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SATURN SA-9/PEGASUS A POSTFLIGHT TRAJECTORY

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ABSTRACT

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This report presents the postflight trajectory for the Saturn SA-9/PEGASUS A test flight. Fourth of the Block II series, SA-9 was the first vehicle to carry a Pegasus payload. Trajectory dependent parameters are given in earth-fixed, space-fixed ephemeris, and geographic coordinate systems. A complete time history of the powered flight trajectory is presented at 1.0 sec intervals from first motion to S-I/S-IV separation and at 5.0 sec intervals from S-I/S-IV separation to insertion. Tables of insertion conditions and various orbital parameters are included in a discussion of the orbital portion of flight.

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SUMMARY

The powered flight trajectory presented here was established from the information provided by external electrical and optical tracking systems and the onboard telemetry system. External tracking data were available from fixed cameras, C-band radar, ODOP, Azusa/GLOTRAC and MISTRAM. Onboard data were obtained from the radar altimeter and the guidance system. The final powered flight trajectory was determined from fixed camera, ODOP, Azusa, C-band radar and radar altimeter data in conjunction with the guidance system output. The MISTRAM system provided more reliable data than any other external tracking system; however, it was not used in the construction of the final trajectory because of its late delivery date. All of the radars furnished consistent, reliable range data; however, some of the angle measurements contained relatively large biases.

SA-9/PEGASUS A was the fifth engineering test of the radar altimeter. The altimeter acquired reliable data from 175 to 240 sec, 420 to 490 sec, and 520 to 631 sec. Although not as continuous as on SA-7, the altimeter data provided a very good altitude trend and was used extensively in stabilizing the vertical component of the reference trajectory.

The S-IV payload at insertion (631.659 sec) had a space-fixed velocity 0.3 m/s (1 ft/s) less than nominal, a perigee altitude of 496.5 km (268.1 nm) and an apogee altitude of 745.0 km (402.3 nm). The estimated lifetime of the S-IV/PEGASUS A orbiting vehicle is approximately 1188 days, which is 62 days less than the nominal lifetime.

1.0 INTRODUCTION

The SA-9 Saturn vehicle was launched from Cape Kennedy on February 16, 1965, at 9:37:03 Eastern Standard Time. Approximately 10 min and 31 sec after launch, the S-IV stage, instrument unit, boilerplate Apollo, and the Pegasus A Meteoroid Technology Satellite were inserted into orbit. The Apollo and shroud were first separated from the S-IV/IU and Pegasus combination and wing deployment on the Pegasus was completed $4\frac{1}{2}$ minutes after insertion.

SA-9 was the fourth flight test of the Saturn I, Block II vehicle, which includes an active S-IV stage. This was the first flight test with a micrometeoroid experiment, Pegasus A. In addition, this was the third flight test with the adaptive guidance in closed loop during the S-IV powered flight phase.

This report presents the postflight mass point trajectory in tabular form from first motion to insertion in Tables IX through XIII and XV through XIX. Also presented are detailed discussions of data sources and their utilization, estimated accuracies of the trajectory, and the booster free flight trajectory. A table of orbital data available on the first 5 revolutions is included in the discussion of the orbital portion of flight. An analysis of the various orbital tracking networks is also presented.

All times listed in the tables are referenced to Range Zero (9:37:03 EST), unless otherwise noted. The time of first motion was defined, from stub fin displacement measurements, as occurring 0.08 sec after Range Zero.

Acknowledgement is given to the Data Reduction Branch of the Computation Laboratory for their efforts in the preparation of the tabulated trajectory data and to the General Electric Trajectories Programming Unit for programmer support in orbit determination.

2.0 COORDINATE SYSTEMS AND TRAJECTORY PARAMETERS

The translational motion of the vehicle's center of gravity is described in several coordinate systems. An initial displacement of 31.9 m (104.7 ft) locates the center of gravity in the coordinate system whose origin lies on the reference ellipsoid. Definitions of the coordinate systems are found in the Appendix.

The Fischer Ellipsoid was used to represent the earth and its gravitational field. Launch pad coordinates are defined with respect to this ellipsoid.

The geographic coordinates and gravity data for Launch Pad 37B at Cape Kennedy are:

Geodetic Latitude:	28.531854 deg N
Longitude:	80.564953 deg W
Gravity:	9.818 m/s ² (32.21 ft/s ²)

Elevations above the reference ellipsoid are:

Base of launch pedestal:	4.9 m (16.1 ft)
C. G. at First Motion:	31.9 m (104.7 ft)

Launch Azimuth:	90 deg E of N
Flight Azimuth:	105 deg E of N
ST-124 Platform Azimuth:	104.998 deg E of N

3.0 POWERED FLIGHT TRAJECTORY ANALYSIS

3.1 Data Sources

Tracking data were available from first motion through insertion. The tracking coverage is illustrated in Figure 1 and itemized in Table I. The relation between the SA-9 flight path and the various tracking sites is shown in Figure 2.

All tracking systems experienced difficulty in maintaining track during S-I cutoff and separation. The drop in signal strength experienced at approximately 480 sec by all C-Band radars tracking the IU beacon on vehicles SA-5 and SA-6 has not occurred on SA-7 and SA-9. Apparently testing the cabling and connectors linking the radar beacon to the antenna under vacuum conditions for voltage breakdown solved the problem.

3.1.1 Antenna Locations

Figure 3 shows the locations of the antennae for the various tracking systems and the vehicle's center of gravity versus time. The tracking data used in establishing the trajectory were transferred to the

vehicle's center of gravity to provide a common reference point for all of the tracking systems.

3.1.2 MISTRAM

Missile Trajectory Measurement (MISTRAM) System tracking data were used for comparisons only and not in the construction of the reference trajectory due to their late reduction. The data were reduced during the following intervals:

<u>Range Time (sec)</u>	<u>Source</u>
39.00 - 146.10	Valkaria (active)
151.00 - 280.55	
283.9 - 685.20	
184.00 - 280.50	Eleuthera (passive)
284.00 - 683.00	

The data were reliable for the periods of powered flight for which they were available. Random error was estimated to be less than 7 m (23 ft). Ground station difficulty prevented the acquisition of active data from the Eleuthera station which caused some reduction in the quality of the data near the end of powered flight. Comparisons between the MISTRAM and reference trajectory are shown in Figures 8 through 10.

3.1.3 GLOTRAC

SA-9 was the third engineering test of the GLOTRAC system on a Saturn vehicle. The GLOTRAC metric data were reduced much too late to be used in the construction of the reference trajectory. The data received were continuous from 20 sec throughout powered flight, making GLOTRAC the only high precision system that provided continuous data during the S-IV powered flight. Comparisons between GLOTRAC and the reference trajectory (Figures 8 through 10) show very good agreement with deviations less than 20 m (66 ft).

3.1.4 Radar Altimeter

An engineering test of the radar altimeter was performed on SA-9. Valid data were obtained from 175 sec throughout powered flight

except for the intervals between 240 and 420 sec and 490 and 520 sec. The random error in the altimeter was estimated to be 75 m (246 ft). Comparisons of the altimeter output with the reference trajectory and several tracking systems are shown in Figure 4. Only the smoothed trends are shown to avoid confusion. This comparison shows a bias of approximately 130 m (426 ft) which is about the magnitude of the bias observed on SA-7.

After the bias was removed, the altimeter data were used in the MARLOCK trajectory program. The altimeter was especially valuable in determining the vertical component of the trajectory, particularly since MISTRAM, GLOTRAC and downrange ODOP were not available in time for the trajectory determination.

3.1.5 ODOP

The ODOP tracking data used in the establishment of the SA-9 reference trajectory were the uprange data which were reduced at MSFC. The ODOP metric data were not received from ETR in time to be used in the reference trajectory. Figures 8 through 10 show comparisons of the ODOP final metric data with the reference trajectory. The X and Z components deviate less than 20 m (66 ft) from the reference trajectory. The Y component, which is normally the worst, drifts off and attains a maximum deviation of 50 m (164 ft) by 580 sec.

3.1.6 Radar

The Grand Bahama (3.16) radar provided the best radar data that were available on SA-9. The systematic errors that showed up on previous flights apparently had been eliminated. Measured parameter and reduced metric data comparisons are shown in Figures 5 through 10.

The Grand Turk (7.18) radar reduced metric data were completely unusable. They are not shown in the earth-fixed Cartesian position comparisons (Figures 8 through 10) because they are completely off the scale of these figures. The measured parameter comparisons (Figures 5 through 7) show the range measurement to be valid, but very large biases are apparent in the angle measurements. The elevation angle is biased 0.05 deg and the azimuth angle is biased 0.06 deg. These are by far the largest biases that have been observed in angle measurements for any radar on Saturn flights. Comparing the

preliminary measured parameters (corrected for refraction only) and the reference trajectory, the angle biases are approximately half of the magnitude shown in Figures 6 and 7. This indicates that in the final reduction the bias corrections were applied in the wrong direction.

Uncorrected measured parameters from the Bermuda (BDA) radar were received from GSFC. A refraction correction was applied to these data. The azimuth angle contained a bias of about 0.025 deg, but the elevation angle compared quite favorably with the reference trajectory. The range measurement deviated from the reference trajectory more than any other radar.

The Merritt Island (19.18) radar provided usable tracking data for the first time on SA-9. Both the elevation and azimuth angles deviated about 0.02 deg from the reference trajectory. The range deviation was less than 20 m (66 ft).

The Antigua (91.18) radar provided excellent range and azimuth measurements; however, the elevation angle was biased about 0.025 deg. This bias produced considerable deviations in the reduced metric data.

The Cape Kennedy (1.16) radar provided good data for the interval it tracked.

The Patrick (0.18) radar was programmed to track the discarded S-I stage after separation. Reliable tracking data were received until 500 sec. Before separation, the 0.18 radar agreed with the reference trajectory to within 25 m (82 ft) in position components and less than 1 m/s (3.28 ft/s) in velocity components.

3.2 Trajectory Composition

External tracking data, telemetered guidance data, radar altimeter data and the insertion point coordinates from orbital tracking were used to establish the postflight trajectory. This trajectory was constructed in the following manner:

<u>Interval (sec)</u>	<u>Description</u>
0.0 - 19.0	Fixed Camera and ODOP data were used in a least squares curve fit. The differences between the resulting curve fit and the actual data were negligible. (Reference 1 discusses in detail the least squares program used to establish this portion of the trajectory.)

- 19.0 - 95.0 ODOP data processed by the smoothing and differentiation program (see the following paragraphs for more discussion on the smoothing and differentiation program).
- 95.0 -135.0 Azusa data processed by the smoothing and differentiation program.
- 135.0 -146.5 Azusa position data processed by the smoothing and differentiation program. Telemetered guidance data were used to determine the velocity and acceleration component profiles.
- 146.5 -631.659 A computed trajectory was determined with the MARLOCK program using a composite of telemetered guidance velocity data, external tracking data, the altimeter output and the insertion point determined from orbital tracking. (The following paragraphs include a discussion of the MARLOCK program.)

Since the trajectory was constructed from several different sources, it was necessary to provide for a merging or blending process to compensate for small biases that existed between data from the various sources. A merging program (a least squares technique) was used to correct the data from the different sources without creating a sharp transient.

The MARLOCK trajectory construction program uses the telemetered guidance velocity data as the generating parameter to compute a trajectory which will best fit the tracking observations yet retain the smoothness of the guidance data. The guidance data can vary only in accordance with a fifteen term guidance error model and the variances assigned to each term. Radar measured parameters, Azusa measured parameters, altimeter data and earth-fixed Cartesian coordinate position data may be used as observations with weights being assigned to each parameter. The guidance error terms are determined using the Kalman linear filter technique and the guidance error terms are applied to the telemetered guidance data to yield the final continuous and smooth best estimate type trajectory.

On SA-9, the following data were used as observations for the MARLOCK program.

<u>System</u>	<u>Type Observations</u>	<u>Interval (sec)</u>
1. 16 Radar	Measured Parameters	160.0 - 300.0
3. 16 Radar	Measured Parameters	75.0 - 550.0
19. 18 Radar	Measured Parameters	192.0 - 600.0
91. 18 Radar	Measured Parameters	350.0 - 630.0
ODOP	Earth-Fixed Positions	10.0 - 115.0
		122.0 - 140.0
		160.0 - 550.0
Azusa	Measured Parameters	160.0 - 250.0
Altimeter	Altitude	175.0 - 240.0
		420.0 - 490.0
		520.0 - 625.0
Insertion	Space-Fixed Ephemeris Positions and Velocities	631.659

The output of this program was used as the postflight trajectory from 146.5 sec to insertion.

The ODOP, Azusa, and computed trajectory earth-fixed Cartesian position data were smoothed over a 10 sec interval using coefficients which are the average of fourth and second degree smoothing coefficients. These coefficients filter the data very satisfactorily as shown by the frequency response curve in Figure 11. The velocity and acceleration data were obtained using fourth degree coefficients because significant bias error would be induced if the average derivative coefficients were used. A more detailed discussion of the smoothing and differentiation techniques can be found in Reference 2.

3.2.1 First Motion Time

Pad measurements 32-B01 and 32-B02 (Displacement at Stub Fins I and III) and vehicle displacement as measured from camera data were available for the determination of first motion time. The first motion times, indicated by these sources, are given in the following table.

<u>Measurement</u>	<u>Range Time (sec)</u>
32-B01 and 32-B02	0.08
Camera Data	0.085

The decision was made by the Flight Evaluation Working Group to use the pad measurements for the determination of the first motion time. The agreement of the two independent measurements in the above table were quite good.

3.2.2 Powered Flight Trajectory

Table II presents a comparison of actual and nominal times of some of the vehicle events in sequential order. The actual altitude and range are shown in Figures 12 and 13, respectively, for the entire powered flight. The actual total inertial acceleration profiles for the S-I stage and the S-IV stage are shown in Figure 14. The actual earth-fixed velocity vector, along with the angle between the earth-fixed velocity vector and the local horizontal plane, is shown in Figure 15. The actual space-fixed velocity and the angle between the space-fixed velocity vector and the local horizontal plane are shown in Figure 16. Mach number and dynamic pressure are shown for the S-I stage powered flight in Figure 17. These parameters were calculated using measured meteorological data to an altitude of 34 km (111,549 ft). Above this altitude, the U.S. Standard reference atmosphere was used.

Various trajectory parameters are given at significant event times in Table III. It should be noted that apex, loss of telemetry signal, and impact apply only to the discarded S-I stage. Several trajectory parameters are given for S-I stage inboard engine cutoff (IECO), S-I stage outboard engine cutoff (OECO) and S-IV stage guidance cutoff (S-IV CO) in Table IV. The velocity gain between OECO and separation due to thrust decay was 2.4 m/s (7.9 ft/s). The velocity gain from S-IV CO to end of thrust decay as defined by this trajectory was 3.3 m/s (10.8 ft/s). Telemetered guidance data indicates that this velocity gain may have been closer to 3.2 m/s (10.5 ft/s).

A comparison of the actual and nominal trajectory can be found in Reference 3. The nominal SA-9 trajectory can be found in Reference 4.

The actual trajectory is presented in the metric system of units in Tables IX through XIII and in the English system of units in Tables XV through XIX.

3.3 Error Analysis of Reference Trajectory

During the S-I powered portion of flight, good coverage was provided by ODOP, Azusa, MISTRAM and several radars. ODOP and Azusa data were used to establish the majority of the reference trajectory during this period. There were no data from high precision systems, except uprange ODOP, available in the required time frame after launch to furnish data during the S-IV powered flight. Therefore, the trajectory was constructed without using MISTRAM or Azusa/GLOTAC data.

Data from the various tracking systems are compared in the earth-fixed plumbline coordinate system with the reference trajectory in Figures 8 through 10. All data were smoothed and transferred from the point of track (antenna locations) to a common point, the vehicle's center of gravity. These curves show only the trend of the data relative to the reference trajectory. The dispersion of the various data gives an indication of the validity of the reference trajectory. Azusa, ODOP, MISTRAM, 1.16 radar and 0.18 radar deviate less than 20 m (66 ft) in all components from the reference trajectory during the S-I powered flight. The comparisons of all systems throughout the S-IV powered flight show deviations of less than 200 m (656 ft) with the exception of three radars (BDA, 7.18, and 91.18). These radars show significant biases in their angle measurements.

Comparisons of the radar measured parameters and the Azusa range measurement with the reference trajectory are shown in Figures 5 through 7. The range measurements deviate less than 20 m (66 ft) from the reference trajectory except for Bermuda which deviates up to 50 m (164 ft). The azimuth and elevation angle comparisons show considerable biases in some of the systems with 7.18 radar being by far the worst.

A comparison of altitudes from the various systems with the radar altimeter data is presented in Figure 4. This comparison shows the altimeter to be biased about 130 m (427 ft) from the reference trajectory. The systems that show large differences are radars which contain biases in the elevation angle measurements.

An estimate of the probable total uncertainty in the powered flight reference trajectory is presented in Figure 18. At OECO, the position components are probably accurate to 20 m (66 ft) and the velocity components to 0.2 m/s (0.7 ft/s). By S-IV CO, the maximum uncertainties increase to about 0.5 m/s (1.6 ft/s) in velocity components and 200 m (656 ft) in position components. On previous vehicles the uncertainty in the vertical component (YE) was greater than the other components; however, it is felt that the altimeter reduced this uncertainty considerably on SA-9.

4.0 S-I STAGE FREE FLIGHT TRAJECTORY

A theoretical free flight trajectory was computed for the discarded S-I stage using initial conditions from the Patrick (0.18) radar at 180 sec. The radar data were numerically smoothed using least squares coefficients (see Figure 11 for frequency response of coefficients). The smoothed velocities were then manually plotted to remove low frequency oscillations. The radar tracking data became invalid after 500 sec. At this time the computed trajectory deviated from tracking by less than 10 m (33 ft) in position components.

Since the attitude of the booster during re-entry is unknown, a nominal tumbling drag coefficient was assumed. In addition, nominal coefficients of drag were used assuming the booster (1) stabilized at an angle of attack of 90 deg and (2) stabilized at an angle of attack of 0 deg. These provide the following possible dispersions:

<u>Drag Condition</u>	<u>Impact Range</u>	<u>Impact Time</u>
0 deg Angle of Attack	967.67 km (522.50 nm)	657.4 sec
Tumbling	961.28 km (519.05 nm)	718.9 sec
90 deg Angle of Attack	957.87 km (517.21 nm)	772.8 sec

The theoretical free flight trajectory utilizing the tumbling drag coefficient data will be considered as the actual trajectory of the S-I booster stage. The impact location relative to the launch site is shown in Figure 19. The trajectory is presented in tabular form in Tables VIII (metric units) and XIV (English units).

5.0 ORBITAL FLIGHT

5.1 Orbital Trajectory

The S-IV-9 stage with Pegasus, Instrument Unit and an Apollo boilerplate payload was inserted into orbit on February 16, 1965, at 14:47:34.659 U. T. (631.659 sec range time). Figure 20 is a ground projection plot showing the locus of the first three orbital revolutions. The orbital insertion parameters for SA-9 were determined by a least squares differential correction procedure using C-Band radar beacon and skin track data over the first revolution.

The classical osculating two-body elements and the corresponding position and space-fixed velocity vectors at orbital insertion are shown in Table V. The orbital elements are referenced to the mean equinox and equator at 0 hr U. T. the day of launch.

A comparison between some of the actual and nominal (preflight trajectory) orbital insertion parameters is shown in Table VI.

The RMS error of the data residuals and the number of data observations utilized are listed in the following table.

INSERTION SOLUTION TRACKING

Station	Time of Track (Universal Time)	Data Types	No. of Valid Observations	RMS Error of Residuals
Grand Turk Island (TPQ-18)	14:47:39- 14:51:24	AZ EL	27 27	0.057 deg 0.045 deg
BEACON TRACK	(636-861 sec R. T.)	RA	26	8 m (26 ft)
Antigua Island (FPQ-6)	14:47:39- 14:53:33	AZ EL	50 60	0.005 deg 0.021 deg
BEACON TRACK	(636-990 sec R. T.)	RA	46	4 m (13 ft)
Bermuda Island (FPS-16)	14:47:35- 14:50:19	AZ EL	26 23	0.025 deg 0.009 deg
BEACON TRACK	(632-796 sec R. T.)	RA	24	12 m (39 ft)
Onboard Radar Altimeter	14:47:38- 14:48:45 (635-702 sec R. T.)	AE*	55	48 m (157 ft)

INSERTION SOLUTION TRACKING (CONT'D)

Station	Time of Track (Universal Time)	Data Types	No. of Valid Observations	RMS Error of Residuals
Carnarvon, Australia (FPQ-6) SKIN TRACK	15:38:00-	AZ	16	0.021 deg
	15:40:18	EL	20	0.030 deg
		RA	21	6 m (20 ft)
Merritt Island, Fla. (TPQ-18) SKIN TRACK	16:23:13-	AZ	47	0.017 deg
	16:29:46	EL	42	0.014 deg
		RA	44	5 m (16 ft)

*AE is the altitude above the Earth's surface.

The RMS residual errors quoted represent the difference between actual radar observations and the predicted observations based on the orbital ephemeris defined by the orbital insertion parameters. In addition, the orbital ephemeris, which was used to generate the predicted tracking, had a velocity impulse of - 0.36 m/s applied at the separation time of the Apollo and shroud from the S-IV/Pegasus (804 sec R. T.). The magnitude and direction of this impulse were determined from the telemetered output of the guidance system. The RMS residual errors were from 1 to 3 times higher than the expected high frequency errors of the measuring systems employed for range measurements and from 1 to 20 times higher for the angle measurements. Included in the RMS residual errors are high frequency errors (assumed gaussian) and systematic errors due to possible instrumentation bias, mathematical model errors and atmospheric refraction errors. The maximum RMS error of the radar residuals was 12 m (40 ft) in range, 0.05 deg in elevation and 0.06 deg in azimuth. The onboard altimeter RMS error was approximately 50 m (160 ft). Expected high frequency errors of the measuring systems are 3 m (10 ft) in range and 0.003 deg in angles for the FPQ-6 and TPQ-18 radars (design specifications), 6 m (20 ft) in range and 0.01 deg in angles for the FPS-16 radars (from prior experience) and 50 m (160 ft) in the altimeter data (from previous experience).

Obvious systematic bias errors are present in the Grand Turk azimuth and elevation residuals. A bias of 0.06 deg in azimuth and 0.05 deg in elevation, when removed, reduced the residuals to high

frequency errors with an RMS residual error of 0.01 deg and 0.02 deg, respectively. A bias of 0.02 deg is also apparent in the Antigua elevation residuals; when removed the RMS residual error decreased to 0.01 deg. Removing these large bias errors reduced the RMS residual errors for the angle measurements from 1 to 10 times the expected high frequency errors. The relative weighting of the observations used in the insertion solutions, according to the expected high frequency errors, requires that the solutions be primarily determined by the range observations. Therefore, biases of the magnitudes and type quoted do not greatly affect the solution parameters.

A systematic bias of + 130 m (426 ft) was removed from the onboard radar altimeter observations before these data were used in the orbital insertion solutions. This bias was also seen in the powered flight altimeter data and was of the same approximate magnitude. A systematic bias of approximately + 100 m (328 ft) was also noted in the SA-7 altimeter data.

5.2 Orbital Insertion Analysis

Insertion condition solutions were made using the Antigua, Grand Turk, Bermuda and the onboard radar altimeter data at insertion and the Carnarvon and Merritt Island tracking data over the first orbit in various combinations. Solutions were obtained for all data sources with and without solving for effective drag. These solutions indicate a maximum deviation from the insertion elements quoted of 0.3 m/s (1.0 ft/s) and 200 m (650 ft) in any velocity or position component.

An independent solution of the orbital insertion parameters using powered flight tracking and guidance data show a maximum deviation of 30 m (100 ft) and 0.5 m/s (1.5 ft/s) in any position or velocity component compared to the orbital tracking insertion solution quoted. The powered flight tracking and guidance data trajectory quoted was constrained to the orbital tracking insertion elements shown in Table V.

The relative agreements in all solutions indicate a maximum error in the quoted insertion position and velocity components of 200 m (650 ft) and 0.5 m/s (1.5 ft/s), respectively.

5.3 Orbital Tracking Summary

Due to the long lifetime of the SA-9 orbiting vehicle, radar tracking coverage was only requested for the first five revolutions. This tracking summary covers all tracking over these five revolutions beginning at insertion (14:47:34.659 U. T.). It also includes optical sightings reported during the first 24 hours.

Orbital tracking of the SA-9 vehicle was conducted by the NASA Space Tracking and Data Acquisition Network (STADAN), which is composed of the global network of Minitrack stations and Minitrack Optical Tracking Stations (MOTS), and the Manned Space Flight Network (MSFN), which is a global network of radar tracking stations and utilizes available DOD elements. Additional tracking support was provided by the Smithsonian Astrophysical Observatory (SAO), and the North American Air Defense (NORAD).

Table VII summarizes the radar and Minitrack tracking during the first five revolutions. The last radar C-Band beacon track of the orbiting vehicle was reported by Pretoria, South Africa at approximately 15:19 U. T. (42 min after liftoff). All subsequent radar tracking was skin track.

Several MOTS optical sightings and twelve optical Baker Nunn observations were reported over the first 24 hours. Stellar magnitudes reported were 2 for the Pegasus and 6 for the Apollo module. No NORAD observations were reported over this first 24 hour period.

Minitrack observations will continue to be made on the orbiting vehicle during the vehicle's lifetime or until termination of the Pegasus experiment.

Adjusted Telemetered Guidance

DATA UTILIZATION

COMPUTED TRAJECTORY (SEE SECTION 3.2)

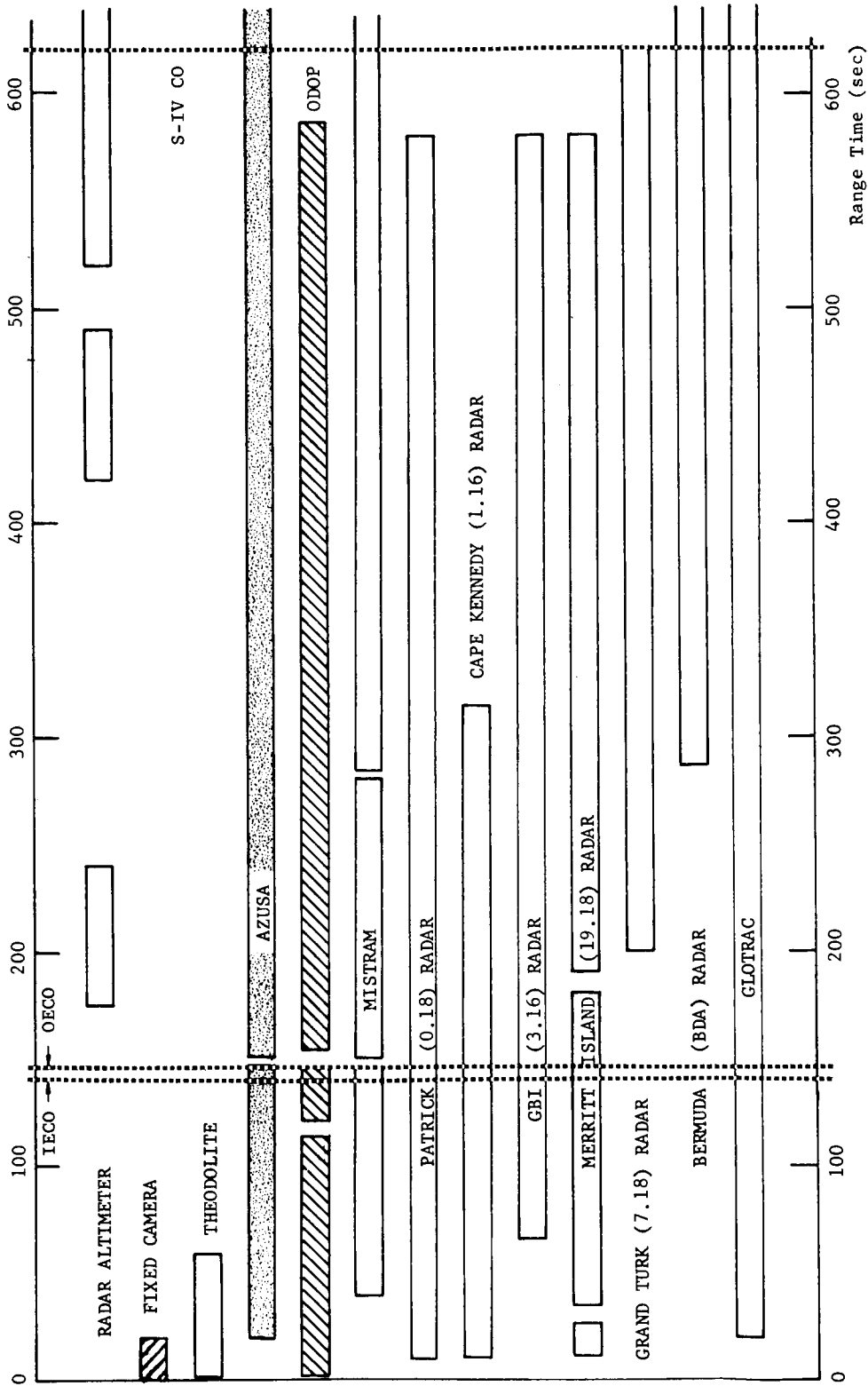


FIGURE 1 AVAILABLE FINAL TRACKING DATA (POWERED FLIGHT)

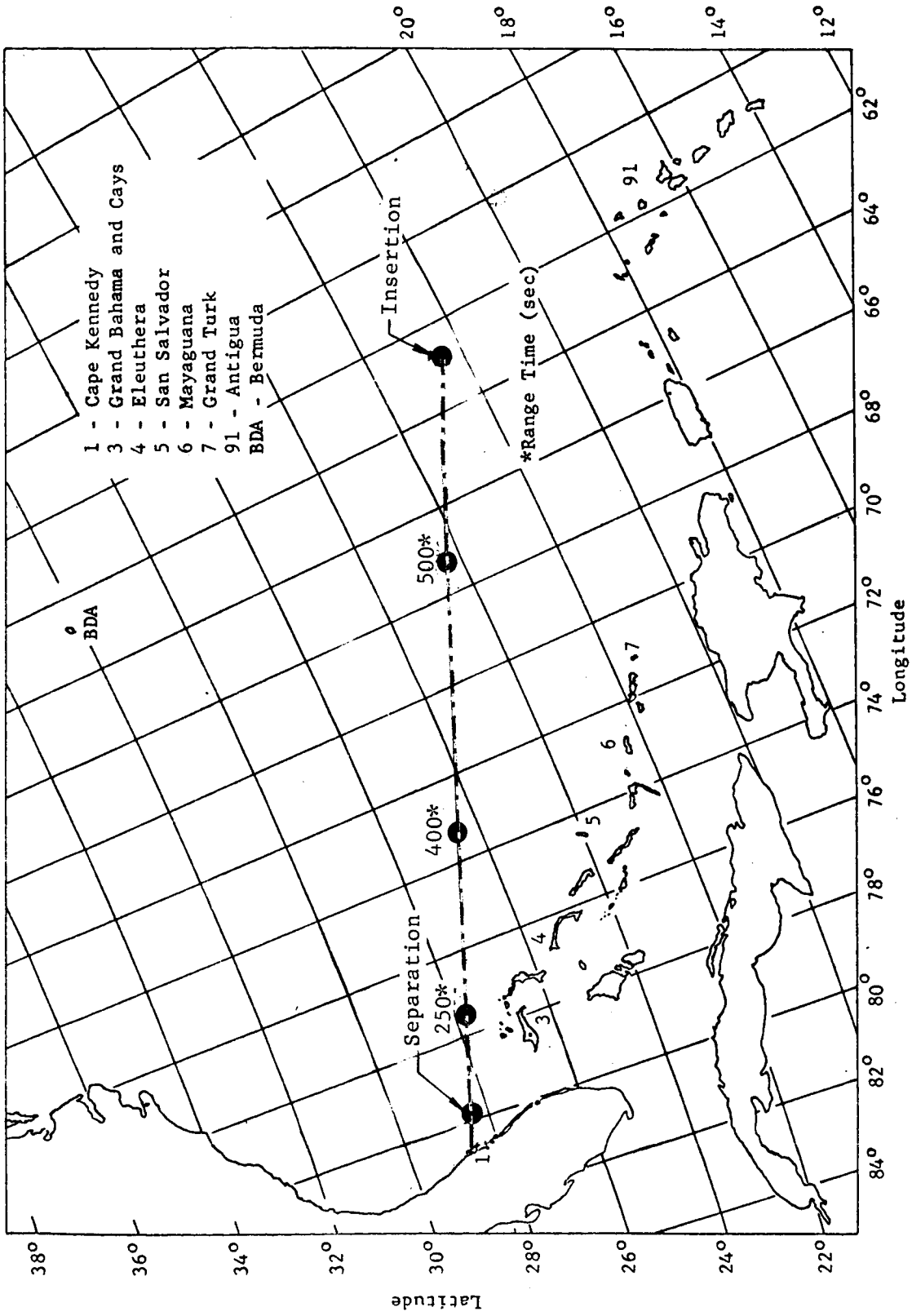


FIGURE 2 TRACKING STATIONS

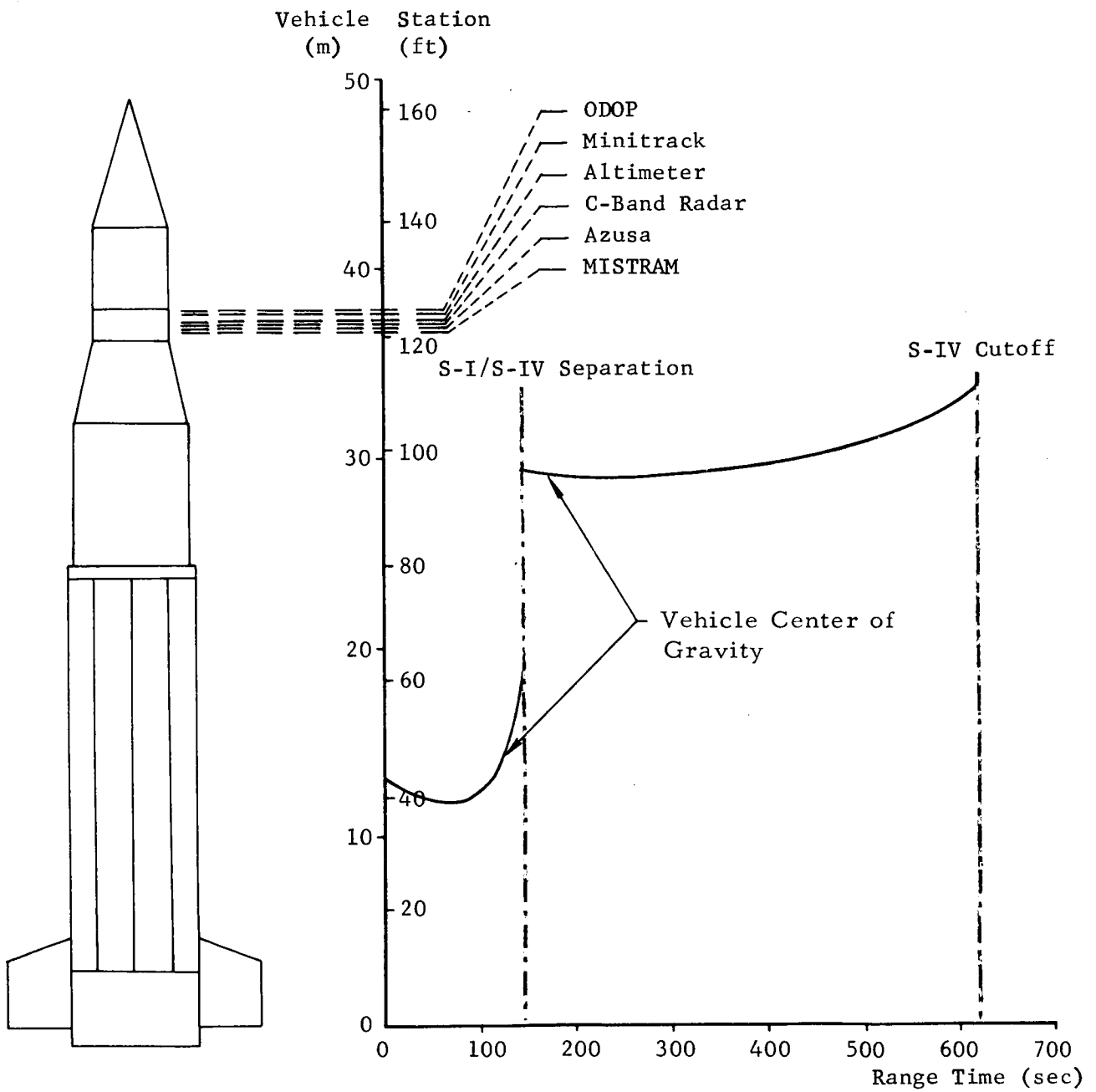


FIGURE 3 ANTENNA LOCATIONS AND VEHICLE CENTER OF GRAVITY VERSUS RANGE TIME

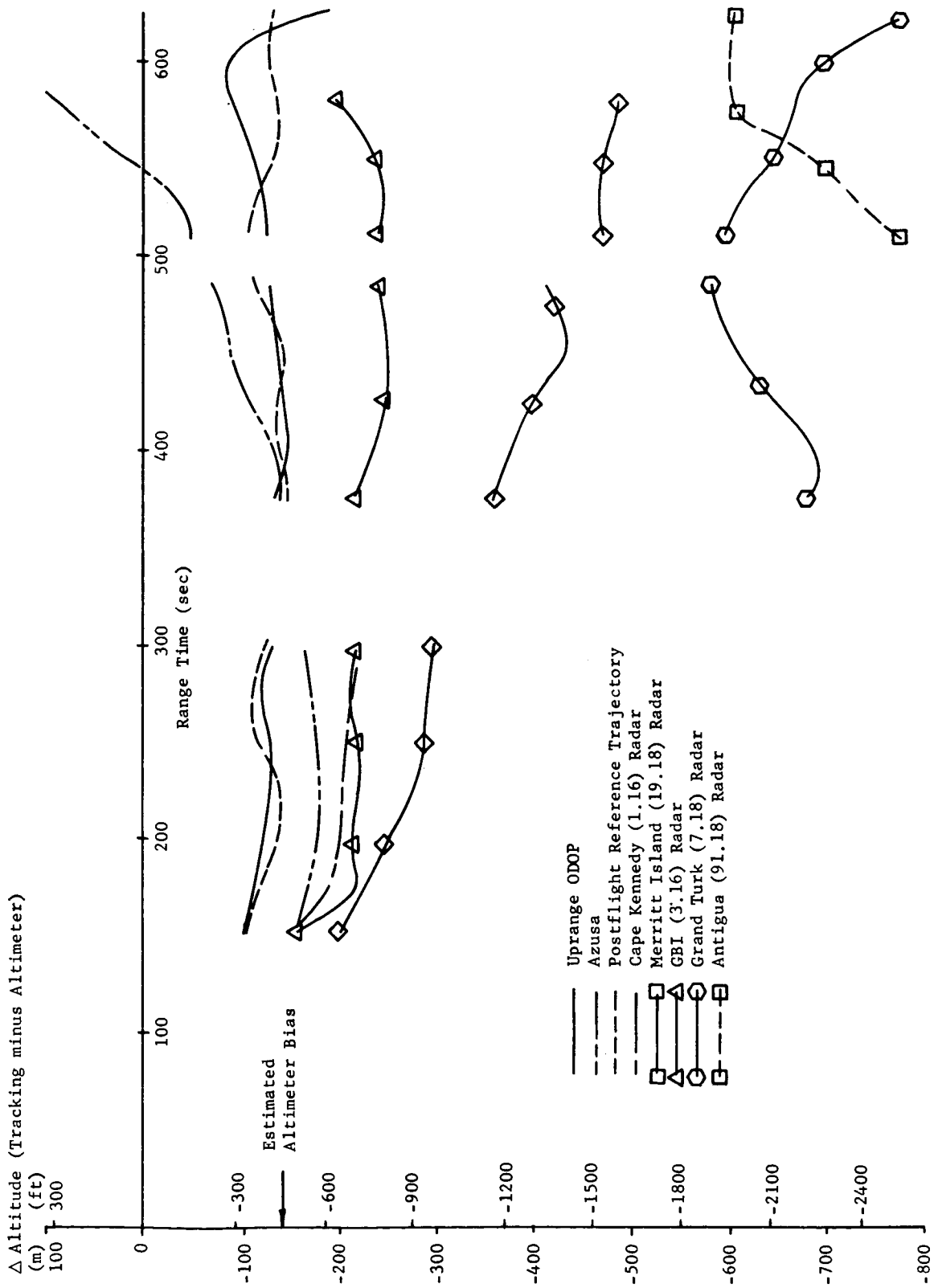


FIGURE 4 ALTITUDE COMPARISONS

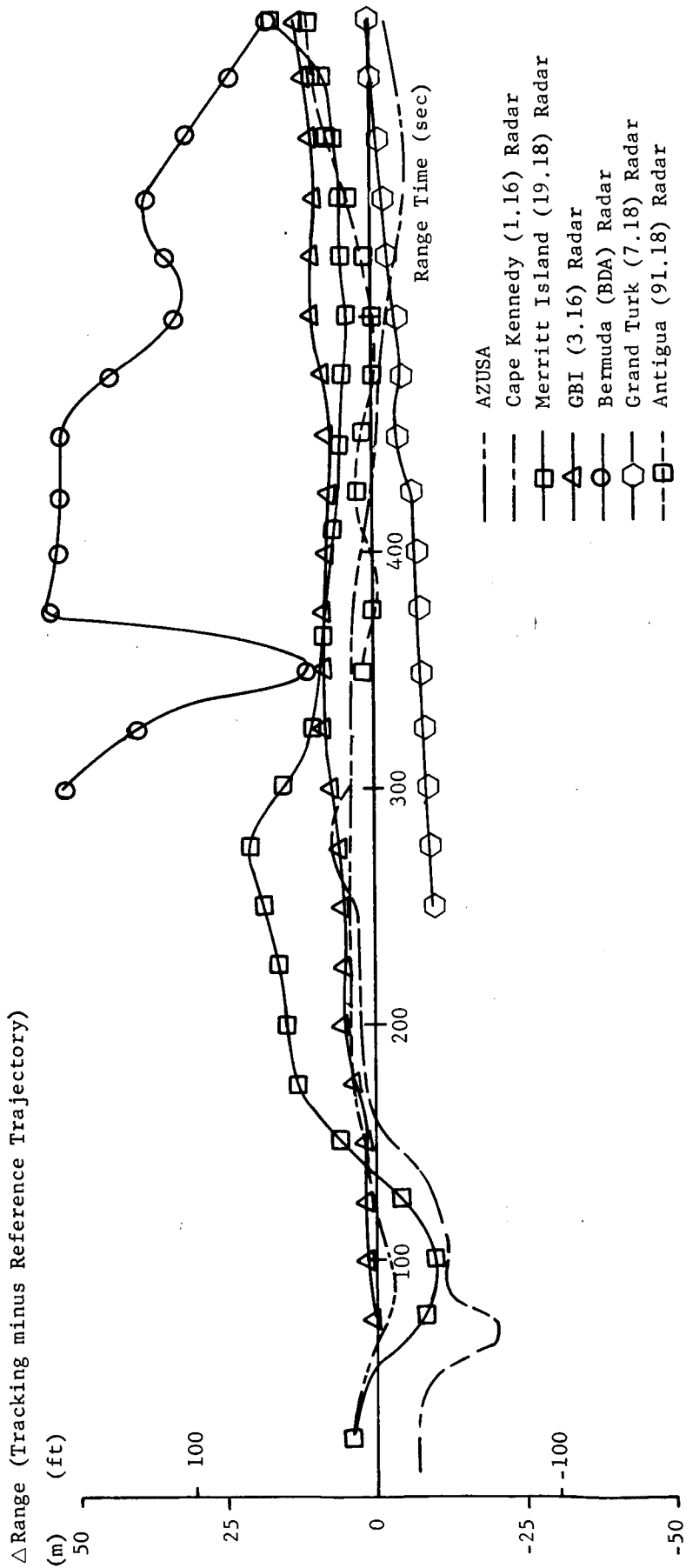


FIGURE 5 MEASURED PARAMETER TRACKING COMPARISONS (RANGE)

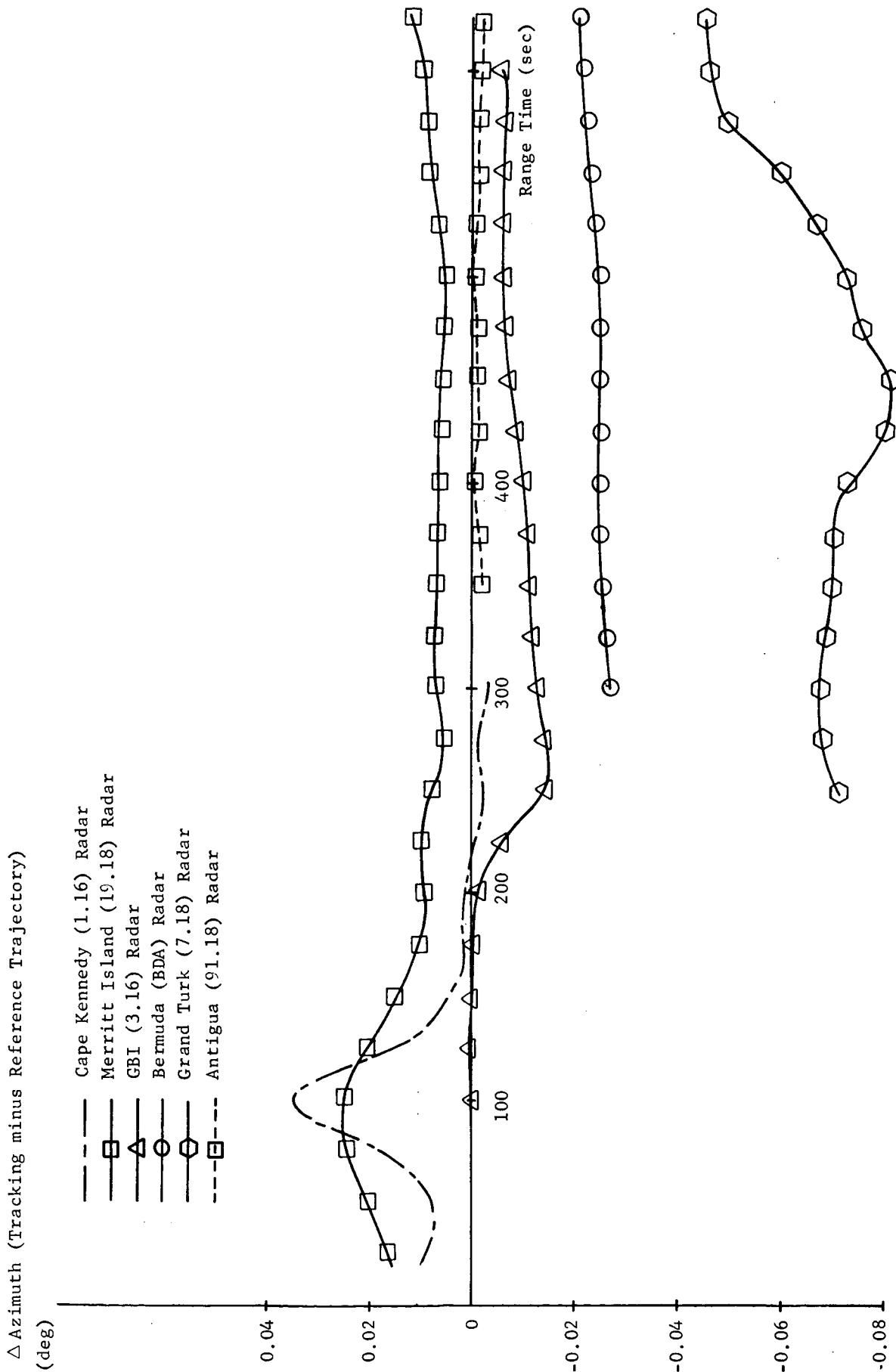


FIGURE 6 MEASURED PARAMETER TRACKING COMPARISONS (AZIMUTH)

--- Cape Kennedy (1.16) Radar
--- Merritt Island (19.18) Radar
--- GBI (3.16) Radar
--- Bermuda (BDA) Radar
--- Grand Turk (7.18) Radar
--- Antigua (91.18) Radar
 Δ Elevation (Tracking minus Reference Trajectory) (deg)

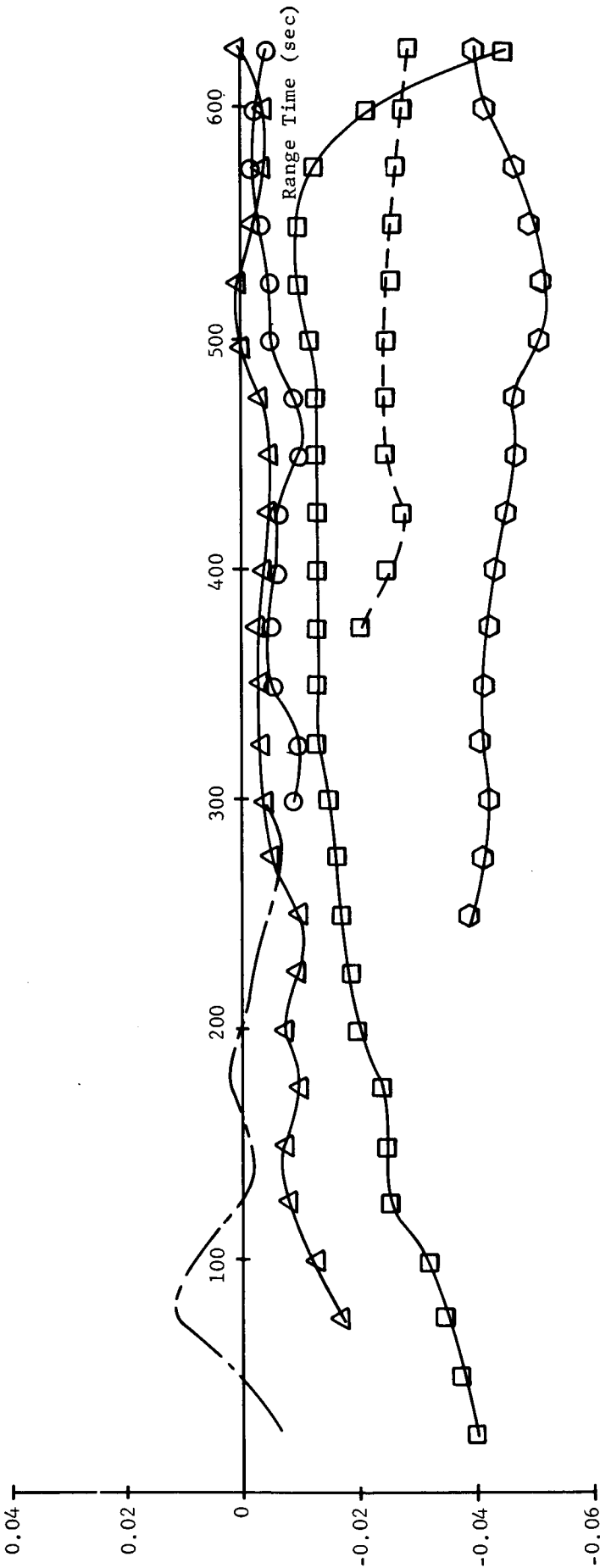


FIGURE 7 MEASURED PARAMETER TRACKING COMPARISONS (ELEVATION)

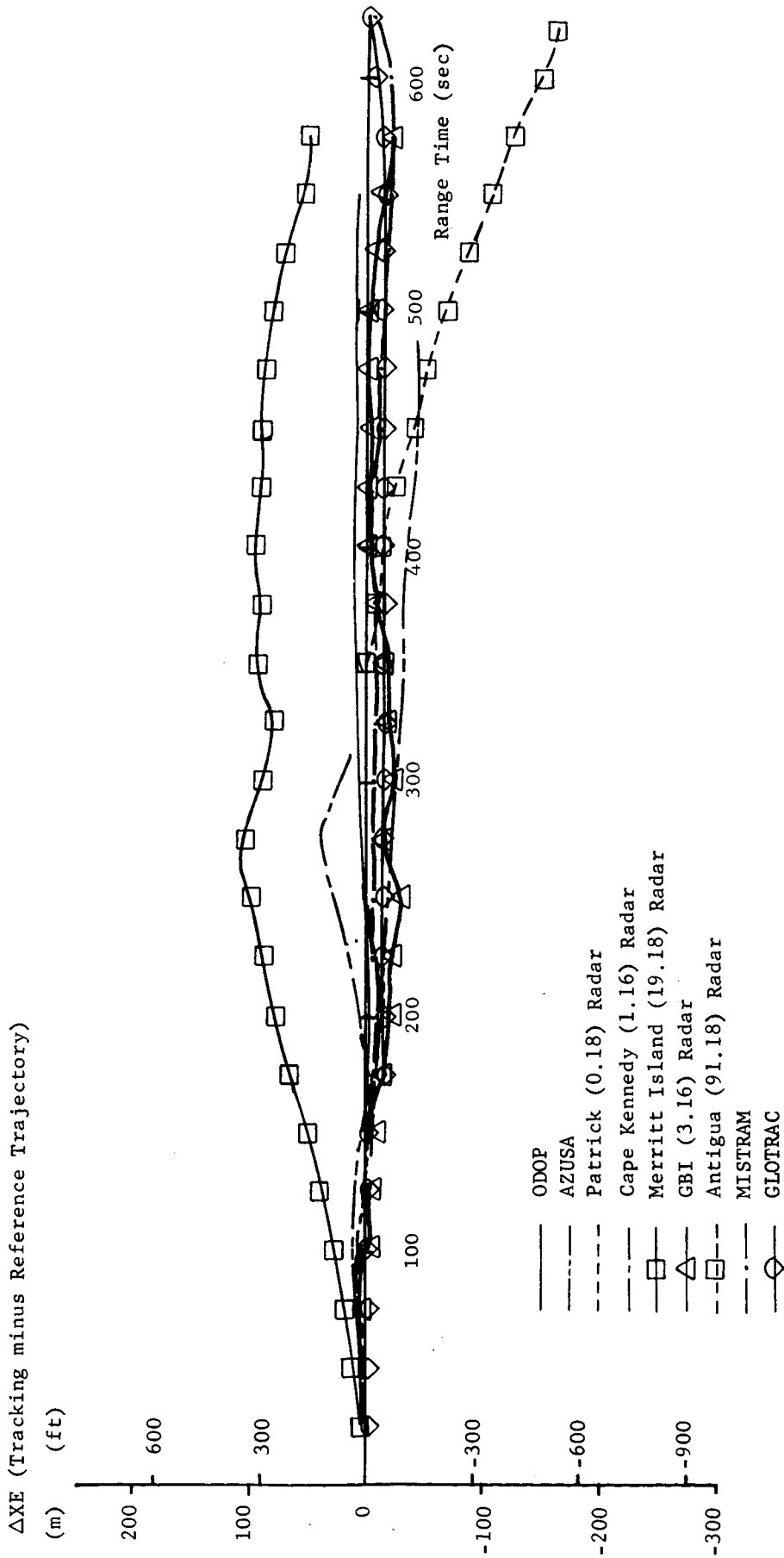


FIGURE 8 METRIC TRACKING COMPARISONS

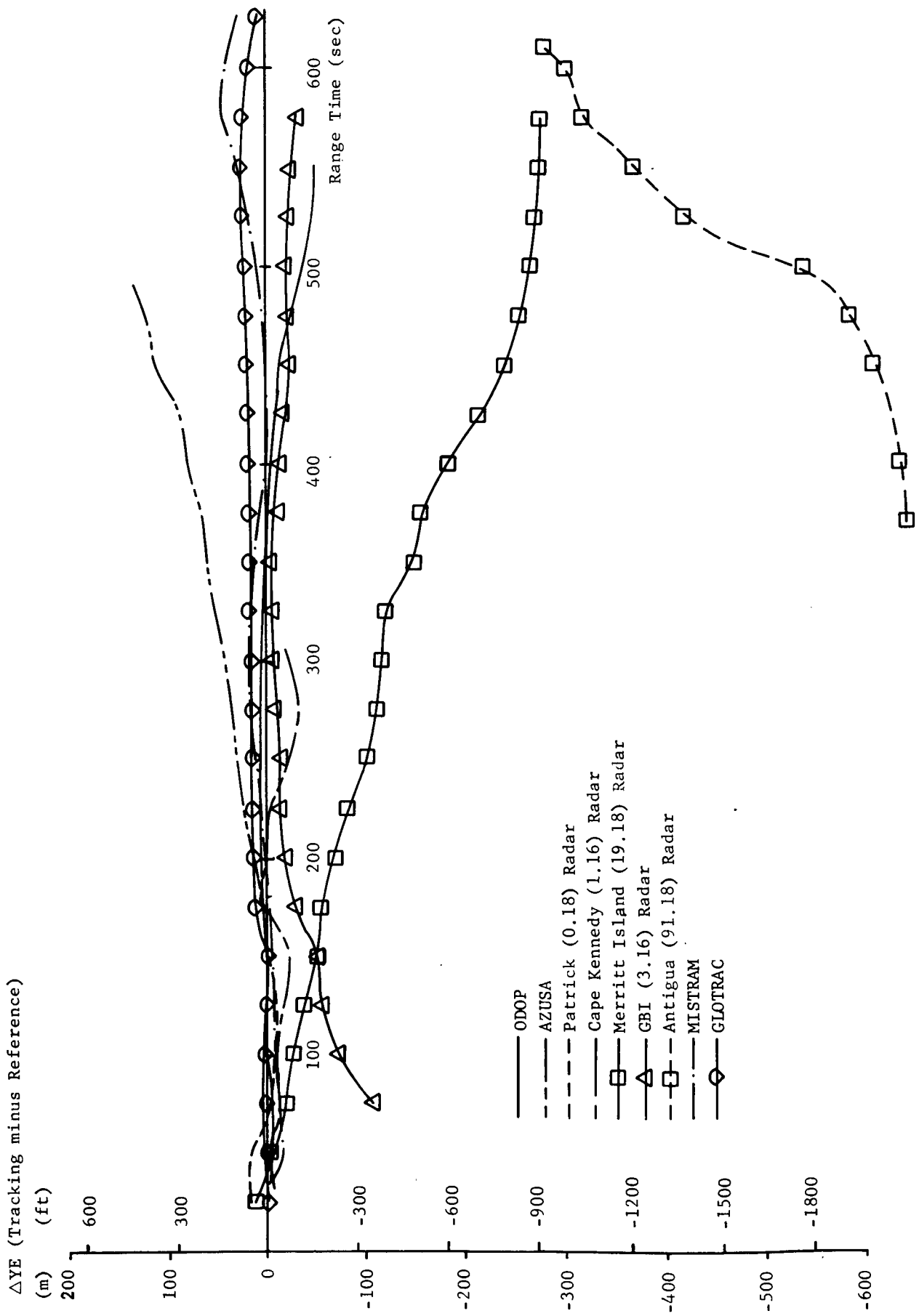


FIGURE 9 METRIC TRACKING COMPARISONS

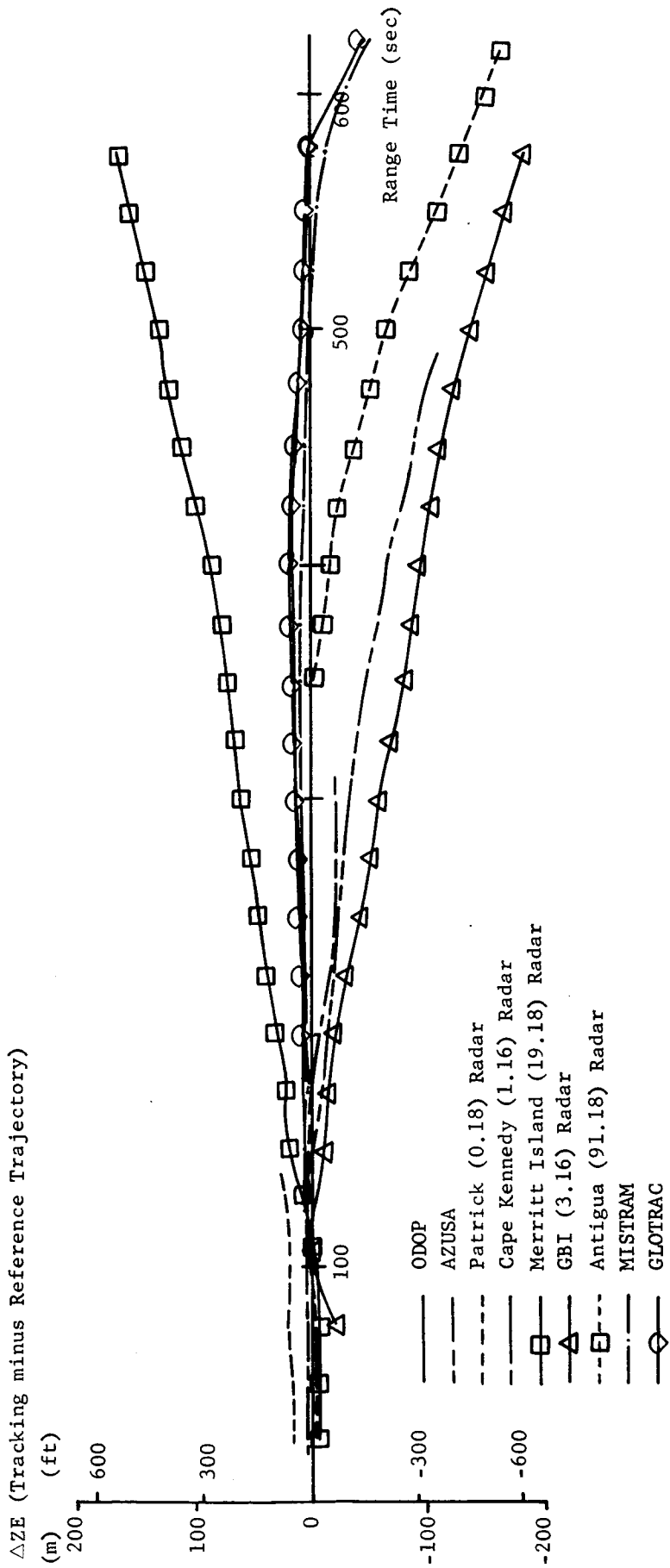


FIGURE 10 METRIC TRACKING COMPARISONS

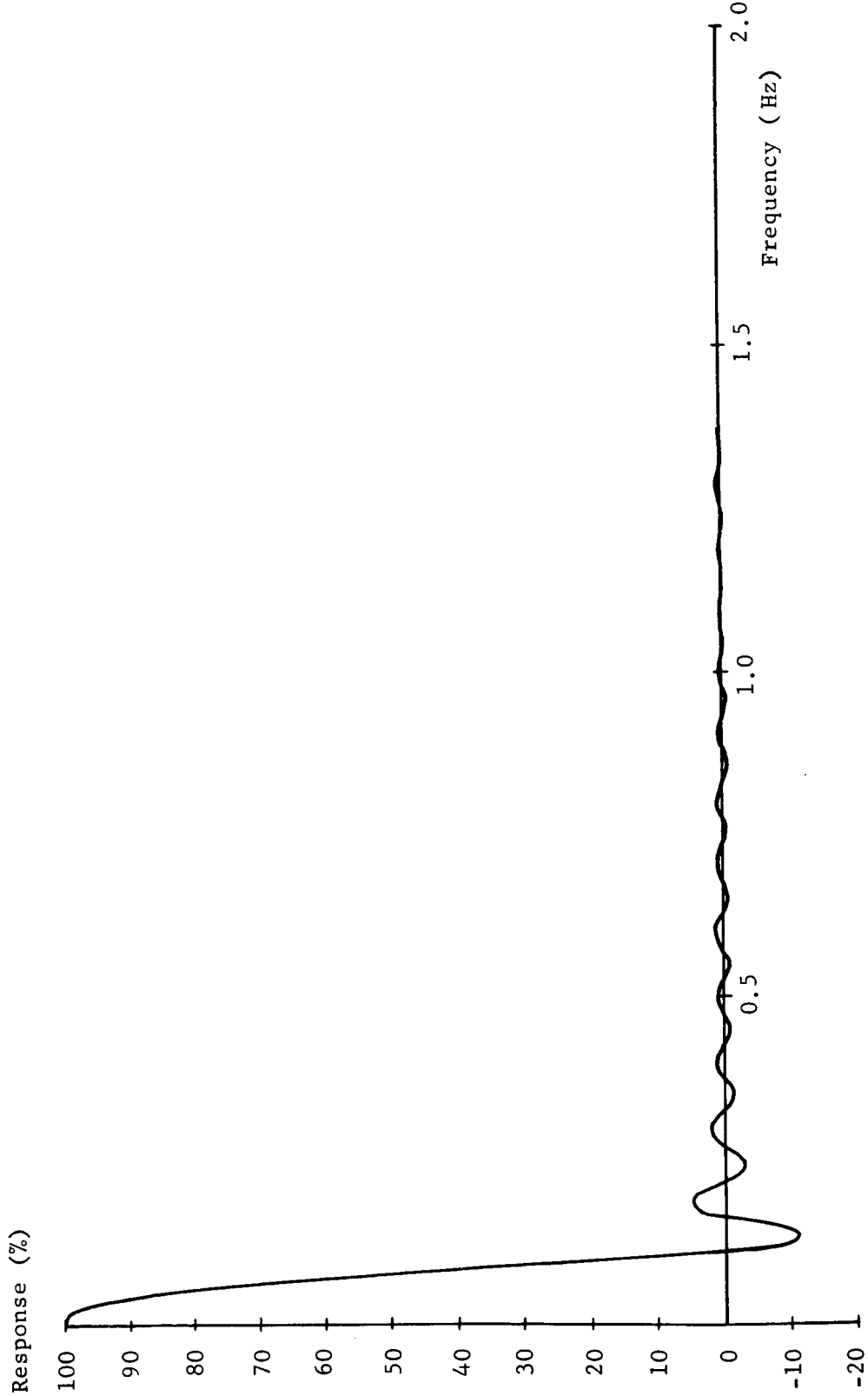


FIGURE 11 FREQUENCY RESPONSE OF SMOOTHING COEFFICIENTS

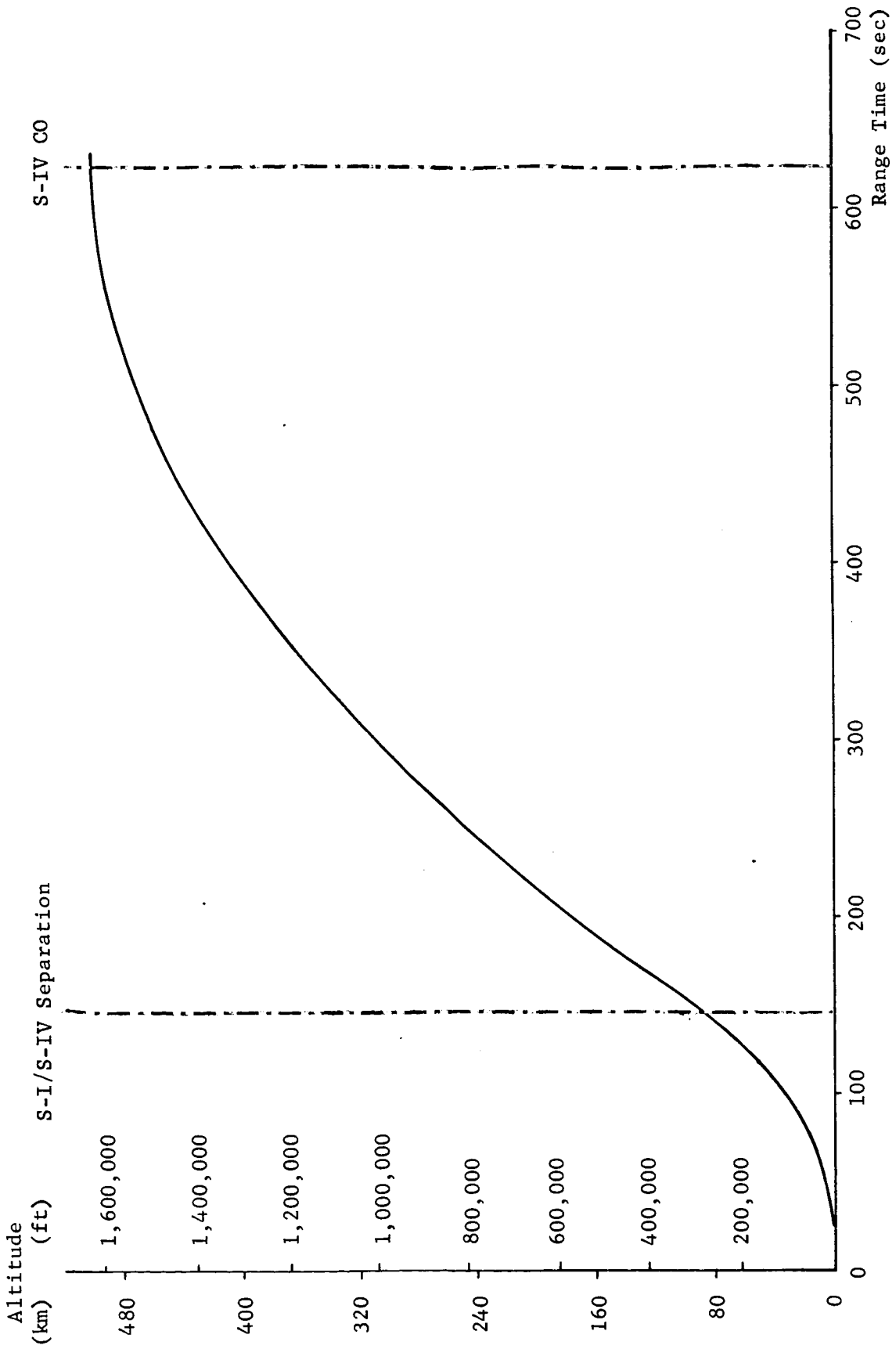


FIGURE 12 ALTITUDE

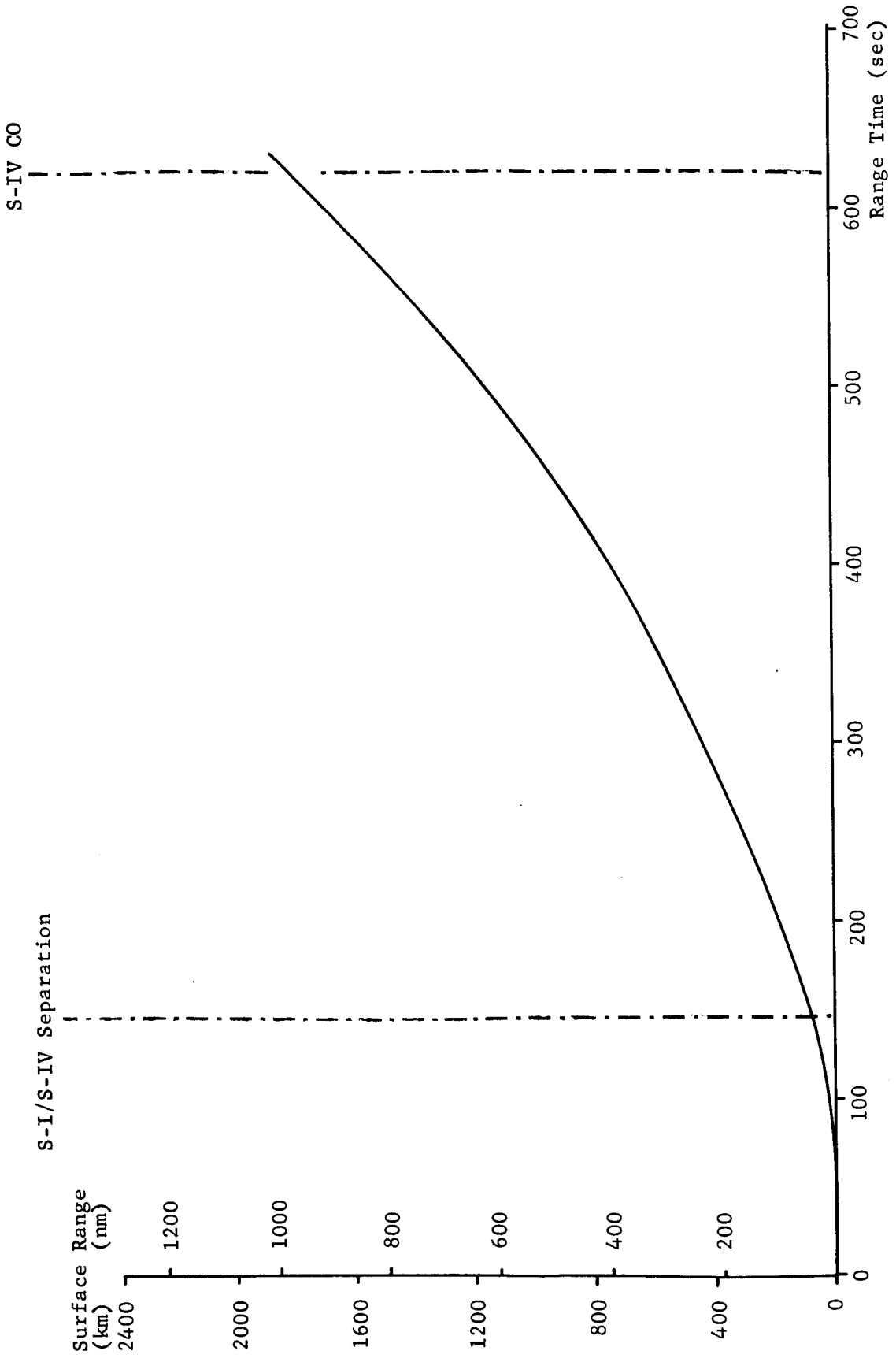


FIGURE 13 SURFACE RANGE

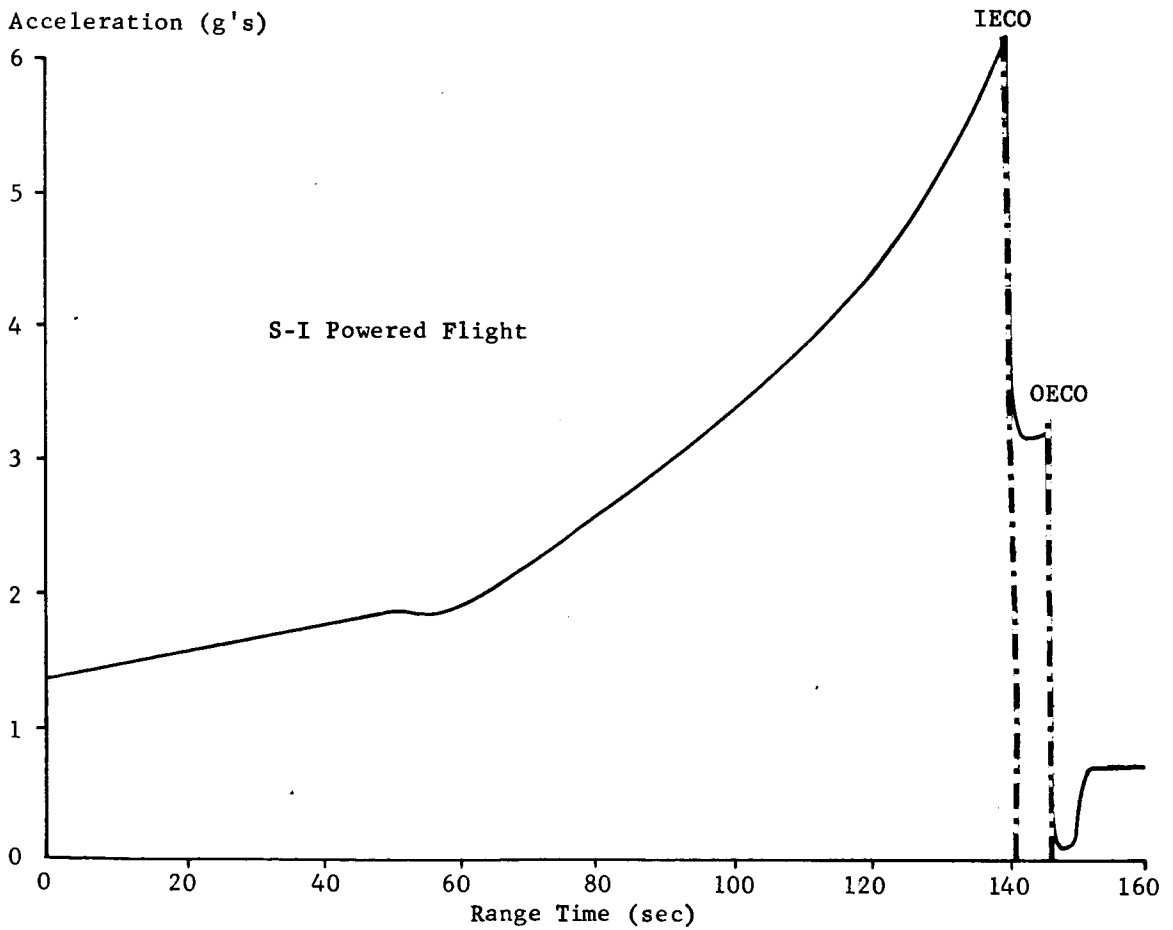
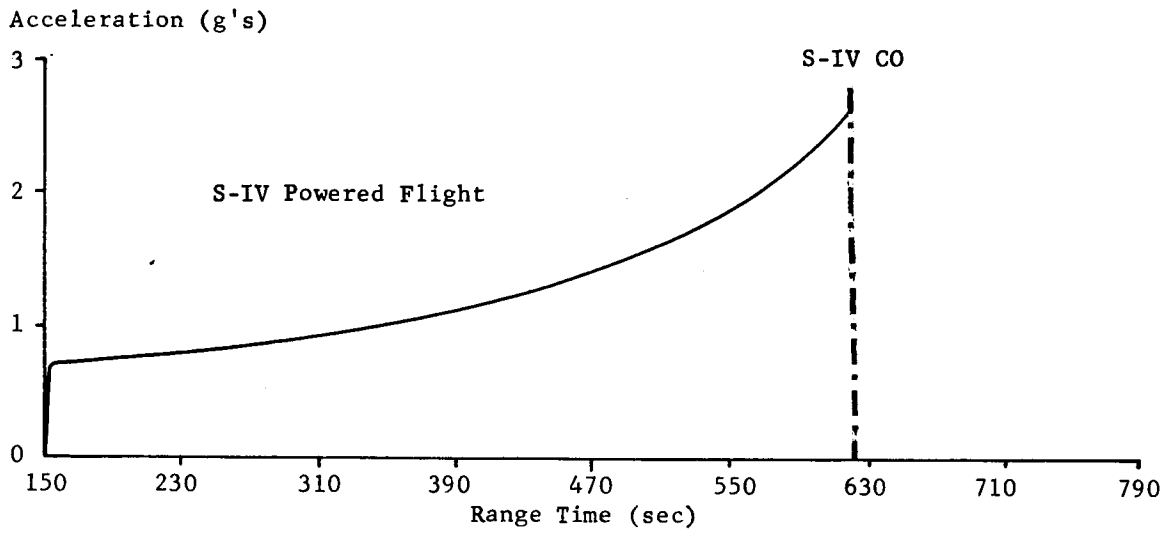


FIGURE 14 TOTAL INERTIAL ACCELERATION

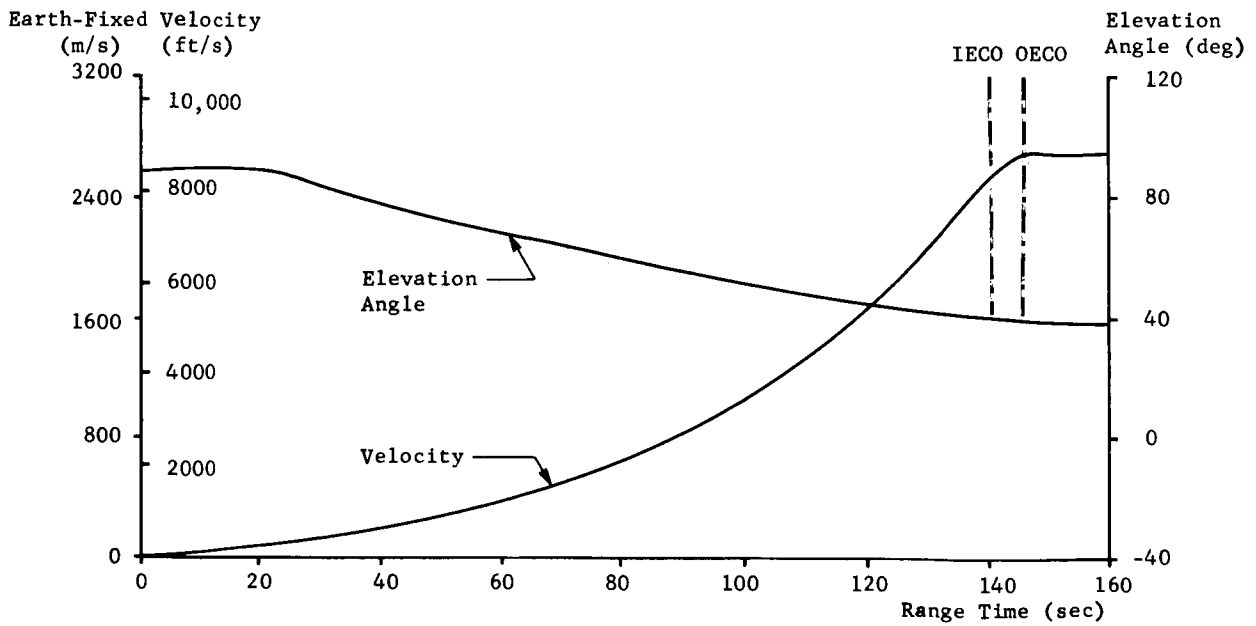
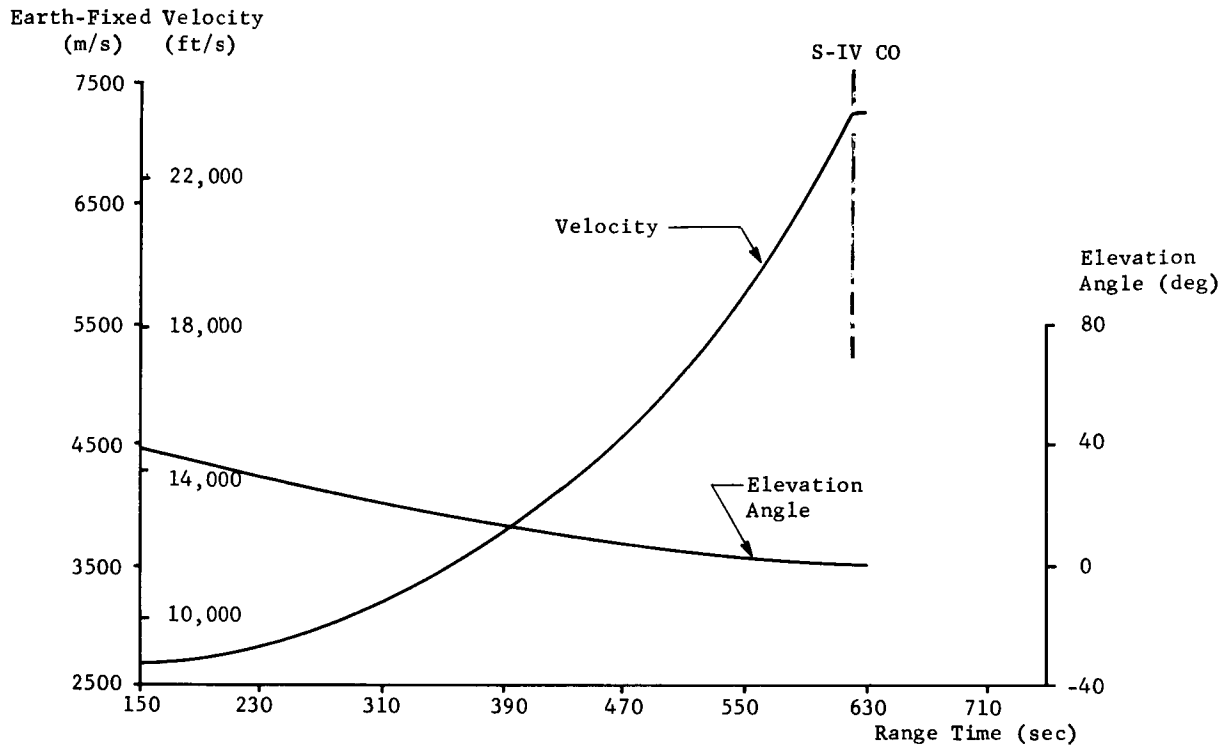


FIGURE 15 EARTH-FIXED VELOCITY AND ELEVATION ANGLE

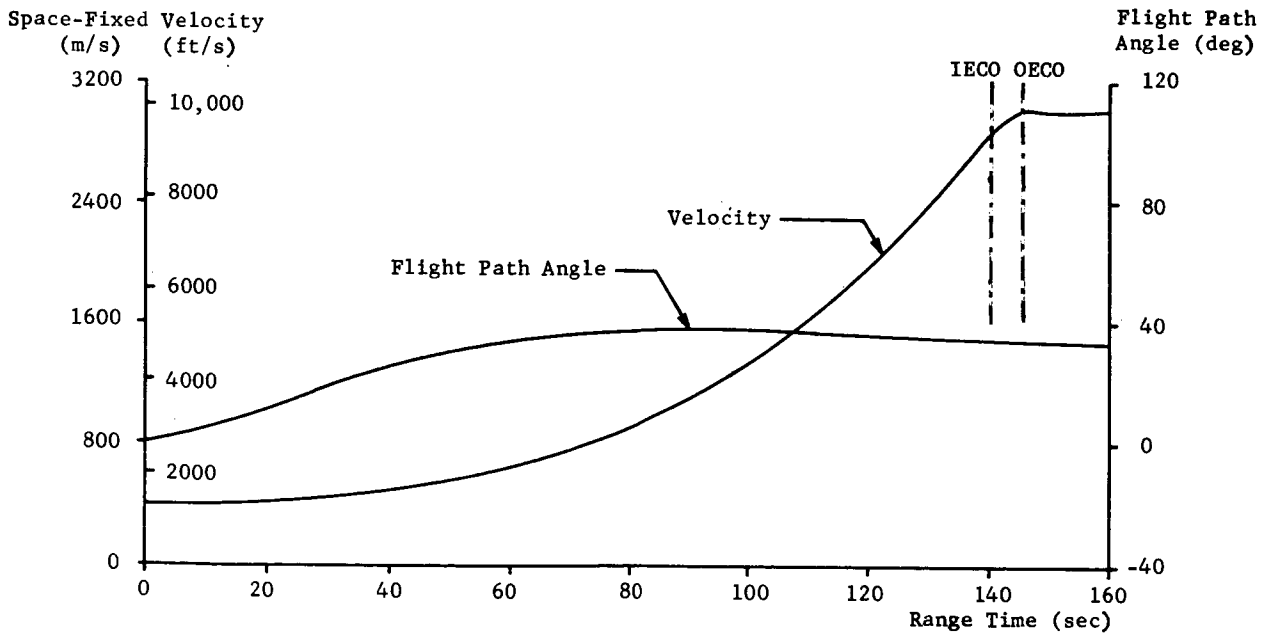
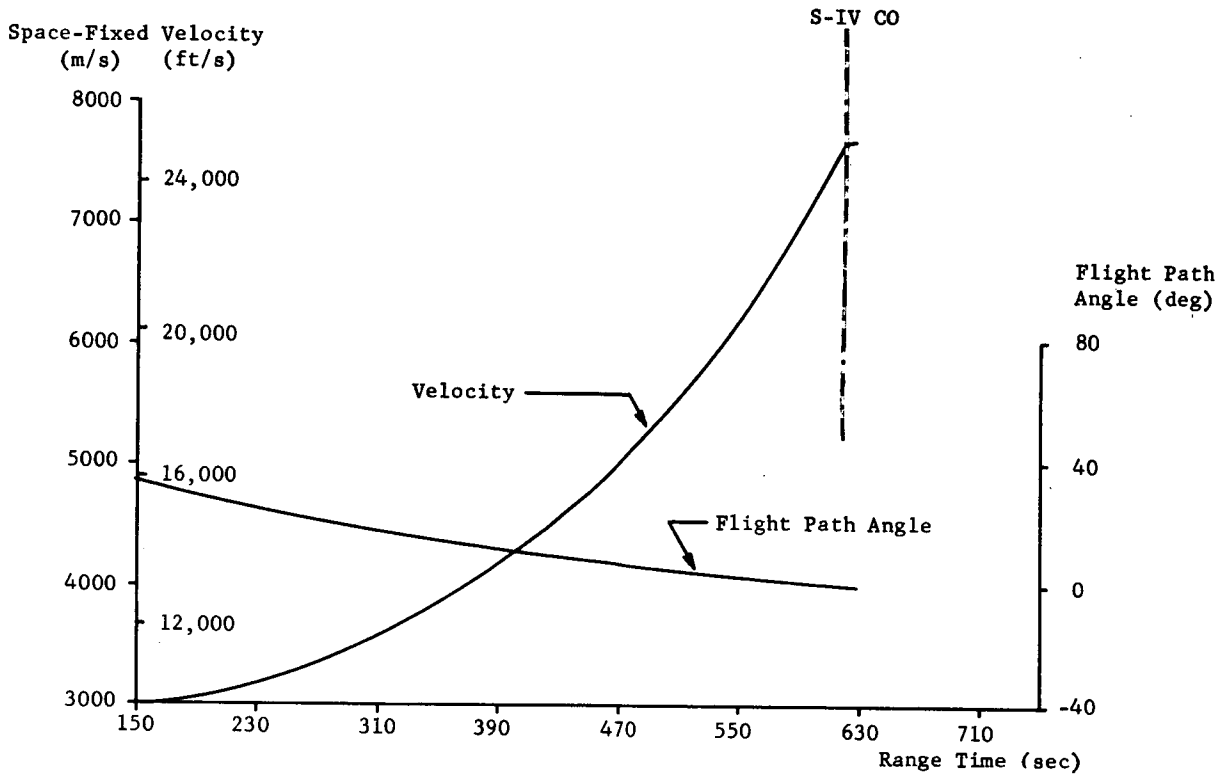


FIGURE 16 SPACE-FIXED VELOCITY AND FLIGHT PATH ANGLE

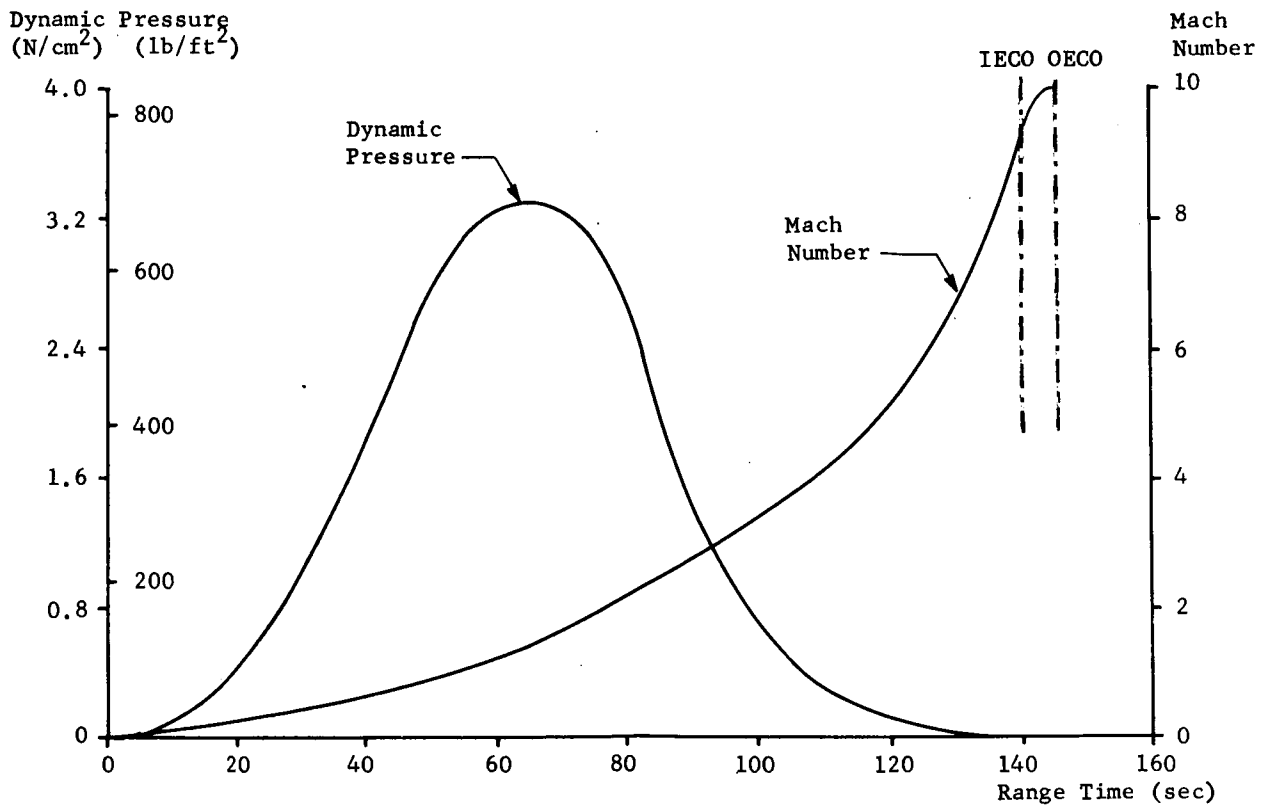


FIGURE 17 MACH NUMBER AND DYNAMIC PRESSURE

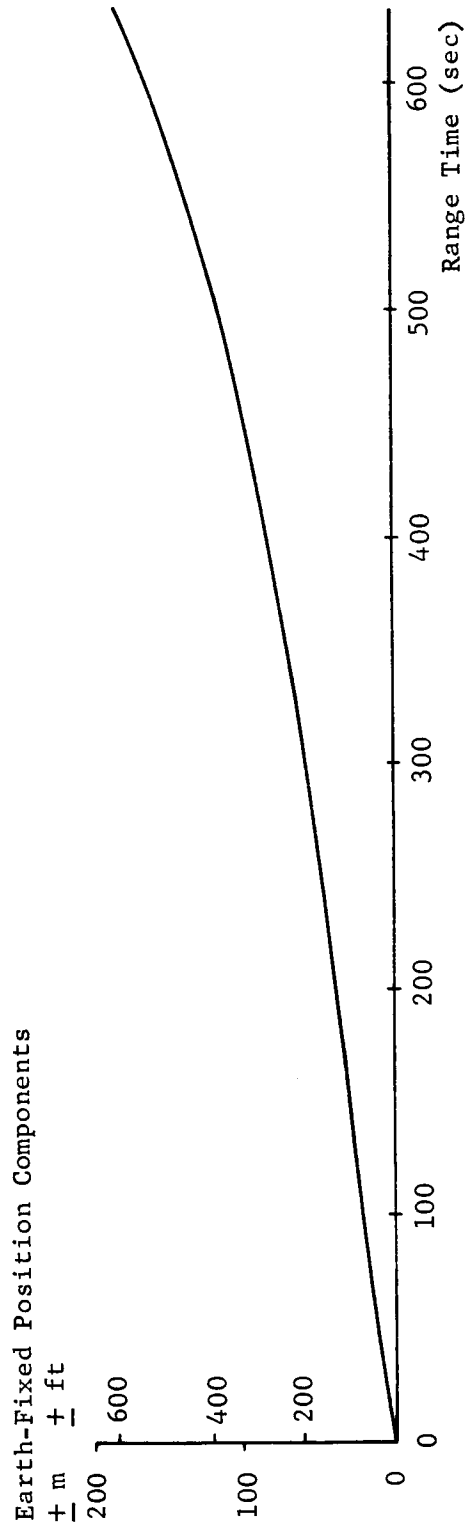
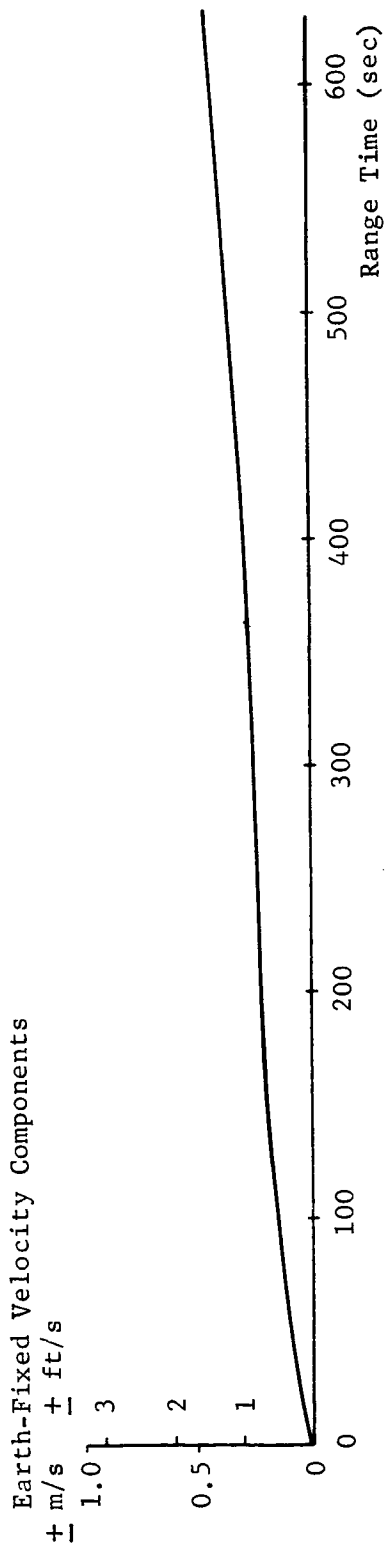


FIGURE 18 ESTIMATED UNCERTAINTY OF REFERENCE TRAJECTORY

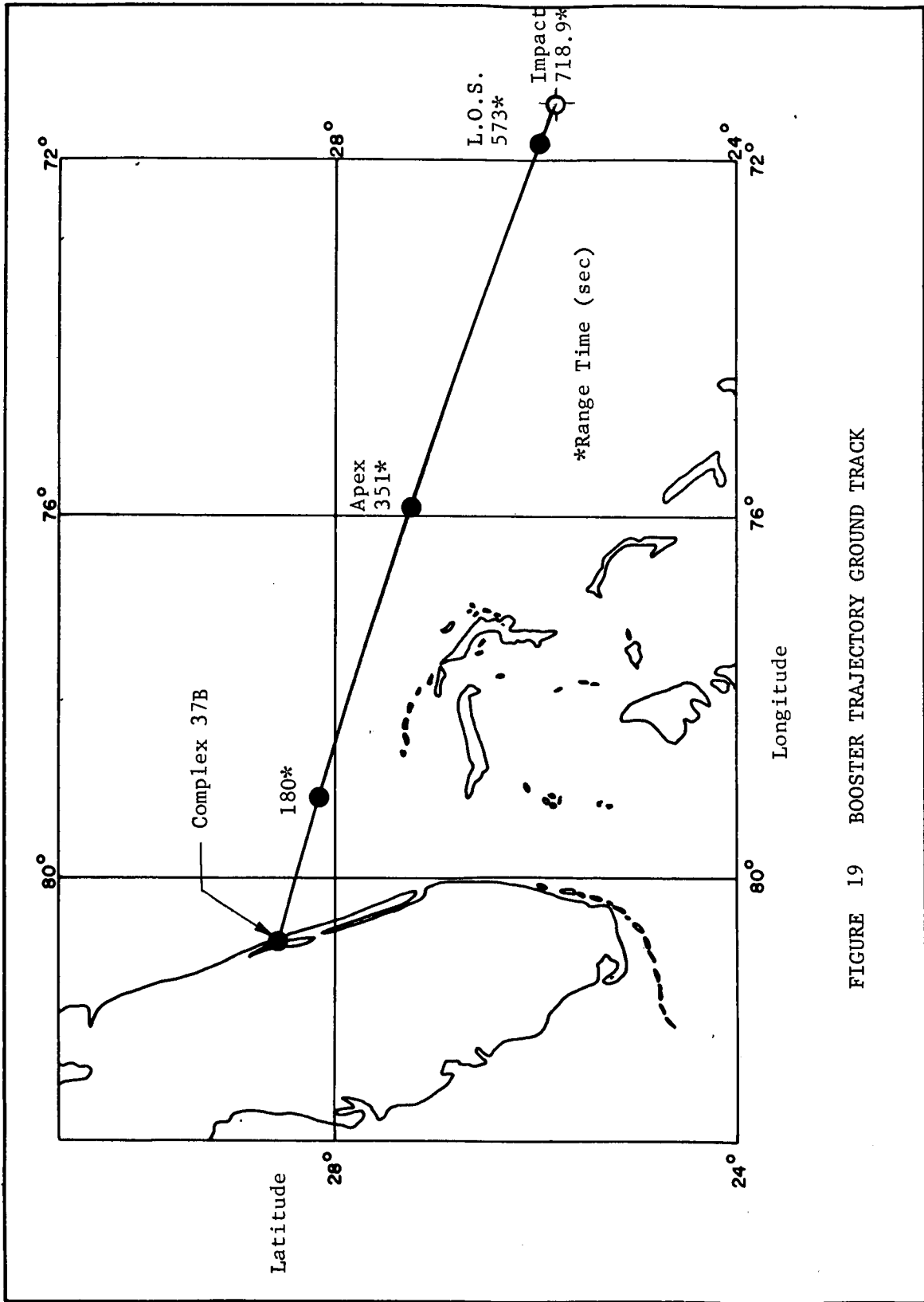


FIGURE 19 BOOSTER TRAJECTORY GROUND TRACK

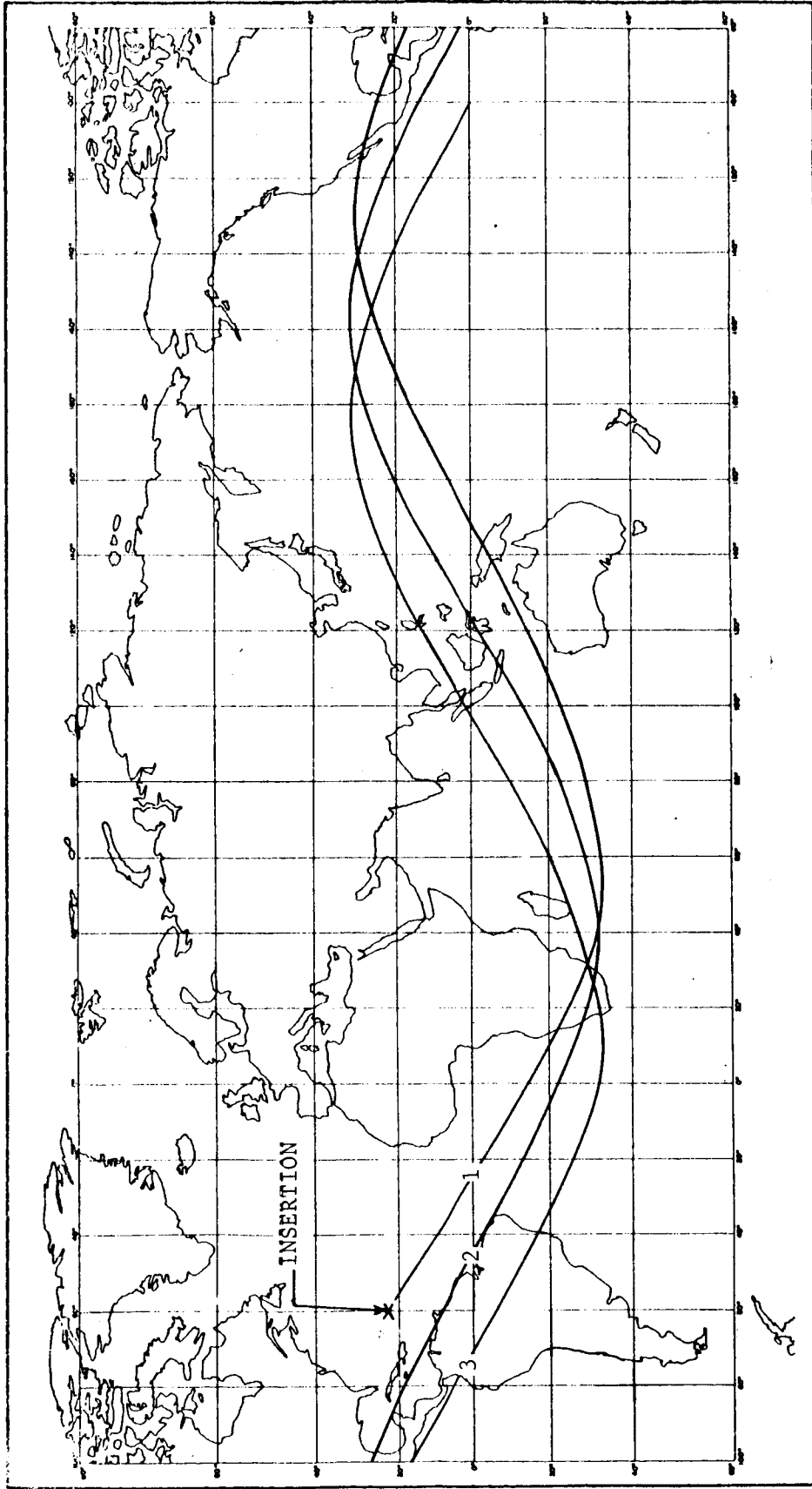


FIGURE 20 GROUND PROJECTION OF FIRST THREE EARTH REVOLUTIONS

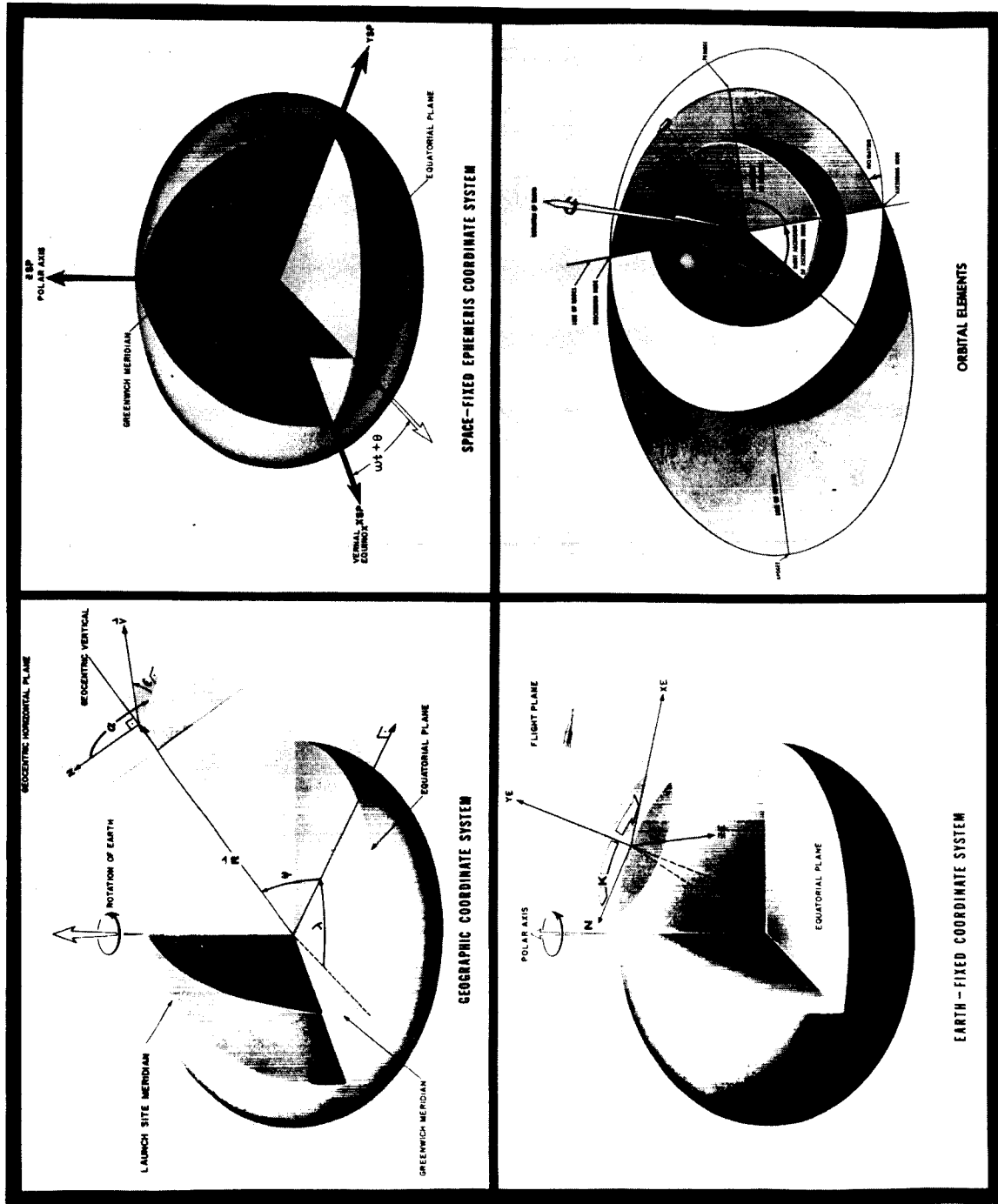


FIGURE 21 TRAJECTORY COORDINATE SYSTEMS

TABLE I TRACKING DATA SOURCES (POWERED FLIGHT)

<u>Data Source</u>	<u>Time Available (sec)</u>
Fixed Camera	0.00 - 18.196
Theodolite	1.4 - 64.0
Azusa	18.5 - 147.0 121.1 - 631.0
ODOP	2.1 - 113.5 121.1 - 146.3 155.1 - 586.0
MISTRAM	39.0 - 146.1 151.0 - 280.5 283.9 - 631.0
GLOTRAC	20.5 - 631.0
Radar Altimeter	175.0 - 240.0 420.0 - 490.0 520.0 - 631.0
Cape Kennedy (1.16) Radar (FPS-16)	10.0 - 315.0
Merritt Island (19.18) Radar (TPQ-18)	12.0 - 27.0 35.0 - 181.0 190.6 - 580.0
GBI (3.16) Radar (FPS-16)	66.0 - 580.0
Grand Turk (7.18) Radar (TPQ-18)	200.0 - 621.3
Antiqua (91.18) Radar (FPQ-6)	342.0 - 621.3
Bermuda (BDA) Radar (FPS-16)	287.0 - 631.0
Patrick (0.18) Radar (FPQ-6) (tracked S-I stage after separation)	10.0 - 580.0

TABLE II TIMES OF EVENTS

Event	Range Time		
	Actual	Nominal	Act - Nom
First Motion	0.08		
LO Signal (Umb Disc)	0.28		
Guidance Detects LO	0.30	0.30	0.00
Pitch Command	8.86	8.85	0.01
Roll Command	8.87	8.86	0.01
Roll Completed	23.90	23.86	0.04
Lock Modules	137.80	138.58	-0.78
IECO	140.22	140.70	-0.48
OECO	145.56	146.70	-1.14
Ullage Rockets Ignite	146.32	147.41	-1.09
Separation	146.42	147.51	-1.09
S-IV Ignition	148.12	149.21	-1.09
Jettison Ullage Rockets & LES	158.42	159.51	-1.09
Introduce Guidance	163.86		
Guidance Cutoff Signal	621.66	630.01	-8.35
Apollo Shroud Separation	803.50	811.80	-8.30
Wing Deployment Complete	902.25		

TABLE III SIGNIFICANT TRAJECTORY PARAMETERS

<u>Event</u>	<u>Parameter</u>	
First Motion	Range Time	0.08 sec
	Total Inertial Acceleration	13.18 m/s ² (43.24 ft/s ²)
Mach One	Range Time	53.208 sec
	Altitude	7.10 km (23294 ft)
Maximum Dynamic Pressure	Range Time	66.0 sec
	Dynamic Pressure	3.313 N/cm ² (691.9 lb/ft ²)
	Altitude	11.64 km (38189 ft)
Maximum Total Inertial Acceleration (S-I Stage)	Range Time	140.34 sec
	Acceleration	60.66 m/s ² (199.02 ft/s ²)
Maximum Earth-Fixed Velocity (S-I Stage)	Range Time	145.70 sec
	Velocity	2701.1 m/s (8861.9 ft/s)
Apex (S-I Stage)	Range Time	351.0 sec
	Altitude	263.29 km (142.17 nm)
	Range	476.32 km (257.19 nm)
	Earth-Fixed Velocity	1990.3 m/s (6529.9 ft/s)
Loss of Telemetry (S-I Stage)	Range Time	573.0 sec
	Altitude	59.72 km (195929 ft)
	Range	911.42 km (492.13 nm)
	Total Inertial Acceleration	-3.91 m/s ² (-12.83 ft/s ²)
	Elevation Angle from Pad	-0.368 deg
Impact (S-I Stage)	Range Time	718.9 sec
	Range	961.30 km (519.06 nm)
	Cross Range	18.26 km (9.86 nm)
	Geodetic Latitude	25.8155 deg
	Longitude	71.3491 deg
Maximum Total Inertial Acceleration (S-IV Stage)	Range Time	621.71 sec
	Acceleration	25.68 m/s ² (84.25 ft/s ²)
Maximum Earth-Fixed Velocity (S-IV Stage)	Range Time	622.0 sec
	Velocity	7257.6 m/s (23811.0 ft/s)

TABLE IV CUTOFF CONDITIONS

Parameters	IECO		OEEO		S-IV CO (Guidance Signal)		
	Actual	Nominal	Act-Nom.	Nominal	Actual	Nominal	Act-Nominal
Range Time (sec)	140.22	140.70*	-0.48	145.56	146.7*	621.659	630.01* -8.351
Altitude (km)	80.02	78.10	1.92	89.05	87.94	499.73	500.07 -0.34
Range (km)	64.73	64.63	0.10	75.35	76.48	1837.69	1856.85 -19.16
Cross Range, Z_e (km)	-0.22	0.01	-0.23	-0.18	0.06	50.63	51.10 -0.47
Cross Range Velocity, \dot{Z}_e (m/s)	7.7	7.8	-0.1	9.5	9.5	225.6	226.5 -0.9
Earth-Fixed Velocity (m/s)	2556.9	2506.7	50.2	2697.8	2662.4	7254.5	7255.0 -0.5
E. F. Velocity Vector Elevation (deg)	40.42	39.82	0.60	39.65	38.97	0.68	-0.04 -0.02
E. F. Velocity Vector Azimuth (deg)	105.40	105.41	-0.01	105.49	105.50	114.34	114.41 -0.07
Space-Fixed Velocity (m/s)	2875.1	2837.4	47.7	3018.8	2986.2	32.6	7678.5 -0.5
Total Inertial Acceleration (m/s^2)	60.52	59.39	1.13	29.83	30.91	-1.08	25.66 0.02

*Based on First Motion Time of 0.08 sec

Earth-Fixed Velocity Accuracy
 OEEO ± 0.2 m/s
 S-IV CO ± 0.5 m/s

Altitude Accuracy
 OEEO ± 20 m
 S-IV CO ± 100 m

TABLE V ORBITAL ELEMENTS AT INSERTION

Time	14:47:34.659 U. T.
Semi-Major Axis	6998.91 km (3779.11 nm)
Eccentricity	0.017754503
Inclination	31.7645 deg
Right Ascension of Ascending Node	167.1532 deg
Argument of Perigee	135.2553 deg
True Anomaly	-1.5580 deg
Mean Sidereal Time, 0 hr U. T. Feb 16, 1965	145.777137 deg
Space-Fixed Velocity	7681.84 m/s (25,202.84 ft/s)
Azimuth of Space-Fixed Velocity (CW from North)	113.1589 deg
Flight Path Angle	-0.02718 deg
Altitude from Earth Center	499.62 km (269.77 nm)
Geocentric Latitude (North)	22.3713 deg
Longitude (East)	297.2119 deg

TABLE VI ORBITAL INSERTION PARAMETERS

	<u>Actual</u>	<u>Nominal</u>	<u>Actual Minus Nominal</u>
Time of Orbital Insertion (Range Time)	631.659 sec	640.01 sec	- 8.351 sec
Space-Fixed Velocity	7681.8 m/s (25202.7 ft/s)	7682.1 m/s (25203.7 ft/s)	- 0.3 m/s (-1.0 ft/s)
Flight Path Angle	-0.027 deg	-0.014 deg	- 0.013 deg
Altitude**	499.6 km (269.8 nm)	500.0 km (270.0 nm)	- 0.4 km (-0.2 nm)
Ground Range	1905.0 km (1028.6 nm)	1924.1 km (1038.9 nm)	-19.1 km (-10.3 nm)
Apogee Altitude*	745.0 km (402.3 nm)	747.1 km (403.4 nm)	- 2.1 km (- 1.1 nm)
Perigee Altitude *	496.5 km (268.1 nm)	496.9 km (268.3 nm)	- 0.4 km (- 0.2 nm)
Period	97.1 min	97.1 min	0.0 min
Inclination	31.76 deg	31.77 deg	- 0.01 deg
Excess Circular Velocity	67.3 m/s (220.8 ft/s)	67.7 m/s (222.1 ft/s)	- 0.4 m/s (-1.3 ft/s)
Lifetime	1188 days	1250 days	-62 days

*Apogee and perigee altitudes are defined assuming a spherical Earth of radius 6378.165 km (3443.9336 nm).

**Altitude is defined assuming an oblate Earth (Fischer Ellipsoid).

TABLE VII
INITIAL SA-9 ORBITAL TRACKING

STATION	INSERTION	REVOLUTION NUMBER				
		1	2	3	4	5
<u>RADAR</u>						
Wallops Island, Va.	S					
Merritt Island, Fla.	B	S				
Bermuda	B					
Grand Bahamas	B					
Grand Turk	B	S				
Antigua	B					
Ascension		B				
Pretoria, S. Africa		B*				
Carnarvon, Australia		S				
White Sands, N.M.		S				
Patrick AFB, Fla.		S				
<u>MINITRACK</u>						
Johannesburg, S. Africa		X	X	X	X	X
Woomera, Australia		X				
Fort Myers, Fla.		X				
Quito, Ecuador			X			
Mojave, Calif.		X	X			
Rosman, N. C.		X				
Lima, Peru				X		
Santiago, Chile					X	X

*Last C-Band beacon reception at approximately 15:19Z (42 min after liftoff)

B C-Band radar beacon track

S Radar Skin track

TABLE VIII BOOSTER FREE FLIGHT TRAJECTORY

Time (sec)	Earth-Fixed Position			Earth-Fixed Velocity				Altitude (m)	Range (m)
	XE (m)	YE (m)	ZE (m)	DXE (m/s)	DYE (m/s)	DZE (m/s)			
160	106561	111973	2	2081	1551	13	112846	104628	
180	148090	141189	299	2073	1369	17	142871	144753	
200	189481	166763	672	2065	1188	20	169506	184477	
220	230705	188725	1118	2057	1008	24	192776	223842	
240	271749	207101	1634	2047	830	28	212705	262899	
260	312600	221914	2219	2038	652	31	229312	301699	
280	353246	233184	2867	2027	475	34	242613	340290	
300	393674	240925	3578	2016	299	37	252620	378721	
320	433871	245149	4347	2004	123	40	259343	417037	
340	473825	245865	5171	1991	-52	43	262788	455286	
360	513523	243076	6048	1978	-227	45	262958	493511	
380	552952	236784	6975	1965	-402	48	259853	531760	
400	592099	226988	7947	1950	-578	50	253471	570077	
420	630950	213679	8961	1935	-753	52	243806	608508	
440	669491	196851	10015	1919	-930	54	230848	647102	
460	707708	176490	11105	1902	-1107	55	214584	685903	
480	745585	152578	12226	1885	-1285	57	195001	724962	
500	783106	125097	13377	1867	-1464	58	172079	764328	
520	820254	94021	14552	1848	-1644	59	145795	804054	
540	857011	59323	15748	1828	-1826	60	116124	844193	
560	893358	20972	16962	1807	-2009	61	83038	884800	
580	929058	-20812	18181	1735	-2135	60	46725	925683	
600	953669	-52583	19035	464	-668	17	18914	954581	
620	957298	-58936	19021	70	-201	-12	13174	959112	
640	958100	-62610	18722	20	-167	-14	9661	960450	
660	958242	-65640	18531	-2	-138	-8	6687	961043	
680	958060	-68193	18353	-13	-118	-6	4134	961245	
700	957784	-70416	18281	-14	-105	-2	1895	961307	
718.9	957482	-72287	18261	-19	-93	-1	0	961290	

TABLE IX
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S
FIRST MOTION						
0.080	0	32	0	0.	-0.	-0.
LIFTOFF SIGNAL						
0.280	0	32	0	0.0	0.7	-0.0
1.0	0	33	0	0.0	3.2	-0.1
2.0	0	38	0	-0.0	6.8	-0.1
3.0	0	47	0	-0.1	10.5	-0.1
4.0	0	59	0	-0.2	14.3	-0.1
5.0	0	75	0	-0.2	18.1	-0.0
6.0	-0	95	0	-0.3	22.1	-0.0
7.0	-0	120	0	-0.4	26.1	-0.1
8.0	-0	148	-0	-0.5	30.2	-0.1
9.0	-1	180	-0	-0.5	34.4	-0.1
10.0	-1	216	-0	-0.6	38.6	-0.2
11.0	-2	257	-0	-0.6	43.0	-0.2
12.0	-3	302	-0	-0.6	47.4	-0.2
13.0	-4	352	-0	-0.6	51.9	-0.2
14.0	-4	406	-1	-0.5	56.6	-0.2
15.0	-5	465	-1	-0.4	61.3	-0.2
16.0	-6	529	-1	-0.3	66.2	-0.1
17.0	-6	597	-1	-0.1	71.1	-0.1
18.0	-6	671	-1	0.3	76.1	0.0
19.0	-6	750	-1	0.7	81.2	0.1
20.0	-5	833	-1	1.3	86.4	0.1
21.0	-3	922	-1	1.9	91.6	0.2
22.0	-1	1017	-1	2.8	97.0	0.2
23.0	1	1116	-0	3.8	102.4	0.2
24.0	6	1221	-0	5.0	107.9	0.3
25.0	11	1332	-0	6.4	113.4	0.3
26.0	18	1448	-0	7.9	119.1	0.2
27.0	27	1570	0	9.6	124.8	0.2
28.0	37	1698	0	11.5	130.6	0.2
29.0	50	1831	0	13.6	136.5	0.2
30.0	64	1971	0	15.8	142.6	0.2

TABLE IX
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S
31.0	81	2116	1	18.2	148.7	0.2
32.0	100	2268	1	20.7	154.9	0.2
33.0	122	2426	1	23.3	161.2	0.2
34.0	147	2591	1	26.0	167.5	0.1
35.0	174	2761	1	28.9	174.0	-0.0
36.0	204	2939	1	31.8	180.5	-0.1
37.0	237	3122	1	34.9	187.1	-0.2
38.0	274	3313	1	38.3	193.8	-0.2
39.0	314	3510	1	41.7	200.6	-0.1
40.0	357	3714	1	45.2	207.5	0.0
41.0	404	3925	1	48.7	214.5	0.0
42.0	454	4143	1	52.3	221.7	0.0
43.0	508	4368	1	56.0	228.9	-0.1
44.0	566	4601	1	59.7	236.2	-0.2
45.0	627	4841	1	63.6	243.6	-0.3
46.0	693	5088	0	67.7	251.1	-0.5
47.0	763	5343	0	72.0	258.7	-0.8
48.0	837	5606	-0	76.3	266.3	-1.2
49.0	915	5876	-2	80.8	274.0	-1.7
50.0	998	6154	-4	85.3	281.8	-2.2
51.0	1085	6440	-6	90.0	289.6	-2.6
52.0	1178	6733	-9	94.9	297.4	-2.9
53.0	1275	7034	-12	100.1	305.0	-3.0
MACH ONE						
53.208	1296	7098	-12	101.2	306.5	-3.0
54.0	1378	7343	-15	105.4	312.4	-3.1
55.0	1486	7659	-18	110.8	319.8	-3.1
56.0	1599	7983	-21	116.4	327.0	-3.0
57.0	1718	8313	-24	122.0	334.3	-3.0
58.0	1843	8651	-27	127.8	341.7	-3.0
59.0	1973	8997	-30	133.7	349.3	-2.9
60.0	2110	9350	-32	139.9	357.1	-2.7
61.0	2253	9711	-35	146.5	365.0	-2.6
62.0	2403	10080	-38	153.3	373.1	-2.7
63.0	2559	10458	-40	160.5	381.4	-3.1
64.0	2723	10843	-44	168.0	389.9	-3.8
65.0	2895	11238	-48	175.6	398.6	-4.5

TABLE IX
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S
MAXIMUM DYNAMIC PRESSURE						
66.000	3074	11641	-53	183.4	407.6	-5.2
67.0	3261	12053	-58	191.3	416.8	-5.7
68.0	3457	12475	-64	199.4	426.2	-6.1
69.0	3660	12906	-70	207.8	435.9	-6.6
70.0	3872	13347	-77	216.6	445.7	-7.1
71.0	4093	13797	-85	225.6	455.6	-7.6
72.0	4323	14258	-92	235.0	465.8	-7.9
73.0	4563	14729	-100	244.8	476.2	-8.0
74.0	4812	15211	-108	254.8	486.8	-7.9
75.0	5072	15703	-116	265.1	497.6	-7.9
76.0	5342	16206	-124	275.8	508.6	-7.8
77.0	5623	16721	-132	286.7	519.9	-7.7
78.0	5916	17246	-139	297.9	531.4	-7.6
79.0	6219	17784	-147	309.5	543.2	-7.4
80.0	6534	18333	-154	321.4	555.2	-7.2
81.0	6862	18894	-161	333.8	567.4	-7.0
82.0	7202	19468	-168	346.6	579.8	-6.7
83.0	7555	20054	-174	359.9	592.3	-6.5
84.0	7921	20653	-181	373.6	605.1	-6.2
85.0	8302	21265	-187	387.8	618.0	-6.0
86.0	8697	21889	-193	402.5	631.0	-5.7
87.0	9107	22527	-198	417.6	644.2	-5.5
88.0	9532	23178	-204	433.2	657.6	-5.3
89.0	9973	23842	-209	449.3	671.0	-5.2
90.0	10431	24520	-214	465.9	684.6	-5.1
91.0	10905	25212	-219	483.1	698.2	-4.9
92.0	11397	25917	-224	500.7	712.0	-4.8
93.0	11906	26636	-229	518.9	725.8	-4.7
94.0	12435	27368	-234	537.6	739.8	-4.5
95.0	12983	28113	-239	556.8	753.8	-4.3
96.0	13551	28872	-244	576.4	768.0	-4.1
97.0	14138	29645	-249	596.6	782.3	-4.0
98.0	14745	30435	-253	617.1	796.7	-3.8
99.0	15373	31239	-256	638.2	811.2	-3.7
100.0	16022	32058	-260	659.7	825.8	-3.6
101.0	16692	32891	-264	681.7	840.6	-3.5

TABLE IX
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S
102.0	17385	33739	-267	704.3	855.5	-3.3
103.0	18101	34602	-270	727.3	870.5	-3.1
104.0	18840	35481	-273	750.8	885.6	-2.9
105.0	19602	36374	-276	774.7	900.9	-2.8
106.0	20389	37283	-279	799.1	916.4	-2.7
107.0	21201	38207	-281	824.0	932.1	-2.5
108.0	22037	39147	-284	849.4	948.0	-2.3
109.0	22900	40104	-286	875.2	964.1	-2.1
110.0	23788	41076	-288	901.5	980.4	-1.9
111.0	24703	42065	-290	928.3	997.0	-1.7
112.0	25645	43070	-291	955.5	1013.8	-1.5
113.0	26614	44093	-293	983.2	1030.7	-1.3
114.0	27611	45132	-294	1011.5	1048.0	-1.1
115.0	28637	46189	-295	1040.2	1065.5	-0.9
116.0	29692	47264	-296	1069.4	1083.3	-0.7
117.0	30776	48356	-296	1099.2	1101.4	-0.5
118.0	31890	49467	-297	1129.4	1119.9	-0.2
119.0	33035	50596	-297	1160.1	1138.7	0.0
120.0	34211	51745	-297	1191.3	1157.8	0.3
121.0	35418	52912	-296	1223.0	1177.3	0.6
122.0	36657	54100	-295	1255.3	1197.2	0.9
123.0	37929	55307	-294	1288.2	1217.4	1.2
124.0	39234	56535	-293	1321.6	1238.1	1.5
125.0	40572	57784	-291	1355.6	1259.2	1.8
126.0	41945	59054	-289	1390.1	1280.7	2.1
127.0	43353	60345	-287	1425.4	1302.6	2.4
128.0	44796	61659	-285	1461.2	1325.1	2.7
129.0	46276	62996	-282	1497.7	1348.0	3.0
130.0	47792	64356	-279	1534.9	1371.4	3.4
131.0	49346	65739	-275	1572.8	1395.2	3.8
132.0	50938	67147	-271	1611.5	1419.6	4.2
133.0	52569	68579	-267	1650.9	1444.4	4.5
134.0	54241	70036	-262	1691.3	1469.7	4.9
135.0	55954	71519	-257	1732.6	1495.4	5.4
136.0	57708	73027	-251	1774.7	1521.5	5.9
137.0	59506	74562	-244	1818.0	1548.0	6.3
138.0	61347	76124	-238	1862.3	1574.9	6.8
139.0	63233	77712	-230	1907.8	1602.2	7.2
140.0	65165	79329	-223	1954.2	1630.2	7.7
IECØ						
140.220	65596	79690	-222	1964.6	1636.5	7.7

TABLE IX
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S
141.0	67141	80971	-215	1989.7	1649.5	8.1
142.0	69143	82626	-206	2014.1	1659.9	8.5
143.0	71170	84292	-198	2037.8	1669.8	8.8
144.0	73220	85967	-189	2061.5	1679.7	9.1
145.0	75294	87652	-180	2085.3	1689.7	9.5
ØECØ						
145.560	76462	88601	-177	2098.5	1695.3	9.5
146.0	77391	89346	-170	2102.9	1694.8	9.9
147.0	79495	91038	-160	2104.2	1686.9	10.1
148.0	81599	92721	-151	2104.8	1678.2	10.3
S-IV ENGINE START						
148.120	81847	92923	-152	2104.8	1677.4	10.1
149.0	83704	94395	-140	2105.2	1669.7	10.5
150.0	85810	96061	-130	2106.5	1661.7	10.7
155.0	96402	104308	-76	2130.5	1636.1	11.8
160.0	107117	112424	-14	2155.0	1611.2	12.9
GUIDANCE INITIATION						
163.860	115473	118607	36	2174.3	1592.5	13.7
165.0	117955	120419	52	2180.0	1587.0	14.0
170.0	128917	128295	127	2204.7	1563.7	16.8
175.0	140001	136057	226	2228.8	1541.1	22.7
180.0	151206	143705	353	2253.5	1518.3	28.2
185.0	162537	151239	507	2279.0	1495.0	33.0
190.0	173996	158656	682	2304.9	1471.7	37.1
195.0	185587	165956	877	2331.3	1448.4	40.7
200.0	197310	173141	1088	2358.1	1425.3	43.8
205.0	209168	180209	1314	2385.4	1402.1	46.4
210.0	221164	187162	1552	2413.0	1378.9	48.8
215.0	233299	193998	1801	2441.1	1355.5	50.8
220.0	245576	200717	2059	2469.6	1332.2	52.5
225.0	257996	207320	2325	2498.6	1308.9	54.0

TABLE IX
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S
230.0	270563	213806	2599	2528.2	1285.3	55.4
235.0	283279	220173	2878	2558.2	1261.7	56.5
240.0	296146	226422	3164	2588.7	1237.9	57.6
245.0	309166	232552	3454	2619.5	1214.0	58.6
250.0	322342	238563	3749	2650.7	1190.0	59.5
255.0	335674	244453	4049	2682.4	1165.9	60.4
260.0	349166	250221	4353	2714.6	1141.5	61.2
265.0	362820	255868	4661	2747.1	1117.0	62.1
270.0	376638	261392	4974	2780.2	1092.4	63.0
275.0	390623	266792	5291	2813.8	1067.5	63.9
280.0	404777	272067	5613	2847.7	1042.6	64.8
285.0	419101	277217	5940	2882.2	1017.4	65.8
290.0	433599	282241	6271	2917.2	992.0	66.8
295.0	448274	287137	6608	2952.6	966.4	67.9
300.0	463127	291904	6951	2988.7	940.6	69.1
305.0	478161	296543	7299	3025.2	914.7	70.3
310.0	493380	301050	7654	3062.3	888.4	71.5
315.0	508785	305426	8015	3099.9	861.9	72.8
320.0	524380	309669	8382	3138.2	835.3	74.2
325.0	540168	313778	8757	3177.1	808.4	75.7
330.0	556152	317752	9139	3216.4	781.1	77.2
335.0	572333	321589	9529	3256.4	753.6	78.8
340.0	588716	325287	9927	3296.9	725.7	80.4
345.0	605304	328846	10333	3338.0	697.6	82.0
350.0	622098	332262	10747	3379.7	669.1	83.7
355.0	639102	335536	11170	3422.1	640.1	85.5
360.0	656320	338663	11602	3465.1	610.9	87.2
365.0	673754	341644	12042	3508.5	581.3	89.0
370.0	691406	344476	12492	3552.6	551.3	90.9
375.0	709281	347156	12952	3597.4	520.8	92.8
380.0	727381	349683	13420	3642.8	489.8	94.7
385.0	745710	352053	13899	3688.8	458.4	96.8
390.0	764270	354266	14388	3735.6	426.6	98.7
395.0	783067	356319	14886	3783.0	394.3	100.8
400.0	802101	358209	15395	3831.1	361.6	102.8
405.0	821379	359934	15915	3880.0	328.4	104.9
410.0	840903	361491	16445	3929.5	294.6	107.0
415.0	860676	362879	16985	3979.9	260.3	109.2
420.0	880703	364092	17537	4030.9	225.2	111.4
425.0	900987	365130	18099	4082.8	189.7	113.6

TABLE IX
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S
430.0	921532	365988	18673	4135.4	153.6	115.8
435.0	942343	366664	19257	4188.9	116.8	118.1
440.0	963423	367154	19854	4243.1	79.4	120.4
445.0	984775	367460	20462	4298.1	41.2	122.8
450.0	1006405	367569	21082	4353.8	2.4	125.2
455.0	1028315	367483	21714	4410.3	-37.3	127.6
460.0	1050510	367195	22357	4467.6	-77.8	130.0
465.0	1072993	366704	23014	4525.9	-119.0	132.5
470.0	1095770	366003	23682	4584.9	-161.2	134.9
475.0	1118844	365090	24363	4644.9	-204.2	137.4
480.0	1142220	363960	25056	4705.8	-248.0	139.9
485.0	1165904	362609	25762	4767.8	-292.8	142.5
490.0	1189900	361031	26481	4830.7	-338.5	145.1
495.0	1214213	359222	27213	4894.7	-385.3	147.8
500.0	1238849	357177	27959	4959.6	-433.0	150.4
505.0	1263812	354891	28718	5025.7	-481.8	153.1
510.0	1289108	352358	29490	5092.8	-531.6	155.9
515.0	1314742	349573	30276	5160.9	-582.7	158.6
520.0	1340720	346529	31076	5230.3	-635.0	161.4
525.0	1367047	343221	31890	5300.8	-688.5	164.3
530.0	1393730	339642	32719	5372.5	-743.3	167.1
535.0	1420775	335786	33562	5445.5	-799.4	170.0
540.0	1448187	331645	34419	5519.7	-857.1	173.0
545.0	1475974	327212	35291	5595.1	-916.2	175.9
550.0	1504140	322480	36178	5671.8	-976.9	178.9
555.0	1532694	317441	37080	5750.0	-1039.2	182.0
560.0	1561642	312085	37998	5829.4	-1103.4	185.0
565.0	1590992	306405	38931	5910.6	-1169.1	188.1
570.0	1620751	300391	39879	5993.3	-1236.7	191.2
575.0	1650927	294034	40843	6077.4	-1306.4	194.3
580.0	1681529	287323	41822	6163.4	-1378.1	197.5
585.0	1712564	280249	42818	6251.1	-1452.1	200.7
590.0	1744042	272799	43830	6340.3	-1528.3	204.0
595.0	1775971	264962	44858	6431.2	-1607.1	207.4
600.0	1808358	256725	45904	6523.9	-1688.1	210.7
605.0	1841213	248076	46966	6618.5	-1771.7	214.1
610.0	1874546	239002	48045	6715.0	-1858.4	217.6
615.0	1908366	229487	49141	6813.5	-1948.1	221.0
620.0	1942682	219514	50255	6914.4	-2040.9	224.5
S-IV CUT OFF						
621.659	1954180	216102	50628	6948.5	-2072.6	225.6

TABLE IX
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE M	YE M	ZE M	DXE M/S	DYE M/S	DZE M/S
625.0	1977393	209132	51384	6944.1	-2098.1	226.7
630.0	2012087	198552	52523	6933.3	-2134.1	228.5
INSERTION						
631.659	2023586	195002	52902	6929.6	-2146.0	229.1

TABLE X
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S
FIRST MOTION						
0.080	1458.554	-5414.860	3028.450	394.9	106.4	0.
LIFTOFF SIGNAL						
0.280	1458.632	-5414.838	3028.450	395.0	105.8	0.3
1.0	1458.917	-5414.763	3028.450	395.6	103.7	1.6
2.0	1459.313	-5414.661	3028.453	396.4	100.7	3.3
3.0	1459.710	-5414.561	3028.457	397.2	97.6	5.1
4.0	1460.107	-5414.465	3028.463	397.9	94.4	6.9
5.0	1460.506	-5414.373	3028.471	398.7	91.1	8.7
6.0	1460.905	-5414.283	3028.480	399.6	87.8	10.6
7.0	1461.305	-5414.197	3028.492	400.4	84.4	12.6
8.0	1461.706	-5414.114	3028.506	401.3	81.0	14.6
9.0	1462.107	-5414.035	3028.521	402.2	77.5	16.6
10.0	1462.510	-5413.959	3028.539	403.1	73.9	18.7
11.0	1462.913	-5413.887	3028.559	404.1	70.3	20.8
12.0	1463.318	-5413.819	3028.581	405.1	66.5	23.0
13.0	1463.723	-5413.754	3028.605	406.2	62.7	25.1
14.0	1464.130	-5413.693	3028.631	407.3	58.8	27.3
15.0	1464.538	-5413.636	3028.659	408.4	54.8	29.5
16.0	1464.947	-5413.584	3028.690	409.7	50.7	31.8
17.0	1465.357	-5413.535	3028.723	411.0	46.6	34.0
18.0	1465.768	-5413.491	3028.758	412.5	42.4	36.3
19.0	1466.182	-5413.450	3028.796	414.1	38.1	38.6
20.0	1466.596	-5413.414	3028.835	415.8	33.8	40.9
21.0	1467.013	-5413.383	3028.877	417.7	29.4	43.2
22.0	1467.432	-5413.355	3028.922	419.7	25.0	45.5
23.0	1467.852	-5413.333	3028.968	421.9	20.6	47.8
24.0	1468.275	-5413.314	3029.017	424.3	16.1	50.2
25.0	1468.701	-5413.300	3029.069	426.9	11.7	52.5
26.0	1469.129	-5413.291	3029.122	429.7	7.1	54.9
27.0	1469.560	-5413.286	3029.179	432.7	2.5	57.2
28.0	1469.994	-5413.286	3029.237	435.9	-2.1	59.6
29.0	1470.432	-5413.290	3029.298	439.3	-6.8	61.9
30.0	1470.873	-5413.300	3029.361	442.8	-11.6	64.3

TABLE X
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S
31.0	1471.317	-5413.314	3029.426	446.5	-16.5	56.7
32.0	1471.766	-5413.333	3029.494	450.4	-21.3	69.1
33.0	1472.218	-5413.357	3029.565	454.4	-26.2	71.5
34.0	1472.674	-5413.385	3029.637	458.5	-31.2	74.0
35.0	1473.134	-5413.419	3029.713	462.7	-36.2	76.5
36.0	1473.599	-5413.458	3029.790	467.1	-41.2	79.1
37.0	1474.068	-5413.502	3029.871	471.7	-46.3	81.6
38.0	1474.542	-5413.551	3029.954	476.4	-51.6	84.0
39.0	1475.021	-5413.605	3030.039	481.3	-56.8	86.4
40.0	1475.505	-5413.664	3030.126	486.3	-62.2	88.8
41.0	1475.994	-5413.729	3030.217	491.3	-67.7	91.3
42.0	1476.487	-5413.800	3030.309	496.5	-73.2	94.0
43.0	1476.986	-5413.876	3030.405	501.7	-78.7	96.7
44.0	1477.490	-5413.957	3030.503	507.0	-84.3	99.4
45.0	1478.000	-5414.044	3030.603	512.6	-89.9	102.2
46.0	1478.515	-5414.137	3030.707	518.3	-95.6	105.0
47.0	1479.036	-5414.236	3030.813	524.2	-101.2	107.8
48.0	1479.563	-5414.340	3030.923	530.2	-106.9	110.8
49.0	1480.096	-5414.449	3031.035	536.4	-112.5	113.9
50.0	1480.636	-5414.565	3031.151	542.7	-118.2	117.0
51.0	1481.182	-5414.686	3031.269	549.1	-123.9	120.1
52.0	1481.734	-5414.813	3031.391	555.7	-129.6	122.9
53.0	1482.293	-5414.945	3031.515	562.4	-135.2	125.5
MACH ONE						
53.208	1482.410	-5414.974	3031.541	563.9	-136.4	126.0
54.0	1482.858	-5415.083	3031.642	569.3	-140.8	127.9
55.0	1483.431	-5415.227	3031.771	576.3	-146.2	130.1
56.0	1484.011	-5415.376	3031.902	583.4	-151.5	132.3
57.0	1484.597	-5415.530	3032.036	590.5	-156.9	134.5
58.0	1485.192	-5415.690	3032.171	597.8	-162.4	136.7
59.0	1485.793	-5415.855	3032.309	605.3	-168.0	138.9
60.0	1486.402	-5416.026	3032.449	613.1	-173.7	141.0
61.0	1487.019	-5416.203	3032.591	621.3	-179.6	143.2
62.0	1487.644	-5416.385	3032.736	629.9	-185.4	145.6
63.0	1488.279	-5416.574	3032.883	638.8	-191.1	148.3
64.0	1488.922	-5416.768	3033.032	648.1	-196.9	151.3
65.0	1489.575	-5416.968	3033.185	657.6	-202.8	154.3

TABLE X
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S
MAXIMUM DYNAMIC PRESSURE						
66.000	1490.237	-5417.173	3033.341	667.3	-208.9	157.4
67.0	1490.909	-5417.386	3033.500	677.2	-215.3	160.4
68.0	1491.591	-5417.604	3033.662	687.3	-221.9	163.4
69.0	1492.283	-5417.830	3033.827	697.8	-228.6	166.5
70.0	1492.986	-5418.062	3033.995	708.5	-235.4	169.6
71.0	1493.700	-5418.301	3034.167	719.7	-242.3	172.7
72.0	1494.425	-5418.547	3034.341	731.2	-249.4	175.7
73.0	1495.162	-5418.800	3034.518	743.1	-256.7	178.6
74.0	1495.911	-5419.061	3034.698	755.3	-264.2	181.3
75.0	1496.673	-5419.329	3034.881	767.8	-271.9	184.1
76.0	1497.447	-5419.605	3035.066	780.7	-279.8	186.9
77.0	1498.234	-5419.889	3035.255	793.9	-287.8	189.7
78.0	1499.034	-5420.181	3035.446	807.4	-296.0	192.5
79.0	1499.848	-5420.481	3035.640	821.4	-304.4	195.4
80.0	1500.677	-5420.790	3035.837	835.7	-312.9	198.2
81.0	1501.520	-5421.107	3036.036	850.5	-321.6	201.0
82.0	1502.378	-5421.433	3036.239	865.7	-330.3	203.8
83.0	1503.251	-5421.768	3036.444	881.5	-339.2	206.6
84.0	1504.141	-5422.112	3036.652	897.7	-348.1	209.3
85.0	1505.047	-5422.465	3036.863	914.5	-357.1	212.0
86.0	1505.970	-5422.826	3037.076	931.7	-366.1	214.7
87.0	1506.910	-5423.197	3037.293	949.4	-375.2	217.4
88.0	1507.868	-5423.577	3037.511	967.6	-384.4	220.1
89.0	1508.845	-5423.966	3037.733	986.3	-393.5	222.7
90.0	1509.841	-5424.364	3037.957	1005.6	-402.6	225.3
91.0	1510.856	-5424.772	3038.184	1025.3	-411.8	227.8
92.0	1511.892	-5425.188	3038.413	1045.6	-420.9	230.3
93.0	1512.948	-5425.614	3038.644	1066.4	-430.1	232.7
94.0	1514.025	-5426.047	3038.878	1087.8	-439.3	234.9
95.0	1515.124	-5426.489	3039.114	1109.6	-448.5	237.1
96.0	1516.246	-5426.940	3039.351	1131.9	-457.7	239.3
97.0	1517.390	-5427.400	3039.591	1154.7	-466.9	241.4
98.0	1518.556	-5427.872	3039.834	1178.0	-476.2	243.5
99.0	1519.746	-5428.353	3040.078	1201.7	-485.5	245.5
100.0	1520.960	-5428.843	3040.325	1226.0	-494.8	247.5
101.0	1522.198	-5429.343	3040.574	1250.8	-504.1	249.4

TABLE X
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S
102.0	1523.461	-5429.852	3040.824	1276.0	-513.5	251.3
103.0	1524.750	-5430.370	3041.076	1301.8	-523.0	253.1
104.0	1526.065	-5430.898	3041.330	1328.1	-532.5	254.8
105.0	1527.406	-5431.435	3041.586	1354.8	-542.0	256.5
106.0	1528.775	-5431.982	3041.844	1382.1	-551.6	258.3
107.0	1530.171	-5432.539	3042.103	1409.8	-561.3	260.0
108.0	1531.594	-5433.105	3042.364	1438.0	-571.2	261.7
109.0	1533.047	-5433.681	3042.626	1466.7	-581.1	263.3
110.0	1534.528	-5434.268	3042.890	1496.0	-591.2	264.9
111.0	1536.039	-5434.864	3043.156	1525.8	-601.4	266.5
112.0	1537.580	-5435.471	3043.424	1556.1	-611.7	268.2
113.0	1539.151	-5436.088	3043.693	1586.9	-622.1	269.9
114.0	1540.754	-5436.715	3043.963	1618.2	-632.6	271.5
115.0	1542.388	-5437.353	3044.236	1650.1	-643.3	273.2
116.0	1544.055	-5438.002	3044.510	1682.5	-654.2	274.9
117.0	1545.754	-5438.662	3044.786	1715.5	-665.2	276.6
118.0	1547.486	-5439.333	3045.063	1749.1	-676.5	278.3
119.0	1549.252	-5440.015	3045.343	1783.2	-688.0	280.1
120.0	1551.052	-5440.709	3045.624	1817.8	-699.8	281.9
121.0	1552.888	-5441.415	3045.906	1853.1	-711.7	283.7
122.0	1554.759	-5442.133	3046.191	1889.0	-723.9	285.6
123.0	1556.666	-5442.863	3046.478	1925.5	-736.4	287.5
124.0	1558.610	-5443.606	3046.766	1962.6	-749.1	289.6
125.0	1560.592	-5444.362	3047.057	2000.4	-762.0	291.7
126.0	1562.612	-5445.130	3047.350	2038.9	-775.2	293.8
127.0	1564.670	-5445.912	3047.645	2078.1	-788.7	296.1
128.0	1566.769	-5446.708	3047.942	2118.0	-802.5	298.4
129.0	1568.907	-5447.518	3048.242	2158.7	-816.7	300.8
130.0	1571.087	-5448.342	3048.544	2200.1	-831.1	303.2
131.0	1573.308	-5449.180	3048.848	2242.4	-845.9	305.6
132.0	1575.572	-5450.034	3049.155	2285.5	-860.9	308.1
133.0	1577.880	-5450.902	3049.464	2329.5	-876.2	310.7
134.0	1580.232	-5451.786	3049.777	2374.5	-891.7	313.2
135.0	1582.630	-5452.686	3050.091	2420.4	-907.6	315.8
136.0	1585.075	-5453.602	3050.407	2467.3	-923.6	318.2
137.0	1587.567	-5454.534	3050.726	2515.4	-939.8	320.7
138.0	1590.108	-5455.482	3051.048	2564.6	-956.2	323.0
139.0	1592.699	-5456.446	3051.371	2614.9	-972.7	325.4
140.0	1595.341	-5457.428	3051.698	2666.4	-989.8	327.8
IECØ						
140.220	1595.929	-5457.647	3051.772	2677.9	-993.6	328.4

TABLE X
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S
141.0	1598.031	-5458.425	3052.026	2705.2	-1000.9	328.6
142.0	1600.750	-5459.429	3052.354	2731.4	-1006.1	327.7
143.0	1603.495	-5460.437	3052.682	2756.6	-1010.9	326.7
144.0	1606.264	-5461.451	3053.008	2781.9	-1015.7	325.8
145.0	1609.060	-5462.469	3053.333	2807.3	-1020.6	324.8
ØECØ						
145.560	1610.633	-5463.042	3053.519	2821.5	-1023.2	324.5
146.0	1611.879	-5463.492	3053.658	2825.7	-1022.2	323.0
147.0	1614.705	-5464.511	3053.979	2825.1	-1015.1	318.7
148.0	1617.529	-5465.522	3054.296	2823.7	-1007.4	314.3
S-IV ENGINE START						
148.120	1617.865	-5465.643	3054.337	2823.6	-1006.5	314.0
149.0	1620.352	-5466.526	3054.609	2822.3	-999.8	309.9
150.0	1623.174	-5467.523	3054.917	2821.7	-992.6	305.6
155.0	1637.328	-5472.421	3056.402	2839.4	-966.2	287.0
160.0	1651.571	-5477.184	3057.789	2857.6	-940.3	268.6
GUIDANCE INITIATION						
163.860	1662.630	-5480.775	3058.799	2872.2	-920.6	254.6
165.0	1665.907	-5481.821	3059.086	2876.6	-914.8	250.5
170.0	1680.336	-5486.334	3060.292	2895.1	-891.0	231.4
175.0	1694.856	-5490.736	3061.396	2912.9	-869.5	210.1
180.0	1709.466	-5495.029	3062.393	2931.2	-847.5	188.8
185.0	1724.169	-5499.209	3063.285	2950.2	-824.7	167.9
190.0	1738.969	-5503.275	3064.073	2969.8	-801.3	147.4
195.0	1753.868	-5507.222	3064.759	2989.8	-777.6	127.2
200.0	1768.867	-5511.050	3065.346	3010.2	-753.7	107.4
205.0	1783.971	-5514.759	3065.834	3031.1	-729.4	87.9
210.0	1799.179	-5518.345	3066.225	3052.4	-704.9	68.6
215.0	1814.495	-5521.807	3066.520	3074.1	-680.0	49.3
220.0	1829.921	-5525.144	3066.718	3096.3	-654.9	30.3
225.0	1845.458	-5528.355	3066.822	3118.9	-629.6	11.2

TABLE X
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S
230.0	1861.110	-5531.439	3066.830	3142.0	-603.9	-7.9
235.0	1876.879	-5534.393	3066.743	3165.4	-577.9	-27.0
240.0	1892.765	-5537.218	3066.560	3189.3	-551.7	-46.2
245.0	1908.772	-5539.910	3066.281	3213.5	-525.3	-65.4
250.0	1924.901	-5542.470	3065.906	3238.0	-498.6	-84.8
255.0	1941.153	-5544.896	3065.433	3262.9	-471.7	-104.3
260.0	1957.530	-5547.187	3064.863	3288.1	-444.5	-124.0
265.0	1974.035	-5549.341	3064.193	3313.7	-417.2	-143.8
270.0	1990.668	-5551.358	3063.424	3339.8	-389.6	-163.9
275.0	2007.433	-5553.237	3062.554	3366.2	-361.7	-184.1
280.0	2024.331	-5554.975	3061.582	3392.9	-333.7	-204.6
285.0	2041.363	-5556.573	3060.508	3420.1	-305.4	-225.3
290.0	2058.532	-5558.029	3059.329	3447.6	-276.8	-246.2
295.0	2075.839	-5559.341	3058.045	3475.5	-248.0	-267.4
300.0	2093.288	-5560.509	3056.654	3503.9	-219.0	-288.9
305.0	2110.879	-5561.530	3055.156	3532.7	-189.7	-310.7
310.0	2128.615	-5562.405	3053.548	3561.9	-160.0	-332.7
315.0	2146.499	-5563.131	3051.828	3591.5	-130.1	-355.0
320.0	2164.531	-5563.706	3049.997	3621.6	-100.1	-377.6
325.0	2182.716	-5564.130	3048.052	3652.3	-69.6	-400.5
330.0	2201.055	-5564.402	3045.991	3683.3	-38.8	-423.8
335.0	2219.550	-5564.518	3043.813	3714.8	-7.6	-447.4
340.0	2238.203	-5564.478	3041.517	3746.6	23.9	-471.2
345.0	2257.017	-5564.279	3039.100	3779.0	55.7	-495.4
350.0	2275.993	-5563.920	3036.562	3811.7	88.0	-519.9
355.0	2295.135	-5563.398	3033.900	3845.0	120.7	-544.9
360.0	2314.444	-5562.712	3031.113	3878.7	153.9	-570.1
365.0	2333.922	-5561.859	3028.198	3912.8	187.4	-595.7
370.0	2353.572	-5560.838	3025.155	3947.3	221.3	-621.7
375.0	2373.396	-5559.645	3021.981	3982.3	255.9	-648.0
380.0	2393.396	-5558.278	3018.674	4017.8	290.8	-674.7
385.0	2413.575	-5556.735	3015.233	4053.7	326.4	-701.9
390.0	2433.934	-5555.013	3011.655	4090.2	362.4	-729.4
395.0	2454.477	-5553.111	3007.938	4127.1	398.9	-757.4
400.0	2475.207	-5551.024	3004.080	4164.6	435.9	-785.7
405.0	2496.125	-5548.750	3000.080	4202.6	473.5	-814.5
410.0	2517.234	-5546.288	2995.935	4241.1	511.8	-843.6
415.0	2538.537	-5543.632	2991.643	4280.2	550.5	-873.3
420.0	2560.036	-5540.781	2987.201	4319.7	590.1	-903.5
425.0	2581.735	-5537.730	2982.607	4359.8	630.2	-934.2

TABLE X
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S
430.0	2603.636	-5534.477	2977.858	4400.5	671.0	-965.3
435.0	2625.742	-5531.018	2972.953	4441.8	712.5	-997.0
440.0	2648.055	-5527.350	2967.888	4483.6	754.7	-1029.1
445.0	2670.579	-5523.474	2962.662	4525.8	797.6	-1061.8
450.0	2693.315	-5519.377	2957.270	4568.6	841.3	-1095.1
455.0	2716.266	-5515.059	2951.711	4611.8	885.8	-1128.9
460.0	2739.434	-5510.517	2945.980	4655.6	931.2	-1163.4
465.0	2762.823	-5505.746	2940.076	4700.0	977.4	-1198.4
470.0	2786.435	-5500.741	2933.995	4744.8	1024.6	-1234.1
475.0	2810.272	-5495.498	2927.735	4790.4	1072.7	-1270.3
480.0	2834.339	-5490.013	2921.291	4836.6	1121.6	-1307.2
485.0	2858.639	-5484.281	2914.661	4883.4	1171.5	-1344.9
490.0	2883.175	-5478.296	2907.841	4930.9	1222.5	-1383.3
495.0	2907.949	-5472.054	2900.827	4979.1	1274.5	-1422.4
500.0	2932.966	-5465.550	2893.616	5027.8	1327.5	-1462.2
505.0	2958.229	-5458.778	2886.204	5077.3	1381.6	-1502.8
510.0	2983.740	-5451.732	2878.587	5127.5	1436.9	-1544.2
515.0	3009.505	-5444.407	2870.760	5178.2	1493.3	-1586.5
520.0	3035.525	-5436.797	2862.720	5229.9	1551.1	-1629.6
525.0	3061.805	-5428.894	2854.463	5282.2	1610.1	-1673.6
530.0	3088.348	-5420.694	2845.983	5335.2	1670.4	-1718.5
535.0	3115.158	-5412.188	2837.276	5389.0	1732.1	-1764.4
540.0	3142.240	-5403.370	2828.338	5443.6	1795.3	-1811.3
545.0	3169.595	-5394.233	2819.162	5498.8	1860.0	-1859.2
550.0	3197.229	-5384.767	2809.744	5554.8	1926.3	-1908.1
555.0	3225.145	-5374.967	2800.079	5611.8	1994.3	-1958.3
560.0	3253.348	-5364.822	2790.160	5669.3	2064.0	-2009.5
565.0	3281.840	-5354.324	2779.981	5728.0	2135.4	-2062.0
570.0	3310.629	-5343.464	2769.537	5787.7	2208.7	-2115.7
575.0	3339.719	-5332.233	2758.822	5848.1	2284.0	-2170.8
580.0	3369.113	-5320.620	2747.827	5909.6	2361.5	-2227.4
585.0	3398.817	-5308.615	2736.546	5972.1	2441.2	-2285.3
590.0	3428.835	-5296.205	2724.971	6035.3	2522.9	-2344.8
595.0	3459.171	-5283.381	2713.094	6099.4	2607.2	-2406.0
600.0	3489.831	-5270.129	2700.909	6164.6	2693.8	-2468.6
605.0	3520.819	-5256.438	2688.406	6230.7	2782.9	-2532.9
610.0	3552.140	-5242.295	2675.576	6297.7	2875.0	-2599.2
615.0	3583.798	-5227.683	2662.411	6365.8	2970.0	-2667.3
620.0	3615.798	-5212.589	2648.899	6435.3	3068.1	-2737.5
S-IV CUT OFF						
621.659	3626.492	-5207.471	2644.338	6458.7	3101.5	-2761.4

TABLE X
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP KM	YSP KM	ZSP KM	DXSP M/S	DYSP M/S	DZSP M/S
625.0	3648.053	-5197.067	2635.089	6446.1	3124.6	-2773.6
630.0	3680.228	-5181.365	2621.180	6423.7	3156.5	-2789.8
INSERTION						
631.659	3690.879	-5176.120	2616.548	6416.2	3167.0	-2795.1

TABLE XI
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
FIRST MOTION						
0.080	0.08	3.38	-0.16	0.84	-2.78	1.74
LIFTOFF SIGNAL						
0.280	0.05	3.42	-0.13	0.82	-2.83	1.73
1.0	-0.01	3.53	-0.05	0.78	-2.97	1.73
2.0	-0.06	3.65	0.01	0.75	-3.11	1.75
3.0	-0.08	3.75	0.03	0.75	-3.21	1.78
4.0	-0.09	3.83	0.03	0.76	-3.28	1.83
5.0	-0.08	3.90	0.01	0.78	-3.33	1.88
6.0	-0.08	3.98	-0.01	0.81	-3.38	1.93
7.0	-0.07	4.05	-0.03	0.84	-3.43	1.97
8.0	-0.06	4.13	-0.04	0.87	-3.49	2.02
9.0	-0.05	4.21	-0.04	0.90	-3.56	2.06
10.0	-0.04	4.30	-0.04	0.93	-3.64	2.10
11.0	-0.02	4.40	-0.03	0.97	-3.72	2.13
12.0	-0.00	4.49	-0.01	1.01	-3.81	2.16
13.0	0.03	4.59	0.01	1.06	-3.89	2.18
14.0	0.07	4.69	0.03	1.12	-3.98	2.20
15.0	0.12	4.79	0.04	1.19	-4.07	2.22
16.0	0.19	4.88	0.06	1.28	-4.14	2.24
17.0	0.27	4.97	0.07	1.38	-4.21	2.26
18.0	0.37	5.06	0.07	1.49	-4.27	2.27
19.0	0.49	5.14	0.07	1.63	-4.33	2.29
20.0	0.62	5.22	0.06	1.77	-4.37	2.30
21.0	0.77	5.30	0.05	1.93	-4.41	2.32
22.0	0.93	5.37	0.03	2.11	-4.44	2.33
23.0	1.10	5.44	0.02	2.29	-4.48	2.34
24.0	1.27	5.52	0.00	2.48	-4.51	2.34
25.0	1.46	5.60	-0.01	2.68	-4.54	2.35
26.0	1.64	5.68	-0.01	2.87	-4.59	2.35
27.0	1.82	5.77	-0.01	3.07	-4.64	2.35
28.0	1.99	5.86	-0.01	3.25	-4.69	2.35
29.0	2.15	5.96	0.00	3.43	-4.76	2.36
30.0	2.30	6.06	0.01	3.60	-4.83	2.36

TABLE XI
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
31.0	2.44	6.10	0.02	3.74	-4.85	2.35
32.0	2.55	6.22	-0.01	3.89	-4.92	2.40
33.0	2.65	6.33	-0.06	4.02	-4.97	2.47
34.0	2.76	6.43	-0.11	4.15	-5.01	2.54
35.0	2.89	6.52	-0.13	4.30	-5.06	2.57
36.0	3.03	6.56	-0.11	4.45	-5.09	2.54
37.0	3.21	6.64	-0.03	4.63	-5.18	2.47
38.0	3.39	6.73	0.07	4.81	-5.27	2.39
39.0	3.51	6.84	0.11	4.94	-5.37	2.37
40.0	3.54	6.96	0.08	5.01	-5.45	2.45
41.0	3.59	7.08	0.11	5.08	-5.56	2.47
42.0	3.66	7.19	0.14	5.17	-5.66	2.48
43.0	3.74	7.30	0.16	5.27	-5.75	2.50
44.0	3.83	7.40	0.19	5.38	-5.84	2.51
45.0	3.93	7.49	0.20	5.50	-5.91	2.51
46.0	4.05	7.57	0.22	5.63	-5.97	2.51
47.0	4.19	7.65	0.24	5.78	-6.02	2.50
48.0	4.34	7.71	0.25	5.94	-6.06	2.49
49.0	4.50	7.77	0.26	6.11	-6.09	2.47
50.0	4.68	7.82	0.26	6.29	-6.11	2.45
51.0	4.87	7.85	0.27	6.48	-6.11	2.42
52.0	5.07	7.73	0.27	6.65	-5.98	2.31
53.0	5.30	7.52	0.27	6.83	-5.77	2.15
MACH ØNE						
53.208	5.32	7.48	0.27	6.84	-5.73	2.13
54.0	5.39	7.37	0.27	6.88	-5.63	2.07
55.0	5.45	7.30	0.26	6.92	-5.55	2.03
56.0	5.48	7.29	0.25	6.95	-5.54	2.02
57.0	5.49	7.35	0.24	6.98	-5.58	2.06
58.0	5.79	7.49	0.23	7.30	-5.65	2.07
59.0	6.07	7.70	0.21	7.63	-5.78	2.11
60.0	6.36	7.85	0.20	7.94	-5.86	2.14
61.0	6.69	8.01	0.09	8.32	-5.89	2.23
62.0	7.04	8.18	-0.24	8.74	-5.81	2.50
63.0	7.34	8.37	-0.62	9.11	-5.74	2.85
64.0	7.56	8.61	-0.83	9.41	-5.80	3.10
65.0	7.70	8.87	-0.76	9.60	-6.04	3.14

TABLE XI
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
MAXIMUM DYNAMIC PRESSURE						
66.000	7.84	9.11	-0.54	9.76	-6.34	3.03
67.0	8.02	9.33	-0.36	9.97	-6.59	2.94
68.0	8.26	9.52	-0.40	10.25	-6.69	3.01
69.0	8.54	9.71	-0.52	10.58	-6.75	3.14
70.0	8.87	9.89	-0.56	10.95	-6.83	3.19
71.0	9.23	10.08	-0.42	11.32	-7.02	3.07
72.0	9.60	10.27	-0.18	11.69	-7.24	2.87
73.0	9.91	10.48	0.01	12.02	-7.48	2.74
74.0	10.19	10.70	0.07	12.34	-7.65	2.74
75.0	10.46	10.94	0.06	12.66	-7.81	2.79
76.0	10.76	11.17	0.05	13.00	-7.95	2.85
77.0	11.08	11.40	0.09	13.36	-8.12	2.85
78.0	11.43	11.63	0.16	13.74	-8.30	2.82
79.0	11.75	11.87	0.23	14.10	-8.50	2.81
80.0	12.12	12.10	0.22	14.51	-8.63	2.83
81.0	12.54	12.30	0.22	14.97	-8.74	2.84
82.0	13.03	12.47	0.23	15.48	-8.82	2.80
83.0	13.52	12.65	0.26	15.99	-8.91	2.74
84.0	14.01	12.81	0.27	16.50	-8.98	2.70
85.0	14.45	12.98	0.27	16.97	-9.07	2.68
86.0	14.89	13.14	0.23	17.43	-9.12	2.69
87.0	15.35	13.28	0.19	17.92	-9.15	2.69
88.0	15.84	13.40	0.15	18.43	-9.16	2.67
89.0	16.35	13.51	0.14	18.95	-9.17	2.62
90.0	16.87	13.60	0.13	19.48	-9.16	2.55
91.0	17.40	13.70	0.13	20.01	-9.17	2.47
92.0	17.92	13.79	0.14	20.53	-9.18	2.40
93.0	18.42	13.91	0.15	21.05	-9.21	2.32
94.0	18.91	14.03	0.16	21.55	-9.24	2.27
95.0	19.38	14.15	0.16	22.02	-9.27	2.22
96.0	19.82	14.24	0.19	22.48	-9.30	2.13
97.0	20.29	14.34	0.15	22.95	-9.30	2.11
98.0	20.81	14.44	0.10	23.49	-9.28	2.08
99.0	21.28	14.57	0.11	23.97	-9.32	2.03
100.0	21.78	14.70	0.13	24.49	-9.37	1.96
101.0	22.29	14.83	0.15	25.01	-9.41	1.89

TABLE XI
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
102.0	22.79	14.95	0.17	25.51	-9.44	1.82
103.0	23.28	15.08	0.20	26.01	-9.50	1.74
104.0	23.72	15.23	0.20	26.48	-9.56	1.71
105.0	24.16	15.39	0.14	26.95	-9.59	1.74
106.0	24.63	15.58	0.12	27.45	-9.67	1.74
107.0	25.10	15.79	0.14	27.95	-9.79	1.72
108.0	25.58	16.01	0.19	28.46	-9.93	1.67
109.0	26.06	16.23	0.25	28.97	-10.07	1.62
110.0	26.55	16.44	0.26	29.49	-10.18	1.60
111.0	27.01	16.65	0.20	30.00	-10.26	1.64
112.0	27.49	16.87	0.15	30.52	-10.35	1.68
113.0	28.00	17.11	0.17	31.07	-10.49	1.66
114.0	28.49	17.38	0.21	31.60	-10.65	1.65
115.0	28.97	17.65	0.21	32.13	-10.82	1.67
116.0	29.47	17.96	0.21	32.69	-11.00	1.70
117.0	29.96	18.29	0.23	33.24	-11.20	1.73
118.0	30.45	18.62	0.24	33.79	-11.43	1.76
119.0	30.96	18.97	0.29	34.36	-11.66	1.78
120.0	31.49	19.31	0.32	34.95	-11.89	1.79
121.0	32.01	19.68	0.31	35.54	-12.11	1.86
122.0	32.55	20.07	0.30	36.16	-12.35	1.93
123.0	33.12	20.46	0.30	36.80	-12.59	1.99
124.0	33.70	20.87	0.30	37.46	-12.85	2.05
125.0	34.27	21.29	0.28	38.12	-13.11	2.14
126.0	34.90	21.73	0.29	38.83	-13.39	2.20
127.0	35.52	22.18	0.28	39.54	-13.67	2.28
128.0	36.16	22.66	0.30	40.27	-13.98	2.35
129.0	36.82	23.16	0.35	41.02	-14.33	2.39
130.0	37.53	23.64	0.39	41.81	-14.65	2.43
131.0	38.29	24.11	0.39	42.66	-14.93	2.48
132.0	39.09	24.57	0.39	43.55	-15.20	2.51
133.0	39.92	25.04	0.38	44.46	-15.46	2.56
134.0	40.79	25.48	0.35	45.41	-15.69	2.60
135.0	41.85	25.80	0.37	46.50	-15.81	2.49
136.0	42.89	26.18	0.40	47.60	-15.99	2.41
137.0	43.93	26.62	0.42	48.71	-16.21	2.37
138.0	44.97	27.11	0.44	49.82	-16.48	2.35
139.0	45.99	27.65	0.47	50.94	-16.80	2.35
140.0	47.01	28.26	0.49	52.07	-17.17	2.39

IECØ

140.220	47.00	28.44	0.48	52.10	-17.31	2.49
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TABLE XI
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
141.0	24.81	10.97	0.36	26.59	-5.61	-0.71
142.0	24.28	10.12	0.36	25.88	-4.96	-1.00
143.0	23.98	9.71	0.38	25.49	-4.66	-1.13
144.0	23.90	9.74	0.39	25.43	-4.70	-1.11
145.0	24.06	10.21	0.40	25.69	-5.07	-0.93
ØECØ						
145.560	22.75	9.64	0.41	24.29	-4.78	-0.92
146.0	5.80	-5.09	0.28	4.48	5.34	-3.99
147.0	1.08	-8.17	0.25	-0.79	7.29	-4.36
148.0	0.63	-8.82	0.24	-1.38	7.78	-4.56
S-IV ENGINE START						
148.120	0.38	-8.83	0.26	-1.63	7.74	-4.52
149.0	0.86	-8.60	0.24	-1.12	7.62	-4.51
150.0	3.88	-6.19	0.26	2.37	6.00	-4.06
155.0	4.86	-5.03	0.26	3.58	5.16	-3.73
160.0	5.02	-4.94	0.22	3.75	5.13	-3.69
GUIDANCE INITIATION						
163.860	5.04	-4.87	0.21	3.79	5.09	-3.65
165.0	5.03	-4.76	0.26	3.80	4.97	-3.64
170.0	4.90	-4.45	0.99	3.65	4.32	-4.08
175.0	4.90	-4.54	1.16	3.60	4.31	-4.27
180.0	5.07	-4.62	1.02	3.76	4.48	-4.23
185.0	5.15	-4.72	0.86	3.83	4.67	-4.15
190.0	5.23	-4.73	0.71	3.91	4.77	-4.05
195.0	5.30	-4.66	0.67	4.00	4.74	-4.00
200.0	5.39	-4.57	0.63	4.11	4.70	-3.95
205.0	5.48	-4.65	0.51	4.18	4.85	-3.90
210.0	5.58	-4.65	0.43	4.29	4.91	-3.85
215.0	5.69	-4.64	0.35	4.40	4.96	-3.81
220.0	5.73	-4.62	0.29	4.44	4.99	-3.76
225.0	5.86	-4.73	0.27	4.54	5.11	-3.82

TABLE XI
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE		DDYE		DDZE		DDXSP		DDYSP		DDZSP	
	M/S	SQ	M/S	SQ	M/S	SQ	M/S	SQ	M/S	SQ	M/S	SQ
230.0	6.02		-4.71		0.22		4.70		5.15		-3.81	
235.0	6.12		-4.74		0.25		4.78		5.18		-3.87	
240.0	6.14		-4.79		0.17		4.80		5.27		-3.83	
245.0	6.23		-4.71		0.19		4.89		5.21		-3.82	
250.0	6.28		-4.81		0.16		4.91		5.32		-3.86	
255.0	6.42		-4.93		0.15		5.02		5.45		-3.94	
260.0	6.46		-4.87		0.24		5.05		5.38		-4.00	
265.0	6.56		-4.90		0.18		5.14		5.45		-3.98	
270.0	6.64		-4.99		0.18		5.19		5.54		-4.04	
275.0	6.77		-5.04		0.19		5.30		5.60		-4.11	
280.0	6.87		-4.97		0.16		5.40		5.58		-4.07	
285.0	6.92		-5.03		0.18		5.43		5.64		-4.12	
290.0	7.03		-5.10		0.17		5.52		5.72		-4.17	
295.0	7.15		-5.17		0.22		5.60		5.78		-4.28	
300.0	7.27		-5.15		0.25		5.71		5.77		-4.33	
305.0	7.41		-5.24		0.25		5.82		5.88		-4.40	
310.0	7.49		-5.38		0.25		5.85		6.01		-4.48	
315.0	7.56		-5.35		0.24		5.93		6.01		-4.48	
320.0	7.74		-5.40		0.23		6.08		6.09		-4.54	
325.0	7.80		-5.34		0.28		6.14		6.03		-4.57	
330.0	7.90		-5.55		0.28		6.17		6.22		-4.68	
335.0	8.03		-5.56		0.29		6.29		6.26		-4.73	
340.0	8.16		-5.58		0.39		6.39		6.25		-4.85	
345.0	8.29		-5.65		0.36		6.50		6.36		-4.89	
350.0	8.44		-5.75		0.37		6.61		6.46		-4.98	
355.0	8.55		-5.87		0.33		6.68		6.61		-5.03	
360.0	8.65		-5.90		0.32		6.77		6.66		-5.05	
365.0	8.80		-5.93		0.40		6.89		6.68		-5.17	
370.0	8.90		-6.17		0.32		6.93		6.94		-5.25	
375.0	8.97		-6.10		0.42		6.99		6.86		-5.31	
380.0	9.09		-6.29		0.38		7.06		7.06		-5.39	
385.0	9.27		-6.36		0.40		7.20		7.14		-5.49	
390.0	9.41		-6.40		0.41		7.31		7.21		-5.54	
395.0	9.54		-6.46		0.43		7.41		7.27		-5.62	
400.0	9.71		-6.62		0.40		7.54		7.46		-5.71	
405.0	9.81		-6.67		0.44		7.61		7.51		-5.79	
410.0	10.00		-6.78		0.40		7.75		7.66		-5.85	
415.0	10.12		-6.89		0.47		7.83		7.74		-6.00	
420.0	10.33		-7.01		0.48		8.00		7.88		-6.11	
425.0	10.51		-7.16		0.40		8.13		8.09		-6.15	

TABLE XI
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
430.0	10.63	-7.29	0.47	8.20	8.19	-6.29
435.0	10.76	-7.45	0.47	8.27	8.36	-6.40
440.0	10.89	-7.60	0.46	8.34	8.51	-6.50
445.0	11.10	-7.69	0.48	8.51	8.62	-6.60
450.0	11.28	-7.82	0.47	8.64	8.78	-6.70
455.0	11.44	-7.96	0.49	8.75	8.92	-6.82
460.0	11.54	-8.19	0.50	8.78	9.13	-6.96
465.0	11.71	-8.28	0.50	8.91	9.24	-7.05
470.0	11.93	-8.44	0.49	9.07	9.43	-7.15
475.0	12.07	-8.66	0.49	9.14	9.65	-7.30
480.0	12.30	-8.87	0.50	9.29	9.86	-7.46
485.0	12.46	-9.09	0.51	9.38	10.09	-7.61
490.0	12.68	-9.20	0.55	9.55	10.20	-7.74
495.0	12.90	-9.51	0.51	9.67	10.53	-7.90
500.0	13.11	-9.63	0.55	9.83	10.65	-8.05
505.0	13.38	-9.88	0.56	10.00	10.91	-8.23
510.0	13.54	-10.15	0.54	10.08	11.19	-8.39
515.0	13.80	-10.35	0.56	10.26	11.40	-8.56
520.0	14.05	-10.61	0.51	10.43	11.70	-8.70
525.0	14.20	-10.78	0.58	10.51	11.84	-8.88
530.0	14.52	-11.13	0.57	10.72	12.21	-9.10
535.0	14.77	-11.41	0.57	10.87	12.50	-9.29
540.0	14.98	-11.67	0.58	10.98	12.76	-9.47
545.0	15.25	-11.96	0.60	11.15	13.05	-9.69
550.0	15.53	-12.34	0.59	11.31	13.43	-9.93
555.0	15.76	-12.62	0.63	11.44	13.70	-10.14
560.0	16.11	-12.95	0.65	11.67	14.04	-10.40
565.0	16.45	-13.41	0.57	11.86	14.53	-10.63
570.0	16.66	-13.61	0.62	11.99	14.73	-10.81
575.0	17.00	-14.12	0.65	12.16	15.21	-11.16
580.0	17.36	-14.54	0.63	12.39	15.65	-11.43
585.0	17.70	-15.07	0.63	12.56	16.17	-11.76
590.0	18.06	-15.52	0.71	12.76	16.58	-12.13
595.0	18.40	-15.96	0.69	12.95	17.03	-12.39
600.0	18.74	-16.48	0.71	13.12	17.52	-12.74
605.0	19.00	-16.98	0.66	13.22	18.03	-12.99
610.0	19.52	-17.66	0.71	13.52	18.68	-13.48
615.0	19.90	-18.14	0.72	13.73	19.15	-13.80
620.0	20.36	-19.02	0.70	13.92	20.01	-14.31

S-IV CUT OFF

621.659	20.48	-19.31	0.70	13.95	20.27	-14.47
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TABLE XI
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE M/S SQ	DDYE M/S SQ	DDZE M/S SQ	DDXSP M/S SQ	DDYSP M/S SQ	DDZSP M/S SQ
625.0	-2.17	-7.20	0.35	-4.49	6.34	-3.24
630.0	-2.21	-7.19	0.35	-4.53	6.32	-3.23
INSERTION						
631.659	-2.22	-7.19	0.34	-4.54	6.31	-3.22

TABLE XII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S
FIRST MØTION							
0.080	6373.350	-80.56495	28.37067	28.53185	0.	90.000	0.
LIFTØFF SIGNAL							
0.280	6373.350	-80.56495	28.37067	28.53185	37.018	87.192	0.7
1.0	6373.351	-80.56495	28.37067	28.53185	30.052	88.135	3.2
2.0	6373.356	-80.56495	28.37067	28.53185	10.756	88.951	6.8
3.0	6373.365	-80.56495	28.37067	28.53185	338.303	89.255	10.5
4.0	6373.377	-80.56495	28.37068	28.53186	312.912	89.235	14.3
5.0	6373.393	-80.56495	28.37068	28.53186	302.598	89.147	18.1
6.0	6373.413	-80.56496	28.37068	28.53186	300.340	89.081	22.1
7.0	6373.437	-80.56496	28.37068	28.53186	301.674	89.043	26.1
8.0	6373.466	-80.56496	28.37068	28.53186	304.430	89.024	30.2
9.0	6373.498	-80.56497	28.37069	28.53186	307.461	89.020	34.4
10.0	6373.534	-80.56497	28.37069	28.53187	310.173	89.033	38.6
11.0	6373.575	-80.56498	28.37069	28.53187	312.341	89.065	43.0
12.0	6373.620	-80.56499	28.37070	28.53188	314.001	89.119	47.4
13.0	6373.670	-80.56499	28.37070	28.53188	315.351	89.198	52.0
14.0	6373.724	-80.56500	28.37071	28.53189	317.007	89.306	56.6
15.0	6373.783	-80.56501	28.37071	28.53189	319.899	89.443	61.3
16.0	6373.847	-80.56501	28.37072	28.53190	327.083	89.607	66.2
17.0	6373.915	-80.56501	28.37072	28.53190	351.986	89.776	71.1
18.0	6373.989	-80.56501	28.37072	28.53190	61.138	89.780	76.1
19.0	6374.067	-80.56501	28.37073	28.53190	91.840	89.538	81.2
20.0	6374.151	-80.56500	28.37072	28.53190	100.119	89.208	86.4
21.0	6374.240	-80.56499	28.37072	28.53190	103.042	88.824	91.7
22.0	6374.334	-80.56497	28.37072	28.53190	104.146	88.391	97.0
23.0	6374.434	-80.56493	28.37071	28.53189	104.509	87.912	102.5
24.0	6374.539	-80.56489	28.37070	28.53188	104.556	87.392	108.0
25.0	6374.650	-80.56484	28.37069	28.53187	104.486	86.833	113.6
26.0	6374.766	-80.56477	28.37067	28.53185	104.395	86.243	119.3
27.0	6374.888	-80.56469	28.37065	28.53183	104.330	85.628	125.1
28.0	6375.016	-80.56458	28.37063	28.53181	104.312	84.994	131.1
29.0	6375.149	-80.56446	28.37060	28.53178	104.336	84.351	137.2
30.0	6375.289	-80.56432	28.37057	28.53175	104.417	83.707	143.5

TABLE XII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S
31.0	6375.434	-80.56415	28.37053	28.53171	104.484	83.064	149.8
32.0	6375.586	-80.56396	28.37049	28.53167	104.496	82.426	156.2
33.0	6375.744	-80.56375	28.37044	28.53162	104.426	81.811	162.8
34.0	6375.909	-80.56351	28.37039	28.53156	104.250	81.212	169.5
35.0	6376.079	-80.56324	28.37033	28.53150	104.043	80.627	176.4
36.0	6376.257	-80.56294	28.37026	28.53144	103.895	80.047	183.3
37.0	6376.440	-80.56261	28.37019	28.53137	103.858	79.463	190.4
38.0	6376.631	-80.56225	28.37011	28.53129	103.965	78.877	197.6
39.0	6376.828	-80.56186	28.37002	28.53120	104.137	78.302	204.9
40.0	6377.032	-80.56143	28.36993	28.53110	104.290	77.755	212.4
41.0	6377.243	-80.56097	28.36983	28.53100	104.359	77.242	220.0
42.0	6377.462	-80.56047	28.36971	28.53089	104.341	76.763	227.7
43.0	6377.687	-80.55994	28.36959	28.53077	104.262	76.307	235.6
44.0	6377.919	-80.55937	28.36946	28.53064	104.174	75.860	243.6
45.0	6378.159	-80.55877	28.36933	28.53050	104.090	75.407	251.8
46.0	6378.407	-80.55812	28.36919	28.53036	103.987	74.948	260.1
47.0	6378.662	-80.55743	28.36904	28.53021	103.816	74.492	268.5
48.0	6378.924	-80.55670	28.36888	28.53005	103.572	74.049	277.0
49.0	6379.195	-80.55592	28.36872	28.52989	103.291	73.619	285.7
50.0	6379.473	-80.55510	28.36855	28.52972	103.034	73.198	294.5
51.0	6379.758	-80.55423	28.36837	28.52954	102.851	72.772	303.3
52.0	6380.052	-80.55332	28.36819	28.52936	102.777	72.333	312.2
53.0	6380.353	-80.55235	28.36800	28.52916	102.799	71.874	321.0
MACH ONE							
53.208	6380.417	-80.55214	28.36796	28.52912	102.812	71.776	322.8
54.0	6380.662	-80.55133	28.36779	28.52896	102.877	71.401	329.8
55.0	6380.978	-80.55026	28.36757	28.52874	102.975	70.924	338.4
56.0	6381.302	-80.54913	28.36735	28.52851	103.069	70.455	347.1
57.0	6381.633	-80.54795	28.36710	28.52827	103.158	69.997	355.9
58.0	6381.971	-80.54672	28.36685	28.52801	103.254	69.549	364.9
59.0	6382.317	-80.54542	28.36658	28.52774	103.371	69.103	374.0
60.0	6382.670	-80.54407	28.36629	28.52746	103.509	68.653	383.5
61.0	6383.031	-80.54266	28.36599	28.52715	103.614	68.191	393.3
62.0	6383.400	-80.54118	28.36568	28.52684	103.625	67.713	403.4
63.0	6383.778	-80.53963	28.36535	28.52651	103.524	67.230	413.8
64.0	6384.164	-80.53800	28.36501	28.52616	103.352	66.750	424.5
65.0	6384.558	-80.53630	28.36465	28.52581	103.174	66.282	435.6

TABLE XII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S
MAXIMUM DYNAMIC PRESSURE							
66.000	6384.961	-80.53453	28.36429	28.52544	103.040	65.833	447.0
67.0	6385.374	-80.53267	28.36391	28.52507	102.964	65.402	458.6
68.0	6385.796	-80.53074	28.36352	28.52467	102.921	64.982	470.6
69.0	6386.227	-80.52872	28.36311	28.52426	102.875	64.564	482.9
70.0	6386.668	-80.52661	28.36269	28.52384	102.820	64.143	495.5
71.0	6387.119	-80.52442	28.36225	28.52340	102.783	63.718	508.5
72.0	6387.580	-80.52214	28.36180	28.52294	102.755	63.289	521.8
73.0	6388.052	-80.51976	28.36132	28.52246	102.852	62.862	535.5
74.0	6388.534	-80.51729	28.36082	28.52197	102.935	62.438	549.5
75.0	6389.026	-80.51471	28.36030	28.52144	103.027	62.021	563.9
76.0	6389.530	-80.51204	28.35975	28.52089	103.114	61.610	578.6
77.0	6390.045	-80.50926	28.35918	28.52032	103.198	61.206	593.8
78.0	6390.571	-80.50637	28.35858	28.51972	103.287	60.807	609.3
79.0	6391.109	-80.50336	28.35796	28.51909	103.381	60.412	625.2
80.0	6391.659	-80.50025	28.35730	28.51843	103.478	60.020	641.6
81.0	6392.221	-80.49701	28.35662	28.51774	103.570	59.626	658.3
82.0	6392.795	-80.49366	28.35590	28.51702	103.658	59.228	675.5
83.0	6393.382	-80.49018	28.35515	28.51628	103.745	58.822	693.1
84.0	6393.981	-80.48656	28.35437	28.51549	103.830	58.412	711.1
85.0	6394.593	-80.48281	28.35356	28.51467	103.909	57.998	729.6
86.0	6395.219	-80.47892	28.35271	28.51382	103.983	57.582	748.5
87.0	6395.858	-80.47488	28.35182	28.51293	104.049	57.165	767.8
88.0	6396.509	-80.47070	28.35090	28.51200	104.104	56.745	787.5
89.0	6397.175	-80.46636	28.34993	28.51104	104.154	56.321	807.6
90.0	6397.854	-80.46186	28.34894	28.51003	104.199	55.893	828.1
91.0	6398.546	-80.45720	28.34789	28.50899	104.243	55.460	849.1
92.0	6399.253	-80.45237	28.34681	28.50791	104.285	55.023	870.4
93.0	6399.973	-80.44736	28.34569	28.50678	104.326	54.585	892.2
94.0	6400.706	-80.44217	28.34453	28.50561	104.367	54.146	914.5
95.0	6401.452	-80.43678	28.34332	28.50440	104.407	53.707	937.2
96.0	6402.213	-80.43121	28.34206	28.50314	104.445	53.271	960.3
97.0	6402.988	-80.42545	28.34076	28.50183	104.481	52.837	983.8
98.0	6403.780	-80.41950	28.33941	28.50047	104.513	52.410	1007.7
99.0	6404.586	-80.41335	28.33800	28.49906	104.541	51.985	1032.1
100.0	6405.406	-80.40699	28.33655	28.49760	104.568	51.564	1057.0
101.0	6406.242	-80.40042	28.33505	28.49610	104.596	51.146	1082.3

TABLE XII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S
102.0	6407.093	-80.39364	28.33349	28.49453	104.624	50.732	1108.1
103.0	6407.958	-80.38663	28.33188	28.49292	104.654	50.323	1134.3
104.0	6408.839	-80.37940	28.33021	28.49124	104.683	49.919	1161.1
105.0	6409.735	-80.37194	28.32849	28.48951	104.707	49.523	1188.3
106.0	6410.647	-80.36425	28.32671	28.48773	104.728	49.133	1215.9
107.0	6411.575	-80.35632	28.32488	28.48589	104.752	48.752	1244.1
108.0	6412.518	-80.34814	28.32298	28.48398	104.774	48.379	1272.8
109.0	6413.478	-80.33972	28.32102	28.48202	104.799	48.014	1302.1
110.0	6414.454	-80.33105	28.31900	28.47999	104.824	47.656	1331.9
111.0	6415.447	-80.32212	28.31692	28.47790	104.848	47.306	1362.2
112.0	6416.457	-80.31293	28.31478	28.47575	104.869	46.964	1393.1
113.0	6417.484	-80.30348	28.31257	28.47353	104.888	46.629	1424.5
114.0	6418.529	-80.29376	28.31029	28.47124	104.906	46.302	1456.5
115.0	6419.591	-80.28376	28.30794	28.46889	104.926	45.984	1489.1
116.0	6420.671	-80.27348	28.30553	28.46647	104.946	45.675	1522.2
117.0	6421.769	-80.26293	28.30305	28.46398	104.965	45.375	1556.0
118.0	6422.886	-80.25208	28.30049	28.46141	104.985	45.084	1590.5
119.0	6424.022	-80.24094	28.29787	28.45878	105.005	44.802	1625.5
120.0	6425.177	-80.22951	28.29517	28.45607	105.026	44.529	1661.2
121.0	6426.352	-80.21777	28.29239	28.45328	105.047	44.265	1697.6
122.0	6427.548	-80.20573	28.28954	28.45042	105.068	44.010	1734.7
123.0	6428.763	-80.19338	28.28661	28.44748	105.087	43.762	1772.4
124.0	6430.000	-80.18071	28.28360	28.44445	105.106	43.523	1810.9
125.0	6431.258	-80.16772	28.28051	28.44135	105.124	43.292	1850.2
126.0	6432.538	-80.15440	28.27734	28.43817	105.141	43.068	1890.2
127.0	6433.840	-80.14075	28.27408	28.43490	105.158	42.852	1930.9
128.0	6435.165	-80.12677	28.27074	28.43155	105.175	42.643	1972.5
129.0	6436.513	-80.11244	28.26732	28.42811	105.193	42.442	2015.0
130.0	6437.885	-80.09776	28.26380	28.42459	105.212	42.247	2058.3
131.0	6439.281	-80.08272	28.26020	28.42097	105.231	42.058	2102.5
132.0	6440.702	-80.06732	28.25651	28.41726	105.250	41.873	2147.6
133.0	6442.148	-80.05155	28.25272	28.41346	105.268	41.692	2193.6
134.0	6443.620	-80.03541	28.24883	28.40956	105.286	41.513	2240.6
135.0	6445.119	-80.01886	28.24484	28.40556	105.306	41.337	2288.7
136.0	6446.644	-80.00193	28.24076	28.40145	105.327	41.161	2337.6
137.0	6448.196	-79.98459	28.23656	28.39725	105.344	40.983	2387.8
138.0	6449.777	-79.96684	28.23227	28.39294	105.364	40.805	2439.0
139.0	6451.385	-79.94867	28.22786	28.38851	105.381	40.628	2491.3
140.0	6453.022	-79.93007	28.22335	28.38398	105.402	40.455	2545.0
IECØ							
140.220	6453.388	-79.92592	28.22235	28.38299	105.402	40.419	2556.9

TABLE XII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LONG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S
141.0	6454.686	-79.91105	28.21873	28.37935	105.418	40.297	2584.5
142.0	6456.363	-79.89179	28.21405	28.37465	105.436	40.148	2610.0
143.0	6458.052	-79.87231	28.20930	28.36989	105.454	40.005	2634.5
144.0	6459.751	-79.85261	28.20450	28.36507	105.469	39.864	2659.2
145.0	6461.462	-79.83270	28.19964	28.36019	105.487	39.726	2683.9
ØECØ							
145.560	6462.425	-79.82148	28.19693	28.35747	105.490	39.652	2697.8
146.0	6463.182	-79.81258	28.19473	28.35526	105.504	39.594	2700.9
147.0	6464.901	-79.79240	28.18980	28.35031	105.520	39.464	2696.9
148.0	6466.611	-79.77223	28.18486	28.34535	105.536	39.332	2692.0
S-IV ENGINE START							
148.120	6466.816	-79.76985	28.18430	28.34479	105.532	39.318	2691.5
149.0	6468.314	-79.75207	28.17992	28.34039	105.552	39.201	2687.0
150.0	6470.009	-79.73192	28.17497	28.33543	105.569	39.069	2683.0
155.0	6478.412	-79.63070	28.15006	28.31043	105.645	38.416	2686.3
160.0	6486.702	-79.52859	28.12478	28.28505	105.723	37.772	2690.7
GUIDANCE INITIATION							
163.860	6493.034	-79.44917	28.10503	28.26522	105.781	37.280	2695.1
165.0	6494.892	-79.42561	28.09915	28.25932	105.758	37.135	2696.5
170.0	6502.983	-79.32174	28.07313	28.23321	105.919	36.523	2703.0
175.0	6510.980	-79.21706	28.04661	28.20659	106.121	35.934	2709.8
180.0	6518.885	-79.11157	28.01953	28.17941	106.309	35.339	2717.4
185.0	6526.697	-79.00523	27.99191	28.15168	106.477	34.733	2725.8
190.0	6534.416	-78.89800	27.96376	28.12343	106.623	34.124	2735.0
195.0	6542.041	-78.78985	27.93512	28.09468	106.755	33.517	2744.9
200.0	6549.574	-78.68076	27.90599	28.06544	106.874	32.916	2755.7
205.0	6557.015	-78.57070	27.87638	28.03572	106.980	32.312	2767.3
210.0	6564.367	-78.45964	27.84631	28.00553	107.077	31.714	2779.6
215.0	6571.627	-78.34757	27.81578	27.97488	107.166	31.115	2792.6
220.0	6578.799	-78.23445	27.78479	27.94378	107.247	30.522	2806.5
225.0	6585.881	-78.12026	27.75334	27.91222	107.323	29.931	2821.2

TABLE XII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S
230.0	6592.875	-78.00498	27.72145	27.88020	107.396	29.338	2836.7
235.0	6599.780	-77.88859	27.68909	27.84772	107.464	28.750	2852.9
240.0	6606.598	-77.77105	27.65628	27.81478	107.529	28.165	2870.0
245.0	6613.327	-77.65235	27.62300	27.78138	107.592	27.584	2887.7
250.0	6619.969	-77.53247	27.58926	27.74750	107.654	27.006	2906.2
255.0	6626.525	-77.41140	27.55503	27.71315	107.716	26.434	2925.4
260.0	6632.992	-77.28910	27.52033	27.67831	107.777	25.863	2945.4
265.0	6639.374	-77.16557	27.48513	27.64298	107.840	25.299	2966.2
270.0	6645.668	-77.04077	27.44943	27.60714	107.902	24.738	2987.8
275.0	6651.877	-76.91469	27.41321	27.57078	107.964	24.182	3010.2
280.0	6657.999	-76.78731	27.37647	27.53390	108.028	23.633	3033.3
285.0	6664.036	-76.65860	27.33920	27.49648	108.093	23.087	3057.2
290.0	6669.988	-76.52856	27.30138	27.45851	108.159	22.547	3082.0
295.0	6675.854	-76.39715	27.26299	27.41998	108.226	22.013	3107.5
300.0	6681.635	-76.26434	27.22404	27.38088	108.294	21.484	3134.0
305.0	6687.332	-76.13013	27.18449	27.34117	108.364	20.962	3161.3
310.0	6692.944	-75.99448	27.14435	27.30087	108.435	20.444	3189.4
315.0	6698.473	-75.85738	27.10359	27.25995	108.507	19.934	3218.4
320.0	6703.917	-75.71879	27.06220	27.21840	108.581	19.431	3248.3
325.0	6709.278	-75.57870	27.02016	27.17620	108.656	18.933	3279.2
330.0	6714.557	-75.43707	26.97746	27.13333	108.732	18.441	3310.8
335.0	6719.751	-75.29389	26.93408	27.08978	108.809	17.955	3343.4
340.0	6724.863	-75.14913	26.89002	27.04554	108.887	17.476	3376.8
345.0	6729.893	-75.00275	26.84525	27.00060	108.966	17.005	3411.1
350.0	6734.839	-74.85475	26.79976	26.95492	109.045	16.539	3446.4
355.0	6739.703	-74.70509	26.75353	26.90851	109.126	16.077	3482.5
360.0	6744.484	-74.55375	26.70654	26.86134	109.207	15.624	3519.6
365.0	6749.182	-74.40070	26.65879	26.81339	109.289	15.178	3557.5
370.0	6753.798	-74.24591	26.61025	26.76466	109.372	14.738	3596.3
375.0	6758.330	-74.08936	26.56092	26.71513	109.455	14.303	3636.1
380.0	6762.780	-73.93102	26.51076	26.66477	109.539	13.875	3676.8
385.0	6767.147	-73.77086	26.45977	26.61357	109.625	13.452	3718.4
390.0	6771.431	-73.60885	26.40792	26.56151	109.709	13.038	3761.2
395.0	6775.632	-73.44497	26.35520	26.50858	109.795	12.630	3804.8
400.0	6779.750	-73.27917	26.30159	26.45475	109.882	12.229	3849.5
405.0	6783.786	-73.11144	26.24707	26.40000	109.969	11.835	3895.3
410.0	6787.739	-72.94173	26.19161	26.34433	110.056	11.446	3942.0
415.0	6791.609	-72.77002	26.13522	26.28770	110.144	11.065	3989.9
420.0	6795.396	-72.59626	26.07784	26.23009	110.233	10.688	4038.8
425.0	6799.099	-72.42044	26.01948	26.17149	110.322	10.319	4088.8

TABLE XII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST KM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S
430.0	6802.720	-72.24251	25.96011	26.11187	110.411	9.956	4139.9
435.0	6806.257	-72.06244	25.89970	26.05121	110.502	9.599	4192.2
440.0	6809.710	-71.88018	25.83823	25.98948	110.593	9.250	4245.6
445.0	6813.084	-71.69573	25.77568	25.92667	110.685	8.905	4300.1
450.0	6816.371	-71.50902	25.71202	25.86275	110.777	8.567	4355.6
455.0	6819.573	-71.32003	25.64724	25.79770	110.870	8.234	4412.3
460.0	6822.690	-71.12872	25.58131	25.73149	110.964	7.905	4470.2
465.0	6825.721	-70.93506	25.51420	25.66410	111.058	7.584	4529.4
470.0	6828.667	-70.73900	25.44589	25.59550	111.152	7.267	4589.7
475.0	6831.527	-70.54050	25.37635	25.52566	111.246	6.956	4651.4
480.0	6834.301	-70.33952	25.30556	25.45457	111.342	6.651	4714.5
485.0	6836.988	-70.13601	25.23347	25.38217	111.438	6.352	4778.9
490.0	6839.588	-69.92993	25.16007	25.30846	111.535	6.058	4844.8
495.0	6842.101	-69.72124	25.08532	25.23338	111.633	5.770	4912.1
500.0	6844.526	-69.50987	25.00918	25.15693	111.731	5.487	4980.8
505.0	6846.864	-69.29579	24.93164	25.07905	111.830	5.210	5051.0
510.0	6849.113	-69.07895	24.85265	24.99971	111.930	4.938	5122.8
515.0	6851.274	-68.85929	24.77217	24.91889	112.030	4.672	5196.1
520.0	6853.345	-68.63676	24.69018	24.83654	112.130	4.409	5271.2
525.0	6855.327	-68.41130	24.60664	24.75263	112.232	4.153	5347.9
530.0	6857.218	-68.18287	24.52150	24.66711	112.334	3.901	5426.3
535.0	6859.018	-67.95139	24.43473	24.57996	112.437	3.654	5506.5
540.0	6860.727	-67.71681	24.34628	24.49113	112.541	3.411	5588.5
545.0	6862.343	-67.47908	24.25612	24.40056	112.645	3.173	5672.4
550.0	6863.866	-67.23811	24.16420	24.30823	112.750	2.939	5758.1
555.0	6865.295	-66.99386	24.07047	24.21409	112.856	2.708	5846.0
560.0	6866.628	-66.74625	23.97489	24.11808	112.962	2.481	5935.8
565.0	6867.864	-66.49520	23.87741	24.02015	113.070	2.260	6028.0
570.0	6869.004	-66.24063	23.77797	23.92027	113.177	2.043	6122.6
575.0	6870.046	-65.98247	23.67652	23.81836	113.286	1.828	6219.3
580.0	6870.988	-65.72063	23.57301	23.71437	113.395	1.617	6318.7
585.0	6871.828	-65.45503	23.46737	23.60825	113.504	1.409	6420.7
590.0	6872.566	-65.18558	23.35954	23.49993	113.616	1.204	6525.0
595.0	6873.199	-64.91218	23.24947	23.38935	113.728	1.001	6632.2
600.0	6873.725	-64.63476	23.13708	23.27644	113.841	0.803	6742.1
605.0	6874.142	-64.35321	23.02231	23.16114	113.955	0.607	6854.8
610.0	6874.450	-64.06743	22.90509	23.04337	114.069	0.412	6970.8
615.0	6874.643	-63.77731	22.78535	22.92306	114.184	0.219	7089.9
620.0	6874.717	-63.48274	22.66300	22.80014	114.299	0.028	7212.8

S-IV CUT OFF

621.659	6874.716	-63.38399	22.62182	22.75876	114.338	-0.035	7254.5
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TABLE XII
 GEØGRAPHIC CØØRDINATES

TIME SEC	EC DIST KM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL M/S
625.0	6874.699	-63.18465	22.53839	22.67494	114.424	-0.036	7257.7
630.0	6874.679	-62.88679	22.41302	22.54897	114.555	-0.030	7257.9

INSERTIØN

631.659	6874.673	-62.78809	22.37128	22.50703	114.598	-0.029	7257.9
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TABLE XIII
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL M/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES N/CM SQ	RANGE M	ALTITUDE M
FIRST MOTIØN							
0.080	408.9	0.	90.000	0.014	0.001	0	32
LIFTØFF SIGNAL							
0.280	409.0	0.095	89.996	0.014	0.001	0	32
1.0	409.0	0.446	89.987	0.017	0.002	0	33
2.0	409.0	0.950	89.983	0.024	0.004	0	38
3.0	409.0	1.469	89.982	0.034	0.008	0	47
4.0	409.0	2.000	89.982	0.044	0.014	0	59
5.0	409.1	2.541	89.980	0.055	0.021	-0	75
6.0	409.2	3.093	89.975	0.066	0.031	-0	95
7.0	409.4	3.654	89.968	0.078	0.043	-0	119
8.0	409.6	4.226	89.959	0.090	0.057	-1	148
9.0	409.9	4.807	89.950	0.102	0.073	-1	180
10.0	410.3	5.400	89.941	0.115	0.092	-2	216
11.0	410.7	6.005	89.934	0.128	0.114	-3	257
12.0	411.2	6.621	89.929	0.140	0.137	-4	302
13.0	411.7	7.248	89.927	0.153	0.162	-4	352
14.0	412.4	7.887	89.930	0.167	0.190	-5	406
15.0	413.2	8.536	89.936	0.180	0.221	-6	465
16.0	414.0	9.195	89.947	0.195	0.255	-7	529
17.0	415.1	9.862	89.961	0.209	0.292	-7	597
18.0	416.2	10.535	89.980	0.224	0.332	-7	671
19.0	417.6	11.213	90.003	0.239	0.375	-7	749
20.0	419.2	11.893	90.029	0.254	0.420	-7	833
21.0	420.9	12.575	90.059	0.269	0.468	-5	922
22.0	422.9	13.257	90.093	0.285	0.519	-4	1016
23.0	425.1	13.936	90.130	0.301	0.572	5	1116
24.0	427.6	14.611	90.171	0.318	0.628	7	1221
25.0	430.3	15.283	90.217	0.335	0.687	11	1332
26.0	433.3	15.950	90.267	0.352	0.748	18	1448
27.0	436.5	16.611	90.323	0.369	0.811	26	1570
28.0	440.0	17.268	90.386	0.386	0.877	36	1698
29.0	443.7	17.920	90.454	0.404	0.944	49	1831
30.0	447.6	18.575	90.529	0.423	1.016	63	1971

TABLE XIII
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL M/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES N/CM SQ	RANGE M	ALTITUDE M
31.0	451.8	19.221	90.608	0.442	1.090	80	2116
32.0	456.1	19.850	90.688	0.461	1.166	99	2268
33.0	460.7	20.477	90.767	0.481	1.245	121	2426
34.0	465.4	21.098	90.841	0.502	1.329	145	2591
35.0	470.4	21.710	90.914	0.523	1.417	172	2761
36.0	475.6	22.314	90.991	0.545	1.503	202	2938
37.0	480.9	22.902	91.078	0.567	1.590	235	3122
38.0	486.5	23.482	91.181	0.589	1.679	272	3313
39.0	492.3	24.052	91.293	0.612	1.770	311	3510
40.0	498.2	24.617	91.407	0.637	1.870	354	3714
41.0	504.3	25.178	91.513	0.662	1.965	401	3925
42.0	510.5	25.736	91.609	0.686	2.056	451	4143
43.0	516.9	26.287	91.699	0.711	2.146	505	4368
44.0	523.5	26.828	91.788	0.737	2.238	562	4601
45.0	530.3	27.353	91.879	0.764	2.333	624	4841
46.0	537.4	27.864	91.969	0.791	2.427	689	5088
47.0	544.7	28.359	92.050	0.819	2.515	758	5343
48.0	552.1	28.843	92.117	0.847	2.602	832	5606
49.0	559.8	29.317	92.175	0.877	2.696	910	5876
50.0	567.6	29.778	92.233	0.907	2.780	993	6154
51.0	575.6	30.221	92.302	0.936	2.857	1080	6440
52.0	583.7	30.638	92.391	0.965	2.921	1172	6733
53.0	591.9	31.023	92.500	0.994	2.977	1269	7034
MACH ONE							
53.208	593.7	31.099	92.524	1.000	2.986	1290	7098
54.0	600.3	31.377	92.622	1.023	3.022	1371	7343
55.0	608.6	31.704	92.749	1.055	3.080	1479	7659
56.0	617.1	32.014	92.877	1.088	3.137	1592	7983
57.0	625.6	32.313	93.004	1.124	3.194	1711	8314
58.0	634.4	32.608	93.135	1.159	3.241	1835	8652
59.0	643.4	32.898	93.274	1.191	3.257	1965	8997
60.0	652.7	33.181	93.423	1.227	3.289	2101	9351
61.0	662.4	33.453	93.568	1.262	3.304	2243	9712
62.0	672.5	33.711	93.693	1.297	3.306	2393	10081
63.0	683.1	33.957	93.790	1.323	3.255	2549	10458
64.0	694.0	34.197	93.866	1.353	3.218	2712	10844
65.0	705.2	34.436	93.936	1.400	3.252	2883	11238

TABLE XIII
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL M/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES N/CM SQ	RANGE M	ALTITUDE M
MAXIMUM DYNAMIC PRESSURE							
66.000	716.7	34.678	94.017	1.447	3.270	3062	11641
67.0	728.5	34.922	94.112	1.494	3.278	3248	12054
68.0	740.5	35.163	94.216	1.547	3.295	3442	12476
69.0	752.9	35.397	94.319	1.601	3.300	3645	12907
70.0	765.7	35.620	94.419	1.658	3.304	3856	13348
71.0	778.8	35.833	94.525	1.715	3.286	4076	13798
72.0	792.3	36.036	94.650	1.773	3.260	4305	14259
73.0	806.2	36.232	94.792	1.833	3.223	4544	14731
74.0	820.5	36.422	94.945	1.890	3.162	4792	15212
75.0	835.1	36.606	95.103	1.961	3.132	5051	15705
76.0	850.1	36.785	95.261	2.020	3.049	5320	16208
77.0	865.5	36.959	95.418	2.096	3.006	5599	16723
78.0	881.3	37.126	95.578	2.145	2.873	5890	17249
79.0	897.5	37.287	95.743	2.221	2.808	6192	17787
80.0	914.1	37.441	95.909	2.268	2.663	6506	18336
81.0	931.2	37.585	96.076	2.336	2.565	6831	18898
82.0	948.7	37.715	96.242	2.368	2.391	7169	19472
83.0	966.8	37.833	96.410	2.409	2.244	7520	20059
84.0	985.3	37.936	96.579	2.453	2.110	7884	20658
85.0	1004.4	38.027	96.747	2.504	1.993	8263	21270
86.0	1023.8	38.107	96.912	2.555	1.880	8655	21895
87.0	1043.8	38.174	97.074	2.617	1.782	9062	22534
88.0	1064.2	38.229	97.232	2.673	1.679	9484	23185
89.0	1085.0	38.271	97.386	2.728	1.576	9922	23850
90.0	1106.4	38.298	97.538	2.771	1.464	10377	24529
91.0	1128.2	38.312	97.689	2.836	1.379	10847	25221
92.0	1150.4	38.313	97.839	2.896	1.292	11335	25927
93.0	1173.2	38.303	97.988	2.978	1.223	11841	26647
94.0	1196.4	38.282	98.136	3.058	1.153	12366	27380
95.0	1220.0	38.252	98.283	3.124	1.074	12910	28126
96.0	1244.2	38.213	98.427	3.154	0.977	13473	28886
97.0	1268.7	38.167	98.568	3.210	0.902	14055	29661
98.0	1293.7	38.115	98.705	3.299	0.847	14657	30452
99.0	1319.1	38.056	98.839	3.382	0.790	15279	31257
100.0	1345.0	37.992	98.970	3.439	0.723	15922	32078
101.0	1371.4	37.921	99.100	3.474	0.654	16586	32913

TABLE XIII
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL M/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES N/CM SQ	RANGE M	ALTITUDE M
102.0	1398.3	37.845	99.228	3.564	0.608	17273	33763
103.0	1425.6	37.764	99.356	3.680	0.578	17982	34628
104.0	1453.4	37.680	99.482	3.741	0.533	18713	35508
105.0	1481.6	37.594	99.603	3.802	0.490	19468	36404
106.0	1510.3	37.505	99.719	3.863	0.449	20247	37315
107.0	1539.5	37.416	99.835	3.925	0.411	21050	38242
108.0	1569.3	37.326	99.949	3.990	0.375	21878	39185
109.0	1599.5	37.236	100.062	4.062	0.342	22731	40145
110.0	1630.2	37.146	100.174	4.135	0.312	23609	41120
111.0	1661.5	37.055	100.283	4.210	0.284	24513	42112
112.0	1693.3	36.965	100.388	4.286	0.259	25444	43122
113.0	1725.7	36.874	100.490	4.364	0.236	26402	44148
114.0	1758.6	36.785	100.590	4.445	0.214	27387	45192
115.0	1792.0	36.696	100.689	4.529	0.195	28400	46253
116.0	1826.0	36.610	100.786	4.617	0.177	29442	47332
117.0	1860.7	36.527	100.882	4.710	0.161	30512	48430
118.0	1895.9	36.446	100.976	4.817	0.146	31612	49546
119.0	1931.7	36.368	101.068	4.938	0.134	32741	50681
120.0	1968.2	36.293	101.160	5.066	0.122	33900	51836
121.0	2005.2	36.221	101.250	5.199	0.111	35090	53010
122.0	2043.0	36.152	101.339	5.339	0.100	36312	54204
123.0	2081.4	36.085	101.425	5.486	0.091	37565	55419
124.0	2120.6	36.022	101.509	5.640	0.081	38850	56655
125.0	2160.4	35.961	101.591	5.801	0.073	40168	57912
126.0	2201.0	35.903	101.672	5.970	0.065	41519	59191
127.0	2242.4	35.848	101.751	6.146	0.058	42905	60491
128.0	2284.6	35.797	101.828	6.330	0.051	44324	61815
129.0	2327.5	35.748	101.905	6.521	0.045	45779	63162
130.0	2371.3	35.702	101.982	6.721	0.039	47269	64533
131.0	2416.0	35.657	102.058	6.929	0.034	48796	65928
132.0	2461.6	35.613	102.133	7.145	0.030	50360	67348
133.0	2508.2	35.570	102.206	7.370	0.025	51961	68793
134.0	2555.7	35.527	102.278	7.603	0.022	53601	70264
135.0	2604.2	35.483	102.352	7.844	0.018	55281	71761
136.0	2653.6	35.436	102.425	8.095	0.015	57002	73285
137.0	2704.3	35.385	102.494	8.356	0.013	58764	74836
138.0	2756.0	35.332	102.565	8.627	0.010	60568	76415
139.0	2808.9	35.277	102.633	8.910	0.008	62415	78022
140.0	2863.0	35.224	102.703	9.208	0.007	64306	79658
IECØ							
140.220	2875.1	35.213	102.714	9.276	0.006	64727	80024

TABLE XIII
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL M/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES N/CM SQ	RANGE M	ALTITUDE M
141.0	2903.1	35.154	102.755	9.466	0.005	66239	81320
142.0	2929.1	35.065	102.796	9.686	0.004	68198	82996
143.0	2954.2	34.980	102.835	9.778	0.003	70179	84684
144.0	2979.4	34.895	102.872	9.869	0.002	72182	86382
145.0	3004.7	34.813	102.911	9.961	0.002	74208	88090
ØECØ							
145.560	3018.8	34.769	102.926	10.013	0.001	75347	89053
146.0	3022.2	34.722	102.942	10.024	0.001	76254	89809
147.0	3018.8	34.599	102.956	9.885	0.001	78307	91526
148.0	3014.5	34.472	102.969	9.733	0.001	80359	93235
S-IV ENGINE START							
148.120	3014.1	34.459	102.965	9.715	0.001	80601	93440
149.0	3010.1	34.347	102.982	9.587	0.000	82411	94936
150.0	3006.8	34.221	102.995	9.451	0.000	84462	96630
155.0	3013.0	33.642	103.078	8.727	0.000	94768	105025
160.0	3020.3	33.072	103.163	7.832	0.000	105170	113308
GUIDANCE INITIATION							
163.860	3026.8	32.638	103.227	7.116	0.000	113266	119633
165.0	3028.9	32.511	103.246	6.807	0.000	115668	121489
170.0	3038.0	31.974	103.367	5.739	0.000	126264	129572
175.0	3047.1	31.459	103.555	5.066	0.000	136955	137561
180.0	3057.1	30.940	103.733	4.596	0.000	147742	145458
185.0	3067.9	30.412	103.895	4.279	0.000	158627	153261
190.0	3079.5	29.883	104.039	4.076	0.000	169616	160971
195.0	3091.8	29.355	104.171	3.958	0.000	180709	168587
200.0	3105.0	28.835	104.293	3.883	0.000	191910	176111
205.0	3118.9	28.313	104.404	3.821	0.000	203220	183544
210.0	3133.5	27.795	104.507	3.767	0.000	214641	190885
215.0	3148.8	27.278	104.604	3.735	0.000	226176	198137
220.0	3164.9	26.767	104.695	3.706	0.000	237827	205298
225.0	3181.8	26.258	104.781	3.680	0.000	249596	212371

TABLE XIII
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL M/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES N/CM SQ	RANGE M	ALTITUDE M
230.0	3199.5	25.748	104.865	3.657	0.000	261487	219355
235.0	3217.8	25.242	104.945	3.636	0.000	273501	226250
240.0	3237.0	24.740	105.023	3.621	0.000	285641	233058
245.0	3256.8	24.241	105.100	3.613	0.000	297909	239777
250.0	3277.3	23.746	105.175	3.606	0.000	310307	246409
255.0	3298.4	23.255	105.251	3.601	0.000	322837	252954
260.0	3320.4	22.766	105.326	3.597	0.000	335502	259411
265.0	3343.0	22.283	105.402	3.595	0.000	348304	265781
270.0	3366.4	21.802	105.478	3.595	0.000	361245	272065
275.0	3390.6	21.326	105.554	3.596	0.000	374328	278262
280.0	3415.4	20.856	105.632	3.598	0.000	387556	284374
285.0	3441.0	20.389	105.711	3.602	0.000	400930	290399
290.0	3467.4	19.927	105.791	3.608	0.000	414453	296339
295.0	3494.6	19.469	105.872	3.616	0.000	428129	302194
300.0	3522.6	19.016	105.954	3.628	0.000	441959	307963
305.0	3551.4	18.569	106.038	3.641	0.000	455946	313648
310.0	3581.0	18.126	106.122	3.656	0.000	470094	319248
315.0	3611.4	17.688	106.208	3.671	0.000	484406	324764
320.0	3642.6	17.256	106.296	3.688	0.000	498883	330196
325.0	3674.9	16.830	106.384	3.706	0.000	513530	335544
330.0	3707.8	16.407	106.474	3.725	0.000	528349	340810
335.0	3741.6	15.990	106.565	3.746	0.000	543344	345991
340.0	3776.2	15.578	106.656	3.767	0.000	558517	351090
345.0	3811.7	15.172	106.749	3.790	0.000	573872	356106
350.0	3848.0	14.771	106.842	3.814	0.000	589411	361039
355.0	3885.3	14.373	106.937	3.839	0.000	605138	365888
360.0	3923.4	13.981	107.031	3.865	0.000	621057	370655
365.0	3962.3	13.595	107.127	3.892	0.000	637171	375339
370.0	4002.1	13.215	107.224	3.920	0.000	653482	379940
375.0	4042.8	12.838	107.320	3.949	0.000	669994	384458
380.0	4084.4	12.466	107.418	3.980	0.000	686711	388893
385.0	4126.9	12.100	107.518	4.011	0.000	703636	393244
390.0	4170.5	11.739	107.616	4.044	0.000	720774	397513
395.0	4215.0	11.383	107.716	4.079	0.000	738127	401698
400.0	4260.4	11.034	107.816	4.117	0.000	755700	405801
405.0	4306.9	10.690	107.917	4.156	0.000	773497	409820
410.0	4354.4	10.350	108.018	4.196	0.000	791522	413757
415.0	4402.9	10.016	108.121	4.237	0.000	809779	417610
420.0	4452.5	9.685	108.223	4.280	0.000	828272	421380
425.0	4503.1	9.360	108.326	4.323	0.000	847005	425066

TABLE XIII
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL M/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES N/CM SQ	RANGE M	ALTITUDE M
430.0	4554.8	9.041	108.430	4.368	0.000	865984	428669
435.0	4607.7	8.727	108.534	4.414	0.000	885212	432188
440.0	4661.7	8.418	108.640	4.462	0.000	904695	435624
445.0	4716.7	8.113	108.746	4.510	0.000	924435	438979
450.0	4772.7	7.813	108.852	4.560	0.000	944439	442247
455.0	4829.9	7.518	108.959	4.611	0.000	964711	445430
460.0	4888.3	7.225	109.066	4.663	0.000	985256	448528
465.0	4947.8	6.939	109.175	4.717	0.000	1006078	451540
470.0	5008.6	6.656	109.283	4.772	0.000	1027183	454466
475.0	5070.7	6.379	109.391	4.828	0.000	1048577	457306
480.0	5134.1	6.105	109.501	4.886	0.000	1070265	460059
485.0	5198.9	5.837	109.612	4.945	0.000	1092252	462725
490.0	5265.1	5.573	109.723	5.006	0.000	1114546	465304
495.0	5332.8	5.313	109.835	5.069	0.000	1137153	467796
500.0	5401.8	5.059	109.947	5.133	0.000	1160078	470199
505.0	5472.3	4.808	110.061	5.198	0.000	1183327	472514
510.0	5544.4	4.562	110.175	5.266	0.000	1206909	474741
515.0	5617.9	4.320	110.289	5.335	0.000	1230829	476879
520.0	5693.3	4.082	110.404	5.406	0.000	1255095	478927
525.0	5770.1	3.848	110.520	5.479	0.000	1279714	480884
530.0	5848.7	3.619	110.637	5.553	0.000	1304693	482752
535.0	5929.1	3.393	110.755	5.630	0.000	1330041	484527
540.0	6011.3	3.171	110.873	5.709	0.000	1355765	486211
545.0	6095.4	2.952	110.992	5.789	0.000	1381875	487802
550.0	6181.2	2.737	111.111	5.872	0.000	1408377	489300
555.0	6269.3	2.525	111.232	5.957	0.000	1435283	490702
560.0	6359.2	2.316	111.353	6.044	0.000	1462599	492008
565.0	6451.5	2.111	111.475	6.134	0.000	1490338	493218
570.0	6546.2	1.911	111.597	6.227	0.000	1518509	494330
575.0	6643.0	1.711	111.721	6.321	0.000	1547124	495344
580.0	6742.5	1.515	111.845	6.419	0.000	1576192	496257
585.0	6844.5	1.322	111.969	6.520	0.000	1605727	497069
590.0	6949.0	1.131	112.096	6.624	0.000	1635739	497777
595.0	7056.1	0.941	112.223	6.730	0.000	1666241	498380
600.0	7166.0	0.755	112.351	6.840	0.000	1697246	498875
605.0	7278.8	0.572	112.480	6.953	0.000	1728766	499262
610.0	7394.8	0.389	112.609	7.069	0.000	1760816	499538
615.0	7513.9	0.207	112.740	7.190	0.000	1793411	499699
620.0	7636.8	0.027	112.871	7.314	0.000	1826565	499741
S-IV CUT OFF							
621.659	7678.5	-0.033	112.915	7.356	0.000	1837692	499728

TABLE XIII
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL M/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES N/CM SQ	RANGE M	ALTITUDE M
625.0	7681.7	-0.034	112.996	7.360	0.000	1860177	499690
630.0	7681.8	-0.029	113.118	7.360	0.000	1893828	499636
INSERTION							
631.659	7681.8	-0.027	113.159	7.360	0.000	1904994	499619

TABLE XIV BOOSTER FREE FLIGHT TRAJECTORY

Time (sec)	Earth-Fixed Position			Earth-Fixed Velocity				Altitude (ft)	Range (mm)
	XE (ft)	YE (ft)	ZE (ft)	DXE (ft/s)	DYE (ft/s)	DZE (ft/s)			
160	349605	367361	7	6827	5089	43	370225	56	
180	485854	463213	981	6801	4491	56	468731	78	
200	621649	547116	2205	6775	3897	66	556115	100	
220	756897	619169	3668	6748	3307	79	632460	121	
240	891554	679457	5361	6716	2723	92	697843	142	
260	1025578	728055	7280	6686	2139	102	752327	163	
280	1158929	765030	9406	6650	1558	112	795965	184	
300	1291566	790427	11739	6614	981	121	828796	204	
320	1423444	804285	14262	6575	404	131	850853	225	
340	1554525	806634	16965	6532	-171	141	862155	245	
360	1684766	797484	19842	6489	-745	148	862712	266	
380	1814125	776841	22884	6447	-1319	157	852526	287	
400	1942558	744702	26073	6398	-1896	164	831588	307	
420	2070021	701038	29399	6348	-2470	171	799879	328	
440	2196466	645829	32857	6296	-3051	177	757366	349	
460	2321848	579028	36433	6240	-3632	180	704007	370	
480	2446115	500578	40111	6184	-4216	187	639759	391	
500	2569214	410418	43887	6125	-4803	190	564557	412	
520	2691089	308464	47742	6063	-5394	194	478324	434	
540	2811682	194627	51666	5997	-5991	197	380980	456	
560	2930929	68805	55649	5928	-6591	200	272431	478	
580	3048053	-68280	59648	5692	-7005	197	153295	500	
600	3128797	-172514	62450	1522	-2192	56	62053	515	
620	3140703	-193357	62404	230	-659	-39	43221	518	
640	3143334	-205411	61423	66	-548	-46	31696	519	
660	3143800	-215352	60797	-7	-453	-26	21939	519	
680	3143203	-223728	60212	-43	-387	-20	13563	519	
700	3142298	-231021	59976	-46	-344	-7	6217	519	
718.9	3141307	-237159	59911	-62	-305	-3	0	519	

TABLE XV
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	CXE FT/S	DYE FT/S	DZE FT/S
FIRST MOTION						
0.080	0	105	0	0.	-0.	-0.
LIFTOFF SIGNAL						
0.280	0	105	0	0.0	2.2	-0.1
1.0	0	109	0	0.1	10.4	-0.3
2.0	0	126	-0	-0.0	22.2	-0.3
3.0	0	154	-0	-0.2	34.4	-0.3
4.0	0	194	-0	-0.5	46.8	-0.2
5.0	-0	247	-0	-0.8	59.5	-0.1
6.0	-1	313	-0	-1.1	72.4	-0.1
7.0	-2	392	-0	-1.3	85.6	-0.2
8.0	-4	484	-1	-1.5	99.0	-0.3
9.0	-5	590	-1	-1.7	112.7	-0.4
10.0	-7	710	-2	-1.8	126.7	-0.6
11.0	-10	843	-2	-1.9	140.9	-0.7
12.0	-12	991	-3	-2.0	155.5	-0.7
13.0	-14	1154	-4	-1.9	170.4	-0.7
14.0	-17	1332	-4	-1.8	185.7	-0.7
15.0	-19	1526	-5	-1.5	201.2	-0.6
16.0	-20	1735	-6	-0.9	217.1	-0.4
17.0	-21	1960	-6	-0.2	233.2	-0.2
18.0	-22	2201	-6	0.9	249.7	0.0
19.0	-20	2459	-6	2.3	266.4	0.2
20.0	-18	2734	-6	4.1	283.4	0.4
21.0	-12	3026	-5	6.4	300.7	0.6
22.0	-5	3335	-5	9.2	318.2	0.7
23.0	4	3662	-4	12.5	335.9	0.8
24.0	18	4007	-3	16.4	353.9	0.8
25.0	36	4370	-2	20.9	372.1	0.8
26.0	59	4751	-1	25.9	390.6	0.8
27.0	88	5151	-0	31.6	409.4	0.7
28.0	122	5570	-0	37.8	428.4	0.7
29.0	163	6008	0	44.6	447.8	0.7
30.0	210	6466	1	51.9	467.8	0.7

TABLE XV
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S
31.0	266	6944	2	59.7	487.9	0.8
32.0	329	7442	3	67.9	508.1	0.8
33.0	401	7960	4	76.5	528.7	0.7
34.0	481	8499	4	85.4	549.6	0.4
35.0	571	9059	4	94.7	570.8	-0.0
36.0	670	9641	4	104.4	592.3	-0.4
37.0	779	10244	4	114.7	613.9	-0.6
38.0	899	10869	3	125.5	635.9	-0.5
39.0	1029	11516	3	136.8	658.2	-0.3
40.0	1171	12185	3	148.3	680.8	0.0
41.0	1325	12878	3	159.9	703.8	0.1
42.0	1490	13593	3	171.7	727.2	0.0
43.0	1668	14332	3	183.6	750.9	-0.3
44.0	1857	15095	3	195.9	775.0	-0.7
45.0	2059	15882	2	208.8	799.3	-1.1
46.0	2274	16694	0	222.2	823.8	-1.7
47.0	2502	17530	-1	236.2	848.6	-2.6
48.0	2745	18391	-4	250.4	873.7	-3.9
49.0	3002	19278	-8	265.0	899.0	-5.5
50.0	3274	20190	-14	279.9	924.6	-7.1
51.0	3561	21127	-22	295.4	950.2	-8.5
52.0	3864	22090	-31	311.5	975.6	-9.4
53.0	4183	23078	-41	328.3	1000.6	-9.9
MACH ONE						
53.208	4252	23287	-43	331.9	1005.7	-10.0
54.0	4520	24091	-51	345.8	1025.1	-10.0
55.0	4874	25129	-61	363.7	1049.1	-10.0
56.0	5246	26190	-70	381.8	1072.9	-10.0
57.0	5637	27275	-80	400.3	1096.9	-9.9
58.0	6046	28384	-90	419.2	1121.2	-9.8
59.0	6474	29518	-100	438.7	1146.0	-9.4
60.0	6922	30677	-109	459.1	1171.5	-8.8
61.0	7392	31861	-117	480.5	1197.5	-8.4
62.0	7883	33072	-126	503.1	1224.0	-8.8
63.0	8397	34310	-135	526.7	1251.2	-10.3
64.0	8935	35575	-146	551.0	1279.1	-12.5
65.0	9498	36869	-160	576.1	1307.7	-14.9

TABLE XV
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S
MAXIMUM DYNAMIC PRESSURE						
66.000	10086	38191	-176	601.6	1337.2	-17.1
67.0	10700	39544	-194	627.6	1367.5	-18.7
68.0	11341	40927	-213	654.3	1398.4	-20.1
69.0	12008	42341	-234	681.9	1430.0	-21.6
70.0	12704	43788	-256	710.5	1462.1	-23.2
71.0	13428	45267	-280	740.2	1494.9	-24.8
72.0	14183	46778	-305	771.1	1528.3	-25.8
73.0	14970	48324	-331	803.0	1562.3	-26.1
74.0	15789	49904	-357	836.0	1597.1	-26.1
75.0	16641	51519	-383	869.9	1632.5	-25.8
76.0	17528	53170	-409	904.7	1668.8	-25.6
77.0	18450	54857	-434	940.6	1705.8	-25.3
78.0	19408	56582	-459	977.5	1743.6	-24.9
79.0	20404	58346	-484	1015.5	1782.2	-24.3
80.0	21438	60148	-507	1054.6	1821.5	-23.6
81.0	22512	61990	-531	1095.1	1861.5	-22.9
82.0	23628	63872	-553	1137.1	1902.1	-22.1
83.0	24786	65795	-575	1180.6	1943.3	-21.3
84.0	25989	67759	-595	1225.7	1985.1	-20.4
85.0	27237	69766	-615	1272.4	2027.4	-19.6
86.0	28533	71815	-634	1320.5	2070.3	-18.8
87.0	29878	73908	-653	1370.2	2113.6	-18.0
88.0	31273	76043	-670	1421.3	2157.4	-17.5
89.0	32720	78223	-688	1474.1	2201.5	-17.0
90.0	34221	80448	-704	1528.6	2246.0	-16.6
91.0	35777	82716	-721	1584.8	2290.8	-16.2
92.0	37390	85030	-736	1642.8	2335.9	-15.7
93.0	39062	87389	-752	1702.4	2381.3	-15.3
94.0	40798	89789	-769	1763.7	2427.1	-14.7
95.0	42597	92233	-786	1826.6	2473.2	-14.2
96.0	44459	94723	-803	1891.1	2519.7	-13.6
97.0	46386	97262	-818	1957.2	2566.5	-13.1
98.0	48377	99852	-831	2024.7	2613.8	-12.6
99.0	50435	102490	-844	2093.7	2661.4	-12.2
100.0	52564	105176	-856	2164.4	2709.4	-11.9
101.0	54764	107910	-867	2236.7	2757.8	-11.4

TABLE XV
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S
102.0	57038	110693	-878	2310.6	2806.6	-10.9
103.0	59386	113525	-889	2386.2	2855.9	-10.3
104.0	61810	116406	-899	2463.3	2905.6	-9.6
105.0	64312	119337	-908	2541.8	2955.9	-9.1
106.0	66894	122319	-917	2621.9	3006.6	-8.7
107.0	69556	125352	-925	2703.5	3058.1	-8.2
108.0	72301	128436	-933	2786.6	3110.3	-7.6
109.0	75130	131573	-941	2871.3	3163.1	-7.0
110.0	78044	134764	-947	2957.6	3216.7	-6.2
111.0	81045	138008	-953	3045.5	3271.0	-5.5
112.0	84136	141307	-958	3134.9	3326.0	-4.8
113.0	87316	144661	-963	3225.9	3381.7	-4.3
114.0	90588	148072	-967	3318.5	3438.2	-3.7
115.0	93953	151539	-970	3412.8	3495.7	-3.0
116.0	97414	155064	-973	3508.7	3554.1	-2.3
117.0	100971	158648	-975	3606.2	3613.6	-1.6
118.0	104627	162293	-976	3705.3	3674.1	-0.8
119.0	108383	165998	-976	3806.0	3735.8	0.1
120.0	112240	169766	-976	3908.5	3798.6	1.1
121.0	116201	173597	-974	4012.6	3862.6	2.1
122.0	120266	177492	-972	4118.5	3927.8	3.1
123.0	124439	181453	-968	4226.3	3994.2	4.1
124.0	128720	185482	-963	4335.9	4062.0	5.0
125.0	133111	189579	-958	4447.4	4131.2	6.0
126.0	137616	193746	-952	4560.8	4201.7	6.9
127.0	142234	197984	-944	4676.4	4273.8	7.8
128.0	146970	202294	-936	4793.9	4347.3	8.8
129.0	151824	206680	-927	4913.6	4422.5	9.9
130.0	156798	211141	-916	5035.6	4499.3	11.1
131.0	161896	215680	-905	5160.0	4577.6	12.3
132.0	167120	220297	-892	5286.9	4657.5	13.7
133.0	172472	224996	-878	5416.5	4738.9	14.9
134.0	177955	229777	-862	5548.9	4821.7	16.1
135.0	183574	234641	-844	5684.2	4906.2	17.6
136.0	189331	239590	-825	5822.5	4991.7	19.2
137.0	195229	244626	-804	5964.7	5078.6	20.5
138.0	201269	249749	-782	6110.1	5166.9	22.2
139.0	207457	254962	-758	6259.0	5256.5	23.6
140.0	213796	260265	-733	6411.6	5348.6	25.3
IECØ						
140.220	215209	261451	-732	6445.5	5369.2	25.2

TABLE XV
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S
141.0	220278	265654	-707	6527.9	5411.8	26.5
142.0	226849	271084	-679	6608.0	5445.8	27.8
143.0	233498	276547	-651	6685.6	5478.3	29.0
144.0	240224	282043	-622	6763.4	5510.7	29.9
145.0	247029	287572	-591	6841.5	5543.6	31.2
ØECØ						
145.560	250860	290685	-582	6885.0	5562.0	31.2
146.0	253907	293131	-560	6899.4	5560.5	32.3
147.0	260809	298680	-528	6903.6	5534.4	33.1
148.0	267714	304202	-496	6905.4	5506.1	33.8
S-IV ENGINE START						
148.120	268528	304864	-501	6905.6	5503.2	33.1
149.0	274619	309696	-463	6907.0	5478.0	34.5
150.0	281527	315161	-429	6911.1	5451.6	35.2
155.0	316278	342219	-251	6989.9	5367.9	38.7
160.0	351435	368844	-48	7070.1	5286.2	42.4
GUIDANCE INITIATION						
163.860	378848	389129	120	7133.4	5224.6	45.0
165.0	386991	395075	171	7152.3	5206.7	45.8
170.0	422956	420915	418	7233.3	5130.3	55.0
175.0	459319	446381	740	7312.3	5056.0	74.4
180.0	496082	471474	1158	7393.4	4981.2	92.6
185.0	533257	496190	1662	7476.9	4905.0	108.3
190.0	570854	520524	2238	7562.1	4828.5	121.7
195.0	608880	544476	2876	7648.7	4752.0	133.4
200.0	647343	568047	3570	7736.5	4676.3	143.7
205.0	686248	591238	4311	7826.1	4600.0	152.4
210.0	725604	614048	5092	7916.6	4523.8	160.0
215.0	765417	636476	5909	8008.8	4447.2	166.5
220.0	805695	658521	6756	8102.4	4370.8	172.2
225.0	846444	680184	7629	8197.7	4294.3	177.1

TABLE XV
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S
230.0	887674	701462	8526	8294.7	4217.0	181.6
235.0	929393	722353	9444	8393.0	4139.3	185.4
240.0	971608	742855	10380	8492.9	4061.4	188.9
245.0	1014325	762967	11333	8594.1	3983.1	192.1
250.0	1057551	782686	12301	8696.6	3904.3	195.1
255.0	1101293	802010	13284	8800.5	3825.1	198.0
260.0	1145559	820936	14281	8906.0	3745.1	200.8
265.0	1190355	839462	15293	9012.8	3664.9	203.8
270.0	1235690	857584	16319	9121.5	3584.0	206.8
275.0	1281572	875301	17360	9231.6	3502.4	209.6
280.0	1328007	892608	18416	9342.9	3420.6	212.7
285.0	1375004	909504	19488	9456.0	3337.9	216.0
290.0	1422570	925986	20576	9570.8	3254.6	219.3
295.0	1470714	942049	21681	9687.2	3170.6	222.9
300.0	1519445	957691	22805	9805.4	3086.0	226.6
305.0	1568770	972909	23948	9925.3	3000.8	230.6
310.0	1618700	987698	25111	10047.0	2914.6	234.6
315.0	1669243	1002054	26295	10170.4	2827.7	238.9
320.0	1720407	1015975	27501	10295.8	2740.4	243.5
325.0	1772205	1029456	28731	10423.4	2652.1	248.3
330.0	1824645	1042494	29985	10552.6	2562.7	253.3
335.0	1877735	1055082	31264	10683.8	2472.3	258.4
340.0	1931485	1067215	32568	10816.7	2381.0	263.6
345.0	1985905	1078890	33900	10951.6	2288.7	269.0
350.0	2041004	1090100	35259	11088.4	2195.2	274.6
355.0	2096793	1100839	36647	11227.4	2100.2	280.4
360.0	2153281	1111100	38063	11368.3	2004.2	286.1
365.0	2210478	1120879	39509	11510.9	1907.2	292.1
370.0	2268393	1130169	40985	11655.6	1808.7	298.3
375.0	2327037	1138962	42492	11802.4	1708.6	304.4
380.0	2386421	1147253	44030	11951.4	1607.1	310.8
385.0	2446554	1155030	45600	12102.3	1504.0	317.5
390.0	2507449	1162290	47203	12255.9	1399.7	323.8
395.0	2569116	1169024	48839	12411.4	1293.7	330.6
400.0	2631567	1175225	50510	12569.2	1186.4	337.3
405.0	2694813	1180885	52213	12729.6	1077.4	344.3
410.0	2758867	1185996	53952	12892.1	966.4	351.1
415.0	2823740	1190547	55725	13057.4	853.9	358.3
420.0	2889445	1194529	57535	13224.9	738.9	365.5
425.0	2955994	1197932	59380	13395.0	622.3	372.7

TABLE XV
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S
430.0	3023400	1200747	61262	13567.6	503.8	379.9
435.0	3091677	1202965	63180	13743.2	383.1	387.5
440.0	3160837	1204574	65137	13921.1	260.4	395.1
445.0	3230891	1205578	67132	14101.4	135.3	402.9
450.0	3301854	1205937	69166	14284.2	7.8	410.7
455.0	3373738	1205652	71239	14469.6	-122.3	418.5
460.0	3446555	1204709	73351	14657.6	-255.3	426.5
465.0	3520319	1203096	75504	14848.6	-390.5	434.6
470.0	3595045	1200799	77697	15042.2	-528.9	442.7
475.0	3670748	1197803	79931	15239.1	-669.8	450.7
480.0	3747442	1194096	82205	15439.1	-813.7	459.0
485.0	3825144	1189662	84522	15642.3	-960.5	467.5
490.0	3903871	1184486	86880	15848.9	-1110.7	476.0
495.0	3983640	1178551	89282	16058.9	-1264.0	484.8
500.0	4064465	1171842	91728	16271.8	-1420.5	493.5
505.0	4146364	1164341	94218	16488.4	-1580.6	502.4
510.0	4229356	1156031	96752	16708.6	-1744.2	511.4
515.0	4313457	1146892	99331	16932.1	-1911.7	520.5
520.0	4398686	1136906	101956	17159.9	-2083.4	529.6
525.0	4485063	1126052	104627	17391.2	-2258.8	538.9
530.0	4572605	1114311	107345	17626.4	-2438.7	548.3
535.0	4661335	1101659	110111	17865.7	-2622.8	557.9
540.0	4751270	1088074	112924	18109.2	-2812.0	567.4
545.0	4842433	1073531	115785	18356.7	-3006.0	577.1
550.0	4934844	1058007	118695	18608.3	-3205.0	587.0
555.0	5028525	1041472	121655	18864.8	-3409.6	597.0
560.0	5123498	1023901	124665	19125.3	-3619.9	607.0
565.0	5219789	1005265	127725	19391.6	-3835.7	617.1
570.0	5317423	985534	130836	19663.1	-4057.4	627.2
575.0	5416427	964678	133998	19939.0	-4286.0	637.6
580.0	5516826	942662	137212	20221.3	-4521.5	648.1
585.0	5618650	919452	140479	20508.9	-4764.1	658.5
590.0	5721924	895010	143798	20801.4	-5014.0	669.4
595.0	5826675	869297	147173	21099.7	-5272.5	680.4
600.0	5932932	842273	150602	21403.9	-5538.3	691.4
605.0	6040726	813899	154087	21714.1	-5812.6	702.6
610.0	6150085	784129	157628	22030.7	-6097.0	713.8
615.0	6261044	752911	161225	22353.9	-6391.3	725.1
620.0	6373630	720191	164878	22684.9	-6695.8	736.5

S-IV CUT OFF

621.659	6411353	708995	166103	22796.9	-6799.8	740.2
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TABLE XV
EARTH-FIXED PLUMBLINE POSITIONS AND VELOCITIES

TIME SEC	XE FT	YE FT	ZE FT	DXE FT/S	DYE FT/S	DZE FT/S
625.0	6487509	686129	168583	22782.5	-6883.6	743.9
630.0	6601334	651418	172319	22746.9	-7001.6	749.6
INSERTION						
631.659	6639062	639770	173564	22734.8	-7040.8	751.5

TABLE XVI
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S
FIRST MOTION						
0.080	787.556	-2923.790	1635.232	1295.5	348.9	0.
LIFTOFF SIGNAL						
0.280	787.599	-2923.779	1635.232	1296.0	347.1	1.1
1.0	787.752	-2923.738	1635.232	1298.0	340.3	5.2
2.0	787.966	-2923.683	1635.234	1300.5	330.4	10.9
3.0	788.180	-2923.629	1635.236	1303.1	320.2	16.7
4.0	788.395	-2923.577	1635.239	1305.6	309.6	22.6
5.0	788.610	-2923.527	1635.243	1308.2	298.9	28.7
6.0	788.826	-2923.479	1635.249	1310.9	288.0	34.9
7.0	789.042	-2923.433	1635.255	1313.7	276.9	41.3
8.0	789.258	-2923.388	1635.262	1316.5	265.7	47.9
9.0	789.475	-2923.345	1635.271	1319.5	254.2	54.6
10.0	789.692	-2923.304	1635.280	1322.6	242.5	61.4
11.0	789.910	-2923.265	1635.291	1325.8	230.5	68.3
12.0	790.129	-2923.228	1635.303	1329.1	218.3	75.4
13.0	790.347	-2923.193	1635.316	1332.5	205.8	82.5
14.0	790.567	-2923.161	1635.330	1336.1	192.9	89.7
15.0	790.787	-2923.130	1635.345	1340.0	179.8	96.9
16.0	791.008	-2923.101	1635.362	1344.1	166.5	104.2
17.0	791.229	-2923.075	1635.380	1348.5	152.9	111.6
18.0	791.452	-2923.051	1635.399	1353.3	139.0	119.0
19.0	791.675	-2923.029	1635.419	1358.5	125.0	126.5
20.0	791.899	-2923.010	1635.440	1364.1	110.9	134.1
21.0	792.124	-2922.993	1635.463	1370.3	96.6	141.6
22.0	792.350	-2922.978	1635.487	1377.0	82.1	149.3
23.0	792.577	-2922.966	1635.512	1384.3	67.6	156.9
24.0	792.805	-2922.956	1635.539	1392.2	53.0	164.6
25.0	793.035	-2922.948	1635.566	1400.7	38.2	172.3
26.0	793.266	-2922.943	1635.595	1409.9	23.4	180.0
27.0	793.499	-2922.941	1635.626	1419.7	8.3	187.7
28.0	793.733	-2922.941	1635.657	1430.1	-6.9	195.4
29.0	793.970	-2922.943	1635.690	1441.2	-22.3	203.2
30.0	794.208	-2922.948	1635.724	1452.8	-38.1	211.0

TABLE XVI
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S
31.0	794.448	-2922.956	1635.759	1465.0	-54.1	218.8
32.0	794.690	-2922.966	1635.796	1477.6	-69.9	226.6
33.0	794.934	-2922.979	1635.834	1490.7	-86.1	234.6
34.0	795.180	-2922.994	1635.873	1504.2	-102.3	242.8
35.0	795.429	-2923.012	1635.914	1518.1	-118.7	251.1
36.0	795.680	-2923.033	1635.956	1532.5	-135.3	259.5
37.0	795.933	-2923.057	1635.999	1547.5	-152.1	267.7
38.0	796.189	-2923.083	1636.044	1563.1	-169.1	275.7
39.0	796.448	-2923.113	1636.090	1579.1	-186.5	283.5
40.0	796.709	-2923.145	1636.137	1595.5	-204.1	291.4
41.0	796.973	-2923.180	1636.186	1612.0	-222.0	299.7
42.0	797.239	-2923.218	1636.236	1628.8	-240.0	308.3
43.0	797.509	-2923.259	1636.288	1645.9	-258.2	317.2
44.0	797.781	-2923.303	1636.341	1663.5	-276.6	326.2
45.0	798.056	-2923.350	1636.395	1681.6	-295.1	335.3
46.0	798.334	-2923.400	1636.451	1700.4	-313.6	344.4
47.0	798.616	-2923.453	1636.508	1719.8	-332.1	353.8
48.0	798.900	-2923.510	1636.567	1739.6	-350.6	363.6
49.0	799.188	-2923.569	1636.628	1759.8	-369.2	373.8
50.0	799.479	-2923.631	1636.690	1780.4	-387.8	384.0
51.0	799.774	-2923.697	1636.755	1801.5	-406.5	393.9
52.0	800.072	-2923.765	1636.820	1823.1	-425.2	403.2
53.0	800.374	-2923.837	1636.887	1845.3	-443.7	411.7
MACH ONE						
53.208	800.437	-2923.852	1636.901	1850.0	-447.5	413.4
54.0	800.679	-2923.911	1636.956	1867.9	-461.8	419.5
55.0	800.989	-2923.989	1637.025	1890.8	-479.6	426.9
56.0	801.302	-2924.069	1637.096	1913.9	-497.2	434.1
57.0	801.618	-2924.152	1637.168	1937.4	-514.8	441.3
58.0	801.939	-2924.239	1637.242	1961.3	-532.7	448.5
59.0	802.264	-2924.328	1637.316	1986.0	-551.1	455.6
60.0	802.593	-2924.420	1637.392	2011.6	-570.0	462.7
61.0	802.926	-2924.516	1637.468	2038.3	-589.1	469.9
62.0	803.264	-2924.614	1637.546	2066.4	-608.1	477.8
63.0	803.606	-2924.716	1637.626	2095.8	-627.0	486.6
64.0	803.953	-2924.821	1637.707	2126.2	-645.9	496.2
65.0	804.306	-2924.928	1637.789	2157.4	-665.3	506.3

TABLE XVI
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S
MAXIMUM DYNAMIC PRESSURE						
66.000	804.663	-2925.040	1637.873	2189.3	-685.5	516.4
67.0	805.026	-2925.154	1637.959	2221.7	-706.5	526.3
68.0	805.395	-2925.272	1638.047	2255.0	-728.1	536.2
69.0	805.768	-2925.394	1638.136	2289.2	-750.1	546.3
70.0	806.148	-2925.519	1638.226	2324.6	-772.3	556.6
71.0	806.533	-2925.648	1638.319	2361.2	-795.0	566.8
72.0	806.925	-2925.781	1638.413	2399.0	-818.3	576.5
73.0	807.323	-2925.918	1638.509	2438.0	-842.3	585.8
74.0	807.727	-2926.059	1638.606	2478.0	-867.0	594.9
75.0	808.139	-2926.204	1638.705	2519.1	-892.2	603.9
76.0	808.557	-2926.353	1638.805	2561.3	-918.0	613.1
77.0	808.982	-2926.506	1638.906	2604.6	-944.3	622.4
78.0	809.414	-2926.664	1639.010	2649.1	-971.1	631.7
79.0	809.853	-2926.826	1639.114	2694.8	-998.6	641.0
80.0	810.301	-2926.992	1639.221	2741.8	-1026.6	650.2
81.0	810.756	-2927.164	1639.329	2790.3	-1055.0	659.5
82.0	811.219	-2927.340	1639.438	2840.3	-1083.7	668.8
83.0	811.691	-2927.521	1639.549	2892.0	-1112.7	677.8
84.0	812.171	-2927.706	1639.661	2945.3	-1142.0	686.8
85.0	812.660	-2927.897	1639.775	3000.3	-1171.5	695.7
86.0	813.159	-2928.092	1639.890	3056.8	-1201.2	704.5
87.0	813.666	-2928.292	1640.007	3114.9	-1231.1	713.3
88.0	814.184	-2928.497	1640.125	3174.6	-1261.0	722.1
89.0	814.711	-2928.707	1640.245	3235.9	-1291.0	730.8
90.0	815.249	-2928.922	1640.366	3299.1	-1321.0	739.3
91.0	815.797	-2929.142	1640.488	3363.9	-1350.9	747.5
92.0	816.356	-2929.367	1640.612	3430.5	-1380.9	755.5
93.0	816.926	-2929.597	1640.737	3498.8	-1411.0	763.3
94.0	817.508	-2929.831	1640.863	3568.7	-1441.1	770.8
95.0	818.102	-2930.069	1640.990	3640.4	-1471.3	778.0
96.0	818.707	-2930.313	1641.118	3713.6	-1501.5	785.0
97.0	819.325	-2930.562	1641.248	3788.5	-1531.9	791.9
98.0	819.955	-2930.816	1641.379	3864.8	-1562.3	798.8
99.0	820.597	-2931.076	1641.511	3942.7	-1592.7	805.5
100.0	821.253	-2931.341	1641.644	4022.3	-1623.3	812.0
101.0	821.921	-2931.611	1641.778	4103.5	-1654.0	818.3

TABLE XVI
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S
102.0	822.603	-2931.885	1641.914	4186.5	-1684.8	824.4
103.0	823.299	-2932.165	1642.050	4271.1	-1715.8	830.3
104.0	824.009	-2932.450	1642.187	4357.3	-1746.9	835.9
105.0	824.734	-2932.740	1642.325	4445.0	-1778.2	841.6
106.0	825.472	-2933.036	1642.464	4534.3	-1809.7	847.3
107.0	826.226	-2933.336	1642.604	4625.3	-1841.6	852.9
108.0	826.995	-2933.642	1642.745	4717.9	-1873.9	858.5
109.0	827.779	-2933.953	1642.887	4812.2	-1906.6	863.9
110.0	828.579	-2934.270	1643.029	4908.1	-1939.6	869.2
111.0	829.395	-2934.592	1643.173	5005.8	-1973.1	874.5
112.0	830.227	-2934.919	1643.317	5105.2	-2006.8	879.9
113.0	831.075	-2935.253	1643.463	5206.2	-2040.9	885.4
114.0	831.941	-2935.591	1643.609	5309.1	-2075.4	890.8
115.0	832.823	-2935.936	1643.756	5413.7	-2110.5	896.2
116.0	833.723	-2936.286	1643.904	5520.1	-2146.2	901.8
117.0	834.640	-2936.643	1644.053	5628.4	-2182.5	907.4
118.0	835.576	-2937.005	1644.203	5738.4	-2219.5	913.1
119.0	836.529	-2937.373	1644.353	5850.2	-2257.3	918.9
120.0	837.501	-2937.748	1644.505	5964.0	-2295.8	924.7
121.0	838.493	-2938.129	1644.658	6079.7	-2335.1	930.8
122.0	839.503	-2938.517	1644.812	6197.4	-2375.1	937.0
123.0	840.533	-2938.911	1644.966	6317.2	-2415.9	943.4
124.0	841.582	-2939.312	1645.122	6439.0	-2457.5	950.0
125.0	842.652	-2939.720	1645.279	6563.1	-2500.0	956.9
126.0	843.743	-2940.135	1645.437	6689.4	-2543.4	964.0
127.0	844.854	-2940.557	1645.597	6818.0	-2587.7	971.4
128.0	845.987	-2940.987	1645.757	6949.0	-2632.9	978.9
129.0	847.142	-2941.424	1645.919	7082.4	-2679.3	986.7
130.0	848.319	-2941.869	1646.082	7218.3	-2726.7	994.7
131.0	849.518	-2942.322	1646.246	7357.0	-2775.1	1002.7
132.0	850.741	-2942.783	1646.412	7498.4	-2824.5	1010.9
133.0	851.987	-2943.252	1646.579	7642.8	-2874.7	1019.3
134.0	853.257	-2943.729	1646.748	7790.3	-2925.7	1027.7
135.0	854.552	-2944.215	1646.917	7941.0	-2977.8	1035.9
136.0	855.872	-2944.709	1647.088	8094.7	-3030.3	1044.0
137.0	857.218	-2945.213	1647.260	8252.6	-3083.3	1052.1
138.0	858.590	-2945.725	1647.434	8413.9	-3137.1	1059.8
139.0	859.989	-2946.245	1647.609	8579.0	-3191.4	1067.5
140.0	861.415	-2946.775	1647.785	8748.0	-3247.4	1075.3
IECØ						
140.220	861.733	-2946.894	1647.825	8785.8	-3259.7	1077.6

TABLE XVI
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S
141.0	862.868	-2947.314	1647.962	8875.5	-3283.8	1078.1
142.0	864.336	-2947.856	1648.140	8961.1	-3300.7	1075.1
143.0	865.818	-2948.400	1648.316	9043.9	-3316.6	1071.9
144.0	867.313	-2948.948	1648.492	9126.9	-3332.2	1068.9
145.0	868.823	-2949.497	1648.668	9210.4	-3348.3	1065.7
ØECØ						
145.560	869.672	-2949.806	1648.768	9256.9	-3357.0	1064.7
146.0	870.345	-2950.050	1648.843	9270.6	-3353.8	1059.7
147.0	871.871	-2950.600	1649.017	9268.8	-3330.2	1045.7
148.0	873.396	-2951.146	1649.188	9264.2	-3305.1	1031.1
S-IV ENGINE START						
148.120	873.577	-2951.211	1649.210	9263.9	-3302.1	1030.3
149.0	874.920	-2951.688	1649.357	9259.5	-3280.2	1016.7
150.0	876.444	-2952.226	1649.523	9257.6	-3256.5	1002.6
155.0	884.086	-2954.871	1650.325	9315.6	-3169.9	941.7
160.0	891.777	-2957.443	1651.074	9375.3	-3084.9	881.3
GUIDANCE INITIATION						
163.860	897.748	-2959.382	1651.619	9423.2	-3020.2	835.3
165.0	899.518	-2959.947	1651.775	9437.5	-3001.3	821.7
170.0	907.309	-2962.384	1652.425	9498.5	-2923.4	759.0
175.0	915.149	-2964.760	1653.022	9556.6	-2852.7	689.2
180.0	923.038	-2967.078	1653.560	9616.8	-2780.6	619.6
185.0	930.977	-2969.336	1654.041	9679.2	-2705.6	550.8
190.0	938.968	-2971.531	1654.467	9743.3	-2629.0	483.5
195.0	947.013	-2973.662	1654.838	9808.9	-2551.1	417.3
200.0	955.112	-2975.729	1655.154	9875.9	-2472.9	352.5
205.0	963.267	-2977.731	1655.418	9944.7	-2393.0	288.3
210.0	971.479	-2979.668	1655.629	10014.4	-2312.6	224.9
215.0	979.749	-2981.537	1655.788	10085.7	-2230.8	161.7
220.0	988.078	-2983.339	1655.896	10158.3	-2148.6	99.3
225.0	996.468	-2985.073	1655.952	10232.6	-2065.5	36.8

TABLE XVI
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S
230.0	1004.919	-2986.738	1655.956	10308.4	-1981.2	-26.0
235.0	1013.433	-2988.333	1655.909	10385.2	-1896.0	-88.7
240.0	1022.012	-2989.858	1655.810	10463.5	-1810.0	-151.6
245.0	1030.655	-2991.312	1655.659	10542.9	-1723.3	-214.7
250.0	1039.363	-2992.695	1655.457	10623.4	-1635.8	-278.2
255.0	1048.139	-2994.004	1655.201	10705.0	-1547.7	-342.1
260.0	1056.982	-2995.241	1654.893	10787.9	-1458.4	-406.7
265.0	1065.894	-2996.405	1654.532	10871.8	-1368.8	-471.8
270.0	1074.875	-2997.494	1654.117	10957.4	-1278.2	-537.7
275.0	1083.927	-2998.508	1653.647	11044.0	-1186.6	-604.1
280.0	1093.051	-2999.447	1653.122	11131.6	-1094.9	-671.1
285.0	1102.248	-3000.309	1652.542	11220.7	-1001.9	-739.1
290.0	1111.518	-3001.096	1651.906	11311.0	-908.2	-807.8
295.0	1120.864	-3001.804	1651.212	11402.6	-813.7	-877.4
300.0	1130.285	-3002.434	1650.461	11495.7	-718.4	-947.9
305.0	1139.783	-3002.986	1649.652	11590.2	-622.3	-1019.2
310.0	1149.360	-3003.458	1648.784	11686.0	-525.1	-1091.5
315.0	1159.016	-3003.850	1647.855	11783.2	-427.0	-1164.7
320.0	1168.753	-3004.161	1646.867	11882.0	-328.3	-1238.9
325.0	1178.572	-3004.390	1645.816	11982.6	-228.4	-1314.1
330.0	1188.474	-3004.537	1644.704	12084.3	-127.3	-1390.4
335.0	1198.461	-3004.599	1643.528	12187.5	-25.1	-1467.7
340.0	1208.533	-3004.578	1642.288	12292.1	78.3	-1546.0
345.0	1218.692	-3004.470	1640.983	12398.2	182.8	-1625.4
350.0	1228.938	-3004.276	1639.612	12505.7	288.6	-1705.8
355.0	1239.274	-3003.995	1638.175	12614.8	396.1	-1787.8
360.0	1249.700	-3003.624	1636.670	12725.4	504.8	-1870.5
365.0	1260.217	-3003.164	1635.096	12837.2	614.7	-1954.4
370.0	1270.827	-3002.612	1633.453	12950.5	726.1	-2039.5
375.0	1281.531	-3001.968	1631.739	13065.3	839.5	-2125.9
380.0	1292.331	-3001.230	1629.954	13181.7	954.2	-2213.7
385.0	1303.226	-3000.397	1628.096	13299.4	1070.7	-2302.9
390.0	1314.219	-2999.467	1626.163	13419.4	1188.8	-2393.1
395.0	1325.312	-2998.440	1624.157	13540.4	1308.7	-2484.8
400.0	1336.505	-2997.313	1622.074	13663.3	1430.1	-2577.6
405.0	1347.799	-2996.086	1619.914	13788.1	1553.5	-2672.1
410.0	1359.197	-2994.756	1617.676	13914.4	1679.0	-2767.8
415.0	1370.700	-2993.322	1615.358	14042.7	1806.2	-2865.3
420.0	1382.309	-2991.782	1612.959	14172.3	1936.0	-2964.4
425.0	1394.025	-2990.135	1610.479	14303.9	2067.6	-3064.9

TABLE XVI
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S
430.0	1405.851	-2988.378	1607.915	14437.4	2201.5	-3166.9
435.0	1417.787	-2986.511	1605.266	14572.8	2337.7	-3270.9
440.0	1429.835	-2984.530	1602.531	14709.9	2476.0	-3376.4
445.0	1441.997	-2982.437	1599.710	14848.6	2616.8	-3483.7
450.0	1454.274	-2980.225	1596.798	14988.8	2760.2	-3592.8
455.0	1466.666	-2977.894	1593.796	15130.7	2906.2	-3703.8
460.0	1479.176	-2975.441	1590.702	15274.2	3055.3	-3816.8
465.0	1491.805	-2972.865	1587.514	15419.8	3206.8	-3931.7
470.0	1504.554	-2970.163	1584.231	15567.0	3361.5	-4048.7
475.0	1517.426	-2967.332	1580.850	15716.4	3519.2	-4167.6
480.0	1530.421	-2964.370	1577.371	15868.0	3679.9	-4288.9
485.0	1543.542	-2961.275	1573.791	16021.6	3843.5	-4412.4
490.0	1556.790	-2958.043	1570.109	16177.4	4010.8	-4538.3
495.0	1570.167	-2954.673	1566.321	16335.5	4181.4	-4666.7
500.0	1583.675	-2951.161	1562.428	16495.4	4355.2	-4797.2
505.0	1597.316	-2947.504	1558.425	16657.8	4532.8	-4930.5
510.0	1611.091	-2943.700	1554.312	16822.4	4714.1	-5066.4
515.0	1625.003	-2939.745	1550.087	16989.0	4899.3	-5204.9
520.0	1639.052	-2935.635	1545.745	17158.4	5088.9	-5346.5
525.0	1653.242	-2931.368	1541.287	17329.9	5282.4	-5490.7
530.0	1667.574	-2926.941	1536.708	17503.9	5480.4	-5638.1
535.0	1682.051	-2922.348	1532.007	17680.4	5682.7	-5788.6
540.0	1696.674	-2917.586	1527.180	17859.5	5890.1	-5942.4
545.0	1711.445	-2912.653	1522.226	18040.8	6102.5	-6099.6
550.0	1726.366	-2907.542	1517.141	18224.5	6319.9	-6260.2
555.0	1741.439	-2902.250	1511.922	18411.3	6542.9	-6424.8
560.0	1756.667	-2896.772	1506.566	18600.1	6771.6	-6593.0
565.0	1772.052	-2891.104	1501.070	18792.7	7006.0	-6765.2
570.0	1787.597	-2885.240	1495.431	18988.5	7246.5	-6941.4
575.0	1803.304	-2879.176	1489.645	19186.5	7493.6	-7122.1
580.0	1819.175	-2872.905	1483.708	19388.5	7747.7	-7307.7
585.0	1835.214	-2866.423	1477.616	19593.5	8009.1	-7497.8
590.0	1851.423	-2859.722	1471.367	19800.8	8277.3	-7693.0
595.0	1867.803	-2852.798	1464.954	20011.2	8553.9	-7893.6
600.0	1884.358	-2845.642	1458.374	20224.9	8837.8	-8099.0
605.0	1901.090	-2838.250	1451.623	20441.8	9130.2	-8310.1
610.0	1918.002	-2830.613	1444.696	20661.9	9432.3	-8527.4
615.0	1935.096	-2822.723	1437.587	20885.2	9744.0	-8751.1
620.0	1952.374	-2814.573	1430.291	21113.1	10065.9	-8981.4

S-IV CUT OFF

621.659	1958.149	-2811.809	1427.828	21189.9	10175.6	-9059.8
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TABLE XVI
SPACE-FIXED EPHEMERIS POSITIONS AND VELOCITIES

TIME SEC	XSP NM	YSP NM	ZSP NM	DXSP FT/S	DYSP FT/S	DZSP FT/S
625.0	1969.791	-2806.192	1422.834	21148.6	10251.3	-9099.6
630.0	1987.164	-2797.713	1415.324	21075.2	10355.8	-9152.8
INSERTIØN						
631.659	1992.915	-2794.881	1412.823	21050.6	10390.4	-9170.3

TABLE XVII
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
FIRST MOTION						
0.080	0.25	11.11	-0.53	2.75	-9.12	5.70
LIFTOFF SIGNAL						
0.280	0.18	11.22	-0.43	2.70	-9.28	5.68
1.0	-0.02	11.59	-0.16	2.56	-9.76	5.67
2.0	-0.18	11.99	0.04	2.46	-10.22	5.73
3.0	-0.26	12.30	0.10	2.45	-10.53	5.85
4.0	-0.28	12.57	0.09	2.50	-10.75	5.99
5.0	-0.28	12.81	0.03	2.57	-10.92	6.16
6.0	-0.25	13.04	-0.04	2.66	-11.08	6.32
7.0	-0.23	13.29	-0.09	2.75	-11.26	6.48
8.0	-0.20	13.55	-0.13	2.84	-11.45	6.63
9.0	-0.16	13.82	-0.14	2.94	-11.68	6.76
10.0	-0.12	14.12	-0.13	3.05	-11.93	6.88
11.0	-0.07	14.42	-0.09	3.17	-12.20	6.98
12.0	-0.00	14.74	-0.04	3.31	-12.49	7.07
13.0	0.10	15.06	0.02	3.47	-12.78	7.15
14.0	0.23	15.39	0.09	3.67	-13.06	7.22
15.0	0.41	15.70	0.14	3.90	-13.34	7.29
16.0	0.63	16.01	0.19	4.18	-13.59	7.35
17.0	0.90	16.31	0.21	4.52	-13.82	7.40
18.0	1.23	16.60	0.22	4.90	-14.02	7.46
19.0	1.61	16.87	0.21	5.33	-14.20	7.51
20.0	2.04	17.13	0.19	5.82	-14.34	7.56
21.0	2.52	17.37	0.15	6.35	-14.47	7.60
22.0	3.05	17.62	0.10	6.92	-14.58	7.64
23.0	3.60	17.86	0.05	7.52	-14.68	7.67
24.0	4.18	18.11	0.01	8.14	-14.79	7.69
25.0	4.78	18.36	-0.03	8.78	-14.91	7.71
26.0	5.37	18.63	-0.04	9.42	-15.04	7.71
27.0	5.96	18.92	-0.04	10.06	-15.21	7.72
28.0	6.52	19.22	-0.02	10.67	-15.40	7.72
29.0	7.05	19.55	0.01	11.26	-15.62	7.73
30.0	7.55	19.89	0.04	11.82	-15.85	7.75

TABLE XVII
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
31.0	7.99	20.02	0.06	12.28	-15.91	7.70
32.0	8.38	20.41	-0.02	12.75	-16.15	7.86
33.0	8.71	20.77	-0.20	13.18	-16.32	8.11
34.0	9.07	21.09	-0.37	13.63	-16.45	8.33
35.0	9.48	21.38	-0.44	14.11	-16.60	8.43
36.0	9.96	21.54	-0.36	14.59	-16.71	8.33
37.0	10.55	21.80	-0.10	15.19	-16.98	8.10
38.0	11.12	22.08	0.22	15.77	-17.30	7.83
39.0	11.51	22.44	0.37	16.21	-17.63	7.78
40.0	11.63	22.82	0.27	16.44	-17.88	8.02
41.0	11.79	23.22	0.37	16.68	-18.24	8.09
42.0	12.00	23.60	0.46	16.96	-18.58	8.15
43.0	12.26	23.95	0.54	17.28	-18.87	8.19
44.0	12.56	24.27	0.61	17.64	-19.15	8.22
45.0	12.91	24.58	0.67	18.05	-19.38	8.23
46.0	13.30	24.85	0.73	18.49	-19.59	8.23
47.0	13.74	25.10	0.77	18.96	-19.76	8.21
48.0	14.23	25.31	0.81	19.48	-19.89	8.16
49.0	14.76	25.50	0.85	20.04	-19.98	8.10
50.0	15.34	25.64	0.87	20.63	-20.04	8.02
51.0	15.96	25.76	0.88	21.26	-20.05	7.92
52.0	16.64	25.35	0.89	21.82	-19.61	7.57
53.0	17.40	24.66	0.89	22.40	-18.92	7.07
MACH ONE						
53.208	17.47	24.55	0.88	22.44	-18.81	7.00
54.0	17.68	24.19	0.88	22.57	-18.47	6.79
55.0	17.87	23.94	0.86	22.70	-18.22	6.65
56.0	17.97	23.92	0.83	22.79	-18.17	6.64
57.0	18.03	24.13	0.79	22.91	-18.32	6.75
58.0	18.99	24.58	0.75	23.95	-18.54	6.78
59.0	19.93	25.26	0.70	25.03	-18.96	6.94
60.0	20.87	25.75	0.64	26.06	-19.21	7.01
61.0	21.96	26.29	0.29	27.28	-19.33	7.32
62.0	23.11	26.83	-0.78	28.66	-19.08	8.22
63.0	24.07	27.47	-2.03	29.90	-18.84	9.36
64.0	24.79	28.24	-2.73	30.86	-19.03	10.17
65.0	25.27	29.11	-2.51	31.51	-19.81	10.29

TABLE XVII
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
MAXIMUM DYNAMIC PRESSURE						
66.000	25.72	29.90	-1.76	32.04	-20.79	9.93
67.0	26.31	30.61	-1.19	32.69	-21.61	9.65
68.0	27.11	31.24	-1.31	33.64	-21.96	9.87
69.0	28.03	31.86	-1.72	34.72	-22.14	10.30
70.0	29.10	32.45	-1.85	35.92	-22.42	10.45
71.0	30.29	33.07	-1.37	37.15	-23.02	10.07
72.0	31.49	33.69	-0.59	38.35	-23.77	9.43
73.0	32.52	34.38	0.04	39.43	-24.53	8.99
74.0	33.45	35.10	0.22	40.48	-25.09	8.98
75.0	34.33	35.88	0.20	41.52	-25.61	9.17
76.0	35.31	36.63	0.15	42.66	-26.09	9.34
77.0	36.37	37.40	0.31	43.84	-26.66	9.33
78.0	37.48	38.15	0.52	45.07	-27.24	9.26
79.0	38.54	38.96	0.75	46.26	-27.89	9.21
80.0	39.75	39.69	0.74	47.60	-28.32	9.29
81.0	41.15	40.35	0.72	49.11	-28.67	9.31
82.0	42.76	40.92	0.74	50.80	-28.94	9.19
83.0	44.37	41.49	0.86	52.47	-29.25	9.00
84.0	45.95	42.02	0.88	54.13	-29.47	8.87
85.0	47.40	42.59	0.89	55.66	-29.75	8.81
86.0	48.85	43.11	0.77	57.20	-29.92	8.83
87.0	50.36	43.59	0.62	58.80	-30.02	8.84
88.0	51.97	43.98	0.49	60.47	-30.05	8.78
89.0	53.64	44.33	0.46	62.16	-30.09	8.59
90.0	55.35	44.63	0.41	63.90	-30.07	8.38
91.0	57.08	44.93	0.43	65.64	-30.08	8.12
92.0	58.78	45.25	0.45	67.36	-30.11	7.87
93.0	60.45	45.63	0.50	69.05	-30.21	7.62
94.0	62.04	46.02	0.51	70.69	-30.32	7.44
95.0	63.57	46.41	0.52	72.26	-30.42	7.27
96.0	65.04	46.71	0.62	73.74	-30.50	7.00
97.0	66.55	47.04	0.50	75.29	-30.50	6.91
98.0	68.26	47.39	0.34	77.05	-30.46	6.83
99.0	69.81	47.80	0.35	78.65	-30.58	6.66
100.0	71.46	48.23	0.41	80.34	-30.73	6.44
101.0	73.14	48.65	0.49	82.05	-30.88	6.19

TABLE XVII
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
102.0	74.76	49.04	0.55	83.71	-30.99	5.96
103.0	76.36	49.47	0.67	85.34	-31.17	5.70
104.0	77.84	49.96	0.64	86.89	-31.35	5.62
105.0	79.27	50.49	0.44	88.43	-31.48	5.71
106.0	80.81	51.10	0.39	90.07	-31.74	5.71
107.0	82.34	51.80	0.46	91.70	-32.13	5.63
108.0	83.92	52.52	0.63	93.38	-32.59	5.47
109.0	85.50	53.24	0.81	95.05	-33.04	5.30
110.0	87.10	53.93	0.85	96.76	-33.41	5.23
111.0	88.63	54.61	0.65	98.43	-33.65	5.38
112.0	90.18	55.34	0.49	100.12	-33.94	5.51
113.0	91.85	56.14	0.57	101.92	-34.40	5.44
114.0	93.46	57.02	0.68	103.67	-34.95	5.41
115.0	95.06	57.92	0.69	105.43	-35.48	5.46
116.0	96.69	58.92	0.70	107.25	-36.08	5.56
117.0	98.31	59.99	0.74	109.06	-36.76	5.67
118.0	99.89	61.10	0.80	110.85	-37.49	5.79
119.0	101.57	62.23	0.95	112.72	-38.25	5.83
120.0	103.31	63.37	1.06	114.66	-39.00	5.88
121.0	105.02	64.58	1.00	116.61	-39.74	6.11
122.0	106.80	65.84	0.98	118.64	-40.51	6.33
123.0	108.67	67.13	0.99	120.75	-41.32	6.52
124.0	110.56	68.46	0.99	122.90	-42.16	6.72
125.0	112.45	69.86	0.93	125.06	-43.02	7.02
126.0	114.50	71.29	0.94	127.38	-43.92	7.22
127.0	116.55	72.78	0.92	129.72	-44.85	7.48
128.0	118.63	74.35	0.97	132.10	-45.88	7.71
129.0	120.80	75.97	1.16	134.57	-47.02	7.83
130.0	123.13	77.56	1.28	137.18	-48.07	7.97
131.0	125.63	79.10	1.27	139.96	-48.98	8.13
132.0	128.26	80.63	1.29	142.87	-49.88	8.25
133.0	130.98	82.14	1.25	145.86	-50.72	8.38
134.0	133.84	83.60	1.15	148.99	-51.47	8.52
135.0	137.29	84.66	1.23	152.57	-51.88	8.18
136.0	140.73	85.90	1.30	156.17	-52.45	7.92
137.0	144.14	87.32	1.38	159.80	-53.18	7.76
138.0	147.53	88.93	1.46	163.45	-54.07	7.70
139.0	150.90	90.73	1.54	167.13	-55.11	7.72
140.0	154.25	92.70	1.61	170.82	-56.32	7.84
IECØ						
140.220	154.21	93.30	1.57	170.93	-56.80	8.17

TABLE XVII
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
141.0	81.40	35.98	1.17	87.25	-18.40	-2.32
142.0	79.66	33.19	1.20	84.91	-16.28	-3.28
143.0	78.66	31.85	1.23	83.63	-15.29	-3.72
144.0	78.43	31.95	1.27	83.42	-15.41	-3.65
145.0	78.95	33.50	1.31	84.30	-16.65	-3.07
ØECØ						
145.560	74.64	31.63	1.36	79.69	-15.69	-3.02
146.0	19.03	-16.72	0.92	14.69	17.53	-13.09
147.0	3.56	-26.80	0.81	-2.60	23.91	-14.30
148.0	2.07	-28.95	0.79	-4.54	25.53	-14.97
S-IV ENGINE START						
148.120	1.25	-28.96	0.84	-5.35	25.39	-14.83
149.0	2.81	-28.22	0.80	-3.66	25.01	-14.79
150.0	12.74	-20.31	0.86	7.77	19.70	-13.33
155.0	15.96	-16.50	0.86	11.76	16.95	-12.24
160.0	16.47	-16.20	0.74	12.32	16.85	-12.11
GUIDANCE INITIATION						
163.860	16.53	-15.97	0.68	12.42	16.69	-11.96
165.0	16.52	-15.61	0.86	12.47	16.31	-11.94
170.0	16.07	-14.61	3.26	11.97	14.17	-13.40
175.0	16.06	-14.89	3.81	11.81	14.14	-14.00
180.0	16.63	-15.16	3.36	12.34	14.69	-13.87
185.0	16.91	-15.50	2.81	12.57	15.31	-13.63
190.0	17.15	-15.53	2.33	12.84	15.64	-13.30
195.0	17.39	-15.29	2.21	13.12	15.54	-13.13
200.0	17.69	-15.00	2.07	13.49	15.43	-12.95
205.0	17.96	-15.27	1.66	13.72	15.92	-12.79
210.0	18.30	-15.25	1.41	14.06	16.10	-12.64
215.0	18.66	-15.22	1.15	14.43	16.27	-12.49
220.0	18.79	-15.16	0.96	14.58	16.36	-12.33
225.0	19.23	-15.51	0.88	14.91	16.78	-12.52

TABLE XVII
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
230.0	19.74	-15.47	0.72	15.41	16.91	-12.49
235.0	20.07	-15.55	0.82	15.68	17.00	-12.69
240.0	20.15	-15.70	0.56	15.74	17.29	-12.56
245.0	20.43	-15.45	0.62	16.04	17.10	-12.55
250.0	20.59	-15.78	0.53	16.11	17.47	-12.67
255.0	21.07	-16.16	0.50	16.45	17.89	-12.93
260.0	21.20	-15.99	0.78	16.57	17.64	-13.12
265.0	21.52	-16.06	0.59	16.87	17.87	-13.07
270.0	21.77	-16.36	0.59	17.02	18.17	-13.26
275.0	22.22	-16.52	0.64	17.38	18.37	-13.48
280.0	22.52	-16.30	0.53	17.72	18.31	-13.36
285.0	22.69	-16.51	0.57	17.81	18.51	-13.53
290.0	23.07	-16.72	0.55	18.10	18.77	-13.70
295.0	23.46	-16.97	0.71	18.38	18.98	-14.04
300.0	23.84	-16.90	0.83	18.73	18.94	-14.19
305.0	24.32	-17.21	0.83	19.10	19.29	-14.45
310.0	24.57	-17.64	0.81	19.21	19.73	-14.70
315.0	24.81	-17.55	0.80	19.45	19.72	-14.71
320.0	25.39	-17.73	0.77	19.95	19.99	-14.90
325.0	25.60	-17.53	0.93	20.16	19.79	-14.98
330.0	25.90	-18.20	0.93	20.26	20.42	-15.37
335.0	26.33	-18.25	0.96	20.63	20.54	-15.52
340.0	26.76	-18.30	1.27	20.98	20.51	-15.90
345.0	27.20	-18.54	1.17	21.33	20.86	-16.03
350.0	27.68	-18.85	1.21	21.68	21.19	-16.33
355.0	28.05	-19.27	1.07	21.93	21.70	-16.49
360.0	28.37	-19.35	1.04	22.20	21.86	-16.58
365.0	28.87	-19.46	1.30	22.59	21.92	-16.96
370.0	29.21	-20.24	1.07	22.73	22.77	-17.21
375.0	29.43	-20.02	1.37	22.93	22.50	-17.42
380.0	29.84	-20.63	1.23	23.17	23.17	-17.69
385.0	30.41	-20.87	1.33	23.62	23.44	-18.01
390.0	30.86	-21.01	1.33	24.00	23.65	-18.18
395.0	31.29	-21.20	1.42	24.32	23.86	-18.45
400.0	31.87	-21.72	1.33	24.73	24.47	-18.75
405.0	32.19	-21.89	1.44	24.97	24.63	-18.99
410.0	32.80	-22.25	1.30	25.44	25.14	-19.19
415.0	33.21	-22.62	1.55	25.69	25.41	-19.67
420.0	33.90	-22.99	1.58	26.23	25.84	-20.03
425.0	34.49	-23.49	1.30	26.67	26.53	-20.16

TABLE XVII
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ	DDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
430.0	34.89	-23.90	1.53	26.90	26.85	-20.65
435.0	35.31	-24.46	1.53	27.13	27.41	-21.01
440.0	35.72	-24.94	1.52	27.37	27.92	-21.33
445.0	36.40	-25.23	1.56	27.92	28.29	-21.65
450.0	37.01	-25.67	1.55	28.36	28.79	-21.99
455.0	37.54	-26.12	1.62	28.72	29.25	-22.38
460.0	37.86	-26.88	1.65	28.80	29.96	-22.85
465.0	38.43	-27.16	1.66	29.24	30.32	-23.12
470.0	39.13	-27.68	1.60	29.76	30.93	-23.47
475.0	39.59	-28.41	1.61	29.97	31.65	-23.94
480.0	40.35	-29.10	1.65	30.49	32.36	-24.48
485.0	40.88	-29.84	1.68	30.77	33.09	-24.97
490.0	41.60	-30.19	1.80	31.32	33.48	-25.41
495.0	42.32	-31.20	1.66	31.73	34.55	-25.93
500.0	43.02	-31.58	1.82	32.25	34.95	-26.41
505.0	43.88	-32.40	1.83	32.82	35.81	-27.01
510.0	44.43	-33.31	1.79	33.08	36.72	-27.53
515.0	45.28	-33.96	1.85	33.68	37.41	-28.08
520.0	46.10	-34.80	1.69	34.22	38.38	-28.54
525.0	46.60	-35.37	1.92	34.49	38.86	-29.12
530.0	47.65	-36.51	1.87	35.16	40.05	-29.86
535.0	48.47	-37.44	1.86	35.66	41.02	-30.48
540.0	49.14	-38.30	1.89	36.03	41.87	-31.07
545.0	50.03	-39.24	1.95	36.59	42.82	-31.78
550.0	50.96	-40.48	1.94	37.11	44.07	-32.56
555.0	51.71	-41.40	2.05	37.53	44.95	-33.28
560.0	52.85	-42.49	2.13	38.28	46.06	-34.12
565.0	53.95	-44.00	1.88	38.92	47.69	-34.88
570.0	54.65	-44.65	2.02	39.35	48.32	-35.47
575.0	55.76	-46.33	2.13	39.91	49.90	-36.61
580.0	56.95	-47.71	2.06	40.64	51.34	-37.49
585.0	58.08	-49.45	2.06	41.21	53.04	-38.57
590.0	59.26	-50.92	2.34	41.86	54.38	-39.79
595.0	60.36	-52.37	2.26	42.48	55.88	-40.65
600.0	61.48	-54.06	2.35	43.03	57.48	-41.79
605.0	62.34	-55.71	2.15	43.38	59.17	-42.61
610.0	64.05	-57.93	2.33	44.35	61.28	-44.22
615.0	65.28	-59.50	2.36	45.04	62.84	-45.27
620.0	66.81	-62.41	2.28	45.66	65.64	-46.94

S-IV CUT OFF

621.659	67.20	-63.35	2.29	45.77	66.51	-47.48
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TABLE XVII
EARTH-FIXED PLUMBLINE AND SPACE-FIXED EPHEMERIS ACCELERATIONS

TIME SEC	DDXE FT/S SQ	DDYE FT/S SQ	DDZE FT/S SQ	CDXSP FT/S SQ	DDYSP FT/S SQ	DDZSP FT/S SQ
625.0	-7.13	-23.63	1.15	-14.73	20.80	-10.64
630.0	-7.25	-23.59	1.14	-14.86	20.74	-10.58
INSERTIØN						
631.659	-7.30	-23.58	1.13	-14.90	20.72	-10.57

TABLE XVIII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S
FIRST MOTION							
0.080	3441.334	-80.56495	28.37067	28.53185	0.	90.000	0.
LIFTØFF SIGNAL							
0.280	3441.334	-80.56495	28.37067	28.53185	37.018	87.192	2.2
1.0	3441.334	-80.56495	28.37067	28.53185	30.052	88.135	10.5
2.0	3441.337	-80.56495	28.37067	28.53185	10.756	88.951	22.2
3.0	3441.342	-80.56495	28.37067	28.53185	338.303	89.255	34.4
4.0	3441.348	-80.56495	28.37068	28.53186	312.912	89.235	46.8
5.0	3441.357	-80.56495	28.37068	28.53186	302.598	89.147	59.5
6.0	3441.368	-80.56496	28.37068	28.53186	300.340	89.081	72.5
7.0	3441.381	-80.56496	28.37068	28.53186	301.674	89.043	85.6
8.0	3441.396	-80.56496	28.37068	28.53186	304.430	89.024	99.0
9.0	3441.414	-80.56497	28.37069	28.53186	307.461	89.020	112.7
10.0	3441.433	-80.56497	28.37069	28.53187	310.173	89.033	126.7
11.0	3441.455	-80.56498	28.37069	28.53187	312.341	89.065	141.0
12.0	3441.480	-80.56499	28.37070	28.53188	314.001	89.119	155.5
13.0	3441.506	-80.56499	28.37070	28.53188	315.391	89.198	170.4
14.0	3441.536	-80.56500	28.37071	28.53189	317.007	89.306	185.7
15.0	3441.567	-80.56501	28.37071	28.53189	319.899	89.443	201.2
16.0	3441.602	-80.56501	28.37072	28.53190	327.083	89.607	217.1
17.0	3441.639	-80.56501	28.37072	28.53190	351.986	89.776	233.2
18.0	3441.679	-80.56501	28.37072	28.53190	61.138	89.780	249.7
19.0	3441.721	-80.56501	28.37073	28.53190	91.840	89.538	266.4
20.0	3441.766	-80.56500	28.37072	28.53190	100.119	89.208	283.4
21.0	3441.814	-80.56499	28.37072	28.53190	103.042	88.824	300.7
22.0	3441.865	-80.56497	28.37072	28.53190	104.146	88.391	318.3
23.0	3441.919	-80.56493	28.37071	28.53189	104.509	87.912	336.1
24.0	3441.976	-80.56489	28.37070	28.53188	104.556	87.392	354.3
25.0	3442.036	-80.56484	28.37069	28.53187	104.486	86.833	372.7
26.0	3442.098	-80.56477	28.37067	28.53185	104.395	86.243	391.5
27.0	3442.164	-80.56469	28.37065	28.53183	104.330	85.628	410.6
28.0	3442.233	-80.56458	28.37063	28.53181	104.312	84.994	430.1
29.0	3442.305	-80.56446	28.37060	28.53178	104.336	84.351	450.0
30.0	3442.381	-80.56432	28.37057	28.53175	104.417	83.707	470.6

TABLE XVIII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S
31.0	3442.459	-80.56415	28.37053	28.53171	104.484	83.064	491.6
32.0	3442.541	-80.56396	28.37049	28.53167	104.496	82.426	512.6
33.0	3442.626	-80.56375	28.37044	28.53162	104.426	81.811	534.2
34.0	3442.715	-80.56351	28.37039	28.53156	104.250	81.212	556.2
35.0	3442.807	-80.56324	28.37033	28.53150	104.043	80.627	578.6
36.0	3442.903	-80.56294	28.37026	28.53144	103.895	80.047	601.4
37.0	3443.002	-80.56261	28.37019	28.53137	103.858	79.463	624.6
38.0	3443.105	-80.56225	28.37011	28.53129	103.965	78.877	648.2
39.0	3443.212	-80.56186	28.37002	28.53120	104.137	78.302	672.2
40.0	3443.322	-80.56143	28.36993	28.53110	104.290	77.755	696.8
41.0	3443.436	-80.56097	28.36983	28.53100	104.359	77.242	721.7
42.0	3443.554	-80.56047	28.36971	28.53089	104.341	76.763	747.2
43.0	3443.675	-80.55994	28.36959	28.53077	104.262	76.307	773.1
44.0	3443.801	-80.55937	28.36946	28.53064	104.174	75.860	799.4
45.0	3443.931	-80.55877	28.36933	28.53050	104.090	75.407	826.1
46.0	3444.064	-80.55812	28.36919	28.53036	103.987	74.948	853.3
47.0	3444.202	-80.55743	28.36904	28.53021	103.816	74.492	880.9
48.0	3444.344	-80.55670	28.36888	28.53005	103.572	74.049	908.9
49.0	3444.490	-80.55592	28.36872	28.52989	103.291	73.619	937.3
50.0	3444.640	-80.55510	28.36855	28.52972	103.034	73.198	966.1
51.0	3444.794	-80.55423	28.36837	28.52954	102.851	72.772	995.1
52.0	3444.953	-80.55332	28.36819	28.52936	102.777	72.333	1024.2
53.0	3445.115	-80.55235	28.36800	28.52916	102.799	71.874	1053.1
MACH ONE							
53.208	3445.150	-80.55214	28.36796	28.52912	102.812	71.776	1059.1
54.0	3445.282	-80.55133	28.36779	28.52896	102.877	71.401	1081.9
55.0	3445.453	-80.55026	28.36757	28.52874	102.975	70.924	1110.4
56.0	3445.627	-80.54913	28.36735	28.52851	103.069	70.455	1138.9
57.0	3445.806	-80.54795	28.36710	28.52827	103.158	69.997	1167.7
58.0	3445.989	-80.54672	28.36685	28.52801	103.254	69.549	1197.0
59.0	3446.175	-80.54542	28.36658	28.52774	103.371	69.103	1227.2
60.0	3446.366	-80.54407	28.36629	28.52746	103.509	68.653	1258.3
61.0	3446.561	-80.54266	28.36599	28.52715	103.614	68.191	1290.3
62.0	3446.761	-80.54118	28.36568	28.52684	103.625	67.713	1323.4
63.0	3446.964	-80.53963	28.36535	28.52651	103.524	67.230	1357.6
64.0	3447.173	-80.53800	28.36501	28.52616	103.352	66.750	1392.8
65.0	3447.386	-80.53630	28.36465	28.52581	103.174	66.282	1429.1

TABLE XVIII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S
MAXIMUM DYNAMIC PRESSURE							
66.000	3447.603	-80.53453	28.36429	28.52544	103.040	65.833	1466.4
67.0	3447.826	-80.53267	28.36391	28.52507	102.964	65.402	1504.8
68.0	3448.054	-80.53074	28.36352	28.52467	102.921	64.982	1544.1
69.0	3448.287	-80.52872	28.36311	28.52426	102.875	64.564	1584.4
70.0	3448.525	-80.52661	28.36269	28.52384	102.820	64.143	1625.8
71.0	3448.768	-80.52442	28.36225	28.52340	102.783	63.718	1668.3
72.0	3449.017	-80.52214	28.36180	28.52294	102.755	63.289	1712.0
73.0	3449.272	-80.51976	28.36132	28.52246	102.852	62.862	1756.8
74.0	3449.532	-80.51729	28.36082	28.52197	102.935	62.438	1802.8
75.0	3449.798	-80.51471	28.36030	28.52144	103.027	62.021	1850.0
76.0	3450.070	-80.51204	28.35975	28.52089	103.114	61.610	1898.4
77.0	3450.348	-80.50926	28.35918	28.52032	103.198	61.206	1948.1
78.0	3450.632	-80.50637	28.35858	28.51972	103.287	60.807	1999.0
79.0	3450.923	-80.50336	28.35796	28.51909	103.381	60.412	2051.3
80.0	3451.220	-80.50025	28.35730	28.51843	103.478	60.020	2104.9
81.0	3451.523	-80.49701	28.35662	28.51774	103.570	59.626	2159.8
82.0	3451.833	-80.49366	28.35590	28.51702	103.658	59.228	2216.2
83.0	3452.150	-80.49018	28.35515	28.51628	103.745	58.822	2274.0
84.0	3452.474	-80.48656	28.35437	28.51549	103.830	58.412	2333.1
85.0	3452.804	-80.48281	28.35356	28.51467	103.909	57.998	2393.7
86.0	3453.142	-80.47892	28.35271	28.51382	103.983	57.582	2455.6
87.0	3453.487	-80.47488	28.35182	28.51293	104.049	57.165	2518.9
88.0	3453.839	-80.47070	28.35090	28.51200	104.104	56.745	2583.6
89.0	3454.198	-80.46636	28.34993	28.51104	104.154	56.321	2649.5
90.0	3454.565	-80.46186	28.34894	28.51003	104.199	55.893	2716.9
91.0	3454.939	-80.45720	28.34789	28.50899	104.243	55.460	2785.6
92.0	3455.320	-80.45237	28.34681	28.50791	104.285	55.023	2855.7
93.0	3455.709	-80.44736	28.34569	28.50678	104.326	54.585	2927.3
94.0	3456.105	-80.44217	28.34453	28.50561	104.367	54.146	3000.3
95.0	3456.508	-80.43678	28.34332	28.50440	104.407	53.707	3074.7
96.0	3456.918	-80.43121	28.34206	28.50314	104.445	53.271	3150.5
97.0	3457.337	-80.42545	28.34076	28.50183	104.481	52.837	3227.7
98.0	3457.765	-80.41950	28.33941	28.50047	104.513	52.410	3306.2
99.0	3458.200	-80.41335	28.33800	28.49906	104.541	51.985	3386.3
100.0	3458.643	-80.40699	28.33655	28.49760	104.568	51.564	3467.8
101.0	3459.094	-80.40042	28.33505	28.49610	104.596	51.146	3550.8

TABLE XVIII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S
102.0	3459.553	-80.39364	28.33349	28.49453	104.624	50.732	3635.4
103.0	3460.021	-80.38663	28.33188	28.49292	104.654	50.323	3721.6
104.0	3460.496	-80.37940	28.33021	28.49124	104.683	49.919	3809.3
105.0	3460.980	-80.37194	28.32849	28.48951	104.707	49.523	3898.5
106.0	3461.473	-80.36425	28.32671	28.48773	104.728	49.133	3989.3
107.0	3461.973	-80.35632	28.32488	28.48589	104.752	48.752	4081.8
108.0	3462.483	-80.34814	28.32298	28.48398	104.774	48.379	4176.0
109.0	3463.001	-80.33972	28.32102	28.48202	104.799	48.014	4272.0
110.0	3463.528	-80.33105	28.31900	28.47999	104.824	47.656	4369.7
111.0	3464.064	-80.32212	28.31692	28.47790	104.848	47.306	4469.2
112.0	3464.610	-80.31293	28.31478	28.47575	104.869	46.964	4570.5
113.0	3465.164	-80.30348	28.31257	28.47353	104.888	46.629	4673.6
114.0	3465.728	-80.29376	28.31029	28.47124	104.906	46.302	4778.5
115.0	3466.302	-80.28376	28.30794	28.46889	104.926	45.984	4885.4
116.0	3466.885	-80.27348	28.30553	28.46647	104.946	45.675	4994.3
117.0	3467.478	-80.26293	28.30305	28.46398	104.965	45.375	5105.1
118.0	3468.081	-80.25208	28.30049	28.46141	104.985	45.084	5218.1
119.0	3468.694	-80.24094	28.29787	28.45878	105.005	44.802	5333.1
120.0	3469.318	-80.22951	28.29517	28.45607	105.026	44.529	5450.2
121.0	3469.953	-80.21777	28.29239	28.45328	105.047	44.265	5569.6
122.0	3470.598	-80.20573	28.28954	28.45042	105.068	44.010	5691.2
123.0	3471.254	-80.19338	28.28661	28.44748	105.087	43.762	5815.1
124.0	3471.922	-80.18071	28.28360	28.44445	105.106	43.523	5941.3
125.0	3472.601	-80.16772	28.28051	28.44135	105.124	43.292	6070.1
126.0	3473.293	-80.15440	28.27734	28.43817	105.141	43.068	6201.3
127.0	3473.996	-80.14075	28.27408	28.43490	105.158	42.852	6335.1
128.0	3474.711	-80.12677	28.27074	28.43155	105.175	42.643	6471.6
129.0	3475.439	-80.11244	28.26732	28.42811	105.193	42.442	6610.8
130.0	3476.180	-80.09776	28.26380	28.42459	105.212	42.247	6752.8
131.0	3476.934	-80.08272	28.26020	28.42097	105.231	42.058	6897.8
132.0	3477.701	-80.06732	28.25651	28.41726	105.250	41.873	7045.8
133.0	3478.482	-80.05155	28.25272	28.41346	105.268	41.692	7196.9
134.0	3479.277	-80.03541	28.24883	28.40956	105.286	41.513	7351.2
135.0	3480.086	-80.01886	28.24484	28.40556	105.306	41.337	7508.8
136.0	3480.909	-80.00193	28.24076	28.40145	105.327	41.161	7669.3
137.0	3481.748	-79.98459	28.23656	28.39725	105.344	40.983	7833.9
138.0	3482.601	-79.96684	28.23227	28.39294	105.364	40.805	8001.9
139.0	3483.469	-79.94867	28.22786	28.38851	105.381	40.628	8173.6
140.0	3484.353	-79.93007	28.22335	28.38398	105.402	40.455	8349.6
IECØ							
140.220	3484.551	-79.92592	28.22235	28.38299	105.402	40.419	8388.9

TABLE XVIII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S
141.0	3485.252	-79.91105	28.21873	28.37935	105.418	40.297	8479.5
142.0	3486.157	-79.89179	28.21405	28.37465	105.436	40.148	8563.0
143.0	3487.069	-79.87231	28.20930	28.36989	105.454	40.005	8643.4
144.0	3487.987	-79.85261	28.20450	28.36507	105.469	39.864	8724.3
145.0	3488.910	-79.83270	28.19964	28.36019	105.487	39.726	8805.6
ØECØ							
145.560	3489.430	-79.82148	28.19693	28.35747	105.490	39.652	8851.0
146.0	3489.839	-79.81258	28.19473	28.35526	105.504	39.594	8861.3
147.0	3490.767	-79.79240	28.18980	28.35031	105.520	39.464	8848.2
148.0	3491.691	-79.77223	28.18486	28.34535	105.536	39.332	8831.9
S-IV ENGINE START							
148.120	3491.802	-79.76985	28.18430	28.34479	105.532	39.318	8830.3
149.0	3492.610	-79.75207	28.17992	28.34039	105.552	39.201	8815.7
150.0	3493.525	-79.73192	28.17497	28.33543	105.569	39.069	8802.5
155.0	3498.063	-79.63070	28.15006	28.31043	105.645	38.416	8813.3
160.0	3502.539	-79.52859	28.12478	28.28505	105.723	37.772	8827.8
GUIDANCE INITIATION							
163.860	3505.958	-79.44917	28.10503	28.26522	105.781	37.280	8842.2
165.0	3506.961	-79.42561	28.09915	28.25932	105.798	37.135	8846.8
170.0	3511.330	-79.32174	28.07313	28.23321	105.919	36.523	8868.1
175.0	3515.648	-79.21706	28.04661	28.20659	106.121	35.934	8890.3
180.0	3519.917	-79.11157	28.01953	28.17941	106.309	35.339	8915.3
185.0	3524.135	-79.00523	27.99191	28.15168	106.477	34.733	8942.8
190.0	3528.302	-78.89800	27.96376	28.12343	106.623	34.124	8973.0
195.0	3532.419	-78.78985	27.93512	28.09468	106.755	33.517	9005.7
200.0	3536.487	-78.68076	27.90599	28.06544	106.874	32.916	9041.1
205.0	3540.505	-78.57070	27.87638	28.03572	106.980	32.312	9079.1
210.0	3544.474	-78.45964	27.84631	28.00553	107.077	31.714	9119.4
215.0	3548.395	-78.34757	27.81578	27.97488	107.166	31.115	9162.2
220.0	3552.267	-78.23445	27.78479	27.94378	107.247	30.522	9207.7
225.0	3556.091	-78.12026	27.75334	27.91222	107.323	29.931	9256.0

TABLE XVIII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S
230.0	3559.868	-78.00498	27.72145	27.88020	107.396	29.338	9306.9
235.0	3563.596	-77.88859	27.68909	27.84772	107.464	28.750	9360.1
240.0	3567.277	-77.77105	27.65628	27.81478	107.529	28.165	9416.0
245.0	3570.911	-77.65235	27.62300	27.78138	107.592	27.584	9474.2
250.0	3574.498	-77.53247	27.58926	27.74750	107.654	27.006	9534.8
255.0	3578.037	-77.41140	27.55503	27.71315	107.716	26.434	9597.9
260.0	3581.529	-77.28910	27.52033	27.67831	107.777	25.863	9663.5
265.0	3584.975	-77.16557	27.48513	27.64298	107.840	25.299	9731.5
270.0	3588.374	-77.04077	27.44943	27.60714	107.902	24.738	9802.5
275.0	3591.726	-76.91469	27.41321	27.57078	107.964	24.182	9875.9
280.0	3595.032	-76.78731	27.37647	27.53390	108.028	23.633	9951.7
285.0	3598.292	-76.65860	27.33920	27.49648	108.093	23.087	10030.2
290.0	3601.505	-76.52856	27.30138	27.45851	108.159	22.547	10111.4
295.0	3604.673	-76.39715	27.26299	27.41998	108.226	22.013	10195.3
300.0	3607.794	-76.26434	27.22404	27.38088	108.294	21.484	10282.1
305.0	3610.870	-76.13013	27.18449	27.34117	108.364	20.962	10371.6
310.0	3613.901	-75.99448	27.14435	27.30087	108.435	20.444	10463.8
315.0	3616.886	-75.85738	27.10359	27.25995	108.507	19.934	10558.9
320.0	3619.826	-75.71879	27.06220	27.21840	108.581	19.431	10657.1
325.0	3622.720	-75.57870	27.02016	27.17620	108.656	18.933	10758.4
330.0	3625.571	-75.43707	26.97746	27.13333	108.732	18.441	10862.3
335.0	3628.376	-75.29389	26.93408	27.08978	108.809	17.955	10969.1
340.0	3631.136	-75.14913	26.89002	27.04554	108.887	17.476	11078.8
345.0	3633.851	-75.00275	26.84525	27.00060	108.966	17.005	11191.4
350.0	3636.522	-74.85475	26.79976	26.95492	109.045	16.539	11306.9
355.0	3639.148	-74.70509	26.75353	26.90851	109.126	16.077	11425.5
360.0	3641.730	-74.55375	26.70654	26.86134	109.207	15.624	11547.2
365.0	3644.267	-74.40070	26.65879	26.81339	109.289	15.178	11671.5
370.0	3646.759	-74.24591	26.61025	26.76466	109.372	14.738	11798.8
375.0	3649.206	-74.08936	26.56092	26.71513	109.455	14.303	11929.3
380.0	3651.609	-73.93102	26.51076	26.66477	109.539	13.875	12062.9
385.0	3653.967	-73.77086	26.45977	26.61357	109.625	13.452	12199.5
390.0	3656.280	-73.60885	26.40792	26.56151	109.709	13.038	12339.9
395.0	3658.549	-73.44497	26.35520	26.50858	109.795	12.630	12483.0
400.0	3660.772	-73.27917	26.30159	26.45475	109.882	12.229	12629.5
405.0	3662.951	-73.11144	26.24707	26.40000	109.969	11.835	12779.8
410.0	3665.086	-72.94173	26.19161	26.34433	110.056	11.446	12933.1
415.0	3667.176	-72.77002	26.13522	26.28770	110.144	11.065	13090.2
420.0	3669.220	-72.59626	26.07784	26.23009	110.233	10.688	13250.5
425.0	3671.220	-72.42044	26.01948	26.17149	110.322	10.319	13414.6

TABLE XVIII
GEOGRAPHIC COORDINATES

TIME SEC	EC DIST NM	LONG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S
430.0	3673.175	-72.24251	25.96011	26.11187	110.411	9.956	13582.3
435.0	3675.085	-72.06244	25.89970	26.05121	110.502	9.599	13754.0
440.0	3676.949	-71.88018	25.83823	25.98948	110.593	9.250	13929.1
445.0	3678.771	-71.69573	25.77568	25.92667	110.685	8.905	14107.8
450.0	3680.546	-71.50902	25.71202	25.86275	110.777	8.567	14290.1
455.0	3682.275	-71.32003	25.64724	25.79770	110.870	8.234	14476.2
460.0	3683.958	-71.12872	25.58131	25.73149	110.964	7.905	14666.1
465.0	3685.595	-70.93506	25.51420	25.66410	111.058	7.584	14860.1
470.0	3687.185	-70.73900	25.44589	25.59550	111.152	7.267	15058.0
475.0	3688.730	-70.54050	25.37635	25.52566	111.246	6.956	15260.4
480.0	3690.227	-70.33952	25.30556	25.45457	111.342	6.651	15467.4
485.0	3691.678	-70.13601	25.23347	25.38217	111.438	6.352	15678.8
490.0	3693.082	-69.92993	25.16007	25.30846	111.535	6.058	15894.9
495.0	3694.439	-69.72124	25.08532	25.23338	111.633	5.770	16115.8
500.0	3695.749	-69.50987	25.00918	25.15693	111.731	5.487	16341.1
505.0	3697.011	-69.29579	24.93164	25.07905	111.830	5.210	16571.6
510.0	3698.225	-69.07895	24.85265	24.99971	111.930	4.938	16807.2
515.0	3699.392	-68.85929	24.77217	24.91889	112.030	4.672	17047.7
520.0	3700.510	-68.63676	24.69018	24.83654	112.130	4.409	17294.1
525.0	3701.580	-68.41130	24.60664	24.75263	112.232	4.153	17545.5
530.0	3702.601	-68.18287	24.52150	24.66711	112.334	3.901	17802.7
535.0	3703.574	-67.95139	24.43473	24.57996	112.437	3.654	18065.8
540.0	3704.496	-67.71681	24.34628	24.49113	112.541	3.411	18335.0
545.0	3705.369	-67.47908	24.25612	24.40056	112.645	3.173	18610.1
550.0	3706.191	-67.23811	24.16420	24.30823	112.750	2.939	18891.4
555.0	3706.963	-66.99386	24.07047	24.21409	112.856	2.708	19179.8
560.0	3707.682	-66.74625	23.97489	24.11808	112.962	2.481	19474.4
565.0	3708.350	-66.49520	23.87741	24.02015	113.070	2.260	19776.9
570.0	3708.966	-66.24063	23.77797	23.92027	113.177	2.043	20087.1
575.0	3709.528	-65.98247	23.67652	23.81836	113.286	1.828	20404.4
580.0	3710.037	-65.72063	23.57301	23.71437	113.395	1.617	20730.8
585.0	3710.491	-65.45503	23.46737	23.60825	113.504	1.409	21065.3
590.0	3710.889	-65.18558	23.35954	23.49993	113.616	1.204	21407.6
595.0	3711.231	-64.91218	23.24947	23.38935	113.728	1.001	21759.2
600.0	3711.514	-64.63476	23.13708	23.27644	113.841	0.803	22119.6
605.0	3711.740	-64.35321	23.02231	23.16114	113.955	0.607	22489.6
610.0	3711.906	-64.06743	22.90509	23.04337	114.069	0.412	22870.0
615.0	3712.010	-63.77731	22.78535	22.92306	114.184	0.219	23260.9
620.0	3712.050	-63.48274	22.66300	22.80014	114.299	0.028	23663.9

S-IV CUTOFF

621.659	3712.050	-63.38399	22.62182	22.75876	114.338	-0.035	23800.9
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TABLE XVIII
 GEØGRAPHIC CØØRDINATES

TIME SEC	EC DIST NM	LØNG DEG	GC LAT DEG	LAT DEG	VEL-AZ DEG	VEL-ELEV DEG	EF VEL FT/S
625.0	3712.041	-63.18465	22.53839	22.67494	114.424	-0.036	23811.3
630.0	3712.030	-62.88679	22.41302	22.54897	114.555	-0.030	23811.9

INSERTIØN

631.659	3712.026	-62.78809	22.37128	22.50703	114.598	-0.029	23812.0
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TABLE XIX
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL FT/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES LB/FT SQ	RANGE NM	ALTITUDE FT
FIRST MOTION							
0.080	1341.6	0.	90.000	0.014	0.293	-0.	105
LIFT OFF SIGNAL							
0.280	1341.7	0.095	89.996	0.014	0.299	-0.000	105
1.0	1341.9	0.446	89.987	0.017	0.422	0.000	109
2.0	1341.9	0.950	89.983	0.024	0.877	0.000	126
3.0	1341.9	1.469	89.982	0.034	1.688	0.000	154
4.0	1342.0	2.000	89.982	0.044	2.880	-0.000	194
5.0	1342.2	2.541	89.980	0.055	4.474	-0.000	247
6.0	1342.6	3.093	89.975	0.066	6.490	-0.000	313
7.0	1343.2	3.654	89.968	0.078	8.951	-0.001	392
8.0	1343.9	4.226	89.959	0.090	11.882	-0.001	484
9.0	1344.9	4.807	89.950	0.102	15.314	-0.001	590
10.0	1346.0	5.400	89.941	0.115	19.277	-0.002	709
11.0	1347.4	6.005	89.934	0.128	23.753	-0.002	843
12.0	1349.0	6.621	89.929	0.140	28.515	-0.002	991
13.0	1350.8	7.248	89.927	0.153	33.834	-0.003	1154
14.0	1353.0	7.887	89.930	0.167	39.730	-0.003	1332
15.0	1355.5	8.536	89.936	0.180	46.223	-0.004	1525
16.0	1358.4	9.195	89.947	0.195	53.310	-0.004	1735
17.0	1361.8	9.862	89.961	0.209	60.998	-0.004	1959
18.0	1365.6	10.535	89.980	0.224	69.300	-0.004	2201
19.0	1370.1	11.213	90.003	0.239	78.219	-0.004	2459
20.0	1375.2	11.893	90.029	0.254	87.663	-0.004	2734
21.0	1381.0	12.575	90.059	0.269	97.697	-0.003	3026
22.0	1387.5	13.257	90.093	0.285	108.304	-0.003	3335
23.0	1394.8	13.936	90.130	0.301	119.454	0.003	3662
24.0	1402.9	14.611	90.171	0.318	131.145	0.004	4006
25.0	1411.8	15.283	90.217	0.335	143.414	0.006	4370
26.0	1421.5	15.950	90.267	0.352	156.226	0.010	4751
27.0	1432.1	16.611	90.323	0.369	169.455	0.014	5151
28.0	1443.4	17.268	90.386	0.386	183.082	0.020	5570
29.0	1455.6	17.920	90.454	0.404	197.261	0.026	6008
30.0	1468.6	18.575	90.529	0.423	212.191	0.034	6466

TABLE XIX
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL FT/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES LB/FT SQ	RANGE NM	ALTITUDE FT
31.0	1482.3	19.221	90.608	0.442	227.727	0.043	6943
32.0	1496.5	19.850	90.688	0.461	243.464	0.053	7442
33.0	1511.5	20.477	90.767	0.481	259.964	0.065	7960
34.0	1527.1	21.098	90.841	0.502	277.475	0.078	8499
35.0	1543.3	21.710	90.914	0.523	295.939	0.093	9059
36.0	1560.2	22.314	90.991	0.545	313.941	0.109	9641
37.0	1577.8	22.902	91.078	0.567	332.137	0.127	10244
38.0	1596.2	23.482	91.181	0.589	350.723	0.147	10869
39.0	1615.2	24.052	91.293	0.612	369.638	0.168	11516
40.0	1634.7	24.617	91.407	0.637	390.459	0.191	12186
41.0	1654.6	25.178	91.513	0.662	410.341	0.217	12877
42.0	1675.0	25.736	91.609	0.686	429.413	0.244	13593
43.0	1696.0	26.287	91.699	0.711	448.112	0.273	14332
44.0	1717.6	26.828	91.788	0.737	467.371	0.304	15095
45.0	1739.9	27.353	91.879	0.764	487.245	0.337	15882
46.0	1763.1	27.864	91.969	0.791	506.949	0.372	16694
47.0	1786.9	28.359	92.050	0.819	525.364	0.409	17530
48.0	1811.4	28.843	92.117	0.847	543.350	0.449	18392
49.0	1836.5	29.317	92.175	0.877	563.007	0.491	19278
50.0	1862.1	29.778	92.233	0.907	580.611	0.536	20190
51.0	1888.3	30.221	92.302	0.936	596.633	0.583	21128
52.0	1915.0	30.638	92.391	0.965	610.013	0.633	22090
53.0	1942.0	31.023	92.500	0.994	621.701	0.685	23079
MACH ONE							
53.208	1947.7	31.099	92.524	1.000	623.617	0.696	23288
54.0	1969.4	31.377	92.622	1.023	631.126	0.740	24092
55.0	1996.9	31.704	92.749	1.055	643.206	0.799	25130
56.0	2024.6	32.014	92.877	1.088	655.255	0.860	26190
57.0	2052.6	32.313	93.004	1.124	667.054	0.924	27276
58.0	2081.3	32.608	93.135	1.159	676.822	0.991	28385
59.0	2110.8	32.898	93.274	1.191	680.153	1.061	29519
60.0	2141.4	33.181	93.423	1.227	686.944	1.134	30678
61.0	2173.2	33.453	93.568	1.262	690.005	1.211	31862
62.0	2206.4	33.711	93.693	1.297	690.479	1.292	33074
63.0	2241.0	33.957	93.790	1.323	679.784	1.376	34312
64.0	2276.8	34.197	93.866	1.353	672.097	1.464	35577
65.0	2313.7	34.436	93.936	1.400	679.188	1.557	36871

TABLE XIX
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL FT/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES LB/FT SQ	RANGE NM	ALTITUDE FT
MAXIMUM DYNAMIC PRESSURE							
66.000	2351.5	34.678	94.017	1.447	683.022	1.653	38194
67.0	2390.1	34.922	94.112	1.494	684.564	1.754	39547
68.0	2429.5	35.163	94.216	1.547	688.168	1.859	40930
69.0	2470.1	35.397	94.319	1.601	689.273	1.968	42345
70.0	2512.0	35.620	94.419	1.658	689.975	2.082	43792
71.0	2555.1	35.833	94.525	1.715	686.210	2.201	45270
72.0	2599.5	36.036	94.650	1.773	680.881	2.325	46783
73.0	2645.1	36.232	94.792	1.833	673.113	2.453	48329
74.0	2691.8	36.422	94.945	1.890	660.327	2.588	49910
75.0	2739.8	36.606	95.103	1.961	654.094	2.727	51526
76.0	2789.0	36.785	95.261	2.020	636.895	2.872	53177
77.0	2839.5	36.959	95.418	2.096	627.735	3.023	54865
78.0	2891.3	37.126	95.578	2.145	599.997	3.180	56591
79.0	2944.5	37.287	95.743	2.221	586.364	3.343	58355
80.0	2999.0	37.441	95.909	2.268	556.150	3.513	60159
81.0	3055.1	37.585	96.076	2.336	535.796	3.689	62002
82.0	3112.7	37.715	96.242	2.368	499.366	3.871	63885
83.0	3171.9	37.833	96.410	2.409	468.670	4.061	65809
84.0	3232.8	37.936	96.579	2.453	440.672	4.257	67776
85.0	3295.1	38.027	96.747	2.504	416.254	4.461	69784
86.0	3359.0	38.107	96.912	2.555	392.595	4.673	71835
87.0	3424.4	38.174	97.074	2.617	372.206	4.893	73929
88.0	3491.4	38.229	97.232	2.673	350.671	5.121	76067
89.0	3559.8	38.271	97.386	2.728	329.200	5.358	78249
90.0	3629.8	38.298	97.538	2.771	305.736	5.603	80475
91.0	3701.3	38.312	97.689	2.836	288.104	5.857	82747
92.0	3774.4	38.313	97.839	2.896	269.782	6.121	85064
93.0	3849.0	38.303	97.988	2.978	255.491	6.394	87426
94.0	3925.1	38.282	98.136	3.058	240.899	6.677	89828
95.0	4002.8	38.252	98.283	3.124	224.296	6.971	92276
96.0	4081.9	38.213	98.427	3.154	204.024	7.275	94770
97.0	4162.5	38.167	98.568	3.210	188.336	7.589	97313
98.0	4244.4	38.115	98.705	3.299	176.916	7.914	99908
99.0	4327.9	38.056	98.839	3.382	164.992	8.250	102551
100.0	4412.8	37.992	98.970	3.439	151.103	8.597	105242
101.0	4499.4	37.921	99.100	3.474	136.543	8.956	107982

TABLE XIX
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL FT/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES LB/FT SQ	RANGE NM	ALTITUDE FT
102.0	4587.4	37.845	99.228	3.564	127.047	9.327	110771
103.0	4677.1	37.764	99.356	3.680	120.788	9.709	113609
104.0	4768.3	37.680	99.482	3.741	111.258	10.104	116497
105.0	4860.9	37.594	99.603	3.802	102.271	10.512	119436
106.0	4955.1	37.505	99.719	3.863	93.778	10.933	122426
107.0	5051.0	37.416	99.835	3.925	85.786	11.366	125467
108.0	5148.5	37.326	99.949	3.990	78.344	11.813	128561
109.0	5247.7	37.236	100.062	4.062	71.512	12.274	131708
110.0	5348.6	37.146	100.174	4.135	65.209	12.748	134909
111.0	5451.2	37.055	100.283	4.210	59.410	13.236	138164
112.0	5555.6	36.965	100.388	4.286	54.085	13.739	141475
113.0	5661.6	36.874	100.490	4.364	49.204	14.256	144843
114.0	5769.5	36.785	100.590	4.445	44.740	14.788	148267
115.0	5879.3	36.696	100.689	4.529	40.661	15.335	151749
116.0	5990.9	36.610	100.786	4.617	36.948	15.897	155290
117.0	6104.5	36.527	100.882	4.710	33.559	16.475	158891
118.0	6220.1	36.446	100.976	4.817	30.571	17.069	162553
119.0	6337.6	36.368	101.068	4.938	27.913	17.679	166277
120.0	6457.2	36.293	101.160	5.066	25.428	18.305	170065
121.0	6578.9	36.221	101.250	5.199	23.103	18.947	173917
122.0	6702.8	36.152	101.339	5.339	20.934	19.607	177835
123.0	6828.9	36.085	101.425	5.486	18.908	20.283	181821
124.0	6957.3	36.022	101.509	5.640	17.018	20.977	185875
125.0	7088.0	35.961	101.591	5.801	15.259	21.689	189999
126.0	7221.2	35.903	101.672	5.970	13.624	22.419	194195
127.0	7357.0	35.848	101.751	6.146	12.108	23.167	198463
128.0	7495.3	35.797	101.828	6.330	10.708	23.933	202806
129.0	7636.2	35.748	101.905	6.521	9.418	24.719	207226
130.0	7780.0	35.702	101.982	6.721	8.235	25.523	211723
131.0	7926.7	35.657	102.058	6.929	-7.155	26.348	216300
132.0	8076.3	35.613	102.133	7.145	6.175	27.192	220958
133.0	8229.0	35.570	102.206	7.370	5.289	28.057	225700
134.0	8384.8	35.527	102.278	7.603	4.496	28.942	230526
135.0	8544.0	35.483	102.352	7.844	3.790	29.850	235438
136.0	8706.2	35.436	102.425	8.095	3.168	30.779	240438
137.0	8872.4	35.385	102.494	8.356	2.624	31.730	245527
138.0	9042.0	35.332	102.565	8.627	2.152	32.704	250706
139.0	9215.4	35.277	102.633	8.910	1.748	33.701	255978
140.0	9393.1	35.224	102.703	9.208	1.407	34.722	261345
IECØ							
140.220	9432.7	35.213	102.714	9.276	1.338	34.950	262545

TABLE XIX
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL FT/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES LB/FT SQ	RANGE NM	ALTITUDE FT
141.0	9524.7	35.154	102.755	9.466	1.107	35.766	266799
142.0	9610.0	35.065	102.796	9.686	0.856	36.824	272298
143.0	9692.3	34.980	102.835	9.778	0.640	37.893	277833
144.0	9774.8	34.895	102.872	9.869	0.477	38.975	283404
145.0	9857.9	34.813	102.911	9.961	0.355	40.069	289010
ØECØ							
145.560	9904.2	34.769	102.926	10.013	0.300	40.684	292168
146.0	9915.3	34.722	102.942	10.024	0.262	41.174	294650
147.0	9904.2	34.599	102.956	9.885	0.187	42.282	300283
148.0	9890.0	34.472	102.969	9.733	0.134	43.390	305890
S-IV ENGINE START							
148.120	9888.6	34.459	102.965	9.715	0.129	43.521	306562
149.0	9875.8	34.347	102.982	9.587	0.097	44.498	311471
150.0	9864.7	34.221	102.995	9.451	0.071	45.606	317028
155.0	9885.1	33.642	103.078	8.727	0.017	51.170	344571
160.0	9909.1	33.072	103.163	7.832	0.005	56.788	371744
GUIDANCE INITIATION							
163.860	9930.6	32.638	103.227	7.116	0.002	61.159	392496
165.0	9937.3	32.511	103.246	6.807	0.002	62.456	398586
170.0	9967.1	31.974	103.367	5.739	0.001	68.177	425104
175.0	9997.1	31.459	103.555	5.066	0.000	73.950	451316
180.0	10029.9	30.940	103.733	4.596	0.000	79.774	477224
185.0	10065.3	30.412	103.895	4.279	0.000	85.652	502826
190.0	10103.4	29.883	104.039	4.076	0.000	91.585	528120
195.0	10143.8	29.355	104.171	3.958	0.000	97.575	553107
200.0	10186.9	28.835	104.293	3.883	0.000	103.623	577792
205.0	10232.6	28.313	104.404	3.821	0.000	109.730	602177
210.0	10280.4	27.795	104.507	3.767	0.000	115.897	626265
215.0	10330.7	27.278	104.604	3.735	0.000	122.125	650055
220.0	10383.5	26.767	104.695	3.706	0.000	128.416	673551
225.0	10439.0	26.258	104.781	3.680	0.000	134.771	696756

TABLE XIX
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL FT/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES LB/FT SQ	RANGE NM	ALTITUDE FT
230.0	10497.0	25.748	104.865	3.657	0.000	141.192	719669
235.0	10557.2	25.242	104.945	3.636	0.000	147.679	742292
240.0	10620.0	24.740	105.023	3.621	0.000	154.234	764625
245.0	10684.9	24.241	105.100	3.613	0.000	160.858	786671
250.0	10752.2	23.746	105.175	3.606	0.000	167.552	808429
255.0	10821.7	23.255	105.251	3.601	0.000	174.318	829900
260.0	10893.6	22.766	105.326	3.597	0.000	181.157	851086
265.0	10967.7	22.283	105.402	3.595	0.000	188.069	871986
270.0	11044.8	21.802	105.478	3.595	0.000	195.057	892602
275.0	11124.0	21.326	105.554	3.596	0.000	202.121	912935
280.0	11205.5	20.856	105.632	3.598	0.000	209.263	932985
285.0	11289.5	20.389	105.711	3.602	0.000	216.485	952753
290.0	11376.1	19.927	105.791	3.608	0.000	223.787	972241
295.0	11465.2	19.469	105.872	3.616	0.000	231.171	991449
300.0	11557.1	19.016	105.954	3.628	0.000	238.639	1010377
305.0	11651.5	18.569	106.038	3.641	0.000	246.191	1029028
310.0	11748.6	18.126	106.122	3.656	0.000	253.831	1047402
315.0	11848.3	17.688	106.208	3.671	0.000	261.558	1065498
320.0	11950.9	17.256	106.296	3.688	0.000	269.375	1083320
325.0	12056.6	16.830	106.384	3.706	0.000	277.284	1100867
330.0	12164.7	16.407	106.474	3.725	0.000	285.286	1118142
335.0	12275.6	15.990	106.565	3.746	0.000	293.382	1135142
340.0	12389.2	15.578	106.656	3.767	0.000	301.575	1151870
345.0	12505.6	15.172	106.749	3.790	0.000	309.866	1168326
350.0	12624.8	14.771	106.842	3.814	0.000	318.256	1184510
355.0	12747.0	14.373	106.937	3.839	0.000	326.749	1200421
360.0	12872.1	13.981	107.031	3.865	0.000	335.344	1216059
365.0	12999.7	13.595	107.127	3.892	0.000	344.045	1231427
370.0	13130.2	13.215	107.224	3.920	0.000	352.852	1246522
375.0	13263.8	12.838	107.320	3.949	0.000	361.768	1261345
380.0	13400.3	12.466	107.418	3.980	0.000	370.794	1275896
385.0	13539.7	12.100	107.518	4.011	0.000	379.933	1290172
390.0	13682.8	11.739	107.616	4.044	0.000	389.187	1304176
395.0	13828.6	11.383	107.716	4.079	0.000	398.557	1317907
400.0	13977.7	11.034	107.816	4.117	0.000	408.046	1331367
405.0	14130.3	10.690	107.917	4.156	0.000	417.655	1344555
410.0	14286.0	10.350	108.018	4.196	0.000	427.388	1357469
415.0	14445.4	10.016	108.121	4.237	0.000	437.246	1370112
420.0	14607.9	9.685	108.223	4.280	0.000	447.231	1382480
425.0	14774.0	9.360	108.326	4.323	0.000	457.346	1394574

TABLE XIX
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL FT/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES LB/FT SQ	RANGE NM	ALTITUDE FT
430.0	14943.7	9.041	108.430	4.368	0.000	467.594	1406394
435.0	15117.2	8.727	108.534	4.414	0.000	477.976	1417940
440.0	15294.2	8.418	108.640	4.462	0.000	488.496	1429212
445.0	15474.6	8.113	108.746	4.510	0.000	499.155	1440221
450.0	15658.6	7.813	108.852	4.560	0.000	509.956	1450942
455.0	15846.2	7.518	108.959	4.611	0.000	520.902	1461386
460.0	16037.6	7.225	109.066	4.663	0.000	531.995	1471549
465.0	16233.1	6.939	109.175	4.717	0.000	543.239	1481431
470.0	16432.4	6.656	109.283	4.772	0.000	554.635	1491031
475.0	16636.1	6.379	109.391	4.828	0.000	566.186	1500347
480.0	16844.3	6.105	109.501	4.886	0.000	577.897	1509379
485.0	17056.8	5.837	109.612	4.945	0.000	589.769	1518127
490.0	17274.0	5.573	109.723	5.006	0.000	601.807	1526589
495.0	17496.0	5.313	109.835	5.069	0.000	614.013	1534763
500.0	17722.3	5.059	109.947	5.133	0.000	626.392	1542648
505.0	17953.8	4.808	110.061	5.198	0.000	638.946	1550244
510.0	18190.2	4.562	110.175	5.266	0.000	651.679	1557550
515.0	18431.5	4.320	110.289	5.335	0.000	664.594	1564563
520.0	18678.7	4.082	110.404	5.406	0.000	677.697	1571282
525.0	18930.9	3.848	110.520	5.479	0.000	690.990	1577705
530.0	19188.8	3.619	110.637	5.553	0.000	704.478	1583831
535.0	19452.4	3.393	110.755	5.630	0.000	718.165	1589657
540.0	19722.2	3.171	110.873	5.709	0.000	732.055	1595181
545.0	19997.9	2.952	110.992	5.789	0.000	746.153	1600401
550.0	20279.7	2.737	111.111	5.872	0.000	760.463	1605314
555.0	20568.5	2.525	111.232	5.957	0.000	774.991	1609915
560.0	20863.5	2.316	111.353	6.044	0.000	789.741	1614200
565.0	21166.4	2.111	111.475	6.134	0.000	804.718	1618169
570.0	21476.9	1.911	111.597	6.227	0.000	819.930	1621818
575.0	21794.5	1.711	111.721	6.321	0.000	835.380	1625144
580.0	22121.1	1.515	111.845	6.419	0.000	851.076	1628140
585.0	22455.9	1.322	111.969	6.520	0.000	867.023	1630804
590.0	22798.4	1.131	112.096	6.624	0.000	883.229	1633128
595.0	23150.1	0.941	112.223	6.730	0.000	899.698	1635105
600.0	23510.6	0.755	112.351	6.840	0.000	916.440	1636730
605.0	23880.7	0.572	112.480	6.953	0.000	933.459	1637999
610.0	24261.1	0.389	112.609	7.069	0.000	950.765	1638904
615.0	24652.0	0.207	112.740	7.190	0.000	968.365	1639432
620.0	25055.0	0.027	112.871	7.314	0.000	986.266	1639569
S-IV CUT OFF							
621.659	25191.9	-0.033	112.915	7.356	0.000	992.274	1639528

TABLE XIX
SPECIAL TRAJECTORY DEPENDENT PARAMETERS

TIME SEC	SF VEL FT/S	FLT-PATH DEG	HEAD DEG	MACH	DYN-PRES LB/FT SQ	RANGE NM	ALTITUDE FT
625.0	25202.3	-0.034	112.996	7.360	0.000	1004.415	1639402
630.0	25202.8	-0.029	113.118	7.360	0.000	1022.585	1639226
INSERTION							
631.659	25202.8	-0.027	113.159	7.360	0.000	1028.614	1639170

APPENDIX

DEFINITION OF SYMBOLS

<u>Symbol</u>	<u>Definition</u>
XE, YE, ZE	<p>Position, velocity and acceleration components in the <u>Earth-Fixed Cartesian Coordinate System</u>. 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 X-Z plane is tangent to the reference ellipsoid at the origin of the coordinate system. The positive X-axis is oriented in the flight azimuth direction, 105 deg E of N. The Y-axis is normal to the X-Z plane and is positive above the origin. The Z-axis is normal to the X-Y plane and is in a right hand relation to the X-Y axes with the positive direction 195 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 21.</p>
DXE, DYE, DZE	
DDXE, DDYE, DDZE	
XSP, YSP, ZSP	<p>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 of 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 21.</p>
DXSP, DYSP, DZSP	
DDXSP, DDYSP, DDZSP	

DEFINITION OF SYMBOLS (CONT'D)

<u>Symbol</u>	<u>Definition</u>
E. C. DIST	<p>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). A subvehicle point is defined as the intersection of the reference ellipsoid and the radius vector from the vehicle to the center of the earth. The geocentric latitude and longitude refer to the subvehicle point. Geocentric latitude is the angle between the radius vector 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.</p>
LONG	
G. C. LAT	
E. F. VEL	<p>Earth-fixed velocity of 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 21.</p>
VEL-AZ	
VEL-ELEV	

DEFINITION OF SYMBOLS (CONT'D)

<u>Symbol</u>	<u>Definition</u>
S. F. VEL	Space-fixed velocity of vehicle in the <u>Geographic Coordinate System</u> .
FLT-PATH	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.
HEAD	
LAT	Geodetic latitude of vehicle
MACH	Mach number
DYN PRES	Dynamic Pressure
ALTITUDE	Distance from the subvehicle point 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.
Mean Sidereal Time (θ)	The <u>mean sidereal time</u> is the angle between the mean vernal equinox and the Greenwich meridian for the epoch of midnight on the day of launch.

DEFINITION OF SYMBOLS (CONT'D)

<u>Symbol</u>	<u>Definition</u>
Orbital Element	The <u>Orbital Element System</u> is defined by six osculating elements of the two body ellipse with the reference body being determined by the body constants used, normally those of the earth. The elements are the semi-major axis of the ellipse; the eccentricity; the right ascension of the ascending node (Point of intersection of the orbital plane and earth equatorial plane); the inclination of the orbital plane to the earth equatorial plane; the argument of perigee or the angle between the ascending node and the perigee; the true anomaly or the angle between the perigee point and the satellite point. The various orbital elements are shown in Figure 21.

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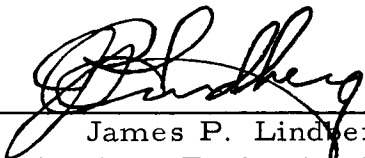
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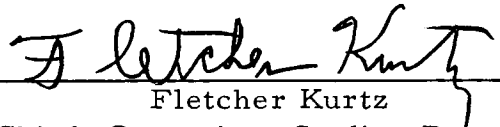
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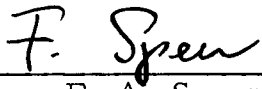
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