

TBE Technical Report CS91-TR-JSC-017

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**THE FRAGMENTATION OF THE
NIMBUS 6 ROCKET BODY**

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November 1991

Prepared for:

NASA Lyndon B. Johnson Space Center
Houston, Texas 77058

Contract NAS9-18209
DRD SE-1432T

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The Fragmentation of the Nimbus 6 Rocket Body

Abstract: On 1 May 1991 the Nimbus 6 second stage Delta Rocket Body experienced a major breakup at an altitude of approximately 1,100 km. There were numerous pieces left in long-lived orbits, adding to the long-term hazard in this orbital regime already present from previous Delta Rocket Body explosions. The assessed cause of the event is an accidental explosion of the Delta second stage by documented processes experienced by other similar Delta second stages.

Background

Nimbus 6 and the Nimbus 6 Rocket Body (Satellite Number 7946, International Designator 1975-052B) were launched from the Vandenberg Western Test Range on 12 June 1975. The Delta 2910 launch vehicle lofted the 830 kg Nimbus 6 Payload into a sun-synchronous, 99.6 degree inclination, 1,100 km high orbit, leaving one launch fragment and the Delta Second Stage Rocket Body. This was the 23rd Delta launch of a Second Stage Rocket Body in the Delta 100 or later series of boosters and the 111th Delta launch overall.

On 1 May 1991 the Nimbus 6 Delta second stage broke up into a large, high altitude debris cloud as reported by a NAVSPASUR data analysis message (Appendix 1). The initial breakup message released by NAVSPASUR on 2 May 1991 indicated 53 associated element sets of adequate quality were used to calculate the breakup location and time.

The first fragmentation of a Delta 100 or later series second stage occurred on 28 December 1973 when the NOAA 3 Second Stage Rocket Body broke-up into 197 cataloged objects. The next Delta second stage fragmentation occurred on 22 May 1975 when the Landsat 1 (ERTS-1) Rocket Body explosively disintegrated into 226 cataloged objects. Landsat 1 rode on a Delta 900, the first launch of the Delta 100 series of rockets [ref 1].

In "A Later Look at Delta Second Stage On-Orbit Explosions" by John Gabbard of TBE in March, 1985 [ref 2], the Nimbus 6 and Nimbus 7 Delta Second Stage Rocket Bodies were assessed to be the most likely remaining on-orbit Delta second stages to fragment. Nimbus 7, launched on a Delta 2910, experienced a small anomalous event generating 27 fragments (only 1

object was cataloged) on 26 Dec 81 [ref 3]. Starting with the Dynamics Explorer launch (Delta 155) the second stage has been burned or vented to depletion to eliminate any residual propellants of meaningful mass from the Rocket Body.

Delta Second Stage History

The Delta launch vehicle was first successfully launched on 12 August 1960 when a Delta DM-19 placed Echo 1A into orbit. The second stage initially used an AJ-10-142 engine. Later versions of the Delta employed variants of the AJ-10-118 engine which used IRFNA/UDMH propellants through the Delta N-6 vehicle. The last launch of a pre-100 series Delta vehicle was Delta 88, a Delta N vehicle using an AJ-10-118E second stage [ref 1].

In 1972 the Delta 100 series was introduced with a revised AJ-10-118F engine which utilized N_2O_4 /Aerozine-50 propellants and a modified internal propellant container configuration. A diagram of the common bulkhead between the propellant tanks is shown in Figure 1 [ref 2]. Since Delta 89, Delta second stages have employed N_2O_4 /Aerozine-50 propellants and the newer internal design. The Delta 100 and 1000 series employed the AJ-10-118F engine, while later variants continued to employ similar second stage designs. The Landsat 1 and NOAA 3 second stages were of this design. The Delta 2910 and related series utilized a similar propellant tank configuration with a different engine design. The Nimbus 6 Rocket Body is one of a series of this variant which have undergone large fragmentation events. The Delta 3920 and similar variants utilize the AJ-10-118K-ITIP (Improved Transtage Injector Program). A proposed new second stage could be employed on the Delta 7930 which incorporates a cryogenic stage with a single Pratt & Whitney RL-10 engine [refs 4, 5, and 6].

Starting from Delta 89, 46 second stages remain in orbit. Eight of these stages have fragmented into large debris clouds, while two others have suffered minor piece separations. All of the Delta Rocket Bodies experiencing explosions -- except for GMS (Himawari I) -- were in sun-synchronous orbits with ample amounts of propellant and oxidizer on-board. The GMS event occurred shortly after launch, possibly due to a propellant tank failure unrelated to the other Delta Second Stage events [ref 7]. After Delta 155 depletion burns have been conducted on each mission. No depleted Delta second stages have fragmented as of this report date. Table 1 itemizes the present status of all Delta second stages still in orbit starting with Delta 89 [refs 1, 3, 5, and 8].

The four digit Delta numbering convention identifies the second stage type in the third digit. A zero in the third digit indicates the AJ-10-118F, an one indicates the second stage variant, and a two indicates later versions of the AJ-10-118 series.

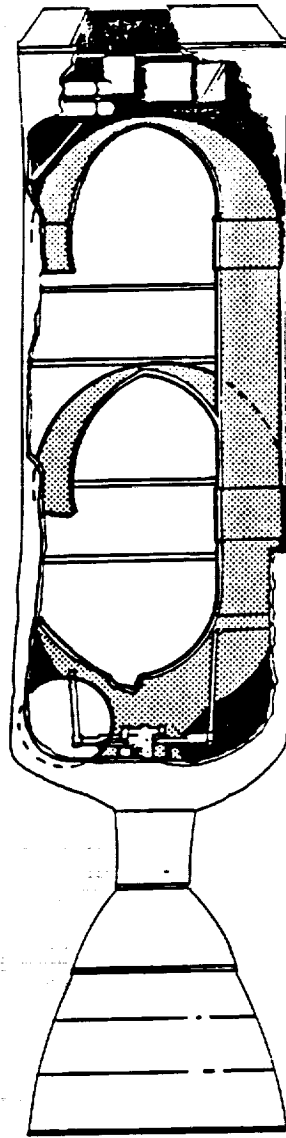


Figure 1. Delta Second Stage Common Bulkhead Between Tanks.

TABLE 1: On-Orbit Delta Second Stage Summary

#	Name	Type	Notes
89	Landsat 1/ERTS 1	900	Fragmented on 22 May 75 with 226 cataloged debris
91	NOAA 2	300	Depletion burn ended early; no fuel, oxidizer remains; 102.8 degree inclination slightly eccentric orbit
93	Nimbus 5	900	Propellants depleted; sun-sync orbit
97	Explorer 50	1600	Oxidizer depleted, fuel remains; 28 degree inclination
98	NOAA 3	300	Fragmented on 28 Dec 73 with 197 cataloged debris
104	NOAA 4	2310	Fragmented on 20 Aug 75 with 145 cataloged debris
107	Landsat 2	2910	Fragmented on 9 Feb 76 with 207 cataloged debris
109	Geos 3	2410	Small event with 3 cataloged debris in Mar 78; substantial fuel on board; in 115.0 degree inclination
111	Nimbus 6	2910	Fragmented on 1 May 91; more than 350 debris tracked
113	COS-B	2913	Depleted fuel, some oxidizer left; in 89.2 inclination
114	Symphonie 2	2914	Propellants depleted; LEO parking orbit
126	NOAA 5	2310	Fragmented on 24 Dec 77 with 157 cataloged debris
128	Nato 3B	2914	Propellants depleted; LEO parking orbit
131	GOES 2	2914	Fuel depleted, oxidizer present; LEO parking orbit
132	GMS	2914	Fragmented on day of launch (14 Jul 77) with 168 cataloged debris; unique (in a 29 degree inclination)
133	Sirio	2313	Propellants depleted; LEO parking orbit
136	Meteosat 1	2914	Propellants depleted; LEO parking orbit
137	Sakura 1A (CS 1)	2914	Propellants depleted; LEO parking orbit
139	Landsat 3 + Oscar	2910	Fragmented on 27 Jan 81 with 208 cataloged debris
140	BSE	2914	Propellants depleted; LEO parking orbit
141	OTS 2	3914	Propellants depleted; LEO parking orbit
142	GOES 3	2914	Propellants depleted; LEO parking orbit
145	Nimbus 7	2910	Small event with 1 cataloged debris on 26 Dec 81 (27 fragments associated with event); substantial fuel on board
157	SME + Uosat 1	2310	Depletion burn; 99.9 degree inclination
166	IRAS	3910	Depletion burn; 100.1 degree inclination
167	RCA Satcom 6	3924	Depletion burn; LEO parking orbit
168	GOES 6	3214	Depletion burn; LEO parking orbit
169	Exosat	3914	Depletion burn; unusual orbit, 72.3 degree inclination
172	RCA Satcom 7	3924	Depletion burn; LEO parking orbit
174	Landsat 5 + Uosat	3920	Depletion burn; sun-sync orbit
175	AMPTE	3924	Depletion burn; 28.9 inclination orbit
177	Nato 3D	3914	Depletion burn; LEO parking orbit
179	GOES 7	3924	Depletion burn; LEO parking orbit
188	Navstar 2-4	6925	Depletion burn; LEO parking orbit
189	COBE	5920	Depletion burn; sun-sync orbit
190	Navstar 2-5	6925	Depletion burn; LEO parking orbit
191	Navstar 2-6	6925	Depletion burn; LEO parking orbit
194	Palapa B2R	6925	Depletion burn; LEO parking orbit
195	Rosat	6920	Depletion burn; 52.5 degree orbit
198	Marcopolo 2/BSB R	6925	Depletion burn; LEO parking orbit
200	Inmarsat 2 F1	6925	Depletion burn; LEO parking orbit
201	Navstar 2-10	7925	Depletion burn; LEO parking orbit
202	Nato 4A	7925	Depletion burn; LEO parking orbit
203	Inmarsat 2 F2	6925	Depletion burn; LEO parking orbit
204	ASC 2	7925	Depletion burn; LEO parking orbit
205	Aurora 2	7925	Depletion burn; LEO parking orbit
206	Navstar + LOSAT-X	7925	Left LOSAT-X in LEO very close to rocket body; possible no depletion burn (?); 407 x 393 km, 37.5 degree inclination orbit; 7925 booster (?)

Of the remaining on-orbit Rocket Bodies which have not undergone a large fragmentation, the NOAA 2, Nimbus 7, and Geos 3 Delta Second Stages are possible candidates for future fragmentations. Nimbus 7 and Geos 3 have suffered minor events which may neutralize the fragmentation process experienced by similar Delta Rocket Bodies. NOAA 2 has no fuel on-board, but could suffer over pressurization of the oxidizer tank which contains moderate amounts of N_2O_4 [ref 8].

Breakup Event Analysis

On 1 May 1991 at 08:55:34.1 GMT the Nimbus 6 second stage underwent a major fragmentation. The Naval Space Surveillance System (NAVSPASUR) determined the time and location of the event from 53 associated pieces (Appendix 1). This analysis identified the location of the event at 66.3N, 322.3E. Figure 2 is a graphical representation of the breakup location point obtained by propagating the pre-event element set to the calculated event time using the USAF Space Command validated SATRAK program. The event location over Greenland is indicated by a black circle.

The last pre-event element set was epoched nine days prior to the breakup (22 April 1991) on element set number 821 as shown below:

```
1 7946U 75 52 B 91112.56709963 .00000050 00000 0 55458-2 0 821
2 7946 99.5801 329.2109 0006217 148.3989 211.7525 13.4300714677751
```

During the initial catalog process, NAVSPASUR constructed a total of 386 analyst satellites. TBE was in contact with NAVSPASUR and NASA Johnson Spaceflight Center personnel on 2 May 1991. NAVSPASUR graciously supported our request for early analyst satellite element set data. An early element set for each of these objects is shown in Appendix 2. During the first pass of the cloud through the NAVSPASUR fence 68 objects were observed during a 54 minute span. The second pass lasted 84 minutes and 115 objects were observed [ref 9]. During the first few days after the event many of the objects were released by the Space Surveillance Center (SSC) with 60XXX series numbers, but were later converted to the 80XXX analyst satellite series. Very few of the original 80XXX numbers remain in the analyst satellite database in October, 1991 either because the object was cataloged or lost and deleted from the database.

Mr. Paul Maley, a regular and experienced visual observer of satellites, was able to observe nine objects from early element data. The results of his observations are contained in Appendix 3. Mr. Maley measured the average brightness of the observed objects at magnitudes between +9.5 to +8.

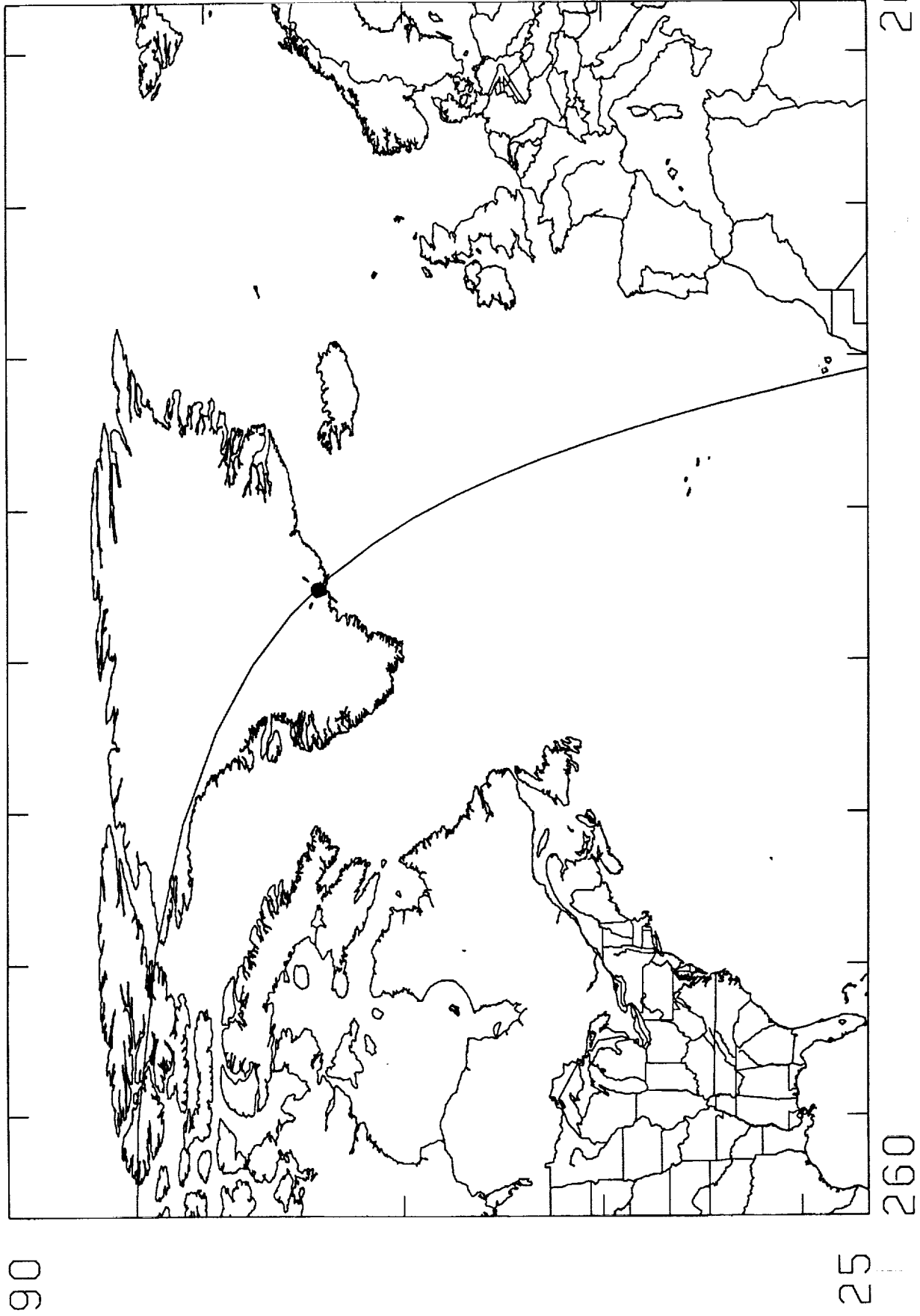


Figure 2. Location of Nimbus 6 Rocket Body Fragmentation.

A Gabbard diagram of the Nimbus 6 Rocket Body based on the early 386 element sets contained in Appendix 2 is shown in Figure 3. This diagram does not represent a "snapshot" of element sets all epoched near the same point in time; rather, the initial 386 element sets listed in Appendix 2 were used to generate this plot at the epoch time of each element set. Because of the altitude of the event the relationship of the plot parameters remain valid.

Figure 4 plots the orbital period versus inclination using the early element data. An apparent asymmetry exists in the plotted data. The out-of-plane forces affect both the inclination and the right ascension values; prior analysis indicates that asymmetry in this plot is highly suggestive of an asymmetrical event. The initial distribution of the early data for eccentricity versus period is shown in Figure 5.

The Nimbus 6 event altitude is between the 3 NOAA and 3 Landsat Delta Second Stage explosions. The characteristics of this cloud include high decay rate objects first seen in the small Nimbus 7 Delta Rocket Body fragmentation [ref 3] and the classical objects observed in the other large Delta events. This fragmentation includes high observed velocity changes in excess of 500 m/s. The tank contained 99 kg of residual fuel and 147 kg of residual oxidizer, the second highest mass of any of the related rocket bodies [ref 8].

The characteristics of the Nimbus 7 Rocket Body minor event and larger fragmentations of the other related Delta Rocket Bodies overlay onto the Nimbus 6 Rocket Body Gabbard diagram. This supports the contention that this fragmentation is a classical Delta Second Stage event accompanied by the unusual "Nimbus 7 Rocket Body fragments" properties.

Current State of the Nimbus 6 Rocket Body Debris Cloud

A 15 October 1991 database was utilized to assess the current state of the Nimbus 6 Rocket Body debris cloud. The most recently cataloged object in this data was object 21687, international designator 1975-052JP, indicating 230 objects credited to the international designator and 228 pieces associated with the event (including SSC #7946, the original rocket body number, as an object in the debris cloud). A total of 16 objects have decayed including the single cataloged operational debris (SSC #7965) unrelated to the breakup. Counting the original rocket body object, this leaves 213 on-orbit cataloged objects associated with the breakup event.

A review of the analyst satellite (8XXXXX) database maintained at field level 1 accuracies revealed 119 analyst satellites which were in the correct altitude band and inclination range to be considered for correlation with the Nimbus 6 Rocket Body cloud. Each analyst satellite was examined on a Gabbard diagram to eliminate objects which do not fit the debris cloud

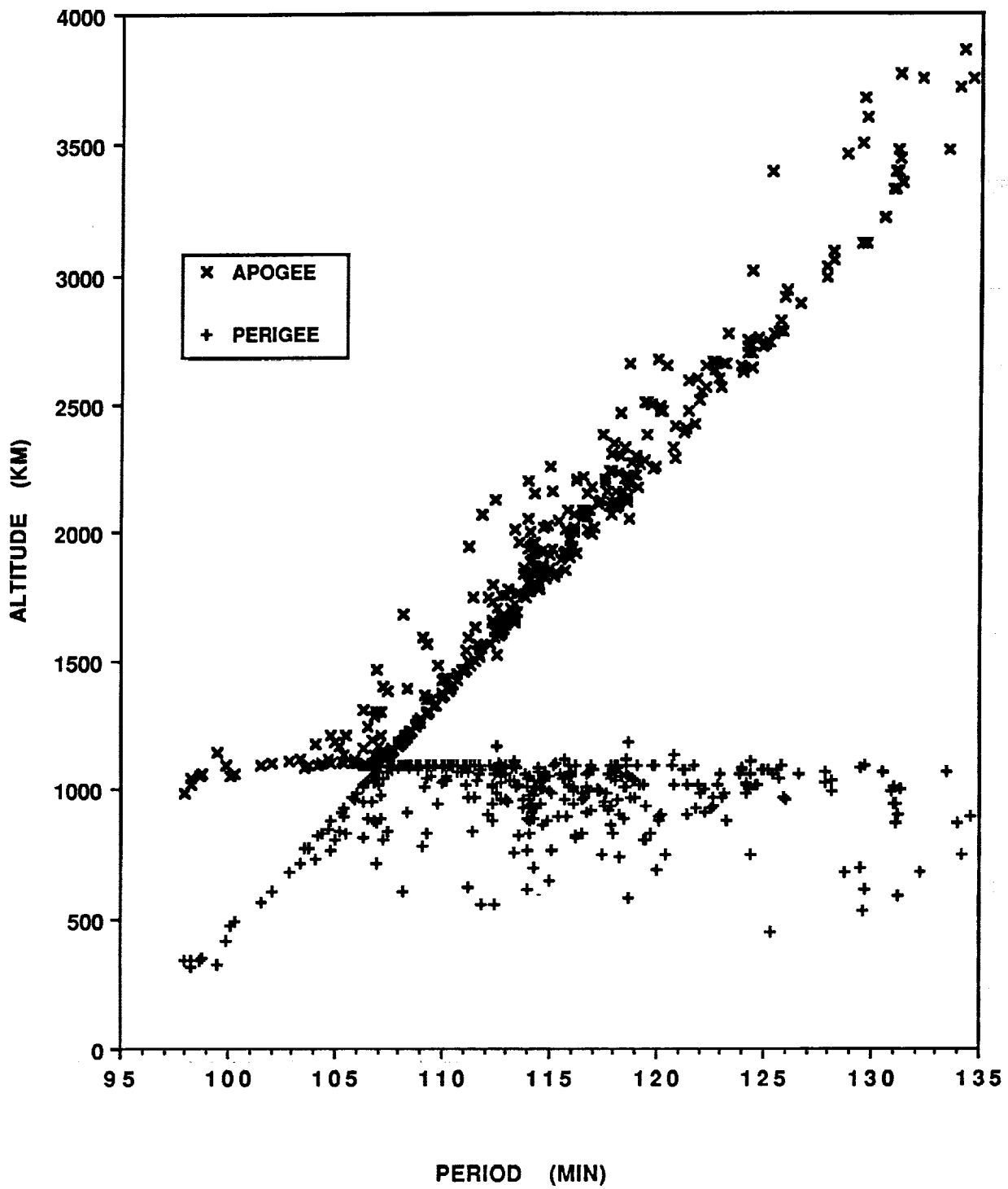


Figure 3. Initial 386 Element Set Gabbard Diagram.

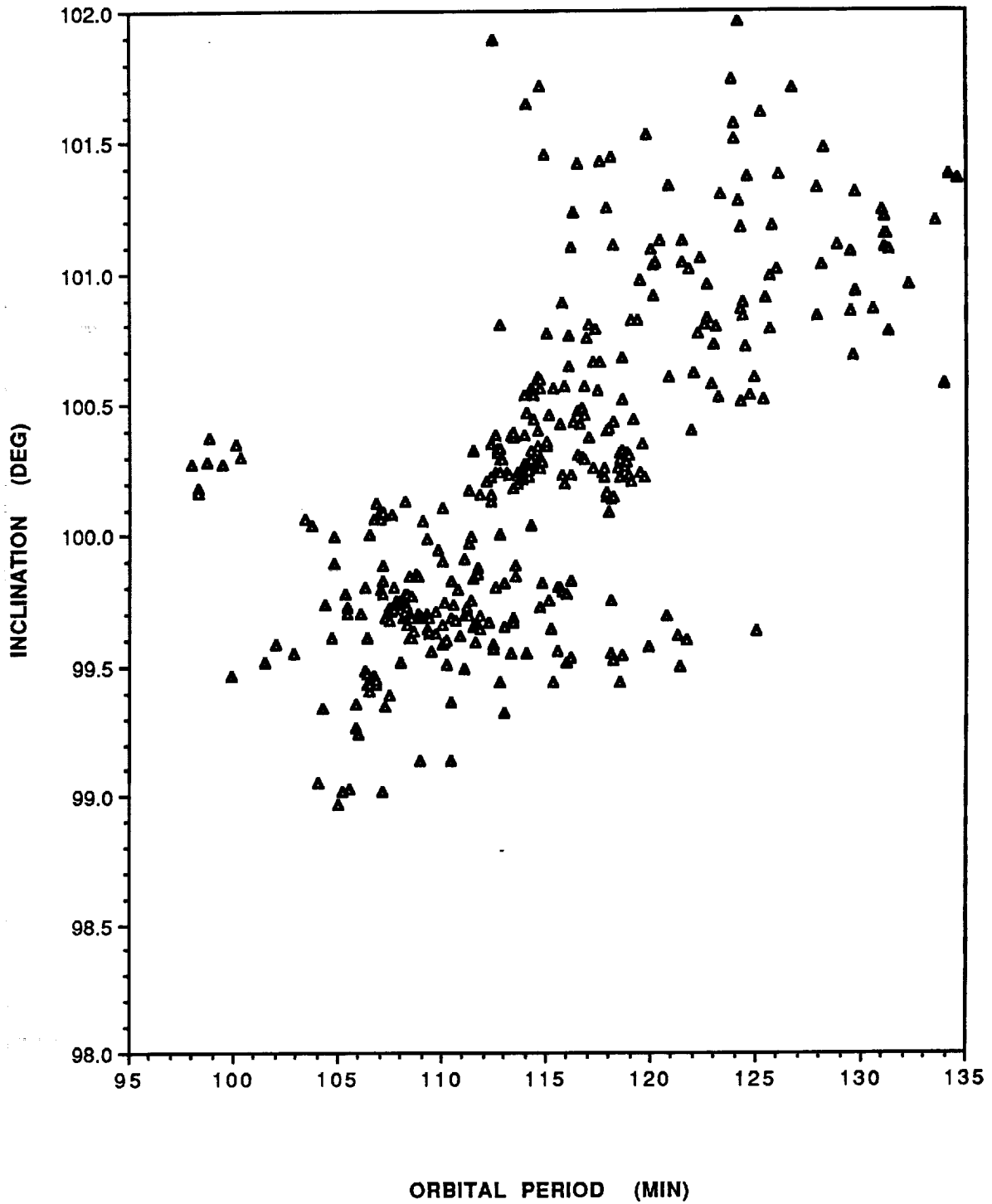


Figure 4. Initial 386 Element Set Inclination vs Period Plot.

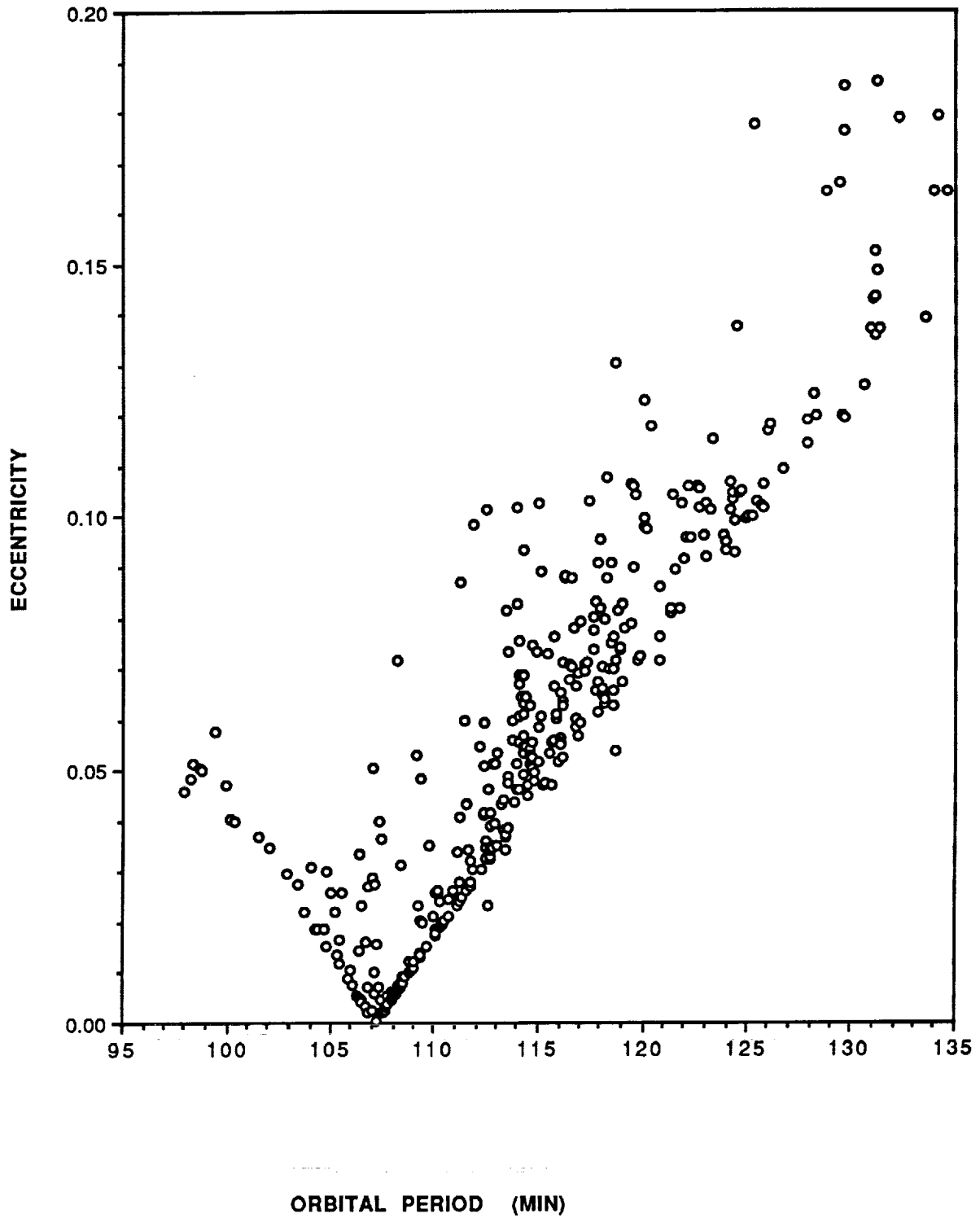


Figure 5. Initial 386 Element Set Eccentricity vs Period Plot.

parameters, narrowing the list of candidates to 55 possible uncataloged objects. Orbital plane was examined for fit and nine additional objects were eliminated due to poor planar correlation. The remaining 46 objects have been assessed to fit the Nimbus 6 Rocket Body cloud and should be examined for maintainability, quality of element set, trackability, and other catalog criteria considerations. Many of the analyst satellite candidates had old epoch times and are either going lost or are over several weeks old in the field level 1 database.

Of the existing 46 analyst satellites with good planar and Gabbard diagram matches, 27 have epoch times within 10 days of the database epoch. Most of these are in the 87XXX series of NAVSPASUR maintained element sets. If maintainability of these objects can be demonstrated and other catalog criteria can be met these objects should be cataloged at the earliest opportunity to ensure they do not suffer the fate of the lost 19 analyst satellite matches. These objects are listed in Appendix 4.

The current Gabbard Diagram based upon cataloged and analyst data is illustrated in Figure 6. Figures 7 and 8 illustrate the eccentricity and inclination properties of the current cloud. The dramatic asymmetry contained in the original element data from NAVSPASUR and illustrated in Figure 4 is not as pronounced in Figure 7. Some asymmetry exists in the remaining element sets and can still be observed in Figures 7 and 8. The majority of the analyst satellites contributing to the more dramatic asymmetry seen in the 386 object cloud (Figure 4) were never cataloged and do not currently exist in the field level 1 element data. It is unlikely that the initial inclinations in the original cloud were in error because significant errors in initial inclination on multi-pass objects are rare. The disposition of the objects between 115-120 minutes in period around 100.5 degrees in inclination (Figure 4) is not known. They do not appear in the current data.

There are 29 cataloged and 16 analyst satellites in the current cloud which are undergoing unusually rapid decay and orbit changes not previously associated with other major Delta Rocket Body fragmentations. Careful comparison of the decay characteristics of these objects with solar activity levels did not reveal a good correlation between the F10 index and decay rate. It is likely that other perturbative forces such as solar pressure are affecting these rather high mean altitude, high ballistic coefficient objects. Each of these objects were examined to determine whether they were correctly associated with this debris cloud and were found to be correctly cataloged. The objects in the interior of the upper Gabbard plot arms are most suspect to catalog error, while other objects on the "outside" of the plot arms could belong to other parent sources but also could be correctly cataloged. The objects are discussed below.

Interior Gabbard Diagram Objects: Objects found within the Gabbard diagram arms are normally mis-cataloged and belong to another breakup. In every debris cloud originating from these series of Delta second stages there are numerous examples where pieces have been associated and cataloged with an incorrect Delta fragmentation. Objects appearing in the interior of the upper arms of a Gabbard diagram have perigee heights above the altitude of the event.

This class of objects currently possess acceptable planar values for the Nimbus 6 Rocket Body fragmentation. Examination of the element set history profile reveals a steady progression into less eccentric orbits with higher altitude perigee heights. Originally, each of these objects fit well on the early Gabbard plot, and each object's historical element sets match the original Gabbard plot (see Figure 2). As shown in Figure 9, each of these objects have increasing perigee heights while simultaneously circularizing, but are undergoing constant decay as the mean altitude of each orbit declines over time. These decay rates are much more rapid than rates exhibited by other objects in the debris cloud and expected rates associated with fragmentation debris at that altitude. The progressions of four objects relative to the original 386 object cloud as shown in Figure 9 are based upon historical reconstruction of the element set piece history. The inner arm objects are depicted in green and purple and represent objects 21436 and 21513, respectively. Preliminary analysis indicates that these pieces may be oscillating between increasing and decreasing perigees. Despite the increases in perigee, these objects are decaying rapidly relative to the remainder of the cloud. Figure 10 plots the gradual increase in perigee (and coincident decrease in apogee) for 4 inner piece cataloged satellites, including the two diagrammed in Figure 9.

Exterior Gabbard Diagram Objects: The identified exterior diagram objects, e.g. those objects on the outside of the plot arms, can be correctly associated with the breakup in question. Many breakups exhibit characteristics where numerous pieces are injected into "halo" portions of the Gabbard plot. Objects with the lowest perigee heights which are outliers on the current plot were examined to determine whether they were correctly associated with the Nimbus 6 Rocket Body fragmentation "halo" or could be associated with another event. Analysis indicates the identified objects are undergoing rapid decay relative to the rest of the cloud much like the inner arm objects discussed above. These objects are undergoing an increase in eccentricity while perigee height is decreasing. Figure 9 also shows two selected outer pieces depicted in red and magenta, representing the object element histories for 21451 and 21517, respectively.

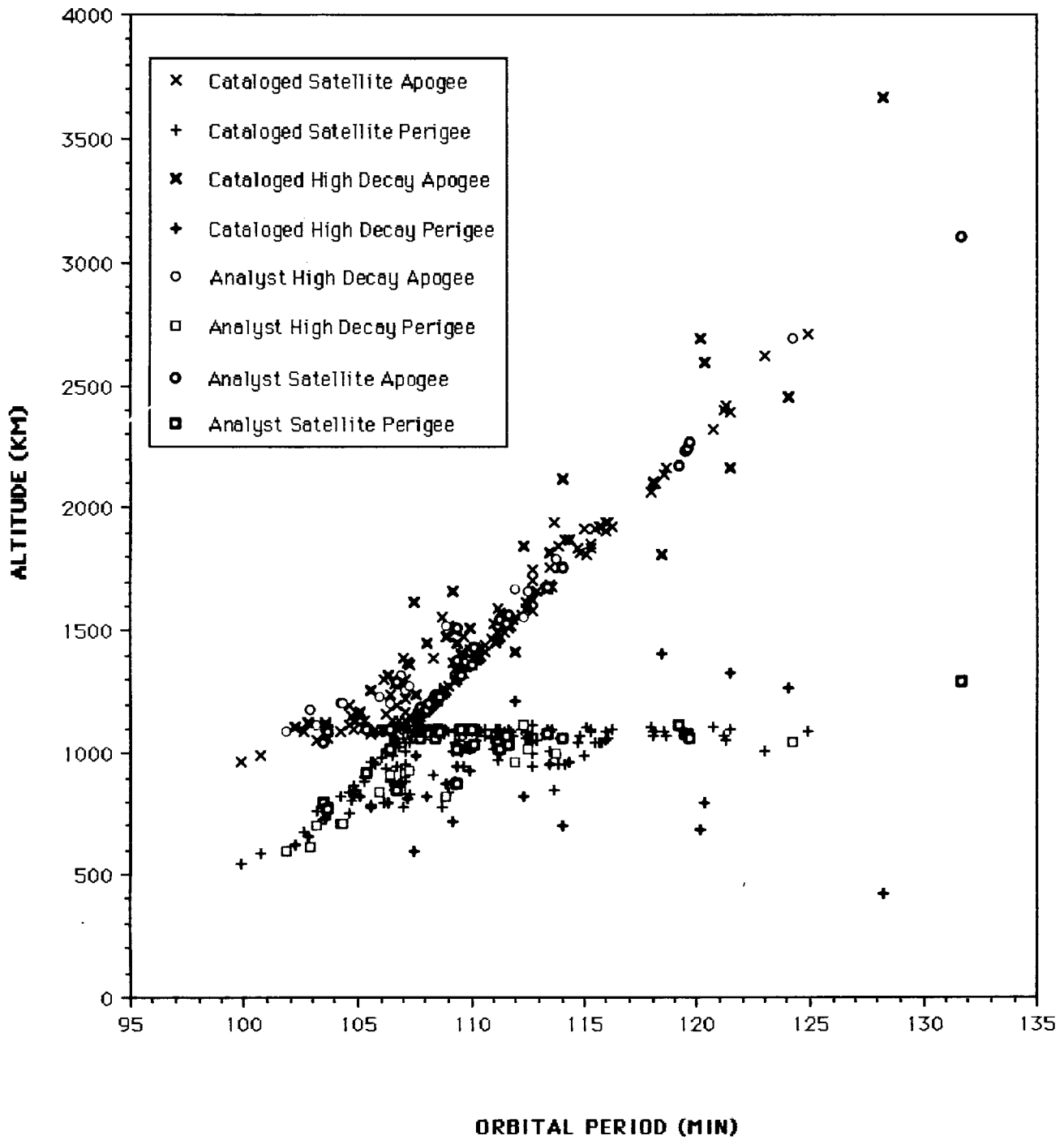


Figure 6. October 15 Gabbard Diagram.



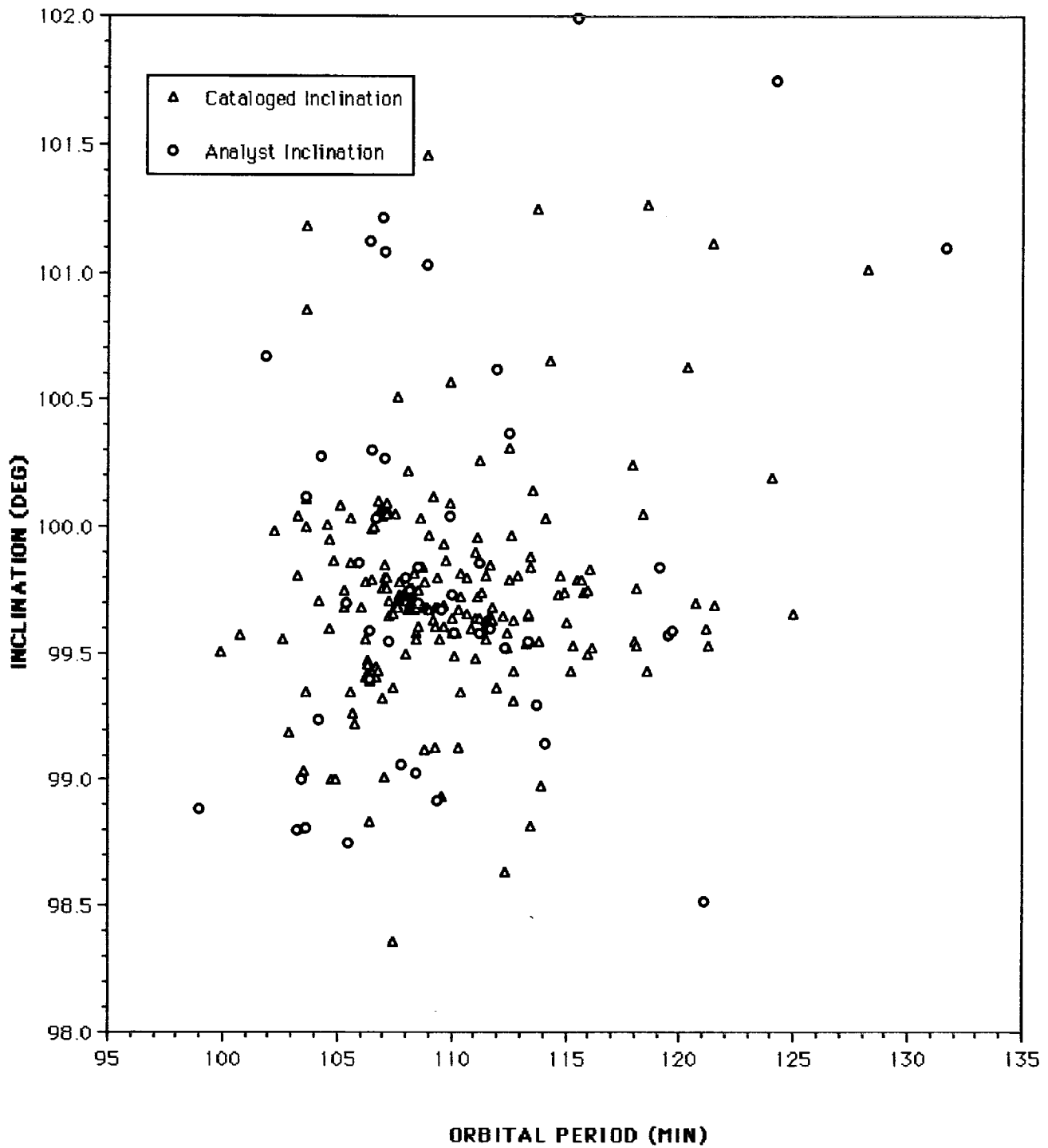
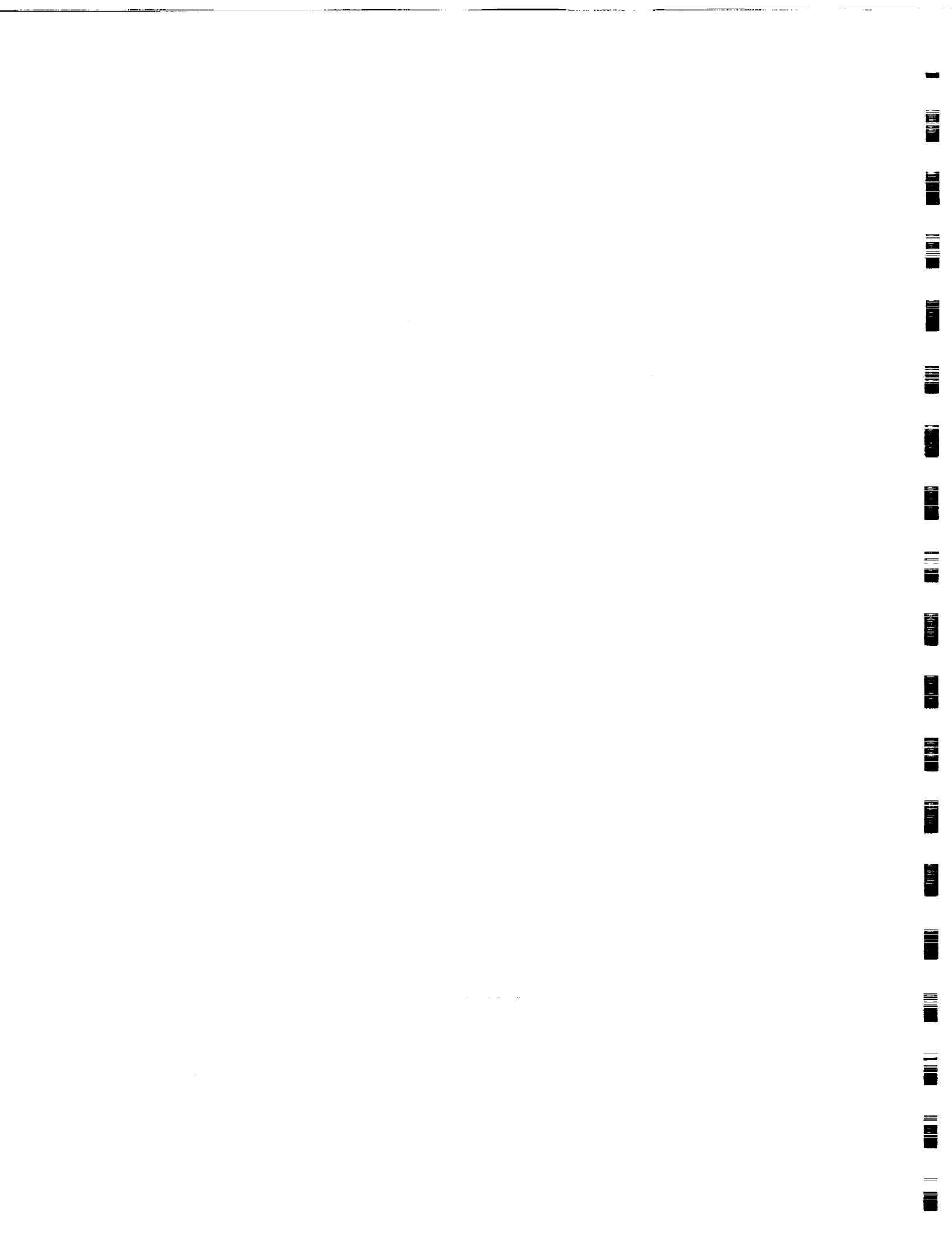


Figure 7. October 15 Inclination vs Period Plot.



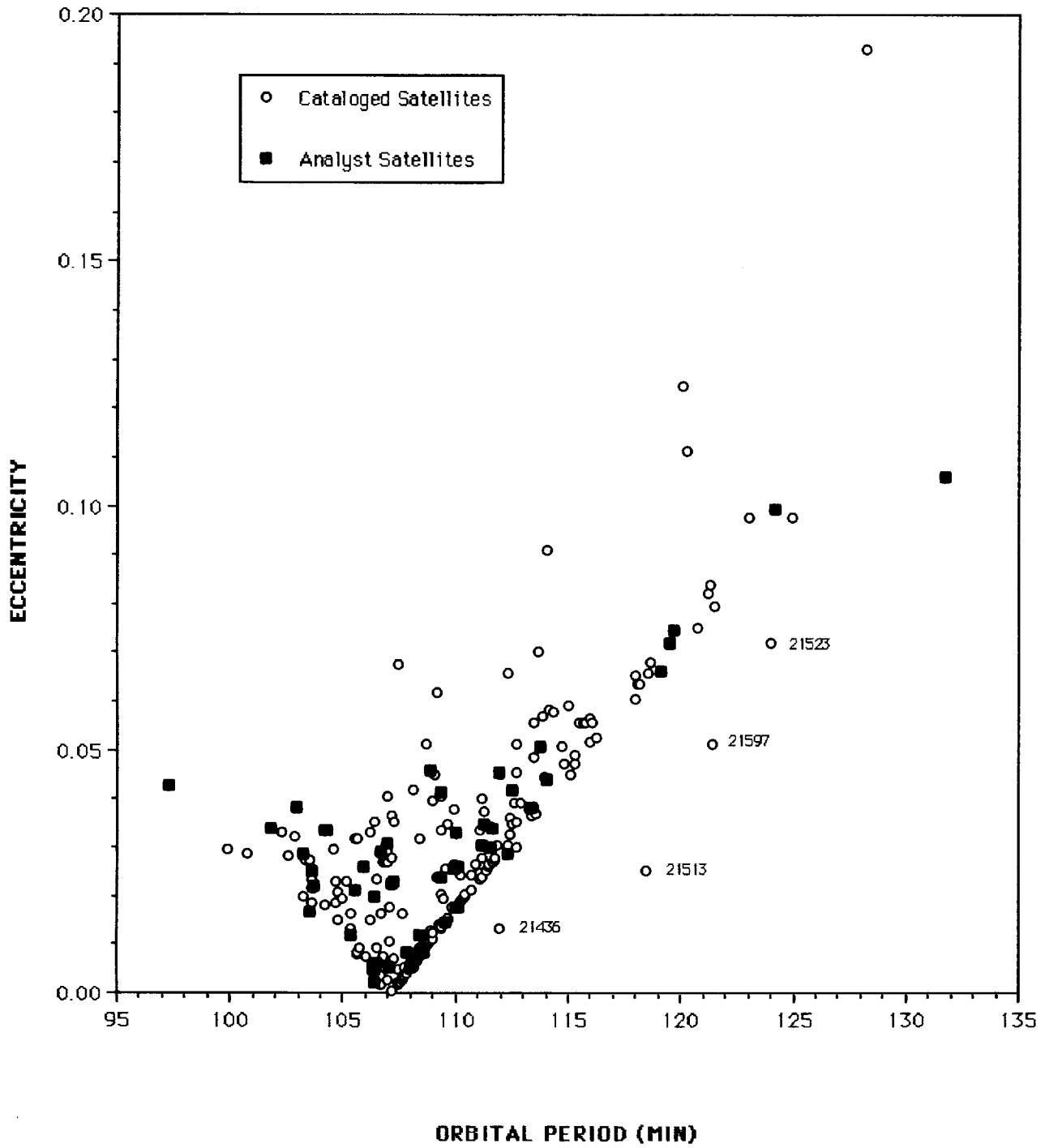


Figure 8. October 15 Eccentricity vs Period Plot.



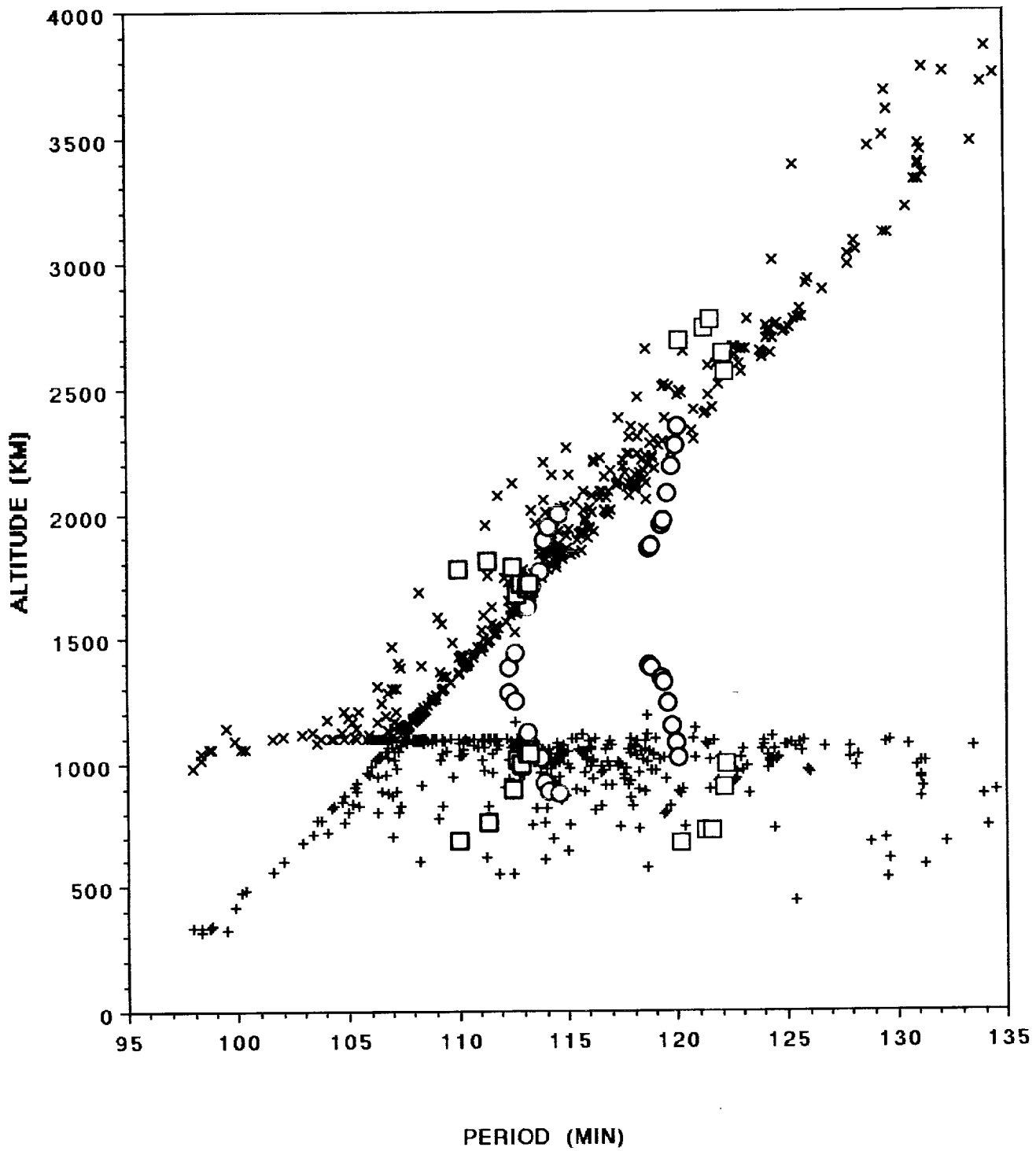
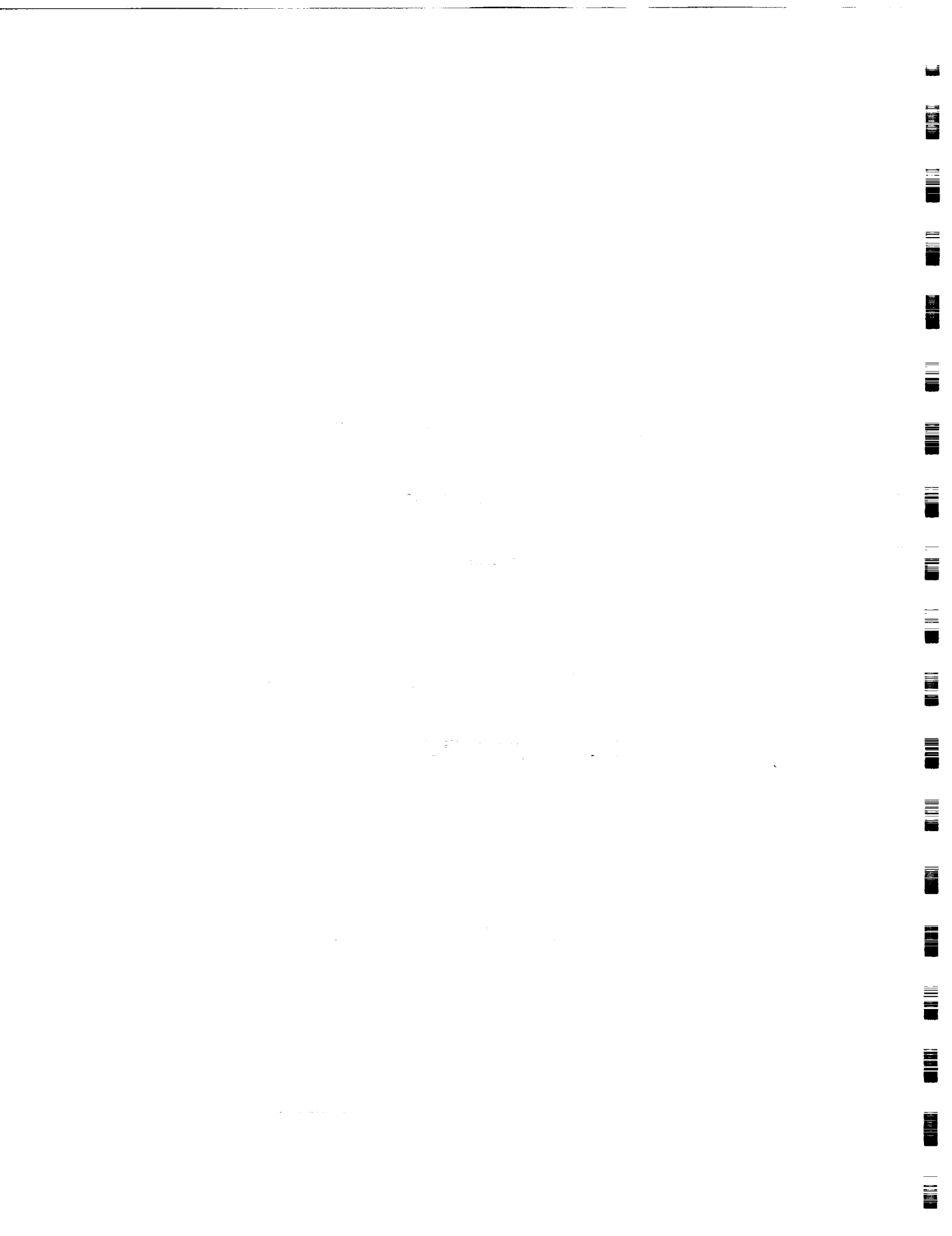


Figure 9. Four Object Element Set Histories.



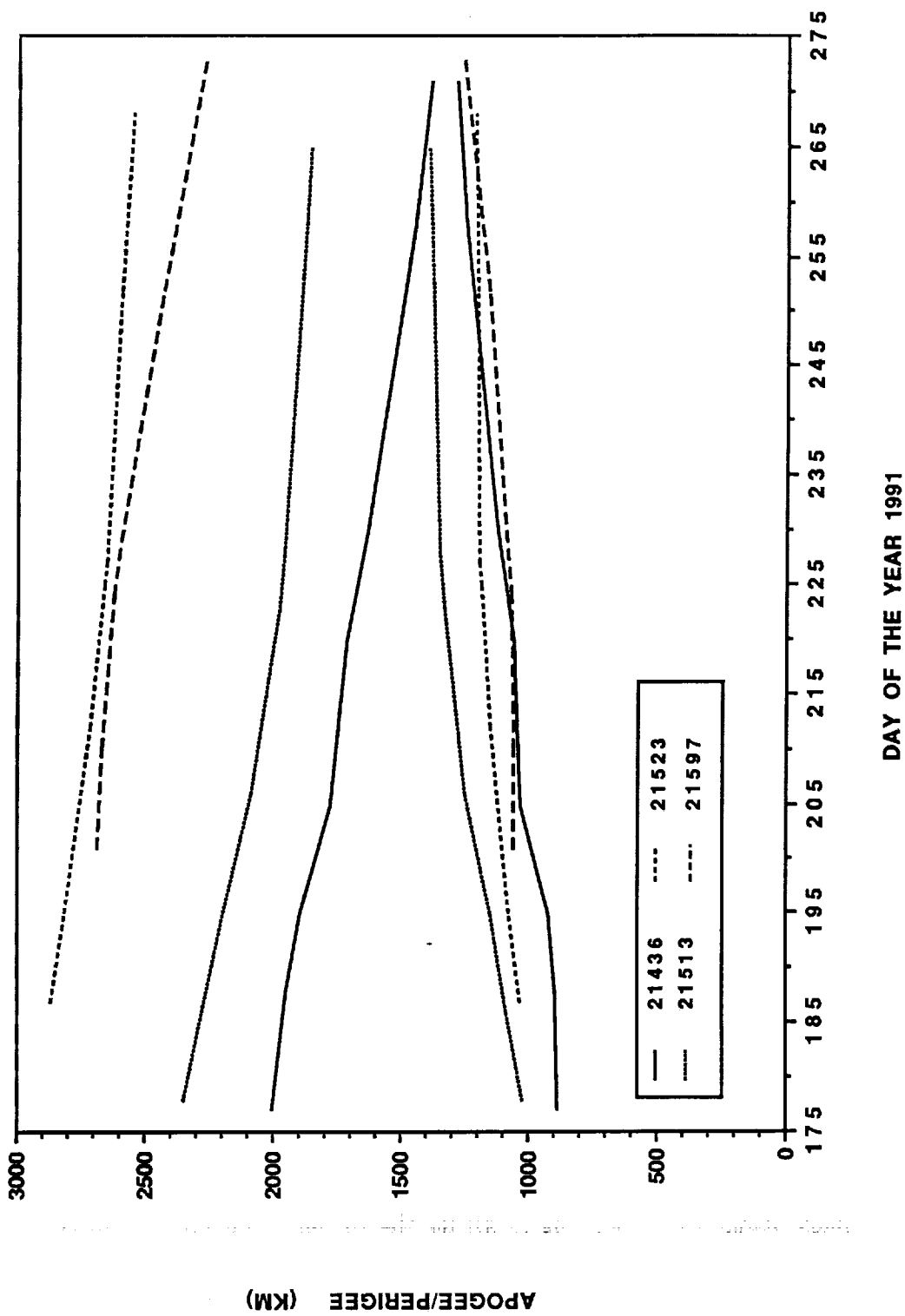


Figure 10. Four Selected Object Apogee/Perigee Behaviors.

These satellites demonstrate the oscillating motion postulated for the inner pieces and are already undergoing a reversal in the decreasing perigee progression. Note that movement for all four objects shown in Figure 9 is to the left on the Gabbard diagram, indicating the unusually rapid decay process. Object 21451 has moved out of the range of orbital planes associated with the cloud, including an inclination change of over 1.5 degrees. This change in RA could not be accurately tracked due to lack of adequate historical data.

The objects identified in Figure 6 which fit the Gabbard diagram are also experiencing rapid decay and oscillating motion. Figure 11 shows one such object which underwent an initial increase in perigee and decrease in apogee, followed by a continuous decrease in perigee with a lesser decrease rate in apogee. The object now fits on the current Gabbard diagram, but did not fit well during mid-August. As evidenced by the eccentricity plot, the object gradually circularized while the perigee was increasing, then became more eccentric as the decay rate increased.

Previous Delta Rocket Body breakups were examined for historical evidence of similar high decay rate satellites within one year of each fragmentation. The Landsat 3 Rocket Body cloud contained a few anomalous objects which are plotted in Figure 13. Note that the Landsat 3 Rocket Body cloud was much lower than any of the NOAA Delta Rocket Body events and the Nimbus 6 Rocket Body fragmentation under study. Only one object in the cloud displayed any unusual orbital parameter changes and is included in the Figure 13 plots. This object (12286) had an abnormally small number of element sets released during the period the object was tracked, and was finally lost when it was still over 700 km high.

The only Delta cloud with an appreciable number of objects which decayed rapidly after the event was the Nimbus 7 Rocket Body small fragmentation. Only one cataloged object, the original Nimbus 7 Rocket Body, was associated with this event, although 27 fragments were tracked [ref 3]. In a memorandum from John Gabbard to Don Kessler of NASA/SN-3, the analyst satellites were noted to possess very high area to mass ratios. The objects were not cataloged because the very high decay rates made adequate catalog maintenance of the pieces very difficult. Mr. Gabbard postulated the objects may have originated from an insulating blanket attached to this class of rocket bodies. Another possible mechanism for the Nimbus 7 objects was a "mini-explosion" where residual pressure ejected light and large layers from the propellant tanks [ref 10].

The available Radar Cross Sections (RCS) for the current cataloged objects is plotted in Figure 12. The lower plot shows a slight trend toward larger objects injected into higher mean altitudes, although this association is weak. The smaller objects (below 0.5 m²) are evenly

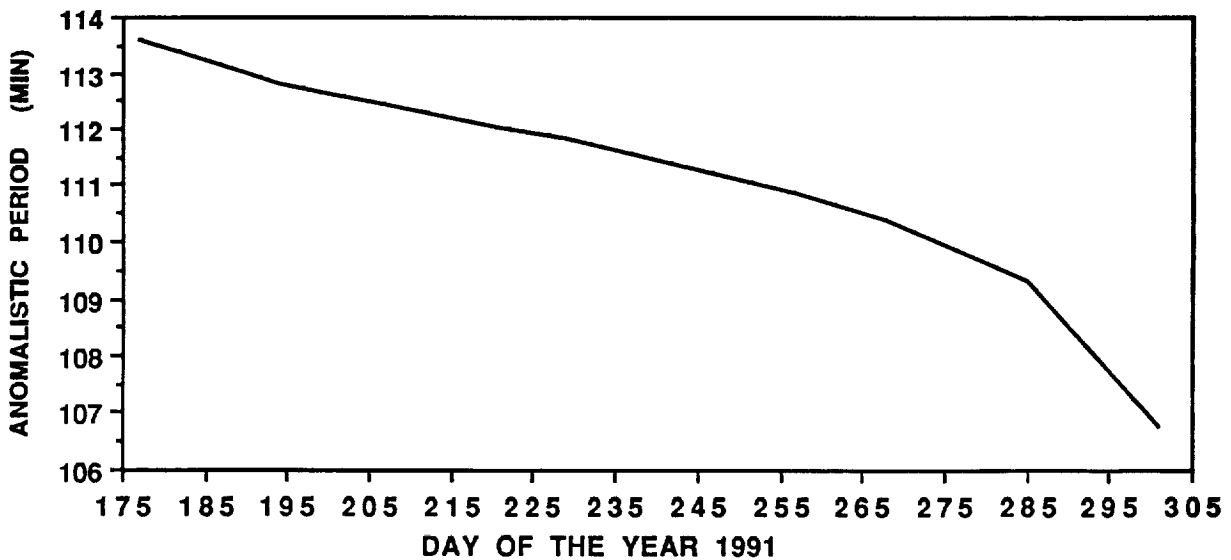
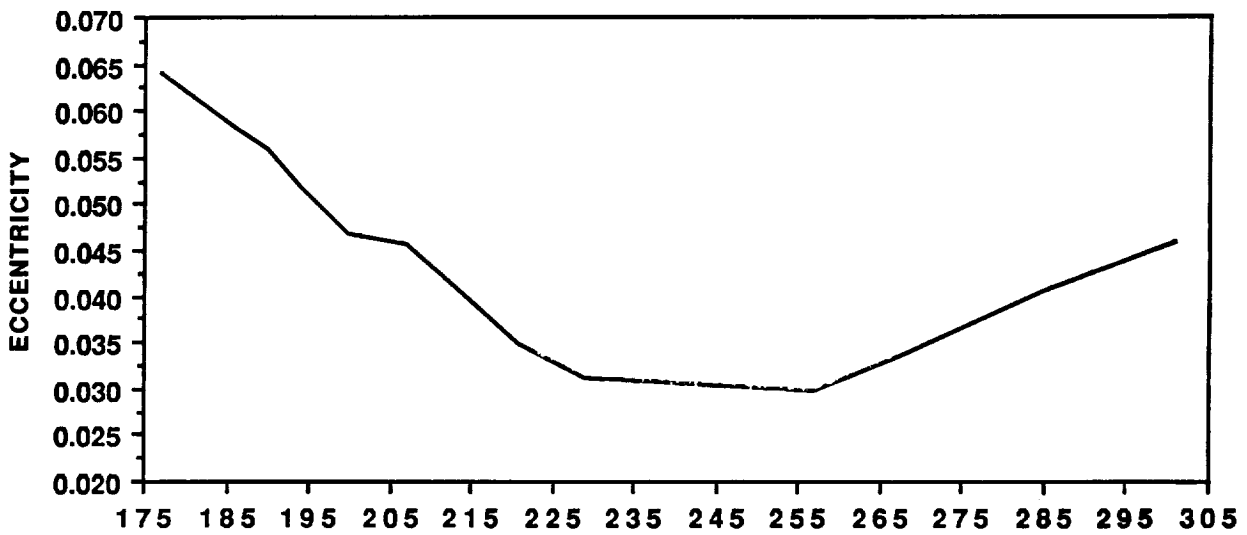
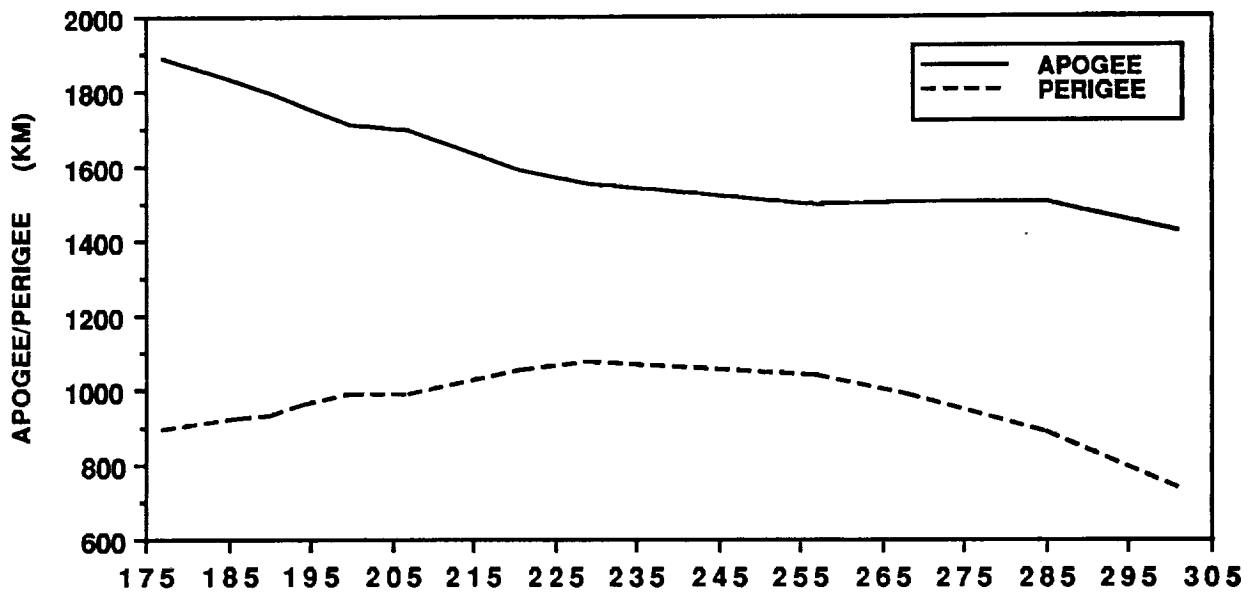


Figure 11. Satellite 21522 Historical Behavior.

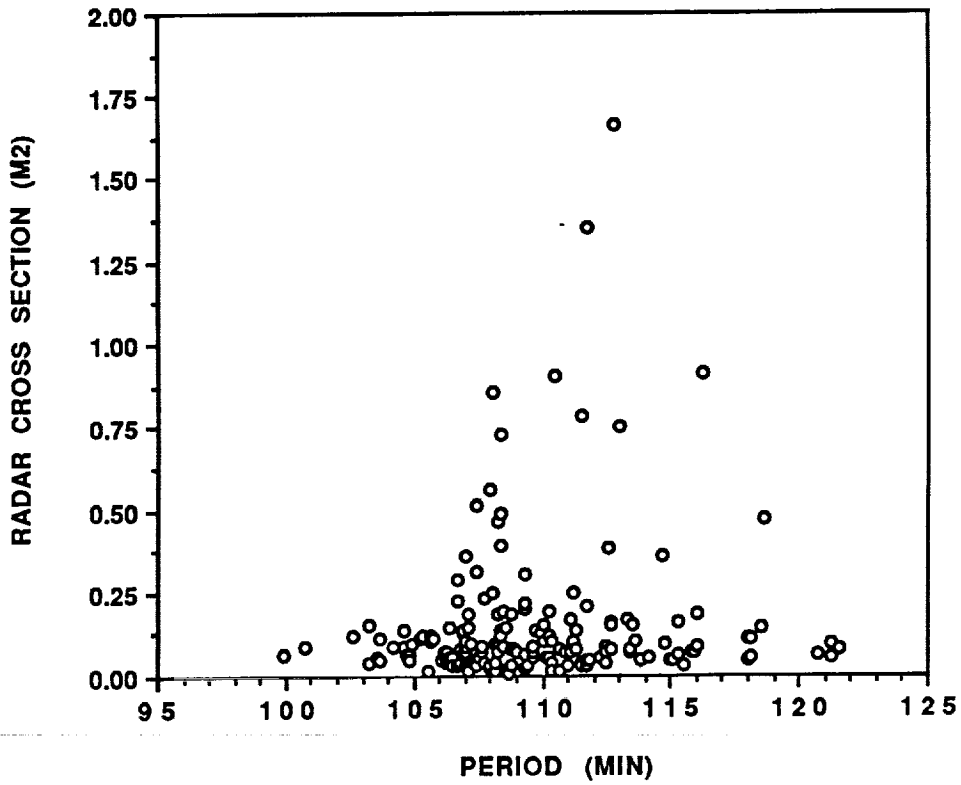
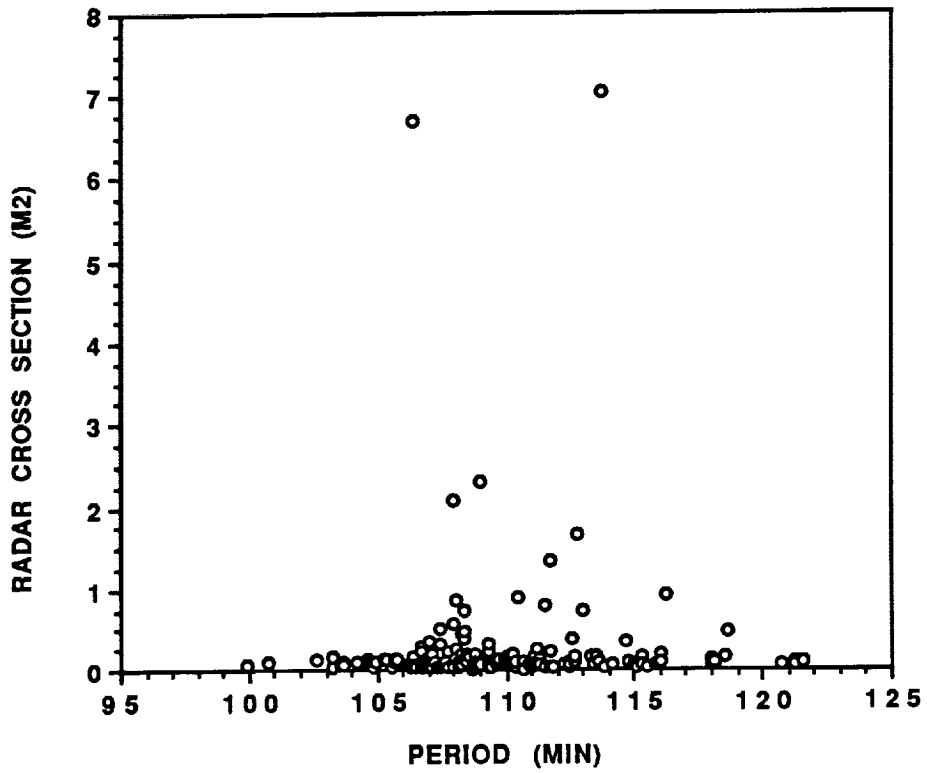


Figure 12. Nimbus 6 Radar Cross Section Plot.

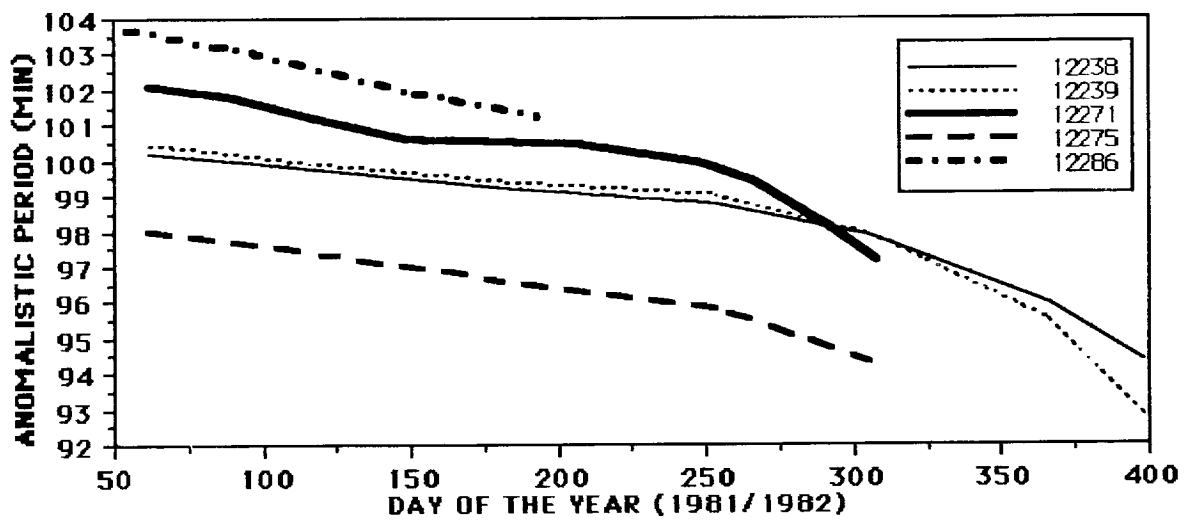
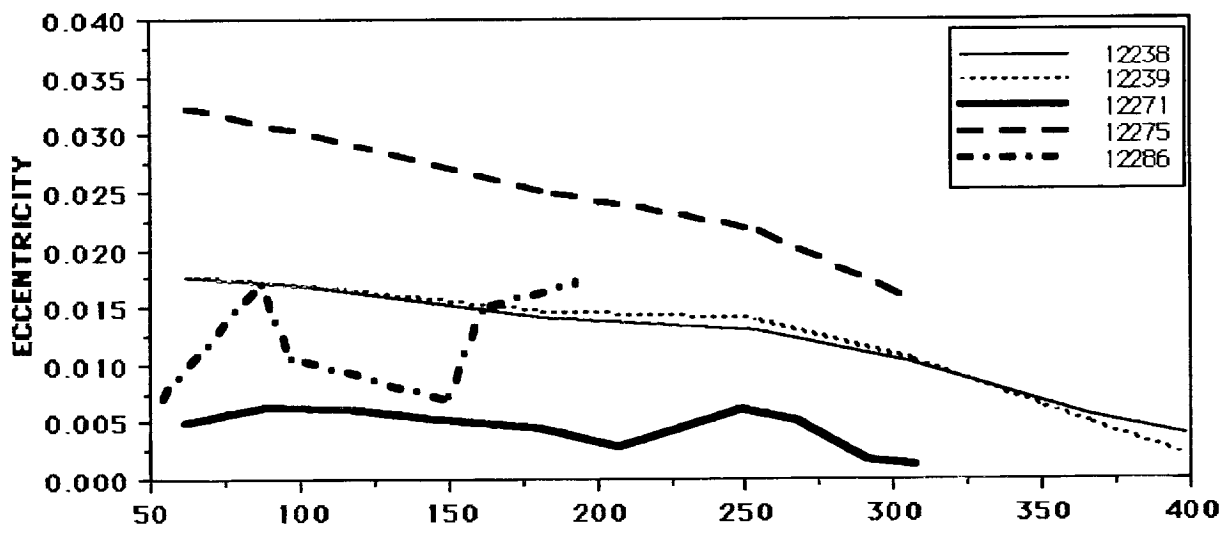
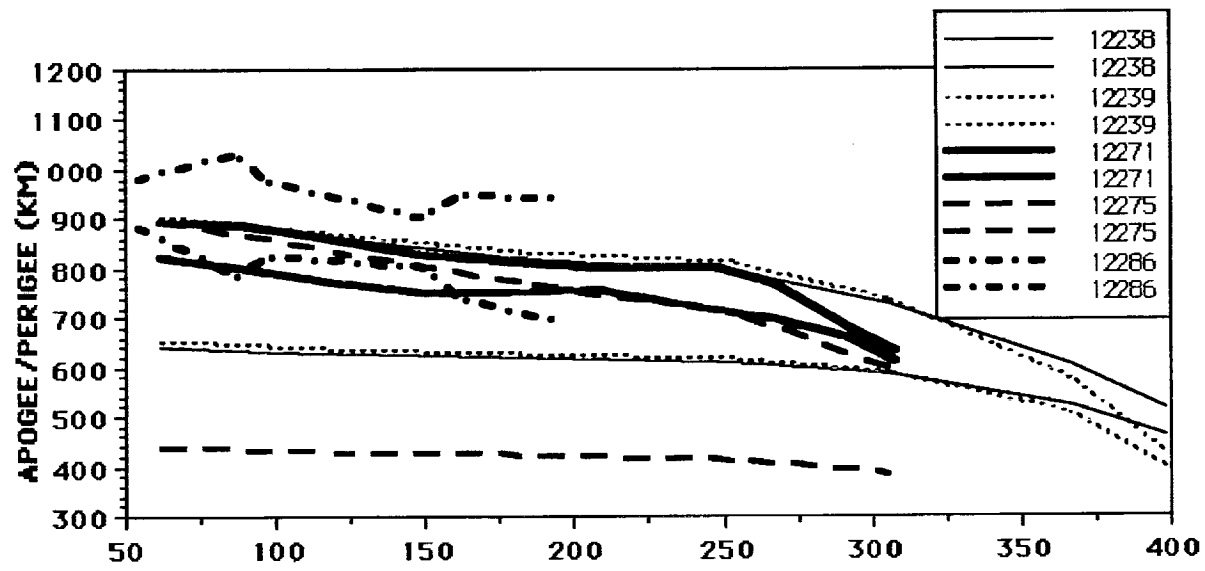
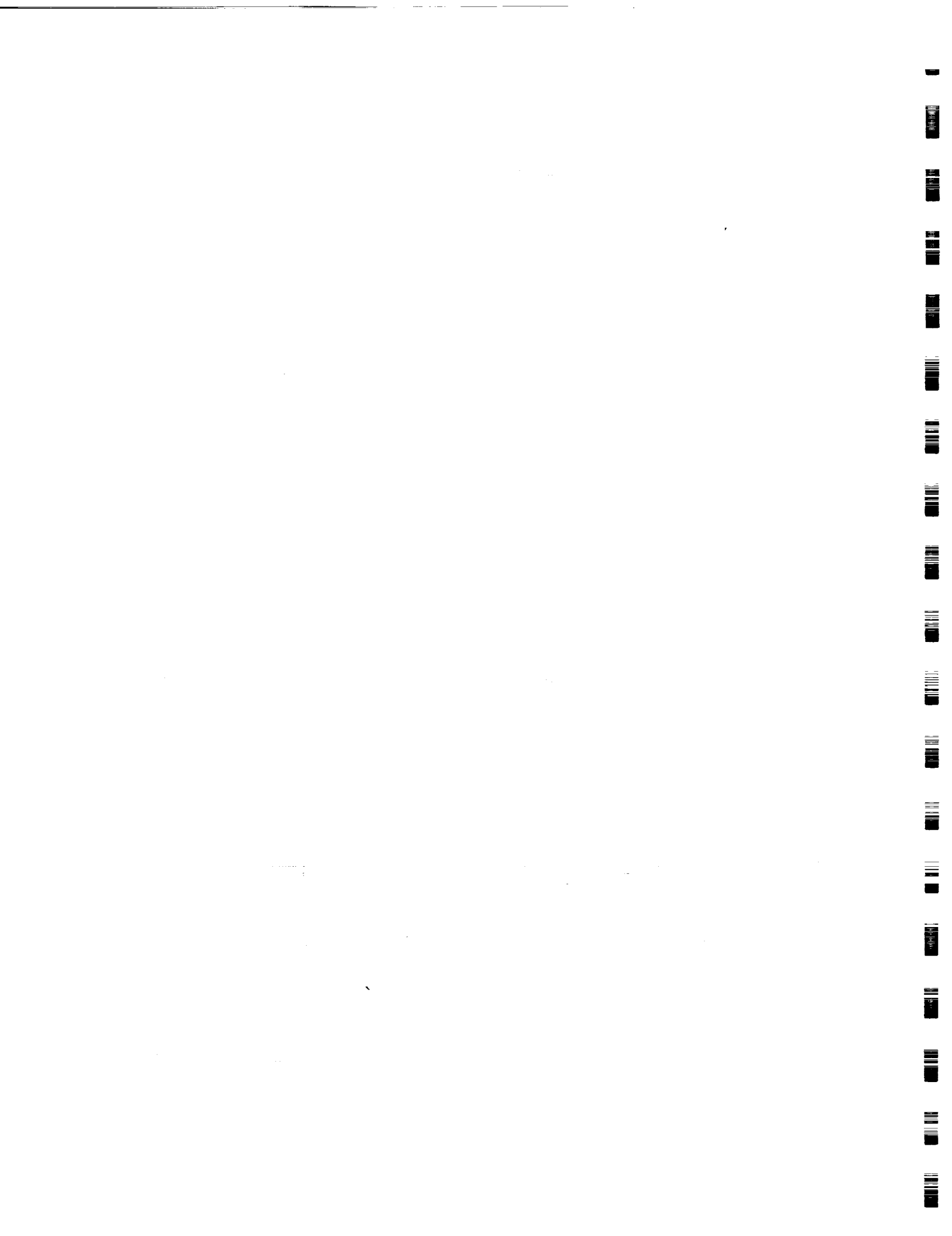


Figure 13. Selected Unusual Landsat 3 Object Histories.



spread between 104 and 115 minutes in orbital period. This distribution reflects the high delta velocities (> 500 m/s) imparted to many of the objects in the debris cloud.

Cause Assessment

This event exhibits classical Delta Rocket Body explosion characteristics accompanied by the unusual type of objects associated with the Nimbus 7 Rocket Body minor fragmentation. The high velocities imparted to some cloud members can be attributed to the high residual fuel mass left in the Nimbus 6 Rocket Body. The highest probable cause of this event is the documented Delta Second Stage failure mechanism associated with non-depleted, sun-synchronous orbit Delta Rocket Bodies since Delta 89.

A Computation of Miss Between Orbits (COMBO) analysis using the AFSPACECOM validated SATRAK astrodynamics toolbox revealed no tracked satellite approaches near the Nimbus 6 Rocket Body close to the calculated time of the fragmentation. Although a collision with untracked debris cannot be ruled out, the presence of a known fragmentation mechanism combined with an expected object distribution consistent with previous explosive events indicates a collision cause unlikely.

Long-Term Effects

The majority of this debris cloud will be long-lived in highly inclined orbits. Approximately 10% of the cloud is experiencing abnormal decay rates and should re-enter the Earth's atmosphere within 1 year of the event. Although the Nimbus 6 Rocket Body is in an altitude regime not occupied by other related Delta Second Stage events, numerous other significant breakups have occurred in this altitude regime (e.g. Transit 4A Rocket Body, OPS 7613 Rocket Body, Nimbus 4 Rocket Body, etc.). Overall, the Nimbus 6 Rocket Body fragments will simply add to the existing long-lived debris clouds previously created in highly inclined orbits.

REFERENCES

- [1] *Interavia Space Directory 1989-90*, edited by Andrew Wilson, pp. 385-8.
- [2] *A Later Look At Delta Second Stage On-Orbit Explosions*, John R. Gabbard, Teledyne Brown Engineering Technical Report CS85-BMDSC-00-24, March, 1985.
- [3] *History of On-Orbit Satellite Fragmentations, Fourth Edition*, Nicholas L. Johnson and David J. Nauer, Teledyne Brown Engineering Report CS90-TR-JSC-002, January, 1990.
- [4] Andrew Wilson, "Delta Digest", *Spaceflight*, Vol. 21, 10 October 1979, pp. 413-19.
- [5] *Interavia Space Directory 1991-2*, edited by Andrew Wilson, pp. 299-303.
- [6] *Jane's Spaceflight Directory 1986*, edited by Reginal Turnill, pp. 320-1.
- [7] *The Explosion of Satellite 10704 and Other Delta Second Stage Rockets*, John R. Gabbard, NORAD/ADCOM DCS/Plans, Technical Memorandum 81-5, May, 1981.
- [8] *Investigation of Delta Second Stage On-Orbit Explosions*, C.S. Gumpel, McDonnell Douglas Astronautics Company - West, Technical Document MDC-H0047, April, 1982.
- [9] *Nimbus 6 Delta Upper Stage Rocket Body Breakup Report*, Edna L. Jenkins and Herbert V. Reynolds, Naval Space Surveillance Center.
- [10] Memorandum from John R. Gabbard of NORAD/J5YS to Donald Kessler of NASA/SN-3, 10 June 1981.

APPENDIX 1

NAVSPASUR Breakup Analysis Message



RCV MSG #
06926

TIME
1936

RADAY
122/91

RET MSG #
00191

IMI

1SW/CC/DO/LK/CV/XR/AC/CVXC//KR//302//JPPSO//62W//OSI//2163//TA//SVC//OPR-
3SW/CC/AC/LGM/PKB/LGS/LGT/SG/RM//1003MSSQ//DA/IG/DTM/SP/SS/DE//MAS/AFSS/1.
AFCOM/AAFES/3423/DET4 AFOTEC/DET2 AFSC/DET25 SMALC/FSI/PRC/DET 1MES/18 SUP

DATUZYUW RUCKSGG5553 1221748-UUUU--RUVHEMA.

ZNR UUUUU

O 021748Z MAY 91

FM NAVSPASUR DAHLGREN VA//30//

TO RUVESLA/HQ USSPACECOM PETERSON AFB CO//J3SS//

RUCIAEA/FTD WRIGHT PATTERSON AFB OH//XOOD//

RUCEAAA/HQ USSPACECOM CHEYENNE MOUNTAIN AFB CO//J3SDS/J20//

RUWOMSB/MILL STONE HILL RADAR WESTFORD MA

RUWTBCA/NASA JOHNSON SPACE CEN HOUSTON TX//SN3//

RUDMNSC/NAVTECHINTCEN WASHINGTON DC//DA41//

RUVHEMA/PETERSON AFB CO//TELEDYNE BROWN ENGINEERING//

ZEN/COMNAVSPACECOM DAHLGREN VA//N2//

BT

UNCLAS //N03840//

FOR JOHNSON SPACE CENTER ATTN: R RAST

SUBJ: SATELLITE SUPPORT

MSGID/GENADMIN/NAVSPASUR//

RMKS/1. DATA

SUBJ: BREAKUP ANALYSIS

1. ANALYSIS OF THE BREAKUP OF SCC NO. 07946

YIELDS THE FOLLOWING TIME AND LOCATION OF BREAKUP BASED

ON ELEMENT SETS GENERATED ON 53 ASSOCIATED PIECES:

PAGE 02 RUCKSGG5553 UNCLAS

DATE/TIME	LAT(N)	LONG(W)	ALT(NM)	ST DEV(NM)
910501 85534.1	66.3	37.7	587.9	1.3

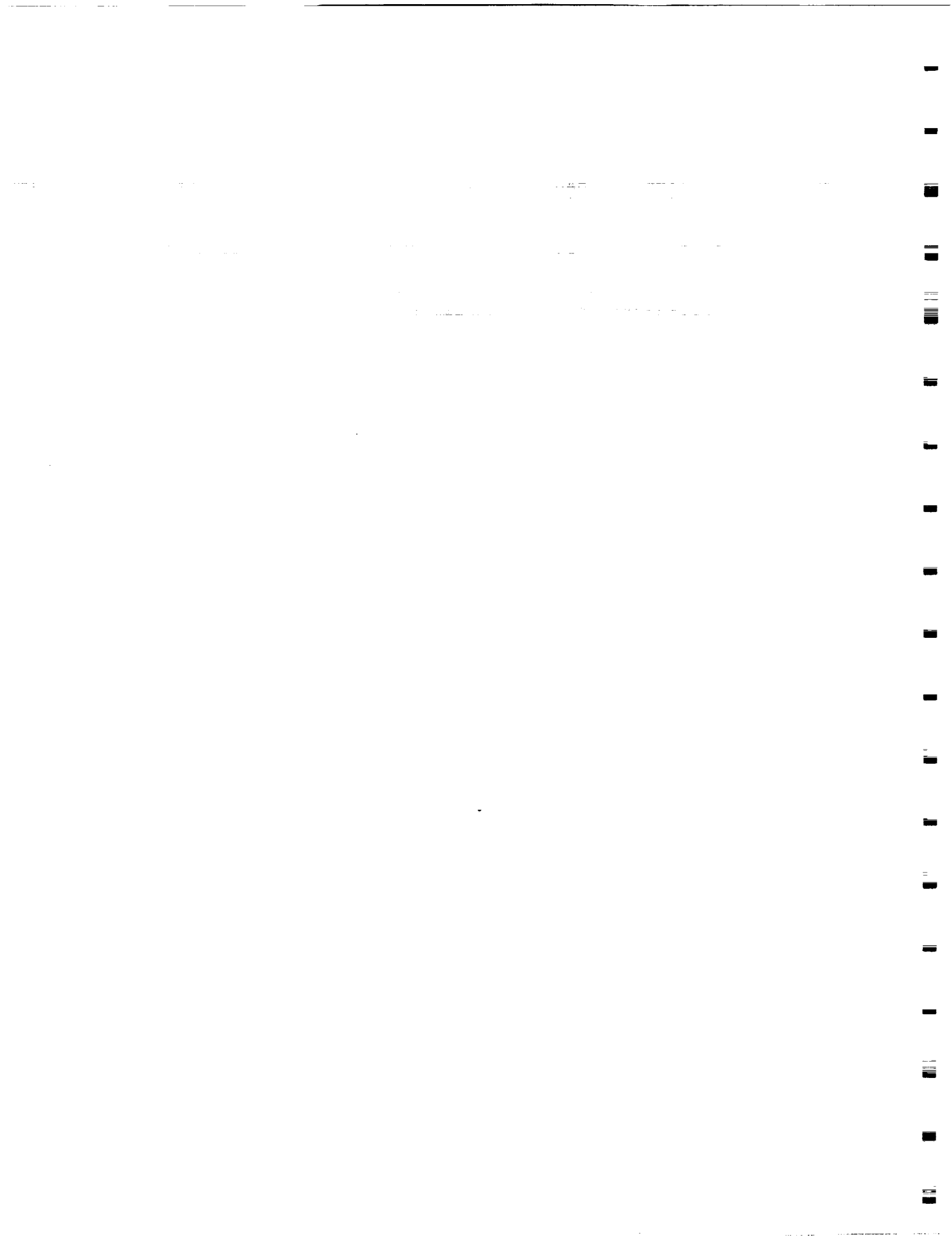
//

BT

#5553 NNNN

TBE

>



APPENDIX 2

**NAVSPASUR Generated Initial
386 Analyst Satellite Element Sets**

1970-1971

1	80001U		91122.63050210	.00011205	00000-0	99999-4	0	00024
2	80001	099.7497	339.2206 0036981	081.3400	279.2435	13.36431834778880		
1	80002U		91122.61517450	.00003776	00000-0	99999-4	0	00032
2	80002	099.4301	338.3776 0046305	244.9616	114.7239	13.52774605778868		
1	80003U		91122.60388814	.00082333	00000-0	81541-1	0	00028
2	80003	099.0278	337.3207 0257163	179.7360	180.4425	13.64813900778865		
1	80004U		91122.56220329	.00010489	00000-0	17436-1	0	00025
2	80004	099.8420	339.3880 0316220	143.6262	218.7227	13.28661475778855		
1	80005U		91122.57447402	.00277253	00000-0	99999-4	0	00021
2	80005	100.4626	340.8424 0666852	100.3135	267.4152	12.33180332778842		
1	80006U		91122.59457560	.00012922	00000-0	99999-4	0	00020
2	80006	100.2673	340.3273 0718832	090.8842	277.4971	12.12975466778841		
1	80007U		91122.57681033	.00082061	00000-0	99999-4	0	00024
2	80007	100.9047	341.9292 1031503	084.0971	287.6813	11.48574152778836		
1	80008U		91122.57222044	.00020464	00000-0	28878-1	0	00022
2	80008	099.9864	339.7640 0484606	142.6747	220.9521	13.17430822778851		
1	80009U		91122.61809959	.00012971	00000-0	99999-4	0	00023
2	80009	099.4617	338.4710 0033753	216.1098	143.8286	13.49617323000112		
1	80010U		91122.56268740	.00020305	00000-0	99999-4	0	00026
2	80010	099.6974	339.0031 0078768	082.8556	278.1988	13.28602770000104		
1	80011U		91122.63249045	.00002255	00000-0	99999-4	0	00026
2	80011	099.7411	339.1995 0046903	076.9353	283.7524	13.34339979000111		
1	80012U		91122.57357633	.00026858	00000-0	99999-4	0	00028
2	80012	099.6865	338.9643 0137080	075.3822	286.2919	13.16707336000103		
1	80013U		91122.61354647	.00018287	00000-0	99999-4	0	00023
2	80013	099.8196	339.2647 0393770	035.2782	327.4168	12.75060599000102		
1	80014U		91122.61326480	.00005141	00000-0	99999-4	0	00023
2	80014	099.4848	338.5377 0056461	253.3481	106.1982	13.54842405000116		
1	80015U		91122.50690800	.00144273	00000-0	99999-4	0	00022
2	80015	099.7524	338.9072 0631108	057.6152	308.4774	12.19214499000093		
1	80016U		91122.61429603	.00012370	00000-0	99999-4	0	00028
2	80016	099.4753	338.5084 0051787	259.6080	099.9747	13.537455040000117		
1	80017U		91122.62915949	.00000887	00000-0	99999-4	0	00027
2	80017	099.7191	339.1184 0032804	036.2768	324.1071	13.37875575000119		
1	80018U		91122.63429701	.00015374	00000-0	99999-4	0	00028
2	80018	099.7438	339.2020 0057368	080.2264	280.5854	13.32456532000117		
1	80019U		91122.59703699	.00017122	00000-0	99999-4	0	00028
2	80019	099.8323	339.3140 0263455	075.7652	287.3021	12.91711502000107		
1	80020U		91122.60014311	.00020473	00000-0	99999-4	0	00021
2	80020	099.6929	338.9460 0280040	075.8848	287.3665	12.88495818000105		
1	80021U		91122.62351277	.00000000	00000-0	99999-4	0	00023
2	80021	099.7750	339.3094 0003702	179.2127	180.9534	13.43810037000114		
1	80022U		91122.61379944	.00003942	00000-0	99999-4	0	00022
2	80022	099.6480	338.8020 0353972	078.1481	285.9536	12.74431200000116		
1	80023U		91122.63058032	.00196769	00000-0	99999-4	0	00027
2	80023	100.2591	340.3935 0470927	092.1507	273.4006	12.57616982000114		
1	80024U		91122.53800827	.00016148	00000-0	99999-4	0	00026
2	80024	099.5028	338.2218 0820409	081.4254	287.9147	11.86545692000086		
1	80025U		91122.58118816	.00009236	00000-0	99999-4	0	00022
2	80025	099.6611	338.8767 0175291	070.3909	291.6500	13.08512554000102		
1	80026U		91122.56744162	.00000000	00000-0	99999-4	0	00020
2	80026	099.6997	339.0120 0101144	069.7450	291.4981	13.23381981000101		
1	80027U		91122.59351267	.00009059	00000-0	99999-4	0	00027
2	80027	099.7287	339.0505 0241166	070.1417	292.5970	12.95439113000109		
1	80028U		91122.58312932	.00012642	00000-0	99999-4	0	00025
2	80028	099.5984	338.7169 0243076	106.3636	256.4814	13.06233185000101		
1	80029U		91122.61494708	.00003251	00000-0	99999-4	0	00028
2	80029	099.4339	338.3939 0046913	241.2847	118.4101	13.53018061000113		

1	80030U		91122.61578428	.00008539	00000-0	99999-4	0	00026
2	80030	099.4297	338.3846 0042203	245.4966	114.2296	13.52127389000113		
1	80031U		91122.62707830	.00018640	00000-0	99999-4	0	00023
2	80031	099.6721	339.0253 0020276	038.6153	321.6946	13.40083719000115		
1	80032U		91122.56231785	.00019970	00000-0	99999-4	0	00025
2	80032	099.6949	338.9964 0079579	089.1218	271.9496	13.28998537000103		
1	80033U		91122.63405205	.00007027	00000-0	99999-4	0	00024
2	80033	099.6884	339.0559 0054217	059.1613	301.5353	13.32738845000114		
1	80034U		91122.54136521	.00021095	00000-0	99999-4	0	00028
2	80034	099.5986	338.4730 0820175	074.1090	294.9082	11.83319657000092		
1	80035U		91122.55349507	.00129815	00000-0	99999-4	0	00029
2	80035	100.7257	341.5378 0920867	087.1305	283.4947	11.71030758000096		
1	80036U		91122.62795366	.00009429	00000-0	99999-4	0	00024
2	80036	100.0781	340.1028 0022435	056.9700	303.4098	13.39093795000115		
1	80037U		91122.59968661	.00014451	00000-0	99999-4	0	00022
2	80037	099.8554	339.3764 0321677	098.1362	265.6815	12.88766251000100		
1	80038U		91122.62772084	.00081416	00000-0	20111-1	0	00021
2	80038	099.5157	338.7746 0368256	236.6649	119.9226	14.18243096000111		
1	80039U		91122.61224706	.00042602	00000-0	99999-4	0	00021
2	80039	100.2903	340.5271 0347916	053.0893	310.2005	12.76193217000108		
1	80040U		91122.60761807	.00375422	00000-0	29130-1	0	00026
2	80040	099.4642	338.6690 0471856	240.4537	114.9146	14.41463024000116		
1	80041U		91122.60775253	.00040961	00000-0	52713-1	0	00027
2	80041	099.3574	338.1942 0089414	262.6271	096.5155	13.60910038000118		
1	80042U		91122.62256980	.00010534	00000-0	99999-4	0	00024
2	80042	099.8296	339.4504 0060106	160.9372	199.4550	13.44734606000111		
1	80043U		91122.59966044	.00019685	00000-0	99999-4	0	00026
2	80043	099.8756	339.4252 0275799	056.5589	306.2023	12.89106530000074		
1	80044U		91122.56093034	.00091181	00000-0	99999-4	0	00025
2	80044	099.7085	339.0401 0072673	074.9308	286.0317	13.30657125000103		
1	80045U		91122.57295436	.00009627	00000-0	99999-4	0	00021
2	80045	099.6973	338.9935 0131308	073.1169	288.4769	13.17373877000107		
1	80046U		91122.59057566	.00021413	00000-0	18211-1	0	00026
2	80046	099.7307	339.2205 0186280	227.6389	130.9306	13.79680490000112		
1	80047U		91122.61744703	.00234514	00000-0	99999-4	0	00029
2	80047	101.3322	343.1894 0862231	040.0024	326.1791	11.91980712000106		
1	80048U		91122.59312004	.00008677	00000-0	99999-4	0	00021
2	80048	099.4412	338.1545 0656827	074.7276	292.5793	12.14753619000092		
1	80049U		91122.59507756	.00030083	00000-0	27799-1	0	00024
2	80049	099.6051	338.8864 0187069	279.3702	078.6783	13.74929036000119		
1	80050U		91122.53270195	.00296344	00000-0	99999-4	0	00022
2	80050	100.3317	340.4809 0348628	054.5853	308.7699	12.77739708000080		
1	80051U		91122.62295793	.00028229	00000-0	99999-4	0	00029
2	80051	100.2175	340.3118 0439114	093.0051	272.1811	12.64991963000105		
1	80052U		91122.57491396	.00217675	00000-0	99999-4	0	00026
2	80052	100.2888	340.4048 0587080	082.1489	284.6176	12.32996006000100		
1	80053U		91122.63353517	.00000967	00000-0	99999-4	0	00020
2	80053	099.5127	338.5902 0061840	030.4894	330.0328	13.33335126000119		
1	80054U		91122.55840511	.00007858	00000-0	99999-4	0	00023
2	80054	099.7484	339.1494 0057753	093.9422	266.8784	13.33319324000103		
1	80055U		91122.56403875	.00023175	00000-0	99999-4	0	00023
2	80055	099.6073	338.7615 0082793	071.8917	289.1676	13.27149311000101		
1	80056U	75052	91123.58951482	.00140928	00000-0	99999-4	0	00024
2	80056	100.2819	341.3123 0494836	090.4286	275.3915	12.55346830000191		
1	80057U	75052	91123.11185990	.00020488	00000-0	20049-1	0	00022
2	80057	099.0156	337.7845 0220749	189.1359	170.6187	13.68890946000171		
1	80058U	75052	91123.16528975	.00000000	00000-0	99999-4	0	00023
2	80058	099.6962	339.5629 0074844	070.2169	290.7515	13.28482814000159		

1	80059U	75052	91123.66077203	.00005417	00000-0	16770-1	0	00022
2	80059	100.0376	340.7303 0569602	018.7106	343.4467	12.60105070000218		
1	80060U	75052	91123.13966027	.00008911	00000-0	22210-1	0	00025
2	80060	100.3211	341.1446 0431311	119.2540	245.2822	12.91037090000144		
1	80061U	75052	91123.12695153	.00004433	00000-0	99999-4	0	00020
2	80061	099.6173	338.9515 0811708	079.0357	290.1225	11.87392814000131		
1	80062U	75052	91123.07415871	.00000334	00000-0	99999-4	0	00028
2	80062	099.6704	339.2839 0306740	058.9681	304.1595	12.82450338000134		
1	80063U	75052	91123.12234349	.00000133	00000-0	99999-4	0	00021
2	80063	099.8255	339.8159 0203274	079.1153	283.3228	13.04047757000140		
1	80064U	75052	91123.14705269	.00012076	00000-0	13343-1	0	00023
2	80064	099.3453	338.6366 0398206	332.3868	025.7061	13.42474251000159		
1	80065U	75052	91123.09093483	.00000340	00000-0	99999-4	0	00021
2	80065	099.6709	339.2678 0370234	070.0209	294.0787	12.69966384000131		
1	80066U	75052	91123.11543061	.00001416	00000-0	99999-4	0	00022
2	80066	100.1083	340.5868 0259772	114.2033	248.6929	13.09005548000145		
1	80067U	75052	91123.08598695	.00000000	00000-0	99999-4	0	00020
2	80067	099.6874	339.4748 0061597	079.3907	281.4628	13.31545248000149		
1	80068U	75052	91123.11854683	.00005538	00000-0	99999-4	0	00028
2	80068	099.6436	339.1612 0469816	061.8418	302.9734	12.50106673000131		
1	80069U	75052	91123.09998135	.00000250	00000-0	99999-4	0	00023
2	80069	099.6864	339.4514 0121857	086.6216	274.9310	13.20813325000148		
1	80070U	75052	91123.07460215	.00000000	00000-0	99999-4	0	00029
2	80070	099.3858	338.6715 0048422	351.8490	008.2335	13.40473029000130		
1	80071U	75052	91123.11504221	.00009785	00000-0	99999-4	0	00020
2	80071	099.9055	340.0335 0213002	101.8788	260.6763	13.09399474000104		
1	80072U	75052	91123.08797910	.00000875	00000-0	99999-4	0	00027
2	80072	099.7231	339.5667 0068860	050.3516	310.4137	13.30042592000106		
1	80073U	75052	91123.11960099	.00004830	00000-0	99999-4	0	00027
2	80073	099.6910	339.1530 0765651	068.4215	299.7011	11.92479257000101		
1	80074U	75052	91123.13090605	.00006535	00000-0	89845-2	0	00028
2	80074	099.7982	339.8895 0142670	311.1283	047.8056	13.54404161000086		
1	80075U	75052	91123.58424072	.00000667	00000-0	99999-4	0	00020
2	80075	099.4474	339.3383 0073522	171.3602	188.9321	13.48109857000176		
1	80076U	75052	91123.12033014	.00000596	00000-0	99999-4	0	00024
2	80076	099.4359	338.6108 0475587	062.7082	302.2034	12.48842552000108		
1	80077U	75052	91123.09383746	.00032548	00000-0	20440-1	0	00025
2	80077	099.0523	337.9089 0308620	292.7091	064.2145	13.83563499000115		
1	80078U	75052	91123.07724295	.00000404	00000-0	99999-4	0	00027
2	80078	099.7120	339.5507 0026556	050.6512	309.7446	13.38341140000100		
1	80079U	75052	91123.08748028	.00004581	00000-0	99999-4	0	00028
2	80079	099.7414	339.6134 0071267	088.8236	272.1530	13.30380059000111		
1	80080U	75052	91123.58895365	.00232305	00000-0	99999-4	0	00029
2	80080	100.3074	341.2300 0738870	087.3489	281.2236	12.11020990000197		
1	80081U	75052	91123.10869263	.00021810	00000-0	19111-1	0	00028
2	80081	098.9648	337.6553 0260089	186.6565	173.1549	13.71336293000140		
1	80082U	75052	91123.14256123	.00004848	00000-0	99999-4	0	00026
2	80082	099.6567	339.3335 0272991	071.7415	291.3657	12.89294929000082		
1	80083U	75052	91123.12955305	.00001676	00000-0	99999-4	0	00028
2	80083	099.6198	339.2453 0264010	097.0658	266.1016	12.98669068000119		
1	80084U	75052	91123.10500573	.00308871	00000-0	99999-4	0	00027
2	80084	100.5619	341.7018 0492183	032.0136	331.0303	12.60457858000100		
1	80085U	75052	91123.14862422	.00007230	00000-0	88951-2	0	00025
2	80085	099.7262	339.6681 0366600	153.6514	208.4234	13.40494403000117		
1	80086U	75052	91123.16674775	.00000097	00000-0	99999-4	0	00021
2	80086	099.6873	339.5399 0082294	076.6370	284.4421	13.27402492000112		
1	80087U	75052	91123.09128344	.00001403	00000-0	99999-4	0	00021
2	80087	099.6818	339.3010 0370243	059.1742	304.5672	12.69779210000104		
1	80088U	75052	91123.16097946	.00006406	00000-0	17057-1	0	00023
2	80088	099.4425	338.7357 0514902	012.6103	348.7769	12.76545129000117		

1	80089U	75052	91123.12404294	.00011323	00000-0	14734-1	0	00021
2	80089	099.2367	338.3615 0107428	201.2550	158.4560	13.59520663000086		
1	80090U	75052	91123.15026443	.00001582	00000-0	99999-4	0	00027
2	80090	099.7098	339.6165 0022329	095.2654	265.1537	13.39623852000116		
1	80091U	75052	91123.11375919	-.00000131	00000-0	00000+0	0	00029
2	80091	099.7732	339.8326 0134022	215.5097	143.7518	13.67429230000110		
1	80092U	75052	91123.11035363	.00001605	00000-0	99999-4	0	00022
2	80092	099.7119	339.4929 0153921	073.6476	288.1975	13.13013472000140		
1	80093U	75052	91123.07056146	.00008028	00000-0	12952-1	0	00027
2	80093	099.0198	337.6842 0155130	332.3303	027.0062	13.43792806000104		
1	80094U	75052	91123.11162947	.00227360	00000-0	99999-4	0	00021
2	80094	100.2553	340.7994 0503629	091.5765	274.3466	12.55142356000144		
1	80095U	75052	91123.09834847	.00005251	00000-0	99999-4	0	00027
2	80095	099.1389	337.9740 0105648	057.8536	303.3266	13.22164961000079		
1	80096U	75052	91123.58958231	.00249127	00000-0	99999-4	0	00028
2	80096	100.2357	341.0178 0743384	091.0012	277.6613	12.10624746000127		
1	80097U	75052	91123.10996348	.00151361	00000-0	99999-4	0	00020
2	80097	100.6055	341.8003 0529590	031.4914	331.7186	12.56652798000071		
1	80098U	75052	91123.05887965	.00001520	00000-0	99999-4	0	00020
2	80098	099.4049	338.7410 0046011	246.0593	113.6213	13.52825112000107		
1	80099U	75052	91123.52003568	.00000815	00000-0	56177-3	0	00028
2	80099	100.0346	341.0572 0221470	249.1788	108.5946	13.88202208000130		
1	80100U	75052	91123.57762380	.00022712	00000-0	99999-4	0	00020
2	80100	100.2578	341.1125 0698871	089.2919	278.8490	12.16669614000165		
1	80101U	75052	91123.58188467	.00002058	00000-0	99999-4	0	00021
2	80101	099.1385	338.3481 0195303	067.9177	294.3017	13.04589739000167		
1	80102U	75052	91123.10270786	.00096479	00000-0	99999-4	0	00026
2	80102	100.7835	341.9874 1024197	077.9783	293.4341	11.46597824000067		
1	80103U	75052	91123.57507734	.00153872	00000-0	99999-4	0	00025
2	80103	100.2713	341.2805 0463305	094.9558	270.4988	12.63534615000174		
1	80104U	75052	91123.53766769	-.00000124	00000-0	99999-4	0	00029
2	80104	099.5317	339.1680 0526391	067.9316	297.7189	12.39172122000167		
1	80105U	75052	91123.13902517	.00009273	00000-0	99999-4	0	00022
2	80105	099.4319	338.8711 0023063	238.9180	121.0209	13.48128957000088		
1	80106U	75052	91123.57267282	.00002010	00000-0	99999-4	0	00026
2	80106	099.5524	339.1986 0661600	083.9507	283.6886	12.19446143000153		
1	80107U	75052	91123.58213166	.00000000	00000-0	99999-4	0	00027
2	80107	099.3638	338.9533 0198230	052.6163	309.3286	13.04465389000134		
1	80108U	75052	91123.08920313	.00052945	00000-0	99999-4	0	00027
2	80108	100.5380	341.3321 1050989	092.4594	279.7286	11.55243301000060		
1	80109U	75052	91123.56047293	-.00003772	00000-0	99999-4	0	00023
2	80109	099.6227	339.6929 0131025	065.8234	295.6982	13.17243972000130		
1	80110U	75052	91123.16678211	.00201019	00000-0	99999-4	0	00024
2	80110	100.2334	340.8705 0431912	095.3201	269.7765	12.72170987000110		
1	80111U	75052	91123.56429107	.00011714	00000-0	15201-1	0	00029
2	80111	099.2617	338.8742 0090071	219.2176	140.2846	13.60373415000140		
1	80112U	75052	91123.53730395	-.00000526	00000-0	99999-4	0	00020
2	80112	099.7790	340.1487 0063466	079.9741	280.9002	13.31237256000165		
1	80113U	75052	91123.51829140	-.00000006	00000-0	99999-4	0	00029
2	80113	099.6889	339.7581 0234193	062.2627	300.2457	12.96648841000120		
1	80114U	75052	91123.03072421	.00000000	00000-0	99999-4	0	00022
2	80114	099.7298	339.3471 0509090	096.3125	269.6575	12.55624403000067		
1	80115U		91123.52691973	.00001040	00000-0	99999-4	0	00022
2	80115	099.6529	339.6504 0261770	069.4074	293.5333	12.91466593000161		
1	80116U	75052	91123.55253377	.00333050	00000-0	99999-4	0	00026
2	80116	100.3294	341.4671 0353379	045.8257	317.1740	12.77154724000164		
1	80117U	75052	91123.61364788	.00000000	00000-0	99999-4	0	00029
2	80117	099.7130	340.0282 0066103	074.3461	286.5450	13.30545487000143		

1	80118U	75052	91124.58095145	.00004872	00000-0	53915-2	0	00022
2	80118	099.7011	341.0990 0167368	288.4364	069.9088	13.65924373000215		
1	80119U	75052	91124.59151922	.00042724	00000-0	99999-4	0	00022
2	80119	101.1816	344.2572 1019069	057.7731	311.8347	11.44777030000249		
1	80120U	75052	91123.12975923	.00048033	00000-0	14878-1	0	00026
2	80120	099.5823	339.4745 0348276	227.2800	129.9009	14.11642024000112		
1	80121U	75052	91124.58739889	.00150682	00000-0	99999-4	0	00021
2	80121	099.8281	341.6999 0628336	082.5103	284.7273	12.39544254000326		
1	80122U	75052	91124.09625919	.00131713	00000-0	61875+0	0	00027
2	80122	100.5266	342.0907 1016651	096.8664	274.9362	11.69047457000152		
1	80123U	75052	91124.49113778	.00210292	00000-0	99999-4	0	00020
2	80123	100.3175	342.1919 0325331	048.7686	314.1387	12.77841079000258		
1	80124U	75052	91124.12064135	.00167981	00000-0	99999-4	0	00029
2	80124	100.2408	341.7006 0476751	094.4146	271.1980	12.67908644000107		
1	80125U	75052	91124.17897024	.00342374	00000-0	99999-4	0	00027
2	80125	100.2870	341.9706 0389325	057.2718	306.5751	12.77377359000149		
1	80126U	75052	91124.14174666	.00022423	00000-0	99999-4	0	00025
2	80126	100.2665	341.7256 0449089	086.5249	278.7513	12.57798885000143		
1	80127U	75052	91124.17130087	.00141585	00000-0	99999-4	0	00029
2	80127	100.4222	342.1648 0470827	066.3053	298.7133	12.44906176000115		
1	80128U	75052	91124.06324465	.00001194	00000-0	99999-4	0	00024
2	80128	099.7413	340.5390 0061059	068.6956	292.1145	13.31323011000045		
1	80130U	75052	91124.62255346	.00068703	00000-0	99999-4	0	00029
2	80130	100.3432	342.9988 0543527	027.9575	335.0065	12.56806654000107		
1	80131U	75052	91124.61558415	.00000000	00000-0	99999-4	0	00028
2	80131	100.5510	343.0574 0534788	046.3856	318.0771	12.59812332000104		
1	80132U	75052	91124.55871934	.00009778	00000-0	99999-4	0	00027
2	80132	099.7485	340.5139 0633553	054.3615	311.5171	12.19006139000126		
1	80133U	75052	91124.62512369	.00020361	00000-0	99999-4	0	00021
2	80133	100.5936	343.1600 0555782	032.3020	331.1305	12.55897344000114		
1	80134U	75052	91124.60859373	.00118715	00000-0	27268+0	0	00025
2	80134	100.2264	342.1542 0672467	081.2526	286.4550	12.62979088000046		
1	80135U	75052	91124.61801992	.00206190	00000-0	99999-4	0	00021
2	80135	100.2594	342.0098 0697345	085.6852	282.3927	12.28053165000077		
1	80136U	75052	91124.58531797	.00001281	00000-0	99999-4	0	00026
2	80136	099.5532	340.2090 0382688	079.7270	284.7172	12.70877382000239		
1	80137U	75052	91124.60945100	.00000335	00000-0	99999-4	0	00025
2	80137	099.8461	341.3170 0125010	096.7400	264.8458	13.23025928000149		
1	80138U	75052	91124.59963039	.00000050	00000-0	99999-4	0	00020
2	80138	099.7653	341.0972 0081779	063.2840	297.7118	13.27074886000148		
1	80139U	75052	91124.14223603	.00256709	00000-0	99999-4	0	00021
2	80139	100.1462	341.2641 0677245	087.4550	280.4214	12.22163917000104		
1	80140U	75052	91125.14305043	.00184612	00000-0	99999-4	0	00026
2	80140	101.3072	344.7963 1196409	062.7815	309.0318	11.10654353000232		
1	80141U	75052	91124.58477492	.00203034	00000-0	99999-4	0	00022
2	80141	100.8231	343.4282 0674569	060.5930	306.1134	12.09688159000240		
1	80142U	75052	91125.59616988	.00187903	00000-0	99999-4	0	00026
2	80142	100.3963	342.8993 0917544	088.2776	282.3360	11.80853635000278		
1	80143U	75052	91124.59002894	.00219626	00000-0	99999-4	0	00029
2	80143	100.3910	342.4900 0367816	053.2915	310.1816	12.69790097000167		
1	80144U	75052	91125.09946298	.00237602	00000-0	11275+1	0	00022
2	80144	101.0595	344.5002 0958809	037.9244	328.5988	11.77489247000234		
1	80145U	75052	91125.58378995	.00171244	00000-0	99999-4	0	00022
2	80145	100.5600	343.3196 0525412	094.1087	272.0612	12.55314572000295		
1	80146U	75052	91125.56230409	.00003716	00000-0	99999-4	0	00026
2	80146	099.7517	341.9932 0063490	052.0122	308.7190	13.32598109000205		
1	80147U	75052	91125.55913920	.00273346	00000-0	99999-4	0	00020
2	80147	100.2260	342.5520 0751225	085.8315	282.8540	12.15472462000155		

1	80148U	75052	91125.62671967	.00146165	00000-0	41618+0	0	00029
2	80148	100.2421	342.9167 0562517	102.3659	264.1452	12.66144437000177		
1	80149U	75052	91125.07359488	.00254823	00000-0	66684+0	0	00021
2	80149	100.2134	342.4360 0599592	104.1578	262.7375	12.66073477000096		
1	80150U	75052	91125.57338416	.00073250	00000-0	19399+0	0	00020
2	80150	100.4456	343.6752 0646846	045.6222	319.6438	12.58609120000166		
1	80151U	75052	91125.09364522	.00058160	00000-0	21539+0	0	00027
2	80151	100.5649	343.5284 0691410	054.2313	312.1470	12.32259909000077		
1	80152U	75052	91125.57526048	.00105959	00000-0	40570+0	0	00029
2	80152	100.2045	342.4543 0827886	080.8281	288.5833	12.10123794000109		
1	80153U	75052	91126.56639710	.00273445	00000-0	99999-4	0	00021
2	80153	100.3150	343.5920 0744150	079.5778	288.8591	12.11329659000289		
1	80154U	75052	91125.58979113	.00209539	00000-0	99999-4	0	00020
2	80154	100.8046	344.7184 0415930	030.5072	331.9967	12.77535257000102		
1	80155U	75052	91126.15722281	.00235200	00000-0	68685+0	0	00024
2	80155	100.3732	343.7846 0794042	068.4284	300.0004	12.30884432000237		
1	80156U	75052	91124.56738293	.00028005	00000-0	79396-1	0	00024
2	80156	100.2414	342.2177 0463508	053.3508	310.9698	12.79156135*****6		
1	80157U	75052	91126.56415145	.00335666	00000-0	12989+1	0	00023
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1	80158U	75052	91125.55210614	.00001848	00000-0	37931-2	0	00024
2	80158	099.9425	342.4170 0351973	353.5129	006.1933	13.12056126000165		
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2	80159	101.2546	345.4659 0821491	111.3834	257.7284	12.21347616000150		
1	80160U	75052	91124.45881961	-.00000102	00000-0	99999-4	0	00010
2	80160	099.5925	340.3000 0342912	101.5079	262.5164	12.90419141000008		
1	80161U	75052	91124.79699758	.00000008	00000-0	99999-4	0	00013
2	80161	099.8013	341.1270 0347495	085.1159	279.0042	12.79912578000002		
1	80162U	75052	91124.33170458	.00000453	00000-0	99999-4	0	00019
2	80162	099.8007	340.5702 0557874	033.6021	329.9630	12.44862358000009		
1	80163U	75052	91124.84358555	.00000413	00000-0	11199-2	0	00012
2	80163	099.5507	340.3821 0609088	111.3963	255.3638	12.62664091000000		
1	80164U	75052	91125.02893270	.00000418	00000-0	99999-4	0	00013
2	80164	099.7454	341.3302 0177753	064.2120	297.7661	13.08137667000000		
1	80165U	75052	91124.98480513	.00000329	00000-0	99999-4	0	00011
2	80165	099.7803	341.0276 0565818	034.8354	328.8838	12.41355245000003		
1	80166U	75052	91124.27594872	-.00001966	00000-0	99999-4	0	00017
2	80166	099.8005	340.9377 0054513	114.4925	246.2449	13.37114000000002		
1	80167U	75052	91124.04540650	.00005944	00000-0	99999-4	0	00017
2	80167	099.7351	340.3856 0205137	068.9496	293.3863	13.02918951000000		
1	80168U	75052	91124.33395500	.00000415	00000-0	99999-4	0	00010
2	80168	099.7834	340.5196 0560476	034.1863	329.4473	12.43919307000007		
1	80169U	75052	91124.25253542	.00000717	00000-0	99999-4	0	00016
2	80169	099.6290	340.3224 0151689	055.7640	305.8267	13.13400064000009		
1	80170U	75052	91124.35339932	.00001777	00000-0	99999-4	0	00014
2	80170	099.7375	340.8281 0039161	072.2146	288.3779	13.35975680000007		
1	80171U	75052	91124.29989386	.00000907	00000-0	99999-4	0	00016
2	80171	099.6368	340.4491 0091300	079.2880	281.9044	13.26250453000001		
1	80172U	75052	91124.09250002	.00000907	00000-0	99999-4	0	00011
2	80172	099.6356	340.2129 0202418	011.7412	348.8800	13.17175306000007		
1	80173U	75052	91124.34561763	.00001041	00000-0	99999-4	0	00019
2	80173	099.6037	340.3012 0190380	069.9717	292.2286	13.05941772000008		
1	80174U	75052	91124.08373862	.00000812	00000-0	11049-2	0	00015
2	80174	099.7050	340.5806 0074893	221.0314	138.5606	13.58031065000003		
1	80175U	75052	91124.36267084	.00000658	00000-0	99999-4	0	00015
2	80175	099.7561	340.8693 0060504	073.3967	287.4313	13.31843137000005		
1	80176U	75052	91124.38580771	.00000134	00000-0	99999-4	0	00018
2	80176	099.6926	340.6621 0110155	056.8341	304.3788	13.21672360000001		

1	80177U	75052	91124.35635547	.00000158	00000-0	99999-4	0	00014
2	80177	099.6789	340.5007 0246350	092.8181	270.1644	13.01201294000008		
1	80178U	75052	91124.55435380	.00000200	00000-0	26056-3	0	00011
2	80178	100.0623	342.0062 0288883	326.8332	031.5397	13.46017083000000		
1	80179U	75052	91124.35448619	.00000570	00000-0	99999-4	0	00016
2	80179	099.8904	340.9473 0486378	020.5626	341.4798	12.68823494000006		
1	80180U	75052	91124.28996356	.00000576	00000-0	99999-4	0	00012
2	80180	099.9117	341.0721 0246097	079.0537	283.8659	12.96557423000007		
1	80181U	75052	91124.29065372	.00000842	00000-0	99999-4	0	00015
2	80181	099.4914	339.8980 0340491	108.7510	255.1369	12.96180559000006		
1	80182U	75052	91124.07586780	.00001005	00000-0	33008-2	0	00012
2	80182	099.7526	340.2579 0608386	105.1199	261.8370	12.51233291000002		
1	80183U	75052	91124.32273202	.00000840	00000-0	12248-2	0	00012
2	80183	100.0650	341.7986 0162038	162.3395	198.3951	13.49695927000002		
1	80184U	75052	91124.81926740	.00000842	00000-0	99999-4	0	00011
2	80184	099.7742	341.3415 0075985	037.3934	323.2970	13.29602609000009		
1	80185U	75052	91125.59428860	.00010048	00000-0	27531-1	0	00028
2	80185	099.3212	340.4087 0512040	108.9411	256.8308	12.751694230000329		
1	80186U	75052	91126.57149314	.00070099	00000-0	11540+0	0	00025
2	80186	099.9941	344.4719 0597822	047.9618	317.1236	12.92620105000074		
1	80187U	75052	91125.65061602	.00152759	00000-0	58089+0	0	00020
2	80187	100.2811	342.8006 0815806	087.8094	281.6567	12.12356849000046		
1	80188U	75052	91126.61781026	.00172611	00000-0	99999-4	0	00026
2	80188	100.2584	343.8248 0557611	085.9488	280.5541	12.56112263000134		
1	80189U	75052	91126.60020355	.00176699	00000-0	56995+0	0	00021
2	80189	100.5458	344.8497 0546736	046.0973	318.4406	12.60595093000107		
1	80190U	75052	91126.58945023	.00241278	00000-0	99999-4	0	00020
2	80190	100.5325	344.7874 0512171	028.6745	334.1947	12.63487483000199		
1	80191U	75052	91126.59934215	.00040896	00000-0	99999-4	0	00026
2	80191	101.3263	346.2045 1145516	050.5646	319.1590	11.26271655000408		
1	80192U	75052	91126.55134365	.00112644	00000-0	99999-4	0	00022
2	80192	100.3013	343.8092 0603520	079.4699	287.4140	12.33374114000251		
1	80193U	75052	91125.00619673	.00005542	00000-0	99999-4	0	00021
2	80193	099.6347	340.1879 1003343	047.9434	320.3020	11.51746554000197		
1	80194U	75052	91125.52202010	.00004409	00000-0	99999-4	0	00011
2	80194	099.5750	340.6509 0726045	065.3696	302.1577	12.01219401000157		
1	80195U	75052	91125.10968380	.00002014	00000-0	99999-4	0	00015
2	80195	099.5054	340.6977 0261789	106.0864	256.9705	13.06594599000208		
1	80196U	75052	91125.08703357	.00000934	00000-0	99999-4	0	00014
2	80196	099.6407	340.9605 0305636	085.2523	278.3851	12.87693840000208		
1	80197U	75052	91125.54920963	.00000688	00000-0	99999-4	0	00016
2	80197	099.6563	341.4328 0271858	066.8189	296.1741	12.88951872000235		
1	80198U	75052	91126.06216216	.00002668	00000-0	99999-4	0	00025
2	80198	099.6413	342.0511 0234791	116.1232	246.4704	13.18513924000327		
1	80199U	75052	91125.56255284	.00000792	00000-0	99999-4	0	00012
2	80199	099.5842	341.3818 0187493	063.9575	298.1168	13.08706513000235		
1	80200U	75052	91126.57329793	.00005391	00000-0	99999-4	0	00014
2	80200	099.5582	341.7025 0534607	083.2600	282.9408	12.46825291000289		
1	80201U	75052	91127.07760898	.00000348	00000-0	99999-4	0	00013
2	80201	099.5128	341.9261 0517361	047.1853	317.1946	12.41883612000382		
1	80202U	75052	91126.60422440	.00003920	00000-0	40403-2	0	00013
2	80202	099.6110	342.6330 0336509	154.6784	207.1731	13.53947653000346		
1	80203U	75052	91125.06772358	.00176743	00000-0	99999-4	0	00020
2	80203	100.6462	343.6376 0555872	038.7280	325.2721	12.41179168000255		
1	80204U	75052	91126.16414697	.00008507	00000-0	65416-2	0	00018
2	80204	099.9998	343.6749 0300311	294.5485	062.5100	13.74018372000291		
1	80205U	75052	91125.07228429	.00001305	00000-0	12860-2	0	00018
2	80205	099.8927	342.2008 0152192	228.3642	130.4822	13.73716303000214		

1	80206U	75052	91126.57736964	.00009598	00000-0	44988-2	0	00011
2	80206	099.5463	342.9327 0297690	256.2176	100.6142	13.9944	1423000459	
1	80207U	75052	91125.06771662	.00151377	00000-0	99999-4	0	00027
2	80207	100.6446	343.6350 0550593	039.1523	324.8484	12.4114	4379000193	
1	80208U	75052	91126.55217612	.00160951	00000-0	99999-4	0	00010
2	80208	101.1005	345.2069 1356759	035.3161	333.0853	10.9866	66933000334	
1	80209U	75052	91126.55579560	.00006693	00000-0	99999-4	0	00016
2	80209	099.6049	342.4500 0092896	091.6177	269.6060	13.2810	8033000290	
1	80210U	75052	91125.54534270	.00001209	00000-0	99999-4	0	00013
2	80210	099.5276	340.6199 0640142	049.8303	315.7435	12.1848	84897000221	
1	80211U	75052	91125.58725246	.00001669	00000-0	99999-4	0	00013
2	80211	100.0006	342.3896 0344255	076.0811	287.8761	12.7732	3883000229	
1	80212U	75052	91126.58683265	.00014705	00000-0	17356-1	0	00018
2	80212	100.0522	343.8040 0532683	136.5101	227.9761	13.2013	1289000397	
1	80213U	75052	91125.52964542	.00023432	00000-0	99999-4	0	00015
2	80213	100.8617	343.7782 1259923	049.8719	320.6338	11.0319	3153000026	
1	80214U	75052	91127.57160398	.00002797	00000-0	99999-4	0	00022
2	80214	099.6842	343.4161 0198561	057.7998	304.2657	13.0419	8339000392	
1	80215U	75052	91125.53007705	.00246564	00000-0	62831+0	0	00021
2	80215	100.5597	343.9326 0731721	046.4234	319.5742	12.4814	49834000408	
1	80216U	75052	91126.04523148	.00281003	00000-0	81185+0	0	00023
2	80216	101.1064	345.9467 0880461	041.5162	324.9948	12.1789	7828000356	
1	80217U	75052	91127.07530638	.00225637	00000-0	99999-4	0	00028
2	80217	100.4417	344.4889 0780464	080.6969	288.1786	12.0851	8162000604	
1	80218U	75052	91126.16100455	.01465506	00000-0	43894-1	0	00020
2	80218	100.1845	345.0417 0483546	236.3155	119.0728	14.6482	0657000448	
1	80219U	75052	91126.57388958	.01250928	00000-0	29112-1	0	00029
2	80219	100.1613	345.4540 0512667	255.1800	099.1802	14.6466	7860000789	
1	80220U	75052	91123.49131738	.01451882	00000-0	51531-1	0	00012
2	80220	100.3772	342.2533 0501069	231.0589	124.4543	14.5716	5338000056	
1	80221U	75052	91125.46268352	.02346400	00000-0	64746-1	0	00017
2	80221	100.2762	344.2367 0575633	284.6701	069.0419	14.4783	0883000059	
1	80222U	75052	91126.58884239	.00778329	00000-0	96299-1	0	00026
2	80222	100.3456	345.8225 0404949	225.9577	130.7787	14.3845	2083000406	
1	80223U	75052	91126.59696281	.00549495	00000-0	76837-1	0	00022
2	80223	100.2959	345.6241 0398622	232.8997	123.5401	14.3521	5695000634	
1	80224U	75052	91126.16656444	.00001073	00000-0	13666-2	0	00020
2	80224	100.0061	343.5097 0235668	159.0100	202.1368	13.5231	6609000304	
1	80225U	75052	91125.61208604	.00243389	00000-0	99999-4	0	00024
2	80225	100.3807	343.4676 0441957	047.8270	315.9932	12.7077	8125000494	
1	80226U	75052	91125.58403138	.00304612	00000-0	65085+0	0	00021
2	80226	101.7115	347.3609 0745766	117.2776	250.6804	12.5570	9746000241	
1	80227U	75052	91125.11114077	.00133786	00000-0	30632+0	0	00024
2	80227	101.4485	346.1276 0735952	007.7597	353.4585	12.5345	6642000189	
1	80228U	75052	91126.15430936	.00237702	00000-0	80750+0	0	00024
2	80228	100.3384	343.5408 0584070	104.1498	262.5703	12.5244	0526000184	
1	80229U	75052	91125.11552486	.00189384	00000-0	99999-4	0	00027
2	80229	100.3582	342.8577 0519715	088.1464	277.9455	12.5169	4699000053	
1	80230U	75052	91125.55500736	.00211100	00000-0	74840+0	0	00023
2	80230	100.7640	344.3824 0651892	037.7009	326.8397	12.4050	9189000184	
1	80231U	75052	91126.04077613	.00231358	00000-0	99999-4	0	00026
2	80231	101.0955	345.7883 0635312	025.9605	337.2336	12.4002	7522000307	
1	80232U	75052	91125.56851283	.00140083	00000-0	50128+0	0	00026
2	80232	100.4751	343.4358 0679321	096.3474	271.5810	12.3606	6220000480	
1	80233U	75052	91125.53422295	.00240935	00000-0	99999-4	0	00022
2	80233	100.2230	342.5493 0660093	083.7939	283.8235	12.2256	7419000425	
1	80234U	75052	91126.19160043	.00164902	00000-0	99999-4	0	00025
2	80234	100.4007	343.5851 0614411	081.1068	285.9435	12.2178	8771000551	
1	80235U	75052	91125.54442398	.00149277	00000-0	99999-4	0	00028

2	80235	100.1394	342.3610	0705792	083.8591	284.2731	12.19278611000185
1	80236U	75052	91125.54072083		.00019727	00000-0	99999-4 0 00025
2	80236	101.4471	346.4284	0653696	039.4177	325.3003	12.19983510000292
1	80237U	75052	91126.55794218		.00109471	00000-0	4094170 0 00023
2	80237	100.8037	344.9169	1060736	043.1263	324.8515	11.74731137000079
1	80238U	75052	91126.54425433		.00241657	00000-0	99999-4 0 00028
2	80238	101.1772	345.7896	1047207	081.3990	290.4406	11.58553884000097
1	80239U	75052	91126.52552547		.00080303	00000-0	99999-4 0 00023
2	80239	101.4806	346.4487	1201562	040.5272	327.9550	11.23138303000081
1	80240U	75052	91126.55801958		.00204602	00000-0	74186+0 0 00027
2	80240	101.1492	345.4409	1520072	058.8278	315.3867	10.98288332000067
1	80241U	75052	91128.57912067		.00000913	00000-0	12530-2 0 00023
2	80241	100.0852	346.0976	0277918	319.1185	038.9828	13.43967954000414
1	80242U	75052	91128.55171124		.00000577	00000-0	99999-4 0 00025
2	80242	099.7554	344.3907	0250610	049.4082	312.8983	12.93380184000382
1	80243U	75052	91128.54446349		.00000195	00000-0	99999-4 0 00025
2	80243	099.6946	344.2061	0279416	082.2586	281.0584	12.94661665000613
1	80244U	75052	91128.51371857		.00000621	00000-0	99999-4 0 00028
2	80244	099.6822	344.6905	0072531	136.8971	223.8338	13.42223474000595
1	80245U	75052	91128.53726445		.00002174	00000-0	99999-4 0 00023
2	80245	099.8558	345.0460	0100992	066.2184	294.9946	13.23882058000424
1	80246U	75052	91128.54087161		.00003293	00000-0	18505-2 0 00025
2	80246	100.0599	346.6019	0277012	257.2467	099.8028	13.92952527000592
1	80247U	75052	91128.04047583		.00005503	00000-0	99999-4 0 00029
2	80247	099.6870	343.9843	0140904	074.3373	287.3696	13.17498902000264
1	80248U	75052	91128.06175578		.00000382	00000-0	99999-4 0 00028
2	80248	099.8414	344.0010	0387675	038.9719	323.9074	12.68509359000415
1	80249U	75052	91128.54452793		.00001611	00000-0	39782-2 0 00027
2	80249	099.9690	345.1006	0405806	107.4429	257.1849	12.94617503000572
1	80250U	75052	91128.12634348		.00000456	00000-0	99999-4 0 00025
2	80250	099.5608	343.6362	0197752	098.7261	263.6788	13.15536320000464
1	80251U	75052	91129.15647983		.00267352	00000-0	88715+0 0 00028
2	80251	100.5369	347.0878	0547162	023.2049	339.3234	12.58776216000398
1	80252U	75052	91126.03328037		.06543353	00000-0	11452+2 0 00029
2	80252	100.1993	343.3753	0735782	078.7497	289.9272	12.67960550000161
1	80253U	75052	91126.19940730		.00438682	00000-0	98135+0 0 00020
2	80253	100.4677	344.4562	0686884	040.8378	324.2746	12.62282503000136
1	80254U	75052	91128.54100654		.00245438	00000-0	74007+0 0 00022
2	80254	101.0299	347.4938	0982711	096.4260	274.9967	11.99072906000701
1	80255U	75052	91125.57920310		.00090229	00000-0	99999-4 0 00020
2	80255	101.1264	345.1886	0896734	042.5307	324.2141	11.85365470000335
1	80256U	75052	91129.09485485		.00037535	00000-0	99999-4 0 00011
2	80256	100.8572	346.2609	1201098	061.7910	309.9438	11.12141281000717
1	80257U	75052	91124.55162890		.03148056	00000-0	18424+2 0 00026
2	80257	101.2430	344.2690	1370822	041.9539	328.0280	10.99951702*****3
1	80258U	75052	91128.59733641		.00116781	00000-0	99999-4 0 00029
2	80258	101.2024	346.6732	1394254	072.5800	302.2796	10.78526411000640
1	80259U	75052	91128.16594213		.00015139	00000-0	12436-1 0 00026
2	80259	099.3378	343.6903	0186992	233.1644	125.2707	13.81567970000552
1	80260U	75052	91128.51335127		.00150259	00000-0	40120+0 0 00026
2	80260	100.2410	345.6050	0533928	086.5379	279.7055	12.73864872000550
1	80261U	75052	91128.56040299		.00339998	00000-0	10879+1 0 00012
2	80261	101.4274	349.0981	0801411	015.5072	346.9524	12.24549298000602
1	80262U	75052	91128.16770185		.00141115	00000-0	99999-4 0 00020
2	80262	100.4106	345.1806	0651073	087.3743	280.2042	12.20150105000606
1	80263U	75052	91128.52960767		.00107992	00000-0	99999-4 0 00012
2	80263	100.5220	345.9935	0764675	086.3900	282.4568	12.14233671000421
1	80264U	75052	91128.59444858		.00517641	00000-0	10481+1 0 00019
2	80264	100.9732	347.2658	1064484	105.4085	266.7643	12.05759397000821

1	80265U	75052	91126.03669573	.00122632	00000-0	38373+0	0	00022
2	80265	101.0373	345.3522	0977525	101.8494	269.4156	11.97920959000234	
1	80266U	75052	91125.16783362	.00133474	00000-0	48607+0	0	00026
2	80266	101.0171	344.3719	1025531	098.6769	273.2102	11.81887601000242	
1	80267U	75052	91128.56792356	.00107945	00000-0	48912+0	0	00020
2	80267	100.6217	345.9867	0960177	087.8717	283.2242	11.79961516000696	
1	80268U	75052	91127.09836938	.00082326	00000-0	26165+0	0	00024
2	80268	101.3032	346.5742	1154141	091.6630	281.7063	11.67937819000402	
1	80269U	75052	91128.80800805	.00381751	00000-0	16918+1	0	00029
2	80269	100.7972	346.5580	1029102	078.2971	293.2160	11.70393384000432	
1	80270U	75052	91127.12853968	.00027788	00000-0	99999-4	0	00024
2	80270	101.5719	347.5464	0935269	052.1798	316.0597	11.61638162000468	
1	80271U	75052	91128.08813772	.00064317	00000-0	99999-4	0	00029
2	80271	101.9610	349.6424	1013765	035.5264	330.9517	11.59826409000539	
1	80272U	75052	91127.57656538	.00278814	00000-0	13206+1	0	00020
2	80272	101.2798	346.8169	1070604	024.5971	340.2917	11.60041797000565	
1	80273U	75052	91128.09326232	.00078118	00000-0	99999-4	0	00026
2	80273	100.8655	346.1715	1035473	049.3514	319.3359	11.59142098000275	
1	80274U	75052	91128.57940586	.00079594	00000-0	99999-4	0	00023
2	80274	101.6091	348.6454	1003530	046.8383	321.2576	11.50275759000704	
1	80275U	75052	91127.12263119	.00051767	00000-0	99999-4	0	00026
2	80275	100.9923	345.6483	1066646	039.2039	328.1899	11.45669198000231	
1	80276U	75052	91127.13368253	.00108439	00000-0	51762+0	0	00023
2	80276	101.0134	345.7717	1170401	087.5800	285.8850	11.43597971000284	
1	80277U	75052	91127.17287319	.00238773	00000-0	99999-4	0	00025
2	80277	101.7090	347.7900	1096288	049.4347	319.7392	11.36796461000232	
1	80278U	75052	91128.57854218	.00246568	00000-0	13498+1	0	00015
2	80278	101.0308	346.7045	1245691	030.0420	336.6910	11.23882779000619	
1	80279U	75052	91128.53461470	.00301028	00000-0	11752+1	0	00010
2	80279	100.5809	344.8268	1642095	093.9586	285.0422	10.74949654000263	
1	80280U	75052	91127.14196186	.00000441	00000-0	50756-3	0	00023
2	80280	099.7230	343.7141	0118914	217.4989	141.8275	13.66512502000286	
1	80281U	75052	91127.53083719	.00000394	00000-0	99999-4	0	00024
2	80281	099.5667	342.7923	0359510	084.1158	280.1215	12.80332094000228	
1	80282U	75052	91127.10166132	.00001491	00000-0	99999-4	0	00028
2	80282	099.8231	342.9777	0479341	077.9736	287.5058	12.54046923000258	
1	80283U	75052	91129.08909827	.00000272	00000-0	99999-4	0	00020
2	80283	099.7945	345.6393	0027109	162.1570	198.1010	13.45866508000545	
1	80284U	75052	91127.06115143	.00000096	00000-0	99999-4	0	00021
2	80284	099.5830	342.4671	0326652	073.0381	290.6679	12.80534049000107	
1	80285U	75052	91127.59689768	.02730310	00000-0	86085-1	0	00029
2	80285	100.2795	346.8217	0505179	279.1377	075.1610	14.59213828000073	
1	80286U	75052	91127.54291633	.04824228	00000-0	20784+1	0	00011
2	80286	101.8914	348.2253	1016292	128.0819	241.9402	12.80104084000063	
1	80287U	75052	91127.52911146	.00096307	00000-0	99999-4	0	00022
2	80287	100.1313	344.4559	0416427	105.2646	259.5290	12.81840499000220	
1	80288U	75052	91127.15638726	.00108856	00000-0	99999-4	0	00025
2	80288	100.2358	344.4495	0332371	029.7943	332.2098	12.77360315000230	
1	80289U	75052	91125.18094367	.02309696	00000-0	15318+1	0	00020
2	80289	101.6495	345.9579	1019085	130.2817	239.3697	12.63190976000051	
1	80290U	75052	91128.57843908	.00187303	00000-0	99999-4	0	00018
2	80290	100.2199	345.5848	0463866	078.0164	287.2935	12.62056822000492	
1	80291U	75052	91127.57545040	.00212020	00000-0	61331+0	0	00024
2	80291	100.3023	344.8625	0627223	099.0052	268.3024	12.56235214000118	
1	80292U	75052	91128.57240460	.00032254	00000-0	11041+0	0	00026
2	80292	100.4260	345.7539	0705913	084.8127	283.3459	12.34900825000342	

1	80293U	75052	91125.16477955	.00288717	00000-0	96288+0	0	00023
2	80293	101.4166	346.1702 0709766	044.4578	321.1786	12.35885883	0000002	
1	80294U	75052	91128.12502984	.00171198	00000-0	64806+0	0	00029
2	80294	100.6603	346.3464 0710953	030.1599	333.8940	12.28129137	0000155	
1	80295U	75052	91125.55037201	.00058120	00000-0	20857+0	0	00015
2	80295	100.1500	342.3637 0799682	087.5567	281.7120	12.18187566	0000062	
1	80296U	75052	91127.59385132	.00156075	00000-0	99999-4	0	00017
2	80296	100.5739	344.7069 0962539	088.6476	282.4827	11.71874054	0000245	
1	80297U	75052	91127.56076994	.00052577	00000-0	99999-4	0	00010
2	80297	101.5081	347.7487 0951472	054.4987	314.1442	11.61498669	0000403	
1	80298U	75052	91127.59013928	.00078081	00000-0	99999-4	0	00021
2	80298	101.3689	347.3589 1046958	036.7461	330.1268	11.56146318	0000409	
1	80299U	75052	91128.52959596	.00053268	00000-0	99999-4	0	00015
2	80299	100.8383	346.2101 0931432	067.0913	302.5990	11.58012276	0000155	
1	80300U	75052	91128.48056378	.00158508	00000-0	99999-4	0	00023
2	80300	101.0871	346.6356 1371958	062.7830	310.6541	10.96501152	0000295	
1	80301U	75052	91129.17326754	.00175217	00000-0	43431+0	0	00020
2	80301	100.2247	346.2886 0509446	083.3444	282.5859	12.81583156	0000538	
1	80302U	75052	91128.55346351	.00315876	00000-0	64395+0	0	00026
2	80302	100.1562	345.7662 0593678	053.3770	312.0958	12.81355599	0000226	
1	80303U	75052	91127.06000016	.04391234	00000-0	57491+1	0	00012
2	80303	100.1819	344.2734 0813514	077.6001	291.7785	12.69844501	0000296	
1	80304U	75052	91127.54643719	.00694846	00000-0	98185+0	0	00025
2	80304	100.3855	345.6602 0826658	038.3457	327.4184	12.63900474	0000050	
1	80305U	75052	91127.61157564	.00686625	00000-0	99220+0	0	00018
2	80305	100.4582	345.6985 0893505	056.1707	312.1977	12.51457231	0000319	
1	80306U	75052	91127.09792323	.00505221	00000-0	15514+1	0	00027
2	80306	100.2288	344.3059 0715135	078.0737	290.0200	12.39957513	0000055	
1	80307U	75052	91128.18547946	.00102760	00000-0	99999-4	0	00022
2	80307	101.5300	348.5236 0718173	038.7346	326.3434	12.02314858	0000479	
1	80308U	75052	91124.59855515	.00150164	00000-0	64110+0	0	00021
2	80308	100.8331	343.3693 1020476	043.1240	324.5754	11.73870740	0000055	
1	80309U	75052	91128.59551249	.00226377	00000-0	99999-4	0	00010
2	80309	101.7417	349.1044 0964822	040.7640	326.2026	11.62591777	0000524	
1	80310U	75052	91128.10549765	.00232390	00000-0	11330+1	0	00021
2	80310	101.2166	346.8490 1437318	036.3625	332.7335	10.98613179	0000121	
1	80311U	6011	91125.55570195	.00072733	00000-0	30825+0	0	00011
2	80311	101.1475	344.7229 1486386	059.8851	314.1533	10.97457366	*****5	
1	80312U	75052	91127.55912625	.00788404	00000-0	38947+1	0	00025
2	80312	101.2177	346.4529 1431987	037.4447	331.8760	10.98825879	0000207	
1	80313U	75052	91125.58627466	.04644270	00000-0	19957+2	0	00020
2	80313	101.3634	345.1350 1644171	084.6752	294.2396	10.70068796	0000102	
1	80314U	75052	91129.08666169	.00000785	00000-0	99999-4	0	00023
2	80314	099.7520	345.3533 0053007	066.4156	294.3005	13.33338228	0000974	
1	80315U	75052	91129.16816319	.03583271	00000-0	10611+0	0	00025
2	80315	100.2734	348.7821 0458627	271.8452	082.8519	14.70107590	0000197	
1	80316U	75052	91129.09142744	.00135540	00000-0	10332+0	0	00021
2	80316	100.0811	346.5898 0506132	143.4093	220.3225	13.46281517	0000470	
1	80317U	75052	91129.02129890	.00386936	00000-0	99999-4	0	00020
2	80317	100.3480	346.4704 0412561	049.1765	314.4770	12.81999061	0000244	
1	80318U	75052	91129.56139143	.05872191	00000-0	35894+1	0	00020
2	80318	100.1697	346.5144 0868398	072.5515	297.2386	12.94242483	0000613	
1	80319U	75052	91128.57813449	.00293815	00000-0	90153+0	0	00022
2	80319	100.4678	346.4882 0557502	032.3551	331.0957	12.62259610	0000111	
1	80320U	75052	91130.57472947	.00412228	00000-0	76047+0	0	00028
2	80320	100.2762	347.9644 0755034	047.4251	318.8654	12.62110029	0000422	
1	80321U	75052	91128.18759778	.00481457	00000-0	11007+1	0	00029
2	80321	100.2202	344.5802 1043222	087.2855	284.7647	12.03378985	0000361	

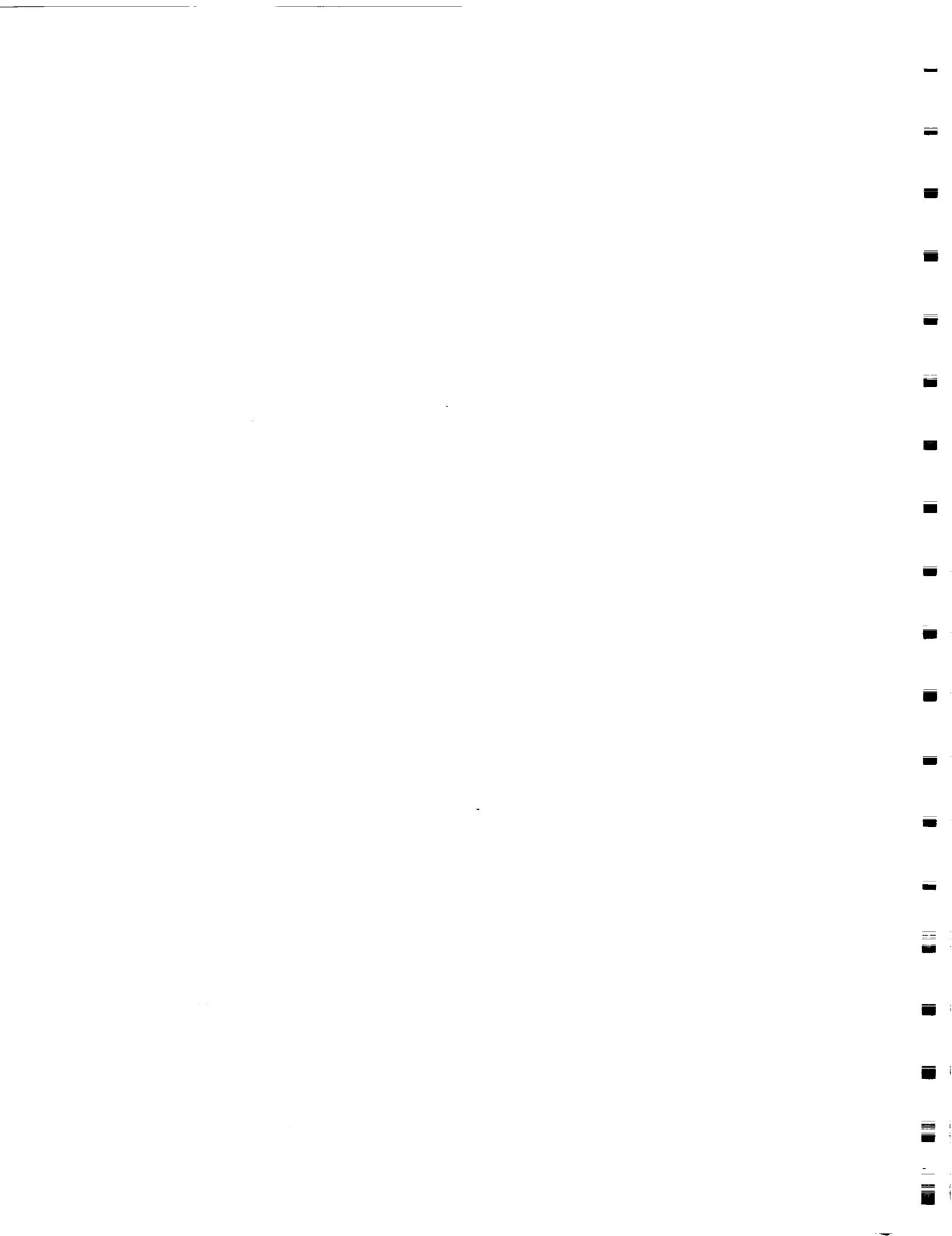
1	80322U	75052	91129.60009399	.00583331	00000-0	12158+1	0	00027
2	80322	100.2380	345.6725 1061309	084.6338	287.5409	12.04890749000239		
1	80323U	75052	91128.57099546	.00588253	00000-0	95474+0	0	00025
2	80323	101.1264	348.1118 1178743	061.8518	309.7262	11.96209527000460		
1	80324U	75052	91129.51977513	.00306973	00000-0	10671+1	0	00024
2	80324	100.7721	347.0606 1062881	080.3238	291.6574	11.78331567000166		
1	80325U	75052	91129.05595609	.00384012	00000-0	99999-4	0	00020
2	80325	100.5092	346.2912 1049101	110.4114	261.2958	11.58661390000500		
1	80326U	75052	91129.17603405	.00132523	00000-0	99999-4	0	00026
2	80326	100.6034	345.6663 0995819	083.4369	287.9229	11.52559013000474		
1	80327U	75052	91129.57305425	.00066011	00000-0	99999-4	0	00020
2	80327	100.8912	347.9042 0994337	036.5468	329.9766	11.57526419000338		
1	80328U	75052	91128.58026156	.02647056	00000-0	40320+1	0	00028
2	80328	100.9570	346.1434 1786736	076.0096	303.4298	10.89072058000173		
1	80329U	75052	91129.51774483	.01698116	00000-0	37592+1	0	00025
2	80329	101.3768	347.8788 1792750	080.7271	299.2450	10.73365025000161		
1	80330U	75052	91130.62831950	.00124935	00000-0	99999-4	0	00029
2	80330	100.7545	348.8049 0567991	047.2007	317.5832	12.31396514000106		
1	80331U	75052	91130.63058170	.00344943	00000-0	87235+0	0	00024
2	80331	100.2295	347.0524 0762515	074.5720	293.8824	12.43834554000119		
1	80332U	75052	91129.56934084	.00277057	00000-0	99999-4	0	00028
2	80332	100.4020	346.9233 0514566	054.0151	310.7940	12.56401744000051		
1	80333U	75052	91130.54649635	.00134706	00000-0	99999-4	0	00027
2	80333	100.5651	348.3803 0613320	039.7087	324.7670	12.42683621000223		
1	80334U	75052	91129.53746300	.00230376	00000-0	78722+0	0	00028
2	80334	100.6622	347.5916 0776944	030.1583	334.2393	12.24476385000109		
1	80335U	75052	91129.59039483	.00247758	00000-0	99999-4	0	00028
2	80335	100.6045	346.4035 0716614	084.0383	284.2187	11.91973484000103		
1	80336U	75052	91129.57317646	.01500465	00000-0	18249+1	0	00020
2	80336	101.0945	348.9425 1230201	062.9380	309.3026	11.99581996000061		
1	80337U	75052	91129.53548169	.00171735	00000-0	99999-4	0	00021
2	80337	100.8406	346.7354 1194197	068.4380	303.9831	11.26313217000054		
1	80338U	75052	91129.54109491	.00121383	00000-0	45571+0	0	00020
2	80338	100.2370	345.8099 0740921	080.6056	287.8370	12.24273381000236		
1	80339U	75052	91129.60116284	.00218359	00000-0	99999-4	0	00024
2	80339	100.3246	345.8685 0629192	083.3732	283.8906	12.14407833000116		
1	80340U	75052	91129.54872224	.00000580	00000-0	99999-4	0	00027
2	80340	099.8046	344.8480 0555535	022.3111	340.1576	12.45872204000384		
1	80341U	75052	91129.51012943	.00001841	00000-0	99999-4	0	00020
2	80341	099.7906	345.4516 0213575	050.8645	311.1674	13.00876962000394		
1	80342U	75052	91129.08515761	.00000524	00000-0	99999-4	0	00027
2	80342	099.5934	344.5236 0260544	098.3696	264.7498	13.07653755000245		
1	80343U	75052	91129.55228359	.00000774	00000-0	99999-4	0	00020
2	80343	099.6691	344.6893 0373565	059.1570	304.6145	12.69729163000316		
1	80344U	75052	91132.12118887	.00002684	00000-0	99999-4	0	00024
2	80344	099.6624	348.1873 0070961	051.5985	309.1976	13.29241404000743		
1	80345U	75052	91131.08404622	.00089482	00000-0	99999-4	0	00025
2	80345	100.2867	347.0543 0700098	082.0812	285.9445	12.14575456000295		
1	80346U	75052	91131.51462449	.00328718	00000-0	10573+1	0	00020
2	80346	100.8859	347.4661 0665951	078.1408	289.4058	12.44389661000229		
1	80347U	75052	91131.52881325	.00272512	00000-0	99999-4	0	00023
2	80347	100.2021	348.0360 0602755	087.9238	279.1092	12.42770145000223		
1	80348U	75052	91128.59694497	.00123858	00000-0	99999-4	0	00027
2	80348	100.8024	347.0587 0594647	040.9400	323.5197	12.30859455*****8		
1	80349U	75052	91131.59681123	.00263469	00000-0	15727+0	0	00029
2	80349	099.5435	346.7507 1302629	099.6681	275.4178	12.13767750001098		
1	80350U	75052	91130.48023599	.00214545	00000-0	10006+1	0	00011
2	80350	101.3807	349.4513 1185702	018.5401	345.5663	11.42384633000388		

1	80351U	75052	91129.81369144	.01972481	00000-0	34904+1	0	00021
2	80351	100.7215	346.9213 1376080	084.2116	291.5397	11.57228126000203		
1	80352U	75052	91132.55644155	.00162199	00000-0	99999-4	0	00020
2	80352	100.3806	349.2788 0233670	043.1974	318.7630	12.79173660000929		
1	80353U	75052	91129.55553170	.10487714	00000-0	43243+1	0	00013
2	80353	100.1593	346.1804 0984415	073.9937	297.4578	12.87782189000055		
1	80354U	75052	91129.15021796	.00479787	00000-0	13716+1	0	00027
2	80354	100.4802	346.8958 0781303	070.5906	297.8539	12.34050572000427		
1	80355U	75052	91132.53404662	.00423663	00000-0	82405+0	0	00023
2	80355	100.4310	349.2696 0879951	081.6774	288.3603	12.38971862000549		
1	80356U	75052	91131.60804682	.00126312	00000-0	31787+0	0	00025
2	80356	100.2538	348.1578 0646501	100.6456	266.8546	12.61618770000188		
1	80357U	75052	91130.55179397	.20571497	00000-0	99697+1	0	00022
2	80357	100.1308	347.3800 0718369	075.6430	293.6945	13.30946641000063		
1	80358U	75052	91131.57099716	.02110476	00000-0	31211+1	0	00026
2	80358	100.4295	348.2124 1080268	067.9412	303.4317	12.17863755000179		
1	80359U	75052	91132.52931900	.02623684	00000-0	36756+1	0	00022
2	80359	101.1075	349.8116 1645257	052.2545	321.8188	11.18083973000324		
1	80360U	75052	91131.09519512	.00149796	00000-0	99999-4	0	00023
2	80360	100.6819	348.4363 0540844	053.3957	311.6015	12.136378050000410		
1	80361U	75052	91129.75006407	.04271481	00000-0	34985+1	0	00029
2	80361	100.7761	347.3808 1861205	056.5701	320.2385	10.97072893000078		
1	80362U	75052	91129.53986168	.05413418	00000-0	45141+1	0	00022
2	80362	100.7687	348.4591 1029561	043.4121	324.6109	12.51965931000235		
1	80363U	75052	91131.53325383	.00149650	00000-0	99999-4	0	00025
2	80363	100.3788	348.2149 0346016	104.6895	259.3228	12.69936082000178		
1	80364U	75052	91130.58343492	.00193915	00000-0	37217+0	0	00024
2	80364	101.2345	351.1172 0885021	048.7222	318.7187	12.38807743000118		
1	80365U	75052	91131.21784031	.00198871	00000-0	57373+0	0	00025
2	80365	100.9151	348.5878 0997319	109.1095	262.1062	11.99039158000147		
1	80366U	75052	91131.53762182	.00382233	00000-0	94090+0	0	00028
2	80366	100.1660	347.1819 0908774	078.1061	292.0936	12.21965385000733		
1	80367U	75052	91132.59224751	.00000973	00000-0	99999-4	0	00016
2	80367	099.8831	349.3974 0102067	135.0040	225.9915	13.44760827000580		
1	80368U	75052	91132.56646227	.000009635	00000-0	00000+0	0	00015
2	80368	100.1197	350.2878 0270332	305.0626	052.5852	13.47859379000371		
1	80369U	75052	91131.50501302	.00471499	00000-0	10268+1	0	00011
2	80369	100.2064	348.5257 0547194	080.9534	285.3664	12.84151424000224		
1	80370U	75052	91131.53194170	.00277458	00000-0	63443+0	0	00018
2	80370	100.2460	348.0160 0687132	085.3888	282.5824	12.61021175000111		
1	80371U	75052	91130.58402086	.06809834	00000-0	65605+1	0	00019
2	80371	100.9344	347.5531 1760957	073.9786	305.2608	11.10401420000216		
1	80372U	75052	91130.05307875	.02212970	00000-0	59139+1	0	00012
2	80372	100.2899	346.7494 0634796	079.4607	287.8807	12.59825623000122		
1	80373U	75052	91132.08786175	.00219824	00000-0	61504+0	0	00013
2	80373	100.3233	348.6498 0609505	081.4165	285.5968	12.60717357000302		
1	80374U	75052	91129.56851745	.00993117	00000-0	10258+1	0	00014
2	80374	100.2937	346.3555 0935202	085.4966	285.3253	12.59767365000252		
1	80375U	75052	91132.50593776	.00376221	00000-0	87280+0	0	00019
2	80375	100.2941	349.1816 0688724	096.6189	271.4302	12.59968353000356		
1	80376U	75052	91130.13406496	.00867723	00000-0	17962+1	0	00012
2	80376	100.3106	347.0907 0880702	058.5144	309.9809	12.35641024*****5		
1	80377U	75052	91132.47334292	.00270807	00000-0	10396+1	0	00011
2	80377	100.7838	350.0702 0713220	013.1476	348.7573	12.26948032000169		
1	80378U	75052	91132.50658557	.00214597	00000-0	64868+0	0	00015
2	80378	100.2529	348.4281 0833085	074.1333	295.0376	12.22872236000349		
1	80379U	75052	91129.57001728	.00481546	00000-0	10487+1	0	00010
2	80379	100.0855	345.3509 0955651	081.6671	289.2139	12.20583358000110		
1	80380U	75052	91130.13275671	.01208323	00000-0	17996+1	0	00019
2	80380	100.5534	347.3008 1030207	096.8659	275.1702	12.26339121000431		

1	80381U	75052	91130.57903267	.00001862	00000-0	64360-2	0	00014
2	80381	100.3513	348.0051 0900498	032.5000	332.8753	12.04786402000247		
1	80382U	75052	91132.15682582	.00149670	00000-0	99999-4	0	00013
2	80382	100.8195	349.5257 0789383	080.8879	288.0948	12.061814590000534		
1	80383U	75052	91131.50318630	.00308447	00000-0	85878+0	0	00017
2	80383	100.3158	347.4900 0908620	077.2185	292.9291	12.15398521000207		
1	80384U	75052	91132.52143485	.00275870	00000-0	89054+0	0	00018
2	80384	101.0373	350.5033 1042931	085.5587	286.4201	11.85568421000292		
1	80385U	75052	91131.54673666	.01061790	00000-0	25949+0	0	00017
2	80385	100.5169	348.3513 1775189	054.8829	320.6847	11.48776420000100		
1	80386U	75052	91131.54291076	.01381603	00000-0	21164+1	0	00013
2	80386	101.0843	349.0561 1658328	053.5522	320.8239	11.122270400000059		
1	80387U	75052	91130.65649301	.08586574	00000-0	47214+1	0	00018
2	80387	100.6824	347.9353 1853250	054.7402	321.8004	11.110461260000099		

APPENDIX 3

**Memorandum From Paul Maley to
Nicholas Johnson on Visible Observations**



Post-It brand fax transmittal memo 7671		# of pages	1
To	NICK Johnson	From	P. MALEY
Co.	TBE	Co.	
Dept.		Phone #	
Fax #	719 574 6329	Fax #	

TO: N.L. JOHNSON
 FROM: P. MALEY
 SUBJECT: DELTA FRAGMENTS

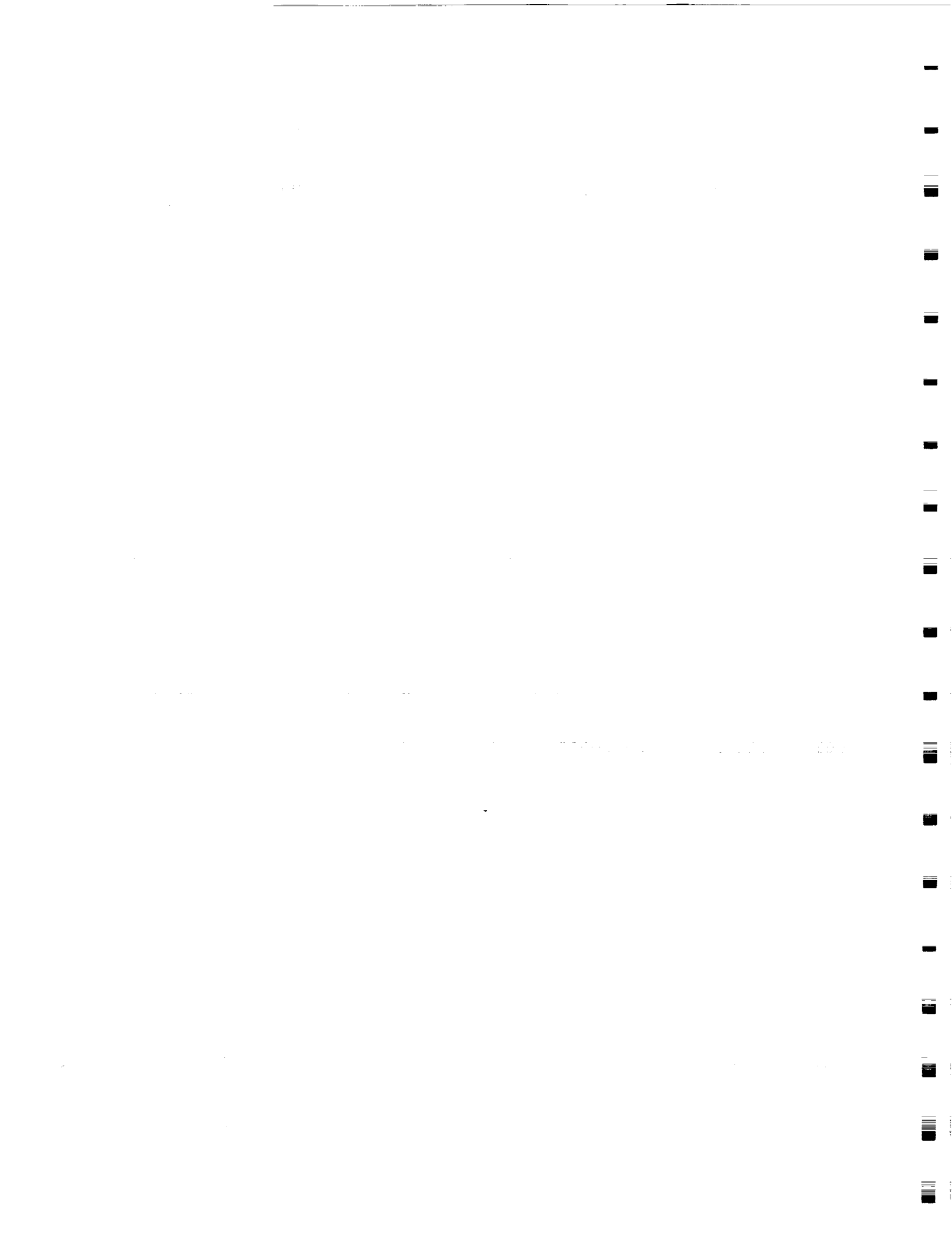
BASED ON YOUR FAX LIST OF OBJECTS I WAS ABLE TO OBSERVE THE FOLLOWING PIECES LAST NIGHT. YOU DID NOT PUT IDENTIFICATION BESIDE EACH ELSET SO I GAVE IT AN ARBITRARY DESIGNATOR BEGINNING WITH 10001, THE FIRST SET AND ENDING WITH 10025.

OBJECT

- 10002 BRIGHT, WITH SMOOTH TUMBLING MOTION VARYING FROM +6 TO +7 WITH A FLASH PERIOD (NOT TUMBLE PERIOD) OF ABOUT 3 SECONDS range 859 st. mi
- 10018 STEADY, +9 range 784
- UNK 1 STEADY, +8; came right after 10018 so range may be similar (?)
- 10009 ONLY SAY ONE BLIP FOLLOWED BY A COMPLETE INVISIBILITY. EACH BLIP FOLLOWED BY THE NEXT ABOUT 3.0 SECONDS APART (JUST LIKE 1002), MAGNITUDE +11 (REAL FAINT) range 706
- 10004 STEADY, +9 BUT I FOLLOWED IT FOR A WHILE AND IT GRADUALLY GOT TO +8. (I FOLLOWED OTHERS FOR ABOUT 15 SECONDS JUST TO SEE IF THERE WAS SOME SHORT TO MODERATE VARIATION INVOLVED) range 604
- 10013 STEADY, +9 GRADUALLY RISING TO +8 range 966
- UNK 2 STEADY +9, came right after 10013 so range may be similar (?)
- 10022 STEADY +8, BUT MAYBE A SLIGHT VARIATION SUSPECTED range 861
- 10019 STEADY +9.5 range 824

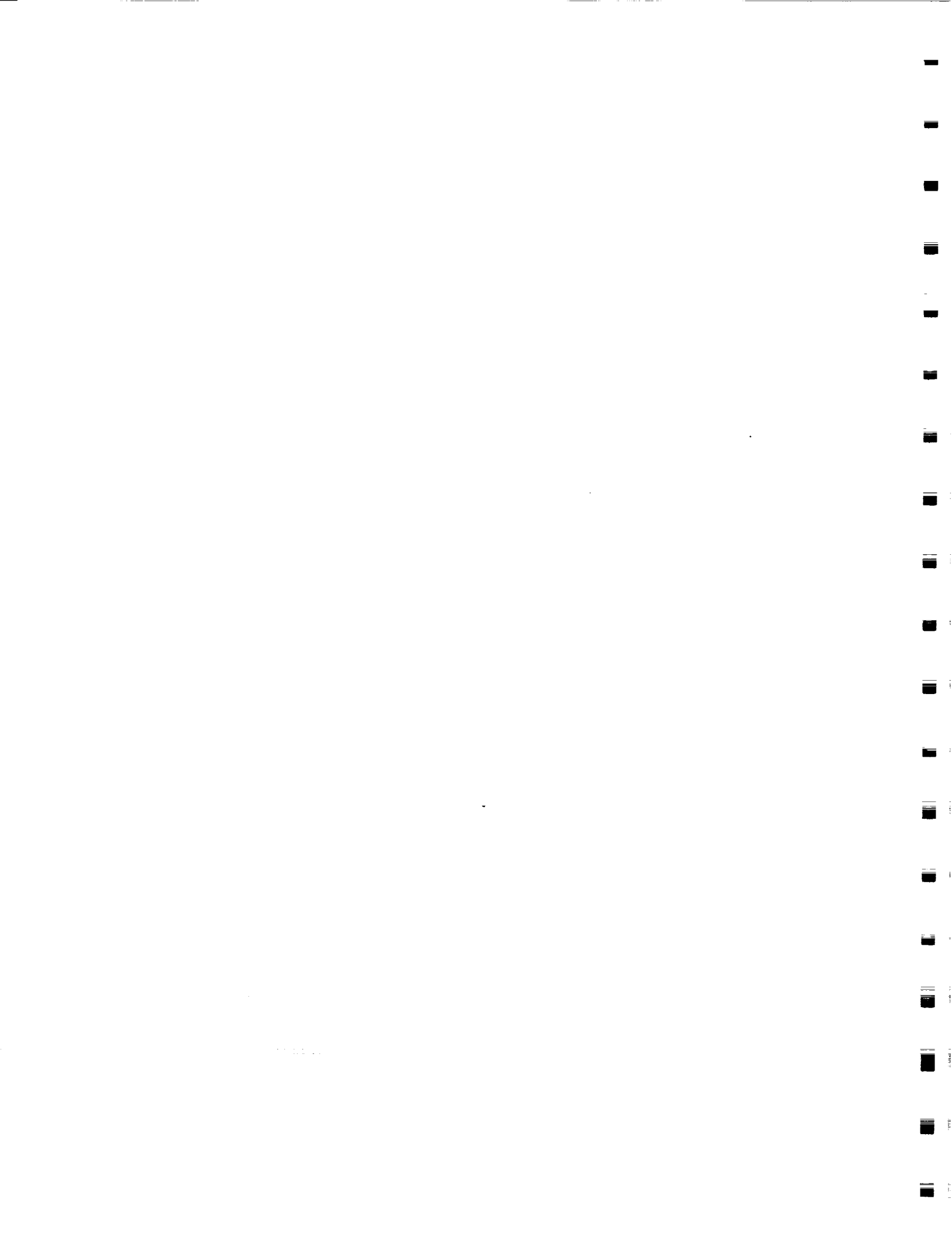
10024 and 10025 were not observed although both were at the same spot in the sky but ranges were 1035 and 833, so maybe the unknowns ranges were not at all related to the previous observed object!

Both UNK1 and UNK2 were definitely part of the same crowd; observing conditions were excellent but clouds are back already. This was really great!!



APPENDIX 4

**Analyst Satellite Elements Associated
with Nimbus 6 Cloud on 15 October 1991**



1	80001U		91274.98464626	0.00000367	00000-0	20683-2 0	30	
2	80001	99.5707	91.8669	0718954	117.4974	250.1067	12.04780116	960
1	80008U		91287.53528029	0.00000421	00000-0	92234-3 0	11	
2	80008	99.7410	135.4942	0078444	67.8644	293.0817	13.31230564	275
1	80761U		91240.01439548	0.00000013	00000-0	99998-4 0	250	
2	80761	99.5477	76.5908	0383159	187.2970	172.2050	12.69827733	8720
1	80780U		91239.51859444	0.00000021	00000-0	99998-4 0	100	
2	80780	99.7331	85.3815	0174771	159.6968	201.3942	13.08217671	8630
1	80798U		91240.10542102	0.00003855	00000-0	26494-2 0	300	
2	80798	100.1178	107.0529	0221096	302.7048	55.2963	13.88946959	14230
1	80811U		91240.03775807	0.03239191	00000-0	11391+1 0	160	
2	80811	98.7964	86.2969	0286418	15.6449	344.2356	13.94843617	5110
1	80829U		91240.14246909	0.00170008	00000-0	53050+0 0	80	
2	80829	99.3043	83.9999	0509763	7.8568	353.0658	12.65672023	5240
1	80843U		91239.58049182	0.00376892	00000-0	91642+0 0	40	
2	80843	100.6243	91.2794	0453774	57.1689	307.4534	12.86105113	2490
1	80844U		91241.57855126	-0.00001986	00000-0	-22633-2 0	90	
2	80844	99.6961	98.4741	0117202	285.9173	72.9126	13.66538476	2910
1	80845U		91239.53538148	0.00005414	00000-0	65934-2 0	100	
2	80845	100.0300	97.5907	0291028	40.1691	322.0605	13.49915858	2940
1	80846U		91240.13268054	0.00173128	00000-0	98886+0 0	100	
2	80846	101.7463	74.2695	0994491	156.1214	209.4046	11.59332457	3930
1	81511U		91280.10316939	0.00000034	00000-0	12136-3 0	37	
2	81511	99.7303	128.5858	0057391	60.4422	300.2381	13.32367907	1671
1	81513U		91279.50592007	0.00000413	00000-0	96779-3 0	28	
2	81513	99.8410	128.1754	0084266	62.1623	298.8170	13.26689325	1062
1	87010U		91283.35118513	-0.00001723	00000-0	-38441-2 0	39	
2	87010	102.1234	81.7342	0237091	337.0844	21.9379	13.16680821	5188
1	87016U		91287.53963401	0.00002373	00000-0	58810-2 0	125	
2	87016	100.0381	135.0949	0257308	98.0139	265.8358	13.09789699	1811
1	87017U		91283.46711871	0.00357585	00000-0	10254+1 0	177	
2	87017	100.3718	117.2426	0417604	266.3343	89.5203	12.80024939	4501
1	87045U		91285.01763573	0.00182417	00000-0	63691+0 0	89	
2	87045	99.5232	113.6712	0285120	88.6505	274.4796	12.81811400	4589
1	87049U		91274.13147534	0.00000033	00000-0	99998-4 0	62	
2	87049	99.8035	124.4394	0053410	71.1456	289.8932	13.33601164	3684
1	87054U		91288.02314961	0.00000020	00000-0	99998-4 0	168	
2	87054	99.5781	123.5081	0306356	89.0817	274.5542	12.94894491	4139
1	87076U		91281.55171295	0.00019235	00000-0	28306-1 0	29	
2	87076	99.4040	129.5073	0048595	208.3263	151.9617	13.53581578	2983
1	87078U		91279.01636969	0.00000005	00000-0	99998-4 0	26	
2	87078	99.8434	100.1318	0661447	116.1081	257.0260	12.08496740	2824
1	87085U		91276.15891017	0.00765857	00000-0	84967+0 0	21	
2	87085	101.2117	137.2927	0307937	63.8379	299.4718	13.46450605	2926
1	87098U		91286.77984973	0.00000014	00000-0	99998-4 0	53	
2	87098	99.1540	107.1092	0443489	44.9845	318.6362	12.62268151	3622
1	87104U		91274.03273145	0.00000037	00000-0	99998-4 0	32	
2	87104	99.0555	111.6307	0084526	351.5566	8.8427	13.35706525	1243
1	87112U		91278.50235850	0.01469461	00000-0	17100+1 0	18	
2	87112	101.0827	120.0768	0224734	212.0939	146.6589	13.44469234	1383
1	87120U		91276.03644406	0.05711365	00000-0	18347+1 0	04	
2	87120	99.2350	120.4396	0336371	359.4130	0.7028	13.81954402	746
1	87128U		91283.95317001	0.00015322	00000-0	80022-1 0	26	
2	87128	99.5984	97.7250	0744157	130.7525	236.0555	12.03405078	1257
1	87131U		91287.07414258	0.00000564	00000-0	14829-2 0	46	
2	87131	99.5786	125.8459	0260373	92.1939	270.9044	13.07735794	5090
1	87134U		91285.10693573	0.01006772	00000-0	11224+1 0	20	
2	87134	101.1195	127.4091	0198048	156.9078	204.4218	13.53541075	1267
1	87135U		91277.06089564	0.00665978	00000-0	90751+0 0	03	
2	87135	99.5541	111.2368	0231508	155.1095	206.1914	13.42082874	187

1	87139U		91283.11546015	0.00940202	00000-0	11277+1	0	35
2	87139	101.0318	132.0778	0460477	298.8116	56.1757	13.22248568	669
1	87148U		91281.50329119	0.02150134	00000-0	10084+1	0	01
2	87148	100.2831	122.2344	0335531	52.4604	310.7459	13.80683078	52
1	87159U		91278.18129339	0.32291463	00000-0	25167+1	0	06
2	87159	102.6952	141.8729	0385285	138.9925	224.3723	13.98798756	193
1	87857U		91280.70068308	0.00003813	00000-0	27107-2	0	284
2	87857	99.0045	184.8448	0167453	262.9282	95.5049	13.91549334	13129
1	87894U		91260.37764908	-0.00000003	00000-0	99998-4	0	90
2	87894	101.1015	69.1878	1057454	51.6413	317.5242	10.93357631	5550
1	87929U		91283.55201387	0.00000032	00000-0	99998-4	0	241
2	87929	99.7466	131.7229	0077831	77.2824	283.7048	13.31224070	9373
1	87946U		91235.54499889	0.03388019	00000-0	69785+0	0	00
2	87946	100.6696	93.1914	0339850	86.5045	277.5388	14.14038542	120
1	87966U		91278.57345185	0.00763505	00000-0	74028+0	0	134
2	87966	99.8559	123.7608	0259766	29.2560	326.0909	13.59118152	16988
1	87967U		91285.48077794	0.00000021	00000-0	99998-4	0	282
2	87967	99.7326	127.1286	0176411	53.3530	308.3754	13.08257995	14645
1	87971U		91287.49660151	0.00000033	00000-0	99998-4	0	86
2	87971	99.0298	120.7897	0118718	331.8208	27.7312	13.28055104	11650
1	87972U		91286.11159747	0.00002015	00000-0	55831-2	0	199
2	87972	99.8582	126.4229	0346902	10.9957	349.8555	12.94377394	10792
1	87975U		91281.51929311	0.00000029	00000-0	99998-4	0	99
2	87975	99.6957	127.4956	0090748	65.0452	296.0102	13.26211005	10841
1	87978U		91286.09019348	0.00000018	00000-0	99998-4	0	199
2	87978	99.6109	121.2144	0298736	30.3328	331.4939	12.90628351	8517
1	87980U		91285.58092076	0.00000161	00000-0	22365-3	0	130
2	87980	99.6959	142.5533	0118260	173.1173	187.1605	13.66562289	8920
1	87987U		91288.01146774	0.00000019	00000-0	99998-4	0	154
2	87987	99.6012	122.2989	0341405	93.7225	270.3111	12.89557736	9216
1	87990U		91288.43720175	0.00000210	00000-0	12184-2	0	82
2	87990	99.5673	101.8815	0718693	91.4106	276.9215	12.04786019	5581
1	87996U		91266.77370009	0.00003012	00000-0	51104-2	0	60
2	87996	98.9211	94.7845	0415957	25.9231	336.1741	13.16453775	3070
1	87997U		91283.07994834	0.00001115	00000-0	29182-2	0	57
2	87997	99.6693	125.3562	0147054	57.2872	304.2349	13.14157224	7877

