宇宙情報センター

ONLINE SPACE NOTES

Artificial Satellite around the World

Cosmic Information Center MENU

HOME INDEX TOP

JAPANESE

ONLINE SPACE NOTES / Artificial Satellites

Why Do Satellites Go Around the Earth?

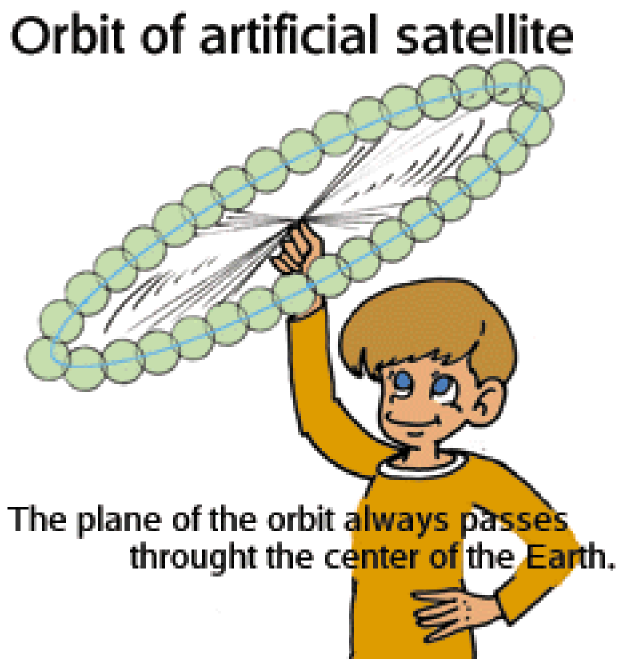
The greater the velocity of a thrown object, the further it will travel

If a ball is thrown horizontally, the higher the release speed the further the ball will fly. The trajectory approaches the curvature of the Earth. If a ball is thrown from the top of a high mountain with a low velocity, then it will quickly fall to the Earth's surface. If the throwing speed is progressively increased, the ball will land further and further away. If the ball is given enough speed to make one orbit of the Earth, then it has become an artificial satellite of the Earth.

The speed required: more than 7.9 kilometers a second

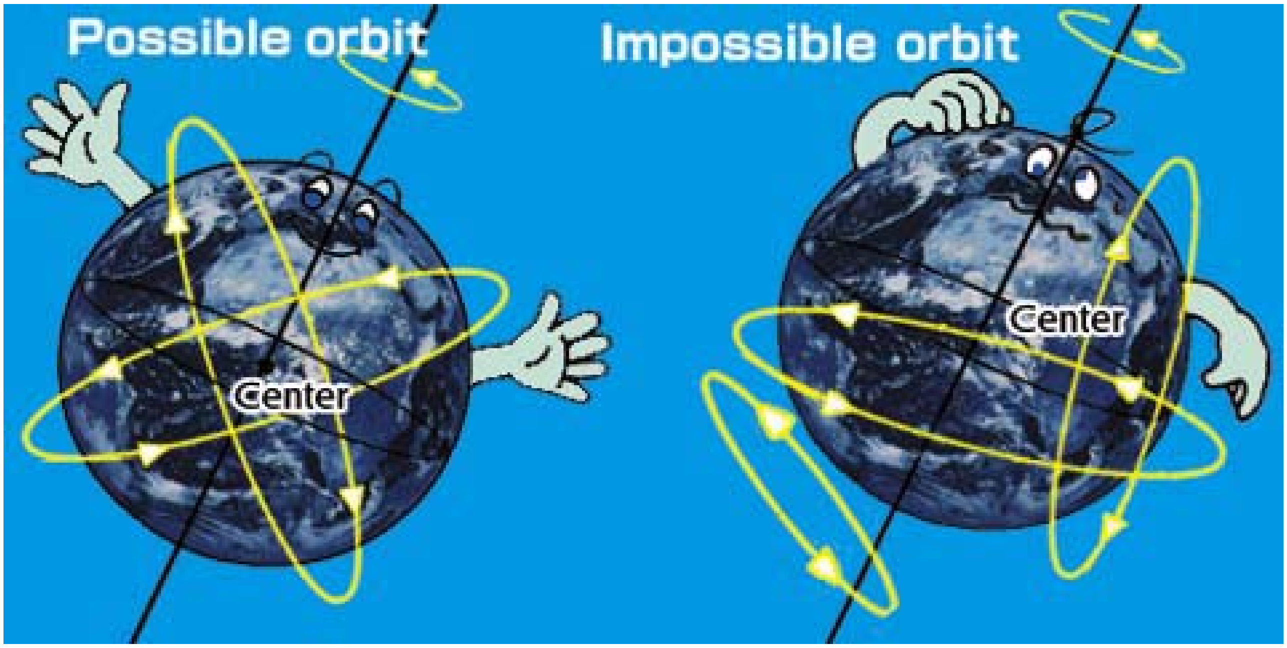
If the speed of the ball exceeds 7.9 kilometers per second (about 28,000 kilometers an hour) it would not fall but continue flying around the Earth. If the air has no friction this ball will continue to orbit the Earth permanently at its original release speed, and will thus become an "artificial moon" or "artificial satellite" of the Earth. An artificial satellite like the moon does not fall but continues to orbit the Earth because the force of the Earth's gravitational attraction is balanced by the force that is trying to escape the Earth's pull.

What Is an Orbit?



Orbit: the path followed by a satellite

The velocity that a satellite needs to keep it flying close to the surface of the Earth, 7.9 kilometers per second, or the speed at which the Earth's gravity and the centrifugal force of the satellite's rotation are in balance, is known as "the first astronautical velocity." The path followed by the satellite is called its "orbit." If the first space velocity is exceeded, the s atellite's orbit becomes an ellipse, and at close to double this velocity, at 11.2 kilometers per second, a speed known as "the second astronautical velocity" or "escape velocity," the satellite escapes the influence of Earth's gravity and leaves its orbit.



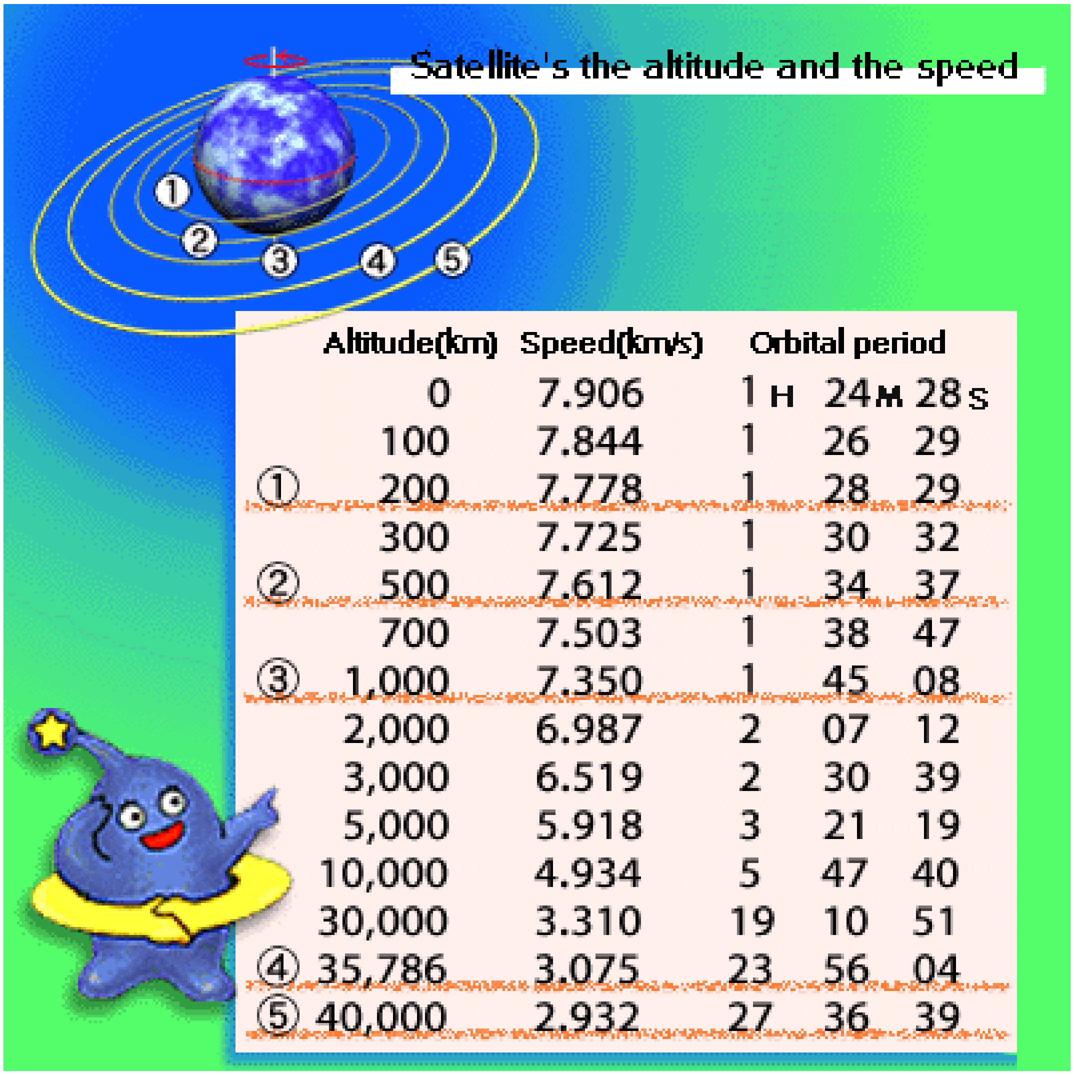
The plane of the orbit always passes through the center of the Earth

A satellite always moves in a fixed plane. This is called the orbital plane, and in the case of a satellite orbiting the Earth this plane always passes through the center of the Earth. The altitude of an artificial satellite above the Earth and the shape of its orbit depends on the satellite's purpose, but no satellite can have an orbital plane that does not pass through the center of the Earth.

Cosmic Information Center MENU

HOME INDEX TOP

The Altitude and Velocity of Satellites



	Altitude(km)	Speed(km/s)	Orbital period		
	0	7.906	1H	24M	28S
	100	7.844	1	26	29
①	200	7.778	1	28	29
	300	7.725	1	30	32
②	500	7.612	1	34	37
	700	7.503	1	38	47
③	1,000	7.350	1	45	08
	2,000	6.987	2	07	12
	3,000	6.519	2	30	39
	5,000	5.918	3	21	19
	10,000	4.934	5	47	40
	30,000	3.310	19	10	51
④	35,786	3.075	23	56	04
⑤	40,000	2.932	27	36	39

The higher a satellite's altitude, the lower its velocity can be

The speeds of satellites vary according to their distance from the Earth's surface. Because the gravitational force is weaker at higher altitudes, the satellite's velocity can be lower. The duration of one orbit is known as the "orbital period," and for a circular orbit, the higher the altitude, the longer the orbital period becomes. So the altitude of a satellite making one orbit of the Earth in 24 hours (in other words, a "geostationary" satellite that follows the Earth's rotation) would be about 36,000 kilometers. But an orbit with a lower altitude would be faster relative to the Earth's rotation speed , and an orbit further out would be slower.

Cosmic Information Center
MENU

HOME INDEX TOP

Structure and Design for Satellites (1)

Satellite design begins from the conceptual design

Satellite design begins with a conceptual design, which is to make clear the purpose of the satellite and to examine the systems necessary to complete its mission. Next comes the preliminary design and basic design stages. During the preliminary design stage, an experimental model is constructed to test whether new technologies can be realized and the results are reflected in the basic design stage. After that, the basic design stage prepares an engineering model, upon which many tests are carried out to confirm the adequacy of the basic design's electronics or composition.

A model is often re-made and tested

Test results obtained from an engineering model reflect on a detailed design, and a prototype model built to the exact specifications of the final satellite is produced. Tests are conducted on the prototype model under conditions even harsher than those it would experience in space. After these tests have confirmed that there were no irregularities, the flight model to be launched is built, and further tests are conducted on it under conditions matching those in which it will experience in space.

Procedure of the satellite design

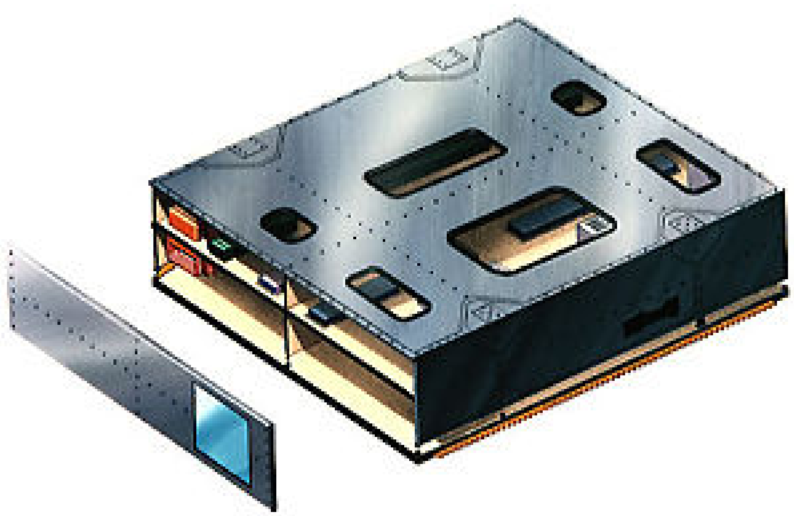
Under the process, where continuous testing and the results of the tests reflect on designs, the period from design to launch for new satellites can extend from 7 to 12 years, and even 2 to 3 years for series models. As not only time, but a large amount of cost is necessary, satellite design is a major project carried out by people such as system engineers, who must carry out their plans under the thorough management in cost, schedule and the performance.

HOME INDEX TOP

Structure and Design for Satellites (2)

Conditions needed during design stages

The basic conditions needed during the design of a satellite are, because of the launching ability of the rocket as well as the carrying capability of the rocket's fairing, weight and volume. Other conditions include whether it should be a minimal power object because it is to be powered by solar energy, how it will bear the harsh conditions of launch and space (vibrations, shock, heat, etc.), and whether it would be highly reliable because it cannot be repaired if it breaks down.



Mission Equipment and Bus Equipment

A satellite system is made up of mission equipment, which is necessary to carry out the job to be done by that satellite, and bus equipment, which performs the basic functions of the satellite. Some examples of mission equipment include Earth observation sensors for Earth observation satellites and transponders for communications and broadcasting satellites. Bus equipment is made up of many subsystems, such as the telemetry tracking and command system, electrical power system, attitude control system, propulsion system, structural system and thermal control system.

Photo: A rainfall radar, one of the mission equipments on the Tropical Rainfall Measuring Mission (TRMM)

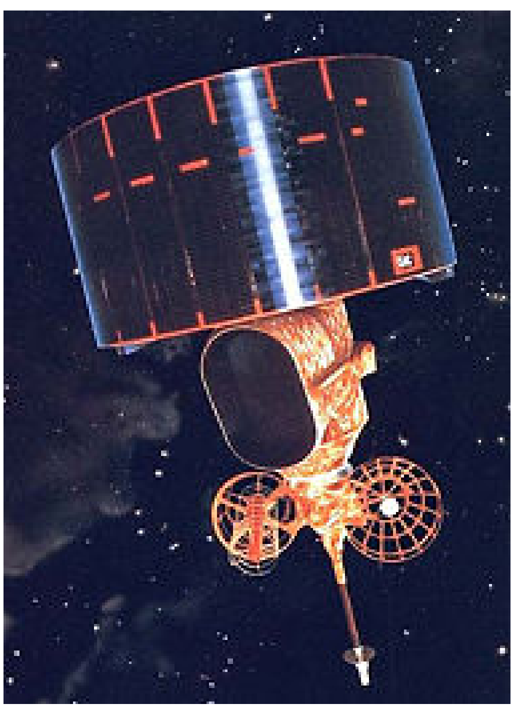
The role of Bus Equipment and the subsystems

The telemetry tracking and command system mainly deals with communications with Earth. The electrical power system supplies power to the various types of equipment board the satellite, and this system can include solar energy cells. The attitude control system determines whether the satellite is regularly in its correct position. The propulsion system is responsible for positional and orbital control. The structural system makes up the satellite's structure and preserves it. The major function of the thermal control system is to make sure that the equipment carried on the satellite remains at a stable temperature level in a space environment.

Photo: The propulsion system on the Communications and Broadcasting Engineering Test Satellite (COMETS)

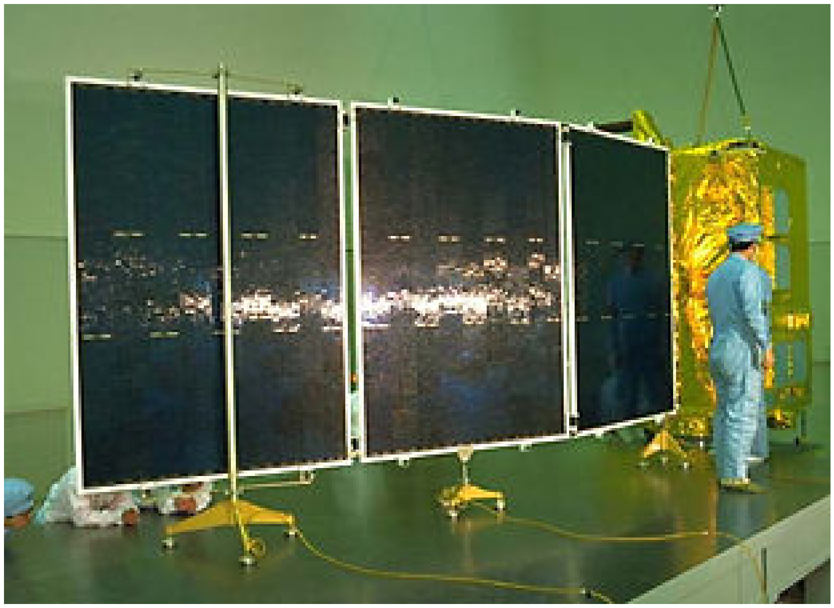
Structure and Design for Satellites (3)

The outside of a satellite and Attitude Control System



Satellites come in spherical shapes, cylindrical shapes, box shapes, and the multimission module system, where bus equipment and mission equipment are divided into upper and lower sections. Satellite shapes are decided according to the size and weight of carried equipments, type of attitude control system, and type of rocket used to launch the satellite. Generally, cylindrical or polygonal satellites use a spin stabilized system for attitude control, while box-shaped satellites use three-axis control systems.

Photo (above): Kiku 7 (ETS-VII), a box-shaped satellite
Photo (left): Himawari 5 (GMS-5), a cylindrical satellite



Power sources for satellites

Power sources for satellites are generally solar batteries or strage batteries. While the satellite is getting rays from the Sun, power is supplied by solar cells, and when the satellite is hidden from the Sun, it uses strage batteries. In the case of solar cells, when spin stabilized systems are used, they are stored on the surface of the satellite, while in cases where the three-axis control system is used, they are stored by solar array paddles that are attached to the surface of the satellite.
As for the solar cells in space, semi-conductors of monocrystal silicone are generally used. To prevent deterioration, the surface is covered by panels made of objects such as glass, which helps to limit the effects of electrons and protons found in orbit. Recently, there have been improvements in radiation resistance, and weight reduction meaning they have become thinner. In addition, gallium arsenide cells, which have a high conversion rate, have also been used in space. Where silicon solar batteries have a conversion rate of about 14 percent, gallium arsenide solar batteries are about 17 percent.
Photo : The solar array paddles on Momo 1-b, Marine Observation Satellite

---

Cosmic Information Center MENU

HOME INDEX TOP

Structure and Design for Satellites (4)

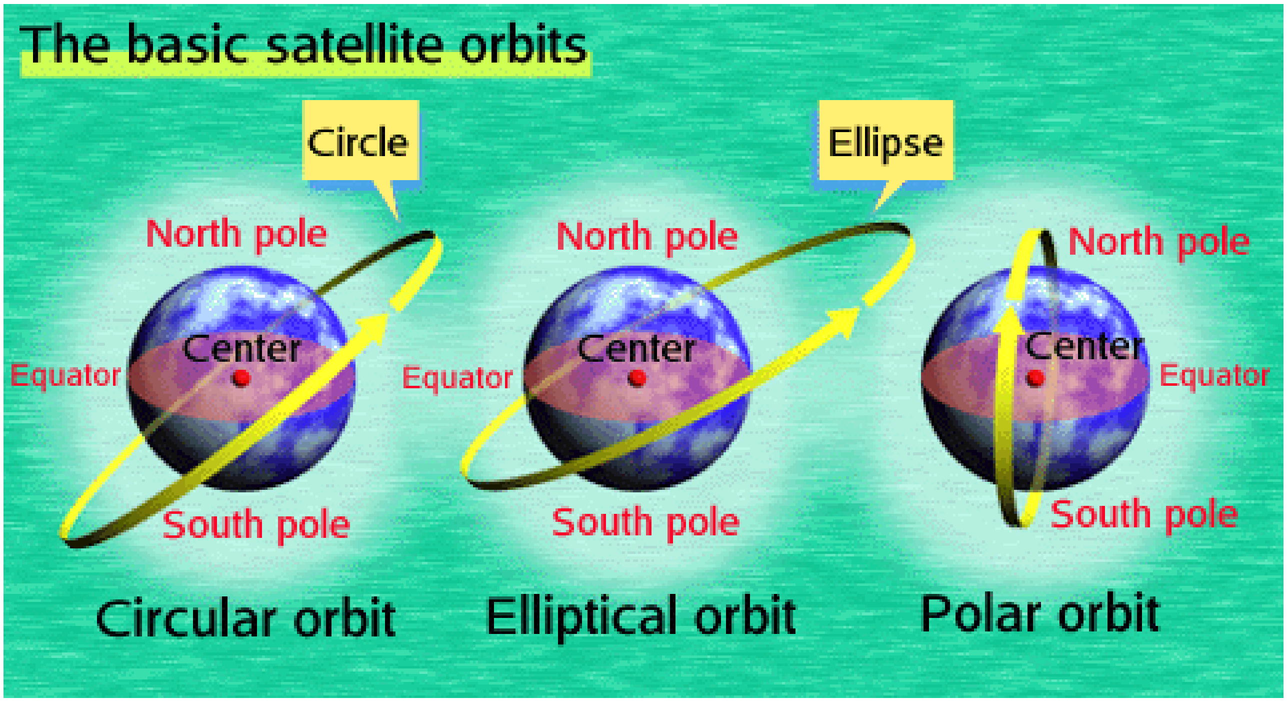
Materials used to build satellites

Satellites need to be built of materials strong enough to withstand the harsh environment of space, as well as be light and small. To satisfy these conditions, they have to be made of materials with special characteristics that are not generally found in components used in everyday machinery. Usually, satellites are made of aluminum alloys and reinforced fiber plastic for lightness, and, depending on where the component is to be used, could also employ strong materials such as stainless steel or titanium. In the case of electronic components, they are encased in special metal cases or ceramics to make sure that no gas appears even in a super vacuum.

Electronic components used on satellites

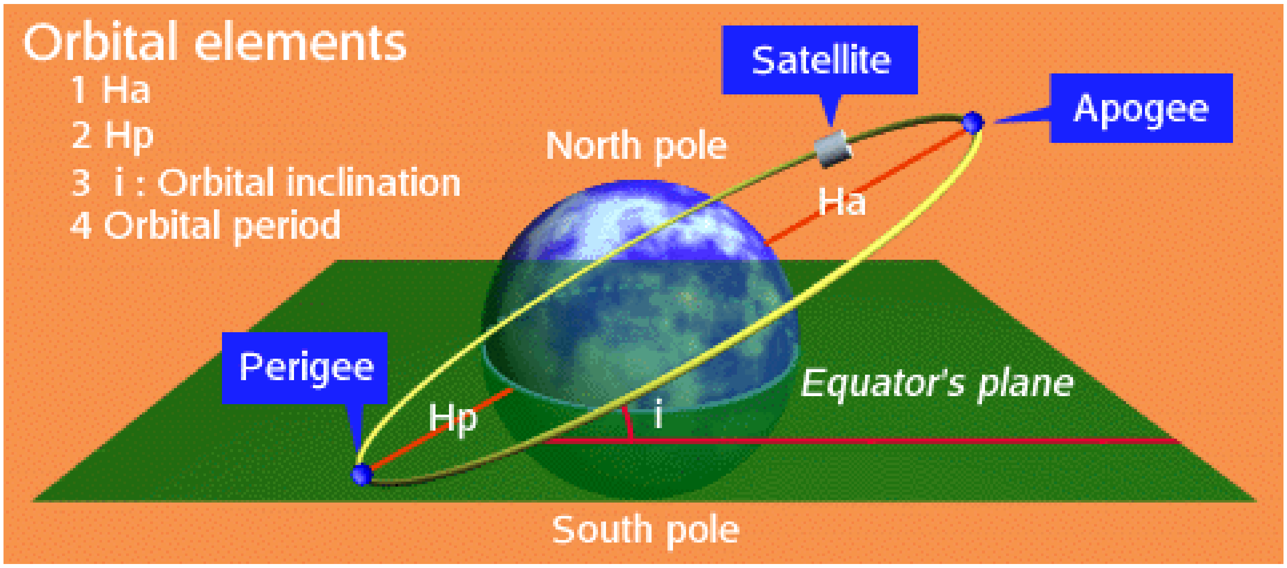
Electronic components used on satellites have to be able to withstand the harsh conditions of space, such as the vibrations or shock at launch time or when changing orbit, super vacuums, or extreme changes of temperature in space. Once satellites break down, they cannot be changed as easily as parts in electronic products on Earth, which means that they have to be highly reliable. As there is a limit to the power-generating ability of solar batteries, electronic components for satellites also have to have low energy consumption.
In addition, as satellites can be hit directly by high-energy particles beamed out from the Sun, and depending on orbit, they pass through the Van Allen Belt, where a lot of the particles exist. Thus satellites are strongly influenced by radiation. To protect electronic components' performance from deteriorating because of that radiation, a strategy is in place using such methods as covering them in an aluminum case.

The Elements of a Satellite Orbit



The greater the difference between perigee and apogee the more elliptical the orbit

The point where a satellite in an Earth-centered orbit is closest to the Earth's surface is known as the perigee. The point at which it is farthest away is the apogee. Orbits may be circular, elliptical, polar, and so on. When there is no difference between perigee and apogee the orbit is circular, when the difference is large the orbit becomes an elongated circle or ellipse. An orbit passing over the Earth's North and South Poles, whether circular or elliptical, is called a polar orbit.



The elements of an orbit are altitude, inclination, and period

The following variables characterize the flight of a satellite, and they are known as its orbital elements. There are four: the distance from the surface of the Earth at perigee; the distance at apogee; the angle between the orbital plane and the plane of the Earth's equator (orbital inclination); and the duration of one orbit (orbital period). If the orbital inclination is zero degrees, the satellite's orbit is following the Earth's equator. A larger orbital inclination means an orbit nearer the Earth's poles. So an orbit with an inclination of ninety degrees will be a "polar orbit" passing over the Earth's North and South Poles.

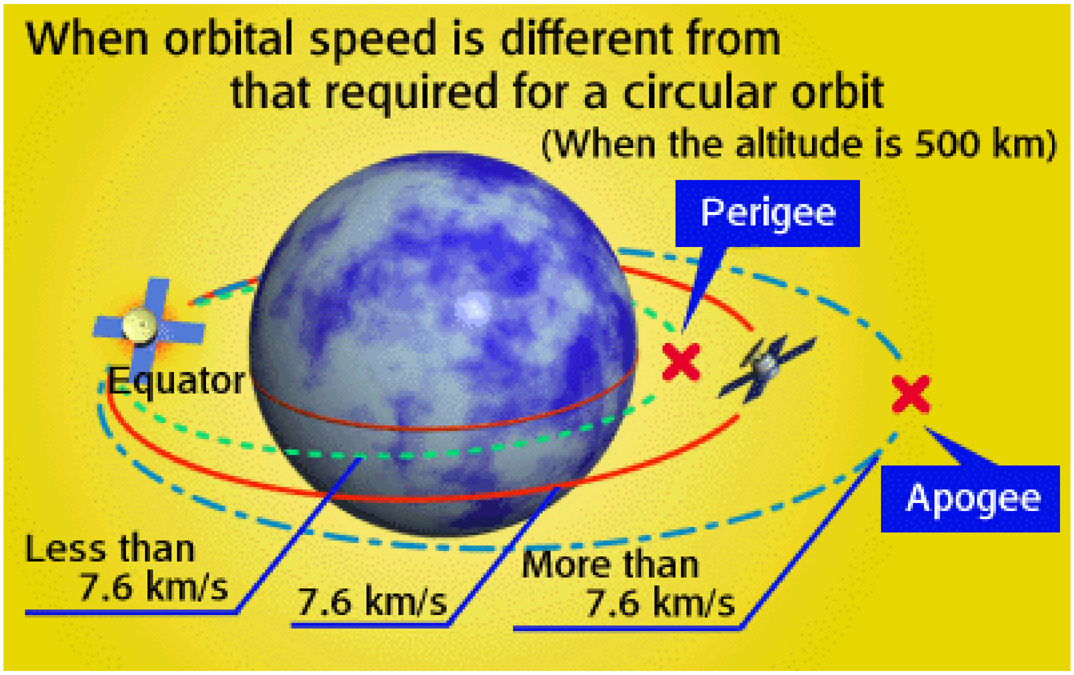
Cosmic Information Center MENU

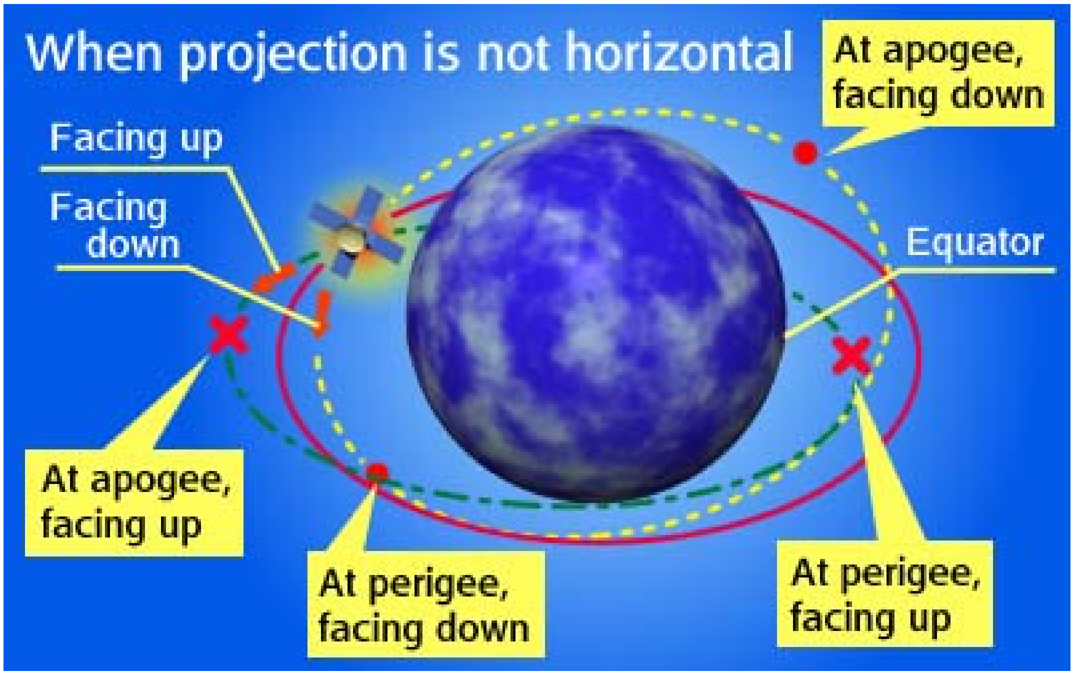
HOME INDEX TOP

Elliptical Orbits•i,P•j

When the velocity is not that of a circular orbit, and the line of flight is not horizontal, the orbit becomes elliptical

When a satellite is projected at sufficient height and at the necessary velocity for a circular orbit (7.9 kilometers per second), the satellite will take up a circular orbit. If the velocity is faster or slower, or if the projection is not horizontal, an elliptical orbit will result.



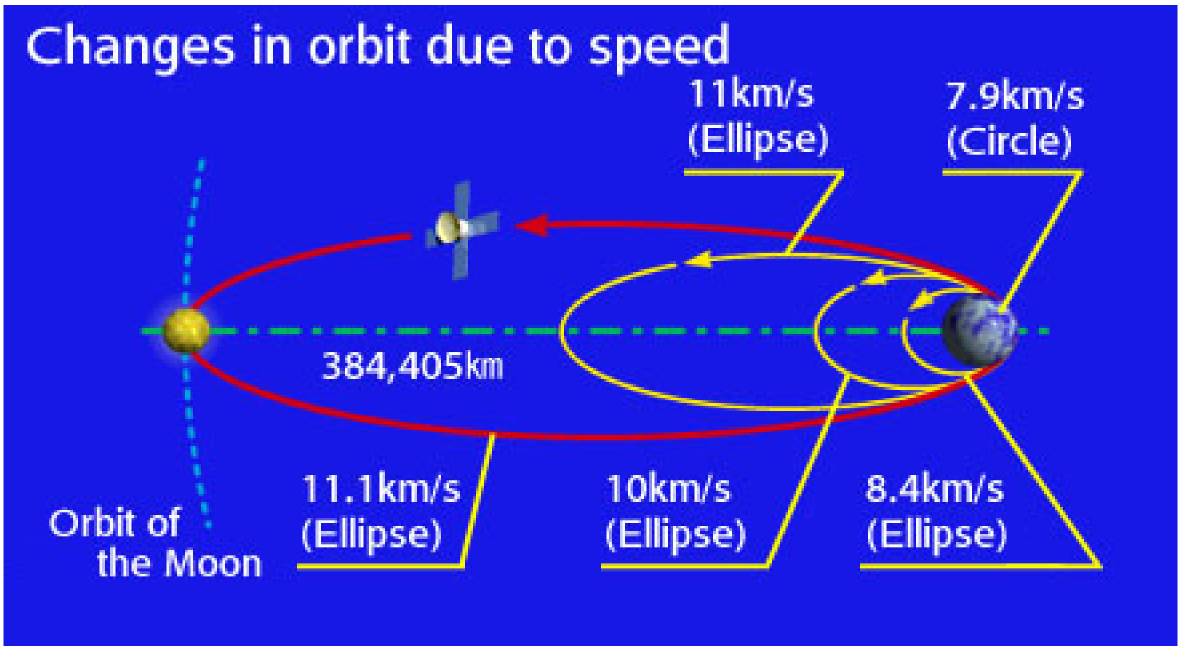

When projection is not horizontal
At apogee, facing down
Facing up
Facing down
Equator
At apogee, facing up
At perigee, facing down
At perigee, facing up

JAPANESE

Elliptical Orbits•i,Q•j

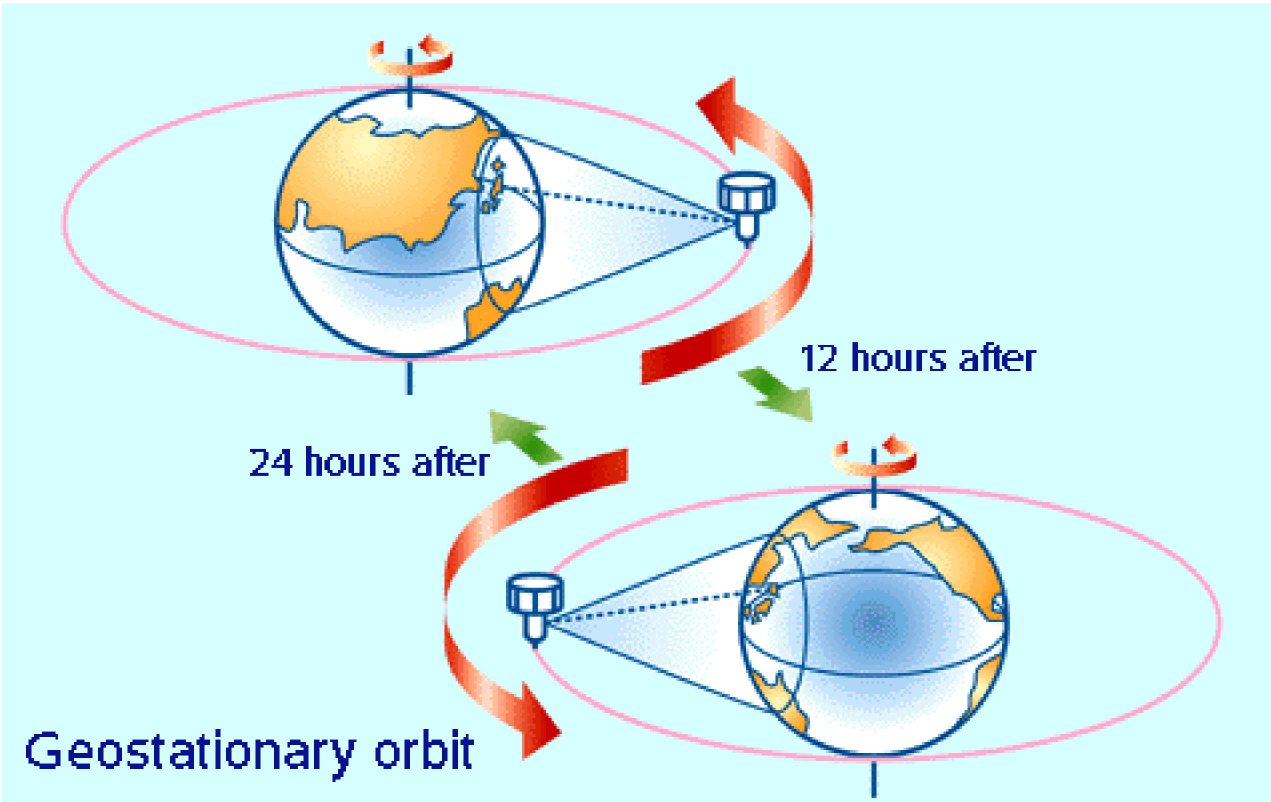
The higher the projection velocity, the longer the elliptical orbit

Different speeds produce different orbits. The higher the projection speed, the apogee opposite the point of final acceleration will be further out, so the orbit will become more elongated.



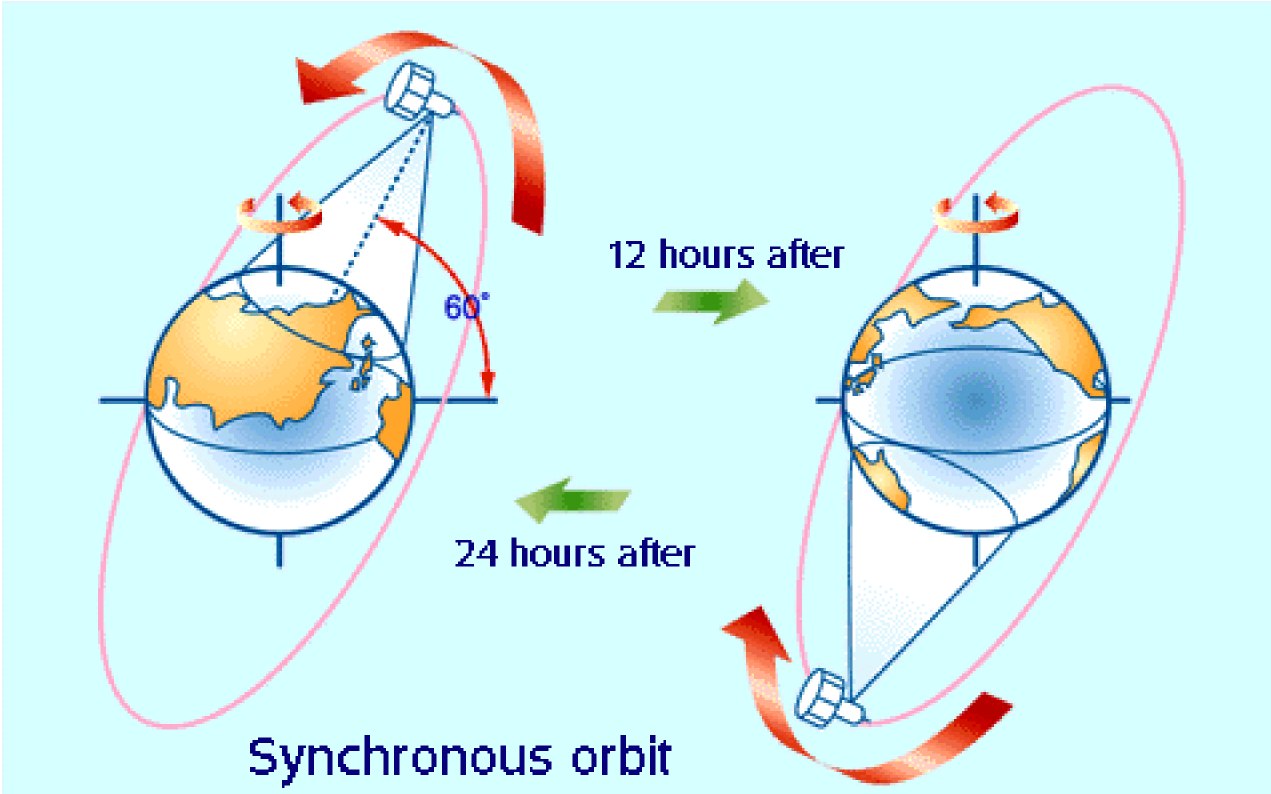
Cosmic Information Center MENU
HOME INDEX TOP

Typical Satellite Orbits(1)



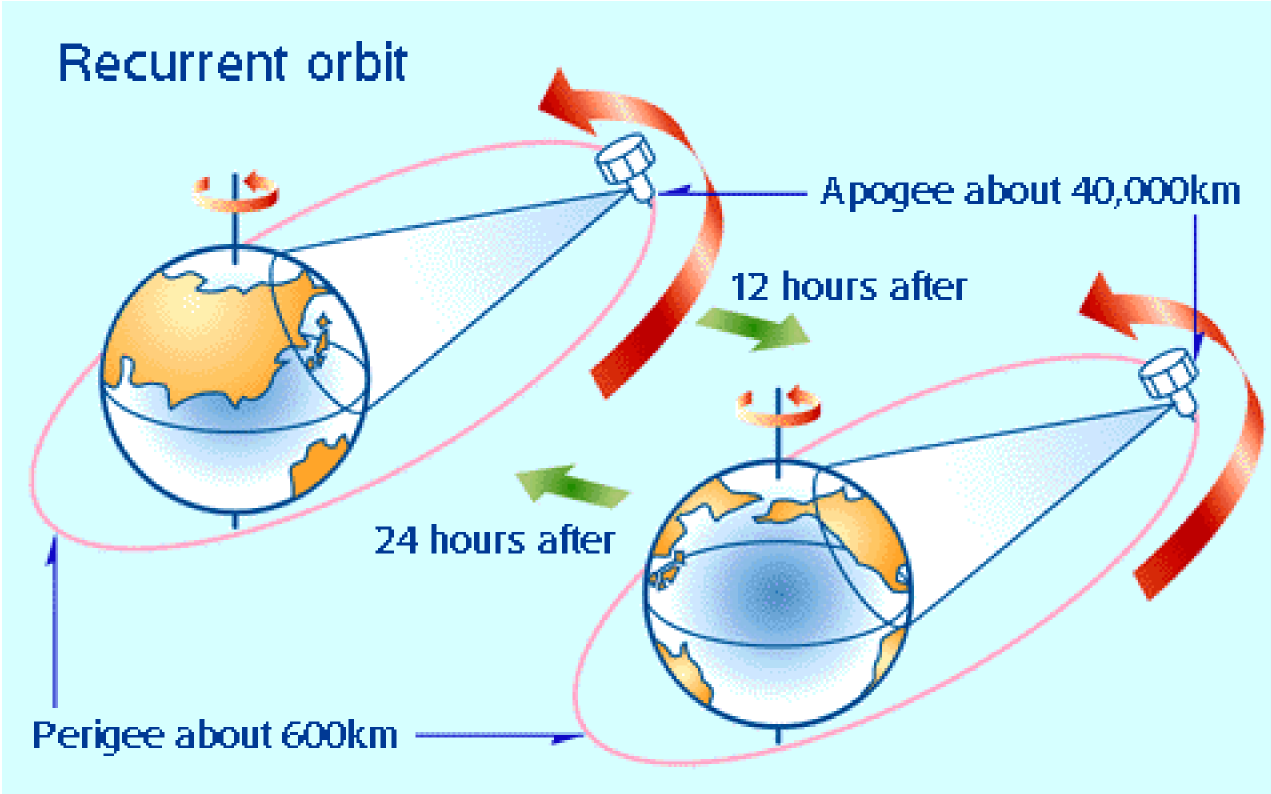
A satellite that appears to remain in the same position above the Earth is called a "geostationary satellite."

The orbit is circular. And its inclination is zero degrees, which means that it is above the Earth's equator. The altitude is about 36,000 kilometers, and the satellite travels at 3 kilometers per second. The satellite's orbital period is about the same as the Earth's rotation period, roughly 24 hours. From Earth the satellite appears to be stationary and is called a geostationary satellite. Many weather observation satellites and broadcast satellites use this kind of orbit.



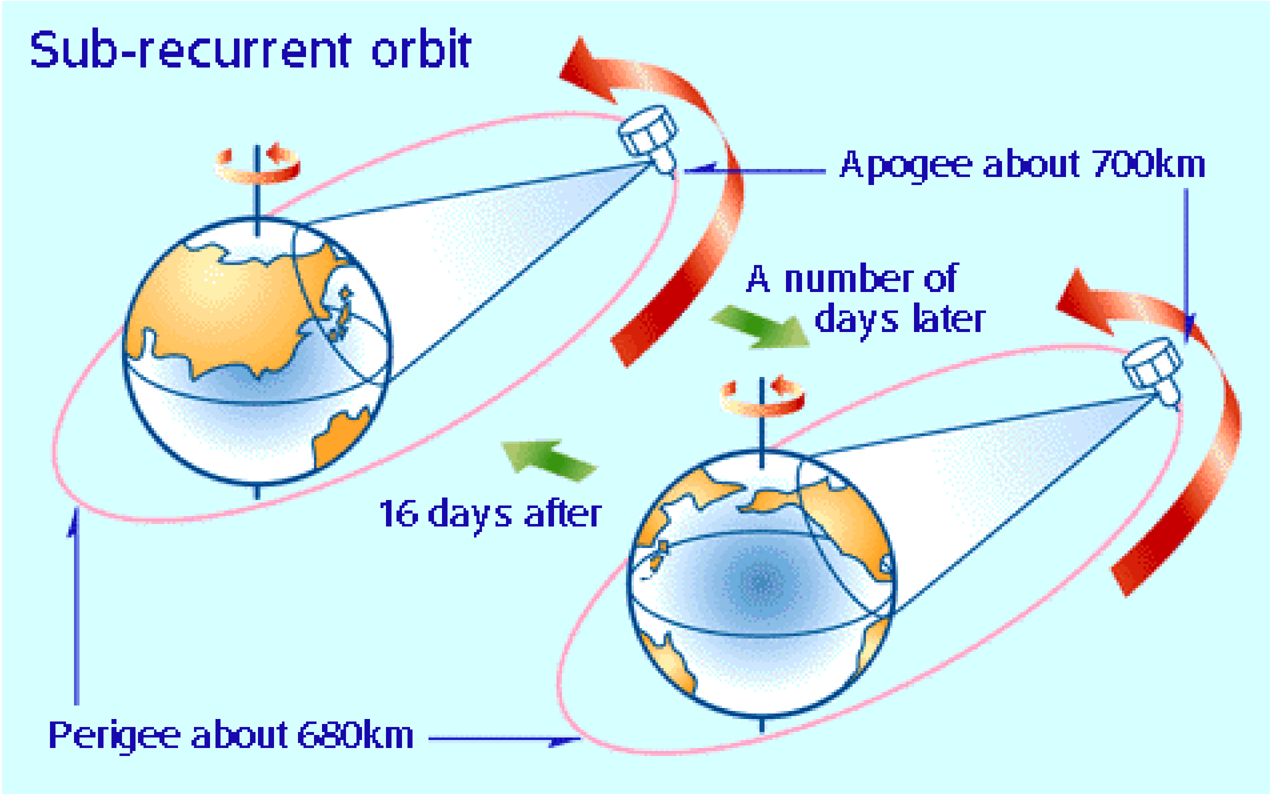
A satellite in a synchronous orbit goes around the Earth once a day returning to its original position

An orbit in which the satellite completes one circuit around the Earth in one day, then appears in the same position above the Earth's surface, is known as a "synchronous orbit." The duration of one orbit of the satellite is the same as the Earth's rotation period. So while a geostationary orbit is one form of synchronous orbit, it differs in that the orbital inclination is not always zero and its form may be elliptical. A typical role for a satellite in synchronous orbit is the monitoring of, and providing communications for, areas in the Earth's higher latitudes. This kind of coverage is difficult for a satellite in geostationary orbit.



A satellite in a recurrent orbit returns to its starting point above the Earth's surface within one day

A recurrent orbit is an orbit in which the satellite returns to the same position over the surface of the Earth within 24 hours, regardless of how many orbits it has made in that time. The orbital period of the satellite is an integral fraction of the Earth's rotation period. If the perigee is about 600 kilometers and the apogee about 40,000 kilometers, the satellite will follow an elongated, elliptical orbit with a period of about 12 hours, returning to a point over the same ground position twice a day. A satellite in such an orbit is suitable for communications and observation functions over higher latitudes.



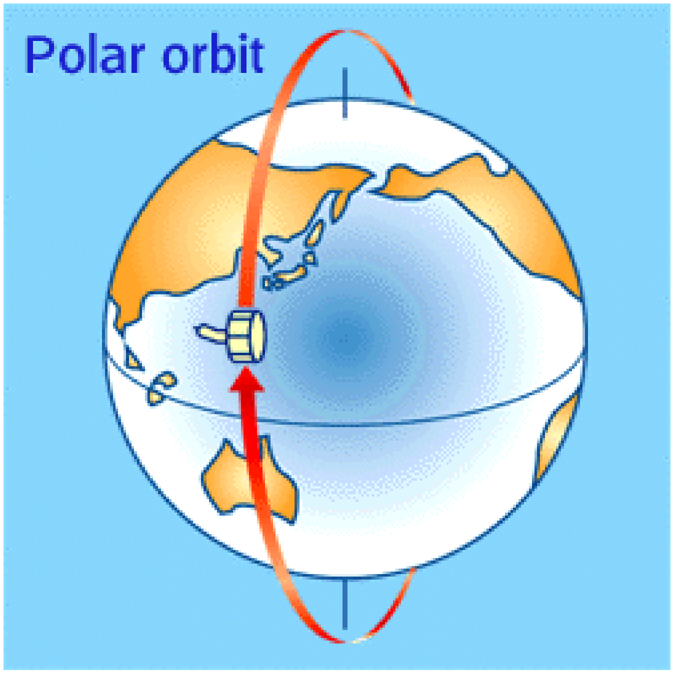
In a sub-recurrent orbit the satellite returns to the same point above the Earth's surface a number of days later

Although orbiting the Earth several times a day, the satellite returns regularly after a set time to its starting position above the surface of the Earth. One of the Landsat Earth observation satellites has a perigee of 680 kilometers, an apogee of 700 kilometers, and a period of 98.5 minutes, going around the Earth 15 times in one day. After 16 days it returns to the sky over its starting point on the Earth's surface. Its orbit would be called a 16-day sub-recurrent orbit. Long-term, regular monitoring of the Earth's surface would be a suitable mission for a satellite in such an orbit.

Cosmic Information Center
MENU

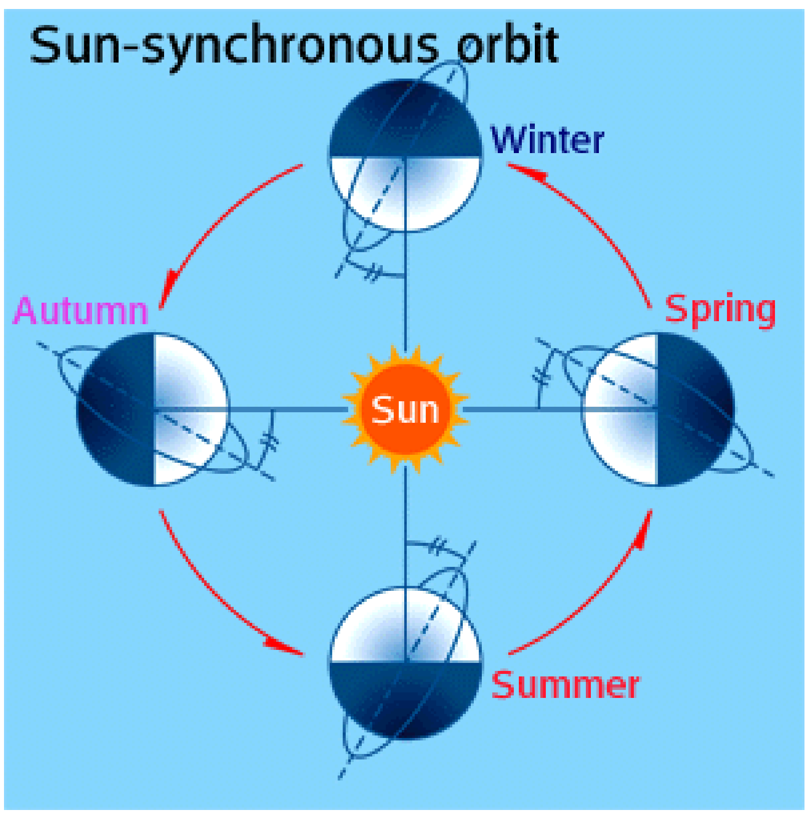
HOME INDEX TOP

Typical Satellite Orbits(2)



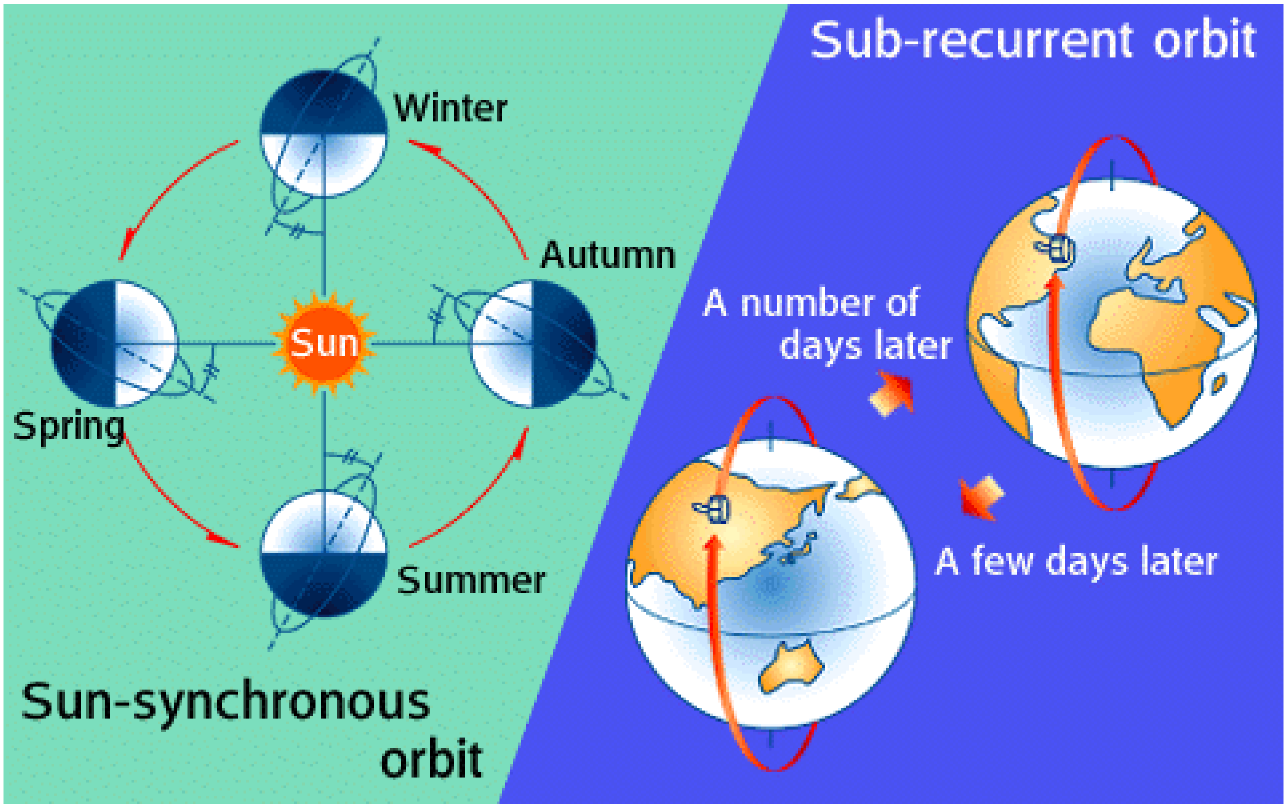
An orbit passing through the sky near the North and South Poles

An orbit with a inclination of 90 degrees, or close to it, is called a "polar orbit." Because the Earth is rotating as the satellite follows a polar orbit, the satellite can survey the whole of the Earth's surface, including the poles, in a few days. Many observation satellites that need to cover the entire Earth are in polar or near-polar orbits.



Sun-synchronous orbit: the satellite's orbital plane and the Sun's direction are always the same

In a sun-synchronous orbit, the direction of rotation of the orbital plane and the period (the rotation angle per day) are the same as the Earth's orbital period (the rotation angle per day). In other words, the whole orbital plane of a satellite going around the Earth takes one year to complete one revolution, and the orbital plane of the satellite and the orientation of the Sun are always the same. This kind of orbit can only be a polar orbit, but it cannot be a polar orbit with a full 90-degree inclination, because then the satellite's orbital plane would not complete a full rotation. A satellite with an inclination larger than 90 degrees will rotate in the same direction as the Earth.Also, this orbital inclination varies with the satellite's altitude. For example, in the case of a circular orbit with an altitude of 800 kilometers, an orbital inclination of 98.4 degrees gives a sun-synchronous orbit. Looking at the Earth from a satellite in this orbit, the Sun's light would always be coming from the same angle, so the satellite would be appropriate for monitoring a site that must always be observed under the same conditions.



Sun-synchronous sub-recurrent orbit: used by many Earth observation satellites

A sun synchronous sub-recurrent orbit is an orbit that combines a sun-synchronous orbit with a sub-recurrent orbit. Satellites launched into this kind of orbit appear in the sky over a certain point every few days. Because they repeatedly pass the same point in the same time zone, they can observe the point many times under the same conditions. This orbit is especially effective for covering broad areas of the Earth's surface. Many Earth observation satellites have been launched into this kind of orbit to carry out global surveys.

Cosmic Information Center MENU

HOME INDEX TOP

Technology Demonstration Satellites

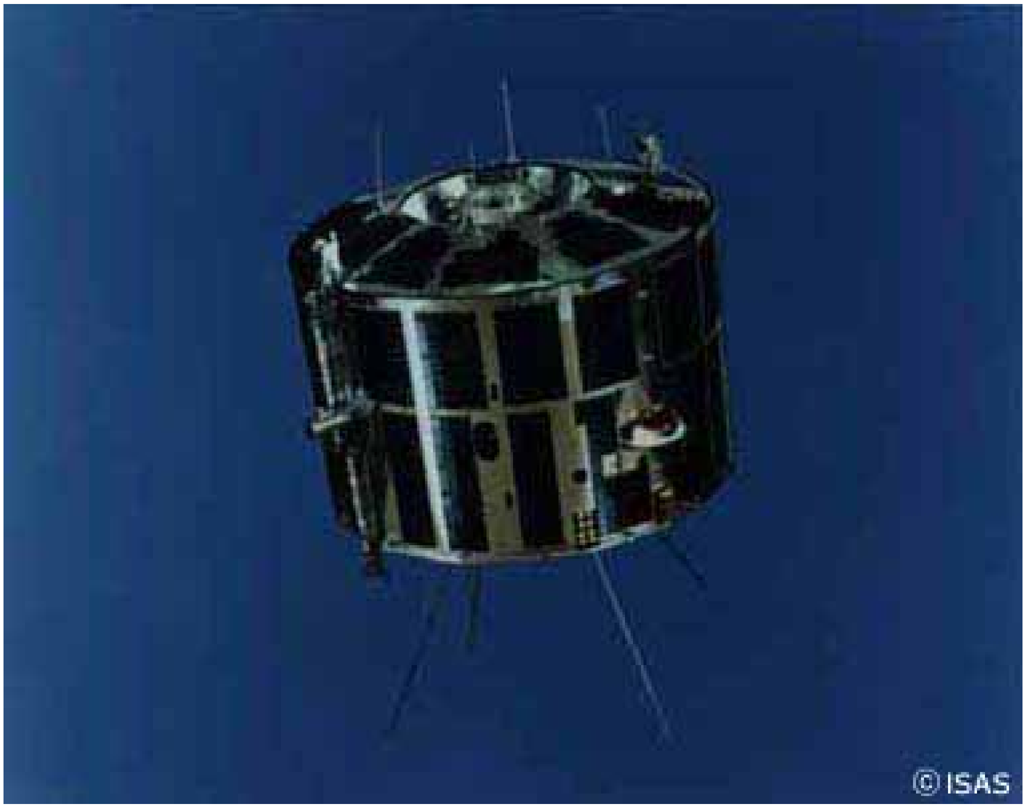
Technology demonstration and experimental satellites are used to check functions

Experimental satellites are used in the development of various other kinds of satellites, to test their performance in real space operations. Examples include the Tansei series of satellites from ISAS (Institute of Space and Aeronautical Science) and the ETS-1 (Kiku) series from NASDA (National Space Development Agency of Japan).

JAPANESE

ONLINE SPACE NOTES / Artificial Satellites

Scientific Satellites



Solar system observation satellites are used for observing the Sun and the planets

Solar system observation satellites are scientific satellites used to survey the Earth and its vicinity, and other components and phenomena within the solar system. They are used for observing the planets of the solar system, an such things as the Earth's upper atmosphere and the magnetosphere, the van Allen (radiation) belt, cosmic rays, and the solar wind.Japan has surveyed aurora and space plasma (Kyokko), and particles discharged from the Sun (Hinotori), among other phenomena. ISAS satellites perform a variety of survey tasks with globally significant results.

•@

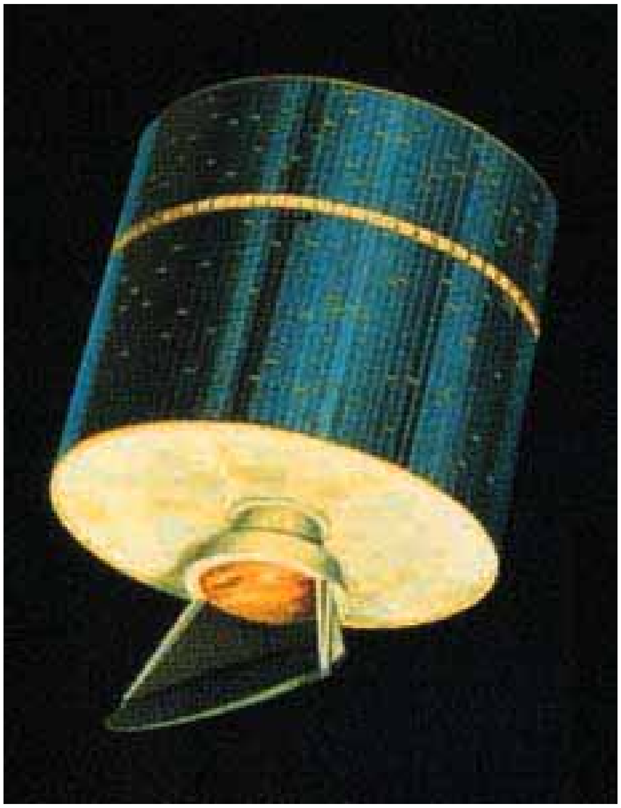
Astronomical observation satellites are used for scientific surveys that target space

ISAS (Institute of Space and Aeronautical Science) satellites carry out a wide range of scientific surveys of space beyond the solar system.

Cosmic Information Center
MENU

HOME INDEX TOP

Communications and Broadcast Satellites



Communications satellites overcome the difficulty of long-range direct communication

If a communications satellite is on a line of sight from two points on the Earth's surface, it can act as a relay between points too widely separated for direct transmission. The Intelsat satellite on a geostationary orbit above the Pacific Ocean relays international telephone and television signals. In 1983 Japan also launched a communications satellite, Sakura 2a. Currently, Sakura 3b carries domestic communications and facsimile newspaper pages.

Broadcast satellites allow any home equipped with an antenna to receive signals

The big difference between a telecommunications satellite and a broadcast satellite is that a telecommunications satellite needs a receiving station with a large antenna on the Earth's surface, whereas every home can receive the signal of a broadcast satellite with only a small antenna. In Japan, beginning with the Yuri series of broadcast satellites, NASDA (National Space Development Agency of Japan) has been launching and operating telecommunications and broadcast satellites for government entities. Furthermore, private telecommunication companies have also been launching and operating somekind of satelltes.

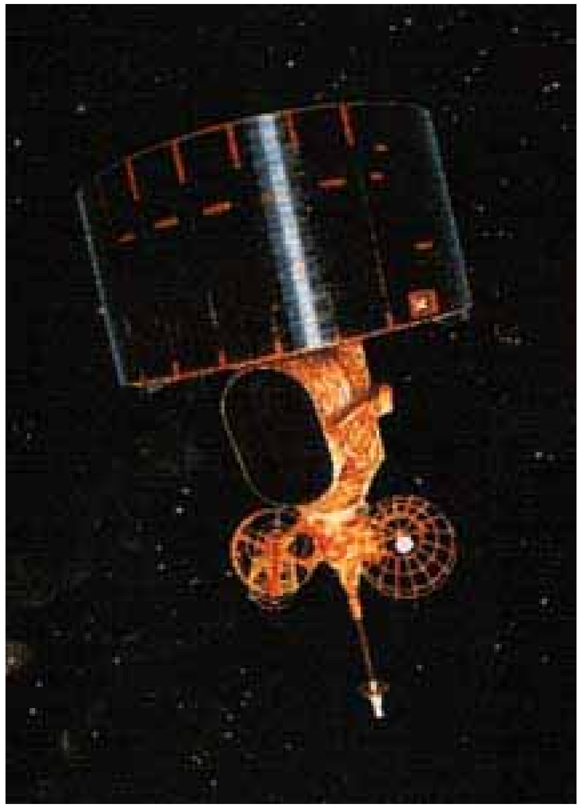
Cosmic Information Center MENU

HOME INDEX TOP

JAPANESE

ONLINE SPACE NOTES / Artificial Satellites

Weather and Earth-Observation Satellites



Images from weather satellites, which play an active role in such fields as weather-forecasting

A weather satellite is one that observes the current weather from above the Earth to improve the accuracy of weather-forecasting.

Weather satellites date back to 1959, when NASA's Vanguard 2 photographed the weather on the Earth's surface. Currently, in accordance with an international agreement, there are five weather satellites in a 35,800-km altitude geostationary orbit, contributing to the world's weather information. These include Japan's Himawari 5 and four other satellites launched by the US and Europe. More over, there are two US NOAA satellites and four Russian Meteor satellites in polar orbits.

Earth-observation satellites monitor the Earth's environment from space

Earth-observation satellites survey things like the Earth's resources, environment, and pollution. They also monitor sea conditions. Many of them have been launched into Sun-synchronous sub-recurrent orbits and the data from their global observations have been analyzed via a global network. Japanese Earth observation satellites include the Marine Observation Satellite Momo 1, which observes the temperatures and speeds of marine currents using infrared radiometer and microwave scanning radiatometer from a height of 900 kilometers. Another is the Earth Resources Satellite Fuyo.

Cosmic Information Center MENU

HOME INDEX TOP

Other Satellites

Geodetic survey satellites accurately measure distance and direction between two points on the Earth's surface

Geodetic survey satellites can provide distance and direction information about two points on the surface of the Earth. By measuring two points simultaneously from a satellite in orbit, distance and bearing can be measured. These data are used for making accurate maps. The US Lageos satellite, a 60-centimeter diameter sphere, is in orbit at an altitude of 5,900 kilometers. The spherical surface can receive laser beams from the Earth, and bounce the beams through prisms to the launch site on the Earth.

•@

Navigation and position information satellites support navigation systems

Navigation satellites can provide the surface positions of ships, airplanes, and road vehicles. Several such satellites have been launched, and transmissions from them form the basis of a practical navigation system that gives position. Among these satellites is the US Marisat.

•@

Military reconnaissance satellites carry out reconnaissance an missile detection missions

Military satellites are used for reconnaissance, communications, and missile and rocket-launch detection. They also conduct "space damage" experiments. The United States has Navstar and other military satellites.

Cosmic Information Center
MENU

HOME INDEX TOP

JAPANESE

ONLINE SPACE NOTES / Artificial Satellites

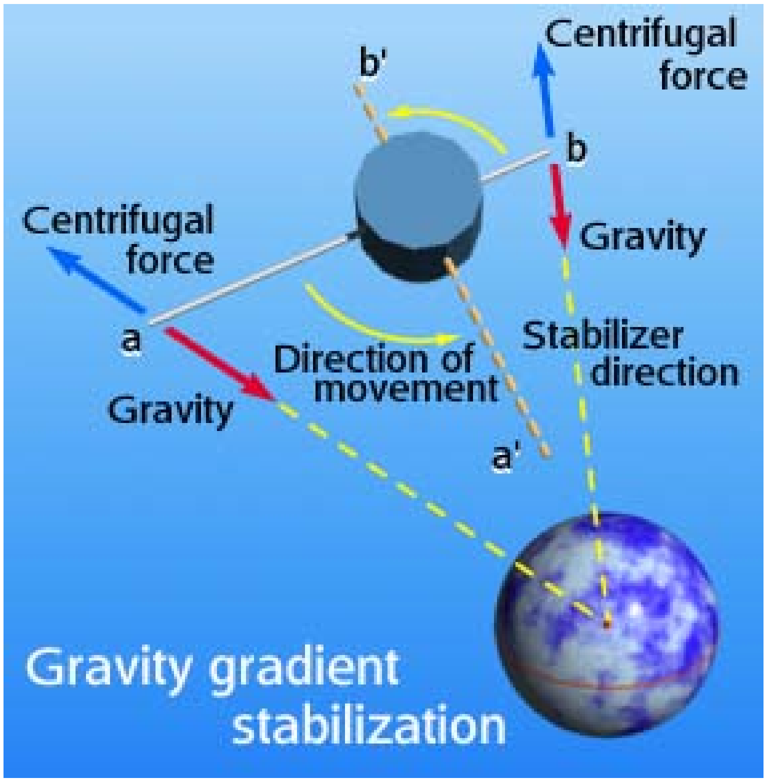
Satellite Attitude Control•i,P•j

Protecting a satellite's attitude from the effects of gravity, the Earth's magnetic field, and radio interference.

A satellite must maintain a certain attitude while in orbit to allow precise pointing of an antenna toward the Earth, to allow the accurate orientation of observation instruments toward the object being observed, and to direct solar panels toward the Sun. But the satellite receives interference from such phenomena as the Earth's gravitational and magnetic fields, and the solar wind. These phenomena tend to disturb the satellite's attitude, so it is necessary to control attitude to keep the satellite stable.

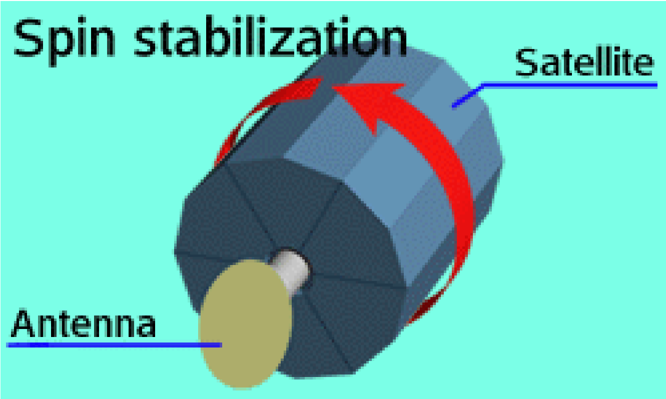
•@

Passive stabilization system



Gravity gradient stabilization utilizes the Earth's gravity to keep a satellite's attitude stable

A passive stabilization system utilizes terrestrial gravity to maintain a stable satellite attitude. It is based on the principle that the Earth's gravity field has a gradient. If the satellite is fitted with a long arm, the arm will point toward the Earth and thus give the satellite stability. The Moon, following the same principle, keeps the same part of its surface facing the Earth. However, this sort of system is very unsteady, so there few actual examples of its use.



In spin stabilization, the whole satellite spins like a top

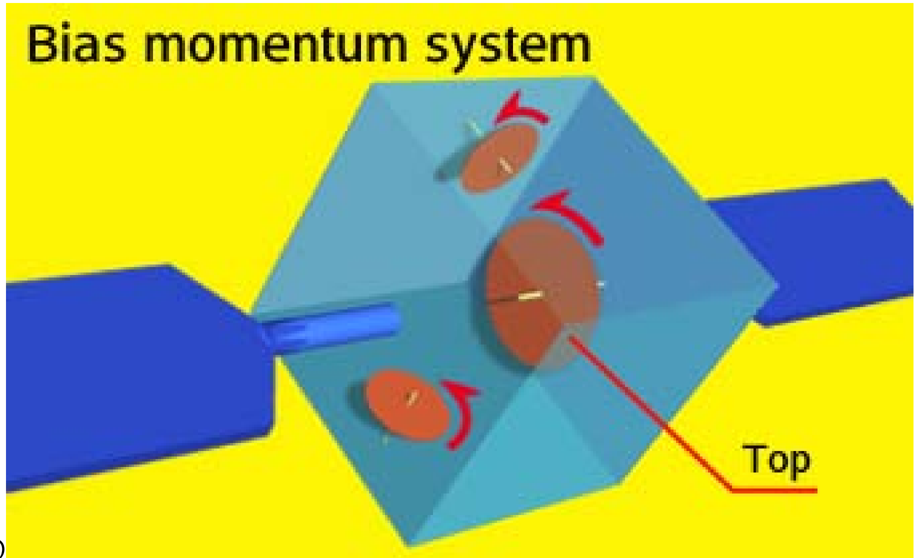
Spin stabilization is a means of stabilizing the attitude of a satellite without its antennas , or even the entire satellite, by spinning it like a top. This is a very reliable system, but one disadvantage is that, because large solar collectors cannot be used, large amounts of electric power are not available.

Cosmic Information Center MENU

HOME INDEX TOP

Satellite Attitude Control•i,Q•j

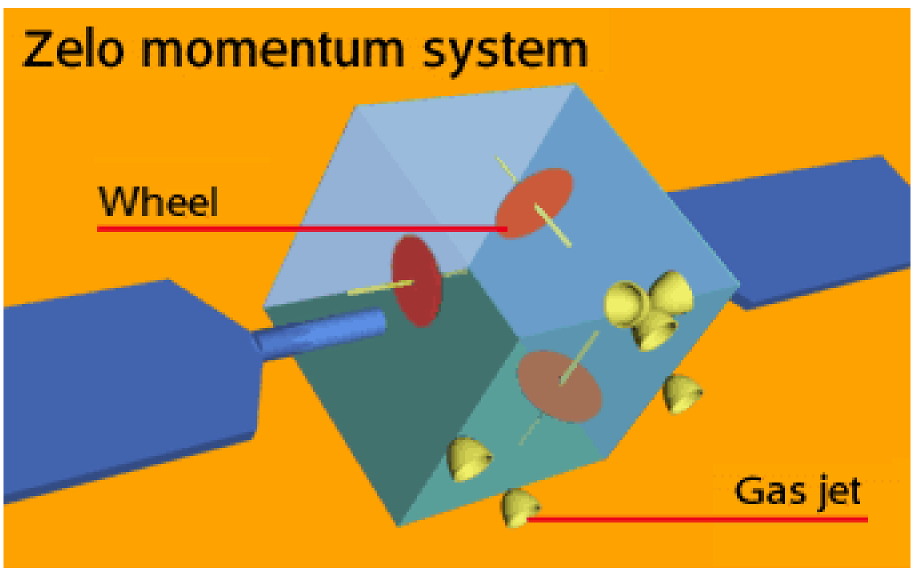
Three-axis control system

•@

In a bias momentum system, a large top is set spinning inside the satellite

Inside a satellite with a bias momentum system, a relatively large top or flywheel is made to spin, and this spin imparts attitude stability to the satellite.

•@



In a zero momentum system, small motors adjust and stabilize satellite attitude

A satellite with a zero momentum system carries a wheels that register movement about the three axes (vertical, horizontal, altitude). Gas jets and other small engines are used to correct deviations from the flight path, and to stabilize the satellite in other ways.

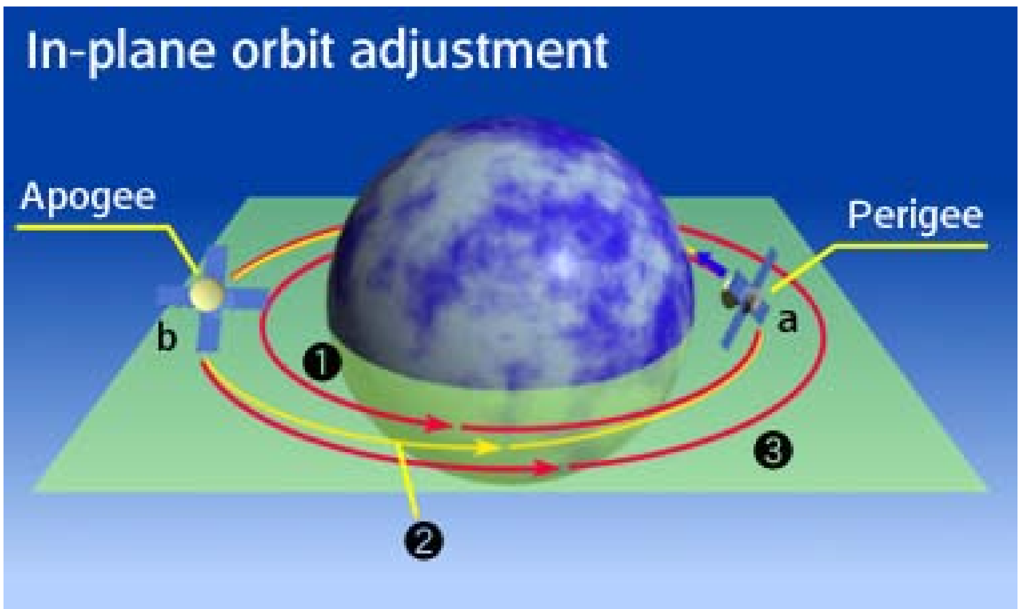
Cosmic Information Center
MENU

HOME INDEX TOP

Control of Satellite Orbits

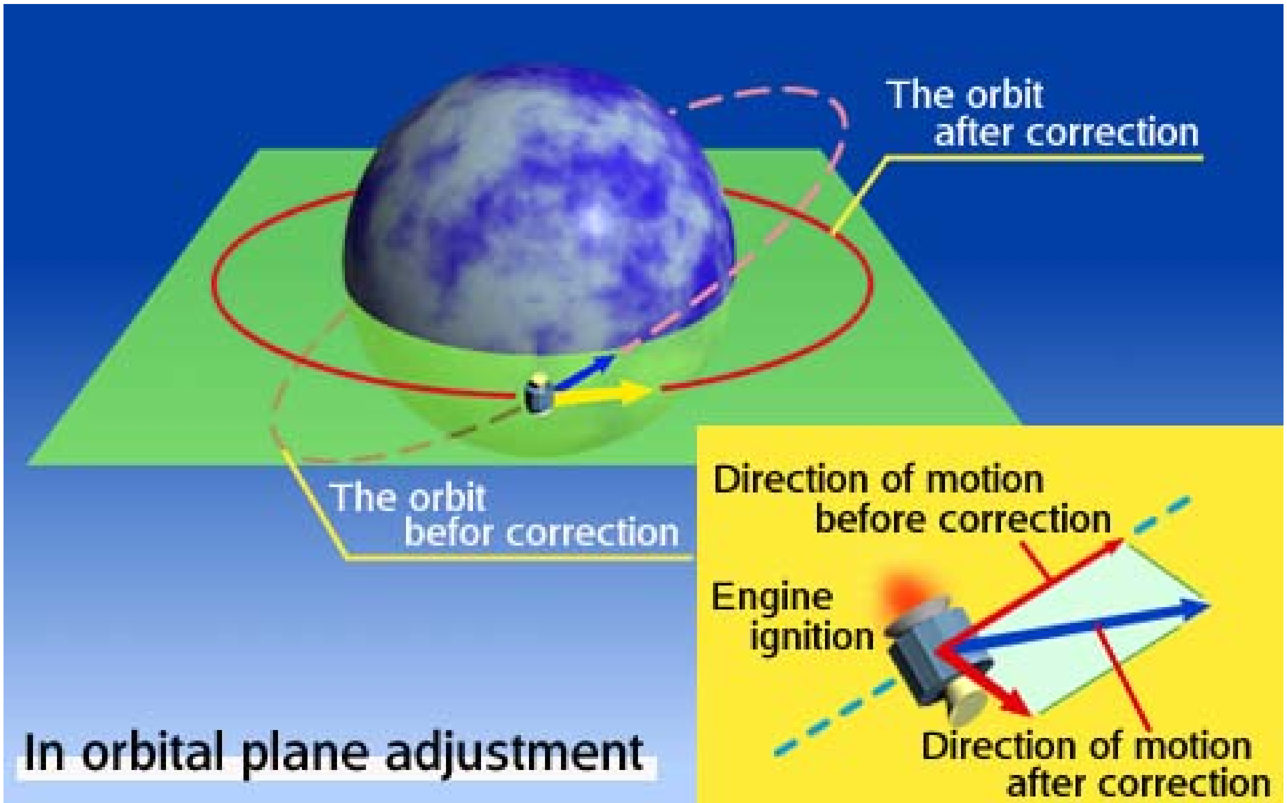
Orbit control involves making changes in a satellite's orbit to enable it to fulfill its mission

The influence of solar and lunar gravity, of air friction, and other effects over a long period of time cause the orbit of a satellite to wander, and so the orbit must be adjusted to allow the satellite to fulfill its ultimate mission, for example a rendezvous docking. This adjustment is called "orbit control." Broadly, this is done in two ways.



In-plane orbit adjustment alters the size and shape of an orbit in the orbital plane only

The size and shape of a satellite's orbit in the orbital plane can be altered by firing the engines to increase or decrease orbital velocity. In this way the perigee, apogee, period, and shape (circular/elliptical) of the orbit are changed. To move from orbit 1 to orbit 2, increase speed at perigee a. To move from orbit 2 to orbit 3, further increase speed at apogee b.



In orbital plane adjustment, engines are fired perpendicular to the orbital plane

In orbital plane adjustment, engines are fired to increase power perpendicular to the satellite's orbital plane. This procedure is used to change the inclination and the ascending node of the satellite's orbit.

Cosmic Information Center MENU

HOME INDEX TOP

Communications Satellite "AsiaSat"

Private international satellite company for fixed communication set up in Hong Kong

Asia Satellite Telecommunications Co., Ltd., a joint British, Chinese and Hong Kong enterprise, commenced operations with the launch of AsiaSat 1 over the western Pacific Ocean in April 1990. Although owned by China and officially registered as a Chinese domestic communications satellite, AsiaSat 1 features a broad beam area extending from the Far East to the Middle East. AsiaSat 2 was launched in November 1995, equipped with Ku-band as well as C-band transponders, and capable of servicing China and the rest of the Asian region. AsiaSat 1 carries 24 C-band transponders, a portion of which are leased for use by Mongolia, Pakistan, Myanmar and other countries in the region.

Star TV purchased by Murdoch

Star TV, with its "borderless television broadcasting service", has served to focus particular attention on the AsiaSat system covering 40 countries throughout virtually the entire Asian region. The company commenced a 5-channel 24-hour service in October 1991, including news, music, movie and sports programming, as well as a Chinese language channel. Between 1993 and 1995, Star TV was purchased by News Corporation (owned by Australian media mogul Robert Murdoch), which has applied its extensive broadcast and film expertise to diversify programming targeted at each Asian country serviced. With the easing of Japanese broadcast regulations in August 1994, Star TV has moved to strengthen its programming directed at Japan as well.

JAPANESE

ONLINE SPACE NOTES / Artificial Satellites

Commercial imaging satellite Ikonos

Satellite with 1-meter resolution offers quality images for sale

A U.S. private company has started a new service to provide high-resolution images taken by satellite. Objects as small as one-meter across can be distinguished in their images, from parked cars to trees. Although their satellite's resolution power is still behind the most advanced reconnaissance satellites that is said to be able to see a 15-centimeter object from orbit, the precision of their images is the highest among commercial satellites and surpasses those taken by many other operating satellites, including a Russian satellite with a 2-meter resolution power or an Indian one with 5-meter resolution.
The company uses a satellite, named Ikonos, which was launched by a U.S. private company Space Imaging, Inc. in September 1999 from Vandenberg Air Force Base. It travels in a North-South orbit around the Earth at an altitude of 680 kilometers. The satellite takes one hour and 28 minutes to make a round and is capable of covering the whole planet in three days. The satellite images are sold for 30,000 yen per one square kilometer. In Japan, the sale of the images is managed by a major trading company.
Photo: A sample image captured by Ikonos commercial imaging satellite

End of Cold War diverts military technology to commercial use

Previously, the U.S. government didn't allow high-resolution satellite images to be released to the public due to military security reasons. However, since the Cold War structure has collapsed, following the Soviet Unions' breakup as well as Germany's reunion, the U.S. government decided to permit a diversion of military technology for commercial purposes. The sale of Ikonos images is permitted worldwide, except to seven countries including North Korea and Iraq, and in case of wars or conflicts, there will be limitations on targets in specific regions or on the sale of the images. Because of the quality of the images as well as their fast delivery, it takes only 30 minutes after shooting, the service has attracted clients such as government organizations and the media worldwide. Japan's Defense Agency has decided to purchase the images for information collection purposes. Future suggestions for the use of Ikonos' images includes, city planning, mapping, collection of damage information in case of natural disasters, observation of environmental pollutions, car navigation systems and /or TV game software.

Cosmic Information Center MENU

HOME INDEX TOP

Japanese Satellites

(After 1997)

Engineering development and test satellites

- Kiku 7 [Orihime and Hikoboshi] (ETS-VII)
- Engineering Test Satellite VIII (ETS-VIII)

Communications and Broadcast Satellites

- Optical Inter-orbit Communications Engineering Test Satellite (OICETS)
- Data Relay Test Satellite (DRTS)

Geo-observation Satellites

- Tropical Rainfall Measuring Mission (TRMM)
- Advanced Earth Observing Satellite-II (ADEOS-II)
- Advanced Land Observing Satellite (ALOS)

Mission Demonstration Satellites

- Mission Demonstration test Satellite-1
  (MDS-1: for verification of commercially produced components)

Multi-functional Transport Satellite

- Multi-functional Transport Satellite (MTSAT)