

APPLICATION: Satellite Motion

Once a satellite is positioned in its final orbit by rocket thrusts the satellite no further propulsion is necessary. If it is in a circular orbit the satellite continues to move with a uniform circular motion.

The force required to produce the centripetal acceleration is directed towards the centre of the circle.

This force is the gravitational force of attraction to the Earth on the satellite. For all objects this gravitational force is directed towards the centre of the Earth. Since the force must also be towards the centre of the circular orbit, the centre of the orbit of any Earth satellite in circular orbit must coincide with the centre of the Earth.

The centre of the orbit always must be the centre of the Earth so it is not possible to have a satellite orbiting parallel to the equator at any other latitudes.

An Equatorial Orbit is an orbit in which the satellite is always above the equator of the Earth.

A Geostationary orbit (GEO - geostationary Earth orbit) ensures the satellite will always remain above a particular point on the Earth's surface as it rotates. This orbit is an equatorial orbit because the satellite moves in a plane perpendicular to the Earth's axis of rotation. The direction of the motion of the satellite in orbit must be the same as the direction of the Earth's rotation.

A Polar Orbit is an orbit in which the satellite passes over the North and the South poles. Satellites used for meteorology or surveillance have Polar orbits and low altitudes so that a closer view of the Earth and higher resolution can be achieved.

Satellite Launch

A satellite is launched into orbit either by a rocket or the space shuttle cargo bay.

If the satellite is going to be placed in an Equatorial orbit it is most economical to launch it as close to the equator as possible.

The earth is rotating west to east as seen from space, so it is most economical launch the satellites in this direction, so that the speed of the Earth's contributes to the final orbit speed.