

Satellites by Gareth Jones

What is a Satellite?

A Satellite is anything that orbits something else. A moon is a satellite, as is the Earth. Planets are satellites of their star, Moons are satellites of their planet. Asteroids and Comets are satellites as well, as they too orbit a star or planet.

Artificial Satellites

There are many Satellites which are man-made and have been sent into space for a number of reasons. They transmit television, radio and telephone signals. There are different types of Satellite:

Communication Satellites: These beam signals from one place to another such as television, radio and telephone signals.

Navigational Satellites: These locate a certain place on the Earth. Boats use these when at sea, involving the use of a GPS system.

Monitoring Satellites: These are used to show information like weather.

Astronomical Satellites: These can show images of stars and galaxies. They are a lot more useful to scientists than conventional satellites as the pictures are a lot clearer and more accurate.

Geostationary orbit

Communications satellites beam microwave signals from one part of the earth to another. The signals can carry radio and TV programmes, computer data and telephone conversations. Satellites of this type are normally put into a geostationary orbit. This means that their orbital motion exactly matches the earth's rotation so that they appear stationary in the sky. As a result, satellite TV dishes down on the ground can be mounted in fixed positions. They do not have to move in order to track the satellite. For a geostationary orbit, an orbit time of exactly 24 hours is required.

A satellite in geostationary orbit stays above one point on the Earth. In order to do this its orbit must be circular and completed in one sidereal day – the time the earth takes to revolve around once - following the direction of the Earth's own orbit around its axis, so it circles the equator. Many weather observation satellites and broadcast satellites are geostationary.

Communications Satellite

The Syncom 4 communications satellite was launched from the Space Shuttle Discovery. Modern communications satellites receive, amplify and retransmit information back to Earth, providing television, telefax, telephone, radio and digital data links around the world. Syncom 4 follow a geosynchronous orbit – that is, it orbits at the same speed as the Earth spins keeping the satellite in a fixed position above the earth. This type of orbit enables uninterrupted communication links between ground stations.

Hundreds of active communications satellites are now in orbit, but there are many different countries. They receive signals from one ground station, amplify them then retransmit them at a different frequency to another station. One frequency band used, 500 MHz wide, is divided into repeater channels of various bandwidths (located at 6 GHz for upwards or "uplink" transmission, and 4 GHz for downward or "downlink" transmission). A band at 14 GHz (uplink) and 11 or 12 GHz (downlink) is also much in use, mostly with fixed (non-mobile) ground stations. An 80 MHz wide band at about 1.5GHz (uplink and downlink) is used with small, mobile ground stations (ships, land vehicles and aircraft). Solar energy cells mounted on large panels attached to the satellite produce power for reception and transmission.