# Satellites

## Satellites - Introduction

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A **satellite** is an object which **orbits another object**.
The Moon is a natural satellite which orbits earth and Sputnik is a man made satellite as it was put into an orbit of the earth.

The **period** of a satellite is the **time** taken for the satellite to **complete one** orbit.

The **period** of a satellite depends on the **height of the satellite above the object** it is orbiting. The **higher** the orbit of the satellite the **greater** the period and vice versa.

## Geostationary Satellite

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A **geostationary satellite** is a satellite which:

- has a period of 24 hours
- orbits at roughly 36000 km above the earth's surface which is much higher than other satellites
- stays above the same point on the earth's surface at all times.

## Satellite Communication

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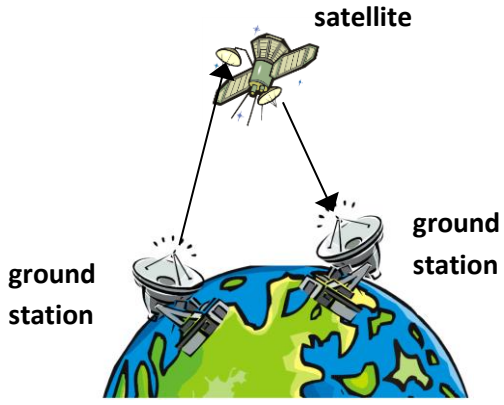
**Ground stations** send microwave signals to the satellite using a curved dish transmitter to transmit a strong signal. At the satellite the signal is **collected** by a curved dish receiver, then **amplified** and finally **retransmitted** (at a different frequency) back to the ground using another curved dish transmitter. The transmitting and receiving aerials are placed at the **focal point of the curved reflector.**

**The signal is sent at a speed of 300 000 000 $ms^{-1}$. This allows the equation d = vt to be used with satellite communication.**



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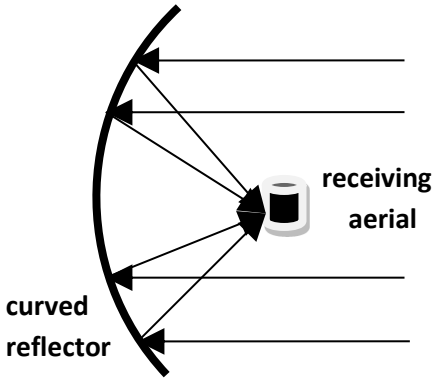
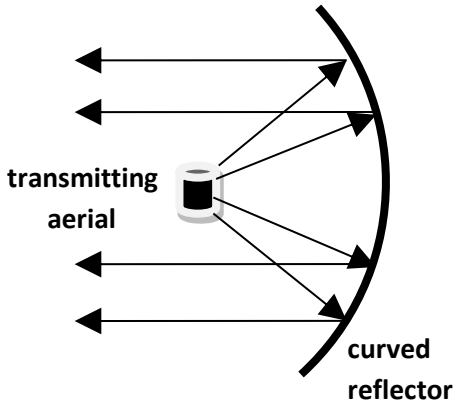
## Satellite Communication – Parabolic (Curved) Reflectors

**Receiving the signal**




Curved reflectors are used to increase the strength of a received signal from a satellite or other source. The curved shape of the reflector collects the signal over a large area and brings it to a **focus**. The receiving aerial is placed at the focus so that it receives a strong signal.

**Transmitting the signal**




Curved reflectors are also used on certain transmitters to transmit a strong, parallel signal beam. In a dish transmitter the transmitting aerial is placed at the focus and the curved shape of the reflector produces a parallel signal beam.

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## Applications of Satellites

Satellites are being used by many countries in different ways. For example:

- **Sending a television or radio signal across the country or to another country**
  The Olympic Games can be beamed around the world using satellite communication. Three geostationary satellites, placed in orbit above the equator permits worldwide communication with satellites communicating with ground stations in different continents.
- **Navigation**
  There are many Global Positioning Satellite (G.P.S) systems available to put in a car so that you don't get lost. This uses the basic equation d = vt to establish your position.
- **Weather monitoring**
  The **weather satellite** is a type of satellite that is primarily used to monitor the weather and climate of the Earth.

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## Using Satellites to Monitor Global Change

Global environmental change is one of the most pressing international concerns of the 21st century. For many years, various types of satellites have been used to detect and monitor worldwide changes including:

- the effects of global warming
- depletion in the ozone layer and
- large scale changes in land cover.

These changes have been down to both:

- natural occurrences and
- as a consequence of the impact of our actions.

Satellites which are used to monitor such events orbit at heights much smaller than 36000 km and do not stay above the same point on the Earth's surface. This allows continuous observation and monitoring of the Earth's land, atmosphere, oceans and ice caps.
For example, the 2002 oil spill off the northwest coast of Spain was watched carefully by the European ENVISAT satellite, which, though not a weather satellite, flies an instrument (ASAR) which can see changes in the sea surface. It orbits at a height of approximately 800 km. With this information collected by the satellite, rescue teams and environmental agencies can attend the scene quickly and minimise the damage caused.
Other disasters, both natural and otherwise can be detected and monitored in a similar way.