



Caithness International Science Festival

Activity Sheet

Destination Space: Spaceports



Unleash the **Power**
of Curiosity.





Activity 1: Space Industry and Jobs

Do you know about the opportunities and jobs associated with the Space Industry? It is estimated that 400,000 people contributed to the Moon landings. The UK's Satellite industry currently employs over 42,000 people with that number increasing with projects such as Mission to Mars and building Spaceports. Are they all scientists? Of course not! Lawyers, chefs, doctors, mathematicians, textile designers, graphic designers, and people of countless more professions are needed.

Discuss and list out the professions and job role in space research. Check the following link wherein, pupils can find out what role they can play in a Mission to Mars, according to their interests: [Space Careers](#)

Activity 2: Microgravity in Space

Gravity is a force exerted by all objects with mass that causes them to be attracted to each other. The huge gravitational force exerted by Earth pulls everything on Earth towards its centre.

When we think of astronauts in space or on the International Space Station (ISS), we picture them floating around as if the Earth is exerting no gravitational force, but this is not the case! Gravity on ISS is around 90% as strong as it is at Earth's surface.

What you'll need:

- Optional: heart rate monitors, step counters, timers.
- Rulers
- Notebook
- Pencil/pen



What you do:

You can perform simple activities as part of the training session, for example:

- Base-Station walk Back: Perform a walk, progressing to 1600 m (1 mi) to improve lung, heart, and other muscle endurance. How long did it take?
- Crew Strength Training: Do some body-weight squats and push-ups to develop upper and lower body strength in muscles and bones. How many can you do?
- Jump for the moon: Jump training with a rope, both while stationary and moving, to increase bone strength and to improve heart and other muscle endurance.
- The speed of light: You will perform a time reaction activity using a ruler to practice your hand-eye reaction time and improve your concentration. Hold the ruler with one hand and drop it. Note the distance on the ruler. How can you improve your reaction time?



You should record your observations in a Notebook (i.e., Mission Journal). Can you improve over time? For more activities, check the NASA's website: [Mission X activities](#)

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For example, if you drop an apple on Earth, it falls towards the ground. If an astronaut on the space station drops an apple, it falls too. It just doesn't look like it's falling. That's because they're all falling together: the apple, the astronaut and the station. Because they're all falling at the same rate, objects inside of the station appear to float in a state we call "zero gravity" (0g), or more accurately microgravity. We experience instances of microgravity every day, when going down in a lift or over a bump in the road.

In the microgravity environment on-board the ISS, items will float around. This activity, will show that how floating (or microgravity) can makes things difficult to work with.

Activity 3: Getting used to Floating

What You'll Need

- Hair Dryer
- Ping Pong Balls
- Basket or Cup to catch the ball
- Adult/partner for help

Hold onto the hair dryer and ask adult or a partner to hold basket. After switching the hair dryer on, place the ping pong ball on top of the hair dryer to make it hover. Once you have done that, you will have to direct the pingpong ball to fall into the basket or cup their partner is holding. Repeat this until all the balls are in the basket. Swap with the partner and repeat.

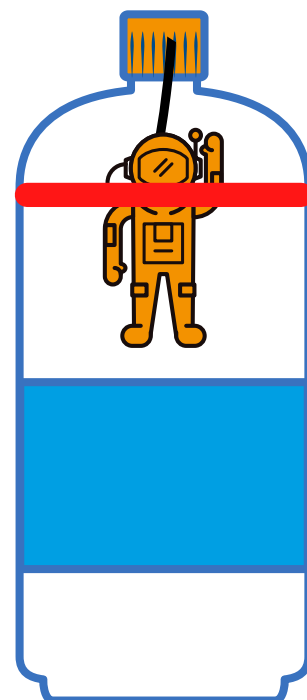
You can extend this activity to discuss what a typical day on the ISS would look like and how microgravity would affect those activities. e.g., how would you eat, sleep, drink, go to the toilet, wash your hair, etc.



Activity 4: Falling astronaut

What You'll Need

- 2-litre clear recyclable bottle
- Coloured tape or marker
- Drawing of an astronaut on a piece of cardboard
- String



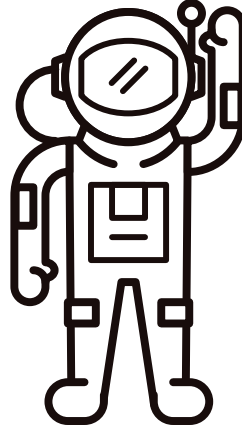
Draw broad stripe on bottle with tape or marker. Attach string to cardboard astronaut. Hold string in neck of bottle with a finger so astronaut is even with the line. First, release just the string and hold the bottle. Observe astronaut falling to bottle bottom. Then, reset and release string and bottle together. Observe astronaut falling with bottle during drop.

The astronaut is floating in the falling bottle just as real astronauts float in the ISS. Optional: You can record and play-back this experiment as it goes very fast.

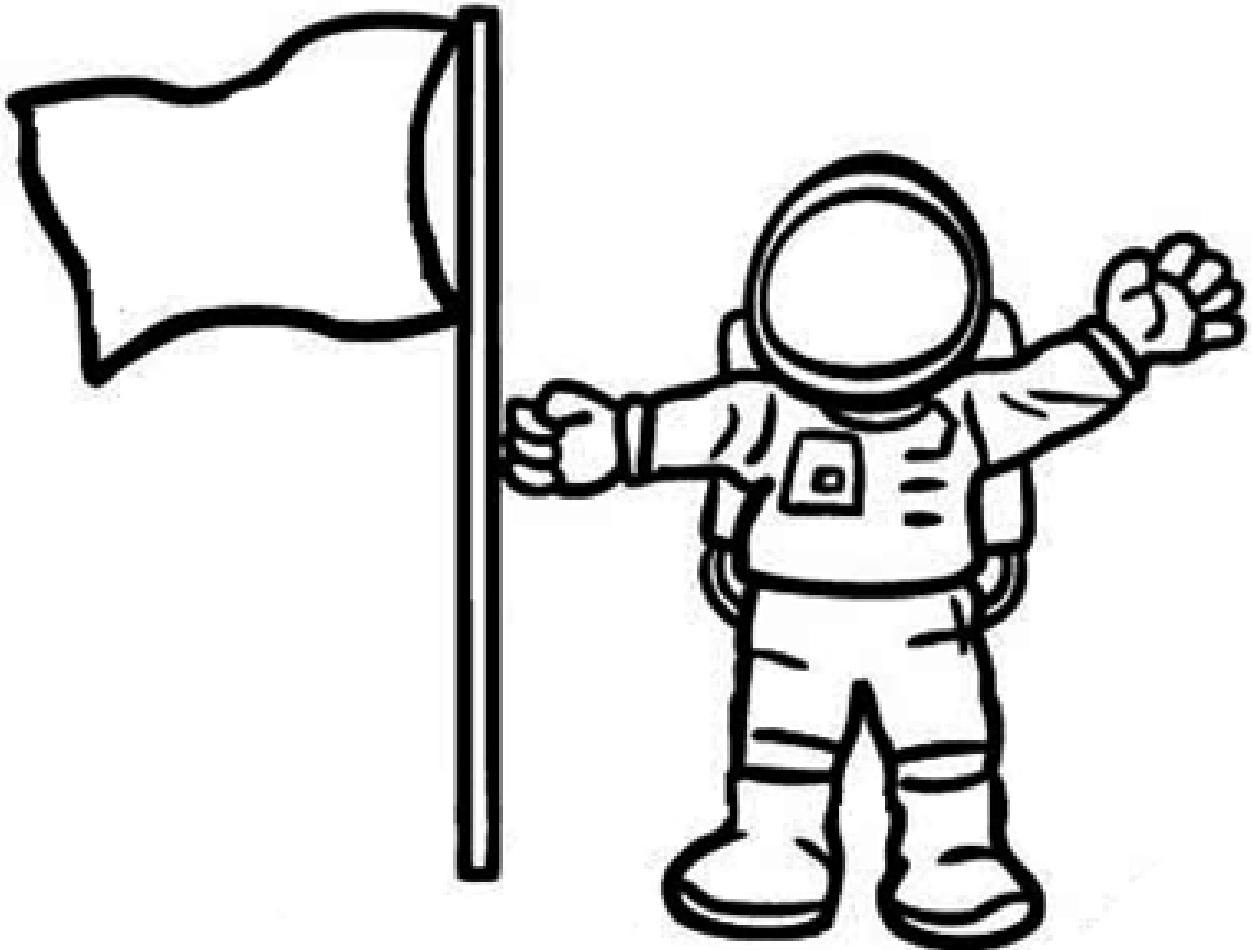
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Template: Astronaut



Template: Draw an Astronaut





Making space sustainable

According to ESA's data, the number of rocket launches and the number of satellites these rocket have placed into Earth orbit since the start of the space age (in 1957) is miniscule if compared to the number of debris estimated in our Earth's orbit. So, what is floating in our space?



The amount of debris in Earth's orbit, approximately 170 million objects, includes spent rocket stages, dead spacecrafts, broken satellites and a few tools lost during spacewalk. The UK along with other countries are working on methods to keep the outer space safe and sustainable for future generations. UN and UK sign agreement to promote space sustainability.

Threat from space debris

In space, debris can travel at high speed, even if they are as small as dust particles. Smaller debris can cause major damage or even threaten a spacewalking astronaut. Whereas collision with large pieces can disable or even destroy spacecrafts, for example space debris object from an Ariane rocket collided with the French Cerise spacecraft in 1996 resulting in severe damage. Work as a group to make a poster listing various debris found in space, their measurements, their impact and any space collisions which have been recorded.

Measures to reduce space debris

The UK Space Agency and European Space Agency are working on various projects to remove debris already in space. Other measures are being taken during the designing and building stage of the spacecraft. For example, the Columbus lab on the International Space Station is protected by special shielding, to reduce the flecks of paint and dust. The materials used in making spacecrafts are subject to 'Rebound test' to determine how they would react if impacted by a space debris.



What is a satellite?

Look for some pictures of Moon, Jupiter's Moons, some space junk and of different satellites. Think what they all have in common. You are right! they are actually all satellites.

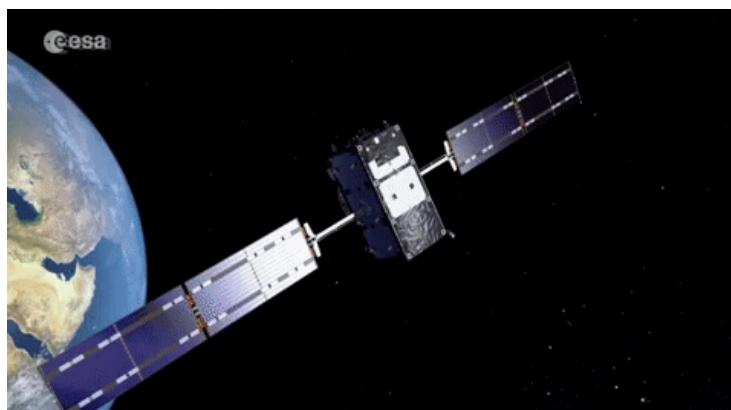
A satellite is anything that orbits a planet. However, most of the time when we talk about satellites we are talking about artificial, or human made satellites that orbit the Earth. But have you thought why we put these machines in orbit around the Earth?

Activity 3: Build a Satellite

For the activity, write down different parts of a satellite, while doing this encourage think about the shape, size and why those parts would be needed.

What You'll Need

- Cardboard
- Tape,
- Pencil
- Colour pens
- A bit of imagination



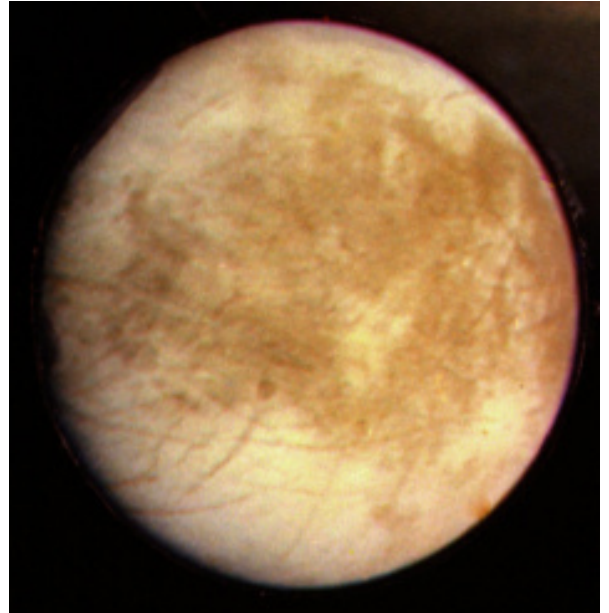
Pointers: All satellites look similar because it costs too much to redesign them. The central frame is the main part of the satellite that houses all of the electronics such as computer processor, temperature controls and batteries. On the outside, extra devices such as scientific sensors, communication dishes and cameras are mounted. Often, satellites last for an average 8 years, which is why they need batteries that are solar powered. The satellite should be small enough to fit inside a rocket, which means some of the components are stored folded up until the satellite is deployed.



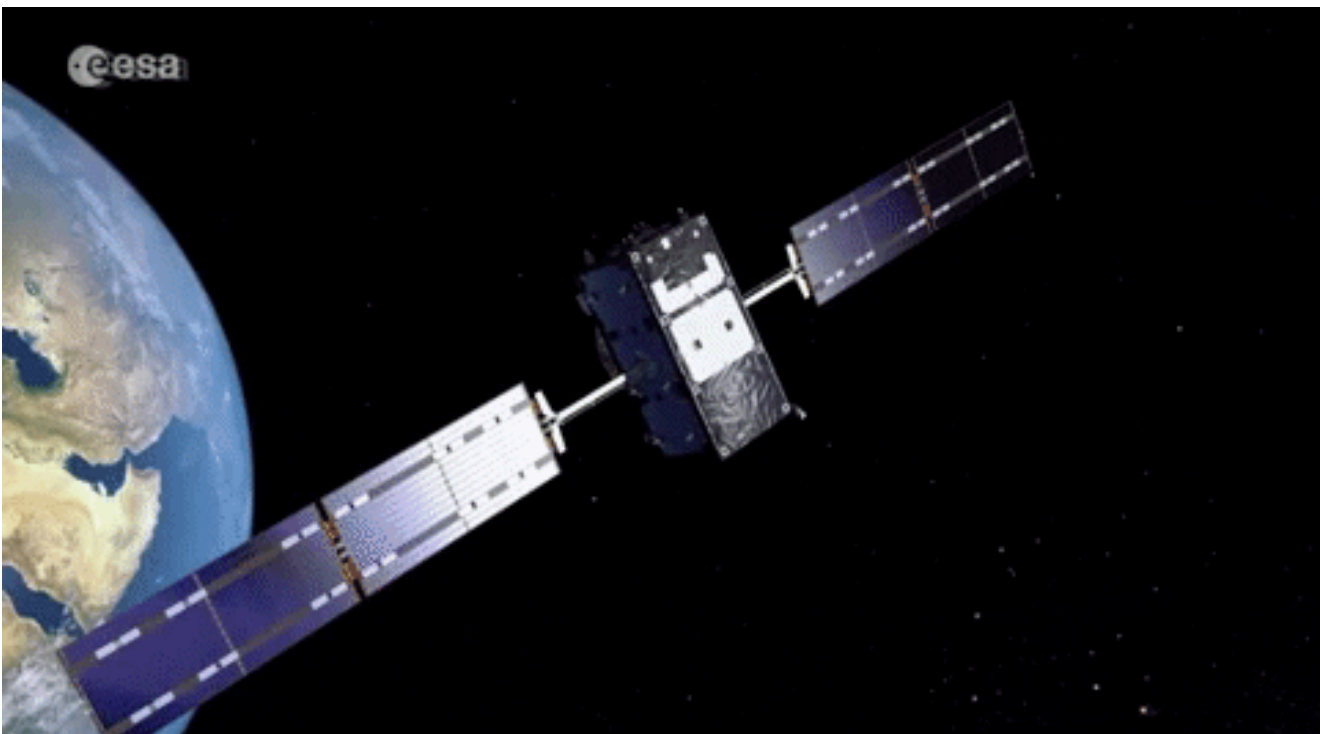
Pictures



Moon



Europa



Satellite



Satellite Applications

Satellites have been used for a wide range of functions from enabling communications to monitoring disasters. One of the first types of satellites were the communication satellites, used to send signals much further, thus helping to connect remote and distant locations easily. Most communications satellites are in geostationary orbit above the Earth at around 36,000km.

Another type of satellite is used for navigation purposes through a network of transmitters in orbit around the Earth. Most satellite navigation are handled by two networks, Russian GLONASS and the US GPS. However, recently a new network has been completed by the European Union called Galileo, which can track objects down to an astonishing 1cm accuracy.

Remote sensing satellites are other type of satellites used to gather information about an object while orbiting around it. They are used for weather forecasts, land surveying and humanitarian applications. These satellites are also commonly sent to orbit objects other than the Earth. For example, scientist to carry out experiments to planets, moons and other celestial objects.

Activity 4: Guess the satellite image

What You'll Need

- Paper
- Pencil
- A bit of creative thinking

What to do

For the activity, look at the Satellite Images taken from all around the world. Using some creative thinking, try to guess what each image shows and record your ideas for each image.



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