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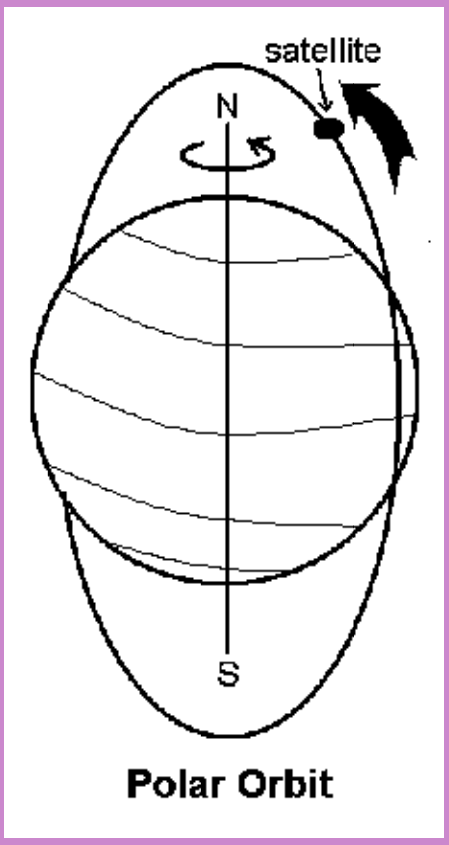
Getting a bird’s eye view

Taking a bird’s eye view is part bird and part view, says, S.Ananthanarayanan.

A bird’s eye view is getting a large picture in one frame. Its also being able to make out what you see. Remote sensing satellites do just that, from high up and with special optics.

Satellite orbits

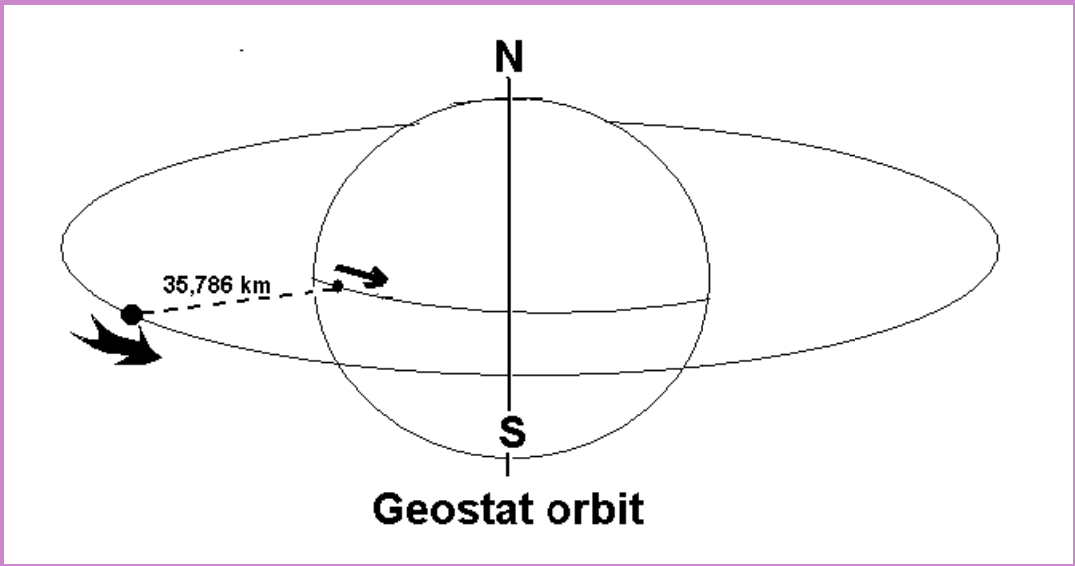
There are two kinds of orbits. One kind that sees all parts of the earth time the satellite goes round and the other kind where the satellite stays above the same place all the time.



In the first kind, the satellite orbits in a north-south direction, or in a plane that contains the axis of the earth’s rotation, like in the first picture. While the satellite goes around, north-south, the earth rotates, west-east and the satellite must find itself continuously passing over a different places on the earth.

This kind of satellite is usually made to move fast, so that it covers all areas of the earth during these 12 hours that it takes the earth to make a half rotation.. A fast moving satellite needs to be close to the earth, where gravity is strong enough to hold it in place. The orbits of ‘polar satellites’, as this kind are called, are hence just 500 to 800 kilometres above the ground and these satellites take pictures of great clarity.

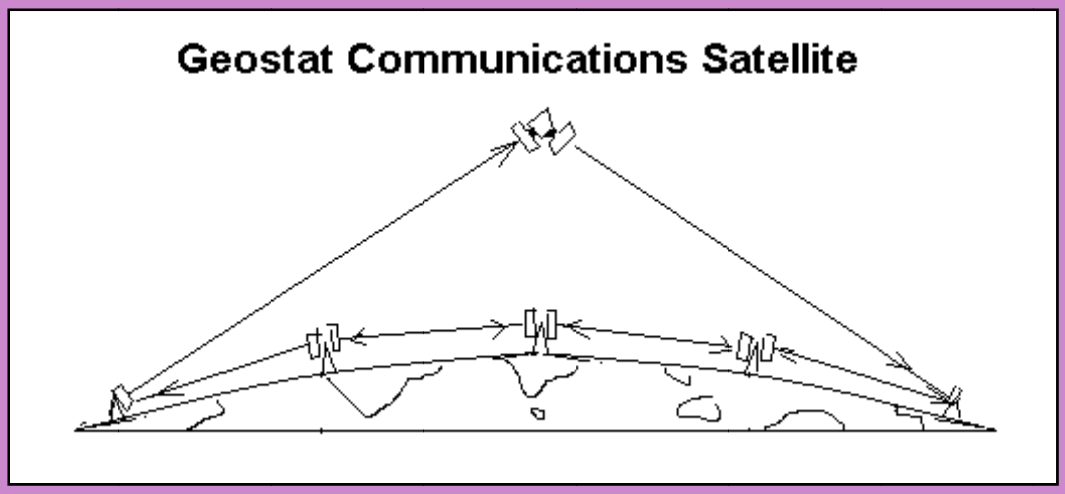
The other kind, the ‘geostationary satellite’ orbits the earth along the equator and at the same speed as the earth’s rotation. This happens only at a particular height above the earth, about 36,000 kilometers, and that is where all the ‘geostsats’ are found.



The satellite is first launched so that it is nearly 'geostationary' and then allowed to drift till it is over the part of the earth where it is required. At this spot its speed is adjusted so that it becomes truly 'fixed' and can perform its function

The functions

Geostationary satellites are like antennas that cover vast territories or like light houses visible from great distances. They are hence mostly used for communications and navigation. They have arrangements to receive radio signals from many places below them and then to send them on again over a wide area. Geostats have revolutionized television coverage, telephony and business communications



Polar satellites are at low altitudes and capture pictures in good detail. These are used for imaging - topography, vegetation, rock, sand or water body formations, roads and city layouts, salinity or temperature distribution of seawater, even movement of shoals for fish! Over the several passes that a polar satellite makes, it can collect a number of pictures of spots in a cluster and then sew the pictures together to produce a detailed map.

The sensors in the satellite cameras are sensitive to different kinds of light, from the visible to infra-red to microwaves. Depending on how different media reflect or absorb the different wavelengths of light, it is possible to detect and measure different qualities, an important one being moisture content. Using this property, for instance, the satellite can identify different kinds of vegetation, kinds of soil, even cracks in rock formations, as soil tends to collect and trap moisture in cracks.

The sensors

The sensors most frequently used are the 'Charged Coupled Device' or CCD cameras. Here, the visible light or the infra red is collected in lenses and focused on the CCD array. This consists of tiny cells that respond with electric current when the light or Infra red strikes them. These tiny electric currents are measured and transmitted as digital signals to the earth stations or to on board computers. Computers, usually in earth stations, process the data pouring in and can not only present images but can present different aspects of the data to different classes of users.