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SATELLITE ORBITAL DATA

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ORBITAL INFORMATION[1]

The orbital elements have been derived by the indicated staff members of the Satellite Tracking Program, Smithsonian Astrophysical Observatory, employing the SAO Differential Orbit Improvement Program (DØI).

Field-reduced photographs from SAO Baker-Nunn cameras comprise the majority of observations used in computing these orbital data. SAO Moonwatch teams, the NASA Minitrack network, foreign observatories, miscellaneous U.S. and foreign observers, and various radar installations also contribute valuable observations.

As opposed to osculating elements, the elements presented here are mean elements in the sense that the effects of the short-period perturbations due to the earth's oblateness have been eliminated.

SAO mean elements have been derived from observations covering several days and are given in the form of a table. The successive sets of elements are essentially independent of each other. They are dependent, however, in the sense that high-order coefficients in the secular and the long-periodic terms are generally considered as known and as constant for periods of several weeks or months, as dictated by convenience.

The times of epoch in the mean elements are reckoned in Julian Days, but for the sake of convenience the number 2400000.5 has been subtracted to provide an abbreviated notation which we call "Modified Julian Days," or "MJD."

The units of the orbital elements are degrees for angular quantities, megameters (Mm = 10^6 meters) for linear quantities, and revolutions for the mean anomaly M and its derivatives.

[1]This work was supported in part by grant NsG 87-60 from the National Aeronautics and Space Administration.

The tabulated values of the SAO mean elements give the values of argument of perigee ω, right ascension of the ascending node Ω, inclination i, eccentricity e, and mean anomaly M as functions of time $t = T - T_0$ (where T_0 is the reference epoch) expressed in days. The single digit placed at the right of each value represents the standard error for that element and refers to the last digit given.

The same tabulation also gives the mean (anomalistic) motion n, the orbital acceleration $n'/2$ or $n'(dn/dt)$, and the semimajor axis a or the geocentric distance of perigee q (in megameters). Of the last three columns, the one headed N indicates the number of observations used for the computation of a set of elements; the one headed D, the number of days used; and the one headed σ, the standard error of the representation of the observations relative to their assumed accuracy.

SAO smoothed elements have been derived from observations covering about 2 weeks or more. They are given as functions of time and generally include both secular and periodic terms. The general expression for any element E is

$$E = E_0 + E_1 t + E_2 t^2 + \ldots + \sum A_i \sin (B_i + C_i t) \quad ,$$

where $t = T - T_0$ is again expressed in days. The presence of a standard error associated with a particular coefficient indicates that this quantity was determined by the process of differential orbit improvement; the absence of a standard error means that the quantity was taken from some other source.

In our computer program, the inclination and the argument of perigee are referred to the true equator of date; the right ascension of the ascending node, however, is reckoned from the mean equinox of 1950.0 along the corresponding mean equator to the intersection with the moving true equator of date, and then along the true equator of date. To transform from right ascension of the node as determined by the DØI to right ascension of the node referred to the mean equinox of date, one uses

$$\Omega^\circ = \Omega^\circ (D\emptyset I) + 3^\circ.508 \times 10^{-5} (MJD - 33281) \quad ,$$

where MJD stands for the Modified Julian Day of the date.

The mean (anomalistic) motion n can be obtained from the smoothed elements by differentiating the expression for M, and the orbital acceleration n′ can be obtained by twice differentiating the same expression for M.

The sun-perigee data are related to the perturbing effects of atmospheric drag. From left to right are the Modified Julian Day (MJD); the perigee height Z (in kilometers) above the International Ellipsoid of Reference; the geocentric latitude of the perigee (ϕ); the angular geocentric distance (ψ) from the perigee of the sun; and the difference in right ascension (D. R. A.) between the perigee and the sun; all these angles are expressed in degrees. In the last column we give the rate of change of the period ($\dot{P}$) expressed in days per day.

I. SAO smoothed elements

The following elements are based on 60 observations and are valid for the period January 1 through January 15, 1964.

$T_0 = 38402.0$ MJD

$\omega = (197.^\circ 75 \pm 6) + (7.^\circ 68 \pm 1)t - .^\circ 000841t^2 + .^\circ 3266 \cos \omega$

$\Omega = (3.^\circ 253 \pm 6) - (5.^\circ 128 \pm 1)t - .^\circ 7052 \times 10^{-4}t^2 + .^\circ 0030 \cos \omega$

$i = (33.^\circ 200 \pm 3) + .^\circ 0010851t + .^\circ 1263 \times 10^{-4}t^2 - .^\circ 0038 \sin \omega$

$e = (.08723 \pm 6) - (.21 \pm 9) \times 10^{-4}t - .4096 \times 10^{-6}t^2 + .0004990 \sin \omega$

$M = (.5612 \pm 2) + (13.73757 \pm 4)t + (.660 \pm 3) \times 10^{-4}t^2$

$- (.29 \pm 7) \times 10^{-6}t^3 - .0009345 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.80$

The following elements are based on 75 observations and are valid for the period January 15 through February 1, 1964.

$T_0 = 38418.0$ MJD

$\omega = (320.^\circ 14 \pm 2) + (7.^\circ 659 \pm 3)t - .^\circ 000841 \times t^2 + .^\circ 3266 \cos \omega$

$\Omega = (281.^\circ 179 \pm 5) - (5.^\circ 129 \pm 1)t - .^\circ 7052 \times 10^{-4}t^2 + .^\circ 0030 \cos \omega$

$i = (33.^\circ 203 \pm 1) + .^\circ 0014892t + .^\circ 1263 \times 10^{-4}t^2 - .^\circ 0038 \sin \omega$

$e = (.08708 \pm 3) - (.11 \pm 6) \times 10^{-4}t - .4096 \times 10^{-6}t^2 + .0004990 \sin \omega$

$M = (.37904 \pm 5) + (13.73952 \pm 1)t + (.651 \pm 2) \times 10^{-4}t^2$

$+ (.47 \pm 3) \times 10^{-6}t^3 - .0009345 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.78$

The following elements are based on 57 observations and are valid for the period February 1 through February 15, 1964.

T_0 = 38432.0 MJD

$\omega = (67^\circ.34 \pm 2) + (7^\circ.660 \pm 5)t - ^\circ.000841t^2 + ^\circ.3266 \cos \omega$

$\Omega = (209^\circ.363 \pm 5) - (5^\circ.131 \pm 1)t - ^\circ.7052 \times 10^{-4}t^2 + ^\circ.0030 \cos \omega$

$i = (33^\circ.195 \pm 1) + ^\circ.0018429t + ^\circ.126310^{-4}t^2 - ^\circ.0038 \sin \omega$

$e = (.08714 \pm 5) - (.45 \pm 92) \times 10^{-5}t - .4096 \times 10^{-6}t^2 + .0004990 \sin \omega$

$M = (.74545 \pm 7) + (13.74135 \pm 2)t + (.706 \pm 3) \times 10^{-4}t^2$

$+ (.89 \pm 6) \times 10^{-6}t^3 - .0009345 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.10$

The following elements are based on 67 observations and are valid for the period February 15 through March 1, 1964.

T_0 = 38447.0 MJD

$\omega = (182^\circ.34 \pm 2) + (7^\circ.678 \pm 4)t - ^\circ.000841t^2 + ^\circ.3266 \cos \omega$

$\Omega = (132^\circ.373 \pm 4) - (5^\circ.1343 \pm 9)t - ^\circ.7052 \times 10^{-4}t^2 + ^\circ.0030 \cos \omega$

$i = (33^\circ.205 \pm 1) + ^\circ.0022218t + ^\circ.1263 \times 10^{-4}t^2 - ^\circ.0038 \sin \omega$

$e = (.08695 \pm 2) - (.24 \pm 4) \times 10^{-4}t - .4096 \times 10^{-6}t^2 + .0004990 \sin \omega$

$M = (.88379 \pm 6) + (13.74392 \pm 1)t + (.0001152 \pm 2)t^2$

$+ (.197 \pm 5) \times 10^{-5}t^3 - .0009345 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.05$

The following elements are based on 79 observations and are valid for the period March 1 through March 15, 1964.

T_0 = 38461.0 MJD

$\omega = (289^\circ.67 \pm 3) + (7^\circ.687 \pm 6)t - {}^\circ.00172627t^2 + {}^\circ.32613 \cos\omega$

$\Omega = (60^\circ.515 \pm 4) - (5^\circ.136 \pm 1)t - {}^\circ.00021170t^2 + {}^\circ.0029662 \cos\omega$

$i = (33^\circ.201 \pm 2) + {}^\circ.00096t + {}^\circ.325 \times 10^{-5}t^2 - {}^\circ.0038057 \sin\omega$

$e = (.08673 \pm 2) - (.12 \pm 4) \times 10^{-4}t + .5606221 \times 10^{-6}t^2 + .00049905 \sin\omega$

$M = (.3239 \pm 1) + (13.74744 \pm 2)t + (.0001402 \pm 4)t^2$

$+ (.63 \pm 6) \times 10^{-6}t^3 - .00093318 \cos\omega$

Standard error of one observation: $\sigma = \pm 2''.40$

The following elements are based on 88 observations and are valid for the period March 15 through April 1, 1964.

T_0 = 38477.0 MJD

$\omega = (52^\circ.49 \pm 2) + (7^\circ.667 \pm 4)t - {}^\circ.00172627t^2 + {}^\circ.32613 \cos\omega$

$\Omega = (338^\circ.323 \pm 4) - (5^\circ.138 \pm 1)t - {}^\circ.00021170t^2 + {}^\circ.0029662 \cos\omega$

$i = (33^\circ.202 \pm 1) - {}^\circ.00057t + {}^\circ.325 \times 10^{-5}t^2 - {}^\circ.0038057 \sin\omega$

$e = (.08653 \pm 3) - (.24 \pm 58) \times 10^{-5}t + .5606221 \times 10^{-6}t^2 + .00049905 \sin\omega$

$M = (.32065 \pm 5) + (13.75225 \pm 1)t + (.0001649 \pm 2)t^2$

$+ (.89 \pm 5) \times 10^{-6}t^3 - .00093318 \cos\omega$

Standard error of one observation: $\sigma = \pm 1''.88$

T (MJD)	ω	Ω	i	e	M	n	n′/2	q	N	D	σ
38396.0	151.27 4	34.01 1	33.203 8	.0874 1	.1392 1	13.73668 2	.81E-4 8	6.719601	10	8	.88
38400.0	182.01 3	13.505 5	33.205 3	.08722 7	.0874 1	13.737256 4	.63E-4 2	6.720529	23	8	.86
38404.0	213.1 3	352.977 9	33.200 3	.08666 7	.0365 4	13.737777 2	.68E-4 1	6.724515	35	8	.62
38408.0	243.23 2	332.469 7	33.206 2	.08676 3	.99074 6	13.738261 2	.549E-4 8	6.723574	49	8	.70
38412.0	274.13 1	311.960 5	33.206 1	.08665 3	.94418 3	13.738749 2	.677E-4 8	6.724257	52	8	.85
38416.0	304.99 1	291.450 4	33.206 1	.08673 3	.89977 3	13.739248 2	.598E-4 9	6.723476	33	8	.71
38420.0	335.75 2	270.921 7	33.203 2	.08685 4	.85750 6	13.739759 2	.67E-4 1	6.722426	19	8	.84
38424.0	6.39 3	250.413 6	33.200 1	.08714 4	.81767 8	13.740339 2	.75E-4 1	6.720142	23	8	.75
38428.0	36.89 4	229.900 6	33.198 2	.08751 6	.7806 1	13.740885 3	.58E-4 1	6.717182	20	8	.71
38432.0	67.48 2	209.369 5	33.194 2	.08760 5	.74503 5	13.741399 3	.77E-4 1	6.716354	20	8	.73
38436.0	97.90 1	188.837 3	33.196 1	.08765 3	.71228 4	13.742009 1	.766E-4 8	6.715801	38	8	.61
38440.0	128.42 2	168.320 4	33.197 1	.08738 3	.68164 5	13.742718 2	.980E-4 9	6.717589	49	8	.63
38444.0	159.00 2	147.780 6	33.201 2	.08712 4	.65386 8	13.743458 2	.90E-4 1	6.719222	47	8	1.01
38448.0	189.55 2	127.242 6	33.204 1	.08689 3	.62916 7	13.744336 2	.121E-3 1	6.720635	31	8	.71
38452.0	220.39 3	106.723 7	33.206 2	.08657 2	.60742 9	13.74521 4	.1384E-3 8	6.722734	24	8	.60
38456.0	251.18 4	86.187 5	33.207 2	.08634 2	.5901 1	13.74618 5	.118E-3 1	6.724131	34	8	.74
38460.0	282.05 3	65.654 4	33.210 2	.08621 1	.5764 1	13.74725 4	.1451E-3 8	6.724678	39	8	.71
38464.0	312.93 3	45.106 7	33.204 2	.08630 2	.5669 1	13.74823 5	.138E-3 1	6.723751	41	8	.89
38468.0	343.70 1	24.565 4	33.205 9	.08648 1	.56213 4	13.74948 1	.1628E-3 4	6.721970	59	8	.43
38472.0	14.38 2	4.014 4	33.203 1	.08668 2	.56263 5	13.75078 3	.1546E-3 6	6.720133	68	8	.62
38476.0	45.00 2	343.463 5	33.200 2	.08689 3	.56803 7	13.75195 3	.1631E-3 9	6.718204	48	8	.83
38480.0	75.48 2	322.901 8	33.197 2	.08690 4	.57871 8	13.75322 3	.1726E-3 9	6.717651	33	8	.68
38484.0	106.08 7	302.324 3	33.204 8	.0869 1	.5947 3	13.75448 8	.167E-3 3	6.717213	17	8	1.55

Table 1

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1958 ALPHA

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
			Perigee In Sunlight		
38396.	343.	15.3	97.9	267.8	-0.859E-06
38400.	342.	-1.1	90.3	269.2	-0.668E-06
38404.	348.	-17.4	82.4	271.3	-0.721E-06
38408.	350.	-29.3	74.1	276.7	-0.582E-06
38412.	352.	-33.1	64.2	287.9	-0.717E-06
38416.	349.	-26.7	56.7	298.1	-0.634E-06
38420.	345.	-13.0	55.0	302.8	-0.710E-06
38424.	342.	3.5	59.0	304.2	-0.795E-06
38428.	341.	19.2	63.9	306.4	-0.614E-06
38432.	343.	30.4	64.3	313.3	-0.816E-06
38436.	344.	32.8	58.1	324.6	-0.811E-06
38440.	343.	25.4	46.0	334.2	-0.104E-05
38444.	342.	11.3	31.4	338.5	-0.953E-06
38448.	342.	-5.2	20.5	339.9	-0.128E-05
38452.	347.	-20.8	20.3	343.0	-0.147E-05
38456.	352.	-31.2	25.3	351.1	-0.125E-05
38460.	352.	-32.4	26.8	3.3	-0.154E-05
38464.	349.	-23.6	23.1	12.8	-0.146E-05
38468.	344.	-8.8	17.9	16.8	-0.172E-05
38472.	342.	7.8	20.4	18.5	-0.164E-05
38476.	343.	22.8	30.9	22.1	-0.172E-05
38480.	345.	32.0	41.6	30.8	-0.182E-05
38484.	345.	31.7	48.9	42.8	-0.177E-05

Satellite 1959 Alpha 1 (Vanguard 2) Nouhad Kettaneh

I. SAO smoothed elements

The following elements are based on 155 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38410.0$ MJD

$\omega = (253^\circ.072 \pm 5) + (5^\circ.2912 \pm 6)t - ^\circ.0003392t^2 + ^\circ.1532 \cos\omega$

$\Omega = (358^\circ.159 \pm 2) - (3^\circ.5200 \pm 2)t - ^\circ.3283 \times 10^{-4}t^2 + ^\circ.0077 \cos\omega$

$i = (32^\circ.8821 \pm 7) - ^\circ.0068 \sin\omega$

$e = (.16411 \pm 1) - (.16 \pm 11) \times 10^{-5}t + .0004577 \sin\omega$

$M = (.02298 \pm 2) + (11.479744 \pm 2)t + (.92 \pm 2) \times 10^{-6}t^2$

$+ (.14 \pm 2) \times 10^{-7}t^3 - .0004413 \cos\omega$

Standard error of one observation: $\sigma = \pm 1''.15$

The following elements are based on 243 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38440.0$ MJD

$\omega = (51^\circ.839 \pm 6) + (5^\circ.2948 \pm 8)t - ^\circ.0003392t^2 + ^\circ.1532 \cos\omega$

$\Omega = (252^\circ.557 \pm 1) - (3^\circ.5207 \pm 2)t - ^\circ.328 \times 10^{-4}t^2 + ^\circ.0077 \cos\omega$

$i = (32^\circ.8751 \pm 5) - ^\circ.0068 \sin\omega$

$e = (.164072 \pm 8) - (.17 \pm 10) \times 10^{-7}t + .0004577 \sin\omega$

$M = (.41546 \pm 2) + (11.479769 \pm 3)t + (.257 \pm 3) \times 10^{-5}t^2$

$+ (.19 \pm 3) \times 10^{-7}t^3 - .0004413 \cos\omega$

Standard error of one observation: $\sigma = \pm 1''.03$

The following elements are based on 221 observations and are valid for the period March 1 through April 1, 1964.

$T_0 = 38470.0$ MJD

$\omega = (210^\circ.671 \pm 8) + (5^\circ.2928 \pm 7)t - ^\circ.00029302t^2 + ^\circ.1529 \cos \omega$

$\Omega = (146^\circ.942 \pm 2) - (3^\circ.5204 \pm 2)t - ^\circ.12833 \times 10^{-4}t^2 + ^\circ.0077 \cos \omega$

$i = (32^\circ.8783 \pm 5) - ^\circ.0068 \sin \omega$

$e = (.164020 \pm 6) + (.21 \pm 8) \times 10^{-5}t + .0004575 \sin \omega$

$M = (.81026 \pm 3) + (11.479899 \pm 2)t + (.348 \pm 2) \times 10^{-5}t^2$

$+ (.10 \pm 3) \times 10^{-7}t^3 - .0004404 \cos \omega$

Standard error of one observation $\sigma = \pm 1''.05$

T (MJD)	ω	Ω	i	e	M	n	n"/2	q	N	D	σ
38398.0	189.35 2	40.384 9	32.887 4	.16400 5	.26667 3	11.479701 2	.8E-6 9	6.938121	18	8	.67
38402.0	210.59 1	26.305 4	32.891 4	.16389 4	.18548 3	11.479699 2	.5E-6 9	6.939007	22	8	.58
38406.0	231.812 9	12.230 2	32.892 2	.16372 3	.10428 2	11.479697 2	.56E-5 8	6.940470	40	8	.39
38410.0	253.07 1	358.157 4	32.892 2	.16372 4	.02293 4	11.479685 2	.19E-5 7	6.940426	46	8	.37
38414.0	274.19 1	344.089 5	32.892 2	.16362 3	.94209 4	11.479695 2	.35E-5 7	6.941243	38	8	.38
38418.0	295.46 2	330.010 5	32.891 2	.16367 3	.86074 5	11.479719 2	.22E-5 8	6.940844	42	8	.61
38422.0	316.69 2	315.923 5	32.885 2	.16373 3	.77957 6	11.479727 2	.4E-6 7	6.940316	45	8	.62
38426.0	337.90 2	301.843 4	32.881 1	.16385 3	.69840 5	11.479740 1	.16E-5 6	6.939329	53	8	.53
38430.0	359.05 1	287.765 2	32.8785 9	.16403 2	.61745 5	11.479753 1	.19E-5 5	6.937852	78	8	.42
38434.0	20.21 1	273.692 2	32.8761 9	.16423 1	.53647 4	11.479773 1	.31E-5 4	6.936148	90	8	.41
38438.0	41.35 1	259.609 3	32.871 1	.16441 1	.45565 4	11.479797 1	.32E-5 6	6.934641	78	8	.47
38442.0	62.49 1	245.515 3	32.8670 9	.16450 2	.37486 4	11.479816 1	.31E-5 6	6.933916	67	8	.43
38446.0	83.60 1	231.434 3	32.8656 9	.16454 2	.29416 4	11.479835 1	.24E-5 6	6.933595	70	8	.42
38450.0	104.71 1	217.345 3	32.864 1	.16452 2	.21355 5	11.479861 2	.31E-5 7	6.933769	53	8	.45
38454.0	125.88 1	203.263 3	32.867 1	.16434 2	.13280 5	11.479884 1	.19E-5 5	6.935189	33	8	.35
38458.0	147.03 2	189.175 3	32.871 1	.16422 1	.05221 5	11.479907 2	.40E-5 8	6.936187	43	8	.41
38462.0	168.17 2	175.095 4	32.875 1	.16408 1	.97168 5	11.47980 1	.31E-5 5	6.937372	69	8	.49
38466.0	189.32 1	161.013 3	32.8798 8	.163930 8	.89122 4	11.479824 1	.33E-5 4	6.938640	80	8	.43
38470.0	210.54 1	146.934 4	32.8832 9	.163783 9	.81064 4	11.479851 1	.28E-5 6	6.939857	75	8	.45
38474.0	231.78 2	132.846 5	32.887 1	.16370 2	.73008 5	11.479875 2	.29E-5 6	6.940567	61	8	.46
38478.0	252.98 2	118.770 4	32.888 1	.16364 2	.64973 6	11.479904 2	.19E-5 6	6.941030	42	8	.36
38482.0	274.22 3	104.695 3	32.887 2	.16364 3	.56932 8	11.479934 2	.42E-5 9	6.940983	36	8	.46

Table 2

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1959 ALPHA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38398.	560.	-5.1	56.3	304.5	-0.121E-07
38402.	562.	-16.0	52.5	304.6	-0.759E-08
38406.	566.	-25.3	48.8	306.6	-0.850E-07
38410.	568.	-31.3	44.4	311.4	-0.288E-07
38414.	569.	-32.8	39.3	318.0	-0.531E-07
38418.	568.	-29.4	33.9	324.2	-0.334E-07
38422.	565.	-21.9	30.1	328.1	-0.607E-08
38426.	562.	-11.8	30.1	329.4	-0.243E-07
38430.	559.	-0.5	34.1	329.3	-0.288E-07
38434.	559.	10.8	40.0	329.2	-0.470E-07
38438.	559.	21.0	45.3	330.4	-0.486E-07
38442.	561.	28.8	48.2	334.1	-0.470E-07
38446.	561.	32.6	47.5	340.4	-0.364E-07
38450.	561.	31.7	42.9	347.5	-0.470E-07
38454.	561.	26.1	34.8	353.0	-0.288E-07
38458.	560.	17.2	24.0	355.8	-0.607E-07
38462.	559.	6.4	11.8	356.6	-0.470E-07
38466.	560.	-5.0	3.7	356.7	-0.501E-07
38470.	563.	-16.0	14.4	357.5	-0.425E-07
38474.	566.	-25.3	25.0	0.2	-0.440E-07
38478.	568.	-31.3	33.1	5.6	-0.288E-07
38482.	569.	-32.8	37.8	13.0	-0.637E-07

Satellite 1959 Eta 1 (Vanguard 3) Eleanor Mann

I. SAO smoothed elements

The following elements are based on 69 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38410.0$ MJD

$\omega = (300^\circ.309 \pm 5) + (4^\circ.8938 \pm 6)t - ^\circ.000103t^2 + ^\circ.1295 \cos \omega$

$\Omega = (83^\circ.139 \pm 4) - (3^\circ.2885 \pm 4)t - ^\circ.18 \times 10^{-4}t^2 + ^\circ.0090 \cos \omega$

$i = (33^\circ.351 \pm 1) - ^\circ.000128t - ^\circ.0077 \sin \omega$

$e = (.18855 \pm 3) + .33 \times 10^{-5}t + .000452 \sin \omega$

$M = (.216097 \pm 9) + (11.090167 \pm 1)t + (.403 \pm 3) \times 10^{-5}t^2$

$- (.38 \pm 3) \times 10^{-7}t^3 - .000376 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.50$

The following elements are based on 72 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38440.0$ MJD

$\omega = (87^\circ.18 \pm 2) + (4^\circ.886 \pm 2)t - ^\circ.000103t^2 + ^\circ.1295 \cos \omega$

$\Omega = (344^\circ.54 \pm 1) - (3^\circ.288 \pm 1)t - ^\circ.18 \times 10^{-4}t^2 + ^\circ.0090 \cos \omega$

$i = (33^\circ.354 \pm 3) - ^\circ.000128t - ^\circ.0077 \sin \omega$

$e = (.18845 \pm 5) + .57 \times 10^{-4}t + .000452 \sin \omega$

$M = (.92365 \pm 3) + (11.090386 \pm 4)t + (.410 \pm 9) \times 10^{-5}t^2$

$- (.86 \pm 11) \times 10^{-7}t^3 - .000376 \cos \omega$

Standard error of one observation: $\sigma = \pm 4''.93$

The following elements are based on 66 observations and are valid for the period March 1 through April 1, 1964.

$T_0 = 38470.0$ MJD

$\omega = (234^\circ.14 \pm 1) + (4^\circ.878 \pm 1)t - ^\circ.000103t^2 + ^\circ.1295 \cos \omega$

$\Omega = (245^\circ.849 \pm 4) - (3^\circ.2893 \pm 7)t - ^\circ.18 \times 10^{-4}t^2 + ^\circ.0090 \cos \omega$

$i = (33^\circ.343 \pm 2) - ^\circ.000128t - ^\circ.0077 \sin \omega$

$e = (.18828 \pm 3) + .57 \times 10^{-4}t + .000452 \sin \omega$

$M = (.63603 \pm 3) + (11.090531 \pm 4)t + (.35 \pm 1) \times 10^{-5}t^2$

$+ (.20 \pm 8) \times 10^{-7}t^3 - .000376 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.08$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38398.0	241.493 7	122.604 5	33.356 2	.18813 4	.13493 2	11.090066 9	.4E-5 1	6.894843	16	6	.41
38402.0	261.144 7	109.43 1	33.358 2	.18808 6	.49509 2	11.090097 6	.5E-5 1	6.895229	16	6	.41
38406.0	280.73 2	96.31 3	33.359 2	.1882 2	.85548 9	11.09019 3	.10E-4 3	6.894330	18	6	.42
38410.0	300.40 2	83.12 1	33.363 2	.1880 1	.21586 9	11.0901 1	.8E-5 2	6.895903	21	6	.43
38414.0	319.97 1	70.00 1	33.356 5	.18828 7	.57655 2	11.09019 1	.8E-5 5	6.893465	15	6	.45
38418.0	339.63 7	56.80 6	33.33 5	.1892 4	.9371 1	11.09027 9	.9E-4 4	6.886023	9	6	3.16
38422.0											
38430.0											
38434.0	57.85 2	4.23 2	33.344 5	.18904 3	.38147 2	11.090328 8	.5E-5 1	6.886979	15	6	.58
38438.0	77.40 1	351.10 1	33.348 3	.18912 3	.74293 2	11.09038 1	.5E-5 1	6.886309	17	6	.60
38442.0	96.92 2	337.92 2	33.343 3	.18921 6	.10459 4	11.09040 2	.1E-5 3	6.885549	13	6	.70
38446.0	116.47 1	324.79 1	33.343 2	.18900 3	.46620 2	11.09042 1	.1E-5 2	6.887318	20	6	.53
38450.0	136.02 2	311.63 1	33.344 3	.18888 4	.82790 3	11.09044 1	.2E-5 1	6.888346	20	6	.75
38454.0	155.54 4	298.47 2	33.34 1	.18870 5	.18970 8	11.09034 6	-.4E-5 3	6.889861	11	6	.91
38458.0	175.5 2	285.10 7	33.39 2	.1875 3	.5509 2	11.09083 7	.4E-4 1	6.899588	5	6	.28
38462.0	194.87 7	272.18 4	33.33 2	.1901 6	.9119 4	11.0902 2	.11E-4 4	6.877753	8	6	.43
38466.0	214.4 4	259.3 2	33.0 3	.192 5	.273 2	11.0903 3	.8E-5 3	6.862826	10	6	.36
38470.0	233.92 2	245.838 5	33.342 4	.18824 6	.63661 7	11.09045 3	.9E-5 3	6.893690	15	6	.41
38474.0	253.56 2	232.70 1	33.354 4	.18825 4	.99842 4	11.09056 1	.3E-5 2	6.893573	24	6	.71
38478.0	273.24 1	219.516 7	33.346 2	.18813 3	.36031 3	11.09059 1	.4E-5 1	6.894650	18	6	.42
38482.0	292.85 3	206.39 2	33.361 5	.18816 7	.72238 7	11.09064 3	.5E-5 5	6.894356	14	6	1.01

Table 3

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1959 ETA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38398.	521.	-28.9	67.3	75.8	-0.650E-07
38402.	523.	-32.9	70.6	80.7	-0.813E-07
38406.	522.	-32.7	75.7	86.6	-0.163E-06
38410.	522.	-28.3	81.3	91.4	-0.130E-06
38414.	518.	-20.7	86.3	93.8	-0.130E-06
38418.	508.	-11.0	90.3	94.2	-0.146E-05
38434.	513.	27.7	101.8	95.6	-0.813E-07
38438.	514.	32.4	106.0	100.5	-0.813E-07
38442.	514.	33.1	110.6	106.6	-0.163E-07
		Perigee In Earth Shadow			
38446.	514.	29.5	114.6	112.2	-0.163E-07
38450.	513.	22.4	117.1	115.5	-0.325E-07
38454.	513.	13.2	117.7	116.6	0.650E-07
38458.	521.	2.5	116.7	116.6	-0.650E-06
38462.	500.	-8.1	115.1	116.2	-0.179E-06
38466.	486.	-17.9	114.4	117.0	-0.130E-06
38470.	520.	-26.4	114.8	118.9	-0.146E-06
38474.	521.	-31.8	118.0	123.8	-0.488E-07
38478.	523.	-33.3	123.6	130.3	-0.650E-07
38482.	521.	-30.4	130.5	136.4	-0.813E-07

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ.
38395.0	19.4 1	223.203 4	47.259 4	.02804 3	.4803 4	12.54427 1	-.3E-4 2	7.604283	20	2	.81
38396.0	24.02 9	219.891 3	47.262 3	.02810 2	.0207 3	12.544341 7	.4E-4 1	7.603785	30	2	.61
38397.0	28.22 9	216.581 3	47.264 3	.02808 2	.5627 3	12.544382 9	-.1E-4 9	7.603941	35	2	.61
38398.0	31.81 9	213.266 4	47.262 3	.02793 2	.1065 3	12.544438 9	.5E-4 1	7.605088	28	2	.64
38399.0	35.9 2	209.948 7	47.260 5	.02784 4	.6492 4	12.54443 2	-.1E-4 3	7.605780	21	2	.93
38400.0	40.37 8	206.645 4	47.267 3	.02782 2	.1908 2	12.544469 9	.4E-4 2	7.605925	18	2	.46
38401.0	44.18 9	203.331 4	47.265 3	.02765 2	.7345 3	12.54447 1	-.3E-4 2	7.607278	16	2	.48
38402.0	47.85 8	200.016 5	47.259 2	.02746 2	.2788 3	12.544477 8	.2E-4 1	7.608702	12	2	.38
38403.0	51.5 3	196.69 1	47.258 7	.0274 1	.8233 8	12.54456 3	-.3E-4 3	7.608992	10	2	1.06
38404.0	54.6 4	193.35 2	47.264 9	.0277 3	.370 1	12.54451 6	-.1E-3 1	7.607071	7	2	1.12
38405.0	58.72 9	190.052 6	47.251 4	.02681 6	.9130 3	12.54460 1	.1E-4 3	7.613768	13	2	.55
38406.0	62.36 6	186.737 4	47.249 3	.02640 4	.4580 2	12.544660 9	.6E-4 2	7.616984	21	2	.57
38407.0	65.98 5	183.417 3	47.249 3	.02598 4	.0032 1	12.544684 8	.2E-4 2	7.620196	18	2	.44
38408.0	69.53 7	180.104 4	47.248 4	.02545 6	.5487 2	12.54474 1	.5E-4 2	7.624343	18	2	.70
38409.0	72.98 7	176.787 4	47.251 4	.02503 5	.0948 2	12.54478 1	.7E-4 2	7.627649	26	2	.82
38410.0	76.50 8	173.467 5	47.249 5	.02451 7	.6407 2	12.54481 1	.7E-4 2	7.631666	25	2	1.06
38411.0	79.90 6	170.157 5	47.249 3	.02390 5	.1872 2	12.54475 1	-.11E-3 2	7.636483	37	2	.91
38412.0	83.27 4	166.845 3	47.243 2	.02319 3	.7337 1	12.544478 7	-.6E-4 1	7.642168	54	2	.74
38413.0	87.14 4	163.533 2	47.241 2	.02270 3	.2787 1	12.544302 5	-.13E-3 1	7.646023	60	2	.67
38414.0	90.50 7	160.212 4	47.234 3	.02207 5	.8249 2	12.54396 1	-.12E-3 2	7.651073	48	2	.99
38415.0	93.7 1	156.91 1	47.239 5	.0215 1	.3714 4	12.54364 2	-.20E-3 3	7.655384	22	2	1.26
38416.0	97.4 2	153.59 1	47.231 6	.0208 2	.9163 5	12.54327 2	-.14E-3 4	7.661122	19	2	1.41
38417.0	101.0 1	150.28 1	47.226 5	.0200 1	.4610 3	12.54297 2	-.15E-3 3	7.667454	22	2	1.11
38418.0	104.6 1	146.97 1	47.224 5	.0194 1	.0057 3	12.54264 3	-.8E-4 4	7.672844	22	2	1.04
38419.0	108.2 1	143.64 1	47.212 3	.01852 9	.5504 3	12.54227 1	-.13E-3 3	7.679559	24	2	1.02
38420.0	112.03 9	140.337 8	47.207 3	.01801 7	.0940 2	12.54196 1	-.14E-3 2	7.683685	24	2	.78
38421.0	116.06 8	136.991 7	47.207 2	.01679 5	.6369 2	12.54163 1	-.12E-3 2	7.693381	22	2	.64
38422.0	120.1 1	133.679 8	47.203 3	.01609 6	.1796 4	12.54131 2	-.15E-3 3	7.698994	23	2	.91
38423.0	124.2 1	130.361 6	47.203 3	.01536 5	.7221 3	12.54103 1	-.10E-3 2	7.704771	28	2	.75
38424.0	128.4 1	127.040 8	47.202 3	.01463 5	.2641 3	12.54072 2	-.19E-3 3	7.710619	22	2	.71
38425.0	132.7 2	123.723 8	47.202 4	.01378 7	.8055 5	12.54049 1	-.11E-3 2	7.717395	13	2	.56

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38426.0	137.1 2	120.412 7	47.199 4	.01312 7	.3466 5	12.540303 8	-.8E-4 2	7.722664	16	2	.53
38427.0	141.9 2	117.094 8	47.203 4	.01228 6	.8866 5	12.54009 1	-.9E-4 2	7.729305	19	2	.59
38428.0	146.6 2	113.789 7	47.198 4	.01162 5	.4269 5	12.539882 8	-.12E-3 1	7.734553	20	2	.53
38429.0	152.0 3	110.474 8	47.198 5	.01092 7	.9650 9	12.53972 1	-.4E-4 2	7.740061	16	2	.61
38430.0	156.9 3	107.154 9	47.195 5	.01036 6	.5044 8	12.53960 1	-.10E-3 2	7.744530	20	2	.64
38431.0	162.0 3	103.84 1	47.194 4	.00981 6	.0434 9	12.53945 2	-.4E-4 2	7.748857	23	2	.65
38432.0	167.3 4	100.51 1	47.196 6	.00921 8	.582 1	12.53938 2	-.7E-4 4	7.753637	18	2	.75
38433.0	176.1 5	97.228 8	47.213 8	.00824 7	.111 2	12.53942 2	-.10E-3 2	7.761157	20	2	.83
38434.0	183.1 6	93.91 1	47.22 1	.00744 9	.645 2	12.53918 3	-.20E-3 4	7.767534	17	2	.96
38435.0	190. 1	90.61 2	47.22 1	.0072 1	.178 3	12.53923 3	-.8E-4 4	7.769792	13	2	1.19
38436.0	198. 2	87.28 2	47.23 2	.0067 2	.710 6	12.53932 3	-.9E-4 5	7.773382	16	2	1.88
38437.0	206. 2	83.98 2	47.23 2	.0062 1	.243 5	12.53926 3	-.9E-4 5	7.777402	16	2	1.74
38438.0	217. 2	80.71 2	47.21 2	.0060 1	.766 7	12.53947 3	-.17E-3 5	7.779069	16	2	2.09
38439.0	223. 3	77.41 2	47.21 2	.0054 1	.302 7	12.53943 3	-.4E-4 4	7.783215	16	2	2.22
38440.0	234. 5	74.11 3	47.20 3	.0055 2	.83 2	12.53968 6	.1E-3 9	7.782157	14	2	3.45
38441.0	251. 2	70.79 1	47.23 1	.00513 6	.333 6	12.53970 3	-.25E-3 5	7.785400	18	2	1.48
38442.0	259. 4	67.49 2	47.21 2	.0053 1	.87 1	12.53995 5	.4E-4 8	7.784334	22	2	3.21
38443.0	276. 4	64.18 2	47.22 2	.0052 1	.38 1	12.53991 4	-.10E-3 8	7.784588	25	2	3.74
38444.0	289. 2	60.87 1	47.23 1	.0056 1	.894 6	12.54289 3	.6E-4 5	7.780657	24	2	2.36
38445.0	296. 2	57.565 8	47.22 1	.00549 9	.428 5	12.54315 3	.22E-3 5	7.781127	25	2	1.89
38446.0	307.6 8	54.252 5	47.213 6	.00645 6	.952 2	12.54328 1	.10E-3 2	7.773578	34	2	1.00
38447.0	316.8 4	50.954 4	47.223 4	.00629 4	.483 1	12.543509 8	.13E-3 1	7.774722	29	2	.44
38448.0	323. 1	47.647 9	47.223 9	.00684 9	.020 3	12.54376 2	-.1E-4 4	7.770341	23	2	1.10
38449.0	333. 1	44.34 1	47.23 1	.0071 1	.550 4	12.54412 3	.8E-4 5	7.768012	25	2	1.75
38450.0	340.3 5	41.032 7	47.214 5	.00782 5	.086 1	12.54421 1	.5E-4 2	7.762459	33	2	.77
38451.0	347.7 3	37.777 8	47.237 5	.00858 4	.6219 9	12.544430 8	.12E-3 1	7.756471	30	2	.50
38452.0	354.3 7	34.42 2	47.218 8	.0087 1	.160 2	12.54470 2	.3E-4 3	7.755526	30	2	1.01
38453.0	2.3 2	31.098 7	47.206 4	.00915 5	.6953 6	12.544898 8	.13E-3 1	7.751837	28	2	.42
38454.0	8.0 4	27.80 1	47.206 7	.0100 1	.236 1	12.54516 1	.15E-3 2	7.745112	30	2	.75

T (MJD)	ω	Ω	i	e	M	n	n''/2	q	N	D	σ
38455.0	13.4 2	24.498 8	47.208 4	.01057 7	.7787 8	12.54688 2	.7E-4 4	7.739878	23	2	.50
38456.0	18.7 3	21.177 9	47.203 6	.01106 9	.3217 9	12.54710 1	.8E-4 1	7.735994	26	2	.87
38457.0	24.4 3	17.862 8	47.192 5	.01205 7	.8633 7	12.54721 1	.5E-4 2	7.728142	29	2	.71
38458.0	29.7 2	14.565 9	47.196 4	.01243 6	.4066 5	12.54742 1	.10E-3 2	7.725081	27	2	.62
38459.0	34.5 2	11.235 8	47.194 5	.01310 6	.9514 5	12.547709 9	.15E-3 2	7.719754	25	2	.62
38460.0	39.3 2	7.914 8	47.185 5	.01385 6	.4963 5	12.547976 8	.11E-3 2	7.713805	25	2	.58
38461.0	44.1 1	4.585 8	47.176 3	.01469 5	.0417 4	12.548177 9	.6E-4 2	7.707092	24	2	.62
38462.0	49.2 1	1.280 9	47.179 3	.01539 6	.5864 4	12.54846 1	.15E-3 2	7.701513	24	2	.74
38463.0	53.45 8	357.953 6	47.180 2	.01608 5	.1337 2	12.548801 8	.17E-3 1	7.696014	25	2	.45
38464.0	57.50 9	354.632 7	47.183 2	.01675 5	.6820 3	12.54912 1	.15E-3 2	7.690643	27	2	.50
38465.0	61.7 1	351.310 8	47.185 2	.01744 5	.2302 3	12.549425 8	.15E-3 2	7.685080	19	2	.51
38466.0	65.81 6	347.994 4	47.185 2	.01820 4	.7788 2	12.549783 8	.21E-3 1	7.679018	18	2	.31
38467.0	70.00 9	344.655 8	47.190 3	.01901 6	.3277 3	12.550174 9	.14E-3 2	7.672477	20	2	.48
38468.0	74.03 6	341.338 6	47.195 2	.01980 4	.8774 2	12.550562 9	.20E-3 2	7.666195	28	2	.44
38469.0	77.79 6	338.025 7	47.194 3	.02041 3	.4282 2	12.550967 6	.22E-3 1	7.661244	34	2	.45
38470.0	81.56 8	334.728 9	47.183 5	.02105 5	.9794 2	12.551392 9	.21E-3 2	7.656044	27	2	.46
38471.0	85.46 5	331.396 6	47.192 3	.02191 4	.5307 1	12.551844 6	.19E-3 2	7.649125	31	2	.45
38472.0	89.31 4	328.065 5	47.201 3	.02259 4	.0826 1	12.552261 7	.22E-3 1	7.643685	30	2	.41
38473.0	93.08 6	324.747 6	47.210 4	.02323 5	.6352 2	12.55271 1	.22E-3 1	7.638462	25	2	.52
38474.0	96.78 6	321.432 7	47.205 5	.02385 7	.1884 2	12.55315 1	.20E-3 2	7.633446	19	2	.56
38475.0	100.46 6	318.110 7	47.218 6	.02466 7	.7421 2	12.55360 1	.24E-3 1	7.626906	22	2	.63
38476.0	104.02 3	314.794 3	47.213 2	.02517 3	.29656 7	12.554094 5	.231E-3 7	7.622762	25	2	.32
38477.0	107.93 4	311.478 3	47.221 3	.02590 4	.8505 1	12.554572 5	.261E-3 9	7.616875	24	2	.35
38478.0	111.58 5	308.153 4	47.222 4	.02643 5	.4058 2	12.555048 9	.22E-3 1	7.612484	23	2	.49
38479.0	115.26 7	304.842 4	47.227 4	.02708 9	.9614 2	12.555521 8	.22E-3 1	7.607219	20	2	.39
38480.0	119.02 7	301.516 5	47.233 4	.02766 9	.5173 2	12.55601 1	.24E-3 2	7.602541	18	2	.40
38481.0	122.70 7	298.203 9	47.228 5	.02807 8	.0738 2	12.556460 9	.28E-3 2	7.599149	18	2	.50
38482.0	126.34 9	294.887 6	47.230 4	.02869 8	.6310 3	12.55693 1	.22E-3 2	7.594108	13	2	.46
38483.0	130.22 4	291.565 2	47.242 2	.02937 4	.1879 1	12.557357 6	.22E-3 1	7.588571	11	2	.26
38484.0	133.89 5	288.247 2	47.237 2	.02978 5	.7459 2	12.557810 7	.22E-3 1	7.585239	16	2	.40
38485.0	137.70 6	284.927 2	47.236 2	.03026 5	.3039 2	12.558270 8	.25E-3 2	7.581289	14	2	.37

Table 4

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1960 IOTA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38395.	1227.	14.1	56.8	316.2	0.381E-06
38396.	1227.	17.4	59.6	315.2	-0.508E-06
38397.	1228.	20.3	62.4	313.9	0.127E-06
38398.	1230.	22.8	65.0	312.3	-0.635E-06
38399.	1231.	25.5	67.5	311.2	0.127E-06
38400.	1232.	28.4	69.8	310.7	-0.508E-06
38401.	1235.	30.8	71.9	309.7	0.381E-06
38402.	1237.	33.0	73.9	308.7	-0.254E-06
38403.	1238.	35.1	75.7	307.9	0.381E-06
38404.	1236.	36.8	77.4	306.7	0.127E-05
38405.	1244.	38.9	78.6	306.8	-0.127E-06
38406.	1248.	40.6	79.7	306.6	-0.763E-06
38407.	1251.	42.1	80.6	306.5	-0.254E-06
38408.	1256.	43.5	81.3	306.6	-0.635E-06
38409.	1260.	44.6	81.9	306.8	-0.890E-06
38410.	1264.	45.6	82.1	307.2	-0.890E-06
38411.	1269.	46.3	82.3	307.6	0.140E-05
38412.	1275.	46.8	82.2	308.0	0.763E-06
38413.	1279.	47.2	81.6	309.3	0.165E-05
38414.	1284.	47.2	81.2	309.8	0.153E-05
38415.	1289.	47.1	80.8	310.2	0.254E-05
38416.	1294.	46.7	79.9	311.2	0.178E-05

Table 4 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1960 IOTA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38417.	1300.	46.1	78.8	312.0	0.191E-05
38418.	1305.	45.3	77.7	312.6	0.102E-05
38419.	1312.	44.2	76.6	313.1	0.165E-05
38420.	1315.	42.9	75.1	313.7	0.178E-05
38421.	1324.	41.2	73.4	314.3	0.153E-05
38422.	1329.	39.4	71.7	314.6	0.191E-05
38423.	1334.	37.4	70.0	314.8	0.127E-05
38424.	1339.	35.1	68.2	314.9	0.242E-05
38425.	1345.	32.6	66.4	314.8	0.140E-05
38426.	1350.	30.0	64.5	314.5	0.102E-05
38427.	1355.	26.9	62.4	314.4	0.114E-05
38428.	1360.	23.8	60.6	314.0	0.153E-05
38429.	1364.	20.1	58.3	313.9	0.509E-06
38430.	1368.	16.7	56.6	313.3	0.127E-05
38431.	1372.	13.1	55.1	312.7	0.509E-06
38432.	1376.	9.3	53.6	312.1	0.890E-06
38433.	1383.	2.9	49.1	313.9	0.127E-05
38434.	1389	-2.3	46.8	314.3	0.254E-05
38435.	1392.	-7.3	45.0	314.7	0.102E-05
38436.	1396.	-13.1	42.7	316.0	0.114E-05
38437.	1401.	-18.8	40.8	317.6	0.114E-05
38438.	1405.	-26.2	37.5	322.2	0.216E-05
38439.	1410.	-30.0	37.8	323.1	0.509E-06

Table 4 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1960 IOTA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38440.	1411.	-36.4	35.9	329.6	-0.127E-05
38441.	1417.	-44.0	33.7	345.3	0.318E-05
38442.	1417.	-46.1	34.4	352.0	-0.509E-06
38443.	1418.	-46.9	36.4	12.4	0.127E-05
38444.	1413.	-44.0	39.4	26.3	-0.763E-06
38445.	1412.	-41.3	40.3	30.8	-0.280E-05
38446.	1402.	-35.6	43.3	39.4	-0.127E-05
38447.	1402.	-30.2	45.3	44.0	-0.165E-05
38448.	1396.	-26.2	45.5	45.2	0.127E-06
38449.	1392.	-19.5	48.2	49.0	-0.102E-05
38450.	1385.	-14.3	49.2	50.1	-0.635E-06
38451.	1379.	-9.0	50.5	51.2	-0.153E-05
38452.	1377.	-4.2	51.2	51.4	-0.381E-06
38453.	1373.	1.7	53.4	52.6	-0.165E-05
38454.	1367.	5.9	53.9	52.2	-0.191E-05
38455.	1362.	9.8	54.4	51.7	-0.889E-06
38456.	1359.	13.6	55.0	51.2	-0.102E-05
38457.	1352.	17.6	56.2	51.2	-0.635E-06
38458.	1350.	21.3	57.2	51.0	-0.127E-05
38459.	1345.	24.6	58.0	50.6	-0.191E-05
38460.	1340.	27.7	59.0	50.4	-0.140E-05
38461.	1334.	30.7	60.1	50.4	-0.762E-06
38462.	1330.	33.7	61.8	51.0	-0.191E-05

Table 4 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1960 IOTA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38463.	1325.	36.1	62.7	51.1	-0.216E-05
38464.	1320.	38.2	63.5	51.2	-0.190E-05
38465.	1316.	40.2	64.5	51.7	-0.190E-05
38466.	1310.	42.0	65.6	52.4	-0.267E-05
38467.	1304.	43.6	66.7	53.4	-0.178E-05
38468.	1298.	44.9	67.7	54.5	-0.254E-05
38469.	1294.	45.8	68.4	55.5	-0.279E-05
38470.	1289.	46.5	69.2	56.6	-0.267E-05
38471.	1282.	47.0	69.9	58.0	-0.241E-05
38472.	1277.	47.2	70.6	59.4	-0.279E-05
38473.	1272.	47.1	71.0	60.7	-0.279E-05
38474.	1266.	46.8	71.3	61.9	-0.254E-05
38475.	1260.	46.2	71.5	62.9	-0.305E-05
38476.	1255.	45.4	71.4	63.7	-0.293E-05
38477.	1249.	44.3	71.5	64.7	-0.331E-05
38478.	1244.	43.0	71.2	65.3	-0.279E-05
38479.	1238.	41.6	70.8	65.6	-0.279E-05
38480.	1233.	39.9	70.3	65.8	-0.304E-05
38481.	1229.	38.1	69.5	65.7	-0.355E-05
38482.	1223.	36.3	68.6	65.4	-0.279E-05
38483.	1217.	34.1	67.7	65.1	-0.279E-05
38484.	1213.	31.9	66.5	64.5	-0.279E-05
38485.	1208.	29.6	65.2	63.7	-0.317E-05

I. SAO smoothed elements

The following elements are based on 61 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38410.0$ MJD

$\omega = (96^\circ.628 \pm 8) + (2^\circ.819 \pm 1)t + ^\circ.000158t^2 + ^\circ.3458 \cos \omega$

$\Omega = (22^\circ.334 \pm 1) - (3^\circ.3925 \pm 3)t + ^\circ.10 \times 10^{-5}t^2 + ^\circ.0142 \cos \omega$

$i = (49^\circ.954 \pm 2) + ^\circ.181 \times 10^{-4}t - ^\circ.0042 \sin \omega$

$e = (.118650 \pm 7) - .732 \times 10^{-5}t + .0007292 \sin \omega$

$M = (.81832 \pm 2) + (12.817382 \pm 3)t + (.386 \pm 3) \times 10^{-5}t^2$

$- (.14 \pm 36) \times 10^{-8}t^3 - .0008867 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.38$

The following elements are based on 82 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38440.0$ MJD

$\omega = (181^\circ.178 \pm 9) + (2^\circ.8226 \pm 8)t + ^\circ.000158t^2 + ^\circ.3458 \cos \omega$

$\Omega = (280^\circ.546 \pm 2) - (3^\circ.3926 \pm 2)t + ^\circ.10 \times 10^{-5}t^2 + ^\circ.0142 \cos \omega$

$i = (49^\circ.949 \pm 1) + ^\circ.181 \times 10^{-4}t - ^\circ.0042 \sin \omega$

$e = (.11858 \pm 1) - .732 \times 10^{-5}t + .0007292 \sin \omega$

$M = (.34387 \pm 2) + (12.817664 \pm 2)t + (.694 \pm 4) \times 10^{-5}t^2$

$+ (.133 \pm 5) \times 10^{-6} - .0008867 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.60$

The following elements are based on 101 observations and are valid for the period March 1 through April 1, 1964.

$T_0 = 38470.0$ MJD

$\omega = (265^\circ.76 \pm 1) + (2^\circ.8137 \pm 9)t + ^\circ.000158t^2 + ^\circ.3458 \cos \omega$

$\Omega = (178^\circ.759 \pm 1) - (3^\circ.3931 \pm 1)t + ^\circ.10 \times 10^{-5}t^2 + ^\circ.0142 \cos \omega$

$i = (49^\circ.950 \pm 1) + ^\circ.181 \times 10^{-4}t - ^\circ.0042 \sin \omega$

$e = (.11870 \pm 2) - .732 \times 10^{-5} + .0007292 \sin \omega$

$M = (.88401 \pm 3) + (12.818396 \pm 3)t + (.1123 \pm 4) \times 10^{-4}t^2$

$- (.14 \pm 4) \times 10^{-7}t^3 - .0008867 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.28$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38398.0	62.92 2	63.052 6	49.948 5	.11928 2	.01003 5	12.817317 3	.6E-5 2	6.792407	9	6	.41
38402.0	74.19 2	49.47 1	49.948 8	.11939 3	.27926 5	12.817351 2	.1E-5 2	6.791529	10	6	.55
38406.0	85.40 2	35.907 3	49.945 3	.11938 1	.54872 5	12.817381 2	.6E-5 2	6.791591	19	6	.59
38410.0	96.57 2	22.336 2	49.955 4	.11938 1	.81849 5	12.817402 3	.2E-5 2	6.791603	22	6	.61
38414.0	107.8 3	8.76 2	49.95 2	.1195 9	.0882 4	12.817430 4	.11E-4 3	6.790364	14	6	.96
38418.0	119.00 1	355.190 6	49.954 5	.11933 1	.35811 4	12.817458 2	.2E-5 1	6.791957	17	6	.44
38422.0	130.24 6	341.64 2	49.96 2	.11922 4	.6280 2	12.81750 1	-.1E-4 1	6.792829	7	6	.98
38426.0	141.50 2	328.028 8	49.943 5	.11907 2	.89809 4	12.817537 2	.4E-5 1	6.793935	11	6	.30
38430.0	152.71 2	314.446 9	49.942 3	.11895 2	.16848 5	12.817572 2	.2E-5 1	6.794890	15	6	.38
38434.0	163.85 2	300.86 1	49.949 3	.11879 3	.43907 8	12.817614 3	.6E-5 2	6.796068	14	6	.46
38438.0	175.16 2	287.319 5	49.950 2	.11873 2	.70953 4	12.817663 3	.4E-5 2	6.796541	14	6	.44
38442.0	186.49 2	273.759 4	49.939 5	.11853 2	.98009 5	12.817705 3	.5E-5 2	6.798012	18	6	.61
38446.0	197.80 2	260.186 4	49.942 4	.11841 3	.25090 6	12.817766 2	.15E-4 2	6.798933	17	6	.49
38450.0	209.08 1	246.609 2	49.951 1	.11824 3	.52218 3	12.817858 2	.16E-4 1	6.800228	25	6	.51
38454.0	220.38 1	233.039 2	49.952 2	.11818 3	.79382 3	12.817974 3	.12E-4 1	6.800683	16	6	.53
38458.0	231.65 5	219.465 4	49.952 5	.1181 1	.0659 2	12.818063 2	.14E-4 2	6.801217	20	6	.34
38462.0	243.0 1	205.893 7	49.951 6	.1179 2	.3382 4	12.818172 2	.11E-4 1	6.802548	24	6	.38
38466.0	254.4 2	192.33 2	49.956 9	.1180 3	.6107 7	12.818250 4	.13E-4 2	6.802023	23	6	.53
38470.0	265.6 2	178.73 2	49.942 7	.1176 2	.8847 6	12.818350 4	.12E-4 2	6.804818	25	6	.46
38474.0	277.06 1	165.17 2	49.963 3	.1184 1	.15765 5	12.818440 5	.7E-5 4	6.798823	17	6	.57
38478.0	288.33 2	151.621 8	49.960 4	.11798 6	.43172 3	12.818524 5	.23E-4 4	6.801986	20	6	.85
38482.0	299.71 1	138.043 5	49.960 5	.11798 4	.70594 3	12.818621 2	.136E-4 9	6.801958	16	6	.79

Table 5

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1960 XI 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Earth Shadow			
38398.	424.	43.0	158.0	190.8	-0.730E-07
38402.	425.	47.4	154.2	187.6	-0.122E-07
38406.	426.	49.7	151.7	186.3	-0.730E-07
38410.	426.	49.5	151.3	185.7	-0.243E-07
38414.	423.	46.8	153.4	184.2	-0.134E-06
38418.	423.	42.0	157.4	180.6	-0.243E-07
38422.	422.	35.8	162.2	174.9	0.122E-06
38426.	420.	28.5	163.9	167.3	-0.487E-07
38430.	419.	20.5	159.1	158.4	-0.243E-07
38434.	419.	12.3	149.4	148.6	-0.730E-07
38438.	418.	3.7	137.9	138.5	-0.487E-07
38442.	420.	-5.0	125.8	128.4	-0.609E-07
38446.	422.	-13.5	114.2	118.4	-0.183E-06
		Perigee In Sunlight			
38450.	425.	-21.8	103.7	109.1	-0.195E-06
38454.	428.	-29.7	95.2	100.7	-0.146E-06
38458.	431.	-36.9	89.2	93.9	-0.170E-06
38462.	434.	-43.0	85.9	89.0	-0.134E-06
38466.	435.	-47.5	85.3	86.7	-0.158E-06
38470.	439.	-49.7	86.1	86.1	-0.146E-06
38474.	433.	-49.4	87.6	86.6	-0.852E-07
38478.	435.	-46.6	88.1	85.8	-0.280E-06
38482.	433.	-41.7	86.6	82.9	-0.166E-06

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38395.0	156.37 4	242.22 1	38.953 3	.11789 6	.1809 1	12.99722 1	.330E-2 5	6.739413	9	2	.79
38396.0	161.7 1	237.99 3	38.97 1	.1171 1	.1817 3	13.00359 5	.351E-2 7	6.743120	16	2	3.91
38397.0	167.42 4	233.77 1	38.954 5	.11691 5	.18841 9	13.01223 2	.508E-2 3	6.741735	28	2	1.98
38398.0	172.81 2	229.484 6	38.963 3	.11647 3	.20607 6	13.02109 1	.381E-2 2	6.742056	29	2	1.03
38399.0	178.33 3	225.230 8	38.965 3	.11615 3	.23077 8	13.02788 1	.315E-2 2	6.742103	20	2	1.01
38400.0	183.90 2	220.963 9	38.964 3	.1159 1	.26170 5	13.03400 2	.292E-2 4	6.742030	14	2	.51
38401.0	189.44 1	216.695 7	38.965 2	.11543 9	.29869 4	13.03998 1	.307E-2 2	6.743431	10	2	.28
38402.0	195.00 7	212.43 2	38.965 7	.1154 1	.3417 2	13.04668 2	.373E-2 3	6.741625	9	2	1.25
38403.0	200.46 3	208.18 1	38.966 3	.11513 5	.39229 5	13.054390 8	.399E-2 2	6.740749	10	2	.57
38404.0	206.06 3	203.88 2	38.970 6	.1145 1	.45097 8	13.06343 1	.482E-2 2	6.742840	12	2	.78
38405.0	211.68 2	199.612 4	38.963 2	.11414 3	.51905 4	13.072915 7	.461E-2 1	6.741899	18	2	.53
38406.0	217.21 2	195.322 4	38.966 2	.11383 2	.59674 3	13.081871 6	.4309E-2 9	6.741245	24	2	.69
38407.0	222.796 8	191.020 2	38.968 1	.11351 2	.68288 2	13.090199 5	.4066E-2 8	6.740762	31	2	.52
38408.0	228.422 7	186.720 2	38.970 1	.11321 2	.77702 2	13.098109 5	.387E-2 1	6.740358	36	2	.52
38409.0	234.038 9	182.417 4	38.969 2	.11293 2	.87895 2	13.105714 7	.373E-2 2	6.739848	32	2	.59
38410.0	239.67 4	178.10 2	38.967 8	.11270 7	.98823 7	13.11327 2	.427E-2 8	6.739042	23	2	1.77
38411.0	245.30 1	173.769 6	38.964 3	.11229 3	.10623 3	13.123386 7	.558E-2 3	6.738670	21	2	.57
38412.0	251.03 2	169.44 1	38.968 9	.11183 8	.23468 5	13.13341 2	.456E-2 4	6.738754	25	2	1.25
38413.0	256.60 1	165.119 7	38.967 4	.11159 4	.37273 3	13.141802 9	.398E-2 2	6.737694	34	2	.70
38414.0	262.26 1	160.788 6	38.972 4	.11128 4	.51851 3	13.149927 6	.412E-2 1	6.737265	37	2	.74
38415.0	267.96 1	156.445 7	38.973 5	.11095 4	.67246 3	13.15807 1	.394E-2 2	6.737000	20	2	.54
38416.0	273.65 1	152.081 8	38.963 4	.11082 3	.83432 4	13.16554 1	.365E-2 2	6.735449	18	2	.52
38417.0	279.34 1	147.722 7	38.961 4	.11058 3	.00351 3	13.172929 8	.374E-2 1	6.734721	30	2	.54
38418.0	285.01 2	143.373 9	38.965 4	.11031 4	.18020 5	13.18053 1	.399E-2 2	6.734166	40	2	.82
38419.0	290.70 1	139.017 6	38.967 2	.11016 3	.36475 3	13.189064 7	.454E-2 1	6.732379	33	2	.54
38420.0	296.37 1	134.638 5	38.966 1	.10992 3	.55850 3	13.198050 6	.437E-2 1	6.731180	28	2	.46
38421.0	302.03 1	130.264 5	38.967 1	.10953 3	.76111 3	13.206539 9	.406E-2 2	6.731181	29	2	.60
38422.0	307.814 8	125.873 5	38.966 1	.10939 2	.97149 2	13.214294 6	.370E-2 1	6.729619	27	2	.62
38423.0	313.44 3	121.48 2	38.967 4	.10915 7	.18978 7	13.22226 2	.452E-2 4	6.728785	21	2	1.51
38424.0	319.20 5	117.12 3	38.963 3	.1086 1	.4166 1	13.23197 2	.503E-2 3	6.729425	22	2	.94
38425.0	324.97 1	112.674 5	38.964 1	.10856 2	.65352 2	13.241393 7	.437E-2 1	6.726703	24	2	.43

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
*38426.0	330.64 3	108.26 1	38.962 5	.10825 6	.89972 8	13.25077 5	.479E-2 3	6.725864	35	2	1.72
38427.0	336.44 1	103.845 4	38.962 1	.10805 2	.15515 3	13.26014 1	.436E-2 1	6.724220	36	2	.50
38428.0	341.83 3	99.35 2	38.978 4	.1064 1	.4212 1	13.26842 3	.389E-2 2	6.733656	34	2	.81
38429.0	347.51 3	94.94 4	38.978 8	.1060 2	.6937 2	13.27583 5	.395E-2 2	6.734621	22	2	.91
38430.0	353.66 5	90.55 2	38.964 5	.1074 3	.9720 2	13.28440 3	.432E-2 9	6.720754	16	2	.45
38431.0	359.49 4	86.13 1	38.956 4	.1076 3	.2606 2	13.29379 2	.558E-2 1	6.716448	20	2	.51
38432.0	5.26 4	81.70 1	38.951 5	.1070 3	.5610 2	13.30729 2	.694E-2 1	6.716263	18	2	.43
38433.0	11.00 5	77.22 2	38.954 8	.1064 3	.8754 3	13.32078 4	.665E-2 3	6.716318	21	2	.59
38434.0	16.75 6	72.75 2	38.95 1	.1057 4	.2032 3	13.33449 3	.764E-2 5	6.716810	20	2	.71
38435.0	22.47 5	68.28 1	38.949 7	.1046 3	.5459 2	13.34942 2	.659E-2 5	6.719940	13	2	.44
38436.0	28.36 2	63.791 9	38.948 8	.10465 7	.90128 7	13.36191 4	.624E-2 2	6.715548	12	2	.55
38437.0	34.08 5	59.28 2	38.96 2	.10425 9	.2697 1	13.37430 4	.618E-2 2	6.714365	19	4	1.29
38438.0	39.6 1	54.70 5	39.06 5	.1041 2	.6506 3	13.3870 1	.759E-2 5	6.710911	18	4	2.40
38439.0	45.6 3	49.6 2	39.5 1	.1025 5	.0471 7	13.4040 1	.854E-2 6	6.717750	12	4	2.31
38440.0											
38445.0											
38446.0	87.4 1	18.27 7	38.94 3	.0998 2	.2382 2	13.50683 7	.860E-2 3	6.703464	33	4	5.80
38447.0	93.03 3	13.70 2	38.953 8	.09891 4	.75482 7	13.52533 2	.896E-2 2	6.703989	27	4	1.85
38448.0	98.92 3	9.09 2	38.954 8	.09814 5	.28897 7	13.54263 2	.841E-2 1	6.704050	34	4	2.00
38449.0	104.95 2	4.458 8	38.946 2	.09772 3	.83940 5	13.55906 1	.876E-2 1	6.701698	26	4	.84
38450.0	110.82 2	359.816 4	38.9451 1	.09700 3	.40766 5	13.57721 5	.99E-2 1	6.701111	22	2	.68
38451.0	116.83 2	355.169 5	38.9464 1	.09608 2	.99572 4	13.59941 5	.113E-1 2	6.700640	19	2	.48
38452.0	122.82 1	350.499 3	38.9478 1	.09497 1	.60848 2	13.62580 3	.12389E-1 8	6.700154	15	2	.35
38453.0	128.815 7	345.846 4	38.9492 1	.09388 1	.24610 2	13.64922 2	.1196E-1 3	6.700544	13	2	.24
38454.0	134.91 5	341.24 7	38.9506 1	.09284 7	.9077 2	13.6746 2	.1301E-1 5	6.699976	9	2	.83

*A cubic was used in the mean anomaly equation from 1 February-31 March, 1964.

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38455.0	141.0 2	336.41 3	38.9521 1	.0920 2	.5956 4	13.6996 1	.112E-1 2	6.698242	20	2	.97
38456.0	147.09 3	331.627 7	38.9536 1	.09105 4	.30578 8	13.7204 1	.102E-1 2	6.698205	28	2	1.00
38457.0	153.20 3	326.871 9	38.949 1	.09013 5	.03589 8	13.73969 6	.962E-2 3	6.698707	28	2	1.05
38458.0	159.59 9	322.11 2	38.950 1	.08931 9	.7844 2	13.75927 8	.1191E-1 3	6.698403	36	2	3.17
38459.0	165.68 7	317.28 2	38.950 1	.0881 1	.5581 2	13.79093 9	.1831E-1 9	6.697222	31	2	3.03
38460.0	171.81 3	312.48 1	38.942 1	.08645 4	.36761 6	13.82613 6	.1584E-1 2	6.697762	28	2	.68
38461.0	178.12 6	307.64 4	38.940 1	.08516 9	.2085 1	13.8549 1	.135E-1 5	6.697937	25	2	1.04
38462.0	184.47 5	302.73 2	38.939 1	.07577 7	.0758 3	13.8801 3	.131E-1 3	6.698663	13	2	.67
38463.0	190.75 1	297.899 3	38.937 1	.08291 3	.96945 4	13.90814 7	.140E-1 5	6.697211	14	2	.39
38464.0	197.08 4	292.99 1	38.936 1	.0818 4	.8916 2	13.9364 2	.15E-1 2	6.696141	10	2	.63
38465.0	203.52 3	288.055 7	38.936 5	.08084 8	.83932 7	13.9594 5	.1188E-1 2	6.695896	10	2	.58
38466.0	209.99 4	283.146 9	38.924 6	.07918 6	.8110 1	13.98538 7	.126E-1 2	6.699685	12	2	.87
38467.0	216.50 8	278.13 4	38.95 2	.0799 7	.8094 4	14.01386 9	.1424E-1 3	6.685245	7	2	1.10
38468.0	223.0 1	273.07 5	39.01 3	.078 1	.8371 5	14.04100 2	.1307E-1 4	6.690745	9	2	1.72
38469.0	229.5 2	268.06 4	39.05 3	.077 2	.8914 8	14.069 2	.11E-1 5	6.692182	8	2	2.12
38470.0	236.12 8	263.11 2	38.94 2	.0754 9	.9718 4	14.0946 3	.141E-1 2	6.692212	11	4	1.44
38471.0	242.23 9	258.08 1	38.944 8	.07336 8	.084 4	14.123 2	.14E-1 1	6.698120	9	4	1.03
38472.0	249.16 4	252.99 1	38.926 8	.07268 2	.217 1	14.162 3	.4E-2 2	6.690744	10	4	.34
38473.0	256.09 8	247.89 3	38.92 2	.07204 5	.3855 2	14.17880 6	.106E-1 1	6.690030	19	4	1.54
38474.0	263.5 2	242.68 9	38.90 4	.07125 2	.5744 5	14.20121 5	.1185E-1 4	6.688702	30	4	5.66
38475.0	269.9 2	237.60 6	38.91 2	.0702 1	.7895 4	14.22675 4	.1382E-1 6	6.688223	19	2	1.80
38476.0	276.09 4	232.49 2	38.932 7	.06861 3	.03273 8	14.25788 4	.1529E-1 9	6.689952	12	2	.79
38477.0	282.9 1	227.32 2	38.94 1	.0671 1	.3069 3	14.29364 7	.2136E-1 9	6.689890	16	2	2.02
38478.0	289.8 1	222.10 1	38.932 8	.0657 1	.6224 3	14.33857 4	.2179E-1 5	6.685828	20	2	1.46
38479.0	296.64 5	216.86 1	38.940 7	.06378 5	.9817 2	14.38081 4	.2129E-1 7	6.686253	16	2	1.20
38480.0	303.45 7	211.59 2	38.941 8	.06208 7	.3830 2	14.42218 5	.209E-1 2	6.685561	15	2	1.49
38481.0	310.2 2	206.27 5	38.93 2	.0609 3	.8248 7	14.4648 4	.23E-1 1	6.680890	13	2	3.05
38482.0	316.7 2	200.92 5	38.94 2	.0591 3	.3081 7	14.5027 2	.181E-1 5	6.682600	12	2	3.56
38483.0	324.6 1	195.54 3	38.917 9	.05778 8	.8237 4	14.54080 7	.200E-1 2	6.679650	13	2	2.46
38484.0	330.5 1	190.23 4	38.93 1	.05596 8	.3830 4	14.5807 2	.246E-1 2	6.680328	12	2	2.33
38485.0	337.8 3	184.76 4	38.92 1	.0533 4	.9886 7	14.639 1	.341E-1 5	6.681323	8	2	1.82

*A cubic was used in the mean anomaly equation from 1 February - 31 March 1964.

Table 6

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1961 DELTA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Earth Shadow			
38395.	362.	14.6	125.7	123.0	-0.391E-04
38396.	366.	11.4	123.7	122.0	-0.415E-04
38397.	364.	7.9	121.8	121.3	-0.600E-04
38398.	364.	4.5	119.4	120.1	-0.449E-04
38399.	364.	1.1	117.1	119.1	-0.371E-04
38400.	364.	-2.5	114.6	118.0	-0.344E-04
38401.	365.	-5.9	112.2	117.0	-0.361E-04
38402.	364.	-9.4	109.8	116.0	-0.438E-04
		Perigee In Sunlight			
38403.	363.	-12.7	107.4	115.1	-0.468E-04
38404.	366.	-16.0	105.3	114.4	-0.565E-04
38405.	366.	-19.3	103.3	113.8	-0.539E-04
38406.	366.	-22.4	101.5	113.4	-0.504E-04
38407.	366.	-25.3	100.0	113.2	-0.475E-04
38408.	367.	-28.1	98.7	113.3	-0.451E-04
38409.	367.	-30.6	97.8	113.6	-0.434E-04
38410.	367.	-32.9	97.3	114.3	-0.497E-04
38411.	367.	-34.8	97.0	115.3	-0.648E-04
38412.	368.	-36.5	97.2	116.6	-0.529E-04
38413.	367.	-37.7	97.7	118.0	-0.461E-04
38414.	367.	-38.6	98.5	119.8	-0.477E-04

Table 6 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1961 DELTA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38415.	367.	-38.9	99.6	121.7	-0.455E-04
38416.	366.	-38.9	101.0	123.5	-0.421E-04
38417.	365.	-38.3	102.6	125.4	-0.431E-04
38418.	364.	-37.4	104.4	127.1	-0.459E-04
38419.	361.	-36.0	106.4	128.6	-0.522E-04
38420.	360.	-34.3	108.4	129.7	-0.502E-04
		Perigee In Earth Shadow			
38421.	359.	-32.2	110.5	130.6	-0.466E-04
38422.	357.	-29.8	112.7	131.3	-0.424E-04
38423.	355.	-27.2	114.7	131.6	-0.517E-04
38424.	355.	-24.3	116.7	131.7	-0.575E-04
38425.	351.	-21.2	118.6	131.5	-0.498E-04
38426.	350.	-18.0	120.2	131.0	-0.546E-04
38427.	347.	-14.6	121.7	130.5	-0.496E-04
38428.	356.	-11.3	122.6	129.4	-0.442E-04
38429.	357.	-7.8	123.5	128.5	-0.448E-04
38430.	342.	-4.0	124.7	127.9	-0.490E-04
38431.	338.	-0.3	125.3	127.0	-0.631E-04
38432.	338.	3.3	125.6	126.1	-0.784E-04
38433.	338.	6.9	125.6	125.1	-0.750E-04
38434.	339.	10.4	125.5	124.2	-0.859E-04
38435.	343.	13.9	125.3	123.4	-0.740E-04
38436.	339.	17.4	125.2	122.9	-0.699E-04

Table 6 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1961 DELTA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38437.	339.	20.6	124.9	122.4	-0.691E-04
38438.	336.	23.7	124.3	121.8	-0.847E-04
38439.	344.	27.0	123.7	121.2	-0.951E-04
38446.	334.	38.9	128.7	131.5	-0.943E-04
38447.	334.	38.9	129.8	133.2	-0.980E-04
38448.	334.	38.4	131.1	135.2	-0.917E-04
38449.	331.	37.4	132.7	137.1	-0.953E-04
38450.	330.	36.0	134.1	138.6	-0.107E-03
38451.	329.	34.1	135.7	140.0	-0.122E-03
38452.	328.	31.9	137.1	141.0	-0.133E-03
38453.	327.	29.3	138.5	141.7	-0.128E-03
38454.	326.	26.4	139.8	142.3	-0.139E-03
38455.	323.	23.3	140.6	142.3	-0.119E-03
38456.	322.	20.0	141.1	142.0	-0.108E-03
38457.	322.	16.5	141.3	141.6	-0.102E-03
38458.	321.	12.7	141.3	141.2	-0.126E-03
38459.	319.	8.9	140.6	140.4	-0.193E-03
38460.	320.	5.1	139.7	139.5	-0.166E-03
38461.	320.	1.2	138.5	138.6	-0.141E-03
38462.	320.	-2.8	137.1	137.7	-0.136E-03
38463.	319.	-6.7	135.5	136.9	-0.145E-03
38464.	318.	-10.6	133.9	136.1	-0.154E-03
38465.	319.	-14.5	132.3	135.5	-0.122E-03
38466.	323.	-18.3	130.8	135.2	-0.129E-03

Table 6 (cont.)
RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE
1961 DELTA 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38467.	310.	-22.0	129.4	135.0	-0.145E-03
38468.	316.	-25.4	128.2	135.0	-0.133E-03
38469.	319.	-28.6	127.3	135.4	-0.111E-03
38470.	320.	-31.5	127.0	136.5	-0.142E-03
38471.	326.	-33.8	126.6	137.2	-0.140E-03
38472.	320.	-36.0	127.1	139.3	-0.399E-04
38473.	320.	-37.6	128.0	141.7	-0.105E-03
38474.	319.	-38.6	129.5	144.9	-0.118E-03
38475.	318.	-38.9	130.9	147.1	-0.137E-03
38476.	320.	-38.7	132.5	149.0	-0.150E-03
38477.	320.	-37.8	134.8	151.5	-0.209E-03
38478.	315.	-36.2	137.5	153.8	-0.212E-03
38479.	315.	-34.2	140.4	155.7	-0.206E-03
38480.	313.	-31.6	143.4	157.0	-0.201E-03
38481.	307.	-28.7	146.4	157.8	-0.220E-03
38482.	308.	-25.5	149.0	157.9	-0.172E-03
38483.	304.	-21.3	152.7	158.9	-0.189E-03
38484.	304.	-18.0	154.1	157.9	-0.231E-03
38485.	304.	-13.7	155.9	157.7	-0.318E-03

I. SAO smoothed elements

The following elements are based on 111 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38410.0$ MJD

$\omega = (186^\circ.676 \pm 5) + (1^\circ.9879 \pm 5)t + ^\circ.208 \times 10^{-4}t^2 + ^\circ.1139 \cos \omega$

$\Omega = (252^\circ.584 \pm 2) - (1^\circ.8589 \pm 2)t + ^\circ.16 \times 10^{-5}t^2 + ^\circ.0145 \cos \omega$

$i = (44^\circ.8008 \pm 9) - ^\circ.46 \times 10^{-5}t - ^\circ.0077 \sin \omega$

$e = (.242488 \pm 7) - .257 \times 10^{-5}t + .0005181 \sin \omega$

$M = (.64713 \pm 1) + (9.126125 \pm 1)t + (.32 \pm 2) \times 10^{-6}t^2$

$- .0003162 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.45$

The following elements are based on 100 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38440.0$ MJD

$\omega = (246^\circ.262 \pm 5) + (1^\circ.9860 \pm 5)t + ^\circ.208 \times 10^{-4}t^2 + ^\circ.1139 \cos \omega$

$\Omega = (196^\circ.796 \pm 3) - (1^\circ.8598 \pm 3)t + ^\circ.16 \times 10^{-5}t^2 + ^\circ.0145 \cos \omega$

$i = (44^\circ.797 \pm 1) - ^\circ.46 \times 10^{-5}t - ^\circ.0077 \sin \omega$

$e = (.24258 \pm 2) - .257 \times 10^{-5}t + .0005181 \sin \omega$

$M = (.431205 \pm 7) + (9.1261414 \pm 7)t + (.30 \pm 2) \times 10^{-6}t^2$

$- .0003162 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.28$

The following elements are based on 108 observations and are valid for the period March 1 through April 1, 1964.

$T_0 = 38470.0$ MJD

$\omega = (305^\circ.800 \pm 3) + (1^\circ.9842 \pm 3)t + ^\circ.208 \times 10^{-4}t^2 + ^\circ.1139 \cos \omega$

$\Omega = (141^\circ.003 \pm 2) - (1^\circ.8595 \pm 2)t + ^\circ.16 \times 10^{-5}t^2 + ^\circ.0145 \cos \omega$

$i = (44^\circ.801 \pm 1) - ^\circ.46 \times 10^{-5}t - ^\circ.0077 \sin \omega$

$e = (.24262 \pm 2) - .257 \times 10^{-5}t + .0005181 \sin \omega$

$M = (.215871 \pm 5) + (9.1261693 \pm 5)t + (.32 \pm 2) \times 10^{-6}t^2$

$- .0003162 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.05$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38398.0	162.72 1	274.880 4	44.801 2	.24265 1	.13400 2	9.126126 2	-.5E-5 2	7.325071	22	6	.43
38402.0	170.66 1	267.440 4	44.800 2	.24258 1	.63847 3	9.126120 2	.1E-7 9	7.325789	14	6	.32
38406.0	178.600 8	260.003 3	44.803 1	.242504 9	.14297 2	9.126121 2	.1E-5 1	7.326509	24	6	.36
38410.0	186.56 1	252.570 3	44.802 1	.24243 1	.64744 2	9.126140 1	.3E-5 1	7.327202	28	6	.43
38414.0	194.52 1	245.133 5	44.802 3	.24233 1	.15197 2	9.126135 2	-.1E-5 1	7.328157	21	6	.46
38418.0	202.457 9	237.700 3	44.805 2	.24231 2	.65649 2	9.126125 2	.18E-5 9	7.328341	21	6	.42
38422.0	210.43 1	230.262 4	44.802 2	.24220 4	.16095 2	9.126133 3	.2E-5 1	7.329493	17	6	.44
38426.0	218.36 2	222.820 5	44.799 3	.24224 3	.66554 3	9.126143 1	-.3E-6 6	7.329057	13	6	.49
38430.0	226.33 1	215.384 3	44.803 2	.24217 3	.17004 2	9.126135 2	-.6E-6 9	7.329739	21	6	.53
38434.0	234.30 1	207.945 3	44.804 2	.24214 3	.67453 2	9.126131 1	.1E-6 9	7.330007	31	6	.45
38438.0	242.25 1	200.505 4	44.802 2	.24209 3	.17905 2	9.126135 1	.3E-6 6	7.330551	25	6	.38
38442.0	250.192 6	193.064 5	44.799 3	.24219 4	.68361 1	9.126144 1	-.15E-5 7	7.329572	21	6	.36
38446.0	258.159 7	185.633 5	44.803 3	.24213 5	.18812 1	9.126142 1	.13E-5 9	7.330095	14	6	.30
38450.0	266.12 1	178.19 2	44.799 6	.2422 1	.69268 2	9.126135 2	-.2E-5 1	7.329178	19	6	.69
38454.0	274.08 2	170.76 2	44.807 7	.2421 1	.19718 3	9.126151 5	.6E-5 3	7.330429	12	6	1.00
38458.0	282.013 9	163.32 2	44.809 3	.2421 1	.70183 2	9.126150 2	.7E-6 9	7.330409	19	6	.49
38462.0	289.970 6	155.890 7	44.808 2	.24211 4	.206413 8	9.126156 2	.1E-5 1	7.330266	27	6	.39
38466.0	297.917 7	148.448 4	44.809 2	.24210 5	.71104 1	9.126141 2	.9E-5 1	7.330403	28	6	.42
38470.0	305.866 6	141.012 4	44.808 2	.24214 3	.215688 9	9.126169 2	.5E-6 8	7.330045	22	6	.39
38474.0	313.83 1	133.56 1	44.811 3	.24220 8	.720350 8	9.126159 2	-.1E-5 2	7.329443	19	6	.33
38478.0	321.79 2	126.12 1	44.805 3	.24219 9	.22495 2	9.126156 5	.6E-5 3	7.329493	17	6	.46
38482.0	329.711 7	118.702 2	44.800 2	.24234 4	.72966 1	9.126158 4	.7E-5 2	7.328120	19	6	.38

Table 7

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1962 ALPHA EPSILON 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Earth Shadow			
38398.	948.	12.1	157.0	158.7	0.120E-06
38402.	948.	6.6	149.2	152.6	-0.240E-09
38406.	948.	1.0	141.3	146.5	-0.240E-07
38410.	949.	-4.6	133.4	140.4	-0.720E-07
38414.	950.	-10.2	125.8	134.4	0.240E-07
		Perigee In Sunlight			
38418.	952.	-15.6	118.6	128.7	-0.432E-07
38422.	954.	-20.9	112.0	123.4	-0.480E-07
38426.	955.	-25.9	106.2	118.5	0.720E-08
38430.	957.	-30.6	101.4	114.3	0.144E-07
38434.	959.	-34.9	97.7	110.9	-0.240E-08
38438.	961.	-38.6	95.2.	108.3	-0.720E-08
38442.	961.	-41.5	93.8	106.6	0.360E-07
38446.	962.	-43.6	93.5	105.7	-0.312E-07
38450.	961.	-44.7	94.1	105.5	0.480E-07
38454.	963.	-44.7	95.2	105.5	-0.144E-06
38458.	962.	-43.6	96.4	105.3	-0.168E-07
38462.	961.	-41.5	97.5	104.5	-0.240E-07
38466.	960.	-38.5	98.0	103.0	-0.216E-06
38470.	959.	-34.8	97.7	100.7	-0.120E-07
38474.	957.	-30.6	96.4	97.6	0.240E-07
38478.	955.	-25.8	94.0	93.8	-0.144E-06
38482.	952.	-20.8	90.5	89.4	-0.168E-06

Satellite 1962 Beta Mu 1 (Anna 1B) Geraldine Mendes

I. SAO smoothed elements

The following elements are based on 186 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38410.0$ MJD

$\omega = (76^\circ.38 \pm 5) + (2^\circ.966 \pm 6)t + 5^\circ.9471 \cos \omega$

$\Omega = (260^\circ.395 \pm 1) - (3^\circ.6091 \pm 1)t + ^\circ.00089867 \cos \omega$

$i = (50^\circ.1417 \pm 8) - ^\circ.00026201 \sin \omega$

$e = (.00709 \pm 1) + (.44 \pm 10) \times 10^{-5} t + .00075402 \sin \omega$

$M = (.4243 \pm 1) + (13.34496 \pm 2)t + (.37 \pm 2) \times 10^{-6} t^2$

$- .015165 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.68$

The following elements are based on 118 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38440.0$ MJD

$\omega = (165^\circ.0 \pm 1) + (2^\circ.94 \pm 1)t + 5^\circ.9471 \cos \omega$

$\Omega = (152^\circ.118 \pm 1) - (3^\circ.6091 \pm 1)t + ^\circ.00089867 \cos \omega$

$i = (50^\circ.1426 \pm 9) - ^\circ.00026201 \sin \omega$

$e = (.007115 \pm 8) + (.41 \pm 80) \times 10^{-6} t + .00075402 \sin \omega$

$M = (.7740 \pm 3) + (13.34499 \pm 3)t - (.16 \pm 2) \times 10^{-5} t^2$

$- .015165 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.30$

The following elements are based on 161 observations and are valid for the period March 1 through April 1, 1964.

$T_0 = 38470.0$ MJD

$\omega = (254^\circ.28 \pm 7) + (3^\circ.027 \pm 9)t + 5^\circ.9471 \cos \omega$

$\Omega = (43^\circ.849 \pm 1) - (3^\circ.6087 \pm 1)t + ^\circ.00089867 \cos \omega$

$i = (50^\circ.1446 \pm 8) - ^\circ.00026201 \sin \omega$

$e = (.00706 \pm 1) - (.9 \pm 13) \times 10^{-6} t + .00075402 \sin \omega$

$M = (.1192 \pm 2) + (13.34467 \pm 3)t - (.39 \pm 2) \times 10^{-6} t^2$

$- .015165 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.45$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38398.0	45.2 2	303.700 4	50.148 3	.00736 6	.2737 5	13.345123 7	.3E-5 6	7.452340	23	4	.99
38402.0	55.8 2	289.268 5	50.142 3	.00778 6	.6568 7	13.345157 6	-.5E-5 5	7.449200	37	4	1.35
38406.0	66.4 3	274.827 5	50.139 4	.00777 7	.0398 7	13.345131 7	-.2E-5 6	7.449264	32	4	1.30
38410.0	77.5 1	260.400 3	50.140 2	.00772 3	.4216 3	13.345153 3	-.2E-5 3	7.449669	28	4	.52
38414.0	88.4 1	245.961 2	50.139 2	.00781 4	.8037 4	13.345156 3	-.7E-5 3	7.448963	35	4	.65
38418.0	99.1 2	231.524 3	50.144 2	.00789 2	.1866 5	13.345150 3	-.2E-5 3	7.448395	20	4	.52
38422.0	109.2 3	217.083 2	50.139 2	.00779 2	.5711 8	13.345143 3	.4E-5 2	7.449086	17	4	.43
38426.0	120.3 2	202.642 3	50.143 3	.00775 2	.9527 7	13.345140 3	-.1E-5 3	7.449414	29	4	.67
38430.0	130.6 4	188.209 3	50.141 3	.00769 3	.337 1	13.345122 3	-.4E-5 2	7.449878	16	4	.53
38434.0	141.9 3	173.772 4	50.143 2	.00753 2	.7178 7	13.345122 3	.1E-5 3	7.451048	19	4	.39
38438.0	153.4 5	159.336 9	50.145 2	.00741 4	.098 1	13.345092 6	-.17E-4 5	7.452014	18	4	.62
38442.0	164.8 5	144.90 1	50.142 4	.00723 3	.479 2	13.345096 4	.1E-5 4	7.453372	13	4	.49
38446.0	178.3 5	130.458 5	50.147 3	.00694 3	.855 1	13.345091 6	-.12E-4 6	7.455552	20	4	.85
38450.0	188.3 3	116.022 5	50.144 5	.00694 2	.2393 8	13.345065 3	.7E-5 3	7.455506	13	4	.32
38454.0	200.7 3	101.590 3	50.141 3	.00675 4	.6175 8	13.345046 5	.3E-5 4	7.456982	16	4	.64
38458.0	213.5 2	87.155 1	50.144 2	.00664 2	.9944 6	13.345043 2	-.3E-5 2	7.457785	24	4	.42
38462.0	226.3 2	72.720 1	50.142 1	.00646 2	.3714 5	13.345033 2	-.4E-5 2	7.459119	30	4	.43
38466.0	238.9 2	58.292 4	50.151 4	.00641 4	.7490 6	13.345021 5	-.1E-5 4	7.459560	26	4	.60
38470.0	252.3 2	43.842 4	50.143 3	.00636 4	.1243 5	13.345014 3	.1E-5 3	7.459932	20	4	.43
38474.0	265.6 1	29.409 3	50.142 2	.00622 3	.4999 3	13.345012 3	.1E-5 5	7.460972	22	4	.51
38478.0	278.5 4	14.97 2	50.140 6	.0063 1	.877 1	13.345016 8	-.6E-5 7	7.460093	14	4	.94
38482.0	291.8 2	.56 1	50.141 3	.00640 6	.2522 7	13.345029 9	.01E-4 6	7.459599	12	4	.49

Table 8

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1962 BETA MU 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38398.	1080.	33.0	75.2	52.8	-0.337E-07
38402.	1079.	39.4	74.4	44.4	0.562E-07
38406.	1081.	44.7	75.0	38.0	0.225E-07
38410.	1083.	48.5	76.2	34.5	0.225E-07
38414.	1083.	50.1	76.1	32.4	0.786E-07
38418.	1082.	49.3	73.8	30.2	0.225E-07
38422.	1082.	46.5	69.1	26.1	-0.449E-07
38426.	1080.	41.5	62.2	21.4	0.112E-07
38430.	1079.	35.7	53.5	13.7	0.449E-07
38434.	1077.	28.3	43.6	5.4	-0.112E-07
38438.	1076.	20.1	34.1	355.9	0.191E-06
38442.	1076.	11.6	28.0	345.5	-0.112E-07
38446.	1077.	1.3	26.9	335.9	0.135E-06
38450.	1077.	-6.4	35.7	324.1	-0.786E-07
38454.	1080.	-15.7	45.4	314.2	-0.337E-07
38458.	1083.	-25.1	55.3	305.4	0.337E-07
38462.	1087.	-33.7	64.0	298.1	0.449E-07
38466.	1090.	-41.1	70.7	292.9	0.112E-07
38470.	1093.	-47.0	74.1	291.5	-0.112E-07
38474.	1095.	-49.9	75.2	293.1	-0.112E-07
38478.	1094.	-49.4	75.1	295.0	0.674E-07
38482.	1092.	-45.5	74.4	295.8	-0.112E-07

Satellite 1962 Beta Tau 2 (Injun 3) Beatrice Miller

I. SAO smoothed elements

The following elements are based on 105 observations and are valid for the period January 1 through January 16, 1964.

$T_0 = 38402.0$ MJD

$\omega = (75^\circ.84 \pm 7) - (1^\circ.14 \pm 1)t - ^\circ.18 \times 10^4 t^2 + ^\circ.2469 \cos \omega$

$\Omega = (269^\circ.251 \pm 6) - (1^\circ.7465 \pm 4)t - ^\circ.776 \times 10^{-4} t^2 + ^\circ.0322 \cos \omega$

$i = (70^\circ.355 \pm 9) - ^\circ.0022 \sin \omega$

$e = (.1494 \pm 3) - (.05 \pm 45) \times 10^{-4} t + .195 \times 10^{-6} t^2 + .0007072 \sin \omega$

$M = (.6151 \pm 3) + (12.64896 \pm 5)t + (.0002763 \pm 9)t^2 + (.73 \pm 11) \times 10^{-6} t^3$
$- (.97 \pm 19) \times 10^{-7} t^4 - .0006551 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.40$

The following elements are based on 113 observations and are valid for the period January 16 through February 1, 1964.

$T_0 = 38418.0$ MJD

$\omega = (57^\circ.694 \pm 6) - (1^\circ.137 \pm 2)t - ^\circ.18 \times 10^{-4} t^2 + ^\circ.2469 \cos \omega$

$\Omega = (241^\circ.283 \pm 1) - (1^\circ.7488 \pm 3)t - ^\circ.776 \times 10^{-4} t^2 + ^\circ.0322 \cos \omega$

$i = (70^\circ.350 \pm 2) - ^\circ.0022 \sin \omega$

$e = (.14919 \pm 3) - (.14 \pm 5) \times 10^{-4} t + .195 \times 10^{-6} t^2 + .0007072 \sin \omega$

$M = (.06843 \pm 2) + (12.657519 \pm 6)t + (.0002454 \pm 5)t^2 + (.26 \pm 4) \times 10^{-6} t^3$
$+ (.72 \pm 8) \times 10^{-7} t^4 - .0006551 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.73$

The following elements are based on 61 observations and are valid for the period February 1 through February 20, 1964.

$T_0 = 38436.0$ MJD

$\omega = (37^\circ.30 \pm 2) - (1^\circ.140 \pm 3)t - ^\circ.18 \times 10^{-4}t^2 + ^\circ.2469 \cos \omega$

$\Omega = (209^\circ.771 \pm 4) - (1^\circ.7526)t - ^\circ.776 \times 10^{-4}t^2 + ^\circ.0322 \cos \omega$

$i = (70^\circ.354 \pm 5) - ^\circ.0022 \sin \omega$

$e = (.14901 \pm 8) - (.17 \pm 10) \times 10^{-4}t + .195 \times 10^{-6}t^2 + .0007072 \sin \omega$

$M = (.98663 \pm 4) + (12.667060 \pm 8)t + (.0003000 \pm 8)t^2$

$+ (.107 \pm 4) \times 10^{-5}t^3 - (.47 \pm 8) \times 10^{-7}t^4 - .0006551 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.38$

The following elements are based on 23 observations and are valid for the period March 15 through April 1, 1964.

$T_0 = 38476.0$ MJD

$\omega = (351^\circ.6 \pm 2) - (1^\circ.12 \pm 2)t - ^\circ.18 \times 10^{-4}t^2 + ^\circ.2469 \cos \omega$

$\Omega = (139^\circ.54 \pm 3) - (1^\circ.760 \pm 2)t - ^\circ.776 \times 10^{-4}t^2 + ^\circ.0322 \cos \omega$

$i = (70^\circ.353 \pm 8) - ^\circ.0022 \sin \omega$

$e = (.1483 \pm 7) - (.00012 \pm 7)t + .195 \times 10^{-6}t^2 + .0007072 \sin \omega$

$M = (.2380 \pm 2) + (12.69682 \pm 3)t + (.000413 \pm 2)t^2 + (.30 \pm 2) \times 10^{-5}t^3$

$- (.19 \pm 2) \times 10^{-6}t^4 - .0006551 \cos \omega$

Standard error of one observation: $\sigma = \pm 3''.95$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38396.0	82.69 8	279.735 8	70.36 1	.1503 3	.7309 4	12.64559 1	.325E-3 6	6.613181	26	6	.56
38398.0	80.42 9	276.25 1	70.36 1	.1503 4	.0234 4	12.646812 4	.290E-3 3	6.613223	42	6	.80
38400.0	78.16 6	272.753 6	70.356 9	.1503 2	.3182 3	12.647886 3	.247E-3 2	6.612648	34	6	.46
38402.0	75.88 7	269.268 8	70.37 1	.1502 2	.6150 3	12.648911 3	.262E-3 2	6.613403	32	6	.50
38404.0	73.60 7	265.776 6	70.366 9	.1500 2	.9140 3	12.650048 2	.296E-3 2	6.614116	34	6	.46
38406.0	71.31 6	262.270 5	70.349 7	.1498 2	.2154 2	12.651207 3	.274E-3 2	6.615145	41	6	.49
38408.0	69.08 4	258.774 4	70.343 6	.1499 1	.5188 2	12.652257 3	.253E-3 2	6.614479	48	6	.49
38410.0	66.88 7	255.278 6	70.340 9	.1500 2	.8241 3	12.653323 4	.273E-3 2	6.612941	43	6	.73
38412.0	64.60 1	251.790 2	70.351 3	.14994 6	.13195 4	12.654451 3	.287E-3 2	6.613170	47	6	.67
38414.0	62.353 7	248.292 2	70.349 2	.14985 4	.44198 3	12.655543 3	.250E-3 1	6.613495	53	6	.60
38416.0	60.101 5	244.798 1	70.350 2	.14981 3	.75405 2	12.656522 2	.235E-3 1	6.613510	61	6	.50
38418.0	57.849 6	241.301 1	70.348 2	.14978 3	.06799 2	12.657472 3	.239E-3 1	6.613385	49	6	.49
38420.0	55.585 8	237.805 1	70.349 2	.14978 4	.38393 3	12.658505 2	.262E-3 1	6.613063	38	6	.44
38422.0	53.28 2	234.305 2	70.344 3	.14963 6	.70215 7	12.659521 2	.249E-3 1	6.613828	31	6	.53
38424.0	51.04 1	230.809 2	70.348 4	.14965 4	.02209 5	12.660548 3	.263E-3 2	6.613350	31	6	.63

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38426.0	48.76 1	227.310 2	70.345 3	.14960 3	.34429 4	12.661599 3	.260E-3 2	6.613378	28	6	.43
38428.0	46.52 2	223.811 3	70.350 5	.14955 3	.66845 6	12.662591 8	.244E-3 4	6.613358	19	6	.47
38430.0	44.25 1	220.303 3	70.349 4	.14953 5	.99454 4	12.663571 6	.261E-3 3	6.613235	28	6	.69
38432.0	41.995 8	216.803 2	70.348 3	.14943 3	.32269 2	12.664679 4	.300E-3 2	6.613611	25	6	.45
38434.0	39.735 9	213.303 3	70.346 4	.14938 4	.65326 3	12.665892 3	.303E-3 2	6.613587	27	6	.56
38436.0	37.47 2	209.811 7	70.336 8	.14924 9	.98622 4	12.667042 2	.279E-3 2	6.614250	21	6	.68
38438.0	35.25 3	206.30 1	70.35 1	.1492 1	.32132 6	12.668201 6	.297E-3 3	6.613894	20	6	1.03
38440.0	32.95 4	202.79 1	70.35 1	.1492 2	.65905 6	12.669471 4	.323E-3 2	6.614029	19	6	.81
38442.0	30.63 9	199.28 1	70.35 2	.1491 4	.9994 1	12.670717 8	.304E-3 3	6.614421	10	6	.47
38444.0	28.7 5	195.66 7	70.46 7	.150 2	.3417 7	12.67195 1	.313E-3 4	6.603600	6	6	.45
38446.0											
38470.0											
38472.0	356.6 2	146.60 4	70.35 1	.1475 7	.4561 2	12.693769 4	.358E-3 2	6.618337	9	6	.55
38474.0											
38476.0											
38478.0	348.8 3	135.7 1	70.27 4	.156 2	.6327 3	12.69849 1	.421E-3 6	6.552479	6	7	1.90
38480.0	347.0 5	132.5 1	70.36 4	.151 3	.0313 5	12.70023 2	.44E-3 1	6.592286	9	6	3.31
38482.0	345.10 2	129.021 8	70.355 3	.1477 1	.43346 3	12.701947 5	.400E-3 4	6.614246	10	6	.41
38484.0	342.89 3	125.471 8	70.346 4	.1469 1	.83904 8	12.703571 6	.425E-3 4	6.619563	10	6	.80

Table 9

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1962 BETA TAU 2

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38396.	254.	69.1	103.8	67.3	-0.406E-05
38398.	253.	68.2	99.7	55.8	-0.363E-05
38400.	253.	67.2	95.8	44.8	-0.309E-05
38402.	253.	66.0	92.1	34.3	-0.328E-05
38404.	253.	64.6	88.8	24.2	-0.370E-05
38406.	254.	63.1	85.7	14.6	-0.342E-05
38408.	253.	61.6	83.2	5.4	-0.316E-05
38410.	251.	60.0	81.2	356.7	-0.341E-05
38412.	250.	58.3	79.7	348.1	-0.358E-05
38414.	250.	56.5	78.8	339.9	-0.312E-05
38416.	249.	54.7	78.4	331.9	-0.293E-05
38418.	249.	52.9	78.8	324.1	-0.298E-05
38420.	248.	51.0	79.7	316.5	-0.327E-05
38422.	248.	49.0	81.2	309.1	-0.311E-05
38424.	246.	47.1	83.4	301.8	-0.328E-05
38426.	246.	45.1	86.0	294.7	-0.324E-05
38428.	245.	43.1	89.2	287.7	-0.304E-05
38430.	244.	41.1	92.8	280.8	-0.326E-05
38432.	244.	39.1	96.8	273.9	-0.374E-05
38434.	243.	37.0	101.2	267.2	-0.378E-05

Table 9 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1962 BETA TAU 2

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Earth Shadow			
38436.	243.	35.0	105.8	260.6	-0.348E-05
38438.	242.	32.9	110.7	254.0	-0.370E-05
38440.	241.	30.8	115.9	247.5	-0.402E-05
38442.	241.	28.7	121.2	241.0	-0.379E-05
38444.	230.	26.9	126.8	234.5	-0.390E-05
38472.	240.	-3.2	147.5	147.8	-0.444E-05
38482.	237.	-14.0	117.0	117.2	-0.496E-05
38484.	243.	-16.1	111.2	111.0	-0.527E-05

Satellite 1962 Beta Upsilon 1 (Relay 1) Beatrice Miller

I. SAO smoothed elements

The following elements are based on 160 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38411.0$ MJD

$\omega = (301^\circ.318 \pm 2) + (1^\circ.2112 \pm 3)t + ^\circ.0962 \cos\omega$

$\Omega = (68^\circ.039 \pm 1) - (1^\circ.2799 \pm 1)t + ^\circ.0158 \cos\omega$

$i = (47^\circ.5189 \pm 7) - ^\circ.0082 \sin\omega$

$e = (.284744 \pm 8) + (.532 \pm 95) \times 10^{-5}t + .0005025 \sin\omega$

$M = (.648794 \pm 3) + (7.7809349 \pm 6)t + (.50 \pm 2) \times 10^{-6}t^2$

$- .0002587 \cos\omega$

Standard error of one observation: $\sigma = \pm 1''.48$

The following elements are based on 209 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38441.0$ MJD

$\omega = (337^\circ.686 \pm 2) + (1^\circ.2127 \pm 2)t + ^\circ.0962 \cos\omega$

$\Omega = (29^\circ.6412 \pm 8) - (1^\circ.2799 \pm 1)t + ^\circ.0158 \cos\omega$

$i = (47^\circ.5231 \pm 5) - ^\circ.0082 \sin\omega$

$e = (.284825 \pm 6) + (.49 \pm 7) \times 10^{-5}t + .0005025 \sin\omega$

$M = (.077087 \pm 3) + (7.7809457 \pm 4)t + (.49 \pm 14) \times 10^{-7}t^2$

$- .0002587 \cos\omega$

Standard error of one observation: $\sigma = \pm 1''.29$

The following elements are based on 129 observations and are valid for the period March 1 through April 1, 1964.

T_0 = 38471.0 MJD

ω = (14°.094 ± 3) + (1°.2148 ± 4)t + °.0962 cos ω

Ω = (351°.249 ± 2) - (1°.2801 ± 3)t + °.0158 cos ω

i = (47°.5264 ± 9) - °.0082 sin ω

e = (.284936 ± 8) + (.19 ± 13) × 10^{-5}t + .0005025 sin ω

M = (.505480 ± 6) + (7.7809493 ± 8)t + (.20 ± 5) × $10^{-6}t^2$

- .0002587 cos ω

Standard error of one observation: σ = ± 1!98

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38410.0	300.160 2	69.3271 9	47.5247 7	.284300 8	.867724 3	7.7809298 5	.4E-6 3	7.698906	35	6	.10
38414.0	305.010 2	64.2098 9	47.5214 8	.284375 7	.991449 3	7.7809303 5	-.3E-6 4	7.698101	31	6	.09
38418.0	309.866 2	59.090 1	47.523 1	.284396 8	.115180 5	7.7809392 9	.11E-5 8	7.697865	34	6	.12
38422.0	314.711 2	53.9750 9	47.5234 8	.284403 7	.238951 4	7.7809417 7	.9E-6 5	7.697783	33	6	.09
38426.0	319.564 3	48.849 1	47.5274 8	.28449 1	.362727 5	7.7809394 7	-.8E-6 4	7.696821	35	6	.11
38430.0	324.424 2	43.733 1	47.5288 9	.28450 1	.486474 5	7.780941 1	.12E-5 6	7.696795	54	6	.19
38434.0	329.274 2	38.615 1	47.5280 8	.284495 8	.610259 4	7.780937 1	.28E-5 6	7.696799	51	6	.16
38438.0	334.126 2	33.4963 8	47.5249 6	.284598 7	.734040 3	7.7809454 6	-.11E-5 4	7.695690	45	6	.11
38442.0	338.999 1	28.3774 6	47.5256 5	.284647 5	.857776 2	7.7809407 4	-.3E-6 3	7.695162	37	6	.09
38446.0	343.856 2	23.258 1	47.5272 8	.284683 8	.981535 4	7.7809428 8	.4E-6 7	7.694776	30	6	.10
38450.0	348.701 2	18.1369 9	47.5264 5	.284759 5	.105337 4	7.7809471 3	.2E-6 4	7.693958	28	6	.05
38454.0	353.557 3	13.019 1	47.5271 6	.284855 7	.229114 5	7.7809410 9	-.13E-5 6	7.692925	20	6	.07
38458.0	358.417 4	7.904 2	47.5286 9	.28483 1	.352879 8	7.780939 3	.3E-5 1	7.693212	17	6	.09
38462.0	3.256 2	2.783 1	47.5272 7	.284916 6	.476696 5	7.780948 1	.21E-5 6	7.692269	32	6	.11
38466.0	8.100 4	357.666 2	47.529 1	.28500 1	.600516 7	7.780950 2	.2E-5 1	7.691318	28	6	.17
38470.0	12.973 8	352.539 4	47.528 2	.28506 2	.72431 3	7.780946 3	-.3E-5 2	7.690726	19	6	.26
38474.0	17.824 3	347.426 2	47.522 1	.285079 8	.848081 5	7.780953 1	.12E-5 8	7.690507	37	6	.17
38478.0	22.680 1	342.3067 7	47.5223 4	.285157 4	.971902 2	7.7809558 9	.14E-5 5	7.689670	26	6	.06

Table 10

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1962 BETA UPSILON 1

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38410.	1329.	-39.6	71.6	83.2	-0.132E-07
38414.	1328.	-37.2	69.5	79.2	0.991E-08
38418.	1326.	-34.5	66.9	74.8	-0.363E-07
38422.	1325.	-31.6	63.9	70.2	-0.297E-07
38426.	1323.	-28.6	60.4	65.3	0.264E-07
38430.	1322.	-25.4	56.6	60.3	-0.396E-07
38434.	1321.	-22.1	52.4	55.0	-0.925E-07
38438.	1320.	-18.8	47.8	49.7	0.363E-07
38442.	1318.	-15.3	43.0	44.3	0.991E-08
38446.	1317.	-11.8	38.0	38.8	-0.132E-07
38450.	1316.	-8.3	32.8	33.2	-0.661E-08
38454.	1315.	-4.7	27.7	27.6	0.429E-07
38458.	1315.	-1.2	22.7	22.1	-0.991E-07
38462.	1314.	2.4	18.1	16.5	-0.694E-07
38466.	1313.	6.0	14.4	11.0	-0.661E-07
38470.	1313.	9.5	12.6	5.6	0.991E-07
38474.	1313.	13.0	13.3	0.2	-0.396E-07
38478.	1313.	16.5	16.0	354.9	-0.462E-07

Satellite 1963 13A (Telstar 2) Phyllis Stern

I. SAO smoothed elements

The following elements are based on 135 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38410.0$ MJD

$\omega = (120^\circ.330 \pm 4) + 1^\circ.21622t + ^\circ.0465 \cos \omega$

$\Omega = (277^\circ.568 \pm 2) - 1^\circ.05437t + ^\circ.0197 \cos \omega$

$i = (42^\circ.758 \pm 1) + ^\circ.17 \times 10^{-4}t - ^\circ.0118 \sin \omega$

$e = (.400613 \pm 9) - .828 \times 10^{-5}t + .0003970 \sin \omega$

$M = (.245627 \pm 5) + (6.3914343 \pm 1)t + (.41 \pm 1) \times 10^{-6}t^2 - .0001394 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.50$.

The following elements are based on 67 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38440.0$ MJD

$\omega = (156^\circ.822 \pm 6) + (1^\circ.21622)t + ^\circ.0465 \cos \omega$

$\Omega = (245^\circ.949 \pm 3) - (1^\circ.05437)t + ^\circ.0197 \cos \omega$

$i = (42^\circ.746 \pm 2) + ^\circ.17 \times 10^{-4}t - ^\circ.0118 \sin \omega$

$e = (.400434 \pm 2) - .828 \times 10^{-5}t + .0003970 \sin \omega$

$M = (.988920 \pm 6) + (6.3914493 \pm 2)t + (.28 \pm 2) \times 10^{-6}t^2$

$- .0001394 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.35$

The following elements are based on 112 observations and are valid for the period March 1 through April 1, 1964.

T_0 = 38470.0 MJD

ω = (193°.328 ± 5) + 1°.21622t + °.0465 cos ω

Ω = (214°.336 ± 3) - 1°.05437t + °.0197 cos ω

i = (42°.751 ± 2) + °.17 × 10^{-4}t - °.0118 sin ω

e = (.40053 ± 4) - .828 × 10^{-5}t + .0003970 sin ω

M = (.73234 ± 1) + (6.3914555 ± 2)t + (.29 ± 3) × $10^{-6}t^2$

- .0001394 cos ω

Standard error of one observation σ = ± 1!40

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38396.0	103.30 1	292.309 8	42.745 2	.40119 2	.76565 1	6.3914276 8	.10E-5 4	7.344009	24	8	.53
38400.0	108.155 7	288.091 5	42.745 2	.40115 2	.331390 8	6.3914268 6	-.6E-6 3	7.344465	25	8	.41
38404.0	113.007 8	283.875 5	42.747 2	.40112 2	.897111 9	6.3914267 6	.5E-6 3	7.344949	29	8	.53
38408.0	117.850 6	279.663 3	42.748 1	.40096 1	.462802 7	6.3914334 6	.15E-5 3	7.346791	38	8	.46
38412.0	122.740 5	275.448 3	42.746 1	.40091 1	.028578 6	6.3914417 5	.6E-6 2	7.347462	39	8	.42
38416.0	127.581 6	271.229 3	42.744 1	.40089 1	.594377 7	6.3914359 6	-.11E-5 3	7.347676	35	8	.46
38420.0	132.448 9	267.014 3	42.745 2	.40081 2	.16011 1	6.3914390 5	.21E-5 3	7.348720	31	8	.54
38424.0	137.31 1	262.801 3	42.742 3	.40073 2	.72589 1	6.3914498 5	.6E-6 2	7.349716	29	8	.53
38428.0	142.18 1	258.585 3	42.738 4	.40068 2	.29169 1	6.3914471 5	-.11E-5 2	7.350254	27	8	.51
38432.0	147.05 1	254.364 4	42.746 4	.40065 3	.85747 1	6.3914383 7	-.8E-6 3	7.350606	22	8	.48
38436.0	151.907 9	250.152 5	42.746 3	.40058 3	.423325 9	6.3914513 9	.21E-5 5	7.351497	26	8	.52
38440.0	156.74 1	245.947 7	42.746 3	.40057 4	.98909 1	6.391459 5	.1E-5 1	7.351584	23	8	.56
38444.0	161.60 1	241.727 9	42.749 4	.4007 1	.55486 2	6.391454 4	-.1E-5 2	7.349490	16	8	.57
38448.0	166.53 2	237.50 1	42.743 6	.4003 1	.12062 4	6.391452 5	.1E-5 3	7.354480	16	8	.86
38452.0	171.41 2	233.27 1	42.737 5	.4004 1	.68640 2	6.391458 4	-.1E-5 1	7.353530	13	8	.67
38456.0	176.23 2	229.066 7	42.742 3	.40053 8	.25224 1	6.391450 1	-.13E-5 6	7.352132	15	8	.38
38460.0	181.11 2	224.860 8	42.746 3	.40046 8	.81800 1	6.391449 2	.1E-4 1	7.353010	16	8	.47
38464.0	185.982 8	220.633 6	42.749 3	.40046 5	.38379 2	6.391454 3	.1E-5 2	7.353002	18	8	.40
38468.0	190.845 6	216.410 5	42.754 3	.40034 7	.94966 3	6.391458 2	.1E-5 1	7.354479	23	8	.35
38472.0	195.717 6	212.200 5	42.754 3	.40064 7	.51533 2	6.391452 2	.6E-6 9	7.350795	38	8	.40
38476.0	200.594 6	207.985 4	42.754 2	.40064 5	.08110 1	6.391461 1	.13E-5 7	7.350706	48	8	.38
38480.0	205.470 9	203.769 6	42.756 2	.40057 6	.64695 1	6.391463 1	-.22E-5 6	7.351613	36	8	.45
38484.0	210.34 1	199.555 8	42.761 3	.40060 7	.21275 2	6.391464 1	.11E-5 7	7.351252	30	8	.52

Table 11

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1963 13A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Earth Shadow			
38396.	975.	41.3	126.1	118.6	-0.490E-07
38400.	975.	40.2	124.0	116.2	0.294E-07
38404.	975.	38.7	121.6	113.6	-0.245E-07
		Perigee In Sunlight			
38408.	976.	36.9	118.9	110.8	-0.734E-07
38412.	976.	34.8	115.8	107.7	-0.294E-07
38416.	976.	32.5	112.3	104.3	0.539E-07
38420.	976.	30.1	108.5	100.8	-0.103E-06
38424.	976.	27.4	104.3	97.1	-0.294E-07
38428.	976.	24.6	99.8	93.2	0.539E-07
38432.	975.	21.7	95.0	89.2	0.392E-07
38436.	975.	18.6	90.0	85.1	-0.103E-06
38440.	975.	15.5	84.9	80.8	-0.490E-07
38444.	972.	12.4	79.6	76.5	0.490E-07
38448.	977.	9.1	74.4	72.2	-0.490E-07
38452.	975.	5.8	69.1	67.8	0.490E-07
38456.	974.	2.6	64.0	63.4	0.636E-07
38460.	975.	-0.8	59.1	59.1	-0.490E-06
38464.	975.	-4.1	54.6	54.7	-0.490E-07
38468.	976.	-7.3	50.4	50.4	-0.490E-07
38472.	973.	-10.6	46.9	46.2	-0.294E-07
38476.	974.	-13.8	44.1	42.1	-0.636E-07
38480.	975.	-17.0	42.2	38.1	0.108E-06
38484.	975.	-20.1	41.2	34.2	-0.539E-07

I. SAO smoothed elements

The following elements are based on 129 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38410.0$ MJD

$\omega = (119^\circ.14 \pm 1) + (3^\circ.493 \pm 2)t + ^\circ.000408t^2 + ^\circ.7159 \cos \omega$

$\Omega = (263^\circ.612 \pm 1) - (4^\circ.1715 \pm 2)t - ^\circ.22 \times 10^{-5}t^2 + ^\circ.0085 \cos \omega$

$i = (49^\circ.739 \pm 1) - ^\circ.0023 \sin \omega$

$e = (.06138 \pm 1) - .3373 \times 10^{-4}t + .419 \times 10^{-6}t^2 + .0007663 \sin \omega$

$M = (.87392 \pm 4) + (14.103722 \pm 6)t + (.76 \pm 1) \times 10^{-5}t^2 + (.24 \pm 5) \times 10^{-7}t^3$
$+ (.65 \pm 5) \times 10^{-8}t^4 - .0018040 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.98$

The following elements are based on 153 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38440.0$ MJD

$\omega = (224^\circ.37 \pm 2) + (3^\circ.500 \pm 2)t + ^\circ.000408t^2 + ^\circ.7159 \cos \omega$

$\Omega = (138^\circ.468 \pm 1) - (4^\circ.1719 \pm 1)t - ^\circ.22 \times 10^{-5}t^2 + ^\circ.0085 \cos \omega$

$i = (49^\circ.739 \pm 1) - ^\circ.0023 \sin \omega$

$e = (.06115 \pm 1) - .859 \times 10^{-5}t + .419 \times 10^{-6}t^2 + .0007663 \sin \omega$

$M = (.99563 \pm 5) + (14.104540 \pm 4)t + (.1469 \pm 4) \times 10^{-4}t^2$
$- (.15 \pm 4) \times 10^{-7}t^3 - .0018040 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.03$

The following elements are based on 163 observations and are valid for the period March 1 through April 1, 1964.

$T_0 = 38470.0$ MJD

$\omega = (329^\circ.60 \pm 2) + (3^\circ.505 \pm 2)t + ^\circ.000408t^2 + ^\circ.7159 \cos \omega$

$\Omega = (13^\circ.308 \pm 2) - (4^\circ.1726 \pm 2)t - ^\circ.22 \times 10^{-5}t^2 + ^\circ.0085 \cos \omega$

$i = (49^\circ.742 \pm 2) - ^\circ.0023 \sin \omega$

$e = (.06122 \pm 1) + .1655 \times 10^{-4}t + .419 \times 10^{-6}t^2 + .0007663 \sin \omega$

$M = (.14602 \pm 6) + (14.105549 \pm 7)t + (.1684 \pm 4) \times 10^{-4}t^2$

$- (.88 \pm 45) \times 10^{-8}t^3 - .0018040 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.73$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38396.0	70.25 3	322.021 7	49.745 6	.06189 3	.42399 7	14.103470 4	.109E-4 9	6.788111	16	8	.75
38400.0	84.1 2	305.332 7	49.741 8	.0619 3	.8381 8	14.103549 2	.93E-5 9	6.787720	16	8	.63
38404.0	98.1 1	288.639 8	49.735 6	.0620 2	.2522 4	14.103624 2	.88E-5 7	6.787081	23	8	.59
38408.0	111.88 2	271.954 5	49.737 2	.06202 3	.66724 8	14.103682 2	.66E-5 8	6.787100	27	8	.60
38412.0	125.71 1	255.267 3	49.735 2	.06186 2	.08245 2	14.103755 2	.96E-5 8	6.788255	34	8	.59
38416.0	139.59 1	238.581 2	49.734 1	.06162 2	.49787 2	14.103821 1	.80E-5 6	6.789965	44	8	.62
38420.0	153.51 1	221.894 1	49.738 1	.06151 2	.91345 3	14.103908 1	.132E-4 5	6.790761	43	8	.50
38424.0	167.53 2	205.205 2	49.738 2	.06137 2	.32926 7	14.104026 1	.152E-4 5	6.791727	50	8	.60
38428.0	181.55 3	188.517 2	49.738 2	.06115 2	.74560 9	14.104134 1	.116E-4 5	6.793275	40	8	.53
38432.0	195.59 3	171.837 3	49.745 2	.06097 2	.16234 7	14.104238 2	.158E-4 7	6.794561	30	8	.45
38436.0	209.71 2	155.145 3	49.745 1	.06078 1	.57938 6	14.104372 1	.169E-4 6	6.795876	39	8	.42
38440.0	223.83 3	138.465 6	49.741 3	.06062 2	.99700 8	14.104500 2	.169E-4 8	6.797013	37	8	.66
38444.0	238.05 2	121.774 3	49.742 3	.06055 2	.41490 6	14.104606 1	.107E-4 6	6.797456	38	8	.48
38448.0	252.27 3	105.091 3	49.744 3	.06048 2	.83318 8	14.104710 1	.157E-4 6	6.797925	44	8	.59
38452.0	266.47 2	88.406 1	49.745 1	.060439 9	.25205 5	14.1048442 7	.17E-4 4	6.798175	45	8	.40
38456.0	280.68 2	71.722 1	49.743 1	.060418 8	.67149 5	14.1049659 9	.135E-4 4	6.798289	58	8	.52
38460.0	294.88 3	55.039 2	49.745 2	.060461 9	.09145 8	14.105103 1	.215E-4 5	6.797930	57	8	.64
38464.0	309.01 3	38.351 3	49.748 3	.06058 1	.51229 9	14.105252 1	.148E-4 5	6.797000	41	8	.53
38468.0	323.24 3	21.658 4	49.740 3	.06069 1	.93335 8	14.105362 1	.152E-4 7	6.796213	33	8	.60
38472.0	337.41 5	4.972 8	49.739 2	.06087 2	.3551 1	14.105506 2	.210E-4 8	6.794848	32	8	.62
38476.0	351.53 3	348.284 4	49.739 2	.06110 2	.77763 8	14.105655 2	.145E-4 6	6.793164	35	8	.53
38480.0	5.50 2	331.595 5	49.741 3	.06115 2	.20120 7	14.105761 1	.122E-4 4	6.792720	40	8	.46
38484.0	19.49 4	314.903 6	49.741 6	.06136 2	.6251 1	14.105885 2	.200E-4 8	6.791185	39	8	.90

Table 12

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1963 26A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Earth Shadow			
38396.	421.	45.9	114.0	101.4	-0.110E-06
38400.	422.	49.4	113.5	100.3	-0.935E-07
38404.	421.	49.1	113.4	100.7	-0.885E-07
38408.	419.	45.1	111.3	99.1	-0.664E-07
		Perigee In Sunlight			
38412.	418.	38.3	106.0	94.3	-0.965E-07
38416.	417.	29.6	96.9	86.5	-0.804E-07
38420.	415.	19.9	84.6	76.6	-0.133E-06
38424.	414.	9.5	70.2	65.5	-0.153E-06
38428.	415.	-1.2	55.2	53.9	-0.117E-06
38432.	417.	-11.8	41.3	42.4	-0.159E-06
38436.	421.	-22.2	31.0	31.7	-0.170E-06
38440.	425.	-31.9	28.0	22.7	-0.170E-06
38444.	428.	-40.4	32.1	16.3	-0.108E-06
38448.	431.	-46.6	38.1	13.4	-0.158E-06
38452.	432.	-49.6	42.4	13.8	-0.171E-06
38456.	432.	-48.6	43.2	15.1	-0.136E-06
38460.	430.	-43.8	40.0	14.1	-0.216E-06
38464.	426.	-36.4	33.4	9.5	-0.149E-06
38468.	422.	-27.2	24.6	1.9	-0.153E-06
38472.	418.	-17.0	17.7	352.3	-0.211E-06
38476.	415.	-6.5	19.8	341.5	-0.146E-06
38480.	414.	4.2	29.8	330.2	-0.123E-06
38484.	414.	14.8	41.7	319.2	-0.201E-06

Satellite 1963 30D Eleanor Mann

I. SAO smoothed elements

The following elements are based on 397 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38410.0$ MJD

$\omega = (222^\circ.79 \pm 3) - ^\circ.57976t - ^\circ.010876t^2$

$\Omega = (44^\circ.8095 \pm 8) - ^\circ.05705t - ^\circ.51 \times 10^{-5}t^2$

$i = (88^\circ.389 \pm 1) - ^\circ.000411t$

$e = (.02552 \pm 1) - .128 \times 10^{-4}t - .27 \times 10^{-5}t^2$

$M = (.67171 \pm 7) + (8.5718346 \pm 2)t + (.3132 \pm 2) \times 10^{-4}t^2$

Standard error of one observation: $\sigma = \pm 1''.30$

The following elements are based on 288 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38440.0$ MJD

$\omega = (196^\circ.63 \pm 2) - 1^\circ.18307t - ^\circ.011139t^2$

$\Omega = (43^\circ.0928 \pm 6) - ^\circ.05738t + ^\circ.77 \times 10^{-5}t^2$

$i = (88^\circ.3727 \pm 8) - ^\circ.000514t$

$e = (.023103 \pm 9) - .000113t + .64 \times 10^{-6}t^2$

$M = (.85185 \pm 5) + (8.5735690 \pm 2)t + (.3247 \pm 2) \times 10^{-4}t^2$

Standard error of one observation $\sigma = \pm 1''.08$

The following elements are based on 260 observations and are valid for the period March 1 through April 1, 1964.

$T_0 = 38470.0$ MJD

$\omega = (152^\circ.64 \pm 5) - 1^\circ.53813t + {}^\circ.004191t^2$

$\Omega = (41^\circ.3774 \pm 8) - {}^\circ.05752t - {}^\circ.16 \times 10^{-4}t^2$

$i = (88^\circ.364 \pm 1) + {}^\circ.000172t$

$e = (.02241 \pm 1) + .0001142t + .44 \times 10^{-5}t^2$

$M = (.0841 \pm 1) + (8.5746860 \pm 2)t - (.832 \pm 2) \times 10^{-5}t^2$

Standard error of one observation: $\sigma = \pm 1''.28$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38398.0	228.6 2	45.493 2	88.390 4	.02545 8	.8128 6	8.571087 2	.300E-4 8	9.830177	45	8	.47
38402.0	226.56 6	45.266 1	88.394 2	.02544 2	.0995 2	8.571326 1	.303E-4 6	9.830157	63	8	.38
38406.0	224.65 5	45.037 1	88.391 2	.02552 2	.3857 2	8.571577 1	.319E-4 5	9.829188	107	8	.41
38410.0	222.55 4	44.809 1	88.388 1	.02551 1	.6724 1	8.5718411 9	.336E-4 4	9.829091	131	8	.40
38414.0	220.13 4	44.582 1	88.388 1	.02542 1	.9600 1	8.5720919 9	.305E-4 4	9.829801	106	8	.39
38418.0	217.52 4	44.354 1	88.387 1	.02525 2	.2482 1	8.572333 1	.292E-4 5	9.831302	104	8	.41
38422.0	214.44 3	44.125 1	88.385 1	.02499 2	.53771 9	8.5725771 9	.319E-4 4	9.833762	128	8	.37
38426.0	211.10 3	43.896 1	88.378 1	.02459 2	.82795 9	8.572656 1	.316E-4 5	9.837701	139	8	.43
38430.0	207.37 3	43.669 1	88.377 1	.02424 2	.11932 8	8.5729138 9	.328E-4 4	9.841035	140	8	.40
38434.0	203.35 2	43.439 1	88.377 1	.02383 2	.41153 7	8.573178 1	.332E-4 4	9.844993	94	8	.36
38438.0	198.92 4	43.206 2	88.373 2	.02334 2	.7049 1	8.573443 1	.330E-4 5	9.849674	49	8	.40
38442.0	194.18 5	42.978 1	88.371 2	.02285 2	.9992 1	8.573700 1	.321E-4 6	9.854463	57	8	.41
38446.0	189.17 5	42.750 1	88.369 2	.02242 2	.2943 1	8.573958 1	.317E-4 4	9.858598	58	8	.36
38450.0	183.76 8	42.520 1	88.368 2	.02203 2	.5906 2	8.574215 1	.317E-4 5	9.862359	52	8	.43
38454.0	178.3 3	42.291 2	88.369 3	.02172 2	.8869 7	8.574473 1	.323E-4 6	9.865279	49	8	.44
38458.0	172.1 2	42.065 2	88.362 3	.02164 2	.1856 4	8.574883 1	-.80E-5 6	9.865764	50	8	.46
38462.0	165.8 1	41.835 1	88.363 2	.02171 2	.4846 3	8.574822 1	-.81E-5 5	9.865069	66	8	.41
38466.0	159.3 1	41.605 1	88.366 2	.02199 2	.7840 3	8.5747564 9	-.85E-5 5	9.862286	81	8	.44
38470.0	152.8 1	41.376 1	88.365 2	.02242 2	.0837 3	8.573652 1	-.91E-5 5	9.858027	79	8	.43
38474.0	146.4 1	41.149 1	88.366 2	.02300 2	.3831 3	8.5746139 9	-.79E-5 5	9.852208	72	8	.39
38478.0	140.05 9	40.919 1	88.367 2	.02379 3	.6825 2	8.574559 1	-.60E-5 5	9.844340	74	8	.40
38482.0	134.11 9	40.687 2	88.363 2	.02467 4	.9809 3	8.574494 1	-.93E-5 6	9.835515	64	8	.49

Table 13

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1963 30D

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38398.	3464.	-48.6	51.1	303.6	-0.817E-06
38402.	3463.	-46.5	54.3	298.8	-0.825E-06
38406.	3461.	-44.6	57.9	294.1	-0.868E-06
38410.	3461.	-42.5	61.8	289.5	-0.915E-06
38414.	3460.	-40.1	65.9	284.8	-0.830E-06
38418.	3461.	-37.5	70.3	280.3	-0.795E-06
38422.	3462.	-34.4	75.1	275.7	-0.868E-06
38426.	3465.	-31.1	80.1	271.3	-0.860E-06
38430.	3467.	-27.4	85.3	266.8	-0.893E-06
38434.	3470.	-23.3	90.8	262.4	-0.903E-06
38438.	3474.	-18.9	96.5	258.1	-0.898E-06
38442.	3477.	-14.2	102.2	253.8	-0.873E-06
38446.	3481.	-9.2	107.9	249.6	-0.862E-06
38450.	3484.	-3.8	113.5	245.4	-0.862E-06
38454.	3487.	1.7	118.7	241.2	-0.879E-06
38458.	3488.	7.9	123.4	237.1	0.218E-06
38462.	3488.	14.2	127.1	232.9	0.220E-06
38466.	3487.	20.7	129.5	228.8	0.231E-06
38470.	3484.	27.2	130.3	224.7	0.248E-06
38474.	3480.	33.6	129.4	220.6	0.215E-06
38478.	3475.	39.9	127.0	216.4	0.163E-06
38482.	3468.	45.9	123.5	212.2	0.253E-06

Satellite 1963 53A (Explorer 19) Beatrice Miller

I. SAO smoothed elements

The following elements are based on 138 observations and are valid for the period December 19, 1963, through January 1, 1964.

$T_0 = 38389.0$ MJD

$\omega = (149°.157 \pm 7) - (1°.951 \pm 1)t + °.000138t^2 + °.4942 \cos \omega$

$\Omega = (72°.156 \pm 2) - (°.9663 \pm 3)t - °.2345 \times 10^{-4}t^2 + °.0071 \cos \omega$

$i = (78°.603 \pm 3) - °.0013 \sin \omega$

$e = (.11386 \pm 2) - (.85 \pm 4) \times 10^{-4}t - .1874 \times 10^{-6}t^2 + .0009732 \sin \omega$

$M = (.18334 \pm 2) + (12.430313 \pm 5)t + (.78 \pm 2) \times 10^{-5}t^2$

$- (.174 \pm 6) \times 10^{-5}t^3 - .0012886 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.25$

The following elements are based on 333 observations and are valid for the period January 1 through February 1, 1964.

$T_0 = 38411.0$ MJD

$\omega = (105°.785 \pm 5) - (1°.9911 \pm 5)t + °.000138t^2 + °.4942 \cos \omega$

$\Omega = (50°.9160 \pm 8) - (°.96513 \pm 7)t - °.2345 \times 10^{-4}t^2 + °.0071 \cos \omega$

$i = (78°.6057 \pm 7) - °.0013 \sin \omega$

$e = (.11212 \pm 1) - (.21 \pm 1) \times 10^{-4}t - .1874 \times 10^{-6}t^2 + .0009732 \sin \omega$

$M = (.65059 \pm 1) + (12.430482 \pm 1)t + (.1667 \pm 6) \times 10^{-4}t^2$

$+ (.926 \pm 3) \times 10^{-6}t^3 + (.142 \pm 3) \times 10^{-7}t^4 - .0012886 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.74$

The following elements are based on 335 observations and are valid for the period February 1 through March 1, 1964.

$T_0 = 38441.0$ MJD

$\omega = (46^\circ.161 \pm 8) - (1^\circ.974 \pm 1)t + {}^\circ.000138t^2 + {}^\circ.4942 \cos \omega$

$\Omega = (21^\circ.956 \pm 1) - ({}^\circ.9659 \pm 1)t - {}^\circ.2345 \times 10^{-4}t^2 + {}^\circ.0071 \cos \omega$

$i = (78^\circ.605 \pm 1) - {}^\circ.0013 \sin \omega$

$e = (.11253 \pm 2) + (.43 \pm 2) \times 10^{-4}t - .1874 \times 10^{-6}t^2 + .0009732 \sin \omega$

$M = (.61168 \pm 3) + (12.434657 \pm 3)t + (.0001266 \pm 1)t^2$

$+ (.1426 \pm 5) \times 10^{-5}t^3 + (.67 \pm 5) \times 10^{-8}t^4 - .0012886 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.88$

The following elements are based on 245 observations and are valid for the period March 1 through April 1, 1964.

$T_0 = 38471.0$ MJD

$\omega = (347^\circ.81 \pm 1) - (1^\circ.940 \pm 2)t + {}^\circ.000138t^2 + {}^\circ.4942 \cos \omega$

$\Omega = (352^\circ.935 \pm 2) - ({}^\circ.9679 \pm 2)t - {}^\circ.2345 \times 10^{-4}t^2 + {}^\circ.0071 \cos \omega$

$i = (78^\circ.602 \pm 2) - {}^\circ.0013 \sin \omega$

$e = (.11332 \pm 2) - (.34 \pm 3) \times 10^{-4}t - .1874 \times 10^{-6}t^2 + .0009732 \sin \omega$

$M = (.78854 \pm 5) + (12.443336 \pm 5)t + (.808 \pm 2) \times 10^{-4}t^2$

$- (.1939 \pm 6) \times 10^{-5}t^3 + (.201 \pm 7) \times 10^{-7}t^4 - .0012886 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.45$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38384.0	158.43 1	76.984 3	78.592 4	.11458 3	.03348 4	12.43012 1	.63E-4 7	6.971193	50	4	.45
38385.0	156.48 1	76.018 2	78.597 4	.11455 2	.46358 3	12.430235 3	.45E-4 3	6.971384	73	4	.44
38386.0	154.52 1	75.052 2	78.600 4	.11455 2	.89380 4	12.430319 4	.42E-4 4	6.971303	74	4	.46
38387.0	152.58 1	74.081 3	78.606 4	.11449 2	.32404 5	12.430366 3	.24E-4 3	6.971771	65	4	.46
38388.0	150.72 8	73.121 4	78.600 6	.11447 3	.7540 3	12.430406 6	.15E-4 5	6.971890	41	4	.37
38389.0	148.8 1	72.138 5	78.621 8	.11437 4	.1843 4	12.430400 4	-.3E-5 3	6.972674	24	4	.43
38390.0	146.7 1	71.172 4	78.618 7	.11429 4	.6151 3	12.430398 4	.5E-5 5	6.973309	25	4	.45
38391.0	144.92 2	70.204 5	78.620 7	.11417 5	.04483 6	12.43042 3	-.1E-4 3	6.974302	21	4	.53
38392.0	142.95 1	69.245 3	78.609 5	.11416 3	.47521 4	12.430389 5	-.6E-5 6	6.974400	27	4	.39
38393.0	140.99 1	68.278 3	78.611 4	.11415 3	.90452 3	12.430366 3	-.8E-5 3	6.974465	29	4	.36
38394.0	139.04 1	67.321 4	78.598 6	.11406 4	.33582 4	12.430356 4	-.8E-5 6	6.975166	33	4	.53

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38395.0	137.08 1	66.354 4	78.600 5	.11401 4	.76609 4	12.430342 5	-.6E-5 4	6.975555	37	4	.52
38396.0	135.12 1	65.386 3	78.602 5	.11398 4	.19638 4	12.430333 5	.5E-5 4	6.975788	40	4	.52
38397.0	133.16 1	64.422 4	78.601 5	.11398 4	.62667 4	12.430344 6	.7E-5 5	6.975797	36	4	.49
38398.0	131.3 1	63.447 5	78.617 8	.1138 1	.0565 4	12.430355 6	.4E-5 4	6.976974	29	4	.48
38399.0	129.298 9	62.487 3	78.605 3	.11371 2	.48708 3	12.430347 5	-.7E-5 6	6.977926	33	4	.44
38400.0	127.325 5	61.522 2	78.604 2	.11368 2	.91741 1	12.430327 3	-.6E-5 2	6.978173	32	4	.32
38401.0	125.364 6	60.557 2	78.602 2	.11366 2	.34769 1	12.430314 3	-.4E-5 4	6.978354	34	4	.40
38402.0	123.403 5	59.594 2	78.602 2	.11367 2	.77797 1	12.430307 5	-.2E-5 4	6.978286	32	4	.39
38403.0	121.443 5	58.629 2	78.603 2	.11359 2	.20822 1	12.430289 5	-.10E-4 2	6.978851	21	4	.30
38404.0	119.47 2	57.665 4	78.605 3	.11348 4	.63850 6	12.430300 6	.1E-4 1	6.979783	13	4	.55
38405.0	117.48 1	56.701 3	78.605 3	.11339 4	.06884 3	12.430307 6	.12E-4 4	6.980475	14	4	.40
38406.0	115.520 9	55.735 2	78.603 2	.11336 3	.49911 2	12.430323 3	.6E-5 4	6.980678	20	4	.44
38407.0	113.549 9	54.769 3	78.605 2	.11327 3	.92942 2	12.430333 3	.5E-5 3	6.981390	24	4	.55
38408.0	111.610 9	53.803 2	78.605 2	.11324 2	.35968 2	12.430334 3	-.7E-5 3	6.981593	32	4	.58
38409.0	109.639 7	52.839 2	78.606 1	.11322 2	.79002 2	12.430372 4	.14E-4 2	6.981801	28	4	.42
38410.0	107.67 1	51.875 2	78.604 2	.11318 2	.22039 3	12.430414 3	.24E-4 3	6.982065	35	4	.56
38411.0	105.71 1	50.914 2	78.602 2	.11315 2	.65081 3	12.430440 3	.9E-5 3	6.982287	35	4	.52
38412.0	103.72 1	49.948 2	78.602 2	.11307 2	.08130 3	12.430478 4	.17E-4 3	6.982932	36	4	.57
38413.0	101.74 1	48.984 1	78.602 2	.11303 2	.51180 3	12.430523 3	.23E-4 3	6.983195	42	4	.49
38414.0	99.75 1	48.018 2	78.604 2	.11296 2	.94240 3	12.430567 2	.21E-4 3	6.983736	37	4	.56
38415.0	97.79 1	47.053 2	78.604 2	.11293 2	.37297 4	12.430624 2	.23E-4 2	6.983956	39	4	.65
38416.0	95.78 1	46.089 1	78.606 1	.11289 1	.80369 2	12.430675 2	.33E-4 2	6.984228	44	4	.48
38417.0	93.808 9	45.125 1	78.605 1	.11287 1	.23439 2	12.430747 1	.38E-4 1	6.984349	41	4	.45
38418.0	91.838 8	44.1583 9	78.6034 9	.112863 7	.66517 2	12.430829 1	.43E-4 1	6.984409	60	4	.43
38419.0	89.864 8	43.1940 9	78.6031 9	.112852 7	.09605 2	12.430915 1	.43E-4 1	6.984465	72	4	.44
38420.0	87.888 8	42.2291 8	78.6035 9	.112840 9	.52702 2	12.431006 1	.45E-4 1	6.984518	63	4	.41
38421.0	85.914 9	41.2633 9	78.603 1	.112833 7	.95808 2	12.431110 1	.55E-4 1	6.984538	74	4	.46
38422.0	83.90 1	40.299 1	78.604 1	.112816 7	.38934 2	12.431220 2	.58E-4 1	6.984630	59	4	.50
38423.0	81.93 1	39.334 1	78.606 2	.11282 1	.82062 3	12.431342 2	.60E-4 2	6.984570	44	4	.62
38424.0	79.951 9	38.369 1	78.603 1	.112826 7	.25204 2	12.431469 1	.66E-4 1	6.984461	61	4	.46
38425.0	77.961 6	37.4030 6	78.6016 7	.112841 5	.68363 1	12.431601 1	.708E-4 9	6.984293	82	4	.30

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38426.0	75.958 5	36.4389 7	78.6022 8	.112837 5	.11528 1	12.431746 1	.73E-4 1	6.984269	98	4	.31
38427.0	74.039 5	35.4744 6	78.6026 7	.112824 6	.54708 1	12.431891 1	.718E-4 9	6.984316	105	4	.30
38428.0	72.052 6	34.5105 7	78.6027 8	.112862 7	.97907 1	12.432029 1	.729E-4 9	6.983962	96	4	.34
38429.0	70.040 7	33.5469 9	78.6056 9	.11294 1	.41126 2	12.432174 2	.75E-4 1	6.983324	99	4	.44
38430.0	68.076 7	32.5806 9	78.6056 9	.11293 1	.84350 2	12.432329 1	.84E-4 1	6.983301	85	4	.44
38431.0	66.085 5	31.6126 6	78.6073 6	.112993 8	.27596 1	12.432510 1	.80E-4 1	6.982756	83	4	.27
38432.0	64.152 6	30.6490 7	78.6073 7	.11295 1	.70846 1	12.432681 2	.89E-4 1	6.983061	93	4	.33
38433.0	62.191 9	29.685 1	78.604 2	.11295 2	.14122 2	12.432869 2	.95E-4 2	6.982992	63	4	.40
38434.0	60.238 9	28.719 1	78.606 1	.11291 2	.57415 2	12.433079 2	.109E-3 2	6.983236	57	4	.42
38435.0	58.25 1	27.758 2	78.604 3	.11300 5	.00737 3	12.433282 4	.102E-3 4	6.982406	33	4	.60
38436.0	56.28 1	26.792 2	78.608 3	.11306 4	.44073 3	12.433483 4	.99E-4 3	6.981829	34	4	.62
38437.0	54.316 9	25.828 2	78.607 3	.11314 4	.87431 2	12.433686 4	.99E-4 5	6.981162	32	4	.53
38438.0	52.36 1	24.861 2	78.608 3	.11312 4	.30808 3	12.433919 5	.121E-3 5	6.981248	29	4	.52
38439.0	50.40 1	23.896 2	78.609 4	.11311 4	.74210 3	12.434170 7	.128E-3 7	6.981229	25	4	.52
38440.0	48.42 6	22.929 3	78.605 6	.1133 1	.1764 2	12.434420 5	.121E-3 5	6.979874	21	4	.49
38441.0	46.54 9	21.961 4	78.603 8	.1135 1	.6106 3	12.434673 6	.129E-3 5	6.978055	19	4	.49
38442.0	44.52 3	20.995 4	78.607 9	.1134 1	.0456 1	12.434922 6	.126E-3 6	6.978940	20	4	.58
38443.0	42.59 2	20.028 4	78.600 8	.11340 8	.48059 8	12.435179 5	.121E-3 5	6.978536	25	4	.59
38444.0	40.64 2	19.063 4	78.604 7	.11341 9	.91586 7	12.435425 5	.130E-3 4	6.978378	24	4	.59
38445.0	38.69 2	18.097 5	78.603 8	.11340 9	.35136 7	12.435690 6	.132E-3 6	6.978360	24	4	.60
38446.0	36.75 2	17.134 5	78.608 7	.11346 7	.78710 7	12.435979 6	.155E-3 5	6.977802	24	4	.50
38447.0	34.81 2	16.162 4	78.600 7	.11348 6	.22317 6	12.436285 5	.152E-3 4	6.977487	21	4	.43
38448.0	33.1 2	15.19 1	78.59 2	.11348 6	.6588 8	12.436587 4	.147E-3 4	6.977428	24	4	.42
38449.0	31.3 3	14.22 1	78.58 2	.11338 6	.0948 9	12.436899 6	.158E-3 5	6.978072	25	4	.48
38450.0	29.2 3	13.27 2	78.60 2	.11340 9	.532 1	12.437219 6	.163E-3 6	6.977812	25	4	.46
38451.0	27.3 3	12.30 2	78.60 2	.1134 1	.970 1	12.437601 7	.195E-3 6	6.977902	24	4	.49
38452.0	25.8 4	11.36 2	78.63 3	.1132 2	.406 1	12.437991 7	.206E-3 5	6.978975	20	4	.52
38453.0	23.7 2	10.38 2	78.62 2	.1134 2	.8446 8	12.438387 4	.190E-3 4	6.977566	19	4	.39
38454.0	21.7 3	9.41 2	78.62 3	.1133 2	.283 1	12.438771 6	.197E-3 5	6.978013	18	4	.45

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38455.0	19.8 4	8.45 3	78.63 4	.1132 3	.722 1	12.43915 1	.175E-3 9	6.978698	15	4	.55
38456.0	17.9 4	7.50 3	78.65 3	.1132 4	.161 1	12.439464 7	.143E-3 5	6.978839	16	4	.46
38457.0	15.48 8	6.51 2	78.62 2	.1136 1	.6024 3	12.439742 9	.147E-3 9	6.975446	14	4	.53
38458.0	13.53 5	5.524 7	78.608 7	.11373 4	.0423 1	12.440053 9	.182E-3 7	6.974168	16	4	.45
38459.0	11.60 3	4.555 3	78.606 2	.11369 3	.48251 8	12.440419 5	.197E-3 4	6.974325	21	4	.36
38460.0	9.62 2	3.587 3	78.609 2	.11363 2	.92317 6	12.440796 4	.183E-3 3	6.974628	21	4	.32
38461.0	7.74 3	2.621 4	78.609 3	.11363 2	.36395 7	12.441138 5	.158E-3 5	6.974533	24	4	.46
38462.0	5.78 2	1.655 3	78.609 2	.11358 2	.80525 6	12.441438 4	.137E-3 4	6.974800	27	4	.40
38463.0	3.78 2	0.687 4	78.612 3	.11351 2	.24697 6	12.441703 5	.127E-3 5	6.975246	29	4	.58
38464.0	1.92 2	359.715 3	78.606 2	.11351 2	.68850 6	12.441949 5	.118E-3 4	6.975178	32	4	.48
38465.0	359.96 2	358.747 3	78.607 2	.11348 2	.13058 5	12.442178 3	.104E-3 3	6.975309	32	4	.43
38466.0	358.04 2	357.778 4	78.607 2	.11344 2	.57275 6	12.442393 5	.110E-3 4	6.975514	29	4	.47
38467.0	356.09 2	356.812 5	78.605 2	.11341 3	.01523 5	12.442614 3	.113E-3 4	6.975703	31	4	.42
38468.0	354.15 2	355.844 6	78.606 3	.11337 3	.45791 6	12.442829 3	.104E-3 3	6.975948	29	4	.41
38469.0	352.19 2	354.866 6	78.609 3	.11329 3	.90087 6	12.443036 4	.98E-4 4	6.976510	30	4	.37
38470.0	350.25 2	353.903 7	78.606 3	.11325 4	.34396 7	12.443221 3	.88E-4 3	6.976753	33	4	.39
38471.0	348.32 2	352.928 7	78.609 3	.11316 4	.78720 8	12.443401 4	.81E-4 3	6.977395	32	4	.39
38472.0	346.42 3	351.976 8	78.602 4	.11320 4	.2305 1	12.443554 5	.71E-4 5	6.976988	27	4	.46
38473.0	344.48 3	351.013 8	78.599 4	.11315 4	.6741 1	12.443686 5	.54E-4 5	6.977351	25	4	.45
38474.0	342.59 3	350.036 6	78.599 4	.11306 3	.11763 9	12.443786 5	.43E-4 5	6.978033	22	4	.37
38475.0	340.60 5	349.065 8	78.603 5	.11302 5	.5616 2	12.443890 8	.55E-4 6	6.978301	26	4	.50
38476.0	338.5 1	348.09 1	78.605 9	.1125 2	.0062 4	12.444004 5	.64E-4 4	6.982015	31	4	.39
38477.0	336.7 1	347.11 1	78.615 9	.1127 1	.4497 3	12.444127 4	.67E-4 4	6.980354	35	4	.39
38478.0	334.64 9	346.148 9	78.611 6	.1126 1	.8941 3	12.444262 4	.67E-4 3	6.981729	41	4	.39
38479.0	332.81 7	345.190 8	78.603 5	.1126 1	.3380 3	12.444385 4	.50E-4 3	6.981480	46	4	.38
38480.0	330.86 5	344.225 6	78.601 4	.11258 7	.7825 2	12.444480 3	.34E-4 3	6.981510	46	4	.35
38481.0	328.91 7	343.262 6	78.598 5	.11255 9	.2269 2	12.444535 4	.34E-4 3	6.981707	44	4	.39
38482.0	326.90 7	342.295 7	78.595 6	.11242 8	.6717 2	12.444590 4	.25E-4 4	6.982734	38	4	.40
38483.0	324.96 4	341.333 6	78.591 5	.11240 6	.1163 2	12.444615 5	.3E-5 5	6.982873	36	4	.50
38484.0	323.03 3	340.375 5	78.583 4	.11227 5	.5608 1	12.444635 6	.15E-4 6	6.983871	39	4	.52
38485.0	321.06 3	339.401 4	78.584 5	.11218 4	.0055 1	12.444683 3	.25E-4 2	6.984600	58	4	.56

Table 14

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1963 53A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38384.	596.	21.1	47.1	344.3	-0.815E-06
38385.	596.	23.0	49.7	341.7	-0.582E-06
38386.	597.	24.9	52.4	339.2	-0.944E-06
38387.	598.	26.8	55.1	336.6	-0.311E-06
38388.	598.	28.6	57.7	334.1	-0.194E-06
38389.	600.	30.5	60.4	331.5	0.388E-07
38390.	601.	32.6	63.3	328.9	-0.647E-07
38391.	603.	34.3	65.9	326.3	0.129E-06
38392.	604.	36.2	68.7	323.6	0.777E-07
38393.	604.	38.1	71.4	321.0	0.104E-06
38394.	606.	40.0	74.2	318.2	0.104E-06
38395.	607.	41.9	76.9	315.5	0.777E-07
38396.	608.	43.8	79.6	312.7	-0.647E-07
38397.	608.	45.6	82.3	309.9	-0.906E-07
38398.	610.	47.4	84.9	307.0	-0.518E-07
38399.	612.	49.3	87.5	304.1	0.906E-07
38400.	613.	51.2	90.1	301.0	0.777E-07
38401.	614.	53.1	92.6	297.9	0.518E-07
38402.	614.	54.9	95.1	294.8	0.259E-07
38403.	615.	56.8	97.5	291.5	0.129E-06
38404.	617.	58.6	99.9	288.1	-0.129E-06
38405.	618.	60.4	102.2	284.5	-0.155E-06
38406.	619.	62.2	104.4	280.7	-0.777E-07

Table 14 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1963 53A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38407.	620.	64.0	106.5	276.8	-0.647E-07
38408.	621.	65.7	108.5	272.6	0.906E-07
38409.	622.	67.4	110.3	268.1	-0.181E-06
38410.	622.	69.1	112.1	263.2	-0.311E-06
38411.	623.	70.7	113.7	257.9	-0.116E-06
		Perigee In Earth Shadow			
38412.	624.	72.2	115.2	252.0	-0.220E-06
38413.	625.	73.7	116.5	245.4	-0.298E-06
38414.	625.	75.0	117.7	237.9	-0.272E-06
38415.	626.	76.2	118.7	229.6	-0.298E-06
38416.	626.	77.2	119.4	220.0	-0.427E-06
38417.	627.	78.0	120.0	209.5	-0.492E-06
38418.	627.	78.5	120.4	198.1	-0.557E-06
38419.	627.	78.6	120.6	186.1	-0.557E-06
38420.	627.	78.4	120.5	174.2	-0.582E-06
38421.	627.	77.9	120.3	162.9	-0.712E-06
38422.	627.	77.1	119.8	152.4	-0.751E-06
38423.	626.	76.1	119.1	143.1	-0.777E-06
38424.	626.	74.8	118.3	134.9	-0.854E-06
38425.	626.	73.5	117.2	127.6	-0.916E-06
38426.	625.	72.0	115.9	121.2	-0.945E-06
38427.	625.	70.5	114.5	115.5	-0.929E-06

Table 14 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1963 53 A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38428.	624.	68.8	113.0	110.2	-0.943E-06
38429.	623.	67.1	111.2	105.4	-0.971E-06
38430.	623.	65.4	109.3	101.0	-0.109E-05
38431.	622.	63.7	107.3	96.9	-0.104E-05
38432.	621.	61.9	105.2	93.1	-0.115E-05
38433.	621.	60.1	103.0	89.5	-0.123E-05
38434.	620.	58.3	100.7	86.1	-0.141E-05
38435.	619.	56.5	98.3	82.8	-0.132E-05
38436.	618.	54.6	95.8	79.6	-0.128E-05
38437.	616.	52.8	93.3	76.5	-0.128E-05
38438.	616.	50.9	90.6	73.6	-0.157E-05
38439.	615.	49.1	88.0	70.7	-0.166E-05
38440.	613.	47.2	85.2	67.9	-0.157E-05
38441.	611.	45.4	82.5	65.1	-0.167E-05
38442.	611.	43.4	79.6	62.4	-0.163E-05
38443.	610.	41.6	76.7	59.8	-0.156E-05
38444.	609.	39.7	73.8	57.2	-0.168E-05
38445.	608.	37.8	70.8	54.6	-0.171E-05
38446.	607.	35.9	67.9	52.1	-0.200E-05
38447.	606.	34.0	64.9	49.6	-0.197E-05
38448.	605.	32.4	62.0	47.2	-0.190E-05
38449.	605.	30.6	59.1	44.8	-0.204E-05

Table 14 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1963 53A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38450.	604.	28.6	55.9	42.3	-0.211E-05
38451.	604.	26.7	52.8	39.9	-0.252E-05
38452.	604.	25.3	50.0	37.7	-0.266E-05
38453.	603.	23.2	46.8	35.3	-0.246E-05
38454.	602.	21.3	43.6	32.9	-0.255E-05
38455.	603.	19.4	40.5	30.6	-0.226E-05
38456.	602.	17.5	37.3	28.2	-0.185E-05
38457.	599.	15.2	33.8	25.8	-0.190E-05
38458.	597.	13.3	30.6	23.5	-0.235E-05
38459.	597.	11.4	27.4	21.2	-0.255E-05
38460.	597.	9.4	24.2	18.9	-0.236E-05
38461.	597.	7.6	21.0	16.6	-0.204E-05
38462.	597.	5.7	17.8	14.3	-0.177E-05
38463.	597.	3.7	14.6	12.0	-0.164E-05
38464.	597.	1.9	11.5	9.8	-0.152E-05
38465.	597.	-0.0	8.4	7.5	-0.134E-05
38466.	597.	-1.9	5.4	5.2	-0.142E-05
38467.	597.	-3.8	3.1	3.0	-0.146E-05
38468.	598.	-5.7	3.2	0.7	-0.134E-05
38469.	599.	-7.7	5.7	358.4	-0.127E-05
38470.	599.	-9.6	8.6	356.1	-0.114E-05
38471.	600.	-11.4	11.7	353.9	-0.105E-05
38472.	600.	-13.3	14.8	351.6	-0.917E-06
38473.	600.	-15.2	18.0	349.3	-0.697E-06

Table 14 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1963 53 A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38474.	601.	-17.1	21.1	347.0	-0.555E-06
38475.	602.	-19.0	24.4	344.7	-0.710E-06
38476.	606.	-21.1	27.7	342.3	-0.827E-06
38477.	605.	-22.8	30.7	340.0	-0.865E-06
38478.	607.	-24.8	34.0	337.7	-0.865E-06
38479.	607.	-26.6	37.0	335.4	-0.646E-06
38480.	608.	-28.5	40.1	333.0	-0.439E-06
38481.	609.	-30.4	43.2	330.6	-0.439E-06
38482.	610.	-32.4	46.4	328.2	-0.323E-06
38483.	611.	-34.2	49.5	325.8	-0.387E-07
38484.	613.	-36.1	52.5	323.3	-0.194E-06
38485.	614.	-38.0	55.6	320.8	-0.323E-06

I. SAO smoothed elements

The following elements are based on 274 observations and are valid for the period January 25 through February 1, 1964.

$T_0 = 38423.0$ MJD

$\omega = (97^\circ.01 \pm 3) - (2^\circ.88 \pm 1)t$

$\Omega = (37^\circ.0692 \pm 7) - (^\circ.8139 \pm 3)t$

$i = (81^\circ.4997 \pm 8)$

$e = (.018934 \pm 5) + (.14 \pm 2) \times 10^{-4}t$

$M = (.29176 \pm 9) + (13.22456 \pm 4)t + (.761 \pm 3) \times 10^{-4}t^2$

$+ (.18 \pm 1) \times 10^{-5}t^3$

Standard error of one observation: $\sigma = \pm 1''.25$

The following elements are based on 230 observations and are valid for the period February 1 through February 15, 1964.

$T_0 = 38432.0$ MJD

$\omega = (71^\circ.59 \pm 4) - (2^\circ.65 \pm 1)t$

$\Omega = (29^\circ.7492 \pm 8) - (^\circ.8136 \pm 2)t$

$i = (81^\circ.499 \pm 1)$

$e = (.01980 \pm 1) + (.145 \pm 3) \times 10^{-3}t$

$M = (.3177 \pm 1) + (13.22532 \pm 3)t + (.922 \pm 2) \times 10^{-4}t^2$

$+ (.228 \pm 4) \times 10^{-5}t^3$

Standard error of one observation: $\sigma = \pm 1''.68$

The following elements are based on 72 observations and are valid for the period February 15 through March 1, 1964.

$T_0 = 38448.0$ MJD

$\omega = (34^\circ.64 \pm 8) - (2^\circ.08 \pm 3)t$

$\Omega = (16^\circ.723 \pm 3) - (^\circ.8151 \pm 4)t$

$i = (81^\circ.487 \pm 4)$

$e = (.02308 \pm 3) + (.203 \pm 9) \times 10^{-3}t$

$M = (.9386 \pm 2) + (13.22790 \pm 8)t + (.1487 \pm 3) \times 10^{-3}t^2$

$+ (.38 \pm 4) \times 10^{-6}t^3$

Standard error of one observation: $\sigma = \pm\ ''.80$

The following elements are based on 41 observations and are valid for the period March 1 through March 16, 1964.

$T_0 = 38462.0$ MJD

$\omega = (9^\circ.21 \pm 9) - (1^\circ.67 \pm 2)t$

$\Omega = (5^\circ.251 \pm 4) - (^\circ.8201 \pm 9)t$

$i = (81^\circ.454 \pm 3)$

$e = (.02480 \pm 4) + (.68 \pm 13) \times 10^{-4}t$

$M = (.1468 \pm 2) + (13.23059 \pm 5)t + (.1140 \pm 5) \times 10^{-3}t^2$

$- (.162 \pm 5) \times 10^{-5}t^3$

Standard error of one observation: $\sigma = \pm\ ''.13$

The following elements are based on 55 observations and are valid for the period March 16 through April 1, 1964.

T_0 = 38478.0 MJD

$\omega = (340^\circ.8 \pm 6) - (1^\circ.87 \pm 6)t$

$\Omega = (352^\circ.12 \pm 1) - (^\circ.8189 \pm 7)t$

$i = (81^\circ.453 \pm 6)$

$e = (.0235 \pm 3) - (.18 \pm 3) \times 10^{-3}t$

$M = (.865 \pm 2) + (13.2339 \pm 2)t + (.586 \pm 3) \times 10^{-4}t^2$

$- (.78 \pm 5) \times 10^{-6}t^3$

Standard error of one observation: $\sigma = \pm 1''.65$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38423.0	97.05 4	37.0692 8	81.5001 8	.018938 6	.2917 1	13.22459 4	.759E-4 4	7.411785	275	8	.55
38424.0	94.01 5	36.2561 9	81.499 1	.018955 8	.5167 1	13.22474 5	.799E-4 4	7.411604	243	8	.70
38425.0	90.99 5	35.4434 8	81.500 1	.018973 7	.7419 1	13.22462 5	.783E-4 3	7.411506	183	8	.59
38426.0	88.18 5	34.6296 9	81.501 1	.019045 8	.9667 1	13.22495 6	.756E-4 4	7.410846	172	8	.62
38427.0	85.35 5	33.8161 9	81.501 1	.019138 8	.1917 1	13.22510 5	.736E-4 4	7.410081	181	8	.64
38428.0	82.52 4	33.002 1	81.502 1	.019242 9	.4168 1	13.22514 5	.727E-4 4	7.409284	195	8	.68
38429.0	79.74 4	32.189 1	81.501 1	.01934 1	.6420 1	13.22531 5	.711E-4 4	7.408515	192	8	.64
38430.0	76.90 5	31.376 1	81.501 1	.01948 2	.8674 1	13.22518 7	.774E-4 5	7.407482	189	8	.79
38431.0	74.15 5	30.562 1	81.501 2	.01959 2	.0927 1	13.22490 8	.846E-4 6	7.406711	170	8	.74
38432.0	71.56 4	29.747 1	81.501 1	.01976 2	.3178 1	13.22520 5	.929E-4 5	7.405363	163	8	.62
38433.0	68.95 4	28.934 1	81.500 1	.01994 2	.5431 1	13.22535 4	.971E-4 5	7.403931	144	8	.60
38434.0	66.34 4	28.122 1	81.499 2	.02016 2	.7686 1	13.22550 5	.1007E-3 6	7.402244	126	8	.65
38435.0	63.76 5	27.308 1	81.499 2	.02035 3	.9943 1	13.22561 5	.1042E-3 7	7.400704	108	8	.66
38436.0	61.23 6	26.496 2	81.495 3	.02060 4	.2200 2	13.22570 8	.114E-3 1	7.398852	81	8	.75
38437.0	58.74 8	25.682 2	81.498 4	.02075 5	.4458 2	13.2260 1	.121E-3 1	7.397544	59	8	.78
38438.0	56.2 1	24.870 2	81.498 4	.02098 5	.6719 3	13.2262 1	.132E-3 1	7.395788	50	8	.81
38439.0	54.18 7	24.057 2	81.500 3	.02119 4	.8970 2	13.22611 6	.1367E-3 7	7.394193	46	8	.59
38440.0	51.94 6	23.245 2	81.500 4	.02143 4	.1229 2	13.22622 5	.1380E-3 7	7.392381	37	8	.55
38441.0	49.63 7	22.430 2	81.498 5	.02164 3	.3493 2	13.22634 6	.1382E-3 7	7.390707	37	8	.52
38442.0	47.40 7	21.616 3	81.496 5	.02186 4	.5757 2	13.22653 6	.1389E-3 8	7.388955	43	8	.66
38443.0	45.0 1	20.798 3	81.489 4	.02202 6	.8028 4	13.2264 2	.1421E-3 9	7.387831	42	8	.78
38444.0	42.96 9	19.983 3	81.487 4	.02227 5	.0294 3	13.2267 1	.145E-3 1	7.385873	44	8	.77
38445.0	40.85 5	19.169 2	81.487 3	.02246 3	.2563 1	13.22690 9	.1484E-3 7	7.384289	46	8	.59
38446.0	38.79 4	18.354 2	81.487 3	.02267 3	.4834 1	13.22728 8	.1472E-3 7	7.382581	46	8	.56
38447.0	36.73 6	17.538 3	81.487 3	.02287 3	.7108 2	13.22757 9	.1454E-3 8	7.380976	48	8	.57
38448.0	34.69 9	16.723 3	81.485 4	.02306 3	.9386 3	13.2279 1	.1453E-3 8	7.379432	48	8	.61
38449.0	32.5 2	15.907 4	81.484 4	.02328 4	.1668 5	13.2283 2	.146E-3 1	7.377587	45	8	.67
38450.0	30.2 2	15.088 5	81.481 5	.02352 6	.3957 7	13.2288 2	.152E-3 1	7.375579	36	8	.67
38451.0	28.8 1	14.27 2	81.48 2	.02359 5	.6223 3	13.228442 4	.154E-3 1	7.375200	31	8	.66
38452.0	25. 2	13.48 3	81.51 4	.0239 3	.856 7	13.228751 9	.155E-3 1	7.372465	28	8	.66
38453.0	25. 3	12.64 4	81.48 4	.0240 3	.081 8	13.229048 9	.150E-3 2	7.372115	25	8	.71
38454.0	25. 3	11.82 4	81.48 4	.0239 4	.304 9	13.22933 1	.144E-3 2	7.372872	20	8	.64

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38455.0	25. 3	11.00 4	81.48 5	.0238 4	.528 9	13.22961 1	.138E-3 3	7.373588	15	8	.60
38456.0	16. 3	10.06 6	81.33 7	.0249 7	.777 9	13.22988 1	.135E-3 1	7.364462	12	8	.49
38457.0	18.7 3	9.347 6	81.451 5	.02425 5	.9935 8	13.230155 6	.138E-3 2	7.369576	14	8	.47
38458.0	16.5 3	8.535 7	81.454 5	.02434 5	.2245 8	13.230427 7	.128E-3 2	7.368773	17	8	.76
38459.0	13.9 2	7.716 5	81.457 3	.02463 4	.4570 6	13.2294 3	.133E-3 2	7.366986	16	8	.45
38460.0	12.6 1	6.899 4	81.456 2	.02465 3	.6859 4	13.2305 2	.120E-3 2	7.366477	16	8	.36
38461.0	10.84 9	6.082 5	81.457 2	.02471 2	.9164 3	13.2305 2	.108E-3 4	7.366006	15	8	.28
38462.0	9.0 1	5.245 7	81.457 3	.02480 5	.1473 3	13.2308 2	.104E-3 3	7.365210	16	8	.47
38463.0	7.49 6	4.428 4	81.456 2	.02492 5	.3776 2	13.23084 9	.1042E-3 8	7.364239	20	8	.30
38464.0	5.8 1	3.613 8	81.455 3	.0249 2	.6087 4	13.2311 2	.101E-3 1	7.364224	25	8	.50
38465.0	3.9 3	2.80 1	81.450 4	.0247 4	.8405 8	13.2311 3	.96E-4 1	7.365499	26	8	.51
38466.0	2.4 3	2.02 3	81.44 1	.0249 5	.0713 9	13.2313 3	.92E-4 1	7.363905	25	8	.43
38467.0	.8 4	1.19 4	81.44 1	.0249 6	.303 1	13.2312 3	.890E-4 8	7.364353	26	8	.54
38468.0	359.1 5	.34 3	81.45 1	.0250 7	.535 2	13.2322 5	.88E-4 1	7.363053	24	8	.59
38469.0	357.6 4	359.54 2	81.441 8	.0252 5	.766 1	13.2319 6	.86E-4 1	7.361555	26	8	.56
38470.0	356.0 5	358.72 2	81.438 8	.0251 5	.998 2	13.2318 6	.83E-4 1	7.362590	28	8	.60
38471.0	353.5 7	357.88 3	81.45 1	.0245 6	.232 2	13.2329 6	.75E-4 2	7.366502	26	8	.80
38472.0	352.0 7	357.07 3	81.44 1	.0247 6	.464 2	13.2334 5	.72E-4 2	7.364839	24	8	.79
38473.0	350.3 8	356.24 3	81.44 1	.0246 6	.697 3	13.2333 6	.68E-4 2	7.365716	20	8	.78
38474.0	348.8 9	355.43 3	81.44 1	.0247 7	.929 3	13.2337 9	.62E-4 4	7.364883	18	8	.73
38475.0	346.4 9	354.61 2	81.44 1	.0244 5	.164 3	13.234 1	.66E-4 2	7.367066	21	8	.62
38476.0	344.3 8	353.77 2	81.447 9	.0238 4	.398 2	13.2343 7	.68E-4 1	7.371241	22	8	.53
38477.0	342.3 7	352.93 2	81.458 9	.0235 4	.632 2	13.23328 1	.63E-4 1	7.374196	23	8	.56
38478.0	340. 1	352.12 3	81.45 1	.0232 5	.866 4	13.23339 1	.58E-4 1	7.376161	25	8	.65
38479.0	339. 1	351.31 2	81.45 1	.0234 5	.098 3	13.23351 1	.55E-4 1	7.374734	25	8	.63
38480.0	338. 1	350.49 3	81.45 1	.0233 5	.331 3	13.23361 2	.54E-4 2	7.375566	21	8	.60
38481.0	335. 1	349.64 2	81.46 1	.0229 4	.567 3	13.23376 1	.47E-4 1	7.378237	22	8	.53
38482.0	333.6 7	348.81 1	81.470 7	.0229 2	.800 2	13.2340 6	.465E-4 7	7.378405	28	8	.46
38483.0	332.2 9	348.02 2	81.460 8	.0228 3	.034 3	13.2340 8	.46E-4 1	7.379152	31	8	.61
38484.0	330.5 8	347.20 1	81.458 7	.0227 3	.267 2	13.2347 6	.46E-4 1	7.379566	35	8	.53
38485.0	328.7 8	346.39 1	81.455 7	.0225 2	.502 2	13.2347 6	.468E-4 9	7.381015	45	8	.54

Table 15

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1964 4A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38423.	1054.	79.0	117.0	216.4	-0.868E-06
38424.	1054.	80.6	116.8	200.1	-0.914E-06
38425.	1054.	81.4	116.3	179.5	-0.895E-06
38426.	1053.	81.3	115.5	158.9	-0.864E-06
38427.	1053.	80.3	114.5	140.3	-0.842E-06
38428.	1052.	78.7	113.2	125.7	-0.831E-06
38429.	1050.	76.7	111.7	114.7	-0.813E-06
38430.	1049.	74.4	110.0	106.1	-0.885E-06
38431.	1048.	72.1	108.1	99.4	-0.967E-06
38432.	1046.	69.8	106.0	94.0	-0.106E-05
38433.	1044.	67.4	103.9	89.2	-0.111E-05
38434.	1041.	64.9	101.5	85.1	-0.115E-05
38435.	1039.	62.5	99.1	81.3	-0.119E-05
38436.	1037.	60.1	96.6	77.9	-0.130E-05
38437.	1035.	57.7	93.9	74.7	-0.138E-05
38438.	1032.	55.3	91.2	71.7	-0.151E-05
38439.	1030.	53.3	88.7	69.0	-0.156E-05
38440.	1027.	51.1	86.0	66.3	-0.158E-05
38441.	1025.	48.9	83.2	63.7	-0.158E-05
38442.	1022.	46.7	80.4	61.2	-0.159E-05
38443.	1020.	44.4	77.4	58.7	-0.162E-05
38444.	1017.	42.4	74.7	56.3	-0.166E-05
38445.	1015.	40.3	71.8	54.0	-0.170E-05

Table 15 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1964 4A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38446.	1012.	38.3	68.9	51.7	-0.168E-05
38447.	1010.	36.3	66.0	49.5	-0.166E-05
38448.	1008.	34.2	63.1	47.2	-0.166E-05
38449.	1005.	32.1	60.1	45.0	-0.167E-05
38450.	1003.	29.8	56.9	42.8	-0.174E-05
38451.	1002.	28.5	54.4	40.7	-0.176E-05
38452.	998.	24.7	50.1	38.3	-0.177E-05
38453.	997.	24.7	48.6	36.5	-0.171E-05
38454.	998.	24.7	47.1	34.8	-0.165E-05
38455.	999.	24.7	45.6	33.0	-0.158E-05
38456.	988.	15.8	37.3	29.6	-0.154E-05
38457.	993.	18.5	37.8	28.4	-0.158E-05
38458.	992.	16.3	34.6	26.3	-0.146E-05
38459.	990.	13.7	31.1	24.1	-0.152E-05
38460.	989.	12.5	28.6	22.2	-0.137E-05
38461.	988.	10.7	25.7	20.2	-0.123E-05
38462.	987.	8.9	22.8	18.1	-0.119E-05
38463.	986.	7.4	20.1	16.2	-0.119E-05
38464.	986.	5.7	17.3	14.2	-0.115E-05
38465.	987.	3.9	14.3	12.1	-0.110E-05
38466.	986.	2.4	11.7	10.2	-0.105E-05
38467.	986.	0.8	9.1	8.2	-0.102E-05
38468.	985.	-0.9	6.4	6.2	-0.101E-05

Table 15 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1964 4A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38469.	983.	-2.4	4.3	4.3	-0.982E-06
38470.	984.	-4.0	3.1	2.3	-0.948E-06
38471.	988.	-6.4	5.0	0.2	-0.857E-06
38472.	987.	-7.9	7.1	358.2	-0.822E-06
38473.	988.	-9.6	9.7	356.2	-0.777E-06
38474.	987.	-11.1	12.3	354.3	-0.708E-06
38475.	990.	-13.4	15.7	352.2	-0.754E-06
38476.	994.	-15.5	18.8	350.1	-0.776E-06
38477.	998.	-17.5	21.9	348.0	-0.720E-06
38478.	1000.	-19.8	25.2	345.9	-0.662E-06
38479.	999.	-20.8	27.4	344.0	-0.628E-06
38480.	1000.	-21.7	29.6	342.1	-0.617E-06
38481.	1004.	-24.7	33.5	339.8	-0.537E-06
38482.	1004.	-26.1	36.1	337.8	-0.531E-06
38483.	1005.	-27.5	38.6	335.9	-0.525E-06
38484.	1006.	-29.1	41.3	333.8	-0.525E-06
38485.	1008.	-30.9	44.2	331.7	-0.534E-06

I. SAO smoothed elements

The following elements are based on 131 observations and are valid for the period January 30 through February 15, 1964.

$T_0 = 38432.0$ MJD

$\omega = (211^\circ.52 \pm 2) + (10^\circ.094 \pm 3)t - ^\circ.005247t^2 + ^\circ.8269 \cos \omega$

$\Omega = (122^\circ.593 \pm 3) - (6^\circ.5355 \pm 5)t - ^\circ.0003424t^2 + ^\circ.00051 \cos \omega$

$i = (31^\circ.4576 \pm 7) - ^\circ.402 \times 10^{-4}t - ^\circ.0017 \sin \omega$

$e = (.035432 \pm 7) - (.90 \pm 16) \times 10^{-5}t + .3007 \times 10^{-5}t^2 + .0005101 \sin \omega$

$M = (.27070 \pm 5) + (15.197984 \pm 9)t + (.0003346 \pm 4)t^2 + (.26 \pm 1) \times 10^{-5}t^3$
$- (.37 \pm 6) \times 10^{-7}t^4 - (.27 \pm 1) \times 10^{-7}t^5 - .0023845 \cos \omega$

Standard error of one observation: $\sigma = \pm 2''.63$

The following elements are based on 208 observations and are valid for the period February 15 through March 1, 1964.

$T_0 = 38448.0$ MJD

$\omega = (13^\circ.36 \pm 2) + (10^\circ.115 \pm 3)t - ^\circ.005247t^2 + ^\circ.8269 \cos \omega$

$\Omega = (17^\circ.936 \pm 3) - (6^\circ.5455 \pm 7)t - ^\circ.0003424t^2 + ^\circ.00051 \cos \omega$

$i = (31^\circ.459 \pm 1) - ^\circ.402 \times 10^{-4}t - ^\circ.0017 \sin \omega$

$e = (.03493 \pm 1) - (.21 \pm 2) \times 10^{-4}t + .3007 \times 10^{-5}t^2 + .0005101 \sin \omega$

$M = (.52111 \pm 5) + (15.208594 \pm 9)t + (.0004258 \pm 4)t^2 + (.100 \pm 1) \times 10^{-4}t^3$
$- (.141 \pm 6) \times 10^{-6}t^4 - (.58 \pm 2) \times 10^{-7}t^5 - .0023845 \cos \omega$

Standard error of one observation: $\sigma = \pm 3''.75$

The following elements are based on 67 observations and are valid for the period March 1 through March 17, 1964.

$T_0 = 38463.0$ MJD

$\omega = (165^\circ.13 \pm 3) + (10^\circ.138 \pm 5)t - ^\circ.002994t^2 + ^\circ.8805 \cos \omega$

$\Omega = (279^\circ.648 \pm 4) - (6^\circ.5592 \pm 8)t - ^\circ.000259t^2 + ^\circ.00047 \cos \omega$

$i = (31^\circ.460 \pm 2) + ^\circ.000213t - ^\circ.0016 \sin \omega$

$e = (.03456 \pm 3) - (.40 \pm 4) \times 10^{-4}t - .1215 \times 10^{-5}t^2 + .0005104 \sin \omega$

$M = (.74776 \pm 9) + (15.22148 \pm 2)t + (.0004035 \pm 7)t^2 - (.138 \pm 2) \times 10^{-4}t^3$
$- (.29 \pm 1) \times 10^{-6}t^4 + (.98 \pm 2) \times 10^{-7}t^5 - .0025393 \cos \omega$

Standard error of one observation: $\sigma = \pm 3''.60$

The following elements are based on 163 observations and are valid for the period March 17 through April 1, 1964.

$T_0 = 38478.0$ MJD

$\omega = (317^\circ.450 \pm 9) + (10^\circ.150 \pm 2)t - ^\circ.002994t^2 + ^\circ.8805 \cos \omega$

$\Omega = (181^\circ.200 \pm 2) - (6^\circ.5672 \pm 4)t - ^\circ.000259t^2 + ^\circ.00047 \cos \omega$

$i = (31^\circ.4562 \pm 4) + ^\circ.00213t - ^\circ.0016 \sin \omega$

$e = (.034159 \pm 4) - (.12 \pm 1) \times 10^{-4}t - .1215 \times 10^{-5}t^2 + .0005104 \sin \omega$

$M = (.13850 \pm 2) + (15.230468 \pm 6)t + (.0003207 \pm 3)t^2 - (.294 \pm 6) \times 10^{-5}t^3$
$- (.63 \pm 1) \times 10^{-6}t^4 + (.84 \pm 1) \times 10^{-7}t^5 - .0025393 \cos \omega$

Standard error of one observation: $\sigma = \pm 1''.65$

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38426.0	150.21 4	161.797 5	31.4561 9	.03580 1	.0961 1	15.193621 2	.336E-3 2	6.637593	59	4	.91
38427.0	159.89 4	155.259 7	31.457 1	.03581 1	.2918 1	15.194299 3	.335E-3 2	6.637308	40	4	.90
38428.0	170.10 4	148.723 7	31.457 1	.03564 1	.4867 1	15.194956 3	.329E-3 3	6.638297	44	4	1.04
38429.0	180.23 3	142.187 4	31.458 8	.03550 8	.68250 8	15.195589 2	.306E-3 1	6.639080	34	4	.56
38430.0	190.38 3	135.654 6	31.460 1	.03536 9	.87875 9	15.196172 2	.275E-3 4	6.639850	23	4	.59
38431.0	200.61 1	129.12 2	31.460 5	.03531 3	.0753 3	15.196828 9	.325E-3 6	6.640029	20	4	1.66
38432.0	210.60 8	122.60 1	31.460 2	.03516 2	.2732 2	15.197533 6	.360E-3 7	6.640865	17	4	.92
38433.0	220.97 7	116.05 1	31.461 2	.03503 1	.4707 2	15.198241 4	.347E-3 3	6.641545	16	4	.73
38434.0	230.90 3	109.513 5	31.460 1	.03493 2	.67023 9	15.198943 4	.342E-3 4	6.642017	29	4	.95
38435.0	241.28 2	102.980 3	31.460 1	.03489 1	.86907 6	15.199648 3	.362E-3 2	6.642050	31	4	.84
38436.0	251.58 3	96.443 5	31.459 2	.03485 2	.06881 9	15.200309 7	.334E-3 6	6.642143	32	4	1.34
38437.0	261.89 1	89.904 2	31.459 1	.03478 1	.26917 4	15.200922 2	.288E-3 2	6.642470	37	4	.64
38438.0	272.11 2	83.362 3	31.459 1	.03473 2	.47027 5	15.201555 2	.325E-3 3	6.642649	35	4	.83
38439.0	282.30 1	76.827 2	31.4598 7	.03472 1	.67210 3	15.202240 2	.378E-3 2	6.642519	34	4	.44
38440.0	292.61 1	70.288 2	31.4596 7	.03472 1	.87433 3	15.202988 2	.372E-3 2	6.642280	37	4	.45
38441.0	302.89 1	63.744 2	31.4593 7	.034733 8	.07734 3	15.203690 1	.347E-3 1	6.641988	42	4	.49
38442.0	313.095 9	57.200 2	31.4590 5	.034772 7	.28125 2	15.204350 1	.317E-3 1	6.641526	40	4	.37
38443.0	323.32 1	50.659 2	31.4585 7	.034843 6	.48567 3	15.204985 2	.315E-3 2	6.640854	37	4	.39
38444.0	333.55 1	44.113 2	31.4585 7	.034879 6	.69073 3	15.205704 1	.356E-3 1	6.640392	40	4	.42
38445.0	343.70 1	37.571 2	31.4583 8	.034926 6	.89670 4	15.206420 2	.360E-3 2	6.639860	40	4	.43
38446.0	353.86 2	31.025 3	31.4586 9	.034987 7	.10334 5	15.207168 2	.379E-3 2	6.639226	43	4	.52
38447.0	4.01 2	24.481 3	31.4581 8	.035083 7	.31076 4	15.207928 2	.387E-3 2	6.638344	52	4	.57
38448.0	14.06 1	17.935 2	31.4580 9	.035177 8	.51921 4	15.208710 2	.392E-3 1	6.637470	53	4	.61
38449.0	24.17 1	11.390 3	31.458 1	.03512 1	.72819 4	15.209528 2	.451E-3 2	6.637590	59	4	.83
38450.0	34.182 9	4.834 2	31.457 8	.035259 7	.93832 2	15.210449 1	.478E-3 1	6.636399	60	4	.56
38451.0	44.16 1	358.293 2	31.4573 9	.035335 9	.14949 3	15.211448 2	.508E-3 1	6.635586	67	4	.72
38452.0	54.13 1	351.746 3	31.457 1	.03538 1	.36166 3	15.212473 2	.519E-3 2	6.634965	73	4	.85
38453.0	64.18 1	345.197 3	31.459 1	.03534 1	.57464 4	15.213436 2	.462E-3 2	6.634985	63	4	1.03
38454.0	74.15 2	338.651 4	31.458 1	.03535 1	.78874 4	15.214332 2	.424E-3 2	6.634611	58	4	1.13

T (MJD)	ω	Ω	i	e	M	n	n'/2	q	N	D	σ
38455.0	84.10 3	332.104 6	31.457 2	.03534 2	.00370 7	15.215129 3	.387E-3 3	6.634477	51	4	1.72
38456.0	94.00 2	325.554 6	31.457 1	.03534 2	.21955 6	15.215875 4	.362E-3 3	6.634231	45	4	1.40
38457.0	103.94 2	318.997 5	31.457 1	.03531 2	.43599 5	15.216602 3	.360E-3 3	6.634282	36	4	1.07
38458.0	113.96 3	312.438 6	31.457 2	.03526 2	.65289 9	15.217338 6	.395E-3 6	6.634392	31	4	1.20
38459.0	123.95 4	305.875 6	31.453 3	.03507 3	.8706 1	15.218295 4	.484E-3 4	6.635390	26	4	1.31
38460.0	133.86 4	299.330 6	31.456 3	.03496 4	.0896 1	15.218383 5	.501E-3 5	6.636168	19	4	1.13
38461.0	144.10 2	292.774 4	31.456 2	.03493 3	.30866 6	15.219337 4	.461E-3 3	6.636095	14	4	.67
38462.0	154.36 3	286.216 8	31.457 4	.03489 4	.52850 9	15.220204 5	.421E-3 5	6.636075	13	4	.95
38463.0	164.6 8	279.65 1	31.459 6	.0348 4	.749 2	15.221010 5	.386E-3 5	6.636490	11	4	.67
38464.0	175.6 7	273.06 1	31.474 5	.0352 3	.968 2	15.221722 5	.351E-3 4	6.633813	10	4	.63
38465.0	186.1 8	266.49 1	31.484 7	.0352 4	.190 2	15.22241 1	.340E-3 8	6.633504	07	4	.56
38466.0	195.5 9	259.967 6	31.464 4	.0347 5	.415 3	15.223049 3	.336E-3 1	6.636793	12	8	1.02
38467.0	204.6 9	253.407 5	31.465 4	.0340 4	.642 3	15.223710 2	.329E-3 1	6.640872	11	8	.92
38468.0	214.86 4	246.845 4	31.460 3	.03388 3	.8660 1	15.224361 2	.323E-3 1	6.641842	14	8	.87
38469.0	225.14 2	240.280 4	31.458 2	.03378 2	.09063 6	15.224998 2	.3165E-3 8	6.642321	21	8	.68
38470.0	235.50 2	233.717 4	31.456 1	.03371 2	.31557 6	15.225667 7	.297E-3 2	6.642618	36	8	.91
38471.0	245.73 2	227.154 3	31.4566 9	.03366 1	.54158 5	15.226264 3	.2846E-3 8	6.642828	39	8	.67
38472.0	256.22 2	220.593 4	31.457 1	.03371 2	.76730 5	15.226877 8	.286E-3 5	6.642247	33	4	.80
38473.0	266.54 2	214.030 3	31.4567 8	.03370 1	.99414 4	15.227447 2	.264E-3 2	6.642186	39	4	.63
38474.0	276.87 2	207.464 3	31.4570 9	.03369 1	.22147 4	15.227978 2	.267E-3 2	6.642101	45	4	.76
38475.0	287.18 2	200.900 3	31.4576 8	.033706 9	.44939 4	15.228525 2	.288E-3 2	6.641816	48	4	.71
38476.0	297.50 2	194.335 3	31.4575 9	.033716 9	.67783 5	15.229111 2	.303E-3 2	6.641576	55	4	.81
38477.0	307.82 2	187.766 3	31.4570 9	.033728 8	.90685 5	15.229743 2	.320E-3 2	6.641311	57	4	.70
38478.0	318.09 2	181.200 3	31.4577 7	.033811 7	.13664 5	15.230383 2	.322E-3 2	6.640558	61	4	.63
38479.0	328.25 2	174.638 3	31.4583 7	.033874 6	.36737 5	15.231010 1	.304E-3 2	6.639938	62	4	.65
38480.0	338.50 2	168.068 3	31.4579 7	.033922 6	.59847 5	15.231609 1	.300E-3 2	6.639438	54	4	.61
38481.0	348.73 2	161.497 3	31.4578 7	.034004 7	.83020 5	15.232198 2	.296E-3 2	6.638704	44	4	.62
38482.0	358.85 2	154.927 4	31.4578 9	.034090 8	.06269 6	15.232764 2	.276E-3 2	6.637943	33	4	.66
38483.0	9.04 2	148.360 3	31.4555 8	.034143 6	.29573 6	15.233323 2	.276E-3 2	6.637417	31	4	.51
38484.0	19.05 4	141.784 5	31.456 2	.03420 1	.5297 1	15.233940 4	.350E-3 3	6.636863	29	4	.89
38485.0	29.22 2	135.220 3	31.4552 8	.034303 8	.76385 5	15.234611 3	.392E-3 4	6.635942	31	4	.52

Table 16

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1964 5A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Sunlight			
38426.	261.	15.0	32.5	2.1	-0.291E-05
38427.	260.	10.3	27.7	3.3	-0.290E-05
38428.	260.	5.1	22.5	4.6	-0.285E-05
38429.	261.	-0.1	17.4	5.7	-0.265E-05
38430.	262.	-5.4	12.8	6.8	-0.238E-05
38431.	262.	-10.6	9.6	8.2	-0.281E-05
38432.	264.	-15.4	9.3	9.7	-0.312E-05
38433.	266.	-20.0	12.2	11.9	-0.300E-05
38434.	267.	-23.9	16.0	14.2	-0.296E-05
38435.	268.	-27.2	20.6	17.6	-0.313E-05
38436.	269.	-29.7	25.0	21.4	-0.289E-05
38437.	270.	-31.1	29.1	25.7	-0.249E-05
38438.	270.	-31.4	32.8	30.2	-0.281E-05
38439.	270.	-30.7	36.1	34.5	-0.327E-05
38440.	269.	-28.8	39.2	38.7	-0.322E-05
38441.	268.	-26.0	41.8	42.3	-0.300E-05
38442.	266.	-22.4	44.2	45.3	-0.274E-05
38443.	265.	-18.2	46.3	47.7	-0.273E-05
38444.	263.	-13.4	48.4	49.6	-0.308E-05
38445.	262.	-8.4	50.4	51.1	-0.311E-05
38446.	261.	-3.2	52.5	52.4	-0.328E-05
38447.	260.	2.1	54.7	53.5	-0.335E-05
38448.	259.	7.3	57.2	54.7	-0.339E-05

Table 16 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1964 5A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
38449.	260.	12.3	59.9	56.0	-0.390E-05
38450.	260.	17.0	62.9	57.7	-0.413E-05
38451.	260.	21.3	66.1	59.7	-0.439E-05
38452.	260.	25.0	69.4	62.3	-0.449E-05
38453.	261.	28.0	73.0	65.6	-0.399E-05
38454.	262.	30.1	76.5	69.2	-0.366E-05
38455.	262.	31.3	79.9	73.2	-0.334E-05
38456.	262.	31.4	83.1	77.3	-0.313E-05
38457.	261.	30.4	86.1	81.4	-0.311E-05
38458.	261.	28.5	88.9	85.2	-0.341E-05
38459.	261.	25.6	91.3	88.5	-0.418E-05
38460.	261.	22.1	93.2	91.1	-0.433E-05
38461.	260.	17.8	95.0	93.5	-0.398E-05
38462.	259.	13.1	96.4	95.5	-0.363E-05
38463.	259.	8.0	97.6	97.0	-0.333E-05
38464.	255.	2.3	99.1	99.0	-0.303E-05
38465.	255.	-3.2	100.2	100.5	-0.293E-05
38466.	259.	-8.0	100.5	101.1	-0.290E-05
38467.	263.	-12.5	100.7	101.7	-0.284E-05
38468.	265.	-17.4	102.1	103.6	-0.279E-05
38469.	267.	-21.7	104.0	106.0	-0.273E-05

Table 16 (cont.)

RELATIVE POSITIONS OF THE SUN AND THE PERIGEE OF SATELLITE 1964 5A

MJD	Z	ϕ	ψ	D.R.A.	$\dot{P}$
		Perigee In Earth Shadow			
38470.	268.	-25.5	106.3	109.0	-0.256E-05
38471.	269.	-28.4	109.0	112.6	-0.246E-05
38472.	269.	-30.5	112.4	116.9	-0.247E-05
38473.	270.	-31.4	116.1	121.4	-0.228E-05
38474.	269.	-31.2	120.1	126.0	-0.230E-05
38475.	269.	-29.9	124.3	130.4	-0.248E-05
38476.	268.	-27.6	128.7	134.4	-0.261E-05
38477.	267.	-24.3	133.0	137.9	-0.276E-05
38478.	265.	-20.4	137.1	140.6	-0.278E-05
38479.	263.	-15.9	140.7	142.8	-0.262E-05
38480.	262.	-11.0	143.7	144.6	-0.259E-05
38481.	261.	-5.9	145.9	146.0	-0.255E-05
38482.	260.	-0.6	147.2	147.2	-0.238E-05
38483.	259.	4.7	147.4	148.4	-0.238E-05
38484.	259.	9.8	146.9	149.6	-0.302E-05
38485.	259.	14.8	145.8	151.2	-0.338E-05