REVISED JANUARY 3, 1984

ATTACHED:

1. MAP OVERLAY

2. FORMAT EXPLANATION OF THE NASA PREDICTION BULLETIN

3. FORMAT EXPLANATION OF THE TWO-LINE ORBITAL ELEMENTS

January 3, 1984

MAP OVERLAY METHOD OF HAND COMPUTING STATION PREDICTIONS

MATERIALS REQUIRED:

1. Two dimensional projection of the world.
2. Acetate sheet (same size as the projection of the world).
3. Prediction Bulletin (sample enclosed).
4. Chart for Determining Elevation and Slant Range of Satellite (enclosed).
5. Grease pencil.

DEFINITIONS

1. SUB-SATELLITE PLOT -

A plot of the intersection of the radius vector from the center of the earth to the satellite with the surface of the earth.

2. EQUATOR CROSSING -

The longitude at which the radius vector intersects with equator as the satellite travels from south to north.

3. SLANT RANGE -

The distance from the observer to the satellite.

4. AZIMUTH -

The angle measured in a clockwise direction between true North and the line from the observer to the point on the sub-satellite plot that describes the satellite's position at the time in question.

5. ELEVATION -

The angle measured from a plane tangent to the observer's position to a line from the observer's position to the satellite.

6. ACQUISITION CIRCLES -

Concentric arcs drawn on the projection of the world equidistant from the observer's position (these would appear as true circles on a spherical globe, but appear distorted on a two dimensional projection).

7. SN -

Indicates that the satellite is traveling in a south to north direction.

8. NS -

Indicates that the satellite is traveling in a north to south direction.

9. N PT -

Designates the northern most point (inclination) which the sub-satellite plot describes on the projection.

10. S PT -

Designates the southern most point (inclination) which the sub-satellite plot describes on the projection.

The Map Overlay Method is a simplified system used to predict the slant range, azimuth and elevation to a satellite from an observer's position at a specified time using the materials mentioned above. The preparations needed to get the desired information can be broken down into three steps as follows:

1. Construction of the sub-satellite plot on an acetate overlay.

2. Determination of the time, height, and sub-satellite point at which the satellite is visible to the observer.

3. Conversion of the information to slant range, azimuth, elevation, and time.

CONSTRUCTION OF THE SUB-SATELLITE PLOT

1. Fasten the projection of the world to a flat surface.

2. Temporarily fasten the acetate sheet over the projection and trace the equatorial line on the acetate (the equatorial line will be used for reference purposes).

3. Mark a convenient point on the equatorial line proximate to the left edge of the world map to use as the starting point of the sub-satellite plot. Near this point mark the "height" of the satellite which is found in Part III of the Prediction Bulletin in the third column to the right of SN 0. It may be more useful to change all the "heights" to statute miles, since the "Chart for Determining Elevation and Slant Range of Satellite" is marked in these units.

4. For each LAT N (Latitude North) and LAT S (Latitude South) given in Part III of the Prediction Bulletin, subtract the respective L CORR (Longitude Correction) from the longitude used as the starting point; add 360 to this sum and plot the resulting point on the acetate. Mark the "minutes plus" and the "height" close to the point. (NOTE: For these calculations, Longitude West from zero to 180 degrees is denoted by a minus sign, the Longitude East from zero to 180 degrees is denoted by a positive number. This notation should not be confused with that used in Part II of the Prediction Bulletin in which the longitude of the equator crossings are positive numbers and are given in West Longitude from zero to 360 degrees).

EXAMPLE: Under the LAT N column of Part III of the sample Prediction Bulletin use the L CORR for 10 degrees latitude while the satellite is traveling SN. If 180 degrees west longitude (-180) were used as the starting point on the equatorial line, the summation described above would be as follows:

$$(-180°) + (-349°) = -529°*$$

*When this total is greater than -360°, then subtract 360°.
i.e., -529 + 360° = -169°

The point 10 degrees north latitude and 169 degrees west longitude would be plotted on the acetate with the "minutes plus," 4.33, and "height," 938.5 kilometers, written close to the point.

5. Draw a smooth curve through the sub-satellite points which will result in a sine wave type curve for near earth satellites.

DETERMINATION OF VISIBILITY FOR AN OBSERVER

1. Remove the acetate sheet and draw "acquisition circles" around the observer's position on the map of the world. These circles should be drawn at approximately 300 nautical miles (5 degrees measured along a great circle) from each "acquisition circle" outward from the observer's position.

2. Using Part II of the Prediction Bulletin, position the sub-satellite plot according to the west longitude equator crossings. When the sub-satellite plot crosses the "acquisition circles," note the ground distance in degrees from the observer, the "height," and the time. Repeat the above for as many points as are needed by interpolating between "acquisition circles" and time marks for a smooth track of the satellite (one point per minute should be adequate for all except near overhead passes).

Map Overlay Method
January 3, 1984

CALCULATION OF TIME, AZIMUTH, ELEVATION AND SLANT RANGE

1. Add the time for each point to the TIME Z (time GMT) for the Equator Crossing which resulted in intersections of the "acquisition circles" to get the GMT time for each point. (NOTE: The times given for the equator crossings are in hours and minutes; for example, for revolution 91056 of the sample Prediction Bulletin the time is 17 hours and 14.65 minutes GMT.)

2. The azimuth for each point can be approximated from a visual inspection of the world map and the sub-satellite points.

3. The "Chart for Determining Elevation and Slant Range of Satellite" is to be used to derive the elevation and slant range for each point and can be best explained by the following example.

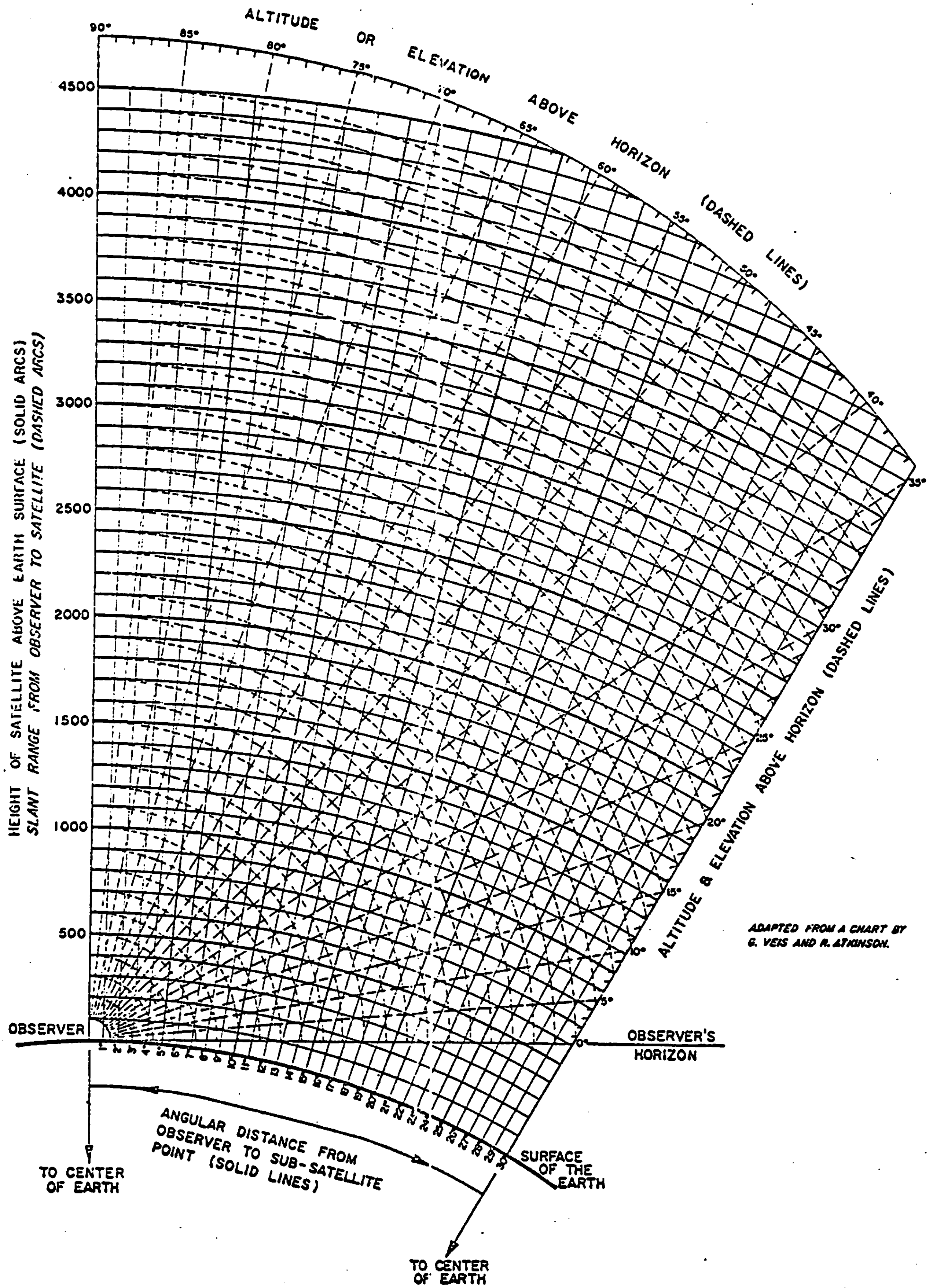
EXAMPLE: If a sub-satellite point is 20 great circle degrees from the observer and the "Height" of the satellite at this point is 1100 miles, the elevation angle will be approximately 25 degrees and the slant range will be approximately 1910 miles. This result is derived by marking a point on the perpendicular, 11 divisions (one division represents 100 miles) above 20 degrees on the arc which represents the surface of the earth; drawing a line outward from the observer through the point noting the elevation marked on the elevation scale and then noting the number of dashed arcs (each arc represents 100 miles) from the observer to the point.

Should there by any comments or questions concerning this format, please contact Control Center Support Section, Code 513.2, Project Operations Branch, NASA Goddard Space Flight Center, Greenbelt, Maryland 20771.

Control Center Support Section, Code 513.2
Project Operations Branch
Mission Operations Division
Mission and Data Operations Directorate

CHART FOR DETERMINING ELEVATION & SLANT RANGE OF SATELLITE

ALL DISTANCES ARE IN STATUTE MILES - 5 STATUTE MILES EQUAL APPROXIMATELY 8 KILOMETERS.



NASA PREDICTION BULLETIN

NASA 51004

NASA GODDARD SPACE FLIGHT CENTER, CODE 513.2, GREENBELT, MD. 20771

ISSUE DATE: January 3, 1984

BLTN 857 ELEM 857 OBJ 01328 1965 032 A ; IN 3 PARTS PART I

```
1 01328U 65032   A 83349.24300270 -.00000033                    0  8577
2 01328  41.1933  87.2961 0244602 334.5611  24.3295 13.36331356909569
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THIS PREDICTION SHOULD NOT BE USED FOR PRECISE SCIENTIFIC ANALYSIS.

PART II S-N EQUATOR CROSSINGS.

REV	TIME Z	LONG W	REV	TIME Z	LONG W	REV	TIME Z	LONG W
20 DEC 83								
91023	602.29	112.88	91024	749.93	140.18	91025	937.58	167.49
91026	1125.23	194.79	91027	1312.88	222.09	91028	1500.52	249.40
91029	1648.17	276.70	91030	1835.82	304.00	91031	2023.47	331.31
91032	2211.11	358.61	91033	2358.76	25.92			
21 DEC 83								
91034	146.41	53.22	91035	334.05	80.52	91036	521.70	107.83
91037	709.35	135.13	91038	857.00	162.44	91039	1044.64	189.74
91040	1232.29	217.04	91041	1419.94	244.35	91042	1607.59	271.65
91043	1755.23	298.96	91044	1942.88	326.26	91045	2130.53	353.56
91046	2318.18	20.87						
22 DEC 83								
91047	105.82	48.17	91048	253.47	75.48	91049	441.12	102.78
91050	628.76	130.08	91051	816.41	157.39	91052	1004.06	184.69
91053	1151.71	212.00	91054	1339.35	239.30	91055	1527.00	266.60
91056	1714.65	293.91	91057	1902.30	321.21	91058	2049.94	348.52
91059	2237.59	15.82						
23 DEC 83								
91060	25.24	43.12	91061	212.88	70.43	91062	400.53	97.73
91063	548.18	125.04	91064	735.83	152.34	91065	923.47	179.64
91066	1111.12	206.95	91067	1258.77	234.25	91068	1446.41	261.55
91069	1634.06	288.86	91070	1821.71	316.16	91071	2009.36	343.47
91072	2157.00	10.77	91073	2344.65	38.07			
24 DEC 83								
91074	132.30	65.38	91075	319.94	92.68	91076	507.59	119.99
91077	655.24	147.29	91078	842.88	174.59	91079	1030.53	201.90
91080	1218.18	229.20	91081	1405.83	256.51	91082	1553.47	283.81
91083	1741.12	311.11	91084	1928.77	338.42	91085	2116.41	5.72
91086	2304.06	33.02						
25 DEC 83								
91087	51.71	60.33	91088	239.35	87.63	91089	427.00	114.94
91090	614.65	142.24	91091	802.29	169.54			

PART III. REDUCTION TO OTHER LATITUDES AND HEIGHTS FOR REV 91056

LAT N	MINUTES PLUS	L CORR	HT KILOM	LAT S	MINUTES PLUS	L CORR	HT KILOM
SN 0	0.	0.	944.0	NS 0	53.38	193.54	1300.4I
SN 5	2.15	354.84	939.6	NS 5	55.75	188.44	1305.6I
SN 10	4.33	349.54	938.5	NS 10	58.14	183.19	1307.8I
SN 15	6.55	343.94	940.8	NS 25	60.60	177.65	1306.8I
SN 20	8.85	337.83	946.8	NS 20	63.13	171.60	1302.2I
SN 25	11.30	330.89	957.0	NS 25	65.82	164.72	1293.4I
SN 30	13.98	322.63	972.4	NS 30	68.75	156.47	1279.5I
SN 35	17.17	311.72	995.6	NS 35	72.15	145.66	1257.6I
SN 40	21.92	293.27	1037.9	NS 40	77.21	127.34	1216.1I
N PT	25.88	276.58	1077.3	S PT	81.33	110.64	1175.6I
NS 40	29.90	259.83	1120.1I	SN 40	85.41	93.91	1131.6I
NS 35	34.81	241.48	1170.9I	SN 35	90.26	75.54	1078.4I
NS 30	38.16	230.64	1203.4I	SN 30	93.51	64.68	1044.2I
NS 25	41.04	222.39	1228.3I	SN 25	96.25	56.39	1017.3I
NS 20	43.69	215.50	1249.7I	SN 20	98.73	49.46	995.5I
NS 15	46.20	209.44	1267.0I	SN 15	101.07	43.35	977.6I
NS 10	48.63	203.39	1281.1I	SN 10	103.31	37.76	963.2
NS 5	51.01	198.64	1292.2I	SN 5	105.49	32.46	952.1
NS 0	53.38	193.54	1300.4I	SN 0	107.65	27.30	944.3

January 3, 1984

FORMAT EXPLANATION OF THE NASA PREDICTION BULLETIN

The format of the NASA Prediction Bulletin is in three parts (see sample bulletin). Part I consists of classical orbital elements presented in a two-line format. Part II provides the orbit number with the time and longitude for predicted equator crossings. Part III provides the data to be added to the equator crossing to compute the satellite position throughout a specific orbit. A format explanation of all three parts of the NASA Prediction Bulletin is attached.

Plus (+) signs will not be printed. All values are assumed positive unless preceded by a minus (-) sign.

Questions or comments concerning the NASA Prediction Bulletins may be directed to the Control Center Support Section, Code 513.2, Project Operations Branch, NASA Goddard Space Flight Center, Greenbelt, Md. 20771.

CLASSICAL ELEMENT FORMAT (LINE ONE)

COL	NAME	DESCRIPTION	UNITS	FIELD FORMAT
1	LINNO	Line number of Element Data (Always 1 for Line 1)	None	X
2	Blank			
3-7	SATNO	Satellite Number	None	XXXXX
8	U	Not Applicable	None	X
9	Blank			
10-11	IDYR	International Designator (Last Two Digits of Launch Year)	Launch Yr	XX
12-14	IDLNO	International Designator (Launch Number of the Year)	None	XXX
15-17	IDPNO	International Designator (Piece of Launch)	None	XXX
18	Blank			
19-20	EPYR	Epoch Year (Last Two Digits of the Year)	Epoch Yr	XX
21-32	EPOCH	Epoch (Julian Day and Fractional portion of the Day)	Day	XXX.XXXXXXXX
33	Blank			
34-43	NDOT2 or BTERM	First Time Derivative of the Mean Motion or Ballistic Coefficient (depending on the ephemeris type)	Revolutions per day^2 or meters^2 per kilogram	±.XXXXXXXX (If NDOT2 is greater than unity, a positive value is assumed w/o a sign)

(LINE ONE CONT)

COL	NAME	DESCRIPTION	UNITS	FIELD FORMAT
44	Blank			
45-52	NDDOT 6	Second Time Derivative of Mean Motion (Field will be blank if NDDOT6 is not applicable)	Revolutions per day^3	±XXXXX-X (Decimal point assumed between Columns 45 and 46)
53	Blank			
54-61	BSTAR or AGOM	BSTAR drag term if GP4 general perturbations theory was used. Otherwise will be the radiation pressure coefficient.		±XXXXX-X
62	Blank			
63	EPHTYP	Ephemeris Type (Specifies the ephemeris theory used to produce the elements)	None	X
64	Blank			
65-68	ELNO	Element Number	None	XXXX
69	CKSUM	Check Sum (Modulo 10)*	None	X

NOTE: BSTAR is the drag term produced by use of GP4 ephemeris theory (Lane-Cranford, AIAA Paper Nr. 69-925). AGOM is the radiation pressure coefficient produced and used in special perturbations type ephemeris theory. These are included in the new format only for the possible use of special users in the future. The common user who works with NDOT2 and NDDOT6 should ignore these values.

*Letters, blanks, and periods are equal to 0 and a minus sign (-) is equal to 1.

(LINE TWO)

COL	NAME	DESCRIPTION	UNITS	FIELD FORMAT
1	LINNO	Line Number of Element Data (Always 2 for Line 2)	None	X
2	Blank			
3-7	SATNO	Satellite Number	None	XXXXX
8	Blank			
9-16	II	Inclination	Degrees	XXX.XXXX
17	Blank			
18-25	NODE	Right Ascension of the Ascending Node	Degrees	XXX.XXXX
26	Blank			
27-33	EE	Eccentricity (decimal pt assumed)	None	.XXXXXXX
34	Blank			
35-42	OMEGA	Argument of Perigee	Degrees	XXX.XXXX
43	Blank			
44-51	MM	Mean Anomaly	Degrees	XXX.XXXX
52	Blank			
53-63	NN	Mean Motion	Revolutions per day	XX.XXXXXXXX
64-68	REVNO	Revolution Number at Epoch	Revolutions	XXXXX
69	CKSUM	Check Sum (Modulo 10)*	None	X

*Letters, blanks, and periods are equal to 0 and a minus sign (-) is equal to 1.

EQUATOR CROSSING FORMAT

The format for Part II is as follows:

DA MON YR
REV TIME Z LONG W

Explanation:

a. DA: Day

b. MON: Month

c. YR: Year

d. REV: Number of South-North (S-N) equator crossings the satellite has made between launch and Time Z orbit number.

e. TIME Z: Time, Greenwich Mean Time, for which the corresponding REV is valid. Measured in hours, minutes, and hundredths of a minute.

f. LONG W: Longitude West of the S-N equator crossing. Measured in degrees and hundredths of a degree.

REDUCTION TO OTHER LATITUDES AND HEIGHTS FORMAT

The format for Part III is as follows:

LAT	MINUTES	L	HT	LAT	MINUTES	L	HT
N	PLUS	CORR	KILOM	S	PLUS	CORR	KILOM

Explanation:

a. LAT: N — Latitude North of the sub-satellite point measured in specific degree intervals, except for the insertion of the northern most point (N PT).

b. MINUTES: PLUS — Time, measured in minutes and hundredths of a minute, to be added to the equator crossing time to get the time for which the latitude reading is valid.

c.	L CORR:	Longitude correction, measured in degrees and hundredths of a degree, to be added to the equator crossing longitude to get the longitude for which the latitude reading is valid. If the sum of the longitude correction and the equator crossing longitude is greater than 360 degrees, subtract 360 to get the true value..
d.	HT KILOM:	Height of the spacecraft corresponding to the particular sub-satellite points and time. Measured in kilometers and tenths of a kilometer. The leter "I" means the spacecraft is in sunlight and is visible to the observer if the observer is in darkness conditions.
e.	LAT: S	Latitude South of the sub-satellite point measured in specific degree intervals, except for the insertion of the southern most point (S PT).

NASA PREDICTION BULLETIN

NASA 51004

NASA GODDARD SPACE FLIGHT CENTER, CODE 513.2, GREENBELT, MD. 20771

ISSUE DATE: January 3, 1984

BLTN 357 ELEM 357 OBJ 01328 1965 032 A ; IN 3 PARTS PART 1

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1 01328U 65032   A 83349.24300270 -.00000033                    0  5577
2 01328  41.1933  87.2961 0244602 334.5611  24.3295 13.36331356909569
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91032	2211.11	358.61	91033	2358.76	25.92			
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91034	146.41	53.22	91035	334.05	80.52	91036	521.70	107.83
91037	709.35	135.13	91038	857.00	162.44	91039	1044.64	189.74
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91043	1755.23	298.96	91044	1942.88	326.26	91045	2130.53	353.56
91046	2318.18	20.87						
22 DEC 83								
91047	105.82	48.17	91048	253.47	75.48	91049	441.12	102.78
91050	628.76	130.08	91051	816.41	157.39	91052	1004.06	184.69
91053	1151.71	212.00	91054	1339.35	239.30	91055	1527.00	266.60
91056	1714.65	293.91	91057	1902.30	321.21	91058	2049.94	348.52
91059	2237.59	15.82						
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91063	548.18	125.04	91064	735.83	152.34	91065	923.47	179.64
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91072	2157.00	10.77	91073	2344.65	38.07			
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91077	655.24	147.29	91078	842.88	174.59	91079	1030.53	201.90
91080	1218.18	229.20	91081	1405.83	256.51	91082	1553.47	283.81
91083	1741.12	311.11	91084	1928.77	338.42	91085	2116.41	5.72
91086	2304.06	33.02						
25 DEC 83								
91087	51.71	60.33	91088	239.35	87.63	91089	427.00	114.94
91090	614.65	142.24	91091	802.29	169.54			

PART III. REDUCTION TO OTHER LATITUDES AND HEIGHTS FOR REV 91056

LAT N		MINUTES PLUS	L CORR	HT KILOM	LAT S		MINUTES PLUS	L CORR	HT KILOM
SN	0	0.	0.	944.0	NS	0	53.38	193.54	1300.4I
SN	5	2.15	354.84	939.6	NS	5	55.75	188.44	1305.6I
SN	10	4.33	349.54	938.5	NS	10	58.14	183.19	1307.8I
SN	15	6.55	343.94	940.9	NS	25	60.60	177.65	1306.8I
SN	20	8.85	337.83	946.8	NS	20	63.13	171.60	1302.2I
SN	25	11.30	330.89	957.0	NS	25	65.82	164.72	1293.4I
SN	30	13.98	322.63	972.4	NS	30	68.75	156.47	1279.5I
SN	35	17.17	311.72	995.6	NS	35	72.18	145.66	1257.6I
SN	40	21.92	293.27	1037.9	NS	40	77.21	127.34	1216.1I
N	PT	25.88	276.58	1077.3	S	PT	81.33	110.64	1175.6I
NS	40	29.90	259.83	1120.1I	SN	40	85.41	93.91	1131.8I
NS	35	34.81	241.48	1170.9I	SN	35	90.26	75.54	1078.4I
NS	30	38.16	230.64	1203.4I	SN	30	93.51	64.68	1044.2I
NS	25	41.04	222.39	1228.3I	SN	25	96.25	56.39	1017.3I
NS	20	43.59	215.50	1249.7I	SN	20	98.73	49.46	995.5I
NS	15	46.20	209.44	1267.3I	SN	15	101.07	43.35	977.6I
NS	10	48.63	203.39	1281.1I	SN	10	103.31	37.78	963.2
NS	5	51.01	198.64	1292.2I	SN	5	105.49	32.46	952.1
NS	0	53.38	193.54	1300.4I	SN	0	107.65	27.30	944.3

January 3, 1984

FORMAT EXPLANATION OF THE TWO-LINE ORBITAL ELEMENTS

Attached is the format explanation of the classical orbital elements presented in a two-line format (see sample).

Plus (+) signs will not be printed. All values are assumed positive unless preceded by a minus (-) sign.

Questions or comments concerning the Two-Line orbital elements may be directed to the Control Center Support Section, Code 513.2, Project Operations Branch, NASA Goddard Space Flight Center, Greenbelt, Md. 20771.

CLASSICAL ELEMENT FORMAT (LINE ONE)

COL	NAME	DESCRIPTION	UNITS	FIELD FORMAT
1	LINNO	Line number of Element Data (Always 1 for Line 1)	None	X
2	Blank			
3-7	SATNO	Satellite Number	None	XXXXX
8	U	Not Applicable	None	X
9	Blank			
10-11	IDYR	International Designator (Last Two Digits of Launch Year)	Launch Yr	XX
12-14	IDLNO	International Designator (Launch Number of the Year)	None	XXX
15-17	IDPNO	International Designator (Piece of Launch)	None	XXX
18	Blank			
19-20	EPYR	Epoch Year (Last Two Digits of the Year)	Epoch Yr	XX
21-32	EPOCH	Epoch (Day and Fractional Days of the Year)	Days	XXX.XXXXXXXX
33	Blank			
34-43	NDOT2 or BTERM	First Time Derivative of the Mean Motion or Ballistic Coefficient (depending on the ephemeris type)	Revolutions per day^2 or meters^2 per kilogram	±.XXXXXXXX (If NDOT2 is greater than unity, a positive value is assumed w/o a sign)

(LINE ONE CONT)

COL	NAME	DESCRIPTION	UNITS	FIELD FORMAT
44	Blank			
45-52	NDDOT 6	Second Time Derivative of Mean Motion (Field will be blank if NDDOT6 is not applicable)	Revolutions per day[3]	±XXXXX-X (Decimal point assumed between Columns 45 and 46)
53	Blank			
54-61	BSTAR or AGOM	BSTAR drag term if GP4 general perturbations theory was used. Otherwise will be the radiation pressure coefficient.		±XXXXX-X
62	Blank			
63	EPHTYP	Ephemeris Type (Specifies the ephemeris theory used to produce the elements)	None	X
64	Blank			
65-68	ELNO	Element Number	None	XXXX
69	CKSUM	Check Sum (Modulo 10)*	None	X

NOTE: BSTAR is the drag term produced by use of GP4 ephemeris theory (Lane-Cranford, AIAA Paper Nr. 69-925). AGOM is the radiation pressure coefficient produced and used in special perturbations type ephemeris theory. These are included in the new format only for the possible use of special users in the future. The common user who works with NDOT2 and NDDOT6 should ignore these values.

*Letters, blanks, and periods are equal to 0 and a minus sign (-) is equal to 1.

(LINE TWO)

COL	NAME	DESCRIPTION	UNITS	FIELD FORMAT
1	LINNO	Line Number of Element Data (Always 2 for Line 2)	None	X
2	Blank			
3-7	SATNO	Satellite Number	None	XXXXX
8	Blank			
9-16	II	Inclination	Degrees	XXX.XXXX
17	Blank			
18-25	NODE	Right Ascension of the Ascending Node	Degrees	XXX.XXXX
26	Blank			
27-33	EE	Eccentricity (decimal pt assumed)	None	.XXXXXXX
34	Blank			
35-42	OMEGA	Argument of Perigee	Degrees	XXX.XXXX
43	Blank			
44-51	MM	Mean Anomaly	Degrees	XXX.XXXX
52	Blank			
53-63	NN	Mean Motion	Revolutions per day	XX.XXXXXXXX
64-68	REVNO	Revolution Number at Epoch	Revolutions	XXXXX
69	CKSUM	Check Sum (Modulo 10)*	None	X

*Letters, blanks, and periods are equal to 0 and a minus sign (-) is equal to 1.

TWO LINE ORBITAL ELEMENTS

NASA 51006

NASA GODDARD SPACE FLIGHT CENTER, CODE 513.2, GREENBELT, MD. 20771

ISSUE DATE: January 3, 1984

```
1 01325U 65032   A 33349.24300270 -.00000033                    0  6577
2 01325  41.1933  87.2961 0244602 334.5611  24.3295 13.36331356909569
```