr:min:sec, g.e.t.	78:35:30.3
Mass, lb	77 770.4
Altitude above LLS, n. mi.	58.6
Selenographic latitude, deg	8.7
Selenographic longitude, deg	-140.9
Inertial velocity, fps	5486.2
Perilune altitude above LLS, n. mi.	58.6
Apolune altitude above LLS, n. mi.	170.4

DOI burnout

Time, hr:min:sec, g.e.t.	78:35:54.4
Altitude above LLS, n. mi.	58.6
Selenographic latitude, deg	8.8
Selenographic longitude, deg	-142.2
Inertial velocity, fps	5280.2
Selenographic inclination, deg	9.0
Burn duration, sec	24.1
Inertial burn arc, deg	1.2
Plane change, deg	0.0
ΔV, fps	206.0
SPS propellant used, lb	1566.2
Orbit period, hr:min:sec	01:54:25.2
Perilune altitude above LLS, n. mi.	10.9
Apolune altitude above LLS, n. mi.	58.6

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. Undocking and separation are performed at $96^{\text{h}}13^{\text{m}}31^{\text{s}}$ g.e.t. (approximately 17 hr 38 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	74:29
DOI	End of 2	78:36
Begin rest period	4	83:45
End rest period	9	92:45
Begin IVT to LM	10	95:15
Undocking and separation	12	96:14

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 2.2°N and 121.0°E during the twelfth orbit 2.50 hours before landing. The required data for this maneuver are given in table 5-X.

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.

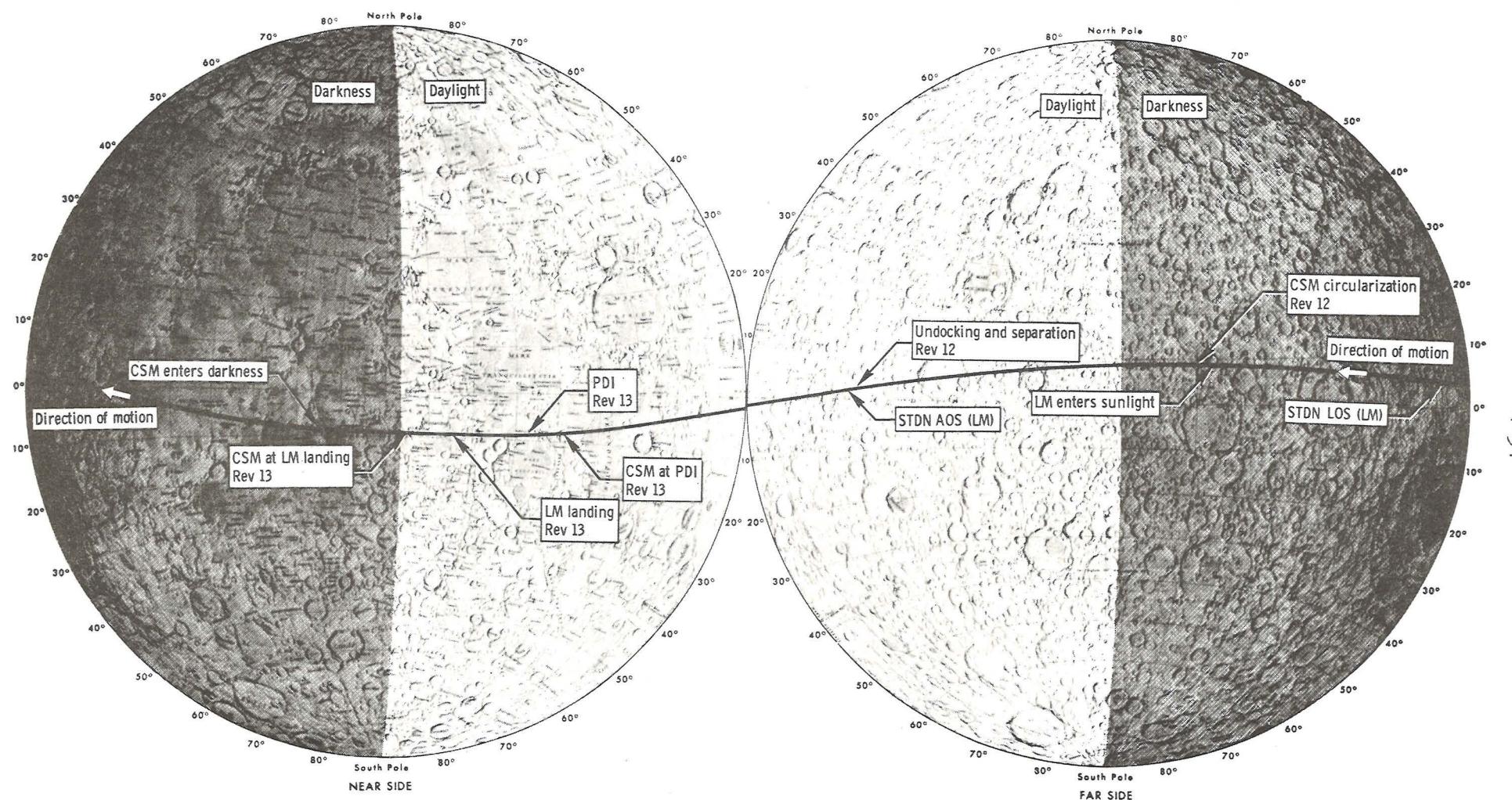
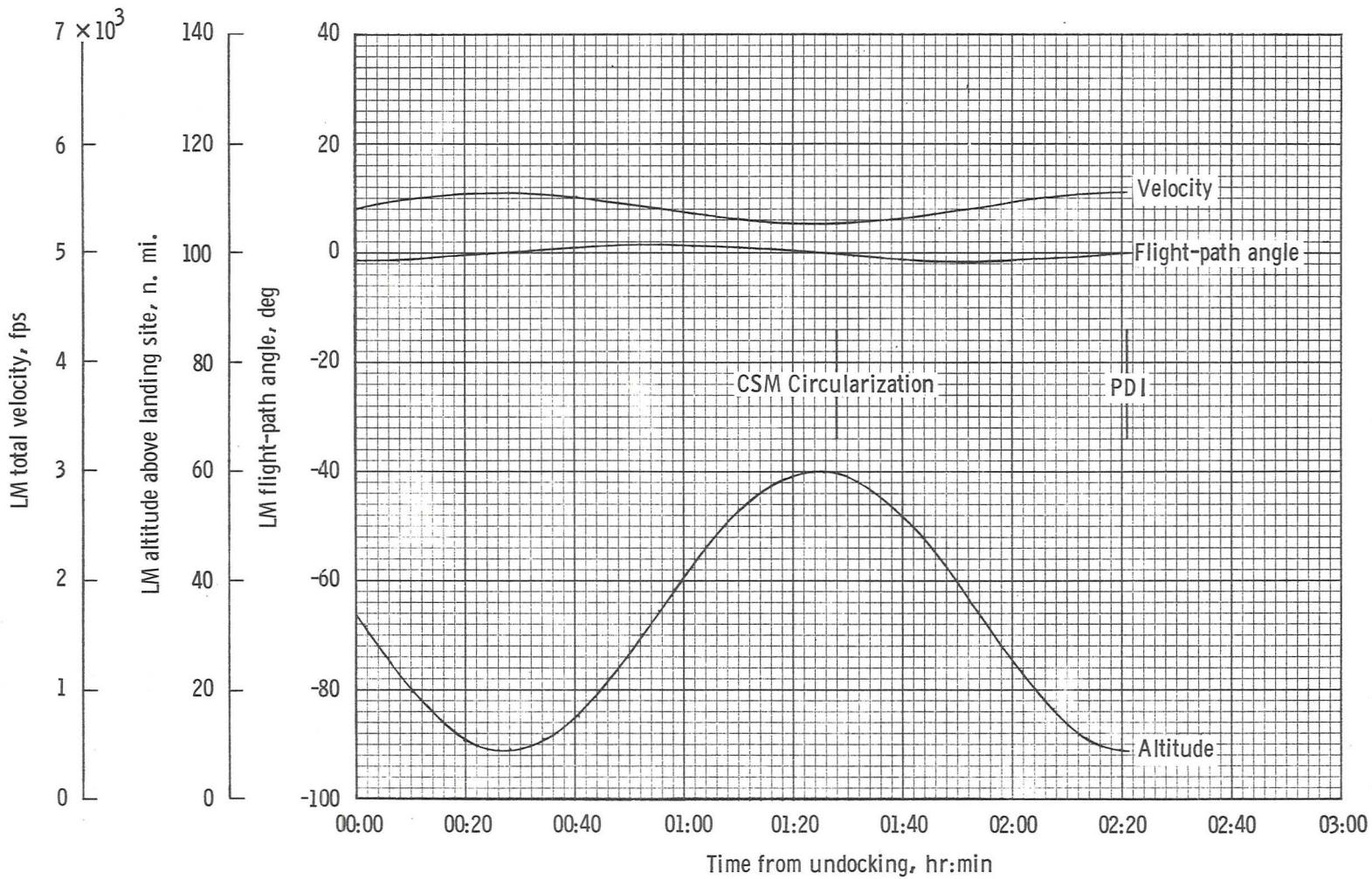
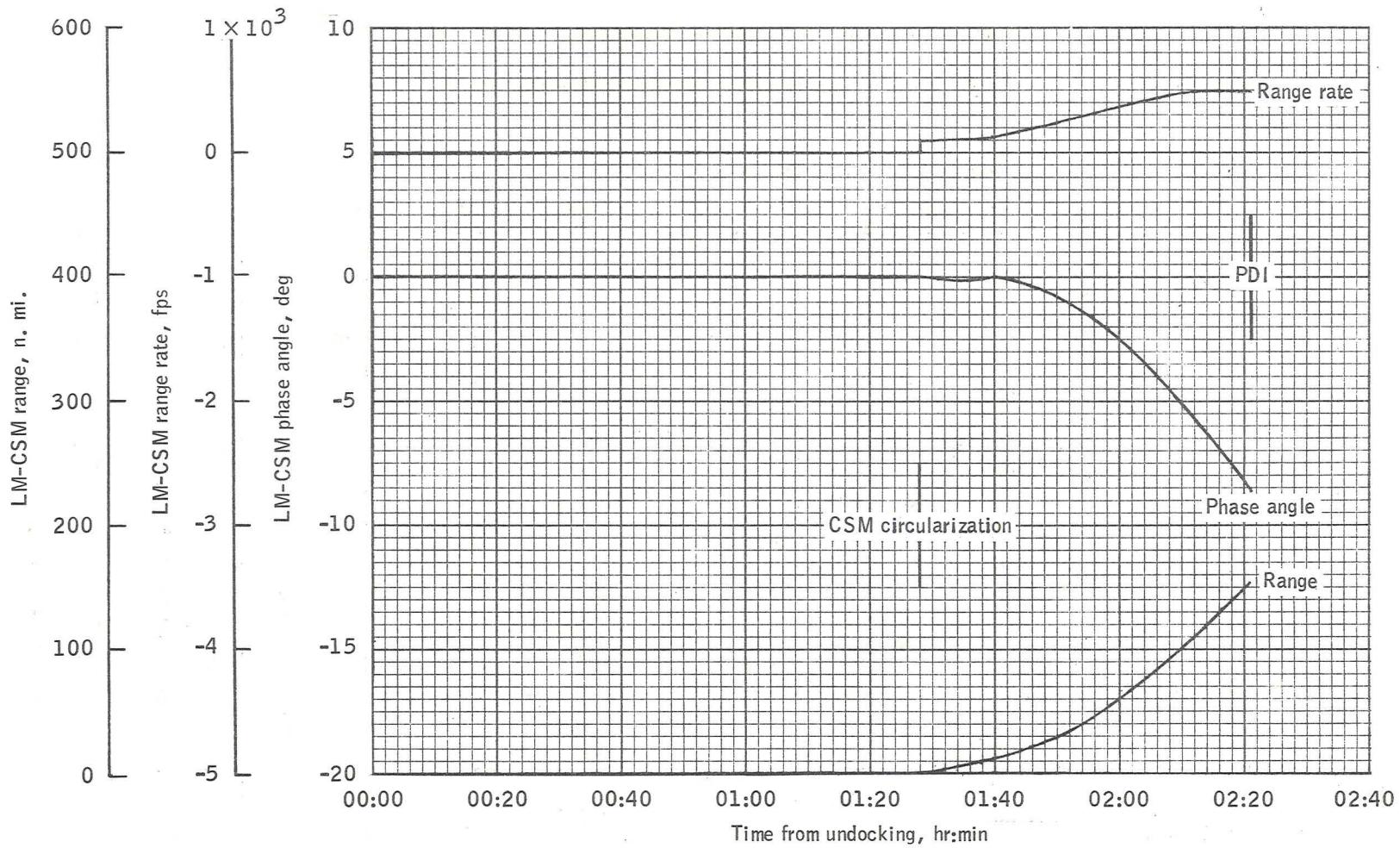


Figure 4.9-1.- LM and CSM events from undocking to landing.



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

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 (CSM referenced).

Figure 4.9-2.- Concluded.

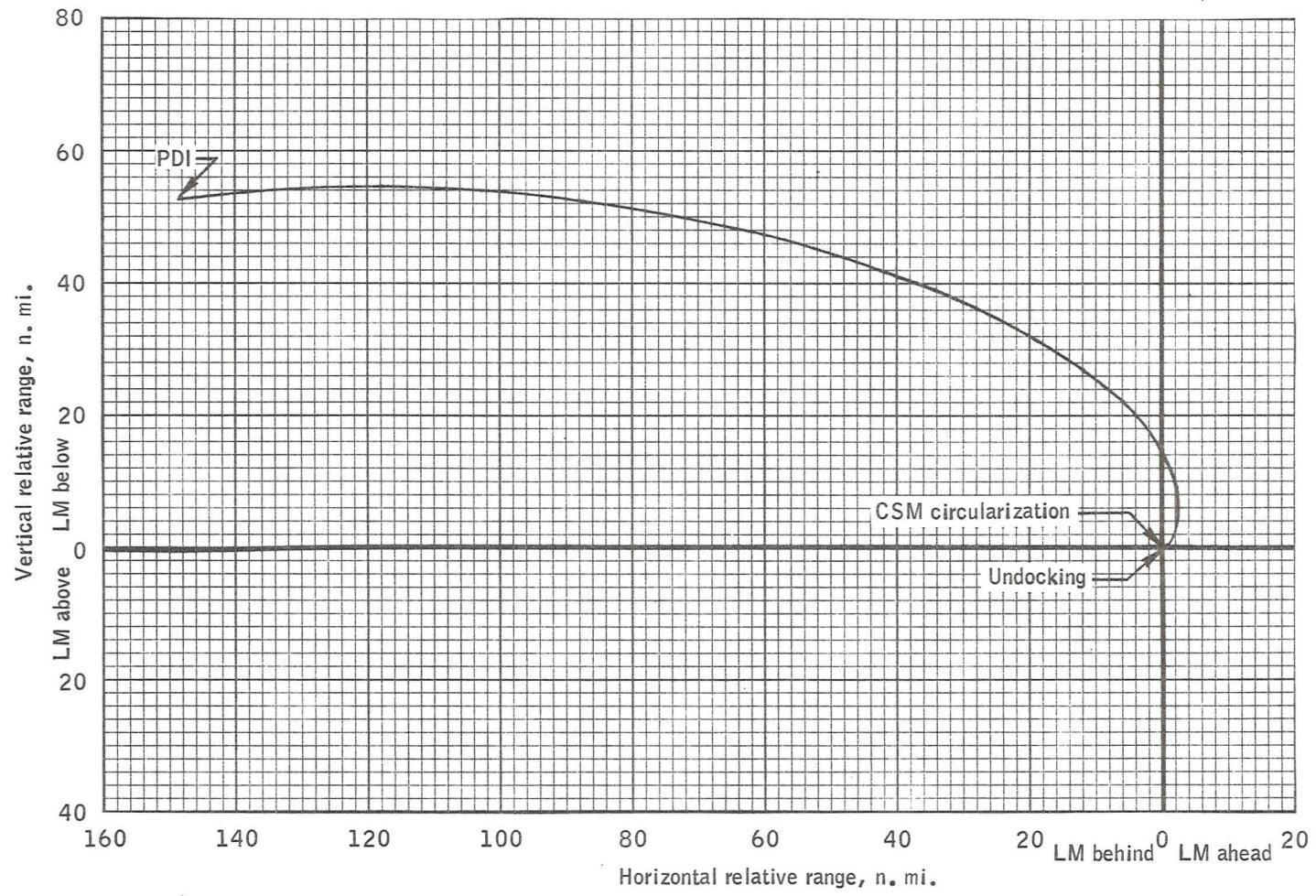


Figure 4.9-3.- LM-CSM relative motion from undocking to PDI (curvilinear coordinate system).

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4.10 LM TRAJECTORY FROM
PDI TO LANDING

4.10 LM Trajectory from PDI to Landing

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

4.10.1 Powered descent.- The LM powered descent is designed to transfer the LM from the perilune of a 59.9- by 8.6-n. mi. orbit to a soft landing on the lunar surface at the Descartes landing site (latitude 9.00°S, longitude 15.52°E, radius 938.353 n. mi.). 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 20° left yaw from pre-PDI to 3 minutes after ignition (see fig. 4.10-4). 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 pre-determined 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-X) to the approach phase targets (table 5-X).

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-X) 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 4.10-1. 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 4.10-2. Major events indicated are throttle recovery, high gate, low gate, and landing. In figure 4.10-2(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 4.10-2(b). Time histories of the LM thrust angle and FDAI pitch angle are shown in figure 4.10-2(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 4.10-2(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 4.10-3, 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 4.10-4 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 may occur during the early part of the Apollo 16 powered descent. Therefore, a 20° 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.

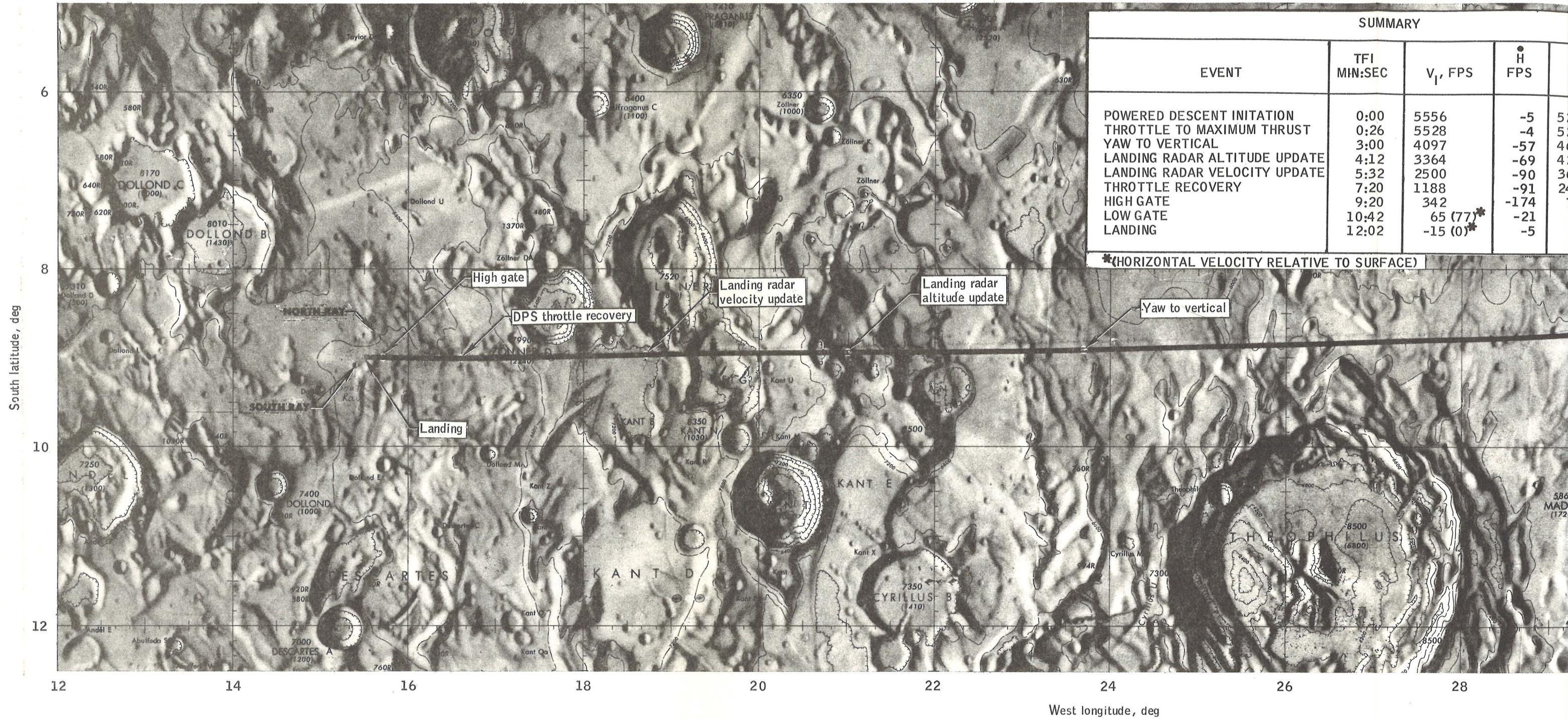
Events indicated in figure 4.10-4 are PDI, yaw to vertical, landing radar accepted, throttle recovery, high gate, low gate, and landing.

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 4.10-5 shows the terrain for the nominal -90° approach azimuth into the landing site at Descartes. The a priori model (a series of slopes) has been superimposed over the actual terrain.

An approach phase summary from high gate to low gate is presented in figure 4.10-6. 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 Descartes is presented in figure 4.10-7. Also shown is the LM landing dispersion ellipse.

A landing phase summary (from low gate to landing) is presented in figure 4.10-8. 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.



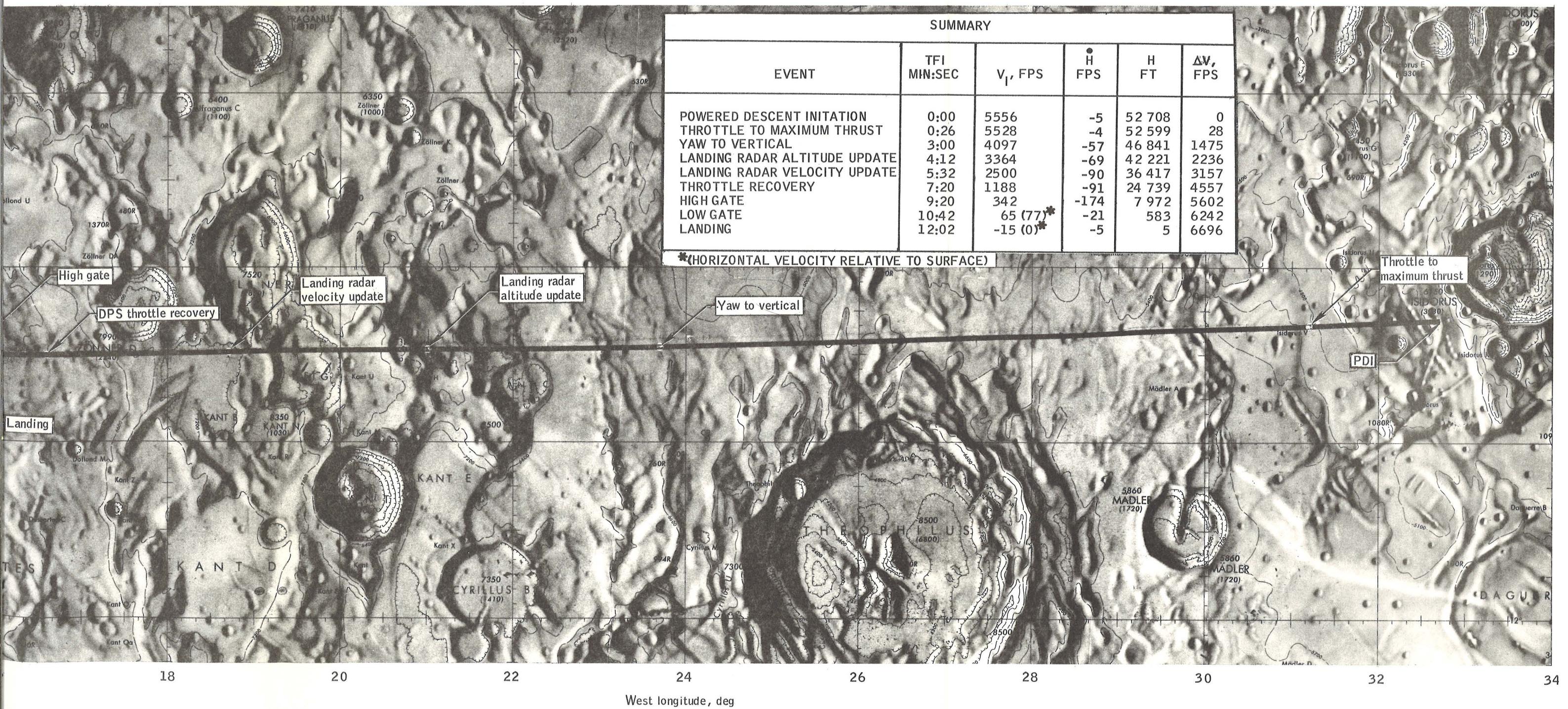
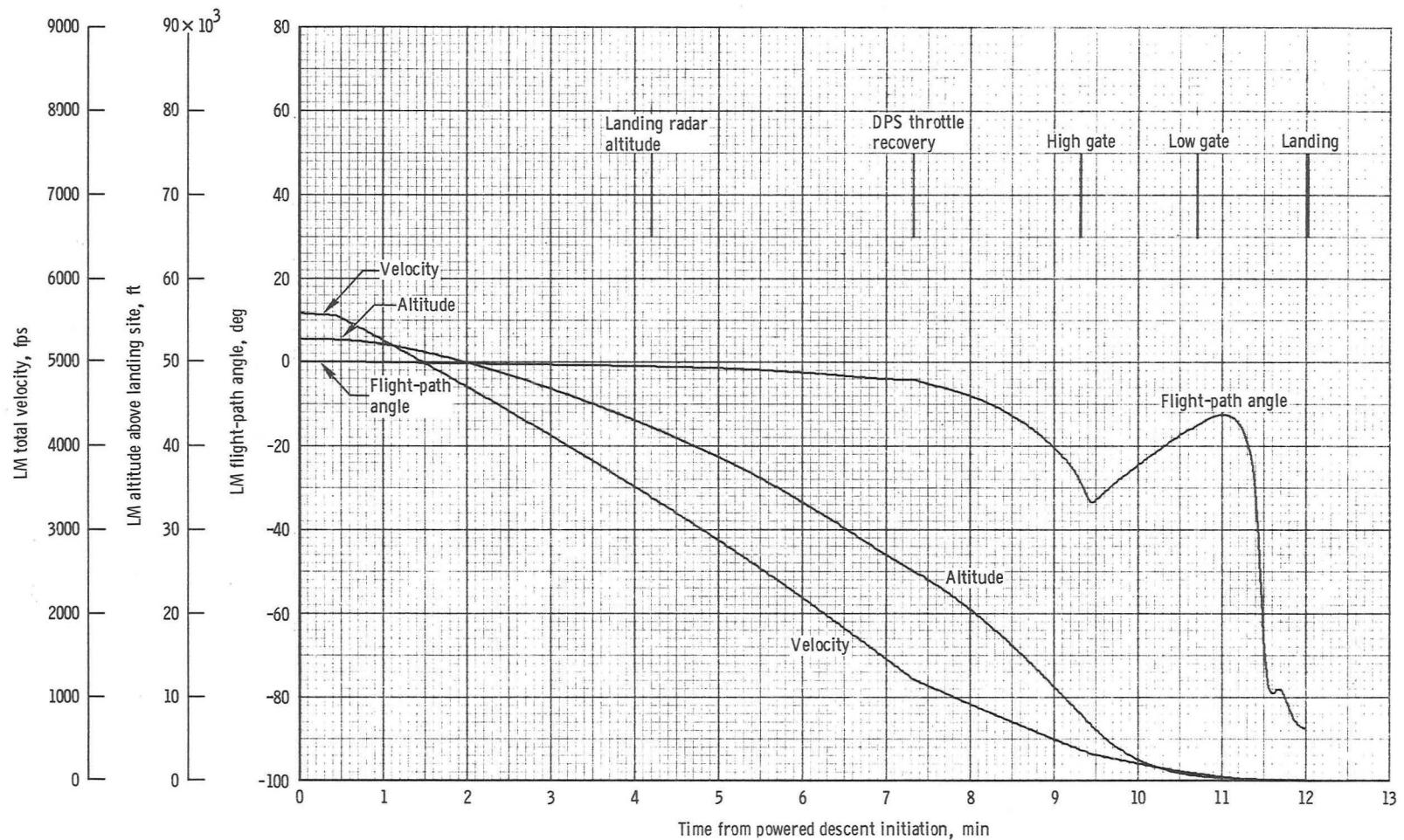
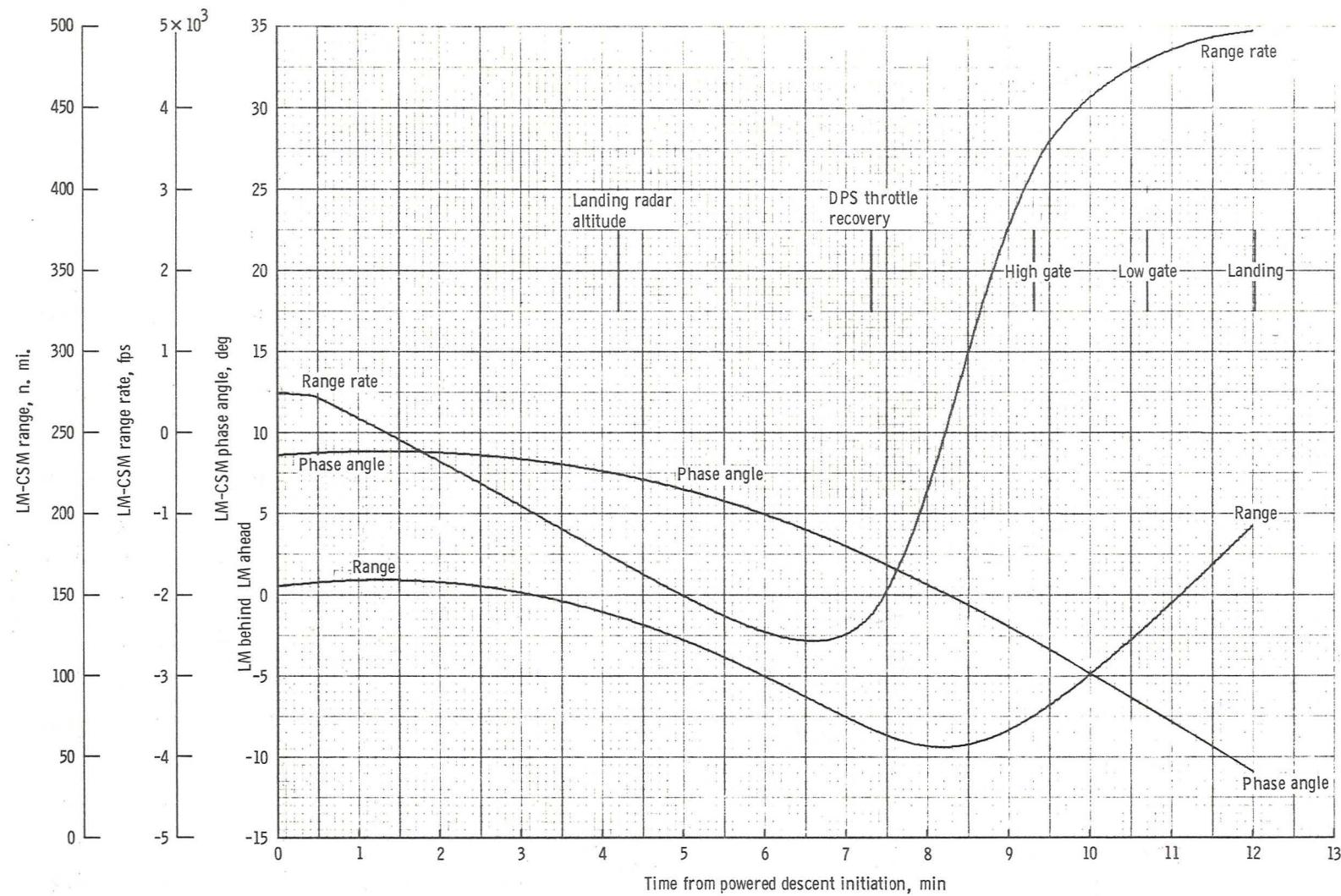


Figure 4.10-1.- LM powered descent groundtrack.



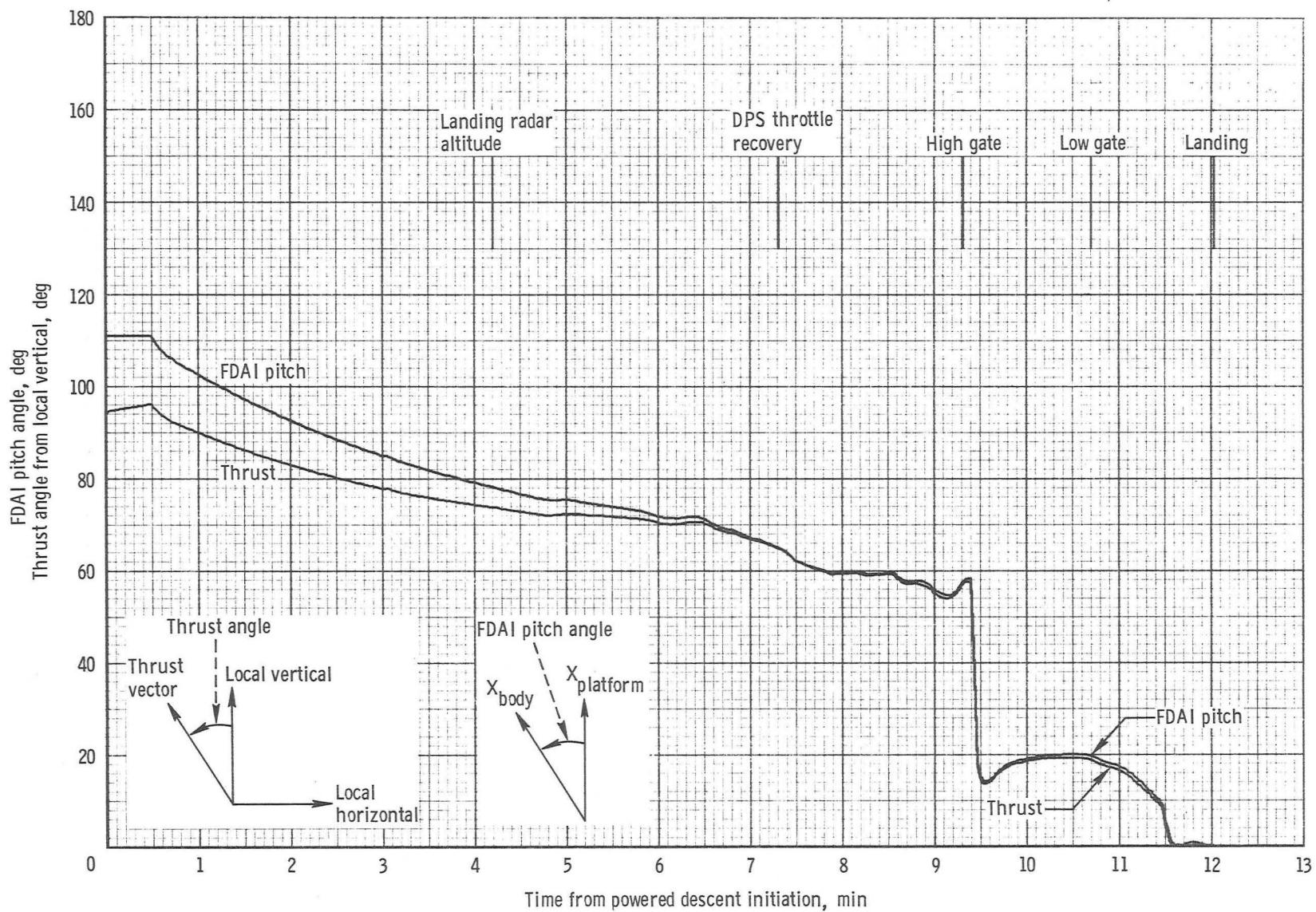
(a) LM velocity, altitude, and flight-path angle.

Figure 4.10-2. - Time history of LM-CSM trajectory parameters from PDI to landing.



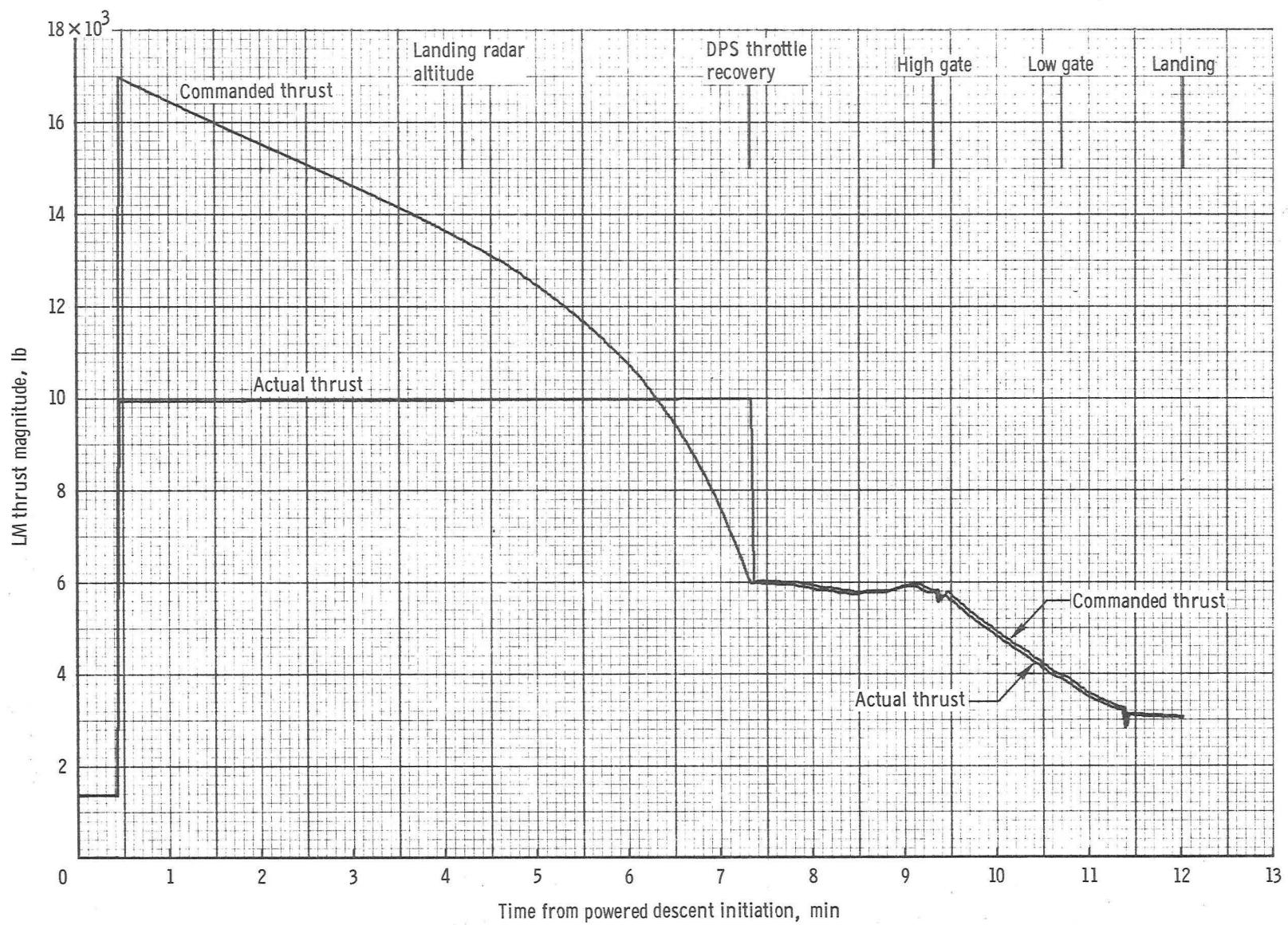
(b) LM-CSM range, range rate, and phase angle.

Figure 4.10-2 - Continued.



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

Figure 4.10-2 - Continued.



(d) LM thrust magnitude.

Figure 4.10-2. - Concluded.

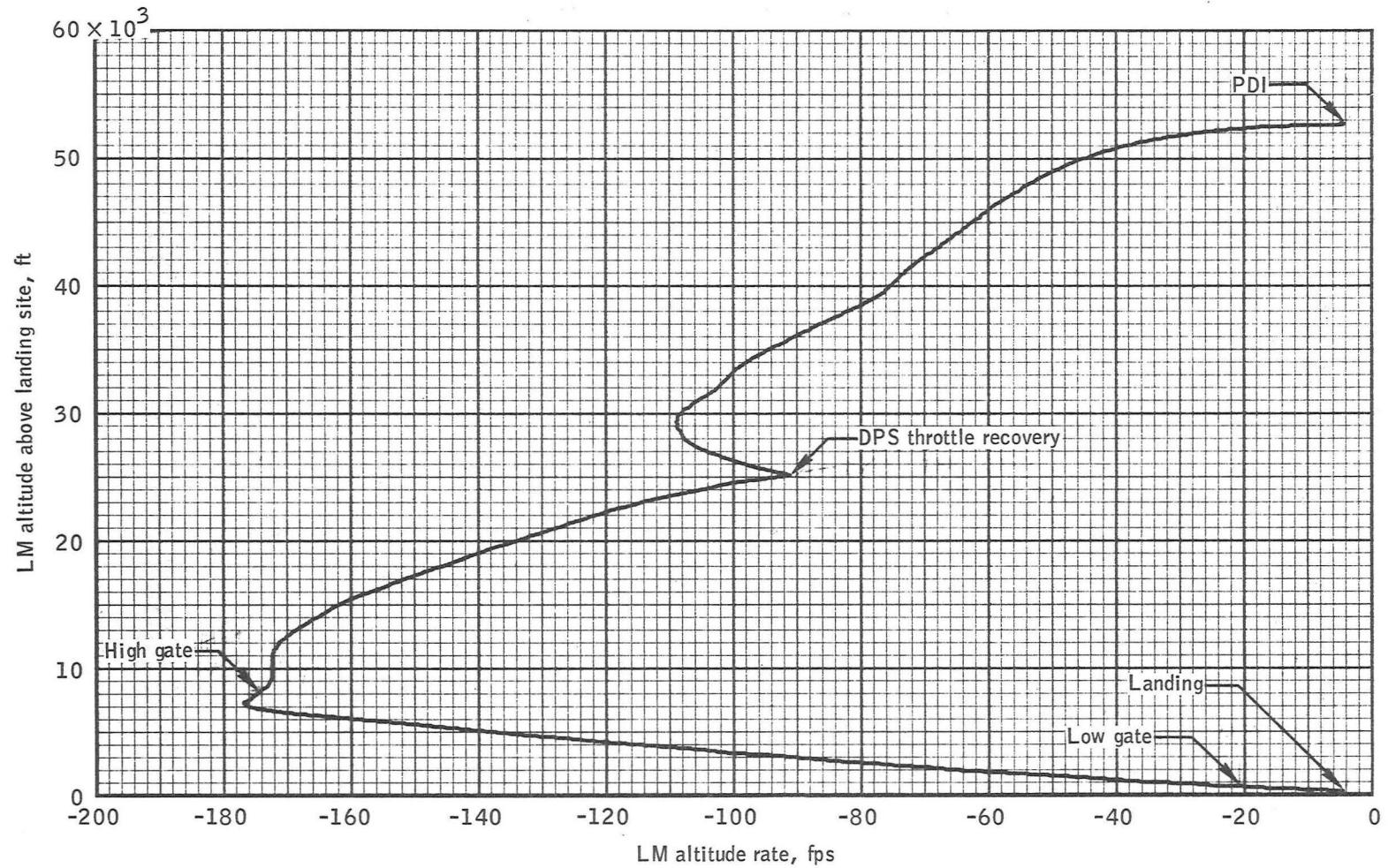


Figure 4.10-3.- Altitude above landing site versus altitude rates.

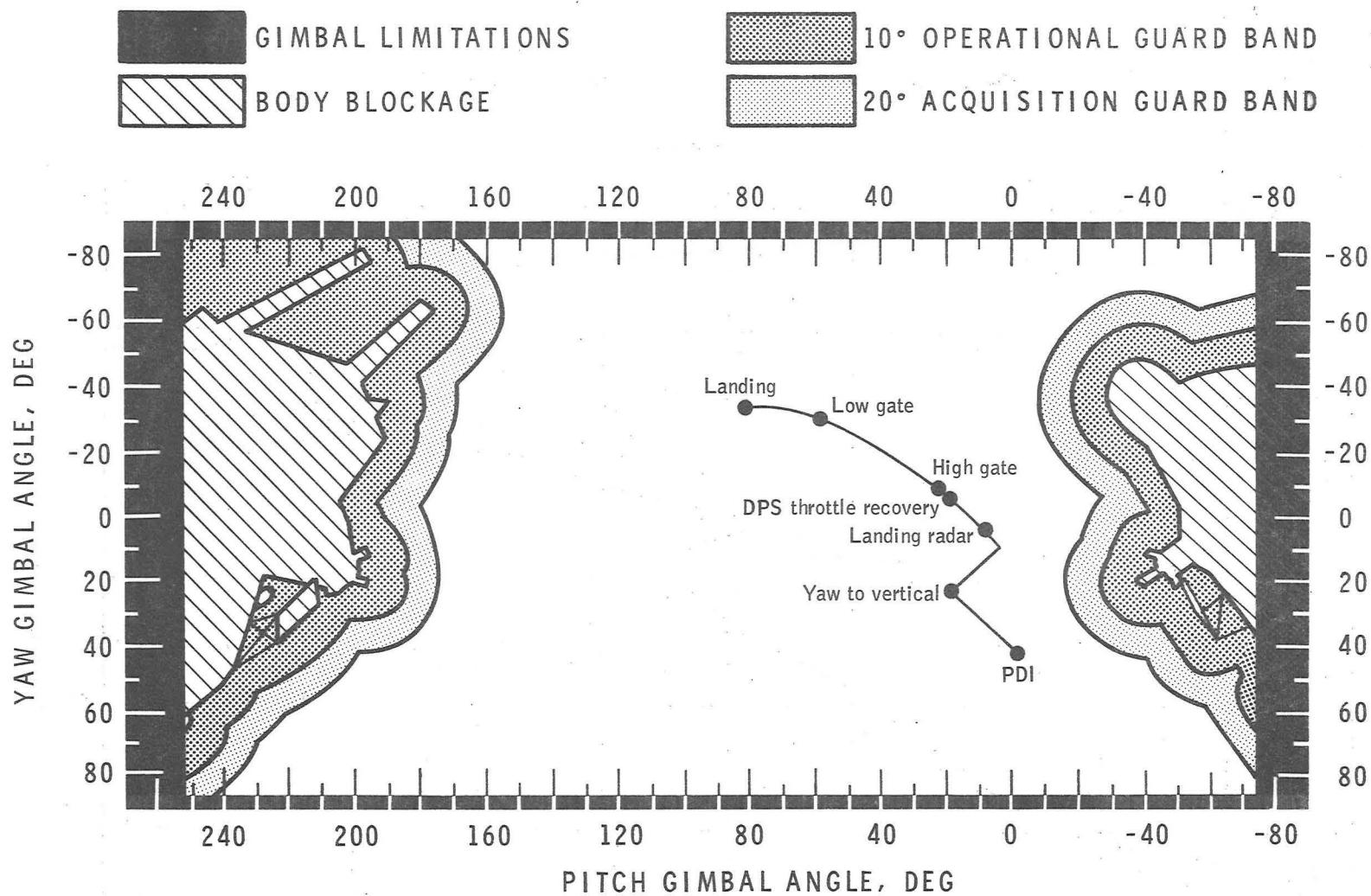


Figure 4.10-4.- S-band gimbal angle profile.

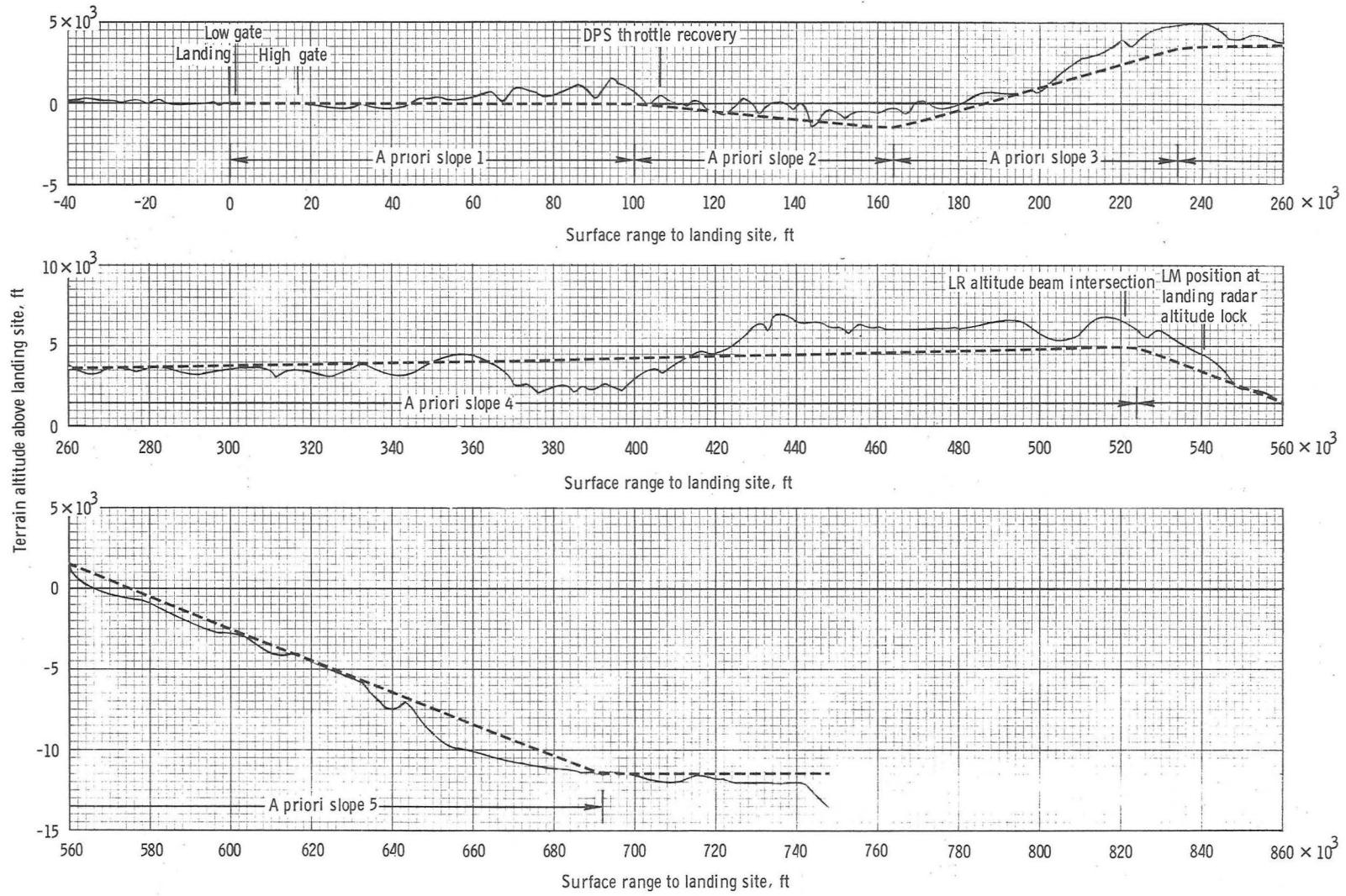


Figure 4.10-5.- Descartes terrain profile.

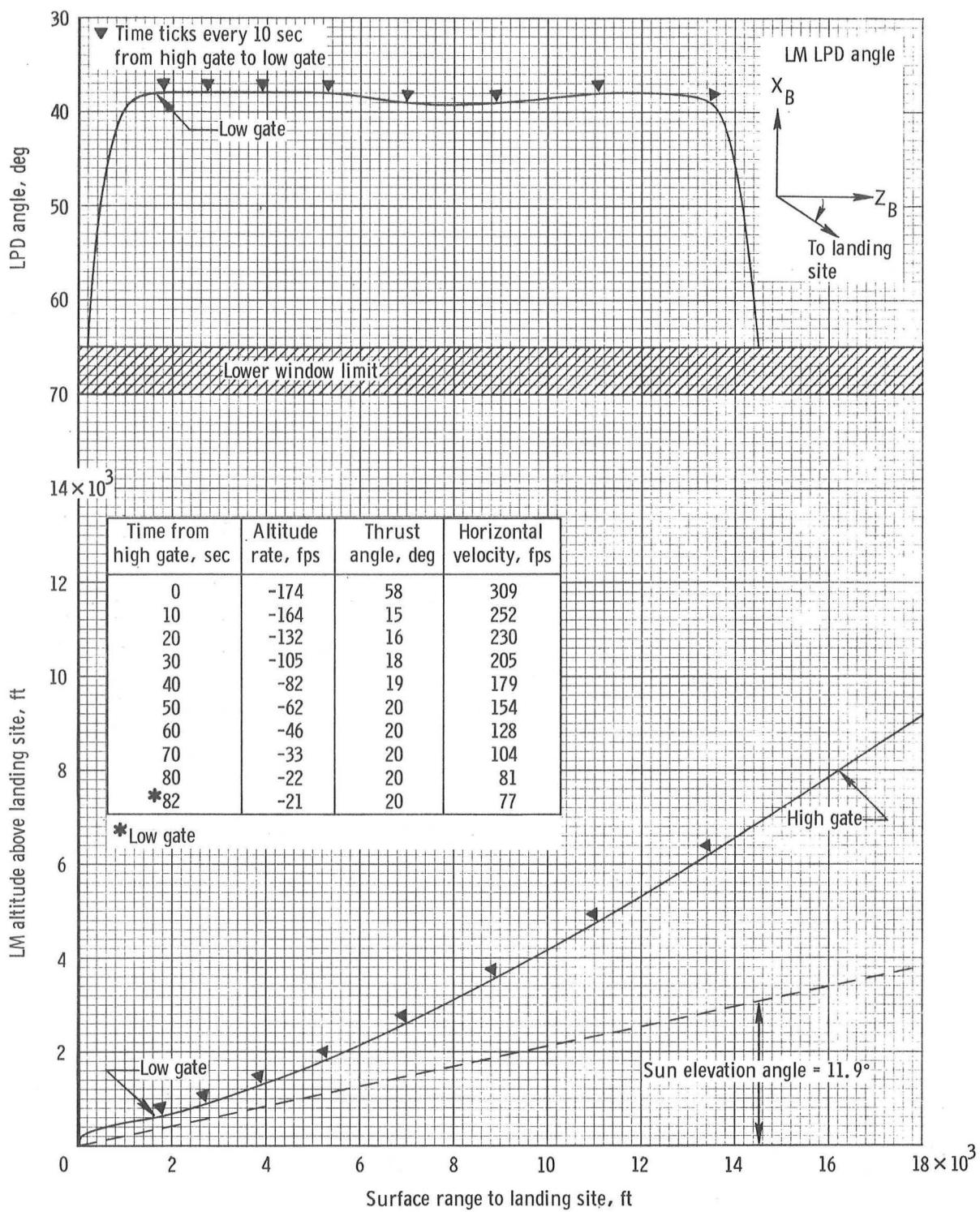


Figure 4.10-6. - Approach phase summary.

14-75

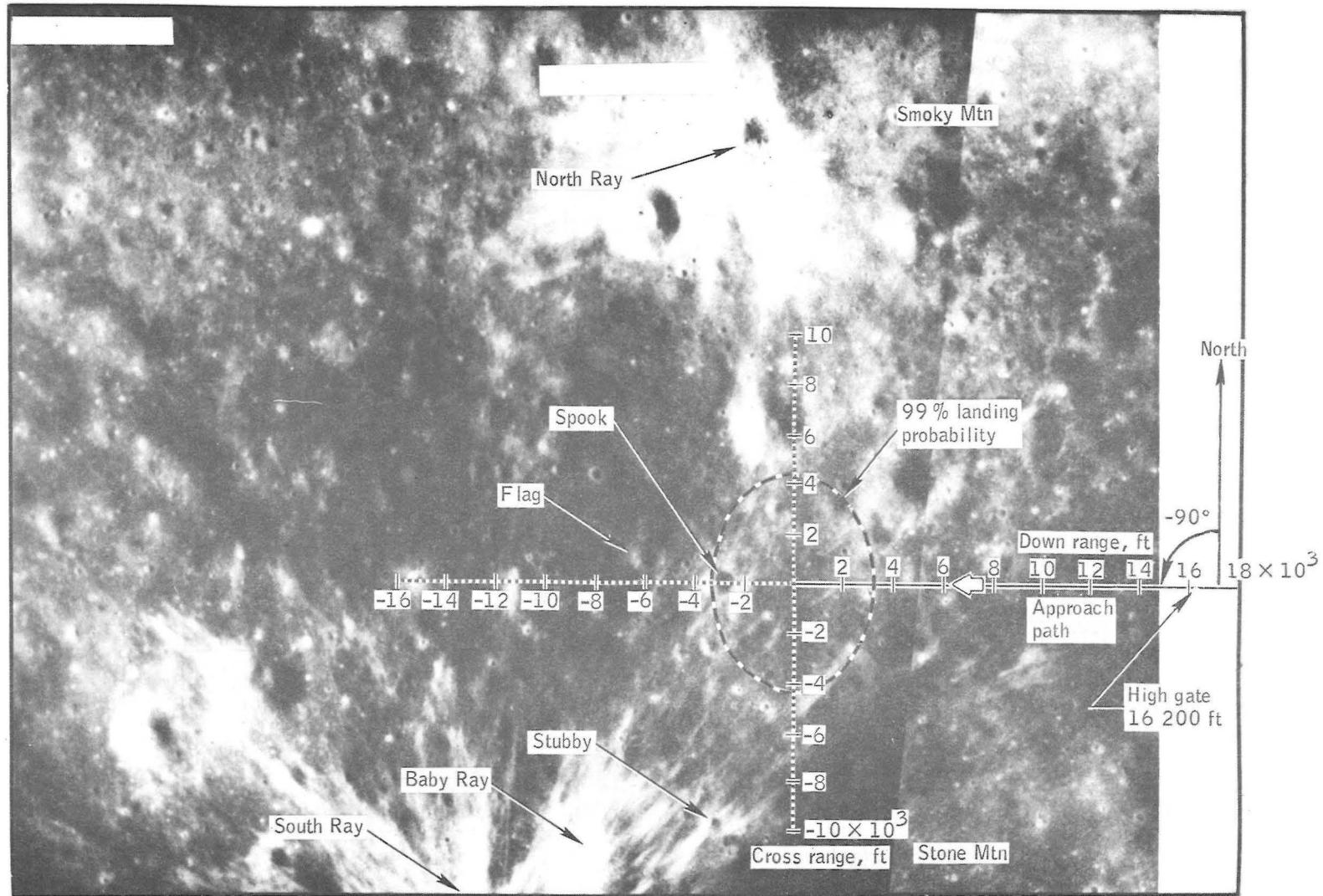


Figure 7.- Descartes landing site topography.

Time from low gate, sec	Thrust angle, deg	Horizontal velocity, fps
0	20	77
10	18	56
20	17	38
30	14	22
*40	11	9
**80	0	0

* Begin vertical descent

** Landing

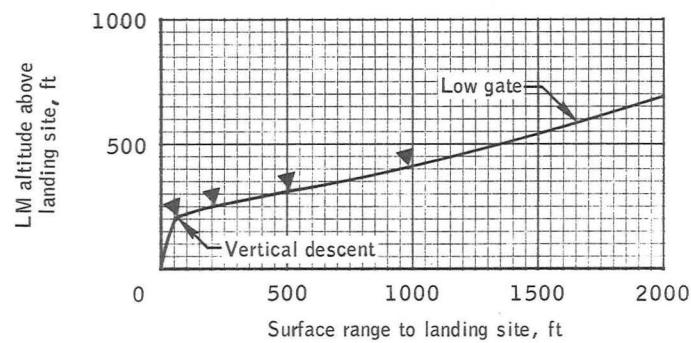
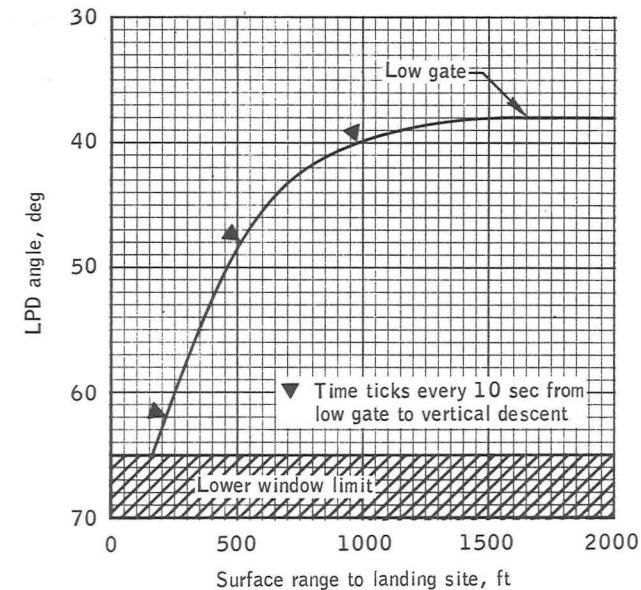
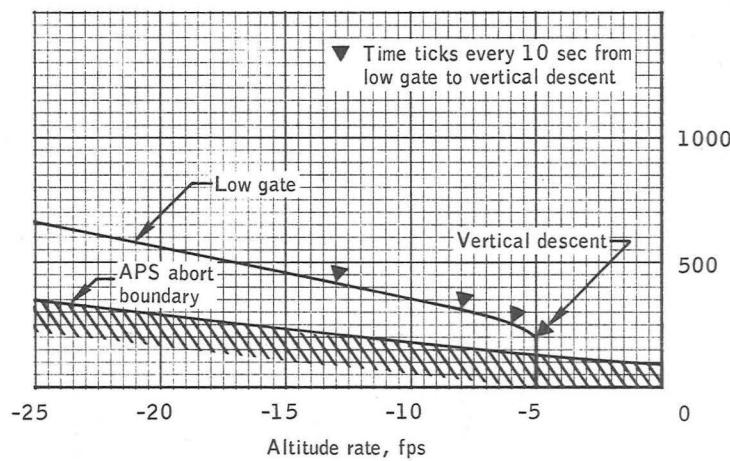


Figure 4.10-8.- Landing phase summary.

4.11 CSM Solo Activities

4.11.1 CSM circularization.- This maneuver, which occurs at 9.0°N and 159.8°W and 88 minutes after undocking, transfers the CSM from the initial elliptical orbit to a near circular parking orbit shaped so that after the powered ascent (or a descent abort), the rendezvous phasing is improved.

The maneuver is a 5.9-second external ΔV burn performed by the SPS. The target load for the maneuver is shown in table 5-X.

4.11.2 CSM first lunar orbit plane change.- Approximately 78 hours after LOI 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 9.75 revolutions before LM ascent. The target load for the maneuver is presented in table 5-XI.

The burn characteristics are the following.

Burn initiation

Time, hr:min:sec, g.e.t.	152:28:48.1
Mass, lb	38 752.8
Altitude above LLS, n. mi.	57.4
Selenographic latitude, deg	-4.9
Selenographic longitude, deg	-67.8
Inertial velocity, fps	5355.6
Selenographic inclination, deg	9.0
Perilune altitude above LLS, n. mi.	57.3
Apolune altitude above LLS, n. mi.	62.2

Burn cutoff

Time, hr:min:sec, g.e.t.	152:28:57.2
Altitude above LLS, n. mi.	57.4
Selenographic latitude, deg	-4.9
Selenographic longitude, deg	-68.3
Inertial velocity, fps	5355.4
Selenographic inclination, deg	10.5
Burn duration, sec	9.1
Inertial burn arc, deg	0.5
Plane change, deg	1.7
ΔV , fps	158.7
SPS propellant used, lb	602.3
Perilune altitude above LLS, n. mi.	57.3
Apolune altitude above LLS, n. mi.	62.0

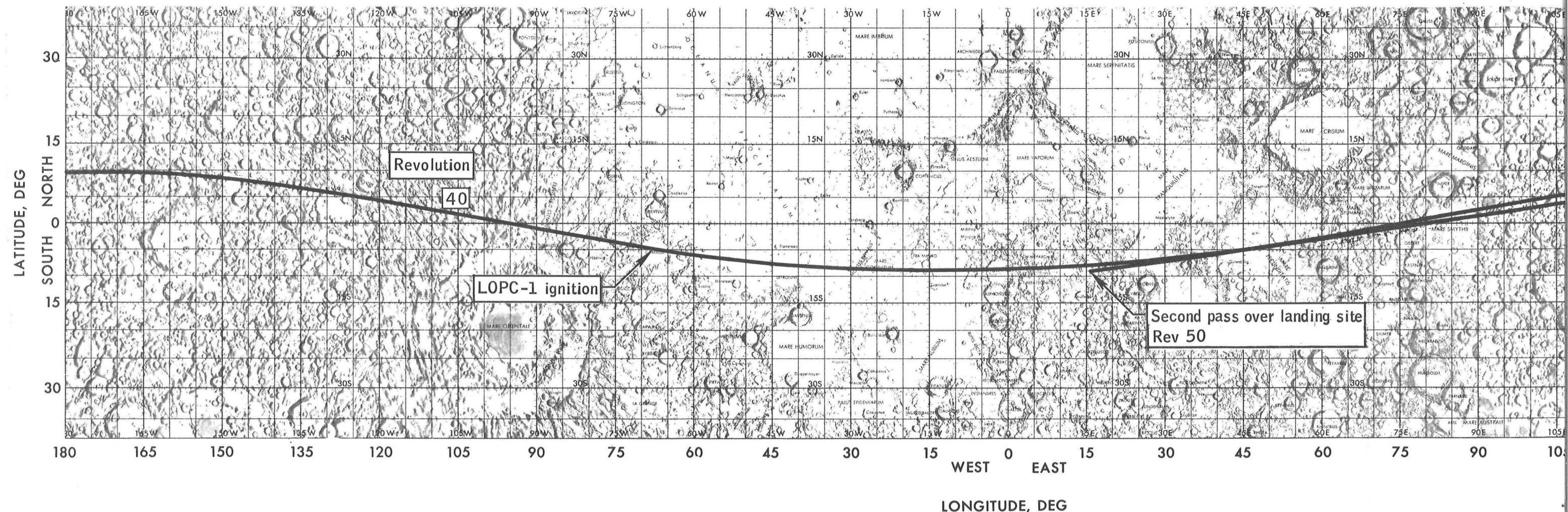


Figure 4.1
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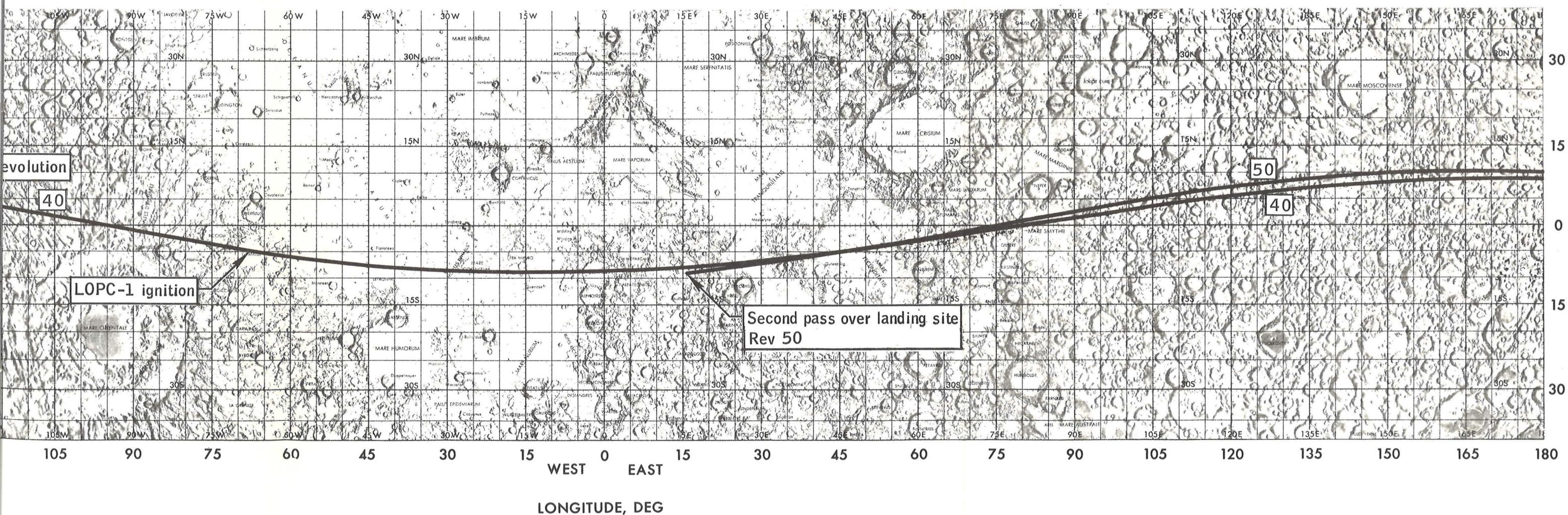


Figure 4.11-1.- CSM first lunar orbit plane change and second pass over landing site.

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 9.02-n. mi. (54 784/ft) by 45.4-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 73 hours of lunar surface stay time. 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 summarized in figure 4.12-3. Included in this figure are orbital insertion characteristics, total ascent phase performance, onboard displays at insertion, and groundtrack information from lift-off to insertion. Yaw steering is used during the orbital insertion phase, if required, to maneuver the LM into the plane of the CSM orbit. The nominal ascent is essentially inplane and requires no yaw steering. To maintain S-band communication during the ascent, the pilot yaw maneuver is not required. LM ascent radar coverage for a 0° minimum elevation angle is included in the mission radar time line (table 6-I). For a 3° minimum elevation angle, the radar coverage data showed no change. The LM ascent weight summary is shown in table 5-II. The target load for LM ascent is presented in table 5-XII, 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 4.12-4, 4.12-5, and 4.12-6, respectively.

The LM-CSM range-range rate profile is shown in figure 4.12-7. The S-band gimbal angle profile, which shows the vehicle body blockage constraints, is shown in figure 4.12-8.

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 \dot{W} , lb/sec	Total thrust, lb	Total \dot{W} , lb/sec	I_{SP} , sec
LM lift-off	0	3518.59	11.36	63.56	0.23	3582.15	11.59	308.97
	60	3511.06	11.33	54.87	0.20	3565.93	11.53	309.36
	120	3503.37	11.30	44.67	0.16	3548.04	11.46	309.52
	180	3497.11	11.28	33.05	0.12	3530.16	11.40	309.54
	240	3493.24	11.28	19.73	0.07	3512.97	11.35	309.47
	300	3492.10	11.29	14.13	0.01	3496.23	11.30	309.39
	360	3493.43	11.30	14.69	0.05	3508.12	11.35	309.07
	420	3496.33	11.31	38.15	0.14	3534.48	11.45	308.69
LM insertion	434.3	3497.10	11.32	44.61	0.16	3541.71	11.48	308.60

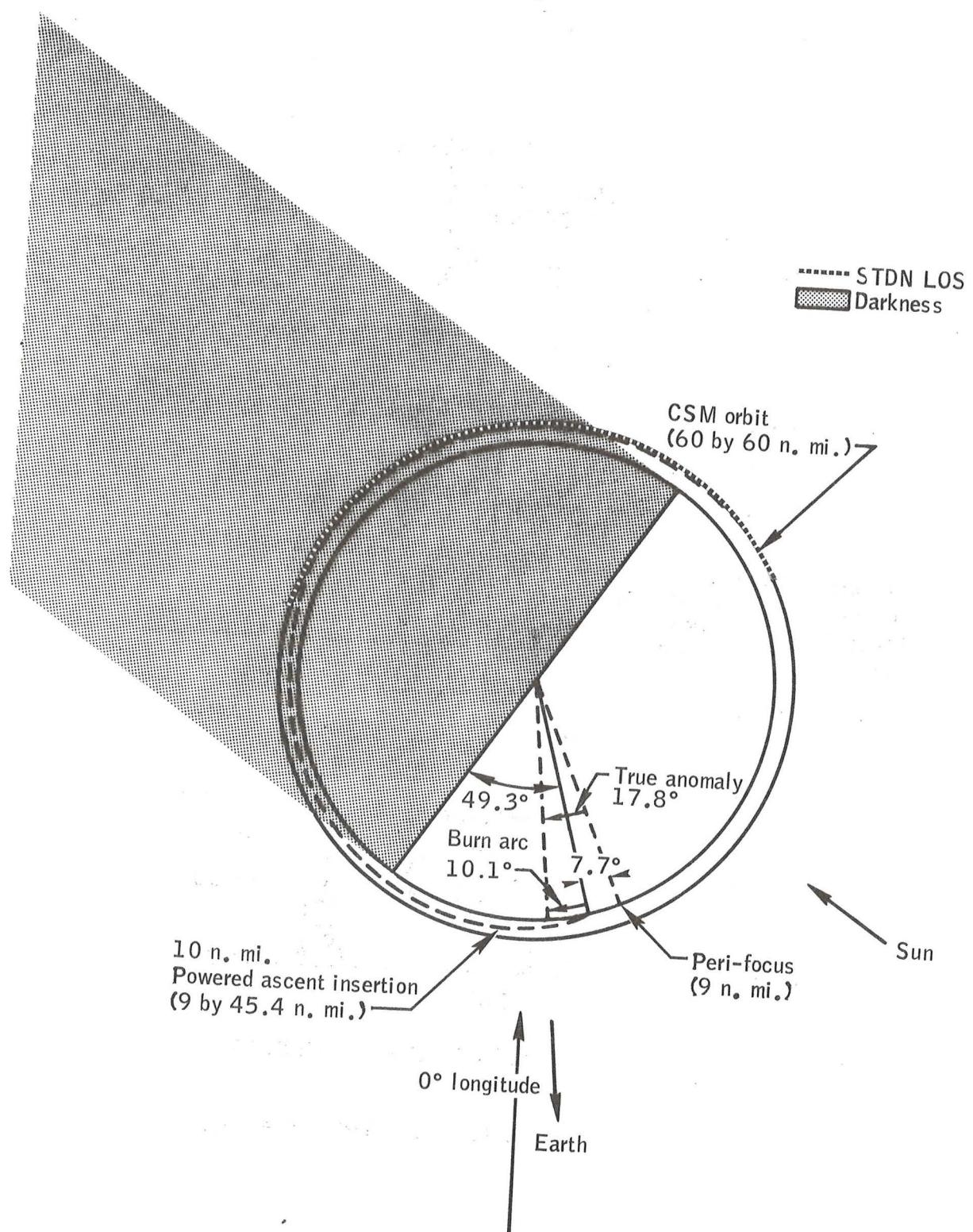


Figure 4.12-1.- LM ascent.

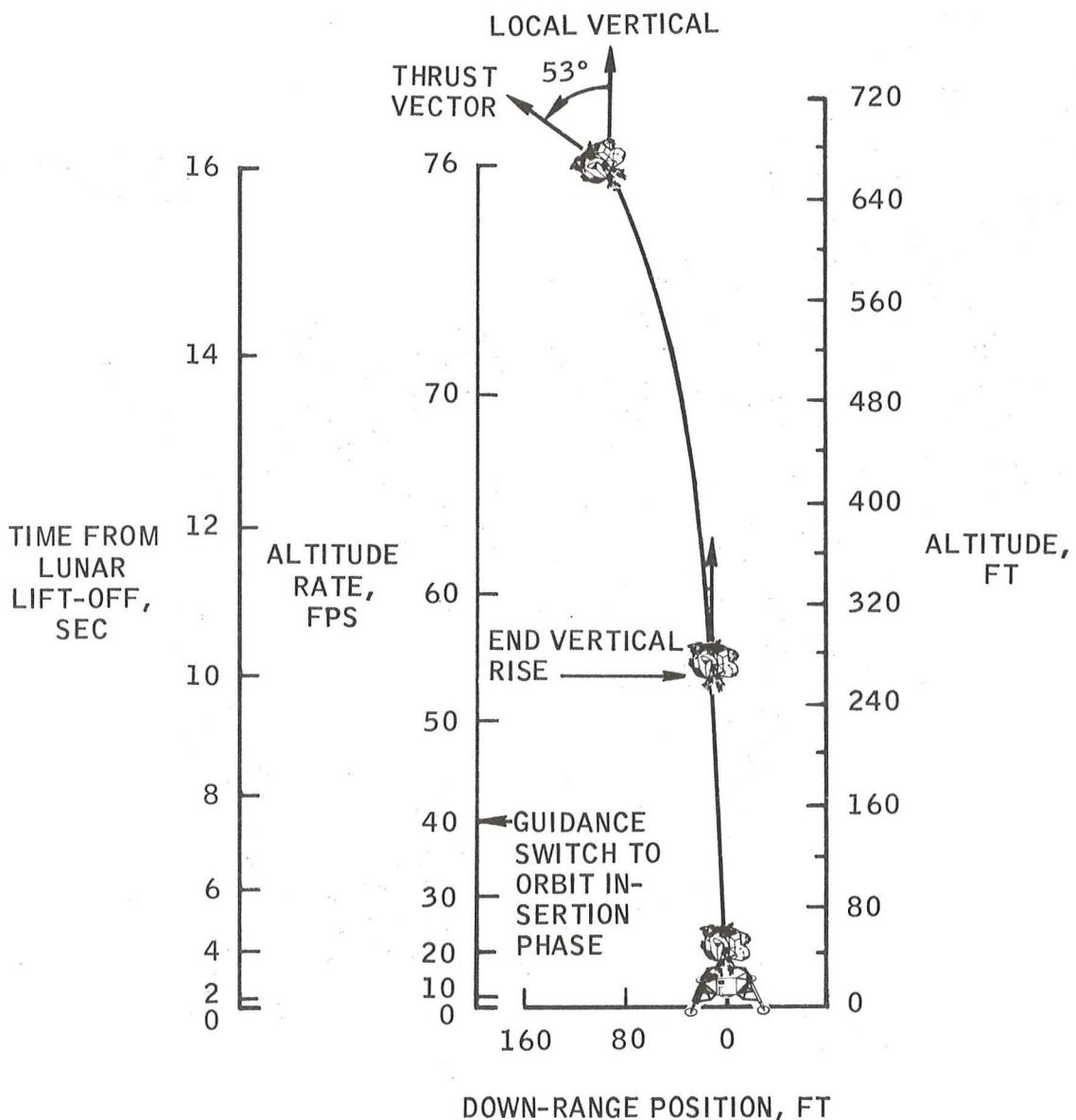


Figure 4.12-2.- Vertical rise phase.

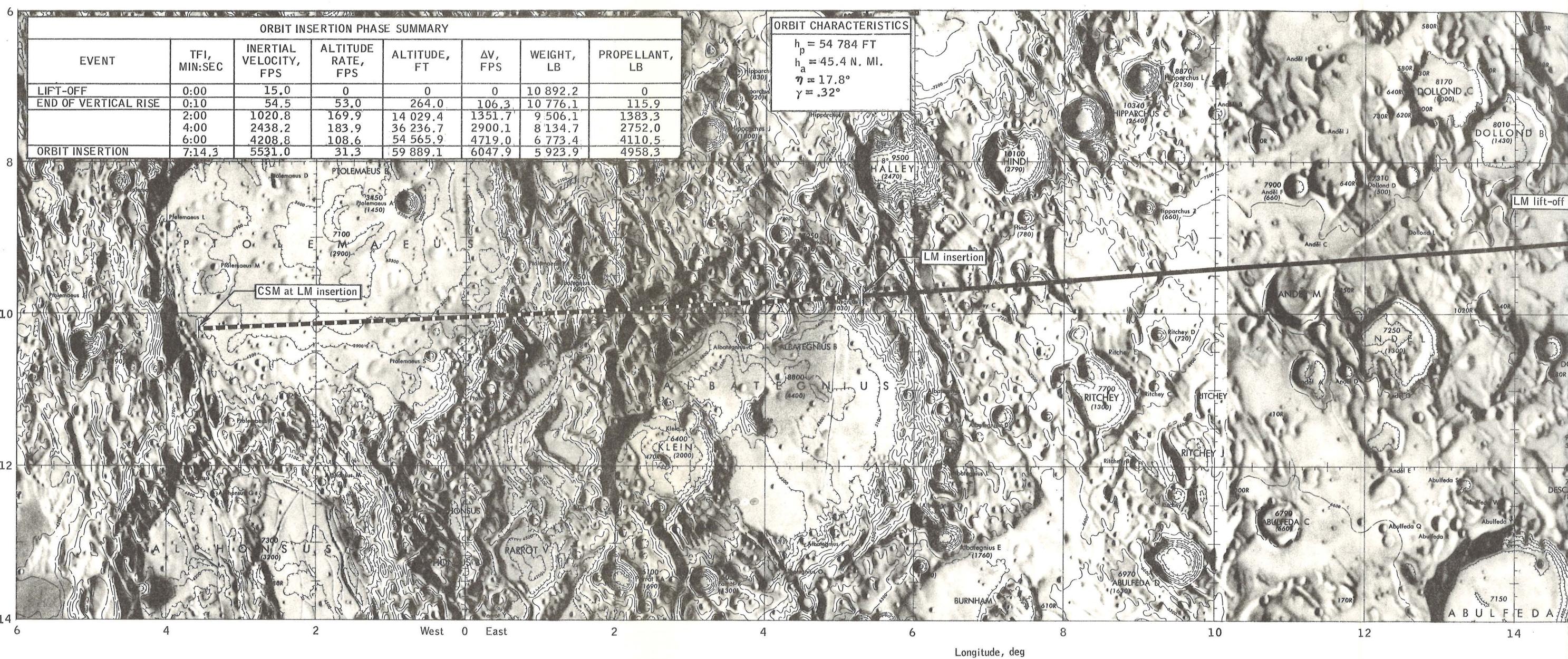
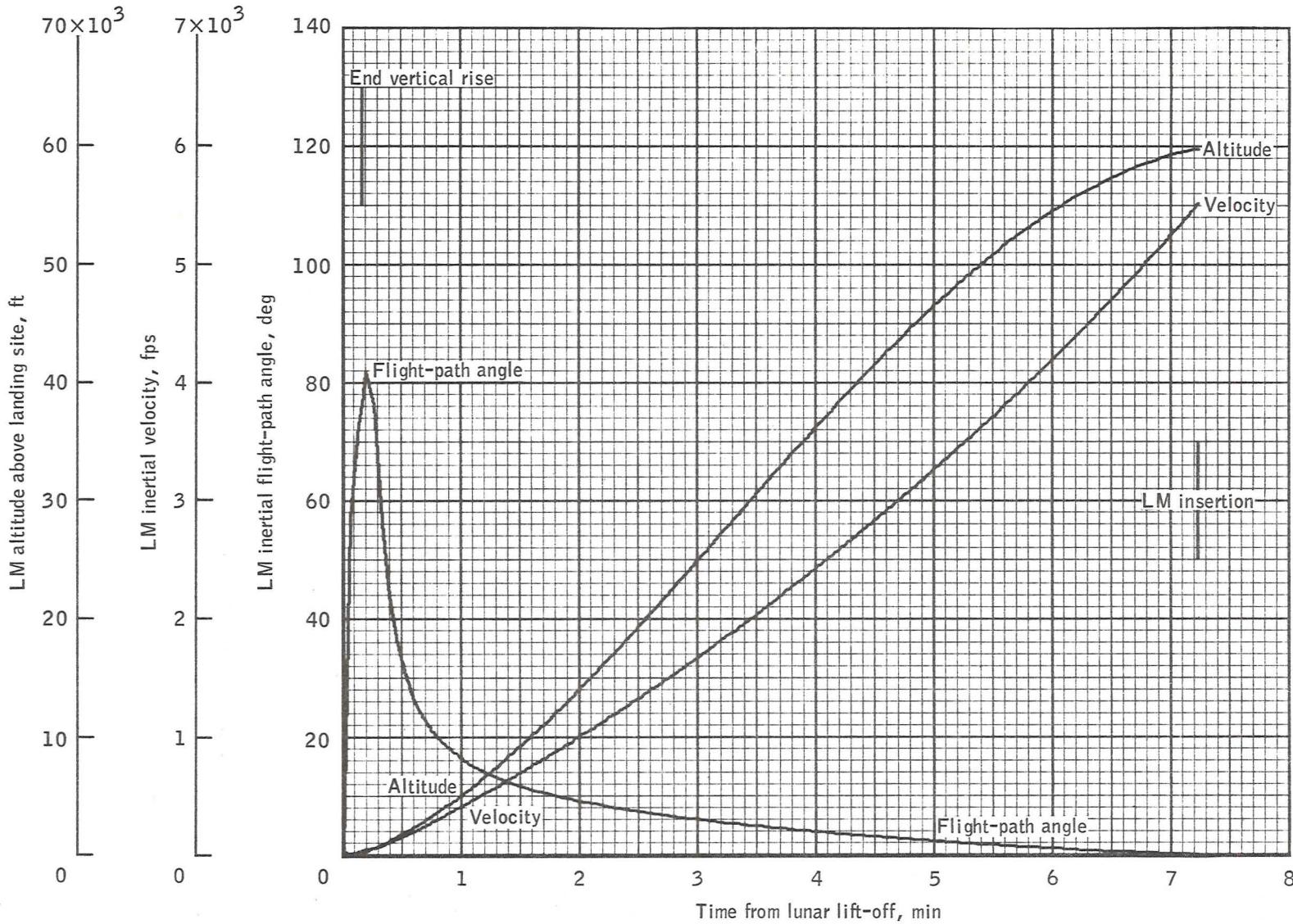


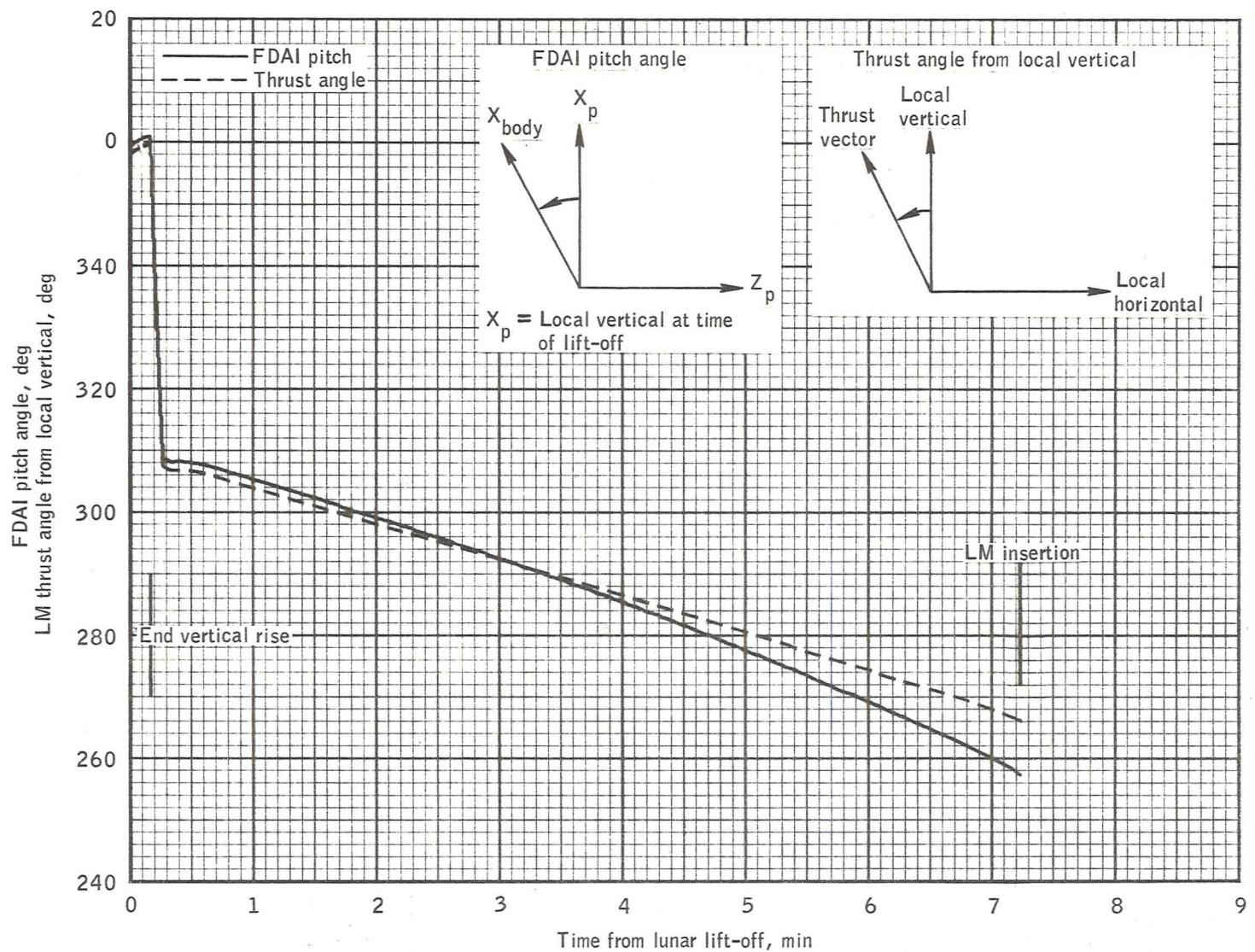


Figure 4.12-3.- LM and CSM groundtracks.



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

Figure 4.12-4.- Time history of LM trajectory parameters from lunar lift-off to LM insertion.



(b) LM thrust and FDAO pitch angles.

Figure 4.12-4.- Concluded.

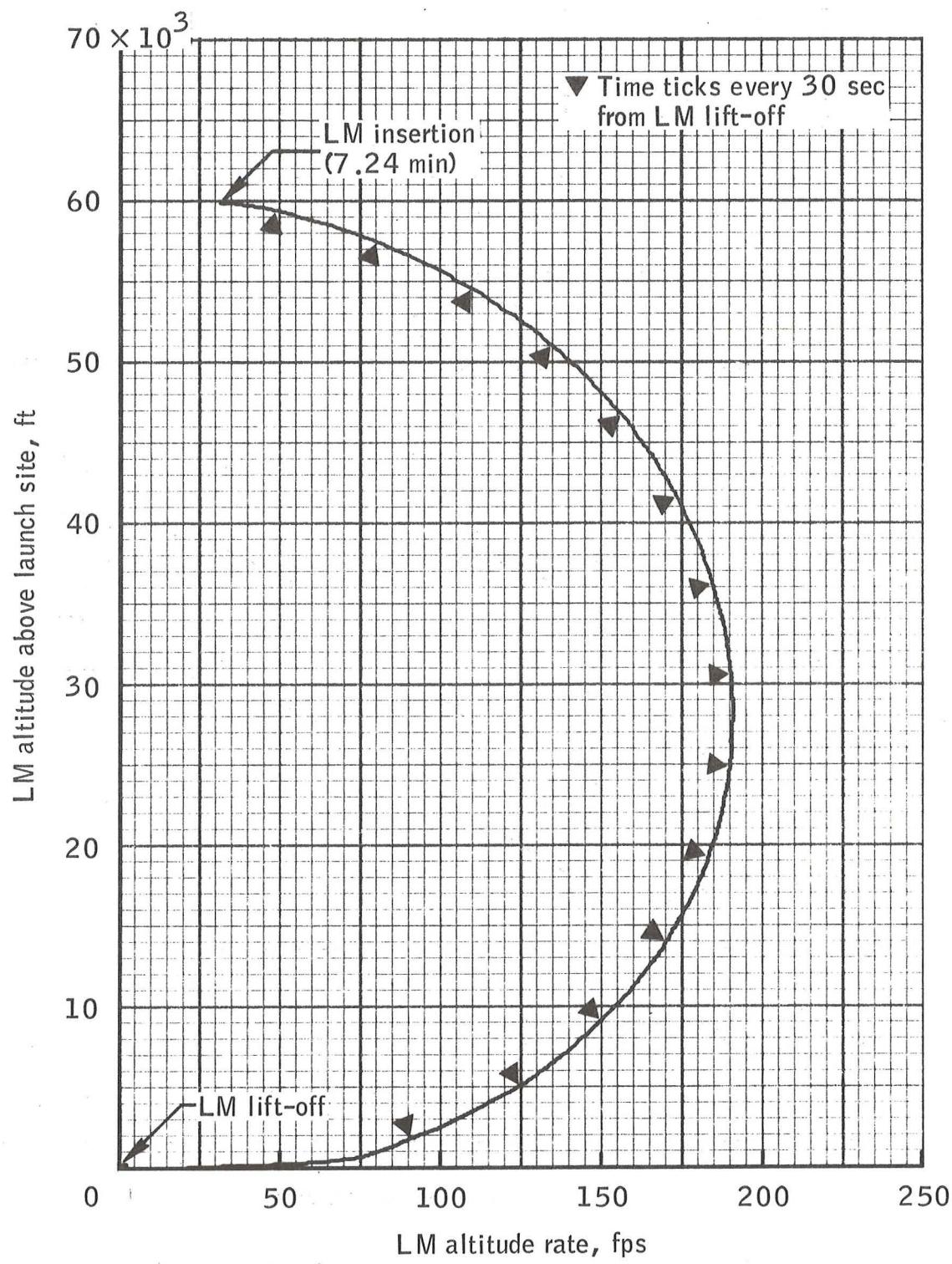


Figure 4.12-5.- LM altitude versus altitude rate during powered ascent.

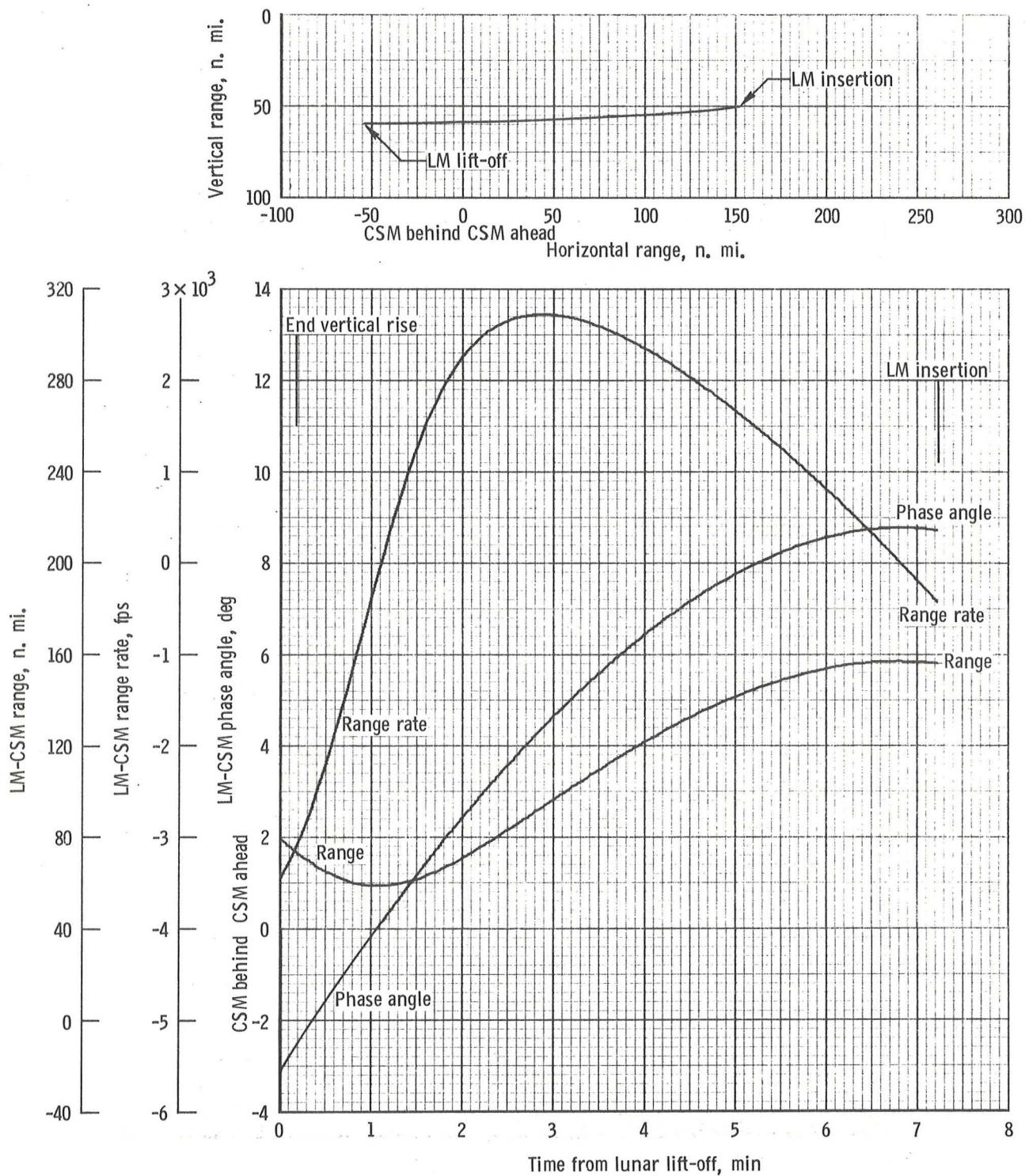


Figure 4.12-6. - LM-CSM range, range rate, and phase angle versus time from lift-off and vertical range versus horizontal range (CSM referenced).

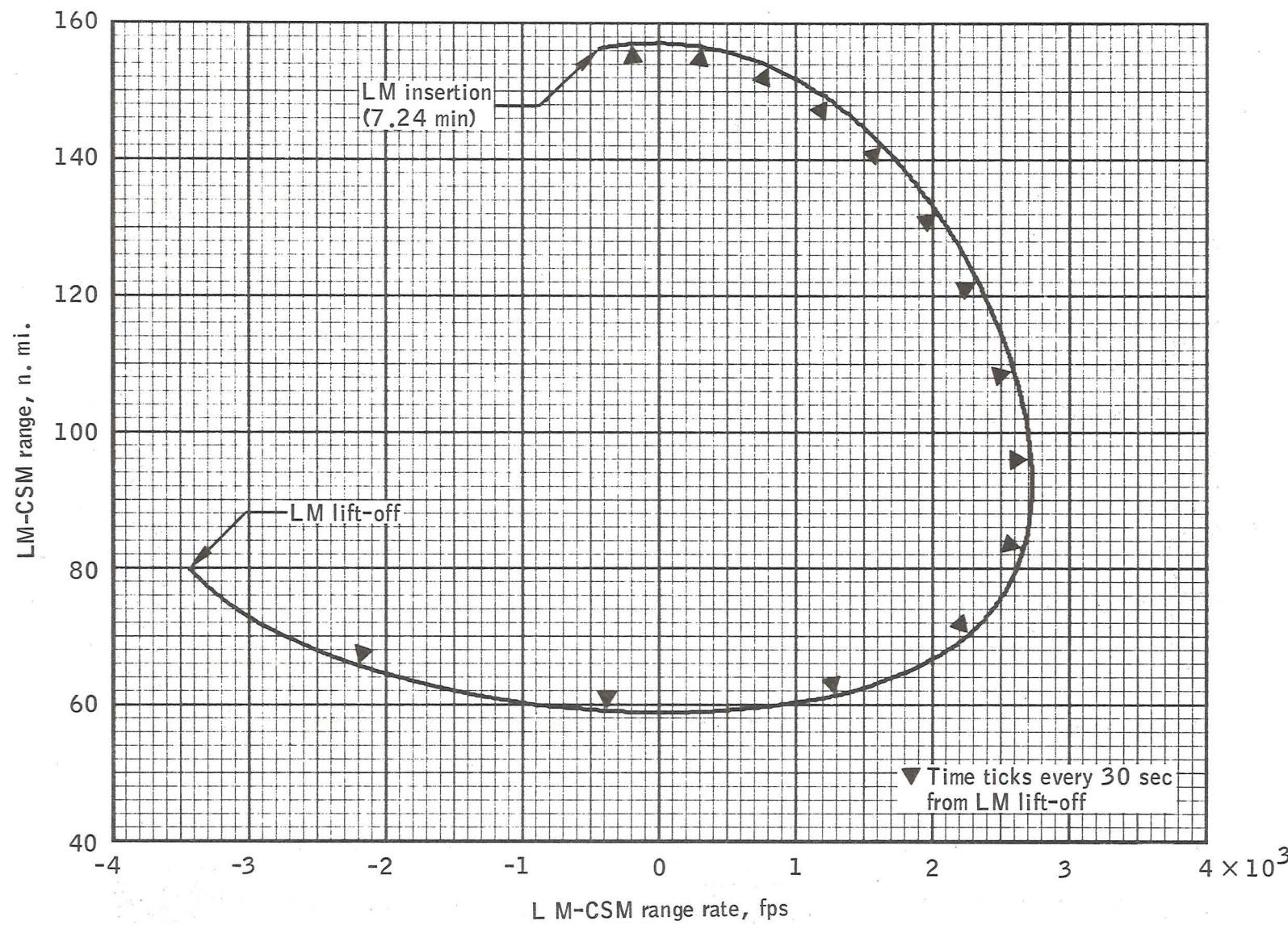


Figure 4.12-7.- LM-CSM range versus LM-CSM range rate during powered ascent.

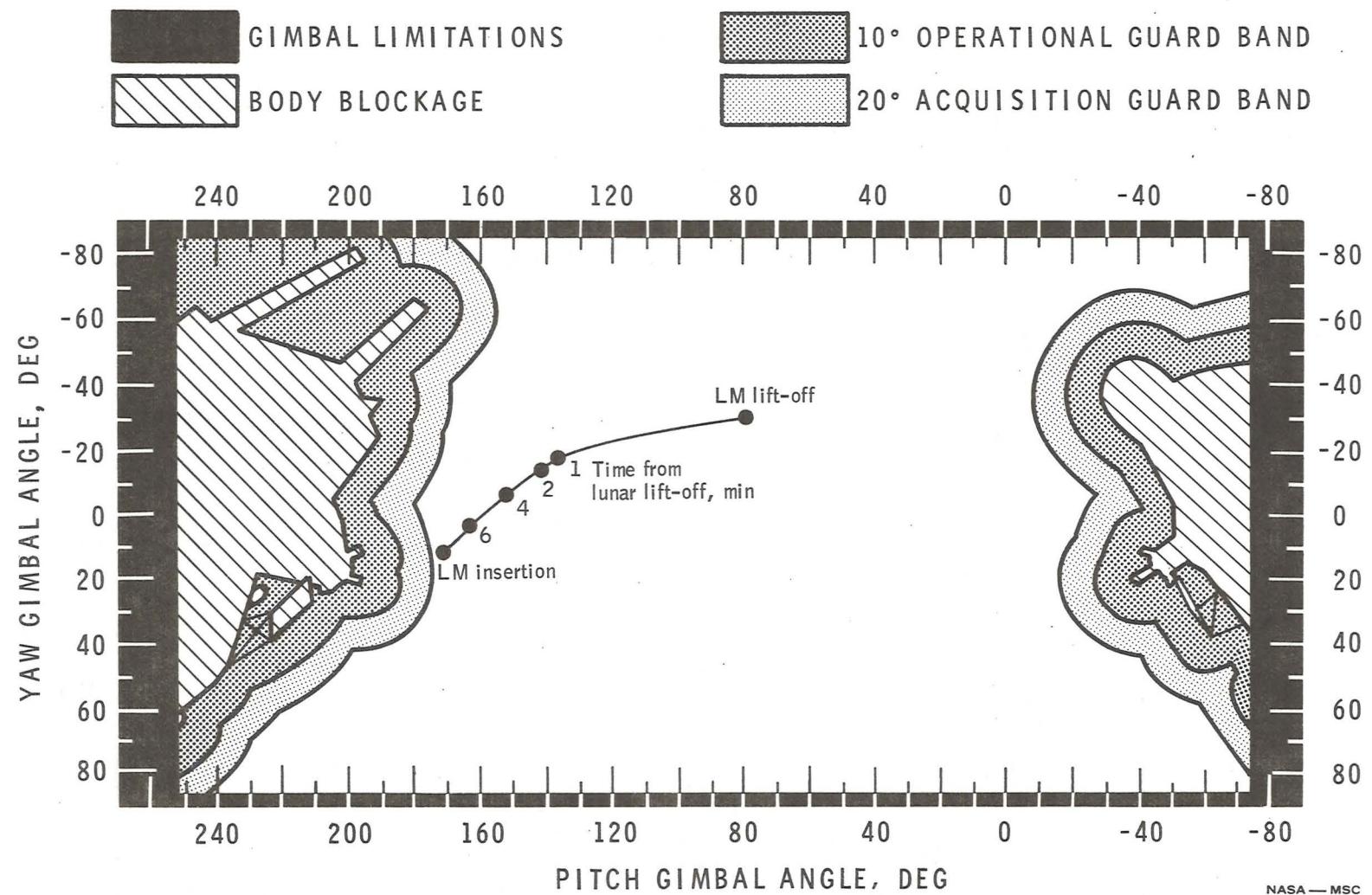


Figure 4.12-8.- S-band gimbal angle profile during powered ascent.

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 3 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 about 26.6° at TPI.
- 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 3 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, is initiated 47 minutes after insertion (16 min prior to daylight). 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 7.5° 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 2.5 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-XII. 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.	172:39:12.9
Latitude, deg N	6.5
Longitude, deg W	144.0
Altitude above landing site, n. mi.	44.3
Phase angle, deg	1.7
Duration, sec	10.5
ΔV , fps	21.8
Propellant used, lb	14.3

Main engine burn

Start time, hr:min:sec, g.e.t.	172:39:22.9
ΔV , fps	50.3
Duration, sec	2.5
Propellant used, lb	30.0

TPI termination

Time, hr:min:sec, g.e.t.	172:39:25.4
Latitude, deg N	6.6
Longitude, deg W	144.6
Altitude above landing site, n. mi.	44.3
Resultant h_a/h_p , n. mi.	61.9/44.0
Catchup rate, deg/min	0.033

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 4.13-I. Line-of-sight corrections will be made as required. Final approach and stationkeeping should occur at approximately $173^{\text{h}}24^{\text{m}}31.5^{\text{s}}$ g.e.t., approximately 29 minutes after the vehicles enter sunlight on the back side of the moon. Docking should occur at approximately $173^{\text{h}}40^{\text{m}}00^{\text{s}}$ g.e.t. to complete 1.9 hours of rendezvous activities.

TABLE 4.13-I.- RENDEZVOUS MANEUVER SUMMARY

Event	Time, 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	171:55:22.9	RCS	0.0	0.0	5923.9	0.0	44.7/9.0	143.1	-438.5
TPI APS burn ^d	172:39:22.9	APS	2.5	50.3	5909.6	30.0	61.9/44.0	32.0	-132.5
MC-1 ^c	172:54:22.9	RCS $\pm Z$ (two-jet)	0.0	0.0	5909.6	0.0	61.9/44.0	14.7	-95.7
MC-2 ^c	173:09:22.9	RCS $\pm Z$ (two-jet)	0.0	0.0	5909.6	0.0	61.9/44.0	4.5	-44.9
First braking maneuver	173:20:16.4	RCS -Z (two-jet)	12.9	14.2	5879.6	9.2	61.4/52.5	0.4	-19.7
Second braking maneuver	173:21:29.3	RCS -Z (two-jet)	8.8	9.7	5870.4	6.3	60.5/55.7	0.2	-9.8
Third braking maneuver	173:23:07.6	RCS -Z (two-jet)	4.3	4.8	5864.1	3.1	60.1/57.4	0.08	-4.9
Fourth braking maneuver	173:24:27.2	RCS -Z (two-jet)	4.2	4.7	5861.0	3.0	59.8/59.3	0.02	-0.2
Docking	173:40:00.0	--	--	--	5858.0	--	59.8/59.3	0.0	0.0

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

^bAltitudes measured above landing site.

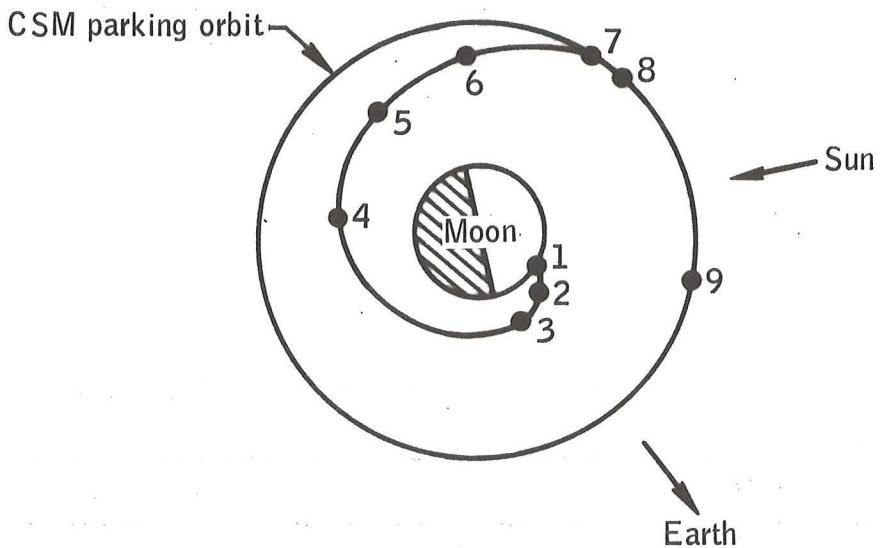
^cNominally a zero ΔV maneuver.

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

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

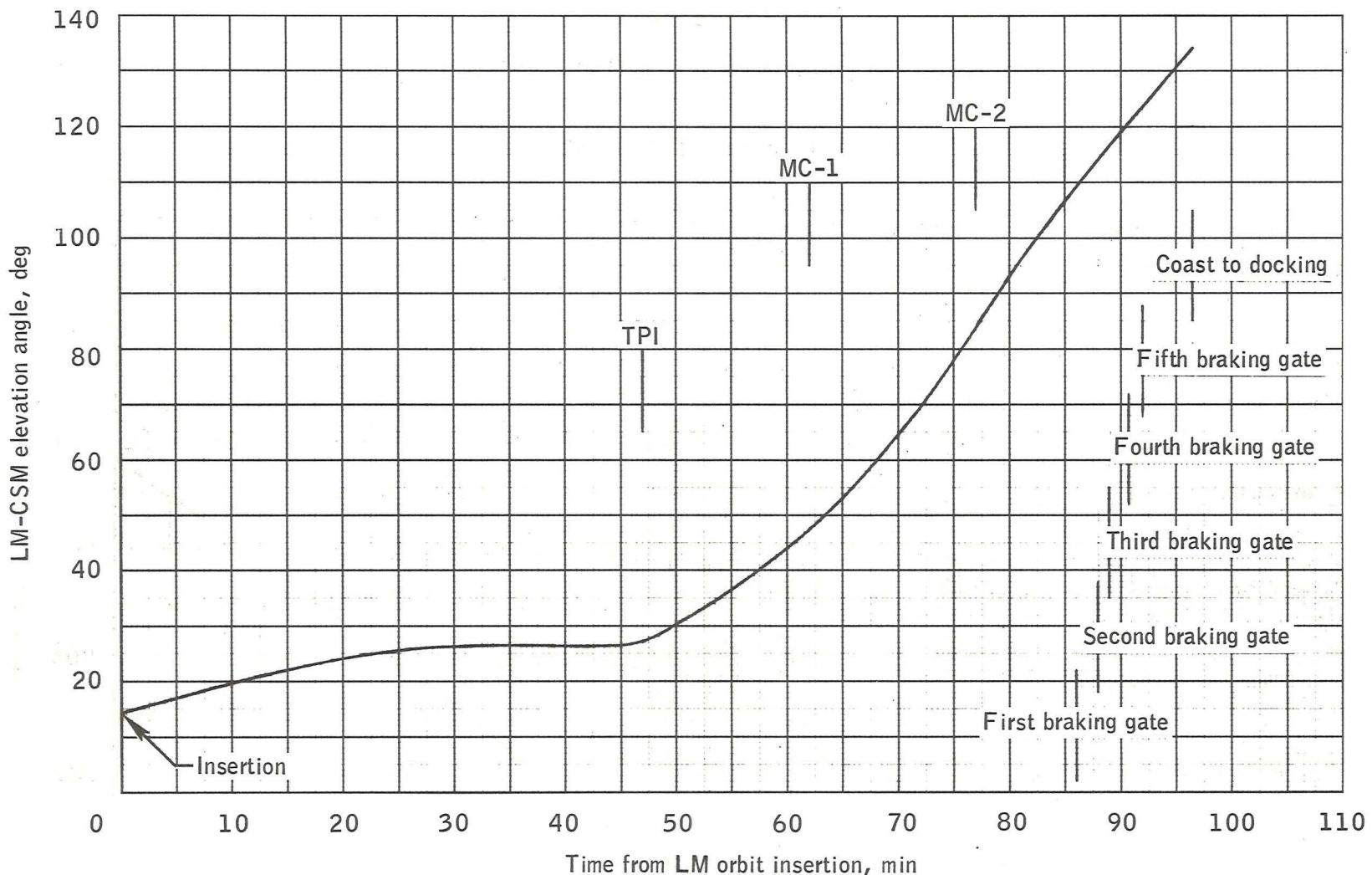
Event	Time, hr:min:sec, g.e.t.
Insertion	171:52:22.9
Tweak	171:55:22.9
Sunset	172:07:45.8
STDN LOS	172:24:58.0
TPI (ullage on)	172:39:12.9
MC-1	172:54:22.9
Sunrise	172:55:36.5
MC-2	173:09:22.9
STDN AOS	173:11:40.7
First braking maneuver	173:20:16.4
Second braking maneuver	173:21:29.3
Third braking maneuver	173:23:07.6
Fourth braking maneuver	173:24:27.2
Docking	173:40:00.0

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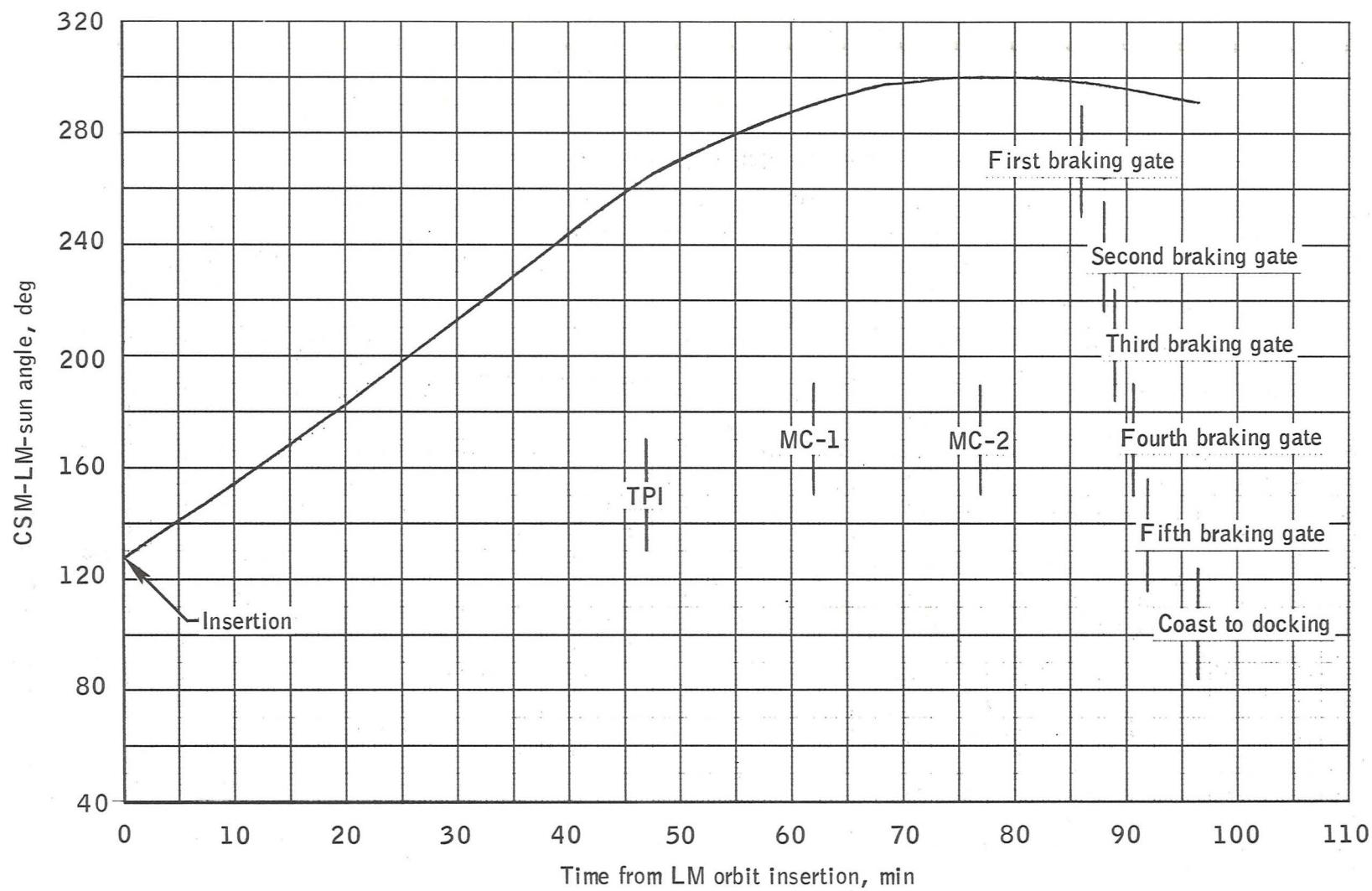
Event	Ground elapsed time, hr:min:sec
1. Lift-off	171:45:08.6
2. LM insertion	171:52:22.9
3. Tweak	171:55:22.9
4. TPI (ullage on)	172:39:12.9
5. MC-1	172:54:22.9
6. MC-2	173:09:22.9
7. Begin braking	173:20:16.4
8. Begin stationkeeping	173:24:31.5
9. Docking	173:40:00.0

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



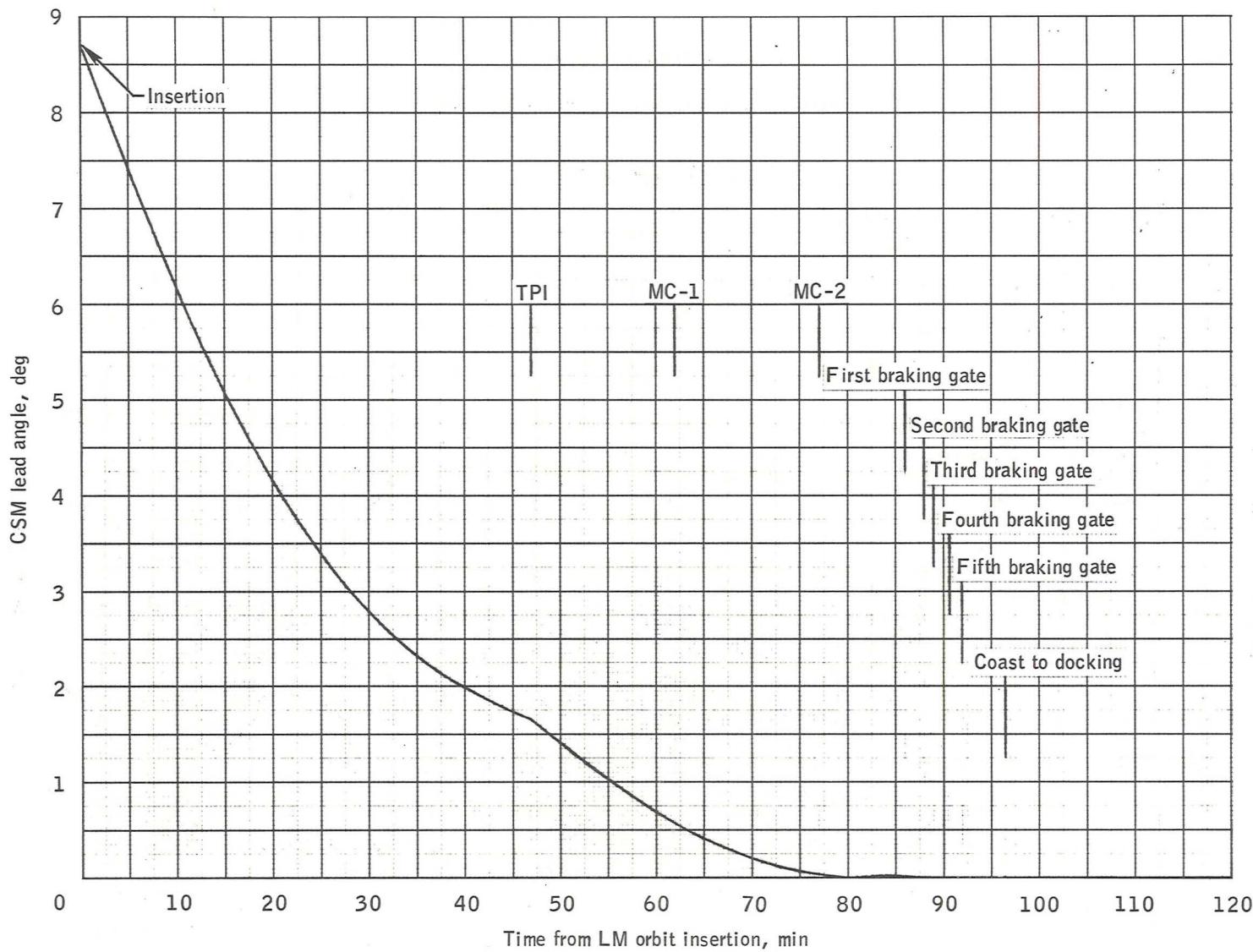
(a) LM-CSM elevation angle versus time from LM orbit insertion.

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



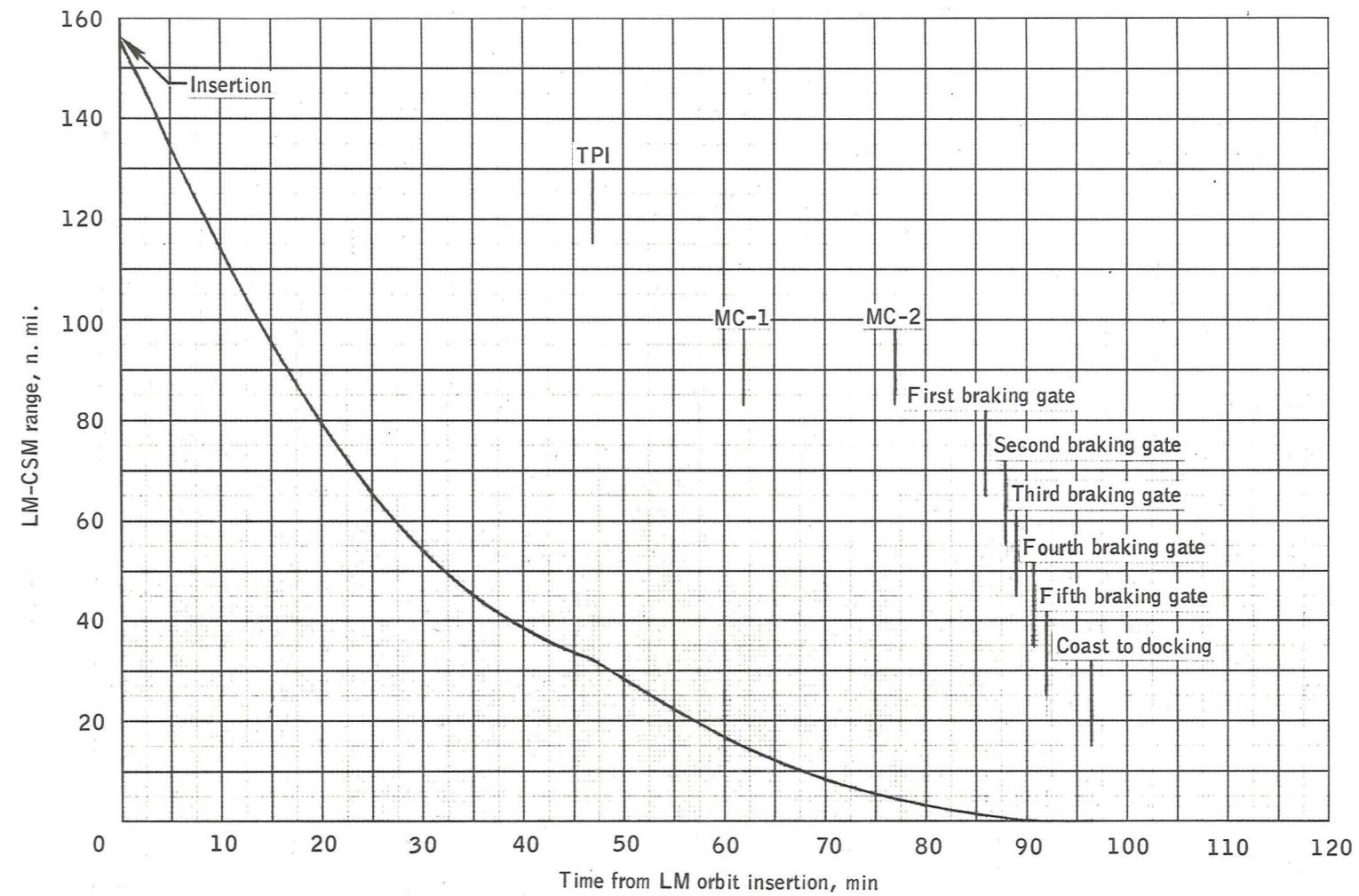
(b) CSM-LM-sun angle versus time from LM orbit insertion.

Figure 4.13-2.- Continued.



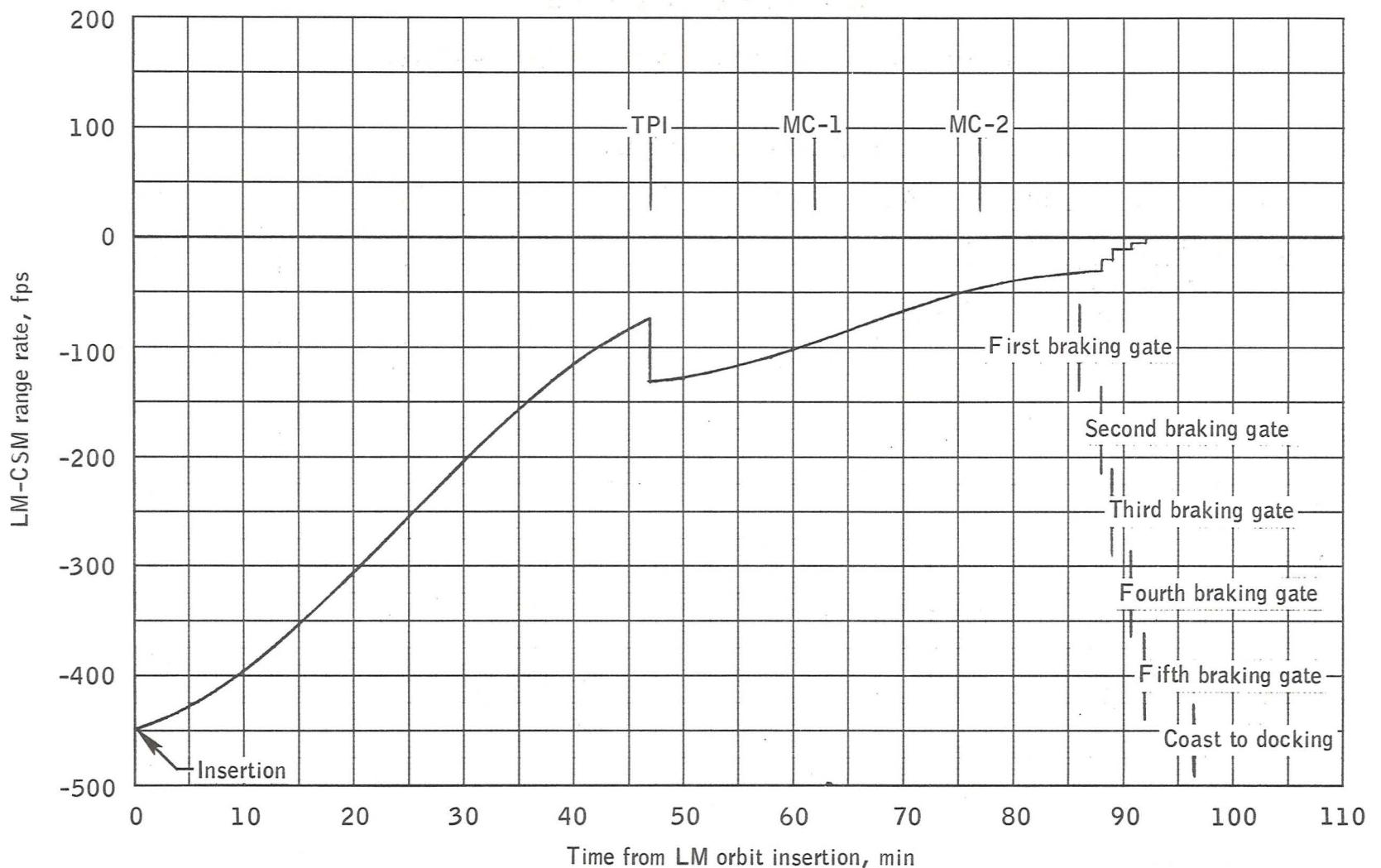
(c) CSM lead angle versus time from LM orbit insertion.

Figure 4.13-2.- Continued.



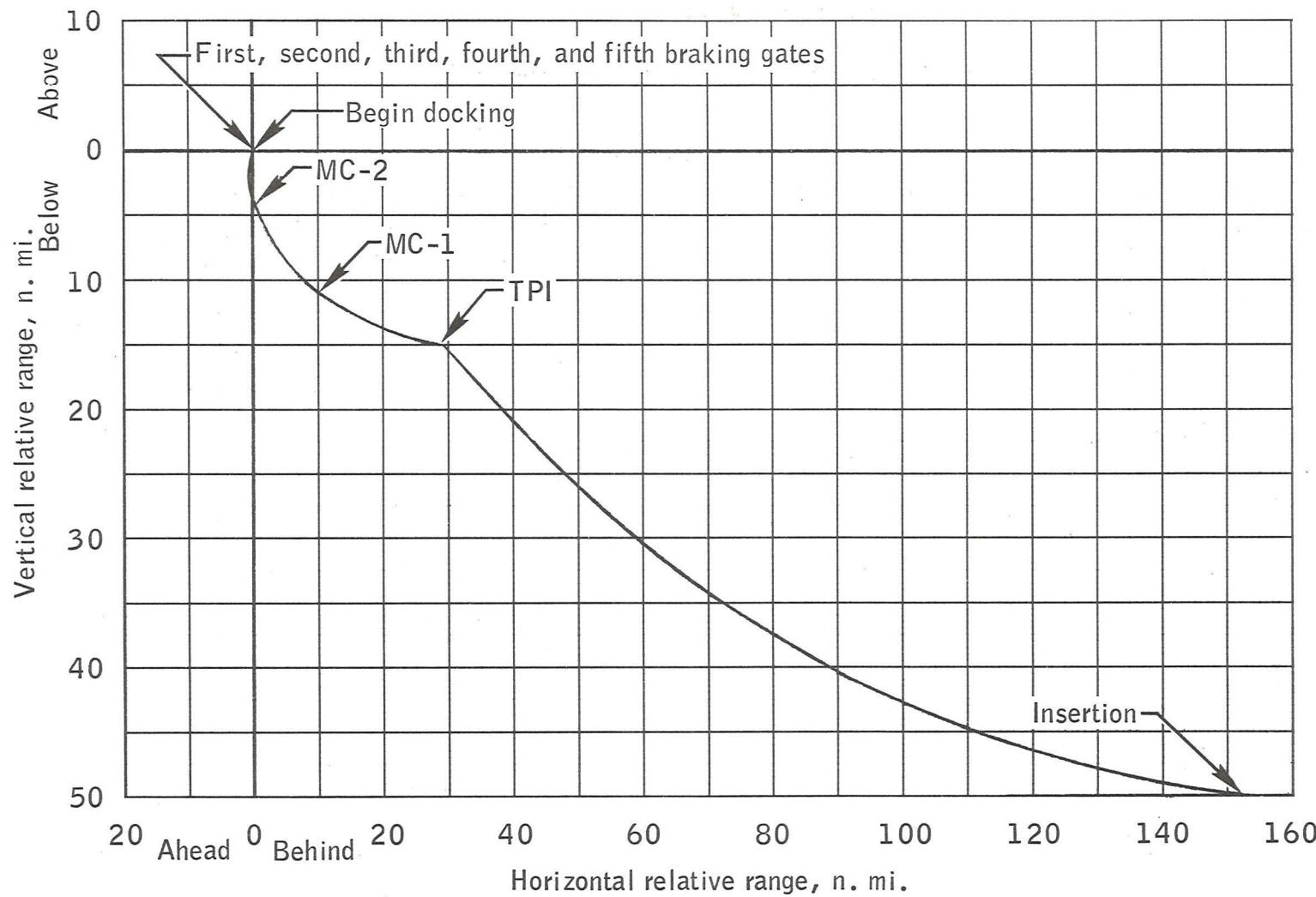
(d) LM-CSM range versus time from LM orbit insertion.

Figure 4.13-2.- Continued.



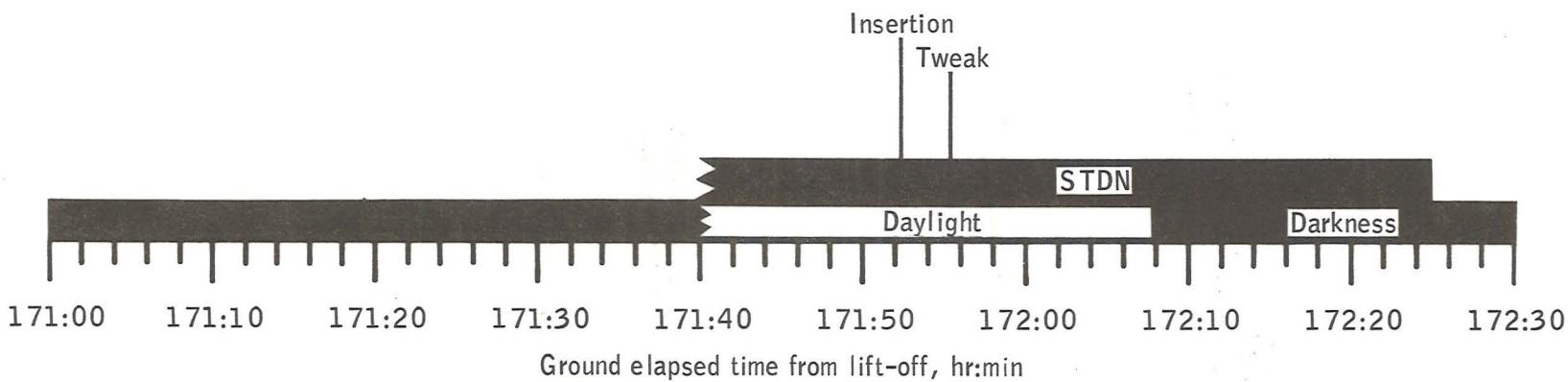
(e) LM-CSM range rate versus time from LM orbit insertion.

Figure 4.13-2.- Continued.



(f) Vertical relative range versus horizontal relative range.

Figure 4.13-2.- Concluded.



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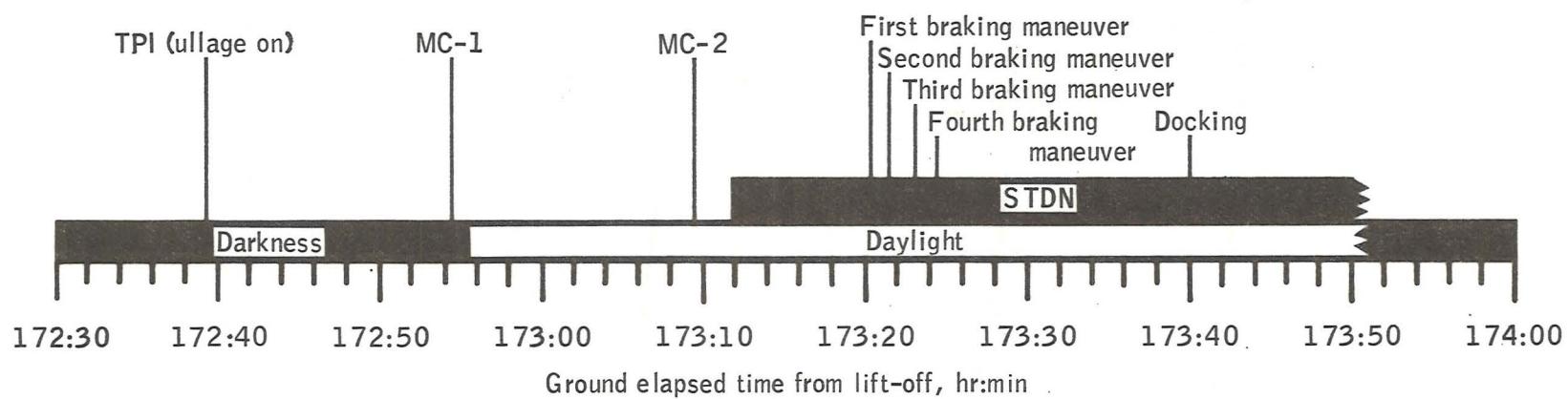


Figure 4.13-3.- Mission events and tracking summaries for LM-active rendezvous.

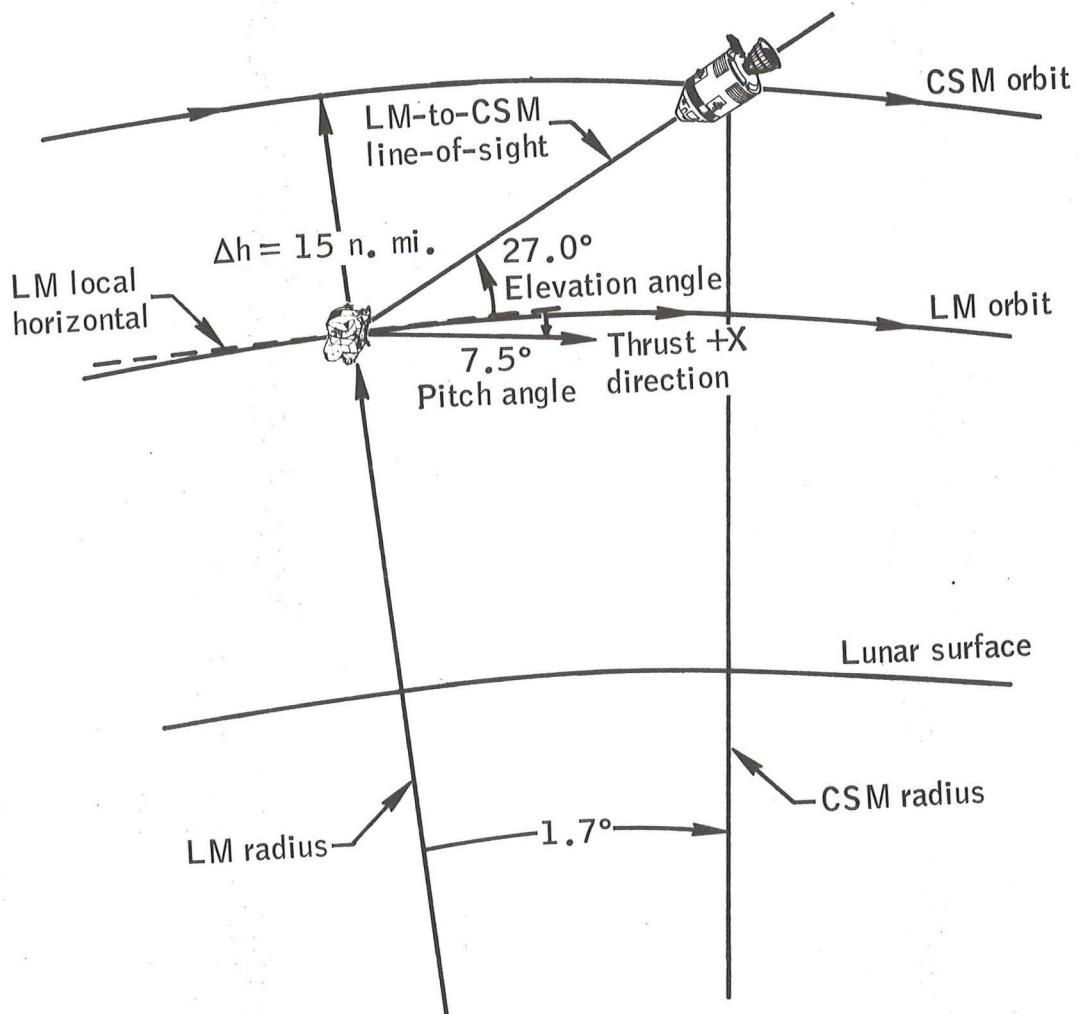


Figure 4.13-4.- LM-CSM relative geometry at TPI.

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4.14 LM JETTISON AND SEPARATION
TO TEI

4.14 LM Ascent Stage Jettison and Separation to CSM Transearth Injection

4.14.1 LM ascent stage jettison.— Since the publication of the Apollo 16 Operational Trajectory for March 17 launch, the LM ascent stage target impact point has been changed from 14.68°E and 9.00°S to 14.97°E and 9.48°S . This change is reflected in this Operational Trajectory (for an April 16 launch). The reason for the change is that, with the new impact point, the ascent stage impact can possibly be viewed by the lunar rover television camera. Two major trajectory differences result from moving the impact point:

- a. ΔV required for deorbit increases from 216.5 fps to 229.6 fps
- b. The middle IMU gimbal angle changes from 352.1° to 339.7°

The LM ascent stage is jettisoned from the CSM about two revolutions after docking at $177^{\text{h}}31^{\text{m}}15^{\text{s}}$ g.e.t. The LM is jettisoned in the inertial attitude required for the LM deorbit maneuver which occurs about 105 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 2-fps posigrade 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-XIII.

The LM deorbit burn occurs at $179^{\text{h}}16^{\text{m}}29^{\text{s}}$ g.e.t. at a longitude of 86.24°E . There are about 9.5 minutes of STDN coverage prior to the deorbit maneuver in which to command the LM for deorbit. The deorbit is targeted to impact the lunar surface at 14.97°E longitude and 9.48°S latitude. Because of the far easterly longitude of the deorbit maneuver, for the LM antenna to be acquired by STDN stations the LM must be inertially oriented to a pitched-down attitude of approximately 49° 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 STDN communication. The total ΔV required for deorbit is 229.6 fps. This RCS burn (+X, four-jet) will be about 95.5 seconds long. The target load for deorbit is shown in table 5-XIII.

After deorbit the LM coasts for about 21.5 minutes in a 68.2- by -40.6-n. mi. orbit prior to impacting the lunar surface. The velocity of impact is 5550.0 fps with a flight-path angle of -3.2° .

The LM deorbit groundtrack is shown in figure 4.14-1. The 3σ dispersion ellipse shown in this figure is ± 12.33 n. mi. down range and ± 0.73 n. mi. cross range. The Apollo 16 landing site is outside of this ellipse; therefore, no damage to the experiment packages left from lunar stay is probable.

4.14.2 CSM second lunar orbit plane change (LOPC-2). - Approximately $118^{\text{h}}45^{\text{m}}$ after LOI, the CSM performs a second plane change on rev 61 to increase lunar surface photography coverage. The maneuver is performed $15^{\text{h}}43^{\text{m}}$ after LM jettison. The target load for the maneuver is presented in table 5-XIII.

The characteristics of the burn are the following:

Burn initiation

Time, hr:min:sec, g.e.t.	193:13:46.2
Mass, lb	38 433.2
Altitude above LLS, n. mi.	58.0
Selenographic latitude, deg	0.1
Selenographic longitude, deg	65.0
Inertial velocity, fps	5354.5
Selenographic inclination, deg	10.4
Perilune altitude above LLS, n. mi.	57.9
Apolune altitude above LLS, n. mi.	62.9

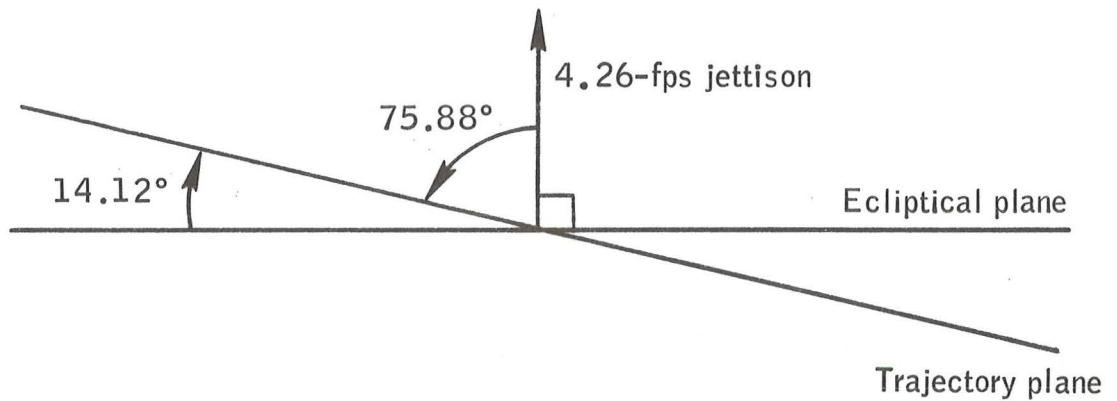
Burn cutoff

Time, hr:min:sec, g.e.t.	193:14:02.0
Altitude above LLS, n. mi.	58.0
Selenographic latitude, deg	0.0
Selenographic longitude, deg	64.2
Inertial velocity, fps	5354.5
Selenographic inclination, deg	13.4
Burn duration, sec	15.8
Inertial burn arc, deg	0.8
Plane change, deg	3.0
ΔV , fps	282.5
SPS propellant used, lb	1056.8
Perilune altitude above LLS, n. mi.	57.9
Apolune altitude above LLS, n. mi.	62.9

4.14.3 Shaping burn and subsatellite jettison. - The CSM performs a shaping burn on rev 73 at $216^{\text{h}}49^{\text{m}}11.7^{\text{s}}$ g.e.t. to place the SC in an orbit so that, when the subsatellite is jettisoned at $218^{\text{h}}02^{\text{m}}08.3^{\text{s}}$ g.e.t. at the ascending node on rev 73, it will have a lunar orbit lifetime of at least 1 year.

The lunar orbit subsatellite is jettisoned at $218^{\text{h}}02^{\text{m}}08.3^{\text{s}}$ g.e.t. as the CSM crosses the lunar equator at the ascending node of rev 73. 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;

thus, the spin axis of the subsatellite will be perpendicular to the line of sight to the sun, allowing maximum sunlight incidence on the solar cells.



Jettison altitude: Fixed inertial with CSM
local horizontal angles of

$$P = 94.9$$

$$Y = -0.2^\circ$$

$$R = 91.4$$

TABLE 4.14-I.- LM DEORBIT SUMMARY

Event	Time, hr:min:sec g.e.t.	Latitude, deg	Longitude, deg	Burn duration, sec	V, fps	Inertial velocity, fps	Mass, lb	Local horizontal attitudes, deg	
								Pitch	Yaw
Jettison	177:31:15.0	-4.50	46.66	--	2.5	5344.5	5253.9	-90.0	-20.4
Deorbit	179:16:29.2	2.74	86.24	95.5	229.6	5348.6	5253.9	-131.1	-20.4
Impact	179:39:28.6	-9.48	14.97	--	--	5550.0	5122.2	-59.1	-20.9

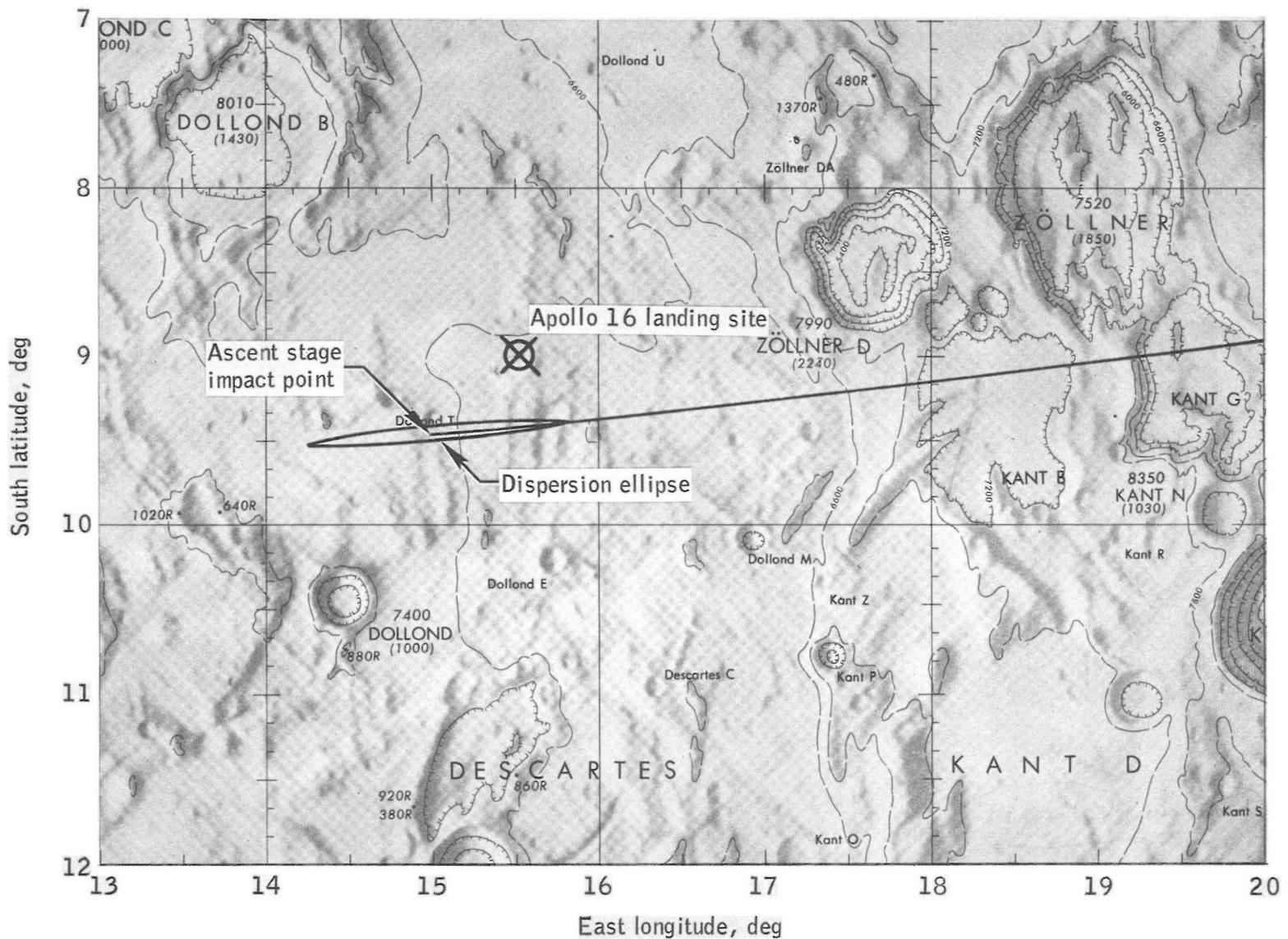


Figure 4.14-1.- Apollo 16 LM ascent stage impact groundtrack.

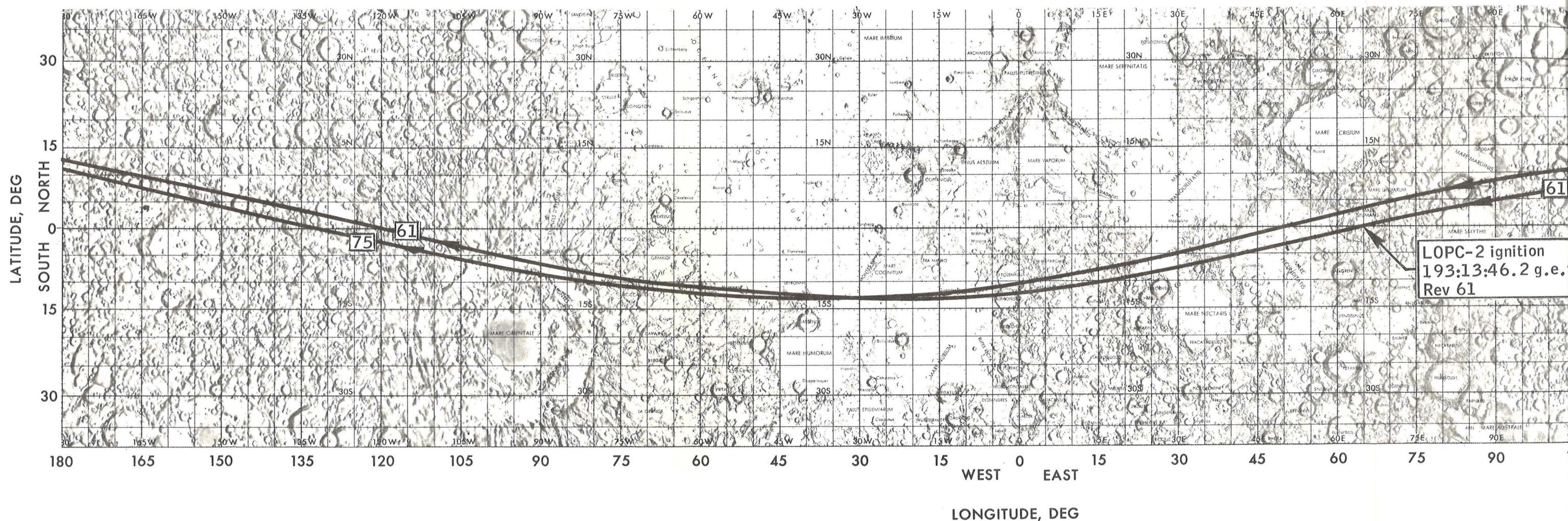


Figure
luna

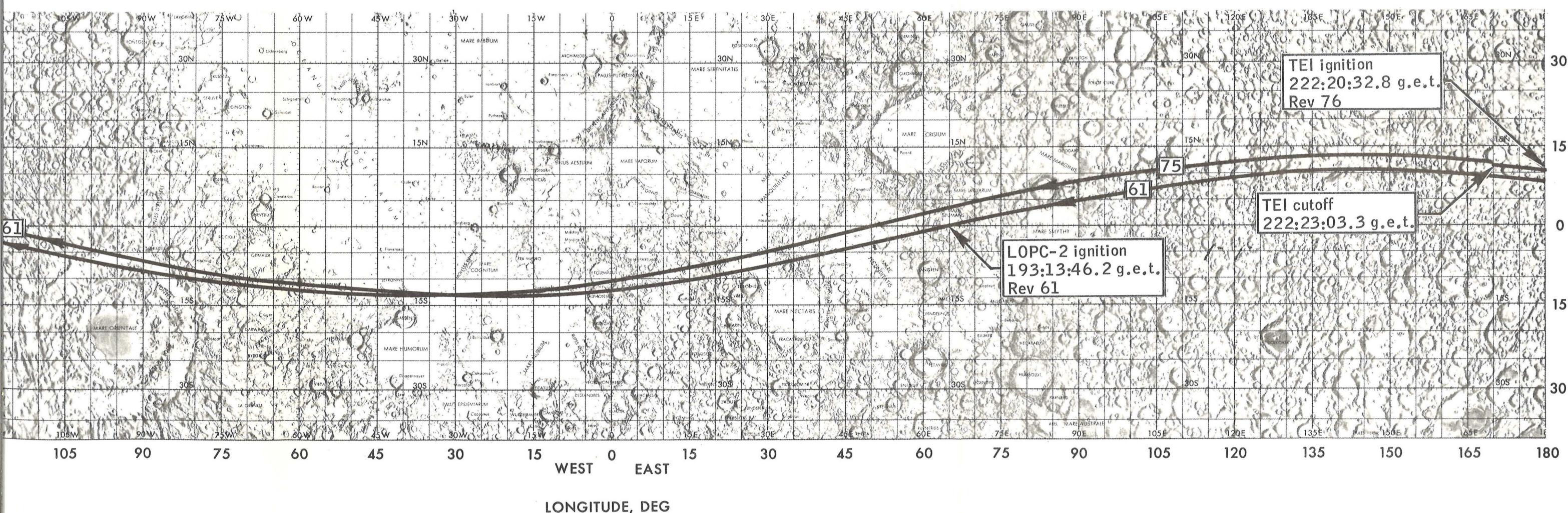


Figure 4.14-2.- Groundtracks for CSM second
lunar orbit plane change and TEI.

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4.15 TRANSEARTH INJECTION

4.15 Transearth Injection

The TEI maneuver occurs $147^{\text{h}}46^{\text{m}}$ after LOI and approximately $50^{\circ}36^{\text{m}}$ after LM ascent. For a 68.0-hour transearth flight time and a 62° 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 alined to the TEI preferred REFSMMAT. The target load is presented in table 5-XIV.

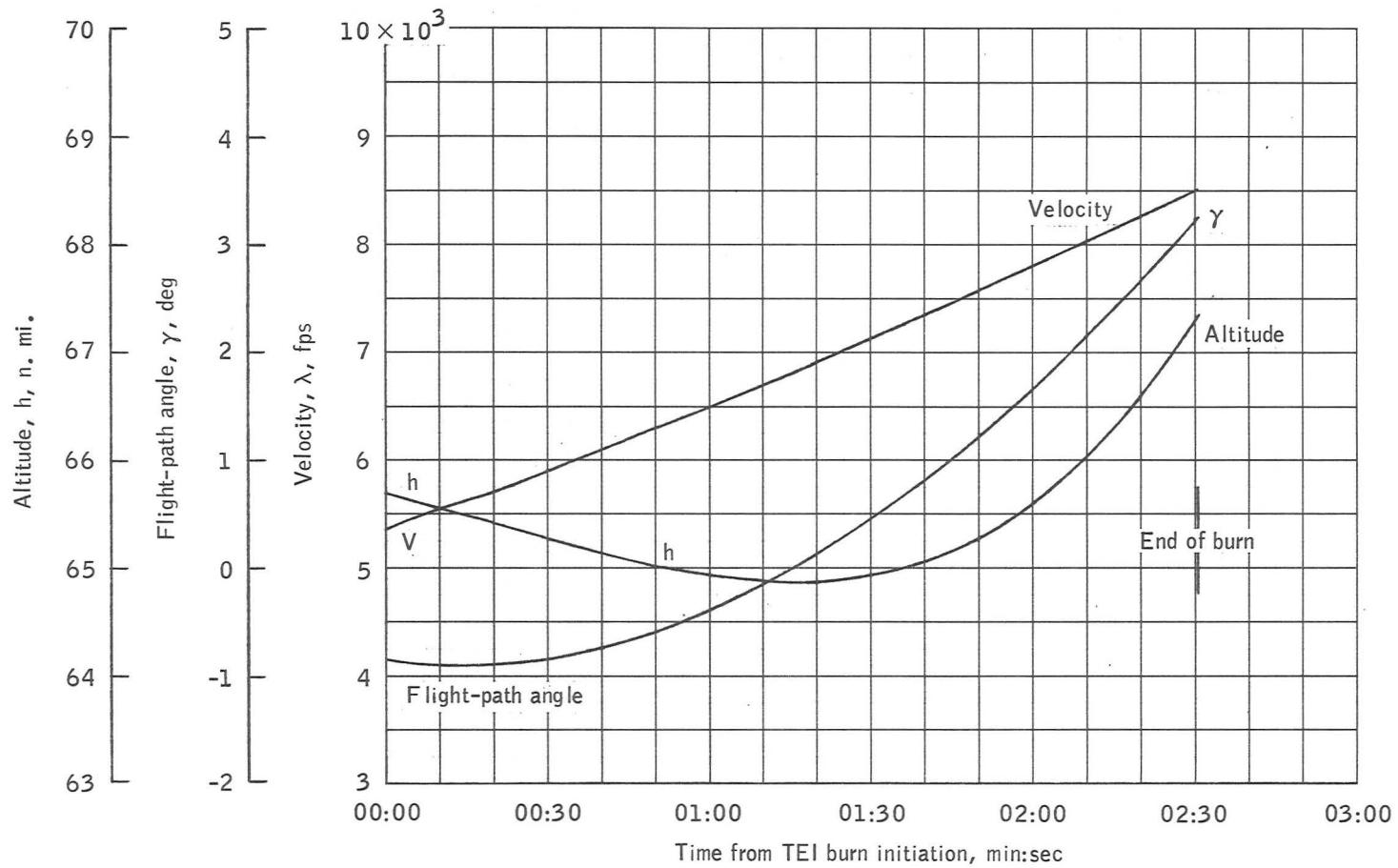
The characteristics of the burn are the following.

TEI burn initiation

Time, hr:min:sec, g.e.t.	222:20:32.8
Mass, lb	37 025.0
Altitude above LLS, n. mi.	65.7
Selenographic latitude, deg	10.3
Selenographic longitude, deg	179.7
Inertial velocity, fps	5339.3
Selenographic inclination, deg	13.4
Perilune altitude above LLS, n. mi.	54.7

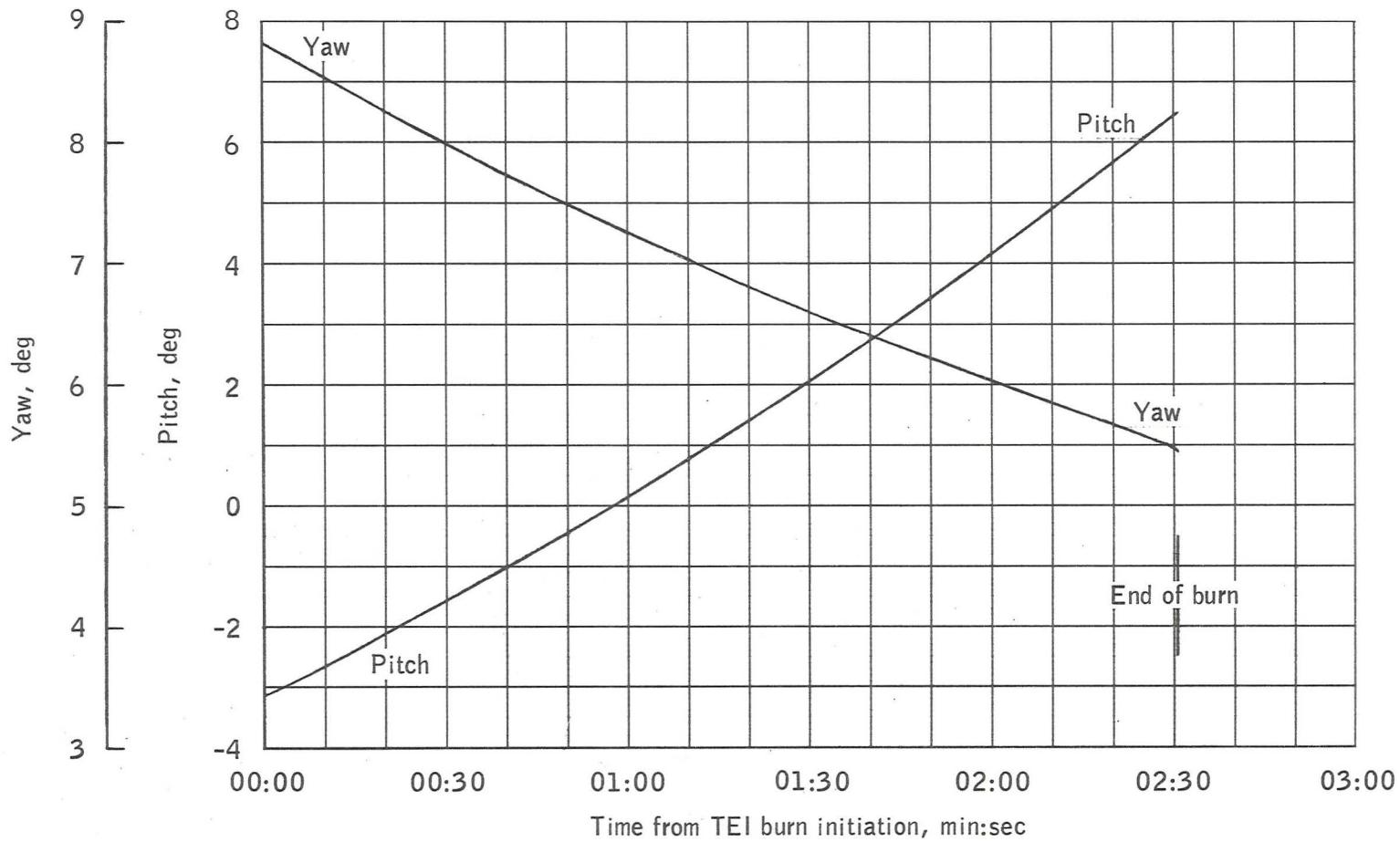
TEI burnout

Time, hr:min:sec, g.e.t.	222:23:03.3
Altitude above LLS, n. mi.	67.3
Selonographic latitude, deg	11.9
Selenographic longitude, deg	170.0
Inertial velocity, fps	8521.2
Selenographic inclination, deg	15.5
Burn duration, sec	150.5
Inertial burn arc, deg	9.7
Plane change, deg	3.3
ΔV , fps	3212.2
SPS propellant used, lb	10 059.7
Perilune altitude above LLS, n. mi.	64.7



(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.

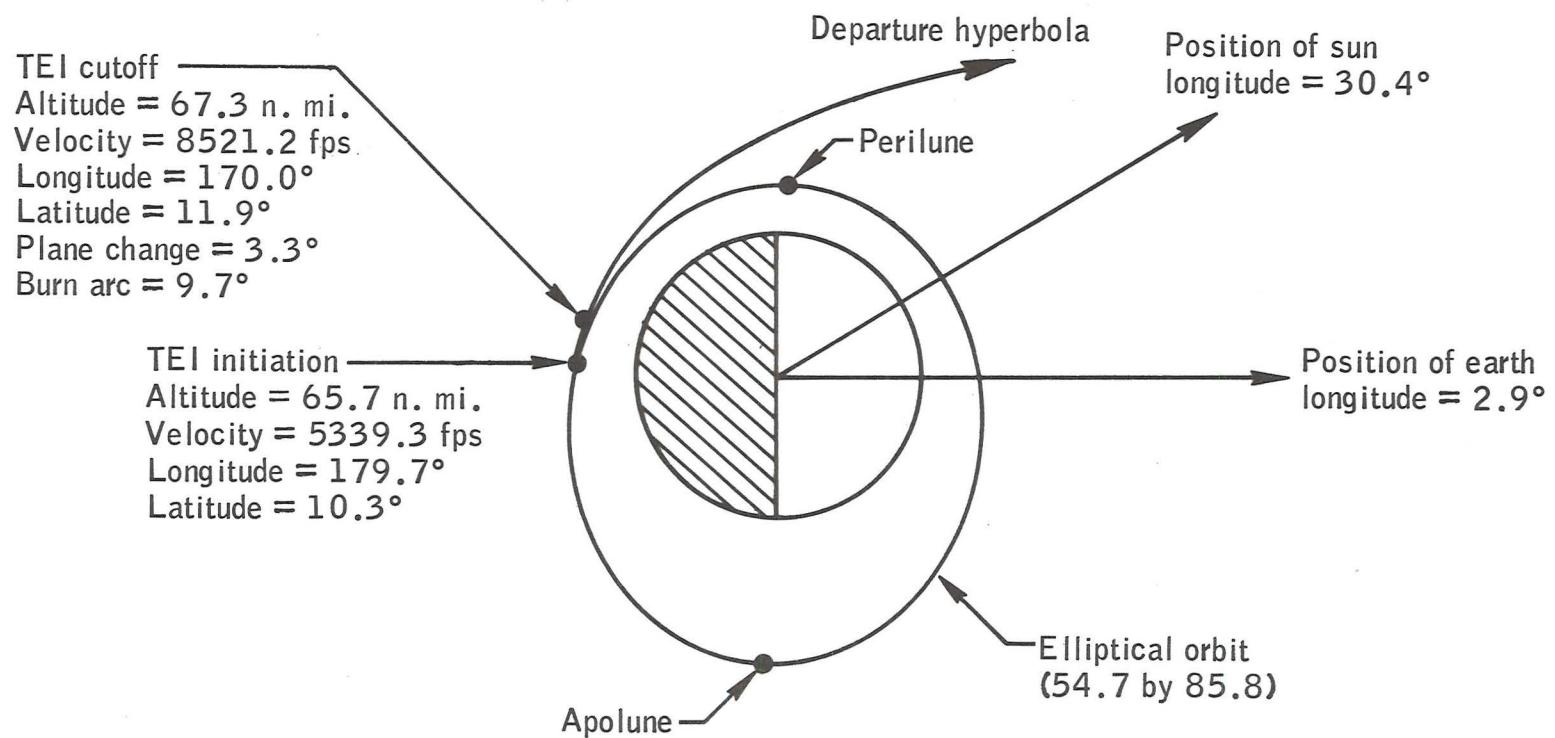


Figure 4.15-2.- TEI geometry.

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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 mid-course strategy, which includes the threshold values for each maneuver, is contained in reference 5. Altitude is plotted against time for the last 10 hours of transearth coast in figure 4.16-4.

The SC is in the lunar umbra during the entire TEI burn, enters sunlight approximately 4 minutes after cutoff, and remains in sunlight until earth entry.

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

The SC is acquired by STDN approximately 8 minutes after TEI cutoff. The last station to lose signal prior to entry interface is HSK (0° minimum elevation). LOS occurs at $290^{\text{h}}18^{\text{m}}$ g.e.t. or approximately 4 minutes prior to entry interface.

The primary trajectory parameters at entry interface are the following.

APOLLO TRACKING NETWORK

All stations operational May 1968

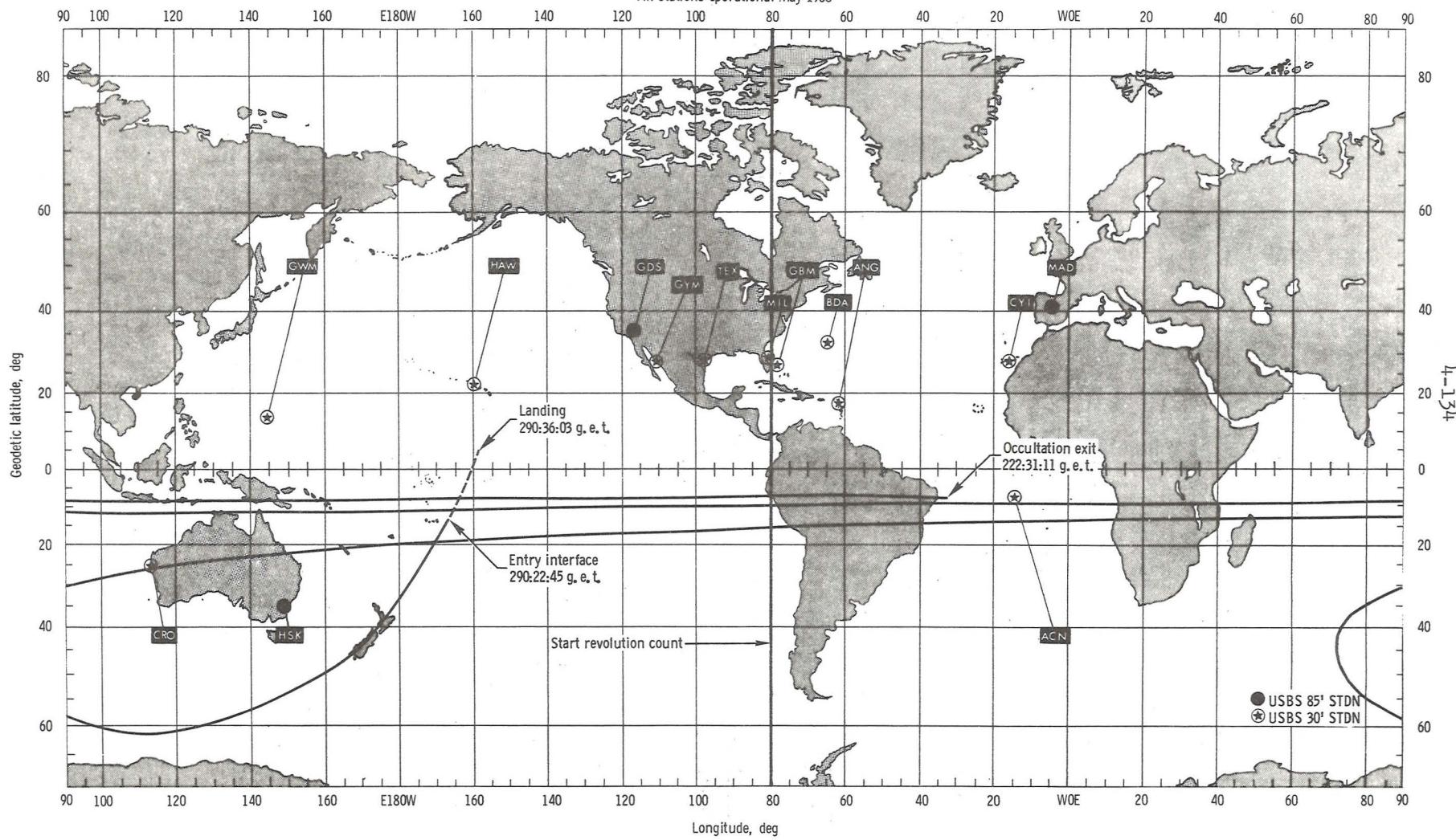


Figure 4.16-1. - Transearth coast groundtrack.

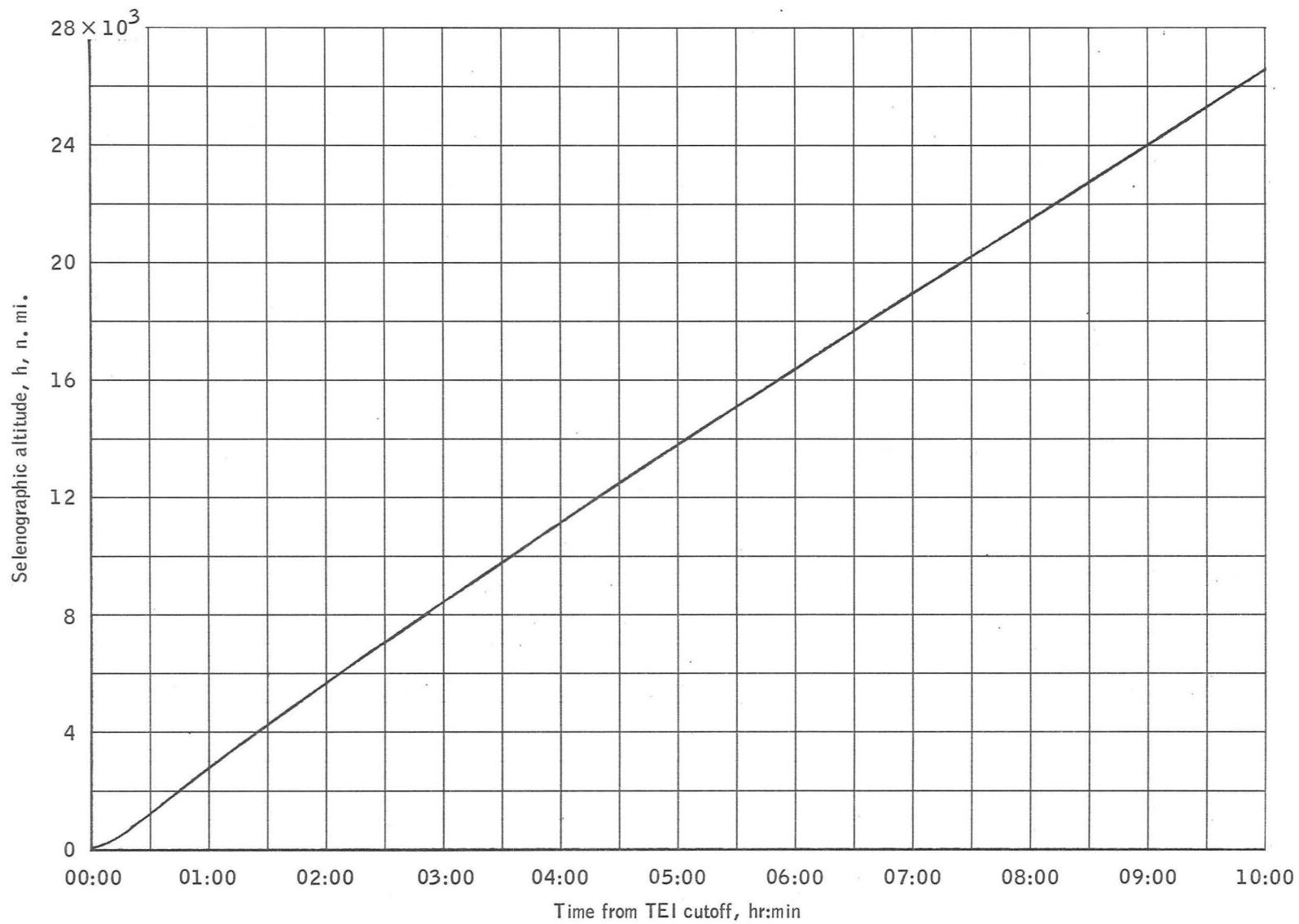


Figure 4.16-2.- Selenographic altitude time history during the first 10 hours of transearth coast.

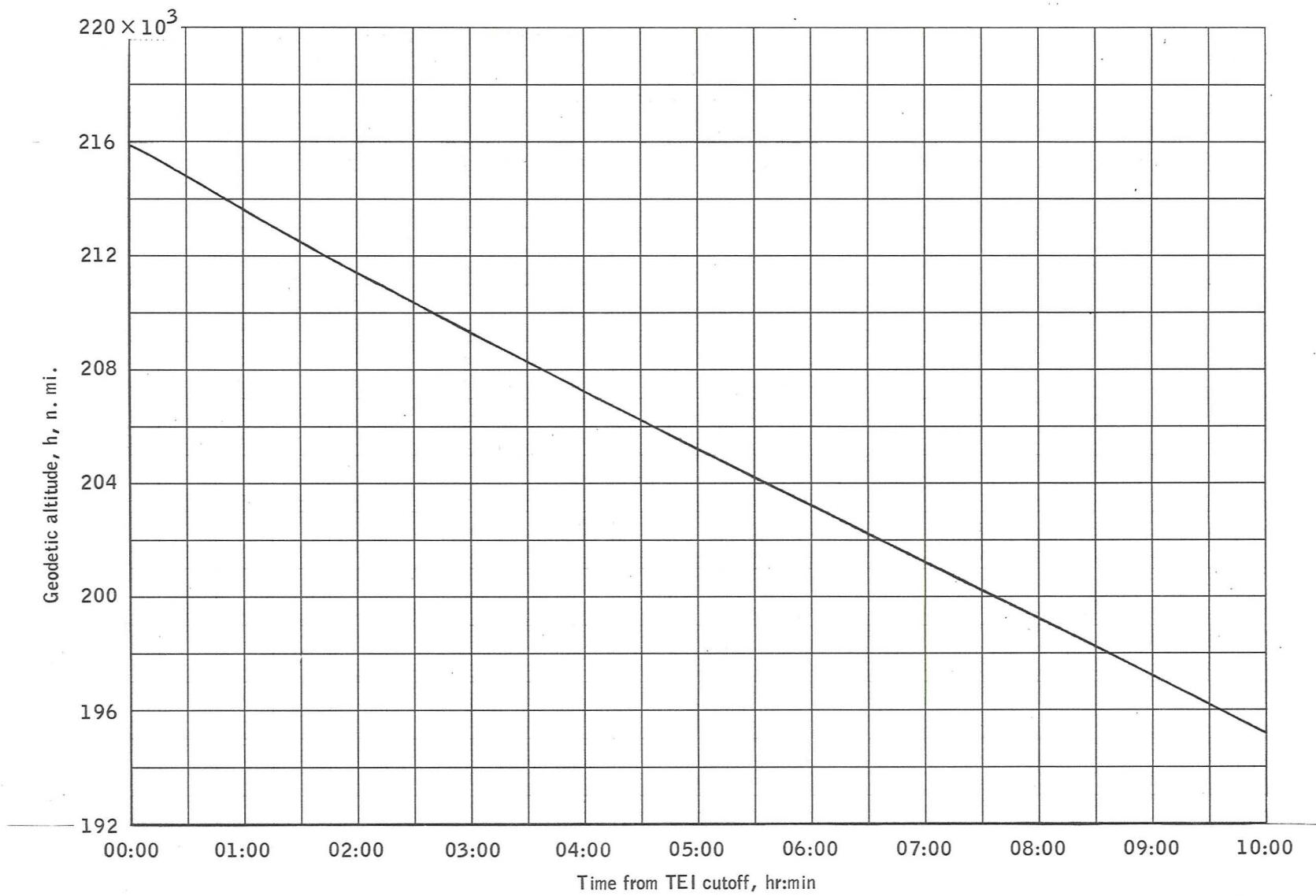


Figure 4.16-3.- Geodetic altitude time history during the first 10 hours of transearth coast.

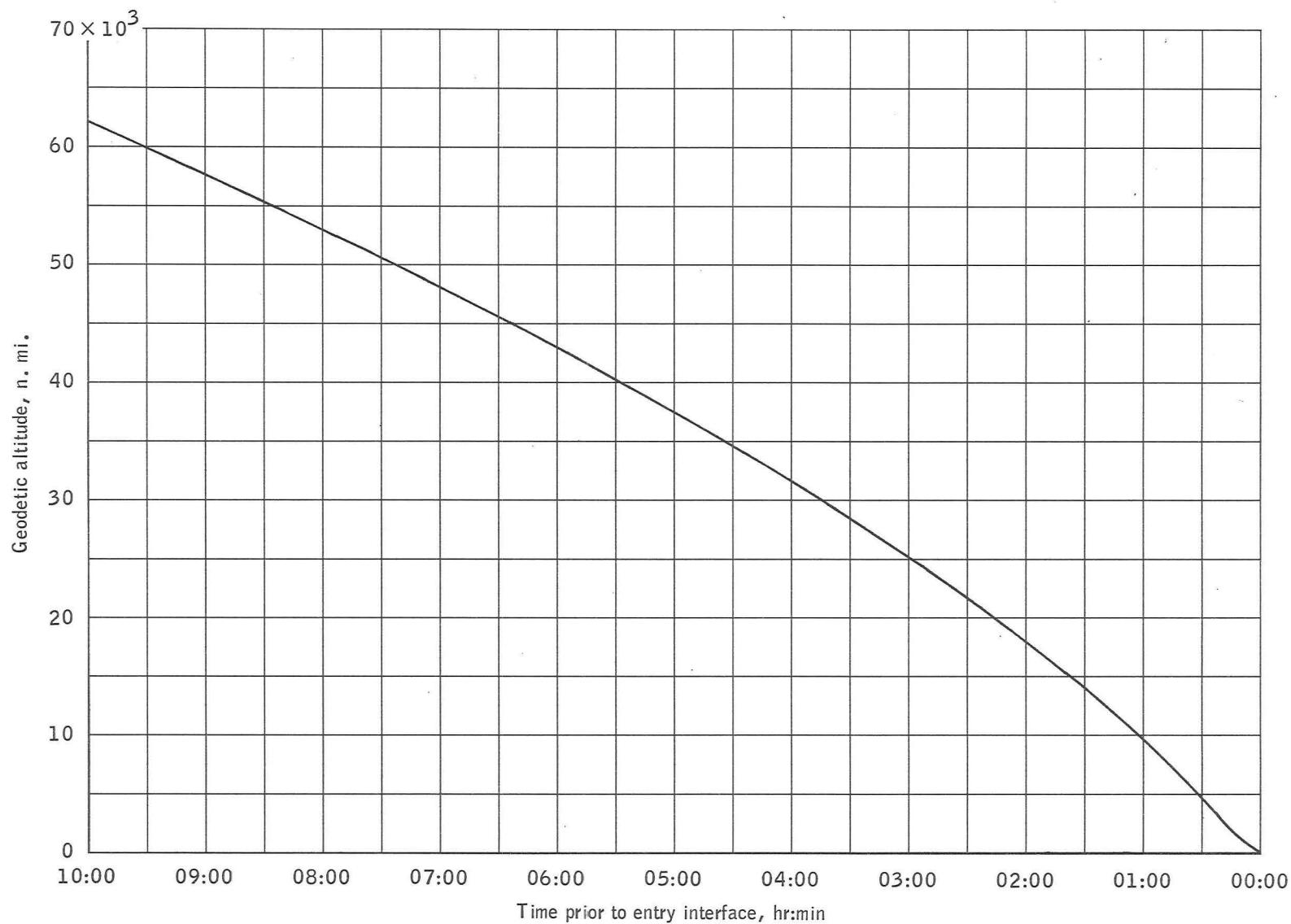


Figure 4.16-4.- Geodetic altitude time history 10 hours prior to entry interface.

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4.17 ENTRY

4.17 Entry

The entry phase of the operational trajectory was simulated with the Apollo Reentry Simulation program with six degrees of freedom. Three-degree-of-freedom trajectories were used to determine the CM maneuver footprint. The entry corridor is presented in figure 4.17-1.

At the nominal entry interface, 290 hours 22 minutes 45 seconds after lift-off, the CM is at an altitude of 399 681 feet, and the coordinates are 12.983°S geodetic latitude and 167.239°W longitude. Inertial velocity, flight-path angle, and azimuth at this point are 36 176 feet per second, 6.50° below the local horizontal, and 29.021° , respectively. The gimbal angles at $0.05g$ are as follows: yaw = 0° , pitch = 153° , roll = 0° .

The CM maneuver footprint and the nominal ground trace on a map of the entry area are presented in figure 4.17-2. The footprint is extended to a 3500-n. mi. entry range. The nominal landing target location is 1190 n. mi. down range from the entry interface position, and the coordinates of the target are 158.67°W longitude and 5.00°N geodetic latitude. A sequence of pertinent events is given in table 4.17-1 and includes the period of communications blackout which occurs along the trajectory. The guidance phases are shown in figure 4.17-3, 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 4.17-4. Time histories of the total heating rate and the total heat load are presented in figure 4.17-5. The maximum total heating rate is $323.8 \text{ Btu}/\text{ft}^2\text{-sec}$, and the total heat load is $26494.8 \text{ Btu}/\text{ft}^2$. Time histories for inertial and relative velocity and flight-path angles are presented in figures 4.17-6(a) and 4.17-6(b), respectively.

The CM RCS uses 11.6 pounds of propellant for the separation and attitude hold maneuvers before the spacecraft reaches 400 000-foot altitude, and the CM RCS uses 47.7 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 4.17-7. In figure 4.17-8, the altitude is plotted in relation to relative velocity, and the boundary for S-band communication blackout is shown. Time histories for the primary DSKY displays, commanded bank angle, inertial velocity, and load factor are shown in figure 4.7-9. The load factor at the center of gravity reaches a first maximum of $6.9g$ and a second maximum of $3.1g$. Time histories for the FINAL PHASE DSKY displays, commanded bank angle, cross-range error, and down-range error are shown in figure 4.17-10.

The drogue parachute deployment sequence begins at an altitude of 23 300 feet, which is 7 minutes, 49 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 later after the baroswitch closes. The CM, suspended on the main parachutes, reaches landing 13 minutes 18 seconds after entry interface. The relative velocity and relative flight-path angle are plotted against time from drogue chute deployment in figure 4.17-11. Load factor and altitude are plotted against time from drogue chute deployment in figure 4.17-12.

The two traces of entry monitor subsystem (EMS) parameters in figure 4.17-13 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-IV. The conditions at entry interface and the CMC entry erasable load quantities are presented in table 4.17-II, and the entry REFSMMAT is presented in table 5-XV.

TABLE 4.17-I.- ENTRY EVENTS SEQUENCE

Event	Time from lift-off, hr:min:sec	Time from 400 000 ft, min:sec
Entry	290:22:45	00:00
Enter S-band communication blackout	290:23:02	00:17
Guidance changes from P63 to P64 load factor > 0.05g	290:23:13	00:28
Initiate constant drag control load factor > KA	290:23:37	00:52
Maximum heating rate	290:23:55	01:10
Guidance initiated at RDOT = -700 fps	290:24:03	01:18
Maximum load factor (first)	290:24:07	01:22
Subcircular velocity	290:24:47	02:02
Guidance change from P64 to P67	290:24:51	02:06
Exit S-band communication blackout	290:26:18	03:33
Maximum load factor (second)	290:28:27	05:42
Termination of CMC Guidance	290:29:35	06:50
Drogue parachutes deployment	290:30:34	07:49
Main parachutes deployment	290:31:17	08:31
Landing	290:36:03	13:18

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

Elapsed time from launch, hr:min:sec	290:22:45
Inertial velocity, fps	36 176
Inertial flight-path angle, deg	-6.50
Inertial azimuth, deg	29.02
Spacecraft geodetic latitude, deg S	12.986
Spacecraft longitude, deg W	167.24
Altitude, ft	399 681
Target geodetic latitude, deg N	5.00
Target longitude, deg W	158.67

CMC ERASABLE LOAD PARAMETERS

Parameter name	Description	Preliminary value
ALFAPAD	Hypersonic value of angle of attack (α) for CM in trimmed flight	-18.51°
EMSALT	EMS initialization altitude	290 000.1 ft
LADPAD	Update value for minimum reference L/D	0.27
LODPAD	Update value for minimum reference L/D, final phase	0.207

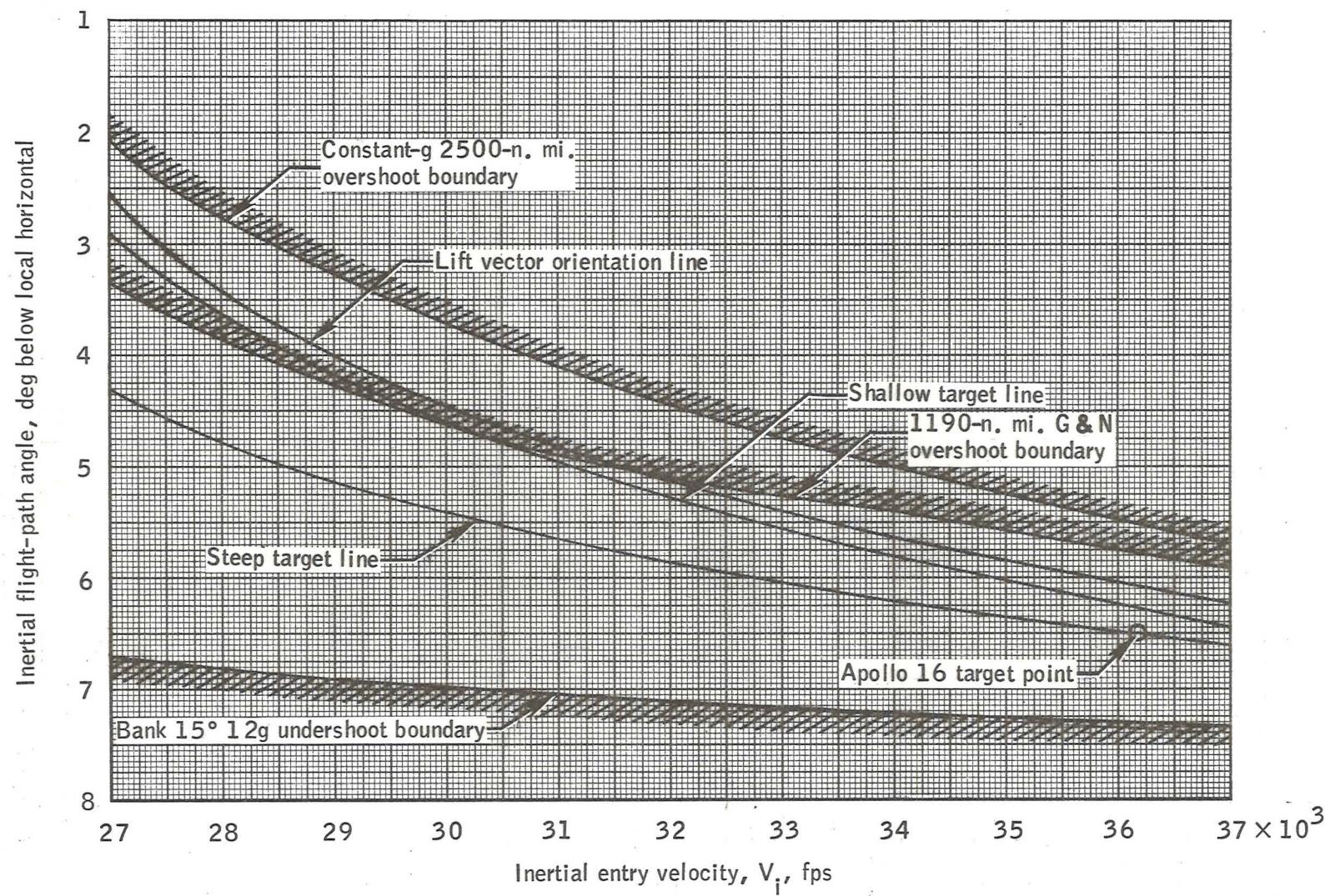


Figure 4.17-1.- Entry corridor.

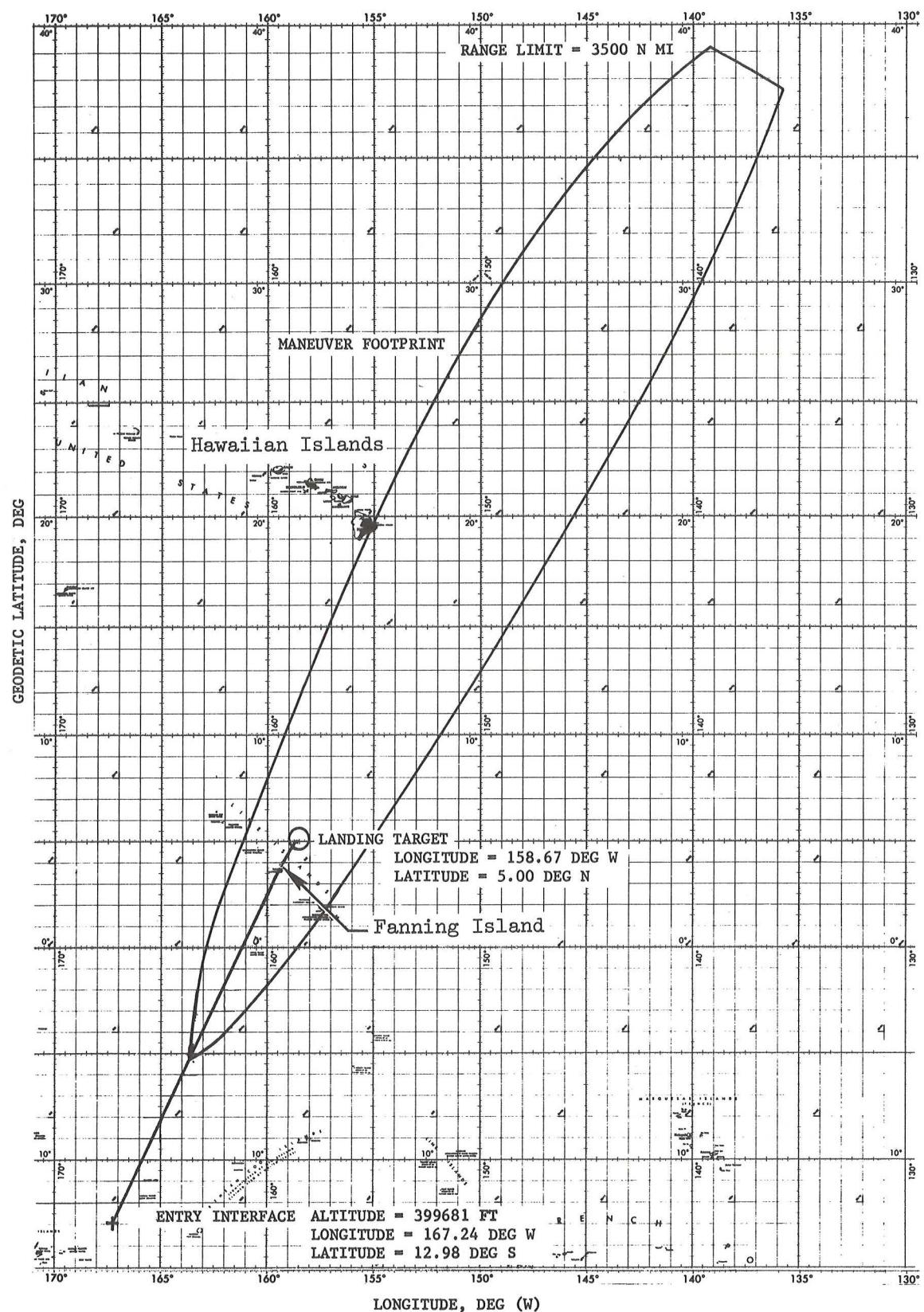


Figure 4.17-2.- Maneuver footprint and nominal groundtrack.

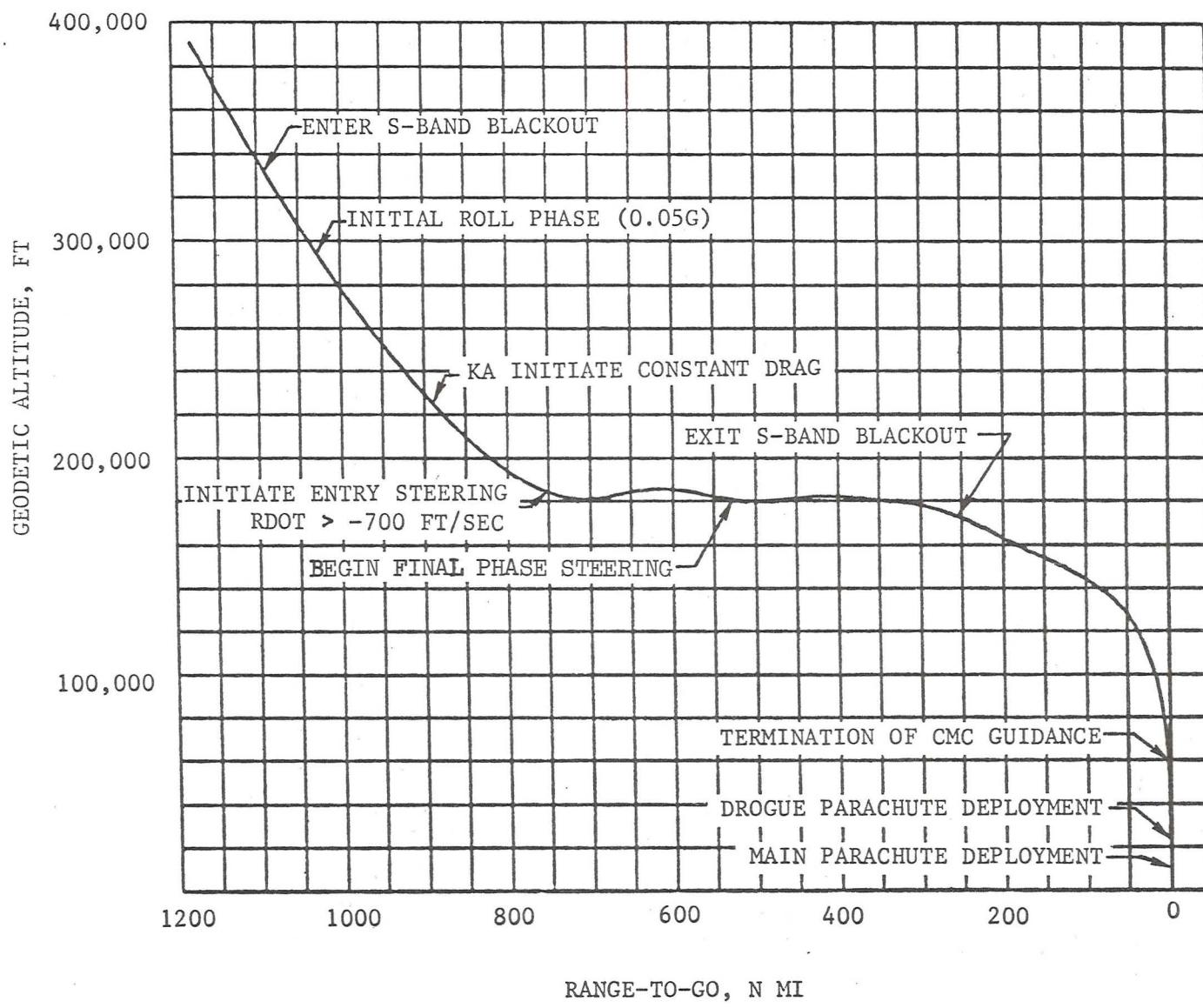


Figure 4.17-3.- Geodetic altitude versus range-to-go.

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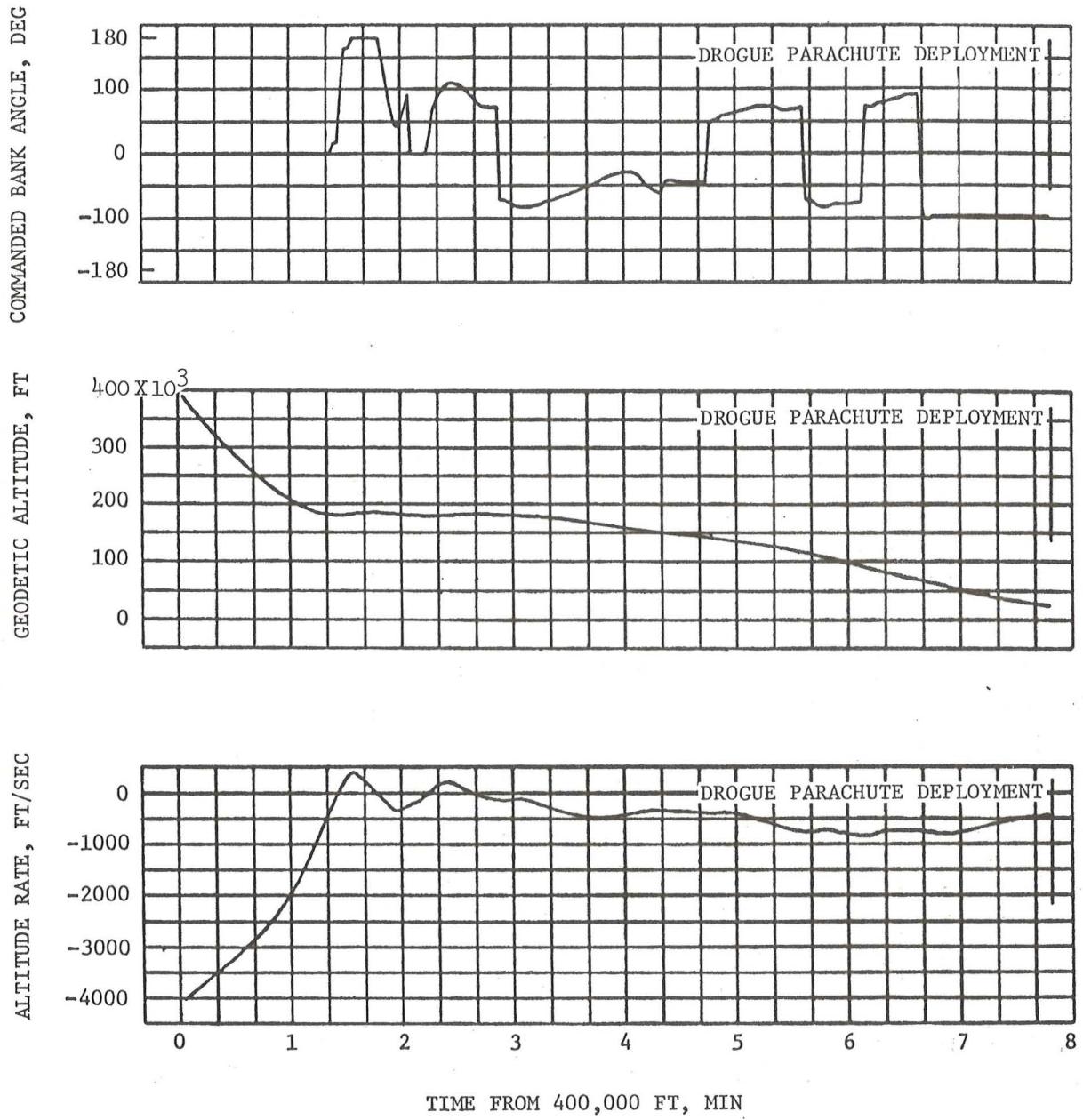


Figure 4.17-4.- Time history of CMC commanded bank angle, altitude, and altitude rate.

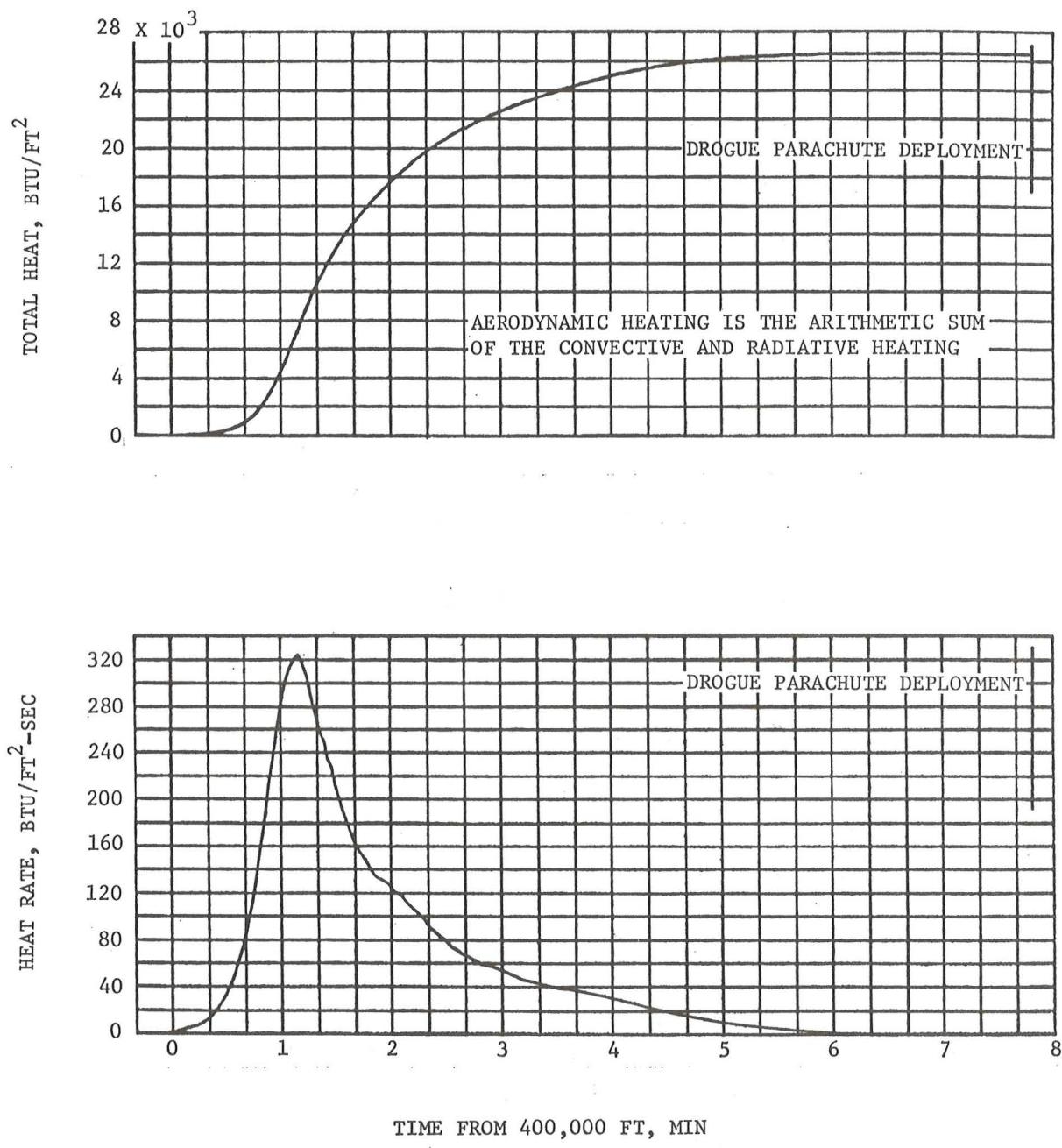
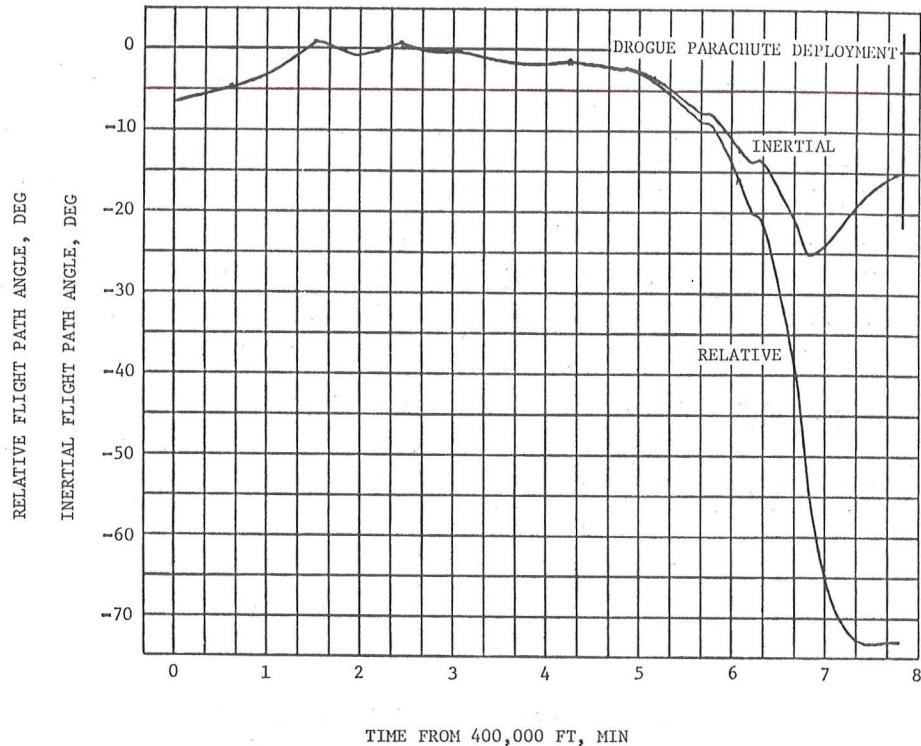
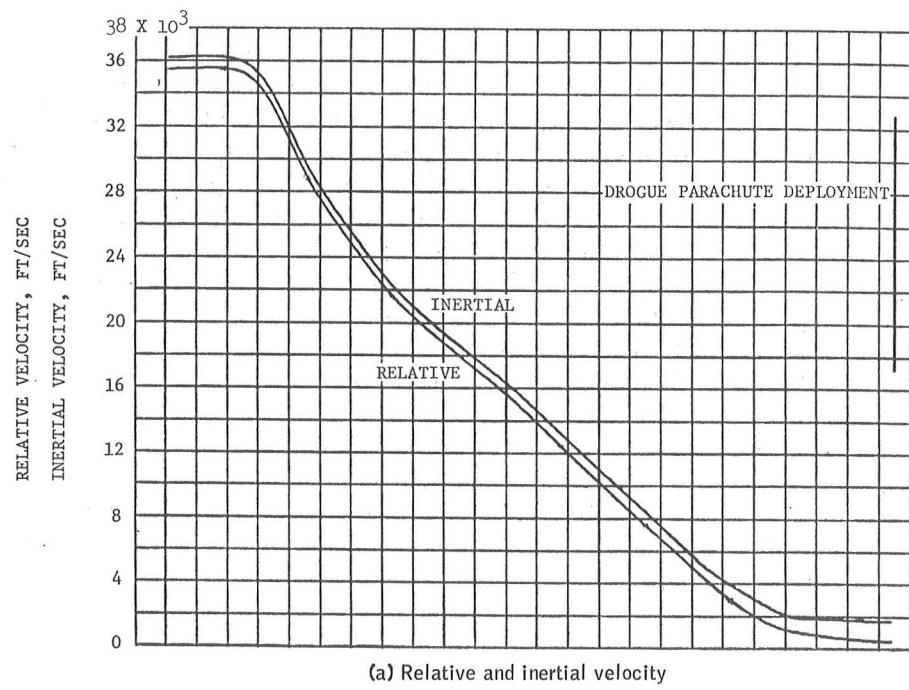


Figure 4.17-5.- Time history of total aerodynamic heating rate and heat load.



(b) Relative and inertial flight-path angle.

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

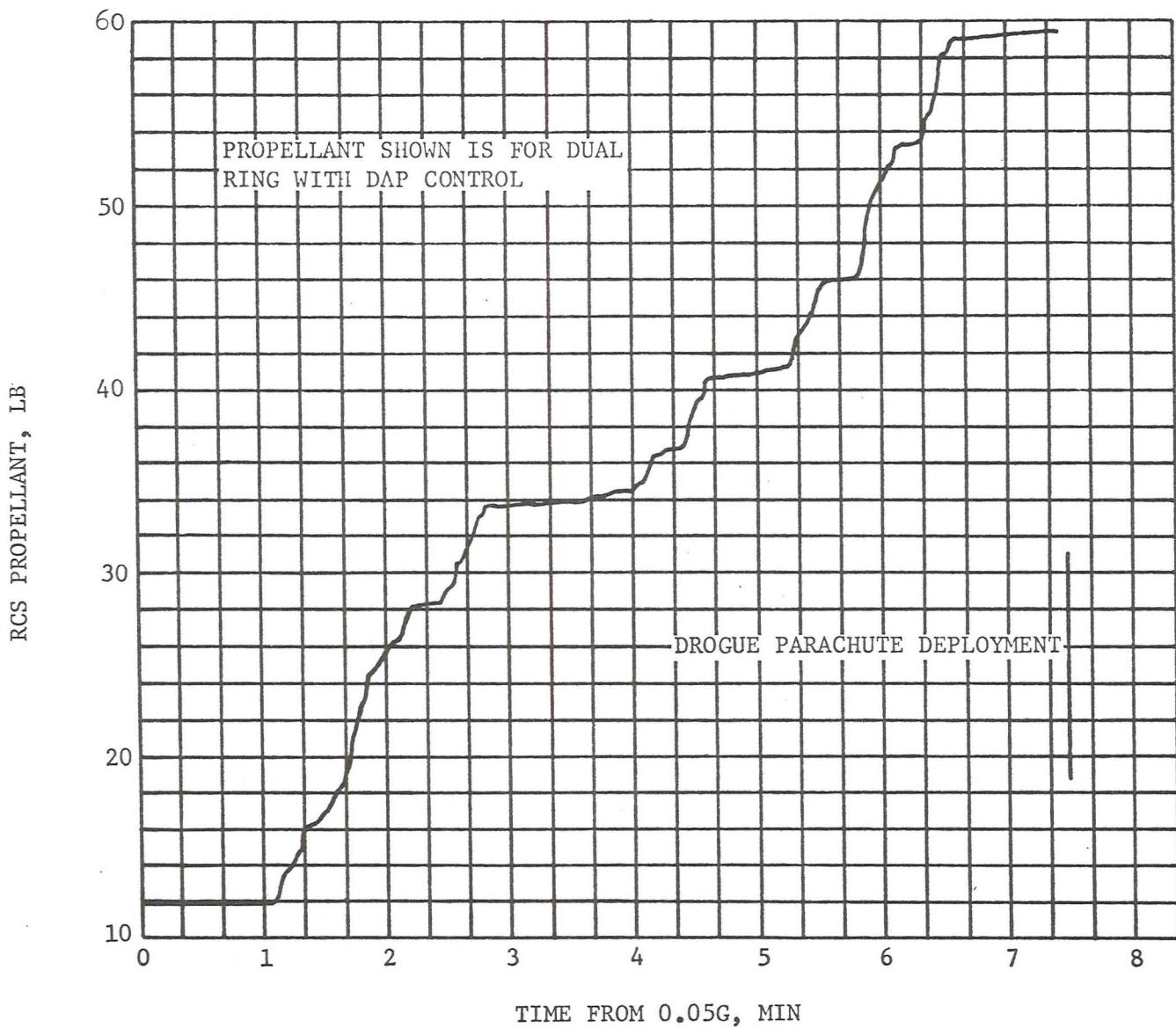


Figure 4.17-7.- Total propellant consumed from CSM separation.

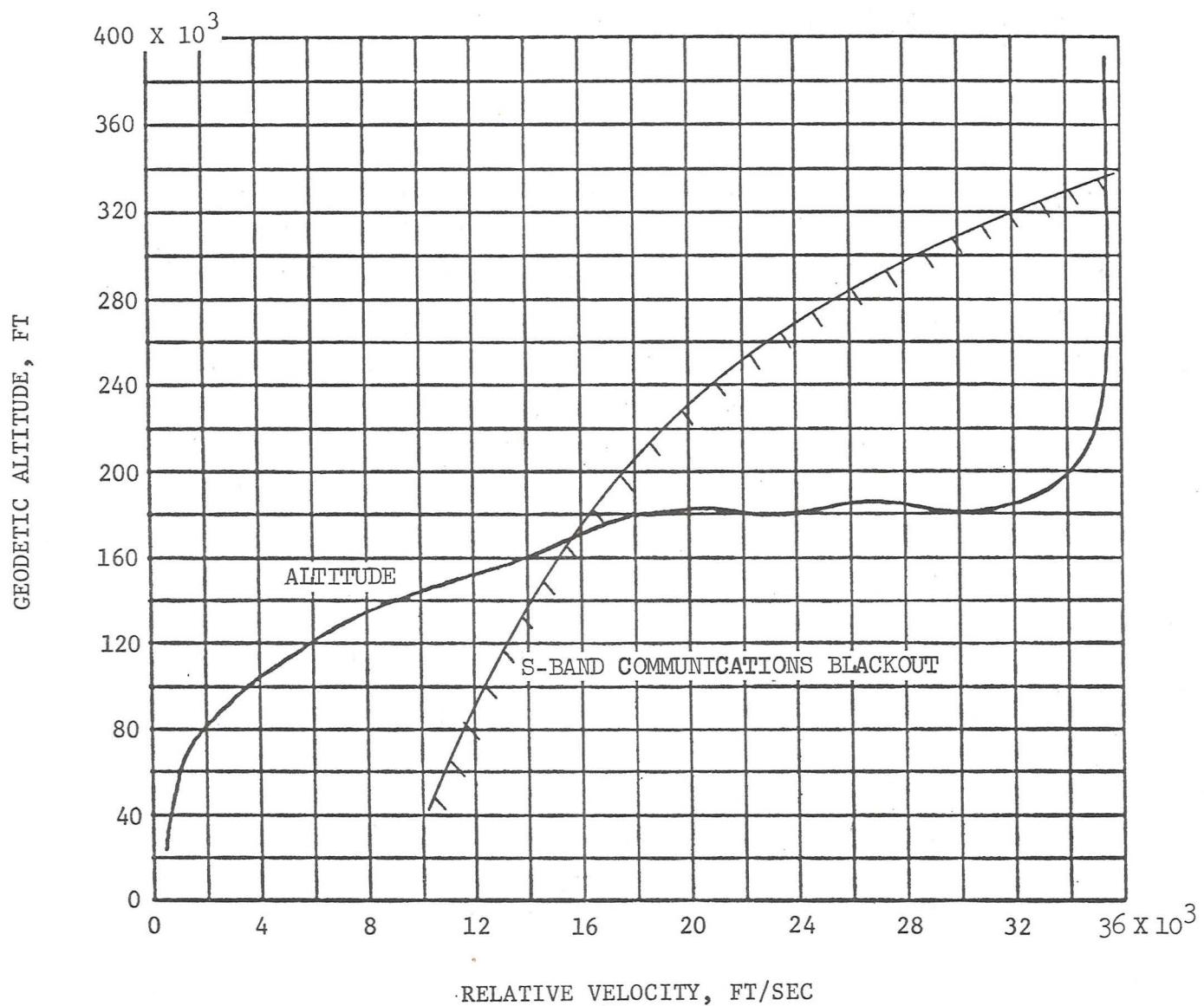


Figure 4.17-8.- Communications blackout.

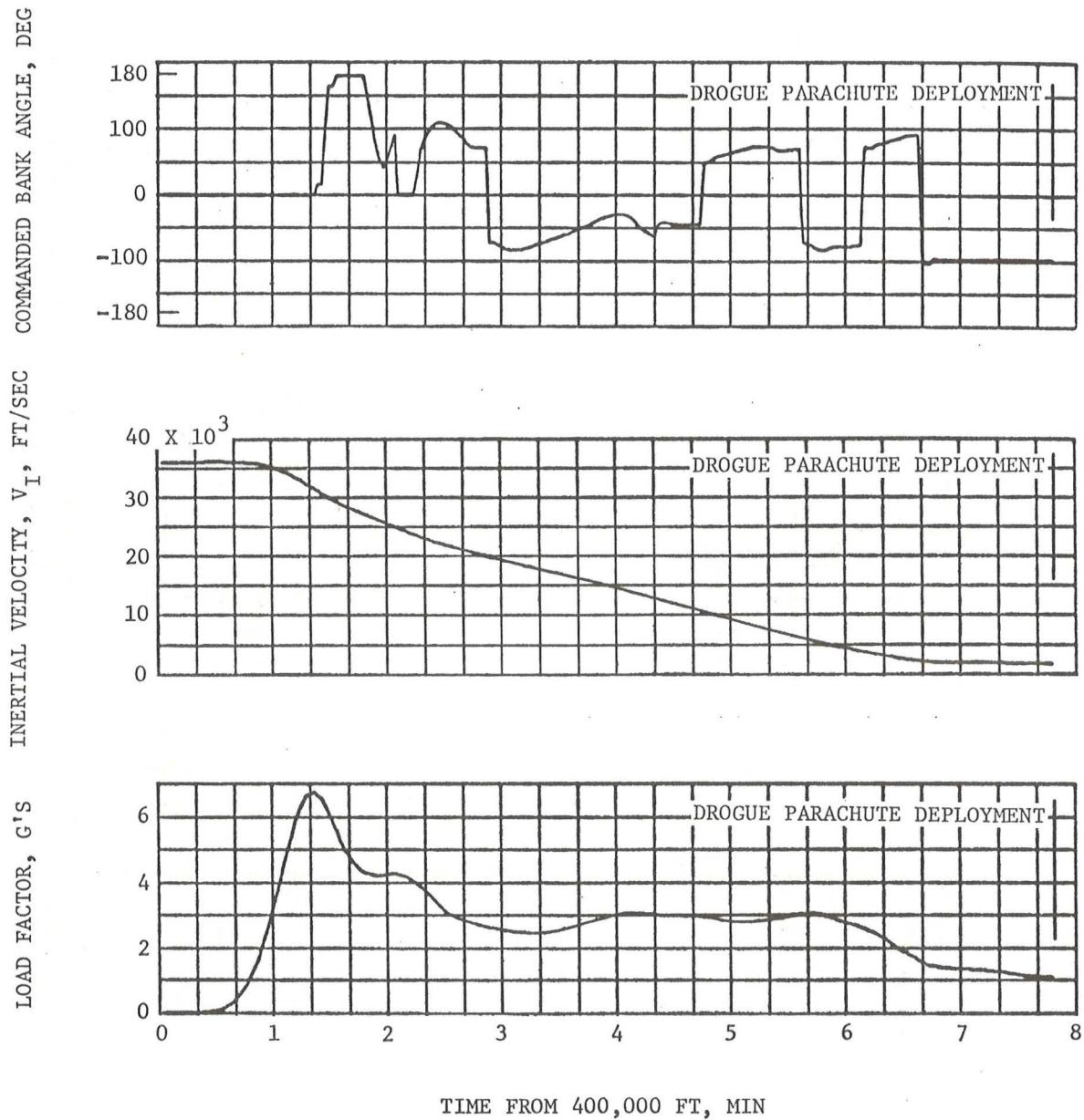


Figure 4.17-9.- Primary DSKY displays VERB 06 NOUN 74.

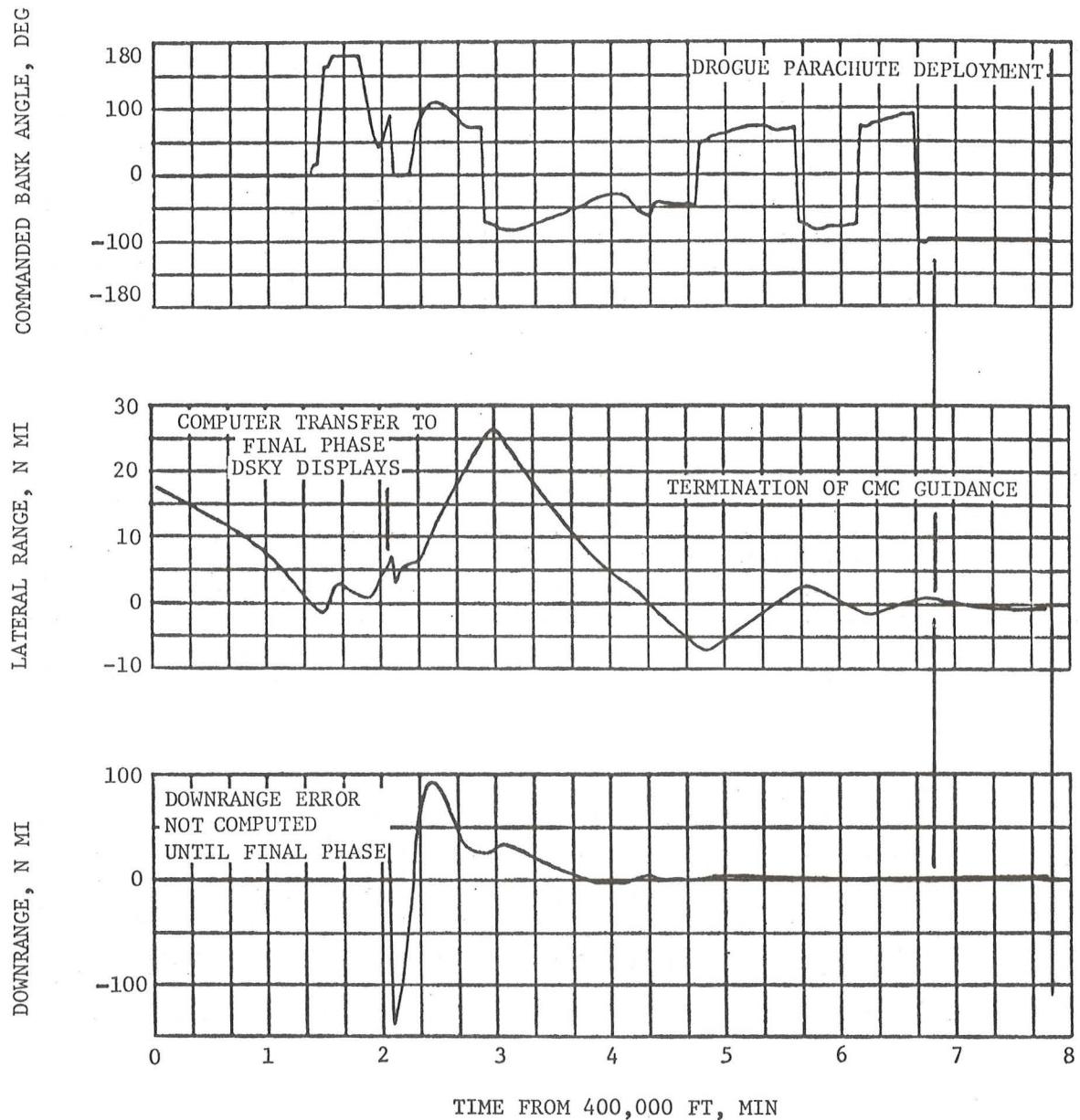


Figure 4.17-10.- DSKY displays (final phase) VERB 06 NOUN 66.

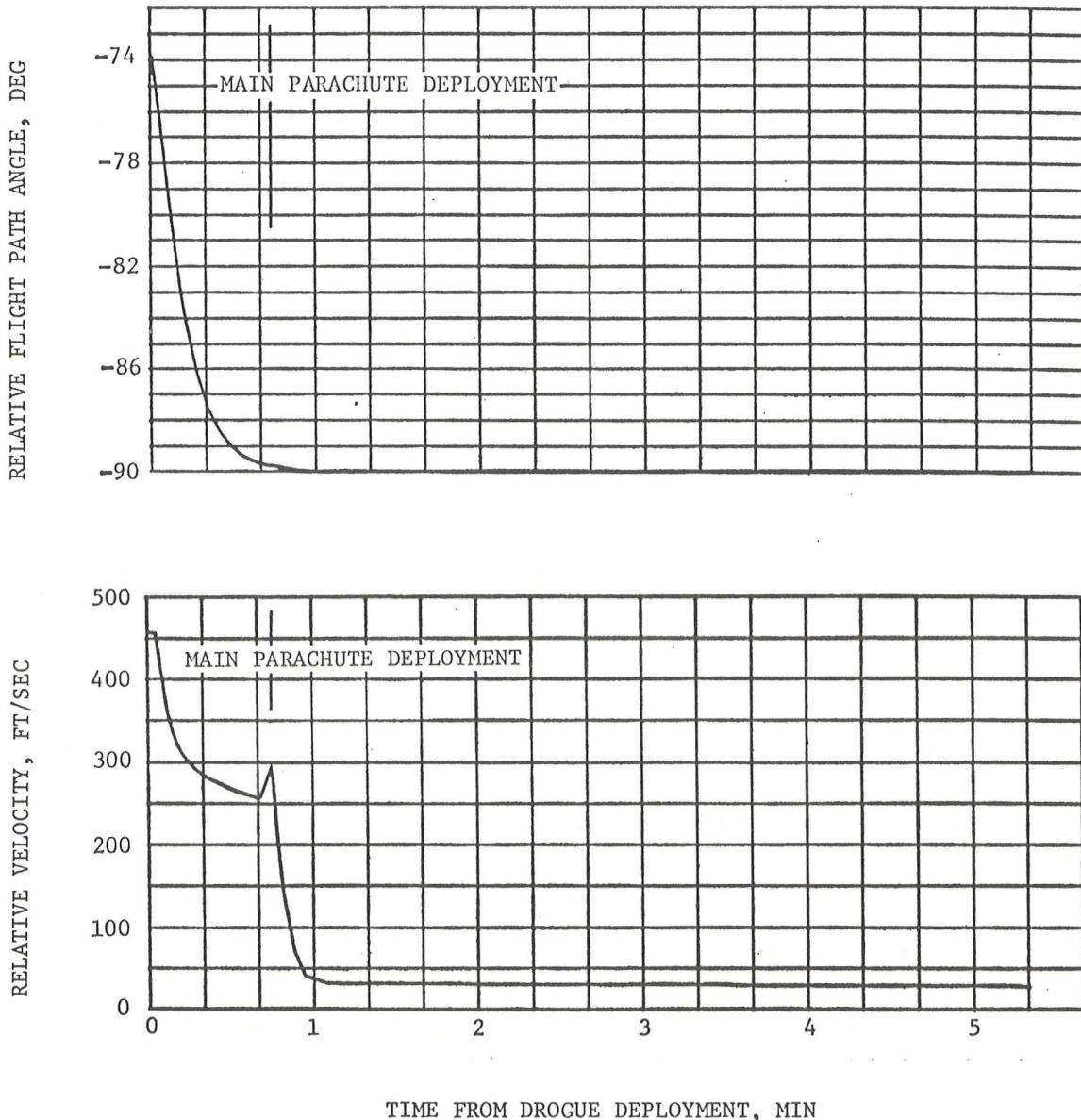


Figure 4.17-11.- Time history of relative velocity and relative flight-path angle from drogue parachute deployment.

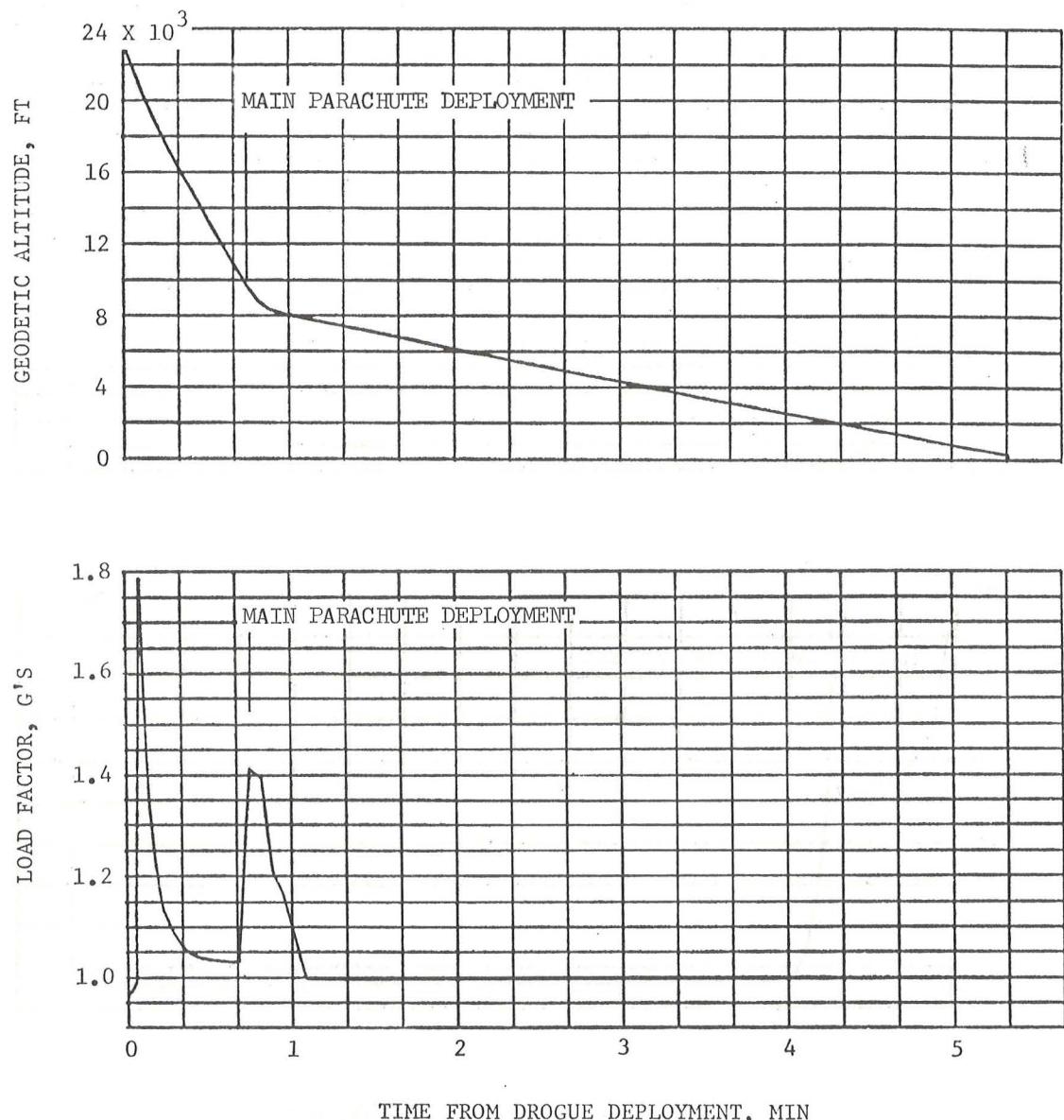
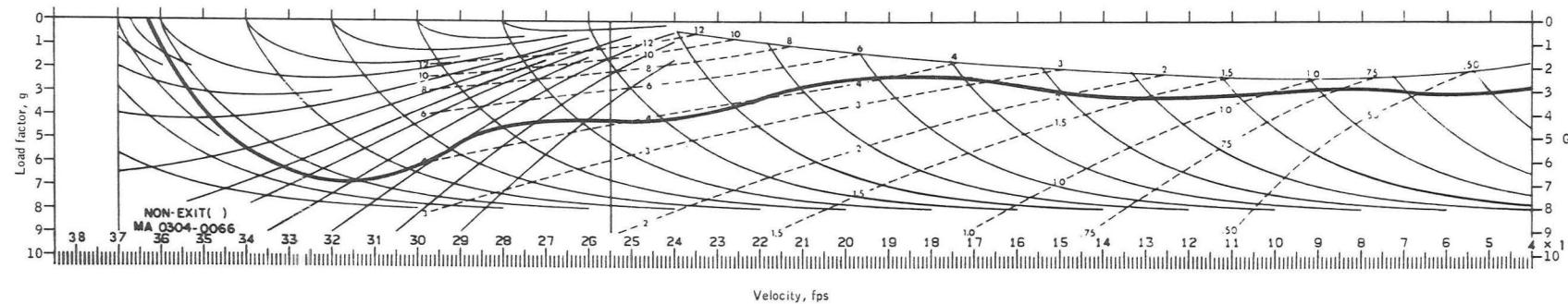
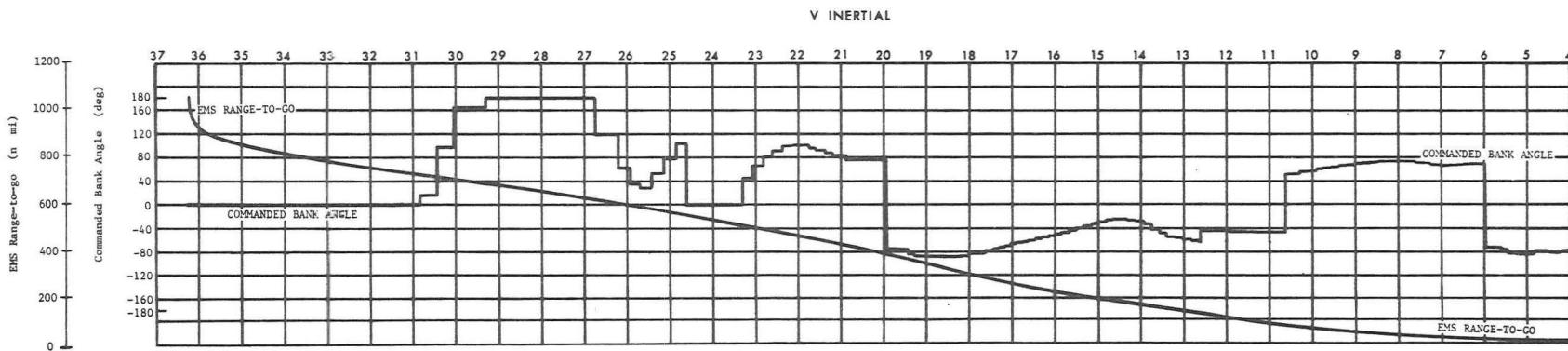


Figure 4.17-12.- Time history of geodetic altitude and load factor from drogue parachute deployment.

EMS LUNAR NON-EXIT RANGE LIMIT PATTERN (5/12/69)



(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 16 (J-2) mission operational trajectory.

Lunar landing site position	Table 5-I
Spacecraft weight summary	Table 5-II
Engine performance summary	Table 5-III
Command module mass properties	Table 5-IV
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LM ascent REFSMMAT, target loads, and gimbal angles	Table 5-XII
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Preferred TEI REFSMMAT, target loads, and gimbal angles	Table 5-XIV
Entry REFSMMAT	Table 5-XV

TABLE 5-I.- LUNAR LANDING SITE POSITION

Launch date	April 16, 1972
Lunar site name	Descartes
Latitude, deg	-9.00028
Longitude, deg	15.51639
Altitude, ^a n. mi.	-0.1405

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

TABLE 5-II.- SPACECRAFT WEIGHT SUMMARY

(a) CSM and LM

Total CSM inert, lb	26	310.0
CM, lb	12	752.9
SM, lb	13	459.2
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	222.5
LM descent stage, lb	6	159.7
LM DPS tanked, lb	19	482.1
LM ascent stage + RCS propellant, lb	5	352.9
LM APS tanked, lb	5	227.8
Spacecraft at earth launch (including SLA and LES), lb	116	218.3
Spacecraft before T&D, lb	107	079.3

TABLE 5-II.- SPACECRAFT WEIGHT SUMMARY - Concluded

(b) LM ascent weight summary

	lb
Weight of LM crew, inert weights, consumables and APS propellant trapped outside tanks	5 664.4
LM APS fuel tanked	2 011.4
LM APS oxidizer tanked	3 216.4
Tanked APS propellant	5 227.8
Total weight of ascent stage at touchdown	10 928.1
Net off-loaded weight on lunar surface	-35.9
Total ascent stage lift-off weight	10 892.2

TABLE 5-III.- ENGINE PERFORMANCE SUMMARY

(a) Service module propulsion performance summary

Burn	Propulsion system	I_{sp} , sec	Thrust, lb	Flow rate, lb/sec
LOI	SPS ^a	314.9	20 800	66.0
	SPS ^b	314.9	20 993	66.7
DOI	SPS ^c	314.8	20 469	65.0
Initial sep	RCS ^d	269.13	355.25	1.32
CIRC	SPS ^c	314.8	20 570	65.3
LOPC-1	SPS	314.8	20 920	66.4
Final sep	RCS ^e	263.58	181.87	0.69
LOPC-1	SPS	314.9	21 037	66.8
Shaping burn	SPS ^c	314.7	20 342	64.6
TEI	SPS	314.9	21 050	66.8

^aBefore crossover (260-sec burn time).^bAfter crossover (260-sec burn time).^cSingle bore.^dFour-quad.^eTwo-quad.

TABLE 5-III.- ENGINE PERFORMANCE SUMMARY - Concluded

(b) Lunar module performance tabular inputs

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
1373	298.4	79.5	281.0	0	3582.2	309.0
3053	298.4			40	3571.6	309.3
3959	299.6			80	3560.0	309.4
4967	302.0			120	3548.0	309.5
5995	305.9			160	3536.1	309.5
9932	307.5			200	3524.3	309.5
9986	304.9			240	3513.0	309.5
				280	3501.8	309.4
				320	3495.8	309.3
				360	3508.1	309.1
				400	3525.0	308.8
				434.3	3541.7	308.6

TABLE 5-IV.- COMMAND MODULE MASS PROPERTIES
 (FOR NOMINAL END-OF-MISSION ENTRY)

CM weight, lb

Entry	12	884.7
Main chute deploy	12	312.0
Landing	11	848.1

Centers of gravity in Apollo coordinate system, in.

X_A	1039.09
Y_A	0.10
Z_A	5.68

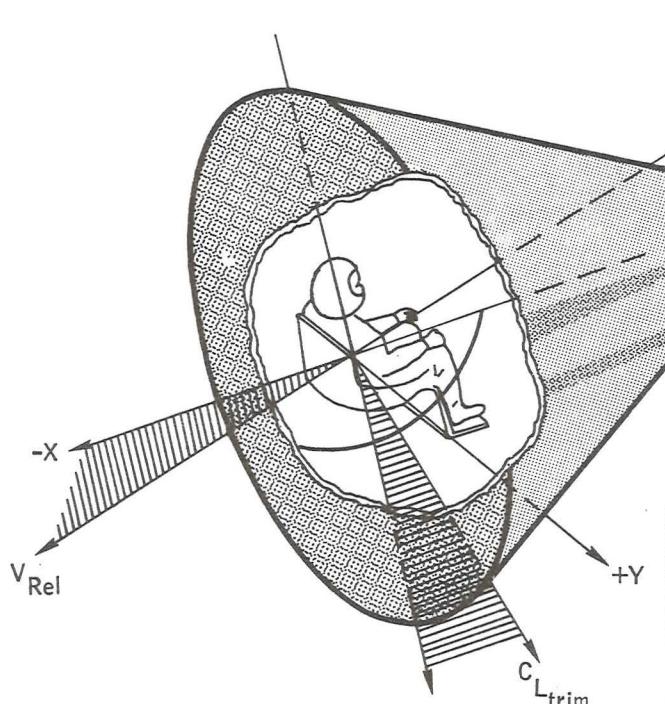
Moments of inertia, slug-ft²

I_{XX}	5876.0
I_{YY}	5256.0
I_{ZZ}	4708.0

Products of inertia, slug-ft²

I_{XY}	58.0
I_{XZ}	-398.0
I_{YZ}	-17.0

TABLE 5-V.- COMMAND MODULE AERODYNAMIC COEFFICIENTS



Center of gravity location in body coordinates

$$X_{cg} = 1039.09 \text{ in.}$$

$$Y_{cg} = 0.10 \text{ in.}$$

$$Z_{cg} = 5.68 \text{ in.}$$

AERODYNAMIC COEFFICIENTS AT TRIM ANGLE OF ATTACK
AS A FUNCTION OF MACH NUMBER

MACH	α , deg	C_L	C_D	L/D
0.400	167.690	0.232900	0.854983	0.272404
0.700	165.423	0.251652	0.991140	0.253902
0.900	162.864	0.304048	1.074016	0.283095
1.100	156.590	0.466459	1.189520	0.392140
1.200	156.676	0.454490	1.174992	0.386803
1.350	155.483	0.535136	1.295774	0.412986
1.650	154.750	0.529437	1.284606	0.412140
2.000	154.894	0.515373	1.303918	0.395250
2.400	155.517	0.487974	1.275245	0.382651
3.000	155.979	0.459714	1.254206	0.366538
4.000	157.670	0.423382	1.242853	0.340654
10.000	158.250	0.411300	1.253874	0.328023
29.500	161.492	0.367901	1.316282	0.279500

TABLE 5-VI.- J-2 MISSION REFSMMAT SUMMARY

(April 16 launch)

Applicable maneuvers	REFSMMAT	Alinement criteria (IMU axis)	Remarks
Launch TLI T&D	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 Passive thermal control MCC-3 MCC-4 SIM bay door jettison	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 completes the right-hand system	At the beginning of the barbecue 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-VI.- J-2 MISSION REFSMMAT SUMMARY - Continued

Applicable maneuvers	REFSMMAT	Alinement criteria (IMU axis)	Remarks
DOI Separation Circularization Powered descent	Landing Site (CSM & 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 IM FDAI will display: Roll = 0 Pitch = 0 Yaw = 0
First CSM plane change	Preferred (CSM only) (heads down)	Same as above preferred alinement definition.	At burn ignition, the FDAI will display: Roll = 0 Pitch = 0 Yaw = 0
IM ascent Rendezvous CSM sep after LM jettison LM deorbit Shaping burn Subsatellite jettison	Ascent (CSM & LM)	X-axis along positive lunar radius vector at landing site at predicted lift-off time. Z-axis down range parallel to the CSM orbital plane and perpendicular to X. Y-axis completes the right-hand system.	At nominal lift-off time, the IM FDAI will display: Roll = 359 Pitch = 359 Yaw = 005
Second CSM plane change	Preferred (heads down)	Same as above preferred alinement definition.	At burn ignition, the FDAI will display: Roll = 0 Pitch = 0 Yaw = 0
TEI	Preferred (heads down)	Same as above preferred alinement definition. REFSMMAT defined at TEI ignition.	In a heads-down orientation at burn ignition, the FDAI will display: Roll = 180 Pitch = 0 Yaw = 0

TABLE 5-VI.- J-2 MISSION REFSMMAT SUMMARY - Concluded

Applicable maneuvers	REFSMMAT	Alinement criteria (IMU axis)	Remarks
MCC-5 MCC-6	PTC	Same as above PTC alinement.	Same as above PTC remarks.
MCC-7 Entry	Entry	X-axis is in local horizontal plane in the direction of flight at entry interface (400 000 ft). Z-axis is down along negative radius at entry interface. Y-axis completes the 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-VII.- LAUNCH PAD REFSMMAT

(a) Applicable maneuvers

1. Launch
2. TLI
3. T&D

(b) Definition of REFSMMAT

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

(c) REFSMMAT components

XIMUX = -.64021342 XIMUY = .71888603 XIMUZ = .27079442

YIMUX = .21522065 YIMUY = .50624020 YIMUZ = -.83510533

ZIMUX = -.73743259 ZIMUY = -.47636510 ZIMUZ = -.47882090

TABLE 5-VIII.- 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

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

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(c) REFSMMAT components

$X_{IX} = -0.34202014$	$X_{IY} = -0.86212824$	$X_{IZ} = -0.37384102$
$Y_{IX} = -0.93969262$	$Y_{IY} = 0.31378901$	$Y_{IZ} = 0.13606700$
$Z_{IX} = 0.0$	$Z_{IY} = 0.39783331$	$Z_{IZ} = -0.91745771$

TABLE 5-IX.- PREFERRED (LOI) REFSSMAT, TARGET LOAD, AND GIMBAL ANGLES

(a) Applicable maneuver

1. LOI

(b) Definition of REFSMMAT

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

(c) REF\$MMAT components

XIMUX = -.99273112 XIMUY = -.10086262 XIMUZ = -.065663399

YIMUX = -.0018531615 **YIMUY** = -.53271311 **YIMUZ** = .84629387

ZIMUX = -.12033917 ZIMUY = .84026394 ZIMUZ = .52865396

(d) Target load for LOI maneuver

[Propulsion system: SPS; guidance: external ΔV]

T_{IG} , hr:min:sec, g.e.t.	74:28:38.6
ΔV_X , fps .	-2788.0
ΔV_Y , fps .	-218.9
ΔV_Z , fps .	-241.6
Mass, lb .	102 642.7

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

(e) Gimbal angles at t_{IG}

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

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

(a) Applicable maneuvers

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

(b) Definition of REFSMMAT

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

(c) REFSMMAT components

$$X_{IX} = 0.67000809 \quad X_{IY} = -0.59984984 \quad X_{IZ} = -0.43734347$$

$$Y_{IX} = 0.12951155 \quad Y_{IY} = -0.48564437 \quad Y_{IZ} = 0.86450928$$

$$Z_{IX} = -0.73096916 \quad Z_{IY} = -0.63586926 \quad Z_{IZ} = -0.24769819$$

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

(d) Target load for DOI maneuver

[Propulsion system: SPS; guidance: external ΔV]

(e) Gimbal angles at t_{TG}

IGA, deg	282.1
MGA, deg	359.3
OGA, deg	0.1

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

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

[Propulsion system: SM RCS]

t_{IG} , hr:min:sec, g.e.t.	96:13:30.8
ΔV_X , fps .	0.0
ΔV_Y , fps .	0.0
ΔV_Z , fps .	1.0
CSM weight, lb .	39 332.6

(g) CSM gimbal angles at t_{TG}

IGA, deg	104.3
MGA, deg	0.0
OGA, deg	0.0

(h) Target load for CSM circularization manuever

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

t_{IG} , hr:min:sec, g.e.t.	97:41:44.5
ΔV_X , fps .	69.7
ΔV_Y , fps .	0.0
ΔV_Z , fps .	-71.2
CSM weight at t_{IG} , lb .	39 318.1

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

(i) Gimbal angles at t_{IG}

IGA, deg	141.1
MGA, deg	357.9
OGA, deg	0.0

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

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

 t_{IG} , hr:min:sec, g.e.t. 98:34:40.9

Ignition algorithm targets

RIGXG, ft	-158 064.02
RIGZG, ft	-1 542 272.5
VIGG, fps	5 542.5743

Ignition algorithm correction factors

k_X	0.33 ⁴
k_Y , ft ⁻¹	2.207 ⁻⁷
k_V , ft/fps	498.0

(k) Gimbal angles at t_{IG}

IGA, deg	110.9
MGA, deg	0.0
OGA, deg	20.0

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

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

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

Position, ft

Velocity, fps

V _X	.....	-196.46916
V _Y	.....	0.0
V _Z	.....	-166.75997

Acceleration, ft/sec²

A _X	.....	-0.71824813
A _Y	.....	0.0
A _Z	.....	-8.3024504

Jerk, ft/sec³

$a_{TENDBRAK} = 62$ sec (time-to-go at program switch).

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

(m) 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).

TABLE 5-X.- LANDING SITE REFSMMAT, TARGET LOAD,

AND GIMBAL ANGLES - Concluded

(n) Target load for vertical descent (P66)

Velocity, fps

TABLE 5-XI.- PREFERRED (LOPC-1) REFSMMAT,
TARGET LOAD, AND GIMBAL ANGLES

(a) Applicable maneuver

1. LOPC-1

(b) Definition of REFSMMAT

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

(c) REFSMMAT components

$$XIMUX = .19271396 \quad XIMUY = -.46004412 \quad XIMUZ = .86672992$$

$$YIMUX = -.96383853 \quad YIMUY = .076933106 \quad YIMUZ = .25514033$$

$$ZIMUX = -.18405603 \quad ZIMUY = -.88455679 \quad ZIMUZ = -.42858217$$

(d) Target load for lunar orbit plane change maneuver

[Propulsion system: SPS; guidance: external ΔV]

t_{IG} , hr:min:sec, g.e.t.	152:28:48.1
ΔV_X , fps	-2.6
ΔV_Y , fps	158.6
ΔV_Z , fps	0.0
Mass _{IG} , lb	38 752.8

TABLE 5-XI.- PREFERRED (LOPC-1) REFSMMAT, TARGET

LOAD, AND GIMBAL ANGLES - Concluded

(e) Gimbal angles at t_{IG}

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

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

(a) Applicable maneuvers

1. LM ascent
2. Rendezvous
3. CSM separation following LM jettison
4. LM deorbit
5. Shaping burn
6. Subsatellite jettison

(b) Definition of REFSMMAT

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

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(c) REFSMMAT components

XIMUX = .97651225	XIMUY = -.040487846	XIMUZ = -.21162371
-------------------	---------------------	--------------------

YIMUX = .16677693	YIMUY = -.47981822	YIMUZ = .86137097
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ZIMUX = -.13641596	ZIMUY = -.87643324	ZIMUZ = -.46179592
--------------------	--------------------	--------------------

TABLE 5-XII.- 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.	171:45:08.6
R_D (desired injection radius), ft	5 761 537.9
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 . .	5 530.6
Weight at t_{IG} , lb .	10 892.2

(e) Gimbal angles at t_{TG}

IGA, deg	359.3
MGA, deg	359.4
OGA, deg	354.5

TABLE 5-XII.- 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.	172:39:12.9
ΔV_X , fps	71.5
ΔV_Y , fps	0.2
ΔV_Z , fps	9.4
Weight at t_{IG} , lb	5923.9

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

IGA, deg	103.4
MGA, deg	0.0
OGA, deg	0.0

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

[Propulsion system: CSM RCS]

t_{IG} , hr:min:sec, g.e.t.	177:36:15.0
ΔV_X , fps	2.0
ΔV_Y , fps	0.0
ΔV_Z , fps	0.0
Weight, lb	38 523.9

^aAll targets include ΔV's from ullage.

b_t is ullage on time.

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

(i) Gimbal angles at t_{IG}

IGA, deg	34.6
MGA, deg	20.3
OGA, deg	350.0

(j) Target load for LM deorbit

[Propulsion system: LM RCS]

t_{IG} , hr:min:sec, g.e.t.	179:16:29.2
ΔV_X , fps	-134.5
ΔV_Y , fps	-80.0
ΔV_Z , fps	168.0
Weight, lb	5253.9

(k) Gimbal angles at t_{IG}

IGA, deg	214.4
MGA, deg	339.7
OGA, deg	310.0

(l) Target load for shaping burn

[Propulsion system: SPS; guidance: external ΔV]

t_{IG} , hr:min:sec, g.e.t.	216:49:11.7
ΔV_X , fps	25.1
ΔV_Y , fps	0.0
ΔV_Z , fps	-28.5
Weight, lb	37 305.3

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

(m) Gimbal angles at t_{IG}

IGA, deg	58.1
MGA, deg	357.3
OGA, deg	3.0

TABLE 5-XIII.- PREFERRED (LOPC-2) REFSMMAT,

TARGET LOAD, AND GIMBAL ANGLES

(a) Applicable maneuver

1. LOPC-2

(b) Definition of REFSMMAT

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

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(c) REFSMMAT components

XIMUX = -.17472490 XIMUY = .45229768 XIMUZ = -.87458448

YIMUX = -.79685180 YIMUY = .45679535 YIMUZ = .39543043

ZIMUX = .57835838 ZIMUY = .76600575 ZIMUZ = .28060070

(d) Target load for lunar orbit plane change maneuver

[Propulsion system: SPS; guidance: external ΔV]

t_{IG} , hr:min:sec, g.e.t.	193:13:46.2
ΔV_X , fps	-7.4
ΔV_Y , fps	-282.4
ΔV_Z , fps	0.0
Mass _{IG} , lb	38 433.2

TABLE 5-XIII.- PREFERRED (LOPC-2) REFSMMAT,
TARGET LOAD, AND GIMBAL ANGLES - Concluded

(e) Gimbal angles at t_{IG}

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

TABLE 5-XIV.- PREFERRED (TEI) REFSMMAT, TARGET

LOAD, AND GIMBAL ANGLES

(a) Applicable maneuver

1. TEI

(b) Definition of REFSMMAT

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

(c) REFSMMAT components

XIMUX = .06333484 XIMUY = .75647791 XIMUZ = .65094537

YIMUX = .21795169 **YIMUY** = -.64699487 **YIMUZ** = .73068099

ZIMUX = .97390234 ZIMUY = .09559708 ZIMUZ = -.20585295

(d) Target load for TEI maneuver

[Propulsion system: SPS; guidance: external ΔV]

TABLE 5-XIV.- PREFERRED (TEI) REFSMMAT, TARGET
LOAD, AND GIMBAL ANGLES - Concluded

(e) Gimbal angles at t_{IG}

IGA, deg	0.0
MGA, deg	0.0
OGA, deg	180.0

TABLE 5-XV.- ENTRY REFSMMAT

(a) Applicable maneuvers

1. MCC-7

2. Entry

(b) Definition of REFSMMAT

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

PLATFORM
STABLE
MEMBERS

(c) REFSMMAT components

XIX = .24623360 XIY = .46136661 XIZ = .85235547

YIX = -.01381990 YIY = .88101469 YIZ = -.47288702

ZIX = -.96911197 ZIY = .10466121 ZIZ = .22331146

6.0 RADAR AND SHADOW DATA

TABLE 6-I.- MISSION RADAR TIMELINE

(a) STDN 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 = 355.831251
 ALTR = 2552.489, SRANGE = 850000.0, FTINDC = 2.0
 RADAR =HSK-25 X-Y USB-85, LATR = -35.583494, LONR = 148.977527
 ALTR = 3756.555, SRANGE = 850000.0, FTINDC = 2.0
 RADAR =GDS-28 X-Y USB-85, LATR = 35.341594, LONR = 243.126104
 ALTR = 2975.716, SRANGE = 850000.0, FTINDC = 2.0
 RADAR =PKS-96 H-D USB210, LATR = -32.998769, LONR = 148.263517
 ALTR = 1322.176, SRANGE = 2100000.0, FTINDC = 0.0
 RADAR =MAR-95 H-D USB210, LATR = 35.425958, LONR = 243.110517
 ALTR = 3169.286, SRANGE = 2100000.0, FTINDC = 0.0
 RADAR =STN-00 A-E USB150, LATR = 37.409722, LONR = 237.822083
 ALTR = 525.000, SRANGE = 1500000.0, FTINDC = 0.0
 RADAR =MIL-71 X-Y USB-30, LATR = 28.508272, LONR = 279.306367
 ALTR = -137.795, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =BDA-02 X-Y USB-30, LATR = 32.351250, LONR = 295.341845
 ALTR = -111.548, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =CYI-04 X-Y USB-30, LATR = 27.764536, LONR = 344.465851
 ALTR = 567.584, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =ACN-75 X-Y USB-30, LATR = -7.954794, LONR = 345.672387
 ALTR = 1712.595, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =CRO-08 X-Y USB-30, LATR = -24.906577, LONR = 113.725496
 ALTR = -49.213, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =GWM-24 X-Y USB-30, LATR = 13.310575, LONR = 144.736038
 ALTR = 469.159, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =HAW-12 X-Y USB-30, LATR = 22.126307, LONR = 200.334503
 ALTR = 3723.747, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =TEX-16 X-Y USB-30, LATR = 27.653750, LONR = 262.620834
 ALTR = -65.617, SRANGE = 300000.0, FTINDC = 1.0
 RADAR =SHIP 1 INSERTION, LATR = 27.000000, LONR = 311.000000
 ALTR = 0.000, SRANGE = 23400.0, FTINDC = 0.0

TABLE 6-I.- MISSION RADAR TIMELINE - Continued

(b) Definitions of radar table headings

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	Parkes deep space
TEX-16	Texas S-band
MAR-95	Goldstone deep space (210 ft)
STN-00	Stanford, California, S-band

TABLE 6-I.- MISSION RADAR TIMELINE - Continued

(c) CSM acquisition and termination - 0° minimum elevation

16 APR 72 EOI TO TLI LAZ 72.1

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	RANGE
BDA-02	0 0 40	0	0	11	57	142	6	85	3	87	5	650				0	0	12	37	145	5	84	0	90	6	805
SHIP 1	0 3 47	0	0	11	57	-53	61	-25	10	-66	63	395				0	0	15	44	170	21	66	0	90	24	806
CYI-04	0 6 44	0	0	16	46	4	15	-73	0	-90	17	805				0	0	23	30	-177	-20	113	0	90	-23	798
CRO-08	0 5 23	0	0	52	21	135	-30	-123	0	-90	-33	790				0	0	57	44	-10	-34	128	0	90	-38	790
HSK-25	0 5 36	0	0	59	37	-164	11	-76	0	-90	-76	788				0	1	5	13	-26	38	40	0	-90	40	784
GDS-28	0 4 4	0	1	28	59	-2	-53	-167	0	90	-13	795				0	1	33	3	93	-22	118	0	90	62	801
TEX-16	0 6 40	0	1	31	3	-49	-4	-95	0	-90	-5	801				0	1	37	43	142	21	66	0	90	24	807
MIL-71	0 6 30	0	1	34	55	-39	11	-78	0	-90	12	805				0	1	41	25	159	19	69	0	90	21	807
BDA-02	0 6 47	0	1	38	20	-19	4	-85	0	-90	5	807				0	1	45	7	162	-4	95	0	90	-5	805
SHIP 1	0 6 35	0	1	42	7	-13	24	-63	0	-90	27	806				0	1	48	42	-179	-1	91	0	90	-1	800
CYI-04	0 4 48	0	1	49	58	42	-12	-104	0	-90	-14	800				0	1	54	46	158	-58	164	0	90	-74	791
CRO-08	0 5 50	0	2	25	2	155	-35	-129	0	-90	-39	790				0	2	30	53	2	-16	107	0	90	-17	788
		16 APR 72 TLI TO LOI LAZ 72.1																								
HAW-12	13 41 3	0	2	43	24	-74	-42	-136	0	-90	-46	1925				0	16	24	27	99	26	-62	0	-90	28	79048
STN-00	11 41 4	0	2	49	13	-40	-20	-115	0	-90	-25	3225				0	14	30	18	98	26	-57	0	-90	33	71819
GDS-28	11 10 54	0	2	49	53	-40	-15	-109	0	90	-71	3371				0	14	0	46	97	26	-58	0	-90	-58	69869
MAR-95	10 33 46	0	2	51	8	-34	-12	-110	6	-84	-19	3306				0	13	24	54	96	26	-62	6	-83	28	67092
TEX-16	9 19 51	0	2	53	29	-31	1	-89	0	-90	1	4164				0	12	13	21	95	27	-60	0	-90	30	62451
MIL-71	8 4 20	0	2	58	4	-17	8	-81	0	-90	9	5137				0	11	2	24	93	27	-59	0	-90	31	57231
BDA-02	6 59 7	0	3	3	33	-3	12	-76	0	-90	14	6258				0	10	2	39	91	27	-58	0	-90	32	52601
SHIP 1	1 57 26	0	3	12	58	12	20	-68	0	-90	22	8073				0	5	10	24	69	30	-68	27	-61	19	23398
CYI-04	0 55 32	0	4	15	6	56	27	-59	0	-90	31	17880				0	5	10	38	69	28	-58	0	-90	32	24947
MAD-23	0 3 41	0	4	38	47	65	26	-55	0	-90	-55	21030				0	4	42	29	66	26	-55	0	-90	-55	21500

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	13	36	41	0	6	19	44	91	30	59	0	90	31	32572	0	19	56	24	102	26	-63	0	-90	27	91375
HSK-25	8	57	51	0	8	40	5	95	33	48	0	-90	48	45758	0	17	37	55	100	28	-54	0	-90	-54	83460
CRO-08	10	11	45	0	10	29	10	99	31	56	0	90	34	54676	0	20	40	55	102	27	-60	0	-90	30	93805
MAD-23	15	16	39	0	15	57	41	103	25	56	0	-90	56	77396	1	7	14	20	107	24	-58	0	-90	-58	124234
CYI-04	13	59	41	0	17	25	9	105	26	61	0	90	29	82713	1	7	24	50	107	24	-62	0	-90	28	124681
ACN-75	11	28	34	0	18	39	16	106	27	63	0	90	27	87031	1	6	7	50	106	25	-64	0	-90	26	121344
BDA-02	14	18	37	0	20	36	40	106	25	60	0	90	30	93583	1	10	55	17	108	24	-61	0	-90	29	133389
MIL-71	13	57	17	0	21	53	21	107	25	61	0	90	29	97678	1	11	50	39	108	24	-63	0	-90	27	135589
TEX-16	13	51	48	0	23	4	16	107	25	62	0	90	28	101350	1	12	56	4	108	24	-63	0	-90	27	138143
GDS-28	14	30	48	1	0	3	26	107	25	59	0	-90	59	104335	1	14	34	14	109	23	-61	0	-90	-61	141889
STN-00	14	42	40	1	0	18	47	107	25	58	0	90	32	105099	1	15	1	28	109	23	-60	0	-90	30	142909
MAR-95	13	23	39	1	0	37	33	108	25	64	6	83	26	105666	1	14	1	12	109	24	-65	6	-83	25	140280
HAW-12	13	23	4	1	3	32	31	109	25	63	0	90	27	114363	1	16	55	35	109	24	-64	0	-90	26	147104
GWM-24	12	45	29	1	7	37	15	110	25	65	0	90	25	125209	1	20	22	43	110	24	-66	0	-90	24	154399
HSK-25	9	18	49	1	9	5	44	110	26	58	0	-90	58	128917	1	18	24	33	110	25	-59	0	-90	-59	150278
CRO-08	10	16	37	1	10	58	45	111	25	62	0	90	28	133521	1	21	15	22	110	24	-63	0	-90	27	156186
PKS-96	1	48	51	1	12	53	18	110	26	14	30	23	57	136316	1	14	42	8	110	25	-15	30	-24	57	140463
MAD-23	14	47	23	1	16	36	17	111	23	59	0	-90	59	146406	2	7	23	41	112	22	-60	0	-90	-60	175334
CYI-04	13	40	15	1	17	56	33	112	23	63	0	90	27	149293	2	7	36	48	112	23	-64	0	-90	26	175716
ACN-75	11	26	20	1	18	59	57	112	24	66	0	90	24	151528	2	6	26	17	111	23	-66	0	-90	24	173634
BDA-02	14	0	42	1	21	4	12	112	23	62	0	90	28	155816	2	11	4	54	112	22	-63	0	-90	27	181737
MIL-71	13	42	24	1	22	18	10	113	23	63	0	90	27	158302	2	12	0	35	112	22	-64	0	-90	26	183314

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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	13	37	52	1	23	27	35	113	23	64	0	90	26	160593	2	13	5	27	112	22	-65	0	-90	25	185063
GDS-28	14	13	46	2	0	27	31	113	23	62	0	-90	62	162541	2	14	41	18	113	22	-62	0	-90	-62	187623
STN-00	14	24	53	2	0	43	7	113	23	61	0	90	29	163045	2	15	7	59	113	22	-62	0	-90	28	188358
MAR-95	13	8	29	2	1	0	27	113	23	66	6	83	24	163239	2	14	8	56	113	22	-67	6	-83	23	186404
HAW-12	13	13	27	2	3	50	28	113	23	65	0	90	25	168932	2	17	3	55	113	22	-66	0	-90	24	191455
GWM-24	12	39	29	2	7	51	2	114	23	66	0	90	24	176130	2	20	30	31	113	22	-67	0	-90	23	196838
HSK-25	9	29	11	2	9	10	8	114	24	60	0	-90	60	178409	2	18	39	20	113	23	-61	0	-90	-61	193909
CRO-08	10	20	52	2	11	5	30	114	24	64	0	90	26	181741	2	21	26	22	113	23	-64	0	-90	26	198225
PKS-96	2	42	7	2	12	36	52	114	24	22	30	32	54	182548	2	15	18	59	113	24	-22	30	-33	53	186952
MAD-23	9	27	53	2	16	49	55	115	22	60	0	-90	60	191083	3	2	17	48	113	22	-112	56	14	-31	203079
CYI-04	8	10	34	2	18	7	13	115	22	65	0	90	25	193095	3	2	17	47	113	22	-100	69	-20	-3	202728
ACN-75	7	11	38	2	19	6	10	115	23	67	0	90	23	194628	3	2	17	47	113	23	-36	51	-25	30	203244
BDA-02	5	4	10	2	21	13	26	115	22	64	0	90	26	197893	3	2	17	36	114	22	105	64	26	-7	202860
MIL-71	3	51	22	2	22	26	12	115	22	65	0	90	25	199787	3	2	17	34	114	22	89	50	40	1	203298
TEX-16	2	42	29	2	23	35	2	115	22	65	0	90	25	201606	3	2	17	31	114	22	81	35	55	7	203948
GDS-28	1	42	59	3	0	34	32	115	22	63	0	-90	63	203173	3	2	17	31	114	22	77	20	-32	66	204740
STN-00	1	27	18	3	0	50	14	115	22	62	0	90	28	203597	3	2	17	31	114	22	75	16	73	15	204947
MAR-95	1	10	58	3	1	6	32	115	22	67	6	84	23	203679	3	2	17	31	114	22	77	20	69	13	204740
	16 APR 72			LOI TO DOI				LAZ 72.1																	
GDS-28	1	24	40	3	2	50	11	114	22	81	27	-17	62	203992	3	4	14	51	115	22	92	43	2	47	203237
STN-00	1	24	38	3	2	50	12	114	22	79	23	67	10	204201	3	4	14	50	115	22	91	39	51	0	203433
MAR-95	1	24	37	3	2	50	12	114	22	81	27	63	8	203990	3	4	14	50	115	22	92	43	47	-2	203237
TEX-16	1	24	41	3	2	50	14	114	22	84	43	47	4	203222	3	4	14	55	115	22	93	60	30	-2	202607

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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											
	1	24	39	3	2	50	19	114	22	93	58	32	-1	202650	3	4	14	58	115	22	111	75	14	-5	202283											
MIL-71	1	24	40	3	2	50	23	114	22	116	70	18	-8	202314	3	4	15	3	115	22	-175	80	-1	-10	202223											
CYI-04	1	24	38	3	2	50	38	113	22	-94	62	-28	-2	202512	3	4	15	16	114	22	-85	44	-46	3	203224											
MAD-23	1	24	39	3	2	50	39	113	22	-104	50	12	-38	202897	3	4	15	17	114	22	-90	35	0	-55	203642											
ACN-75	1	24	36	3	2	50	43	113	23	-45	46	-34	30	203053	3	4	15	19	114	23	-58	30	-55	27	203855											
HAW-12	0	18	14	3	3	56	31	115	22	66	0	90	24	204611	3	4	14	45	116	22	68	4	86	22	205347											
HAW-12	1	24	46	3	4	58	33	116	22	71	13	76	18	205020	3	6	23	18	117	22	77	31	58	11	204086											
STN-00	1	24	48	3	4	58	39	115	22	98	48	42	-5	203285	3	6	23	27	116	22	118	63	25	-12	202830											
MAR-95	1	24	49	3	4	58	40	115	22	100	52	37	-6	203109	3	6	23	29	116	22	122	67	19	-12	202713											
GDS-28	1	24	49	3	4	58	41	115	22	100	52	7	37	203107	3	6	23	30	116	22	122	67	12	19	202713											
TEX-16	1	24	52	3	4	58	46	115	22	102	70	19	-4	202590	3	6	23	37	116	22	173	84	1	-6	202478											
MIL-71	1	24	52	3	4	58	50	115	22	150	83	4	-6	202414	3	6	23	42	116	22	-111	74	-15	-6	202605											
BDA-02	1	24	50	3	4	58	54	114	22	-130	75	-12	-10	202499	3	6	23	45	116	22	-102	59	-30	-6	202949											
MAD-23	1	24	46	3	4	59	4	114	22	-83	26	-14	-63	204276	3	6	23	50	115	21	-71	11	-58	-68	205224											
CYI-04	1	24	45	3	4	59	6	114	22	-81	34	-56	7	203878	3	6	23	51	115	22	-74	17	-73	15	204916											
ACN-75	1	24	43	3	4	59	9	114	22	-62	21	-67	26	204561	3	6	23	52	115	22	-67	3	-87	23	205707											
				16 APR 72			DOI TO SEP			LAZ 72.1																										
HAW-12	1	5	10	3	7	10	47	117	22	80	42	47	7	203535	3	8	15	57	118	22	84	56	34	3	203210											
GDS-28	1	5	12	3	7	10	57	116	22	149	74	13	8	202531	3	8	16	9	117	21	-154	75	14	-7	202763											
MAR-95	1	5	13	3	7	10	58	116	22	150	74	8	-13	202532	3	8	16	10	117	21	-155	75	-7	-14	202765											
STN-00	1	5	12	3	7	10	59	116	22	139	70	13	-15	202606	3	8	16	11	117	21	-175	74	-2	-16	202779											
TEX-16	1	5	13	3	7	11	7	116	22	-117	78	-11	-5	202473	3	8	16	19	117	22	-98	65	-25	-3	202975											
MIL-71	1	5	14	3	7	11	10	115	22	-98	63	-26	-4	202753	3	8	16	23	116	21	-90	50	-40	0	203455											

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	1	5	15	3	7	11	13	115	22	-94	49	-41	-2	203222	3	8	16	28	116	21	-86	36	-54	3	204059
MAD-23	0	16	49	3	7	11	19	115	21	-64	3	-84	-64	205641	3	7	28	8	115	21	-62	0	-90	-62	205003
CYI-04	0	33	26	3	7	11	22	115	21	-69	6	-83	21	205419	3	7	44	48	116	21	-66	0	-90	24	204758
GWM-24	0	11	26	3	8	4	20	118	21	68	0	90	22	205429	3	8	15	46	118	21	69	2	87	21	205894
GWM-24	1	5	19	3	9	4	40	118	21	71	14	75	19	205267	3	10	9	59	119	21	73	28	61	15	204703
HAW-12	1	5	21	3	9	4	51	117	22	87	68	22	1	202911	3	10	10	12	118	21	94	82	8	-1	202933
GDS-28	1	5	21	3	9	4	60	117	21	-124	68	13	-18	202899	3	10	10	21	118	21	-106	56	10	-32	203476
MAR-95	1	5	21	3	9	5	0	117	21	-124	68	-19	-12	202900	3	10	10	21	118	21	-106	56	-33	-9	203476
STN-00	1	5	18	3	9	5	1	117	21	-139	70	-14	-15	202858	3	10	10	19	118	21	-114	60	-28	-12	203369
TEX-16	1	5	21	3	9	5	5	116	21	-91	54	-36	-1	203301	3	10	10	25	117	21	-85	40	-50	4	204118
MIL-71	1	5	20	3	9	5	9	116	21	-85	39	-51	4	203905	3	10	10	28	117	21	-79	26	-64	10	204848
BDA-02	1	5	18	3	9	5	10	116	21	-80	26	-64	9	204574	3	10	10	28	117	21	-73	13	-76	16	205557
HSK-25	0	53	55	3	9	16	9	118	22	62	0	-90	62	205498	3	10	10	3	119	22	55	9	-75	54	205779
GWM-24	1	5	33	3	10	58	23	119	21	73	39	49	13	204171	3	12	3	56	120	21	72	54	35	10	203789
HSK-25	1	5	22	3	10	58	37	119	22	46	17	-67	44	205355	3	12	3	60	120	22	34	25	-61	30	205107
HAW-12	1	5	28	3	10	58	45	118	21	-102	86	-4	-1	202924	3	12	4	13	119	21	-90	72	-18	0	203311
STN-00	1	5	18	3	10	59	1	118	21	-102	50	-39	-8	203686	3	12	4	19	119	21	-92	38	-52	-1	204454
MAR-95	1	5	18	3	10	59	1	117	21	-96	46	-43	-4	203841	3	12	4	19	118	21	-87	34	-56	2	204662
GDS-28	1	5	16	3	10	59	4	117	21	-96	46	6	-43	203839	3	12	4	20	118	21	-87	34	-4	-56	204664
TEX-16	1	5	22	3	10	59	4	117	21	-80	29	-60	9	204639	3	12	4	26	118	21	-75	16	-73	15	205628
BDA-02	0	17	5	3	10	59	5	117	21	-67	3	-87	23	206126	3	11	16	10	117	21	-65	0	-90	25	205499
MIL-71	1	5	14	3	10	59	12	117	21	-74	15	-74	15	205421	3	12	4	25	118	21	-68	2	-88	22	206436

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	0	46	56	3	11	16	53	119	22	66	0	90	24	205464	3	12	3	49	120	22	61	9	80	29	206004
CRO-08	1	5	14	3	12	52	50	120	22	54	18	68	34	205480	3	13	58	4	121	21	44	29	51	39	205119
PKS-96	1	5	25	3	12	52	55	119	22	23	32	32	52	204760	3	13	58	21	120	22	6	35	9	54	204827
GWM-24	1	5	22	3	12	52	55	120	21	68	65	23	9	203463	3	13	58	17	120	21	48	78	9	8	203459
HSK-25	1	5	21	3	12	52	58	119	22	22	29	-59	19	204869	3	13	58	19	120	22	5	33	-57	4	204950
HAW-12	1	5	24	3	12	53	10	119	21	-86	60	-30	2	203585	3	13	58	33	120	21	-83	46	-44	5	204362
STN-00	1	5	22	3	12	53	11	118	21	-85	28	-62	5	204937	3	13	58	34	120	20	-76	16	-74	13	205881
MAR-95	1	5	20	3	12	53	14	118	21	-81	24	-66	8	205177	3	13	58	35	119	20	-73	11	-78	17	206152
TEX-16	0	28	16	3	12	53	14	118	21	-70	6	-84	20	206223	3	13	21	30	119	20	-67	0	-90	23	205493
GDS-28	1	5	18	3	12	53	16	118	21	-81	24	-20	-65	205177	3	13	58	35	119	20	-73	11	-55	-70	206154
CRO-08	1	5	23	3	14	46	40	121	21	33	36	37	43	204794	3	15	52	4	122	21	16	42	17	45	204734
GWM-24	1	5	24	3	14	46	48	120	21	-22	82	-3	8	203436	3	15	52	12	121	21	-65	71	-18	8	203828
HSK-25	1	5	26	3	14	46	49	120	22	-8	32	-57	-7	204970	3	15	52	15	121	21	-25	29	-59	-21	205377
PKS-96	1	5	24	3	14	46	50	120	22	-8	35	-11	54	204838	3	15	52	14	121	21	-25	32	-34	51	205243
STN-00	0	38	37	3	14	46	55	119	20	-70	7	-83	20	206414	3	15	25	32	120	20	-65	0	-90	25	205826
GDS-28	0	10	36	3	14	46	55	119	20	-66	2	-85	-66	206698	3	14	57	32	119	20	-65	0	-90	-65	206278
HAW-12	1	5	28	3	14	46	55	119	21	-80	35	-55	9	204858	3	15	52	23	120	20	-76	21	-69	13	205843
CRO-08	1	5	12	3	16	41	3	121	21	0	44	0	46	204670	3	17	46	15	122	21	-19	42	-20	45	205001
GWM-24	1	5	11	3	16	41	15	121	21	-72	59	-30	9	204107	3	17	46	25	122	20	-75	45	-44	11	204888
HSK-25	1	5	9	3	16	41	15	121	21	-36	24	-61	-33	205641	3	17	46	24	122	21	-49	16	-67	-47	206361
HAW-12	0	47	37	3	16	41	18	120	20	-72	10	-80	18	206462	3	17	28	55	121	20	-69	0	-90	21	206395
MAD-23	0	16	30	3	17	29	20	123	20	64	0	-90	64	206418	3	17	45	50	123	20	66	3	-83	66	207113

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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	1	5	20	3	18	34	41	123	20	74	12	-54	70	206630	3	19	40	1	124	19	83	23	-15	66	206202
CRO-08	1	5	22	3	18	35	2	122	21	-33	37	-36	42	205230	3	19	40	24	123	20	-47	28	-54	37	205922
GWM-24	1	5	20	3	18	35	9	121	20	-74	33	-56	13	205415	3	19	40	29	123	20	-73	19	-70	16	206445
HSK-25	0	47	50	3	18	35	10	122	21	-57	8	-76	-57	206820	3	19	22	60	122	20	-64	0	-90	-64	206630
CYI-04	0	56	48	3	18	43	9	123	20	68	0	90	22	206882	3	19	39	57	124	19	74	11	79	16	206878
ACN-75	0	2	4	3	19	37	54	124	20	70	0	90	20	207411	3	19	39	58	124	20	70	0	90	20	207496
CYI-04	1	5	28	3	20	28	19	124	19	79	21	68	11	206318	3	21	33	48	125	19	85	35	55	4	205799
ACN-75	1	5	27	3	20	28	20	124	20	67	12	77	22	206867	3	21	33	46	125	20	63	26	62	24	206263
MAD-23	1	5	28	3	20	28	22	124	19	91	32	2	58	205748	3	21	33	50	125	19	102	44	13	45	205397
GWM-24	0	33	53	3	20	29	12	122	20	-71	7	-82	18	207096	3	21	3	5	123	19	-70	0	-90	20	206474
CRO-08	1	5	10	3	20	29	13	123	20	-55	19	-67	33	206383	3	21	34	23	124	20	-64	8	-81	26	207318
BDA-02	1	5	10	3	22	22	44	125	19	70	4	85	20	207529	3	23	27	54	126	19	78	17	73	11	207007
ACN-75	1	5	16	3	22	22	50	125	20	58	37	49	25	205749	3	23	28	6	126	20	47	49	33	26	205425
MAD-23	1	5	22	3	22	22	51	125	19	114	53	17	34	205072	3	23	28	13	126	19	135	62	20	19	204987
CYI-04	1	5	17	3	22	22	51	125	19	90	46	44	0	205334	3	23	28	8	126	19	99	59	30	-5	205065
MIL-71	0	11	59	3	23	15	55	126	19	69	0	90	21	207357	3	23	27	54	126	19	70	2	87	20	207855
	16 APR 72			SEP TO CIR										LAZ 72.1											
MIL-71	1	5	17	4	0	16	33	126	19	75	13	77	14	207290	4	1	21	50	127	19	82	26	64	7	206746
BDA-02	1	5	17	4	0	16	36	126	19	84	27	63	5	206481	4	1	21	53	127	19	92	40	50	-2	206042
MAD-23	1	5	23	4	0	16	44	126	19	160	67	21	8	204878	4	1	22	7	127	19	-162	67	22	-7	205096
CYI-04	1	5	17	4	0	16	45	126	19	112	70	19	-7	204821	4	1	22	2	127	19	156	80	4	-9	204878
ACN-75	1	5	20	4	0	16	46	126	20	33	57	20	27	205161	4	1	22	6	127	19	6	63	3	27	205212
TEX-16	0	57	13	4	0	24	35	126	19	69	0	90	21	207634	4	1	21	48	128	19	75	11	79	15	207575

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16 APR 72

CIR TO PCI

LAZ 72.1

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	RANGE
GDS-28	1	11	59	4	2	8	43	127	18	72	7	-68	71	207998	4	3	20	42	128	18	82	20	-21	68	207297
TEX-16	1	11	58	4	2	8	43	127	19	80	21	68	10	207164	4	3	20	40	128	18	87	36	54	3	206460
STN-00	1	11	59	4	2	8	43	127	18	70	4	86	20	208200	4	3	20	43	128	18	79	16	73	10	207519
MAR-95	1	11	58	4	2	8	45	127	18	72	7	83	17	207996	4	3	20	43	128	18	82	20	70	8	207298
MIL-71	1	12	0	4	2	8	47	127	19	87	36	54	2	206386	4	3	20	47	128	18	96	51	39	-4	205826
BDA-02	1	12	0	4	2	8	51	127	19	100	50	40	-6	205786	4	3	20	52	128	18	116	64	24	-11	205430
CYI-04	1	11	57	4	2	9	5	126	19	-140	78	-8	-9	205047	4	3	21	2	127	18	-107	65	-24	-7	205395
ACN-75	1	11	59	4	2	9	7	126	19	-18	61	-10	27	205390	4	3	21	7	127	19	-44	53	-28	26	205780
MAD-23	1	11	56	4	2	9	9	126	19	-137	62	21	-18	205359	4	3	21	5	127	18	-115	52	18	-34	205818
GDS-28	1	12	13	4	4	7	15	128	18	88	30	-3	60	206942	4	5	19	28	129	18	99	44	9	46	206384
STN-00	1	12	10	4	4	7	16	128	18	86	26	64	3	207163	4	5	19	26	129	18	97	39	51	-6	206587
MAR-95	1	12	11	4	4	7	16	128	18	88	30	60	2	206941	4	5	19	27	129	18	99	44	46	-7	206384
TEX-16	1	12	14	4	4	7	17	128	18	92	47	43	-2	206155	4	5	19	31	129	18	104	62	28	-6	205738
MIL-71	1	12	14	4	4	7	21	128	18	104	61	28	-7	205643	4	5	19	35	129	18	131	75	12	-10	205453
BDA-02	1	12	14	4	4	7	25	128	18	137	72	13	-13	205396	4	5	19	39	129	18	-164	75	-4	-14	205450
CYI-04	1	12	13	4	4	7	36	127	18	-98	55	-35	-4	205834	4	5	19	49	128	18	-89	40	-50	1	206574
MAD-23	1	12	11	4	4	7	37	127	18	-104	43	14	-45	206294	4	5	19	48	128	18	-92	30	3	-60	207046
ACN-75	1	12	11	4	4	7	40	127	19	-54	44	-40	25	206259	4	5	19	51	128	19	-63	29	-58	23	207077
HAW-12	0	24	3	4	4	55	19	129	18	71	0	90	19	207572	4	5	19	22	130	18	73	5	85	17	208442
HAW-12	1	11	54	4	6	5	44	130	18	77	15	74	13	207977	4	7	17	38	131	18	82	31	59	7	207208
MAR-95	1	11	60	4	6	5	51	129	18	109	53	36	-11	206158	4	7	17	50	130	18	130	65	20	-16	205878
GDS-28	1	11	57	4	6	5	53	129	18	108	53	13	35	206154	4	7	17	50	130	18	130	65	17	19	205876

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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	1	11	56	4	6	5	53	129	18	106	48	41	-11	206333	4	7	17	50	130	18	125	60	25	-17	206004
TEX-16	1	11	56	4	6	5	58	129	18	118	72	16	-9	205641	4	7	17	54	130	18	-180	80	0	-10	205614
MIL-71	1	11	57	4	6	6	4	129	18	179	80	0	-10	205518	4	7	18	1	130	18	-121	71	-16	-10	205753
BDA-02	1	11	60	4	6	6	6	128	18	-131	70	-16	-13	205674	4	7	18	5	129	18	-108	57	-32	-10	206131
MAD-23	1	11	57	4	6	6	15	128	18	-84	21	-15	-68	207641	4	7	18	12	129	17	-74	8	-62	-72	208510
CYI-04	1	11	56	4	6	6	17	128	18	-84	29	-61	5	207197	4	7	18	14	129	17	-77	14	-75	12	208152
ACN-75	1	11	56	4	6	6	22	128	18	-67	19	-70	21	207760	4	7	18	17	129	18	-71	3	-87	19	208811
HAW-12	1	12	15	4	8	4	8	130	18	86	42	48	3	206852	4	9	16	23	131	17	92	58	32	-1	206334
STN-00	1	12	17	4	8	4	14	130	18	146	67	13	-19	205983	4	9	16	32	131	17	-169	69	-4	-20	206028
GDS-28	1	12	16	4	8	4	15	130	18	157	71	18	7	205898	4	9	16	31	131	17	-153	70	18	-9	206015
MAR-95	1	12	13	4	8	4	18	130	18	157	71	8	-18	205898	4	9	16	31	131	17	-153	70	-9	-18	206016
MIL-71	1	12	11	4	8	4	28	129	18	-106	61	-28	-8	206124	4	9	16	39	130	17	-95	46	-44	-3	206756
BDA-02	1	12	13	4	8	4	29	129	18	-99	47	-43	-6	206626	4	9	16	41	130	17	-89	32	-58	1	207406
CYI-04	0	20	16	4	8	4	35	129	17	-73	4	-86	17	208871	4	8	24	51	129	17	-70	0	-90	20	208173
TEX-16	1	10	24	4	8	6	13	130	18	-129	75	-12	-9	205742	4	9	16	37	130	17	-105	61	-28	-7	206235
GWM-24	0	16	42	4	8	59	30	132	17	72	0	90	18	208335	4	9	16	12	132	17	73	4	86	17	208991
GWM-24	1	11	59	4	10	2	43	132	17	75	15	75	14	208495	4	11	14	42	133	17	78	31	59	10	207690
HSK-25	1	12	0	4	10	2	50	132	18	66	2	-85	66	209246	4	11	14	50	133	18	55	14	-66	53	208608
HAW-12	1	12	5	4	10	2	55	131	17	99	69	21	-3	206178	4	11	14	60	132	17	136	83	5	-5	206069
STN-00	1	12	11	4	10	3	1	131	17	-141	65	-16	-19	206247	4	11	15	13	131	17	-116	54	-33	-15	206691
GDS-28	1	12	11	4	10	3	2	130	17	-128	64	17	-20	206287	4	11	15	13	131	17	-108	51	14	-37	206806
MAR-95	1	12	12	4	10	3	2	130	17	-129	64	-21	-16	206288	4	11	15	14	131	17	-109	51	-37	-12	206807

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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	1	12	11	4	10	3	9	130	17	-97	51	-39	-4	206696	4	11	15	20	131	17	-88	36	-54	1	207486
MIL-71	1	12	14	4	10	3	10	130	17	-89	36	-54	1	207338	4	11	15	24	131	17	-82	21	-69	8	208260
BDA-02	1	12	11	4	10	3	13	130	17	-83	22	-68	6	208046	4	11	15	23	131	17	-75	8	-82	15	209004
CRO-08	1	12	1	4	12	1	10	133	18	70	1	89	20	209564	4	13	13	11	134	17	62	15	73	27	208794
GWM-24	1	12	4	4	12	1	11	133	17	79	42	47	8	207313	4	13	13	15	133	17	80	59	31	5	206773
HSK-25	1	11	60	4	12	1	18	132	18	47	22	-60	42	208332	4	13	13	18	133	17	31	31	-55	27	207935
HAW-12	1	12	1	4	12	1	29	132	17	-127	82	-7	-5	206214	4	13	13	31	133	17	-99	67	-23	-4	206563
GDS-28	1	12	2	4	12	1	36	131	17	-99	42	10	-47	207309	4	13	13	37	132	16	-89	28	-2	-62	208113
STN-00	1	11	60	4	12	1	36	131	17	-105	46	-43	-11	207146	4	13	13	36	132	16	-93	32	-58	-3	207892
MAR-95	1	12	1	4	12	1	37	131	17	-99	42	-48	-7	207309	4	13	13	38	132	16	-89	28	-62	1	208113
TEX-16	1	12	1	4	12	1	38	131	17	-83	25	-65	6	208133	4	13	13	38	132	16	-77	10	-80	13	209103
MIL-71	0	53	18	4	12	1	42	131	17	-77	11	-79	13	208949	4	12	54	60	132	16	-71	0	-90	19	208747
PKS-96	0	21	29	4	12	51	49	133	17	38	30	47	43	206895	4	13	13	18	133	17	33	33	41	45	207840
CRO-08	1	12	13	4	13	59	46	134	17	55	24	61	31	208423	4	15	11	59	134	17	42	36	43	37	207910
GWM-24	1	12	15	4	13	59	49	133	17	77	70	20	4	206622	4	15	12	5	134	16	45	86	3	3	206537
HSK-25	1	12	13	4	13	59	54	133	17	19	35	-54	15	207865	4	15	12	6	134	17	-1	37	-53	-1	207860
PKS-96	1	12	13	4	13	59	54	133	17	20	37	25	48	207757	4	15	12	7	134	17	0	40	-1	50	207740
HAW-12	1	12	16	4	14	0	3	132	17	-93	56	-34	-2	206998	4	15	12	19	133	16	-87	40	-50	2	207768
STN-00	1	12	15	4	14	0	3	132	16	-86	23	-67	3	208507	4	15	12	18	133	16	-77	9	-81	13	209420
MAR-95	1	3	28	4	14	0	3	132	16	-83	18	-72	7	208757	4	15	3	31	133	16	-75	6	-84	15	209120
GDS-28	1	12	14	4	14	0	4	132	16	-83	18	-22	-71	208758	4	15	12	17	133	16	-74	4	-75	-73	209697
TEX-16	0	0	28	4	14	0	6	132	16	-72	0	-90	18	209815	4	14	0	34	132	16	-72	0	-90	18	209798

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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	1	11	58	4	15	58	25	134	17	30	43	29	39	207739	4	17	10	23	135	17	8	48	7	41	207607
GWM-24	1	12	1	4	15	58	31	134	16	-69	81	-8	3	206683	4	17	10	32	135	16	-81	65	-25	4	207075
PKS-96	1	11	59	4	15	58	36	134	17	-15	39	-18	49	207910	4	17	10	35	135	17	-34	33	-41	44	208301
HSK-25	1	11	58	4	15	58	36	134	17	-15	36	-53	-12	208036	4	17	10	34	135	17	-34	30	-55	-29	208426
STN-00	0	0	1	4	15	58	38	133	16	-70	0	-90	20	210054	4	15	58	39	133	16	-70	0	-90	20	210053
HAW-12	1	11	59	4	15	58	43	133	16	-83	29	-61	6	208402	4	17	10	41	134	16	-78	13	-77	12	209401
CRO-08	1	14	9	4	17	54	58	135	17	-8	48	-7	41	207826	4	19	9	7	136	16	-32	43	-29	39	208068
GWM-24	1	12	16	4	17	56	55	134	16	-81	53	-36	5	207548	4	19	9	10	135	16	-80	37	-53	8	208353
HSK-25	1	12	12	4	17	56	59	134	17	-45	24	-58	-40	208869	4	19	9	11	135	16	-58	14	-65	-56	209585
HAW-12	0	11	12	4	17	56	59	134	16	-74	2	-87	16	210143	4	18	8	12	134	16	-73	0	-90	17	209742
MAD-23	0	33	9	4	18	35	35	136	15	70	0	-90	70	209049	4	19	8	43	137	15	75	6	-69	74	210055
CYI-04	1	12	3	4	19	55	6	137	15	74	2	87	16	210385	4	21	7	9	138	15	82	17	73	8	209602
MAD-23	1	12	4	4	19	55	8	137	15	82	14	-28	74	209681	4	21	7	12	138	15	93	27	7	63	209048
CRO-08	1	12	15	4	19	55	37	135	16	-44	36	-43	36	208473	4	21	7	52	136	16	-57	25	-62	29	209211
GWM-24	1	12	12	4	19	55	40	135	15	-79	25	-64	10	209029	4	21	7	52	136	15	-77	9	-81	13	210092
HSK-25	0	30	14	4	19	55	41	135	16	-66	5	-77	-65	210182	4	20	25	55	136	16	-70	0	-90	-70	209292
ACN-75	0	45	13	4	20	21	57	137	16	74	0	90	16	209374	4	21	7	10	138	15	73	10	79	17	210004
CYI-04	1	12	12	4	21	53	28	138	15	87	27	63	3	209189	4	23	5	40	139	15	96	42	48	-4	208527
ACN-75	1	12	7	4	21	53	34	138	15	70	21	68	19	209522	4	23	5	41	139	15	64	37	50	20	208777
MAD-23	1	12	8	4	21	53	35	138	15	102	36	16	52	208747	4	23	5	44	138	14	117	48	22	36	208293
CRO-08	1	12	0	4	21	54	11	136	16	-64	15	-73	25	209824	4	23	6	11	137	15	-73	1	-89	17	210791
BDA-02	0	2	22	4	23	3	13	139	14	73	0	90	17	210706	4	23	5	35	139	14	73	0	90	17	210806

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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
	BDA-02	1	10	24	4	23	52	4	139	14	79	10	80	10	210376	5	1	2	28	140	14	88	24	66	2	209580
CYI-04	1	12	20	4	23	52	7	138	15	103	53	37	-8	208252	5	1	4	27	139	14	122	67	20	-12	207934
MAD-23	1	12	18	4	23	52	12	138	14	132	55	25	25	208153	5	1	4	30	139	14	161	62	26	9	208044
ACN-75	1	12	18	4	23	52	12	138	15	57	47	38	21	208459	5	1	4	30	139	15	40	60	20	22	208102
MIL-71	0	50	58	5	0	13	20	139	14	74	0	90	16	209999	5	1	4	19	140	14	79	10	80	10	210461
MIL-71	1	12	2	5	1	50	35	140	14	85	20	70	5	210013	5	3	2	37	141	14	93	35	55	-2	209304
TEX-16	1	11	56	5	1	50	36	140	14	77	6	84	13	210869	5	3	2	31	141	14	85	20	70	5	210083
BDA-02	1	12	2	5	1	50	37	140	14	95	34	56	-4	209272	5	3	2	39	141	14	107	48	41	-11	208723
CYI-04	1	12	3	5	1	50	49	139	14	148	74	8	-13	207899	5	3	2	53	140	14	-148	74	-9	-14	208005
MAD-23	1	12	0	5	1	50	53	139	14	-173	63	26	-3	208128	5	3	2	53	140	14	-141	58	26	-20	208392
ACN-75	1	12	1	5	1	50	55	139	15	17	66	8	23	208056	5	3	2	56	140	14	-24	66	-11	22	208177
GDS-28	0	26	47	5	2	35	44	140	14	73	0	-90	73	210047	5	3	2	31	141	14	77	5	-69	76	210975
STN-00	0	7	14	5	2	55	18	141	13	73	0	90	17	210886	5	3	2	32	141	13	74	1	89	16	211193
STN-00	1	12	16	5	3	48	56	141	13	81	10	79	9	210800	5	5	1	12	142	13	91	24	66	-1	210119
MAR-95	1	12	14	5	3	48	57	141	14	83	14	75	6	210567	5	5	1	11	142	13	94	28	62	-3	209884
TEX-16	1	12	17	5	3	48	58	141	14	90	31	59	0	209669	5	5	1	15	142	13	99	46	44	-7	209052
GDS-28	1	12	15	5	3	48	58	141	14	83	14	-24	74	210565	5	5	1	13	142	13	94	28	7	62	209884
MIL-71	1	12	17	5	3	49	2	140	14	100	45	44	-7	208977	5	5	1	18	141	13	114	60	28	-12	208550
BDA-02	1	12	16	5	3	49	4	140	14	118	58	29	-15	208529	5	5	1	21	141	13	147	68	12	-18	208335
CYI-04	1	12	19	5	3	49	15	140	14	-122	66	-21	-12	208279	5	5	1	34	140	13	-104	52	-37	-9	208826
MAD-23	1	12	17	5	3	49	17	139	14	-124	51	25	-31	208741	5	5	1	34	140	13	-108	39	21	-48	209358
ACN-75	1	12	19	5	3	49	19	140	14	-44	59	-23	22	208477	5	5	1	39	140	14	-61	45	-41	20	209085

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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	1	12	6	5	5	47	38	142	13	101	38	52	-9	209535	5	6	59	43	142	13	116	51	36	-16	209062
GDS-28	1	12	5	5	5	47	39	142	13	101	38	14	51	209533	5	6	59	44	142	13	116	51	20	35	209061
STN-00	1	12	3	5	5	47	39	142	13	99	33	57	-8	209757	5	6	59	41	142	13	113	46	42	-16	209249
TEX-16	1	12	8	5	5	47	42	141	13	108	56	33	-10	208792	5	6	59	50	142	13	131	69	16	-14	208524
MIL-71	1	12	9	5	5	47	46	141	13	132	69	16	-14	208440	5	6	59	56	142	13	-176	74	-1	-16	208429
BDA-02	1	12	9	5	5	47	49	141	13	-180	71	0	-19	208389	5	6	59	59	142	13	-137	65	-18	-18	208626
MAD-23	1	12	8	5	5	47	59	140	13	-99	30	15	-59	209884	5	7	0	7	141	13	-88	17	-7	-73	210725
CYI-04	1	12	9	5	5	48	1	140	13	-97	41	-48	-5	209342	5	7	0	10	141	13	-89	26	-64	1	210220
ACN-75	1	12	13	5	5	48	5	140	14	-67	35	-53	19	209654	5	7	0	19	141	13	-73	19	-70	16	210627
HAW-12	1	10	19	5	5	49	14	142	13	76	0	90	14	211554	5	6	59	32	143	13	82	15	75	8	210820
HAW-12	1	12	9	5	7	45	56	143	13	86	26	64	4	210364	5	8	58	5	144	13	93	42	48	-2	209650
MAR-95	1	12	9	5	7	46	8	142	13	130	59	25	-20	208918	5	8	58	16	143	12	164	66	7	-23	208799
GDS-28	1	12	8	5	7	46	8	142	13	130	59	21	23	208916	5	8	58	16	143	12	164	66	23	6	208797
STN-00	1	12	7	5	7	46	8	142	13	126	54	30	-20	209070	5	8	58	15	143	12	154	63	13	-24	208886
TEX-16	1	12	6	5	7	46	15	142	13	165	75	4	-15	208541	5	8	58	20	143	13	-138	71	-13	-14	208711
MIL-71	1	12	2	5	7	46	22	142	13	-140	70	-13	-15	208614	5	8	58	24	143	13	-113	58	-30	-12	209044
BDA-02	1	12	6	5	7	46	22	141	13	-119	57	-30	-15	208964	5	8	58	29	142	12	-104	43	-46	-10	209594
MAD-23	0	45	31	5	7	46	28	141	13	-80	8	-50	-77	211342	5	8	31	59	142	12	-74	0	-90	-74	210713
CYI-04	1	11	59	5	7	46	32	141	13	-84	16	-74	6	210892	5	8	58	32	142	12	-76	1	-89	14	211897
ACN-75	0	33	51	5	7	46	38	141	13	-75	8	-82	15	211359	5	8	20	29	141	13	-77	0	-90	13	210579
HAW-12	1	12	21	5	9	44	37	143	13	98	53	37	-5	209336	5	10	56	58	144	12	113	68	21	-8	208987
STN-00	1	12	22	5	9	44	44	143	12	180	65	0	-25	208946	5	10	57	6	144	12	-144	60	-18	-24	209188

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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	1	12	21	5	9	44	45	143	12	-167	67	23	-5	208906	5	10	57	6	144	12	-133	59	22	-22	209226
MAR-95	1	12	20	5	9	44	46	143	12	-167	67	-6	-23	208908	5	10	57	5	144	12	-133	59	-24	-21	209227
TEX-16	1	12	21	5	9	44	51	142	13	-118	62	-25	-13	209019	5	10	57	12	143	12	-103	47	-42	-9	209640
BDA-02	1	12	21	5	9	44	53	142	12	-96	33	-56	-5	210154	5	10	57	14	143	12	-87	19	-71	2	211065
MIL-71	1	12	19	5	9	44	54	142	13	-103	48	-41	-9	209503	5	10	57	13	143	12	-94	33	-57	-3	210315
GWM-24	1	9	47	5	9	48	56	144	13	77	0	90	13	211844	5	10	58	43	145	12	81	16	74	9	211312
HSK-25	0	32	60	5	10	23	55	144	13	74	0	-90	74	210802	5	10	56	54	145	13	69	6	-73	68	211782
GWM-24	1	12	3	5	11	43	2	145	12	83	26	63	6	210735	5	12	55	5	146	12	86	43	47	3	210000
HSK-25	1	11	59	5	11	43	13	145	13	62	15	-61	58	211376	5	12	55	12	145	13	49	26	-53	42	210807
HAW-12	1	12	7	5	11	43	14	144	12	138	77	9	-10	208927	5	12	55	21	145	12	-141	77	-8	-10	209020
MAR-95	1	12	5	5	11	43	24	143	12	-118	51	-35	-17	209584	5	12	55	30	144	12	-104	38	-51	-11	210259
STN-00	1	12	6	5	11	43	24	143	12	-127	54	-31	-21	209491	5	12	55	31	144	12	-110	41	-47	-15	210097
GDS-28	1	12	7	5	11	43	24	143	12	-118	51	21	-34	209583	5	12	55	32	144	12	-104	38	17	-50	210261
TEX-16	1	12	4	5	11	43	31	143	12	-96	37	-53	-5	210174	5	12	55	34	144	12	-88	22	-68	2	211086
MIL-71	1	12	5	5	11	43	32	143	12	-88	22	-68	2	210941	5	12	55	36	144	12	-81	7	-83	9	211934
BDA-02	0	44	8	5	11	43	33	143	12	-81	9	-81	9	211716	5	12	27	41	144	12	-76	0	-90	14	211100
CRO-08	0	19	59	5	12	35	5	146	12	76	0	90	14	211333	5	12	55	4	146	12	74	4	86	16	212081
GWM-24	1	12	18	5	13	41	30	145	12	88	55	35	1	209679	5	14	53	48	146	12	93	71	19	-1	209317
CRO-08	1	12	15	5	13	41	31	146	12	69	14	75	21	211613	5	14	53	46	147	12	59	29	58	27	210912
PKS-96	1	12	16	5	13	41	38	145	13	40	35	43	39	210502	5	14	53	54	146	12	21	42	21	44	210242
HSK-25	1	12	15	5	13	41	38	145	13	38	33	-50	31	210583	5	14	53	54	146	12	19	40	-48	14	210342
HAW-12	1	12	20	5	13	41	43	144	12	-115	68	-20	-9	209285	5	14	54	3	145	11	-100	53	-37	-6	209847

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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	1	12	19	5	13	41	46	144	12	-101	32	-57	-9	210628	5	14	54	4	145	11	-90	18	-72	0	211484
GDS-28	1	12	18	5	13	41	47	144	12	-96	28	11	-61	210831	5	14	54	5	145	11	-86	14	-15	-75	211735
MAR-95	1	12	17	5	13	41	48	144	12	-96	28	-62	-5	210830	5	14	54	6	145	11	-86	14	-76	4	211735
TEX-16	0	54	52	5	13	41	49	144	12	-83	11	-78	7	211773	5	14	36	41	145	11	-77	0	-90	13	211671
CRO-08	1	12	8	5	15	40	14	146	12	50	37	45	31	210581	5	16	52	22	147	12	32	48	26	35	210211
GWM-24	1	12	15	5	15	40	18	146	12	104	83	7	-2	209268	5	16	52	32	147	11	-101	80	-10	-2	209403
PKS-96	1	12	11	5	15	40	24	146	12	5	45	5	45	210241	5	16	52	35	147	12	-19	43	-19	44	210414
HSK-25	1	12	11	5	15	40	26	146	12	4	42	-48	3	210350	5	16	52	36	147	12	-19	41	-48	-14	210532
GDS-28	0	23	5	5	15	40	28	145	11	-80	5	-66	-79	212380	5	16	3	33	145	11	-77	0	-90	-77	211609
STN-00	0	48	9	5	15	40	28	145	11	-83	9	-81	7	212109	5	16	28	37	146	11	-77	0	-90	13	211617
HAW-12	1	12	17	5	15	40	29	145	11	-94	42	-48	-3	210370	5	16	52	46	146	11	-88	26	-64	2	211291
CRO-08	1	12	10	5	17	38	44	147	12	15	52	11	36	210153	5	18	50	54	148	11	-13	53	-10	36	210224
GWM-24	1	12	11	5	17	38	50	146	11	-93	68	-22	-1	209684	5	18	51	1	147	11	-90	51	-39	0	210293
PKS-96	1	9	57	5	17	38	56	146	12	-33	39	-34	41	210695	5	18	48	53	147	11	-50	30	-53	34	211133
HAW-12	1	7	43	5	17	38	57	146	11	-84	15	-75	6	211976	5	18	46	40	147	10	-79	0	-90	11	212740
HSK-25	1	12	4	5	17	38	57	146	12	-33	36	-49	-26	210812	5	18	51	1	147	11	-50	28	-51	-43	211375
CRO-08	1	12	19	5	19	37	24	147	11	-31	49	-24	34	210464	5	20	49	43	148	11	-50	39	-43	30	211009
GWM-24	1	12	21	5	19	37	24	147	11	-87	40	-50	2	210855	5	20	49	45	148	10	-84	23	-67	5	211833
HSK-25	1	12	19	5	19	37	28	147	11	-59	20	-55	-54	211883	5	20	49	47	148	11	-71	7	-68	-70	212733
MAD-23	1	10	56	5	19	38	21	148	10	77	0	-90	77	213011	5	20	49	17	149	10	88	12	-11	77	212414
CYI-04	0	7	1	5	20	42	11	150	10	79	0	90	11	212781	5	20	49	12	150	10	80	1	88	10	213055
CYI-04	1	12	3	5	21	35	30	149	10	85	12	78	5	212564	5	22	47	33	150	10	93	27	63	-3	211791

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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	1	12	4	5	21	35	32	149	10	95	21	13	68	212018	5	22	47	35	150	9	108	34	25	52	211430
ACN-75	1	12	2	5	21	35	32	150	10	78	8	82	12	212808	5	22	47	34	151	10	75	24	65	14	211929
GWM-24	0	51	7	5	21	36	4	148	10	-82	12	-78	8	212542	5	22	27	11	149	10	-80	0	-90	10	212319
CRO-08	1	12	3	5	21	36	5	148	11	-59	30	-56	26	211499	5	22	48	8	149	10	-70	17	-72	19	212378
CYI-04	1	12	22	5	23	33	53	150	10	99	37	53	-7	211390	6	0	46	15	151	9	112	52	36	-13	210854
MAD-23	1	12	23	5	23	33	54	150	9	119	42	28	41	211162	6	0	46	17	151	9	139	52	31	24	210842
ACN-75	1	12	19	5	23	33	57	150	10	72	35	53	15	211469	6	0	46	16	151	10	63	51	36	16	210862
CRO-08	0	28	53	5	23	36	13	149	10	-76	6	-84	14	212987	6	0	5	6	149	10	-79	0	-90	11	212216
BDA-02	0	45	58	6	0	0	10	151	9	79	0	90	11	212314	6	0	46	7	151	9	85	9	81	5	213001
MIL-71	1	12	6	6	1	32	29	151	9	82	5	85	8	213359	6	2	44	35	152	9	91	20	70	-1	212564
BDA-02	1	12	3	6	1	32	32	151	9	91	19	71	-1	212533	6	2	44	34	152	9	102	33	57	-10	211845
CYI-04	1	12	13	6	1	32	38	151	9	125	61	25	-16	210647	6	2	44	51	152	9	161	70	7	-19	210511
MAD-23	1	12	11	6	1	32	41	151	9	158	57	31	12	210772	6	2	44	51	152	9	-171	58	32	-5	210828
ACN-75	1	12	8	6	1	32	45	151	10	52	61	23	17	210627	6	2	44	53	152	9	17	72	5	17	210475
TEX-16	0	22	47	6	2	21	45	152	9	80	0	90	10	212610	6	2	44	32	152	9	83	5	85	7	213426
TEX-16	1	12	14	6	3	30	49	152	9	88	15	75	2	212944	6	4	43	3	153	8	97	30	60	-6	212179
MIL-71	1	12	15	6	3	30	53	152	9	97	30	60	-6	212128	6	4	43	7	153	8	108	44	44	-13	211503
BDA-02	1	12	17	6	3	30	54	152	9	110	43	46	-15	211516	6	4	43	11	153	8	128	55	29	-21	211097
CYI-04	1	12	16	6	3	31	11	151	9	-164	70	-6	-19	210602	6	4	43	26	152	8	-128	61	-24	-17	210923
MAD-23	1	12	14	6	3	31	11	151	9	-150	55	32	-17	211024	6	4	43	24	152	8	-127	46	31	-34	211465
ACN-75	1	12	9	6	3	31	18	151	9	-21	72	-7	17	210573	6	4	43	27	152	9	-55	61	-25	16	210930
GDS-28	1	9	5	6	3	33	58	152	9	80	0	-90	80	213685	6	4	43	3	153	8	89	13	-3	77	213127

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION 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	0	48	24	6	3	54	39	152	8	80	0	90	10	212763	6	4	43	2	153	8	87	9	81	3 213375
MAR-95	0	36	50	6	4	6	14	153	8	84	6	84	6	212202	6	4	43	4	153	8	89	13	77	1 213128
MAR-95	1	12	21	6	5	29	27	153	8	96	23	67	-6	212693	6	6	41	49	154	8	108	36	53	-15 212072
GDS-28	1	12	21	6	5	29	27	153	8	96	23	14	67	212692	6	6	41	49	154	8	108	36	23	50 212070
STN-00	1	12	21	6	5	29	27	153	8	94	18	72	-3	212942	6	6	41	49	154	8	106	31	58	-13 212305
TEX-16	1	12	22	6	5	29	30	153	8	103	40	49	-10	211786	6	6	41	52	154	8	118	55	32	-16 211311
MIL-71	1	12	20	6	5	29	34	153	8	118	54	33	-16	211233	6	6	41	54	154	8	144	65	15	-20 210991
BDA-02	1	12	23	6	5	29	37	153	8	146	62	16	-23	210981	6	6	42	0	153	8	-175	65	-2	-25 210996
MAD-23	1	12	23	6	5	29	46	152	8	-115	38	29	-45	211887	6	6	42	9	153	8	-102	25	24	-62 212648
CYI-04	1	12	21	6	5	29	48	152	8	-114	52	-35	-15	211296	6	6	42	9	153	8	-102	37	-52	-9 212038
ACN-75	1	12	21	6	5	29	53	152	9	-66	50	-37	15	211348	6	6	42	14	153	8	-74	35	-54	13 212170
HAW-12	1	0	55	6	7	27	53	154	8	86	10	80	4	213592	6	8	28	48	155	7	91	23	67	-1 212305
STN-00	1	0	48	6	7	28	0	154	8	115	40	47	-19	211982	6	8	28	48	155	7	130	49	33	-25 211060
MAR-95	1	0	46	6	7	28	2	154	8	118	45	41	-20	211772	6	8	28	48	155	7	136	54	27	-25 210894
GDS-28	1	0	46	6	7	28	2	154	8	118	45	25	39	211770	6	8	28	48	155	7	135	54	27	24 210891
TEX-16	1	0	42	6	7	28	6	154	8	134	63	20	-18	211135	6	8	28	48	154	7	166	69	5	-20 210466
MIL-71	1	0	35	6	7	28	13	153	8	173	69	2	-21	210982	6	8	28	48	154	7	-149	66	-13	-20 210540
BDA-02	1	0	34	6	7	28	14	153	8	-149	62	-15	-24	211151	6	8	28	48	154	7	-127	54	-30	-21 210906
MAD-23	1	0	24	6	7	28	24	153	8	-94	16	13	-73	213203	6	8	28	48	154	7	-85	5	-43	-83 213350
CYI-04	1	0	20	6	7	28	28	153	8	-95	27	-63	-5	212616	6	8	28	48	153	7	-89	14	-76	1 212829
ACN-75	1	0	15	6	7	28	33	153	8	-77	23	-66	12	212809	6	8	28	48	153	8	-81	9	-80	9 213098
16 APR 72										PC1 TO JET				LAZ 72.1										
HAW-12	0	11	22	6	8	28	57	155	7	91	23	67	-1	212311	6	8	40	19	155	7	92	26	64	-2 212772

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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	0	11	27	6	8	28	57	155	7	135	54	27	24	210898	6	8	40	24	155	7	139	56	27	22	211450
STN-00	0	11	27	6	8	28	57	155	7	131	49	33	-25	211067	6	8	40	24	155	7	134	51	30	-26	211609
MAR-95	0	11	28	6	8	28	57	155	7	136	54	27	-25	210901	6	8	40	25	155	7	140	56	24	-26	211453
TEX-16	0	11	33	6	8	28	57	154	7	167	69	5	-20	210473	6	8	40	31	154	7	174	70	2	-20	211073
MIL-71	0	11	37	6	8	28	57	154	7	-149	66	-13	-20	210548	6	8	40	34	154	7	-143	65	-16	-20	211193
BDA-02	0	11	41	6	8	28	57	154	7	-127	54	-30	-21	210914	6	8	40	38	154	7	-124	52	-33	-20	211600
MAD-23	0	11	44	6	8	28	57	154	7	-85	5	-44	-83	213360	6	8	40	41	154	7	-83	3	-66	-83	214105
CYI-04	0	11	48	6	8	28	57	153	7	-89	14	-76	1	212838	6	8	40	45	154	7	-88	12	-78	2	213606
ACN-75	0	11	51	6	8	28	57	153	8	-81	9	-80	9	213108	6	8	40	48	153	8	-81	7	-83	9	213896
HAW-12	1	12	13	6	9	26	32	155	7	97	37	53	-6	212312	6	10	38	45	156	7	108	52	36	-11	211735
STN-00	1	12	14	6	9	26	38	154	7	152	57	17	-29	211493	6	10	38	52	155	7	-176	59	-2	-31	211502
GDS-28	1	12	13	6	9	26	42	154	7	160	61	28	10	211376	6	10	38	54	155	7	-165	61	28	-7	211463
MAR-95	1	12	13	6	9	26	43	154	7	160	60	11	-28	211377	6	10	38	57	155	7	-165	61	-8	-28	211467
TEX-16	1	12	14	6	9	26	47	154	7	-153	68	-10	-20	211189	6	10	39	1	155	7	-124	57	-28	-18	211587
MIL-71	1	12	14	6	9	26	50	154	7	-125	57	-28	-18	211479	6	10	39	5	155	7	-109	43	-45	-14	212115
BDA-02	1	12	14	6	9	26	53	154	7	-112	43	-45	-16	212017	6	10	39	7	155	7	-101	29	-61	-9	212814
CYI-04	0	5	25	6	9	26	57	153	7	-82	1	-89	8	214274	6	9	32	22	153	7	-82	0	-90	8	214080
GWM-24	1	12	21	6	11	24	49	156	7	85	11	79	5	213886	6	12	37	10	157	7	89	28	62	1	213022
HSK-25	1	12	23	6	11	24	55	156	8	75	7	-65	74	214135	6	12	37	18	157	7	64	20	-50	58	213436
HAW-12	1	12	27	6	11	24	56	156	7	119	62	25	-13	211510	6	12	37	23	156	7	156	73	7	-15	211351
STN-00	1	12	29	6	11	25	2	155	7	-154	57	-16	-29	211666	6	12	37	31	156	6	-130	48	-35	-25	212087
GDS-28	1	12	29	6	11	25	2	155	7	-144	56	28	-19	211680	6	12	37	31	156	6	-122	46	27	-36	212180

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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	1	12	28	6	11	25	3	155	7 -144	56	-21	-26	211681	6	12	37	32	156	6 -122	46	-40	-22	212181	
TEX-16	1	12	30	6	11	25	6	155	7 -112	48	-40	-14	212001	6	12	37	36	156	6 -101	33	-57	-9	212783	
BDA-02	1	12	30	6	11	25	8	154	7 -94	19	-71	-4	213421	6	12	37	38	155	6 -85	4	-86	5	214392	
MIL-71	1	12	25	6	11	25	10	155	7 -101	33	-56	-9	212654	6	12	37	36	155	6 -92	18	-72	-2	213580	
GWM-24	1	12	13	6	13	23	30	157	7 92	39	51	-2	212544	6	14	35	44	158	6 98	56	34	-5	211954	
CRO-08	1	12	12	6	13	23	33	157	7 80	4	86	10	214480	6	14	35	45	158	7 73	19	70	16	213661	
HSK-25	1	12	13	6	13	23	41	157	7 55	28	-46	46	213064	6	14	35	53	158	7 39	39	-44	29	212626	
HAW-12	1	12	23	6	13	23	41	156	7 -161	74	-5	-15	211417	6	14	36	4	157	6 -123	63	-23	-14	211752	
STN-00	1	12	23	6	13	23	47	156	6 -117	40	-46	-21	212486	6	14	36	11	156	6 -104	27	-62	-13	213249	
GDS-28	1	12	24	6	13	23	47	156	6 -111	37	26	-48	212629	6	14	36	12	156	6 -100	23	21	-65	213455	
MAR-95	1	12	26	6	13	23	48	156	6 -111	37	-51	-17	212629	6	14	36	14	156	6 -100	23	-67	-9	213456	
TEX-16	1	12	26	6	13	23	51	155	7 -94	22	-68	-4	213387	6	14	36	17	156	6 -87	7	-83	3	214398	
MIL-71	0	35	33	6	13	23	53	155	6 -87	8	-82	3	214239	6	13	59	25	156	6 -83	0	-90	7	213452	
PKS-96	1	8	42	6	13	27	13	157	7 56	30	55	29	212811	6	14	35	55	158	7 41	41	38	35	212555	
GWM-24	1	12	18	6	15	21	59	157	6 106	67	22	-6	211729	6	16	34	17	158	6 147	81	5	-7	211581	
CRO-08	1	12	15	6	15	21	59	158	7 66	29	59	21	213212	6	16	34	14	159	6 53	43	41	26	212624	
HSK-25	1	12	14	6	15	22	10	157	7 25	44	-43	18	212477	6	16	34	25	158	7 1	48	-42	0	212422	
PKS-96	1	12	12	6	15	22	11	157	7 27	46	24	38	212390	6	16	34	23	158	7 2	50	1	40	212320	
HAW-12	1	12	21	6	15	22	12	157	6 -110	53	-35	-12	212125	6	16	34	33	157	6 -100	38	-52	-8	212881	
GDS-28	1	9	41	6	15	22	16	156	6 -92	14	10	-76	214050	6	16	31	57	157	5 -83	0	-90	-83	214838	
STN-00	1	12	16	6	15	22	16	156	6 -96	18	-72	-6	213813	6	16	34	32	157	5 -86	4	-86	4	214733	
MAR-95	0	38	47	6	15	22	17	156	6 -92	14	-76	-2	214049	6	16	1	4	157	6 -87	6	-84	3	213272	

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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	1	12	26	6	17	20	35	158	6	40	51	28	29	212385	6	18	33	2	159	6	13	58	8	31	212222
GWM-24	1	12	31	6	17	20	36	158	6	-136	80	-7	-7	211672	6	18	33	7	159	5	-106	65	-25	-7	212053
PKS-96	1	12	29	6	17	20	42	158	7	-10	49	-14	39	212438	6	18	33	11	159	6	-40	43	-35	35	212819
HSK-25	1	12	27	6	17	20	43	158	7	-17	46	-42	-11	212543	6	18	33	9	159	6	-39	40	-43	-29	212923
HAW-12	1	12	28	6	17	20	45	157	6	-95	27	-63	-4	213483	6	18	33	13	158	5	-89	11	-79	1	214512
CRO-08	1	12	13	6	19	19	17	159	6	-9	59	-6	31	212264	6	20	31	31	160	6	-38	53	-25	28	212573
GWM-24	1	12	14	6	19	19	18	158	5	-99	53	-36	-5	212444	6	20	31	32	159	5	-94	30	-53	-3	213260
PKS-96	0	34	45	6	19	19	25	158	6	-52	36	-48	30	213186	6	19	54	9	159	6	-59	30	-56	26	212226
HSK-25	1	12	12	6	19	19	26	158	6	-51	33	-44	-40	213288	6	20	31	38	159	6	-65	22	-46	-57	214017
GWM-24	1	14	19	6	21	15	50	159	5	-91	25	-65	-1	213961	6	22	30	9	160	4	-87	8	-82	3	214975
MAD-23	1	12	22	6	21	17	16	160	5	90	7	-2	83	214968	6	22	29	38	161	4	102	19	30	68	214298
CRO-08	1	12	28	6	21	17	39	159	6	-52	45	-38	26	212929	6	22	30	8	160	5	-66	32	-56	20	213655
HSK-25	1	10	18	6	21	17	44	159	6	-73	13	-52	-69	214576	6	22	28	2	160	5	-84	0	-90	-84	215352
CYI-04	0	55	24	6	21	34	12	161	5	85	0	90	5	214559	6	22	29	36	162	4	91	11	79	-1	214761
ACN-75	0	46	49	6	21	42	51	161	5	85	0	90	5	214248	6	22	29	40	162	5	84	11	79	6	214791
CYI-04	1	12	18	6	23	15	50	161	4	97	22	68	-6	214253	7	0	28	8	162	4	107	36	52	-14	213555
MAD-23	1	12	20	6	23	15	52	161	4	110	28	33	56	213909	7	0	28	12	162	4	126	39	36	39	213423
ACN-75	1	12	17	6	23	15	56	162	5	81	22	67	8	214209	7	0	28	13	162	4	78	39	50	10	213423
CRO-08	1	12	23	6	23	16	23	160	5	-73	22	-67	16	214226	7	0	28	45	161	5	-82	7	-83	8	215219
BDA-02	1	12	24	7	1	14	0	162	4	88	4	86	2	215473	7	2	26	29	163	3	98	18	72	-7	214685
CYI-04	1	12	26	7	1	14	13	162	4	116	46	41	-18	213214	7	2	26	39	163	3	136	58	23	-22	212836
MAD-23	1	12	23	7	1	14	17	162	4	139	46	36	27	213220	7	2	26	40	163	3	164	52	37	10	213057

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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	1	12	20	7	1	14	21	162	4	73	51	38	11	213031	7	2	26	41	163	4	60	67	20	11	212609
MIL-71	0	20	13	7	2	6	15	163	3	86	0	90	4	214743	7	2	26	29	163	3	88	4	86	2	215486
MIL-71	1	12	26	7	3	12	48	163	3	94	15	75	-4	214963	7	4	25	13	164	3	104	29	60	-12	214225
BDA-02	1	12	25	7	3	12	51	163	3	105	28	62	-13	214230	7	4	25	16	164	3	118	41	45	-21	213658
CYI-04	1	12	29	7	3	12	59	163	3	158	64	10	-24	212741	7	4	25	28	163	3	-162	64	-9	-25	212839
MAD-23	1	12	28	7	3	12	59	162	3	-177	53	37	-2	213089	7	4	25	27	163	3	-150	48	38	-19	213350
ACN-75	1	12	27	7	3	13	3	163	4	35	76	8	12	212505	7	4	25	30	163	4	-39	75	-9	11	212610
TEX-16	1	11	34	7	3	13	36	163	3	86	0	90	4	215789	7	4	25	10	164	3	95	15	75	-4	215017
MAR-95	1	12	18	7	5	11	11	164	3	92	8	82	-2	215524	7	6	23	29	165	2	103	21	68	-12	214791
GDS-28	1	12	13	7	5	11	15	164	3	92	8	14	82	215519	7	6	23	28	165	2	103	21	30	65	214789
STN-00	1	12	14	7	5	11	15	164	3	89	3	87	1	215776	7	6	23	28	165	2	100	17	73	-10	215051
TEX-16	1	12	15	7	5	11	16	164	3	100	25	65	-9	214520	7	6	23	31	165	3	112	40	48	-17	213855
MIL-71	1	12	17	7	5	11	18	164	3	111	39	49	-16	213811	7	6	23	35	165	3	128	52	32	-22	213339
BDA-02	1	12	17	7	5	11	22	164	3	130	49	33	-25	213376	7	6	23	39	165	2	156	58	15	-29	213147
MAD-23	1	12	18	7	5	11	34	163	3	-135	43	37	-31	213624	7	6	23	51	164	2	-118	32	37	-48	214235
CYI-04	1	12	16	7	5	11	36	163	3	-139	59	-22	-23	213032	7	6	23	52	164	3	-119	46	-40	-19	213570
ACN-75	1	12	16	7	5	11	42	163	4	-62	66	-21	11	212831	7	6	23	58	164	3	-75	50	-39	9	213433
STN-00	1	12	25	7	7	9	41	165	2	108	26	63	-16	214630	7	8	22	6	166	2	123	38	47	-25	214086
GDS-28	1	12	24	7	7	9	42	165	2	111	30	31	54	214379	7	8	22	6	166	2	126	43	33	36	213870
MAR-95	1	12	24	7	7	9	42	165	2	111	30	58	-18	214381	7	8	22	6	166	2	126	42	41	-26	213873
TEX-16	1	12	24	7	7	9	45	165	3	122	49	37	-20	213536	7	8	22	9	166	2	145	60	18	-24	213231
MIL-71	1	12	29	7	7	9	46	165	3	145	59	19	-25	213174	7	8	22	15	165	2	-179	64	0	-26	213132

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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
BDA-02	1	12	29	7	7	9	51	164	2	178	60	1	-30	213145	7	8	22	20	165	2	-150	56	-19	-29	213364
MAD-23	1	12	31	7	7	9	56	164	2	-108	24	36	-60	214722	7	8	22	28	165	2	-97	11	32	-77	215567
CYI-04	1	12	27	7	7	10	2	164	3	-109	37	-51	-15	214043	7	8	22	29	165	2	-100	22	-68	-9	214924
ACN-75	1	12	30	7	7	10	5	164	3	-80	39	-51	8	213961	7	8	22	35	164	3	-84	22	-68	6	214935
HAW-12	0	48	32	7	7	33	30	165	2	87	0	90	3	215052	7	8	22	3	166	2	92	10	80	-2	215562
HAW-12	0	27	56	7	9	8	19	166	2	97	21	69	-6	215009	7	9	36	15	166	2	100	27	62	-9	213497
STN-00	0	27	51	7	9	8	24	166	2	135	45	35	-30	213823	7	9	36	15	166	2	144	48	28	-32	212513
GDS-28	0	27	50	7	9	8	25	166	2	140	50	33	25	213642	7	9	36	15	166	2	150	53	33	18	212357
MAR-95	0	27	50	7	9	8	25	166	2	140	50	29	-30	213645	7	9	36	15	166	2	150	53	21	-32	212360
TEX-16	0	27	45	7	9	8	30	165	2	169	64	5	-25	213172	7	9	36	15	165	2	-175	64	-2	-26	211999
MIL-71	0	27	41	7	9	8	34	165	2	-154	61	-13	-26	213248	7	9	36	15	165	2	-143	58	-21	-25	212181
BDA-02	0	27	39	7	9	8	36	165	2	-133	50	-32	-26	213634	7	9	36	15	165	2	-126	45	-39	-24	212653
MAD-23	0	9	33	7	9	8	40	165	2	-89	2	-28	-88	216131	7	9	18	12	165	2	-88	0	-90	-88	215771
CYI-04	0	27	31	7	9	8	44	164	2	-94	12	-78	-4	215546	7	9	36	15	165	2	-91	6	-84	-1	214740
ACN-75	0	27	25	7	9	8	50	164	3	-86	10	-80	4	215623	7	9	36	15	165	2	-87	4	-86	3	214855
				16 APR 72				JET TO PC2				LAZ	72.1												
ACN-75	0	16	8	7	9	36	28	165	2	-87	4	-86	3	214853	7	9	52	36	165	2	-88	0	-90	2	215091
CYI-04	0	26	46	7	9	36	28	165	2	-91	6	-84	-1	214738	7	10	3	14	165	2	-88	0	-90	2	215454
HAW-12	0	44	11	7	9	36	28	166	2	100	27	62	-9	213490	7	10	20	39	167	2	105	37	52	-12	214272
STN-00	0	44	20	7	9	36	28	166	2	144	48	28	-32	212507	7	10	20	48	166	1	159	52	15	-35	213625
GDS-28	0	44	20	7	9	36	28	166	2	150	53	33	18	212352	7	10	20	49	166	2	167	56	34	7	213512
MAR-95	0	44	20	7	9	36	28	166	2	150	53	21	-32	212354	7	10	20	49	166	2	167	55	9	-34	213515
TEX-16	0	44	30	7	9	36	28	165	2	-175	64	-2	-26	211994	7	10	20	58	166	2	-153	61	-14	-25	213341

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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
MIL-71	0 44 36	7	9	36	28	165	2	-142	58	-21	-25	212177	7	10	21	4	166	2	-128	51	-32	-23	213685		
BDA-02	0 44 36	7	9	36	28	165	2	-125	45	-39	-24	212650	7	10	21	4	166	2	-116	37	-50	-21	214277		
HAW-12	1 12 30	7	11	6	46	167	2	113	47	41	-15	213894	7	12	19	16	167	1	132	61	23	-19	213488		
MAR-95	1 12 32	7	11	6	56	166	2	-172	56	-6	-34	213563	7	12	19	28	167	1	-144	50	-26	-31	213852		
STN-00	1 12 33	7	11	6	56	166	2	179	54	1	-36	213623	7	12	19	28	167	1	-153	51	-20	-35	213832		
GDS-28	1 12 34	7	11	6	56	166	2	-172	56	34	-5	213561	7	12	19	30	167	1	-144	50	34	-22	213851		
TEX-16	1 12 29	7	11	7	4	166	2	-134	55	-27	-23	213585	7	12	19	33	167	1	-116	42	-45	-19	214186		
MIL-71	1 12 31	7	11	7	8	166	2	-117	42	-44	-19	214081	7	12	19	38	166	1	-105	28	-61	-13	214884		
BDA-02	1 12 31	7	11	7	8	165	2	-107	28	-61	-15	214779	7	12	19	38	166	1	-97	13	-76	-7	215687		
HSK-25	1 3 43	7	11	15	34	167	3	87	0	-90	87	215971	7	12	19	17	168	2	78	12	-43	73	215730		
GWM-24	0 54 36	7	11	24	33	167	2	88	0	90	2	215550	7	12	19	9	168	1	92	12	78	-2	215723		
GWM-24	1 12 32	7	13	5	28	168	1	94	24	66	-4	215146	7	14	17	60	169	1	100	40	49	-8	214386		
HAW-12	1 12 35	7	13	5	35	167	1	155	67	10	-21	213375	7	14	18	11	168	1	-159	67	-9	-21	213462		
HSK-25	1 12 29	7	13	5	36	168	2	71	22	-40	61	215265	7	14	18	5	169	2	58	35	-38	44	214666		
STN-00	1 12 35	7	13	5	42	167	1	-137	45	-34	-31	214091	7	14	18	17	167	1	-120	34	-52	-25	214703		
GDS-28	1 12 36	7	13	5	43	167	1	-130	43	34	-34	214163	7	14	18	18	167	1	-114	31	34	-51	214849		
MAR-95	1 12 36	7	13	5	43	167	1	-130	43	-39	-28	214165	7	14	18	18	167	1	-114	31	-56	-21	214850		
TEX-16	1 12 36	7	13	5	47	166	1	-108	32	-56	-15	214684	7	14	18	23	167	1	-98	17	-73	-8	215613		
MIL-71	1 12 33	7	13	5	48	166	1	-99	18	-72	-8	215473	7	14	18	22	167	1	-91	2	-88	-1	216482		
BDA-02	0 17 5	7	13	5	50	166	1	-91	4	-86	-1	216302	7	13	22	55	166	1	-89	0	-90	1	215696		
CRO-08	0 40 38	7	13	37	23	168	2	88	0	90	2	215293	7	14	18	1	169	2	84	9	81	6	216087		
PKS-96	0 29 58	7	13	48	8	168	2	65	30	58	21	213616	7	14	18	6	169	2	60	35	51	24	214626		

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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	1	12	23	7	15	4	14	168	1	106	52	37	-10	213977	7	16	16	36	169	0	122	67	20	-12	213590
CRO-08	1	12	19	7	15	4	16	169	2	79	19	70	11	215527	7	16	16	34	170	1	70	35	54	17	214789
HSK-25	1	12	21	7	15	4	23	168	2	46	42	-38	32	214356	7	16	16	45	169	1	24	51	-37	15	214093
PKS-96	1	12	20	7	15	4	24	168	2	48	43	38	29	214297	7	16	16	44	169	1	26	53	19	33	214016
HAW-12	1	12	28	7	15	4	26	168	1	-135	61	-21	-20	213651	7	16	16	54	168	0	-116	48	-39	-17	214216
GDS-28	1	12	28	7	15	4	30	167	1	-106	22	34	-63	215353	7	16	16	58	168	0	-96	8	34	-80	216273
STN-00	1	12	28	7	15	4	30	167	1	-111	26	-63	-18	215165	7	16	16	58	168	0	-99	12	-78	-9	216038
MAR-95	1	12	27	7	15	4	32	167	1	-106	22	-67	-15	215353	7	16	16	59	168	0	-96	8	-82	-5	216274
TEX-16	0	31	43	7	15	4	34	167	1	-93	7	-83	-3	216235	7	15	36	17	167	0	-89	0	-90	1	215419
CRO-08	1	12	36	7	17	2	40	169	1	61	44	42	20	214406	7	18	15	16	170	1	42	57	24	24	213996
GWM-24	1	12	38	7	17	2	42	169	1	149	75	8	-13	213491	7	18	15	20	170	0	-142	73	-10	-13	213598
PKS-96	1	12	35	7	17	2	52	169	1	7	56	5	34	213967	7	18	15	27	170	1	-24	54	-16	33	214111
HSK-25	1	12	31	7	17	2	53	169	1	5	53	-37	3	214053	7	18	15	25	170	1	-23	51	-36	-14	214204
HAW-12	1	12	39	7	17	2	53	168	0	-108	38	-51	-14	214696	7	18	15	32	169	0	-99	22	-68	-9	215607
STN-00	0	14	20	7	17	2	57	168	0	-92	3	-87	-2	216617	7	17	17	17	168	0	-90	0	-90	0	216083
CRO-08	1	12	35	7	19	1	36	170	1	21	63	11	25	213869	7	20	14	10	171	0	-18	64	-9	25	213942
GWM-24	1	12	37	7	19	1	39	169	0	-120	65	-22	-12	213821	7	20	14	15	170	0	-106	49	-40	-11	214445
HAW-12	0	49	38	7	19	1	43	169	0	-95	11	-79	-5	216247	7	19	51	21	170	0	-91	0	-90	-1	215915
HSK-25	1	12	33	7	19	1	45	169	1	-40	46	-37	-26	214431	7	20	14	18	170	0	-58	36	-36	-44	215006
PKS-96	1	12	33	7	19	1	46	169	1	-41	49	-30	30	214336	7	20	14	19	170	0	-59	38	-48	24	214919
GWM-24	1	12	26	7	21	0	23	170	0	-101	38	-52	-9	214942	7	22	12	49	171	-1	-96	21	-69	-6	215918
CRO-08	1	12	23	7	21	0	26	170	0	-40	58	-22	24	214110	7	22	12	50	171	0	-61	46	-40	19	214650

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	1	12	20	7	21	0	33	170	0	-68	27	-36	-55	215446	7	22	12	53	171	0	-80	14	-35	-73	216296
MAD-23	0	29	25	7	21	42	51	172	-1	91	0	90	89	215846	7	22	12	15	172	-1	96	5	49	82	216792
MAD-23	1	12	35	7	22	58	24	172	-1	104	14	44	70	216342	8	0	10	59	173	-2	117	26	43	53	215727
CYI-04	1	12	32	7	22	58	26	172	-1	95	7	83	-5	216772	8	0	10	58	173	-2	104	22	68	-13	215971
ACN-75	1	12	33	7	22	58	29	172	0	89	9	81	1	216621	8	0	11	2	173	-1	87	26	64	3	215709
CRO-08	1	12	40	7	22	58	51	171	0	-70	37	-52	16	215105	8	0	11	31	172	-1	-80	22	-68	9	215985
GWM-24	0	40	10	7	22	58	52	171	-1	-93	9	-81	-3	216594	7	23	39	2	171	-1	-91	0	-90	-1	215928
HSK-25	0	24	23	7	22	58	55	171	0	-87	5	-35	-84	216871	7	23	23	18	171	0	-90	0	87	-90	216065
CYI-04	0	16	33	8	0	57	13	173	-1	111	31	57	-18	215493	8	1	13	46	173	-2	114	35	53	-19	214523
MAD-23	0	16	31	8	0	57	15	173	-2	128	34	43	41	215384	8	1	13	46	173	-2	132	36	43	37	214468
ACN-75	0	16	28	8	0	57	18	173	-1	85	38	52	4	215170	8	1	13	46	173	-1	84	42	48	4	214185
CRO-08	0	16	3	8	0	57	43	172	-1	-85	11	-79	4	216596	8	1	13	46	172	-1	-87	8	-82	3	216023
	16 APR 72			PC2 TO SBN										LAZ 72.1											
CRO-08	0	36	35	8	1	14	2	172	-1	-87	8	-82	3	216015	8	1	50	37	172	-1	-91	0	-90	-1	216422
CYI-04	0	55	39	8	1	14	2	173	-2	114	35	53	-19	214509	8	2	9	41	174	-2	125	45	39	-24	214940
MAD-23	0	55	40	8	1	14	2	173	-2	132	36	43	37	214455	8	2	9	42	174	-2	147	42	43	24	215052
ACN-75	0	55	42	8	1	14	2	173	-1	84	42	48	4	214171	8	2	9	44	174	-1	81	55	34	5	214546
BDA-02	0	15	47	8	1	53	43	174	-2	92	0	90	-2	216558	8	2	9	30	174	-2	94	3	87	-4	217153
BDA-02	1	12	46	8	2	55	21	174	-2	101	13	77	-10	216645	8	4	8	6	175	-2	112	27	62	-20	215917
CYI-04	1	12	44	8	2	55	32	174	-2	139	53	27	-27	214686	8	4	8	17	174	-2	168	59	7	-30	214527
MAD-23	1	12	43	8	2	55	34	173	-2	162	46	43	12	214935	8	4	8	17	174	-3	-172	47	43	-5	214973
ACN-75	1	12	42	8	2	55	39	174	-1	75	67	23	6	214263	8	4	8	21	174	-2	40	82	5	6	214087
MIL-71	1	10	55	8	2	57	9	174	-2	92	0	90	-2	217329	8	4	8	4	175	-2	101	14	75	-11	216601

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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	1	12	42	8	4	54	10	175	-2	98	10	80	-8	216906	8	6	6	52	176	-3	108	25	64	-16	216134
MIL-71	1	12	44	8	4	54	10	175	-2	107	24	65	-16	216093	8	6	6	54	176	-3	120	38	48	-23	215463
BDA-02	1	12	47	8	4	54	11	175	-2	121	36	50	-25	215516	8	6	6	58	175	-3	139	47	32	-31	215096
CYI-04	1	12	47	8	4	54	20	174	-2	-169	59	-6	-30	214560	8	6	7	7	175	-3	-140	52	-26	-28	214886
MAD-23	1	12	47	8	4	54	21	174	-2	-156	44	43	-17	215110	8	6	7	8	175	-3	-135	36	44	-34	215559
ACN-75	1	12	47	8	4	54	27	174	-2	-48	81	-7	6	214128	8	6	7	14	175	-2	-78	65	-24	5	214495
GDS-28	0	36	37	8	5	30	14	175	-3	93	0	90	87	216257	8	6	6	51	176	-3	99	7	51	79	217165
STN-00	0	12	37	8	5	54	13	176	-3	94	0	90	-4	216938	8	6	6	50	176	-3	96	2	88	-6	217434
MAR-95	0	4	31	8	6	2	21	176	-3	98	6	84	-8	216991	8	6	6	52	176	-3	99	7	83	-9	217168
MAR-95	1	12	35	8	6	52	46	176	-3	106	16	73	-15	216667	8	8	5	22	177	-3	118	29	58	-25	216017
GDS-28	1	12	33	8	6	52	48	176	-3	106	16	43	68	216663	8	8	5	21	177	-3	118	29	41	50	216014
TEX-16	1	12	37	8	6	52	48	176	-3	115	35	53	-21	215677	8	8	5	25	176	-3	131	47	35	-27	215170
STN-00	1	12	32	8	6	52	49	176	-3	103	12	78	-13	216933	8	8	5	22	177	-3	115	24	64	-23	216270
MIL-71	1	12	36	8	6	52	56	175	-3	131	47	36	-27	215128	8	8	5	32	176	-3	155	56	16	-31	214865
BDA-02	1	12	37	8	6	52	56	175	-3	155	52	18	-34	214918	8	8	5	33	176	-3	-176	54	-3	-36	214910
CYI-04	1	12	40	8	6	53	8	175	-3	-127	45	-39	-25	215199	8	8	5	48	175	-3	-113	31	-57	-20	215934
MAD-23	1	12	39	8	6	53	8	175	-3	-124	30	45	-46	215916	8	8	5	47	175	-3	-110	17	48	-63	216670
ACN-75	1	12	37	8	6	53	17	175	-2	-83	54	-36	4	214847	8	8	5	55	175	-3	-88	36	-54	2	215669
HAW-12	1	12	42	8	8	51	15	177	-3	96	6	84	-6	217358	8	10	3	57	178	-4	104	22	68	-13	216503
STN-00	1	12	48	8	8	51	18	176	-3	125	32	52	-29	215899	8	10	4	6	177	-4	143	42	34	-37	215502
GDS-28	1	12	46	8	8	51	19	176	-3	129	37	40	39	215667	8	10	4	5	177	-4	149	46	39	21	215324
MAR-95	1	12	47	8	8	51	19	176	-3	129	37	46	-30	215670	8	10	4	6	177	-4	149	46	27	-36	215328

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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	1	12	47	8	8	51	23	176	-3	146	54	22	-29	214956	8	10	4	11	177	-4	177	59	2	-31	214875
MIL-71	1	12	50	8	8	51	25	176	-3	176	58	2	-32	214820	8	10	4	15	177	-4	-153	54	-18	-31	215012
BDA-02	1	12	47	8	8	51	29	176	-3	-157	52	-17	-34	215030	8	10	4	16	176	-4	-134	43	-38	-31	215462
MAD-23	0	48	44	8	8	51	31	175	-3	-102	9	53	-75	217186	8	9	40	15	176	-4	-95	0	90	-85	216683
CYI-04	1	12	50	8	8	51	37	175	-3	-106	21	-68	-15	216475	8	10	4	27	176	-4	-97	6	-84	-7	217449
ACN-75	1	12	43	8	8	51	50	175	-3	-89	25	-65	1	216268	8	10	4	32	176	-3	-92	8	-82	-2	217347
HAW-12	1	12	46	8	10	50	6	177	-4	110	32	56	-17	215994	8	12	2	52	178	-4	123	47	38	-22	215415
STN-00	1	12	50	8	10	50	9	177	-4	158	47	19	-40	215339	8	12	2	59	178	-4	-176	48	-4	-42	215353
MAR-95	1	12	49	8	10	50	11	177	-4	165	50	12	-39	215208	8	12	2	59	178	-4	-168	50	-10	-39	215299
GDS-28	1	12	48	8	10	50	11	177	-4	165	50	39	9	215205	8	12	2	59	178	-4	-168	50	40	-8	215296
TEX-16	1	12	47	8	10	50	17	177	-4	-161	57	-12	-31	214946	8	12	3	4	177	-4	-136	48	-32	-28	215351
BDA-02	1	12	48	8	10	50	21	176	-4	-123	35	-50	-26	215837	8	12	3	9	177	-4	-110	22	-67	-19	216641
MIL-71	1	12	47	8	10	50	21	176	-4	-136	49	-31	-29	215252	8	12	3	8	177	-4	-120	36	-50	-24	215898
HSK-25	0	22	7	8	11	40	48	178	-3	94	0	90	86	216857	8	12	2	54	179	-3	91	4	11	86	217647
GWM-24	1	12	49	8	12	48	39	179	-4	90	9	81	-6	217398	8	14	1	7	179	-4	102	25	64	-10	216507
HAW-12	1	12	37	8	12	48	45	178	-4	136	55	26	-24	215123	8	14	1	23	179	-5	167	63	7	-27	214956
STN-00	1	12	41	8	12	48	49	178	-4	-159	46	-19	-40	215450	8	14	1	31	178	-5	-138	38	-40	-35	215866
HSK-25	1	12	27	8	12	48	53	178	-3	84	14	-23	75	217110	8	14	1	20	179	-4	73	28	-29	58	216392
GDS-28	1	12	37	8	12	48	54	177	-4	-151	46	40	-20	215444	8	14	1	32	178	-5	-131	37	41	-37	215943
MAR-95	1	12	35	8	12	48	56	177	-4	-151	46	-25	-37	215446	8	14	1	31	178	-5	-131	37	-45	-32	215945
TEX-16	1	12	40	8	12	48	58	177	-4	-123	40	-44	-25	215698	8	14	1	38	178	-5	-111	26	-62	-19	216481
MIL-71	1	12	40	8	12	49	2	177	-4	-111	27	-62	-19	216368	8	14	1	42	178	-5	-102	12	-78	-12	217298

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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	
BDA-02	1	1	19	8	12	49	4	177	-4	-103	12	-77	-13	217177	8	13	50	23	178	-5	-95	0	-90	-5	217439	
GWM-24	1	12	40	8	14	47	15	179	-4	106	37	52	-13	215988	8	15	59	55	-180	-5	117	52	35	-16	215384	
CRO-08	1	12	36	8	14	47	21	179	-4	90	9	81	0	217496	8	15	59	57	-180	-4	83	25	65	7	216653	
HAW-12	1	12	45	8	14	47	24	178	-4	-168	63	-6	-26	214981	8	16	0	9	179	-5	-137	55	-26	-25	215307	
PKS-96	1	12	36	8	14	47	27	179	-4	67	37	50	19	215951	8	16	0	3	180	-4	50	50	33	24	215472	
HSK-25	1	12	37	8	14	47	27	179	-4	64	37	-30	46	215976	8	16	0	5	180	-4	47	49	-31	29	215522	
STN-00	1	12	45	8	14	47	28	178	-5	-126	32	-53	-30	216221	8	16	0	14	179	-5	-113	19	-69	-21	216970	
MAR-95	1	12	44	8	14	47	29	178	-5	-121	29	-57	-26	216348	8	16	0	13	179	-5	-108	16	-73	-18	217159	
GDS-28	1	12	43	8	14	47	31	178	-5	-121	29	42	-49	216345	8	16	0	15	179	-5	-108	16	48	-66	217159	
TEX-16	1	12	47	8	14	47	33	178	-4	-104	17	-73	-14	217037	8	16	0	20	179	-5	-96	1	-89	-6	218033	
MIL-71	0	8	44	8	14	47	34	178	-4	-96	2	-88	-6	217903	8	14	56	18	178	-5	-95	0	-90	-5	217588	
GWM-24	1	12	44	8	16	46	5	180	-5	129	62	22	-17	215098	8	17	58	49	-180	-5	168	71	4	-19	214963	6-30
CRO-08	1	12	39	8	16	46	8	-180	-4	77	35	54	11	216138	8	17	58	47	-179	-5	65	50	37	16	215554	
PKS-96	1	12	43	8	16	46	14	180	-4	34	57	20	27	215254	8	17	58	57	-180	-5	1	62	0	28	215192	
HSK-25	1	10	54	8	16	46	15	180	-4	31	55	-31	17	215316	8	17	57	9	-180	-5	0	59	-31	0	215183	
HAW-12	1	12	52	8	16	46	15	179	-5	-124	46	-38	-23	215628	8	17	59	7	180	-5	-112	32	-56	-18	216403	
GDS-28	0	34	16	8	16	46	17	179	-5	-101	7	58	-77	217700	8	17	20	33	179	-5	-97	0	90	-83	216864	
STN-00	0	55	14	8	16	46	18	179	-5	-105	11	-79	-15	217480	8	17	41	32	180	-6	-97	0	-90	-7	217341	
MAR-95	0	3	56	8	16	46	18	179	-5	-101	7	-83	-11	217700	8	16	50	14	179	-5	-101	6	-84	-11	217556	
GWM-24	1	12	42	8	18	44	43	-180	-5	-157	70	-8	-18	215000	8	19	57	25	-179	-6	-126	58	-27	-18	215370	
CRO-08	1	12	32	8	18	44	47	-179	-5	52	60	25	18	215260	8	19	57	19	-179	-5	18	69	7	20	215082	
HAW-12	1	12	37	8	18	44	55	180	-5	-106	22	-68	-14	216934	8	19	57	32	-179	-6	-99	6	-84	-9	217947	

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	1	12	33	8	18	44	56	-180	-4	-23	60	-13	28	215249	8	19	57	29	-179	-5	-50	51	-32	24	215620
HSK-25	1	12	32	8	18	44	57	-180	-4	-23	57	-31	-12	215331	8	19	57	29	-179	-5	-49	49	-30	-29	215702
GWM-24	1	12	41	8	20	43	28	-179	-6	-115	49	-39	-16	215725	8	21	56	9	-178	-6	-106	32	-56	-14	216539
CRO-08	1	12	38	8	20	43	28	-179	-5	-16	69	-6	20	215092	8	21	56	7	-178	-6	-53	61	-24	17	215399
PKS-96	1	10	40	8	20	43	34	-179	-5	-62	43	-44	20	215954	8	21	54	14	-178	-5	-76	30	-59	12	216571
HSK-25	1	12	42	8	20	43	34	-179	-5	-61	41	-29	-41	216032	8	21	56	16	-178	-5	-75	28	-25	-58	216755
MAD-23	1	12	28	8	22	41	51	-177	-6	99	0	89	81	218379	8	23	54	19	-176	-7	111	13	58	66	217696
GWM-24	1	12	41	8	22	42	17	-179	-6	-102	21	-68	-11	217115	8	23	54	57	-178	-7	-98	5	-85	-8	218191
CRO-08	1	12	37	8	22	42	18	-178	-5	-66	51	-36	15	215698	8	23	54	55	-178	-6	-78	37	-53	9	216432
HSK-25	1	12	35	8	22	42	24	-179	-5	-83	19	-20	-70	217248	8	23	54	59	-178	-6	-93	5	33	-84	218163
ACN-75	0	56	53	8	22	57	29	-177	-6	96	0	90	-6	217631	8	23	54	22	-176	-6	95	13	77	-4	217657
CYI-04	0	33	44	8	23	20	32	-177	-7	97	0	90	-7	217138	8	23	54	16	-176	-7	101	7	83	-11	218028
ACN-75	0	10	47	9	0	38	24	-176	-6	93	24	66	-3	217158	9	0	49	12	-176	-6	93	27	63	-3	216486
MAD-23	0	8	59	9	0	40	13	-176	-7	119	21	52	55	217274	9	0	49	12	-176	-7	121	22	52	53	216750
CYI-04	0	8	58	9	0	40	14	-176	-7	107	17	72	-17	217484	9	0	49	12	-176	-7	109	19	70	-18	216936
CRO-08	0	8	19	9	0	40	53	-178	-6	-84	26	-64	5	216951	9	0	49	12	-178	-6	-85	24	-66	4	216638
				16 APR 72						SBN TO TEI				LAZ 72.1											
CYI-04	1	5	57	9	0	49	14	-176	-7	109	19	70	-18	216934	9	1	55	11	-175	-7	119	31	55	-24	216795
MAD-23	1	5	59	9	0	49	14	-176	-7	121	22	52	53	216747	9	1	55	13	-176	-7	135	31	50	37	216801
ACN-75	1	6	2	9	0	49	14	-176	-6	93	27	63	-3	216484	9	1	55	16	-175	-7	92	43	47	-1	216260
CRO-08	1	6	35	9	0	49	14	-178	-6	-85	24	-66	4	216637	9	1	55	49	-177	-6	-92	10	-80	-2	218006
MAD-23	1	14	47	9	2	40	55	-176	-7	147	37	49	26	216502	9	3	55	42	-175	-8	170	41	48	8	216403
CYI-04	1	14	45	9	2	40	55	-176	-7	128	40	43	-29	216356	9	3	55	40	-175	-8	149	50	23	-34	216040

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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	1	14	43	9	2	41	0	-176	-7	90	54	36	0	215776	9	3	55	43	-175	-7	89	72	18	0	215414
BDA-02	1	9	33	9	2	45	57	-175	-7	98	0	90	-8	218308	9	3	55	30	-174	-8	108	13	76	-18	217864
MIL-71	0	3	15	9	3	52	14	-174	-8	99	0	90	-9	218497	9	3	55	29	-174	-8	99	1	89	-9	218612
MIL-71	1	14	45	9	4	41	8	-174	-8	105	11	79	-14	218002	9	5	55	53	-174	-8	116	25	63	-23	217279
BDA-02	1	14	47	9	4	41	8	-175	-8	115	22	65	-23	217328	9	5	55	56	-174	-8	130	35	48	-32	216780
MAD-23	1	14	58	9	4	41	15	-175	-8	175	42	48	-4	216350	9	5	56	13	-174	-8	-152	37	49	-22	216671
CYI-04	1	14	57	9	4	41	15	-175	-8	167	54	9	-35	215866	9	5	56	12	-174	-8	-163	53	-13	-35	216023
ACN-75	1	14	55	9	4	41	22	-175	-7	82	84	6	1	215233	9	5	56	17	-174	-8	-89	78	-12	0	215407
TEX-16	0	57	22	9	4	58	31	-174	-8	99	0	90	-9	217794	9	5	55	53	-173	-8	106	12	78	-15	218047
				16	APR	72				TEI	TU	ENT			LAZ	72.1									
GDS-28	10	58	1	9	6	31	11	-174	-8	101	1	84	79	219020	9	17	29	12	-175	-9	-101	0	90	-79	196341
TEX-16	9	47	5	9	6	31	11	-174	-8	110	19	70	-19	217957	9	16	18	17	-175	-8	-100	0	-90	-10	198722
MIL-71	8	39	41	9	6	31	13	-174	-8	122	32	54	-26	217260	9	15	10	54	-175	-8	-100	0	-90	-10	201011
BDA-02	7	33	6	9	6	31	14	-174	-8	139	40	38	-35	216865	9	14	4	20	-175	-8	-100	0	-90	-10	203236
MAD-23	3	25	13	9	6	31	18	-175	-8	142	34	50	-31	217176	9	9	56	31	-175	-8	-101	0	90	-79	211577
CYI-04	4	20	51	9	6	31	19	-175	-8	149	50	-23	-34	216472	9	10	52	9	-175	-8	-99	0	-90	-9	209685
ACN-75	4	36	44	9	6	31	24	-175	-7	90	69	-21	0	215880	9	11	8	8	-176	-7	-97	0	-90	-7	209152
STN-00	11	0	26	9	6	47	55	-174	-8	100	0	90	-10	218440	9	17	48	21	-175	-9	-101	0	-90	-11	195657
MAR-95	10	4	14	9	6	54	57	-174	-8	104	6	84	-14	217794	9	16	59	11	-175	-9	-105	6	-84	-15	197001
HAW-12	11	24	25	9	9	5	46	-174	-8	98	0	90	-8	213323	9	20	30	11	-175	-9	-99	0	-90	-9	190122
HSK-25	12	30	49	9	11	57	2	-174	-7	99	0	90	81	207516	10	0	33	50	-175	-8	-100	0	90	-80	181499
GWM-24	11	35	45	9	12	42	17	-174	-8	98	0	90	-8	205999	10	0	18	3	-175	-9	-99	0	-90	-9	182065
PKS-96	7	46	27	9	14	24	21	-174	-7	79	30	60	10	200861	9	22	10	48	-175	-8	-79	30	-60	9	184885

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	12 22 12	9	14	24	45	-174	-7	98	0	90	-8	202565	10	2	46	57	-175	-9	-99	0	-90	-9	176645		
MAD-23	10 44 37	9	23	1	49	-173	-9	102	0	90	78	184790	10	9	46	26	-175	-11	-104	0	90	-76	160577		
ACN-75	12 2 10	9	23	6	37	-173	-8	99	0	90	-9	184622	10	11	8	47	-175	-10	-100	0	-90	-10	157270		
CYI-04	11 10 31	9	23	35	16	-173	-9	100	0	90	-10	183599	10	10	45	47	-175	-11	-102	0	-90	-12	158198		
BDA-02	10 59 19	10	2	57	9	-173	-10	101	0	90	-11	176266	10	13	56	28	-174	-11	-103	0	-90	-13	150349		
MIL-71	11 6 14	10	3	58	12	-173	-10	101	0	90	-11	174000	10	15	4	26	-174	-11	-103	0	-90	-13	147473		
TEX-16	11 7 7	10	5	4	39	-173	-10	101	0	90	-11	171505	10	16	11	46	-174	-12	-103	0	-90	-13	144579		
GDS-28	10 49 30	10	6	30	53	-173	-10	103	0	90	77	168222	10	17	20	23	-174	-12	-105	0	90	-75	141582		
STN-00	10 44 2	10	6	54	39	-173	-10	103	0	90	-13	167308	10	17	38	42	-174	-12	-105	0	-90	-15	140775		
MAR-95	9 48 2	10	7	1	47	-173	-10	107	6	84	-17	166673	10	16	49	50	-174	-12	-109	6	-84	-19	142563		
HAW-12	11 14 47	10	9	10	49	-173	-10	101	0	90	-11	161992	10	20	25	35	-174	-12	-103	0	-90	-13	133243		
HSK-25	12 55 49	10	11	51	47	-172	-9	102	0	90	78	155521	11	0	47	36	-173	-12	-105	0	90	-75	120737		
GWM-24	11 28 48	10	12	47	33	-172	-11	101	0	90	-11	153224	11	0	16	20	-174	-13	-103	0	-90	-13	122275		
PKS-96	8 2 19	10	14	19	49	-172	-10	82	30	60	7	147657	10	22	22	8	-174	-12	-84	30	-60	5	126082		
CRO-08	12 35 35	10	14	22	29	-172	-10	101	0	90	-11	149257	11	2	58	4	-173	-13	-104	0	-90	-14	114148		
ACN-75	12 7 50	10	23	10	38	-171	-12	102	0	90	-12	125471	11	11	18	28	-172	-16	-106	0	-90	-16	85962		
MAD-23	10 6 16	10	23	22	39	-171	-13	108	0	90	72	124887	11	9	28	55	-172	-17	-113	0	90	-67	92600		
CYI-04	10 46 23	10	23	50	37	-171	-13	105	0	90	-15	123532	11	10	37	0	-172	-17	-110	0	-90	-20	88509		
BDA-02	10 24 50	11	3	17	44	-170	-14	107	0	90	-17	113128	11	13	42	34	-171	-19	-113	0	-90	-23	76695		
MIL-71	10 34 56	11	4	17	59	-170	-15	107	0	90	-17	109974	11	14	52	55	-171	-20	-113	0	-90	-23	71919		
TEX-16	10 34 45	11	5	25	21	-170	-15	107	0	90	-17	106372	11	16	0	6	-171	-21	-114	0	-90	-24	67174		
GDS-28	10 0 51	11	6	58	8	-169	-16	110	0	90	70	101272	11	16	58	59	-170	-22	-118	0	90	-62	62848		

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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	9	50	4	11	7	24	2	-169	-16	110	0	90	-20	99818	11	17	14	6	-170	-23	-119	0	-90	-29	61711
MAR-95	8	54	56	11	7	31	21	-169	-16	115	6	83	-25	99045	11	16	26	16	-170	-22	-122	6	-83	-32	64912
HAW-12	10	41	2	11	9	34	20	-168	-17	108	0	90	-18	92281	11	20	15	22	-169	-26	-118	0	-90	-28	46975
HSK-25	14	29	59	11	11	48	26	-168	-15	109	0	90	71	84090	12	2	18	25	41	-3	94	0	90	86	1695
GWM-24	10	58	57	11	13	12	35	-167	-18	109	0	90	-19	78679	12	0	11	32	-166	-40	-131	0	-90	-41	22638
PKS-96	11	51	22	11	14	20	39	-167	-17	92	30	60	-2	72436	12	2	12	1	42	-74	162	30	29	-55	1924
CRO-08	11	44	28	11	14	27	23	-166	-17	109	0	90	-19	73680	12	2	11	51	30	-45	142	0	90	-52	3248

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TABLE 6-I.- MISSION RADAR TIMELINE - Continued

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

16 APR 72 LM TRACKING FROM PDI TO LANDING LAZ 72-1

VEHICLE ↓ 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	0 12 2	4	2	34	41	126	18	-128	59	20	-24	204342				4	2	46	42	127	18	-124	57	20	-27	204260
GUS-28	0 12 2	4	2	34	41	128	18	76	12	-50	72	206572				4	2	46	42	128	18	77	14	-41	71	206310
MAR-95	0 12 2	4	2	34	41	128	18	76	12	78	14	206572				4	2	46	42	128	18	77	14	76	12	206310
STN-00	0 12 2	4	2	34	41	128	18	73	8	81	17	206784				4	2	46	42	128	18	75	10	79	15	206525
MIL-71	0 12 2	4	2	34	41	128	18	90	42	48	0	204996				4	2	46	42	128	18	91	44	46	-1	204754
BDA-02	0 12 2	4	2	34	41	127	18	105	55	34	-8	204467				4	2	46	42	128	18	107	57	32	-9	204257
CYI-04	0 12 2	4	2	34	41	127	19	-122	74	-13	-8	203983				4	2	46	42	127	18	-117	72	-16	-8	203883
ACN-75	0 12 2	4	2	34	41	127	19	-29	59	-16	27	204337				4	2	46	42	127	19	-33	58	-19	27	204242
TEX-16	0 12 2	4	2	34	41	128	18	82	27	63	7	205727				4	2	46	42	128	18	83	29	61	6	205464

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TABLE 6-I.- MISSION RADAR TIMELINE - Continued

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

16 APR 72 LM ASCENT TRACKING LAZ 7201

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 7 14	7	3	45	9	163	3	-164	51	37	-10	211897	7	3	52	23	163	3	-161	51	37	-12	211851			
MIL-71 X-Y USB-30	0 7 14	7	3	45	9	164	3	98	21	69	-8	213336	7	3	52	23	164	3	99	23	67	-9	213194			
BDA-02 X-Y USB-30	0 7 14	7	3	45	9	163	3	110	34	55	-17	212672	7	3	52	23	164	3	112	35	53	-18	212546			
CYI-04 X-Y USB-30	0 7 14	7	3	45	9	163	3	176	65	2	-25	211469	7	3	52	23	163	3	-180	65	0	-25	211407			
ACN-75 X-Y USB-30	0 7 14	7	3	45	9	163	4	2	78	0	12	211232	7	3	52	23	163	4	-6	78	-1	12	211169	6 13 00		
TEX-16 X-Y USB-30	0 7 14	7	3	45	9	164	3	90	7	83	0	214187	7	3	52	23	164	3	91	8	82	-1	214038			

TABLE 6-I.- MISSION RADAR TIMELINE - Continued

(f) LM acquisition and termination during rendezvous - 0° minimum elevation
COAST TO RENDEZVOUS RADAR TRACKING PRIOR TO TPI

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA									
	HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USB-85	0	10	0	171	52	23	163	3	-161	51	37	-12	211949	172	2	23	163	3	-158	50	38	-14	212140
MIL-71 X-Y USB-30	0	10	0	171	52	23	164	3	99	23	67	-9	213290	172	2	23	164	3	101	25	65	-10	213347
BDA-02 X-Y USB-30	0	10	0	171	52	23	164	3	112	35	53	-18	212642	172	2	23	164	3	113	37	51	-19	212721
CYI-04 X-Y USB-30	0	10	0	171	52	23	163	3	180	65	0	-25	211505	172	2	23	163	3	-174	65	-3	-25	211674
ACN-75 X-Y USB-30	0	10	0	171	52	23	163	4	-7	78	-1	12	211206	172	2	23	163	4	-18	78	-4	12	211437
TEX-16 X-Y USB-30	0	10	0	171	52	23	164	3	91	8	82	-1	214134	172	2	23	164	3	92	10	80	-2	214180
RENDEZVOUS RADAR TRACKING PRIOR TO TPI																							
MAD-23 X-Y USB-85	0	17	60	172	2	23	163	3	-158	50	38	-14	212140	172	20	23	163	3	-152	49	38	-18	213016
MIL-71 X-Y USB-30	0	17	60	172	2	23	164	3	101	25	65	-10	213347	172	20	23	164	3	103	28	61	-11	213972
BDA-02 X-Y USB-30	0	17	60	172	2	23	164	3	113	37	51	-19	212721	172	20	23	164	3	117	40	47	-20	213390
CYI-04 X-Y USB-30	0	17	60	172	2	23	163	3	-174	65	-3	-25	211674	172	20	23	163	3	-164	64	-7	-25	212513

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	0	17	60		172	2	23	163	4	-18	78	-4	12	211457		172	20	23	163	4	-35	76	-8	11	212281
TEX-16 X-Y USB-30	0	17	60		172	2	23	164	3	92	10	80	-2	214180		172	20	23	164	3	94	14	76	-4	214780
COAST TU TPI																									
TEX-16 X-Y USB-30	0	4	12		172	20	23	164	3	94	14	76	-4	214780		172	24	35	164	3	94	15	75	-4	214949
MIL-71 X-Y USB-30	0	4	13		172	20	23	164	3	103	28	61	-11	213972		172	24	36	164	3	104	29	60	-12	214149
BDA-02 X-Y USB-30	0	4	19		172	20	23	164	3	117	40	47	-20	213390		172	24	42	164	3	118	41	46	-21	213582
CYI-04 X-Y USB-30	0	4	30		172	20	23	163	3	-164	64	-7	-25	212513		172	24	53	163	3	-162	64	-9	-25	212756
MAD-23 X-Y USB-85	0	4	32		172	20	23	163	3	-152	49	38	-18	213016		172	24	55	163	3	-150	48	38	-19	213270
ACN-75 X-Y USB-30	0	4	35		172	20	23	163	4	-35	76	-8	11	212281		172	24	58	163	4	-39	75	-9	11	212532
ULLAGE FOR TPI																									
TPI																									
COAST TU 1ST BRAKING GATE																									
STN-00 A-E USB150	0	7	11		173	11	15	164	3	89	3	87	1	215771		173	18	25	164	3	90	5	85	0	215337
GDS-28 X-Y USB-85	0	7	10		173	11	15	164	3	92	8	14	82	215513		173	18	25	164	3	93	9	18	80	215078

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA										
	HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MIL-71 X-Y USB-30	0	7	6	173	11	19	164	3	111	39	49	-16	213804	173	18	25	164	3	113	41	47	-17	213392
TEX-16 X-Y USB-30	0	7	8	173	11	19	164	3	100	25	65	-9	214512	173	18	25	164	3	101	27	63	-10	214083
BDA-02 X-Y USB-30	0	7	5	173	11	21	164	3	100	49	33	-25	2129572	173	18	25	164	3	132	50	32	-25	212984
MAD-23 X-Y USB-85	0	0	53	173	11	34	163	3	-155	43	37	-31	213623	173	18	25	163	3	-133	42	37	-33	213327
CYI-04 X-Y USB-30	0	0	52	173	11	34	163	3	-159	59	-21	-23	213029	173	18	25	163	3	-137	58	-23	-23	212724
ACN-75 X-Y USB-30	0	0	46	173	11	39	163	4	-62	60	-21	11	212831	173	18	25	163	4	-64	65	-23	11	212535
COAST TO 2ND BRAKING GATE																							
MAD-23 X-Y USB-85	0	2	23	173	18	25	163	3	-155	42	37	-33	213327	173	20	48	163	3	-132	42	37	-34	213224
GDS-28 X-Y USB-85	0	2	23	173	18	25	164	3	93	9	18	80	215070	173	20	48	164	3	93	10	19	80	214933
MIL-71 X-Y USB-30	0	2	23	173	18	25	164	3	113	41	47	-17	213392	173	20	48	164	3	113	41	47	-17	213253
BDA-02 X-Y USB-30	0	2	23	173	18	25	164	3	132	50	32	-25	212984	173	20	48	164	3	133	51	31	-26	212853

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA											
	HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CYI-04 X-Y USB-30	0	2	23	173	18	25	163	3	-137	58	-23	-23	212724	173	20	48	163	3	-136	57	-24	-23	212618
ACN-75 X-Y USB-30	0	2	23	173	18	25	163	4	-64	65	-23	11	212535	173	20	48	163	4	-65	64	-24	11	212430
TEX-16 X-Y USB-30	0	2	23	173	18	25	164	3	101	27	63	-10	214083	173	20	48	164	3	102	27	62	-10	213939
STN-00 A-E USB150	0	2	23	173	18	25	164	3	90	5	85	0	215537	173	20	48	164	3	90	5	85	0	215192
	1ST BRAKING MANEUVER *																						
MAD-23 X-Y USB-85	0	0	11	173	20	48	163	3	-132	42	37	-34	213224	173	20	59	163	3	-132	42	37	-34	213217
GDS-28 X-Y USB-85	0	0	11	173	20	48	164	3	93	10	19	80	214933	173	20	59	164	3	93	10	19	80	214922
MIL-71 X-Y USB-30	0	0	11	173	20	48	164	3	113	41	47	-17	213253	173	20	59	164	3	113	41	46	-17	213243
BDA-02 X-Y USB-30	0	0	11	173	20	48	164	3	133	51	31	-26	212853	173	20	59	164	3	133	51	31	-26	212843
CYI-04 X-Y USB-30	0	0	11	173	20	48	163	3	-136	57	-24	-23	212618	173	20	59	163	3	-136	57	-24	-23	212610
ACN-75 X-Y USB-30	0	0	11	173	20	48	163	4	-65	64	-24	11	212430	173	20	59	163	4	-65	64	-24	11	212422

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA											
	HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	
TEX-16 X-Y USB-30	0	0	11	173	20	48	164	3	102	27	62	-10	213939	173	20	59	164	3	102	27	62	-10	213928	
STN-00 A-E USB150	0	0	11	173	20	48	164	3	90	5	85	0	215192	173	20	59	164	3	91	5	85	-1	215181	
	COAST TO 3RD BRAKING GATE																							
MAD-23 X-Y USB-85	0	1	3	173	20	59	163	3	-132	42	37	-34	213217	173	22	1	163	3	-132	41	37	-34	213172	
GDS-28 X-Y USB-85	0	1	3	173	20	59	164	3	93	10	19	80	214922	173	22	1	164	3	94	10	20	80	214858	
MIL-71 X-Y USB-30	0	1	3	173	20	59	164	3	113	41	46	-17	213243	173	22	1	164	3	114	41	46	-17	213183	
BDA-02 X-Y USB-30	0	1	3	173	20	59	164	3	133	51	31	-26	212843	173	22	1	164	3	133	51	31	-26	212786	
CYI-04 X-Y USB-30	0	1	3	173	20	59	163	3	-130	57	-24	-23	212610	173	22	1	163	3	-135	57	-24	-23	212564	
ACN-75 X-Y USB-30	0	1	3	173	20	59	163	4	-65	64	-24	11	212422	173	22	1	163	4	-65	64	-24	11	212377	
TEX-16 X-Y USB-30	0	1	3	173	20	59	164	3	102	27	62	-10	213928	173	22	1	164	3	102	27	62	-11	213865	
STN-00 A-E USB150	0	1	3	173	20	59	164	3	91	5	85	-1	215181	173	22	1	164	3	91	5	85	-1	215118	

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2ND BRAKING MANEUVER *

VEHICLE 2 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA															
		HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	
MAD-23 X-Y USB-85	0 0 9					173	22	1	163	3 -132	41	37	-34	213172					173	22	10	163	3 -132	41	37	-34	213166
GDS-28 X-Y USB-85	0 0 9					173	22	1	164	3 94	10	20	80	214858					173	22	10	164	3 94	10	20	80	214849
MIL-71 X-Y USB-30	0 0 9					173	22	1	164	3 114	41	46	-17	213183					173	22	10	164	3 114	41	46	-17	213174
BDA-02 X-Y USB-30	0 0 9					173	22	1	164	3 133	51	31	-26	212786					173	22	10	164	3 133	51	31	-26	212778
CYI-04 X-Y USB-30	0 0 9					173	22	1	163	3 -135	57	-24	-23	212564					173	22	10	163	3 -135	57	-24	-23	212557
ACN-75 X-Y USB-30	0 0 9					173	22	1	163	4 -65	64	-24	11	212377					173	22	10	163	4 -65	64	-24	11	212370
TEX-16 X-Y USB-30	0 0 9					173	22	1	164	3 102	27	62	-11	213865					173	22	10	164	3 102	27	62	-11	213856
STN-00 A-E USB150	0 0 9					173	22	1	164	3 91	5	85	-1	215118					173	22	10	164	3 91	5	85	-1	215109
COAST TO 4TH BRAKING GATE																											
MAD-23 X-Y USB-85	0 1 29					173	22	10	163	3 -132	41	37	-34	213106					173	23	40	163	3 -132	41	37	-34	213103
GDS-28 X-Y USB-85	0 1 29					173	22	10	164	3 94	10	20	80	214849					173	23	40	164	3 94	10	20	79	214761

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA											
	HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MIL-71 X-Y USB-30	0	1	29	173	22	10	164	3	114	41	46	-17	213174	173	23	40	164	3	114	42	46	-18	213089
BDA-02 X-Y USB-30	0	1	29	173	22	10	164	3	135	51	31	-26	212778	173	23	40	164	3	134	51	30	-26	212698
CYI-04 X-Y USB-30	0	1	29	173	22	10	163	3	-135	57	-24	-23	212557	173	23	40	163	3	-135	57	-25	-23	212493
ACN-75 X-Y USB-30	0	1	29	173	22	10	163	4	-65	64	-24	11	212370	173	23	40	163	3	-65	63	-24	11	212307
TEX-16 X-Y USB-30	0	1	29	173	22	10	164	3	102	27	62	-11	213850	173	23	40	164	3	102	28	62	-11	213768
STN-00 A-E USB150	0	1	29	173	22	10	164	3	91	5	85	-1	215109	173	23	40	164	3	91	6	84	-1	215020
3RD BRAKING MANEUVER *																							
MAD-23 X-Y USB-30	0	0	4	173	23	40	163	3	-132	41	37	-34	213103	173	23	44	163	3	-132	41	37	-34	213100
GDS-23 X-Y USB-25	0	0	4	173	23	40	164	3	94	10	20	79	214761	173	23	44	164	3	94	10	20	79	214756
MIL-71 X-Y USB-30	0	0	4	173	23	40	164	3	114	42	40	-18	213089	173	23	44	164	3	114	42	40	-18	213085
BDA-02 X-Y USB-30	0	0	4	173	23	40	164	3	134	51	30	-26	212690	173	23	44	164	3	134	51	30	-26	212694

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA											
	HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
CYI-04 X-Y USB-30	0	0	4	173	23	40	163	3	-135	57	-25	-23	212493	173	23	44	163	3	-135	57	-25	-23	212490
ACN-75 X-Y USB-30	0	0	4	173	23	40	163	3	-65	63	-24	11	212307	173	23	44	163	3	-65	63	-25	11	212304
TEX-16 X-Y USB-30	0	0	4	173	23	40	164	3	102	28	62	-11	213768	173	23	44	164	3	102	28	62	-11	213763
STN-00 A-E USB150	0	0	4	173	23	40	164	3	91	6	84	-1	215020	173	23	44	164	3	91	6	84	-1	215016
	COAST TO 5TH BRAKING GATE																						
MAD-23 X-Y USB-85	0	1	15	173	23	44	163	3	-132	41	37	-34	213100	173	24	59	163	3	-131	41	37	-35	213049
GDS-28 X-Y USB-85	0	1	15	173	23	44	164	3	94	10	20	79	214756	173	24	59	164	3	94	10	21	79	214683
MIL-71 X-Y USB-30	0	1	15	173	23	44	164	3	114	42	46	-18	213085	173	24	59	164	3	114	42	46	-18	213015
BDA-02 X-Y USB-30	0	1	15	173	23	44	164	3	134	51	30	-26	212694	173	24	59	164	3	134	51	30	-26	212628
CYI-04 X-Y USB-30	0	1	15	173	23	44	163	3	-135	57	-25	-23	212490	173	24	59	163	3	-134	57	-25	-23	212437
ACN-75 X-Y USB-30	0	1	15	173	23	44	163	3	-65	63	-25	11	212304	173	24	59	163	3	-66	63	-25	11	212251

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA									STATION TERMINATION DATA											
	HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	
TEX-16 X-Y USB-30	0	1	15	173	23	44	164	3	102	28	62	-11	213703	173	24	59	164	3	102	28	61	-11	213690	
STN-00 A-E USB150	0	1	15	173	23	44	164	3	91	6	84	-1	215016	173	24	59	164	3	91	6	84	-1	214942	
	4TH BRAKING MANEUVER																							
MAD-23 X-Y USB-85	0	0	4	173	24	59	163	3	-131	41	37	-35	213049	173	25	4	163	3	-131	41	37	-35	213046	
GDS-28 X-Y USB-85	0	0	4	173	24	59	164	3	94	10	21	79	214683	173	25	4	164	3	94	10	21	79	214679	
MIL-71 X-Y USB-30	0	0	4	173	24	59	164	3	114	42	46	-18	213015	173	25	4	164	3	114	42	46	-18	213011	
BDA-02 X-Y USB-30	0	0	4	173	24	59	164	3	134	51	30	-26	212628	173	25	4	164	3	134	51	30	-26	212624	
CYI-04 X-Y USB-30	0	0	4	173	24	59	163	3	-134	57	-25	-23	212437	173	25	4	163	3	-134	57	-25	-23	212434	
ACN-75 X-Y USB-30	0	0	4	173	24	59	163	3	-66	63	-25	11	212251	173	25	4	163	3	-66	63	-25	11	212249	
TEX-16 X-Y USB-30	0	0	4	173	24	59	164	3	102	28	61	-11	213690	173	25	4	164	3	102	28	61	-11	213686	
STN-00 A-E USB150	0	0	4	173	24	59	164	3	91	6	84	-1	214942	173	25	4	164	3	91	6	84	-1	214938	

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COAST TO DOCKING

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA												
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X-Y USB-85	0	4	23		173	25	4	163	3 -131	41	37	-35	213046		173	29	27	163	3 -130	40	37	-36	212882	
GDS-28 X-Y USB-85	0	4	23		173	25	4	164	3 94	10	21	79	214679		173	29	27	164	3 95	11	22	78	214436	
MIL-71 X-Y USB-30	0	4	23		173	25	4	164	3 114	42	46	-18	213011		173	29	27	164	3 115	43	44	-18	212782	
BDA-02 X-Y USB-30	0	4	23		173	25	4	164	3 134	51	30	-26	212624		173	29	27	164	3 136	52	29	-26	212409	
CYI-04 X-Y USB-30	0	4	23		173	25	4	163	3 -134	57	-25	-23	212434		173	29	27	163	3 -133	56	-26	-22	212264	
ACN-75 X-Y USB-30	0	4	23		173	25	4	163	3 -06	63	-25	11	212249		173	29	27	163	3 -67	62	-26	11	212081	
TEX-16 X-Y USB-30	0	4	23		173	25	4	164	3 102	28	61	-11	213686		173	29	27	164	3 103	29	60	-11	213446	
STN-00 A-E USB150	0	4	23		173	25	4	164	3 91	6	84	-1	214938		173	29	27	164	3 92	7	83	-2	214697	

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TABLE 6-I.- MISSION RADAR TIMELINE - Continued

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

16 APR 72

EOI TO TLI

LAZ 72.1

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	0	2	59	0	0	11	57	-53	01	-25	10	-66	63	395	0	0	14	56	171	29	59	3	86	31	645
CYI-04	0	2	21	0	0	17	28	7	16	-73	3	-87	16	644	0	0	22	49	179	-19	114	3	87	-23	638
CRO-08	0	3	31	0	0	53	17	131	-42	-135	3	-86	-45	630	0	0	56	48	-5	-46	141	3	85	-51	630
HSK-25	0	3	54	0	1	0	28	-150	17	-66	3	-83	-66	627	0	1	4	22	-38	42	31	3	-87	30	625
TEX-16	0	5	16	0	1	31	45	-47	0	-92	3	-87	-2	641	0	1	37	1	141	25	63	3	87	27	646
MIL-71	0	5	2	0	1	35	39	-39	16	-73	3	-87	17	646	0	1	40	41	158	24	64	3	87	26	647
BDA-02	0	5	25	0	1	39	2	-16	6	-85	3	-87	5	646	0	1	44	26	160	-3	95	3	87	-5	645
SHIP 1	0	5	10	0	1	42	50	-12	28	-60	3	-87	30	646	0	1	48	0	180	3	88	3	87	2	642
CYI-04	0	2	36	0	1	51	4	54	-25	-120	3	-87	-30	639	0	1	53	40	124	-59	-179	3	-22	-87	633
CRO-08	0	4	12	0	2	25	52	152	-44	-138	3	-86	-48	630	0	2	30	3	4	-25	116	3	87	-26	628
					16	APR	72					TLI TO LOI			LAZ	72.1									
HAW-12	13	25	17	0	2	43	49	-69	-41	-137	3	-86	-47	1844	0	16	9	6	99	26	-63	3	-87	27	77922
STN-00	11	21	46	0	2	49	50	-37	-18	-116	3	-87	-26	3184	0	14	11	36	97	26	-59	3	-87	31	70410
GDS-28	10	52	5	0	2	50	30	-37	-14	-109	3	81	-71	3334	0	13	42	35	97	26	-60	3	-84	-60	68471
MAR-95	10	33	46	0	2	51	8	-34	-12	-110	6	-84	-19	3306	0	13	24	54	96	26	-62	6	-83	28	67092
TEX-16	9	1	59	0	2	54	18	-28	3	-89	3	-87	1	4164	0	11	56	18	94	27	-61	3	-87	29	61041
MIL-71	7	45	41	0	2	59	11	-14	10	-81	3	-87	9	5192	0	10	44	52	92	27	-61	3	-87	29	55717
BDA-02	6	38	37	0	3	5	7	0	13	-70	3	-87	14	6391	0	9	43	44	90	27	-60	3	-87	30	50903
SHIP 1	1	54	48	0	3	15	36	16	21	-68	3	-87	22	8378	0	5	10	24	69	30	-68	27	-61	19	23398
GWM-24	13	4	18	0	6	37	52	92	30	00	3	87	30	34244	0	19	42	10	101	26	-64	3	-87	26	90405
HSK-25	8	16	49	0	9	1	12	96	33	46	3	-86	46	47380	0	17	18	1	100	29	-51	3	-85	-54	82098
CRO-08	9	38	27	0	10	46	19	99	31	54	3	86	36	55818	0	20	24	46	102	27	-58	3	-86	32	92747
MAD-23	14	38	23	0	16	17	17	104	25	59	3	-84	58	78431	1	6	55	41	107	24	-61	3	-84	-61	123250

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	13	28	19	0	17	41	10	105	26	62	3	87	28	83481	1	7	9	29	107	24	-64	3	-87	26	123843
ACN-75	11	0	47	0	18	53	19	106	27	62	3	87	28	87653	1	5	54	5	106	25	-64	3	-87	26	120560
BDA-02	13	45	40	0	20	53	29	106	25	62	3	87	28	94313	1	10	39	9	108	24	-64	3	-87	26	132561
MIL-71	13	25	57	0	22	9	14	107	25	63	3	87	27	98330	1	11	35	12	108	24	-64	3	-87	26	134798
TEX-16	13	20	56	0	23	19	56	107	25	63	3	87	27	101967	1	12	40	52	108	24	-65	3	-87	25	137374
GDS-28	13	50	46	1	0	20	44	108	25	62	3	-84	61	105016	1	14	17	30	109	24	-63	3	-83	-63	141078
STN-00	14	7	27	1	0	36	47	108	25	61	3	87	29	105808	1	14	44	14	109	23	-63	3	-87	27	142085
MAR-95	13	23	39	1	0	37	33	108	25	64	6	83	26	105666	1	14	1	12	109	24	-65	6	-83	25	140280
HAW-12	12	54	2	1	3	47	11	109	25	64	3	87	25	114858	1	16	41	13	109	24	-66	3	-87	24	146402
GWM-24	12	18	6	1	7	51	2	110	25	65	3	87	25	125614	1	20	9	8	110	24	-66	3	-87	24	153752
HSK-25	8	43	13	1	9	23	33	110	26	55	3	-85	55	129472	1	18	6	45	110	25	-56	3	-85	-56	149467
CRO-08	9	46	14	1	11	14	4	111	25	60	3	87	30	133951	1	21	0	18	110	24	-61	3	-87	29	155496
PKS-96	1	48	51	1	12	53	18	110	26	14	30	23	57	136316	1	14	42	8	110	25	-15	30	-24	57	140463
MAD-23	14	10	50	1	16	54	43	112	23	62	3	-84	62	146894	2	7	5	40	112	22	-63	3	-83	-63	174624
CYI-04	13	10	6	1	18	11	42	112	23	65	3	87	25	149652	2	7	21	48	112	23	-66	3	-87	24	175097
ACN-75	10	59	32	1	19	13	24	112	24	65	3	87	25	151817	2	6	12	55	111	23	-66	3	-87	24	173057
BDA-02	13	29	27	1	21	20	13	112	23	64	3	87	26	156178	2	10	49	40	112	22	-65	3	-87	25	181240
MIL-71	13	11	59	1	22	33	31	113	23	65	3	87	25	158631	2	11	45	30	112	22	-66	3	-87	24	182717
TEX-16	13	7	54	1	23	42	37	113	23	65	3	87	25	160905	2	12	50	31	112	22	-66	3	-87	24	184474
GDS-28	13	40	44	2	0	44	6	113	23	64	3	-83	64	162896	2	14	24	50	113	22	-65	3	-83	-65	187008
MAR-95	13	8	29	2	1	0	27	113	23	66	6	83	24	163239	2	14	8	56	113	22	-67	6	-83	23	186404
STN-00	13	50	49	2	1	0	30	113	23	63	3	87	27	163421	2	14	51	19	113	22	-64	3	-87	26	187744

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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	12	44	57	2	4	4	48	113	23	66	3	87	24	169191	2	16	49	44	113	22	-67	3	-87	23	190897
GWM-24	12	12	53	2	8	4	32	114	23	67	3	87	23	176342	2	20	17	5	113	22	-68	3	-87	22	196305
HSK-25	8	55	14	2	9	27	16	114	24	58	3	-84	58	178719	2	18	22	29	113	23	-58	3	-84	-58	193302
CRO-08	9	51	14	2	11	20	22	114	24	62	3	87	28	181976	2	21	11	35	113	23	-63	3	-87	27	197662
PKS-96	2	42	7	2	12	36	52	114	24	22	30	32	54	182548	2	15	18	59	113	24	-22	30	-33	53	186952
MAD-23	9	10	5	2	17	7	43	115	22	63	3	-83	63	191355	3	2	17	48	113	22	-112	56	14	-31	203079
CYI-04	7	55	38	2	18	22	9	115	22	66	3	87	24	193304	3	2	17	47	113	22	-100	69	-20	-3	202728
ACN-75	6	58	22	2	19	19	25	115	23	66	3	87	24	194799	3	2	17	47	113	23	-36	51	-25	30	203244
BDA-02	4	48	27	2	21	29	9	115	22	66	3	87	24	198116	3	2	17	36	114	22	105	64	26	-7	202860
MIL-71	3	36	23	2	22	41	10	115	22	66	3	87	24	199996	3	2	17	34	114	22	89	50	40	1	203298
TEX-16	2	27	41	2	23	49	50	115	22	67	3	87	23	201816	3	2	17	31	114	22	81	35	55	7	203948
GDS-28	1	20	45	3	0	50	46	115	22	65	3	-83	65	203429	3	2	17	31	114	22	77	20	-32	66	204740
MAR-95	1	10	58	3	1	6	32	115	22	67	6	84	23	203679	3	2	17	31	114	22	77	20	69	13	204740
STN-00	1	10	34	3	1	6	57	115	22	64	3	87	25	203869	3	2	17	31	114	22	75	16	73	15	204947
				16 APR 72				LCL TO DOI					LAZ 72.1												
GDS-28	1	24	40	3	2	50	11	114	22	81	27	-17	62	203992	3	4	14	51	115	22	92	43	2	47	203237
STN-00	1	24	58	3	2	50	12	114	22	79	23	67	10	204201	3	4	14	50	115	22	91	39	51	0	203433
MAR-95	1	24	37	3	2	50	12	114	22	81	27	63	8	203990	3	4	14	50	115	22	92	43	47	-2	203237
TEX-16	1	24	41	3	2	50	14	114	22	84	43	47	4	203222	3	4	14	55	115	22	93	60	30	-2	202607
MIL-71	1	24	39	3	2	50	19	114	22	93	58	32	-1	202650	3	4	14	58	115	22	111	75	14	-5	202283
BDA-02	1	24	40	3	2	50	23	114	22	116	70	18	-8	202314	3	4	15	3	115	22	-175	80	-1	-10	202223
CYI-04	1	24	38	3	2	50	38	113	22	-94	62	-28	-2	202512	3	4	15	16	114	22	-85	44	-46	3	203224
MAD-23	1	24	39	3	2	50	39	113	22	-104	50	12	-38	202897	3	4	15	17	114	22	-90	35	0	-55	203642

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VEHICLE 1 RADAR TABLE

VEHICLE	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
	HRS	MIN	SEC																						
ACN-75	1	24	.36	3	2	50	.43	113	23	-45	46	-34	30	203053	3	4	15	19	114	23	-58	30	-55	27	203855
HAW-12	0	3	.28	3	4	11	.17	116	22	68	3	87	22	205206	3	4	14	.45	116	22	68	4	86	22	205347
HAW-12	1	24	.40	3	4	58	.33	116	22	71	13	76	18	205020	3	6	23	.18	117	22	77	31	58	11	204086
STN-00	1	24	.48	3	4	58	.39	115	22	98	48	42	-5	203285	3	6	23	.27	116	22	118	63	25	-12	202830
MAR-95	1	24	.49	3	4	58	.40	115	22	100	52	37	-6	203109	3	6	23	.29	116	22	122	67	19	-12	202713
GDS-28	1	24	.49	3	4	58	.41	115	22	100	52	7	37	203107	3	6	23	.30	116	22	122	67	12	19	202713
TEX-16	1	24	.52	3	4	58	.46	115	22	102	70	19	-4	202590	3	6	23	.37	116	22	173	84	1	-6	202478
MIL-71	1	24	.52	3	4	58	.50	115	22	150	83	4	-6	202414	3	6	23	.42	116	22	-111	74	-15	-6	202605
BDA-02	1	24	.50	3	4	58	.54	114	22	-130	75	-12	-10	202499	3	6	23	.45	116	22	-102	59	-30	-6	202949
MAD-23	1	24	.40	3	4	59	.4	114	22	-83	26	-14	-63	204276	3	6	23	.50	115	21	-71	11	-58	-68	205224
CYI-04	1	24	.45	3	4	59	.6	114	22	-81	34	-56	7	203878	3	6	23	.51	115	22	-74	17	-73	15	204916
ACN-75	1	24	.43	3	4	59	.9	114	22	-62	21	-67	26	204561	3	6	23	.52	115	22	-67	3	-87	23	205707
				16 APR 72				DCI TO SEP				LAZ 72.1													
HAW-12	1	5	10	3	7	10	.47	117	22	80	42	47	7	203535	3	8	15	.57	118	22	84	56	34	3	203210
GDS-28	1	5	12	3	7	10	.57	116	22	149	74	13	8	202531	3	8	16	.9	117	21	-154	75	14	-7	202763
MAR-95	1	5	13	3	7	10	.58	116	22	150	74	8	-13	202532	3	8	16	10	117	21	-155	75	-7	-14	202765
STN-00	1	5	12	3	7	10	.59	116	22	139	70	13	-15	202606	3	8	16	11	117	21	-175	74	-2	-16	202779
TEX-16	1	5	13	3	7	11	.7	116	22	-117	78	-11	-5	202473	3	8	16	.19	117	22	-98	65	-25	-3	202975
MIL-71	1	5	14	3	7	11	.10	115	22	-98	63	-26	-4	202753	3	8	16	.23	116	21	-90	50	-40	0	203455
BDA-02	1	5	15	3	7	11	.13	115	22	-94	49	-41	-2	203222	3	8	16	.28	116	21	-86	36	-54	3	204059
CYI-04	0	17	.18	3	7	11	.22	115	21	-69	6	-83	21	205419	3	7	28	.40	115	21	-67	3	-87	23	204807
GWM-24	1	5	.19	3	9	4	.40	118	21	71	14	75	19	205267	3	10	9	.59	119	21	73	28	61	15	204703
HAW-12	1	5	.21	3	9	4	.51	117	22	87	68	22	1	202911	3	10	10	12	118	21	94	82	8	-1	202933

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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	1	5	21	3	9	4	60	117	21	-124	68	13	-18	202899	3	10	10	21	118	21	-106	56	10	-32	203476
MAR-95	1	5	21	3	9	5	0	117	21	-124	68	-19	-12	202900	3	10	10	21	118	21	-106	56	-33	-9	203476
STN-00	1	5	18	3	9	5	1	117	21	-139	70	-14	-15	202858	3	10	10	19	118	21	-114	60	-28	-12	203369
TEX-16	1	5	21	3	9	5	5	116	21	-91	54	-36	-1	203301	3	10	10	25	117	21	-85	40	-50	4	204118
MIL-71	1	5	20	3	9	5	9	116	21	-85	39	-51	4	203905	3	10	10	28	117	21	-79	26	-64	10	204848
BDA-02	1	5	18	3	9	5	10	116	21	-80	26	-64	9	204574	3	10	10	28	117	21	-73	13	-76	16	205557
HSK-25	0	35	50	3	9	34	13	118	22	60	3	-84	60	204804	3	10	10	3	119	22	55	9	-75	54	205779
GWM-24	1	5	33	3	10	58	23	119	21	73	39	49	13	204171	3	12	3	56	120	21	72	54	35	10	203789
HSK-25	1	5	22	3	10	58	37	119	22	46	17	-67	44	205355	3	12	3	60	120	22	34	25	-61	30	205107
HAW-12	1	5	28	3	10	58	45	118	21	-102	86	-4	-1	202924	3	12	4	13	119	21	-90	72	-18	0	203311
STN-00	1	5	18	3	10	59	1	118	21	-102	50	-39	-8	203686	3	12	4	19	119	21	-92	38	-52	-1	204454
MAR-95	1	5	18	3	10	59	1	117	21	-96	46	-43	-4	203841	3	12	4	19	118	21	-87	34	-56	2	204662
GDS-28	1	5	16	3	10	59	4	117	21	-96	46	6	-43	203839	3	12	4	20	118	21	-87	34	-4	-56	204664
TEX-16	1	5	22	3	10	59	4	117	21	-80	29	-60	9	204639	3	12	4	26	118	21	-75	16	-73	15	205628
BDA-02	0	0	57	3	10	59	5	117	21	-67	3	-87	23	206126	3	11	0	2	117	21	-67	3	-87	23	206087
MIL-71	1	1	30	3	10	59	12	117	21	-74	15	-74	15	205421	3	12	0	42	118	21	-68	3	-87	22	206194
CRO-08	0	31	1	3	11	32	48	120	22	64	3	87	25	205069	3	12	3	49	120	22	61	9	80	29	206004
CRO-08	1	5	14	3	12	52	50	120	22	54	18	68	34	205480	3	13	58	4	121	21	44	29	51	39	205119
PKS-96	1	5	25	3	12	52	55	119	22	23	32	32	52	204760	3	13	58	21	120	22	6	35	9	54	204827
GWM-24	1	5	22	3	12	52	55	120	21	68	65	23	9	203463	3	13	58	17	120	21	48	78	9	8	203459
HSK-25	1	5	21	3	12	52	58	119	22	22	29	-59	19	204869	3	13	58	19	120	22	5	33	-57	4	204950
HAW-12	1	5	24	3	12	53	10	119	21	-86	60	-30	2	203585	3	13	58	33	120	21	-83	46	-44	5	204362

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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	1 5 22	3	12	53	11	118	21	-85	28	-62	5	204937	3	13	58	34	120	20	-76	16	-74	13	205881	
MAR-95	1 5 20	3	12	53	14	118	21	-81	24	-66	8	205177	3	13	58	35	119	20	-73	11	-78	17	206152	
TEX-16	0 12 28	3	12	53	14	118	21	-70	6	-84	20	206223	3	13	5	43	118	21	-68	3	-87	22	205748	
GDS-28	1 5 18	3	12	53	16	118	21	-81	24	-20	-65	205177	3	13	58	35	119	20	-73	11	-55	-70	206154	
CRO-08	1 5 23	3	14	46	40	121	21	33	36	37	43	204794	3	15	52	4	122	21	16	42	17	45	204734	
GWM-24	1 5 24	3	14	46	48	120	21	-22	82	-3	8	203436	3	15	52	12	121	21	-65	71	-18	8	203828	
HSK-25	1 5 26	3	14	46	49	120	22	-8	32	-57	-7	204970	3	15	52	15	121	21	-25	29	-59	-21	205377	
PKS-96	1 5 24	3	14	46	50	120	22	-8	35	-11	54	204838	3	15	52	14	121	21	-25	32	-34	51	205243	
STN-00	0 20 38	3	14	46	55	119	20	-70	7	-83	20	206414	3	15	7	33	120	20	-67	3	-87	23	205702	
HAW-12	1 5 28	3	14	46	55	119	21	-80	35	-55	9	204858	3	15	52	23	120	20	-76	21	-69	13	205843	
CRO-08	1 5 12	3	16	41	3	121	21	0	44	0	46	204670	3	17	46	15	122	21	-19	42	-20	45	205001	
GWM-24	1 5 11	3	16	41	15	121	21	-72	59	-30	9	204107	3	17	46	25	122	20	-75	45	-44	11	204888	
HSK-25	1 5 9	3	16	41	15	121	21	-36	24	-61	-33	205641	3	17	46	24	122	21	-49	16	-67	-47	206361	
HAW-12	0 32 30	3	16	41	18	120	20	-72	10	-80	18	206462	3	17	13	48	121	20	-70	3	-87	20	205801	
MAD-23	1 5 20	3	18	34	41	123	20	74	12	-54	70	206630	3	19	40	1	124	19	83	23	-15	60	206202	
CRO-08	1 5 22	3	18	35	2	122	21	-33	37	-36	42	205230	3	19	40	24	123	20	-47	28	-54	37	205922	
GWM-24	1 5 20	3	18	35	9	121	20	-74	33	-56	13	205415	3	19	40	29	123	20	-73	19	-70	16	206445	
HSK-25	0 29 22	3	18	35	10	122	21	-57	8	-76	-57	206820	3	19	4	32	122	21	-62	3	-84	-62	206028	
CYI-04	0 40 50	3	18	59	7	124	20	69	3	87	21	206106	3	19	39	57	124	19	74	11	79	16	206878	
CYI-04	1 5 28	3	20	28	19	124	19	79	21	68	11	206318	3	21	33	48	125	19	85	35	55	4	205799	
ACN-75	1 5 27	3	20	28	20	124	20	67	12	77	22	206867	3	21	33	46	125	20	63	26	62	24	206263	
MAD-23	1 5 28	3	20	28	22	124	19	91	32	2	58	205748	3	21	33	50	125	19	102	44	13	45	205397	

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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	0	19	32	3	20	29	12	122	20	-71	7	-82	18	207096	3	20	48	44	123	20	-71	3	-87	19	206455
CRO-08	1	5	10	3	20	29	13	123	20	-75	19	-67	33	206383	3	21	34	23	124	20	-64	8	-81	26	207318
BDA-02	1	5	10	3	22	22	44	125	19	70	4	85	20	207529	3	23	27	54	126	19	78	17	73	11	207007
ACN-75	1	5	16	3	22	22	50	125	20	58	37	49	25	205749	3	23	28	6	126	20	47	49	33	26	205425
MAD-23	1	5	22	3	22	22	51	125	19	114	53	17	34	205072	3	23	28	13	126	19	135	62	20	19	204987
CYI-04	1	5	17	3	22	22	51	125	19	90	46	44	0	205334	3	23	28	8	126	19	99	59	30	-5	205065
				16	APR	72									SEP TO CIR					LAZ	72.1				
MIL-71	1	5	17	4	0	16	33	126	19	75	13	77	14	207290	4	1	21	50	127	19	82	26	64	7	206746
BDA-02	1	5	17	4	0	16	36	126	19	84	27	63	5	206481	4	1	21	53	127	19	92	40	50	-2	206042
MAD-23	1	5	23	4	0	16	44	126	19	160	67	21	8	204878	4	1	22	7	127	19	-162	67	22	-7	205096
CYI-04	1	5	17	4	0	16	45	126	19	112	70	19	-7	204821	4	1	22	2	127	19	156	80	4	-9	204878
ACN-75	1	5	20	4	0	16	46	126	20	33	57	20	27	205161	4	1	22	6	127	19	6	63	3	27	205212
TEX-16	0	41	25	4	0	40	23	127	19	71	3	87	19	206844	4	1	21	48	128	19	75	11	79	15	207575
				16	APR	72									CIR TO PC1					LAZ	72.1				
GDS-28	1	11	59	4	2	8	43	127	18	72	7	-68	71	207998	4	3	20	42	128	18	82	20	-21	68	207297
TEX-16	1	11	58	4	2	8	43	127	19	80	21	68	10	207164	4	3	20	40	128	18	87	36	54	3	206460
STN-00	1	11	59	4	2	8	43	127	18	70	4	86	20	208200	4	3	20	43	128	18	79	16	73	10	207519
MAR-95	1	11	58	4	2	8	45	127	18	72	7	83	17	207996	4	3	20	43	128	18	82	20	70	8	207298
MIL-71	1	12	0	4	2	8	47	127	19	87	36	54	2	206386	4	3	20	47	128	18	96	51	39	-4	205826
BDA-02	1	12	0	4	2	8	51	127	19	100	50	40	-6	205786	4	3	20	52	128	18	116	64	24	-11	205430
CYI-04	1	11	57	4	2	9	5	126	19	-140	78	-8	-9	205047	4	3	21	2	127	18	-107	65	-24	-7	205395
ACN-75	1	11	59	4	2	9	7	126	19	-18	61	-10	27	205390	4	3	21	7	127	19	-44	53	-28	26	205780
MAD-23	1	11	56	4	2	9	9	126	19	-137	62	21	-18	205359	4	3	21	5	127	18	-115	52	18	-34	205818
GDS-28	1	12	13	4	4	7	15	128	18	88	30	-3	60	206942	4	5	19	28	129	18	99	44	9	46	206384

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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	1	12	10	4	4	7	16	128	18	86	26	64	3	207163	4	5	19	26	129	18	97	39	51	-6	206587
MAR-95	1	12	11	4	4	7	16	128	18	88	30	60	2	206941	4	5	19	27	129	18	99	44	46	-7	206384
TEX-16	1	12	14	4	4	7	17	128	18	92	47	43	-2	206155	4	5	19	31	129	18	104	62	28	-6	205738
MIL-71	1	12	14	4	4	7	21	128	18	104	61	28	-7	205643	4	5	19	35	129	18	131	75	12	-10	205453
BDA-02	1	12	14	4	4	7	25	128	18	137	72	13	-13	205396	4	5	19	39	129	18	-164	75	-4	-14	205450
CYI-04	1	12	13	4	4	7	36	127	18	-98	55	-35	-4	205834	4	5	19	49	128	18	-89	40	-50	1	206574
MAD-23	1	12	11	4	4	7	37	127	18	-104	43	14	-45	206294	4	5	19	48	128	18	-92	30	3	-60	207046
ACN-75	1	12	11	4	4	7	40	127	19	-54	44	-40	25	206259	4	5	19	51	128	19	-63	29	-58	23	207077
HAW-12	0	9	20	4	5	10	2	130	18	72	3	87	18	208053	4	5	19	22	130	18	73	5	85	17	208442
HAW-12	1	11	54	4	6	5	44	130	18	77	15	74	13	207977	4	7	17	38	131	18	82	31	59	7	207208
MAR-95	1	11	60	4	6	5	51	129	18	109	53	36	-11	206158	4	7	17	50	130	18	130	65	20	-16	205878
GDS-28	1	11	57	4	6	5	53	129	18	108	53	13	35	206154	4	7	17	50	130	18	130	65	17	19	205876
STN-00	1	11	56	4	6	5	53	129	18	106	48	41	-11	206333	4	7	17	50	130	18	125	60	25	-17	206004
TEX-16	1	11	56	4	6	5	58	129	18	118	72	16	-9	205641	4	7	17	54	130	18	-180	80	0	-10	205614
MIL-71	1	11	57	4	6	6	4	129	18	179	80	0	-10	205518	4	7	18	1	130	18	-121	71	-16	-10	205753
BDA-02	1	11	60	4	6	6	6	128	18	-131	70	-16	-13	205674	4	7	18	5	129	18	-108	57	-32	-10	206131
MAD-23	1	11	57	4	6	6	15	128	18	-84	21	-15	-68	207641	4	7	18	12	129	17	-74	8	-62	-72	208510
CYI-04	1	11	56	4	6	6	17	128	18	-84	29	-61	5	207197	4	7	18	14	129	17	-77	14	-75	12	208152
ACN-75	1	11	56	4	6	6	22	128	18	-67	19	-70	21	207760	4	7	18	17	129	18	-71	3	-87	19	208811
HAW-12	1	12	15	4	8	4	8	130	18	86	42	48	3	206852	4	9	16	23	131	17	92	58	32	-1	206334
STN-00	1	12	17	4	8	4	14	130	18	146	67	13	-19	205983	4	9	16	32	131	17	-169	69	-4	-20	206028
GDS-28	1	12	16	4	8	4	15	130	18	157	71	18	7	205898	4	9	16	31	131	17	-153	70	18	-9	206015

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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	1	12	13	4	8	4	18	130	18	157	71	8	-18	205898	4	9	16	31	131	17	-153	70	-9	-18	206016
MIL-71	1	12	11	4	8	4	28	129	18	-106	61	-28	-8	206124	4	9	16	39	130	17	-95	46	-44	-3	206756
BDA-02	1	12	13	4	8	4	29	129	18	-99	47	-43	-6	206626	4	9	16	41	130	17	-89	32	-58	1	207406
CYI-04	0	5	27	4	8	4	35	129	17	-73	4	-86	17	208871	4	8	10	2	129	17	-72	3	-87	18	208674
TEX-16	1	10	24	4	8	6	13	130	18	-129	75	-12	-9	205742	4	9	16	37	130	17	-105	61	-28	-7	206235
GWM-24	0	3	7	4	9	13	4	132	17	73	3	87	17	208866	4	9	16	12	132	17	73	4	86	17	208991
GWM-24	1	11	59	4	10	2	43	132	17	75	15	75	14	208495	4	11	14	42	133	17	78	31	59	10	207690
HAW-12	1	12	5	4	10	2	55	131	17	99	69	21	-3	206178	4	11	14	60	132	17	136	83	5	-5	206069
STN-00	1	12	11	4	10	3	1	131	17	-141	65	-16	-19	206247	4	11	15	13	131	17	-116	54	-33	-15	206691
GDS-28	1	12	11	4	10	3	2	130	17	-128	64	17	-20	206287	4	11	15	13	131	17	-108	51	14	-37	206806
MAR-95	1	12	12	4	10	3	2	130	17	-129	64	-21	-16	206288	4	11	15	14	131	17	-109	51	-37	-12	206807
TEX-16	1	12	11	4	10	3	9	130	17	-97	51	-39	-4	206696	4	11	15	20	131	17	-88	36	-54	1	207486
MIL-71	1	12	14	4	10	3	10	130	17	-89	36	-54	1	207338	4	11	15	24	131	17	-82	21	-69	8	208260
BDA-02	1	12	11	4	10	3	13	130	17	-83	22	-68	6	208046	4	11	15	23	131	17	-75	8	-82	15	209004
HSK-25	1	5	59	4	10	8	51	132	18	65	3	-83	65	208891	4	11	14	50	133	18	55	14	-66	53	208608
GWM-24	1	12	4	4	12	1	11	133	17	79	42	47	8	207313	4	13	13	15	133	17	80	59	31	5	206773
HSK-25	1	11	60	4	12	1	18	132	18	47	22	-60	42	208332	4	13	13	18	133	17	31	31	-55	27	207935
HAW-12	1	12	1	4	12	1	29	132	17	-127	82	-7	-5	206214	4	13	13	31	133	17	-99	67	-23	-4	206563
GDS-28	1	12	2	4	12	1	36	131	17	-99	42	10	-47	207309	4	13	13	37	132	16	-89	28	-2	-62	208113
STN-00	1	11	60	4	12	1	36	131	17	-105	46	-43	-11	207146	4	13	13	36	132	16	-93	32	-58	-3	207892
MAR-95	1	12	1	4	12	1	37	131	17	-99	42	-48	-7	207309	4	13	13	38	132	16	-89	28	-62	1	208113
TEX-16	1	12	1	4	12	1	38	131	17	-83	25	-65	6	208133	4	13	13	38	132	16	-77	10	-80	13	209103

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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
MIL-71	0 37 49	4	12	1	42	131	17	-77	11	-79	13	208949				4	12	39	31	132	16	-73	3	-87	17	208164
CRO-08	1 1 8	4	12	12	3	133	17	69	3	87	21	208897				4	13	13	11	134	17	62	15	73	27	208794
PKS-96	0 21 29	4	12	51	49	133	17	38	30	47	43	206895				4	13	13	18	133	17	33	33	41	45	207840
CRO-08	1 12 13	4	13	59	46	134	17	55	24	61	31	208423				4	15	11	59	134	17	42	36	43	37	207910
GWM-24	1 12 15	4	13	59	49	133	17	77	70	20	4	206622				4	15	12	5	134	16	45	86	3	3	206537
HSK-25	1 12 13	4	13	59	54	133	17	19	35	-54	15	207865				4	15	12	6	134	17	-1	37	-53	-1	207860
PKS-96	1 12 13	4	13	59	54	133	17	20	37	25	48	207757				4	15	12	7	134	17	0	40	-1	50	207740
HAW-12	1 12 16	4	14	0	3	132	17	-93	56	-34	-2	206998				4	15	12	19	133	16	-87	40	-50	2	207768
STN-00	1 12 15	4	14	0	3	132	16	-86	23	-67	3	208507				4	15	12	18	133	16	-77	9	-81	13	209420
MAR-95	1 3 28	4	14	0	3	132	16	-83	18	-72	7	208757				4	15	3	31	133	16	-75	6	-84	15	209120
GDS-28	1 12 14	4	14	0	4	132	16	-83	18	-22	-71	208758				4	15	12	17	133	16	-74	4	-75	-73	209697
CRO-08	1 11 58	4	15	58	25	134	17	30	43	29	39	207739				4	17	10	23	135	17	8	48	7	41	207607
GWM-24	1 12 1	4	15	58	31	134	16	-69	81	-8	3	206683				4	17	10	32	135	16	-81	65	-25	4	207075
PKS-96	1 11 59	4	15	58	36	134	17	-15	39	-18	49	207910				4	17	10	35	135	17	-34	33	-41	44	208301
HSK-25	1 11 58	4	15	58	36	134	17	-15	36	-53	-12	208036				4	17	10	34	135	17	-34	30	-55	-29	208426
HAW-12	1 11 59	4	15	58	43	133	16	-83	29	-61	6	208402				4	17	10	41	134	16	-78	13	-77	12	209401
CRO-08	1 14 9	4	17	54	58	135	17	-8	48	-7	41	207826				4	19	9	7	136	16	-32	43	-29	39	208068
GWM-24	1 12 16	4	17	56	55	134	16	-81	53	-36	5	207548				4	19	9	10	135	16	-80	37	-53	8	208353
HSK-25	1 12 12	4	17	56	59	134	17	-45	24	-58	-40	208869				4	19	9	11	135	16	-58	14	-65	-56	209585
MAD-23	0 14 44	4	18	53	59	137	15	73	3	-80	73	209431				4	19	8	43	137	15	75	6	-69	74	210055
MAD-23	1 12 4	4	19	55	8	137	15	82	14	-28	74	209681				4	21	7	12	138	15	93	27	7	63	209048
CRO-08	1 12 15	4	19	55	37	135	16	-44	36	-43	36	208473				4	21	7	52	136	16	-57	25	-62	29	209211

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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	1	12	12	4	19	55	40	135	15	-79	25	-64	10	209029	4	21	7	52	136	15	-77	9	-81	13	210092
HSK-25	0	12	49	4	19	55	41	135	16	-66	5	-77	-65	210182	4	20	8	30	135	16	-68	3	-82	-68	209696
CYI-04	1	9	36	4	19	57	33	137	15	74	3	87	16	210242	4	21	7	9	138	15	82	17	73	8	209602
ACN-75	0	31	30	4	20	35	40	137	15	74	3	87	16	209108	4	21	7	10	138	15	73	10	79	17	210004
CYI-04	1	12	12	4	21	53	28	138	15	87	27	63	3	209189	4	23	5	40	139	15	96	42	48	-4	208527
ACN-75	1	12	7	4	21	53	34	138	15	70	21	68	19	209522	4	23	5	41	139	15	64	37	50	20	208777
MAD-23	1	12	8	4	21	53	35	138	15	102	36	16	52	208747	4	23	5	44	138	14	117	48	22	36	208293
CRO-08	1	2	50	4	21	54	11	130	16	-64	15	-73	25	209824	4	22	57	1	137	15	-72	3	-87	18	210188
BDA-02	1	10	24	4	23	52	4	139	14	79	10	80	10	210376	5	1	2	28	140	14	88	24	66	2	209580
CYI-04	1	12	20	4	23	52	7	138	15	103	53	37	-8	208252	5	1	4	27	139	14	122	67	20	-12	207934
MAD-23	1	12	18	4	23	52	12	138	14	132	55	25	25	208153	5	1	4	30	139	14	161	62	26	9	208044
ACN-75	1	12	18	4	23	52	12	138	15	57	47	38	21	208459	5	1	4	30	139	15	40	60	20	22	208102
MIL-71	0	35	15	5	0	29	4	139	14	76	3	87	14	209532	5	1	4	19	140	14	79	10	80	10	210461
MIL-71	1	12	2	5	1	50	35	140	14	85	20	70	5	210013	5	3	2	37	141	14	93	35	55	-2	209304
TEX-16	1	11	56	5	1	50	36	140	14	77	6	84	13	210869	5	3	2	31	141	14	85	20	70	5	210083
BDA-02	1	12	2	5	1	50	37	140	14	95	34	56	-4	209272	5	3	2	39	141	14	107	48	41	-11	208723
CYI-04	1	12	3	5	1	50	49	139	14	148	74	8	-13	207899	5	3	2	53	140	14	-148	74	-9	-14	208005
MAD-23	1	12	0	5	1	50	53	139	14	-173	63	26	-3	208128	5	3	2	53	140	14	-141	58	26	-20	208392
ACN-75	1	12	1	5	1	50	55	139	15	17	66	8	23	208056	5	3	2	56	140	14	-24	66	-11	22	208177
GDS-28	0	10	13	5	2	52	18	141	14	76	3	-78	75	210544	5	3	2	31	141	14	77	5	-69	76	210975
STN-00	1	12	16	5	3	48	56	141	13	81	10	79	9	210800	5	5	1	12	142	13	91	24	66	-1	210119
MAR-95	1	12	14	5	3	48	57	141	14	83	14	75	6	210567	5	5	1	11	142	13	94	28	62	-3	209884

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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	1	12	17	5	3	48	58	141	14	90	31	59	0	209669	5	5	1	15	142	13	99	46	44	-7	209052
GDS-28	1	12	15	5	3	48	58	141	14	83	14	-24	74	210565	5	5	1	13	142	13	94	28	7	62	209884
MIL-71	1	12	17	5	3	49	2	140	14	100	45	44	-7	208977	5	5	1	18	141	13	114	60	28	-12	208550
BDA-02	1	12	16	5	3	49	4	140	14	118	58	29	-15	208529	5	5	1	21	141	13	147	68	12	-18	208335
CYI-04	1	12	19	5	3	49	15	140	14	-122	66	-21	-12	208279	5	5	1	34	140	13	-104	52	-37	-9	208826
MAD-23	1	12	17	5	3	49	17	139	14	-124	51	25	-31	208741	5	5	1	34	140	13	-108	39	21	-48	209358
ACN-75	1	12	19	5	3	49	19	140	14	-44	59	-23	22	208477	5	5	1	39	140	14	-61	45	-41	20	209085
MAR-95	1	12	6	5	5	47	38	142	13	101	38	52	-9	209535	5	6	59	43	142	13	116	51	36	-16	209062
GDS-28	1	12	5	5	5	47	39	142	13	101	38	14	51	209533	5	6	59	44	142	13	116	51	20	35	209061
STN-00	1	12	3	5	5	47	39	142	13	99	33	57	-8	209757	5	6	59	41	142	13	113	46	42	-16	209249
TEX-16	1	12	8	5	5	47	42	141	13	108	56	33	-10	208792	5	6	59	50	142	13	131	69	16	-14	208524
MIL-71	1	12	9	5	5	47	46	141	13	132	69	16	-14	208440	5	6	59	56	142	13	-176	74	-1	-16	208429
BDA-02	1	12	9	5	5	47	49	141	13	-180	71	0	-19	208389	5	6	59	59	142	13	-137	65	-18	-18	208626
MAD-23	1	12	8	5	5	47	59	140	13	-99	30	15	-59	209884	5	7	0	7	141	13	-88	17	-7	-73	210725
CYI-04	1	12	9	5	5	48	1	140	13	-97	41	-48	-5	209342	5	7	0	10	141	13	-59	26	-64	1	210220
ACN-75	1	12	13	5	5	48	5	140	14	-67	35	-53	19	209654	5	7	0	19	141	13	-73	19	-70	16	210627
HAW-12	0	56	23	5	6	3	9	142	13	77	3	87	13	210700	5	6	59	32	143	13	82	15	75	8	210820
HAW-12	1	12	9	5	7	45	56	143	13	86	26	64	4	210364	5	8	58	5	144	13	93	42	48	-2	209650
MAR-95	1	12	9	5	7	46	8	142	13	130	59	25	-20	208918	5	8	58	16	143	12	164	66	7	-23	208799
GDS-28	1	12	8	5	7	46	8	142	13	130	59	21	23	208916	5	8	58	16	143	12	164	66	23	6	208797
STN-00	1	12	7	5	7	46	8	142	13	126	54	30	-20	209070	5	8	58	15	143	12	154	63	13	-24	208886
TEX-16	1	12	6	5	7	46	15	142	13	165	75	4	-15	208541	5	8	58	20	143	13	-138	71	-13	-14	208711

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VEHICLE 1 KADAR 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	1	12	2	5	7	40	22	142	13	-140	70	-13	-15	208614	5	8	58	24	143	13	-113	58	-30	-12	209044
BDA-02	1	12	6	5	7	40	22	141	13	-119	57	-30	-15	208964	5	8	58	29	142	12	-104	43	-46	-10	209594
MAD-23	0	28	12	5	7	46	28	141	13	-80	8	-50	-77	211342	5	8	14	40	141	12	-76	3	-78	-76	210472
CYI-04	1	1	20	5	7	46	32	141	13	-84	16	-74	6	210892	5	8	47	53	142	12	-78	3	-87	12	211196
ACN-75	0	20	17	5	7	46	38	141	13	-75	8	-82	15	211359	5	8	6	54	141	13	-76	3	-87	14	210692
HAW-12	1	12	21	5	9	44	37	143	13	98	53	37	-5	209336	5	10	56	58	144	12	113	68	21	-8	208987
STN-00	1	12	22	5	9	44	44	143	12	180	65	0	-25	208946	5	10	57	6	144	12	-144	60	-18	-24	209188
GDS-28	1	12	21	5	9	44	45	143	12	-167	67	23	-5	208906	5	10	57	6	144	12	-133	59	22	-22	209226
MAR-95	1	12	20	5	9	44	46	143	12	-167	67	-6	-23	208908	5	10	57	5	144	12	-133	59	-24	-21	209227
TEX-16	1	12	21	5	9	44	51	142	13	-118	62	-25	-13	209019	5	10	57	12	143	12	-103	47	-42	-9	209640
BDA-02	1	12	21	5	9	44	53	142	12	-96	33	-56	-5	210154	5	10	57	14	143	12	-87	19	-71	2	211065
MIL-71	1	12	19	5	9	44	54	142	13	-103	48	-41	-9	209503	5	10	57	13	143	12	-94	33	-57	-3	210315
GWM-24	0	56	33	5	10	2	10	144	12	78	3	87	12	211036	5	10	58	43	145	12	81	16	74	9	211312
HSK-25	0	16	35	5	10	40	19	145	13	72	3	-81	71	211101	5	10	56	54	145	13	69	6	-73	68	211782
GWM-24	1	12	3	5	11	43	2	145	12	83	26	63	6	210735	5	12	55	5	146	12	86	43	47	3	210000
HSK-25	1	11	59	5	11	43	13	145	13	62	15	-61	58	211376	5	12	55	12	145	13	49	26	-53	42	210807
HAW-12	1	12	7	5	11	43	14	144	12	138	77	9	-10	208927	5	12	55	21	145	12	-141	77	-8	-10	209020
MAR-95	1	12	5	5	11	43	24	143	12	-118	51	-35	-17	209584	5	12	55	30	144	12	-104	38	-51	-11	210259
STN-00	1	12	6	5	11	43	24	143	12	-127	54	-31	-21	209491	5	12	55	31	144	12	-110	41	-47	-15	210097
GDS-28	1	12	7	5	11	43	24	143	12	-118	51	21	-34	209583	5	12	55	32	144	12	-104	38	17	-50	210261
TEX-16	1	12	4	5	11	43	31	143	12	-96	37	-53	-5	210174	5	12	55	34	144	12	-88	22	-68	2	211086
MIL-71	1	12	5	5	11	43	32	143	12	-88	22	-68	2	210941	5	12	55	36	144	12	-81	7	-83	9	211934

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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
BDA-02	0	28	35	5	11	43	33	143	12	-81	9	-81	9	211716	5	12	12	8	143	12	-78	3	-87	12	210884
CRO-08	0	5	40	5	12	49	24	146	12	75	3	87	15	211858	5	12	55	4	146	12	74	4	86	16	212081
GWM-24	1	12	18	5	13	41	30	145	12	88	55	35	1	209679	5	14	53	48	146	12	93	71	19	-1	209317
CRO-08	1	12	15	5	13	41	31	146	12	69	14	75	21	211613	5	14	53	46	147	12	59	29	58	27	210912
PKS-96	1	12	16	5	13	41	38	145	13	40	35	43	39	210502	5	14	53	54	146	12	21	42	21	44	210242
HSK-25	1	12	15	5	13	41	38	145	13	38	33	-50	31	210583	5	14	53	54	146	12	19	40	-48	14	210342
HAW-12	1	12	20	5	13	41	43	144	12	-115	68	-20	-9	209285	5	14	54	3	145	11	-100	53	-37	-6	209847
STN-00	1	12	19	5	13	41	46	144	12	-101	32	-57	-9	210628	5	14	54	4	145	11	-90	18	-72	0	211484
GDS-28	1	12	18	5	13	41	47	144	12	-96	28	11	-61	210831	5	14	54	5	145	11	-86	14	-15	-75	211735
MAR-95	1	12	17	5	13	41	48	144	12	-96	28	-62	-5	210830	5	14	54	6	145	11	-86	14	-76	4	211735
TEX-16	0	40	4	5	13	41	49	144	12	-83	11	-78	7	211773	5	14	21	53	145	11	-79	3	-87	11	211046
CRO-08	1	12	8	5	15	40	14	146	12	50	37	45	31	210581	5	16	52	22	147	12	32	48	26	35	210211
GWM-24	1	12	15	5	15	40	18	146	12	104	83	7	-2	209268	5	16	52	32	147	11	-101	80	-10	-2	209403
PKS-96	1	12	11	5	15	40	24	146	12	5	45	5	45	210241	5	16	52	35	147	12	-19	43	-19	44	210414
HSK-25	1	12	11	5	15	40	26	146	12	4	42	-48	3	210350	5	16	52	36	147	12	-19	41	-48	-14	210532
GDS-28	0	7	38	5	15	40	28	145	11	-80	5	-66	-79	212380	5	15	48	5	145	11	-79	3	-75	-78	212098
STN-00	0	31	43	5	15	40	28	145	11	-83	9	-81	7	212109	5	16	12	11	145	11	-79	3	-87	11	211247
HAW-12	1	12	17	5	15	40	29	145	11	-94	42	-48	-3	210370	5	16	52	46	146	11	-88	26	-64	2	211291
CRO-08	1	12	10	5	17	38	44	147	12	15	52	11	36	210153	5	18	50	54	148	11	-13	53	-10	36	210224
GWM-24	1	12	11	5	17	38	50	146	11	-93	68	-22	-1	209684	5	18	51	1	147	11	-90	51	-39	0	210293
PKS-96	1	9	57	5	17	38	56	146	12	-33	39	-34	41	210695	5	18	48	53	147	11	-50	30	-53	34	211133
HAW-12	0	53	56	5	17	38	57	146	11	-84	15	-75	6	211976	5	18	32	53	147	10	-80	3	-87	10	211857

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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	1	12	4	5	17	38	57	140	12	-33	36	-49	-26	210812	5	18	51	1	147	11	-50	28	-51	-43	211375
CRO-08	1	12	19	5	19	37	24	147	11	-31	49	-24	34	210464	5	20	49	43	148	11	-50	39	-43	30	211009
GWM-24	1	12	21	5	19	37	24	147	11	-87	40	-50	2	210855	5	20	49	45	148	10	-84	23	-67	5	211833
HSK-25	1	12	19	5	19	37	28	147	11	-59	20	-55	-54	211883	5	20	49	47	148	11	-71	7	-68	-70	212733
MAD-23	0	53	46	5	19	55	29	149	10	79	3	-74	79	212011	5	20	49	17	149	10	88	12	-11	77	212414
CYI-04	1	12	3	5	21	35	30	149	10	85	12	78	5	212564	5	22	47	33	150	10	93	27	63	-3	211791
MAD-23	1	12	4	5	21	35	32	149	10	95	21	13	68	212018	5	22	47	35	150	9	108	34	25	52	211430
ACN-75	1	12	2	5	21	35	32	150	10	78	8	82	12	212808	5	22	47	34	151	10	75	24	65	14	211929
GWM-24	0	37	38	5	21	36	4	148	10	-82	12	-78	8	212542	5	22	13	42	148	10	-81	3	-87	9	211820
CRO-08	1	12	3	5	21	36	5	148	11	-59	30	-56	26	211499	5	22	48	8	149	10	-70	17	-72	19	212378
CYI-04	1	12	22	5	23	33	53	150	10	99	37	53	-7	211390	6	0	46	15	151	9	112	52	36	-13	210854
MAD-23	1	12	23	5	23	33	54	150	9	119	42	28	41	211162	6	0	46	17	151	9	139	52	31	24	210842
ACN-75	1	12	19	5	23	33	57	150	10	72	35	53	15	211469	6	0	46	16	151	10	63	51	36	16	210862
CRO-08	0	14	7	5	23	36	13	149	10	-76	6	-84	14	212987	5	23	50	20	149	10	-77	3	-87	13	212481
BDA-02	0	29	53	6	0	16	14	151	9	81	3	87	9	212064	6	0	46	7	151	9	85	9	81	5	213001
MIL-71	1	12	6	6	1	32	29	151	9	82	5	85	8	213359	6	2	44	35	152	9	91	20	70	-1	212564
BDA-02	1	12	3	6	1	32	32	151	9	91	19	71	-1	212533	6	2	44	34	152	9	102	33	57	-10	211845
CYI-04	1	12	13	6	1	32	38	151	9	125	61	25	-16	210647	6	2	44	51	152	9	161	70	7	-19	210511
MAD-23	1	12	11	6	1	32	41	151	9	158	57	31	12	210772	6	2	44	51	152	9	-171	58	32	-5	210828
ACN-75	1	12	8	6	1	32	45	151	10	52	61	23	17	210627	6	2	44	53	152	9	17	72	5	17	210475
TEX-16	0	8	7	6	2	36	25	152	9	82	3	87	8	213103	6	2	44	32	152	9	83	5	85	7	213426
TEX-16	1	12	14	6	3	30	49	152	9	88	15	75	2	212944	6	4	43	3	153	8	97	30	60	-6	212179

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	1	12	15	6	3	30	53	152	9	97	30	60	-6	212128	6	4	43	7	153	8	108	44	44	-13	211503
BDA-02	1	12	17	6	3	30	54	152	9	110	43	46	-15	211516	6	4	43	11	153	8	128	55	29	-21	211097
CYI-04	1	12	16	6	3	31	11	151	9	-164	70	-6	-19	210602	6	4	43	26	152	8	-128	61	-24	-17	210923
MAD-23	1	12	14	6	3	31	11	151	9	-150	55	32	-17	211024	6	4	43	24	152	8	-127	46	31	-34	211465
ACN-75	1	12	9	6	3	31	18	151	9	-21	72	-7	17	210573	6	4	43	27	152	9	-55	61	-25	16	210930
GDS-28	0	55	17	6	3	49	46	152	8	82	3	-70	81	212759	6	4	43	3	153	8	89	13	-3	77	213127
MAR-95	0	36	50	6	4	6	14	153	8	84	6	84	6	212202	6	4	43	4	153	8	89	13	77	1	213128
STN-00	0	31	15	6	4	11	47	153	8	82	3	87	8	212409	6	4	43	2	153	8	87	9	81	3	213375
MAR-95	1	12	21	6	5	29	27	153	8	96	23	67	-6	212693	6	6	41	49	154	8	108	36	53	-15	212072
GDS-28	1	12	21	6	5	29	27	153	8	96	23	14	67	212692	6	6	41	49	154	8	108	36	23	50	212070
STN-00	1	12	21	6	5	29	27	153	8	94	18	72	-3	212942	6	6	41	49	154	8	106	31	58	-13	212305
TEX-16	1	12	22	6	5	29	30	153	8	103	40	49	-10	211786	6	6	41	52	154	8	118	55	32	-16	211311
MIL-71	1	12	20	6	5	29	34	153	8	118	54	33	-16	211233	6	6	41	54	154	8	144	65	15	-20	210991
BDA-02	1	12	23	6	5	29	37	153	8	146	62	16	-23	210981	6	6	42	0	153	8	-175	65	-2	-25	210996
MAD-23	1	12	23	6	5	29	46	152	8	-115	38	29	-45	211887	6	6	42	9	153	8	-102	25	24	-62	212648
CYI-04	1	12	21	6	5	29	48	152	8	-114	52	-35	-15	211296	6	6	42	9	153	8	-102	37	-52	-9	212038
ACN-75	1	12	21	6	5	29	53	152	9	-66	50	-37	15	211348	6	6	42	14	153	8	-74	35	-54	13	212170
HAW-12	1	0	55	6	7	27	53	154	8	86	10	80	4	213592	6	8	28	48	155	7	91	23	67	-1	212305
STN-00	1	0	48	6	7	28	0	154	8	115	40	47	-19	211982	6	8	28	48	155	7	130	49	33	-25	211060
MAR-95	1	0	46	6	7	28	2	154	8	118	45	41	-20	211772	6	8	28	48	155	7	136	54	27	-25	210894
GDS-28	1	0	40	6	7	28	2	154	8	118	45	25	39	211770	6	8	28	48	155	7	135	54	27	24	210891
TEX-16	1	0	42	6	7	28	6	154	8	134	63	20	-18	211135	6	8	28	48	154	7	166	69	5	-20	210466

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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	1	0	35	6	7	28	13	153	8	173	69	2	-21	210982	6	8	28	48	154	7	-149	66	-13	-20	210540
BDA-02	1	0	34	6	7	28	14	153	8	-149	62	-15	-24	211151	6	8	28	48	154	7	-127	54	-30	-21	210906
MAD-23	1	0	24	6	7	28	24	153	8	-94	16	13	-73	213203	6	8	28	48	154	7	-85	5	-43	-83	213350
CYI-04	1	0	20	6	7	28	28	153	8	-95	27	-63	-5	212616	6	8	28	48	153	7	-89	14	-76	1	212829
ACN-75	1	0	15	6	7	28	33	153	8	-77	23	-66	12	212809	6	8	28	48	153	8	-81	9	-80	9	213098
				16	APR	72				PC1	TO JET			LAZ 72.1											
HAW-12	0	11	22	6	8	28	57	155	7	91	23	67	-1	212311	6	8	40	19	155	7	92	26	64	-2	212772
GDS-28	0	11	27	6	8	28	57	155	7	135	54	27	24	210898	6	8	40	24	155	7	139	56	27	22	211450
STN-00	0	11	27	6	8	28	57	155	7	131	49	33	-25	211067	6	8	40	24	155	7	134	51	30	-26	211609
MAR-95	0	11	28	6	8	28	57	155	7	136	54	27	-25	210901	6	8	40	25	155	7	140	56	24	-26	211453
TEX-16	0	11	33	6	8	28	57	154	7	167	69	5	-20	210473	6	8	40	31	154	7	174	70	2	-20	211073
MIL-71	0	11	37	6	8	28	57	154	7	-149	66	-13	-20	210548	6	8	40	34	154	7	-143	65	-16	-20	211193
BDA-02	0	11	41	6	8	28	57	154	7	-127	54	-30	-21	210914	6	8	40	38	154	7	-124	52	-33	-20	211600
MAD-23	0	11	44	6	8	28	57	154	7	-85	5	-44	-83	213360	6	8	40	41	154	7	-83	3	-66	-83	214105
CYI-04	0	11	48	6	8	28	57	153	7	-89	14	-76	1	212838	6	8	40	45	154	7	-88	12	-78	2	213606
ACN-75	0	11	51	6	8	28	57	153	8	-81	9	-80	9	213108	6	8	40	48	153	8	-81	7	-83	9	213896
HAW-12	1	12	13	6	9	26	32	155	7	97	37	53	-6	212312	6	10	38	45	156	7	108	52	36	-11	211735
STN-00	1	12	14	6	9	26	38	154	7	152	57	17	-29	211493	6	10	38	52	155	7	-176	59	-2	-31	211502
GDS-28	1	12	13	6	9	26	42	154	7	160	61	28	10	211376	6	10	38	54	155	7	-165	61	28	-7	211463
MAR-95	1	12	13	6	9	26	43	154	7	160	60	11	-28	211377	6	10	38	57	155	7	-165	61	-8	-28	211467
TEX-16	1	12	14	6	9	26	47	154	7	-153	68	-10	-20	211189	6	10	39	1	155	7	-124	57	-28	-18	211587
MIL-71	1	12	14	6	9	26	50	154	7	-125	57	-28	-18	211479	6	10	39	5	155	7	-109	43	-45	-14	212115
BDA-02	1	12	14	6	9	26	53	154	7	-112	43	-45	-16	212017	6	10	39	7	155	7	-101	29	-61	-9	212814

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	1	12	21	6	11	24	49	156	7	85	11	79	5	213886	6	12	37	10	157	7	89	28	62	1	213022
HSK-25	1	12	23	6	11	24	55	156	8	75	7	-65	74	214135	6	12	37	18	157	7	64	20	-50	58	213436
HAW-12	1	12	27	6	11	24	56	156	7	119	62	25	-13	211510	6	12	37	23	156	7	156	73	7	-15	211351
STN-00	1	12	29	6	11	25	2	155	7	-154	57	-16	-29	211660	6	12	37	31	156	6	-130	48	-35	-25	212087
GDS-28	1	12	29	6	11	25	2	155	7	-144	56	28	-19	211680	6	12	37	31	156	6	-122	46	27	-36	212180
MAR-95	1	12	28	6	11	25	3	155	7	-144	56	-21	-26	211681	6	12	37	32	156	6	-122	46	-40	-22	212181
TEX-16	1	12	30	6	11	25	6	155	7	-112	48	-40	-14	212001	6	12	37	36	156	6	-101	33	-57	-9	212783
BDA-02	1	12	30	6	11	25	8	154	7	-94	19	-71	-4	213421	6	12	37	38	155	6	-85	4	-86	5	214392
MIL-71	1	12	25	6	11	25	10	155	7	-101	33	-56	-9	212654	6	12	37	36	155	6	-92	18	-72	-2	213580
GWM-24	1	12	13	6	13	23	30	157	7	92	39	51	-2	212544	6	14	35	44	158	6	98	56	34	-5	211954
CRO-08	1	12	12	6	13	23	33	157	7	80	4	86	10	214480	6	14	35	45	158	7	73	19	70	16	213661
HSK-25	1	12	13	6	13	23	41	157	7	55	28	-46	46	213064	6	14	35	53	158	7	39	39	-44	29	212626
HAW-12	1	12	23	6	13	23	41	156	7	-161	74	-5	-15	211417	6	14	36	4	157	6	-123	63	-23	-14	211752
STN-00	1	12	23	6	13	23	47	156	6	-117	40	-46	-21	212480	6	14	36	11	156	6	-104	27	-62	-13	213249
GDS-28	1	12	24	6	13	23	47	156	6	-111	37	26	-48	212629	6	14	36	12	156	6	-100	23	21	-65	213455
MAR-95	1	12	26	6	13	23	48	156	6	-111	37	-51	-17	212629	6	14	36	14	156	6	-100	23	-67	-9	213456
TEX-16	1	12	26	6	13	23	51	155	7	-94	22	-68	-4	213387	6	14	36	17	156	6	-87	7	-83	3	214398
MIL-71	0	21	4	6	13	23	53	155	6	-87	8	-82	3	214239	6	13	44	57	156	6	-84	3	-87	6	213541
PKS-96	1	8	42	6	13	27	13	157	7	56	30	55	29	212811	6	14	35	55	158	7	41	41	38	35	212555
GWM-24	1	12	18	6	15	21	59	157	6	106	67	22	-6	211729	6	16	34	17	158	6	147	81	5	-7	211581
CRO-08	1	12	15	6	15	21	59	158	7	66	29	59	21	213212	6	16	34	14	159	6	53	43	41	26	212624
HSK-25	1	12	14	6	15	22	10	157	7	25	44	-43	18	212477	6	16	34	25	158	7	1	48	-42	0	212422

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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	1	12	12	6	15	22	11	157	7	27	46	24	38	212390	6	16	34	23	158	7	2	50	1	40	212320
HAW-12	1	12	21	6	15	22	12	157	6	-110	53	-35	-12	212125	6	16	34	33	157	6	-100	38	-52	-8	212881
GDS-28	0	54	19	6	15	22	16	156	6	-92	14	10	-76	214050	6	16	16	35	157	5	-85	3	-57	-85	213882
STN-00	1	12	16	6	15	22	16	156	6	-96	18	-72	-6	213813	6	16	34	32	157	5	-86	4	-86	4	214733
MAR-95	0	38	47	6	15	22	17	156	6	-92	14	-76	-2	214049	6	16	1	4	157	6	-87	6	-84	3	213272
CRO-08	1	12	26	6	17	20	35	158	6	40	51	28	29	212385	6	18	33	2	159	6	13	58	8	31	212222
GWM-24	1	12	31	6	17	20	36	158	6	-136	80	-7	-7	211672	6	18	33	7	159	5	-106	65	-25	-7	212053
PKS-96	1	12	29	6	17	20	42	158	7	-16	49	-14	39	212438	6	18	33	11	159	6	-40	43	-35	35	212819
HSK-25	1	12	27	6	17	20	43	158	7	-17	46	-42	-11	212543	6	18	33	9	159	6	-39	40	-43	-29	212923
HAW-12	1	12	28	6	17	20	45	157	6	-95	27	-63	-4	213483	6	18	33	13	158	5	-89	11	-79	1	214512
CRO-08	1	12	13	6	19	19	17	159	6	-9	59	-6	31	212264	6	20	31	31	160	6	-38	53	-25	28	212573
GWM-24	1	12	14	6	19	19	18	158	5	-99	53	-36	-5	212444	6	20	31	32	159	5	-94	36	-53	-3	213260
PKS-96	0	34	45	6	19	19	25	158	6	-52	36	-48	30	213186	6	19	54	9	159	6	-59	30	-56	26	212226
HSK-25	1	12	12	6	19	19	26	158	6	-51	33	-44	-40	213288	6	20	31	38	159	6	-65	22	-46	-57	214017
GWM-24	1	14	19	6	21	15	50	159	5	-91	25	-65	-1	213961	6	22	30	9	160	4	-87	8	-82	3	214975
MAD-23	1	12	22	6	21	17	16	160	5	90	7	-2	83	214968	6	22	29	38	161	4	102	19	30	68	214298
CRO-08	1	12	28	6	21	17	39	159	6	-52	45	-38	26	212929	6	22	30	8	160	5	-66	32	-56	20	213655
HSK-25	0	54	41	6	21	17	44	159	6	-73	13	-52	-69	214576	6	22	12	25	160	5	-81	3	-71	-81	214383
CYI-04	0	40	30	6	21	49	6	161	4	87	3	87	3	213951	6	22	29	36	162	4	91	11	79	-1	214761
ACN-75	0	33	44	6	21	55	56	161	5	85	3	87	5	213936	6	22	29	40	162	5	84	11	79	6	214791
CYI-04	1	12	18	6	23	15	50	161	4	97	22	68	-6	214253	7	0	28	8	162	4	107	36	52	-14	213555
MAD-23	1	12	20	6	23	15	52	161	4	110	28	33	56	213909	7	0	28	12	162	4	126	39	36	39	213423

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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	1	12	17	6	23	15	56	162	5	81	22	67	8	214209	7	0	28	13	162	4	78	39	50	10	213423
CRO-08	1	12	23	6	23	16	23	160	5	-73	22	-67	16	214226	7	0	28	45	161	5	-82	7	-83	8	215219
BDA-02	1	12	24	7	1	14	6	162	4	88	4	86	2	215473	7	2	26	29	163	3	98	18	72	-7	214685
CYI-04	1	12	26	7	1	14	13	162	4	116	46	41	-18	213214	7	2	26	39	163	3	136	58	23	-22	212836
MAD-23	1	12	23	7	1	14	17	162	4	139	46	36	27	213220	7	2	26	40	163	3	164	52	37	10	213057
ACN-75	1	12	20	7	1	14	21	162	4	73	51	38	11	215031	7	2	26	41	163	4	60	67	20	11	212609
MIL-71	0	5	44	7	2	20	44	163	3	88	3	87	2	215261	7	2	26	29	163	3	88	4	86	2	215486
MIL-71	1	12	26	7	3	12	48	163	3	94	15	75	-4	214963	7	4	25	13	164	3	104	29	60	-12	214225
BDA-02	1	12	25	7	3	12	51	163	3	105	28	62	-13	214230	7	4	25	16	164	3	118	41	45	-21	213658
CYI-04	1	12	29	7	3	12	59	163	3	158	64	10	-24	212741	7	4	25	28	163	3	-162	64	-9	-25	212839
MAD-23	1	12	28	7	3	12	59	162	3	-177	53	37	-2	213089	7	4	25	27	163	3	-150	48	38	-19	213350
ACN-75	1	12	27	7	3	13	3	163	4	35	76	8	12	212505	7	4	25	30	163	4	-39	75	-9	11	212610
TEX-16	0	57	27	7	3	27	44	163	3	88	3	87	2	214920	7	4	25	10	164	3	95	15	75	-4	215017
MAR-95	1	12	18	7	5	11	11	164	3	92	8	82	-2	215524	7	6	23	29	165	2	103	21	68	-12	214791
GDS-28	1	12	13	7	5	11	15	164	3	92	8	14	82	215519	7	6	23	28	165	2	103	21	30	65	214789
STN-00	1	12	14	7	5	11	15	164	3	89	3	87	1	215776	7	6	23	28	165	2	100	17	73	-10	215051
TEX-16	1	12	15	7	5	11	16	164	3	100	25	65	-9	214520	7	6	23	31	165	3	112	40	48	-17	213855
MIL-71	1	12	17	7	5	11	18	164	3	111	39	49	-16	213811	7	6	23	35	165	3	128	52	32	-22	213339
BDA-02	1	12	17	7	5	11	22	164	3	130	49	33	-25	213376	7	6	23	39	165	2	156	58	15	-29	213147
MAD-23	1	12	18	7	5	11	34	163	3	-135	43	37	-31	213624	7	6	23	51	164	2	-118	32	37	-48	214235
CYI-04	1	12	16	7	5	11	36	163	3	-139	59	-22	-23	213032	7	6	23	52	164	3	-119	46	-40	-19	213570
ACN-75	1	12	16	7	5	11	42	163	4	-62	66	-21	11	212831	7	6	23	58	164	3	-75	50	-39	9	213433

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VEHICLE 1 KADAR 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	1	12	25	7	7	9	41	165	2	108	26	63	-16	214630	7	8	22	6	166	2	123	38	47	-25	214086
GDS-28	1	12	24	7	7	9	42	165	2	111	30	31	54	214379	7	8	22	6	166	2	126	43	33	36	213870
MAR-95	1	12	24	7	7	9	42	165	2	111	30	58	-18	214381	7	8	22	6	166	2	126	42	41	-26	213873
TEX-16	1	12	24	7	7	9	45	165	3	122	49	37	-20	213536	7	8	22	9	166	2	145	60	18	-24	213231
MIL-71	1	12	29	7	7	9	46	165	3	145	59	19	-25	213174	7	8	22	15	165	2	179	64	0	-26	213132
BDA-02	1	12	29	7	7	9	51	164	2	178	60	1	-30	213145	7	8	22	20	165	2	150	56	-19	-29	213364
MAD-23	1	12	31	7	7	9	56	164	2	-108	24	36	-60	214722	7	8	22	28	165	2	-97	11	32	-77	215567
CYI-04	1	12	27	7	7	10	2	164	3	-109	37	-51	-15	214043	7	8	22	29	165	2	-100	22	-68	-9	214924
ACN-75	1	12	30	7	7	10	5	164	3	-80	39	-51	8	213961	7	8	22	35	164	3	-84	22	-68	6	214935
HAW-12	0	24	18	7	7	47	45	166	2	89	3	87	1	214685	7	8	22	3	166	2	92	10	80	-2	215562
HAW-12	0	27	56	7	9	8	19	166	2	97	21	69	-6	215009	7	9	36	15	166	2	100	27	62	-9	213497
STN-00	0	27	51	7	9	8	24	166	2	135	45	35	-30	213823	7	9	36	15	166	2	144	48	28	-32	212513
GDS-28	0	27	50	7	9	8	25	166	2	140	50	33	25	213642	7	9	36	15	166	2	150	53	33	18	212357
MAR-95	0	27	50	7	9	8	25	166	2	140	50	29	-30	213645	7	9	36	15	166	2	150	53	21	-32	212360
TEX-16	0	27	45	7	9	8	30	165	2	169	64	5	-25	213172	7	9	36	15	165	2	175	64	-2	-26	211999
MIL-71	0	27	41	7	9	8	34	165	2	-154	61	-13	-26	213248	7	9	36	15	165	2	-143	58	-21	-25	212181
BDA-02	0	27	39	7	9	8	36	165	2	-133	50	-32	-26	213634	7	9	36	15	165	2	-126	45	-39	-24	212653
CYI-04	0	27	31	7	9	8	44	164	2	-94	12	-78	-4	215546	7	9	36	15	165	2	-91	6	-84	-1	214740
ACN-75	0	27	25	7	9	8	50	164	3	-86	10	-80	4	215623	7	9	36	15	165	2	-87	4	-86	3	214855
	16 APR 72			JET TO PC2										LAZ 72.1											
ACN-75	0	2	55	7	9	36	28	165	2	-87	4	-86	3	214853	7	9	39	23	165	2	-87	3	-87	3	214845
CYI-04	0	12	22	7	9	36	28	165	2	-91	6	-84	-1	214738	7	9	48	51	165	2	-90	3	-87	0	214845
HAW-12	0	44	11	7	9	36	28	160	2	100	27	62	-9	213490	7	10	20	39	167	2	105	37	52	-12	214272

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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	0	44	20	7	9	36	28	166	2	144	48	28	-32	212507	7	10	20	48	166	1	159	52	15	-35	213625
GDS-28	0	44	20	7	9	36	28	166	2	150	53	33	18	212352	7	10	20	49	166	2	167	56	34	7	213512
MAR-95	0	44	20	7	9	36	28	166	2	150	53	21	-32	212354	7	10	20	49	166	2	167	55	9	-34	213515
TEX-16	0	44	30	7	9	36	28	165	2	-175	64	-2	-26	211994	7	10	20	58	166	2	-153	61	-14	-25	213341
MIL-71	0	44	36	7	9	36	28	165	2	-142	58	-21	-25	212177	7	10	21	4	166	2	-128	51	-32	-23	213685
BDA-02	0	44	36	7	9	36	28	165	2	-125	45	-39	-24	212650	7	10	21	4	166	2	-116	37	-50	-21	214277
HAW-12	1	12	30	7	11	6	46	167	2	113	47	41	-15	213894	7	12	19	16	167	1	132	61	23	-19	213488
MAR-95	1	12	32	7	11	6	56	166	2	-172	56	-6	-34	213563	7	12	19	28	167	1	-144	50	-26	-31	213852
STN-00	1	12	33	7	11	6	56	166	2	179	54	1	-36	213623	7	12	19	28	167	1	-153	51	-20	-35	213832
GDS-28	1	12	34	7	11	6	56	166	2	-172	56	34	-5	213561	7	12	19	30	167	1	-144	50	34	-22	213851
TEX-16	1	12	29	7	11	7	4	166	2	-134	55	-27	-23	213585	7	12	19	33	167	1	-116	42	-45	-19	214186
MIL-71	1	12	31	7	11	7	8	166	2	-117	42	-44	-19	214081	7	12	19	38	166	1	-105	28	-61	-13	214884
BDA-02	1	12	31	7	11	7	8	165	2	-107	28	-61	-15	214779	7	12	19	38	166	1	-97	13	-76	-7	215687
HSK-25	0	48	38	7	11	30	40	167	2	85	3	-60	84	215147	7	12	19	17	168	2	78	12	-43	73	215730
GWM-24	0	41	17	7	11	37	52	167	2	89	3	87	1	214988	7	12	19	9	168	1	92	12	78	-2	215723
GWM-24	1	12	32	7	13	5	28	168	1	94	24	66	-4	215146	7	14	17	60	169	1	100	40	49	-8	214386
HAW-12	1	12	35	7	13	5	35	167	1	155	67	10	-21	213375	7	14	18	11	168	1	-159	67	-9	-21	213462
HSK-25	1	12	29	7	13	5	36	168	2	71	22	-40	61	215265	7	14	18	5	169	2	58	35	-38	44	214666
STN-00	1	12	35	7	13	5	42	167	1	-137	45	-34	-31	214091	7	14	18	17	167	1	-120	34	-52	-25	214703
GDS-28	1	12	36	7	13	5	43	167	1	-130	43	34	-34	214163	7	14	18	18	167	1	-114	31	34	-51	214849
MAR-95	1	12	36	7	13	5	43	167	1	-130	43	-39	-28	214165	7	14	18	18	167	1	-114	31	-56	-21	214850
TEX-16	1	12	36	7	13	5	47	166	1	-108	32	-56	-15	214684	7	14	18	23	167	1	-98	17	-73	-8	215613

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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
MIL-71	1 12 42	7	13	5 48	166	1	-99	18 -72	-8	215473	7	14	15 31	167	1	-91	3 -87	-1	216302					
BDA-02	0 2 44	7	13	5 50	166	1	-91	4 -86	-1	216302	7	13	8 34	166	1	-91	3 -87	-1	216206					
PKS-96	0 29 58	7	13	48 8	168	2	65	30 58	21	213616	7	14	18 6	169	2	60	35 51	24	214626					
CRO-08	0 26 34	7	13	51 27	168	2	87	3 87	3	215222	7	14	18 1	169	2	84	9 81	6	216087					
GWM-24	1 12 23	7	15	4 14	168	1	106	52 37	-10	213977	7	16	16 36	169	0	122	67 20	-12	213590					
CRO-08	1 12 19	7	15	4 16	169	2	79	19 70	11	215527	7	16	16 34	170	1	70	35 54	17	214789					
HSK-25	1 12 21	7	15	4 23	168	2	46	42 -38	32	214356	7	16	16 45	169	1	24	51 -37	15	214093					
PKS-96	1 12 20	7	15	4 24	168	2	48	43 38	29	214297	7	16	16 44	169	1	26	53 19	33	214016					
HAW-12	1 12 28	7	15	4 26	168	1	-135	61 -21	-20	213651	7	16	16 54	168	0	-116	48 -39	-17	214216					
GDS-28	1 12 28	7	15	4 30	167	1	-106	22 34	-63	215353	7	16	16 58	168	0	-96	8 34	-80	216273					
STN-00	1 12 28	7	15	4 30	167	1	-111	26 -63	-18	215165	7	16	16 58	168	0	-99	12 -78	-9	216038					
MAR-95	1 12 27	7	15	4 32	167	1	-106	22 -67	-15	215353	7	16	16 59	168	0	-96	8 -82	-5	216274					
TEX-16	0 17 35	7	15	4 34	167	1	-93	7 -83	-3	216235	7	15	22 9	167	1	-91	3 -87	-1	215623					
CRO-08	1 12 36	7	17	2 40	169	1	61	44 42	20	214406	7	18	15 16	170	1	42	57 24	24	213996					
GWM-24	1 12 38	7	17	2 42	169	1	149	75 8	-13	213491	7	18	15 20	170	0	-142	73 -10	-13	213598					
PKS-96	1 12 35	7	17	2 52	169	1	7	56 5	34	213967	7	18	15 27	170	1	-24	54 -16	33	214111					
HSK-25	1 12 31	7	17	2 53	169	1	5	53 -37	3	214053	7	18	15 25	170	1	-23	51 -36	-14	214204					
HAW-12	1 12 39	7	17	2 53	168	0	-108	38 -51	-14	214696	7	18	15 32	169	0	-99	22 -68	-9	215607					
CRO-08	1 12 35	7	19	1 36	170	1	21	63 11	25	213869	7	20	14 10	171	0	-18	64 -9	25	213942					
GWM-24	1 12 37	7	19	1 39	169	0	-120	65 -22	-12	213821	7	20	14 15	170	0	-106	49 -40	-11	214445					
HAW-12	0 35 50	7	19	1 43	169	0	-95	11 -79	-5	216247	7	19	37 32	169	0	-92	3 -87	-2	215477					
HSK-25	1 12 33	7	19	1 45	169	1	-40	46 -37	-26	214431	7	20	14 18	170	0	-58	36 -36	-44	215006					

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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	1	12	33	7	19	1	46	169	1	-41	49	-30	30	214336	7	20	14	19	170	0	-59	38	-48	24	214919
GWM-24	1	12	26	7	21	0	23	170	0	-101	38	-52	-9	214942	7	22	12	49	171	-1	-96	21	-69	-6	215918
CRO-08	1	12	23	7	21	0	26	170	0	-40	58	-22	24	214110	7	22	12	50	171	0	-61	46	-40	19	214650
HSK-25	1	12	20	7	21	0	33	170	0	-68	27	-36	-55	215446	7	22	12	53	171	0	-80	14	-35	-73	216296
MAD-23	0	12	10	7	22	0	5	172	-1	94	3	54	85	216303	7	22	12	15	172	-1	96	5	49	82	216792
MAD-23	1	12	35	7	22	58	24	172	-1	104	14	44	70	216342	8	0	10	59	173	-2	117	26	43	53	215727
CYI-04	1	12	32	7	22	58	26	172	-1	95	7	83	-5	216772	8	0	10	58	173	-2	104	22	68	-13	215971
ACN-75	1	12	33	7	22	58	29	172	0	89	9	81	1	216621	8	0	11	2	173	-1	87	26	64	3	215709
CRO-08	1	12	40	7	22	58	51	171	0	-70	37	-52	16	215105	8	0	11	31	172	-1	-80	22	-68	9	215985
GWM-24	0	26	59	7	22	58	52	171	-1	-93	9	-81	-3	216594	7	23	25	51	171	-1	-92	3	-87	-2	215820
HSK-25	0	8	28	7	22	58	55	171	0	-87	5	-35	-84	216871	7	23	7	23	171	0	-88	3	-34	-86	216552
CYI-04	0	16	33	8	0	57	13	173	-1	111	31	57	-18	215493	8	1	13	46	173	-2	114	35	53	-19	214523
MAD-23	0	16	31	8	0	57	15	173	-2	128	34	43	41	215384	8	1	13	46	173	-2	132	36	43	37	214468
ACN-75	0	16	28	8	0	57	18	173	-1	85	38	52	4	215170	8	1	13	46	173	-1	84	42	48	4	214185
CRO-08	0	16	3	8	0	57	43	172	-1	-85	11	-79	4	216596	8	1	13	46	172	-1	-87	8	-82	3	216023
				16 APR 72			PC2 TO SBN				LAZ 72.1														
CRO-08	0	22	6	8	1	14	2	172	-1	-87	8	-82	3	216015	8	1	36	8	172	-1	-90	3	-87	0	215862
CYI-04	0	55	39	8	1	14	2	173	-2	114	35	53	-19	214509	8	2	9	41	174	-2	125	45	39	-24	214940
MAD-23	0	55	40	8	1	14	2	173	-2	132	36	43	37	214455	8	2	9	42	174	-2	147	42	43	24	215052
ACN-75	0	55	42	8	1	14	2	173	-1	84	42	48	4	214171	8	2	9	44	174	-1	81	55	34	5	214546
BDA-02	0	0	57	8	2	8	33	174	-2	94	3	87	-4	217120	8	2	9	30	174	-2	94	3	87	-4	217153
BDA-02	1	12	46	8	2	55	21	174	-2	101	13	77	-10	216645	8	4	8	6	175	-2	112	27	62	-20	215917
CYI-04	1	12	44	8	2	55	32	174	-2	139	53	27	-27	214686	8	4	8	17	174	-2	168	59	7	-30	214527

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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	1	12	43	8	2	55	34	173	-2	162	46	43	12	214935	8	4	8	17	174	-3	-172	47	43	-5	214973
ACN-75	1	12	42	8	2	55	39	174	-1	75	67	23	6	214263	8	4	8	21	174	-2	40	82	5	6	214087
MIL-71	0	56	38	8	3	11	26	174	-2	94	3	87	-4	216459	8	4	8	4	175	-2	101	14	75	-11	216601
TEX-16	1	12	42	8	4	54	10	175	-2	98	10	80	-8	216906	8	6	6	52	176	-3	108	25	64	-16	216134
MIL-71	1	12	44	8	4	54	10	175	-2	107	24	65	-16	216093	8	6	6	54	176	-3	120	38	48	-23	215463
BDA-02	1	12	47	8	4	54	11	175	-2	121	36	50	-25	215516	8	6	6	58	175	-3	139	47	32	-31	215096
CYI-04	1	12	47	8	4	54	20	174	-2	-169	59	-6	-30	214560	8	6	7	7	175	-3	-140	52	-26	-28	214886
MAD-23	1	12	47	8	4	54	21	174	-2	-156	44	43	-17	215110	8	6	7	8	175	-3	-135	36	44	-34	215559
ACN-75	1	12	47	8	4	54	27	174	-2	-48	81	-7	6	214128	8	6	7	14	175	-2	-78	65	-24	5	214495
GDS-28	0	20	17	8	5	46	34	176	-3	96	3	62	84	216417	8	6	6	51	176	-3	99	7	51	79	217165
MAR-95	0	4	31	8	6	2	21	176	-3	98	6	84	-8	216991	8	6	6	52	176	-3	99	7	83	-9	217168
MAR-95	1	12	35	8	6	52	46	176	-3	106	16	73	-15	216667	8	8	5	22	177	-3	118	29	58	-25	216017
GDS-28	1	12	33	8	6	52	48	176	-3	106	16	43	68	216663	8	8	5	21	177	-3	118	29	41	50	216014
TEX-16	1	12	37	8	6	52	48	176	-3	115	35	53	-21	215677	8	8	5	25	176	-3	131	47	35	-27	215170
STN-00	1	12	32	8	6	52	49	176	-3	103	12	78	-13	216933	8	8	5	22	177	-3	115	24	64	-23	216270
MIL-71	1	12	36	8	6	52	56	175	-3	131	47	36	-27	215128	8	8	5	32	176	-3	155	56	16	-31	214865
BDA-02	1	12	37	8	6	52	56	175	-3	155	52	18	-34	214918	8	8	5	33	176	-3	-176	54	-3	-36	214910
CYI-04	1	12	40	8	6	53	8	175	-3	-127	45	-39	-25	215199	8	8	5	48	175	-3	-113	31	-57	-20	215934
MAD-23	1	12	39	8	6	53	8	175	-3	-124	30	45	-46	215916	8	8	5	47	175	-3	-110	17	48	-63	216670
ACN-75	1	12	37	8	6	53	17	175	-2	-83	54	-36	4	214847	8	8	5	55	175	-3	-88	36	-54	2	215669
HAW-12	1	12	42	8	8	51	15	177	-3	96	6	84	-6	217358	8	10	3	57	178	-4	104	22	68	-13	216503
STN-00	1	12	48	8	8	51	18	176	-3	125	32	52	-29	215899	8	10	4	6	177	-4	143	42	34	-37	215502

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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	1	12	46	8	8	51	19	170	-3	129	37	40	39	215667	8	10	4	5	177	-4	149	46	39	21	215324
MAR-95	1	12	47	8	8	51	19	176	-3	129	37	46	-30	215670	8	10	4	6	177	-4	149	46	27	-36	215328
TEX-16	1	12	47	8	8	51	23	176	-3	146	54	22	-29	214956	8	10	4	11	177	-4	177	59	2	-31	214875
MIL-71	1	12	50	8	8	51	25	176	-3	176	58	2	-32	214820	8	10	4	15	177	-4	-153	54	-18	-31	215012
BDA-02	1	12	47	8	8	51	29	170	-3	-157	52	-17	-34	215030	8	10	4	16	176	-4	-134	43	-38	-31	215462
MAD-23	0	32	11	8	8	51	31	175	-3	-102	9	53	-75	217186	8	9	23	42	176	-4	-97	3	68	-82	216306
CYI-04	1	12	50	8	8	51	37	175	-3	-106	21	-68	-15	216475	8	10	4	27	176	-4	-97	6	-84	-7	217449
ACN-75	1	12	43	8	8	51	50	175	-3	-89	25	-65	1	216268	8	10	4	32	176	-3	-92	8	-82	-2	217347
HAW-12	1	12	46	8	10	50	6	177	-4	110	32	56	-17	215994	8	12	2	52	178	-4	123	47	38	-22	215415
STN-00	1	12	50	8	10	50	9	177	-4	158	47	19	-40	215339	8	12	2	59	178	-4	-176	48	-4	-42	215353
MAR-95	1	12	49	8	10	50	11	177	-4	165	50	12	-39	215208	8	12	2	59	178	-4	-168	50	-10	-39	215299
GDS-28	1	12	48	8	10	50	11	177	-4	165	50	39	9	215205	8	12	2	59	178	-4	-168	50	40	-8	215296
TEX-16	1	12	47	8	10	50	17	177	-4	-161	57	-12	-31	214946	8	12	3	4	177	-4	-136	48	-32	-28	215351
BDA-02	1	12	48	8	10	50	21	176	-4	-123	35	-50	-26	215837	8	12	3	9	177	-4	-110	22	-67	-19	216641
MIL-71	1	12	47	8	10	50	21	176	-4	-136	49	-31	-29	215252	8	12	3	8	177	-4	-120	36	-50	-24	215898
HSK-25	0	6	42	8	11	50	13	178	-3	92	3	31	87	217390	8	12	2	54	179	-3	91	4	11	86	217647
GWM-24	1	12	29	8	12	48	39	179	-4	96	9	81	-6	217398	8	14	1	7	179	-4	102	25	64	-10	216507
HAW-12	1	12	37	8	12	48	45	178	-4	136	55	26	-24	215123	8	14	1	23	179	-5	167	63	7	-27	214956
STN-00	1	12	41	8	12	48	49	178	-4	-159	46	-19	-40	215450	8	14	1	31	178	-5	-138	38	-40	-35	215866
HSK-25	1	12	27	8	12	48	53	178	-3	84	14	-23	75	217110	8	14	1	20	179	-4	73	28	-29	58	216392
GDS-28	1	12	37	8	12	48	54	177	-4	-151	46	40	-20	215444	8	14	1	32	178	-5	-131	37	41	-37	215943
MAR-95	1	12	35	8	12	48	56	177	-4	-151	46	-25	-37	215446	8	14	1	31	178	-5	-131	37	-45	-32	215945

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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	1	12	40	8	12	48	58	177	-4	-123	40	-44	-25	215698	8	14	1	38	178	-5	-111	26	-62	-19	216481
MIL-71	1	12	40	8	12	49	2	177	-4	-111	27	-62	-19	216368	8	14	1	42	178	-5	-102	12	-78	-12	217298
BDA-02	0	46	18	8	12	49	4	177	-4	-103	12	-77	-13	217177	8	13	35	22	178	-5	-97	3	-87	-7	216642
GWM-24	1	12	40	8	14	47	15	179	-4	106	37	52	-13	215988	8	15	59	55	-180	-5	117	52	35	-16	215384
CRO-08	1	12	36	8	14	47	21	179	-4	90	9	81	0	217496	8	15	59	57	-180	-4	83	25	65	7	216653
HAW-12	1	12	45	8	14	47	24	178	-4	-168	63	-6	-26	214981	8	16	0	9	179	-5	-137	55	-26	-25	215307
PKS-96	1	12	36	8	14	47	27	179	-4	67	37	50	19	215951	8	16	0	3	180	-4	50	50	33	24	215472
HSK-25	1	12	37	8	14	47	27	179	-4	64	37	-30	46	215976	8	16	0	5	180	-4	47	49	-31	29	215522
STN-00	1	12	45	8	14	47	28	178	-5	-126	32	-53	-30	216221	8	16	0	14	179	-5	-113	19	-69	-21	216970
MAR-95	1	12	44	8	14	47	29	178	-5	-121	29	-57	-26	216348	8	16	0	13	179	-5	-108	16	-73	-18	217159
GDS-28	1	12	43	8	14	47	31	178	-5	-121	29	42	-49	216345	8	16	0	15	179	-5	-108	16	48	-66	217159
TEX-16	1	4	33	8	14	47	33	178	-4	-104	17	-73	-14	217037	8	15	52	6	179	-5	-97	3	-87	-7	217514
GWM-24	1	12	44	8	16	46	5	180	-5	129	62	22	-17	215098	8	17	58	49	-180	-5	168	71	4	-19	214963
CRO-08	1	12	39	8	16	46	8	-180	-4	77	35	54	11	216138	8	17	58	47	-179	-5	65	50	37	16	215554
PKS-96	1	12	43	8	16	46	14	180	-4	34	57	20	27	215254	8	17	58	57	-180	-5	1	62	0	28	215192
HSK-25	1	10	54	8	16	46	15	180	-4	31	55	-31	17	215316	8	17	57	9	-180	-5	0	59	-31	0	215183
HAW-12	1	12	52	8	16	46	15	179	-5	-124	46	-38	-23	215628	8	17	59	7	180	-5	-112	32	-56	-18	216403
GDS-28	0	18	57	8	16	46	17	179	-5	-101	7	58	-77	217700	8	17	5	14	179	-5	-99	3	70	-81	217030
STN-00	0	39	14	8	16	46	18	179	-5	-105	11	-79	-15	217480	8	17	25	31	179	-5	-99	3	-87	-9	216700
MAR-95	0	3	56	8	16	46	18	179	-5	-101	7	-83	-11	217700	8	16	50	14	179	-5	-101	6	-84	-11	217556
GWM-24	1	12	42	8	18	44	43	-180	-5	-157	70	-8	-18	215000	8	19	57	25	-179	-6	-126	58	-27	-18	215370
CRO-08	1	12	32	8	18	44	47	-179	-5	52	60	25	18	215260	8	19	57	19	-179	-5	18	69	7	20	215082

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VEHICLE 1 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA										STATION TERMINATION DATA											
	HRS	MIN	SEC	DAY	HR	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	DAY	HR	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
HAW-12	1	12	37	8	18	44	55	180	-5	-106	22	-68	-14	216934	8	19	57	32	-179	-6	-99	6	-84	-9	217947
PKS-96	1	12	33	8	18	44	56	-180	-4	-23	60	-13	28	215249	8	19	57	29	-179	-5	-50	51	-32	24	215620
HSK-25	1	12	32	8	18	44	57	-180	-4	-23	57	-31	-12	215331	8	19	57	29	-179	-5	-49	49	-30	-29	215702
GWM-24	1	12	41	8	20	43	28	-179	-6	-115	49	-39	-16	215725	8	21	56	9	-178	-6	-106	32	-56	-14	216539
CRO-08	1	12	38	8	20	43	28	-179	-5	-16	69	-6	20	215092	8	21	56	7	-178	-6	-53	61	-24	17	215399
PKS-96	1	10	40	8	20	43	34	-179	-5	-62	43	-44	20	215954	8	21	54	14	-178	-5	-76	30	-59	12	216571
HSK-25	1	12	42	8	20	43	34	-179	-5	-61	41	-29	-41	216032	8	21	56	16	-178	-5	-75	28	-25	-58	216755
GWM-24	1	12	41	8	22	42	17	-179	-6	-102	21	-68	-11	217115	8	23	54	57	-178	-7	-98	5	-85	-8	218191
CRO-08	1	12	37	8	22	42	18	-178	-5	-60	51	-36	15	215698	8	23	54	55	-178	-6	-78	37	-53	9	216432
HSK-25	1	12	35	8	22	42	24	-179	-5	-83	19	-20	-70	217248	8	23	54	59	-178	-6	-93	5	33	-84	218163
MAD-23	0	56	52	8	22	57	27	-177	-6	101	3	75	78	217450	8	23	54	19	-176	-7	111	13	58	66	217696
ACN-75	0	44	3	8	23	10	18	-177	-6	96	3	87	-6	217025	8	23	54	22	-176	-6	95	13	77	-4	217657
CYI-04	0	18	42	8	23	35	34	-176	-7	99	3	87	-9	217348	8	23	54	16	-176	-7	101	7	83	-11	218028
ACN-75	0	10	47	9	0	38	24	-176	-6	93	24	66	-3	217158	9	0	49	12	-176	-6	93	27	63	-3	216486
MAD-23	0	8	59	9	0	40	13	-176	-7	119	21	52	55	217274	9	0	49	12	-176	-7	121	22	52	53	216750
CYI-04	0	8	58	9	0	40	14	-176	-7	107	17	72	-17	217484	9	0	49	12	-176	-7	109	19	70	-18	216936
CRO-08	0	8	19	9	0	40	53	-178	-6	-84	26	-64	5	216951	9	0	49	12	-178	-6	-85	24	-66	4	216638
				16 APR 72			SBN TO TEI				LAZ 72.1														
CYI-04	1	5	57	9	0	49	14	-176	-7	109	19	70	-18	216934	9	1	55	11	-175	-7	119	31	55	-24	216795
MAD-23	1	5	59	9	0	49	14	-176	-7	121	22	52	53	216747	9	1	55	13	-176	-7	135	31	50	37	216801
ACN-75	1	6	2	9	0	49	14	-176	-6	93	27	63	-3	216484	9	1	55	16	-175	-7	92	43	47	-1	216260
CRO-08	1	6	35	9	0	49	14	-178	-6	-85	24	-66	4	216637	9	1	55	49	-177	-6	-92	10	-80	-2	218006
MAD-23	1	14	47	9	2	40	55	-176	-7	147	37	49	26	216502	9	3	55	42	-175	-8	170	41	48	8	216403

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
CYI-04	1 14 45	9	2	40	55	-176	-7	128	40	43	-29	216356	9	3	55	40	-175	-8	149	50	23	-34	216040	
ACN-75	1 14 43	9	2	41	0	-176	-7	90	54	36	0	215776	9	3	55	43	-175	-7	89	72	18	0	215414	
BDA-02	0 54 16	9	3	1	14	-175	-7	101	3	87	-11	217414	9	3	55	30	-174	-8	108	13	76	-18	217864	
MIL-71	1 14 45	9	4	41	8	-174	-8	105	11	79	-14	218002	9	5	55	53	-174	-8	116	25	63	-23	217279	
BDA-02	1 14 47	9	4	41	8	-175	-8	115	22	65	-23	217328	9	5	55	56	-174	-8	130	35	48	-32	216780	
MAD-23	1 14 58	9	4	41	15	-175	-8	-175	42	48	-4	216350	9	5	56	13	-174	-8	-152	37	49	-22	216671	
CYI-04	1 14 57	9	4	41	15	-175	-8	167	54	9	-35	215866	9	5	56	12	-174	-8	-163	53	-13	-35	216023	
ACN-75	1 14 55	9	4	41	22	-175	-7	82	84	6	1	215233	9	5	56	17	-174	-8	-89	78	-12	0	215407	
TEX-16	0 42 21	9	5	13	32	-174	-8	100	3	87	-10	217197	9	5	55	53	-173	-8	106	12	78	-15	218047	
		16 APR 72						TEL TO ENT				LAZ 72.1												
TEX-16	9 33 21	9	6	31	11	-174	-8	110	19	70	-19	217957	9	16	4	33	-175	-8	-101	3	-87	-11	199010	
MIL-71	8 25 53	9	6	31	13	-174	-8	122	32	54	-26	217260	9	14	57	6	-175	-8	-101	3	-87	-11	201297	
BDA-02	7 18 29	9	6	31	14	-174	-8	139	40	38	-35	216865	9	13	49	42	-175	-8	-102	3	-87	-12	203543	
MAD-23	3 9 14	9	6	31	18	-175	-8	-142	34	50	-31	217170	9	9	40	32	-175	-8	-103	3	77	-76	211943	
CYI-04	4 7 10	9	6	31	19	-175	-8	-149	50	-23	-34	216472	9	10	38	29	-175	-8	-101	3	-87	-11	209968	
ACN-75	4 24 18	9	6	31	24	-175	-7	-90	69	-21	0	215880	9	10	55	42	-176	-7	-97	3	-87	-7	209391	
GDS-28	10 34 8	9	6	40	9	-174	-8	102	3	76	78	218573	9	17	14	16	-175	-9	-103	3	77	-77	196669	
MAR-95	10 4 14	9	6	54	57	-174	-8	104	6	84	-14	217794	9	16	59	11	-175	-9	-105	6	-84	-15	197001	
STN-00	10 30 2	9	7	2	58	-174	-8	102	3	87	-12	217651	9	17	32	60	-175	-9	-103	3	-87	-13	196000	
HAW-12	10 58 11	9	9	18	55	-174	-8	100	3	87	-10	212685	9	20	17	5	-175	-9	-101	3	-87	-11	190397	
HSK-25	12 6 58	9	12	11	50	-174	-7	97	3	65	83	206839	10	0	18	48	-175	-8	-98	3	69	-82	181860	
GWM-24	11 10 36	9	12	54	58	-174	-8	99	3	87	-9	205389	10	0	5	34	-175	-9	-100	3	-87	-10	182334	
PKS-96	7 46 27	9	14	24	21	-174	-7	79	30	60	10	200861	9	22	10	48	-175	-8	-79	30	-60	9	184885	

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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	11	55	31	9	14	38	3	-174	-7	97	3	87	-7	201936	10	2	33	34	-175	-9	-98	3	-87	-8	176959
MAD-23	10	12	3	9	23	18	6	-173	-9	105	3	79	75	184030	10	9	30	9	-175	-11	-107	3	80	-73	161044
ACN-75	11	37	36	9	23	18	52	-173	-8	98	3	87	-8	184005	10	10	56	28	-175	-10	-100	3	-87	-10	157589
CYI-04	10	42	46	9	23	49	8	-173	-9	102	3	87	-12	182922	10	10	31	54	-175	-11	-104	3	-87	-14	158576
BDA-02	10	30	10	10	3	11	47	-173	-10	103	3	87	-13	175545	10	13	41	57	-174	-11	-105	3	-87	-15	150779
MIL-71	10	38	14	10	4	12	13	-173	-10	103	3	87	-13	173296	10	14	50	28	-174	-11	-105	3	-87	-15	147888
TEX-16	10	39	18	10	5	18	34	-173	-10	103	3	87	-13	170799	10	15	57	52	-174	-12	-105	3	-87	-15	145000
GDS-28	10	19	6	10	6	46	6	-173	-10	105	3	78	75	167458	10	17	5	12	-174	-12	-107	3	80	-73	142069
MAR-95	9	48	2	10	7	1	47	-173	-10	107	6	84	-17	166673	10	16	49	50	-174	-12	-109	6	-84	-19	142563
STN-00	10	12	42	10	7	10	22	-173	-10	105	3	87	-15	166521	10	17	23	5	-174	-12	-108	3	-87	-18	141283
HAW-12	10	48	10	10	9	24	9	-172	-10	102	3	87	-12	161284	10	20	12	19	-174	-12	-105	3	-87	-15	133674
HSK-25	12	29	32	10	12	6	44	-172	-10	100	3	73	80	154729	11	0	32	16	-173	-12	-102	3	76	-77	121315
GWM-24	11	3	26	10	13	0	13	-172	-11	102	3	87	-12	152519	11	0	3	39	-174	-13	-104	3	-87	-14	122716
PKS-96	8	2	19	10	14	19	49	-172	-10	82	30	60	7	147657	10	22	22	8	-174	-12	-84	30	-60	5	126082
CRO-08	12	8	20	10	14	35	55	-172	-10	100	3	87	-10	148508	11	2	44	15	-173	-13	-103	3	-87	-12	114678
ACN-75	11	42	37	10	23	23	6	-171	-12	102	3	87	-12	124689	11	11	5	43	-172	-16	-106	3	-87	-16	86572
MAD-23	9	32	21	10	23	39	46	-171	-14	111	3	82	69	123878	11	9	12	7	-172	-17	-115	3	83	-64	93413
CYI-04	10	17	42	11	0	5	0	-171	-13	107	3	87	-17	122649	11	10	22	43	-172	-17	-111	3	-87	-21	89198
BDA-02	9	54	9	11	3	33	8	-170	-15	109	3	87	-19	112146	11	13	27	18	-171	-19	-115	3	-87	-25	77528
MIL-71	10	5	33	11	4	32	44	-170	-15	109	3	87	-19	109012	11	14	38	17	-171	-20	-115	3	-87	-25	72748
TEX-16	10	5	38	11	5	39	58	-170	-15	109	3	87	-19	105401	11	15	45	35	-171	-21	-115	3	-87	-25	68037
GDS-28	9	28	36	11	7	14	22	-169	-16	112	3	82	68	100183	11	16	42	57	-170	-22	-120	3	84	-60	63863

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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
MAR-95	8 54 56	11	7	31	21	-169	-16	115	6	83	-25	99045	11	16	26	16	-170	-22	-122	6	-83	-32	64912	
STN-00	9 16 24	11	7	40	55	-169	-10	113	3	87	-23	98682	11	16	57	20	-170	-22	-121	3	-86	-31	62792	
HAW-12	10 12 33	11	9	48	26	-168	-17	109	3	87	-19	91262	11	20	0	58	-169	-26	-120	3	-87	-29	48052	
HSK-25	14 14 6	11	12	3	53	-168	-16	107	3	80	73	82934	12	2	17	59	40	-7	97	3	67	82	1629	
GWM-24	10 30 37	11	13	26	14	-167	-18	110	3	87	-20	77601	11	23	56	51	-166	-38	-131	3	-86	-41	24280	
PKS-96	11 51 22	11	14	20	39	-167	-17	92	30	60	-2	72436	12	2	12	1	42	-74	162	30	29	-55	1924	
CRO-08	11 29 25	11	14	41	33	-166	-17	108	3	87	-18	72529	12	2	10	58	29	-50	145	3	85	-55	3278	

TABLE 6-I.- MISSION RADAR TIMELINE - Continued

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

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
		16	APR	72	LM TRACKING FROM PDI TO LANDING												LAZ	72	01							
MAD-23	0 12 2	4	2	34 41	126	18	-128	59	20	-24	204342					4	2	46	42	127	18	-124	57	20	-27	204260
GDS-28	0 12 2	4	2	34 41	128	18	76	12	-50	72	206572					4	2	46	42	128	18	77	14	-41	71	206310
MAR-95	0 12 2	4	2	34 41	128	18	76	12	78	14	206572					4	2	46	42	128	18	77	14	76	12	206310
STN-00	0 12 2	4	2	34 41	128	18	73	8	81	17	206784					4	2	46	42	128	18	75	10	79	15	206525
MIL-71	0 12 2	4	2	34 41	128	18	90	42	48	0	204996					4	2	46	42	128	18	91	44	46	-1	204754
BDA-02	0 12 2	4	2	34 41	127	18	105	55	34	-8	204467					4	2	46	42	128	18	107	57	32	-9	204257
CYI-04	0 12 2	4	2	34 41	127	19	-122	74	-13	-8	203983					4	2	46	42	127	18	-117	72	-16	-8	203883
ACN-75	0 12 2	4	2	34 41	127	19	-29	59	-16	27	204337					4	2	46	42	127	19	-33	58	-19	27	204242
TEX-16	0 12 2	4	2	34 41	128	18	82	27	63	7	205727					4	2	46	42	128	18	83	29	61	6	205464

TABLE 6-I.- MISSION RADAR TIMELINE - Continued

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

VEHICLE 1 RADAR TABLE

VEHICLE	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
		16	APR	72	LM	ASCENT	TRACKING	LAZ	72+1													
MAD-23 X-Y USB-85	0 7 14	7	3	45	9	163	3 -164	51	37 -10	211897				7	3	52	23	163	3 -161	51	37 -12	211851
MIL-71 X-Y USB-30	0 7 14	7	3	45	9	164	3 98	21 69	-8	213336				7	3	52	23	164	3 99	23 67	-9	213194
BDA-02 X-Y USB-30	0 7 14	7	3	45	9	163	3 110	34 55	-17	212672				7	3	52	23	164	3 112	35 53	-18	212546
CYI-04 X-Y USB-30	0 7 14	7	3	45	9	163	3 176	65 2	-25	211469				7	3	52	23	163	3 -180	65 0	-25	211407
ACN-75 X-Y USB-30	0 7 14	7	3	45	9	163	4 2	78 0	12	211232				7	3	52	23	163	4 -6	78 -1	12	211169
TEX-16 X-Y USB-30	0 7 14	7	3	45	9	164	3 90	7 83	0	214187				7	3	52	23	164	3 91	8 82	-1	214038

TABLE 6-I.- MISSION RADAR TIMELINE - Concluded

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

COAST TO RENDEZVOUS RADAR TRACKING PRIOR TO TPI

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA															
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
MAD-23 X=Y USB=85	0	10	0		171	52	23	163	3 -161	51	37 -12	211949				172	2	23	163	3 -158	50	38 -14	212140				
MIL-71 X=Y USB=30	0	10	0		171	52	23	164	3 99	23	67 -9	213290				172	2	23	164	3 101	25	65 -10	213347				
BDA-02 X=Y USB=30	0	10	0		171	52	23	164	3 112	35	53 -18	212642				172	2	23	164	3 113	37	51 -19	212721				
CYI-04 X=Y USB=30	0	10	0		171	52	23	163	3 180	65	0 -25	211505				172	2	23	163	3 -174	65	-3 -25	211674				
ACN-75 X=Y USB=30	0	10	0		171	52	23	163	4 -7	78	-1 12	211268				172	2	23	163	4 -18	78	-4 12	211437				
TEX-16 X=Y USB=30	0	10	0		171	52	23	164	3 91	8	82 -1	214134				172	2	23	164	3 92	10	80 -2	214180				
RENDEZVOUS RADAR TRACKING PRIOR TO TPI																											
MAD-23 X=Y USB=85	0	17	60		172	2	23	163	3 -158	50	38 -14	212140				172	20	23	163	3 -152	49	38 -18	213016				
MIL-71 X=Y USB=30	0	17	60		172	2	23	164	3 101	25	65 -10	213347				172	20	23	164	3 103	28	61 -11	213972				
BDA-02 X=Y USB=30	0	17	60		172	2	23	164	3 113	37	51 -19	212721				172	20	23	164	3 117	40	47 -20	213390				
CYI-04 X=Y USB=30	0	17	60		172	2	23	163	3 -174	65	-3 -25	211674				172	20	23	163	3 -164	64	-7 -25	212513				

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VEHICLE 2 RADAR TABLE

TRACKING TIME				STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
ACN-75 X-Y USB-30	0	17	60		172	2	23	163	4	+18	78	-4	12	211437		172	20	23	163	4	+35	76	-8	11	212281
TEX-16 X-Y USB-30	0	17	60		172	2	23	164	3	92	10	80	-2	214180		172	20	23	164	3	94	14	76	-4	214780
COAST TO TPI																									
TEX-16 X-Y USB-30	0	4	12		172	20	23	164	3	94	14	76	-4	214780		172	24	35	164	3	94	15	75	-4	214949
MIL-71 X-Y USB-30	0	4	13		172	20	23	164	3	103	28	61	-11	213972		172	24	36	164	3	104	29	60	-12	214149
BDA-02 X-Y USB-30	0	4	19		172	20	23	164	3	117	40	47	+20	213390		172	24	42	164	3	118	41	46	-21	213582
CYI-04 X-Y USB-30	0	4	30		172	20	23	163	3	+164	64	-7	+25	212513		172	24	53	163	3	-162	64	=9	+25	212756
MAD-23 X-Y USB-85	0	4	32		172	20	23	163	3	-152	49	38	+18	213016		172	24	55	163	3	-150	48	38	+19	213270
ACN-75 X-Y USB-30	0	4	35		172	20	23	163	4	+35	76	-8	11	212281	100	172	24	58	163	4	+39	75	+9	11	212532
ULLAGE FOR TPI																									
TPI																									
COAST TO 1ST BRAKING GATE																									
GDS-28 X-Y USB-85	0	6	11		173	11	14	164	3	92	8	14	02	215514		173	17	25	164	3	93	9	18	81	215140
STN-00 A-E USB150	0	6	11		173	11	14	164	3	89	3	87	1	215771		173	17	25	164	3	90	5	85	0	215398

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA											
	HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
TEX-16 X=Y USB=30	0	6	8	173	11	18	164	3	100	25	65	-9	214514	173	17	25	164	3	101	26	63	-10	214145
MIL-71 X=Y USB=30	0	6	5	173	11	20	164	3	111	39	49	+16	213804	173	17	25	164	3	113	40	47	+17	213451
BDA-02 X=Y USB=30	0	6	2	173	11	23	164	3	130	49	33	-25	213370	173	17	25	164	3	132	50	32	-25	213040
CYI-04 X=Y USB=30	0	5	53	173	11	32	163	3	-139	59	+21	+23	213030	173	17	25	163	3	-137	58	+23	+23	212770
MAD-23 X=Y USB=85	0	5	51	173	11	34	163	3	-135	43	37	+31	213621	173	17	25	163	3	-133	42	37	+33	213371
ACN-75 X=Y USB=30	0	5	46	173	11	40	163	4	-62	66	+21	11	212830	173	17	25	163	4	-64	65	+23	11	212579
COAST TO 2ND BRAKING GATE																							
MAD-23 X=Y USB=85	0	2	17	173	17	25	163	3	-133	42	37	-33	213371	173	19	42	163	3	-133	42	37	-33	213272
GDS-28 X=Y USB=85	0	2	17	173	17	25	164	3	93	9	18	81	215140	173	19	42	164	3	93	9	19	80	215000
MIL-71 X=Y USB=30	0	2	17	173	17	25	164	3	113	40	47	+17	213451	173	19	42	164	3	113	41	47	+17	213317
BDA-02 X=Y USB=30	0	2	17	173	17	25	164	3	132	50	32	-25	213040	173	19	42	164	3	133	51	31	-25	212913

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VEHICLE Z RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA															
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
CYI-04 X=Y USB=30	0	2	17		173	17	25	163	3 -137	58 -23	-23	212770				173	19	42	163	3 -136	58 -24	-23	212667				
AGN-75 X=Y USB=30	0	2	17		173	17	25	163	4 -64	65 -23	11	212579				173	19	42	163	4 -64	64 -24	11	212478				
TEX-16 X=Y USB=30	0	2	17		173	17	25	164	3 101	26	63 -10	214145				173	19	42	164	3 102	27	63 -10	214005				
STN-00 A=E USB150	0	2	17		173	17	25	164	3 90	5	85	0 215398				173	19	42	164	3 90	5 85	0	215258				
1ST BRAKING MANEUVER *																											
MAD-23 X=Y USB=85	0	0	15		173	19	42	163	3 -133	42	37 -33	213272				173	19	58	163	3 -133	42	37 -33	213261				
GDS-28 X=Y USB=85	0	0	15		173	19	42	164	3 93	9	19	80 215000				173	19	58	164	3 93	9 19	80	214984				
MIL-71 X=Y USB=30	0	0	15		173	19	42	164	3 113	41	47 -17	213317				173	19	58	164	3 113	41	47 -17	213302				
BDA-02 X=Y USB=30	0	0	15		173	19	42	164	3 133	51	31 -25	212913				173	19	58	164	3 133	51	31 -25	212899				
CYI-04 X=Y USB=30	0	0	15		173	19	42	163	3 -136	58 -24	-23	212667				173	19	58	163	3 -136	58 -24	-23	212655				
AGN-75 X=Y USB=30	0	0	15		173	19	42	163	4 -64	64 -24	11	212478				173	19	58	163	4 -64	64 -24	11	212467				

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	
TEX-16 X-Y USB-30	0	0	15		173	19	42	164	3	102	27	63	-10	214005		173	19	58	164	3	102	27	63	-10	213989
STN-00 A-E USB150	0	0	15		173	19	42	164	3	90	5	85	0	215258		173	19	58	164	3	90	5	85	0	215243
COAST TO 3RD BRAKING GATE																									
MAD-23 X-Y USB-85	0	0	57		173	19	58	163	3	133	42	37	-33	213261		173	20	55	163	3	132	42	37	-34	213219
GDS-28 X-Y USB-85	0	0	57		173	19	58	164	3	93	9	19	80	214984		173	20	55	164	3	93	10	19	80	214926
MIL-71 X-Y USB-30	0	0	57		173	19	58	164	3	113	41	47	-17	213302		173	20	55	164	3	113	41	46	-17	213247
BDA-02 X-Y USB-30	0	0	57		173	19	58	164	3	133	51	31	-25	212899		173	20	55	164	3	133	51	31	-26	212846
CYI-04 X-Y USB-30	0	0	57		173	19	58	163	3	136	58	-24	-23	212655		173	20	55	163	3	136	57	-24	-23	212613
ACN-75 X-Y USB-30	0	0	57		173	19	58	163	4	-64	64	-24	11	212467		173	20	55	163	4	-65	64	-24	11	212425
TEX-16 X-Y USB-30	0	0	57		173	19	58	164	3	102	27	63	-10	213989		173	20	55	164	3	102	27	62	-10	213932
STN-00 A-E USB150	0	0	57		173	19	58	164	3	90	5	85	0	215243		173	20	55	164	3	90	5	85	0	215184

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2ND BRAKING MANEUVER *

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA												
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X=Y USB-85	0	0	9		173	20	55	163	3 -132	42	37 -34	213219				173	21	4	163	3 -132	42	37 -34	213213	
GDS-28 X=Y USB-85	0	0	9		173	20	55	164	3 93	10	19 80	214926				173	21	4	164	3 93	10	19 80	214917	
MIL-71 X=Y USB-30	0	0	9		173	20	55	164	3 113	41	46 -17	213247				173	21	4	164	3 113	41	46 -17	213238	
BDA-02 X=Y USB-30	0	0	9		173	20	55	164	3 133	51	31 -26	212846				173	21	4	164	3 133	51	31 -26	212838	
CYI-04 X=Y USB-30	0	0	9		173	20	55	163	3 -136	57 -24	-23	212613				173	21	4	163	3 -136	57 -24	-23	212606	
ACN-75 X=Y USB-30	0	0	9		173	20	55	163	4 -65	64 -24	11	212425				173	21	4	163	4 -65	64 -24	11	212418	
TEX-16 X=Y USB-30	0	0	9		173	20	55	164	3 102	27	62 -10	213932				173	21	4	164	3 102	27	62 -10	213923	
STN-00 A=E USB150	0	0	9		173	20	55	164	3 90	5 85	0	215184				173	21	4	164	3 91	5 85	-1	215176	
COAST TO 4TH BRAKING GATE																								
MAD-23 X=Y USB-85	0	1	30		173	21	4	163	3 -132	42	37 -34	213213				173	22	33	163	3 -132	41	37 -34	213150	
GDS-28 X=Y USB-85	0	1	30		173	21	4	164	3 93	10	19 80	214917				173	22	33	164	3 94	10	20 79	214826	

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA													
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MIL-71 X=Y USB-30	0	1	30		173	21	4	164	3	113	41	46	-17	213238		173	22	33	164	3	114	41	46	-18	213152
BDA-02 X=Y USB-30	0	1	30		173	21	4	164	3	133	51	31	-26	212838		173	22	33	164	3	133	51	30	-26	212757
CYI-04 X=Y USB-30	0	1	30		173	21	4	163	3	-136	57	-24	-23	212606		173	22	33	163	3	-135	57	-24	-23	212541
ACN-75 X=Y USB-30	0	1	30		173	21	4	163	4	-65	64	-24	11	212418		173	22	33	163	3	-65	64	-24	11	212354
TEX-16 X=Y USB-30	0	1	30		173	21	4	164	3	102	27	62	-10	213923		173	22	33	164	3	102	27	62	-11	213833
STN-00 A=E USB150	0	1	30		173	21	4	164	3	91	5	85	-1	215176		173	22	33	164	3	91	6	84	-1	215086
3RD BRAKING MANEUVER *																									
MAD-23 X=Y USB-85	0	0	4		173	22	33	163	3	-132	41	37	-34	213150		173	22	38	163	3	-132	41	37	-34	213147
GDS-28 X=Y USB-85	0	0	4		173	22	33	164	3	94	10	20	79	214826		173	22	38	164	3	94	10	20	79	214822
MIL-71 X=Y USB-30	0	0	4		173	22	33	164	3	114	41	46	-18	213152		173	22	38	164	3	114	41	46	-18	213148
BDA-02 X=Y USB-30	0	0	4		173	22	33	164	3	133	51	30	-26	212757		173	22	38	164	3	133	51	30	-26	212753

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VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA															
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
CYI-04 X=Y USB=30	0	0	4		173	22	33	163	3 -135	57	-24	-23	212541		173	22	38	163	3 -135	57	-24	-23	212538				
ACN-75 X=Y USB=30	0	0	4		173	22	33	163	3 -65	64	-24	11	212354		173	22	38	163	3 -65	64	-24	11	212351				
TEX-16 X=Y USB=30	0	0	4		173	22	33	164	3 102	27	62	-11	213833		173	22	38	164	3 102	28	62	-11	213829				
STN-00 A=E USB150	0	0	4		173	22	33	164	3 91	6	84	-1	215086		173	22	38	164	3 91	6	84	-1	215081				
COAST TO 5TH BRAKING GATE																											
MAD-23 X=Y USB=85	0	1	15		173	22	38	163	3 -132	41	37	-34	213147		173	23	53	163	3 -132	41	37	-34	213094				
GDS-28 X=Y USB=85	0	1	15		173	22	38	164	3 94	10	20	79	214822		173	23	53	164	3 94	10	20	79	214747				
MIL-71 X=Y USB=30	0	1	15		173	22	38	164	3 114	41	46	-18	213148		173	23	53	164	3 114	42	46	-18	213077				
BDA-02 X=Y USB=30	0	1	15		173	22	38	164	3 133	51	30	-26	212753		173	23	53	164	3 134	51	30	-26	212686				
CYI-04 X=Y USB=30	0	1	15		173	22	38	163	3 -135	57	-24	-23	212538		173	23	53	163	3 -135	57	-25	-23	212484				
ACN-75 X=Y USB=30	0	1	15		173	22	38	163	3 -65	64	-24	11	212351		173	23	53	163	3 -65	63	-25	11	212297				

VEHICLE 2 RADAR TABLE

	TRACKING TIME			STATION ACQUISITION DATA								STATION TERMINATION DATA															
	HRS	MIN	SEC		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE		
TEX-16 X=Y USB=30	0	1	15		173	22	30	164	3	102	28	62	-11	213829		173	23	53	164	3	102	28	62	-11	213755		
STN-00 A=E USB150	0	1	15		173	22	30	164	3	91	6	84	-1	215081		173	23	53	164	3	91	6	84	-1	215007		
4TH BRAKING MANEUVER																											
MAD-23 X=Y USB=85	0	0	4		173	23	53	163	3	-132	41	37	-34	213094		173	23	57	163	3	-132	41	37	-34	213091		
GDS-28 X=Y USB=85	0	0	4		173	23	53	164	3	94	10	20	79	214747		173	23	57	164	3	94	10	20	79	214743		
MIL-71 X=Y USB=30	0	0	4		173	23	53	164	3	114	42	46	-18	213077		173	23	57	164	3	114	42	46	-18	213073		
BDA-02 X=Y USB=30	0	0	4		173	23	53	164	3	134	51	30	-26	212686		173	23	57	164	3	134	51	30	-26	212682		
CYI-04 X=Y USB=30	0	0	4		173	23	53	163	3	-135	57	-25	-23	212484		173	23	57	163	3	-135	57	-25	-23	212481		
ACN-75 X=Y USB=30	0	0	4		173	23	53	163	3	-65	63	-25	11	212297		173	23	57	163	3	-65	63	-25	11	212294		
TEX-16 X=Y USB=30	0	0	4		173	23	53	164	3	102	28	62	-11	213755		173	23	57	164	3	102	28	62	-11	213751		
STN-00 A=E USB150	0	0	4		173	23	53	164	3	91	6	84	-1	215007		173	23	57	164	3	91	6	84	-1	215003		

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COAST TO DOCKING

VEHICLE 2 RADAR TABLE

VEHICLE	TRACKING TIME	STATION ACQUISITION DATA										STATION TERMINATION DATA										
		HRS	MIN	SEC	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE	HRS	MIN	SEC	RA	DEC	AZ	ELV	X	Y	RANGE
MAD-23 X=Y USB=85	0 4 21	173	23	57	163	3	-132	41	37	-34	213091	173	28	18	163	3	-130	41	37	-35	212922	
GDS-28 X=Y USB=85	0 4 21	173	23	57	164	3	94	10	20	79	214743	173	28	18	164	3	94	11	22	78	214497	
MIL-71 X=Y USB=30	0 4 21	173	23	57	164	3	114	42	46	-18	213073	173	28	18	164	3	115	42	45	-18	212839	
BQA-02 X=Y USB=30	0 4 21	173	23	57	164	3	134	51	30	-26	212682	173	28	18	164	3	135	52	29	-26	212462	
CYI-04 X=Y USB=30	0 4 21	173	23	57	163	3	-135	57	-25	-23	212481	173	28	18	163	3	-133	56	-26	-22	212306	
ACN-75 X=Y USB=30	0 4 21	173	23	57	163	3	-65	63	-25	11	212294	173	28	18	163	3	-67	62	-26	11	212122	
TEX-16 X=Y USB=30	0 4 21	173	23	57	164	3	102	28	62	-11	213751	173	28	18	164	3	103	29	61	-11	213506	
STN-00 A=E USB150	0 4 21	173	23	57	164	3	91	6	84	-1	215003	173	28	18	164	3	92	7	83	-2	214757	

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TABLE 6-II.- MISSION SHADOW TIMELINE

(a) CSM

16 APR 72	EOI TO TLI	LAZ 72.1	AT PHASE INITIATION				TIME SPENT IN REGION			
			VEH IN SUNLIGHT	TIME SPENT IN REGION	VEH IN SUNLIGHT	TIME SPENT IN REGION	VEH IN SUNLIGHT	TIME SPENT IN REGION	VEH IN SUNLIGHT	TIME SPENT IN REGION
				DAY HRS MINS SECS		DAY HRS MINS SECS		DAY HRS MINS SECS		DAY HRS MINS SECS
VEH ENTERING EARTH PENUMBRA			0 0 27 13.2				0 0 0 7.7			
					0 0 0 7.7					
VEH ENTERING EARTH UMBRA			0 0 27 20.9				0 0 37 15.5			
					0 0 37 15.5					
VEH ENTERING EARTH PENUMBRA			0 1 4 36.4				0 0 0 8.7			
					0 0 0 8.7					
VEH ENTERING SUNLIGHT			0 1 4 45.1				0 0 50 14.3			
					0 0 50 14.3					
VEH ENTERING EARTH PENUMBRA			0 1 54 59.4				0 0 0 8.3			
					0 0 0 8.3					
VEH ENTERING EARTH UMBRA			0 1 55 7.7				0 0 37 14.1			
					0 0 37 14.1					
VEH ENTERING EARTH PENUMBRA			0 2 32 21.8				0 0 0 7.3			
					0 0 0 7.3					
VEH ENTERING SUNLIGHT			0 2 32 29.1							

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LIGHTING CONDITION FOR VEH 1

16 APR 72

TLI TO LOI

LAZ 72.1

VEH IN SUNLIGHT

AT PHASE INITIATION

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	3	0	22	1.9		0	0	3
					0	0	3	7.5
VEH ENTERING LUNAR UMBRA	3	0	25	9.4		0	1	38
					0	1	38	39.8
VEH ENTERING LUNAR PENUMBRA	3	2	3	49.3		0	0	1
					0	0	1	4.9
VEH ENTERING SUNLIGHT	3	2	4	54.1				

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LIGHTING CONDITION FOR VEH 1

16 APR 72 LCI TO DOI LAZ 72.1
 VEH IN SUNLIGHT AT PHASE INITIATION

	VEH ENTERING LUNAR PENUMBRA	TIME SPENT IN REGION			
		DAYS	HRS	mins	SECS
	VEH ENTERING LUNAR PENUMBRA	3	3	43	51.7
				0	0 0 11.3
	VEH ENTERING LUNAR UMBRA	3	3	44	3.0
				0	0 44 22.2
	VEH ENTERING LUNAR PENUMBRA	3	4	28	25.2
				0	0 0 10.5
	VEH ENTERING SUNLIGHT	3	4	28	35.7
				0	1 23 55.6
	VEH ENTERING LUNAR PENUMBRA	3	5	52	31.3
				0	0 0 11.3
	VEH ENTERING LUNAR UMBRA	3	5	52	42.6

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LIGHTING CONDITION FOR VEH 1

16 APR 72 DOI TO SEP LAZ 72.1

VEH IN LUNAR UMBRA AT PHASE INITIATION

	TIME SPENT IN REGION	DAYS HRS MINS SECS				DAYS HRS MINS SECS					
		VEH ENTERING LUNAR PENUMBRA	3	6	37	9.1	VEH ENTERING SUNLIGHT	3	6	37	20.3
								0	0	0	11.2
								0	1	54	10.2
		VEH ENTERING LUNAR PENUMBRA	3	8	31	30.6					
								0	0	0	15.3
		VEH ENTERING SUNLIGHT	3	8	31	45.9					
								0	1	5	35.2
		VEH ENTERING LUNAR PENUMBRA	3	9	37	21.1					
								0	0	0	11.5
		VEH ENTERING LUNAR UMBRA	3	9	37	32.6					
								0	0	48	14.0
		VEH ENTERING LUNAR PENUMBRA	3	10	25	46.6					
								0	0	0	11.2
		VEH ENTERING SUNLIGHT	3	10	25	57.8					
								0	1	54	10.7
		VEH ENTERING LUNAR PENUMBRA	3	12	20	8.5					
								0	0	0	10.6
		VEH ENTERING SUNLIGHT	3	12	20	19.0					
								0	1	5	38.1
		VEH ENTERING LUNAR PENUMBRA	3	13	25	57.1					

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LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	11.1
VEH ENTERING LUNAR UMBRA	3	13	26	8.3				
					0	0	48	15.9
VEH ENTERING LUNAR PENUMBRA	3	14	14	24.2				
					0	0	0	11.2
VEH ENTERING SUNLIGHT	3	14	14	35.4				
					0	1	54	11.0
VEH ENTERING LUNAR PENUMBRA	3	16	8	46.4				
					0	0	0	10.6
VEH ENTERING SUNLIGHT	3	16	8	57.0				
					0	1	5	36.5
VEH ENTERING LUNAR PENUMBRA	3	17	14	33.5				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	3	17	14	44.4				
					0	0	48	17.5
VEH ENTERING LUNAR PENUMBRA	3	18	3	1.9				
					0	0	0	11.1
VEH ENTERING SUNLIGHT	3	18	3	13.0				
					0	1	5	58.8
VEH ENTERING LUNAR PENUMBRA	3	19	9	11.8				
					0	0	48	12.5
VEH ENTERING LUNAR PENUMBRA	3	19	57	24.3				

66

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION							
	DAYS	HRS	MINS	SECS	DAYS	HRS	MINS	SECS
					0	0	0	10.7
VEH ENTERING SUNLIGHT	3	19	57	35.0				
					0	1	5	35.2
VEH ENTERING LUNAR PENUMBRA	3	21	3	10.2				
					0	0	0	10.6
VEH ENTERING LUNAR UMBRA	3	21	3	20.8				
					0	0	48	18.9
VEH ENTERING LUNAR PENUMBRA	3	21	51	39.7				
					0	0	0	11.1
VEH ENTERING SUNLIGHT	3	21	51	50.8				
					0	1	5	31.7
VEH ENTERING LUNAR PENUMBRA	3	22	57	22.4				
					0	0	0	9.3
VEH ENTERING LUNAR UMBRA	3	22	57	31.7				
					0	0	48	30.6
VEH ENTERING LUNAR PENUMBRA	3	23	46	2.3				
					0	0	0	10.8
VEH ENTERING SUNLIGHT	3	23	46	13.1				

LIGHTING CONDITION FOR VEH 1

16 APR 72

SEP TO CIR

LAZ 72.1

VEH IN SUNLIGHT

AT PHASE INITIATION

	TIME SPENT IN REGION DAYS HRS MINS SECS	TIME SPENT IN REGION DAYS HRS MINS SECS			
		DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	4 0 51 46.3			0 0 0 10.0	
VEH ENTERING LUNAR UMBRA	4 0 51 56.3			0 0 48 26.3	
VEH ENTERING LUNAR PENUMBRA	4 1 40 22.6			0 0 0 11.3	
VEH ENTERING SUNLIGHT	4 1 40 33.8				

6-98

LIGHTING CONDITION FOR VEH 1

16 APR 72

CIR TO PC1

LAZ 72.1

VEH IN SUNLIGHT

AT PHASE INITIATION

	TIME SPENT IN REGION DAYS HRS MINS SECS	TIME SPENT IN REGION DAYS HRS MINS SECS			
		DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	4 2 53 10.9		0	0	0 8.1
VEH ENTERING LUNAR UMBRA	4 2 53 19.0		0	0	45 50.8
VEH ENTERING LUNAR PENUMBRA	4 3 39 9.9		0	0	0 10.7
VEH ENTERING SUNLIGHT	4 3 39 20.5		0	1	12 41.2
VEH ENTERING LUNAR PENUMBRA	4 4 52 1.8		0	0	0 10.6
VEH ENTERING LUNAR UMBRA	4 4 52 12.4		0	0	45 48.4
VEH ENTERING LUNAR PENUMBRA	4 5 38 .8		0	0	0 10.7
VEH ENTERING SUNLIGHT	4 5 38 11.5		0	1	12 35.2
VEH ENTERING LUNAR PENUMBRA	4 6 50 46.8		0	0	0 10.5
VEH ENTERING LUNAR UMBRA	4 6 50 57.3		0	0	45 51.7
VEH ENTERING LUNAR PENUMBRA	4 7 36 48.9				

66-99

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING SUNLIGHT	4	7	36	59.3	0	0	0	10.4
VEH ENTERING LUNAR PENUMBRA	4	8	49	32.4	0	1	12	33.2
VEH ENTERING LUNAR UMBRA	4	8	49	40.7	0	0	0	8.2
VEH ENTERING LUNAR PENUMBRA	4	9	35	34.8	0	0	45	54.1
VEH ENTERING SUNLIGHT	4	9	35	45.5	0	0	0	10.7
VEH ENTERING LUNAR PENUMBRA	4	10	48	25.4	0	1	12	39.9
VEH ENTERING LUNAR UMBRA	4	10	48	35.9	0	0	0	10.6
VEH ENTERING LUNAR PENUMBRA	4	11	34	25.6	0	0	45	49.7
VEH ENTERING SUNLIGHT	4	11	34	39.2	0	0	0	13.6
VEH ENTERING LUNAR PENUMBRA	4	12	47	10.3	0	1	12	31.0
VEH ENTERING LUNAR UMBRA	4	12	47	20.9	0	0	0	10.6

6-100

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION
	DAYS	HRS	MINS	SECS	
VEH ENTERING LUNAR PENUMBRA	4	13	33	13.6	0 0 45 52.8
VEH ENTERING SUNLIGHT	4	13	33	24.0	0 0 0 10.3
VEH ENTERING LUNAR PENUMBRA	4	14	45	54.2	0 1 12 30.2
VEH ENTERING LUNAR UMBRA	4	14	46	2.5	0 0 0 8.3
VEH ENTERING LUNAR PENUMBRA	4	15	31	59.8	0 0 0 10.7
VEH ENTERING SUNLIGHT	4	15	32	10.6	0 1 12 38.4
VEH ENTERING LUNAR PENUMBRA	4	16	44	49.0	0 0 0 10.5
VEH ENTERING LUNAR UMBRA	4	16	44	59.4	0 0 45 54.1
VEH ENTERING LUNAR PENUMBRA	4	17	30	53.5	0 0 0 3.8
VEH ENTERING SUNLIGHT	4	17	30	57.3	0 1 12 36.7
VEH ENTERING LUNAR PENUMBRA	4	18	43	34.0	

TOTAL

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SECS
	0	0	0	10.6
VEH ENTERING LUNAR UMBRA	4	18	43	44.6
	0	0	45	53.8
VEH ENTERING LUNAR PENUMBRA	4	19	29	38.4
	0	0	0	10.3
VEH ENTERING SUNLIGHT	4	19	29	48.7
	0	1	12	27.4
VEH ENTERING LUNAR PENUMBRA	4	20	42	16.1
	0	0	0	15.3
VEH ENTERING LUNAR UMBRA	4	20	42	31.4
	0	0	45	53.6
VEH ENTERING LUNAR PENUMBRA	4	21	28	25.0
	0	0	0	10.7
VEH ENTERING SUNLIGHT	4	21	28	35.8
	0	1	12	36.9
VEH ENTERING LUNAR PENUMBRA	4	22	41	12.6
	0	0	0	10.3
VEH ENTERING LUNAR UMBRA	4	22	41	22.9
	0	0	45	48.8
VEH ENTERING LUNAR PENUMBRA	4	23	27	11.8
	0	0	0	10.2
VEH ENTERING SUNLIGHT	4	23	27	21.9

6-102

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	1	12	35.9
VEH ENTERING LUNAR PENUMBRA	5	0	39	57.9				
					0	0	0	10.7
VEH ENTERING LUNAR UMBRA	5	0	40	8.6				
					0	0	45	54.7
VEH ENTERING LUNAR PENUMBRA	5	1	26	3.3				
					0	0	0	10.2
VEH ENTERING SUNLIGHT	5	1	26	13.5				
					0	1	12	31.3
VEH ENTERING LUNAR PENUMBRA	5	2	38	44.8				
					0	0	0	10.2
VEH ENTERING LUNAR UMBRA	5	2	38	55.0				
					0	0	45	55.4
VEH ENTERING LUNAR PENUMBRA	5	3	24	50.3				
					0	0	0	10.7
VEH ENTERING SUNLIGHT	5	3	25	1.1				
					0	1	12	35.2
VEH ENTERING LUNAR PENUMBRA	5	4	37	36.3				
					0	0	0	10.1
VEH ENTERING LUNAR UMBRA	5	4	37	46.3				
					0	0	45	50.2
VEH ENTERING LUNAR PENUMBRA	5	5	23	36.5				

6-103

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAYS HRS MINS SECS			DAYS HRS MINS SECS
				0 0 0 10.4
VEH ENTERING SUNLIGHT	5 5 23 46.9			
				0 1 12 35.0
VEH ENTERING LUNAR PENUMBRA	5 6 36 21.9			
				0 0 0 10.8
VEH ENTERING LUNAR UMBRA	5 6 36 32.7			
				0 0 45 55.5
VEH ENTERING LUNAR PENUMBRA	5 7 22 28.2			
				0 0 0 14.6
VEH ENTERING SUNLIGHT	5 7 22 42.8			
				0 1 12 25.6
VEH ENTERING LUNAR PENUMBRA	5 8 35 8.4			
				0 0 0 10.3
VEH ENTERING LUNAR UMBRA	5 8 35 18.7			
				0 0 45 57.0
VEH ENTERING LUNAR PENUMBRA	5 9 21 15.7			
				0 0 0 10.7
VEH ENTERING SUNLIGHT	5 9 21 26.4			
				0 1 12 33.4
VEH ENTERING LUNAR PENUMBRA	5 10 33 59.8			
				0 0 0 3.8
VEH ENTERING LUNAR UMBRA	5 10 34 3.6			

6-TOT

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	45	58.0
VEH ENTERING LUNAR PENUMBRA	5	11	20	1.6				
					0	0	0	10.6
VEH ENTERING SUNLIGHT	5	11	20	12.2				
					0	1	12	33.9
VEH ENTERING LUNAR PENUMBRA	5	12	32	46.1				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	5	12	32	56.9				
					0	0	46	.7
VEH ENTERING LUNAR PENUMBRA	5	13	18	57.6				
					0	0	0	8.5
VEH ENTERING SUNLIGHT	5	13	19	6.1				
					0	1	12	26.2
VEH ENTERING LUNAR PENUMBRA	5	14	31	32.3				
					0	0	0	10.4
VEH ENTERING LUNAR UMBRA	5	14	31	42.7				
					0	0	45	58.5
VEH ENTERING LUNAR PENUMBRA	5	15	17	41.2				
					0	0	0	10.6
VEH ENTERING SUNLIGHT	5	15	17	51.8				
					0	1	12	24.9
VEH ENTERING LUNAR PENUMBRA	5	16	30	16.8				

6-105

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	MIN	SECS
VEH ENTERING LUNAR UMBRA	5	16	30	30.7
				0 0 0 13.9
VEH ENTERING LUNAR PENUMBRA	5	17	16	27.0
				0 0 45 56.3
VEH ENTERING SUNLIGHT	5	17	16	37.7
				0 1 12 32.7
VEH ENTERING LUNAR PENUMBRA	5	18	29	10.4
				0 0 0 10.8
VEH ENTERING LUNAR UMBRA	5	18	29	21.3
				0 0 45 59.7
VEH ENTERING LUNAR PENUMBRA	5	19	15	21.0
				0 0 0 8.4
VEH ENTERING SUNLIGHT	5	19	15	29.3
				0 1 12 27.0
VEH ENTERING LUNAR PENUMBRA	5	20	27	56.3
				0 0 0 10.5
VEH ENTERING LUNAR UMBRA	5	20	28	6.8
				0 0 45 59.9
VEH ENTERING LUNAR PENUMBRA	5	21	14	6.7
				0 0 0 10.6
VEH ENTERING SUNLIGHT	5	21	14	17.3

6-106

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	1	12	26.6
VEH ENTERING LUNAR PENUMBRA	5	22	26	43.9				
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	5	22	26	54.9				
					0	0	45	57.7
VEH ENTERING LUNAR PENUMBRA	5	23	12	52.6				
					0	0	0	10.8
VEH ENTERING SUNLIGHT	5	23	13	3.4				
					0	1	12	31.5
VEH ENTERING LUNAR PENUMBRA	6	0	25	34.9				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	6	0	25	45.8				
					0	0	45	58.5
VEH ENTERING LUNAR PENUMBRA	6	1	11	44.3				
					0	0	0	9.9
VEH ENTERING SUNLIGHT	6	1	11	54.2				
					0	1	12	26.4
VEH ENTERING LUNAR PENUMBRA	6	2	24	20.6				
					0	0	0	10.6
VEH ENTERING LUNAR UMBRA	6	2	24	31.1				
					0	0	46	1.2
VEH ENTERING LUNAR PENUMBRA	6	3	10	32.3				

6-107

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	10.5
VEH ENTERING SUNLIGHT	6	3	10	42.8				
					0	1	12	26.1
VEH ENTERING LUNAR PENUMBRA	6	4	23	8.9				
					0	0	0	8.3
VEH ENTERING LUNAR UMBRA	6	4	23	17.2				
					0	0	46	1.2
VEH ENTERING LUNAR PENUMBRA	6	5	9	18.4				
					0	0	0	10.9
VEH ENTERING SUNLIGHT	6	5	9	29.3				
					0	1	12	30.2
VEH ENTERING LUNAR PENUMBRA	6	6	21	59.5				
					0	0	0	10.8
VEH ENTERING LUNAR UMBRA	6	6	22	10.3				
					0	0	45	58.9
VEH ENTERING LUNAR PENUMBRA	6	7	8	9.2				
					0	0	0	13.9
VEH ENTERING SUNLIGHT	6	7	8	23.1				
					0	1	12	21.9
VEH ENTERING LUNAR PENUMBRA	6	8	20	45.0				
					0	0	0	10.7
VEH ENTERING LUNAR UMBRA	6	8	20	55.6				

6-108

LIGHTING CONDITION FOR VEH 1

16 APR 72

PC1 TO JET

LAZ 72.1

VEH IN LUNAR UMBRA

AT PHASE INITIATION

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	6	9	6	52.5		0	0	0
								10.4
VEH ENTERING SUNLIGHT	6	9	7	2.9		0	1	12
								29.1
VEH ENTERING LUNAR PENUMBRA	6	10	19	32.0		0	0	0
								10.8
VEH ENTERING LUNAR UMBRA	6	10	19	42.8		0	0	46
								.8
VEH ENTERING LUNAR PENUMBRA	6	11	5	43.6		0	0	0
								15.8
VEH ENTERING SUNLIGHT	6	11	5	59.4		0	1	12
								19.1
VEH ENTERING LUNAR PENUMBRA	6	12	18	18.5		0	0	0
								10.3
VEH ENTERING LUNAR UMBRA	6	12	18	28.8		0	0	46
								1.3
VEH ENTERING LUNAR PENUMBRA	6	13	4	30.2		0	0	0
								10.8
VEH ENTERING SUNLIGHT	6	13	4	41.0		0	1	12
								28.3
VEH ENTERING LUNAR PENUMBRA	6	14	17	9.3				

6-1094

LIGHTING CONDITION FOR VEH 1

					TIME SPENT IN REGION			
	DAY	HRS	mins	SECS	DAY	HRS	mins	SECS
					0	0	0	10.3
VEH ENTERING LUNAR UMBRA	6	14	17	19.6				
					0	0	45	55.9
VEH ENTERING LUNAR PENUMBRA	6	15	3	15.5				
					0	0	0	10.6
VEH ENTERING SUNLIGHT	6	15	3	26.1				
					0	1	12	28.2
VEH ENTERING LUNAR PENUMBRA	6	16	15	54.3				
					0	0	0	10.9
VEH ENTERING LUNAR UMBRA	6	16	16	5.1				
					0	0	46	1.5
VEH ENTERING LUNAR PENUMBRA	6	17	2	6.6				
					0	0	0	14.5
VEH ENTERING SUNLIGHT	6	17	2	21.1				
					0	1	12	19.4
VEH ENTERING LUNAR PENUMBRA	6	18	14	40.5				
					0	0	0	10.4
VEH ENTERING LUNAR UMBRA	6	18	14	50.9				
					0	0	46	2.7
VEH ENTERING LUNAR PENUMBRA	6	19	0	53.6				
					0	0	0	10.8
VEH ENTERING SUNLIGHT	6	19	1	4.4				

OTT-6

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	1	12	26.9
VEH ENTERING LUNAR PENUMBRA	6	20	13	31.3				
					0	0	0	2.4
VEH ENTERING LUNAR UMBRA	6	20	13	33.7				
					0	0	46	5.1
VEH ENTERING LUNAR PENUMBRA	6	20	59	38.7				
					0	0	0	10.7
VEH ENTERING SUNLIGHT	6	20	59	49.5				
					0	1	12	27.2
VEH ENTERING LUNAR PENUMBRA	6	22	12	16.7				
					0	0	0	10.9
VEH ENTERING LUNAR UMBRA	6	22	12	27.6				
					0	0	46	6.7
VEH ENTERING LUNAR PENUMBRA	6	22	58	34.3				
					0	0	0	8.5
VEH ENTERING SUNLIGHT	6	22	58	42.8				
					0	1	12	19.8
VEH ENTERING LUNAR PENUMBRA	7	0	11	2.6				
					0	0	0	10.5
VEH ENTERING LUNAR UMBRA	7	0	11	13.1				
					0	0	46	4.0
VEH ENTERING LUNAR PENUMBRA	7	0	57	17.1				

LIGHTING CONDITION FOR VEH 1

				TIME SPENT IN REGION				
	DAY	HRS	MIN	SEC	DAY	HRS	MIN	SEC
					0	0	0	10.8
VEH ENTERING SUNLIGHT	7	0	57	27.9				
					0	1	12	16.7
VEH ENTERING LUNAR PENUMBRA	7	2	9	44.6				
					0	0	0	13.6
VEH ENTERING LUNAR UMBRA	7	2	9	58.2				
					0	0	46	4.0
VEH ENTERING LUNAR PENUMBRA	7	2	56	2.2				
					0	0	0	10.8
VEH ENTERING SUNLIGHT	7	2	56	13.0				
					0	1	12	26.2
VEH ENTERING LUNAR PENUMBRA	7	4	8	39.2				
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	7	4	8	50.2				
					0	0	46	5.9
VEH ENTERING LUNAR PENUMBRA	7	4	54	56.1				
					0	0	0	8.4
VEH ENTERING SUNLIGHT	7	4	55	4.5				
					0	1	12	20.4
VEH ENTERING LUNAR PENUMBRA	7	6	7	24.9				
					0	0	0	10.5
VEH ENTERING LUNAR UMBRA	7	6	7	35.5				

6-112

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HR	MIN	SEC
VEH ENTERING LUNAR PENUMBRA	7	6	53	40.7
				0 0 0 10.7
VEH ENTERING SUNLIGHT	7	6	53	51.4
				0 1 12 17.6
VEH ENTERING LUNAR PENUMBRA	7	8	6	9.1
				0 0 0 14.0
VEH ENTERING LUNAR UMBRA	7	8	6	23.1
				0 0 46 2.7
VEH ENTERING LUNAR PENUMBRA	7	8	52	25.8
				0 0 0 10.9
VEH ENTERING SUNLIGHT	7	8	52	36.7

LIGHTING CONDITION FOR VEH 1

16 APR 72

JET TO PC2

LAZ 72.1

VEH IN SUNLIGHT

AT PHASE INITIATION

VEH ENTERING LUNAR PENUMBRA	7	10	5	4.4	TIME SPENT IN REGION						
					DAYS	HRS	mins	SECS	DAYS	HRS	mins
VEH ENTERING LUNAR UMBRA	7	10	5	15.4		0	0	0	11.0		
VEH ENTERING LUNAR PENUMBRA	7	10	51	19.9		0	0	46	4.5		
VEH ENTERING SUNLIGHT	7	10	51	28.4		0	0	0	8.5		
VEH ENTERING LUNAR PENUMBRA	7	12	3	57.9		0	1	12	29.6		
VEH ENTERING LUNAR UMBRA	7	12	4	8.7		0	0	0	10.7		
VEH ENTERING LUNAR PENUMBRA	7	12	50	14.8		0	0	0	6.1		
VEH ENTERING SUNLIGHT	7	12	50	25.4		0	0	0	10.6		
VEH ENTERING LUNAR PENUMBRA	7	14	2	52.3		0	1	12	26.9		
VEH ENTERING LUNAR UMBRA	7	14	3	.8		0	0	0	8.5		
VEH ENTERING LUNAR PENUMBRA	7	14	49	8.6		0	0	46	7.8		

6-114

LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION DAYS HRS MINS SECS	DAYS HRS MINS SECS			
		0	0	0	11.0
VEH ENTERING SUNLIGHT	7 14 49 19.6				
		0	1	12	32.4
VEH ENTERING LUNAR PENUMBRA	7 16 1 52.0				
		0	0	0	10.8
VEH ENTERING LUNAR UMBRA	7 16 2 2.8				
		0	0	46	.4
VEH ENTERING LUNAR PENUMBRA	7 16 48 3.2				
		0	0	0	10.3
VEH ENTERING SUNLIGHT	7 16 48 13.5				
		0	1	12	31.7
VEH ENTERING LUNAR PENUMBRA	7 18 0 45.2				
		0	0	0	10.9
VEH ENTERING LUNAR UMBRA	7 18 0 56.2				
		0	0	46	6.1
VEH ENTERING LUNAR PENUMBRA	7 18 47 2.3				
		0	0	0	15.4
VEH ENTERING SUNLIGHT	7 18 47 17.7				
		0	1	12	22.3
VEH ENTERING LUNAR PENUMBRA	7 19 59 40.0				
		0	0	0	10.5
VEH ENTERING LUNAR UMBRA	7 19 59 50.5				

6-115

LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	46	6.9
VEH ENTERING LUNAR PENUMBRA	7	20	45	57.4				
					0	0	0	10.9
VEH ENTERING SUNLIGHT	7	20	46	8.3				
					0	1	12	21.7
VEH ENTERING LUNAR PENUMBRA	7	21	58	30.0				
					0	0	0	13.6
VEH ENTERING LUNAR UMBRA	7	21	58	43.6				
					0	0	46	7.2
VEH ENTERING LUNAR PENUMBRA	7	22	44	50.7				
					0	0	0	10.9
VEH ENTERING SUNLIGHT	7	22	45	1.7				
					0	1	12	31.3
VEH ENTERING LUNAR PENUMBRA	7	23	57	33.0				
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	7	23	57	44.1				
					0	0	46	6.5
VEH ENTERING LUNAR PENUMBRA	8	0	43	50.6				
					0	0	0	9.0
VEH ENTERING SUNLIGHT	8	0	43	59.6				

9T1-6

LIGHTING CONDITION FOR VEH 1

16 APR 72

PC2 TO SBN

LAZ 72.1

VEH IN SUNLIGHT

AT PHASE INITIATION

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	8	1	56	21.9		0	0	0
					0	0	0	10.7
VEH ENTERING LUNAR UMBRA	8	1	56	32.6		0	0	46
					0	0	46	6.9
VEH ENTERING LUNAR PENUMBRA	8	2	42	39.5		0	0	0
					0	0	0	10.7
VEH ENTERING SUNLIGHT	8	2	42	50.2		0	1	12
					0	1	12	28.2
VEH ENTERING LUNAR PENUMBRA	8	3	55	18.4		0	0	0
					0	0	0	8.5
VEH ENTERING LUNAR UMBRA	8	3	55	27.0		0	0	46
					0	0	46	6.2
VEH ENTERING LUNAR PENUMBRA	8	4	41	33.2		0	0	0
					0	0	0	11.1
VEH ENTERING SUNLIGHT	8	4	41	44.2		0	1	12
					0	1	12	31.9
VEH ENTERING LUNAR PENUMBRA	8	5	54	16.1		0	0	0
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	8	5	54	27.1		0	0	46
					0	0	46	7.9
VEH ENTERING LUNAR PENUMBRA	8	6	40	35.0				

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LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION	TIME SPENT IN REGION
	DAYS HRS MINS SECS	DAYS HRS MINS SECS
	0 0 0 3.8	
VEH ENTERING SUNLIGHT	8 6 40 38.8	
		0 1 12 30.8
VEH ENTERING LUNAR PENUMBRA	8 7 53 9.5	
		0 0 0 10.9
VEH ENTERING LUNAR UMBRA	8 7 53 20.5	
		0 0 46 7.0
VEH ENTERING LUNAR PENUMBRA	8 8 39 27.5	
		0 0 0 10.5
VEH ENTERING SUNLIGHT	8 8 39 38.0	
		0 1 12 21.6
VEH ENTERING LUNAR PENUMBRA	8 9 51 59.6	
		0 0 0 15.8
VEH ENTERING LUNAR UMBRA	8 9 52 15.4	
		0 0 46 6.9
VEH ENTERING LUNAR PENUMBRA	8 10 38 22.3	
		0 0 0 11.0
VEH ENTERING SUNLIGHT	8 10 38 33.3	
		0 1 12 30.4
VEH ENTERING LUNAR PENUMBRA	8 11 51 3.7	
		0 0 0 2.4
VEH ENTERING LUNAR UMBRA	8 11 51 6.1	

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LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION	DAYS HRS MINS SECS				DAYS HRS MINS SECS			
		0	0	46	9.7	0	0	0	10.9
VEH ENTERING LUNAR PENUMBRA		8	12	37	15.8				
						0	1	12	31.0
VEH ENTERING SUNLIGHT		8	12	37	26.7				
						0	0	0	11.1
VEH ENTERING LUNAR PENUMBRA		8	13	49	57.8				
						0	0	46	8.8
VEH ENTERING LUNAR UMBRA		8	13	50	8.9				
						0	0	0	8.5
VEH ENTERING LUNAR PENUMBRA		8	14	36	17.7				
						0	1	12	25.7
VEH ENTERING SUNLIGHT		8	14	36	26.2				
						0	0	0	10.8
VEH ENTERING LUNAR PENUMBRA		8	15	48	51.9				
						0	0	46	8.4
VEH ENTERING LUNAR UMBRA		8	15	49	2.7				
						0	0	0	10.7
VEH ENTERING LUNAR PENUMBRA		8	16	35	11.1				
						0	1	12	26.6
VEH ENTERING SUNLIGHT		8	16	35	21.9				
						0	0	0	48.5
VEH ENTERING LUNAR PENUMBRA		8	17	47					

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LIGHTING CONDITION FOR VEH 1

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
					0	0	0	8.6
VEH ENTERING LUNAR UMBRA	8	17	47	57.1				
					0	0	46	7.7
VEH ENTERING LUNAR PENUMBRA	8	18	34	4.8				
					0	0	0	11.1
VEH ENTERING SUNLIGHT	8	18	34	15.9				
					0	1	12	30.3
VEH ENTERING LUNAR PENUMBRA	8	19	46	46.2				
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	8	19	46	57.2				
					0	0	46	10.0
VEH ENTERING LUNAR PENUMBRA	8	20	33	7.2				
					0	0	0	3.1
VEH ENTERING SUNLIGHT	8	20	33	10.3				
					0	1	12	29.4
VEH ENTERING LUNAR PENUMBRA	8	21	45	39.8				
					0	0	0	11.0
VEH ENTERING LUNAR UMBRA	8	21	45	50.7				
					0	0	46	8.5
VEH ENTERING LUNAR PENUMBRA	8	22	31	59.2				
					0	0	0	10.5
VEH ENTERING SUNLIGHT	8	22	32	9.7				

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LIGHTING CONDITION FOR VEH 1

	TIME SPENT IN REGION			
	DAY	HRS	mins	SECS
VEH ENTERING LUNAR PENUMBRA	8	23	44	29.9
	0	0	0	15.8
VEH ENTERING LUNAR UMBRA	8	23	44	45.7
	0	0	46	8.4
VEH ENTERING LUNAR PENUMBRA	9	0	30	54.1
	0	0	0	11.0
VEH ENTERING SUNLIGHT	9	0	31	5.1

LIGHTING CONDITION FOR VEH 1

16 APR 72

SBN TO TEI

LAZ 72.1

VEH IN SUNLIGHT

AT PHASE INITIATION

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	9	1	45	34.7		0	0	0
								9.2
VEH ENTERING LUNAR UMBRA	9	1	45	43.8		0	0	45
								55.6
VEH ENTERING LUNAR PENUMBRA	9	2	31	39.4		0	0	0
								11.2
VEH ENTERING SUNLIGHT	9	2	31	50.6		0	1	14
								22.8
VEH ENTERING LUNAR PENUMBRA	9	3	46	13.4		0	0	0
								10.9
VEH ENTERING LUNAR UMBRA	9	3	46	24.4		0	0	45
								55.5
VEH ENTERING LUNAR PENUMBRA	9	4	32	19.8		0	0	0
								11.1
VEH ENTERING SUNLIGHT	9	4	32	30.9		0	1	14
								21.1
VEH ENTERING LUNAR PENUMBRA	9	5	46	52.0		0	0	0
								11.1
VEH ENTERING LUNAR UMBRA	9	5	47	3.1				

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LIGHTING CONDITION FOR VEH 1

16 APR 72

TEI TO ENT

LAZ 72.1

VEH IN LUNAR UMBRA

AT PHASE INITIATION

	DAYS	HRS	MINS	SECS	TIME SPENT IN REGION			
					DAYS	HRS	MINS	SECS
VEH ENTERING LUNAR PENUMBRA	9	6	27	19.5	0	0	0	5.1
VEH ENTERING SUNLIGHT	9	6	27	24.6				

TABLE 6-II.- MISSION SHADOW TIMELINE - Continued

(b) LM descent

16 APR 72 LM TRACKING FROM PDI TO LANDING LAZ 72-1
VEH IN SUNLIGHT AT PHASE INITIATION

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TABLE 6-II.- MISSION SHADOW TIMELINE - Concluded

(c) LM rendezvous

LIGHTING CONDITION FOR VEH 2

RENDEZVOUS RADAR TRACKING PRIOR TO TPI

VEH IN PENUMBRA AT PHASE INITIATION

	TIME SPENT IN REGION					
	HRS	mins	SECS	HRS	mins	SECS
VEH ENTERING LUNAR UMBRA	172	7	43.8			

LIGHTING CONDITION FOR VEH 2

COAST TO 1ST BRAKING GATE

VEH IN PENUMBRA AT PHASE INITIATION

	TIME SPENT IN REGION					
	HRS	mins	SECS	HRS	mins	SECS
VEH ENTERING SUNLIGHT	172	55	48.0			

6-125.

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