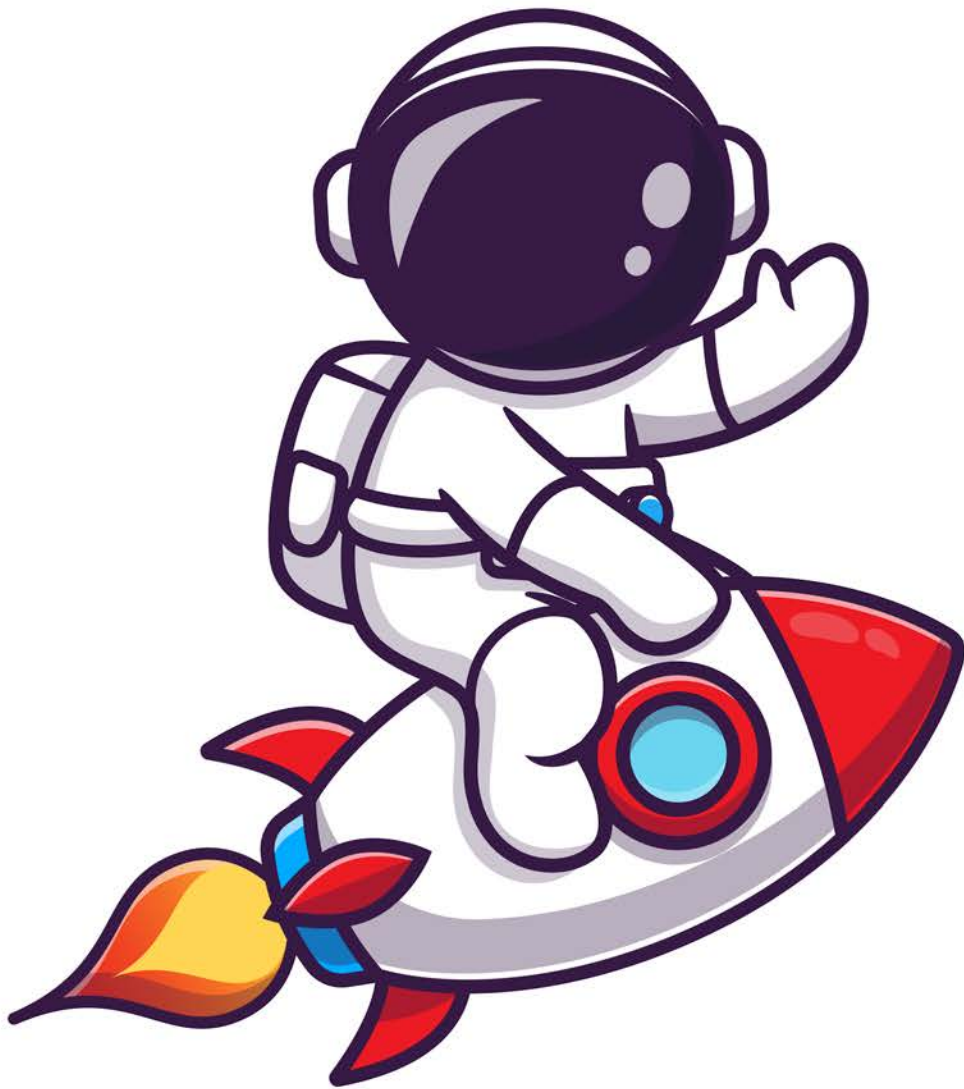




THE SCHOOLS'
OBSERVATORY

PROUD TO BE PART OF
LIVERPOOL
JOHN MOORES
UNIVERSITY



Let's Explore
Astronauts!



Background information

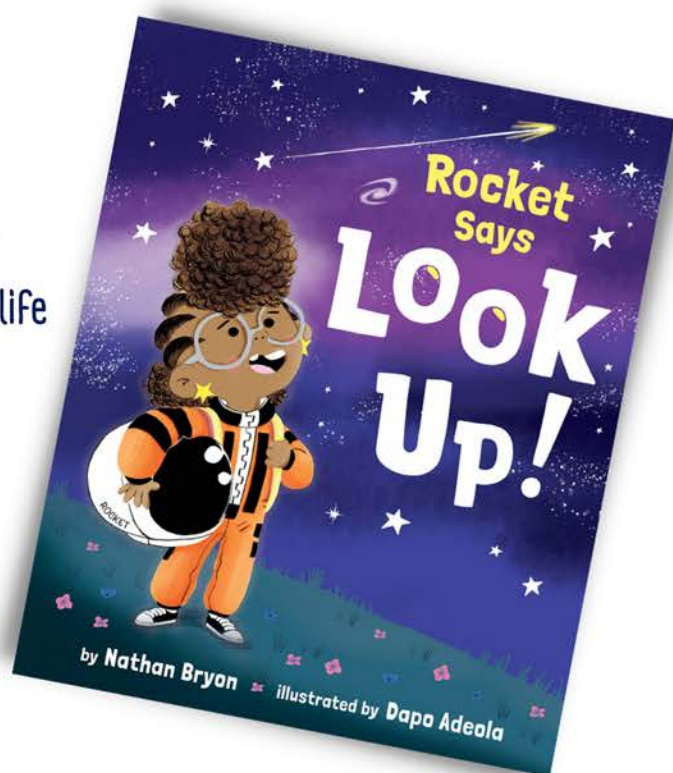
The Schools' Observatory use the wonders of space to inspire the next generation of scientists, programmers and engineers. They provide resources for schools, support for teachers and free use of the world's largest robotic telescope through their website, schoolsobservatory.org.

The Schools' Observatory is proud to be part of Liverpool John Moores University and are based in LJMU's Astrophysics Research Institute in Liverpool, UK.

In partnership with Durham Book Festival's Little Read, The Schools' Observatory have created packs of themed resources for Early Years Foundation Stage children. These can be used at home or in nursery settings to engage children with the story, "Look up" by Nathan Bryan.

The main character in "Look up" is Rocket. Rocket is going to be the greatest astronaut, star-catcher, space-traveller who ever lived! Rocket is totally prepared for her future. She has "defied gravity... captured rare and exotic life forms... and built a ship to the stars!"

This pack of activities focuses on the topic of astronauts. Rocket refers to floating in space like an astronaut as having "defied gravity".



This booklet has information for you on pages 3 to 8, ideas for activities to do with the children on pages 9 to 14 and finally additional resources and weblinks we think you might be interested in on pages 15 to 17.

Astronauts: Contents

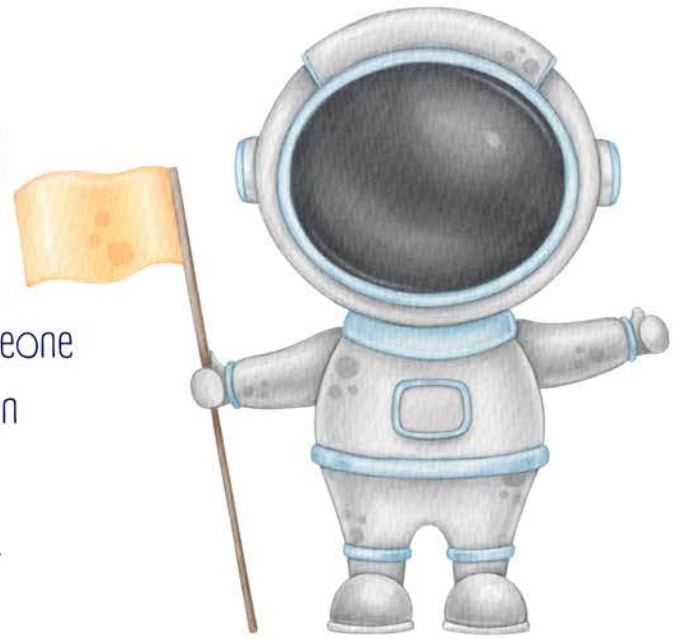
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Please note: the images used in this document are not to scale.

What is an astronaut?

Astronauts are people who travel to space. They have usually had years of special training.

The word 'astronaut' means 'star sailor'. Various parts of the world have different words for someone who travels to space. Europe, America, and Japan use the word 'astronaut'. Russia uses the word 'cosmonaut' and China uses the word 'taikonaut'.



How many people have been to space?

More than 500 people have been to space. Those men and women have come from over 40 countries, including the UK. The first person to travel to space was the Russian cosmonaut, Yuri Gagarin in 1961. The first woman to travel to space was Valentina Tereshkova in 1963. British astronauts include Helen Sharman and Tim Peake.

Where have astronauts been in space?

The first astronauts orbited the Earth for several days before returning home. In 1969, Neil Armstrong and Buzz Aldrin were the first people to walk on the Moon as part of the Apollo mission. In total, 12 astronauts have visited the Moon. Astronauts have not been to any other moons or planets.

Since the 1970s, astronauts have visited and lived on space stations. These are spacecraft in orbit around the Earth which provide a place for astronauts to stay for days or even months. British astronaut, Helen Sharman, visited the MIR space station. British astronaut, Tim Peake, stayed on the International Space Station (ISS).

Astronauts

Currently, the ISS is the only space station which always has an astronaut on board. There has always been someone staying on the ISS since November 2000. The ISS is 400 km above the Earth's surface. It travels around the Earth 16 times a day! Astronauts live and work on the ISS in groups. The ISS is larger than a 6-bedroom house which means several astronauts can stay there at once. Astronauts travel to the ISS in a rocket. They return to Earth in a space capsule.

You can learn more about travelling to space using our Rocket Activity Pack.

What do astronauts do in space?

Astronauts go to space to do their job. Their job might be doing science experiments, making improvements to a space station, or collecting rocks from the Moon!

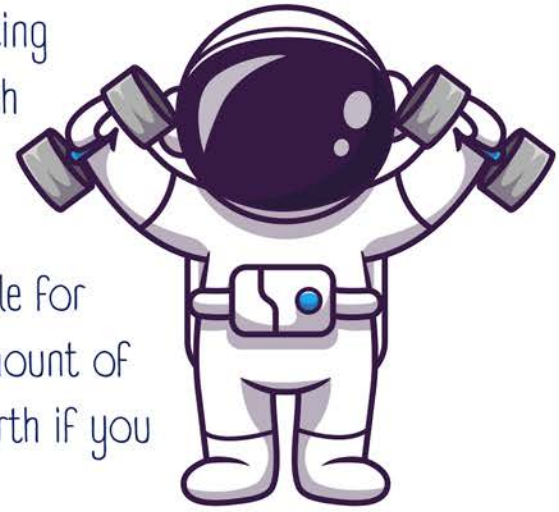
Sometimes astronauts get to go on a 'space walk'. This is when an astronaut leaves the space station or spacecraft while they are in space. Astronauts must wear their space suits when they are on a space walk. These walks are also called EVAs – Extra Vehicular Activities.

Astronauts must also eat, rest, exercise, and keep themselves and their living spaces clean. They spend their free time sending messages to their family, playing games, reading books, and listening to music. Many astronauts have said their favourite way to spend time is watching the Earth through the spacecraft windows.



What is it like living in space?

Astronauts on the ISS have to get used to everything floating around, including water! This makes it a bit difficult to wash and shower. They also have to use a special space toilet!



Astronauts have to live in a small space with the same people for months at a time. They are only allowed to take a small amount of personal luggage with them. And you can't pop back to Earth if you forget something!

Astronauts need to keep healthy while they are in space. They exercise for over 2 hours every day using special exercise machines. They make sure they have a balanced diet and eat 3 meals a day. There is equipment for heating food but there is no fridge on the space station. Because there isn't a fridge, food is kept in packets or dried to make sure it doesn't go bad. They can add water to some food or drink powder to rehydrate it.

Astronauts can choose from many types of foods like fruit, nuts, peanut butter, chicken, beef, seafood, cakes. They can also choose to drink coffee, tea, or fruit juice. Astronauts tend to eat tortilla wraps rather than bread. This is because bread makes too many crumbs which could float into astronauts' eyes or into the equipment!

Why do astronauts wear spacesuits?

Spacesuits protect astronauts in space. They are like a tiny spacecraft for each astronaut. A spacesuit provides all things an astronaut needs to survive. They contain oxygen to breathe, water to drink, and they stop the astronaut from getting too hot or cold. The suit also protects the person inside from getting hurt by fast-moving space dust. Space helmets contain special gold-line visors to protect astronauts' eyes from sunlight. Some spacesuits have a small jetpack. If an astronaut floats away from the space station, they can use the jetpack to safely float back.

Spacesuits contain several parts. There is a helmet, gloves, a section for upper body and arms, and a section for lower body, legs and feet. Astronauts wear a stretchy bodysuit under the hard space suit. The bodysuit contains tubes which allow water to flow around the astronaut, keeping their body cool. Space suits contain materials like mylar (often used on Earth for emergency first-aid blankets) and Gore-Tex (often used on Earth in waterproof shoes and clothing). Astronauts usually have a mission patch sewn onto their spacesuit. Each mission has its own patch which symbolises the goal of the mission.

There is also a kind of backpack called a life support system (LSS). The LSS contains the water, oxygen, and power for the suit. It also removes the carbon dioxide which the astronaut breathes out and keeps the suit at a safe pressure.

Astronauts sometimes have to spend a long time wearing their spacesuits. Spacewalks can take hours. They also need to be the rocket a long time before take-off. To avoid any nasty accidents, astronauts wear a 'Maximum Absorbency Garment' under their spacesuit – it's like a really big nappy!

Why do astronauts float in space?

On space stations, the crew live in microgravity which means everything floats! This happens because the station is in free fall around the Earth. Everything inside falls at the same rate – it does not matter how much mass it has. The station, its crew, and any objects on board fall together. So if you are inside, everything floats with you.

But there is still gravity in space. Space stations fall around the Earth because of gravity and momentum. The high speed the space station is travelling at gives it a lot of momentum. Its momentum wants to carry it off into space in a straight line. The Earth's gravity pulls it back towards the Earth. The constant tug of war between these forces creates a curved path called an orbit.

Astronauts did not float on the Moon. This is because there is gravity on the Moon. However, the gravity is much weaker on the Moon compared to the Earth. This meant the astronauts could bounce around easily because they felt lighter.

How do you become an astronaut?

Astronauts are usually experts in science. They often have experience flying planes. Astronauts also need to be physically fit. Most astronauts can speak English and Russian. They must also be willing to travel away from their families for long periods of time.

If someone has all or most of these qualities, they may be selected to be an astronaut. They will then have to go through years of training before they are ready to carry out a space mission.

More recently, people have gone to space as space tourists. Space tourists do not have to be as skilled as astronauts. However, they do have to pay very large amounts of money for a trip to space!

Have animals been to space?

Yes, animals have been to space. The first living things in space were two fruit flies! In the 1950s, the USA and USSR sent lots of animals to space. These included mice, monkeys, rabbits, cats, and dogs. Scientists were testing if the creatures could survive the journey. Some test animals survived, but sadly not all.

Animals are still sometimes sent to the ISS to test the effects of floating. These are usually small animals like frogs, worms, or insects. Today there are more laws to make sure that animals are cared for in space.



Feedback

We welcome feedback from practitioners. If you want to let us know how much your children have enjoyed our activity or how we could improve it, please send us some feedback using the details below:

Share your astronaut creations with The Schools' Observatory!
Email SchoolsObs@ljamu.ac.uk or tag [@SchoolsObs](https://www.instagram.com/SchoolsObs) on social media.

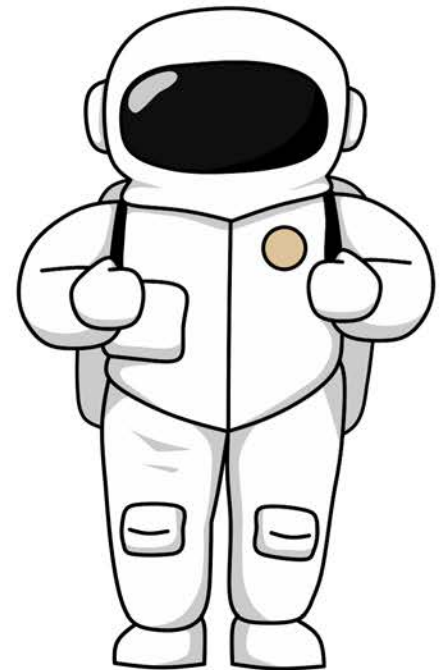
Astronauts: Activities

How to introduce the topic of astronauts

- Use the 'Look Up' story – ask the children what they think it would be like travelling to space. Do they know the names of anyone who has been to space?
- Ask children what they know about astronauts
- Put out any books you have featuring astronauts
- Show the children videos and pictures of people in space
 - Use our Additional Resources from page 15

Activity 1 – Pack your bag for space

What do astronauts need to take with them to space? Can they just pop to the shop if they forget something? What if there is an emergency? Are there things they need to take that we usually have with us on Earth (air/oxygen)? Are there things we use on Earth that wouldn't work in space (think about floating)?



- Put out a selection of items. Include items essential to space travel - like food, water, air tank (this can just be an empty bottle labelled air tank), medical equipment - as well as items which are less essential.
- Ask children to select items to take to space – they can put them in a bag or rucksack if you have one.
- Encourage children to explain their choices and think about how they would use the item in space.
- Explain that astronauts can only take a limited amount of stuff with them to space.
- Challenge children to choose only 5 items from those they originally selected. The rest they must leave behind.
- Encourage children to select items which would be most important in space.

Activity 2 – Create a healthy astronaut meal

Food sent to space is specially packed and stored so that it stays fresh for a long time (there are no fridges or freezers in space!). Ask children to use cut out pictures of food items or toy food to assemble a healthy meal for an astronaut. Children must think about the following things:

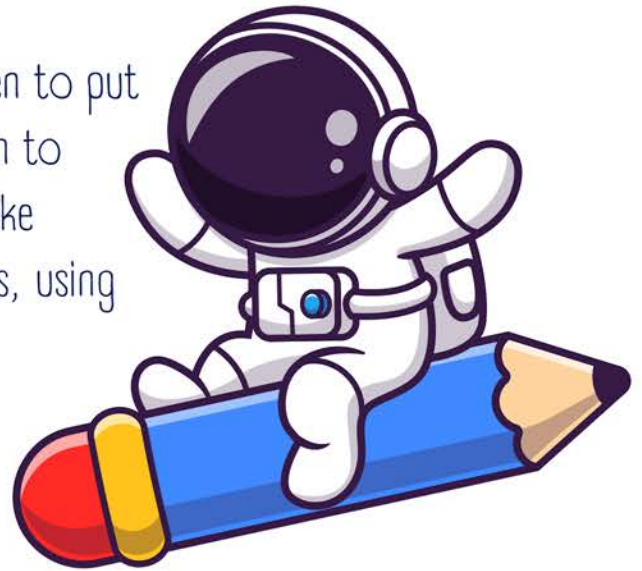
- Astronauts need to be able to eat the meal while everything is floating
- The food shouldn't make crumbs – they might damage the space station
- It must be a healthy, balanced meal
- It needs to taste nice!



Activity 3 – Astronaut challenge

Astronauts have to carry out experiments while everything is floating. They also have to maintain and fix parts of the space station while wearing bulky space suits. Challenge the children to carry out tasks like an astronaut.

- Mimic wearing a space suit by asking the children to put on a thick coat and big gloves. Ask the children to carry out tasks that require fine motor skills like stacking blocks, holding a pencil, using scissors, using play dough, doing up a zip or fastening.
- Mimic a floating environment using a tank of water. Ask children to move small items from one lidded pot to another, while keeping the pots underwater. You might want to give the children tools to help with this task, like a net, large spoon or gripping tongs.



Activity 4 - Exploring space suit materials

Space suits are made of special materials to protect the astronauts in space. The materials must be strong, keep the astronauts at a good temperature, and let the astronauts move about.

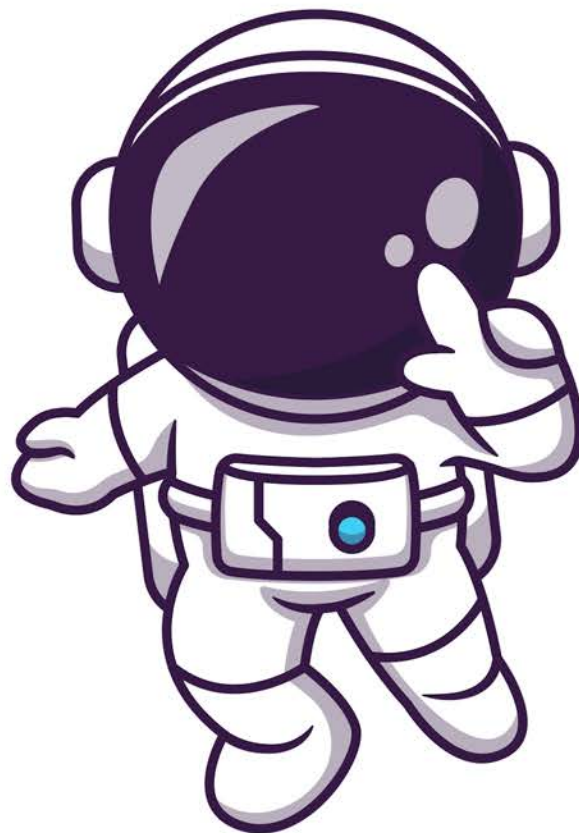
- Put out a selection of different materials. Try to include reflective material like foil, warm or insulating material, material that will or won't rip, waterproof material, absorbent material.
- Children explore materials and choose those they think would make the best space suit.
- They could dress themselves or toys up in the materials, ready for space!



Activity 5 - Move like an astronaut

Astronauts on the Moon do a funny hopping run. This is for several reasons: there is not as much gravity on the Moon so they feel lighter; there is no air pushing down on them; they are wearing bulky space suits. All this means if they tried to take normal steps they might accidentally fly up into the air and fall over.

- Children can watch videos of astronauts on the Moon and try to mimic the way they move.
 - We have included some in the Additional Resources from page 15.
- Children can walk in sand and leave footprints like astronauts did in the dust on the Moon.
- You can tie sponges to the bottom of children's shoes with string or elastic bands. This simulates moving on the Moon in a bouncy way.



Astronauts: Activities

Communication, Language, Emotions

Astronauts must work as a team and follow rules to stay space. They are away from home for a long time, staying in a small space with the same few people so they must manage their emotions.

- Ask children to name emotions that astronauts may feel in space.
- Ask children to think about how astronauts could help another astronaut who was feeling sad, angry, or lonely.
- Children collaborate to create rules for your 'space station' (i.e., learning environment)

Art & Design ideas

Display images of astronauts on the International Space Station and Apollo astronauts on the Moon. We've included links to some examples in the Additional Resources from page 15.

- make a space station from junk materials
- dress up as an astronaut
- create a space helmet
- create a mission badge (see page 17)

Astronauts: Additional Resources & Web Links

Word Bank

astronaut	gravity	space station
balanced diet	healthy	space suit
exercise	material	space walk
experiments	mission	space
float	Moon	

Videos of Astronauts

This collection of videos contains UK astronaut, Tim Peake's answers to children's questions about being in space:

www.stem.org.uk/resources/elibrary/resource/496449/ask-astronaut-tim-peake

Views of space

Earth from the International Space Station

www.youtube.com/watch?v=XBPjVzSoepo

Pictures of the International Space Station

www.nasa.gov/mission_pages/station/images/index.html

Earth from the Moon

www.nasa.gov/image-feature/earth-rising-over-the-moons-horizon

Astronauts: Additional Resources & Web Links

The Schools' Observatory Website

You can use The Schools' Observatory website to search for more information about space missions. We think these are good places to start learning:

www.schoolsobservatory.org/search/



Apollo Missions

Buzz Aldrin

Helen Sharman

Neil Armstrong

The International Space Station

The Mir Space Station

Valentina Tereshkova

Yuri Gagarin

Astronauts: Additional Resources & Web Links

In the Space Station

Pizza night on the Space Station

www.youtube.com/watch?v=z74OwRy8o9I

Space Food

www.youtube.com/watch?v=AZxORIV0wss

Washing your hair in space

www.youtube.com/watch?v=uljNfZbUYu8

Brushing your teeth in space

www.youtube.com/watch?v=3bCo6C532p8

Exercising in space

www.youtube.com/watch?v=ikouWcXhd0

Tennis in space

www.youtube.com/watch?v=uE4k4P1nKuk

Using the toilet in space

www.youtube.com/watch?v=C-65mBQ7s_Q

Getting ill in space

www.youtube.com/watch?v=goZM9NbH_40

Sleeping in space

www.youtube.com/watch?v=UyFYgeE32f0

Astronauts: Additional Resources & Web Links

On the Moon

Images from the Apollo missions

www.nasa.gov/mission_pages/apollo/images.html

Videos from the Apollo Missions

www.nasa.gov/specials/apollo50th/videos.html

Driving on the Moon

www.youtube.com/watch?v=NRqHubCtKmE

Footage of Apollo 11 – the first crewed mission to the Moon

www.youtube.com/watch?v=M9uHmRFmr4

Apollo 11 Moonwalk

www.youtube.com/watch?v=hxPbnFc7iU8

Astronauts: Additional Resources & Web Links

Mission Badges

Each crewed spaceflight has its own mission badge. This is usually worn as a patch by astronauts on their space suits.

The UK astronaut, Tim Peake flew on the Principia Mission. The mission badge was designed by a British school pupil who won a competition on the children's TV programme, Blue Peter. NASA's mission badges are often designed by the astronauts. The astronauts choose pictures, colours, and symbols that explain the importance of the mission and represent each of the astronauts on the team.

Archive of NASA mission patches

https://history.nasa.gov/mission_patches.html

European Space Agency mission patches

[www.esa.int/About Us/ESA history/European human spaceflight patches](http://www.esa.int/About_Us/ESA_history/European_human_spaceflight_patches)