

SECTION 9
ORBIT DATA - LAUNCH TRAJECTORY

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9.1 MISSION PROFILE

IUE was launched by a three-stage Delta 2914 launch vehicle from Cape Kennedy on January 26, 1978 at 17^h 36^m 05.206 GMT. At an altitude of 89 nautical miles, it was injected into a near-circular parking orbit with an inclination of 28.7 degrees. After coasting for about 34 minutes, the booster injected the spacecraft into a transfer orbit with an argument of perigee of 257.4 degrees. Following injection into the transfer orbit, the spacecraft orbit and attitude were determined from tracking and telemetry data. The hydrazine reaction control system was then used to reorient the spacecraft into the apogee motor firing attitude. About 22 minutes prior to the second apogee passage of the transfer orbit, the apogee boost motor was fired to inject the satellite into a synchronous orbit with an eccentricity of 0.25.

9.2 ORBITAL ELEMENTS

The parking orbit achieved was defined by the following parameters:

Semi-major Axis	6542.496 km
Eccentricity	0.01871
Inclination	28.728 deg
Right Ascension of the Ascending Node	209.185 deg
Argument of Perigee	47.791 deg
Mean Anomaly	94.746 deg
Epoch	780126 17 ^h 44 ^m 59 ^s .0 GMT

Following the period of coasting, the spacecraft was injected into the parking orbit. The orbital parameters were:

Semi-major Axis	29677.110 km
Eccentricity	0.77946
Inclination	28.710 deg
Right Ascension of the Ascending Node	209.170 deg
Argument of Perigee	257.010 deg
Mean Anomaly	0.662 deg

Epoch	780126 18 ^h 19 ^m 50. ^s 0	GMT
Right Ascension	196.47	deg
Declination	-5.74	deg
Spin Rate	63.13	rpm

In the transfer orbit, a maneuver was executed to reorient the spin axis of the spacecraft from the injection attitude to the attitude necessary for firing the apogee boost motor (ABM). The subsequent orbital parameters were:

Semi-major Axis	29458.648	km
Eccentricity	0.77769	
Inclination	28.668	deg
Right Ascension of the Ascending Node	208.556	deg
Argument of Perigee	257.586	deg
Mean Anomaly	236.826	deg
Epoch	780127 03 ^h 30 ^m 30. ^s 0	GMT
Right Ascension	22.43	deg
Declination	3.30	deg
Spin Rate	62.83	rpm

Prior to the firing of the apogee boost motor, two attitude touchup maneuvers were executed. The firing of the ABM occurred on January 27, 1978 at 14^h 53^m 54^s GMT, which placed the spacecraft in a drift orbit with an eastward drift rate of 0.123 degrees per day. The resulting orbital parameters as evaluated were:

Semi-major Axis	42085.412	km
Eccentricity	0.24180	
Inclination	28.672	deg
Right Ascension of the Ascending Node	208.435	deg
Argument of Perigee	256.658	deg
Mean Anomaly	178.836	deg
Epoch	780127 14 ^h 54 ^m 10. ^s 0	GMT
Right Ascension	22.25	deg
Declination	3.38	deg
Spin Rate	62.92	rpm

Events following the apogee boost motor firings included a maneuver to reorient the spacecraft spin axis to a sun angle of 120 degrees and to reduce the spacecraft spin rate from 62.8 to 4.4 rpm.

9.3 STATION ACQUISITION MANEUVERS

Due to the violation of a tracking constraint at NTT, the first station acquisition maneuver was performed at 01^h 54^m 32^s.0 on February 14, 1978 with the objective of changing the eastward drift rate of 0.15 degrees per day to a westward drift rate of 0.05 degrees per day. The predicted post-maneuver elements and the achieved post-maneuver elements are presented as evaluated at the Epoch of the maneuver:

	<u>Predicted Post-Maneuver</u>	<u>Achieved Post-Maneuver</u>
Semi-major Axis (km)	42169.053	42166.995
Eccentricity	0.2396278	0.2395886
Inclination (deg)	28.6330	28.6333
Node (deg)	207.7397	207.7482
Argument of Perigee (deg)	257.3918	257.3944
Mean Anomaly (deg)	3.7637	3.7765
Drift Rate (deg/day)	0.04909 W	0.02274 W

The second station acquisition maneuver was executed at 16^h 34^m 13^s.0 on July 24, 1978 to avoid a violation of the tracking constraint at the VILSPA tracking site. The predicted Post-Maneuver parameters and the achieved Post-Maneuver parameters are presented as evaluated at the epoch of the maneuver:

	<u>Predicted Post-Maneuver</u>	<u>Achieved Post-Maneuver</u>
Semi-major Axis (km)	42154.44	42152.17
Eccentricity	0.23966	0.23962
Inclination	28.485	28.482
Node	204.319	204.303
Argument of Perigee (deg)	260.812	260.808
Mean Anomaly	4.756	4.760
Drift Rate (deg/day)	0.13269E	0.16205E

Periodically, subsequent maneuvers will be necessary to maintain the spacecraft in a position such that the tracking constraints will not be violated.

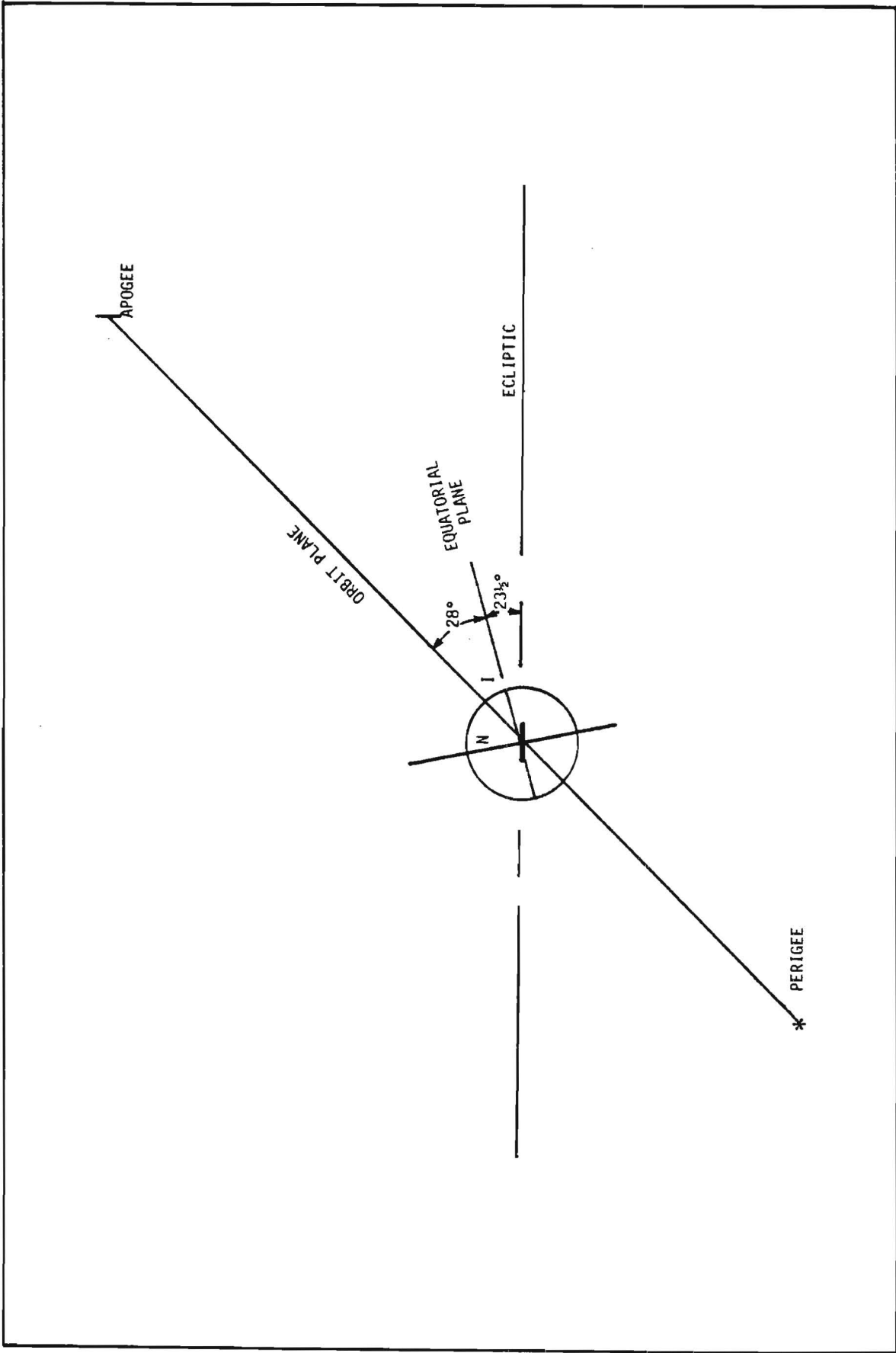


Figure 9-1. IUE Orbit Plane

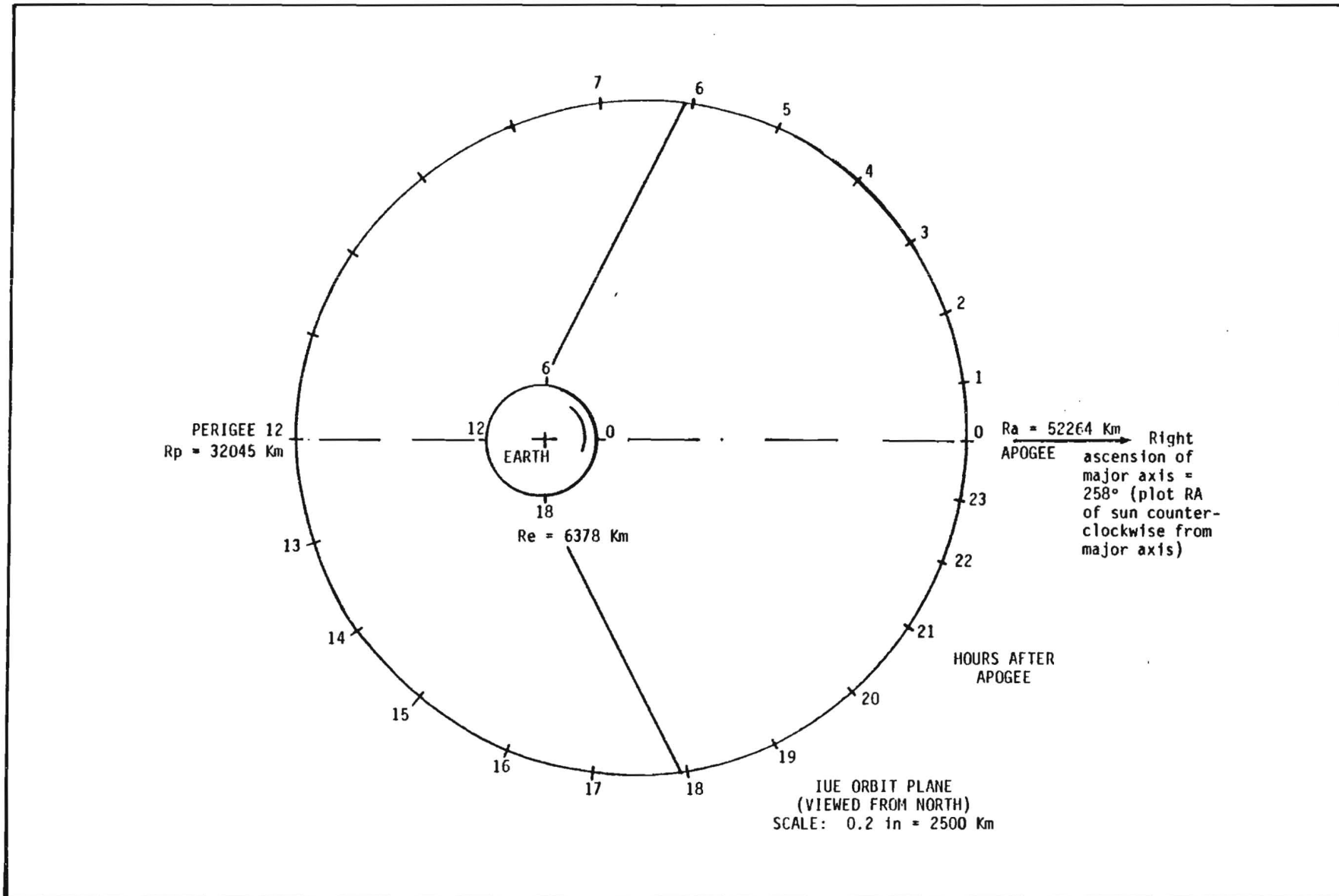


Figure 9-2. IUE Orbit Plane (Viewed From North)

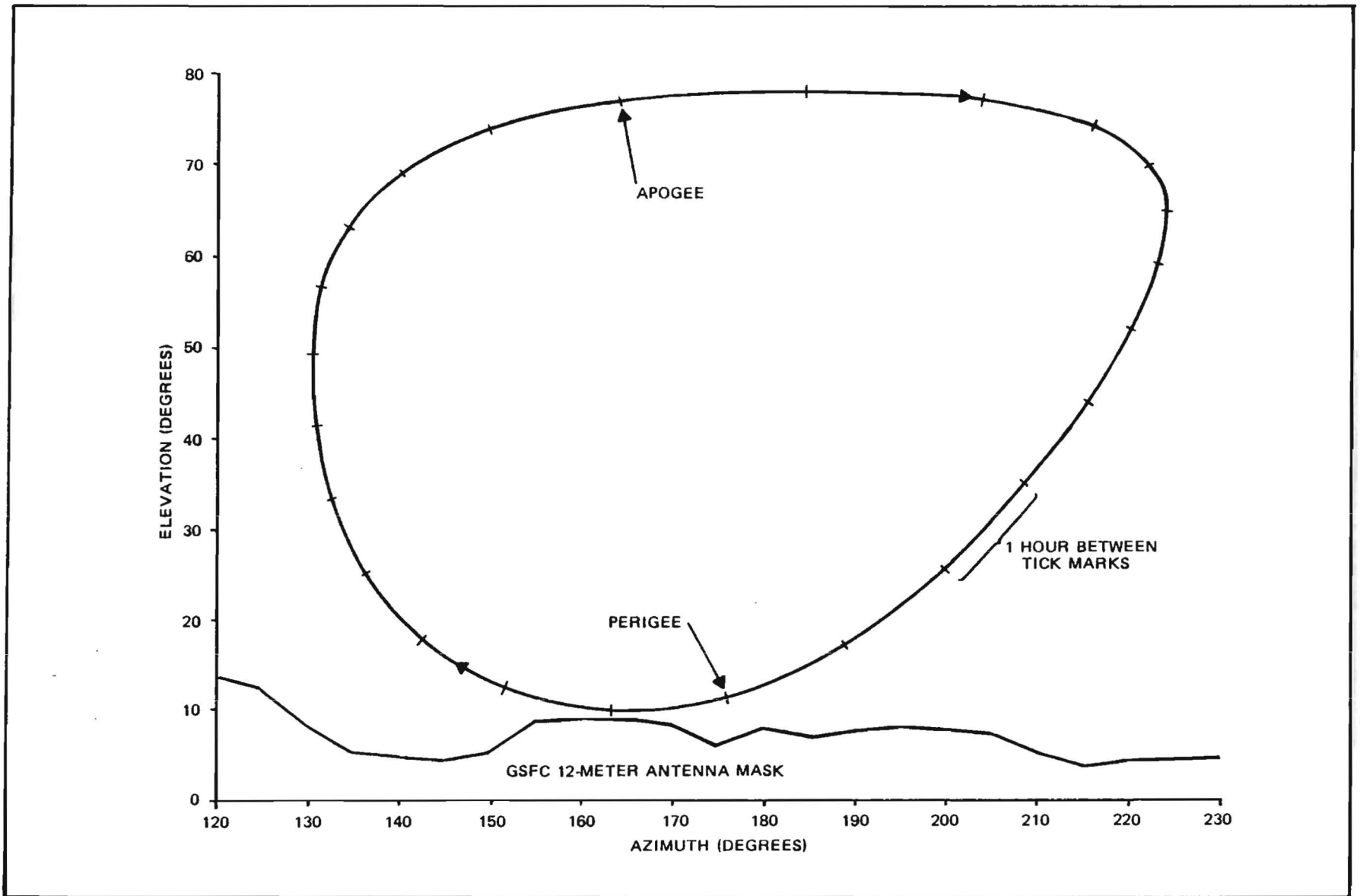


Figure 9-3. GSFC Tracking Mask and Nominal Tracking Pattern

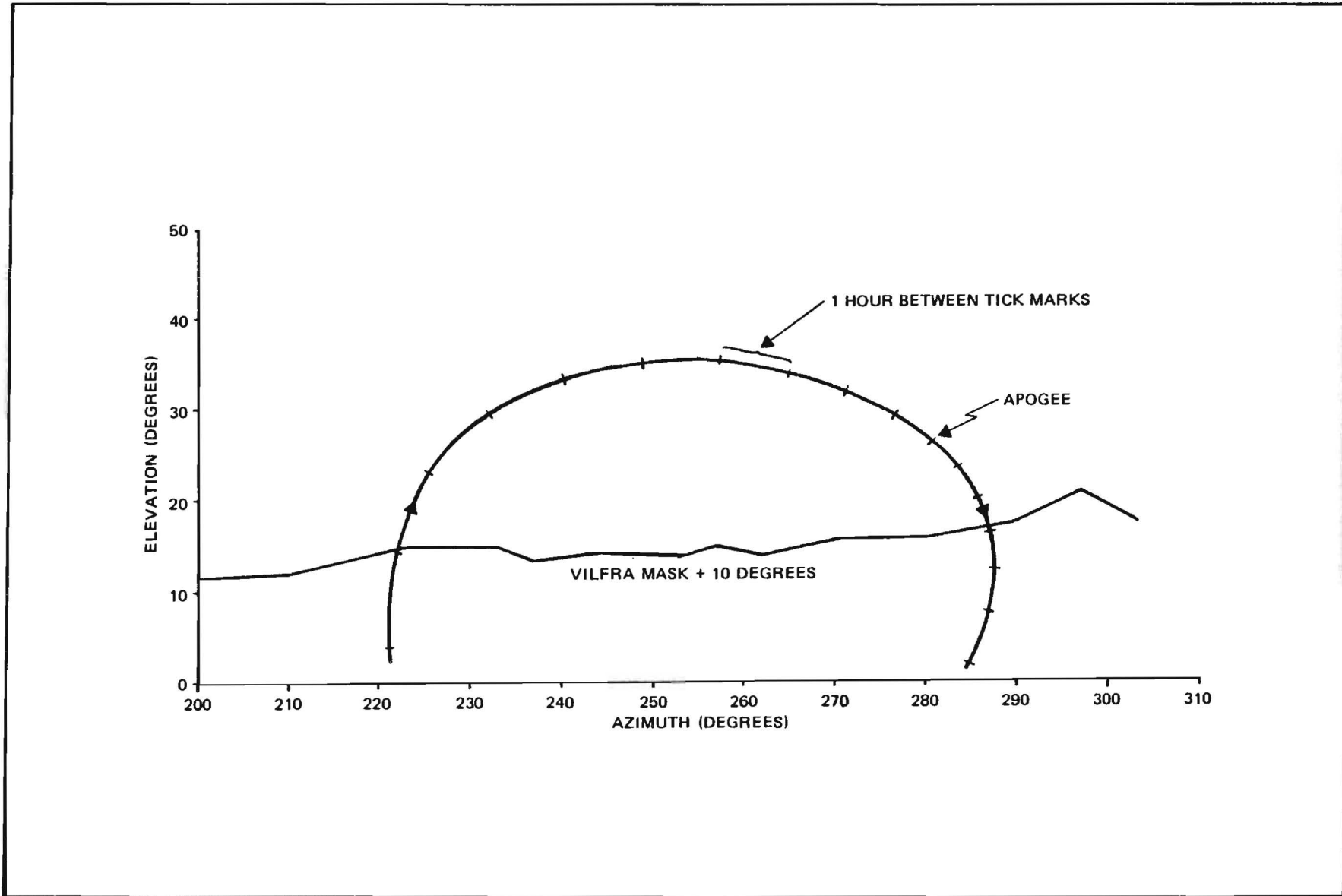


Figure 9-4. VILSPA Tracking Mask and Nominal Tracking Pattern