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TRACKING AND FLIGHT RECONSTRUCTION
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ABSTRACT AND LIST OF KEY WORDS

This document presents the postflight trajectory for the Apollo/Saturn V SA-513 Skylab I flight. Included is an analysis of the orbital and powered flight trajectories of the launch vehicle, the orbital trajectory of the spent S-II stage, and the free flight impact trajectory of the expended S-IC stage. Launch vehicle trajectory dependent parameters are provided in earth-fixed launch site, launch vehicle navigation, and geographic polar coordinate systems. The time history of the trajectory parameters for the launch vehicle is presented from guidance reference release to the transfer to ATM control.

Tables of significant launch vehicle parameters at engine cutoff, stage separation and workshop orbit insertion are included in this document. Figures of such parameters as altitude, surface and cross range, and the magnitude of total velocity and acceleration as a function of range time for the powered flight trajectory are presented.

Postflight Trajectory
Powered Flight Trajectory
Orbital Trajectory
Spent Stage Trajectory
Skylab I
SA-513

CONTENTS

ILLUSTRATIONS

ILLUSTRATIONS (Continued)

TABLES

REFERENCES

1. NASA Document SE008-001-1, "Project Apollo Coordinate System Standards," June 1965.

2. NASA Document MPR-SAT-FE-73-4, "Skylab Launch Vehicle Flight Evaluation Report - SA-513 Skylab 1 Mission," August 1, 1973.

3. Boeing Memorandum 5-9410-H-651, "SL-1 Launch Vehicle Operational Trajectory Data for May 14 Launch," April 20, 1973.

4. NASA Document M-D E 8020.008B, "Natural Environment and Physical Standards for the Apollo Program," April 1965.

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GLOSSARY OF TERMS

Altitude	The distance between the vehicle and its subvehicle point on the surface of the Fischer Ellipsoid.
Ascent Phase	The segment of the vehicle flight from launch to parking orbit insertion.
Average Range Rate	The change in range per unit time computed over a finite interval.
Azimuth Angle	The angle, positive clockwise, from true north to the projection of the range vector on the ground station tangent plane (PACSS3a).
Cross Range	The vehicle lateral position measured in the earth-fixed launch site centered coordinate system (PACSS10).
Descending Node	The angle measured in the equatorial plane from the launch meridian at TGRR to the descending node of the orbit at the specified time.
Dynamic Pressure	The force per unit area of the atmosphere on the vehicle resulting from its motion through the atmosphere.
Elevation Angle	The angle between the range vector and its projection on the ground station tangent plane. This angle is positive above the ground station tangent plane (PACSS3a).
Flight Path Angle	The angle between the vehicle space-fixed velocity vector and a plane normal to a vector from the center of the earth to the vehicle. This angle is positive above the plane.
Heading Angle	The angle between the north direction in a plane normal to a vector from the center of the earth to the vehicle and the projection of the space-fixed velocity vector on the plane.

GLOSSARY OF TERMS (Continued)

Inclination	The angle between the earth's north polar axis and the orbital angular momentum vector.
Inertial Acceleration	The magnitude of the vehicle acceleration in the launch vehicle platform accelerometer coordinate system (PACSS12).
Instantaneous Range Rate	The rate of change of the distance from the receiving tracker to the vehicle at the specified time.
Latitude (geodetic)	The angle between the equatorial plane and the line normal to the ellipsoidal surface at a specified point, measured positive north in the meridian of the point.
Longitude	The angle between the plane of the Greenwich Meridian and the plane of the meridian containing the specified point measured positive eastward from the Greenwich Meridian.
Mach Number	The ratio of the vehicle velocity relative to the surrounding atmosphere to the speed of sound in the atmosphere.
Measured Parameter	A primary measurement made by any ground station, e.g., elevation angle.
Range	The average of the uplink and downlink signal travel distances (PACSS3a, PACSS3c, and PACSS3d).
Space-Fixed Velocity	The magnitude of the vehicle velocity in the launch vehicle navigation coordinate system (PACSS13).
Subvehicle Point	The point of intersection of the ellipsoidal surface and a line normal to this surface passing through the vehicle center of mass.
Surface Range	The arc length between the launch site and subvehicle point measured along the surface of the Fischer Ellipsoid.

GLOSSARY OF TERMS (Continued)

Workshop Orbit Phase	The segment of the vehicle flight from workshop orbit insertion to transfer to ATM control.
X-Angle	30' Antennas - The angle measured in the plane of the ground station prime vertical from the zenith to the projection of the slant range vector onto this plane, positive eastward (PACSS3c) 85' Antennas - The angle measured in the meridian plane of the ground station from the zenith to the projection of the slant range vector onto this plane, positive southward (PACSS3d)
Y-Angle	30' Antennas - The angle between the slant range vector and its projection onto the plane of the ground station prime vertical, positive when the slant range vector is north of the plane (PACSS3c) 85' Antennas - The angle between the slant range vector and its projection onto the meridian plane of the radar site, positive when the slant range vector is east of the meridian plane (PACSS3d)

LIST OF ABBREVIATIONS

ABBREVIATION	DEFINITION/STATION
ATM	Apollo Telescope Mount
BDAQ (67.18)	Bermuda (FPQ-6) C-Band
BDA3	Bermuda S-Band
CECO	Center Engine Cutoff
CKYF (1.16)	Cape Kennedy C-Band
CROQ	Carnarvon C-Band
CRO3	Carnarvon S-Band
CYI3	Canary Island S-Band
EMR	Engine Mixture Ratio
GATE	Guidance and Tracking Evaluation Program
GCS	Guidance Cutoff Signal
GDS8	Goldstone S-Band
GRR	Range Time of Guidance Reference Release
HAW3	Hawaii S-Band
HSK8	Honeysuckle S-Band
IP Raw MP	Impact Predictor Raw Measured Parameters
IU	Instrument Unit
LID	Lunar Impact Determination Program
MAD8	Madrid S-Band
MIL3	Merritt Island S-Band
MLAT (19.18)	Merritt Island C-Band
OCP	Orbital Correction Program
OECO	Outboard Engine Cutoff
OMPT	Observed Mass Point Trajectory
OWS	Orbiting Workshop
PACSS	Project Apollo Coordinate System Standards
PATQ (0.18)	Patrick Air Force Base C-Band
REV	Revolution
rss	Root Sum Square
STDN	Satellite Tracking and Data Network
TEX3	Corpus Christi S-Band
USB	Unified S-Band
WLPQ (4.18)	Wallops Island C-Band

SOURCE DATA PAGE

The following listed government-furnished documentation was used in the preparation of this document:

EXHIBIT FF LINE ITEM NUMBER	GFD TITLE	DATE RECEIVED
S&E-AERO-P-#35c	OMPT Format	4/1/73
S&E-AERO-P-#17	Tracking and Network Specifications	5/1/73
	Operational Trajectory Certified Data	4/20/73
I-MO-#4a	Trajectory Point and/or Orbital Elements	5/15/73
I-MO-#4c	Six Seconds Raw Radar	5/15/73
I-MO-#4f	Meteorological Data (Final)	5/17/73
I-MO-#6	IP Raw MP	5/15/73
I-MO-#9	Pulse Radar: BDAQ, MLAT, CKYF, PATQ, CROQ, and WLPQ Data USB: MIL3, BDA3, CYI3, CRO3, HAW3, TEX3, MAD8, HSK8, and GDS8 Data	5/18/73
I-MO-#17c	Final Significant Time of Events	6/13/73
I-MO-#18b	Final Guidance Velocities Ascent Phase	5/15/73
I-MO-#18c	Orbital Venting Acceleration Data	5/22/73

SECTION 1

SUMMARY AND INTRODUCTION

The Apollo Saturn V SA-513 vehicle was launched from Launch Complex 39, Pad A, at the Kennedy Space Center on May 14, 1973, at 12:30:00 Eastern Standard Time at an azimuth of 90 degrees east of north. Guidance Reference Release occurred at -16.958 seconds. First motion occurred at 0.2 second. A roll maneuver was initiated at 12.2 seconds to place the vehicle on a flight azimuth of 40.880 degrees east of north.

All trajectory parameters were close to nominal from liftoff to workshop orbit insertion. The OWS was inserted into a workshop orbit at 598.96 seconds at an altitude of 442.2 km (238.8 nmi) and a total space-fixed velocity of 7,649.3 m/s (25,096.1 ft/s).

The spent S-II stage orbit parameters were also close to nominal. At 7,200.0 seconds (2 hours) the S-II was at an altitude of 427.1 km (230.6 nmi) and a total space-fixed velocity of 7,648.6 m/s (25,093.8 ft/s).

The impact location of the spent S-IC stage is estimated to be 34.333 degrees north latitude and 74.354 degrees west longitude at 651.63 seconds.

A more detailed description of the postflight mass point launch vehicle trajectory and launch parameters is given in Section 2. The trajectory is divided into the following phases, each discussed in a separate subsection of Section 2:

a. Ascent (guidance reference release to workshop orbit insertion)
b. Workshop orbit (orbit insertion to transfer to ATM control)
c. S-II spent stage early orbit
d. S-IC spent stage to earth impact

The trajectories for the first three of the above phases were established from external C-band radar and S-band tracking data and ST-124M-3 inertial platform guidance velocity data. Since no tracking data were available for the S-IC spent stage, the trajectory phase outlined in (d) above was simulated using actual separation conditions and meteorological data plus nominal drag and retrorocket representations.

Section 3 contains a description of the trajectory reconstruction methods, a summary of the tracking data used in the analysis with the resulting residual plots, and an estimate of the uncertainty in the reconstructed trajectory.

SECTION 1 (Continued)

Appendix A provides a definition of the symbols, nomenclature, and coordinate systems used in the report. Appendix B is a tabular history of selected trajectory parameters in metric units. Appendix C presents the same parameters expressed in English units.

SECTION 2

TRAJECTORY DESCRIPTION

This section describes the reconstructed trajectory, referenced to the Instrument Unit, by providing plotted histories of pertinent variables and tables of important parameters at significant event times. The complete time history of selected Observed Mass Point Trajectory parameters, in both metric and English units, is tabulated in Appendices B and C, respectively. These tabulations are given in accordance with "Project Apollo Coordinate System Standards" (Reference 1) and are in earth-fixed launch site (PACSS10), launch vehicle navigation (PACSS13), and geographic polar (PACSS1) coordinate systems. Computations of the transformations relating the various coordinate systems are based on the earth's spin axis as it was oriented at GRR. For convenience, these systems are described in Appendix A along with a definition of other terms and symbols used.

A comparison of actual and nominal times for significant flight events is presented in Table 2-I. The actual times for these events are taken from Reference 2. The nominal data and times are taken from Reference 3. Range time, which is referenced to Range Time Zero, is used throughout this documentation unless otherwise specified. Range Time Zero was established at 17:30:00 Greenwich Mean Time on May 14, 1973.

The Fischer Ellipsoid of 1960 (Reference 4) is used as the representative model for the earth and its gravitational field. All latitude and longitude coordinates are defined with respect to this ellipsoid.

The geographic coordinates for Launch Complex 39, Pad A, at the Kennedy Space Center are as follows:

Geodetic Latitude	28.608422 degrees north
Longitude	80.604133 degrees west

The height of the Instrument Unit of the launch vehicle above the reference ellipsoid is 116.65m (382.71 ft).

The azimuth alignments are as follows:

Launch Azimuth	90.0 degrees east of north
Flight Azimuth	40.880 degrees east of north
ST-124M-3 Platform Azimuth	40.880 degrees east of north

SECTION 2 (Continued)

2.1 ASCENT PHASE

The trajectory parameters from guidance reference release to workshop orbit insertion were close to nominal. The space-fixed velocity and altitude at S-IC OECO were 18.0 m/s (59.1 ft/s) and 0.5 km (0.3 nmi) greater than nominal, respectively. The altitude was 0.1 km (0.0 nmi) greater than nominal, and the space-fixed velocity was 0.3 m/s (1.0 ft/s) less than nominal at S-II guidance cutoff signal. The maximum acceleration was 43.66 m/s^2 (4.45g) during the S-IC phase.

Some significant trajectory parameters are tabulated in Table 2-II at key events such as Mach 1, maximum acceleration, etc. Trajectory parameters at engine cutoff times are presented in Table 2-III. Table 2-IV shows trajectory parameters at stage separation times.

To supplement these discrete time tabulations, a number of parameters are plotted over the entire ascent phase. Figure 2-1 shows the vehicle ground track, the spent S-IC stage impact trajectory, and the location of the tracking stations used in the reconstruction. Altitude, surface range, and cross range are plotted versus time in Figures 2-2 through 2-4, respectively. Space-fixed velocity and flight path angle are shown in Figure 2-5. Figure 2-6 gives total inertial acceleration. Dynamic pressure and mach number are plotted in Figure 2-7. The ascent phase trajectory is tabulated in Tables B-I through B-III in metric units, and in Tables C-I through C-III in English units.

2.2 WORKSHOP ORBIT PHASE

The workshop orbit phase spans the interval from insertion to the transfer to ATM control at 17,400.7 seconds. Figure 2-8 illustrates the vehicle ground track following workshop orbit insertion and shows the vehicle location at significant event times (see Table 2-1).

The OWS was inserted into a near circular earth orbit at 598.96 seconds, 0.64 second greater than nominal. The workshop orbit insertion conditions were close to nominal. Table 2-V gives the actual workshop orbit insertion conditions and provides a comparison with the nominal values.

During the workshop orbit, no major thrusting occurred; however, the orbit was continuously perturbed by low-level workshop venting. The resulting small velocity perturbations were considered in this analysis. An acceleration model was built from the ST-124M-3 guidance platform velocity data and

2.2 (Continued)

incorporated in the orbit solutions. Table 2-VI presents a tabular acceleration history derived from the platform velocity data as adjusted during the analysis (see Paragraph 3.1.2). The workshop orbit phase is tabulated in Table B-IV in metric units and in Table C-IV in English units.

2.3 S-II SPENT STAGE ORBIT PHASE

Skin tracking data of the spent S-II stage were received from the Merritt Island, Bermuda and Carnarvon C-band radars for portions of the second, fifth, and sixth orbits. Separate orbit solutions using these data sets were made for the second and sixth orbits using a gravity-only model. Comparisons of the actual and nominal orbits at two hours range time are presented in Table 2-VII. At two hours, the OWS and S-II are in the same orbital plane and the OWS trails the S-II by three degrees; the separation distance is 298 kilometers. Table 2-VIII presents the spent S-II stage orbital parameters at the midpoint of the sixth orbit.

2.4 S-IC SPENT STAGE IMPACT TRAJECTORY

Postflight predictions of earth surface impact parameters for the spent S-IC stage were computed using a mass point trajectory simulation computer program. S-IC separation position and velocity data from the postflight trajectory were combined with nominal main propulsion system decay performance and nominal retrorocket performance to initialize the simulation program.

Three separate theoretical trajectories were computed for the spent S-IC stage using the actual meteorological data. These three trajectories represent the following booster atmospheric drag conditions:

a. Zero-degree angle-of-attack entry
b. Ninety-degree angle-of-attack entry
c. Tumbling entry

The tumbling booster case is considered to define actual case impact conditions although no tracking coverage was available for confirmation.

Results of the three computed S-IC spent stage trajectories are summarized in Table 2-IX. The ground track is shown in Figure 2-1.

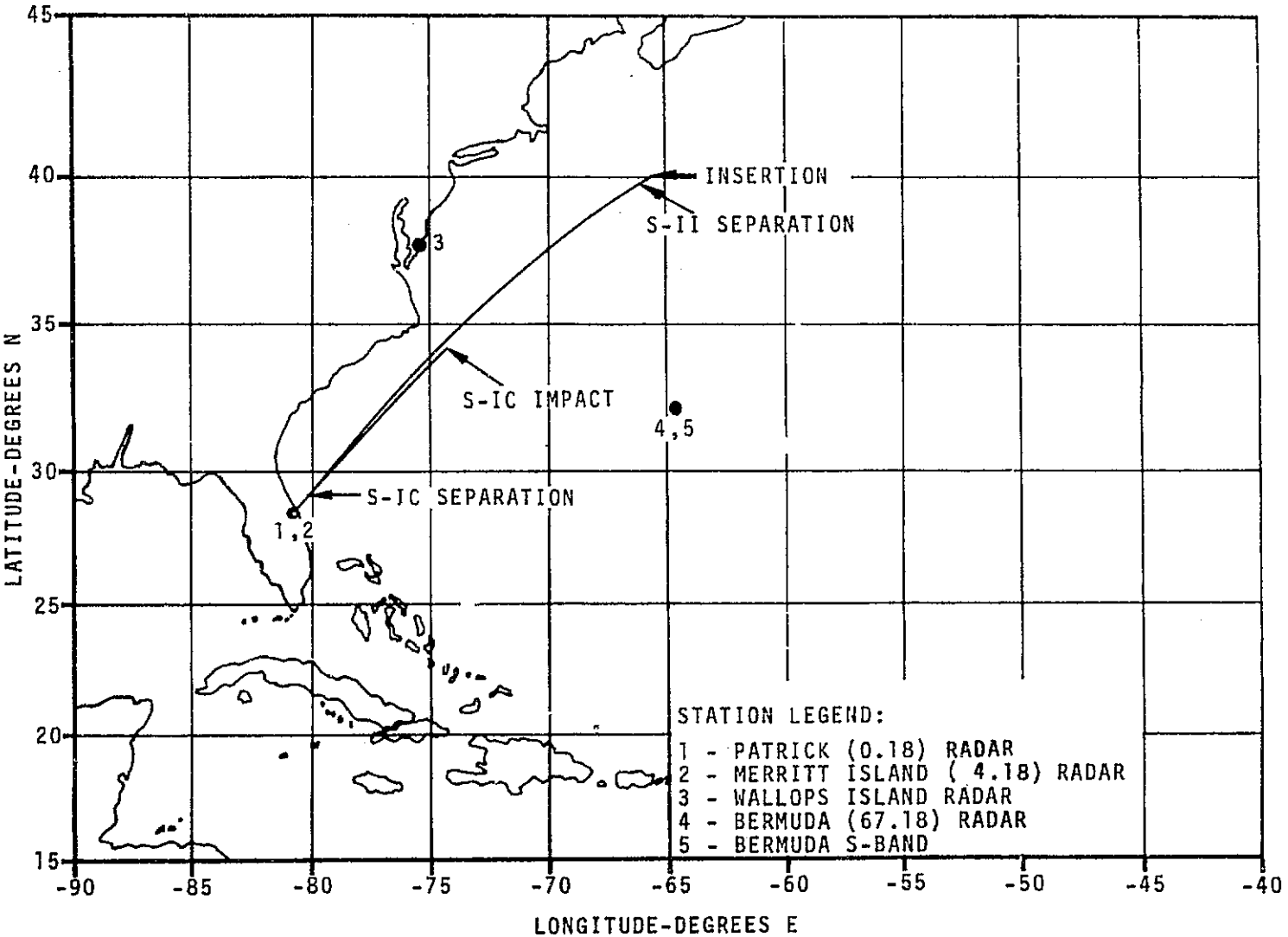


FIGURE 2-1. GROUND TRACKS AND TRACKING STATIONS-ASCENT PHASE

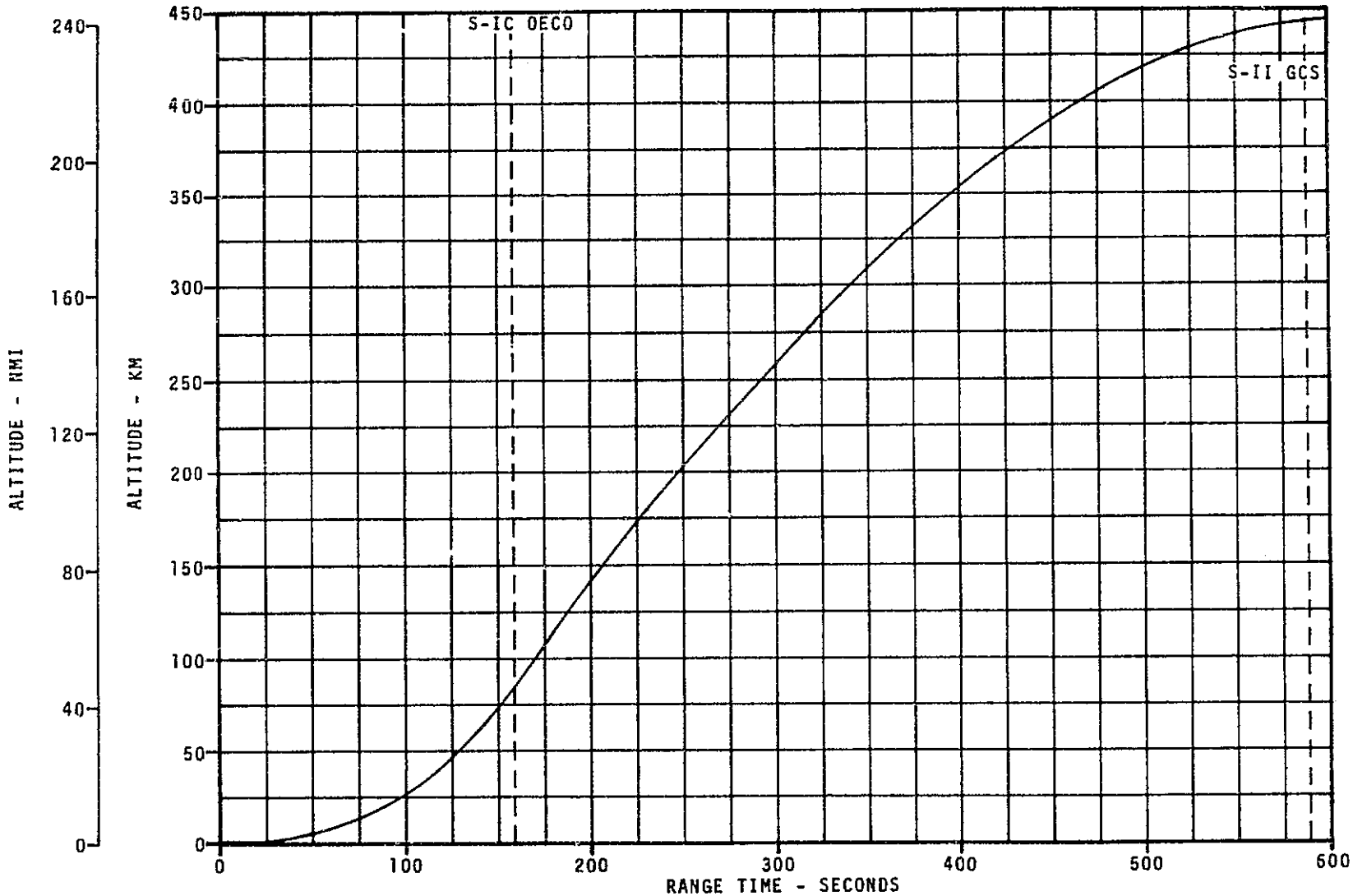


FIGURE 2-2. ALTITUDE-ASCENT PHASE

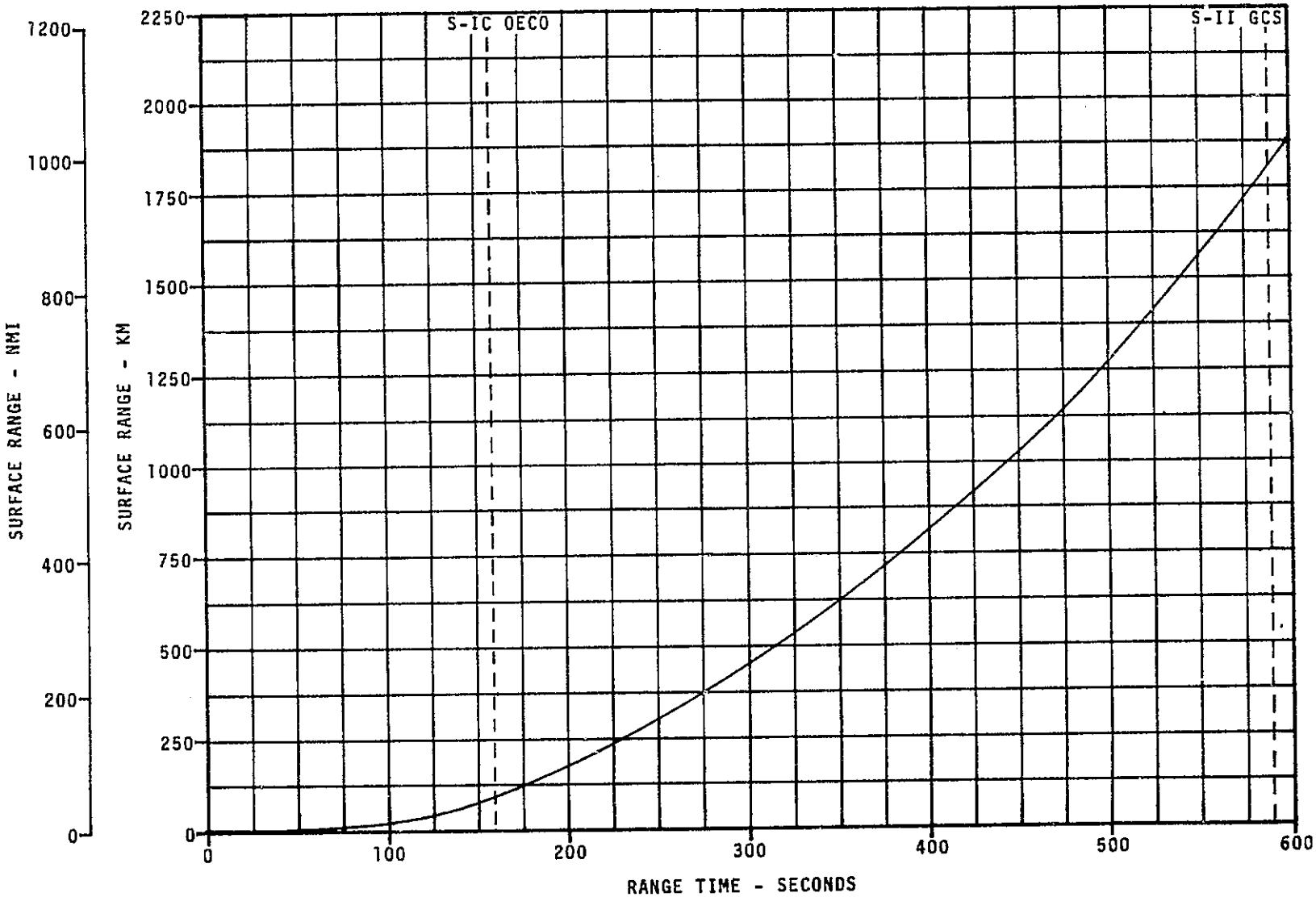


FIGURE 2-3. SURFACE RANGE-ASCENT PHASE

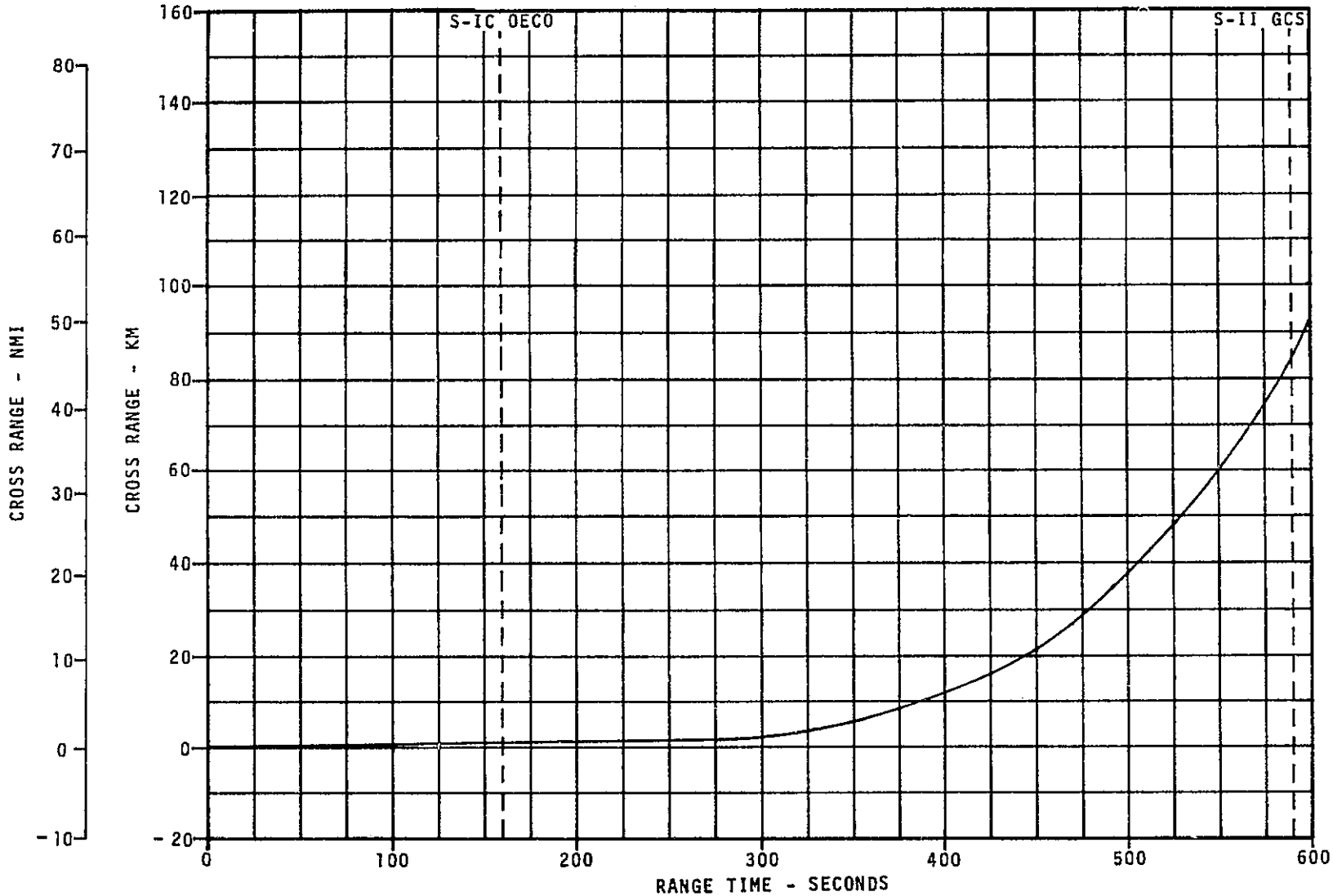


FIGURE 2-4. CROSS RANGE-ASCENT PHASE

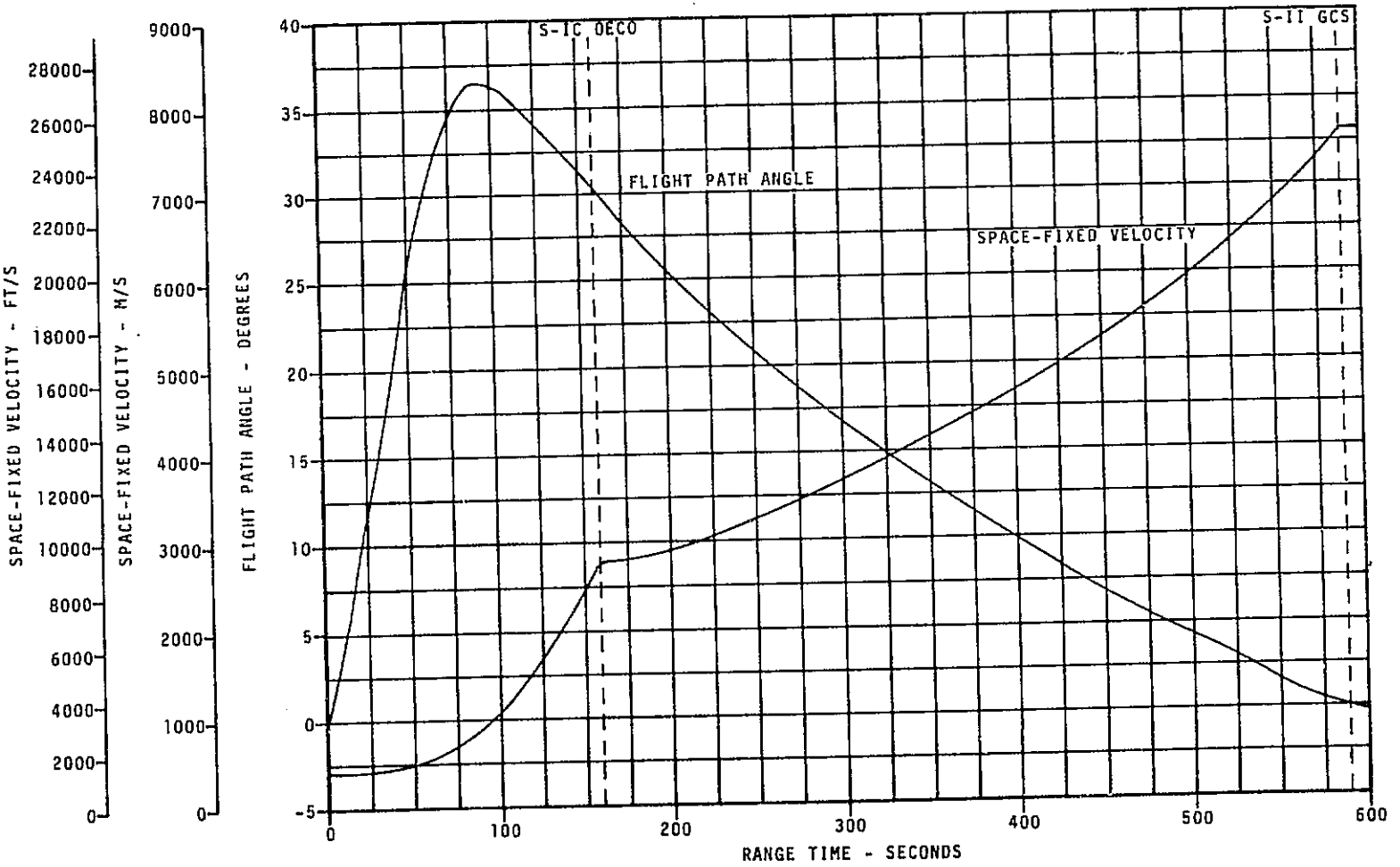


FIGURE 2-5. SPACE-FIXED VELOCITY AND FLIGHT PATH ANGLE-ASCENT PHASE

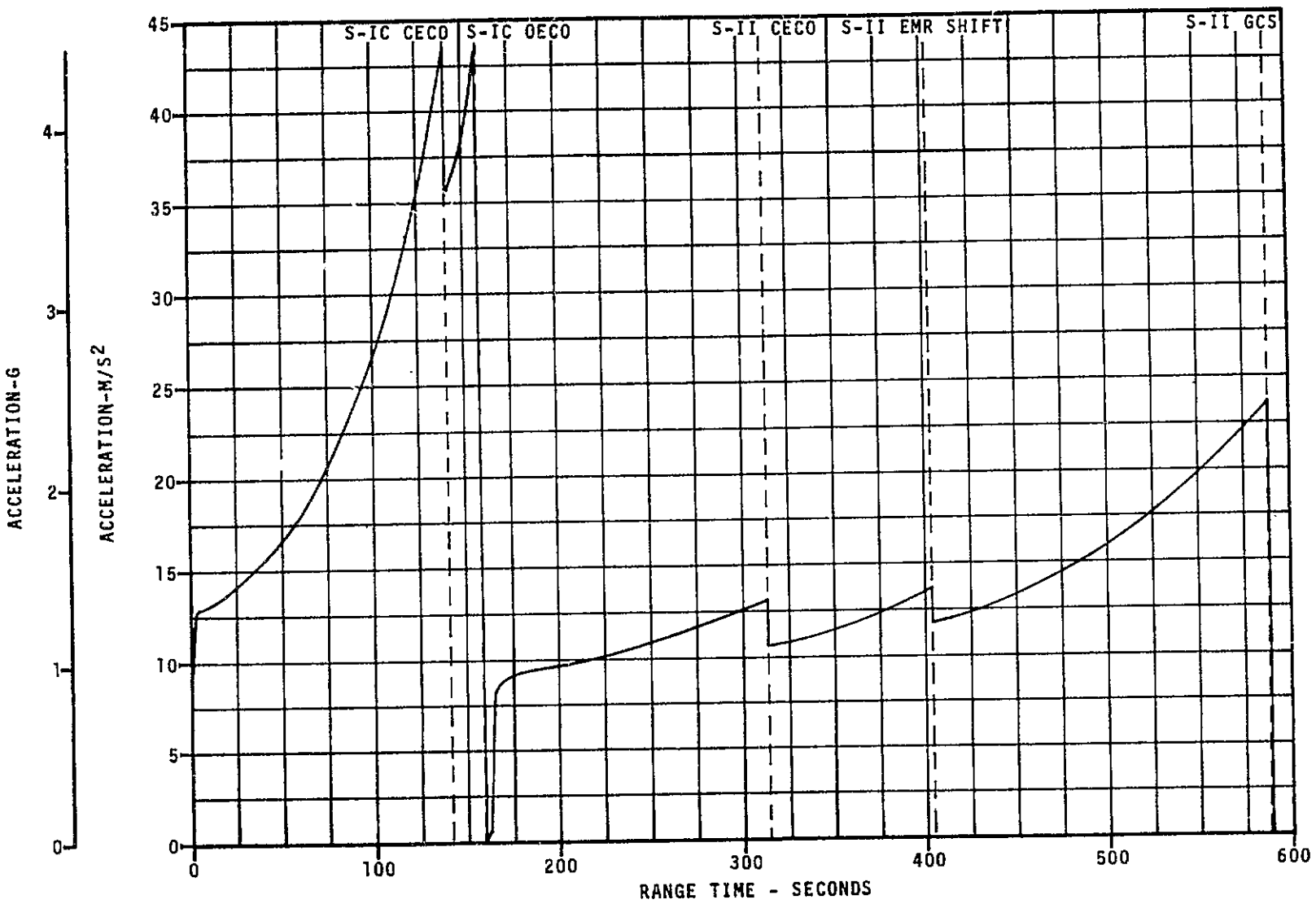


FIGURE 2-6. TOTAL INERTIAL ACCELERATION-ASCENT PHASE

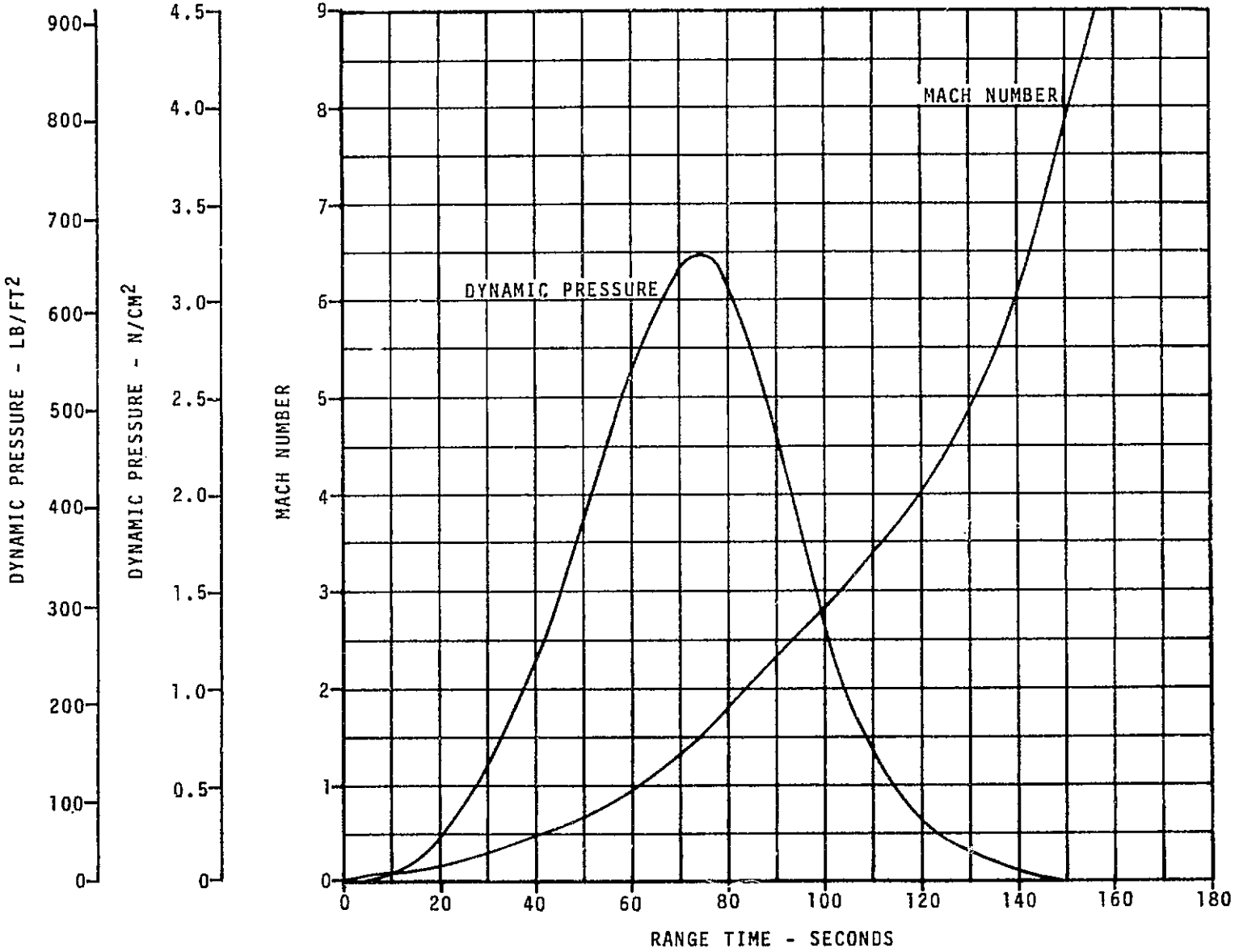


FIGURE 2-7. MACH NUMBER AND DYNAMIC PRESSURE-ASCENT PHASE

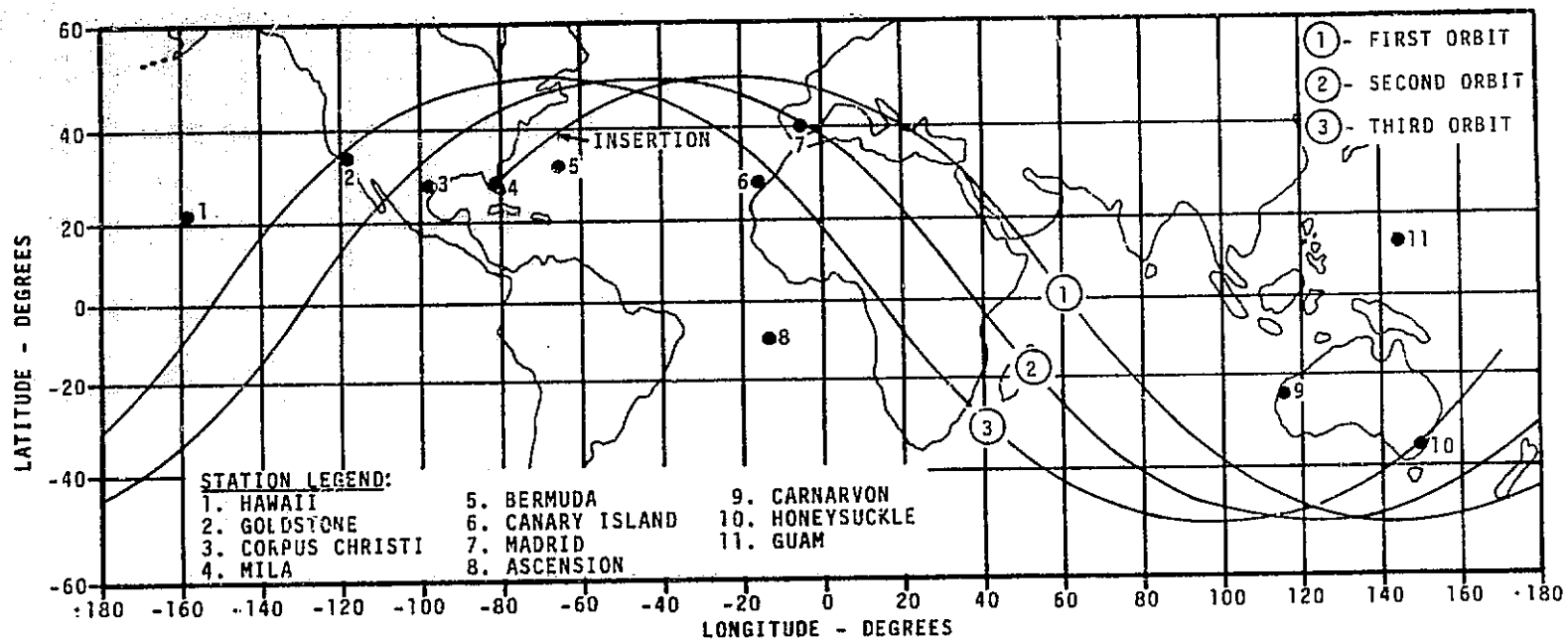


FIGURE 2-8. SA-513 ORBITING WORKSHOP GROUND TRACK

TABLE 2-I. TIMES OF SIGNIFICANT EVENTS

EVENT	ACTUAL	NOMINAL	ACT-NOM
Guidance Reference Release	-16.958	-17.030	0.072
First Motion	0.2	0.2	0.0
Start of Timebase 1	0.6	0.5	0.1
Mach 1	61.0	61.5	-0.5
Maximum Dynamic Pressure	73.5	75.0	-1.5
S-IC Center Engine Cutoff	140.72	140.62	0.10
S-IC Outboard Engine Cutoff (1 and 3)	158.16	158.16	0.00
S-IC/S-II Separation Command	159.9	159.9	0.0
S-II Center Engine Cutoff	314.05	314.24	-0.19
S-II Guidance Cutoff Signal	588.96	588.32	0.64
S-II/OWS Separation Command	591.1	590.5	0.6
Workshop Orbit Insertion	598.96	598.32	0.64
Payload Shroud Jettison	920.4	907.9	12.5
Initiate ATM Deployment	999.1	998.5	0.6
Initiate ATM Solar Array Deployment	1492.3	1491.7	0.6
Transfer to ATM Control	17400.7	17400.1	0.6

NOTE: Times used are vehicle times.

TABLE 2-II. SIGNIFICANT TRAJECTORY PARAMETERS

EVENT		PARAMETER	VALUE
First Motion		Range Time, sec	0.22
		Total Non-Gravitational Acceleration, m/s^2 (ft/s^2) (g)	11.24 (36.88) (1.15)
MACH 1		Range Time, sec	61.0
		Altitude, km (nmi)	7.7 (4.2)
Maximum Dynamic Pressure		Range Time, sec	73.5
		Dynamic Pressure, n/cm^2 (lbf/ft^2)	3.25 (678.78)
		Altitude, km (nmi)	12.0 (6.5)
*Maximum Total Non-Gravitational Acceleration:	S-IC	Range Time, sec	140.72
		Acceleration, m/s^2 (ft/s^2) (g)	43.66 (143.24) (4.45)
	S-II	Range Time, sec	589.00
		Acceleration, m/s^2 (ft/s^2) (g)	24.00 (78.74) (2.45)
*Maximum Earth-Fixed Velocity:	S-IC	Range Time, sec	159.00
		Velocity, m/s (ft/s)	2,565.3 (8,416.3)
	S-II	Range Time, sec	591.1
		Velocity, m/s (ft/s)	7,332.2 (24,055.8)

*Nearest Time Point Available

TABLE 2-III. ENGINE CUTOFF CONDITIONS

PARAMETER	S-IC CECO (ENGINE SOLENOID)	S-IC OECO (ENGINE SOLENOID)	S-II CECO (ENGINE SOLENOID)	S-II GUIDANCE CUTOFF SIGNAL
Range Time, sec	140.72	158.16	314.05	588.96
Altitude, km (n mi)	62.4 (33.7)	85.2 (46.0)	273.2 (147.5)	442.1 (238.7)
Space Fixed Velocity, m/s (ft/s)	2,214.4 (7,265.1)	2,800.5 (9,188.0)	3,860.6 (12,666.0)	7,641.9 (25,071.9)
Flight Path Angle, deg	32.446	30.581	15.759	0.014
Heading Angle, deg	50.494	48.443	48.111	56.383
Surface Range, km (n mi)	54.1 (29.2)	85.7 (46.3)	493.5 (266.5)	1,810.7 (977.7)
Cross Range, km (n mi)	0.4 (0.2)	0.4 (0.2)	2.5 (1.3)	84.5 (45.6)
Cross Range Velocity, m/s (ft/s)	-1.4 (-4.6)	-1.7 (-5.6)	55.2 (181.1)	709.9 (2,329.1)
Inclination, deg				50.029
Descending Node, deg				153.249
Eccentricity				0.0021
C_3, m^2/s^2 (ft^2/s^2)				-58,638,675 (-631,181,445)

TABLE 2-IV. STAGE SEPARATION CONDITIONS

S-IC/S-II SEPARATION		S-II/OWS SEPARATION	
PARAMETER	VALUE	PARAMETER	VALUE
Range Time, sec	159.9	Range Time, sec	591.1
Altitude, km (n mi)	87.7 (47.4)	Altitude, km (n mi)	442.1 (238.7)
Space-Fixed Velocity, m/s (ft/s)	2,807.0 (9,209.3)	Space-Fixed Velocity, m/s (ft/s)	7,648.2 (25,092.5)
Flight Path Angle, deg	30.344	Flight Path Angle, deg	0.003
Heading Angle, deg	48.422	Heading Angle, deg	-56.480
Surface Range, km (n mi)	89.4 (48.3)	Surface Range, km (n mi)	1,825.4 (985.6)
Cross Range, km (n mi)	0.4 (0.2)	Cross Range, km (n mi)	86.0 (46.4)
Cross Range Velocity, m/s (ft/s)	-1.7 (-5.6)	Cross Range Velocity, m/s (ft/s)	712.1 (2,336.3)
Geodetic Latitude, deg N	29.213	Geodetic Latitude, deg N	39.772
Longitude, deg E	-80.001	Longitude, deg E	-66.000

TABLE 2-V. WORKSHOP ORBIT INSERTION CONDITIONS AND COMPARISONS

PARAMETER	ACTUAL	NOMINAL	ACT-NOM
Range Time, sec	598.96	598.32	0.64
Altitude, km (nmi)	442.2 (238.8)	442.1 (238.7)	0.1 (0.1)
Space-Fixed Velocity, m/s (ft/s)	7,649.3 (25,096.1)	7,648.7 (25,094.2)	0.6 (1.9)
Flight Path Angle, deg	-0.007	0.001	-0.008
Heading Angle, deg	56.827	56.777	0.050
Inclination, deg	50.030	50.028	0.002
Descending Node, deg	153.252	153.248	0.004
Eccentricity	0.0002	0.0003	-0.0001
Apogee Altitude, km* (nmi)	433.8 (234.2)	433.3 (234.0)	0.5 (0.2)
Perigee Altitude, km* (nmi)	431.5 (233.0)	429.5 (231.9)	2.0 (1.1)
Period, min	93.23	93.21	0.02
Geodetic Latitude, deg N	40.051	40.009	0.042
Longitude, deg E	-65.484	-65.564	0.080

*Based on a Spherical Earth with Radius = 6,378.165 km.

TABLE 2-VI. OWS RECONSTRUCTED ORBITAL ACCELERATION HISTORY (PACSS12)

RANGE TIME (SEC)	$\ddot{X}_{12}(M/S^2)$	$\ddot{Y}_{12}(M/S^2)$	$\ddot{Z}_{12}(M/S^2)$
592	-1.4759E-00	2.4127E-01	1.4476E-01
593	0.0	-4.7192E-02	4.7192E-02
594	2.7778E-03	-8.3333E-03	-8.3333E-03
600	2.9506E-03	-8.1078E-03	1.1726E-03
606	2.9506E-03	1.7880E-03	1.1726E-03
614	-3.3742E-04	1.7880E-03	1.1726E-03
638	-3.3742E-04	-2.4340E-03	-2.6194E-04
712	3.6509E-04	-2.4340E-03	-2.6194E-04
826	3-6509E-04	6.7599E-04	-2.6194E-04
937	3.6509E-04	-7.0318E-05	-2.6194E-04
967	3.6509E-04	-7.0318E-05	1.0533E-03
972	-1.9105E-03	-7.0318E-05	1.0533E-03
996	2.8292E-04	-7.0318E-05	1.0533E-03
1010	2.8292E-04	-7.0318E-05	-5.8569E-04
1106	2.8292E-04	1.8820E-04	-5.8569E-04
1115	2.8292E-04	1.8820E-04	-1.0094E-05
1450	-8.2722E-04	1.8820E-04	-1.0094E-05
1500	-1.2133E-04	1.8820E-04	-1.0094E-05
1618	-1.2133E-04	1.8820E-04	-1.8257E-05
1670	-1.1293E-04	1.8820E-04	-1.8257E-05
1845	1.4556E-05	1.8820E-04	-1.8257E-05
2161	9.9178E-06	1.8820E-04	-2.2390E-05
2445	9.9178E-06	1.5566E-04	-2.2390E-05
2468	-2.1769E-05	1.5566E-04	-2.2390E-05
2725	4.4029E-05	1.5566E-04	-6.5484E-05
3876	4.4029E-05	1.7666E-04	5.9473E-04
3890	-2.9554E-05	1.7666E-04	5.9473E-04
3947	-2.9554E-05	1.7666E-04	-3.3548E-05
4680	-1.9300E-06	-7.0432E-05	-1.2357E-05
5922	3.9636E-05	-7.0432E-05	3.6046E-05
6114	8.8112E-05	-7.0432E-05	3.6046E-05
6255	8.8112E-05	-6.8539E-05	-3.8207E-05
6674	-4.9394E-07	-6.8539E-05	-3.8207E-05
7320	-4.9394E-07	-8.2551E-05	-2.5272E-06
7422	-8.2845E-07	-8.2551E-05	-2.5272E-06
21600	0.0	0.0	0.0

NOTE: Above accelerations are constant from time point to next time point.

TABLE 2-VII. COMPARISON OF ACTUAL AND NOMINAL ORBITAL PARAMETERS FOR S-II SPENT STAGE - 2:00:00 RANGE TIME

PARAMETER	ACTUAL	NOMINAL	ACT-NOM
Radius (km)	6,796.713	6,795.679	1.034
Velocity (m/s)	7,648.6	7,648.2	0.4
Right Ascension - TOD (deg)	163.696	163.755	-0.059
Declination (deg)	39.276	39.239	0.037
Heading (deg)	123.929	123.969	-0.040
Path Angle (deg)	-0.217	-0.231	0.014
C_3 (km^2/s^2)	-58.791200	-58.815334	0.024134
Period (min)	92.58	92.52	0.06
Apogee Radius (km)	6,810.6	6,810.1	0.5
Perigee Radius (km)	6,749.4	6,744.3	5.1
Altitude	427.1	426.1	1.0
Semi-Major Axis (km)	6,780.0	6,777.2	2.8
Eccentricity	0.004517	0.004860	-0.000343
Inclination (deg)	50.037	50.034	0.003
Right Ascension of Node - TOD (deg)	26.957	26.950	0.007
Argument of Perigee (deg)	-112.352	-111.263	-1.089
True Anomaly (deg)	-123.333	-124.360	1.027

TABLE 2-VIII. S-II SPENT STAGE ORBITAL PARAMETERS ON SIXTH ORBIT

PARAMETER	SIXTH ORBIT MIDPOINT
Time (GMT)	May 15 1:54:24
C_3 (km^2/s^2)	-58.738148
Period (min)	92.70
Apogee Radius (km)	6,821.7
Perigee Radius (km)	6,750.5
Semi-Major Axis (km)	6,786.1
Eccentricity	0.005247
Inclination (deg)	50.068
Right Ascension of Node - TOD (deg)	25.605
Argument of Perigee (deg)	-122.180
True Anomaly (deg)	-57.820

TABLE 2-IX. S-IC SPENT STAGE TRAJECTORY PARAMETERS

EVENT	PARAMETER	VALUE
Impact: Tumbling Case	Range Time, sec	651.633
	Latitude, deg N	34.333
	Longitude, deg E	-74.354
	Surface Range, km	868.9
	(nmi)	(469.2)
Impact: 0° Angle-of-Attack	Range Time, sec	610.599
	Latitude, deg N	34.367
	Longitude, deg E	-74.315
	Surface Range, km	874.0
	(nmi)	(471.9)
Impact: 90° Angle-of-Attack	Range Time, sec	686.435
	Latitude, deg N	34.312
	Longitude, deg E	-74.377
	Surface Range, km	865.8
	(nmi)	(467.5)
Apex: Tumbling Case	Range Time, sec	327.317
	Altitude, km	205.5
	(nmi)	(111.0)
	Surface Range, km	430.2
	(nmi)	(232.3)

SECTION 3

TRAJECTORY ACCURACY

Trajectory reconstruction is an estimation process with the resulting confidence level or accuracy of the trajectory dependent upon the following factors:

a. Quantity of tracking data
b. Quality of tracking data
c. Consistency between tracking and guidance velocity data
d. Continuity between trajectory phases (boost trajectory and workshop orbit)

These factors vary from flight to flight so that a rigorous statistical error analysis of the reconstructed trajectory is difficult to obtain. However, the extent to which systematic errors can be identified and corrected, plus random errors averaged out, determines the accuracy of the reconstruction. This section summarizes the results for the SA-513 flight and leads to the position and velocity uncertainties for the reconstructed trajectory. In addition, the basic analysis methods used in the reconstruction are presented in this section.

3.1 TRAJECTORY RECONSTRUCTION METHODS

The trajectory reconstruction process takes place in three stages:

a. Initial data preparation
b. Main analysis
c. Output data processing

The initial data preparation converts the raw tracking and guidance velocity data to a form compatible with the estimation programs. This includes correction for atmospheric refraction (for OCP and GATE), conversion of doppler count to instantaneous range rate, data editing, and data reformatting.

The main analysis effort is conducted with three separate estimation tools. The tools are:

a. The Guidance and Tracking Evaluation program that uses a Kalman estimation method to fit C-band and S-band measurements during powered and non-powered flight phases. The GATE program employs the Cowell formulation of the differential equations of motion to model tracker angles, range, and instantaneous range rate.

3.1 (Continued)

b. The Orbital Correction Program that uses a weighted least squares estimation method to fit C-band and S-band measurements during non-powered flight phases. The OCP employs the Cowell formulation of the differential equations of motion to model tracker angles, range, and instantaneous range rate.

c. The Lunar Impact Determination program that uses a Kalman estimation method to fit C-band and S-band measurements during non-powered flight phases. The LID program employs the Encke formulation of the differential equations of motion to model tracker angles, range, and average range rate.

These three tools were used to iteratively develop the separate powered and non-powered flight trajectory segments. Capability exists with the three tools to incorporate end point constraints as required to provide trajectory continuity and consistency. The residual plots (see Paragraph 3.2.2) depicted in this section were produced with the GATE program for the ascent phase and with the LID program for the orbit phase.

After the main analysis is completed, the separate trajectory segments are merged together and transformed to several coordinate systems to provide the output trajectory listings and tapes. Included in this output data processing is a rework of the first 20 seconds of the ascent phase to better represent the early launch portion of the trajectory. Also, the engine start, cutoff, and mixture ratio shift transient areas of the powered flight portions of the trajectory are reshaped in order to better represent the conditions and to incorporate the specific event times.

3.1.1 Powered Flight Trajectory Determination

The GATE program is used to determine the powered flight phase of the trajectory (ascent phase). Telemetered guidance velocity data from on-board the vehicle are used as generating parameters in conjunction with a comprehensive gravity model to produce a trajectory to fit the available tracking data. The Kalman estimation scheme is generally used to solve for coefficients of a guidance error model and, when desired, for corrections to initial position and velocity.

3.1.2 Non-Powered Flight Trajectory Determination

The three above mentioned tools were used for non-powered or coasting orbit determination. The OCP uses a polynomial to represent the non-gravitational accelerations. The GATE and LID programs use either polynomial or tabular representations

3.1.2 (Continued)

of the perturbing accelerations (see Section 2.2). The perturbing accelerations are used in conjunction with a comprehensive gravity model to simulate the trajectory used to fit the tracking data. The estimation techniques are applied to obtain, generally, the initial vehicle position and velocity plus acceleration bias terms. For the workshop orbit, several iterations were made to determine the segment biases needed to adjust the observed accelerations to the values required for a consistent orbit. Table 2-VI provides a time history of the corrected platform accelerations.

3.1.3 Estimation of Trajectory Segments

With the three estimation programs, the analysis proceeds by successive iterations to eliminate poor-quality and inconsistent tracking data from the solutions. Other estimation controls, such as relative data weights, are varied from run to run until an overall best-estimate trajectory is obtained. State vectors from adjacent segments can be used in a particular segment and weighted appropriately to provide initial or final constraining state vectors. This constraint feature permits the development of a continuous and consistent trajectory when the segments are later merged. The criteria for evaluating a particular solution include the magnitudes and shapes of tracking residuals (differences between actual tracking and the reconstructed trajectory), the values of the guidance error model coefficients and/or acceleration bias terms, and the consistency between the independently estimated trajectory segments. A state vector comparison is used for judging the consistency between the various state vectors developed at time points common to two trajectory segments. The time point used for state vector consistency judgment in this analysis is workshop orbit insertion at 598.96 seconds.

3.2 TRAJECTORY DATA SOURCES

3.2.1 Tracking Data-Quantity

Time periods for which C-band radar and S-band tracking data were available for SA-513 launch vehicle and workshop reconstruction are illustrated in Figure 3-1. The geographic locations of the tracking stations are shown on ground track Figures 2-1 and 2-8 and are itemized in Table 3-I. Most of the tracking data were used except for isolated points or for data segments which were inconsistent with adjacent data.

Skin tracking during the second, fifth and sixth orbits by the Merritt Island and Bermuda C-band radars provided data for spent S-II stage orbit reconstruction. The C-band tracking data were provided in azimuth angle, elevation angle,

3.2.1 (Continued)

and range measured parameters. These measurements are defined in Reference 1 and are designated as PACSS3a. The USB tracking data were provided in X-angle, Y-angle, range and range rate measured parameters. These, also, are defined in Reference 1, and are designated as PACSS3c and 3d, for the 30-foot and 85-foot antennas, respectively.

As shown in Figure 3-1, adequate data exists in order to determine the SA-513 launch vehicle and workshop trajectory. In general, tracking coverage was redundant.

3.2.2 Tracking Data-Quality

Measured parameter comparisons between the tracking data and the reconstructed trajectory were calculated as required in the various PACSS3 coordinate systems. The position components of the trajectory in PACSS10 were transformed into the measured parameters of the PACSS3 system appropriate to each tracker. To more accurately model the tracking measurements, precession and nutation of the earth and aberration effects are modeled in the analysis programs. Residual differences or deviations (observed tracking data minus calculated tracking data, O-C) were determined for the various tracking data sets. These residual differences are used for assessing the quality of the tracking data as well as determining how well the reconstructed trajectory fits the data.

The ascent phase measured parameter residuals are shown in Figures 3-2 through 3-6. Measured parameter residuals during the workshop orbit phase are given chronologically in Figures 3-7 through 3-24 with Table 3-II showing the residuals for the relatively few USB range measurements. Table 3-III provides the residual statistics for the spent S-II stage orbit analysis.

It is to be noted that the above measured parameter residuals for all phases of the flight depict the consistent data sets which were used in the reconstruction of the various trajectory phases. Residual plots are included for Wallops Island even though the data were not used in the reconstruction due to uncertainty in the location of the tracker.

3.2.3 Guidance Velocity Data

Guidance velocity data throughout the separate trajectory phases were received from the ST-124M-3 inertial platform. The velocity data during the powered phase were used directly by the GATE program as non-gravitational generating parameters. Velocity data during the orbit phase was reduced to a tabular

3.2.3 (Continued)

acceleration history and used by the OCP, GATE, and LID programs to model non-gravitational effects (see Paragraphs 2.2, 3.1.2, and Table 2-VI).

3.3 CONSISTENCY BETWEEN TRACKING AND GUIDANCE VELOCITY DATA

The consistency between tracking and guidance velocity data can be obtained by examining guidance velocity error plots during powered flight trajectory segments. These error plots give the differences between the guidance velocities from the ST-124M-3 platform and those derived from the reconstructed trajectory which fit the tracking data.

The guidance velocity error plots for the ascent phase had reasonable shapes and magnitudes. The maximum error amounted to 0.4 m/sec (1.3 ft/sec) in the vertical direction, 0.3 m/sec (1.0 ft/sec) in the crossrange direction, and 0.7 m/sec (2.3 ft/sec) in the downrange direction, referenced to the launch vehicle platform accelerometer coordinate system (PACSS12).

3.4 CONTINUITY BETWEEN TRAJECTORY PHASES

The continuity between independently estimated trajectory segments is used as one of the indicators of the trajectory accuracy. A measure of the continuity between two adjacent trajectory segments is obtained by differencing the state vectors at a time point common to both segments. As noted in Paragraph 3.1.3, the time point normally used for continuity judgments is at orbit insertion.

Comparisons at workshop orbit insertion were made for the SA-513 analysis and are described below. Following these comparisons, the separate trajectory segments were merged together, in the manner also described below, to produce the complete trajectory from GRR to the transfer to ATM control at 17,400.7 seconds range time. Comparisons of orbit insertion state vectors as independently determined by the powered flight and orbit analyses yielded excellent agreement. The position and velocity components of the two best-estimate solutions had a spread of 60.0 m (196.7 ft) and 0.16 m/s (0.52 ft/s) in the vertical direction, 17.0 m (53.8 ft) and 0.34 m/s (1.12 ft/s) in the cross range direction, and 71.0 m (232.9 ft) and 0.06 m/s (0.20 ft/s) in the downrange direction, referenced to the earth-fixed launch site coordinate system (PACSS10). Since these differences are very small and since the confidence for the boost trajectory segment is greater at OWS insertion than the orbit segment (because the boost fit

3.4 (Continued)

had available more data near insertion) the insertion point quoted in this document is taken from the boost trajectory segment. The workshop orbit segment, however, is generated from the state vector which was obtained by the composite fit of the available orbit tracking data.

3.5 TRAJECTORY UNCERTAINTIES

As an aid in estimating the trajectory accuracy, some of the tracking data throughout the various trajectory phases were transformed into the earth-fixed launch site components (PACSS10) and differenced with the reconstructed trajectory. The resulting residuals or deviations should provide a direct indication of the spread of the tracking data about the trajectory. However, for this analysis, some problem was encountered with the S-band X-angle observations during the orbit phase. The general consistency of range rate, Y-angle, and range observations can be seen in Figures 3-7 through 3-24 and Table 3-II. The above mentioned figures also graphically illustrate the X-angle inconsistency. As a result, the PACSS10 transformations for the orbit phase do not provide a realistic indication of the trajectory errors. The orbit uncertainties are thereby determined from the initial state errors and past experience with equivalent residuals as given by the range, range-rate and Y-angle measurements. It should be noted that the boost phase transformations are based entirely on C-band radar data.

The position deviations during the ascent phase are shown for the C-band trackers in Figures 3-25 through 3-28. Deviations for the orbit phase are shown in Figures 3-29 through 3-37 for the S-band stations.

Based upon the information of the above paragraphs and a priori knowledge, the trajectory uncertainties were conservatively estimated. The uncertainties for the ascent phase are shown in Figure 3-38. At S-IC OECO, the uncertainties in position and velocity components in PACSS10 are 80 m (262 ft) and 0.5 m/s (1.6 ft/s), respectively. Throughout the orbit, the uncertainties in position and velocity components in PACSS10 are 1,000 m (3,280 ft) and 1.5 m/s (4.9 ft/s), respectively. The total radius and velocity magnitude uncertainties throughout the orbit phase are estimated at 600 m (1,968 ft) and 1.0 m/s (3.3 ft/s), respectively.

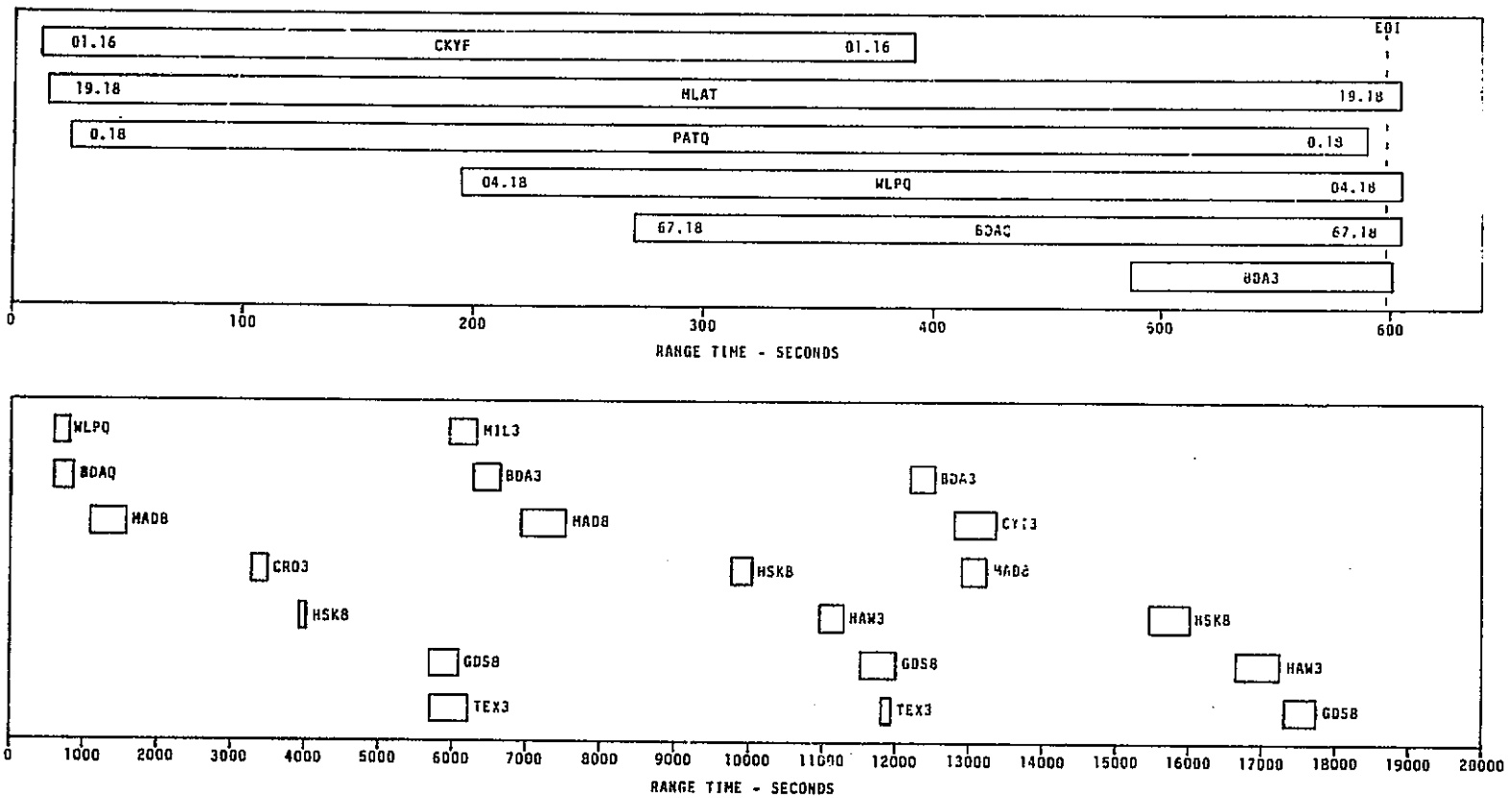


FIGURE 3-1. SA-513 TRACKING DATA AVAILABILITY - LAUNCH VEHICLE AND WORKSHOP

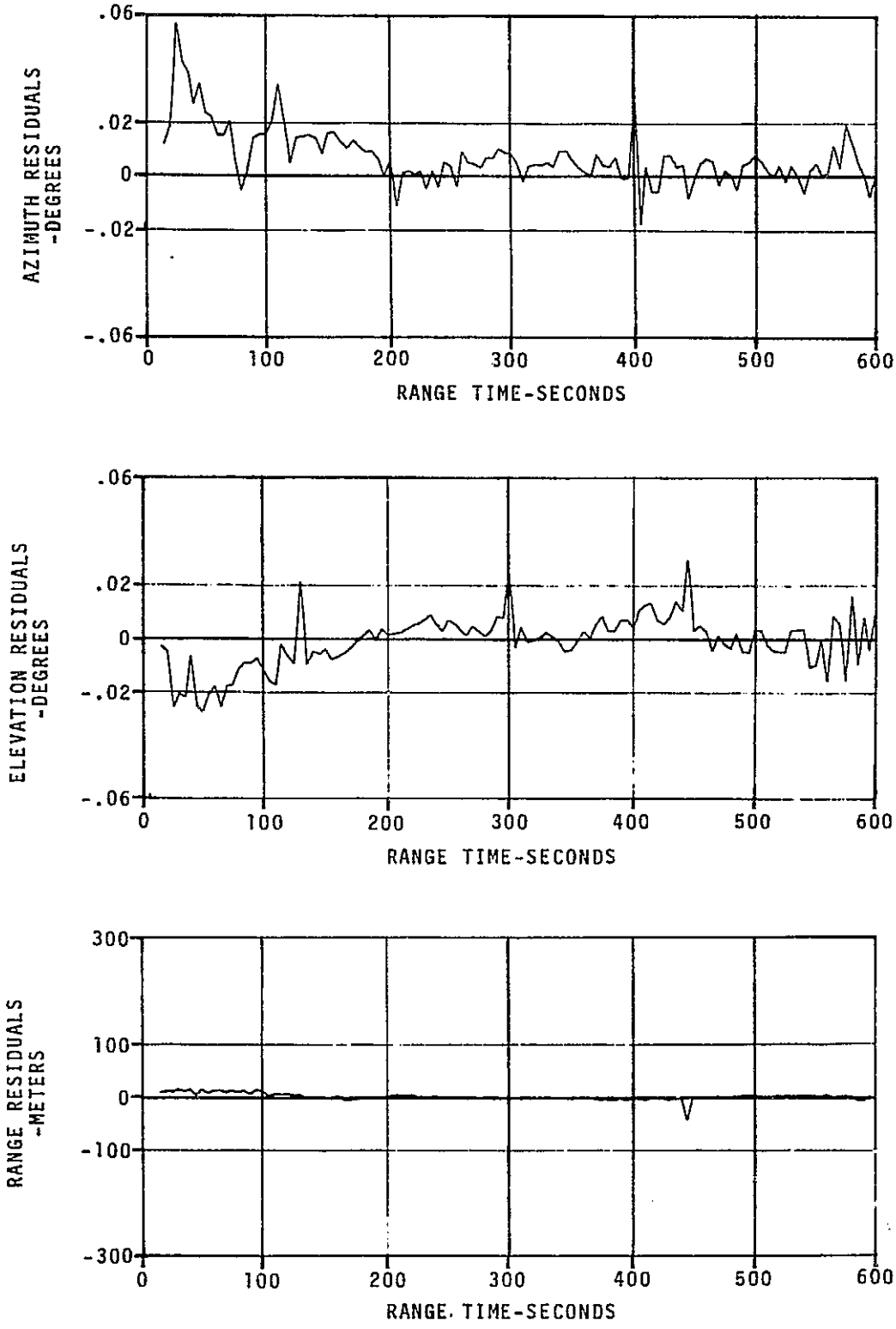


FIGURE 3-2. MERRITT ISLAND C-BAND RADAR TRACKING DEVIATIONS-ASCENT PHASE (MLAT)

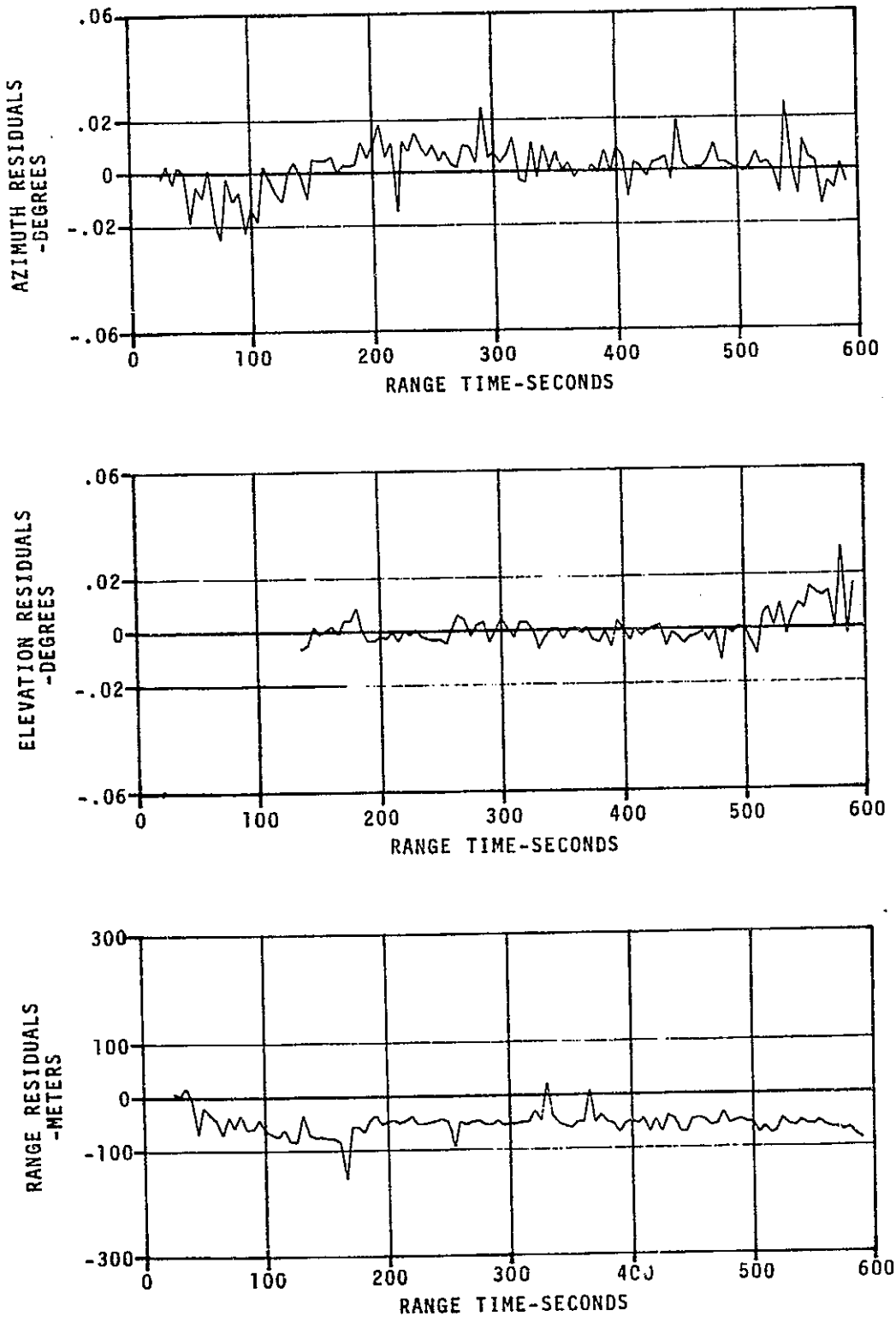


FIGURE 3-3. PATRICK AFB C-BAND RADAR TRACKING DEVIATIONS-ASCENT PHASE (PATQ)

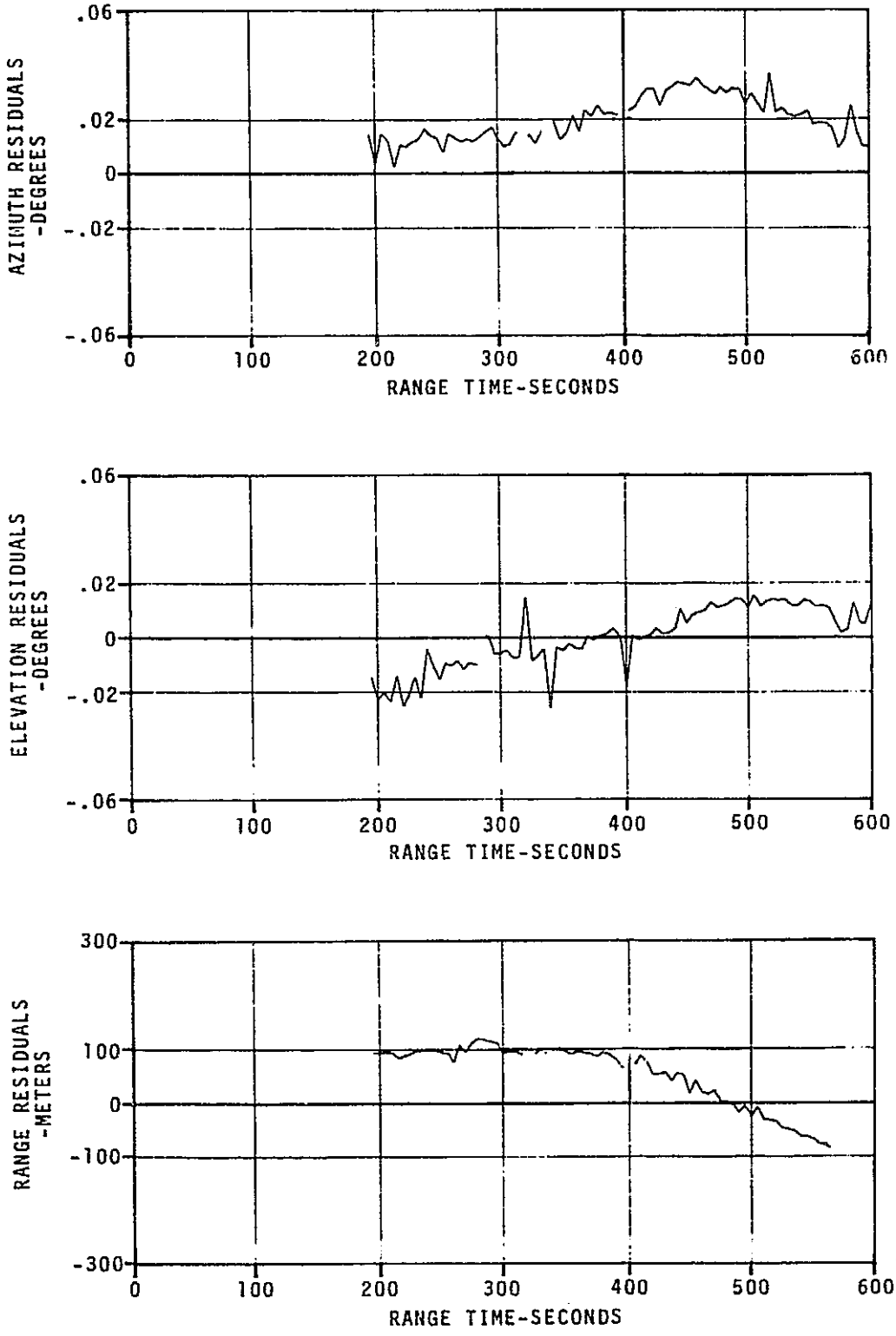


FIGURE 3-4. WALLOPS ISLAND C-BAND RADAR TRACKING DEVIATIONS-ASCENT PHASE (WLPQ)

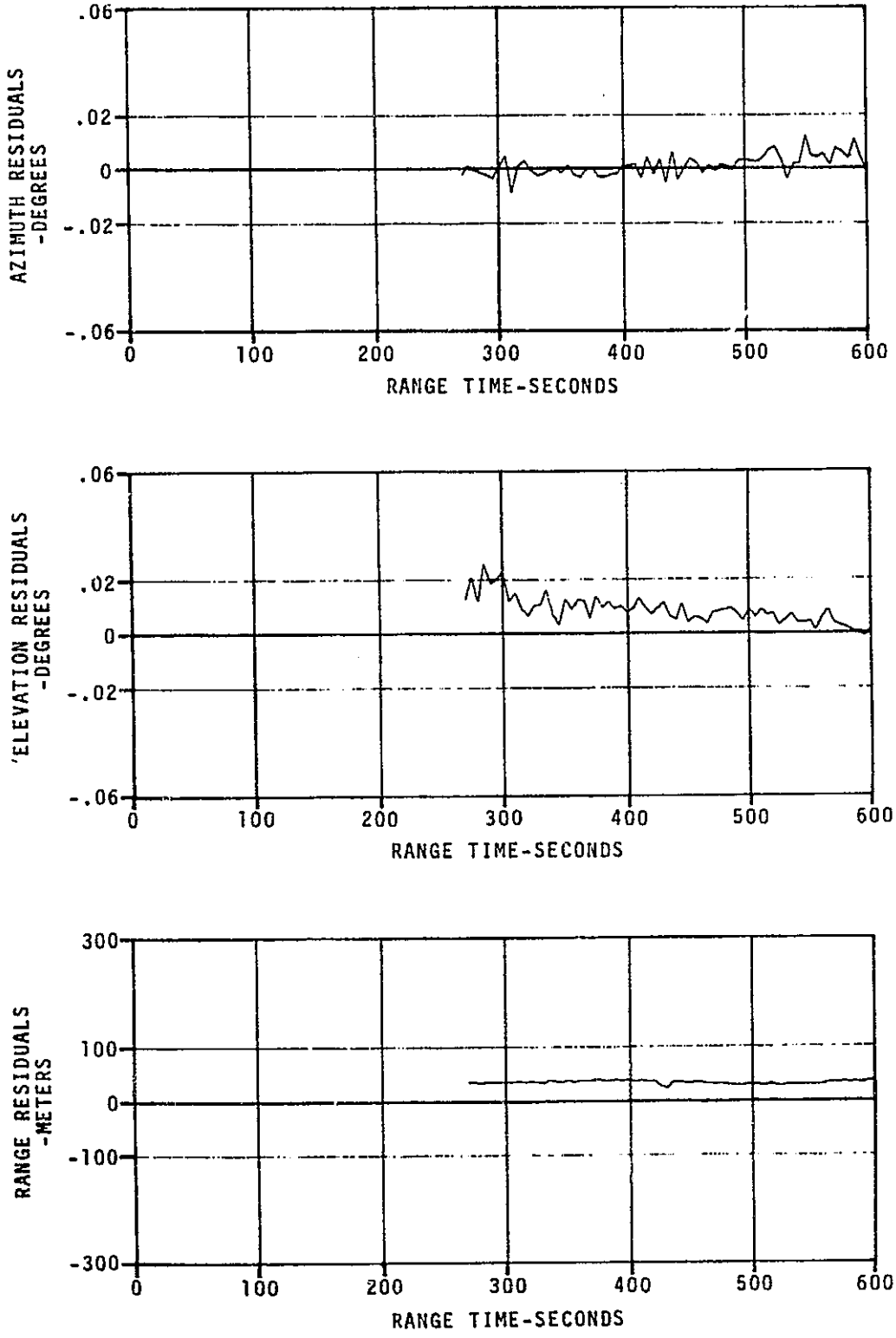


FIGURE 3-5. BERMUDA C-BAND RADAR TRACKING DEVIATIONS-ASCENT PHASE (BDAQ)

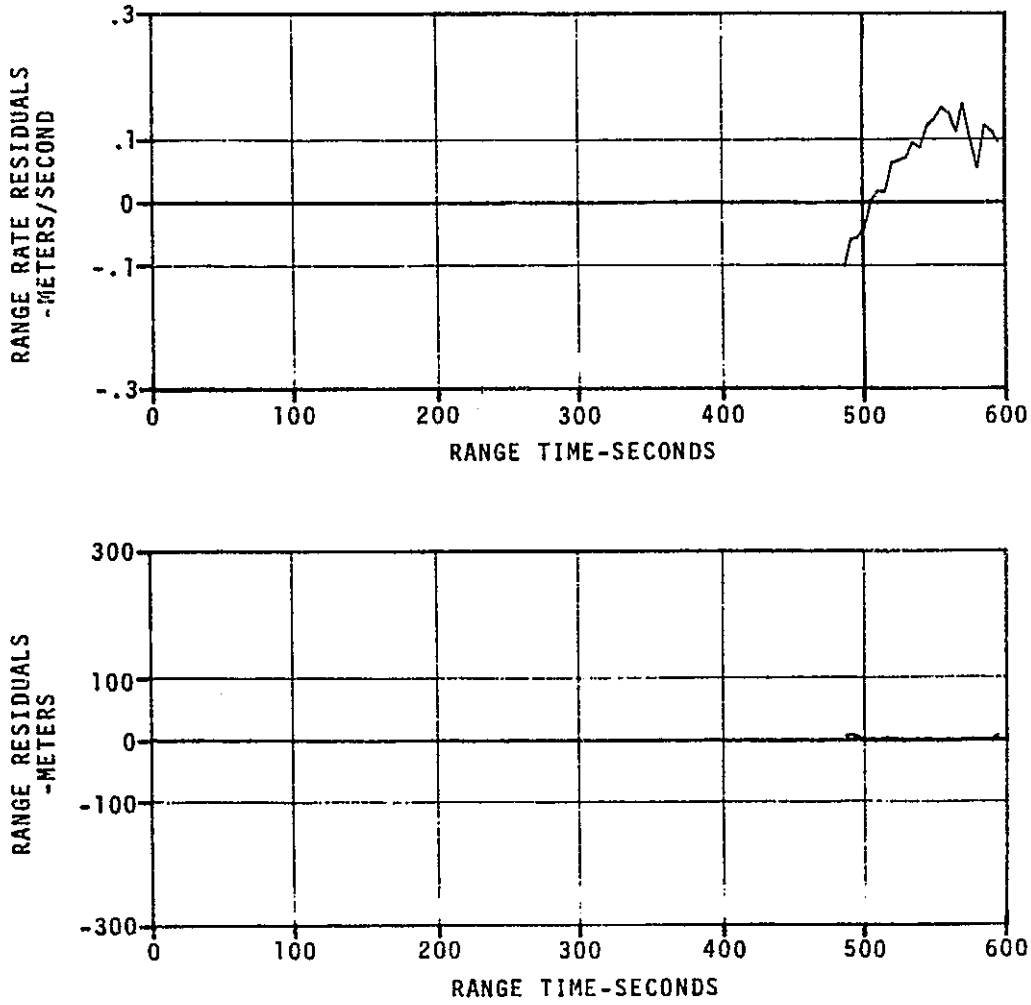


FIGURE 3-6. BERMUDA S-BAND TRACKING DEVIATIONS -ASCENT PHASE (BDA3)

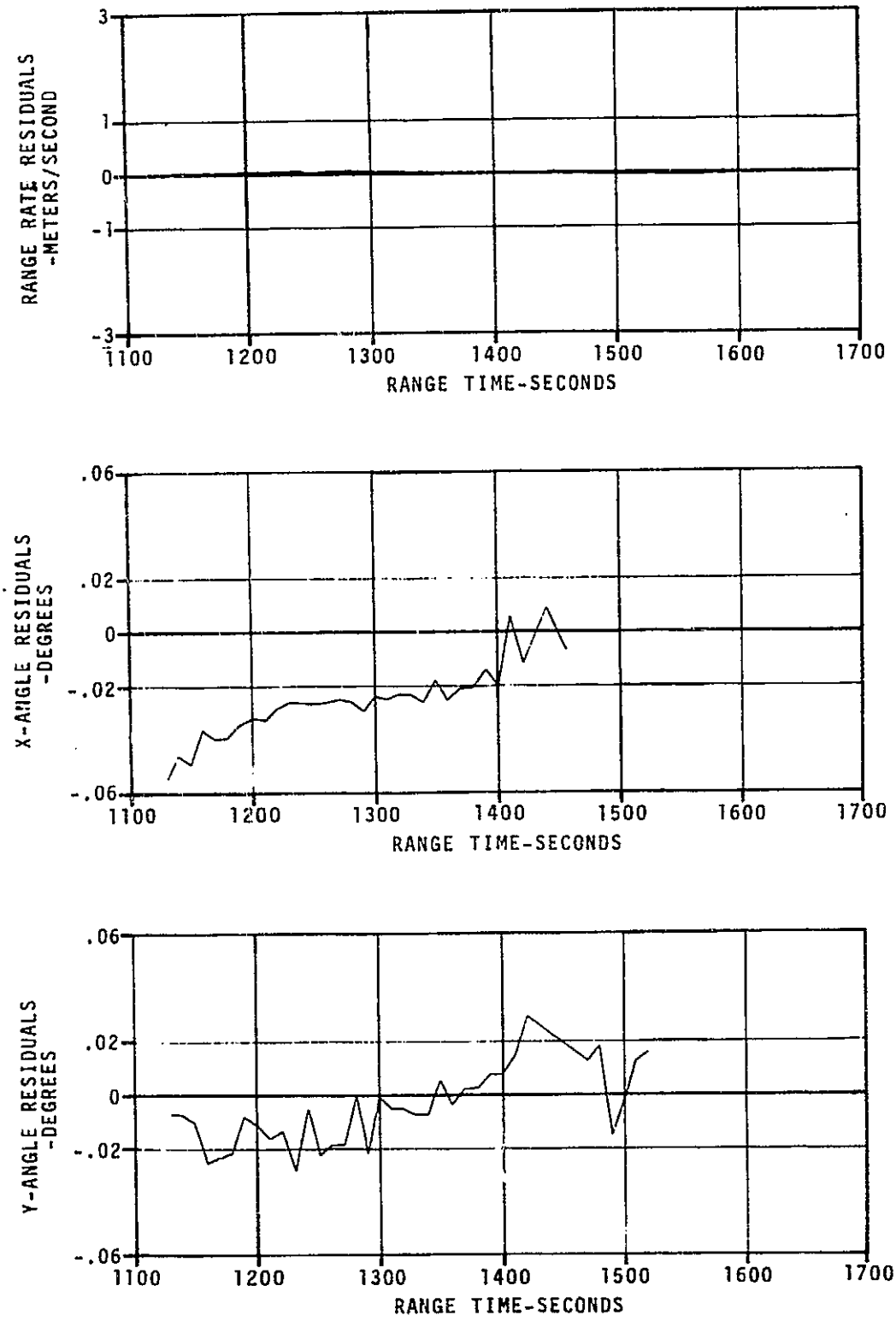


FIGURE 3-7. MADRID S-BAND TRACKING DEVIATIONS-ORBIT PHASE-REV. 1 (MAD8)

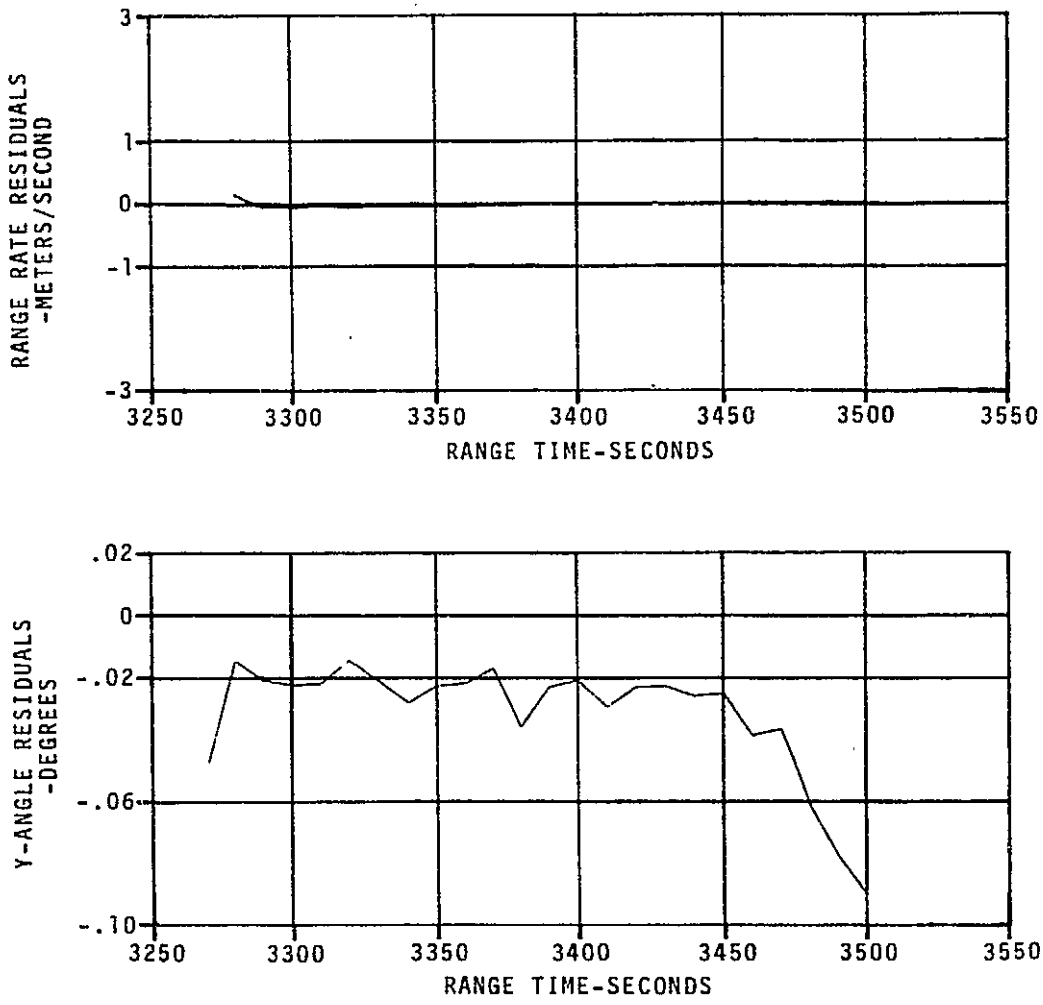


FIGURE 3-8. CARNARVON S-BAND TRACKING DEVIATIONS-ORBIT PHASE-REV. 1 (CR03)

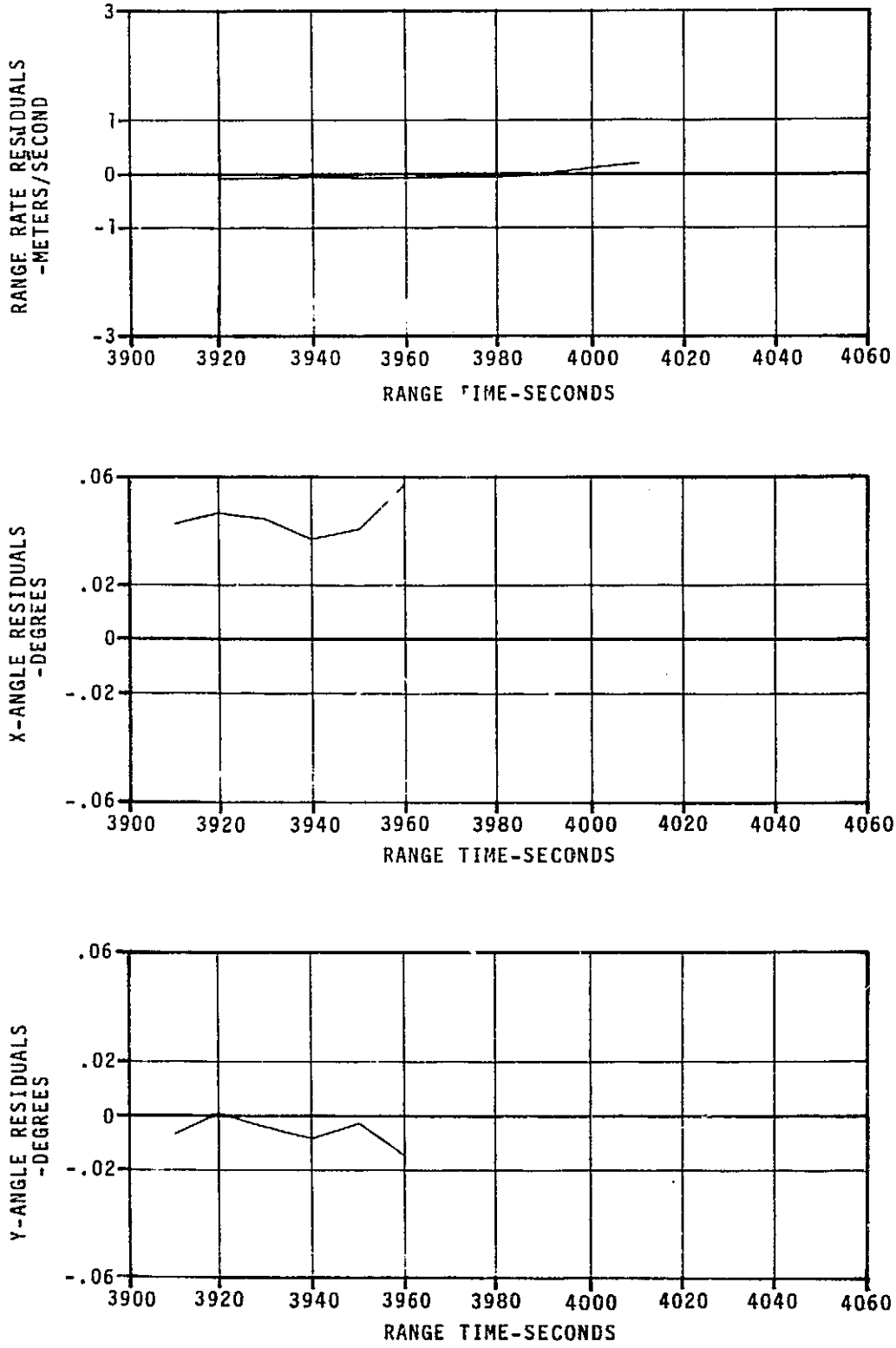


FIGURE 3-9. HONEYSUCKLE S-BAND TRACKING DEVIATIONS -ORBIT PHASE- REV. 1 (HSK8)

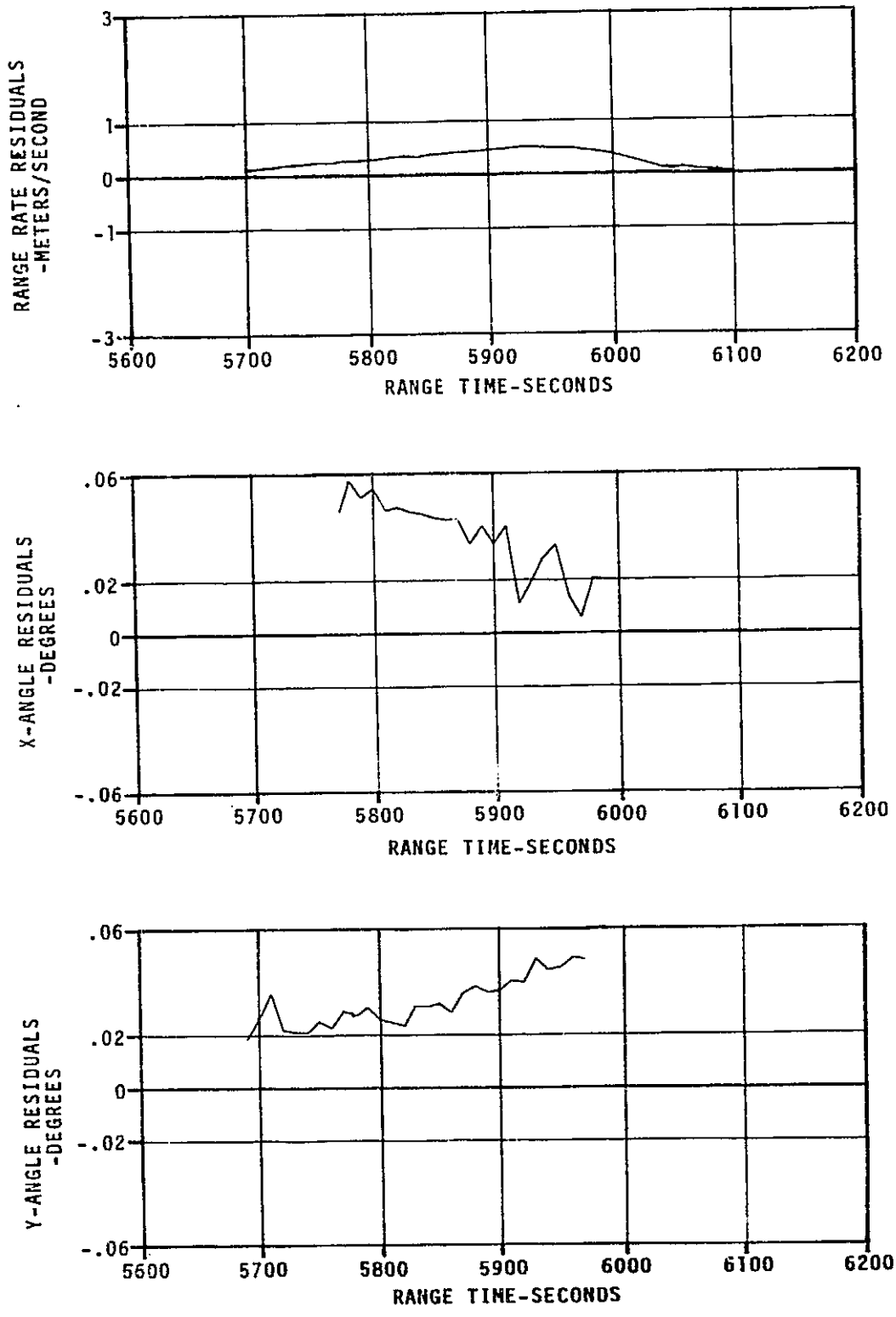


FIGURE 3-10. GOLDSTONE S-BAND TRACKING DEVIATIONS-ORBIT PHASE- REV. 1 (GDS8)

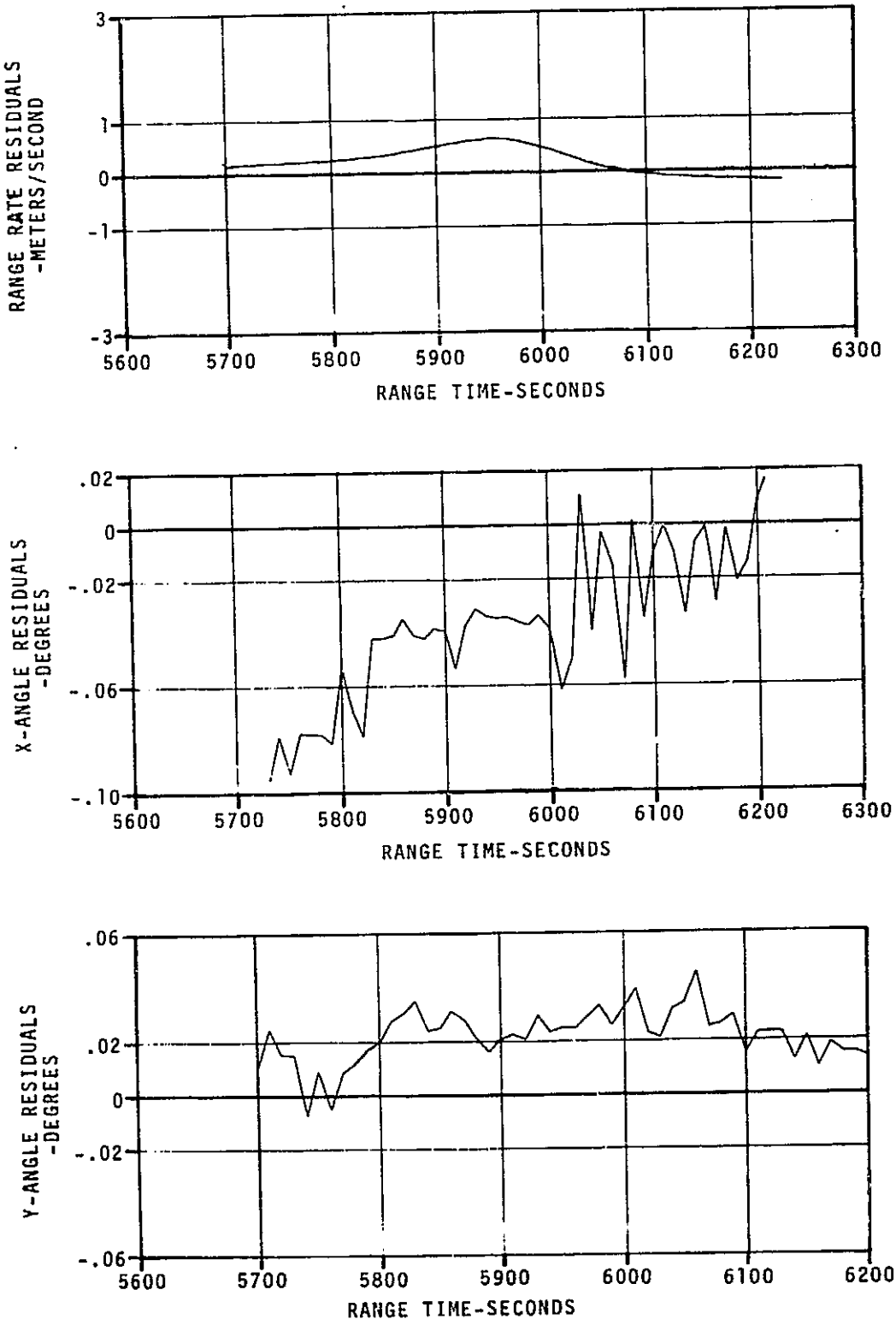


FIGURE 3-11. CORPUS CHRISTI S-BAND TRACKING DEVIATIONS -ORBIT PHASE- REV. 1 (TEX3)

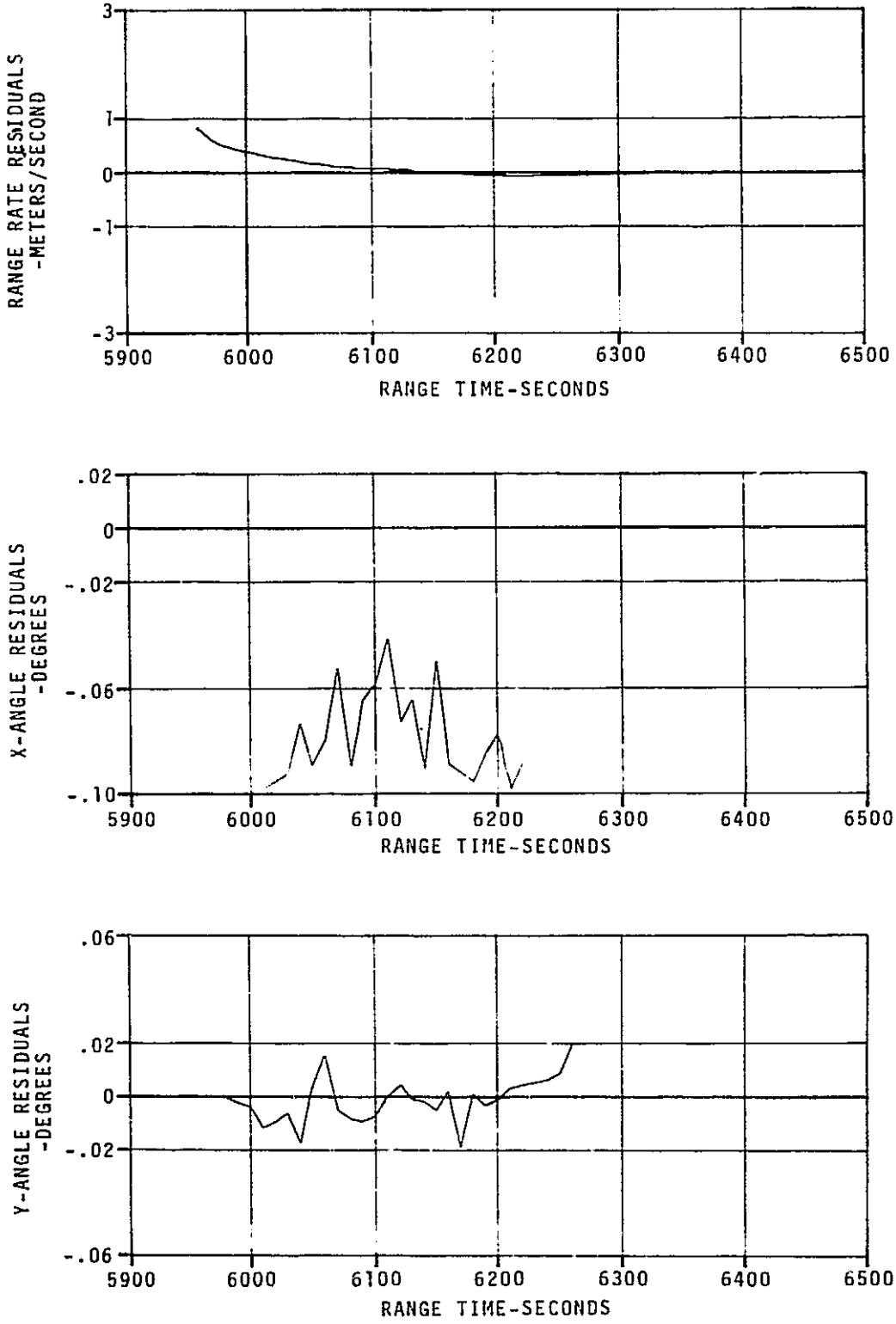


FIGURE 3-12. MERRITT ISLAND S-BAND TRACKING DEVIATIONS-ORBIT PHASE - REV. 1 AND 2 (MIL3)

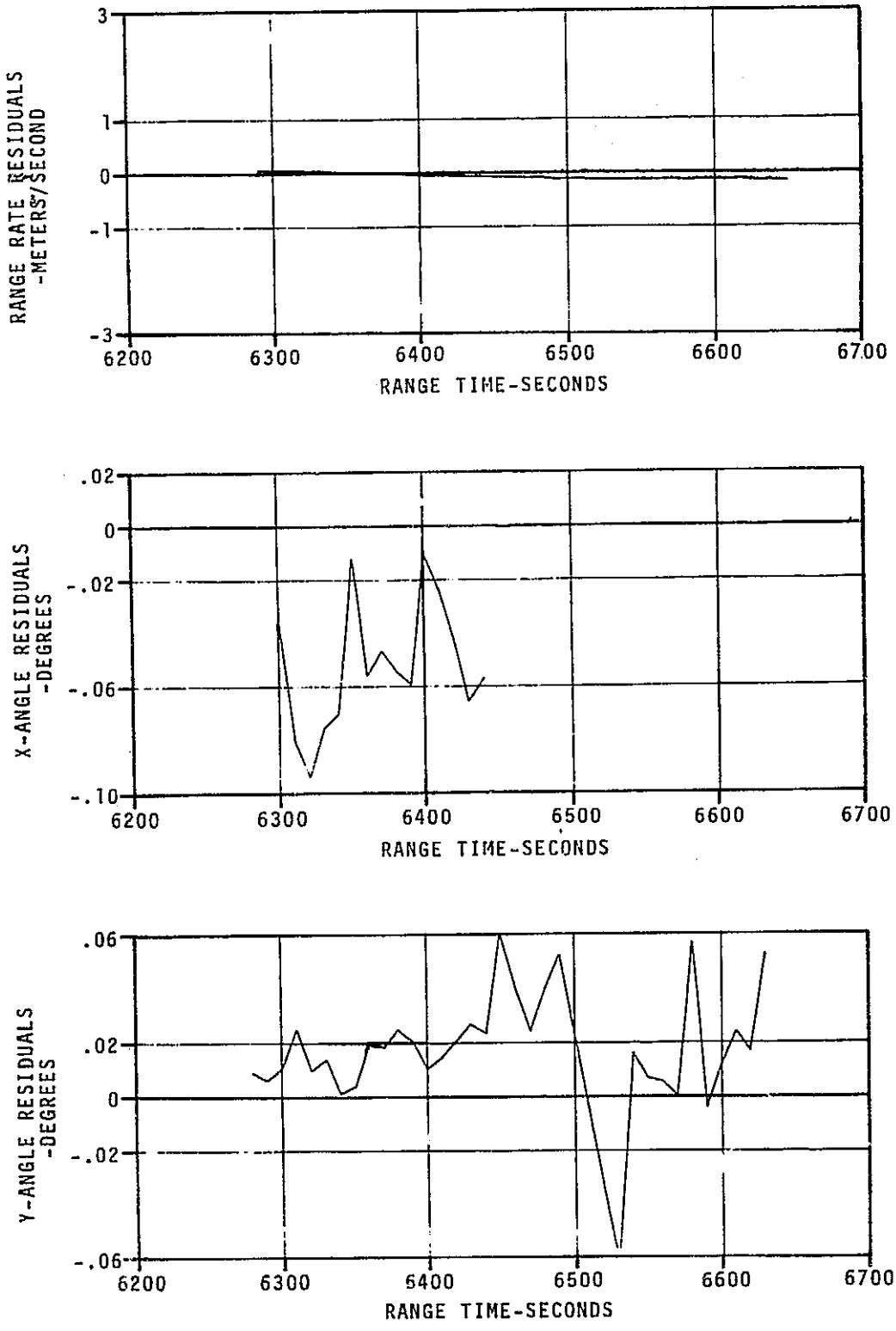


FIGURE 3-13. BERMUDA S-BAND TRACKING DEVIATIONS-ORBIT PHASE- REV. 2 (BDA3)

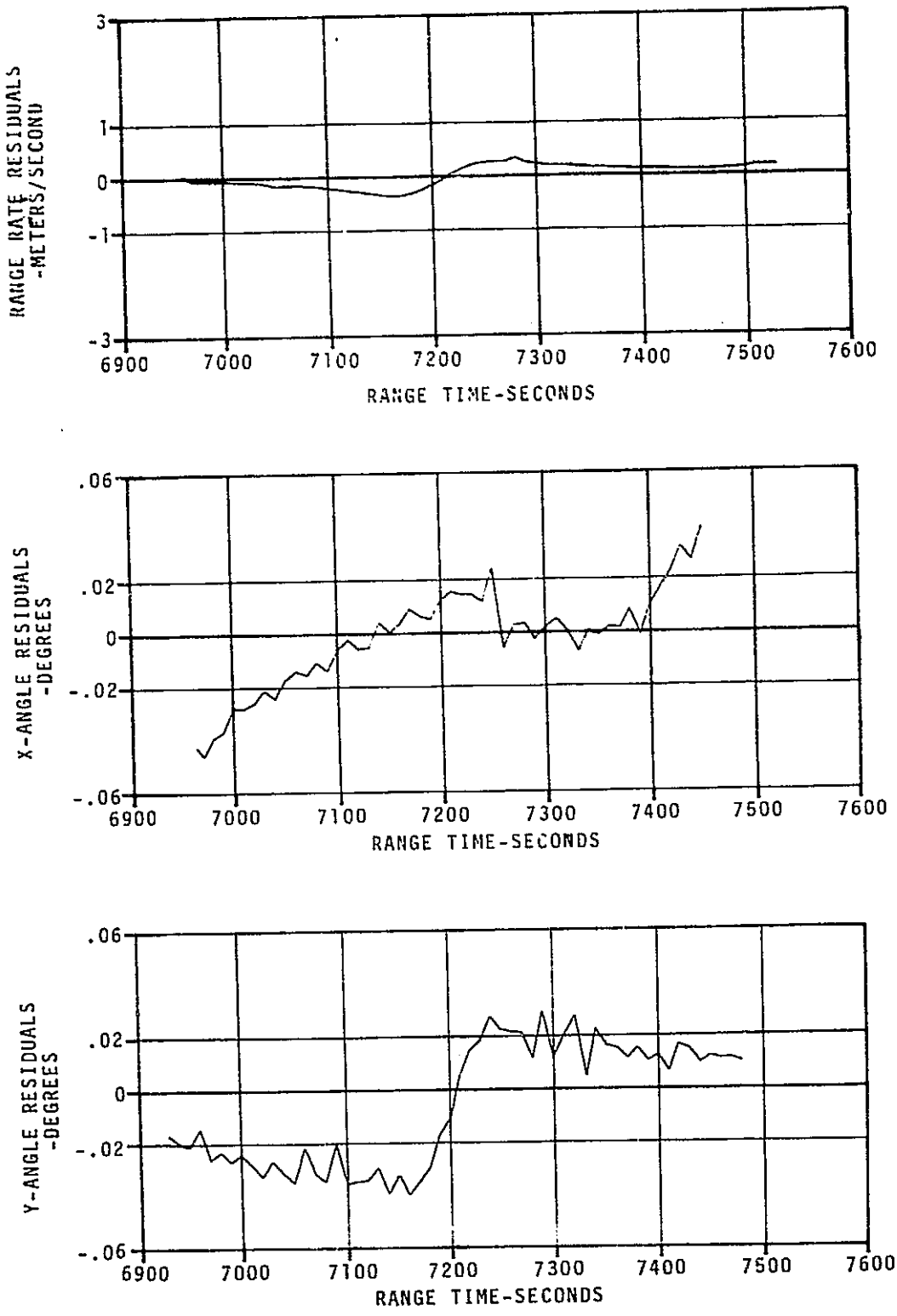


FIGURE 3-14. MADRID S-BAND TRACKING DEVIATIONS-ORBIT PHASE- REV. 2 (MAD8)

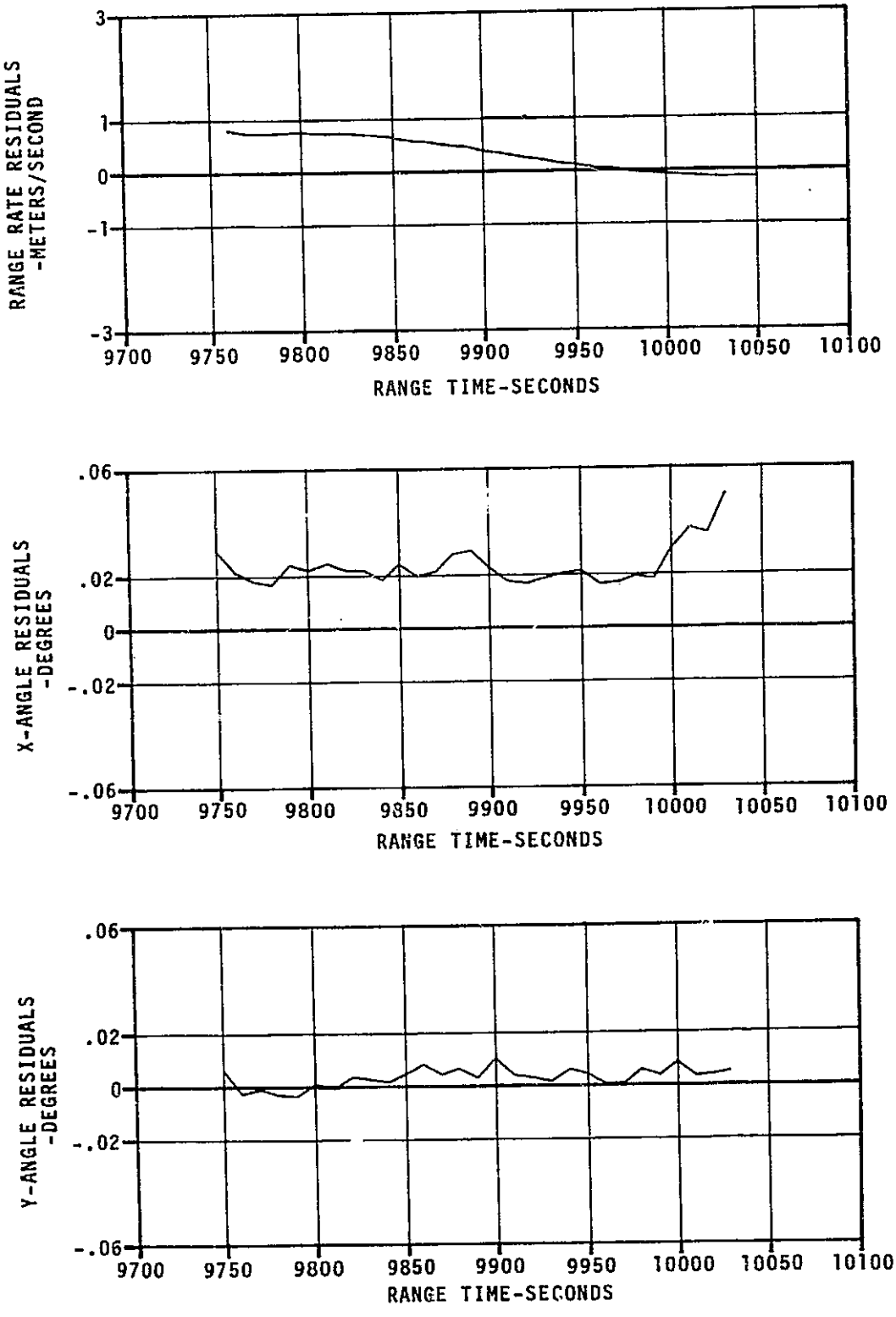


FIGURE 3-15. HONEYSUCKLE S-BAND TRACKING DEVIATIONS-ORBIT PHASE-REV. 2 (HSK8)

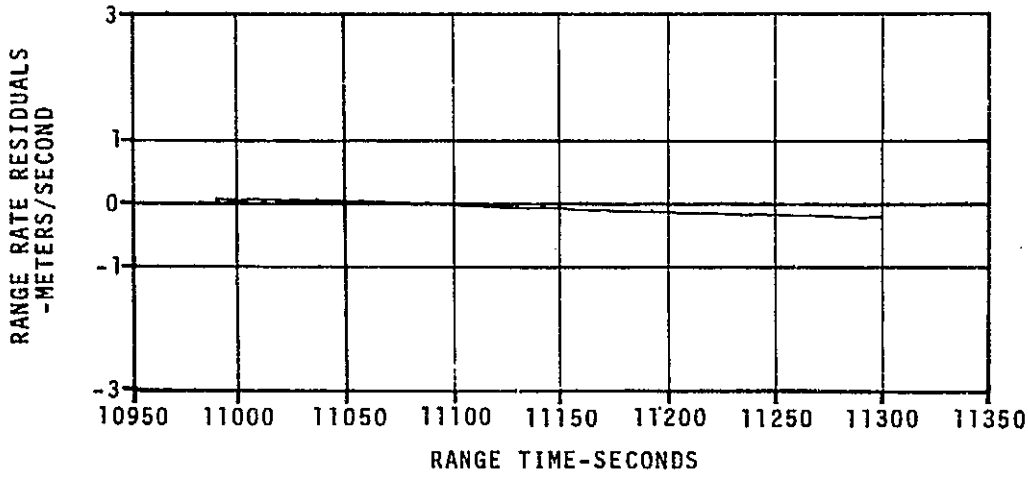


FIGURE 3-16. HAWAII S-BAND TRACKING DEVIATIONS-ORBIT PHASE- REV. 2 (HAW3)

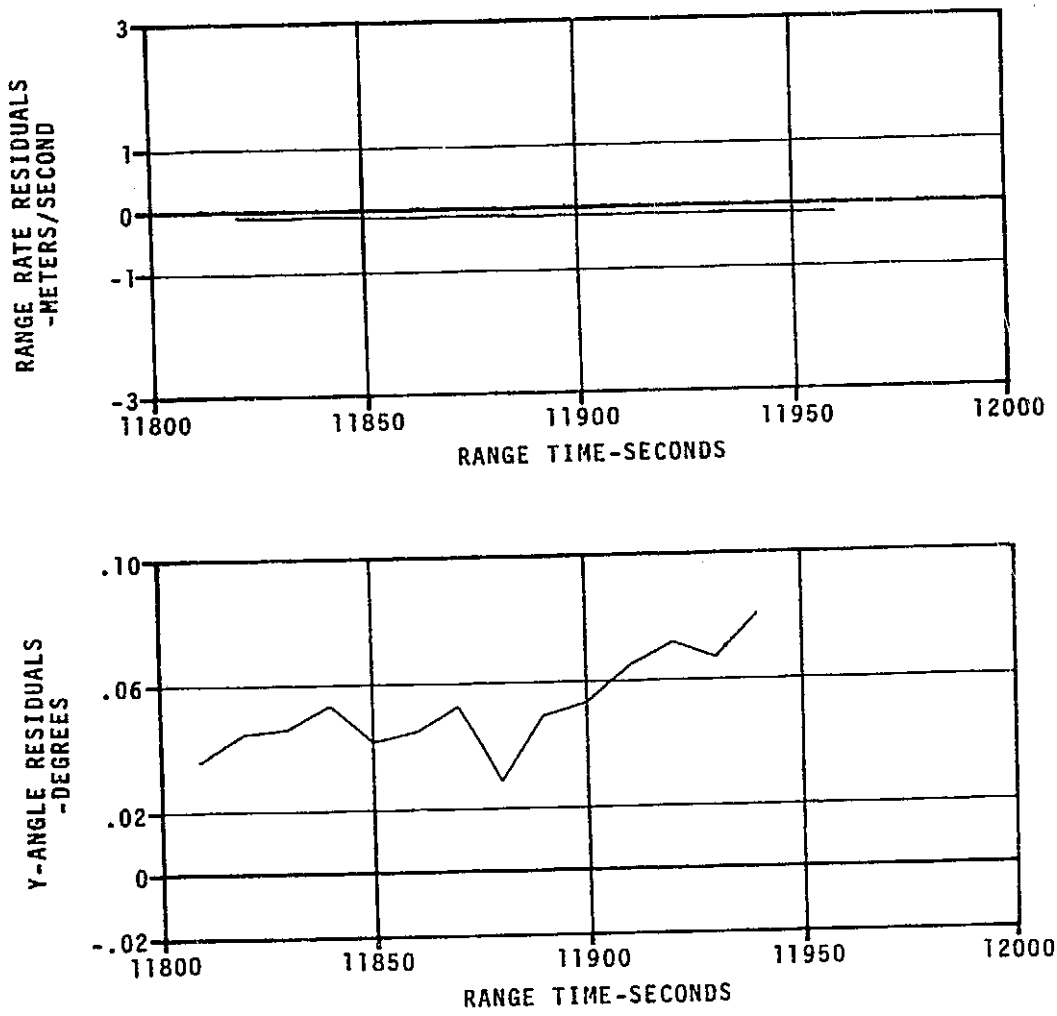


FIGURE 3-17. GOLDSTONE S-BAND TRACKING DEVIATIONS- ORBIT PHASE- REV. 2 (GDS8)

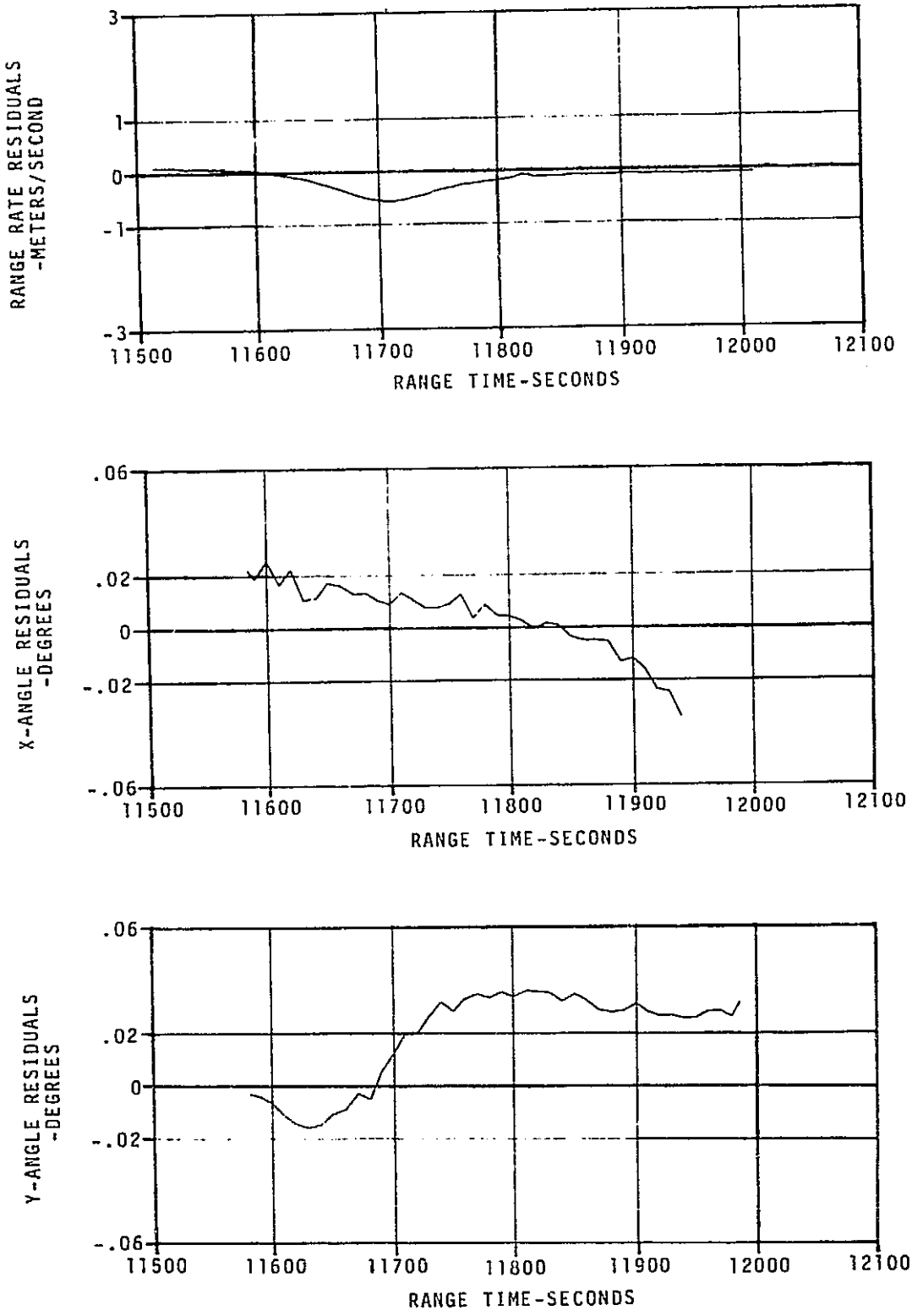


FIGURE 3-18. CORPUS CHRISTI S-BAND TRACKING DEVIATIONS -ORBIT PHASE- REV. 2 (TEX3)

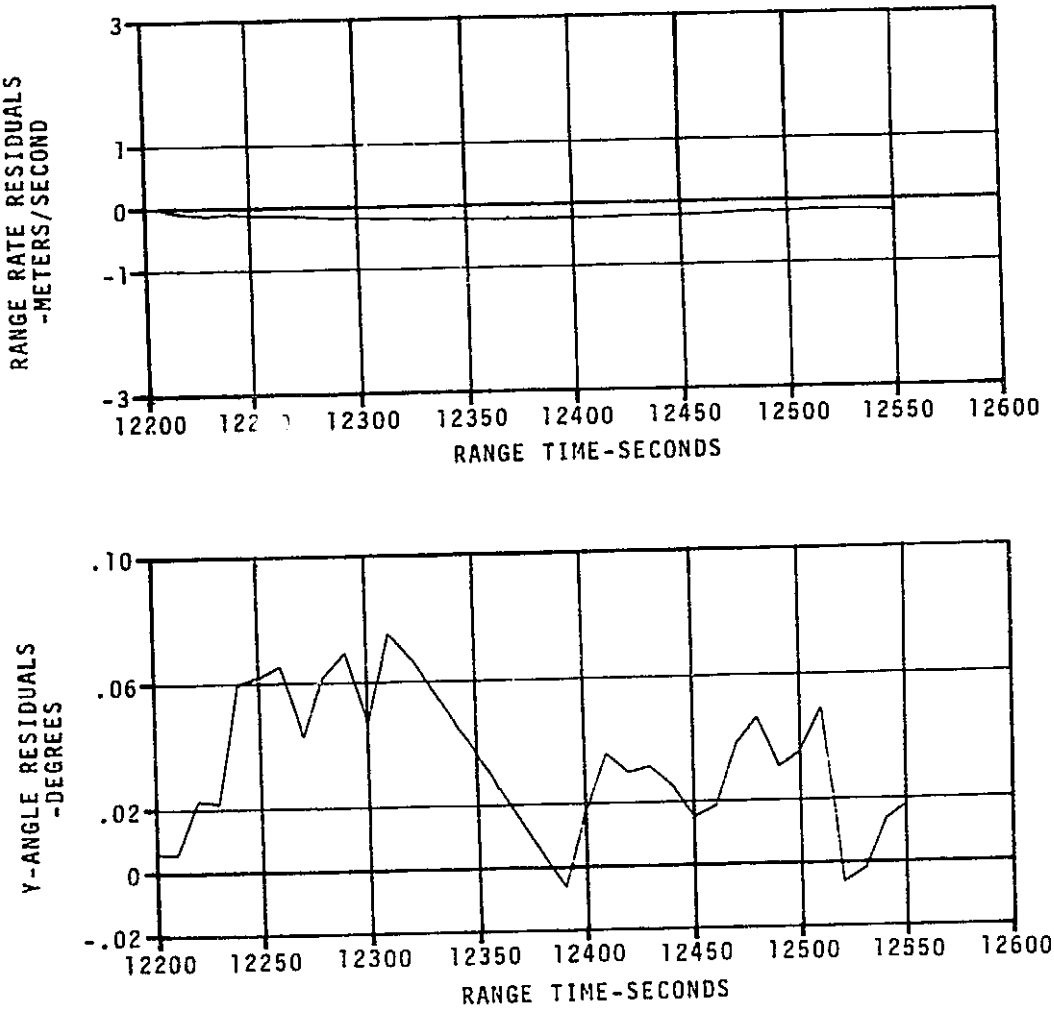


FIGURE 3-19. BERMUDA S-BAND TRACKING DEVIATIONS-ORBIT PHASE- REV. 3 (BDA3)

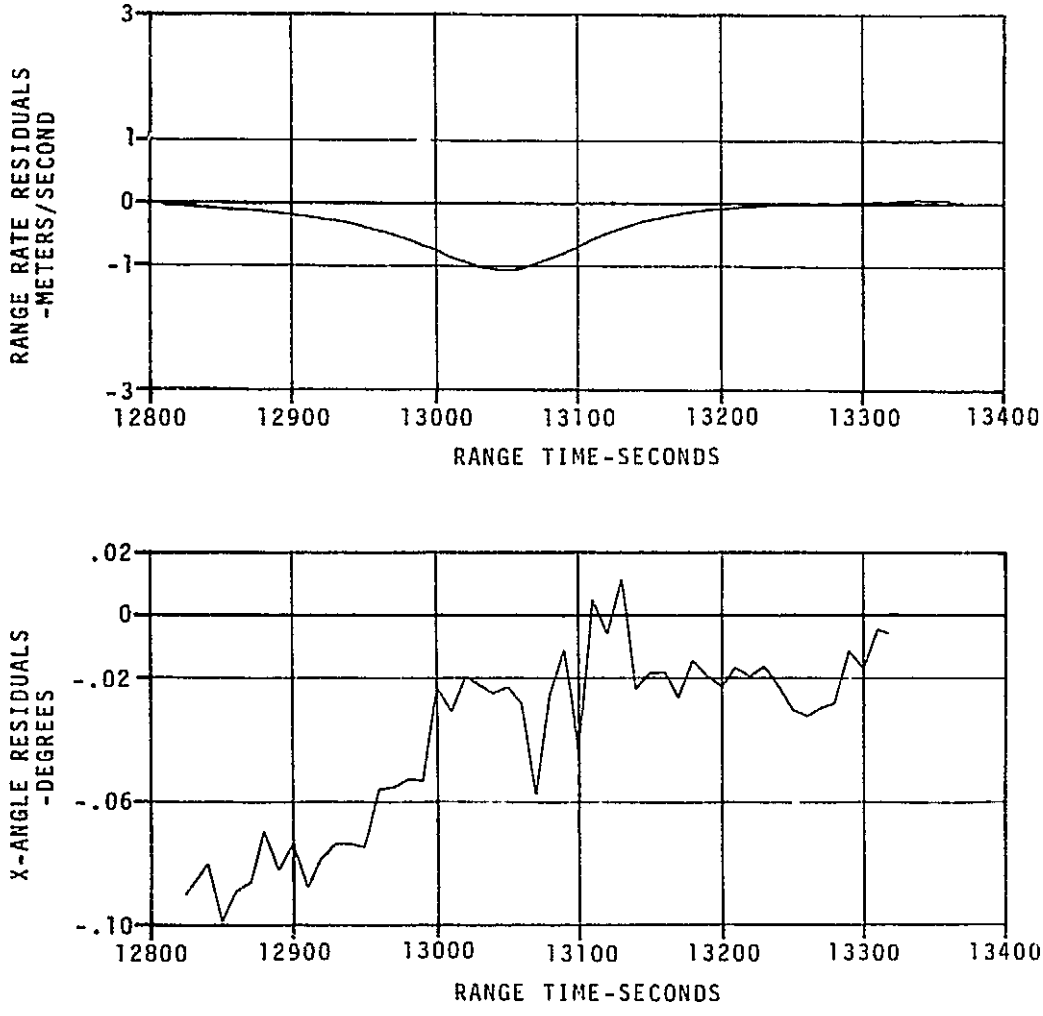


FIGURE 3-20. CANARY ISLAND S-BAND TRACKING DEVIATIONS -ORBIT PHASE- REV. 3 (CYI3)

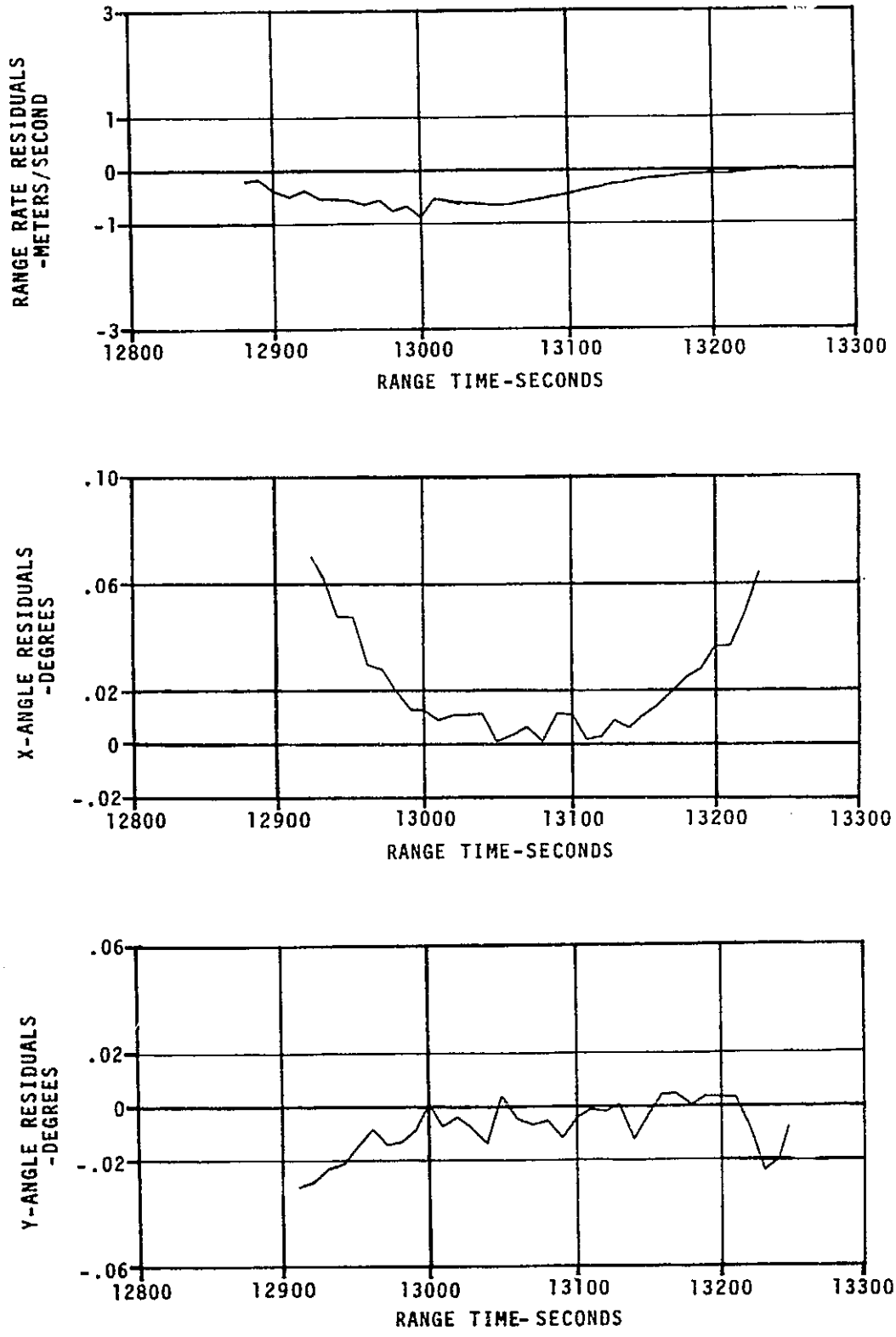


FIGURE 3-21. MADRID S-BAND TRACKING DEVIATIONS-ORBIT PHASE- REV. 3 (MAD8)

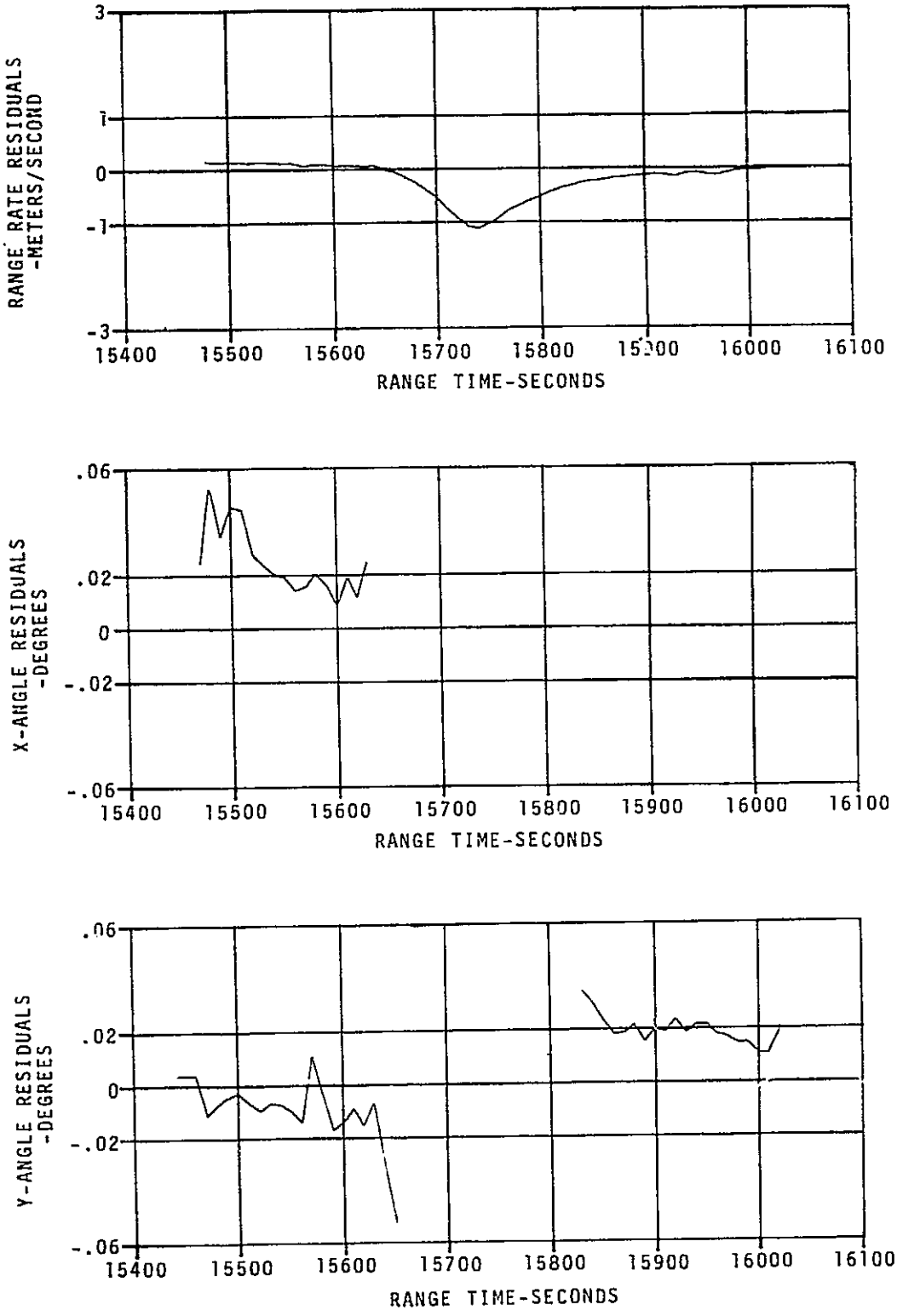


FIGURE 3-22. HONEYSUCKLE S-BAND TRACKING DEVIATIONS-ORBIT PHASE- REV. 3 (HSK8)

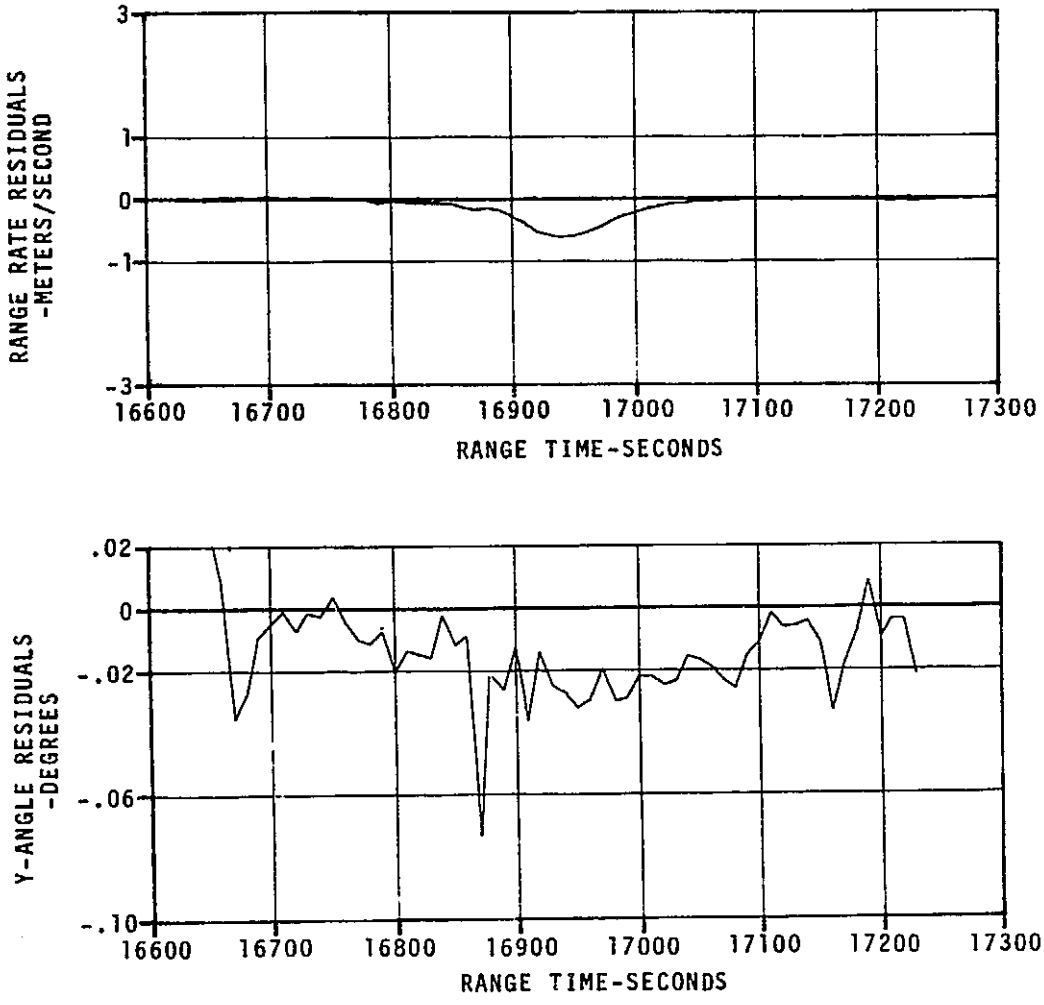


FIGURE 3-23. HAWAII S-BAND TRACKING DEVIATIONS-ORBIT PHASE- REV. 3 (HAW3)

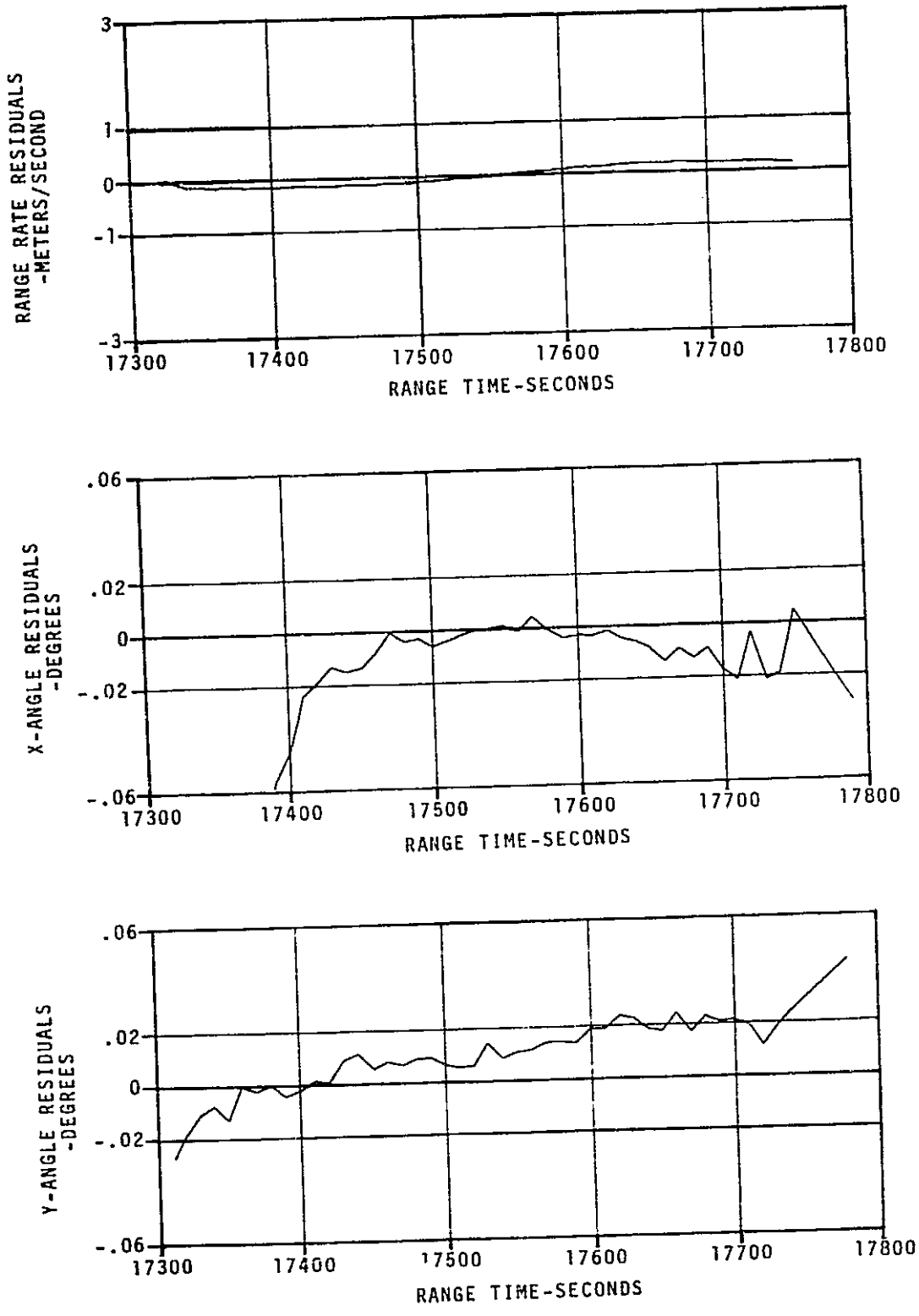


FIGURE 3-24. GOLDSTONE S-BAND TRACKING DEVIATIONS-ORBIT PHASE-REV. 3 (GDS8)

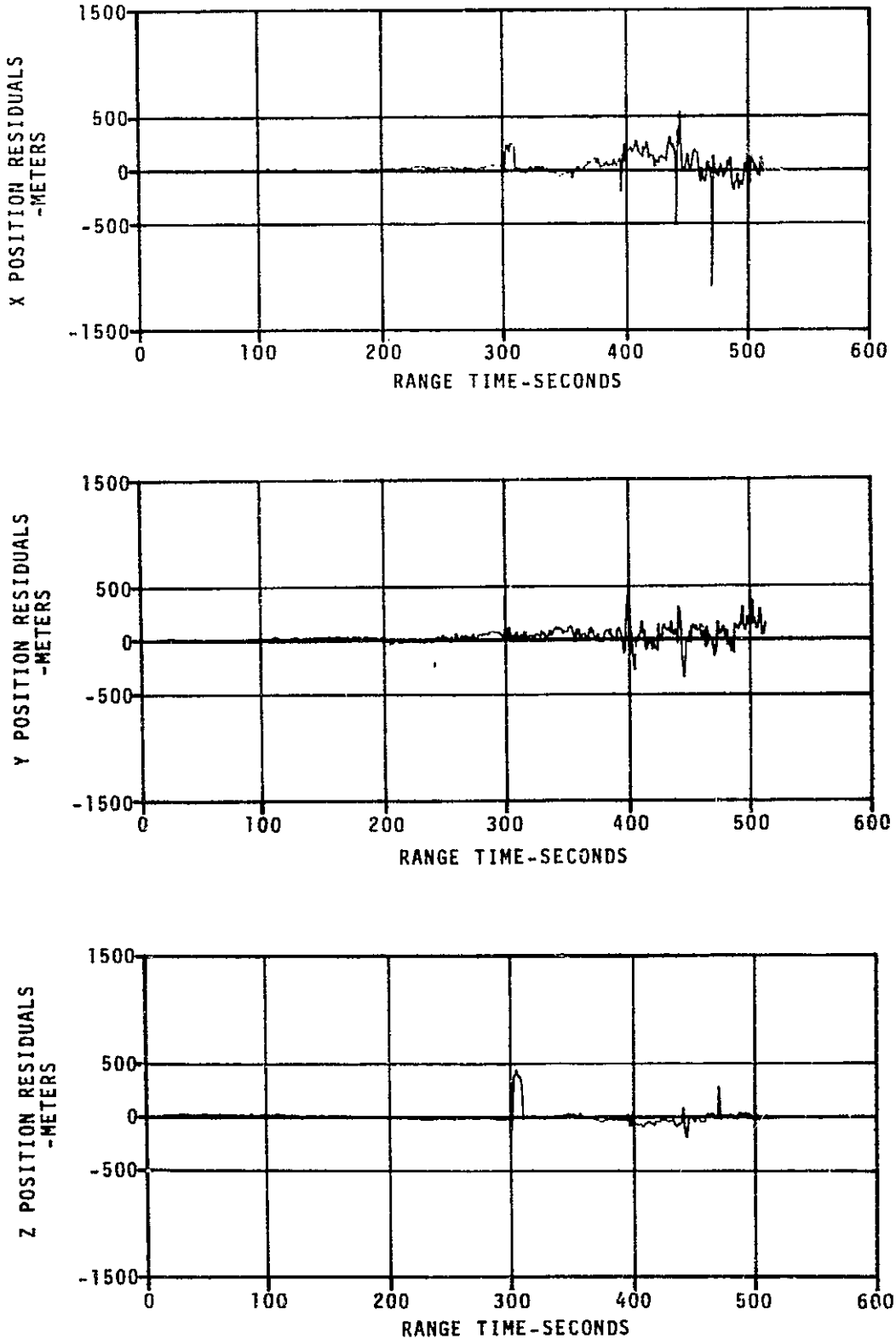


FIGURE 3-25. PACSS10 POSITION DEVIATIONS-ASCENT PHASE (MLAT)

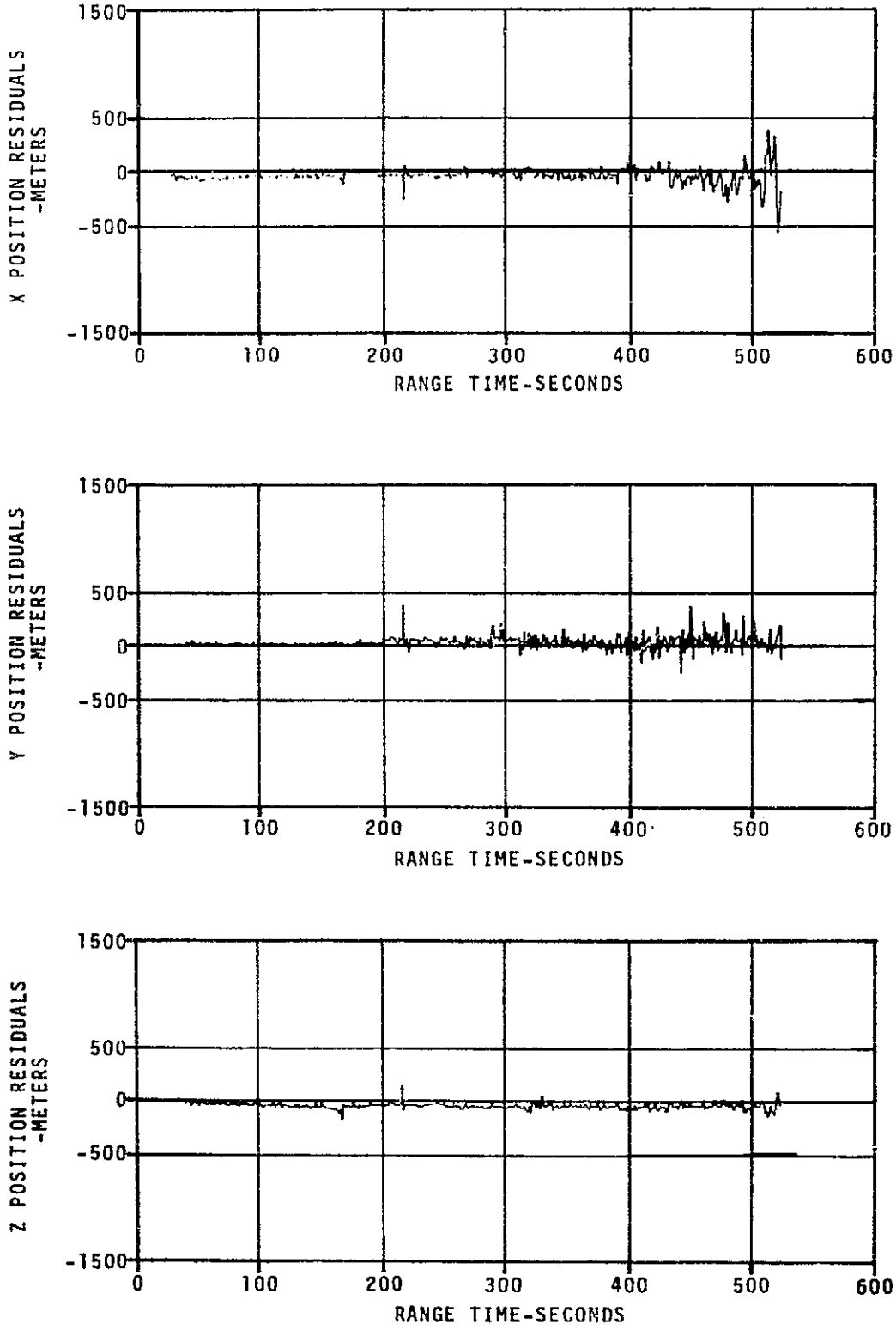


FIGURE 3-26. PACSSIO POSITION DEVIATIONS-ASCENT PHASE (PATQ)

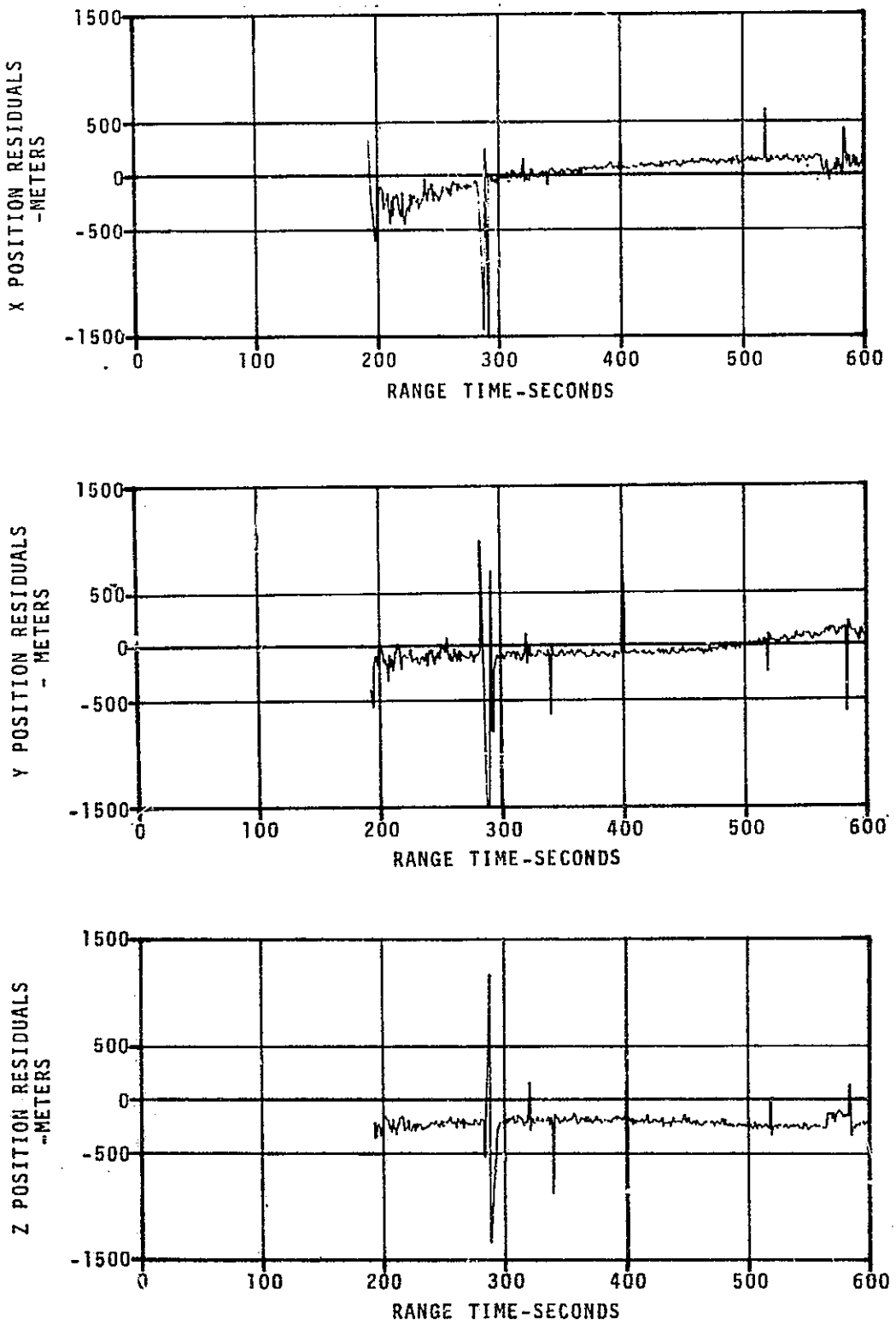


FIGURE 3-27. PACSS10 POSITION DEVIATIONS-ASCENT PHASE (WLPQ)

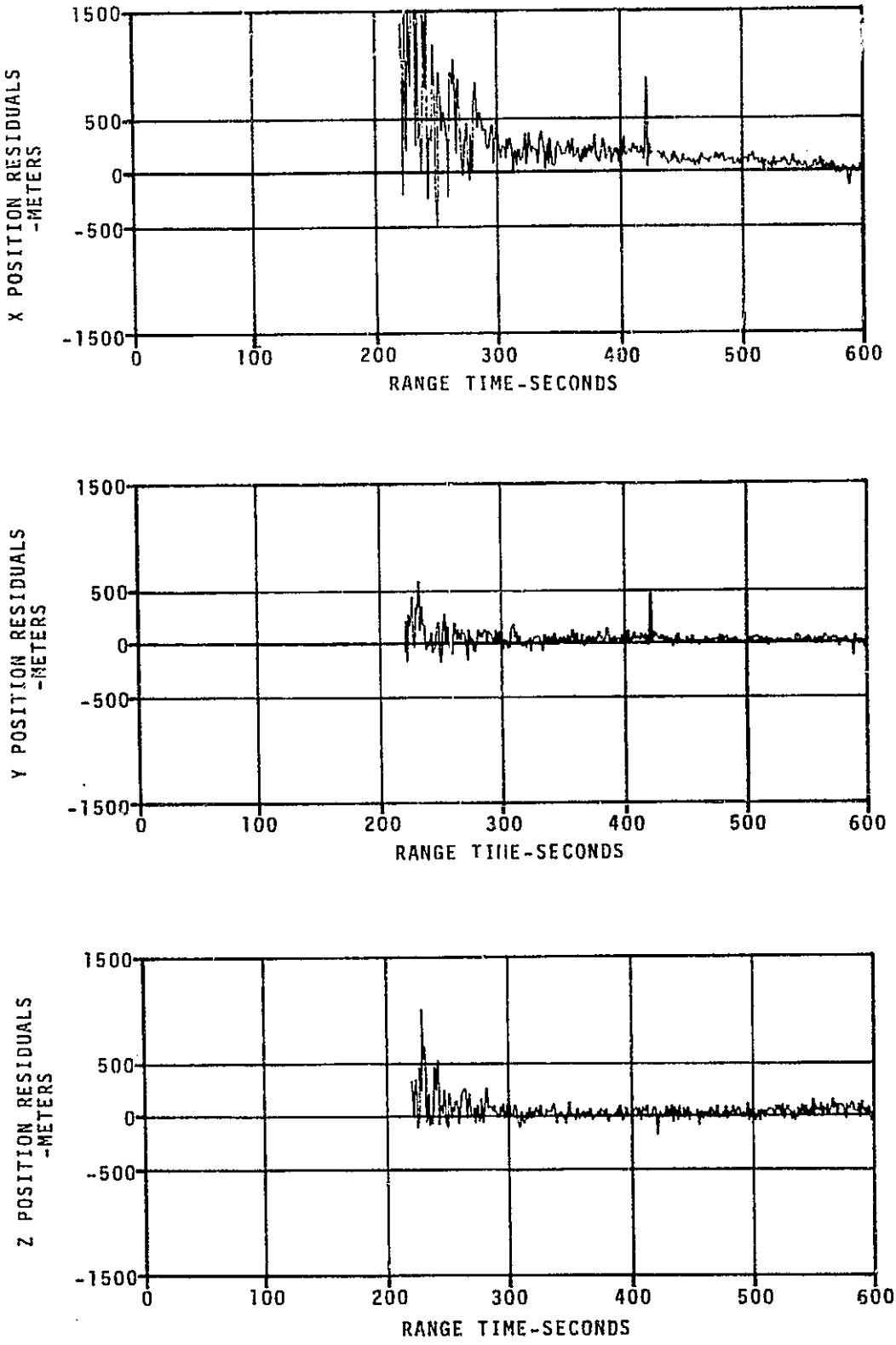


FIGURE 3-28. PACSS10 POSITION DEVIATIONS-ASCENT PHASE (BDAQ)

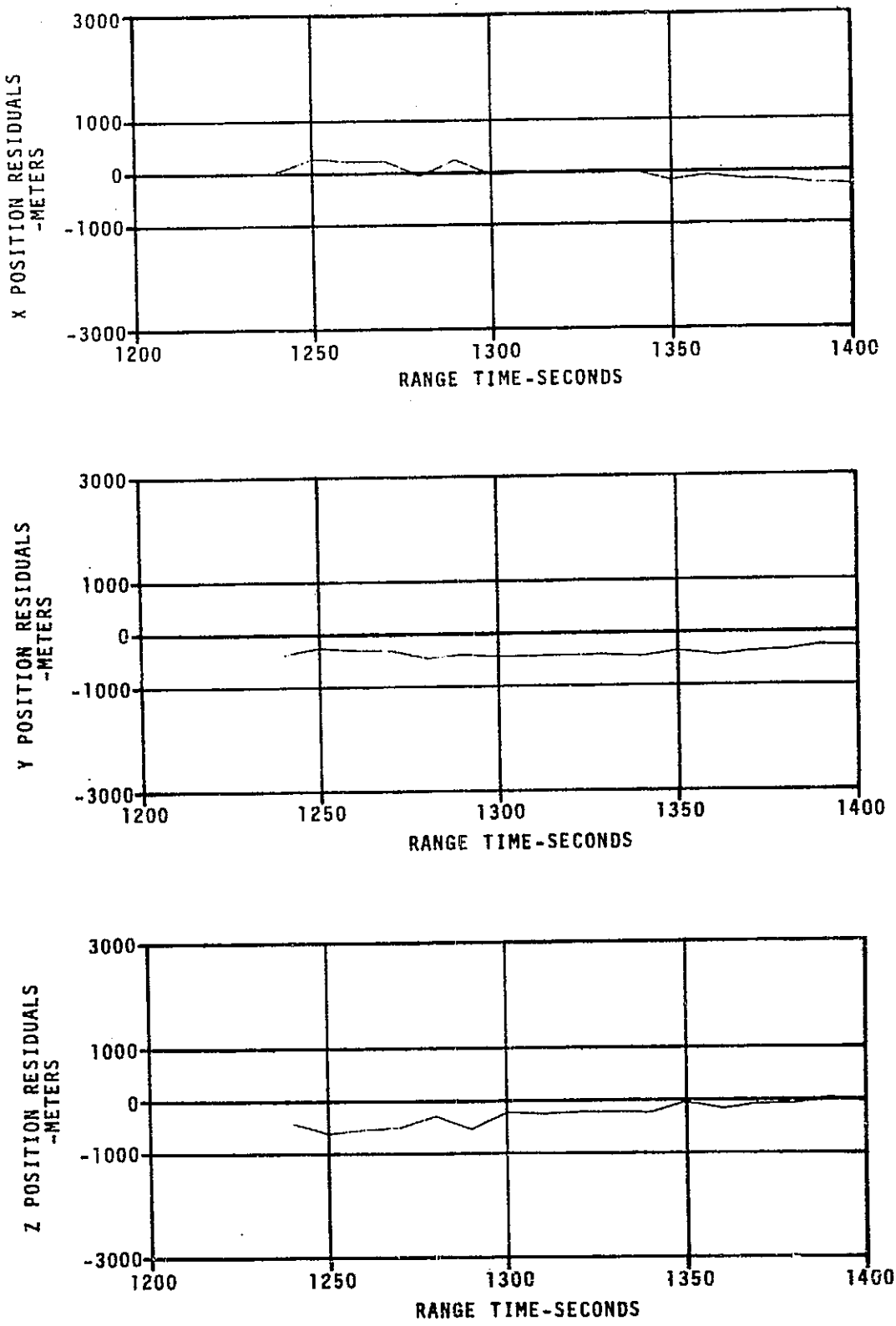


FIGURE 3-29. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 1 (MAD8)

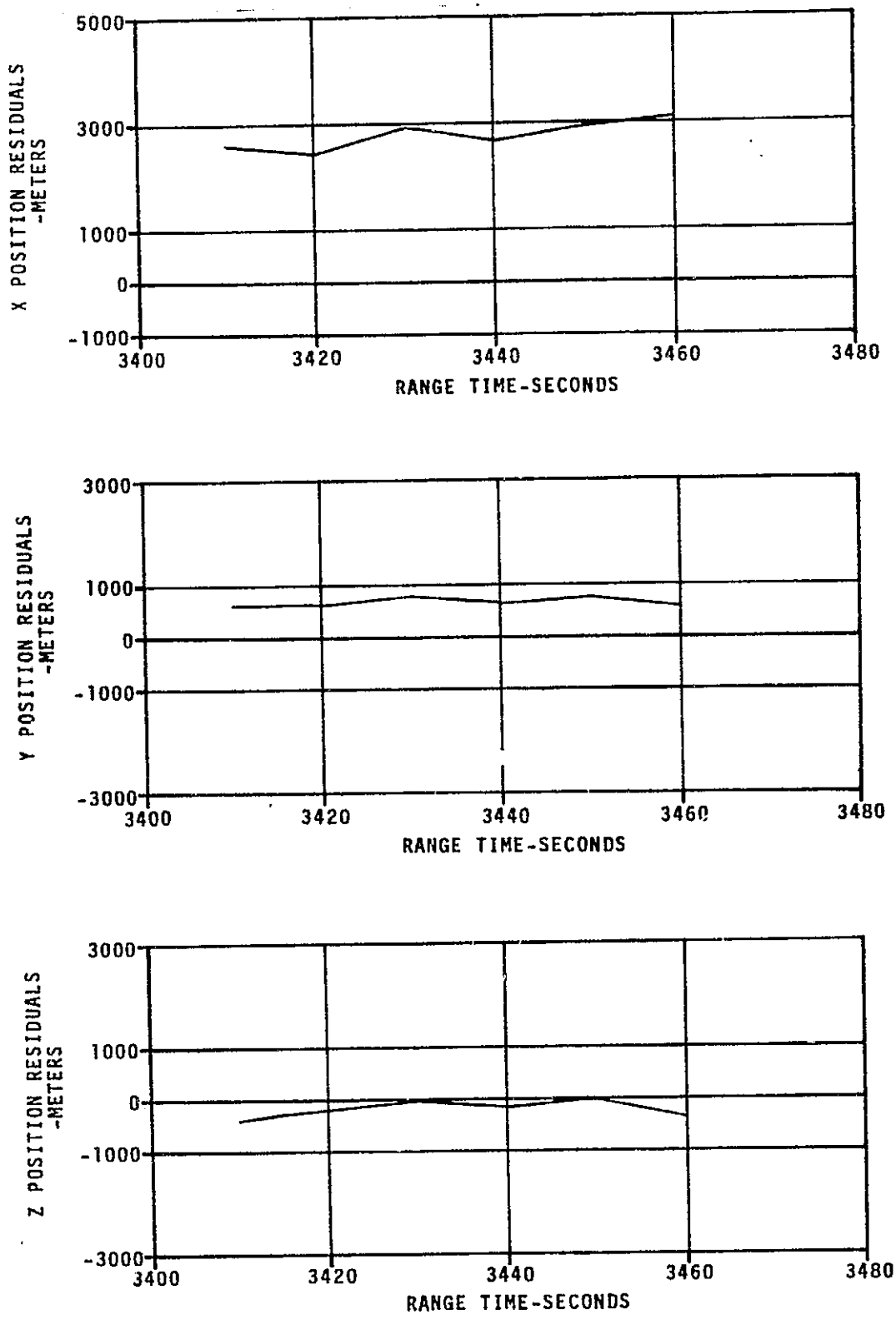


FIGURE 3-30. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 1 (CR03)

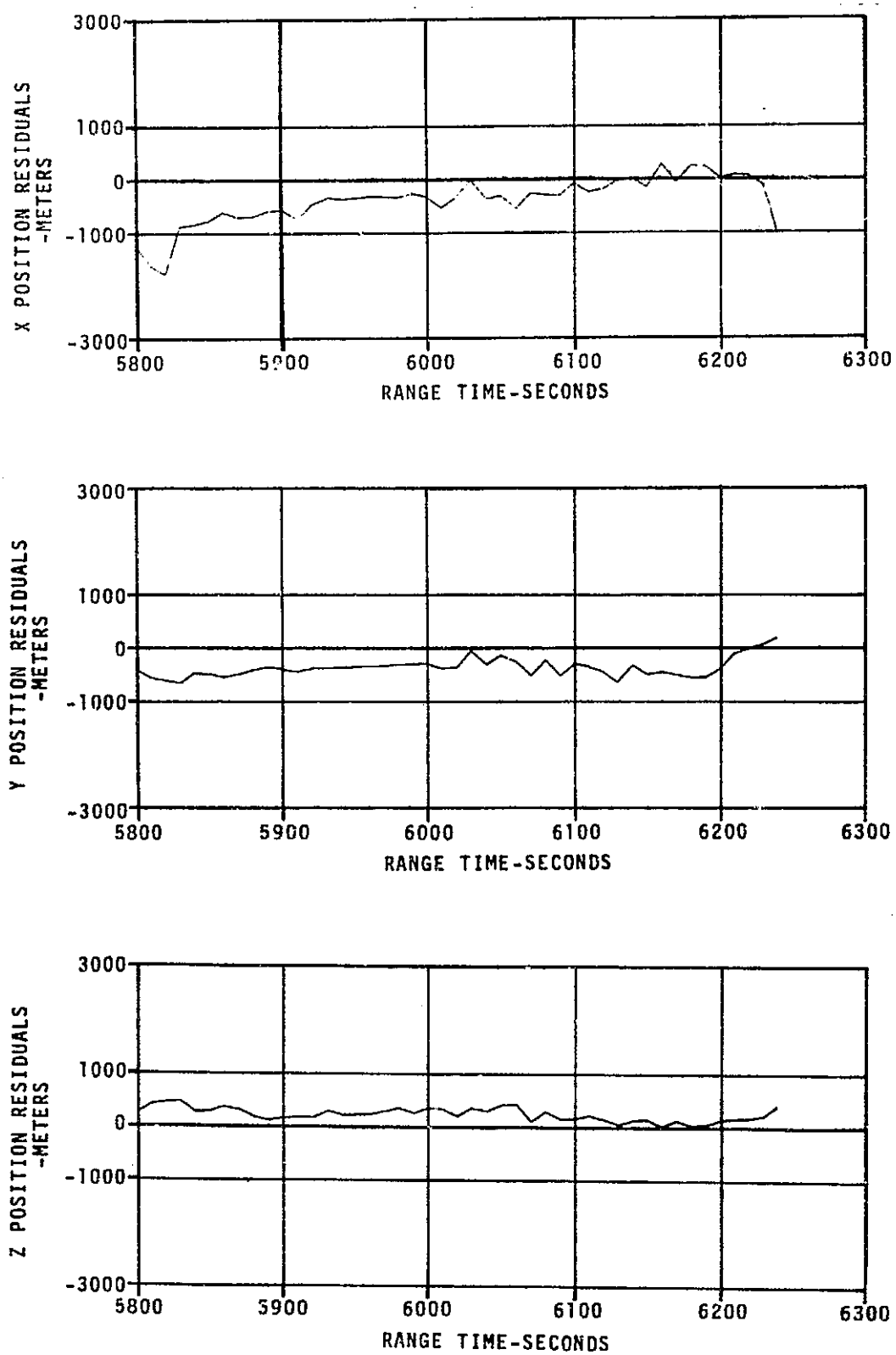
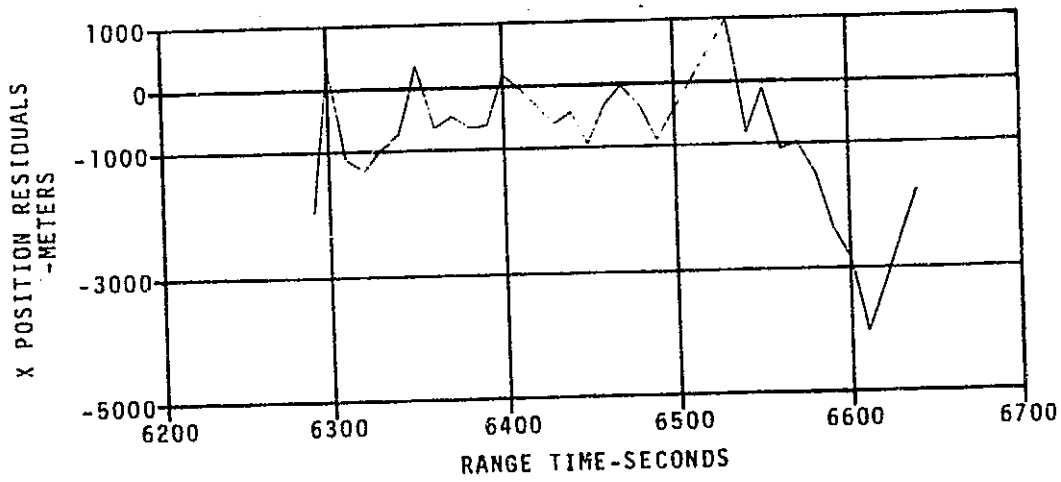
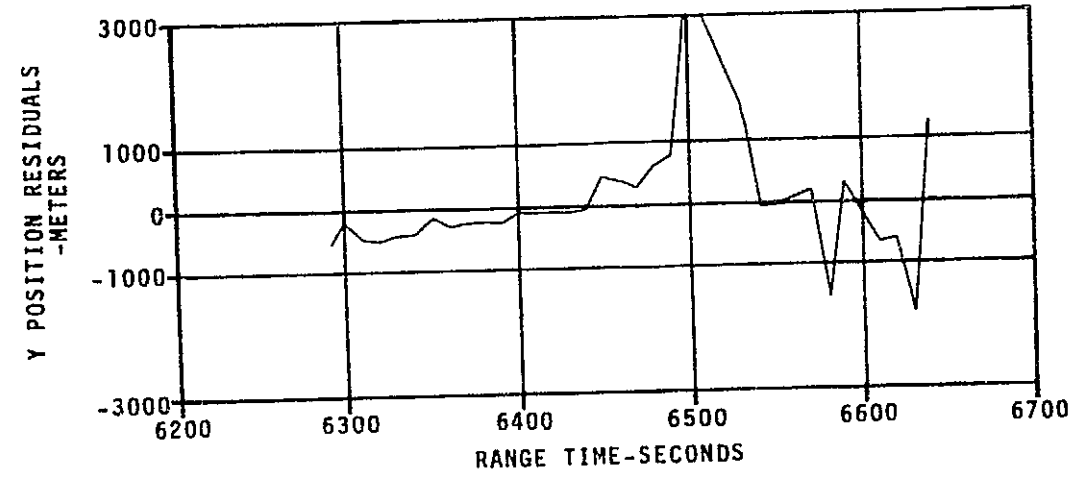


FIGURE 3-31. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 1 (TEX3)





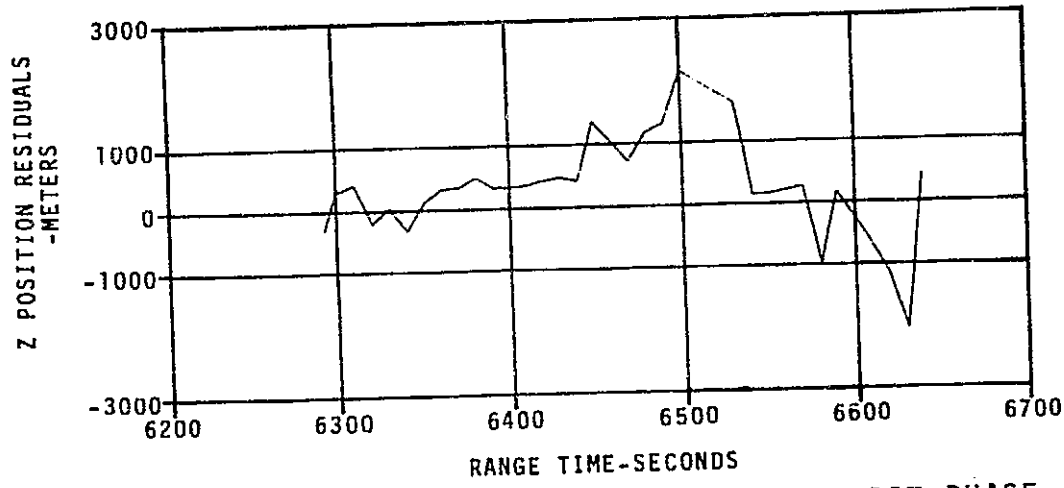


FIGURE 3-32. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 2 (BDA3)

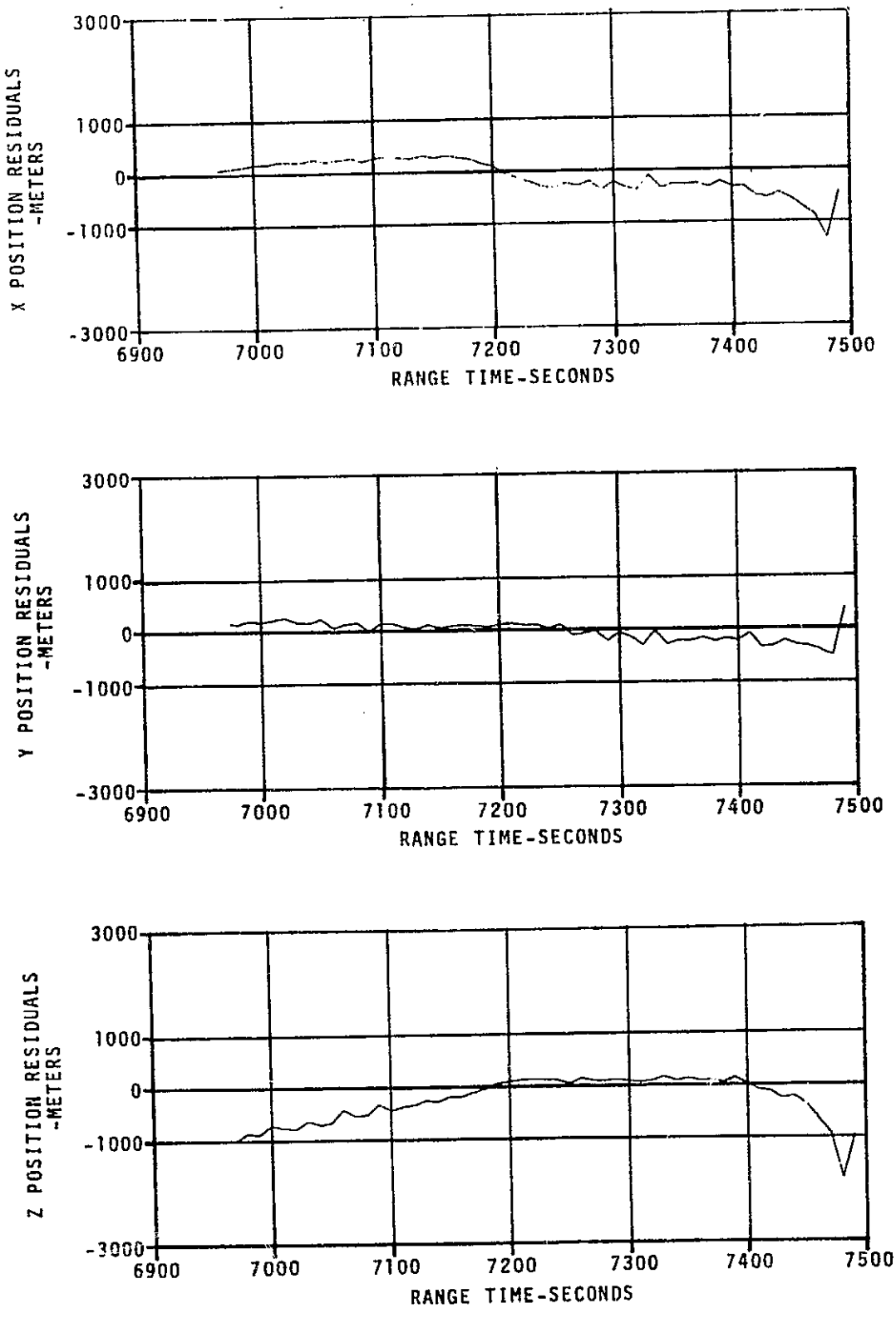


FIGURE 3-33. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 2 (MAD8)

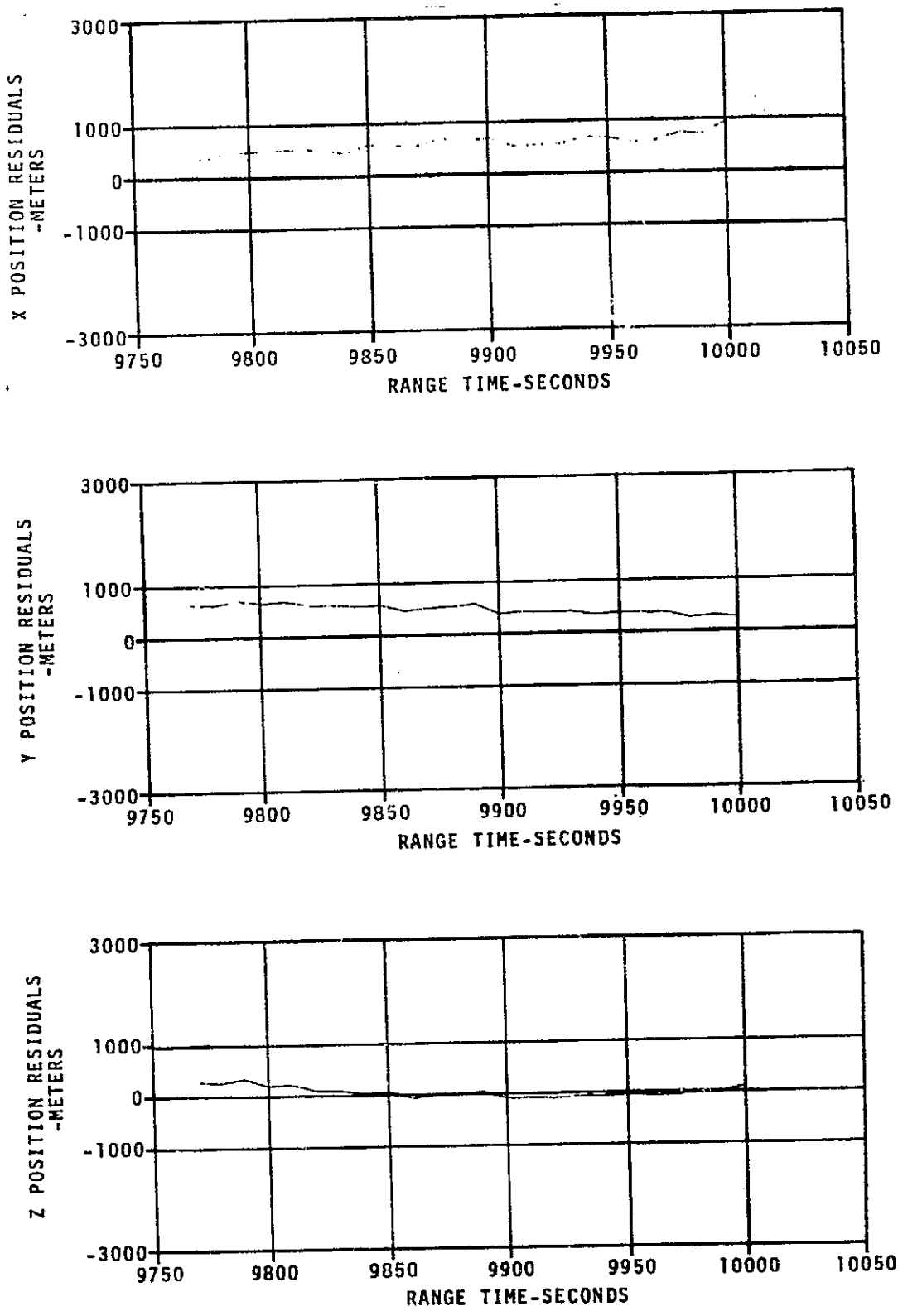


FIGURE 3-34. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 2 (HSK8)

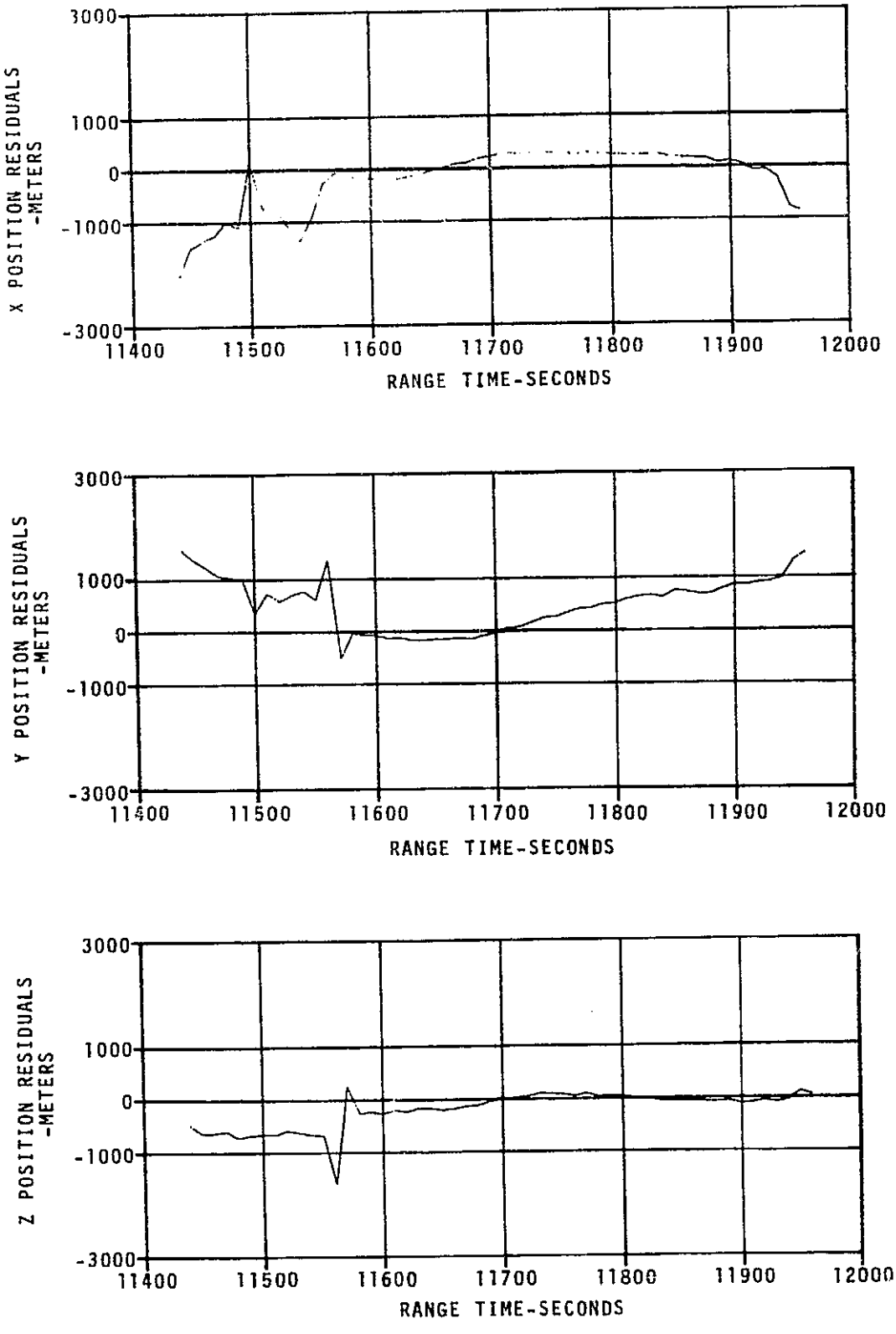


FIGURE 3-35. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 2 (GDS8)

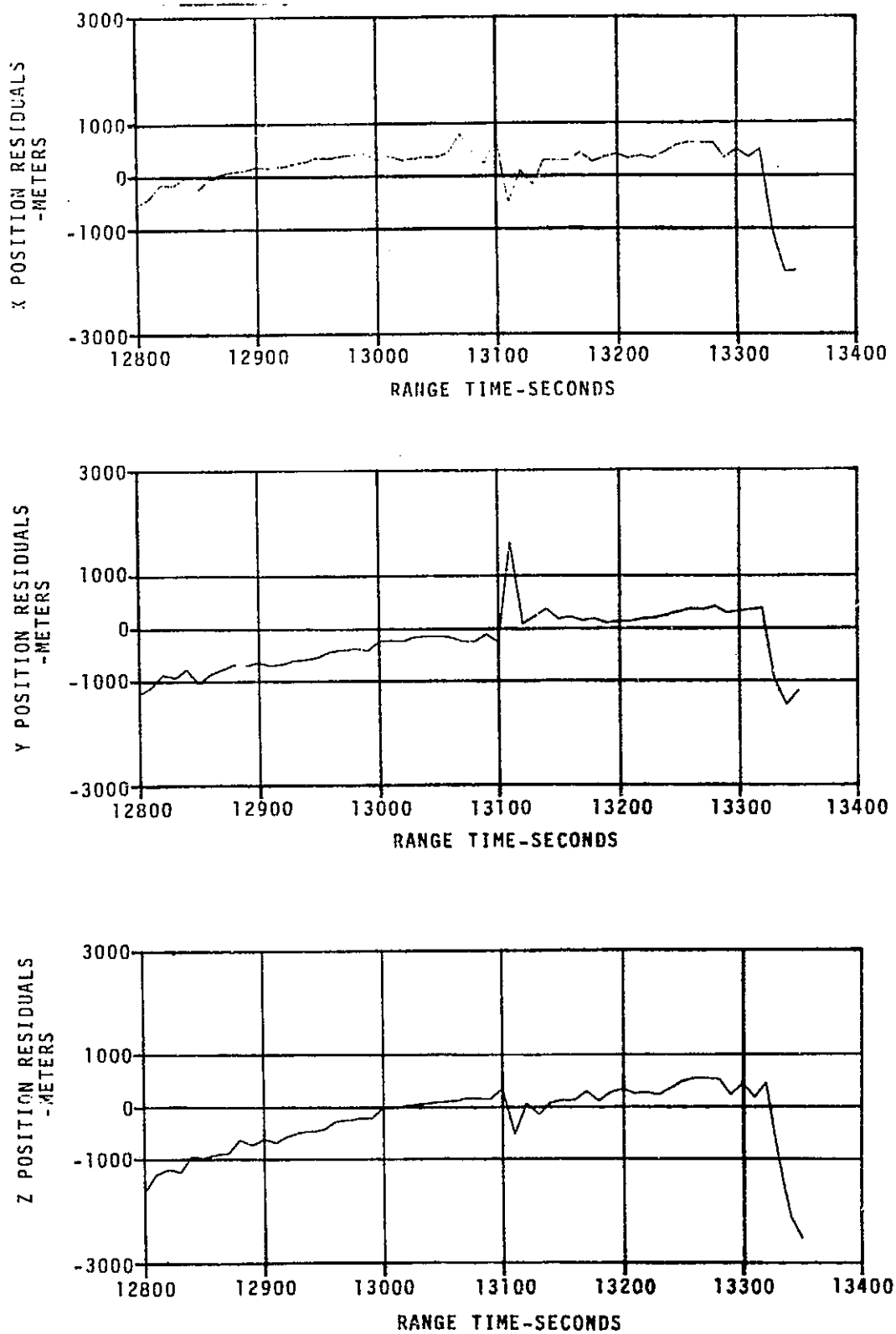


FIGURE 3-36. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 3 (CYI3)

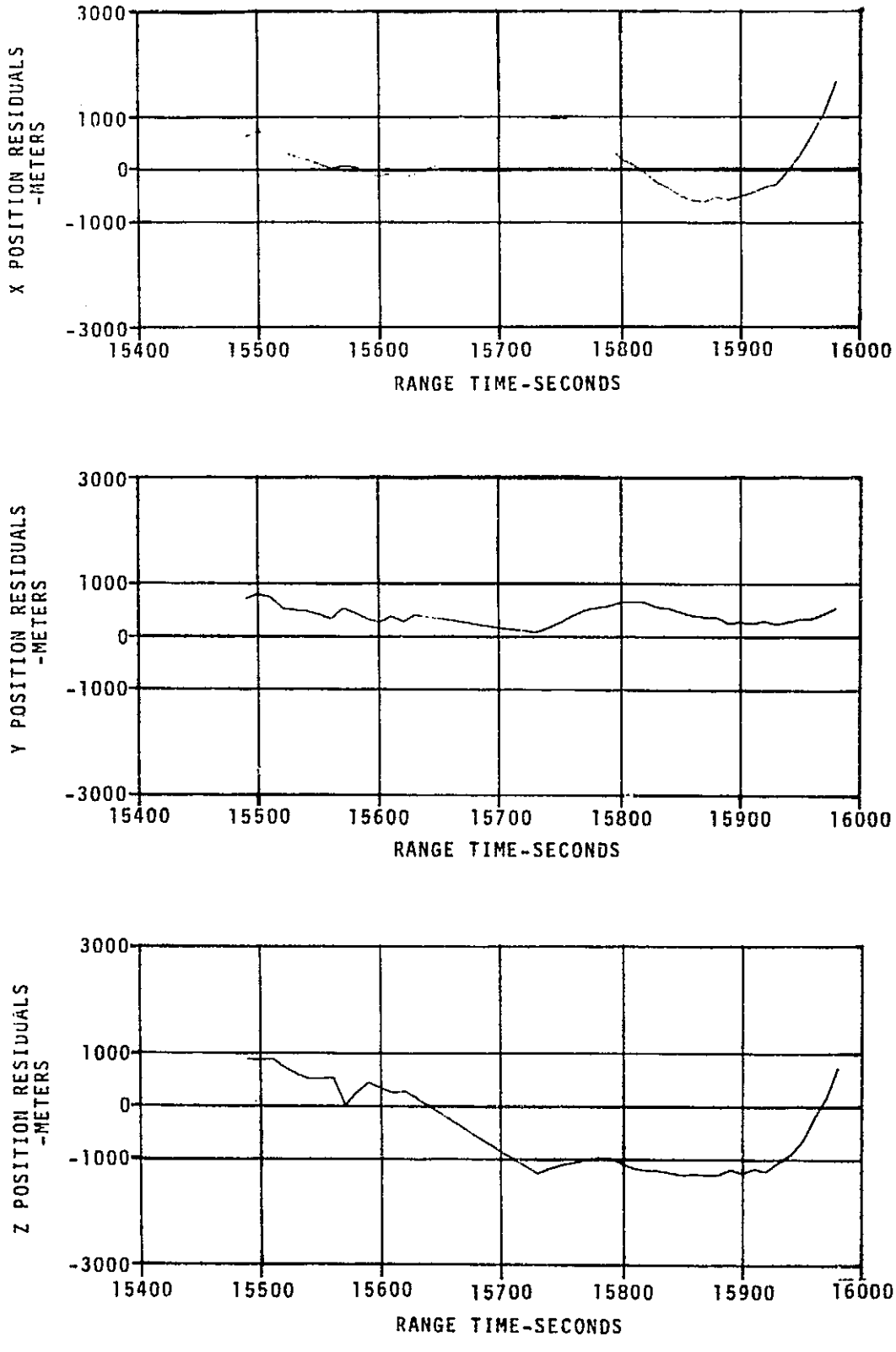


FIGURE 3-37. PACSS10 POSITION DEVIATIONS-ORBIT PHASE -REV. 3 (HSK8)

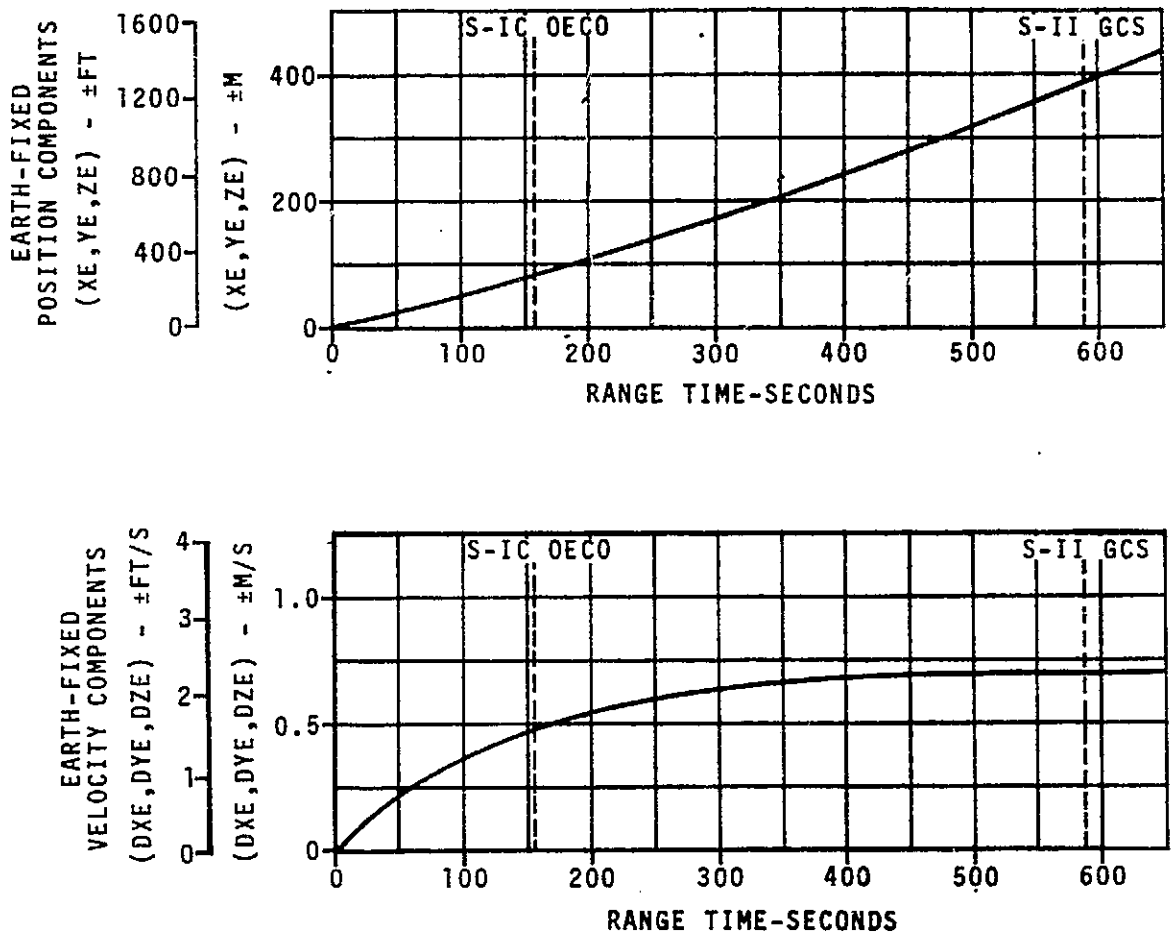


FIGURE 3-38. ASCENT PHASE ESTIMATED TRAJECTORY UNCERTAINTY

TABLE 3-I. TRACKING STATION LOCATIONS

ABBREVIATION	NAME	LATITUDE, N	LONGITUDE, E	HEIGHT (m)
MLAT	Merritt Island C-Band (19.18)	28.42486194	279.33559611	12.0
PATQ	Patrick AFB C-Band (0.18)	28.22655278	279.40070833	15.0
CKYF	Cape Kennedy C-Band (1.16)	28.48176667	279.42348611	14.0
WLPQ	Wallops Island C-Band (4.18)	37.86023056	284.49069167	17.0
BDAQ	Bermuda C-Band (67.18)	32.34796389	295.34625833	19.0
CRO3	Carnarvon USB	-24.90657778	113.72557222	5.0
HSK8	Honeysuckle USB	-35.58345944	148.97781111	1143.0
HAW3	Hawaii USB	22.12630833	200.33483889	1143.0
GDS8	Goldstone USB	35.34159444	243.12640278	921.0
TEX3	Texas USB	27.65375000	262.62137778	-39.0
MIL3	Merritt Island USB	28.50827222	279.30653056	-54.0
BDA3	Bermuda USB	32.35128611	295.34181944	21.0
CYI3	Canary USB	27.76453611	344.36608333	179.0
MAD8	Madrid USB	40.45499167	355.83154722	783.0

TABLE 3-II. OWS ORBIT RANGE RESIDUALS

STATION	RANGE TIME (SEC)	Δ-RANGE (M)
CRO3	3280	-51
	3300	-57
	3320	-56
HSK8	3930	2
TEX3	5700	-74
BDA3	6290	-17
HSK8	9770	75
HAW3	11010	59
GDS8	11440	36
BDA3	12230	8
CYI3	12790	113
HSK8	15490	71
	15730	18
HAW3	16640	53

TABLE 3-III. S-II SPENT STAGE RESIDUAL STATISTICS

S-II SPENT STAGE SECOND ORBIT SOLUTION STATISTICS				
STATION (ORBIT)	OBS	NO. OBS	MEAN	STANDARD DEVIATION
MLAT(2)	AZ	65	-0.002 DEG	0.008 DEG
	EL	65	-0.040 DEG	0.023 DEG
	RA	65	0.1m(0.3 FT)	14.7m (48.2 FT)
BDAQ(2)	AZ	43	-0.009 DEG	0.037 DEG
	EL	0	-	-
	RA	43	0.6m(2.0 FT)	9.5m(31.2 FT)
S-II SPENT STAGE SIXTH ORBIT SOLUTION STATISTICS				
STATION (ORBIT)	OBS	NO. OBS	MEAN	STANDARD DEVIATION
MLAT(4&5/6)	AZ	157	0.002 DEG	0.007 DEG
	EL	146	-0.006 DEG	0.023 DEG
	RA	178	-5.3m(-17.4 FT)	24.3m(79.7m)
CRO(5)	AZ	71	0.005 DEG	0.006 DEG
	EL	64	-0.003 DEG	0.007 DEG
	RA	99	2.8m(9.2 FT)	7.4m(24.3 FT)

APPENDIX A

DEFINITIONS OF TRAJECTORY SYMBOLS AND COORDINATE SYSTEMS

XE, YE, ZE DXE, DYE, DZE DDXE, DDYE, DDZE	Position, velocity, and acceleration components of vehicle Instrument Unit in Earth-Fixed Launch Site Coordinate System. The origin of this system is at the intersection of Fischer Ellipsoid (1960) and the normal to it which passes through the launch site. The X-axis coincides with the ellipsoid normal passing through the site, positive upward. The Z-axis is parallel to the earth-fixed flight azimuth, defined at guidance reference release time, and is positive downrange. The Y-axis completes a right-handed system. This coordinate system is identical to Standard Coordinate System 10 of Project Apollo Coordinate System Standards, abbreviated as PACSS10.
XS, YS, ZS DXS, DYS, DZS DDXS, DDYS, DDZS	Position, velocity, and acceleration components of vehicle Instrument Unit in Launch Vehicle Navigation Coordinate System. The origin of this system is at the center of the earth. The X-axis is parallel to Fischer Ellipsoid normal through the launch site, positive upward. The Z-axis is parallel to the flight azimuth, positive downrange. The Y-axis completes a righ-handed system. The direction of the coordinate axes remains fixed in space at guidance reference release. This coordinate system is identical to Standard Coordinate System 13 of Project Apollo Coordinate System Standards, abbreviated as PACSS13.
GC DIST DEC GD LAT LONG	Position components of vehicle Instrument Unit in Geographic Polar Coordinate System. Position in this system is defined by the geocentric distance (GC DIST), geocentric declination (DEC) geodetic latitude (GD LAT), and longitude (LONG). Geocentric distance is

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APPENDIX A (Continued)

	the distance from the geocenter to vehicle Instrument Unit. Geocentric declination is the angle between the radius vector of the vehicle and the equatorial plane, positive north of the equatorial plane. Geodetic latitude is the angle between the normal to the Fischer Ellipsoid through the subvehicle point and the equatorial plane, positive north of the equatorial plane. Longitude is the angle between the projection of the radius vector into the equatorial plane and the Greenwich meridian, positive east of the Greenwich meridian. This coordinate system is identical to Standard Coordinate System 1 of Project Apollo Coordinate System Standards, abbreviated as PACSS1.
EF VEL VEL-AZ VEL-EL	Earth-fixed velocity of vehicle Instrument Unit in Geographic Polar Coordinate System. Velocity in this system is given in terms of azimuth (VEL-AZ), elevation (VEL-EL) and magnitude of the earth-fixed velocity vector (EF VEL). Azimuth is the angle between the projection of the velocity vector into the local horizontal plane and the north direction in this plane, positive east of north. Elevation is the angle between the velocity vector and the local horizontal plane, positive above the horizontal plane. This coordinate system is identical to Standard Coordinate System 1 of Project Apollo Coordinate System Standards, abbreviated as PACSS1.
SF VEL FLT-PATH HEAD	Space-fixed velocity of vehicle Instrument Unit in Geographic Polar Coordinate System. Velocity in this system is given in terms of heading angle (HEAD), flight path angle (FLT-PATH), and magnitude of the space-fixed velocity vector (SF VEL). Heading angle is the angle between the projection of the velocity vector into the local horizontal

APPENDIX A (Continued)

	plane and the north direction in this plane, positive east of north. Flight path angle is the angle between the velocity vector and the local horizontal plane, positive above the horizontal plane. This coordinate system is identical to Standard Coordinate System 1 of Project Apollo Coordinate System Standards, abbreviated as PACSS1.
ALTITUDE	Perpendicular distance from vehicle Instrument Unit to Fischer Ellipsoid, positive above Fischer Ellipsoid.
RANGE	Surface range, measured along Fischer Ellipsoid from the launch site to the subvehicle point.
TIME	Range time, referenced to nearest integer second before IU umbilical disconnect.

APPENDIX B

TIME HISTORY OF TRAJECTORY PARAMETERS - METRIC UNITS

The postflight trajectory, from guidance reference release to transfer to ATM control, is tabulated in metric units in Tables B-I through B-IV.

Table B-I gives the earth-fixed launch site position, velocity, and acceleration components for the ascent phase of flight.

Table B-II gives the launch vehicle navigation position, velocity, and acceleration components for the ascent phase of flight.

Table B-III gives the geographic polar coordinates for the ascent phase of flight.

Table B-IV gives the geographic polar coordinates for the workshop orbit phase of flight.

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
GUIDANCE REFERENCE RELEASE									
-16.958	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-16.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-15.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-14.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-13.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-12.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-11.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-10.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-9.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-8.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-7.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-6.0	117	0.	0	0.0	0.0	0.0	0.0	0.0	0.0
-5.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-4.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-3.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-2.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
ALL HOLDDOWN ARMS RELEASED									
0.200	117	0	0	0.0	0.0	0.0	0.0	0.0	0.0
LIFTOFF - START OF TIME BASE 1									
0.600	117	0	0	0.7	-0.0	0.0	1.93	-0.02	0.00
1.0	117	0	0	1.5	-0.0	-0.0	2.33	-0.00	-0.00
2.0	120	0	0	4.2	-0.0	-0.0	2.79	0.01	-0.01
3.0	126	0	0	7.0	0.0	-0.0	2.89	0.05	-0.05
4.0	134	0	0	9.9	0.1	-0.1	2.94	0.13	-0.10
5.0	146	0	0	12.9	0.3	-0.2	3.06	0.20	-0.14
6.0	160	1	-1	16.0	0.5	-0.4	3.11	0.21	-0.15
7.0	178	1	-1	19.2	0.7	-0.5	3.22	0.19	-0.10
8.0	198	2	-2	22.5	0.8	-0.6	3.29	0.16	-0.03
9.0	223	3	-2	25.8	1.0	-0.6	3.30	0.12	-0.06
10.0	250	4	-3	29.0	1.1	-0.8	3.29	0.09	-0.21
11.0	281	5	-4	32.4	1.2	-0.8	3.44	0.21	0.09
12.0	315	6	-4	35.9	1.4	-0.7	3.46	0.18	0.10
13.0	352	8	-5	39.3	1.6	-0.6	3.47	0.18	0.19
14.0	393	10	-5	42.9	1.8	-0.4	3.59	0.19	0.16

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
15.0	438	11	-6	46.4	2.0	-0.2	3.57	0.15	0.10
16.0	486	14	-6	50.1	2.1	-0.2	3.70	0.17	0.08
17.0	538	16	-6	53.8	2.3	-0.1	3.81	0.18	0.14
18.0	594	18	-6	57.7	2.5	0.1	3.89	0.18	0.23
19.0	654	21	-6	61.6	2.6	0.4	3.96	0.12	0.36
20.0	717	23	-5	65.6	2.8	0.8	4.02	0.17	0.37
21.0	785	26	-4	69.6	3.0	1.2	4.09	0.17	0.43
22.0	857	29	-3	73.8	3.1	1.6	4.15	0.17	0.49
23.0	932	33	-1	78.0	3.3	2.2	4.23	0.17	0.55
24.0	1012	36	1	82.2	3.5	2.8	4.31	0.17	0.63
25.0	1097	39	5	86.6	3.6	3.4	4.39	0.17	0.72
26.0	1186	43	8	91.0	3.8	4.2	4.47	0.17	0.81
27.0	1279	47	13	95.5	4.0	5.1	4.55	0.16	0.92
28.0	1377	51	18	100.1	4.1	6.0	4.63	0.15	1.03
29.0	1479	55	25	104.8	4.3	7.1	4.71	0.14	1.15
30.0	1586	60	33	109.5	4.4	8.3	4.78	0.13	1.28
31.0	1698	64	42	114.3	4.5	9.7	4.86	0.12	1.40
32.0	1815	69	52	119.2	4.6	11.1	4.94	0.10	1.53
33.0	1937	73	64	124.2	4.7	12.7	5.02	0.09	1.65
34.0	2063	78	78	129.3	4.8	14.4	5.11	0.08	1.78
35.0	2195	83	93	134.4	4.9	16.3	5.20	0.07	1.91
36.0	2332	88	110	139.7	4.9	18.3	5.28	0.06	2.04
37.0	2475	93	130	145.0	5.0	20.4	5.37	0.05	2.17
38.0	2622	98	151	150.4	5.1	22.6	5.45	0.05	2.31
39.0	2775	103	175	155.9	5.1	25.0	5.54	0.05	2.46
40.0	2934	108	201	161.5	5.2	27.5	5.62	0.06	2.60
41.0	3098	113	230	167.1	5.2	30.2	5.70	0.05	2.75
42.0	3268	118	262	172.9	5.3	33.0	5.78	0.05	2.90
43.0	3444	124	296	178.7	5.3	36.0	5.87	0.06	3.06
44.0	3626	129	334	184.6	5.4	39.2	5.96	0.07	3.22
45.0	3813	135	375	190.6	5.5	42.5	6.05	0.08	3.38
46.0	4007	140	419	196.7	5.6	45.9	6.15	0.09	3.54
47.0	4207	146	466	202.9	5.7	49.5	6.24	0.10	3.70
48.0	4413	151	518	209.2	5.8	53.3	6.33	0.12	3.85
49.0	4625	157	573	215.6	5.9	57.2	6.42	0.13	4.01
50.0	4844	163	632	222.0	6.0	61.3	6.51	0.13	4.16
51.0	5069	169	696	228.6	6.2	65.6	6.60	0.13	4.31
52.0	5301	176	764	235.2	6.3	69.9	6.69	0.13	4.47
53.0	5540	182	836	242.0	6.4	74.5	6.79	0.13	4.63
54.0	5785	188	913	248.8	6.5	79.2	6.88	0.12	4.80
55.0	6038	195	994	255.7	6.7	84.1	6.97	0.11	4.98
56.0	6297	202	1081	262.8	6.7	89.1	7.03	0.13	5.14
57.0	6563	208	1173	269.8	6.9	94.4	7.15	0.09	5.38

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
58.0	6837	215	1270	277.0	6.9	99.9	7.18	0.09	5.58
59.0	7117	222	1378	284.2	7.0	105.6	7.25	0.09	5.79
60.0	7405	229	1491	291.5	7.1	111.5	7.24	0.04	6.02
MACH 1									
61.000	7700	237	1596	298.8	7.2	117.6	7.34	0.08	6.26
62.0	8003	244	1715	306.1	7.2	124.0	7.36	0.03	6.44
63.0	8312	251	1844	313.5	7.3	130.5	7.34	0.13	6.61
64.0	8629	258	1977	320.9	7.4	137.1	7.47	0.04	6.66
65.0	8954	266	2118	328.3	7.5	144.1	7.49	0.18	7.27
66.0	9286	273	2266	335.9	7.7	151.4	7.56	0.28	7.36
67.0	9626	281	2421	343.5	7.8	158.9	7.69	-0.01	7.59
68.0	9973	289	2584	351.2	7.9	166.5	7.76	0.17	7.74
69.0	10328	297	2754	359.1	8.0	174.4	7.91	-0.02	8.07
70.0	10691	305	2933	367.0	8.0	182.6	8.06	-0.01	8.20
71.0	11062	313	3119	375.2	8.0	190.8	8.16	-0.05	8.37
72.0	11442	321	3314	383.4	7.9	199.2	8.28	-0.10	8.59
73.0	11829	329	3518	391.7	7.8	208.0	8.38	-0.15	8.84
MAXIMUM DYNAMIC PRESSURE									
73.500	12026	333	3623	395.9	7.7	212.4	8.43	-0.17	8.96
74.0	12225	337	3730	400.1	7.6	216.9	8.48	-0.20	9.10
75.0	12629	344	3952	408.7	7.4	226.2	8.58	-0.26	9.39
76.0	13042	351	4183	417.3	7.1	235.7	8.67	-0.34	9.69
77.0	13464	359	4423	426.0	6.7	245.5	8.75	-0.41	9.99
78.0	13894	365	4674	434.8	6.3	255.7	8.84	-0.49	10.28
79.0	14334	371	4935	443.7	5.7	266.1	8.93	-0.56	10.56
80.0	14782	376	5206	452.7	5.2	276.8	9.03	-0.61	10.84
81.0	15239	381	5488	461.7	4.5	287.8	9.12	-0.64	11.13
82.0	15705	385	5782	470.9	3.9	299.1	9.21	-0.64	11.42
83.0	16181	389	6087	480.2	3.3	310.6	9.30	-0.62	11.72
84.0	16666	392	6403	489.5	2.7	322.5	9.39	-0.58	12.03
85.0	17160	394	6732	498.9	2.1	334.7	9.47	-0.53	12.36
86.0	17664	396	7073	508.4	1.6	347.2	9.55	-0.48	12.70
87.0	18177	398	7426	518.0	1.2	360.1	9.63	-0.42	13.03
88.0	18700	399	7793	527.7	0.8	373.3	9.71	-0.37	13.37
89.0	19232	399	8173	537.5	0.4	386.8	9.80	-0.31	13.69
90.0	19775	399	8567	547.3	0.1	400.7	9.89	-0.27	14.01
91.0	20327	399	8974	557.2	-0.1	414.8	9.98	-0.22	14.33
92.0	20889	399	9396	567.2	-0.3	429.3	10.06	-0.17	14.64
93.0	21461	399	9833	577.3	-0.5	444.1	10.14	-0.13	14.96

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
94.0	22044	398	10285	587.5	-0.6	559.3	10.22	-0.08	15.29
95.0	22636	398	10752	597.8	-0.6	474.7	10.29	-0.03	15.62
96.0	23239	397	11234	608.1	-0.6	490.5	10.36	0.02	15.96
97.0	23853	396	11733	618.5	-0.6	506.6	10.43	0.07	16.29
98.0	24476	396	12248	629.0	-0.5	523.1	10.50	0.10	16.63
99.0	25111	396	12779	639.5	-0.4	539.9	10.57	0.13	16.98
100.0	25755	395	13328	650.1	-0.2	557.1	10.65	0.14	17.32
101.0	26411	395	13893	660.8	-0.1	574.5	10.73	0.15	17.65
102.0	27077	395	14477	671.6	0.1	592.4	10.80	0.15	17.99
103.0	27754	395	15078	682.4	0.2	610.5	10.88	0.14	18.33
104.0	28442	395	15698	693.3	0.3	629.0	10.95	0.14	18.67
105.0	29141	396	16336	704.3	0.5	647.9	11.01	0.13	19.03
106.0	29850	396	16994	715.3	0.6	667.1	11.07	0.12	19.39
107.0	30571	397	17671	726.4	0.7	686.7	11.12	0.11	19.76
108.0	31303	398	18367	737.6	0.8	706.6	11.19	0.09	20.14
109.0	32046	399	19084	748.8	0.9	726.9	11.27	0.06	20.51
110.0	32801	400	19821	760.1	0.9	747.6	11.37	0.03	20.87
111.0	33567	401	20580	771.6	1.0	768.7	11.48	-0.00	21.21
112.0	34344	402	21359	783.1	0.9	790.0	11.62	-0.04	21.55
113.0	35133	402	22160	794.8	0.9	811.7	11.76	-0.06	21.97
114.0	35934	403	22982	806.6	0.8	833.8	11.90	-0.08	22.19
115.0	36746	404	23827	818.6	0.8	856.1	12.05	-0.08	22.52
116.0	37571	405	24695	830.7	0.7	878.8	12.18	-0.09	22.87
117.0	38408	405	25585	842.9	0.6	901.9	12.31	-0.09	23.24
118.0	39257	406	26499	855.3	0.5	925.3	12.43	-0.09	23.64
119.0	40118	406	27436	867.8	0.4	949.2	12.55	-0.10	24.04
120.0	40993	407	28397	880.4	0.3	973.4	12.67	-0.10	24.46
121.0	41879	407	29383	893.1	0.2	998.1	12.79	-0.10	24.88
122.0	42779	407	30394	906.0	0.1	1023.2	12.93	-0.10	25.29
123.0	43691	407	31430	919.0	-0.0	1048.7	13.07	-0.09	25.71
124.0	44617	407	32491	932.2	-0.1	1074.6	13.21	-0.09	26.13
125.0	45556	407	33579	945.4	-0.2	1101.0	13.37	-0.08	26.57
126.0	46508	407	34693	958.9	-0.3	1127.8	13.52	-0.07	27.01
127.0	47474	406	35835	972.5	-0.3	1155.0	13.68	-0.07	27.47
128.0	48453	406	37003	986.3	-0.4	1182.7	13.85	-0.07	27.93
129.0	49446	406	38200	1000.2	-0.5	1210.9	14.03	-0.07	28.41
130.0	50453	405	39425	1014.3	-0.6	1239.6	14.20	-0.07	28.91
131.0	51475	404	40680	1028.6	-0.6	1268.7	14.39	-0.07	29.42
132.0	52511	404	41963	1043.1	-0.7	1298.4	14.57	-0.08	29.94
133.0	53561	403	43277	1057.8	-0.8	1328.6	14.77	-0.08	30.48
134.0	54626	402	44620	1072.6	-0.9	1359.4	14.97	-0.11	31.02
135.0	55706	401	45996	1087.7	-0.9	1390.7	15.16	-0.07	31.56
136.0	56802	400	47402	1102.9	-1.0	1422.5	15.36	-0.07	32.13

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
137.0	57913	399	48841	1118.4	-1.1	1455.0	15.58	-0.10	32.73
138.0	59039	398	50312	1134.1	-1.2	1488.0	15.82	-0.09	33.32
139.0	60181	397	51817	1150.0	-1.3	1521.6	16.05	-0.06	33.92
140.0	61339	396	53356	1166.2	-1.3	1555.8	16.28	-0.08	34.52
S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)									
140.720	62184	395	54487	1178.0	-1.4	1580.8	16.45	-0.07	34.95
141.0	62514	394	54929	1181.9	-1.4	1589.7	11.64	-0.05	28.29
142.0	63703	393	56535	1193.6	-1.4	1618.1	11.70	-0.03	28.52
143.0	64903	391	58167	1205.3	-1.5	1646.8	11.79	-0.02	28.84
144.0	66115	390	59828	1217.2	-1.5	1675.8	11.87	-0.02	29.17
145.0	67338	388	61519	1229.1	-1.5	1705.1	12.00	-0.02	29.54
146.0	68574	387	63239	1241.2	-1.5	1734.8	12.11	0.00	29.89
147.0	69821	385	64989	1253.3	-1.5	1764.9	12.24	0.00	30.29
148.0	71081	384	66769	1265.7	-1.5	1795.5	12.41	0.01	30.84
149.0	72352	382	68580	1278.3	-1.5	1826.6	12.57	0.01	31.34
150.0	73637	381	70422	1290.9	-1.5	1858.2	12.73	0.01	31.89
151.0	74934	379	72297	1303.7	-1.5	1890.3	12.91	-0.03	32.43
152.0	76245	378	74203	1316.7	-1.5	1923.0	13.09	0.06	32.98
153.0	77568	376	76143	1329.8	-1.5	1956.3	13.26	-0.02	33.52
154.0	78904	375	78116	1343.2	-1.5	1990.0	13.44	0.02	34.07
155.0	80254	373	80123	1356.7	-1.5	2024.4	13.62	-0.02	34.61
156.0	81618	372	82164	1370.4	-1.5	2059.3	13.80	0.03	35.15
157.0	82995	370	84241	1384.3	-1.5	2094.7	13.98	-0.07	35.70
158.0	84387	369	86354	1398.4	-1.7	2130.7	14.16	-0.20	36.24
S-IC OUTBOARD ENGINE CUTOFF (ENGINES 1 AND 3)									
158.160	84611	369	86696	1400.7	-1.7	2136.5	14.19	-0.15	36.33
159.0	85788	367	88496	1401.0	-1.7	2148.9	-9.36	0.06	-0.21
S-IC/S-II SEPARATION COMMAND									
159.900	87045	366	90428	1392.6	-1.6	2148.7	-9.40	0.07	-0.20
160.0	87183	366	90642	1391.7	-1.6	2148.7	-9.40	0.07	-0.20
162.0	89951	362	94943	1372.9	-1.5	2148.2	-9.38	0.07	-0.25
164.0	92680	359	99241	1357.5	-1.4	2152.5	-5.72	0.02	5.35
166.0	95384	357	103557	1346.7	-1.3	2164.0	-5.13	0.02	6.17
168.0	98067	354	107898	1336.9	-1.3	2177.2	-4.53	0.03	7.06
170.0	100732	352	112267	1327.9	-1.2	2191.2	-4.40	0.04	7.21
172.0	103379	349	116664	1319.2	-1.1	2205.7	-4.33	0.04	7.29
174.0	106009	347	121090	1310.6	-1.0	2220.4	-4.30	0.04	7.32

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
176.0	108621	345	125545	1302.0	-1.0	2235.0	-4.26	0.05	7.36
178.0	111217	343	130030	1293.5	-0.9	2249.8	-4.22	0.05	7.40
180.0	113795	342	134544	1285.1	-0.8	2264.7	-4.18	0.05	7.44
182.0	116357	340	139089	1276.8	-0.7	2279.6	-4.14	0.05	7.48
184.0	118903	339	143663	1268.6	-0.5	2294.6	-4.10	0.05	7.51
186.0	121432	338	148267	1260.4	-0.4	2309.6	-4.07	0.06	7.54
188.0	123944	337	152901	1252.3	-0.3	2324.7	-4.03	0.06	7.57
190.0	126441	337	157566	1244.3	-0.2	2339.9	-4.00	0.06	7.61
192.0	128921	337	162261	1236.3	-0.1	2355.2	-3.97	0.07	7.64
194.0	131386	337	166987	1228.4	0.1	2370.5	-3.94	0.07	7.68
196.0	133835	337	171743	1220.5	0.2	2385.8	-3.89	0.07	7.70
198.0	136268	337	176530	1212.9	0.4	2401.2	-3.79	0.07	7.69
200.0	138687	338	181348	1205.4	0.5	2416.6	-3.64	0.07	7.64
202.0	141090	339	186196	1198.3	0.7	2431.8	-3.49	0.08	7.59
204.0	143480	341	191075	1191.4	0.8	2446.9	-3.39	0.08	7.57
206.0	145856	343	195984	1184.7	1.0	2462.1	-3.35	0.09	7.60
208.0	148219	345	200923	1178.0	1.2	2477.4	-3.35	0.10	7.67
210.0	150568	348	205893	1171.3	1.4	2492.8	-3.36	0.11	7.73
212.0	152904	351	210894	1164.6	1.6	2508.3	-3.37	0.13	7.80
214.0	155226	354	215927	1157.8	1.9	2524.0	-3.37	0.15	7.86
216.0	157535	358	220990	1151.1	2.2	2539.7	-3.37	0.17	7.92
218.0	159831	363	226086	1144.3	2.6	2555.6	-3.38	0.18	7.98
220.0	162112	369	231213	1137.6	2.9	2571.7	-3.39	0.19	8.05
222.0	164381	375	236372	1130.8	3.3	2587.8	-3.40	0.21	8.12
224.0	166636	382	241564	1124.0	3.8	2604.1	-3.41	0.23	8.18
226.0	168877	390	246789	1117.1	4.3	2620.6	-3.42	0.25	8.25
228.0	171104	399	252047	1110.3	4.8	2637.1	-3.41	0.26	8.31
230.0	173318	409	257337	1103.5	5.3	2653.8	-3.42	0.27	8.38
232.0	175518	420	262662	1096.6	5.8	2670.6	-3.43	0.28	8.44
234.0	177704	432	268020	1089.7	6.4	2687.6	-3.45	0.29	8.51
236.0	179877	446	273412	1082.8	7.0	2704.7	-3.47	0.29	8.58
238.0	182036	460	278839	1075.9	7.6	2721.9	-3.48	0.30	8.66
240.0	184180	476	284300	1068.9	8.2	2739.3	-3.49	0.32	8.73
242.0	186311	493	289796	1061.9	8.9	2756.8	-3.50	0.33	8.80
244.0	188428	512	295327	1054.9	9.5	2774.5	-3.51	0.34	8.86
246.0	190531	531	300894	1047.9	10.2	2792.3	-3.52	0.36	8.93
248.0	192619	553	306497	1040.8	11.0	2810.2	-3.53	0.38	9.00
250.0	194694	575	312135	1033.7	11.8	2828.3	-3.54	0.40	9.07
252.0	196754	600	317810	1026.6	12.6	2846.5	-3.56	0.41	9.14
254.0	198801	626	323521	1019.5	13.4	2864.8	-3.58	0.42	9.22
256.0	200832	653	329269	1012.3	14.2	2883.4	-3.59	0.44	9.29
258.0	202850	682	335055	1005.2	15.1	2902.0	-3.60	0.46	9.36
260.0	204853	714	340878	997.9	16.0	2920.8	-3.61	0.47	9.43

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
262.0	206842	747	346739	990.7	17.0	2939.7	-3.63	0.48	9.51
264.0	208816	782	352637	983.4	18.0	2958.8	-3.64	0.50	9.58
266.0	210775	819	358573	976.1	19.0	2978.1	-3.65	0.51	9.65
268.0	212720	858	364549	968.8	20.0	2997.4	-3.67	0.54	9.73
270.0	214651	899	370563	961.5	21.1	3017.0	-3.69	0.56	9.82
272.0	216566	942	376617	954.1	22.3	3036.7	-3.71	0.58	9.90
274.0	218467	988	382710	946.6	23.4	3056.6	-3.73	0.59	9.97
276.0	220353	1036	388843	939.1	24.6	3076.6	-3.75	0.61	10.05
278.0	222223	1087	395017	931.6	25.9	3096.8	-3.76	0.63	10.13
280.0	224079	1140	401231	924.1	27.2	3117.1	-3.78	0.65	10.22
282.0	225920	1195	407485	916.5	28.5	3137.6	-3.80	0.67	10.29
284.0	227745	1254	413781	908.9	29.8	3158.3	-3.83	0.69	10.37
286.0	229555	1315	420119	901.2	31.2	3179.1	-3.85	0.71	10.46
288.0	231350	1379	426498	893.5	32.7	3200.1	-3.87	0.73	10.54
290.0	233129	1445	432919	885.7	34.2	3221.3	-3.90	0.75	10.63
292.0	234892	1515	439383	877.9	35.7	3242.6	-3.92	0.77	10.71
294.0	236640	1588	445890	870.0	37.2	3264.1	-3.94	0.79	10.79
296.0	238373	1664	452440	862.1	38.8	3285.8	-3.97	0.81	10.88
298.0	240089	1743	459033	854.1	40.5	3307.6	-4.00	0.83	10.97
300.0	241789	1826	465670	846.1	42.1	3329.7	-4.02	0.85	11.05
302.0	243473	1912	472352	838.1	43.9	3351.9	-4.05	0.87	11.14
304.0	245141	2002	479078	829.9	45.6	3374.2	-4.08	0.90	11.23
306.0	246793	2095	485849	821.7	47.5	3396.8	-4.11	0.92	11.32
308.0	248428	2191	492665	813.5	49.3	3419.5	-4.14	0.94	11.42
310.0	250047	2292	499527	805.2	51.2	3442.5	-4.17	0.96	11.51
312.0	251649	2396	506435	796.8	53.2	3465.6	-4.21	0.98	11.61
314.0	253234	2505	513390	788.4	55.1	3488.0	-4.24	1.00	11.70
S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)									
314.050	253273	2507	513564	788.1	55.2	3488.5	-4.24	1.00	11.70
316.0	254801	2616	520386	778.3	56.9	3508.0	-5.16	0.85	9.27
318.0	256347	2732	527421	768.0	58.6	3526.6	-5.20	0.84	9.34
320.0	257873	2851	534492	757.5	60.3	3545.3	-5.24	0.84	9.40
322.0	259377	2973	541602	747.0	62.0	3564.1	-5.27	0.89	9.46
324.0	260861	3099	548749	736.4	63.8	3583.1	-5.31	0.92	9.52
326.0	262323	3228	555934	725.8	65.7	3602.2	-5.35	0.95	9.58
328.0	263764	3362	563158	715.1	67.6	3621.4	-5.39	0.96	9.64
330.0	265184	3499	570420	704.3	69.5	3640.7	-5.42	0.98	9.71
332.0	266581	3640	577721	693.4	71.5	3660.2	-5.46	0.99	9.77
334.0	267957	3785	585061	682.5	73.5	3679.8	-5.49	1.01	9.84
336.0	269311	3934	592440	671.4	75.6	3699.6	-5.53	1.04	9.90
338.0	270643	4087	599859	660.3	77.6	3719.4	-5.57	1.05	9.97

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
340.0	271952	4244	607318	649.1	79.8	3739.4	-5.62	1.08	10.03
342.0	273239	4406	614817	637.9	82.0	3759.6	-5.67	1.10	10.10
344.0	274504	4572	622356	626.5	84.2	3779.8	-5.72	1.13	10.17
346.0	275745	4743	629936	615.0	86.5	3800.3	-5.77	1.15	10.25
348.0	276964	4918	637557	603.4	88.8	3820.8	-5.82	1.17	10.31
350.0	278159	5098	645220	591.7	91.1	3841.5	-5.86	1.18	10.38
352.0	279330	5283	652923	580.0	93.5	3862.4	-5.90	1.21	10.45
354.0	280478	5472	660669	568.1	95.9	3883.3	-5.95	1.24	10.52
356.0	281603	5666	668457	556.2	98.5	3904.4	-5.99	1.27	10.59
358.0	282703	5866	676287	544.1	101.0	3925.7	-6.04	1.30	10.65
360.0	283779	6071	684160	532.0	103.6	3947.0	-6.08	1.32	10.73
362.0	284831	6281	692075	519.8	106.3	3968.6	-6.13	1.33	10.80
364.0	285858	6496	700034	507.5	109.0	3990.3	-6.19	1.34	10.88
366.0	286861	6716	708036	495.1	111.6	4012.1	-6.24	1.36	10.95
368.0	287838	6942	716083	482.5	114.4	4034.1	-6.29	1.37	11.02
370.0	288791	7174	724173	469.9	117.1	4056.2	-6.34	1.40	11.10
372.0	289718	7411	732307	457.2	120.0	4078.5	-6.40	1.43	11.17
374.0	290619	7654	740487	444.3	122.9	4100.9	-6.46	1.46	11.24
376.0	291495	7902	748711	431.3	125.8	4123.4	-6.51	1.48	11.32
378.0	292345	8157	756980	418.3	128.8	4146.1	-6.56	1.49	11.40
380.0	293168	8418	765296	405.1	131.8	4169.0	-6.61	1.51	11.48
382.0	293965	8684	773657	391.8	134.8	4192.0	-6.68	1.53	11.55
384.0	294735	8957	782064	378.4	137.9	4215.2	-6.74	1.55	11.63
386.0	295478	9236	790518	364.8	141.0	4238.5	-6.81	1.57	11.70
388.0	296194	9521	799018	351.1	144.2	4262.0	-6.87	1.60	11.78
390.0	296883	9812	807566	337.4	147.4	4285.7	-6.93	1.63	11.86
392.0	297544	10110	816161	323.4	150.7	4309.5	-6.98	1.66	11.94
394.0	298177	10415	824804	309.4	154.0	4333.4	-7.04	1.69	12.02
396.0	298781	10727	833495	295.3	157.4	4357.5	-7.11	1.72	12.10
398.0	299358	11045	842234	281.0	160.9	4381.8	-7.18	1.72	12.19
400.0	299905	11370	851022	266.5	164.4	4406.3	-7.25	1.76	12.27
402.0	300424	11703	859859	252.0	167.9	4430.9	-7.33	1.79	12.36
404.0	300913	12042	868745	237.2	171.4	4455.4	-7.49	1.71	10.67
406.0	301372	12388	877678	222.2	174.7	4476.8	-7.58	1.59	10.68
408.0	301802	12741	886653	206.9	177.9	4498.1	-7.68	1.63	10.70
410.0	302200	13100	895670	191.5	181.2	4519.6	-7.78	1.64	10.73
412.0	302567	13465	904731	175.8	184.5	4541.0	-7.85	1.66	10.76
414.0	302903	13838	913835	160.1	187.8	4562.7	-7.91	1.68	10.81
416.0	303207	14217	922982	144.2	191.2	4584.4	-7.93	1.70	10.86
418.0	303480	14602	932173	128.3	194.6	4606.1	-7.96	1.72	10.92
420.0	303721	14995	941407	112.3	198.1	4628.0	-8.03	1.74	10.97
422.0	303929	15395	950685	96.2	201.6	4650.0	-8.14	1.77	11.03
424.0	304105	15802	960007	79.8	205.2	4672.1	-8.26	1.81	11.08

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
426.0	304248	16215	969373	63.2	208.8	4694.4	-8.35	1.84	11.15
428.0	304358	16637	978784	46.4	212.5	4716.7	-8.39	1.86	11.21
430.0	304434	17066	988240	29.6	216.3	4739.2	-8.41	1.87	11.27
432.0	304476	17502	997741	12.8	220.0	4761.8	-8.43	1.88	11.33
434.0	304485	17946	1007288	-4.2	223.8	4784.6	-8.48	1.89	11.40
436.0	304459	18397	1016880	-21.2	227.6	4807.4	-8.55	1.91	11.48
438.0	304400	18856	1026518	-38.4	231.4	4830.5	-8.62	1.93	11.54
440.0	304306	19323	1036202	-55.7	235.3	4853.6	-8.69	1.94	11.59
442.0	304177	19797	1045932	-73.1	239.2	4876.8	-8.75	1.97	11.66
444.0	304013	20279	1055709	-90.7	243.1	4900.2	-8.81	1.99	11.72
446.0	303814	20770	1065533	-108.4	247.2	4923.7	-8.89	2.03	11.79
448.0	303580	21269	1075404	-126.3	251.3	4947.4	-8.98	2.06	11.85
450.0	303309	21775	1085323	-144.3	255.4	4971.1	-9.08	2.09	11.92
452.0	303002	22290	1095289	-162.6	259.6	4995.0	-9.18	2.11	11.99
454.0	302659	22813	1105303	-181.0	263.9	5019.1	-9.28	2.13	12.05
456.0	302278	23345	1115365	-199.7	268.1	5043.3	-9.38	2.16	12.11
458.0	301860	23886	1125476	-218.5	272.5	5067.6	-9.48	2.19	12.18
460.0	301404	24435	1135635	-237.6	276.9	5092.0	-9.59	2.22	12.26
462.0	300910	24994	1145844	-256.9	281.4	5116.6	-9.68	2.24	12.33
464.0	300376	25561	1156102	-276.3	285.9	5141.3	-9.78	2.26	12.39
466.0	299804	26137	1166409	-296.0	290.4	5166.1	-9.88	2.30	12.46
468.0	299192	26723	1176767	-315.8	295.1	5191.1	-9.99	2.33	12.53
470.0	298541	27318	1187174	-335.9	299.8	5216.3	-10.08	2.36	12.60
472.0	297849	27922	1197632	-356.2	304.5	5241.5	-10.18	2.39	12.67
474.0	297116	28536	1208140	-376.6	309.3	5266.9	-10.29	2.43	12.74
476.0	296342	29159	1218700	-397.3	314.2	5292.5	-10.40	2.46	12.81
478.0	295527	29793	1229310	-418.2	319.2	5318.2	-10.51	2.49	12.88
480.0	294669	30436	1239972	-439.3	324.2	5344.0	-10.61	2.52	12.95
482.0	293769	31089	1250686	-460.7	329.2	5370.0	-10.72	2.55	13.02
484.0	292826	31753	1261452	-482.2	334.4	5396.1	-10.83	2.58	13.08
486.0	291840	32427	1272271	-504.0	339.5	5422.3	-10.95	2.61	13.16
488.0	290810	33111	1283142	-526.0	344.8	5448.7	-11.07	2.64	13.24
490.0	289736	33806	1294066	-548.3	350.1	5475.3	-11.20	2.67	13.32
492.0	288617	34512	1305043	-570.8	355.5	5502.0	-11.33	2.71	13.38
494.0	287452	35228	1316074	-593.6	360.9	5528.8	-11.46	2.74	13.45
496.0	286242	35955	1327159	-616.6	366.4	5555.8	-11.58	2.78	13.52
498.0	284985	36694	1338297	-639.9	372.0	5582.9	-11.69	2.80	13.60
500.0	283682	37443	1349490	-663.4	377.7	5610.2	-11.82	2.83	13.68
502.0	282332	38204	1360738	-687.2	383.4	5637.7	-11.94	2.87	13.76
504.0	280933	38977	1372041	-711.2	389.1	5665.3	-12.07	2.91	13.83
506.0	279487	39761	1383399	-735.4	395.0	5693.0	-12.20	2.95	13.91
508.0	277991	40557	1394813	-760.0	400.9	5720.9	-12.34	2.98	13.99
510.0	276447	41365	1406283	-784.8	406.9	5749.0	-12.47	3.01	14.07

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
512.0	274852	42184	1417809	-809.9	413.0	5777.2	-12.61	3.04	14.15
514.0	273207	43016	1429392	-835.2	419.1	5805.6	-12.74	3.08	14.23
516.0	271511	43861	1441032	-860.9	425.3	5834.1	-12.89	3.11	14.32
518.0	269763	44718	1452728	-886.8	431.5	5862.8	-13.04	3.15	14.39
520.0	267964	45587	1464483	-913.0	437.9	5891.7	-13.19	3.19	14.47
522.0	266111	46469	1476295	-939.6	444.3	5920.7	-13.34	3.23	14.55
524.0	264205	47364	1488166	-966.4	450.8	5949.9	-13.49	3.26	14.63
526.0	262245	48272	1500095	-993.5	457.3	5979.2	-13.64	3.29	14.72
528.0	260231	49194	1512083	-1021.0	463.9	6008.8	-13.80	3.33	14.81
530.0	258161	50128	1524130	-1048.7	470.6	6038.5	-13.97	3.37	14.90
532.0	256036	51076	1536237	-1076.8	477.4	6068.4	-14.13	3.42	14.98
534.0	253854	52038	1548404	-1105.3	484.3	6098.4	-14.28	3.47	15.06
536.0	251614	53013	1560631	-1134.0	491.3	6128.6	-14.45	3.51	15.15
538.0	249317	54003	1572918	-1163.1	498.3	6159.0	-14.62	3.55	15.24
540.0	246962	55007	1585267	-1192.5	505.5	6189.6	-14.80	3.59	15.33
542.0	244547	56025	1597677	-1222.3	512.7	6220.3	-14.98	3.63	15.43
544.0	242073	57058	1610148	-1252.4	520.0	6251.3	-15.16	3.68	15.52
546.0	239537	58105	1622682	-1282.9	527.4	6282.4	-15.33	3.72	15.62
548.0	236941	59168	1635278	-1313.7	534.9	6313.8	-15.50	3.77	15.72
550.0	234282	60245	1647937	-1344.9	542.5	6345.3	-15.68	3.81	15.82
552.0	231561	61338	1660660	-1376.4	550.2	6377.0	-15.87	3.86	15.91
554.0	228776	62446	1673446	-1408.4	557.9	6409.0	-16.06	3.91	16.01
556.0	225927	63569	1686296	-1440.7	565.8	6441.1	-16.26	3.96	16.10
558.0	223013	64709	1699210	-1473.4	573.8	6473.4	-16.45	4.02	16.20
560.0	220034	65864	1712189	-1506.5	581.9	6505.9	-16.65	4.06	16.31
562.0	216987	67036	1725234	-1540.0	590.0	6538.6	-16.86	4.11	16.42
564.0	213873	68225	1738344	-1573.9	598.3	6571.6	-17.07	4.16	16.53
566.0	210691	69430	1751520	-1608.3	606.7	6604.7	-17.30	4.21	16.62
568.0	207440	70651	1764763	-1643.2	615.1	6638.0	-17.60	4.26	16.68
570.0	204118	71890	1778072	-1678.8	623.7	6671.4	-17.99	4.32	16.70
572.0	200724	73146	1791449	-1715.2	632.4	6704.9	-18.36	4.37	16.74
574.0	197257	74420	1804892	-1752.1	641.2	6738.4	-18.60	4.42	16.84
576.0	193715	75711	1818402	-1789.4	650.1	6772.3	-18.72	4.47	17.03
578.0	190099	77021	1831981	-1827.0	659.1	6806.6	-18.82	4.52	17.28
580.0	186407	78348	1845629	-1864.8	668.2	6841.3	-18.93	4.57	17.47
582.0	182640	79693	1859347	-1902.7	677.3	6876.4	-18.99	4.60	17.65
584.0	178796	81057	1873135	-1940.7	686.6	6911.9	-19.05	4.64	17.84
586.0	174877	82440	1886995	-1978.9	695.9	6947.8	-19.11	4.68	18.02
588.0	170881	83841	1900927	-2017.2	705.3	6984.0	-19.17	4.73	18.21
	S-II GUIDANCE CUTOFF SIGNAL								
588.960	168936	84520	1907640	-2035.6	709.9	7001.5	-19.20	4.74	18.30

TABLE B-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ
590.0	166812	85260	1914927	-2046.2	711.5	7004.1	-7.88	0.62	-1.71
	S-II/OWS SEPARATION COMMAND								
591.100	164557	86043	1922628	-2054.8	712.1	7002.2	-7.79	0.59	-1.78
592.0	162705	86684	1928929	-2062.2	712.5	7000.6	-9.12	0.10	-2.01
594.0	158564	88110	1942926	-2078.5	713.4	6996.4	-7.65	0.57	-2.21
596.0	154392	89538	1956914	-2093.6	714.5	6991.7	-7.55	0.58	-2.35
598.0	150189	90968	1970893	-2108.6	715.7	6987.0	-7.54	0.58	-2.36
	ORBIT INSERTION								
598.960	148162	91655	1977600	-2115.9	716.3	6984.7	-7.54	0.58	-2.37

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
15.0	6373.695	21.636	-5.032	45.6	310.7	267.6	3.54	0.15	0.12
16.0	6373.742	21.946	-4.764	49.2	310.9	267.7	3.68	0.17	0.09
17.0	6373.793	22.257	-4.497	52.9	311.1	267.9	3.79	0.18	0.16
18.0	6373.848	22.569	-4.229	56.8	311.2	268.1	3.86	0.18	0.25
19.0	6373.907	22.880	-3.960	60.6	311.4	268.4	3.93	0.13	0.38
20.0	6373.969	23.191	-3.692	64.6	311.5	268.8	4.00	0.17	0.39
21.0	6374.036	23.503	-3.423	68.6	311.7	269.2	4.06	0.17	0.45
22.0	6374.107	23.815	-3.154	72.7	311.9	269.7	4.13	0.17	0.51
23.0	6374.182	24.127	-2.884	76.9	312.1	270.2	4.20	0.17	0.58
24.0	6374.261	24.439	-2.613	81.1	312.2	270.8	4.28	0.18	0.65
25.0	6374.344	24.751	-2.342	85.5	312.4	271.5	4.36	0.18	0.74
26.0	6374.431	25.064	-2.070	89.8	312.6	272.3	4.44	0.17	0.84
27.0	6374.524	25.376	-1.797	94.3	312.8	273.2	4.52	0.17	0.94
28.0	6374.620	25.689	-1.524	98.9	312.9	274.2	4.60	0.16	1.06
29.0	6374.721	26.002	-1.249	103.5	313.1	275.3	4.68	0.15	1.18
30.0	6374.827	26.315	-0.973	108.2	313.2	276.6	4.76	0.14	1.30
31.0	6374.938	26.629	-0.696	113.0	313.4	277.9	4.84	0.13	1.43
32.0	6375.053	26.942	-0.417	117.9	313.5	279.4	4.91	0.12	1.56
33.0	6375.174	27.256	-0.137	122.9	313.6	281.1	5.00	0.10	1.68
34.0	6375.299	27.569	0.145	127.9	313.7	282.8	5.08	0.09	1.81
35.0	6375.430	27.883	0.429	133.0	313.8	284.7	5.17	0.08	1.94
36.0	6375.565	28.197	0.715	138.2	313.8	286.7	5.25	0.07	2.07
37.0	6375.706	28.511	1.002	143.5	313.9	288.8	5.34	0.07	2.21
38.0	6375.852	28.825	1.292	148.9	314.0	291.1	5.42	0.07	2.35
39.0	6376.004	29.139	1.585	154.3	314.1	293.5	5.50	0.07	2.49
40.0	6376.161	29.453	1.879	159.9	314.1	296.1	5.59	0.07	2.64
41.0	6376.324	29.767	2.177	165.5	314.2	298.8	5.67	0.07	2.79
42.0	6376.492	30.081	2.477	171.2	314.3	301.7	5.75	0.07	2.94
43.0	6376.666	30.395	2.780	177.0	314.3	304.7	5.84	0.08	3.10
44.0	6376.846	30.710	3.087	182.9	314.4	307.9	5.93	0.09	3.26
45.0	6377.032	31.024	3.396	188.9	314.5	311.2	6.02	0.10	3.42
46.0	6377.224	31.339	3.709	194.9	314.6	314.7	6.11	0.11	3.58
47.0	6377.422	31.653	4.026	201.1	314.7	318.4	6.20	0.12	3.74
48.0	6377.626	31.968	4.346	207.3	314.9	322.2	6.29	0.13	3.89
49.0	6377.836	32.283	4.670	213.6	315.0	326.2	6.38	0.15	4.05
50.0	6378.053	32.598	4.999	220.1	315.1	330.3	6.47	0.15	4.21
51.0	6378.277	32.913	5.331	226.6	315.3	334.6	6.56	0.15	4.36
52.0	6378.506	33.229	5.668	233.2	315.4	339.1	6.65	0.15	4.51
53.0	6378.743	33.544	6.009	239.9	315.6	343.7	6.75	0.15	4.68
54.0	6378.986	33.860	6.355	246.7	315.7	348.4	6.84	0.14	4.85
55.0	6379.236	34.176	6.706	253.5	315.9	353.4	6.93	0.13	5.03
56.0	6379.493	34.492	7.062	260.5	316.0	358.5	6.99	0.15	5.20
57.0	6379.757	34.808	7.423	267.5	316.1	363.8	7.11	0.11	5.44

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
GUIDANCE REFERENCE RELEASE									
-16.958	6373.387	11.754	-13.579	0.0	309.0	267.4	-0.02	-0.01	0.01
-16.0	6373.387	12.050	-13.323	-0.0	309.0	267.5	-0.02	-0.01	0.01
-15.0	6373.387	12.359	-13.056	-0.1	308.9	267.5	-0.02	-0.01	0.01
-14.0	6373.387	12.668	-12.788	-0.1	308.9	267.5	-0.02	-0.01	0.01
-13.0	6373.387	12.977	-12.521	-0.1	308.9	267.5	-0.02	-0.01	0.01
-12.0	6373.386	13.286	-12.253	-0.1	308.9	267.5	-0.02	-0.01	0.01
-11.0	6373.386	13.595	-11.986	-0.2	308.9	267.5	-0.02	-0.01	0.01
-10.0	6373.386	13.904	-11.718	-0.2	308.9	267.5	-0.02	-0.01	0.01
-9.0	6373.386	14.213	-11.451	-0.2	308.9	267.5	-0.02	-0.01	0.01
-8.0	6373.386	14.522	-11.183	-0.2	308.9	267.5	-0.02	-0.01	0.01
-7.0	6373.385	14.831	-10.916	-0.3	308.9	267.6	-0.02	-0.01	0.01
-6.0	6373.385	15.140	-10.648	-0.3	308.9	267.6	-0.02	-0.01	0.01
-5.0	6373.385	15.448	-10.380	-0.3	308.9	267.6	-0.02	-0.01	0.01
-4.0	6373.385	15.757	-10.113	-0.3	308.8	267.6	-0.02	-0.01	0.01
-3.0	6373.384	16.066	-9.845	-0.4	308.8	267.6	-0.02	-0.01	0.01
-2.0	6373.384	16.375	-9.578	-0.4	308.8	267.6	-0.02	-0.01	0.01
-1.0	6373.383	16.684	-9.310	-0.4	308.8	267.6	-0.02	-0.01	0.01
0.0	6373.383	16.993	-9.042	-0.4	308.8	267.6	-0.02	-0.01	0.01
ALL HOLDDOWN ARMS RELEASED									
0.200	6373.383	17.054	-8.989	-0.4	308.8	267.6	-0.02	-0.01	0.01
LIFTOFF - START OF TIME BASE 1									
0.600	6373.383	17.178	-8.882	0.2	308.8	267.6	1.90	-0.02	0.01
1.0	6373.383	17.301	-8.775	1.1	308.8	267.6	2.31	-0.01	0.01
2.0	6373.385	17.610	-8.507	3.7	308.8	267.6	2.77	0.00	-0.00
3.0	6373.391	17.919	-8.239	6.5	308.8	267.6	2.87	0.04	-0.04
4.0	6373.398	18.228	-7.972	9.4	308.9	267.6	2.91	0.12	-0.08
5.0	6373.409	18.537	-7.704	12.4	309.0	267.5	3.04	0.19	-0.13
6.0	6373.423	18.846	-7.437	15.4	309.2	267.3	3.09	0.21	-0.13
7.0	6373.440	19.155	-7.170	18.6	309.4	267.2	3.20	0.18	-0.09
8.0	6373.460	19.465	-6.902	21.8	309.6	267.2	3.27	0.16	-0.02
9.0	6373.484	19.774	-6.635	25.1	309.8	267.2	3.28	0.12	-0.05
10.0	6373.511	20.084	-6.368	28.3	309.8	267.0	3.27	0.08	-0.19
11.0	6373.541	20.394	-6.101	31.7	310.0	267.0	3.42	0.21	0.11
12.0	6373.574	20.704	-5.834	35.1	310.2	267.1	3.44	0.18	0.12
13.0	6373.611	21.015	-5.567	38.5	310.4	267.3	3.45	0.18	0.21
14.0	6373.651	21.325	-5.300	42.0	310.6	267.5	3.57	0.19	0.18

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
58.0	6380.028	35.124	7.790	274.6	316.2	369.3	7.13	0.11	5.64
59.0	6380.306	35.440	8.162	281.8	316.3	375.1	7.20	0.11	5.84
60.0	6380.592	35.757	8.540	289.0	316.4	381.0	7.19	0.06	6.07
MACH 1									
61.000	6380.884	36.073	8.924	296.2	316.5	387.2	7.28	0.10	6.31
62.0	6381.184	36.390	9.314	303.5	316.6	393.6	7.31	0.06	6.50
63.0	6381.492	36.706	9.711	310.8	316.7	400.2	7.28	0.15	6.67
64.0	6381.806	37.023	10.115	318.2	316.8	406.9	7.41	0.06	6.72
65.0	6382.128	37.340	10.525	325.6	316.9	414.0	7.43	0.20	7.33
66.0	6382.457	37.657	10.943	333.0	317.2	421.3	7.50	0.30	7.42
67.0	6382.794	37.974	11.368	340.6	317.3	428.9	7.63	0.01	7.65
68.0	6383.138	38.291	11.801	348.2	317.4	436.6	7.70	0.20	7.81
69.0	6383.490	38.609	12.241	356.0	317.5	444.6	7.84	0.00	8.13
70.0	6383.850	38.926	12.690	363.9	317.5	452.8	7.99	0.01	8.27
71.0	6384.218	39.244	13.147	372.0	317.6	461.0	8.09	-0.02	8.44
72.0	6384.594	39.562	13.612	380.1	317.5	469.6	8.21	-0.07	8.66
73.0	6384.979	39.879	14.086	388.3	317.4	478.4	8.31	-0.12	8.91
MAXIMUM DYNAMIC PRESSURE									
73.500	6385.174	40.038	14.326	392.5	317.4	482.9	8.36	-0.15	9.04
74.0	6385.371	40.196	14.569	396.7	317.3	487.4	8.41	-0.18	9.18
75.0	6385.772	40.514	15.061	405.2	317.1	496.8	8.50	-0.24	9.47
76.0	6386.181	40.831	15.562	413.7	316.8	506.4	8.59	-0.31	9.77
77.0	6386.599	41.147	16.074	422.3	316.4	516.3	8.67	-0.39	10.07
78.0	6387.026	41.463	16.595	431.0	316.0	526.5	8.76	-0.47	10.36
79.0	6387.462	41.779	17.127	439.8	315.5	537.0	8.85	-0.54	10.64
80.0	6387.906	42.094	17.669	448.7	314.9	547.8	8.94	-0.59	10.92
81.0	6388.359	42.409	18.222	457.7	314.3	558.8	9.03	-0.62	11.21
82.0	6388.821	42.723	18.787	466.8	313.7	570.2	9.12	-0.62	11.50
83.0	6389.293	43.036	19.363	475.9	313.1	581.9	9.21	-0.60	11.80
84.0	6389.773	43.349	19.951	485.2	312.5	593.8	9.29	-0.56	12.12
85.0	6390.263	43.661	20.551	494.5	312.0	606.1	9.37	-0.51	12.45
86.0	6390.762	43.973	21.163	503.9	311.5	618.7	9.45	-0.46	12.79
87.0	6391.271	44.284	21.788	513.4	311.0	631.7	9.52	-0.41	13.13
88.0	6391.789	44.595	22.427	522.9	310.7	645.0	9.60	-0.35	13.46
89.0	6392.317	44.906	23.078	532.6	310.3	658.6	9.68	-0.30	13.79
90.0	6392.854	45.216	23.744	542.3	310.1	672.6	9.77	-0.25	14.11
91.0	6393.401	45.526	24.424	552.1	309.8	686.8	9.85	-0.21	14.43
92.0	6393.958	45.836	25.118	562.0	309.6	701.4	9.94	-0.16	14.74
93.0	6394.525	46.145	25.827	572.0	309.5	716.3	10.02	-0.11	15.07

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
94.0	6395.102	46.455	26.550	582.0	309.4	731.6	10.09	-0.07	15.39
95.0	6395.690	46.764	27.290	592.1	309.4	747.1	10.15	-0.02	15.73
96.0	6396.287	47.073	28.045	602.3	309.4	763.0	10.22	0.03	16.06
97.0	6396.894	47.383	28.816	612.6	309.4	779.3	10.28	0.07	16.40
98.0	6397.512	47.692	29.603	622.9	309.5	795.8	10.35	0.11	16.75
99.0	6398.140	48.002	30.408	633.3	309.6	812.8	10.42	0.13	17.09
100.0	6398.778	48.312	31.229	643.7	309.8	830.0	10.49	0.15	17.43
101.0	6399.427	48.622	32.068	654.3	309.9	847.6	10.57	0.15	17.77
102.0	6400.087	48.932	32.924	664.9	310.1	865.6	10.64	0.15	18.11
103.0	6400.757	49.242	33.799	675.5	310.2	883.8	10.71	0.14	18.45
104.0	6401.438	49.552	34.692	686.3	310.4	902.5	10.78	0.14	18.80
105.0	6402.130	49.862	35.604	697.1	310.5	921.5	10.83	0.13	19.15
106.0	6402.832	50.173	36.535	707.9	310.6	940.8	10.89	0.12	19.51
107.0	6403.546	50.484	37.486	718.8	310.7	960.5	10.94	0.10	19.89
108.0	6404.270	50.794	38.456	729.8	310.8	980.6	11.00	0.08	20.26
109.0	6405.005	51.105	39.447	740.8	310.9	1001.0	11.08	0.05	20.64
110.0	6405.752	51.416	40.459	751.9	310.9	1021.9	11.17	0.02	21.00
111.0	6406.509	51.727	41.491	763.2	310.9	1043.0	11.28	-0.02	21.35
112.0	6407.278	52.038	42.545	774.5	310.9	1064.5	11.41	-0.05	21.68
113.0	6408.058	52.349	43.620	786.0	310.8	1086.4	11.55	-0.08	22.01
114.0	6408.850	52.660	44.718	797.6	310.8	1108.6	11.69	-0.09	22.33
115.0	6409.653	52.970	45.837	809.4	310.7	1131.1	11.83	-0.10	22.66
116.0	6410.469	53.281	46.980	821.2	310.6	1153.9	11.96	-0.11	23.01
117.0	6411.296	53.592	48.145	833.3	310.4	1177.1	12.08	-0.11	23.39
118.0	6412.135	53.902	49.334	845.4	310.3	1200.7	12.19	-0.12	23.78
119.0	6412.987	54.212	50.547	857.6	310.2	1224.7	12.31	-0.12	24.20
120.0	6413.851	54.522	51.784	870.0	310.1	1249.1	12.42	-0.13	24.61
121.0	6414.727	54.832	53.045	882.5	309.9	1273.9	12.54	-0.13	25.03
122.0	6415.616	55.142	54.332	895.1	309.8	1299.2	12.67	-0.13	25.45
123.0	6416.517	55.452	55.644	907.8	309.7	1324.8	12.81	-0.13	25.87
124.0	6417.431	55.762	56.982	920.7	309.6	1350.9	12.95	-0.12	26.30
125.0	6418.358	56.071	58.346	933.7	309.4	1377.5	13.09	-0.11	26.73
126.0	6419.299	56.381	59.737	946.9	309.3	1404.4	13.24	-0.11	27.18
127.0	6420.252	56.690	61.155	960.2	309.2	1431.8	13.40	-0.11	27.64
128.0	6421.219	56.999	62.601	973.7	309.1	1459.7	13.56	-0.11	28.11
129.0	6422.200	57.308	64.074	987.3	309.0	1488.1	13.73	-0.11	28.59
130.0	6423.194	57.617	65.577	1001.1	308.9	1516.9	13.90	-0.12	29.09
131.0	6424.202	57.926	67.108	1015.1	308.8	1546.3	14.08	-0.12	29.60
132.0	6425.224	58.234	68.670	1029.3	308.6	1576.1	14.25	-0.13	30.13
133.0	6426.261	58.543	70.261	1043.6	308.5	1606.6	14.44	-0.13	30.67
134.0	6427.311	58.851	71.883	1058.1	308.3	1637.5	14.63	-0.16	31.21
135.0	6428.377	59.160	73.536	1072.9	308.2	1669.0	14.82	-0.13	31.76
136.0	6429.457	59.468	75.221	1087.8	308.1	1701.0	15.01	-0.13	32.33

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
137.0	6430.553	59.776	76.938	1102.9	307.9	1733.7	15.23	-0.16	32.93
138.0	6431.663	60.084	78.689	1118.2	307.8	1766.9	15.45	-0.16	33.53
139.0	6432.789	60.391	80.473	1133.8	307.6	1800.7	15.68	-0.13	34.13
140.0	6433.931	60.699	82.291	1149.6	307.5	1835.1	15.90	-0.15	34.73
S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)									
140.720	6434.764	60.920	83.622	1161.1	307.4	1860.3	16.07	-0.14	35.17
141.0	6435.089	61.006	84.143	1164.9	307.3	1869.2	11.30	-0.12	28.48
142.0	6436.261	61.314	86.028	1176.2	307.2	1897.8	11.35	-0.10	28.71
143.0	6437.444	61.621	87.941	1187.6	307.1	1926.7	11.43	-0.10	29.03
144.0	6438.637	61.928	89.882	1199.1	307.0	1955.9	11.51	-0.10	29.36
145.0	6439.842	62.235	91.853	1210.7	306.9	1985.4	11.64	-0.10	29.73
146.0	6441.059	62.542	93.853	1222.3	306.8	2015.3	11.74	-0.09	30.08
147.0	6442.288	62.848	95.884	1234.1	306.7	2045.6	11.86	-0.09	30.49
148.0	6443.528	63.155	97.945	1246.1	306.6	2076.4	12.02	-0.09	31.04
149.0	6444.780	63.462	100.036	1258.3	306.6	2107.7	12.18	-0.09	31.54
150.0	6446.044	63.768	102.160	1270.5	306.5	2139.5	12.33	-0.09	32.09
151.0	6447.321	64.075	104.316	1282.9	306.4	2171.8	12.50	-0.14	32.64
152.0	6448.610	64.381	106.504	1295.5	306.3	2204.7	12.67	-0.05	33.19
153.0	6449.912	64.687	108.725	1308.2	306.2	2238.2	12.84	-0.13	33.73
154.0	6451.227	64.993	110.980	1321.1	306.1	2272.2	13.01	-0.10	34.28
155.0	6452.554	65.299	113.269	1334.2	305.9	2306.7	13.18	-0.14	34.83
156.0	6453.895	65.605	115.594	1347.5	305.8	2341.8	13.35	-0.09	35.37
157.0	6455.250	65.911	117.953	1360.9	305.7	2377.5	13.52	-0.19	35.92
158.0	6456.618	66.217	120.349	1374.5	305.4	2413.7	13.69	-0.33	36.47
S-IC OUTBOARD ENGINE CUTOFF (ENGINES 1 AND 3)									
158.160	6456.838	66.265	120.736	1376.7	305.3	2419.5	13.72	-0.28	36.56
159.0	6457.995	66.522	122.774	1376.8	305.2	2432.0	-9.56	-0.05	-0.15
S-IC/S-II SEPARATION COMMAND									
159.900	6459.229	66.797	124.961	1368.2	305.2	2431.9	-9.60	-0.04	-0.15
160.0	6459.365	66.827	125.203	1367.2	305.2	2431.9	-9.60	-0.04	-0.15
162.0	6462.083	67.437	130.070	1348.0	305.1	2431.5	-9.58	-0.04	-0.19
164.0	6464.762	68.047	134.935	1332.2	305.0	2435.9	-5.96	-0.09	5.42
166.0	6467.415	68.657	139.819	1320.9	304.8	2447.6	-5.38	-0.09	6.25
168.0	6470.046	69.267	144.727	1310.6	304.6	2460.9	-4.79	-0.09	7.14
170.0	6472.658	69.876	149.663	1301.0	304.5	2475.1	-4.66	-0.08	7.29
172.0	6475.251	70.485	154.628	1291.8	304.3	2489.8	-4.59	-0.08	7.38
174.0	6477.826	71.093	159.623	1282.6	304.1	2504.7	-4.56	-0.09	7.40

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
176.0	6480.382	71.701	164.647	1273.5	303.9	2519.5	-4.52	-0.08	7.44
178.0	6482.920	72.309	169.701	1264.5	303.8	2534.4	-4.49	-0.08	7.48
180.0	6485.440	72.916	174.785	1255.6	303.6	2549.4	-4.45	-0.09	7.52
182.0	6487.942	73.523	179.899	1246.7	303.4	2564.5	-4.42	-0.09	7.55
184.0	6490.427	74.130	185.043	1237.9	303.3	2579.7	-4.38	-0.09	7.59
186.0	6492.894	74.736	190.217	1229.1	303.1	2594.9	-4.35	-0.09	7.62
188.0	6495.343	75.342	195.422	1220.5	302.9	2610.2	-4.32	-0.09	7.65
190.0	6497.776	75.948	200.658	1211.9	302.7	2625.5	-4.28	-0.09	7.68
192.0	6500.191	76.553	205.924	1203.3	302.6	2640.9	-4.25	-0.08	7.72
194.0	6502.589	77.158	211.222	1194.8	302.4	2656.4	-4.23	-0.08	7.75
196.0	6504.970	77.763	216.550	1186.4	302.2	2671.9	-4.18	-0.09	7.77
198.0	6507.335	78.367	221.909	1178.1	302.0	2687.4	-4.09	-0.09	7.76
200.0	6509.683	78.971	227.299	1170.1	301.9	2702.9	-3.94	-0.09	7.71
202.0	6512.015	79.574	232.721	1162.4	301.7	2718.3	-3.79	-0.08	7.66
204.0	6514.333	80.178	238.173	1154.9	301.5	2733.6	-3.69	-0.08	7.64
206.0	6516.635	80.780	243.655	1147.5	301.4	2748.9	-3.65	-0.07	7.68
208.0	6518.923	81.383	249.168	1140.2	301.2	2764.3	-3.65	-0.07	7.74
210.0	6521.196	81.985	254.712	1132.9	301.1	2779.9	-3.67	-0.06	7.81
212.0	6523.454	82.587	260.288	1125.6	301.0	2795.5	-3.67	-0.05	7.87
214.0	6525.698	83.189	265.895	1118.2	300.9	2811.3	-3.68	-0.03	7.93
216.0	6527.927	83.791	271.533	1110.8	300.9	2827.3	-3.68	-0.02	7.98
218.0	6530.141	84.393	277.204	1103.4	300.8	2843.3	-3.69	-0.01	8.05
220.0	6532.341	84.994	282.907	1096.0	300.8	2859.5	-3.71	0.00	8.12
222.0	6534.525	85.596	288.642	1088.6	300.8	2875.8	-3.72	0.02	8.19
224.0	6536.695	86.198	294.410	1081.1	300.9	2892.2	-3.74	0.03	8.25
226.0	6538.850	86.800	300.211	1073.6	301.0	2908.8	-3.74	0.05	8.31
228.0	6540.990	87.402	306.045	1066.1	301.1	2925.5	-3.75	0.06	8.38
230.0	6543.114	88.004	311.913	1058.6	301.2	2942.3	-3.75	0.07	8.44
232.0	6545.224	88.607	317.814	1051.1	301.3	2959.3	-3.77	0.07	8.51
234.0	6547.319	89.209	323.750	1043.5	301.5	2976.3	-3.79	0.07	8.57
236.0	6549.398	89.812	329.720	1035.9	301.6	2993.6	-3.81	0.08	8.64
238.0	6551.462	90.416	335.724	1028.3	301.8	3010.9	-3.83	0.08	8.72
240.0	6553.511	91.020	341.763	1020.6	302.0	3028.4	-3.84	0.10	8.79
242.0	6555.545	91.624	347.838	1012.9	302.2	3046.1	-3.85	0.11	8.85
244.0	6557.563	92.228	353.948	1005.2	302.4	3063.9	-3.86	0.11	8.92
246.0	6559.565	92.833	360.093	997.4	302.6	3081.8	-3.88	0.13	8.99
248.0	6561.552	93.439	366.275	989.6	302.9	3099.8	-3.89	0.14	9.06
250.0	6563.524	94.045	372.493	981.8	303.2	3118.0	-3.90	0.15	9.12
252.0	6565.480	94.651	378.747	974.0	303.5	3136.3	-3.93	0.16	9.19
254.0	6567.420	95.259	385.038	966.1	303.8	3154.8	-3.95	0.17	9.27
256.0	6569.344	95.867	391.366	958.2	304.2	3173.4	-3.96	0.18	9.34
258.0	6571.252	96.475	397.732	950.2	304.5	3192.2	-3.98	0.20	9.41
260.0	6573.145	97.085	404.135	942.2	304.9	3211.1	-4.00	0.21	9.48

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
262.0	6575.021	97.695	410.576	934.2	305.4	3230.1	-4.02	0.22	9.55
264.0	6576.882	98.306	417.056	926.2	305.8	3249.3	-4.03	0.23	9.62
266.0	6578.726	98.919	423.574	918.1	306.3	3268.6	-4.04	0.24	9.70
268.0	6580.554	99.532	430.130	910.0	306.8	3288.1	-4.07	0.26	9.78
270.0	6582.366	100.146	436.726	901.8	307.3	3307.7	-4.09	0.28	9.86
272.0	6584.161	100.761	443.361	893.6	307.9	3327.6	-4.11	0.29	9.94
274.0	6585.940	101.377	450.036	885.3	308.5	3347.5	-4.14	0.30	10.02
276.0	6587.702	101.995	456.751	877.0	309.1	3367.6	-4.16	0.31	10.09
278.0	6589.448	102.614	463.507	868.7	309.7	3387.9	-4.18	0.33	10.17
280.0	6591.177	103.234	470.303	860.3	310.4	3408.3	-4.20	0.34	10.25
282.0	6592.889	103.855	477.140	851.8	311.1	3428.9	-4.23	0.36	10.33
284.0	6594.584	104.478	484.019	843.3	311.8	3449.7	-4.25	0.38	10.41
286.0	6596.262	105.103	490.939	834.8	312.6	3470.6	-4.28	0.40	10.49
288.0	6597.923	105.729	497.901	826.2	313.4	3491.6	-4.31	0.41	10.58
290.0	6599.567	106.356	504.906	817.5	314.2	3512.9	-4.34	0.42	10.66
292.0	6601.194	106.985	511.953	808.8	315.1	3534.3	-4.36	0.44	10.74
294.0	6602.802	107.617	519.043	800.1	316.0	3555.9	-4.39	0.45	10.83
296.0	6604.394	108.249	526.177	791.3	316.9	3577.6	-4.42	0.47	10.91
298.0	6605.967	108.884	533.354	782.4	317.8	3599.5	-4.46	0.48	11.00
300.0	6607.523	109.521	540.575	773.4	318.8	3621.6	-4.48	0.50	11.08
302.0	6609.061	110.159	547.840	764.4	319.8	3643.9	-4.51	0.52	11.17
304.0	6610.581	110.800	555.150	755.3	320.9	3666.3	-4.55	0.54	11.26
306.0	6612.082	111.443	562.506	746.2	322.0	3688.9	-4.58	0.56	11.35
308.0	6613.565	112.088	569.906	737.0	323.1	3711.7	-4.62	0.57	11.44
310.0	6615.030	112.735	577.353	727.7	324.3	3734.7	-4.65	0.59	11.53
312.0	6616.476	113.385	584.845	718.3	325.4	3757.9	-4.69	0.60	11.63
314.0	6617.903	114.037	592.384	708.9	326.6	3780.4	-4.73	0.61	11.72
	S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)								
314.050	6617.939	114.053	592.573	708.7	326.7	3780.9	-4.73	0.61	11.72
316.0	6619.310	114.691	599.965	697.9	327.6	3800.4	-5.62	0.47	9.28
318.0	6620.695	115.347	607.584	686.6	328.5	3818.9	-5.66	0.46	9.34
320.0	6622.057	116.005	615.241	675.3	329.5	3837.7	-5.70	0.45	9.40
322.0	6623.396	116.665	622.935	663.8	330.4	3856.5	-5.74	0.49	9.46
324.0	6624.712	117.327	630.667	652.3	331.5	3875.4	-5.79	0.52	9.52
326.0	6626.005	117.991	638.437	640.7	332.5	3894.5	-5.83	0.55	9.58
328.0	6627.275	118.657	646.245	629.0	333.6	3913.8	-5.87	0.56	9.64
330.0	6628.521	119.326	654.092	617.2	334.7	3933.1	-5.91	0.56	9.70
332.0	6629.744	119.996	661.978	605.3	335.9	3952.6	-5.95	0.57	9.76
334.0	6630.943	120.669	669.903	593.4	337.0	3972.2	-5.99	0.59	9.83
336.0	6632.118	121.345	677.867	581.4	338.2	3991.9	-6.03	0.61	9.89
338.0	6633.268	122.022	685.870	569.3	339.5	4011.8	-6.07	0.62	9.95

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
340.0	6634.395	122.702	693.914	557.1	340.7	4031.7	-6.12	0.64	10.02
342.0	6635.496	123.385	701.997	544.7	342.0	4051.8	-6.18	0.66	10.08
344.0	6636.573	124.071	710.121	532.3	343.4	4072.1	-6.23	0.68	10.16
346.0	6637.626	124.759	718.286	519.8	344.7	4092.5	-6.29	0.69	10.23
348.0	6638.653	125.449	726.491	507.2	346.1	4113.0	-6.34	0.70	10.29
350.0	6639.654	126.143	734.738	494.4	347.5	4133.7	-6.38	0.72	10.36
352.0	6640.630	126.840	743.026	481.6	349.0	4154.5	-6.43	0.73	10.42
354.0	6641.580	127.539	751.356	468.7	350.5	4175.4	-6.49	0.76	10.49
356.0	6642.505	128.241	759.728	455.6	352.0	4196.4	-6.53	0.79	10.56
358.0	6643.403	128.947	768.142	442.5	353.6	4217.6	-6.58	0.81	10.62
360.0	6644.275	129.656	776.598	429.3	355.2	4238.9	-6.63	0.82	10.69
362.0	6645.120	130.368	785.097	416.0	356.9	4260.4	-6.68	0.83	10.77
364.0	6645.938	131.084	793.640	402.5	358.5	4282.0	-6.74	0.83	10.84
366.0	6646.730	131.802	802.226	389.0	360.2	4303.8	-6.80	0.84	10.91
368.0	6647.494	132.524	810.855	375.3	361.9	4325.7	-6.85	0.85	10.98
370.0	6648.231	133.250	819.529	361.5	363.6	4347.7	-6.91	0.87	11.05
372.0	6648.940	133.979	828.246	347.6	365.4	4369.9	-6.98	0.90	11.13
374.0	6649.621	134.712	837.008	333.6	367.2	4392.2	-7.04	0.92	11.20
376.0	6650.274	135.448	845.815	319.4	369.0	4414.7	-7.09	0.93	11.27
378.0	6650.899	136.188	854.667	305.2	370.9	4437.3	-7.15	0.94	11.35
380.0	6651.495	136.932	863.565	290.8	372.8	4460.1	-7.21	0.95	11.42
382.0	6652.062	137.679	872.508	276.3	374.7	4483.0	-7.28	0.97	11.49
384.0	6652.600	138.430	881.497	261.7	376.7	4506.1	-7.35	0.98	11.57
386.0	6653.109	139.186	890.532	246.9	378.7	4529.3	-7.41	1.00	11.64
388.0	6653.588	139.945	899.614	232.0	380.7	4552.7	-7.48	1.01	11.71
390.0	6654.037	140.708	908.743	217.0	382.7	4576.2	-7.54	1.03	11.79
392.0	6654.456	141.476	917.919	201.8	384.8	4599.9	-7.60	1.06	11.87
394.0	6654.844	142.248	927.143	186.5	386.9	4623.7	-7.67	1.08	11.95
396.0	6655.202	143.024	936.414	171.1	389.1	4647.7	-7.74	1.10	12.03
398.0	6655.528	143.804	945.733	155.5	391.3	4671.8	-7.82	1.10	12.11
400.0	6655.824	144.589	955.101	139.8	393.6	4696.1	-7.90	1.13	12.19
402.0	6656.087	145.378	964.518	123.9	395.9	4720.6	-7.98	1.16	12.28
404.0	6656.319	146.172	973.983	107.8	398.1	4745.0	-8.11	1.09	10.58
406.0	6656.519	146.971	983.494	91.5	400.1	4766.1	-8.20	0.96	10.59
408.0	6656.685	147.773	993.048	75.0	402.1	4787.3	-8.31	1.00	10.60
410.0	6656.819	148.579	1002.644	58.3	404.1	4808.5	-8.41	1.00	10.63
412.0	6656.918	149.389	1012.282	41.4	406.1	4829.8	-8.49	1.01	10.66
414.0	6656.984	150.203	1021.964	24.3	408.1	4851.3	-8.55	1.03	10.71
416.0	6657.015	151.021	1031.688	7.2	410.2	4872.8	-8.58	1.05	10.75
418.0	6657.013	151.844	1041.455	-10.0	412.3	4894.3	-8.61	1.06	10.81
420.0	6656.975	152.670	1051.265	-27.3	414.4	4916.0	-8.68	1.07	10.86
422.0	6656.903	153.501	1061.119	-44.8	416.5	4937.8	-8.79	1.09	10.91
424.0	6656.796	154.337	1071.016	-62.6	418.8	4959.7	-8.92	1.12	10.97

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
426.0	6656.653	155.176	1080.958	-80.5	421.0	4981.7	-9.02	1.15	11.03
428.0	6656.474	156.021	1090.943	-98.6	423.3	5003.8	-9.07	1.16	11.09
430.0	6656.258	156.870	1100.973	-116.8	425.6	5026.1	-9.09	1.16	11.15
432.0	6656.006	157.723	1111.048	-135.0	428.0	5048.4	-9.11	1.17	11.21
434.0	6655.718	158.582	1121.167	-153.3	430.3	5070.9	-9.17	1.17	11.27
436.0	6655.393	159.445	1131.331	-171.7	432.7	5093.5	-9.24	1.18	11.34
438.0	6655.031	160.312	1141.541	-190.3	435.0	5116.3	-9.32	1.19	11.40
440.0	6654.632	161.185	1151.797	-209.0	437.4	5139.2	-9.39	1.20	11.46
442.0	6654.195	162.062	1162.098	-227.9	439.8	5162.1	-9.46	1.21	11.51
444.0	6653.721	162.944	1172.445	-246.9	442.3	5185.2	-9.52	1.23	11.58
446.0	6653.208	163.831	1182.839	-266.0	444.8	5208.5	-9.60	1.26	11.64
448.0	6652.656	164.723	1193.279	-285.3	447.3	5231.8	-9.70	1.29	11.70
450.0	6652.066	165.620	1203.766	-304.8	449.9	5255.3	-9.80	1.31	11.77
452.0	6651.437	166.523	1214.300	-324.6	452.5	5278.9	-9.91	1.32	11.83
454.0	6650.768	167.430	1224.882	-344.5	455.2	5302.6	-10.01	1.33	11.89
456.0	6650.059	168.343	1235.511	-364.6	457.8	5326.5	-10.12	1.35	11.95
458.0	6649.309	169.262	1246.188	-385.0	460.6	5350.4	-10.23	1.37	12.01
460.0	6648.519	170.186	1256.913	-405.6	463.3	5374.5	-10.34	1.39	12.09
462.0	6647.687	171.115	1267.686	-426.4	466.1	5398.8	-10.44	1.40	12.15
464.0	6646.813	172.050	1278.508	-447.4	468.9	5423.1	-10.54	1.42	12.21
466.0	6645.897	172.991	1289.379	-468.6	471.8	5447.6	-10.65	1.44	12.27
468.0	6644.939	173.937	1300.298	-490.0	474.7	5472.3	-10.76	1.47	12.34
470.0	6643.937	174.890	1311.268	-511.6	477.7	5497.0	-10.86	1.49	12.41
472.0	6642.892	175.848	1322.287	-533.5	480.7	5521.9	-10.97	1.51	12.47
474.0	6641.803	176.812	1333.355	-555.5	483.7	5546.9	-11.08	1.53	12.54
476.0	6640.670	177.783	1344.474	-577.8	486.8	5572.1	-11.19	1.56	12.60
478.0	6639.492	178.759	1355.644	-600.3	489.9	5597.3	-11.31	1.58	12.67
480.0	6638.268	179.742	1366.864	-623.1	493.1	5622.8	-11.42	1.60	12.74
482.0	6636.999	180.732	1378.135	-646.0	496.3	5648.3	-11.53	1.62	12.80
484.0	6635.684	181.728	1389.457	-669.2	499.5	5674.0	-11.65	1.64	12.86
486.0	6634.322	182.730	1400.831	-692.7	502.8	5699.8	-11.78	1.66	12.94
488.0	6632.913	183.739	1412.256	-716.4	506.2	5725.8	-11.90	1.68	13.01
490.0	6631.456	184.755	1423.734	-740.3	509.5	5751.9	-12.03	1.70	13.08
492.0	6629.952	185.777	1435.264	-764.6	513.0	5778.1	-12.17	1.72	13.14
494.0	6628.398	186.807	1446.846	-789.1	516.4	5804.4	-12.31	1.75	13.20
496.0	6626.795	187.843	1458.482	-813.8	519.9	5830.9	-12.44	1.77	13.27
498.0	6625.143	188.886	1470.170	-838.8	523.5	5857.6	-12.56	1.79	13.35
500.0	6623.440	189.937	1481.912	-864.1	527.1	5884.3	-12.68	1.81	13.42
502.0	6621.686	190.995	1493.708	-889.6	530.7	5911.3	-12.82	1.83	13.49
504.0	6619.881	192.060	1505.557	-915.4	534.4	5938.3	-12.95	1.86	13.56
506.0	6618.024	193.133	1517.461	-941.4	538.2	5965.5	-13.09	1.89	13.64
508.0	6616.115	194.213	1529.419	-967.8	542.0	5992.9	-13.23	1.91	13.71
510.0	6614.153	195.300	1541.433	-994.4	545.8	6020.4	-13.38	1.93	13.78

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
512.0	6612.137	196.396	1553.501	-1021.3	549.7	6048.0	-13.51	1.95	13.86
514.0	6610.068	197.499	1565.625	-1048.5	553.6	6075.8	-13.66	1.97	13.94
516.0	6607.943	198.610	1577.804	-1076.0	557.6	6103.8	-13.81	2.00	14.02
518.0	6605.764	199.729	1590.040	-1103.8	561.6	6131.9	-13.97	2.02	14.09
520.0	6603.528	200.857	1602.332	-1131.9	565.6	6160.2	-14.13	2.05	14.16
522.0	6601.236	201.992	1614.681	-1160.3	569.8	6188.6	-14.28	2.07	14.23
524.0	6598.886	203.136	1627.087	-1189.1	573.9	6217.1	-14.44	2.09	14.31
526.0	6596.479	204.288	1639.550	-1218.1	578.1	6245.8	-14.60	2.11	14.39
528.0	6594.014	205.448	1652.070	-1247.5	582.4	6274.7	-14.77	2.13	14.47
530.0	6591.489	206.617	1664.648	-1277.2	586.7	6303.7	-14.94	2.16	14.55
532.0	6588.905	207.795	1677.285	-1307.3	591.0	6332.9	-15.11	2.20	14.63
534.0	6586.260	208.981	1689.980	-1337.7	595.5	6362.3	-15.27	2.24	14.71
536.0	6583.554	210.177	1702.734	-1368.4	600.0	6391.8	-15.44	2.26	14.79
538.0	6580.786	211.381	1715.547	-1399.5	604.5	6421.4	-15.62	2.29	14.87
540.0	6577.955	212.595	1728.420	-1430.9	609.1	6451.3	-15.81	2.32	14.96
542.0	6575.062	213.818	1741.353	-1462.8	613.8	6481.3	-16.00	2.34	15.05
544.0	6572.104	215.050	1754.345	-1495.0	618.5	6511.5	-16.18	2.37	15.14
546.0	6569.082	216.292	1767.399	-1527.5	623.2	6541.9	-16.36	2.41	15.22
548.0	6565.994	217.543	1780.513	-1560.4	628.1	6572.4	-16.54	2.44	15.32
550.0	6562.840	218.804	1793.689	-1593.7	633.0	6603.1	-16.72	2.47	15.41
552.0	6559.619	220.075	1806.926	-1627.4	637.9	6634.1	-16.93	2.50	15.50
554.0	6556.330	221.356	1820.225	-1661.5	643.0	6665.2	-17.13	2.53	15.58
556.0	6552.973	222.647	1833.586	-1695.9	648.1	6696.4	-17.33	2.57	15.67
558.0	6549.546	223.948	1847.011	-1730.8	653.2	6727.9	-17.53	2.61	15.76
560.0	6546.049	225.260	1860.498	-1766.1	658.5	6759.5	-17.74	2.64	15.86
562.0	6542.481	226.582	1874.049	-1801.8	663.8	6791.3	-17.96	2.67	15.97
564.0	6538.842	227.915	1887.664	-1838.0	669.2	6823.4	-18.18	2.70	16.07
566.0	6535.129	229.259	1901.342	-1874.6	674.6	6855.6	-18.41	2.74	16.15
568.0	6531.343	230.614	1915.086	-1911.7	680.1	6888.0	-18.73	2.77	16.20
570.0	6527.482	231.979	1928.894	-1949.6	685.7	6920.4	-19.12	2.80	16.21
572.0	6523.544	233.356	1942.768	-1988.2	691.3	6952.8	-19.50	2.84	16.23
574.0	6519.528	234.745	1956.706	-2027.5	697.0	6985.4	-19.75	2.87	16.32
576.0	6515.434	236.144	1970.709	-2067.2	702.8	7018.2	-19.88	2.90	16.51
578.0	6511.259	237.556	1984.779	-2107.1	708.6	7051.5	-19.99	2.93	16.75
580.0	6507.005	238.979	1998.916	-2147.2	714.5	7085.2	-20.11	2.96	16.93
582.0	6502.671	240.414	2013.120	-2187.5	720.5	7119.2	-20.18	2.99	17.11
584.0	6498.255	241.861	2027.393	-2228.0	726.5	7153.6	-20.25	3.01	17.29
586.0	6493.759	243.320	2041.735	-2268.6	732.5	7188.4	-20.32	3.04	17.47
588.0	6489.181	244.791	2056.147	-2309.3	738.6	7223.5	-20.40	3.06	17.66
S-II GUIDANCE CUTOFF SIGNAL									
588.960	6486.955	245.502	2063.090	-2328.9	741.5	7240.5	-20.43	3.08	17.74

TABLE B-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS KM	YS KM	ZS KM	DXS M/S	DYS M/S	DZS M/S	DDXS M/S SQ	DDYS M/S SQ	DDZS M/S SQ
590.0	6484.525	246.274	2070.625	-2340.3	742.0	7242.8	-8.49	-0.28	-2.05
S-II/OWS SEPARATION COMMAND									
591.100	6481.947	247.089	2078.589	-2349.6	741.7	7240.5	-8.40	-0.32	-2.12
592.0	6479.829	247.756	2085.104	-2357.5	741.3	7238.5	-9.71	-0.84	-2.39
594.0	6475.096	249.238	2099.576	-2375.0	740.3	7233.6	-8.25	-0.32	-2.55
596.0	6470.329	250.718	2114.038	-2391.3	739.7	7228.2	-8.14	-0.31	-2.69
598.0	6465.530	252.197	2128.489	-2407.6	739.0	7222.9	-8.14	-0.31	-2.70
ORBIT INSERTION									
598.960	6463.215	252.906	2135.422	-2415.5	738.7	7220.3	-8.13	-0.32	-2.71

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
GUIDANCE REFERENCE RELEASE											
-16.958	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-16.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-15.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-14.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-13.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-12.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-11.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-10.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-9.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-8.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-7.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-6.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-5.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-4.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-3.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-2.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
-1.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
0.0	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
ALL HOLDDOWN ARMS RELEASED											
0.200	6373.412	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	408.6	0	117
LIFTOFF - START OF TIME BASE 1											
0.600	6373.412	-80.6041	28.4470	325.17	89.45	0.7	90.00	0.09	408.6	0	117
1.0	6373.413	-80.6041	28.4470	325.73	89.55	1.5	90.00	0.21	408.6	0	117
2.0	6373.415	-80.6041	28.4470	307.84	89.81	4.2	90.00	0.59	408.7	0	120
3.0	6373.421	-80.6041	28.4470	204.72	89.78	7.0	90.00	0.99	408.7	0	126
4.0	6373.430	-80.6041	28.4470	176.78	89.28	9.9	90.02	1.39	408.8	0	134
5.0	6373.441	-80.6041	28.4470	170.62	88.61	12.9	90.04	1.81	408.9	0	146
6.0	6373.455	-80.6041	28.4470	168.47	88.01	16.0	90.08	2.25	409.1	0	160
7.0	6373.473	-80.6041	28.4470	166.93	87.65	19.2	90.11	2.69	409.3	1	178
8.0	6373.494	-80.6041	28.4469	164.24	87.54	22.5	90.13	3.14	409.5	2	198
9.0	6373.518	-80.6041	28.4469	160.44	87.58	25.8	90.14	3.60	409.8	3	223
10.0	6373.545	-80.6041	28.4469	164.89	87.54	29.1	90.17	4.06	410.0	4	250
11.0	6373.576	-80.6041	28.4469	162.89	87.55	32.4	90.19	4.53	410.3	5	281
12.0	6373.610	-80.6041	28.4469	155.76	87.60	35.9	90.19	5.01	410.8	7	315
13.0	6373.648	-80.6041	28.4469	148.16	87.65	39.4	90.19	5.49	411.4	8	352
14.0	6373.689	-80.6041	28.4469	140.54	87.67	42.9	90.19	5.97	412.0	10	393

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
15.0	6373.734	-80.6041	28.4469	135.39	87.67	46.5	90.19	6.46	412.6	11	438
16.0	6373.782	-80.6041	28.4469	132.44	87.68	50.1	90.19	6.96	413.2	13	486
17.0	6373.834	-80.6041	28.4468	129.39	87.65	53.9	90.20	7.47	413.9	15	538
18.0	6373.889	-80.6040	28.4468	124.80	87.63	57.7	90.19	8.00	414.7	17	594
19.0	6373.949	-80.6040	28.4468	118.65	87.60	61.7	90.17	8.52	415.5	20	654
20.0	6374.013	-80.6040	28.4468	111.90	87.54	65.6	90.15	9.06	416.5	22	717
21.0	6374.080	-80.6040	28.4468	105.85	87.44	69.7	90.12	9.60	417.5	25	785
22.0	6374.152	-80.6039	28.4468	99.97	87.30	73.8	90.08	10.15	418.7	27	857
23.0	6374.228	-80.6039	28.4468	94.43	87.13	78.1	90.04	10.70	419.9	30	932
24.0	6374.308	-80.6038	28.4468	89.34	86.93	82.3	89.99	11.26	421.2	34	1012
25.0	6374.392	-80.6038	28.4468	84.70	86.69	86.7	89.94	11.82	422.6	38	1097
26.0	6374.481	-80.6037	28.4468	80.48	86.43	91.2	89.87	12.39	424.2	42	1186
27.0	6374.574	-80.6037	28.4468	76.59	86.12	95.7	89.79	12.96	425.9	47	1279
28.0	6374.672	-80.6036	28.4468	73.04	85.79	100.4	89.70	13.53	427.7	53	1377
29.0	6374.775	-80.6035	28.4468	69.83	85.42	105.1	89.60	14.11	429.6	59	1479
30.0	6374.882	-80.6035	28.4469	66.96	85.02	109.9	89.49	14.69	431.6	67	1586
31.0	6374.994	-80.6034	28.4469	64.38	84.60	114.8	89.36	15.28	433.8	76	1698
32.0	6375.110	-80.6033	28.4470	62.06	84.15	119.8	89.22	15.86	436.2	86	1815
33.0	6375.232	-80.6031	28.4470	59.98	83.68	124.9	89.06	16.45	438.7	97	1937
34.0	6375.359	-80.6030	28.4471	58.14	83.20	130.2	88.90	17.03	441.3	110	2063
35.0	6375.491	-80.6029	28.4472	56.50	82.70	135.5	88.71	17.62	444.1	125	2195
36.0	6375.628	-80.6027	28.4473	55.06	82.19	140.9	88.52	18.20	447.0	142	2332
37.0	6375.770	-80.6025	28.4474	53.78	81.67	146.5	88.31	18.79	450.1	161	2475
38.0	6375.917	-80.6024	28.4475	52.66	81.14	152.2	88.10	19.37	453.3	182	2622
39.0	6376.071	-80.6022	28.4476	51.67	80.61	158.0	87.86	19.95	456.7	205	2775
40.0	6376.229	-80.6020	28.4478	50.78	80.06	163.9	87.62	20.53	460.3	231	2934
41.0	6376.393	-80.6017	28.4479	50.00	79.50	169.9	87.37	21.10	464.1	259	3098
42.0	6376.563	-80.6015	28.4481	49.31	78.94	176.1	87.10	21.67	468.1	291	3268
43.0	6376.739	-80.6012	28.4483	48.71	78.38	182.4	86.82	22.23	472.2	325	3444
44.0	6376.921	-80.6009	28.4486	48.17	77.81	188.8	86.53	22.78	476.6	362	3626
45.0	6377.108	-80.6006	28.4488	47.70	77.24	195.4	86.23	23.33	481.1	403	3813
46.0	6377.302	-80.6003	28.4491	47.28	76.66	202.1	85.92	23.88	485.8	447	4007
47.0	6377.502	-80.5999	28.4494	46.92	76.09	209.0	85.60	24.41	490.8	494	4207
48.0	6377.708	-80.5995	28.4497	46.60	75.52	216.0	85.27	24.94	495.9	546	4413
49.0	6377.920	-80.5991	28.4500	46.32	74.95	223.1	84.93	25.46	501.3	601	4625
50.0	6378.138	-80.5986	28.4504	46.07	74.38	230.4	84.58	25.97	506.8	660	4844
51.0	6378.364	-80.5982	28.4508	45.84	73.82	237.9	84.23	26.47	512.6	724	5069
52.0	6378.595	-80.5977	28.4512	45.63	73.27	245.5	83.86	26.97	518.5	791	5301
53.0	6378.834	-80.5971	28.4517	45.43	72.72	253.3	83.49	27.45	524.6	864	5540
54.0	6379.079	-80.5966	28.4522	45.24	72.18	261.2	83.11	27.93	531.0	941	5785
55.0	6379.331	-80.5960	28.4527	45.06	71.64	269.3	82.72	28.39	537.5	1022	6038
56.0	6379.590	-80.5953	28.4533	44.87	71.10	277.5	82.32	28.85	544.2	1109	6297
57.0	6379.856	-80.5947	28.4539	44.71	70.57	286.0	81.91	29.29	551.2	1201	6563

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
58.0	6380.130	-80.5940	28.4545	44.54	70.02	294.6	81.50	29.72	558.4	1299	6837
59.0	6380.410	-80.5932	28.4552	44.39	69.48	303.3	81.07	30.13	565.8	1402	7117
60.0	6380.698	-80.5925	28.4559	44.23	68.93	312.1	80.63	30.53	573.4	1510	7405
MACH 1											
61.000	6380.993	-80.5916	28.4566	44.08	68.37	321.2	80.18	30.91	581.3	1625	7700
62.0	6381.295	-80.5908	28.4574	43.94	67.82	330.3	79.73	31.27	589.3	1746	8003
63.0	6381.604	-80.5899	28.4582	43.81	67.27	339.6	79.27	31.61	597.6	1873	8313
64.0	6381.921	-80.5889	28.4591	43.70	66.73	349.0	78.82	31.95	605.9	2007	8630
65.0	6382.246	-80.5879	28.4600	43.60	66.18	358.6	78.36	32.26	614.6	2148	8954
66.0	6382.578	-80.5869	28.4610	43.55	65.61	368.5	77.89	32.55	623.7	2296	9287
67.0	6382.917	-80.5858	28.4620	43.47	65.05	378.5	77.42	32.84	632.9	2452	9626
68.0	6383.264	-80.5846	28.4630	43.38	64.51	388.8	76.94	33.11	642.4	2614	9974
69.0	6383.619	-80.5834	28.4642	43.28	63.97	399.3	76.45	33.38	652.1	2785	10329
70.0	6383.982	-80.5822	28.4653	43.17	63.44	410.0	75.96	33.64	662.0	2964	10692
71.0	6384.352	-80.5809	28.4666	43.07	62.94	420.9	75.48	33.90	672.1	3150	11063
72.0	6384.731	-80.5795	28.4678	42.96	62.43	432.1	74.98	34.14	682.5	3346	11443
73.0	6385.119	-80.5781	28.4692	42.84	61.93	443.5	74.48	34.38	693.1	3549	11830
MAXIMUM DYNAMIC PRESSURE											
73.500	6385.315	-80.5774	28.4699	42.77	61.68	449.4	74.23	34.49	698.5	3654	12027
74.0	6385.514	-80.5766	28.4706	42.71	61.43	455.2	73.98	34.60	704.0	3762	12226
75.0	6385.918	-80.5751	28.4721	42.57	60.94	467.1	73.46	34.82	715.2	3983	12631
76.0	6386.331	-80.5735	28.4736	42.43	60.45	479.3	72.95	35.02	726.6	4214	13044
77.0	6386.752	-80.5718	28.4752	42.27	59.95	491.7	72.42	35.21	738.3	4455	13466
78.0	6387.182	-80.5701	28.4769	42.11	59.46	504.4	71.89	35.39	750.2	4705	13896
79.0	6387.621	-80.5683	28.4786	41.95	58.97	517.4	71.35	35.55	762.5	4966	14336
80.0	6388.069	-80.5665	28.4804	41.79	58.48	530.6	70.81	35.71	775.0	5237	14784
81.0	6388.526	-80.5645	28.4823	41.63	57.99	544.1	70.27	35.85	787.8	5519	15241
82.0	6388.992	-80.5626	28.4843	41.48	57.51	557.8	69.73	35.98	800.9	5811	15708
83.0	6389.467	-80.5605	28.4863	41.34	57.03	571.9	69.20	36.10	814.3	6116	16184
84.0	6389.951	-80.5584	28.4885	41.21	56.56	586.2	68.67	36.21	828.1	6432	16669
85.0	6390.445	-80.5561	28.4907	41.10	56.08	600.8	68.15	36.30	842.2	6759	17164
86.0	6390.949	-80.5539	28.4930	41.01	55.61	615.7	67.64	36.38	856.6	7100	17668
87.0	6391.461	-80.5515	28.4954	40.93	55.14	630.9	67.13	36.45	871.4	7452	18181
88.0	6391.984	-80.5490	28.4979	40.87	54.67	646.4	66.63	36.50	886.6	7818	18704
89.0	6392.516	-80.5465	28.5005	40.82	54.21	662.2	66.15	36.54	902.1	8197	19238
90.0	6393.058	-80.5439	28.5032	40.78	53.75	678.3	65.67	36.58	917.9	8589	19780
91.0	6393.610	-80.5412	28.5059	40.75	53.29	694.7	65.20	36.60	934.1	8996	20333
92.0	6394.172	-80.5383	28.5088	40.73	52.84	711.4	64.74	36.61	950.6	9417	20896
93.0	6394.744	-80.5354	28.5118	40.71	52.40	728.4	64.29	36.62	967.5	9852	21469

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
94.0	6395.326	-80.5324	28.5148	40.71	51.96	745.7	63.85	36.61	984.7	10302	22052
95.0	6395.919	-80.5293	28.5180	40.71	51.52	763.3	63.42	36.60	1002.3	10767	22646
96.0	6396.521	-80.5261	28.5213	40.71	51.09	781.3	63.00	36.58	1020.2	11248	23249
97.0	6397.135	-80.5228	28.5247	40.72	50.66	799.5	62.58	36.55	1038.4	11745	23864
98.0	6397.758	-80.5194	28.5282	40.74	50.24	818.1	62.18	36.51	1057.0	12258	24488
99.0	6398.392	-80.5158	28.5318	40.75	49.82	836.9	61.79	36.47	1075.9	12787	25123
100.0	6399.037	-80.5122	28.5355	40.77	49.41	856.1	61.40	36.41	1095.1	13333	25760
101.0	6399.692	-80.5084	28.5393	40.79	49.00	875.6	61.02	36.36	1114.7	13896	26426
102.0	6400.359	-80.5045	28.5433	40.81	48.59	895.5	60.65	36.30	1134.6	14477	27094
103.0	6401.036	-80.5005	28.5474	40.83	48.20	915.6	60.28	36.23	1154.9	15075	27772
104.0	6401.724	-80.4964	28.5515	40.84	47.80	936.1	59.92	36.16	1175.5	15692	28461
105.0	6402.423	-80.4922	28.5559	40.86	47.41	957.0	59.57	36.08	1196.4	16327	29162
106.0	6403.133	-80.4878	28.5603	40.87	47.03	978.1	59.22	36.00	1217.7	16981	29873
107.0	6403.854	-80.4833	28.5649	40.88	46.65	999.6	58.88	35.91	1239.3	17654	30596
108.0	6404.587	-80.4786	28.5696	40.89	46.27	1021.4	58.54	35.82	1261.2	18347	31330
109.0	6405.330	-80.4738	28.5744	40.90	45.90	1043.6	58.21	35.72	1283.6	19059	32075
110.0	6406.086	-80.4689	28.5794	40.91	45.53	1066.2	57.88	35.62	1306.2	19792	32832
111.0	6406.852	-80.4639	28.5845	40.91	45.17	1089.1	57.56	35.53	1329.3	20545	33600
112.0	6407.630	-80.4587	28.5898	40.91	44.82	1112.4	57.25	35.43	1352.7	21319	34380
113.0	6408.420	-80.4534	28.5952	40.91	44.47	1136.1	56.94	35.32	1376.5	22115	35172
114.0	6409.222	-80.4479	28.6008	40.91	44.14	1160.1	56.63	35.23	1400.6	22932	35975
115.0	6410.036	-80.4423	28.6065	40.90	43.81	1184.5	56.34	35.13	1425.1	23771	36791
116.0	6410.862	-80.4365	28.6123	40.90	43.49	1209.3	56.05	35.03	1450.0	24632	37619
117.0	6411.701	-80.4306	28.6183	40.90	43.17	1234.5	55.76	34.93	1475.2	25515	38459
118.0	6412.552	-80.4245	28.6245	40.89	42.86	1260.1	55.48	34.83	1500.9	26421	39312
119.0	6413.415	-80.4182	28.6308	40.89	42.56	1286.1	55.21	34.73	1527.0	27351	40177
120.0	6414.291	-80.4119	28.6373	40.89	42.26	1312.5	54.94	34.62	1553.5	28304	41056
121.0	6415.180	-80.4053	28.6439	40.89	41.96	1339.4	54.68	34.52	1580.4	29281	41947
122.0	6416.083	-80.3986	28.6507	40.89	41.67	1366.7	54.42	34.41	1607.8	30283	42851
123.0	6416.998	-80.3917	28.6577	40.89	41.39	1394.4	54.17	34.31	1635.6	31309	43769
124.0	6417.926	-80.3846	28.6648	40.88	41.11	1422.6	53.92	34.20	1663.9	32361	44700
125.0	6418.869	-80.3774	28.6722	40.89	40.83	1451.2	53.68	34.10	1692.6	33438	45644
126.0	6419.824	-80.3700	28.6797	40.89	40.56	1480.3	53.45	33.99	1721.8	34541	46602
127.0	6420.794	-80.3624	28.6873	40.89	40.29	1509.9	53.22	33.88	1751.5	35671	47574
128.0	6421.777	-80.3547	28.6952	40.89	40.03	1540.0	52.99	33.78	1781.7	36827	48560
129.0	6422.775	-80.3467	28.7032	40.89	39.78	1570.6	52.77	33.67	1812.4	38011	49560
130.0	6423.787	-80.3386	28.7115	40.89	39.52	1601.7	52.56	33.57	1843.6	39223	50575
131.0	6424.814	-80.3303	28.7199	40.89	39.27	1633.3	52.34	33.46	1875.3	40463	51604
132.0	6425.855	-80.3218	28.7285	40.90	39.03	1665.5	52.14	33.35	1907.6	41732	52648
133.0	6426.911	-80.3131	28.7374	40.90	38.79	1698.3	51.93	33.25	1940.4	43029	53707
134.0	6427.983	-80.3041	28.7464	40.90	38.55	1731.6	51.73	33.14	1973.9	44357	54782
135.0	6429.070	-80.2950	28.7556	40.90	38.32	1765.5	51.54	33.04	2007.9	45715	55871
136.0	6430.172	-80.2857	28.7650	40.91	38.09	1800.0	51.35	32.93	2042.5	47103	56977

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
137.0	6431.291	-80.2762	28.7747	40.91	37.86	1835.1	51.16	32.83	2077.7	48523	58098
138.0	6432.425	-80.2664	28.7845	40.91	37.64	1870.9	50.97	32.72	2113.5	49575	59236
139.0	6433.576	-80.2564	28.7946	40.92	37.42	1907.3	50.80	32.62	2150.0	51459	60390
140.0	6434.744	-80.2463	28.8049	40.92	37.21	1944.4	50.62	32.52	2187.2	52976	61561
	S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)										
140.720	6435.596	-80.2388	28.8125	40.92	37.06	1971.5	50.49	32.45	2214.3	54091	62415
141.0	6435.929	-80.2358	28.8155	40.92	37.00	1980.9	50.45	32.42	2223.8	54527	62749
142.0	6437.128	-80.2252	28.8262	40.93	36.80	2010.7	50.32	32.30	2253.8	56109	63952
143.0	6438.339	-80.2144	28.8371	40.94	36.60	2040.8	50.19	32.19	2284.0	57717	65167
144.0	6439.562	-80.2034	28.8482	40.94	36.40	2071.2	50.06	32.08	2314.6	59352	66393
145.0	6440.798	-80.1922	28.8595	40.95	36.21	2101.9	49.93	31.97	2345.6	61016	67633
146.0	6442.046	-80.1808	28.8710	40.95	36.02	2133.1	49.81	31.86	2376.9	62709	68885
147.0	6443.308	-80.1692	28.8827	40.96	35.84	2164.7	49.69	31.75	2408.7	64430	70149
148.0	6444.582	-80.1574	28.8946	40.97	35.65	2196.8	49.57	31.64	2440.9	66181	71427
149.0	6445.869	-80.1454	28.9067	40.98	35.47	2229.5	49.45	31.53	2473.8	67961	72718
150.0	6447.169	-80.1333	28.9190	40.98	35.29	2262.6	49.33	31.43	2507.1	69771	74022
151.0	6448.483	-80.1209	28.9315	40.99	35.11	2296.3	49.22	31.32	2540.9	71612	75340
152.0	6449.811	-80.1082	28.9442	41.00	34.94	2330.6	49.11	31.21	2575.4	73484	76672
153.0	6451.153	-80.0954	28.9571	41.01	34.76	2365.5	49.00	31.11	2610.5	75388	78018
154.0	6452.509	-80.0824	28.9702	41.01	34.59	2400.9	48.89	31.00	2646.1	77324	79378
155.0	6453.879	-80.0691	28.9836	41.02	34.42	2437.0	48.78	30.90	2682.3	79292	80753
156.0	6455.264	-80.0556	28.9971	41.03	34.25	2473.6	48.67	30.80	2719.1	81294	82142
157.0	6456.664	-80.0418	29.0110	41.04	34.09	2510.8	48.57	30.70	2756.4	83329	83546
158.0	6458.079	-80.0279	29.0250	41.04	33.92	2548.6	48.46	30.60	2794.3	85399	84966
	S-IC OUTBOARD ENGINE CUTOFF (ENGINES 1 AND 3)										
158.160	6458.307	-80.0256	29.0273	41.04	33.90	2554.7	48.44	30.58	2800.5	85734	85194
159.0	6459.504	-80.0137	29.0392	41.05	33.77	2565.3	48.41	30.48	2811.3	87497	86396
	S-IC/S-II SEPARATION COMMAND										
159.900	6460.783	-80.0009	29.0520	41.06	33.63	2560.5	48.42	30.34	2807.0	89388	87679
160.0	6460.924	-79.9995	29.0535	41.06	33.61	2560.0	48.42	30.33	2806.5	89597	87820
162.0	6463.744	-79.9711	29.0820	41.08	33.30	2549.4	48.44	30.03	2796.9	93805	90649
164.0	6466.528	-79.9427	29.1104	41.09	33.00	2544.8	48.45	29.75	2793.1	98007	93443
166.0	6469.291	-79.9141	29.1390	41.11	32.69	2548.8	48.43	29.47	2797.9	102223	96214
168.0	6472.036	-79.8855	29.1677	41.13	32.39	2554.9	48.41	29.20	2804.8	106460	98968
170.0	6474.766	-79.8566	29.1966	41.14	32.09	2562.1	48.39	28.94	2812.8	110722	101707
172.0	6477.481	-79.8275	29.2256	41.16	31.79	2570.1	48.36	28.68	2821.5	115007	104432
174.0	6480.182	-79.7983	29.2548	41.18	31.50	2578.3	48.34	28.42	2830.4	119319	107142

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
176.0	6482.870	-79.7689	29.2841	41.20	31.21	2586.6	48.32	28.17	2839.4	123655	109839
178.0	6485.544	-79.7392	29.3136	41.21	30.93	2595.2	48.29	27.92	2848.6	128018	112523
180.0	6488.205	-79.7094	29.3433	41.23	30.64	2603.9	48.27	27.67	2858.0	132406	115193
182.0	6490.852	-79.6794	29.3731	41.25	30.36	2612.8	48.25	27.42	2867.6	136820	117850
184.0	6493.487	-79.6492	29.4031	41.27	30.08	2621.9	48.23	27.18	2877.3	141260	120495
186.0	6496.109	-79.6188	29.4333	41.29	29.81	2631.1	48.20	26.94	2887.2	145726	123127
188.0	6498.719	-79.5882	29.4636	41.31	29.54	2640.6	48.18	25.70	2897.3	150219	125746
190.0	6501.317	-79.5574	29.4942	41.33	29.27	2650.2	48.16	26.47	2907.5	154738	128354
192.0	6503.902	-79.5263	29.5248	41.34	29.01	2659.9	48.14	26.23	2917.8	159283	130949
194.0	6506.476	-79.4951	29.5557	41.36	28.74	2669.8	48.12	26.00	2928.4	163856	133533
196.0	6509.038	-79.4637	29.5867	41.38	28.49	2679.9	48.10	25.78	2939.0	168455	136105
198.0	6511.589	-79.4321	29.6179	41.40	28.23	2690.2	48.08	25.55	2949.8	173080	138665
200.0	6514.129	-79.4002	29.6493	41.42	27.99	2700.5	48.07	25.34	2960.7	177733	141215
202.0	6516.658	-79.3682	29.6808	41.44	27.75	2711.0	48.05	25.14	2971.7	182412	143755
204.0	6519.178	-79.3360	29.7125	41.46	27.52	2721.6	48.03	24.94	2982.8	187118	146285
206.0	6521.689	-79.3035	29.7444	41.48	27.30	2732.3	48.02	24.74	2994.0	191850	148806
208.0	6524.190	-79.2709	29.7765	41.51	27.08	2743.2	48.00	24.55	3005.4	196609	151318
210.0	6526.683	-79.2380	29.8087	41.53	26.86	2754.2	47.99	24.36	3016.9	201394	153821
212.0	6529.167	-79.2049	29.8411	41.55	26.64	2765.5	47.97	24.17	3028.6	206206	156316
214.0	6531.643	-79.1717	29.8736	41.57	26.42	2776.9	47.96	23.97	3040.5	211045	158801
216.0	6534.109	-79.1382	29.9063	41.60	26.20	2788.4	47.95	23.79	3052.5	215911	161279
218.0	6536.567	-79.1045	29.9392	41.62	25.98	2800.1	47.93	23.60	3064.7	220806	163747
220.0	6539.017	-79.0705	29.9723	41.65	25.77	2812.0	47.92	23.41	3077.1	225728	166207
222.0	6541.457	-79.0364	30.0056	41.67	25.56	2824.1	47.91	23.22	3089.6	230678	168659
224.0	6543.890	-79.0020	30.0390	41.70	25.34	2836.3	47.90	23.04	3102.3	235656	171102
226.0	6546.313	-78.9674	30.0726	41.73	25.13	2848.7	47.89	22.85	3115.2	240663	173537
228.0	6548.729	-78.9325	30.1064	41.76	24.92	2861.3	47.89	22.67	3128.2	245699	175963
230.0	6551.136	-78.8975	30.1403	41.79	24.71	2874.1	47.88	22.49	3141.4	250764	178381
232.0	6553.535	-78.8622	30.1745	41.82	24.50	2887.0	47.87	22.30	3154.8	255858	180791
234.0	6555.925	-78.8266	30.2088	41.85	24.30	2900.1	47.86	22.12	3168.3	260982	183193
236.0	6558.308	-78.7908	30.2433	41.88	24.09	2913.4	47.86	21.94	3182.1	266136	185586
238.0	6560.682	-78.7548	30.2780	41.91	23.88	2926.8	47.85	21.76	3195.9	271320	187972
240.0	6563.048	-78.7185	30.3129	41.94	23.68	2940.5	47.85	21.59	3210.0	276534	190349
242.0	6565.406	-78.6820	30.3480	41.97	23.48	2954.3	47.84	21.41	3224.3	281779	192719
244.0	6567.756	-78.6452	30.3832	42.00	23.28	2968.3	47.84	21.23	3238.7	287055	195080
246.0	6570.098	-78.6082	30.4187	42.03	23.08	2982.4	47.84	21.06	3253.3	292362	197433
248.0	6572.432	-78.5709	30.4543	42.07	22.88	2996.8	47.83	20.89	3268.0	297700	199779
250.0	6574.758	-78.5334	30.4901	42.10	22.68	3011.3	47.83	20.71	3283.0	303071	202117
252.0	6577.076	-78.4955	30.5262	42.14	22.48	3026.0	47.83	20.54	3298.1	308473	204447
254.0	6579.387	-78.4575	30.5624	42.17	22.29	3040.9	47.83	20.37	3313.4	313907	206770
256.0	6581.690	-78.4191	30.5988	42.21	22.10	3055.9	47.83	20.20	3328.8	319374	209084
258.0	6583.985	-78.3805	30.6354	42.24	21.90	3071.2	47.83	20.03	3344.5	324873	211392
260.0	6586.272	-78.3416	30.6722	42.28	21.71	3086.6	47.83	19.87	3360.3	330406	213691

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
262.0	6588.552	-78.3025	30.7093	42.32	21.52	3102.2	47.83	19.70	3376.3	335972	215983
264.0	6590.825	-78.2630	30.7465	42.35	21.33	3118.0	47.83	19.53	3392.5	341571	218269
266.0	6593.090	-78.2233	30.7839	42.39	21.15	3134.0	47.84	19.37	3408.9	347204	220546
268.0	6595.347	-78.1833	30.8215	42.43	20.96	3150.2	47.84	19.21	3425.4	352872	222816
270.0	6597.598	-78.1430	30.8593	42.47	20.78	3166.6	47.84	19.05	3442.2	358573	225078
272.0	6599.841	-78.1024	30.8974	42.51	20.59	3183.1	47.85	18.89	3459.2	364310	227334
274.0	6602.077	-78.0615	30.9356	42.55	20.41	3199.9	47.85	18.73	3476.3	370082	229582
276.0	6604.305	-78.0203	30.9741	42.59	20.23	3216.8	47.86	18.57	3493.7	375888	231823
278.0	6606.526	-77.9788	31.0127	42.64	20.05	3234.0	47.87	18.41	3511.2	381731	234058
280.0	6608.741	-77.9370	31.0516	42.68	19.88	3251.3	47.88	18.25	3528.9	387610	236285
282.0	6610.948	-77.8949	31.0907	42.72	19.70	3268.9	47.88	18.10	3546.8	393524	238505
284.0	6613.148	-77.8525	31.1300	42.77	19.52	3286.6	47.89	17.95	3564.9	399475	240718
286.0	6615.342	-77.8098	31.1695	42.81	19.35	3304.5	47.90	17.79	3583.2	405464	242925
288.0	6617.528	-77.7667	31.2092	42.86	19.18	3322.7	47.91	17.64	3601.7	411489	245124
290.0	6619.708	-77.7233	31.2492	42.90	19.01	3341.0	47.92	17.49	3620.4	417551	247317
292.0	6621.880	-77.6796	31.2893	42.95	18.84	3359.5	47.94	17.34	3639.3	423652	249503
294.0	6624.046	-77.6356	31.3297	42.99	18.67	3378.3	47.95	17.19	3658.4	429791	251682
296.0	6626.205	-77.5912	31.3703	43.04	18.50	3397.2	47.96	17.04	3677.7	435967	253855
298.0	6628.358	-77.5465	31.4112	43.09	18.33	3416.4	47.98	16.90	3697.3	442183	256021
300.0	6630.504	-77.5015	31.4522	43.14	18.17	3435.7	47.99	16.75	3717.0	448438	258181
302.0	6632.643	-77.4561	31.4935	43.19	18.00	3455.3	48.00	16.61	3736.9	454732	260333
304.0	6634.776	-77.4103	31.5350	43.24	17.84	3475.1	48.02	16.46	3757.0	461066	262480
306.0	6636.902	-77.3642	31.5767	43.29	17.68	3495.1	48.04	16.32	3777.4	467440	264620
308.0	6639.021	-77.3178	31.6187	43.34	17.52	3515.3	48.05	16.18	3797.9	473854	266754
310.0	6641.135	-77.2710	31.6609	43.39	17.36	3535.8	48.07	16.04	3818.7	480310	268881
312.0	6643.242	-77.2238	31.7033	43.44	17.20	3556.4	48.09	15.90	3839.7	486806	271002
314.0	6645.342	-77.1762	31.7460	43.50	17.05	3576.4	48.11	15.76	3860.1	493344	273117
	S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)										
314.050	6645.394	-77.1750	31.7471	43.50	17.05	3576.9	48.11	15.76	3860.6	493508	273170
316.0	6647.434	-77.1283	31.7889	43.54	16.88	3593.8	48.13	15.61	3877.8	499919	275223
318.0	6649.516	-77.0801	31.8319	43.59	16.72	3609.7	48.15	15.46	3894.1	506528	277320
320.0	6651.588	-77.0316	31.8752	43.64	16.55	3625.8	48.17	15.32	3910.5	513170	279406
322.0	6653.648	-76.9828	31.9186	43.69	16.39	3642.1	48.20	15.17	3927.1	519845	281481
324.0	6655.698	-76.9337	31.9622	43.74	16.23	3658.5	48.22	15.02	3943.9	526554	283546
326.0	6657.738	-76.8842	32.0060	43.79	16.07	3675.1	48.24	14.88	3960.9	533296	285600
328.0	6659.766	-76.8345	32.0500	43.84	15.90	3691.9	48.27	14.73	3978.0	540073	287643
330.0	6661.784	-76.7844	32.0941	43.90	15.74	3708.9	48.30	14.59	3995.3	546884	289676
332.0	6663.792	-76.7340	32.1385	43.95	15.58	3726.0	48.32	14.44	4012.8	553730	291698
334.0	6665.788	-76.6832	32.1830	44.00	15.42	3743.3	48.35	14.30	4030.4	560611	293710
336.0	6667.774	-76.6321	32.2277	44.06	15.27	3760.8	48.37	14.16	4048.2	567527	295711
338.0	6669.749	-76.5807	32.2726	44.11	15.11	3778.4	48.40	14.02	4066.1	574478	297701

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
340.0	6671.714	-76.5289	32.3177	44.16	14.95	3796.2	48.43	13.88	4084.3	581465	299681
342.0	6673.667	-76.4768	32.3630	44.22	14.80	3814.2	48.46	13.74	4102.6	588488	301650
344.0	6675.610	-76.4244	32.4085	44.27	14.64	3832.3	48.49	13.60	4121.1	595547	303608
346.0	6677.542	-76.3716	32.4541	44.33	14.49	3850.7	48.52	13.46	4139.7	602643	305556
348.0	6679.464	-76.3184	32.5000	44.39	14.33	3869.2	48.55	13.32	4158.6	609776	307493
350.0	6681.374	-76.2649	32.5460	44.44	14.18	3887.9	48.58	13.18	4177.6	616946	309419
352.0	6683.273	-76.2110	32.5923	44.50	14.03	3906.8	48.61	13.04	4196.8	624154	311334
354.0	6685.162	-76.1568	32.6387	44.56	13.88	3925.8	48.64	12.90	4216.2	631399	313238
356.0	6687.040	-76.1021	32.6854	44.62	13.73	3945.1	48.68	12.77	4235.7	638682	315132
358.0	6688.907	-76.0471	32.7322	44.68	13.58	3964.5	48.71	12.63	4255.5	646004	317014
360.0	6690.762	-75.9918	32.7793	44.74	13.43	3984.1	48.74	12.50	4275.4	653364	318886
362.0	6692.607	-75.9360	32.8265	44.80	13.28	4003.9	48.78	12.36	4295.5	660764	320747
364.0	6694.441	-75.8799	32.8740	44.86	13.13	4023.9	48.81	12.23	4315.8	668202	322597
366.0	6696.264	-75.8233	32.9216	44.92	12.99	4044.1	48.85	12.10	4336.3	675680	324437
368.0	6698.076	-75.7664	32.9695	44.99	12.84	4064.4	48.88	11.97	4357.0	683198	326265
370.0	6699.878	-75.7091	33.0175	45.05	12.70	4085.0	48.92	11.83	4377.9	690756	328083
372.0	6701.668	-75.6514	33.0658	45.11	12.55	4105.7	48.96	11.70	4398.9	698355	329889
374.0	6703.447	-75.5932	33.1142	45.17	12.41	4126.7	48.99	11.57	4420.2	705995	331685
376.0	6705.214	-75.5347	33.1629	45.24	12.27	4147.8	49.03	11.44	4441.6	713676	333469
378.0	6706.971	-75.4757	33.2118	45.30	12.12	4169.2	49.07	11.31	4463.3	721398	335243
380.0	6708.717	-75.4163	33.2609	45.37	11.98	4190.7	49.11	11.19	4485.1	729162	337005
382.0	6710.451	-75.3565	33.3102	45.43	11.84	4212.5	49.15	11.06	4507.1	736968	338757
384.0	6712.175	-75.2963	33.3597	45.50	11.70	4234.4	49.19	10.93	4529.4	744817	340497
386.0	6713.887	-75.2356	33.4094	45.56	11.56	4256.6	49.23	10.80	4551.8	752709	342226
388.0	6715.588	-75.1745	33.4594	45.63	11.43	4278.9	49.27	10.68	4574.4	760644	343945
390.0	6717.278	-75.1130	33.5095	45.69	11.29	4301.4	49.31	10.55	4597.3	768622	345652
392.0	6718.956	-75.0510	33.5599	45.76	11.15	4324.2	49.36	10.43	4620.3	776644	347347
394.0	6720.623	-74.9886	33.6105	45.83	11.02	4347.2	49.40	10.31	4643.6	784711	349032
396.0	6722.279	-74.9257	33.6613	45.90	10.88	4370.4	49.44	10.18	4667.1	792822	350705
398.0	6723.924	-74.8623	33.7123	45.97	10.75	4393.8	49.49	10.06	4690.8	800978	352367
400.0	6725.557	-74.7985	33.7636	46.04	10.61	4417.4	49.53	9.94	4714.7	809179	354018
402.0	6727.178	-74.7342	33.8150	46.11	10.48	4441.2	49.58	9.82	4738.8	817426	355658
404.0	6728.789	-74.6695	33.8667	46.18	10.35	4465.0	49.62	9.70	4762.8	825718	357286
406.0	6730.386	-74.6043	33.9186	46.24	10.22	4485.7	49.67	9.58	4783.8	834054	358901
408.0	6731.971	-74.5386	33.9707	46.31	10.09	4506.4	49.71	9.45	4804.8	842429	360504
410.0	6733.543	-74.4726	34.0229	46.38	9.95	4527.2	49.76	9.33	4825.8	850845	362094
412.0	6735.102	-74.4061	34.0754	46.45	9.82	4548.2	49.80	9.21	4847.0	859301	363671
414.0	6736.646	-74.3391	34.1280	46.51	9.69	4569.4	49.85	9.09	4868.5	867798	365234
416.0	6738.178	-74.2718	34.1808	46.58	9.56	4590.6	49.90	8.97	4890.0	876335	366784
418.0	6739.696	-74.2040	34.2338	46.65	9.43	4612.0	49.95	8.85	4911.7	884913	368320
420.0	6741.201	-74.1357	34.2870	46.72	9.30	4633.6	50.00	8.73	4933.5	893533	369844
422.0	6742.692	-74.0670	34.3404	46.79	9.18	4655.4	50.05	8.61	4955.5	902194	371354
424.0	6744.170	-73.9978	34.3940	46.86	9.05	4677.3	50.10	8.50	4977.7	910897	372850

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
426.0	6745.634	-73.9281	34.4477	46.94	8.92	4699.4	50.15	8.38	5000.1	919642	374333
428.0	6747.084	-73.8580	34.5017	47.01	8.79	4721.7	50.20	8.26	5022.7	928430	375802
430.0	6748.520	-73.7875	34.5558	47.08	8.66	4744.2	50.25	8.14	5045.4	937260	377257
432.0	6749.943	-73.7164	34.6101	47.15	8.54	4766.9	50.30	8.03	5068.3	946134	378698
434.0	6751.352	-73.6449	34.6647	47.23	8.42	4789.8	50.35	7.91	5091.4	955051	380126
436.0	6752.747	-73.5729	34.7194	47.30	8.29	4812.9	50.41	7.80	5114.8	964012	381541
438.0	6754.129	-73.5004	34.7743	47.37	8.17	4836.1	50.46	7.69	5138.3	973017	382942
440.0	6755.497	-73.4274	34.8294	47.45	8.05	4859.6	50.51	7.58	5162.0	982066	384330
442.0	6756.852	-73.3539	34.8847	47.52	7.93	4883.2	50.57	7.47	5185.8	991160	385704
444.0	6758.193	-73.2799	34.9402	47.60	7.81	4907.1	50.62	7.36	5209.9	1000299	387064
446.0	6759.521	-73.2054	34.9958	47.67	7.70	4931.1	50.67	7.25	5234.2	1009484	388412
448.0	6760.835	-73.1303	35.0517	47.75	7.58	4955.3	50.73	7.14	5258.6	1018714	389745
450.0	6762.135	-73.0548	35.1078	47.83	7.46	4979.8	50.79	7.03	5283.3	1027990	391065
452.0	6763.421	-72.9787	35.1641	47.90	7.34	5004.4	50.84	6.92	5308.2	1037313	392371
454.0	6764.694	-72.9021	35.2205	47.98	7.23	5029.3	50.90	6.81	5333.2	1046682	393664
456.0	6765.952	-72.8250	35.2772	48.06	7.11	5054.3	50.96	6.71	5358.5	1056099	394942
458.0	6767.196	-72.7473	35.3341	48.14	6.99	5079.6	51.02	6.60	5384.0	1065563	396206
460.0	6768.426	-72.6691	35.3912	48.22	6.88	5105.0	51.08	6.49	5409.7	1075075	397456
462.0	6769.642	-72.5904	35.4484	48.30	6.76	5130.7	51.14	6.38	5435.6	1084635	398692
464.0	6770.842	-72.5110	35.5059	48.38	6.65	5156.6	51.20	6.27	5461.7	1094244	399913
466.0	6772.029	-72.4311	35.5636	48.46	6.53	5182.8	51.26	6.17	5488.1	1103902	401120
468.0	6773.200	-72.3507	35.6215	48.54	6.42	5209.1	51.32	6.06	5514.6	1113609	402312
470.0	6774.357	-72.2697	35.6796	48.62	6.30	5235.7	51.38	5.95	5541.4	1123366	403489
472.0	6775.498	-72.1881	35.7379	48.71	6.19	5262.4	51.44	5.85	5568.4	1133174	404651
474.0	6776.625	-72.1059	35.7964	48.79	6.07	5289.4	51.51	5.74	5595.6	1143032	405799
476.0	6777.737	-72.0231	35.8551	48.87	5.96	5316.7	51.57	5.63	5623.0	1152940	406931
478.0	6778.833	-71.9397	35.9140	48.96	5.85	5344.1	51.64	5.53	5650.7	1162901	408048
480.0	6779.914	-71.8557	35.9731	49.04	5.73	5371.8	51.70	5.42	5678.6	1172913	409150
482.0	6780.979	-71.7711	36.0324	49.13	5.62	5399.8	51.77	5.32	5706.8	1182977	410236
484.0	6782.029	-71.6858	36.0919	49.22	5.51	5427.9	51.84	5.21	5735.1	1193094	411308
486.0	6783.063	-71.6000	36.1517	49.30	5.40	5456.3	51.90	5.11	5763.7	1203264	412363
488.0	6784.082	-71.5135	36.2116	49.39	5.29	5484.9	51.97	5.00	5792.6	1213487	413403
490.0	6785.084	-71.4264	36.2717	49.48	5.17	5513.8	52.04	4.90	5821.6	1223764	414427
492.0	6786.071	-71.3386	36.3321	49.57	5.06	5543.0	52.11	4.80	5851.0	1234096	415435
494.0	6787.041	-71.2502	36.3927	49.66	4.95	5572.3	52.18	4.69	5880.5	1244483	416426
496.0	6787.994	-71.1611	36.4535	49.75	4.84	5601.9	52.25	4.59	5910.4	1254924	417402
498.0	6788.932	-71.0714	36.5145	49.84	4.73	5631.8	52.32	4.48	5940.4	1265422	418361
500.0	6789.852	-70.9809	36.5757	49.93	4.62	5661.9	52.39	4.38	5970.8	1275975	419303
502.0	6790.756	-70.8898	36.6371	50.02	4.51	5692.3	52.47	4.28	6001.3	1286585	420229
504.0	6791.643	-70.7981	36.6987	50.11	4.40	5723.0	52.54	4.18	6032.2	1297252	421138
506.0	6792.513	-70.7056	36.7606	50.21	4.29	5753.9	52.61	4.07	6063.3	1307977	422030
508.0	6793.366	-70.6124	36.8226	50.30	4.19	5785.1	52.69	3.97	6094.7	1318759	422905
510.0	6794.202	-70.5185	36.8849	50.40	4.08	5816.5	52.76	3.87	6126.3	1329600	423764

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
512.0	6795.020	-70.4239	36.9474	50.49	3.97	5848.3	52.84	3.77	6158.2	1340501	424604
514.0	6795.821	-70.3285	37.0101	50.59	3.86	5880.3	52.92	3.67	6190.4	1351460	425428
516.0	6796.604	-70.2324	37.0730	50.68	3.75	5912.6	53.00	3.57	6222.9	1362480	426233
518.0	6797.370	-70.1356	37.1361	50.78	3.65	5945.2	53.07	3.47	6255.7	1373560	427022
520.0	6798.117	-70.0380	37.1995	50.88	3.54	5978.1	53.15	3.37	6288.8	1384702	427792
522.0	6798.846	-69.9397	37.2631	50.98	3.43	6011.2	53.23	3.26	6322.1	1395904	428544
524.0	6799.557	-69.8406	37.3268	51.08	3.33	6044.7	53.31	3.16	6355.8	1407169	429278
526.0	6800.250	-69.7407	37.3908	51.18	3.22	6078.5	53.39	3.06	6389.7	1418497	429993
528.0	6800.924	-69.6400	37.4551	51.28	3.12	6112.5	53.48	2.96	6424.0	1429888	430691
530.0	6801.579	-69.5385	37.5195	51.38	3.01	6146.9	53.56	2.87	6458.5	1441343	431369
532.0	6802.215	-69.4363	37.5842	51.48	2.91	6181.6	53.64	2.77	6493.4	1452862	432028
534.0	6802.832	-69.3332	37.6491	51.58	2.80	6216.6	53.73	2.67	6528.6	1464446	432669
536.0	6803.430	-69.2293	37.7142	51.69	2.70	6252.0	53.81	2.57	6564.1	1476095	433290
538.0	6804.008	-69.1245	37.7795	51.79	2.59	6287.6	53.90	2.47	6599.9	1487811	433892
540.0	6804.567	-69.0189	37.8450	51.89	2.49	6323.6	53.98	2.37	6636.1	1499593	434475
542.0	6805.106	-68.9125	37.9108	52.00	2.38	6360.0	54.07	2.27	6672.6	1511443	435037
544.0	6805.625	-68.8052	37.9768	52.11	2.28	6396.7	54.16	2.17	6709.5	1523360	435580
546.0	6806.123	-68.6970	38.0430	52.21	2.18	6433.7	54.25	2.07	6746.7	1535347	436103
548.0	6806.602	-68.5879	38.1094	52.32	2.07	6471.1	54.34	1.98	6784.2	1547402	436605
550.0	6807.059	-68.4780	38.1761	52.43	1.97	6508.9	54.43	1.88	6822.2	1559528	437087
552.0	6807.497	-68.3671	38.2430	52.54	1.87	6547.1	54.52	1.78	6860.5	1571724	437549
554.0	6807.913	-68.2553	38.3101	52.65	1.77	6585.6	54.62	1.69	6899.1	1583991	437989
556.0	6808.308	-68.1426	38.3774	52.76	1.66	6624.4	54.71	1.59	6938.2	1596331	438409
558.0	6808.682	-68.0289	38.4449	52.88	1.56	6663.7	54.80	1.49	6977.6	1608743	438808
560.0	6809.035	-67.9143	38.5127	52.99	1.46	6703.3	54.90	1.40	7017.4	1621228	439185
562.0	6809.366	-67.7987	38.5807	53.10	1.36	6743.4	55.00	1.30	7057.6	1633788	439541
564.0	6809.675	-67.6822	38.6489	53.22	1.26	6783.9	55.09	1.20	7098.2	1646422	439874
566.0	6809.961	-67.5647	38.7174	53.33	1.16	6824.7	55.19	1.11	7139.2	1659132	440186
568.0	6810.226	-67.4461	38.7861	53.45	1.06	6866.0	55.29	1.01	7180.6	1671919	440476
570.0	6810.467	-67.3266	38.8550	53.57	0.95	6907.6	55.39	0.91	7222.4	1684782	440742
572.0	6810.685	-67.2060	38.9241	53.69	0.85	6949.6	55.49	0.81	7264.5	1697723	440985
574.0	6810.878	-67.0844	38.9934	53.81	0.74	6992.0	55.59	0.71	7307.0	1710743	441203
576.0	6811.045	-66.9617	39.0630	53.93	0.63	7034.8	55.70	0.60	7350.0	1723842	441396
578.0	6811.188	-66.8380	39.1328	54.05	0.53	7078.3	55.80	0.51	7393.6	1737021	441564
580.0	6811.306	-66.7131	39.2028	54.17	0.43	7122.3	55.91	0.41	7437.8	1750282	441708
582.0	6811.400	-66.5872	39.2731	54.29	0.33	7166.9	56.01	0.32	7482.5	1763625	441828
584.0	6811.471	-66.4602	39.3436	54.42	0.23	7212.0	56.12	0.22	7527.7	1777051	441925
586.0	6811.519	-66.3320	39.4143	54.54	0.14	7257.6	56.22	0.14	7573.4	1790562	441998
588.0	6811.544	-66.2027	39.4853	54.66	0.06	7303.6	56.33	0.05	7619.6	1804158	442050
	S-II GUIDANCE CUTOFF SIGNAL										
588.960	6811.549	-66.1403	39.5194	54.72	0.01	7325.9	56.38	0.01	7641.9	1810715	442067

TABLE B-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
590.0	6811.549	-66.0723	39.5564	54.78	0.00	7331.5	56.43	0.00	7647.6	1817635	442081
	S-II/OWS SEPARATION COMMAND										
591.100	6811.550	-66.0004	39.5955	54.83	0.00	7332.2	56.48	0.00	7648.2	1825364	442096
592.0	6811.551	-65.9415	39.6275	54.87	0.00	7332.7	56.52	0.00	7648.7	1831525	442109
594.0	6811.549	-65.8104	39.6984	54.96	-0.01	7333.4	56.60	-0.01	7649.4	1845219	442133
596.0	6811.547	-65.6790	39.7691	55.06	-0.01	7333.3	56.69	-0.01	7649.4	1858914	442157
598.0	6811.546	-65.5473	39.8397	55.15	-0.01	7333.3	56.78	-0.01	7649.4	1872608	442181
	ORBIT INSERTION										
598.960	6811.545	-65.4839	39.8735	55.20	-0.01	7333.2	56.83	-0.01	7649.3	1879182	442193

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
ORBIT INSERTION								
598.960	6811.545	-65.4839	39.8735	40.0506	56.83	-0.01	7649.3	442.193
600.0	6811.544	-65.4153	39.9101	40.0873	56.87	-0.01	7649.3	442.205
650.0	6811.478	-62.0190	41.6133	41.7920	59.23	-0.00	7649.1	442.769
700.0	6811.455	-58.4352	43.1974	43.3770	61.80	-0.00	7648.8	443.335
750.0	6811.438	-54.6579	44.6496	44.8294	64.57	-0.00	7648.6	443.859
800.0	6811.429	-50.6866	45.9560	46.1357	67.54	-0.00	7648.3	444.337
850.0	6811.428	-46.5263	47.1027	47.2820	70.72	0.00	7648.1	444.764
900.0	6811.436	-42.1886	48.0761	48.2548	74.08	0.00	7647.8	445.134
PAYLOAD SHROUD JETTISON								
920.400	6811.428	-40.3720	48.4204	48.5989	75.50	0.00	7647.7	445.252
950.0	6811.454	-37.6928	48.8634	49.0415	77.61	0.00	7647.7	445.443
INITIATE ATM DEPLOYMENT								
999.100	6811.449	-33.1501	49.4445	49.6221	81.20	0.00	7647.5	445.652
1000.0	6811.482	-33.0659	49.4534	49.6309	81.27	0.00	7647.6	445.689
1050.0	6811.519	-28.3421	49.8372	50.0143	85.03	0.01	7647.4	445.867
1100.0	6811.566	-23.5614	50.0087	50.1856	88.86	0.01	7647.3	445.977
1150.0	6811.622	-18.7676	49.9650	50.1421	92.70	0.01	7647.2	446.017
1200.0	6811.688	-14.0051	49.7070	49.8843	96.50	0.01	7647.2	445.988
1250.0	6811.763	-9.3164	49.2389	49.4166	100.23	0.01	7647.2	445.890
1300.0	6811.846	-4.7394	48.5678	48.7462	103.84	0.01	7647.2	445.726
1350.0	6811.938	-0.3054	47.7039	47.8828	107.30	0.01	7647.3	445.497
1400.0	6812.037	3.9616	46.6589	46.8384	110.59	0.02	7647.3	445.208
1450.0	6812.142	8.0456	45.4462	45.6260	113.69	0.02	7647.4	444.861
INITIATE ATM SOLAR ARRAY DEPLOYMENT								
1492.300	6812.165	11.3509	44.299[illegible]	44.4792	116.15	0.02	7647.5	444.456
1500.0	6812.252	11.9376	44.0795	44.2592	116.58	0.02	7647.6	444.461
1550.0	6812.366	15.6352	42.5727	42.7519	119.27	0.02	7647.8	444.013
1600.0	6812.483	19.1410	40.9394	41.1176	121.74	0.02	7647.9	443.524
1650.0	6812.601	22.4613	39.1927	39.3690	124.02	0.02	7648.1	442.999
1700.0	6812.720	25.6055	37.3445	37.5182	126.10	0.02	7648.4	442.447
1750.0	6812.838	28.5847	35.4062	35.5763	128.00	0.02	7648.6	441.873
1800.0	6812.953	31.4111	33.3879	33.5534	129.72	0.02	7648.8	441.285
1850.0	6813.066	34.0972	31.2989	31.4589	131.27	0.02	7649.0	440.692
1900.0	6813.173	36.6559	29.1477	29.3011	132.66	0.02	7649.3	440.099

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
1950.0	6813.275	39.0996	26.9419	27.0875	133.91	0.01	7649.5	439.516
2000.0	6813.369	41.4402	24.6882	24.8251	135.03	0.01	7649.7	438.948
2050.0	6813.454	43.6894	22.3928	22.5199	136.01	0.01	7649.9	438.404
2100.0	6813.529	45.8581	20.0615	20.1777	136.88	0.01	7650.2	437.890
2150.0	6813.593	47.9566	17.6991	17.8036	137.62	0.01	7650.4	437.413
2200.0	6813.646	49.9947	15.3104	15.4024	138.27	0.01	7650.5	436.977
2250.0	6813.685	51.9819	12.8997	12.9783	138.80	0.00	7650.7	436.590
2300.0	6813.711	53.9270	10.4709	10.5355	139.24	0.00	7650.9	436.255
2350.0	6813.723	55.8385	8.0278	8.0778	139.58	0.00	7651.0	435.976
2400.0	6813.720	57.7245	5.5740	5.6089	139.83	-0.00	7651.1	435.757
2450.0	6813.702	59.5930	3.1127	3.1323	139.99	-0.00	7651.2	435.599
2500.0	6813.669	61.4519	0.6473	0.6513	140.06	-0.01	7651.3	435.506
2550.0	6813.621	63.3088	-1.8190	-1.8305	140.04	-0.01	7651.3	435.477
2600.0	6813.559	65.1714	-4.2830	-4.3099	139.93	-0.01	7651.3	435.512
2650.0	6813.481	67.0474	-6.7413	-6.7834	139.72	-0.01	7651.3	435.612
2700.0	6813.390	68.9447	-9.1907	-9.2477	139.43	-0.01	7651.3	435.772
2750.0	6813.286	70.8713	-11.6277	-11.6990	139.04	-0.02	7651.3	435.993
2800.0	6813.168	72.8355	-14.0488	-14.1338	138.56	-0.02	7651.2	436.268
2850.0	6813.039	74.8462	-16.4499	-16.5480	137.97	-0.02	7651.1	436.596
2900.0	6812.900	76.9122	-18.8271	-18.9374	137.28	-0.02	7651.0	436.971
2950.0	6812.750	79.0433	-21.1759	-21.2974	136.48	-0.02	7650.9	437.387
3000.0	6812.593	81.2495	-23.4913	-23.6233	135.56	-0.02	7650.8	437.839
3050.0	6812.428	83.5414	-25.7682	-25.9094	134.52	-0.03	7650.6	438.320
3100.0	6812.259	85.9303	-28.0006	-28.1501	133.34	-0.03	7650.5	438.824
3150.0	6812.085	88.4281	-30.1820	-30.3387	132.02	-0.03	7650.3	439.344
3200.0	6811.909	91.0469	-32.3052	-32.4680	130.55	-0.03	7650.2	439.872
3250.0	6811.732	93.7993	-34.3623	-34.5302	128.92	-0.03	7650.0	440.401
3300.0	6811.556	96.6982	-36.3444	-36.5164	127.12	-0.03	7649.9	440.924
3350.0	6811.382	99.7560	-38.2418	-38.4169	125.13	-0.03	7649.7	441.434
3400.0	6811.213	102.9845	-40.0437	-40.2210	122.96	-0.03	7649.6	441.924
3450.0	6811.049	106.3941	-41.7384	-41.9172	120.58	-0.02	7649.5	442.386
3500.0	6810.892	109.9928	-43.3135	-43.4931	118.01	-0.02	7649.3	442.814
3550.0	6810.743	113.7855	-44.7555	-44.9354	115.22	-0.02	7649.2	443.203
3600.0	6810.603	117.7723	-46.0507	-46.2305	112.23	-0.02	7649.2	443.547
3650.0	6810.475	121.9479	-47.1852	-47.3644	109.04	-0.02	7649.1	443.841
3700.0	6810.358	126.2999	-48.1452	-48.3239	105.66	-0.02	7649.0	444.081
3750.0	6810.254	130.8086	-48.9181	-49.0962	102.12	-0.01	7649.0	444.263
3800.0	6810.163	135.4462	-49.4928	-49.6703	98.44	-0.01	7649.0	444.384
3850.0	6810.086	140.1782	-49.8606	-50.0377	94.67	-0.01	7649.0	444.443
3900.0	6810.024	144.9639	-50.0155	-50.1925	90.84	-0.01	7649.1	444.437
3950.0	6809.975	149.7594	-49.9550	-50.1321	87.01	-0.01	7649.1	444.366
4000.0	6809.941	154.5204	-49.6802	-49.8576	83.20	-0.00	7649.2	444.231
4050.0	6809.921	159.2044	-49.1954	-49.3732	79.48	-0.00	7649.3	444.033

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
4100.0	6809.916	163.7741	-48.5082	-48.6866	75.88	0.00	7649.5	443.774
4150.0	6809.925	168.1984	-47.6287	-47.8077	72.42	0.00	7649.6	443.457
4200.0	6809.948	172.4540	-46.5690	-46.7486	69.15	0.00	7649.8	443.085
4250.0	6809.984	176.5255	-45.3424	-45.5222	66.07	0.01	7650.0	442.664
4300.0	6810.032	-179.5956	-43.9627	-44.1425	63.19	0.01	7650.2	442.197
4350.0	6810.092	-175.9113	-42.4438	-42.6231	60.52	0.01	7650.4	441.691
4400.0	6810.161	-172.4187	-40.7994	-40.9775	58.06	0.01	7650.6	441.151
4450.0	6810.240	-169.1111	-39.0424	-39.2186	55.79	0.01	7650.9	440.584
4500.0	6810.327	-165.9789	-37.1848	-37.3583	53.73	0.01	7651.1	439.997
4550.0	6810.421	-163.0109	-35.2378	-35.4076	51.85	0.01	7651.4	439.397
4600.0	6810.520	-160.1950	-33.2115	-33.3767	50.14	0.02	7651.6	438.792
4650.0	6810.624	-157.5183	-31.1153	-31.2748	48.60	0.02	7651.8	438.189
4700.0	6810.654	-154.9678	-28.9570	-29.1098	47.22	0.01	7652.1	437.519
4750.0	6810.753	-152.5318	-26.7450	-26.8899	45.98	0.01	7652.4	436.935
4800.0	6810.853	-150.1979	-24.4856	-24.6217	44.88	0.01	7652.6	436.375
4850.0	6810.952	-147.9547	-22.1850	-22.3112	43.90	0.01	7652.8	435.848
4900.0	6811.048	-145.7911	-19.8488	-19.9641	43.05	0.01	7653.0	435.358
4950.0	6811.141	-143.6969	-17.4821	-17.5856	42.31	0.01	7653.1	434.914
5000.0	6811.230	-141.6622	-15.0894	-15.1802	41.68	0.01	7653.3	434.520
5050.0	6811.313	-139.6778	-12.6751	-12.7525	41.15	0.01	7653.4	434.181
5100.0	6811.390	-137.7348	-10.2431	-10.3064	40.72	0.01	7653.5	433.903
5150.0	6811.460	-135.8247	-7.7972	-7.8458	40.39	0.01	7653.6	433.689
5200.0	6811.522	-133.9394	-5.3408	-5.3743	40.15	0.01	7653.6	433.542
5250.0	6811.576	-132.0708	-2.8774	-2.8955	40.00	0.01	7653.6	433.464
5300.0	6811.622	-130.2113	-0.4102	-0.4128	39.94	0.01	7653.6	433.457
5350.0	6811.659	-128.3530	2.0575	2.0705	39.97	0.00	7653.5	433.521
5400.0	6811.687	-126.4884	4.5225	4.5509	40.09	0.00	7653.4	433.655
5450.0	6811.707	-124.6096	6.9815	7.0250	40.30	0.00	7653.3	433.858
5500.0	6811.717	-122.7088	9.4311	9.4895	40.60	0.00	7653.2	434.128
5550.0	6811.720	-120.7779	11.8679	11.9406	41.00	-0.00	7653.0	434.463
5600.0	6811.715	-118.8086	14.2882	14.3746	41.49	-0.00	7652.8	434.858
5650.0	6811.703	-116.7920	16.6882	16.7875	42.09	-0.00	7652.6	435.308
5700.0	6811.685	-114.7191	19.0637	19.1751	42.79	-0.00	7652.3	435.810
5750.0	6811.660	-112.5802	21.4101	21.5328	43.60	-0.00	7652.0	436.356
5800.0	6811.631	-110.3653	23.7227	23.8556	44.54	-0.00	7651.8	436.941
5850.0	6811.599	-108.0635	25.9959	26.1381	45.60	-0.01	7651.5	437.557
5900.0	6811.563	-105.6636	28.2240	28.3743	46.79	-0.01	7651.2	438.198
5950.0	6811.526	-103.1538	30.4003	30.5576	48.12	-0.01	7650.9	438.856
6000.0	6811.488	-100.5217	32.5175	32.6809	49.61	-0.01	7650.5	439.523
6050.0	6811.451	-97.7547	34.5676	34.7360	51.26	-0.01	7650.2	440.192
6100.0	6811.416	-94.8401	36.5417	36.7140	53.08	-0.01	7649.9	440.855
6150.0	6811.384	-91.7655	38.4300	38.6053	55.08	-0.00	7649.6	441.504
6200.0	6811.356	-88.5191	40.2215	40.3990	57.27	-0.00	7649.3	442.132

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
6250.0	6811.333	-85.0910	41.9046	42.0835	59.67	-0.00	7649.0	442.732
6300.0	6811.316	-81.4732	43.4666	43.6463	62.27	-0.00	7648.8	443.296
6350.0	6811.306	-77.6615	44.8943	45.0741	65.07	-0.00	7648.5	443.819
6400.0	6811.304	-73.6560	46.1736	46.3533	68.09	0.00	7648.2	444.294
6450.0	6811.310	-69.4630	47.2908	47.4700	71.30	0.00	7648.0	444.715
6500.0	6811.324	-65.0954	48.2323	48.4109	74.69	0.00	7647.8	445.080
6550.0	6811.348	-60.5739	48.9856	49.1636	78.24	0.00	7647.7	445.382
6600.0	6811.382	-55.9268	49.5398	49.7173	81.93	0.01	7647.5	445.620
6650.0	6811.425	-51.1894	49.8865	50.0636	85.71	0.01	7647.4	445.791
6700.0	6811.478	-46.4028	50.0201	50.1970	89.54	0.01	7647.3	445.893
6750.0	6811.540	-41.6109	49.9384	50.1154	93.37	0.01	7647.3	445.925
6800.0	6811.611	-36.8580	49.6428	49.8202	97.17	0.01	7647.2	445.887
6850.0	6811.691	-32.1860	49.1381	49.3159	100.88	0.01	7647.2	445.781
6900.0	6811.779	-27.6318	48.4320	48.6105	104.47	0.01	7647.3	445.608
6950.0	6811.875	-23.2255	47.5351	47.7141	107.90	0.01	7647.3	445.371
7000.0	6811.977	-18.9896	46.4594	46.6389	111.16	0.02	7647.4	445.073
7050.0	6812.085	-14.9389	45.2182	45.3981	114.22	0.02	7647.5	444.719
7100.0	6812.199	-11.0810	43.8256	44.0053	117.07	0.02	7647.7	444.312
7150.0	6812.315	-7.4175	42.2953	42.4745	119.72	0.02	7647.8	443.859
7200.0	6812.435	-3.9450	40.6410	40.8188	122.16	0.02	7648.0	443.365
7250.0	6812.555	-0.6565	38.8753	39.0512	124.41	0.02	7648.2	442.838
7300.0	6812.676	2.4578	37.0102	37.1833	126.45	0.02	7648.4	442.282
7350.0	6812.795	5.4090	35.0569	35.2262	128.32	0.02	7648.6	441.707
7400.0	6812.911	8.2097	33.0253	33.1899	130.00	0.02	7648.9	441.119
7450.0	6813.024	10.8723	30.9246	31.0835	131.53	0.02	7649.1	440.526
7500.0	6813.131	13.4097	28.7631	28.9151	132.90	0.02	7649.3	439.935
7550.0	6813.231	15.8343	26.5481	26.6923	134.12	0.01	7649.6	439.353
7600.0	6813.323	18.1579	24.2865	24.4218	135.21	0.01	7649.8	438.789
7650.0	6813.406	20.3920	21.9843	22.1095	136.18	0.01	7650.0	438.249
7700.0	6813.478	22.5474	19.6469	19.7612	137.02	0.01	7650.2	437.740
7750.0	6813.539	24.6345	17.2795	17.3819	137.75	0.01	7650.4	437.269
7800.0	6813.588	26.6629	14.8865	14.9761	138.37	0.01	7650.6	436.840
7850.0	6813.623	28.6420	12.4722	12.5483	138.89	0.00	7650.8	436.459
7900.0	6813.645	30.5804	10.0405	10.1025	139.31	0.00	7650.9	436.132
7950.0	6813.652	32.4867	7.5951	7.6425	139.63	-0.00	7651.1	435.861
8000.0	6813.644	34.3691	5.1396	5.1718	139.87	-0.00	7651.2	435.650
8050.0	6813.620	36.2353	2.6772	2.6941	140.01	-0.00	7651.3	435.501
8100.0	6813.582	38.0932	0.2113	0.2127	140.06	-0.01	7651.3	435.416
8150.0	6813.528	39.9505	-2.2549	-2.2691	140.02	-0.01	7651.4	435.395
8200.0	6813.459	41.8149	-4.7182	-4.7478	139.90	-0.01	7651.4	435.439
8250.0	6813.376	43.6940	-7.1753	-7.2201	139.68	-0.01	7651.4	435.545
8300.0	6813.278	45.5958	-9.6229	-9.6824	139.37	-0.02	7651.4	435.713
8350.0	6813.167	47.5285	-12.0574	-12.1312	138.97	-0.02	7651.3	435.939

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
8400.0	6813.044	49.5003	-14.4753	-14.5627	138.47	-0.02	7651.2	436.220
8450.0	6812.908	51.5200	-16.8727	-16.9730	137.86	-0.02	7651.2	436.552
8500.0	6812.763	53.5969	-19.2453	-19.3576	137.15	-0.02	7651.1	436.930
8550.0	6812.608	55.7405	-21.5886	-21.7121	136.33	-0.02	7650.9	437.349
8600.0	6812.445	57.9611	-23.8978	-24.0314	135.39	-0.02	7650.8	437.803
8650.0	6812.275	60.2694	-26.1673	-26.3101	134.32	-0.03	7650.7	438.284
8700.0	6812.101	62.6767	-28.3912	-28.5421	133.12	-0.03	7650.5	438.788
8750.0	6811.922	65.1950	-30.5630	-30.7208	131.77	-0.03	7650.4	439.306
8800.0	6811.742	67.8366	-32.6752	-32.8390	130.27	-0.03	7650.2	439.831
8850.0	6811.562	70.6141	-34.7198	-34.8885	128.61	-0.03	7650.1	440.356
8900.0	6811.382	73.5404	-36.6877	-36.8603	126.78	-0.03	7649.9	440.873
8950.0	6811.205	76.6277	-38.5690	-38.7446	124.76	-0.03	7649.8	441.376
9000.0	6811.033	79.8877	-40.3529	-40.5305	122.55	-0.03	7649.6	441.858
9050.0	6810.866	83.3304	-42.0274	-42.2064	120.14	-0.02	7649.5	442.311
9100.0	6810.707	86.9634	-43.5800	-43.7596	117.53	-0.02	7649.4	442.729
9150.0	6810.556	90.7908	-44.9970	-45.1769	114.70	-0.02	7649.3	443.107
9200.0	6810.415	94.8119	-46.2648	-46.4444	111.68	-0.02	7649.2	443.438
9250.0	6810.284	99.0201	-47.3693	-47.5485	108.45	-0.02	7649.1	443.719
9300.0	6810.166	103.4018	-48.2970	-48.4756	105.04	-0.02	7649.1	443.945
9350.0	6810.060	107.9358	-49.0355	-49.2134	101.47	-0.01	7649.1	444.113
9400.0	6809.968	112.5932	-49.5740	-49.7515	97.78	-0.01	7649.1	444.219
9450.0	6809.890	117.3380	-49.9043	-50.0814	93.99	-0.01	7649.1	444.262
9500.0	6809.826	122.1289	-50.0210	-50.1980	90.16	-0.01	7649.2	444.242
9550.0	6809.777	126.9218	-49.9223	-50.0994	86.32	-0.01	7649.2	444.156
9600.0	6809.743	131.6724	-49.6096	-49.7871	82.53	-0.00	7649.3	444.007
9650.0	6809.724	136.3389	-49.0881	-49.2661	78.83	-0.00	7649.5	443.796
9700.0	6809.719	140.8849	-48.3658	-48.5444	75.25	0.00	7649.6	443.524
9750.0	6809.729	145.2809	-47.4532	-47.6324	71.83	0.00	7649.8	443.195
9800.0	6809.752	149.5049	-46.3627	-46.5424	68.58	0.00	7650.0	442.812
9850.0	6809.788	153.5427	-45.1077	-45.2876	65.54	0.01	7650.2	442.380
9900.0	6809.836	157.3871	-43.7021	-43.8818	62.70	0.01	7650.4	441.904
9950.0	6809.896	161.0371	-42.1597	-42.3388	60.06	0.01	7650.6	441.389
10000.0	6809.966	164.4962	-40.4942	-40.6720	57.64	0.01	7650.8	440.843
10050.0	6810.045	167.7720	-38.7182	-38.8940	55.41	0.01	7651.1	440.270
10100.0	6810.132	170.8741	-36.8437	-37.0166	53.38	0.01	7651.3	439.679
10150.0	6810.226	173.8141	-34.8817	-35.0508	51.53	0.01	7651.6	439.076
10200.0	6810.325	176.6044	-32.8421	-33.0064	49.85	0.02	7651.8	438.470
10250.0	6810.428	179.2576	-30.7341	-30.8925	48.34	0.02	7652.1	437.867
10300.0	6810.534	-178.2135	-28.5658	-28.7173	46.99	0.02	7652.3	437.276
10350.0	6810.641	-175.7965	-26.3447	-26.4882	45.77	0.02	7652.5	436.703
10400.0	6810.748	-173.4796	-24.0774	-24.2118	44.69	0.02	7652.7	436.156
10450.0	6810.854	-171.2513	-21.7700	-21.8943	43.74	0.02	7652.9	435.642
10500.0	6810.958	-169.1009	-19.4279	-19.5411	42.91	0.02	7653.1	435.168

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
10550.0	6811.058	-167.0180	-17.0560	-17.1573	42.19	0.01	7653.3	434.740
10600.0	6811.153	-164.9930	-14.6591	-14.7476	41.58	0.01	7653.4	434.363
10650.0	6811.243	-163.0166	-12.2413	-12.3161	41.07	0.01	7653.5	434.043
10700.0	6811.326	-161.0801	-9.8064	-9.8671	40.66	0.01	7653.6	433.784
10750.0	6811.402	-159.1751	-7.3582	-7.4041	40.34	0.01	7653.6	433.589
10800.0	6811.471	-157.2933	-4.9003	-4.9310	40.11	0.01	7653.6	433.461
10850.0	6811.530	-155.4270	-2.4358	-2.4512	39.98	0.01	7653.6	433.403
10900.0	6811.582	-153.5682	0.0317	0.0319	39.94	0.01	7653.6	433.416
10950.0	6811.624	-151.7094	2.4992	2.5150	39.98	0.01	7653.5	433.499
11000.0	6811.657	-149.8428	4.9634	4.9946	40.12	0.00	7653.4	433.652
11050.0	6811.681	-147.9607	7.4210	7.4673	40.35	0.00	7653.3	433.874
11100.0	6811.697	-146.0552	9.8687	9.9297	40.66	0.00	7653.1	434.162
11150.0	6811.704	-144.1181	12.3029	12.3781	41.08	0.00	7652.9	434.514
11200.0	6811.703	-142.1410	14.7199	14.8086	41.59	-0.00	7652.7	434.925
11250.0	6811.696	-140.1151	17.1158	17.2174	42.20	-0.00	7652.5	435.390
11300.0	6811.681	-138.0311	19.4865	19.6000	42.93	-0.00	7652.2	435.905
11350.0	6811.661	-135.8795	21.8273	21.9519	43.76	-0.00	7652.0	436.464
11400.0	6811.636	-133.6498	24.1332	24.2679	44.72	-0.00	7651.7	437.059
11450.0	6811.607	-131.3314	26.3989	26.5426	45.80	-0.00	7651.4	437.685
11500.0	6811.575	-128.9128	28.6182	28.7698	47.01	-0.00	7651.1	438.333
11550.0	6811.541	-126.3820	30.7845	30.9430	48.38	-0.01	7650.7	438.997
11600.0	6811.507	-123.7268	32.8904	33.0547	49.89	-0.01	7650.4	439.669
11650.0	6811.473	-120.9344	34.9276	35.0967	51.57	-0.00	7650.1	440.340
11700.0	6811.441	-117.9921	36.8871	37.0600	53.42	-0.00	7649.8	441.003
11750.0	6811.411	-114.8877	38.7589	38.9347	55.46	-0.00	7649.5	441.651
11800.0	6811.385	-111.6095	40.5319	40.7097	57.69	-0.00	7649.2	442.276
11850.0	6811.364	-108.1480	42.1943	42.3734	60.12	-0.00	7648.9	442.870
11900.0	6811.348	-104.4958	43.7334	43.9131	62.75	-0.00	7648.6	443.428
11950.0	6811.339	-100.6492	45.1355	45.3154	65.60	-0.00	7648.4	443.942
12000.0	6811.337	-96.6096	46.3869	46.5665	68.64	0.00	7648.1	444.407
12050.0	6811.343	-92.3842	47.4737	47.6528	71.89	0.00	7647.9	444.817
12100.0	6811.358	-87.9873	48.3825	48.5610	75.31	0.00	7647.7	445.169
12150.0	6811.382	-83.4410	49.1009	49.2788	78.89	0.00	7647.6	445.458
12200.0	6811.414	-78.7749	49.6186	49.7960	82.60	0.01	7647.4	445.682
12250.0	6811.457	-74.0256	49.9275	50.1045	86.39	0.01	7647.3	445.838
12300.0	6811.508	-69.2346	50.0227	50.1996	90.22	0.01	7647.3	445.924
12350.0	6811.569	-64.4464	49.9025	50.0796	94.05	0.01	7647.2	445.941
12400.0	6811.639	-59.7049	49.5691	49.7465	97.84	0.01	7647.2	445.888
12450.0	6811.717	-55.0513	49.0277	49.2057	101.53	0.01	7647.2	445.767
12500.0	6811.804	-50.5215	48.2867	48.4653	105.09	0.01	7647.3	445.579
12550.0	6811.898	-46.1441	47.3568	47.5360	108.50	0.01	7647.3	445.328
12600.0	6811.999	-41.9404	46.2505	46.4302	111.72	0.02	7647.4	445.017
12650.0	6812.105	-37.9237	44.9813	45.1611	114.74	0.02	7647.6	444.650

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
12700.0	6812.216	-34.1005	43.5630	43.7426	117.56	0.02	7647.7	444.231
12750.0	6812.330	-30.4715	42.0095	42.1885	120.17	0.02	7647.9	443.768
12800.0	6812.447	-27.0324	40.3343	40.5118	122.58	0.02	7648.1	443.265
12850.0	6812.565	-23.7758	38.5499	38.7254	124.79	0.02	7648.3	442.728
12900.0	6812.682	-20.6916	36.6682	36.8407	126.80	0.02	7648.5	442.166
12950.0	6812.798	-17.7682	34.7001	34.8687	128.63	0.02	7648.7	441.585
13000.0	6812.911	-14.9931	32.6555	32.8192	130.29	0.02	7648.9	440.993
13050.0	6813.020	-12.3538	30.5433	30.7010	131.79	0.02	7649.2	440.397
13100.0	6813.123	-9.8374	28.3716	28.5224	133.13	0.01	7649.4	439.804
13150.0	6813.219	-7.4318	26.1478	26.2905	134.33	0.01	7649.6	439.223
13200.0	6813.307	-5.1251	23.8784	24.0120	135.40	0.01	7649.9	438.660
13250.0	6813.386	-2.9058	21.5694	21.6928	136.34	0.01	7650.1	438.122
13300.0	6813.453	-0.7634	19.2263	19.3385	137.16	0.01	7650.3	437.616
13350.0	6813.509	1.3125	16.8539	16.9540	137.87	0.01	7650.5	437.149
13400.0	6813.553	3.3314	14.4567	14.5440	138.47	0.01	7650.7	436.726
13450.0	6813.583	5.3026	12.0389	12.1126	138.97	0.00	7650.9	436.352
13500.0	6813.599	7.2346	9.6044	9.6638	139.38	0.00	7651.0	436.031
13550.0	6813.601	9.1361	7.1569	7.2015	139.68	-0.00	7651.2	435.768
13600.0	6813.587	11.0149	4.6998	4.7293	139.90	-0.00	7651.3	435.565
13650.0	6813.559	12.8791	2.2365	2.2505	140.03	-0.01	7651.4	435.425
13700.0	6813.515	14.7363	-0.2298	-0.2313	140.06	-0.01	7651.4	435.349
13750.0	6813.456	16.5943	-2.6958	-2.7128	140.01	-0.01	7651.5	435.337
13800.0	6813.382	18.4607	-5.1584	-5.1907	139.87	-0.01	7651.5	435.389
13850.0	6813.293	20.3433	-7.6141	-7.6616	139.63	-0.01	7651.5	435.504
13900.0	6813.191	22.2501	-10.0598	-10.1219	139.31	-0.02	7651.4	435.680
13950.0	6813.075	24.1891	-12.4917	-12.5680	138.89	-0.02	7651.4	435.914
14000.0	6812.947	26.1688	-14.9063	-14.9961	138.37	-0.02	7651.3	436.203
14050.0	6812.808	28.1981	-17.2997	-17.4022	137.74	-0.02	7651.2	436.542
14100.0	6812.659	30.2862	-19.6675	-19.7819	137.01	-0.02	7651.1	436.926
14150.0	6812.500	32.4428	-22.0052	-22.1305	136.17	-0.02	7651.0	437.349
14200.0	6812.335	34.6783	-24.3078	-24.4431	135.21	-0.03	7650.9	437.807
14250.0	6812.163	37.0035	-26.5697	-26.7140	134.11	-0.03	7650.7	438.292
14300.0	6811.986	39.4298	-28.7849	-28.9371	132.89	-0.03	7650.6	438.797
14350.0	6811.806	41.9693	-30.9467	-31.1057	131.52	-0.03	7650.4	439.315
14400.0	6811.625	44.6344	-33.0475	-33.2122	129.99	-0.03	7650.3	439.840
14450.0	6811.443	47.4377	-35.0791	-35.2486	128.30	-0.03	7650.1	440.363
14500.0	6811.264	50.3919	-37.0324	-37.2056	126.43	-0.03	7650.0	440.878
14550.0	6811.087	53.5095	-38.8972	-39.0732	124.38	-0.03	7649.8	441.378
14600.0	6810.916	56.8016	-40.6625	-40.8404	122.14	-0.03	7649.7	441.854
14650.0	6810.750	60.2781	-42.3162	-42.4953	119.69	-0.02	7649.6	442.302
14700.0	6810.592	63.9459	-43.8455	-44.0253	117.04	-0.02	7649.4	442.713
14750.0	6810.444	67.8083	-45.2369	-45.4168	114.18	-0.02	7649.3	443.084
14800.0	6810.305	71.8638	-46.4765	-46.6561	111.11	-0.02	7649.3	443.408

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
14850.0	6810.178	76.1045	-47.5503	-47.7294	107.85	-0.02	7649.2	443.680
14900.0	6810.063	80.5155	-48.4450	-48.6235	104.41	-0.02	7649.2	443.897
14950.0	6809.961	85.0742	-49.1484	-49.3263	100.82	-0.01	7649.2	444.055
15000.0	6809.873	89.7503	-49.6502	-49.8276	97.11	-0.01	7649.2	444.152
15050.0	6809.799	94.5068	-49.9425	-50.1195	93.31	-0.01	7649.2	444.186
15100.0	6809.740	99.3017	-50.0206	-50.1976	89.47	-0.01	7649.2	444.155
15150.0	6809.696	104.0904	-49.8832	-50.0603	85.64	-0.01	7649.3	444.061
15200.0	6809.668	108.8290	-49.5326	-49.7101	81.86	-0.00	7649.4	443.903
15250.0	6809.654	113.4767	-48.9743	-49.1524	78.18	-0.00	7649.5	443.684
15300.0	6809.655	117.9979	-48.2170	-48.3956	74.62	0.00	7649.7	443.404
15350.0	6809.670	122.3646	-47.2714	-47.4507	71.23	0.00	7649.9	443.068
15400.0	6809.699	126.5561	-46.1503	-46.3300	68.02	0.01	7650.0	442.680
15450.0	6809.740	130.5596	-44.8671	-45.0470	65.01	0.01	7650.2	442.243
15500.0	6809.794	134.3692	-43.4359	-43.6156	62.21	0.01	7650.5	441.763
15550.0	6809.860	137.9845	-41.8704	-42.0493	59.61	0.01	7650.7	441.246
15600.0	6809.935	141.4102	-40.1840	-40.3615	57.22	0.01	7650.9	440.698
15650.0	6810.020	144.6540	-38.3894	-38.5647	55.03	0.01	7651.2	440.125
15700.0	6810.112	147.7262	-36.4984	-36.6706	53.03	0.01	7651.4	439.535
15750.0	6810.211	150.6384	-34.5216	-34.6899	51.21	0.02	7651.7	438.936
15800.0	6810.315	153.4031	-32.4690	-32.6323	49.57	0.02	7651.9	438.333
15850.0	6810.423	156.0330	-30.3495	-30.5067	48.09	0.02	7652.1	437.736
15900.0	6810.533	158.5409	-28.1711	-28.3213	46.76	0.02	7652.4	437.152
15950.0	6810.645	160.9390	-25.9412	-26.0831	45.57	0.02	7652.6	436.587
16000.0	6810.756	163.2391	-23.6662	-23.7989	44.51	0.02	7652.8	436.050
16050.0	6810.866	165.4526	-21.3521	-21.4745	43.58	0.02	7653.0	435.547
16100.0	6810.973	167.5901	-19.0042	-19.1154	42.77	0.02	7653.2	435.085
16150.0	6811.076	169.6618	-16.6275	-16.7266	42.07	0.02	7653.3	434.669
16200.0	6811.175	171.6774	-14.2265	-14.3125	41.48	0.01	7653.4	434.306
16250.0	6811.267	173.6459	-11.8053	-11.8776	40.98	0.01	7653.5	434.000
16300.0	6811.353	175.5761	-9.3677	-9.4257	40.59	0.01	7653.6	433.756
16350.0	6811.431	177.4763	-6.9175	-6.9607	40.29	0.01	7653.6	433.576
16400.0	6811.501	179.3547	-4.4581	-4.4861	40.08	0.01	7653.6	433.465
16450.0	6811.562	-178.7810	-1.9928	-2.0054	39.97	0.01	7653.6	433.422
16500.0	6811.615	-176.9228	0.4750	0.4780	39.94	0.01	7653.6	433.450
16550.0	6811.658	-175.0633	2.9422	2.9607	40.00	0.01	7653.5	433.548
16600.0	6811.692	-173.1945	5.4055	5.4394	40.15	0.00	7653.4	433.717
16650.0	6811.717	-171.3089	7.8616	7.9106	40.39	0.00	7653.2	433.953
16700.0	6811.733	-169.3983	10.3071	10.3707	40.73	0.00	7653.1	434.255
16750.0	6811.741	-167.4547	12.7385	12.8162	41.16	0.00	7652.9	434.619
16800.0	6811.741	-165.4696	15.1521	15.2432	41.69	-0.00	7652.7	435.042
16850.0	6811.733	-163.4340	17.5438	17.6476	42.33	-0.00	7652.4	435.519
16900.0	6811.718	-161.3387	19.9095	20.0251	43.07	-0.00	7652.2	436.043
16950.0	6811.698	-159.1739	22.2444	22.3709	43.92	-0.00	7651.9	436.610

TABLE B-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST KM	LONG DEG E	DEC DEG N.	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL M/S	ALTITUDE KM
17000.0	6811.673	-156.9292	24.5436	24.6799	44.90	-0.00	7651.6	437.212
17050.0	6811.644	-154.5937	26.8014	26.9466	46.00	-0.00	7651.3	437.843
17100.0	6811.612	-152.1559	29.0117	29.1647	47.25	-0.00	7651.0	438.495
17150.0	6811.578	-149.6038	31.1678	31.3274	48.63	-0.01	7650.6	439.160
17200.0	6811.543	-146.9250	33.2620	33.4273	50.18	-0.01	7650.3	439.832
17250.0	6811.509	-144.1067	35.2860	35.4559	51.89	-0.01	7650.0	440.502
17300.0	6811.477	-141.1362	37.2305	37.4040	53.77	-0.00	7649.7	441.163
17350.0	6811.447	-138.0014	39.0855	39.2617	55.84	-0.00	7649.4	441.806
17400.0	6811.420	-134.6911	40.8396	41.0177	58.11	-0.00	7649.1	442.425
TRANSFER TO ATM CONTROL								
17400.700	6811.394	-134.6435	40.8634	41.0415	58.14	-0.00	7649.0	442.407

APPENDIX C

TIME HISTORY OF TRAJECTORY PARAMETERS - ENGLISH UNITS

The postflight trajectory, from guidance reference release to transfer to ATM control, is tabulated in English units in Table C-I through C-VII.

Table C-I gives the earth-fixed launch site position, velocity, and acceleration components for the ascent phase of flight.

Table C-II gives the launch vehicle navigation position, velocity, and acceleration components for the ascent phase of flight.

Table C-III gives the geographic polar coordinates for the ascent phase of flight.

Table C-IV gives the geographic polar coordinates for the workshop orbit phase of flight.

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
GUIDANCE REFERENCE RELEASE									
-16.958	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-16.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-15.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-14.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-13.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-12.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-11.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-10.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-9.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-8.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-7.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-6.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-5.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-4.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-3.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-2.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
ALL HOLDDOWN ARMS RELEASED									
0.200	383	0	0	0.0	0.0	0.0	0.0	0.0	0.0
LIFTOFF - START OF TIME BASE 1									
0.600	383	0	0	2.2	-0.0	0.0	6.32	-0.05	0.00
1.0	385	0	0	5.0	-0.0	-0.0	7.65	-0.01	-0.01
2.0	394	0	0	13.7	-0.0	-0.0	9.16	0.02	-0.05
3.0	412	0	0	23.1	0.1	-0.1	9.50	0.15	-0.15
4.0	440	0	0	32.6	0.3	-0.4	9.63	0.42	-0.32
5.0	478	1	-1	42.4	0.9	-0.8	10.04	0.64	-0.46
6.0	525	2	-2	52.6	1.5	-1.2	10.21	0.69	-0.48
7.0	583	4	-3	62.9	2.2	-1.7	10.57	0.61	-0.34
8.0	651	6	-5	73.7	2.8	-1.9	10.81	0.53	-0.10
9.0	730	9	-7	84.5	3.3	-1.9	10.82	0.41	-0.21
10.0	820	13	-9	95.3	3.6	-2.5	10.80	0.28	-0.68
11.0	921	17	-12	106.3	4.1	-2.6	11.29	0.68	0.30
12.0	1033	21	-14	117.7	4.7	-2.3	11.34	0.59	0.33
13.0	1156	26	-16	129.0	5.3	-1.8	11.39	0.59	0.64
14.0	1291	32	-18	140.6	5.9	-1.3	11.79	0.63	0.53

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
15.0	1437	38	-19	152.4	6.5	-0.8	11.70	0.48	0.34
16.0	1596	44	-20	164.3	7.0	-0.5	12.14	0.57	0.25
17.0	1766	52	-20	176.6	7.6	-0.2	12.49	0.59	0.47
18.0	1949	60	-20	189.2	8.1	0.4	12.75	0.59	0.77
19.0	2145	68	-19	202.1	8.7	1.4	12.98	0.41	1.18
20.0	2353	77	-17	215.2	9.1	2.5	13.19	0.55	1.21
21.0	2575	86	-14	228.5	9.7	3.8	13.41	0.55	1.41
22.0	2810	96	-9	242.0	10.2	5.3	13.63	0.55	1.61
23.0	3059	107	-3	255.8	10.8	7.1	13.87	0.55	1.82
24.0	3322	118	5	269.7	11.3	9.0	14.12	0.55	2.06
25.0	3599	129	15	284.0	11.9	11.2	14.39	0.55	2.35
26.0	3890	142	27	298.5	12.4	13.7	14.66	0.54	2.67
27.0	4196	154	43	313.3	13.0	16.6	14.93	0.53	3.01
28.0	4517	167	61	328.4	13.5	19.8	15.19	0.50	3.38
29.0	4853	181	82	343.7	14.0	23.4	15.44	0.47	3.78
30.0	5204	195	108	359.3	14.4	27.3	15.70	0.44	4.19
31.0	5571	210	137	375.1	14.8	31.7	15.95	0.39	4.60
32.0	5954	225	171	391.2	15.2	36.5	16.21	0.34	5.01
33.0	6354	240	210	407.5	15.5	41.8	16.48	0.29	5.43
34.0	6769	256	255	424.1	15.8	47.4	16.77	0.25	5.85
35.0	7202	272	305	441.0	16.0	53.5	17.05	0.22	6.27
36.0	7652	288	362	458.2	16.2	59.9	17.33	0.20	6.70
37.0	8119	304	425	475.7	16.4	66.9	17.61	0.18	7.13
38.0	8603	321	496	493.5	16.6	74.2	17.89	0.17	7.58
39.0	9106	338	574	511.5	16.8	82.0	18.16	0.18	8.06
40.0	9626	355	660	529.8	16.9	90.3	18.43	0.18	8.54
41.0	10165	372	755	548.3	17.1	99.1	18.70	0.18	9.03
42.0	10723	389	858	567.2	17.3	108.4	18.98	0.18	9.53
43.0	11300	406	972	586.3	17.5	118.2	19.26	0.20	10.04
44.0	11896	424	1095	605.7	17.7	128.5	19.56	0.23	10.56
45.0	12511	442	1229	625.4	18.0	139.3	19.86	0.27	11.09
46.0	13147	460	1374	645.4	18.2	150.7	20.16	0.30	11.62
47.0	13802	478	1530	665.7	18.6	162.6	20.46	0.34	12.13
48.0	14478	497	1699	686.3	18.9	174.9	20.76	0.38	12.63
49.0	15175	516	1880	707.2	19.3	187.8	21.06	0.41	13.14
50.0	15893	536	2075	728.5	19.8	201.2	21.36	0.44	13.65
51.0	16632	556	2283	750.0	20.2	215.1	21.66	0.44	14.15
52.0	17393	576	2505	771.8	20.6	229.5	21.96	0.43	14.65
53.0	18176	597	2742	793.9	21.0	244.4	22.27	0.41	15.18
54.0	18981	618	2994	816.3	21.4	259.9	22.58	0.40	15.74
55.0	19808	640	3262	839.1	21.8	275.9	22.87	0.36	16.33
56.0	20659	662	3546	862.0	22.1	292.5	23.07	0.42	16.88
57.0	21532	684	3847	885.3	22.5	309.7	23.47	0.29	17.66

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
58.0	22430	707	4166	908.8	22.8	327.7	23.56	0.29	18.31
59.0	23350	730	4503	932.5	23.1	346.4	23.78	0.28	18.99
60.0	24295	753	4859	956.3	23.3	365.8	23.77	0.13	19.74
MACH 1									
61.000	25263	776	5235	980.2	23.5	385.9	24.08	0.26	20.52
62.0	26255	800	5631	1004.3	23.7	406.7	24.16	0.11	21.13
63.0	27271	823	6049	1028.4	23.9	428.1	24.08	0.42	21.70
64.0	28312	848	6488	1052.7	24.2	449.9	24.49	0.12	21.86
65.0	29377	872	6949	1077.2	24.5	472.8	24.58	0.58	23.84
66.0	30466	897	7434	1101.9	25.3	496.7	24.81	0.92	24.15
67.0	31581	922	7943	1127.0	25.7	521.3	25.23	-0.04	24.89
68.0	32721	948	8476	1152.3	26.0	546.4	25.47	0.57	25.39
69.0	33886	974	9036	1178.0	26.2	572.3	25.95	-0.07	26.46
70.0	35077	1000	9621	1204.2	26.2	599.0	26.43	-0.03	26.91
71.0	36294	1027	10233	1230.8	26.3	625.8	26.77	-0.15	27.45
72.0	37538	1053	10873	1257.8	26.0	653.7	27.16	-0.32	28.17
73.0	38810	1079	11541	1285.1	25.6	682.3	27.51	-0.48	28.99
MAXIMUM DYNAMIC PRESSURE									
73.500	39456	1092	11886	1298.9	25.4	696.9	27.67	-0.56	29.41
74.0	40109	1104	12238	1312.7	25.1	711.7	27.83	-0.66	29.87
75.0	41435	1129	12965	1340.7	24.3	742.1	28.14	-0.87	30.81
76.0	42790	1153	13722	1369.0	23.3	773.4	28.43	-1.10	31.79
77.0	44173	1176	14512	1397.6	22.1	805.6	28.72	-1.35	32.77
78.0	45585	1197	15334	1426.5	20.6	838.8	29.01	-1.61	33.73
79.0	47026	1217	16190	1455.6	18.8	873.0	29.31	-1.83	34.66
80.0	48497	1235	17080	1485.1	16.9	908.1	29.61	-2.02	35.57
81.0	49997	1251	18006	1514.9	14.9	944.2	29.92	-2.11	36.50
82.0	51527	1264	18969	1544.9	12.8	981.2	30.23	-2.11	37.45
83.0	53087	1276	19969	1575.3	10.8	1019.1	30.53	-2.03	38.45
84.0	54677	1286	21007	1606.0	8.8	1058.1	30.80	-1.90	39.48
85.0	56299	1294	22085	1636.9	6.9	1098.1	31.07	-1.74	40.55
86.0	57951	1300	23204	1668.1	5.3	1139.2	31.33	-1.57	41.66
87.0	59635	1304	24364	1699.6	3.8	1181.4	31.59	-1.39	42.76
88.0	61350	1308	25567	1731.3	2.5	1224.7	31.86	-1.21	43.86
89.0	63098	1309	26814	1763.3	1.4	1269.1	32.14	-1.03	44.92
90.0	64877	1310	28106	1795.6	0.4	1314.5	32.43	-0.87	45.97
91.0	66689	1310	29444	1828.2	-0.4	1361.0	32.73	-0.72	47.01
92.0	68534	1310	30829	1861.0	-1.0	1408.6	33.01	-0.57	48.04
93.0	70411	1308	32261	1894.2	-1.5	1457.1	33.29	-0.41	49.09

TABLE C-1. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
94.0	72322	1307	33743	1927.6	-1.8	1506.8	33.53	-0.25	50.16
95.0	74266	1305	35275	1961.2	-2.0	1557.5	33.75	-0.09	51.25
96.0	76245	1303	36858	1995.1	-2.0	1609.3	33.98	0.07	52.35
97.0	78257	1301	38494	2029.2	-1.9	1662.2	34.21	0.22	53.46
98.0	80303	1299	40183	2063.5	-1.6	1716.2	34.45	0.34	54.58
99.0	82384	1298	41927	2098.1	-1.2	1771.4	34.69	0.42	55.70
100.0	84499	1297	43726	2132.9	-0.8	1827.6	34.94	0.47	56.81
101.0	86650	1296	45582	2168.0	-0.3	1885.0	35.19	0.49	57.92
102.0	88835	1296	47496	2203.3	0.2	1943.4	35.45	0.48	59.02
103.0	91056	1296	49470	2238.9	0.7	2003.0	35.69	0.47	60.13
104.0	93313	1297	51503	2274.7	1.1	2063.7	35.92	0.45	61.27
105.0	95606	1299	53597	2310.7	1.6	2125.6	36.12	0.43	62.42
106.0	97935	1301	55754	2346.9	2.0	2188.6	36.30	0.40	63.61
107.0	100300	1303	57975	2383.3	2.4	2252.8	36.49	0.36	64.82
108.0	102701	1305	60260	2419.9	2.7	2318.3	36.71	0.30	66.06
109.0	105139	1308	62612	2456.7	3.0	2385.0	36.97	0.21	67.28
110.0	107615	1311	65031	2493.9	3.1	2452.8	37.29	0.10	68.47
111.0	110127	1314	67518	2531.4	3.1	2521.9	37.67	-0.01	69.60
112.0	112678	1317	70075	2569.3	3.1	2592.0	38.11	-0.12	70.69
113.0	115266	1321	72702	2607.6	2.9	2663.2	38.58	-0.20	71.75
114.0	117893	1323	75402	2646.4	2.7	2735.5	39.06	-0.25	72.80
115.0	120559	1326	78174	2685.7	2.5	2808.9	39.52	-0.27	73.88
116.0	123264	1328	81020	2725.4	2.2	2883.3	39.96	-0.29	75.03
117.0	126010	1330	83941	2765.6	1.9	2959.0	40.37	-0.30	76.25
118.0	128796	1332	86938	2806.1	1.6	3035.9	40.77	-0.31	77.54
119.0	131622	1333	90013	2847.1	1.2	3114.1	41.17	-0.33	78.89
120.0	134490	1335	93167	2888.5	0.9	3193.7	41.56	-0.34	80.25
121.0	137399	1335	96401	2930.3	0.6	3274.6	41.98	-0.34	81.62
122.0	140351	1336	99717	2972.5	0.3	3356.9	42.41	-0.33	82.98
123.0	143345	1336	103115	3015.1	-0.1	3440.6	42.87	-0.31	84.36
124.0	146381	1336	106598	3058.2	-0.4	3525.7	43.35	-0.28	85.74
125.0	149461	1335	110167	3101.8	-0.6	3612.2	43.85	-0.25	87.16
126.0	152585	1334	113823	3146.0	-0.9	3700.1	44.36	-0.24	88.62
127.0	155753	1333	117568	3190.6	-1.1	3789.4	44.90	-0.23	90.11
128.0	158966	1332	121403	3235.8	-1.3	3880.3	45.45	-0.23	91.64
129.0	162225	1331	125329	3281.5	-1.6	3972.8	46.02	-0.23	93.22
130.0	165530	1329	129349	3327.8	-1.8	4066.8	46.60	-0.23	94.86
131.0	168881	1327	133463	3374.7	-2.0	4162.5	47.20	-0.24	96.53
132.0	172279	1325	137674	3422.2	-2.3	4259.9	47.81	-0.25	98.24
133.0	175725	1322	141984	3470.3	-2.5	4359.1	48.45	-0.26	100.00
134.0	179220	1320	146393	3519.1	-2.9	4460.0	49.10	-0.35	101.78
135.0	182764	1317	150904	3568.5	-3.1	4562.6	49.75	-0.24	103.55
136.0	186359	1314	155519	3618.6	-3.4	4667.1	50.39	-0.24	105.41

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
137.0	190002	1310	160239	3669.3	-3.6	4773.5	51.12	-0.31	107.37
138.0	193697	1306	165067	3720.9	-4.0	4881.8	51.89	-0.29	109.33
139.0	197444	1302	170004	3773.1	-4.2	4992.1	52.66	-0.20	111.28
140.0	201245	1298	175053	3826.2	-4.4	5104.4	53.42	-0.26	113.26
	S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)								
140.720	204016	1295	178762	3864.8	-4.6	5186.4	53.98	-0.21	114.68
141.0	205099	1293	180214	3877.7	-4.7	5215.5	38.19	-0.15	92.83
142.0	209001	1289	185481	3916.0	-4.7	5308.7	38.37	-0.09	93.57
143.0	212937	1284	190837	3954.5	-4.8	5402.8	38.67	-0.08	94.62
144.0	216912	1279	196287	3993.3	-4.9	5498.0	38.96	-0.07	95.70
145.0	220926	1274	201833	4032.5	-5.0	5594.3	39.37	-0.07	96.90
146.0	224979	1269	207477	4072.1	-5.0	5691.7	39.74	0.00	98.07
147.0	229071	1264	213218	4112.0	-5.0	5790.5	40.16	0.01	99.38
148.0	233204	1259	219059	4152.4	-5.0	5890.8	40.71	0.02	101.18
149.0	237377	1254	225000	4193.8	-5.0	5992.9	41.24	0.02	102.84
150.0	241591	1249	231044	4235.3	-4.9	6096.4	41.76	0.03	104.62
151.0	245848	1244	237194	4277.1	-4.9	6201.8	42.35	-0.11	106.41
152.0	250146	1239	243449	4319.8	-4.9	6309.1	42.93	0.20	108.19
153.0	254488	1235	249813	4363.0	-4.8	6418.1	43.52	-0.06	109.98
154.0	258872	1230	256285	4406.8	-4.8	6529.0	44.11	0.05	111.76
155.0	263302	1225	262870	4451.2	-4.8	6641.7	44.69	-0.06	113.55
156.0	267775	1220	269568	4496.2	-4.8	6756.1	45.28	0.08	115.34
157.0	272295	1215	276382	4541.8	-4.9	6872.3	45.87	-0.21	117.12
158.0	276860	1210	283314	4587.9	-5.4	6990.4	46.45	-0.66	118.91
	S-IC OUTBOARD ENGINE CUTOFF (ENGINES 1 AND 3)								
158.160	277596	1209	284436	4595.4	-5.5	7009.4	46.55	-0.49	119.19
159.0	281458	1204	290341	4596.6	-5.5	7050.1	-30.72	0.18	-0.68
	S-IC/S-II SEPARATION COMMAND								
159.900	285579	1200	296681	4568.9	-5.4	7049.5	-30.82	0.21	-0.66
160.0	286033	1199	297381	4565.8	-5.4	7049.4	-30.84	0.21	-0.66
162.0	295114	1189	311492	4504.2	-4.9	7047.8	-30.79	0.22	-0.81
164.0	304067	1179	325593	4453.6	-4.6	7061.9	-18.75	0.08	17.54
166.0	312939	1170	339755	4418.2	-4.4	7099.7	-16.83	0.08	20.24
168.0	321742	1162	353996	4386.3	-4.2	7142.9	-14.87	0.09	23.15
170.0	330486	1154	368329	4356.5	-4.0	7188.9	-14.44	0.13	23.65
172.0	339170	1146	382755	4327.9	-3.7	7236.6	-14.20	0.14	23.93
174.0	347798	1139	397276	4299.7	-3.4	7284.6	-14.09	0.14	24.02

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
176.0	356369	1132	411893	4271.7	-3.1	7332.8	-13.96	0.15	24.15
178.0	364885	1126	426608	4243.9	-2.8	7381.3	-13.84	0.16	24.29
180.0	373345	1121	441419	4216.3	-2.5	7430.0	-13.71	0.17	24.41
182.0	381750	1116	456328	4189.0	-2.1	7478.9	-13.59	0.17	24.52
184.0	390101	1112	471335	4162.0	-1.8	7528.1	-13.47	0.18	24.64
186.0	398398	1109	486440	4135.1	-1.4	7577.5	-13.35	0.19	24.74
188.0	406642	1107	501645	4108.6	-1.0	7627.0	-13.24	0.20	24.85
190.0	414832	1105	516948	4082.2	-0.6	7676.9	-13.11	0.21	24.95
192.0	422971	1104	532352	4056.1	-0.2	7726.9	-13.01	0.22	25.07
194.0	431057	1104	547856	4030.1	0.3	7777.1	-12.92	0.23	25.18
196.0	439091	1105	563461	4004.4	0.7	7827.6	-12.76	0.23	25.25
198.0	447075	1107	579166	3979.2	1.2	7878.1	-12.44	0.23	25.22
200.0	455009	1110	594973	3954.8	1.7	7928.3	-11.95	0.24	25.06
202.0	462895	1114	610879	3931.4	2.2	7978.3	-11.45	0.26	24.89
204.0	470735	1119	626886	3908.9	2.7	8028.0	-11.12	0.27	24.84
206.0	478530	1125	642992	3886.8	3.3	8077.8	-10.99	0.30	24.94
208.0	486282	1132	659197	3864.8	3.9	8127.9	-10.99	0.34	25.15
210.0	493990	1140	675503	3842.8	4.6	8178.4	-11.03	0.38	25.37
212.0	501653	1150	691911	3820.7	5.4	8229.3	-11.05	0.42	25.59
214.0	509273	1162	708421	3798.6	6.3	8280.7	-11.05	0.48	25.78
216.0	516848	1175	725034	3776.5	7.3	8332.4	-11.06	0.54	25.97
218.0	524379	1191	741751	3754.4	8.4	8384.6	-11.08	0.58	26.18
220.0	531865	1209	758573	3732.2	9.6	8437.2	-11.12	0.62	26.41
222.0	539307	1230	775500	3709.9	10.9	8490.2	-11.16	0.68	26.64
224.0	546705	1253	792534	3687.5	12.4	8543.7	-11.19	0.75	26.85
226.0	554057	1279	809675	3665.1	13.9	8597.6	-11.21	0.81	27.06
228.0	561365	1309	826924	3642.7	15.6	8652.0	-11.20	0.86	27.27
230.0	568628	1342	844283	3620.3	17.4	8706.7	-11.22	0.90	27.49
232.0	575846	1378	861752	3597.8	19.2	8761.9	-11.26	0.92	27.70
234.0	583020	1419	879331	3575.3	21.0	8817.5	-11.32	0.94	27.92
236.0	590147	1463	897022	3552.6	22.9	8873.6	-11.38	0.96	28.15
238.0	597230	1510	914826	3529.8	24.9	8930.2	-11.43	0.99	28.41
240.0	604266	1562	932743	3506.9	26.9	8987.2	-11.46	1.05	28.65
242.0	611257	1618	950775	3483.9	29.1	9044.7	-11.48	1.09	28.86
244.0	618202	1679	968922	3460.9	31.3	9102.7	-11.51	1.13	29.08
246.0	625101	1743	987186	3437.9	33.6	9161.0	-11.54	1.18	29.30
248.0	631953	1813	1005566	3414.7	36.0	9219.9	-11.58	1.25	29.53
250.0	638760	1887	1024065	3391.6	38.6	9279.2	-11.62	1.30	29.75
252.0	645520	1967	1042683	3368.3	41.2	9338.9	-11.68	1.33	29.98
254.0	652233	2052	1061421	3344.9	43.9	9399.1	-11.73	1.37	30.23
256.0	658899	2143	1080280	3321.4	46.7	9459.8	-11.77	1.43	30.48
258.0	665518	2239	1099261	3297.8	49.6	9521.0	-11.81	1.50	30.72
260.0	672090	2341	1118365	3274.1	52.7	9582.7	-11.86	1.55	30.95

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
262.0	678614	2450	1137592	3250.3	55.8	9644.8	-11.91	1.58	31.19
264.0	685091	2565	1156944	3226.5	59.0	9707.4	-11.94	1.63	31.42
266.0	691520	2686	1176422	3202.5	62.3	9770.5	-11.98	1.69	31.66
268.0	697901	2814	1196026	3178.5	65.8	9834.1	-12.04	1.76	31.93
270.0	704234	2949	1215759	3154.4	69.4	9898.3	-12.10	1.84	32.22
272.0	710519	3091	1235620	3130.1	73.1	9963.0	-12.18	1.89	32.48
274.0	716754	3241	1255611	3105.7	76.9	10028.1	-12.24	1.94	32.72
276.0	722941	3399	1275733	3081.1	80.9	10093.8	-12.29	2.00	32.97
278.0	729079	3565	1295987	3056.5	84.9	10160.1	-12.34	2.06	33.24
280.0	735167	3739	1316373	3031.8	89.1	10226.8	-12.40	2.12	33.51
282.0	741206	3921	1336894	3006.9	93.4	10294.1	-12.48	2.19	33.77
284.0	747195	4113	1357550	2981.9	97.9	10361.9	-12.56	2.27	34.03
286.0	753133	4313	1378342	2956.7	102.5	10430.2	-12.63	2.34	34.30
288.0	759021	4523	1399271	2931.3	107.2	10499.1	-12.71	2.40	34.58
290.0	764859	4742	1420339	2905.8	112.1	10568.5	-12.79	2.45	34.86
292.0	770645	4971	1441546	2880.2	117.0	10638.5	-12.86	2.52	35.13
294.0	776379	5210	1462893	2854.4	122.1	10709.1	-12.93	2.58	35.41
296.0	782062	5460	1484383	2828.4	127.4	10780.2	-13.02	2.65	35.70
298.0	787693	5720	1506014	2802.3	132.8	10851.8	-13.12	2.72	35.98
300.0	793271	5991	1527790	2776.0	138.3	10924.1	-13.20	2.79	36.27
302.0	798797	6273	1549711	2749.5	143.9	10996.9	-13.28	2.86	36.55
304.0	804269	6567	1571778	2722.8	149.7	11070.3	-13.38	2.95	36.85
306.0	809688	6872	1593993	2696.0	155.7	11144.3	-13.48	3.03	37.15
308.0	815053	7189	1616355	2668.9	161.8	11219.0	-13.58	3.09	37.46
310.0	820364	7519	1638869	2641.7	168.0	11294.2	-13.69	3.15	37.77
312.0	825620	7862	1661533	2614.2	174.4	11370.1	-13.80	3.21	38.07
314.0	830820	8217	1684349	2586.5	180.9	11443.7	-13.91	3.27	38.38
S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)									
314.050	830969	8226	1684921	2585.8	181.1	11445.3	-13.91	3.27	38.39
316.0	835960	8584	1707303	2553.6	186.6	11509.2	-16.92	2.78	30.43
318.0	841033	8963	1730382	2519.6	192.1	11570.1	-17.05	2.77	30.63
320.0	846038	9353	1753584	2485.4	197.7	11631.6	-17.18	2.76	30.83
322.0	850975	9754	1776909	2450.9	203.3	11693.3	-17.31	2.91	31.03
324.0	855843	10167	1800357	2416.1	209.4	11755.4	-17.43	3.02	31.23
326.0	860640	10592	1823931	2381.4	215.5	11818.1	-17.56	3.11	31.44
328.0	865368	11029	1847630	2346.2	221.8	11881.2	-17.68	3.17	31.64
330.0	870025	11479	1871456	2310.7	228.1	11944.7	-17.79	3.20	31.84
332.0	874611	11941	1895409	2275.0	234.6	12008.6	-17.91	3.25	32.06
334.0	879125	12417	1919490	2239.0	241.2	12072.9	-18.03	3.33	32.28
336.0	883567	12906	1943701	2202.9	247.9	12137.7	-18.14	3.40	32.48
338.0	887936	13409	1968041	2166.4	254.8	12202.9	-18.28	3.46	32.69

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
340.0	892232	13925	1992513	2129.7	261.7	12268.5	-18.43	3.53	32.91
342.0	896455	14456	2017115	2092.7	268.9	12334.5	-18.59	3.61	33.14
344.0	900603	15001	2041851	2055.3	276.2	12401.1	-18.77	3.69	33.38
346.0	904676	15561	2066720	2017.6	283.6	12468.0	-18.93	3.76	33.61
348.0	908673	16136	2091723	1979.6	291.2	12535.5	-19.08	3.82	33.84
350.0	912594	16726	2116862	1941.3	298.9	12603.4	-19.22	3.88	34.07
352.0	916438	17331	2142137	1902.7	306.8	12671.8	-19.37	3.95	34.28
354.0	920205	17953	2167550	1863.9	314.8	12740.6	-19.52	4.06	34.51
356.0	923893	18591	2193100	1824.7	323.0	12809.8	-19.67	4.18	34.73
358.0	927503	19245	2218789	1785.2	331.5	12879.5	-19.80	4.27	34.95
360.0	931034	19917	2244618	1745.4	340.1	12949.6	-19.95	4.32	35.19
362.0	934485	20606	2270588	1705.4	348.7	13020.3	-20.12	4.35	35.45
364.0	937855	21312	2296700	1665.0	357.5	13091.4	-20.30	4.39	35.70
366.0	941145	22035	2322954	1624.2	366.3	13163.0	-20.47	4.45	35.93
368.0	944352	22777	2349352	1583.1	375.3	13235.1	-20.63	4.50	36.16
370.0	947477	23537	2375895	1541.7	384.3	13307.7	-20.81	4.58	36.41
372.0	950518	24314	2402583	1499.8	393.6	13380.8	-21.01	4.68	36.65
374.0	953476	25111	2429418	1457.6	403.1	13454.3	-21.20	4.78	36.89
376.0	956349	25927	2456401	1415.1	412.7	13528.3	-21.36	4.84	37.13
378.0	959136	26762	2483532	1372.2	422.4	13602.8	-21.52	4.90	37.39
380.0	961837	27616	2510812	1329.0	432.3	13677.9	-21.70	4.96	37.65
382.0	964452	28491	2538244	1285.4	442.3	13753.4	-21.90	5.03	37.89
384.0	966979	29386	2565826	1241.4	452.4	13829.5	-22.12	5.10	38.14
386.0	969417	30301	2593562	1196.9	462.6	13906.0	-22.33	5.16	38.39
388.0	971766	31236	2621451	1152.1	473.0	13983.0	-22.53	5.24	38.64
390.0	974025	32193	2649494	1106.8	483.6	14060.6	-22.72	5.33	38.91
392.0	976193	33171	2677693	1061.2	494.4	14138.7	-22.90	5.44	39.17
394.0	978269	34171	2706049	1015.2	505.4	14217.3	-23.10	5.54	39.44
396.0	980253	35193	2734563	968.8	516.6	14296.4	-23.31	5.63	39.71
398.0	982144	36237	2763235	921.9	527.8	14376.1	-23.55	5.65	39.99
400.0	983941	37304	2792068	874.5	539.3	14456.3	-23.79	5.77	40.26
402.0	985642	38394	2821061	826.8	550.9	14537.1	-24.05	5.88	40.54
404.0	987247	39508	2850214	778.3	562.4	14617.5	-24.56	5.60	35.00
406.0	988755	40643	2879519	728.9	573.1	14687.6	-24.87	5.21	35.04
408.0	990163	41800	2908965	678.9	583.7	14757.7	-25.19	5.34	35.09
410.0	991470	42978	2938551	628.2	594.4	14827.9	-25.51	5.39	35.20
412.0	992675	44178	2968278	576.9	605.2	14898.4	-25.77	5.44	35.31
414.0	993777	45399	2998146	525.1	616.2	14969.5	-25.94	5.52	35.46
416.0	994775	46642	3028156	473.2	627.3	15040.6	-26.03	5.59	35.63
418.0	995669	47908	3058309	421.0	638.5	15112.0	-26.13	5.64	35.81
420.0	996459	49197	3088605	368.6	649.9	15183.8	-26.34	5.71	35.99
422.0	997143	50508	3119044	315.5	661.4	15256.0	-26.70	5.81	36.18
424.0	997721	51842	3149629	261.7	673.1	15328.5	-27.11	5.94	36.37

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
426.0	998190	53200	3180359	207.2	685.1	15401.5	-27.40	6.04	36.59
428.0	998549	54583	3211235	152.3	697.3	15474.9	-27.54	6.11	36.79
430.0	998798	55989	3242258	97.1	709.5	15548.6	-27.59	6.14	36.98
432.0	998937	57421	3273430	41.9	721.8	15622.8	-27.66	6.17	37.18
434.0	998966	58877	3304750	-13.6	734.2	15697.4	-27.82	6.20	37.42
436.0	998883	60358	3336220	-69.5	746.6	15772.4	-28.05	6.26	37.65
438.0	998687	61863	3367840	-125.8	759.2	15847.9	-28.30	6.32	37.85
440.0	998379	63395	3399612	-182.7	771.9	15923.8	-28.52	6.38	38.04
442.0	997956	64951	3431536	-239.9	784.7	16000.1	-28.72	6.45	38.24
444.0	997419	66534	3463612	-297.5	797.7	16076.8	-28.92	6.54	38.46
446.0	996766	68142	3495843	-355.6	810.9	16153.9	-29.16	6.65	38.67
448.0	995996	69777	3528229	-414.2	824.3	16231.5	-29.46	6.76	38.88
450.0	995109	71440	3560769	-473.5	838.0	16309.5	-29.78	6.86	39.12
452.0	994102	73129	3593467	-533.3	851.7	16388.0	-30.11	6.93	39.34
454.0	992975	74847	3626321	-593.9	865.7	16466.8	-30.43	7.00	39.54
456.0	991726	76592	3659334	-655.1	879.8	16546.1	-30.76	7.08	39.74
458.0	990354	78366	3692506	-716.9	894.0	16625.8	-31.11	7.20	39.97
460.0	988858	80168	3725838	-779.5	908.5	16706.0	-31.45	7.29	40.22
462.0	987236	82000	3759331	-842.7	923.2	16786.7	-31.76	7.35	40.45
464.0	985487	83861	3792985	-906.5	937.9	16867.8	-32.07	7.43	40.65
466.0	983609	85752	3826802	-971.0	952.9	16949.3	-32.41	7.54	40.87
468.0	981602	87673	3860783	-1036.2	968.1	17031.3	-32.76	7.65	41.11
470.0	979464	89624	3894927	-1102.0	983.5	17113.7	-33.08	7.74	41.34
472.0	977194	91607	3929238	-1168.5	999.1	17196.6	-33.40	7.84	41.57
474.0	974790	93621	3963714	-1235.7	1014.9	17280.0	-33.75	7.96	41.78
476.0	972251	95667	3998358	-1303.5	1030.9	17363.8	-34.11	8.07	42.02
478.0	969575	97745	4033170	-1372.1	1047.1	17448.1	-34.47	8.16	42.27
480.0	966762	99855	4068151	-1441.4	1063.5	17532.9	-34.82	8.26	42.50
482.0	963809	101999	4103301	-1511.4	1080.2	17618.1	-35.17	8.36	42.71
484.0	960716	104176	4138623	-1582.1	1097.0	17703.7	-35.55	8.46	42.93
486.0	957480	106387	4174117	-1653.6	1114.0	17789.8	-35.93	8.56	43.19
488.0	954101	108632	4209783	-1725.8	1131.2	17876.5	-36.32	8.65	43.45
490.0	950576	110912	4245623	-1798.9	1148.6	17963.6	-36.73	8.76	43.69
492.0	946905	113227	4281638	-1872.8	1166.3	18051.2	-37.16	8.88	43.90
494.0	943085	115577	4317828	-1947.5	1184.1	18139.2	-37.59	9.00	44.12
496.0	939114	117963	4354195	-2023.1	1202.2	18227.7	-37.99	9.11	44.37
498.0	934992	120386	4390739	-2099.5	1220.5	18316.7	-38.36	9.20	44.63
500.0	930716	122846	4427462	-2176.6	1239.0	18406.2	-38.76	9.29	44.89
502.0	926285	125342	4464365	-2254.5	1257.7	18496.3	-39.18	9.40	45.13
504.0	921697	127877	4501449	-2333.3	1276.7	18586.8	-39.59	9.55	45.38
506.0	916951	130449	4538712	-2412.9	1295.9	18677.8	-40.02	9.68	45.64
508.0	912045	133060	4576159	-2493.4	1315.3	18769.4	-40.47	9.77	45.90
510.0	906977	135711	4613790	-2574.8	1335.0	18861.4	-40.92	9.87	46.15

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
512.0	901745	138400	4651605	-2657.0	1354.8	18954.0	-41.36	9.98	46.42
514.0	896348	141130	4689606	-2740.2	1374.9	19047.1	-41.81	10.09	46.70
516.0	890784	143900	4727794	-2824.3	1395.2	19140.8	-42.30	10.22	46.97
518.0	885050	146711	4766169	-2909.4	1415.8	19235.0	-42.79	10.35	47.22
520.0	879145	149563	4804734	-2995.5	1436.6	19329.7	-43.28	10.47	47.48
522.0	873068	152458	4843488	-3082.6	1457.6	19424.9	-43.77	10.59	47.74
524.0	866815	155394	4882434	-3170.6	1478.9	19520.6	-44.26	10.69	48.01
526.0	860385	158374	4921571	-3259.6	1500.4	19616.9	-44.77	10.80	48.30
528.0	853776	161396	4960902	-3349.7	1522.1	19713.8	-45.29	10.91	48.59
530.0	846985	164462	5000427	-3440.8	1544.1	19811.3	-45.82	11.05	48.87
532.0	840012	167573	5040148	-3532.9	1566.4	19909.3	-46.35	11.22	49.15
534.0	832853	170728	5080065	-3626.2	1589.0	20007.9	-46.86	11.38	49.42
536.0	825506	173929	5120179	-3720.4	1611.8	20107.0	-47.40	11.52	49.70
538.0	817970	177175	5160493	-3815.8	1635.0	20206.7	-47.98	11.64	50.00
540.0	810243	180469	5201007	-3912.3	1658.4	20307.0	-48.57	11.78	50.31
542.0	802320	183809	5241721	-4010.1	1682.1	20407.9	-49.16	11.92	50.63
544.0	794202	187198	5282639	-4108.9	1706.1	20509.5	-49.73	12.06	50.93
546.0	785884	190634	5323760	-4209.0	1730.4	20611.7	-50.28	12.21	51.24
548.0	777365	194119	5365086	-4310.1	1754.9	20714.5	-50.84	12.36	51.57
550.0	768643	197654	5406618	-4412.3	1779.8	20817.9	-51.43	12.51	51.89
552.0	759715	201239	5448358	-4515.8	1805.0	20922.0	-52.06	12.66	52.21
554.0	750579	204874	5490307	-4620.6	1830.5	21026.8	-52.70	12.83	52.52
556.0	741232	208561	5532465	-4726.6	1856.3	21132.1	-53.33	13.01	52.83
558.0	731671	212299	5574836	-4833.9	1882.5	21238.1	-53.97	13.17	53.16
560.0	721895	216091	5617418	-4942.5	1909.0	21344.8	-54.63	13.33	53.51
562.0	711900	219935	5660215	-5052.5	1935.8	21452.2	-55.32	13.49	53.88
564.0	701684	223834	5703228	-5163.8	1963.0	21560.3	-56.00	13.65	54.23
566.0	691244	227787	5746457	-5276.5	1990.4	21669.1	-56.75	13.82	54.54
568.0	680577	231796	5789904	-5391.0	2018.2	21778.3	-57.76	13.98	54.73
570.0	669678	235861	5833570	-5507.9	2046.3	21887.8	-59.04	14.16	54.79
572.0	658544	239982	5877456	-5627.1	2074.9	21997.5	-60.25	14.35	54.92
574.0	647168	244160	5921561	-5748.4	2103.7	22107.7	-61.02	14.51	55.25
576.0	635549	248397	5965887	-5870.9	2132.9	22218.8	-61.43	14.66	55.87
578.0	623684	252692	6010437	-5994.2	2162.4	22331.4	-61.75	14.82	56.66
580.0	611572	257047	6055214	-6118.1	2192.2	22445.3	-62.09	14.98	57.30
582.0	599212	261461	6100219	-6242.5	2222.3	22560.5	-62.30	15.10	57.91
584.0	586603	265936	6145457	-6367.2	2252.6	22676.9	-62.50	15.24	58.52
586.0	573744	270472	6190928	-6492.4	2283.2	22794.6	-62.70	15.37	59.13
588.0	560634	275069	6236636	-6618.0	2314.1	22913.4	-62.90	15.50	59.74
	S-II GUIDANCE CUTOFF SIGNAL								
588.960	554251	277298	6258663	-6678.5	2329.0	22970.9	-63.00	15.57	60.04

TABLE C-I. EARTH-FIXED LAUNCH SITE POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ
590.0	547282	279725	6282568	-6713.3	2334.2	22979.5	-25.84	2.05	-5.61
	S-II/OWS SEPARATION COMMAND								
591.100	539886	282292	6307836	-6741.6	2336.4	22973.2	-25.55	1.93	-5.84
592.0	533809	284395	6328508	-6765.6	2337.8	22967.8	-29.93	0.34	-6.58
594.0	520222	289074	6374430	-6819.1	2340.5	22954.0	-25.10	1.88	-7.24
596.0	506534	293759	6420323	-6868.6	2344.3	22938.6	-24.76	1.90	-7.69
598.0	492747	298452	6466185	-6918.1	2348.1	22923.2	-24.74	1.89	-7.75
	ORBIT INSERTION								
598.960	486094	300707	6488187	-6941.9	2349.9	22915.7	-24.74	1.89	-7.77

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
GUIDANCE REFERENCE RELEASE									
-16.958	3441.354	6.347	-7.332	0.0	1013.7	877.4	-0.07	-0.03	0.03
-16.0	3441.354	6.507	-7.194	-0.1	1013.6	877.5	-0.07	-0.03	0.03
-15.0	3441.353	6.674	-7.049	-0.2	1013.6	877.5	-0.07	-0.03	0.03
-14.0	3441.353	6.840	-6.905	-0.3	1013.6	877.6	-0.07	-0.03	0.03
-13.0	3441.353	7.007	-6.761	-0.3	1013.5	877.6	-0.07	-0.03	0.03
-12.0	3441.353	7.174	-6.616	-0.4	1013.5	877.6	-0.07	-0.03	0.03
-11.0	3441.353	7.341	-6.472	-0.5	1013.5	877.7	-0.07	-0.03	0.03
-10.0	3441.353	7.508	-6.327	-0.6	1013.5	877.7	-0.07	-0.03	0.03
-9.0	3441.353	7.674	-6.183	-0.7	1013.4	877.7	-0.07	-0.03	0.03
-8.0	3441.353	7.841	-6.038	-0.8	1013.4	877.8	-0.07	-0.03	0.03
-7.0	3441.353	8.008	-5.894	-0.9	1013.4	877.8	-0.07	-0.03	0.03
-6.0	3441.353	8.175	-5.749	-0.9	1013.3	877.8	-0.07	-0.03	0.03
-5.0	3441.353	8.341	-5.605	-1.0	1013.3	877.9	-0.07	-0.03	0.03
-4.0	3441.352	8.508	-5.460	-1.1	1013.3	877.9	-0.07	-0.03	0.03
-3.0	3441.352	8.675	-5.316	-1.2	1013.2	877.9	-0.07	-0.03	0.03
-2.0	3441.352	8.842	-5.171	-1.3	1013.2	878.0	-0.07	-0.03	0.03
-1.0	3441.352	9.008	-5.027	-1.4	1013.2	878.0	-0.07	-0.03	0.03
0.0	3441.351	9.175	-4.882	-1.5	1013.1	878.0	-0.07		
ALL HOLDDOWN ARMS RELEASED									
0.200	3441.351	9.209	-4.854	-1.5	1013.1	878.1	-0.07	-0.03	0.03
LIFTOFF - START OF TIME BASE 1									
0.600	3441.351	9.275	-4.796	0.7	1013.1	878.1	6.25	-0.07	0.04
1.0	3441.352	9.342	-4.738	3.5	1013.1	878.1	7.57	-0.03	0.02
2.0	3441.353	9.509	-4.593	12.1	1013.1	878.1	9.09	0.00	-0.01
3.0	3441.356	9.675	-4.449	21.4	1013.1	878.0	9.43	0.14	-0.12
4.0	3441.360	9.842	-4.304	30.8	1013.4	877.9	9.56	0.40	-0.28
5.0	3441.366	10.009	-4.160	40.6	1013.9	877.5	9.97	0.63	-0.42
6.0	3441.373	10.176	-4.016	50.6	1014.6	877.1	10.14	0.66	-0.44
7.0	3441.382	10.343	-3.871	60.9	1015.2	876.7	10.50	0.60	-0.29
8.0	3441.393	10.510	-3.727	71.5	1015.8	876.5	10.73	0.52	-0.05
9.0	3441.406	10.677	-3.583	82.3	1016.3	876.5	10.75	0.40	-0.16
10.0	3441.420	10.845	-3.439	93.0	1016.6	876.0	10.73	0.28	-0.63
11.0	3441.437	11.012	-3.294	103.9	1017.0	875.9	11.21	0.67	0.35
12.0	3441.455	11.179	-3.150	115.2	1017.7	876.3	11.27	0.59	0.38
13.0	3441.474	11.347	-3.006	126.5	1018.3	876.9	11.32	0.59	0.69
14.0	3441.496	11.515	-2.862	138.0	1018.9	877.5	11.72	0.63	0.59

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
15.0	3441.520	11.682	-2.717	149.6	1019.4	878.0	11.63	0.49	0.39
16.0	3441.545	11.850	-2.573	161.4	1019.9	878.4	12.06	0.57	0.31
17.0	3441.573	12.018	-2.428	173.7	1020.5	878.8	12.42	0.60	0.53
18.0	3441.603	12.186	-2.283	186.2	1021.1	879.5	12.67	0.60	0.83
19.0	3441.634	12.354	-2.138	199.0	1021.7	880.5	12.90	0.42	1.24
20.0	3441.668	12.522	-1.993	212.0	1022.1	881.7	13.11	0.56	1.28
21.0	3441.704	12.691	-1.848	225.2	1022.7	883.1	13.33	0.57	1.48
22.0	3441.742	12.859	-1.703	238.6	1023.3	884.7	13.55	0.57	1.68
23.0	3441.783	13.027	-1.557	252.3	1023.8	886.5	13.79	0.57	1.89
24.0	3441.825	13.196	-1.411	266.2	1024.4	888.5	14.05	0.58	2.14
25.0	3441.870	13.365	-1.265	280.4	1025.0	890.8	14.31	0.58	2.43
26.0	3441.918	13.533	-1.118	294.8	1025.6	893.4	14.58	0.57	2.75
27.0	3441.967	13.702	-0.970	309.5	1026.1	896.3	14.84	0.55	3.10
28.0	3442.020	13.871	-0.823	324.4	1026.6	899.6	15.10	0.53	3.47
29.0	3442.074	14.040	-0.674	339.6	1027.2	903.3	15.36	0.51	3.87
30.0	3442.131	14.209	-0.525	355.1	1027.6	907.4	15.61	0.47	4.28
31.0	3442.191	14.378	-0.376	370.8	1028.1	911.9	15.86	0.43	4.70
32.0	3442.253	14.548	-0.225	386.8	1028.5	916.8	16.12	0.38	5.11
33.0	3442.318	14.717	-0.074	403.1	1028.8	922.1	16.39	0.33	5.53
34.0	3442.386	14.886	0.078	419.6	1029.1	927.8	16.67	0.29	5.95
35.0	3442.457	15.056	0.232	436.4	1029.4	934.0	16.96	0.26	6.38
36.0	3442.530	15.225	0.386	453.5	1029.7	940.6	17.24	0.24	6.80
37.0	3442.606	15.395	0.541	470.8	1029.9	947.6	17.52	0.23	7.24
38.0	3442.685	15.564	0.698	488.5	1030.1	955.1	17.79	0.22	7.69
39.0	3442.767	15.734	0.856	506.4	1030.4	963.1	18.06	0.23	8.17
40.0	3442.851	15.903	1.015	524.6	1030.6	971.5	18.33	0.23	8.66
41.0	3442.939	16.073	1.175	543.0	1030.8	980.4	18.60	0.23	9.15
42.0	3443.030	16.243	1.338	561.7	1031.0	989.8	18.87	0.23	9.65
43.0	3443.124	16.412	1.501	580.7	1031.3	999.7	19.15	0.26	10.17
44.0	3443.221	16.582	1.667	600.0	1031.5	1010.2	19.44	0.29	10.69
45.0	3443.322	16.752	1.834	619.6	1031.8	1021.1	19.75	0.33	11.23
46.0	3443.425	16.922	2.003	639.5	1032.2	1032.6	20.04	0.36	11.75
47.0	3443.532	17.092	2.174	659.7	1032.6	1044.7	20.34	0.40	12.27
48.0	3443.642	17.261	2.347	680.1	1033.0	1057.2	20.63	0.44	12.78
49.0	3443.756	17.432	2.522	700.9	1033.4	1070.2	20.93	0.48	13.29
50.0	3443.873	17.602	2.699	722.0	1033.9	1083.8	21.23	0.50	13.80
51.0	3443.994	17.772	2.879	743.3	1034.4	1097.8	21.52	0.51	14.30
52.0	3444.118	17.942	3.060	765.0	1034.9	1112.4	21.83	0.50	14.81
53.0	3444.246	18.112	3.245	787.0	1035.4	1127.5	22.13	0.48	15.34
54.0	3444.377	18.283	3.432	809.2	1035.9	1143.1	22.44	0.47	15.90
55.0	3444.512	18.453	3.621	831.8	1036.3	1159.3	22.72	0.44	16.50
56.0	3444.651	18.624	3.813	854.6	1036.7	1176.1	22.92	0.49	17.05
57.0	3444.793	18.795	4.008	877.7	1037.1	1193.5	23.31	0.36	17.84

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
58.0	3444.940	18.965	4.206	901.1	1037.5	1211.7	23.40	0.37	18.49
59.0	3445.090	19.136	4.407	924.5	1037.8	1230.5	23.61	0.36	19.17
60.0	3445.244	19.307	4.611	948.1	1038.1	1250.1	23.60	0.20	19.93
MACH 1									
61.000	3445.402	19.478	4.819	971.9	1038.4	1270.4	23.90	0.33	20.71
62.0	3445.564	19.649	5.029	995.8	1038.6	1291.5	23.98	0.18	21.33
63.0	3445.730	19.820	5.244	1019.7	1039.0	1313.1	23.89	0.50	21.90
64.0	3445.900	19.991	5.462	1043.8	1039.3	1335.1	24.30	0.19	22.06
65.0	3446.073	20.162	5.683	1068.1	1039.7	1358.1	24.38	0.66	24.04
66.0	3446.251	20.333	5.909	1092.6	1040.5	1382.3	24.60	1.00	24.36
67.0	3446.433	20.504	6.138	1117.4	1041.1	1407.1	25.02	0.03	25.10
68.0	3446.619	20.676	6.372	1142.5	1041.5	1432.4	25.26	0.65	25.61
69.0	3446.809	20.847	6.610	1168.0	1041.7	1458.6	25.73	0.01	26.68
70.0	3447.003	21.019	6.852	1194.0	1041.8	1485.5	26.21	0.05	27.13
71.0	3447.202	21.190	7.099	1220.4	1041.9	1512.5	26.54	-0.08	27.68
72.0	3447.405	21.362	7.350	1247.1	1041.7	1540.6	26.92	-0.24	28.41
73.0	3447.613	21.533	7.606	1274.1	1041.4	1569.5	27.27	-0.40	29.23
MAXIMUM DYNAMIC PRESSURE									
73.500	3447.718	21.619	7.736	1287.8	1041.2	1584.2	27.43	-0.49	29.65
74.0	3447.825	21.704	7.867	1301.5	1040.9	1599.2	27.58	-0.58	30.11
75.0	3448.041	21.876	8.132	1329.2	1040.2	1629.8	27.89	-0.79	31.06
76.0	3448.262	22.047	8.403	1357.3	1039.3	1661.3	28.17	-1.03	32.04
77.0	3448.488	22.218	8.679	1385.6	1038.1	1693.8	28.46	-1.28	33.03
78.0	3448.718	22.388	8.961	1414.2	1036.7	1727.3	28.74	-1.53	33.99
79.0	3448.953	22.559	9.248	1443.0	1035.0	1761.8	29.03	-1.76	34.92
80.0	3449.193	22.729	9.541	1472.2	1033.2	1797.1	29.32	-1.95	35.84
81.0	3449.438	22.899	9.839	1501.6	1031.3	1833.5	29.63	-2.04	36.77
82.0	3449.687	23.069	10.144	1531.4	1029.2	1870.7	29.93	-2.05	37.73
83.0	3449.942	23.238	10.455	1561.5	1027.2	1909.0	30.21	-1.97	38.73
84.0	3450.201	23.407	10.773	1591.8	1025.3	1948.2	30.48	-1.84	39.77
85.0	3450.466	23.575	11.097	1622.4	1023.5	1988.6	30.74	-1.68	40.85
86.0	3450.736	23.744	11.427	1653.2	1021.9	2030.0	30.99	-1.51	41.95
87.0	3451.010	23.912	11.765	1684.3	1020.5	2072.5	31.24	-1.33	43.06
88.0	3451.290	24.080	12.109	1715.7	1019.2	2116.1	31.50	-1.15	44.16
89.0	3451.575	24.247	12.461	1747.3	1018.2	2160.8	31.77	-0.98	45.24
90.0	3451.865	24.415	12.821	1779.2	1017.3	2206.5	32.05	-0.82	46.29
91.0	3452.161	24.582	13.188	1811.4	1016.5	2253.4	32.33	-0.67	47.33
92.0	3452.461	24.749	13.562	1843.8	1015.9	2301.2	32.61	-0.53	48.37
93.0	3452.767	24.916	13.945	1876.6	1015.5	2350.2	32.86	-0.37	49.43

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
94.0	3453.079	25.084	14.336	1909.5	1015.2	2400.1	33.09	-0.22	50.50
95.0	3453.396	25.251	14.735	1942.7	1015.0	2451.2	33.31	-0.06	51.59
96.0	3453.719	25.418	15.143	1976.1	1015.1	2503.3	33.52	0.10	52.70
97.0	3454.047	25.585	15.559	2009.7	1015.2	2556.6	33.74	0.24	53.82
98.0	3454.380	25.752	15.985	2043.6	1015.5	2611.0	33.97	0.36	54.94
99.0	3454.719	25.919	16.419	2077.7	1015.9	2666.5	34.19	0.44	56.07
100.0	3455.064	26.086	16.862	2112.0	1016.4	2723.2	34.43	0.48	57.19
101.0	3455.414	26.254	17.315	2146.5	1016.8	2780.9	34.67	0.50	58.30
102.0	3455.770	26.421	17.778	2181.3	1017.3	2839.8	34.91	0.48	59.41
103.0	3456.132	26.588	18.250	2216.3	1017.8	2899.8	35.14	0.47	60.53
104.0	3456.500	26.756	18.732	2251.5	1018.3	2960.9	35.36	0.45	61.67
105.0	3456.873	26.924	19.225	2286.9	1018.7	3023.1	35.54	0.42	62.82
106.0	3457.253	27.091	19.727	2322.5	1019.1	3086.6	35.72	0.39	64.02
107.0	3457.638	27.259	20.241	2358.3	1019.5	3151.2	35.89	0.34	65.24
108.0	3458.029	27.427	20.765	2394.3	1019.8	3217.1	36.09	0.27	66.48
109.0	3458.426	27.595	21.300	2430.5	1020.0	3284.2	36.34	0.18	67.71
110.0	3458.829	27.763	21.846	2467.0	1020.1	3352.5	36.65	0.06	68.90
111.0	3459.238	27.930	22.403	2503.9	1020.1	3422.0	37.01	-0.05	70.04
112.0	3459.653	28.098	22.972	2541.1	1020.0	3492.6	37.44	-0.16	71.14
113.0	3460.075	28.266	23.553	2578.7	1019.8	3564.2	37.89	-0.25	72.20
114.0	3460.502	28.434	24.146	2616.8	1019.5	3637.0	38.36	-0.30	73.26
115.0	3460.936	28.602	24.750	2655.4	1019.2	3710.8	38.80	-0.33	74.35
116.0	3461.376	28.769	25.367	2694.4	1018.9	3785.8	39.22	-0.35	75.50
117.0	3461.823	28.937	25.996	2733.8	1018.5	3862.0	39.62	-0.37	76.73
118.0	3462.276	29.105	26.638	2773.6	1018.1	3939.4	40.01	-0.38	78.03
119.0	3462.736	29.272	27.293	2813.8	1017.7	4018.1	40.39	-0.41	79.38
120.0	3463.202	29.440	27.961	2854.3	1017.3	4098.2	40.76	-0.42	80.75
121.0	3463.675	29.607	28.642	2895.3	1016.9	4179.6	41.16	-0.43	82.13
122.0	3464.155	29.774	29.337	2936.6	1016.5	4262.4	41.57	-0.43	83.50
123.0	3464.642	29.942	30.045	2978.4	1016.0	4346.6	42.02	-0.41	84.89
124.0	3465.136	30.109	30.768	3020.7	1015.6	4432.2	42.48	-0.39	86.28
125.0	3465.636	30.276	31.504	3063.4	1015.2	4519.2	42.96	-0.37	87.71
126.0	3466.144	30.443	32.255	3106.6	1014.9	4607.7	43.45	-0.37	89.17
127.0	3466.659	30.610	33.021	3150.3	1014.5	4697.7	43.96	-0.36	90.67
128.0	3467.181	30.777	33.802	3194.5	1014.1	4789.1	44.49	-0.37	92.21
129.0	3467.710	30.944	34.597	3239.2	1013.7	4882.1	45.04	-0.37	93.80
130.0	3468.247	31.111	35.409	3284.5	1013.4	4976.8	45.60	-0.39	95.44
131.0	3468.792	31.277	36.236	3330.4	1013.0	5073.1	46.18	-0.40	97.13
132.0	3469.343	31.444	37.079	3376.9	1012.6	5171.1	46.77	-0.42	98.85
133.0	3469.903	31.611	37.938	3423.9	1012.1	5270.8	47.39	-0.44	100.62
134.0	3470.471	31.777	38.814	3471.6	1011.6	5372.4	48.01	-0.53	102.41
135.0	3471.046	31.944	39.706	3519.9	1011.2	5475.7	48.63	-0.44	104.19
136.0	3471.629	32.110	40.616	3568.9	1010.7	5580.8	49.25	-0.44	106.06

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
137.0	3472.221	32.276	41.543	3618.4	1010.3	5687.8	49.96	-0.53	108.03
138.0	3472.820	32.443	42.488	3668.7	1009.7	5796.8	50.70	-0.51	109.99
139.0	3473.428	32.609	43.452	3719.8	1009.3	5907.8	51.44	-0.43	111.96
140.0	3474.045	32.775	44.433	3771.6	1008.8	6020.8	52.18	-0.50	113.95
	S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)								
140.720	3474.495	32.894	45.152	3809.3	1008.4	6103.4	52.71	-0.46	115.38
141.0	3474.670	32.941	45.434	3821.9	1008.3	6132.6	37.07	-0.40	93.43
142.0	3475.303	33.107	46.452	3859.0	1008.0	6226.4	37.23	-0.34	94.18
143.0	3475.941	33.273	47.484	3896.4	1007.6	6321.1	37.51	-0.34	95.23
144.0	3476.586	33.438	48.532	3934.0	1007.3	6416.9	37.78	-0.34	96.32
145.0	3477.237	33.604	49.596	3972.0	1006.9	6513.8	38.18	-0.34	97.53
146.0	3477.894	33.770	50.677	4010.3	1006.6	6612.0	38.52	-0.28	98.70
147.0	3478.557	33.935	51.773	4049.0	1006.3	6711.3	38.91	-0.28	100.02
148.0	3479.227	34.101	52.886	4088.2	1006.0	6812.3	39.44	-0.28	101.83
149.0	3479.903	34.267	54.015	4128.2	1005.7	6915.0	39.95	-0.29	103.49
150.0	3480.585	34.432	55.162	4168.4	1005.4	7019.3	40.44	-0.30	105.29
151.0	3481.275	34.598	56.326	4208.9	1005.1	7125.3	41.01	-0.45	107.08
152.0	3481.971	34.763	57.507	4250.2	1004.8	7233.3	41.56	-0.15	108.88
153.0	3482.674	34.928	58.707	4292.0	1004.5	7343.0	42.13	-0.42	110.67
154.0	3483.384	35.094	59.924	4334.4	1004.1	7454.6	42.68	-0.32	112.47
155.0	3484.101	35.259	61.161	4377.4	1003.8	7568.0	43.25	-0.45	114.26
156.0	3484.825	35.424	62.416	4420.9	1003.4	7683.2	43.80	-0.31	116.06
157.0	3485.556	35.589	63.690	4464.9	1002.9	7800.1	44.37	-0.62	117.85
158.0	3486.295	35.754	64.983	4509.6	1002.0	7918.9	44.93	-1.08	119.65
	S-IC OUTBOARD ENGINE CUTOFF (ENGINES 1 AND 3)								
158.160	3486.414	35.780	65.192	4516.8	1001.8	7938.1	45.02	-0.91	119.93
159.0	3487.038	35.919	66.293	4517.1	1001.5	7979.1	-31.38	-0.16	-0.50
	S-IC/S-II SEPARATION COMMAND								
159.900	3487.705	36.067	67.474	4488.8	1001.3	7978.6	-31.48	-0.13	-0.48
160.0	3487.778	36.084	67.604	4485.7	1001.3	7978.6	-31.50	-0.13	-0.48
162.0	3489.246	36.413	70.232	4422.7	1001.0	7977.4	-31.44	-0.13	-0.64
164.0	3490.692	36.743	72.859	4370.6	1000.6	7991.8	-19.56	-0.29	17.80
166.0	3492.125	37.072	75.496	4333.6	1000.0	8030.3	-17.65	-0.30	20.50
168.0	3493.546	37.401	78.146	4300.0	999.4	8073.9	-15.72	-0.31	23.42
170.0	3494.956	37.730	80.812	4268.5	998.9	8120.5	-15.30	-0.28	23.92
172.0	3496.356	38.059	83.493	4238.1	998.3	8168.8	-15.07	-0.27	24.20
174.0	3497.746	38.387	86.189	4208.1	997.8	8217.4	-14.97	-0.28	24.29

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
176.0	3499.126	38.715	88.902	4178.3	997.2	8266.1	-14.84	-0.28	24.42
178.0	3500.497	39.044	91.631	4148.7	996.6	8315.1	-14.72	-0.28	24.55
180.0	3501.857	39.372	94.376	4119.3	996.1	8364.3	-14.61	-0.28	24.66
182.0	3503.209	39.699	97.137	4090.2	995.5	8413.8	-14.50	-0.28	24.78
184.0	3504.550	40.027	99.915	4061.3	994.9	8463.5	-14.38	-0.29	24.90
186.0	3505.882	40.354	102.709	4032.6	994.4	8513.4	-14.26	-0.29	25.00
188.0	3507.205	40.682	105.520	4004.2	993.8	8563.5	-14.16	-0.28	25.10
190.0	3508.518	41.009	108.347	3975.9	993.2	8613.8	-14.05	-0.28	25.20
192.0	3509.822	41.335	111.190	3947.9	992.6	8664.3	-13.95	-0.28	25.31
194.0	3511.117	41.662	114.051	3920.0	992.1	8715.1	-13.87	-0.28	25.42
196.0	3512.403	41.988	116.928	3892.4	991.5	8766.0	-13.72	-0.29	25.49
198.0	3513.680	42.315	119.821	3865.2	990.9	8817.0	-13.40	-0.29	25.46
200.0	3514.948	42.641	122.732	3838.9	990.3	8867.8	-12.92	-0.29	25.30
202.0	3516.207	42.967	125.659	3813.5	989.8	8918.2	-12.42	-0.27	25.13
204.0	3517.458	43.292	128.603	3789.0	989.2	8968.4	-12.09	-0.26	25.08
206.0	3518.701	43.618	131.563	3764.9	988.7	9018.7	-11.97	-0.24	25.18
208.0	3519.937	43.943	134.540	3740.9	988.2	9069.3	-11.98	-0.21	25.39
210.0	3521.164	44.269	137.534	3716.9	987.8	9120.3	-12.03	-0.19	25.61
212.0	3522.384	44.594	140.544	3692.8	987.5	9171.7	-12.06	-0.15	25.82
214.0	3523.595	44.919	143.572	3668.6	987.2	9223.6	-12.07	-0.10	26.01
216.0	3524.799	45.244	146.616	3644.4	987.1	9275.8	-12.09	-0.05	26.20
218.0	3525.994	45.568	149.678	3620.2	987.0	9328.4	-12.11	-0.03	26.40
220.0	3527.182	45.893	152.757	3595.9	987.0	9381.5	-12.16	0.00	26.63
222.0	3528.361	46.218	155.854	3571.5	987.0	9435.0	-12.22	0.05	26.86
224.0	3529.533	46.543	158.969	3547.0	987.2	9488.9	-12.26	0.11	27.07
226.0	3530.696	46.868	162.101	3522.4	987.4	9543.3	-12.28	0.16	27.27
228.0	3531.852	47.193	165.251	3497.8	987.8	9598.0	-12.29	0.19	27.48
230.0	3532.999	47.518	168.419	3473.2	988.2	9653.2	-12.31	0.22	27.69
232.0	3534.138	47.844	171.606	3448.5	988.7	9708.8	-12.36	0.24	27.91
234.0	3535.269	48.169	174.811	3423.6	989.1	9764.9	-12.43	0.24	28.12
236.0	3536.392	48.495	178.034	3398.7	989.6	9821.4	-12.50	0.25	28.35
238.0	3537.507	48.821	181.277	3373.6	990.1	9878.3	-12.56	0.27	28.60
240.0	3538.613	49.147	184.538	3348.4	990.7	9935.8	-12.60	0.31	28.84
242.0	3539.711	49.473	187.817	3323.1	991.3	9993.7	-12.64	0.35	29.05
244.0	3540.801	49.799	191.117	3297.7	992.1	10052.0	-12.67	0.37	29.26
246.0	3541.882	50.126	194.435	3272.3	992.8	10110.8	-12.72	0.41	29.48
248.0	3542.955	50.453	197.773	3246.8	993.7	10170.0	-12.76	0.47	29.71
250.0	3544.019	50.780	201.130	3221.2	994.7	10229.7	-12.81	0.50	29.93
252.0	3545.075	51.108	204.507	3195.5	995.7	10289.8	-12.88	0.52	30.15
254.0	3546.123	51.436	207.904	3169.6	996.8	10350.4	-12.95	0.55	30.40
256.0	3547.162	51.764	211.321	3143.6	997.9	10411.4	-13.00	0.60	30.65
258.0	3548.192	52.093	214.758	3117.5	999.2	10473.0	-13.05	0.66	30.88
260.0	3549.214	52.422	218.216	3091.3	1000.5	10535.0	-13.11	0.69	31.11

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
262.0	3550.227	52.751	221.693	3065.0	1001.9	10597.5	-13.18	0.71	31.34
264.0	3551.232	53.081	225.192	3038.6	1003.3	10660.4	-13.22	0.74	31.58
266.0	3552.228	53.412	228.711	3012.1	1004.9	10723.8	-13.27	0.79	31.82
268.0	3553.215	53.743	232.252	2985.4	1006.5	10787.7	-13.34	0.85	32.08
270.0	3554.193	54.074	235.813	2958.6	1008.2	10852.2	-13.42	0.91	32.36
272.0	3555.163	54.407	239.396	2931.7	1010.1	10917.2	-13.50	0.95	32.62
274.0	3556.123	54.739	243.000	2904.6	1012.0	10982.7	-13.57	0.99	32.86
276.0	3557.075	55.073	246.626	2877.3	1014.1	11048.7	-13.64	1.03	33.11
278.0	3558.017	55.407	250.274	2849.9	1016.2	11115.2	-13.70	1.08	33.37
280.0	3558.951	55.742	253.943	2822.4	1018.4	11182.2	-13.77	1.13	33.64
282.0	3559.875	56.077	257.635	2794.7	1020.7	11249.8	-13.87	1.17	33.89
284.0	3560.791	56.414	261.349	2766.9	1023.1	11317.8	-13.96	1.24	34.15
286.0	3561.697	56.751	265.086	2738.9	1025.6	11386.4	-14.04	1.30	34.42
288.0	3562.594	57.089	268.845	2710.6	1028.2	11455.5	-14.14	1.34	34.70
290.0	3563.481	57.428	272.627	2682.2	1031.0	11525.2	-14.23	1.38	34.97
292.0	3564.359	57.768	276.433	2653.7	1033.8	11595.4	-14.31	1.43	35.24
294.0	3565.228	58.108	280.261	2624.9	1036.7	11666.2	-14.40	1.48	35.52
296.0	3566.087	58.450	284.113	2596.0	1039.7	11737.6	-14.50	1.54	35.80
298.0	3566.937	58.793	287.988	2566.8	1042.8	11809.4	-14.62	1.59	36.08
300.0	3567.777	59.136	291.887	2537.5	1046.0	11881.9	-14.71	1.63	36.36
302.0	3568.607	59.481	295.810	2507.9	1049.3	11954.9	-14.81	1.69	36.64
304.0	3569.428	59.827	299.757	2478.1	1052.8	12028.5	-14.92	1.76	36.94
306.0	3570.239	60.174	303.729	2448.1	1056.3	12102.7	-15.03	1.83	37.23
308.0	3571.040	60.523	307.725	2417.9	1060.0	12177.5	-15.15	1.88	37.54
310.0	3571.831	60.872	311.745	2387.5	1063.8	12253.0	-15.27	1.92	37.84
312.0	3572.611	61.223	315.791	2356.7	1067.7	12329.0	-15.40	1.96	38.15
314.0	3573.382	61.575	319.862	2325.8	1071.7	12402.7	-15.52	2.00	38.45
S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)									
314.050	3573.401	61.584	319.964	2325.1	1071.8	12404.4	-15.53	2.00	38.45
316.0	3574.142	61.928	323.955	2289.8	1074.9	12468.4	-18.43	1.54	30.44
318.0	3574.889	62.283	328.069	2252.8	1077.9	12529.3	-18.57	1.52	30.64
320.0	3575.625	62.638	332.204	2215.5	1080.9	12590.8	-18.71	1.49	30.83
322.0	3576.348	62.994	336.358	2177.9	1084.0	12652.5	-18.85	1.62	31.03
324.0	3577.058	63.352	340.533	2140.0	1087.5	12714.7	-18.99	1.72	31.23
326.0	3577.757	63.710	344.728	2102.1	1091.0	12777.4	-19.13	1.79	31.43
328.0	3578.442	64.070	348.944	2063.7	1094.6	12840.5	-19.26	1.83	31.62
330.0	3579.115	64.431	353.181	2025.0	1098.2	12903.9	-19.39	1.85	31.82
332.0	3579.775	64.793	357.439	1986.0	1102.0	12967.8	-19.51	1.89	32.04
334.0	3580.423	65.156	361.718	1946.9	1105.8	13032.1	-19.64	1.94	32.25
336.0	3581.057	65.521	366.019	1907.4	1109.7	13096.8	-19.77	2.00	32.45
338.0	3581.678	65.887	370.340	1867.7	1113.7	13162.0	-19.92	2.04	32.65

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
340.0	3582.286	66.254	374.683	1827.6	1117.9	13227.5	-20.09	2.09	32.87
342.0	3582.881	66.623	379.048	1787.2	1122.1	13293.5	-20.27	2.16	33.09
344.0	3583.463	66.993	383.435	1746.5	1126.5	13359.9	-20.46	2.22	33.32
346.0	3584.031	67.364	387.843	1705.3	1131.0	13426.8	-20.63	2.27	33.55
348.0	3584.586	67.737	392.274	1663.9	1135.5	13494.1	-20.79	2.31	33.77
350.0	3585.126	68.112	396.727	1622.1	1140.2	13561.9	-20.94	2.35	33.99
352.0	3585.653	68.488	401.202	1580.0	1144.9	13630.1	-21.11	2.41	34.20
354.0	3586.166	68.866	405.700	1537.6	1149.8	13698.7	-21.28	2.49	34.42
356.0	3586.666	69.245	410.220	1494.8	1154.9	13767.8	-21.43	2.60	34.63
358.0	3587.151	69.626	414.763	1451.8	1160.2	13837.3	-21.59	2.66	34.85
360.0	3587.621	70.009	419.329	1408.4	1165.5	13907.3	-21.74	2.69	35.09
362.0	3588.078	70.393	423.919	1364.7	1170.9	13977.7	-21.93	2.71	35.33
364.0	3588.520	70.779	428.531	1320.6	1176.3	14048.6	-22.12	2.73	35.58
366.0	3588.947	71.168	433.167	1276.1	1181.8	14120.0	-22.31	2.76	35.80
368.0	3589.360	71.557	437.827	1231.3	1187.4	14191.9	-22.49	2.80	36.03
370.0	3589.758	71.949	442.510	1186.1	1193.0	14264.2	-22.68	2.85	36.27
372.0	3590.140	72.343	447.217	1140.5	1198.8	14337.0	-22.89	2.94	36.50
374.0	3590.508	72.738	451.948	1094.4	1204.7	14410.2	-23.10	3.01	36.73
376.0	3590.861	73.136	456.704	1048.0	1210.8	14484.0	-23.28	3.06	36.97
378.0	3591.198	73.536	461.483	1001.3	1216.9	14558.2	-23.45	3.09	37.22
380.0	3591.520	73.937	466.288	954.1	1223.1	14632.9	-23.65	3.13	37.47
382.0	3591.826	74.341	471.117	906.6	1229.4	14708.1	-23.87	3.18	37.71
384.0	3592.117	74.746	475.970	858.6	1235.8	14783.8	-24.10	3.23	37.95
386.0	3592.391	75.154	480.849	810.1	1242.3	14859.9	-24.32	3.27	38.19
388.0	3592.650	75.564	485.753	761.2	1248.9	14936.6	-24.54	3.32	38.43
390.0	3592.892	75.977	490.682	711.8	1255.6	15013.7	-24.75	3.39	38.69
392.0	3593.119	76.391	495.637	662.1	1262.5	15091.4	-24.95	3.48	38.95
394.0	3593.328	76.808	500.617	611.9	1269.5	15169.6	-25.16	3.56	39.21
396.0	3593.521	77.227	505.623	561.3	1276.7	15248.3	-25.40	3.62	39.47
398.0	3593.698	77.648	510.655	510.2	1283.9	15327.5	-25.64	3.62	39.74
400.0	3593.857	78.072	515.713	458.6	1291.2	15407.2	-25.91	3.71	40.01
402.0	3594.000	78.498	520.798	406.6	1298.7	15487.5	-26.18	3.80	40.28
404.0	3594.125	78.927	525.909	353.8	1306.0	15567.4	-26.60	3.57	34.72
406.0	3594.233	79.358	531.044	300.3	1313.6	15636.9	-26.91	3.17	34.74
408.0	3594.322	79.791	536.203	246.1	1319.1	15706.4	-27.25	3.27	34.79
410.0	3594.394	80.226	541.384	191.3	1325.6	15776.1	-27.59	3.29	34.88
412.0	3594.448	80.664	546.589	135.8	1332.2	15845.9	-27.85	3.33	34.98
414.0	3594.484	81.103	551.816	79.8	1338.9	15916.3	-28.04	3.38	35.13
416.0	3594.501	81.545	557.067	23.5	1345.7	15986.8	-28.14	3.43	35.28
418.0	3594.499	81.989	562.341	-32.9	1352.6	16057.6	-28.25	3.46	35.46
420.0	3594.479	82.435	567.638	-89.7	1359.5	16128.7	-28.48	3.51	35.63
422.0	3594.440	82.884	572.958	-147.1	1366.6	16200.1	-28.85	3.59	35.80
424.0	3594.382	83.335	578.303	-205.2	1373.9	16271.9	-29.28	3.68	35.98

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
426.0	3594.305	83.789	583.670	-264.1	1381.3	16344.1	-29.59	3.76	36.19
428.0	3594.208	84.244	589.062	-323.5	1388.9	16416.7	-29.75	3.80	36.39
430.0	3594.092	84.703	594.478	-383.1	1396.5	16489.7	-29.81	3.82	36.57
432.0	3593.956	85.164	599.918	-442.9	1404.1	16563.1	-29.90	3.82	36.76
434.0	3593.800	85.627	605.382	-502.9	1411.8	16636.9	-30.07	3.84	36.99
436.0	3593.625	86.093	610.870	-563.3	1419.5	16711.1	-30.31	3.87	37.22
438.0	3593.429	86.562	616.383	-624.3	1427.2	16785.7	-30.58	3.90	37.40
440.0	3593.214	87.033	621.920	-685.7	1435.1	16860.7	-30.82	3.94	37.58
442.0	3592.978	87.506	627.483	-747.6	1443.0	16936.1	-31.03	3.98	37.78
444.0	3592.722	87.983	633.070	-809.9	1451.0	17011.9	-31.25	4.05	37.98
446.0	3592.445	88.462	638.682	-872.7	1459.2	17088.1	-31.50	4.13	38.18
448.0	3592.147	88.943	644.319	-936.1	1467.5	17164.7	-31.82	4.22	38.38
450.0	3591.828	89.428	649.982	-1000.1	1476.0	17241.7	-32.16	4.29	38.61
452.0	3591.489	89.915	655.670	-1064.8	1484.6	17319.2	-32.51	4.33	38.82
454.0	3591.127	90.405	661.383	-1130.2	1493.3	17397.0	-32.84	4.37	39.01
456.0	3590.744	90.898	667.122	-1196.3	1502.1	17475.2	-33.19	4.43	39.19
458.0	3590.340	91.394	672.888	-1263.1	1511.0	17553.9	-33.56	4.51	39.41
460.0	3589.913	91.893	678.679	-1330.6	1520.1	17633.0	-33.92	4.57	39.65
462.0	3589.464	92.395	684.496	-1398.8	1529.3	17712.5	-34.24	4.61	39.86
464.0	3588.992	92.900	690.339	-1467.7	1538.5	17792.5	-34.58	4.66	40.05
466.0	3588.497	93.408	696.209	-1537.3	1547.9	17872.8	-34.93	4.73	40.26
468.0	3587.980	93.919	702.105	-1607.5	1557.4	17953.6	-35.30	4.81	40.49
470.0	3587.439	94.433	708.028	-1678.5	1567.1	18034.8	-35.64	4.88	40.71
472.0	3586.875	94.950	713.978	-1750.2	1576.9	18116.5	-35.98	4.95	40.92
474.0	3586.287	95.471	719.954	-1822.6	1586.9	18198.5	-36.34	5.03	41.13
476.0	3585.675	95.995	725.958	-1895.7	1597.0	18281.0	-36.73	5.11	41.35
478.0	3585.039	96.522	731.989	-1969.6	1607.3	18364.0	-37.10	5.17	41.58
480.0	3584.378	97.053	738.047	-2044.2	1617.7	18447.4	-37.48	5.24	41.80
482.0	3583.693	97.587	744.133	-2119.6	1628.2	18531.2	-37.84	5.31	41.99
484.0	3582.983	98.125	750.247	-2195.7	1638.9	18615.4	-38.24	5.38	42.20
486.0	3582.247	98.666	756.388	-2272.6	1649.7	18700.1	-38.64	5.44	42.45
488.0	3581.487	99.211	762.557	-2350.4	1660.7	18785.3	-39.05	5.50	42.69
490.0	3580.700	99.760	768.755	-2428.9	1671.7	18870.9	-39.48	5.57	42.92
492.0	3579.887	100.312	774.980	-2508.4	1682.9	18957.0	-39.94	5.65	43.11
494.0	3579.049	100.867	781.235	-2588.8	1694.3	19043.4	-40.38	5.74	43.32
496.0	3578.183	101.427	787.517	-2670.0	1705.9	19130.3	-40.80	5.82	43.55
498.0	3577.291	101.990	793.828	-2752.1	1717.5	19217.7	-41.20	5.87	43.79
500.0	3576.371	102.558	800.168	-2834.9	1729.3	19305.6	-41.62	5.93	44.04
502.0	3575.424	103.129	806.538	-2918.6	1741.2	19393.9	-42.05	6.01	44.26
504.0	3574.450	103.704	812.936	-3003.2	1753.4	19482.7	-42.48	6.12	44.50
506.0	3573.447	104.283	819.363	-3088.7	1765.7	19572.0	-42.94	6.20	44.74
508.0	3572.416	104.866	825.820	-3175.1	1778.1	19661.7	-43.41	6.26	44.98
510.0	3571.357	105.454	832.307	-3262.4	1790.7	19751.9	-43.88	6.32	45.22

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
512.0	3570.269	106.045	838.823	-3350.7	1803.4	19842.6	-44.34	6.39	45.46
514.0	3569.151	106.641	845.370	-3439.9	1816.2	19933.9	-44.81	6.47	45.73
516.0	3568.004	107.241	851.946	-3530.1	1829.3	20025.6	-45.32	6.55	45.98
518.0	3566.827	107.845	858.553	-3621.3	1842.4	20117.8	-45.84	6.64	46.22
520.0	3565.620	108.454	865.190	-3713.6	1855.8	20210.5	-46.35	6.73	46.45
522.0	3564.382	109.067	871.858	-3806.8	1869.3	20303.7	-46.86	6.80	46.69
524.0	3563.114	109.685	878.556	-3901.1	1883.0	20397.4	-47.38	6.87	46.95
526.0	3561.814	110.307	885.286	-3996.5	1896.8	20491.6	-47.90	6.93	47.22
528.0	3560.483	110.933	892.046	-4092.9	1910.7	20586.3	-48.45	7.00	47.48
530.0	3559.119	111.564	898.838	-4190.4	1924.8	20681.5	-49.01	7.09	47.75
532.0	3557.724	112.200	905.661	-4289.0	1939.1	20777.3	-49.56	7.22	48.00
534.0	3556.296	112.841	912.516	-4388.7	1953.6	20873.6	-50.09	7.33	48.26
536.0	3554.835	113.486	919.403	-4489.5	1968.3	20970.4	-50.66	7.43	48.51
538.0	3553.340	114.137	926.322	-4591.5	1983.3	21067.7	-51.26	7.51	48.79
540.0	3551.812	114.792	933.272	-4694.7	1998.4	21165.6	-51.88	7.60	49.08
542.0	3550.249	115.452	940.255	-4799.1	2013.6	21264.1	-52.50	7.69	49.37
544.0	3548.652	116.118	947.271	-4904.8	2029.1	21363.2	-53.09	7.79	49.66
546.0	3547.020	116.788	954.319	-5011.6	2044.8	21462.8	-53.67	7.89	49.95
548.0	3545.353	117.464	961.400	-5119.5	2060.6	21563.0	-54.25	7.99	50.25
550.0	3543.650	118.145	968.514	-5228.7	2076.7	21663.9	-54.87	8.09	50.55
552.0	3541.911	118.831	975.662	-5339.2	2093.0	21765.3	-55.53	8.19	50.84
554.0	3540.135	119.523	982.843	-5451.0	2109.5	21867.3	-56.19	8.31	51.13
556.0	3538.322	120.220	990.057	-5564.1	2126.2	21969.9	-56.85	8.44	51.42
558.0	3536.472	120.922	997.306	-5678.5	2143.2	22073.0	-57.52	8.55	51.72
560.0	3534.584	121.631	1004.589	-5794.3	2160.4	22176.8	-58.21	8.66	52.05
562.0	3532.657	122.345	1011.905	-5911.5	2177.8	22281.3	-58.93	8.77	52.38
564.0	3530.692	123.064	1019.257	-6030.1	2195.4	22386.4	-59.64	8.87	52.71
566.0	3528.687	123.790	1026.643	-6150.1	2213.3	22492.2	-60.41	8.98	52.99
568.0	3526.643	124.521	1034.064	-6272.1	2231.3	22598.3	-61.44	9.08	53.14
570.0	3524.558	125.259	1041.520	-6396.4	2249.6	22704.7	-62.75	9.19	53.17
572.0	3522.432	126.002	1049.011	-6523.1	2268.1	22811.1	-63.98	9.32	53.26
574.0	3520.264	126.752	1056.537	-6651.9	2286.8	22918.0	-64.78	9.43	53.56
576.0	3518.053	127.508	1064.098	-6782.0	2305.7	23025.7	-65.23	9.52	54.15
578.0	3515.799	128.270	1071.695	-6913.0	2324.9	23134.8	-65.58	9.62	54.94
580.0	3513.502	129.038	1079.328	-7044.7	2344.2	23245.4	-65.97	9.72	55.55
582.0	3511.161	129.813	1086.998	-7176.9	2363.7	23357.1	-66.20	9.80	56.15
584.0	3508.777	130.594	1094.705	-7309.6	2383.4	23469.9	-66.44	9.88	56.74
586.0	3506.349	131.382	1102.449	-7442.8	2403.2	23584.0	-66.68	9.97	57.33
588.0	3503.878	132.177	1110.230	-7576.5	2423.2	23699.3	-66.92	10.05	57.92
S-II GUIDANCE CUTOFF SIGNAL									
588.960	3502.675	132.560	1113.980	-7640.8	2432.9	23755.0	-67.04	10.09	58.21

TABLE C-II. LAUNCH VEHICLE NAVIGATION POSITIONS, VELOCITIES, AND ACCELERATIONS-ASCENT PHASE (CONTINUED)

TIME SEC	XS NM	YS NM	ZS NM	DXS FT/S	DYS FT/S	DZS FT/S	DDXS FT/S SQ	DDYS FT/S SQ	DDZS FT/S SQ
590.0	3501.363	132.977	1118.048	-7678.2	2434.5	23762.3	-27.86	-0.93	-6.73
S-II/OWS SEPARATION COMMAND									
591.100	3499.971	133.417	1122.348	-7768.7	2433.4	23754.8	-27.56	-1.04	-6.96
592.0	3498.828	133.778	1125.866	-7734.6	2432.0	23748.3	-31.86	-2.75	-7.85
594.0	3496.272	134.578	1133.680	-7792.1	2428.8	23732.2	-27.07	-1.05	-8.36
596.0	3493.698	135.377	1141.489	-7845.6	2426.7	23714.7	-26.72	-1.03	-8.81
598.0	3491.107	136.175	1149.292	-7899.1	2424.7	23697.1	-26.70	-1.03	-8.87
ORBIT INSERTION									
598.960	3489.857	136.558	1153.036	-7924.7	2423.7	23688.5	-26.69	-1.04	-8.90

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
GUIDANCE REFERENCE RELEASE											
-16.958	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-16.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-15.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-14.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-13.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-12.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-11.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-10.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-9.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-8.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-7.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-6.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-5.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-4.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-3.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-2.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
-1.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
0.0	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
ALL HOLDDOWN ARMS RELEASED											
0.200	3441.367	-80.6041	28.4470	0.0	90.00	0.0	90.00	0.0	1340.7	0.0	383
LIFTOFF - START OF TIME BASE 1											
0.600	3441.367	-80.6041	28.4470	325.17	89.45	2.2	90.00	0.09	1340.7	-0.000	383
1.0	3441.367	-80.6041	28.4470	325.73	89.55	5.0	90.00	0.21	1340.7	0.000	385
2.0	3441.369	-80.6041	28.4470	307.84	89.81	13.7	90.00	0.59	1340.7	0.000	394
3.0	3441.372	-80.6041	28.4470	204.72	89.78	23.1	90.00	0.99	1340.8	0.000	412
4.0	3441.377	-80.6041	28.4470	176.78	89.28	32.6	90.02	1.39	1341.1	-0.000	440
5.0	3441.383	-80.6041	28.4470	170.62	88.61	42.5	90.04	1.81	1341.5	-0.000	478
6.0	3441.391	-80.6041	28.4470	168.47	88.01	52.6	90.08	2.25	1342.1	0.000	525
7.0	3441.400	-80.6041	28.4470	166.93	87.65	63.0	90.11	2.69	1342.8	0.000	583
8.0	3441.411	-80.6041	28.4469	164.24	87.54	73.7	90.13	3.14	1343.6	0.001	651
9.0	3441.424	-80.6041	28.4469	160.44	87.58	84.6	90.14	3.60	1344.6	0.001	730
10.0	3441.439	-80.6041	28.4469	164.89	87.54	95.4	90.17	4.06	1345.2	0.002	820
11.0	3441.456	-80.6041	28.4469	162.89	87.55	106.5	90.19	4.53	1346.3	0.003	921
12.0	3441.474	-80.6041	28.4469	155.76	87.60	117.8	90.19	5.01	1347.9	0.004	1033
13.0	3441.494	-80.6041	28.4469	148.16	87.65	129.2	90.19	5.49	1349.7	0.004	1156
14.0	3441.517	-80.6041	28.4469	140.54	87.67	140.7	90.19	5.97	1351.7	0.005	1291

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
15.0	3441.541	-80.6041	28.4469	135.39	87.67	152.5	90.19	6.46	1353.7	0.006	1437
16.0	3441.567	-80.6041	28.4469	132.44	87.68	164.4	90.19	6.96	1355.7	0.007	1596
17.0	3441.595	-80.6041	28.4468	129.39	87.65	176.7	90.20	7.47	1357.9	0.008	1766
18.0	3441.625	-80.6040	28.4468	124.80	87.63	189.4	90.19	8.00	1360.5	0.009	1949
19.0	3441.657	-80.6040	28.4468	118.65	87.60	202.3	90.17	8.52	1363.3	0.011	2145
20.0	3441.692	-80.6040	28.4468	111.90	87.54	215.4	90.15	9.06	1366.4	0.012	2353
21.0	3441.728	-80.6040	28.4468	105.85	87.44	228.7	90.12	9.60	1369.8	0.013	2575
22.0	3441.767	-80.6039	28.4468	99.97	87.30	242.3	90.08	10.15	1373.6	0.015	2810
23.0	3441.808	-80.6039	28.4468	94.43	87.13	256.1	90.04	10.70	1377.6	0.016	3059
24.0	3441.851	-80.6038	28.4468	89.34	86.93	270.1	89.99	11.26	1381.9	0.018	3322
25.0	3441.896	-80.6038	28.4468	84.70	86.69	284.5	89.94	11.82	1386.6	0.020	3599
26.0	3441.944	-80.6037	28.4468	80.48	86.43	299.1	89.87	12.39	1391.7	0.023	3890
27.0	3441.995	-80.6037	28.4468	76.59	86.12	314.0	89.79	12.96	1397.2	0.025	4196
28.0	3442.048	-80.6036	28.4468	73.04	85.79	329.2	89.70	13.53	1403.1	0.028	4517
29.0	3442.103	-80.6035	28.4468	69.83	85.42	344.8	89.60	14.11	1409.4	0.032	4853
30.0	3442.161	-80.6035	28.4469	66.96	85.02	360.6	89.49	14.69	1416.2	0.036	5204
31.0	3442.221	-80.6034	28.4469	64.38	84.60	376.7	89.36	15.28	1423.4	0.041	5571
32.0	3442.284	-80.6033	28.4470	62.06	84.15	393.2	89.22	15.86	1431.1	0.046	5954
33.0	3442.350	-80.6031	28.4470	59.98	83.68	409.9	89.06	16.45	1439.2	0.052	6354
34.0	3442.418	-80.6030	28.4471	58.14	83.20	427.1	88.90	17.03	1447.8	0.060	6769
35.0	3442.489	-80.6029	28.4472	56.50	82.70	444.6	88.71	17.62	1456.9	0.068	7202
36.0	3442.563	-80.6027	28.4473	55.06	82.19	462.4	88.52	18.20	1466.5	0.077	7652
37.0	3442.640	-80.6025	28.4474	53.78	81.67	480.7	88.31	18.79	1476.6	0.087	8119
38.0	3442.720	-80.6024	28.4475	52.66	[illegible]	499.3	88.10	19.37	1487.3	0.098	8603
39.0	3442.803	-80.6022	28.4476	51.67	80.61	518.3	87.86	19.95	1498.5	0.111	9106
40.0	3442.888	-80.6020	28.4478	50.78	80.06	537.7	87.62	20.53	1510.3	0.125	9626
41.0	3442.977	-80.6017	28.4479	50.00	79.50	557.5	87.37	21.10	1522.7	0.140	10165
42.0	3443.069	-80.6015	28.4481	49.31	78.94	577.7	87.10	21.67	1535.7	0.157	10723
43.0	3443.164	-80.6012	28.4483	48.71	78.38	598.4	86.82	22.23	1549.3	0.175	11300
44.0	3443.262	-80.6009	28.4486	48.17	77.81	619.4	86.53	22.78	1563.5	0.196	11896
45.0	3443.363	-80.6006	28.4488	47.70	77.24	641.0	86.23	23.33	1578.4	0.217	12511
46.0	3443.468	-80.6003	28.4491	47.28	76.66	663.0	85.92	23.88	1594.0	0.241	13147
47.0	3443.575	-80.5999	28.4494	46.92	76.09	685.6	85.60	24.41	1610.2	0.267	13802
48.0	3443.687	-80.5995	28.4497	46.60	75.52	708.5	85.27	24.94	1627.0	0.295	14478
49.0	3443.801	-80.5991	28.4500	46.32	74.95	732.0	84.93	25.46	1644.6	0.324	15175
50.0	3443.919	-80.5986	28.4504	46.07	74.38	756.0	84.58	25.97	1662.8	0.356	15893
51.0	3444.041	-80.5982	28.4508	45.84	73.82	780.5	84.23	26.47	1681.6	0.391	16632
52.0	3444.166	-80.5977	28.4512	45.63	73.27	805.4	83.86	26.97	1701.1	0.427	17393
53.0	3444.295	-80.5971	28.4517	45.43	72.72	830.9	83.49	27.45	1721.2	0.466	18176
54.0	3444.427	-80.5966	28.4522	45.24	72.18	857.0	83.11	27.93	1742.0	0.508	18981
55.0	3444.563	-80.5960	28.4527	45.06	71.64	883.5	82.72	28.39	1763.5	0.552	19809
56.0	3444.703	-80.5953	28.4533	44.87	71.10	910.6	82.32	28.85	1785.6	0.599	20659
57.0	3444.847	-80.5947	28.4539	44.71	70.57	938.2	81.91	29.29	1808.4	0.649	21533

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
58.0	3444.994	-80.5940	28.4545	44.54	70.02	966.4	81.50	29.72	1832.1	0.701	22430
59.0	3445.146	-80.5932	28.4552	44.39	69.48	995.0	81.07	30.13	1856.4	0.757	23351
60.0	3445.301	-80.5925	28.4559	44.23	68.93	1024.1	80.63	30.53	1881.3	0.815	24295
	MACH 1										
61.000	3445.460	-80.5916	28.4566	44.08	68.37	1053.7	80.18	30.91	1907.0	0.877	25263
62.0	3445.624	-80.5908	28.4574	43.94	67.82	1083.8	79.73	31.27	1933.5	0.943	26256
63.0	3445.791	-80.5899	28.4582	43.81	67.27	1114.3	79.27	31.61	1960.5	1.012	27272
64.0	3445.962	-80.5889	28.4591	43.70	66.73	1145.1	78.82	31.95	1988.0	1.084	28313
65.0	3446.137	-80.5879	28.4600	43.60	66.18	1176.7	78.36	32.26	2016.5	1.160	29378
66.0	3446.316	-80.5869	28.4610	43.55	65.61	1209.0	77.89	32.55	2046.3	1.240	30468
67.0	3446.499	-80.5858	28.4620	43.47	65.05	1241.9	77.42	32.84	2076.6	1.324	31583
68.0	3446.687	-80.5846	28.4630	43.38	64.51	1275.5	76.94	33.11	2107.6	1.412	32722
69.0	3446.878	-80.5834	28.4642	43.28	63.97	1309.9	76.45	33.38	2139.4	1.504	33888
70.0	3447.074	-80.5822	28.4653	43.17	63.44	1345.2	75.96	33.64	2172.0	1.600	35079
71.0	3447.275	-80.5809	28.4666	43.07	62.94	1381.1	75.48	33.90	2205.1	1.701	36297
72.0	3447.479	-80.5795	28.4678	42.96	62.43	1417.7	74.98	34.14	2239.2	1.806	37541
73.0	3447.688	-80.5781	28.4692	42.84	61.93	1455.2	74.48	34.38	2274.0	1.916	38813
	MAXIMUM DYNAMIC PRESSURE										
73.500	3447.794	-80.5774	28.4699	42.77	61.68	1474.3	74.23	34.49	2291.8	1.973	39459
74.0	3447.902	-80.5766	28.4706	42.71	61.43	1493.5	73.98	34.60	2309.7	2.031	40112
75.0	3448.120	-80.5751	28.4721	42.57	60.94	1532.6	73.46	34.82	2346.3	2.151	41440
76.0	3448.343	-80.5735	28.4736	42.43	60.45	1572.5	72.95	35.02	2383.7	2.275	42795
77.0	3448.570	-80.5718	28.4752	42.27	59.95	1613.3	72.42	35.21	2422.1	2.405	44179
78.0	3448.802	-80.5701	28.4769	42.11	59.46	1655.0	71.89	35.39	2461.3	2.540	45591
79.0	3449.039	-80.5683	28.4786	41.95	58.97	1697.5	71.35	35.55	2501.5	2.681	47033
80.0	3449.281	-80.5665	28.4804	41.79	58.48	1740.8	70.81	35.71	2542.6	2.828	48504
81.0	3449.528	-80.5645	28.4823	41.63	57.99	1785.1	70.27	35.85	2584.6	2.980	50005
82.0	3449.780	-80.5626	28.4843	41.48	57.51	1830.2	69.73	35.98	2627.6	3.138	51535
83.0	3450.036	-80.5605	28.4863	41.34	57.03	1876.3	69.20	36.10	2671.6	3.302	53097
84.0	3450.298	-80.5584	28.4885	41.21	56.56	1923.2	68.67	36.21	2716.7	3.473	54688
85.0	3450.564	-80.5561	28.4907	41.10	56.08	1971.1	68.15	36.30	2763.0	3.650	56311
86.0	3450.836	-80.5539	28.4930	41.01	55.61	2020.0	67.64	36.38	2810.4	3.833	57964
87.0	3451.113	-80.5515	28.4954	40.93	55.14	2069.9	67.13	36.45	2859.0	4.024	59650
88.0	3451.395	-80.5490	28.4979	40.87	54.67	2120.7	66.63	36.50	2908.7	4.221	61366
89.0	3451.683	-80.5465	28.5005	40.82	54.21	2172.5	66.15	36.54	2959.5	4.426	63115
90.0	3451.975	-80.5439	28.5032	40.78	53.75	2225.4	65.67	36.58	3011.5	4.638	64896
91.0	3452.273	-80.5412	28.5059	40.75	53.29	2279.2	65.20	36.60	3064.7	4.857	66710
92.0	3452.577	-80.5383	28.5088	40.73	52.84	2334.0	64.74	36.61	3118.9	5.085	68557
93.0	3452.886	-80.5354	28.5118	40.71	52.40	2389.8	64.29	36.62	3174.2	5.320	70436

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
94.0	3453.200	-80.5324	28.5148	40.71	51.96	2446.6	63.85	36.61	3230.7	5.563	72350
95.0	3453.520	-80.5293	28.5180	40.71	51.52	2504.4	63.42	36.60	3288.3	5.814	74296
96.0	3453.845	-80.5261	28.5213	40.71	51.09	2563.2	63.00	36.58	3347.0	6.073	76277
97.0	3454.176	-80.5228	28.5247	40.72	50.66	2623.1	62.58	36.55	3406.8	6.342	78292
98.0	3454.513	-80.5194	28.5282	40.74	50.24	2683.9	62.18	36.51	3467.7	6.619	80342
99.0	3454.855	-80.5158	28.5318	40.75	49.82	2745.8	61.79	36.47	3529.7	6.904	82426
100.0	3455.204	-80.5122	28.5355	40.77	49.41	2808.8	61.40	36.41	3592.9	7.199	84545
101.0	3455.557	-80.5084	28.5393	40.79	49.00	2872.8	61.02	36.36	3657.2	7.503	86700
102.0	3455.917	-80.5045	28.5433	40.81	48.59	2937.9	60.65	36.30	3722.5	7.817	88890
103.0	3456.283	-80.5005	28.5474	40.83	48.20	3004.1	60.28	36.23	3789.0	8.140	91115
104.0	3456.654	-80.4964	28.5515	40.84	47.80	3071.3	59.92	36.16	3856.6	8.473	93377
105.0	3457.032	-80.4922	28.5559	40.86	47.41	3139.6	59.57	36.08	3925.2	8.816	95675
106.0	3457.415	-80.4878	28.5603	40.87	47.03	3209.0	59.22	36.00	3995.0	9.169	98009
107.0	3457.805	-80.4833	28.5649	40.88	46.65	3279.5	58.88	35.91	4065.9	9.532	100380
108.0	3458.200	-80.4786	28.5696	40.89	46.27	3351.2	58.54	35.82	4137.9	9.906	102788
109.0	3458.602	-80.4738	28.5744	40.90	45.90	3424.0	58.21	35.72	4211.2	10.291	105233
110.0	3459.009	-80.4689	28.5794	40.91	45.53	3498.0	57.88	35.62	4285.6	10.687	107716
111.0	3459.423	-80.4639	28.5845	40.91	45.17	3573.2	57.56	35.53	4361.2	11.094	110236
112.0	3459.844	-80.4587	28.5898	40.91	44.82	3649.6	57.25	35.43	4438.0	11.512	112795
113.0	3460.270	-80.4534	28.5952	40.91	44.47	3727.2	56.94	35.32	4515.9	11.941	115392
114.0	3460.703	-80.4479	28.6008	40.91	44.14	3806.1	56.63	35.23	4595.1	12.382	118029
115.0	3461.143	-80.4423	28.6065	40.90	43.81	3886.2	56.34	35.13	4675.5	12.835	120705
116.0	3461.589	-80.4365	28.6123	40.90	43.49	3967.6	56.05	35.03	4757.1	13.300	123421
117.0	3462.041	-80.4306	28.6183	40.90	43.17	4050.2	55.76	34.93	4840.0	13.777	126178
118.0	3462.501	-80.4245	28.6245	40.89	42.86	4134.2	55.48	34.83	4924.2	14.266	128976
119.0	3462.967	-80.4182	28.6308	40.89	42.56	4219.5	55.21	34.73	5009.8	14.768	131816
120.0	3463.440	-80.4119	28.6373	40.89	42.26	4306.2	54.94	34.62	5096.8	15.283	134697
121.0	3463.920	-80.4053	28.6439	40.89	41.96	4394.3	54.68	34.52	5185.1	15.811	137621
122.0	3464.407	-80.3986	28.6507	40.89	41.67	4483.8	54.42	34.41	5275.0	16.351	140588
123.0	3464.902	-80.3917	28.6577	40.89	41.39	4574.8	54.17	34.31	5366.2	16.906	143598
124.0	3465.403	-80.3846	28.6648	40.88	41.11	4667.2	53.92	34.20	5459.0	17.473	146652
125.0	3465.912	-80.3774	28.6722	40.89	40.83	4761.2	53.68	34.10	5553.2	18.055	149750
126.0	3466.428	-80.3700	28.6797	40.89	40.56	4856.7	53.45	33.99	5649.0	18.651	152894
127.0	3466.951	-80.3624	28.6873	40.89	40.29	4953.8	53.22	33.88	5746.4	19.261	156082
128.0	3467.482	-80.3547	28.6952	40.89	40.03	5052.4	52.99	33.78	5845.4	19.885	159317
129.0	3468.021	-80.3467	28.7032	40.89	39.78	5152.8	52.77	33.67	5946.0	20.524	162599
130.0	3468.567	-80.3386	28.7115	40.89	39.52	5254.8	52.56	33.57	6048.4	21.179	165928
131.0	3469.122	-80.3303	28.7199	40.89	39.27	5358.7	52.34	33.46	6152.6	21.848	169305
132.0	3469.684	-80.3218	28.7285	40.90	39.03	5464.3	52.14	33.35	6258.5	22.533	172730
133.0	3470.254	-80.3131	28.7374	40.90	38.79	5571.8	51.93	33.25	6366.3	23.234	176205
134.0	3470.833	-80.3041	28.7464	40.90	38.55	5681.1	51.73	33.14	6475.9	23.951	179730
135.0	3471.420	-80.2950	28.7556	40.90	38.32	5792.4	51.54	33.04	6587.5	24.684	183305
136.0	3472.015	-80.2857	28.7650	40.91	38.09	5905.6	51.35	32.93	6701.0	25.434	186932

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
137.0	3472.619	-80.2762	28.7747	40.91	37.86	6020.8	51.16	32.83	6816.5	26.200	190612
138.0	3473.232	-80.2664	28.7845	40.91	37.64	6138.2	50.97	32.72	6934.2	26.984	194344
139.0	3473.853	-80.2564	28.7946	40.92	37.42	6257.6	50.80	32.62	7053.9	27.786	198131
140.0	3474.484	-80.2463	28.8049	40.92	37.21	6379.2	50.62	32.52	7175.8	28.605	201973
S-IC CENTER ENGINE CUTOFF (ENGINE SOLENOID)											
140.720	3474.944	-80.2388	28.8125	40.92	37.06	6468.1	50.49	32.45	7264.9	29.207	204775
141.0	3475.123	-80.2358	28.8155	40.92	37.00	6499.1	50.45	32.42	7296.1	29.442	205870
142.0	3475.771	-80.2252	28.8262	40.93	36.80	6596.8	50.32	32.30	7394.3	30.296	209817
143.0	3476.425	-80.2144	28.8371	40.94	36.60	6695.4	50.19	32.19	7493.6	31.165	213801
144.0	3477.085	-80.2034	28.8482	40.94	36.40	6795.2	50.06	32.08	7593.9	32.048	217826
145.0	3477.753	-80.1922	28.8595	40.95	36.21	6896.2	49.93	31.97	7695.5	32.946	221892
146.0	3478.427	-80.1808	28.8710	40.95	36.02	6998.4	49.81	31.86	7798.3	33.860	225999
147.0	3479.108	-80.1692	28.8827	40.96	35.84	7102.0	49.69	31.75	7902.5	34.790	230149
148.0	3479.796	-80.1574	28.8946	40.97	35.65	7207.3	49.57	31.64	8008.3	35.735	234341
149.0	3480.491	-80.1454	28.9067	40.98	35.47	7314.5	49.45	31.53	8116.1	36.696	238576
150.0	3481.193	-80.1333	28.9190	40.98	35.29	7423.2	49.33	31.43	8225.4	37.673	242856
151.0	3481.902	-80.1209	28.9315	40.99	35.11	7533.6	49.22	31.32	8336.4	38.667	247180
152.0	3482.619	-80.1082	28.9442	41.00	34.94	7646.2	49.11	31.21	8449.5	39.678	251549
153.0	3483.344	-80.0954	28.9571	41.01	34.76	7760.7	49.00	31.11	8564.5	40.706	255965
154.0	3484.076	-80.0824	28.9702	41.01	34.59	7877.1	48.89	31.00	8681.4	41.751	260427
155.0	3484.816	-80.0691	28.9836	41.02	34.42	7995.3	48.78	30.90	8800.2	42.814	264937
156.0	3485.564	-80.0556	28.9971	41.03	34.25	8115.5	48.67	30.80	8920.9	43.895	269495
157.0	3486.319	-80.0418	29.0110	41.04	34.09	8237.5	48.57	30.70	9043.4	44.994	274101
158.0	3487.083	-80.0279	29.0250	41.04	33.92	8361.5	48.46	30.60	9167.8	46.112	278758
S-IC OUTBOARD ENGINE CUTOFF (ENGINES 1 AND 3)											
158.160	3487.207	-80.0256	29.0273	41.04	33.90	8381.5	48.44	30.58	9187.9	46.293	279509
159.0	3487.853	-80.0137	29.0392	41.05	33.77	8416.2	48.41	30.48	9223.5	47.244	283450
S-IC/S-II SEPARATION COMMAND											
159.900	3488.544	-80.0009	29.0520	41.06	33.63	8400.6	48.42	30.34	9209.3	48.266	287660
160.0	3488.620	-79.9995	29.0535	41.06	33.61	8398.9	48.42	30.33	9207.7	48.379	288123
162.0	3490.143	-79.9711	29.0820	41.08	33.30	8364.2	48.44	30.03	9176.1	50.650	297406
164.0	3491.646	-79.9427	29.1104	41.09	33.00	8348.9	48.45	29.75	9163.7	52.919	306570
166.0	3493.138	-79.9141	29.1390	41.11	32.69	8362.2	48.43	29.47	9179.6	55.196	315663
168.0	3494.620	-79.8855	29.1677	41.13	32.39	8382.1	48.41	29.20	9202.0	57.484	324698
170.0	3496.094	-79.8566	29.1966	41.14	32.09	8405.9	48.39	28.94	9228.2	59.785	333685
172.0	3497.560	-79.8275	29.2256	41.16	31.79	8432.0	48.36	28.68	9256.7	62.099	342623
174.0	3499.018	-79.7983	29.2548	41.18	31.50	8458.9	48.34	28.42	9286.0	64.427	351516

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
176.0	3500.470	-79.7689	29.2841	41.20	31.21	8486.3	48.32	28.17	9315.6	66.769	360364
178.0	3501.913	-79.7392	29.3136	41.21	30.93	8514.3	48.29	27.92	9345.9	69.124	369169
180.0	3503.350	-79.7094	29.3433	41.23	30.64	8542.9	48.27	27.67	9376.7	71.493	377930
182.0	3504.780	-79.6794	29.3731	41.25	30.36	8572.2	48.25	27.42	9408.1	73.877	386648
184.0	3506.203	-79.6492	29.4031	41.27	30.08	8602.0	48.23	27.18	9440.0	76.274	395324
186.0	3507.618	-79.6188	29.4333	41.29	29.81	8632.3	48.20	26.94	9472.5	78.686	403959
188.0	3509.028	-79.5882	29.4636	41.31	29.54	8663.3	48.18	26.70	9505.5	81.112	412553
190.0	3510.430	-79.5574	29.4942	41.33	29.27	8694.7	48.16	26.47	9539.0	83.552	421107
192.0	3511.826	-79.5263	29.5248	41.34	29.01	8726.8	48.14	26.23	9573.0	86.006	429623
194.0	3513.216	-79.4951	29.5557	41.36	28.74	8759.3	48.12	26.00	9607.5	88.475	438099
196.0	3514.599	-79.4637	29.5867	41.38	28.49	8792.4	48.10	25.78	9642.5	90.958	446537
198.0	3515.977	-79.4321	29.6179	41.40	28.23	8826.0	48.08	25.56	9677.9	93.456	454939
200.0	3517.348	-79.4002	29.6493	41.42	27.99	8860.0	48.07	25.34	9713.7	95.968	463305
202.0	3518.714	-79.3682	29.6808	41.44	27.75	8894.3	48.05	25.14	9749.7	98.495	471637
204.0	3520.075	-79.3360	29.7125	41.46	27.52	8929.1	48.03	24.94	9786.1	101.036	479937
206.0	3521.430	-79.3035	29.7444	41.48	27.30	8964.2	48.02	24.74	9822.9	103.591	488208
208.0	3522.781	-79.2709	29.7765	41.51	27.08	8999.9	48.00	24.55	9860.2	106.160	496450
210.0	3524.127	-79.2380	29.8087	41.53	26.86	9036.2	47.99	24.36	9898.0	108.744	504663
212.0	3525.468	-79.2049	29.8411	41.55	26.64	9073.0	47.97	24.17	9936.4	111.342	512847
214.0	3526.805	-79.1717	29.8736	41.57	26.42	9110.4	47.96	23.97	9975.4	113.955	521002
216.0	3528.137	-79.1382	29.9063	41.60	26.20	9148.3	47.95	23.79	10014.8	116.583	529129
218.0	3529.464	-79.1045	29.9392	41.62	25.98	9186.8	47.93	23.60	10054.8	119.225	537228
220.0	3530.786	-79.0705	29.9723	41.65	25.77	9225.8	47.92	23.41	10095.4	121.883	545299
222.0	3532.104	-79.0364	30.0056	41.67	25.56	9265.4	47.91	23.22	10136.5	124.556	553343
224.0	3533.418	-79.0020	30.0390	41.70	25.34	9305.5	47.90	23.04	10178.2	127.244	561358
226.0	3534.726	-78.9674	30.0726	41.73	25.13	9346.3	47.89	22.85	10220.4	129.948	569346
228.0	3536.031	-78.9325	30.1064	41.76	24.92	9387.5	47.89	22.67	10263.2	132.667	577306
230.0	3537.330	-78.8975	30.1403	41.79	24.71	9429.4	47.88	22.49	10306.5	135.402	585240
232.0	3538.626	-78.8622	30.1745	41.82	24.50	9471.8	47.87	22.30	10350.4	138.153	593146
234.0	3539.916	-78.8266	30.2088	41.85	24.30	9514.8	47.86	22.12	10394.8	140.919	601026
236.0	3541.203	-78.7908	30.2433	41.88	24.09	9558.3	47.86	21.94	10439.8	143.702	608879
238.0	3542.485	-78.7548	30.2780	41.91	23.88	9602.5	47.85	21.76	10485.4	146.501	616705
240.0	3543.762	-78.7185	30.3129	41.94	23.68	9647.2	47.85	21.59	10531.5	149.317	624505
242.0	3545.035	-78.6820	30.3480	41.97	23.48	9692.5	47.84	21.41	10578.3	152.149	632279
244.0	3546.304	-78.6452	30.3832	42.00	23.28	9738.4	47.84	21.23	10625.6	154.997	640026
246.0	3547.569	-78.6082	30.4187	42.03	23.08	9784.9	47.84	21.06	10673.4	157.863	647748
248.0	3548.829	-78.5709	30.4543	42.07	22.88	9832.0	47.83	20.89	10721.9	160.745	655443
250.0	3550.085	-78.5334	30.4901	42.10	22.68	9879.6	47.83	20.71	10770.9	163.645	663114
252.0	3551.337	-78.4955	30.5262	42.14	22.48	9927.8	47.83	20.54	10820.4	166.562	670759
254.0	3552.585	-78.4575	30.5624	42.17	22.29	9976.6	47.83	20.37	10870.6	169.496	678378
256.0	3553.828	-78.4191	30.5988	42.21	22.10	10026.1	47.83	20.20	10921.3	172.448	685973
258.0	3555.067	-78.3805	30.6354	42.24	21.90	10076.1	47.83	20.03	10972.7	175.417	693542
260.0	3556.303	-78.3416	30.6722	42.28	21.71	10126.7	47.83	19.87	11024.7	179.405	701087

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
262.0	3557.534	-78.3025	30.7093	42.32	21.52	10177.9	47.83	19.70	11077.2	181.410	708607
264.0	3558.761	-78.2630	30.7465	42.35	21.33	10229.7	47.83	19.53	11130.3	184.434	716103
266.0	3559.984	-78.2233	30.7839	42.39	21.15	10282.2	47.84	19.37	11184.0	187.475	723574
268.0	3561.203	-78.1833	30.8215	42.43	20.96	10335.2	47.84	19.21	11238.4	190.535	731022
270.0	3562.418	-78.1430	30.8593	42.47	20.78	10389.0	47.84	19.05	11293.4	193.614	738446
272.0	3563.629	-78.1024	30.8974	42.51	20.59	10443.3	47.85	18.89	11349.0	196.712	745846
274.0	3564.836	-78.0615	30.9356	42.55	20.41	10498.3	47.85	18.73	11405.3	199.828	753222
276.0	3566.039	-78.0203	30.9741	42.59	20.23	10553.9	47.86	18.57	11462.1	202.964	760576
278.0	3567.239	-77.9788	31.0127	42.64	20.05	10610.2	47.87	18.41	11519.6	206.118	767905
280.0	3568.435	-77.9370	31.0516	42.68	19.88	10667.1	47.88	18.25	11577.8	209.292	775212
282.0	3569.626	-77.8949	31.0907	42.72	19.70	10724.7	47.88	18.10	11636.5	212.486	782496
284.0	3570.814	-77.8525	31.1300	42.77	19.52	10782.8	47.89	17.95	11695.9	215.700	789758
286.0	3571.999	-77.8098	31.1695	42.81	19.35	10841.7	47.90	17.79	11756.0	218.933	796997
288.0	3573.179	-77.7667	31.2092	42.86	19.18	10901.2	47.91	17.64	11816.7	222.186	804213
290.0	3574.356	-77.7233	31.2492	42.90	19.01	10961.3	47.92	17.49	11878.0	225.460	811407
292.0	3575.529	-77.6796	31.2893	42.95	18.84	11022.1	47.94	17.34	11940.1	228.754	818579
294.0	3576.699	-77.6356	31.3297	42.99	18.67	11083.6	47.95	17.19	12002.7	232.068	825729
296.0	3577.865	-77.5912	31.3703	43.04	18.50	11145.8	47.96	17.04	12066.1	235.404	832857
298.0	3579.027	-77.5465	31.4112	43.09	18.33	11208.6	47.98	16.90	12130.1	238.760	839964
300.0	3580.186	-77.5015	31.4522	43.14	18.17	11272.1	47.99	16.75	12194.8	242.137	847049
302.0	3581.341	-77.4561	31.4935	43.19	18.00	11336.3	48.00	16.61	12260.1	245.536	854113
304.0	3582.492	-77.4103	31.5350	43.24	17.84	11401.2	48.02	16.46	12326.2	248.956	861155
306.0	3583.640	-77.3642	31.5767	43.29	17.68	11466.9	48.04	16.32	12393.0	252.397	868176
308.0	3584.785	-77.3178	31.6187	43.34	17.52	11533.2	48.05	16.18	12460.4	255.861	875177
310.0	3585.926	-77.2710	31.6609	43.39	17.36	11600.3	48.07	16.04	12528.7	259.346	882156
312.0	3587.063	-77.2238	31.7033	43.44	17.20	11668.0	48.09	15.90	12597.6	262.854	889115
314.0	3588.198	-77.1762	31.7460	43.50	17.05	11733.7	48.11	15.76	12664.4	266.384	896053
	S-II CENTER ENGINE CUTOFF (ENGINE SOLENOID)										
314.050	3588.226	-77.1750	31.7471	43.50	17.05	11735.2	48.11	15.76	12665.9	266.473	896226
316.0	3589.327	-77.1283	31.7889	43.54	16.88	11790.6	48.13	15.61	12722.4	269.935	902964
318.0	3590.451	-77.0801	31.8319	43.59	16.72	11842.8	48.15	15.46	12775.8	273.503	909842
320.0	3591.570	-77.0316	31.8752	43.64	16.55	11895.8	48.17	15.32	12829.9	277.089	916685
322.0	3592.683	-76.9828	31.9186	43.69	16.39	11949.1	48.20	15.17	12884.3	280.694	923494
324.0	3593.790	-76.9337	31.9622	43.74	16.23	12003.0	48.22	15.02	12939.3	284.316	930268
326.0	3594.891	-76.8842	32.0060	43.79	16.07	12057.6	48.24	14.88	12995.0	287.957	937007
328.0	3595.986	-76.8345	32.0500	43.84	15.90	12112.7	48.27	14.73	13051.2	291.616	943712
330.0	3597.076	-76.7844	32.0941	43.90	15.74	12168.3	48.30	14.59	13107.9	295.294	950381
332.0	3598.160	-76.7340	32.1385	43.95	15.58	12224.4	48.32	14.44	13165.2	298.990	957016
334.0	3599.238	-76.6832	32.1830	44.00	15.42	12281.2	48.35	14.30	13223.1	302.706	963615
336.0	3600.310	-76.6321	32.2277	44.06	15.27	12338.5	48.37	14.16	13281.4	306.440	970180
338.0	3601.376	-76.5807	32.2726	44.11	15.11	12396.3	48.40	14.02	13340.4	310.193	976710

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
340.0	3602.437	-76.5289	32.3177	44.16	14.95	12454.7	48.43	13.88	13399.9	313.966	983205
342.0	3603.492	-76.4768	32.3630	44.22	14.80	12513.7	48.46	13.74	13459.9	317.758	989665
344.0	3604.541	-76.4244	32.4085	44.27	14.64	12573.3	48.49	13.60	13520.6	321.570	996090
346.0	3605.584	-76.3716	32.4541	44.33	14.49	12633.4	48.52	13.46	13581.8	325.401	1002480
348.0	3606.622	-76.3184	32.5000	44.39	14.33	12694.2	48.55	13.32	13643.6	329.253	1008834
350.0	3607.653	-76.2649	32.5460	44.44	14.18	12755.5	48.58	13.18	13706.1	333.124	1015153
352.0	3608.679	-76.2110	32.5923	44.50	14.03	12817.5	48.61	13.04	13769.1	337.016	1021436
354.0	3609.699	-76.1568	32.6387	44.56	13.88	12880.0	48.64	12.90	13832.6	340.928	1027684
356.0	3610.713	-76.1021	32.6854	44.62	13.73	12943.1	48.68	12.77	13896.8	344.861	1033896
358.0	3611.721	-76.0471	32.7322	44.68	13.58	13006.8	48.71	12.63	13961.6	348.814	1040073
360.0	3612.723	-75.9918	32.7793	44.74	13.43	13071.1	48.74	12.50	14026.9	352.788	1046214
362.0	3613.719	-75.9360	32.8265	44.80	13.28	13136.1	48.78	12.36	14092.9	356.784	1052320
364.0	3614.709	-75.8799	32.8740	44.86	13.13	13201.7	48.81	12.23	14159.5	360.800	1058390
366.0	3615.693	-75.8233	32.9216	44.92	12.99	13267.9	48.85	12.10	14226.8	364.838	1064425
368.0	3616.672	-75.7664	32.9695	44.99	12.84	13334.8	48.88	11.97	14294.6	368.898	1070423
370.0	3617.644	-75.7091	33.0175	45.05	12.70	13402.2	48.92	11.83	14363.1	372.979	1076386
372.0	3618.611	-75.6514	33.0658	45.11	12.55	13470.3	48.96	11.70	14432.2	377.082	1082313
374.0	3619.572	-75.5932	33.1142	45.17	12.41	13539.0	48.99	11.57	14501.9	381.207	1088204
376.0	3620.526	-75.5347	33.1629	45.24	12.27	13608.4	49.03	11.44	14572.2	385.354	1094059
378.0	3621.475	-75.4757	33.2118	45.30	12.12	13678.4	49.07	11.31	14643.2	389.524	1099878
380.0	3622.417	-75.4163	33.2609	45.37	11.98	13749.1	49.11	11.19	14714.9	393.716	1105660
382.0	3623.354	-75.3565	33.3102	45.43	11.84	13820.5	49.15	11.06	14787.2	397.931	1111406
384.0	3624.284	-75.2963	33.3597	45.50	11.70	13892.4	49.19	10.93	14860.2	402.169	1117116
386.0	3625.209	-75.2356	33.4094	45.56	11.56	13965.1	49.23	10.80	14933.8	406.430	1122790
388.0	3626.127	-75.1745	33.4594	45.63	11.43	14038.4	49.27	10.68	15008.0	410.715	1128427
390.0	3627.040	-75.1130	33.5095	45.69	11.29	14112.4	49.31	10.55	15082.9	415.023	1134027
392.0	3627.946	-75.0510	33.5599	45.76	11.15	14187.0	49.36	10.43	15158.6	419.354	1139591
394.0	3628.846	-74.9886	33.6105	45.83	11.02	14262.4	49.40	10.31	15234.9	423.710	1145118
396.0	3629.740	-74.9257	33.6613	45.90	10.88	14338.5	49.44	10.18	15311.9	428.089	1150608
398.0	3630.628	-74.8623	33.7123	45.97	10.75	14415.3	49.49	10.06	15389.6	432.493	1156061
400.0	3631.510	-74.7985	33.7636	46.04	10.61	14492.8	49.53	9.94	15468.0	436.922	1161477
402.0	3632.386	-74.7342	33.8150	46.11	10.48	14571.0	49.58	9.82	15547.2	441.375	1166856
404.0	3633.255	-74.6695	33.8667	46.18	10.35	14649.0	49.62	9.70	15626.1	445.852	1172197
406.0	3634.118	-74.6043	33.9186	46.24	10.22	14716.8	49.67	9.58	15694.8	450.353	1177498
408.0	3634.974	-74.5386	33.9707	46.31	10.09	14784.8	49.71	9.45	15763.6	454.875	1182757
410.0	3635.822	-74.4726	34.0229	46.38	9.95	14853.1	49.76	9.33	15832.8	459.420	1187974
412.0	3636.664	-74.4061	34.0754	46.45	9.82	14921.8	49.80	9.21	15902.4	463.985	1193146
414.0	3637.498	-74.3391	34.1280	46.51	9.69	14991.4	49.85	9.09	15972.8	468.573	1198275
416.0	3638.325	-74.2718	34.1808	46.58	9.56	15061.1	49.90	8.97	16043.3	473.183	1203359
418.0	3639.145	-74.2040	34.2338	46.65	9.43	15131.4	49.95	8.85	16114.5	477.815	1208400
420.0	3639.957	-74.1357	34.2870	46.72	9.30	15202.2	50.00	8.73	16186.1	482.469	1213397
422.0	3640.762	-74.0670	34.3404	46.79	9.18	15273.6	50.05	8.61	16258.3	487.146	1218351
424.0	3641.560	-73.9978	34.3940	46.86	9.05	15345.5	50.10	8.50	16331.1	491.845	1223261

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
426.0	3642.351	-73.9281	34.4477	46.94	8.92	15418.1	50.15	8.38	16404.5	496.567	1228126
428.0	3643.134	-73.8580	34.5017	47.01	8.79	15491.3	50.20	8.26	16478.6	501.312	1232945
430.0	3643.909	-73.7879	34.5558	47.08	8.66	15565.1	50.25	8.14	16553.2	506.080	1237719
432.0	3644.677	-73.7164	34.6101	47.15	8.54	15639.5	50.30	8.03	16628.4	510.871	1242448
434.0	3645.438	-73.6449	34.6647	47.23	8.42	15714.6	50.35	7.91	16704.2	515.686	1247134
436.0	3646.192	-73.5729	34.7194	47.30	8.29	15790.3	50.41	7.80	16780.7	520.525	1251775
438.0	3646.938	-73.5004	34.7743	47.37	8.17	15866.6	50.46	7.69	16857.9	525.387	1256371
440.0	3647.677	-73.4274	34.8294	47.45	8.05	15943.6	50.51	7.58	16935.6	530.273	1260924
442.0	3648.408	-73.3539	34.8847	47.52	7.93	16021.2	50.57	7.47	17013.9	535.184	1265432
444.0	3649.132	-73.2799	34.9402	47.60	7.81	16099.4	50.62	7.36	17092.9	540.118	1269896
446.0	3649.849	-73.2054	34.9958	47.67	7.70	16178.2	50.67	7.25	17172.5	545.078	1274316
448.0	3650.559	-73.1303	35.0517	47.75	7.58	16257.7	50.73	7.14	17252.7	550.061	1278691
450.0	3651.261	-73.0548	35.1078	47.83	7.46	16337.9	50.79	7.03	17333.7	555.070	1283022
452.0	3651.955	-72.9787	35.1641	47.90	7.34	16418.7	50.84	6.92	17415.3	560.104	1287307
454.0	3652.642	-72.9021	35.2205	47.98	7.23	16500.3	50.90	6.81	17497.9	565.163	1291547
456.0	3653.322	-72.8250	35.2772	48.06	7.11	16582.4	50.96	6.71	17580.4	570.248	1295741
458.0	3653.994	-72.7473	35.3341	48.14	6.99	16665.3	51.02	6.60	17664.0	575.358	1299889
460.0	3654.658	-72.6691	35.3912	48.22	6.88	16748.8	51.08	6.49	17748.3	580.494	1303990
462.0	3655.314	-72.5904	35.4484	48.30	6.76	16833.1	51.14	6.38	17833.3	585.656	1308044
464.0	3655.962	-72.5110	35.5059	48.38	6.65	16918.1	51.20	6.27	17919.1	590.844	1312051
466.0	3656.603	-72.4311	35.5636	48.46	6.53	17003.8	51.26	6.17	18005.5	596.059	1316009
468.0	3657.235	-72.3507	35.6215	48.54	6.42	17090.2	51.32	6.06	18092.6	601.301	1319920
470.0	3657.860	-72.2697	35.6796	48.62	6.30	17177.4	51.38	5.95	18180.4	606.569	1323782
472.0	3658.476	-72.1881	35.7379	48.71	6.19	17265.2	51.44	5.85	18269.0	611.865	1327596
474.0	3659.085	-72.1059	35.7964	48.79	6.07	17353.8	51.51	5.74	18358.3	617.188	1331360
476.0	3659.685	-72.0231	35.8551	48.87	5.96	17443.1	51.57	5.63	18448.3	622.538	1335075
478.0	3660.277	-71.9397	35.9140	48.96	5.85	17533.3	51.64	5.53	18539.1	627.916	1338740
480.0	3660.861	-71.8557	35.9731	49.04	5.73	17624.1	51.70	5.42	18630.7	633.322	1342355
482.0	3661.436	-71.7711	36.0324	49.13	5.62	17715.7	51.77	5.32	18723.0	638.756	1345920
484.0	3662.003	-71.6858	36.0919	49.22	5.51	17808.1	51.84	5.21	18816.0	644.219	1349434
486.0	3662.561	-71.6000	36.1517	49.30	5.40	17901.2	51.90	5.11	18909.8	649.710	1352897
488.0	3663.111	-71.5135	36.2116	49.39	5.29	17995.2	51.97	5.00	19004.4	655.231	1356308
490.0	3663.652	-71.4264	36.2717	49.48	5.17	18090.0	52.04	4.90	19099.9	660.780	1359667
492.0	3664.185	-71.3386	36.3321	49.57	5.06	18185.5	52.11	4.80	19196.1	666.359	1362974
494.0	3664.709	-71.2502	36.3927	49.66	4.95	18281.9	52.18	4.69	19293.1	671.967	1366228
496.0	3665.224	-71.1611	36.4535	49.75	4.84	18379.0	52.25	4.59	19390.9	677.605	1369428
498.0	3665.730	-71.0714	36.5145	49.84	4.73	18477.0	52.32	4.48	19489.6	683.273	1372574
500.0	3666.227	-70.9809	36.5757	49.93	4.62	18575.9	52.39	4.38	19589.1	688.971	1375666
502.0	3666.715	-70.8898	36.6371	50.02	4.51	18675.6	52.47	4.28	19689.4	694.700	1378704
504.0	3667.194	-70.7981	36.6987	50.11	4.40	18776.1	52.54	4.18	19790.6	700.460	1381686
506.0	3667.664	-70.7056	36.7606	50.21	4.29	18877.6	52.61	4.07	19892.7	706.251	1384614
508.0	3668.124	-70.6124	36.8226	50.30	4.19	18979.9	52.69	3.97	19995.6	712.073	1387485
510.0	3668.575	-70.5185	36.8849	50.40	4.08	19083.1	52.76	3.87	20099.5	717.927	1390300

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
512.0	3669.017	-70.4239	36.9474	50.49	3.97	19187.2	52.84	3.77	20204.2	723.812	1393059
514.0	3669.450	-70.3285	37.0101	50.59	3.86	19292.2	52.92	3.67	20309.9	729.730	1395760
516.0	3669.873	-70.2324	37.0730	50.68	3.75	19399.3	53.00	3.57	20416.5	735.680	1398404
518.0	3670.286	-70.1356	37.1361	50.78	3.65	19505.2	53.07	3.47	20524.0	741.663	1400989
520.0	3670.689	-70.0380	37.1995	50.88	3.54	19613.1	53.15	3.37	20632.5	747.679	1403516
522.0	3671.083	-69.9397	37.2631	50.98	3.43	19721.9	53.23	3.26	20741.9	753.728	1405984
524.0	3671.467	-69.8406	37.3268	51.08	3.33	19831.7	53.31	3.16	20852.3	759.811	1408392
526.0	3671.841	-69.7407	37.3908	51.18	3.22	19942.4	53.39	3.06	20963.6	765.927	1410740
528.0	3672.205	-69.6400	37.4551	51.28	3.12	20054.2	53.48	2.96	21076.0	772.078	1413027
530.0	3672.559	-69.5385	37.5195	51.38	3.01	20167.1	53.56	2.87	21189.4	778.263	1415252
532.0	3672.902	-69.4363	37.5842	51.48	2.91	20280.9	53.64	2.77	21303.8	784.483	1417416
534.0	3673.235	-69.3332	37.6491	51.58	2.80	20395.8	53.73	2.67	21419.3	790.737	1419518
536.0	3673.558	-69.2293	37.7142	51.69	2.70	20511.7	53.81	2.57	21535.7	797.028	1421556
538.0	3673.870	-69.1245	37.7795	51.79	2.59	20628.7	53.90	2.47	21653.3	803.354	1423531
540.0	3674.172	-69.0189	37.8450	51.89	2.49	20746.8	53.98	2.37	21771.9	809.716	1425442
542.0	3674.463	-68.9125	37.9108	52.00	2.38	20866.1	54.07	2.27	21891.7	816.114	1427288
544.0	3674.743	-68.8052	37.9768	52.11	2.28	20986.5	54.16	2.17	22012.7	822.549	1429069
546.0	3675.013	-68.6970	38.0430	52.21	2.18	21108.1	54.25	2.07	22134.8	829.021	1430784
548.0	3675.271	-68.5879	38.1094	52.32	2.07	21230.8	54.34	1.98	22258.0	835.530	1432432
550.0	3675.518	-68.4780	38.1761	52.43	1.97	21354.7	54.43	1.88	22382.5	842.078	1434014
552.0	3675.754	-68.3671	38.2430	52.54	1.87	21479.8	54.52	1.78	22508.1	848.663	1435528
554.0	3675.979	-68.2553	38.3101	52.65	1.77	21606.2	54.62	1.69	22635.0	855.287	1436973
556.0	3676.192	-68.1426	38.3774	52.76	1.66	21733.7	54.71	1.59	22763.0	861.950	1438350
558.0	3676.394	-68.0289	38.4449	52.88	1.56	21862.5	54.80	1.49	22892.3	868.652	1439658
560.0	3676.585	-67.9143	38.5127	52.99	1.46	21992.6	54.90	1.40	23022.9	875.393	1440895
562.0	3676.763	-67.7987	38.5807	53.10	1.36	22124.0	55.00	1.30	23154.8	882.175	1442062
564.0	3676.930	-67.6822	38.6489	53.22	1.26	22256.8	55.09	1.20	23288.1	888.997	1443158
566.0	3677.085	-67.5647	38.7174	53.33	1.16	22390.9	55.19	1.11	23422.7	895.860	1444181
568.0	3677.228	-67.4461	38.7861	53.45	1.06	22526.3	55.29	1.01	23558.5	902.764	1445131
570.0	3677.358	-67.3266	38.8550	53.57	0.95	22662.8	55.39	0.91	23695.5	909.710	1446005
572.0	3677.476	-67.2060	38.9241	53.69	0.85	22800.5	55.49	0.81	23833.7	916.697	1446801
574.0	3677.580	-67.0844	38.9934	53.81	0.74	22939.5	55.59	0.71	23973.1	923.727	1447517
576.0	3677.670	-66.9617	39.0630	53.93	0.63	23080.1	55.70	0.60	24114.2	930.800	1448150
578.0	3677.747	-66.8380	39.1328	54.05	0.53	23222.7	55.80	0.51	24257.3	937.916	1448702
580.0	3677.811	-66.7131	39.2028	54.17	0.43	23367.3	55.91	0.41	24402.2	945.077	1449174
582.0	3677.862	-66.5872	39.2731	54.29	0.33	23513.5	56.01	0.32	24548.9	952.281	1449568
584.0	3677.900	-66.4602	39.3436	54.42	0.23	23661.4	56.12	0.22	24697.2	959.531	1449885
586.0	3677.926	-66.3320	39.4143	54.54	0.14	23810.9	56.22	0.14	24847.1	966.826	1450126
588.0	3677.940	-66.2027	39.4853	54.66	0.06	23962.0	56.33	0.05	24998.6	974.167	1450295
	S-II GUIDANCE CUTOFF SIGNAL										
588.960	3677.942	-66.1403	39.5194	54.72	0.01	24035.2	56.38	0.01	25071.9	977.708	1450350

TABLE C-III. GEOGRAPHIC POLAR COORDINATES-ASCENT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	VEL-AZ DEG	VEL-EL DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
590.0	3677.942	-66.0723	39.5564	54.78	0.00	24053.6	56.43	0.00	25090.4	981.553	1450397
	S-II/OWS SEPARATION COMMAND										
591.100	3677.943	-66.0004	39.5955	54.83	0.00	24055.7	56.48	0.00	25092.6	985.618	1450447
592.0	3677.943	-65.9415	39.6275	54.87	0.00	24057.4	56.52	0.00	25094.3	988.944	1450488
594.0	3677.942	-65.8104	39.6984	54.96	-0.01	24059.6	56.60	-0.01	25096.5	996.339	1450568
596.0	3677.941	-65.6790	39.7691	55.06	-0.01	24059.4	56.69	-0.01	25096.4	1003.733	1450647
598.0	3677.940	-65.5473	39.8397	55.15	-0.01	24059.2	56.78	-0.01	25096.3	1011.128	1450726
	ORBIT INSERTION										
598.960	3677.940	-65.4839	39.8735	55.20	-0.01	24059.2	56.83	-0.01	25096.3	1014.677	1450764

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	GC LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
ORBIT INSERTION								
598.960	3677.940	-65.4839	39.8735	40.0506	56.83	-0.01	25096.3	238.765
600.0	3677.939	-65.4153	39.9101	40.0873	56.87	-0.01	25096.2	238.772
650.0	3677.904	-62.0190	41.6133	41.7920	59.23	-0.00	25095.5	239.076
700.0	3677.891	-58.4352	43.1974	43.3770	61.80	-0.00	25094.6	239.382
750.0	3677.882	-54.6579	44.6496	44.8294	64.57	-0.00	25093.7	239.665
800.0	3677.877	-50.6866	45.9560	46.1357	67.54	-0.00	25092.8	239.923
850.0	3677.877	-46.5263	47.1027	47.2820	70.72	0.00	25092.0	240.153
900.0	3677.881	-42.1886	48.0761	48.2548	74.08	0.00	25091.3	240.353
PAYLOAD SHROUD JETTISON								
920.400	3677.877	-40.3720	48.4204	48.5989	75.50	0.00	25091.0	240.417
950.0	3677.891	-37.6928	48.8634	49.0415	77.61	0.00	25090.7	240.520
INITIATE ATM DEPLOYMENT								
999.100	3677.888	-33.1501	49.4445	49.6221	81.20	0.00	25090.3	240.633
1000.0	3677.906	-33.0659	49.4534	49.6309	81.27	0.00	25090.4	240.653
1050.0	3677.926	-28.3421	49.8372	50.0143	85.03	0.01	25090.0	240.749
1100.0	3677.951	-23.5614	50.0087	50.1856	88.86	0.01	25089.6	240.808
1150.0	3677.982	-18.7676	49.9650	50.1421	92.70	0.01	25089.4	240.830
1200.0	3678.017	-14.0051	49.7070	49.8843	96.50	0.01	25089.3	240.814
1250.0	3678.058	-9.3164	49.2389	49.4166	100.23	0.01	25089.2	240.761
1300.0	3678.103	-4.7394	48.5678	48.7462	103.84	0.01	25089.3	240.673
1350.0	3678.152	-0.3054	47.7039	47.8828	107.30	0.01	25089.4	240.549
1400.0	3678.206	3.9616	46.6589	46.8384	110.59	0.02	25089.7	240.393
1450.0	3678.263	8.0456	45.4462	45.6260	113.69	0.02	25090.0	240.206
INITIATE ATM SOLAR ARRAY DEPLOYMENT								
1492.300	3678.275	11.3509	44.2994	44.4792	116.15	0.02	25090.2	239.987
1500.0	3678.322	11.9376	44.0795	44.2592	116.58	0.02	25090.6	239.990
1550.0	3678.383	15.6352	42.5727	42.7519	119.27	0.02	25091.1	239.748
1600.0	3678.446	19.1410	40.9394	41.1176	121.74	0.02	25091.7	239.484
1650.0	3678.510	22.4613	39.1927	39.3690	124.02	0.02	25092.3	239.201
1700.0	3678.574	25.6055	37.3445	37.5182	126.10	0.02	25093.0	238.902
1750.0	3678.638	28.5847	35.4062	35.5763	128.00	0.02	25093.7	238.592
1800.0	3678.701	31.4111	33.3879	33.5534	129.72	0.02	25094.5	238.275
1850.0	3678.761	34.0972	31.2989	31.4589	131.27	0.02	25095.3	237.954
1900.0	3678.819	36.6559	29.1477	29.3011	132.66	0.02	25096.0	237.635

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
1950.0	3678.874	39.0996	26.9419	27.0875	133.91	0.01	25096.8	237.320
2000.0	3678.925	41.4402	24.6882	24.8251	135.03	0.01	25097.5	237.013
2050.0	3678.971	43.6894	22.3928	22.5199	136.01	0.01	25098.2	236.719
2100.0	3679.011	45.8581	20.0615	20.1777	136.88	0.01	25098.9	236.442
2150.0	3679.046	47.9566	17.6991	17.8036	137.62	0.01	25099.6	236.184
2200.0	3679.074	49.9947	15.3104	15.4024	138.27	0.01	25100.2	235.949
2250.0	3679.096	51.9819	12.8997	12.9783	138.80	0.00	25100.8	235.740
2300.0	3679.110	53.9270	10.4709	10.5355	139.24	0.00	25101.3	235.559
2350.0	3679.116	55.8385	8.0278	8.0778	139.58	0.00	25101.7	235.408
2400.0	3679.114	57.7245	5.5740	5.6089	139.83	-0.00	25102.1	235.290
2450.0	3679.105	59.5930	3.1127	3.1323	139.99	-0.00	25102.4	235.205
2500.0	3679.087	61.4519	0.6473	0.6513	140.06	-0.01	25102.6	235.154
2550.0	3679.061	63.3088	-1.8190	-1.8305	140.04	-0.01	25102.7	235.139
2600.0	3679.027	65.1714	-4.2830	-4.3099	139.93	-0.01	25102.8	235.158
2650.0	3678.986	67.0474	-6.7413	-6.7834	139.72	-0.01	25102.8	235.211
2700.0	3678.936	68.9447	-9.1907	-9.2477	139.43	-0.01	25102.7	235.298
2750.0	3678.880	70.8713	-11.6277	-11.6990	139.04	-0.02	25102.6	235.417
2800.0	3678.817	72.8355	-14.0488	-14.1338	138.56	-0.02	25102.4	235.566
2850.0	3678.747	74.8462	-16.4499	-16.5480	137.97	-0.02	25102.1	235.743
2900.0	3678.671	76.9122	-18.8271	-18.9374	137.28	-0.02	25101.8	235.945
2950.0	3678.591	79.0433	-21.1759	-21.2974	136.48	-0.02	25101.4	236.170
3000.0	3678.506	81.2495	-23.4913	-23.6233	135.56	-0.02	25101.0	236.414
3050.0	3678.417	83.5414	-25.7682	-25.9094	134.52	-0.03	25100.5	236.674
3100.0	3678.325	85.9303	-28.0006	-28.1501	133.34	-0.03	25100.0	236.946
3150.0	3678.231	88.4281	-30.1820	-30.3387	132.02	-0.03	25099.5	237.227
3200.0	3678.136	91.0469	-32.3052	-32.4680	130.55	-0.03	25099.0	237.512
3250.0	3678.041	93.7993	-34.3623	-34.5302	128.92	-0.03	25098.5	237.798
3300.0	3677.946	96.6982	-36.3444	-36.5164	127.12	-0.03	25098.0	238.080
3350.0	3677.852	99.7560	-38.2418	-38.4169	125.13	-0.03	25097.5	238.355
3400.0	3677.761	102.9845	-40.0437	-40.2210	122.96	-0.03	25097.1	238.620
3450.0	3677.672	106.3941	-41.7384	-41.9172	120.58	-0.02	25096.6	238.869
3500.0	3677.587	109.9928	-43.3135	-43.4931	118.01	-0.02	25096.3	239.101
3550.0	3677.507	113.7855	-44.7555	-44.9354	115.22	-0.02	25095.9	239.311
3600.0	3677.432	117.7723	-46.0507	-46.2305	112.23	-0.02	25095.7	239.496
3650.0	3677.362	121.9479	-47.1852	-47.3644	109.04	-0.02	25095.4	239.655
3700.0	3677.299	126.2999	-48.1452	-48.3239	105.66	-0.02	25095.3	239.785
3750.0	3677.243	130.8086	-48.9181	-49.0962	102.12	-0.01	25095.2	239.883
3800.0	3677.194	135.4462	-49.4928	-49.6703	98.44	-0.01	25095.2	239.948
3850.0	3677.152	140.1782	-49.8606	-50.0377	94.67	-0.01	25095.3	239.980
3900.0	3677.119	144.9639	-50.0155	-50.1925	90.84	-0.01	25095.4	239.977
3950.0	3677.092	149.7594	-49.9550	-50.1321	87.01	-0.01	25095.6	239.939
4000.0	3677.074	154.5204	-49.6802	-49.8576	83.20	-0.00	25095.9	239.865
4050.0	3677.063	159.2044	-49.1954	-49.3732	79.48	-0.00	25096.2	239.758

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
4100.0	3677.061	163.7741	-48.5082	-48.6866	75.88	0.00	25096.7	239.619
4150.0	3677.065	168.1984	-47.6287	-47.8077	72.42	0.00	25097.2	239.447
4200.0	3677.078	172.4540	-46.5690	-46.7486	69.15	0.00	25097.7	239.247
4250.0	3677.097	176.5255	-45.3424	-45.5222	66.07	0.01	25098.4	239.019
4300.0	3677.123	-179.5956	-43.9627	-44.1425	63.19	0.01	25099.1	238.767
4350.0	3677.155	-175.9113	-42.4438	-42.6231	60.52	0.01	25099.8	238.494
4400.0	3677.193	-172.4187	-40.7994	-40.9775	58.06	0.01	25100.5	238.202
4450.0	3677.236	-169.1111	-39.0424	-39.2186	55.79	0.01	25101.3	237.896
4500.0	3677.283	-165.9789	-37.1848	-37.3583	53.73	0.01	25102.1	237.579
4550.0	3677.333	-163.0109	-35.2378	-35.4076	51.85	0.01	25102.9	237.255
4600.0	3677.387	-160.1950	-33.2115	-33.3767	50.14	0.02	25103.7	236.929
4650.0	3677.443	-157.5183	-31.1153	-31.2748	48.60	0.02	25104.5	236.603
4700.0	3677.459	-154.9678	-28.9570	-29.1098	47.22	0.01	25105.4	236.241
4750.0	3677.513	-152.5318	-26.7450	-26.8899	45.98	0.01	25106.2	235.926
4800.0	3677.566	-150.1979	-24.4856	-24.6217	44.88	0.01	25106.9	235.624
4850.0	3677.620	-147.9547	-22.1850	-22.3112	43.90	0.01	25107.6	235.339
4900.0	3677.672	-145.7911	-19.8488	-19.9641	43.05	0.01	25108.2	235.075
4950.0	3677.722	-143.6969	-17.4821	-17.5856	42.31	0.01	25108.7	234.835
5000.0	3677.770	-141.6622	-15.0894	-15.1802	41.68	0.01	25109.2	234.622
5050.0	3677.815	-139.6778	-12.6751	-12.7525	41.15	0.01	25109.6	234.439
5100.0	3677.856	-137.7348	-10.2431	-10.3064	40.72	0.01	25109.9	234.289
5150.0	3677.894	-135.8247	-7.7972	-7.8458	40.39	0.01	25110.1	234.174
5200.0	3677.928	-133.9394	-5.3408	-5.3743	40.15	0.01	25110.2	234.094
5250.0	3677.957	-132.0708	-2.8774	-2.8955	40.00	0.01	25110.2	234.052
5300.0	3677.982	-130.2113	-0.4102	-0.4128	39.94	0.01	25110.1	234.048
5350.0	3678.002	-128.3530	2.0575	2.0705	39.97	0.00	25109.9	234.082
5400.0	3678.017	-126.4884	4.5225	4.5509	40.09	0.00	25109.6	234.155
5450.0	3678.027	-124.6096	6.9815	7.0250	40.30	0.00	25109.2	234.265
5500.0	3678.033	-122.7088	9.4311	9.4895	40.60	0.00	25108.8	234.411
5550.0	3678.035	-120.7779	11.8679	11.9406	41.00	-0.00	25108.2	234.591
5600.0	3678.032	-118.8086	14.2882	14.3746	41.49	-0.00	25107.5	234.804
5650.0	3678.025	-116.7920	16.6882	16.7875	42.09	-0.00	25106.8	235.048
5700.0	3678.015	-114.7191	19.0637	19.1751	42.79	-0.00	25106.0	235.318
5750.0	3678.002	-112.5802	21.4101	21.5328	43.60	-0.00	25105.1	235.613
5800.0	3677.987	-110.3653	23.7227	23.8556	44.54	-0.00	25104.2	235.929
5850.0	3677.969	-108.0635	25.9959	26.1381	45.63	-0.01	25103.3	236.262
5900.0	3677.950	-105.6636	28.2240	28.3743	46.79	-0.01	25102.3	236.608
5950.0	3677.930	-103.1538	30.4003	30.5576	48.12	-0.01	25101.2	236.963
6000.0	3677.909	-100.5217	32.5175	32.6809	49.61	-0.01	25100.2	237.324
6050.0	3677.890	-97.7547	34.5676	34.7360	51.26	-0.01	25099.2	237.685
6100.0	3677.871	-94.8401	36.5417	36.7140	53.08	-0.01	25098.2	238.043
6150.0	3677.853	-91.7655	38.4300	38.6053	55.08	-0.00	25097.2	238.393
6200.0	3677.838	-88.5191	40.2215	40.3990	57.27	-0.00	25096.2	238.732

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	GEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
6250.0	3677.826	-85.0910	41.9046	42.0835	59.67	-0.00	25095.2	239.056
6300.0	3677.816	-81.4732	43.4666	43.6463	62.27	-0.00	25094.3	239.361
6350.0	3677.811	-77.6615	44.8943	45.0741	65.07	-0.00	25093.5	239.643
6400.0	3677.810	-73.6560	46.1736	46.3533	68.09	0.00	25092.7	239.899
6450.0	3677.813	-69.4630	47.2908	47.4700	71.30	0.00	25092.0	240.127
6500.0	3677.821	-65.0954	48.2323	48.4109	74.69	0.00	25091.3	240.324
6550.0	3677.834	-60.5739	48.9856	49.1636	78.24	0.00	25090.8	240.487
6600.0	3677.852	-55.9268	49.5398	49.7173	81.93	0.01	25090.3	240.616
6650.0	3677.875	-51.1894	49.8865	50.0636	85.71	0.01	25089.9	240.708
6700.0	3677.904	-46.4028	50.0201	50.1970	89.54	0.01	25089.6	240.763
6750.0	3677.937	-41.6109	49.9384	50.1154	93.37	0.01	25089.5	240.780
6800.0	3677.976	-36.8580	49.6428	49.8202	97.17	0.01	25089.4	240.760
6850.0	3678.019	-32.1860	49.1381	49.3159	100.88	0.01	25089.4	240.703
6900.0	3678.066	-27.6318	48.4320	48.6105	104.47	0.01	25089.5	240.609
6950.0	3678.118	-23.2255	47.5351	47.7141	107.90	0.01	25089.7	240.481
7000.0	3678.173	-18.9896	46.4594	46.6389	111.16	0.02	25090.0	240.320
7050.0	3678.232	-14.9389	45.2182	45.3981	114.22	0.02	25090.4	240.129
7100.0	3678.293	-11.0810	43.8256	44.0053	117.07	0.02	25090.8	239.909
7150.0	3678.356	-7.4175	42.2953	42.4745	119.72	0.02	25091.3	239.665
7200.0	3678.420	-3.9450	40.6410	40.8188	122.16	0.02	25091.9	239.398
7250.0	3678.485	-0.6565	38.8753	39.0512	124.41	0.02	25092.5	239.113
7300.0	3678.551	2.4578	37.0102	37.1833	126.45	0.02	25093.2	238.813
7350.0	3678.615	5.4090	35.0569	35.2262	128.32	0.02	25093.9	238.503
7400.0	3678.678	8.2097	33.0253	33.1899	130.00	0.02	25094.7	238.185
7450.0	3678.738	10.8723	30.9246	31.0835	131.53	0.02	25095.4	237.865
7500.0	3678.796	13.4097	28.7631	28.9151	132.90	0.02	25096.2	237.546
7550.0	3678.850	15.8343	26.5481	26.6923	134.12	0.01	25097.0	237.232
7600.0	3678.900	18.1579	24.2865	24.4218	135.21	0.01	25097.7	236.927
7650.0	3678.945	20.3920	21.9843	22.1095	136.18	0.01	25098.4	236.636
7700.0	3678.984	22.5474	19.6469	19.7612	137.02	0.01	25099.1	236.361
7750.0	3679.017	24.6345	17.2795	17.3819	137.75	0.01	25099.8	236.106
7800.0	3679.043	26.6629	14.8865	14.9761	138.37	0.01	25100.4	235.875
7850.0	3679.062	28.6420	12.4722	12.5483	138.89	0.00	25101.0	235.669
7900.0	3679.074	30.5804	10.0405	10.1025	139.31	0.00	25101.4	235.492
7950.0	3679.078	32.4867	7.5951	7.6425	139.63	-0.00	25101.9	235.346
8000.0	3679.073	34.3691	5.1396	5.1718	139.87	-0.00	25102.2	235.232
8050.0	3679.061	36.2353	2.6772	2.6941	140.01	-0.00	25102.5	235.152
8100.0	3679.040	38.0932	0.2113	0.2127	140.06	-0.01	25102.8	235.106
8150.0	3679.011	39.9505	-2.2549	-2.2691	140.02	-0.01	25102.9	235.095
8200.0	3678.974	41.8149	-4.7182	-4.7478	139.90	-0.01	25103.0	235.118
8250.0	3678.929	43.6940	-7.1753	-7.2201	139.68	-0.01	25102.9	235.175
8300.0	3678.876	45.5958	-9.6229	-9.6824	139.37	-0.02	25102.9	235.266
8350.0	3678.816	47.5285	-12.0574	-12.1312	138.97	-0.02	25102.7	235.388

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
8400.0	3678.749	49.5003	-14.4753	-14.5627	138.47	-0.02	25102.5	235.540
8450.0	3678.676	51.5200	-16.8727	-16.9730	137.86	-0.02	25102.2	235.719
8500.0	3678.598	53.5969	-19.2453	-19.3576	137.15	-0.02	25101.9	235.923
8550.0	3678.514	55.7405	-21.5884	-21.7121	136.33	-0.02	25101.5	236.150
8600.0	3678.426	57.9611	-23.8978	-24.0314	135.39	-0.02	25101.1	236.395
8650.0	3678.334	60.2694	-26.1673	-26.3101	134.32	-0.03	25100.6	236.655
8700.0	3678.240	62.6767	-28.3912	-28.5421	133.12	-0.03	25100.1	236.926
8750.0	3678.144	65.1950	-30.5630	-30.7208	131.77	-0.03	25099.6	237.206
8800.0	3678.047	67.8366	-32.6752	-32.8390	130.27	-0.03	25099.1	237.490
8850.0	3677.949	70.6141	-34.7198	-34.8885	128.61	-0.03	25098.6	237.773
8900.0	3677.852	73.5404	-36.6877	-36.8603	126.78	-0.03	25098.1	238.052
8950.0	3677.757	76.6277	-38.5690	-38.7446	124.76	-0.03	25097.6	238.324
9000.0	3677.664	79.8877	-40.3529	-40.5305	122.55	-0.03	25097.2	238.584
9050.0	3677.574	83.3304	-42.0274	-42.2064	120.14	-0.02	25096.8	238.829
9100.0	3677.487	86.9634	-43.5800	-43.7596	117.53	-0.02	25096.4	239.055
9150.0	3677.406	90.7908	-44.9970	-45.1769	114.70	-0.02	25096.1	239.258
9200.0	3677.330	94.8119	-46.2648	-46.4444	111.68	-0.02	25095.8	239.438
9250.0	3677.259	99.0201	-47.3693	-47.5485	108.45	-0.02	25095.6	239.589
9300.0	3677.195	103.4018	-48.2970	-48.4756	105.04	-0.02	25095.5	239.711
9350.0	3677.138	107.9358	-49.0355	-49.2134	101.47	-0.01	25095.4	239.802
9400.0	3677.089	112.5932	-49.5740	-49.7515	97.78	-0.01	25095.4	239.859
9450.0	3677.046	117.3380	-49.9043	-50.0814	93.99	-0.01	25095.5	239.883
9500.0	3677.012	122.1289	-50.0210	-50.1980	90.16	-0.01	25095.7	239.871
9550.0	3676.986	126.9218	-49.9223	-50.0994	86.32	-0.01	25096.0	239.825
9600.0	3676.967	131.6724	-49.6096	-49.7871	82.53	-0.00	25096.3	239.745
9650.0	3676.957	136.3389	-49.0881	-49.2661	78.83	-0.00	25096.7	239.631
9700.0	3676.954	140.8849	-48.3658	-48.5444	75.25	0.00	25097.2	239.484
9750.0	3676.959	145.2809	-47.4532	-47.6324	71.83	0.00	25097.7	239.306
9800.0	3676.972	149.5049	-46.3627	-46.5424	68.58	0.00	25098.3	239.099
9850.0	3676.991	153.5427	-45.1077	-45.2876	65.54	0.01	25099.0	238.866
9900.0	3677.017	157.3871	-43.7021	-43.8818	62.70	0.01	25099.7	238.609
9950.0	3677.050	161.0371	-42.1597	-42.3388	60.06	0.01	25100.4	238.331
10000.0	3677.087	164.4962	-40.4942	-40.6720	57.64	0.01	25101.2	238.036
10050.0	3677.130	167.7720	-38.7182	-38.8940	55.41	0.01	25102.0	237.727
10100.0	3677.177	170.8741	-36.8437	-37.0166	53.38	0.01	25102.8	237.408
10150.0	3677.228	173.8141	-34.8817	-35.0508	51.53	0.01	25103.6	237.082
10200.0	3677.281	176.6044	-32.8421	-33.0064	49.85	0.02	25104.4	236.755
10250.0	3677.337	179.2576	-30.7341	-30.8925	48.34	0.02	25105.2	236.429
10300.0	3677.394	-178.2135	-28.5658	-28.7173	46.99	0.02	25106.0	236.110
10350.0	3677.452	-175.7965	-26.3447	-26.4882	45.77	0.02	25106.7	235.801
10400.0	3677.510	-173.4796	-24.0774	-24.2118	44.69	0.02	25107.4	235.505
10450.0	3677.567	-171.2513	-21.7700	-21.8943	43.74	0.02	25108.1	235.228
10500.0	3677.623	-169.1009	-19.4279	-19.5411	42.91	0.02	25108.6	234.972

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
10550.0	3677.677	-167.0160	-17.0560	-17.1573	42.19	0.01	25109.1	234.741
10600.0	3677.729	-164.9930	-14.6591	-14.7476	41.58	0.01	25109.6	234.537
10650.0	3677.777	-163.0166	-12.2413	-12.3161	41.07	0.01	25109.9	234.365
10700.0	3677.822	-161.0801	-9.8064	-9.8671	40.66	0.01	25110.2	234.224
10750.0	3677.863	-159.1751	-7.3582	-7.4041	40.34	0.01	25110.3	234.119
10800.0	3677.900	-157.2933	-4.9003	-4.9310	40.11	0.01	25110.4	234.050
10850.0	3677.932	-155.4270	-2.4358	-2.4512	39.98	0.01	25110.3	234.019
10900.0	3677.960	-153.5682	0.0317	0.0319	39.94	0.01	25110.2	234.026
10950.0	3677.983	-151.7094	2.4992	2.5150	39.98	0.01	25110.0	234.071
11000.0	3678.000	-149.8428	4.9634	4.9946	40.12	0.00	25109.6	234.153
11050.0	3678.014	-147.9607	7.4210	7.4673	40.35	0.00	25109.2	234.273
11100.0	3678.022	-146.0552	9.8687	9.9297	40.66	0.00	25108.7	234.429
11150.0	3678.026	-144.1181	12.3029	12.3781	41.08	0.00	25108.1	234.619
11200.0	3678.026	-142.1410	14.7199	14.8086	41.59	-0.00	25107.4	234.840
11250.0	3678.021	-140.1151	17.1158	17.2174	42.20	-0.00	25106.6	235.092
11300.0	3678.014	-138.0311	19.4865	19.6000	42.93	-0.00	25105.8	235.370
11350.0	3678.003	-135.8795	21.8273	21.9519	43.76	-0.00	25104.9	235.672
11400.0	3677.989	-133.6498	24.1332	24.2679	44.72	-0.00	25103.9	235.993
11450.0	3677.973	-131.3314	26.3989	26.5426	45.80	-0.00	25102.9	236.331
11500.0	3677.956	-128.9128	28.6182	28.7698	47.01	-0.00	25101.9	236.681
11550.0	3677.938	-126.3820	30.7845	30.9430	48.38	-0.01	25100.9	237.040
11600.0	3677.920	-123.7268	32.8904	33.0547	49.89	-0.01	25099.8	237.402
11650.0	3677.901	-120.9344	34.9276	35.0967	51.57	-0.00	25098.7	237.765
11700.0	3677.884	-117.9921	36.8871	37.0600	53.42	-0.00	25097.7	238.123
11750.0	3677.868	-114.8877	38.7589	38.9347	55.46	-0.00	25096.7	238.472
11800.0	3677.854	-111.6095	40.5319	40.7097	57.69	-0.00	25095.7	238.810
11850.0	3677.842	-108.1480	42.1943	42.3734	60.12	-0.00	25094.8	239.131
11900.0	3677.834	-104.4958	43.7334	43.9131	62.75	-0.00	25093.9	239.432
11950.0	3677.829	-100.6492	45.1355	45.3154	65.60	-0.00	25093.0	239.709
12000.0	3677.828	-96.6096	46.3869	46.5665	68.64	0.00	25092.3	239.960
12050.0	3677.831	-92.3842	47.4737	47.6528	71.89	0.00	25091.6	240.182
12100.0	3677.839	-87.9873	48.3825	48.5610	75.31	0.00	25091.0	240.372
12150.0	3677.852	-83.4410	49.1009	49.2788	78.89	0.00	25090.4	240.528
12200.0	3677.870	-78.7749	49.6186	49.7960	82.60	0.01	25090.0	240.649
12250.0	3677.892	-74.0256	49.9275	50.1045	86.39	0.01	25089.7	240.733
12300.0	3677.920	-69.2346	50.0227	50.1996	90.22	0.01	25089.4	240.780
12350.0	3677.953	-64.4464	49.9025	50.0796	94.05	0.01	25089.3	240.789
12400.0	3677.991	-59.7049	49.5691	49.7465	97.84	0.01	25089.2	240.760
12450.0	3678.033	-55.0513	49.0277	49.2057	101.53	0.01	25089.3	240.695
12500.0	3678.080	-50.5215	48.2867	48.4653	105.09	0.01	25089.4	240.594
12550.0	3678.131	-46.1441	47.3568	47.5360	108.50	0.01	25089.7	240.458
12600.0	3678.185	-41.9404	46.2505	46.4302	111.72	0.02	25090.0	240.290
12650.0	3678.242	-37.9237	44.9813	45.1611	114.74	0.02	25090.4	240.092

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
12700.0	3678.302	-34.1005	43.5630	43.7426	117.56	0.02	25090.9	239.866
12750.0	3678.364	-30.4715	42.0095	42.1885	120.17	0.02	25091.4	239.615
12800.0	3678.427	-27.0324	40.3343	40.5118	122.58	0.02	25092.0	239.344
12850.0	3678.491	-23.7758	38.5499	38.7254	124.79	0.02	25092.7	239.054
12900.0	3678.554	-20.6916	36.6682	36.8407	126.80	0.02	25093.4	238.751
12950.0	3678.617	-17.7682	34.7001	34.8687	128.63	0.02	25094.1	238.437
13000.0	3678.678	-14.9931	32.6555	32.8192	130.29	0.02	25094.9	238.117
13050.0	3678.737	-12.3538	30.5433	30.7010	131.79	0.02	25095.7	237.795
13100.0	3678.792	-9.8374	28.3716	28.5224	133.13	0.01	25096.5	237.475
13150.0	3678.844	-7.4318	26.1478	26.2905	134.33	0.01	25097.2	237.161
13200.0	3678.892	-5.1251	23.8784	24.0120	135.40	0.01	25098.0	236.857
13250.0	3678.934	-2.9058	21.5694	21.6928	136.34	0.01	25098.7	236.567
13300.0	3678.970	-0.7634	19.2263	19.3385	137.16	0.01	25099.4	236.294
13350.0	3679.001	1.3125	16.8539	16.9540	137.87	0.01	25100.1	236.042
13400.0	3679.024	3.3314	14.4567	14.5440	138.47	0.01	25100.7	235.813
13450.0	3679.041	5.3026	12.0389	12.1126	138.97	0.00	25101.3	235.611
13500.0	3679.049	7.2346	9.6044	9.6638	139.38	0.00	25101.8	235.438
13550.0	3679.050	9.1361	7.1569	7.2015	139.68	-0.00	25102.2	235.296
13600.0	3679.043	11.0149	4.6998	4.7293	139.90	-0.00	25102.6	235.187
13650.0	3679.027	12.8791	2.2365	2.2505	140.03	-0.01	25102.9	235.111
13700.0	3679.004	14.7363	-0.2298	-0.2313	140.06	-0.01	25103.1	235.070
13750.0	3678.972	16.5943	-2.6958	-2.7128	140.01	-0.01	25103.2	235.063
13800.0	3678.932	18.4607	-5.1584	-5.1907	139.87	-0.01	25103.3	235.091
13850.0	3678.884	20.3433	-7.6141	-7.6616	139.63	-0.01	25103.2	235.154
13900.0	3678.829	22.2501	-10.0598	-10.1219	139.31	-0.02	25103.2	235.249
13950.0	3678.766	24.1891	-12.4917	-12.5680	138.89	-0.02	25103.0	235.375
14000.0	3678.697	26.1688	-14.9063	-14.9961	138.37	-0.02	25102.8	235.531
14050.0	3678.622	28.1981	-17.2997	-17.4022	137.74	-0.02	25102.5	235.714
14100.0	3678.541	30.2862	-19.6675	-19.7819	137.01	-0.02	25102.1	235.921
14150.0	3678.456	32.4428	-22.0052	-22.1305	136.17	-0.02	25101.7	236.150
14200.0	3678.366	34.6783	-24.3078	-24.4431	135.21	-0.03	25101.3	236.397
14250.0	3678.274	37.0035	-26.5697	-26.7140	134.11	-0.03	25100.8	236.659
14300.0	3678.178	39.4298	-28.7849	-28.9371	132.89	-0.03	25100.4	236.931
14350.0	3678.081	41.9693	-30.9467	-31.1057	131.52	-0.03	25099.8	237.211
14400.0	3677.983	44.6344	-33.0475	-33.2122	129.99	-0.03	25099.3	237.495
14450.0	3677.885	47.4377	-35.0791	-35.2486	128.30	-0.03	25098.8	237.777
14500.0	3677.788	50.3919	-37.0324	-37.2056	126.43	-0.03	25098.3	238.055
14550.0	3677.693	53.5095	-38.8972	-39.0732	124.38	-0.03	25097.8	238.325
14600.0	3677.600	56.8016	-40.6625	-40.8404	122.14	-0.03	25097.4	238.582
14650.0	3677.511	60.2781	-42.3162	-42.4953	119.69	-0.02	25097.0	238.824
14700.0	3677.426	63.9459	-43.8455	-44.0253	117.04	-0.02	25096.6	239.046
14750.0	3677.345	67.8083	-45.2369	-45.4168	114.18	-0.02	25096.3	239.246
14800.0	3677.270	71.8638	-46.4765	-46.6561	111.11	-0.02	25096.0	239.421

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
14850.0	3677.202	76.1045	-47.5503	-47.7294	107.85	-0.02	25095.8	239.568
14900.0	3677.140	80.5155	-48.4450	-48.6235	104.41	-0.02	25095.7	239.685
14950.0	3677.085	85.0742	-49.1484	-49.3263	100.82	-0.01	25095.7	239.770
15000.0	3677.037	89.7503	-49.6502	-49.8276	97.11	-0.01	25095.7	239.823
15050.0	3676.997	94.5068	-49.9425	-50.1195	93.31	-0.01	25095.8	239.841
15100.0	3676.966	99.3017	-50.0206	-50.1976	89.47	-0.01	25096.0	239.825
15150.0	3676.942	104.0904	-49.8832	-50.0603	85.64	-0.01	25096.2	239.774
15200.0	3676.926	108.8290	-49.5326	-49.7101	81.86	-0.00	25096.5	239.689
15250.0	3676.919	113.4767	-48.9743	-49.1524	78.18	-0.00	25096.9	239.570
15300.0	3676.919	117.9979	-48.2170	-48.3956	74.62	0.00	25097.4	239.419
15350.0	3676.927	122.3646	-47.2714	-47.4507	71.23	0.00	25098.0	239.238
15400.0	3676.943	126.5561	-46.1503	-46.3300	68.02	0.01	25098.6	239.028
15450.0	3676.966	130.5596	-44.8671	-45.0470	65.01	0.01	25099.2	238.792
15500.0	3676.995	134.3692	-43.4359	-43.6156	62.21	0.01	25099.9	238.533
15550.0	3677.030	137.9845	-41.8704	-42.0493	59.61	0.01	25100.7	238.254
15600.0	3677.071	141.4102	-40.1840	-40.3615	57.22	0.01	25101.4	237.958
15650.0	3677.116	144.6540	-38.3894	-38.5647	55.03	0.01	25102.2	237.648
15700.0	3677.166	147.7262	-36.4984	-36.6706	53.03	0.01	25103.0	237.330
15750.0	3677.220	150.6384	-34.5216	-34.6899	51.21	0.02	25103.9	237.006
15800.0	3677.276	153.4031	-32.4690	-32.6323	49.57	0.02	25104.7	236.681
15850.0	3677.334	156.0330	-30.3495	-30.5067	48.09	0.02	25105.4	236.359
15900.0	3677.394	158.5409	-28.1711	-28.3213	46.76	0.02	25106.2	236.043
15950.0	3677.454	160.9390	-25.9412	-26.0831	45.57	0.02	25106.9	235.738
16000.0	3677.514	163.2391	-23.6662	-23.7989	44.51	0.02	25107.6	235.448
16050.0	3677.573	165.4526	-21.3521	-21.4745	43.58	0.02	25108.2	235.176
16100.0	3677.631	167.5901	-19.0042	-19.1154	42.77	0.02	25108.8	234.927
16150.0	3677.687	169.6618	-16.6275	-16.7266	42.07	0.02	25109.3	234.703
16200.0	3677.740	171.6774	-14.2265	-14.3125	41.48	0.01	25109.7	234.507
16250.0	3677.790	173.6459	-11.8053	-11.8776	40.98	0.01	25110.0	234.341
16300.0	3677.836	175.5761	-9.3677	-9.4257	40.59	0.01	25110.2	234.209
16350.0	3677.878	177.4763	-6.9175	-6.9607	40.29	0.01	25110.3	234.113
16400.0	3677.916	179.3547	-4.4581	-4.4861	40.08	0.01	25110.4	234.052
16450.0	3677.949	-178.7810	-1.9928	-2.0054	39.97	0.01	25110.3	234.029
16500.0	3677.978	-176.9228	0.4750	0.4780	39.94	0.01	25110.2	234.044
16550.0	3678.001	-175.0633	2.9422	2.9607	40.00	0.01	25109.9	234.097
16600.0	3678.019	-173.1945	5.4055	5.4394	40.15	0.00	25109.5	234.188
16650.0	3678.033	-171.3089	7.8616	7.9106	40.39	0.00	25109.1	234.316
16700.0	3678.042	-169.3983	10.3071	10.3707	40.73	0.00	25108.5	234.479
16750.0	3678.046	-167.4547	12.7385	12.8162	41.16	0.00	25107.9	234.676
16800.0	3678.046	-165.4696	15.1521	15.2432	41.69	-0.00	25107.2	234.904
16850.0	3678.041	-163.4340	17.5438	17.6476	42.33	-0.00	25106.4	235.161
16900.0	3678.034	-161.3387	19.9095	20.0251	43.07	-0.00	25105.5	235.444
16950.0	3678.023	-159.1739	22.2444	22.3709	43.92	-0.00	25104.6	235.750

TABLE C-IV. GEOGRAPHIC POLAR COORDINATES-ORBIT PHASE (CONTINUED)

TIME SEC	GC DIST NM	LONG DEG E	DEC DEG N	GD LAT DEG N	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	ALTITUDE NM
17000.0	3678.009	-156.9292	24.5436	24.6799	44.90	-0.00	25103.6	236.075
17050.0	3677.993	-154.5937	26.8014	26.9466	46.00	-0.00	25102.6	236.416
17100.0	3677.976	-152.1559	29.0117	29.1647	47.25	-0.00	25101.6	236.768
17150.0	3677.958	-149.6038	31.1678	31.3274	48.63	-0.01	25100.5	237.128
17200.0	3677.939	-146.9250	33.2620	33.4273	50.18	-0.01	25099.5	237.490
17250.0	3677.921	-144.1067	35.2860	35.4559	51.89	-0.01	25098.4	237.852
17300.0	3677.903	-141.1362	37.2305	37.4040	53.77	-0.00	25097.4	238.209
17350.0	3677.887	-138.0014	39.0855	39.2617	55.84	-0.00	25096.4	238.556
17400.0	3677.873	-134.6911	40.8396	41.0177	58.11	-0.00	25095.4	238.890
TRANSFER TO ATM CONTROL								
17400.700	3677.859	-134.6435	40.8634	41.0415	58.14	-0.00	25095.3	238.881