



Which Satellite am I?

Background

Satellite: *a natural body that revolves around a planet; a moon.
An object designed to be launched into orbit around the Earth, another planet, the Sun etc.*

History changed on October 4, 1957, when the Soviet Union successfully launched Sputnik I. The world's first artificial satellite was about the size of a basketball, weighed only 83 kg, and took about 98 minutes to orbit the Earth on its elliptical path. That launch saw the beginnings of new political, military, technological, and scientific developments. The Sputnik launch also marked the start of the space age and the American - Russian space race, and ultimately led to the creation of NASA and the Apollo Moon landings.



Sputnik 1

Things have come a long way in the last few decades. Now there are over 8000 artificial objects in orbit around our planet and around 3000 of them are satellites. Satellites influence many aspects of our everyday lives. They are used for transmitting telephone and television signals. They monitor the weather and takes images that we see on the daily weather forecasts. They are used to track hurricanes and look at floods and forest fires. Many cars and lorries have GPS (a Global Positioning System) that uses satellites to locate their exact position on the Earth's surface. Delivery and Mail companies can track their parcels using satellites, so the customer knows exactly when they will receive the goods. And, of course, there are many secret military applications of satellites - the list is endless.

Satellites are placed in very specific orbits to allow them to perform in the optimum way. Communications and some weather satellites are in what is known as a '**geostationary**' orbit. In this orbit, the satellite appears to 'hang' over the same spot on the Earth's surface all the time. It takes the satellite 24 hours the complete one orbital period, the same length of time it takes the Earth to rotate once on its axis. To be in a geostationary orbit, the satellite must be at a height of 35,780 km above the Earth's surface. The other main type of orbit is a '**polar**' orbit. This is when satellites pass over the Earth from pole to pole and as the Earth rotates beneath it, the satellite will view a different part of its surface each time, eventually viewing the whole globe during the course of a day. Polar orbits are much lower than geostationary orbits. The American NOAA Earth Observation satellites orbit at a height of around 879km and take 1 hour and 42 minutes to complete each revolution.

Of course, the Earth has its own natural satellite – the Moon. This takes 27.3 days to orbit around our planet at a distance of some 384,400 km. Just as man-made satellites affect our everyday lives, some believe that the Moon has influence over our lives controlling our moods and behaviour!



Topic

Properties of artificial and natural satellites.

Overview

Students will be given the names of 7 natural and man-made satellites with basic background information on each. They will then have 7 sets of clues and they will have to match each set of clues to a particular satellite. They will need to think about the job each satellite does and its special properties to be able to match them up successfully.

Key Question

What properties distinguish natural satellites from man-made satellites?

Key Ideas

Man-made satellites are put in specific orbits around our Earth and other planets to do certain jobs e.g. to send digital communications or to monitor the weather. These orbits can be distinguished by height above the planet and the orbital period i.e. the time it takes the satellite to complete one revolution. The orbits of natural satellites are much more varied and these satellites are larger and heavier than their artificial counterparts. Satellites such as our Moon were once part of planet Earth, whereas Mars' moons are thought to be captured asteroids.

National Curriculum Links

Science Key Stage 3: Scientific Enquiry, Considering Evidence 2 k – m
Physical Processes, The Earth and Beyond 4 b, e

Science Key Stage 4: Scientific Enquiry, Considering Evidence 2 m
Physical Processes, The Earth and Beyond 4 a, b



Materials and Preparation

Each student will need:

- Satellites Student Worksheet
- Satellites Student Activity
- Pens and paper

Management

This activity should take one lesson to complete (and can be finished for homework if not done in the lesson time!) Students can work on the activity individually.

1. Give each student a copy of the worksheet and activity.
2. Introduce the subject of satellites. Explain what a satellite is and talk about natural and artificial satellites. Mention the different jobs that man-made satellites do and how this determines the orbits that they are put in.
3. Get the students to complete the 'Satellites Worksheet'. This will give them a chance to think about the subject area before starting the activity.
4. When the worksheets have been completed, discuss answers with the whole of the class, encouraging students to explain their reasoning.
5. Next students should work through the 'Satellites Activity'. It should be self-explanatory – basically students have to identify 7 different satellites from a series of clues. All the information they need to do this is contained in the activity.
6. When the students have completed their activity sheets, go through the answers with the whole of the class explaining the reasons why each set of clues represents a certain satellite.

Further Activities

1. A satellite orbiting around another satellite? The Satellite student activity looks at man-made satellites that orbit the Earth and Mars, but we have also sent satellites to study our own natural satellite – the Moon. Students should pick a satellite to research that has orbited (or will orbit) the Moon. The most recent are NASA's Clementine and Lunar Prospector spacecraft, and ESA's SMART – 1 that was launched in 2003. Using the Internet students can find out about their chosen satellite, its orbit and what its mission was (or will be). A good place to start is <http://nssdc.gsfc.nasa.gov>. Students can present their research in the form of a newspaper article or poster.



2. Satellites and their products can be found in many aspects of our daily lives. Weather forecasts, disaster monitoring, communications, military intelligence. They are often featured in newspaper and magazine articles or on the TV. Students could create a satellite bulletin board and collect any articles that feature satellites and bring them into class to pin up on the board. This project would need to run over several weeks or even a whole term for students to find sufficient examples.
3. Earth and Mars are not the only planets in the solar system that have natural satellites. Students could find out which planets have moons, how many they have and what they are like. Print out tables such as the one below and get students to do some research to fill them in, using books and the Internet:

Planet	Number of Moons	Name of Moons	Size of Moons	Mass of Moons	Orbit of Moons
Mercury					
Venus					
Earth					
Mars					
Jupiter					
Saturn					
Uranus					
Neptune					
Pluto					

There are large spaces under Jupiter, Saturn and Uranus as they have lots of satellites!!