Remark: The start time for calculation has been put back in order to show the satellite prior to the event.

Select start of calculation:
Date: 8 August 2013
Time: 22 : 30 : 33 Now
Select duration: 10 Minutes
Select interval: 1 Minute go!

```
Name:           USA 61 / NOSS 2-1B
Military Sat.:  US Navy's spaceborne electronic intelligence
                (ELINT) system, White Cloud, is based on SSU
                (Subsatellite Unit) satellites and is intended
                for determining the location of warships of
                foreign states by exploiting the ships' onboard
                radioelectronic equipment from several positions
                (White Cloud, Ranger). The tringle may brighten
                up by up to 2 magnitudes.
Brightness:      5.5 mag (at 1000 km, 50% illuminated)
                 3.6 mag (at perigee, full illumination)
                Mean magnitude from visual observations
RCS:            5m² (Radar cross section)
USSPACECOM Nr: 20691    Internat. Designator: 1990-050C
Orbit:          601.6 x 1609 km, 107.4min  Inclination: 63.4°
Age Elements:   4.9 days (Orbit from amateur sources)
```

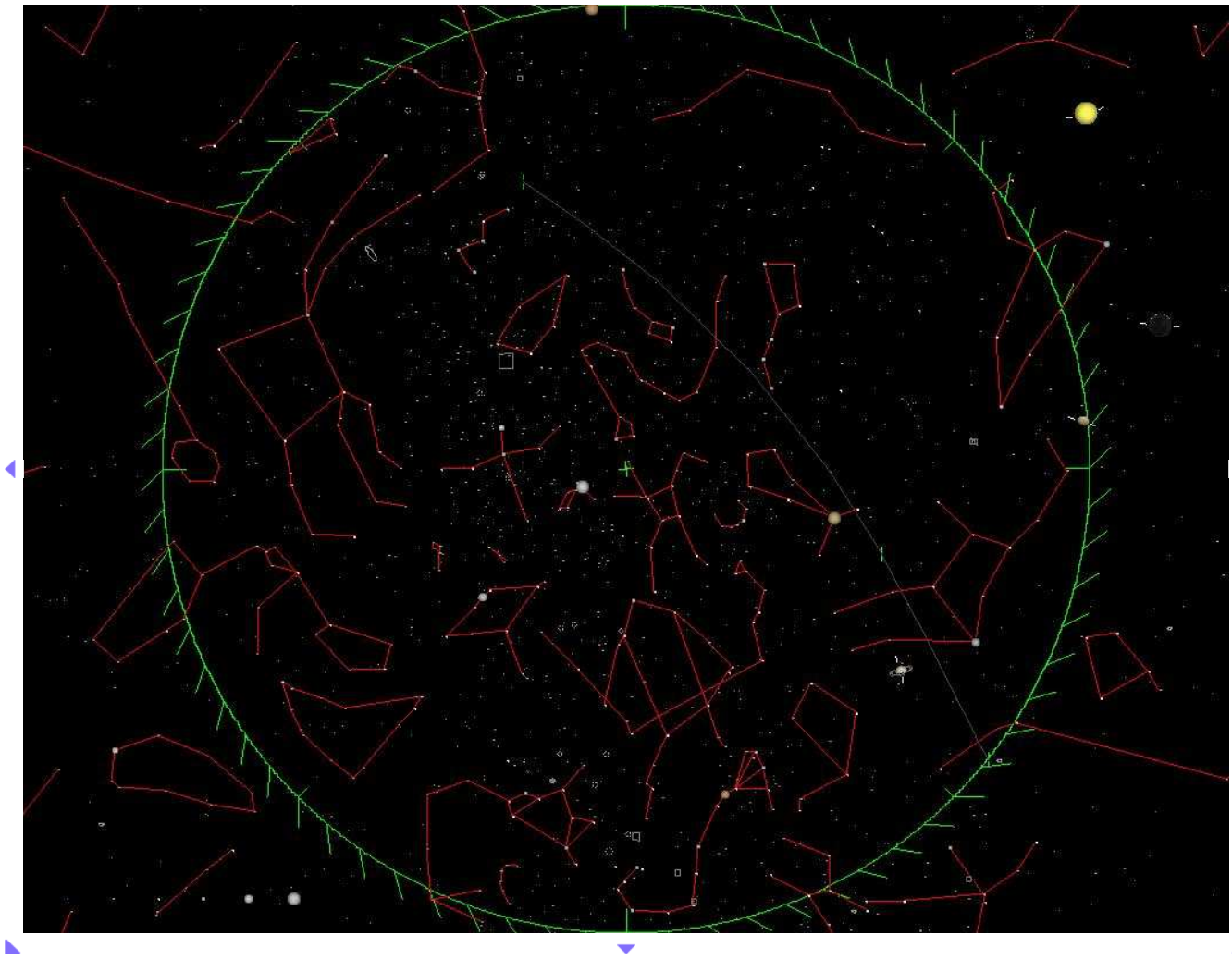
Satellite Menu
- Orbit History/Zoom
- Sighting Opportunities
- Data & view of the Earth
- Finder Chart
- Ground Track Map
- Transit Centerline
- Orbit Elements (TLE)

See more/less data and options by changing the user level!

Simulation
- 800 Output size
- Grid
- Main lines
- Constellations
- Boundaries
- no line of Horizon
- Negate colors
- draw no symbols
- Realism (e.g., show Planets/Moons)

Telescope
- Vertex is up
- Telrad
- Left-right mirrored image
- Inverted image
- Digitized Sky Survey photographic plates (supports only equatorial view)
- Auto Limiting Magnitude

Pointing
Whole Sky
Center Satellite
Sky Field of View
Zenith Direction
Object Name, NGC M PGC Cr Tr B Sh2 PK Abell Mrk ACO SDSS 2QZ / SAO HIP TYC HD FK5 XZ GI Struve
17:41:37.866 Right Ascension
44:10:12 Declination
go!



Stars as seen from the observer.
Visual limiting magnitude: 5.5 mag

Time:

Thursday, 8 August 2013, 22h 30m 33s
JD: **2456513.3545508** TDT: 2456513.3553278 deltaT: 67.13 sec
Apparent sidereal time: Local: 17h 41m 37.866s Greenwich: 17h 40m 35.466s
(Times in **CEST, UTC+02:00**, topocentric data for **Barbaste, France**)

Map Center:

Azimuth direction: 90.12° E (East)
Altitude: 89.92°
Right Ascension: 17h 42m 03.701s Apparent coordinates
Declination: + 44° 10' 11.18" Apparent coordinates

Right Ascension: 17h 41m 37.866s J2000
Declination: + 44° 10' 12.00" J2000

Elongation from Sun center: 102.74°
Elongation from Moon center: 99.99°

Rises: 11h 31m on following day (Azimuth: 11.2° N)
Transit: 22h 30m 59s (Altitude: +90.00°)
Sets: 9h 27m on following day (Azimuth: 348.8° N)

Opposition in R.A.: 16. June 2013 23h 36m CEST Elongation: 112.5°
Conjunction in R.A.: 17. December 2013 16h 53m CET Elongation: 67.5°

Sun:

Altitude: -12.7°
Azimuth: 307.6°

Moon:

Altitude: -9.9°
Azimuth: 284.9°
Phase, illum. fraction: 3.8% (geocentric)

Print E-mail

Positions are shown in **topocentric (for objects within the solar system, geocentric otherwise) astrometric (airfree) equatorial coordinates at equinox J2000.0 (Right Ascension/Declination) and epoch of date given**. Stereoscopic projection is used for the star chart. If you zoom into a field of view in order of minutes of arc, you will get a fantastic photographic background image from the Digitized Sky Survey (DSS) from the Mount Palomar observatory.

Pointing the mouse to targets reveals their names - the higher the selected user level, the more features are labeled. The highest level "Astronomer" displays all object names. You can switch the user level just next to the small Earth icon on top of each page.

Select start of calculation:
Date: 8 August 2013
Time: 22 : 15 : 03 Now
Select duration: 30 Minutes go!

Bright Satellites

- Tracking of satellites all over the sky.
- Searching for satellites found within a certain area (given by celestial coordinates and diameter). This point is taken from the last starchart geometry. To change the center and diameter, click **here** (field of view must be at least 1° and at most 90°). Satellites a re sorted by ascending elongation from selected center point. For the listed events the conjunction must not take place during the selected time window, but the satellites must be within the search radius. If you are a astro photographer, you can also find the time interval where no LEO satellite will pass through your field of view.

Magnitude cutoff used for the following list: 4.5 Mag. (☐ Manual selection) go!

Thursday 8 August 2013

Time (24-hour clock)	Object (Link)	Event
	Observer Site	**Barbaste, France** **WGS84: Lon: +0d15m36.00s Lat: +44d10m12.00s Alt: 161m** **All times in CET or CEST (during summer)**
22h15m03s	Cosmos 1939 Rocket (19046 1988-032-B) →Ground track →Star chart	**Appears** **22h09m31s** 5.5mag az:142.5° SE h:11.2° **Culmination** **22h13m04s** **4.0mag** az: 71.9° **ENE** **h:42.9°** distance: 780.8km height above Earth: 555.2km elevation of Sun: -10° angular velocity: 0.58°/s **at Meridian** **22h16m57s** 7.2mag az: 0.0° N h:9.4° **Disappears** **22h19m00s** 8.3mag az:354.3° N horizon
22h15m03s	USA 81/SBWASS R3/Singleton 3 (21949 1992-023-A) →Ground track →Star chart	**Appears** **22h02m02s** 7.6mag az:173.8° S horizon **Culmination** **22h09m34s** **4.8mag** az: 91.0° **E** **h:63.5°** distance: 875.7km height above Earth: 794.1km elevation of Sun: -10° angular velocity: 0.50°/s **Disappears** **22h17m11s** 8.7mag az: 8.6° N horizon
22h15m22s	Cosmos 1602 (15331 1984-105-A) →Ground track →Star chart	**Appears** **22h09m12s** 7.7mag az:184.5° S horizon **at Meridian** **22h13m48s** 5.2mag az:180.0° S h:36.1° **Culmination** **22h15m22s** **4.4mag** az: 97.0° **E** **h:81.4°** distance: 558.8km height above Earth: 553.2km elevation of Sun: -10° angular velocity: 0.80°/s **Disappears** **22h21m32s** 8.8mag az: 9.9° N horizon
22h19m13s	Cosmos 1975 (19573 1988-093-A) →Ground track →Star chart	**Appears** **22h15m11s** 5.8mag az:160.7° SSE h:8.5° **Culmination** **22h19m13s** **4.1mag** az: 91.9° **E** **h:36.8°** distance: 883.5km height above Earth: 565.8km elevation of Sun: -11° angular velocity: 0.51°/s **Disappears** **22h25m17s** 7.6mag az: 16.9° NNE horizon

	22h24m39s	USA 209/STSS Demo SV-2 (35938 2009-052-B) →Ground track →Star chart	**Appears** **22h13m31s** 9.3mag az:217.4° SW horizon **at Meridian** **22h23m53s** 6.4mag az:180.0° S h:72.3° **Culmination** **22h24m39s** **6.3mag** az:132.1° **SE** **h:78.0°** distance: 1378.0km height above Earth: 1353.2km elevation of Sun: -12° angular velocity: 0.30°/s **Disappears** **22h35m53s** 9.1mag az: 47.5° NE horizon
	22h24m42s	**Glonss BrzTank (28116 2003-056-E)** →Ground track →Star chart	**Appears** **22h21m00s** **6.1mag** **az:215.4° SW** horizon **at Meridian** **22h23m51s** **3.3mag** **az:180.0° S** h:26.9° **Culmination** **22h24m42s** **2.8mag** **az:132.8° SE** **h:37.6°** **distance: 624.8km height above Earth: 399.2km elevation of Sun: -12° angular velocity: 0.88°/s** **Disappears** **22h32m24s** **7.3mag** **az: 56.7° ENE** **horizon** **Time uncertainty of about 1 seconds**
	22h27m54s	**ISS** →Ground track →Star chart	**Appears** **22h22m29s** **0.7mag** **az:249.7° WSW** horizon **Culmination** **22h27m54s** **-3.0mag** **az:333.8° NNW** h:54.4° **distance: 511.8km height above Earth: 422.8km elevation of Sun: -12° angular velocity: 0.86°/s** **at Meridian** **22h28m14s** **-3.1mag** **az: 0.0° N** **h:51.3°** **Disappears** **22h33m21s** **-0.4mag** **az: 58.0° ENE** **horizon**
	22h28m25s	USA 186/KH (28888 2005-042-A) →Ground track →Star chart	**Appears** **22h24m23s** 6.3mag az:130.9° SE h:15.4° **Culmination** **22h28m25s** **5.5mag** az: 66.5° **ENE** **h:41.9°** distance: 1245.7km height above Earth: 891.4km elevation of Sun: -12° angular velocity: 0.34°/s **at Meridian** **22h33m50s** 8.4mag az: 0.0° N h:11.6° **Disappears** **22h36m55s** 9.7mag az:353.1° N horizon Time uncertainty of about 2 seconds
	22h29m53s	USA 234/FIA Radar 2 (38109 2012-014-A) →Ground track →Star chart	**Appears** **22h24m10s** 5.4mag az:126.7° SE h:14.6° **Culmination** **22h29m53s** **4.0mag** az: 38.4° **NE** **h:88.0°** distance: 1112.0km height above Earth: 1111.5km elevation of Sun: -13° angular velocity: 0.39°/s **at Meridian** **22h29m57s** 4.0mag az: 0.0° N h:87.4° **Disappears** **22h38m57s** 10.7mag az:310.7° NW horizon
	22h31m39s	Astro F (28939 2006-005-A) →Ground track →Star chart	**Appears** **22h29m06s** 5.4mag az:141.1° SE h:18.4° **Culmination** **22h31m39s** **4.3mag** az: 71.4° **ENE** **h:49.9°** distance: 695.9km height above Earth: 547.2km elevation of Sun: -13° angular velocity: 0.64°/s **at Meridian** **22h34m43s** 7.2mag az: 0.0° N h:15.6° **Disappears** **22h37m51s** 9.1mag az:351.8° N horizon
	22h33m03s	Cosmos 1939 (19045 1988-032-A) →Ground track →Star chart	**Appears** **22h31m22s** 4.8mag az:129.5° SE h:21.9° **Culmination** **22h33m03s** **4.1mag** az: 72.9° **ENE** **h:39.2°** distance: 661.3km height above Earth: 437.4km elevation of Sun: -13° angular velocity: 0.68°/s **at Meridian** **22h36m44s** 7.7mag az: 0.0° N h:6.8° **Disappears** **22h38m13s** 8.6mag az:355.5° N horizon Time uncertainty of about 3 seconds
	22h36m39s	USA 208/STSS Demo SV-1 (35937 2009-052-A) →Ground track →Star chart	**Appears** **22h25m28s** 9.3mag az:221.8° SW horizon **at Meridian** **22h36m27s** 6.4mag az:180.0° S h:85.1° **Culmination** **22h36m39s** **6.4mag** az:134.3° **SE** **h:86.6°** distance: 1356.5km height above Earth: 1354.7km elevation of Sun: -14° angular velocity: 0.31°/s **Disappears** **22h47m55s** 9.1mag az: 47.5° NE horizon
probable satellite	22h37m05s	USA 61/NOSS 2-1B (20691 1990-050-C)	**Appears** **22h30m33s** 8.1mag az:231.1° SW horizon **Culmination** **22h37m05s** **5.8mag** az:314.0° **NW** **h:51.7°**

		→Ground track →Star chart	distance: 873.3km height above Earth: 705.8km elevation of Sun: -14° angular velocity: 0.51°/s **at Meridian** **22h38m23s** 6.0mag az: 0.0° N h:40.6° **Disappears** **22h45m09s** 8.3mag az: 35.9° NE horizon
probable satellite	22h37m49s	USA 62/NOSS 2-1C (20692 1990-050-D) →Ground track →Star chart	**Appears** **22h31m17s** 8.1mag az:232.3° SW horizon **Culmination** **22h37m49s** **5.9mag** az:314.6° **NW** **h:49.5°** distance: 895.6km height above Earth: 704.9km elevation of Sun: -14° angular velocity: 0.50°/s **at Meridian** **22h39m10s** 6.1mag az: 0.0° N h:38.7° **Disappears** **22h45m51s** 8.3mag az: 35.8° NE horizon
	22h39m33s	Cosmos 1508 Rocket (14484 1983-111-B) →Ground track →Star chart	**Appears** **22h36m14s** 5.4mag az:167.2° SSE h:14.4° **Culmination** **22h39m33s** **3.8mag** az: 92.6° **E** **h:53.8°** distance: 734.1km height above Earth: 606.3km elevation of Sun: -14° angular velocity: 0.60°/s **Disappears** **22h46m27s** 8.1mag az: 12.6° NNE horizon Time uncertainty of about 1 seconds
	22h40m23s	NOSS 3-3 Rocket (28538 2005-004-B) →Ground track →Star chart	**Appears** **22h30m26s** 6.2mag az:199.7° SSW horizon **at Meridian** **22h37m29s** 4.2mag az:180.0° S h:38.2° **Culmination** **22h40m23s** **3.6mag** az:118.8° **ESE** **h:60.7°** distance: 1374.2km height above Earth: 1228.7km elevation of Sun: -14° angular velocity: 0.31°/s **Disappears** **22h50m58s** 6.7mag az: 39.0° NE horizon
	22h41m33s	NOSS 2-1 (E) (20642 1990-050-E) →Ground track →Star chart	**Appears** **22h34m58s** 8.1mag az:232.7° SW horizon **Culmination** **22h41m33s** **6.0mag** az:314.9° **NW** **h:49.4°** distance: 919.7km height above Earth: 723.7km elevation of Sun: -14° angular velocity: 0.49°/s **at Meridian** **22h42m56s** 6.2mag az: 0.0° N h:38.7° **Disappears** **22h49m46s** 8.4mag az: 36.0° NE horizon
	22h41m36s	USA 29/DMSP 5D-2/F9 (18822 1988-006-A) →Ground track →Star chart	**Appears** **22h34m00s** 9.6mag az: 16.1° NNE horizon **Culmination** **22h41m36s** **5.7mag** az:102.5° **ESE** **h:67.2°** distance: 864.7km height above Earth: 805.0km elevation of Sun: -14° angular velocity: 0.48°/s **at Meridian** **22h44m46s** 7.0mag az:180.0° S h:24.1° **Disappears** **22h48m25s** 8.4mag az:187.7° S h:2.9°
	22h44m43s	Spot 5 Rocket (27422 2002-021-B) →Ground track →Star chart	**Appears** **22h39m00s** 6.0mag az:176.5° S h:7.3° **at Meridian** **22h40m31s** 5.4mag az:180.0° S h:15.5° **Culmination** **22h44m43s** **4.3mag** az:258.8° **W** **h:62.3°** distance: 884.3km height above Earth: 794.9km elevation of Sun: -15° angular velocity: 0.50°/s **Disappears** **22h52m14s** 8.9mag az:343.9° NNW horizon

20 Items/Events: Export to Outlook/iCal Print E-mail

Used satellite data set is from 7 August 2013

Hide glossary

Glossary:

Time

The local time in 24-hour format at which the satellite is visible at its best. The satellite may be observable *before* this time. 0:00 or 0h00m is midnight, 12h is noon, 18h is 6 pm. The time zone is the one indicated on the left of the Earth icon on top of (almost) each page. Daylight saving is applied automatically.

Appears

Local time at which the satellite appears visually. The first figure indicates the **visual brightness** of the object. The smaller the number, the brighter and more eye-catching it appears to an observer. The units are astronomical magnitudes [m]. **Azimuth** is given in degrees counting from geographic north clockwise to the east direction. The three-character direction code is given as well. In case the satellite exits from the Earth shadow and comes into the glare of the Sun, the elevation above horizon is given in degrees for this event. If this figure is omitted, the satellite is visible straight from the horizon.

Culmination

Time at which the satellite reaches his highest point in the sky as seen from the observer. For description of

the figures see **Appears**.
Visually "better" passes of satellites are indicated by highlighting the information. The selection within the list of all possible transits is coupled with the observer level, the daylight, and several other conditions.

at Meridian
Time of the transit of the meridian, i.e. the satellite is due South or due North. At this time, the satellite will not reach its highest point of the pass. Look for culmination.

Disappears
Local time of visual disappearance of the satellite. This may either be the time at which the satellite moves below the observer's horizon or the entry of the object in the shadow of Earth (the elevation is given for this event). The low Earth orbiting (LEO) satellites are usually visible for about 10 seconds more than the listed time, when they start fading rapidly.

Magnitude/Mag:
The magnitude indicates the **visual brightness** of an object. The brightest star (Sirius) reaches -1.4m, whereas 6m is the limit of the unaided eye. Venus, the brightest planet, reaches -4m. The Moon at first quarter is -8m, about the same magnitude that the brightest Iridium flares can produce.

Object
The name and identification information of the satellite. Besides the name, the number in the catalog of the USSPACECOM is given (5-digits code), and the International Designator Code in the form launch year - launch number of the year - launch part (usually one launch produces several orbiting objects).

Spy Satellites:
Satellites with name **USA** are US military satellites (common names e.g., Keyhole KH, Lacrosse).

Close to Moon/Sun
The satellite is closer than 1.5 degrees from the center of the Moon or the Sun, but the satellite does not cross in front of the Moon/Sun. The direction and distance to the center line on Earth is given. *For the Sun, move to the indicated center line position and observer with proper equipment. By no means observe the Sun without special filters!*

Crosses the disk of Moon/Sun:
The satellite passes in front of the Moon or the Sun; the event may be observed using a small telescope (equipped with special mylar filters for the Sun only!), especially if the event takes place in broad daylight. The direction and distance to the center line on Earth is given. Moon phases are not checked for. The timing may slightly change due to the quality and age of the used orbital elements and active orbit maintenance. *By no means observe the Sun without special filters!* Please feel free to report successful observations!

Separation
Angular distance of an object (e.g., star) with regard of the reference object (e.g., main star or center of moon), measured among the center of figures. Often, this value is given for the closest distance among two objects.

Position Angle / PA
Angle, defining a position on an apparent disk or the position of e.g. a dimmer star (or the anti-solar point for lunar eclipses) with regard of the main star or the center of disk. It is counted around the reference points (center of disk/brighter star) from *celestial north* direction 0° to east (left) 90°, south 180° to west (right) 270° in coun ter clockwise direction.

Position Angle rel. Vertex
Angle, defining a position on an apparent disk. It is counted around the reference points (center of disk) from local up, *zenith* direction 0° to east (left) 90°, south 180° to west (right) 270° in counter clockwise direction.

Clock-face Direction
In a simple clock-face coordinate system with the clock face superimposed on the satellite itself, with 12:00 o'clock being at the top and 9:00 o'clock being at the left, the satellite will seem to move toward the given direction. This number is helpful when observing with binoculars.

Daylight pass
This satellite pass over the observer is taking place on broad daylight and cannot be observed without special equipment (automated guided telescope or radio ham equipment).

Radio pass
The satellite is not outside the shadow of Earth during the whole pass (hence not lighted by the Sun) and is therefore not visible. However, using radio equipment, the satellite can be detected.

Ascending/descending Orbit:
Satellites are orbiting around the earth center. Therefore the point on the Earth surface "below" the satellite (i.e., the sub-satellite point) crosses the equator twice every orbit. The part of the orbit with northernbound motion component is called ascending, and a southernbound motion is called descending.

Rise
The satellites rises above the horizon of the observer (cf. **Appear** for visual rising of the satellite).

Set
The satellites sets below the horizon of the observer, but may not have been visible before (cf. **Disappear**).

Side-look
Time at which the observer is passing exactly at the side of the satellite (as seen from the satellite).

Off-Nadir
Angle at which the observer appears from the nadir (down direction) as seen from the satellite.

Squint angle
Angle relative to the satellite orbit; flight direction is 0°. The angle is counted clockwise, with ri ght looking at 90° and left looking at 270°.

Range
Distance to the satellite.

0-Doppler / Zero-Doppler
Time at which the range between satellite and observer does not change, i.e., the range rate is zero.

Forecasted Decay:
All Earth orbiting satellites are exposed to atmospheric drag, which lowers the orbit. Usually, this is countermeasured by frequent firings of the rocket engines - as long there is propulsion available. At an altitude of about 120 km, the objects are destroyed in the atmosphere by a fiery play; the over 100 km long light trace is visible even at daylight. Predications however are difficult. CalSky calculates the evolution of the satellite elements and the time of final decay based on SatEvo by Alan Pickup.

Top