

HELP1,C,79

Satellite Interrogator Database Satellite Information

@DATABASE AREA DESCRIPTIONS:

- 1- INTDES International Designation
- 2- NAME Satellite Common Name
- 3- CATNMBR Satellite Catalog Number
- 4- COUNTRY Country of ownership
- 5- LDATE Launch Date
- 6- LSITE Launch Site
- 7- ORBIT Orbital Period
- 8- INCLINE Inclination of the Spacecraft
- 9- APOGEE Apogee of the Spacecraft
- 10- PERIGEE Perigee of the Spacecraft

##

@HISTORY - U.S. POLAR ORBITING AND GEOSTATIONARY WEATHER SATELLITE

- 1- The first U.S. weather satellite was launched on April 1, 1960, TIROS 1.
- 2- Weather satellite series (POLAR ORBITING AND GEOSTATIONARY SERIES), TIROS, NIMBUS, ESSA, ATS, ITOS, TIROS-N (NOAA A-H). GOES.

Select the name of the Satellite Series for more information

##

@TIROS SERIES: (Television Infrared Observation Satellite)

Orbit: Polar 470 NMI

First launched April 1, 1960

Last of the series launched July 2, 1965

TIROS 1 through 10

270 lbs. total weight

42" X 19" Cylindrical in shape

Systems: Low-resolution TV camera (f 1.5 lens) and
High resolution TV cameras (f 1.8 lens)
the onboard systems did not change much during
this series except for lens types and Vidicon
tubes.

##

@NIMBUS SERIES: (NIMBUS is Latin for cloud)

Orbit: Polar 470 NMI

First launched August 28, 1964

Last of the series launched October 1978

NIMBUS 1 through 7

912 lbs. total weight to over 2000 lbs in later satellites in the series

57" X 118 " 132" across the solar panels
Hexagonal main section

Systems: This spacecraft was the first of the APT (Automatic Picture Transmission) AVCS (Vidicon camera system) for daytime observations, HRIR (High resolution infrared radiometer) for night time observations.

##

@ESSA SERIES: (U.S. Environmental Science Services Administration) also known as TOS (TIROS Operational Satellites) from ESSA-3 on

Orbit: Polar 400 NMI

First launched February 3 1966

Last of the series launched February 26, 1969

ESSA 1 through 9

305 lbs to 320 lbs

22" X 42 " cylindrical 18- sided polygon

Systems: APT, AVCS similar to the NIMBUS series spacecraft

##

@ATS SERIES: (Applications Technology Satellites)

Orbit: Geostationary 2047 NMI

First launched on December 7, 1986

Last of the series launched May 30, 1974 with
ATS series satellites were the first

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Geostationary weather satellites and carried other experiments not weather related.

ATS 1 through 6

815 lbs to 3090 lbs on ATS-6

56" X 72" cylindrical

Systems: Spin Scan Cloud Camera (SSCC) This satellite returned the first photo of the earth covering nearly the entire full disk (Stationary View) on December 9, 1966

##

@ITOS SERIES: (Improved TIROS Operational System)

Orbit: Polar 470 NMI

First launched on January 23, 1970

Last of the series launched on July 26, 1976

ITOS-1 through H (NOAA 1 through 5)

682 lbs to 750 lbs

40" X 48" with 14' solar panels, rectangular

Systems:AVCS, APT FPR (Flat plate radiometer)
SPM (Solar proton monitor)

##

@TIROS-N SERIES (Television Infrared Observation Satellite)

Orbit: Polar 470 NMI

First launched October 13, 1978 (NOAA-6)

Last of the series launched May 15, 1991

The NOAA class of satellite is the current satellite in NOAA's polar orbiting program.

NOAA 6 through 12

3097 lbs

74" X 146" cylindrical in shape with a large

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solar array at one end

Systems: APT, AVHRR (Advanced Very High Resolution Radiometer) SAR (Search and Rescue) SBVUV (Solar Backscatter Ultraviolet Spectral Radiometer) MSU (Microwave Sounding Unit) SSU (Stratospheric Sound Unit)

TIROS-N Notes:

APT transmissions are carried out on the 137 Mhz band. APT provides the direct read out user with Visual spectrum daylight images of 4 Km resolution along with normally 1 other channel of Infrared spectral data. Night time imaging provides two channels of Infrared data. HRPT (High Resolution Picture Transmission) of 1.1 Km resolution is available to the direct read out user on 1700 Mhz.

SAR (Search And Rescue) is a cooperative project between various nation and provide data collection of distress signal on 121.5 Mhz., 243 Mhz. and 406 Mhz. ELT's (Emergency Locator Transmitters) EPIRB (Emergency Position Indicating Radio Beacons)

These transmitters are located on aircraft and ships at sea. Should a transmitter become active the data recorded by the satellite contains user coded information along with the location of the signal. This data is the transmitted to ground stations who notify rescue teams in the affected area. This system has to date found many downed aircraft and provided locations of ships at sea that are in trouble.

##

@GOES SERIES: (Geostationary Operational Environmental Satellite)

Geostationary 22,300 NMI

First launched October 16, 1975

Last of the series launched in 1987

GOES 3 through 7

1841 lbs

81" X 123" cylindrical in shape with solar

panels bonded to the entire exterior surface

Systems: VISSR (Visible/Infrared spin scanner
radiometer (VAS) WEFAX (Weather Facsimile)
NMC (National Meteorological Charts)

GOES NOTES: The current GOES satellite is GOES-7. This platform is dying and plans for a new GOES-NEXT are well under way with GOES 8 launched in April of 1994. Meteosat and the U.S. Government have worked out a lease program for the use of a METS satellite which has been moved over to provide western hemisphere coverage should GOES-7 fail. The MET satellite is now transmitting normal WEFAX data to U.S. Ground stations. Due to on board instruments on the MET series spacecraft VAS transmissions are not available.

##

@OTHER METEOROLOGICAL SATELLITES

METEOR SERIES: (Russian near earth observation satellites)

Meteor 2 series: Provide regular APT over the United

Meteor 3 series: Provide regular APT Visual and IR

FengYun Series: Chinese polar orbiting providing APT Visual and IR along with HRPT data. The FengYun series spacecraft have been plagued with many problems with their instrumentation and do not transmit on a regular basis.

Okean series: Russian, ocean observation series numbered 1 through 3. Transmit 3 types of APT Visual, IR, Side Looking Radar. This series has not been heard from in this hemisphere in over a year now, although reports from the UK indicate that they are turned on over the north pole during European passes.

COSMOS series: Cosmos 1602 is the only known satellite in the series transmitting APT. This series of satellite transmit APT in the same form as the Okean series spacecraft. Not much is known about these transmissions. This spacecraft has not been heard from since 1990.

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GOMS series: Russia is now building a Geostationary platform for launch sometime next year. This spacecraft will provide them with data similar to our GOES series. This platform will also double as a communications satellite.

GMS series: Japan has placed into orbit their version of our GOES Geostationary satellite. This satellite provide them with WEFAX data.

METEOSAT series:Placed into orbit by the European Space Agency, this spacecraft provides Europe with WEFAX data.

INSAT series: Indian Geostationary satellite, Transmitting WEFAX and doubles as a communications satellite.

##

@NORAD/NASA 2-LINE SATELLITE DATA

NORAD maintains general perturbation element sets on all resident space objects. These element sets are periodically refined so as to maintain a reasonable prediction capability on all space objects. In turn, these element sets are provided to users.

Space related telephone BBS around the country are posting current Keplerian data. The most recent element sets received from NASA/Goddard Space Flight Center for several categories of satellites: Amateur Radio, Earth Resources, Manned Spacecraft, Navigation, Weather, and NASA's 30 Day Specials(which contain objects launched within the last 30 days and are often easy to spot visually). More specifically, these include the following satellites or satellite series: OSCAR, Radio Sputnik, UOSAT, Cosmos, LandSat, SeaSat 1, SPOT, Mir, Salyut 7, Soyuz, LDEF, US Space Shuttle, NAVSTAR (GPS), GOES, Meteor, and NOAA.

These elements are be maintained in ASCII format in the file. Data for each satellite will consist of three lines in the following format:

AAAAAAAAAAAA
1 NNNNNNU NNNNNAAA NNNNN.NNNNNNNNN +.NNNNNNNNN +NNNNN-N +NNNNN-N N NNNNN
2 NNNNN NNN.NNNN NNN.NNNN NNNNNNNN NNN.NNNN NNN.NNNN NN.NNNNNNNNNNNNNNN

Line 1 is a eleven-character name. Lines 2 and 3 are the standard Two-Line Orbital Element Set Format identical to that used by NASA and NORAD. The format description is:

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Line 2

Column	Description
01-01	Line Number of Element Data
03-07	Satellite Number
10-11	International Designator (Last two digits of launch year)
12-14	International Designator (Launch number of the year)
15-17	International Designator (Piece of launch)
19-20	Epoch Year (Last two digits of year)
21-32	Epoch (Julian Day and fractional portion of the day)
34-43	First Time Derivative of the Mean Motion (rev/day ²) or Ballistic Coefficient (Depending of ephemeris type)
45-52	Second Time Derivative of Mean Motion (Blank if N/A)
54-61	BSTAR drag term if GP4 general perturbation theory was used. Otherwise, radiation pressure coefficient.
63-63	Ephemeris type
65-68	Element number
69-69	Check Sum (Modulo 10) (Letters, blanks, periods = 0; minus sign = 1; plus sign = 2)

Line 3

Column	Description
01-01	Line Number of Element Data
03-07	Satellite Number
09-16	Inclination [Degrees]
18-25	Right Ascension of the Ascending Node [Degrees]
27-33	Eccentricity (decimal point assumed)
35-42	Argument of Perigee [Degrees]
44-51	Mean Anomaly [Degrees]
53-63	Mean Motion [Revs per day]
64-68	Revolution number at epoch [Revs]
69-69	Check Sum (Modulo 10)

All other columns are blank or fixed.

Example:

```
NOAA 6
1 11416U      86 50.28438588 0.00000140      67960-4 0 5293
2 11416 98.5105 69.3305 0012788 63.2828 296.9658 14.24899292346978
```

Note that the International Designator fields are usually blank, as issued in the NASA Prediction Bulletins. All epochs are UTC. Satellites will be ordered by their NASA Catalog Number. The

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data file will be updated as soon as possible after receipt of new element sets or whenever element sets are received for the Space Shuttle.

##

@MEAN CLASSICAL ELEMENTS

Five independent quantities called "orbital elements" are sufficient to completely describe the size, shape and orientation of an orbit. A sixth element is required to pinpoint the position of the satellite along the orbit at a particular time. The classical set of six orbital elements are defined as:

1. a, semi-major axis, a constant defining the size of the conic orbit.
2. e, eccentricity, a constant defining the shape of the conic orbit.
3. i, inclination, the angle between the Z axis, i.e. like the North Pole, and the angular momentum vector, $h = R \times V$, i.e. the vector R crossed with the vector V.
4. \hat{U} , longitude of the ascending node, the angle, in the fundamental plane, between the Greenwich Prime Meridian and the point where the satellite crosses the fundamental plane in a northerly direction, (ascending node). This angle is measured counterclockwise when viewed from the north side of the fundamental plane.
5. w, argument of periapsis, the angle, in the plane of the satellite's orbit, between the ascending node and the periapsis point, measured in the direction of the satellite's motion.
6. T, time of periapsis passage, the time when the satellite was at periapsis.
- 6a. Sometimes the time of periapsis passage is replaced by the true anomaly, v, the angle, in the plane of the satellite's orbit, between perigee and the position of the satellite at the particular time, t0, called the epoch.

* (To convert from T to v)
$$v = (360 \text{ deg}) * t0 / T$$

- 6b. The NASA/NORAD element sets include the right ascension of the ascending node (RAAN) instead of the

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longitude of the ascending node but the conversion is between the two is not hard to do.

Elements used for study

Mir

```
1 16609U      90272.82451929 .00046194 00000-0 56285-3 0 9636
2 16609 51.6113 162.6955 0026137 101.1206 259.2727 15.59612888264453
```

From the example 2-line elements for Mir the epoch is;

9-29-1990 @ 19.78846296 UTC (19h 47m 18.4666s).

The GST for that date and time is 305.1334 deg..

From the elements the RAAN is 162.6955 deg..

Therefore:

$$\text{Longitude} = \text{RAAN} - \text{GST}$$

$$-142.4379 = (162.6955 - 305.1334)$$

The sharp reader will notice that the NORAD elements do NOT include the semi-major axis, a . It is possible to calculate the semi-major axis with the data in a NORAD elements set. The approach would be;

1. Convert the mean motion into degrees per second. and calculate the time to complete one orbit, this will be called the period.
2. Using the period and the earth's gravitational constant, μ , the semi-major axis can be calculated.

(equations used)

$$x_{n_s} = (\text{mean motion} * 360) / 86400$$

$$\text{per} = 360 / x_{n_s}$$

$$a = ((\text{per}^2 * \mu) / (4 * \pi^2))^{1/3}$$

$$\mu = 3.986012E+14 \text{ m}^3/\text{sec}^2.$$

The starting point for the study of motion of one body orbiting another, such as an artificial satellite about the earth, is always the two-body problem; i.e., two point masses attracted to each other according to Newton's Law of Universal Gravitation, the inverse square law. The solution is well-known; the two

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bodies move about each other in conic sections. For bounded motions, such as those of an earth satellite, this conic is either a circle or an ellipse.

The problem can be formulated in different ways, but is always convenient to choose a coordinate system with the origin centered at one of the bodies. The position of the second body then can be specified, for example, by giving its initial Cartesian position and velocity coordinates and then integrating the equations of motion to find the future positions and velocities. The Cartesian system is not the most convenient one in which to represent the motion because an analytic solution cannot be obtained and the integrations must be done numerically. By adopting a polar coordinate system, one is able to effect an analytic solution referred to above which can be specified in terms of six constants of motion; five orbital elements, a, e, i, w, \dot{U} and the time of pericenter passage T . The last constant can be, and usually is, replaced by the mean anomaly M which is a linear function of time. This is a very convenient way to specify the initial position and velocity of a satellite and it also allows an easy visualization of the motion. The position and velocity of the satellite at any future time can be specified in terms of these six constants, a, e, i, w, \dot{U}, M and time.

In realistic applications, such as artificial satellites about the earth, there are forces acting on the satellite in addition to the inverse square force although this is the dominant one. Other gravitational forces are due to distant bodies such as the moon and sun but the principal additional gravitational forces are due to the non-sphericity of the earth. All of the gravitational forces are conservative and can be represented by a potential function. In addition to these extra gravitational forces, there are non-conservative forces such as atmospheric drag. All of these forces other than the inverse square force are called perturbations. The prediction of motion considering these additional forces is called Perturbation Theory. The orbital elements, constant for pure two-body motion, become slowly varying functions of time when the perturbations are considered. Differential equations describing the time rates of change of the elements are called the Lagrange Planetary Equations, LPE and can be found in any standard book on celestial mechanics. Considering conservative forces only, which can be represented by a potential function, the part of the potential other than the two-body part is conventionally called the disturbing function, represented by R , and the LPE are:

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$$a = 2 / n a * (\dot{U}R / \dot{U}M)$$

$$e = (-(1-e^2)^{1/2} / na^2e) * \dot{U}R / \dot{U}w + (1-e^2/na^2e) * \dot{U}R / \dot{U}M$$

$$i = \cot i / (na^2(1-e^2)^{1/2} * \dot{U}R / \dot{U}w - \dot{U}R / (\dot{U}na^2(1-e^2)^{1/2})$$

$$w = (1-e^2)^{1/2} * \dot{U}R / na^2e \dot{U}e - \cot i * \dot{U}R / (na^2(1-e^2)^{1/2}) * \dot{U}i$$

$$\dot{U} = \dot{U}R / (na^2 \sin i * (1-e^2)^{1/2}) * \dot{U}i$$

$$M = n - 2\dot{U}R/na\dot{U}a - 1-e^2 * \dot{U}R/(na^2e * \dot{U}e).$$

* where \dot{U} is the partial derivative

starting from the very simple representation of the gravitational potential between two point masses of magnitude m_0 and m_i separated by distance r as;

$$V = -G * (m_0 * m_i) / r$$

one can, by applying this to a satellite of mass m_0 and to every infinitesimal mass point m_i of the earth and integrating over the whole earth, arrive at the following potential function for the earth;

$$V = -\mu/r \left(1 - \sum_{n=2}^{\infty} J_n P_n(\sin \dot{U}) (re/r)^n + \sum_{n=2}^{\infty} \sum_{m=1}^n J_{nm} (re/r)^n P_n^m(\sin \dot{U}) \cos(m(\dot{O}-\dot{O})) \right).$$

$n=2$

$n=2m=1$

mn

The first term is the one giving pure two-body motion and the additional terms are the perturbing terms. The first sum, zonal harmonics, represents the flattening and other distortions relative to the equator and the second sum, tesseral harmonics, represents the non-uniformity of the earth in longitude. If, as is frequently done, one assumes that the earth possesses rotational symmetry, then the second sum vanishes. The neglect of the second sum usually produces no noticeable effects except in the case of geosynchronous satellites. Then one must consider those terms which cause slow long-period drifts of the geosynchronous position.

For close earth satellites one can usually take about three terms from the first sum and get very accurate results; even the first term alone will produce very satisfactory results in most cases for short-time periods.

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The J_n are constants which depend on the mass distribution in the earth and are deduced from analysis of observed satellite motions.

$$J_2 = 1.082616 \times 10^{-3}$$

$$J_3 = -2.53881 \times 10^{-6}$$

$$J_4 = -1.65597 \times 10^{-6}$$

The $P_n(\sin \hat{U})$ are Legendre polynomials of index n and are even functions of $\sin \hat{U}$ for n even and odd functions for n odd. The J_2 term describes the flattening of the earth and the J_3 term the so-called pear shape. J_2 , which is three orders of magnitude larger than J_3 , gives rise to secular changes in the elements w , \hat{U} , and M while J_3 gives rise to long-period oscillations in e and w . In general, even harmonics cause long-period and secular changes in the elements, and odd harmonics cause long-period oscillations.

Short-period oscillations can result from all terms; but since J_2 is so much larger than the other coefficients, generally only the J_2 short-period terms are considered. Secular terms are those which monotonically increase or decrease with time. For first order solutions this change with time is linear. Long-period terms are those which oscillate with a period of typically one to two months, and short-period terms are those which oscillate with a period of one orbital period or some rational fraction of it. To finish formulating the problem, the disturbing function is expressed in terms of the orbital elements and then the appropriate partial derivatives are taken and substituted into the LPE. One then has a coupled set of first order non-linear ordinary differential equations. Because they are non-linear, they can be solved only by various approximation methods. The usual method is to assume that the solutions can be represented in some type of power series expansion in a small parameter and arrive at sets of approximation equations which can be a close representation of the real motion, at least over short-time periods.

The complete solution consists of the sum of the secular terms, short-period terms, and the long-period terms; i.e.,

$$a = a_{osc} + a_{sp} + a_{lp}$$

##

@MODELS FOR PROPAGATION OF NORAD ELEMENT SETS

NORAD maintains general perturbation element sets on all resident space objects. These element sets are periodically refined so as to maintain a reasonable prediction capability on all space objects. In turn, these element sets are provided to users.

The most important point to be noted is that not just any prediction model will suffice. The NORAD element sets are "mean" values obtained by removing periodic variations in a particular way. In order to obtain good predictions, these periodic variations must be reconstructed (by the prediction model) in exactly the same way they were removed by NORAD. Hence, putting NORAD element sets into a different model (even though the model may be more accurate or even a numerical integrator) will result in degraded predictions.

All space objects are classified by NORAD as near-Earth (period less than 225 minutes) or deep-space (period greater than or equal 225 minutes). Depending on the period, the NORAD element sets are automatically generated with the near-Earth or deep-space model.

##

@TELEPHONE BBS's-Obtaining Current Keplerian Data

The following telephone BBS's post current Keplerian data as it becomes available.

MAPS-NET BBS Hampstead, Maryland SYSOP: Charles Davis 410-239-4247 24 Hours, 2400/9600/14.400 8bit NO parity 1 stop	The Barter Board Baltimore, Maryland SYSOP: Thom LaCosta 410-239-4247 24 Hours, 2400/9600/14.400 8Bit NO parity 1 Stop
Celestial RCP/M Fairborn, Ohio SYSOP: Dr, T.S. Kelso 513-427-0674 24 Hours, 9600/2400/1200 8 Bit NO parity 1 stop	Datalink RBBS System Dallas Remote Imaging Group (DRIG) Dallas, Texas SYSOP: Dr. Jeff Wallach 214-394-7438 24 hours, 14.400/9600/2400/1200 8 bit NO parity 1 stop.

RPV BBS
Rancho Palos Verdes, Ca.

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SYSOP: Dave Ransom Jr.
310-541-7299 or 310-544-8977
24 hours, 14.400/9600/2400/1200 baud,
8 bit NO parity 1 stop.

To obtain the elements from the DATALINK BBS and MAPS-NET BBS, (with the least amount of trouble), just dial up the BBS and login. The next step is to type "D", for download and then type " BULLE90 " as the file to download, open an ZMODEM file transfer mode with your telecommunications software. (The file name is always called BULLE90) This will transfer the NASA 2-line elements to a file on the users computer. The downloading of BULLE90 should take about 2 minutes at 2400 baud.

NOTE

Files downloaded from other BBS's other than DATALINK will have some characters at the top of the file that will need to be removed with a word processor (PC-Write, Edlin etc. works very well). The keplerian data must be saved in a pure ASCII file format. Saving the Data in and ASCII format insures that all of the data will be read into your tracking program with out errors.

EXAMPLE: CURRENT ELEMENT SET 123 <- Remove this data

##

@NASA BBS - OBTAINING ELEMENTS

The following is a partial extract from the notice sent out by the NASA Goddard Space Flight Center's Orbital Information Group. Interested users should write to the address given and request access to the RBBS; include your full name and address with your request.

The NASA OIG RBBS has four lines operating in rotation. A modem and software is required to download data. The RBBS operates at 2400/1200/300 baud. You MUST write for access and password; you cannot call and log on without having first received that information by mail from NASA OIG!

* IMPORTANT NOTE *

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Note that the format used on RBBS for two-line orbital elements is slightly different from that required by programs like TRAKSAT, INSTANTRAK, and SDSTRAK. Several programs are "in process" to simplify conversion to the standard format and are posted on the above listed BBS's. One such program is called ORBITEL and can be found and ELEMEN.ZIP.

For some time the Orbital Information Group's Reports and Information Dissemination (RAID) section has been developing an electronic bulletin board as a way to reduce our cost of providing orbital elements to users worldwide, in addition to providing mail users with an around-the-clock way to obtain the latest two-line element set iteration.

Development and enhancement of the electronic bulletin board is completed, and activation was on September 16, 1991. The official name of the RAID Bulletin Board System is RBBS. Effective immediately, ALL USERS ARE ENCOURAGED TO USE THE RBBS INSTEAD OF THE MAIL SERVICE.

Those who use the service and find it serves their needs or is an acceptable alternative to the slower and more costly mail service, should advise us to drop them from mail distribution. This may be done by advising the RBBS SYSOP or by sending a letter. Users may not continue to use the RBBS and to receive mail service.

The RBBS permits users of our NASA Prediction Bulletins and Two-line Orbital Elements (TLE's) access to the latest element set provided to us, avoiding the mail delay, in addition to allowing a user the flexibility of accessing the two-line element set of choice. One may obtain the latest two-line element set iteration around-the-clock from anywhere in the world, via telephone modem.

Correspondence regarding this service should be sent to:

NASA Goddard Space Flight Center
Project Operations Branch/513
Attn: Orbital Information Group
Greenbelt, MD 20771
USA

The RBBS is updated with revised TLE's on the following schedule:

Monday TLE's revised between 12:00 GMT Friday and 12:00 GMT Monday.

Wednesday TLE's revised between 12:00 GMT Monday and 12:00 GMT Wednesday.

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Friday TLE's revised between 12:00 GMT Wednesday and 12:00 GMT Friday.

Should a holiday fall on a day that the RBBS is scheduled to be updated with the latest TLE's, updating will be done on the next Monday through Friday working day.

##

@VISUAL SIGHTING OF SPACECRAFT

Below is a list of some satellites that are "good hunting" for the optical users. (First timers should look for the smallest magnitude satellites, i.e., Mir, Kvant-1, HST.) Use of your tracking program along with current Keplerian data is a must when looking for visible satellites.

Norad ID#	Vis Mag*	Satellite Name
00694	3.0	Atlas Centaur 2
01001	3.3	Transtage 3
01359	3.3	Transtage 4
03598	3.0	OAD 2 R/B
04597	3.3	Cosmos 374 R/B
04622	3.3	Cosmos 375 R/B
04786	1.9	Cosmos 382
04966	2.3	Cosmos 398
05994	.9	Pageos
06155	3.0	OAD 3 R/B (Copernicus R/B)
06212	2.7	1972-076A Radcat
06779	3.0	IntelSat 4 F-3 R/B
08074	1.6	Pageos 1 DEB (Pageos H)
10967	3.0	SeaSat 1
12054	2.4	Cosmos 1220
12069	3.0	FltSatCom 4 R/B
12363	3.0	Comstar 4 R/B
12445	3.0	IntelSat 5-2 R/B
12465	-1.6	Cosmos 1271 R/B
12497	3.0	IntelSat 5-1 R/B
13007	3.0	IntelSat 5-3 R/B
15423	2.5	KH 11-6
15772	2.9	Cosmos 1656 R/B(4)
16182	2.5	Cosmos 1697 R/B
16609	-.4	Mir Space Station
16615	3.2	Spot 1 R/B
16910	2.8	EGP/JAS-1 R/B

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17358	2.9	Cosmos 1603 R/B(4)
17369	3.3	Cosmos 1818
17528	3.1	MOS-1 R/B
17590	2.5	Cosmos 1833 R/B
17845	-.4	Kvant-1 (part of Mir)
17974	2.5	Cosmos 1844 R/B
18187	3.3	Cosmos 1867
18441	2.5	KH 11-7
19120	2.5	Cosmos 1943 R/B
19274	3.3	Okean 1
19460	3.3	USA 32
19461	3.3	USA 32 R/B
19625	2.5	KH 11-8
19650	.7	Cosmos 1980 R/B
19671	1.8	Lacrosse
19911	2.7	Delta Star
20147	2.4	Cosmos 2033
20261	3.3	In-Cosmos 24
20322	1.8	Cosmic Background Explorer
20335	-.4	Kvant-2 (part of Mir)
20443	3.1	Spot 2 R/B
20491	3.1	MOS-1B R/B
20516	2.0	USA 53
20523	3.0	IntelSat 6-3
20525	2.4	Cosmos 2060
20580	-.8	Hubble Space Telescope (HST)
20625	2.5	Cosmos 2082 R/B
20635	-.4	Kristall Module (part of Mir)
20638	3.2	ROSAT
20683	3.2	Gamma
20765	2.4	Cosmos 2096
20963	2.0	USA 67 (STS-38 Payload)
20985	2.4	Cosmos 2107
21015	2.5	Cosmos 2112 R/B
21065	2.4	Cosmos 2122
21147	1.8	Lacrosse 2
21148	2.9	Lacrosse 2 R/B
21213	2.2	Almaz 1 radar spacecraft
21225	2.8	Gamma Ray Observatory (GRO)
21311	-.4	Soyuz TM-12 (part of Mir)
21610	3.1	ERS-1 R/B
21638	-1.1	STS-43 (landed)
21653	3.0	Intelsat-6
21662	-.4	Progress M9 (part of Mir)
21700	-1.1	STS-48 (landed)

* This magnitude is an approximation, it assumes 75% illumination of the satellite and 900 Km slant range.

##

@SOURCE

This is the source of the payload. Usually, the source of the payload is the same as the source of the launch, but not always. For instance, the US launches payloads for many other countries and organizations (e.g., NATO or ESA).

ARGENT	Argentina
AUSTRAL	Australia
BRAZIL	Brazil
CANADA	Canada
CZECH	Czechoslovakia
ESA	European Space Agency
ESRO	European Space Research Organization
FRANCE	France
FR/FRG	France/Federal Republic of Germany
FRG	Federal Republic of Germany
IMSO	International Maritime Satellite Organization
INDIA	India
INDNSA	Indonesia
ISRAEL	Israel
ITSO	International Telecommunications Satellite Organization
ITALY	Italy
JAPAN	Japan
KOREA	Korea
LUXEMB	Luxemburg
MEXICO	Mexico
NATO	North Atlantic Treaty Organization
NETH	Netherlands
PAKIST	Pakistan
PORTUG	Portugal
PRC	People's Republic of China
SAUDI	Saudi Arabia
SPAIN	Spain
SWEDEN	Sweden
THAI	Thailand
UK	United Kingdom
US	United States of America
USSR	Russia

##

@LSITE

This refers to the launch site from which the object was launched. As of today, there are currently 18 launch sites around the world. The codes and their meanings are:

AFETR Air Force Eastern Test Range, Florida, USA
 (Cape Canaveral)

Sheet1

AFWTR Air Force Western Test Range, California, USA
(Edwards Air Force Base)

CHINA Chinese Launch Complex, PRC, China
(Xchang)

FRGUI French Guiana
(French Guiana)

HGSTR Hammaguira Space Track Range

KSCUT Kagoshima Space Center - University of Tokyo
(Japan)

KYMSC Kapustin Yar Missile and Space Complex
(Russia)

PLMSC Plesetsk Missile and Space Complex
(Russia)

SCMTR Shangchengtze Missile Test Range, PRC
(China)

SRILR Sriharikota Launching Range
(India)

SNMLP San Marco Launch Platform, Indian Ocean
(Kenya)

TANSC Tanegashima Space Center
(Japan)

TYMSC Tyuratam Missile and Space Center, Kazakhstan
(Russia)

WLPIS Wallops Island
(Virginia, USA)

WOMRA Woomera
(Australia)

WUZLF Wuzhai Launch Facility, PRC
(China)

XICLF Xi Chang Launch Facility, PRC
(China)

YAVNE Yavne Launch Facility
(Israel)

##

@ORBIT(s)

EARTH ORB	Earth Orbit (Geocentric)
SOLAR ORB	Solar Orbit (Heliocentric)
LUNAR ORB	Lunar Orbit (Selenocentric)
MARS ORBT	Mars Orbit (Areocentric)
VENUS ORB	Venus Orbit
BARYCNTRC	Barycentric Orbit
SS ESCAPE or SSET	Solar System Escape Trajectory
CENM	Current Elements Not Maintained
ELNA	Elements Not Available

##

@SEARCH

Record: 000001

05/26/9

Satellite Data Base View Menu				

International:	1963 001A			
Catalog Number:	521			
Satellite:	SPUTNIK 25			
Country Owner:	USSR			
Launch Date:	04 JAN 63			
Launch Site:	TYMSC			

Decay	Orbital Period	Inclination	Apogee	Perigee
05 JAN 63	88.0	64.6	189	165

EDIT/VIEW: Delete Edit Find Goto Locate

Next-record Previous-record Return

FINDING SOMETHING

Let's assume we want to find a satellite with the name of TIROS.
Simply choose F for find...you'll see a selection of search index names

SET INDEX: 1-INTDES 2-NAME 3-CATNMBR 4-COUNTRY 5-LDATE 6-LSITE 7-ORBIT
8-INCLINE 9-APOGEE 10-PERIGEE

Sheet1

Since we are attempting to find the Name TIROS, select number 2, and then enter TIROS as the name. SATINIT will find the first name that matches TIROS and display the information for you. At the bottom of the screen you'll see:

EDIT/VIEW: Delete Edit Find Goto Locate
Next-record Previous-record Return

You may then select 'N' for the next TIROS, P for the previous TIROS or any of the other commands available.

LOCATING ITEMS

SATINIT has a very flexible location system.. With it, you can locate a satellite that matches a series of criteria you select. SATINIT makes use of Xbase logic for all the searches.

Lets assume you want to locate ALL satellites that were launched in April of 1960. The launch date field lists the launch date in the following format, DD MMM YY, So satellites launched in APRril of 1960 would have an entry of the day's digits, then APR, then 60.

To locate the above, simply choose L from the edit menu. You will then see the matrix on the next page.

#. Field	#. Operators
1. intdes	1. Equal
2. catnr	2. Not equal
3. name	3. Greater than
4. source	4. Greater or equal
5. launch	5. Less than
6. lsite	6. Less or equal
7. decay	7. Contains
8. period	8. Is Contained in
9. inc	
10. apogee	{C} = Connectors
11. perigee	
12.	' ' = <exit>

13.			'A' = .AND.	
14.			'O' = .OR.	

Enter FIELD #

Since we are looking for a launch date, we select field 5(launch), and since we want ALL launches in april of 1960, we would select 7 (contains) then APR 60 as a value. Press ENTER when you have defined your last condition. We have now told SATINIT to locate ALL satellites launched in APR of 60.

Satinit will write the search conditons as follows:

```
("APR 60"$UPPER(A->launch))
```

This search criteria will be saved for later use.

In another example, we could look for NON-US satellites launched from AFETR (Cape Canaveral). We would select field 6 (LSITE) and enter AFETR as the site...then we select A for the logical AND...then select field 4 (SOURCE) and enter US as the value, then select 2 for Not Equal. Finally, press enter to finish your selection. Satinit will write the search conditions as follows:

```
(UPPER(A->lsite)="AFE").AND.(UPPER(A->source)<"US")
```

This search criteria will be saved for later use.

REPORTS

The same logic can be used to create custom reports...AND Satinit stores your search criteria...allowing you select a complicated search at any time.

While viewing a report on-screen, you may press the ESC key. You will be asked if you want to go backwards in the report, continue or quit.

You may add, delete or modify any of the criteria listed in the location database.

##
