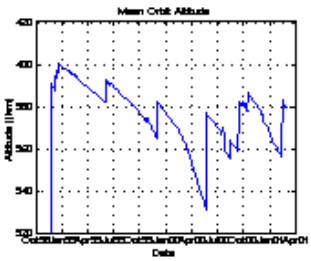
Select start of calculation:

Date: 8 September 2009

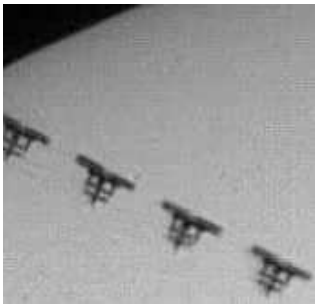
Time: 21 : 00 : 00 . 00 in TDT Now

Select duration: 1 Hour go!



ISS mean orbital altitude: only the regular orbit maintanance through thruster firings can yield a 'stable' orbit throughout the years (© CalSky / A. Barmettler)

Assembly state of ISS as of 2010 (NASA).



Solar Transit of ISS captured at August 16, 2003. © Roland Stalder from Lucerne, Switzerland.

Visibility of International Space Station ISS

The International Space Station ISS is the queen of the satellites. Since fall 2000 the ISS is manned. It makes an incredible sight when it passes sunlit overhead.

On this page you find the accurate time and position predictions in order not to miss the show. You find even the times and places for transits of ISS across the disk of sun or moon, and occulatations or close encounters with planets or bright stars.

You can also be alerted automatically of ISS passes or transits using CalSky's E-mail Alert service. Simply fill out the form given on the previous link and click 'Go', and choose one of the prepared alerts.

- 2-day map where ISS crosses the Sun in Google Map
- 2-day map where ISS crosses the Moon in Google Map

```
Name:           ISS
Launched:       20 Nov 1998
Dimensions:     73 m x 44.5 m x 27.5 m
Brightness:     -2.0 mag (at 1000 km, 50% illuminated)
                -5.1 mag (at perigee, full illumination)
                Mean magnitude estimated from object size
RCS:            402m2 (Radar cross section)
USSPACECOM Nr: 25544    Internat. Designator: 1998-067A
Orbit:          341.8 x 354.3 km, 91.5min  Inclination: 51.6°
Age Elements:   0.3 days (based on 13 days old data; NASA.
                Planned orbit boosts are taken into account)
```

Satellite Menu

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

Select satellite events for your location

☑ **Show satellite passes**

☐ **Show invisible passes/radar remote sensing SAR:** Calculate all passes, day or night, even if not optically visible

Auto **Minimum elevation:** Show satellite passes with at least this altitude above horizon

90° **Maximum elevation:** Show satellite passes with at most this altitude above horizon

go!

Automatic **Maximum sun elevation:** Sun must be below this altitude limit during the satellite pass

Special filters for the event of ◉ **culmination** ○ **side-look (athwart)** ○ **0-Doppler**

☑ **Ascending:** show ascending passes ☑ **Descending:** passes on descending orbit

0° - 90° **Off-nadir angle limits:** observer must appear from the satellite within these off-nadir angles

☑ **Right-looking:** observer must be to the right of the satellite ☑ **Left-Looking:** observer to the left

☐ **Optical Remote Sensing:** Altitude of Sun is at least 15° at the observer's site

☑ **Close fly-bys of satellite with sun, moon, planets, and stars**

Maximum angular separation from Sun/Moon/planets/stars for close encounters: ◉ 1½° ○ 5° ○ 10° ○ .5°

or

Maximum distance to center line: ○ 5 km ○ 10 ○ 15 ○ 25 ○ 50 ○ 100 ○ 250 km

☐ **Only transits:** Calculate and display sun/moon/planet/star **crossers only, but no close encounters**

☐ **Only Sun/Moon events:** Display **transits/encounters only with the Sun or Moon**, but not with planets and stars

☐ **Satellite must be illuminated:** Display only transit/encounter events where the satellite is illuminated by the Sun and hence visible; e.g., the satellite can be detected as a dark silhouette against the Moon

☐ **Hide 'double' solar transits** (events/geographic places with passing of the satellite in front of the Sun on consecutively passes)

☐ **Mirror hemisphere images:** the satellite tracks are shown with reversed east and west directions

Tuesday 8 September 2009

Time (24-hour clock)	Object (Link)	Event
	Observer Site	Le Taillan, France WGS84: Lon: -0d40m09.86s Lat: +44d54m16.74s Alt: 66m All times in CET or CEST (during summer)
21h11m54s	ISS →Ground track →Star chart	Ascending Orbit. Earth revolutions since launch: 61911.2 **Appears 21h07m17s** -0.0mag az:212.1° SSW horizon **at Meridian 21h10m40s** -2.5mag az:180.0° S h:18.9° **Culmination 21h11m54s -3.4mag** az:139.6° **SE h:25.9°** distance: 719.9km height above Earth: 344.9km elevation of Sun: -9° angular velocity: 0.63°/s **Disappears 21h14m14s** -2.2mag az: 81.8° E h:11.0°

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

☐ 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.

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