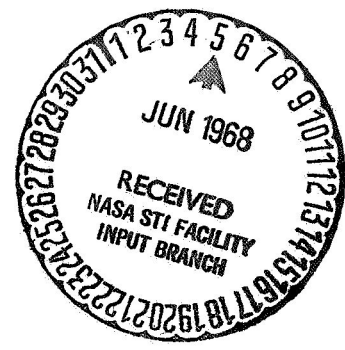


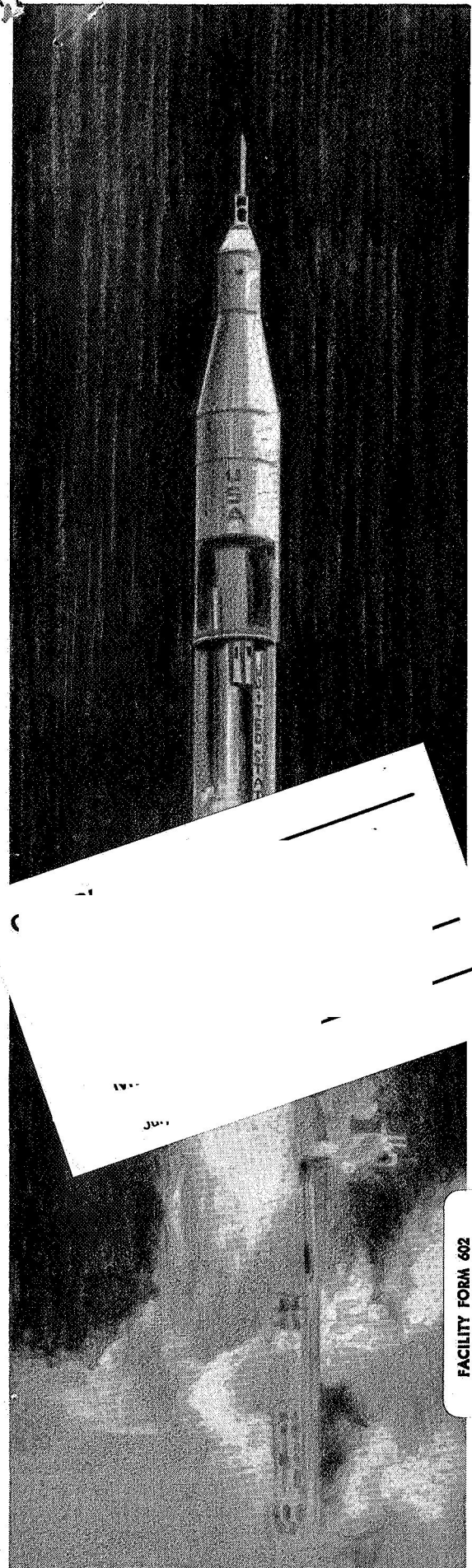
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SATURN AS-204/LM-1  
POSTFLIGHT TRAJECTORY



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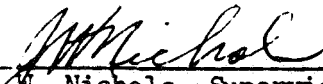
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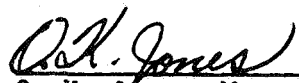
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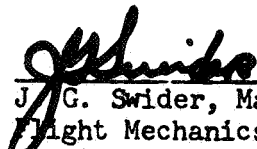
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## FOREWORD

This report presents the postflight trajectory of the Saturn AS-204/LM-1 vehicle from guidance reference release at Cape Kennedy to S-IVB/LM-1 separation which occurred in the vicinity of the Carnarvon tracking station. Included in the report is an analysis of the powered flight trajectory, orbital flight trajectory, the ballistic free flight trajectory of the expended S-IB stage, and orbital effects of S-IVB passivation.

The trajectory determination and documentation were performed by the Aerospace Physics Branch of Chrysler Corporation Space Division in compliance with the work scope of contract NASS-4016, Schedule II, Supplemented Agreement MSFC-1, Amendment 87, BB Item 3.1.5-4-201, Part IV.

Acknowledgements are made to the personnel of Marshall Space Flight Center, R-AERO-FFT, for their assistance and cooperation, and to the Dynamics Programming Unit of CCSD Computer Services for their invaluable assistance.

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## SUMMARY

The Apollo Saturn Vehicle, AS-204/LM-1, was launched from Cape Kennedy, Florida, at 5:48:08 P.M. EST on January 22, 1968. The primary mission of this flight was to place the Lunar Module (LM-1) in an elliptical earth orbit (85 by 120 nm) for unmanned tests of the spacecraft and subsystems operations. This report presents the AS-204/LM-1 postflight trajectory from guidance reference release to S-IVB/LM-1 separation. The trajectory is presented in the earth-fixed plumbline, space-fixed ephemeris, and geographic coordinate systems. Time histories of trajectory parameters are given in tabular form; at 1.0 sec intervals from guidance reference release to S-IB/S-IVB separation, at 5.0 sec intervals from S-IB/S-IVB separation to orbital insertion, and at 10.0 sec intervals from insertion to S-IVB/LM-1 separation. Some discussion is given to the orbital conditions of flight through passivation (in-orbit dump of propellants) of the S-IVB stage. Also included is a tabulation at 10.0 sec intervals of the expended S-IB stage ballistic free flight trajectory to impact.

The trajectory was established from data provided by external electronic tracking systems and telemetered onboard data from the ST-124M guidance platform. The postflight trajectory was very close to the predicted nominal. At S-IVB/LM-1 separation (3235.24 sec) the vehicle had a space-fixed velocity of only 0.9 m/s (2.9 ft/s) greater than nominal. The altitude, at this point, was 1.2 km (0.6 nm) lower than nominal and the flight path angle was 0.005 deg less than nominal.

## 1.0 INTRODUCTION

The Saturn IB AS-204/LM-1 vehicle was launched from KSC at 5:48:08 P.M. EST on January 22, 1968. The launch azimuth from Pad 37B was 90° east of north. After liftoff the vehicle was rolled to a flight azimuth of 72° east of north. The S-IVB stage and spacecraft (Lunar Module) were placed into an elliptical earth orbit for test of the spacecraft subsystems operations. Also a passivation experiment (fuel and LOX dump) was conducted with the S-IVB stage after separation from the spacecraft.

This report presents the postflight mass-point reference trajectory, and associated information, from guidance reference release (-4.956 sec) to S-IVB/LM-1 separation (3235.242 sec). All times are referenced to the established Range Zero of 5:48:08 P.M. EST, unless otherwise specified. Comparison of this trajectory with the nominal is given for some specific parameters as indications of vehicle performance. Reference 1 provides documentation of the nominal trajectory. Also presented in this report are details of available tracking data, the data utilization, an error analysis, the orbital determination, and the S-IB stage ballistic free flight. Accompanying the discussion are figures and tables of the trajectory data in both the metric and English units of measure.

## 2.0 COORDINATE SYSTEMS AND LAUNCH PARAMETERS

The translational motion of the vehicle's center of gravity is tabulated in three coordinate systems: earth-fixed plumbline, space-fixed ephemeris, and geographic. These coordinate systems conform to the "Project Apollo Coordinate System Standards" and are defined in Appendix A and graphically illustrated in Figure 1. The earth-fixed plumbline coordinate system has its origin located at the launch site

on the reference earth model. In the earth-fixed system, the vehicle's center of gravity has an initial displacement of 34.5 m (113.2 ft) above the reference ellipsoid.

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

The geographic coordinates and gravity data for launch pad 37B at Cape Kennedy are:

Geodetic Latitude	28.531856 deg
Longitude	80.564953 deg
Acceleration of Gravity	9.818 m/sec <sup>2</sup> (32.21 ft/sec <sup>2</sup> )

Elevation above the reference ellipsoid are:

Base of Launch Pedestal	4.9 m (16.1 ft)
C. G. at First Motion	34.5 m (113.2 ft)

Azimuth alignments are:

Launch Azimuth	90° E of N
Flight Azimuth	72° E of N
ST-124M Platform Azimuth	72° E of N

## 3.0 POWERED FLIGHT TRAJECTORY ANALYSIS

### 3.1 Data Sources

Tracking data and telemetered guidance data were available from first motion through insertion (S-IVB CO + 10 sec). The coverage of each tracking system is itemized in Table I and shown in Figure 2. The vehicle ground track relative to the tracking stations is shown in Figure 3. The antenna locations for the various tracking systems and the vehicle's center of gravity versus time are shown in Figure 4. Comparison of each individual tracking system with the reference trajectory is illustrated in Figures 5 through 10 and discussed below. The metric comparisons are shown in Figures 5 through 7 and the measured parameter comparisons are shown in Figures 8 through 10.

#### 3.1.1 ODOP

Data from the ODOP tracking system were available from first motion to 119 sec. ODOP was not used directly in the trajectory but was used indirectly in the Final Launch Phase and MARLOCK computer programs (discussed in section 3.2). Significant weighting influence was given to the XE and YE components of the ODOP data in the MARLOCK trajectory solution. Comparisons between ODOP and the reference trajectory reveal maximum deviations of less than 5 m (16 ft) in the XE and YE components. However, the ZE component began to diverge at 28 sec and continued to a maximum deviation of 35 m (115 ft) at the end of the ODOP track.

#### 3.1.2 GLOTRAC Station I (Mark II Azusa)

Measured parameters and metric data received from GLOTRAC Station I covered a time span of 52.3 to 410.0 sec. The GLOTRAC Station I range



data were used in the MARLOCK solution and deviations of the range from the reference trajectory are negligible. The metric data were not used in establishing the best estimate trajectory. However, comparisons reveal deviations from the reference trajectory of less than 25 m (82 ft), 65 m (213 ft), and 15 m (49 ft) in the XE, YE, and ZE components, respectively.

### 3.1.3 GLOTRAC

Reduced metric GLOTRAC data were received from 23.0 to 552.9 sec. These data were not incorporated in the reference trajectory because of late arrival. The position and velocity data were very smooth and in general the GLOTRAC data appeared to be of excellent quality. Comparisons between GLOTRAC and the reference trajectory reveal maximum deviations of 35 m (115 ft) in the XE, 17 m (56 ft) in the YE and 5 m (16 ft) in the ZE components.

### 3.1.4 Radar

Patrick (0.18) radar produced data from 23.0 to 541.0 sec. The quality of these data was not as high as usually received from station 0.18. The range data were extremely noisy and appeared to have a large bias. The range and elevation data show a discontinuity at approximately 404 sec, apparently caused by a switch from beacon to skin track.

The Grand Bahama (3.18) radar produced a good set of tracking data from 98.0 to 534.0 sec. The range data were in excellent agreement with the reference trajectory and the elevation data contained an apparent bias of less than 0.03 deg. These data were given more weight than usual in the MARLOCK Program.

The Grand Turk (7.18) radar data were available from 201.4 to 604.0 sec. The measured parameter comparisons give an indication of a larger than usual systematic error. The range deviation from the reference trajectory was greater than any of the other radars, with a maximum deviation of approximately 70 m (230 ft) at end of track. However, the data seem to be of good quality. The range data were smoothest of all the radar data and the azimuth data revealed deviations of less than 0.02 deg.

Merritt Island (19.18) radar produced an excellent set of data from 9.0 to 380.0 sec. The maximum deviation in the azimuth angle data was 0.005 deg at the beginning of track and decreased at a linear rate to 0.002 deg at the end of track. The elevation data reveal a maximum deviation of about 0.01 deg after 50 sec of flight. The range shows a maximum deviation of approximately 10 m (33 ft).

There were two independent sets of radar data received from Bermuda; one from the FPQ-6 and one from the FPS-16 instruments. Although data points were received beginning at 11.0 sec (see Table I), useable data did not begin until about 325 sec for the FPQ-6 and about 400 seconds for the FPS-16. Both systems provided useable data through the remaining powered flight. Both systems revealed the same deviation characteristics, from the reference trajectory, as shown in Figures 8 through 10. The peculiarity and consistency of deviations of both trackers lead to the conclusion that station location errors may exist. The FPQ-6 range measurement deviated from the reference trajectory from a + 45 m (148 ft) to a -32 m (-105 ft). The angle deviations were less than 0.02 deg in azimuth and elevation. The FPS-16 range measurement deviated from + 55 m (180 ft) to -12 m (-39 ft).

The azimuth and elevation angle data from the FPS-16 did not appear to be as good as obtained from the FPQ-6 angles. An assumed station location error of 0.00034 deg longitude was applied as a correction to the tracking site longitude. This resulted in a considerable reduction of the range deviations for both the FPQ-6 and FPS-16 instruments, as follows: The FPQ-6 range deviation was reduced to a spread of +16 m (52 ft) to -16 m (-52 ft). The FPS-16 range deviation was reduced to a spread of +28 m (92 ft) to -5 m (-16 ft). Changing the station location also virtually eliminated the humps in the FPQ-6 angle deviations and greatly reduced the humps in the FPS-16 angle deviations.

### 3.2 Trajectory Composition (Powered Flight)

Tracking data from C-band radars, covering the major portion of powered flight, were available for establishing the postflight trajectory. The only data received from high precision tracking systems (in time for utilization) were ODOP and GLOTRAC Station I. Telemetered guidance information and measured meteorological data were also received and utilized in the postflight trajectory determination.

The initial launch phase (from first motion to 28.0 sec) was established by a least squares curve fit to the ODOP data in the Final Launch Phase program (see Reference 2 for discussion of technique). From 28.0 sec to orbit insertion (603.34 sec), the trajectory was established by a composite fit of the available tracking data. This composite fit is often referred to as the best estimate trajectory, the reference postflight trajectory, or the reconstructed trajectory.

The composite fit or best estimate trajectory is established through the utilization of a computer program called MARLOCK. This program uses telemetered guidance velocity data as the generating parameter to compute a trajectory which will best fit the tracking data, yet retain the smoothness of the guidance data. The guidance data can vary only in accordance with an eighteen term error model and the variances assigned to each error coefficient. The error coefficients are determined using the Kalman linear filtering technique and applied to the telemetered guidance data to produce the final smooth and continuous trajectory. Reference 3 gives a theoretical discussion of the MARLOCK program.

### 3.3 Powered Flight Trajectory

A comparison of actual and nominal times at some significant flight events is presented in Table II. Altitude and surface range are graphically illustrated in Figures 11 and 12, respectively, for the entire powered flight. Figure 13 is an illustration of the total inertial acceleration profiles for the S-IB and S-IVB stages. The magnitude of the total earth-fixed velocity vector and the associated elevation angle, positive above the local horizontal, are shown in Figure 14. The magnitude of the space-fixed velocity vector and the angle between this vector and the local horizontal plane are shown in Figure 15. The Mach number and dynamic pressure parameters are shown during the S-IB powered flight in Figure 16.

The meteorological associated trajectory parameters were calculated using measured meteorological data for the day of launch. The measured data were furnished to an altitude of 62 km (33 nm). At this altitude the Patrick AFB, 1963 standard reference atmosphere was merged with the measured data.

Various trajectory parameters, such as altitude, surface range, and velocity, are given at some significant flight event times in Table III. The apex, loss of telemetry, and impact of the discarded S-IB stage are also included in Table III. Several trajectory parameters are compared with nominal at thrust cutoff for the S-IB and S-IVB stages in Table IV. Trajectory parameters, for the purpose of performance evaluation, are compared to nominal in Table V for the S-IB/S-IVB separation event and in Table VI for the S-IVB/LM-1 insertion and separation events. The vehicle flight evaluation report, Reference 4, provides details of vehicle subsystems performance. Tables VII through X present orbital trajectory information which is discussed in Section 4.0 below.

The actual postflight trajectory, from guidance reference release to S-IVB/LM-1 separation is tabulated in both metric and English units of measure in Tables XI through XVI. These tables present the trajectory in the earth-fixed plumbline, space-fixed ephemeris, and geographic coordinate systems. The data are tabulated at 1.0 sec increments from guidance reference release to S-IB/S-IVB separation, continuing at 5.0 sec increments to insertion, and at 10.0 sec increments from insertion to S-IVB/LM-1 separation.

The actual trajectory was very close to the nominal, as reflected in the previously mentioned tables where comparisons are made. The velocity gain due to thrust decay between OECD and S-IB/S-IVB separation amounted to 5.4 m/s (17.7 ft/s) which was 0.9 m/s (3.0 ft/s) less than predicted. The velocity gain after S-IVB CO, due to thrust decay, amounted to 6.8 m/s (22.3 ft/s) which was 0.7 m/s (2.3 ft/s) greater than predicted.

### 3.4 Error Analyses

During the major portion of first stage powered flight, good coverage was provided by ODOP, GLOTRAC Station I, and Merritt Island radar. These three sets of data were the main data used in the MARLOCK program during this portion of the flight. The remaining powered flight trajectory was reconstructed as a composite fit of all available tracking data, consisting mainly of radar data.

The metric data from the ODOP, GLOTRAC Station I systems reveal good agreement with the reference trajectory. The GLOTRAC data for this flight appears to be of excellent quality. The maximum deviation between the GLOTRAC and the reference trajectory was only 35 m (115 ft) in any component. All metric data were smoothed, differentiated and transformed from the point of track (antenna locations) to a common point, the vehicle's center of gravity.

The measured parameter comparisons reveal the maximum range deviation to exist in the Grand Turk (7.18) system, which appears to be the result of a large systematic error. With the exception of Grand Turk the largest range deviation is 55 m (180 ft) in the Bermuda FPS-16 system. However, comparisons after a change in the Bermuda longitude, as previously discussed, reveal a maximum range deviation of 40 m (131 ft) which is in the Patrick (0.18) system. The range and angle deviations of all the radars appear to be biased, or show systematic trends that may be represented by a realistic error model. The comparison curves show only the trend of the data relative to the reference trajectory. The dispersion of these data and their analyses give an indication of the validity of the reference trajectory.



An estimate of the total uncertainty of the powered flight trajectory is presented in Figure 17. At S-IB outboard engine cutoff the position uncertainty is about 30 m (98 ft) and the velocity uncertainty is about 0.3 m/s (1.0 ft/s). At S-IVB CO the uncertainties have increased to about 200 m (656 ft) in the XE and ZE components and 250 m (820 ft) in the YE component. The velocity uncertainties at S-IVB CO have increased to 0.5 m/s (1.6 ft/s) in the DXE and DZE components and 1.5 m/s (4.9 ft/s) in the DYE component.

#### 4.0 ORBITAL TRAJECTORY ANALYSIS

##### 4.1 Orbital Trajectory

The AS-204 S-IVB/LM-1 vehicle was inserted into orbit at 22 hrs 58 min 11.34 sec U.T. (603.34 sec Range Time). Figure 18 is a ground projection plot showing the first two orbital revolutions. The orbital insertion parameters for AS-204 were determined by a least squares differential correction procedure using C-Band radar orbital tracking data over the first two revolutions and by the insertion point established by the best estimate powered flight trajectory.

The primary objective of the AS-204 flight was to provide tests of the Lunar Module (LM) subsystems. Also, a fuel and LOX dump experiment with the S-IVB stage was planned following S-IVB/LM-1 separation. The S-IVB/LM-1 separation occurred over Carnarvon at 3235.242 sec with the S-IVB passivation period (fuel and LOX dump) beginning at 8774.31 sec and ending at 9084.51 sec.

#### 4.2 Orbital Data Sources

Orbital tracking of the AS-204 vehicle was conducted by the NASA Space Tracking and Data Acquisition Network (STADAN). This network provided the C-Band radar data used in determination of the AS-204 orbital trajectory. A summary of the stations furnishing data for use in determining the S-IVB orbital trajectory is presented in Table VII. These data cover portions of the first four revolutions of flight.

Bermuda (FPS-16), Tananarive and Canary Island furnished tracking data in the first revolution prior to S-IVB/LM-1 separation. California was the only tracking site which furnished data during the first revolution following S-IVB/LM-1 separation. Data for the second revolution was furnished by Bermuda (FPS-16), Tananarive, California, Grand Bahama and Hawaii. Tananarive and Ascension tracked the S-IVB vehicle during the third and fourth revolutions and California furnished some data in the third revolution.

#### 4.3 Trajectory Analysis

The Orbital Correction Program (OCP) was used to provide solutions for the insertion conditions and orbital trajectory, utilizing orbital tracking data and representative orbital acceleration models. Solutions were made using various combinations of; Bermuda (FPS-16) data at insertion, Tananarive data in the early part of the first revolution (Rev 1), and Bermuda (FPS-16) and Grand Bahama data in the early part of the second revolution (Rev 2). Solutions were attempted incorporating all orbital tracking data received. However, the four sets of data mentioned above provided the only reasonable solutions. From the most reasonable solution, Table VIII provides a tabulation of the number of observations and the root mean square (RMS) of the residuals associated with each measured parameter.

Telemetered guidance accelerometer data were furnished to represent the actual orbiting vehicle acceleration. These data were utilized in orbital solutions even though there was a gap in the telemetered accelerations from 1400 to 2600 sec, Range Time. Solutions were also made by adjusting the predicted orbital accelerations through perturbations of the drag coefficient to compensate for deviations between the actual and predicted data. The two methods resulted in compatible fits to the tracking data.

Considering the reasonable OCP solutions and the agreement between the orbital and powered flight solutions, the estimated uncertainty of the insertion position and velocity components is no greater than quoted at S-IVB CO in section 3.4, above.

The orbital trajectory from insertion to S-IVB/LM-1 separation was obtained by initializing with the insertion conditions established by the best estimate powered flight trajectory and integrating the equations of motion. The adjusted acceleration data were used due to the large data gap in the telemetered accelerations in this area of flight. This integrated trajectory defined the orbital parameters at insertion and separation. The orbital parameters of the S-IVB stage, subsequent to separation, were computed by initializing at S-IVB/LM-1 separation and integrating the equations of motion using the telemetered guidance accelerations. The orbital parameters at insertion, S-IVB/LM-1 separation, and at the beginning of Rev 2 are presented in Table IX.

#### 4.4 S-IVB Passivation Experiment

The scheduled S-IVB fuel and LOX dump was initiated at 8774.31 sec and terminated at 9084.51 sec. Radar tracking data were not available in the

area of the dump period. Therefore, the orbital parameters at the beginning and end of passivation were calculated from an integrated S-IVB orbital trajectory using the telemetered acceleration data. The telemetered acceleration magnitude profile, during the passivation period, is shown in Figure 19.

In addition to the actual S-IVB orbital trajectory, a theoretical trajectory was initiated at the beginning of passivation and integrated through the dump period assuming nominal drag forces and no dump forces. The orbital parameters at the end of passivation from this theoretical trajectory are compared to the parameters computed from the actual S-IVB orbital trajectory. This comparison, which reveals the effect of the fuel and LOX dump on the S-IVB orbit, is presented in Table X. The effects of the fuel and LOX dump on the S-IVB altitude and space-fixed velocity orbiting profiles are shown in Figures 20 and 21, respectively. The solid line in these figures represent the actual S-IVB orbital trajectory. The dashed line represents the theoretical (no dump) trajectory.

#### 5.0 S-IB AND S-IVB STAGE FREE FLIGHT TRAJECTORIES

Three theoretical free flight trajectories were computed for the discarded S-IB stage using initial conditions at S-IB/S-IVB separation. The trajectories were integrated from separation to impact using actual retro-rocket performance and actual outboard engine decay data. The three trajectories were calculated by assuming nominal drag coefficients for three types of S-IB stage free-flight conditions. These three conditions for the expended S-IB stage are: (1) stabilized at zero deg angle of attack, (2) a tumbling body, and (3) stabilized at 90 deg angle of attack. This provides the following S-IB stage impact locations.

<u>Drag Condition</u>	<u>Impact Range</u>	<u>Impact Time</u>
0 deg Angle of Attack	532.99 km (287.79 nm)	501.6 sec
Tumbling Body	523.64 km (282.74 nm)	562.7 sec
90 deg Angle of Attack	517.81 km (279.60 nm)	604.5 sec

Radar tracking data were not available to confirm the results obtained. However, on previous flights the tumbling drag case was proven to be close to the actual tracking data. For this reason, the theoretical free-flight trajectory utilizing the tumbling drag coefficient data is considered the actual trajectory of the expended S-IB stage. This ballistic free flight trajectory is presented in tabular form in Table XVII (metric units) and Table XVIII (English units). The ground track and impact are also shown in Figure 3.

The S-IVB expended stage remained in earth orbit, following S-IVB/LM-1 separation, for approximately 10 revolutions. Due to the lack of tracking data during the final revolutions, the S-IVB free flight re-entry trajectory was not computed. However, it is understood the S-IVB free flight will be documented under a separate cover by R-AERO-FT of the Marshall Space Flight Center.

#### 6.0 GOVERNMENT FURNISHED DATA

The Government furnished data used to establish the postflight trajectory of the AS-204 vehicle is tabulated in Table XIX.

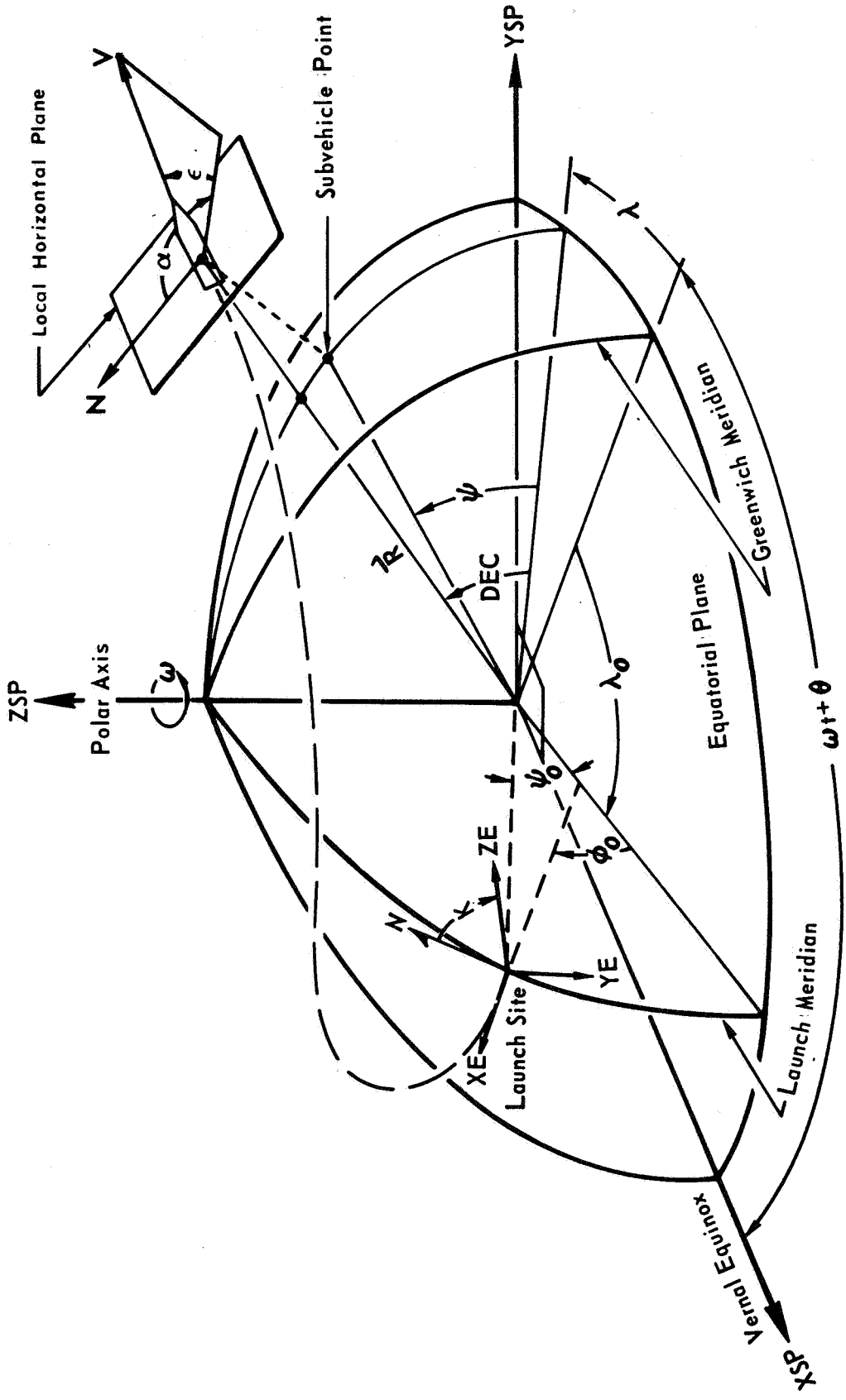


Figure 1. Trajectory Coordinate Systems



DATA UTILIZATION



Insertion

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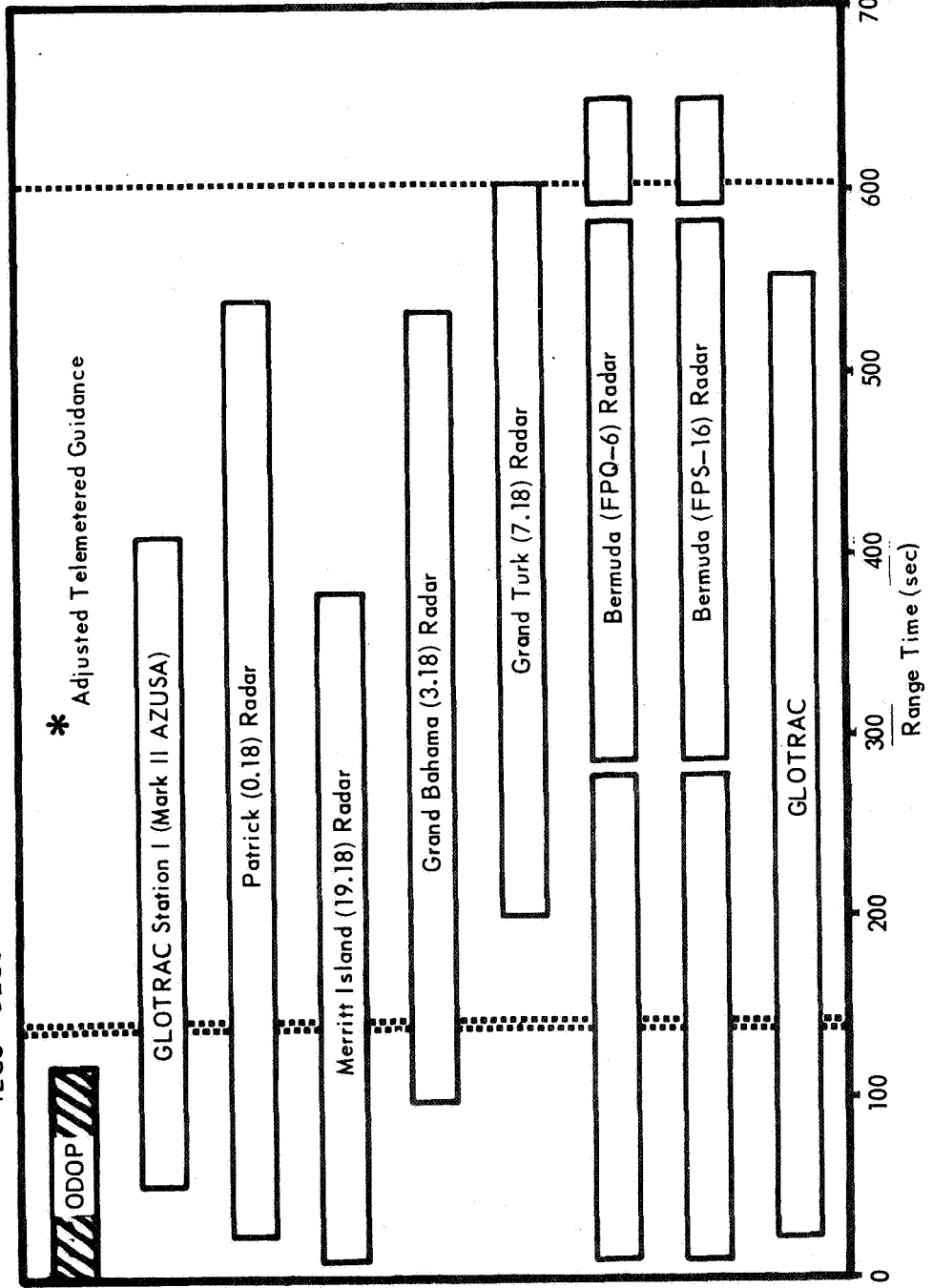


Figure 2. Available Tracking Data (Powered Flight)

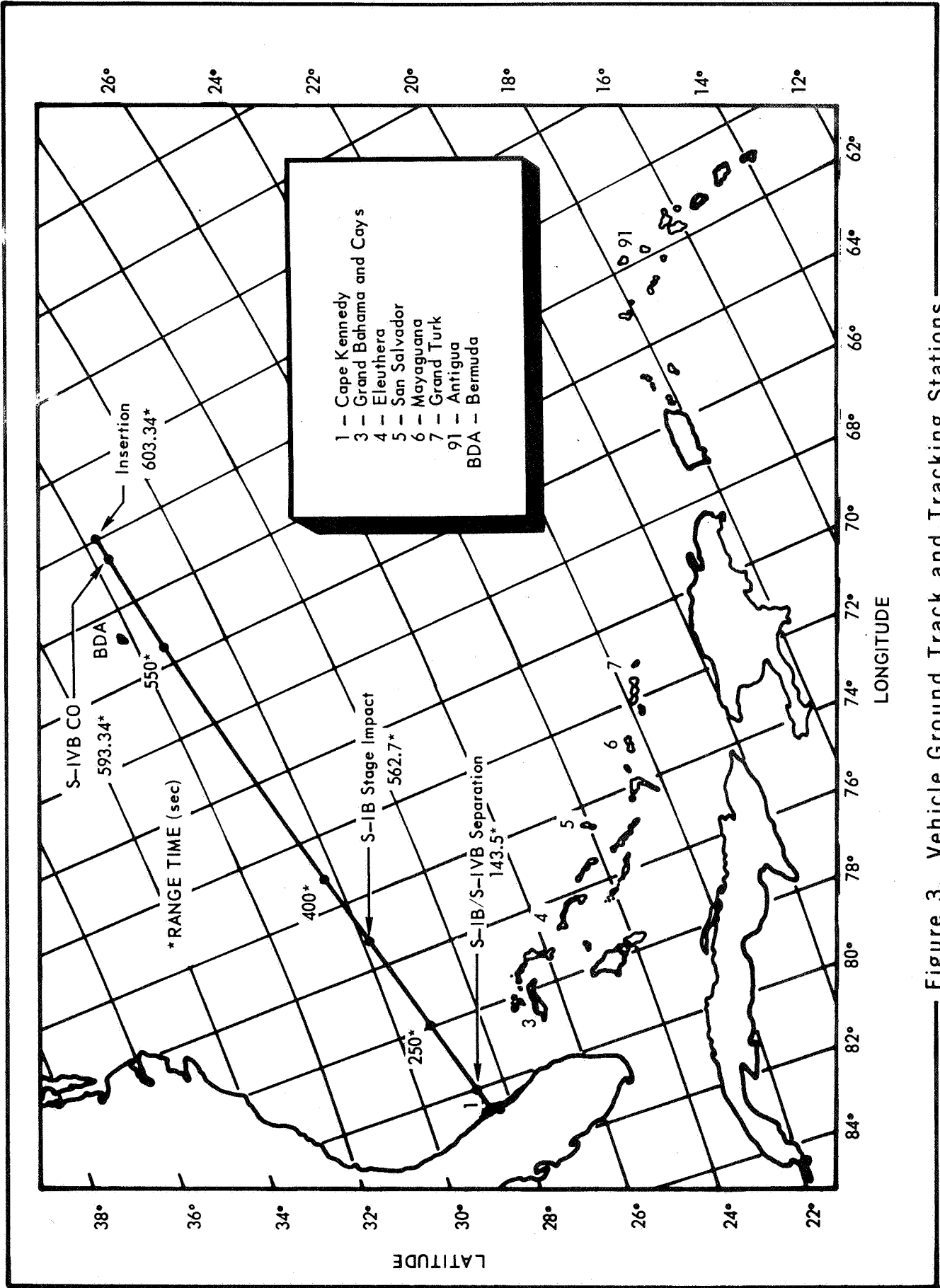


Figure 3. Vehicle Ground Track and Tracking Stations

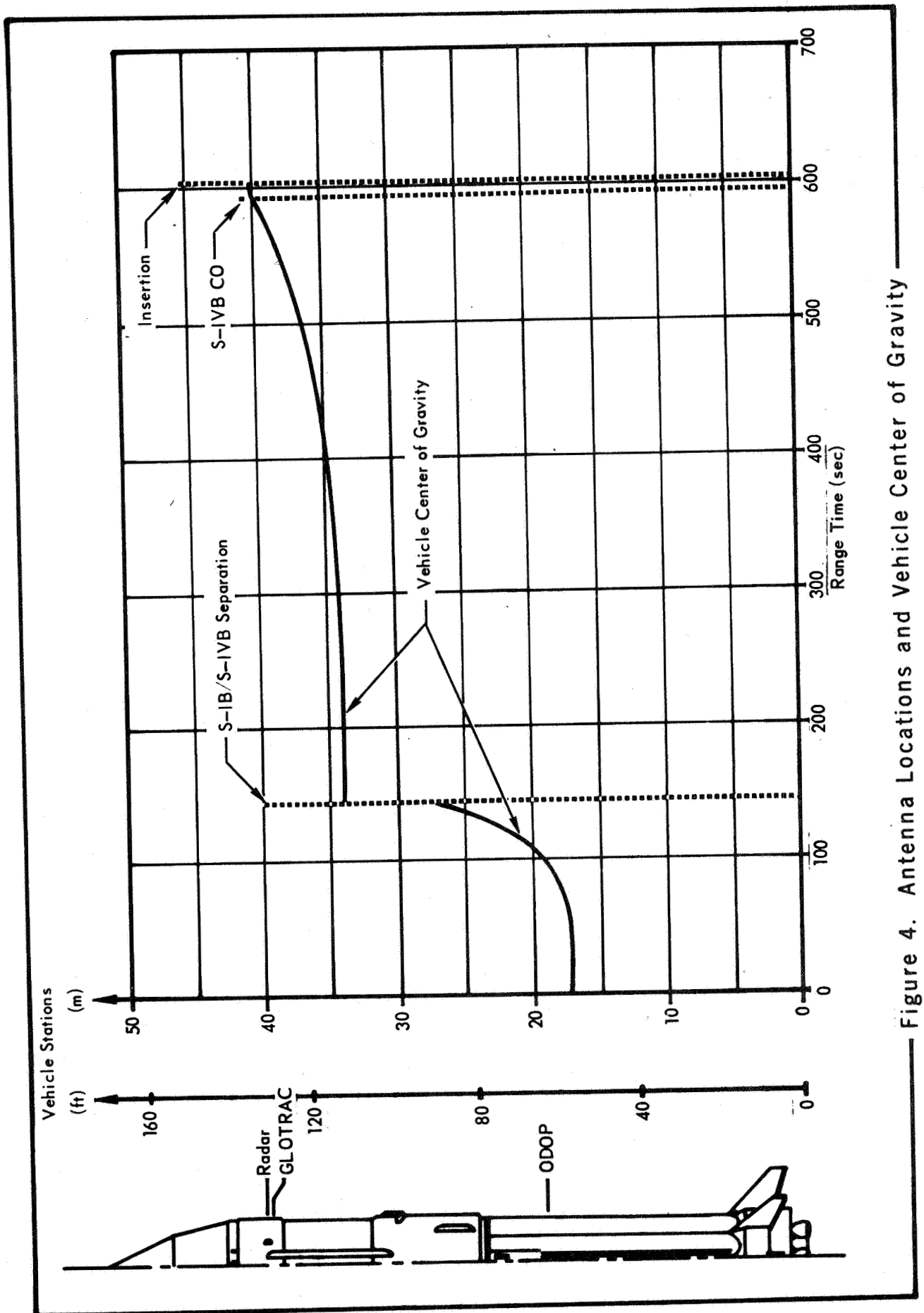


Figure 4. Antenna Locations and Vehicle Center of Gravity

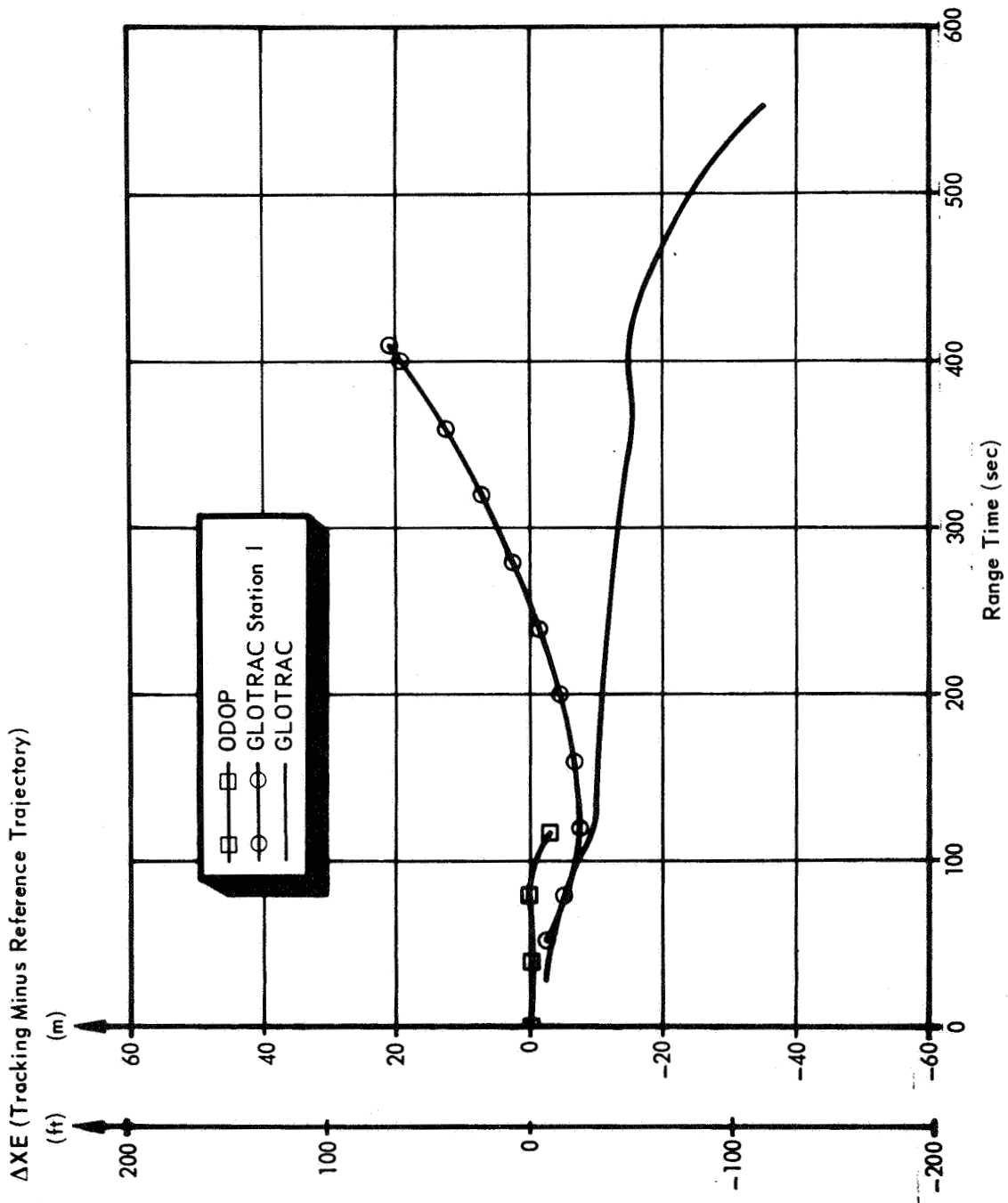


Figure 5. Metric Tracking Comparisons (XE)

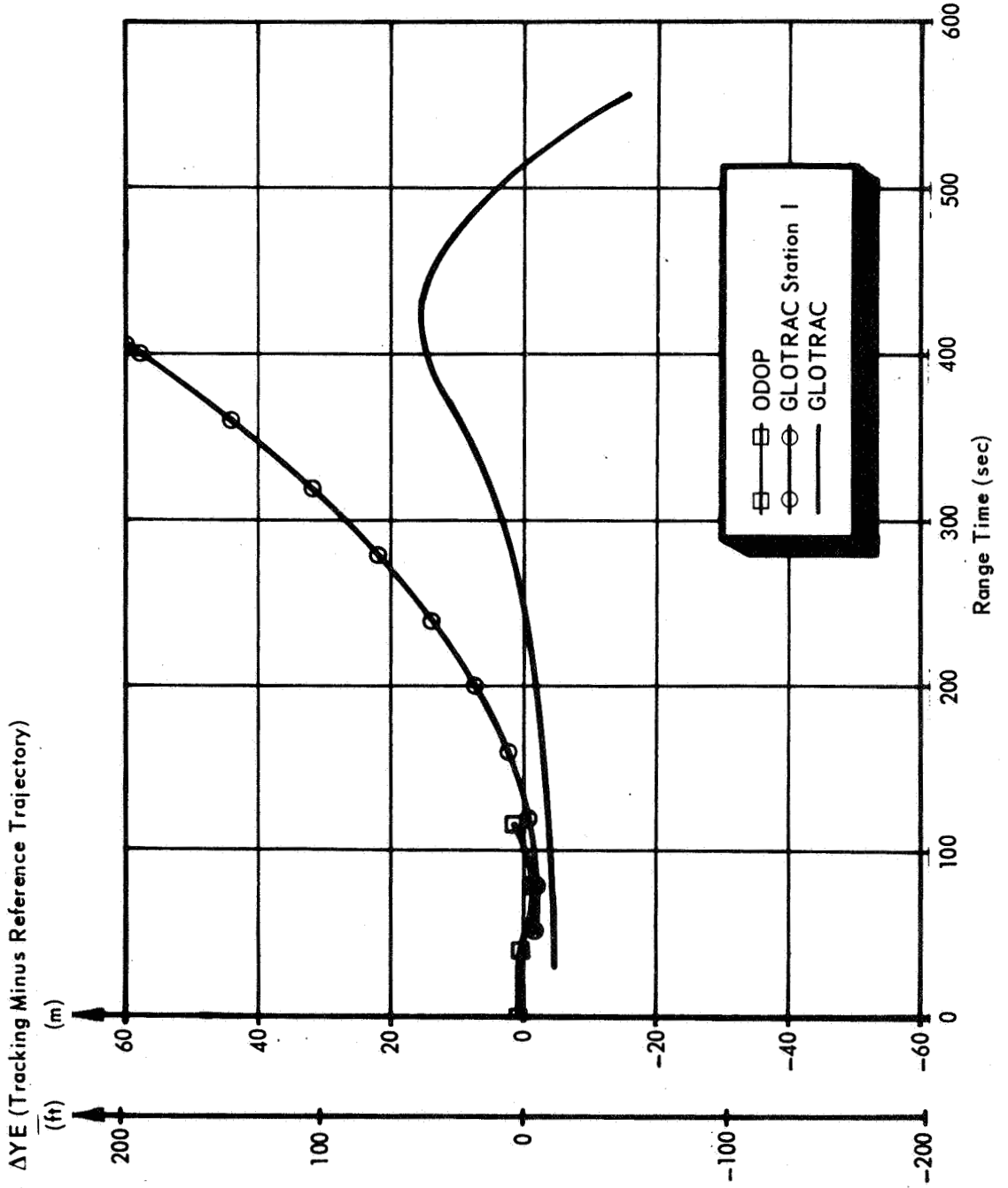


Figure 6. Metric Tracking Comparisons (YE)

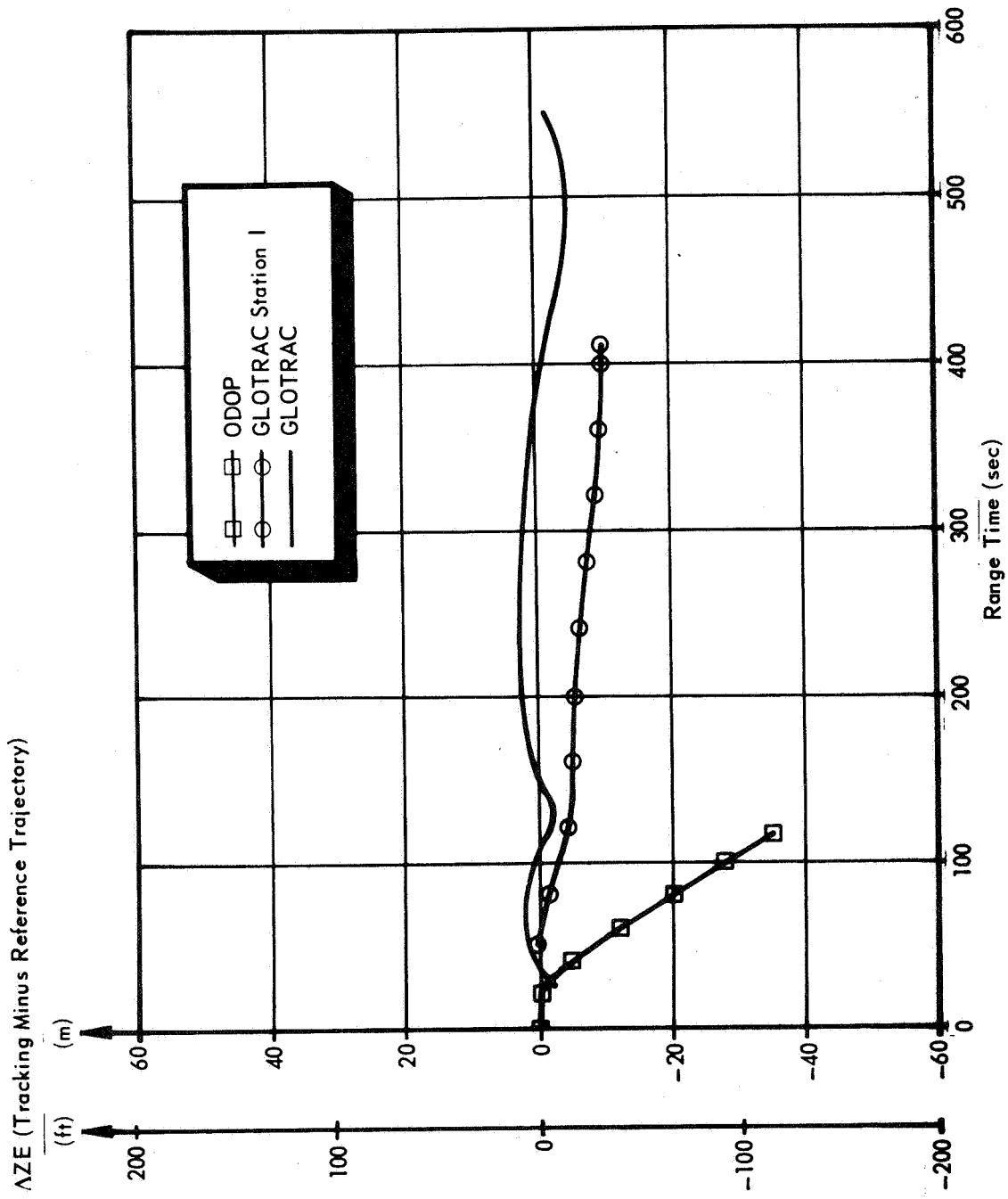


Figure 7. Metric Tracking Comparisons (ZE)



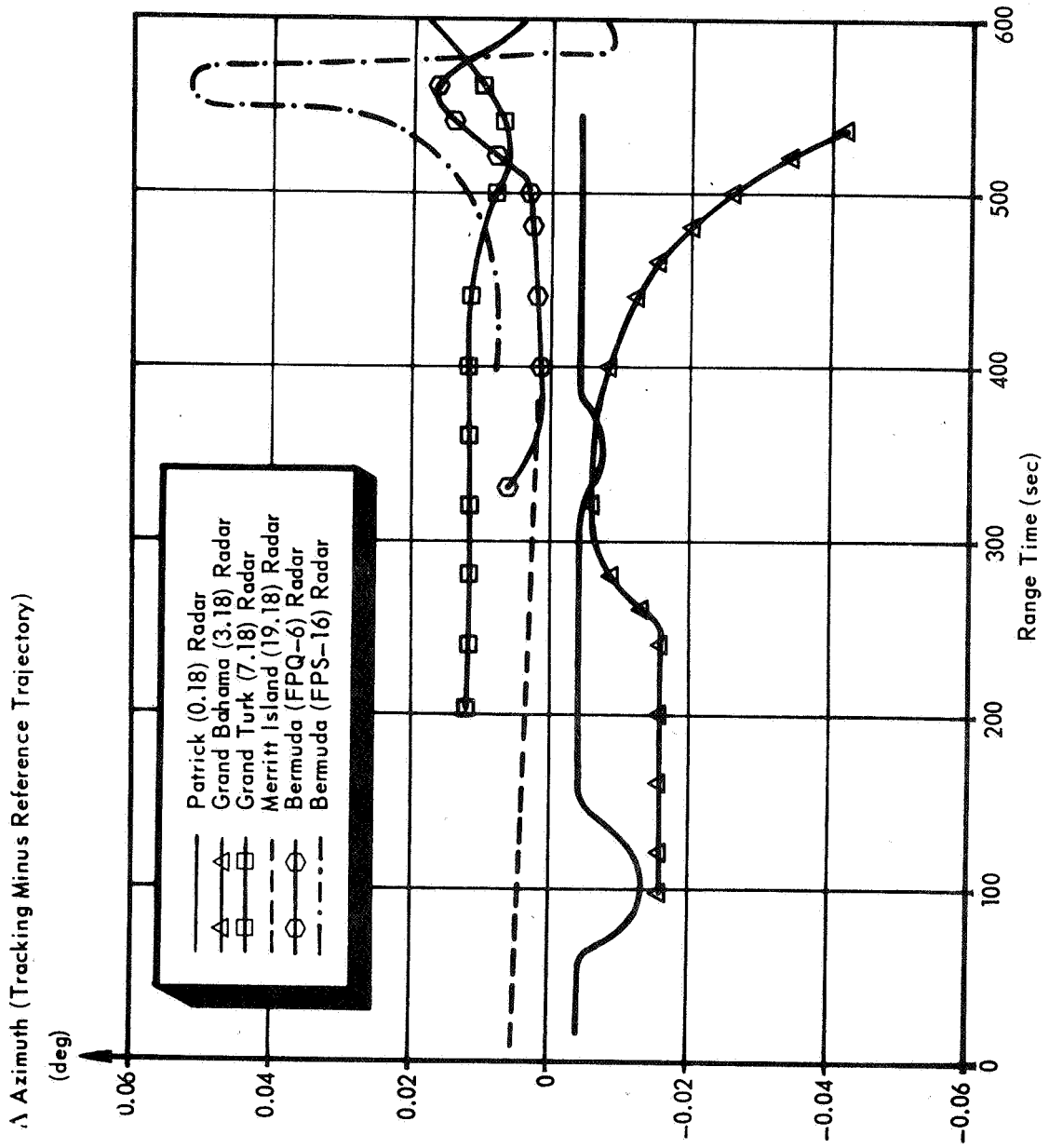


Figure 8. Measured Parameter Tracking Comparison (Azimuth)

$\Delta$ Elevation (Tracking Minus Reference Trajectory)

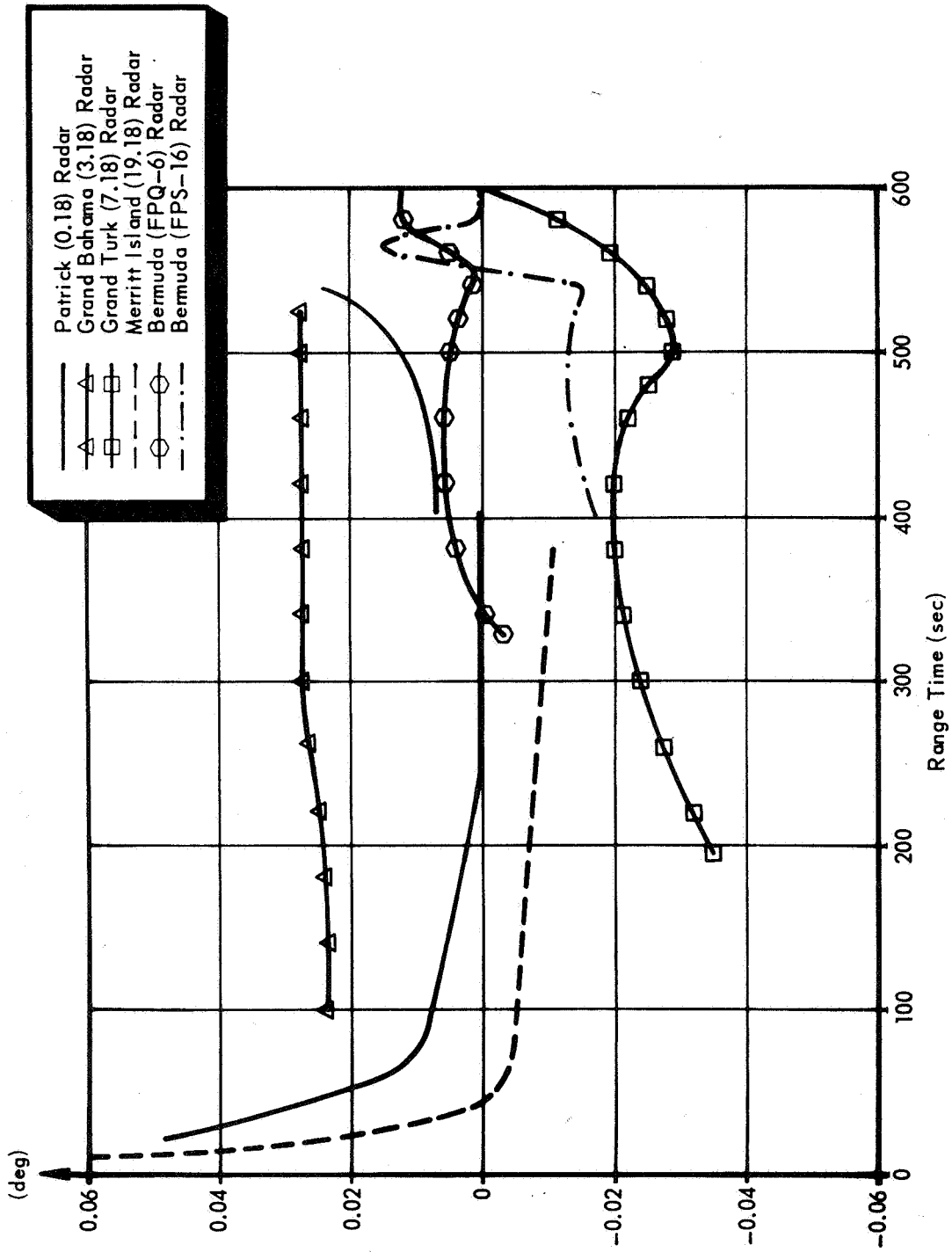


Figure 9. Measured Parameter Tracking Comparison (Elevation)

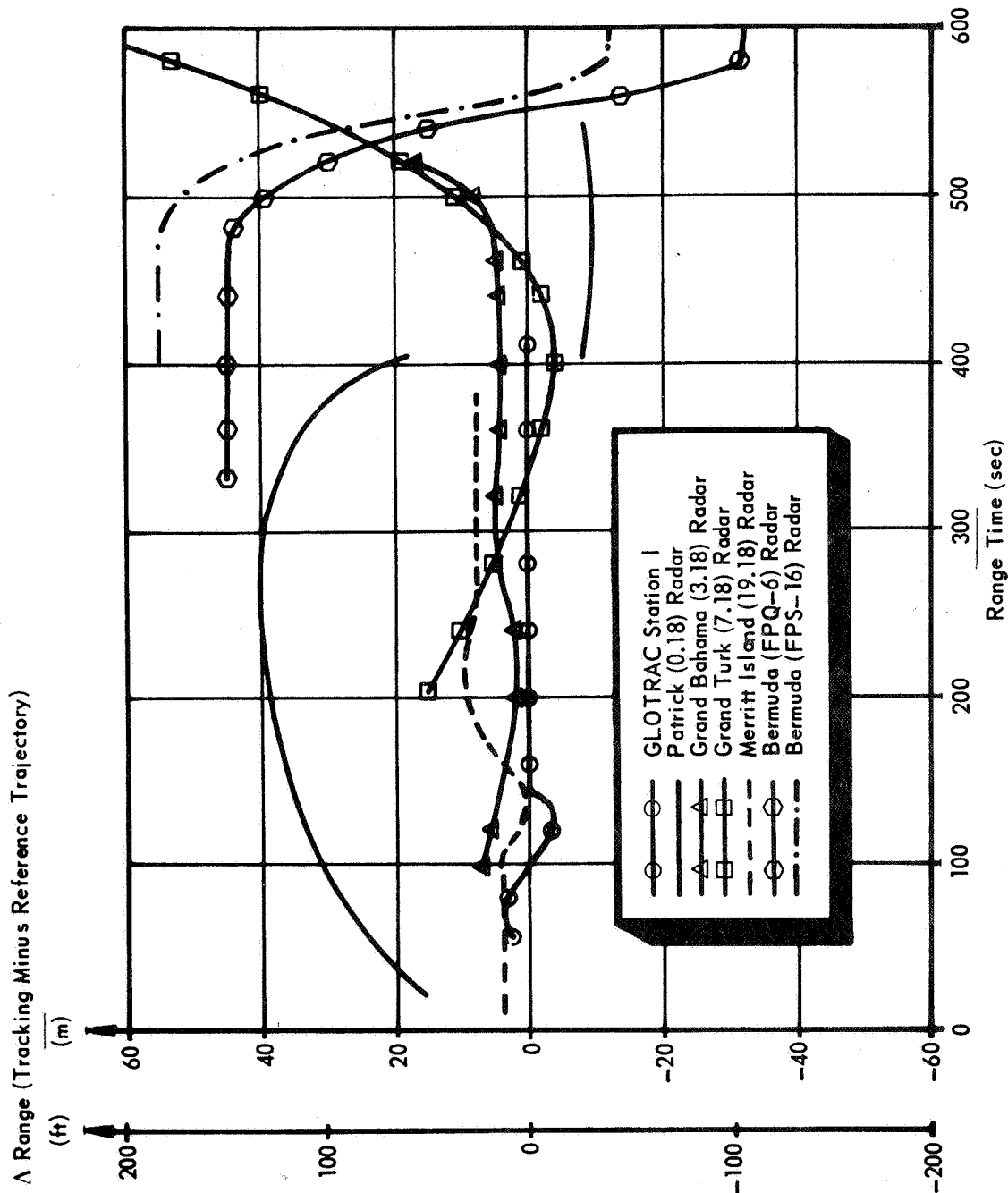


Figure 10. Measured Parameter Tracking Comparison (Range)

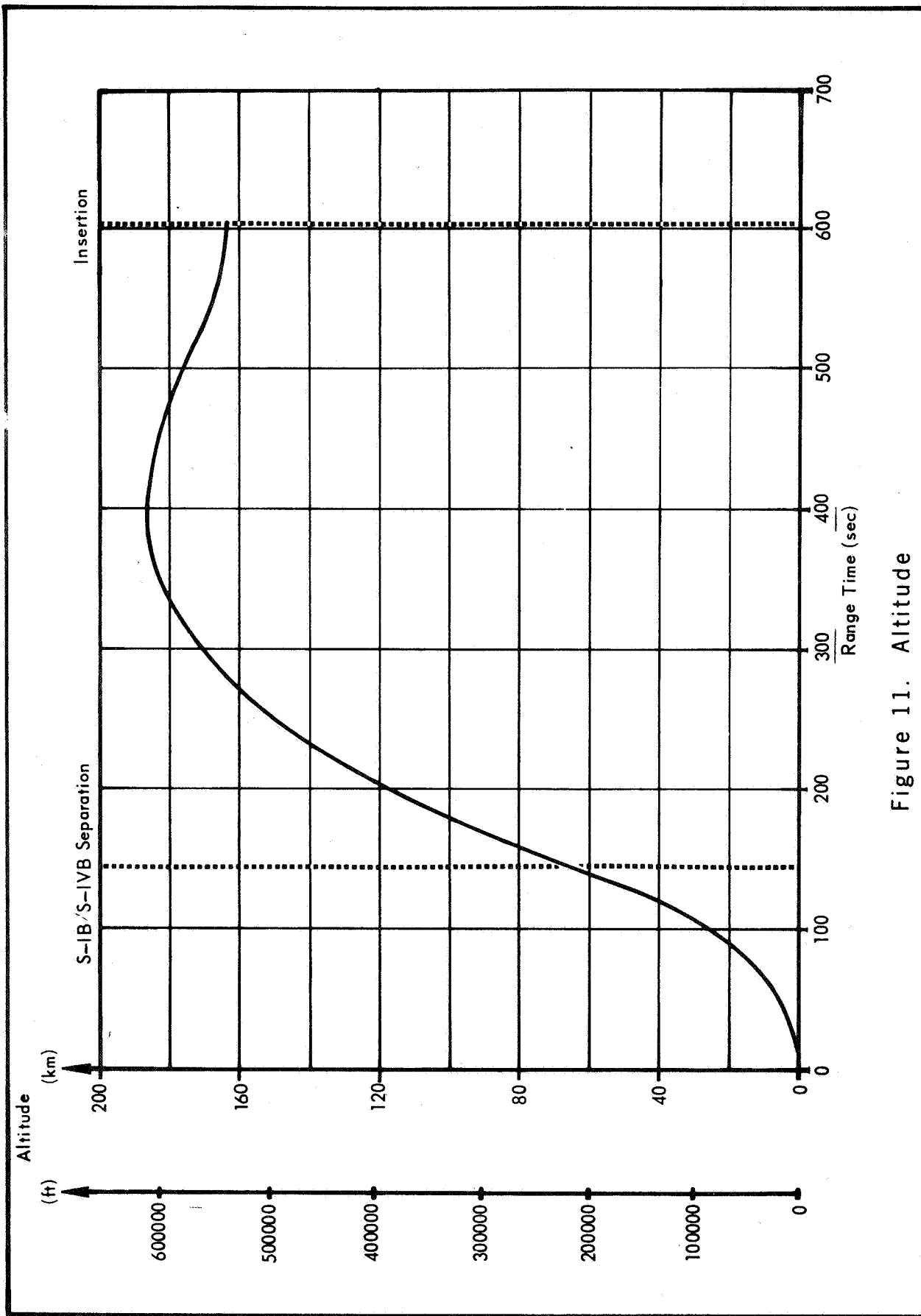


Figure 11. Altitude

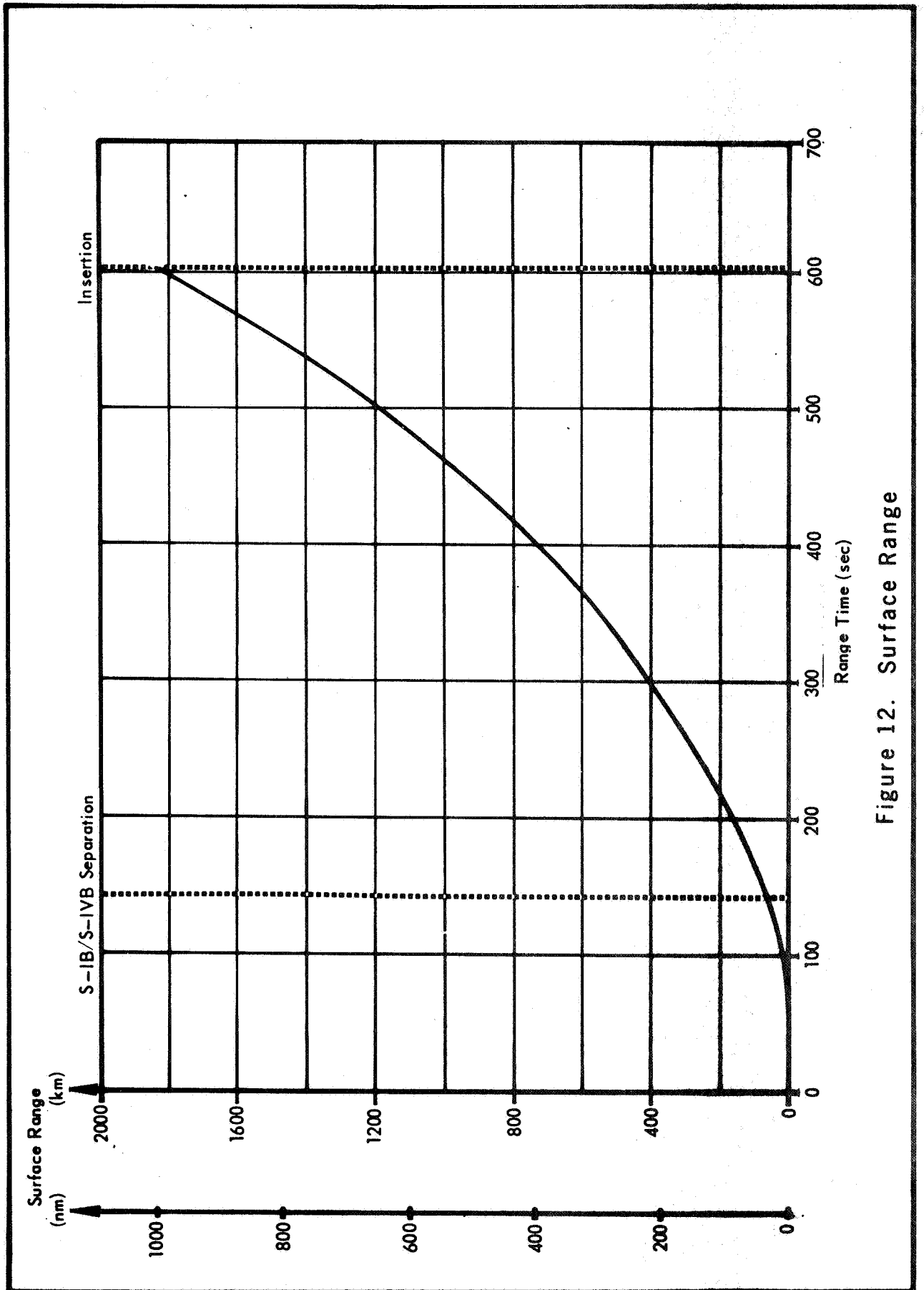


Figure 12. Surface Range

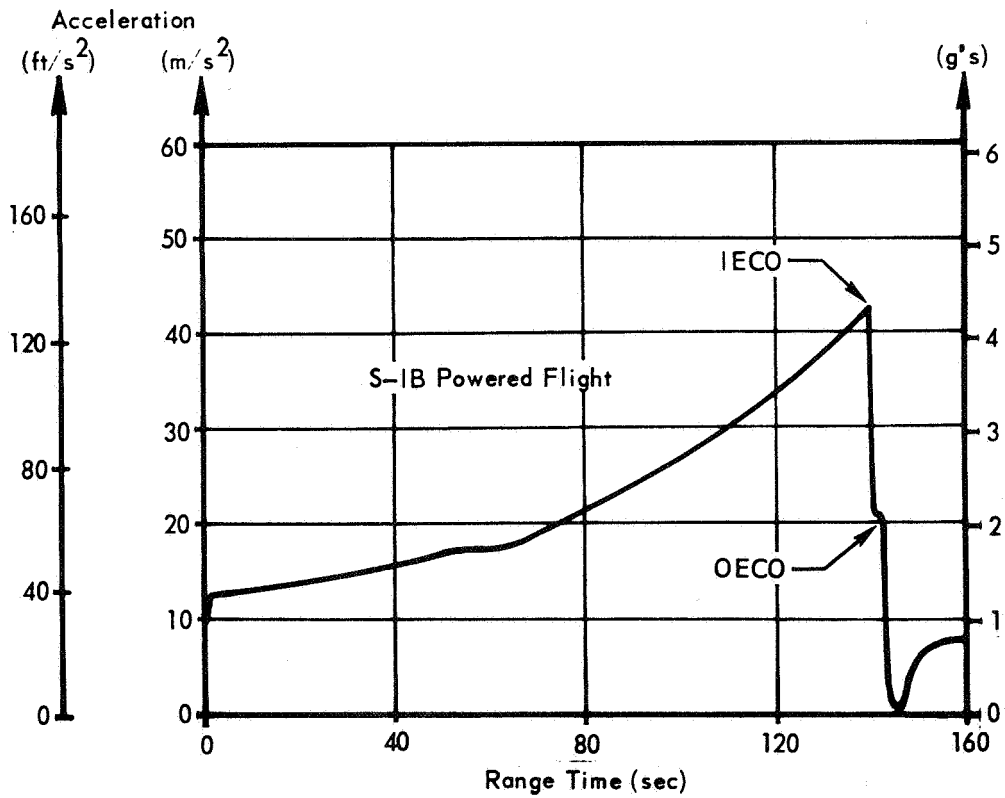
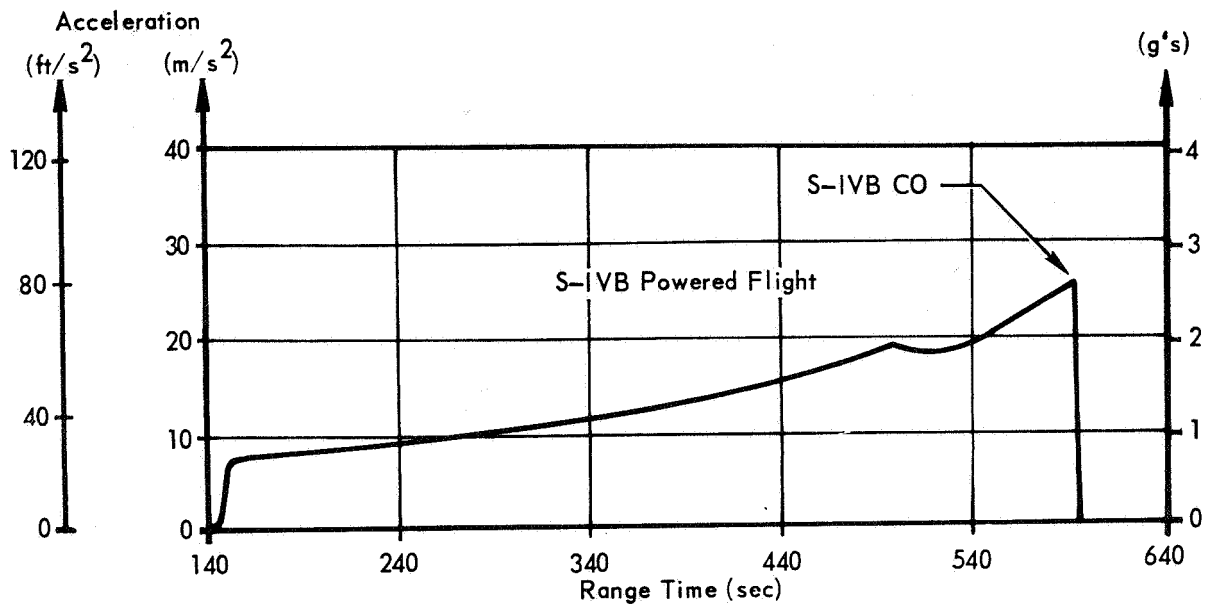


Figure 13. Total Inertial Acceleration

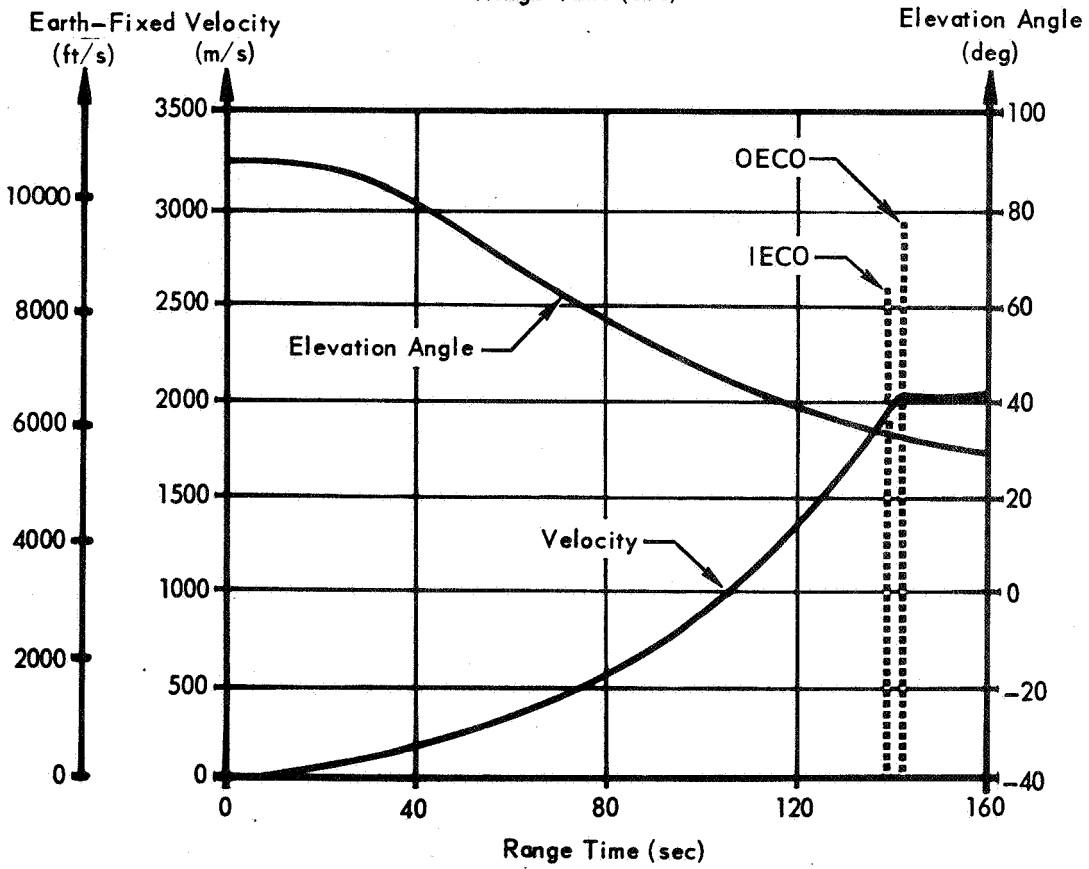
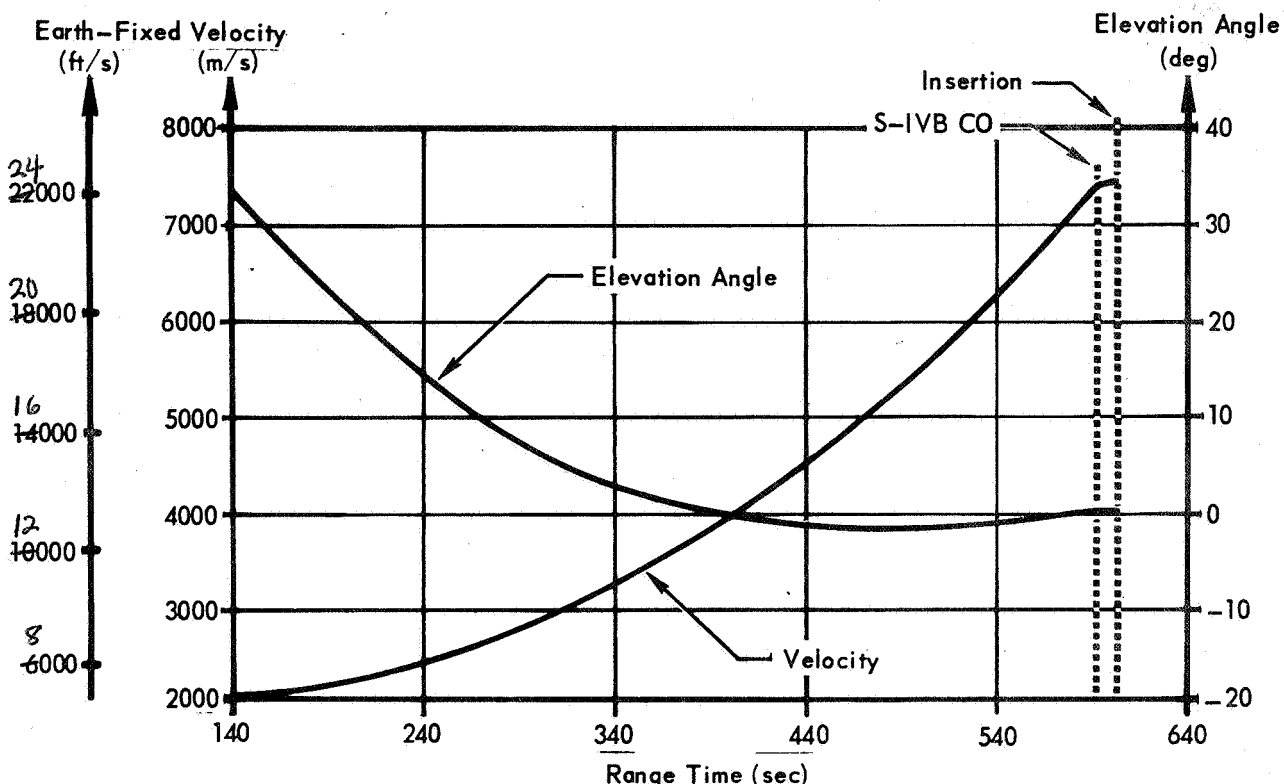


Figure 14. Earth-Fixed Velocity and Elevation Above Local Horizontal

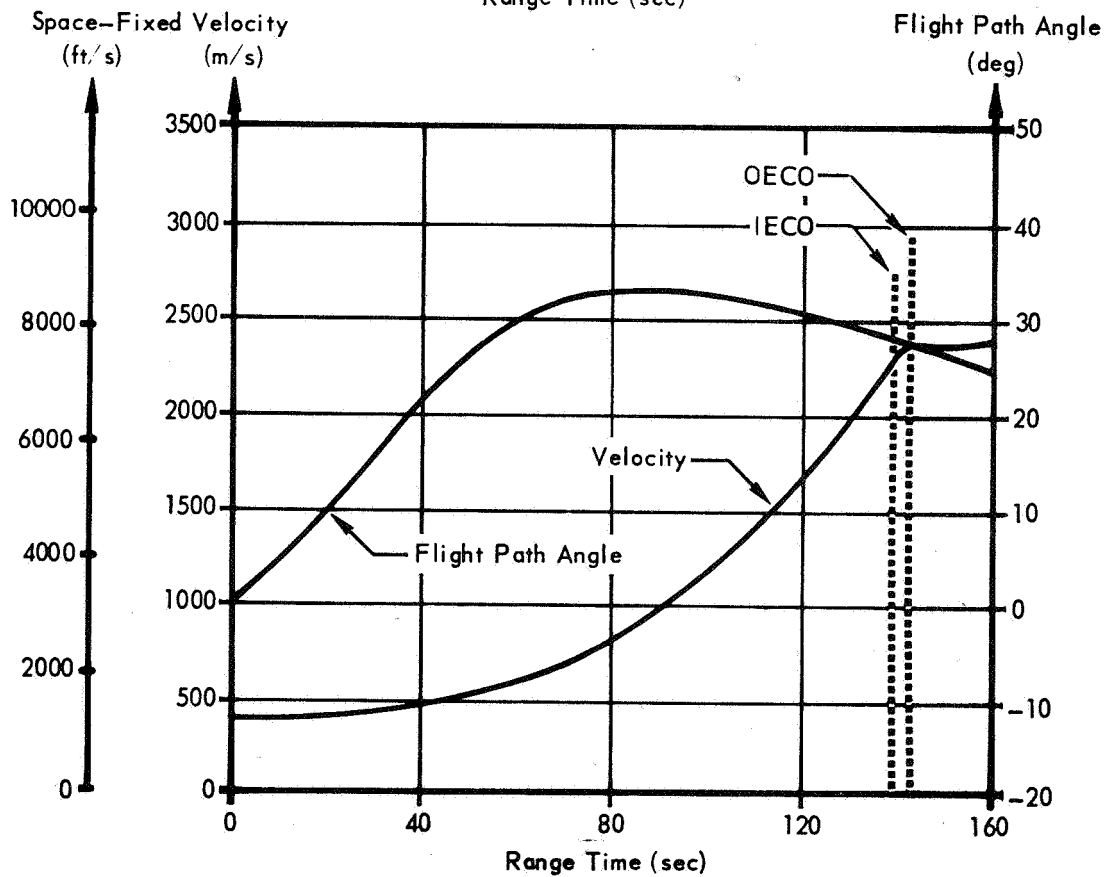
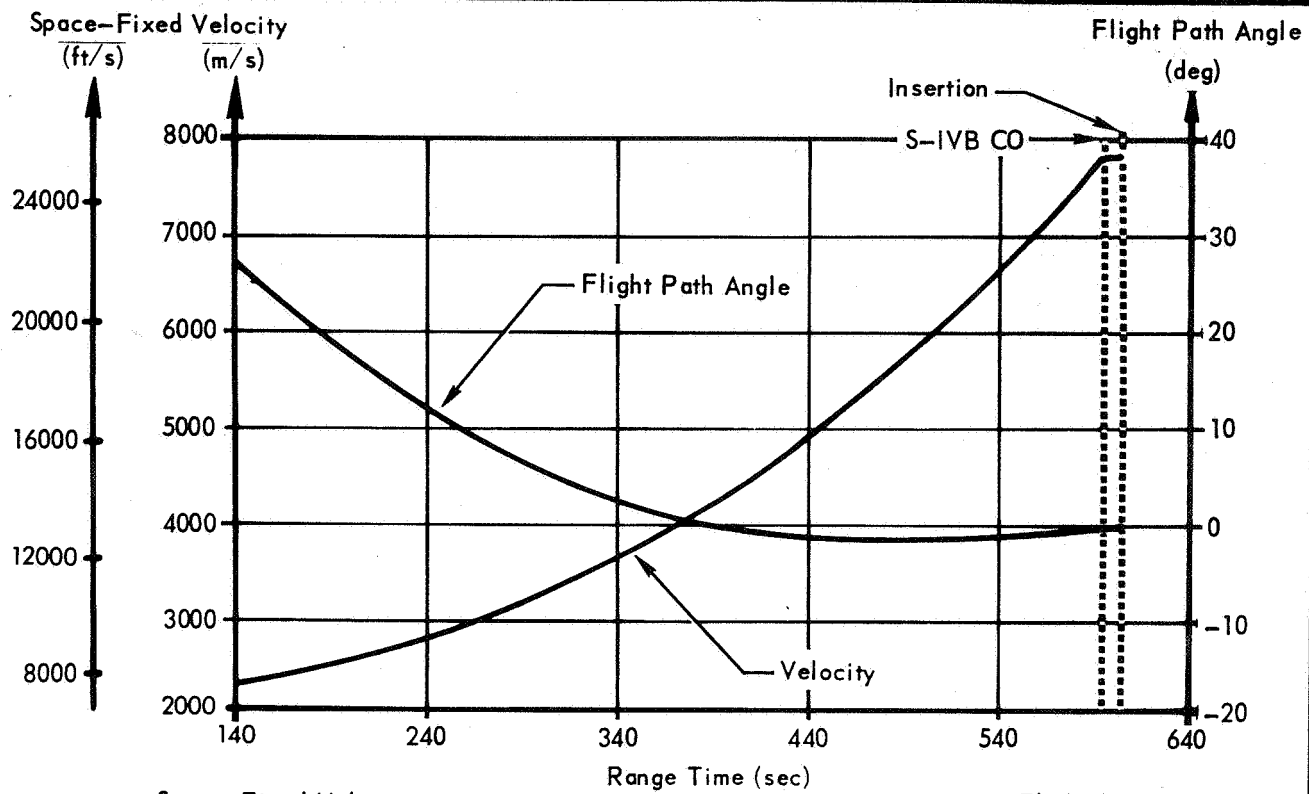


Figure 15. Space-Fixed Velocity and Flight Path Angle



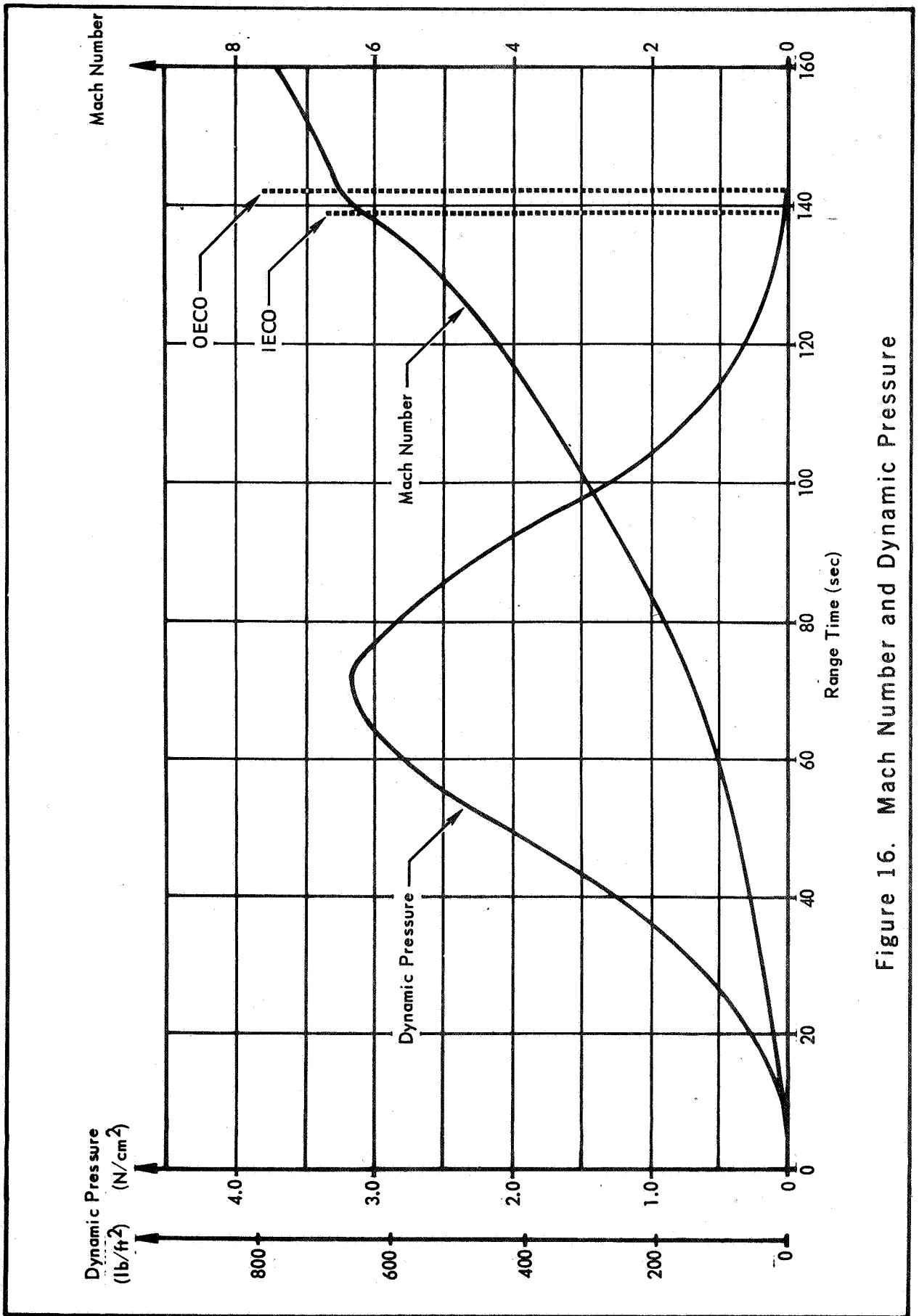


Figure 16. Mach Number and Dynamic Pressure

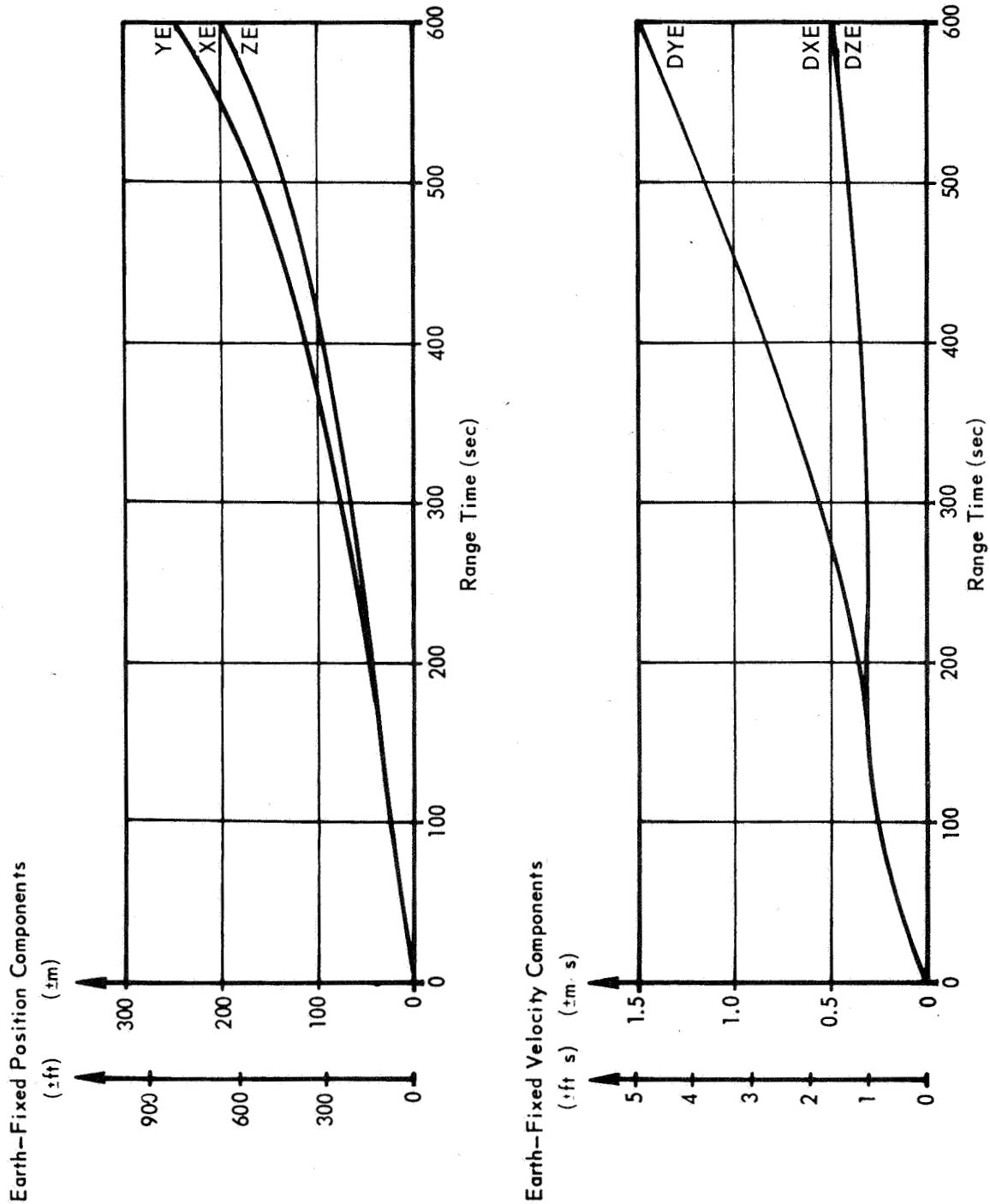


Figure 17. Estimated Uncertainty of Reference Trajectory (Powered Flight)

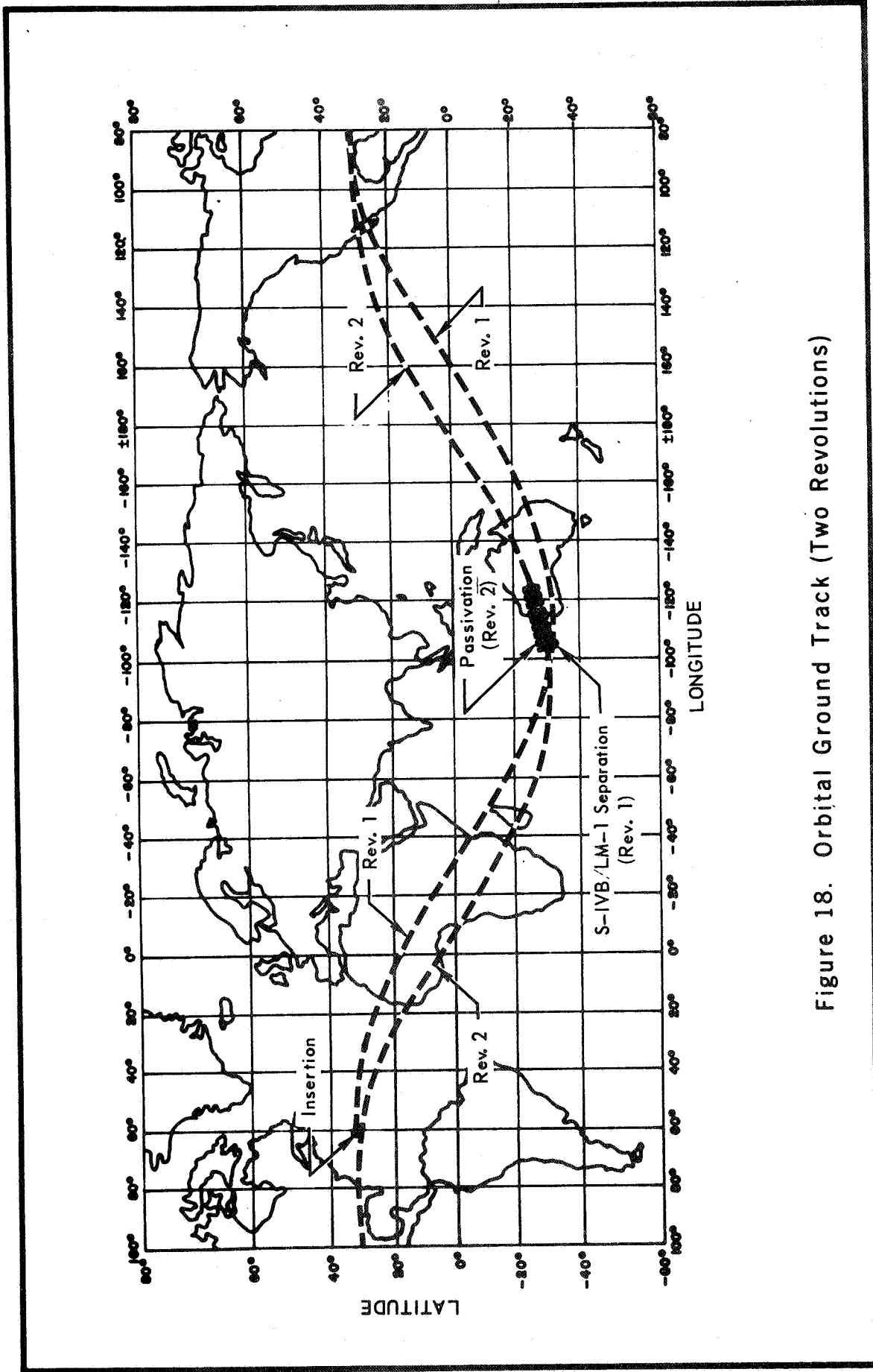


Figure 18. Orbital Ground Track (Two Revolutions)

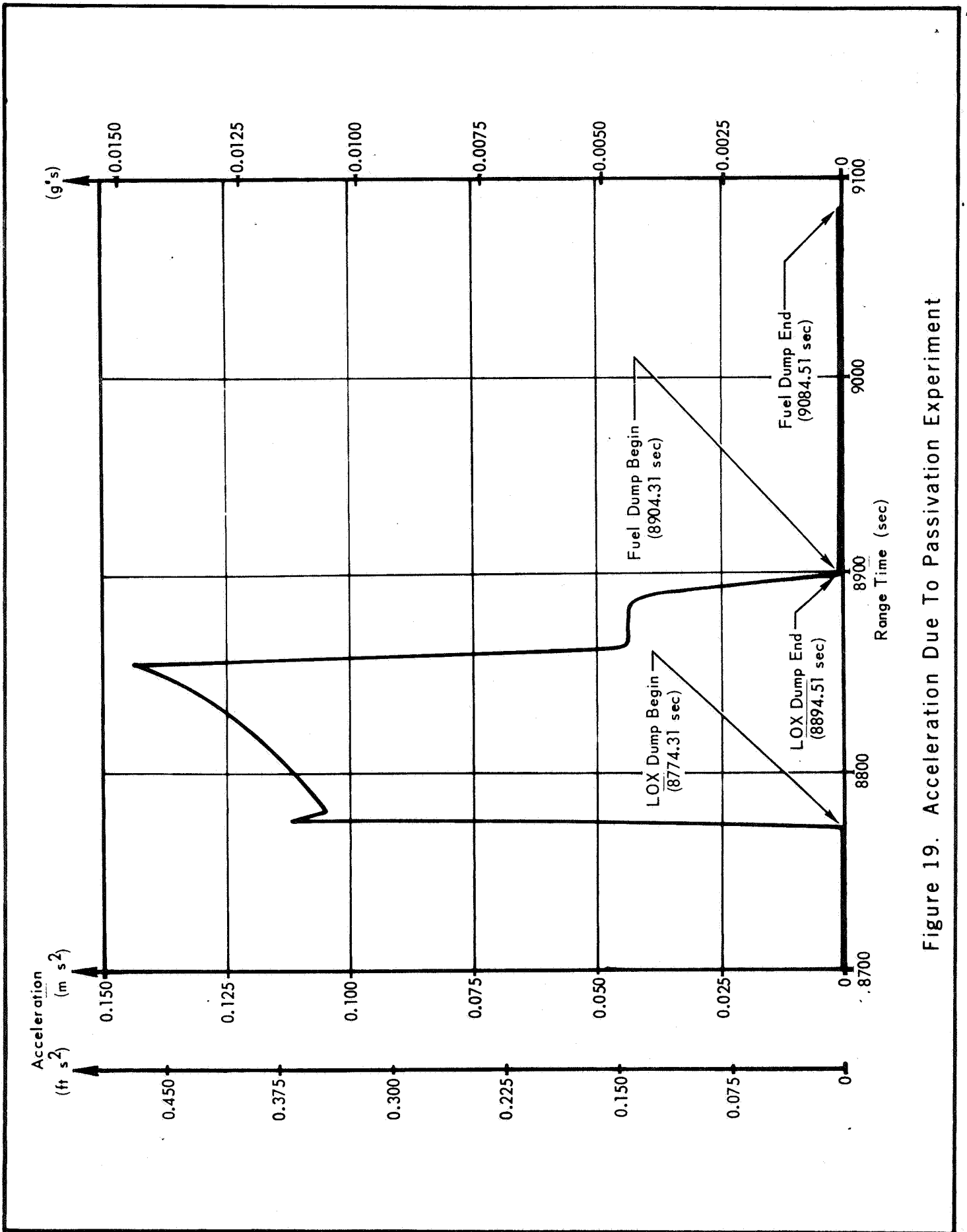


Figure 19. Acceleration Due To Passivation Experiment

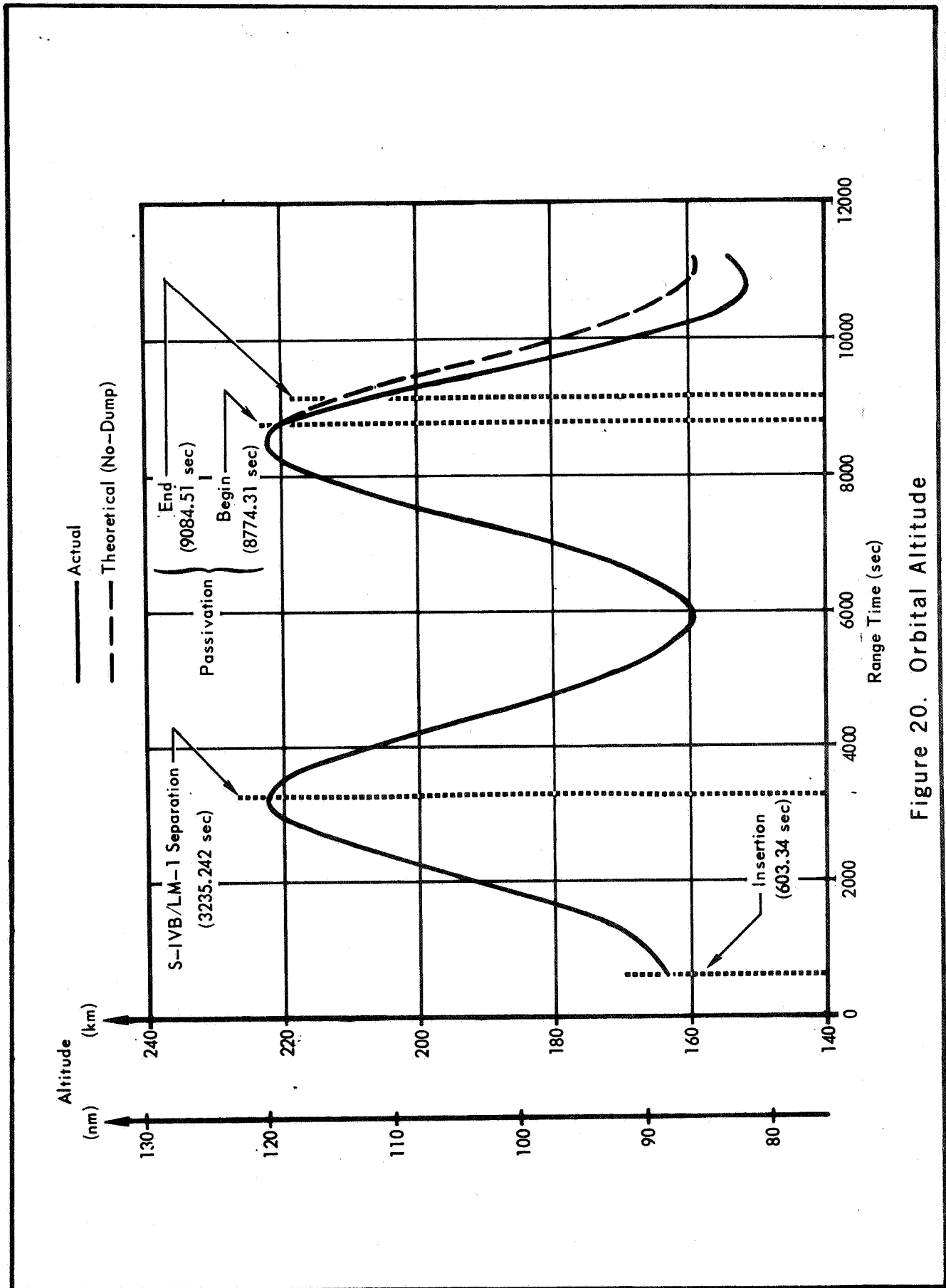


Figure 20. Orbital Altitude

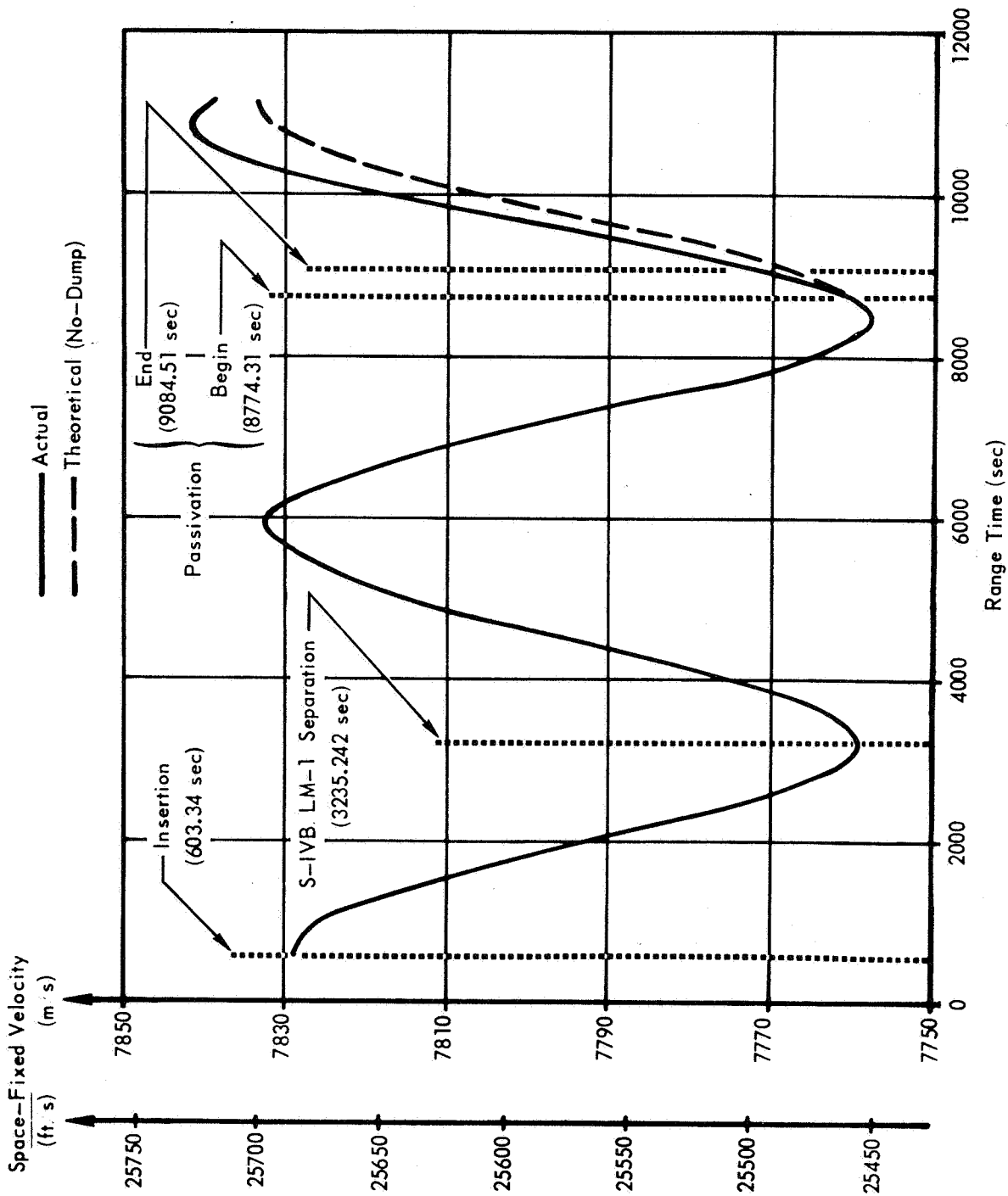


Figure 21. Orbital Space-Fixed Velocity

TABLE I  
TRACKING DATA SOURCES AVAILABLE DURING POWERED FLIGHT

<u>Data Source</u>	<u>Interval(sec)</u>
ODOP	0.0 - 119.0
GLOTRAC Station I (Mark II AZUSA)	52.3 - 410.0
Patrick (0.18) Radar (FPQ-6)	23.0 - 541.0
Merritt Island (19.18) Radar (TPQ-18)	9.0 - 380.0
Grand Bahama (3.18) Radar (TPQ-18)	98.0 - 534.0
Grand Turk (7.18) Radar (TPQ-18)	201.4 - 604.0
Bermuda Radar (FPQ-6)	11.0 - 278.0 287.0 - 583.0 592.0 - 650.0
Bermuda Radar (FPS-16)	11.0 - 278.0 287.0 - 583.0 592.0 - 650.0
GLOTRAC	23.0 - 552.9

TABLE II  
TIMES OF EVENTS

<u>Event</u>	<u>Time (sec)</u>		
	<u>Actual</u>	<u>Nominal</u>	<u>Act-Nom</u>
Guidance Reference Release	- 4.956	---	---
First Motion	0.20	0.20	0.00
L. O. Signal (Umb. Disc.)	0.36	0.40	-0.04
Mach One	59.76	60.18	-0.42
Maximum Dynamic Pressure	71.50	74.20	-2.70
IECO	138.97	139.34	-0.37
OECO	142.25	142.34	-0.09
S-IB/S-IVB Separation (Signal)	143.50	143.64	-0.14
S-IB/S-IVB Separation (Physical)	143.57	143.72	-0.15
Guidance Initiation (IGM)	159.47	159.34	0.13
S-IVB CO	593.34	598.35	-5.01
Orbit Insertion	603.34	608.35	-5.01
S-IVB/IM Separation	3235.24	3235.20	0.04

Note: Actual times are referenced to Range Zero (5:48:08 P.M. EST). Nominal times are obtained from Reference 1 and adjusted to the actual 0.2 sec first motion time.



TABLE III  
SIGNIFICANT TRAJECTORY PARAMETERS

<u>Event</u>	<u>Parameters</u>	<u>Actual Value</u>
First Motion	Range Time	0.20 sec
	Total Inertial Acceleration	12.11 m/s <sup>2</sup> (39.73 ft/s <sup>2</sup> )
Mach 1	Range Time	59.76 sec
	Altitude	7.49 km (4.04 nm)
Maximum Dynamic Pressure	Range Time	71.50 sec
	Dynamic Pressure	3.13 n/cm <sup>2</sup> (653.70 lb/ft <sup>2</sup> )
	Altitude	11.47 km (6.19 nm)
Maximum Total Inertial Acceleration (S-IB Stage)	Range Time	139.07 sec
	Acceleration	42.71 m/s <sup>2</sup> (140.12 ft/s <sup>2</sup> )
Maximum Earth-Fixed Velocity (S-IB Stage)	Range Time	142.60 sec
	Velocity	2025.0 m/s (6643.7 ft/s)
Apex (S-IB Stage)	Range Time	264.93 sec
	Altitude	129.22 km (69.77 nm)
	Surface Range	261.02 km (140.94 nm)
	Earth-Fixed Velocity	1652.7 m/s (5422.4 ft/s)
Loss of Telemetry (S-IB Stage)	Range Time	397.10 sec
	Altitude	52.39 km (28.29 nm)
	Surface Range	476.96 km (257.54 nm)
	Total Earth-Fixed Acceleration	-7.69 m/s <sup>2</sup> (25.23 ft/s <sup>2</sup> )
	Elevation Angle From Pad	4.09 deg

TABLE III (Cont'd)

SIGNIFICANT TRAJECTORY PARAMETERS

<u>Event</u>	<u>Parameters</u>	<u>Actual Value</u>
Impact (S-IB Stage)	Range Time	562.70 sec
	Surface Range	523.64 km (282.74 nm)
	Cross Range	5.27 km (2.85 nm)
	Geodetic Latitude	29.85 deg
	Longitude	75.39 deg
Maximum Total Inertial Acceleration (S-IVB Stage)	Range Time	593.44 sec
	Acceleration	25.38 m/s <sup>2</sup> (83.27 ft/s <sup>2</sup> )
Maximum Earth-Fixed Velocity (S-IVB Stage)	Range Time	595.00 sec
	Velocity	7422.5 m/s (24352.0 ft/s)

TABLE IV

CUTOFF CONDITIONS

<u>Parameter</u>	<u>Units</u>	<u>IECO</u>	<u>OECO</u>	<u>S-IVB CO</u>
Range Time	sec	138.97	142.25	593.34
Altitude	km	59.20	62.79	163.42
	mm	31.96	33.90	88.24
Range	km	54.99	60.41	1765.21
	mm	29.69	32.62	953.14
Cross Range, YE	km	0.24	0.25	87.57
	mm	0.13	0.13	47.28
Cross Range Velocity, DYE	m/s	2.4	2.6	527.6
	ft/s	8.0	8.6	1731.1
Earth-Fixed Velocity	m/s	1964.4	2022.4	7415.0
	ft/s	6445.0	6635.3	24327.5
Earth-Fixed Velocity Vector Elevation	deg	33.58	32.84	-0.01
Earth-Fixed Velocity Vector Azimuth	deg	72.24	72.27	85.25
Space Fixed Velocity	m/s	2305.1	2365.4	7820.8
	ft/s	7562.7	7760.4	25658.7
Total Inertial Acceleration	m/s <sup>2</sup>	42.59	18.71	25.38
	ft/s <sup>2</sup>	139.73	61.38	83.26

Earth-Fixed Velocity Accuracy

OECO ±0.3 m/s (±1.0 ft/s)  
 S-IVB CO ±0.5 m/s (±1.6 ft/s)

Altitude Accuracy

OECO ± 30 m (±98 ft)  
 S-IVB CO ±200 m (±656 ft)

TABLE V  
S-IB/S-IVB SEPARATION CONDITIONS

Parameters	Units	Separation Signal			Physical Separation (EBW Firing)		
		Actual	Nominal	Act-Nom	Actual	Nominal	Act-Nom
Range Time	sec	143.50	143.64	- 0.14	143.57	143.72	- 0.15
Altitude	km	64.16	63.49	0.67	64.24	63.58	0.66
	nm	34.64	34.28	0.36	34.69	34.33	0.36
Range	km	62.52	62.63	- 0.11	62.63	62.77	- 0.14
	nm	33.76	33.82	- 0.06	33.82	33.90	- 0.08
Space-Fixed Velocity	m/s	2365.7	2369.8	- 4.1	2365.5	2369.6	- 4.1
	ft/s	7761.9	7775.3	- 13.4	7761.2	7774.6	- 13.4
Cross Range	km	0.25	-0.05	0.30	0.25	-0.05	0.30
	nm	0.13	-0.03	0.16	0.13	-0.03	0.16
Flight Path Angle	deg	27.394	27.161	0.233	27.381	27.146	0.235
Heading Angle	deg	75.709	75.644	0.065	75.709	75.644	0.065

TABLE VI

S-IVB/LM-1 INSERTION AND SEPARATION CONDITIONS

Parameters	Units	Orbit Insertion			S-IVB/LM-1 Separation		
		Actual	Nominal	Act-Nom	Actual	Nominal	Act-Nom
Range Time	sec	603.34	608.35	- 5.01	3235.24	3235.20	0.04
Altitude	km	163.44	163.22	0.22	222.11	223.31	- 1.20
	mm	88.24	88.12	0.12	119.93	120.58	- 0.65
Range	km	1837.56	1868.55	-30.99	19304.99	NA	NA
	mm	992.20	1008.93	-16.73	10423.86	NA	NA
Space-Fixed Velocity	m/s	7828.5	7828.6	- 0.1	7759.1	7758.2	0.9
	ft/s	25685.3	25685.6	- 0.3	25457.6	25454.7	2.9
Cross Range	km	92.87	96.24	- 3.37	106.04	NA	NA
	mm	50.15	51.97	- 1.82	57.25	NA	NA
Flight Path Angle	deg	0.005	0.008	- 0.003	- 0.013	- 0.008	- 0.005
Heading Angle	deg	85.914	86.125	- 0.211	94.573	94.580	- 0.007

TABLE VII

AVAILABLE ORBITAL TRACKING DATA

<u>Stations</u>	<u>Tracking Received</u>			
	Rev 1	Rev 2	Rev 3	Rev 4
Bermuda (FPS-16)	X	X		
Tananarive (FPS-16)	X	X	X	X
California (FPS-16)	X	X	X	
Canary Island (MPS-26)	X			
Grand Bahama (TPQ-18)		X		
Hawaii (FPS-16)		X		
Ascension (FPS-16)			X	X

Revolution 1 began at 603.34 sec Range Time

Revolution 2 began at 5901 sec Range Time

Revolution 3 began at 11198 sec Range Time

Revolution 4 began at 16487 sec Range Time

TABLE VIII

## ORBITAL TRACKING UTILIZATION SUMMARY

Station	Time of Track (Range Time in sec)		Data Type	Valid Observations	RMS Error of Residuals
Bermuda (FPS-16) (Rev 1)	Begin	604	AZ	25	0.009 deg
	End	748	EL	25	0.014 deg
			RA	25	11 m (36 ft)
Tananarive (Rev 1)	Begin	2332	AZ	22	0.011 deg
	End	2464	EL	21	0.009 deg
			RA	22	5 m (16 ft)
Grand Bahama (Rev 2)	Begin	5824	AZ	42	0.007 deg
	End	6112	EL	43	0.013 deg
			RA	47	6 m (20 ft)
Bermuda (FPS-16) (Rev 2)	Begin	6016	AZ	39	0.011 deg
	End	6274	EL	41	0.021 deg
			RA	44	14 m (46 ft)

TABLE IX

## ORBITAL ELEMENTS AT SIGNIFICANT TIMES

PARAMETERS	UNITS	INSERTION	S-IVB/ $L_{1-2}$ SEPARATION	BEGIN REV. 2
Time	(Range Time in sec)	603.34	3235.242	5901.0
Space Fixed Velocity	(m/s) (ft/s)	7828.4 25683.4	7759.1 25456.4	7833.0 25698.5
Flight Path Angle	(deg)	0.004	- 0.013	0.018
Altitude	(km) (nm)	163.44 88.25	222.11 119.93	159.07 85.89
Apogee	(km) (nm)	221.49 119.60	216.35 116.82	223.63 120.75
Perigee	(km) (nm)	157.62 85.11	163.68 88.49	153.16 82.70
Period	(min)	88.28	88.29	88.26
Eccentricity		0.0049	0.0040	0.0054
Inclination	(deg)	31.627	31.628	31.627



TABLE X

S-IVB PASSIVATION EFFECT ON ORBIT

PARAMETER	UNITS	BEGIN DUMP	END DUMP (Actual)	NO DUMP (Theoretical)	EFFECT OF DUMP (Dump Minus No Dump)
Range Time	sec	8774.31	9084.51	9084.51	---
Apogee	km	216.49	223.18	217.31	5.87
	nm	116.90	120.51	117.34	3.17
Perigee	km	160.49	154.78	162.14	- 7.36
	nm	86.66	83.57	87.55	- 3.98
Space-Fixed Velocity	m/s	7760.2	7771.6	7767.5	4.1
	ft/s	25459.8	25497.2	25483.7	13.5
Flight Path Angle	deg	- 0.089	- 0.263	- 0.172	- 0.091
Inclination	deg	31.628	31.639	31.637	0.002
Eccentricity	---	0.0043	0.0052	0.0042	0.0010
Period	min	88.26	88.27	88.29	- 0.02

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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									
-4.956	35	0	0	0.0	0.0	0.0	0.00	0.00	0.00
-4.0	35	0	0	0.0	0.0	0.0	0.00	0.00	0.00
-3.0	35	0	0	0.0	0.0	0.0	0.00	0.00	0.00
-2.0	35	0	0	0.0	0.0	0.0	0.00	0.00	0.00
-1.0	35	0	0	0.0	0.0	0.0	0.00	0.00	0.00
RANGE ZERO AT 17 48 08 EST									
0.000	35	0	0	0.0	0.0	0.0	0.00	0.00	0.00
FIRST MOTION									
0.200	34	0	0	-0.0	-0.0	0.0	2.32	0.02	0.02
LIFTOFF									
0.360	35	0	0	0.4	0.0	0.0	2.36	0.02	0.01
1.0	35	0	0	1.9	0.0	0.0	2.51	0.01	0.01
2.0	38	0	0	4.5	0.0	0.0	2.69	-0.00	0.00
3.0	44	0	0	7.3	0.0	0.0	2.83	-0.01	0.00
4.0	53	0	0	10.2	0.0	0.0	2.93	-0.01	-0.00
5.0	65	0	0	13.2	-0.0	0.0	3.01	-0.01	-0.01
6.0	79	0	0	16.2	-0.0	-0.0	3.08	-0.02	-0.01
7.0	97	0	0	19.3	-0.0	-0.0	3.14	-0.02	-0.00
8.0	118	0	0	22.5	-0.1	-0.0	3.20	-0.02	-0.00
9.0	142	0	0	25.7	-0.1	-0.0	3.27	-0.02	-0.00
10.0	169	0	0	29.0	-0.1	-0.0	3.34	-0.02	0.01
11.0	200	0	0	32.4	-0.1	0.0	3.42	-0.02	0.02
12.0	234	0	0	35.9	-0.1	0.0	3.50	-0.02	0.03
13.0	272	-0	0	39.4	-0.1	0.1	3.58	-0.01	0.05
14.0	313	-0	0	43.0	-0.2	0.1	3.67	-0.01	0.07
15.0	358	-0	1	46.7	-0.2	0.2	3.76	-0.01	0.10
16.0	406	-0	1	50.5	-0.2	0.3	3.85	-0.01	0.13
17.0	459	-0	2	54.4	-0.2	0.5	3.93	-0.00	0.17
18.0	515	-1	3	58.4	-0.2	0.7	4.02	0.00	0.22
19.0	576	-1	3	62.5	-0.2	0.9	4.10	0.01	0.27
20.0	640	-1	4	66.6	-0.2	1.2	4.18	0.02	0.32

TABLE x1  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
21.0	709	-1	5	70.8	-0.1	1.6	4.26	0.03	0.38
22.0	782	-1	7	75.1	-0.1	2.0	4.33	0.04	0.45
23.0	859	-1	9	79.5	-0.0	2.4	4.41	0.05	0.51
24.0	941	-1	12	84.0	0.0	3.0	4.49	0.07	0.59
25.0	1027	-1	15	88.5	0.1	3.6	4.57	0.08	0.66
26.0	1118	-1	20	93.1	0.2	4.3	4.65	0.09	0.74
27.0	1213	-1	24	97.8	0.3	5.1	4.74	0.09	0.82
28.0	1313	-1	30	102.6	0.4	6.0	4.83	0.10	0.91
29.0	1418	-1	37	107.5	0.4	6.9	4.92	0.09	1.00
30.0	1528	-0	44	112.4	0.5	8.0	5.03	0.07	1.09
31.0	1643	-0	53	117.5	0.6	9.1	5.12	0.03	1.22
32.0	1763	0	63	122.7	0.6	10.4	5.22	-0.01	1.36
33.0	1889	1	74	127.9	0.6	11.8	5.30	-0.04	1.51
34.0	2019	1	87	133.3	0.5	13.4	5.40	-0.05	1.65
35.0	2155	2	101	138.7	0.5	15.1	5.50	-0.02	1.76
36.0	2297	2	118	144.3	0.5	16.9	5.58	0.02	1.86
37.0	2444	3	136	149.9	0.5	18.9	5.67	0.04	1.97
38.0	2596	3	156	155.6	0.5	20.9	5.77	0.05	2.10
39.0	2755	4	178	161.4	0.6	23.1	5.85	0.04	2.25
40.0	2919	4	202	167.3	0.6	25.4	5.93	0.03	2.42
41.0	3090	5	229	173.3	0.7	27.9	6.02	0.03	2.59
42.0	3266	6	259	179.4	0.7	30.6	6.14	0.05	2.79
43.0	3448	6	291	185.6	0.8	33.5	6.24	0.08	3.00
44.0	3637	7	326	191.8	0.9	36.6	6.32	0.11	3.19
45.0	3832	8	365	198.2	1.0	39.9	6.41	0.13	3.39
46.0	4034	9	407	204.6	1.1	43.4	6.44	0.12	3.60
47.0	4242	10	452	211.1	1.2	47.1	6.51	0.09	3.81
48.0	4456	12	501	217.7	1.3	51.0	6.59	0.04	4.01
49.0	4677	13	555	224.3	1.3	55.1	6.68	0.01	4.22
50.0	4904	14	612	231.0	1.3	59.4	6.77	-0.01	4.43
51.0	5139	15	674	237.8	1.3	63.9	6.79	-0.01	4.67
52.0	5380	17	741	244.7	1.3	68.6	6.93	0.07	4.81
53.0	5628	18	812	251.6	1.3	73.6	6.95	0.02	5.10
54.0	5883	19	889	258.6	1.3	78.8	7.01	0.03	5.25
55.0	6146	21	970	265.6	1.4	84.1	6.98	0.07	5.45
56.0	6415	22	1058	272.7	1.5	89.7	7.10	0.14	5.75
57.0	6691	23	1150	279.7	1.6	95.5	6.98	0.15	5.94
58.0	6974	25	1249	286.7	1.7	101.5	6.92	0.15	6.09
59.0	7265	27	1354	293.5	1.7	107.7	6.83	0.09	6.38
59.760	7490	28	1438	298.6	1.8	112.6	6.73	0.07	6.49

MACH ONE

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
60.0	7562	29	1465	300.2	1.8	114.1	6.71	0.06	6.54
61.0	7865	30	1583	306.8	1.8	120.7	6.61	0.03	6.77
62.0	8176	32	1707	313.4	1.7	127.6	6.62	-0.02	6.98
63.0	8493	34	1839	320.2	1.8	134.5	6.73	0.21	7.08
64.0	8816	36	1977	327.0	2.1	141.6	6.86	0.35	7.28
65.0	9147	38	2122	334.0	2.4	149.1	6.92	0.24	7.62
66.0	9485	40	2275	341.0	2.6	156.8	6.98	0.31	7.89
67.0	9829	43	2436	348.0	2.9	164.8	7.07	0.35	8.12
68.0	10181	46	2606	355.2	3.2	173.0	7.17	0.38	8.36
69.0	10540	50	2783	362.5	3.6	181.5	7.24	0.45	8.72
70.0	10907	53	2969	369.8	4.0	190.4	7.29	0.46	9.12
71.0	11280	58	3164	377.1	4.5	199.7	7.39	0.49	9.50
71.500	11470	60	3265	380.8	4.7	204.5	7.46	0.47	9.68
72.0	11661	62	3369	384.6	4.9	209.4	7.52	0.45	9.81
73.0	12050	67	3583	392.2	5.3	219.3	7.67	0.30	10.05
74.0	12446	73	3808	399.9	5.5	229.4	7.82	0.08	10.21
75.0	12850	78	4043	407.8	5.5	239.7	7.98	-0.13	10.35
76.0	13262	84	4288	415.9	5.3	250.2	8.14	-0.31	10.69
77.0	13682	89	4544	424.1	4.8	261.0	8.24	-0.47	10.91
78.0	14110	93	4810	432.3	4.3	272.1	8.28	-0.54	11.29
79.0	14547	98	5088	440.6	3.8	283.6	8.33	-0.51	11.72
80.0	14992	101	5378	449.0	3.4	295.5	8.46	-0.36	12.11
81.0	15446	104	5680	457.6	3.2	307.7	8.64	-0.17	12.42
82.0	15908	108	5994	466.3	3.0	320.3	8.85	-0.03	12.62
83.0	16379	111	6321	475.2	3.0	332.9	9.03	0.03	12.76
84.0	16859	114	6660	484.3	3.1	345.7	9.10	0.02	12.82
85.0	17348	117	7013	493.4	3.1	358.7	9.15	0.00	13.02
86.0	17846	120	7378	502.6	3.1	371.9	9.23	-0.00	13.38
87.0	18354	123	7757	511.9	3.1	385.5	9.32	-0.02	13.82
88.0	18870	126	8149	521.3	3.0	399.5	9.42	-0.03	14.28
89.0	19397	129	8556	530.7	3.0	414.0	9.49	-0.05	14.67
90.0	19932	132	8978	540.3	2.9	428.8	9.55	-0.08	15.02
91.0	20477	135	9414	549.8	2.8	444.0	9.57	-0.12	15.38
92.0	21032	138	9866	559.4	2.7	459.6	9.58	-0.16	15.79
93.0	21597	140	10334	569.0	2.5	475.6	9.61	-0.17	16.21
94.0	22171	143	10818	578.6	2.4	492.0	9.69	-0.16	16.61
95.0	22754	145	11318	588.4	2.2	508.9	9.78	-0.13	17.02
96.0	23348	147	11836	598.2	2.1	526.0	9.85	-0.08	17.38
97.0	23951	149	12371	608.0	2.0	543.6	9.86	-0.06	17.72
98.0	24564	151	12923	617.9	2.0	561.5	9.89	-0.04	18.06

MAX Q

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XF 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
99.0	25187	153	13494	627.8	2.0	579.7	9.93	-0.02	18.40
100.0	25820	155	14083	637.8	1.9	598.3	10.00	-0.02	18.77
101.0	26463	157	14691	647.8	1.9	617.2	10.07	-0.03	19.13
102.0	27116	159	15318	657.9	1.9	636.5	10.15	-0.03	19.46
103.0	27779	161	15964	668.1	1.9	656.2	10.22	-0.02	19.79
104.0	28453	163	16630	678.4	1.9	676.2	10.29	-0.01	20.16
105.0	29136	165	17316	688.7	1.9	696.5	10.35	0.01	20.51
106.0	29830	167	18023	699.0	1.9	717.2	10.43	0.04	20.85
107.0	30535	168	18751	709.5	1.9	738.2	10.52	0.06	21.21
108.0	31250	170	19500	720.1	2.0	759.6	10.67	0.08	21.63
109.0	31975	172	20271	730.9	2.1	781.4	10.78	0.07	22.01
110.0	32712	175	21063	741.7	2.2	803.6	10.86	0.06	22.38
111.0	33459	177	21878	752.5	2.2	826.2	10.90	0.04	22.73
112.0	34217	179	22716	763.5	2.3	849.1	10.93	0.04	23.08
113.0	34986	181	23576	774.4	2.3	872.4	11.01	0.04	23.49
114.0	35766	184	24461	785.5	2.3	896.1	11.12	0.04	23.94
115.0	36558	186	25369	796.7	2.4	920.2	11.21	0.04	24.36
116.0	37360	188	26301	807.9	2.4	944.7	11.26	0.03	24.71
117.0	38174	191	27258	819.2	2.4	969.7	11.29	0.02	25.06
118.0	38999	193	28241	830.5	2.4	995.0	11.38	0.00	25.52
119.0	39835	196	29248	841.9	2.4	1020.8	11.46	-0.00	26.02
120.0	40683	198	30282	853.4	2.4	1047.0	11.54	-0.01	26.51
121.0	41543	201	31343	865.0	2.4	1073.7	11.58	-0.01	27.00
122.0	42414	203	32430	876.6	2.4	1101.0	11.61	-0.01	27.47
123.0	43297	205	33545	888.2	2.4	1128.7	11.61	-0.01	27.91
124.0	44191	208	34687	899.8	2.4	1156.8	11.61	-0.01	28.33
125.0	45097	210	35858	911.4	2.4	1185.4	11.62	-0.00	28.85
126.0	46014	213	37058	923.0	2.4	1214.5	11.63	0.01	29.44
127.0	46943	215	38287	934.7	2.4	1244.3	11.67	0.00	30.04
128.0	47884	217	39546	946.4	2.4	1274.6	11.70	0.00	30.67
129.0	48836	220	40836	958.1	2.4	1305.5	11.68	0.01	31.25
130.0	49800	222	42158	969.7	2.4	1337.1	11.60	0.00	31.80
131.0	50776	224	43510	981.2	2.4	1369.1	11.52	-0.01	32.40
132.0	51763	227	44895	992.7	2.4	1401.7	11.47	0.04	32.95
133.0	52761	229	46313	1004.1	2.4	1435.1	11.40	0.01	33.62
134.0	53771	231	47765	1015.4	2.4	1469.1	11.32	0.01	34.29
135.0	54792	233	49250	1026.8	2.4	1503.6	11.36	0.01	34.85
136.0	55825	236	50771	1038.3	2.4	1538.7	11.56	0.02	35.31
137.0	56869	238	52327	1050.1	2.4	1574.1	11.82	0.03	35.75
138.0	57925	240	53918	1062.3	2.4	1610.1	12.16	0.02	36.09
138.970	58961	243	55497	1073.8	2.4	1645.0	12.48	0.03	36.32

IECO

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S	DDXE M/S SQ	DCYE M/S SQ	DDZE M/S SQ
OEEO									
139.0	58993	243	55546	1074.2	2.4	1645.6	12.51	0.03	36.39
140.0	60071	245	57206	1079.1	2.5	1669.1	2.27	0.08	20.53
141.0	61151	248	58885	1081.0	2.6	1687.9	1.85	0.08	18.95
142.0	62233	250	60581	1081.9	2.6	1704.8	1.39	0.07	16.90
142.250	62504	251	61008	1082.0	2.6	1708.7	0.19	0.07	15.85
143.0	63315	253	62293	1077.5	2.7	1713.0	-5.53	0.06	6.68
S-IB/S-IVB SEPARATION SIGNAL									
143.500	63853	254	63150	1073.2	2.7	1713.5	-8.49	0.06	1.24
EBW FIRING (SEPARATION SIGNAL PLUS 0.07 SECONDS)									
143.570	63933	254	63262	1072.6	2.7	1713.6	-8.53	0.07	1.17
144.0	64393	255	63999	1068.6	2.7	1713.7	-8.67	0.07	0.50
145.0	65457	258	65712	1059.4	2.7	1713.9	-8.91	0.07	0.11
150.0	70649	272	74298	1020.8	2.8	1726.9	-6.27	-0.04	5.24
155.0	75679	284	83001	992.0	2.2	1755.5	-5.57	-0.14	6.08
GUIDANCE INITIATION									
159.470	80057	293	90907	967.4	1.7	1782.6	-5.49	-0.15	6.24
160.0	80569	294	91852	964.5	1.6	1785.8	-5.48	-0.13	6.23
165.0	85323	302	100858	936.9	1.6	1816.8	-5.60	0.12	6.38
170.0	89936	314	110023	907.7	3.3	1849.5	-5.95	0.34	6.62
175.0	94400	335	119353	878.3	5.0	1882.6	-5.79	0.38	6.67
180.0	98720	365	128850	849.4	7.0	1916.1	-5.79	0.38	6.71
185.0	102895	404	138515	820.7	8.9	1949.8	-5.73	0.39	6.81
190.0	106927	454	148350	792.0	10.9	1984.1	-5.73	0.42	6.89
195.0	110815	514	158357	763.3	13.0	2018.8	-5.76	0.41	7.01
200.0	114560	585	168539	734.4	15.4	2054.0	-5.79	0.53	7.08
205.0	118159	669	178898	705.2	18.3	2089.8	-5.87	0.65	7.23
210.0	121612	769	189438	675.8	21.8	2126.1	-5.91	0.70	7.29
215.0	124917	886	200160	646.2	25.3	2162.7	-5.91	0.71	7.37
220.0	128074	1022	211066	616.6	28.8	2199.8	-5.94	0.71	7.45
225.0	131083	1175	222158	587.0	32.5	2237.3	-5.89	0.74	7.56
230.0	133944	1346	233440	557.6	36.2	2275.3	-5.89	0.73	7.65

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
235.0	136658	1536	244912	528.1	39.9	2313.8	-5.89	0.77	7.76
240.0	139225	1745	256578	498.5	43.7	2352.7	-5.91	0.77	7.83
245.0	141643	1974	268440	468.9	47.6	2392.0	-5.94	0.77	7.90
250.0	143914	2221	280499	439.2	51.4	2431.9	-5.92	0.77	8.03
255.0	146036	2488	292759	409.6	55.4	2471.9	-5.90	0.80	8.04
260.0	148010	2775	305220	380.2	59.4	2512.7	-5.90	0.80	8.22
265.0	149837	3082	317886	350.7	63.4	2554.0	-5.88	0.82	8.30
270.0	151518	3410	330761	321.3	67.6	2595.7	-5.91	0.83	8.42
275.0	153050	3758	343845	291.7	71.8	2638.2	-5.92	0.85	8.53
280.0	154435	4127	357143	262.1	76.0	2681.0	-5.95	0.86	8.61
285.0	155671	4518	370656	232.3	80.4	2724.4	-5.95	0.87	8.73
290.0	156758	4931	384387	202.6	84.3	2768.2	-5.91	0.63	8.83
295.0	157697	5359	398339	173.2	87.1	2812.5	-5.88	0.63	8.90
300.0	158490	5804	412513	143.7	91.1	2857.5	-5.94	0.94	9.05
305.0	159134	6272	426914	113.9	96.1	2903.1	-5.96	1.00	9.18
310.0	159629	6764	441545	84.2	100.8	2949.3	-5.94	0.91	9.34
315.0	159976	7279	456409	54.4	105.4	2996.2	-5.96	0.96	9.43
320.0	160173	7819	471509	24.5	110.4	3043.9	-6.02	1.00	9.58
325.0	160220	8383	486848	-5.7	115.4	3092.1	-6.03	1.00	9.72
330.0	160116	8973	502431	-35.9	120.4	3141.0	-6.06	1.02	9.83
335.0	159861	9587	518259	-66.2	125.6	3190.3	-6.06	1.03	9.94
340.0	159454	10228	534335	-96.5	130.8	3240.5	-6.06	1.05	10.11
345.0	158896	10895	550665	-126.8	136.1	3291.3	-6.06	1.08	10.24
350.0	158186	11589	567250	-157.2	141.4	3342.9	-6.07	1.07	10.37
355.0	157324	12310	584094	-187.6	146.8	3395.1	-6.10	1.08	10.53
360.0	156310	13057	601202	-218.2	152.3	3448.1	-6.13	1.12	10.70
365.0	155142	13833	618577	-248.8	157.9	3502.0	-6.13	1.13	10.94
370.0	153821	14636	636224	-279.6	163.6	3556.9	-6.22	1.10	11.04
375.0	152345	15468	654147	-310.7	169.3	3612.7	-6.18	1.21	11.26
380.0	150714	16330	672352	-341.9	175.2	3669.4	-6.27	1.18	11.45
385.0	148926	17220	690843	-373.4	181.2	3727.0	-6.31	1.21	11.61
390.0	146980	18141	709623	-405.1	187.2	3785.4	-6.35	1.22	11.75
395.0	144875	19093	728698	-436.9	193.3	3844.6	-6.38	1.24	11.94
400.0	142611	20075	748071	-468.8	199.6	3904.8	-6.38	1.25	12.13
405.0	140187	21089	767748	-500.9	205.9	3966.1	-6.44	1.27	12.37
410.0	137602	22134	787733	-533.1	212.3	4028.3	-6.44	1.29	12.53
415.0	134855	23212	808032	-565.5	218.8	4091.5	-6.49	1.30	12.77
420.0	131946	24322	828650	-598.1	225.4	4155.8	-6.55	1.35	12.98
425.0	128874	25466	849592	-630.9	232.2	4221.2	-6.57	1.36	13.20
430.0	125637	26644	870864	-664.0	239.0	4287.9	-6.65	1.38	13.48
435.0	122233	27857	892473	-697.4	246.0	4356.0	-6.68	1.42	13.74
440.0	118662	29104	914426	-731.0	253.1	4425.4	-6.75	1.44	14.02
445.0	114923	30388	936730	-765.0	260.3	4496.4	-6.84	1.44	14.32
450.0	111013	31708	959391	-799.2	267.5	4568.2	-6.90	1.45	14.53

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
455.0	106930	33064	982415	-833.8	274.9	4641.7	-6.94	1.51	14.84
460.0	102674	34457	1005810	-868.8	282.6	4716.7	-7.02	1.54	15.14
465.0	98242	35889	1029584	-904.0	290.3	4793.1	-7.10	1.57	15.43
470.0	93633	37361	1053743	-939.7	298.3	4870.8	-7.19	1.61	15.70
475.0	88844	38872	1078294	-975.8	306.4	4950.3	-7.24	1.63	16.07
480.0	83874	40425	1103248	-1012.2	314.5	5031.4	-7.35	1.65	16.40
485.0	78720	42018	1128611	-1050.0	323.0	5114.3	-7.82	1.73	16.79
490.0	73370	43655	1154395	-1090.3	331.7	5199.4	-8.19	1.73	17.11
495.0	67816	45335	1180606	-1131.7	340.4	5285.4	-8.42	1.75	17.27
500.0	62051	47059	1207248	-1174.2	349.2	5371.0	-8.60	1.77	17.11
505.0	56072	48827	1234317	-1217.7	358.1	5456.6	-8.77	1.79	16.89
510.0	49873	50640	1261810	-1261.9	367.3	5540.6	-8.86	1.91	16.72
515.0	43453	52500	1289720	-1306.1	376.7	5623.2	-8.81	1.82	16.53
520.0	36813	54406	1318044	-1350.0	385.7	5706.7	-8.74	1.79	16.70
525.0	29955	56356	1346786	-1393.3	394.3	5790.0	-8.59	1.67	16.68
530.0	22881	58349	1375946	-1435.9	402.7	5874.1	-8.42	1.69	16.95
535.0	15599	60383	1405529	-1476.9	411.2	5959.5	-7.99	1.71	17.20
540.0	8117	62460	1435542	-1515.3	419.7	6046.3	-7.40	1.71	17.55
545.0	449	64580	1465995	-1551.9	428.3	6135.2	-7.35	1.74	17.93
550.0	-7405	66744	1496896	-1590.8	437.1	6225.8	-8.39	1.81	18.39
555.0	-15468	68952	1528257	-1635.0	446.4	6318.9	-9.15	1.89	18.82
560.0	-23758	71208	1560088	-1681.4	456.1	6414.1	-9.36	1.99	19.27
565.0	-32283	73514	1592401	-1728.3	466.1	6511.6	-9.36	1.99	19.73
570.0	-41042	75869	1625207	-1776.0	476.0	6611.4	-9.81	1.99	20.17
575.0	-50048	78274	1658519	-1826.9	486.3	6713.8	-10.58	2.14	20.73
580.0	-59316	80733	1692349	-1880.3	497.4	6818.8	-10.61	2.29	21.35
585.0	-68851	83249	1726712	-1933.7	508.8	6926.9	-10.91	2.23	21.94
590.0	-78656	85820	1761621	-1988.4	519.9	7038.0	-10.87	2.26	22.55
593.340	-85356	87570	1785253	-2023.6	527.7	7114.0	-10.23	2.42	22.88
595.0	-88727	88447	1797069	-2037.6	528.9	7117.4	-8.05	0.46	-2.09
600.0	-99016	91098	1832629	-2078.0	531.2	7106.0	-8.05	0.45	-2.39
603.340	-106001	92874	1856349	-2104.8	532.7	7098.1	-8.04	0.45	-2.42
605.0	-109506	93766	1868129	-2118.1	533.5	7094.0	-8.03	0.45	-2.44
610.0	-120197	96439	1903568	-2158.3	535.7	7081.8	-8.04	0.45	-2.43
620.0	-142181	101819	1974263	-2238.5	540.2	7057.0	-8.01	0.44	-2.53
630.0	-164966	107242	2044705	-2318.4	544.5	7031.2	-7.98	0.44	-2.62

S-IVB GUIDANCE CUTOFF

ORBIT INSERTION



TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
640.0	-188549	112709	2114884	-2398.0	548.9	7004.4	-7.93	0.43	-2.75
650.0	-212925	118219	2184789	-2477.2	553.1	6976.5	-7.90	0.42	-2.84
660.0	-238091	123771	2254410	-2556.0	557.3	6947.6	-7.87	0.41	-2.93
670.0	-264044	129364	2323737	-2634.5	561.4	6917.8	-7.83	0.41	-3.02
680.0	-290781	134998	2392763	-2712.7	565.4	6887.1	-7.80	0.40	-3.11
690.0	-318297	140672	2461477	-2790.5	569.3	6855.5	-7.76	0.39	-3.20
700.0	-346590	146384	2529871	-2868.0	573.2	6823.1	-7.73	0.38	-3.29
710.0	-375656	152135	2597936	-2945.1	577.0	6789.8	-7.69	0.38	-3.38
720.0	-405491	157924	2665663	-3021.8	580.7	6755.6	-7.65	0.37	-3.46
730.0	-436090	163750	2733044	-3098.1	584.4	6720.5	-7.61	0.36	-3.55
740.0	-467452	169612	2800071	-3174.0	588.0	6684.6	-7.57	0.35	-3.64
750.0	-499570	175509	2866733	-3249.5	591.5	6647.8	-7.53	0.35	-3.72
760.0	-532441	181441	2933024	-3324.6	594.9	6610.2	-7.49	0.34	-3.81
770.0	-566061	187407	2998934	-3399.3	598.2	6571.7	-7.44	0.33	-3.89
780.0	-600425	193406	3064455	-3473.5	601.5	6532.4	-7.40	0.32	-3.98
790.0	-635529	199437	3129578	-3547.3	604.7	6492.2	-7.35	0.31	-4.06
800.0	-671369	205499	3194296	-3620.6	607.7	6451.2	-7.31	0.30	-4.14
810.0	-707939	211591	3258599	-3693.4	610.7	6409.3	-7.26	0.30	-4.22
820.0	-745236	217713	3322480	-3765.8	613.6	6366.7	-7.21	0.29	-4.31
830.0	-783253	223864	3385930	-3837.6	616.5	6323.2	-7.16	0.28	-4.39
840.0	-821987	230042	3448942	-3909.0	619.2	6278.9	-7.11	0.27	-4.47
850.0	-861432	236248	3511506	-3979.9	621.8	6233.9	-7.06	0.26	-4.55
860.0	-901583	242479	3573616	-4050.3	624.4	6188.0	-7.01	0.25	-4.63
870.0	-942435	248735	3635263	-4120.1	626.8	6141.3	-6.96	0.24	-4.71
880.0	-983983	255015	3696439	-4189.4	629.2	6093.8	-6.90	0.23	-4.79
890.0	-1026221	261319	3757137	-4258.1	631.5	6045.6	-6.85	0.22	-4.86
900.0	-1069144	267644	3817348	-4326.3	633.6	5996.6	-6.79	0.21	-4.94
910.0	-1112746	273991	3877066	-4394.0	635.7	5946.8	-6.74	0.20	-5.02
920.0	-1157022	280358	3936281	-4461.1	637.7	5896.2	-6.68	0.19	-5.09
930.0	-1201966	286744	3994988	-4527.6	639.5	5844.9	-6.62	0.18	-5.17
940.0	-1247572	293148	4053177	-4593.5	641.3	5792.9	-6.56	0.17	-5.24
950.0	-1293834	299569	4110843	-4658.8	643.0	5740.1	-6.50	0.16	-5.32
960.0	-1340746	306007	4167977	-4723.5	644.5	5686.6	-6.44	0.15	-5.39
970.0	-1388397	312460	4224572	-4787.6	646.0	5632.3	-6.38	0.14	-5.46
980.0	-1436492	318926	4280621	-4851.1	647.3	5577.4	-6.32	0.13	-5.53
990.0	-1485323	325406	4336117	-4914.0	648.6	5521.7	-6.25	0.12	-5.60
1000.0	-1534775	331897	4391052	-4976.2	649.7	5465.3	-6.19	0.11	-5.67
1010.0	-1584846	338400	4445420	-5037.8	650.7	5408.2	-6.13	0.10	-5.74
1020.0	-1635529	344912	4499214	-5098.8	651.7	5350.5	-6.06	0.09	-5.81
1030.0	-1686819	351433	4552427	-5159.0	652.5	5292.0	-6.00	0.08	-5.88
1040.0	-1738708	357961	4605052	-5218.6	653.2	5232.9	-5.93	0.06	-5.95
1050.0	-1791189	364496	4657083	-5277.6	653.8	5173.1	-5.86	0.05	-6.01
1060.0	-1844257	371036	4708512	-5335.8	654.2	5112.7	-5.79	0.04	-6.08
1070.0	-1897904	377581	4759334	-5393.4	654.6	5051.6	-5.72	0.03	-6.14

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
1080.0	-1952123	384128	4809541	-5450.3	654.9	4989.8	-5.65	0.02	-6.21
1090.0	-2006907	390677	4859128	-5506.4	655.0	4927.5	-5.58	0.01	-6.27
1100.0	-2062249	397228	4908088	-5561.9	655.0	4864.5	-5.51	-0.00	-6.33
1110.0	-2118143	403777	4956416	-5616.6	654.9	4800.9	-5.44	-0.02	-6.39
1120.0	-2174580	410325	5004103	-5670.7	654.7	4736.6	-5.37	-0.03	-6.45
1130.0	-2231553	416871	5051146	-5723.9	654.4	4671.8	-5.29	-0.04	-6.51
1140.0	-2289056	423412	5097538	-5776.5	653.9	4606.4	-5.22	-0.05	-6.57
1150.0	-2347081	429949	5143272	-5828.3	653.4	4540.4	-5.14	-0.06	-6.63
1160.0	-2405619	436479	5188344	-5879.3	652.7	4473.8	-5.07	-0.07	-6.69
1170.0	-2464665	443002	5232747	-5929.6	651.9	4406.7	-4.99	-0.09	-6.74
1180.0	-2524210	449516	5276477	-5979.2	650.9	4339.0	-4.91	-0.10	-6.80
1190.0	-2584246	456020	5319526	-6027.9	649.9	4270.8	-4.84	-0.11	-6.85
1200.0	-2644765	462513	5361891	-6075.9	648.7	4202.0	-4.76	-0.12	-6.90
1210.0	-2705761	468993	5403565	-6123.1	647.4	4132.7	-4.68	-0.14	-6.96
1220.0	-2767225	475460	5444543	-6169.5	646.0	4062.9	-4.60	-0.15	-7.01
1230.0	-2829149	481939	5484821	-6215.1	644.4	3992.6	-4.52	-0.16	-7.06
1240.0	-2891525	488349	5524393	-6259.9	642.8	3921.7	-4.44	-0.17	-7.11
1250.0	-2954345	494768	5563254	-6304.0	641.0	3850.4	-4.36	-0.19	-7.16
1260.0	-3017601	501168	5601399	-6347.2	639.1	3778.6	-4.28	-0.20	-7.20
1270.0	-3081285	507549	5638824	-6389.5	637.0	3706.3	-4.20	-0.21	-7.25
1280.0	-3145389	513908	5675524	-6431.1	634.9	3633.6	-4.11	-0.22	-7.30
1290.0	-3209905	520246	5711494	-6471.8	632.6	3560.4	-4.03	-0.24	-7.34
1300.0	-3274823	526560	5746730	-6511.7	630.2	3486.7	-3.95	-0.25	-7.39
1310.0	-3340137	532849	5781227	-6550.8	627.6	3412.6	-3.86	-0.26	-7.43
1320.0	-3405837	539111	5814981	-6589.0	624.9	3338.1	-3.78	-0.27	-7.47
1330.0	-3471915	545347	5847988	-6626.4	622.1	3263.2	-3.70	-0.29	-7.51
1340.0	-3538362	551554	5880244	-6662.9	619.2	3187.9	-3.61	-0.30	-7.55
1350.0	-3605171	557731	5911745	-6698.6	616.2	3112.2	-3.52	-0.31	-7.59
1360.0	-3672331	563877	5942487	-6733.4	613.0	3036.1	-3.44	-0.32	-7.63
1370.0	-3739836	569990	5972465	-6767.4	609.7	2959.6	-3.35	-0.34	-7.67
1380.0	-3807676	576070	6001677	-6800.5	606.2	2882.8	-3.26	-0.35	-7.70
1390.0	-3875842	582115	6030119	-6832.7	602.7	2805.6	-3.18	-0.36	-7.74
1400.0	-3944327	588123	6057788	-6864.0	599.0	2728.0	-3.09	-0.38	-7.77
1410.0	-4013120	594094	6084679	-6894.5	595.2	2650.1	-3.00	-0.39	-7.80
1420.0	-4082213	600027	6110789	-6924.0	591.2	2571.9	-2.91	-0.40	-7.84
1430.0	-4151597	605919	6136116	-6952.7	587.2	2493.4	-2.82	-0.41	-7.87
1440.0	-4221264	611769	6160657	-6980.5	582.9	2414.6	-2.73	-0.43	-7.90
1450.0	-4291204	617577	6184407	-7007.4	578.6	2335.5	-2.64	-0.44	-7.93
1460.0	-4361408	623341	6207365	-7033.4	574.2	2256.1	-2.56	-0.45	-7.95
1470.0	-4431869	629060	6229528	-7058.5	569.6	2176.4	-2.46	-0.47	-7.98
1480.0	-4502575	634732	6250893	-7082.7	564.9	2096.5	-2.37	-0.48	-8.01
1490.0	-4573519	640357	6271457	-7106.0	560.0	2016.3	-2.28	-0.49	-8.03
1500.0	-4644692	645932	6291218	-7128.4	555.0	1935.9	-2.19	-0.50	-8.05
1510.0	-4716083	651457	6310173	-7149.8	549.9	1855.2	-2.10	-0.52	-8.08

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
1520.0	-4787685	656930	6328321	-7170.4	544.7	1774.3	-2.01	-0.53	-8.10
1530.0	-4859488	662351	6345659	-7190.0	539.4	1693.2	-1.92	-0.54	-8.12
1540.0	-4931482	667717	6362185	-7208.7	533.9	1612.0	-1.83	-0.55	-8.14
1550.0	-5003660	673028	6377898	-7226.5	528.3	1530.5	-1.73	-0.57	-8.16
1560.0	-5076010	678283	6392794	-7243.4	522.6	1448.8	-1.64	-0.58	-8.17
1570.0	-5148525	683479	6406873	-7259.4	516.7	1367.0	-1.55	-0.59	-8.19
1580.0	-5221195	688616	6420133	-7274.4	510.7	1285.0	-1.46	-0.60	-8.21
1590.0	-5294010	693693	6432573	-7288.5	504.6	1202.9	-1.36	-0.62	-8.22
1600.0	-5366961	698708	6444191	-7301.7	498.4	1120.6	-1.27	-0.63	-8.23
1610.0	-5440040	703660	6454985	-7313.9	492.0	1038.2	-1.18	-0.64	-8.24
1620.0	-5513237	708548	6464955	-7325.2	485.5	955.7	-1.08	-0.65	-8.26
1630.0	-5586541	713370	6474100	-7335.6	478.9	873.1	-0.99	-0.67	-8.27
1640.0	-5659945	718126	6482418	-7345.0	472.2	790.4	-0.90	-0.68	-8.27
1650.0	-5733439	722814	6489908	-7353.5	465.4	707.7	-0.80	-0.69	-8.28
1660.0	-5807013	727433	6496571	-7361.1	458.4	624.8	-0.71	-0.70	-8.29
1670.0	-5880658	731981	6502404	-7367.7	451.3	541.9	-0.62	-0.72	-8.29
1680.0	-5954364	736458	6507408	-7373.4	444.1	458.9	-0.52	-0.73	-8.30
1690.0	-6028123	740863	6511583	-7378.2	436.8	375.9	-0.43	-0.74	-8.30
1700.0	-6101925	745193	6514927	-7382.0	429.3	292.9	-0.33	-0.75	-8.30
1710.0	-6175760	749448	6517441	-7384.9	421.7	209.9	-0.24	-0.76	-8.31
1720.0	-6249619	753627	6519124	-7386.8	414.1	126.8	-0.15	-0.77	-8.31
1730.0	-6323493	757729	6519977	-7387.8	406.2	43.8	-0.05	-0.79	-8.30
1740.0	-6397373	761752	6520000	-7387.9	398.3	-39.3	0.04	-0.80	-8.30
1750.0	-6471248	765695	6519192	-7387.0	390.3	-122.3	0.13	-0.81	-8.30
1760.0	-6545110	769557	6517554	-7385.2	382.1	-205.3	0.23	-0.82	-8.30
1770.0	-6618949	773338	6515087	-7382.5	373.9	-288.2	0.32	-0.83	-8.29
1780.0	-6692757	777035	6511791	-7378.8	365.5	-371.1	0.41	-0.84	-8.28
1790.0	-6766522	780647	6507666	-7374.2	357.0	-453.9	0.51	-0.85	-8.28
1800.0	-6840237	784174	6502714	-7368.6	348.4	-536.6	0.60	-0.87	-8.27
1810.0	-6913892	787615	6496935	-7362.1	339.7	-619.2	0.69	-0.88	-8.26
1820.0	-6987477	790968	6490330	-7354.7	330.9	-701.7	0.79	-0.89	-8.25
1830.0	-7060983	794232	6482900	-7346.4	321.9	-784.2	0.88	-0.90	-8.24
1840.0	-7134401	797407	6474647	-7337.1	312.9	-866.5	0.97	-0.91	-8.22
1850.0	-7207722	800490	6465571	-7326.9	303.8	-948.6	1.07	-0.92	-8.21
1860.0	-7280937	803481	6455674	-7315.8	294.5	-1030.7	1.16	-0.93	-8.20
1870.0	-7354035	806380	6444958	-7303.7	285.2	-1112.6	1.25	-0.94	-8.18
1880.0	-7427008	809184	6433424	-7290.8	275.7	-1194.3	1.34	-0.95	-8.16
1890.0	-7499847	811894	6421073	-7276.9	266.1	-1275.8	1.44	-0.96	-8.15
1900.0	-7572542	814507	6407908	-7262.0	256.5	-1357.2	1.53	-0.97	-8.13
1910.0	-7645084	817023	6393930	-7246.3	246.7	-1438.3	1.62	-0.98	-8.11
1920.0	-7717465	819441	6379142	-7229.7	236.9	-1519.3	1.71	-0.99	-8.09
1930.0	-7789675	821760	6363545	-7212.1	226.9	-1600.0	1.80	-1.00	-8.06
1940.0	-7861704	823979	6347141	-7193.6	216.8	-1680.6	1.89	-1.01	-8.04
1950.0	-7933544	826096	6329934	-7174.3	206.7	-1760.9	1.98	-1.02	-8.02

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
1960.0	-8005187	828112	6311925	-7154.0	196.5	-1840.9	2.07	-1.03	-7.99
1970.0	-8076621	830025	6293117	-7132.8	186.1	-1920.7	2.16	-1.04	-7.97
1980.0	-8147840	831834	6273512	-7110.7	175.7	-2000.2	2.25	-1.05	-7.94
1990.0	-8218833	833539	6253114	-7087.8	165.2	-2079.5	2.34	-1.06	-7.91
2000.0	-8289592	835137	6231924	-7063.9	154.6	-2158.4	2.43	-1.07	-7.88
2010.0	-8360109	836630	6209946	-7039.2	143.9	-2237.1	2.52	-1.07	-7.85
2020.0	-8430373	838014	6187184	-7013.5	133.1	-2315.4	2.61	-1.08	-7.82
2030.0	-8500376	839291	6163639	-6987.0	122.2	-2393.5	2.70	-1.09	-7.79
2040.0	-8570110	840458	6139315	-6959.6	111.3	-2471.2	2.78	-1.10	-7.76
2050.0	-8639566	841516	6114216	-6931.4	100.2	-2548.6	2.87	-1.11	-7.72
2060.0	-8708735	842463	6088345	-6902.2	89.1	-2625.6	2.96	-1.12	-7.69
2070.0	-8777608	843298	6061705	-6872.2	77.9	-2702.3	3.04	-1.12	-7.65
2080.0	-8846177	844021	6034300	-6841.4	66.7	-2778.6	3.13	-1.13	-7.61
2090.0	-8914433	844631	6006134	-6809.7	55.3	-2854.6	3.21	-1.14	-7.58
2100.0	-8982367	845127	5977210	-6777.1	43.9	-2930.1	3.30	-1.15	-7.54
2110.0	-9049972	845509	5947532	-6743.7	32.4	-3005.3	3.38	-1.15	-7.50
2120.0	-9117238	845775	5917105	-6709.4	20.8	-3080.1	3.47	-1.16	-7.46
2130.0	-9184158	845926	5885932	-6674.3	9.2	-3154.4	3.55	-1.17	-7.42
2140.0	-9250722	845959	5854017	-6638.4	-2.5	-3228.4	3.64	-1.17	-7.37
2150.0	-9316922	845875	5821366	-6601.6	-14.3	-3301.9	3.72	-1.18	-7.33
2160.0	-9382751	845674	5787981	-6564.0	-26.1	-3375.0	3.80	-1.19	-7.28
2170.0	-9448200	845353	5753868	-6525.6	-38.0	-3447.6	3.88	-1.19	-7.24
2180.0	-9513261	844913	5719031	-6486.4	-50.0	-3519.7	3.96	-1.20	-7.19
2190.0	-9577925	844354	5683475	-6446.4	-62.0	-3591.4	4.04	-1.20	-7.15
2200.0	-9642185	843674	5647204	-6405.5	-74.1	-3662.7	4.12	-1.21	-7.10
2210.0	-9706033	842873	5610223	-6363.9	-86.2	-3733.4	4.20	-1.22	-7.05
2220.0	-9769460	841950	5572537	-6321.4	-98.4	-3803.7	4.28	-1.22	-7.00
2230.0	-9832459	840905	5534152	-6278.2	-110.6	-3873.4	4.36	-1.23	-6.95
2240.0	-9895022	839737	5495071	-6234.2	-122.9	-3942.6	4.44	-1.23	-6.90
2250.0	-9957141	838446	5455301	-6189.5	-135.3	-4011.4	4.52	-1.24	-6.85
2260.0	-10018809	837032	5414846	-6143.9	-147.7	-4079.5	4.59	-1.24	-6.79
2270.0	-10080017	835493	5373711	-6097.6	-160.1	-4147.2	4.67	-1.25	-6.74
2280.0	-10140758	833830	5331903	-6050.5	-172.6	-4214.3	4.74	-1.25	-6.68
2290.0	-10201025	832041	5289427	-6002.7	-185.1	-4280.9	4.82	-1.25	-6.63
2300.0	-10260810	830128	5246288	-5954.1	-197.7	-4346.9	4.89	-1.26	-6.57
2310.0	-10320106	828088	5202491	-5904.8	-210.3	-4412.3	4.97	-1.26	-6.51
2320.0	-10378905	825922	5158043	-5854.8	-222.9	-4477.2	5.04	-1.27	-6.46
2330.0	-10437199	823630	5112950	-5804.0	-235.6	-4541.4	5.11	-1.27	-6.40
2340.0	-10494983	821210	5067216	-5752.6	-248.3	-4605.1	5.18	-1.27	-6.34
2350.0	-10552248	818664	5020849	-5700.4	-261.0	-4668.2	5.26	-1.28	-6.28
2360.0	-10608988	815989	4973854	-5647.5	-273.8	-4730.7	5.33	-1.28	-6.22
2370.0	-10665195	813187	4926237	-5593.9	-286.6	-4792.5	5.40	-1.28	-6.15
2380.0	-10720863	810257	4878005	-5539.6	-299.4	-4853.8	5.46	-1.28	-6.09
2390.0	-10775984	807198	4829164	-5484.6	-312.3	-4914.4	5.53	-1.29	-6.03

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
2400.0	-10830552	804011	4779720	-5428.9	-325.2	-4974.4	5.60	-1.29	-5.96
2410.0	-10884560	800695	4729679	-5372.6	-338.0	-5033.7	5.67	-1.29	-5.90
2420.0	-10938002	797250	4679048	-5315.6	-350.9	-5092.4	5.73	-1.29	-5.83
2430.0	-10990870	793676	4627834	-5257.9	-363.9	-5150.4	5.80	-1.29	-5.77
2440.0	-11043159	789973	4576043	-5199.6	-376.8	-5207.7	5.86	-1.29	-5.70
2450.0	-11094861	786140	4523682	-5140.7	-389.8	-5264.4	5.93	-1.30	-5.63
2460.0	-11145970	782178	4470757	-5081.1	-402.7	-5320.4	5.99	-1.30	-5.57
2470.0	-11196481	778086	4417276	-5020.9	-415.7	-5375.7	6.05	-1.30	-5.50
2480.0	-11246387	773864	4363246	-4960.1	-428.6	-5430.3	6.11	-1.30	-5.43
2490.0	-11295681	769513	4308672	-4898.7	-441.6	-5484.2	6.17	-1.30	-5.36
2500.0	-11344358	765032	4253564	-4836.6	-454.6	-5537.4	6.23	-1.30	-5.29
2510.0	-11392412	760421	4197926	-4774.0	-467.6	-5589.9	6.29	-1.30	-5.21
2520.0	-11439836	755681	4141767	-4710.8	-480.5	-5641.7	6.35	-1.30	-5.14
2530.0	-11486625	750810	4085094	-4647.0	-493.5	-5692.8	6.41	-1.30	-5.07
2540.0	-11532774	745811	4027914	-4582.6	-506.5	-5743.1	6.47	-1.30	-5.00
2550.0	-11578276	740681	3970235	-4517.7	-519.4	-5792.7	6.52	-1.29	-4.92
2560.0	-11623125	735422	3912063	-4452.2	-532.4	-5841.5	6.58	-1.29	-4.85
2570.0	-11667317	730034	3853407	-4386.1	-545.3	-5889.6	6.63	-1.29	-4.77
2580.0	-11710846	724516	3794274	-4319.6	-558.2	-5936.9	6.68	-1.29	-4.70
2590.0	-11753707	718870	3734671	-4252.5	-571.1	-5983.5	6.74	-1.29	-4.62
2600.0	-11795894	713094	3674606	-4184.8	-584.0	-6029.3	6.79	-1.29	-4.54
2610.0	-11837402	707190	3614087	-4116.7	-596.8	-6074.4	6.84	-1.28	-4.47
2620.0	-11878226	701158	3553121	-4048.0	-609.7	-6118.6	6.89	-1.28	-4.39
2630.0	-11918361	694997	3491717	-3978.9	-622.5	-6162.1	6.94	-1.28	-4.31
2640.0	-11957803	688709	3429882	-3909.3	-635.3	-6204.8	6.99	-1.28	-4.23
2650.0	-11996545	682292	3367624	-3839.2	-648.0	-6246.7	7.03	-1.27	-4.15
2660.0	-12034584	675749	3304950	-3768.6	-660.7	-6287.8	7.08	-1.27	-4.07
2670.0	-12071916	669078	3241870	-3697.6	-673.4	-6328.1	7.13	-1.27	-4.00
2680.0	-12108534	662281	3178391	-3626.1	-686.0	-6367.6	7.17	-1.26	-3.91
2690.0	-12144435	655357	3114520	-3554.1	-698.7	-6406.3	7.22	-1.26	-3.83
2700.0	-12179615	648308	3050267	-3481.8	-711.2	-6444.2	7.26	-1.25	-3.75
2710.0	-12214069	641133	2985640	-3409.0	-723.7	-6481.2	7.30	-1.25	-3.66
2720.0	-12247793	633833	2920646	-3335.8	-736.2	-6517.4	7.34	-1.25	-3.58
2730.0	-12280783	626409	2855294	-3262.2	-748.7	-6552.8	7.38	-1.24	-3.50
2740.0	-12313035	618860	2789592	-3188.1	-761.0	-6587.4	7.42	-1.24	-3.41
2750.0	-12344545	611188	2723549	-3113.7	-773.4	-6621.1	7.46	-1.23	-3.33
2760.0	-12375309	603393	2657172	-3039.0	-785.7	-6654.0	7.50	-1.23	-3.25
2770.0	-12405323	595475	2590471	-2963.8	-797.9	-6686.1	7.53	-1.22	-3.16
2780.0	-12434584	587436	2523454	-2888.3	-810.0	-6717.2	7.57	-1.21	-3.08
2790.0	-12463088	579274	2456129	-2812.4	-822.1	-6747.6	7.60	-1.21	-2.99
2800.0	-12490831	570993	2388505	-2736.2	-834.2	-6777.1	7.64	-1.20	-2.91
2810.0	-12517811	562591	2320590	-2659.7	-846.2	-6805.7	7.67	-1.19	-2.82
2820.0	-12544024	554069	2252394	-2582.8	-858.1	-6833.5	7.70	-1.19	-2.73
2830.0	-12569467	545429	2183924	-2505.7	-869.9	-6860.4	7.73	-1.18	-2.65

TABLE XI  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
2840.0	-12594136	536671	2115190	-2428.2	-881.7	-6886.4	7.76	-1.17	-2.56
2850.0	-12618029	527795	2046199	-2350.4	-893.4	-6911.6	7.79	-1.17	-2.47
2860.0	-12641144	518803	1976961	-2272.4	-905.0	-6935.8	7.82	-1.16	-2.38
2870.0	-12663476	509695	1907485	-2194.0	-916.6	-6959.2	7.85	-1.15	-2.30
2880.0	-12685023	500471	1837779	-2115.4	-928.1	-6981.8	7.87	-1.14	-2.21
2890.0	-12705783	491134	1767853	-2036.6	-939.5	-7003.4	7.90	-1.14	-2.12
2900.0	-12725754	481682	1697714	-1957.5	-950.8	-7024.2	7.92	-1.13	-2.03
2910.0	-12744932	472118	1627372	-1878.1	-962.0	-7044.1	7.95	-1.12	-1.94
2920.0	-12763315	462443	1556836	-1798.6	-973.1	-7063.0	7.97	-1.11	-1.85
2930.0	-12780902	452656	1486114	-1718.8	-984.2	-7081.1	7.99	-1.10	-1.76
2940.0	-12797691	442759	1415216	-1638.8	-995.1	-7098.3	8.01	-1.09	-1.68
2950.0	-12813678	432754	1344150	-1558.6	-1006.0	-7114.7	8.03	-1.08	-1.59
2960.0	-12828862	422640	1272926	-1478.2	-1016.8	-7130.1	8.05	-1.07	-1.50
2970.0	-12843242	412419	1201552	-1397.7	-1027.4	-7144.6	8.06	-1.06	-1.41
2980.0	-12856815	402091	1130037	-1317.0	-1038.0	-7158.2	8.08	-1.05	-1.32
2990.0	-12869581	391659	1058391	-1236.1	-1048.5	-7170.9	8.10	-1.04	-1.23
3000.0	-12881537	381122	986622	-1155.1	-1058.8	-7182.7	8.11	-1.03	-1.14
3010.0	-12892682	370483	914740	-1073.9	-1069.1	-7193.6	8.12	-1.02	-1.05
3020.0	-12903015	359741	842753	-992.6	-1079.3	-7203.6	8.14	-1.01	-0.95
3030.0	-12912534	348898	770671	-911.2	-1089.3	-7212.7	8.15	-1.00	-0.86
3040.0	-12921239	337955	698502	-829.7	-1099.2	-7220.9	8.16	-0.99	-0.77
3050.0	-12929128	326914	626256	-748.1	-1109.0	-7228.2	8.17	-0.98	-0.68
3060.0	-12936200	315775	553942	-666.4	-1118.7	-7234.5	8.17	-0.96	-0.59
3070.0	-12942455	304539	481568	-584.6	-1128.3	-7240.0	8.18	-0.95	-0.50
3080.0	-12947892	293208	409145	-502.8	-1137.8	-7244.5	8.19	-0.94	-0.41
3090.0	-12952510	281784	336681	-420.8	-1147.1	-7248.2	8.19	-0.93	-0.32
3100.0	-12956309	270266	264184	-338.9	-1156.4	-7250.9	8.20	-0.92	-0.23
3110.0	-12959288	258657	191665	-256.9	-1165.5	-7252.7	8.20	-0.90	-0.14
3120.0	-12961447	246957	119133	-174.9	-1174.4	-7253.6	8.20	-0.89	-0.05
3130.0	-12962785	235169	46596	-92.8	-1183.3	-7253.6	8.20	-0.88	0.05
3140.0	-12963303	223293	-25936	-10.8	-1192.0	-7252.7	8.20	-0.86	0.14
3150.0	-12963001	211330	-98455	71.3	-1200.5	-7250.9	8.20	-0.85	0.23
3160.0	-12961878	199282	-170951	153.3	-1209.0	-7248.2	8.20	-0.84	0.32
3170.0	-12959935	187151	-243415	235.3	-1217.3	-7244.5	8.20	-0.82	0.41
3180.0	-12957172	174937	-315838	317.3	-1225.5	-7240.0	8.20	-0.81	0.50
3190.0	-12953589	162642	-388211	399.2	-1233.5	-7234.5	8.19	-0.80	0.59
3200.0	-12949188	150268	-460526	481.1	-1241.4	-7228.2	8.19	-0.78	0.68
3210.0	-12943967	137815	-532771	563.0	-1249.1	-7220.9	8.18	-0.77	0.77
3220.0	-12937929	125286	-604940	644.7	-1256.7	-7212.7	8.17	-0.75	0.86
3230.0	-12931073	112682	-677022	726.4	-1264.1	-7203.6	8.16	-0.74	0.95

S-IVB/LM SEPARATION

3235.242      -12927153      106045      -714771      769.2      -1268.0      -7198.5      8.16      -0.73      1.00

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	CXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
GUIDANCE REFERENCE RELEASE									
-4.956	5169.524	2173.506	3028.451	-158.5	377.0	0.0	0.00	0.03	0.00
-4.0	5169.373	2173.866	3028.451	-158.5	377.0	0.0	0.00	0.03	0.00
-3.0	5169.214	2174.243	3028.451	-158.5	376.9	0.0	0.00	0.03	0.00
-2.0	5169.056	2174.620	3028.451	-158.6	376.9	0.0	0.00	0.03	0.00
-1.0	5168.897	2174.996	3028.451	-158.6	376.9	0.0	0.00	0.03	0.00
RANGE ZERO AT 17 48 08 EST									
0.000	5168.739	2175.373	3028.451	-158.6	376.9	0.0	0.00	0.03	0.00
FIRST MOTION									
0.200	5168.707	2175.449	3028.451	-158.6	376.9	0.0	1.88	0.84	1.09
LIFTOFF									
0.360	5168.682	2175.509	3028.451	-158.3	377.0	0.2	1.91	0.85	1.12
1.0	5168.581	2175.751	3028.451	-157.1	377.6	0.9	2.04	0.90	1.19
2.0	5168.424	2176.129	3028.453	-155.0	378.5	2.2	2.18	0.95	1.29
3.0	5168.270	2176.508	3028.456	-152.8	379.4	3.5	2.29	0.99	1.36
4.0	5168.119	2176.888	3028.460	-150.5	380.3	4.9	2.37	1.02	1.41
5.0	5167.969	2177.269	3028.465	-148.1	381.3	6.3	2.43	1.05	1.45
6.0	5167.823	2177.650	3028.472	-145.7	382.4	7.8	2.49	1.07	1.48
7.0	5167.678	2178.033	3028.481	-143.2	383.4	9.3	2.54	1.09	1.51
8.0	5167.536	2178.417	3028.491	-140.7	384.5	10.8	2.59	1.12	1.54
9.0	5167.397	2178.802	3028.502	-138.1	385.5	12.3	2.64	1.14	1.58
10.0	5167.260	2179.188	3028.516	-135.4	386.7	13.9	2.70	1.17	1.61
11.0	5167.126	2179.575	3028.530	-132.7	387.8	15.6	2.75	1.21	1.65
12.0	5166.994	2179.964	3028.547	-130.0	389.0	17.2	2.81	1.25	1.69
13.0	5166.866	2180.353	3028.565	-127.2	390.2	18.9	2.87	1.29	1.74
14.0	5166.740	2180.744	3028.585	-124.3	391.5	20.7	2.93	1.34	1.78
15.0	5166.617	2181.137	3028.606	-121.4	392.8	22.5	2.99	1.40	1.83
16.0	5166.497	2181.530	3028.630	-118.4	394.2	24.4	3.04	1.46	1.88
17.0	5166.380	2181.925	3028.655	-115.3	395.7	26.3	3.10	1.52	1.93
18.0	5166.266	2182.321	3028.682	-112.3	397.2	28.2	3.14	1.59	1.98
19.0	5166.156	2182.719	3028.712	-109.1	398.7	30.2	3.19	1.66	2.02
20.0	5166.048	2183.119	3028.743	-105.9	400.4	32.3	3.23	1.74	2.07

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
21.0	5165.944	2183.520	3028.776	-102.7	402.1	34.4	3.26	1.82	2.11
22.0	5165.842	2183.923	3028.812	-99.5	404.0	36.5	3.29	1.91	2.16
23.0	5165.745	2184.328	3028.849	-96.2	405.9	38.7	3.32	1.99	2.20
24.0	5165.650	2184.735	3028.889	-92.9	407.9	40.9	3.35	2.08	2.25
25.0	5165.559	2185.144	3028.931	-89.6	410.0	43.2	3.38	2.18	2.30
26.0	5165.471	2185.555	3028.976	-86.2	412.2	45.5	3.41	2.28	2.35
27.0	5165.386	2185.968	3029.022	-82.8	414.4	47.9	3.44	2.38	2.41
28.0	5165.305	2186.384	3029.072	-79.4	416.8	50.3	3.48	2.49	2.48
29.0	5165.227	2186.803	3029.123	-75.9	419.3	52.8	3.50	2.59	2.55
30.0	5165.153	2187.223	3029.177	-72.4	421.9	55.4	3.53	2.69	2.64
31.0	5165.082	2187.646	3029.234	-68.9	424.6	58.1	3.53	2.81	2.75
32.0	5165.015	2188.073	3029.294	-65.4	427.5	60.9	3.52	2.94	2.87
33.0	5164.951	2188.501	3029.356	-61.9	430.4	63.9	3.50	3.08	2.98
34.0	5164.891	2188.934	3029.422	-58.5	433.5	66.9	3.51	3.22	3.06
35.0	5164.834	2189.369	3029.490	-55.0	436.8	70.0	3.55	3.36	3.12
36.0	5164.780	2189.808	3029.562	-51.4	440.2	73.1	3.57	3.49	3.16
37.0	5164.731	2190.250	3029.636	-47.9	443.7	76.3	3.59	3.62	3.21
38.0	5164.685	2190.695	3029.714	-44.3	447.3	79.5	3.61	3.76	3.28
39.0	5164.642	2191.145	3029.796	-40.8	451.1	82.9	3.60	3.92	3.37
40.0	5164.603	2191.598	3029.880	-37.2	455.1	86.3	3.57	4.07	3.46
41.0	5164.567	2192.055	3029.968	-33.7	459.2	89.8	3.55	4.25	3.56
42.0	5164.535	2192.517	3030.060	-30.1	463.5	93.4	3.56	4.46	3.65
43.0	5164.507	2192.983	3030.155	-26.6	468.1	97.1	3.54	4.68	3.72
44.0	5164.482	2193.454	3030.254	-23.1	472.8	100.8	3.52	4.88	3.79
45.0	5164.460	2193.929	3030.357	-19.7	477.7	104.7	3.49	5.08	3.88
46.0	5164.442	2194.410	3030.464	-16.3	482.9	108.6	3.40	5.26	3.95
47.0	5164.428	2194.895	3030.575	-12.9	488.2	112.6	3.34	5.44	4.07
48.0	5164.416	2195.386	3030.689	-9.6	493.7	116.7	3.29	5.62	4.20
49.0	5164.408	2195.883	3030.808	-6.4	499.3	121.0	3.24	5.80	4.33
50.0	5164.403	2196.385	3030.931	-3.2	505.2	125.4	3.20	6.00	4.44
51.0	5164.401	2196.894	3031.059	-0.1	511.2	129.9	3.10	6.20	4.52
52.0	5164.403	2197.409	3031.191	3.1	517.4	134.4	3.16	6.40	4.56
53.0	5164.407	2197.930	3031.328	6.1	523.9	139.1	3.01	6.62	4.69
54.0	5164.415	2198.457	3031.470	9.1	530.5	143.8	2.99	6.77	4.75
55.0	5164.425	2198.991	3031.616	12.0	537.3	148.5	2.87	6.94	4.76
56.0	5164.439	2199.532	3031.767	14.9	544.4	153.4	2.84	7.26	4.84
57.0	5164.455	2200.080	3031.923	17.5	551.6	158.2	2.64	7.38	4.82
58.0	5164.474	2200.636	3032.084	20.1	559.0	163.1	2.52	7.48	4.83
59.0	5164.495	2201.199	3032.250	22.5	566.5	168.0	2.28	7.66	4.92

MACH ONE

59.760 5164.513 2201.632 3032.379 24.1 572.2 171.7 2.14 7.71 4.91



TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DCZSP M/S SQ
60.0	5164.518	2201.770	3032.420	24.6	574.0	172.9	2.09	7.74	4.93
61.0	5164.544	2202.348	3032.596	26.5	581.7	177.9	1.88	7.88	4.97
62.0	5164.572	2202.934	3032.776	28.3	589.6	182.9	1.76	8.03	5.07
63.0	5164.601	2203.528	3032.962	30.2	597.7	187.9	1.87	8.26	4.96
64.0	5164.632	2204.129	3033.152	32.1	606.0	192.9	1.91	8.53	4.96
65.0	5164.665	2204.740	3033.348	34.0	614.6	198.0	1.75	8.78	5.17
66.0	5164.700	2205.359	3033.549	35.7	623.4	203.2	1.68	9.05	5.22
67.0	5164.736	2205.988	3033.755	37.4	632.5	208.5	1.65	9.29	5.29
68.0	5164.775	2206.625	3033.966	39.0	641.9	213.9	1.61	9.54	5.38
69.0	5164.815	2207.272	3034.183	40.6	651.5	219.4	1.51	9.89	5.45
70.0	5164.856	2207.929	3034.405	42.0	661.6	225.0	1.34	10.24	5.57
71.0	5164.899	2208.595	3034.633	43.3	671.9	230.6	1.24	10.60	5.70
71.500	5164.920	2208.933	3034.749	43.9	677.2	233.5	1.20	10.76	5.79
72.0	5164.943	2209.273	3034.867	44.4	682.6	236.4	1.17	10.87	5.88
73.0	5164.988	2209.961	3035.106	45.6	693.5	242.4	1.12	11.05	6.14
74.0	5165.034	2210.660	3035.352	46.6	704.6	248.7	1.10	11.13	6.44
75.0	5165.081	2211.371	3035.604	47.7	715.7	255.3	1.09	11.21	6.73
76.0	5165.129	2212.092	3035.863	48.7	727.0	262.2	1.04	11.39	7.03
77.0	5165.178	2212.826	3036.129	49.7	738.4	269.4	0.91	11.60	7.28
78.0	5165.229	2213.570	3036.402	50.4	750.1	276.7	0.73	11.89	7.47
79.0	5165.279	2214.326	3036.683	51.0	762.2	284.2	0.56	12.27	7.58
80.0	5165.331	2215.095	3036.971	51.6	774.6	291.8	0.50	12.70	7.62
81.0	5165.383	2215.876	3037.267	52.1	787.5	299.5	0.54	13.10	7.64
82.0	5165.435	2216.670	3037.570	52.6	800.7	307.2	0.64	13.41	7.67
83.0	5165.488	2217.478	3037.881	53.3	814.1	314.9	0.74	13.61	7.76
84.0	5165.542	2218.299	3038.200	54.0	827.7	322.6	0.75	13.68	7.81
85.0	5165.596	2219.133	3038.527	54.7	841.5	330.5	0.68	13.85	7.90
86.0	5165.651	2219.982	3038.862	55.3	855.5	338.5	0.56	14.18	8.05
87.0	5165.707	2220.845	3039.204	55.7	869.8	346.6	0.40	14.56	8.22
88.0	5165.763	2221.722	3039.555	56.0	884.5	354.9	0.24	14.96	8.40
89.0	5165.819	2222.615	3039.914	56.2	899.6	363.4	0.09	15.29	8.56
90.0	5165.875	2223.522	3040.282	56.1	915.0	372.0	-0.05	15.59	8.71
91.0	5165.932	2224.445	3040.659	55.9	930.7	380.8	-0.24	15.87	8.85
92.0	5165.987	2225.384	3041.044	55.6	946.6	389.7	-0.45	16.18	8.99
93.0	5166.043	2226.339	3041.438	55.0	962.9	398.8	-0.65	16.54	9.14
94.0	5166.097	2227.310	3041.842	54.3	979.7	408.0	-0.79	16.90	9.27
95.0	5166.151	2228.298	3042.255	53.4	996.7	417.3	-0.92	17.27	9.40
96.0	5166.204	2229.304	3042.677	52.3	1014.1	426.8	-1.04	17.62	9.50
97.0	5166.256	2230.327	3043.108	51.2	1031.8	436.3	-1.20	17.90	9.57
98.0	5166.307	2231.367	3043.549	49.9	1049.8	445.9	-1.35	18.21	9.66

MAX Q

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
99.0	5166.356	2232.427	3044.000	48.4	1068.2	455.6	-1.49	18.50	9.75
100.0	5166.404	2233.504	3044.461	46.9	1086.8	465.4	-1.63	18.83	9.89
101.0	5166.450	2234.601	3044.931	45.1	1105.7	475.4	-1.75	19.14	10.02
102.0	5166.495	2235.716	3045.412	43.3	1124.9	485.5	-1.87	19.44	10.16
103.0	5166.537	2236.851	3045.903	41.3	1144.5	495.7	-1.98	19.73	10.27
104.0	5166.577	2238.006	3046.404	39.2	1164.4	506.0	-2.11	20.06	10.40
105.0	5166.616	2239.180	3046.915	37.0	1184.5	516.5	-2.24	20.38	10.50
106.0	5166.652	2240.375	3047.437	34.7	1205.0	527.0	-2.35	20.70	10.61
107.0	5166.685	2241.590	3047.969	32.3	1225.9	537.7	-2.46	21.03	10.73
108.0	5166.716	2242.827	3048.512	29.8	1247.1	548.5	-2.55	21.43	10.90
109.0	5166.745	2244.084	3049.066	27.1	1268.6	559.5	-2.67	21.78	11.06
110.0	5166.771	2245.364	3049.632	24.3	1290.5	570.6	-2.79	22.10	11.21
111.0	5166.794	2246.666	3050.208	21.4	1312.7	581.9	-2.96	22.39	11.34
112.0	5166.814	2247.990	3050.796	18.4	1335.2	593.3	-3.11	22.69	11.46
113.0	5166.831	2249.337	3051.395	15.2	1358.0	604.8	-3.26	23.05	11.60
114.0	5166.844	2250.706	3052.006	11.8	1381.2	616.5	-3.42	23.45	11.78
115.0	5166.854	2252.099	3052.628	8.3	1404.8	628.4	-3.55	23.83	11.93
116.0	5166.861	2253.516	3053.262	4.6	1428.7	640.4	-3.70	24.13	12.06
117.0	5166.864	2254.957	3053.909	0.8	1453.0	652.5	-3.87	24.41	12.19
118.0	5166.863	2256.423	3054.568	-3.2	1477.6	664.8	-4.04	24.81	12.36
119.0	5166.858	2257.912	3055.239	-7.4	1502.6	677.2	-4.24	25.24	12.54
120.0	5166.849	2259.428	3055.922	-11.7	1528.0	689.9	-4.44	25.66	12.71
121.0	5166.835	2260.969	3056.619	-16.3	1553.8	702.6	-4.66	26.07	12.87
122.0	5166.816	2262.535	3057.328	-21.1	1580.0	715.6	-4.88	26.47	13.01
123.0	5166.793	2264.129	3058.050	-26.1	1606.6	728.6	-5.11	26.83	13.13
124.0	5166.764	2265.749	3058.786	-31.4	1633.6	741.8	-5.34	27.17	13.24
125.0	5166.730	2267.397	3059.534	-36.9	1660.9	755.1	-5.59	27.60	13.38
126.0	5166.691	2269.071	3060.296	-42.7	1688.7	768.6	-5.89	28.08	13.54
127.0	5166.646	2270.774	3061.072	-48.7	1717.0	782.3	-6.18	28.59	13.73
128.0	5166.594	2272.506	3061.861	-55.1	1745.8	796.1	-6.48	29.10	13.91
129.0	5166.536	2274.266	3062.664	-61.7	1775.1	810.0	-6.80	29.57	14.05
130.0	5166.470	2276.055	3063.481	-68.8	1804.8	824.1	-7.15	29.99	14.17
131.0	5166.398	2277.875	3064.312	-76.2	1835.0	838.4	-7.54	30.44	14.31
132.0	5166.319	2279.724	3065.158	-83.9	1865.5	852.7	-7.85	30.89	14.39
133.0	5166.231	2281.605	3066.018	-92.0	1896.6	867.2	-8.27	31.40	14.56
134.0	5166.135	2283.517	3066.892	-100.6	1928.2	881.8	-8.68	31.92	14.71
135.0	5166.030	2285.461	3067.782	-109.4	1960.3	896.6	-8.94	32.38	14.88
136.0	5165.917	2287.437	3068.686	-118.3	1992.9	911.6	-9.02	32.83	15.09
137.0	5165.794	2289.446	3069.605	-127.3	2025.9	926.9	-9.04	33.28	15.33
138.0	5165.663	2291.488	3070.539	-136.1	2059.4	942.5	-8.95	33.67	15.59
138.970	5165.527	2293.501	3071.461	-145.0	2091.8	957.5	-8.82	33.97	15.80

IECO

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	CXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
139.0	5165.522	2293.564	3071.490	-145.0	2092.4	957.8	-8.83	34.04	15.83
140.0	5165.372	2295.670	3072.453	-153.5	2113.3	966.5	-8.94	17.58	6.59
141.0	5165.215	2297.791	3073.423	-161.8	2129.4	972.5	-8.47	16.14	5.96
142.0	5165.049	2299.928	3074.398	-170.0	2143.4	977.4	-7.79	14.31	5.19
OEEO									
142.250	5165.007	2300.464	3074.643	-172.0	2146.6	978.5	-8.22	13.03	4.34
143.0	5164.875	2302.077	3075.377	-178.0	2148.6	977.5	-8.13	3.56	-0.88
S-1B/S-IVB SEPARATION SIGNAL									
143.500	5164.785	2303.151	3075.866	-181.9	2147.5	975.5	-7.72	-1.90	-3.77
EBW FIRING (SEPARATION SIGNAL PLUS 0.07 SECONDS)									
143.570	5164.781	2303.297	3075.934	-182.5	2147.3	975.3	-7.71	-1.97	-3.82
144.0	5164.702	2304.220	3076.353	-185.9	2146.0	973.4	-7.48	-2.56	-4.06
145.0	5164.512	2306.364	3077.325	-193.6	2142.9	969.1	-7.47	-2.96	-4.28
150.0	5163.447	2317.055	3082.123	-232.9	2140.0	954.1	-8.01	2.07	-1.54
155.0	5162.184	2327.784	3086.878	-272.3	2152.8	948.6	-7.91	2.95	-0.89
GUIDANCE INITIATION									
159.470	5160.888	2337.435	3091.109	-307.6	2165.8	944.6	-7.94	3.10	-0.80
160.0	5160.724	2338.583	3091.609	-311.7	2167.4	944.1	-7.92	3.10	-0.82
165.0	5159.067	2349.458	3096.318	-351.3	2182.8	939.4	-8.02	3.28	-1.04
170.0	5157.208	2360.413	3100.999	-392.7	2199.6	932.9	-8.37	3.45	-1.33
175.0	5155.140	2371.455	3105.648	-434.4	2216.9	926.5	-8.25	3.56	-1.27
180.0	5152.864	2382.583	3110.264	-475.8	2234.6	920.1	-8.28	3.58	-1.26
185.0	5150.381	2393.801	3114.849	-517.3	2252.5	913.9	-8.28	3.67	-1.21
190.0	5147.691	2405.109	3119.404	-559.0	2270.8	907.8	-8.32	3.74	-1.22
195.0	5144.791	2416.510	3123.928	-600.9	2289.5	901.8	-8.41	3.82	-1.19
200.0	5141.681	2428.005	3128.421	-643.2	2308.7	895.6	-8.44	3.92	-1.28
205.0	5138.358	2439.597	3132.883	-685.9	2328.4	888.9	-8.56	4.05	-1.39
210.0	5134.821	2451.290	3137.310	-729.0	2348.5	881.8	-8.61	4.10	-1.43
215.0	5131.068	2463.083	3141.701	-772.3	2369.0	874.7	-8.65	4.16	-1.42
220.0	5127.098	2474.980	3146.057	-815.8	2389.7	867.6	-8.72	4.21	-1.41
225.0	5122.910	2486.981	3150.377	-859.6	2410.9	860.6	-8.74	4.32	-1.38
230.0	5118.502	2499.089	3154.663	-903.5	2432.3	853.8	-8.78	4.38	-1.35

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	CXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
235.0	5113.874	2511.305	3158.916	-947.8	2454.2	847.1	-8.84	4.47	-1.35
240.0	5109.024	2523.632	3163.134	-992.3	2476.4	840.3	-8.90	4.52	-1.34
245.0	5103.951	2536.070	3167.319	-1037.1	2498.9	833.6	-8.96	4.56	-1.33
250.0	5098.652	2548.621	3171.471	-1082.2	2521.7	827.1	-9.02	4.66	-1.29
255.0	5093.129	2561.287	3175.590	-1127.3	2544.7	820.5	-9.00	4.68	-1.31
260.0	5087.379	2574.070	3179.676	-1172.8	2568.3	814.1	-9.10	4.82	-1.26
265.0	5081.400	2586.972	3183.731	-1218.5	2592.4	807.9	-9.13	4.89	-1.24
270.0	5075.193	2599.994	3187.755	-1264.4	2616.8	801.7	-9.22	4.96	-1.23
275.0	5068.755	2613.140	3191.748	-1310.8	2641.6	795.6	-9.28	5.05	-1.22
280.0	5062.084	2626.411	3195.711	-1357.6	2666.8	789.5	-9.35	5.10	-1.22
285.0	5055.179	2639.809	3199.643	-1404.7	2692.3	783.4	-9.42	5.19	-1.20
290.0	5048.037	2653.334	3203.546	-1452.1	2718.0	777.9	-9.51	5.17	-0.95
295.0	5040.657	2666.988	3207.424	-1499.9	2743.6	773.5	-9.53	5.22	-0.92
300.0	5033.039	2680.772	3211.279	-1547.8	2770.2	768.3	-9.57	5.46	-1.17
305.0	5025.180	2694.691	3215.106	-1595.9	2797.6	762.3	-9.65	5.57	-1.19
310.0	5017.079	2708.748	3218.903	-1644.5	2825.4	756.7	-9.75	5.66	-1.06
315.0	5008.734	2722.946	3222.673	-1693.6	2853.6	751.4	-9.81	5.74	-1.09
320.0	5000.143	2737.285	3226.416	-1743.0	2882.4	745.8	-9.92	5.84	-1.11
325.0	4991.303	2751.771	3230.132	-1793.0	2911.7	740.4	-10.01	5.94	-1.08
330.0	4982.212	2766.404	3233.820	-1843.4	2941.3	735.0	-10.10	6.02	-1.08
335.0	4972.868	2781.185	3237.482	-1894.1	2971.3	729.6	-10.16	6.10	-1.06
340.0	4963.269	2796.118	3241.116	-1945.3	3002.0	724.4	-10.24	6.24	-1.03
345.0	4953.414	2811.205	3244.726	-1996.9	3033.2	719.3	-10.31	6.35	-1.01
350.0	4943.300	2826.451	3248.310	-2048.8	3064.9	714.3	-10.40	6.43	-0.98
355.0	4932.926	2841.855	3251.869	-2101.2	3097.0	709.5	-10.51	6.54	-0.96
360.0	4922.287	2857.422	3255.404	-2154.2	3129.8	704.6	-10.62	6.67	-0.95
365.0	4911.383	2873.153	3258.915	-2207.6	3163.3	700.0	-10.76	6.86	-0.91
370.0	4900.210	2889.055	3262.404	-2261.7	3197.4	695.4	-10.89	6.88	-0.89
375.0	4888.765	2905.128	3265.870	-2316.5	3232.2	690.9	-10.96	7.12	-0.90
380.0	4877.044	2921.378	3269.314	-2372.0	3267.6	686.5	-11.15	7.21	-0.87
385.0	4865.044	2937.806	3272.735	-2428.1	3303.7	682.1	-11.26	7.33	-0.87
390.0	4852.762	2954.416	3276.135	-2484.8	3340.3	677.8	-11.37	7.41	-0.86
395.0	4840.194	2971.210	3279.513	-2542.2	3377.5	673.5	-11.50	7.56	-0.84
400.0	4827.339	2988.192	3282.870	-2600.0	3415.4	669.4	-11.60	7.70	-0.80
405.0	4814.193	3005.365	3286.207	-2658.7	3454.1	665.5	-11.78	7.87	-0.78
410.0	4800.752	3022.734	3289.525	-2717.9	3493.5	661.6	-11.90	7.98	-0.77
415.0	4787.012	3040.301	3292.824	-2777.9	3533.6	657.9	-12.04	8.16	-0.72
420.0	4772.972	3058.071	3296.104	-2838.6	3574.5	654.2	-12.19	8.32	-0.73
425.0	4758.626	3076.048	3299.366	-2900.0	3616.3	650.6	-12.34	8.48	-0.70
430.0	4743.970	3094.235	3302.610	-2962.4	3658.9	647.2	-12.55	8.68	-0.67
435.0	4729.000	3112.638	3305.838	-3025.8	3702.5	644.0	-12.72	8.88	-0.64
440.0	4713.711	3131.261	3309.050	-3089.9	3747.1	640.8	-12.92	9.08	-0.62
445.0	4698.099	3150.111	3312.247	-3155.4	3792.8	637.8	-13.16	9.26	-0.58
450.0	4682.157	3169.190	3315.428	-3221.5	3839.0	634.9	-13.33	9.41	-0.56

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
455.0	4665.881	3188.503	3318.596	-3288.8	3886.4	632.2	-13.53	9.65	-0.55
460.0	4649.267	3208.057	3321.750	-3357.1	3935.0	629.5	-13.75	9.86	-0.53
465.0	4632.309	3227.855	3324.891	-3426.5	3984.6	626.9	-13.97	10.06	-0.52
470.0	4615.000	3247.903	3328.019	-3496.9	4035.0	624.3	-14.19	10.25	-0.51
475.0	4597.337	3268.207	3331.134	-3568.6	4086.7	621.9	-14.43	10.52	-0.46
480.0	4579.313	3288.773	3334.238	-3641.4	4139.7	619.7	-14.70	10.74	-0.43
485.0	4560.920	3309.605	3337.330	-3716.3	4193.5	617.1	-15.27	10.90	-0.62
490.0	4542.144	3330.709	3340.407	-3794.3	4248.2	613.7	-15.75	11.00	-0.71
495.0	4522.974	3352.087	3343.467	-3873.9	4303.1	610.0	-16.02	11.04	-0.80
500.0	4503.404	3373.739	3346.506	-3954.0	4357.3	605.5	-16.09	10.84	-0.94
505.0	4483.432	3395.660	3349.521	-4035.0	4411.1	600.6	-16.12	10.59	-1.09
510.0	4463.055	3417.847	3352.510	-4115.7	4463.4	594.6	-16.07	10.46	-1.29
515.0	4442.277	3440.292	3355.466	-4195.6	4514.6	588.0	-15.97	10.27	-1.24
520.0	4421.098	3462.994	3358.392	-4275.9	4566.3	582.2	-16.02	10.39	-1.13
525.0	4399.519	3485.954	3361.289	-4355.9	4617.9	576.9	-15.94	10.36	-0.97
530.0	4377.540	3509.173	3364.162	-4435.8	4670.1	572.5	-15.95	10.63	-0.83
535.0	4355.162	3532.658	3367.015	-4515.1	4723.9	568.9	-15.75	10.98	-0.58
540.0	4332.391	3556.415	3369.854	-4593.3	4779.7	567.0	-15.48	11.47	-0.19
545.0	4309.230	3580.459	3372.688	-4671.1	4837.9	566.5	-15.66	11.79	-0.10
550.0	4285.676	3604.794	3375.518	-4751.7	4896.5	565.1	-16.72	11.78	-0.53
555.0	4261.704	3629.424	3378.335	-4837.7	4955.3	561.6	-17.55	11.86	-0.84
560.0	4237.294	3654.349	3381.132	-4926.6	5015.1	557.1	-17.95	12.17	-0.90
565.0	4212.435	3679.578	3383.907	-5017.2	5076.6	552.9	-18.23	12.51	-0.78
570.0	4187.120	3705.117	3386.661	-5109.7	5139.5	548.9	-18.82	12.69	-0.87
575.0	4161.332	3730.974	3389.393	-5206.1	5203.3	543.7	-19.69	12.89	-1.22
580.0	4135.053	3757.152	3392.096	-5305.7	5268.6	537.5	-20.03	13.42	-1.18
585.0	4108.272	3783.663	3394.769	-5407.0	5336.3	531.8	-20.62	13.73	-1.12
590.0	4080.979	3810.516	3397.415	-5511.2	5405.7	526.6	-20.93	14.23	-0.96
S-IVB GUIDANCE CUTOFF									
593.340	4062.456	3828.651	3399.169	-5580.6	5454.1	523.9	-20.56	14.79	-0.70
595.0	4053.179	3837.705	3400.033	-5594.5	5450.9	517.1	-5.89	-5.22	-4.80
600.0	4025.133	3864.892	3402.558	-5623.5	5423.7	492.8	-5.73	-5.47	-4.87
ORBIT INSERTION									
603.340	4006.318	3882.976	3404.177	-5642.7	5405.3	476.6	-5.70	-5.49	-4.87
605.0	3996.945	3891.945	3404.955	-5652.2	5396.1	468.5	-5.69	-5.50	-4.87
610.0	3968.613	3918.856	3407.237	-5680.7	5368.2	444.1	-5.68	-5.51	-4.87
620.0	3911.523	3972.259	3411.434	-5737.2	5312.3	395.3	-5.60	-5.59	-4.88
630.0	3853.871	4025.099	3415.143	-5793.0	5255.5	346.5	-5.52	-5.67	-4.89

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
640.0	3795.667	4077.366	3418.364	-5847.8	5197.9	297.6	-5.40	-5.77	-4.89
650.0	3736.919	4129.054	3421.095	-5901.5	5139.4	248.7	-5.32	-5.84	-4.90
660.0	3677.639	4180.152	3423.337	-5954.4	5080.1	199.7	-5.24	-5.91	-4.90
670.0	3617.834	4230.653	3425.089	-6006.5	5020.1	150.7	-5.15	-5.99	-4.90
680.0	3557.513	4280.551	3426.350	-6057.6	4959.4	101.6	-5.07	-6.06	-4.90
690.0	3496.684	4329.838	3427.122	-6108.0	4897.9	52.6	-4.98	-6.13	-4.90
700.0	3435.356	4378.507	3427.400	-6157.4	4835.8	3.5	-4.89	-6.20	-4.91
710.0	3373.539	4426.552	3427.193	-6206.0	4773.0	-45.5	-4.80	-6.26	-4.90
720.0	3311.240	4473.965	3426.492	-6253.7	4709.5	-94.5	-4.72	-6.33	-4.90
730.0	3248.469	4520.739	3425.302	-6300.4	4645.3	-143.6	-4.63	-6.40	-4.90
740.0	3185.234	4566.870	3423.621	-6346.3	4580.5	-192.6	-4.54	-6.46	-4.90
750.0	3121.545	4612.348	3421.451	-6391.3	4515.0	-241.5	-4.45	-6.53	-4.90
760.0	3057.411	4657.168	3418.790	-6435.4	4448.9	-290.5	-4.36	-6.59	-4.89
770.0	2992.841	4701.324	3415.641	-6478.5	4382.2	-339.4	-4.26	-6.65	-4.89
780.0	2927.844	4744.809	3412.003	-6520.7	4314.8	-388.2	-4.17	-6.72	-4.88
790.0	2862.429	4787.617	3407.877	-6562.0	4246.8	-437.0	-4.08	-6.78	-4.88
800.0	2796.606	4829.742	3403.263	-6602.4	4178.2	-485.7	-3.99	-6.84	-4.87
810.0	2730.385	4871.179	3398.162	-6641.8	4109.0	-534.4	-3.89	-6.90	-4.86
820.0	2663.774	4911.921	3392.575	-6680.2	4039.2	-583.0	-3.80	-6.95	-4.85
830.0	2596.783	4951.962	3386.503	-6717.8	3968.9	-631.5	-3.70	-7.01	-4.84
840.0	2529.422	4991.297	3379.946	-6754.3	3898.0	-679.9	-3.61	-7.07	-4.83
850.0	2461.700	5029.920	3372.906	-6789.9	3826.5	-728.2	-3.51	-7.12	-4.82
860.0	2393.628	5067.826	3365.383	-6824.5	3754.5	-776.3	-3.42	-7.17	-4.81
870.0	2325.213	5105.009	3357.379	-6858.1	3682.0	-824.4	-3.32	-7.23	-4.80
880.0	2256.468	5141.464	3348.895	-6890.8	3609.0	-872.4	-3.22	-7.28	-4.79
890.0	2187.401	5177.187	3339.932	-6922.5	3535.4	-920.2	-3.12	-7.33	-4.78
900.0	2118.022	5212.171	3330.492	-6953.1	3461.3	-967.9	-3.02	-7.38	-4.76
910.0	2048.341	5246.412	3320.575	-6982.8	3386.8	-1015.5	-2.93	-7.43	-4.75
920.0	1978.369	5279.905	3310.183	-7011.5	3311.7	-1062.9	-2.83	-7.47	-4.73
930.0	1908.114	5312.645	3299.318	-7039.2	3236.2	-1110.1	-2.73	-7.52	-4.72
940.0	1837.588	5344.628	3287.981	-7065.9	3160.3	-1157.2	-2.63	-7.57	-4.70
950.0	1766.799	5375.849	3276.174	-7091.6	3083.9	-1204.1	-2.53	-7.61	-4.68
960.0	1695.759	5406.304	3263.899	-7116.3	3007.0	-1250.9	-2.43	-7.65	-4.67
970.0	1624.478	5435.989	3251.157	-7139.9	2929.8	-1297.5	-2.32	-7.69	-4.65
980.0	1552.964	5464.899	3237.950	-7162.5	2852.1	-1343.8	-2.22	-7.74	-4.63
990.0	1481.230	5493.030	3224.281	-7184.2	2774.0	-1390.0	-2.12	-7.77	-4.61
1000.0	1409.285	5520.378	3210.151	-7204.7	2695.6	-1436.0	-2.02	-7.81	-4.59
1010.0	1337.138	5546.940	3195.562	-7224.3	2616.7	-1481.8	-1.92	-7.85	-4.57
1020.0	1264.802	5572.711	3180.516	-7242.8	2537.5	-1527.3	-1.81	-7.89	-4.54
1030.0	1192.285	5597.689	3165.016	-7260.3	2457.9	-1572.7	-1.71	-7.92	-4.52
1040.0	1119.599	5621.869	3149.063	-7276.8	2378.0	-1617.8	-1.61	-7.96	-4.50
1050.0	1046.753	5645.249	3132.661	-7292.2	2297.8	-1662.6	-1.51	-7.99	-4.48
1060.0	973.758	5667.824	3115.811	-7306.6	2217.2	-1707.3	-1.40	-8.02	-4.45
1070.0	900.624	5689.592	3098.516	-7319.9	2136.3	-1751.7	-1.30	-8.05	-4.43

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
1080.0	827.363	5710.550	3080.779	-7332.2	2055.2	-1795.8	-1.20	-8.08	-4.40
1090.0	753.983	5730.694	3062.601	-7343.5	1973.7	-1839.7	-1.09	-8.11	-4.37
1100.0	680.497	5750.023	3043.986	-7353.7	1892.0	-1883.3	-0.99	-8.14	-4.35
1110.0	606.913	5768.533	3024.936	-7362.9	1810.0	-1926.6	-0.88	-8.16	-4.32
1120.0	533.243	5786.222	3005.455	-7371.0	1727.7	-1969.7	-0.78	-8.19	-4.29
1130.0	459.498	5803.087	2985.544	-7378.0	1645.2	-2012.4	-0.67	-8.21	-4.26
1140.0	385.686	5819.126	2965.207	-7384.0	1562.5	-2054.9	-0.57	-8.23	-4.23
1150.0	311.820	5834.336	2944.446	-7389.0	1479.6	-2097.1	-0.47	-8.25	-4.20
1160.0	237.910	5848.717	2923.265	-7392.9	1396.5	-2139.0	-0.36	-8.27	-4.17
1170.0	163.966	5862.265	2901.667	-7395.7	1313.1	-2180.6	-0.26	-8.29	-4.14
1180.0	89.998	5874.978	2879.655	-7397.5	1229.6	-2221.8	-0.15	-8.31	-4.11
1190.0	16.018	5886.856	2857.232	-7398.3	1145.9	-2262.8	-0.05	-8.33	-4.08
1200.0	-57.964	5897.897	2834.401	-7398.0	1062.1	-2303.4	0.06	-8.34	-4.04
1210.0	-131.938	5908.098	2811.166	-7396.6	978.1	-2343.6	0.16	-8.35	-4.01
1220.0	-205.893	5917.459	2787.529	-7394.2	894.0	-2383.6	0.27	-8.37	-3.98
1230.0	-279.819	5925.979	2763.495	-7390.8	809.8	-2423.2	0.37	-8.38	-3.94
1240.0	-353.705	5933.655	2739.067	-7386.3	725.5	-2462.4	0.48	-8.39	-3.91
1250.0	-427.540	5940.488	2714.242	-7380.7	641.1	-2501.3	0.58	-8.40	-3.87
1260.0	-501.315	5946.476	2689.048	-7374.1	556.6	-2539.8	0.68	-8.41	-3.83
1270.0	-575.018	5951.619	2663.453	-7366.4	472.0	-2578.0	0.79	-8.41	-3.80
1280.0	-648.641	5955.915	2637.483	-7357.7	387.3	-2615.8	0.89	-8.42	-3.76
1290.0	-722.170	5959.366	2611.138	-7348.0	302.7	-2653.2	1.00	-8.42	-3.72
1300.0	-795.597	5961.969	2584.420	-7337.2	217.9	-2690.2	1.10	-8.43	-3.68
1310.0	-868.910	5963.724	2557.334	-7325.4	133.2	-2726.9	1.20	-8.43	-3.65
1320.0	-942.100	5964.633	2529.884	-7312.5	48.5	-2763.1	1.31	-8.43	-3.61
1330.0	-1015.156	5964.693	2502.073	-7298.6	-36.3	-2799.0	1.41	-8.43	-3.57
1340.0	-1088.068	5963.907	2473.905	-7283.6	-121.0	-2834.5	1.51	-8.43	-3.53
1350.0	-1160.825	5962.273	2445.385	-7267.6	-205.7	-2869.5	1.61	-8.42	-3.48
1360.0	-1233.417	5959.792	2416.516	-7250.6	-290.4	-2904.1	1.72	-8.42	-3.44
1370.0	-1305.834	5956.465	2387.304	-7232.6	-375.0	-2938.3	1.82	-8.41	-3.40
1380.0	-1378.066	5952.292	2357.751	-7213.5	-459.6	-2972.1	1.92	-8.41	-3.36
1390.0	-1450.102	5947.274	2327.862	-7193.5	-544.1	-3005.5	2.02	-8.40	-3.32
1400.0	-1521.931	5941.411	2297.642	-7172.4	-628.4	-3038.4	2.12	-8.39	-3.27
1410.0	-1593.545	5934.705	2267.095	-7150.2	-712.7	-3070.9	2.22	-8.38	-3.23
1420.0	-1664.933	5927.157	2236.225	-7127.1	-796.9	-3103.0	2.32	-8.37	-3.18
1430.0	-1736.085	5918.767	2205.037	-7103.0	-881.0	-3134.6	2.42	-8.36	-3.14
1440.0	-1806.989	5909.537	2173.534	-7077.8	-964.9	-3165.8	2.52	-8.34	-3.09
1450.0	-1877.638	5899.469	2141.723	-7051.7	-1048.7	-3196.5	2.62	-8.33	-3.05
1460.0	-1948.019	5888.564	2109.607	-7024.5	-1132.3	-3226.7	2.72	-8.31	-3.00
1470.0	-2018.125	5876.824	2077.190	-6996.4	-1215.8	-3256.5	2.82	-8.29	-2.96
1480.0	-2087.944	5864.250	2044.478	-6967.3	-1299.0	-3285.8	2.92	-8.27	-2.91
1490.0	-2157.467	5850.844	2011.475	-6937.2	-1382.1	-3314.7	3.02	-8.26	-2.86
1500.0	-2226.684	5836.609	1978.186	-6906.1	-1465.0	-3343.0	3.11	-8.23	-2.81
1510.0	-2295.585	5821.546	1944.616	-6874.0	-1547.6	-3370.9	3.21	-8.21	-2.77

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	CXSP M/S	YDYP M/S	DZSP M/S	DDXSP M/S SQ	DCYSP M/S SQ	CCZSP M/S SQ
1520.0	-2364.161	5805.657	1910.769	-6841.0	-1630.0	-3398.3	3.31	-8.19	-2.72
1530.0	-2432.402	5788.946	1876.651	-6807.0	-1712.2	-3425.3	3.40	-8.16	-2.67
1540.0	-2500.297	5771.415	1842.265	-6772.0	-1794.1	-3451.7	3.50	-8.14	-2.62
1550.0	-2567.839	5753.065	1807.618	-6736.1	-1875.8	-3477.6	3.59	-8.11	-2.57
1560.0	-2635.017	5733.900	1772.714	-6699.2	-1957.1	-3503.1	3.69	-8.08	-2.52
1570.0	-2701.821	5713.923	1737.558	-6661.4	-2038.2	-3528.0	3.78	-8.06	-2.47
1580.0	-2768.242	5693.136	1702.155	-6622.7	-2119.0	-3552.5	3.87	-8.03	-2.42
1590.0	-2834.271	5671.543	1666.511	-6583.0	-2199.5	-3576.4	3.97	-7.99	-2.37
1600.0	-2899.899	5649.147	1630.629	-6542.4	-2279.7	-3599.8	4.06	-7.96	-2.32
1610.0	-2965.116	5625.951	1594.516	-6500.9	-2359.5	-3622.7	4.15	-7.93	-2.26
1620.0	-3029.913	5601.958	1558.177	-6458.4	-2439.0	-3645.1	4.24	-7.89	-2.21
1630.0	-3094.282	5577.172	1521.616	-6415.1	-2518.1	-3667.0	4.33	-7.86	-2.16
1640.0	-3158.212	5551.597	1484.840	-6370.8	-2596.9	-3688.3	4.42	-7.82	-2.11
1650.0	-3221.695	5525.237	1447.852	-6325.7	-2675.2	-3709.1	4.51	-7.78	-2.05
1660.0	-3284.722	5498.094	1410.659	-6279.6	-2753.2	-3729.4	4.60	-7.74	-2.00
1670.0	-3347.285	5470.173	1373.266	-6232.7	-2830.8	-3749.1	4.68	-7.70	-1.95
1680.0	-3409.374	5441.479	1335.678	-6184.9	-2908.0	-3768.4	4.77	-7.66	-1.89
1690.0	-3470.981	5412.015	1297.901	-6136.3	-2984.7	-3787.0	4.86	-7.62	-1.84
1700.0	-3532.097	5381.785	1259.939	-6086.7	-3061.1	-3805.2	4.94	-7.58	-1.79
1710.0	-3592.713	5350.795	1221.799	-6036.4	-3136.9	-3822.8	5.03	-7.53	-1.73
1720.0	-3652.821	5319.048	1183.485	-5985.1	-3212.4	-3839.8	5.11	-7.49	-1.68
1730.0	-3712.413	5286.549	1145.004	-5933.1	-3287.3	-3856.3	5.19	-7.44	-1.62
1740.0	-3771.480	5253.303	1106.361	-5880.2	-3361.8	-3872.3	5.28	-7.39	-1.57
1750.0	-3830.014	5219.315	1067.560	-5826.5	-3435.8	-3887.7	5.36	-7.34	-1.51
1760.0	-3888.007	5184.589	1028.608	-5772.0	-3509.3	-3902.6	5.44	-7.29	-1.46
1770.0	-3945.450	5149.130	989.511	-5716.6	-3582.3	-3916.9	5.52	-7.24	-1.40
1780.0	-4002.336	5112.945	950.273	-5660.5	-3654.8	-3930.6	5.60	-7.19	-1.35
1790.0	-4058.657	5076.037	910.901	-5603.5	-3726.7	-3943.8	5.68	-7.14	-1.29
1800.0	-4114.405	5038.412	871.400	-5545.8	-3798.1	-3956.4	5.75	-7.09	-1.23
1810.0	-4169.571	5000.076	831.775	-5487.4	-3869.0	-3968.5	5.83	-7.03	-1.18
1820.0	-4224.150	4961.033	792.032	-5428.1	-3939.3	-3979.9	5.91	-6.98	-1.12
1830.0	-4278.131	4921.291	752.178	-5368.1	-4009.1	-3990.9	5.98	-6.92	-1.06
1840.0	-4331.509	4880.854	712.217	-5307.3	-4078.2	-4001.2	6.05	-6.86	-1.01
1850.0	-4384.276	4839.729	672.155	-5245.8	-4146.8	-4011.0	6.13	-6.80	-0.95
1860.0	-4436.424	4797.920	631.998	-5183.6	-4214.8	-4020.3	6.20	-6.74	-0.89
1870.0	-4487.946	4755.435	591.752	-5120.7	-4282.2	-4028.9	6.27	-6.68	-0.84
1880.0	-4538.835	4712.279	551.422	-5057.0	-4348.9	-4037.0	6.34	-6.62	-0.78
1890.0	-4589.083	4668.459	511.014	-4992.7	-4415.1	-4044.5	6.41	-6.56	-0.72
1900.0	-4638.685	4623.980	470.533	-4927.6	-4480.6	-4051.5	6.48	-6.50	-0.67
1910.0	-4687.633	4578.849	429.986	-4861.9	-4545.4	-4057.8	6.55	-6.43	-0.61
1920.0	-4735.920	4533.073	389.379	-4795.4	-4609.7	-4063.6	6.62	-6.37	-0.55
1930.0	-4783.540	4486.659	348.716	-4728.4	-4673.2	-4068.8	6.68	-6.30	-0.49
1940.0	-4830.485	4439.612	308.004	-4660.6	-4736.1	-4073.5	6.75	-6.23	-0.44
1950.0	-4876.750	4391.939	267.249	-4592.2	-4798.3	-4077.5	6.81	-6.17	-0.38



TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
1960.0	-4922.328	4343.647	226.456	-4523.2	-4859.8	-4081.0	6.87	-6.10	-0.32
1970.0	-4967.212	4294.744	185.630	-4453.6	-4920.7	-4083.9	6.93	-6.03	-0.26
1980.0	-5011.397	4245.236	144.779	-4383.3	-4980.8	-4086.3	7.00	-5.96	-0.20
1990.0	-5054.876	4195.131	103.907	-4312.4	-5040.2	-4088.0	7.06	-5.89	-0.15
2000.0	-5097.644	4144.435	63.021	-4241.0	-5098.9	-4089.2	7.11	-5.82	-0.09
2010.0	-5139.694	4093.155	22.126	-4169.9	-5156.9	-4089.8	7.17	-5.74	-0.03
2020.0	-5181.021	4041.299	-18.773	-4096.3	-5214.1	-4089.8	7.23	-5.67	0.03
2030.0	-5221.618	3988.875	-59.669	-4023.1	-5270.6	-4089.3	7.28	-5.60	0.08
2040.0	-5261.481	3935.890	-100.556	-3949.4	-5326.4	-4088.1	7.34	-5.52	0.14
2050.0	-5300.604	3882.351	-141.429	-3875.1	-5381.3	-4086.4	7.39	-5.45	0.20
2060.0	-5338.981	3828.266	-182.282	-3800.3	-5435.6	-4084.1	7.45	-5.37	0.26
2070.0	-5376.607	3773.642	-223.110	-3724.9	-5489.0	-4081.3	7.50	-5.29	0.31
2080.0	-5413.478	3718.488	-263.906	-3649.1	-5541.7	-4077.8	7.55	-5.21	0.37
2090.0	-5449.587	3662.812	-304.664	-3572.7	-5593.5	-4073.8	7.60	-5.14	0.43
2100.0	-5484.931	3606.619	-345.380	-3495.9	-5644.6	-4069.2	7.65	-5.06	0.49
2110.0	-5519.503	3549.921	-386.047	-3418.5	-5694.9	-4064.1	7.69	-4.98	0.54
2120.0	-5553.300	3492.724	-426.660	-3340.8	-5744.4	-4058.4	7.74	-4.90	0.60
2130.0	-5586.317	3435.036	-467.212	-3262.5	-5793.1	-4052.1	7.78	-4.82	0.66
2140.0	-5618.549	3376.866	-507.699	-3183.8	-5840.9	-4045.2	7.83	-4.73	0.72
2150.0	-5649.991	3318.221	-548.114	-3104.7	-5887.9	-4037.7	7.87	-4.65	0.77
2160.0	-5680.641	3259.110	-588.452	-3025.1	-5934.1	-4029.7	7.91	-4.57	0.83
2170.0	-5710.493	3199.542	-628.707	-2945.2	-5979.4	-4021.2	7.95	-4.48	0.89
2180.0	-5739.543	3139.525	-668.873	-2864.8	-6023.9	-4012.0	7.99	-4.40	0.94
2190.0	-5767.787	3079.067	-708.946	-2784.0	-6067.5	-4002.3	8.03	-4.31	1.00
2200.0	-5795.222	3018.177	-748.918	-2702.9	-6110.3	-3992.1	8.07	-4.23	1.05
2210.0	-5821.844	2956.864	-788.785	-2621.4	-6152.2	-3981.2	8.10	-4.14	1.11
2220.0	-5847.649	2895.136	-828.541	-2539.6	-6193.3	-3969.9	8.14	-4.06	1.17
2230.0	-5872.634	2833.000	-868.181	-2457.4	-6233.5	-3957.9	8.17	-3.97	1.22
2240.0	-5896.796	2770.469	-907.698	-2374.8	-6272.7	-3945.4	8.21	-3.88	1.28
2250.0	-5920.130	2707.549	-947.088	-2292.0	-6311.1	-3932.4	8.24	-3.79	1.33
2260.0	-5942.634	2644.249	-986.344	-2208.8	-6348.7	-3918.8	8.27	-3.70	1.39
2270.0	-5964.305	2580.579	-1025.462	-2125.4	-6385.3	-3904.7	8.30	-3.62	1.44
2280.0	-5985.141	2516.547	-1064.435	-2041.6	-6421.0	-3890.0	8.32	-3.53	1.50
2290.0	-6005.137	2452.162	-1103.259	-1957.6	-6455.8	-3874.7	8.35	-3.44	1.55
2300.0	-6024.292	2387.434	-1141.928	-1873.3	-6489.7	-3858.9	8.38	-3.34	1.60
2310.0	-6042.603	2322.371	-1180.436	-1788.8	-6522.7	-3842.6	8.40	-3.25	1.66
2320.0	-6060.068	2256.983	-1218.779	-1704.1	-6554.8	-3825.8	8.42	-3.16	1.71
2330.0	-6076.684	2191.279	-1256.950	-1619.1	-6585.9	-3808.4	8.45	-3.07	1.77
2340.0	-6092.449	2125.268	-1294.945	-1533.9	-6616.1	-3790.5	8.47	-2.98	1.82
2350.0	-6107.361	2058.960	-1332.757	-1448.5	-6645.4	-3772.0	8.49	-2.89	1.87
2360.0	-6121.418	1992.363	-1370.383	-1362.9	-6673.8	-3753.0	8.50	-2.79	1.92
2370.0	-6134.618	1925.487	-1407.816	-1277.1	-6701.2	-3733.5	8.52	-2.70	1.98
2380.0	-6146.959	1858.342	-1445.052	-1191.2	-6727.7	-3713.5	8.54	-2.61	2.03
2390.0	-6158.441	1790.937	-1482.085	-1105.1	-6753.2	-3693.0	8.55	-2.51	2.08

TABLE XII  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DCZSP M/S SQ
2400.0	-6169.061	1723.281	-1518.909	-1018.9	-6777.8	-3671.9	8.57	-2.42	2.13
2410.0	-6178.818	1655.385	-1555.521	-932.5	-6801.4	-3650.3	8.58	-2.32	2.18
2420.0	-6187.710	1587.257	-1591.914	-846.0	-6824.1	-3628.3	8.59	-2.23	2.23
2430.0	-6195.737	1518.907	-1628.084	-759.4	-6845.8	-3605.7	8.60	-2.13	2.28
2440.0	-6202.898	1450.344	-1664.026	-672.8	-6866.5	-3582.6	8.61	-2.04	2.33
2450.0	-6209.192	1381.579	-1699.734	-586.0	-6886.3	-3559.0	8.62	-1.94	2.38
2460.0	-6214.618	1312.621	-1735.204	-499.2	-6905.2	-3534.9	8.62	-1.84	2.43
2470.0	-6219.175	1243.479	-1770.431	-412.3	-6923.0	-3510.3	8.63	-1.75	2.48
2480.0	-6222.863	1174.164	-1805.410	-325.3	-6939.9	-3485.3	8.63	-1.65	2.53
2490.0	-6225.682	1104.684	-1840.135	-238.4	-6955.8	-3459.7	8.64	-1.56	2.58
2500.0	-6227.631	1035.050	-1874.603	-151.4	-6970.8	-3433.7	8.64	-1.46	2.63
2510.0	-6228.710	965.271	-1908.808	-64.4	-6984.7	-3407.2	8.64	-1.36	2.67
2520.0	-6228.919	895.358	-1942.745	22.6	-6997.7	-3380.2	8.64	-1.26	2.72
2530.0	-6228.257	825.320	-1976.411	109.6	-7009.7	-3352.8	8.64	-1.17	2.77
2540.0	-6226.727	755.167	-2009.799	196.5	-7020.8	-3324.9	8.63	-1.07	2.81
2550.0	-6224.327	684.908	-2042.907	283.5	-7030.8	-3296.5	8.63	-0.97	2.86
2560.0	-6221.058	614.554	-2075.728	370.3	-7039.9	-3267.7	8.62	-0.87	2.91
2570.0	-6216.921	544.113	-2108.258	457.1	-7048.0	-3238.4	8.62	-0.78	2.95
2580.0	-6211.916	473.597	-2140.493	543.8	-7055.1	-3208.6	8.61	-0.68	3.00
2590.0	-6206.044	403.015	-2172.429	630.5	-7061.2	-3178.4	8.60	-0.58	3.04
2600.0	-6199.307	332.377	-2204.061	717.0	-7066.3	-3147.8	8.59	-0.48	3.08
2610.0	-6191.704	261.692	-2235.384	803.4	-7070.5	-3116.8	8.58	-0.38	3.13
2620.0	-6183.238	190.971	-2266.394	889.7	-7073.6	-3085.3	8.57	-0.29	3.17
2630.0	-6173.910	120.223	-2297.088	975.9	-7075.8	-3053.3	8.55	-0.19	3.21
2640.0	-6163.720	49.458	-2327.460	1061.9	-7077.0	-3021.0	8.54	-0.09	3.26
2650.0	-6152.671	-21.314	-2357.506	1147.8	-7077.2	-2988.2	8.52	0.01	3.30
2660.0	-6140.765	-92.082	-2387.223	1233.5	-7076.4	-2955.1	8.50	0.11	3.34
2670.0	-6128.002	-162.838	-2416.606	1319.0	-7074.6	-2921.5	8.49	0.20	3.38
2680.0	-6114.385	-233.570	-2445.651	1404.3	-7071.8	-2887.5	8.47	0.30	3.42
2690.0	-6099.916	-304.271	-2474.354	1489.5	-7068.1	-2853.1	8.44	0.40	3.46
2700.0	-6084.596	-374.929	-2502.712	1574.4	-7063.3	-2818.3	8.42	0.50	3.50
2710.0	-6068.429	-445.534	-2530.719	1659.0	-7057.6	-2783.1	8.40	0.60	3.54
2720.0	-6051.417	-516.078	-2558.373	1743.5	-7050.9	-2747.6	8.38	0.69	3.58
2730.0	-6033.561	-586.549	-2585.669	1827.6	-7043.2	-2711.6	8.35	0.79	3.61
2740.0	-6014.865	-656.939	-2612.604	1911.5	-7034.6	-2675.3	8.32	0.89	3.65
2750.0	-5995.331	-727.237	-2639.174	1995.2	-7024.9	-2638.6	8.30	0.99	3.69
2760.0	-5974.962	-797.435	-2665.376	2078.5	-7014.3	-2601.6	8.27	1.08	3.72
2770.0	-5953.761	-867.521	-2691.205	2161.6	-7002.7	-2564.2	8.24	1.18	3.76
2780.0	-5931.731	-937.486	-2716.658	2244.3	-6990.2	-2526.4	8.21	1.28	3.79
2790.0	-5908.875	-1007.321	-2741.732	2326.8	-6976.6	-2488.3	8.17	1.37	3.83
2800.0	-5885.197	-1077.015	-2766.423	2408.9	-6962.1	-2449.8	8.14	1.47	3.86
2810.0	-5860.699	-1146.560	-2790.727	2490.6	-6946.6	-2411.0	8.11	1.57	3.90
2820.0	-5835.386	-1215.945	-2814.642	2572.0	-6930.2	-2371.9	8.07	1.66	3.93
2830.0	-5809.260	-1285.160	-2838.164	2653.0	-6912.8	-2332.4	8.03	1.76	3.96

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TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
2840.0	-5782.326	-1354.197	-2861.290	2733.7	-6894.4	-2292.7	8.00	1.85	3.99
2850.0	-5754.588	-1423.045	-2884.016	2814.0	-6875.1	-2252.6	7.96	1.95	4.03
2860.0	-5726.048	-1491.695	-2906.340	2893.8	-6854.8	-2212.2	7.92	2.04	4.06
2870.0	-5696.712	-1560.138	-2928.259	2973.3	-6833.6	-2171.5	7.88	2.14	4.09
2880.0	-5666.584	-1628.364	-2949.768	3052.3	-6811.4	-2130.4	7.83	2.23	4.12
2890.0	-5635.667	-1696.363	-2970.866	3131.0	-6788.3	-2089.1	7.79	2.32	4.15
2900.0	-5603.966	-1764.126	-2991.550	3209.1	-6764.2	-2047.5	7.75	2.42	4.17
2910.0	-5571.486	-1831.644	-3011.816	3286.8	-6739.2	-2005.7	7.70	2.51	4.20
2920.0	-5538.231	-1898.907	-3031.662	3364.1	-6713.2	-1963.5	7.66	2.60	4.23
2930.0	-5504.206	-1965.906	-3051.086	3440.9	-6686.4	-1921.1	7.61	2.70	4.26
2940.0	-5469.415	-2032.632	-3070.083	3517.2	-6658.6	-1878.4	7.56	2.79	4.28
2950.0	-5433.864	-2099.074	-3088.653	3593.0	-6629.8	-1835.4	7.51	2.88	4.31
2960.0	-5397.557	-2165.225	-3106.791	3668.3	-6600.2	-1792.2	7.46	2.97	4.33
2970.0	-5360.500	-2231.075	-3124.497	3743.1	-6569.6	-1748.8	7.41	3.06	4.36
2980.0	-5322.698	-2296.615	-3141.766	3817.3	-6538.2	-1705.1	7.36	3.15	4.38
2990.0	-5284.155	-2361.835	-3158.598	3891.0	-6505.8	-1661.2	7.30	3.24	4.40
3000.0	-5244.879	-2426.727	-3174.989	3964.2	-6472.5	-1617.0	7.25	3.33	4.43
3010.0	-5204.873	-2491.282	-3190.937	4036.9	-6438.3	-1572.6	7.19	3.42	4.45
3020.0	-5164.143	-2555.490	-3206.441	4108.9	-6403.2	-1528.0	7.14	3.51	4.47
3030.0	-5122.696	-2619.344	-3221.497	4180.4	-6367.3	-1483.2	7.08	3.60	4.49
3040.0	-5080.537	-2682.833	-3236.105	4251.3	-6330.4	-1438.2	7.02	3.69	4.51
3050.0	-5037.672	-2745.950	-3250.261	4321.6	-6292.7	-1393.0	6.96	3.77	4.53
3060.0	-4994.107	-2808.684	-3263.965	4391.3	-6254.1	-1347.6	6.90	3.86	4.55
3070.0	-4949.848	-2871.029	-3277.213	4460.4	-6214.6	-1302.0	6.84	3.95	4.57
3080.0	-4904.901	-2932.974	-3290.004	4528.9	-6174.3	-1256.3	6.78	4.03	4.59
3090.0	-4859.272	-2994.512	-3302.337	4596.7	-6133.1	-1210.3	6.72	4.12	4.60
3100.0	-4812.969	-3055.634	-3314.210	4663.9	-6091.1	-1164.2	6.65	4.20	4.62
3110.0	-4765.996	-3116.331	-3325.621	4730.5	-6048.2	-1117.9	6.59	4.28	4.63
3120.0	-4718.362	-3176.595	-3336.568	4796.4	-6004.5	-1071.5	6.52	4.37	4.65
3130.0	-4670.071	-3236.418	-3347.051	4861.6	-5959.9	-1024.9	6.45	4.45	4.66
3140.0	-4621.133	-3295.791	-3357.066	4926.1	-5914.6	-978.2	6.39	4.53	4.68
3150.0	-4571.552	-3354.706	-3366.615	4990.0	-5868.4	-931.4	6.32	4.61	4.69
3160.0	-4521.336	-3413.156	-3375.694	5053.1	-5821.3	-884.4	6.25	4.69	4.70
3170.0	-4470.491	-3471.130	-3384.302	5115.6	-5773.5	-837.3	6.18	4.77	4.72
3180.0	-4419.026	-3528.624	-3392.439	5177.3	-5724.9	-790.1	6.11	4.85	4.73
3190.0	-4366.947	-3585.626	-3400.103	5238.4	-5675.5	-742.7	6.04	4.93	4.74
3200.0	-4314.261	-3642.131	-3407.294	5298.7	-5625.3	-695.3	5.96	5.01	4.75
3210.0	-4260.976	-3698.129	-3414.009	5358.2	-5574.3	-647.8	5.89	5.09	4.76
3220.0	-4207.099	-3753.614	-3420.249	5417.1	-5522.5	-600.2	5.82	5.17	4.77
3230.0	-4152.637	-3808.577	-3426.013	5475.1	-5470.0	-552.5	5.74	5.24	4.77
3235.242	-4123.857	-3837.177	-3428.843	5505.3	-5442.2	-527.4	5.70	5.28	4.78

S-IVB/LM SEPARATION

TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
GUIDANCE REFERENCE RELEASE											
-4.956	6373.353	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	408.9	0	35
-4.0	6373.353	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	408.9	0	35
-5.0	6373.353	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	408.9	0	35
-2.0	6373.353	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	408.9	0	35
-1.0	6373.353	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	408.9	0	35
RANGE ZERO AT 17 48 08 EST											
0.000	6373.353	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	408.9	0	35
FIRST MOTION											
0.200	6373.353	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	408.9	0	34
LIFTOFF											
0.360	6373.353	-80.5650	28.3707	109.02	89.51	0.4	90.00	0.05	408.9	0	35
1.0	6373.353	-80.5650	28.3707	102.54	89.66	1.9	90.00	0.27	408.9	0	35
2.0	6373.357	-80.5650	28.3707	80.81	89.81	4.5	90.00	0.64	409.0	0	38
3.0	6373.362	-80.5650	28.3707	40.63	89.85	7.3	90.00	1.02	409.0	0	44
4.0	6373.371	-80.5650	28.3707	9.59	89.83	10.2	90.00	1.43	409.1	0	53
5.0	6373.383	-80.5649	28.3707	355.52	89.79	13.2	89.99	1.84	409.1	0	65
6.0	6373.397	-80.5649	28.3707	348.99	89.75	16.2	89.99	2.27	409.2	0	79
7.0	6373.415	-80.5649	28.3707	345.82	89.72	19.3	89.99	2.70	409.4	0	97
8.0	6373.436	-80.5649	28.3707	344.63	89.70	22.5	89.98	3.15	409.5	0	118
9.0	6373.460	-80.5650	28.3707	345.01	89.68	25.7	89.98	3.60	409.7	0	142
10.0	6373.487	-80.5650	28.3707	347.00	89.67	29.0	89.98	4.06	409.9	0	169
11.0	6373.518	-80.5650	28.3707	350.75	89.65	32.4	89.97	4.53	410.2	0	200
12.0	6373.552	-80.5650	28.3707	356.43	89.64	35.9	89.97	5.01	410.5	0	234
13.0	6373.590	-80.5650	28.3707	4.02	89.62	39.4	89.96	5.50	410.9	0	272
14.0	6373.631	-80.5649	28.3707	13.10	89.59	43.0	89.96	6.00	411.3	0	313
15.0	6373.676	-80.5649	28.3707	22.80	89.54	46.7	89.95	6.52	411.8	1	358
16.0	6373.724	-80.5649	28.3707	32.13	89.46	50.5	89.94	7.04	412.3	1	406
17.0	6373.777	-80.5649	28.3707	40.39	89.36	54.4	89.93	7.57	413.0	2	459
18.0	6373.833	-80.5649	28.3707	47.28	89.23	58.4	89.93	8.12	413.7	2	515
19.0	6373.894	-80.5649	28.3707	52.88	89.07	62.5	89.91	8.67	414.5	3	576
20.0	6373.958	-80.5649	28.3707	57.37	88.88	66.6	89.90	9.23	415.4	4	640

TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
21.0	6374.027	-80.5649	28.3707	60.97	88.67	70.8	89.89	9.79	416.5	5	709
22.0	6374.100	-80.5649	28.3707	63.87	88.44	75.2	89.87	10.36	417.6	7	782
23.0	6374.177	-80.5649	28.3707	66.23	88.18	79.5	89.86	10.94	418.9	9	859
24.0	6374.259	-80.5648	28.3707	68.15	87.90	84.0	89.84	11.52	420.3	12	941
25.0	6374.345	-80.5648	28.3707	69.72	87.61	88.6	89.82	12.11	421.8	15	1027
26.0	6374.436	-80.5648	28.3707	70.98	87.29	93.2	89.80	12.70	423.5	19	1118
27.0	6374.531	-80.5647	28.3708	71.97	86.97	97.9	89.78	13.29	425.3	24	1213
28.0	6374.631	-80.5647	28.3708	72.74	86.62	102.7	89.75	13.89	427.3	30	1313
29.0	6374.736	-80.5646	28.3708	73.30	86.26	107.7	89.72	14.49	429.4	36	1418
30.0	6374.846	-80.5645	28.3708	73.61	85.90	112.7	89.69	15.10	431.7	44	1528
31.0	6374.961	-80.5644	28.3708	73.58	85.51	117.8	89.64	15.70	434.1	53	1643
32.0	6375.081	-80.5643	28.3708	73.37	85.10	123.1	89.59	16.31	436.7	63	1763
33.0	6375.207	-80.5642	28.3709	73.01	84.66	128.5	89.52	16.92	439.5	74	1889
34.0	6375.337	-80.5641	28.3709	72.65	84.20	133.9	89.45	17.53	442.5	87	2019
35.0	6375.473	-80.5640	28.3709	72.40	83.73	139.6	89.38	18.13	445.8	101	2155
36.0	6375.615	-80.5638	28.3710	72.32	83.25	145.3	89.30	18.73	449.2	118	2297
37.0	6375.762	-80.5636	28.3710	72.32	82.78	151.1	89.23	19.33	452.7	136	2444
38.0	6375.914	-80.5634	28.3711	72.35	82.30	157.0	89.15	19.93	456.5	156	2596
39.0	6376.073	-80.5632	28.3711	72.39	81.82	163.1	89.07	20.52	460.5	178	2755
40.0	6376.237	-80.5630	28.3712	72.40	81.32	169.2	88.98	21.10	464.7	202	2919
41.0	6376.407	-80.5627	28.3713	72.41	80.81	175.5	88.89	21.68	469.1	229	3090
42.0	6376.584	-80.5624	28.3713	72.42	80.27	182.0	88.79	22.24	473.8	258	3266
43.0	6376.766	-80.5621	28.3714	72.47	79.72	188.6	88.68	22.80	478.8	291	3448
44.0	6376.955	-80.5618	28.3715	72.56	79.16	195.3	88.58	23.35	484.0	326	3637
45.0	6377.150	-80.5614	28.3716	72.67	78.58	202.2	88.47	23.88	489.4	365	3832
46.0	6377.351	-80.5610	28.3717	72.74	77.99	209.2	88.36	24.40	495.2	406	4034
47.0	6377.559	-80.5605	28.3718	72.79	77.38	216.3	88.24	24.91	501.2	452	4242
48.0	6377.774	-80.5600	28.3720	72.78	76.77	223.5	88.11	25.40	507.4	501	4456
49.0	6377.995	-80.5595	28.3721	72.73	76.15	230.9	87.97	25.88	513.8	554	4677
50.0	6378.222	-80.5590	28.3723	72.67	75.53	238.5	87.82	26.34	520.5	612	4904
51.0	6378.456	-80.5584	28.3724	72.57	74.90	246.2	87.66	26.79	527.4	674	5139
52.0	6378.697	-80.5577	28.3726	72.55	74.29	254.1	87.51	27.23	534.6	740	5380
53.0	6378.945	-80.5570	28.3728	72.51	73.65	262.2	87.35	27.65	542.1	812	5628
54.0	6379.201	-80.5563	28.3730	72.46	73.02	270.3	87.19	28.05	549.7	888	5883
55.0	6379.463	-80.5555	28.3732	72.45	72.39	278.6	87.03	28.44	557.6	969	6146
56.0	6379.732	-80.5546	28.3734	72.48	71.75	287.0	86.87	28.80	565.8	1056	6415
57.0	6380.008	-80.5537	28.3737	72.51	71.10	295.5	86.71	29.14	574.1	1149	6691
58.0	6380.292	-80.5527	28.3739	72.51	70.47	304.1	86.55	29.47	582.6	1248	6975
59.0	6380.582	-80.5517	28.3742	72.51	69.81	312.6	86.38	29.75	591.3	1352	7265
59.760	6380.807	-80.5509	28.3744	72.49	69.31	319.1	86.25	29.95	597.9	1436	7490

MACH ONE

TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
60.0	6380.879	-80.5506	28.3745	72.49	69.15	321.2	86.20	30.01	600.0	1464	7562
61.0	6381.182	-80.5495	28.3748	72.45	68.49	329.7	86.02	30.25	608.9	1581	7866
62.0	6381.493	-80.5483	28.3751	72.39	67.82	338.4	85.84	30.47	617.9	1705	8176
63.0	6381.809	-80.5470	28.3755	72.43	67.18	347.3	85.68	30.69	627.2	1836	8493
64.0	6382.133	-80.5457	28.3758	72.52	66.55	356.4	85.53	30.90	636.8	1974	8817
65.0	6382.464	-80.5442	28.3762	72.57	65.91	365.7	85.37	31.09	646.6	2119	9147
66.0	6382.801	-80.5427	28.3766	72.63	65.27	375.3	85.21	31.27	656.7	2272	9485
67.0	6383.146	-80.5412	28.3771	72.70	64.64	385.1	85.06	31.44	667.1	2433	9830
68.0	6383.498	-80.5395	28.3775	72.76	64.01	395.1	84.90	31.60	677.7	2602	10182
69.0	6383.857	-80.5378	28.3780	72.85	63.38	405.4	84.75	31.75	688.7	2779	10541
70.0	6384.223	-80.5360	28.3784	72.92	62.73	415.9	84.60	31.88	700.0	2964	10907
71.0	6384.596	-80.5341	28.3790	73.01	62.07	426.8	84.45	31.99	711.7	3159	11281
MAX Q											
71.500	6384.786	-80.5331	28.3792	73.05	61.74	432.3	84.37	32.04	717.7	3260	11471
72.0	6384.977	-80.5321	28.3795	73.08	61.41	437.9	84.29	32.09	723.8	3363	11662
73.0	6385.366	-80.5300	28.3800	73.12	60.76	449.4	84.13	32.19	736.1	3577	12051
74.0	6385.762	-80.5278	28.3806	73.12	60.14	461.1	83.95	32.28	748.6	3801	12447
75.0	6386.166	-80.5255	28.3812	73.07	59.53	473.1	83.76	32.38	761.4	4035	12851
76.0	6386.578	-80.5231	28.3818	72.97	58.95	485.4	83.55	32.48	774.3	4280	13263
77.0	6386.998	-80.5206	28.3825	72.83	58.38	497.9	83.33	32.58	787.6	4535	13684
78.0	6387.426	-80.5180	28.3832	72.69	57.81	510.8	83.11	32.66	801.1	4800	14112
79.0	6387.863	-80.5153	28.3839	72.56	57.23	524.0	82.88	32.72	815.0	5077	14549
80.0	6388.308	-80.5125	28.3847	72.46	56.65	537.5	82.66	32.78	829.4	5366	14995
81.0	6388.762	-80.5096	28.3855	72.39	56.08	551.5	82.46	32.83	844.1	5667	15448
82.0	6389.224	-80.5065	28.3864	72.35	55.52	565.7	82.27	32.87	859.2	5980	15911
83.0	6389.695	-80.5033	28.3872	72.33	54.99	580.3	82.09	32.92	874.5	6305	16382
84.0	6390.175	-80.5000	28.3881	72.32	54.49	595.0	81.92	32.97	890.0	6643	16862
85.0	6390.664	-80.4966	28.3891	72.31	54.00	610.0	81.75	33.02	905.7	6994	17352
86.0	6391.162	-80.4931	28.3901	72.30	53.52	625.3	81.59	33.06	921.7	7358	17850
87.0	6391.670	-80.4894	28.3911	72.29	53.04	640.8	81.42	33.09	938.0	7735	18358
88.0	6392.187	-80.4856	28.3921	72.27	52.56	656.8	81.26	33.11	954.7	8126	18876
89.0	6392.713	-80.4816	28.3932	72.26	52.07	673.1	81.09	33.12	971.8	8531	19402
90.0	6393.249	-80.4776	28.3944	72.24	51.59	689.8	80.92	33.12	989.3	8951	19939
91.0	6393.795	-80.4733	28.3956	72.22	51.11	706.7	80.76	33.11	1007.1	9385	20484
92.0	6394.350	-80.4689	28.3968	72.20	50.63	724.0	80.59	33.09	1025.2	9835	21040
93.0	6394.914	-80.4644	28.3981	72.17	50.15	741.6	80.43	33.06	1043.7	10300	21605
94.0	6395.489	-80.4597	28.3994	72.15	49.67	759.6	80.26	33.02	1062.6	10781	22180
95.0	6396.073	-80.4549	28.4007	72.13	49.20	777.9	80.10	32.98	1081.9	11279	22764
96.0	6396.667	-80.4499	28.4021	72.11	48.73	796.6	79.95	32.92	1101.5	11793	23359
97.0	6397.270	-80.4447	28.4036	72.10	48.26	815.6	79.80	32.87	1121.4	12325	23963
98.0	6397.884	-80.4393	28.4051	72.09	47.81	834.9	79.65	32.81	1141.7	12874	24577

TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
99.0	6398.508	-80.4338	28.4066	72.09	47.35	854.6	79.51	32.74	1162.3	13441	25201
100.0	6399.142	-80.4281	28.4082	72.09	46.90	874.5	79.37	32.66	1183.2	14027	25836
101.0	6399.785	-80.4222	28.4099	72.09	46.47	894.8	79.23	32.59	1204.4	14631	26480
102.0	6400.440	-80.4162	28.4116	72.08	46.03	915.4	79.10	32.51	1226.0	15253	27134
103.0	6401.104	-80.4099	28.4134	72.08	45.61	936.5	78.97	32.43	1247.9	15895	27799
104.0	6401.778	-80.4035	28.4152	72.08	45.19	957.8	78.84	32.34	1270.2	16557	28474
105.0	6402.463	-80.3969	28.4171	72.08	44.78	979.5	78.72	32.26	1292.7	17238	29160
106.0	6403.158	-80.3900	28.4190	72.08	44.38	1001.5	78.60	32.17	1315.7	17940	29856
107.0	6403.864	-80.3830	28.4210	72.09	43.98	1023.9	78.48	32.08	1339.0	18662	30562
108.0	6404.581	-80.3758	28.4230	72.10	43.60	1046.7	78.37	31.98	1362.7	19405	31279
109.0	6405.308	-80.3683	28.4251	72.10	43.22	1070.0	78.26	31.89	1386.8	20170	32007
110.0	6406.047	-80.3607	28.4272	72.11	42.84	1093.6	78.15	31.80	1411.2	20956	32746
111.0	6406.796	-80.3528	28.4295	72.11	42.48	1117.5	78.04	31.70	1436.0	21764	33496
112.0	6407.556	-80.3447	28.4317	72.12	42.11	1141.8	77.94	31.60	1461.2	22595	34257
113.0	6408.328	-80.3364	28.4341	72.12	41.76	1166.5	77.83	31.50	1486.7	23448	35030
114.0	6409.110	-80.3279	28.4365	72.13	41.41	1191.6	77.73	31.40	1512.6	24325	35813
115.0	6409.904	-80.3191	28.4389	72.13	41.06	1217.2	77.63	31.30	1539.0	25225	36608
116.0	6410.710	-80.3101	28.4415	72.14	40.72	1243.1	77.54	31.19	1565.7	26149	37414
117.0	6411.527	-80.3009	28.4441	72.14	40.39	1269.4	77.44	31.09	1592.8	27097	38232
118.0	6412.355	-80.2914	28.4467	72.14	40.06	1296.0	77.35	30.98	1620.2	28069	39061
119.0	6413.195	-80.2817	28.4495	72.14	39.73	1323.2	77.26	30.87	1648.2	29067	39902
120.0	6414.047	-80.2717	28.4523	72.15	39.41	1350.8	77.17	30.76	1676.5	30091	40755
121.0	6414.911	-80.2615	28.4551	72.15	39.09	1378.8	77.08	30.65	1705.3	31140	41619
122.0	6415.786	-80.2510	28.4581	72.15	38.77	1407.3	76.99	30.53	1734.6	32216	42496
123.0	6416.674	-80.2403	28.4611	72.16	38.45	1436.2	76.91	30.41	1764.3	33319	43384
124.0	6417.573	-80.2293	28.4642	72.16	38.14	1465.5	76.83	30.29	1794.4	34449	44285
125.0	6418.484	-80.2180	28.4674	72.16	37.83	1495.2	76.74	30.17	1824.9	35607	45197
126.0	6419.408	-80.2064	28.4706	72.17	37.52	1525.5	76.67	30.04	1855.9	36793	46121
127.0	6420.343	-80.1946	28.4739	72.17	37.21	1556.2	76.59	29.91	1887.5	38007	47057
128.0	6421.290	-80.1825	28.4773	72.18	36.90	1587.5	76.51	29.77	1919.5	39252	48006
129.0	6422.249	-80.1701	28.4808	72.18	36.59	1619.4	76.44	29.63	1952.1	40526	48966
130.0	6423.220	-80.1573	28.4844	72.19	36.28	1651.7	76.37	29.49	1985.3	41831	49938
131.0	6424.204	-80.1443	28.4880	72.19	35.97	1684.4	76.29	29.34	2018.8	43166	50923
132.0	6425.199	-80.1310	28.4918	72.20	35.66	1717.6	76.23	29.19	2052.8	44534	51919
133.0	6426.207	-80.1174	28.4956	72.20	35.34	1751.5	76.16	29.04	2087.5	45933	52928
134.0	6427.226	-80.1034	28.4995	72.21	35.03	1785.8	76.09	28.87	2122.7	47365	53949
135.0	6428.257	-80.0891	28.5035	72.21	34.72	1820.7	76.02	28.71	2158.4	48830	54981
136.0	6429.300	-80.0745	28.5076	72.22	34.41	1856.2	75.96	28.56	2194.7	50330	56025
137.0	6430.355	-80.0596	28.5118	72.23	34.12	1892.2	75.90	28.40	2231.5	51864	57082
138.0	6431.423	-80.0443	28.5161	72.23	33.85	1928.9	75.84	28.26	2268.9	53432	58151
IECO											
138.970	6432.471	-80.0291	28.5203	72.24	33.58	1964.4	75.79	28.12	2305.1	54987	59201

TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
139.0	6432.504	-80.0286	28.5204	72.24	33.58	1965.1	75.78	28.13	2305.8	55036	59233
140.0	6433.595	-80.0127	28.5249	72.25	33.34	1987.5	75.75	27.97	2328.9	56672	60326
141.0	6434.689	-79.9966	28.5294	72.26	33.11	2004.4	75.73	27.82	2346.5	58324	61421
142.0	6435.785	-79.9803	28.5340	72.27	32.89	2019.1	75.71	27.66	2361.9	59995	62518
	OEEO										
142.250	6436.059	-79.9762	28.5351	72.27	32.84	2022.4	75.71	27.62	2365.4	60415	62793
143.0	6436.881	-79.9639	28.5385	72.28	32.68	2023.7	75.71	27.49	2367.2	61679	63616
	S-IB/S-IVB SEPARATION SIGNAL										
143.500	6437.427	-79.9556	28.5408	72.28	32.57	2021.8	75.71	27.39	2365.7	62523	64163
	EBW FIRING (SEPARATION SIGNAL PLUS 0.07 SECONDS)										
143.570	6437.508	-79.9546	28.5411	72.28	32.56	2021.6	75.71	27.38	2365.5	62633	64244
144.0	6437.975	-79.9475	28.5431	72.29	32.47	2019.6	75.71	27.30	2363.8	63358	64711
145.0	6439.055	-79.9311	28.5477	72.30	32.26	2014.9	75.72	27.11	2359.8	65043	65793
150.0	6444.332	-79.8487	28.5706	72.34	31.20	2006.1	75.74	26.19	2354.6	73481	71077
155.0	6449.460	-79.7653	28.5938	72.37	30.16	2016.4	75.72	25.33	2368.2	82023	76213
	GUIDANCE INITIATION										
159.470	6453.938	-79.6897	28.6148	72.39	29.25	2028.1	75.70	24.57	2382.8	89775	80697
160.0	6454.463	-79.6806	28.6173	72.39	29.14	2029.6	75.69	24.48	2384.6	9C701	81222
165.0	6459.343	-79.5945	28.6411	72.44	28.13	2044.2	75.69	23.65	2402.2	99519	86110
170.0	6464.096	-79.5069	28.6653	72.53	27.07	2060.2	75.72	22.78	2421.3	108484	90871
175.0	6468.718	-79.4177	28.6897	72.63	26.02	2077.5	75.76	21.92	2441.6	117600	95501
180.0	6473.211	-79.3269	28.7144	72.73	25.00	2095.9	75.80	21.08	2463.0	126871	100001
185.0	6477.576	-79.2346	28.7394	72.83	24.00	2115.6	75.84	20.26	2485.3	136296	104375
190.0	6481.817	-79.1406	28.7646	72.94	23.02	2136.4	75.88	19.46	2508.7	145879	108624
195.0	6485.932	-79.0450	28.7902	73.04	22.06	2158.4	75.93	18.67	2533.1	155623	112747
200.0	6489.924	-78.9478	28.8160	73.15	21.11	2181.5	75.98	17.89	2558.5	165530	116747
205.0	6493.791	-78.8488	28.8420	73.26	20.18	2205.7	76.05	17.12	2584.9	175602	120622
210.0	6497.532	-78.7480	28.8683	73.41	19.25	2231.0	76.12	16.36	2612.4	185843	124371
215.0	6501.148	-78.6455	28.8949	73.55	18.35	2257.4	76.20	15.61	2640.8	196256	127996
220.0	6504.639	-78.5412	28.9216	73.68	17.47	2284.8	76.27	14.88	2670.1	206842	131496
225.0	6508.007	-78.4350	28.9486	73.82	16.61	2313.3	76.35	14.17	2700.4	217604	134872
230.0	6511.252	-78.3270	28.9759	73.95	15.78	2342.9	76.43	13.48	2731.6	228546	138126



TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
235.0	6514.377	-78.2170	29.0033	74.09	14.96	2373.6	76.51	12.81	2763.9	239668	141259
240.0	6517.381	-78.1052	29.0310	74.22	14.17	2405.4	76.59	12.15	2797.1	250975	144272
245.0	6520.266	-77.9914	29.0589	74.35	13.40	2438.0	76.67	11.51	2831.0	262469	147166
250.0	6523.033	-77.8756	29.0871	74.48	12.65	2471.8	76.75	10.89	2866.0	274152	149942
255.0	6525.682	-77.7578	29.1155	74.62	11.93	2506.2	76.83	10.29	2901.7	286026	152600
260.0	6528.215	-77.6380	29.1441	74.75	11.24	2542.0	76.91	9.70	2938.5	298095	155143
265.0	6530.635	-77.5161	29.1729	74.88	10.56	2578.8	76.99	9.14	2976.3	310362	157572
270.0	6532.942	-77.3920	29.2020	75.01	9.91	2616.4	77.08	8.59	3014.8	322829	159888
275.0	6535.139	-77.2659	29.2313	75.14	9.28	2655.2	77.16	8.06	3054.4	335501	162094
280.0	6537.224	-77.1376	29.2608	75.27	8.67	2694.8	77.24	7.54	3094.8	348379	164189
285.0	6539.200	-77.0070	29.2905	75.40	8.08	2735.5	77.33	7.04	3136.2	361468	166174
290.0	6541.068	-76.8742	29.3205	75.52	7.51	2776.9	77.41	6.56	3178.3	374769	168052
295.0	6542.830	-76.7392	29.3508	75.62	6.97	2819.2	77.47	6.10	3221.0	388286	169823
300.0	6544.489	-76.6019	29.3813	75.74	6.45	2862.5	77.55	5.65	3264.9	402022	171492
305.0	6546.044	-76.4622	29.4120	75.88	5.94	2906.9	77.64	5.22	3309.8	415981	173057
310.0	6547.498	-76.3201	29.4429	76.01	5.46	2952.2	77.73	4.80	3355.5	430166	174521
315.0	6548.853	-76.1756	29.4741	76.14	4.99	2998.6	77.82	4.40	3402.3	444581	175885
320.0	6550.108	-76.0286	29.5055	76.28	4.55	3046.0	77.92	4.01	3450.1	459231	177151
325.0	6551.267	-75.8791	29.5370	76.41	4.11	3094.3	78.01	3.64	3498.7	474119	178320
330.0	6552.329	-75.7271	29.5688	76.54	3.70	3143.5	78.11	3.28	3548.2	489249	179392
335.0	6553.296	-75.5724	29.6008	76.68	3.31	3193.4	78.21	2.93	3598.4	504624	180370
340.0	6554.171	-75.4151	29.6330	76.82	2.93	3244.6	78.30	2.60	3649.8	520248	181255
345.0	6554.955	-75.2551	29.6654	76.95	2.57	3296.6	78.40	2.29	3702.0	536125	182049
350.0	6555.651	-75.0923	29.6980	77.09	2.23	3349.6	78.50	1.99	3755.2	552260	182756
355.0	6556.260	-74.9268	29.7307	77.22	1.91	3403.4	78.60	1.71	3809.2	568656	183375
360.0	6556.785	-74.7584	29.7637	77.36	1.60	3458.4	78.71	1.43	3864.3	585318	183911
365.0	6557.227	-74.5872	29.7968	77.50	1.31	3514.4	78.81	1.18	3920.4	602251	184364
370.0	6557.590	-74.4130	29.8301	77.64	1.04	3571.6	78.92	0.93	3977.7	619459	184737
375.0	6557.873	-74.2358	29.8636	77.77	0.77	3630.0	79.02	0.70	4036.2	636949	185032
380.0	6558.080	-74.0556	29.8972	77.91	0.53	3689.4	79.13	0.47	4095.7	654725	185250
385.0	6558.213	-73.8722	29.9310	78.05	0.29	3750.1	79.24	0.26	4156.4	672793	185393
390.0	6558.272	-73.6857	29.9650	78.20	0.07	3811.6	79.35	0.06	4218.0	691158	185463
395.0	6558.260	-73.4960	29.9991	78.34	-0.14	3874.2	79.46	-0.12	4280.6	709824	185463
400.0	6558.181	-73.3029	30.0334	78.48	-0.33	3937.9	79.57	-0.30	4344.3	728797	185394
405.0	6558.036	-73.1065	30.0678	78.63	-0.51	4002.9	79.69	-0.46	4409.4	748082	185260
410.0	6557.828	-72.9067	30.1024	78.77	-0.67	4069.0	79.80	-0.61	4475.4	767685	185064
415.0	6557.561	-72.7035	30.1371	78.92	-0.82	4136.2	79.92	-0.75	4542.7	787612	184808
420.0	6557.237	-72.4966	30.1719	79.06	-0.96	4204.7	80.04	-0.87	4611.2	807870	184496
425.0	6556.859	-72.2862	30.2068	79.21	-1.08	4274.4	80.16	-0.99	4680.9	828463	184129
430.0	6556.430	-72.0721	30.2418	79.36	-1.20	4345.6	80.28	-1.09	4752.1	849398	183711
435.0	6555.953	-71.8542	30.2769	79.51	-1.30	4418.4	80.40	-1.19	4824.8	870684	183246
440.0	6555.432	-71.6325	30.3121	79.66	-1.38	4492.5	80.53	-1.27	4898.9	892327	182736
445.0	6554.869	-71.4069	30.3473	79.82	-1.46	4568.4	80.66	-1.34	4974.8	914336	182184
450.0	6554.268	-71.1772	30.3827	79.97	-1.53	4645.3	80.79	-1.41	5051.7	936717	181595

TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
455.0	6553.631	-70.9434	30.4180	80.13	-1.58	4724.0	80.92	-1.46	5130.3	959478	180970
460.0	6552.964	-70.7055	30.4535	80.28	-1.63	4804.3	81.05	-1.50	5210.7	982626	180314
465.0	6552.269	-70.4633	30.4889	80.44	-1.66	4886.2	81.18	-1.53	5292.5	1006171	179631
470.0	6551.551	-70.2167	30.5244	80.61	-1.68	4969.6	81.32	-1.55	5375.8	1030119	178924
475.0	6550.812	-69.9657	30.5598	80.77	-1.69	5054.8	81.46	-1.57	5461.0	1054479	178197
480.0	6550.059	-69.7101	30.5953	80.94	-1.69	5141.9	81.60	-1.57	5548.1	1079261	177455
485.0	6549.294	-69.4498	30.6307	81.10	-1.69	5231.0	81.75	-1.57	5637.2	1104474	176702
490.0	6548.513	-69.1848	30.6661	81.27	-1.70	5322.8	81.90	-1.58	5728.9	1130129	175932
495.0	6547.714	-68.9149	30.7014	81.44	-1.71	5415.9	82.05	-1.59	5822.0	1156237	175145
500.0	6546.897	-68.6400	30.7366	81.62	-1.72	5508.9	82.20	-1.60	5915.0	1182802	174340
505.0	6546.065	-68.3602	30.7716	81.80	-1.72	5602.3	82.35	-1.60	6008.3	1209823	173519
510.0	6545.217	-68.0754	30.8065	81.98	-1.72	5694.3	82.52	-1.61	6100.3	1237299	172682
515.0	6544.355	-67.7857	30.8412	82.16	-1.72	5785.2	82.68	-1.60	6191.1	1265223	171832
520.0	6543.488	-67.4912	30.8756	82.35	-1.69	5876.9	82.85	-1.58	6282.8	1293594	170976
525.0	6542.622	-67.1918	30.9097	82.53	-1.65	5968.4	83.01	-1.55	6374.3	1322416	170122
530.0	6541.769	-66.8874	30.9435	82.71	-1.60	6060.5	83.17	-1.50	6466.3	1351688	169280
535.0	6540.940	-66.5781	30.9770	82.89	-1.51	6153.5	83.34	-1.42	6559.3	1381416	168462
540.0	6540.154	-66.2637	31.0102	83.08	-1.39	6247.4	83.50	-1.30	6653.2	1411603	167687
545.0	6539.432	-65.9443	31.0430	83.26	-1.24	6342.9	83.67	-1.16	6748.7	1442257	166976
550.0	6538.783	-65.6197	31.0754	83.45	-1.10	6440.6	83.84	-1.03	6846.4	1473386	166337
555.0	6538.194	-65.2897	31.1073	83.65	-0.98	6542.2	84.02	-0.93	6948.0	1505005	165759
560.0	6537.659	-64.9542	31.1388	83.85	-0.88	6646.5	84.20	-0.83	7052.2	1537129	165234
565.0	6537.180	-64.6131	31.1698	84.05	-0.76	6753.2	84.39	-0.71	7158.9	1569771	164766
570.0	6536.768	-64.2662	31.2002	84.25	-0.63	6862.3	84.57	-0.60	7268.1	1602942	164364
575.0	6536.424	-63.9134	31.2300	84.46	-0.51	6974.9	84.76	-0.48	7380.7	1636655	164029
580.0	6536.144	-63.5545	31.2593	84.67	-0.40	7090.8	84.96	-0.38	7496.5	1670927	163759
585.0	6535.936	-63.1893	31.2878	84.89	-0.26	7209.7	85.16	-0.25	7615.4	1705773	163561
590.0	6535.813	-62.8178	31.3156	85.10	-0.12	7331.9	85.36	-0.12	7737.7	1741207	163447
S-IVB GUIDANCE CUTOFF											
593.340	6535.783	-62.5659	31.3337	85.25	-0.01	7415.0	85.50	-0.01	7820.8	1765212	163423
595.0	6535.783	-62.4399	31.3426	85.32	0.00	7422.2	85.57	0.00	7828.0	1777221	163426
600.0	6535.785	-62.0601	31.3685	85.54	0.00	7422.6	85.77	0.00	7828.4	1813398	163437
ORBIT INSERTION											
603.340	6535.787	-61.8063	31.3851	85.69	0.01	7422.7	85.91	0.00	7828.5	1837565	163444
605.0	6535.788	-61.6801	31.3931	85.76	0.01	7422.7	85.98	0.01	7828.4	1849576	163448
610.0	6535.792	-61.2998	31.4165	85.98	0.01	7422.7	86.19	0.01	7828.5	1885754	163460
620.0	6535.804	-60.5388	31.4596	86.43	0.01	7423.2	86.61	0.01	7828.9	1958113	163486
630.0	6535.820	-59.7770	31.4976	86.87	0.01	7423.6	87.03	0.01	7829.4	2030475	163515

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TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
640.0	6535.841	-59.0146	31.5306	87.31	0.02	7423.9	87.45	0.02	7829.7	2102841	163547
650.0	6535.866	-58.2516	31.5586	87.76	0.02	7423.8	87.88	0.02	7829.6	2175209	163581
660.0	6535.896	-57.4882	31.5815	88.21	0.02	7423.8	88.30	0.02	7829.6	2247576	163618
670.0	6535.930	-56.7244	31.5993	88.65	0.03	7423.7	88.72	0.03	7829.5	2319941	163659
680.0	6535.969	-55.9604	31.6121	89.10	0.03	7423.7	89.15	0.03	7829.5	2392306	163702
690.0	6536.013	-55.1962	31.6198	89.54	0.04	7423.6	89.57	0.03	7829.4	2464670	163748
700.0	6536.061	-54.4320	31.6224	89.99	0.04	7423.5	89.99	0.04	7829.4	2537033	163797
710.0	6536.113	-53.6678	31.6200	90.44	0.04	7423.4	90.42	0.04	7829.3	2609395	163849
720.0	6536.170	-52.9036	31.6125	90.89	0.05	7423.4	90.84	0.04	7829.2	2681756	163903
730.0	6536.232	-52.1397	31.5999	91.33	0.05	7423.3	91.26	0.05	7829.1	2754115	163961
740.0	6536.298	-51.3760	31.5822	91.78	0.05	7423.2	91.69	0.05	7829.0	2826473	164021
750.0	6536.369	-50.6127	31.5595	92.22	0.06	7423.1	92.11	0.05	7829.0	2898829	164084
760.0	6536.444	-49.8498	31.5318	92.67	0.06	7423.0	92.53	0.06	7828.9	2971183	164150
770.0	6536.524	-49.0875	31.4989	93.11	0.06	7422.9	92.95	0.06	7828.8	3043536	164219
780.0	6536.608	-48.3259	31.4611	93.56	0.07	7422.8	93.37	0.06	7828.7	3115888	164290
790.0	6536.696	-47.5649	31.4182	94.00	0.07	7422.7	93.79	0.07	7828.6	3188237	164364
800.0	6536.789	-46.8047	31.3704	94.44	0.07	7422.6	94.21	0.07	7828.5	3260585	164442
810.0	6536.887	-46.0454	31.3175	94.88	0.08	7422.5	94.63	0.07	7828.3	3332930	164521
820.0	6536.989	-45.2871	31.2596	95.32	0.08	7422.4	95.04	0.08	7828.2	3405274	164604
830.0	6537.095	-44.5299	31.1968	95.76	0.08	7422.3	95.46	0.08	7828.1	3477615	164690
840.0	6537.205	-43.7737	31.1291	96.20	0.09	7422.2	95.87	0.08	7828.0	3549954	164778
850.0	6537.320	-43.0188	31.0564	96.63	0.09	7422.1	96.29	0.09	7827.8	3622291	164869
860.0	6537.440	-42.2652	30.9789	97.06	0.09	7421.9	96.70	0.09	7827.7	3694625	164962
870.0	6537.563	-41.5129	30.8964	97.50	0.10	7421.8	97.11	0.09	7827.6	3766957	165059
880.0	6537.691	-40.7620	30.8092	97.93	0.10	7421.7	97.51	0.10	7827.4	3839287	165158
890.0	6537.823	-40.0127	30.7171	98.36	0.10	7421.6	97.92	0.10	7827.3	3911614	165260
900.0	6537.960	-39.2649	30.6202	98.78	0.11	7421.4	98.32	0.10	7827.1	3983938	165364
910.0	6538.100	-38.5189	30.5185	99.21	0.11	7421.3	98.72	0.10	7827.0	4056259	165471
920.0	6538.245	-37.7745	30.4121	99.63	0.11	7421.1	99.12	0.11	7826.8	4128578	165581
930.0	6538.394	-37.0319	30.3010	100.05	0.12	7421.0	99.52	0.11	7826.6	4200893	165694
940.0	6538.547	-36.2911	30.1852	100.46	0.12	7420.8	99.92	0.11	7826.5	4273206	165809
950.0	6538.704	-35.5523	30.0648	100.88	0.12	7420.7	100.31	0.12	7826.3	4345516	165927
960.0	6538.865	-34.8155	29.9398	101.29	0.13	7420.5	100.70	0.12	7826.1	4417822	166048
970.0	6539.031	-34.0806	29.8102	101.70	0.13	7420.4	101.09	0.12	7825.9	4490126	166172
980.0	6539.200	-33.3479	29.6761	102.11	0.13	7420.2	101.47	0.13	7825.8	4562426	166298
990.0	6539.373	-32.6173	29.5375	102.51	0.14	7420.0	101.86	0.13	7825.6	4634722	166427
1000.0	6539.551	-31.8889	29.3944	102.91	0.14	7419.9	102.23	0.13	7825.4	4707015	166558
1010.0	6539.732	-31.1627	29.2469	103.31	0.14	7419.7	102.61	0.13	7825.2	4779305	166692
1020.0	6539.917	-30.4388	29.0950	103.71	0.14	7419.5	102.99	0.14	7825.0	4851591	166829
1030.0	6540.106	-29.7173	28.9388	104.10	0.15	7419.3	103.36	0.14	7824.8	4923873	166969
1040.0	6540.299	-28.9981	28.7784	104.49	0.15	7419.2	103.73	0.14	7824.6	4996152	167111
1050.0	6540.496	-28.2814	28.6136	104.88	0.15	7419.0	104.09	0.15	7824.4	5068427	167256
1060.0	6540.697	-27.5670	28.4447	105.26	0.16	7418.8	104.45	0.15	7824.1	5140698	167403
1070.0	6540.901	-26.8552	28.2715	105.64	0.16	7418.6	104.81	0.15	7823.9	5212964	167553

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TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
1080.0	6541.109	-26.1459	28.0943	106.02	0.16	7418.4	105.17	0.15	7823.7	5285227	167706
1090.0	6541.320	-25.4392	27.9130	106.36	0.16	7418.2	105.52	0.16	7823.5	5357486	167861
1100.0	6541.536	-24.7350	27.7276	106.76	0.17	7418.0	105.87	0.16	7823.2	5429740	168019
1110.0	6541.755	-24.0335	27.5383	107.13	0.17	7417.8	106.21	0.16	7823.0	5501990	168180
1120.0	6541.977	-23.3346	27.3450	107.49	0.17	7417.6	106.56	0.16	7822.8	5574236	168343
1130.0	6542.203	-22.6383	27.1479	107.85	0.18	7417.4	106.90	0.17	7822.5	5646477	168509
1140.0	6542.433	-21.9448	26.9469	108.20	0.18	7417.2	107.23	0.17	7822.3	5718714	168678
1150.0	6542.666	-21.2539	26.7421	108.56	0.18	7417.0	107.56	0.17	7822.0	5790946	168849
1160.0	6542.902	-20.5657	26.5336	108.90	0.18	7416.7	107.89	0.17	7821.8	5863173	169023
1170.0	6543.142	-19.8803	26.3213	109.25	0.19	7416.5	108.21	0.18	7821.5	5935396	169199
1180.0	6543.385	-19.1976	26.1055	109.59	0.19	7416.3	108.54	0.18	7821.3	6007613	169378
1190.0	6543.631	-18.5176	25.8860	109.92	0.19	7416.0	108.85	0.18	7821.0	6079826	169560
1200.0	6543.881	-17.8404	25.6629	110.26	0.19	7415.8	109.17	0.18	7820.7	6152034	169744
1210.0	6544.134	-17.1660	25.4364	110.59	0.20	7415.6	109.48	0.19	7820.5	6224236	169931
1220.0	6544.390	-16.4943	25.2064	110.91	0.20	7415.3	109.78	0.19	7820.2	6296434	170120
1230.0	6544.649	-15.8254	24.9731	111.23	0.20	7415.1	110.08	0.19	7819.9	6368626	170312
1240.0	6544.911	-15.1592	24.7363	111.55	0.20	7414.9	110.38	0.19	7819.6	6440813	170507
1250.0	6545.176	-14.4959	24.4963	111.86	0.21	7414.6	110.68	0.20	7819.3	6512994	170704
1260.0	6545.445	-13.8353	24.2530	112.17	0.21	7414.3	110.97	0.20	7819.1	6585170	170904
1270.0	6545.716	-13.1774	24.0065	112.48	0.21	7414.1	111.25	0.20	7818.8	6657340	171106
1280.0	6545.990	-12.5223	23.7569	112.78	0.21	7413.8	111.54	0.20	7818.5	6729504	171311
1290.0	6546.267	-11.8700	23.5041	113.07	0.22	7413.6	111.82	0.20	7818.2	6801663	171518
1300.0	6546.547	-11.2203	23.2483	113.37	0.22	7413.3	112.09	0.21	7817.9	6873816	171728
1310.0	6546.829	-10.5734	22.9896	113.65	0.22	7413.0	112.36	0.21	7817.6	6945962	171941
1320.0	6547.114	-9.9293	22.7278	113.94	0.22	7412.8	112.63	0.21	7817.3	7018103	172156
1330.0	6547.402	-9.2878	22.4632	114.22	0.22	7412.5	112.89	0.21	7817.0	7090238	172374
1340.0	6547.693	-8.6490	22.1957	114.50	0.23	7412.2	113.15	0.21	7816.6	7162366	172594
1350.0	6547.986	-8.0128	21.9254	114.77	0.23	7411.9	113.41	0.22	7816.3	7234489	172816
1360.0	6548.282	-7.3793	21.6524	115.04	0.23	7411.7	113.66	0.22	7816.0	7306605	173042
1370.0	6548.580	-6.7484	21.3766	115.30	0.23	7411.4	113.91	0.22	7815.7	7378714	173269
1380.0	6548.880	-6.1202	21.0982	115.56	0.23	7411.1	114.15	0.22	7815.4	7450817	173499
1390.0	6549.183	-5.4945	20.8172	115.81	0.24	7410.8	114.39	0.22	7815.0	7522913	173732
1400.0	6549.489	-4.8713	20.5337	116.07	0.24	7410.5	114.62	0.22	7814.7	7595003	173967
1410.0	6549.796	-4.2507	20.2476	116.31	0.24	7410.2	114.86	0.23	7814.4	7667085	174205
1420.0	6550.106	-3.6326	19.9591	116.56	0.24	7409.9	115.08	0.23	7814.0	7739161	174445
1430.0	6550.418	-3.0170	19.6681	116.79	0.24	7409.6	115.31	0.23	7813.7	7811230	174687
1440.0	6550.732	-2.4039	19.3749	117.03	0.24	7409.3	115.53	0.23	7813.4	7883292	174932
1450.0	6551.049	-1.7932	19.0793	117.26	0.25	7409.0	115.74	0.23	7813.0	7955347	175179
1460.0	6551.367	-1.1848	18.7814	117.48	0.25	7408.7	115.95	0.23	7812.7	8027395	175429
1470.0	6551.687	-0.5789	18.4813	117.71	0.25	7408.3	116.16	0.24	7812.3	8099435	175681
1480.0	6552.009	0.0247	18.1790	117.92	0.25	7408.0	116.36	0.24	7812.0	8171468	175936
1490.0	6552.333	0.6261	17.8747	118.14	0.25	7407.7	116.56	0.24	7811.6	8243494	176193
1500.0	6552.659	1.2251	17.5682	118.35	0.25	7407.4	116.76	0.24	7811.3	8315512	176452
1510.0	6552.987	1.8219	17.2597	118.55	0.25	7407.0	116.95	0.24	7810.9	8387522	176714

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TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
1520.0	6553.316	2.4165	16.9492	118.75	0.26	7406.7	117.14	0.24	7810.6	8459525	176978
1530.0	6553.647	3.0090	16.6368	118.95	0.26	7406.4	117.32	0.24	7810.2	8531520	177244
1540.0	6553.980	3.5993	16.3225	119.14	0.26	7406.0	117.50	0.24	7809.8	8603507	177513
1550.0	6554.314	4.1875	16.0064	119.33	0.26	7405.7	117.68	0.25	7809.5	8675487	177783
1560.0	6554.650	4.7736	15.6884	119.51	0.26	7405.4	117.85	0.25	7809.1	8747458	178057
1570.0	6554.987	5.3577	15.3687	119.69	0.26	7405.0	118.02	0.25	7808.7	8819421	178332
1580.0	6555.326	5.9398	15.0473	119.87	0.26	7404.7	118.18	0.25	7808.3	8891376	178610
1590.0	6555.666	6.5200	14.7241	120.04	0.26	7404.3	118.34	0.25	7808.0	8963323	178889
1600.0	6556.007	7.0983	14.3994	120.21	0.26	7404.0	118.50	0.25	7807.6	9035261	179171
1610.0	6556.350	7.6747	14.0731	120.37	0.27	7403.6	118.65	0.25	7807.2	9107191	179456
1620.0	6556.693	8.2492	13.7453	120.53	0.27	7403.2	118.80	0.25	7806.8	9179113	179742
1630.0	6557.038	8.8220	13.4159	120.69	0.27	7402.9	118.95	0.25	7806.4	9251026	180030
1640.0	6557.384	9.3930	13.0851	120.84	0.27	7402.5	119.09	0.25	7806.1	9322931	180321
1650.0	6557.731	9.9623	12.7529	120.99	0.27	7402.1	119.22	0.26	7805.7	9394826	180614
1660.0	6558.079	10.5299	12.4193	121.13	0.27	7401.8	119.36	0.26	7805.3	9466713	180908
1670.0	6558.428	11.0960	12.0844	121.27	0.27	7401.4	119.49	0.26	7804.9	9538592	181205
1680.0	6558.777	11.6604	11.7482	121.40	0.27	7401.0	119.61	0.26	7804.5	9610461	181504
1690.0	6559.128	12.2232	11.4108	121.53	0.27	7400.7	119.73	0.26	7804.1	9682321	181804
1700.0	6559.479	12.7846	11.0721	121.66	0.27	7400.3	119.85	0.26	7803.7	9754172	182107
1710.0	6559.831	13.3445	10.7323	121.78	0.27	7399.9	119.97	0.26	7803.3	9826015	182412
1720.0	6560.184	13.9030	10.3914	121.90	0.27	7399.5	120.08	0.26	7802.9	9897848	182718
1730.0	6560.537	14.4601	10.0494	122.02	0.27	7399.1	120.18	0.26	7802.5	9969671	183027
1740.0	6560.891	15.0159	9.7064	122.13	0.27	7398.7	120.29	0.26	7802.1	10041486	183337
1750.0	6561.245	15.5704	9.3623	122.23	0.27	7398.3	120.38	0.26	7801.7	10113291	183649
1760.0	6561.600	16.1236	9.0173	122.34	0.27	7397.9	120.48	0.26	7801.3	10185086	183963
1770.0	6561.955	16.6757	8.6714	122.44	0.28	7397.6	120.57	0.26	7800.9	10256873	184279
1780.0	6562.310	17.2266	8.3246	122.53	0.28	7397.2	120.66	0.26	7800.5	10328649	184596
1790.0	6562.666	17.7763	7.9769	122.62	0.28	7396.8	120.74	0.26	7800.1	10400416	184915
1800.0	6563.022	18.3250	7.6285	122.71	0.28	7396.3	120.82	0.26	7799.7	10472174	185236
1810.0	6563.378	18.8727	7.2793	122.79	0.28	7395.9	120.90	0.26	7799.3	10543921	185558
1820.0	6563.734	19.4194	6.9293	122.87	0.28	7395.5	120.97	0.26	7798.9	10615659	185882
1830.0	6564.091	19.9651	6.5787	122.94	0.28	7395.1	121.04	0.26	7798.5	10687387	186208
1840.0	6564.447	20.5100	6.2274	123.01	0.28	7394.7	121.11	0.26	7798.1	10759105	186535
1850.0	6564.803	21.0540	5.8756	123.08	0.28	7394.3	121.17	0.26	7797.6	10830813	186864
1860.0	6565.159	21.5972	5.5231	123.14	0.28	7393.9	121.23	0.26	7797.2	10902511	187194
1870.0	6565.515	22.1396	5.1701	123.20	0.28	7393.5	121.28	0.26	7796.8	10974199	187525
1880.0	6565.871	22.6814	4.8166	123.26	0.28	7393.1	121.33	0.26	7796.4	11045877	187858
1890.0	6566.226	23.2224	4.4627	123.31	0.28	7392.6	121.38	0.26	7796.0	11117544	188192
1900.0	6566.582	23.7628	4.1083	123.36	0.28	7392.2	121.43	0.26	7795.6	11189202	188527
1910.0	6566.936	24.3027	3.7535	123.40	0.27	7391.8	121.47	0.26	7795.2	11260849	188864
1920.0	6567.291	24.8420	3.3984	123.44	0.27	7391.4	121.50	0.26	7794.7	11332486	189202
1930.0	6567.645	25.3808	3.0430	123.47	0.27	7390.9	121.53	0.26	7794.3	11404113	189541
1940.0	6567.998	25.9192	2.6873	123.51	0.27	7390.5	121.56	0.26	7793.9	11475729	189881
1950.0	6568.351	26.4572	2.3314	123.53	0.27	7390.1	121.59	0.26	7793.5	11547335	190222

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TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
1960.0	6568.703	26.9948	1.9753	123.56	0.27	7389.7	121.61	0.26	7793.1	11618930	190564
1970.0	6569.055	27.5321	1.6190	123.58	0.27	7389.2	121.63	0.26	7792.7	11690515	190907
1980.0	6569.406	28.0691	1.2626	123.59	0.27	7388.8	121.64	0.26	7792.3	11762090	191252
1990.0	6569.756	28.6060	0.9061	123.60	0.27	7388.4	121.65	0.26	7791.8	11833653	191597
2000.0	6570.105	29.1426	0.5495	123.61	0.27	7387.9	121.66	0.26	7791.4	11905207	191943
2010.0	6570.454	29.6791	0.1929	123.62	0.27	7387.5	121.67	0.26	7791.0	11976749	192289
2020.0	6570.801	30.2156	-0.1637	123.62	0.27	7387.1	121.67	0.26	7790.6	12048281	192637
2030.0	6571.148	30.7520	-0.5202	123.61	0.27	7386.6	121.66	0.25	7790.2	12119803	192985
2040.0	6571.493	31.2883	-0.8766	123.61	0.27	7386.2	121.66	0.25	7789.8	12191313	193334
2050.0	6571.838	31.8248	-1.2329	123.59	0.27	7385.7	121.64	0.25	7789.3	12262813	193683
2060.0	6572.181	32.3613	-1.5890	123.58	0.27	7385.3	121.63	0.25	7788.9	12334302	194033
2070.0	6572.523	32.8980	-1.9449	123.56	0.26	7384.9	121.61	0.25	7788.5	12405781	194383
2080.0	6572.864	33.4349	-2.3006	123.54	0.26	7384.4	121.59	0.25	7788.1	12477248	194734
2090.0	6573.204	33.9720	-2.6561	123.51	0.26	7384.0	121.57	0.25	7787.7	12548705	195085
2100.0	6573.542	34.5093	-3.0112	123.48	0.26	7383.5	121.54	0.25	7787.3	12620151	195437
2110.0	6573.879	35.0470	-3.3659	123.45	0.26	7383.1	121.50	0.25	7786.9	12691586	195789
2120.0	6574.215	35.5850	-3.7203	123.41	0.26	7382.7	121.47	0.25	7786.5	12763010	196141
2130.0	6574.549	36.1235	-4.0743	123.36	0.26	7382.2	121.43	0.25	7786.0	12834424	196493
2140.0	6574.882	36.6624	-4.4278	123.32	0.26	7381.8	121.39	0.24	7785.6	12905826	196845
2150.0	6575.213	37.2018	-4.7808	123.27	0.26	7381.3	121.34	0.24	7785.2	12977218	197197
2160.0	6575.542	37.7417	-5.1333	123.21	0.26	7380.9	121.29	0.24	7784.8	13048599	197550
2170.0	6575.870	38.2822	-5.4852	123.16	0.25	7380.4	121.23	0.24	7784.4	13119969	197902
2180.0	6576.196	38.8234	-5.8365	123.09	0.25	7379.0	121.18	0.24	7784.0	13191328	198254
2190.0	6576.521	39.3652	-6.1872	123.03	0.25	7378.6	121.12	0.24	7783.6	13262675	198606
2200.0	6576.844	39.9078	-6.5372	122.96	0.25	7379.1	121.05	0.24	7783.2	13334012	198958
2210.0	6577.165	40.4511	-6.8865	122.89	0.25	7378.7	120.98	0.24	7782.8	13405339	199309
2220.0	6577.484	40.9952	-7.2351	122.81	0.25	7378.2	120.91	0.23	7782.4	13476654	199660
2230.0	6577.801	41.5401	-7.5829	122.73	0.25	7377.8	120.83	0.23	7782.0	13547958	200011
2240.0	6578.116	42.0860	-7.9298	122.64	0.24	7377.3	120.75	0.23	7781.6	13619251	200361
2250.0	6578.429	42.6327	-8.2759	122.55	0.24	7376.9	120.67	0.23	7781.2	13690534	200710
2260.0	6578.741	43.1805	-8.6211	122.46	0.24	7376.5	120.58	0.23	7780.8	13761805	201059
2270.0	6579.050	43.7293	-8.9653	122.36	0.24	7376.0	120.49	0.23	7780.4	13833065	201407
2280.0	6579.357	44.2791	-9.3086	122.26	0.24	7375.6	120.40	0.23	7780.0	13904315	201755
2290.0	6579.662	44.8301	-9.6508	122.16	0.24	7375.1	120.30	0.22	7779.7	13975554	202101
2300.0	6579.965	45.3822	-9.9920	122.05	0.23	7374.7	120.20	0.22	7779.3	14046781	202447
2310.0	6580.265	45.9355	-10.3322	121.93	0.23	7374.3	120.09	0.22	7778.9	14117998	202792
2320.0	6580.563	46.4900	-10.6711	121.82	0.23	7373.8	119.99	0.22	7778.5	14189204	203136
2330.0	6580.859	47.0458	-11.0090	121.70	0.23	7373.4	119.87	0.22	7778.1	14260398	203479
2340.0	6581.153	47.6029	-11.3456	121.57	0.23	7373.0	119.76	0.22	7777.8	14331582	203820
2350.0	6581.444	48.1614	-11.6810	121.44	0.23	7372.5	119.64	0.21	7777.4	14402755	204161
2360.0	6581.733	48.7212	-12.0150	121.31	0.22	7372.1	119.51	0.21	7777.0	14473917	204500
2370.0	6582.020	49.2825	-12.3478	121.17	0.22	7371.7	119.38	0.21	7776.6	14545068	204838
2380.0	6582.304	49.8453	-12.6792	121.03	0.22	7371.3	119.25	0.21	7776.3	14616208	205174
2390.0	6582.585	50.4096	-13.0092	120.89	0.22	7370.8	119.12	0.21	7775.9	14687337	205509

TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
2400.0	6582.864	50.9755	-13.3378	120.74	0.22	7370.4	118.98	0.20	7775.5	14758456	205843
2410.0	6583.140	51.5430	-13.6648	120.59	0.21	7370.0	118.84	0.20	7775.2	14829563	206175
2420.0	6583.413	52.1121	-13.9904	120.43	0.21	7369.6	118.69	0.20	7774.8	14900659	206505
2430.0	6583.684	52.6829	-14.3144	120.27	0.21	7369.2	118.54	0.20	7774.5	14971744	206833
2440.0	6583.952	53.2554	-14.6367	120.10	0.21	7368.8	118.39	0.20	7774.1	15042818	207160
2450.0	6584.218	53.8297	-14.9575	119.93	0.21	7368.3	118.23	0.19	7773.8	15113881	207485
2460.0	6584.481	54.4057	-15.2765	119.76	0.20	7367.9	118.07	0.19	7773.4	15184933	207808
2470.0	6584.741	54.9836	-15.5938	119.58	0.20	7367.5	117.90	0.19	7773.1	15255974	208129
2480.0	6584.998	55.5633	-15.9094	119.40	0.20	7367.1	117.73	0.19	7772.7	15327003	208448
2490.0	6585.252	56.1450	-16.2231	119.22	0.20	7366.7	117.56	0.19	7772.4	15398022	208764
2500.0	6585.503	56.7286	-16.5349	119.03	0.19	7366.3	117.38	0.18	7772.1	15469029	209079
2510.0	6585.751	57.3141	-16.8449	118.84	0.19	7365.9	117.20	0.18	7771.7	15540025	209391
2520.0	6585.997	57.9017	-17.1530	118.64	0.19	7365.5	117.02	0.18	7771.4	15611010	209701
2530.0	6586.239	58.4913	-17.4590	118.44	0.19	7365.2	116.83	0.18	7771.1	15681983	210009
2540.0	6586.479	59.0829	-17.7630	118.23	0.19	7364.8	116.64	0.18	7770.8	15752944	210314
2550.0	6586.715	59.6767	-18.0650	118.02	0.18	7364.4	116.44	0.17	7770.4	15823895	210616
2560.0	6586.948	60.2726	-18.3648	117.81	0.18	7364.0	116.24	0.17	7770.1	15894833	210916
2570.0	6587.178	60.8707	-18.6625	117.59	0.18	7363.6	116.04	0.17	7769.8	15965759	211214
2580.0	6587.405	61.4710	-18.9580	117.37	0.18	7363.3	115.83	0.17	7769.5	16036674	211508
2590.0	6587.629	62.0735	-19.2512	117.14	0.17	7362.9	115.62	0.16	7769.2	16107576	211800
2600.0	6587.850	62.6782	-19.5421	116.91	0.17	7362.5	115.40	0.16	7768.9	16178467	212089
2610.0	6588.067	63.2853	-19.8308	116.68	0.17	7362.2	115.18	0.16	7768.6	16249345	212375
2620.0	6588.281	63.8946	-20.1170	116.44	0.17	7361.8	114.96	0.16	7768.3	16320210	212658
2630.0	6588.492	64.5063	-20.4008	116.20	0.16	7361.4	114.73	0.15	7768.0	16391062	212938
2640.0	6588.700	65.1204	-20.6821	115.95	0.16	7361.1	114.50	0.15	7767.7	16461901	213215
2650.0	6588.904	65.7368	-20.9609	115.70	0.16	7360.7	114.27	0.15	7767.4	16532727	213489
2660.0	6589.105	66.3556	-21.2372	115.45	0.16	7360.4	114.03	0.15	7767.2	16603539	213759
2670.0	6589.302	66.9769	-21.5109	115.19	0.15	7360.1	113.79	0.14	7766.9	16674337	214026
2680.0	6589.497	67.6006	-21.7819	114.93	0.15	7359.7	113.54	0.14	7766.6	16745120	214290
2690.0	6589.687	68.2268	-22.0502	114.66	0.15	7359.4	113.29	0.14	7766.4	16815889	214550
2700.0	6589.875	68.8555	-22.3157	114.39	0.14	7359.1	113.04	0.14	7766.1	16886642	214807
2710.0	6590.059	69.4867	-22.5785	114.12	0.14	7358.7	112.78	0.13	7765.8	16957379	215061
2720.0	6590.239	70.1204	-22.8384	113.84	0.14	7358.4	112.52	0.13	7765.6	17028100	215311
2730.0	6590.416	70.7566	-23.0955	113.56	0.14	7358.1	112.25	0.13	7765.3	17098803	215557
2740.0	6590.590	71.3954	-23.3496	113.27	0.13	7357.8	111.98	0.13	7765.1	17169489	215799
2750.0	6590.759	72.0367	-23.6008	112.98	0.13	7357.5	111.71	0.12	7764.8	17240156	216038
2760.0	6590.926	72.6807	-23.8489	112.68	0.13	7357.2	111.43	0.12	7764.6	17310804	216273
2770.0	6591.088	73.3272	-24.0940	112.39	0.13	7356.9	111.15	0.12	7764.4	17381430	216503
2780.0	6591.248	73.9762	-24.3359	112.08	0.12	7356.6	110.87	0.12	7764.2	17452035	216730
2790.0	6591.403	74.6279	-24.5747	111.78	0.12	7356.3	110.58	0.11	7763.9	17522616	216953
2800.0	6591.555	75.2822	-24.8103	111.47	0.12	7356.1	110.29	0.11	7763.7	17593173	217172
2810.0	6591.703	75.9391	-25.0426	111.15	0.11	7355.8	109.99	0.11	7763.5	17663704	217387
2820.0	6591.848	76.5986	-25.2717	110.84	0.11	7355.5	109.69	0.11	7763.3	17734206	217598
2830.0	6591.989	77.2607	-25.4974	110.51	0.11	7355.2	109.39	0.10	7763.1	17804678	217804

TABLE XIII  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S	HEAD DEG	FLT-PATH DEG	SF VEL M/S	RANGE M	ALTITUDE M
2840.0	6592.126	77.9254	-25.7197	110.19	0.11	7355.0	109.09	0.10	7762.9	17875116	218006
2850.0	6592.260	78.5927	-25.9385	109.86	0.10	7354.7	108.78	0.10	7762.7	17945519	218204
2860.0	6592.389	79.2625	-26.1539	109.53	0.10	7354.5	108.46	0.09	7762.5	18015884	218397
2870.0	6592.515	79.9350	-26.3658	109.19	0.10	7354.2	108.15	0.09	7762.3	18086205	218586
2880.0	6592.638	80.6100	-26.5740	108.85	0.09	7354.0	107.83	0.09	7762.1	18156479	218771
2890.0	6592.756	81.2876	-26.7787	108.51	0.09	7353.8	107.50	0.09	7762.0	18226702	218951
2900.0	6592.871	81.9678	-26.9797	108.16	0.09	7353.6	107.17	0.08	7761.8	18296867	219126
2910.0	6592.982	82.6505	-27.1770	107.81	0.08	7353.3	106.84	0.08	7761.6	18366967	219297
2920.0	6593.089	83.3357	-27.3705	107.46	0.08	7353.1	106.51	0.08	7761.5	18436994	219463
2930.0	6593.193	84.0234	-27.5603	107.10	0.08	7352.9	106.17	0.07	7761.3	18506939	219625
2940.0	6593.292	84.7136	-27.7462	106.74	0.08	7352.7	105.83	0.07	7761.1	18576790	219782
2950.0	6593.388	85.4062	-27.9282	106.37	0.07	7352.5	105.49	0.07	7761.0	18646534	219934
2960.0	6593.480	86.1013	-28.1063	106.00	0.07	7352.3	105.14	0.07	7760.9	18716154	220081
2970.0	6593.568	86.7987	-28.2805	105.63	0.07	7352.2	104.79	0.06	7760.7	18785628	220223
2980.0	6593.652	87.4986	-28.4506	105.26	0.06	7352.0	104.44	0.06	7760.6	18854933	220360
2990.0	6593.732	88.2008	-28.6167	104.88	0.06	7351.8	104.08	0.06	7760.5	18924036	220493
3000.0	6593.808	88.9053	-28.7787	104.50	0.06	7351.6	103.72	0.05	7760.3	18992896	220620
3010.0	6593.881	89.6120	-28.9365	104.12	0.05	7351.5	103.36	0.05	7760.2	19061462	220743
3020.0	6593.950	90.3211	-29.0902	103.73	0.05	7351.3	103.00	0.05	7760.1	19129668	220860
3030.0	6594.014	91.0323	-29.2397	103.34	0.05	7351.2	102.63	0.05	7760.0	19197422	220973
3040.0	6594.075	91.7456	-29.3850	102.95	0.05	7351.0	102.26	0.04	7759.9	19264606	221080
3050.0	6594.132	92.4611	-29.5260	102.55	0.04	7350.9	101.88	0.04	7759.8	19331051	221182
3060.0	6594.185	93.1787	-29.6626	102.16	0.04	7350.8	101.51	0.04	7759.7	19396524	221279
3070.0	6594.234	93.8983	-29.7949	101.76	0.04	7350.7	101.13	0.03	7759.7	19460683	221371
3080.0	6594.279	94.6198	-29.9228	101.35	0.03	7350.6	100.75	0.03	7759.6	19523021	221457
3090.0	6594.320	95.3433	-30.0463	100.95	0.03	7350.5	100.36	0.03	7759.5	19582760	221538
3100.0	6594.358	96.0686	-30.1654	100.54	0.03	7350.4	99.98	0.03	7759.4	19638681	221614
3110.0	6594.391	96.7958	-30.2800	100.13	0.02	7350.3	99.59	0.02	7759.4	19688851	221685
3120.0	6594.420	97.5247	-30.3900	99.72	0.02	7350.2	99.20	0.02	7759.3	19730275	221750
3130.0	6594.446	98.2553	-30.4955	99.30	0.02	7350.1	98.81	0.02	7759.3	19758778	221810
3140.0	6594.467	98.9875	-30.5964	98.89	0.02	7350.0	98.41	0.01	7759.2	19769914	221865
3150.0	6594.485	99.7213	-30.6928	98.47	0.01	7350.0	98.02	0.01	7759.2	19761432	221914
3160.0	6594.499	100.4566	-30.7845	98.05	0.01	7349.9	97.62	0.01	7759.1	19735062	221958
3170.0	6594.508	101.1934	-30.8715	97.62	0.01	7349.8	97.22	0.01	7759.1	19695110	221996
3180.0	6594.514	101.9315	-30.9539	97.20	0.00	7349.8	96.82	0.00	7759.1	19645887	222029
3190.0	6594.516	102.6710	-31.0315	96.77	-0.00	7349.8	96.41	-0.00	7759.1	19590560	222056
3200.0	6594.514	103.4117	-31.1045	96.35	-0.00	7349.7	96.01	-0.00	7759.1	19531192	222078
3210.0	6594.508	104.1535	-31.1727	95.92	-0.01	7349.7	95.60	-0.01	7759.1	19469087	222095
3220.0	6594.497	104.8965	-31.2361	95.49	-0.01	7349.7	95.20	-0.01	7759.1	19405073	222106
3230.0	6594.484	105.6404	-31.2948	95.05	-0.01	7349.7	94.79	-0.01	7759.1	19339688	222111
3235.242	6594.474	106.0308	-31.3236	94.83	-0.01	7349.7	94.57	-0.01	7759.1	19304991	222112

S-IVB/LM SEPARATION



TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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									
-4.956	113	0	0	0.0	0.0	0.0	0.00	0.00	0.00
-4.0	113	0	0	0.0	0.0	0.0	0.00	0.00	0.00
-3.0	113	0	0	0.0	0.0	0.0	0.00	0.00	0.00
-2.0	113	0	0	0.0	0.0	0.0	0.00	0.00	0.00
-1.0	113	0	0	0.0	0.0	0.0	0.00	0.00	0.00
RANGE ZERO AT 17 48 08 EST									
0.000	113	0	0	0.0	0.0	0.0	0.00	0.00	0.00
FIRST MOTION									
0.200	113	0	0	-0.0	-0.0	0.0	7.60	0.06	0.05
LIFTOFF									
0.360	113	0	0	1.2	0.0	0.0	7.74	0.06	0.04
1.0	116	0	0	6.3	0.0	0.0	8.24	0.03	0.02
2.0	126	0	0	14.9	0.0	0.0	8.84	-0.00	0.00
3.0	146	0	0	24.0	0.0	0.0	9.28	-0.02	-0.01
4.0	174	0	0	33.4	0.0	0.0	9.61	-0.04	-0.02
5.0	212	0	0	43.2	-0.0	0.0	9.87	-0.05	-0.02
6.0	260	0	0	53.1	-0.1	-0.0	10.09	-0.05	-0.02
7.0	319	0	1	63.3	-0.1	-0.0	10.30	-0.05	-0.01
8.0	387	0	1	73.7	-0.2	-0.0	10.51	-0.05	-0.01
9.0	466	0	1	84.4	-0.2	-0.0	10.73	-0.05	0.00
10.0	556	-0	1	95.2	-0.3	-0.0	10.96	-0.05	0.03
11.0	657	-0	1	106.3	-0.3	0.0	11.21	-0.05	0.06
12.0	768	-0	1	117.6	-0.4	0.1	11.48	-0.05	0.10
13.0	892	-1	1	129.3	-0.4	0.2	11.76	-0.05	0.16
14.0	1027	-2	1	141.2	-0.5	0.4	12.04	-0.04	0.23
15.0	1174	-2	2	153.3	-0.5	0.7	12.33	-0.03	0.32
16.0	1334	-3	3	165.8	-0.6	1.1	12.62	-0.02	0.43
17.0	1506	-3	4	178.6	-0.6	1.6	12.91	-0.01	0.56
18.0	1691	-4	6	191.6	-0.6	2.2	13.19	0.01	0.71
19.0	1889	-5	9	205.0	-0.5	3.0	13.46	0.04	0.87
20.0	2101	-6	13	218.5	-0.5	3.9	13.72	0.07	1.06

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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	DCZE FT/S SQ
21.0	2326	-6	17	232.4	-0.4	5.1	13.97	0.10	0.10	1.25
22.0	2565	-7	23	246.5	-0.3	6.5	14.22	0.14	0.14	1.46
23.0	2819	-7	30	260.8	-0.1	8.0	14.47	0.18	0.18	1.69
24.0	3087	-7	39	275.4	0.1	9.8	14.72	0.22	0.22	1.92
25.0	3370	-7	51	290.3	0.3	11.9	14.98	0.25	0.25	2.17
26.0	3668	-7	64	305.4	0.6	14.2	15.25	0.28	0.28	2.42
27.0	3981	-6	80	320.8	0.9	16.7	15.54	0.30	0.30	2.70
28.0	4309	-5	99	336.5	1.2	19.6	15.86	0.32	0.32	2.98
29.0	4653	-4	120	352.5	1.5	22.7	16.16	0.29	0.29	3.27
30.0	5014	-3	145	368.8	1.7	26.1	16.49	0.23	0.23	3.59
31.0	5391	-1	174	385.4	1.9	29.9	16.81	0.09	0.09	4.00
32.0	5785	0	206	402.5	1.9	34.2	17.12	-0.04	-0.04	4.46
33.0	6196	2	243	419.7	1.8	38.9	17.39	-0.14	-0.14	4.95
34.0	6624	4	286	437.2	1.7	44.0	17.72	-0.15	-0.15	5.40
35.0	7071	5	333	455.2	1.6	49.6	18.05	-0.07	-0.07	5.77
36.0	7535	7	386	473.3	1.6	55.6	18.31	0.06	0.06	6.12
37.0	8017	8	445	491.8	1.7	61.9	18.59	0.13	0.13	6.48
38.0	8518	10	511	510.5	1.8	68.5	18.91	0.17	0.17	6.88
39.0	9038	12	584	529.6	1.9	75.7	19.20	0.13	0.13	7.39
40.0	9578	14	664	548.9	2.1	83.3	19.45	0.10	0.10	7.94
41.0	10136	16	752	568.5	2.2	91.5	19.76	0.10	0.10	8.51
42.0	10715	18	849	588.5	2.3	100.4	20.15	0.17	0.17	9.14
43.0	11314	21	955	608.8	2.5	109.9	20.46	0.26	0.26	9.83
44.0	11933	23	1071	629.4	2.9	120.0	20.75	0.37	0.37	10.47
45.0	12573	26	1197	650.2	3.3	130.8	21.04	0.41	0.41	11.13
46.0	13234	30	1334	671.3	3.6	142.3	21.13	0.39	0.39	11.81
47.0	13916	34	1484	692.6	4.0	154.4	21.34	0.29	0.29	12.50
48.0	14619	38	1645	714.1	4.2	167.3	21.61	0.15	0.15	13.17
49.0	15345	42	1820	735.8	4.3	180.8	21.91	0.03	0.03	13.84
50.0	16090	46	2009	757.9	4.3	194.9	22.21	-0.03	-0.03	14.53
51.0	16859	50	2212	780.1	4.2	209.8	22.28	-0.03	-0.03	15.32
52.0	17651	54	2430	802.8	4.3	225.2	22.74	0.23	0.23	15.78
53.0	18465	59	2665	825.5	4.3	241.5	22.80	0.07	0.07	16.73
54.0	19302	63	2916	848.4	4.3	258.4	23.00	0.10	0.10	17.22
55.0	20163	67	3184	871.3	4.5	275.8	22.90	0.23	0.23	17.88
56.0	21046	72	3469	894.6	4.9	294.2	23.29	0.46	0.46	18.86
57.0	21952	77	3774	917.5	5.2	313.4	22.90	0.49	0.49	19.49
58.0	22882	82	4098	940.5	5.5	332.9	22.70	0.49	0.49	19.98
59.0	23834	88	4442	962.9	5.7	353.4	22.41	0.30	0.30	20.93
59.760	24573	92	4718	979.6	5.8	369.3	22.08	0.24	0.24	21.28

MACH ONE

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
60.0	24808	94	4807	984.9	5.8	374.4	22.01	0.20	21.46
61.0	25805	99	5193	1006.7	5.7	396.1	21.69	0.10	22.21
62.0	26823	105	5601	1028.3	5.6	418.5	21.72	-0.07	22.90
63.0	27863	111	6032	1050.4	6.1	441.3	22.08	0.69	23.23
64.0	28925	117	6485	1073.0	7.0	464.7	22.51	1.15	23.88
65.0	30010	124	6963	1095.7	7.7	489.1	22.70	0.79	25.00
66.0	31117	133	7465	1118.6	8.6	514.5	22.90	1.02	25.89
67.0	32249	142	7993	1141.8	9.5	540.6	23.20	1.15	26.64
68.0	33403	152	8548	1165.3	10.6	567.5	23.52	1.25	27.43
69.0	34581	163	9130	1189.2	11.8	595.4	23.75	1.48	28.61
70.0	35782	175	9740	1213.2	13.1	624.8	23.92	1.51	29.92
71.0	37008	189	10381	1237.2	14.7	655.3	24.24	1.62	31.17
MAX Q									
71.500	37630	197	10713	1249.4	15.5	671.1	24.47	1.55	31.75
72.0	38258	205	11053	1261.7	16.2	687.0	24.67	1.46	32.19
73.0	39533	221	11757	1286.7	17.4	719.5	25.17	0.97	32.97
74.0	40833	239	12494	1312.0	18.0	752.8	25.67	0.27	33.49
75.0	42159	257	13264	1338.0	18.0	786.5	26.20	-0.44	33.95
76.0	43510	275	14068	1364.4	17.2	820.9	26.72	-1.02	34.79
77.0	44889	291	14907	1391.3	15.9	856.2	27.02	-1.53	35.79
78.0	46294	307	15782	1418.3	14.3	892.7	27.18	-1.77	37.04
79.0	47727	320	16694	1445.6	12.6	930.4	27.34	-1.66	38.45
80.0	49187	332	17644	1473.2	11.3	969.4	27.75	-1.17	39.72
81.0	50675	343	18634	1501.3	10.4	1009.6	28.33	-0.56	40.73
82.0	52191	353	19665	1530.0	9.9	1050.8	29.02	-0.08	41.42
83.0	53736	363	20737	1559.2	9.9	1092.3	29.63	0.08	41.85
84.0	55311	373	21851	1588.9	10.0	1134.1	29.85	0.06	42.06
85.0	56915	383	23007	1618.9	10.1	1176.7	30.01	0.01	42.71
86.0	58550	393	24206	1649.1	10.1	1220.1	30.30	-0.01	43.91
87.0	60215	403	25449	1679.5	10.0	1264.7	30.56	-0.06	45.35
88.0	61910	413	26737	1710.2	10.0	1310.7	30.89	-0.09	46.84
89.0	63637	423	28071	1741.3	9.9	1358.1	31.13	-0.16	48.13
90.0	65394	433	29454	1772.5	9.7	1406.9	31.35	-0.25	49.29
91.0	67183	442	30887	1803.8	9.3	1456.8	31.39	-0.40	50.47
92.0	69003	451	32369	1835.2	8.9	1507.9	31.42	-0.52	51.79
93.0	70855	460	33904	1866.7	8.4	1560.3	31.54	-0.56	53.19
94.0	72738	468	35491	1898.5	7.8	1614.3	31.78	-0.53	54.50
95.0	74653	476	37133	1930.4	7.3	1669.5	32.08	-0.42	55.84
96.0	76600	483	38831	1962.5	6.9	1725.9	32.32	-0.28	57.03
97.0	78579	489	40586	1994.8	6.7	1783.4	32.37	-0.20	58.13
98.0	80591	496	42399	2027.3	6.6	1842.1	32.44	-0.12	59.26

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
99.0	82635	503	44271	2059.8	6.5	1902.0	32.56	-0.07	60.38
100.0	84711	509	46203	2092.5	6.4	1963.0	32.79	-0.07	61.58
101.0	86821	515	48198	2125.3	6.3	2025.1	33.05	-0.08	62.75
102.0	88963	522	50254	2158.5	6.2	2088.4	33.29	-0.10	63.86
103.0	91139	528	52375	2191.9	6.1	2152.8	33.52	-0.06	64.92
104.0	93348	534	54561	2225.6	6.1	2218.4	33.76	-0.03	66.14
105.0	95591	540	56813	2259.4	6.1	2285.0	33.97	0.04	67.29
106.0	97868	546	59132	2293.5	6.2	2352.9	34.21	0.14	68.42
107.0	100179	553	61519	2327.9	6.4	2421.9	34.51	0.21	69.59
108.0	102525	559	63976	2362.7	6.6	2492.3	35.01	0.27	70.95
109.0	104906	566	66504	2397.8	6.9	2563.8	35.36	0.25	72.22
110.0	107322	573	69105	2433.2	7.1	2636.5	35.63	0.20	73.41
111.0	109774	580	71778	2468.9	7.2	2710.6	35.75	0.14	74.58
112.0	112261	587	74526	2504.8	7.4	2785.7	35.87	0.13	75.73
113.0	114784	595	77350	2540.8	7.5	2862.2	36.12	0.13	77.07
114.0	117344	602	80251	2577.1	7.7	2939.9	36.48	0.12	78.55
115.0	119940	610	83231	2613.7	7.8	3019.1	36.79	0.14	79.91
116.0	122572	618	86290	2650.5	7.9	3099.6	36.96	0.10	81.07
117.0	125242	626	89431	2687.6	8.0	3181.3	37.05	0.05	82.23
118.0	127949	634	92653	2724.8	8.0	3264.4	37.33	0.01	83.72
119.0	130694	642	95960	2762.3	8.0	3348.9	37.60	-0.01	85.38
120.0	133476	650	99351	2800.0	8.0	3435.0	37.85	-0.03	86.96
121.0	136295	658	102830	2837.9	8.0	3522.7	38.00	-0.04	88.57
122.0	139153	666	106397	2875.9	7.9	3612.1	38.08	-0.02	90.14
123.0	142049	674	110054	2914.0	7.9	3702.9	38.10	-0.02	91.55
124.0	144983	682	113803	2952.1	7.9	3795.2	38.08	-0.03	92.96
125.0	147955	690	117645	2990.2	7.9	3889.0	38.13	-0.00	94.65
126.0	150965	697	121581	3028.3	7.9	3984.6	38.17	0.02	96.58
127.0	154013	705	125614	3066.6	7.9	4082.3	38.29	0.01	98.57
128.0	157100	713	129746	3105.0	7.9	4181.8	38.38	0.01	100.61
129.0	160225	721	133978	3143.3	7.9	4283.3	38.31	0.03	102.52
130.0	163386	728	138313	3181.4	7.9	4386.7	38.06	0.00	104.33
131.0	166586	736	142750	3219.2	7.9	4492.0	37.80	-0.04	106.30
132.0	169825	743	147294	3256.8	8.0	4598.9	37.63	0.13	108.10
133.0	173101	751	151946	3294.2	7.9	4708.3	37.40	0.03	110.30
134.0	176414	758	156708	3331.3	7.9	4819.8	37.14	0.03	112.50
135.0	179764	766	161583	3368.6	7.9	4933.1	37.27	0.03	114.34
136.0	183152	774	166572	3406.5	7.9	5048.1	37.93	0.07	115.85
137.0	186577	781	171676	3445.2	7.9	5164.5	38.78	0.10	117.29
138.0	190042	789	176897	3485.2	8.0	5282.4	39.90	0.07	118.41
138.970	193442	796	182075	3523.0	8.0	5396.9	40.94	0.10	119.16

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TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DDXF FT/S SQ	DCYE FT/S SQ	DCZE FT/S SQ
OEEO									
139.0	193548	796	182237	3524.2	8.0	5398.8	41.04	0.10	119.39
140.0	197084	804	187685	3540.2	8.2	5476.0	7.45	0.26	67.36
141.0	200628	812	193191	3546.6	8.4	5537.9	6.07	0.26	62.17
142.0	204177	821	198758	3549.5	8.6	5593.3	4.56	0.23	55.45
142.250	205065	823	200157	3549.8	8.6	5605.9	0.62	0.23	52.00
143.0	207726	829	204373	3535.2	8.8	5620.1	-18.14	0.20	21.92
S-1B/S-IVB SEPARATION SIGNAL									
143.500	209492	833	207186	3520.9	8.9	5621.7	-27.85	0.20	4.07
EBW FIRING (SEPARATION SIGNAL PLUS 0.07 SECONDS)									
143.570	209754	834	207552	3519.0	8.8	5621.9	-27.99	0.23	3.84
144.0	211264	837	209970	3505.9	8.7	5622.3	-28.44	0.23	1.64
145.0	214755	846	215592	3475.8	8.9	5622.9	-29.23	0.23	0.36
150.0	231787	891	243759	3349.0	9.0	5665.8	-20.57	-0.13	17.19
155.0	248290	933	272312	3254.7	7.3	5759.4	-18.27	-0.46	19.95
GUIDANCE INITIATION									
159.470	262655	962	298252	3173.7	5.6	5848.3	-18.02	-0.49	20.48
160.0	264335	965	301353	3164.3	5.4	5859.0	-17.98	-0.43	20.44
165.0	279932	990	330899	3074.0	5.4	5960.8	-18.37	0.39	20.93
170.0	295064	1031	360969	2977.9	10.7	6067.8	-19.52	1.12	21.72
175.0	309712	1098	391580	2881.7	16.5	6176.7	-18.99	1.25	21.87
180.0	323884	1197	422737	2786.9	22.9	6286.4	-18.98	1.25	22.02
185.0	337582	1327	454445	2692.7	29.2	6397.1	-18.78	1.26	22.33
190.0	350810	1489	486711	2598.5	35.9	6509.6	-18.81	1.38	22.59
195.0	363568	1686	519543	2504.3	42.7	6623.5	-18.89	1.34	22.98
200.0	375853	1918	552949	2409.6	50.4	6739.0	-18.99	1.74	23.23
205.0	387662	2193	586936	2313.7	60.2	6856.3	-19.27	2.14	23.72
210.0	398989	2522	621515	2217.0	71.4	6975.3	-19.41	2.30	23.91
215.0	409832	2908	656691	2120.0	82.9	7095.6	-19.40	2.34	24.18
220.0	420189	3351	692473	2022.9	94.6	7217.2	-19.48	2.34	24.43
225.0	430061	3854	728866	1925.9	106.6	7340.4	-19.34	2.41	24.80
230.0	439449	4417	765878	1829.3	118.6	7464.7	-19.31	2.40	25.09

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
235.0	448353	5041	803518	1732.5	130.9	7591.2	-19.34	2.52	25.44
240.0	456774	5726	841792	1635.6	143.4	7718.9	-19.39	2.54	25.68
245.0	464709	6475	880709	1538.4	156.0	7847.8	-19.48	2.52	25.93
250.0	472157	7287	920274	1441.1	168.7	7978.6	-19.43	2.54	26.36
255.0	479120	8163	960495	1344.0	181.7	8109.9	-19.36	2.63	26.37
260.0	485598	9104	1001378	1247.2	194.9	8243.7	-19.34	2.64	26.97
265.0	491593	10111	1042935	1150.7	208.2	8379.4	-19.28	2.69	27.24
270.0	497105	11186	1085173	1054.1	221.8	8516.2	-19.40	2.72	27.61
275.0	502133	12329	1128101	957.1	235.5	8655.4	-19.41	2.78	28.00
280.0	506676	13542	1171728	859.8	249.4	8795.9	-19.51	2.81	28.24
285.0	510731	14824	1216063	762.1	263.7	8938.3	-19.52	2.85	28.64
290.0	514298	16177	1261113	664.8	276.5	9082.1	-19.39	2.07	28.98
295.0	517380	17582	1306886	568.1	285.7	9227.3	-19.29	2.07	29.21
300.0	519979	19041	1353391	471.4	298.9	9374.9	-19.47	3.09	29.68
305.0	522092	20576	1400638	373.8	315.2	9524.5	-19.54	3.27	30.13
310.0	523717	22192	1448638	276.1	330.7	9676.2	-19.48	2.99	30.66
315.0	524854	23883	1497404	178.5	345.8	9830.2	-19.57	3.16	30.95
320.0	525502	25652	1546944	80.4	362.1	9986.4	-19.74	3.28	31.44
325.0	525656	27504	1597271	-18.5	378.6	10144.8	-19.78	3.28	31.88
330.0	525316	29438	1648395	-117.8	395.0	10305.0	-19.90	3.36	32.26
335.0	524479	31455	1700324	-217.1	411.9	10466.7	-19.88	3.38	32.62
340.0	523145	33557	1753068	-316.6	429.0	10631.7	-19.88	3.46	33.17
345.0	521313	35746	1806643	-416.1	446.5	10798.4	-19.88	3.53	33.60
350.0	518983	38022	1861056	-515.8	464.0	10967.5	-19.93	3.52	34.01
355.0	516155	40386	1916320	-615.6	481.5	11138.6	-20.00	3.55	34.53
360.0	512827	42838	1972447	-716.0	499.7	11312.7	-20.10	3.66	35.10
365.0	508996	45383	2029451	-816.4	518.1	11489.6	-20.12	3.72	35.90
370.0	504662	48019	2087349	-917.4	536.6	11669.6	-20.39	3.59	36.22
375.0	499820	50749	2146153	-1019.2	555.5	11852.6	-20.27	3.96	36.95
380.0	494469	53575	2205879	-1121.7	574.8	12038.6	-20.57	3.86	37.58
385.0	488602	56497	2266544	-1225.0	594.4	12227.8	-20.71	3.97	38.10
390.0	482218	59519	2328161	-1328.9	614.2	12419.2	-20.84	3.99	38.53
395.0	475312	62640	2390741	-1433.4	634.3	12613.6	-20.94	4.08	39.19
400.0	467884	65863	2454301	-1538.0	654.8	12811.0	-20.93	4.11	39.79
405.0	459931	69188	2518857	-1643.4	675.5	13012.2	-21.12	4.18	40.59
410.0	451450	72618	2584426	-1749.1	696.5	13216.2	-21.25	4.24	41.10
415.0	442439	76154	2651024	-1855.4	717.7	13423.6	-21.30	4.28	41.89
420.0	432895	79797	2718668	-1962.4	739.6	13634.6	-21.48	4.44	42.57
425.0	422815	83550	2787375	-2070.0	761.8	13849.2	-21.57	4.47	43.30
430.0	412194	87415	2857166	-2178.6	784.2	14068.0	-21.82	4.54	44.23
435.0	401027	91393	2928062	-2288.0	807.1	14291.5	-21.92	4.64	45.09
440.0	389312	95487	3000086	-2398.1	830.5	14519.0	-22.14	4.74	46.01
445.0	377044	99699	3073261	-2509.7	854.1	14751.9	-22.43	4.72	46.97
450.0	364214	104028	3147608	-2622.1	877.7	14987.6	-22.63	4.76	47.68

TABLE XIV  
EARTH-FIXED PLUMRLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
455.0	350820	108477	3223146	-2735.7	901.9	15228.6	-22.78	4.95	48.70
460.0	336856	113049	3299902	-2850.3	927.0	15474.7	-23.03	5.06	49.67
465.0	322316	117748	3377899	-2965.9	952.5	15725.3	-23.29	5.16	50.62
470.0	307194	122575	3457161	-3083.2	978.5	15980.3	-23.59	5.27	51.51
475.0	291483	127534	3537711	-3201.4	1005.1	16241.0	-23.77	5.36	52.71
480.0	275178	132627	3619579	-3320.8	1032.0	16507.4	-24.10	5.40	53.82
485.0	258268	137855	3702793	-3444.7	1059.7	16779.4	-25.64	5.67	55.10
490.0	240716	143225	3787385	-3576.9	1088.2	17058.3	-26.88	5.68	56.14
495.0	222493	148736	3873380	-3713.0	1116.6	17340.6	-27.62	5.74	56.65
500.0	203580	154392	3960786	-3852.5	1145.6	17621.3	-28.22	5.82	56.15
505.0	183963	160193	4049596	-3994.9	1174.8	17902.4	-28.77	5.86	55.43
510.0	163626	166141	4139797	-4140.0	1205.0	18177.8	-29.08	6.27	54.85
515.0	142563	172244	4231365	-4285.1	1235.8	18448.8	-28.91	5.98	54.24
520.0	120778	178497	4324292	-4429.1	1265.4	18722.8	-28.66	5.86	54.78
525.0	98276	184896	4418590	-4571.1	1293.7	18996.2	-28.19	5.47	54.71
530.0	75070	191433	4514258	-4710.8	1321.1	19272.1	-27.62	5.54	55.60
535.0	51177	198108	4611316	-4845.3	1349.0	19552.0	-26.21	5.61	56.42
540.0	26630	204922	4709785	-4971.5	1376.9	19836.9	-24.26	5.60	57.58
545.0	1472	211877	4809695	-5091.6	1405.1	20128.6	-24.13	5.71	58.82
550.0	-24296	218975	4911077	-5219.3	1434.1	20425.7	-27.53	5.95	60.32
555.0	-50750	226221	5013966	-5364.1	1464.4	20731.2	-30.01	6.19	61.74
560.0	-77950	233622	5118399	-5516.4	1496.4	21043.5	-30.71	6.51	63.23
565.0	-105916	241186	5224412	-5670.2	1529.2	21363.6	-30.78	6.52	64.75
570.0	-134656	248913	5332045	-5826.7	1561.7	21691.0	-32.18	6.53	66.19
575.0	-164202	256805	5441335	-5993.9	1595.5	22027.0	-34.70	7.04	68.00
580.0	-194609	264873	5552326	-6168.9	1632.0	22371.5	-34.81	7.50	70.05
585.0	-225891	273126	5665064	-6344.0	1669.2	22726.0	-35.79	7.32	71.98
590.0	-258058	281563	5779595	-6523.6	1705.7	23090.6	-35.66	7.41	73.98
S-IVB GUIDANCE CUTOFF									
593.340	-280040	287303	5857129	-6639.2	1731.1	23340.0	-33.56	7.94	75.07
595.0	-291101	290181	5895897	-6685.0	1735.4	23351.1	-26.41	1.51	-6.86
600.0	-324858	298877	6012561	-6817.4	1742.9	23313.6	-26.41	1.48	-7.84
ORBIT INSERTION									
603.340	-347776	304706	6090385	-6905.5	1747.8	23287.6	-26.38	1.48	-7.94
605.0	-359275	307633	6129032	-6949.2	1750.2	23274.3	-26.36	1.47	-7.99
610.0	-394350	316402	6245304	-7081.0	1757.5	23234.2	-26.36	1.47	-7.99
620.0	-466477	334051	6477241	-7344.2	1772.2	23152.8	-26.27	1.45	-8.30
630.0	-541230	351845	6708349	-7606.4	1786.6	23068.2	-26.17	1.43	-8.61

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
640.0	-618600	369781	6938596	-7867.5	1800.7	22980.5	-26.02	1.40	-9.04
650.0	-698575	387859	7167944	-8127.2	1814.6	22888.6	-25.92	1.38	-9.33
660.0	-781141	406073	7396359	-8385.9	1828.3	22793.8	-25.81	1.35	-9.63
670.0	-866289	424423	7623811	-8643.5	1841.7	22696.1	-25.70	1.33	-9.92
680.0	-954007	442907	7850271	-8900.0	1854.9	22595.5	-25.59	1.31	-10.21
690.0	-1044284	461521	8075711	-9155.3	1867.9	22491.9	-25.47	1.29	-10.50
700.0	-1137109	480263	8300100	-9409.4	1880.6	22385.5	-25.35	1.26	-10.79
710.0	-1232469	499132	8523411	-9662.4	1893.1	22276.2	-25.23	1.24	-11.08
720.0	-1330352	518124	8745614	-9914.0	1905.3	22164.0	-25.10	1.21	-11.36
730.0	-1430745	537238	8966681	-10164.4	1917.3	22049.0	-24.97	1.19	-11.65
740.0	-1533636	556470	9186584	-10413.5	1929.1	21931.1	-24.84	1.16	-11.93
750.0	-1639011	575818	9405294	-10661.2	1940.5	21810.4	-24.70	1.13	-12.21
760.0	-1746856	595280	9622783	-10907.6	1951.8	21686.9	-24.56	1.11	-12.49
770.0	-1857157	614853	9839023	-11152.5	1962.7	21560.6	-24.42	1.08	-12.77
780.0	-1969901	634533	10053986	-11396.0	1973.4	21431.6	-24.28	1.05	-13.04
790.0	-2085072	654320	10267646	-11638.0	1983.8	21299.8	-24.13	1.03	-13.32
800.0	-2202656	674208	10479974	-11878.5	1993.9	21165.3	-23.97	1.00	-13.59
810.0	-2322638	694197	10690942	-12117.5	2003.7	21028.0	-23.82	0.97	-13.86
820.0	-2445001	714282	10900525	-12354.9	2013.3	20888.1	-23.66	0.94	-14.13
830.0	-2569730	734461	11108695	-12590.7	2022.5	20745.5	-23.50	0.91	-14.40
840.0	-2696810	754732	11315426	-12824.9	2031.5	20600.2	-23.34	0.88	-14.66
850.0	-2826222	775090	11520690	-13057.4	2040.2	20452.3	-23.17	0.85	-14.92
860.0	-2957952	795534	11724462	-13288.2	2048.5	20301.7	-23.00	0.82	-15.18
870.0	-3091981	816060	11926716	-13517.3	2056.6	20148.6	-22.82	0.79	-15.44
880.0	-3228293	836664	12127426	-13744.7	2064.3	19992.9	-22.65	0.76	-15.70
890.0	-3366869	857345	12326565	-13970.3	2071.7	19834.6	-22.47	0.73	-15.96
900.0	-3507693	878098	12524109	-14194.1	2078.8	19673.8	-22.29	0.69	-16.21
910.0	-3650744	898920	12720032	-14416.0	2085.6	19510.4	-22.10	0.66	-16.46
920.0	-3796006	919809	12914309	-14636.1	2092.1	19344.6	-21.91	0.63	-16.71
930.0	-3943460	940760	13106915	-14854.3	2098.2	19176.3	-21.72	0.60	-16.95
940.0	-4093085	961772	13297826	-15070.5	2104.0	19005.5	-21.53	0.56	-17.20
950.0	-4244864	982839	13487017	-15284.8	2109.5	18832.3	-21.33	0.53	-17.44
960.0	-4398775	1003960	13674465	-15497.2	2114.6	18656.7	-21.13	0.50	-17.68
970.0	-4554800	1025130	14044032	-15707.5	2119.4	18478.8	-20.93	0.46	-17.92
980.0	-4712919	1046346	14226105	-15915.8	2123.8	18298.4	-20.73	0.43	-18.15
990.0	-4873110	1067605	14406339	-16122.1	2127.9	18115.8	-20.52	0.39	-18.38
1000.0	-5035353	1088902	14584713	-16326.2	2131.6	17930.8	-20.31	0.36	-18.61
1010.0	-5199627	1110236	14761202	-16528.3	2135.0	17743.5	-20.10	0.32	-18.84
1020.0	-5365912	1131601	14935785	-16728.2	2138.0	17554.0	-19.88	0.28	-19.06
1030.0	-5534184	1152995	15108440	-16926.0	2140.7	17362.2	-19.67	0.25	-19.29
1040.0	-5704424	1174413	15279144	-17121.5	2143.0	17168.3	-19.45	0.21	-19.51
1050.0	-5876608	1195853	15447875	-17314.9	2144.9	16972.1	-19.23	0.17	-19.72
1060.0	-6050714	1217311	15614613	-17506.0	2146.5	16773.8	-19.00	0.14	-19.94
1070.0	-6226721	1238782	15614613	-17694.9	2147.7	16573.4	-18.77	0.10	-20.15



TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	DOXE FT/S SQ	DOYE FT/S SQ	DOZE FT/S SQ
1080.0	-6404605	1260263	15779336	-17881.5	2148.5	16370.8	-18.54	0.06	-20.36
1090.0	-6584343	1281750	15942022	-18065.8	2148.9	16166.2	-18.31	0.03	-20.57
1100.0	-6765912	1303240	16102653	-18247.7	2149.0	15959.5	-18.08	-0.01	-20.77
1110.0	-6949289	1324729	16261206	-18427.3	2148.7	15750.8	-17.84	-0.05	-20.97
1120.0	-7134451	1346212	16417663	-18604.5	2148.0	15540.1	-17.60	-0.09	-21.17
1130.0	-7321372	1367687	16572003	-18779.3	2146.9	15327.5	-17.36	-0.13	-21.36
1140.0	-7510029	1389149	16724206	-18951.7	2145.4	15112.9	-17.12	-0.17	-21.56
1150.0	-7700399	1410594	16874254	-19121.7	2143.5	14896.4	-16.87	-0.21	-21.75
1160.0	-7892455	1432018	17022127	-19289.2	2141.3	14678.0	-16.62	-0.25	-21.93
1170.0	-8086174	1453418	17167807	-19454.2	2138.6	14457.7	-16.38	-0.29	-22.12
1180.0	-8281530	1474789	17311275	-19616.7	2135.6	14235.6	-16.12	-0.32	-22.30
1190.0	-8478499	1496128	17452514	-19776.6	2132.1	14011.8	-15.87	-0.36	-22.48
1200.0	-8677054	1517430	17591505	-19934.1	2128.3	13786.1	-15.61	-0.40	-22.65
1210.0	-8877171	1538692	17728231	-20088.9	2124.0	13558.8	-15.36	-0.45	-22.82
1220.0	-9078824	1559910	17862675	-20241.2	2119.4	13329.7	-15.10	-0.49	-22.99
1230.0	-9281986	1581078	17994819	-20390.8	2114.3	13099.0	-14.84	-0.53	-23.16
1240.0	-9486632	1602195	18124648	-20537.9	2108.8	12866.6	-14.57	-0.57	-23.32
1250.0	-9692735	1623254	18252145	-20682.3	2103.0	12632.5	-14.31	-0.61	-23.48
1260.0	-9900268	1644253	18377294	-20824.0	2096.7	12397.0	-14.04	-0.65	-23.64
1270.0	-10109206	1665187	18500079	-20963.1	2090.0	12159.8	-13.77	-0.69	-23.79
1280.0	-10319521	1686051	18620485	-21099.4	2082.9	11921.1	-13.50	-0.73	-23.94
1290.0	-10531185	1706843	18738497	-21233.1	2075.4	11681.0	-13.23	-0.77	-24.09
1300.0	-10744173	1727558	18854100	-21364.0	2067.5	11439.4	-12.95	-0.81	-24.23
1310.0	-10958456	1748191	18967280	-21492.2	2059.1	11196.3	-12.68	-0.86	-24.37
1320.0	-11174007	1768738	19078022	-21617.6	2050.3	10951.9	-12.40	-0.90	-24.51
1330.0	-11390798	1789196	19186314	-21740.2	2041.2	10706.1	-12.12	-0.94	-24.65
1340.0	-11608802	1809560	19292140	-21860.0	2031.6	10459.0	-11.84	-0.98	-24.78
1350.0	-11827990	1829826	19395489	-21977.1	2021.6	10210.6	-11.56	-1.02	-24.91
1360.0	-12048334	1849990	19496348	-22091.3	2011.1	9960.9	-11.28	-1.06	-25.03
1370.0	-12269806	1870047	19594703	-22202.7	2000.3	9710.0	-11.00	-1.11	-25.15
1380.0	-12492378	1889994	19690543	-22311.2	1989.0	9457.9	-10.71	-1.15	-25.27
1390.0	-12716021	1909826	19783857	-22416.9	1977.3	9204.6	-10.42	-1.19	-25.38
1400.0	-12940706	1929539	19874632	-22519.7	1965.2	8950.2	-10.14	-1.23	-25.50
1410.0	-13166405	1949129	19962857	-22619.6	1952.7	8694.7	-9.85	-1.27	-25.60
1420.0	-13393089	1968591	20048522	-22716.6	1939.7	8438.1	-9.56	-1.32	-25.71
1430.0	-13620728	1987922	20131616	-22810.7	1926.4	8180.5	-9.26	-1.36	-25.81
1440.0	-13849293	2007117	20212129	-22901.9	1912.6	7921.9	-8.97	-1.40	-25.91
1450.0	-14078755	2026172	20290051	-22990.1	1898.4	7662.3	-8.68	-1.44	-26.00
1460.0	-14309085	2045083	20365372	-23075.4	1883.7	7401.9	-8.38	-1.48	-26.09
1470.0	-14540254	2063845	20438085	-23157.8	1868.7	7140.5	-8.09	-1.53	-26.18
1480.0	-14772231	2082455	20508179	-23237.2	1853.2	6878.2	-7.79	-1.57	-26.27
1490.0	-15004987	2100908	20575646	-23313.6	1837.3	6615.1	-7.49	-1.61	-26.35
1500.0	-15238492	2119199	20640479	-23387.0	1821.0	6351.3	-7.19	-1.65	-26.43
1510.0	-15472717	2137326	20702669	-23457.4	1804.3	6086.6	-6.89	-1.69	-26.50

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
1520.0	-15707631	2155284	20762209	-23524.9	1787.1	5821.3	-6.59	-1.74	-26.57
1530.0	-15943204	2173068	20819092	-23589.3	1769.6	5555.2	-6.29	-1.78	-26.64
1540.0	-16179407	2190674	20873312	-23650.7	1751.6	5288.6	-5.99	-1.82	-26.70
1550.0	-16416209	2208098	20924861	-23709.1	1733.2	5021.2	-5.69	-1.86	-26.76
1560.0	-16653380	2225337	20973735	-23764.5	1714.4	4753.3	-5.39	-1.90	-26.82
1570.0	-16891489	2242385	21019926	-23816.8	1695.2	4484.9	-5.08	-1.94	-26.87
1580.0	-17129906	2259239	21063431	-23866.1	1675.6	4215.9	-4.78	-1.98	-26.92
1590.0	-17368801	2275895	21104243	-23912.4	1655.5	3946.5	-4.47	-2.02	-26.97
1600.0	-17608144	2292348	21142359	-23955.6	1635.1	3676.6	-4.17	-2.06	-27.01
1610.0	-17847904	2308595	21177774	-23995.8	1614.2	3406.3	-3.86	-2.11	-27.05
1620.0	-18088049	2324631	21210484	-24032.9	1593.0	3135.6	-3.56	-2.15	-27.08
1630.0	-18328551	2340453	21240485	-24066.9	1571.3	2864.6	-3.25	-2.19	-27.12
1640.0	-18569377	2356056	21267775	-24097.9	1549.2	2593.3	-2.94	-2.23	-27.15
1650.0	-18810498	2371437	21292350	-24125.8	1526.8	2321.7	-2.64	-2.27	-27.17
1660.0	-19051882	2386590	21314208	-24150.6	1503.9	2049.9	-2.33	-2.31	-27.19
1670.0	-19293499	2401513	21333348	-24172.3	1480.6	1777.9	-2.02	-2.35	-27.21
1680.0	-19535319	2416202	21349766	-24191.0	1457.0	1505.7	-1.71	-2.39	-27.23
1690.0	-19777310	2430652	21363461	-24206.6	1432.9	1233.4	-1.41	-2.42	-27.24
1700.0	-20019441	2444859	21374433	-24219.2	1408.5	961.0	-1.10	-2.46	-27.24
1710.0	-20261683	2458820	21382681	-24228.6	1383.7	688.5	-0.79	-2.50	-27.25
1720.0	-20504003	2472531	21388204	-24235.0	1358.4	416.0	-0.48	-2.54	-27.25
1730.0	-20746372	2485988	21391002	-24238.3	1332.8	143.6	-0.18	-2.58	-27.25
1740.0	-20988759	2499186	21391075	-24238.5	1306.8	-128.8	0.13	-2.62	-27.24
1750.0	-21231132	2512123	21388425	-24235.7	1280.5	-401.2	0.44	-2.66	-27.23
1760.0	-21473462	2524795	21383052	-24229.7	1253.7	-673.4	0.75	-2.69	-27.22
1770.0	-21715716	2537197	21374957	-24220.7	1226.6	-945.5	1.05	-2.73	-27.20
1780.0	-21957866	2549326	21364143	-24208.6	1199.1	-1217.4	1.36	-2.77	-27.18
1790.0	-22199879	2561179	21350611	-24193.5	1171.3	-1489.0	1.67	-2.80	-27.15
1800.0	-22441726	2572751	21334363	-24175.3	1143.1	-1760.4	1.97	-2.84	-27.13
1810.0	-22683375	2584039	21315403	-24154.0	1114.5	-2031.5	2.28	-2.88	-27.10
1820.0	-22924796	2595039	21293733	-24129.7	1085.5	-2302.3	2.59	-2.91	-27.06
1830.0	-23165958	2605749	21269358	-24102.3	1056.3	-2572.7	2.89	-2.95	-27.02
1840.0	-23406832	2616163	21242280	-24071.9	1026.6	-2842.8	3.20	-2.98	-26.98
1850.0	-23647386	2626280	21212504	-24038.4	996.6	-3112.4	3.50	-3.02	-26.94
1860.0	-23887590	2636094	21180034	-24001.9	966.3	-3381.5	3.80	-3.05	-26.89
1870.0	-24127414	2645603	21144875	-23962.4	935.6	-3650.1	4.11	-3.09	-26.84
1880.0	-24366827	2654804	21107033	-23919.8	904.5	-3918.2	4.41	-3.12	-26.78
1890.0	-24605799	2663693	21066513	-23874.2	873.2	-4185.8	4.71	-3.15	-26.72
1900.0	-24844301	2672267	21023320	-23825.6	841.5	-4452.7	5.01	-3.19	-26.66
1910.0	-25082301	2680522	20977461	-23774.0	809.4	-4719.0	5.31	-3.22	-26.60
1920.0	-25319770	2688455	20928943	-23719.4	777.1	-4984.6	5.61	-3.25	-26.53
1930.0	-25556679	2696062	20877772	-23661.8	744.4	-5249.5	5.91	-3.28	-26.46
1940.0	-25792996	2703342	20823955	-23601.2	711.4	-5513.7	6.21	-3.31	-26.38
1950.0	-26028692	2710290	20767501	-23537.6	678.1	-5777.1	6.50	-3.35	-26.30

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
1960.0	-26263738	2716904	20708416	-23471.1	644.5	-6039.7	6.80	-3.38	-26.22
1970.0	-26498105	2723180	20646710	-23401.6	610.6	-6301.5	7.09	-3.41	-26.13
1980.0	-26731761	2729115	20582390	-23329.2	576.4	-6562.4	7.39	-3.44	-26.04
1990.0	-26964679	2734707	20515466	-23253.9	541.9	-6822.3	7.68	-3.47	-25.95
2000.0	-27196829	2739952	20445946	-23175.6	507.1	-7081.4	7.97	-3.49	-25.86
2010.0	-27428181	2744848	20373841	-23094.4	472.0	-7339.5	8.26	-3.52	-25.76
2020.0	-27658707	2749391	20299160	-23010.3	436.6	-7596.6	8.55	-3.55	-25.66
2030.0	-27888377	2753579	20221913	-22923.3	401.0	-7852.6	8.84	-3.58	-25.55
2040.0	-28117163	2757410	20142111	-22833.5	365.1	-8107.6	9.13	-3.61	-25.44
2050.0	-28345036	2760879	20059764	-22740.7	328.9	-8361.5	9.42	-3.63	-25.33
2060.0	-28571969	2763986	19974885	-22645.1	292.4	-8614.2	9.70	-3.66	-25.22
2070.0	-28797930	2766727	19887483	-22546.7	255.7	-8865.8	9.98	-3.68	-25.10
2080.0	-29022893	2769099	19797572	-22445.5	218.7	-9116.2	10.27	-3.71	-24.98
2090.0	-29246830	2771100	19705163	-22341.4	181.5	-9365.4	10.55	-3.73	-24.85
2100.0	-29469713	2772728	19610268	-22234.6	144.0	-9613.3	10.82	-3.76	-24.73
2110.0	-29691513	2773980	19512901	-22124.9	106.3	-9859.9	11.10	-3.78	-24.60
2120.0	-29912202	2774853	19413074	-22012.5	68.4	-10105.2	11.38	-3.81	-24.46
2130.0	-30131754	2775346	19310801	-21897.4	30.2	-10349.2	11.65	-3.83	-24.33
2140.0	-30350140	2775457	19206095	-21779.5	-8.2	-10591.8	11.93	-3.85	-24.19
2150.0	-30567334	2775182	19098970	-21658.8	-46.8	-10833.0	12.20	-3.87	-24.05
2160.0	-30783308	2774520	18989440	-21535.5	-85.6	-11072.7	12.47	-3.89	-23.90
2170.0	-30998035	2773469	18877521	-21409.5	-124.7	-11311.0	12.74	-3.91	-23.75
2180.0	-31211489	2772026	18763226	-21280.8	-163.9	-11547.7	13.00	-3.93	-23.60
2190.0	-31423642	2770190	18646572	-21149.5	-203.3	-11782.9	13.27	-3.95	-23.45
2200.0	-31634469	2767959	18527572	-21015.5	-243.0	-12016.6	13.53	-3.97	-23.29
2210.0	-31843943	2765330	18406244	-20878.9	-282.8	-12248.7	13.79	-3.99	-23.13
2220.0	-32052038	2762203	18282604	-20739.7	-322.8	-12479.2	14.05	-4.01	-22.97
2230.0	-32258728	2758874	18156666	-20597.9	-362.9	-12708.0	14.31	-4.03	-22.80
2240.0	-32463987	2755043	18028449	-20453.5	-403.3	-12935.2	14.56	-4.04	-22.63
2250.0	-32667790	2750808	17897969	-20306.6	-443.8	-13160.6	14.82	-4.06	-22.46
2260.0	-32870111	2746167	17765242	-20157.2	-484.4	-13384.3	15.07	-4.07	-22.29
2270.0	-33070925	2741119	17630287	-20005.3	-525.2	-13606.3	15.32	-4.09	-22.11
2280.0	-33270208	2735662	17493122	-19850.8	-566.2	-13826.5	15.57	-4.10	-21.93
2290.0	-33467934	2729795	17353763	-19693.4	-607.3	-14044.9	15.81	-4.12	-21.75
2300.0	-33664079	2723516	17212230	-19534.6	-648.5	-14261.4	16.06	-4.13	-21.56
2310.0	-33858618	2716824	17068541	-19372.9	-689.9	-14476.1	16.30	-4.14	-21.37
2320.0	-34051527	2709718	16922714	-19208.7	-731.3	-14688.9	16.54	-4.15	-21.18
2330.0	-34242784	2702197	16774769	-19042.1	-772.9	-14899.8	16.77	-4.16	-20.99
2340.0	-34432362	2694259	16624726	-18873.2	-814.6	-15108.7	17.01	-4.18	-20.79
2350.0	-34620241	2685904	16472602	-18702.0	-856.4	-15315.7	17.24	-4.19	-20.60
2360.0	-34806394	2677130	16318419	-18528.4	-898.3	-15520.6	17.47	-4.19	-20.40
2370.0	-34990801	2667937	16162196	-18352.6	-940.3	-15723.6	17.70	-4.20	-20.19
2380.0	-35173438	2658323	16003955	-18174.4	-982.4	-15924.5	17.93	-4.21	-19.99
2390.0	-35354282	2648289	15843714	-17994.0	-1024.5	-16123.3	18.15	-4.22	-19.78

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
2400.0	-35533311	2637832	15681495	-17811.4	-1066.8	-16320.1	18.37	-4.23	-19.57
2410.0	-35710503	2626953	15517319	-17626.6	-1109.1	-16514.7	18.59	-4.23	-19.36
2420.0	-35885836	2615651	15351208	-17439.6	-1151.4	-16707.2	18.81	-4.24	-19.14
2430.0	-36059288	2603925	15183183	-17250.5	-1193.8	-16897.5	19.02	-4.24	-18.92
2440.0	-36230839	2591775	15013265	-17059.2	-1236.2	-17085.7	19.23	-4.25	-18.70
2450.0	-36400465	2579200	14841476	-16865.8	-1278.7	-17271.6	19.44	-4.25	-18.48
2460.0	-36568148	2566201	14667839	-16670.4	-1321.2	-17455.3	19.65	-4.25	-18.26
2470.0	-36733866	2552776	14492377	-16472.8	-1363.8	-17636.8	19.85	-4.25	-18.03
2480.0	-36897598	2538925	14315111	-16273.3	-1406.3	-17816.0	20.06	-4.26	-17.80
2490.0	-37059325	2524650	14136065	-16071.7	-1448.9	-17992.9	20.25	-4.26	-17.57
2500.0	-37219026	2509948	13955261	-15868.2	-1491.4	-18167.4	20.45	-4.26	-17.34
2510.0	-37376683	2494821	13772724	-15662.7	-1534.0	-18339.7	20.65	-4.26	-17.11
2520.0	-37532274	2479268	13588476	-15455.3	-1576.6	-18509.6	20.84	-4.26	-16.87
2530.0	-37685782	2463289	13402541	-15246.0	-1619.1	-18677.0	21.03	-4.25	-16.63
2540.0	-37837188	2446885	13214943	-15034.8	-1661.6	-18842.1	21.21	-4.25	-16.39
2550.0	-37986472	2430056	13025706	-14821.7	-1704.1	-19004.8	21.40	-4.25	-16.15
2560.0	-38133617	2412803	12834854	-14606.9	-1746.6	-19165.1	21.58	-4.24	-15.90
2570.0	-38278604	2395124	12642413	-14390.2	-1789.0	-19322.8	21.75	-4.24	-15.65
2580.0	-38421415	2377022	12448406	-14171.8	-1831.4	-19478.2	21.93	-4.23	-15.41
2590.0	-38562034	2358497	12252858	-13951.6	-1873.7	-19631.0	22.10	-4.23	-15.16
2600.0	-38700442	2339549	12055795	-13729.8	-1915.9	-19781.3	22.27	-4.22	-14.90
2610.0	-38836624	2320178	11857241	-13506.2	-1958.1	-19929.0	22.44	-4.21	-14.65
2620.0	-38970561	2300387	11657223	-13281.0	-2000.2	-20074.2	22.60	-4.21	-14.39
2630.0	-39102238	2280174	11455765	-13054.2	-2042.2	-20216.9	22.76	-4.20	-14.14
2640.0	-39231639	2259542	11252893	-12825.7	-2084.2	-20357.0	22.92	-4.19	-13.88
2650.0	-39358748	2238492	11048634	-12595.7	-2126.0	-20494.4	23.08	-4.18	-13.62
2660.0	-39483548	2217023	10843013	-12364.2	-2167.7	-20629.3	23.23	-4.17	-13.35
2670.0	-39606026	2195138	10636057	-12131.1	-2209.3	-20761.5	23.38	-4.16	-13.09
2680.0	-39726165	2172837	10427791	-11896.6	-2250.8	-20891.1	23.53	-4.14	-12.83
2690.0	-39843952	2150122	10218243	-11660.6	-2292.2	-21018.0	23.67	-4.13	-12.56
2700.0	-39959371	2126994	10007439	-11423.1	-2333.4	-21142.3	23.81	-4.12	-12.29
2710.0	-40072410	2103455	9795406	-11184.3	-2374.5	-21263.8	23.95	-4.10	-12.02
2720.0	-40183053	2079505	9582172	-10944.1	-2415.4	-21382.7	24.09	-4.09	-11.75
2730.0	-40291288	2055147	9367762	-10702.6	-2456.2	-21498.8	24.22	-4.07	-11.48
2740.0	-40397101	2030381	9152205	-10459.8	-2496.9	-21612.2	24.35	-4.05	-11.20
2750.0	-40500479	2005210	8935527	-10215.7	-2537.3	-21722.9	24.47	-4.04	-10.93
2760.0	-40601410	1979635	8717757	-9970.3	-2577.6	-21830.7	24.60	-4.02	-10.65
2770.0	-40699882	1953659	8498921	-9723.8	-2617.7	-21935.9	24.72	-4.00	-10.37
2780.0	-40795882	1927282	8279048	-9476.0	-2657.6	-22038.2	24.83	-3.98	-10.09
2790.0	-40889399	1900507	8058166	-9227.1	-2697.3	-22137.8	24.95	-3.96	-9.81
2800.0	-40980421	1873336	7836303	-8977.1	-2736.9	-22234.5	25.06	-3.94	-9.53
2810.0	-41068938	1845770	7613486	-8726.0	-2776.2	-22328.4	25.16	-3.92	-9.25
2820.0	-41154939	1817813	7389744	-8473.9	-2815.3	-22419.5	25.27	-3.90	-8.97
2830.0	-41238412	1789466	7165105	-8220.7	-2854.1	-22507.7	25.37	-3.88	-8.68

TABLE XIV  
EARTH-FIXED PLUMBLINE POSITIONS, VELOCITIES AND ACCELERATIONS

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
2840.0	-413193348	1760732	6939599	-7966.5	-2892.8	-22593.2	25.47	-3.85	-8.40
2850.0	-41397738	1731612	6713252	-7711.3	-2931.2	-22675.7	25.56	-3.83	-8.11
2860.0	-41473572	1702109	6486094	-7455.2	-2969.3	-22755.4	25.65	-3.80	-7.82
2870.0	-41546839	1672227	6258154	-7198.2	-3007.2	-22832.2	25.74	-3.78	-7.54
2880.0	-41617533	1641966	6029460	-6940.4	-3044.8	-22906.1	25.83	-3.75	-7.25
2890.0	-41685644	1611331	5800042	-6681.7	-3082.2	-22977.1	25.91	-3.72	-6.96
2900.0	-41751164	1580323	5569928	-6422.1	-3119.3	-23045.2	25.99	-3.70	-6.67
2910.0	-41814084	1548945	5339147	-6161.8	-3156.1	-23110.4	26.07	-3.67	-6.38
2920.0	-41874398	1517201	5107729	-5900.8	-3192.7	-23172.7	26.14	-3.64	-6.08
2930.0	-41932098	1485092	4875702	-5639.1	-3228.9	-23232.1	26.21	-3.61	-5.79
2940.0	-41987177	1452623	4643097	-5376.6	-3264.9	-23288.5	26.28	-3.58	-5.50
2950.0	-42039629	1419796	4409941	-5113.6	-3300.5	-23342.0	26.34	-3.55	-5.20
2960.0	-42089446	1386614	4176266	-4849.9	-3335.8	-23392.6	26.40	-3.52	-4.91
2970.0	-42136624	1353080	3942099	-4585.6	-3370.9	-23440.2	26.46	-3.48	-4.61
2980.0	-42181157	1319198	3707471	-4320.8	-3405.5	-23484.9	26.51	-3.45	-4.32
2990.0	-42223038	1284970	3472411	-4055.4	-3439.9	-23526.6	26.56	-3.42	-4.02
3000.0	-42262264	1250401	3236950	-3789.6	-3473.9	-23565.3	26.61	-3.38	-3.73
3010.0	-42298829	1215494	3001115	-3523.3	-3507.5	-23601.1	26.65	-3.35	-3.43
3020.0	-42332729	1180252	2764938	-3256.6	-3540.9	-23633.9	26.69	-3.31	-3.13
3030.0	-42363961	1144678	2528447	-2989.6	-3573.8	-23663.7	26.73	-3.28	-2.83
3040.0	-42392519	1108777	2291673	-2722.1	-3606.4	-23690.6	26.76	-3.24	-2.54
3050.0	-42418402	1072551	2054646	-2454.4	-3638.6	-23714.4	26.79	-3.20	-2.24
3060.0	-42441606	1036006	1817394	-2186.3	-3670.4	-23735.3	26.82	-3.16	-1.94
3070.0	-42462127	999144	1579949	-1918.0	-3701.9	-23753.3	26.84	-3.12	-1.64
3080.0	-42479965	961970	1342339	-1649.5	-3732.9	-23768.2	26.86	-3.09	-1.34
3090.0	-42495116	924487	1104595	-1380.7	-3763.6	-23780.1	26.88	-3.05	-1.04
3100.0	-42507579	886700	866747	-1111.8	-3793.8	-23789.1	26.90	-3.00	-0.75
3110.0	-42517352	848612	628824	-842.8	-3823.7	-23795.0	26.91	-2.96	-0.45
3120.0	-42524435	810228	390856	-573.7	-3853.1	-23798.0	26.91	-2.92	-0.15
3130.0	-42528827	771552	152873	-304.6	-3882.1	-23798.0	26.92	-2.88	0.15
3140.0	-42530527	732588	-85094	-35.4	-3910.7	-23795.0	26.92	-2.84	0.45
3150.0	-42529535	693340	-323016	233.8	-3938.8	-23789.0	26.92	-2.79	0.75
3160.0	-42525851	653813	-560864	502.9	-3966.5	-23780.1	26.91	-2.75	1.05
3170.0	-42519476	614012	-798608	772.0	-3993.7	-23768.1	26.90	-2.70	1.34
3180.0	-42510411	573940	-1036217	1041.0	-4020.5	-23753.2	26.89	-2.66	1.64
3190.0	-42498657	533603	-1273662	1309.8	-4046.9	-23735.3	26.88	-2.61	1.94
3200.0	-42484215	493005	-1510913	1578.5	-4072.7	-23714.4	26.86	-2.56	2.24
3210.0	-42467088	452150	-1747940	1846.9	-4098.1	-23690.6	26.83	-2.52	2.53
3220.0	-42447277	411044	-1984714	2115.2	-4123.0	-23663.7	26.81	-2.47	2.83
3230.0	-42424785	369691	-2221205	2383.1	-4147.5	-23633.9	26.78	-2.42	3.13
3235.242	-42411923	347917	-2345050	2523.5	-4160.1	-23617.1	26.77	-2.39	3.28

S-IVB/LM SEPARATION

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	CXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DCYSP FT/S SQ	DCZSP FT/S SQ
GUIDANCE REFERENCE RELEASE									
-4.956	2791.320	1173.599	1635.233	-520.0	1236.8	0.0	0.01	0.10	0.00
-4.0	2791.238	1173.794	1635.233	-520.1	1236.7	0.0	0.01	0.10	0.00
-3.0	2791.152	1173.997	1635.233	-520.2	1236.7	0.0	0.01	0.10	0.00
-2.0	2791.067	1174.201	1635.233	-520.3	1236.7	0.0	0.01	0.10	0.00
-1.0	2790.981	1174.404	1635.233	-520.4	1236.6	0.0	0.01	0.10	0.00
RANGE ZERO AT 17 48 08 EST									
0.000	2790.896	1174.608	1635.233	-520.4	1236.6	0.0	0.01	0.10	0.00
FIRST MOTION									
0.200	2790.878	1174.648	1635.233	-520.5	1236.6	0.0	6.16	2.76	3.59
LIFTOFF									
0.360	2790.865	1174.681	1635.233	-519.5	1237.0	0.6	6.27	2.80	3.66
1.0	2790.810	1174.811	1635.233	-515.4	1238.7	3.0	6.68	2.94	3.92
2.0	2790.726	1175.016	1635.234	-508.6	1241.6	7.1	7.16	3.11	4.23
3.0	2790.643	1175.220	1635.235	-501.3	1244.7	11.4	7.51	3.24	4.45
4.0	2790.561	1175.425	1635.237	-493.8	1247.8	16.0	7.78	3.35	4.62
5.0	2790.480	1175.631	1635.240	-486.0	1251.1	20.7	7.99	3.43	4.75
6.0	2790.401	1175.837	1635.244	-478.0	1254.4	25.5	8.17	3.51	4.86
7.0	2790.323	1176.044	1635.249	-469.8	1257.8	30.4	8.33	3.58	4.96
8.0	2790.246	1176.251	1635.254	-461.5	1261.3	35.4	8.50	3.66	5.06
9.0	2790.171	1176.459	1635.261	-453.0	1264.9	40.5	8.67	3.75	5.17
10.0	2790.097	1176.667	1635.268	-444.4	1268.6	45.7	8.85	3.85	5.29
11.0	2790.025	1176.877	1635.276	-435.5	1272.3	51.1	9.04	3.96	5.41
12.0	2789.954	1177.086	1635.284	-426.5	1276.2	56.5	9.23	4.09	5.55
13.0	2789.884	1177.297	1635.294	-417.2	1280.2	62.2	9.43	4.24	5.70
14.0	2789.816	1177.508	1635.305	-407.8	1284.4	67.9	9.62	4.40	5.85
15.0	2789.750	1177.720	1635.317	-398.2	1288.8	73.9	9.81	4.58	6.01
16.0	2789.685	1177.932	1635.329	-388.4	1293.3	80.0	9.99	4.78	6.17
17.0	2789.622	1178.145	1635.343	-378.4	1298.1	86.2	10.16	4.99	6.32
18.0	2789.561	1178.359	1635.358	-368.3	1303.0	92.6	10.31	5.21	6.48
19.0	2789.501	1178.574	1635.374	-358.0	1308.2	99.2	10.45	5.46	6.63
20.0	2789.443	1178.790	1635.390	-347.6	1313.7	105.9	10.58	5.71	6.78

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	CXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
21.0	2789.387	1179.007	1635.408	-337.0	1319.4	112.7	10.70	5.98	6.93
22.0	2789.332	1179.224	1635.428	-326.4	1325.4	119.7	10.80	6.25	7.08
23.0	2789.279	1179.443	1635.448	-315.6	1331.6	126.9	10.90	6.54	7.22
24.0	2789.228	1179.662	1635.469	-304.8	1338.2	134.2	11.00	6.84	7.37
25.0	2789.179	1179.883	1635.492	-293.8	1345.0	141.6	11.09	7.15	7.54
26.0	2789.131	1180.105	1635.516	-282.8	1352.2	149.3	11.19	7.47	7.71
27.0	2789.085	1180.328	1635.541	-271.6	1359.7	157.1	11.29	7.80	7.91
28.0	2789.042	1180.553	1635.568	-260.4	1367.6	165.1	11.40	8.16	8.12
29.0	2789.000	1180.779	1635.596	-249.0	1375.8	173.3	11.49	8.49	8.36
30.0	2788.960	1181.006	1635.625	-237.6	1384.3	181.8	11.57	8.83	8.66
31.0	2788.921	1181.235	1635.656	-226.2	1393.1	190.7	11.58	9.21	9.04
32.0	2788.885	1181.465	1635.688	-214.7	1402.4	199.9	11.56	9.64	9.42
33.0	2788.851	1181.696	1635.721	-203.2	1412.2	209.5	11.49	10.09	9.77
34.0	2788.818	1181.930	1635.757	-191.8	1422.4	219.4	11.53	10.57	10.06
35.0	2788.787	1182.165	1635.794	-180.3	1433.0	229.6	11.63	11.03	10.25
36.0	2788.758	1182.402	1635.832	-168.8	1444.1	239.8	11.70	11.46	10.36
37.0	2788.732	1182.640	1635.873	-157.1	1455.7	250.3	11.77	11.89	10.53
38.0	2788.707	1182.881	1635.915	-145.4	1467.6	261.0	11.83	12.35	10.76
39.0	2788.684	1183.124	1635.959	-133.7	1480.1	271.9	11.79	12.85	11.07
40.0	2788.663	1183.368	1636.004	-122.1	1493.1	283.1	11.70	13.37	11.36
41.0	2788.643	1183.615	1636.052	-110.5	1506.6	294.6	11.66	13.95	11.67
42.0	2788.626	1183.865	1636.102	-98.9	1520.8	306.4	11.67	14.63	11.96
43.0	2788.611	1184.116	1636.153	-87.4	1535.6	318.5	11.60	15.34	12.22
44.0	2788.597	1184.370	1636.206	-75.9	1551.1	330.8	11.53	16.02	12.44
45.0	2788.586	1184.627	1636.262	-64.5	1567.3	343.4	11.44	16.68	12.73
46.0	2788.576	1184.887	1636.320	-53.3	1584.2	356.2	11.16	17.26	12.97
47.0	2788.568	1185.149	1636.379	-42.3	1601.6	369.4	10.95	17.86	13.34
48.0	2788.562	1185.414	1636.441	-31.6	1619.6	383.0	10.78	18.43	13.77
49.0	2788.557	1185.682	1636.506	-21.0	1638.2	397.0	10.64	19.03	14.20
50.0	2788.555	1185.953	1636.572	-10.5	1657.4	411.3	10.51	19.67	14.58
51.0	2788.554	1186.228	1636.641	-0.2	1677.2	426.1	10.16	20.34	14.83
52.0	2788.554	1186.506	1636.712	10.1	1697.7	441.0	10.37	21.00	14.95
53.0	2788.557	1186.787	1636.786	20.0	1718.9	456.2	9.89	21.73	15.38
54.0	2788.561	1187.072	1636.863	29.9	1740.6	471.8	9.80	22.21	15.58
55.0	2788.567	1187.360	1636.942	39.4	1762.8	487.3	9.42	22.78	15.60
56.0	2788.574	1187.652	1637.023	48.8	1786.1	503.1	9.30	23.83	15.86
57.0	2788.583	1187.948	1637.108	57.5	1809.9	519.0	8.67	24.22	15.82
58.0	2788.593	1188.248	1637.194	66.1	1833.8	535.0	8.26	24.55	15.86
59.0	2788.604	1188.552	1637.284	73.7	1858.5	551.1	7.47	25.14	16.14

MACH ONE

59.760 2788.614 1188.786 1637.354 79.0 1877.3 563.3 7.01 25.29 16.12

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DCZSP FT/S SQ
60.0	2788.617	1188.861	1637.376	80.6	1883.3	567.3	6.85	25.39	16.18
61.0	2788.631	1189.173	1637.471	87.0	1908.6	583.6	6.17	25.85	16.31
62.0	2788.646	1189.489	1637.568	92.9	1934.3	600.1	5.79	26.35	16.65
63.0	2788.661	1189.810	1637.668	99.0	1960.9	616.5	6.13	27.09	16.28
64.0	2788.676	1190.135	1637.771	105.5	1988.2	632.8	6.27	27.99	16.28
65.0	2788.696	1190.464	1637.877	111.4	2016.3	649.7	5.75	28.80	16.97
66.0	2788.715	1190.799	1637.985	117.1	2045.4	666.8	5.52	29.70	17.12
67.0	2788.735	1191.138	1638.097	122.6	2075.3	684.2	5.41	30.48	17.35
68.0	2788.755	1191.482	1638.211	128.0	2105.8	701.8	5.30	31.28	17.64
69.0	2788.777	1191.831	1638.328	133.2	2137.6	719.8	4.94	32.44	17.88
70.0	2788.799	1192.186	1638.448	137.8	2170.5	738.1	4.41	33.58	18.29
71.0	2788.822	1192.546	1638.571	141.9	2204.5	756.6	4.06	34.77	18.68
MAX Q									
71.500	2788.834	1192.728	1638.634	143.9	2221.9	766.1	3.92	35.29	19.01
72.0	2788.846	1192.912	1638.697	145.8	2239.5	775.6	3.83	35.68	19.30
73.0	2788.870	1193.284	1638.826	149.5	2275.3	795.4	3.69	36.25	20.16
74.0	2788.895	1193.661	1638.959	153.0	2311.6	816.0	3.61	36.53	21.12
75.0	2788.921	1194.045	1639.095	156.5	2348.2	837.6	3.58	36.76	22.09
76.0	2788.947	1194.434	1639.235	159.9	2385.1	860.2	3.40	37.36	23.06
77.0	2788.973	1194.830	1639.379	162.9	2422.6	883.7	2.97	38.05	23.90
78.0	2789.000	1195.232	1639.526	165.4	2461.1	907.9	2.38	39.01	24.51
79.0	2789.028	1195.640	1639.678	167.5	2500.6	932.5	1.82	40.26	24.88
80.0	2789.056	1196.056	1639.833	169.2	2541.4	957.4	1.64	41.68	25.01
81.0	2789.084	1196.477	1639.993	170.9	2583.6	982.5	1.76	42.98	25.06
82.0	2789.112	1196.906	1640.157	172.6	2627.0	1007.7	2.10	44.00	25.18
83.0	2789.140	1197.342	1640.325	174.7	2671.0	1033.0	2.42	44.64	25.45
84.0	2789.169	1197.786	1640.497	177.1	2715.5	1058.4	2.47	44.88	25.62
85.0	2789.199	1198.236	1640.673	179.4	2760.7	1084.3	2.25	45.44	25.92
86.0	2789.229	1198.695	1640.854	181.3	2806.7	1110.5	1.85	46.51	26.40
87.0	2789.259	1199.161	1641.039	182.7	2853.6	1137.2	1.30	47.76	26.96
88.0	2789.289	1199.634	1641.228	183.8	2901.9	1164.4	0.79	49.07	27.55
89.0	2789.319	1200.116	1641.422	184.3	2951.3	1192.2	0.28	50.18	28.07
90.0	2789.349	1200.606	1641.621	184.2	3001.9	1220.5	-0.17	51.16	28.56
91.0	2789.380	1201.104	1641.824	183.6	3053.4	1249.3	-0.79	52.07	29.03
92.0	2789.410	1201.611	1642.032	182.3	3105.8	1278.6	-1.48	53.10	29.50
93.0	2789.440	1202.127	1642.245	180.5	3159.3	1308.3	-2.12	54.26	29.98
94.0	2789.469	1202.651	1642.463	178.0	3214.1	1338.5	-2.61	55.43	30.42
95.0	2789.499	1203.185	1642.686	175.1	3270.0	1369.2	-3.03	56.67	30.83
96.0	2789.527	1203.728	1642.914	171.7	3327.0	1400.1	-3.41	57.79	31.15
97.0	2789.555	1204.280	1643.147	168.0	3385.1	1431.4	-3.93	58.74	31.41
98.0	2789.583	1204.842	1643.385	163.7	3444.3	1462.9	-4.43	59.73	31.68



TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	CXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SC	DDYSP FT/S SC	DDZSP FT/S SC
99.0	2789.609	1205.414	1643.629	158.9	3504.4	1494.8	-4.90	60.71	32.00
100.0	2789.635	1205.996	1643.877	153.7	3565.5	1527.0	-5.34	61.77	32.44
101.0	2789.660	1206.588	1644.131	148.1	3627.6	1559.7	-5.75	62.79	32.89
102.0	2789.684	1207.190	1644.391	142.0	3690.7	1592.8	-6.14	63.78	33.32
103.0	2789.707	1207.803	1644.656	135.6	3754.9	1626.3	-6.50	64.73	33.68
104.0	2789.729	1208.426	1644.926	128.7	3820.1	1660.2	-6.94	65.83	34.11
105.0	2789.749	1209.060	1645.202	121.5	3886.2	1694.4	-7.35	66.87	34.46
106.0	2789.769	1209.706	1645.484	113.9	3953.4	1729.1	-7.72	67.92	34.80
107.0	2789.787	1210.362	1645.772	105.9	4021.8	1764.1	-8.07	69.01	35.20
108.0	2789.804	1211.030	1646.065	97.6	4091.4	1799.6	-8.36	70.31	35.76
109.0	2789.819	1211.709	1646.364	88.9	4162.1	1835.6	-8.75	71.47	36.29
110.0	2789.833	1212.400	1646.669	79.9	4233.9	1872.1	-9.17	72.50	36.78
111.0	2789.845	1213.103	1646.981	70.3	4306.7	1909.1	-9.70	73.47	37.20
112.0	2789.856	1213.817	1647.298	60.3	4380.5	1946.5	-10.22	74.44	37.58
113.0	2789.865	1214.545	1647.621	49.7	4455.5	1984.4	-10.71	75.62	38.07
114.0	2789.873	1215.284	1647.951	38.7	4531.6	2022.7	-11.21	76.94	38.65
115.0	2789.878	1216.036	1648.287	27.2	4609.0	2061.6	-11.66	78.17	39.15
116.0	2789.882	1216.801	1648.630	15.1	4687.4	2100.9	-12.15	79.15	39.58
117.0	2789.883	1217.580	1648.979	2.6	4767.0	2140.7	-12.70	80.10	39.98
118.0	2789.883	1218.371	1649.335	-10.5	4847.7	2181.0	-13.26	81.39	40.55
119.0	2789.880	1219.175	1649.697	-24.2	4929.7	2221.9	-13.92	82.82	41.15
120.0	2789.875	1219.993	1650.066	-38.5	5013.0	2263.3	-14.55	84.19	41.71
121.0	2789.868	1220.826	1650.442	-53.5	5097.6	2305.2	-15.28	85.54	42.23
122.0	2789.858	1221.671	1650.825	-69.2	5183.8	2347.7	-16.03	86.86	42.68
123.0	2789.845	1222.532	1651.215	-85.7	5271.0	2390.6	-16.76	88.01	43.07
124.0	2789.830	1223.407	1651.612	-102.9	5359.5	2433.8	-17.52	89.14	43.45
125.0	2789.811	1224.296	1652.016	-121.0	5449.1	2477.5	-18.35	90.54	43.91
126.0	2789.790	1225.200	1652.428	-140.0	5540.4	2521.7	-19.32	92.13	44.43
127.0	2789.766	1226.120	1652.846	-159.8	5633.3	2566.5	-20.27	93.79	45.04
128.0	2789.738	1227.055	1653.273	-180.7	5727.7	2611.8	-21.26	95.49	45.64
129.0	2789.706	1228.005	1653.706	-202.5	5823.7	2657.6	-22.31	97.01	46.11
130.0	2789.671	1228.972	1654.147	-225.6	5921.3	2703.9	-23.47	98.39	46.50
131.0	2789.632	1229.954	1654.596	-249.8	6020.2	2750.5	-24.73	99.87	46.94
132.0	2789.589	1230.953	1655.053	-275.1	6120.4	2797.5	-25.76	101.36	47.21
133.0	2789.542	1231.968	1655.517	-301.9	6222.5	2845.1	-27.12	103.02	47.78
134.0	2789.490	1233.001	1655.989	-330.0	6326.3	2893.1	-28.48	104.71	48.25
135.0	2789.433	1234.050	1656.470	-358.9	6431.6	2941.7	-29.34	106.25	48.82
136.0	2789.372	1235.117	1656.958	-388.2	6538.4	2991.0	-29.60	107.71	49.51
137.0	2789.306	1236.202	1657.454	-417.6	6646.6	3041.1	-29.67	109.19	50.28
138.0	2789.235	1237.305	1657.959	-446.7	6756.6	3092.1	-29.38	110.47	51.15

IECO

138.970 2789.161 1238.392 1658.456 -475.8 6863.0 3141.3 -28.93 111.46 51.83

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
139.0	2789.159	1238.425	1658.472	-475.8	6865.0	3142.4	-28.97	111.68	51.93
140.0	2789.078	1239.563	1658.992	-503.5	6933.5	3170.8	-29.32	57.66	21.62
141.0	2788.993	1240.708	1659.516	-530.9	6986.1	3190.5	-27.78	52.96	19.56
142.0	2788.903	1241.862	1660.042	-557.9	7032.3	3206.7	-25.56	46.93	17.04
OECCO									
142.250	2788.881	1242.151	1660.174	-564.4	7042.7	3210.3	-26.97	42.75	14.22
143.0	2788.810	1243.022	1660.571	-584.1	7049.3	3207.0	-26.66	11.69	-2.88
S-IB/S-IVB SEPARATION SIGNAL									
143.500	2788.761	1243.602	1660.835	-596.9	7045.5	3200.6	-25.33	-6.23	-12.36
EBW FIRING (SEPARATION SIGNAL PLUS 0.07 SECONDS)									
143.570	2788.759	1243.681	1660.872	-598.7	7045.0	3199.7	-25.30	-6.45	-12.52
144.0	2788.716	1244.179	1661.098	-609.8	7040.7	3193.7	-24.55	-8.40	-13.33
145.0	2788.613	1245.337	1661.622	-635.3	7030.6	3179.3	-24.52	-9.73	-14.06
150.0	2788.038	1251.109	1664.214	-764.1	7021.1	3130.3	-26.29	6.80	-5.05
155.0	2787.356	1256.903	1666.781	-893.5	7063.0	3112.1	-25.96	9.67	-2.93
GUIDANCE INITIATION									
159.470	2786.656	1262.114	1669.065	-1009.2	7105.8	3099.0	-26.04	10.16	-2.64
160.0	2786.568	1262.734	1669.335	-1022.8	7110.9	3097.5	-25.98	10.16	-2.68
165.0	2785.673	1268.606	1671.878	-1152.7	7161.5	3082.1	-26.32	10.78	-3.42
170.0	2784.669	1274.521	1674.406	-1288.4	7216.6	3060.8	-27.45	11.32	-4.36
175.0	2783.553	1280.483	1676.916	-1425.1	7273.3	3039.5	-27.07	11.67	-4.18
180.0	2782.324	1286.492	1679.408	-1561.1	7331.2	3018.7	-27.16	11.76	-4.13
185.0	2780.984	1292.549	1681.884	-1697.1	7390.1	2998.5	-27.16	12.06	-3.97
190.0	2779.531	1298.655	1684.343	-1833.9	7450.3	2978.5	-27.30	12.29	-4.00
195.0	2777.965	1304.811	1686.786	-1971.6	7511.6	2958.7	-27.59	12.53	-3.90
200.0	2776.286	1311.018	1689.212	-2110.3	7574.4	2938.4	-27.70	12.85	-4.22
205.0	2774.492	1317.277	1691.621	-2250.4	7638.9	2916.3	-28.08	13.30	-4.56
210.0	2772.582	1323.591	1694.012	-2391.6	7705.1	2893.0	-28.25	13.45	-4.70
215.0	2770.555	1329.958	1696.383	-2533.7	7772.3	2869.7	-28.39	13.66	-4.66
220.0	2768.411	1336.382	1698.735	-2676.7	7840.4	2846.5	-28.60	13.81	-4.63
225.0	2766.150	1342.862	1701.068	-2820.3	7909.6	2823.6	-28.67	14.16	-4.52
230.0	2763.770	1349.400	1703.382	-2964.3	7980.0	2801.2	-28.82	14.37	-4.41

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
235.0	2761.271	1355.996	1705.678	-3109.6	8051.9	2779.1	-29.00	14.68	-4.44
240.0	2758.652	1362.652	1707.956	-3255.5	8124.8	2757.0	-29.19	14.82	-4.41
245.0	2755.913	1369.368	1710.215	-3402.4	8198.4	2735.0	-29.40	14.95	-4.38
250.0	2753.052	1376.145	1712.457	-3550.4	8273.3	2713.4	-29.60	15.30	-4.25
255.0	2750.070	1382.984	1714.681	-3698.6	8348.8	2691.9	-29.54	15.34	-4.29
260.0	2746.965	1389.886	1716.888	-3847.8	8426.3	2671.0	-29.85	15.81	-4.12
265.0	2743.737	1396.853	1719.077	-3997.8	8505.3	2650.6	-29.94	16.04	-4.06
270.0	2740.385	1403.885	1721.250	-4148.4	8585.2	2630.2	-30.24	16.28	-4.04
275.0	2736.909	1410.983	1723.406	-4300.7	8666.8	2610.2	-30.46	16.58	-3.99
280.0	2733.307	1418.148	1725.546	-4454.0	8749.2	2590.2	-30.67	16.73	-4.00
285.0	2729.578	1425.383	1727.669	-4608.5	8833.1	2570.3	-30.90	17.04	-3.93
290.0	2725.722	1432.686	1729.776	-4764.0	8917.4	2552.2	-31.22	16.95	-3.13
295.0	2721.737	1440.059	1731.871	-4920.8	9001.2	2537.8	-31.27	17.14	-3.01
300.0	2717.624	1447.501	1733.952	-5077.9	9088.5	2520.6	-31.39	17.90	-3.83
305.0	2713.380	1455.017	1736.018	-5235.9	9178.5	2500.9	-31.65	18.29	-3.89
310.0	2709.006	1462.607	1738.069	-5395.4	9269.6	2482.5	-31.98	18.58	-3.48
315.0	2704.500	1470.273	1740.104	-5556.3	9362.2	2465.1	-32.18	18.83	-3.59
320.0	2699.861	1478.016	1742.125	-5718.6	9456.8	2447.0	-32.56	19.18	-3.64
325.0	2695.088	1485.837	1744.132	-5882.6	9552.8	2429.0	-32.84	19.49	-3.53
330.0	2690.179	1493.738	1746.123	-6048.0	9650.0	2411.4	-33.13	19.75	-3.55
335.0	2685.134	1501.720	1748.100	-6214.2	9748.3	2393.7	-33.32	20.02	-3.47
340.0	2679.951	1509.783	1750.063	-6382.3	9849.2	2376.7	-33.61	20.47	-3.38
345.0	2674.630	1517.929	1752.012	-6551.4	9951.4	2359.8	-33.84	20.82	-3.32
350.0	2669.169	1526.161	1753.947	-6721.9	10055.3	2343.5	-34.12	21.08	-3.22
355.0	2663.567	1534.479	1755.869	-6893.7	10160.7	2327.6	-34.47	21.46	-3.14
360.0	2657.823	1542.884	1757.778	-7067.5	10268.3	2311.8	-34.84	21.89	-3.13
365.0	2651.935	1551.379	1759.674	-7242.8	10378.2	2296.4	-35.29	22.52	-2.97
370.0	2645.902	1559.965	1761.557	-7420.3	10490.2	2281.6	-35.74	22.58	-2.91
375.0	2639.722	1568.644	1763.429	-7600.2	10604.2	2266.9	-35.94	23.35	-2.96
380.0	2633.393	1577.418	1765.288	-7782.1	10720.5	2252.3	-36.57	23.66	-2.85
385.0	2626.914	1586.288	1767.136	-7966.3	10838.9	2237.9	-36.95	24.04	-2.87
390.0	2620.282	1595.257	1768.971	-8152.4	10958.9	2223.7	-37.31	24.31	-2.83
395.0	2613.496	1604.325	1770.795	-8340.4	11081.0	2209.8	-37.73	24.81	-2.77
400.0	2606.555	1613.494	1772.608	-8530.3	11205.4	2196.2	-38.07	25.26	-2.63
405.0	2599.456	1622.767	1774.410	-8722.8	11332.5	2183.3	-38.64	25.83	-2.56
410.0	2592.199	1632.146	1776.201	-8917.2	11461.6	2170.6	-39.04	26.18	-2.53
415.0	2584.780	1641.631	1777.983	-9113.8	11593.2	2158.4	-39.51	26.77	-2.37
420.0	2577.199	1651.226	1779.754	-9312.9	11727.4	2146.3	-40.00	27.29	-2.41
425.0	2569.452	1660.933	1781.515	-9514.5	11864.4	2134.6	-40.48	27.82	-2.28
430.0	2561.539	1670.753	1783.267	-9719.2	12004.1	2123.5	-41.19	28.46	-2.21
435.0	2553.456	1680.690	1785.010	-9927.1	12147.4	2112.7	-41.72	29.12	-2.11
440.0	2545.201	1690.746	1786.744	-10137.6	12293.7	2102.3	-42.40	29.78	-2.04
445.0	2536.770	1700.924	1788.470	-10352.3	12443.6	2092.6	-43.18	30.38	-1.90
450.0	2528.163	1711.226	1790.188	-10569.3	12595.2	2083.1	-43.74	30.86	-1.84

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
455.0	2519.374	1721.654	1791.899	-10790.1	12750.8	2074.1	-44.38	31.65	-1.79
460.0	2510.403	1732.212	1793.602	-11014.3	12910.1	2065.1	-45.10	32.35	-1.75
465.0	2501.247	1742.902	1795.297	-11241.8	13072.7	2056.7	-45.83	33.01	-1.69
470.0	2491.901	1753.728	1796.986	-11472.9	13238.2	2048.2	-46.54	33.62	-1.69
475.0	2482.364	1764.691	1798.668	-11707.9	13407.9	2040.3	-47.34	34.51	-1.52
480.0	2472.631	1775.795	1800.344	-11947.0	13581.6	2033.1	-48.23	35.24	-1.42
485.0	2462.700	1787.044	1802.014	-12192.7	13758.3	2024.6	-50.10	35.77	-2.03
490.0	2452.562	1798.439	1803.676	-12448.6	13937.6	2013.4	-51.68	36.10	-2.34
495.0	2442.211	1809.982	1805.328	-12709.6	14117.9	2001.2	-52.56	36.20	-2.61
500.0	2431.644	1821.673	1806.969	-12972.6	14295.5	1986.6	-52.80	35.56	-3.10
505.0	2420.860	1833.510	1808.597	-13238.2	14472.2	1970.5	-52.87	34.74	-3.59
510.0	2409.857	1845.490	1810.210	-13502.8	14643.7	1950.8	-52.74	34.30	-4.24
515.0	2398.638	1857.609	1811.807	-13765.1	14811.5	1929.3	-52.39	33.69	-4.08
520.0	2387.202	1869.867	1813.386	-14028.7	14981.4	1910.2	-52.56	34.10	-3.71
525.0	2375.550	1882.265	1814.951	-14290.9	15150.5	1892.8	-52.30	33.98	-3.18
530.0	2363.682	1894.802	1816.502	-14553.1	15321.9	1878.2	-52.34	34.88	-2.72
535.0	2351.599	1907.483	1818.043	-14813.3	15498.3	1866.6	-51.68	36.03	-1.89
540.0	2339.304	1920.311	1819.576	-15069.7	15681.5	1860.4	-50.80	37.63	-0.63
545.0	2326.798	1933.293	1821.106	-15325.1	15872.3	1858.7	-51.37	38.67	-0.32
550.0	2314.080	1946.433	1822.634	-15589.5	16064.7	1854.0	-54.86	38.65	-1.74
555.0	2301.136	1959.732	1824.155	-15871.8	16257.7	1842.5	-57.57	38.92	-2.74
560.0	2287.956	1973.190	1825.665	-16163.5	16453.9	1827.8	-58.88	39.94	-2.94
565.0	2274.533	1986.813	1827.163	-16460.6	16655.7	1813.9	-59.80	41.06	-2.57
570.0	2260.864	2000.603	1828.651	-16764.1	16861.9	1800.9	-61.73	41.62	-2.85
575.0	2246.939	2014.565	1830.126	-17080.5	17071.3	1783.9	-64.62	42.30	-3.99
580.0	2232.750	2028.700	1831.585	-17407.3	17285.4	1763.4	-65.73	44.04	-3.87
585.0	2218.290	2043.015	1833.029	-17739.6	17507.6	1744.9	-67.66	45.05	-3.67
590.0	2203.552	2057.514	1834.457	-18081.2	17735.3	1727.6	-68.66	46.67	-3.14
S-IVB GUIDANCE CUTOFF									
593.340	2193.551	2067.306	1835.404	-18309.1	17894.0	1718.9	-67.46	48.52	-2.29
595.0	2188.541	2072.195	1835.871	-18354.5	17883.4	1696.4	-19.34	-17.12	-15.74
600.0	2173.398	2086.875	1837.234	-18450.0	17794.2	1616.8	-18.80	-17.93	-15.98
ORBIT INSERTION									
603.340	2163.239	2096.639	1838.108	-18512.9	17733.9	1563.5	-18.71	-18.01	-15.99
605.0	2158.178	2101.482	1838.529	-18543.9	17703.6	1537.0	-18.66	-18.06	-15.99
610.0	2142.880	2116.013	1839.761	-18637.4	17612.4	1457.1	-18.65	-18.07	-15.99
620.0	2112.053	2144.848	1842.027	-18822.9	17428.7	1297.0	-18.38	-18.33	-16.01
630.0	2080.924	2173.379	1844.030	-19005.8	17242.5	1136.8	-18.10	-18.59	-16.03

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SC	DDYSP FT/S SC	DCZSP FT/S SC
640.0	2049.496	2201.602	1845.769	-19185.7	17053.6	976.4	-17.73	-18.92	-16.05
650.0	2017.775	2229.511	1847.244	-19362.0	16861.5	815.8	-17.45	-19.17	-16.06
660.0	1985.766	2257.101	1848.454	-19535.5	16667.0	655.1	-17.18	-19.40	-16.08
670.0	1953.474	2284.370	1849.400	-19706.2	16470.1	494.3	-16.90	-19.64	-16.08
680.0	1920.903	2311.313	1850.081	-19874.2	16270.9	333.5	-16.62	-19.87	-16.09
690.0	1888.058	2337.926	1850.498	-20039.3	16069.3	172.6	-16.34	-20.10	-16.09
700.0	1854.944	2364.205	1850.649	-20201.5	15865.5	11.6	-16.05	-20.33	-16.09
710.0	1821.565	2390.147	1850.536	-20360.8	15659.4	-149.3	-15.76	-20.55	-16.09
720.0	1787.927	2415.748	1850.158	-20517.2	15451.1	-310.2	-15.47	-20.77	-16.09
730.0	1754.033	2441.004	1849.515	-20670.7	15240.6	-471.0	-15.18	-20.99	-16.08
740.0	1719.889	2465.912	1848.608	-20821.3	15027.9	-631.8	-14.89	-21.21	-16.07
750.0	1685.499	2490.469	1847.436	-20968.8	14813.1	-792.5	-14.59	-21.42	-16.06
760.0	1650.870	2514.669	1845.999	-21113.4	14596.1	-953.0	-14.29	-21.63	-16.05
770.0	1616.005	2538.512	1844.299	-21255.0	14377.1	-1113.5	-13.99	-21.83	-16.03
780.0	1580.909	2561.992	1842.334	-21393.5	14156.1	-1273.7	-13.69	-22.03	-16.02
790.0	1545.588	2585.106	1840.106	-21529.0	13933.0	-1433.8	-13.39	-22.23	-16.00
800.0	1510.047	2607.852	1837.615	-21661.3	13708.0	-1593.6	-13.08	-22.43	-15.97
810.0	1474.290	2630.226	1834.861	-21790.6	13481.0	-1753.3	-12.77	-22.62	-15.95
820.0	1438.323	2652.225	1831.844	-21916.8	13252.1	-1912.6	-12.46	-22.81	-15.92
830.0	1402.151	2673.845	1828.565	-22039.9	13021.3	-2071.7	-12.15	-23.00	-15.89
840.0	1365.779	2695.085	1825.025	-22159.8	12788.7	-2230.5	-11.84	-23.18	-15.86
850.0	1329.212	2715.940	1821.224	-22276.5	12554.3	-2389.0	-11.52	-23.36	-15.83
860.0	1292.456	2736.407	1817.162	-22390.1	12318.1	-2547.1	-11.20	-23.54	-15.79
870.0	1255.515	2756.484	1812.840	-22500.4	12080.1	-2704.8	-10.89	-23.71	-15.75
880.0	1218.395	2776.169	1808.259	-22607.6	11840.4	-2862.1	-10.57	-23.88	-15.71
890.0	1181.102	2795.457	1803.419	-22711.5	11599.1	-3019.1	-10.24	-24.04	-15.67
900.0	1143.640	2814.347	1798.322	-22812.2	11356.1	-3175.5	-9.92	-24.21	-15.63
910.0	1106.016	2832.836	1792.967	-22909.6	11111.5	-3331.6	-9.60	-24.37	-15.58
920.0	1068.234	2850.920	1787.356	-23003.7	10865.3	-3487.1	-9.27	-24.52	-15.53
930.0	1030.299	2868.599	1781.489	-23094.6	10617.6	-3642.1	-8.95	-24.67	-15.48
940.0	992.218	2885.868	1775.368	-23182.1	10368.4	-3796.6	-8.62	-24.82	-15.42
950.0	953.995	2902.726	1768.992	-23266.4	10117.7	-3950.6	-8.29	-24.97	-15.37
960.0	915.637	2919.171	1762.364	-23347.3	9865.6	-4104.0	-7.96	-25.11	-15.31
970.0	877.148	2935.199	1755.484	-23424.9	9612.2	-4256.7	-7.63	-25.24	-15.25
980.0	838.534	2950.809	1748.353	-23499.2	9357.3	-4408.9	-7.29	-25.38	-15.18
990.0	799.800	2965.999	1740.972	-23570.1	9101.2	-4560.4	-6.96	-25.51	-15.12
1000.0	760.953	2980.766	1733.343	-23637.6	8843.7	-4711.3	-6.63	-25.63	-15.05
1010.0	721.997	2995.108	1725.465	-23701.8	8585.1	-4861.4	-6.29	-25.76	-14.98
1020.0	682.938	3009.023	1717.341	-23762.6	8325.2	-5010.9	-5.95	-25.88	-14.91
1030.0	643.782	3022.510	1708.972	-23820.0	8064.1	-5159.7	-5.62	-25.99	-14.84
1040.0	604.535	3035.567	1700.358	-23874.0	7801.9	-5307.7	-5.28	-26.10	-14.76
1050.0	565.201	3048.190	1691.502	-23924.6	7538.7	-5454.9	-4.94	-26.21	-14.68
1060.0	525.787	3060.380	1682.403	-23971.8	7274.3	-5601.3	-4.60	-26.31	-14.60
1070.0	486.298	3072.134	1673.065	-24015.5	7009.0	-5747.0	-4.26	-26.41	-14.52

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
1080.0	446.740	3083.450	1663.487	-24055.9	6742.7	-5891.7	-3.92	-26.51	-14.44
1090.0	407.118	3094.327	1653.672	-24092.8	6475.4	-6035.7	-3.58	-26.60	-14.35
1100.0	367.439	3104.764	1643.621	-24126.3	6207.3	-6178.8	-3.24	-26.69	-14.26
1110.0	327.707	3114.759	1633.335	-24156.3	5938.2	-6320.9	-2.90	-26.78	-14.17
1120.0	287.928	3124.310	1622.816	-24182.9	5668.4	-6462.2	-2.56	-26.86	-14.08
1130.0	248.109	3133.416	1612.065	-24206.1	5397.8	-6602.5	-2.21	-26.93	-13.99
1140.0	208.254	3142.076	1601.083	-24225.8	5126.4	-6741.9	-1.87	-27.01	-13.89
1150.0	168.369	3150.290	1589.874	-24242.1	4854.3	-6880.3	-1.53	-27.08	-13.79
1160.0	128.461	3158.054	1578.437	-24254.9	4581.5	-7017.7	-1.18	-27.14	-13.69
1170.0	88.534	3165.370	1566.775	-24264.3	4308.1	-7154.1	-0.84	-27.20	-13.59
1180.0	48.595	3172.235	1554.889	-24270.2	4034.2	-7289.4	-0.50	-27.26	-13.48
1190.0	8.649	3178.648	1542.782	-24272.6	3759.7	-7423.7	-0.15	-27.31	-13.38
1200.0	-31.298	3184.610	1530.454	-24271.6	3484.6	-7557.0	0.19	-27.36	-13.27
1210.0	-71.241	3190.118	1517.908	-24267.2	3209.1	-7689.1	0.53	-27.41	-13.16
1220.0	-111.173	3195.172	1505.146	-24259.3	2933.2	-7820.1	0.87	-27.45	-13.05
1230.0	-151.090	3199.773	1492.168	-24247.9	2656.9	-7950.0	1.22	-27.49	-12.93
1240.0	-190.985	3203.918	1478.978	-24233.1	2380.2	-8078.8	1.56	-27.52	-12.82
1250.0	-230.853	3207.607	1465.577	-24214.9	2103.2	-8206.4	1.90	-27.55	-12.70
1260.0	-270.688	3210.840	1451.967	-24193.2	1826.0	-8332.8	2.24	-27.58	-12.58
1270.0	-310.485	3213.617	1438.149	-24168.1	1548.5	-8458.0	2.59	-27.60	-12.46
1280.0	-350.238	3215.937	1424.127	-24139.5	1270.8	-8582.0	2.93	-27.62	-12.34
1290.0	-389.941	3217.800	1409.902	-24107.5	993.0	-8704.8	3.27	-27.63	-12.21
1300.0	-429.588	3219.206	1395.475	-24072.1	715.0	-8826.3	3.61	-27.64	-12.09
1310.0	-469.174	3220.154	1380.850	-24033.3	437.0	-8946.5	3.95	-27.65	-11.96
1320.0	-508.693	3220.644	1366.028	-23991.1	159.0	-9065.4	4.28	-27.65	-11.83
1330.0	-548.140	3220.677	1351.011	-23945.4	-119.1	-9183.1	4.62	-27.65	-11.70
1340.0	-587.510	3220.252	1335.802	-23896.4	-397.1	-9299.4	4.96	-27.64	-11.56
1350.0	-626.795	3219.370	1320.402	-23844.0	-675.0	-9414.4	5.30	-27.63	-11.43
1360.0	-665.992	3218.030	1304.815	-23788.2	-952.8	-9528.0	5.63	-27.62	-11.29
1370.0	-705.094	3216.234	1289.041	-23729.0	-1230.4	-9640.2	5.97	-27.60	-11.16
1380.0	-744.096	3213.981	1273.084	-23666.5	-1507.8	-9751.1	6.30	-27.58	-11.02
1390.0	-782.992	3211.271	1256.945	-23600.6	-1785.0	-9860.6	6.63	-27.55	-10.88
1400.0	-821.777	3208.105	1240.628	-23531.3	-2061.8	-9968.6	6.97	-27.52	-10.73
1410.0	-860.446	3204.484	1224.133	-23458.8	-2338.4	-10075.3	7.30	-27.49	-10.59
1420.0	-898.992	3200.409	1207.465	-23382.9	-2614.6	-10180.4	7.63	-27.45	-10.44
1430.0	-937.411	3195.879	1190.625	-23303.7	-2890.4	-10284.1	7.95	-27.41	-10.30
1440.0	-975.696	3190.895	1173.615	-23221.2	-3165.7	-10386.4	8.28	-27.37	-10.15
1450.0	-1013.843	3185.459	1156.438	-23135.4	-3440.6	-10487.1	8.61	-27.32	-10.00
1460.0	-1051.846	3179.570	1139.096	-23046.4	-3714.9	-10586.4	8.93	-27.27	-9.85
1470.0	-1089.700	3173.231	1121.593	-22954.1	-3988.7	-10684.1	9.26	-27.21	-9.70
1480.0	-1127.400	3166.442	1103.930	-22858.5	-4261.9	-10780.3	9.58	-27.15	-9.54
1490.0	-1164.939	3159.203	1086.110	-22759.7	-4534.4	-10874.9	9.90	-27.08	-9.39
1500.0	-1202.313	3151.517	1068.135	-22657.7	-4806.3	-10968.0	10.22	-27.02	-9.23
1510.0	-1239.517	3143.383	1050.009	-22552.5	-5077.4	-11059.5	10.54	-26.94	-9.07

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
1520.0	-1276.545	3134.804	1031.733	-22444.2	-5347.8	-11149.4	10.85	-26.87	-8.91
1530.0	-1313.392	3125.781	1013.310	-22332.6	-5617.4	-11237.8	11.17	-26.79	-8.75
1540.0	-1350.053	3116.315	994.744	-22217.9	-5886.2	-11324.5	11.48	-26.70	-8.59
1550.0	-1386.522	3106.406	976.036	-22100.1	-6154.1	-11409.6	11.79	-26.62	-8.43
1560.0	-1422.795	3096.058	957.189	-21979.1	-6421.1	-11493.1	12.10	-26.52	-8.26
1570.0	-1458.867	3085.271	938.206	-21855.1	-6687.1	-11574.9	12.40	-26.43	-8.10
1580.0	-1494.731	3074.048	919.090	-21728.0	-6952.2	-11655.0	12.71	-26.33	-7.93
1590.0	-1530.384	3062.388	899.844	-21597.8	-7216.3	-11733.6	13.01	-26.23	-7.77
1600.0	-1565.820	3050.295	880.469	-21464.6	-7479.2	-11810.4	13.32	-26.12	-7.60
1610.0	-1601.035	3037.770	860.970	-21328.3	-7741.1	-11885.5	13.61	-26.01	-7.43
1620.0	-1636.022	3024.815	841.348	-21189.1	-8001.9	-11959.0	13.91	-25.90	-7.26
1630.0	-1670.778	3011.432	821.607	-21046.8	-8261.5	-12030.7	14.21	-25.78	-7.09
1640.0	-1705.298	2997.623	801.749	-20901.7	-8519.9	-12100.7	14.50	-25.66	-6.92
1650.0	-1739.576	2983.389	781.778	-20753.5	-8777.0	-12169.0	14.79	-25.53	-6.74
1660.0	-1773.608	2968.733	761.695	-20602.5	-9032.9	-12235.5	15.08	-25.41	-6.57
1670.0	-1807.389	2953.657	741.504	-20448.6	-9287.4	-12300.3	15.37	-25.28	-6.39
1680.0	-1840.915	2938.164	721.209	-20291.8	-9540.7	-12363.4	15.65	-25.14	-6.22
1690.0	-1874.180	2922.254	700.810	-20132.1	-9792.5	-12424.7	15.94	-25.00	-6.04
1700.0	-1907.180	2905.932	680.313	-19969.6	-10042.9	-12484.2	16.21	-24.86	-5.86
1710.0	-1939.910	2889.198	659.719	-19804.4	-10291.8	-12541.9	16.49	-24.71	-5.68
1720.0	-1972.366	2872.056	639.031	-19636.3	-10539.3	-12597.9	16.77	-24.56	-5.51
1730.0	-2004.543	2854.508	618.253	-19465.5	-10785.2	-12652.0	17.04	-24.41	-5.33
1740.0	-2036.436	2836.557	597.387	-19292.0	-11029.6	-12704.4	17.31	-24.25	-5.14
1750.0	-2068.042	2818.204	576.436	-19115.7	-11272.3	-12754.9	17.58	-24.10	-4.96
1760.0	-2099.356	2799.454	555.404	-18936.8	-11513.5	-12803.7	17.84	-23.93	-4.78
1770.0	-2130.373	2780.308	534.293	-18755.3	-11752.9	-12850.6	18.11	-23.77	-4.60
1780.0	-2161.089	2760.769	513.107	-18571.1	-11990.7	-12895.6	18.36	-23.60	-4.42
1790.0	-2191.500	2740.841	491.847	-18384.4	-12226.8	-12938.9	18.62	-23.42	-4.23
1800.0	-2221.601	2720.525	470.518	-18195.0	-12461.1	-12980.3	18.88	-23.25	-4.05
1810.0	-2251.388	2699.825	449.123	-18003.1	-12693.6	-13019.9	19.13	-23.07	-3.86
1820.0	-2280.858	2678.744	427.663	-17808.7	-12924.3	-13057.6	19.38	-22.89	-3.68
1830.0	-2310.006	2657.285	406.144	-17611.9	-13153.1	-13093.4	19.62	-22.70	-3.49
1840.0	-2338.828	2635.450	384.566	-17412.5	-13380.0	-13127.4	19.87	-22.51	-3.31
1850.0	-2367.319	2613.244	362.935	-17210.8	-13605.0	-13159.6	20.11	-22.32	-3.12
1860.0	-2395.477	2590.670	341.252	-17006.6	-13828.0	-13189.8	20.34	-22.12	-2.93
1870.0	-2423.297	2567.730	319.520	-16800.1	-14049.1	-13218.2	20.58	-21.92	-2.75
1880.0	-2450.775	2544.427	297.744	-16591.3	-14268.1	-13244.8	20.81	-21.72	-2.56
1890.0	-2477.907	2520.766	275.925	-16380.1	-14485.1	-13269.4	21.04	-21.52	-2.37
1900.0	-2504.690	2496.749	254.068	-16166.7	-14700.0	-13292.2	21.26	-21.31	-2.18
1910.0	-2531.119	2472.381	232.174	-15951.0	-14912.9	-13313.1	21.48	-21.10	-1.99
1920.0	-2557.192	2447.664	210.248	-15733.1	-15123.5	-13332.1	21.70	-20.89	-1.81
1930.0	-2582.905	2422.602	188.292	-15513.0	-15332.1	-13349.2	21.92	-20.67	-1.62
1940.0	-2608.253	2397.198	166.309	-15290.7	-15538.4	-13364.4	22.13	-20.45	-1.43
1950.0	-2633.234	2371.457	144.303	-15066.4	-15742.5	-13377.7	22.34	-20.23	-1.24

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
1960.0	-2657.844	2345.382	122.276	-14840.0	-15944.3	-13389.2	22.55	-20.01	-1.05
1970.0	-2682.080	2318.976	100.232	-14611.5	-16143.9	-13398.7	22.75	-19.78	-0.86
1980.0	-2705.938	2292.244	78.174	-14380.9	-16341.2	-13406.3	22.95	-19.55	-0.67
1990.0	-2729.415	2265.189	56.105	-14148.4	-16536.1	-13412.1	23.15	-19.32	-0.48
2000.0	-2752.508	2237.816	34.029	-13914.0	-16728.7	-13416.0	23.34	-19.08	-0.29
2010.0	-2775.213	2210.127	11.947	-13677.6	-16918.9	-13417.9	23.53	-18.84	-0.10
2020.0	-2797.527	2182.127	-10.137	-13439.3	-17106.7	-13418.0	23.72	-18.60	0.09
2030.0	-2819.448	2153.820	-32.219	-13199.2	-17292.0	-13416.2	23.90	-18.36	0.28
2040.0	-2840.973	2125.210	-54.296	-12957.3	-17474.9	-13412.5	24.08	-18.11	0.47
2050.0	-2862.097	2096.302	-76.366	-12713.5	-17655.3	-13406.9	24.26	-17.87	0.66
2060.0	-2882.819	2067.098	-98.425	-12468.1	-17833.2	-13399.4	24.43	-17.62	0.84
2070.0	-2903.136	2037.604	-120.470	-12220.9	-18008.5	-13390.0	24.60	-17.36	1.03
2080.0	-2923.044	2007.823	-142.498	-11972.0	-18181.3	-13378.7	24.76	-17.11	1.22
2090.0	-2942.542	1977.760	-164.506	-11721.5	-18351.5	-13365.6	24.92	-16.85	1.41
2100.0	-2961.626	1947.419	-186.490	-11469.4	-18519.1	-13350.5	25.08	-16.59	1.60
2110.0	-2980.293	1916.804	-208.449	-11215.7	-18684.1	-13333.6	25.24	-16.33	1.79
2120.0	-2998.542	1885.920	-230.378	-10960.5	-18846.4	-13314.8	25.39	-16.06	1.97
2130.0	-3016.370	1854.771	-252.274	-10703.8	-19006.1	-13294.1	25.54	-15.80	2.16
2140.0	-3033.774	1823.362	-274.136	-10445.6	-19163.0	-13271.6	25.68	-15.53	2.35
2150.0	-3050.751	1791.696	-295.958	-10186.0	-19317.3	-13247.2	25.82	-15.26	2.53
2160.0	-3067.301	1759.779	-317.739	-9925.0	-19468.8	-13220.9	25.96	-14.99	2.72
2170.0	-3083.419	1727.615	-339.475	-9662.6	-19617.5	-13192.8	26.09	-14.71	2.90
2180.0	-3099.105	1695.208	-361.163	-9398.9	-19763.5	-13162.8	26.22	-14.43	3.09
2190.0	-3114.356	1662.563	-382.800	-9134.0	-19906.6	-13131.0	26.35	-14.16	3.27
2200.0	-3129.170	1629.685	-404.383	-8867.8	-20047.0	-13097.3	26.47	-13.87	3.46
2210.0	-3143.544	1596.579	-425.910	-8600.4	-20184.5	-13061.8	26.59	-13.59	3.64
2220.0	-3157.478	1563.248	-447.376	-8331.9	-20319.2	-13024.5	26.70	-13.31	3.83
2230.0	-3170.969	1529.698	-468.780	-8062.2	-20451.0	-12985.3	26.81	-13.02	4.01
2240.0	-3184.015	1495.934	-490.118	-7791.4	-20579.9	-12944.3	26.92	-12.73	4.19
2250.0	-3196.615	1461.959	-511.386	-7519.6	-20705.9	-12901.6	27.02	-12.45	4.37
2260.0	-3208.766	1427.780	-532.583	-7246.8	-20828.9	-12856.9	27.12	-12.15	4.55
2270.0	-3220.467	1393.401	-553.705	-6973.0	-20949.1	-12810.5	27.22	-11.86	4.73
2280.0	-3231.717	1358.826	-574.749	-6698.3	-21066.2	-12762.3	27.31	-11.57	4.91
2290.0	-3242.515	1324.062	-595.712	-6422.6	-21180.5	-12712.4	27.40	-11.27	5.09
2300.0	-3252.858	1289.111	-616.592	-6146.2	-21291.7	-12660.6	27.48	-10.97	5.27
2310.0	-3262.745	1253.980	-637.385	-5868.8	-21399.9	-12607.0	27.56	-10.68	5.44
2320.0	-3272.175	1218.673	-658.088	-5590.8	-21505.1	-12551.8	27.64	-10.38	5.62
2330.0	-3281.147	1183.196	-678.699	-5311.9	-21607.3	-12494.7	27.71	-10.07	5.79
2340.0	-3289.659	1147.553	-699.214	-5032.4	-21706.5	-12435.9	27.78	-9.77	5.97
2350.0	-3297.711	1111.749	-719.631	-4752.2	-21802.5	-12375.4	27.84	-9.47	6.14
2360.0	-3305.301	1075.790	-739.948	-4471.4	-21895.6	-12313.1	27.90	-9.16	6.31
2370.0	-3312.429	1039.680	-760.160	-4190.0	-21985.5	-12249.1	27.96	-8.86	6.48
2380.0	-3319.093	1003.424	-780.266	-3908.1	-22072.4	-12183.4	28.01	-8.55	6.65
2390.0	-3325.292	967.029	-800.262	-3625.6	-22156.1	-12116.0	28.06	-8.24	6.82



TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
2400.0	-3331.026	930.497	-820.145	-3342.7	-22236.8	-12046.9	28.11	-7.93	6.99
2410.0	-3336.295	893.836	-839.914	-3059.4	-22314.3	-11976.2	28.15	-7.62	7.16
2420.0	-3341.096	857.050	-859.565	-2775.6	-22388.7	-11903.7	28.18	-7.31	7.33
2430.0	-3345.431	820.144	-879.095	-2491.6	-22459.9	-11829.6	28.22	-7.00	7.49
2440.0	-3349.297	783.123	-898.502	-2207.2	-22528.0	-11753.9	28.25	-6.68	7.66
2450.0	-3352.696	745.993	-917.783	-1922.5	-22593.0	-11676.5	28.27	-6.37	7.82
2460.0	-3355.625	708.759	-936.935	-1637.7	-22654.7	-11597.5	28.29	-6.05	7.98
2470.0	-3358.086	671.425	-955.956	-1352.6	-22713.3	-11516.9	28.31	-5.74	8.14
2480.0	-3360.077	633.998	-974.843	-1067.4	-22768.7	-11434.7	28.33	-5.42	8.30
2490.0	-3361.599	596.482	-993.594	-782.1	-22821.0	-11350.8	28.33	-5.10	8.46
2500.0	-3362.652	558.882	-1012.205	-496.7	-22870.0	-11265.5	28.34	-4.78	8.62
2510.0	-3363.234	521.205	-1030.674	-211.2	-22915.8	-11178.5	28.34	-4.47	8.77
2520.0	-3363.347	483.455	-1048.999	74.2	-22958.4	-11090.0	28.34	-4.15	8.93
2530.0	-3362.990	445.637	-1067.177	359.5	-22997.9	-10999.9	28.33	-3.83	9.08
2540.0	-3362.164	407.757	-1085.205	644.8	-23034.1	-10908.3	28.32	-3.51	9.23
2550.0	-3360.868	369.821	-1103.081	930.0	-23067.0	-10815.2	28.31	-3.19	9.39
2560.0	-3359.103	331.832	-1120.803	1214.9	-23096.8	-10720.6	28.29	-2.87	9.53
2570.0	-3356.869	293.798	-1138.368	1499.7	-23123.3	-10624.5	28.27	-2.55	9.68
2580.0	-3354.166	255.722	-1155.774	1784.2	-23146.6	-10527.0	28.24	-2.23	9.83
2590.0	-3350.996	217.611	-1173.018	2068.5	-23166.6	-10428.0	28.22	-1.90	9.98
2600.0	-3347.358	179.469	-1190.098	2352.4	-23183.5	-10327.5	28.18	-1.58	10.12
2610.0	-3343.253	141.302	-1207.011	2636.0	-23197.1	-10225.6	28.14	-1.26	10.26
2620.0	-3338.682	103.116	-1223.755	2919.1	-23207.4	-10122.3	28.10	-0.94	10.40
2630.0	-3333.645	64.915	-1240.328	3201.8	-23214.5	-10017.5	28.06	-0.62	10.54
2640.0	-3328.143	26.705	-1256.728	3484.1	-23218.4	-9911.4	28.01	-0.29	10.68
2650.0	-3322.177	-11.508	-1272.952	3765.8	-23219.0	-9803.9	27.96	0.03	10.82
2660.0	-3315.748	-49.720	-1288.997	4046.9	-23216.4	-9695.1	27.90	0.35	10.95
2670.0	-3308.856	-87.925	-1304.863	4327.5	-23210.6	-9584.9	27.84	0.67	11.09
2680.0	-3301.504	-126.118	-1320.546	4607.4	-23201.5	-9473.4	27.77	0.99	11.22
2690.0	-3293.691	-164.293	-1336.045	4886.7	-23189.2	-9360.5	27.71	1.31	11.35
2700.0	-3285.419	-202.445	-1351.356	5165.2	-23173.7	-9246.4	27.63	1.63	11.48
2710.0	-3276.690	-240.569	-1366.479	5443.0	-23154.9	-9131.0	27.56	1.95	11.60
2720.0	-3267.504	-278.660	-1381.411	5720.0	-23133.0	-9014.3	27.48	2.28	11.73
2730.0	-3257.862	-316.711	-1396.150	5996.2	-23107.8	-8896.4	27.40	2.60	11.85
2740.0	-3247.767	-354.719	-1410.694	6271.5	-23079.3	-8777.3	27.31	2.91	11.98
2750.0	-3237.220	-392.677	-1425.040	6545.9	-23047.7	-8656.9	27.22	3.23	12.10
2760.0	-3226.221	-430.580	-1439.188	6819.4	-23012.9	-8535.4	27.12	3.55	12.22
2770.0	-3214.774	-468.424	-1453.134	7091.9	-22974.8	-8412.6	27.03	3.87	12.33
2780.0	-3202.879	-506.202	-1466.878	7363.3	-22933.6	-8288.7	26.92	4.19	12.45
2790.0	-3190.537	-543.910	-1480.417	7633.8	-22889.2	-8163.7	26.82	4.50	12.56
2800.0	-3177.752	-581.542	-1493.749	7903.1	-22841.6	-8037.5	26.71	4.82	12.67
2810.0	-3164.524	-619.093	-1506.872	8171.3	-22790.8	-7910.2	26.60	5.14	12.78
2820.0	-3150.856	-656.558	-1519.785	8438.4	-22736.8	-7781.8	26.48	5.45	12.89
2830.0	-3136.750	-693.931	-1532.486	8704.2	-22679.7	-7652.4	26.36	5.76	13.00

TABLE XV  
SPACE-FIXED EPHEMERIS POSITIONS, VELOCITIES AND ACCELERATIONS

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
2840.0	-3122.206	-731.208	-1544.973	8968.8	-22619.5	-7521.9	26.24	6.08	13.10
2850.0	-3107.229	-768.383	-1557.244	9232.2	-22556.1	-7390.3	26.11	6.39	13.21
2860.0	-3091.819	-805.451	-1569.298	9494.2	-22489.5	-7257.8	25.98	6.70	13.31
2870.0	-3075.979	-842.407	-1581.133	9754.9	-22419.9	-7124.2	25.84	7.01	13.41
2880.0	-3059.710	-879.246	-1592.748	10014.2	-22347.1	-6989.6	25.70	7.32	13.50
2890.0	-3043.017	-915.963	-1604.140	10272.1	-22271.2	-6854.1	25.56	7.63	13.60
2900.0	-3025.900	-952.552	-1615.308	10528.6	-22192.3	-6717.6	25.42	7.93	13.69
2910.0	-3008.362	-989.009	-1626.251	10783.6	-22110.2	-6580.3	25.27	8.24	13.78
2920.0	-2990.405	-1025.328	-1636.967	11037.1	-22025.1	-6442.0	25.12	8.55	13.87
2930.0	-2972.033	-1061.504	-1647.454	11289.0	-21936.9	-6302.8	24.96	8.85	13.96
2940.0	-2953.248	-1097.533	-1657.712	11539.3	-21845.7	-6162.7	24.80	9.15	14.05
2950.0	-2934.052	-1133.409	-1667.739	11788.0	-21751.5	-6021.8	24.64	9.45	14.13
2960.0	-2914.448	-1169.128	-1677.533	12035.0	-21654.2	-5880.1	24.48	9.75	14.21
2970.0	-2894.439	-1204.684	-1687.093	12280.4	-21553.9	-5737.5	24.31	10.05	14.30
2980.0	-2874.027	-1240.073	-1696.418	12524.0	-21450.7	-5594.2	24.14	10.35	14.37
2990.0	-2853.216	-1275.289	-1705.506	12765.9	-21344.4	-5450.0	23.96	10.64	14.45
3000.0	-2832.008	-1310.328	-1714.357	13006.0	-21235.2	-5305.2	23.78	10.94	14.52
3010.0	-2810.406	-1345.185	-1722.968	13244.3	-21123.1	-5159.6	23.60	11.23	14.60
3020.0	-2788.414	-1379.854	-1731.340	13480.7	-21008.0	-5013.3	23.41	11.52	14.67
3030.0	-2766.035	-1414.332	-1739.469	13715.2	-20890.0	-4866.3	23.23	11.81	14.73
3040.0	-2743.271	-1448.614	-1747.357	13947.8	-20769.1	-4718.6	23.04	12.10	14.80
3050.0	-2720.125	-1482.694	-1755.001	14178.5	-20645.3	-4570.3	22.84	12.38	14.86
3060.0	-2696.602	-1516.568	-1762.400	14407.2	-20518.7	-4421.3	22.64	12.66	14.93
3070.0	-2672.704	-1550.232	-1769.553	14633.9	-20389.2	-4271.7	22.44	12.95	14.99
3080.0	-2648.435	-1583.679	-1776.460	14858.5	-20256.9	-4121.6	22.24	13.23	15.04
3090.0	-2623.797	-1616.907	-1783.120	15081.1	-20121.8	-3970.8	22.03	13.51	15.10
3100.0	-2573.432	-1682.684	-1795.692	15301.6	-19983.9	-3819.6	21.82	13.78	15.15
3120.0	-2547.711	-1715.224	-1801.603	15519.9	-19843.2	-3667.8	21.61	14.06	15.21
3130.0	-2521.637	-1747.526	-1807.263	15736.1	-19699.8	-3515.4	21.39	14.33	15.26
3140.0	-2495.212	-1779.585	-1812.671	15950.0	-19553.6	-3362.7	21.17	14.60	15.30
3150.0	-2468.440	-1811.397	-1817.826	16161.8	-19404.7	-3209.4	20.95	14.87	15.35
3160.0	-2441.326	-1842.957	-1822.729	16371.3	-19253.1	-3055.7	20.73	15.14	15.39
3170.0	-2413.872	-1874.261	-1827.377	16578.5	-19098.9	-2901.6	20.50	15.40	15.43
3180.0	-2386.083	-1905.304	-1831.771	16783.4	-18942.0	-2747.0	20.27	15.67	15.47
3190.0	-2357.963	-1936.083	-1835.909	16986.0	-18782.5	-2592.1	20.04	15.93	15.51
3200.0	-2329.514	-1966.593	-1839.791	17186.3	-18620.3	-2436.8	19.80	16.18	15.54
3210.0	-2300.743	-1996.830	-1843.418	17384.1	-18455.6	-2281.2	19.57	16.44	15.58
3220.0	-2271.651	-2026.789	-1846.787	17579.5	-18288.3	-2125.3	19.32	16.70	15.61
3230.0	-2242.245	-2056.467	-1849.899	17772.5	-18118.5	-1969.1	19.08	16.95	15.64
				17963.0	-17946.2	-1812.6	18.83	17.20	15.66
3235.242	-2226.705	-2071.910	-1851.427	18061.9	-17854.8	-1730.4	18.70	17.33	15.68

S-IVB/LM SEPARATION

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLI-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
GUIDANCE REFERENCE RELEASE											
-4.956	3441.335	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	1341.6	0.000	11.
-4.0	3441.335	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	1341.6	0.000	112
-3.0	3441.335	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	1341.6	0.000	112
-2.0	3441.335	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	1341.6	0.000	112
-1.0	3441.335	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	1341.6	0.000	112
RANGE ZERO AT 17 48 08 EST											
0.000	3441.335	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	1341.6	0.000	112
FIRST MOTION											
0.200	3441.335	-80.5650	28.3707	0.00	90.00	0.0	90.00	0.00	1341.6	0.000	112
LIFTOFF											
0.360	3441.335	-80.5650	28.3707	109.02	89.51	1.2	90.00	0.05	1341.7	0.000	114
1.0	3441.336	-80.5650	28.3707	102.54	89.66	6.3	90.00	0.27	1341.7	-0.000	116
2.0	3441.337	-80.5650	28.3707	80.81	89.81	14.9	90.00	0.64	1341.8	-0.000	126
3.0	3441.340	-80.5650	28.3707	40.63	89.85	24.0	90.00	1.02	1341.9	-0.000	146
4.0	3441.345	-80.5650	28.3707	9.59	89.83	33.4	90.00	1.43	1342.1	0.000	174
5.0	3441.351	-80.5649	28.3707	355.52	89.79	43.2	89.99	1.84	1342.3	0.000	212
6.0	3441.359	-80.5649	28.3707	348.99	89.75	53.1	89.99	2.27	1342.7	0.000	261
7.0	3441.369	-80.5649	28.3707	345.82	89.72	63.3	89.99	2.70	1343.1	0.000	315
8.0	3441.380	-80.5649	28.3707	344.63	89.70	73.7	89.98	3.15	1343.6	0.000	387
9.0	3441.393	-80.5650	28.3707	345.01	89.68	84.4	89.98	3.60	1344.2	-0.000	466
10.0	3441.408	-80.5650	28.3707	347.00	89.67	95.2	89.98	4.06	1344.9	0.000	556
11.0	3441.425	-80.5650	28.3707	350.75	89.65	106.3	89.97	4.53	1345.8	0.000	657
12.0	3441.443	-80.5650	28.3707	356.43	89.64	117.6	89.97	5.01	1346.8	0.000	765
13.0	3441.463	-80.5650	28.3707	4.02	89.62	129.3	89.96	5.50	1348.0	0.000	892
14.0	3441.485	-80.5649	28.3707	13.10	89.59	141.2	89.96	6.00	1349.3	0.000	1027
15.0	3441.510	-80.5649	28.3707	22.80	89.54	153.3	89.95	6.52	1350.9	0.000	1174
16.0	3441.536	-80.5649	28.3707	32.13	89.46	165.8	89.94	7.04	1352.8	0.001	1333
17.0	3441.564	-80.5649	28.3707	40.39	89.36	178.6	89.93	7.57	1354.9	0.001	1506
18.0	3441.595	-80.5649	28.3707	47.28	89.23	191.7	89.93	8.12	1357.2	0.001	1691
19.0	3441.627	-80.5649	28.3707	52.88	89.07	205.0	89.91	8.67	1360.0	0.002	1889
20.0	3441.662	-80.5649	28.3707	57.37	88.88	218.6	89.90	9.23	1363.0	0.002	2101

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
21.0	3441.699	-80.5649	28.3707	60.97	88.67	232.4	89.89	9.79	1366.4	0.003	2326
22.0	3441.739	-80.5649	28.3707	63.87	88.44	246.6	89.87	10.36	1370.2	0.004	2565
23.0	3441.780	-80.5649	28.3707	66.23	88.18	261.0	89.86	10.94	1374.4	0.005	2819
24.0	3441.824	-80.5648	28.3707	68.15	87.90	275.6	89.84	11.52	1379.0	0.007	3087
25.0	3441.871	-80.5648	28.3707	69.72	87.61	290.5	89.82	12.11	1384.0	0.008	3370
26.0	3441.920	-80.5648	28.3707	70.98	87.29	305.7	89.80	12.70	1389.5	0.010	3668
27.0	3441.972	-80.5647	28.3708	71.97	86.97	321.2	89.78	13.29	1395.4	0.013	3981
28.0	3442.026	-80.5647	28.3708	72.74	86.62	337.1	89.75	13.89	1401.9	0.016	4309
29.0	3442.082	-80.5646	28.3708	73.30	86.26	353.3	89.72	14.49	1408.8	0.020	4654
30.0	3442.142	-80.5645	28.3708	73.61	85.90	369.8	89.69	15.10	1416.2	0.024	5014
31.0	3442.204	-80.5644	28.3708	73.58	85.51	386.6	89.64	15.70	1424.2	0.028	5392
32.0	3442.269	-80.5643	28.3708	73.37	85.10	403.9	89.59	16.31	1432.8	0.034	5786
33.0	3442.336	-80.5642	28.3709	73.01	84.66	421.5	89.52	16.92	1442.0	0.040	6196
34.0	3442.407	-80.5641	28.3709	72.65	84.20	439.5	89.45	17.53	1451.9	0.047	6625
35.0	3442.480	-80.5640	28.3709	72.40	83.73	457.9	89.38	18.13	1462.5	0.055	7071
36.0	3442.556	-80.5638	28.3710	72.32	83.25	476.6	89.30	18.73	1473.6	0.063	7535
37.0	3442.636	-80.5636	28.3710	72.32	82.78	495.7	89.23	19.33	1485.4	0.073	8018
38.0	3442.718	-80.5634	28.3711	72.35	82.30	515.1	89.15	19.93	1497.7	0.084	8519
39.0	3442.804	-80.5632	28.3711	72.39	81.82	535.0	89.07	20.52	1510.8	0.096	9039
40.0	3442.893	-80.5630	28.3712	72.40	81.32	555.2	88.98	21.10	1524.6	0.109	9578
41.0	3442.985	-80.5627	28.3713	72.41	80.81	575.8	88.89	21.68	1539.1	0.124	10137
42.0	3443.080	-80.5624	28.3713	72.42	80.27	597.0	88.79	22.24	1554.5	0.140	10715
43.0	3443.178	-80.5621	28.3714	72.47	79.72	618.6	88.68	22.80	1570.7	0.157	11314
44.0	3443.280	-80.5618	28.3715	72.56	79.16	640.7	88.58	23.35	1587.8	0.176	11933
45.0	3443.386	-80.5614	28.3716	72.67	78.58	663.3	88.47	23.88	1605.8	0.197	12573
46.0	3443.494	-80.5610	28.3717	72.74	77.99	686.2	88.36	24.40	1624.6	0.219	13234
47.0	3443.607	-80.5605	28.3718	72.79	77.38	709.6	88.24	24.91	1644.2	0.244	13916
48.0	3443.722	-80.5600	28.3720	72.78	76.77	733.4	88.11	25.40	1664.6	0.271	14620
49.0	3443.842	-80.5595	28.3721	72.73	76.15	757.7	87.97	25.88	1685.7	0.299	15345
50.0	3443.964	-80.5590	28.3723	72.67	75.53	782.6	87.82	26.34	1707.7	0.330	16090
51.0	3444.091	-80.5584	28.3724	72.57	74.90	807.9	87.66	26.79	1730.5	0.364	16859
52.0	3444.221	-80.5577	28.3726	72.55	74.29	833.8	87.51	27.23	1754.0	0.400	17651
53.0	3444.355	-80.5570	28.3728	72.51	73.65	860.1	87.35	27.65	1778.5	0.438	18465
54.0	3444.493	-80.5563	28.3730	72.46	73.02	886.9	87.19	28.05	1803.6	0.479	19303
55.0	3444.634	-80.5555	28.3732	72.45	72.39	913.9	87.03	28.44	1829.3	0.523	20163
56.0	3444.780	-80.5546	28.3734	72.48	71.75	941.7	86.87	28.80	1856.2	0.570	21046
57.0	3444.929	-80.5537	28.3737	72.51	71.10	969.6	86.71	29.14	1883.7	0.621	21953
58.0	3445.082	-80.5527	28.3739	72.51	70.47	997.6	86.55	29.47	1911.4	0.674	22882
59.0	3445.238	-80.5517	28.3742	72.51	69.81	1025.7	86.38	29.75	1939.9	0.730	23834
MACH ONE											
59.760	3445.360	-80.5509	28.3744	72.49	69.31	1046.9	86.25	29.95	1961.6	0.776	24574

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
60.0	3445.399	-80.5506	28.3745	72.49	69.15	1053.7	86.20	30.01	1968.5	0.790	24809
61.0	3445.563	-80.5495	28.3748	72.45	68.49	1081.8	86.02	30.25	1997.7	0.854	25806
62.0	3445.730	-80.5483	28.3751	72.39	67.82	1110.2	85.84	30.47	2027.4	0.921	26824
63.0	3445.901	-80.5470	28.3755	72.43	67.18	1139.4	85.68	30.69	2057.9	0.991	27864
64.0	3446.076	-80.5457	28.3758	72.52	66.55	1169.3	85.53	30.90	2089.1	1.066	28926
65.0	3446.255	-80.5442	28.3762	72.57	65.91	1199.9	85.37	31.09	2121.3	1.144	30011
66.0	3446.437	-80.5427	28.3766	72.63	65.27	1231.3	85.21	31.27	2154.6	1.227	31119
67.0	3446.623	-80.5412	28.3771	72.70	64.64	1263.4	85.06	31.44	2188.6	1.314	32250
68.0	3446.813	-80.5395	28.3775	72.76	64.01	1296.2	84.90	31.60	2223.4	1.405	33405
69.0	3447.007	-80.5378	28.3780	72.85	63.38	1330.0	84.75	31.75	2259.4	1.500	34583
70.0	3447.205	-80.5360	28.3784	72.92	62.73	1364.7	84.60	31.88	2296.7	1.601	35785
71.0	3447.406	-80.5341	28.3790	73.01	62.07	1400.1	84.45	31.99	2335.0	1.706	37011
MAX Q											
71.500	3447.509	-80.5331	28.3792	73.05	61.74	1418.3	84.37	32.04	2354.7	1.760	37633
72.0	3447.612	-80.5321	28.3795	73.08	61.41	1436.7	84.29	32.09	2374.5	1.816	38262
73.0	3447.822	-80.5300	28.3800	73.12	60.76	1474.3	84.13	32.19	2415.0	1.932	39537
74.0	3448.036	-80.5278	28.3806	73.12	60.14	1512.7	83.95	32.28	2456.1	2.052	40837
75.0	3448.255	-80.5255	28.3812	73.07	59.53	1552.1	83.76	32.38	2498.0	2.179	42163
76.0	3448.476	-80.5231	28.3818	72.97	58.95	1592.4	83.55	32.48	2540.5	2.311	43515
77.0	3448.703	-80.5206	28.3825	72.83	58.38	1633.7	83.33	32.58	2583.9	2.449	44894
78.0	3448.934	-80.5180	28.3832	72.69	57.81	1675.9	83.11	32.66	2628.4	2.592	46300
79.0	3449.170	-80.5153	28.3839	72.56	57.23	1719.1	82.88	32.72	2674.0	2.742	47734
80.0	3449.410	-80.5125	28.3847	72.46	56.65	1763.6	82.66	32.78	2721.1	2.898	49195
81.0	3449.655	-80.5096	28.3855	72.39	56.08	1809.3	82.46	32.83	2769.4	3.060	50683
82.0	3449.905	-80.5065	28.3864	72.35	55.52	1856.1	82.27	32.87	2818.9	3.229	52200
83.0	3450.159	-80.5033	28.3872	72.33	54.99	1903.7	82.09	32.92	2869.1	3.405	53747
84.0	3450.418	-80.5000	28.3881	72.32	54.49	1952.1	81.92	32.97	2919.9	3.587	55323
85.0	3450.682	-80.4966	28.3891	72.31	54.00	2001.4	81.75	33.02	2971.4	3.777	56928
86.0	3450.952	-80.4931	28.3901	72.30	53.52	2051.4	81.59	33.06	3023.8	3.973	58564
87.0	3451.226	-80.4894	28.3911	72.29	53.04	2102.4	81.42	33.09	3077.3	4.177	60231
88.0	3451.505	-80.4856	28.3921	72.27	52.56	2154.7	81.26	33.11	3132.1	4.388	61928
89.0	3451.789	-80.4816	28.3932	72.26	52.07	2208.3	81.09	33.12	3188.3	4.606	63656
90.0	3452.078	-80.4776	28.3944	72.24	51.59	2263.0	80.92	33.12	3245.7	4.833	65415
91.0	3452.373	-80.4733	28.3956	72.22	51.11	2318.7	80.76	33.11	3304.2	5.067	67206
92.0	3452.673	-80.4689	28.3968	72.20	50.63	2375.3	80.59	33.09	3363.6	5.310	69029
93.0	3452.978	-80.4644	28.3981	72.17	50.15	2433.0	80.43	33.06	3424.2	5.561	70883
94.0	3453.288	-80.4597	28.3994	72.15	49.67	2492.0	80.26	33.02	3486.2	5.821	72768
95.0	3453.603	-80.4549	28.4007	72.13	49.20	2552.2	80.10	32.98	3549.4	6.090	74686
96.0	3453.924	-80.4499	28.4021	72.11	48.73	2613.4	79.95	32.92	3613.7	6.368	76636
97.0	3454.250	-80.4447	28.4036	72.10	48.26	2675.8	79.80	32.87	3679.1	6.655	78619
98.0	3454.581	-80.4393	28.4051	72.09	47.81	2739.2	79.65	32.81	3745.7	6.952	80634



TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
139.0	3473.274	-80.0286	28.5204	72.24	33.58	6447.3	75.78	28.13	7565.0	29.717	194335
140.0	3473.863	-80.0127	28.5249	72.25	33.34	6520.7	75.75	27.97	7640.7	30.600	197919
141.0	3474.454	-79.9966	28.5294	72.26	33.11	6576.2	75.73	27.82	7698.5	31.493	201512
142.0	3475.046	-79.9803	28.5340	72.27	32.89	6624.5	75.71	27.66	7749.0	32.395	205113
	OECO										
142.250	3475.194	-79.9762	28.5351	72.27	32.84	6635.3	75.71	27.62	7760.4	32.621	206014
143.0	3475.638	-79.9639	28.5385	72.28	32.68	6639.6	75.71	27.49	7766.5	33.304	208715
	S-IB/S-IVB SEPARATION SIGNAL										
143.500	3475.933	-79.9556	28.5408	72.28	32.57	6633.3	75.71	27.39	7761.4	33.760	210508
	EBW FIRING (SEPARATION SIGNAL PLUS 0.07 SECONDS)										
143.570	3475.976	-79.9546	28.5411	72.28	32.56	6632.5	75.71	27.38	7760.7	33.819	210774
144.0	3476.228	-79.9475	28.5431	72.29	32.47	6625.9	75.71	27.30	7755.2	34.210	212308
145.0	3476.811	-79.9311	28.5477	72.30	32.26	6610.4	75.72	27.11	7742.2	35.120	215855
150.0	3479.661	-79.8487	28.5706	72.34	31.20	6581.6	75.74	26.19	7725.2	39.677	233192
155.0	3482.430	-79.7653	28.5938	72.37	30.16	6615.4	75.72	25.33	7769.8	44.289	250041
	GUIDANCE INITIATION										
159.470	3484.848	-79.6897	28.6148	72.39	29.25	6654.0	75.70	24.57	7817.6	48.475	264755
160.0	3485.131	-79.6806	28.6173	72.39	29.14	6658.8	75.69	24.48	7823.4	48.975	266478
165.0	3487.766	-79.5945	28.6411	72.44	28.13	6706.7	75.69	23.65	7881.3	53.736	282514
170.0	3490.333	-79.5069	28.6653	72.53	27.07	6759.1	75.72	22.78	7944.1	58.577	298134
175.0	3492.828	-79.4177	28.6897	72.63	26.02	6815.8	75.76	21.92	8010.7	63.499	313322
180.0	3495.254	-79.3269	28.7144	72.73	25.00	6876.5	75.80	21.08	8080.6	68.505	328088
185.0	3497.611	-79.2346	28.7394	72.83	24.00	6940.8	75.84	20.26	8153.8	73.594	342438
190.0	3499.901	-79.1406	28.7646	72.94	23.02	7009.1	75.88	19.46	8230.5	78.769	356377
195.0	3502.123	-79.0450	28.7902	73.04	22.06	7081.2	75.93	18.67	8310.6	84.030	369906
200.0	3504.279	-78.9478	28.8160	73.15	21.11	7157.0	75.98	17.89	8394.0	89.379	383027
205.0	3506.366	-78.8488	28.8420	73.28	20.18	7236.4	76.05	17.12	8480.7	94.817	395741
210.0	3508.387	-78.7480	28.8683	73.41	19.25	7319.5	76.12	16.36	8570.8	100.347	408043
215.0	3510.339	-78.6455	28.8949	73.55	18.35	7406.0	76.20	15.61	8663.9	105.970	419935
220.0	3512.224	-78.5412	28.9216	73.68	17.47	7496.0	76.27	14.88	8760.1	111.686	431417
225.0	3514.043	-78.4350	28.9486	73.82	16.61	7589.5	76.35	14.17	8859.4	117.497	442494
230.0	3515.795	-78.3270	28.9759	73.95	15.78	7686.5	76.43	13.48	8961.8	123.405	453170

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
235.0	3517.482	-78.2170	29.0033	74.09	14.96	7787.5	76.51	12.81	9067.8	129.410	463449
240.0	3519.104	-78.1052	29.0310	74.22	14.17	7891.6	76.59	12.15	9176.7	135.516	473334
245.0	3520.662	-77.9914	29.0589	74.35	13.40	7998.7	76.67	11.51	9288.2	141.722	482829
250.0	3522.156	-77.8756	29.0871	74.48	12.65	8109.4	76.75	10.89	9403.0	148.030	491935
255.0	3523.586	-77.7578	29.1155	74.62	11.93	8222.5	76.83	10.29	9519.9	154.442	500656
260.0	3524.954	-77.6380	29.1441	74.75	11.24	8339.8	76.91	9.70	9640.7	160.958	508998
265.0	3526.261	-77.5161	29.1729	74.88	10.56	8460.6	76.99	9.14	9764.7	167.582	516967
270.0	3527.507	-77.3920	29.2020	75.01	9.91	8584.0	77.08	8.59	9891.1	174.314	524568
275.0	3528.693	-77.2659	29.2313	75.14	9.28	8711.3	77.16	8.06	10021.1	181.156	531804
280.0	3529.819	-77.1376	29.2608	75.27	8.67	8841.3	77.24	7.54	10153.6	188.110	538677
285.0	3530.886	-77.0070	29.2905	75.40	8.08	8974.6	77.33	7.04	10289.2	195.177	545191
290.0	3531.894	-76.8742	29.3205	75.52	7.51	9110.6	77.41	6.56	10427.4	202.359	551351
295.0	3532.846	-76.7392	29.3508	75.62	6.97	9249.2	77.47	6.10	10567.7	209.658	557164
300.0	3533.741	-76.6019	29.3813	75.74	6.45	9391.5	77.55	5.65	10711.6	217.075	562637
305.0	3534.581	-76.4622	29.4120	75.88	5.94	9537.0	77.64	5.22	10858.8	224.612	567774
310.0	3535.366	-76.3201	29.4429	76.01	5.46	9685.7	77.73	4.80	11009.0	232.271	572576
315.0	3536.098	-76.1756	29.4741	76.14	4.99	9837.9	77.82	4.40	11162.5	240.055	577052
320.0	3536.776	-76.0286	29.5055	76.28	4.55	9993.3	77.92	4.01	11319.1	247.965	581205
325.0	3537.401	-75.8791	29.5370	76.41	4.11	10151.9	78.01	3.64	11478.8	256.004	585039
330.0	3537.975	-75.7271	29.5688	76.54	3.70	10313.3	78.11	3.28	11641.1	264.173	588557
335.0	3538.497	-75.5724	29.6008	76.68	3.31	10477.1	78.21	2.93	11805.8	272.475	591764
340.0	3538.969	-75.4151	29.6330	76.82	2.93	10645.0	78.30	2.60	11974.5	280.911	594668
345.0	3539.393	-75.2551	29.6654	76.95	2.57	10815.6	78.40	2.29	12145.8	289.484	597275
350.0	3539.768	-75.0923	29.6980	77.09	2.23	10989.4	78.50	1.99	12320.1	298.197	599592
355.0	3540.097	-74.9268	29.7307	77.22	1.91	11166.0	78.60	1.71	12497.3	307.050	601625
360.0	3540.381	-74.7584	29.7637	77.36	1.60	11346.3	78.71	1.43	12678.0	316.047	603382
365.0	3540.619	-74.5872	29.7968	77.50	1.31	11530.2	78.81	1.18	12862.3	325.189	604869
370.0	3540.815	-74.4130	29.8301	77.64	1.04	11717.9	78.92	0.93	13050.3	334.481	606093
375.0	3540.968	-74.2358	29.8636	77.77	0.77	11909.3	79.02	0.70	13242.0	343.925	607059
380.0	3541.080	-74.0556	29.8972	77.91	0.53	12104.4	79.13	0.47	13437.4	353.523	607774
385.0	3541.152	-73.8722	29.9310	78.05	0.29	12303.3	79.24	0.26	13636.5	363.279	608244
390.0	3541.184	-73.6857	29.9650	78.20	0.07	12505.2	79.35	0.06	13838.5	373.195	608474
395.0	3541.177	-73.4960	29.9991	78.34	-0.14	12710.6	79.46	-0.12	14044.0	383.274	608473
400.0	3541.134	-73.3029	30.0334	78.48	-0.33	12919.6	79.57	-0.30	14253.0	393.519	608248
405.0	3541.056	-73.1065	30.0678	78.63	-0.51	13132.9	79.69	-0.46	14466.5	403.932	607809
410.0	3540.944	-72.9067	30.1024	78.77	-0.67	13349.6	79.80	-0.61	14683.2	414.517	607166
415.0	3540.800	-72.7035	30.1371	78.92	-0.82	13570.2	79.92	-0.75	14903.7	425.277	606326
420.0	3540.625	-72.4966	30.1719	79.06	-0.96	13794.9	80.04	-0.87	15128.5	436.215	605300
425.0	3540.421	-72.2862	30.2068	79.21	-1.08	14023.8	80.16	-0.99	15357.3	447.334	604097
430.0	3540.189	-72.0721	30.2418	79.36	-1.20	14257.2	80.28	-1.09	15590.7	458.638	602727
435.0	3539.932	-71.8542	30.2769	79.51	-1.30	14496.0	80.40	-1.19	15829.4	470.132	601200
440.0	3539.650	-71.6325	30.3121	79.66	-1.38	14739.1	80.53	-1.27	16072.5	481.818	599526
445.0	3539.346	-71.4069	30.3473	79.82	-1.46	14988.2	80.66	-1.34	16321.5	493.702	597718
450.0	3539.021	-71.1772	30.3827	79.97	-1.53	15240.6	80.79	-1.41	16573.8	505.787	595783



TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
455.0	3538.678	-70.9434	30.4180	80.13	-1.58	15498.7	80.92	-1.46	16831.8	518.076	593733
460.0	3538.317	-70.7055	30.4535	80.28	-1.63	15762.3	81.05	-1.50	17095.3	530.576	591581
465.0	3537.942	-70.4633	30.4889	80.44	-1.66	16030.9	81.18	-1.53	17363.8	543.289	589339
470.0	3537.554	-70.2167	30.5244	80.61	-1.68	16304.4	81.32	-1.55	17637.2	556.220	587021
475.0	3537.156	-69.9657	30.5598	80.77	-1.69	16584.0	81.46	-1.57	17916.8	569.373	584636
480.0	3536.749	-69.7101	30.5953	80.94	-1.69	16869.7	81.60	-1.57	18202.3	582.754	582203
485.0	3536.336	-69.4498	30.6307	81.10	-1.69	17162.1	81.75	-1.57	18494.6	596.368	579730
490.0	3535.914	-69.1848	30.6661	81.27	-1.70	17463.2	81.90	-1.58	18795.7	610.221	577206
495.0	3535.483	-68.9149	30.7014	81.44	-1.71	17768.8	82.05	-1.59	19101.2	624.318	574622
500.0	3535.042	-68.6400	30.7366	81.62	-1.72	18073.8	82.20	-1.60	19406.1	638.662	571982
505.0	3534.592	-68.3602	30.7716	81.80	-1.72	18380.3	82.35	-1.60	19712.4	653.252	569288
510.0	3534.134	-68.0754	30.8065	81.98	-1.72	18682.2	82.52	-1.61	20014.3	668.088	566543
515.0	3533.669	-67.7857	30.8412	82.16	-1.72	18980.2	82.68	-1.60	20312.1	683.166	563755
520.0	3533.201	-67.4912	30.8756	82.35	-1.69	19281.1	82.85	-1.58	20613.0	698.485	560946
525.0	3532.733	-67.1918	30.9097	82.53	-1.65	19581.2	83.01	-1.55	20913.0	714.047	558143
530.0	3532.273	-66.8874	30.9435	82.71	-1.60	19883.4	83.17	-1.50	21215.1	729.853	555380
535.0	3531.825	-66.5781	30.9770	82.89	-1.51	20188.6	83.34	-1.42	21520.1	745.905	552697
540.0	3531.401	-66.2637	31.0102	83.08	-1.39	20496.7	83.50	-1.30	21828.1	762.205	550155
545.0	3531.011	-65.9443	31.0430	83.26	-1.24	20810.0	83.67	-1.16	22141.4	778.757	547822
550.0	3530.660	-65.6197	31.0754	83.45	-1.10	21130.7	83.84	-1.03	22462.1	795.565	545726
555.0	3530.343	-65.2897	31.1073	83.65	-0.98	21463.9	84.02	-0.93	22795.2	812.638	543830
560.0	3530.053	-64.9542	31.1388	83.85	-0.88	21806.0	84.20	-0.83	23137.2	829.983	542107
565.0	3529.795	-64.6131	31.1698	84.05	-0.76	22156.1	84.39	-0.71	23487.3	847.609	540571
570.0	3529.572	-64.2662	31.2002	84.25	-0.63	22514.2	84.57	-0.60	23845.4	865.519	539252
575.0	3529.387	-63.9134	31.2300	84.46	-0.51	22883.6	84.76	-0.48	24214.8	883.723	538154
580.0	3529.235	-63.5545	31.2593	84.67	-0.40	23263.8	84.96	-0.38	24594.9	902.229	537267
585.0	3529.123	-63.1893	31.2878	84.89	-0.26	23653.9	85.16	-0.25	24985.0	921.044	536619
590.0	3529.057	-62.8178	31.3156	85.10	-0.12	24054.9	85.36	-0.12	25386.1	940.177	536243
593.340	3529.041	-62.5659	31.3337	85.25	-0.01	24327.5	85.50	-0.01	25658.7	953.138	536166
595.0	3529.041	-62.4399	31.3426	85.32	0.00	24351.1	85.57	0.00	25682.3	959.622	536175
600.0	3529.042	-62.0601	31.3685	85.54	0.00	24352.4	85.77	0.00	25683.6	979.156	536210
603.340	3529.043	-61.8063	31.3851	85.69	0.01	24352.7	85.91	0.00	25683.9	992.205	536233
605.0	3529.043	-61.6801	31.3931	85.76	0.01	24352.6	85.98	0.01	25683.8	998.691	536247
610.0	3529.046	-61.2998	31.4165	85.98	0.01	24352.8	86.19	0.01	25684.0	1018.226	536286
620.0	3529.052	-60.5388	31.4596	86.43	0.01	24354.2	86.61	0.01	25685.5	1057.296	536372
630.0	3529.061	-59.7770	31.4976	86.87	0.01	24355.5	87.03	0.01	25686.9	1096.369	536466

S-IVB GUIDANCE CUTOFF

593.340	3529.041	-62.5659	31.3337	85.25	-0.01	24327.5	85.50	-0.01	25658.7	953.138	536166
595.0	3529.041	-62.4399	31.3426	85.32	0.00	24351.1	85.57	0.00	25682.3	959.622	536175
600.0	3529.042	-62.0601	31.3685	85.54	0.00	24352.4	85.77	0.00	25683.6	979.156	536210

ORBIT INSERTION

603.340	3529.043	-61.8063	31.3851	85.69	0.01	24352.7	85.91	0.00	25683.9	992.205	536233
605.0	3529.043	-61.6801	31.3931	85.76	0.01	24352.6	85.98	0.01	25683.8	998.691	536247
610.0	3529.046	-61.2998	31.4165	85.98	0.01	24352.8	86.19	0.01	25684.0	1018.226	536286
620.0	3529.052	-60.5388	31.4596	86.43	0.01	24354.2	86.61	0.01	25685.5	1057.296	536372
630.0	3529.061	-59.7770	31.4976	86.87	0.01	24355.5	87.03	0.01	25686.9	1096.369	536466

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
640.0	3529.072	-59.0146	31.5306	87.31	0.02	24356.6	87.45	0.02	25687.9	1135.444	536570
650.0	3529.085	-58.2516	31.5586	87.76	0.02	24356.4	87.88	0.02	25687.8	1174.519	536683
660.0	3529.101	-57.4882	31.5815	88.21	0.02	24356.2	88.30	0.02	25687.6	1213.594	536806
670.0	3529.120	-56.7244	31.5993	88.65	0.03	24356.0	88.72	0.03	25687.4	1252.668	536938
680.0	3529.141	-55.9604	31.6121	89.10	0.03	24355.8	89.15	0.03	25687.3	1291.742	537080
690.0	3529.164	-55.1962	31.6198	89.54	0.04	24355.6	89.57	0.03	25687.1	1330.816	537231
700.0	3529.190	-54.4320	31.6224	89.99	0.04	24355.4	89.99	0.04	25686.8	1369.888	537391
710.0	3529.219	-53.6678	31.6200	90.44	0.04	24355.1	90.42	0.04	25686.6	1408.961	537561
720.0	3529.250	-52.9036	31.6125	90.89	0.05	24354.9	90.84	0.04	25686.4	1448.032	537740
730.0	3529.283	-52.1397	31.5999	91.33	0.05	24354.6	91.26	0.05	25686.1	1487.103	537929
740.0	3529.319	-51.3760	31.5822	91.78	0.05	24354.4	91.69	0.05	25685.8	1526.173	538127
750.0	3529.357	-50.6127	31.5595	92.22	0.06	24354.1	92.11	0.05	25685.6	1565.242	538334
760.0	3529.397	-49.8498	31.5318	92.67	0.06	24353.8	92.53	0.06	25685.3	1604.311	538550
770.0	3529.440	-49.0875	31.4989	93.11	0.06	24353.5	92.95	0.06	25684.9	1643.378	538775
780.0	3529.486	-48.3259	31.4611	93.56	0.07	24353.2	93.37	0.06	25684.6	1682.445	539010
790.0	3529.534	-47.5649	31.4182	94.00	0.07	24352.8	93.79	0.07	25684.3	1721.510	539254
800.0	3529.584	-46.8047	31.3704	94.44	0.07	24352.5	94.21	0.07	25683.9	1760.575	539507
810.0	3529.637	-46.0454	31.3175	94.88	0.08	24352.1	94.63	0.07	25683.5	1799.638	539769
820.0	3529.691	-45.2871	31.2596	95.32	0.08	24351.8	95.04	0.08	25683.1	1838.701	540040
830.0	3529.749	-44.5299	31.1968	95.76	0.08	24351.4	95.46	0.08	25682.7	1877.762	540320
840.0	3529.809	-43.7737	31.1291	96.20	0.09	24351.0	95.87	0.08	25682.3	1916.822	540609
850.0	3529.871	-43.0188	31.0564	96.63	0.09	24350.6	96.29	0.09	25681.9	1955.881	540908
860.0	3529.935	-42.2652	30.9789	97.06	0.09	24350.2	96.70	0.09	25681.5	1994.938	541215
870.0	3530.002	-41.5129	30.8964	97.50	0.10	24349.8	97.11	0.09	25681.0	2033.994	541531
880.0	3530.071	-40.7620	30.8092	97.93	0.10	24349.4	97.51	0.10	25680.5	2073.049	541856
890.0	3530.142	-40.0127	30.7171	98.36	0.10	24348.9	97.92	0.10	25680.0	2112.102	542190
900.0	3530.216	-39.2649	30.6202	98.78	0.11	24348.5	98.32	0.10	25679.5	2151.154	542533
910.0	3530.292	-38.5189	30.5185	99.21	0.11	24348.0	98.72	0.10	25679.0	2190.205	542885
920.0	3530.370	-37.7745	30.4121	99.63	0.11	24347.6	99.12	0.11	25678.5	2229.254	543246
930.0	3530.450	-37.0319	30.3010	100.05	0.12	24347.1	99.52	0.11	25678.0	2268.301	543615
940.0	3530.533	-36.2911	30.1852	100.46	0.12	24346.6	99.92	0.11	25677.4	2307.347	543994
950.0	3530.618	-35.5523	30.0648	100.88	0.12	24346.1	100.31	0.12	25676.8	2346.391	544381
960.0	3530.705	-34.8155	29.9398	101.29	0.13	24345.6	100.70	0.12	25676.3	2385.433	544778
970.0	3530.794	-34.0806	29.8102	101.70	0.13	24345.1	101.09	0.12	25675.7	2424.474	545183
980.0	3530.886	-33.3479	29.6761	102.11	0.13	24344.5	101.47	0.13	25675.1	2463.513	545597
990.0	3530.979	-32.6173	29.5375	102.51	0.14	24344.0	101.86	0.13	25674.5	2502.550	546019
1000.0	3531.075	-31.8889	29.3944	102.91	0.14	24343.4	102.23	0.13	25673.8	2541.585	546450
1010.0	3531.173	-31.1627	29.2469	103.31	0.14	24342.9	102.61	0.13	25673.2	2580.618	546891
1020.0	3531.273	-30.4388	29.0950	103.71	0.14	24342.3	102.99	0.13	25672.5	2619.649	547339
1030.0	3531.375	-29.7173	28.9388	104.10	0.15	24341.7	103.36	0.14	25671.8	2658.679	547798
1040.0	3531.479	-28.9981	28.7784	104.49	0.15	24341.1	103.73	0.14	25671.2	2697.706	548264
1050.0	3531.585	-28.2814	28.6136	104.88	0.15	24340.5	104.09	0.15	25670.5	2736.731	548739
1060.0	3531.694	-27.5670	28.4447	105.26	0.16	24339.9	104.45	0.15	25669.8	2775.755	549223
1070.0	3531.804	-26.8552	28.2715	105.64	0.16	24339.2	104.81	0.15	25669.0	2814.776	549715

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
1080.0	3531.916	-26.1459	28.0943	106.02	0.16	24338.6	105.17	0.15	25668.3	2853.794	550216
1090.0	3532.031	-25.4392	27.9130	106.39	0.16	24338.0	105.52	0.16	25667.6	2892.811	550726
1100.0	3532.147	-24.7350	27.7276	106.76	0.17	24337.3	105.87	0.16	25666.8	2931.825	551244
1110.0	3532.265	-24.0335	27.5383	107.13	0.17	24336.6	106.21	0.16	25666.0	2970.837	551771
1120.0	3532.385	-23.3346	27.3450	107.49	0.17	24335.9	106.56	0.16	25665.2	3009.847	552308
1130.0	3532.507	-22.6383	27.1479	107.85	0.18	24335.2	106.90	0.17	25664.5	3048.854	552852
1140.0	3532.631	-21.9448	26.9469	108.20	0.18	24334.5	107.23	0.17	25663.6	3087.858	553405
1150.0	3532.757	-21.2539	26.7421	108.56	0.18	24333.8	107.56	0.17	25662.8	3126.861	553966
1160.0	3532.884	-20.5657	26.5336	108.90	0.18	24333.1	107.89	0.17	25662.0	3165.860	554537
1170.0	3533.014	-19.8803	26.3213	109.25	0.19	24332.4	108.21	0.18	25661.2	3204.857	555116
1180.0	3533.145	-19.1976	26.1055	109.59	0.19	24331.6	108.54	0.18	25660.3	3243.852	555703
1190.0	3533.278	-18.5176	25.8860	109.92	0.19	24330.9	108.85	0.18	25659.4	3282.843	556299
1200.0	3533.413	-17.8404	25.6629	110.26	0.19	24330.1	109.17	0.18	25658.6	3321.833	556903
1210.0	3533.550	-17.1660	25.4364	110.59	0.20	24329.3	109.48	0.19	25657.7	3360.819	557516
1220.0	3533.688	-16.4943	25.2064	110.91	0.20	24328.5	109.78	0.19	25656.8	3399.802	558137
1230.0	3533.828	-15.8254	24.9731	111.23	0.20	24327.7	110.08	0.19	25655.9	3438.783	558767
1240.0	3533.969	-15.1592	24.7363	111.55	0.20	24326.9	110.38	0.19	25655.0	3477.761	559405
1250.0	3534.113	-14.4959	24.4963	111.86	0.21	24326.1	110.68	0.20	25654.0	3516.735	560053
1260.0	3534.257	-13.8353	24.2530	112.17	0.21	24325.3	110.97	0.20	25653.1	3555.707	560708
1270.0	3534.404	-13.1774	24.0065	112.48	0.21	24324.5	111.25	0.20	25652.1	3594.676	561372
1280.0	3534.552	-12.5223	23.7569	112.78	0.21	24323.7	111.54	0.20	25651.2	3633.641	562044
1290.0	3534.701	-11.8700	23.5041	113.07	0.22	24322.9	111.82	0.20	25650.2	3672.604	562725
1300.0	3534.852	-11.2203	23.2483	113.37	0.22	24322.1	112.09	0.21	25649.2	3711.563	563414
1310.0	3535.005	-10.5734	22.9896	113.65	0.22	24321.0	112.36	0.21	25648.2	3750.520	564111
1320.0	3535.159	-9.9293	22.7278	113.94	0.22	24320.1	112.63	0.21	25647.2	3789.473	564816
1330.0	3535.314	-9.2878	22.4632	114.22	0.22	24319.2	112.89	0.21	25646.2	3828.422	565530
1340.0	3535.471	-8.6490	22.1957	114.50	0.23	24318.3	113.15	0.21	25645.2	3867.368	566253
1350.0	3535.630	-8.0128	21.9254	114.77	0.23	24317.4	113.41	0.22	25644.1	3906.311	566983
1360.0	3535.789	-7.3793	21.6524	115.04	0.23	24316.4	113.66	0.22	25643.1	3945.251	567722
1370.0	3535.950	-6.7484	21.3766	115.30	0.23	24315.5	113.91	0.22	25642.0	3984.187	568468
1380.0	3536.113	-6.1202	21.0982	115.56	0.23	24314.6	114.15	0.22	25641.0	4023.119	569224
1390.0	3536.276	-5.4945	20.8172	115.81	0.24	24313.6	114.39	0.22	25639.9	4062.048	569987
1400.0	3536.441	-4.8713	20.5337	116.07	0.24	24312.6	114.62	0.22	25638.8	4100.973	570759
1410.0	3536.607	-4.2507	20.2476	116.31	0.24	24311.6	114.86	0.23	25637.7	4139.895	571538
1420.0	3536.774	-3.6326	19.9591	116.56	0.24	24310.7	115.08	0.23	25636.6	4178.813	572325
1430.0	3536.943	-3.0170	19.6681	116.79	0.24	24309.7	115.31	0.23	25635.5	4217.727	573121
1440.0	3537.112	-2.4039	19.3749	117.03	0.24	24308.6	115.53	0.23	25634.4	4256.637	573924
1450.0	3537.283	-1.7932	19.0793	117.26	0.25	24307.6	115.74	0.23	25633.3	4295.544	574736
1460.0	3537.455	-1.1848	18.7814	117.48	0.25	24306.6	115.95	0.23	25632.1	4334.446	575556
1470.0	3537.628	-0.5789	18.4813	117.71	0.25	24305.6	116.16	0.24	25631.0	4373.345	576383
1480.0	3537.802	0.0247	18.1790	117.92	0.25	24304.5	116.36	0.24	25629.9	4412.240	577218
1490.0	3537.977	0.6261	17.8747	118.14	0.25	24303.5	116.56	0.24	25628.7	4451.131	578061
1500.0	3538.153	1.2251	17.5682	118.35	0.25	24302.4	116.76	0.24	25627.5	4490.017	578911
1510.0	3538.330	1.8219	17.2597	118.55	0.25	24301.3	116.95	0.24	25626.4	4528.900	579770

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
1520.0	3538.508	2.4165	16.9492	118.75	0.26	24300.2	117.14	0.24	25625.2	4567.778	580636
1530.0	3538.686	3.0090	16.6368	118.95	0.26	24299.1	117.32	0.24	25624.0	4606.652	581509
1540.0	3538.866	3.5993	16.3225	119.14	0.26	24298.0	117.50	0.24	25622.8	4645.522	582390
1550.0	3539.047	4.1875	16.0064	119.33	0.26	24296.9	117.68	0.25	25621.6	4684.388	583279
1560.0	3539.228	4.7736	15.6884	119.51	0.26	24295.8	117.85	0.25	25620.4	4723.249	584175
1570.0	3539.410	5.3577	15.3687	119.69	0.26	24294.6	118.02	0.25	25619.1	4762.106	585078
1580.0	3539.593	5.9398	15.0473	119.87	0.26	24293.5	118.18	0.25	25617.9	4800.959	585989
1590.0	3539.776	6.5200	14.7241	120.04	0.26	24292.4	118.34	0.25	25616.7	4839.807	586907
1600.0	3539.961	7.0983	14.3994	120.21	0.26	24291.2	118.50	0.25	25615.5	4878.651	587832
1610.0	3540.146	7.6747	14.0731	120.37	0.27	24290.0	118.65	0.25	25614.2	4917.490	588765
1620.0	3540.331	8.2492	13.7453	120.53	0.27	24288.8	118.80	0.25	25613.0	4956.324	589704
1630.0	3540.517	8.8220	13.4159	120.69	0.27	24287.7	118.95	0.25	25611.7	4995.154	590651
1640.0	3540.704	9.3930	13.0851	120.84	0.27	24286.5	119.09	0.25	25610.4	5033.980	591604
1650.0	3540.891	9.9623	12.7529	120.99	0.27	24285.3	119.22	0.26	25609.2	5072.800	592564
1660.0	3541.079	10.5299	12.4193	121.13	0.27	24284.0	119.36	0.26	25607.9	5111.616	593531
1670.0	3541.268	11.0960	12.0844	121.27	0.27	24282.8	119.49	0.26	25606.6	5150.427	594504
1680.0	3541.456	11.6604	11.7482	121.40	0.27	24281.6	119.61	0.26	25605.3	5189.234	595485
1690.0	3541.646	12.2232	11.4108	121.53	0.27	24280.4	119.73	0.26	25604.0	5228.035	596471
1700.0	3541.835	12.7846	11.0721	121.66	0.27	24279.1	119.85	0.26	25602.7	5266.832	597465
1710.0	3542.026	13.3445	10.7323	121.78	0.27	24277.9	119.97	0.26	25601.4	5305.623	598464
1720.0	3542.216	13.9030	10.3914	121.90	0.27	24276.6	120.08	0.26	25600.1	5344.410	599470
1730.0	3542.407	14.4601	10.0494	122.02	0.27	24275.3	120.18	0.26	25598.8	5383.192	600482
1740.0	3542.598	15.0159	9.7064	122.13	0.27	24274.1	120.29	0.26	25597.5	5421.969	601500
1750.0	3542.789	15.5704	9.3623	122.23	0.27	24272.8	120.38	0.26	25596.2	5460.740	602524
1760.0	3542.981	16.1236	9.0173	122.34	0.27	24271.5	120.48	0.26	25594.9	5499.507	603554
1770.0	3543.172	16.6757	8.6714	122.44	0.28	24270.2	120.57	0.26	25593.5	5538.268	604590
1780.0	3543.364	17.2266	8.3246	122.53	0.28	24268.9	120.66	0.26	25592.2	5577.024	605631
1790.0	3543.556	17.7763	7.9769	122.62	0.28	24267.6	120.74	0.26	25590.9	5615.775	606678
1800.0	3543.748	18.3250	7.6285	122.71	0.28	24266.2	120.82	0.26	25589.5	5654.521	607730
1810.0	3543.941	18.8727	7.2793	122.79	0.28	24264.9	120.90	0.26	25588.2	5693.262	608788
1820.0	3544.133	19.4194	6.9293	122.87	0.28	24263.6	120.97	0.26	25586.9	5731.997	609851
1830.0	3544.325	19.9651	6.5787	122.94	0.28	24262.2	121.04	0.26	25585.5	5770.727	610919
1840.0	3544.518	20.5100	6.2274	123.01	0.28	24260.9	121.11	0.26	25584.2	5809.452	611992
1850.0	3544.710	21.0540	5.8756	123.08	0.28	24259.5	121.17	0.26	25582.8	5848.171	613070
1860.0	3544.902	21.5972	5.5231	123.14	0.28	24258.2	121.23	0.26	25581.5	5886.885	614152
1870.0	3545.095	22.1396	5.1701	123.20	0.28	24256.8	121.28	0.26	25580.1	5925.593	615239
1880.0	3545.287	22.6814	4.8166	123.26	0.28	24255.4	121.33	0.26	25578.8	5964.296	616331
1890.0	3545.479	23.2224	4.4627	123.31	0.28	24254.1	121.38	0.26	25577.4	6002.994	617427
1900.0	3545.670	23.7628	4.1083	123.36	0.28	24252.7	121.43	0.26	25576.0	6041.686	618528
1910.0	3545.862	24.3027	3.7535	123.40	0.27	24251.3	121.47	0.26	25574.7	6080.372	619632
1920.0	3546.053	24.8420	3.3984	123.44	0.27	24249.9	121.50	0.26	25573.3	6119.053	620740
1930.0	3546.245	25.3808	3.0430	123.47	0.27	24248.5	121.53	0.26	25572.0	6157.728	621853
1940.0	3546.435	25.9192	2.6873	123.51	0.27	24247.1	121.56	0.26	25570.6	6196.398	622969
1950.0	3546.626	26.4572	2.3314	123.53	0.27	24245.7	121.59	0.26	25569.2	6235.062	624088

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
1960.0	3546.816	26.9948	1.9753	123.56	0.27	24244.3	121.61	0.26	25567.9	6273.720	625211
1970.0	3547.006	27.5321	1.6190	123.58	0.27	24242.9	121.63	0.26	25566.5	6312.373	626337
1980.0	3547.195	28.0691	1.2626	123.59	0.27	24241.5	121.64	0.26	25565.1	6351.020	627466
1990.0	3547.384	28.6060	0.9061	123.60	0.27	24240.0	121.65	0.26	25563.8	6389.662	628598
2000.0	3547.573	29.1426	0.5495	123.61	0.27	24238.6	121.66	0.26	25562.4	6428.297	629733
2010.0	3547.761	29.6791	0.1929	123.62	0.27	24237.2	121.67	0.26	25561.0	6466.927	630870
2020.0	3547.949	30.2156	-0.1637	123.62	0.27	24235.8	121.67	0.26	25559.7	6505.551	632010
2030.0	3548.136	30.7520	-0.5202	123.61	0.27	24234.3	121.66	0.25	25558.3	6544.170	633152
2040.0	3548.323	31.2883	-0.8766	123.61	0.27	24232.9	121.66	0.25	25556.9	6582.783	634297
2050.0	3548.509	31.8248	-1.2329	123.59	0.27	24231.4	121.64	0.25	25555.6	6621.389	635443
2060.0	3548.694	32.3613	-1.5890	123.58	0.27	24230.0	121.63	0.25	25554.2	6659.990	636591
2070.0	3548.879	32.8980	-1.9449	123.56	0.26	24228.6	121.61	0.25	25552.9	6698.586	637740
2080.0	3549.063	33.4349	-2.3006	123.54	0.26	24227.1	121.59	0.25	25551.5	6737.175	638891
2090.0	3549.246	33.9720	-2.6561	123.51	0.26	24225.7	121.57	0.25	25550.2	6775.759	640043
2100.0	3549.429	34.5093	-3.0112	123.48	0.26	24224.2	121.54	0.25	25548.8	6814.336	641196
2110.0	3549.611	35.0470	-3.3659	123.45	0.26	24222.8	121.50	0.25	25547.5	6852.908	642351
2120.0	3549.792	35.5850	-3.7203	123.41	0.26	24221.3	121.47	0.25	25546.1	6891.474	643506
2130.0	3549.972	36.1235	-4.0743	123.36	0.26	24219.9	121.43	0.25	25544.8	6930.034	644661
2140.0	3550.152	36.6624	-4.4278	123.32	0.26	24218.4	121.39	0.24	25543.4	6968.589	645817
2150.0	3550.331	37.2018	-4.7808	123.27	0.26	24216.9	121.34	0.24	25542.1	7007.137	646973
2160.0	3550.509	37.7417	-5.1333	123.21	0.26	24215.5	121.29	0.24	25540.8	7045.680	648129
2170.0	3550.686	38.2822	-5.4852	123.16	0.25	24214.0	121.23	0.24	25539.4	7084.216	649285
2180.0	3550.862	38.8234	-5.8365	123.09	0.25	24212.6	121.18	0.24	25538.1	7122.747	650440
2190.0	3551.037	39.3652	-6.1872	123.03	0.25	24211.1	121.12	0.24	25536.8	7161.272	651595
2200.0	3551.212	39.9078	-6.5372	122.96	0.25	24209.7	121.05	0.24	25535.5	7199.791	652748
2210.0	3551.385	40.4511	-6.8865	122.89	0.25	24208.2	120.98	0.24	25534.2	7238.304	653901
2220.0	3551.557	40.9952	-7.2351	122.81	0.25	24206.8	120.91	0.23	25532.8	7276.811	655053
2230.0	3551.728	41.5401	-7.5829	122.73	0.25	24205.3	120.83	0.23	25531.5	7315.312	656203
2240.0	3551.899	42.0860	-7.9298	122.64	0.24	24203.9	120.75	0.23	25530.2	7353.807	657352
2250.0	3552.068	42.6327	-8.2759	122.55	0.24	24202.4	120.67	0.23	25528.9	7392.297	658498
2260.0	3552.236	43.1805	-8.6211	122.46	0.24	24201.0	120.58	0.23	25527.7	7430.780	659642
2270.0	3552.403	43.7293	-8.9653	122.36	0.24	24199.5	120.49	0.23	25526.4	7469.258	660785
2280.0	3552.569	44.2791	-9.3086	122.26	0.24	24198.1	120.40	0.23	25525.1	7507.729	661925
2290.0	3552.733	44.8301	-9.6508	122.16	0.24	24196.7	120.30	0.22	25523.8	7546.195	663062
2300.0	3552.897	45.3822	-9.9920	122.05	0.23	24195.2	120.20	0.22	25522.6	7584.655	664197
2310.0	3553.059	45.9355	-10.3322	121.93	0.23	24193.8	120.09	0.22	25521.3	7623.109	665329
2320.0	3553.220	46.4900	-10.6711	121.82	0.23	24192.4	119.99	0.22	25520.1	7661.557	666456
2330.0	3553.380	47.0458	-11.0090	121.70	0.23	24191.0	119.87	0.22	25518.8	7699.999	667581
2340.0	3553.538	47.6029	-11.3456	121.57	0.23	24189.6	119.76	0.22	25517.6	7738.435	668702
2350.0	3553.696	48.1614	-11.6810	121.44	0.23	24188.2	119.64	0.21	25516.3	7776.866	669819
2360.0	3553.852	48.7212	-12.0150	121.31	0.22	24186.7	119.51	0.21	25515.1	7815.290	670932
2370.0	3554.006	49.2825	-12.3478	121.17	0.22	24185.3	119.38	0.21	25513.9	7853.709	672040
2380.0	3554.160	49.8453	-12.6792	121.03	0.22	24184.0	119.25	0.21	25512.7	7892.121	673144
2390.0	3554.311	50.4096	-13.0092	120.89	0.22	24182.6	119.12	0.21	25511.5	7930.528	674243

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLI-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
2400.0	3554.462	50.9755	-13.3378	120.74	0.22	24181.2	118.98	0.20	25510.3	7968.928	675337
2410.0	3554.611	51.5430	-13.6648	120.59	0.21	24179.8	118.84	0.20	25509.1	8007.323	676426
2420.0	3554.759	52.1121	-13.9904	120.43	0.21	24178.4	118.69	0.20	25508.0	8045.712	677509
2430.0	3554.905	52.6829	-14.3144	120.27	0.21	24177.1	118.54	0.20	25506.8	8084.095	678587
2440.0	3555.050	53.2554	-14.6367	120.10	0.21	24175.7	118.39	0.20	25505.6	8122.472	679659
2450.0	3555.193	53.8297	-14.9575	119.93	0.21	24174.4	118.23	0.19	25504.5	8160.843	680725
2460.0	3555.335	54.4057	-15.2765	119.76	0.20	24173.0	118.07	0.19	25503.4	8199.208	681784
2470.0	3555.475	54.9836	-15.5938	119.58	0.20	24171.7	117.90	0.19	25502.2	8237.567	682837
2480.0	3555.614	55.5633	-15.9094	119.40	0.20	24170.4	117.73	0.19	25501.1	8275.920	683884
2490.0	3555.751	56.1450	-16.2231	119.22	0.20	24169.1	117.56	0.19	25500.0	8314.267	684923
2500.0	3555.887	56.7286	-16.5349	119.03	0.19	24167.8	117.38	0.18	25498.9	8352.607	685954
2510.0	3556.021	57.3141	-16.8449	118.84	0.19	24166.5	117.20	0.18	25497.8	8390.942	686979
2520.0	3556.154	57.9017	-17.1530	118.64	0.19	24165.2	117.02	0.18	25496.7	8429.271	687996
2530.0	3556.285	58.4913	-17.4590	118.44	0.19	24163.9	116.83	0.18	25495.7	8467.593	689005
2540.0	3556.414	59.0829	-17.7630	118.23	0.19	24162.6	116.64	0.18	25494.6	8505.909	690006
2550.0	3556.541	59.6767	-18.0650	118.02	0.18	24161.4	116.44	0.17	25493.6	8544.219	690998
2560.0	3556.667	60.2726	-18.3648	117.81	0.18	24160.1	116.24	0.17	25492.5	8582.523	691983
2570.0	3556.792	60.8707	-18.6625	117.59	0.18	24158.9	116.04	0.17	25491.5	8620.820	692958
2580.0	3556.914	61.4710	-18.9580	117.37	0.18	24157.7	115.83	0.17	25490.5	8659.111	693925
2590.0	3557.035	62.0735	-19.2512	117.14	0.17	24156.4	115.62	0.16	25489.5	8697.395	694882
2600.0	3557.154	62.6782	-19.5421	116.91	0.17	24155.2	115.40	0.16	25488.5	8735.673	695830
2610.0	3557.272	63.2853	-19.8308	116.68	0.17	24154.1	115.18	0.16	25487.5	8773.944	696768
2620.0	3557.387	63.8946	-20.1170	116.44	0.17	24152.9	114.96	0.16	25486.6	8812.208	697697
2630.0	3557.501	64.5063	-20.4008	116.20	0.16	24151.7	114.73	0.15	25485.6	8850.465	698616
2640.0	3557.613	65.1204	-20.6821	115.95	0.16	24150.6	114.50	0.15	25484.7	8888.715	699524
2650.0	3557.724	65.7368	-20.9609	115.70	0.16	24149.4	114.27	0.15	25483.8	8926.958	700422
2660.0	3557.832	66.3556	-21.2372	115.45	0.16	24148.3	114.03	0.15	25482.8	8965.194	701309
2670.0	3557.939	66.9769	-21.5109	115.19	0.15	24147.2	113.79	0.14	25481.9	9003.421	702186
2680.0	3558.044	67.6006	-21.7819	114.93	0.15	24146.1	113.54	0.14	25481.1	9041.641	703052
2690.0	3558.147	68.2268	-22.0502	114.66	0.15	24145.0	113.29	0.14	25480.2	9079.853	703906
2700.0	3558.248	68.8555	-22.3157	114.39	0.14	24143.9	113.04	0.14	25479.3	9118.057	704749
2710.0	3558.347	69.4867	-22.5785	114.12	0.14	24142.9	112.78	0.13	25478.5	9156.252	705580
2720.0	3558.445	70.1204	-22.8384	113.84	0.14	24141.8	112.52	0.13	25477.6	9194.438	706400
2730.0	3558.540	70.7566	-23.0955	113.56	0.14	24140.8	112.25	0.13	25476.8	9232.615	707207
2740.0	3558.634	71.3954	-23.3496	113.27	0.13	24139.8	111.98	0.13	25476.0	9270.782	708003
2750.0	3558.725	72.0367	-23.6008	112.98	0.13	24138.8	111.71	0.12	25475.2	9308.939	708785
2760.0	3558.815	72.6807	-23.8489	112.68	0.13	24137.8	111.43	0.12	25474.5	9347.086	709556
2770.0	3558.903	73.3272	-24.0940	112.39	0.13	24136.8	111.15	0.12	25473.7	9385.221	710313
2780.0	3558.989	73.9762	-24.3359	112.08	0.12	24135.9	110.87	0.12	25472.9	9423.345	711058
2790.0	3559.073	74.6279	-24.5747	111.78	0.12	24135.0	110.58	0.11	25472.2	9461.456	711789
2800.0	3559.155	75.2822	-24.8103	111.47	0.12	24134.0	110.29	0.11	25471.5	9499.553	712508
2810.0	3559.235	75.9391	-25.0426	111.15	0.11	24133.1	109.99	0.11	25470.8	9537.637	713212
2820.0	3559.313	76.5986	-25.2717	110.84	0.11	24132.3	109.69	0.11	25470.1	9575.705	713903
2830.0	3559.389	77.2607	-25.4974	110.51	0.11	24131.4	109.39	0.10	25469.4	9613.757	714580

TABLE XVI  
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S	HEAD DEG	FLT-PATH DEG	SF VEL FT/S	RANGE NM	ALTITUDE FT
2840.0	3559.463	77.9254	-25.7197	110.19	0.11	24130.5	109.09	0.10	25468.8	9651.791	715243
2850.0	3559.535	78.5927	-25.9385	109.86	0.10	24129.7	108.78	0.10	25468.1	9689.805	715892
2860.0	3559.606	79.2625	-26.1539	109.53	0.10	24128.9	108.46	0.09	25467.5	9727.799	716527
2870.0	3559.674	79.9350	-26.3658	109.19	0.10	24128.1	108.15	0.09	25466.9	9765.769	717147
2880.0	3559.740	80.6100	-26.5740	108.85	0.09	24127.3	107.83	0.09	25466.3	9803.714	717752
2890.0	3559.804	81.2876	-26.7787	108.51	0.09	24126.6	107.50	0.09	25465.7	9841.632	718343
2900.0	3559.866	81.9678	-26.9797	108.16	0.09	24125.8	107.17	0.08	25465.2	9879.517	718918
2910.0	3559.926	82.6505	-27.1770	107.81	0.08	24125.1	106.84	0.08	25464.6	9917.368	719479
2920.0	3559.983	83.3357	-27.3705	107.46	0.08	24124.4	106.51	0.08	25464.1	9955.180	720025
2930.0	3560.039	84.0234	-27.5603	107.10	0.08	24123.8	106.17	0.07	25463.6	9992.947	720555
2940.0	3560.093	84.7136	-27.7462	106.74	0.08	24123.1	105.83	0.07	25463.1	10030.664	721069
2950.0	3560.145	85.4062	-27.9282	106.37	0.07	24122.5	105.49	0.07	25462.6	10068.323	721567
2960.0	3560.194	86.1013	-28.1063	106.00	0.07	24121.8	105.14	0.07	25462.1	10105.915	722050
2970.0	3560.242	86.7987	-28.2805	105.63	0.07	24121.2	104.79	0.06	25461.7	10143.428	722517
2980.0	3560.287	87.4986	-28.4506	105.26	0.06	24120.7	104.44	0.06	25461.3	10180.849	722968
2990.0	3560.331	88.2008	-28.6167	104.88	0.06	24120.1	104.08	0.06	25460.9	10218.162	723402
3000.0	3560.372	88.9053	-28.7787	104.50	0.06	24119.6	103.72	0.05	25460.5	10255.343	723820
3010.0	3560.411	89.6120	-28.9365	104.12	0.05	24119.0	103.36	0.05	25460.1	10292.366	724222
3020.0	3560.448	90.3211	-29.0902	103.73	0.05	24118.5	103.00	0.05	25459.7	10329.194	724607
3030.0	3560.483	91.0323	-29.2397	103.34	0.05	24118.1	102.63	0.05	25459.4	10365.779	724976
3040.0	3560.516	91.7456	-29.3850	102.95	0.05	24117.6	102.26	0.04	25459.1	10402.055	725327
3050.0	3560.547	92.4611	-29.5260	102.55	0.04	24117.2	101.88	0.04	25458.7	10437.933	725681
3060.0	3560.575	93.1787	-29.6626	102.16	0.04	24116.8	101.51	0.04	25458.5	10473.285	725981
3070.0	3560.602	93.8983	-29.7949	101.76	0.04	24116.4	101.13	0.03	25458.2	10507.928	726282
3080.0	3560.626	94.6198	-29.9228	101.35	0.03	24116.0	100.75	0.03	25457.9	10541.588	726565
3090.0	3560.648	95.3433	-30.0463	100.95	0.03	24115.7	100.36	0.03	25457.7	10573.845	726832
3100.0	3560.668	96.0686	-30.1654	100.54	0.03	24115.3	99.98	0.03	25457.5	10604.040	727081
3110.0	3560.686	96.7958	-30.2800	100.13	0.02	24115.0	99.59	0.02	25457.3	10631.129	727313
3120.0	3560.702	97.5247	-30.3900	99.72	0.02	24114.8	99.20	0.02	25457.1	10653.496	727527
3130.0	3560.716	98.2553	-30.4955	99.30	0.02	24114.5	98.81	0.02	25456.9	10668.886	727723
3140.0	3560.728	98.9875	-30.5964	98.89	0.02	24114.3	98.41	0.01	25456.8	10674.900	727903
3150.0	3560.737	99.7213	-30.6928	98.47	0.01	24114.0	98.02	0.01	25456.6	10670.319	728064
3160.0	3560.745	100.4566	-30.7845	98.05	0.01	24113.9	97.62	0.01	25456.5	10656.081	728208
3170.0	3560.750	101.1934	-30.8715	97.62	0.01	24113.7	97.22	0.01	25456.4	10634.508	728333
3180.0	3560.753	101.9315	-30.9539	97.20	0.00	24113.5	96.82	0.00	25456.3	10607.930	728441
3190.0	3560.754	102.6710	-31.0315	96.77	-0.00	24113.4	96.41	-0.00	25456.3	10578.056	728531
3200.0	3560.753	103.4117	-31.1045	96.35	-0.00	24113.3	96.01	-0.00	25456.2	10546.000	728604
3210.0	3560.749	104.1535	-31.1727	95.92	-0.01	24113.2	95.60	-0.01	25456.2	10512.466	728657
3220.0	3560.744	104.8965	-31.2361	95.49	-0.01	24113.2	95.20	-0.01	25456.2	10477.901	728693
3230.0	3560.736	105.6404	-31.2948	95.05	-0.01	24113.1	94.79	-0.01	25456.2	10442.596	728711
3235.242	3560.731	106.0308	-31.3236	94.83	-0.01	24113.1	94.57	-0.01	25456.2	10423.861	728713

S-IVB/LM SEPARATION





TABLE XVIII  
S-1B STAGE FREE FLIGHT TRAJECTORY  
EARTH-FIXED PLUMBLINE POSITIONS EARTH-FIXED PLUMBLINE VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S	ALTITUDE FT	RANGE NM	LCNG DEG	LAT DEG
150.0	231468	900	243245	3273.8	10.3	5540.6	232868	39.626	79.8502	28.7339
160.0	262649	1016	298574	2963.4	12.9	5526.6	264754	48.563	79.6887	28.7790
170.0	290747	1159	353791	2656.7	15.7	5517.0	293698	57.464	79.5276	28.8237
180.0	315787	1330	408917	2351.3	18.5	5508.1	319723	66.335	79.3669	28.8679
190.0	337776	1530	463952	2046.8	21.5	5499.0	342838	75.179	79.2065	28.9117
200.0	356725	1761	518894	1742.9	24.6	5489.4	363050	84.001	79.0464	28.9551
210.0	372637	2022	573739	1439.6	27.8	5479.5	380364	92.803	78.8864	28.9981
220.0	385519	2317	628483	1136.8	31.1	5469.2	394784	101.589	78.7266	29.0407
230.0	395375	2645	683122	834.4	34.5	5458.4	406314	110.360	78.5669	29.0830
240.0	402208	3007	737650	532.2	38.0	5447.3	414959	119.122	78.4072	29.1249
250.0	406020	3406	792066	230.3	41.7	5435.7	420718	127.875	78.2475	29.1665
260.0	406815	3841	846363	-71.4	45.4	5423.7	423595	136.623	78.0876	29.2078
270.0	404592	4315	900539	-373.1	49.3	5411.3	423590	145.370	77.9277	29.2487
280.0	399352	4827	954588	-674.9	53.2	5398.5	420703	154.118	77.7676	29.2893
290.0	391095	5380	1008508	-976.7	57.3	5385.3	414933	162.870	77.6072	29.3296
300.0	379818	5973	1062293	-1278.7	61.4	5371.6	406279	171.628	77.4465	29.3697
310.0	365519	6609	1115939	-1581.0	65.7	5357.5	394738	180.397	77.2855	29.4094
320.0	348196	7287	1169442	-1883.7	70.1	5343.0	380308	189.178	77.1241	29.4489
330.0	327845	8010	1222797	-2186.7	74.5	5328.0	362984	197.976	76.9622	29.4881
340.0	304460	8778	1276000	-2490.3	79.1	5312.5	342762	206.792	76.7998	29.5271
350.0	278036	9592	1329046	-2794.5	83.7	5296.5	319637	215.630	76.6368	29.5658
360.0	248567	10453	1381929	-3099.3	88.5	5279.9	293604	224.492	76.4732	29.6043
370.0	216049	11362	1434639	-3404.2	93.3	5261.8	264657	233.382	76.3089	29.6426
380.0	180490	12319	1487148	-3706.8	98.1	5238.6	232805	242.298	76.1440	29.6806
390.0	141957	13324	1539348	-3995.6	102.7	5195.6	198105	251.226	75.9787	29.7183
400.0	100766	14368	1590825	-4224.3	105.7	5078.1	160844	260.097	75.8142	29.7554
410.0	58315	15416	1639950	-4177.6	101.8	4650.1	122284	268.633	75.6559	29.7907
420.0	20589	16321	1680309	-3142.6	73.7	3201.7	87861	275.705	75.5245	29.8197
430.0	-2519	16845	1702533	-1572.9	33.4	1374.8	66616	279.641	75.4514	29.8358
440.0	-13956	17066	1711391	-848.4	14.1	540.3	59938	281.241	75.4216	29.8422
450.0	-21297	17168	1715145	-664.0	7.3	255.0	48928	281.953	75.4083	29.8451
460.0	-27595	17224	1716953	-600.5	4.1	120.0	42799	282.333	75.4013	29.8466
470.0	-33345	17255	1717738	-550.6	2.2	44.4	37132	282.538	75.3974	29.8473
480.0	-38627	17271	1717957	-506.9	1.1	3.9	31885	282.645	75.3954	29.8477
490.0	-43498	17279	1717882	-467.6	0.5	-16.2	27025	282.697	75.3945	29.8479
500.0	-47996	17282	1717669	-432.9	0.2	-25.1	22524	282.722	75.3940	29.8479
510.0	-52173	17283	1717399	-403.5	0.0	-28.3	18339	282.734	75.3937	29.8480
520.0	-56080	17282	1717112	-378.5	-0.1	-28.8	14422	282.739	75.3936	29.8479
530.0	-59754	17282	1716826	-356.8	-0.1	-28.1	10737	282.741	75.3936	29.8479
540.0	-63226	17281	1716550	-337.8	-0.1	-27.1	7255	282.743	75.3936	29.8479
550.0	-66518	17280	1716285	-320.9	-0.1	-25.9	3952	282.743	75.3935	29.8479
560.0	-69650	17279	1716032	-305.9	-0.1	-24.7	809	282.743	75.3935	29.8478
562.7	IMPACT	17278	1715967	-302.3	-0.1	-24.5	0	282.744	75.3935	29.8478

TABLE XIX

## GOVERNMENT FURNISHED DOCUMENTATION

DELIVERABLE ITEM NO. BB 3.1.5-4-201

GFDA NO.	DATE MSFC APPROVAL	DESCRIPTION OF GFD REQ'D	IDENTIFICATION OF GFD
04A00006	1/11/68	Final Vehicle Mass Characteristics	R-P&VE-VAM-67-108.
04A00006	1/11/68	SA-204/SA-205 Vehicle Antenna Locations	BB-3.16.10-1
04A00006	1/11/68	L/V Operational Trajectory	BB-3.1.3-10-M01, Part IV (TN-AP-67-255)
04A00006	1/11/68	Tracking & Telemetry Station Locations	OD Item 9.2.1.3-1
04A00007	1/11/68	Processed Data Requirements	AS-204/LM-1 Processed Data Requirements Document (CGSD)
04A00019	1/31/68	Orbital Radar Tracking Data and Initial State Vector	BDA(FPS-16) Revs. 1 & 2, HAW Revs. 2 & 7, CAL Revs. 1, 2, & 3, CYI Rev. 1, TAN Revs. 2, 3, 4, & 5. Use Predicted Initial State Vector
04A00028	3/ 4/68	Updated ODOP Tracking Data	ODOP Tracking, Reel No. 22052
04A00029	3/ 4/68	Final T-O Meteorological Data	Final T-O Meteorological Data, Reel No. 2559
04A00030	3/ 4/68	Updated Guidance Velocities and Accelerations	Guidance Velocities and Accelerations, Reel No. 14443
04A00030	3/ 4/68	Corrected Measured Parameters (Radars)	Sta. 0.18, Reel No. 24377, Sta. 3.18, Reel No. 15606, Sta. 19.18, Reel No. 3040, GLOTRAC Sta. 1, Reel No. 2112, Sta. 7.18, Reel No. 23702
04A00030	3/ 4/68	Orbital Tracking Data	TAN Rev. 1
04A00031	3/ 4/68	Final Metric Tracking Data (PVA)	GLOTRAC (PVA), Reel No. 19689
04A00031	3/ 4/68	Orbital Venting Accelerations	Guidance Polynomials (Orbital Venting Accelerations)
04A00031	3/ 4/68	Orbital Tracking Data	ASC Revs. 3 & 4, CBI Rev. 2, FRE Revs. 5, 6, & 7.
04A00031 Rev.A	3/21/68	Orbital Venting Accelerations	Corrected Guidance Polynomials (Orbital Venting Accelerations)

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APPENDIX A

DEFINITIONS OF SYMBOLS

<u>Symbol</u>	<u>Definitions</u>
XE, YE, ZE	Position, velocity and acceleration components in the <u>Earth-Fixed Cartesian Coordinate System</u> .
DXE, DYE, DZE	The origin of this system is the projection of the center of gravity of the complete vehicle at first motion onto the Fischer Ellipsoid of 1960. The Y-Z plane is tangent to the reference ellipsoid at the origin of the coordinate system. The positive Z-axis is oriented in the flight azimuth direction, 72 deg E of N. The X-axis is normal to the Y-Z plane and is positive above the origin. The Y-axis is normal to the X-Z plane and is in a right hand relation to the X-Z axes with the positive direction 162 deg E of N. The origin of this earth-fixed system rotates with an angular velocity identical to that of the earth. The earth-fixed coordinate system is shown in Figure 1.
DDXE, DDYE, DDZE	
XSP, YSP, ZSP	Position, velocity and acceleration components in the <u>Space-Fixed Ephemeris Coordinate System</u> . The origin of this system is located at the geocentric center of the earth. The Z-axis points north along the earth's axis of rotation (through the north pole). The X-Y plane is coincident with the equatorial plane. The X-axis points through the vernal equinox. The reference equinox and equator are the mean equinox and equator of date for the epoch of midnight or zero hours on the day of launch. The Y-axis is normal to the X-Z plane and in a right hand relation to the X-, Z-axes. The direction of the coordinate axes remain fixed in space although the origin continues to move with the center of the earth. The space-fixed ephemeris coordinate system is shown in Figure 1.
DXSP, DYSP, DZSP	
DDXSP, DDYSP, DDZSP	
E. C. DIST	Position of vehicle in the <u>Geographic Coordinate System</u> . Position in this system is defined by the radius vector from the vehicle to the geocentric center of the earth (E.C.DIST), geocentric latitude (G.C. LAT) and longitude (LONG). Geocentric latitude is the angle between the radius vector of the sub-vehicle point and the equatorial plane, positive north of the equator. Longitude is the angle between the projection of the radius vector into the equatorial plane and the Greenwich meridian, measured positive east of the Greenwich meridian.
LONG	
G.C. LAT	

## DEFINITIONS OF SYMBOLS (CONT'D)

### Symbols

### Definitions

E.F. VEL	Earth-fixed velocity of the vehicle in the <u>Geographic Coordinate System</u> . Velocity in this system is given in terms of azimuth (VEL-AZ), elevation (VEL-ELEV), and magnitude of the velocity vector (E.F.VEL). Azimuth is the angle between the projection of the velocity vector into the local horizontal plane and the north direction in this plane. Elevation is the angle between the velocity vector and the local horizontal plane. The local horizontal plane is defined as the plane perpendicular to the radius vector from the vehicle to the geocentric center of the earth. The geographic coordinate system is shown in Figure 1.
VEL-AZ	
VEL-ELEV	
S.F. VEL	Space-fixed velocity of vehicle in the Geographic Coordinate System. Velocity is given in terms of flight-path angle (FLT-PATH), heading angle (HEAD), and magnitude of the velocity vector (S.F.VEL). The flight-path angle is the angle between the space fixed velocity vector and the plane normal to the radius vector from the vehicle to the geocentric center of the earth, measured positive upward from this plane. The heading angle is measured positive clockwise from north to the projection of the space-fixed velocity vector in the plane normal to the radius vector.
FLT-PATH	
HEAD	
LAT	Geodetic latitude of vehicle.
MACH	Mach number.
DYN PRES	Dynamic Pressure.
ALTITUDE	Distance from the reference ellipsoid to the center of gravity of the vehicle measured along the radius vector from the vehicle to the geocentric center of the earth.
RANGE	Surface range measured along a spherical earth from the launch site to the subvehicle point. The subvehicle point is defined as the intersection of the reference ellipsoid and the reference ellipsoid normal passing through the vehicle.
DEC	The Declination angle is the angle between the radius vector from the center of the earth to the vehicle and the equatorial plane, positive north of the equator.